Introduction to
INTERNATIONAL
DISASTER
MANAGEMENT

DAMON P. COPPOLA

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Introduction to International Disaster Management

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Introduction to International Disaster Management

Damon P. Coppola

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Dedicated to the men and women, professional and volunteer alike, working to ensure that even the poorest nations of the world are resilient to the consequences of disasters.

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Foreword

Damon Coppola's book is a major contribution to understanding the universal principles of emergency management. Had it been available in 1978, it would have helped me become a better emergency manager. I joined the Office of US Foreign Disaster Assistance (OFDA) in 1978 after serving three years in Viet Nam and a year in Ghana with the development program of the Agency for International Development. My qualifications were that I had common sense and street smarts because I survived Viet Nam, had traveled the world, and worked in Africa. If I applied for the same disaster job today with those qualifications, I would be rejected, fortunately.

Today's emergency managers have a wealth of information available to them and can benefit from the many academic courses offered to build a solid foundation of expertise in disaster preparedness and response. This know-how can aid them in their profession and strengthen their decision-making capability. Damon has compiled an impressive collection of facts, statistics, and checklists that can help a motivated person become a skilled emergency management technician. The chapter on Special Considerations is an insightful look at future challenges and possible solutions. His lessons, combined with field experience and good mentoring, can transform a technician into a competent professional. Insights gained through experience and difficult decision making are how one becomes a leader in the struggle against disasters.

Patterns emerge as I look back on 46 years of international experience, including 28 years and 375 disasters. Leadership and politics play an inordinate role in disaster planning and response internationally as well as in the USA. The recent failures following Hurricane Katrina were predictable, not only because of the known vulnerability of the Gulf Coast, but also because of ineffective leadership. The appointment of

political supporters with no emergency management experience and weak interpersonal skills was a formula for failure. Unfortunately, it is always the disaster victims who pay the price of inept leadership and flawed decision making.

The Office of US Foreign Disaster Assistance (OFDA) and the Federal Emergency Management Agency (FEMA) have been rivals for years, the smaller OFDA wary of the larger FEMA. However, it was OFDA's smallness, its clear mandate, a short chain of command, and almost unlimited resources that enabled OFDA to become so successful and well-known in the 1980s and early 1990s.

OFDA's other critical ingredient for success was leadership. Outstanding leaders willing to take risks to assist disaster victims worldwide were appointed. OFDA's directors—Julia Taft, Julius Becton, and Andrew Natsios—were experienced managers and self-confident individuals who hired strong, experienced, and creative international disaster leaders and then took their advice. Fred Cuny battled the bureaucracy as much as he fought disaster threats. Paul Bell developed a cadre of Latin American emergency managers whose influence has transcended him. Bob Gersony, the remaining OFDA genius, plumbed the depths of many complex international situations to bring clear action recommendations to OFDA directors.

All disasters are local, but also political. Internationally, political influences take different forms than the political aspects in domestic disasters. OFDA prided itself on being "nonpolitical" and responding to all victims' needs. One example, the rapid and generous USG response to the El Asnam earthquake in Algeria (1980), has been cited by some as the reason that the Government of Algeria offered to negotiate the return of the U.S. hostages held by Iran. The only exception to nonpolitical assistance that I experienced was the failure of the USG to respond to a major

hurricane in Sandanista-ruled Nicaragua (1992). Despite severe damage to the eastern coast of Nicaragua, populated primarily by Misquito Indians friendly to the U.S., the Reagan administration refused to allow the U.S. Embassy to declare a disaster. A declaration would have enabled OFDA to provide immediate assistance to needy hurricane victims.

As Damon documents, international disaster programs have had a significant influence on U.S. emergency management. Most well-known of these is the US Urban Search and Rescue Program (USAR Task Forces from Fairfax County, Virginia, and Metro Dade County, Miami, Florida), which was developed by OFDA. FEMA developed and expanded the teams into more than 25 USAR Task Forces that respond to disasters in the United States.

The probability forecasting system used by the National Hurricane Center originated with a U.S. Navy system supported by OFDA to alert and warn vulnerable populations through U.S. embassies around the world. The Bangladesh early warning system, funded by OFDA and enhanced by others, continues to save thousands of lives.

The management of spontaneous donations (Chapter 6), is a continuing problem after U.S. and international disasters. Recognized by OFDA and FEMA in the 1980s, nongovernmental organizations and the USG designed activities to educate potential donors and provided guidance to disaster-stricken country embassies. Today, the Center for International Disaster Information (CIDI) and InterAction work with FEMA, NVOAD members, and the Business Civic Leadership Center (U.S. Chamber of Commerce) to educate donors and foster cooperation to better manage offers of goods, services, and spontaneous volunteers.

Despite the similarities between U.S. and international disaster needs and principles, there is limited cooperation between U.S. emergency managers working on domestic activities and U.S. emergency managers working on international programs. Although international coordination and the role of the United Nations described in Chapter 10 has improved cooperation, significant gaps remain between domestic and international emergency management programs in many donor countries. Damon's excellent use of universally recognized approaches may successfully forge more cooperation as both adherents recognize that they are using similar templates.

James Lee Witt, FEMA's famous and successful director, provided valuable guidance for emergency managers worldwide: "... *we need to take a common-sense, practical approach to reducing the risks we face and protecting our citizens and our communities.*

"We need to identify our risks, educate and communicate to our people about those risks, prepare as best we can for the risks, and then, together, form partnerships to take action to reduce those risks. This approach applies whether we are dealing with a flood, a tornado, a hazardous materials spill, a wildfire, a potential suicide bomb explosion, or a pandemic flu outbreak."

Good luck to the next generation. You will need to learn the basics and be willing to withstand the constraints of a bureaucracy. Perhaps you will be as lucky as I have been and work for outstanding leaders and with courageous colleagues. You will need all this book can provide and lots of personal courage.

Thanks, Damon, for a good start.

Ollie Davidson
Private-Public Partnerships for Disaster
Loss Reduction

Acknowledgments

The author would like to express profound gratitude to George Haddow and Jane Bullock for sharing their invaluable expertise and experience—much of which is dispersed throughout the pages of this text—and for their friendship and constant support. Special thanks also go to Dr. Jack Harrald, Dr. Greg Shaw, Dr. J. René van Dorp, and Dr. Joseph Barbera of the Institute for Crisis, Disaster, and Risk Management at the George Washington University, to Ollie Davidson of Counterpart International and the Humane Society of America, and to Dr. Robert McCreight. Their research, practice, publications, and experience, which have unquestionably made the world safer from the consequences of disasters, served as both a resource and an inspiration in the writing of this text.

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Introduction

The basis for the writing of this book is the juncture of two separate trends: (1) All countries face increased risk from a full range of known and previously unknown hazards; and (2) disaster consequences are having greater adverse effects on populations and environments. To the degree that they are able to, governments pass legislation and take action to prepare for and mitigate the effects of these natural, technological, and intentional hazards. Despite even the best efforts, however, the fury of nature or the folly of man regularly results in disastrous events that overwhelm not only local response capacities but also the response capacities of entire nations or even entire regions. When this happens, the full range of players from the international community is called on to intervene, requiring international disaster management.

The international response to disasters is convoluted, at times chaotic, and always complex. Every country has its own hazard profile, vulnerability fluctuation, and evolution or demise of emergency management systems, as well as unique cultural, economic, and political characteristics. Each of these qualities influences the country's interaction with international disaster management agencies and organizations.

Disaster management as a practice and as a profession is rapidly expanding and improving. Such change is necessarily driven by the modern needs of governments and nongovernmental organizations involved in one or more of the four phases of emergency management—mitigation, preparedness, response, and recovery.

This book was written to serve as a guide and a reference for students, practitioners, and anyone interested in disaster management and its application to the international community.

Chapter 1 provides a general background on the impact and management of disasters worldwide. Included in this discussion is a brief history of emergency management. Several of the issues unique to international disaster management are touched upon, while in-depth coverage is included in later chapters. Finally, several key terms are defined and discussed.

Chapter 2 addresses hazards. The various natural, technological, and intentional hazards are defined, and disaster-specific information is provided. Where applicable, the threat ranges of hazards are illustrated with charts, maps, and other figures.

Chapter 3 examines the existence and assessment of vulnerability and risk. The disparity in these values between countries in relation to their variable levels of wealth is addressed in detail, as is risk perception, an important and influential component of vulnerability and risk.

Chapter 4 covers the mitigation of hazard risk. Mitigation is explained and then followed by definitions and examples of forms of structural and nonstructural mitigation. Insurance, as a mitigation option, is addressed. Finally, various obstacles to effective mitigation are identified and explained.

Chapter 5 addresses disaster preparedness. A general overview of preparedness is followed by several practical topics, including communications, social marketing, training, animals in disasters, public warning, and preparedness obstacles.

Chapter 6 examines the very complex response to international disasters. Following an overview of response, topics addressed include recognition of disasters, disaster assessments, the various components of disaster response (including search and rescue, the provision of food, water, and medical supplies, shelter, sanitation, social services, security, evacuation and relocation, medical treatment, and fatality management), and coordination, among many others.

Chapter 7 covers the recovery period following the disaster response. Components of disaster recovery

addressed include the opportunity factor, sustainability, reconstruction of infrastructure, debris removal, rebuilding homes and lives, economic recovery, debt relief, and other related issues.

Chapters 8 through 10 discuss the various players involved in the management of international disasters. These include governmental disaster management agencies (Chapter 8), nongovernmental organizations (Chapter 9), and the various multilateral organizations and international financial institutions (Chapter 10).

The concluding chapter (Chapter 11) discusses several special topics that must be considered in the management of international disasters. These include coordination, minimum standards, sovereignty, capacity building, equality in distribution of relief, terrorism, emerging epidemics, funding, and the future of international disaster management.

Acronyms

ADA—Afghan Development Association

ADB—Asian Development Bank

ADPC—Asian Disaster Preparedness Center

ADRA—Adventist Development and Relief Agency

ADRC—Asian Disaster Reduction Center

AfDB—African Development Bank

AFRO—WHO Regional Office for Africa

ALNAP—Active Learning Network for Accountability and Performance in Humanitarian Action

APELL—Awareness and Preparedness for Emergencies at a Local Level (UNEP)

ARC—American Red Cross

ATF—Asian Tsunami Fund (ADB)

AusAID—Australian Agency for International Development

BCP—business continuity planning

BCPR—Bureau of Crisis Prevention and Recovery (UNDP)

BIS—Bank for International Settlements

BLS—basic life support

BSTDB—Black Sea Trade and Development Bank

CAP—consolidated appeals process

CARICOM—Caribbean Community

CAT Bonds—catastrophe bonds

CBRNE—chemical, biological, radiological/nuclear, and explosive

CCSDPT—Committee for Coordination of Services to Displaced Persons in Thailand

CDB—Caribbean Development Bank

CDC—Centers for Disease Control and Prevention (US)

CDERA—Caribbean Disaster Emergency Response Agency

CDMP—Caribbean Disaster Mitigation Project (OAS)

CECIS—Common Emergency Communication and Information System (EU)

CEE—Central and Eastern Europe

CENTCOM—United States Central Command (DoD)

CERF—Central Emergency Response Fund (UN)

CEO—chief executive official

CEPREDENAC—Coordination Center for Natural Disaster Prevention in Central America

CF—Canadian Forces

CHAMP—Caribbean Hazard Mitigation Capacity Building Program (OAS)

CHAP—common humanitarian action plan

CHE—complex humanitarian emergency

CHF—Cooperative Housing Foundation (El Salvador)

CIA—Central Intelligence Agency (US)

CIDA—Canada International Development Agency

CIMIC—civil/military information center

CIS—Commonwealth of Independent States

CMCC—civil/military coordination center

CMI—crop moisture index

CMOC—civil–military operations center (DoD)

CMR—crude mortality rate

COEB—Council of Europe Development Bank

COEN—National Emergency Committee for El Salvador

CONRED—Committee for the Reduction of Natural and Man-Made Disasters (Guatemala)

CRD—Coordination and Response Division (UNOCHA)

DAC—Development Assistance Committee (OECD)

DACAAR—Danish Committee for Aid to Afghan Refugees

DART—Disaster Assistance Response Team

DBSA—Development Bank of Southern Africa

DC—District of Columbia (US)

DEMA—Danish Emergency Management Agency

DERC—Deputy Emergency Relief Coordinator (UN)

DESA—Department of Economic and Social Affairs (UN)

DHA—Department of Humanitarian Affairs (UNOCHA)

DHF—dengue hemorrhagic fever

DIPECHO—Disaster Preparedness ECHO

DFAA—Disaster Financial Assistance Arrangements (Canada)

DFID—Department for International Development (Great Britain)

DMP—Disaster Management Programme (UNHABITAT)

DMTP—Disaster Management Training Programme (DMTP)

DoD—Department of Defense (US)

DPCSS—Disaster, Post-Conflict and Safety Section (UNHABITAT)

DPKO—Department of Peacekeeping Operations (UN)

DRA—Deployment Requirements Assessment Team (UN)

DREF—Disaster Relief Emergency Fund (IFRC)

DRM—Disaster Response and Mitigation Division (OFDA)

DRRP—Disaster Reduction and Recovery Programme (UNDP)

DRS—Donor Relations Section (UNOCHA)

DRU—Disaster Reduction Unit (UNDP)

EAS—emergency alert system

EBRD—European Bank for Reconstruction and Development

ECA—Economic Commission for Africa (UN)

ECE—Economic Commission for Europe (UN)

ECHA—Executive Committee on Humanitarian Affairs (UN)

ECHO—European Commission Humanitarian Organizations

ECLAC—Economic Commission for Latin America and the Caribbean (UN)

EIC—Emergency Information and Coordination Support Unit (UNDP)

EMA—Emergency Management Australia

EMOP—Emergency Operation (WFP)

EMOPS—Office of Emergency Programmes (UNICEF)

EMRO—WHO Regional Office for Eastern Mediterranean

EMS—emergency medical services

EMT—emergency medical technician

EOC—emergency operations center

EOP—emergency operations plan

EPA—Environmental Protection Agency (US)

EPF—Emergency Programme Fund (UNICEF)

EPRO—Emergency Preparedness and Response Officers (UNHCR)

EPRS—Emergency Preparedness and Response Section (UNHCR)

ERC—Emergency Relief Coordinator (UN)

ERD—Emergency Response Division (UNDP)

ERL—Emergency Recovery Loan (WB)

ERU—Emergency Response Unit (IFRC)

ESB—Emergency Services Branch (UNOCHA)

ESCAP—Economic and Social Commission for Asia and the Pacific (UN)

ESCWA—Economic and Social Commission for Western Asia (UN)

ETESP—Earthquake and Tsunami Emergency Support Project (ADB)

EUCOM—United States European Command (DoD)

EURO—WHO Regional Office for Europe

FACT—Field Assessment and Coordination Team (IFRC)

FANR—Food, Agriculture, and Natural Resources Directorate (SADC)

FAO—Food and Agriculture Organization (UN)

FARC—Revolutionary Armed Forces of Colombia

FBI—Federal Bureau of Investigation (US)

FCSS—Field Coordination Support Section (UNOCHA)

FCSU—Field Coordination Support Unit (UNOCHA)

FEMA—Federal Emergency Management Agency (US)

FEMID—Strengthening of Local Structures for Disaster Mitigation (CEPREDENAC)

FFP—United States Office of Food for Peace

FHA—Foreign Humanitarian Assistance (DoD)

FIMA—Federal Insurance and Mitigation Administration (US)

FIRM—flood insurance rate map (US)

FONDEN—Fund for Natural Disasters (Mexico)

GDP—gross domestic product

GESI—Global Earthquake Safety Initiative (UN)

GIS—Geographic Information System

GIST—Geographic Information Support Team (UNOCHA)

HAC—Health Action in Crisis Department (WHO)

HACC—humanitarian assistance coordination center

HAO—Humanitarian Assistance Operations (DoD)

HAP-I—Humanitarian Accountability Project

HAST—Humanitarian Assistance Survey Team (DoD)

HAZMAT—hazardous materials

HAZUS—Hazards U.S.

HAZUS-MH—Hazards U.S., Multi-Hazard

HC—Humanitarian Coordinator (UN)

HEB—Humanitarian Emergency Branch (UNOCHA)

HIC—humanitarian information center

HMU—Hazard Management Unit (WB)

HOC—humanitarian operations center

IACNDR—Inter-American Committee for Natural Disaster Reduction (OAS)

IADB—Inter-American Development Bank (also called IDB)

IAP—incident action plan

IASC—Inter-Agency Standing Committee

IATF/DR—Inter-Agency Task Force for Disaster Reduction (UN)

IBRD—International Bank for Reconstruction and Development (WBG)

IC—incident commander

ICRC—International Committee of the Red Cross

ICS—incident command system

ICSID—International Centre for Settlement of Investment Disputes (WBG)

ICVA—International Council for Voluntary Organizations

IDA—International Development Association (WBG)

IDB—Inter-American Development Bank (see IADB)

IDB—Islamic Development Bank

IDNDR—International Decade for Natural Disaster Reduction (UN)

IDP—internally displaced person

IDRL—International Disaster Response Law Project (IFRC)

IED—improvised explosive device

IEFR—International Emergency Food Reserve (WFP)

IETC—International Environmental Technology Center (UNEP)

IFC—International Finance Corporation (WBG)

IFI—international financial institution

IFRC—International Federation of Red Cross/Red Crescent Societies

ILO—International Labour Organization

IMF—International Monetary Fund

IMTF—Inter-Agency Medical/Health Task Force (WHO)

INEE—Interagency Network for Education in Emergencies (UNICEF)

INNED—International Network of NGOs for Emergency and Development

INSARAG—International Search and Rescue Advisory Group

IO—international organization

IOM—International Organization for Migration (UN)

IRA—Irish Republican Army

IRA—Immediate Response Account (WFP)

IRIN—Integrated Regional Information Networks (UNOCHA)

IRU—International Relief Union

ISDR—International Strategy for Disaster Reduction (UN; also called UNISDR)

ISS—International Social Service

ITU—International Telecommunications Union (UN)

JRS—Jesuit Refugee Service

JTF—Joint Task Force (DoD)

MAC—Mines Advisory Group

MCDU—Military and Civil Defense Unit (UNOCHA)

MIC—Monitoring and Information Centre (EU)

MIGA—Multilateral Investment Guarantee Agency (WBG)

MMI—Modified Mercalli Intensity

MoNE—Ministry of National Education (Indonesia)

MRE—Meal Ready to Eat

MSF—Medicin sans Frontiers (Doctors Without Borders)

MUAC—mid-upper arm circumference

NADB—North American Development Bank

NATO—North Atlantic Treaty Organization

NCCI—NGO Coordination Committee in Iraq

NCCNI—NGO Coordinating Committee for Northern Iraq

NFIP—National Flood Insurance Program (US)

NFIRA—National Flood Insurance Reform Act (US)

NHP—Natural Hazards Project (OAS)

NIM—National Institute of Meteorology (US)

NGHA—nongovernmental humanitarian agency

NGO—nongovernmental organization

NOAA—National Oceanographic and Atmospheric Administration (US)

NORTHCOM—United States Northern Command (DoD)

NTHMP—National Tsunami Hazard Mitigation Program

NWS—National Weather Service (US)

NZAID—New Zealand Aid and Development Agency

OCIPEP—Office of Critical Infrastructure Preparedness and Emergency Preparedness (Canada)

OECD—Organization for Economic Cooperation and Development

OFDA—Office of Foreign Disaster Assistance (US)

OIE—World Organization for Animal Health

OSOCC—on-site operations coordination center

OTI—United States Office of Transition Initiatives

PACOM—United States Pacific Command (DoD)

PAHO—Pan American Health Organization

PEPPER—pre-event planning for post-event recovery

PGDM—Post-Georges Disaster Mitigation (OAS)

PINF—People in Need Foundation

PIO—public information officer

PLO—Palestinian Liberation Organization

PPE—personal protective equipment

PPEW—Platform for the Promotion of Early Warning (UN)

PRCS—Pakistan Red Crescent Society

PRGF—Poverty Reduction and Growth Facility (IMF)

PRM—Department of State Bureau of Population, Refugees and Migration (US)

PSEPC—Public Safety and Emergency Preparedness Canada

PTSD—post-traumatic stress disorder

PVC—polyvinyl chloride

PVO—private voluntary organization

QIP—Quick Impact Projects Initiative (UNHCR)

RCB—Response Coordination Branch (UNOCHA)

RD—Regional Director (PSEPC)

RDD—radiological dispersion device

RDRT—Regional Disaster Response Teams (IFRC)

RELSTAT—Strengthening Local Structures and Early Alert Systems (CEPREDENAC)

RESIS—Reduction of Natural Disasters in Central America, Earthquake Preparedness and Hazard Mitigation (CEPREDENAC)

RETA—Regional and Technical Assistance (IMF)

REWU—Regional Early Warning Unit (SADC)

RFP—request for proposals

ROE—rules of engagement

RPG—rocket-propelled grenade

RMT—Response Management Team (OFDA)

RRSU—Regional Remote Sensing Unit (SADC)

SADC—Southern African Development Community

SADCC—Southern African Development Coordination Conference

SARS—severe acute respiratory syndrome

SCHR—Steering Committee for Humanitarian Response (UN)

SEAR—WHO Regional Office for South-East Asia

SEWA—Self-Employed Women's Association (India)

SFHA—Special Flood Hazard Areas (US)

SIDA—Swedish International Development Cooperation Agency

SMAUG—seriousness, manageability, acceptability, urgency, growth

SME—subject matter expert

SO—United States Department of Defense Office of Stability Operations

SOCOM—United States Special Operations Command (DoD)

SPR—Special Program Resources (UNDP)

STAPLEE—social, technical, administrative, political, legal, economic, environmental

START—simple triage and rapid transport

SOUTHCOM—United States Southern Command (DoD)

TAG—Technical Assistance Group (OFDA)

TCER—FAO Rehabilitation and Humanitarian Policies Unit

TCES—FAO Special Emergency Programmes Service

TCP—Technical Cooperation Programme (FAO)

TRANSCOM—United States Transportation Command (DoD)

TRT—Transition Recovery Team (UNDP)

UN—United Nations

UNAIDS—Joint United Nations Programme on HIV/AIDS

UNCCD—United Nations Convention to Combat Desertification

UNCRD—United Nations Centre for Regional Development

UNDAC—United Nations Disaster Assessment and Coordination

UNDMT—United Nations Disaster Management Team

UNDP—United Nations Development Programme

UNDRO—United Nations Disaster Relief Coordinator

UNEP—United Nations Environmental Programme

UNESCO—United Nations Educational, Scientific, and Cultural Organization

UNFPA—United Nations Population Fund

UNHABITAT—United Nations Human Settlement Programme (also called UN-Habitat)

UNHCHR—United Nations High Commissioner for Human Rights

UNHCR—United Nations High Commissioner for Refugees

UNHRD—United Nations Humanitarian Response Depot

UNICEF—United Nations Children's Fund

UNIFEM—United Nations Development Fund for Women

UNISDR—see ISDR

UNITAR—United Nations Institute for Training and Research

UNITES—United Nations Information Technology Service

UNJCL—United Nations Joint Logistics Center

UNMONUC—United Nations Mission in the Congo

UNOCHA—United Nations Office for the Coordination of Humanitarian Affairs

UNODC—United Nations Office on Drugs and Crime

USACOM—United States Atlantic Command (DoD)

USAID—United States Agency for International Development

USAR—urban search and rescue

USDA—United States Department of Agriculture

USFS—United States Forest Service

USGS—United States Geological Survey

USTDA—United States Trade and Development Agency

VOICE—Voluntary Organizations in Cooperation in Emergencies

WB—World Bank (UN)

WBG—World Bank Group (UN)

WFP—World Food Programme (UN)

WHO—World Health Organization (UN)

WMD—weapon of mass destruction

WMO—World Meteorological Organization (UN)

WPRO—WHO Regional Office for the Western Pacific

WWI—World War I

WWII—World War II

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1

The Management of Disasters

INTRODUCTION

Disasters have adversely affected humans since the dawn of our existence. In response, individuals and societies alike have made many attempts to decrease their exposure to the consequences of these disasters, developing measures to address initial impact, as well as post-disaster response and recovery needs. Regardless of the approach adopted, all of these efforts have the same goal: disaster management.

The motivating concepts that guide disaster management, namely the reduction of harm to life, property, and the environment, are largely the same throughout the world. However, the capacity to carry out this mission is by no means uniform. Whether due to political, cultural, economic, or other reasons, the unfortunate reality is that some countries and some regions are more capable than others at addressing the problem. But no nation, regardless of its wealth or influence, is so far advanced as to be fully immune from disasters' negative effects. Furthermore, the emergence of a global economy makes it more and more difficult to contain the consequences of any disaster within one country's borders.

This chapter will examine basic concepts of disaster management and expand upon those concepts to specifically address the management of international disasters. A brief history of disaster management is provided for context. To illustrate the disparity in the effects of disasters around the world, an examination of the global impact of disasters will follow. Finally, several relevant terms used throughout this text will be defined.

DISASTERS THROUGHOUT HISTORY

Disasters are not merely ornamental or interesting events that adorn our collective historical record—these disruptions have served to guide and shape it. Entire civilizations have been decimated in an instant. Time and time again, epidemics and pandemics have resulted in sizeable reductions of the world's population—as much as 50% across Europe during the 14th century bubonic plague ("Black Plague") pandemic. Theorists have even ventured to suggest that many of history's great civilizations, including the Mayans, the Norse, the Minoans, and the Old Egyptian Empire, were ultimately brought to their knees not by their enemies but by the effects of floods, famines, earthquakes, tsunamis, El Niño events, and other widespread disasters (Fagan, 1999). From our modern

TABLE 1-1   Selected Notable Disasters throughout History

Disaster	Year	Number killed
Mediterranean earthquake (Egypt and Syria)	1201	1,100,000
Shaanzi earthquake (China)	1556	830,000
Calcutta typhoon (India)	1737	300,000
Caribbean hurricane (Martinique, St. Eustatius, Barbados)	1780	22,000
Tamboro volcano (Indonesia)	1815	80,000
Influenza epidemic (world)	1917	20,000,000
Yangtze River flood (China)	1931	3,000,000
Famine (Russia)	1932	5,000,000
Bangladesh cyclone (Bangladesh)	1970	300,000
Tangshan earthquake (China)	1976	655,000

Source: St. Louis University, 1997; NBC News, 2004.

perspective, the consequences of the December 2004 tsunami events that struck throughout Asia seem almost inconceivable—over 300,000 people killed in a moment by a devastating wall of water—but this is not close to record-breaking, or even unique, in the greater historical context (see Table 1-1).

THE HISTORY OF DISASTER MANAGEMENT

ANCIENT HISTORY

Hazards, and the disasters that often result have not always existed. To qualify as a hazard, an action, event, or object must maintain a positive likelihood of affecting man, or possibly have a consequence that may adversely affect man's existence. Until humans existed on the planet, neither the likelihood nor the consequence factors of hazards were calculable, and thus their presence is negated.

With the appearance of man, however, followed the incidence of hazards and disasters. Archeological discovery has shown that our prehistoric ancestors faced

many of the same risks that exist today: starvation, inhospitable elements, dangerous wildlife, violence at the hands of other humans, disease, accidental injuries, and more. These early inhabitants did not, however, sit idly by and let themselves become easy victims. Evidence indicates that they took measures to reduce, or *mitigate*, their risks. The mere fact that they chose to inhabit caves is testament to this theory.

Various applications of disaster management appear throughout the historical record. The story of Noah's Ark from the Old Testament, for example, is a lesson in the importance of warning, preparedness, and mitigation. In this tale, believed to be based at least partly upon actual events, Noah is warned of an approaching flood. He and his family prepare for the impending disaster by constructing a floating ark. The protagonist in this story even attempts to mitigate the impact on the planet's biodiversity by collecting two of each species and placing them within the safety of the ark. These individuals are rewarded for their actions in that they survive the disastrous flood. Those who did not perform similar actions, the story tells us, perish.

Evidence of risk management practices can be found as early as 3200 BC. In what is now modern-day Iraq lived a social group known as the Asipu. When community members faced a difficult decision, especially one involving risk or danger, they could appeal to the Asipu for advice. The Asipu, using a process similar to modern-day hazards risk management, would first analyze the problem at hand, then propose several alternatives, and finally give possible outcomes for each alternative (Covello and Mumpower, 1985). Today, this methodology is referred to as *decision analysis*, and it is key to any comprehensive risk management endeavor.

Early history is also marked by incidents of organized emergency response. For example, when in AD 79 the volcano Vesuvius began erupting, two towns in its shadow—Herculaneum and Pompeii—faced an impending catastrophe. But although Herculaneum, which was at the foot of the volcano and therefore directly in the path of its lava flow, was buried almost immediately, the majority of Pompeii's population

survived. This was because the citizens of Pompeii had several hours before the volcano covered their city in ash, and evidence suggests that the city's leaders organized a mass evacuation. The few who refused to leave suffered the ultimate consequence, and today lie as stone impressions in an Italian museum.

MODERN ROOTS

All-hazards disaster and emergency management, wherein a comprehensive approach is applied in order to address most or all of a community's hazard risks, is relatively new. However, many of the concepts that guide today's practice can be traced to the achievements of past civilizations. While the management of disasters during the last few thousand years was limited to single acts or programs addressing individual hazards, many of these accomplishments were quite organized, comprehensive, and surprisingly effective at reducing both human suffering and damage to the built environment. Some examples follow.

Floods have always confounded human settlements. However, archeologists have found evidence in several distinct and unrelated locations that early civilizations made attempts to formally address the flood hazard. One of the most celebrated of these attempts occurred in Egypt during the reign of Amenemhet III (1817–1722 BC). Amenemhet III created what has been described as history's first substantial river control project. Using a system of over 200 "water wheels," some of which remain to this day, the pharaoh effectively diverted the annual floodwaters of the Nile River into Lake Moeris. In doing so, the Egyptians were able to reclaim over 153,000 acres of fertile land that otherwise would have been useless (Quarantelli, 1995; Egyptian State Information Service, n.d.)

The roots of the modern fire department trace back 2000 years, to when the city of Rome was nearly destroyed by fire. Before this event, slaves had been tasked with fighting fires, and their poor training, lack of equipment, and understandable lack of motivation made them highly ineffective. Following the great

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EXHIBIT 1-1   Job Titles within the Roman Corps of Vigiles

Aquarius—A firefighter whose main tasks included supplying water to the *siphos* (pumps) and organizing bucket brigades.

Siphonarius—A firefighter responsible for the supervision and operation of the water pumps.

Uncinarius—An operator of a firefighting hook, which was designed to remove the flammable roofs of houses or buildings.

Source: Gloucestershire Fire and Rescue Service.

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fire, Emperor Augustus established a formal, citywide firefighting unit from within the Roman army, called the Corps of Vigiles. As a result, the firefighting profession became highly respected and, likewise, highly effective, and was emulated throughout the vast Roman Empire for 500 years. The structure of this organization was quite similar to many fire departments today, with members fulfilling job-specific roles (see Exhibit 1-1). With the fall of Rome, however, came the disappearance of the Corps of Vigiles, and organized firefighting did not appear anywhere in the world for another thousand years.

The Incas, who lived throughout the Andes mountains in South America during the 13th to 15th centuries, practiced a form of urban planning that focused on their need to defend themselves from enemy attack. Many of the Incan cities were located at the peaks of rugged, though easily defensible, mountains. The prime example of their architectural achievement is the fortress of Machu Picchu. However, in locating their cities upon mountaintops and other, similar areas, the Incas merely replaced one man-made hazard with a whole range of environmental hazards. To facilitate life on this extreme terrain, the Incas developed an innovative form of land terracing that not only conserved water in their unpredictable climate but also protected their crops—and thus their existence—from the landslides that occurred during periods of heavy precipitation.

As later eras are examined, there emerges still more examples of methods created to address specific hazards and their consequences. One of the greatest and most effective forms of disaster mitigation in history is the collective effort of the British and Indian governments, which sought to reduce Indians' annual suffering and starvation that occurred as result of regular drought patterns. These famines became so devastating during the late 19th century that up to a million people were dying of starvation each year. Government officials commissioned a study and found that sufficient food existed throughout the country to feed the nation's entire population at all times, but that the problem lay in insufficient distribution capacity to address location-specific needs. To correct these shortfalls, planning committees were formed to develop various preventive measures, including a rapid expansion of the extensive railway system that crisscrosses the country (to quickly transport food), the adoption of a method by which indicators of emerging needs were identified and logged in a central repository, and greater monitoring of public health. So effective at controlling famine were these measures that many remain in force today (ISDR, 2005). India's acclaimed railroad, which connects almost every one of that nation's settlements, is a legacy of these efforts.

FIGURE 1-1   Civil Defense Era Poster, Pennsylvania, United States. (*Source:* Library of Congress, 2000.)

CIVIL DEFENSE: THE BIRTH OF MODERN EMERGENCY MANAGEMENT

There is no global formula for how the countries of the world developed their disaster management capacities. However, there is one particular period in recent history that witnessed the greatest overall move toward a centralized safeguarding of citizens—the Civil Defense era.

Modern disaster management, in terms of the emergence of global standards and organized efforts to address preparedness, mitigation, and response activities for a wide range of disasters, did not begin to emerge until the mid-20th century. In most countries, this change materialized as a response to specific disaster events. At the same time, it was further galvanized by a shift in social philosophy, in which the government played an increasing role in preventing and responding to disasters. The legal foundation that allowed for such a shift was the result of advances in warfare technology.

In response to the threat posed by air raids and the ever-present and dreadful prospect of a nuclear attack, many industrialized nations' governments began to form elaborate systems of civil defense. These systems included detection systems, early warning alarms, hardened shelters, search and rescue teams, and local and regional coordinators. Most nations' legislatures also established legal frameworks to guide both the creation and maintenance of these systems through the passage of laws, the creation of national-

level civil defense organizations, and the allocation of funding and personnel.

Despite these impressive efforts, surprisingly few civil defense units evolved over time into more comprehensive disaster or emergency management organizations (Quarantelli, 1995). But the legal framework developed to support them remained in place and formed the basis for modern disaster and emergency management as we know it today. For example:

- Great Britain's disaster management agency traces its roots to the Civil Defense Act of 1948.
- Canada's Office of Critical Infrastructure Preparedness and Emergency Preparedness (OCIPEP) grew out of the Canadian Civil Defense Organization created in 1948.
- The United States Federal Emergency Management Agency grew out of the Federal Civil Defense Act of 1950.
- France's civil protection is a product of that nation's 1950 Ordinance and the 1965 Decree Relating to Civil Defense.
- Algeria Civil Protection grew out of the 1964 Decree on the Administrative Organization of Civil Defense.

While emergency management structures vary from country to country, having formed largely independent and irrespective of each other, patterns do exist. Many countries developed their disaster management capabilities out of necessity and their government's subsequent acceptance of the need to formalize both the authority and budget for an agency to address that risk. Other countries formed their disaster management structures not for civil defense, but after being spurred into action by popular criticism for poor management of a natural disaster (examples include Peru in 1970, Nicaragua in 1972, and Guatemala in 1976, following destructive earthquakes in each country).

And still others, regardless of their disaster history, have no real emergency management structure to speak of.

THE INTERNATIONAL DECADE FOR NATURAL DISASTER REDUCTION

On December 11, 1987, the United Nations General Assembly declared the 1990s as the "International Decade for Natural Disaster Reduction" (IDNDR). This action was taken to promote internationally coordinated efforts to reduce material losses and social and economic disruption caused by natural disasters, especially in developing countries. The stated mission of the IDNDR was to improve each United Nations (UN) member country's capacity to prevent or diminish adverse effects from natural disasters and to establish guidelines for applying existing science and technology to reduce the impact of natural disasters.

On December 22, 1989, through UN Resolution 44/236, the General Assembly set forth the goals they wished to achieve during the IDNDR. In addition to establishing a special UN office in Geneva to coordinate the activities of the IDNDR, the resolution called upon the various UN agencies to:

1. Improve each country's capacity to mitigate the effects of natural disasters expeditiously and effectively, paying special attention to assisting developing countries in the assessment of disaster damage potential and in the establishment of early warning systems and disaster-resistant structures when and where needed;
2. Devise appropriate guidelines and strategies for applying existing scientific and technical knowledge, taking into account the cultural and economic diversity among nations;
3. Foster scientific and engineering endeavors aimed at closing critical gaps in knowledge in order to reduce loss of life and property;
4. Disseminate existing and new technical information related to measures for the assessment, prediction, and mitigation of natural disasters;
5. Develop measures for the assessment, prediction, prevention, and mitigation of natural disasters through programs of technical assistance and technology transfer, demonstration projects, and education and training, tailored to specific

disasters and locations, and to evaluate the effectiveness of those programs (United Nations, 1989).

It was expected that all participating governments would, at the national level:

1. Formulate national disaster-mitigation programs, as well as economic, land use, and insurance policies for disaster prevention, and particularly in developing countries, integrate them fully into their national development programs;

2. Participate during the IDNDR in concerted international action for the reduction of natural disasters and, as appropriate, establish national committees in cooperation with the relevant scientific and technological communities and other concerned sectors with a view to attaining the objective and goals of the decade;

3. Encourage their local administrations to take appropriate steps to mobilize the necessary support from the public and private sectors and to contribute to achieving the purposes of the decade;

4. Keep the Secretary-General informed of their countries' plans and of assistance that could be provided so that the UN could become an international center for the exchange of information and the coordination of international efforts concerning activities in support of the objective and goals of the decade, thus enabling each state to benefit from other countries' experience;

5. Take measures, as appropriate, to increase public awareness of damage risk probabilities and the significance of preparedness, prevention, relief, and short-term recovery activities with respect to natural disasters and to enhance community preparedness through education, training, and other means, taking into account the specific role of the news media;

6. Pay due attention to the impact of natural disasters on healthcare, particularly to activities to mitigate the vulnerability of hospitals and healthcare centers, as well as the impact on food

storage facilities, human shelter, and other social and economic infrastructure;

7. Improve the early international availability of appropriate emergency supplies through the storage or earmarking of such supplies in disaster-prone areas (United Nations, 1989).

THE YOKOHAMA STRATEGY—GLOBAL RECOGNITION OF THE NEED FOR DISASTER MANAGEMENT

In May 1994, UN member states met at the World Conference on Natural Disaster Reduction in Yokohama, Japan, to assess the progress attained by the IDNDR. At this meeting they developed the Yokohama Strategy and Plan of Action for a Safer World. Through this document, the UN affirmed that:

1. The impact of natural disasters in terms of human and economic losses has risen in recent years, and society in general has become more vulnerable to natural disasters. Those usually most affected by natural and other disasters are the poor and socially disadvantaged groups in developing countries as they are least equipped to cope with them.

2. Disaster prevention, mitigation, preparedness, and relief are four elements that contribute to and gain from the implementation of sustainable development policies. These elements, along with environmental protection and sustainable development, are closely interrelated. Therefore, nations should incorporate them in their development plans and ensure efficient follow-up measures at the community, national, sub-regional, and international levels.

3. Disaster prevention, mitigation, and preparedness are better than disaster response in achieving [disaster reduction] goals. Disaster response alone is not sufficient, as it yields only temporary results at a very high cost. We have followed this limited approach for too long. This has been further demonstrated by the recent focus on response to complex emergencies, which, although compelling, should not divert from pursuing a comprehensive approach. Prevention contributes to lasting improvement in safety and is essential to integrated disaster management.

4. The world is increasingly interdependent. All countries shall act in a new spirit of partnership to build a safer

world based on common interests and shared responsibility to save human lives, since natural disasters do not respect borders. Regional and international cooperation will significantly enhance our ability to achieve real progress in mitigating disasters through the transfer of technology and the sharing of information and joint disaster prevention and mitigation activities. Bilateral and multilateral assistance and financial resources should be mobilized to support these efforts.

5. The information, knowledge, and some of the technology necessary to reduce the effects of natural disasters can be available in many cases at low cost and should be applied. Appropriate technology and data, with the corresponding training, should be made available to all freely and in a timely manner, particularly to developing countries.

6. Community involvement and their active participation should be encouraged in order to gain greater insight into the individual and collective perception of development and risk, and to have a clear understanding of the cultural and organizational characteristics of each society as well as of its behavior and interactions with the physical and natural environment. This knowledge is of the utmost importance to determine those things which favor and hinder prevention and mitigation or encourage or limit the preservation of the environment from the development of future generations, and in order to find effective and efficient means to reduce the impact of disasters.

7. The adopted Yokohama Strategy and related Plan of Action for the rest of the Decade and beyond:

   A. Will note that each country has the sovereign responsibility to protect its citizens from natural disasters;

   B. Will give priority attention to the developing countries, in particular the least developed, land-locked countries and the small island developing States;

   C. Will develop and strengthen national capacities and capabilities and, where appropriate, national legislation for natural and other disaster prevention, mitigation, and preparedness, including the mobilization of non-governmental organizations and participation of local communities;

   D. Will promote and strengthen sub-regional, regional, and international cooperation in activities to prevent, reduce, and mitigate natural and other disasters, with particular emphasis on:

      • Human and institutional capacity-building and strengthening;

      • Technology sharing, the collection, the dissemination, and the utilization of information;

      • Mobilization of resources.

   E. The international community and the UN system in particular must provide adequate support to [natural disaster reduction].

   F. The Yokohama Conference is at a crossroad in human progress. In one direction lie the meager results of an extraordinary opportunity given to the UN and its Member States. In the other direction, the UN and the world community can change the course of events by reducing the suffering from natural disasters. Action is urgently needed.

   G. Nations should view the Yokohama Strategy for a Safer World as a call to action, individually and in concert with other nations, to implement policies and goals reaffirmed in Yokohama, and to use the International Decade for Natural Disaster Reduction as a catalyst for change (ISDR, 1994).

The participating member states accepted the following principles, to be applied to disaster management within their own countries. The tenth, and final, principle formalized the requirement that each nation's government accept responsibility for protecting its people from the consequences of disasters:

1. Risk assessment is a required step for the adoption of adequate and successful disaster reduction policies and measures.

2. Disaster prevention and preparedness are of primary importance in reducing the need for disaster relief.

3. Disaster prevention and preparedness should be considered integral aspects of development policy and planning at national, regional, bilateral, multilateral, and international levels.

4. The development and strengthening of capacities to prevent, reduce, and mitigate disasters is a top priority area to be addressed during the 1990s so as to provide a strong basis for follow-up activities after that period.

5. Early warnings of impending disasters and their effective dissemination using telecommunications, including broadcast services, are key factors to successful disaster prevention and preparedness.

6. Preventive measures are most effective when they involve participation at all levels, from the local community through the national government to the regional and international level.

7. Vulnerability can be reduced by the application of proper design and patterns of development focused on target groups, by appropriate education and training of the whole community.

8. The international community accepts the need to share the necessary technology to prevent, reduce, and mitigate disasters; this should be made freely available and in a timely manner as an integral part of technical cooperation.

9. Environmental protection as a component of sustainable development consistent with poverty alleviation is imperative in the prevention and mitigation of natural disasters.
10. Each country bears the primary responsibility for protecting its people, infrastructure, and other national assets from the impact of natural disasters. The international community should demonstrate strong political determination required to mobilize adequate and make efficient use of existing resources, including financial, scientific, and technological means, in the field of natural disaster reduction, bearing in mind the needs of the developing countries, particularly the least developed countries. (ISDR, 1994)

MODERN DISASTER MANAGEMENT— A FOUR-PHASE APPROACH

Comprehensive disaster management is based upon four distinct components: **mitigation**, **preparedness**, **response**, and **recovery**. Although a range of terminology is often used in describing them, effective disaster management utilizes each component in the following manner:

1. *Mitigation*. Involves reducing or eliminating the likelihood or the consequences of a hazard, or both. Mitigation seeks to "treat" the hazard such that it impacts society to a lesser degree. See Chapter 4 for more information.
2. *Preparedness*. Involves equipping people who may be impacted by a disaster or who may be able to help those impacted with the tools to increase their chance of survival and to minimize their financial and other losses. See Chapter 5 for more information.
3. *Response*. Involves taking action to reduce or eliminate the impact of disasters that have occurred or are currently occurring, in order to prevent further suffering, financial loss, or a combination of both. Relief, a term commonly used in international disaster management, is one component of response. See Chapter 6 for more information.
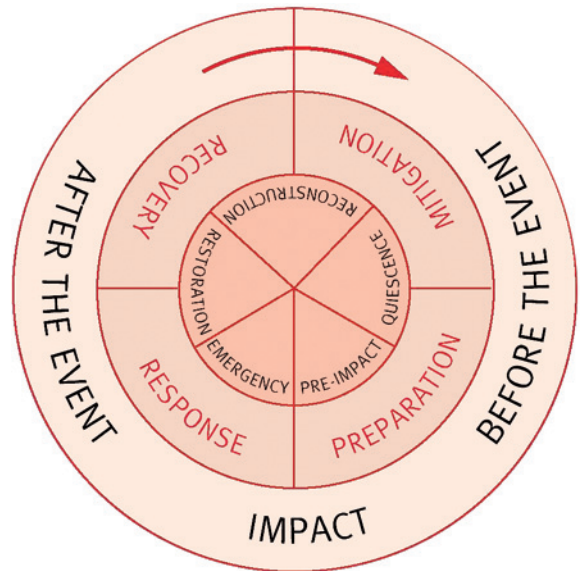
FIGURE 1-2 **The Disaster Management Cycle.** (*Source:* Alexander, 2002.)

4. *Recovery*. Involves returning victims' lives back to a normal state following the impact of disaster consequences. The recovery phase generally begins after the immediate response has ended, and can persist for months or years thereafter. See Chapter 7 for more information.

Various diagrams illustrate the cyclical nature by which these and other related factors are performed over time, though disagreement exists concerning how such a "disaster management cycle" is visualized. These diagrams, such as the one in Figure 1-2, are generalizations, and it must always be understood that many exceptions can be identified in each. In practice, all of these factors are intermixed and are performed to some degree before, during, and after disasters. Disasters tend to exist in a continuum, with the recovery from one often leading straight into another. And while response is often pictured as beginning immediately after disaster impact, it is not uncommon for the actual response to begin well before the disaster actually happens.

WHAT IS INTERNATIONAL DISASTER MANAGEMENT?

Several times each year, the response requirements of disaster events exceed a single nation's or several nations' disaster management abilities. In these instances, the governments of the affected countries call upon the resources of the international response community. This cooperative international response is, by definition, international disaster management.

Over time and through iteration, a recognized and systemic process for responding to international disasters has begun to emerge. Standards for response have been developed by multiple sources, and a recognized group of typical participants has been identified (see Exhibit 1-2). Through practice and study, formulaic, methodical processes for assessing both the affected nations' damage and their various response needs have been identified, tried, and improved upon. What was only 20 years ago a chaotic, ad hoc reaction to international disasters has grown with astounding speed into a highly effective machine.

It is important to add that disasters do not become international just because they have overwhelmed a country's capacity to respond. There must be a commitment on the participants' part to recognize the need for international involvement and to accept the appeal

as made by the host nation's government. The sad truth is that, in practice, not all disasters elicit the same level of international interest and response, whether because of donor fatigue (see Chapter 11), media interest, diverted priorities, or other events that may dilute public interest. The Mozambique floods of 2000 are but one example of a situation in which the international community has been accused of sitting idly by as hundreds of people died (see Exhibit 1-3).

Response and recovery alone, however, are not an effective means of managing disasters if they are performed in the absence of a comprehensive regimen of preparedness and mitigation activities (see Table 1-2). An important focal shift among the world's international disaster management organizations, agencies, and interest groups from disaster response to disaster prevention is evidence of widespread recognition and acceptance of this. Although many national governments, especially in the developing world, have yet to make a dedicated effort toward initiating or improving their pre-disaster management activities, many international development and disaster management agencies are working to address this issue. The UN, whose members consist of almost every country in the world, has made a sustained effort to lead its member nations in addressing their shortfalls—first by dedicating the 1990s the IDNDR (producing the Yokohama Strategy and the Plan of Action for a Safer World), and then by following up with the International Strategy for Disaster Reduction to ensure that forward momentum is maintained.

Today, the United Nations International Strategy for Disaster Reduction (UNISDR) guides the efforts of the international community's overall disaster management mission. Specifically, the UNISDR seeks to build "disaster resilient communities by promoting increased awareness of the importance of disaster reduction as an integral component of sustainable development, with the goal of reducing human, social, economic and environmental losses due to natural hazards and related technological and environmental disasters" (UNISDR, n.d.).

In January of 2005, in Hyogo, Japan, the UN held the World Conference on Disaster Reduction. More

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EXHIBIT 1-2   International Disaster Management Participants

- Victims
- Local first responders
- The governments of the affected countries
- Governments of other countries
- International organizations
- International financial institutions
- Regional organizations and associations
- Nonprofit organizations
- Private organizations—business and industry
- Local and regional donors

EXHIBIT 1-3 **2000 Mozambique Floods Timeline**

February 9— Heavy rain begins falling across most of southern Africa, with Mozambique hit the hardest. The capital, Maputo, is submerged. Throughout the country, hundreds of thousands of families are left homeless and stranded. Damage to crops and infrastructure is severe.

February 11—At least 70 people have died due to the flooding. The UN reports that 150,000 people are in immediate danger due to starvation and disease. Dysentery outbreaks are reported outside the capital.

February 22—Tropical cyclone Eline makes a direct hit on the country, worsening the condition in many areas already submerged by the floods. The South African Air Force begins making airlifts to over 23,000 desperate victims.

February 24—The UN makes an appeal for $13 million in immediate relief, and $65 million for recovery assistance. The appeal goes unanswered. Rainfall draining from other parts of southern Africa begins to flow into Mozambique, worsening already poor conditions.

February 27—More rainfall causes flash floods throughout the country, destroying much of the remaining farmland.

March 2— Floodwaters have risen by up to 26 feet (8 meters) in many parts of the country. International aid workers report that 100,000 people are in need of immediate evacuation, and over 7000 are trapped in trees and need to be rescued (many have been trapped in the trees for several days without food or clean water). Finally, more than three weeks after the crisis began, international disaster management agencies begin to send responders and relief assistance.

Source: BBC News, 2000.

than 4000 participants attended, including representatives from 168 governments, 78 UN specialized agencies and observer organizations, 161 nongovernmental organizations, and 562 journalists from 154 media outlets. The public forum attracted more than 40,000 visitors. The outcome of the conference was a 24-page "framework for action," adopted by all member countries, that outlined members' resolve to pursue "the substantial reduction of disaster losses, in lives and in the social, economic and environmental assets of communities and countries by 2015."

The framework outlined three strategic goals to achieve this:

- The more effective integration of disaster risk considerations into sustainable development policies, planning, and programming at all levels, with a special emphasis on disaster prevention, mitigation, preparedness, and vulnerability reduction
- The development and strengthening of institutions, mechanisms, and capacities at all levels, in particular at the community level, that can systematically contribute to building resilience to hazards
- The systematic incorporation of risk reduction approaches into design and implementation of emergency preparedness, response, and recovery

Chapter 1 The Management of Disasters

TABLE 1-2   **Response and Recovery-Based Management versus Prevention and Risk Reduction–Based Management**

Response and recovery-based efforts	Prevention and risk reduction–based efforts
Primary focus on disaster events	Focus on vulnerability and risk issues
Single, event-based scenarios	Dynamic, multiple risk issues and development scenarios
Basic responsibility to respond to an event	Fundamental need to assess, monitor, and update exposure to changing conditions
Often fixed, location-specific conditions	Extended, changing, shared or regional, local variations
Responsibility in single authority or agency	Involves multiple authorities, interests, actors
Command and control, directed operations	Situation-specific functions, free and open association and participation
Established hierarchical relationships	Shifting, fluid, and tangential relationships
Often focused on hardware and equipment	Dependent on related practices, abilities, and knowledge base
Dependent on specialized expertise	Focused on aligning specialized expertise with public views and priorities
Urgent, immediate, and short time frames in outlook, planning, attention, and returns	Moderate and long time frames in outlook, planning, values, and returns
Rapidly changing, dynamic information usage, which is often conflicting or sensitive in nature	Accumulated, historical, layered, updated, or comparative use of information
Primary, authorized, or singular information sources, need for definitive facts	Open or public information, multiple, diverse, or changing sources, differing perspectives and points of view
In-out or vertical flows of information	Dispersed, lateral flows of information
Relates to matters of public security, safety	Matters of public interest, investment, and safety

Adapted from Jeggle, 2001.

programs in the reconstruction of affected communities (ISDR2, 2005)

The framework also outlined general considerations and key activities in the following five areas, identified as priorities for 2005–2015:

- Ensuring that disaster risk reduction is a national and local priority with a strong institutional basis for implementation
- Identifying, assessing, and monitoring disaster risks and enhancing early warning

- Using knowledge, innovation, and education to build a culture of safety and resilience at all levels
- Reducing underlying risk factors
- Strengthening disaster preparedness for effective response at all levels. (ISDR2, 2005)

With the adoption of this framework, which has coincided with some of the most devastating hazards and disasters in recent memory (including the December 2004 tsunami in Asia, the 7.6 magnitude

earthquake on October 8, 2005, in Pakistan, the November 2005 rioting in France, and the ongoing potential pandemic of avian influenza), international disaster management has climbed to the forefront of the international policy agenda. For years, the nations of the world have watched as country after country, both rich and poor, have suffered the consequences of terrible disasters. However, it has not been until recently that world leaders have begun to fully grasp that many of these consequences could have been reduced through better mitigation and preparedness efforts and more effective response capabilities. As a result, the field of international disaster management is now in a position to influence these leaders in a way previously not possible.

DISASTERS, POVERTY, AND DEVELOPMENT

Research and practice support the theory that there exists a strong correlation between disasters and poverty. It is well documented that those developing countries repeatedly subject to disasters experience stagnant or even negative rates of development over time (see Figure 1-3). Hurricane Mitch, which

destroyed as much as 70% of the infrastructure in Honduras and Nicaragua (UNISDR, 2004), is a prime example, having been blamed with reversing the rates of development in those and other Central American countries by at least a decade (and as much as 20 and 30 years in some areas) (Oxfam, 1998). The same effect also has been witnessed in many of the areas affected by the 2004 tsunami and earthquake events in Southeast Asia (see Exhibit 1-4). For countries with developing economies, the financial setbacks those events inflict can be ruinous, in contrast to their industrialized counterparts. In 2001, for example, earthquakes occurred in both El Salvador and in the United States (Seattle), each causing approximately $2 billion in damages. While this amount had little or no noticeable impact on the U.S. economy, it amounted to 15% of El Salvador's GDP that year (UNDP, 2004b).

The aftermath of a disaster exacerbates the debilitating causes of poverty in developing countries. Each disaster is unique in its consequences, so there is no single formula that can be used to characterize precisely how these problems will play out. The following list, however, provides a general overview of the many ways in which disasters harm poor countries beyond the initial death, injury, and destruction:
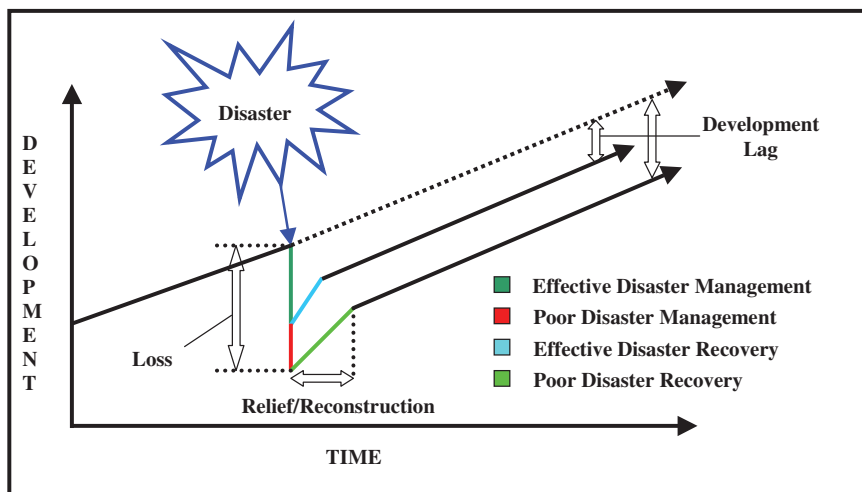
FIGURE 1-3 **Impact of Disasters on Development.** (*Source:* ADRC, 2005.)

- National and international development efforts are stunted, erased, or even reversed
- Sizeable portions of GDP often must be diverted from development projects, social programs, or debt repayment in order to manage the disaster consequences and begin recovery efforts (see Figure 1-4)
- Vital infrastructure is damaged or destroyed, including roads, bridges, airports, sea ports, communications systems, power generation and distribution facilities, water and sewerage plants, requiring years to rebuild
- Schools are damaged or destroyed, leaving students without an adequate source of education for months or even years
- Hospitals and clinics are damaged or destroyed, resulting in an increase in vulnerability to disease of the affected population
- Formal and informal businesses are destroyed, resulting in surges in unemployment and decreased economic stability and strength

- Residents are forced or impelled to leave the affected zone, often never to return, thereby extracting institutional knowledge, cultural and social identity, and economic viability from areas that cannot afford to spare such resources
- Desperation and poverty leads to a rapid upsurge in crime and insecurity
- A general feeling of hopelessness afflicts the affected population, leading to increased rates of depression and a lack of motivation to regain independence from outside assistance.

DISASTER TRENDS

Increased accuracy in the reporting of disaster statistics has helped to provide both greater visualization and confirmation of something many scientists and disaster managers have been warning of for decades—that the nature of disasters is rapidly changing. These changes are generally regarded as resulting from

Country	Year	% of the GDP of previous year	Current US$ (million)
Armenia	2000	5.23	100
Bahamas	2001	Hurricane Michelle 5.00	250
Bangladesh	1998	4.55	2000
Belize	2001	Hurricane Iris 6.60	50
Belize	2000	Hurricane Keith 34.40	266
Colombia	1999	3.42	2900
Czech Republic	2002	3.50	2000
Dominican Republic	1998	Hurricane Georges 12.50	2193
El Salvador	2001	19.99	2800
Georgia	2000	6.60	200
Guyana	1998	4.00	29
Honduras	1998	Hurricane Mitch 37.70	2000
Indonesia	1997	7.87	17,000
Iran	2000	3.44	3500
Jamaica	2002	14.00	1114
Mauritius	1994	Cyclone Holland and Ivy 4.00	135
Mauritius	1999	4.20	175
Nicaragua	1998	50.00	1000 Hurricane Mitch
Papua New Guinea	1994	Rabaul 7.47	400
Tajikistan	1998	5.02	66
Tajikistan	2000	5.76	57
Tonga	2001	Cyclone Waka 36.17	51
Turkey	1999	Izmit 4.62	8500
Turkey	1999	Duzce 5.44	10,000
Yemen	1996	20.69	1200
Japan	1994	Kobe 2.56	131,500

Legend: ■ Hurricane/Cyclone ■ Earthquake ■ Volcano ■ Flood ■ Drought ■ Forest fire

FIGURE 1-4   Selected Natural Disasters: Total Damage and Share of the GDP: 1994–2003. (*Source:* EM-DAT: The OFDA/CRED International Disaster Database; www.em-dat.net) Université Catholique de Louvain—Brussels–Belgium

human actions and development patterns. What is troubling is that these trends indicate that more disasters are occurring each year, with greater intensity, and that a great many more people are affected by them in some way, either indirectly or directly. And while these disasters are becoming less deadly worldwide, they are causing a much greater financial impact on both affected and unaffected nations. Finally, and what may be the most disturbing of these trends, is that the poor countries of the world and their citizens

are assuming a much greater proportion of the impacts of disasters. In sum, recent trends indicate that:

1. The number of people affected by disasters is rising.
2. Overall, disasters are becoming less deadly.
3. Overall, disasters are becoming more costly.
4. Poor countries are disproportionately affected by disaster consequences.
5. The number of disasters is increasing each year.

Trend 1: The Overall Number of People Affected by Disasters Is Rising

Human settlement has always been directed by the needs of individuals and societies, such as the need for food, water, defense, and access to commerce. Almost without exception, increased natural hazard risk has been assumed in favor of these needs, often as result of a confidence that hazard risk either can be accepted as "part of life" or can be effectively managed. Evidence of such behavior is apparent in almost any example of previous human settlement: Communities along rivers build levees; those located along the sea coasts construct sea walls and jetties; farmers place their houses and sow their crops upon the fertile slopes of active volcanoes.

However, as the population and size of these settlements grow, the assumed risk becomes more and more concentrated. The overall rates by which people have relocated from rural areas into cities, called *urbanization*, have continued to increase over time. Rising populations in almost all countries of the world amplifies the urbanization effect. In 1950, less than 30% of the world's 2.5 billion people lived in an urban setting. By 1998, the number of people on Earth had grown to 5.7 billion, and 45% of them lived in cities. UN estimates state that by 2025, there will be 8.3 billion people on Earth, and over 60% of them will live in cities (Britton, 1998).

When humans settle in high-risk urban areas, the hazard risks that they face as individuals increase. As of the year 2000, it was estimated that at least 75% of the world's population lived in areas at risk from a major disaster (UNDP, 2004b). And because these high-risk areas periodically experience major disasters, it logically follows that the number of people who are annually affected by disasters (defined as having their home, crops, animals, livelihoods, or health impacted) is equally high (UNISDR, 2004).

Figure 1-5 displays the observed total number of people annually affected by disasters during the 20th century. Note that, beginning in 1954, there is a significant rise in the number of people affected. It was during this decade that the mass transition toward urbanization began in the industrialized nations, a trend that repeated soon after in most other nations of the world.

Trend 2: Overall, Disasters Are Becoming Less Deadly

The seismic, meteorological, hydrological, and other forces that result in natural hazards are natural processes that occur irrespective of the actions or existence of humans. Water has overflowed the banks of rivers since before man lived beside them. Archeologists and geologists have unearthed evidence that earthquake events occurred during every era of the planet's history. Volcanic activity has been given as much credit for its role in generating life on earth as it has for destroying it. Natural disasters, it has therefore been suggested, are merely the result of humans placing themselves directly into the path of these normal events (see Figure 1-6). United States Geological Survey scientists Susan Hough and Lucile Jones aptly captured this line of thought when they wrote that "earthquakes don't kill people, buildings do" (Hough and Jones, 2002).

Humans are adaptable and quickly adjust to the pressures exerted upon them by nature. People have modified their behavior and their surroundings to accommodate their surrounding climate and topography, often proving successful at counteracting the negative consequences of common daily hazards such as rain or extreme temperatures. For less common events, such as earthquakes and hurricanes, humans have had lower levels of success. Fortunately, modern science has helped to change this fact significantly, at least in those countries in which the technology and technical expertise is within reach. Table 1-3 illustrates the success achieved by the United States in adjusting to hurricane risk during the course of the 20th century.

Globalization and increased international cooperation have helped the world community to more effectively address risk reduction and limit the human impacts of disasters. Although the number of disasters has more than tripled since the 1970s, the number of
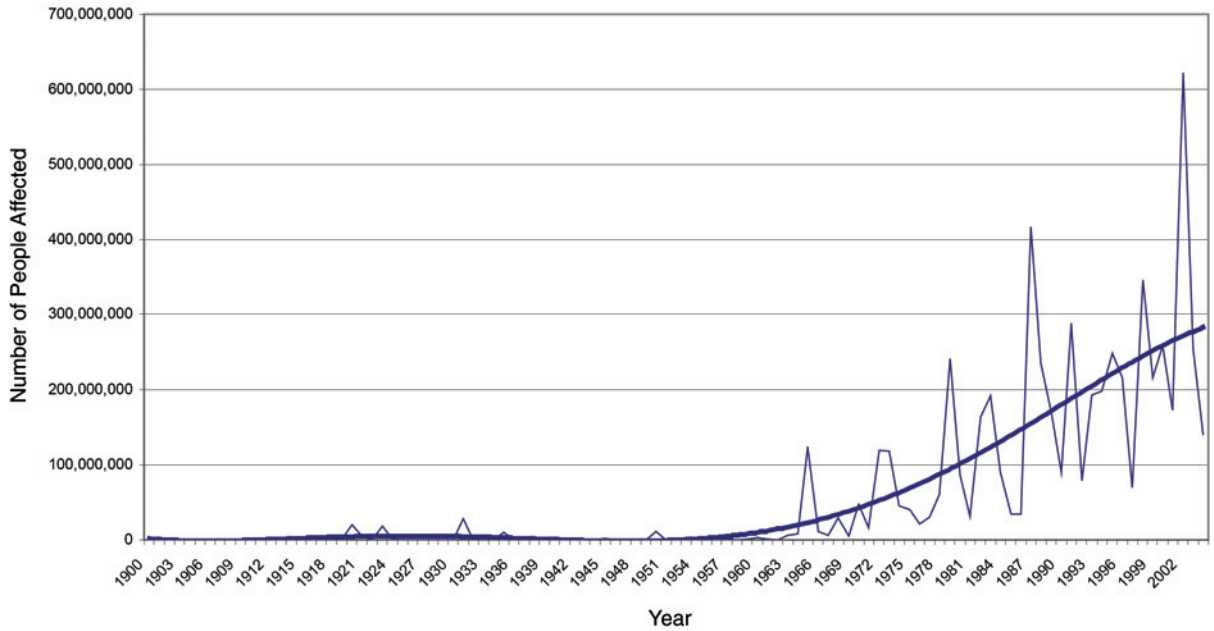
FIGURE 1-5   Total Number of People Affected. World: 1900–2004. (*Source:* EM-DAT: The OFDA/CRED International Disaster Database; www.em-dat.net) Université Catholique de Louvain—Brussels–Belgium
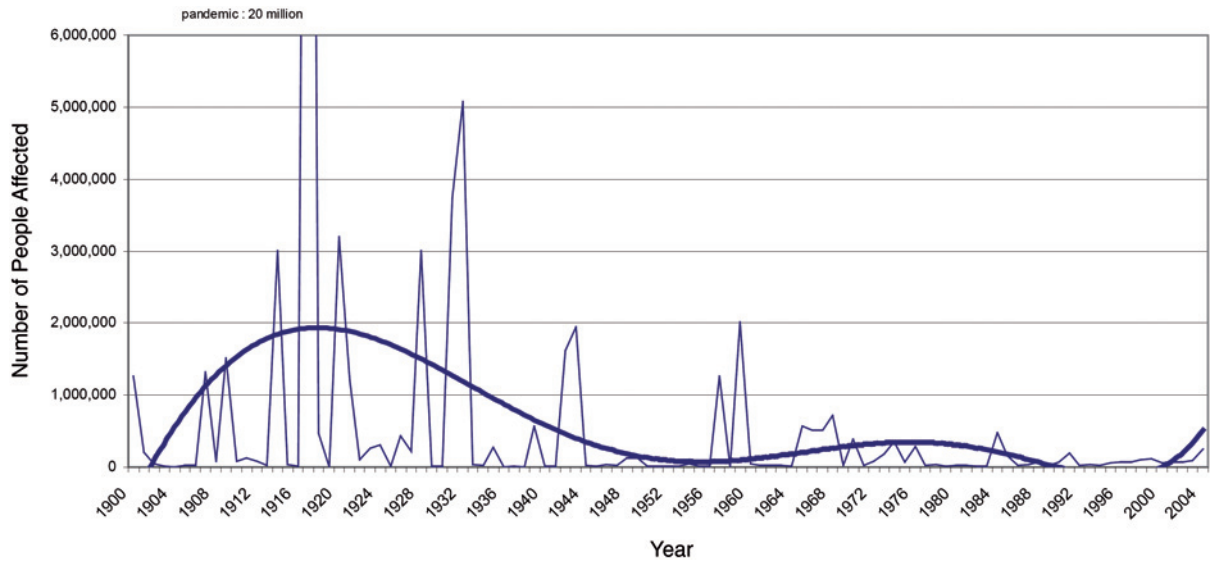
FIGURE 1-6   Total Number of Deaths Reported. World: 1900–2004. (*Source:* EM-DAT: The OFDA/CRED International Disaster Database; www.em-dat.net) Université Catholique de Louvain—Brussels–Belgium

TABLE 1-3 **Deaths Attributed to Hurricanes in the United States, 1900–1999**

Period	Number killed
1900–1919	10,000 (approximate; exact 1900 Galveston death toll is unknown)
1920–1939	3,751
1940–1959	1,119
1960–1979	453
1980–1999	82

Source: Thoreau Institute, 2005.

people worldwide who have perished has fallen by 50% (UNISDR, 2004). Greater recognition of the importance of emergency management and sustainable development are turning the tide on disasters. The efforts of the UN, the many nongovernmental agencies involved in development and disaster preparedness and response, and the efforts of individual governments have shown that humans can effectively influence their vulnerability.

There are several explanations for the falling fatality rates of disasters. These include:

1. More organized and comprehensive preparedness campaigns are helping individuals and communities to decrease their vulnerability and to react more appropriately in the face of disaster.
2. Early warning systems are giving potential victims more time to remove themselves from the dangerous situations associated with impending disasters.
3. Special disaster-specific protection structures, such as tornado safe rooms, are mitigating the impact that disasters have on human life.
4. Building code creation and enforcement are helping to increase the resilience of the various structures and systems upon which humans depend.
5. Secondary, postdisaster consequences, such as famine and disease, are being more effectively managed by modern public-health response mechanisms.
6. Proper zoning procedures and enforcement are helping to prevent people from moving into the path of disasters and helping to remove those who already are there.
7. Sustainable development processes are helping to reduce population movement into areas of highest risk.

Trend 3: Overall, Disasters Are Becoming More Costly

The cost of disasters worldwide is increasing at an alarming rate. A quarter-century ago, the economic damage from any given disaster rarely topped the billion-dollar mark, even accounting for inflation. Now, several do each year (see Figure 1-7). By the year 2000, the cost of disasters worldwide had topped $60 billion per year, as measured by international reinsurance firm Munich Re.

There are many reasons why disasters are getting more expensive, including many of the previous explanations: There are more people in the world, there are more disasters, people are more concentrated together, etc. The fact remains that people continue to move toward urban centers, to build expensive structures and infrastructure in the path of hazards, and to try to overcome the risk of disaster by building structures designed to resist damage. Take hurricanes in the United States, for example. Their basic power and natural characteristics have not changed significantly over time. However, human settlements in high-risk coastal areas have increased. The result of this human behavior is the rising costs of hurricane damage during the past 20 years (Riebeek, 2005).

There are several explanations for the rising financial cost of disasters, including:

1. Increasing urbanization in high-risk zones is occurring throughout the world, concentrating wealth, physical structures, and infrastructure together in high-risk zones.
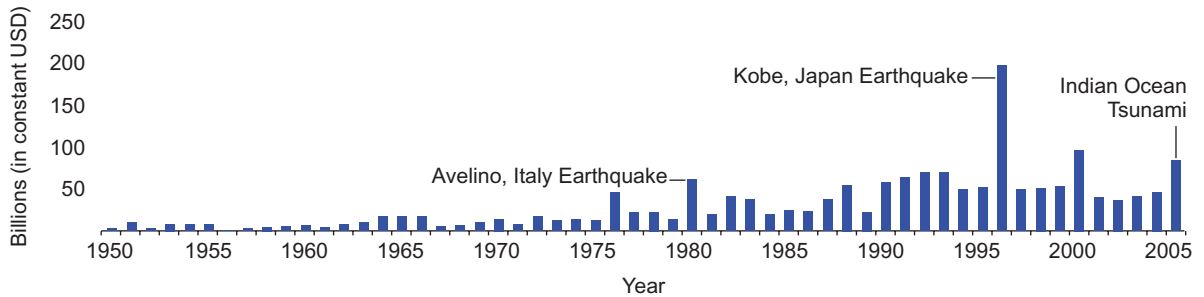
FIGURE 1-7   **Total Amount of Reported Damages (Billion USD at 2004 Prices). World: 1950–2004.** (*Source:* Riebeek, 2005.)

2. Economies are much more dependent upon technologies that tend to fail in times of disaster; one example is the 2003 north-eastern U.S./Canadian electrical blackout, which that resulted in as much as $6 billion in damages.
3. Areas not directly affected are experiencing secondary economic consequences of disaster, as with many world economies following the September 11, 2001, terrorist attacks in the United States.
4. A greater number of less deadly but financially destructive disasters are occurring throughout the world as result of climate change or other factors.
5. Increasing population; the U.S. Census Bureau estimates that the world's population grew from 3.8 billion to 6.3 billion between 1950 and 2003.

Trend 4: Poor Countries Are Disproportionately Affected by Disaster Consequences

Disasters of all kinds strike literally every nation of the world; they do not differentiate between rich and poor countries. However, developing countries suffer the greatest impact and also most often experience subsequent internal civil conflict that leads to complex humanitarian emergencies (CHEs; see Definitions). Between 1980 and 2000, 53% of the deaths attributable to disasters occurred in countries with low human development ratings, although these countries accounted for only 11% of the world's "at-risk" population (UNDP, 2004b) (see Figure 1-8). In fact, on average, 65% of disaster-related injuries and deaths are sustained in countries with per-capita income levels that are below $760 per year (UNEP, 2001) (see Figure 1-9).

Based on these facts, inferences can be drawn about a nation's disaster risk by considering its development status. Public health expert Eric Noji (1997) has identified four primary reasons why the poor in general are often most at risk:

1. They are least able to afford housing that can withstand seismic activity.
2. They often live along coasts where hurricanes, storm surges, or earthquake-generated tsunamis strike or live in floodplains subject to inundation.
3. They are forced by economic circumstances to live in substandard housing built on unstable slopes that are susceptible to landslides or are built next to hazardous industrial sites.
4. They are not educated as to the appropriate life-saving behaviors or actions that they can take when a disaster occurs.

There are also many secondary reasons that contribute. For instance, injuries sustained in disasters, and the disease that often follows, are much more likely to lead to death in poor countries, where acute care may be substandard or nonexistent and the control of disease outbreaks more difficult. The poor are

Deaths + Persons Affected per 100,000 Inhabitants

- 0 – 1,000
- 1,001 – 5,000
- >5,000
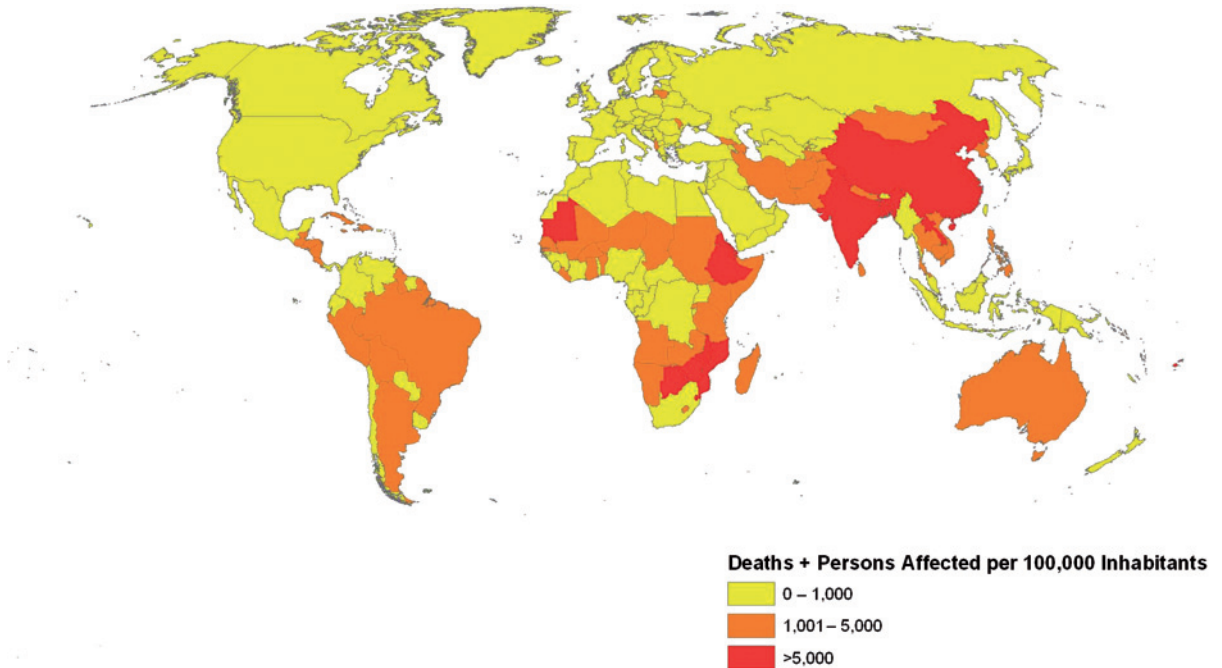
FIGURE 1-8   **Total Number of Deaths and of People Affected by Natural Disasters by 100,000 Inhabitants: 1974–2003.** (*Source:* EM-DAT: The OFDA/CRED International Disaster Database; www.em-dat.net) Université Catholique de Louvain—Brussels–Belgium

also likely to suffer greater disaster consequences as result of minimal or nonexistent enforcement of safety standards, building codes, and zoning regulations (see Figure 1-10). The full range of explanations is both extensive and diverse.

Although the importance of disaster preparedness and mitigation is widely recognized by almost all of the world's countries, and although these principles are widely applied on a growing basis by international development agencies, it still comes as no surprise that countries ranking lower on development indices place disaster management very low in budgetary priority. These nations' resources tend to be focused on social interests such as education and infrastructure or on their military, instead of on projects that serve a preparatory or mitigation need, such as retrofitting structures with hazard-resistant construction. Because all disasters, even those that tend to repeat, are chance

events and thus not guaranteed to happen, disaster management programs in poor countries tend to be viewed as a luxury or even superfluous. Compounding this situation, poverty and uncontrolled urbanization force large populations to concentrate in perilous, high-risk areas that have little or no defense against disasters. Thus, the difference in the effect of a disaster's impact in a rich versus poor country is remarkable. Table 1-4 illustrates these differences.

Trend 5: The Number of Disasters Is Increasing Each Year

All statistics on the annual number of disasters appear to indicate that, over time, the number of significant interactions between man and nature resulting in significant loss of life or property is increasing. Furthermore, all evidence suggests that this trend will
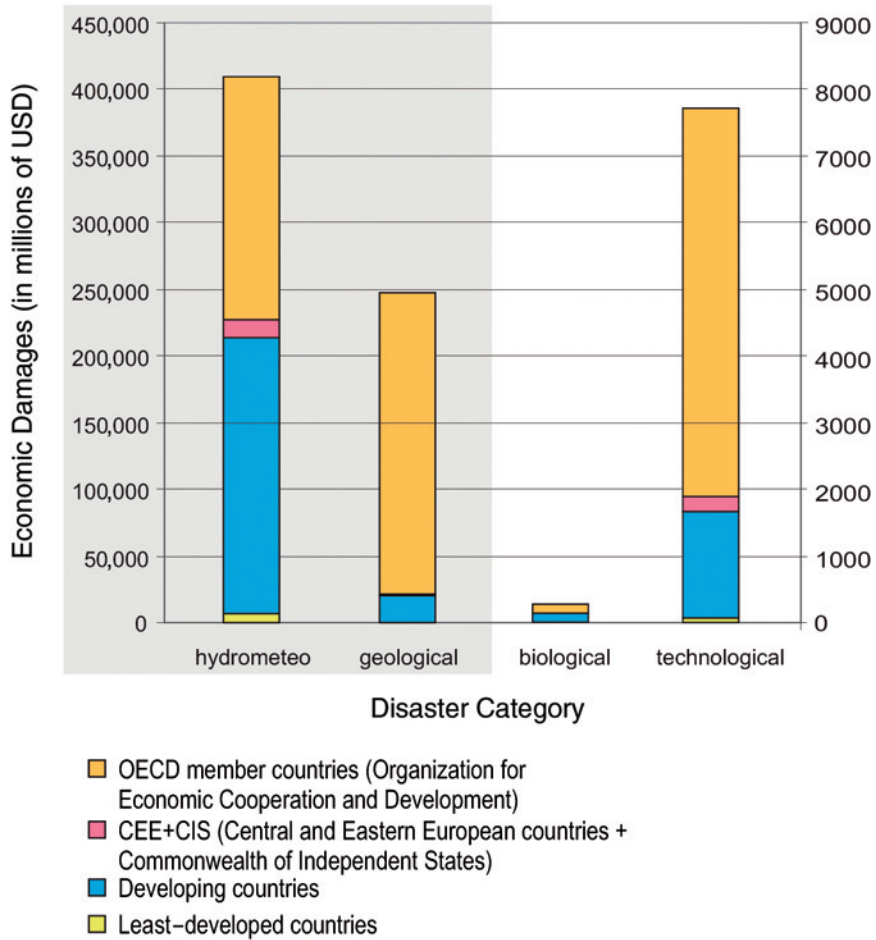
FIGURE 1-9 **Total Amount of Economic Damages Reported in Major World Aggregates 1994–2003. (Million USD, 2003).** (*Source:* EM-DAT: The OFDA/CRED International Disaster Database; www.em-dat.net) Université Catholique de Louvain—Brussels–Belgium

OECD Member Countries: Australia, Austria, Belgium, Canada, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, Luxembourg, Mexico, Netherlands, New Zealand, Norway, Poland, Portugal, Slovakia, South Korea, Spain, Sweden, Switzerland, Turkey, United Kingdom, United States

Central and Eastern Europe (CEE) and Commonwealth of Independent States (CIS) Countries: Albania, Armenia, Azerbaijan, Belarus, Bosnia and Herzegovina, Bulgaria, Croatia, Czech Republic, Estonia, Georgia, Hungary, Kazakhstan, Kyrgyzstan, Latvia, Lithuania, Macedonia, Moldova, Poland, Romania, Russian Federation, Serbia and Montenegro, Slovakia, Slovenia, Tajikistan, Turkmenistan, Ukraine, Uzbekistan

Developing Countries: Algeria, Antigua and Barbuda, Argentina, Bahamas, Bahrain, Barbados,

Belize, Bolivia, Botswana, Brazil, Brunei, Cameroon, Chile, China, Colombia, Congo, Costa Rica, Côte d'Ivoire, Cuba, Cyprus, Dominica, Dominican Republic, Ecuador, Egypt, El Salvador, Fiji, Gabon, Ghana, Grenada, Guatemala, Guyana, Honduras, Hong Kong, China, India, Indonesia, Iran, Iraq, Jamaica, Jordan, Kenya, Kuwait, Lebanon, Libya, Malaysia, Marshall Islands, Mauritius, Mexico, Micronesia, Mongolia, Morocco, Namibia, Nauru, Nicaragua, Nigeria, North Korea, Oman, Pakistan, Palau, Palestinian Territories, Panama, Papua New Guinea, Paraguay, Peru, Philippines, Qatar, Saint Kitts and Nevis, Saint Lucia, St. Vincent and the Grenadines, Saudi Arabia, Seychelles, Singapore, South Africa, South Korea, Sri Lanka, Suriname, Swaziland, Syria, Thailand, Timor-Leste, Tonga, Trinidad and Tobago, Tunisia, Turkey, United Arab Emirates, Uruguay, Venezuela, Vietnam, Zimbabwe

Least-Developed Countries: Afghanistan, Angola, Bangladesh, Benin, Bhutan, Burkina Faso, Burundi, Cambodia, Cape Verde, Central African Republic, Chad, Comoros, Dem. Rep. of the Congo, Djibouti, Equatorial Guinea, Eritrea, Ethiopia, Gambia, Guinea, Guinea-Bissau, Haiti, Kiribati, Laos, Lesotho, Liberia, Madagascar, Malawi, Maldives, Mali, Mauritania, Mozambique, Myanmar, Nepal, Niger, Rwanda, Samoa (Western), São Tomé and Principe, Senegal, Sierra Leone, Solomon Islands, Somalia, Sudan, Tanzania, Togo, Tuvalu, Uganda, Vanuatu, Yemen, Zambia

Source: UNDP, 2004a
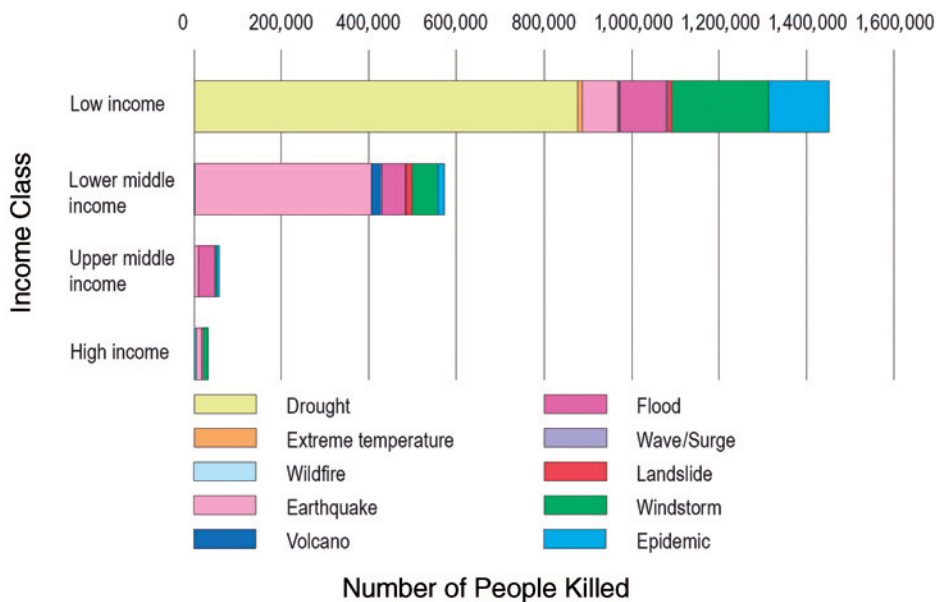
FIGURE 1-10 **Number of People Killed by Disasters by Income Class: 1973–2002.** (*Source:* EM-DAT: The OFDA/CRED International Disaster Database; www.em-dat.net) Université Catholique de Louvain—Brussels–Belgium

TABLE 1-4   **Differences in Disaster Impact between Rich and Poor Countries**

Rich countries	Poor countries
Tend to suffer higher economic losses, but have mechanisms in place to absorb these costs	Have less at risk in terms of financial value, but maintain little or no buffer to absorb even low financial impacts. Economic reverberations can be significant, and social development ultimately suffers
Employ mechanisms that reduce loss of life, such as early warning systems, enforced building codes, and zoning	Lack the resources necessary to take advantage of advanced technologies, and have little ability to enforce building codes and zoning even if these mechanisms do exist
Have immediate emergency and medical care that increase survivability and contain the spread of disease	Sustain massive primary and secondary casualties
Transfer much of personal, private, and public risk to insurance and reinsurance providers	Generally do not participate in insurance mechanisms. Divert funds from development programs to emergency relief and recovery

only continue, without significant changes in settlement and development patterns.

There are two primary explanations for the increasing number of annual disasters. The first, a subject of much debate, is that climate change (both natural and human-influenced) and environmental degradation are together resulting in a greater overall number of hazard events. Disaster managers have noticed a strong correlation between the loss of natural buffer zones (dunes, mangroves, wetlands), the destabilization of slopes, and unnatural increases and decreases in average global temperatures, among other related factors, with the changing dynamics of several major natural hazards. A few examples of hazards that can be heavily influenced by these human actions include landslides, floods, mudslides, extreme heat, and drought.

The second explanation pertains to patterns of increased human settlement in more vulnerable areas. As humans congregate in more urbanized centers, their collective vulnerability to disasters of all origins increases as a result. And when the hazard's risks are realized, its consequences have a much greater poten-tial to result in a disaster than they otherwise would. In other words, incidents that may have been managed locally, with few deaths and only minor damages, will exhibit increasingly greater likelihoods of becoming devastating events with higher population density of the affected areas.

Considerable research has focused upon the phenomenon of marginalization of the urban poor. During mass migrations from rural regions into the cities, the poor are often faced with a shortage of available space within which to live, and are therefore forced to settle in very dangerous hazard zones such as unstable hillsides or floodplains. These groups, often living in disorganized informal settlements, effectively increase the chance that a disaster will result from any number of hazards that threaten the city. Chapter 3 will cover this topic of vulnerability in more depth.

Technological disasters, like their natural counterparts, are also increasing in number each year. In fact, this purely man-made form of disaster is growing at a rate much greater than natural disasters. Figure 1-12 shows that, from 1975 to 2005, the average number of
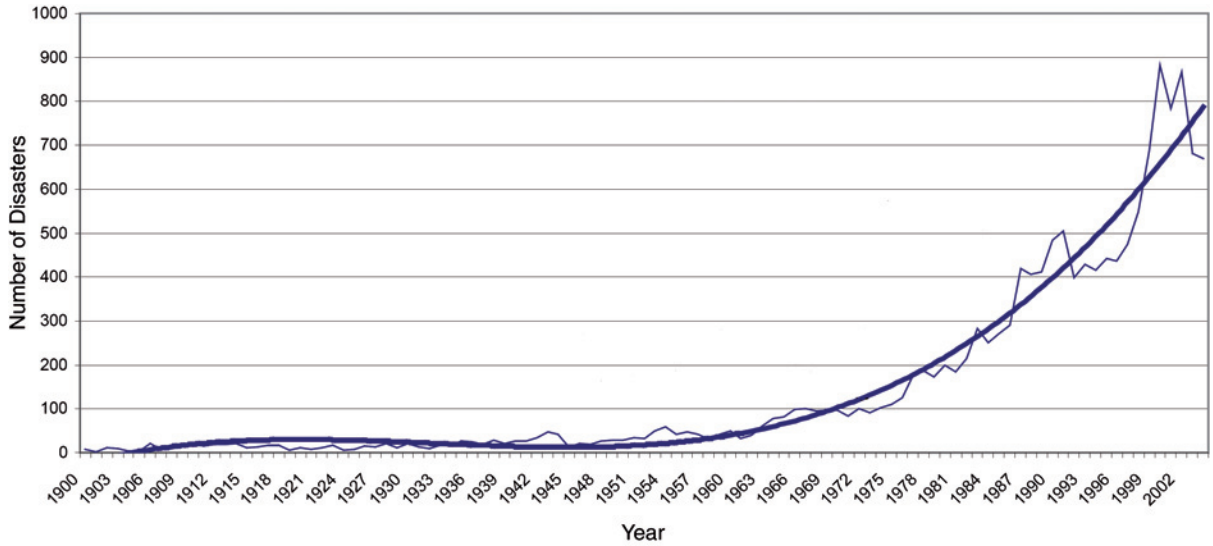
FIGURE 1-11 Total Number of Natural Disasters Reported in the World: 1900–2004. (*Source:* EM-DAT: The OFDA/CRED International Disaster Database; www.em-dat.net) Université Catholique de Louvain—Brussels–Belgium
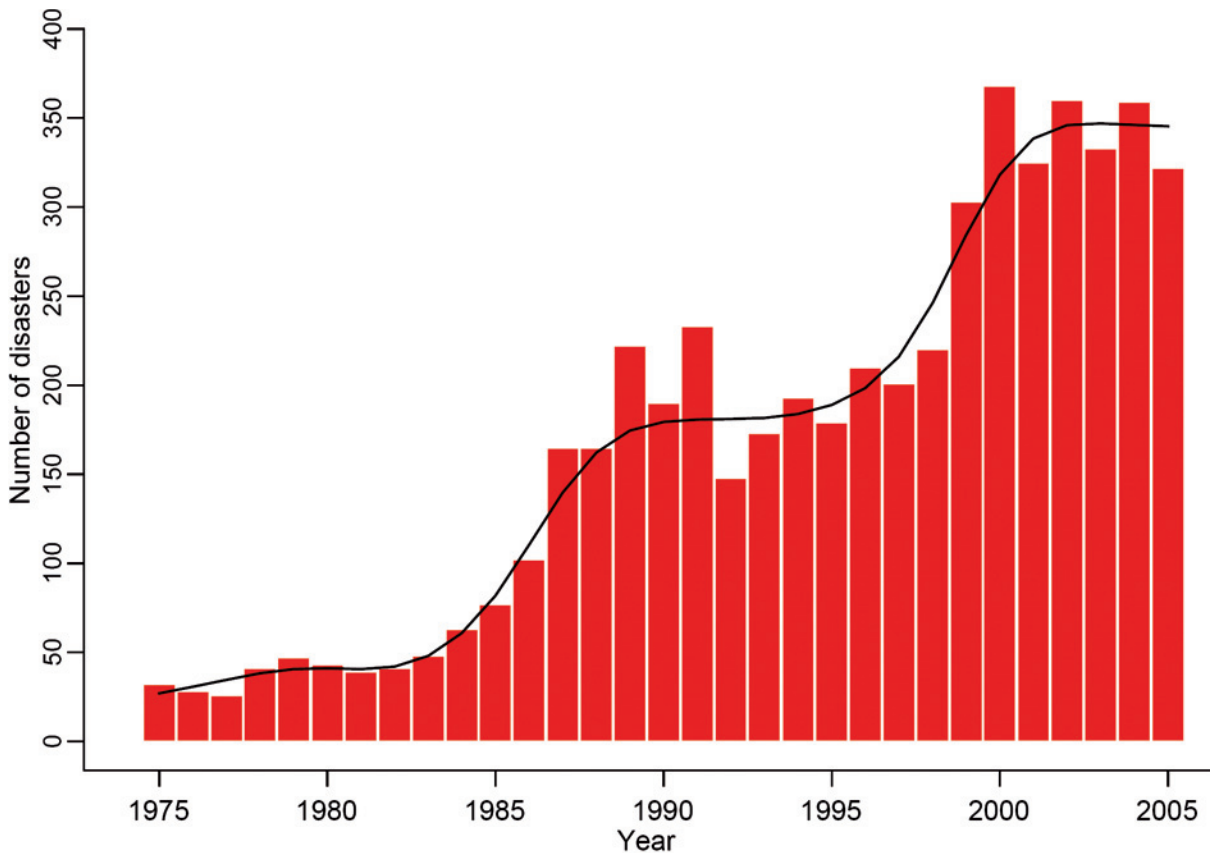
FIGURE 1-12 Total Number of Technological Disasters Reported in the World: 1975–2004. (*Source:* EM-DAT: The OFDA/CRED International Disaster Database; www.em-dat.net) Université Catholique de Louvain—Brussels–Belgium

reported technological disasters occurring worldwide grew from under 50 per year to almost 350 per year. This is a more than sevenfold increase in just 30 years.

DEFINITIONS

Following is a list of defined terms that will be used throughout the text.

Hazard

There is dispute about the origin of the word *hazard*, but it likely came from either the French *hasard*, a game of dice predating craps, or from the Arabic *al-zahr*, which means "the die." Clearly, the term is rooted in the concept of chance. In the modern sense of the word, hazards are events or physical conditions that have the *potential* to cause fatalities, injuries, property damage, infrastructure damage, agricultural loss, damage to the environment, interruption of business, or other types of harm or loss (FEMA, 1997). What determines whether a hazard becomes a disaster are risk and vulnerability.

Our lives are full of hazards, which exist in many forms, defined (in this case) according to their source. Chapter 2 will address the following three hazard types:

- Natural hazards
- Technological hazards
- Intentional hazards

The focus in Chapter 2 will be those hazards that have the potential to cause an international disaster. Cigarette smoke, for instance, is a hazard to public health, but would be unlikely to precipitate an event requiring the international disaster management community. A dam failure, on the other hand, very well could.

Risk

Just as all life is full of hazard, all life is full of risk. However, the concept of risk can have varying mean-

ings depending on the context. Just as it is used differently by insurance specialists versus stockbrokers or physicians, disaster managers employ their own deviation on *risk*. It is not uncommon, for example, for the term to be used in a positive manner to denote "venture" or "opportunity" (Jardine and Hrudey, 1997, p. 490). Such variance in use may come from the word's multiple origins. The Arabic *risq* means "anything that has been given to you [by God] and from which you draw profit" (Kedar, 1970), possibly explaining why some may use the term in relation to fortune or opportunity. However, the Latin *risicum*, which describes a specific scenario faced by sailors attempting to circumvent the danger posed by a barrier reef, seems a more appropriate derivation for use in relation to disaster management, where the term's connotation is always negative.

Unfortunately, even among risk managers, there is no single accepted definition for the term. One of the simplest and most common definitions of risk preferred by many disaster managers, which will be used throughout this text, is one that displayed through the equation stating that risk is the likelihood of an event occurring multiplied by the consequence of that event, were it to occur.

RISK = LIKELIHOOD × CONSEQUENCE
(Ansell and Wharton, 1992)

Likelihood is expressed either as a probability (e.g., .15; 50%) or a frequency (e.g., 1 in 1,000,000; 5 times per year), whichever is appropriate for the analysis being considered. Consequences are a measure of the effect of the hazard on people or property. Expanding upon this definition, it can be said that by reducing either the likelihood of a hazard or the potential consequences that might result, risk is effectively reduced. Likewise, any action that increases the likelihood or consequences of a hazard increases risk.

Vulnerability

There is a reason that two identical events will present as a minor issue in one country and a disaster in another. This reason comes to mind when, in assessing

damages from a hurricane, one comes across a house completely destroyed right next to an unscathed structure. We must also consider why two earthquakes, of almost equal magnitude and intensity, could cause less than 100 deaths in Los Angeles but over 20,000 in Gujarat, India. The answer to all of these issues is vulnerability.

Derived from the Latin term *vulnerabilis*, which means "to wound," vulnerability is a measure of the propensity of an object, area, individual, group, community, country, or other entity to incur the consequences of a hazard. This measurement results from a combination of physical, social, economic, and environmental factors or processes. Vulnerability can be decreased through actions that lower the propensity to incur harm, or it can be increased through actions that increase that propensity. For instance, retrofitting a building to withstand the shaking effects of an earthquake will lower that building's vulnerability to the hazard, thereby lowering risk (*resilience*, the opposite of vulnerability, is a measure of propensity to avoid loss). Populations have vulnerabilities as well, which are raised or lowered according to their practices, beliefs, and economic status. Chapter 3 will expand upon this concept.

Disaster

The term *disaster* is derived from the Latin roots *dis-* and *astro*, meaning "away from the stars" or, in other words, an event to be blamed on an unfortunate astrological configuration. Disasters occur when a hazard risk is realized. There is a caveat to this definition, however: To be considered disastrous, the realized hazard must overwhelm the response capability of a community. An international disaster, as defined by the UN, is "a serious disruption of the functioning of society, causing widespread human, material, or environmental losses which exceed the ability of the affected society to cope using only its own resources" (UN, 1992).

There is an important distinction between an event and a disaster. Not all adverse events are disasters,

only those that overwhelm response capacity. For instance, a simple house fire requires response by a jurisdictional fire department. There is surely property loss, and likely the possibility of injury or loss of life. However, as fires are routine occurrences that are easily managed, they normally are not considered disasters. In the great Chicago fire of 1871, on the other hand, more than 2000 acres of urban land were destroyed over the course of three days. Overall, the destruction included 28 miles of roads, 120 miles of sidewalk, 2000 lampposts, and 18,000 buildings, all totaling over $200 million in property damage (one-third of the value of all property in the city at the time) (Wikipedia, 2005). Between two and three hundred people died. While both events are fires, only the Chicago fire can be called a disaster.

Disasters also grow in intensity as they overwhelm progressively larger response units. A local disaster is not a national disaster, for instance, if a state or provincial response entity can manage the consequences. If not, only then does the disaster become national, thereby requiring the intervention of the national government. In situations in which a national government or several national governments are unable to manage the consequences of an adverse event, the event becomes an international disaster, requiring intervention by a range of international response and relief agencies.

Disasters are measured in terms of the lives lost, injuries sustained, property damaged or lost, and environmental degradation. These consequences manifest themselves through both direct and indirect means, and can be tangible or intangible. Understanding each of these measures is of great importance in assessing vulnerability, as will be shown in Chapter 3.

Disasters may be sudden onset or "creeping." Sudden-onset disasters often happen with little or no warning, and most of their damaging effects are sustained within hours or days. Examples include earthquakes, tsunamis, volcanoes, landslides, tornadoes, and floods. Creeping disasters occur when the ability of response agencies to support people's needs degrades over weeks or months, and they can persist for months or years once discovered. Examples are

drought, famine, soil salination, the AIDS epidemic, and erosion.

Safe

While the term *safe* may seem so obvious as not to require clarification, its context in regards to disaster management is not evident without a solid understanding of risk. Most people assume that referring to something as "safe" implies that all risk has been eliminated. However, because such an absolute level of safety is virtually unattainable in the real world, disaster managers and societies must establish thresholds of risk that define a frequency of occurrence below which those societies need not worry about the hazard. A realistic definition is provided by Derby and Keeney, who contend that a risk becomes "safe," or "acceptable," if it is "associated with the best of the available alternatives, not with the best of the alternatives which we would *hope* to have available" (emphasis added; Derby and Keeney, n.d.).

All aspects of life involve a certain degree of risk. However, as a global society, we are constantly assessing and reassessing what risk levels are acceptable for each and every hazard, considering that which science, technology, and law can offer to treat those risks. For many hazards, especially the natural, technological, and intentional examples provided in Chapter 2, this is true—as evidenced by the vast disparity between the number of people per population unit affected in the rich and poor countries of the world.

Compound (Combination) Disaster

Disasters are not always limited to a single hazard. Sometimes two or more completely independent disasters occur at the same time—an earthquake strike during a flood, for instance. More commonly, however, one disaster triggers a *secondary hazard*. Some secondary hazards only occur as result of a primary hazard, such as a tsunami (from earthquakes, volcanoes, or landslides), while others can occur either because of or independent of other disasters (such as landslides, which can be triggered by heavy rains, earthquakes, volcanoes, or other reasons, or occur purely on their own.) Compound disasters, which can occur either sequentially or simultaneously with one or more disasters, have a tendency to exacerbate consequences and increase victims' issues (such as stress and isolation). They can make search and rescue and other response and recovery tasks more difficult, and, most importantly, can significantly increase the risk of harm to victims and responders alike.

Humanitarian Crisis

A humanitarian crisis is a special situation that results from a combination of the realized consequences of a hazard and the severely diminished coping mechanisms of an affected population. In these situations, the health and life of a very large number of people are threatened. Characteristics of humanitarian crises generally include mass incidence of:

- Starvation/malnutrition
- Disease
- Insecurity
- Lack of shelter (exposure)
- A steadily growing number of victims

Humanitarian crises tend to only worsen without outside intervention.

Complex Humanitarian Emergency

There is a special type of humanitarian emergency that has response needs extending well beyond the normal scope of disaster management activities. These complex humanitarian emergencies (CHE) are the result of a combination of factors directly related to war and insecurity. The IASC describes CHEs as a "humanitarian crisis in a country or region where there is a total or considerable breakdown of authority resulting from the internal and/or external conflict and which requires an international response that goes beyond the mandate or capacity of any single agency" (IASC, 1994). Andrew Natsios, director of the U.S.

Agency for International Development (USAID), identifies five characteristics most commonly seen in CHEs in varying degrees of intensity. They are:

1. Civil conflict, rooted in traditional, ethnic, tribal, and religious animosities (usually accompanied by widespread atrocities)
2. Deteriorated authority of the national government such that public services disappear and political control dissolves
3. Mass movements of population to escape conflict or search for food
4. Massive dislocation of the economic system, resulting in hyperinflation and the devaluation of the currency, major declines in gross national product, skyrocketing unemployment, and market collapse
5. A general decline in food security, often leading to severe malnutrition and occasional widespread starvation (Natsios, 1997).

CHEs, which will be described in further detail in Chapter 2, often result in the creation of both refugees and internally displaced persons (IDPs), who bring to the table entirely new response requirements.

Refugee vs. Internally Displaced Person

In many situations related to war or internal strife, people are forced to flee their homes to escape anticipated or realized violence, often leaving behind all of their possessions. These groups are referred to as *forced migrants*. Where these migrants end up gives them further categorization, which significantly affects how international organizations are able to assist them.

If forced migrants are able to leave their country to seek asylum abroad, they become *refugees* (see Exhibit 1-5). When this happens, the host country generally provides them, as a group, with basic life needs. More importantly, international response agencies are granted access to them and are able to offer them food, shelter, and medical assistance. Refugees are also defended by a set of universally accepted laws that offer them a considerable degree of protection.

EXHIBIT 1-5   Convention Relating to the Status of Refugees: July 28, 1951

A **refugee** is someone who, "owing to well-founded fear of being persecuted for reasons of race, religion, nationality, membership of a particular social group or political opinion, is outside the country of his nationality and is unable, or owing to such fear, is unwilling to avail himself of the protection of that country; or who, not having a nationality and being outside the country of his former habitual residence as a result of such events, is unable or, owing to such fear, is unwilling to return to it."

Source: UNHCR, 1951

Eventually, following the end of whatever conflict forced them from their homes, they are given assistance in returning to their former lives as best as possible. The United Nations High Commissioner for Refugees (UNHCR) estimates that there are more than 10 million refugees throughout the world today.

When forced migrants are unable or unwilling to cross the borders of their country, they become **internally displaced persons (IDP)**. There are many reasons why IDPs do not leave their country, including war in neighboring countries, little ability to travel long distances, and impassable border regions. IDPs have very little physical protection, and often face severe shortages of food, water, and other basic life necessities. They are afforded little protection under international law, and widely recognized agreements (like the Geneva Convention) are often difficult to apply. Mere recognition of IDP crises can be difficult and, once identified, access by international response and relief agencies can be both cumbersome and dangerous. The domestic government, which may view the uprooted people as "enemies of the state," retains ultimate control over their fate. UNHCR estimates that there are currently over 25 million internally

displaced people in at least 50 countries throughout the world (Moore and Shellman, 2002; UNHCR, 2004).

CONCLUSION

International disaster management is a complex discipline. Like disaster management on the national level, it involves actions that seek to mitigate the effects of hazards, ensure that populations are prepared for disasters should they occur, facilitate the response to disasters that do occur, and help nations and people recover in the months and years following disaster events. The remaining chapters of this text will explain what these actions are, how they are performed, and what organizations and individuals perform them.

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2

Hazards

INTRODUCTION

All facets of life include some form of risk, with the source of that risk being the wide range of hazards that we are just beginning to understand. As a global society, we must contend with an array of hazards that may seem limitless but that in practice are considerably limited, owing to our genetics, spatial movements, habits, activities, geographic locations, and a measure of pure chance.

For nations, many of these factors of hazard origin also hold true. Physical location dictates exactly what profile of natural hazards a nation must face. Economic, industrial, and sociopolitical factors dictate hazards of technological and intentional origin. And with globalization, the speed and ease of international travel, and the emergence of global climate change patterns, it is apparent that every nation may be considered a neighbor of every other nation on the planet.

This chapter will begin with a short description of the disaster management processes of hazard identification and hazard analysis (sometimes referred to as *hazard profiling*). This will be followed by a listing and description of many of the hazards that possess catastrophic potential—in other words, those hazards that are capable of causing a disaster.

HAZARD IDENTIFICATION AND HAZARD PROFILING

The first step that must be taken in any effective disaster management effort is the identification and profiling of hazards. It is only logical that a disaster manager concerned with treating a community's or nation's risk must first know what hazards exist and where they exist.

The actual number of possible hazards throughout the world is staggering, and the list is by no means limited to what is found in this, or any other, text. However, disaster managers must be able to identify those hazards that are most likely to occur and that are most devastating should they occur. Understandably, it is impossible to plan for or prevent every possible contingency, so most government and other organized emergency management entities will focus their efforts upon those hazards that would be likely to result in the greatest undesirable consequences.

Disaster managers must attempt to identify every scenario that could possibly occur within a given community or country as result of its geologic, meteorological, hydrologic, biological, economic, technological, political, and social factors. This

hazard assessment, as it is often called, must include not only the actual physical hazards that exist but also the expected secondary hazards, including social reactions and conditions.

In order to begin the processes of risk analysis and risk assessment, which are covered in subsequent chapters, community leaders must identify all of the hazards that the community has experienced in the past and could possibly experience in the future. It is also important, at least in the initial stages of the process, to identify all other possible hazards, regardless of how small their likelihood of occurrence. As will be discussed in Chapter 3, many hazards are extremely unlikely to occur but, due to the nature of their consequences, their mitigation measures must be considered.

The goal of hazard identification is to establish an exhaustive list of hazards upon which further analysis can be performed. Again, it is not the concern of those identifying the hazards to consider what their likelihood or consequences may be. This is a process in which more is definitely better.

A hazard, as defined in Chapter 1, is a source of potential harm to a community, including its population, environment, private and public property, infrastructure, and businesses. For ease of description, hazards can be categorized into several subgroups, namely natural hazards, technological hazards, and intentional hazards. These categories are but one of many ways in which hazards can be subdivided. Other classification systems may involve more or fewer categories and may use different terminology. What is important, however, is that the categories chosen accommodate the full range of hazards such that no group is overlooked.

It is not uncommon for hazards from one of the chosen categories to cause a secondary hazard or disaster in that same category or one of the others. Hazard sequencing, described below, helps to determine these secondary, tertiary, or further disasters. Additionally, some hazards may be correctly placed in more than one category, which can lead to confusion. The division of hazards into these respective lists, however, helps to provide direction to governments or groups tasked with hazard identification, and adds logic to the thought process by which the hazards are identified.

For most countries, natural hazards are the primary concern of disaster managers. The kinds of natural hazards a country may face depend upon that country's climate, geography, geology, and land use practices. Natural hazards fall under the subcategories of tectonic (seismic) hazards, mass movement hazards, hydrologic hazards, meteorological hazards, and biological/health-related hazards.

Technological, or "man-made," hazards are an inevitable product of technological innovation. These hazards, which can occur after the failure of existing technology, tend to be much less understood than their natural counterparts and are increasing in number as the scope of and dependence on technology expands. The most common technological hazards arise from various components of transportation, infrastructure, industry, and buildings/structures.

Intentional hazards is the third category, and includes those hazards that result from the conscious decision of man to act in an antisocial or anti-establishment manner. Like technological hazards, many of these hazards are new and emerging, such as modern biological, chemical, and radiological weapons. Others, such as war, have existed for almost as long as humans themselves.

Hazard identification must be exhaustive to be effective. The product of this process, which is a detailed list of all past disasters and all possible future hazards within the country or community, will be the basis upon which effective disaster management policies and projects may be based. The breadth of knowledge and experience of the team assembled to complete such a process will ultimately be a determinate factor guiding how complete and accurate the generated hazard list will be. Also, because of risk perception (explained in Chapter 3), which defines how different people perceive hazard *significance*, a wide range of viewpoints is highly beneficial.

When identifying hazards, it is important to remember that the process is used simply to identify all of the hazards that might affect the country. It is not

concerned with the severity of their impact or the likelihood of occurrence. Ideally, all hazards with likelihood greater than zero would be identified and their associated risks reduced. However, determining which hazards are treated comes later, and only after hazards are compared (as will be explained in Chapter 3) can hazard priorities be ranked. Additionally, it is often difficult to understand whether even a seemingly insignificant hazard could trigger a much larger secondary hazard.

There are several methods by which hazard identification can be conducted. Ideally, a number of these will be used in conjunction. Some methods can be performed simultaneously, while others follow a logical step-by-step approach. Hazard identification is often used to initiate hazard profiling, which is a process of describing the hazard in its local context. This includes a general description of the hazard, its local historical background, local vulnerability, possible consequences, and estimated likelihood.

Checklists, which are comprehensive lists of hazards, consequences, or vulnerabilities, provide reference information to those performing risk analysis. It is often recommended that the use of checklists be limited until the process has reached an advanced stage. If they must be used to start the hazard identification process, their importance should be downplayed. The experience and knowledge of the assembled team and the discovery of historical records should be relied upon the most heavily, as these resources will reveal the most accurate depiction of the community's hazards (Reiss, 2001). Many studies relating to hazard identification (and other nonrelated tasks) have found that the existence of checklists can block the assessment team's creativity, may limit the ability to "see matters that have never been seen before," and can cause other errors in judgment. Therefore, checklists should be brought in at a later time to ensure that nothing has been left out of consideration or overlooked.

Hazard identification methods can be grouped into two categories: prescriptive and creative. Whichever method is chosen, it is important that a cost- and time-effective overall methodology is established that caters specifically to the needs and capabilities of the government agency or organization performing the hazard risk assessment. This methodology should incorporate several of the methods listed below, either in part or completely. Because this process could be performed indefinitely, the disaster management team must establish a goal that defines when the process has reached a satisfactory end point. These hazard identification methods include:

- *Brainstorming*. This creative process, in which disaster managers use their own knowledge and experience to develop a list of possible hazards, is one of the most effective methods of hazard identification. There are several ways in which the process can be conducted, including workshops, structured interviews, and questionnaires. Whatever methods are used, the quality of the end product will correlate directly with the background, diversity, and experience of the individuals involved in the exercise.

- *Research of the country's disaster and emergency history*. This information can be found by searching newspapers, town/city government records, the Internet, public libraries, local historical societies, and community elders. Presumably, incident reports on past events exist and will generate a list of known hazards. Many of these resources will provide dates, magnitudes, damages, and further evidence of past disasters in the community or state.

- *Reviews of existing plans*. Various types of plans exist within the government (local to national) that may contain information on hazards. National or local transportation, environmental, dam, or public works reports or plans are often useful. Others sources include local police, fire, or emergency management action plans, land use plans, capital improvement plans, building codes, land development regulations, and flood ordinances.

- *Investigation of similar hazard identification efforts in neighboring countries*. Many disasters will extend beyond country borders. Especially in the case of small countries or ones that share

regional climatic, geologic, or hydrologic characteristics, the neighboring countries are likely to share many of the same hazard risks. Investigations of neighboring countries also may turn up natural or technological hazards not present in the original country but that could result in a regional disaster within the country of focus (as with the Chernobyl disaster, in which fallout was carried by wind and weather to many adjacent countries.)

- *Use of maps*. Disaster managers can use maps to overlay known settlement, topographic, hydrologic, and other environmental and technological characteristics in order to determine whether interactions between these factors could result in unforeseen hazards.

- *Interviews*. Interviews with local citizens, risk managers, community leaders, academics, nonprofit relief agencies, international organizations, and other municipal and private sector staff (many of which are described in later chapters) who regularly perform disaster management tasks can provide a wealth of information. Floodplain managers, public works departments, and engineering, planning and zoning, and transportation departments commonly keep records on past and possible future hazards. Fire departments, police departments, and emergency management offices are bound to have a wealth of insight and information.

- *Site visits to public or private facilities*. Public or private facilities that serve as a known source of risk for the community are likely to provide information not only on the hazards they create but also about external factors identified by their own risk management departments as a source of risk for the facility.

Determining the secondary hazards that can arise from the hazards already identified is commonly done using simple brainstorming, or hazard sequencing. Hazard sequencing is most often performed using event trees or fault trees.

There are two primary methods of creating event trees. The first method, shown in Figure 2-1, begins by focusing on the effects of a single identified hazard and then focuses on the subsequent effects of those effects, and so on. The process is repeated until the disaster managers feel all possible secondary effects have been listed.

The second method is very similar to the first, except that it examines all of the events that may occur over the course of a hazard scenario. This scenario-based event tree begins with a timeline depicting the disaster scenario from start to finish, and then examines the various "initiating events" that may occur during the course of the disaster by tracing each event to their possible end states. Figure 2-2 depicts the analysis of one of many possible initiating events. (For more information on event trees, see Kaplan, 1997.)

Fault trees differ from event trees in that they focus on the end state, or consequence, and trace back to the possible initiating events (hazards) that could have triggered the consequence. The first of two methods, shown in Figure 2-3, begins by focusing on the possible causes of a single identified consequence and then focuses on the subsequent causes of those causes, and so on. The process is repeated until all possible causes of the consequence have been listed.

The second method, depicted in Figure 2-4, is similar, except that all of the causes, or initiating events, of a consequence are mapped according to a timeline-based scenario. This fault tree method begins by identifying the consequence, and then examining the scenario for any possible triggering events that could eventually lead to that end state.

HAZARD ANALYSIS

Although the list of hazards generated through these processes will allow disaster managers to know what hazards threaten the community, it tells them little more. Once a hazard has been identified, it must be further described for later use in risk analysis. This descriptive process, called hazard analysis or hazard profiling, allows disaster managers to make more informed calculations of risk, upon which disaster management actions are ultimately taken.
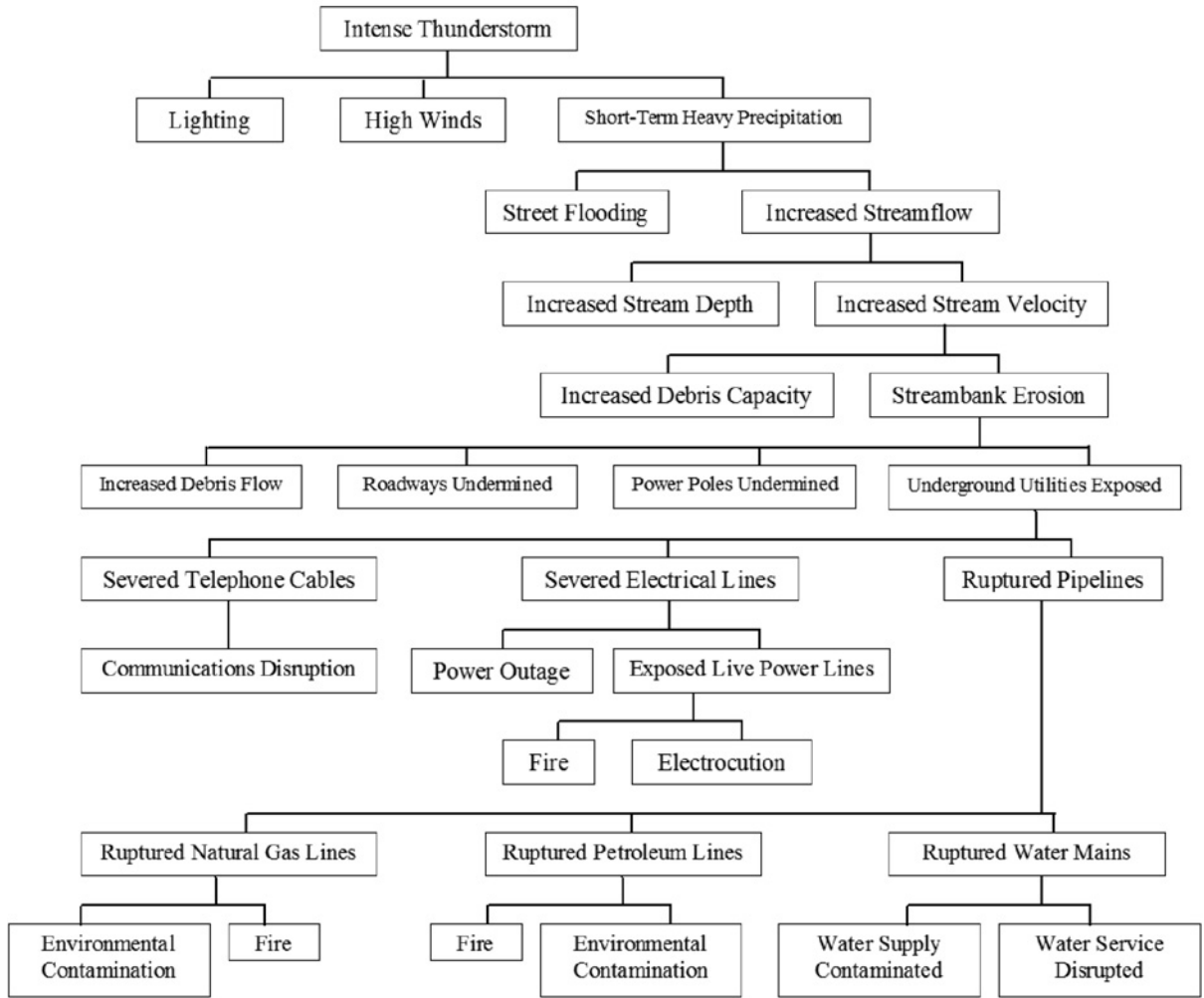
FIGURE 2-1   Event tree. (Adapted from NRC "A Safer Future.")

To analyze a hazard, disaster managers must determine exactly how that hazard exists within the specific community or country. Each hazard will be different in this respect, due to climate, geography, settlement patterns, regional and local political and stability, among many other factors. Disaster managers commonly create what is called a risk statement, which serves to summarize all of the necessary information into a succinct report for each identified hazard. With these reports, disaster managers can more accurately address each hazard in the specific context of the community or country.

Risk statements, or hazard profiles, are described by Emergency Management Australia as tools that "describe the possibility of a hazard (source of risk) affecting an element at risk" (EMA, 2000). In disaster management, a risk statement tells the disaster manager how each hazard impacts that community.

All hazards identified through hazard identification have unique characteristics, and may not be fully
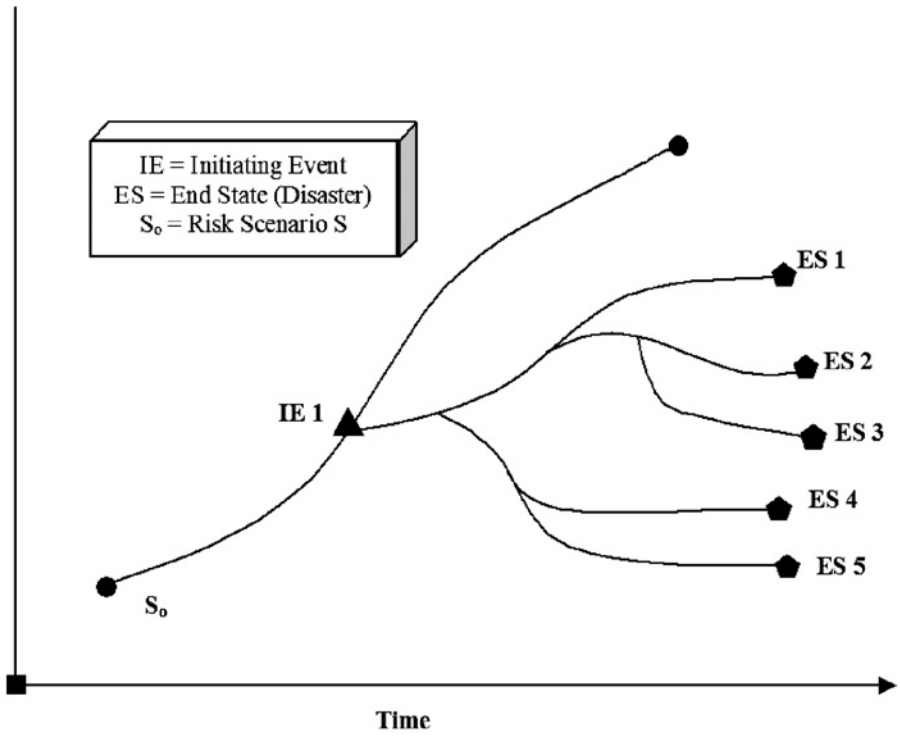
FIGURE 2-2 Event tree 2. (Adapted from Kaplan, 1997.)
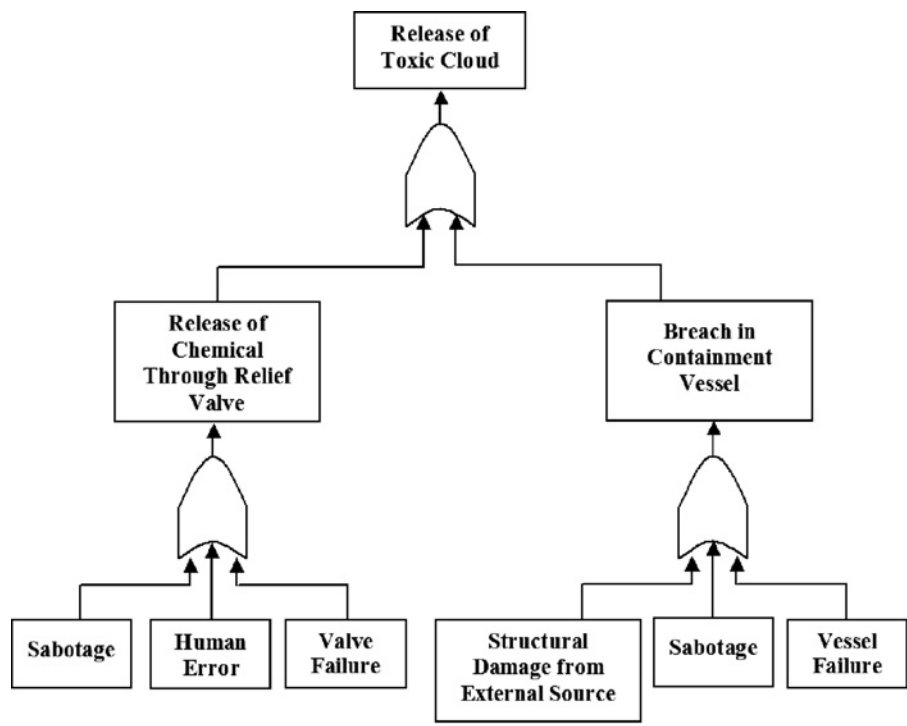
FIGURE 2-3 Fault tree. (Adapted from Slovic, Fischhoff, and Lichtenstein, 1979.)
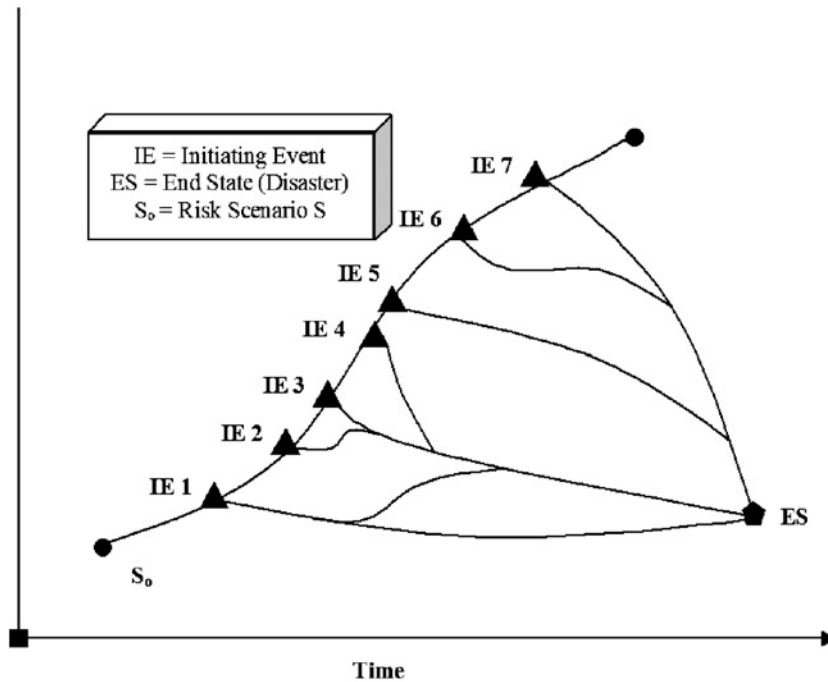
FIGURE 2-4   Fault tree 2. (Adapted from Kaplan, 1997.)

understood by those who have identified them. Even people with extensive backgrounds in hazards may have little or no understanding of how those hazards affect a community or country. This knowledge requires information about a combination of general hazard information and descriptions, community and environmental factors, and vulnerability factors (described in Chapter 3).

There are several methods of generating risk statements, and the main elements of this process are described below. If done properly, the profiles that are generated outfit disaster managers with a powerful tool with which they can adequately assess the community's risk and determine mitigation and preparedness priorities. If done incorrectly, however, they can cause unnecessary confusion and be counterproductive to the disaster management process as a whole.

To begin profiling hazards, it is vital that a base map be obtained or created. A base map contains important geographical, political, population, and

other information upon which hazard information may be overlaid. It is essentially a geographic representation of the community or country as a whole, sometimes called a community profile. Community profiles should include each of the following (adapted from FEMA, 1998):

- *Geography*. Includes topography, mountains, bodies of moving and standing water, canyons, coastal zones, tectonic faults, and other features
- *Property*. Includes land use, construction type, essential facilities, and hazardous materials facilities, among others
- *Infrastructure*. Includes roads, rail lines, airports, utilities, pipelines, bridges, communications, and mass transit systems, among others
- *Demographics*. Includes population size, density, income levels, and special population designations (such as elderly, children, prisons), among others

- *Response agencies*. Includes the locations, facilities, services, and assets of fire, police, emergency management, military, public health, and other response systems

Each hazard that threatens a community will affect it in a unique way. For instance, while heavy rain may be expected to uniformly affect a whole community, landslides and mudflows will only be a problem where there are steep, unstable slopes. The base map is the best way for disaster managers to analyze the spatial extent of hazards and thus plan for the possibility of interaction between hazards and people, structures, infrastructure, the environment, and so on.

To truly compare and analyze risks, it is important that risks are represented individually on a base map, as well as together on a single aggregate risk map. If a standardized map is used for all hazards profiled, disaster managers can maximize the possibility that all the mapped hazards account for timeliness and that there are no errors made due to scale of size, and they can simplify the task of comparing or combining two or more risk maps.

Once hazard maps are generated, disaster managers may move on to creating risk statements. Risk statements, like risk maps, are most effective if data is collected using a standardized format of information retrieval and reporting. A standardized display format ensures that detailed information is both easily readable and understandable to those involved in future steps of the disaster management process. The contents of the risk statements should include (but are not limited to, and not necessarily in the order presented):

1. *Name of the hazard*. Many hazards have different names, so it is important that a risk statement clearly identify exactly what type of hazard is being profiled. For instance, "storms" could be interpreted as windstorms, snowstorms, hurricanes, torrential rainfall, or other hazards. Providing a descriptive hazard identifier minimizes confusion.
2. *General description of the hazard*. The range of individuals involved in the exhaustive disaster

management process probably will have many different levels of knowledge and understanding about the hazards to be analyzed. Additionally, many measurement and rating mechanisms for hazards have changed over time, and others may be extremely useful in determining the local context of a hazard.

3. *Frequency of occurrence of the hazard*. This includes:
   a. *Historical incidences of the hazard*. This could be displayed in a standardized format, either as a spreadsheet, chart, or list. If the hazard happens regularly, it may be indicated as such, with only major events listed. This is often true with floods and snowstorms, for example.
   b. *Predicted frequency of the hazard*. Actual frequencies will be expanded upon in the risk analysis step detailed in Chapter 3.
   c. *Magnitude and potential intensity of the hazard*. Based upon the hazard maps, this measure may be a single figure or a range of possibilities. The magnitude and possible intensity will be important during risk analysis, as these figures help disaster managers to determine the possible consequences of each hazard and to determine what mitigation measures are appropriate.
   d. *Location(s) of the hazard*. For most hazards, the basic hazard map will be both sufficient and highly informative during risk analysis. However, when there are individual areas or regions within the community or country that require special mention and, likewise, special consideration, this may be included as a separate comment or detail. This helps to ensure that those special areas are not overlooked in subsequent processes.
   e. *Estimated spatial extent of impact of the hazard*. This information is also likely to be found on hazard maps. However, there may be special additional comments or facts for some hazards that need to be included sepa-

rately from the visual representation provided by the map.

f. *Duration of hazard event, emergency, or disaster*. For hazards that have occurred frequently in the past, it will be possible to give an accurate estimation of the hazard's duration, based on previous response efforts. However, for disasters that rarely occur or have never occurred, such as a nuclear accident or a specific type of hazardous material spill, estimations are often provided, based upon the hazard description, community vulnerability (see Chapter 3), emergency response capability (Chapter 6), and anticipated international response assistance. This figure will generally be a rough estimate, measured in days rather than hours or minutes, but will be very useful in subsequent steps that analyze possible consequences.

g. *Seasonal pattern or other time-based patterns of the hazard*. This is simply a description of the time of year that a hazard is most likely to appear, if such a pattern exists. Knowing seasonal patterns allows disaster managers to analyze interactions between hazards that could occur simultaneously.

h. *Speed of onset of the hazard event*. The speed of onset of a hazard can help planners in the mitigation phase determine what actions are possible, impossible, and vital given the amount of predisaster time they are likely to have. The public education and communications systems that are planned will be drastically different for each action. Warning systems and evacuation plans must reflect the availability or lack of time within which action can be taken. If responders can be readied before the disaster, the speed of response will be increased significantly. For these reasons and many more, knowing the speed of onset of a hazard is vital in planning.

i. *Availability of warnings for the hazard*. This information is indirectly related to the speed of onset of a hazard, but is also independent in some ways. Each hazard is distinct and has certain characteristics that either do or do not lend themselves to prediction. Some hazards that have a fast onset, such as a volcanic eruption, can be predicted with some degree of confidence (though not always), while some hazards with slower onset times, such as biological terrorism, can not be predicted accurately at all. Yet other hazards provide no advance warning at all, such as a chemical accident.

Even if advance knowledge of a disaster is possible, the capabilities of the local warning system further determine the possibility of adequately informing the public about an impending disaster. Local warning systems are more than the physical alarms, sirens, or announcements; they are also the public's ability to receive, understand, and act upon the warnings they receive. All factors must be considered when determining warning availability.

The risk statement may include both the available technology that could provide warnings of the hazards and the local system's current status of warnings for each specific hazard.

Once the obtainable information listed above has been collected, it should be presented in a standardized, easy-to-read display format.

THE HAZARDS

NATURAL HAZARDS

It has been said before that no disaster is natural, because any disaster event by definition requires interaction either with man, his built environment, or both. However, the many forces that elicit these disasters are in fact natural phenomena that occur regardless of the presence of man. It is possible, and is often the

FIGURE 2-5 Plates of the Earth. (*Source:* USGS, 2005a.)

case, that human actions exacerbate the effect of these natural processes, such as increased flooding after the destruction of wetlands, or landslides on slopes where anchor vegetation has been removed. The following section identifies the most common of these natural processes and briefly describes each.

Tectonic Hazards

Hazards that are associated with the movement of Earth's plates are called tectonic hazards or seismic hazards. Plate tectonics is a study of the movement of these plates, and combines the theories of continental drift and sea-floor spreading. Research is this field has discovered that the lithosphere (the planet's outer shell) is broken up into a pattern of constantly moving oceanic and continental plates, each of which slides over the underlying asthenosphere. Where the plates interact along their margins, many important geological processes occur: mountain chains are formed and lifted, earthquakes begin, and volcanoes emerge.

We now know that there are seven major crustal plates, shown in Figure 2-5, which are subdivided into a number of smaller plates. They are about 80 kilometers thick and are all in constant motion relative to one another, at rates varying from 10 to 130 millimeters per year. Their pattern is neither symmetrical nor simple. The specific type of interaction between plates, including collision, subduction (one plate sliding under another), or separation, determines the kind of tectonic hazard. These hazards occur most often at the boundaries of the great plates, where the interactions originate, but they are by no means limited to these convergent zones.

Earthquakes, which as their name suggests are sudden movements of Earth, are caused by an abrupt release of strains that have accumulated over time along fault lines. The rigid, constantly moving plates often become stuck together at points along their boundaries, and are unable to release the energy that slowly accumulates. Eventually, this snag is released, and the plates snap apart. The reverberation of energy

Number of Earthquakes

▨	0 – 5
▨	6 – 10
▨	>10
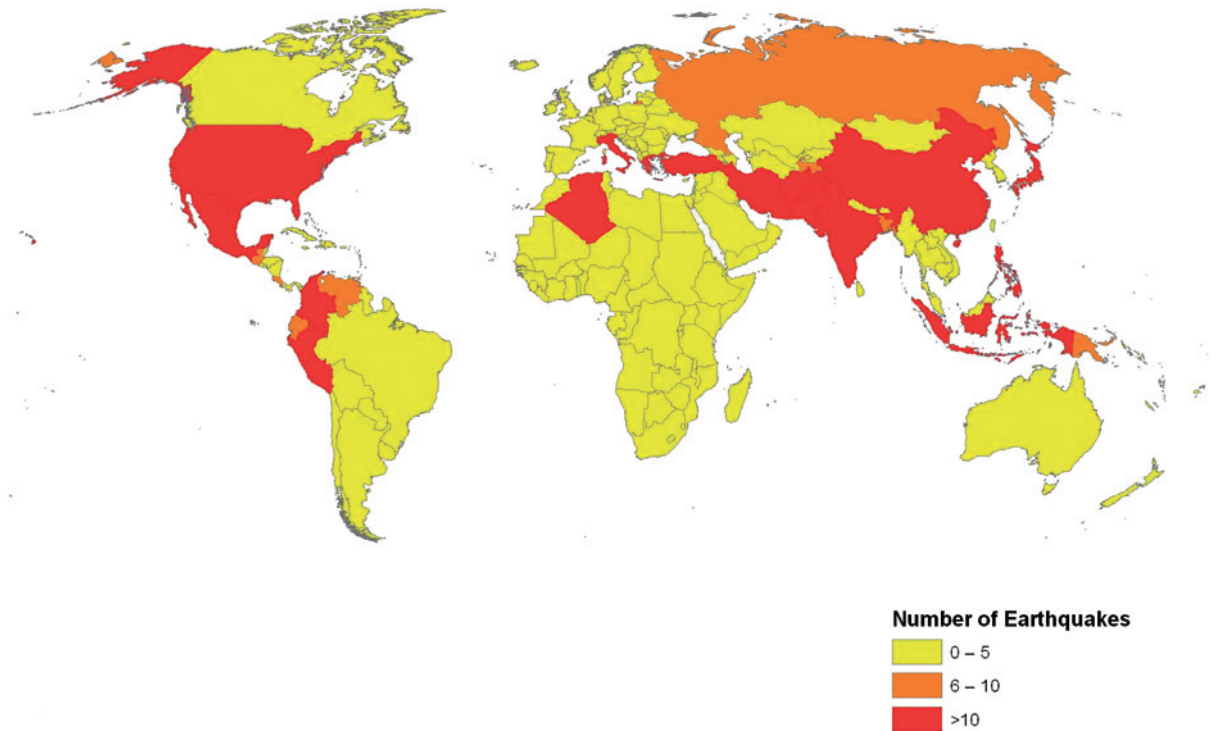
FIGURE 2-6   Number of earthquakes per country—1974 to 2003. (*Source:* www.em-dat.net.)

through the plate from the point where the plates had become snagged is the earthquake (see Figure 2-6).

Seismic waves are generated by the jolting motion of the plates, and extend outward from the origination point, or epicenter, like ripples formed by a stone thrown into a pond. The speed of those waves depends upon the geologic makeup of the materials through which they are passing. For particularly large earthquakes, such as the event that caused the 2004 tsunami events in Asia, the entire world can vibrate for several seconds or minutes.

Fractures within the crust of the Earth along which the plates have slipped with respect to each other are called faults, and are divided into three subgroups as determined by movement:

- *Normal faults* occur in response to pulling or tension; the overlying block moves down the dip of the fault plane.

- *Thrust (reverse) faults* occur in response to squeezing or compression; the overlying block moves up the dip of the fault plane.
- *Strike-slip (lateral) faults* occur in response to either type of stress; the blocks move horizontally past one another. Most faulting along spreading zones is normal, along subduction zones is thrust, and along transform faults is strike-slip (in spreading zones, plates move away from each other; in subduction zones plates move towards each other, with one sliding beneath the other; transform faults occur when plates slide laterally against each other, in opposite directions.)

Earthquakes can occur at a range of depths. The focal depth is the distance below the Earth's surface at which energy from the event was released, while the energy release point is called the focus of the

earthquake (not to be confused with the epicenter). Finally, the earthquake's epicenter is the point on the Earth's surface directly above the focus. Focal depths from 0 to 70 kilometers (43.5 miles) are considered shallow, from 70 to 300 kilometers (43.5 to 186 miles) are considered intermediate, and anything beyond 300 kilometers are considered deep. The focal point may be as deep as 700 kilometers (435 miles). The foci of most earthquakes are concentrated in the Earth's crust and upper mantle (Shedlock and Pakiser, 1994).

Earthquakes have also been known to occur within plates, though less than 10% of all earthquakes occur away from plate boundaries. The powerful New Madrid earthquakes of 1811–1812 in the United States occurred within the North American plate. Although earthquakes can be generated by volcanic activity (see below) or by manmade explosions, the most destructive events are those resulting from plate slippage.

Earthquakes are generally measured according to their magnitude and intensity. The commonly referred-to Richter Scale, named after its creator Charles Richter, is an open-ended logarithmic scale that measures the magnitude, or amount of energy released, by the earthquake, as detected by a seismograph. Most events below 3 are imperceptible to humans, while those above 6 tend to cause damage. Very few earthquakes exceed 9 on the Richter scale. Table 2-1 illustrates the average number of quakes that occur per year within each point on the Richter scale.

The second scale used to measure earthquakes is the Modified Mercalli Intensity Scale (MMI). This scale, which measures the effect of the earthquake on the Earth's surface, is based upon observations rather than scientific measurements, and uses Roman numerals ranging from I to XII. The MMI is useful in determining how a single earthquake affects different geographical areas because, unlike the Richter scale where the event has a single magnitude, different intensities can be assigned to any variant of geographic determination. Also, because the scale does not depend upon instruments, it is possible to assign

TABLE 2-1   Annual Occurrence of Earthquakes

Descriptor	Magnitude	Average annually
Great	8 and higher	1[1]
Major	7–7.9	17[2]
Strong	6–6.9	134[2]
Moderate	5–5.9	1319[2]
Light	4–4.9	13,000 (estimated)
Minor	3–3.9	130,000 (estimated)
Very minor	2–2.9	1,300,000 (estimated)

[1]Based on observations since 1900.
[2]Based on observations since 1990.

Source: USGS, 2005a.

an MMI figure to past earthquakes based upon historical descriptions of the event. Exhibit 2-1 describes the observations associated with each level of intensity on the MMI scale.

Soil liquefaction is a phenomenon that can occur within certain types of soil during an earthquake's shaking period. When loosely packed, waterlogged sediments are exposed to a certain degree of seismic strength (depending on the exact soil makeup), that land becomes jelly-like and loses its ability to support structures. Buildings can lean, topple, or collapse quite easily under these conditions.

Many secondary hazards and, likewise, disasters are known to occur in the aftermath of an earthquake. These include:

- *Landslides, rockslides (rock falls), and avalanches.* The shaking can cause unstable slopes to give way, resulting in landslides that can be more devastating than the quake itself. The 2001 El Salvador earthquakes, in which the vast majority of the 1100 victims died from a series of resulting slides, is but one example. Rockslides and avalanches, both described later in this chapter, are common secondary hazards to earthquakes.

EXHIBIT 2-1   **Description of the Twelve Levels of Modified Mercalli Intensity**

I. Not felt except by a very few under especially favorable conditions.

II. Felt only by a few persons at rest, especially on upper floors of buildings.

III. Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibrations similar to the passing of a truck. Duration estimated.

IV. Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motor cars rocked noticeably.

V. Felt by nearly everyone; many awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop.

VI. Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight.

VII. Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken.

VIII. Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, and walls. Heavy furniture overturned.

IX. Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations.

X. Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent.

XI. Few, if any (masonry) structures remain standing. Bridges destroyed. Rails bent greatly.

XII. Damage total. Lines of sight and level are distorted. Objects thrown into the air.

Source: USGS, 2005.

- *Tsunamis*. When the focus of an earthquake is along a fault under a large body of water and the movement causes a major deformation of Earth's surface, the water's resulting movement can result in a tsunami thousands of miles away. A single, high-magnitude earthquake off the coast of Indonesia caused the 2004 tsunami events throughout Asia. Tsunamis are described in greater detail below.

Beneath Earth's crust lie super-heated gases and molten rock called magma. At certain points along the planet's crust, most notably in the seismically active zones along the plate boundaries, this magma can escape to the surface to become lava. These fissures, or "vents," are known as **volcanoes**. There are currently over 500 active volcanoes throughout the world (see Figure 2-7). There are three main categories, determined by their geologic environment:

- Subduction volcanoes occur when one plate dips beneath another. The plate can then melt into magma, creating a buildup of pressurized material that is thrust to the surface, often explosively.

Number of Volcanos

☐ 0

☐ 1 – 2

☐ >2
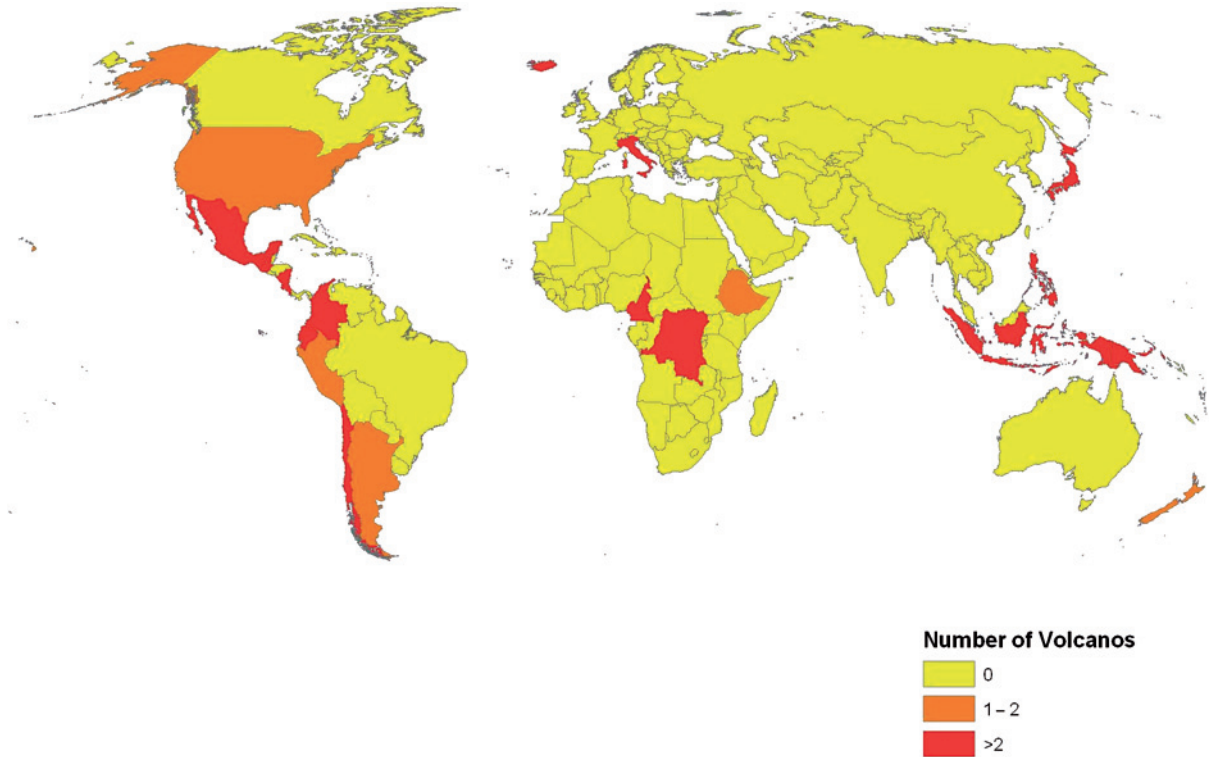
FIGURE 2-7   Number of volcanoes per country—1974 to 2003. (*Source:* www.em-dat.net.)

Subduction volcanoes tend to be the most disastrous, and often create the cone-shaped mountains characteristic of the world's most famous volcanoes.

- Rift volcanoes occur when two plates move away from each other, allowing magma to rise to the surface through the intervening space. These volcanoes tend to be associated with low magma pressure and therefore are not often explosive.
- Hotspot volcanoes occur when there is a weak spot within the interior of a plate under which magma can push through to the surface. Many of the Pacific islands, including the Hawaiian island chain (see Figure 2-8), are hotspot volcanoes (Smith, 1992).

These three categories can be further subdivided according to their shape and composition:

- *Calderas*. When very large and explosive volcanic eruptions occur, ejecting tens to hundreds of cubic kilometers of magma onto Earth's surface, the ground below can subside or collapse into the emptied space. The resulting depression is called a caldera. These spaces can be more than 25 kilometers in diameter and several kilometers deep.
- *Cinder/Scoria cones*. Cinder cones are simple volcanic structures formed by particles and congealed lava ejected from a single vent. As the gas-charged lava is blown violently into the air, it breaks into small fragments that solidify and fall
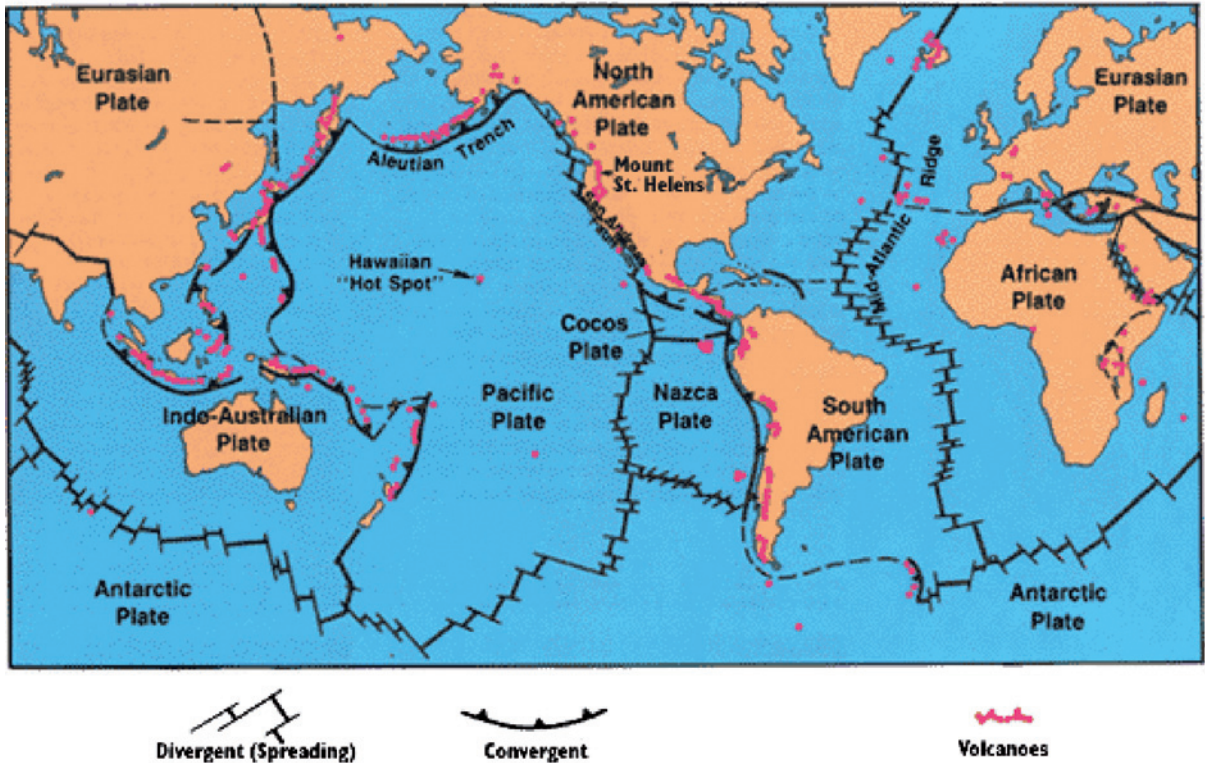
FIGURE 2-8 Volcanoes of the world. (*Source:* USGS, 1997.)

as cinders around the vent, forming a circular or oval cone. Most cinder cones have a bowl-shaped crater at the summit and rarely rise more than 1,000 feet above their surroundings.

- *Composite volcanoes and stratovolcanoes.* Many of the Earth's great mountains are composite volcanoes, also called stratovolcanoes. These structures typically are very large, steep-sided, symmetrical cones made from alternating layers of lava flows, volcanic ash, cinders, blocks, and bombs (blocks are large (greater than 64 mm diameter) rock fragments that are ejected from the volcano in a solid form; bombs are volcanic material that is ejected in a liquid state, but which cools to a solid form before falling to the ground). They can rise as much as 8,000 feet above their bases, and most have a crater at the summit that contains a central vent or a clustered group of vents. The essential feature of a composite volcano is a conduit system through which magma from a reservoir deep in Earth's crust rises to the surface, exiting through the volcano's central crater and/or side walls. The volcano is built up by the accumulation of material erupted through the conduit and increases in size as lava, cinders, ash, etc., are added to its slopes.

- *Continental volcanoes.* These volcanoes are located in unstable, mountainous belts that have thick roots of granite or granite-like rock. Magma is generated near the base of the mountain root, and rises slowly or intermittently along fractures in the crust.

- *Island-arc volcanoes*. When one plate thrusts under another, usually below the ocean's surface, volcanic activity appears several hundred miles forward of the subduction zone in the shape of the leading edge of the underlying plate. A chain of islands is often thrust up in an arc shape from the ocean floor. Examples include the Aleutian Islands and Japan. Eruptions associated with these processes tend to be highly explosive.
- *Lava plateaus*. In some shield-volcano eruptions (see below), basaltic lava pours out slowly from long fissures instead of central vents and floods the surrounding countryside, forming broad plateaus. Iceland is an example of this kind of volcano.
- *Lava domes*. These structures form when lava that is thrust from a vent is too sticky to flow very far and forms a steep mound.
- *Maars (tuff cones)*. These structures are shallow, flat-floored craters that likely have formed above vents as a result of a violent expansion of magmatic gas or steam. Maars range from 200 to 6,500 feet across and from 30 to 650 feet deep, and most are filled with water, forming natural lakes.
- *Oceanic volcanoes*. These structures are aligned along the crest of a broad ridge that marks an active fracture system in the oceanic crust.
- *Shield volcanoes*. These structures are built almost entirely of highly fluid basaltic lava flows. Thousands of flows pour out in all directions over great distances from a central summit vent or a group of vents, building a broad, gently sloping cone with a profile much like that of a warrior's shield. The Hawaiian Islands are shield volcanoes.
- *Submarine volcanoes, ridges, and vents*. These undersea structures are common features on certain zones of the ocean floor along plate boundaries. Some are active and can be seen in shallow water because of steam and rock debris being blasted high above the ocean surface. Many others lie at such great depths that the water's

tremendous weight results in high, confining pressure and prevents the formation and explosive release of steam and gases.
- *Tuyas*. These volcanoes are formed under a glacier, and are commonly found in Canada.

Each year, approximately 50 volcanoes erupt throughout the world, with fatalities occurring in about 1 out of every 20 eruptions. Volcanoes cause injury, death, and destruction through several means. Eruptions can hurl hot rocks, ash, and other debris, called "airfall tephra," as far as 20 miles away. Airborne ash and noxious fumes can spread for hundreds of miles, contaminating water supplies, reducing visibility, instigating electrical storms, collapsing roofs, and causing health problems. Lava flows, which can be slow (aa lava) or fast moving (pahoehoe lava), burn everything they contact. Explosions of gas and lava have been known to flatten entire forests. Especially dangerous are pyroclastic flows (also called "nuées ardentes"), which are superheated (up to 1000°C) fast-moving clouds of gas, dust, glass, and other material that can travel many miles, incinerating everything in their way. Pyroclastic flows account for over 70% of the deaths that have occurred in modern (1900 or later) volcanic eruptions.

Many secondary hazards are associated with volcanoes, including:

- *Earthquakes*. The great changes that occur within the Earth that are associated with the movement of lava often affect the pressure built up between surface plates, causing minor earthquakes to occur. The explosive nature of the volcano itself can cause the plates to shake as well. Though these events are not often associated with widespread damage, they can cause structural damage to the volcano or surrounding land, leading to rock falls, landslides, or other hazards.
- *Rockfalls and landslides*. As volcanoes erupt, they often shake and become unstable. Sections of the volcano may collapse inward or slough away completely. This results in the release of

debris, which becomes subject to the forces of gravity and moves in massive quantities, covering great distances.

- *Mudflows (lahars).* Volcanic eruptions are often accompanied by the generation of large volumes of water. This water can come from a range of sources, including snow pack that accumulated on the volcano during periods of inactivity, cloudbursts resulting from the eruption, or water stored in a crater lake. The water, which mixes with ash from the eruption and soil from the mountainside, turns to a thick mud and rushes quickly down the slopes of the volcano, burying whole towns and cities as it moves. Lahars are second only to pyroclastic flows in terms of their devastating potential (see Figure 2-9). Flash floods are also possible if the water generated does not mix with other materials before descending the slopes of the volcano.
- *Tsunamis.* When a volcanic eruption causes major changes to the ocean floor or along ocean shores, a tsunami may be generated. The famous 1883 eruption of Krakatoa resulted in a tsunami up to 135 feet in height when the volcanic structure collapsed into the ocean. Over 36,000 people living nearby were drowned (see the following discussion for move in formation).
- *Poisonous gases.* Noxious gases, including carbon monoxide, hydrogen, and sulphur-related compounds, are often released in combination with a volcanic eruption, but they can also spontaneously release from a volcano that is not erupting. When these releases overcome a human or animal population, very few survive.

A **tsunami** (pronounced "soo-nah-mee") is a series of waves generated by an undersea disturbance such as an earthquake. The word is Japanese in origin, represented by two characters: "tsu" (harbor) and "nami" (wave). Tsunamis are often incorrectly referred to as tidal waves. In truth, tides result from the gravitational influences of the moon, sun, and planets, a phenomenon that has absolutely nothing to do with the genera-

FIGURE 2-9   Melting snow and ice from the 1982 eruption of Mount St. Helens triggered this lahar on the north flank of the volcano. (*Source:* Tom Casadevall, USGS.)

tion of tsunamis (although the ultimate height of a tsunami striking a coastal area is determined by the tide level at the time of impact.)

There are many events that result in the generation of a tsunami, but earthquakes are the most usual. Other forces that generate the great waves include landslides, volcanic eruptions, explosions and, though extremely rare, the impact of extraterrestrial objects, such as meteorites.

Tsunamis are generated when a large area of water is displaced, either by a shift in the sea floor following an earthquake, or by the introduction of mass from other events. Waves are formed as the displaced water mass attempts to regain its equilibrium. It is important to note that not all earthquakes generate tsunamis; to do so, earthquakes must occur underneath or near the ocean, be large in magnitude, and create movements in the sea floor. While all oceanic regions of the world can experience tsunamis, the countries lying in the Pacific Rim region face a much greater frequency of large, destructive tsunamis because of the presence of numerous large earthquakes in the seismically active "Ring of Fire" (see Figure 2-10).

The waves that are generated travel outward in all directions from the area of the disturbance. The time
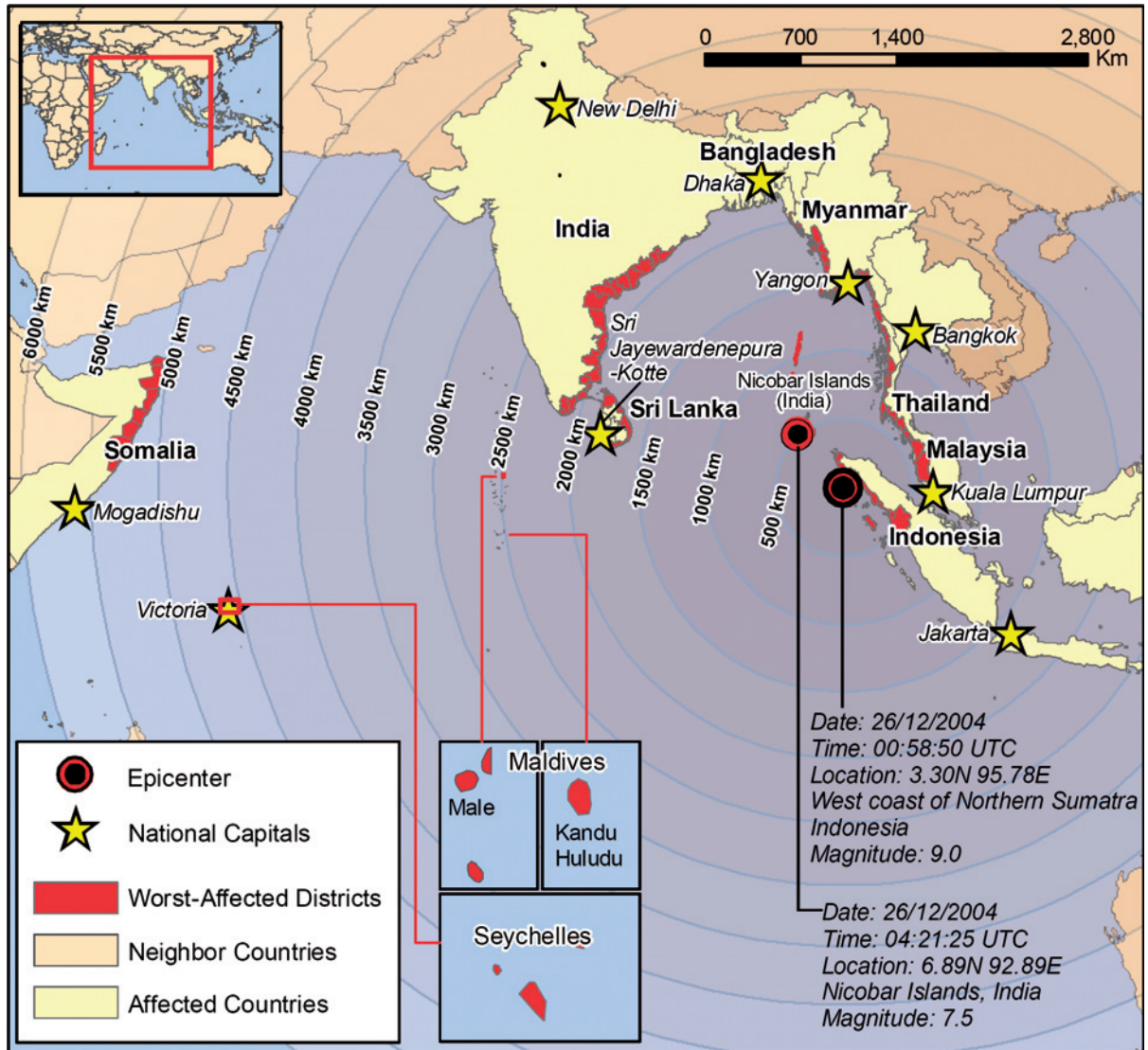
FIGURE 2-10   Areas affected by the December 26, 2004, Indian Ocean tsunami. (*Source:* usgs.gov.)

between wave crests can range from as little as 5 minutes to as much as 90 minutes, and the wave speed in the open ocean averages a staggering 450 miles per hour. Wave heights of more than 100 feet have been recorded. In the open ocean, tsunamis are virtually undetectable to most ships in their path. As the waves approach the shallow coastal waters, they appear normal but their speed decreases significantly. The compression of the wave resulting from the decrease in ocean depth causes the wave to grow higher and crash

onto land—often resulting in great destruction, injuries, and death (NTHMP, 2003).

Strange phenomena that precede a tsunami, such as the ocean receding for hundreds of feet, exposing the ocean floor, have resulted in the death of those who ventured out to explore, only to be drowned by the water's sudden return. Most deaths during a tsunami result from drowning. Other risks associated with the tsunami hazard include flooding, polluted water supplies, destruction of crops, business interruption, loss of infrastructure (roads, electrical lines, etc.), and damaged gas lines. Locally generated tsunamis tend to be the most dangerous, because they can reach a nearby shore in less than 10 minutes. Even with the advent of tsunami warning systems, that is too short a time for local authorities to issue a warning.

By far, the most destructive tsunamis are generated from large, shallow earthquakes with an epicenter or fault line near or on the ocean floor, which can tilt, offset, or displace large areas of the ocean floor from a few kilometers to as much as 1,000 or more kilometers.

Less frequently, tsunami waves can be generated by displacements of water from rockfalls, icefalls, volcanoes, or sudden submarine landslides or slumps; which are the instability and sudden failure of submarine slopes, sometimes triggered by the ground motions of a strong earthquake. The tallest tsunami wave ever observed was caused by a rockfall in Lituya Bay, Alaska on July 9, 1958. Triggered by an earthquake, a rockfall of approximately 40 million cubic meters at the head of the bay generated a wave that reached the incredible height of 1,720 feet (520 meters) on the opposite side of the inlet.

Mass-Movement Hazards

Mass-movement hazards include those events that are caused either by the rapid, gravity-induced downward movement of large quantities of materials (debris movements) or by the contraction (subsidence) or expansion of the Earth from nonseismic means.

Debris movements can be generated by a variety of mechanisms, including intense rainfall or snowfall, rapid snow melt, gradual erosion, a loss of anchoring vegetation, earthquakes, volcanoes, or human interaction. These hazards exist in almost every country of the world, and result in hundreds of deaths worldwide each year. There are three types of movements that can occur: falls, which involve mostly vertical travel through the air; slides, which involve tumbling of rock, soil, or other solid material down a slope; and flows, which involve the downslope movement of fluid masses.

Debris movements are further characterized by the materials that form their mass. The most common include:

- *Landslides*. These hazards can occur whenever the physical mechanisms that prevent soil or bedrock from moving down a slope are weakened or disturbed. Landslides are most often triggered by earthquakes and other seismic hazards, but can be generated by loss of vegetation (especially after fires), human modification, or excessive water saturation of the ground. They can move at very high speeds, or they may occur slowly over days, weeks, or even longer. Landslides can travel great distances and result in very large runoff zones, where the bulk of their devastating effects tend to occur (see Figure 2-11).
- *Rockfalls*. These hazards involve the freefall, rolling, and tumbling of very loose material. They are most commonly the result of seismicity but can occur without external seismic pressures, especially on slopes exceeding 40 degrees. Other common instigators of rockfalls are construction (most notably road construction through mountainous areas), ground freeze, and patterns of animal movement.
- *Debris flows*. These hazards, also referred to as mudflows or mudslides, are less common than landslides but often much more destructive. Debris flows are dependent upon the introduction of great amounts of water from prolonged rainfall, flash flooding, or very rapid snowmelt. The

FIGURE 2-11 Fresh landslide scars in the Ecuadorian Andes. (*Source:* Author.)

FIGURE 2-12 "Battleship Avalanche," located in the San Ivan Mountains in the US state of Colorado. (*Source:* Colorado Avalanche Information Center, photo by Tim Lane, February 28, 1987.)

lubrication provided by the liquid content of the debris allows for much faster descent down the affected slope and, likewise, greater overall distances traveled from the source of the flow.

- *Avalanches*. Avalanches, or snow slides, are movements of debris composed of snow, ice, earth, rock, and any other material that is picked up as they progress down the affected slopes. An avalanche occurs when the gravitational stress pulling downward on the snow exceeds the ability of the snow cover to resist it. Four factors are required for an avalanche to occur: (1) a steep slope; (2) snow cover; (3) a weak layer in the snow cover; and (4) a trigger. Common triggers are heavy alternating periods of snowfall, rain, and melting, or an external increase in pressure (e.g., skiers, animals, or explosions.) About 90% of all avalanches start on slopes of 30–45 degrees (Colorado Avalanche Information Center, n.d.). Failures on slopes of less than 20 degrees rarely occur; on slopes above 60 degrees, the snow rarely accumulates to a critical mass. It is estimated that over 1 million avalanches occur each year worldwide. They typically follow the same paths year after year, leaving scarring along their course. Trained experts thus can easily identify, with a high degree of accuracy, areas that are prone to this hazard (see Figure 2-13). However, unusual weather conditions can produce new paths or cause avalanches to extend beyond their normal paths, and identifying these risk areas takes greater expertise and speculation (see Figure 2-14).

Flooding is a common secondary hazard associated with debris movements, especially when the runoff zone impedes the flow of a river or stream, forming a natural dam. A debris movements can also trigger a tsunami if its runoff zone terminates in a large body of water.

Land subsidence is a loss of surface elevation caused by the removal of subsurface support. Sink-

FIGURE 2-13 Avalanche warning sign, Cotopaxi volcano, Ecuador. (*Source:* Author.)

holes are a form of subsidence. The affected area can range from a broad, regional lowering of the land surface to a pronounced, localized collapse (see Figure 2-15). Subsidence is almost exclusively the result of human activities, including mining (predominantly coal mining), the removal of groundwater or petroleum reserves, and the drainage of organic soils. Other factors, such as the composition of the soil, can contribute to this phenomenon.

Expansive soils are, as their name suggests, soils that tend to increase in volume when they are influenced by some external factor, especially water. The most common type of expansive soil is clay, which expands or contracts as water is added or removed. Adobe is the most significantly affected clay. Expansive soils that have high overlying weight, thus limiting upward expansion, tend to "ooze" in all horizontal directions, leaving a weakened area once the soil returns to its contracted state.

Number of Avalanches/Landslides

	0 – 3
	4 – 10
	11 – 35
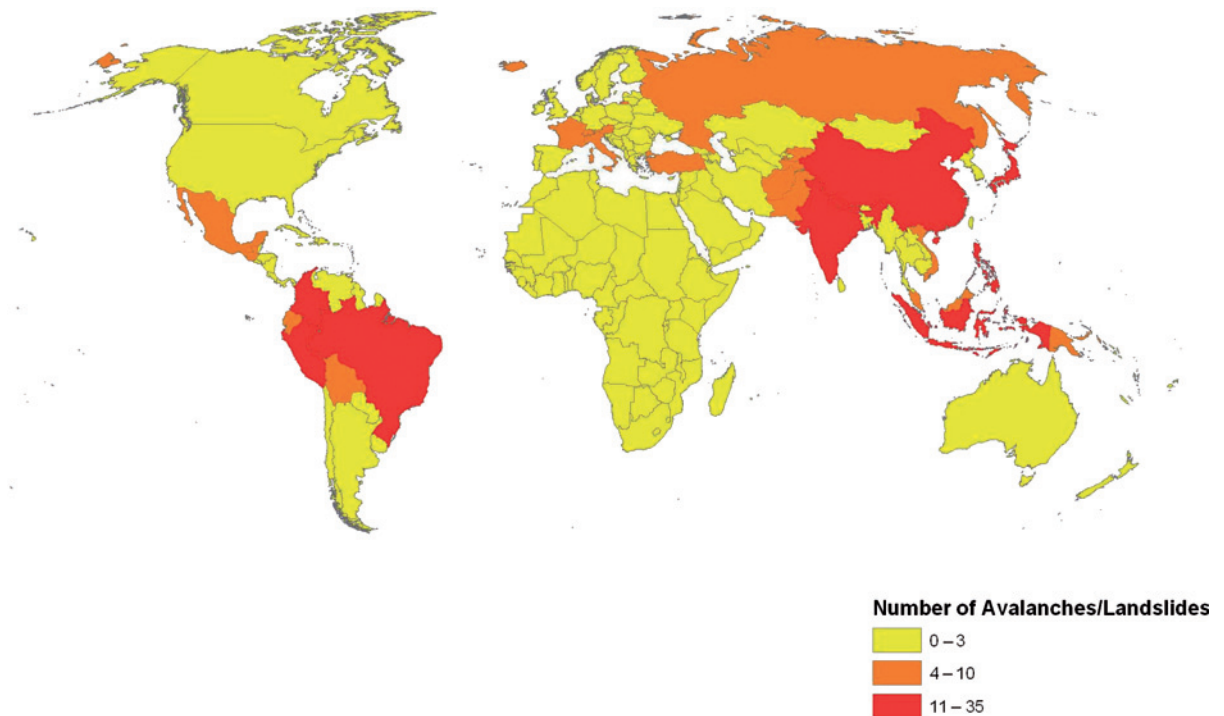
FIGURE 2-14   Number of disasters caused by debris movement per year throughout the world, 1974–2003. (*Source:* www.em-dat.net.)
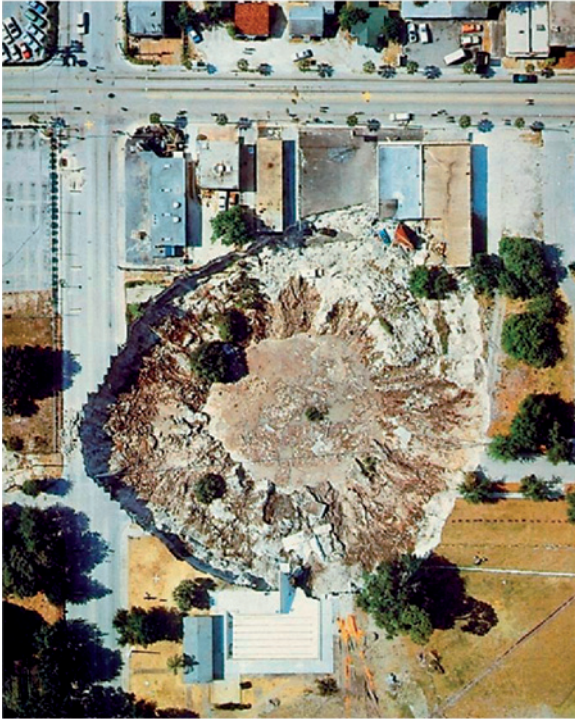
FIGURE 2-15   Collapsed sinkhole in Winter Park, Florida, USA. (*Source:* USGS, 1981.)

Subsidence and expansion, which (generally) occur gradually over extended periods of time, do not pose the same risk to life as sudden-onset types of events. Someone viewing an area affected by subsidence or expansion would probably not detect that anything had occurred. However, when structures are built upon land affected by subsidence or expansion, the damage inflicted tends to be severe. Wells, pipes, and other underground infrastructure, as well as overlying power lines, can be damaged or destroyed. These hazards can make geological survey records obsolete, because reference points can change significantly. Urban centers are most severely affected by these processes, as are transportation routes such as train tracks, roads, and bridges. Farmers also face considerable risk from subsidence, which can alter irrigation patterns and disrupt leveled fields. Any structure

or infrastructure built upon land affected by subsidence or expansion faces grave risk (Gelt, 1992).

Hydrologic Hazards

Either excess or a severe lack of water causes hydrologic hazards. The major hydrologic hazards include flooding (and flash flooding), coastal erosion, soil erosion, salination, drought, and desertification.

Floods, which are by far the most common natural hazard, occur throughout the world. Annually, more people are killed by flooding than any other hazard, with an average of 20,000 deaths and 75 million people affected each year (Brun, n.d.) (see Figure 2-16). Floods can be either slow or fast rising, generally developing over days or weeks. Most often they are a secondary hazard resulting from other meteorological processes, such as prolonged rainfall, localized and intense thunderstorms, or onshore winds (see Figure 2-17). However, other generative processes, including landslides, logjams, avalanches, icepack, levee breakage, and dam failure can also generate rapid and widespread flooding. Flash floods, which occur with little or no warning, are the result of intense rainstorms within a brief period of time.

The five most commonly flooded geographic land types are:

- *River floodplains*. These include the low-lying, highly fertile areas that flank rivers and streams. They tend to be highly populated because of their ample irrigation and fertile soil. However, these regions are also the most likely to flood in any given year.
- *Basins and valleys affected by flash flooding*. In basins and valleys where runoff from intense rainstorms collects and concentrates, flash flooding is a significant risk. More lives are lost in this kind of flooding than any other because very little warning is possible, and evacuation can be difficult due to the terrain surrounding.
- *Land below water-retention structures (dams)*. Dam failures, which can occur due to poor main-
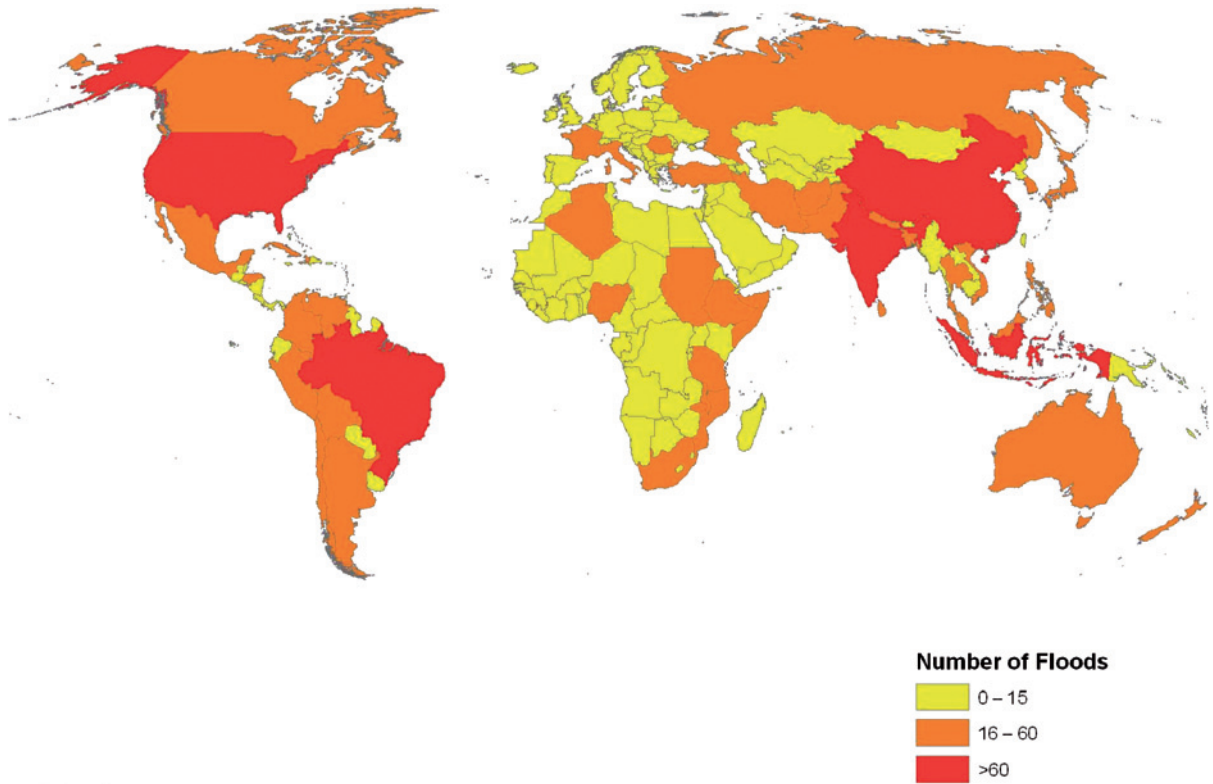
FIGURE 2-16   Flood events per year, 1974–2003. (*Source:* www.em-dat.net.)

tenance or as a secondary disaster from other natural or manmade processes, often cause flooding downstream from the dam as it releases a torrent of retained water. The United States has over 30,000 dams, and most countries have as many or more, most of which are privately built and maintained.

- *Low-lying coastal and inland shorelines*. Coastal shorelines often flood as a result of a storm surge preceding hurricanes, cyclones, and other major windstorms. The storm-surge flooding can be more dangerous than the windstorm itself. Low-lying inland shores surrounding large lakes can be negatively affected when water levels rise significantly.

- *Alluvial fans*. This type of landscape, often the result of previous periods of hydrologic activity, can become very dangerous during flash floods, when unpredictable water drainage patterns emerge. The Middle East is especially prone to this type of disaster (Smith, 1992).

Flash flooding is often the result of rapid, unplanned urbanization, which can greatly reduce the land's ability to absorb rainfall. The resulting runoff has nowhere to go and accumulates as quickly as the rain can fall. Drainage systems can be built to alleviate some of this problem, but very heavy rains will often exceed the capacity of even the best-designed systems of the developed countries.

FIGURE 2-17 Flooding in Gonaïves, Haiti, after Hurricane Jeanne. (*Source:* Manual Santana, USAID, 2004.)

Deforestation is another causative factor of floods. Soil once anchored by vegetation quickly turns to runoff sediment, which is deposited into drainage systems such as rivers and streams, thereby decreasing their holding capacity. As sediment builds up, successive floods occur more rapidly. The water-retention capacity of soil anchored by vegetation is greater than that of deforested land, leading to greater overall amounts of runoff that ultimately results from deforestation.

Secondary effects of flooding include coastal erosion and soil erosion. Erosion effects can increase the chance of future flooding, resulting in a vicious cycle of repeat flooding and further erosion.

A **drought** is a period of unusually dry weather that persists long enough to cause serious problems such as crop damage and water supply shortages. The severity of the drought depends upon its duration, the degree of moisture deficiency, and the size of the affected area. Drought is a hazard that requires many months to emerge and that may persist for many months or years thereafter. This type of hazard is known as a "creeping" hazard. The causes, or triggers, of drought are not well understood, and are often part of constantly changing global climate patterns.

What defines a drought has not been established through any standardized measure. In general, any unusual shortage of useable water can be considered a

drought, but whether the drought becomes a hazard is a factor of the affected region's coping mechanisms. A simple lack of rain does not necessarily constitute a drought, nor does the appearance of a rainstorm indicate the end of a drought. Additionally, what is considered to be an ample quantity of water resources in one geographic area may be considered drought in another area, where more water is required for individual, agricultural, and other needs. Therefore, drought is defined not by any global measure but by the capacity of the affected area to accommodate the changes brought about by the changes in available water. (See Exhibit 2-2 for further discussion.)

Droughts are categorized into four distinct groups:

- *Meteorological drought*. A measure of the difference between observed levels of precipitation and the normal range of values for precipitation in that same area
- *Agricultural drought.* A situation in which the quantity of moisture present in the soil no longer meets the needs of a particular crop
- *Hydrological drought*. When surface and subsurface water supplies fall well below normal levels
- *Socioeconomic (famine) drought.* Refers to the situation that occurs when physical water shortages begin to affect people. This type of drought is caused more by socioeconomic factors (such as restrictive governments, poor farming practices, breakdown of infrastructure, or a failed economy) than by environmental factors, and as such can be the most devastating.

The lack of rainfall associated with drought can cause debilitating effects to both agricultural and urban centers. Crops quickly fail once irrigation systems run dry, and many industrial processes that depend upon water resources must cut back or stop production completely. Hydroelectric power is reduced significantly as river flow rates are reduced, and river-based commerce and transportation can come to a standstill as water levels drop. In poor countries, drought is often, but not always, associated with the emergence of famine (this is never the case in developed countries, where mechanisms to prevent

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EXHIBIT 2-2   The Palmer Drought Index

The Palmer Drought Index is a formula developed by Wayne Palmer in the 1960s to measure drought, using temperature and rainfall information to determine relative dryness. It has become the semi-official drought index.

The Palmer Index is more effective in determining long-term drought (months) than short-term forecasts (weeks). It uses 0 as normal. Drought is shown in terms of negative numbers; for example, −2 is moderate drought, −3 is severe drought, and −4 is extreme drought. The Palmer Index can also reflect excess rain using a corresponding level reflected by positive figures; 0 is normal, 2 is moderate rainfall, etc.

Its advantage is that it is standardized to local climate, so it can be applied to any geographic location to demonstrate relative drought or rainfall conditions. Unfortunately, it is not very useful for short-term forecasts, nor is it particularly useful in calculating supplies of water reserved in snow or other similar reservoirs.

The Crop Moisture Index (CMI) is also a formula developed by Wayne Palmer. The CMI responds more rapidly than the Palmer Index and can change considerably from week to week, so it is more effective in calculating short-term abnormal dryness or wetness affecting agriculture. CMI is designed to indicate normal conditions at the beginning and end of the growing season; it uses the same levels as the Palmer Drought Index. It differs from the Palmer Index in that the CMI formula places less weight on the data from previous weeks and more weight on the most recent week.

Source: NOAA, n.d. (a).

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famine are well established) (see Figure 2-18). The Sahelian drought that began in 1968 was responsible for the deaths of 100,000 to 250,000 people and 12 million cattle, the disruption of millions of lives, and the collapse of the agricultural bases of five countries.

Desertification is a creeping hazard that can be caused by natural processes, human or animal pressures, or as a secondary hazard associated with drought. The world's great deserts came into being long before man and have grown and shrunk according to natural long-term climatic changes affecting rainfall and groundwater patterns. However, since the appearance of man, desert growth has changed significantly, and has become a major concern for many of the world's governments and nongovernmental organizations focused upon environmental health and development (see Exhibit 2-3).

Poor land management is the primary cause of anthropomorphic desertification. Increased population and livestock pressure on marginal lands accelerate the process. In some affected areas, nomads trying to escape the desertified land for less arid regions exacerbate the problem by placing excessive pressures on land that cannot handle it (Watson, 1997). The process of desertification is not one that is easily predictable, nor can it be mapped along expected patterns or boundaries. Areas of desert land can grow and advance in erratic spurts and can occur great distances from natural, known deserts. Often, a geographic area suffering from desertification is widely recognized only after significant damage has occurred. It is still unknown if global-change patterns associated with desertification are permanent, nor are the processes required to stop or reverse desertification well understood.

Droughts are a cause of desertification, but not all droughts automatically result in the creation of desert conditions. In fact, well-managed lands can recover from drought with little effort when rains return.
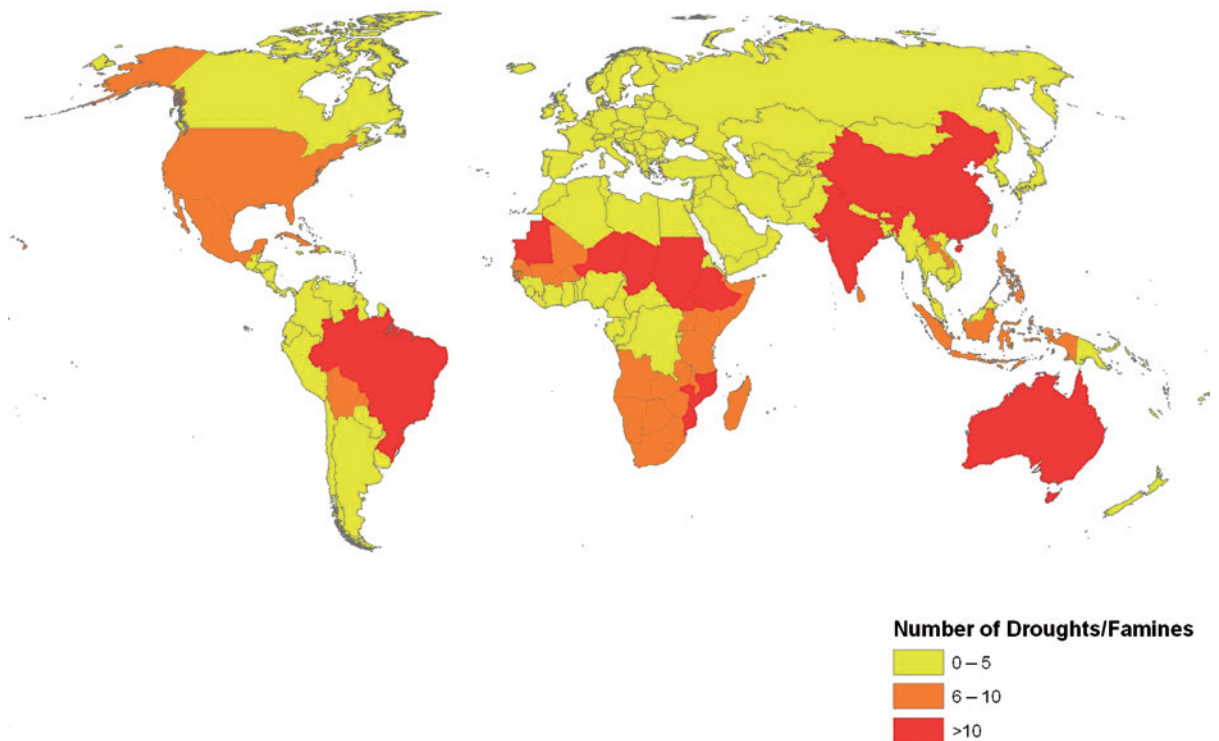
FIGURE 2-18   Drought and famine events per year, 1974–2003. (*Source:* www.em-dat.net.)

Continued land abuse during droughts, however, increases land degradation.

Meteorological Hazards

Meteorological hazards are related to atmospheric weather patterns or conditions. These hazards are generally caused by factors related to precipitation, temperature, wind speed, humidity, or other, more complex factors. As all of the world's people are subject to the erratic nature of weather, there exists no place on Earth that is truly safe from the effects of at least one or more forms of meteorological hazard.

The greatest range of natural hazard types falls under this general category. The following section examines common meteorological hazards.

Tropical cyclones are spinning marine storms that significantly affect coastal zones, but that may also travel far inland under certain conditions. The primary characteristics of these events are their deadly combination of high winds, heavy rainfall, and coastal storm surges (see Figure 2-19).

Tropical cyclones with maximum sustained surface winds of less than 39 mph are called tropical depressions. Once attaining sustained winds of at least 39 mph, they are typically called tropical storms, and assigned a name (see Exhibit 2-4). If winds reach 74 mph, they are called:

- Hurricane in the North Atlantic Ocean, the Northeast Pacific Ocean east of the dateline, or the South Pacific Ocean east of 160E

EXHIBIT 2-3   United Nations Launches International Year of Deserts and Desertification 2006 to Profile Desertification as a Major Threat to Humanity

In its resolution A/Res/58/211 of December 23, 2003, the United Nations General Assembly proclaimed 2006 as the International Year of Deserts and Desertification view to raise public awareness of the issue and protect the biological diversity of deserts as well of the traditional knowledge of those communities affected by desertification.

The main objective of the year is to profile desertification as a major threat to humanity, reinforced under the scenarios of climate change and loss of biological diversity. Dry lands constitute about 41 per cent of the Earth's surface and support more than 2 billion people. Between 10 and 20 per cent of dry lands are degraded or unproductive. Land degradation affects one third of the planet's land surface and threatens the health and livelihoods of more than one billion people in over one hundred countries.

Desertification is one of the world's most alarming processes of environmental degradation. And each year, desertification and drought cause an estimated $42 billion in lost agricultural production. The risks of desertification are substantial and clear. It contributes to food insecurity, famine and poverty, and can give rise to social, economic and political tensions that can cause conflicts, further poverty and land degradation. The great scope and urgency of this challenge led the United Nations General Assembly to proclaim 2006 to be the International Year of Deserts and Desertification.

The Convention to Combat Desertification is the only internationally recognized, legally binding instrument that addresses the problem of land degradation in dry land rural areas. It enjoys a truly universal membership of 191 parties. And, through the Global Environment Facility as its funding mechanism, it is able to channel much-needed resources to projects aimed at combating the problem, particularly in Africa.

The IYDD provides a major opportunity both to strengthen the visibility and importance of the dry lands issue on the international environmental agenda and to highlight the truly global nature of the problem. All countries and civil society organizations have been encouraged to undertake special initiatives to mark the Year, and preparations are now well under way around the world.

The International Year of Deserts and Desertification is a strong reminder of the urgent need to address the far-reaching implications of this problem. United Nations General Secretary recently summarizes the goal of UNCCD in this way: "I look forward to working with Governments, civil society, the private sector, international organizations and others to focus attention on this crucial issue, and to make every day one on which we work to reverse the trend of desertification and set the world on a safer, more sustainable path of development."

Source: United Nations Convention to Combat Desertification. 2005. United Nations Launches International Year of Deserts and Desertification 2006 to Profile Desertification as a Major Threat to Humanity. UNCCD Press Release, December 23. http://www.unccd.int/publicinfo/pressrel/showpressrel.php?pr= press23_12_05

- Typhoon in the Northwest Pacific Ocean west of the dateline
- Severe tropical cyclone in the Southwest Pacific Ocean west of 160E or the Southeast Indian Ocean east of 90E
- Severe cyclonic storm in the North Indian Ocean
- Tropical cyclone in the Southwest Indian Ocean

In order for a tropical cyclone to form, several environmental factors must exist, including:

FIGURE 2-19 The devastation along the beach at Biloxi, Miss., Sept. 15, 2005, following the storm surge of Hurricane Katrina. (*Source:* U.S. Air Force photo by Senior Master Sgt. David H. Lipp.)

- Warm ocean waters (at least 80°F) extending at least 150 feet deep
- An atmosphere that cools quickly enough and is high enough that it is potentially unstable to moist convection. The resulting thunderstorm activity allows the heat stored in the ocean waters to be transformed into a tropical cyclone
- Relatively moist layers near the mid-troposphere (3 miles)
- A minimum distance of at least 300 miles from the equator (to allow for a minimum amount of Coriolis force, or the force caused by Earth's rotation on its axis) to provide near-gradient wind balance

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EXHIBIT 2-4   The Saffir-Simpson Hurricane Scale

The Saffir-Simpson Hurricane Scale assigns ratings of 1 to 5 to cyclonic storms, based upon a measurement of the storm's present intensity. The scale, which was designed for hurricanes but can be used for any cyclonic storm, is used to give an estimate of the potential property damage and flooding expected along affected coastal and inland regions. Wind speed is the determinant factor in the scale, as storm surge values are highly dependent on the slope of the continental shelf in the landfall region. Similar scales, based upon the Saffir-Simpson Hurricane Scale, have been developed specifically for the measurement of typhoons and cyclones.

- *Tropical storm*. Wind speed: 39–73 mph. Minor wind and water-related damage. A storm is given a name at this point.
- *Category 1*. Wind speed: 74–95 mph. No real damage to buildings. Damage to unanchored mobile homes. Some damage to poorly constructed signs. Some coastal flooding and minor pier damage.
- *Category 2*. Wind speed: 96–110 mph. Some damage to building roofs, doors, and windows. Considerable damage to mobile homes. Flood-ing damages piers, and small craft in unprotected moorings may break their moorings. Some trees blown down.
- *Category 3*. Wind speed: 111–130 mph. Some structural damage to small residences and utility buildings. Large trees blown down. Mobile homes and poorly built signs destroyed. Flooding near the coast destroys smaller structures; larger structures damaged by floating debris. Terrain may be flooded well inland.
- *Category 4*. Wind speed: 131–155 mph. More extensive curtain wall failures with some complete roof structure failure on small residences. Major erosion of beach areas. Terrain may be flooded well inland.
- *Category 5*. Wind speed: 156 mph and up. Complete roof failure on many residences and industrial buildings. Some complete building failures with small utility buildings blown over or away. Flooding causes major damage to lower floors of all structures near the shoreline. Massive evacuation of residential areas may be required.

Source: National Hurricane Center, 2005.

- A pre-existing near-surface atmospheric distur-
bance. Tropical cyclones require development of
a weakly organized storm system with sizable
spin and low level inflow
- Low vertical wind shear values (less than
23 mph) between the surface and the upper tro-
posphere. Vertical wind shear is the magnitude of
wind change with height, which can disrupt or
destroy a cyclone (AOML, 2004).

Each year, approximately 80 tropical cyclones
form throughout the world. Those that make landfall
often have devastating consequences, leaving many
people dead and injured and severely damaging all
unprotected structures. They are the most deadly of all
natural hazards. Due to these storms' dependence
upon the oceans for energy, people who live far inland
are generally not at risk from these hazards, nor are
people in especially cold climates. It is estimated that
15–20% of the world's population is at risk from these
hazards.

Monsoons are strong seasonal winds that exist
throughout the world, and reverse in direction at pre-
dictable intervals each year. They are often associated
with heavy rainfall when they cross over warm ocean
waters before heading to cooler landmasses. As the
wind blows over the warm water, the upward convec-
tion of air draws moisture from the ocean surface.
When it passes over the cooler landmass, the moisture
condenses and is deposited in heavy rainfalls that can
last for weeks or months.

Monsoons are most marked and most intimately
associated with the Indian subcontinent, which truly
depends upon the annual cycle of winds for relief
from the long, dry winter months. Without the mon-
soons, agriculture and many other basic life processes
would be impossible. The monsoons in this region
have two distinct seasons: a dry season that runs from
September to March, blowing from the northeast, and
a wet season that runs from June to September, blow-
ing from the southwest. During the wet summer mon-
soon in India, the country receives 50–90% of its
annual rainfall, depending upon location.

Disasters related to monsoons are associated with
secondary effects from either monsoon failure or

FIGURE 2-20   Undated photo of a hurricane in the American
midwest. (*Source:* National Weather Service Historic Collection.)

excessive monsoon rainfall. During years of monsoon
failure, severe drought can ensue, leading to famine in
the lesser-developed countries. Crops struggle or fail
and food shortages may follow without implementa-
tion of pre-established contingency plans. The econ-
omy tends to suffer as well during these years, as is
true during all forms of drought. In years of excessive
monsoon rainfall, severe flooding may result, leading
to drowning, homelessness, and the destruction of
infrastructure, property, and agriculture.

Tornadoes, or funnel clouds, are rapidly spinning
columns of air (vortexes) extending downward from a
cumulonimbus cloud (see Figure 2-20). To be classi-
fied as a tornado, the vortex must be in constant con-
tact with the ground. Thousands of tornadoes are
formed throughout the world each year but, thank-
fully, most do not touch ground and therefore remain
harmless. The United States is the country most sus-
ceptible to these atmospheric hazards, with approxi-
mately 1000 occurring each year. However, based
upon landmass, other countries such as Italy experi-
ence proportionally more events (Smith, 1992).

Tornadoes form when warm, moist air meets cold,
dry air, though the presence of these factors in no way
guarantees that a tornado will form. The most destruc-
tive tornadoes form from supercells, which are
rotating thunderstorms with a well-defined radar

TABLE 2-2   The Fujita-Pearson Tornado Scale

Scale	Wind estimate (mph)	Typical damage
F0	<73	**Light damage.** Some damage to chimneys; branches broken off trees; shallow-rooted trees pushed over; sign boards damaged.
F1	73–112	**Moderate damage.** Peels surface off roofs; mobile homes pushed off foundations or overturned; moving autos blown off roads.
F2	113–157	**Considerable damage.** Roofs torn off frame houses; mobile homes demolished; boxcars overturned; large trees snapped or uprooted; light-object missiles generated; cars lifted off ground.
F3	158–206	**Severe damage.** Roofs and some walls torn off well-constructed houses; trains overturned; most trees in forest uprooted; heavy cars lifted off the ground and thrown.
F4	207–260	**Devastating damage.** Well-constructed houses leveled; structures with weak foundations blown away some distance; cars thrown; large missiles generated.
F5	261–318	**Incredible damage.** Strong frame houses leveled off foundations and swept away; automobile-sized missiles fly through the air in excess of 100 meters; trees debarked; incredible phenomena will occur.

Source: Storm Prediction Center, n.d.

circulation called a mesocyclone. While the conditions necessary for their generation are well known and serve as indicators to when warnings should be issued, very little is known about how exactly tornadoes form. Tornadoes can be as short as seconds or persist for over an hour. The mean length of time is less than 10 minutes.

When a tornado occurs over a body of water, it is called a **waterspout**. These phenomena occur over seas, bays, and lakes worldwide. Although waterspouts are always tornadoes by definition, they are not officially counted in tornado records unless they contact land. They are smaller and weaker than most tornadoes but still can be quite dangerous, overturning small boats, damaging ships, and killing people.

Tornadoes differ between the northern and southern hemispheres in that they generally rotate in opposite directions—clockwise in the southern hemisphere and counterclockwise in the northern (cyclonic). However, there are many known exceptions to this rule, called "anticyclonic tornadoes." Tornadoes can also occur as a single funnel or as a series of many funnels.

Tornadoes average about 300 feet in diameter, and cause a path of destruction about that wide as they travel. Disasters resulting from tornadoes are caused by the damaging winds they generate. Most of the deaths associated with tornadoes are caused by secondary hazards, such as debris missiles and large hail. Tornado damage is rated according to the Fujita-Pearson Tornado Scale, or the F-Scale. This scale relates the degree of damage caused with the intensity of the wind and is assigned after the tornado is generated. Assignment of intensity is largely subjective and, therefore, arbitrary. However, the F-Scale is the most widely used and recognized. It is shown in Table 2-2.

Ice storms are precipitation events involving freezing rain that accumulates on exposed surfaces to a thickness greater than one-quarter of an inch. These storms can extend for hundreds of square miles, and are highly destructive due to the damage caused by the weight of the accumulated ice.

FIGURE 2-21   Ice storm, Lexington, Kentucky, USA, February 2003. (*Source:* Warren Hornsby, NWS, 2003.)

FIGURE 2-22   Cars buried after a blizzard in Washington, DC, 2003. (*Source:* Author.)

Certain conditions must be present in order for freezing rain to occur. Two layers of cold air must be present, each less than or equal to 32°F, with a warm layer greater than 32°F in between them. The position of the warm layer in this arrangement is important, since it determines whether precipitation will fall as freezing rain, sleet, or snow. Relative humidity must be near 100%, and upward-moving air is needed to keep the relative humidity at that level.

Precipitation that begins under these conditions is generated as snow, because the uppermost layer of air is usually cold enough to create flakes. As these snowflakes descend into the warm layer, they begin to melt, sometimes completely. These water drops continue to fall through the lowest cold layer, where they likely do not have sufficient time to refreeze before reaching the ground. They then fall on objects in the bottom-most layer of cold air, which have a surface temperature less than or equal to 32°F, and quickly freeze to form a coat of ice (see Figure 2-21).

The damage associated with ice storms results from the weight of the ice accumulation, which causes tree limbs to break, power lines to fall, and roofs to collapse. Icy roads lead to transportation accidents. Power outages can lead to people being exposed to extremely cold temperatures, and can cause economic impacts due to business interruption and agricultural damage.

Severe winter storms (snowstorms) are extratropical, cold-weather cyclonic weather hazards associated with excessive precipitation of snow, sleet, and ice (see Figure 2-22). Many classifications of winter storms dictate that at least 4 inches of accumulation must occur within 12 hours, or 6 inches within 24 hours. These storms are dangerous because they can make travel very difficult or impossible, are accompanied by dangerously cold temperatures, and can cause many secondary hazards such as avalanches, snow drifts, and floods. The longer-term effects of successive snow accumulation can be disastrous: snow melt and runoff once temperatures begin to rise, leading to mudslides and widespread flooding. *Blizzards* are a type of severe snowstorm accompanied by very low temperatures (below 20°F) and high winds (35 mph or greater).

Hailstorms are meteorological events characterized by the precipitation of balls or lumps of clear ice and compact snow. Cold ground temperatures are not necessary for hailstorms to occur, and these events commonly occur throughout the world, including in the tropics. The process by which hailstones form and grow is not entirely understood, but it is believed that

ice crystals form within a cloud and then are covered in layer upon layer of frozen water and suspended in strong updrafts until the holding capacity of the cloud is exceeded. Hailstones are generally spherical or irregularly spherical and generally vary in diameter from pellet size to half an inch. On rare occasions, giant hailstones have formed, some up to 5 inches in diameter.

The primary negative consequence of hail is damage and injury to crops. In Canada, although no human death has ever been attributed to hail, the stones' damage to crops makes them one of that nation's most costly hazards. One event in Calgary, Alberta in 1991 caused over $450 million in damages in a matter of minutes. Livestock also are at risk due to injuries and fatalities they sustain during the storms. Humans usually escape death but can be injured by hail falling. Property (buildings and cars) often sustains severe damage, and roof collapses are common when the heavy hailstones accumulate quickly. Airplanes have also been reported damaged by storms containing hail.

Frost is a hazard related to agriculture. Frost crystals form when water vapor freezes upon contact with a surface that is below the frost point. Frost is most common in low-lying valleys where heavier, cooler air collects, especially at night. It also can occur when the air temperature is higher than freezing, but just above the surface is below freezing because of this heavier cold air. Crops often can survive freezing temperatures in the absence of frost, as their cells remain in a liquid state as much as 10°F (12°C) below the freezing point of water. However, once frost forms on the plant, the cells begin to sustain damage and often die.

Worldwide crop losses from frost have been estimated to be as high as $2.5 billion each year.

Frost is known to change the shape of topsoils, which can cause ground deformation and damage to overlying structures. Roads often deteriorate more quickly in areas where frost frequently forms. In Finland, Norway, and Sweden, where frost damage to roads is common, an annual average of $10 million in damages per country is normally sustained. Frost can also lead to rockfalls when boulders on high precipices are loosened by frost in the surrounding soil or in cracks on the stone.

Extreme cold temperatures, which may be fleeting or may persist for days or weeks, can have severe negative consequences. What constitutes extreme cold, and its effects varies across geographic regions. For example, in regions relatively unaccustomed to winter weather, near-freezing temperatures are considered "extreme cold." Generally, a significant drop below the average low temperature for an area will cause adverse affects to unprepared people, animals, or property.

Extreme cold is a dangerous situation that can bring on health emergencies in susceptible people, such as those who are without shelter or stranded, or who live in a home that is poorly insulated or without heat. Wind chill, which is a measure of apparent temperature relative to actual temperature based upon observed wind speed, can exacerbate the effects of extreme cold (see Table 2-3). Hypothermia is a dangerous condition that is observed much more frequently during periods of extreme cold.

Extreme cold can cause damage to structures from frozen pipes, including fuel lines, and may lead to bursting or breakage. Fires are common during periods of extreme cold because more people use fireplaces to heat their homes. This effect is increased when power outages accompany the extreme cold. Carbon monoxide poisoning is another related hazard of indoor wood-fired heat.

When extended periods of extreme cold occur, secondary environmental hazards can occur, such as ice jams on major rivers (see Figure 2-23). Flooding behind the jammed ice can be disastrous, especially in conjunction with the extremely cold temperatures that threaten anyone who leaves his shelter.

Extreme heat, like extreme cold, is a temperature-related hazard associated with a significant deviation above normal high temperatures for a given geographical area. Periods of extreme heat are often called "heat waves." Extreme heat most significantly affects humans, though stresses upon electrical infrastructure related to intense demand caused by widespread overuse of air conditioners often causes secondary, exacerbating disasters. Power outages leave people without any option for cooling down, and health effects skyrocket.

TABLE 2-3   Wind Chill Chart

Temperature (°F)

Wind (mph) \	Calm	40	35	30	25	20	15	10	5	0	−5	−10	−15	−20	−25	−30	−35	−40	−45
5		36	31	25	19	13	7	1	−5	−11	−16	−22	−28	−34	−40	−46	−52	−57	−63
10		34	27	21	15	9	3	−4	−10	−16	−22	−28	−35	−41	−47	−53	−59	−66	−72
15		32	25	19	13	6	0	−7	−13	−19	−26	−32	−39	−45	−51	−58	−64	−71	−77
20		30	24	17	11	4	−2	−9	−15	−22	−29	−35	−42	−48	−55	−61	−68	−74	−81
25		29	23	16	9	3	−4	−11	−17	−24	−31	−37	−44	−51	−58	−64	−71	−78	−84
30		28	22	15	8	1	−5	−12	−19	−26	−33	−39	−46	−53	−60	−67	−73	−80	−87
35		28	21	14	7	0	−7	−14	−21	−27	−34	−41	−48	−55	−62	−69	−76	−82	−89
40		27	20	13	6	−1	−8	−15	−22	−29	−36	−43	−50	−57	−64	−71	−78	−84	−91
45		26	19	12	5	−2	−9	−16	−23	−30	−37	−44	−51	−58	−65	−72	−79	−86	−93
50		26	19	12	4	−3	−10	−17	−24	−31	−38	−45	−52	−60	−67	−74	−81	−88	−95
55		25	18	11	4	−3	−11	−18	−25	−32	−39	−46	−54	−61	−68	−75	−82	−89	−97
60		25	17	10	3	−4	−11	−19	−26	−33	−40	−48	−55	−62	−69	−76	−84	−91	−98

Frostbite times   ▮ 30 minutes   ▮ 10 minutes   ▮ 5 minutes

Wind chill (°F) = $35.74 + 0.6215\,T - 35.75(V^{0.16}) + 0.4275T(V^{0.16})$
Where, T = Air Temperature (°F) V = Wind Speed (mph)

Effective 11/01/01

Source: NOAA, 2001.

Between 1979–2002, excessive heat exposure caused 8966 deaths in the United States. That accounts for more deaths than from hurricanes, lightning, tornadoes, floods, and earthquakes combined. Europe was affected by one of the worst heat waves in history in 2003, leading to a catastrophic public health disaster. In total, over 40,000 people died from related causes. Exhibit 2-5 describes the effects of the heat wave by country, including secondary hazards that appeared.

At greater risk are the elderly, children, and people with certain medical conditions, such as heart disease. However, even young and healthy individuals can succumb to heat if they participate in strenuous physical activities during hot weather. Some behaviors also put people at greater risk, such as drinking alcohol, taking part in strenuous outdoor activities in hot weather, and taking medications that impair the body's ability to regulate its temperature or inhibit perspiration.

Windstorms are periods of high wind not associated with convective events (severe local storms, hurricanes, and winter storms). They are considered severe if sustained winds of 40 mph or more persist for an hour or longer, or if sustained winds of 58 mph or more are sustained for any amount of time. At higher elevations, these wind speed minimum limits are increased due to the lower air density, which results in less damage from equal wind forces. Categories of windstorms include:

- *Gradient high winds.* High winds that usually cover a large area, caused by large-scale pressure systems
- *Mesoscale high winds.* High winds that tend to occur after organized convective systems have passed and are associated with barometric "wake depressions" or strong mesoscale high pressure
- *Channeled high winds.* In mountainous areas or in cities with tall buildings, air can be channeled
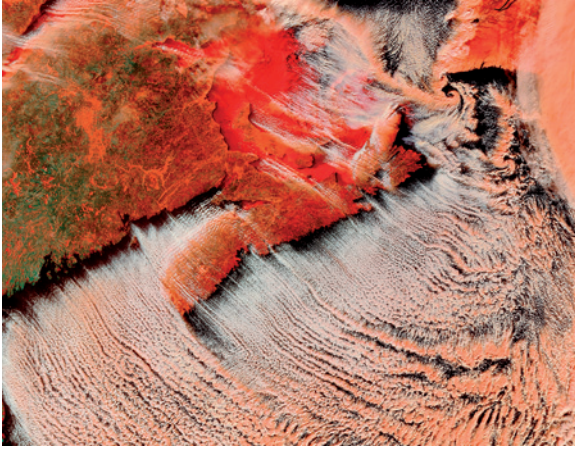
FIGURE 2-23   Satellite image of the St. Lawrence River, Canada. In this picture, taken by the NASA Terra Satellite, ice appears dark red and water appears black. Red over the Gulf of St. Lawrence, top center, and the St. Lawrence River, upper left, attests that both are covered in a layer of ice. The ice has caused problems upstream, beyond the left corner of this image. Ice jams in the Riviere des Prairies, a tributary of the St. Lawrence River, have dammed the river, causing flooding in Montreal and Laval. (*Source:* NASA Earth Observatory, January 25, 2004.)

through constricted passages, producing high winds. Channeled high winds are local in nature but can be extremely strong

- *Tropical-cyclone-associated high winds.* High winds can occur a few hundred miles from where a tropical cyclone has made landfall and are forecast independent of the tropical cyclone
- *Chinook or foehn winds.* Warm, dry winds that occur on the lee side of high mountain ranges, developing with great strength in well-defined areas

Windstorms cause damage primarily because of their powerful wind forces and secondarily from flying debris. Damage associated with windstorms includes impaired visibility, crop damage, damage to or destruction of buildings and vehicles, power outages and other infrastructure damage, and felled or broken trees. These storms often accompany major winter or early spring blizzards, can affect multiple jurisdictions, and may cover a range of hundreds of square miles. The storms can last anywhere from a few hours to three days, with lulls in intensity during the night. They worsen during the late morning and become most intense during the late afternoon, when atmospheric mixing is most pronounced (UCAR, 2005).

The Beaufort Scale is the most common measurement of wind force. The original version of this scale, designed in the 1830s, was a sailing tool that did not include wind speed. However, these speeds were added later to make the tool more useful for meteorologists. Hurricanes are often listed as Beaufort numbers 12–16, with a Category 1 hurricane being Beaufort 12. The scale is shown in Table 2-4.

Sandstorms (called **duststorms** in the United States) occur when very strong winds blow over loose soil or sand, picking up significant amounts of material in the process. In desert regions, sandstorms become a frequent occurrence at certain times of the year due to the intense heating of the air over the desert surface, which in turn causes instability in the lower atmosphere. This instability produces higher winds in the middle troposphere, which are drawn downward and produce much stronger winds at the surface.

Areas where the ground is extremely dry and has very little vegetation are most susceptible to sandstorms (see Figure 2-24). Once particles become airborne, they can reduce visibility to a few feet, cause respiratory problems, and have a damaging, abrasive effect on machinery and structures. Any sandstorm or duststorm that reduces visibility to less than a quarter-mile tends to pose hazards for travelers, cause damage and injury, and affect commerce. Damage caused by these storms includes:

- Impaired visibility and breathing difficulties, especially for outdoor workers, people in recreational activities, and motorists
- Crop damage
- Destruction to buildings, vehicles, and trailers
- Power outages and other infrastructure damage
- Broken trees

EXHIBIT 2-5   Description of the 2003 European Heat Wave, by Country

France

14,847 people, mostly elderly, perished from the heat. In France, where very hot summers are uncommon, most of the population was fully unprepared to protect themselves and avoid overheating and dehydration. Additionally, most homes (including retirement homes) are not equipped with air conditioning. Because extreme heat had not been previously identified as a hazard risk, no contingency plans existed for its management. Further compounding the issue was that the heat wave struck during the August vacation season, when many government employees and doctors were away.

Italy

20,000 people died in Italy, where temperatures varied between 38 and 40 degrees Celsius in most cities for weeks.

United Kingdom

In the UK, the highest temperature since records began in 1911 (38°C/100.4°F) was recorded at London's Heathrow airport on Sunday, August 10, 2003. This was surpassed later the same day at Gravesend, Kent, with a temperature of 38.1°C (100.6°F). 907 people were estimated to have died because of the heat by 15 August.

Portugal

There were extensive forest fires in Portugal related to the heat wave. Five percent of the countryside and 10% of the forests were destroyed, an estimated 4000 km^2. Eighteen people died in the fires.

Germany

In Germany, a record temperature of 40.4 Celsius was recorded at Roth, Bavaria. With only half the normal rainfall, rivers were at their lowest in over a century, and shipping could not navigate the Elbe or Danube Rivers.

Switzerland

Melting glaciers in the Alps caused avalanches and flash floods in Switzerland.

Total Dead

A total of 40,000 people died from the 2003 European heat wave.

Source: Wikipedia.org., 2003.

- Scouring damage to buildings and automobiles
- Damage to electronics, computers, and communications equipment from accumulated dust

Wildfire, which is a brush or wildland fire burning out of control over great geographic range, is often considered a meteorological event because it is so closely associated with the weather conditions necessary to sustain and spread it, called "fire weather." Other factors also contribute to the generation and spread of wildfire, including hydrological conditions, topography, and vegetation (fuel). The following weather conditions promote ignition and rapid spread of fires:

- Low humidity
- High winds (over 10–20 mph)
- Dry thunderstorm (i.e., lightning without rain)
- Unstable air

Other factors that impact the spread and severity of fires include:

- *Dry antecedent conditions.* Prolonged hot, dry conditions greatly increase fire danger. In drought conditions, forests can ignite from a weak source that normally would not be a threat.
- *Urban-wildland interface.* The spread and severity of residential areas into wildlands means the

TABLE 2-4   The Beaufort Wind Scale

Beaufort number	Wind speed (mph)	Description	Wave height (m)	Sea conditions	Land conditions
0	0	Calm	0	Flat	Calm
1	1–3	Light air	0.1	Ripples without crests	Wind motion visible in smoke
2	4–7	Light breeze	0.2	Small wavelets	Wind felt on exposed skin. Leaves rustle
3	8–12	Gentle breeze	0.6	Large wavelets	Leaves and smaller twigs in constant motion
4	13–18	Moderate breeze	1	Small waves	Dust and loose paper raised. Small branches begin to move
5	19–24	Fresh breeze	2	Moderate (1.2 m) longer waves. Some foam and spray	Smaller trees sway
6	25–31	Strong breeze	3	Large waves with foam crests and some spray	Large branches in motion. Umbrella use becomes difficult
7	32–38	Near gale	4	Sea heaps up and foam begins to streak	Whole trees in motion. Effort to walk against the wind
8	39–46	Gale	5.5	Moderately high waves with breaking crests forming spindrift. Streaks of foam	Twigs broken from trees
9	47–54	Severe gale	7	High waves (2.75 m) with dense foam. Wave crests start to roll over. Considerable spray	Light structure damage
10	55–63	Storm	9	Very high waves. The sea surface is white and there is considerable tumbling. Visibility is reduced	Trees uprooted. Considerable structural damage
11	64–74	Violent storm	11.5	Exceptionally high waves	Widespread structural damage
12	75 or more	Hurricane	14+	Huge waves. Air filled with foam and spray. Sea completely white with driving spray. Visibility very greatly reduced	Massive and widespread damage to structures

Source: www.wikipedia.com.

human population faces a greater risk of forest fires.

- *Available fuel.* The spread of fire depends on the amount of burnable material. Trees that contain oily sap, such as eucalyptus, provide tremendous fuel when dry.
- *Hilly terrain.* Fire spreads much faster uphill than downhill, and spreads faster uphill than across level terrain.

Wildfires can cause incredible environmental damage, both during the fire and after they have burned. They often burn any unprotected structure that lies in their path, and many deaths are attributed to people who become stranded within zones of major burning. They can also cause transportation problems when they occur along major road and railway routes. Smoke from wildfires tends to cause severe respiratory problems in susceptible individuals. Once the

FIGURE 2-24   Sandstorm approaching a US military base in Iraq, 2005. (*Source:* Gunnery Sergeant Shannon Arledge, USMC.)

fires have passed or have been extinguished and a major loss of vegetation has occurred, secondary hazards can occur, including mudslides, landslides, river silting, and flooding.

Forecasters use the Haines Index, shown in Exhibit 2-6, to indicate the potential for large fire growth. The Haines Index is a stability index specially designed for fire weather use. It is determined by combining the stability and moisture content of the lower atmosphere into a single number that correlates with large fire growth. Dry air affects fire behavior by lowering fuel moisture, which results in more fuel being available for fire, and by increasing the probability of spotting (new, isolated fires caused by airborne sparks emitted by the primary fire or fires.) Instability affects fire behavior by enhancing the vertical size of the smoke column, resulting in strong surface winds as air rushes into the fire to replace air evacuated by the smoke column. Because the index is derived from the combination of these two factors, which each have a minimum value of 1, the index has a minimum value of 2. When the index is 5 or 6, the probability of extreme fire behavior is moderate to high.

The United Nations Environmental Program monitors worldwide wildfires on their Global Wildfires monitoring site: www.grid.unep.ch/activities/earlywarning/fires/index.php

Thunderstorms are local storms that are accompanied by lightning and thunder, are produced by a cumulonimbus cloud, and are usually accompanied by gusty winds, heavy rain, and occasionally hail. Three factors are required for a thunderstorm to develop. The first, which serves to fuel the storm, is moisture in the form of water vapor, which must lie in the lowest atmospheric levels. Second, there must be a rapid cooling of air above these low, wet levels, decreasing in temperature with altitude, up to two to three miles. Finally, there must be a force strong enough to lift the low moist air to the higher, colder atmospheric layers—usually a cold front (the boundary between where the cold air from one thunderstorm meets the air outside the storm, called an "outflow boundary"). As the moist air rises, it begins to cool, and after some time, the water vapor begins to condense into liquid drops. This process causes warming of the cloud mass, which in turn generates rising currents of air, which can extend up to 10 miles in altitude.

Thunderstorms are classified as nonsevere and severe. Nonsevere thunderstorms rarely last longer than two hours. A typical, nonsevere thunderstorm life cycle consists of three stages:

1. *Cumulus stage.* Warm, moist air rises (updraft) and condenses into tiny water droplets that make up the visible cloud. Outside air is pulled into the cloud. Super-cooled droplets of water are carried far above the freezing level.
2. *Mature stage.* The cloud grows above the freezing level; precipitation forms and becomes heavy enough to fall back to Earth. Friction

caused by the falling precipitation generates downdrafts of cool air that reach Earth's surface. Very heavy rains are associated with this stage. The cloud extends upward to the tropopause, causing a characteristic flat (anvil) top to form. Strong periods of lightning are likely during this stage, which typically lasts from 10 to 20 minutes.

3. *Dissipation stage.* The downward motion of air overcomes the storm, depriving it of moist air. Precipitation begins to subside, and the cloud evaporates.

Thunderstorms become severe when their wind speeds exceed 58 miles per hour and hail forms in balls greater than three-quarters of an inch in diameter. Several different kinds of thunderstorms can form, including:

- *Single cell.* These are short-lived storms, lasting only 20–30 minutes from formation to dissipation, and covering only a limited area of generally a few square miles. These storms are relatively uncommon.
- *Multicell.* These are the most common type of thunderstorm, consisting of an organized cluster of two or more single cells. The storm cells fuel each other with the air that flows between them and cause new cells to form in succession on the flank or rear sides about every 5–15 minutes.
- *Supercell.* These storms, which are always severe due to observed wind speeds, are relatively uncommon. Supercells cause significant damage, last for a long time (generally, 1–6 hours), and travel great distances (200 miles or more) (see Figure 2-25). These storms can cause hurricane-force winds, giant hail (2 inches in diameter or more), and significant tornado activity. A supercell produces updrafts of 56–112 mph that combine with sustained downdrafts to extend the storm's duration.
- *Squall lines.* These are lines or bands of active thunderstorms that can extend over 250–500 miles, can be 10–20 miles wide, and consist of many laterally aligned cells that do not interact or

FIGURE 2-25   A supercell viewed from space. (*Source:* NASA, 2000.)

interfere with one another. The cells involved in the squall line may be a combination of types. These phenomena often form along cold fronts, but they also can form as far as 100 miles ahead of an advancing cold front in the warm sector of an extratropical storm. They often trail a large, flat cloud layer that brings significant rain after the storms pass (UCAR, n.d.).

Thunderstorms cause most of their damage through the rain and wind that they generate. Flash floods are common due to the rapid precipitation, which cannot be absorbed by the ground and quickly becomes runoff. Hail can cause damage to buildings and crops. Lighting can cause fatalities and generate fires. Less common but very damaging are tornadoes that can form as result of these storms.

Fog is essentially a cloud that forms at ground level. However, it is formed by very different processes than those that form clouds in the upper atmosphere. Like clouds, fog consists of airborne condensed water droplets, the result of moist air being cooled to the point at which it can no longer hold all of the water vapor it contains, known as the dewpoint. With fog, this cooling may happen for a variety of reasons, including the cooling and moistening of surface air by rain, infrared cooling of a cloudless, humid air

TABLE 2-5 **Types of Fog**

Type of fog	Factors	Description	Effects
Ground fog	• Clear nights • Stable air (winds less than 5 mph) • Small temperature-dewpoint spread	Heat radiates away from the ground, cooling the ground and surface air. When the air cools to its dewpoint, fog forms (usually a layer of less than 100–200 feet).	Common in many areas, ground fog burns off with the morning sun.
Valley fog	• Cold surface air and weak winter sun • May follow a winter storm or prolonged nighttime cooling	Fog can build to a height of more than 1,500 feet. Weak sun may evaporate lower levels of the fog but leave upper levels in place.	Found in valleys during the winter, valley fog can last for days, until winds are strong enough to push out the cold air.
Advection fog	• Horizontal wind • Warm, humid air • Winter temperatures	Wind pushes warm humid air over the cold ground or water, where it cools to the dewpoint and forms fog.	Advection fog can cover wide areas of the central U.S. in winter. It may be thick enough to close airports.
Upslope fog	• Winds blowing up hills or mountains • Humid air	As humid air pushed up hills and mountains, it cools to its dewpoint and forms fog, which drifts up the mountain.	Upslope fog is common and widespread in most of the world's great mountain chains.
Sea smoke, steam fog	• Body of water • Air much colder than water • Wind	As cold air blows over warmer water, water evaporates into the cold air, increasing the humidity to the dewpoint. Vapor condenses, forming a layer of fog 1 to 2 feet thick over the water.	This type of fog forms most commonly over oceans, lakes, ponds, and streams on fall days.
Precipitation fog	• Warmer air • Cool rain	Some rain evaporates, and the added vapor increases the air to its dewpoint. The vapor then condenses into fog.	Precipitation fog forms on cool, rainy days.

Source: UCAR, 2005.

at night (also called "radiation fog"), and the passage of a warm, moist air mass over a cold surface (usually snow or ice), which produces "advection fog." The various types of fog are listed in Table 2-5.

The primary danger associated with fog is reduced visibility. Major destructive and often fatal highway pileups are often blamed on thick, rapidly developing fog. Aviation accidents also are commonly blamed on this hazard. Constant fog near steep mountain slopes can either cause or be an indicator of high moisture content in the water, which leads to more rapid erosion and subsequent landslides, mudslides, and mountain road collapse.

El Niño and La Niña are related weather phenomena characterized by a disruption in the ocean-atmospheric system of the tropical Pacific (see Figure 2-26). Both of these events are associated with severe negative consequence around the world. The most significant consequence is increased rainfall across the southern parts of the United States and in the northwestern coast of South America (Chile, Peru, and Ecuador). During years of El Niño, devastating drought and associated brush fires often occur in Australia.

In normal, non–El Niño conditions, the trade winds blow toward the west across the tropical Pacific.

These winds literally "pile up" warm surface water in the west Pacific, so that the sea surface is about half a meter higher at Indonesia than at Ecuador. The sea surface temperature is about 46°F (8°C) higher in the west, with cool temperatures off South America, due to an upwelling of cold water from deeper levels. This cold water is nutrient-rich, supporting high levels of primary productivity, diverse marine ecosystems, and major fisheries. Rainfall is found in rising air over the warmest water, and the east Pacific is relatively dry.

During El Niño years, the trade winds relax in the central and western Pacific, leading to a depression of the thermocline (juncture of cold and warm water) in the eastern Pacific and an elevation of the thermocline in the west. Ocean water temperatures reach points well above normal in the eastern Pacific, and rainfall follows that warm water eastward, bringing the associated flooding to South America and drought in Indonesia and Australia. The eastward displacement of the atmospheric heat source overlaying the warmest water results in large changes in the global atmospheric circulation, which in turn forces changes in weather in regions far removed from the tropical Pacific (see Exhibit 2-7).

La Niña is a phenomenon that is often described as being the opposite of El Niño. It is characterized by cooler-than-normal sea surface temperatures in the central and eastern tropical Pacific Ocean and the impacts of the resulting global weather pattern. Like El Niño, La Niña recurs every few years and can persist for as long as two years.

Typically, a La Niña is preceded by a buildup of cooler-than-normal subsurface waters in the tropical Pacific. Eastward-moving atmospheric and oceanic waves help bring cold water to the surface through a complex series of events that are not well understood. Eventually, the easterly trade winds strengthen, cold upwelling off Peru and Ecuador intensifies, and sea-surface temperatures drop below normal. Like El Niño, La Niña tends to peak during the Northern Hemisphere winter.

La Niña years are marked by altered weather patterns in certain parts of the world. Abnormally high rainfall is observed in southeast Asia, while dry to drought conditions occur in South America. Other impacts that have been observed during La Niña years include:

- Abnormally heavy monsoons on the Indian subcontinent
- In the United States, colder and snowier winter in the northern states west of the Great Lakes, drier than normal winter in the Southeast, warmer and drier winters in the Southwest, and enhanced hurricane activity around the mid-Atlantic states
- Torrential rains leading to floods in Southeast Asia
- Wet weather in eastern Australia
- Cool and wet winter in southeastern Africa

Climate change is not a single hazard but an observed change in average global climactic conditions over time. Drastic climate changes have occurred throughout Earth's existence, but over very gradual periods of time. Recent scientific studies have indicated, however, that many of these gradual processes are speeding up significantly, and it is likely that human activities are to blame. As humans have adapted to a specific climate, it is only logical that any significant change in that climate system will cause primary and secondary effects that are very hazardous to human life and property.

While no conclusive correlations have been developed as of yet, it is certain that continued climate change will eventually increase the catastrophic potential of many meteorological hazards that exist today (and will likewise decrease the potential of others). Many interest groups feel that the observed increase in these hazards in recent history are actually a first indication of these increased effects, caused by global warming, air and water pollution, and other human-induced factors. These theories, which decades ago seemed far-fetched, are today attracting the attention of the world's nations, major multilateral groups, and private and nonprofit environmental groups.

Models for predicting climate change have been created, providing insight into what changes can be

EXHIBIT 2-7   World Meteorological Organization Region IV Adopts Consensus El Niño and La Niña Index and Definitions

NOAA announced today, April 28, 2005, that the 26 nations of the World Meteorological Organization's Regional Association IV have adopted a Consensus Index and Definitions of El Niño and La Niña conditions. By doing so, scientists and governments throughout the region can better define potential impacts from these short-term climate shifts and prepare for remedial action.

The Consensus was agreed upon earlier this year by the NOAA National Weather Service, as the U.S. representative, and its meteorological service counterparts in Canada and Mexico. In adopting the North American Consensus, the Regional Association IV Member nations, located in North and Central America and the Caribbean, agreed that the index and definitions could be revised in the future based on further scientific research, and Member nations were urged to define local thresholds for impacts based on the index. The Consensus will now be known as the WMO RA IV Consensus Index and Definitions of El Niño and La Niña. The next step is to seek a worldwide consensus on this approach through the WMO.

By agreeing to the same operational definition for El Niño and La Niña events, members will be better able to collaborate on understanding risks and mitigating impacts throughout the region. Scientists will now be better able to focus on whether observations of the measurable changes in Pacific sea surface temperatures will lead to changes in the rain and temperature patterns around the world. The definitions focus more attention on these shifts and help governments in the region brace for periodic flooding or drought conditions.

As part of the agreement, the WMO Commission for Climatology has established an expert team on El Niño and La Niña definitions. Led by NOAA, the expert team will, among other duties, catalog El Niño and La Niña definitions in operational use globally to further assist improving analysis of local and regional impacts. The index is defined as a three-month average of sea surface temperature departures from normal for a critical region of the equatorial Pacific (Nino 3.4 region; 120W-170W, 5N-5S). This region of the tropical Pacific contains what scientists call the "equatorial cold tongue," a band of cool water that extends along the equator from the coast of South America to the central Pacific Ocean. Departures from average sea surface temperatures in this region are critically important in determining major shifts in the pattern of tropical rainfall, which influence the jet streams and patterns of temperature and precipitation around the world.

Operational definitions for El Niño and La Niña are:

- **El Niño:** A phenomenon in the equatorial Pacific Ocean characterized by a positive sea surface temperature departure from normal (for the 1971–2000 base period) in the Niño 3.4 region greater than or equal in magnitude to 0.5 degrees C, averaged over three consecutive months.
- **La Niña:** A phenomenon in the equatorial Pacific Ocean characterized by a negative sea surface temperature departure from normal (for the 1971–2000 base period) in the Niño 3.4 region greater than or equal in magnitude to 0.5 degrees C, averaged over three consecutive months.

Source: National Oceanographic and Atmospheric Administration (NOAA). 2005. World Meteorological Organization Region IV Adopts Consensus El Niño and La Niña Index and Definitions. NOAA Press Release. April 28. http://www.noaanews. noaa.gov/stories2005/s2428.htm.
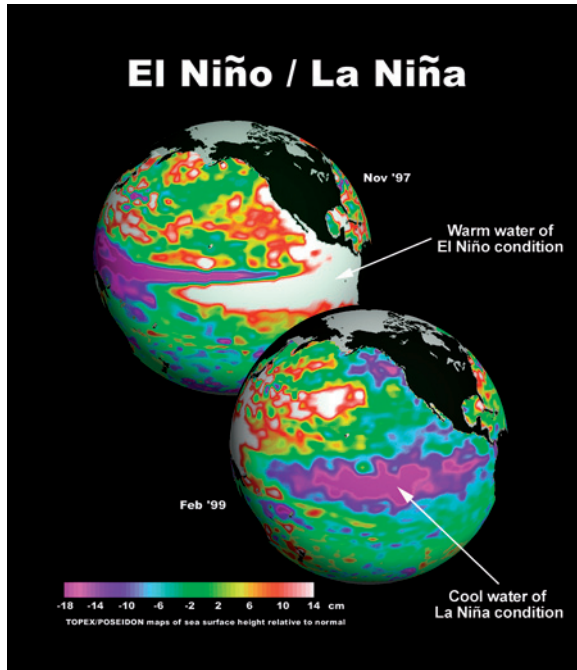
FIGURE 2-26   Image depicting sea surface heights relative to normal, for the 1997 El Niño and 1999 La Niña events. (*Source:* NASA, 1999.)

expected without intervention or behavioral change. Several trends have been recognized. For instance, increases in the amount of greenhouse gases released into the atmosphere will likely raise temperatures over most land surfaces, with great regional variation. Increased drought and storm intensity is likely, including tropical cyclones with higher wind speeds, a wetter Asian monsoon, and, possibly, more intense midlatitude storms.

Storm formation patterns could be altered by decreases in the temperature difference between the poles and the equator caused by global warming. The temperature difference would fuel midlatitude storms, which would affect many of the world's highest-density population centers. With warmer temperatures would come increased atmospheric water vapor and, thus, a hotter, more humid environment. These changes would be most pronounced at the poles. The result would be a lower number of storms generated overall, but those that form would be much more intense. They would also become more difficult to predict and track.

Other effects of climate change include much higher and lower average temperatures and longer periods of cold and heat waves. Environmental changes would occur, such as rising sea levels caused by melting of the world's snow and ice cover at the poles and in glaciers. Coastal flooding would be one of many negative results. Predictions by the Intergovernmental Panel on Climate Change have stated that global warming could cause sea levels to rise 0.11 to 0.77 meters (0.36 to 2.5 feet) by 2100.

Biological/Health-Related Hazards

Biological hazards is the umbrella grouping for all hazards that cause or are related to disease in plants, animals, and humans. Daily life involves contact with many minor biological hazards, including bacteria, viruses, pollutants, chemicals, and toxins. Many of these do cause disease in individuals and are, worldwide, the single greatest cause of death. However, humans constantly seek ways of managing these hazards. Management mechanisms range from simple handwashing to highly complex vaccines and medical treatments. Unfortunately, on many occasions each year, biological hazards become unmanageable, and a disaster results. This section describes the most common biological disasters faced today.

Human epidemics are illnesses caused by single pathogenic sources that affect a quantity of people rising at a rate faster than the disease is being controlled. Epidemics are not a factor of the total number of people with the disease; thus, for certain very rare diseases, a small number of people can constitute an epidemic (often called an **outbreak**). Epidemics are often defined by their geographical range, which can include a community, a country, or even the entire globe (called a **pandemic**). Pathogens can be present normally without causing an epidemic, but a change in certain conditions (such as climatic variance or mutations) may make their spread more effective and/or their treatment more difficult.

Epidemics can arise quickly or gradually, and can be halted quickly or persist for decades. The AIDS pandemic, for instance, which could be controllable (but not cured) with proper medication, public education, and policy, appears to have no end in sight. The SARS epidemic, on the other hand, which struck twice in two consecutive years, was quickly controlled through the action of a coordinated international public health effort. Fears about the possible spread of avian influenza, should it mutate into a form transmissible between humans, have generated estimates of possible deaths numbering in the hundreds of millions, though so far only dozens of people have died over the course of three years.

Controlling epidemics is difficult. It needs a complex set of requirements managed by public health and other government officials, nonprofit agencies, and private facilities such as hospitals and clinics. There are many components to this effort, including recognition of the epidemic (and the ability to test for the disease), the ability to locate victims and backtrack their actions, existing and available medical treatment options and facilities, mechanisms to control further spread of the disease (including quarantine if needed), public education, and short- and long-term disease prevention among those not afflicted (vaccination or other prophylaxis, if available). Self-reporting by those who are infected, which is not always conducted, makes controlling an epidemic much more effective.

Epidemics, statistically, have been the greatest killers of man. History is dotted with epidemic and pandemic events that have decimated populations; see Exhibit 2-8.

EXHIBIT 2-8   Great Epidemics and Pandemics

430 BC	An unknown pathogen that struck during four years of the Peloponnesian War killed one-quarter of the Athenian army, and a quarter of the surrounding population.
AD 165–180	Five million people were killed in Rome by either smallpox or measles in the Antonine Plague (also known as the Plague of Galen).
251–266	A second outbreak of the same or a similar disease that caused the Antonine Plague struck Rome again. Though total numbers of fatalities are not known, it is estimated that over 5000 people per day were dying during the peak of the epidemic.
541–542	The Plague of Justinian, an early outbreak of bubonic plague, killed as many as 25 million people, and reduced the population of the Mediterranean by a quarter.
1347–1350	The Black Plague, a pandemic of bubonic plague, affected many areas throughout the world, reducing the population of Europe by 20 million, or 33% (50% in some countries).
1629–1631	The Great Plague of Milan, an epidemic of bubonic plague, killed 280,000 people. The city of Milan lost about 45% of its population.
1918–1919	The Spanish Flu, a pandemic of influenza, killed an estimated 25–50 million people worldwide in a period of only 18 months, with a majority of deaths occurring during one six-month period. 17 million people died in India alone.

Source: www.wikipedia.org.

Livestock, or a**nimal, epidemics**, including those in aquatic environments, refer to epidemics that affect the life of any animal other than humans (see Figure 2-27). Animal epidemics often strike livestock on a large scale, with great economic consequences to affected regions and countries. Epidemics can cause a loss of confidence in food supplies from the afflicted areas, and even noncontaminated meat can be rendered valueless. A list of common diseases that affect animals throughout the world is provided in Exhibit 2-9.

EXHIBIT 2-9 List of Worldwide Animal Diseases

African Horse Sickness: equine
African Swine Fever: porcine
Anaplasmosis: bovine
Anthrax: any species
Atrophic Rhinitis: porcine
Avian Infectious Bronchitis: avian
Avian Infectious Laryngotracheitis: avian
Avian Influenza: avian
Avian Tuberculosis: avian
Babesiosis: bovine, porcine
Bluetongue: any species
Bovine Spongiform Encephalopathy: bovine
Brucellosis: any species
Caprine Arthritis/Encephalitis: caprine, ovine
Caseous Lymphadenitis: caprine, ovine
Chlamydiosis: avian
Chronic Wasting Disease: cervids
Contagious Agalactia of Sheep and Goats: caprine, ovine
Contagious Bovine Pleuropneumonia: any species
Contagious Caprine Pleuropneumonia: caprine, ovine
Contagious Equine Metritis: equine
Cysticercosis: bovine, porcine
Dermatophilosis: bovine
Dourine: equine
Duck Virus Enteritis: avian
Duck Virus Hepatitis: avian
Echinococcus/Hydatidosis: any species
Enterovirus Encephalomyelitis: porcine
Enzootic Abortion of Ewes: caprine, ovine
Enzootic Bovine Leukosis: bovine

Epizootic Hematopoietic Necrosis: aquaculture
Epizootic Hemorrhagic Disease: cervids
Epizootic Lymphangitis: equine
Equine Encephalomyelitis: avian, equine
Equine Infectious Anemia: equine
Equine Influenza: equine
Equine Piroplasmosis: equine
Equine Rhinopneumonitis: equine
Equine Viral Arteritis: equine
Exotic Myiasis: any species
Foot and Mouth Disease: any species
Fowl Cholera: avian
Fowl Pox: avian
Fowl Typhoid: avian
Genital Campylobacteriosis: bovine
Glanders: any species
Goat and Sheep Pox: caprine, ovine
Heartwater: any species
Hemorrhagic Septicemia: bovine
Hog Cholera: porcine
Horse Mange: equine
Horse Pox: equine
Infectious Avian Encephalomyelitis: avian
Infectious Bovine Rhinotracheitis/Infectious Pustular Vulvovaginitis: bovine
Infectious Bursal Disease: avian
Infectious Hematopoietic Necrosis: aquaculture
Japanese Encephalitis: equine
Leptospirosis: any species
Listeriosis: bovine, caprine, ovine
Lumpy Skin Disease: any species
Maedi-Visna/Ovine Progressive Pneumonia: caprine, ovine

Malignant Catarrhal Fever: any species
Marek's Disease: avian
Mycoplasma gallisepticum: avian
Nairobi Sheep Disease: caprine, ovine
Newcastle Disease: avian
Onchorhynchus masou **Virus Disease:** aquaculture
Ovine Epididymitis: ovine
Ovine Pulmonary Adenomatosis: caprine, ovine
Paramyxovirus: avian
Paratuberculosis: any species
Peste des Petits Ruminants: any species
Porcine Reproductive and Respiratory Syndrome: porcine
Pseudorabies: any species
Pullorum Disease: avian
Q-Fever: caprine, ovine
Rabies: any species
Rift Valley Fever: any species
Rinderpest: any species
Salmonella enteritidis enteritidis: avian
Salmonella typhimirium DT 104: bovine

Salmonellosis: caprine, ovine
Scabies: bovine, caprine, ovine
Scrapie: caprine, ovine
Screwworm: any species
Spring Viremia of Carp: aquaculture
Surra: equine
Swine Vesicular Disease: porcine
Theileriosis: bovine
Toxic Substance Contamination: any species
Transmissible Gastroenteritis: porcine
Transmissible Spongiform Encephalopathy: any species
Trichinellosis: porcine
Trichomoniasis: bovine
Trypanosomiasis: bovine
Tuberculosis: any species
Venezuelan Equine Encephalomyelitis: equine
Vesicular Exanthema: porcine
Vesicular Stomatitis: any species
Viral Hemorrhagic Septicemia: aquaculture

Source: Michigan Department of Community Health, 2005.

FIGURE 2-27   Veterinarian Carole Bolin prepares to inject a cow with the new vaccine for bovine leptospirosis. (*Source:* Keith Weller.)

More information on animal diseases can be found by accessing the British Agrifor website at: http://agrifor.ac.uk/hb/06ce169e8d86491b9454aa5769f41b64.html

Plant and agricultural epidemics threaten to cause both economic and environmental damage. The great Irish potato famine of 1845–1850 (caused by *Phytophthora Infestans* fungus), which resulted in the starvation of over 1 million people and the emigration of another 1.5 million, is possibly the most widely recognized example of a disaster caused by this very real hazard. Two million people died in South Asia as result of the Bengal rice epidemic in 1942. Much more recently, in 1970, the United States was affected by an epidemic that affected corn crops (Corn Leaf Blight), although the result was more economic in nature ($1 billion in losses).

Plant and agricultural epidemics can be caused by a number of factors, many of which are not dependent upon an external biotic organism like pathogens, insects, or animals. Epidemics can be simply the result of a change in climate (including rainfall, temperature, sunlight, relative humidity, and wind). Exhibit 2-10 describes possible sources of plant and agricultural epidemics, and Exhibit 2-11 discusses a recurring agricultural epidemic and its impact.

There are five basic categories of plant diseases:

- *New diseases.* Diseases introduced on a new host within the last five years in a new geographic area
- *Emerging diseases.* Diseases whose incidence has increased within the last 10 to 15 years
- *Reemerging diseases.* Diseases previously known in the area but that are gaining importance
- *Threatening diseases.* Diseases not reported or with limited distribution in a new geographic area
- *Chronic/spreading diseases.* Diseases whose presence has been known for a long period but that are still causing outbreaks

Plant and agricultural outbreaks can be spread by a number of means, including (but not limited to):

- Vectors (insects, such as aphids, are common vectors)
- Propagation of diseased plants
- Planting of infected seeds
- Use of contaminated cattle manure
- Movement of crops in contaminated equipment
- Wind, including hurricanes and tornadoes
- Human transportation of infected plants and fruits (intentional and unintentional)

Controlling certain pathogens can require the complete destruction of a crop as well as crops in surrounding areas. Chemicals used to prevent or control plant and agricultural epidemics have been found on occasion to cause as much, if not more, environmental damage than the disease itself.

EXHIBIT 2-10   Sources of Plant and Agriculture Epidemics

- Nonparasitic
  - High and low temperatures
  - Oxygen deficiency
  - Toxic gases: Air pollution
  - Mineral deficiency and excess
  - Drought
  - Light (too much or too little)
- Fungi
- Bacteria
  - Wilts
  - Rots
  - Blights
  - Galls
- Viruses
  - Reduced growth
  - Mosaics
  - Ringspots
- Algae
- Other plants (toxicity and competition)
- Protozoa
- Insects
- Snails
- Rodents
- Nematodes

Source: Chynoweth, 2003.

Other Natural Hazards

In addition to these natural hazards, there are individual natural hazards that do not fit neatly into any single category. Though the list extends far beyond what is covered in this book, the following are examples of hazards that disaster managers must consider in light of their catastrophic potential.

Meteors and meteorites strike Earth many times each day, most often burning up in the atmosphere before they reach ground. However, on many

EXHIBIT 2-11   Africa Fights Locust Plagues

Locust plagues may predate biblical times, but today scientists still struggle to fully understand and control the swarms that can bring famine to thousands. In Guinea-Bissau, West Africa, desert locusts (*Schistocerca gregaria*) currently threaten to decimate the cashew crop on which nearly two-thirds of the nation's farmers depend. The current outbreak comes on the heels of heavy locust damage in numerous West African countries this past summer and fall.

Food shortages loom in the hardest-hit areas. In Mauritania, government officials estimate that one-third of the nation's 2.8 million inhabitants could go hungry next year. Others in the Sahel region, the semi-desert southern fringe of the Sahara, will share the misery.

The recent plagues mark the worst locust upsurges in 15 years. "The last big infestation was between 1986–89," said Clive Elliott, a locust expert with the UN Food and Agriculture Organization (FAO) in Rome, Italy. "I've spoken to lots of people in the field this year who say that the size and density of the swarms they've seen [in western and northwestern Africa] is larger than in 1988."

If there is a pattern to the plagues, scientists have yet to find it. Twentieth-century plagues occurred in 1926–1934, 1940–1948, 1949–1963, 1967–1969, and 1986–1989. Plagues are spurred by recurrent rainfall during the insect's breeding season. "We've looked for regularities, but locust population dynamics are so driven by the weather we don't find [predictable cycles]," said University of Wyoming entomologist and locust expert Jeff Lockwood. "We can forecast locust [plagues] about as well as we can forecast the weather."

During massive plagues, desert locusts can appear over a land area of nearly 12 million square miles (30 million square kilometers) in some 60 nations—comprising over 20 percent of Earth's land surface. The insects inflict heavy crop damage that's devastating for subsistence farmers, many of whom must flee land that can no longer support their families. The FAO's Desert Locust Information Service reports that during the biggest plagues, the insects may endanger the livelihood of one in every ten people on Earth.

Control Efforts

To control locust plagues, FAO coordinates international efforts and helps national authorities battle the ancient pests with modern technology that includes satellites, pesticides, and helicopters. "Part of our forecasting system is looking at satellite information on vegetation and identifying desert areas where locusts are likely to be found," Elliott said. "We provide information to countries, so that they can target their surveys to those areas. It doesn't always work, but it has proven useful."

Approximately 42,500 square miles (11 million hectares) of African land was sprayed last year with fixed-wing aircraft and helicopters. While the process may control locusts, it also introduces large amounts of environmentally harmful pesticides. It's a problem the FAO says it is attempting to address. "Most of the spraying has been done with conventional organophosphate pesticides," Elliott noted. "The FAO is trying to promote use of more environmentally friendly pesticides. But it's taking longer than we'd like to get it off of the ground."

One possible alternative control method uses a naturally occurring fungus, *Metarhizium anisopliae*, to create a bio-pesticide dubbed green muscle. The fungus is deadly to locusts and grasshoppers but has proven harmless to other insects, plants, and animals—including people.

"Conveyor Belts"

Elliott reports that, while the desert locust plague situation remains serious, hopes are high that heavy control operations in fall 2004 have made an

impact. "We don't know whether we could be into a plague by September of this year, or if by May the whole thing will have petered out," he said. While controlling locust plagues is the FAO's first priority, understanding the ecological role of the massive outbreaks is also important. Thus far, the latter goal has proven somewhat elusive. "We can think of locust swarms as giant conveyor belts of nutrients that move tons and tons of organic material from one place to another," Lockwood said. "Frankly, we have a poor understanding of how this fits into nutrient cycling in Africa."

Although not fully understood, the massive outbreaks are generally believed to have an important ecological role. "You could think of a locust outbreak as a sort of metabolic wildfire. We don't have the capability to do it, but . . . the thought of totally eliminating locust outbreaks would give most ecologists a shiver up their spine," he said. "We just don't know enough about the possible effects."

Source: Handwerk, Brian. 2005. "Africa Fights Locust Plagues." (http://news.nationalgeographic.com/news/2005/01/0107_o50107_tv_locust_plague.html)

occasions these extraterrestrial masses do make contact with Earth, but their decayed size results in minor or inconsequential impact. By 1990, there were still fewer than 5000 known intact meteors found on the planet (SEDS, n.d.). Humans have been injured on a few occasions from meteorites, but the only known fatalities from space objects falling to Earth are a horse in Ohio in 1860 and dog in Egypt in 1911. Property damage has also been negligible.

Large meteors, which could cause major disasters, including the extinction of all life on the planet, are what are referred to in risk management as a "very low probability, very high consequence" hazard. Though emergency managers could ignore them because the possibility of their striking is so low, their consequences must be considered because they are so great (see Table 2-6). In the history of Earth, about 120 large craters have resulted from large meteors, including one whose diameter extends over 100 miles and is thought to be the cause of the extinction of the dinosaurs. Other large meteorites have exploded in the lower atmosphere before reaching ground, destroying everything below but causing no crater to form (including the 1908 Tunguska meteor, which flattened an entire forest over 30 miles across; see Figure 2-28.)

Poisoning of large populations due to natural, non-pathogenic (e.g., *E. coli* food poisoning) circum-

stances is rare, but it happens enough to merit mention as a potential catastrophic hazard. Disasters included in this category result from a poisonous material, such as a gas or a mineral, being introduced into the food supply, water, or the air. These hazards can strike in an instant or kill populations slowly over the course of years.

In 2000, the World Health Organization (WHO) released a press statement describing their urgent concern about the emergence of widespread contamination of wells in many countries throughout the world, including Argentina, Bangladesh, Chile, China, India, Mexico, Taiwan, Thailand, and the United States. The contamination was caused by naturally occurring arsenic in groundwater, and the people who were relying on this water were being afflicted in high numbers with skin lesions, cancers, and other ailments. In Bangladesh alone, over 77 million (of the country's 125 million) people are at risk, and over 100,000 people have developed sicknesses so far. In India, the number of people sickened has exceeded 200,000. The WHO considers the events to be the worst mass poisoning in history (WHO, 2000).

Other means of natural poisoning include naturally occurring mercury from eating excessive amounts of certain fish, carbon monoxide poisoning from traditional indoor cooking practices, excess fluoride in

TABLE 2-6   **Possible Consequences from Impacts of Meteors of Various Sizes**

Asteroid/comet diameter	Energy, and where deposited	Likelihood of occurrence during this century	Potential damage, and required response
>0.3 m	2 tons TNT, upper atmosphere	1000 per year	Dazzling, memorable bolide or "fire ball" seen; harmless
>1 m	100 tons TNT, upper atmosphere	40 per year	Bolide explosion approaching brilliance of the Sun for a second or so; harmless, may yield meteorites
>3 m	2 kT, upper atmosphere	2 per year	Blinding explosion in sky; could be mistaken for atomic bomb
>10 m	100 kT, upper atmosphere	6 per century	Extraordinary explosion in sky; broken windows, but little damage on ground; no warning
>30 m	2 MT, explosion; stratosphere	40%	Devastating stratospheric shock wave may topple trees, weak wooden houses, ignite fires within 10 km; deaths likely if in populated region (1908 Tunguska explosion was several times bigger); advance warning very unlikely, all-hazards advanced planning would apply
>100 m	80 MT, lower atmosphere or surface explosion affecting small region	1%	Low-altitude or ground burst larger than biggest-ever thermonuclear weapon, regionally devastating, shallow crater ~1 km across; after-the-fact national crisis management (advance warning unlikely)
>300 m	2,000 MT, local crater, regional destruction	0.2%	Crater ~5 km across & devastation of region the size of a small nation *or* unprecedented tsunami; advance warning or no notice equally likely; deflect, if possible; internationally coordinated disaster management required
>1 km	80,000 MT, major regional destruction; some global atmospheric effects	0.02%	Destruction of region or ocean rim; potential worldwide climate shock—approaches global civilization destruction level; consider mitigation measures (deflection or planning for unprecedented world catastrophe)
>3 km	1.5 million MT, global	<1-in-50,000	Worldwide, multi-year climate/ecological disaster; civilization destroyed (a new Dark Age), most people killed in aftermath; chances of having to deal with such a comet impact are extremely remote; mitigation extremely challenging
>10 km	100 million MT, global	<1-in-a-million	Mass extinction, potential eradication of human species; little can be done about this extraordinarily unlikely eventuality

Source: Chapman, 2004.

groundwater, radon in groundwater, and sulfur clouds released from volcanic lakes.

Soil salination is a natural hazard caused by both natural and manmade processes. When soil salt content reaches certain levels above normal for a particular ecosystem or region, the soil's normal plant life can no longer survive and the ground becomes effectively "barren." Salination occurs because of three separate processes:

- Naturally occurring salt within the composition of soil
- Geographic conditions that promote the movement of salt in groundwater
- Climatic and meteorological conditions that promote salt accumulation

These natural processes tend to occur slowly, and surrounding ecosystems change in reaction as neces-

FIGURE 2-28 Forest destroyed by a meteor in Tunguska, Siberia, 1908. (*Source:* Anatoly Klypin.)

sary (even if the change results in barren land, such as the natural salt flats found around the world). Human influence has sped up many of these processes, mostly through the use of irrigation, which tends to increase the rate by which water is filtered through the ground and water tables are replaced by an inflow of outside water. Other factors that affect groundwater levels, like the construction of dams, can have the same effect. The Aswan Dam, built in 1970 in Aswan, Egypt, allowed for increased irrigation below the dam, which, due to the high rates of evaporation in the Egyptian heat, has ultimately resulted in dramatic increase in salt content in that soil.

Soil salination has several ultimate consequences. The most obvious is that arable land is eventually made infertile, leading to a decrease in a nation's ability to produce food. In countries like Egypt that have a shortage of arable land, salination can have a significant impact. Infrastructure is also affected. Salt naturally erodes many materials, including those used to fabricate roads, pipes, wires, and building materials. Additionally, groundwater itself can become saline if the soil salt content rises too high, making it unusable for humans and animals. Finally, if soil becomes bar-

ren because of salination, anchor vegetation will die and soil erosion will increase, resulting in a number of secondary hazards mentioned throughout this chapter.

TECHNOLOGICAL HAZARDS

The second major groups of hazards explored in this chapter are technological hazards. Technological hazards are the negative consequences of human innovation that can result in the harm or destruction of life, property, or the environment. They range from chemical spills to power failures, from computer programming bugs to mass transportation accidents. By their very nature, they are generally new hazards in terms of the full spectrum of threats humans have faced, so relatively little is known about their consequences. They can be very difficult to predict, and a wide range of triggers tends to initiate them, including many natural disasters previously discussed. Depending on the circumstances, seemingly equal technological hazards can affect geographic areas from as small as a single city block to as large as an entire continent. As technology advances, the catalog of technological disasters only expands.

Technological hazards differ from natural hazards in that societies have chosen to assume technology's associated risks (known and unknown) in exchange for some realized benefit. Perhaps the best illustration of this cost/benefit gamble, as well as one of the single greatest technological hazards, is the automobile (NIH, 2004). On average, 1.2 million people worldwide die each year in traffic accidents, yet society has collectively decided to accept that risk for the benefit of rapid transit.

Since 1980, the number of reported technological disasters has skyrocketed, increasing at a rate that completely outpaces the increase of natural disasters. Furthermore, the number of people dying as result of these technological disasters is also rising. Figures 2-29 and 2-30 illustrate these increases.

The following section will explore many of the known technological hazards that often strike with
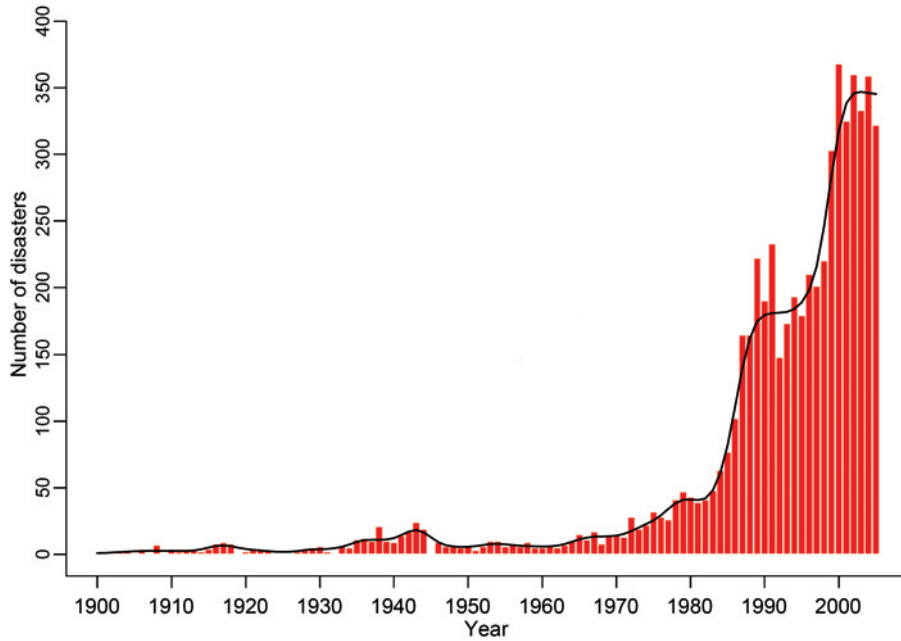
FIGURE 2-29   Total number of reported technological disasters, 1900–2005. (*Source:* www.em-dat.net.)
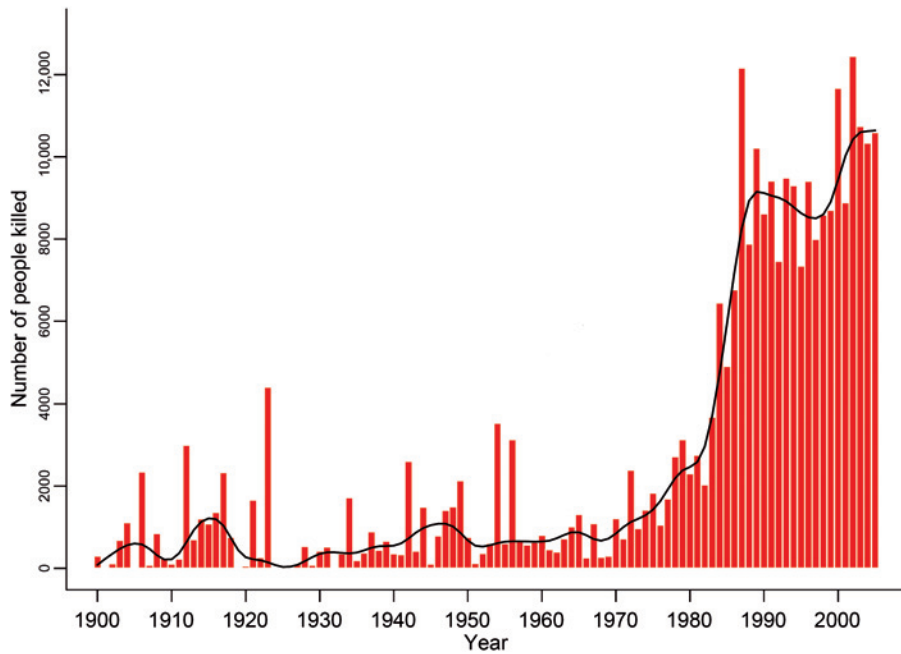

FIGURE 2-30   Total number of people killed in technological disasters, 1900–2005. (*Source:* www.em-dat.net.)

catastrophic consequences and that most disaster managers are likely to face as technology progresses.

Transportation Hazards

Transportation hazards have become such a common part of global society that it seems only the truly tragic events merit international news coverage. Transportation is a technology on which the entire world now depends for travel, commerce, and industry. The vast system of land, sea, and air transportation involves complex and expensive infrastructure, humans or machines to conduct that infrastructure, and laws and policies by which the whole system is guided. A flaw or breakdown in any one of these components can and often does result in a major disaster involving loss of life, injuries, property and environmental damage, and economic consequences.

Transportation infrastructure disasters involve not the vehicles themselves but the systems upon which those vehicles depend. Vast engineering feats are often required to join the world's cities, to cross mountains and waterways, and to shorten the distances from point A to point B. As with all engineering projects, a certain risk is imposed by the very nature of the forces the projects must overcome, including gravity, tension, mass, resistance, and velocity. And, of course, bridges, tunnels, raised highways, mountain roads, overpasses, airport terminals, and other infrastructure components are all subject to the realization of that risk: failure.

A component of infrastructure can fail for many reasons. The most common causes are poor design, poor maintenance, or the introduction of unforeseen or unexpected outside forces (e.g., seismicity or hurricanes), which can cause the impacted structures to collapse or sustain significant damage, often harming or killing those inside or nearby. As the event usually renders these infrastructure components useless, transportation of all individuals and businesses dependent upon the overall system is instantly hindered or eliminated. It thus is not a surprise that transportation infrastructure disasters often result in economic collapse for towns and cities. The failure of even the most

simple footbridges, tens of thousands of which have been constructed throughout the developing world, can have devastating effects, cutting off villagers from their fields or jobs. In many developing countries, where critical transportation routes must traverse very rugged, hazard-prone terrain, a significant amount of government money may be required to repair and maintain those routes.

Airline accidents are relatively rare, but are often both spectacular and catastrophic due to the high number of people involved and the very low number of survivors. Air Safe, an airline safety advocacy website, examined 342 fatal accidents involving both jet and propeller driven aircraft between 1978 and 1995, and found a 90% mortality rate in 58% of the accidents (Air Safe, 2003). When airline accidents occur in cities, in addition to fatalities and injuries sustained by people on the ground, structure fires and collapses usually occur, requiring difficult response efforts. This problem is especially troubling in cities undergoing massive growth, whose airports, constructed in once-empty fields, are now completely surrounded by urban sprawl. Mariscal Sucre International Airport in Quito, Ecuador, where fatal crashes into residential areas have occurred, is such an example.

Rail accidents can occur for both passenger and freight trains, with each posing unique problems for disaster managers. Accidents primarily occur because of contact between two trains, contact between a train and a foreign object (car, animal, debris), onboard fire, or faulty or misaligned tracks (due to external forces, human error, sabotage, or poor maintenance).

Rail accidents involving passenger trains are often mass casualty incidents (see Exhibit 2-12). Due to their sheer weight, it is difficult for trains to suddenly slow down, and accidents are often unavoidable. The increased production and implementation of high-speed train systems is increasing passenger risk. On April 25, 2005, a high-speed train in Japan derailed due to operator error, slamming into a building, killing 107 people and injuring over 450.

Trains are used extensively to transport cargo, much of which is classified as hazardous. Accidents involving train cars with flammable or poisonous

EXHIBIT 2-12   Select Fatal Train Accidents Since 1950

- July 13, 2005: Pakistan (3 trains collide)—over 100 killed
- April 25, 2005: Japan (high-speed train derails)—107 killed
- Dec. 26, 2004: Sri Lanka (train struck by tsunami)—about 2000 killed
- April 22, 2004: North Korea (2 trains collide)—about 161 killed
- Feb. 18, 2004: Iran (HAZMAT train derails)—over 200 killed
- Feb. 20, 2002: Egypt (fire)—over 360 killed
- Aug. 2, 1999: India (2 trains collide)—over 285 killed
- Aug. 20, 1995: India (2 trains collide)—358 killed
- Sept. 22, 1994: Angola (mechanical failure causes derailment)—300 killed
- Jan. 4, 1990: Pakistan (2 trains collide)—over 210 killed
- June 3, 1989: Soviet Union (fire)—575 killed

- June 8, 1991: Pakistan (2 trains collide)—over 100 killed
- June 6, 1981: India (bridge collapse)—over 800 killed
- Oct. 6, 1972: Mexico (passenger train derails)—208 killed
- Feb. 1, 1970: Argentina (2 trains collide)—236 killed
- Nov. 9, 1963: Japan (3 trains collide)—161 killed
- May 3, 1962: Japan (3 trains collide)—160 killed
- Sept. 29, 1957: Pakistan (2 trains collide)—250 killed
- April 3, 1955: Mexico (train derails)—300 killed

Source: The Associated Press, 2005.

gases or liquids have caused several major disasters, and are a significant hazard for any urban area they pass. These accidents can involve explosions, fires, the release of deadly gases, and severe environmental degradation. Evacuations may be necessary to protect the surrounding population, and rescue efforts are difficult to impossible without proper equipment and training.

Maritime accidents, like rail accidents, may involve either passenger vessels or freight vessels, each posing a specific set of risk factors. The range of causes of maritime accidents include weather-related accidents, mechanical failure, human error, overloading (passengers or freight), poor maintenance, fire, collision (other vessels, stationary objects, war, striking of floating or submerged objects or land), sabotage, and terrorism. Large passenger vessels that encounter serious trouble pose a significant challenge to disaster managers in that rescue requires numerous marine search-and-rescue resources deployed within a very short amount of time. Ships can sink quickly, and in cold waters, survivors have only minutes before hypothermia proves fatal. Exhibit 2-13 lists selected maritime disasters with more than 500 fatalities over the past 150 years.

Roadway accidents are the most common type of transportation accident (see Figure 2-31). Although the number of injuries and deaths in individual events are normally much lower than for other forms of accidents, the collective number is much greater: over 1.2 million deaths per year. Mass casualty accidents involving passenger transportation lines, such as intercity buses, are common, especially in developing countries where enforcement of safety standards is sparse, driver training and regulations lax, and rescue resources slim to nonexistent. Hazardous materials

EXHIBIT 2-13   Select Maritime Disasters with More Than 500 Fatalities

- 1865: *Sultana* (explosion)—1700 killed
- 1873: *Atlantic* (sank)—546 killed
- 1904: *General Slocum* (fire)—1021 killed
- 1904: *SS Norge* (sank)—620 killed
- 1912: *Titanic* (sank)—1503 killed
- 1914: *Empress of Ireland* (sank)—1012 killed
- 1915: *Lusitania* (sank)—1198 killed
- 1915: *Eastland* (sank)—845 killed
- 1940: *Lancastria* (sank)—up to 5000 killed
- 1944: *Tango Maru* (sank)—about 3000 killed
- 1944: *Ryusei Maru* (sank)—4998 killed
- 1944: *Toyama Maru* (sank)—about 5600 killed
- 1944: *Koshu Maru* (sank)—about 1540 killed
- 1944: *Junyo Maru* (sank)—about 5620 killed
- 1944: *Rigel* (bombed)—2571 killed
- 1945: *Wilhelm Gustloff* (sank)—about 9000–10,000 killed
- 1945: *Steuben* (sank)—about 4000–4500 killed
- 1945: *Goya* (sank)—over 7000 killed
- 1945: *Cap Arcona* (sank)—about 8000 killed
- 1945: *Thielbek* (sank)—2750 killed
- 1955: *Novorossiysk* (sank)—608 killed
- 1987: *Doña Paz* (sank)—about 4000 killed
- 1994: *M/S Estonia* (sank)—852 killed
- 2002: *Joola* (sank)—950 killed

Source: www.wikipedia.org.

EXHIBIT 2-14   Select Roadway Accidents

- 1945: Thailand—Explosion of a dynamite truck—over 150 killed
- 1956: Colombia—7 ammunition trucks explode—over 1200 killed
- 1965: Togo—Collision with 2 trucks—over 125 killed
- 1973: Egypt—A bus plunged into an irrigation canal—127 killed
- 1978: Spain—A gasoline tanker exploded—over 120 killed
- 1982: Afghanistan—A gasoline tanker exploded in a tunnel—over 2000 killed
- 1992: Kenya—A bus crashed into a bridge—106 killed
- 1995: South Korea—100 cars fell into a hole created by an explosion—110 killed
- 2000: Nigeria—A gasoline tanker struck cars and exploded—over 150 killed
- 2005: Peru—A bus plunged off of a bridge—35 killed
- 2005: Sri Lanka—A bus was hit by a train—59 killed

Source: www.wikipedia.org.

FIGURE 2-31   Bus involved in fatal accident, California, 2001. (*Source:* NTSB, 2001.)

accidents involving tanker trucks or other forms of transportation are also common, and almost always pose a hazard risk to life, property, and the environment. Exhibit 2-14 lists several devastating roadway accidents that have occurred throughout the world.

Infrastructure Hazards

Infrastructure hazards are another type of technological hazard, and are primarily related to critical systems of utilities, services, and other assets (both state-run and private) that serve the public. The consequences of infrastructure hazards may include loss of vital services, injury, death, property damage, or a combination of these. As technological innovation, global communication, and global commerce increase, nations are becoming much more dependent upon their critical infrastructure. The primary types of infrastructure hazards are listed below.

Power failures can be caused by a breakdown in the power generation and/or distribution grid, or by an accident or preceding disaster that somehow damages the grid. Increased dependence upon electronic equipment for communications, management, commerce, and other vital systems has increased public and private entities' vulnerability to the consequences of this hazard. Extended power outages can quickly turn into public health emergencies when life safety systems begin to fail. Without power, citizens can find themselves unable to travel, purchase necessary supplies, heat or cool their homes, communicate, or work. Companies have discovered that power outages lasting as short as one hour can result in millions of dollars in losses and, if extended across a whole region's industry, can result in major economic damage. In 2003, a power outage struck 50 million people in Canada and the United States, resulting in over $6 billion in economic costs to those two countries and affecting businesses, water supplies, transportation systems, communications systems, food supplies, and much more. Figure 2-32 illustrates the geographic range affected by this single event. Experts predict that disasters like this will only increase in number and severity over time.

Telecommunications systems failures, which include telephone (land line and mobile), radio, satellite, and Internet, have economic and social impacts. Most businesses and governments depend upon reliable communications in order to function. When communications systems fail, citizens are unable to contact emergency resources, and businesses are unable to sell their products or provide their services.

Computer network failures are becoming as costly as power and telecommunications failures. Most of the world's businesses and banks are wholly reliant upon the Internet, and public facilities and service providers (such as utilities, communications, public health facilities, traffic systems, and other government-related offices) are heading in that same direction. The interconnectedness of the global internet has created the risk that a collapse of a portion of that network anywhere in the world could result in total collapse of the entire system. This risk is increasing in all countries of the world, rich and poor. Exhibit 2-15 describes the consequences of a 2005 Internet outage in Pakistan.

EXHIBIT 2-15   **Internet Link in Pakistan Restored after over Eleven Days' Breakdown**

ISLAMABAD: Pakistan's Internet users were back on line Friday after more than a week of disruptions caused by a faulty undersea communications cable that connects the country with the rest of the world, an official said. "The repair work has been completed and Internet supply has been restored," said Mashkoor Hussain, a senior official with Pakistan Telecommunications Co. Ltd. [PTCL], which operates the cable.

The cable stopped working on June 27, halting an estimated 10 million Internet connections. Days later, a fault in the cable in the Arabian Sea was located about 15 kilometers (nine miles) southwest of Karachi, Pakistan's main seaport. Pakistan is normally connected to the Internet by a single undersea fiber link, called Southeast Asia, Middle East and Western Europe-3 (SEA-ME-WE-3). It was the second time in three months that Pakistan's

FIGURE 2-32 Geographic area affected by the 2003 blackout in Canada and the United States. (*Source:* U.S. Government Accountability Office, 2003.)

Internet services came to a halt, with a similar cable glitch suspending service in April. PTCL officials have said a new cable would be laid by October this year to avoid similar Internet outages in the future.

Banks, brokerages, internet service providers, and call centers were badly hit by the disruption. Telecom officials say they are now working on erecting a back-up link to avoid similar breakdowns in the future. The optic fiber cable is Pakistan's only telecommunications link with the outside world. Pakistan sought assistance from the 92-member consortium that operates the cable, since the country does not have the technology to deal with such problems on its own. But repairs were hampered by bad weather in the Arabian Sea delaying ships from reaching the problem area for several days.

While the immediate problem has been dealt with, Pakistan's budding IT industry is now pressing the government to give more thought to its communication infrastructure. The government is under fire from industry professionals on two counts:

- First, they are asking the government why a back-up system was not in place. So far, the 39,000 km cable—which links Pakistan to South East Asia, the Middle East and Western Europe—is the country's sole link to the outside world. At the time it was commissioned some four years ago, Pakistan rejected the proposal of linking up with India or Iran as a backup, citing security issues. Telecom officials at the time agued in favor of a satellite link as an alternative. After the breakdown the authorities acquired a back-up satellite system. But it turned out to be insufficient for the country's needs, providing only about half the bandwidth required.

- Second, IT professionals accuse the government of not taking Pakistan's growing commercial dependence on the Internet seriously. The Pakistan Call Centers Association says it may have lost deals amounting to $10 m with their counterparts in India because of the breakdown. There are no estimates of how much money the smaller businesses may have lost due to the disruption, the association says. But independent analysts say that the Pakistan economy's dependence on the Internet has not yet reached a point where such a disruption could lead to serious financial losses.

Telecom officials say that the government has finally shed its security concerns and has agreed on a back-up cable link through India. The back-up is expected to be in place by October this year by the latest, they say. The submarine cable fault has been rectified and all communication services have been fully restored.

Pak Telecom Chief

Addressing a press conference here Friday, President/CEO of Pakistan Telecommunication Company Limited (PTCL) Junaid I Khan said the organization is committed to support the telecom industry and did its best to meet the situation effectively. The PTCL president said the incident was the first during the last five years of operation of the cable in the leg of the 600 km SEA-ME-WE3 Pakistan segment. Though such incidents occurred in the past in other sections of the SEA-ME-WE-3, the impact was not felt due to availability of diversity in related sections, he added.

Junaid said as regards the duration of the cable fault developed on June 27 at 20:56 hours, past history of the rectification period shows that incident localization period is the minimum amongst all occurred in the past and added in the best cases such faults are repaired in minimum 13 days and in the worst case it has taken 110 days in China. Answering a question, he said two special-built ships were involved for the localization and rectification of fault and added the major challenge faced by E-marine cable ships and their crew was weather, considering the monsoon in the region.

Alternate Connectivity

Replying to another question, he said PTCL has already invested Rs. 2.4 billion in arranging alternate connectivity through SEA-ME-WE-4 cable, which will be available by October or November this year. Additionally, terrestrial link with India by replacing the existing analogue system through optical fiber system is also under implementation, he said and added discussions with Etisalat, UAE are also being held for up-gradation of the existing coaxial bilateral link to optical fiber system. He assured after the completion of these project, the problem like interruption of communication will not take place in future.

Source: Faisal Hayyan. 2005. "Internet Link in Lakistan Restored after Over 11 Days Breakdown." Pakistani Times (July 7).

Critical water or sewer system failures can and do occur quite often, primarily as result of natural hazards. Humans depend upon a steady supply of useable water for basic survival, industry, and agriculture, and an interruption of as little as one day can result in a disaster. Many mechanisms can lead to failure of water resources, ultimately resulting in either drinking water contamination, cessation of service, or environmental destruction. If reservoirs that populations depend on become contaminated and this is not quickly discovered, in only a very brief interval, the contaminated water enters the public supply and begins to cause a widespread public health disaster. Following heavy rains or flooding or during times of drought, water and sewer systems can become overloaded or damaged and fail altogether, adversely affecting both the served population and the surrounding environment.

Major gas distribution line (main) breaks are becoming more of a risk as intra- and intercity systems are established. These systems of pipes, which contain highly pressurized and flammable gas, are vulnerable to a range of natural and man-made influences that could ultimately result in their failure. A breach of a gas line can result in fire, environmental pollution (often requiring evacuation of the area), injury, and death. Special expertise is required to respond to a break in a gas distribution line, and significant populations can be affected. The 1906 earthquake that struck San Francisco is an example of the risk posed by gas lines. In this event, ruptured gas lines started fires that quickly spread throughout the city during a time when response resources were strained (see Figure 2-33). The resulting fires greatly contributed to the 700 deaths that were sustained—the greatest single death toll of all earthquakes to strike the United States.

Dam failure is a hazard that exists in almost every country of the world, posing serious danger to all people and property located downstream from the structures. Any structure that is constructed for the purpose of storing, withholding, or diverting water can be classified as a dam. These structures can be constructed using any number of materials, ranging from resilient

FIGURE 2-33   Fires rage in San Francisco after an earthquake severs several gas lines. (*Source:* USGS, 1906.)

concrete to soft earth. The number of dams that exist throughout the world is much greater than most people may realize, and recently stood at 800,000 (IRN, 1999). The vast majority of these are privately constructed, owned, and maintained. The United States alone has over 74,000 dams, with thousands classified as having the potential to cause loss of life and property in the event of failure. China has the greatest number of dams classified as "large," at 22,000. Figure 2-34 and Exhibit 2-16 illustrate the global distribution of large dams.

The most common cause of dam failure is flooding caused by excess amounts of precipitation, but other possible causes include:

- Prolonged periods of rainfall and flooding
- Inadequate spillway capacity, resulting in excess overtopping flows
- Internal erosion caused by embankment or foundation leaking or piping
- Improper maintenance, including failure to remove trees, repair internal seepage problems, replace lost material from the cross-section of the dam and abutments, or maintain gates, valves, and other operational components
- Improper design, including the use of improper construction materials and construction practices
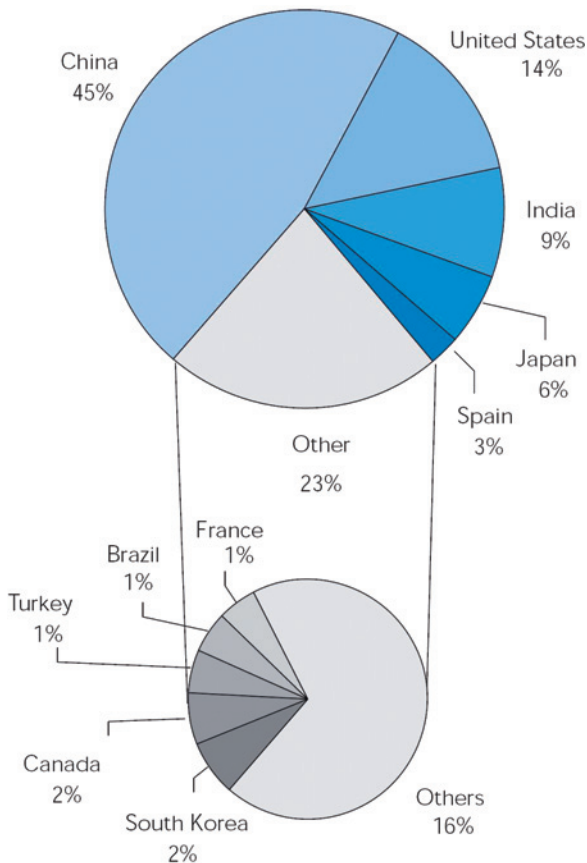
FIGURE 2-34   Share of world dams by country. (*Source:* World Commission on Dams, 2000.)

- Negligent operation, including failure to remove or open gates or valves during high-flow periods
- Failure of upstream dams on the same waterway
- Landslides into reservoirs, which cause surges that result in overtopping
- High winds, which can cause significant wave action and result in substantial erosion
- Sabotage or terrorism
- Earthquakes, which typically cause longitudinal cracks in the tops of embankments that weaken entire structures

The worst disaster caused by dam failure occurred in China in 1975. During one chain-reaction event trig-

gered by a typhoon, 62 interrelated dams failed, the largest of which was the Banquio Dam. These failures resulted in the immediate drowning of 26,000 people and another 100,000–150,000 deaths due to disease and exposure. Almost 6 million buildings were destroyed. Major dam disasters have also occurred in Italy (1961—3,000 killed), the United States (1928— 400 killed; 1889—2,200 killed), and England (1864— 270 killed). The total number of people killed by dams in the 20th century, excluding China, is 13,500 (International Rivers Network, 1999).

Food shortage, defined as the situation that exists when available food supplies do not meet the energy and nutrient requirements of the affected population, can have disastrous consequences. When systems of food production, transportation, and reserve cannot accommodate the local population's needs, a **famine** becomes possible. Malnutrition, starvation, panic, and civil disobedience are often the consequences. Food shortages can be caused by food production crises, social, cultural, political, or economic factors, and environmental hazards. The World Food Programme calls famine the greatest threat to health worldwide, and reports that 797 million people, or 16% of the world's population, currently suffer from the effects of food shortages (WFP, 2005).

Famines are rarely caused by a single factor, but by rather a complex interaction of several ongoing and sudden-onset issues (see Exhibit 2-17). The following list highlights four major food shortage factors:

- *Food production crises.* Caused by changes in climate (temperature, humidity, and rainfall), soil content, biological competition or attack (insects, pathogens, rodents, competing plants), or poor farming practices, for example
- *Social/cultural.* Caused by regional food production policy, crop choice (e.g., cotton vs. corn), labor cost and availability, and dietary preference
- *Political/economic.* Caused by a lack of incentive to farm, exporting too much of the crop, government-imposed price caps (which deter production), taxation and duty policies, availability of food aid, war, and genocide

EXHIBIT 2-16   Number of Dams per Country

Africa		Western Europe		Bulgaria	180
South Africa	539	Spain	1,196	Czech Rep.	118
Zimbabwe	213	France	569	Poland	69
Algeria	107	Italy	524	Yugoslavia	69
Morocco	92	U.K.	517	Slovakia	50
Tunisia	72	Norway	335	Slovenia	30
Nigeria	45	Germany	311	Croatia	29
Côte d'Ivoire	22	Sweden	190	Bosnia-Herz.	25
Angola	15	Switzerland	156	Ukraine	21
D.R. Congo	14	Austria	149	Lithuania	20
Kenya	14	Portugal	103	Macedonia	18
Namibia	13	Finland	55	Hungary	15
Libya	12	Cyprus	52	Latvia	5
Madagascar	10	Greece	46	Moldova	2
Cameroon	9	Iceland	20	**Total**	**1,203**
Mauritius	9	Ireland	16		
Burkina Faso	8	Belgium	15	**North and Central America**	
Ethiopia	8	Denmark	10	United States	6,575
Mozambique	8	Netherlands	10	Canada	793
Lesotho	7	Luxembourg	3	Mexico	537
Egypt	6	**Total**	**4,277**	Cuba	49
Swaziland	6			Dominican R.	11
Ghana	5	**South America**		Costa Rica	9
Sudan	4	Brazil	594	Honduras	9
Zambia	4	Argentina	101	Panama	6
Botswana	3	Chile	88	El Salvador	5
Malawi	3	Venezuela	74	Guatemala	4
Benin	2	Colombia	49	Nicaragua	4
Congo	2	Peru	43	Trinidad & Tobago	4
Guinea	2	Ecuador	11	Jamaica	2
Mali	2	Bolivia	6	Antigua	1
Senegal	2	Uruguay	6	Haiti	1
Seychelles	2	Paraguay	4	**Total**	**8,010**
Sierra Leone	2	Guyana	2		
Tanzania	2	Suriname	1	**Asia**	
Togo	2	**Total**	**979**	China	22,000
Gabon	1			India	4,291
Liberia	1	**Eastern Europe**		Japan	2,675
Uganda	1	Albania	306	South Korea	765
Total	**1,269**	Romania	246	Turkey	625

Thailand	204	Georgia	14	Cambodia	2
Indonesia	96	Uzbekistan	14	Bangladesh	1
Russia	91	Iraq	13	Laos	1
Pakistan	71	Kazakhstan	12	**Total**	**31,340**
North Korea	70	Kyrgyzstan	11		
Iran	66	Tajikistan	7	**Austral-Asia**	
Malaysia	59	Jordan	5	Australia	486
Taipei, China	51	Lebanon	5	New Zealand	86
Sri Lanka	46	Myanmar	5	PNG	3
Syria	41	Nepal	3	Fiji	2
Saudi Arabia	38	Vietnam	3	**Total**	**577**
Azerbaijan	17	Singapore	3		
Armenia	16	Afghanistan	2		
Philippines	15	Brunei	2		

Source: The World Commission on Dams, 2000.

EXHIBIT 2-17   Examples of Historical Famines

- 1845–49: Irish potato famine—potato disease and government policy—1 million died
- 1847: Czech Republic—potato disease—20,000 died
- 1932–33: Ukraine—bad harvests and government policies—3–6 million died
- 1943: Bengal—rice disease and government policies—3 million died
- 1944: Dutch famine—extreme cold and war—30,000 died
- 1945: Vietnam—war—as many as 2 million died
- 1984–85: Ethiopia—drought and war—1 million died
- 1988: Sudan—war and drought—250,000 died
- 1998: Sudan—war—100,000 died

- *Environmental.* Caused by drought, flood, storms, extreme temperatures, the El Niño phenomenon, and many more

Conflict often results in food shortages. One warring faction controls food aid, and withholding such aid is used as a weapon of sorts. This occurred in Ethiopia in the 1980s and in Sudan in 1997. For this reason, famine is often a factor in complex humanitarian emergencies, described in greater detail later in this chapter.

For additional information on food shortages currently affecting the various regions of the world, visit the World Food Programme Interactive Hunger Map: www.wfp.org/country_brief/hunger_map/map/hungermap_popup/map_popup.html

Overburdened public health facilities can be either a cause or a consequence of disaster. Most public health facilities throughout the world are designed to accommodate noncrisis patient caseloads. However, following disasters or during epidemics, the physicians, support staff, facilities, and inventories

upon which these systems depend become quickly strained or overloaded, and a breakdown in service may take place. But even at times, the public health infrastructure can break down due to labor issues (strikes), supply line breaks, loss of facilities, increased demand without increased capacity, and other reasons, the majority of which are related to poverty (see Exhibit 2-18).

Economic failure, which is caused by a collapse or serious downturn in the ability of a country, region, or community to sustain economic solvency, can result in a wide spectrum of disastrous consequences, including but are not limited to:

- Currency devaluation
- High unemployment

EXHIBIT 2-18   US Department of State Advisory on the Risk that Health Services Could Be Overwhelmed in a Pandemic

Health care services likely will be overburdened if confronted by a pandemic. Hospitals and clinics could be overwhelmed by thousands of seriously ill patients, and health care workers might be in short supply because of their own illnesses. Communities and health care providers must plan in advance for maintaining a workable health care system during a crisis that could last several months. Planning should include the delivery of triage care, self-care and telephone consultations.

Health Care Concerns

Health care planning for a potential pandemic should involve all levels of government, including specialists in policy development, legislative review and drafting, human and animal health, patient care, laboratory diagnosis and testing, disaster management and communications. Health professionals must learn how to communicate risk effectively and be able to provide the facts to a frightened population. Experts at the World Health Organization (WHO) and in academia say that communities must prepare for:

- Medical shortages of equipment and supplies such as ventilators, respirators, syringes, anti-bacterial soap, anti-virals, vaccines, clean water and waste management

- Death management challenges: refrigerated trucks dedicated to transporting bodies, and crematory and funeral service facilities that may be in short supply

Disruptions in routine health care services are likely, resulting in the need for alternative sites, such as gymnasiums, nursing homes, daycare facilities and tents, to provide health care. Plans should also address who could serve as alternates in medical positions.

According to WHO, community health care managers should make plans now to determine:

- Where patients will be treated
- What will be the admission criteria for existing and newly created health care facilities
- How specimens will be collected and transported to laboratories
- Who will get priority if there are limited quantities of protective masks and gloves, and
- How large a supply of chlorine for water purification is sufficient if shipments are delayed or suspended. Many cities keep only enough chlorine on hand to last five days to seven days.

Source: US Department of State. 2006. Health Service Could Be Overwhelmed in a Pandemic, Experts Say. March 10. http://usinfo.state.gov/gi/Archive/2006/Mar/11-871715.html.

- Loss of basic government and private services
- Inflation
- Fuel shortages
- Civil unrest
- Hunger and famine
- Crime
- Political upheaval and instability
- Rising international debt
- Loss of foreign investment
- Deterioration of critical infrastructure

Industrial Hazards

The final area of technological hazards we will examine is industrial hazards. Hazardous materials and conditions are a fact of life in the industrialized world. Our ability to extract, create, produce, and provide much of the goods and services we depend upon has introduced a whole new range of hazards that is expanding at an ever-increasing rate. This section details many of the hazards that exist as a result of industry and industrial processes.

Hazardous materials processing and storage accidents are common, affecting almost any private or public facility that works with these kinds of materials. Many of our industrial processes depend upon one or more hazardous materials (solids, liquids, or gases) that, when removed from their controlled setting, can cause injury and death to humans and animals and can devastate the environment. Although safety standards, procedures, and other measures are often in place, all of these are dependent upon a degree of enforcement and a level of environmental control. Therefore, any locality where fabrication, processing, storage, transport (including by pipeline) or disposal of hazardous materials occurs is at risk from these hazardous materials (HAZMAT) incidents (see Table 2-7).

The vast majority of hazardous materials events occur because of accidents during transportation on highways and railroads. The minority of events that do occur at industrial sites ("fixed sites") have a range of causes, including natural disasters, fire, human error, infrastructure deterioration or failure, accidents, sabotage, and terrorism. When the hazardous materials used are flammable or explosive, or when explosive conditions are created as result of certain storage, transportation or processing methods, the risk of an **explosion or fire** exists. This risk extends to **military installations**, where it is very common for munitions and other hazardous or explosive materials to be stored. Nuclear storage, disposal, and electrical generation facilities, as well as many other industries and laboratories that use nuclear and radiological materials, pose a special industrial hazard. Accidents at these types of facilities can have catastrophic consequences that persist for decades or even longer.

In a free and open society, the presence of these hazards is often well mapped and well communicated to the at-risk public. However, there are many societies in which such openness does not exist. In these cases, people will often unknowingly place themselves at even greater risk, by moving closer to the source of risk and doing nothing to protect themselves from a possible incident.

A notorious case of an industrial release accident without effective public disclosure took place in Bhopal, India, in 1984. After the release of methyl isocyanate from a Union Carbide plant, as many as 4000 people in nearby communities died within days, and as many as half a million were injured. Twenty years later, much of the affected population still shows signs of illness caused by this accident. Prior to this catastrophic event, Union Carbide had taken out newspaper announcements warning people living near the plant of the risks of industrial release accidents. However, the company failed to reach their intended audience for various social and cultural reasons. (See Chapter 5 for more information about risk communication.)

Raw materials extraction (mine) accidents, which are caused by fires, explosions, poisoning, flooding, and structural collapse, continue to be a hazard. Because of the underground, confined nature of mines, these events often result in mass casualty and require very difficult technical rescue. Collapse of overlying land can also occur, resulting in severe property damage.

TABLE 2-7   List of Select Industrial Accidents During the Past Thirty Years.

Year	Location	Industry	Description
1978	France	Oil tanker	Amoco Cadiz tanker ran aground off the coast of France, spilling 1.6 million barrels of crude oil.
1979	Pakistan	Fireworks factory	32 people killed in a fire and resulting explosions.
1979	Hungary	Chemical factory	Fire at the North Hungarian Chemical Works factory killed 13 workers.
1979	USA	Nuclear	Three Mile Island nuclear power plant in Pennsylvania almost suffered a core meltdown. Over 140,000 people evacuated.
1982	USA	Chemical waste	2242 residents of Times Beach, Missouri, were evacuated after dioxin found in soil.
1984	Mexico City	Natural gas storage	Explosion at a liquefied natural gas storage plant within the city limits killed over 450 people.
1984	Brazil	Pipeline	Oil pipeline near Cubatao exploded, killing 508.
1984	India	Toxic chemicals	Explosion at Union Carbide pesticide plant in Bhopal released cloud of methyl isocyanate, killing at least 2000 and injured hundreds of thousands.
1985	USA	Fireworks factory	Fire at the Aerlex Corporation Fireworks plant in Oklahoma killed 21 workers.
1986	Ukraine	Nuclear	Chernobyl nuclear power station in the Ukraine was struck by a chemical explosion at the station's fourth reactor and an uncontrolled graphite fire that led to the release of about 3.5% of the fuel stored in the reactor core. Official reports put the immediate death toll at 31, but it is widely believed that many more died in the first hours and weeks after the explosion. The Ukrainian government has estimated 7000–8000 deaths among clean-up workers alone.
1988	North Sea	Oil platform	Platform explosion killed 168 people.
1989	USSR	Gas pipeline	Pipeline explosion between Ula and Asha killed over 650 people.
1989	USA	Oil tanker	Exxon Valdez spilled 11 million gallons of crude oil off the coast of Alaska.
1991	Malaysia	Fireworks factory	21 killed in fires and explosions.
1991	USA	Poultry plant	Fire at chicken processing plant in North Carolina killed 25 people.
1993	Thailand	Toy factory	Fire killed 188 and injured over 400.
1993	Hong Kong	Fireworks factory	27 workers killed in a factory fire.
1998	Nigeria	Oil pipeline	Pipeline at Jesse Nigeria exploded, killing more than 500 people and severely burning hundreds more. Up to 2000 people had been lining up with buckets and bottles to scoop up oil. The fire spread and engulfed the nearby villages of Moosqar and Oghara, killing farmers and villagers sleeping in their homes.
1999	Mexico	Fireworks factory	Explosion in Celeya factory killed 56 people.
2000	Holland	Fireworks factory	Explosion killed 22 and left thousands homeless.
2001	France	Fertilizer factory	Explosion at Azote de France (AZF) agricultural chemicals factory near Toulouse killed 31 and injured at least 650.
2004	Scotland	Plastic factory	ICL Plastic's Stockline Plastics plant in Glasgow exploded, killing 9 and injuring more than 40.

Source: Draffan, n.d.

Mining kills more workers than any other industry, in both large and small accidents ("Mining the Facts," 1998). Over 80% of the world's mine fatalities occur in China, where mining activity is extensive. In 2004 alone, over 6000 miners died in China (Davis and Speigel, 2005), although unofficial statistics have placed the annual average closer to 20,000 (BBC, 2004).

The following website, maintained by the U.S. Department of Labor, details individual mine accident fatalities in the United States: www.msha.gov/fatals/fab.htm

Structural Fires and Failures

Structure fires and failures pose a significant risk that is universal among all countries of the world, rich or poor. The number of causalties from structure fires is greater than from many other hazards combined. This is mainly because almost everyone is dependent upon a built structure for their home, and probably for employment, their government, or for commerce as well. Exposure to this risk, therefore, is extreme. This is an interesting risk, however, in that it is so common that most local agencies are prepared to manage fire or structural failure events, and thus the events rarely transform into disasters. When large structures burn or collapse, however, the chance of a disaster occurring is great, no matter what country is involved (see Exhibit 2-19).

Many natural and manmade factors influence the risk posed by this class of hazard, including design, geographic location, climate, seismicity, construction materials, maintenance, and safety standards

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EXHIBIT 2-19   Historical Structure Fires with 50 or More Fatalities

1811—Richmond Theater fire kills 70, Virginia

1864—Church of La Compana fire kills about 2000, Santiago, Chile

1876—Brooklyn Theater fire kills 295, New York

1903—Iroquois Theater fire kills 602, Illinois

1908—Rhodes Opera House fire kills 170, Pennsylvania

1908—Lakeview Grammar School fire kills 175, Ohio

1919—Mayaguez Theater fire kills 150, Puerto Rico

1923—Cleveland School fire kills 77, South Carolina

1926—Movie theater fire kills 50, Drumcollogher, Ireland

1927—Laurier Palace movie theater fire kills 78, Quebec, Canada

1928—Teatro de Novedades theater fire kills 68, Madrid, Spain

1929—Cleveland Clinic fire kills 125, Ohio

1930—Ohio state penitentiary fire kills 320, Ohio

1940—Rhythm Club fire kills 207, Mississippi

1942—Cocoanut Grove night club fire kills 492, Massachusetts

1944—Ringling Bros, Barnum & Bailey Circus tent fire kills 168, Connecticut

1946—Winecoff Hotel fire kills 119, Georgia

1946—LaSalle Hotel fire kills 61, Illinois

1946—Loebel's Restaurant fire kills 89, Berlin, Germany

1947—Select movie theater fire kills 88, Paris, France

1947—Joelma office fire kills 179, São Paulo, Brazil

1949—St. Anthony's Hospital fire kills 74, Illinois

1957—Katie Jane Nursing Home fire kills 72, Missouri

1958—Our Lady of the Angels school fire kills 95, Illinois

1960—Neuro-Psychiatric Hospital fire kills 170, Guatemala City, Guatemala

1961—Gran Circus Americano fire kills 323, Niteroi, Brazil

1963—Golden Age nursing home fire kills 63, Ohio

1967—Innovation store fire kills 325, Brussels, Belgium

1970—Dance hall fire kills 145, Grenoble, France

1971—Taeyokale Hotel fire kills 163, Seoul, Korea

1971—Club Cinq Sept fire kills 143, St. Laurent du Pont, France

1973—Summerland Leisure Centre fire kills 50, Isle of Man, UK

1977—Beverly Hills Supper Club fire kills 165, Kentucky

1978—Cinema Rex theater fire kills 422, Abadan, Iran

1979—Hotel Coronade Aragon fire kills 74, Zaragoza, Spain

1980—MGM Grand Hotel fire kills 85, Nevada

1985—Soccer stadium fire kills 56, Bradford, UK

1986—Dupont Plaza Hotel fire kills 97, Puerto Rico

1990—Happy Land Social Club fire kills 87, New York

1993—Hasaka Prison fire kills 57, Damascus, Syria

2003—The Station nightclub fire kills 100, Rhode Island

2004—Prison fire kills 103, San Pedro Sula, Honduras

2004—Nightclub fire kills 188, Buenos Aires, Argentina

2005—Prison fire kills 133, Higuey, Dominican Republic

Source: National Fire Protection Association, n.d. Important Dates in Fire History. www.nfpa.org/itemDetail.asp?category ID=954&itemID=23375&URL=Research%20&%20Reports/ Fire%20statistics/Historical&cookie%5Ftest=1

employed. When buildings burn or collapse, they pose great risk not only to the inhabitants but also to the first responders to the event.

One of the greatest structural failures due to nothing other than poor design was the collapse of the Sampoong Department Store in a South Korean mall in 1995. The ceiling on the five-year-old structure collapsed due to the weight of a rooftop water tank and poor quality concrete used in construction. The mall was packed with shoppers at the time, and 500 were killed. Thousands sustained injuries, of which 900 were serious. Figure 2-35 shows the store following the disaster. Other notable structure fires and failures include:

- Hyatt Regency walkway collapse (July 17, 1981): Two thousand people were standing on a hotel atrium walkway in Missouri when the structure collapsed onto people below; 114 people were killed, and over 200 were injured.
- Dubai Airport terminal collapse (September 27, 2004): Five were killed and 17 injured when part of the terminal under construction failed.

- Jerusalem wedding hall collapse (May 24, 2001): A four-story building collapsed while full of people attending a wedding party; 23 were killed, and hundreds injured.

INTERNATIONAL, CIVIL, AND POLITICAL HAZARDS

International, civil, and political hazards include those hazards that exist not due to accident or "act of God," but as a result of the conscious decision of man to act in an antisocial or anti-establishment manner. Assigning these hazards to this category does not imply that they are wrong or right, just that they are caused with intent. Like the technological hazards, many of these hazards are new and emerging, such as modern biological, chemical, and radiological weapons. Others, like war, have existed almost as long as humans themselves.

Terrorism is the most salient hazard due to a remarkable upsurge in terrorist acts during the past

FIGURE 2-35   Sampoong Department Store, South Korea, June 29, 1995. (*Source:* Institute of Historical Studies, 1995.)

decade (see Table 2-8). Terrorism is defined as "the unlawful use or threatened use of force or violence against people or property to coerce or intimidate governments or societies, often to achieve political, religious, or ideological objectives" (GlobalSecurity.org, n.d.). It is important to note that terrorism does not have to involve an actual attack, as the mere threat of terrorism or a terrorism hoax can elicit many physiological and financial consequences of an actual event.

The Council on Foreign Relations has identified several different sources of terrorism, grouped into six major categories:

TABLE 2-8   Top 40 Countries Ranked by Number of Terrorist Attacks, Feb. 2004–Feb. 2005

Rank	Country	Number of attacks	Rank	Country	Number of attacks
1	Iraq	2922	21	China	16
2	Israel/Palestine	1242	22	Yemen	14
3	India	512	23	France	13
4	Nepal	388	24	Lebanon	11
5	Russia	346	24	Greece	11
6	Pakistan	282	26	Serbia and Montenegro	10
7	Afghanistan	145	27	Georgia	9
8	Thailand	97	28	Sudan	7
9	Bangladesh	90	28	Somalia	7
10	Turkey	73	28	Germany	7
11	Algeria	50	28	Bulgaria	7
12	Philippines	43	32	Uzbekistan	6
13	Colombia	38	32	Ukraine	6
14	United Kingdom	37	32	Kuwait	6
15	Saudi Arabia	34	32	Myanmar	6
16	Indonesia	33	32	Bosnia	6
17	Sri Lanka	31	37	Madagascar	5
18	United States	27	37	Laos	5
19	Spain	23	37	Kazakhstan	5
20	Italy	17	37	Czech Republic	5

Source: AON Corporation, 2005.

- *Nationalist terrorism.* Groups seeking to separate from the government that they are targeting with terrorist acts in the hopes of forming an independent state of their own. The terrorist acts are performed to draw international attention, and sympathy, to their cause. Their acts seek a low level of violence in order to avoid appearing barbaric, but enough to garner media attention. Examples include the Irish Republican Army (IRA) and the Palestinian Liberation Organization (PLO).
- *Religious terrorism.* Groups using terrorism as a means to carry out what they envision to be a holy mission. This type of terrorism is especially dangerous because it is not constrained by national boundaries, and often operates outside of normal civil systems. Examples include al Qaeda, Hamas, and Hezbollah.
- *State-sponsored terrorism.* Groups, often working covertly, as mercenaries of a sort. Their actions serve to inflict harm to enemy nations or to instigate conflict. Because of their government backing, these groups may be provided with steady and substantial funding. Examples of states that have been found to have sponsored terrorism include Iran, Libya, and Sudan.
- *Left-wing terrorism.* Groups that seek to end capitalism in favor of communist/socialist regimes. These groups tend to avoid civilian casualties, favoring the destruction of capitalist symbols. Examples include the Red Brigade and the Japanese Red Army.
- *Right-wing terrorism.* Groups that attempt to establish a fascist state by intimidating or removing liberal, democratic elements from government and society. They tend to have weak organizational structures, and rarely garner support outside of their core group. They are most often racist. Examples include neo-Nazis, skinheads, and the Aryan Nation.
- *Anarchist terrorism.* Groups that attack any organized government structure, seeking a total destabilization of the global political framework. Though these groups have been only a minor

threat since their decline in the early 20th century, antiglobalization movements have brought about a resurgence in the anarchist movement. (Council on Foreign Relations, 2004)

A seventh source not included above, but that having an increased impact throughout the world, is single-interest terrorism. These groups attempt to bring attention to a nonpolitical, nonreligious issue they believe needs to be addressed. Examples include environmental, animal rights, agrarian rights, and anti-abortion groups.

The means by which terrorists achieve their often disastrous ends are diverse. Though kidnappings, assassinations, shootings, robberies, and other tactics are regularly employed, the most feared incidents involve weapons of mass destruction (WMDs). WMDs are weapons designed specifically for causing mass casualty harm to humans, and often significant property damage as well.

WMDs can be subdivided into four principal categories, often referred to as CBRNE: chemical, biological, radiological/nuclear, and explosive. While research is ongoing and new practices continue to be discovered, the worldwide emergency management community is largely unprepared and undertrained for dealing with WMDs. Knowledge of the properties and destructive qualities of the various chemical and biological threats is limited at best. The first-responder community, local emergency management organizations, and the general public remain almost completely uninformed about these hazards and have little or no experience in facing their consequences. The same is largely true with community and national leaders and the news media. The CBRNE weapons are described below.

Conventional explosives have existed for centuries, since explosive gunpowder invented by the Chinese for use in firecrackers was modified for use in weaponry. Both traditional and **improvised explosive devices** (IEDs) are the easiest weapons to obtain and use. Instructions for their assembly and use are widely available in print and on the Internet, as well as through the institutional knowledge of informal

criminal networks. When skillfully used, they can inflict massive amounts of destruction to property and can cause significant injuries and fatalities to humans. Conventional explosives are most troubling as a WMD in light of their ability to effectively disperse chemical, biological, or radiological agents.

Conventional explosives and IEDs can be either explosive or incendiary. Explosives inflict damage or harm by the physical destruction caused by the expansion of gases resulting from the ignition of "high- or low-filler" explosive materials. The range of explosive devices includes simple pipe bombs, made from common plumbing materials; satchel charges, which are encased in an ordinary-looking bag such as a backpack and left behind for later detonation; letter or package bombs, delivered through the mail; and car bombs, which can be used to deliver a large amount of explosives. Incendiary devices, also referred to as firebombs, rely upon the ignition of fire to cause damage or harm. Examples include Molotov cocktails (gas-filled bottles capped with a burning rag) and napalm bombs.

Explosions and fires can be delivered as a missile or projectile device, such as a rocket, rocket-propelled grenade (RPG), mortar, or air-dropped bomb. Nontraditional explosive delivery methods are regularly discovered, and include the use of fuel-filled commercial airliners flown into buildings, as occurred on September 11, 2001. Because these weapons rely upon such low technology and are relatively easy to transport and deliver, they are the most commonly utilized terrorist devices. Though suicide bombings, in which the bomber manually delivers and detonates the device on or near his person, are becoming more common, most devices are detonated through the use of timed transmission, remote transmission (radio, cell phone), or other methods (light sensitivity, air pressure, movement, electrical impulse, etc.).

Although more than 70% of terrorist attacks involve the use of conventional explosives, less than 5% of actual and attempted bombings are preceded by any kind of threat or warning. Conventional explosives can be difficult to detect because most easily attainable explosive materials are untraceable. Many

commercial- and military-grade explosives are now required to contain a chemical signature that can be used to both trace their source should they be used for criminal means and make them detectable to trained dogs, but these account for only a fraction of the explosive materials available to terrorists. Because of the graphic nature of the carnage resulting from explosives and the widespread fear historically associated with their use, these weapons are very effective as a terror-spreading device (FEMA, 1999).

Like explosives, **chemical agents** have existed for centuries and have been used repeatedly throughout history. The most significant and first modern, organized use of chemical weapons was during World War I in Belgium. During an attack against Allied forces, German troops released 160 tons of chlorine gas into the air, killing over 10,000 soldiers and injuring another 15,000. In total, 113,000 tons of chemical weapons were used in World War I, killing over 90,000 and injuring 1.3 million.

Chemical weapons are created for the sole purpose of killing, injuring, or incapacitating people. They can enter the body through inhalation, ingestion, or through the skin or eyes. Many different kinds of chemicals have been developed as weapons; they fall under six general categories that are distinguished according their physiological effect.

1. Nerve agents (sarin, VX)
2. Blister agents (mustard gas, lewisite)
3. Blood agents (hydrogen cyanide)
4. Choking/pulmonary agents (phosgene)
5. Irritants (tear gas, capsicum [pepper] spray)
6. Incapacitating agents (BZ, Agent 15)

Terrorists can deliver chemical weapons via several mechanisms. Aerosol devices spread chemicals in liquid, solid (generally powdered), or gas form by causing tiny particulates to be suspended into the air. Explosives can be used to spread the chemicals through the air as well. Containers that hold chemicals, either for warfare or everyday use (such as a truck or train tanker), can be breached, exposing the chemical to the air. Chemicals can be mixed with water or placed into food supplies. Some chemicals

are easily absorbed through the skin and can be placed directly onto a victim to cause harm or death.

In general, chemical attacks are recognized immediately, though whether the attack was chemical or biological may be unclear until further testing. Chemical weapons can be persistent, remaining in the affected area long after the attack, or nonpersistent. Nonpersistent chemicals tend to evaporate quickly, are lighter than air, and lose their ability to harm or kill after about 10 or 15 minutes in open areas. In unventilated rooms, any chemical can linger for a considerable time.

The effect on victims is usually fast and severe. Identifying what chemical has been used presents special difficulties, and responding officials (police, fire, emergency medical services, hazardous materials teams) and hospital staff treating the injured are at risk from their effects. Without proper training and equipment, first-response officials can do little in the immediate aftermath of a chemical terrorist attack (FEMA, 1999).

A list of chemical agents compiled by the Centers for Disease Control (CDC) is presented in Exhibit 2-20.

Biological agents, or "germ" weapons, are live organisms, either bacteria, viruses, or toxins generated by living organisms. They are used to cause illness, injury, or death in humans, livestock, or plants. Awareness of the potential weapon use of bacteria, viruses, and toxins existed long before 2001, when anthrax was used in terrorist mail attacks in the United States. There is evidence of biological warfare as early as the 14th century, when the Mongols used plague-infected corpses to spread disease among their enemies. Because of advances in weapons technology that have allowed much more successful use of bioweapons over much wider geographic limits, biological weapons elicit great concern from counterterrorism officials and emergency planners alike.

Bioweapons can be dispersed either overtly or covertly. Their use can be extremely difficult to recognize because their negative consequences may take hours, days, or even weeks to emerge. This is especially true with bacteria and viruses; toxins generally elicit an immediate response. Recognition is made through a range of methods, including identification of a credible threat, the discovery of weapons materials (dispersion devices, raw biological material, or weapons laboratories), and correct diagnosis of affected humans, animals, or plants. Detection depends upon a collaborative public health monitoring system, trained and aware physicians, patients seeking medical care, and suitable equipment for confirming diagnoses. Bioweapons are unique in that detection is likely to be made not by a first responder but by members of the public health community.

Their devastating potential is confounded by the fact that people normally have no idea that they have been exposed. During the incubation period, when people do not exhibit symptoms but are contagious to others, the disease can spread. Incubation periods can be as short as several hours or as long as several weeks, allowing for wide geographic spreading due to the efficiency of modern travel. The spread of the SARS virus (which was not a bioterrorist attack) throughout all continents of the world is one example of an event when people did not realize they had been exposed to the virus and therefore unknowingly infected others.

Biological weapons are effective at disrupting economic and industrial components of society when they target animals or plants. Terrorists could potentially spread a biological agent over a large geographic area without being detected, causing significant destruction of crops. If the agent spread easily, as is often the case with natural diseases like Dutch elm disease, an entire industry could be devastated. Cattle diseases such as foot and mouth disease and mad cow disease, which occur naturally, could be used for sinister purposes without extensive planning, resources, or technical knowledge. In 1918, the German army spread anthrax and other diseases through exported livestock and animal feed. With globalization, such actions would require relatively little effort.

The primary defense against the use of biological weapons is recognition, which is achieved though proper training of first responders and public health officials. Early detection, before the disease or illness

EXHIBIT 2-20   Chemical Agents Capable of Terrorist Uses

Abrin
Adamsite (DM)
Agent 15
Ammonia
Arsenic
Arsine (SA)
Benzene
Bromobenzylcyanide (CA)
BZ
Cannabinoids
Chlorine (CL)
Chloroacetophenone (CN)
Chlorobenzylidenemalononitrile (CS)
Chloropicrin (PS)
Cyanide
Cyanogen chloride (CK)
Cyclohexyl sarin (GF)
Dibenzoxazepine (CR)
Diphenylchloroarsine (DA)
Diphenylcyanoarsine (DC)
Diphosgene (DP)
Distilled mustard (HD)
Ethyldichloroarsine (ED)
Ethylene glycol
Fentanyls and other opioids
Hydrofluoric acid
Hydrogen chloride
Hydrogen cyanide (AC)
Lewisite (L, L-1, L-2, L-3)
LSD
Mercury
Methyldichloroarsine (MD)

Mustard gas (H) (sulfur mustard)
Mustard/lewisite (HL)
Mustard/T
Nitrogen mustard (HN-1, HN-2, HN-3)
Nitrogen oxide (NO)
Paraquat
Perflurorisobutylene (PHIB)
Phenodichloroarsine (PD)
Phenothiazines
Phosgene (CG)
Phosgene oxime (CX)
Phosphine
Potassium cyanide (KCN)
Red phosphorous (RP)
Ricin
Sarin (GB)
Sesqui mustard
Sodium azide
Sodium cyanide (NaCN)
Soman (GD)
Stibine
Strychnine
Sulfur mustard (H) (mustard gas)
Sulfur trioxide-chlorosulfonic acid (FS)
Super warfarin
Tabun (GA)
Teflon and perflurorisobutylene (PHIB)
Thallium
Titanium tetrachloride (FM)
VX
White phosphorus
Zinc oxide (HC)

Source: www.bt.cdc.gov/agent/agentlistchem.asp

has spread to critical limits, is key to preventing a major public health emergency.

Biological agents are grouped into three categories: A, B, and C. Category A agents are those that have great potential for causing a public health catastrophe and are capable of being disseminated over a large geographic area. Examples of Category A agents are anthrax, smallpox, plague, botulism, tularemia, and viral hemorrhagic fevers. Category B agents are those that have low mortality rates but may be disseminated

over a large geographic area with relative ease. Category B agents include salmonella, ricin, Q fever, typhus, and glanders. Category C agents are common pathogens that have the potential for being engineered for terrorism or weapon purposes. Examples of Category C agents are hantavirus and tuberculosis (FEMA, 1999; www.wikipedia.com, 2005).

Some indicators of biological attack are:

- Stated threat to release a biological agent
- Unusual occurrence of dead or dying animals
- Unusual casualties
  ○ Unusual illness for region/area
  ○ Definite pattern inconsistent with natural disease
- Unusual liquid, spray, vapor, or powder
  ○ Spraying, suspicious devices, packages, or letters
  (FEMA, July 2002)

A list of biological agents compiled by the Centers for Disease Control (CDC) is presented in Exhibit 2-21.

Nuclear and radiological weapons are those that involve the movement of energy through space and material. There are three primary mechanisms by which terrorists can use radiation to carry out an attack: detonation of a nuclear bomb, dispersal of radiological material, and attack on a facility housing nuclear material (power plant, research laboratory, storage site, etc.).

Nuclear weapons are the most devastating attack form. They are also the most difficult to develop or acquire, and so are considered the lowest threat in terms of terrorist potential. A nuclear weapon causes damage to property and harm to life through two separate processes. First, a blast is created by the bomb's detonation. An incredibly large amount of energy is released in the explosion, the result of an uncontrolled chain reaction of atomic splitting. The initial shock wave, which destroys all built structures within a range of up to several miles, is followed by a heat wave reaching tens of millions of degrees close to the point of detonation. High winds accompany the shock and heat waves. The second process by which nuclear

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EXHIBIT 2-21   Biological Agents Capable of Terrorist Uses

Anthrax (*Bacillus anthracis*)
Botulism (*Clostridium botulinum* toxin)
Brucellosis (*Brucella* species)
Cholera (*Vibrio cholerae*)
E. coli O157 : H7 (*Escherichia coli*)
Emerging infectious diseases such as Nipah virus and hantavirus
Epsilon toxin (*Clostridium perfringens*)
Glanders (*Burkholderia mallei*)
Melioidosis (*Burkholderia pseudomallei*)
Plague (*Yersinia pestis*)
Psittacosis (*Chlamydia psittaci*)
Q fever (*Coxiella burnetii*)
Ricin toxin from Ricinus communis (castor beans)
Salmonellosis (*Salmonella* species)

Smallpox (*Variola major*)
Staphylococcal enterotoxin B
Tularemia (*Francisella tularensis*)
Typhoid fever (*Salmonella typhi*)
Typhus fever (*Rickettsia prowazekii*)
Viral encephalitis (alphaviruses [e.g., Venezuelan equine encephalitis, eastern equine encephalitis, western equine encephalitis])
Viral hemorrhagic fevers (filoviruses [e.g., Ebola, Marburg] and arenaviruses [e.g., Lassa, Machupo])
Water safety threats (e.g., *Vibrio cholerae*, *Shigellosis* (Shigella) *Cryptosporidium parvum*)

Source: http://www.bt.cdc.gov/agent/agentlist.asp

weapons inflict damage is through harmful radiation. This radiation and radiological material is the most dangerous close to the detonation area, where high concentrations can cause rapid death, but particles reaching high into the atmosphere can pose a threat several hundreds of miles away under the right meteorological conditions. Radiation can persist for years after the explosion occurs.

Radiological dispersion devices, or RDDs, are simple explosive devices that spread harmful radioactive material upon detonation, without the involvement of a nuclear explosion. These devices are often called "dirty bombs." Some radiological dispersion devices do not require explosives for dispersal. Though illnesses and fatalities are likely very close to the point of dispersal, these devices are more apt to be used to spread terror. As with many biological and chemical weapons, initially detecting that a radiological attack has occurred may be difficult. Special detection equipment and training in its use are a prerequisite.

A third scenario involving nuclear/radiological material entails an attack on a nuclear facility. There are many facilities around the world where nuclear material is stored, including nuclear power plants, hazardous materials storage sites, medical facilities, military installations, and industrial facilities. An attack on any of these could release radiological material into the atmosphere, posing a threat to life and certainly causing fear among those that live nearby.

If a radiological or nuclear attack were to occur, humans and animals would experience both internal and external consequences. External exposure results from any contact with radioactive material outside the body, while internal exposure requires ingestion, inhalation, or injection of radiological materials. Radiation sickness results from high doses of radiation and can result in death if the dosage is high enough. Other effects of radiation exposure can include redness or burning of the skin and eyes, nausea, damage to the body's immune system, and a higher lifetime risk of developing cancer (FEMA, 2002).

Terrorist can use **combined hazards** to achieve a synergistic effect. By using two or more methods, they can increase the efficacy of each agent in terms of its potential to destroy, harm, or kill, creating a more devastating total consequence than if each agent had been used individually. A dirty bomb, in which radiological material is added to a conventional explosive, is one example. The explosive causes physical damage from the expansion of gases, while the radiological material causes severe health effects. The combination causes both physical damage and harmful radiation, and it disperses the radiological material over a much larger area. Additionally, the debris from the conventional explosive becomes dangerous beyond the original explosion due to radiological contamination.

Explosives can be used to deliver chemical or biological weapons. This presents a dangerous scenario. Trauma resulting from the explosion will demand immediate attention from responders, who may enter a contaminated attack scene without first recognizing or taking the time to check if a biological or chemical agent is present. Victims who are rushed to hospitals can cause secondary infections or injuries to emergency medical services and hospital staff. Additionally, contaminated debris can help to spread certain viruses that may not otherwise have entered the body as easily.

When multiple chemicals, biological agents, or a combination are used in an attack, the consequences can confound even those who are normally considered experts. The combination of symptoms resulting from multiple injuries or infections will make diagnosis extremely difficult, as these diagnoses often depend upon a defined set of effects. The multiple agents will cause physiological effects that do not fit any established human, animal, or plant models. The extra time required to identify the agents will undoubtedly cause an overall increase in the efficacy of the terrorist attack.

Terrorists have other options besides WMDs for which governments, businesses, and individuals must be prepared.

Cyberterrorism, which is described by the Federal Bureau of Investigation (FBI) as an "attack against information, computer systems, computer

programs, and data which results in violence against non-combatant targets by sub-national groups or clandestine agents," can cause severe economic damage or result in a loss of critical services (About.com, 2006).

Narcoterrorism also deserves mention. Narcoterrorists are terrorist groups that fund their activities through the global drug trade (including cultivation, production, transport, distribution, and sales). The marriage between terrorist groups and the drug trade is a dangerous one, because each presents a special set of problems that are exacerbated when combined. They protect each other's interests, as their dependence is mutual. The most notorious narcotraffickers are the Revolutionary Armed Forces of Colombia (FARC), though many other terrorist groups participate in the practice to varying degrees (including the Shining Path, the Tamil Tigers, and the Taliban).

Civil unrest, including **protests, strikes, and rioting**, while daily and often non-newsworthy throughout the world, often leads to major property damage, economic damage, injuries, and death. Political and economic instability are very often either the cause or the consequence of this hazard, though nonpolitically and noneconomically motivated civil unrest does occur. Governments often take severe police or military measures to quell civil unrest and, in the process of doing so, can both sustain and inflict casualties. Crowds of demonstrators are as often to blame for instigating violence as they are victims of it, though it can be the actions of a select few seeking to incite a reaction that sets off a violent encounter. Exhibit 2-22 provides several examples during the past century of civil unrest that has turned deadly.

Stampedes, which are uncontrolled, often panicked movements of people, are unpredictable and deadly. They occur at sports venues, festivals, and other events where people congregate together within a facility that cannot accommodate a hurried exit or entrance or hurried movement within the structure or facility.

Most victims in stampedes die because of suffocation or crushing. The force of the crowd behind them places so much pressure upon their chest that breathing is impossible. The passing crowd often tramples those who fall. Exhibit 2-23 lists major stampedes that have occurred throughout the world over the past 40 years.

EXHIBIT 2-22   Deadly Incidents of Civil Unrest

1907: German South-West Africa (Namibia) massacres—40,000 killed

1919: U.S. race riots—an unknown number of people (in the hundreds) killed

1947: Taiwan 228 massacre—as many as 30,000 killed

1959: Tibetan uprising—approximately 87,000 killed

1964: Peruvian soccer game riots—300 killed

1965–68: U.S. race riots—195 killed

1968: Mexico City, Mexico Tlatelolco massacre—as many as 400 killed

1969: South Africa Sharpeville riot—69 killed

1972: Derry, Ireland "Bloody Sunday" events—13 killed

1980: Gwangju, South Korea protests—at least 207 killed

1985: Brussels, Belgium soccer game riot—39 killed

1989: Tiananmen Square protests, China—approximately 1000 killed, 7000 injured

1989: Tbilisi, Georgia protests—20 killed and 4000 injured

1992: Los Angeles race riots—54 killed

2002: Gujarat, India ethnic violence—over 1000 killed

EXHIBIT 2-23 Deadly Stampedes 1968–2005

1968: Argentina soccer stadium stampede—over 70 killed

1971: Glasgow, Scotland soccer game stampede—66 killed

1982: Moscow soccer game stampede—340 killed

1988: Nepal soccer stadium stampede—70 killed

1989: Sheffield, UK, soccer game stampede—95 killed

1990: Mecca, Saudi Arabia, panic at the annual Hajj—1426 killed

1996: Guatemala City soccer game stampede—80 killed

2001: South Africa soccer stadium crush—43 killed

2001: Ghana soccer game stampede—120 killed

2002: Bangladesh festival stampede—30 killed

2003: Chicago nightclub stampede—21 killed

2004: Beijing, China, festival stampede—37 killed

2004: Mecca, Saudi Arabia, Hajj stampede—244 killed

2004: Lucknow, India, stampede during distribution of free clothes—21 killed

2005: Wai, India, religious procession stampede—250–300 killed

2005: Baghdad, Iraq, religious procession stampede—965 killed

2005: Chennai, India, disaster relief camp stampede—42 killed

EXHIBIT 2-24 Disastrous Criminal Events

1966: Tasmania, Australia—Martin Bryant kills 35 people and injures 37

1987: Berkshire, UK—Michael Robert Ryan kills 17 people and injures 15

1996: Dublane, Scotland—Thomas Hamilton kills 17 people

2001: Osaka, Japan—Mamoru Takuma kills 8 people and injures 18

2002: Thuringia, Germany—Robert Steinhauser kills 16 people

2004: Honduras—Criminal gang members massacre 28 people on a bus

Crime, which is common, affecting hundreds of millions of people each year on a small, individual scale, results in disaster when criminals target or affect significant populations or property. Examples of criminal disasters are mass murders, arson, poisoning, illegal dumping, poaching, sabotage, and hostage taking. Many believe, for instance, that the Bhopal chemical disaster, described previously, was the result of one individual sabotaging the Union Carbide plant after having been transferred to a less desirable job. Deranged individuals can massacre for irrational reasons, like the two students who terrorized a high school in Colorado in 1999, killing 12 classmates and teachers. In 1990, a man in New York City who was angry at his girlfriend set fire to a nightclub, killing 87 people. Exhibit 2-24 lists several disastrous criminal events.

War is perhaps the greatest of all manmade hazards, having resulted in hundreds of millions of deaths throughout history. As weapons technology has progressed, war's deadly consequences have increased, with the nuclear bomb retaining the distinction of being the most deadly weapon ever employed. War

devastates populations, economies, and cultures, leaving a lasting mark on all parties involved for generations. The outcome of war is almost always significant in terms of deaths, injuries, damage and destruction of infrastructure, and homelessness, and often involves acts of genocide or other racial or ethnic violence. In almost all wars, the civilian population suffers the greatest consequences.

During and immediately following major conflicts, civilian populations in the war-affected countries are likely to be displaced from their homes and communities, and are subject to many of the threatening conditions associated with general humanitarian crises—namely, shortages of adequate food, water, shelter, healthcare, and other basic services. However, they may also be threatened by violence or further conflict, thereby qualifying their situation as something completely distinct from a regular humanitarian emergency. This special category of disaster that results from ongoing war or violence is the **complex emergency**, or as it is also commonly known, the **complex humanitarian emergency** (CHE; see Chapter 1). The United Nations defines a complex emergency as follows:

> A complex emergency is a humanitarian crisis in a country, region or society where there is a dramatic disruption in the political, economic and social situation, resulting from internal or external conflict or natural disaster, seriously disrupting the population's capacity to survive and the national authorities to respond, and which requires a consolidated multi-sectoral international response. (Wigdel, 2000).

In the 20th century alone, almost 170 million people have died in the midst of CHEs (Stewart, 2000). These disasters are especially fatal due to intentional attempts to alienate or eliminate certain populations. They create large numbers of refugees and internally displaced persons (IDPs), as defined in Chapter 1, who are routinely grouped into camps for aid and/or protection. Under these conditions, their needs are absolute, and their conditions generally abysmal.

Of all types of disaster response, none is more difficult and involved than that directed at treating and ending a CHE. They truly require the full resources of the international response community. These efforts go above and beyond normal disaster responses due to the confounded variable of violence—a desperate lack of security due to the nature of the conflict that created the emergency in the first place. CHEs endanger not only the lives of the directly affected population but also those of the responders. Finally, a wide array of internal and external contextual influences pull and push in all directions, whatever response efforts are mounted, making stability and predictability an often unanswered wish (see Exhibit 2-25 for a list of common contextual influences). Though every CHE is distinct, many characteristics are commonly seen, including, but by no means limited to:

- Substantial civilian casualties, displacement, and suffering
- The need for substantial international assistance to complement local efforts
- Involvement of a substantial number and type of relief organizations
- Humanitarian assistance impeded, delayed, or prevented by politically or conflict-motivated constraints
- Significant security risks for relief workers in many areas
- The need for external political support and mediation to overcome obstacles to assistance, such as difficult access to those in need (McCreight, 2001)

There is much debate about what types of sociopolitical conditions lead to a complex humanitarian emergency, and whether early warning indicators can be developed. It has been recognized, for example, that despite the presence of conflicts throughout the world, CHEs result only within the poorer countries. However, poverty alone by no means indicates a predisposition for CHE formation. A combination of factors is required, including several of the following:

EXHIBIT 2-25   Contextual Influences of CHEs

- Host government/national leaders
- Host nation culture
- Roots of ethnic conflict
- Recent events
- Legal issues
- Desired end state
- Players-imperatives
- Media and public affairs
- Foreign interests
- Public health
- Donor states
- Military–civil cooperation

- NGOs
- Security
- Recovery
- UN mandate
- Stabilization
- Ethnic politics
- Multinational corporations
- Alliances
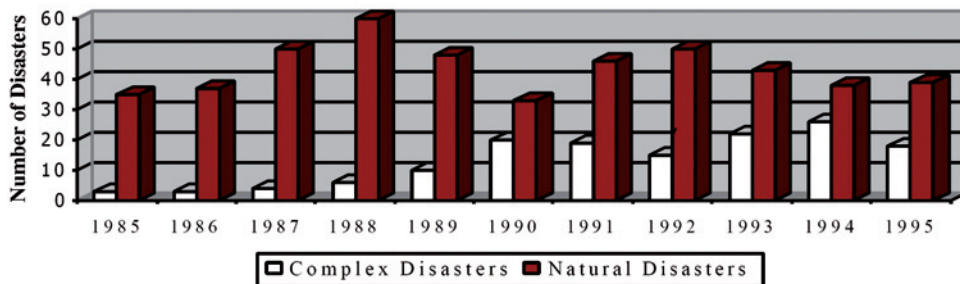- The World Bank

Source: McCreight, 2001.

FIGURE 2-36   Number of natural and complex disasters worldwide, 1985–1995. (*Source:* Lynch, 1998.)

- Income inequality
- Worsening poverty
- Military centrality (spending, power)
- A tradition of conflict
- Deteriorating political climate
- Passage of repressive legislation
- Hardening ideologies
- Scarcities of food, or unequal distribution
- Deteriorating public health conditions
- Flight of the educated class out of the country
- Increased internal military movements
- Massive movements of people
- Recurrent and devastating natural disasters
- Long-standing ethnic, religious, or cultural tensions

(Auvinen and Nafziger, 1999; McCreight, 2001)

Complex humanitarian emergencies combine internal conflicts with large-scale displacements of people, mass famine, and fragile or failing economic, political, and social institutions. Some complex emergencies are exacerbated by the conditions resulting after natural disasters or by inadequate or nonexistent transportation networks. Historically, an equal number of CHEs have developed very quickly as have developed over a more prolonged period, leaving any mechanism for prediction only moderately effective.
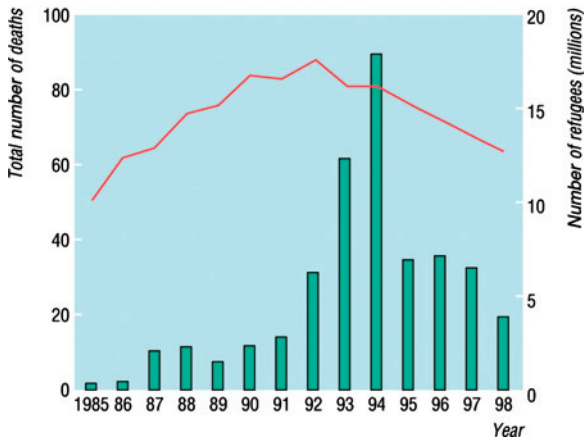
FIGURE 2-37   Number of deaths among humanitarian aid workers, 1985–1998, as a factor of the number of refugees each year. (*Source:* Sheik, et al. 2000.)

CHEs are becoming much more common and, likewise, more widespread in their global range. Before the end of the Cold War, only a handful of CHEs existed at any given time, but today these events are occurring in much greater numbers, in many different parts of the world. For example, between 1978 and 1985, there were an average of only five complex humanitarian emergencies each year, but by 1985 that number had jumped to 20 (CIA, 1995), and has remained at that level since (see Figure 2-36).

Probably the most significant factor that must be considered by any agency responding to a CHE is security. This includes security of relief workers as much as security of the affected population. Peace-keeping missions are often required to ensure the safety of IDPs and marginalized members of the population. Without the security offered by the peacekeepers, it can be impossible for relief agencies to do their jobs, as the warring factions targeting the affected population will likely see relief agencies as hindering their cause and target them as well. Other times, relief workers merely get caught in the crossfire of battle. Either way, the results are tragic and occasionally result in aid workers retreating from the crisis. Exhibit 2-26 provides a list of select events where

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EXHIBIT 2-26   Fatal Incidents Involving Relief Workers

1991: Ethiopia—29 relief workers killed in separate incidents over 9 months

1993–94: Somalia—125 U.S. and UN military personnel killed, 195 wounded

1998: Sudan—3 UN staff killed and 3 wounded in an attack on their vehicle

1999: Sudan—4 Red Cross workers kidnapped and executed

2000: Somalia—20 killed during an attack on a convoy of aid workers

2000: Iraq—2 Food and Agriculture Organization employees killed

2000: Afghanistan—7 UN mine clearance workers killed in an ambush

2000: Indonesia—3 aid workers killed

2001: Congo—6 Red Cross workers killed

2003: Iraq—24 UN employees killed in UN Headquarters bombing

2003: Iraq—12 Red Cross workers killed in a bombing

2004: Afghanistan—5 Doctors Without Borders workers killed

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aid workers have been killed or injured during the response to CHEs.

Figure 2-37 shows the actual number of humanitarian aid workers killed from 1985–1998.

The Chronology of Humanitarian Aid Workers Killed 1997–2001, found online at www.reliefweb.int/symposium/NewChron1997-2001.html, provides a descriptive background about each incident that resulted in the death of one or more humanitarian aid worker during those years.

Civilians trying to flee war have much higher mortality and morbidity statistics. Refugees, who are able

to escape to neighboring countries (see Chapter 7), are usually placed into refugee camps in which conditions range from uncomfortable to squalid. While there, they are subject to outbreaks of communicable diseases, starvation, elevated stress, and violence. When the daily death rate reaches 1 per 10,000 people, refugee or IDP situations are classified as CHEs, though this threshold is by no means absolute and thus, depending on the circumstances, a situation may be called a CHE much earlier.

A measure of mortality called the Crude Mortality Rate (CMR) measures the number of deaths per 10,000 people per day. This metric is used because it helps to standardize the effect of the emergency in terms of numbers dying per day over specific population blocks. This enables events of different sizes to be compared in terms of the effect sustained by the individual. (Absolute numbers are often irrelevant if the compared countries' populations greatly differ, such as 1000 deaths in Jamaica versus China.) Under normal circumstances, CMR rates in the developing world range from about 0.4 to 0.7 deaths per 10,000 people each day. During CHEs, these numbers can range from the baseline of 1 per day to 35 per day (as with Rwandan refugees in Zaire in 1994), and even higher. Mortality in CHEs is a factor of vulnerability to specific causes of death. In general, situations in which violence is the greatest cause of death show high mortality rates among grown men, while situations in which disease and famine are the greatest

threat predominantly affect women, children, and the elderly (see Exhibit 2-27).

Under the provisions of the UN Charter, the United Nations is allowed to intervene in the event of a CHE. The role it takes on, as either a peacekeeper or a peace enforcer, depends upon the decisions of the UN Security Council and the rules outlined in its Charter. These security operations may be active or simply observatory. Exhibit 2-28 provides more insight into the difference between UN Chapter VI and VII Peace Operations.

EXHIBIT 2-27   Selected CHEs and Associated Mortality Figures

Sudan (1983–present)—over 2 million killed
Ethiopia (1984–1993)—up to 2 million killed
Uganda (1987–present)—100,000 killed
Rwanda (1994–1997)—up to 1 million killed
Cambodia (1975–1998)—over 1 million killed
Somalia (1988–present)—500,000 killed
Colombia (late 1990s–present)—35,000 killed
Bosnia-Herzegovina   (1992–1996)—200,000 killed
Congo (1998–2003)—3.8 million killed
Sierra Leone (2002)—20,000 killed

EXHIBIT 2-28   UN Chapter VI and Chapter VII Peace Operations

The UN Charter allows for two different kinds of security activities during CHEs: peacekeeping and peace enforcement.

Peacekeeping, sometimes called "Chapter VI," allows for the introduction of forces, which are noncombatant in nature, on location to monitor peace agreements. It is intended to maintain an established pause in conflict in order to allow UN

and other "peacemakers" the time they need to negotiate a permanent dispute settlement, or to assist in carrying out the terms of that negotiated settlement. There must be some degree of stability within the country or region in order for Chapter VI to be invoked. Chapter VI Peacekeeping is designed to support diplomatic endeavors to achieve or to maintain peace, and often involves the

peacekeepers having to deal with and witness existing tension and violence without actually getting involved in any way as a participant. Peacekeeping forces require an invitation or, at the very least, full consent of all involved parties. Peacekeepers are required to remain impartial towards all these parties as well. Chapter VI Peacekeeping forces may include unarmed observers, lightly armed units, police, and civilian technicians. Operations conducted by peacekeeping forces may include: observation, recording, supervision, monitoring, occupying a buffer or neutral zone, and reporting on the implementation of the truce and any violations thereof. Typical peacekeeping missions include:

- Observing and reporting any alleged violation of the peace agreement
- Handling alleged cease-fire violations and/or alleged border incidents
- Conducting regular liaison visits to units within their area of operation (AO)
- Continuously checking forces within their AO and reporting any changes
- Maintaining up-to-date information on the disposition of forces within their AO
- Periodically visiting forward positions; report on the disposition of forces
- Assisting civil authorities in supervision of elections, transfer of authority, partition of territory, and administration of civil functions

Force may only be used in self-defense. Peacekeepers are not permitted to prevent violations of a truce or cease-fire agreement by the active use of force, as their presence alone is intended to be sufficient to maintain the peace.

Peace Enforcement, on the other hand, or Chapter VII, allows for the use of "such action by air, sea, or land forces as may be necessary" to ensure compliance with UN resolutions, and for the resumption of peace. Peace enforcement could include combat, armed intervention, or the physical threat of armed intervention. In contrast to peacekeeping, peace enforcement forces do not require consent of the parties to the conflict and they need not be neutral or impartial. Typical missions include:

- Protection of humanitarian assistance
- Restoration and maintenance of order and stability
- Enforcement of sanctions
- Guarantee or denial of movement
- Establishment and supervision of protected zones
- Forcible separation of belligerents

Source: US Army, n.d.

CONCLUSION

There are many known hazards, whether natural, manmade, or intentional. It is likely that the list of manmade and intentional hazards will increase as technological discovery advances, though the range of natural hazards will probably remain static. Thankfully, most nations face only a select subset of the exhaustive list provided in this chapter. Awareness of the hazards that affect a nation or region, and full understanding of the causes and consequences of that hazard "profile" are the first steps in the disaster reduction process known as hazards risk management.

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3

Risk and Vulnerability

INTRODUCTION

Risk is an unavoidable part of life, affecting all people without exception, irrespective of geographic or socioeconomic limits. Each choice we make as individuals and as a society involves specific, often unknown, factors of risk, and full risk avoidance generally is impossible.

On the individual level, each person is primarily responsible for managing the risks he faces as he sees fit. For some risks, management may be obligatory, as with automobile speed limits and seatbelt usage. For other personal risks, such as those associated with many recreational sports, individuals are free to decide the degree to which they will reduce their risk exposure, such as wearing a ski helmet or other protective clothing. Similarly, the risk of disease affects humans as individuals, and as such is generally managed by individuals. By employing risk reduction techniques for each life hazard, individuals effectively reduce their vulnerability to those hazard risks.

As a society or a nation, citizens collectively face risks from a range of large-scale hazards. Although these hazards usually result in fewer total injuries and fatalities over the course of each year than individu-

ally faced hazards, they are considered much more significant in that they have the potential to result in many deaths, injuries, or damages in a single event or series of events. In fact, some of these hazards are so great that, if they occurred, they would result in such devastation that the capacity of local response mechanisms would be overwhelmed. This, by definition, is a disaster. For these large-scale hazards, many of which were identified in Chapter 2, vulnerability is most effectively reduced by disaster management efforts collectively, as a society. For most, though not all of these hazards, it is the government's responsibility to manage, or at least guide the management of, hazard risk reduction measures. And when these hazards do result in disaster, it is likewise the responsibility of governments to respond to them and aid in the following recovery.

This text focuses on the management of international disasters, which are those events that overwhelm an individual nation or region's ability to respond, thereby requiring the assistance of the international body of response agencies. This chapter, therefore, will focus not upon individual, daily risks and vulnerabilities, but on the risks and vulnerabilities that apply to the large-scale hazards like those discussed in Chapter 2.

TWO COMPONENTS OF RISK

Chapter 1 defined risk as the interaction of a hazard's consequences with its probability or likelihood. This is its definition in virtually all documents associated with risk management. Clearly defining the meaning of "risk" is important, because the term often carries markedly different meanings for different people (Jardine and Hrudey, 1997). One of the simplest and most common definitions of risk, preferred by many risk managers, is displayed by the equation stating that risk is the likelihood of an event occurring multiplied by the consequence of that event, were it to occur.

RISK = LIKELIHOOD × CONSEQUENCE
(Ansel and Wharton 1992)

LIKELIHOOD

"Likelihood" can be given as a probability or a frequency, whichever is appropriate for the analysis under consideration. Variants of this definition appear in virtually all risk management documents. "Frequency" refers to the number of times an event will occur within an established sample size over a specific period of time. Quite literally, it tells how *frequently* an event occurs. For instance, the frequency of auto accident deaths in the United States averages around 1 per 300 million miles driven (Wilson, 1979).

In contrast to frequency, "probability" refers to single-event scenarios. Its value is expressed as a number between 0 and 1, with 0 signifying a zero chance of occurrence, and 1 signifying certain occurrence. Using the auto accident example, in which the frequency of death is 1 per 300 million miles driven, we can say that the probability of a random person in the United States dying in a car accident equals .000001 if he was to drive 300 miles.

Disaster managers use this formula for risk to determine the likelihood and the consequences of each hazard according to a standardized method of measurement. The identified hazard risks thus can be compared to each other and, therefore, ranked according to severity. (If risks were analyzed and described using different methods and/or terms of reference, it would be very difficult to accurately compare them later in the hazards risk management process.)

This ranking of risks, or "risk evaluation," as it is often called, allows disaster managers to determine which treatment (mitigation and preparedness) options are the most effective, most appropriate, and provide the most benefit per unit of cost. Not all risks are equally serious, and risk analysis can provide a clearer idea of these levels of seriousness.

Without exception governments have a limited amount of funds available to manage the risks they face. While the treatment of one hazard may be less expensive or more easily implemented than the treatment of another, cost and ease alone may not be valid reasons to choose a treatment option. Hazards that have great consequences (in terms of lives lost or injured or property damaged or destroyed) and/or occur with great frequency pose the greatest overall threat. Considering the limited funds, disaster managers generally should recommend first treating those risks that pose the greatest threat. Fiscal realities often drive this analytic approach, resulting in situations in which certain hazards in the community's overall risk profile are mitigated, while others are not addressed at all.

The goal of risk analysis is to establish a standard and therefore comparable measurement of the likelihood and consequence of every identified hazard. The many ways by which likelihoods and consequences are determined are commonly divided into two categories of analysis: quantitative analysis and qualitative analysis. Quantitative analysis uses mathematical and/or statistical data to derive numerical descriptions of risk. Qualitative analysis uses defined terms (words) to describe and categorize the likelihood and consequences of risk. Quantitative analysis gives a specific data point (dollars, probability, frequency, or number of injuries/fatalities, for example) while qualitative analysis allows each qualifier to represent a range of possibilities. It is often cost and time prohibitive, and often not necessary, to find the exact quanti-

tative measures for the likelihood and consequence factors of risk. Qualitative measures, on the other hand, are much easier to determine, and require less time, money and, most importantly, expertise to conduct. For this reason, it is often the preferred measure of choice. The following section provides a general explanation of how these two types of measurement apply to the likelihood and consequence components of risk.

Quantitative Representation of Likelihood

As previously stated, likelihood can be derived as either a frequency or a probability. A quantitative system of measurement exists for each. For frequency, this number indicates the number of times a hazard is expected to result in an actual event over a chosen time frame: 3 times per year, 1 time per decade, 10 times a week, and so on. Probability measures the same data, but the outcome is expressed as a measure between 0 and 1, or as a percentage between 0% and 100%, representing the chance of occurrence. For example, a 50-year flood has a 1/50 chance of occurring in any given year, or a probability of 2% or .02. An event that is expected to occur 2 times in the next 3 years has a .66 probability each year, or a 66% chance of occurrence.

Qualitative Representation of Likelihood

Likelihood can also be expressed using qualitative measurement, using words to describe the chance of occurrence. Each word or phrase has a designated range of possibilities attached to it. For instance, events could be described as follows:

- *Certain.* >99% chance of occurring in a given year (1 or more occurrences per year)
- *Likely.* 50–99% chance of occurring in a given year (1 occurrence every 1 to 2 years)
- *Possible.* 5–49% chance of occurring in a given year (1 occurrence every 2 to 20 years)
- *Unlikely.* 2–5% chance of occurring in a given year (1 occurrence every 20 to 50 years)
- *Rare.* 1–2% chance of occurring in a given year (1 occurrence every 50 to 100 years)
- *Extremely rare.* <1% chance of occurring in a given year (1 occurrence every 100 or more years)

Note that this is just one of a limitless range of qualitative terms and values that can be used to describe the likelihood component of risk. As long as all hazards are compared using the same range of qualitative values, the actual determination of likelihood ranges attached to each term does not necessarily matter (see Exhibit 3-1).

EXHIBIT 3-1   Qualitative Measurements: The Consideration of Risk Perception and Standardization

This chapter will later discuss the concept of risk perception. In brief, different people fear different hazards, for many different reasons. These differences in perception can be based upon experience with previous instances of disasters, specific characteristics of the hazard, or many other combination of reasons. Even the word *risk* has different meanings to different people, ranging from "danger" to "adventure."

Members of assembled disaster management teams are likely to be from different parts of the country or the world, and all have different perceptions of risk (regardless of whether they are able to recognize these differences). Such differences can be subtle, but they make a major difference in the risk analysis process.

Quantitative methods of assessing risk use exact measurements, and are therefore not very susceptible to the effects of risk perception. A 50% likelihood of occurrence is the same to everyone, regardless of their convictions. Unfortunately, there rarely exists sufficient information to make definitive calculations of a hazard's likelihood and consequence.

The exact numeric form of measurement achieved through quantitative measurements is incomparable. The value of qualitative assessments, however, lies in their ability to accommodate for an absence of exact figures and in their ease of use.

Unfortunately, risk perception causes different people to view the terms used in qualitative systems of measurement differently. For this reason, qualitative assessments of risk must be based upon quantitative ranges of possibilities or clear definitions. For example, imagine a qualitative system for measuring the consequences of earthquakes in a particular city, in terms of lives lost and people injured. Now imagine that the disaster management team's options are "None," "Minor," "Moderate," "Major," "Catastrophic." One person on the team could consider 10 lives lost as minor. However, another team member considers the same number of fatalities as catastrophic. It depends on the perception of risk that each has developed over time.

This confusion is significantly alleviated when detailed definitions are used to determine the assig-nation of consequence measurements for each hazard. Imagine the same scenario, using the following qualitative system of measurement (adapted from EMA, 2000):

1. *None*. No injuries or fatalities
2. *Minor*. Small number of injuries but no fatalities; first aid treatment required
3. *Moderate*. Medical treatment needed but no fatalities; some hospitalization
4. *Major*. Extensive injuries, significant hospitalization; fatalities
5. *Catastrophic*. Large number of severe injuries; extended and large numbers requiring hospitalization; significant fatalities

This system of qualitative measurement, with defined terms, makes it more likely that people of different backgrounds or beliefs would choose the same characterization for the same magnitude of event. Were this system to include ranges of values, such as "1–20 fatalities" for "Major", and "over 20 fatalities" for "Catastrophic," the confusion could be alleviated even more.

Consequence

The consequence component of risk describes the effects of the risk on humans, built structures, and the environment. There are generally three factors examined when determining the consequences of a disaster:

1. Deaths/fatalities (human)
2. Injuries (human)
3. Damages (cost, reported in currency, generally US dollars for international comparison)

Although attempts have been made to convert all three factors into monetary amounts in order to derive a single number to quantify the consequences of a disaster, doing so can be controversial (How can one place a value on life?) and complex (Is a young life worth more than an old life? By how much?). Therefore, it is often most appropriate and convenient to maintain a distinction between these three factors.

Categories of consequence can be further divided, and often are to better understand the total sum of all disaster consequences. Two of the most common distinctions are direct and indirect losses, and tangible and intangible losses.

Direct losses, as described by Keith Smith in his book *Environmental Hazards* are "those first order consequences which occur immediately after an event, such as the deaths and damage caused by the throwing down of buildings in an earthquake" (1992). Examples of direct losses are:

• Fatalities
• Injuries (the prediction of injuries is often more valuable than the prediction of fatalities, because

the injured will require a commitment of medical and other resources for treatment [UNDP, 1994])
- Cost of repair or replacement of damaged or destroyed public and private structures (buildings, schools, bridges, roads, etc.)
- Relocation costs/temporary housing
- Loss of business inventory/agriculture
- Loss of income/rental costs
- Community response costs
- Cleanup costs

Indirect losses (also as described by Smith, 1992) may emerge much later and may be much less easy to attribute directly to the event. Examples of indirect losses include:

- Loss of income
- Input/output losses of businesses
- Reductions in business/personal spending ("ripple effects")
- Loss of institutional knowledge
- Mental illness
- Bereavement

Tangible losses are those for which a dollar value can be assigned. Generally, only tangible losses are included in the estimation of future events and the reporting of past events. Examples of tangible losses include:

- Cost of building repair/replacement
- Response costs
- Loss of inventory
- Loss of income

Intangible losses are those that cannot be expressed in universally accepted financial terms. This is the primary reason that human fatalities and human injuries are assessed as a separate category from the cost measurement of consequence in disaster management. These losses are almost never included in damage assessments or predictions. Examples of intangible losses include:

- Cultural losses
- Stress
- Mental illness

- Sentimental value
- Environmental losses (aesthetic value)

Although it is extremely rare for benefits to be included in the assessment of past disasters or the prediction of future ones, it is undeniable that they can exist in the aftermath of disaster events. Like losses, gains can be categorized as direct or indirect, tangible or intangible. Examples of tangible, intangible, direct, and indirect gains include:

- Decreases in future hazard risk by preventing rebuilding in hazard-prone areas
- New technologies used in reconstruction that results in an increase in quality of services
- Removal of old/unused/hazardous buildings
- Jobs created in reconstruction
- Greater public recognition of hazard risk
- Local/state/federal funds for reconstruction or mitigation
- Environmental benefits (fertile soil from a volcano, for example)

As with the likelihood component of risk, the consequences of risk can be described according to quantitative or qualitative reporting methods. Quantitative representations of consequence vary according to deaths/fatalities, injuries, and damages:

- *Deaths/fatalities.* The specific number of people who perished in a past event or who would be expected to perish in a future event; for example, *55 people killed*
- *Injuries.* The specific number of people who were injured in a past event or who would be expected to become injured in a future event. Can be expressed just as injuries, or divided into mild and serious; for example, *530 people injured, 56 seriously*
- *Damages.* The assessed monetary amount of actual damages incurred in a past event, or the expected amount of damages expected to occur in a future event. Occasionally, this number includes insured losses as well; for example, *$2 billion in damages, $980 million in insured losses*

Qualitative Representation of Consequence

As with the qualitative representation of likelihood, words or phrases can be used to describe the effects of a past disaster or the anticipated effects of a future one. These measurements can be assigned to deaths, injuries, or costs (the qualitative measurement of fatalities and injuries often are combined). The following is one example of a qualitative measurement system for injuries and deaths:

- *Insignificant*. No injuries or fatalities
- *Minor*. Small number of injuries but no fatalities; first aid treatment required
- *Moderate*. Medical treatment needed but no fatalities; some hospitalization
- *Major*. Extensive injuries, significant hospitalization; fatalities
- *Catastrophic*. Large number of fatalities and severe injuries requiring hospitalization

Additional measures of consequence are possible, depending on the depth of analysis. These additional measures tend to require a great amount of resources, and are often not reported or cannot be derived from historical information. Examples include:

- *Emergency operations*. Can be measured as a ratio of responders to victims, examining the number of people who will be able to participate in disaster response (can include both official and unofficial responders) as a ratio of the number of people who will require assistance. This ratio will differ significantly depending on the hazard. For example, following a single tornado touchdown, there are usually many more responders than victims, but following a hurricane, there are almost always many more victims than responders. This measure could include the first responders from the community as well as the responders from the surrounding communities with which mutual aid agreements have been made. Emergency operations also can measure the mobilization costs and investment in preparedness capabilities. It can be difficult to measure the stress and overwork of the first

responders and their inability to carry out regular operations (fire suppression, regular police work, regular medical work).
- *Social disruption* (people made homeless/displaced). This can be a difficult measure because, unlike injuries or fatalities, people do not always report their status to municipal authorities (injuries and deaths are reported by the hospitals), and baseline figures do not always exist. It is also difficult to measure how many of those who are injured or displaced have alternative options for shelter or care. Measuring damage to community morale, social contacts and cohesion, and psychological distress can be very difficult, if not impossible.
- *Disruption to economy*. This can be measured in terms of the number of working days lost or the volume of production lost. The value of lost production is relatively easy to measure, while the lost opportunities, lost competitiveness, and damage to reputation can be much more difficult.
- *Environmental impact*. This can be measured in terms of the clean-up costs and the costs to repair and rehabilitate damaged areas. It is harder to measure in terms of the loss of aesthetics and public enjoyment, the consequences of a poorer environment, newly introduced health risks, and the risk of future disasters.

It does not matter what system is used for qualitative analysis, but the same qualitative analysis system must be used for all hazards being analyzed in order to compare risks. It may be necessary for disaster managers to create a qualitative system of measurement tailored to the country or community where they are working. Not all countries or communities are the same, and a small impact in one could be catastrophic to another, so the measurement system should accommodate these differences. For example, a town of 500 people would be severely affected by a disaster that caused 10 deaths, while a city of 5 million may experience that number of deaths in car accidents alone in a given week.

Another benefit of creating an individualized system of qualitative analysis is the incorporation of the alternative measures of consequence (ratio of responders to victims, people made homeless/displaced).

TRENDS

Both the likelihood and the consequences of certain hazard risks can change considerably over time. Some hazards occur more or less frequently because of worldwide changes in climate patterns, while others change in frequency because of measures taken to prevent them or human movements into their path. These trends can be incremental or extreme and can occur suddenly or over centuries. Several short-term trends may even be part of a larger, long-term change.

Changes in Disaster Frequency

Changes in disaster frequency can be the result of both an increase in actual occurrences of a hazard and an increase in human activity where the hazard already exists. It is important to remember that a disaster is not the occurrence of a hazard, but the consequences of a hazard occurring. A tornado hitting an open field, for example, is not considered a disaster.

Changes in climate patterns, plate tectonics, or other natural systems can cause changes in the frequency of particular natural hazards, regardless of whether the cause of the changes are natural, like El Niño, or manmade, like global warming. Changes in frequency for technological or intentional hazards can be the result of many factors, such as increased or decreased regulation of industry and increases in international instability (terrorism).

Increases or decreases in human activity also can cause changes in disaster frequency. As populations move, they inevitably place themselves closer or farther from the range of effects from certain hazards. For instance, if a community begins to develop industrial facilities within a floodplain that was previously

unoccupied, or in an upstream watershed where the resultant runoff increases flood hazards downstream, it increases its risk to property from flooding.

Changes in Disaster Consequences

Like changes in disaster likelihoods, changes in consequences can be the result of changes in the attributes of the hazard itself or changes in human activity that place people and structures either at more or less risk.

Changes in the attributes of the hazard can occur as part of short- or long-term cycles, permanent changes in the natural processes if the hazard is natural, or changes in the nature of the technologies or tactics in the case of technological and intentional hazards. The consequences of natural hazards change only rarely independent of human activities. One example is El Niño events, with intense flooding increasing in some regions of the world and drought affecting others, possibly for years. Technological and intentional hazards, however, change in terms of the severity of their consequences all the time. The attacks on the U.S. embassies in Kenya and Tanzania and the September 11 attacks on the World Trade Center and the Pentagon display an increase in the consequences of terrorist attacks aimed at Americans. A mutation of a certain viral or bacterial organism, resulting in a more deadly pathogen, can cause a drastic increase in consequences, as with the West Nile virus, mad cow disease, and SARS.

Changes in human activities are probably the most significant cause of increases in the consequences of disasters. These trends, unfortunately, are predominantly increasing. While the effects of disasters worldwide are great, their consequences are the most devastating in developing countries. Smith (1992) lists six reasons for these changes (Smith, 1992):

1. **Population growth.** As populations rise, the number of people at risk increases. Population growth can be regional or local, if caused by movements of populations. As urban populations grow, population density increases,

exposing more people to hazards than would have been affected previously.

2. *Land pressure.* Many industrial practices cause ecological degradation, which in turn can lead to an increase in the severity of hazards. Filling in wetlands can cause more severe floods. Lack of available land can lead people to develop areas that are susceptible to landslides, avalanches, floods, and erosion, or that is closer to industrial facilities, among other hazards.

3. *Economic growth.* As more buildings, technology, infrastructure components, and other structures are built, a community's vulnerability to hazards increases. More developed communities with valuable real estate have much more economic risk than communities in which little development has taken place.

4. *Technological innovation.* Societies are becoming more dependent on technology. These systems, however, are susceptible to the effects of natural, technological, and intentional hazards. Technology ranges from communications (the Internet, cell phones, cable lines, satellites) to transportation (larger planes, faster trains, larger ships, roads with greater capacity, raised highways) to utilities (nuclear power plants, large hydroelectric dams) to any number of other facilities and systems (high-rise buildings, life support systems).

5. *Social expectations.* With increases in technology and the advancement of science, people's expectations for public services, including availability of water, easy long-distance transportation, constant electrical energy, etc., also increase. When these systems do not function, the economic and social impacts can be immense.

6. *Growing interdependence.* Individuals, communities, and nations are increasing their interdependence on each other. The SARS epidemic showed how a pathogen could quickly impact dozens of countries on opposite sides of the world through international travel. In the late 1990s, the collapse of many Asian economies

sent ripple effects throughout all the world's economies. The September 11th terrorist attacks in the United States caused the global tourism market to slump.

Disaster managers must investigate the validity of the trends they identify. It is not uncommon for a trend to exist that is based on incomplete records. The technology used to detect many hazards has improved, allowing for detection where it formerly was much more difficult or impossible. Therefore, the lack of recorded instances of certain disasters may very possibly merely be based upon a lack of detection methods.

COMPUTING LIKELIHOOD AND CONSEQUENCE VALUES

Because there is rarely sufficient information to determine the exact statistical likelihood of a disaster occurring, or to determine the exact number of lives and property that would be lost should a disaster occur, using a combination of quantitative and qualitative measurements can be useful. By combining these two methods, the hazards risk management team can achieve a standardized measurement of risk that accommodates less precise measurements of both risk components (likelihood and consequence) in determining the comparative risk between hazards.

The process of determining the likelihood and consequence of each hazard begins with both quantitative and qualitative data and converts it all into a qualitative system of measurement that accommodates all possibilities that hazards present (from the rarest to the most common, and from the least damaging to the most destructive).

DEPTH OF ANALYSIS

The depth of analysis to be undertaken by disaster managers depends on three factors: the amount of time and money available, the risk's seriousness, and

its complexity. According to the information they gather during the identification and characterization of the hazards, disaster managers must decide what level of effort and resources each individual hazard requires.

Each hazard that is analyzed can be considered according to the range of possible intensities it could exhibit. Depending on its characteristics, the hazard may be broken down according to intensity, with separate analyses performed for each possible intensity. The likelihood and consequences for each category of intensity will be different, which in turn results in different treatment (mitigation) options (see Exhibit 3-2).

For instance, the general hazard of "earthquake" could be divided into events of magnitude 4, 5, 6, or 7, and so on. Generally, the lower the intensity of an event, the greater the likelihood of that event occurring, while its consequences tend to decrease. Several thousand earthquakes of very low intensity and magnitude occur daily with little or no consequences at all. However, the rarer large earthquakes must be treated differently because of their potential to inflict massive casualties and damages.

The degree of subdivision of hazards into specific intensities also depends upon the available time and resources. More divisions will give disaster managers a more comprehensive assessment, but a point will come when the added time and resources spent no longer provide enough added value.

In summary, effective qualitative risk analysis is performed using four steps:

1. Calculate the (quantitative) likelihood of each identified hazard (broken down by magnitude or intensity if appropriate)
2. Calculate the (quantitative) consequences that are expected to occur for each hazard (broken down by magnitude or intensity if appropriate), in terms of human impacts and economic/financial impacts
3. Develop a locally tailored qualitative system for measuring the likelihood and consequence of each hazard identified as threatening the community
4. Translate all quantitative data into qualitative measures for each hazard's likelihood and consequence

Disaster managers begin their hazard analysis by calculating (to the best of their ability and resources) the quantitative likelihoods and consequences of each identified hazard risk. It does not matter whether the likelihood or the consequence is analyzed first, or if they are done concurrently, as neither depends upon the other for information. It is important, however, that the quantitative analyses be completed before the qualitative ones, as the qualitative rankings will be based upon the findings of the quantitative analyses.

The following section describes the methods by which the hazards risk management team can perform the quantitative analyses of hazard risks.

QUANTITATIVE ANALYSIS OF DISASTER LIKELIHOOD

Quantitative analysis of the likelihood component of risk seeks to find the statistical probability of the occurrence of a hazard causing a disaster. These

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EXHIBIT 3-2   f:N Curves

f:N curves, which plot historical hazard intensities and likelihoods against the amount of damage inflicted, can provide an estimation of both the likelihood of events of specific magnitude and the consequences should those events occur. Examples of worldwide hazard f:N curves are shown in Figure 3-1.

Individual communities would plot f:N curves for their locality using local historical data. This graphical representation illustrates the justification for dividing hazards according to possible intensities.
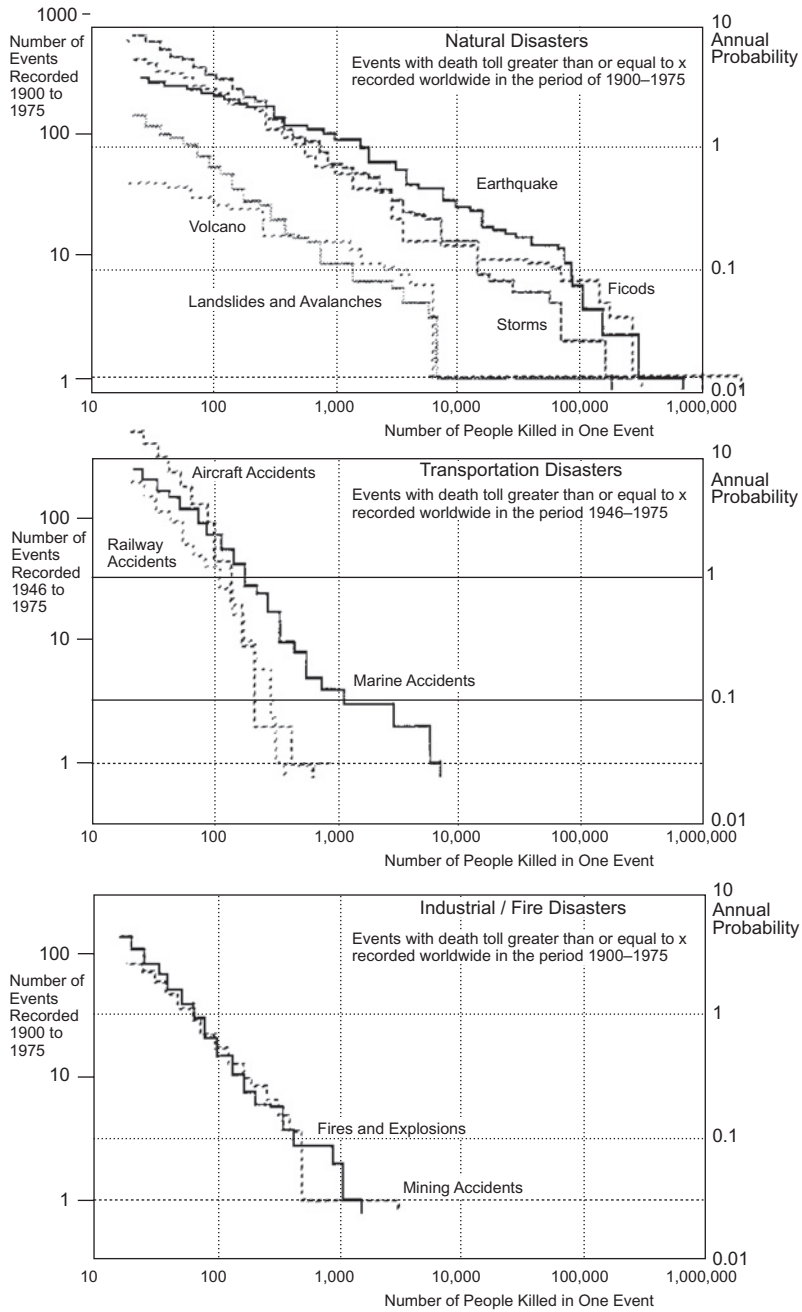
FIGURE 3-1   Examples of worldwide hazard f:N curves. (*Source:* United Nations Development Programme, 1994.)

analyses tend to be based upon historical data gathered in the process of describing identified hazard risks (often called a risk statement). The disaster managers performing a quantitative analysis of disaster likelihood must first establish a standard numerical measurement by which the results of all analyzed hazards will be reported.

One of the most commonly used quantitative measures of likelihood, and the measure that will be used in this example, is the number of times a particular hazard causes a disaster per year. For example, "In country X, it is predicted that there will be 3 major snowstorms per year." (For major events that occur less frequently, like a major flood, this number may be less than 1. A 20-year flood has a 5% chance of occurring in any given year, or would be expected to occur .05 times per year.) The hazard can now be analyzed according to the chosen standard. If the hazard is one that has been divided into individual intensities and magnitudes, a separate figure will be required for each magnitude or intensity.

If records have been maintained for disasters that occur regularly, such as flash floods or snowstorms, it will be fairly easy to calculate the number of occurrences that would be expected to happen in a coming year or years. More often than not, however, sufficient information does not exist to accurately quantify the likelihood of a disaster's future occurrence to a high degree of confidence. This is especially true for hazards that occur infrequently and/or with no apparent pattern of behavior, such as earthquakes, terrorism, or nuclear accidents. This inability to achieve precision is a fundamental reason that qualitative measures are used in the final determination of a hazard's likelihood.

Rare and extremely rare hazards, such as terrorist attacks, nuclear accidents, or airplane crashes (outside of communities where airports exist) may have few if any data points to base an analysis upon. However, this does not mean that there is a 0% probability of the disaster occurring, even if there has been no previous occurrence. For these incidences, consulting with a subject matter expert (SME) is necessary to determine the likelihood of a disaster resulting from the hazard over the course of a given year and to gather any

information on the existence of a rising or falling trend for that particular hazard. Organizations, professional associations, and other bodies, such as the United Nations, national governments, and research facilities, maintain risk data on particular rare hazards. Modeling techniques also can be used to estimate the likelihood of infrequent events.

The more often that a disaster occurs, the more data points those performing the quantitative likelihood assessment will have, and therefore, the more accurate the historical analysis will be (given that the collected data is, in fact, accurate). However, more information must be examined than simply the number of events per year.

The concept of increasing and decreasing trends in hazard likelihoods and consequences was introduced above. Both infrequent and frequently occurring disasters tend to exhibit either falling or rising trends over time, rather than having a steady rate of occurrence. These rising and falling trends must be accounted for if there is to be any accuracy attained in an analysis of likelihood.

For example, if a community has sustained approximately 35 wildfires per year for the past 40 years, it might easily be assumed that it is very likely there will be approximately 35 wildfires per year in the coming years. However, further inspection of historical records discovers that 40 years ago, there was 1 fire, and 39 years ago, there were 3 fires. The number of fires steadily increased until the historical record ended with 70 fires occurring in the past year. Over the 40-year period, the average number of wildfires is in fact 35 per year. However, the rate of wildfires has increased each year from 1 per year 40 years ago to 70 per year last year. Considering this trend, the expected number of wildfires next year cannot be expected to be 35, although the average per year is 35.

It must be assumed from this data that there is a rising trend in the occurrence of wildfires, and that there is likely to be 70 or more fires in the coming year. Why this rising trend is occurring and what can be done to counteract it will need to be examined in the process of determining vulnerability and generating mitigation and preparedness options.

QUANTITATIVE ANALYSIS OF DISASTER CONSEQUENCES

The quantitative analysis of disaster consequences seeks to determine the number of injuries, the number of deaths, the cost of direct damages to property and infrastructure, and the indirect costs associated with the disaster. (Depending on the scope of the analysis, other factors such as homelessness or displacement may be considered as well.) A standard form of measurement must be established for deaths, injuries, and damages. It is most useful if the measurement is per occurrence, as opposed to per year or other time frame.

It will be necessary to analyze the expected consequences of each magnitude or intensity of a hazard if it has been broken down into subcategories.

HISTORICAL DATA

As with the likelihood component of risk, the calculation of hazard consequences should begin by examining the historical data on injuries, fatalities, and property/infrastructure damage and destruction that was gathered during the identification of hazards. However, as previously described, human behavior and/or changes in hazard characteristics often result in either increasing or decreasing trends in disaster consequences over time. Changes in settlement or new development, for example, can significantly increase community vulnerability for two different occurrences of a hazard.

Historical information does have its uses, however, especially with more common hazards for which data has been collected methodically and accurately for many years. Consequence data based upon historical information can act either as a benchmark to validate the findings of more in-depth analyses (described below) or as the actual estimation of consequences, should disaster managers decide to perform a lower level of analysis.

In the section addressing vulnerability, we will explain the process of describing the community and the environment. In this process, information is gathered on the physical community, the built environment, and the social environment, as well as on the critical infrastructure and the interdependence of the community on surrounding and other external communities.

Using hazard maps created or obtained during the process of hazard identification, combined with the description of the community environment, disaster managers can develop numerical figures for the expected number of lives that will be lost, people who will be injured, and the dollar amount of the direct and indirect damages that may occur. (However, it is always important to keep in mind that even the most extensive analyses of consequences are imperfect, as they are heavily based upon assumptions and upon historical data that may or may not indicate future behavior of hazards.)

Consequence analyses must look not only at the location of structures in relation to the hazard but also at the vulnerability of each structure. For instance, imagine that a school is located in a floodplain. Disaster managers have obtained information indicating that the school has been raised to an elevation where it will only be affected by floods of magnitude greater than the 50-year (2% chance/year) flood. Using this information, disaster managers can deduce that such a structure will likely sustain no damage during the course of a 20-year (5% chance/year) flood event.

While disaster managers will likely not have the value of all structures within the community or be able to determine complete data pertaining to lost revenue and inventory, such data deficiencies probably will be consistent across all hazard consequence analyses and will therefore not necessarily cause the results of the analyses to be unreliable. Obviously, more data generally results in more accurate assessments. However, the amount of data that can be collected will always be a factor of available time and resources. Moreover, the process of translating the quantitative data resulting from these analyses into the qualitative determination

of likelihood and consequence can be tailored to accommodate for almost any lack of accuracy.

DEATHS/FATALITIES AND INJURIES

Disaster managers can estimate the number of people who will be hurt or killed by using two methods: estimation based upon historical data and changes in population, or modeling techniques.

To estimate the number of deaths and injuries using historical data, disaster managers must first assemble the data on historical incidences of disasters caused by the particular hazard. Then, using current on the community, a conversion to current conditions can be made. For example, imagine that a Category IV hurricane struck a community in 1955, causing 4 deaths and 35 injuries. The population of the community at the time was approximately 10,000. Today, the population is estimated to be 15,000; in other words, it has increased by a factor of 1.5. By multiplying the historical consequence data by this conversion factor, disaster managers could surmise that there would be approximately 6 deaths and 52 injuries if a Category IV hurricane struck today.

It must be kept in mind that these estimates do not account for mitigation measures taken or new development in the period between disasters. The more recently a comparable disaster has occurred, the more accurate the conversion will be. The use of modern modeling techniques, such as HAZUS and HAZUS-MH, a nationally standardized, GIS-based risk assessment and loss estimation tool developed by the Federal Emergency Management Agency (FEMA), can increase the accuracy of injury and death estimations.

MODELING TECHNIQUES

Various computer-modeling techniques are available to assist disaster managers in estimating the injuries and deaths that would occur should a disaster strike. For instance, HAZUS can be used to estimate the number of injuries and fatalities that would result from earthquakes of varying magnitudes, and it is being updated to include other hazards such as wind and floods. Other models give estimates for hazards such as chemical releases and floods.

The data collected on base maps and the hazard-specific maps created during the hazard identification and description process also can be used to estimate the population affected by the hazard.

Regardless of the method used, a high degree of accuracy is very difficult to attain when estimating the number of injuries and deaths that would occur in future disasters. Many confounding variables affect human behavior and the ability to react to hazard events, including warning times and warning accuracies, the nature of the hazard, and the numbers, resources, and abilities of the emergency responders. These estimations should always be taken to be just that—estimations. The experience of the disaster management team and of other community experts such as first responders and the medical community can be just as valuable in making these estimates.

ABBREVIATED DAMAGE CONSEQUENCE ANALYSIS

If disaster managers choose to perform a lower level of analysis on the consequences of the community's hazards, two pieces of information are needed. The first is the historical incidence of hazard damage for each disaster. The second is data on the population/structural changes in the community since the date of each historical disaster in order to compare to present-day data. Once that data is assembled, the team can calculate damages as they would be expected to affect the community as a comparison between the dates. For instance, imagine that a flood (of a specific magnitude) in 1955 caused $1 million in damages in a community. The community is found to have grown approximately 50% *in the floodplain* in the intervening years. Using this information, the hazards risk management team can estimate the

consequences of a future event of similar magnitude to be approximately $1.5 million in 1955 dollars, or $10,305,622 in 2005 dollars. Currency inflation converters are widely available on the Internet—one site is www.westegg.com/inflation/

If a certain hazard has not affected the community over a significantly extended period of time, or if it has never affected the community, the team may want to either use data from an example of the hazard affecting a community of comparable structure and size or avoid performing a quantitative analysis for the rare hazard.

Full Damage Consequence Analysis

A full damage consequence analysis requires that disaster managers consider the current estimated cost of all physical assets within the country. These include:

- *Losses to structures.* Estimated as a percentage of the total replacement value. This figure is obtained by multiplying the replacement value of the structure by the expected percent damage to the structure.
- *Losses to contents.* Estimated as a percentage of the total replacement value. This figure is obtained by multiplying the replacement value of the contents by the expected percent damage.
- *Losses to structure use and function and cost of displacement.* The losses to structure use is a function of the number of days the structure is expected to be out of use multiplied by the average daily operating budget or sales (annual revenue or budget divided by 365 days). The cost of displacement is the product of the costs incurred as result of the business/service being displaced and the number of days that displacement is necessary. These calculations can apply to businesses, bridges, utilities, public services (libraries), and any other community asset.

To track calculated figures, a standardized worksheet is often created. One example of a standardized worksheet provided by FEMA is shown in Figure 3-2.

Each hazard will affect structures and their contents differently. Many organizations and institutions have made available tables to determine this information for specific hazards. To perform a full damage consequence analysis, disaster managers will need to have the following information (which is often gathered during the process of describing the community and environment and determining the vulnerability of the community):

- Replacement value of all community assets (homes, businesses, and infrastructure)
- Replacement value of inventory (business inventory, personal property in homes, contents of government offices and other buildings)
- Operating budgets/annual revenues of businesses and government assets
- Costs of relocation of operations/services

Once quantitative figures have been calculated for both the likelihood and consequence components of risk, the disaster managers can begin the process of determining the qualitative values assigned to the likelihood and consequence for each hazard (and hazard intensity or magnitude, if the hazard is subdivided into such). They should begin by selecting a system of qualitative measurement or by designing one that suits the needs of both the format of results in the quantitative analysis and the characteristics of the particular country or community.

A disaster, as defined in Chapter 1, is "a serious disruption of the functioning of society, causing widespread human, material, or environmental losses which exceed the ability of the affected society to cope using only its own resources" (UNDP, 1994). Therefore, a specific set of hazard consequences may constitute a disaster in one community but not in another. For instance, 10 injuries may exceed the capacity of the local clinic in a community of 500, but in a large city, 10 injuries could be easily managed.

Whether designing a new system of measurement or using an existing one, it is necessary for the disaster management team to be aware of the local capacity in order to know how many deaths and injuries and how much damage can be sustained before the local

Date: _____   *How will these hazards affect you?*

Hazard _____

Name/ Description of Structure	Structure Loss — Structure Replacement Value ($)	×	Percent Damage (%)	=	Loss to Structure ($)	Contents Loss — Replacement Value of Contents ($)	×	Percent Damage (%)	=	Loss to Contents ($)
		×		=			×		=	
		×		=			×		=	
		×		=			×		=	
		×		=			×		=	
		×		=			×		=	
		×		=			×		=	
		×		=			×		=	
		×		=			×		=	
Total Loss to Structure						**Total Loss to Contents**				

Name/ Description of Structure	Structure Use and Function Loss — Average Daily Operating Budget ($)	×	Functional Downtime (# of days)	+	Displacement Cost per Day ($)	×	Displacement Time ($)	=	Structure Use & Function Loss ($)	Structure Loss + Content Loss + Function Loss ($)
		×		+		×		=		
		×		+		×		=		
		×		+		×		=		
		×		+		×		=		
		×		+		×		=		
		×		+		×		=		
		×		+		×		=		
		×		+		×		=		
Total Loss to Structure Use & Function										
										Total Loss for Hazard Event

FIGURE 3-2   FEMA standardized loss estimation worksheet. (*Source:* FEMA, 2001.)

TABLE 3-1 **An example of a qualitative likelihood measurement system**

Rating	Description and indicative probability
Almost certain	Expected to occur; many recorded incidents; may occur or be exceeded once every 1 to 5 years
Likely	Will probably occur; may occur or to be exceeded once every 20 years
Possible	Might occur; may occur or be exceeded once every 100 years; will generally be close to or exceed past records of severity
Unlikely	Is not expected to occur; little opportunity, reason, or means to occur; may occur or be exceeded once every 250 years
Rare	May only occur in exceptional circumstances; may only occur or be exceeded once every 500 years or more

Source: Cameron, 2002.

TABLE 3-2 **An example of a qualitative likelihood measurement system**

Descriptor	Description
Almost certain	Is expected to occur in most circumstances; and/or high level of recorded incidents and/or strong anecdotal evidence; and/or a strong likelihood the event will recur; and/or great opportunity, reason, or means to occur; may occur once every year or more
Likely	Will probably occur in most circumstances; and/or regular recorded incidents and strong anecdotal evidence; and/or considerable opportunity, reason or means to occur; may occur once every five years
Possible	Might occur at some time; and/or few, infrequent, random recorded incidents or little anecdotal evidence; and/or very few incidents in associated or comparable organizations, facilities or communities; and/or some opportunity, reason or means to occur; may occur once every twenty years
Unlikely	Is not expected to occur; and/or no recorded incidents or anecdotal evidence; and/or no recent incidents in associated organisations, facilities or communities; and/or little opportunity, reason or means to occur; may occur once every one hundred years
Rare	May occur only in exceptional circumstances; may occur once every five hundred or more years

Source: Emergency Management Australia, 2000.

capacity is either stressed or exceeded. They will have the data collected in the hazard identification process and in the description of the community and the environment (described later in this chapter) upon which to base their new or acquired system of measurement.

Creating two measures of consequence can be beneficial: one measuring the tangible physical/material losses associated with cost, and another measuring the intangible losses of deaths/fatalities and injuries. Each qualitative term should have two measures associated with it, corresponding to deaths/injuries and costs. In many instances, the tangible and intangible rankings will not be the same. For instance, there may be no physical damages to structures in a chemical spill, but many people may be injured or die. Other events may cause no immediate deaths or injuries, but cause a great amount of physical loss, such as a large-scale power outage. In either case, the factor that achieves the qualitative measure of greater (higher) consequence is used to determine the consequence of the hazard.

Tables 3-1 to 3-4 provide multiple examples of qualitative measures of likelihood and consequence.

Once a measurement system has been chosen, the disaster managers can assess each hazard according to its qualitative likelihood and consequences, using the quantitative data obtained in the previous steps of the hazard analysis process. These qualitative rankings are then recorded and assessed according to a risk assessment matrix (described below.)

When assessing the qualitative ranking for a hazard consequence, two different types of consequences are usually examined—human impacts (injuries and deaths/fatalities) and material/physical losses. In determining the qualitative consequence ranking, the

TABLE 3-3   **An example of a qualitative consequence measurement system**

Descriptor	Human life and health	Property, financial, environmental
Insignificant	No injuries or fatalities Small number or no people are displaced and only for a short duration Little or no personal support required	Inconsequential or no damage Little or no disruption to community No measurable impact on environment Little or no financial loss
Minor	Small number of injuries but no fatalities. First aid treatment required Some displacement of people (<24 hrs) Some personal support required Some disruption (<24 hrs)	Some damage Small impact on environment with no last effects Some financial loses
Moderate	Medical treatment required but no fatalities. Some hospitalization Localized displacement of people who return within 24 hours	Localized damage that is rectified by routine arrangements. Normal community functioning with some inconvenience Some impact on environment with long-term effect Significant financial loss
Major	Fatalities Extensive injuries, significant hospitalization Large number displaced (>24 hrs duration) External resources required for personal support	Significant damage that requires external resources. Community only partially functioning, some services unavailable Some impact on environment with long-term effects Significant financial loss—some financial assistance required
Catastrophic	Significant fatalities Large number of severe injuries Extended and large numbers requiring hospitalization General and widespread displacement for extended duration	Extensive damage Extensive personal support Community unable to function without significant support Significant impact on environment and/or permanent damage

Source: Cameron, 2002.

hazards risk management team will choose whichever ranking is greater. (Differences between the severity of human and material losses often exist. A poisonous gas leak is a good example of a hazard where few material or physical damages are likely, but many deaths and injuries could occur. In that case, the hazards risk management team would probably base their assessment on the human consequences of the hazard rather than the material/physical consequences.)

TABLE 3-4 **An example of a qualitative consequence measurement system**

Descriptor	Description
Insignificant	No injuries or fatalities. Small number or nil people are displaced and only for short duration. Little or no personal support required (support not monetary or material). Inconsequential or no damage. Little or no disruption to community. No measurable impact on environment. Little or no financial loss
Minor	Small number of injuries but no fatalities. First aid treatment required. Some displacement of people (less than 24 hours). Some personal support required. Some damage. Some disruption (less than 24 hours). Small impact on environment with no lasting effects. Some financial loss
Moderate	Medical treatment required but no fatalities. Some hospitalization. Localized displacement of people who return within 24 hours. Personal support satisfied through local arrangements. Localized damage that is rectified by routine arrangements. Normal community functioning with some inconvenience. Some impact on environment with no long-term effect or small impact on environment with long-term-effect. Significant financial loss
Major	Extensive injuries, significant hospitalization, large number displaced (more than 24 hours duration). Fatalities. External resources required for personal support. Significant damage that requires external resources. Community only partially functioning, some services unavailable. Some impact on environment with long-term effects. Significant financial loss— some financial assistance required
Catastrophic	Large number of severe injuries. Extended and large numbers requiring hospitalization. General and widespread displacement for an extended duration. Significant fatalities. Extensive personal support. Extensive damage. Community unable to function without significant support. Significant impact on environment and/or permanent damage

Source: Emergency Management Australia, 2000.

RISK EVALUATION

Risk evaluation is conducted in order to determine the relative seriousness of hazard risks for the country or community being assessed by the disaster manager. Using the processes listed above and in Chapter 2 to identify hazards that threaten the community, characterize them, and determine their likelihoods and consequences, the disaster managers will have gathered as much information.

By the time the risk evaluation process begins, each hazard will have been identified, described, mapped, and analyzed according to its likelihood of occurrence and its consequences should a disaster occur. All countries and communities undoubtedly face a range of natural, technological, and intentional hazards, each of which requires a different degree of mitigation and risk reduction. Unfortunately, communities rarely are able to dedicate sufficient resources to mitigation to lower all of the community's risks to the lowest possible levels.

As will be shown in Chapters 4 and 5, there are hazards for which the technology exists for mitigation but are cost prohibitive. An example of a risk mitigation measure that is very expensive is the conversion (retrofit) at wastewater treatment plants to less dan-

gerous chemicals, such as using liquid chlorine bleach or other disinfection technologies instead of the more volatile chlorine gas. Exhibit 3-3 illustrates the danger posed by chlorine gas, which is still widely used despite its known dangers.

Other risks may have many options available, each with an associated cost and benefit. Some have direct risk reductions with each incremental increase in cost. A classic example is the practice of increasing the number of firefighters or police officers in a community, which, until reaching a threshold, results in decreased fire hazard risk and decreased crime risk.

Fortunately, however, not all risks require immediate action, and some do not require any action at all. These include those risks for which both the likelihood and the consequences of the risk are extremely low, such as a small meteor strike. While some risks can be reduced easily, others may require exorbitant cash resources, time, and a committed effort to achieve even slight reductions. These possibly limit-

ing factors must also be considered by disaster managers.

In addition to actual reductions in risk related to the likelihood and consequences of a hazard, several risk factors must be considered that will weigh heavily on the perceived "seriousness" of the risk and therefore affect mitigation priorities. For instance, a manmade risk is likely to be considered much less "acceptable" than one that is natural in origin. The degree to which these manmade risks are perceived to be unacceptable can be an important determining factor in assigning mitigation funding. Smith (1992) discusses voluntary and involuntary risks and states, "[T]here is a major difference between voluntary and involuntary risk perception with the public being willing to accept voluntary risks approximately 1000 times greater than involuntary risks."

Risk perception issues also weigh heavily upon such decisions. For instance, consider a rural community in which one person dies per year as result of

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EXHIBIT 3-3   Description of the Dangers of Using Chlorine Gas to Purify Water

Chlorine is often used as a disinfectant in most of the world's water systems because of its cost-effectiveness. The chemical is usually stored in a pressurized, liquid state. When released, chlorine vaporizes into a highly toxic, invisible gas that concentrates at ground levels. Germany used chlorine gas during World War I for this reason, because it would settle into the trenches where British troops were hiding.

It has been estimated that anyone located within two or three miles from a ruptured 90-ton chlorine railcar would be killed if directly exposed to the ensuing cloud. Injuries, including fluid in the lungs and a permanently reduced breathing capacity, could result at distances as great as 10 miles.

Because of the increasing risk of terrorism and other criminal attacks on storage facilities, the [US] Environmental Protection Agency (EPA) has dis-

tributed guidelines that encourage US chemical industry businesses to employ safer technologies. One such facility, the Washington, DC-based Blue Plains wastewater treatment plant, heeded this advice and fully converted from the use of chlorine-gas disinfectant to the safer liquid chlorine bleach. The plant's close proximity to the nation's capital placed it at high perceived risk of terrorist attack, but only as long as the highly-volatile chlorine gas was stored on the site. In switching to liquid chlorine bleach, the threat has essentially been eliminated.

Many other drinking and wastewater treatment plants have also switched to safer technologies. In addition to liquid chlorine bleach, ultraviolet light and ozone may be used to purify the water.

Source: Davis, 2002.

cave-ins of abandoned mine shafts and approximately four people per year are drowned in a river that regularly experiences swift currents following storms. There is likely to be considerable public outcry over the yearly incidence of fatal accidents from the abandoned mines, while the river drowning is viewed as a controllable, easily reduced, voluntary, preventable, observable hazard whose effects are known to those exposed (risk perception concepts are described in greater detail later in this chapter).

There are also risks that societies are able to eliminate altogether but choose not to because the benefits that result from such risks would also disappear (see Exhibit 3-4). This essentially implies that, when evaluating risks, disaster managers must also consider the negative consequences of mitigation or elimination. Eliminating certain beneficial risks can result in adverse effects on the community or society. Examples of situations where the benefits are believed to outweigh the risks include the aesthetic value to

homeowners and collected property taxes for the community from beachfront property construction; collected taxes and created jobs for a community that result from the existence of a factory that produces, stores on-site, or emits hazardous materials; and the reduced reliance on fossil fuels and cheaper power generation costs that exists as result of a nuclear power plant.

One of the primary goals of disaster managers is to formulate a prioritized list of hazard risks to be mitigated. This list should be based upon a combination of factors that includes the hazard's likelihood and consequences, the county's or community's priorities and criteria (in regards to their views on the acceptability of different risks), the benefit-to-cost ratios of mitigating different risks, and the political and social ramifications of certain mitigation decisions.

Hazards were examined individually in each previous step of this process. During the risk evaluation step of the process, risks are compared to each other,

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EXHIBIT 3-4   Acceptability of Risk

Almost everything that provides a benefit also creates some level of risk for either the benefactor(s) or for others who do not necessarily enjoy those benefits. This risk ranges from barely measurable to severe. The side effects of certain prescription drugs, negative health effects from "fast food," or skin cancer from the sun are a few examples at the personal level. On a larger scale, more specifically related to disaster management, is the inundation danger associated with the construction of a power-generating dam. As a society, citizens have come to accept most of these risks without question, although many present much greater risks than some others people refuse to accept.

For instance, tens of thousands of people are killed and over tens of millions suffer disabling injuries each year from falls while using stairs in their homes and elsewhere (Roderick, 1998). It is

unlikely that stairways will be eliminated, despite the fact that they injure and kill many more people than hazards like saccharin, fluoroscopes (shoe-fitting X-ray machines), and extralong tandem trailer trucks, for instance. Why are people willing to accept one risk and not another? The answer can be found in the perceived benefits of each risk. People perceive that the benefit of having multiple stories in a house or other building is worth the risk of injury or death from using stairways. Society does not perceive the risk of injury, illness, or death resulting from saccharin, fluoroscopes, or tandem trucks to be worth the benefits gained from each (low-calorie sweetener, an X-ray look at your foot inside a shoe, and the truck's greater carrying capacity), even though each of these three examples poses less of an absolute population risk than stairways do.

and questions of priority begin to be answered. Prioritization can take place by many methods, and while there is no single correct method, there are many that have been used with success in the past.

The following may be used to determine the prioritization of risk treatment:

1. Creating a risk matrix
2. Comparing hazard risks against levels of risk estimated during the analysis process with previously established risk evaluation criteria
3. Evaluating risks according to the SMAUG methodology (seriousness, manageability, acceptability, urgency, growth)

The final output of risk evaluation should be a prioritized list of risks, which will be used to decide treatment (mitigation) options.

Hazard analysis determined qualitative values describing the likelihood and consequence of each hazard. For those hazards known to exhibit a range of magnitudes or intensities, the likelihood and consequence values were determined for several magnitudes or intensities across the range of possibilities.

Assigning these qualitative values was the first step in a process that allows for a direct comparison of the risks faced by a community. Armed with both the likelihood and consequence values, disaster managers can now begin comparing and ranking the identified risks.

To compare hazards according to their likelihood and consequences, the team must select or create a risk matrix to suit the needs of the country or community. A risk matrix is a direct comparison of the two components of a hazard's risks. In other words, it plots the likelihood and consequence of hazards together in various combinations, with one risk component falling on the X-axis and the other on the Y-axis.

While it does not matter which of these two risk components goes on which axis, the values used must exactly match the values used in the risk analysis qualitative assessments. This is because the terminology must be consistent throughout the process of "calculating" risk from likelihood and consequence, much as if quantitative (numerical) values were being used. For instance, if the possible range of values for the likelihood of a risk included the values "Certain," "Likely," "Possible," "Unlikely," "Rare," and "Extremely Rare," then the risk matrix must include all of those values (on the appropriate axis), in logical consecutive order.

Plotting these values on the matrix results in individual boxes representing unique combinations of likelihood and consequence. The likelihood and consequence values upon which the individual boxes are based can be determined by tracing from that box back to the values indicated on each axis. The number of possible combinations will be the product of the number of likelihood values times the number of consequence values (i.e., if there are 5 values for likelihood and 6 for consequence, the matrix will have 30 possible combinations required to evaluate risk).

Disaster managers must decide whether to use a pre-existing risk matrix or to make a custom risk matrix that suits their specific needs. If they chose to create their own systems of qualitative measurement in the risk analysis process, they must make their own risk matrix. However, even if they used an existing set of qualitative measurements in the risk analysis process, a risk matrix to evaluate each risk may not exist, in which case they would need to make one.

To create a risk matrix, disaster managers must first establish levels, or "classes," of risk representing increasing severity. The levels should range from those that are so low that mitigation is not necessarily needed to risks that are so high that efforts to mitigate them are of highest priority.

One example of such a system is described in the FEMA's "MultiHazard Identification and Risk Assessment" publication (1997). Their risk matrix values are:

1. *Class A.* High-risk condition with highest priority for mitigation and contingency planning (immediate action)
2. *Class B.* Moderate to high risk condition with risk addressed by mitigation and contingency planning (prompt action)

3. *Class C.* Risk condition sufficiently high to give consideration for further mitigation and planning (planned action)
4. *Class D.* Low-risk condition with additional mitigation contingency planning (advisory in nature)

Emergency Management Australia (EMA) (2000) describes risks according the following breakdown:

1. Extreme risk
2. High risk
3. Moderate risk
4. Low risk

Other systems include "Intolerable, Undesirable, Tolerable, Negligible" and "Severe, High, Major, Significant, Moderate, Low, Trivial."

Once these values have been determined and defined as they apply to the disaster manager's priorities, they should be assigned to each combination of likelihood and consequence shown on the matrix. How they are assigned must be determined by personal judgment, expert knowledge, and previously established risk management criteria. An example of a risk matrix from FEMA is shown in Figure 3-3.

Once the values have been assigned to each box on the matrix, each hazard can be evaluated accordingly and the derived values recorded. Because each "risk level" will likely be assigned to more than one matrix box, and because several risks could elicit the same combination of likelihood and risk, the hazards risk management team will not be creating an ordered list of risk priorities, but rather several categories of risk with several hazards falling within each category group. In other words, the disaster manager will have several "classes" of risk, each containing several risks for which no intraclass priorities have been determined.

For instance, if a 50-year flood was determined to be a Class C risk, and an accident involving a truck carrying hazardous materials was determined to be a Class C risk, they would be considered equal risks according to the risk matrix. The results of the risk matrix allow disaster managers to further classify the
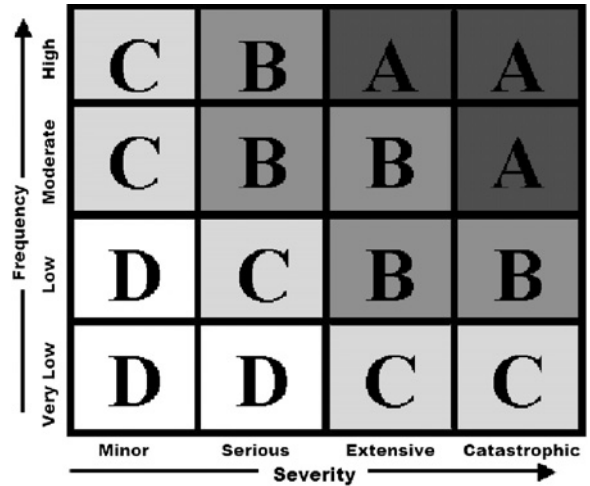

FIGURE 3-3 FEMA "MultiHazard Identification and Risk Assessment" risk matrix.
Class A: High-risk condition with highest priority for mitigation and contingency planning (immediate action)
Class B: Moderate to high-risk condition with risk addressed by mitigation and contingency planning (prompt action)
Class C: Risk condition sufficiently high to give consideration for further mitigation and planning (planned action)
Class D: Low-risk condition with additional mitigation contingency planning (advisory in nature)

hazards threatening their country or community but do not provide a definitive list of priorities for mitigation. Such a list requires further evaluation, as will be described.

It is helpful for disaster managers to begin recording the results of their evaluations on a concise form that allows fast and easy reference to risk evaluation output data so this data can be more easily compared in the prioritization step. Risk registers, as they are called, provide a useful tool, and should include the following information:

- Name of the risk (including specific magnitude and/or intensity if the risk has been broken down into these categories)
- Qualitative likelihood value
- Qualitative consequences value
- Level of risk as determined by evaluation on the risk matrix

- Priority rating
- Additional information, including any of the following
  - Description of possible consequences
  - Adequacy of existing mitigation measures or controls
  - Known mitigation options and alternatives
  - Acceptability of risk

Because people have different risk perceptions, and because there may be more risks than there are resources to mitigate them, disaster managers must develop risk evaluation criteria before any risk identification or analysis takes place. Risk evaluation criteria help disaster managers and citizens make judgments about what they consider to be the most serious risks and set forth performance measures to judge progress in mitigating the community's risks.

In establishing these contextual criteria, disaster managers will also define the political, social, economic, legal, and physical environment within which all of the hazards can occur. Some of criteria include:

- Population issues
  - Death and injuries
  - Displacement
  - Loss of homes and property
  - Loss of jobs and income
  - Loss of sense of security
  - Loss of sense of community
- Business sector issues
  - Damage to facilities
  - Loss of income
  - Business disruption costs
  - Insurance losses
  - Loss of market share
  - Loss of trained employees
  - Bankruptcy
- Community issues
  - Damage or destruction of community infrastructure (i.e., roads, bridges, hospitals, jails, city halls, community service centers, etc.)
  - Loss of tax revenues
  - Disaster response and recovery costs

  - Reduced funding for other community priorities (i.e., education, social services, etc.)
  - Loss of population base
  - Increased community debt and borrowing
  - Economic repercussions
  - Environmental harm
  - Loss of culture/heritage

Disaster managers would also define their analysis as it relates to mitigating the country or community's hazards. This could include several or all of the following:

- Legal requirements
- Cost and equity
- Risks that are clearly unacceptable
- Risks that should be kept as low as reasonably practicable

Additionally, risks that have been evaluated according to the risk matrix will need to be verified for accuracy. It is possible that a risk may have been placed in a category that defines it as being either too great or not great enough—only further analysis can correct such errors.

The Purpose of Evaluating Risk

Gaye Cameron of the University of New South Wales (2002) writes, "The purpose of evaluating risks is to determine that risk levels resulting from the risk analysis step [including the results of the risk matrix] reflect the relative seriousness of each risk." She mentions three tasks that are important to perform at this point in the hazards risk management process:

- Identify which risks require referral to other agencies (i.e., is the risk one that is better mitigated by another local, regional, or national agency rather than one that needs to be considered for mitigation options by the disaster managers?)
- Identify which risks require treatment by the disaster managers
- Further evaluate risks using judgment based upon available data and anecdotal evidence to

further determine the accuracy of the final risk value recorded.

A risk that might be better mitigated by another local, regional, or national agency is hazardous material exposure and other accidents that might occur at or from an extra-jurisdictional utility (like a nuclear power plant) that is adjacent to a second country or community. Hazards that are created in one jurisdiction but whose consequences affect another have caused many cantankerous debates throughout history. These types of cross-jurisdictional problems are most severe on rivers and streams. Pollution content, increased flooding potential, and even decreased quantities of water can all occur in one jurisdiction but be caused by the actions of another. An illustrative example is changes in a river's hydrology brought about by the construction of manmade levees (water-retention walls built along the banks of rivers that allow for higher water levels before flooding occurs). Dams and levees are river structures that often cause these problems. They can cause flooding, both upstream from rising water levels in reservoirs behind the dam and downstream from forced release or failure of the dam.

Cameron (2002) writes that there are two overarching issues that need to be addressed in the risk evaluation process. First, risk levels must be confirmed. Through a process of stakeholder consultation, these levels are reviewed to ensure:

1. They reflect the relative seriousness of each risk.
2. The likelihood and consequence descriptions utilized for risk analysis are appropriate.
3. Local issues have been considered.

Cameron adds, "If, following stakeholder consultation, the risk level is considered inappropriate the risk should be subjected to further analysis using new information or data."

Second, risk acceptability must be addressed:

> In almost all circumstances risk acceptability and treatment will be determined and/or carried out by the agency or agencies responsible for managing the treatment of risks.

> For those risks where no agency is responsible, the [disaster managers] will prepare treatment options for the management of the identified risks. (Cameron, 2002)

For each risk, the levels of risk acceptability (by both the public and by the disaster managers) must be determined in order for the level of mitigation effort required to be determined. Risk acceptability will be discussed in greater detail later.

Once the risk levels of each hazard have been compared to the previously established risk evaluation criteria, the risks must be prioritized, or ranked in the order that the disaster managers feel they should be addressed.

This prioritization can be accomplished in many ways, most of which rely upon the information gathered in the previous steps of the process and build upon the results of the risk matrix. Risk prioritization takes the evaluation of a country or community's hazards beyond merely comparing risks as factors of likelihood and consequence, and uses the expert judgment of the hazards risk management team to add experience, knowledge, and contextual influence to the final determination of mitigation priority.

In risk prioritization, disaster managers must consider the degree of control over each risk and the cost, benefits, and opportunities presented by each risk, and decide which risks are unacceptable at any cost.

One such method for the evaluation of risk, the so-called "SMAUG" (Seriousness, Manageability, Acceptability, Urgency, Growth) approach, designed by Benjamin Tregoe and Charles Kepner, has gained wide acceptance by emergency managers in Australia and New Zealand.

According to this methodology, disaster managers consider five individual factors in determining how a list of risks can be generated that reflects the established priorities of the community. This list includes (each factor is accompanied by the upper and lower extremes by which each risk could be evaluated):

1. **Seriousness**
   a. The risk will affect many people and/or will cost a lot of money (see Exhibit 3-5).

EXHIBIT 3-5   Considering Extreme Events

Rae Zimmerman and Vicki Bier, in their article "Risk Assessment of Extreme Events," shed some light on the extra considerations that must be made when prioritizing hazard lists that include extreme event hazards that are manmade and intentional, such as terrorism.

They write, "Predicting human behavior in emergency situations is already difficult. However, in attempting to estimate and manage the risks of intentional attacks, further difficulties become apparent. First, as pointed out by Woo (2002), 'some idea of event likelihood is needed for intelligent benefit-cost analysis.' However, estimating the likelihood and nature of intentional attacks is an area with which most risk assessors are not yet familiar, although there has been some related work on this problem in other fields. For example, Dickey (1980) interviewed bank robbers to understand the criteria that they used in choosing banks to rob; he found that they preferred banks located near major highways and banks with a single point in the lobby from which they could see all of the employees at once. Similarly, Crowe (2000) and de Becker (1997) report that criminals choose targets based not only on the attractiveness of the target but also on the likelihood that they would be discovered and apprehended. Interviews with incarcerated terrorists could presumably be used to explore the criteria they use in selecting targets, which could be factored into quantitative risk assessments.

"More significantly, protection against a knowledgeable and adaptable adversary is a fundamentally different challenge than protection against accidents or acts of nature. For example, earth-quakes do not get stronger or smarter just because we defend our buildings against them. However, if adversaries know or can easily learn about their target's defensive measures, then they can actively choose to either bypass or circumvent those defenses. Progress in and increased reliance upon detection technologies has made this more important to take into account. For example, metal-screening devices prior to September 11th increased the security and safety of air travel. A network news report early in 2002 suggested that the box cutters used by the terrorists on September 11th to gain control of the hijacked airplanes fell just below the detection settings of such screening devices.

"As noted by Dresher (1961), optimal allocation of defensive resources requires that 'each of the defended targets yield the same payoff to the attacker.' Thus, even if some components can be shored up quite inexpensively, focusing protective investments there can lead to wasted resources if adversaries choose to attack targets that cannot be shored up cost effectively. In other words, critical assets must be defended against all possible attacks, which is much more difficult than just shoring up a few 'weak links.' As a result, Ravid (2001) concludes that security improvements are generally more costly than safety improvements: '[I]nvestment in defensive measures, unlike investment in safety measures, saves a lower number of lives (or other sort of damages) than the apparent direct contribution to those measures.'"

Source: Zimmerman and Bier, 2002.

  b. The risk will affect few or no people or will cost little or nothing.
2. **Manageability**
  a. The risk could be affected by intervention.
  b. The risk cannot be affected by intervention.

3. **Acceptability**
  a. The risk is not acceptable in terms of political, social, or economic impact.
  b. The risk will have little political, social, or economic impact.

4. **Urgency**
   a. The risk urgently needs to be fixed.
   b. The risk could be fixed at a later time with little or no repercussions.
5. **Growth**
   a. The risk will increase quickly.
   b. The risk will remain static. (Lunn, 2003)

Using the SMAUG criteria for evaluation, disaster managers can more precisely determine priorities for mitigating individual risks, beyond the characterizations that resulted from the risk matrix. After the risk matrix evaluation, risks were grouped into categories of seriousness. Now they can be assigned a numerical order defining specific priorities.

It is important to note that the list of priorities will likely change as the risk mitigation options are considered. Risk evaluation has given the hazards risk management team a better idea of those risks for which mitigation must be conducted at all costs, due to their absolute unacceptability. However, for risks with similar mitigation priority rankings, the factors of cost effectiveness of mitigation, technological availability of mitigation options, and other risk treatment factors will require revisiting this priority list and re-ranking risks using additional information.

RISK ACCEPTABILITY

In performing hazard risk assessments and analyses of risk, disaster managers must make decisions about what risks to treat, what risks to prevent at all costs, and what risks can be disregarded because of either low consequence, low frequency, or both. These decisions are based upon the acceptability of risk.

Unfortunately, no disaster manager will ever have complete information about all risks faced by the country or community in regards to the number of people and the area affected, the actual frequency of the hazard in the future, and the actual benefit to be attained through mitigation, among many other factors. If the disaster manager did have all of this information, determining risk acceptability and making

mitigation decisions would be simple. However, in the absence of this perfect information, judgments must be made about the severity of risk for each hazard, and whether or not the community is willing to accept that risk in light of the known information.

Because disaster managers do not work in a vacuum, many factors, be they political, social, or economic, influence the collective determination of what risks are acceptable and what risks are not. The mechanisms by which they can begin to determine such categorization are explained below.

The disaster managers have thus far identified the risks affecting the country or community, analyzed them individually, and evaluated them collectively. They are now left with an ordered list of risks that they must consider for treatment. Ideally, they would treat all risks such that nobody would have to worry about them ever again, but that risk-free world scenario is inconceivable despite modern technology and engineering. While most risks can be reduced by some amount, few can be completely eliminated, and rarely if ever do the funds exist to reduce all risks by an amount that is acceptable to everyone in the community. There will never be complete satisfaction with the ultimate decisions made by disaster managers, mostly because of differences in perception.

Two factors confounding the acceptability of risks are the benefits associated with certain risks, and the creation of new risks by eliminating existing ones. For instance, to completely eliminate the risk from nuclear power generation plants, they would need to be dismantled and taken out of service. The resulting shortage of power would require that fossil-fuel-burning plants increase their production, which in turn would create increased carbon-based pollution, which would likewise create increased health and environmental risks.

ALTERNATIVES

Derby and Keeney (1981), two risk management experts, write:

The key aspect of acceptable risk problems is that the solution is found by a decision among alternatives. The generic problem involves choosing the best combination of advantages and disadvantages from among several alternatives. The risk associated with the best alternative is safe enough.

This is an important distinction—that risks deemed "acceptable" are not necessarily those with risk levels for which we are "happy." They continue:

We all would prefer less risk to more risk if all other consequences were held fixed. However, this is never the case. In a situation with no alternatives, then the level of safety associated with the only course of action is by definition acceptable, no matter how disagreeable the situation. Said another way, acceptable risk is the risk associated with the best of available alternatives, not with the best of the alternatives which we would hope to have available.

There are several factors that together influence the determination of risk acceptability. They include personal, political/social, and economic reasons. Although the three are interrelated, different processes drive them. These processes are described next.

Personal

The personal factors that dictate whether a risk would be considered "acceptable" mirror the risk perception characteristics described below. For example, a risk whose consequences are "dreaded", such as the radiation sickness that could result from a meltdown at a nuclear power plant, is likely to be found less acceptable to individual members of the public than the long-term effects of increased solar radiation (such as skin cancer), which may be caused by a decrease in the ozone layer from increased automobile emissions.

The United Nations Development Programme (UNDP) training program in Vulnerability and Risk Assessment (1994) describes the differences in individual acceptance between risks that are voluntary and involuntary:

Some risks are entered into voluntarily and a distinction is sometimes made between voluntary and involuntary risks. Many recreational activities and sports involve considerable levels of personal risk entered into voluntarily. Indeed the thrill of the risk is part of the enjoyment of the recreation. The benefits of the risk outweigh the costs and so the perception of the risk is reduced; i.e., the threat level that is deemed acceptable is much higher than a risk that is imposed from outside or involuntary.

Other factors that have been shown to affect public acceptance of risk include personal values, gender, ethnicity, education level, and the treatment of the risk by the media.

Political/Social

The political/social acceptability of risk is the product of either democratic processes or other collective mechanisms of determination. In other words, political and social influences are representations of many personal determinations of acceptability. While it is almost certain that not every individual citizen will be happy with the final decisions made concerning a risk's acceptability and treatment, the choices made will reflect the feelings of the majority if those choices are influenced by political and social acceptability.

Because of the differences in the makeup of different communities and populations, risk acceptance will not be universal. It is likely to change from place to place, from time to time, and from hazard to hazard (Alesch, 2001). Acceptability is likely to change even within individual communities over time as the makeup of that community changes. It is these differences that make public participation in the disaster management process important.

Economic

Because countries or communities can rarely support the level of funding required to mitigate all risks, the risk acceptability decision must be influenced by how much each mitigation alternative would cost and what other possible risk mitigation measures would be offset through funding of a specific mitigation effort.
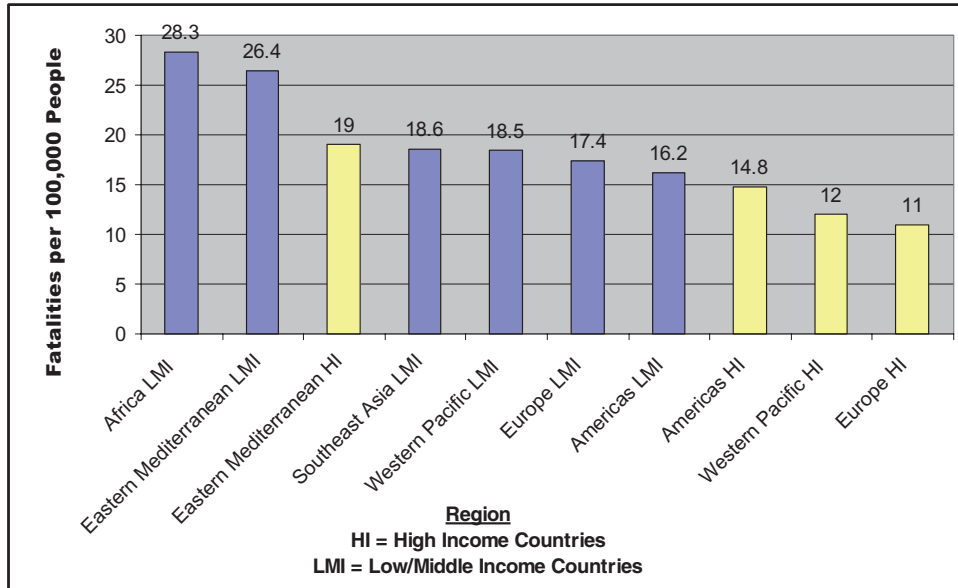
FIGURE 3-4 Worldwide road traffic fatalities. (*Source:* World Health Organization, 1999.)

In general, disaster managers will have to address the costs of reducing a risk in terms of the benefits (actual risk reduction) that would result. Some communities have chosen to simply live with a risk because the costs of mitigating its consequences are prohibitive, and eliminating the risk is unthinkable. For a simplified example, consider the use of the automobile, which highlights the cost/benefit scenario. At present, over a million road traffic fatalities occur throughout the world each year. This obviously presents a great risk. With increased cost, car manufacturers could easily make their cars much safer, and these fatality rates could be reduced significantly. However, such a cost would make automobiles too expensive for the average consumer. Thus, we accept the loss of over a million lives per year for the benefit of having affordable cars. Even if manufacturers spent the money to make cars completely "safe" for occupants, however, there would still be an inherent risk associated, as indicated by the great number of fatalities that are caused by pedestrians who are struck by cars (shown in Figure 3-4). The cost of totally elimi-

nating this particular risk associated with automobiles is inconceivable.

W. Kip Viscusi, in the article "Economic Foundations of the Current Regulatory Reform Efforts" (1996), describes how the economics of an acceptability decision can be influenced by the political and social aspects of that decision. To illustrate his point, he produced a list of risk-reducing regulations that fail a cost/benefit "test" (cost is greater than the benefit), and a list of risk-reducing regulations that pass a cost/benefit "test" (benefit is greater than the cost). His results are shown in Table 3-5 and Table 3-6.

"Injustices" are commonly seen in the disaster management decision-making process, especially concerning the treatment and acceptability of hazard risks (MPPP, 1999). The following are three criticisms of the processes by which risk acceptability is determined:

1. *Those with money and vested interests can influence the process of determining the acceptability of risk.* Because the process of determining

TABLE 3-5   The cost of risk-reducing regulations that fail a benefit cost test per life saved

Regulation	Initial annual risk	Annual lives saved	Cost per life saved (millions of $)
Grain dust	2.1 in 10,000	4	5.3
Radionuclides/uranium mines	1.4 in 10,000	1.1	6.9
Benzene	8.8 in 10,000	3.8	17.10
Arsenic/glass plant	8.0 in 10,000	0.110	19.20
Ethylene oxide	4.4 in 100,000	2.8	25.60
Arsenic/copper smelter	9.0 in 10,000	0.060	26.50
Uranium mill tailings (inactive)	4.3 in 10,000	2.1	27.60
Uranium mill tailings (active)	4.3 in 10,000	2.1	53.00
Asbestos (OSHA, 1986)	6.7 in 100,000	74.7	89.30
Asbestos (EPA, 1989)	2.9 in 100,000	10	104.20
Arsenic/glass manufacturing	3.8 in 100,000	0.25	142.00
Benzene/storage	6.0 in 10,000,000	0.043	202.00
Radionuclides/DOE facilities	4.3 in 1,000,000	0.001	210.00
Radionuclides/elemental phosphorous	1.4 in 100,000	0.046	270.00
Benzene/ethylbenzenol styrene	2.0 in 1,000,000	0.006	483.00
Arsenic/low-arsenic copper	2.6 in 10,000	0.09	764.00
Benzene/maleic anhydride	1.1 in 1,000,000	0.029	820.00
Land disposal	2.3 in 100,000,000	2.52	3,500.00
EDB	2.5 in 10,000	0.002	15,600.00
Formaldehyde	6.8 in 10,000,000	0.010	72,000.00

Viscusi (1996) assumes that $2.8 million per life saved is an acceptable cost. Any cost greater than $2.8 million per life fails the cost/benefit test.

Source: Viscusi, 1996.

risk acceptability (including mitigation spending and regulatory practices) is influenced by politics and may be shaped by political ideology, it is possible for corporate or interest groups to lobby and influence those decisions. This can be seen with hazards such as handguns and assault rifles, environmental degradation, soil and water pollution, or construction in hazardous areas. Increased citizen participation in the process can decrease this type of injustice. By increasing the decision-making power of the general public, a more democratic outcome is possible (though not guaranteed).

2. *Setting a dollar figure (in cost-benefit analyses) on a human life is unethical and unconscionable.* This is primarily a factor related to involuntary risks. To the individuals whose lives are being placed at risk, any dollar figure will seem low or inappropriate as a tradeoff for the acceptance of the risk. Many people would (understandably) feel that their life is too great a price to pay for the existence of any involuntary

TABLE 3-6 The cost of risk-reducing regulations that pass a benefit cost test per life saved

Regulation	Initial annual risk	Annual lives saved	Cost per life saved (millions of $)
Unvented space heaters	2.7 in 100,000	63	.1
Oil and gas well service	1.1 in 1,000	50	.1
Cabin fire protection	6.5 in 100,000,000	15	.2
Passive restraints/belts	9.1 in 100,000	1,850	.3
Underground construction	1.6 in 1,000	8.1	.3
Alcohol and drug control	1.8 in 1,000,000	4.2	.2
Servicing wheel rims	1.4 in 100,000	2.3	.2
Seat cushion flammability	1.6 in 10,000,000	37	.6
Floor emergency lighting	2.2 in 100,000,000	5	.7
Crane-suspended personnel platform	1.8 in 1,000	5	1.2
Concrete and masonry construction	1.4 in 100,000	6.5	1.4
Hazard communication	4 in 100,000	200	1.8
Benzene/fugitive emissions	2.1 in 100,000	.310	2.8

Source: Viscusi, 1996.

risk. The cognitive processes that dictate these "price of a human life" determinations are often different for voluntary risks. As the automobile safety example illustrates, people are willing to accept a certain increase in risk to their own lives for the benefit of more-affordable products. How much more affordable differs by person. But, as shown by relatively recent lawsuits against tobacco companies by smokers who became ill people may be unwilling to accept some voluntary risks despite previous knowledge about those risks.

Because of the controversial nature of placing a value on life, it is rare that a risk assessment study will actually quote a dollar figure for the amount of money that could be saved per human life loss accepted. Postevent studies have calculated the dollar figures spent per life during a crisis, but to speculate on how much a company or government is willing to spend to *save or risk a life* would be extremely unpalatable for most.

3. *Risk management is usually an undemocratic process, as those who may be harmed are not identified or asked if the danger is acceptable to them.* It is not difficult to call to memory a case in which a vulnerable or disadvantaged group of people was exposed to a risk whose benefits were enjoyed by others. Many toxic waste dumps are located in impoverished parts of towns, cities, and states, although the people in those communities had little say in deciding the location of such materials. Related to this injustice is the reality that the impoverished are usually less able to avoid such risks, as the property or jobs available to them are often associated with these very same risks. It is often the poor who must live in the highest risk areas of a

floodplain, or under high-tension power lines, or along highways. These people bear a larger share of the population risk, while many others enjoy much lower risk levels from those particular hazards, even though they enjoy a disproportionate amount of the benefits. Thus, risk communication and public participation are important to counteract these injustices.

In determining the treatment of risks in a country or community, disaster managers must consider each hazard according to its current risk level, and determine if the risk is too great to be left as is. If it is determined to be too great, they must analyze what can be done to reduce the risk, and then make another determination as to the acceptability of the new risk level.

Several methods for determining the acceptability of risks have been developed in the past, and are used to varying degrees (dependent upon the needs of those performing the risk evaluation). They include:

- *The "no go" alternative.* This alternative, which is not always available, is the complete elimination of the risk. Such action can be easier with technological hazards, especially those that are new. How easy depends on how dependent society has become on the technology in question. For example, when DDT was found to be bioaccumulating in birds and mammals and was feared to eventually lead to a "silent spring" (a "silent spring," as described by Rachel Carson, is what would result if DDT were used to the extent that all birds died as a result), the chemical was banned from use. There were alternatives to DDT, and while they may not have been as cost efficient or effective, they were not perceived as being as harmful. For some countries, the more expensive alternatives were acceptable, while in others DDT is still the preferred, cheap option.

However, with hazards that have established a unique niche in society, such as the automobile, eliminating the risk is close to impossible. Eliminating risks is often only possible with the existence of viable alternatives. The possibility of eliminating the risk must always be considered in the assessment. (Because the option is to eliminate the *risk*, and not the *hazard*, natural disasters can be considered for this option—if either the consequences or the frequency is lowered to zero, the risk becomes zero. However, this option is rarely possible given economic and technological constraints.) The emergence of hybrid cars that rely on a combination of gasoline and electric power is a sign of movement toward a viable alternative in terms of fossil-fuel dependence.

- *Accept the risk.* A second option is to simply accept the risk as it is—to do nothing. Certain risks may be so low that the money spent to reduce them would be better spent to treat a more severe hazard. In risk matrices, the risks that fall within the lowest category of both consequence and likelihood are generally the risks that are considered acceptable. After all other risks have been treated to the satisfaction of the hazards risk management team, the low risks can be revisited.

- *Establish a "de minimis risk" level.* De minimis risk dictates that a level of statistical risk for hazards exists, below which people need not concern themselves. This level is often set at either 1 in 100,000 or 1 in 1,000,000, and is set either for a one-year period, or for a lifetime (70 years). The term *de minimis* is a shortened version of the Latin phrase *de minimis non curat lex*, which means "the law does not care about very small matters." This concept is widely used throughout Europe to set guidelines for acceptable levels of risk exposure to the general population. An example of its use in the United States includes a regulation de minimis risk set by the Environmental Protection Agency for human lifetime risk from pesticides of 1 in 1,000,000 over a 70-year lifetime (PMEP, 1997).

De minimis does not seek to prohibit any risk above the levels set. The theory only states that, if a risk falls below that level, no resources need to be spent on its prevention. If a product poses less risk than the de minimis level, for example, then it should

be authorized for production and/or distribution. However, if the risk associated with a product does not fall below the de minimis level, then risk managers need to assess if anything can be done to reduce its risk and if the costs outweigh the benefits, among many other issues.

Proponents for de minimis feel that governments can avoid wasting their time trying to increase the safety of risks already satisfying de minimis requirements, thus freeing them up to spend their resources on other risks of greater concern. Opponents are concerned that some risks exist for which even a 1 in 1,000,000 risk would be too high (Mumpower, 1986). One of their contentions is that risks that affect huge populations would result in a high number of deaths even though the risk is so "low." The smallpox vaccine, for example, has a 1 in 1,000,000 risk of death. However, if the entire world population were to be vaccinated, approximately 6000 fatalities would ensure. A third group feels that the de minimis strategy is effective only if there are two de minimis levels working in conjunction—one that measures absolute risk (1 in 1,000,000 for example), and another that sets the maximum number of allowable expected fatalities (X number of fatalities for country Y, for example).

- *Establish a "de manifestis risk" level.* Related to de minimis risk is the concept of de manifestis risk, or "obnoxious risk." With de manifestis risk, there is a risk level above which mitigation is mandatory. In practice, this level is generally set at 1 in 10,000 per vulnerable individual. This practice is often cited in regards to secondhand smoke exposure in the workplace (Repace Associates, 1999).
- *Perform cost-benefit analyses of risks.* Cost-benefit, or benefit-cost, analyses are probably the most widely used and widely accepted method by which risks and alternatives are evaluated for acceptability. The Massachusetts Precautionary Principle Project (1999) writes:

  [Cost-Benefit Analyses are] where the risks reduced by taking a protective action (like imposing a stricter

regulation on emissions) are equated to benefits (such as a life saved or reduced health costs.) The "benefit" is then compared to the estimated "costs" of implementing the protective action (cost to the industry to install better pollution controls). Often a determination is made as to how much "cost" it is worth to save that life, usually 2 million dollars.

If the cost of controls greatly exceeds the cost of the life saved, regulatory actions may not be taken. Among other flaws, cost-benefit analysis fails to consider who reaps the benefits and who assumes the cost. It also perpetuates the myth that we must decide between economic growth and environmental protection. Cost benefit analysis is also heavily biased towards costs of regulation today, discounting less quantifiable costs such as health damage and benefits of prevention. Cost benefit analysis often overestimates the costs of regulation. It also tries to quantify the unquantifiable, or translate the non-economic, i.e., namely pain and suffering, illness, and disease, into money. Many consider this unethical.

Following the September 11th terrorist attacks, in which hijacked commercial airplanes were used as weapons, considerable effort went into (and continues to go into) securing airways around the world. As security measures increase, so does the cost of ensuring that security, and most of this cost is passed along to the consumer. Questions that require people to consider the financial cost of their own safety are often used to determine individual risk-seeking or risk-averse behavior.

Related to cost-benefit decisions are cost-effectiveness decisions. In the case of cost-effectiveness decisions, the minimum "unit cost" to reduce maximum risk is favored in considering the alternatives for risk mitigation within and between risks.

- *Acceptable risk as the best choice among alternatives.* Derby and Keeney (1981) write that "The answer to 'How safe is safe enough?' depends upon [five steps]. . . . Acceptable risk is determined by what alternatives are available, what objectives must be achieved, the possible consequences of the alternatives, and the values to be used." The five steps they are referring to are:
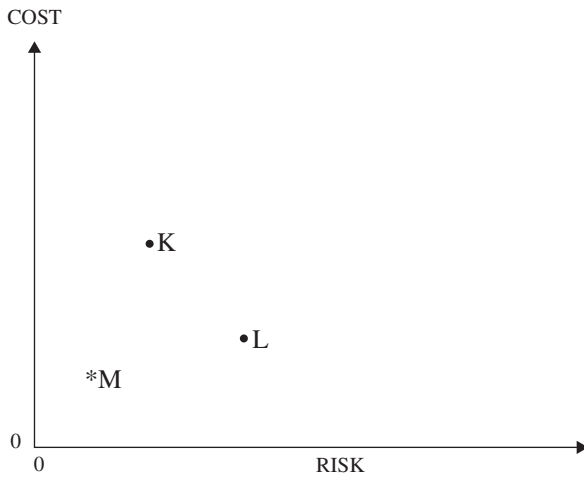
FIGURE 3-5   Risk acceptability Example A. (*Source:* Derby and Keeney, 1981.)
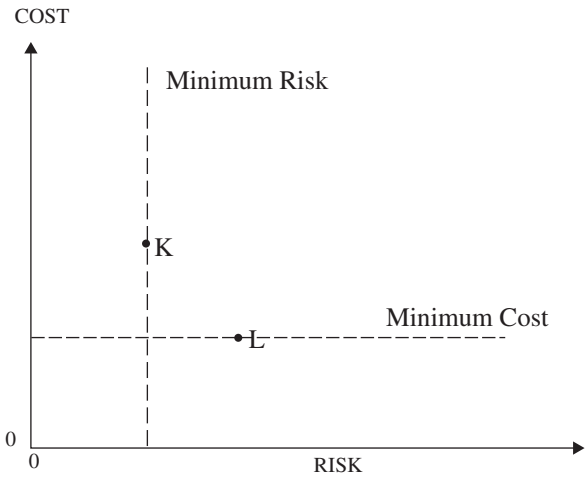

FIGURE 3-6   Risk acceptability Example B. (*Source:* Derby and Keeney, 1981.)

1. Define the alternatives
2. Specify the objectives and measures of effectiveness to indicate the degree to which they are achieved
3. Identify the possible consequences of each alternative
4. Quantify the values for the various consequences
5. Analyze the alternatives to select the best choice.

- Disaster managers will have already completed most of these steps by the time they are deciding which risks to treat. Derby and Keeney provide graphical illustrations of four factors that influence how risk alternatives are chosen and determined to be acceptable. These examples are shown in Figures 3-5 to 3-8 and are discussed in the following.

In Example A, it is assumed that the benefits of all the alternatives are equal. The differences are only in their financial cost and the level of risk (with 0 being the optimal level for both cost and risk). If only alternatives K and L are available, then the choice is between high cost with low risk and low cost with high risk. The acceptable risk would be the level of risk associated with the particular alternative chosen, either K or L.

If another alternative, M, were introduced into the problem, then M with lower cost and lower risk would be preferred to either K or L. Consequently, acceptable risk is now the safety level of alternative M. This risk is different from the level associated with the other alternatives. Clearly, the appropriate level of risk depends on the alternatives available.

Example B shows how acceptable risk changes with what objectives are achieved. In this example, only alternatives K and L are (known to be) available. If the sole objective is to minimize the risk, alternative K would be chosen. The acceptable risk would then be the risk level associated with K. On the other hand, if the sole objective is to minimize the cost, the alternative L would be chosen. Acceptable risk under this objective would be the risk level for L. Each objective leads to choosing different alternatives. In each case, the acceptable risk changes with the objective used to make the choice.

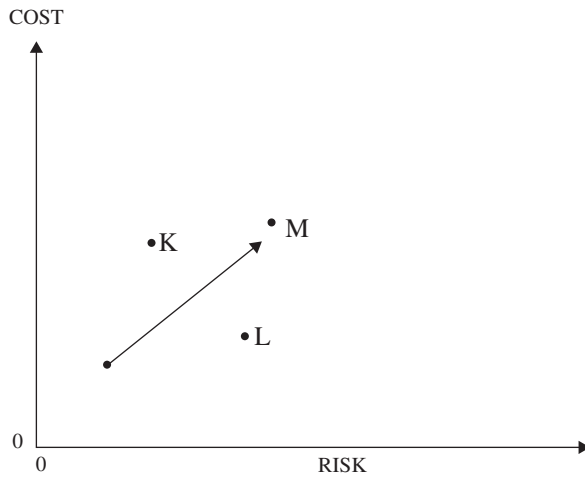Example C shows how new information can change the determination of what is considered

FIGURE 3-7 Risk acceptability Example C. (*Source:* Derby and Keeney, 1981.)

FIGURE 3-8 Risk acceptability Example D. (*Source:* Derby and Keeney, 1981.)

acceptable risk. In this example, we assume that alternative M determines the acceptable risk, as in Example A. However, additional information provided by experience, research, development, or analysis reveals that the initial assessment of alternative M must be revised. Instead of confirming that M has lower cost and lower risk than both alternatives K and L, the new information shows that M has both the high cost of K and the high risk of L. The acceptable risk is now determined by the choice between K and L.

Example D illustrates the effect of values and preferences on the choice between alternatives. In this example, different preferences for trading off increased cost for lower risk are represented by the two curves. In Case 1, the trade-off curve reflects the willingness to incur large costs to reduce risk by small amounts. Alternative K is the most attractive choice with this preference. In Case 2, the trade-off curve reflects less of a willingness to increase costs in exchange for specific reductions in risk. This preference selects alternative L as the best choice. Since acceptable risk is determined by the choice between the two alternatives, these different preferences change what is considered acceptable.

VULNERABILITY

The concept of vulnerability was first presented in Chapter 1, and defined as a measure of the propensity of an object, area, individual, group, community, country, or other entity to incur the consequences of a hazard. As this section will illustrate, measurement of vulnerability results from a combination of physical, social, economic, and environmental factors or processes. These factors are the primary determinant features that dictate how the likelihood and/or consequences components of risk are increased or decreased.

It is important to first clarify the difference between the concepts of vulnerability and exposure, which are often confused. The two words are commonly used interchangeably to describe how a country, region, or community is likely to experience a certain hazard. However, this is incorrect, as the discussion on vulnerability factors will show. The United Nation's risk reduction document *Living with Risk* embodies this concept, saying, "While most natural hazards may be inevitable, disasters are not" (ISDR, 2004).

While vulnerability defines the propensity to incur consequences, exposure merely suggests that the indi-
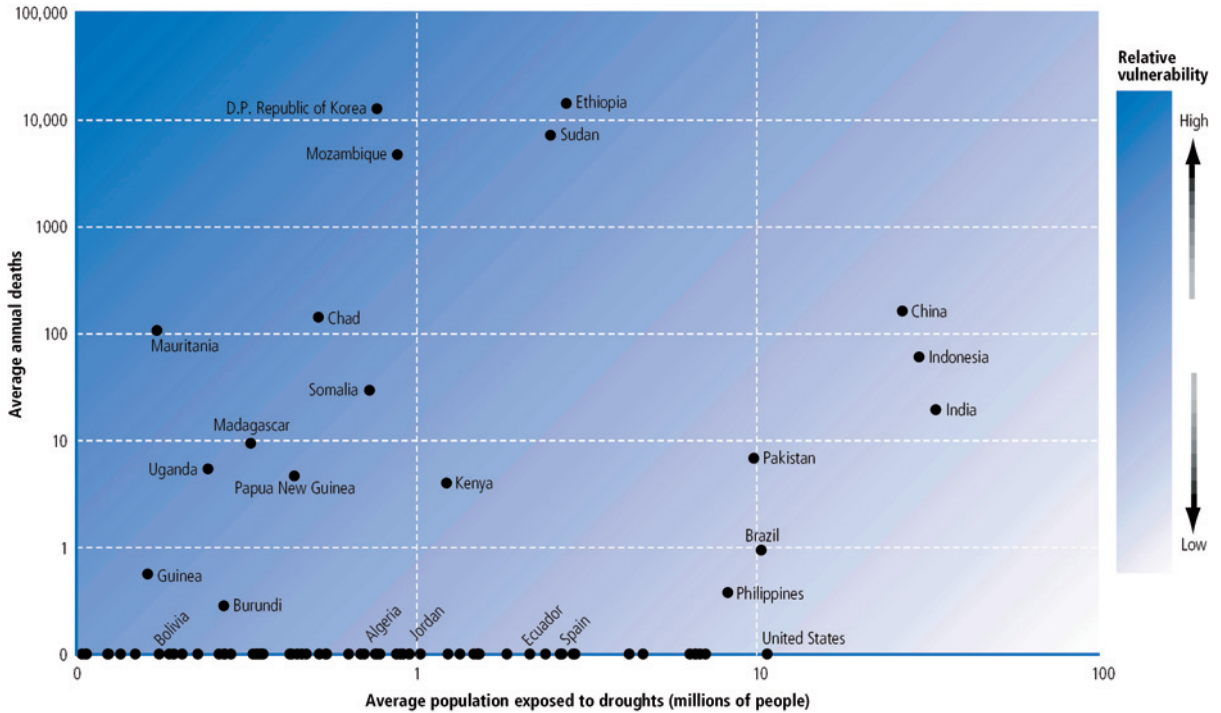
FIGURE 3-9   National vulnerabilities to drought risk as a factor of population exposure. (*Source:* www.em-dat.net.)

vidual, structure, community, nation, or other subject will be *exposed* to the hazard. For instance, one might say "The Spanish are vulnerable to drought," meaning that Spain regularly experiences the drought hazard. But this statement implies more than the speaker intended. The use of the word "vulnerable" implies that the population is likely to incur negative consequences as a result of factors that make it less likely to protect its citizens and built and natural environments from harm, not simply that drought happens there. The reality, as Figures 3-9 and 3-10 illustrate, is that while Spain is exposed to regular drought hazards, it is not vulnerable to their consequences.

Risk is composed of two components—likelihood and consequence. Exposure, or the measure of whether a person, building, population, or nation is likely to experience a hazard, looks only at likelihood. Vulnerability, on the other hand, is a factor of how small or great the consequences will be *should the*

hazard manifest. Figures 3-9 and 3-10 illustrate that, although many different nations are exposed to drought, each experiences differing vulnerabilities. In light of this, it may be more accurate to say that the Spanish face a drought risk, because their exposure likelihood is greater than zero, and that because of measures the nation has taken to reduce drought consequences, it is no longer *vulnerable* to the hazard.

Vulnerability can be studied and measured. Likewise, it can be decreased through actions that lower the propensity to incur harm or increased through actions that increase that propensity—namely, mitigation and preparedness. How these processes are conducted will be detailed below and in later chapters. As the definition in Chapter 1 states, two identical events may present themselves as a minor issue in one country and a major disaster in another. Each country's vulnerabilities will explain the difference.
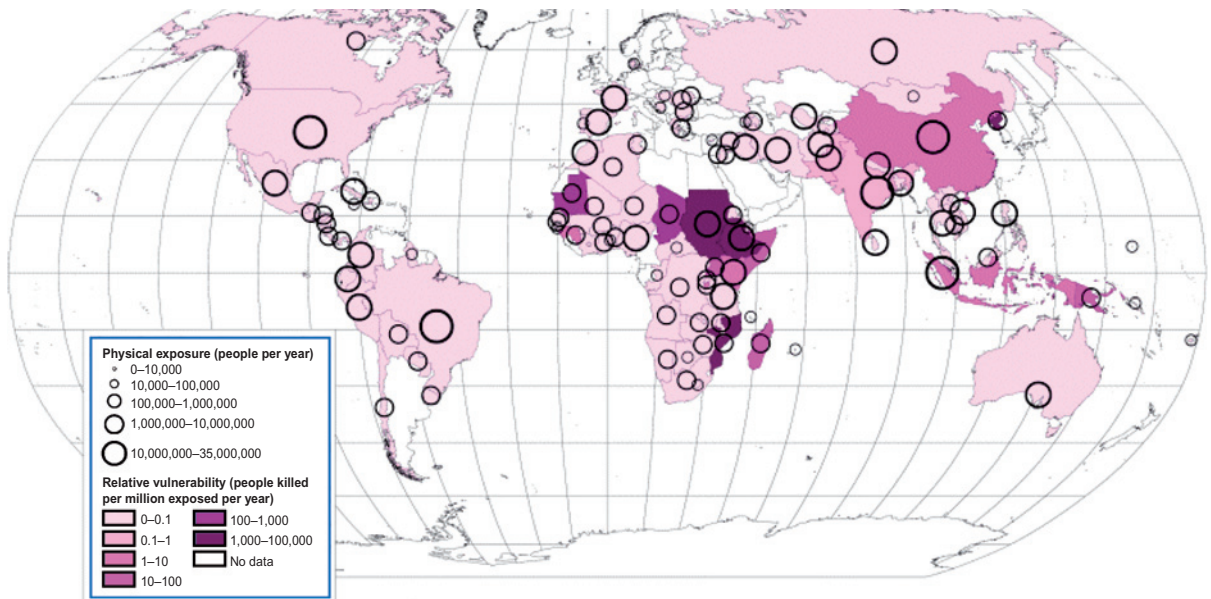
FIGURE 3-10   National vulnerabilities to drought risk as a factor of population exposure. (*Source:* www.em-dat.net.)

There are generally four different types of vulnerability: physical, social, economic, and environmental. Each is determined by a set profile of factors that are identifiable and measurable.

Physical vulnerability generally involves what in the built environment is physically at risk of being affected. The choices societies make about placing structures, transportation routes, and populations either in or out of harm's way effectively determine physical vulnerability. A majority of available mitigation measures are focused upon "hardening" these populations and structures in order to reduce their physical vulnerability to hazards. For instance, a building may be placed in a zone where a flood hazard is known, but raising the structure onto stilts reduces its physical vulnerability. People also are affected by physical vulnerability. As populations move into areas of high risk of disaster, their physical vulnerability increases.

Social vulnerability measures the individual, societal, political, and cultural factors that increase or decrease a population's propensity to incur harm or damage as result of a specific hazard. Certain behaviors can contribute to or reduce that population's ability to protect itself from harm. Within populations may be groups, such as the elderly or the very young, who exhibit different vulnerability factors than the population as a whole.

Economic vulnerability refers to the financial means of individuals, towns, cities, communities, or whole countries to protect themselves from the effects of disasters. Within societies, there may be many economic delineations that further divide groups into economically vulnerable subgroups. As previously discussed, the poor are much more likely to suffer the consequences of disasters as they often do not have the financial means to avoid extreme hazards.

Environmental vulnerability refers to the health and welfare of the natural environment within the area of study that either contributes to or reduces the propensity of the affected population to incur the consequences of disasters. Poor environmental practices, such as deforestation, a lack of land-use planning, or management of hazardous materials, can turn what would have been minor events into major disasters.

Each of these vulnerability elements is interconnected. Economic vulnerability can lead to social vulnerability, which causes populations to build on dangerous land, thereby causing environmental vulnerability and physical vulnerability. This is but one example, but it shows how each factor is equally important to consider when assessing the vulnerability of a country or community.

To better understand an area's vulnerability, disaster managers must attempt to develop a profile of the country's or community's physical, social, economic, and environmental profiles. These four factors will help them determine overall vulnerability, and thereby determine what consequences are likely to occur as result of each hazard and what mitigation and preparedness measures will be most effective at treating those hazard risks. Descriptions and samples of profile components are provided below.

THE PHYSICAL PROFILE

The physical profile of a country, which dictates its physical vulnerability, is generally considered to be a collective examination of three principal components: geography, infrastructure, and populations. The more that is known about each three component, the better understood physical vulnerability will be. Each component contributes to the hazards that are likely to occur and how those hazards' consequences will manifest themselves.

The geographic components of the physical profile include the natural makeup of the area of study. For instance, it is estimated that almost three billion people, or about half of the world's population, currently reside in what is classified as coastal territory. This includes all but two of the world's 15 largest cities (ISDR, 2004). Of course, the economic and industrial benefits provided by a seaside location prompted these populations to move into such zones, but by doing so, the residents increased their exposure to many different hazards, including severe windstorms, flooding, and tsunamis. As a result, they must now accommodate that exposure by taking risk reduction measures, or else experience increased vulnerability to those hazards.

The following list provides several examples of what factors may be seen in a study of a country's geographic makeup:

- Land cover (vegetation)
- Soil type
- Topography
- Slope
- Aspect
- Water resources (lakes, rivers, streams, reservoirs, etc.)
- Wetlands and watersheds
- Faults
- Climate (wind, rainfall, temperature)

The infrastructure components of the physical profile primarily include the interaction between people and the land. This profile is diverse, and is often generalized for regions, or segments (see Exhibit 3-6). Common components of the physical profile include:

- Land use
- Location and construction material of homes
- Location and construction material of businesses
- Zoning and building code delineations
- Critical infrastructure components
  - Hospitals and clinics
  - Schools
  - Senior citizen centers
  - Day care/child care centers
  - Government and other public facilities
  - Prisons and jail facilities
  - Power generation facilities and transmission
  - Water purification facilities and pipes

EXHIBIT 3-6   Sectoring

Sectoring helps to further understand the ways in which a disaster would affect segments of a country or community. Not all areas of a community will be affected by an unforeseen event. Sectoring divides an area into manageable segments or portions based on local geography in relation to a specific hazard. It allows disaster managers to categorize parts of their study area in terms of response and impacts. It is used to identify local service areas in relationship to a hazard and physical features, and allows for the identification of especially vulnerable areas, evaluation of how an area could be or has been affected, and what can be done to respond to specific events.

Knowing the hazard and the potential of its impact in each sector allows for a more accurate identification of appropriate mitigation actions as well as warning and emergency response needs. Sectoring can also be used to organize and conduct emergency response needs within a sector or between adjacent sectors.

Sectors should be defined by easily identifiable boundaries that can be seen on the ground, such as bluffs, rivers, and major highways. These features often dictate who responds and how a response is managed. Things to think about in identifying sectors include:

- People
  - How many people in each sector
  - How many subdivisions in a sector
  - Where people work
  - Where people recreate
  - Where people live
  - Where people gather for civic events
  - Where the special needs populations are located
- Animals and livestock
  - Where animals are located
  - What types of animals are in a specific sector
- Housing and living quarters
  - How many housing units in the sector
  - What types of housing units are present
  - Whether all units are insured
- Critical facilities and response
  - Fire station locations
  - Ambulance locations
  - Hospital locations
  - Emergency first-response locations
  - Emergency coordination locations
  - What the responding zones are
- Special facilities and community resources
  - School locations
  - Nursing home locations
  - Healthcare service locations
  - Prison and jail locations
  - Important historical or cultural locations
- Infrastructure and lifelines
  - Utilities, including pipelines and power lines
  - Roads and bridges
  - Railroads and yards
  - Airports
  - Navigable waterways
  - Dikes, dams, and flood protection
- HAZMAT facilities/public health concerns
  - LUST (leaking underground storage tank) sites
  - MES (municipal emergency services) sites
  - Chemical storage sites
  - Hazardous materials locations
  - Funeral homes
  - Sites containing radioactive materials
- Commercial and industrial facilities
  - Commercial business areas defined
  - Industrial business areas defined
  - Agricultural business areas defined
  - Port facilities identified

- ○ Wastewater treatment and sewer lines
- ○ Gas lines
- ○ Oil and gas transport pipelines
- ○ Oil and gas storage facilities
- Transportation systems
  - ○ Roads and highways
  - ○ Railroads
  - ○ Airports
  - ○ Public transportation systems
- Waterways and port facilities
- Bridges
- Communication facilities
- Landfills
- Dikes and flood protection structures and facilities
- Nuclear power generation plants
- Dams
- Military installations
- Industrial sites that manufacture and/or store hazardous materials
- Emergency management systems
  - ○ Ambulance services
  - ○ Fire services
  - ○ Law enforcement services
  - ○ Emergency first response services
  - ○ Early warning systems
  - ○ Emergency operations centers
  - ○ Emergency equipment (fire trucks, ambulances, response vehicles, etc.)
  - ○ Hazardous materials (HAZMAT) equipment
  - ○ WMD detection teams
  - ○ Evacuation routes and shelters
- Historical and cultural buildings and areas

The population component of the physical profile looks at how people move throughout time. Disasters that occur at different times of the day often can have different consequences, and knowing where people are likely to be at certain times helps to determine vulnerability. At night, most people are likely to be in their homes, while during the weekday, they will be at their jobs. For this reason, physical vulnerabilities will vary throughout the day as population

movements occur. Individual population factors may include:

- Population by jurisdiction (i.e., county, city)
- Population distribution within a county or city
- Population concentrations
- Animal populations
- Locations of major employers and financial centers
- Areas of high-density residential and commercial development
- Recreational areas and facilities

THE SOCIAL PROFILE

The social makeup of a country plays a strong role in its vulnerability. Aspects of the social profile are diverse and comprise education, culture, government, social interaction, values, laws, beliefs, and other aspects of society. Within most countries, and even within individual communities, the vulnerability of different groups varies due to a range of sociocultural factors that help or prevent them from being able to protect themselves from disasters. The prevalence of epidemics, in particular, are heavily influenced by the social factors that vary from one country to another (see Figure 3-11.)

Certain religious, cultural, or traditional practices and beliefs can help or hinder disaster management practices. Though it may not be evident to the people practicing such behavior, their practices may have been a product of adjustment to a hazard. In India, for instance, is a group of people called the Banni, who adapted to the use of a traditional style of single-story, round houses called *bhungas* after a particularly devastating quake in 1819. In 2001, when an earthquake struck in Gujarat, India, killing over 20,000 people (primarily as result of residential structure failure), not a single *bhunga* collapsed.

Disaster managers must be able to recognize when social interactions are either helping or hindering people in reducing their vulnerability to hazards, and
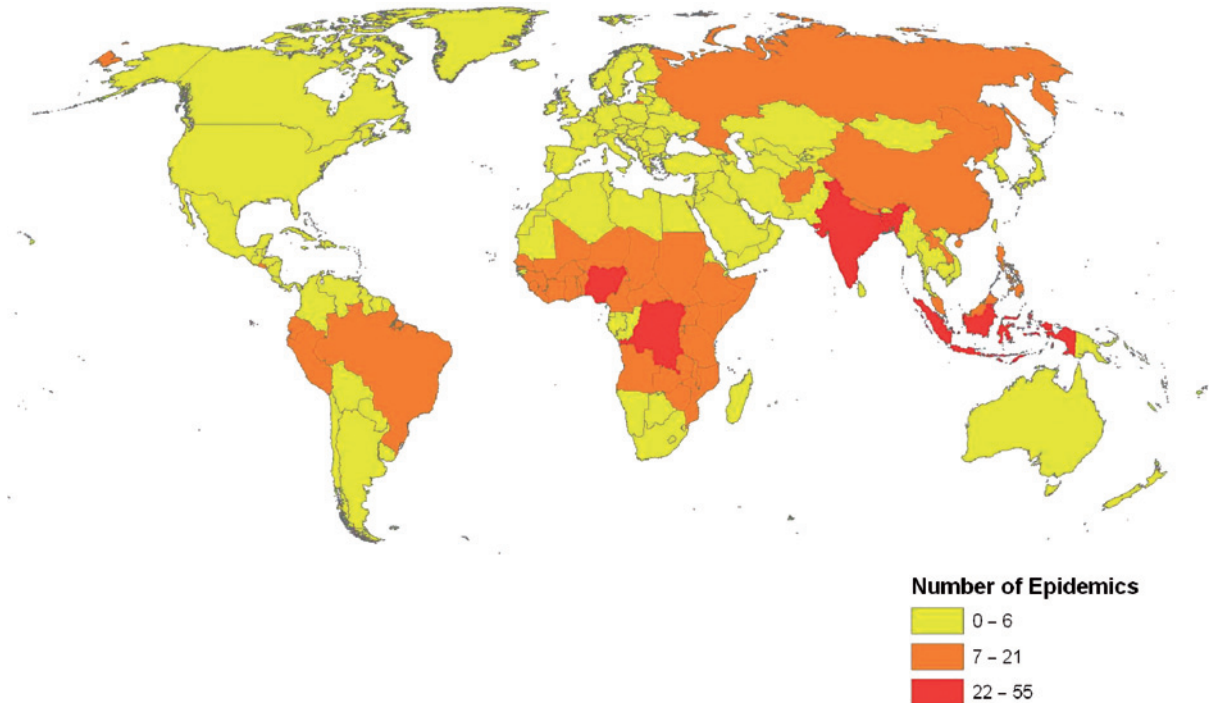
FIGURE 3-11   Number of epidemics by country, 1974–2003. (*Source:* www.em-dat.net.)

must recognize what aspect of that social process is causing the alteration. People tend to be very attached to places and practices. An outsider recommending change without considering the original reasons for the social practices is unlikely to be taken seriously in that community. Additionally, changing certain social practices without regard for their historical bases can actually increase vulnerability due to the common but unintended consequences resulting from a social reaction in response to the change.

Examples of factors that disaster managers must consider when scoping a social vulnerability include:

- Religion
- Age
- Gender
- Literacy
- Health
- Politics

- Security
- Human rights
- Government and governance (including social services)
- Social equality and equity
- Traditional values
- Customs
- Culture

THE ENVIRONMENTAL (NATURAL) PROFILE

A country's or community's natural environment plays a critical role in defining its hazard vulnerability (see Figure 3-13). It also helps to define what risk management practices and actions are possible and most effective. For instance, a mountainous country whose government does not or is not able to restrict
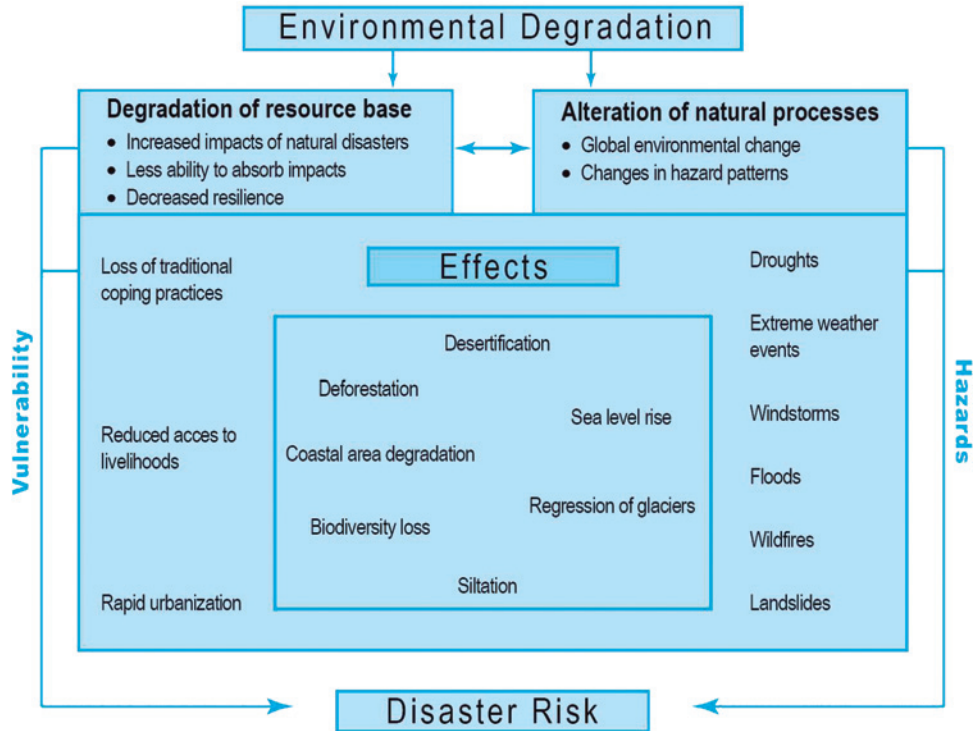
FIGURE 3-12   The link between environmental degradation, natural disasters, and vulnerability. (*Source:* ISDR, 2004.)

clearcutting on unstable slopes is likely to have increased vulnerability to landslides, while a country that does not manage the filling in of wetlands may show an increase in flood propensity. Environments themselves are also vulnerable to the consequences of hazards, and may increase the likelihood that a hazard event develops into a disaster.

The health and vitality of the country's or community's natural environment is critical to measuring its vulnerability to each specific hazard. A healthy and productive natural environment provides excellent protection from a variety of hazards, while a damaged and unhealthy natural environment can reduce protection from specific hazards and, in some cases, increase the hazard's potential impact. Healthy and productive wetlands provide invaluable flood protection by soaking up excess rainwater. Healthy forests are less vulnerable to catastrophic wildfires and reduce landslide

dangers on slopes. Dunes on coastlines provide buffers from storm surge caused by hurricanes and severe storms. Figure 3-12, developed by the UN as part of the International Strategy for Disaster Reduction, illustrates this process of risk augmentation through environmental degradation.

Understanding the direct link between a healthy and productive natural environment and a country's vulnerability to specific hazards is critical to developing an effective risk management strategy. Conducting an inventory of the features of the country's natural environment is an important step. Measuring the health of the country's natural environment is vital in understanding the role that the natural environment can play in protecting a community and reducing the impacts from hazard events (see Figure 3-14). Features of a community's natural environment include, but are not limited to:
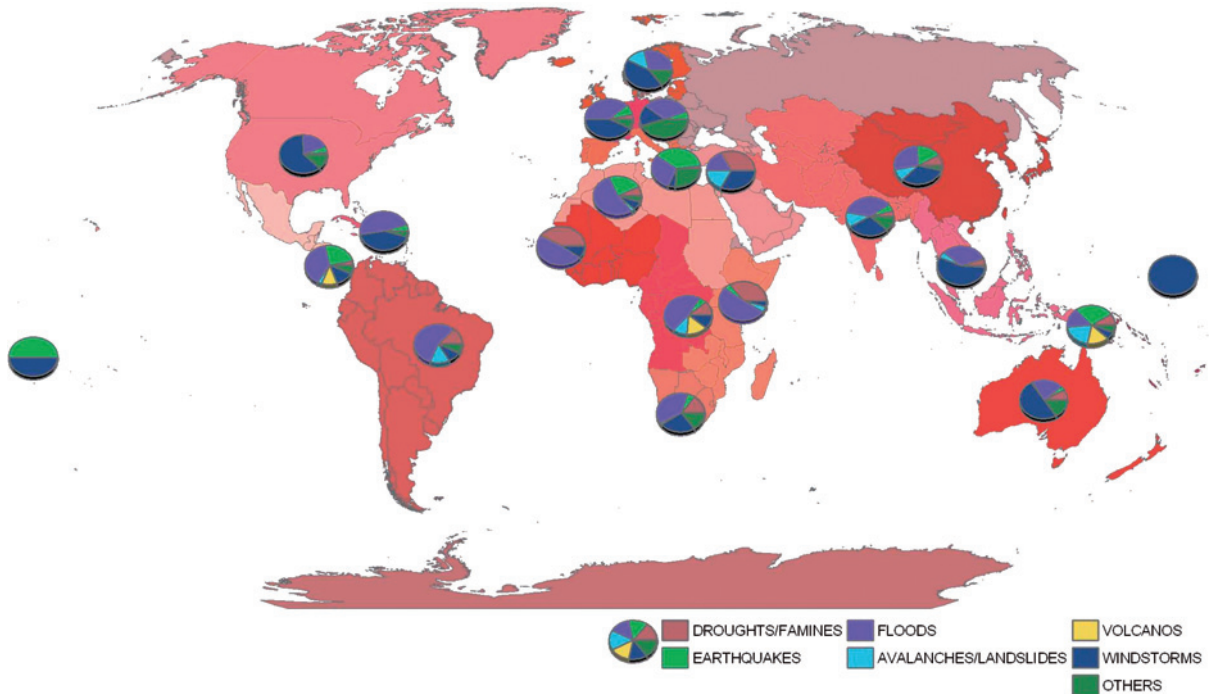
FIGURE 3-13   Regional differences in hazard portfolios (1974–2003). (*Source:* www.em-dat.net.)

- Health of waterways (rivers, streams, creeks, etc.)
- Status of wetlands
- Management of lakes
- Management of forests
- Health of coastal dunes

Human practices that affect the environmental profile of a country (see Exhibit 3-7) include:

- Diking or damming of rivers and creeks
- Filling in wetlands for development
- Channeling of coastal areas such that marsh and wetlands areas are destroyed
- Clearcutting of forests
- Mismanagement of forests such that dead wood builds up (serving as fuel for a forest fire)
- Destruction of coastal dunes

Natural processes also affect the natural environment, such as:

- Rainfall averages
- Wind
- Snowfall and snowmelt averages
- Seasonal trends in severe storms and cyclonic storms
- Seasonal drought
- Lightning

THE ECONOMIC PROFILE

Governments' and populations' financial status will deeply affect their ability to protect themselves from the consequences of disaster. Financial well-being, however, does not indicate that they *will* protect them-

EXHIBIT 3-7 Illegal Destruction of Coral Reefs Worsened Impact of Tsunami

The illegal mining of corals off the southwest coast of Sri Lanka permitted far more onshore destruction from the 26 December 2004 tsunami than occurred in nearby areas whose coral reefs were intact. This is the principal finding of a team of researchers from the United States and Sri Lanka who studied the area earlier this year. Their report is published in the 16 August issue of *Eos*, the newspaper of the American Geophysical Union.

Some of the differences were startling. Lead author Harindra Fernando of Arizona State University reports that in the town of Peraliya, a wave of 10-meter [30-foot] height swept 1.5 kilometers [1 mile] inland, carrying a passenger train about 50 meters [200 feet] off its tracks, with a death toll of 1,700.

Yet, a mere three kilometers [two miles] south, in Hikkaduwa, the tsunami measured just 2–3 meters [7–10 feet] in height, traveled only 50 meters [200 feet] inland, and caused no deaths.

The researchers found that this pattern of patchy inundation to be characteristic of the study area and was not related to such coastline features as headlands, bays, and river channels. Rather, the key factor was the presence or absence of coral and rock reefs offshore. At Hikkaduwa, the hotel strip is fronted by a rock reef and further protected by coral reefs that the local hoteliers protect and nurture, the researchers report. Relatively little damage and few deaths were recorded from there to Dodanduwa, around six kilometers to the south.

From Hikkaduwa north to Akuralla, however, damage and loss of life was extensive. Local residents, interviewed by the authors, say that illegal mining had decimated coral reefs in that area, especially by use of explosives that result in harvests of both coral and fish.

Some eyewitnesses to the tsunami described a visible reduction in the height of the water wall and its deflection parallel with the shore as it approached the coral reef. The researchers conclude that waves that had been blocked by the reef caused even more inundation and damage where they found low resistance gaps due to removal of coral by humans.

The scientists note that the brunt of the tsunami had hit Sri Lanka's eastern shore, but that the southwestern, or leeward, side had also been hit hard. Their analysis of the available data concludes that two or three waves hit the area within an hour, having been channeled and bent around the southern tip of the island, and that another wave struck around two hours later, having bounced back after hitting India or the Maldives. They say that existing computer models cannot adequately explain or predict the wave amplitudes in southwest Sri Lanka, likely due to small-scale ocean processes, including topographic variations due to coral removal, that are not yet well understood.

The authors note that the low-lying Maldives islands directly in the path of the tsunami escaped destruction. They suggest that this may have been due to the presence of healthy coral reefs surrounding the islands. Apparently, in Sri Lanka, very little healthy coral was damaged by the tsunami.

Source: American Geophysical Union press release, August 15, 2005.

selves; rather, it is just a measure of their ability to do so. Other factors may be learned from this economic profile. Trends and tendencies associated with wealth, or the lack thereof, can be deduced. For instance, the poor are often marginalized and forced to live on more dangerous land. Their housing is more likely to be constructed of materials that are unable to withstand environmental pressures. They are more likely to have zero tolerance to delays in basic necessities that often follow disasters.
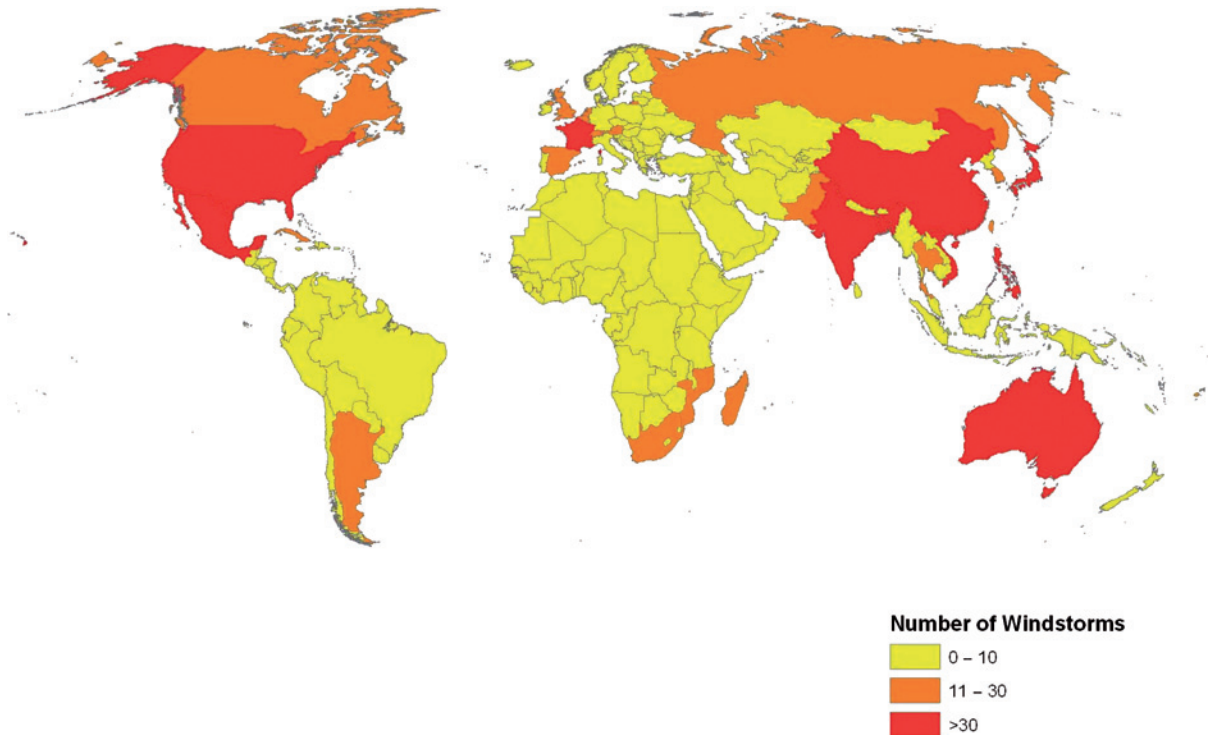
FIGURE 3-14   Number of Severe windstorm events by country, 1974-2003. (*Source:* www.em-dat.net.)

Factors involved in the economic profile that affect vulnerability include:

- Gross domestic product
- Debt
- Access to credit
- Insurance coverage
- Sources of national income
- Funds reserved for disasters
- Social distribution of wealth
- Business continuity planning

It is recognized that poor countries experience more disasters than the wealthy ones. Figures 3-15a and 3-15b illustrate this. This is not surprising, however, when considering the definition of a disaster and the concept of vulnerability. An event only becomes a disaster when the local capacity to respond to the event is exceeded, requiring external assistance to manage the consequences. Because of their strong economic standing, wealthy nations are better able to develop the preparedness, mitigation, response, and recovery mechanisms before events occur, and thus are able to manage them effectively once they do happen. Identical events that occur in a high-income country and a low-income country may be recorded as a routine event in the high-income country while resulting in a full-scale disaster in the poor country. The income of these countries, therefore, results in their discrepancy in vulnerability.

Another income-related factor that determines how significantly an event affects a country is the gross domestic product (GDP), which is a measure of the value of all goods and services produced within a nation in a given year. When considered in the absence of a nation's GDP, the financial consequences of a disaster do not provide a great deal of information
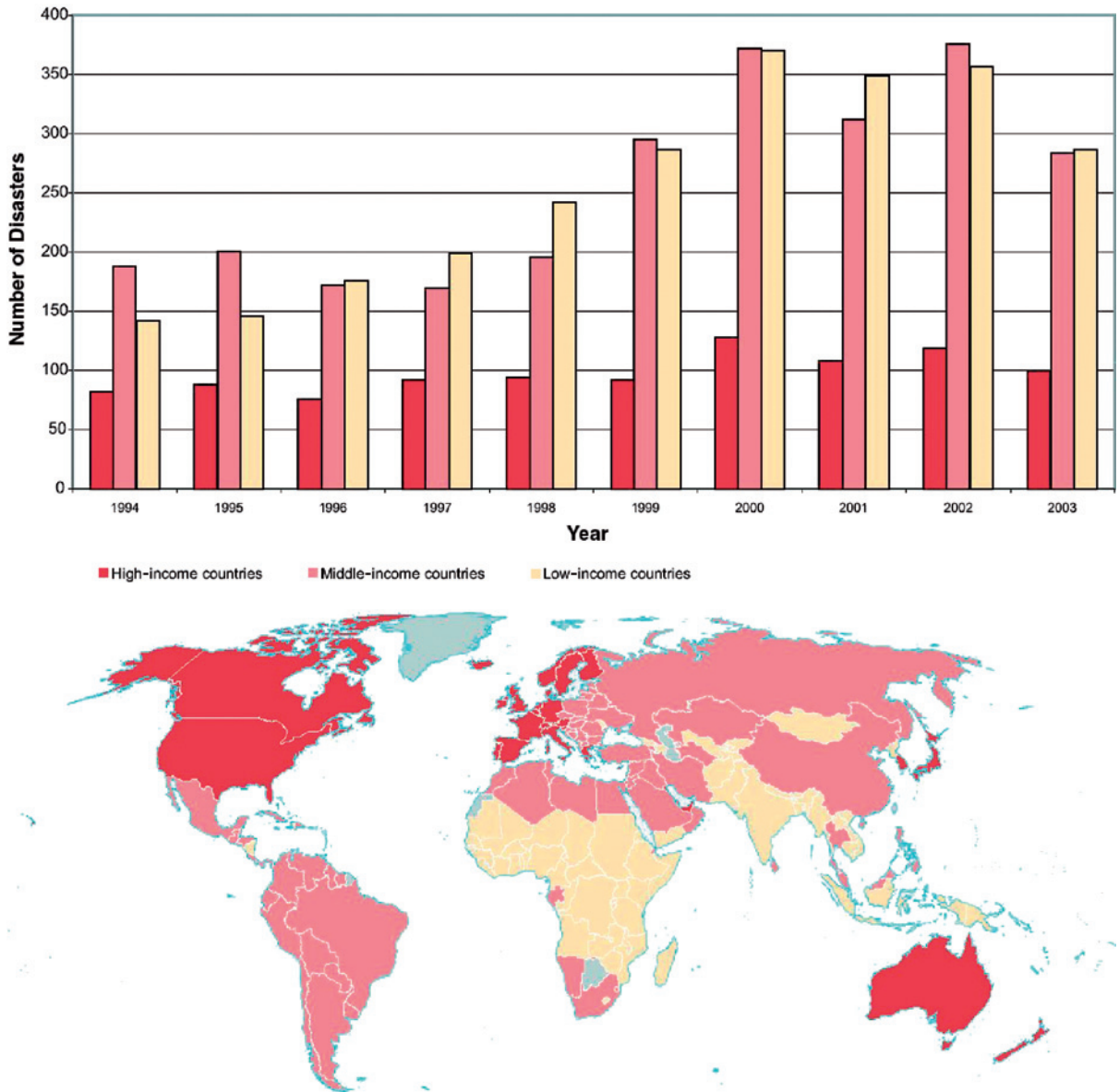
FIGURE 3-15   Total number of disasters by year, 1994–2003 (by income; reference map provided). (*Source:* www.em-dat.net.)

about how badly the country overall was affected. However, when presented as a percentage of GDP, this consequence figure gives much greater perspective on how deeply the nation's economy will feel the impact. For example, a disaster that causes $2 billion in dam-

ages may represent upwards of 38% of total GDP for a country like Honduras, while it would be equal to less than one-tenth of a percent of Japan's. Large-scale disasters that affect, poor countries can literally wipe out their entire economy. Wealthy nations with strong
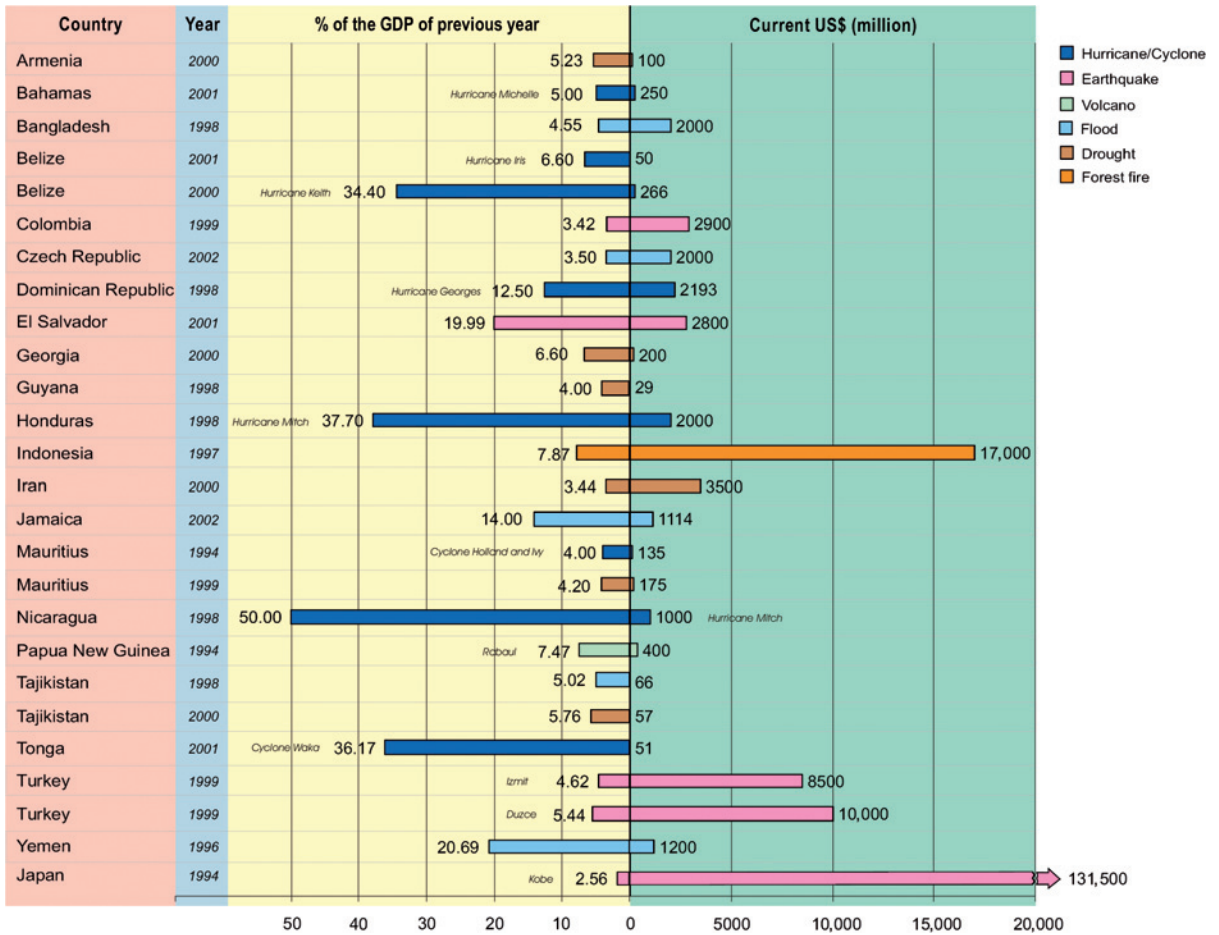
FIGURE 3-16   Disaster damages as a percent of GDP. (*Source:* www.em-dat.net.)

economies can absorb the effects of disasters, and many even have reserve funds set aside for expected events. Poor countries, however, often must borrow significant amounts of funding while concurrently cutting vital social programs to pay for the relief and recovery from a major disaster. As a result, development continues to lag long after the disaster has struck, as debt payments draw heavily off of annual budgetary spending. Figures 3-16 and 3-17 illustrate how disaster events differently affect economies of different sizes.

RISK FACTORS THAT INFLUENCE VULNERABILITY

The United Nations Development Programme (2004), in their report "Reducing Disaster Risk: A Challenge for Development," identifies two main factors that influence risk levels of nations and their populations: urbanization and rural livelihoods. Each factor contains associated processes that further influence a combination of the vulnerability factors previously discussed.
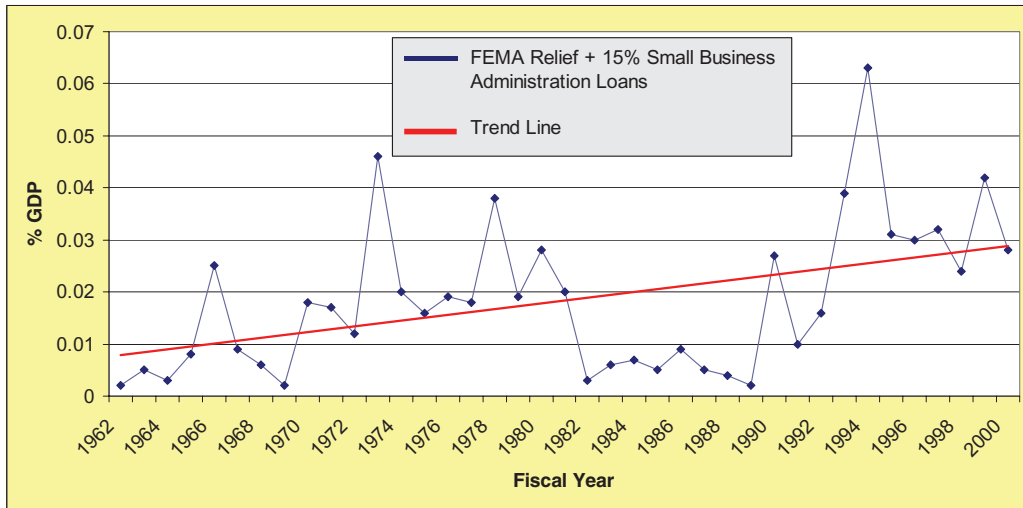
FIGURE 3-17   Disaster relief costs as a percentage of GDP in the United States. (*Source:* Congressional Natural Hazards Caucus and Princeton University, 2001.)

Urbanization

Populations are concentrating in urban centers throughout the world. The UN estimates that by 2007, more than half the world's population will live in cities. This trend toward the development of large "megacities" is evident upon examination of the world's great metropolises. Between 1950 and 1990, the average population of largest 100 cities on the planet grew from 2.1 million to 5.1 million. There are now six times as many cities with over one million people in the developing world as there were in 1950, and 41 cities had populations that exceeded five million in 2000 (UNDP, 2004).

Urbanization—especially rapid urbanization—presents significant challenges for disaster managers and urban planners. In most basic terms, the concentration of people concentrates risk. The absolute numbers of people who are exposed to individual hazards increases as those people settle in closer and closer proximity. As populations become more dense, land pressures require the poor to settle in undesirable,

often dangerous, parts of urban centers (e.g., unstable slopes, in floodplains, and on seismically unstable soil). Governments may not be aware for months or years that these groups are at such high risk, without current census data and risk assessment.

In addition to concentrating populations, urbanization concentrates national wealth and resources into small, often vulnerable pockets. When disasters occur, the likelihood that a significant portion of the nation's infrastructure, industrial output, and governance will be affected greatly increases. Housing, distribution of food, transportation, communications, public health, and many other resources and services can be affected to a much greater degree as urbanization increases.

Governments' ability to ensure the safety of urban populations decreases significantly when surges in population occur in a haphazard, informal manner. It can be very difficult, if not impossible, for officials to prevent people emigrating from rural areas from building and operating in a way that increases their risk, most significantly in the short term. Disaster and emergency management services must grow with

populations to ensure adequate protection. Even wealthy countries often have a lag in services as recognition and funding catch up—but in poor countries the situation can be much worse, because political pressure and the competition of financial interests often rob disaster management programs of much-needed funding.

The UNDP identified several characteristics of urbanization that contribute to risk and vulnerability, including:

- *Risk by origin*. Some cities are inherently risky because of their location. Mexico City, for example, is located very near active seismic faults, and was built upon soft soil that amplifies seismic waves to dangerous levels in certain parts of the city. In this case, the vulnerability of the population is increasing through urbanization because the urban center itself is inherently risky.
- *Increasing physical exposure*. As mentioned above, when rapid urbanization occurs, marginalized groups are very often pushed to the more dangerous, risky parts of the city, even to places where construction may previously have been prohibited. In this case, overall population exposure increases because people are moving into higher-risk pockets that exist within the overall boundaries of the urban environment.
- *Social exclusion*. Rural areas often have community-based coping and support systems that allow for decreased overall vulnerability to the consequences of hazards. However, these bonds are much less common in urban areas. Migrants often have trouble adjusting to the new demands of city life, requiring them to disregard many of the protection measures they may have otherwise taken. Their social "safety nets" are reduced or eliminated when they move away from families and friends, and it may be years before they are able to fill the resulting void. These groups tend to face the greatest risk from disaster consequences.
- *Modification and generation of hazard patterns*. Rapid urbanization not only changes the charac-

ter and size of a city, it affects its natural and built environments as well. Growing populations alter the way many services and resources, such as water, sewerage, garbage disposal, and hazardous materials generation, are managed. These increased pressures can easily create or modify existing hazards, or can result in completely new hazards. For instance, land pressure often results in the filling of wetlands to allow for new construction. The decreased hydrological holding capacity of the land may result in increased flooding where flooding was previously not a problem. This filled land may be less stable in the event of an earthquake because of the lack of bedrock below foundations.
- *Increasing physical vulnerability*. In addition to causing people to move into high-risk areas (increasing their physical exposure; see above), urbanization tends to cause groups to live and function in a manner that increases the likelihood that they will become victim to a disaster. Moving into risky areas does not automatically imply that vulnerability has been increased—as with the proper mitigation measures, the likelihood and consequence factors of risk can be reduced. However, because it is the poor who are most likely to move to these areas, expecting that the great (and expensive) measures required to compensate for the increased hazard risk in the area will be taken is unrealistic. As such, population vulnerability increases. It should be noted, however, that even in previously populated areas, increased density can result in conditions that increase vulnerability.
- *Urbanization of new regions*. It is not uncommon, in the modern age of transportation, commerce, and communications, for previously undeveloped areas to transform into large urban centers in a relatively short time. New markets, newly discovered resources, and increased population mobility can result in rapid settlement of people in an area that is at particular risk for one or more hazards about which few or no people are aware. The UN points out the disasters that

resulted from earthquakes in Peru in 1990 and 1991, in Costa Rica in 1991, and in Colombia in 1992 as consequences of new region urbanization.

- *Access to loss mitigation mechanisms*. Rapid urbanization places increased pressure on the government to provide mitigation and other disaster reduction and response services. However, even if these services are increased or developed, there is always a lag in time between recognition of the increased vulnerability and the development of services to reduce that vulnerability. Apart from major disasters, marginalized groups, especially those in informal squatter communities, face the risk of devastating consequences from minor storms, fires, landslides, and other hazards that normally would cause little or no damage.

Rural Livelihoods

More than half the world's population and, according to the World Bank (2005), more than 70% of the impoverished live in rural areas. Like their urban counterparts, rural populations experience vulnerability from disasters because of a unique set of factors resulting directly from the classification of their living conditions as rural. The following lists several of these factors, as identified by the United Nations Development Programme:

- *Rural poverty*. In the absence of large, organized government entities, rural communities may be left to fend for themselves for disaster mitigation and response resources. This is pronounced in the developing world. With little or no money to spend on prevention, the rural poor have few options to mitigate for disaster risk. When what little they are able to do ultimately fails as result of a disaster, the catastrophic loss of crops, equipment, livestock, housing, and possessions is devastating, and relief resources may be nonexistent. Although they may have developed long-established social systems to counteract the effects of disasters, those systems may fail for many reasons, including changes in the demographic makeup of the community, climate change, changes in markets, and environmental degradation.

- *Environmental degradation*. Many of the world's rural poor engage in environmentally destructive practices. Most often, these practices are directly related to agricultural or other income-generating practices. Deforestation, overgrazing of land, poor farming practices, and alteration of waterways can all lead to an increase in the likelihood or consequence factors of risk. In these cases, it is not uncommon for regular events, such as annual rains, to result in disasters that did not normally affect the region—mudslides and flash floods, for example.

- *Nondiversified economies*. Many rural areas rely on just a few sources or even one source of income. This increases the chance that a hazard will result in the destruction of much of the area's income-generation abilities. A plant epidemic is one example of a hazard that can cause a disaster that would not have occurred with a more diversified range of resources. Shifts in global market prices can result in a drop in local income, increasing the vulnerability of the area's population. The worst-case scenario, which involves a drop in global prices in conjunction with a disaster, has happened on multiple occasions in the recent past.

- *Isolation and remoteness*. Rural populations that are far outside the reaches of national and regional government services often have little outside intervention to reduce their vulnerability from disasters. Poor transportation and communications infrastructure severely hinders pre- and postdisaster assistance. When disasters do occur, it can be days or weeks before news of it reaches the outside world and assistance is provided. War-torn areas are especially susceptible, as was evident after the 2004 tsunami events in Banda Aceh province in Indonesia.

RISK PERCEPTION

An important component of disaster management is the recognition that a hazard exists. However, recognizing the hazard is only the beginning, as one must also be able to judge the relative seriousness of that hazard in comparison to other hazards. The process of risk analysis helps disaster managers to do just that. For laypeople, however, and in the absence of such technical and involved analysis, the mechanisms by which they *perceive* the hazards that threaten them can be very different, and very complex.

The study of why people fear the things they do (and also why they do not fear other things) is called risk perception. Traditionally, people do not tend to fear the things that are statistically most likely to kill them, and an abundance of research has been dedicated specifically to finding out why. Understanding these trends in public risk perception can help disaster managers understand why people are disproportionately afraid of spectacular hazards they are statistically less vulnerable to than, for instance, automobile accidents, food poisoning, heart disease, or cancer.

In their article "Rating the Risks," acclaimed risk perception experts Paul Slovic, Baruch Fischhoff and Sarah Lichtenstein begin, "People respond to the hazards they perceive" (Slovic, Fischhoff, and Lichtenstein, 1979). This statement is important for two reasons. First, its opposite is true. People generally do not respond to the hazards that they do not perceive. Second, it has been found that these stated perceptions are based primarily upon inaccurate sources of information, such as mass media outlets, social networks, and other external sources, as opposed to personal experience and expert knowledge.

Slovic et al. identified four "Risk Perception Fallibility" conclusions to explain the ways in which people tend to inaccurately view the hazards in their world. These conclusions, which help to explain how populations decide which disasters to prepare for and why, are:

1. *Cognitive limitations, coupled with the anxieties generated by facing life as a gamble, cause*

uncertainty to be denied, risks to be distorted, and statements of fact to be believed with unwarranted confidence. People tend to fear a specific risk less as they become better informed with more details of the risk. However, what a person can discover about a risk will almost never be complete, as the actual likelihood or consequence most risks pose cannot be quantified in a way that addresses the specific threat faced by individuals (even well-known risks such as cancer or heart disease) (Ropeik, 2002).

The more uncertainty a risk poses or, as Slovic et al. state, "the more of a gamble something is," the more people will fear it. In the face of uncertainty, people will consciously or subconsciously make personal judgments based upon very imperfect information in order to establish some individual concept of the risk they face. Judgments based upon uncertainties and imperfect information often cause people to wrongly perceive their own risk in a way that *overstates* reality.

In Mexico City, for instance, where a public insecurity crisis is a priority political topic and a constant subject in the press, but where no reliable crime statistics have been available for over seven years, people have overestimated their personal risk from violent crime by up to 86%. According to a 2002 comprehensive countrywide poll measuring the incidence of crime, approximately 14 of every 100 citizens of Mexico City would fall victim to some form of crime in the 12 months following the survey (ICESI, 2002). However, when asked in a poll what they believed their chance was of falling victim to crime in that same time period, many people responded with an 80–100% chance.

2. *Perceived risk is influenced (and sometimes biased) by the imaginability and memorability of the hazard.* People, therefore, may not have valid perceptions about even familiar risks.

People are more afraid of those things that they can imagine or remember. The likelihood of occurrence of

these easily *available* risks, as they are called, tend to be overestimated. For instance, we rarely hear about a person dying from a "common" cause such as a heart attack, unless somebody close to us dies of that specific cause. However, the media will report heavily on a death that is result of an "uncommon" cause, like the West Nile virus. The result tends to be that people underestimate common risks and overestimate rare risks.

Social scientists Slovic, Fischhoff, and Lichtenstein performed a study to measure this phenomenon, and found that people greatly overestimated their risk from rare events such as botulism, tornadoes, pregnancy complications, and floods, while underestimating their risk from stroke, diabetes, cancer, and heart disease (Slovic et al., 1979). Generally, people tend to fear what they hear about repetitively or often. This phenomenon is referred to as the "availability heuristic," which states that people perceive an event to be likely or frequent if instances of the event are *easy to imagine or recall*. This perception bias can be correct when considering events that really are frequently observed, such as people who believe that automobile accidents are common because almost everyone they know has been involved in one. However, when a risk that is spectacular but not necessarily common receives constant media attention, people often wrongly assume that similar events are very likely to occur.

3. *Disaster management experts' risk perceptions correspond closely to statistical frequencies of death.* Laypeople's risk perceptions are based in part on frequencies of death, with some striking discrepancies. It appears that the concept of risk for laypeople includes qualitative aspects such as dread and the likelihood of a mishap being fatal. Their risk perceptions are also affected by catastrophic potential.

It can be difficult for people to fully understand statistics they are given, and even more difficult to conceptualize how those statistics apply to them personally. Furthermore, statistics tend to do little to affect how people perceive the calculated risks. This is

not to say that the average person lacks sufficient intelligence to process numbers; rather, the numbers are not the sole source of influence on public risk perception.

Extensive research has discovered that people rank their risks by using other, more heavily weighted *qualitative* factors, as well as the quantitative likelihood of a hazard resulting in personal consequence (Slovic et al., 1979). People are generally more concerned with the consequence component of risk than they are about the likelihood component (recall that Risk = Likelihood × Consequence).

It is important to examine the quality and usefulness of statistics provided to the public by the media regarding risks. Without complete information, media-provided statistics are meaningless and likely misleading. In the absence of complete information, people tend to over- rather than underestimate their vulnerability. Economists have classified this tendency to overestimate unknown or unclear risks as "risk-ambiguity aversion" (Economist, 2002).

However, even if statistics provided by the media or other sources are straightforward, people have difficulty understanding how those numbers affect them as an individual, even if they are a risk "expert." Few people can conceptualize the difference between a "one-in-a-million" and a "one-in-one-hundred-thousand" chance of occurrence (Jardine and Hrudley, 1997).

People tend to need other clues to help them put these numbers into perspective. Many tend to view their chance of being affected by rare but spectacular hazards in a comparable fashion to how people believe that they can beat long odds to win a state lottery. James Walsh writes in his book *True Odds*:

> The odds are greater you'll be struck by lightning than win even the easiest lottery. They're better that you'll be dealt a royal flush on the opening hand of a poker game (1 in 649,739). They're better that you'll be killed by terrorists while traveling abroad (1 in 650,000). If you bought 100 tickets a week your entire adult life, from age 18 to 75, you'd have a 1 percent chance of winning a lottery. Lotteries really play on the inability of the general public to appreciate how small long odds are. (Walsh, 1996)

In Walsh's calculations, the odds of winning the lottery are 1 in $57 \times 52 \times 100 \times 100 = 29,640,000$.

It is the qualitative factors that people consider most heavily when weighing their personal risk. Slovic et al. (1980) proposed that there are 17 risk characteristics that influence public risk perception. These characteristics fall under two subgroups (called "factors"): factors related to dread (Factor 1), and factors related to how much is known about the risk (Factor 2). A third factor, encompassing a single, 18th characteristic, which measures the number of people exposed to the hazard, will not be covered in this section.

Using these 17 characteristics, Slovic et al. examined public perceptions of 90 risks and plotted their findings on a two-dimensional graph depicting Factor 1 on the X-axis and Factor 2 on the Y-axis. Characteristics of Factors 1 and 2 are discussed in the following.

Factor 1: Factors Related to Dread

- *Dreaded vs. not dreaded*. People fear risks that cause painful, violent deaths more than risks that do not. David Ropeik, Director of Risk Communication at the Harvard Center for Risk Analysis, writes, "What are you more afraid of: being eaten by a shark or dying of a heart attack in your sleep? Both leave you equally as dead, but one—being eaten alive—is a more dreadful way to go" (Ropeik, 2002). Of course, millions of people around the world die from heart attacks while sleeping every year, but less than 15 fall victim to sharks in the same time period (Wiggins, 2002).
- *Uncontrollable vs. controllable*. People tend to be less fearful of risks that they feel they can control. For instance, most people feel safer as a driver in a car than as a passenger because they are controlling the movement of the vehicle, and they know their own skills in accident avoidance. When people lack control of a situation, a risk seems more pronounced. Examples of uncontrollable risks are airplane travel, street crime, pesticides in food, and terrorism.

- *Globally catastrophic vs. not globally catastrophic*. Risks that have the potential to affect the entire world tend to be deemed greater than those that only would affect local or national populations. For instance, the effects of nuclear war, whose aftermath could include widespread nuclear fallout and long-term physiological effects beyond the borders of any one state, is far scarier than the effects a conventional war taking place in a country other than one's own.
- *Fatal consequences vs. not fatal consequences*. A risk that results in death is more feared than other, nonlethal risks. For example, even though auto accidents are much more likely than airplane accidents, the chance of fatality is much greater for airplane accidents, and airplane accidents are thus more feared.
- *Not equitable vs. equitable*. Risks that affect one group with a greater statistical likelihood and/or consequence than the general population tend to be considered greater than those that affect all people equally, especially to those within the groups more severely affected. This is especially true if the risk disproportionately affects children.
- *Catastrophic vs. individual*. Risks that affect a great number of people in one location or at one time are more feared than those that affect individuals one at a time, over a wide location. Terrorism and earthquakes are examples of catastrophic hazards, while heart disease, auto accidents, and drowning are considered individual hazards.
- *High risk to future generations vs. low risk to future generations*. A risk that extends across generations, especially one that will affect future generations, is considered scarier than ones that will be mitigated or prevented within our own lifetime. The most apparent example of this is nuclear radiation, which can remain dangerous for thousands of years. Because of this extended danger, there still are no agreements on where spent nuclear fuel will be stored in the United States after it is no longer useful for power generation.

- *Not easily reduced vs. easily reduced*. People are more afraid of risks that cannot be easily mitigated. The effort required to reduce crime or drug use is much greater than the effort required to prevent drowning or bicycle injuries. Simply wearing a helmet on a bike, or a life preserver on a pleasure boat, greatly reduces the likelihood of injury or death. However, it takes months or years to combat a crime wave or drug problem plaguing a town or city.
- *Risk increasing vs. risk decreasing*. A risk that appears to be growing in likelihood or consequence becomes more feared. However, if a risk appears to be more easily mitigated or is decreasing in likelihood or consequence, people begin to fear it less.
- *Involuntary vs. voluntary*. Why are people more afraid of drunk drivers than of eating high-cholesterol food that will raise their risk of heart disease? How can some people smoke cigarettes, wholly unconcerned about their cancer risk, while those around them complain incessantly? The most obvious answer for both questions is that people are more concerned with risks that are involuntary than with those they bring upon themselves. Keith Smith, in *Environmental Hazards: Assessing Risk and Reducing Disaster*, discusses voluntary and involuntary risk and states, "there is a major difference between voluntary and involuntary risk perception with the public being willing to accept voluntary risks approximately *1,000 times greater than involuntary risks*" (emphasis added) (Smith, 1992).
- *Affects me vs. doesn't affect me*. Terrorism has been reported almost daily in the media for years, but until September 11, 2001, Americans who did not travel abroad did not worry about it. After that date, preventing terrorism became a national concern and a government priority. The *statistical* risk to the average person in the United States was raised only a miniscule amount, but the mere fact that people suddenly knew *for certain* that foreign terrorism could occur at home made them much more afraid.

- *Not preventable vs. preventable*. A risk that cannot be mitigated or prepared for is more feared than one that can be. For instance, in the early 1980s HIV and AIDS were seen as always fatal, and were terribly feared. With modern medicine, people who are HIV positive can live for years without contracting AIDS. While the disease is still feared, it is not perceived to be as dangerous as it was 20 years ago.

Factor 2: Factors Related to How Much Is Known about the Risk

- *Not observable vs. observable*. Risks that can be seen are less feared than those that cannot be seen or visualized. The dangers associated with radon or genetic manipulation are considered not observable, while secondhand smoke is observable.
- *Unknown to those exposed vs. known to those exposed*. If people have no way of knowing whether they are exposed to a risk, they will fear that risk more. Food irradiation and biological terrorism are examples of risks where people may not be able to know if they have been exposed.
- *Effect delayed vs. effect immediate*. Risks that cause immediate harm or damage tend to be less feared than those that cause negative effects at some future time following exposure. This is the primary reason why people tend to fear the effects of biological terrorism much more than conventional or even chemical warfare.
- *New risk vs. old risk*. Risks we are facing for the first time are much scarier than risks that we have had plenty of time to become "accustomed" to. Few people fear cars for their accident risk or fear the risk posed by vaccines, as we have lived with these technologies for decades. When anthrax was mailed to news agencies and politicians in New York, Washington, D.C., and Florida, people became extremely frightened when opening their mail, while today it is highly unlikely that anyone continues to wear a mask and rubber gloves while opening letters.

- *Risks unknown to science vs. risks known to science.* When risks can be explained using scientific evidence, people fear them less because of increased understanding. Many diseases raise questions when they are first discovered, but once their methods of transmission, prevention, and cure are revealed, they become less of a concern.

4. *Disagreements about risk should not be expected to evaporate in the presence of "evidence."* Definitive evidence, particularly about rare hazards, is difficult to obtain. Weaker information is likely to be interpreted in a way that reinforces existing beliefs (Slovic et al., 1979).

Slovic et al. (1979) discovered that "people's beliefs change slowly and are extraordinarily persistent in the face of contrary evidence. New evidence appears reliable and informative if it is consistent with one's initial belief; contrary evidence is dismissed as unreliable, erroneous, or unrepresentative." They add, "Convincing people that the catastrophe they fear is extremely unlikely is difficult under the best conditions. Any mishap could be seen as proof of high risk, whereas demonstrating safety would require a massive amount of evidence," evidence that is sometimes impossible to obtain in an accurate or timely manner (Slovic et al., 1979).

This stubbornness is compounded by the fact that once people make their initial judgments, they believe with overwhelming confidence that they are correct. This phenomenon, called the "overconfidence heuristic," states that people often are unaware of how little they know about a risk, and of how much more information they need to make an informed decision. More often than not, people believe that they know much more about risks than they actually do.

Slovic and his colleagues conducted a study to determine whether people knew if homicides were more frequent than suicides. Of participants who answered incorrectly, 12.5% gave odds of 100:1 that their answer was correct, and 30% gave odds of 50:1 that their answer was correct. In fact, suicides happen much more frequently than homicides, with an incidence of 1.7 suicides per homicide (CDC, 2002).

The overconfidence heuristic has been linked to media coverage of other spectacular events, specifically in regards to how people's rating of risks is dependent on the amount of media coverage a risk receives. For example, one study showed that a greater percentage of crimes covered by the media involve perpetrators and victims of different races than occurs in reality. In other words, a news story is more likely to describe a white victim of a black attacker than a black victim of a black attacker, even though the latter is more common. This inconsistency in coverage is seen as the main reason Caucasians overestimate their likelihood of being a victim of interracial crime by a factor of 3 (Twomey, 2001).

Paul Slovic writes that "strong beliefs are hard to modify" and "naïve views are easily manipulated by presentation format" (Slovic, 1986). Often, only time will change people's opinions about the risks they personally face. One reason that people are more scared of a new risk than an old risk is that they have not been able to gather enough information to alter their initial fearful impression. After time has passed and they realize that their expectations for victimization have not been realized for themselves or anybody that they know, they can begin to question the validity of their views.

Elspeth Young of the Australian National University describes social constructs of risk. These are human attributes that define how different people assess risk and determine personal vulnerability. They include:

1. *Socioeconomic characteristics* (*including age, gender, ethnicity, income, education, employment, and health*). "Older people and children may be much more vulnerable than active adults. Poorer people, with fewer capital resources, are likely to suffer far more from the effects of hazards such as flood invasion of their homes. Some specific ethnic groups may be much less able to take advantage of the assistance offered because of communication problems and cultural differences" (Young, 1998).

2. *People's knowledge of the environment and the hazards that the environment poses to them* (*traditional ecological knowledge*). "Traditional ecological knowledge may be effectively used to cope with a situation that outsiders perceive to be threatening, and generally provides much more detailed understanding of local environments. It can be valuable in predicting the threats posed by hazards (e.g. when significant floods are actually likely)" (Young, 1998).

3. *Their ignorance.* "For example, people who have newly moved into a vulnerable area often lack knowledge of the actual threats posed by hazards such as severe [wild]fires, and fail to take suggested precautions seriously" (Young, 1998).

4. *Their ability to cope with those hazards.* "[People are able to cope] through technology, financial attributes, education, political power, and having a voice. Knowledge, high levels of education, and high incomes generally give people more confidence in articulating their feelings and needs and hence they may be able to cope better with adversity" (Young, 1998).

5. *Their ability to access help from outside.* "Having confidence makes asking for assistance much easier" (Young, 1998).

The ways in which hazard risk is presented or reported greatly influence how people perceive the hazard. For instance, Slovic and Weber (2002) describe several ways that a risk manager could describe the risk from a nearby factory to an exposed population. While all of measurements will describe the same risk factor, each one is likely to produce a different number. The ways in which people perceive that number will be different as well. Such measurements include (Slovic and Weber, 2002):

1. Deaths per million people in the population
2. Deaths per million people within x miles of the source of exposure
3. Deaths per unit of concentration
4. Deaths per facility
5. Deaths per ton of air toxin released

6. Deaths per ton of air toxin absorbed by people
7. Deaths per ton of chemical produced
8. Deaths per million dollars of product produced
9. Loss of life expectancy associated with exposure to the hazard

Richard Wilson (1979) describes ways in which risks can be compared by calculating risks that increase a person's chance of death by one in one million (0.000001). It must be noted that these risks are population risks, as opposed to individual risks. These compared risks are provided as Exhibit 3-8.

Risk comparisons can also cause incorrect perception of risk if they are not presented in an appropriate manner. Kenneth Warner (1989) describes how the media often use vivid comparisons to better explain risks to their audience. He gives three examples of comparisons provided by the media to describe the risks associated with cigarette smoking:

1. "On average, cigarettes kill as many people as would die if three passenger-laden jumbo jets crashed every day, month after month, year after year."
2. "In one year, cigarettes kill more Americans than died in World War I, the Korean War, and the Vietnam War combined."
3. "The annual death toll associated with cigarette smoking is equal to that of a hydrogen bomb dropped in the heart of a city such as Miami, Kansas City, Cleveland, or wherever." (Warner, 1989)

Warner describes how the conceptual differences between the slow death associated with smoking-induced cancer or emphysema and the immediate deaths associated with being shot in a war, incinerated in a hydrogen blast, or killed in a plane crash render such comparisons ineffective. These comparisons attempt to elicit the fear associated with the risk characteristics identified by Slovic, Fischhoff, and Lichtenstein (1979). Studies have shown, however, that these types of comparisons lack the desired effect.

People's perceptions of risk can also be influenced by the emotions elicited by a particular report on a

EXHIBIT 3-8   Risks That Increase Chance of Death by 0.000001 (1 in 1 Million), Followed by the Cause of Death

- Smoking 1.4 cigarettes (cancer, heart disease)
- Drinking one-half liter of wine (cirrhosis of the liver)
- Spending one hour in a coal mine (black lung disease)
- Spending three hours in a coal mine (accident)
- Living two days in New York or Boston (air pollution)
- Traveling six minutes by canoe (accident)
- Traveling 10 miles by bicycle (accident)
- Traveling 300 miles by car (accident)
- Flying 1000 miles by jet (accident)
- Flying 6000 miles by jet (cancer caused by cosmic radiation)
- Living two months in Denver (cancer caused by cosmic radiation)
- Living three months in average brick or stone building (cancer caused by natural radioactivity)
- One chest X-ray taken in a good hospital (cancer caused by radiation)

- Living two months with a cigarette smoker (cancer, heart disease)
- Eating 40 tablespoons of peanut butter (liver cancer caused by aflatoxin B)
- Drinking Miami drinking water for one year (cancer caused by chloroform)
- Drinking 30 12-ounce cans of diet soda (cancer caused by saccharin)
- Living five years at the boundary of a typical nuclear power plant in the open (cancer caused by radiation)
- Living 20 years near a PVC plant (cancer caused by vinyl chloride)
- Living 150 years within 20 miles of a nuclear power plant (cancer caused by radiation)
- Eating 100 charcoal-broiled steaks (cancer from benzopyrene)

Source: Adapted from Wilson, 1979.

hazard. According to a report in the *Washington Post*, Jennifer Lerner of Carnegie Mellon University discovered that people who watched media reports framed in a way to cause fear, like one on bioterrorism, would likely overestimate their personal exposure to risk. However, people who watched reports that elicited anger, such as ones showing Palestinians and other people celebrating the 9/11 attacks, were likely to perceive their exposure to terrorism as relatively less than the fearful group's perception. Lerner attributes to the effects of these fear-inducing reports the fact that in surveys conducted after 9/11, Americans felt they faced a 20% chance of being a direct victim of future attacks, and felt that the "average American" faced a 48% chance of being a victim (Vedantam, 2003).

Lerner found that women tended to respond with more fear to terrorism risk-related articles, while men tended to respond more with anger. She contends, "the government and the media can unwittingly alter risk perception by making people either fearful or angry," and further state, "[u]sed responsibly, that connection could also be used to better communicate the real degree of risk" (Lerner, 2003).

Risk Perception Is Necessary for Disaster Management and Communications

Most people do not rely on statistical likelihoods to determine what risks they fear but consider other qualitative aspects, which can be due to attributes of the hazard itself or each individual's personal experience

and information exposure. The outcome of these risk perception effects is that there is no single, universal, agreed-upon ranking of hazard risks.

Disaster managers need to consider risk when performing their assessments, but also are influenced by the effects of risk perception, regardless of their knowledge or expertise in risk management. C. J. Pitzer writes in the *Australian Journal of Emergency Management*:

> We make a fundamental mistake when we, as safety managers, deal with risk as a "fixed attribute," something physical that can be precisely measured and managed. The misconception of risk as a fixed attribute is ingrained into our industry and is a product of the so-called science of risk management. Risk management has created the illusion that risk can be quantified on the basis of probability, exposure to risk, and from the likely consequences of accidents occurring. Risk management science can even produce highly technical and mathematically advanced models of the probabilistic nature of a risk.
>
> The problem with this is that risk is not a physical quantum. It is, instead, a social construction. Everyone has a unique set of assumptions and experiences that shape their interpretations of objects or events. People tend to ignore, "misperceive" or deny events that do not fit their worldview. People find what they expect to find. (Pitzer, 1999)

Elspeth Young writes:

> risk should not be defined solely by pre-determined, supposedly objective criteria that enable its various levels to be gauged through quantification. It is also a social construct, interpreted differently by all of us. Some find certain events or situations unacceptably risky and will do their utmost to avoid being involved, while to others the same events may offer exhilaration and thrills that stimulate their whole purpose of living. There may even be others to whom the particular event is a non-issue, something to be totally ignored. These differences in perception and response, coupled with differences in people's socio-economic characteristics and circumstances, result in a wide range of vulnerability in any community. Social aspects of risk interpretation must be recognized if risk is to be effectively managed, and community participation in the practical management of the problem faced is a vital component of this approach. (Young, 1998).

When disaster managers perform the hazards risk management process, they take many steps during the process that require the use of both qualitative assessments and personal experience and opinions. Because of differences in risk perception, the hazards risk management process can be flawed if risk managers do not accommodate inconsistencies between their own and their constituents' perceptions and reality.

For instance, during hazard identification, a hazard first must be perceived as a risk before it is identified as one. Perception is not the same as awareness. An obvious example is a hazards risk management team that is *unaware* that chlorine is used to purify water in the community. Without this knowledge, they may not know that the hazardous chemical (capable of causing mass casualty disasters) is not only transported by truck through populated areas several times a year but also stored in a location where a leak or explosion could result in many fatalities. This is *not* an issue of risk perception. Now, imagine that the same team is aware of the above information but they have never heard of a disaster actually happening, or the one accident they have heard of did not result in any deaths, and they decide that the chlorine is something they do not need to worry about in their assessment. This is a result of the effects of risk perception (the availability and overconfidence heuristics, in this case).

Risk perception may have the opposite, compounding effect for disaster managers. For instance, it is possible that a risk that is essentially harmless or has extremely low likelihood or consequence is perceived to be much greater than reality by a manager or by the public. Such faulty perceptions on the part of the disaster management team could result in time or funding wasted in mitigation and preparation for a risk that may never happen, at the expense of neglecting a more severe risk that threatens the population to a greater degree. However, if the disaster managers have an accurate impression of a risk and determine that it is low enough that they need not worry about it, while the public perceives it to be significant, they run the risk of appearing negligent. Only effective public education and risk communication can counter the effects of public (mis)perception of risk.

Risk perception can also influence the way that the mitigation of a hazard is considered by decision

makers or by constituents within a community. If a hazard is not perceived to be a significant risk by those who decide to fund mitigation projects, funding is unlikely to be provided without significant efforts being made to correct those perceptions. Likewise, if the public does not perceive a hazard to affect them personally, they are unlikely to take any personal measures to prepare or mitigate for that hazard. Once again, the presence of differing risk perceptions highlights the need for effective risk communication as a component of mitigation and preparedness.

Risk perception can lead to difficulties in making important decisions on the management of hazard risks. Slovic and Weber write:

> perceptions of risk play a prominent role in the decisions people make, in the sense that differences in risk perception lie at the heart of disagreements about the best course of action between technical experts and members of the general public, men vs. women, and people from different cultures. Both individual and group differences in preference for risky decision alternatives and situational differences in risk preference have been shown to be associated with differences in perceptions of the relative risk of choice options, rather than with differences in attitude towards perceived risk. (Slovic and Weber, 2002)

Managing risk perceptions is an important component of the hazards risk management process. With an understanding of the perceptions and misperceptions of risk made by their constituents, hazards risk managers can work to correct those misperceptions and address the public's fears and concerns. Failure to do so could easily lead to any of the mistakes discussed here.

Barry Glassner provides one example of the secondary effects of misperception of risk on a community. In the 1990s, the media widely reported on a "crime wave" against tourists in Florida that resulted in 10 murders. It was called a crime wave because the media labeled it as such.

> Objectively speaking, 10 murders out of 41 million visitors did not even constitute a ripple, much less a wave, especially considering that at least 97% of all victims of crime in Florida are Floridians. Although the Miami area had the highest crime rate in the nation during this period, it was not tourists who had most cause for worry. One study showed that British, German, and Canadian tourists who flock to Florida each year to avoid winter weather were more than 70 times more likely to be victimized at home. (Glassner, 1999).

This widespread misperception of risk was not adequately managed and made many tourists think twice before traveling to Florida, and the tourism industry suffered as a result.

It is important for risk managers to evaluate personal perceptions because they will undoubtedly influence the process of risk identification, subsequent analysis, and treatment. Because much of the risk identification and analysis processes are based upon qualitative information, great discrepancies can exist, even between experts.

Risk managers must be as certain as possible that their assumptions and perceptions concerning risk mirror reality as closely as possible. Risk managers who incorrectly overstate a hazard will devote a disproportionate and inappropriate amount of available resources and time to that hazard.

For hazards risk management to be effective, an overall philosophy of cost effectiveness must be employed, and without accurate information and risk perceptions, such cost effectiveness is unlikely.

Risk managers must not assume anything. They must utilize as many historical records and officially recognized hazard profiles as possible. Many public, private, and nonprofit agencies specialize in specific hazards and are likely to have the most accurate information concerning risk likelihood and consequence data.

The public is likely to overestimate some risks and underestimate others, depending upon the general risk perception characteristics listed above. If the public collectively overestimates the likelihood or consequence of a particular hazard, such as the presence of a nearby nuclear power plant, then they may demand from public officials a significant effort to decrease what they see as a great risk. While initiating

an increased level of preparedness and mitigation may not be a particularly effective and efficient use of resources, simply ignoring the public's concerns can have significant political implications.

With an understanding of the public's perceptions, risk managers can initiate a program of risk communication and public education to increase understanding and steer public concern toward risks of greater consequence and likelihood, such as house fires or floods.

Conversely, disaster managers should be aware of a collective public risk perception that underestimates the incidence or consequences of a certain hazard, such as underground power lines. A significant number of people have been killed who made contact with underground power lines while performing construction or landscaping work. Public education campaigns have regularly stressed to citizens the significance of the hazard. Similar campaigns are employed for risks such as drug abuse, forest fires, smoking, poisons, and so on. These risks tend to be ones that kill many more people than all natural hazards combined, but are not considered appropriately "risky" by the public.

The Term *Safe*

Those involved in disaster management are often faced with defining what level of safety from hazard exposure is considered sufficient. There is not necessarily a correct answer to the question "How safe is safe enough?" (Derby and Keeney, 1981) Most people assume that referring to something as "safe" implies that all risk has been eliminated. However, because such an absolute level of safety is virtually unattainable in the real world, risk managers must establish thresholds of risk that define a frequency of occurrence below which society need not worry about the hazard. Derby and Keeney contend that a risk becomes "safe," or "acceptable," if it is "associated with the best of the available alternatives, not with the best of the alternatives which we would *hope* to have available" (emphasis added, Derby and Keeney, 1981).

This definition can cause great disagreement between the public and disaster management officials. The public may expect a level of safety determined to be zero risk for some hazards, such as terrorism in the United States today. Officials may need to continually recalibrate the public's perception of these hazards to let the public know that, while the risks are in fact still possible, they have been mitigated to the best of the country's or community's social, economic (available resources), and technological abilities. While the chances of a terrorist attack will always exist, governments strive to attain levels of security dictating that the risks are so low that people need not worry.

To determine what level of safety is most acceptable, Derby and Keeney (1981) contend that the best combination of advantages and disadvantages must be chosen from among several alternatives. For instance, although the risk of car accidents is one of the greatest we face on a daily basis, eliminating the risk by prohibiting the use of cars is impractical. However, we can make cars more resistant to impact, add seat belts and air bags, and enact laws and regulations that limit the ways in which cars are operated the cars. The result is a level of safety upon which society agrees is acceptable in relation to the benefits (mobility) retained.

Paul Barnes of the Australia Department of Primary Industries explains the importance of establishing an agreement on what constitutes safety in the community. He writes:

Is our goal Community Safety or Safer Communities? As a societal outcome, Community Safety can be sought via efficient and effective regulation at an institutional level. Associated with this regulation must be similarly high standards of risk management applied at the community level. The establishment of safer communities, however, is a different matter. Before this can be sought as a goal, determinations must be made about what safety means to the communities themselves. To do this, institutional regulators must ensure that use of their expertise does not promote inflexibility in understanding the world-views of the public. (Barnes, 2002)

CONCLUSION

Risk and vulnerability reduction are paramount to reducing injuries, deaths, and damages associated with disasters. All nations may significantly reduce their risk and vulnerability, no matter their wealth or facilities. Yet most nations, disaster management emphasis focuses only upon the postdisaster functions of response and recovery, rather than predisaster mitigation and preparedness. Fortunately, nations such as Australia, New Zealand, and the United States and international organizations such as the United Nations are working hard to reverse these reactive attitudes.

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4

Mitigation

INTRODUCTION

Mitigation, sometimes called prevention or risk reduction, is often considered the "cornerstone of disaster management" (FEMA, 2005). While the three other components of the disaster management cycle (preparedness, response, and recovery) are performed either in reaction to hazards or in anticipation of their consequences, mitigation measures seek to reduce the likelihood or consequences of hazard risk before a disaster ever occurs.

Mitigation is by no means a simple answer to the hazard problem, however. In fact, because of the numerous difficulties associated with it, only in the last few decades has its full potential at controlling hazard risk been recognized. Mitigation measures tend to be costly, disruptive, time consuming, and in some cases socially unpalatable. They almost always carry their own inherent risk and do not always work as intended. Political will for mitigation is hard to come by in many situations, and the public's attention span tends to be too short to accommodate the significant life changes that may be necessary for mitigation to work. Furthermore, mitigation traditionally has been a luxury of the rich nations, with many societies considering it to be something they cannot justify or afford in light of other, more immediate issues.

However, as the practice of mitigation grows throughout the world, in both wealthy and developing nations, it is emerging as a means of measurably reducing the incidence of many types of disaster. The International Decade for Natural Disaster Reduction and the subsequent International Strategy for Disaster Reduction have proclaimed its value. Following the 2004 tsunami events in Asia that resulted in the deaths of over 120,000 people, it was recognized that a simple, cost-effective early warning system like those currently in use in many nations around the globe would have prevented such a significant loss of life. Clearly, the solutions exist, but the problem lies in implementation.

This chapter will provide an overview of mitigation and describe its various forms. Insurance as a mitigation option will be detailed. Finally, several of the many obstacles to mitigation will be presented.

WHAT IS MITIGATION?

Mitigation is defined as any sustained effort undertaken to reduce a hazard risk through the reduction of

the likelihood and/or the consequence component of that hazard's risk. In other words, mitigation seeks either to make a hazard less likely to occur or to reduce the negative effects if it were to occur.

Each hazard is unique in its effect on humans and the natural and built environments. Likewise, each hazard has a unique set of mitigation options from which disaster managers may choose that have been developed or been conceived but remain to be developed. Each option carries an associated cost, a level of feasibility based upon several factors, and an expected success rate for actually reducing the risk as designed. What methods, if any, the disaster manager selects will be wholly dependent upon these and a range of other factors, including the amount of funds available, the anticipated social and physical consequences of such actions, and the receptiveness of the geographic environment into which the measure will be applied.

Once identified and analyzed, as explained in the preceding chapters, risks can be evaluated to determine methods to handle them. As part of this process, mitigation techniques are identified (or developed, if adequate mitigation does not exist for a specific risk) and considered according to their ability to reduce or eliminate hazard likelihood or consequence. While it is true that most risks can be reduced through proper mitigation, such efforts generally become increasingly expensive as the actual level of risk reduction increases. Therefore, depending on the nature of the risk, several different mitigation alternatives may need to be considered and applied to ensure a comprehensive examination of costs to benefits, as shown below.

MITIGATION GOALS

When considering the mitigation options suitable for treating a hazard risk, several general goals classify the outcome that disaster managers may seek: risk likelihood reduction, risk consequences reduction, risk avoidance, risk acceptance, and risk transfer, sharing, or spreading.

Risk Likelihood Reduction

It is possible to reduce the chance that many hazards will manifest themselves. For these hazards, risk is reduced through a reduction in likelihood. Of course, for some hazards, such as hurricanes, such intervention obviously is not yet technically possible (despite many attempts to prove the contrary, including the proposal to detonate a nuclear device in a hurricane's eye). Other hazards, such as river flooding, have several mitigation options available to disaster managers, including dikes, levees, and buyouts (see below), each with associated benefits and secondary risks.

Technological and intentional hazards tend to have a greater overall application of measures that seek to reduce hazard likelihood, simply because the very existence of these hazards is a direct result of human decision. For example, tandem trailers, developed for cargo transport, have been proven to be involved in more accidents than traditional single-trailer rigs. Restricting the use of these vehicles immediately reduces the risk likelihood. While we can't feasibly "decide" not to have a natural hazard, we can do so with other hazard forms.

Mitigation measures that seek to reduce risk likelihood tend to be nonstructural in nature, though not without exception.

Risk Consequences Reduction

The second primary goal that disaster managers seek through mitigation is a reduction in the impact of a hazard to humans, structures, the environment, or any combination of these. Mitigation measures that address consequences assume that a hazard will occur with an associated intensity or magnitude, and they ensure that the protected structure, population, system, or other subject is able to withstand such an event without negative consequence. Again using the example of hurricane mitigation, we can see that there is a much greater chance of mitigation success with some hazards when disaster managers address those hazards' consequences. Mechanisms enabling structures

to be raised above storm surge levels and strengthened against wind damage, storm shelters for affected populations, and regulations restricting actions and activities in high-risk areas all work to considerably reduce the consequences from hurricanes.

Most hazards have one or more options for disaster consequence reduction, which cannot always be said of likelihood reduction. For natural disasters, these measures tend to be structural, and address the hardening of structures and systems and the protection of people. For technological hazards, consequence reduction revolves around the development of primary and redundant safety, containment, and cleanup systems. Consequence reduction for intentional hazards, especially terrorism, are still in the primary stages of development, though the increase in global attention to terrorism involving weapons of mass destruction has drastically quickened the pace of such research and development efforts.

Risk Avoidance

Some hazard risks are so great that even with a partial reduction in either their likelihood or consequence, the resulting outcome is still unacceptable. For these risks, only total avoidance is considered, and so it is deemed necessary to take action to reduce either the likelihood or the consequence factor to absolute zero. One day, future discoveries may allow for manageability of these hazards such that they are tolerated, but current methods of mitigation are either nonexistent or prohibitively expensive.

Total risk avoidance for natural hazards usually means removing all people and structures out of the affected area. Such measures are understandably unrealistic for hazards that have a wide geographic range. Of course, civilizations have tended to avoid such high-risk areas—as is evident by the historical lack of development in harsh or dangerous climates such as the Antarctic continent. Risk avoidance may be possible for other hazards for which risk is not so all-encompassing and can be mapped within regions. For example, buyout programs seek to physically remove all structures within a floodplain and then restrict all future construction in that reclaimed area.

Risk avoidance is most commonly used in the treatment of technological disasters, for which risk acceptability is subject to more critical consideration in society. For example, since the famed 1979 Three Mile Island nuclear reactor accident, not one new reactor has been approved for construction in the United States. In the case of natural disasters, implementing risk avoidance measures in areas that have already been settled can be very difficult, due to sociocultural and legal matters. Avoidance mitigation often involves uprooting whole communities, at least a temporary reduction in services and quality of life, and the disruption of cultural and social frameworks. These measures are rarely conducted without resistance, ultimately requiring forced implementation by law enforcement or other government authority figures.

Risk Acceptance

For certain hazards, disaster managers, as well as societies and individuals, will consider a certain risk to be acceptable "as is." It may be determined that any further reduction in risk is either too expensive or unnecessary. Several reasons might lead to this decision.

First, every community, country, or region has a whole range of hazards with which it must contend, and it assuredly has limited funding to treat that range of hazards. Certain risks, shown by their cost-benefit analyses, are better left untreated so that funding that would have been dedicated to that treatment may be applied to other hazards for which risk reduction will have greater value.

Second, some risk reduction measures will result in one or more undesirable consequences. These secondary consequences may simply be the reduction in an enjoyed benefit that existed because of the hazard, or undesirable consequences may be expected to arise as a direct result of the mitigation measure (in which case, the secondary consequences are considered more damaging or undesirable than the consequences of the hazard risk itself).

A third reason risk acceptance many be practiced relates to sociocultural patterns. Many cultures identify with a certain place or location, and would rather face a certain risk than leave for a "safer" option. Certain religious beliefs cause people to accept risks as the will of some higher power that is beyond their control, not as an avoidable option. These reasons pose especially difficult obstacles to disaster managers, as will be detailed later in this chapter.

Unlike risk avoidance, risk acceptance is rarely considered a luxury. Japan, for instance, spends more that $2 billion on mitigation-related projects each year (UNDP, 1994). In most cases, risk acceptance is entertained or applied not when risk reduction or avoidance measures are unavailable but when they are unaffordable. Understandably, risk acceptance, even if in a de facto manner, occurs most commonly in poor nations that are forced into such decisions by their lack of available funds.

Risk Transfer, Sharing, or Spreading

The final and most debated goal of mitigation is risk transfer, sharing, or spreading. The concept behind this goal is that the risk is not actually reduced, but its consequence or likelihood is diluted across a large group of people such that each suffers an average consequence (which may in fact be greater or less than what each would have suffered without participation in the measure).

The most common forms of risk transfer are insurance coverage and international reinsurance. Insurance reduces the financial consequence of a hazard risk by eliminating the monetary loss of property. Insurers charge a calculated premium, priced according to the hazard's expected frequency and consequence, that guarantees the repayment of losses in the event that the insured hazard occurs. The cost of the disaster is thereby shared by (or "spread across") all customers through the payment of premiums. Victims and nonvictims alike pay the same premium (the "consequence"), with the common fund collected bearing the brunt of the disaster.

Risk sharing, spreading, and insurance schemes appeared as early as 1950 BC when shipping companies began practicing bottomry, the sharing of costs related to maritime risk among all vessels in a fleet (Covello and Mumpower, 1985). Insurance as a mitigation option is not without controversy, and is discussed in further detail later in this chapter. Noninsurance forms of risk spreading do exist, including crop diversification and redundancy in lifeline systems. These will also be discussed.

More direct risk sharing and spreading measures are common in developing countries, where informal agreements exist within social groups to accommodate the particular needs of victims within those groups. One common practice is food sharing schemes, which ensure that all members of a community have enough to eat despite seasonal or unexpected shortages of their personal crops.

TYPES OF MITIGATION: STRUCTURAL AND NONSTRUCTURAL

The mitigation measures that are employed to achieve the first two goals listed above, a reduction in the likelihood or consequence of a hazard, are grouped into two primary categories: structural and nonstructural. Though these two terms are almost universally used to differentiate between the various options available to disaster managers, much disagreement exists concerning the actual delineation of what makes something structural or nonstructural.

For the purposes of this text, structural mitigation is defined as a risk reduction effort performed through the construction or altering of the physical environment through the application of engineered solutions. Nonstructural mitigation is defined as a measure that reduces risk through modification in human behavior or natural processes without requiring the use of engineered structures. It must be noted that, while there are several mitigation measures that will clearly fit into one category or the other regardless of the definition of the terms, there are also many that could go

either way, and may appear as one form in this text and another form elsewhere. These two categories are described in detail below.

STRUCTURAL MITIGATION

Structural mitigation measures are those that involve or dictate the necessity for some form of construction, engineering, or other mechanical changes or improvements aimed at reducing hazard risk likelihood or consequence. They often are considered attempts at "man controlling nature" when applied to natural disasters. Structural measures are generally expensive and include a full range of regulation, compliance, enforcement, inspection, maintenance, and renewal issues.

Though each hazard has a unique set of structural mitigation measures that may be applied to its risk, these measures may be grouped across some general categories. Each category will be described below, with examples of how the mitigation type would be applied to one or more individual hazard types. The general structural mitigation groups to be described are:

- Resistant construction
- Building codes and regulatory measures
- Relocation
- Structural modification
- Construction of community shelters
- Construction of barrier, deflection, or retention systems
- Detection systems
- Physical modification
- Treatment systems
- Redundancy in life safety infrastructure

Resistant Construction

Clearly, the best way to maximize the chance that a structure is able to resist the forces inflicted by various hazards is to ensure that it is designed in such a way *prior to construction* to do just that. Through aware-

FIGURE 4-1   House built on stilts above annual flood levels in Guayas Province, Ecuador. (*Source:* Author.)

ness and education, individual, corporate, and government entities can be informed of the hazards that exist and the measures that can be taken to mitigate the risks of those hazards, allowing resistant construction to be considered. As a mitigation option, designing hazard resistance into the structure from the start is the most cost-effective option and the option most likely to succeed.

Of course, whether builders choose to use hazard-resistant design depends upon whether they have access to the financial resources, the technical expertise necessary to correctly engineer the construction, and the material resources required for such measures.

Where cultures have adapted to living with a hazard, construction styles may incorporate hazard-resistant design. This is often seen in areas with annual flooding, where houses are built on stilts (see Figure 4-1). An example of a culturally adjusted hazard-resistant construction style is the houses built by the Banni in India (discussed in Chapter 3), which resist the shaking of earthquakes. Little funding and minimal added effort are required to design these mitigation measure into the construction from the start, but building a standard, nonresistant house and altering it at a later time is both cost- and ability-prohibitive.

Building Codes and Regulatory Measures

Hazard-resistant construction, explained above, is clearly an effective way to reduce vulnerability to select hazards. However, the builder of the house must apply these resistant construction measures for there to be an actual reduction in a population's overall vulnerability. One way that governments can ensure members of the population apply hazard-resistant construction is by creating building codes to guide construction and passing legislation that requires those codes be followed.

Regulatory structures are one of the most widely adopted structural mitigation measures, used in almost every country of the world in some form. With sufficient knowledge about the hazards likely to affect a region or a country, engineers can develop building codes that guide builders to ensure that their designs are able to resist the forces of the relevant hazards. Though simple in theory, inherent problems with codes and regulations can drastically decrease their effectiveness.

Building codes ensure that structure designs include resistance to various forms of external pressure. Each hazard emits a unique set of external pressures on structures, including:

- Lateral and/or vertical shaking (earthquakes)
- Lateral and/or uplift load pressure (severe storms, cyclonic storms, tornadoes, windstorms)
- Extreme heat (structure fires, wildland fires, forest fires)
- Roof loading (hailstorms, snowstorms, ash falls)
- Hydrological pressure (floods, storm surge)

When properly applied, building codes offer a great deal of protection from a wide range of hazards. They are a primary reason for the drastic drop in the number of earthquake deaths in the developing world during the last century. They are so effective because they completely integrate protection measures into the structure from the design phase onward, rather than applying the measures after construction.

Unfortunately, these measures have several negative aspects that prevent them from being used more widely and more effectively. Although almost all countries have building codes, few use them to their fullest capacity. First, any increase in building resistance increases the subsequent cost of construction. Developers fight the creation of strict building codes because the need to use stronger and additional materials decreases the profit margins of their structures.

Second, in order for building codes to be successful, there must be compliance. Compliance can only be ensured through enforcement, which creates a new budgetary expense for government officials. Even when enforcement is possible through building inspections, misconduct is always possible in the form of bribery, neglect, cronyism, etc. Inspectors may lack the proper training or expertise to adequately do their job, leaving them unable to correctly identify hazardous conditions or breaches in building codes.

Relocation

Occasionally, the most sensible way to protect a structure or a people from a hazard is to relocate it or them away from the hazard. Homes and other structures may be disassembled or transported intact.

Flooding is the most common reason that structures are relocated. Though destroying the original structure and rebuilding it elsewhere is often less expensive and technically more feasible, in certain circumstances such actions are either impossible or undesirable. For example, the structure in question may be a cultural heritage site that cannot be replaced. The Abu Simbel temple in Egypt, which would have been flooded after the damming of the Nile at Aswan, was moved 90 meters from its original location to protect it.

In some instances where the hazard area is especially great, moving entire communities may be necessary. One such example is the town of Valdez, Alaska, which was relocated in 1967 after hazard assessments showed that the entire town was built upon unstable soil. Fifty-two of the original structures were moved to a new site four miles away, while the rest were destroyed and rebuilt in their new location.

FIGURE 4-2   Mexico City parking garage with external steel frame retrofit. (*Source:* Author.)

Structural Modification

Scientific progress and ongoing research continually provide new information about hazards. This new information can reveal that structures in identified risk zones are not designed to resist the forces of a likely hazard. There are three treatment options for these structures. First is to do nothing. Second, the structure may be demolished and rebuilt to accommodate the new hazard information. Third, often the most appropriate action, is to modify the structure such that it resists the anticipated external forces. This action is often referred to as retrofitting (see Figure 4-2).

How the retrofit affects the structure depends on the hazard risk that is being treated. Examples of hazards and their retrofits include:

- *Cyclonic storms*. Wind-resistant shingles; shutters; waterproofing (often called secondary water resistance [SWR]); stronger frame connections and joints (including "roof straps," which help secure the roof to the main structure of the house); structural elevation; lateral support structures; stronger doorways (including garage doors)
- *Earthquakes*. Sheer walls; removal of cripple walls; foundation anchor bolts; frame anchor connections; floor framing; chimney reinforcement; base isolation systems; external frames; removal of roof weight; soft-story reinforcement
- *Floods*. Structural elevation; first-floor conversion; "wet" and "dry" floodproofing; foundation flood vents
- *Wildfire*. Replacement of external materials, including decks, gutters, downspouts, paneling, doors, window frames, and roof shingles, with those that are fire-resistant
- *Hail*. Increase roof slope; strengthen roof materials; strengthen load-carrying capacity of flat or shallow-angle roofs
- *Tornadoes*. In addition to the modifications for cyclonic storms, construction of a "safe room" or basement shelter
- *Lightning*. Electrical grounding of the house with lightning rods or other devices
- *Extreme heat*. Air-conditioning systems
- *Terrorism*. Hardening of exterior walls; construction of blast walls; replacement of glass with shatter-resistant material; use of a filtered and restricted-access air system; restricted-access entryway

Construction of Community Shelters

The lives of community residents can be protected from a disaster's consequences through the construction of shelters designed to withstand a certain type or range of hazard consequences. Shelters are usually constructed when it is either unlikely or unrealistic for all or a majority of community members to be able to protect themselves from the hazard in their homes or elsewhere. Two systems must be in place in order for shelters to work. First, there must be an effective early warning system that would enable residents to have enough time to travel to the shelter before the hazard event. This immediately rules out several

hazards for which warning is impossible or unlikely, such as earthquakes or landslides. Second, there must be a public education campaign that both raises awareness of the existence of the shelter and teaches residents how to recognize when to travel to the shelter.

During the Cold War, many countries built shelters or designated qualified buildings to protect citizens from the dangerous fallout effects of a nuclear attack. Shelters are much more likely to be utilized in poor communities throughout the world, where housing construction is especially deficient. For this reason, it is common for community development projects to design community buildings like schools that double as a shelter in the event of a disaster.

Construction of Barrier, Deflection, or Retention Systems

The forces that many hazards exert upon man and the built environment can be controlled through specifically engineered structures. These structures fall under three main categories: barriers, deflection systems, and retention systems.

Barriers are designed to stop a physical force dead in its tracks. Their job is to absorb the impact of whatever force is being exerted. They are, in other words, blocking devices. Barrier walls can be made of natural materials, such as trees, bushes, or even existing soil, or they can be constructed of foreign materials, such as stone, concrete, wood, or metal. Depending upon the hazard type, barriers may be built on just one side of a structure, or may completely surround it. Examples of barriers and the hazards they are designed to protect against include:

- Seawalls (cyclonic storm surges, tsunamis, high waves, rough seas, and coastal erosion) (see Figure 4-3)
- Floodwalls (floods, flash floods)
- Natural or synthetic wind and particle movement barriers (strong seasonal winds, sand drift, dune movement, beach erosion, snow drift)
- Defensible spaces (wildfires, forest fires)

FIGURE 4-3   Example of a seawall failure following Hurricane Jeanne in 2004, Melbourne Shores, Florida. (*Source:* United States Geological Survey, 2004.)

- Mass movement protection walls (landslides, mudslides, rockslides, avalanches)
- Security fences, checkpoints (terrorism, civil disturbances)
- HAZMAT linings (ground contamination)

Deflection systems are designed to divert the physical force of a hazard, allowing it to change course so that a structure situated in its original path escapes harm. Like barriers, deflection systems may be constructed from a full range of materials, both natural and manmade. Examples of deflection systems and the hazards they are designed to protect against include:

FIGURE 4-4   Flood spillway in use on Hayes Lake, Roseau River, United States. (*Source:* US National Oceanographic and Atmospheric Administration, 2002.)

- Avalanche bridges (snow avalanches)
- Chutes (landslides, mudflows, lahars, rockslides)
- Lava flow channels (volcanic lava)
- Diversion trenches, channels, canals, and spillways (floods) (see Figure 4-4)

Retention systems are designed to contain a hazard, thereby preventing its destructive forces from ever being released. These structures generally seek to increase the threshold to which hazards are physically maintained. Examples include:

- Dams (drought, floods)
- Levees and flood walls (floods)
- Slit dams (sedimentation, floods)
- Landslide walls (masonry, concrete, rock cage, crib walls, bin walls, and buttress walls)
- Slope stabilization covers (concrete, netting, wire mesh, vegetation) (landslides, mudflows, rockfalls) (see Figure 4-5)

Detection systems are designed to recognize a hazard that might not otherwise be perceptible to humans. They have applications for natural, technological, and intentional hazards. As more funding is dedicated to the research and development of detection systems, their ability to prevent disasters or warn of hazard consequences before disaster strikes increases. With natural disasters, detection systems

FIGURE 4-5   Slope covered with concrete and outfitted with drainage pipes to prevent landslides. (*Source:* Author.)

are primarily used to save lives. With technological and intentional hazards, however, it may be possible to prevent an attack, explosion, fire, accident, or other damaging event. Examples of detection systems are:

- Imaging satellites (wildfires, hurricanes, volcanoes, landslides, avalanches, floods, fire risk, terrorism, virtually all hazards)
- Chemical/biological/radiological/explosive detection systems (technological hazards (chemical leaks, pipeline failures), terrorism)
- Ground movement monitoring system (seismicity, volcanic activity, dam failure, expansive soils, land subsidence, rail infrastructure failure)
- Flood gauges (hydrologic hazards)
- Weather stations (severe weather, tornadoes)
- Undersea and buoy oceanic movement detection (tsunamis) (see Figure 4-6)
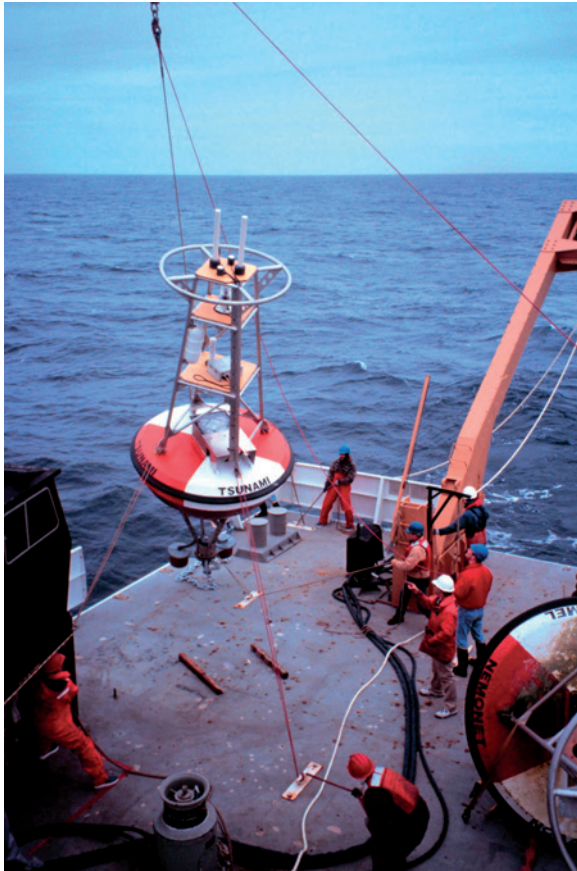- Information systems (epidemics, WMD terrorism)

FIGURE 4-6   Tsunami buoy being deployed in the Pacific Ocean by the US National Oceanographic and Atmospheric Administration (NOAA) ship *Ronald H. Brown*. (*Source:* NOAA photo.)

FIGURE 4-7   Slope terracing in Nepal. (Photo courtesy of Sharon Ketchum.)

- Anchors and piling—landslides
- Removal and/or replacement of soils—expansive soils
- Wetland reclamation—flooding
- Dredging rivers—flooding
- Dredging reservoirs—drought

Treatment systems seek to remove a hazard from a natural system that humans depend on. These systems may be designed for nonstop use or for use in certain circumstances where a hazard is known to be present. Examples include:

- Water treatment systems
- HEPA air filtration ventilation systems
- Airborne pathogen decontamination systems
- Hazardous materials (HAZMAT) decontamination systems

One last structural mitigation measure is **redundancy in life safety infrastructure**. As humans have evolved beyond subsistence living, they have become more dependent upon each other and on societal infrastructure. Today, private and government infrastructure may provide an individual with food, water, sewerage, electricity, communications, transportation, medical care, and more. With such great dependency on these systems, failure in any one could quickly lead

Physical modification is the group of mitigation measures that alters the physical landscape in such a manner that hazard likelihood or consequence is reduced. This can be performed through simple landscaping measures or through the use of engineered devices. Ground modification examples include:

- Slope terracing—landslides, mudflows, erosion (see Figure 4-7)
- Slope drainage—landslides, mudflows, erosion
- Regrading of steep slopes—landslides, mudflows, rockfalls, erosion, avalanches

to catastrophe. Examples of life safety systems into which redundancy may be built include:

- Electricity infrastructure
- Public health infrastructure
- Emergency management infrastructure
- Water storage, treatment, conveyance, and delivery systems
- Transportation infrastructure
- Irrigation systems
- Food delivery

NONSTRUCTURAL MITIGATION

Nonstructural mitigation, as defined previously, generally involves a reduction in the likelihood or consequence of risk through modifications in human behavior or natural processes, without requiring the use of engineered structures. Nonstructural mitigation techniques are often considered mechanisms where "man adapts to nature." They tend to be less costly and fairly easy for communities with few financial or technological resources to implement.

The following section describes several of the various categories into which nonstructural mitigation measures may be grouped, and provides several examples of each:

- Regulatory measures
- Community awareness and education programs
- Nonstructural physical modifications
- Environmental control
- Behavioral modification

Regulatory Measures

Regulatory measures limit hazard risk by legally dictating human actions. Regulations can be applied to several facets of societal and individual life, and are when it is determined that such action is required for the common good of the society. Though the use of regulatory measures is pervasive, compliance is a widespread problem because the cost of enforcement can be prohibitive and inspectors may be untrained, ineffective, or susceptible to bribes.

Examples of regulatory mitigation measures include:

- *Land use management (zoning)*. This is legally imposed restriction on how land may be used. It may apply to specific geographic designations, such as coastal zone management, hillside or slope management, floodplain development restrictions, or microclimatic siting of structures (such as placing structures only on the leeward side of a hill)
- *Open space preservation (green spaces)*. This practice attempts to limit the settlement or activities of people in areas that are known to be at high risk for one or more hazards.
- *Protective resource preservation*. In some situations, a tract of land is not at risk from a hazard, but a new hazard will be created by disturbing that land. Examples include protecting forests that serve to block wind and wetlands preservation.
- *Denial of services to high-risk areas*. When squatter and informal settlements form on high-risk land despite the existence of preventive regulatory measures, it is possible to discourage growth and reverse settlement trends by ensuring that services such as electricity, running water, and communications do not reach the unsafe settlement. This measure is only acceptable when performed in conjunction with a project that seeks to offer alternative, safe accommodations for the inhabitants (otherwise, a secondary humanitarian disaster may result).
- *Density control*. By regulating the number of people who may reside in an area of known or estimated risk, it is possible to limit vulnerability and control the amount of resources considered adequate for protection from and response to that known hazard. Many response mechanisms are overwhelmed because the number of casualties in an affected area is much higher than was anticipated.

- *Building use regulations*. To protect against certain hazards, it is possible to restrict the type of activities that may be performed in a building. These restrictions may apply to people, materials, or activities.
- *Mitigation easements*. Easements are agreements between private individuals or organizations and the government that dictate how a particular tract of land will be used. Mitigation easements are agreements to restrict the private use of land for the purposes of risk reduction.
- *HAZMAT manufacture, use, transport, and disposal*. Hazardous materials are a major threat to life and property in all countries. Most governments have developed safety standards and procedures to guide the way that these materials are manufactured and used by businesses and individuals, the mechanisms by which they are transported from place to place, and the methods and devices that contain them.
- *Safety standards and regulations*. Regulations that guide safe activities and practices are diverse and apply to more situations than could be described in this chapter. Safety regulations may apply to individuals (seatbelt laws), households (use of smoke detectors), communities, businesses, and governments. The establishment of building codes, as described in the section on structural mitigation, is an example of a safety regulation.
- *Natural resource use regulations*. The use of common natural resources, such as aquifers, can be controlled for the purpose of minimizing hazard risk (in this case, drought).
- *Storm water management regulations*. Storm water runoff can be destructive to the areas where it originates, through erosion, and to the areas where it terminates, through silting, pollution, changes to stream flows, and other effects. Development, especially when large amounts of land are covered with impervious materials like concrete, can drastically increase the amount of runoff by decreasing the holding capacity of the land. Regulations on storm water management,

imposed on private and public development projects, help to manage those negative effects, thereby reducing both hazard risk and environmental vulnerability.
- *Environmental protection regulations*. Certain environmental features, such as rivers, streams, lakes, and wetlands, play an important part in reducing the vulnerability of a community or country. Preventing certain behaviors, such as dumping or polluting, helps to ensure that these resources continue to offer their risk reduction benefits.
- *Public disclosure regulations*. Property owners may be required to disclose all known risks, such as flood or earthquake hazard risk, when selling their property. This ensures hazard awareness and increases the chance that purchasers will take appropriate action for those known risks when they begin construction or other activities on that land.
- *Mitigation requirements on loans*. Banks and other lending institutions have much at stake when they lend money to developers. Therefore, lenders can apply mitigation requirements or at the very least require that hazard assessments be conducted, and governments can require that such actions be taken by those lending institutions. Such policies limit the building of unsafe projects.

Community Awareness and Education Programs

The public is most able to protect themselves from the effects of a hazard if they are first informed that the hazard exists, and then educated about what they can do to limit their risk.

Public education programs are considered both mitigation and preparedness measures. An informed public that applies appropriate measures to reduce their risk before a disaster occurs has performed mitigation. However, a public that has been trained in response activities has participated in a preparedness activity.

Often termed "risk communication," projects designed to educate the public may include one or more of the following:

- Awareness of the hazard risk
- Behavior
  ◦ Predisaster risk reduction behavior
  ◦ Predisaster preparedness behavior
  ◦ Postdisaster response behavior
  ◦ Postdisaster recovery behavior
- Warning

A more detailed description is provided in Chapter 5.

Warning systems inform the public that a hazard risk has reached a threshold requiring certain protective actions. Depending upon the hazard type and the warning system's technological capabilities, the amount of time citizens will have to act will vary. Some warning systems, especially those that apply to technological and intentional hazards, are not able to provide warning until the hazard has already begun to exhibit its damaging behavior (such as a leak at a chemical production facility, or an accident involving a hazardous materials tanker truck). The UN Platform for the Promotion of Early Warning (PPEW, n.d.) states that four separate factors are necessary for effective early warning:

1. Prior knowledge of the risks faced by communities
2. A technical monitoring and warning service for these risks
3. The dissemination of understandable warnings to those at risk
4. Knowledge by people of how to react and the capacity to do so

Warning systems, therefore, are dependent upon hazard identification and analysis, effective detection systems (as described in Structural Mitigation), and public education. Early warning systems have been developed to varying capacities for the following hazards:

- Drought
- Tornados
- Cyclonic storms
- Epidemics
- Landslides
- Earthquakes
- Chemical releases
- Volcanoes
- Floods
- Wildfires
- Air raids/attacks
- Terrorist threats

For an inventory of early warning systems, see http://database.unep.dkkv.org/

Risk mapping involves presenting the likelihood and consequence components in the format of a physical map, with figures based upon a specific hazard or set of hazards. Risk maps are fundamental to disaster management, and are very effective as a mitigation tool. Using risk maps, governments and other entities can most effectively dedicate resources to areas of greatest need, and plan in advance of incidents, so that adequate response resources are able to reach those highest-risk areas without unforeseen problems. Risk maps are generally based upon the base maps discussed in Chapter 2, but include the added information acquired through the risk analysis and assessment described in Chapter 3 (see Figure 4-8).

Nonstructural Physical Modifications

Several different mitigation options, while not structural in nature, involve a physical modification to a structure or to property that results in reduced risk.

Examples include:

- *Securing of furniture, pictures, and appliances, and installing latches on cupboards.* In many earthquakes, the majority of injuries are caused by falling furniture and other unsecured belongings. Economic costs also can be reduced significantly through this very inexpensive, simple measure that generally requires little more than
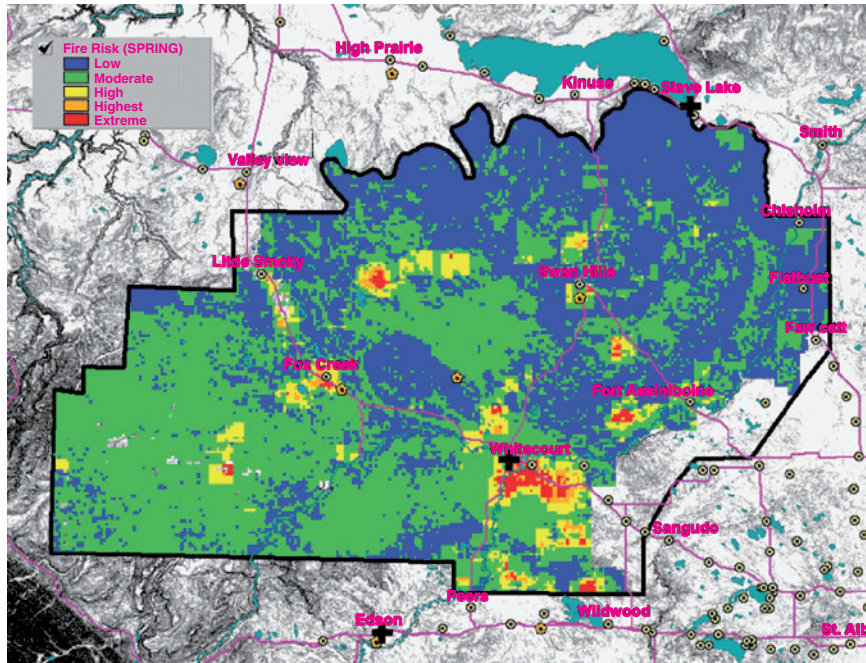
FIGURE 4-8   Map detailing the likelihood of fire determined by activities and presence of causative agents. (*Source:* Alberta Sustainable Resource Development.)

connecting items to walls through the use of a specially designed thin metal strap.

- *Removal or securing of projectiles.* During tornadoes, items commonly found outside the house, such as cooking grills, furniture, and stored wood, may become airborne projectiles that cause harm, fatalities, or further property damage.

Environmental Control

Structural mitigation involves engineered structures that control hazards. It is also possible to control or influence hazards through nonengineered structural means. These nonstructural mechanisms tend to be highly hazard specific, and include:

- Explosive detonation to relieve seismic pressure (earthquakes)

- Launched or placed explosives to release stored snow cover (avalanches)
- Cloud seeding (hail, hurricanes, drought, snow)
- Chemical surface treatment (ice and snow storms)
- Controlled burns (wildfires)
- Bombing of volcano flows
- Dune and beach restoration or preservation (storm surges, erosion)
- Forest and vegetation management (landslides, mudflows, flooding, erosion)
- Riverine and reservoir sediment and erosion control (flooding)
- Replacement of soils (expansive soils)
- Hillside drainage (landslides, mudslides, erosion)
- Slope grading (landslides, mudslides, rockfalls, erosion)
- Disease vector eradication (epidemics) (see Figure 4-9 and Exhibit 4-1)

EXHIBIT 4-1   Dengue Fever Eradication—An Example of Failed Mitigation

Dengue fever is caused by four closely related "flavoviruses," known as DEN-1, DEN-2, DEN-3, and DEN-4. When people are infected with one of these viruses, they gain lifetime immunity if they survive the illness. However, they will not have cross-protective immunity, and therefore people living in dengue-endemic areas can actually have four dengue infections during their lifetime. Dengue fever occurs predominantly in the tropics, and is spread through a cycle of infection between humans and the *Aedes Aegypti* mosquito.

Infection with dengue fever results in a full range of nonspecific viral symptoms spanning from mild to severe and fatal hemorrhagic disease. Important risk factors for the disease include the strain and serotype of the infecting virus, as well as the age, immune status, and genetic predisposition of the infected person.

The emergence of dengue fever has been most dramatic in Latin America. In an effort to eradicate yellow fever, which is also transmitted by the *Aedes Aegypti* mosquito, the Pan American Health Organization (PAHO) organized a campaign that effectively eradicated the insect from most Central and South American countries during the 1950s and 1960s. As a result, epidemic dengue was also limited, occurring only sporadically in some Caribbean islands during this time. The eradication program was officially discontinued in the United States in 1970, and subsequently stopped elsewhere in the following years. As a result, the species began to reinfest countries from which it had been eradicated, and by 1997, the geographic distribution of *Aedis Aegypti* was wider than its distribution before the eradication program (see Figure 4-9).

In 1970, only DEN-2 virus was present in the Americas. DEN-1 was introduced in 1977, resulting in 16 years of major epidemics throughout the region. DEN-4 was introduced in 1981 and caused similar epidemics. Also in 1981, a new strain of DEN-2 from Southeast Asia caused the first major dengue hemorrhagic fever (DHF) epidemic in the Americas. This strain has spread rapidly throughout the region and has caused outbreaks of DHF in Venezuela, Colombia, Brazil, French Guiana, Suriname, and Puerto Rico. By 1997, 18 countries in the region had reported confirmed DHF cases, and it is now endemic in many of these countries.

The DEN-3 virus reappeared in the Americas after an absence of 16 years, first detected in Nicaragua in 1994. Almost simultaneously, the strain was confirmed in Panama and, in early 1995, in Costa Rica. In Nicaragua, considerable numbers of DHF cases were associated with the epidemic. Gene testing from the DEN-3 strains isolated from Panama and Nicaragua showed that the new American DEN-3 strain likely came from Asia, since it is genetically distinct from the DEN-3 strain found previously in the Americas, but is identical to the DEN-3 virus serotype that caused major epidemics in Sri Lanka and India in the 1980s. As suggested by the finding of a new DEN-3 strain and the susceptibility of the population in the American tropics to it, DEN-3 spread rapidly throughout the region, causing major dengue epidemics in Central America in 1995.

As of 1997, dengue was the most important mosquito-borne viral disease affecting humans; its global distribution is comparable to that of malaria, and an estimated 2.5 billion people live in areas at risk for epidemic transmission. Each year, tens of millions of cases of dengue fever occur and, depending on the year, up to hundreds of thousands of cases of DHF. The case-fatality rate of DHF in most countries is about 5%, with most fatalities affecting children and young adults.
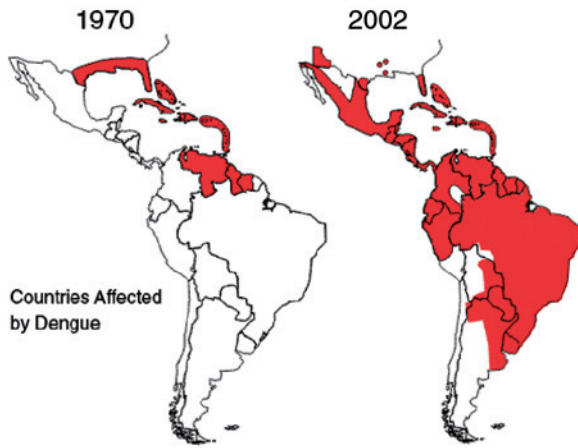
Source: CDC, 2005.

FIGURE 4-9 Incidence of dengue fever (in red) showing 1970 levels during a mosquito eradication campaign, and 1997 levels, many years after the eradication campaign was stopped. (*Source:* US Centers for Disease Control.)

Behavioral Modification

Through collective action, a community can alter the behavior of individuals; resulting in some common risk reduction benefit. Voluntary behavior modification measures are more difficult to implement than the regulatory measures listed above, because they usually involve some form of sacrifice. However, through effective public education, behavioral modification is possible. Tax incentives, or subsidies, can help to increase the success of behavioral modification practices. Examples of mitigation measures that involve behavioral modification include:

- *Rationing.* Rationing is often performed prior to and during periods of drought. Because it can be very difficult for governments to limit vital services such as water to citizens, it is up to citizens to limit their individual usage. Electricity rationing is also performed during periods of extreme heat or cold to ensure that electrical climate control systems are able to perform as required.

- *Environmental conservation.* Many practices, in both urban and rural areas, are very destructive to the environment. Once the environmental feature—be it a body of water, a forest, or a hillside—is destroyed, secondary hazardous consequences may appear that could have been avoided. Through proper education and the offering of alternatives, destructive practices can be halted before too much damage is done. Examples of environmental conservation include environmentally friendly farming practices, wood harvesting that does not cause deforestation, and protecting coral reefs from dynamite fishing and other fishing practices.

- *Tax incentives, subsidies, and other financial rewards for safe practices.* Individuals and businesses can be coaxed into safer practices that reduce overall risk through financial incentives. Examples of schemes that use financial incentives include lower insurance premiums, housing buyout programs to move out of high-risk areas, farm subsidies for allowing land to be used for flood control during emergencies, and environmentally friendly farming practices (no deforestation, responsible grazing practices, flexible farming and cropping).

- *Strengthening of social ties.* When a community strengthens its social ties, it is more likely to withstand a hazard's stresses. For many reasons, the largest of which is urbanization, these ties break and are not replaced. In Chicago in 1995, a heat wave caused the death of 739 people. It was later determined that weak social structures were primarily to blame for the deaths, which could have been prevented had friends, family, or neighbors checked on the victims.

RISK TRANSFER, SHARING, AND SPREADING

Risk transfer, sharing, and spreading are often considered mitigation measures, though they do

absolutely nothing to reduce actual disaster conse-
quences or reduce hazard likelihood. The concept
behind them is that the financial disaster consequences
that do occur are shared by a large group of people,
rather than the entire burden falling only on the
affected individuals. The result is a calculated average
consequence cost, such as an insurance premium.

Insurance, which is the most common mitigation
measure in this category, is defined as: "A promise of
compensation for specific potential future losses in
exchange for a periodic payment" (InvestorWords.
com, 2003). Insurance is a mechanism by which the
financial well-being of an individual, company, or
other entity is protected against an incidence of unex-
pected loss. Insurance can be mandatory (required by
law) or optional.

Insurance operates through the use of premiums, or
payments determined by the insurer. In exchange for
premiums, the insurer agrees to pay the policyholder
a sum of money (up to an established maximum
amount) upon the occurrence of a specifically defined
disastrous event. The majority of insurance policies
include a deductible, which can be a fixed amount per
loss (e.g., the first $1000 of a loss), a percentage of the
loss (5% of the total loss), or a combination. The
insurer pays the remaining amount, up to the limits
established in the original contract. In general, the
lower (smaller) the deductible associated with a pol-
icy, the higher the premiums. Common examples of
insurance include automobile insurance, health insur-
ance, disability insurance, life insurance, flood insur-
ance, earthquake insurance, terrorism insurance, and
business insurance.

Insurance allows losses to be shared across wide
populations. To briefly summarize, insurance works as
follows. An auto insurer (for example) takes into
account all of the policyholders it will be insuring. It
then estimates the cost of compensating policyholders
for all accidents expected to occur during the time
period established in the premiums (usually six
months to a year.) The company then divides that cost,
adding its administrative costs, across all policyhold-
ers. The premiums can be further calculated using

information that gives more specific definitions of
risk to certain individuals. For example, if one policy-
holder has 10 moving violations (speeding tickets) in
a period of 10 years and has been found at fault in
five accidents during the same period, that policy-
holder is statistically a greater risk to the insurer than
someone who has never had an accident or moving
violation. It follows, then, that the first policyholder
would be expected to pay a higher premium for
equal coverage. Insurance companies make the
majority of their profits through investing the premi-
ums collected.

To cover losses in case the severity of accidents or
disasters is greater than estimated when the policies
were created, insurance companies rely on the ser-
vices of reinsurance companies. Reinsurance com-
panies insure insurance companies, and tend to be
internationally based to allow the risk to be spread
across even greater geographical ranges.

Insurance industry researchers Howard Kunreuther
and Paul Freemen investigated the insurability of
risks, especially those associated with disastrous con-
sequence. They found that two conditions must be sat-
isfied for a risk to be insurable. First, the hazard in
question must be identifiable and quantifiable. In
other words, the likelihood and consequence factors
must be well understood before an insurer can respon-
sibly and accurately set insurance premiums such
that they will be able to adequately compensate cus-
tomers in the event of a disaster. Second, insurers
must be able to set premiums for "each potential
customer or class of customers" (Kunreuther and
Freement, 1997). Common hazards, such as house
fires and storm damage, have a wealth of information
available upon which insurers may calculate their pre-
miums. For catastrophic but rare events, such as earth-
quakes, it can be difficult or impossible to estimate
with any degree of precision how often events
will occur and what damages would result (see
Exhibit 4-2).

In the wealthier nations of the world, most property
owners and renters have some form of insurance that
protects the structure itself, the contents of the

EXHIBIT 4-2   Findings of the ProVention Consortium International Conference on the Potential of Insurance for Disaster Risk Management in Developing Countries: Challenges

Lack of information needed for underwriting. Many developing countries lack the data and information needed for sound underwriting and product development. The quality and availability of data may vary, such that in a capital city some information may be available, while in rural areas information may be held only locally and in forms that are not easily understood by noncommunity individuals. Insurance services require information about potential losses and client demand, including data on assets at risk and the vulnerability and hazard exposure of those assets.

Lack of local insurance expertise. In countries where insurance is not common, there is often a distinct lack of local expertise, ranging from actuarial science, underwriting, and risk assessment to claims management and client support.

Lack of awareness and understanding of insurance. It takes time to develop awareness among potential clients about the benefits and costs of insurance, whether the clients are national or local governments, community groups, or low-income individuals. Awareness is important not only for demand development and sales; but also because the design of insurance products should be based on client needs. Potential clients need an awareness of basic insurance principles and how these tools could help them before they can articulate their needs and thus generate demand.

High opportunity cost of premiums for the poor. It is often asked if insurance is truly a viable option for the very poor, because premiums are not productive (unless a claim is made), and other needs may be more pressing. Paying premiums will generally not be a priority for a poor household if doing so would require foregoing essentials.

Lack of legal structure and financial services infrastructure. Many developing countries lack the regulatory framework that makes insurance pro-

vision possible. Some micro-insurance services are provided in semi-legal ways because the legal environment in host countries does not allow formal insurance. Community groups may be able to aggregate business and overcome moral hazard, adverse selection, and data needs, but formal insurance providers may not be legally allowed to offer services to these groups. Some developing countries' legal systems are developing towards market economy standards, but may not yet be mature enough to link with the international capital markets. Also, many developing countries lack the infrastructure to provide insurance services. Inadequate technological infrastructure such as communications may hinder insurance services and claims management.

Lack of a culture of risk reduction and mitigation. Insurance functions on the assumption that the underlying risk is reduced as much as possible, with insurance thus mitigating against the remaining unpreventable and unpredictable events ("residual risk"). Many developing countries lack a culture of predisaster risk reduction, or resources and incentives for action are often inadequate. Without a culture of risk reduction and insurance as forms of mitigation, establishing successful insurance will be challenging.

Partner differences in vocabulary, organizational operations, and timelines. Partners in different schemes that provide insurance services might include any mix of national and local governments, NGOs, civil society and the poor, commercial enterprises, and international organizations. Each potential partner may operate with different vocabularies, goals, and methods, and along different timelines. Different operational structures can also be a challenge: While national governments may need to run decisions through complex and time-consuming   democratic   decision-making

processes, commercial entities need to make decisions based on profitability and other strategic concerns. There is the example of a partnership that fell apart when the involved national government could not provide insurance and reinsurance partners with necessary data by a certain deadline, even though products had been developed and the partnership was ready to move forward.

Need to define partner roles clearly. The word "partnership" among international organizations and national governments often signifies a broad willingness to engage in discussions, while in business the term often implies contractual obligations. Further to such basic differences of understanding and interpretation, there are examples of a national government establishing a pattern of "bailing out" disaster victims following earthquakes, thus creating a disincentive to purchase insurance from a scheme that the government itself supported as mandatory. International organizations have at times acted as reinsurers for client countries, which in many cases is inappropriate. Roles and agreements must be examined carefully and adjusted so that there is no confusion and detraction of the opportunities and responsibilities of each partner.

Lack of national stability and thus insurance industry confidence. Developing countries may lack the stability in government, regulatory framework, and economy that is required for the provision of sustainable insurance services. Constantly changing governments and regulatory frameworks make it difficult for the insurance industry to establish itself and develop a viable market. Unstable macroeconomies can affect the ability of potential clients to pay premiums over a long period of time. The insurance industry is aware of these risks and commensurately wary of doing business under such conditions.

Source: ProVention Consortium, 2004.

structure, or both (see Figure 4-10). However, for the reasons listed above, this coverage is often limited to common events, with specific preclusions against more unlikely natural and technological disasters. These special disasters require the purchase of policies formulated to assume the specific risk for each causative hazard.

General homeowner and renter policies cover losses that commonly occur and are not catastrophic in nature, such as fires, wind damage, theft, and plumbing damage. Catastrophic hazards, like earthquakes, landslides, and floods, are often precluded because of the wide spatial damage they inflict. Hazard damages that affect a wide spatial territory present a special problem for insurance companies because of the mechanisms by which insurance functions. For example, in the event of a fire or theft in a single home, the cost of the damages or losses would be easily absorbed by the premiums of the unaffected policyholders. However, in the case of an earthquake, a large number of people will be affected, resulting in a sum total much greater than their collective premiums, such that the total funds collected from the premiums will be less than the capital required to pay for damages. The bankruptcy of insurance companies due to catastrophic losses has been prevalent throughout the history of the insurance industry.

Policies for specific catastrophic hazards can often be purchased separately from basic homeowners or renters insurance policies or as riders to them. However, these entail specific problems that deserve mentioning. In general, only those people who are likely to suffer the specific loss defined in the policy are likely to purchase that type of policy, creating the need for much higher premiums than if the specific hazard policy were spread across a more general population. This phenomenon, called "adverse selection," has made the business of hazard insurance undesirable to many insurance companies.
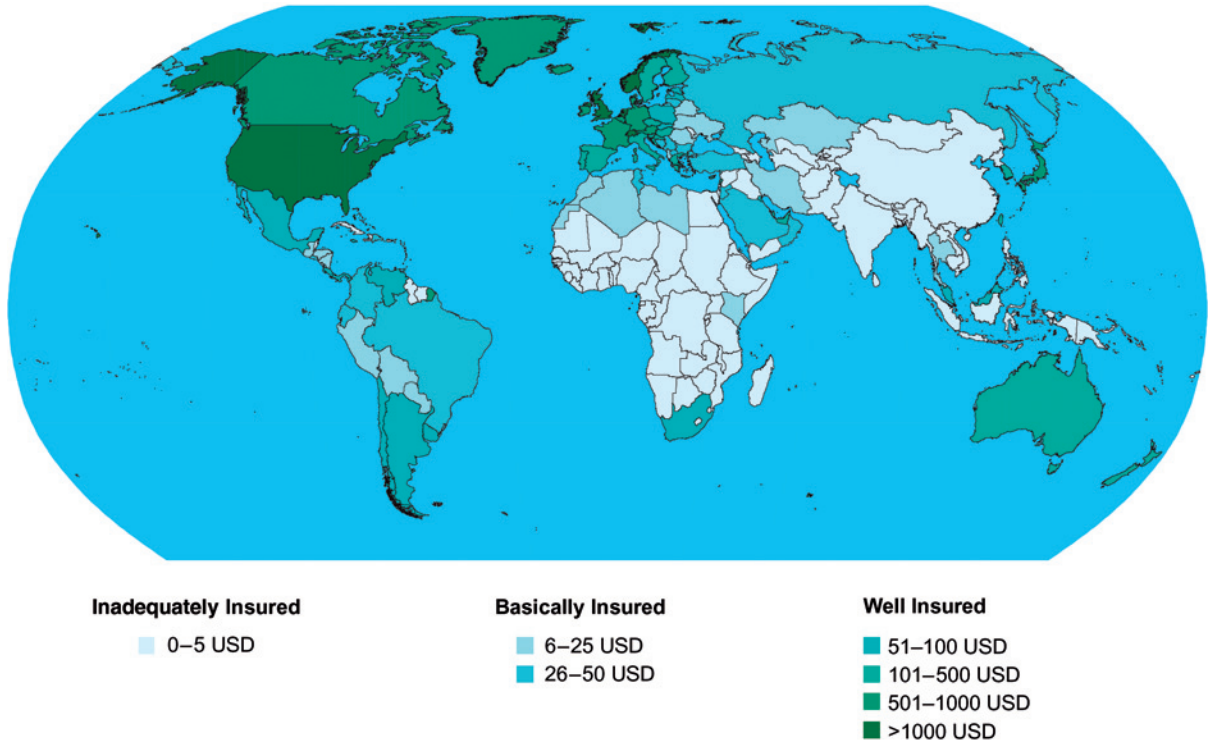
FIGURE 4-10   Worldwide insurance coverage. (*Source:* MunichRe, 2004, Munich.)

Several methods have been adopted to address the problems associated with adverse selection. Examples include:

- *The inclusion of these disasters in basic/comprehensive homeowners and renters policies, regardless of exposure or vulnerability.* This spreads out the risk across the entire population of policyholders in the country, regardless of differential risk between individuals. Additionally, controls are placed upon the minimum spatial zones within which each company can provide policies to ensure that the ratio of policies affected by a disaster to those unaffected are kept as low as possible.
- *The introduction of government backing on insurance coverage of catastrophic events.* In this scenario, the insurers are liable for paying for damages up to an established point, beyond which the government supplements the payments. Terrorism insurance, as discussed later in this section, is an example of government backing on insurance coverage of catastrophic events.
- *Heavier reliance on international reinsurance companies.* Buying reinsurance can spread the local risk to wider areas of coverage, thereby reducing the chance that annual claims exceed collected premiums. Unfortunately, many companies are unable to purchase all the reinsurance that they would like to have. Additionally, because many of these policies require the insurers to pay a percentage of total claims placed, the amount they ultimately pay in catastrophic disasters can be massive despite reinsurance coverage.

Several advantages gained through the use of insurance have been identified, including:

1. *Victims are guaranteed a secure and predictable amount of compensation for their losses.* With this coverage, they do not have to rely on disaster relief, and reliance on government assistance is reduced as well.

2. *Insurance allows for losses to be distributed in an equitable fashion, protecting many for only a fraction of the cost each would have incurred individually if exposed to hazards.* This can help the economy overall by reducing bankruptcies, reducing reliance on federal government assistance, and increasing the security of small businesses and individuals, often the most severely affected victims of disaster.

3. *Insurance can actually reduce hazard impact by encouraging policyholders to adopt certain required mitigation measures.* As policyholders reduce their vulnerability to risk, their premiums fall. The owners of automobiles that have airbags, antitheft devices, and passive restraint devices, for instance, will receive a discount on their premiums. Homeowners who develop outside of the floodplain or who install fire suppression systems will also receive these benefits. Additionally, this gives financial/economic disincentives for people or businesses to build in areas that are exposed to hazards.

Limitations on hazard insurance exist as well, and include the following issues:

1. *Insurance may be impossible to purchase in the highest-risk areas* if the private insurance companies decide that their risk is too high. This is especially true for hazards like landslides that affect a very specific segment of the population.

2. *Participation in insurance plans is voluntary.* Although private insurance companies can earn a profit despite overall low participation, benefits in terms of mitigation value become limited by low participation. Furthermore, it is not uncommon for homeowners and renters to save money by purchasing policies that cover less than is needed for catastrophic losses, which increases their potential (though reduced) reliance on government relief.

3. *Participation in insurance has been known to encourage people to act more irresponsibly than they may act without such coverage.* For instance, if a person knows that his furniture is likely to be replaced if it is damaged in a flood, he is less likely to move that furniture out of harm's way (such as moving it to a second floor of his home) during the warning phase of the disaster. This phenomenon is termed the "moral hazard." In the long run, this causes damage payouts to increase and, as a result, premiums to increase as well.

4. *Many insurance companies are pulling out of specific disaster insurance plans because the probability that they will not be able to cover catastrophic losses is too great.* Before 1988, there had never been a single disaster event for which the insurance industry as a whole needed to pay over $1 billion in claims. Since that time, there have been over 20 events for which claims have exceeded that threshold (see Table 4-1). Hurricane Andrew required $15.5 billion in compensation, and estimates for insured losses in the September 11th terrorist attacks have been as high as $40 billion (International Insurance Society, 2003).

5. *Catastrophic losses that cover a wide but specific geographic space within a country may result in inequitable premium increases if coverage areas are too general.* For instance, the Northridge, California earthquake cost insurers more than $12 billion in claims, but only $1 billion in premiums had been collected in the entire state of California. Therefore, the payment for this event and, likewise, the required increase in premiums were "subsidized" by other states that were not affected and were not at such high risk (Mileti, 1999).

Insurance has been denied status as a true mitigation measure by many experts because it is seen as

TABLE 4-1   The 10 Most Costly World Insurance Losses, 1970–2004

Rank	Date	Country	Event	Insured loss in 2004 U.S. dollars (millions)[b]
1	Aug. 23, 1992	United States, Bahamas	Hurricane Andrew	$21,542
2	Sept. 11, 2001	United States	Terrorist attack	20,035
3	Jan. 17, 1994	United States	Northridge earthquake (magnitude 6.6)	17,843
4	Sept. 2, 2004	United States, Caribbean: Barbados, etc.	Hurricane Ivan; damage to oil rigs	11,000
5	Aug. 11, 2004	United States, Caribbean: Cuba, Jamaica, etc.	Hurricane Charley	8,000
6	Sept. 27, 1991	Japan	Typhoon Mireille	7,831
7	Jan. 25, 1990	Europe: France, United Kingdom, etc.	Winter storm Daria	6,639
8	Dec. 25, 1999	Europe: France, Switzerland, etc.	Winter storm Lothar	6,578
9	Sept. 15, 1989	Puerto Rico, United States, etc.	Hurricane Hugo	6,393
10	Aug. 26, 2004	United States, Bahamas	Hurricane Frances	5,000

[a]Property and business interruption losses, excluding life and liability losses.
[b]Adjusted to 2004 dollars by Swiss Re.
[c]Note that, while final figures for the insurance losses for Hurricane Katrina (August, 2005) have not yet been tallied, industry estimates place the final cost at between $30 and $40 billion, thereby ensuring its status as the greatest insurance loss from a single event.

Source: Swiss Re, *sigma*, No. 1/2005. Insured losses for natural catastrophes in the United States and the Sept. 11 terrorist attack from ISO.

redistributing losses rather than actually eliminating exposure to the hazard (which would effectively limit absolute losses). This is a widely debatable issue, which requires many assumptions. For instance, one must assume that an individual has the ability to move out of a risky situation or has other options that present less risk before stating that the mere presence of insurance encourages him to live in the riskier situation. One also must assume that we would be able to limit all losses, or that we could reach consensus as a society about which hazard risk should be considered insurable and at which level of risk insurance should be limited or prevented.

The International Insurance Institute maintains profiles on the insurance industry in most countries of the world, accessible at: www.internationalinsurance.org/international/toc/

The United States has a nationally managed insurance program designed to insure against the risk of flood hazards. Exhibit 4-3 describes this program in detail.

EXHIBIT 4-3   The U.S. National Flood Insurance Program

History of the Program

Up until 1968, federal actions related to flooding were primarily responses to significant events that resulted in using structural measures to control flooding. Major riverine flood disasters of the 1920s and 1930s led to considerable federal involvement in protecting life and property from flooding through the use of structural flood-control projects, such as dams and levees, with the passage of the Flood Control Act of 1936. Generally, the only available financial recourse to assist flood victims was in the form of disaster assistance. Despite the billions of dollars in federal investments in struc-

tural flood-control projects, the losses to life and property and the amount of assistance to disaster victims from floods continued to increase.

As early as the 1950s, when the feasibility of providing flood insurance was first proposed, it became clear that private insurance companies could not profitably provide such coverage at an affordable price, primarily because of the catastrophic nature of flooding and the inability to develop an actuarial rate structure that could adequately reflect the risk to which flood-prone properties are exposed. The U.S. Congress proposed an experimental program designed to demonstrate the feasibility of the private sector providing flood insurance by enacting the Federal Insurance Act of 1956, but this Act was never implemented.

In recognition of increasing flood losses and disaster relief costs, major steps were taken in the 1960s to redefine federal policy and approaches to flood control. In 1965, Congress passed the Southeast Hurricane Disaster Relief Act. The Act was as a result of the extensive damage caused by Hurricane Betsy in the Gulf states. The Act provided financial relief for the flooding victims and authorized a feasibility study of a national flood insurance program. The resulting report was entitled "Insurance and Other Programs for Financial Assistance to Flood Victims." Shortly thereafter, the Bureau of the Budget Task Force on Federal Flood Control in 1966 advocated a broader perspective on flood control within the context of floodplain development in House Document 465, "A Unified National Program for Managing Flood Losses." House Document 465 included five major goals:

1. Improve basic knowledge about flood hazards
2. Coordinate and plan new developments in the floodplain
3. Provide technical services
4. Move toward a practical national program of flood insurance

5. Adjust federal flood control policy to sound criteria and changing needs

The National Flood Insurance Act of 1968

Congressional Document 465 and the prior feasibility study provided the basis for the National Flood Insurance Act of 1968. The primary purposes of the 1968 Act creating the NFIP are to:

1. Better indemnify individuals for flood losses through insurance
2. Reduce future flood damages through state and community floodplain management regulations
3. Reduce federal expenditures for disaster assistance and flood control

Section 1315 of the 1968 Act is a key provision that prohibits FEMA from providing flood insurance unless the community adopts and enforces floodplain management regulations that meet or exceed the floodplain management criteria established in accordance with Section 1361(c) of the Act. These floodplain management criteria are contained in 44 Code of Federal Regulations (CFR) Part 60, Criteria for Land Management and Use. The emphasis of the NFIP floodplain management requirements is directed toward reducing threats to lives and the potential for damages to property in flood-prone areas. Over 19,700 communities presently participate in the NFIP. These include nearly all communities with significant flood hazards.

In addition to providing flood insurance and reducing flood damages through floodplain management regulations, the NFIP identifies and maps the nation's floodplains. Mapping flood hazards creates broad-based awareness of the flood hazards and provides the data needed for floodplain management programs and to actuarially rate new construction for flood insurance.

When the NFIP was created, the U.S. Congress recognized that insurance for "existing buildings"

constructed before a community joined the program would be prohibitively expensive if the premiums were not subsidized by the federal government. Congress also recognized that individuals who did not have sufficient knowledge of the flood hazard to make informed decisions built most of these flood-prone buildings. Under the NFIP, "existing buildings" are generally referred to as Pre-FIRM (Flood Insurance Rate Map) buildings. These buildings were built before the flood risk was known and identified on the community's FIRM. Currently about 26% of the 4.3 million NFIP policies in force are Pre-FIRM subsidized, compared to 70% of the policies being subsidized in 1978.

In exchange for the availability of subsidized insurance for existing buildings, communities are required to protect new construction and substantially improved structures through adoption and enforcement of community floodplain management ordinances. The 1968 Act requires that full actuarial rates reflecting the complete flood risk be charged on all buildings constructed or substantially improved on or after the effective date of the initial FIRM for the community or after December 31, 1974, whichever is later. These buildings are generally referred to as "Post-FIRM" buildings.

Early in the program's history, the federal government found that providing subsidized flood insurance for existing buildings was not a sufficient incentive for communities to voluntarily join the NFIP or for individuals to purchase flood insurance. Tropical Storm Agnes in 1972, which caused extensive riverine flooding along the East Coast, proved that few property owners in identified floodplains were insured. This storm cost the nation more in disaster assistance than any previous disaster. For the nation as a whole, only a few thousand communities participated in the NFIP and only 95,000 policies were in force.

As a result, Congress passed the Flood Disaster Protection Act of 1973. The 1973 Act prohibits federal agencies from providing financial assistance for acquisition or construction of buildings and certain disaster assistance in the floodplains in any community that did not participate in the NFIP by July 1,1975, or within one year of being identified as flood-prone.

Additionally, the 1973 Act required that federal agencies and federally insured or regulated lenders had to require flood insurance on all grants and loans for acquisition or construction of buildings in designated Special Flood Hazard Areas (SFHAs) in communities that participate in the NFIP. This requirement is referred to as the Mandatory Flood Insurance Purchase Requirement. The SFHA is that land within the floodplain of a community subject to a 1% or greater chance of flooding in any given year, commonly referred to as the 100-year flood.

The Mandatory Flood Insurance Purchase Requirement, in particular, resulted in a dramatic increase in the number of communities that joined the NFIP in subsequent years. In 1973, just over 2200 communities participated in the NFIP. Within four years, approximately 15,000 communities had joined the program. It also resulted in a dramatic increase in the number of flood insurance policies in force. In 1977, approximately 1.2 million flood insurance policies were in force, an increase of almost 900,000 over the number of policies in force in December of 1973.

The authors of the original study of the NFIP thought that the passage of time, natural forces, and more stringent floodplain management requirements and building codes would gradually eliminate the number of Pre-FIRM structures. Nevertheless, modern construction techniques have extended the useful life of these Pre-FIRM buildings beyond what was originally expected. However, their numbers overall continue to decrease. The decrease in the number of Pre-FIRM buildings has been attributed to a number of factors, such as severe floods in which buildings were destroyed or substantially damaged, redevelopment, natural

attrition, acquisition of flood damaged structures, as well as flood control projects.

In 1994, Congress amended the 1968 Act and the 1973 Act with the National Flood Insurance Reform Act (NFIRA). The 1994 Act included measures, among others, to:

- Increase compliance by mortgage lenders with the mandatory purchase requirement and improve coverage
- Increase the amount of flood insurance coverage that can be purchased
- Provide flood insurance coverage for the cost of complying with floodplain management regulations by individual property owners (Increased Cost of Compliance coverage)
- Establish a Flood Mitigation Assistance grant program to assist states and communities to develop mitigation plans and implement measures to reduce future flood damages to structures
- Codify the NFIP's Community Rating System
- Require FEMA to assess its flood hazard map inventory at least once every five years

Funding for the NFIP is through the National Flood Insurance Fund, which was established in the Treasury by the 1968 Act. Premiums collected are deposited into the fund, and losses and operating and administrative costs are paid out of the fund. In addition, the program has the authority to borrow up to $1.5 billion from the Treasury, which must be repaid along with interest. Until 1986, federal salaries and program expenses, as well as the costs associated with flood hazard mapping and floodplain management, were paid by an annual appropriation from Congress. From 1987 to 1990, Congress required the program to pay these expenses out of premium dollars. When expressed in current dollars, $485 million of policyholder premiums were transferred to pay salary and other expenses of the program. Beginning in 1991, a Federal policy fee of $25, which was increased to $30 in 1995, is applied to most policies in order to generate the funds for salaries, expenses, and mitigation costs.

The program currently has three basic components:

1. Identifying and mapping flood-prone communities
2. Enforcing the requirement that communities adopt and enforce floodplain management regulations
3. The provision of flood insurance

Source: FEMA and FIMA, 2002.

Risk-Sharing Pools

Claire Reiss of the Public Entity Risk Institute and author of *Risk Identification and Analysis: A Guide for Small Public Entities* describes an alternative for local governments and other small public entities that are considering purchasing insurance: risk-sharing pools. Reiss writes:

A public entity that is considering purchasing traditional insurance may also consider public risk-sharing pools. These are associations of public entities with similar functions that have banded together to share risks by creating their own insurance vehicles. Pools sometimes structure themselves or their programs as group insurance purchase arrangements, through which individual members benefit from the group's collective purchasing power. Members pay premiums, which (1) fund the administrative costs of operating the pool, including claims management expenses and (2) pay members' covered losses.

Pools can provide significant advantages to their members. For example, they offer insurance that is specific to public entities at premiums that are generally stable and affordable. Many pools also offer additional benefits and services at little or no extra charge, including advice on safety and risk management; seminars on loss control; updates on changes in the insurance industry; and property appraisal and inspection. Some pools offer members the opportunity to receive dividends for maintaining a good loss record.

Some membership organizations for public entities sponsor pools or endorse insurance products that are then marketed to their members. However, sponsorship or endorsement by a membership organization does not guarantee that the insurance is broad enough to meet the needs of a given entity or that the insurance provider is financially stable. A public entity must apply the same due diligence to a consideration of these programs that it would apply to a comparison of available commercial insurance programs. (Reiss, 2001)

OBSTACLES TO MITIGATION

Mitigation is not yet practiced to its fullest extent. Though the potential exists to reduce hazard risk throughout the world through the various mitigation measures discussed in the previous section, among others, formidable obstacles stand in the way.

The first and primary obstacle is cost. Mitigation projects can be very expensive. Though governments may have the resources to carry out even very costly mitigation projects, they choose not to in favor of spending money on programs that are perceived to be more pressing. The reality is that governments maintain limited funds to support development, and many consider hazards to be chance events that might not occur. When drafting their budgets, they therefore tend to favor programs requiring regular funding, such as military, educational, economic, or infrastructure projects.

The second obstacle is low levels of political support or "buy-in." It is important for politicians to maintain their high public standing, so they tend to prefer projects that increase their stature over risky endeavors that may not offer a return in the short run. Mitigation, which is often conducted during periods that no imminent threat exists and which may require some level of sacrifice or hardship, may be hard to "sell" to the local politicians. Convincing the local decision-making authority of the need to undertake a mitigation measure is crucial to getting the project off the ground.

Sociocultural issues are a third potential obstacle. Mitigation measures almost always result in a change of some sort, whether to place (location), practice, or a physical structure. People and cultures may tie meaning to these factors and resist any project that involves an alteration they find undesirable. Disaster managers unaware of these sociocultural ties are likely to create mitigation measures that do not take these important issues into consideration, dooming their program to failure before it even begins.

Risk perception is the fourth major obstacle to mitigation. How people perceive a hazard that threatens them will play a large part in what they do to prevent it, and how much they are willing to sacrifice to avoid it. First, the hazard must be recognized. Second, the two risk components of consequence and likelihood must be accurately perceived. And third, there must be a belief that the hazard risk is reducible. Inaccuracies in any of these three areas can quickly derail a mitigation effort.

ASSESSING AND SELECTING MITIGATION OPTIONS

Once a comprehensive hazards risk analysis and assessment have been completed, as described in Chapters 2 and 3, and risk mitigation options have been generated for each hazard on the prioritized list, disaster managers can begin assessing their options. Each hazard may have several risk mitigation options to choose from, each option resulting in different impacts upon society. Several factors must be considered when assessing each identified risk mitigation actions, including:

- The expected impact that each risk mitigation option will have on reducing the identified hazard risks and vulnerabilities
- The probability that each action will be implemented
- Mechanisms for funding and leveraging of resources necessary to implement each option

IMPACT OF RISK MITIGATION OPTIONS ON COMMUNITY RISK REDUCTION

The most critical issue in assessing a risk mitigation option is determining its impact on reducing the identified risk or vulnerability in the community. Several factors must be considered when assessing the risk reduction to be accomplished through individual mitigation options or groups of mitigation options. These factors, each of which is analyzed according to the six categories of mitigation listed above, include:

- Reduced number of deaths and injuries
- Reduced property damage
- Reduced economic loss

PROBABILITY THAT EACH ACTION WILL BE IMPLEMENTED

Determining the probability that an individual mitigation action or a group of mitigation actions will be implemented is critical in determining feasibility. Numerous factors impact the probability that an individual mitigation action or a group of mitigation actions will be implemented, including:

1. *Political support.* Without sufficient political support, it is difficult or impossible to implement mitigation actions. Strong political support, developed over the course of the planning process, increases the probability of implementation. Weak political support, as a result of limited or even no understanding of the risk management strategy, decreases the probability of implementation.

2. *Public support.* Support from the public is critical, especially when such support is needed to pass funding bills and regulatory restrictions to enable the implementation of particular mitigation actions. Public support is most easily acquired through public participation throughout the entire disaster management process, including the implementation phase.

3. *Support from the business sector.* Business owners play a key role in their communities, and so their support for a community risk management strategy is critical for successful implementation. Businesses may have much to gain, but also have much to lose, from the consequences of a particular mitigation option. The business community generally plays a large role in any community in generating funding and public support for risk management actions and, likewise, is a good partner in mitigation.

4. *Support from nonprofit and interest groups.* A variety of groups are active in any community, including environmental groups, voluntary organizations, neighborhood and church organizations, and labor unions, to name a few. Their participation helps generate support among community members and their families. Conversely, their opposition can generate great resistance and even legal action that could delay or foreclose the implementation of mitigation actions.

5. *Cost.* The cost of a mitigation action can impact the probability of its implementation. The best way to mitigate cost issues is to educate political leaders, the public, the business sector, and nonprofit and community groups of the expected benefits of the action and the expected reduction in casualties and property losses when the next disaster strikes. If a mitigation option has been analyzed accurately and has been chosen because its benefits clearly outweigh its costs, then selling it to these stakeholders is possible. Changing risk perceptions to match reality is the primary obstacle.

6. *Long-term vs. short-term benefits.* Political leaders and business executives are sensitive to the need to produce immediate results, either in their term of office or in the next business quarter. This may cause them to support short-term actions that will produce fast, identifiable results. The long-term, sustainable option is always the best, though convincing people may not be easy when cheaper, shorter-term options exist.

The STAPLEE Method of Assessing Mitigation Options

There are many methods by which the hazards risk management team can assess the mitigation options that they have generated for each identified hazard risk. One method, or framework as it is often called, that has been developed by FEMA is the STAPLEE method.

STAPLEE guides the disaster managers in their assessment by utilizing a systematic approach for addressing options. The term "STAPLEE" is an acronym that stands for the following evaluation criteria:

- Social
- Technical
- Administrative
- Political
- Legal
- Economic
- Environmental

Each of these terms represents an opportunity or constraint to implementing a particular mitigation option. Because communities are generally very different in their overall makeup, a single mitigation option analyzed according to the STAPLEE criteria may produce very different outcomes in different places.

Each criteria considers a different aspect of the community and requires different methods of information collection and analysis. There is no definable or identifiable priority or weight assigned to any of these criteria—the order of the letters in the acronym was determined by the word they formed (which was meant to be easy to remember).

The criteria include (adapted from FEMA, 2005b):

1. *Social.* A mitigation option will only be viable if it is socially accepted within the community where it is implemented. The public is instrumental in guiding decisions such as these through their support or lack thereof. Even with public support, a proposed mitigation option

might not work, but without public support, that the taken action will almost certainly fail.

Disaster managers must have a clear understanding of how the mitigation option will affect the population. They must investigate several questions that will guide their interpretation of this criterion, including:

- Will the proposed action adversely affect any one segment of the population? Will it give some disproportionate benefit to only one segment?
- Will the action disrupt established neighborhoods, break up legal, political, or electoral districts, or cause the relocation of lower-income people?
- Is the proposed action compatible with present and future community values?
- Will the actions adversely affect cultural values or resources?

2. *Technical.* If the proposed action is investigated and found to not be technically feasible, it is probably not a good option. Additionally, it is important to investigate, when looking into the technical feasibility of each option, whether it will help to reduce losses in the long term and whether it has any secondary effects that could nullify its benefits.

By addressing the following questions, the hazards risk management team can determine the suitability of their proposed actions based on the actual degree of help those actions will ultimately provide:

- How effective is the action in avoiding or reducing future losses? It is important that the measures taken are able to achieve the anticipated results, not a fraction thereof.
- Will it create more problems than it fixes?
- Does it solve the problem or only a symptom?

3. *Administrative.* This measure investigates the community's capabilities for carrying out the projects that would be required to implement each of the mitigation options. Specifically, the disaster managers will look at each option's requirements in terms of:

- Staffing
- Funding
- Maintenance

The community may be able to implement some options on their own, using their own resources, while other options will require (often significant) outside assistance. The questions disaster managers must answer include:

- Does the jurisdiction have the capability (staff, technical experts, and/or funding) to implement the action, and can it be readily obtained?
- Can the community provide the necessary maintenance work required to maintain the method of mitigation?
- Can the implementation project be accomplished in a timely manner, without excessive disruption to the community?

4. *Political.* Mitigation actions tend to be highly political. Like most other government actions, they tend to entail the spending of local funds and the use of local services, require permits and permissions, involve some alteration to the fabric of the community, may involve some use of public lands, and involve a certain amount of risk for the political leaders who authorize the actions. The political nature of each option will likewise be an influential decision-making factor when options are being chosen for implementation.

Disaster managers will need to be aware of or will need to investigate how local, regional, and national political leaders feel about issues related to such agenda items as the environment, economic development, safety, and emergency management. Logically, actions that go against the current administration's political ideology in any of these areas are likely to receive less support than those that are in line with its beliefs. It is not uncommon for proposed mitigation actions to fail because they lack this much-needed political support.

Disaster managers can measure political support for their mitigation options by addressing the following questions:

- Is there political support to implement and maintain this action?
- Have political leaders participated in the planning process so far?
- Is there a local champion willing to help see the action to completion?
- Who are the stakeholders in this proposed action, and how do they feel about the changes that will occur as a result of the action?
- Is there enough public support, toward which political leaders are likely to lean, to ensure the success of the action?
- Have all of the stakeholders been offered an opportunity to participate in the planning process?
- How can the mitigation objectives be accomplished at the lowest "cost" to the public?

5. *Legal.* Many mitigation options will require actions to be taken that need legal authority in order to be lawfully conducted. Disaster managers must determine whether they will be able to establish the legal authority at the national, provincial, state, or local levels to implement the proposed mitigation actions. It even may be necessary to propose the passage of new laws or regulations to accommodate the needs of the mitigation measure if such legal authority is weak or does not exist. However, this legal authority is best established long before the mitigation action is taken because of the exhaustive process of making or changing laws.

Depending upon the country where the mitigation actions are being conducted, government entities at each structural level may operate under their own specific source of delegated authority. Local governments may operate under "enabling legislation" that gives them the power to engage in certain activities, or under informal governance systems based on tribal or other forms of law.

Disaster managers will need to identify the unit of government that will ultimately have the authority to grant or deny the permission to undertake the actions necessary to implement the mitigation action. They will be well served to understand the interrelationships

between the various levels of government in order to better anticipate any political roadblocks or challenges that may arise. Much of this information can be obtained by asking:

- Does the government in question have the authority to grant permissions or permits for the work that is to be conducted?
- Is there a technical, scientific, or legal basis for the mitigation action (i.e., does the mitigation action "fit" the hazard setting?)?
- Are the proper laws, ordinances, and resolutions in place to implement the action?
- Are there any potential legal consequences?
- Will there by any issues of liability for the actions or support of actions, or lack of action, by any of the mitigation stakeholders?
- Is the action likely to be challenged by stakeholders who may be negatively affected?

6. *Economic.* Like all community projects, mitigation options must prove to be cost-effective to the community before they are considered viable for implementation. The mitigation measures must be also be affordable to those who will be funding the project. Mitigation projects often require maintenance long after the project is completed, at the expense of the community where it is implemented. For this reason, affordability means many things, including being fundable without restructuring local budgets, fundable but with some budget restructuring required, fundable but requiring a special tax to be imposed, fundable but requiring external loans, and so on.

Mitigation measures that are cost-free to the community or that can be financed within a current budget cycle are much more attractive to government officials who are making funding decisions than options that will require general obligation bonds or other forms of debt that will ultimately draw upon future community funds.

Those communities that have very little money to support mitigation actions (a common condition) are

likely to be more willing to support a mitigation option if it can be funded, either in part or in whole, by some alternative (outside) source or sources. Disaster managers should ask the following questions when considering the economic aspects of mitigation options:

- Are there currently sources of funds that can be used to implement the action?
- What benefits will the action provide?
- Does the cost seem reasonable for the size of the problem and likely benefits?
- What financial burden will be placed on the tax base or local economy to implement or maintain this action?
- Will the result of the action negatively affect the economy in some secondary manner, such as reducing some form of income generation that was dependent upon the existence of the hazard?
- Does the action contribute to other community economic goals, such as capital improvements or economic development?

7. *Environmental.* Many mitigation measures affect the natural environment, either positively or negatively (and occasionally both positively and negatively to some degree). Disaster managers must consider these effects, as their actions could have long-term effects on the community and could negate any positive gains of the mitigation action.

Of course, benefits to the environment often that arise from the implementation of a mitigation measure, which must be considered in the choosing of options. Floodplain buyout programs, for instance, which include acquisition and relocation of structures out of identified floodplains, help to restore the natural function of the floodplain. Vegetation management, which is often performed to control the wildfire hazard risk to humans and property, also provides the same protection to the environment.

Questions that disaster managers should ask when considering the environmental factors associated with particular mitigation options include:

- How will this action affect the environment (including land, water, and air resources and endangered species)?
- Will this action comply with environmental laws and regulations?
- Is the action consistent with the community's environmental values and goals?

EMERGENCY RESPONSE CAPACITY AS A RISK MITIGATION MEASURE

Development of a nation's emergency response capacity is often cited as one of the most important mitigation measures that can be taken. The ability of emergency and disaster response mechanisms to manage a disastrous event and prevent further injuries, fatalities, and destruction of property and the environment will play a large part in determining that community's or country's vulnerability.

To be truly effective, emergency capabilities must be tailored to the risks of the community. Though they are primarily designed to handle the routine emergencies experienced by the community, the region, or the country, these resources can be developed so they can manage large-scale events as well. In general, emergency and disaster management systems will minimally include:

- Fire department resources
- Law enforcement resources
- Public health infrastructure (clinics, hospitals, ambulances, etc.)

Additional resources that help to specialize emergency management and ensure that the community or country is prepared for major disasters include, but are not limited to:

- Search-and-rescue teams (wilderness and urban)
- Hazardous materials teams
- Special weapons and tactics teams
- Emergency management specialists or departments
- Disaster medical and mortuary teams

- Debris management teams
- Mass casualty management teams
- Infrastructure repair resources
- Communications coordinators
- Volunteer management teams

Developing an emergency management capacity also involves taking several important actions. These may involve:

- Creation of comprehensive emergency response plans for the range of known hazards that exist, detailing responsibilities, operational tasks, leadership roles, and administrative issues (such as what agency pays for what actions, and what reimbursement will occur)
- Establishment of statutory authority for response and recovery
- Creation of mutual aid agreements within countries (between communities) and around international regions, to formalize assistance before disasters strike
- Development of a full training and exercise regimen

Preparedness and response actions and resources will be described in much greater detail in Chapters 5 and 6, while the components of an emergency response capacity will be described in Chapter 8.

INCORPORATING MITIGATION INTO DEVELOPMENT AND RELIEF PROJECTS

More and more each year, especially as a result of the United Nations' efforts during the International Decade for Natural Disaster Reduction and the International Strategy for Disaster Reduction, mitigation is recognized as an essential component of all pre- and postdisaster development projects. Development workers, be they national, international, or other, must be aware of the hazard risks that exist where they are developing and must incorporate those risks into their project designs (see Exhibit 4-4).

EXHIBIT 4-4 Organization of American States: "Decision Criteria with Limited Information"

Unfortunately, even with the current efforts to map worldwide risk, there are situations where projects must go ahead with little or no information on risk. The Organization of American States, which is heavily involved in development and reconstruction in Latin America, has designated four available options to accommodate such situations when international funding is involved:

Cut-off period. This is the crudest procedure for incorporating natural hazard risk into economic analysis. For the most part, it is used by private investment agencies with a primary interest in capital return. To be economically feasible under the cut-off-period method, a project must accrue benefits that exceed its cost in relatively few years. For very risky projects, such as those at high risk of flooding or landslides, the cut-off period might be set as low as two or three years. The logic of the cut-off-period rule is that, because costs and benefits are uncertain beyond the cut-off date, they should be ignored when determining project feasibility. To determine the length of the cut-off period, a rough idea of the riskiness of the project should be sought during the pre-feasibility analysis. The method is appropriate when three conditions are present: (1) few records concerning natural hazard risk are available, (2) the likely hazards are of fast rather than slow onset, and (3) the magnitude of potential disasters is great.

Discount rate adjustment. Adding a risk premium to the discount rate is another ad hoc way to reflect uncertainty in project analysis. A variation is to add a premium to the discount rate for the benefits accruing to the project as a result of mitigation, and to subtract a premium for the costs, a procedure consistent with the fact that hazards decrease benefits and increase costs. Introducing these premiums into feasibility calculations has the effect of giving less weight to increasingly uncertain future costs and benefits. This is consistent with the conventional expectation that an investor will require higher rates of return for riskier investments. The analyst using this method must determine an arbitrary risk premium to add to the discount rate. The same kind of hazard information used for the cut-off method is applicable here, and the method is applicable to both slow- and rapid-onset hazards. Again, this information should be available by the pre-feasibility stage of planning.

Game-theory approaches. Two strategies from game theory are applicable to introducing risk assessment into the economic appraisal of projects: the "maximin-gain" and the "minimax-regret." Both can be applied at the earliest stages of project formulation, as the necessary minimum information on historical hazardous events and damage becomes available. From this information, it is possible to estimate the comparative benefits of equivalent project alternatives, given varying severities of a hazardous event. The game-theory approaches are best suited to short-term, high-impact hazards for which most-least-damage scenarios can be produced.

Given the possible net benefits accrued under different hazard conditions, the maximin-gain approach seeks the project alternative that will give the highest net return in the worst-case scenario; the selection of a particular project alternative is based entirely on security and is thus very conservative. Minimax-regret takes a different approach by considering the sum of the losses that each project alternative might incur given the probabilities of hazardous events occurring. The alternative with the smallest sum of possible losses when all scenarios are considered is the one that would be selected.

Sensitivity analysis. Using this method, an analyst tests the effect of changes in the values of key project parameters (e.g., halving the income from admission fees or doubling the maintenance cost) on net costs and benefits. To assess the impact of natural hazards, values are changed according to previous hazard information, damage reports, etc., so that the effects of a possible natural event on the

economic feasibility of the project can be quantified. With this type of analysis, it is possible to determine how much a key parameter can change before the project becomes economically unfeasible. The analysis can also be used to test the effect of mitigation measures.

Source: OAS, 1991.

Of course, mitigation is costly, and for this reason its incorporation may be resisted. However, through education, regulation, and enforcement, it is easy to teach these officials that it may not be worth spending the money on the project in the first place if there is little chance the structure or system is unlikely to survive a disaster in the near or even distant future. This is especially true for projects that involve large amounts of national or foreign debt, because the debt will still exist even if the structure has been destroyed. Resilience is one of the fundamental bases of sustainable development.

The World Bank has begun to embrace this philosophy and has created the Disaster Management Facility to assess risks around the world and incorporate their findings into consideration for development projects. They are gradually gaining a greater awareness of site-specific risks that exist in many countries of the world, especially poor countries, where risk assessments were nonexistent, inaccurate, or severely out of date. With this tool in hand, they can more accurately assess large development projects, such as schools, hospitals, or other components of infrastructure, and determine if the project design accounts for the hazard risks with which the new structure will need to contend. It is in the best interest of both the lender and the borrower to take such actions, because both will ultimately suffer in the event of a disaster that results in loss of the structure or project.

Finally, mitigation must be incorporated into relief projects. It has often been said that disasters are opportunities in disguise. Despite the death, suffering, and destruction, the event allows for a fresh start, and with proper planning, the society that is rebuilt can be made resilient to the hazard that brought about its previous destruction. There are conflicting goals in the aftermath of disasters—the goal to rebuild as quickly as possible, and the goal to rebuild as strongly as possible. It is vital that relief efforts fully assess the future risks of the region, based upon the new information gained in the aftermath of the disaster, and incorporate all of those findings into any relief and reconstruction project. For the structures that are left standing, this information may be used to retrofit, relocate, or perform other mitigation measures as listed above. Finally, the opportunity to fine-tune both public education efforts and response capabilities may be gained in this period as well.

CONCLUSION

Mitigation traditionally has been perceived as a luxury of the wealthy nations. Yet, through unilateral, multilateral, and nonprofit financial and technical assistance, many of the poorer nations of the world are beginning to not only recognize mitigation's benefits but to benefit from its practice as well.

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5

Preparedness

INTRODUCTION

In the 16th century, Miguel de Cervantes Saavedra, author of *Don Quixote*, wrote, "Forewarned; Forearmed. To be prepared is half the victory." In terms of effective disaster management, his words could not ring more true. Though mitigation measures are highly effective at reducing disaster risk, they cannot eliminate every threat to a community or country. When disasters strike, there may be little or no time to make any additional arrangements, to learn any new skills, or to acquire needed supplies. Disaster preparedness—defined as actions taken in advance of a disaster to ensure adequate response to its impacts, and the relief and recovery from its consequences—is performed to eliminate the need for any last-minute actions.

Many different organizations and individuals, including emergency response agencies, government officials, businesses, and citizens, conduct disaster preparedness activities. Each has a unique role to play and unique responsibilities to fulfill when disasters strike. The range of activities that constitute the preparedness component of the comprehensive emergency management cycle is expansive, and these actions are often the primary factors that determine whether actual response actions are successful.

This chapter will present an overview of disaster preparedness, followed by descriptions and discussions of the planning process, including Emergency Operations Plans (EOPs), exercises, training, equipment, statutory authority, warning, and public preparedness. A discussion of the media's role in disaster management is included as well.

OVERVIEW OF DISASTER PREPAREDNESS

The goals of disaster preparedness are knowing what to do in a disaster's aftermath, knowing how to do it, and being equipped with the right tools to do it effectively. This difficult process may take years before attaining satisfactory levels, and maintaining such levels is an ongoing effort.

Preparedness minimizes hazards' adverse effects through effective precautionary measures that ensure a timely, appropriate, and efficient organization and delivery of response and relief action. Responding to any disaster, especially a catastrophic event, is guaranteed to be unique, complex, and confusing.

Preparedness actions and activities can be divided according to recipient. The government component, which includes administration, emergency

management, public health, and other services agencies, is one group. Individuals and businesses are the second group. Preparedness of the first group is normally defined and conducted through the creation and application of an Emergency Operations Plan (EOP) and bolstered by training and exercises. The basics of government preparedness actions are provided below.

GOVERNMENT PREPAREDNESS

People in almost all nations have come to expect that their government will intervene in times of disaster and come to their aid. Likewise, many governments have assured their constituents that their response needs would be met should a disaster ever occur. Despite any image these governments may project regarding their ability to effectively govern and protect their people, the true test of their abilities is during times of disaster. Whether they pass that test is a matter of how well they have prepared themselves to respond.

The diverse range of government preparedness actions may be grouped into five general categories: planning, exercise, training, equipment, and statutory authority.

PLANNING

Emergency and disaster response planning at the government level is a necessary and involved process. In the event of a disaster, each government jurisdictional level will be expected or required to perform a range of tasks and functions in the lead up to its aftermath. Clearly, the onset of that disaster is not the ideal time to begin planning. Governments must know well in advance not only what they will need to do but also how they will do it, what equipment they use, and how others can and will assist them.

The most comprehensive methodology used to plan for disasters is the creation of a community or national Emergency Operations Plan (EOP). These plans can be scaled up or down depending upon the needs of the community and the particular disaster, and are able to accommodate the complex and diverse needs of a full range of disaster response and recovery actions.

The Emergency Operations Plan (EOP)

An Emergency Operations Plan is a document that describes in intricate detail the people and agencies who will be involved in the response to hazard events (including disasters), the responsibilities and actions of these individuals and agencies, and when and where those responsibilities and actions will be called upon. It also describes how citizens and structures will be protected in the event of a disaster. It may catalogue the equipment, facilities, and resources available within and outside the jurisdiction. EOPs are also referred to as contingency plans, continuity of operations plans, emergency response plans, and counter disaster plans, though the functions of each remain largely similar to what is described above.

EOPs are required at every level of government, from local to national. They also can be created for individual entities, such as schools, hospitals, prisons, or utilities. Plans can be integrated, which improves overall community response coordination. Beyond the national level, it is possible to create international EOPs, spanning countries, continents, and the entire globe, and because of the rising number of regional disaster events, the number of international plans has been increasing each year.

At each jurisdictional level where disaster planning is conducted, all players involved in the emergency response and recovery (the "stakeholders") must be included, preferably from conception of the plan onward, to ensure that the resulting process and document are consistent, complete, and trouble-free.

EOPs not only define what is done at each organizational level, but also address under what circumstances each organizational level interacts, and how they will do so. It is important to note that EOPs are most effective when they are designed to be

adaptable to the full range of hazards identified for the community.

The components of an effective emergency response plan include:

- Hazards risk analysis
- The basic plan
- Functional annexes
- Hazard-specific annexes

Before an EOP can be created, a **hazard risk analysis** must be performed. Different hazard types result in different consequences, so having a response mechanism that can accommodate the expected range of consequences is the wisest use of limited resources.

Through the hazard identification and description and the risk analysis and assessment processes, disaster managers will have discovered not only which hazards exist in the community but also how they affect the community, and will have prioritized them by need for treatment. Using this information, they likely will have addressed the mitigation of risk, as described in Chapter 4. The EOP follows in this line of thinking.

The **basic plan**, also called the "base plan," is the main body of the document that describes emergency operations within the community or country. The main purpose of this document is to introduce and describe various concepts and policies, clarify individual and agency responsibilities, and delineate authority. The components of a Basic Emergency Operations Plan, each of which is described, include:

- *The introductory material.* The introductory material, found at the very beginning of the plan, introduces the document, explains its need, and establishes credibility. It usually begins with a promulgation document, normally in the form of an open letter written and signed by the jurisdiction's most senior executive. This document provides confirmation that the plan is official and has been approved at the highest levels of government.

The promulgation document may be accompanied by a signatures page, which includes the most senior executive within each agency, department, or organization included in the body of the plan. The signatures page provides a level of credibility in that it shows that each involved organization not only participated in the plan's preparation but also that they agree to the role they will be required to play. An expanded signatures section may include endorsements by key figures, thereby giving the plan further credibility.

A title page may be included to provide information about the document itself, including the names of those involved in its publication and the date and place of publication. A record of changes is also valuable. Change records, which include the dates of specific changes and what changes occur, are an effective form of version control among users. A distribution record, which outlines exactly who is provided with a copy of the plan, ensures that each time changes occur, the correct people are provided with an updated copy.

A table of contents is included in the introductory section. The table of contents should include the material in the basic plan, as well as any graphs and charts for easy reference and any supplementary materials (such as annexes) that follow the basic plan. Finally, if necessary, are a glossary of key terms and a list of acronyms.

- *Purpose*. The purpose is one or more pages that clearly and concisely explain exactly what the plan is, why it was created, and what it does. Providing a brief explanation of each component of the plan is helpful, so that such explanatory information may be omitted from the main body of the document.

- *Situation and assumptions*. The situation section defines the plan's scope. It allows the reader or user to understand why and exactly for what the document is needed. The amount of information provided in this section is truly a factor of how

much the users of the document would be expected to reasonably know. Commonly known information may be omitted, as may information that provides no benefit to the user in terms of disaster preparedness. Components of the situation section may include:

○ Geographical limit of the jurisdiction affected by the plan
○ Geographical, political, and demographic description of the affected area
○ Important, relevant information about the area, such as main population centers and utilities
○ Listing of the area's identified hazards, including their geographic range, likelihood, and consequences, as well as specific vulnerable populations and facilities
○ Special populations, such as the elderly, marginalized groups, children, disabled, and linguistically distinct
○ Maps and other useful facts and figures

The assumptions section describes those details that the creators of the plan assume to be true, or that they believe would be true during the plan's activation. This section explains to readers and users that planning is performed without perfect information and that adjustments may need to be made if certain original assumptions are later discovered to be erroneous. Information stated in the assumptions section may range from the obvious (e.g., "Officials are aware that disasters may occur and that they shoulder specific responsibilities in the execution of the response plan developed for these disasters.") to conjecture ("A biological attack will involve a period of uncertainty and confusion, during which time it may not be apparent that an attack has occurred.").

• *Concept of operations.* The concept of operations section explains to the user how the planned disaster response will play out. Topics covered by the concept of operations section include what situations will initiate activation of the plan or a declaration of emergency, when and how an emergency operations center will be activated and staffed, what other general actions will be taken (and when and by whom), and additional logical, planned sequences and actions. Predisaster issues are covered in this section as well, including warning and evacuation.

The concept of operations section is intended to give the reader a general overview of how response will be carried out. If more specific instruction is required, it will be covered under the annexes section.

• *Organization and assignment of responsibilities.* This section of the plan describes and illustrates the actual organizational structure of the disaster management function of government. Organizational charts and other methods are often used for illustration. A detailed list follows of the actual organizational titles (roles) that will be involved in the response to a disaster (the roles are used, such as "Fire Chief," rather than the names of those that fill them, so that the plan need not be altered when there are changes in the people assigned to those roles). The actual responsibilities assigned to the person filling each role are listed, with information dictating how and when those responsibilities will be carried out (see Exhibit 5-1). In many cases, responsibilities require the involvement of several actors, and in such cases this section stipulates primary and supportive designations to clarify leadership. A chart or matrix is often included in this section that lists each responsibility or category of responsibilities on one axis and designates the primary and supportive roles along the other axis.

National plans, as well as many regional or local plans, also may list various government agencies that have been assigned responsibilities in line with their regular missions, and may describe the tasks and functions these agencies are expected to perform in the event of a disaster. For instance, the Ministry or Department of Transportation may be responsible for ensuring that all transportation routes are mitigated from a range of hazards and are quickly repaired in the aftermath of a disaster.

EXHIBIT 5-1   Example of Responsibilities (Select) That May Be Assigned in an EOP "Organization and Assigned Responsibilities" Section

Chief Executive Official ("CEO")

- Sets policy for the emergency response organization
- Assumes responsibility for the overall response and recovery operations
- Authorizes the mitigation strategy for recovery
- Identifies by title or position the individuals responsible for serving as Incident Commander (IC), Emergency Operations Center (EOC) Manager, Health and Medical Coordinator, Communications Coordinator, Warning Coordinator, Public Information Officer (PIO), Evacuation Coordinator, Mass Care Coordinator, and Resource Manager
- Identifies by title or position the individuals assigned to work in the EOC during emergencies

Fire Department

- Manages fire department resources and directs fire department operations

Police Department

- Manages law enforcement resources and directs traffic control and law enforcement operations

Health and Medical Coordinator

- Coordinates the use of health and medical resources and personnel involved in providing medical assistance to disaster victims
- Meets with the heads of local public health, emergency medical (EMS), hospital, environmental health, mental health, and mortuary services, or their designees, to review and prepare emergency health and medical plans and ensure their practicality and interoperability. When appropriate, includes local representatives of professional societies and associations in these meetings to gain their members' understanding of and support for health and medical plans
- Meets with representatives of fire and police departments, emergency management agencies, military departments, state and federal agencies, and the ARC to discuss coordination of disaster plans

Public Works

- Manages public works resources and directs public works operations (e.g., water supply/treatment, road maintenance, trash/debris removal)
- Coordinates with private sector utilities (e.g., power and gas) on shutdown and service restoration
- Coordinates with private sector utilities and contractors for use of private sector resources in public works–related operations

Warning Coordinator

- Determines warning resource requirements
- Identifies warning system resources in the jurisdiction that are available to warn the public
- Performs a survey to establish warning sites
- Identifies areas to be covered by fixed-site warning systems
- Develops procedures to warn areas not covered by existing warning systems
- Develops special warning systems for those with hearing and sight disabilities
- Develops means to give expedited warning to custodial institutions (e.g., nursing homes, schools, prisons)
- Coordinates warning requirements with the local Emergency Alert System (EAS) stations and other radio/TV stations in the jurisdiction

- Develops a chart of various warning systems, applicability of each to various hazards, and procedures for activating each
- Coordinates planning requirements with the EOC Manager

Emergency Operations Center (EOC) Manager

- Manages the EOC as a physical facility (e.g., layout and setup), oversees its activation, and ensures it is staffed to support response organizations' needs
- Oversees the planning and development of procedures to accomplish the emergency communications function during emergency operations
- Ensures a sufficient number of personnel are assigned to the communications and information processing sections in the EOC
- Oversees the planning and development of the warning function
- Reviews and updates listings, including phone numbers of emergency response personnel to be notified of emergency situations
- Designates one or more facilities to serve as the jurisdiction's alternate EOC
- Ensures that communications, warning, and other necessary operations support equipment is readily available for use in the alternate EOC

Emergency Manager

- Coordinates with the Communications Coordinator, Warning Coordinator, PIO, Evacuation Coordinator, Health and Medical Coordinator, Resource Manager, and Mass Care Coordinator to ensure necessary planning considerations are included in the EOP
- Coordinates with the local chapter of the ARC, Salvation Army, other public service nonprofit organizations, the School Superintendent, etc.,

as appropriate to identify a lead organization, if possible, and personnel to perform mass care operations jobs
- Coordinates volunteer support efforts to include the activities of volunteers from outside the jurisdiction and the assistance offered by unorganized volunteer and neighborhood groups within the jurisdiction
- Works with the PIO to develop emergency information packets and emergency instructions for the public
- Coordinates planning requirements with the emergency management staff in neighboring jurisdictions that have been identified as potentially hazard-free and have agreed to house evacuees in their mass care facilities
- Coordinates the provision of mass care needs for personnel performing medical duties during catastrophic emergencies
- Assists, as appropriate, the animal care and control agency staff's efforts to coordinate the preparedness actions needed to protect and care for animals during and following catastrophic emergencies. Assists the Resource Manager as needed to prepare for response operations:
  - Convenes planning meetings for the function in consultation with (or on the advice of) the Resource Manager
  - Designates Emergency Management Agency staff to serve in key posts, as appropriate. (Whether the Resource Manager should be an emergency management official—given the emergency resources focus—or a Department of General Services person is left to the discretion of the jurisdiction.)
- Advocates that mitigation concerns be addressed appropriately during response and recovery operations

Source: FEMA, 1996.

Generally, representatives from these agencies take an active role in the planning process and are signatories of the final plan. To be effective, the plan must outline the services expected of these agencies both before and after disasters occur, and also must detail how these agencies will cover the added expenses they will incur as a result of participation in the disaster response.

- *Administration and logistics.* The administration and logistics section outlines the jurisdiction's policies in regards to general support and services and resource management required prior to and during the disaster response. If any agreements between jurisdictions, nations, or other organizational levels exist, they are referenced within this section. Other items that may be defined include:
  - Volunteer management
  - Record keeping
  - Reporting
  - Financial management and reimbursement for services and resources
  - Legal liabilities and protections
- *Plan development and logistics.* This section describes how the plan is or was developed, how it will be maintained, updated, and changed, and who will be responsible for those actions. A projected maintenance schedule is often included, detailing what kind of information will be checked for timeliness and accuracy, and what kind of assessments (such as exercises) to base changes on. Procedures for recording changes to ensure version control and distributing the updated plan may be defined as well. If a regimen of testing and exercising (see below) exists, it will be detailed within this section.
- *Authorities and references.* Any emergency operations plan must have a statutory authority upon which its operations are based. Without legal authority, many of the actions listed in the plan may not be possible. All actions must have a legal basis long before a disaster occurs, and the authorities section is a way to record the existence of those needed authorities.

The references section provides the source information for much of the information found in the plan. Provided reference information allows for effective plan updating and maintenance, establishes further credibility to the materials, and allows users to expand upon the information as necessary. An accurate reference section can actually help to limit the overall size of the plan, as it can direct users to much of the non-emergency information that does not necessarily need to be called upon in the time-constrained aftermath of a disaster.

EOP base plans are often supplemented by **functional annexes** that provide much more highly detailed information about the operational needs of specific response mechanisms. These annexes go into much greater detail about who does what in fulfilling the many different functions in an emergency response. Annexes may cover any specific task or function that is conducted in the lead up to, response, or aftermath of the many different disaster types.

The planners themselves must determine what functions need this extra treatment, as all jurisdictions have unique needs. Depending upon the type of activity, a significant amount of further study, research, and testing may be required, such as for evacuation planning, for instance.

For ease of understanding and clarity the organization of each annex may follow the basic organization used in the base plan, ensuring, however, that information is not unnecessarily repeated.

Various functions that may be covered by individual annexes in the plan (to be determined on a case-by-case basis), include:

- Direction and control
- Notification and warning
- Evacuation
- Communications
- Public works
- Public information
- Fire suppression
- Search and rescue
- Emergency medical services and mass care
- Mortuary services

- Security and perimeter control
- Inclusion of military resources
- Transportation
- Traffic control
- Relief
- Short- and long-term recovery
- Financial management
- International coordination
- Volunteer management
- Donations management
- Vulnerable populations

Hazard-specific annexes contain operational information not covered in the basic plan and may include preparedness, response, and recovery actions. Building on information in the base plan, the hazard-specific annex may stipulate the risk information for individual hazards, including the geographic range, the population likely to be affected, and the season or time the disaster is most likely.

This annex will contain many of the same components required for the base plan, the difference being that the information here is hazard specific. Special detection and warning systems, evacuation routes, risk maps, preparedness and response issues, and other topics may be included. These annexes could be created for any hazard affecting the community, at the planners' discretion.

Exhibit 5-2 points to some EOP examples.

> **EXHIBIT 5-2   Examples of Emergency Operations Plans (EOPs) Available Online**
>
> - Kingston, Canada—www.cityofkingston.ca/residents/emergency/responseplan.asp
> - Baltimore County, Maryland—www.co.ba.md.us/Agencies/fire/emergencyplan/
> - Queensland, Australia—www.health.qld.gov.au/emerg_serv/11201.pdf

EXERCISE

A major part of the preparedness effort of a community or country's response capability is a regimen of exercises. Response exercises allow those involved in emergency and disaster response, as defined in the EOP, to practice their roles and responsibilities before an actual event occurs. Exercises not only prepare the individuals to carry out their duties but also help find problems in the plan in nonemergency situations. This allows for adequate time to address those problems, so unnecessary setbacks do not affect an actual response.

Exercises also serve a very important preparedness function: introducing individuals and agencies involved in response. Response officials often do not formally meet each other until an actual disaster occurs. They may not know exactly what each other does, either during the response or even in their regular functions. Through predisaster introductions, officials are able to immediately call upon the right people in a time of need, without having to second-guess whether the person is the appropriate resource.

A comprehensive exercise program is built upon the specific needs of the community or country for which the exercises are being designed. It has four major components, and they are scheduled logically, from easy to difficult, basic to complex, to allow for incremental learning and experience. Each component of a comprehensive exercise program is listed and described below.

1. *Drill.* A drill is a controlled, supervised method by which a single disaster management operation or function is practiced or tested. Most people are aware of drills, having practiced evacuation from their school classrooms as a child or from their workplace office as an adult. In relation to emergency and disaster response planning, drills are exercises that focus upon the individual building blocks of the EOP in order to perfect each of those components, such that full operation of the plan may run more smoothly.

   Drills are most effective when they mimic real-life situations. For instance, if roadway clearance were being tested, the most effective

drill format would include the controlled placement of debris or some other hazard in a roadway, followed by the actual deployment and use of the proper equipment to remove the debris. The amount of time required to plan and carry out a drill wholly depends upon the function or action being tested, as does the involvement of staff, and the location of the drill.

2. *Tabletop exercise.* A tabletop exercise is designed to allow disaster management officials to practice the full activation of the emergency response plan within the confines of a controlled, low-stress discussion scenario. The tabletop exercise follows a narrative hypothetical scenario predesigned to analyze a specific range of functions outlined in the EOP (such as a hazardous materials incident). Rather than requiring participants to actually perform their functions as defined in the plan, this exercise seeks to elicit a detailed dialogue within which problems and weaknesses may be identified and addressed.

   Tabletop exercises work because they remove stress and time limits from the situation. They gather officials who may not have known each other and allow them to understand what each will do during a disaster response. Officials often discover that their assumptions about the way situations will play out or how other officials might act are completely wrong.

   Tabletop exercises are conducted by a facilitator, who begins by introducing the scenario and offering a brief narrative. Over the course of the exercise, the facilitator describes hypothetical actions and events and questions participants about what they would do at each juncture.

3. *Functional exercise.* The functional exercise tests and practices disaster managers' capabilities by simulating an event to which they must respond. Unlike a drill, which tests one function or activity, the functional exercise tests a full range of associated activities that together fulfill a greater overall response purpose.

   The functional exercise is a step above the tabletop exercise in that it is time dependent, thereby introducing stress to the scenario, and requires participants to actually act upon their roles and responsibilities rather than simply discuss what they would do. However, the functional exercise does not require a full activation of the emergency response plan, as it does not seek to test all plan components and participants. For instance, a fire department may wish to test how its members would respond to a chemical terrorist attack, carrying out all the tasks and functions as outlined in the EOP. Even though police, public health, and other officials would be involved in a real chemical attack, the functional exercise in this case would not include those players.

4. *Full-scale exercise.* The full-scale exercise is a scenario-based event that seeks to create an atmosphere closely mimicking an actual disaster. All players required to act during a real event, as outlined in the EOP, are involved in the full-scale exercise, working in real time and using all of the required equipment and procedures. Ideally, the full functional capacity of the response mechanism is tested.

   Full-scale and functional exercises often use props, actors, and other tools to make the scenario as real as possible. For instance, for a wildfire scenario, a controlled fire may be set so responders can experience what they would most likely confront in a real event. A full-scale exercise tests all facets of the plan for accuracy and effectiveness. Both the full-scale and functional exercises are expensive, complex, and require months or years to plan.

TRAINING

Training is the third component to government preparedness. It goes without saying that disaster response officials are more effective if they are trained to do their jobs. However, this statement must be taken one step further in disaster management, as response officials may place their lives in unnecessary and grave danger if they are not adequately trained in the particulars of specialized response. Untrained or

insufficiently trained responders add to the possibility of a secondary emergency or disaster, and further strain response resources by diverting officials to manage responder rescue and injury care.

Disaster management training is not universally available. Though first-response officials, namely police, fire, and emergency medical services, are likely to have some basic standard of introductory training no matter where they are located, the specialized instruction required of disaster response is much more technical. Many developed nations have established centralized or regional training facilities to bring these skills to the local level. However, most countries still depend on outside training assistance or establish a small number of specially trained teams throughout the country that can be deployed to a disaster as necessary.

The following is a list of specialized training that falls outside the standard course of instruction generally required of fire, police, or EMS officials:

- Evacuation
- Mass care
- Mass fatalities management
- Debris management
- Flood-fighting operations
- Warning coordination
- Spontaneous volunteer management
- Hazardous materials
- Weapons of mass destruction
- Cyclonic storm response
- Urban and wilderness search and rescue
- Radiological response
- Crowd control
- Response to terrorist attacks
- Wildfire and wildland fire response

The following examples of nationally based, academic, and nonprofit training centers are given for further investigation:

- Asian Disaster Preparedness Center (Thailand) —www.adpc.net
- Federal Emergency Management Agency Emergency Management Institute (USA)—www. training.fema.gov/emiweb

- Emergency Management Australia Education and Training Program (Australia)—www.ema.gov. au/agd/EMA/emaInternet.nsf/Page/Education Training
- Emergency Preparedness College (Canada)— www.ocipep.gc.ca/ep/college/cepc_e.asp
- Fire Services College (United Kingdom)— www.fireservicecollege.ac.uk/
- New Zealand Ministry of Civil Defence (New Zealand)—www.mcdem.govt.nz/memwebsite. nsf
- Disaster Management Institute of Southern Africa (South Africa)—www.disaster.co.za
- George Washington University Institute for Crisis, Disaster, and Risk Management (USA)— www.gwu.edu/icdrm
- United Nations Disaster Management Training Programme—www.undmtp.org/default.asp

EQUIPMENT

The development of tools and other equipment to assist in disaster response and recovery has helped response agencies to drastically reduce the number of injuries and deaths and the amount of property damaged or destroyed as result of disaster events. This equipment has also increased the effectiveness of response agencies by protecting the life of the responders themselves. Unfortunately, access to this equipment depends on available resources, and therefore, there exists great disparity throughout the world in terms of who has what equipment.

Opponents of advanced technology, as applied to disaster and emergency management equipment, contend that too much reliance on technologically advanced equipment is a mistake. These critics feel that responders will be worse off in the event of equipment failure than they might have been had they not depended so heavily on the technology in the first place.

Fire suppression equipment is designed to limit the spread of fires affecting all forms of structures and vehicles, as well as land and sea areas. Fire suppression equipment ranges from hand-held devices to large vehicles. Equipment may include:

- Vehicles (trucks, tractors, boats, airplanes, helicopters)
- Devices (extinguishers, hose assemblies, imaging devices)
- Chemicals
- Access equipment (ladders, cranes, cutting and spreading tools)

Rescue equipment is designed to save the life of humans or animals trapped or unable to free themselves from a dangerous situation. Rescue could be from a burning or damaged building, from floodwaters, or from burial under a mass movement (landslide, mudflow, avalanche), among other situations. Rescue equipment could include:

- Shoring and other support devices to stabilize collapsed buildings or mine shafts
- Vehicles and tools designed to extract victims from hard-to-reach locations (such as tree or building tops, high elevations, swift water, or isolated harsh terrain)
- Digging, cutting, spreading, and other manipulation devices
- Imaging, listening, and locating devices (including specially trained animals)
- Specialized medical and emergency care devices (such as confined-space medical equipment)

Personal Protective Equipment (PPE) (also called Personnel Protective Equipment) is designed to protect responders from the life-threatening hazards they may face while performing their duties. Different forms of PPE may be acquired to protect responders from the following hazards:

- Extreme heat or cold
- Low or unsafe oxygen (including smoke, CO, and CO_2)
- Biological or chemical hazards
- Radiological hazards
- Blast or bullet protection
- Eye-injury hazards
- Medical pathogens
- Loud noises
- Presence of explosive gases

- Loss of consciousness (alarm to alert other responders that a colleague has lost consciousness)

Disasters involving **hazardous materials** require special response expertise and equipment to limit further injury to people, property, and the environment. Tens of thousands of HAZMAT incidents ranging in size occur each year throughout the world. The types of services performed by HAZMAT teams include site assessment, container evaluations, threat assessments, removal of victims, search and rescue, ventilation of toxic gases and smoke, identification of materials, evacuation, and safety monitoring. The released chemicals often must first be stabilized (especially if they are burning) and then contained and/or decontaminated. The surrounding area may be hazardous to responders' health because of airborne gases or caustic liquids or solids. Only specially trained and equipped responders can safely respond to HAZMAT incidents, which may include terrorist events involving WMDs (biological, chemical, radiological, or explosive devices). Equipment required for HAZMAT response could include:

- Specialized fire suppression gear
- Specialized PPE
- Containment equipment
- Neutralization equipment
- Cleanup equipment
- Decontamination equipment (for the environment, property, victims, and responders)

Disaster medical care goes far beyond regular emergency care. Disasters may involve a quantity of injured and dead that surpasses the capabilities of nondisaster scenarios. Hospitals can quickly become overwhelmed, and the abilities of medical practitioners spread thin. Specialized disaster medical care equipment helps to alleviate many of these stresses. This equipment may include:

- Mass-casualty victim transport vehicles
- Vehicles to transport medical officials to the disaster
- Mobile and field hospitals and morgues (see Figure 5-1)

FIGURE 5-1   U.S. Coast Guard Floating Hospital *USNS Comfort*, docked in New York City following the September 11th attacks, to provide additional mass care medical capacity. (*Source:* FEMA Photo, Michael Rieger.)

- Stockpiled surge-capacity pharmaceuticals and other medical equipment in key locations

Command and control of disaster situations depends heavily upon the ability of responders to effectively communicate with each other via **communications systems,** with an established central command post or emergency operations center (EOC). Information is a key element in disaster response, and communications systems facilitate gathering and dispersing that information. Communications systems may involve the use of the following:

- Radios (conventional, trunked, and "ham")
- Telephones (land line, cellular, and satellite)
- Facsimile machines
- E-mail

Public warning and alert systems have immense value to a disaster management system. They provide citizens with awareness of an impending hazard event before it occurs, allowing them to prepare themselves fully or even avoid the hazard altogether. Many people will not take preparedness measures for a hazard until the likelihood of catastrophe is certain, and for these people, the warning system may be the only difference between stocking up on needed supplies and protection and facing the disaster wholly unprepared.

Communications between the public and emergency responders allows the public to benefit from the responders' expertise and event-specific information. Responders, likewise, need to be able to receive information from the public to fully assess the disaster's response needs. Systems that allow the public to alert government response agencies are especially important in rural or isolated areas where notification would otherwise be difficult or impossible. Equipment involved may include:

- Public emergency reporting system ("9-1-1 system")
- Telephone-based public warning system ("reverse-9-1-1 system")
- Remote-activated emergency (weather) radios
- Sirens and public announcement (PA) systems
- Signs (electronic or conventional, stationary or moveable)
- Internet-based warning
- Disaster public information systems (to answer the flood of public inquiries during and in the aftermath of disasters, which can flood communications lines and distract response resources)

Other emergency and disaster response support equipment are designed to facilitate one or more components of disaster response, as detailed in Chapter 6. This equipment may serve any of the following response functions:

- Disaster feeding
- Transportation (vehicles and temporary infrastructures, e.g., bridges)
- Storage, retrieval, and reporting of information
- Security and safety
- Environmental testing
- Shelter
- Imaging
- Damage and needs assessments

STATUTORY AUTHORITY

The final link in government emergency preparedness is statutory authority. Government response

actions involve a diverse range of government officials and agencies interacting with the public and with businesses and operating on public and private land. There are often broad expenditures of funds, suspensions of normal government and private activities, and other major deviations from "normal." In order to ensure that all individuals and agencies involved in the emergency management system are able to carry out their duties, it is vitally important that the proper statutory authorities exist.

Statutory authorities ensure that emergency and disaster response agencies and functions are established, staffed, and receive regular funding. During emergencies, the costs of services and supplies can skyrocket and, without previously established laws defining where that money will come from and who may authorize it, confusion will quickly ensue.

When government functions are disrupted in times of disaster, there can be situations in which leadership figures are unable or unwilling to take control. Alternatively, multiple figures may try to take control. Statutory authorities establish defined lines of control

and succession. The Emergency Operations Plan dictates the actions of specific authorities, and the statutory authorities give them the power to take those actions.

Agreements between neighboring communities and countries and between different jurisdictions within the same country require a legal framework before the onset of a disaster. Through these "mutual aid agreements," governments not only gain the benefit of the new partner's resources and expertise but also learn about those capabilities and form relationships with partners before a high-stress, time-constrained disaster scenario.

Statutory authorities are updated as required by new information or expanded needs. New and changing hazards can bring about changes in the emergency management system as a whole. The creation of the U.S. Department of Homeland Security in response to the terrorist attacks of September 11th is an example of new laws created in response to a new hazard.

Exhibit 5-3 discusses some other characteristics of successful emergency management organizations.

EXHIBIT 5-3   The 20 Characteristics of Effective Emergency Management Organizational Structures

The Public Entity Risk Institute, a nonprofit institute dedicated to researching the risk-based needs of public, private, and nonprofit organizations, developed a list of 20 characteristics common to emergency management agencies that were found to be successful in managing risk and the consequences of hazards.

1. Roles of elected officials defined
2. Strong and definitive lines of command in all phases of emergency management
3. Routine organizational structure similar to disaster organizational structure
4. Emergency management procedures are as close to routine operational procedures as possible
5. Good interpersonal relationships
6. Emergency management planning is an ongoing activity
7. All-hazard approach taken by emergency management agencies
8. Disaster prevention and mitigation practices
9. Motivation (incentives) provided for involvement in emergency management
10. Citizen involvement in emergency management

11. Strong coordination among participating agencies
12. Public/private cooperation
13. Multiple use of resources for both day-to-day and disaster operations
14. Public disaster information functions clearly defined
15. Ongoing monitoring for potential disasters
16. Internal alerting procedures

17. Ability to alert the public maximized
18. Active intergovernmental coordination
19. Ability to maintain comprehensive records during a disaster
20. Eligibility for [local, national, and international funding] considered

Source: Public Entity Risk Institute, 2001.

PUBLIC PREPAREDNESS

In the event of a disaster, it is assumed that response resources will be stretched to the limits of their capacity or even exceed their capacity during at least the first few hours of response. It is important that the public be prepared to provide for their own response needs in order to supplement these strained official resources.

Public preparedness can be considered actions taken to empower ordinary citizens to help themselves, their families, their neighbors, or complete strangers. To be effective, this effort must exceed simply raising awareness of a hazard. A prepared public must be given the skills that allow them to perform specialized actions such as search and rescue, first aid, or fire suppression.

In recent years, disaster managers have established more effective ways to increase public knowledge of disaster preparedness and response activities and to get the public to act upon that knowledge. Until recently, it was thought that the public was incapable of acting rationally in the face of disaster. Response officials feared the public would panic or would be unable to use preparedness information effectively. However, studies of actual postdisaster scenarios found that the public acts rationally and effectively, even when frightened or stressed. These studies highlight the need for governments and other agencies to help the public prepare.

During its International Decade of Natural Disaster Reduction, the UN introduced increasing disaster risk awareness among the more vulnerable populations as an important component of an effective risk reduction campaign. Today, through its International Strategy for Disaster Reduction, the UN has proclaimed that public disaster education is a key factor in reducing nations' vulnerability, and therefore that governments are responsible for carrying out citizen training. Public preparedness is also one of four key objectives that guide the international strategy.

PUBLIC EDUCATION

Public education—also called risk communication, preparedness education, social marketing, and disaster education—is the backbone of any effective public preparedness effort. According to risk communication experts M. Granger Morgan, Baruch Fischhoff, Ann Bostrom, and Cynthia Atman, public education is "communication intended to supply laypeople with the information they need to make informed, independent judgments about risks to health, safety, and the environment" (Morgan et al., 2002). Creating messages that satisfy these high ideals requires extensive time, experience, and planning.

As was briefly touched upon in Chapter 4, public education efforts have three main goals:

1. Awareness of the hazard risk
2. Behavior
   a. Predisaster risk reduction behavior
   b. Predisaster preparedness behavior
   c. Postdisaster response behavior
   d. Postdisaster recovery behavior
3. Warning

Public education, in both formal and informal capacities, seeks to provide risk-related information in the most effective way possible to a predetermined target audience. Morgan et al. (2003) point out that public education campaigns can help people to:

1. Identify those risks that are large enough to warrant some of their very limited time and attention (for risks that are under personal control)
2. Identify the "best buys" in risk, which have significant compensating benefits for taking risks and no missed opportunities for cheaply reducing risk, or in which accepting a little more risk gains great benefits
3. Inform themselves and others around them about social risks that require participation or greater social consensus to bring about change or instigate mitigation measures

Public education, as it pertains to awareness, behavior, and warning, will be addressed next.

Awareness

The first step in educating the public about hazards and risks is correcting feelings of apathy toward preparedness, which are often based upon incorrect assumptions concerning personal need or the ability to affect one's fate. Correcting these feelings is best initiated by raising awareness about those hazards and risks. The actual occurrence of a disaster unfortunately is the most likely (and effective) means by which people are made aware of a particular hazard risk, but most disaster managers would prefer that the public be enlightened long before a disaster happens.

The process of raising awareness involves more than simply telling citizens what causes risk. Citizens must also be informed of how the risk affects them, why they are at risk, and where and when the hazard will likely strike. They must fully understand the risk as it applies to them and to the population as a whole in order to effectively absorb that information.

Hazard risks exist in many forms, as described in Chapters 2 and 3 and as experienced and perceived by individuals and communities. In a study performed by Morgan et al. (2002), citizens were asked to make lists of the risks that most concerned them. Their responses ranged from threats that would result in injury or death, such as accidents, disease, and crime to economic risks that would result in a financial loss, to "personal concern"–related risks, such as "love-life" problems or problems in school or at work. Only 10% of the cited risks related to the "environmental" (natural) or technological hazards that result in disasters.

Morgan and his colleagues wrote, "Whereas professional risk experts devote many hours to considering rare and unusual hazards, most people do not share this preoccupation. With jobs, family, friends, and the other demands of daily living, their lives are filled with more immediate concerns. . . . The time that most people can devote to rare or unusual risks is usually very limited." Public education aimed at raising hazard risk awareness must be as accurate, trustworthy, and effective as possible because, as this research showed, communicators face formidable social and psychological obstacles.

Public education communicators must be aware of how target audiences acquire their risk information, and then design their message within that framework. Many groups, especially the poor, gather much of their information through informal social networks rather than newspapers, government sources, or other formal communications methods. They may mistrust government and other "official" sources of information, and likely disregard messages framed within that context. Another group, transient populations (e.g., tourists), has a limited capacity and time frame to learn about a hazard because they are outside their normal social and physical environment. Through targeted educational material, such as hotel room placards and pamphlets, these populations have been

quickly and effectively trained in preparedness measures ranging from fire to tsunami response. There are also many special needs populations in almost every community, including the elderly, young children, the disabled, and the illiterate. Each of these special populations must be approached in a manner that addresses their particular method of perception and learning. "Obstacles to Effective Risk Communication," presented later in this chapter, expands upon this concept as it relates to developing countries, where public education can be the most challenging.

Three categories dictate how the goals of public education can be reached (Morgan et al., 2002):

1. *Advice and answers*. "People who are poised, waiting to be told what to do, just need explicit instruction, summarizing the conclusions that they would reach if they had sufficient time and knowledge. It is not hard to imagine sometimes wanting a trusted doctor, lawyer, insurance agent, or investment counselor to spare us the details and tell us what we should do."
2. *Numbers*. "People often want to make choices themselves. Rather than instruction on how to choose, they want quantitative summaries of expert knowledge. For example, they may need to know the costs, probability of success, and probability of adverse side effects associated with alternative medical treatments. Having received such information, they can plug the values into their personal decision-making model and make the choice that makes most sense for their personal situations."
3. *Process and framing*. "In some cases, people need to know more than just a few numbers. They need to learn how a risk is created and how it can be controlled. That information allows them to monitor their own surrounding, identify risky situations, and devise appropriate responses. Such knowledge allows people to follow (and join) the public debate and be competent citizens. A risk communication effort that provides such information assumes that its audience is motivated to obtain such understanding

and invest in the effort to gain it (when they believe that their efforts will be rewarded)."

Behavior

Once the public is made aware of a hazard, they are primed to receive information that will help them reduce their risk to that hazard, and thereby reduce their overall vulnerability. The actions that people can be instructed to take apply to four separate categories, depending on when they occur and for what purpose:

1. Predisaster risk reduction behavior
2. Predisaster preparedness behavior
3. Postdisaster response behavior
4. Postdisaster recovery behavior

Public education measures that address **predisaster risk reduction (mitigation) behavior** seek to instruct a population, which is already aware of the existence of a hazard risk, about the range of available options that can help reduce their individual and collective vulnerabilities to that risk. For instance, people living in areas where earthquakes are a problem could be shown how to secure their furniture to avoid injuries. Once informed about how their actions can affect their risk levels, people are more likely to act to improve their chances of avoiding disaster in the future.

Predisaster preparedness education attempts to inform the public about what they can do before a disaster happens. Actions include stockpiling certain materials, establishing individual, family, and community plans of action, and designating safe meeting places.

Education in **postdisaster response behavior** seeks to teach an informed public how to react in the midst of and aftermath of a hazard event. For instance, the public must be instructed to recognize warnings and told what to do in response to those warnings, including the proper way to participate in an evacuation. This type of education also seeks to empower the public to provide first-response services to their families, friends, neighbors, and themselves, supplementing the assuredly overextended emergency management resources of their community. In nearly

all disasters, it is the common citizen who provides the greatest amount of life-saving assistance to the wounded—not formal emergency management resources, whose actions come into play primarily after the critical first hour when the lives of the most severely injured have been saved.

Finally, education focused on **postdisaster recovery**, which tends to be provided only in the aftermath of a disaster, teaches the public how to rebuild their lives. This can include helping people to locate government, nonprofit, or international resources dedicated to relief and recovery, and how to provide those services for themselves.

Though individuals and families can take general activities to prepare themselves for all hazards, most hazard types have specific preparedness, response, and recovery actions that have been found to be most effective. Public educators must be ready and able to address the specific instructional behavior (see Exhibit 5-4).

EXHIBIT 5-4   Social Marketing

The concept of social marketing in public education is quickly gaining acceptance because of its potential in disaster management. A Novartis Foundation paper entitled "The Social Marketing Concept" (1992) defines social marketing as "the design, implementation and control of programs aimed at increasing the acceptability of a social idea or practice in one or more groups of target adopters." Social marketing was introduced in 1971 by Philip Kotler and Gerald Zaltman and combines "traditional approaches to social change with commercial marketing and advertising techniques" (Novartis Foundation, 1992).

Social marketing borrows the lessons and methods perfected by the commercial sector to affect public behavior and learning. These lessons and practices include:

- Setting measurable objectives
- Doing market research
- Developing products and services that correspond to genuine needs
- Creating demand for them through advertising
- Marketing through a network of outlets at prices that make it possible to achieve the sales objectives

The primary difference between social and commercial marketing is related only to their content and objectives, not to the methods by which their goals are achieved. The Novartis authors contend that the social concept of marketing is somewhat more challenging than commercial marketing because, rather than influencing what people buy, it seeks to influence people's ideas and behaviors.

Social marketing expert Les Robinson has identified **"a seven-step social marketing approach,"** which involves the following seven essential elements (Robinson, 1998):

1. *Knowledge (awareness)*. "An obvious first step is that people must know there is a problem; know there is a practical, viable solution or alternative. This is important. People are practical—they will always demand clear, simple, feasible road maps before they start a journey to a strange place. And identify the personal costs of inaction and the benefits of action in concrete terms people can relate to (i.e. they 'own' the problem). An awareness campaign aims to harness people's judgment."

2. *Desire*. "Change involves *imagination*. People need to be able to visualize a different, desirable, future for themselves. This is different to being able to recognize rational benefits. Desire is an emotion, not a kind of

knowledge. Advertising agencies understand this well—they stimulate raw emotions like lust, fear, envy, and greed in order to create desire. However, desire can also be created by evoking a future life which is more satisfying, healthy, attractive, and safe."

3. *Skills*. "Knowing what to do: Being able to easily visualize the steps required to reach the goal. This is not about emotion—it is purely rational (it is what we have rationality for). People learn skills best by *seeing* someone else do them. The best way to do this is to break the actions down into simple steps and use illustrations to make visualization easy. It's amazing how many social marketing campaigns forget this element."

4. *Optimism*. "The belief that success is probable or inevitable. Strong political or community leadership is probably an important ingredient of optimism. I can't over-emphasize optimism. [U.S. Environmental Protection Agency] research showed about 14% of the population are disabled from environmental action by their sense of isolation and powerlessness. If government and business are not leading by example, who can blame people for sensing their individual efforts may be futile?"

5. *Facilitation*. "Having outside support: People are busy with limited resources and few choices. They may need accessible services, infrastructure, and support networks that overcome practical obstacles to carrying out the action. If personal behavior change is blocked by real-world obstacles (and it usu-

ally is), then all the communications on earth will be ineffective. The role of an education strategy might therefore need to be expanded to involve the establishment of new services and infrastructure. This is why recycling has been successful—we now have simple, quick, low-cost collection services which make recycling easy."

6. *Stimulation*. "Having a kick-start: We are creatures of routine. Even with all the knowledge, desire, good will, and services in the world, there is still the inertia of habit to overcome. How can social marketers create moments that reach into our lives and compel us into wakefulness? When I think of the moments that have compelled me to act, they are of two kinds—either threatening or inspirational."

7. *Feedback and reinforcement*. "A host of voices, situations, and institutions daily compel us to act in undesirable, unhealthy and antisocial ways. These forces don't disappear just because we've run a campaign. Effective social marketing is about continuous recruitment and reinforcement of messages—with regular communications that report back to people on the success of their efforts and the next steps that are expected of them. Many NGOs (CAA, Amnesty, Greenpeace, etc.) have [learned] this lesson and devote considerable resources to continuously feeding success stories and updates to their contributors, as well as new calls for support and action. We need to learn the same lesson and devote resources to celebrating people's successes."

Requirements of a Public Education Message

Numerous components of effective public education have been identified as vital to the success of an effective campaign. Morgan et al. (2002) concluded that effective public education requires authoritative

and trustworthy sources. They added that if the communicators are perceived to personally gain from such preparedness, the public may be skeptical about their intentions. Dennis Mileti (1999) contends that several characteristics must be considered in creating messages:

- Amount of material
- Speed of presentation
- Number of arguments
- Repetition
- Style
- Clarity
- Ordering
- Forcefulness
- Specificity
- Consistency
- Accuracy
- Extremity of the position advocated

These characteristics are adjusted depending upon whether the communicators intend to attract attention or enhance the acceptance of their message (Mileti, 1999). Singer and Endreny (1993) claim that, in order for a message to be considered comprehensive, it should include the annual mortality associated with the hazard (if known), the "spatial extent" of the hazard, the time frame associated with the hazard, and alternatives for mitigation.

Communicators must ensure that their messages are understood by their target audience (Morgan et al., 2002), which changes from community to community, depending on demographics. Mileti (1999) writes, "Most hazard awareness and education programs have assumed a homogeneous 'public,' and have done little to tailor information materials to different groups." He adds that hazard awareness programs are more effective if they rely on multiple sources transmitting multiple messages through multiple outlets, and that radio and television are best at maintaining hazard awareness, while printed materials tend to provide more specific instructions.

The U.S. Centers for Disease Control and Prevention (CDC) state that community representatives must be involved in planning and developing public education campaigns to ensure community "buy in." Public education activities must support other components of risk education and reduction activities, and the objectives for public action must be based on a realistic assessment of what the education method can be expected to contribute to actual preparedness and prevention (CDC, 1995).

Goals of a well-planned and public education effort include:

- Raising awareness
- Increasing knowledge
- Refuting myths and misconceptions
- Influencing attitudes and social norms
- Reinforcing knowledge, attitudes, and behaviors
- Suggesting and enabling action
- Illustrating the benefits of a behavior
- Increasing support and/or demand for services
- Helping coalesce organizational relationships (CDC, 1995)

Methods of Public Education

The possible methods or "channels" by which disaster managers may educate the public are numerous and diverse. Feasibility and audience suitability are the key factors in choosing the appropriate method. Each method has inherent benefits and shortfalls, which must be weighed individually when planning a public education project. The various methods include:

- The mass media
  - Television (public service announcements, or PSAs, paid advertisements, editorials, press releases, interviews)
  - Radio (live or prerecorded PSAs, call-in shows, interviews, announcements)
  - Newspapers (news releases, editorials, letters to the editor, paid or donated advertisements)
  - Magazines (educational story, paid or donated advertisements)
  - Internet (press releases, online news media, posted educational materials, downloadable documents, online question submission utility)
- Within the community
  - Schools (courses, special events, distributed material, integrated coursework, games, coloring books, contests)

- Businesses (advertisements, posters, endorsements, employee preparedness campaigns, inserts with utility mailings/phone books/shopping bags/paychecks, giveaway items, waiting room information, calendars) (see Figure 5-2)
  - Organizations (guest presenters, special course offerings)
  - Churches (pamphlets, events, community service projects)
  - Libraries (courses, topical discussions, guest speakers, informational tables or resource sections, pamphlets)
  - Outdoors (advertisements, signs)
  - Special events ("preparedness day," theater, information booths or tables, contests)
- Interpersonal social networks
  - One-on-one meetings
  - Informal social networks ("train the trainer" courses)
  - Within family networks (information distributed in school to bring home, video/DVD/textbook lending or giveaway program)

Warning

The final goal of disaster management public education is warning. Warnings are used primarily to help recipients understand that their risk situation has changed to one with increased or certain likelihood and to provide authoritative instruction on the appropriate action to take. Warnings differ from awareness in that they instruct recipients to take immediate action.

Warning systems and messages must be designed to reach the full range of possible recipients within their communities, no matter where people are or what time it is. Employing multiple systems, in partnership with various private and nonprofit entities, is often the only way to maximize population coverage. Examples of the various groups to consider in planning for hazard warnings include people:

- At home
- In school
- At work

- In public spaces
- In their cars
- Who are disabled
- Who speak different languages
- Who are uneducated or have little education
- Who are poor

Warnings must inform people of an impending hazard or disaster and must instruct them on what to do before, during, and after the hazard. They may include information on how citizens can get more information, such as a website, radio or TV station, or a phone number.

Public warnings are more than just a message. Warnings are built upon complex systems designed for the specifics of each hazard, population, and environment. Comprehensive warning systems seek to do most or all of the following, in order:

1. *Detect the presence of a hazard*. This step involves collecting data from a number of possible pre-established sensing and detection systems, including weather sensors, water flow sensors, seismicity and ground deformation sensors, air and water monitoring devices, and satellites, for example.
2. *Assess the threat posed by that hazard*. All hazards include some variable component of risk likelihood, which changes through time as more information becomes available. The data collected from the sensing and detection systems allow disaster managers to update their assessments of the hazard and then consider how the community or country would be affected.
3. *Determine the population facing risk from that hazard*. The most effective warnings are those that target populations according to their risk, thereby ensuring that those not at risk avoid taking unnecessary actions, which can get in the way of disaster managers. Targeted warnings also allow responders to focus their assistance on those people with the most pressing needs.
4. *Inform the population*. One of the most difficult decisions a disaster manager makes is whether to issue a warning. Many are afraid that the

3 STEPS TO DISASTER PREPAREDNESS

GET A PLAN!

The following list can get you started toward creating your family preparedness plan.

◆ Meet with household members to discuss the dangers of and how to respond to possible emergency events, including fire, severe weather, hazardous spills, and terrorism.

◆ Identify your safest shelter, usually a small center room away from windows during a tornado—even better, build a tornado SafeRoom. Also, Instruct household members to turn on the radio for emergency information.

◆ Plan to get inside a sturdy building when it storms. (You will need to avoid lightning out-of-doors and to leave mobile homes or autos in windstorms or tornados.)

◆ Adopt an emergency buddy, such as a close neighbor or a friend, so you can look out for each other at home, school, and work.

◆ Teach adults how to turn off the water and electricity at main switches.

◆ Post emergency contact numbers near all telephones and pre-program emergency numbers into phones with autodial capabilities.

◆ Teach children how and when to dial **9-1-1** to get emergency assistance and how to make long-distance telephone calls on both home and cell phones.

◆ Pick a friend or relative who all family members will call if separated during an emergency. It is often easier to call out-of-state during an emergency than within the affected area.

◆ Pick two meeting places: A place near your home and a place outside your neighborhood in case you cannot return home after an emergency.

◆ Take a basic first-aid and CPR class.

◆ Keep family records in a water and fireproof safe. Inexpensive models can be purchased at most hardware stores.

GET INVOLVED!

Citizen Corps was created to help coordinate volunteer activities that will make our communities safer, stronger, and better prepared to respond to threats of crime, terrorism, and disasters of all kinds.

If you live in the Tulsa area and would like more information on the Tulsa Mayor's Citizen Corps program, complete this form and mail it to: Tulsa Mayor's Citizen Corps, Room 532, City Hall, Tulsa, OK 74103, or fax it to 918-596-7345

Name:_____
Address:_____
City:_____State:_____Zip:_____
Phone:_____
Email:_____

If you live outside the Tulsa area and would like to get involved in Citizen Corps, you may visit the national Citizen Corps web site at www.CitizenCorps.gov. For more information on Citizen Corps in Oklahoma, contact Linda Soos-Davis at (405) 521-2481.

citizen★corps

Tulsa Mayor's Citizen Corps

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GET A KIT!

The following list includes suggested items for disaster kits.

While the "home" kit is designed to maintain a family for up to three days, the "go" kit would include a scaled-down list of the same or similar items that would fit into a back-pack and would be ready if the family had to leave home in a hurry. Some people keep a prepared "go" kit in the trunk of their car. Remember, keeping it essential and practical is the goal.

◆ A first aid kit and prescription medications (be sure to check expiration dates).

◆ An extra pair of glasses or contact lenses and solution (be sure to check expiration dates).

◆ A list of family physicians, important medical information, and the style and serial number of medical devices such as pacemakers.

◆ A battery-powered radio, flashlight, and plenty of extra batteries. (If possible, get a NOAA emergency radio, too.)

◆ Identification, credit cards, cash, and photocopies of important family documents including home insurance information.

◆ An extra set of car and house keys.

◆ Special items for infants, the elderly, or family members with disabilities.

◆ At least a three-day supply of water (one gallon per person per day). Store water in sealed, unbreakable containers. Replace every six months.

◆ A three- to five-day supply of non-perishable packaged or canned food and a non-electric can opener.

◆ A change of clothing, rain gear, and sturdy shoes. Inexpensive plastic ponchos for "go" kits.

◆ Blankets, emergency blankets constructed of aluminized polyester, bedding, or sleeping bags.

◆ Tools such as screwdrivers, cutters, and scissors. Also duct tape, waterproof matches, an ABC fire extinguisher, flares, plastic storage containers, needle and thread, pen and paper, a compass, garbage bags, personal hygiene products, a whistle, and regular household bleach.

FIGURE 5-2   Public education in the community: McDonalds Corporation donated the space and the printed materials for disaster education on their food tray liners in Tulsa, Oklahoma, as part of the Tulsa Mayor's Citizen Corps effort to reduce public risk. (*Source:* Tulsa Mayor's Citizen Corps, 2003.)

public will panic if they are told about a disaster or that they will accuse the disaster manager of "crying wolf" if the hazard does not materialize. However, researchers have found both these outcomes to be rare in actual practice. And if the disaster management agency has followed established guidelines on risk assessment, their decision on issuing a warning can only be regarded as responsible.

5. *Determine appropriate protective actions that may be taken*. Using their updated assessment of the situation, disaster managers must determine which protective actions the public should be instructed to take. For some hazards, such as chemical releases, the public may have been told about multiple, conflicting actions, such as both evacuation and sheltering in place (remaining at their indoor location, while sealing off the outside environment as much as possible).

6. *Direct the public to take those actions*. Through previous education efforts, the public should already be aware of the hazard and knowledgeable about the types of actions that may be required during a warning. Disaster managers must decide on the best course of action and relay that information to the public through previously established mechanisms. A warned public will seek information on what to do next, and it is important that a clear message be given to guide them.

7. *Support the actions being taken by the public*. Actual response assets (such as police and fire officials, emergency management officials, volunteers, and other established responders) should assist the public in following any broadcasted instructions; for instance, facilitating evacuation efforts.

Warning systems are much more than technology and last-minute decisions. An effective warning system involves three distinct processes that are crucial so the public will actually take appropriate action. The three processes are:

• *Planning*. During this first phase, disaster managers must consider what hazards allow for warnings, how and when the public will be warned, what the public can do in response to those warnings, what terminology will be used, and what authority and equipment is needed to issue the warnings. Warning plans can be integrated into community or national EOPs as a functional annex.

• *Public education*. The public will not automatically respond to a siren, announcement, or other form of warning just because the warning is given. Studies have shown that even with education about warnings, as few as 40% of recipients will take appropriate action. Without previous instruction on what to do, it can be assumed that even fewer would respond. Disaster managers must incorporate a full explanation of warnings into regular public disaster education campaigns, including what they will sound like, what they mean, where more information can be obtained, and the possible actions that will be taken in response.

• *Testing and evaluation*. Finally, as with official responders, testing and evaluation is necessary to ensure that recipients are not exposed to the action warning process for the first time during a disaster. Testing allows citizens to experience the warning in a low-stress environment and to hear the actual sound or wording of a warning when they are not anxious or scared. Testing also allows disaster managers to ensure that their assumptions about the system and its processes reflect what will actually take place during a real warning event. Evaluation of the warning system helps to ensure in advance that the system is as effective as it can be.

Many different words are used to describe the severity of a hazard warning. Confusion about these words may cause recipients to respond with either too much or too little action. Therefore, clarity and consistency is important. In general, the terminology used to describe warnings include:

• *Warning*. The hazardous event is underway or is highly likely to occur soon. Generally, an immediate threat to life and/or property exists. The public should take immediate protective action.

- *Advisory*. Advisories, like warnings, are given for events that are currently occurring or are about to occur. Advisories apply to events that are less severe than warnings in terms of the expected consequences to life and property. However, action to protect life and property are strongly recommended.
- *Watch*. Watches are issued when the likelihood of a hazardous event has increased significantly, but where and when the event will occur is uncertain. Watches are issued so that recipients may begin taking precautionary measures as far in advance as possible, even though there is a significant chance that the event may not materialize.
- *Outlook*. An outlook is a prediction of a hazardous event in the near future, based upon conditions that are beginning to look favorable for the onset of that event. Outlooks do not usually include action information or recommendations to prepare for the possible event.
- *Statement*. Statements are not warnings themselves, but are used to provide detailed follow-up information to warnings, advisories, or watches.

THE MEDIA AS A PUBLIC EDUCATOR

The media plays a significant role in disaster and emergency management, both before and after disasters occur. The media are well recognized for the invaluable service they consistently perform during the initial critical moments of a disaster when the emergency response efforts are mobilized. In these events, the media transmit warning messages and alerts and give instructions on where to evacuate, where to seek medical care and shelter, and where to go for more specific information (Mileti, 1999). In this sense, the media has assumed a tremendous disaster management responsibility. By providing vital information, the media's ability to educate people during times of disaster may be even more likely to save lives than many of the other emergency response components described in this text (Furman, 2002). For this reason, the emergency response community has embraced the media, recognizing that they will be the primary, if not the only, means of informing large numbers of potential victims (McCormick Tribune Foundation, 2002).

In regards to the preparedness phase of emergency management, the primary public education tasks assumed by the media include raising citizen awareness to the presence of an existing or future hazard and proving information to those citizens regarding prevention or protection (Burkhart, 1991). The effectiveness of the media as a conduit of educational information has been studied extensively, most notably in the area of public health. Many studies have shown a positive correlation between the use of the media and an increase in the promoted knowledge or behavior. A team of researchers working in Nigeria, for example, found that the promotion of family planning and clinic sites on local television played a significant role in the number of people utilizing those services (Piotrow et al., 1990). A study conducted in the United States extended these results to the industrialized world, finding that over 60% of Americans learn about cancer prevention from the media, while less than 20% do so from physicians (Nelken, 1987).

The behavioral modifications and preparatory measures taken by recipients as result of media public education on natural and technological hazards have also been shown to be promising. Social scientists have gone as far as to claim that people use the media more than any other source to obtain hazard information (Walsh, 1996). Mitigation specialists at the Federal Emergency Management Agency (FEMA) claim that the media role in community and citizen preparedness is critical for the success of such efforts (FEMA, 1998). Personal preparedness is most likely to be undertaken by people attentive to the news media, though this tendency is usually accompanied by other behavioral characteristics, such as personal experience or expendable income. In this sense, media risk communication is seen to be an important *supplemental* component to official public preparedness communication (Burkhart, 1991; Mileti, 1999). Many factors determine how people view hazards, but for hazards that are extreme in consequence and rare in occurrence (like terrorism), the media are the *most* influential source of information (Singer and Endreny, 1993).

At the same time, some contest the view of the media as a successful risk communicator, with a handful of social scientists claiming that the media are ineffective or only moderately effective at informing the public about the risks they face. It has been theorized that there are "built-in, organizational, competitive and institutional biases" that prevent the media from informing citizens about hazards (Winston, 1985). Furthermore, these biases may be coupled with procedural standards that can make effective communication of risk difficult. For instance, the media often reports on specific events, rather than longer-term issues such as preparedness and mitigation. Additionally, they are more likely to describe the short-term consequences of disaster events rather than follow the event over the longer term. Widespread deficiencies in journalists' knowledge about hazards and disaster management are partly to blame, which makes them unable to transfer effective and useful knowledge to the public at large. Other studies conclude that restrictions of time and space prevent adequate knowledge transfer (Willis, 1997) and that the media's insistence on taking control of the selection and presentation of message format leads to a decrease in message effectiveness (Burkhart, 1991). Not all social scientists blame the media for inefficiencies, however. For instance, it has been found that public denial about risks gives them a false sense of protection, causing them to ignore media warnings unless they are direct victims (Raphael, 1986). Jerry Hauer of the New York City Office of Emergency Management feels that the emergency management community tends to exclude the media from training and drills due to fear that they will leak sensitive planning information or that their reports will cause mass panic, thereby preventing the media from effectively informing the public (McCormick Tribune Foundation, 2002).

Regardless of their level of effectiveness, the media play a vital role in risk communication. For instance, while they often avoid contributing *solutions* to problems, they are effective at raising awareness about issues and communicating degrees of urgency (Willis, 1997).

One particular issue that must be examined when considering the media's ability to educate the public about risk is their ability to do so in a way that gives citizens an accurate perception of their personal vulnerability. In what is probably one of the earliest descriptions of the media's power to influence public risk perception and, likewise, preparedness and mitigative behavior, Walter Lippmann (1922) wrote in his acclaimed *Public Opinion*:

> We shall assume that what each man does is based not on direct and certain knowledge, but on pictures made by himself or given to him. If his atlas tells him that the world is flat he will not sail near what he believes to be the edge of our planet for fear of falling off.

Because the media's depiction of public health- and safety-related issues has either a direct or indirect effect on public behavior, they must be as accurate as possible in their presentation of such hazards (Willis, 1997). It is through perception that the public must judge their own risk and prepare themselves appropriately. It is important for the public not to understate risks, because they will likely not take the time and or money needed to adequately prepare themselves, but exaggerating the risk of a hazard can have drastic consequences, including stress-related health problems and financial and economic effects from business and tourism losses.

Thus far, research has found that the media tend to overstate the risk of hazards they focus on (which also tend to be those that are the least likely to occur) and understate commonly occurring hazards (Singer and Endreny, 1993). One study found that almost 80% of Americans feel that they are subject to more risk than their parents were 20 years ago, when evidence has shown that Americans today have a "competitive advantage in terms of disease, accidents, nutrition, medical care, and life expectancy," and that the media portrayal of risk is mainly to blame (Altheide, 2002). One reason this occurs is that they do not have the time or resources to ensure the accuracy of their reports beyond reasonable doubt.

Related to this concern is the concern that the public will become emotionally afraid of risks instead of

aware of their dangers. This distinction is important because it determines the types of preparedness measures citizens take in response to the messages they receive and the rationality with which those actions are made. When people are presented with a risk, they are more likely to take preventive and preparatory measures if they are led to believe that the risk is a danger that can be managed than if it is one that they should fear (Bullock, 2003). Past research has found that increasing the levels of public fear can actually cause a decrease in public preparedness behavior (Mullis, 1998). Unfortunately, the very nature of media culture may promote and even amplify fear by attempting to draw viewers through entertainment and framing (Altheide, 2002; Willis, 1997).

OBSTACLES TO EFFECTIVE PUBLIC EDUCATION AND PREPAREDNESS

Risk communication is recognized for its importance, as well as for the complex challenges associated with it. Although the World Bank claims that "awareness programs addressing existing hazards and physical and social vulnerabilities are often central to social risk reduction" (World Bank, 2002), the National Research Council Committee on Risk Perception and Communication writes, "risk messages are difficult to formulate in ways that are accurate, clear, and not misleading" (NRC, 1989).

Risk communicators working in developing countries have experienced project failure due to obstacles they did not plan for or could not overcome, ranging from internal and external political affairs to economic constraints to sociocultural issues. Even with the best-laid plans, the effectiveness of risk communication is likely to fall short of the communicator's expectations (Morgan et al., 2002). Therefore, it is vital that risk communicators be well prepared.

There are many reasons that risk communication so often misses its intended mark despite exhaustive planning, and in many cases such failures could have been prevented or minimized. Internal reasons for project failure can be budgetary shortfalls, perfor-

mance problems, or schedule mishaps (Eisner, 2002). There can be many external obstacles as well, whether political, economic, or sociocultural, and they exist worldwide. Overcoming them is essential for maximizing the likelihood of success in risk communications efforts.

Successful risk communications tend to be highly situation-dependent. Practitioners who succeed in reaching target audiences with their intended messages effectively identified and mitigated for situational obstacles. Risk communicators working in developing countries may encounter obstacles not typically encountered in developed countries. If these obstacles are not considered in the planning stages, the communicators may face insurmountable problems in executing their project. Some obstacles that should be factored into risk communication projects in the developing world are reviewed below.

LITERACY AND EDUCATION

According to a study conducted in 2000 by the United Nations Educational, Scientific, and Cultural Organization (UNESCO), there are an estimated 862 million illiterate adults throughout the world, about two-thirds of whom are women (UNESCO, 2002). The study indicates that developing countries have much higher illiteracy rates than developed countries. Over 90% of the world's illiterate adults reside in developing countries (UNESCO, 2000).

Illiteracy severely limits risk communication. A message can be distributed countless ways through written media, including leaflets, newspapers, billboards, and informational booklets. However, these tools are virtually ineffective if the target population is unable to read their messages.

Poor levels of education also can act as an obstacle to effective risk communication. If deprived of basic skills, for example, a person will be unlikely to understand the statistics included in risk communication or to completely understand the specific risk factors being explained (arsenic in water or biological means of spreading diseases, for example.) This barrier

applies to formal risk education campaigns, such as for HIV/AIDS or nutrition, as well as to warnings and instructions included with consumer products.

A public health study (Swanson, 2000) in Honduras, where 30% of the population is illiterate, exemplifies the obstacles related to illiteracy and low education levels in risk communication. Clinics in rural areas, where the majority of the country's illiterate live, found that their patients had problems following the instructions for their medication. Doctors performing house calls discovered that many patients were either not taking their medication at all or doing so incorrectly, in many instances putting their health and lives in danger. The study revealed that due to illiteracy, patients visiting rural clinics were unable to understand the instructions explaining the use of their medication. Physicians had been giving oral instructions to the illiterate patients (who were unable to read the medicine bottles), but the instructions were often detailed and/or confusing. Further, many mothers were visiting the clinics with several children who required upwards of 15 different medications, each with their own instructions—a formidable memory task for anyone. By the time these patients arrived home, they were often unable to remember which directions applied to which medications, if they remembered any directions at all. In response, the clinics developed several measures to reduce this communications obstacle, such as relaying instructions directly to an adolescent in the family (who are typically more educated, less occupied with household duties, and more receptive to input from a physician) and using cartoon drawings to convey medical instructions.

LANGUAGE

Language is an obvious obstacle to risk communication in both the developing and developed world. It would seem that simply learning the language of the target population would mitigate this issue, but the answer is not always that straightforward. In many countries, like Suriname in South America, for instance, several languages are spoken and each language has several dialects. There are "bush" tribes with populations under 10 thousand, such as the approximately 600 Carib Indians who speak Wayana (Danenorg, 2002). Many of these languages are unwritten, and few translators are usually available to assist in risk communication projects. This does not even account for local dialects, which can make a language unrecognizable between two villages of the same tribe.

There are more than six thousand recognized languages throughout the world, many disappearing as fast as others are evolving (Famighetti, 1998). It is a common misconception that the people of a nation will speak the "official" language of that particular country, and one that can easily lead to risk communicators not reaching target audiences. In Suriname, for example, the official language is Dutch, and schools are required to teach in Dutch. It would seem logical to assume that all Surinamer students therefore speak Dutch, but outside of the capital of Paramaribo this is not the case (wikipedia.com, 2002). As a result, any Dutch-language risk education project designed to be included in regular classroom studies would likely fail. Even if the risk communicators were aware of this fact, and were able to establish the primary language of their target audience, it is possible that a great number of people would not be fluent enough in that language to understand anything but the most basic message.

Further, there may be particular abstractions and colloquialisms that cause common terms and phrases to have vastly different meanings among two speakers of the same language (Beebe et al., 2000). Several humorous examples from the business world illustrate ways in which abstractions can severely distort a message. When General Motors introduced the Chevy Nova in South America, marketing agents were unaware that *no va* translated into Spanish as "it won't go." Surprisingly low car sales prompted GM to change the name of the car to Caribe, meaning "savage" in the Carib language of the West Indies. Ford had a similar problem in Brazil with its compact model, the Pinto, which identified the car in Brazilian Portuguese as "tiny male genitals." Ford quickly replaced all the Pinto nameplates with ones that read Corcel, meaning "horse." Parker Pen, marketing a ballpoint pen in Mexico, claimed that its product would not "leak in one's pocket and make them pregnant," because mar-

keting executives had unwittingly used the Spanish adjective *embarasada*, which means "pregnant," not "embarrassed" (Confederation College, 2002).

These marketing mishaps are a headache for the companies involved and are costly in terms of product sales and reputation, but when the same misunderstandings occur in risk communication, the result can be counterproductive at best and deadly at worst. In the wake of Hurricane Mitch, the nonprofit organization World Vision distributed powdered chlorine to many villages in Central America for purifying water. There was found to be widespread appropriate use of the chlorine in villages where Spanish was the primary language, but inquiries revealed that indigenous villagers (whose first language was not Spanish) were using the chemical to wash their clothes. Because the powdered chlorine was distributed to these populations without instructions in their native language, they were unable to properly utilize the preventive measure. In this instance, the primary outcome was many gastrointestinal illnesses that probably could have been avoided. But consequences could have been much worse if villagers had ingested the chlorine in deadly doses as a resulted of poor risk communication (Swanson, 2000).

ACCESS TO TECHNOLOGY AND THE MEDIA

Risk communicators regularly employ the media to convey a message to a target audience. This is particularly true during sudden-onset disasters, where the media become the primary, if not only, source of communication between emergency response officials and the public. Recent events indicate the media-reliance trend is rapidly increasing, most notably in regards to the "CNN effect"—the ability for disaster information to be broadcast throughout the world in just seconds or minutes (Livingston, 1997). Of course, this form of communication is only possible if the target audience has access to television, radio, newspaper, or the Internet. When access is substandard or nonexistent, risk communicators are presented with a formidable obstacle.

The Internet is digitally connecting the world's population at ever-increasing rates. It is estimated that over one billion people currently have access to the Internet (Internet World Stats, 2006). However, that access is not uniform, and the majority of the "connected" population lives within the borders of North America, Europe, and the Pacific Rim (Thompson, 2002). Of the 5.5 billion people who do not have access to the Internet, most live in the Middle East, Africa, South Asia, and Latin America. In this information age in which the Internet is gaining greater acceptance as a primary form of communication, many people are bound to be hopelessly left behind. Recognizing the dangers that can arise from such a great technology gap, the UN has initiated the United Nations Information Technology Service (UNITES) to help developing countries "benefit from the opportunities emerging from the digital revolution" (UNITES, 2002). Currently, however, the Internet is an ineffective medium for reaching many audiences.

Lack of access is an issue for older communications technologies as well, including radio, television, and telephone. These communications media, while more widespread than the Internet because of their institutionalization and financial and technical feasibility, are still unavailable to a great number of those living in developing countries. For example, it is estimated that three billion people have never made a telephone call (Mutume, 2002). Averaged across all developing countries, there are only 185 radios and 115 televisions per 1000 people, compared to 1005 radios and 524 televisions per 1000 people in developed countries (UNESCO, 2001). Newspaper readership levels follow these same trends.

While they may be the message vehicles of choice for risk communicators, researchers, and the media, these forms of communication may thus not be effective in developing countries. Therefore, it is important to identify and utilize alternate, nontechnical forms of risk communication.

CLASS STRUCTURE

Social scientists have focused considerable research upon community stratification (Cockerham et al., 1986). "Social stratification" refers to the way

that certain societies' populations are divided into hierarchical groups based upon inequality. Every society has some form of social stratification, the United States included, but several countries formalize, institutionalize, and even legalize these divisions. Such "caste" systems, as they are called, often prevent crossing from a lower group to a higher one, or vice versa, effectively limiting access at each successive drop in class ranking (Norton, 2002). Apartheid in South Africa and the Indian Caste system are two well-known examples, but many lesser-known versions still exist throughout the world.

These institutionalized hierarchical systems have remained steadfast for centuries. Their effect has gone beyond the basic socioeconomic factors of wealth and power, creating a psychological "reality" that should not be underestimated by outsiders, who may not fully understand their influence. Emergency responders have encountered these issues during crisis events, when it would seem such barriers would temporarily cease to exist, and only cultural sensitivity and creativity have prevented secondary social crises. For instance, after a 7.7 magnitude earthquake struck in Gujarat, India, leaving near-total destruction of buildings in much of the state, international response agencies arrived to assist the Indian government. They were quickly surprised to find that tent camps were divided by caste, and that the upper castes received relief aid before lower ones did (amdavad.com, 2001). Not recognizing the existence of the caste system could easily have angered groups and caused civil unrest, but fully appeasing the caste system would virtually guarantee that the lowest castes would rarely, if ever, receive food or blankets. It took the creativity and organization of NGOs and international organizations like the UNDP, who have had extensive experience working under similar conditions, to ensure that as many projects as possible worked effectively under such constraints.

Risk communicators attempting to effectively transfer their message to populations with such forms of class structures will face a formidable challenge. They will need an authoritative grasp of the history and culture of their target audience, much of which may not be formally recorded. They likely will encounter strong resistance unless they can find a diplomatic way to appease all groups while still achieving their stated goals. Furthermore, they will find resistance to change if the risk reduction message requires people to behave unlike traditional members of their caste (even if that behavior would reduce personal risk.)

POVERTY, OR THE EFFECTS OF POVERTY

Poverty, as it influences behavior, access, and opportunity, is an obstacle to risk communicators in almost all countries. However, in developing countries, where poverty is pronounced and affects a large percentage of the population, these constraints will be even more pronounced. Poverty and disasters are intimately connected, as demonstrated by several UN and World Bank studies (UNDP, 1998). Poverty often causes disasters, as it forces poor populations to live under conditions that directly place them at great risk. In fact, the poor countries sustain 90% of all natural disaster events and, likewise, 90% of all disaster injuries and deaths (Boullé, 1999, and ISDR, 2004).

In many developing nations, for example, illegal shantytowns crop up on unstable, contaminated, or other disaster-prone land surrounding major cities. The manner in which these shantytowns are built often makes them dangerous, for they foster deforestation, improper construction of drainage systems (if constructed at all), and unsanitary sewage disposal, among many other suboptimal conditions (IADB, 1999). The urban poor live under such precarious conditions because they have no other viable, easily identifiable alternatives. Their vulnerability to disasters is extreme, though little is done to mitigate this even in the face of extensive knowledge of the existing risks. Many who died during Hurricane Mitch were residents of shantytowns in drainage ditches, water runoff zones, or on steep inclines that were known to be unsafe for construction (BBC News, 1998).

People living in extreme poverty are often unwilling or unable to participate in conventional risk reduction measures that do not fully account for their

poverty (IFRC, 2000). If risk communicators do not consider the economic means and monetary constraints of their audience, their message will surely fall upon deaf ears. Poor people do not live on unstable slopes because they don't know the risks; they do so because they are poor and cannot find alternate housing (Dawra, 2002). Simply informing them that they are at high risk from landslides will do little; nor will offering alternatives, unless those alternatives are 100% financially viable for the target population.

CULTURAL UNDERSTANDING

Incorporating cultural context to risk communication can be very difficult. Risk communicators must fully understand the ways in which not only their words but also their actions, tone of voice, gestures, dress, and approach to discussion will influence the efficacy of their message. This "cultural sensitivity" to group-specific attributes must be observed in all countries, but generally to a greater degree in developing nations, where technology and globalization are not as pronounced (Akande, 2002). Ignoring this can result in a myriad of negative outcomes, from a communication breakdown to anger, insult, or an increase in risk.

Many African cultures have strong stigmas against discussions about sex. As a result, many HIV/AIDS programs have had a hard time getting people involved in their outreach efforts (Crosson, 2002). These strong cultural barriers have greatly contributed to the fact that Africans are contracting HIV at a rate that is not only much greater than in many other parts of the world, but is also only diminishing slightly, despite intensive risk-reduction programs (United Nations, 2001).

Cultural barriers are not impenetrable, however, if risk communicators avoid ethnocentrisms and utilize creative measures that accommodate local norms. For instance, a group of physicians working with Vietnamese and Ethiopian patients suffering from diabetes used culturally sensitive methods to encourage adherence to prescription instructions and dietary modifications. With a full understanding of cultural biases, they explained to patients that stigmas associated with

amputations (a common effect of diabetes-related complications) were greater than stigmas associated with an illness requiring constant medication. The doctors created diets using food alternatives that were entirely within the regular range of choices for each cultural group. In addition, they tailored their education to reflect the cooking styles of each group, using measurements such as "a cupped hand of rice" instead of "8 ounces of rice." As a result, these physicians achieved an 87% compliance rate among their target audience (Lai, 2000).

LACK OF GOVERNMENT SPONSORSHIP

Effective risk communication is undoubtedly enhanced by the official support of a nation's government, even if that support is marginal. This enhancement is pronounced if there is great trust in the government agency or official that is championing the cause being communicated. Governments can show this support by performing actions ranging from making official statements of endorsement to passing laws requiring or prohibiting certain activities. However, if a nation's government does not support the public information message, their stance becomes a severe detriment for communicators. In extreme cases, when the government position is in complete opposition to that of the risk communicators, risky behaviors of the targeted group can even increase.

These methods have proven successful in many developing countries, illustrated by a decline in the spread of HIV/AIDS among sex workers in Thailand. A simple but comprehensive campaign aimed at convincing female prostitutes to use condoms resulted in almost complete compliance with the safety practice, and the number of new HIV/AIDS cases dropped dramatically (Cohen, 2002). In both these examples, the government echoed a message being broadcast by various actors, ranging from religious groups to international organizations.

Numerous foreign governments, nonprofit groups, and international organizations are working hard to educate Africans about both the means of transmission

and prevention of HIV/AIDS. In Botswana, President Festus Mogae considers the fight against HIV/AIDS a top priority, and the government allocates a sizeable portion of the budget to fund HIV/AIDS education programs. This strong government support has assisted risk communicators in teaching safer behavior (Secure the Future, 1999). Although the actual percentage of persons living with HIV/AIDS in Botswana is the highest in both Africa and the world, government-integrated education programs have curbed infection rates (UNAIDS, 2000). Infection rates have fallen dramatically in other African countries whose governments support HIV/AIDS education, such as Uganda, where infection rates among adults fell from 14% to less than 8% in under a decade (Africa Action, 2000).

However, in South Africa, the picture is much different. In South Africa, HIV/AIDS has reached epidemic proportions, far exceeding the mean levels of the rest of the continent (according to Avert, 2002, the Africa mean is 9.0%, and South Africa's is 20.1%). Since his election in 1999, President Thabo Mbeki has maintained that, contrary to billions of dollars' worth of research and conclusive findings by scientists in almost every region of the world, HIV does not cause AIDS (Russell, 2000). His message has not gone unheard, and it is having disastrous effects on groups working to prevent the spread of HIV/AIDS in South Africa. The Anglican bishop Peter Lee wrote to the African National Congress, stating, "Men in rural KwaZulu-Natal constantly said they did not need to change their sexual behavior because 'the big man'— President Mbeki—believed sex and HIV/Aids were not linked" (Kindra, 2001). Even the South African Minister of Health denounced HIV as the cause of AIDS, and knocked the available anti-retroviral treatments as an ineffective "litmus test for a strong HIV/AIDS strategy" (Horton, 2000).

CONFLICTING INTERESTS OF "BIG BUSINESS"

A sizeable proportion of the risks people face are a product of industrial activities. This is especially true with processes requiring the use of hazardous materials. Mitigating such risks can incur heavy costs, and these costs rise considerably when minimum safety standards for production are set conservatively. Sovereign governments retain the authority to make regulatory decisions concerning risk levels imposed on populations, decisions that almost always are a compromise between ensuring public safety and allowing for the financial viability of (risk-creating) businesses. Of course, not all governments enforce regulations to the same extent, as most industrial processes do not fall under international safety guidelines. Countries wishing to create a financial incentive for businesses willing to accept the moral trade-off of increased societal risk can enact more liberal policies concerning the use of hazardous materials in industrial processes (Karan, Bladen, and Wilson, 1986). These governments tend to downplay the risks caused by certain industries, even contradicting warnings made by risk communicators and the media, in order to protect their income-generating businesses. This practice poses a major challenge to attempts to educate the public.

Preferential treatment toward business is generally more pronounced in developing countries, where governments are often in debt and unable to adequately fund necessary social programs. Of course, all countries depend on the economic engines of industry, but developed countries tend to have stricter safety standards, enforced by government regulating agencies. This is not always the case in developing countries, and the situation is compounded by the reality that governments may be unwilling to establish disincentives for companies interested in investing in their country. This is not to say, however, that poor countries will always side with industry at the expense of safety. However, many people have suffered the effects of a disaster that could have been prevented had their government not colluded with a private company to hide societal risks. This is exactly what happened in Bhopal, India in 1984.

By 1984, Union Carbide had been producing a powerful pesticide containing highly toxic methyl isocyanate at their Bhopal facility for several years. Production procedures had much lower safety standards

than in an identical facility based in the United States, at a much lower cost to the company. It was well known by both Union Carbide and the Indian government that an accidental chemical release would result in a deadly gas cloud, possibly killing many people in the plant's immediate vicinity. In what appeared to be an attempt to prevent an alarmist uproar, which would threaten both the income and employment generated by Union Carbide, the local government downplayed the actual safety risk to the local population (Chemical Safety and Hazard Investigation Board [CSB], 1999). Many illegal squatter settlements had sprung up around the plant over the years, well within what would be considered a proximity posing an extreme health risk. However, though Union Carbide and the Indian government were aware of these settlements, they did nothing to remove them. On December 24, 1984, 40 tons of poisonous gas were released in the middle of the night. Many people awoke, unable to breathe. Thousands panicked and fled their houses; hundreds died in the streets. Ironically, had residents been adequately educated in how to protect themselves in the case of an accidental release, they would have known to shut their windows and remain indoors until the cloud passed.

Although this case led to many "community right to know" laws in wealthier nations (CSB, 1999), governments continue to give excessive liberty to dangerous businesses in many poor countries. Risk communicators should find innovative ways to counteract false pretenses provided by government and business by working to change the political practices of government, alter the belief systems of the people, or a combination of both.

HOSTILE OR RESTRICTIVE GOVERNMENTS

One of the greatest challenges for risk communicators can be access to their target populations. People of all countries face risks, and they have a fundamental right to be informed about those risks. However, when nations impose severe restrictions on speech, media, information, or movement, reaching at-risk

groups using conventional methods may not be possible. Directly confronting these restrictions may place risk communicators at odds with the law or in harm's way. It is not hard to imagine how those trying to enter an oppressively ruled country for the purpose of public education could fall under government suspicion for attempted espionage or inciting civil unrest.

This last obstacle, while frustrating and at times dangerous, is not impossible to overcome. Often, it may simply be a problem of association or affiliation. A country is less likely to believe that the communicators are serving an ulterior motive if they are working under the representation of an international organization such as the UN or the Pan American Health Organization or with an international nonprofit organization like Catholic Relief Services. Groups representing an official organization or government agency may face difficulty in overcoming their political links, making it challenging to convince the host country government that both the government and their citizens will benefit from risk reduction programs these groups sponsor. While persistence and tactful diplomacy usually works best, this is not always the case.

When they assumed control of Afghanistan in 1996, the Taliban implemented a strict form of Islamic law that greatly conflicted with the widely accepted Universal Declaration of Human Rights (as established by the United Nations). Under Afghanistan's new legal system, women were severely restricted in their freedom of movement, their right to seek formal education, and their right to communicate with strangers. They were not allowed to perform any work outside the home (with the exception of health professionals), attend school (formal or informal, including home-based schooling), be in the presence of a radio or television, or move about in public without a male relative escort (RAWA, 2002). As a result, many women were not educated about their health risks and what they could do to prevent injury and disease. Under Taliban rule, only one hospital was designated for "maternity" issues (UNHCR, 2002), and there were no formal means of maternity-care training or treatment outside this one facility. In fact, many

women who attempted to visit hospitals or clinics unaccompanied by a male relative, even in emergency situations, were threatened and often badly beaten by Taliban officials. A documented result was an increase in both infant mortality and maternal death from pregnancy-related issues (Kissling and Sippel, 2001). This environment was so hostile that even the United Nations Population Fund, a highly experienced international organization, was unable to perform many "family planning" projects (Kissling and Sippel, 2001).

This case, and similar ones in countries like North Korea, China, Myanmar, and Somalia, illustrate the need for improving methods of countering obstacles in risk communications when working with restrictive governments. Access restrictions can even stem from the home country of the communicator, for example,

due to bilateral political relationships, as is the case with the United States and Cuba. There are thousands of nonprofit, religious, and other nongovernmental organizations that strive to perform humanitarian projects involving risk education in countries ruled by restrictive regimes, but there is no collective record of the methods they have found successful.

CONCLUSION

Preparedness must occur at both the government level and the individual level to reduce risk and vulnerability. Through the efforts of governments, nongovernmental organizations, and the media, preparedness levels throughout the world are steadily increasing, despite the many obstacles that exist.

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APPENDIX 5-1
Guidance on Creating a Public Education Campaign for Earthquakes

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Earthquakes

Awareness Messages
Why talk about earthquakes?

Earthquakes strike suddenly, without warning. Earthquakes can occur at any time of the year and at any time of the day or night. On a yearly basis, 70 to 75 damaging earthquakes occur throughout the world. Estimates of losses from a future earthquake in the United States approach $200 billion.

Forty-five states and territories in the United States are at moderate to very high risk of earthquakes, and they are located in every region of the country. California has experienced the most frequent damaging earthquakes; however, Alaska has experienced the greatest number of large earthquakes—many of which caused little damage because of the area's low population density at the time.

In November 2002, a magnitude 7.9 earthquake in south-central Alaska ruptured the Denali Fault in the Alaska Mountain Range, about 90 miles (145 kilometers) south of Fairbanks. Although this was the strongest earthquake ever recorded in the interior of Alaska, it caused no deaths and little damage to structures because the region was sparsely populated. In February 2001, the 6.8 magnitude Nisqually earthquake struck the Puget Sound area 12 miles (20 kilometers) northeast of Olympia, Washington. Hundreds of people were injured and damages were estimated at more than $3.5 billion. In January 1994, the Los Angeles region of southern California was struck by a 6.7 magnitude earthquake centered in the San Fernando

Valley town of Northridge. The Northridge earthquake killed 57 people, injured 9000, and displaced 20,000 from their homes. It was one of the costliest earthquakes in U.S. history, destroying or damaging thousands of buildings, collapsing freeway interchanges, and rupturing gas lines that exploded into fires.

The most widely felt sequence of earthquakes in the contiguous 48 states was along the New Madrid Fault in Missouri, where a three-month long series of quakes from 1811 to 1812 included three with estimated magnitudes of 7.6, 7.7, and 7.9 on the Richter Scale. These earthquakes were felt over the entire eastern United States, with Missouri, Tennessee, Kentucky, Indiana, Illinois, Ohio, Alabama, Arkansas, and Mississippi experiencing the strongest ground shaking.

Where earthquakes have occurred in the past, they will happen again.

What are earthquakes and what causes them?

An earthquake is a sudden, rapid shaking of the earth caused by the breaking and shifting of rock beneath the earth's surface. For hundreds of millions of years, the forces of plate tectonics have shaped the earth as the huge plates that form the surface move slowly over, under, past, and away from each other. Sometimes the movement is gradual. At other times, the plates are locked together, unable to release the accumulating energy as they bend or stretch. When the forces grow strong enough, the plates suddenly break free causing the ground to shake. Most earthquakes occur at the boundaries where two plates meet; however, some earthquakes occur in the middle of plates.

Aftershocks are smaller earthquakes that follow the main shock and can cause further damage to weakened buildings. Aftershocks can occur in the first hours, days, weeks, or even months after the quake. Some earthquakes are actually foreshocks that precede a larger earthquake.

Ground shaking from earthquakes can collapse buildings and bridges; disrupt gas, electric, and telephone service; and sometimes trigger landslides, avalanches, flash floods, fires, and huge, destructive, seismic sea waves called tsunamis. Buildings with foundations resting on unconsolidated landfill and other unstable soils are at increased risk of damage. Also, mobile homes and homes not attached to their foundations are at particular risk because they can be shaken off their foundations during an earthquake. When an earthquake occurs in a populated area, it may cause deaths and injuries and extensive property damage.

The Northridge, California, earthquake of January 17, 1994, struck a modern urban environment generally designed to withstand the forces of earthquakes. Its economic cost, nevertheless, was estimated at $20 billion. Fortunately, relatively few lives were lost. Exactly one year later, Kobe, Japan, a densely populated community less prepared for earthquakes than Northridge, was devastated by one of the most costly earthquakes ever to occur. Property losses were projected at $96 billion, and at least 5378 people were killed. These two earthquakes tested building codes and construction practices, as well as emergency preparedness and response procedures.

How can I protect myself in an earthquake?

Ground vibrations during an earthquake are seldom the direct cause of death or injury. Most earthquake-related injuries and deaths result from collapsing walls, flying glass, and falling objects caused by the ground shaking. It is extremely important for a person to move as little as possible to reach the place of safety he or she has identified, because most injuries occur when people try to move more than a few feet during the shaking.

Much of the damage caused by earthquakes is predictable and preventable. We must all work together in our communities to apply our knowledge to enact and enforce up-to-date building codes, retrofit older unsafe buildings, and avoid building in hazardous areas, such as those prone to landslides. We must also look for and eliminate hazards at home, where our children spend their days, and where we work. And we must learn and practice what to do if an earthquake occurs.

Action Messages

Be Prepared for an Earthquake
Protect Yourself
Core Action Messages
- **Pick "safe places" in each room.**
- **Practice drop, cover, and hold on.**

For general preparedness, every household should create and practice a Family Disaster Plan and assemble and maintain a Disaster Supplies Kit. In addition, every household should take earthquake-specific precautions and plan and practice what to do in the event of an earthquake.

If you are at risk from earthquakes, you should:

- **Discuss with members of your household the possibility of earthquakes and what to do to stay safe if one occurs.** Knowing how to respond will help reduce fear.
- **Pick "safe places" in each room of your home and your office or school.** A safe place could be under a piece of furniture, such as a sturdy table or desk, or against an interior wall away from windows, bookcases, or tall furniture that could fall on you. The shorter the distance to your safe place, the less likely it is that you will be injured by furnishings that become flying debris during the shaking. Injury statistics show that persons moving more than five feet (1.5 meters) during an earthquake's shaking are the most likely to experience injury.
- **Practice drop, cover, and hold on in each safe place.** Drop to the floor, take cover under a

sturdy piece of furniture, and hold on to a leg of the furniture. If suitable furniture is not nearby, sit on the floor next to an interior wall and cover your head and neck with your arms. Responding quickly in an earthquake may help protect you from injury. Practice drop, cover, and hold on at least twice a year.

- **Keep a flashlight and sturdy shoes by each person's bed.**
- **Talk with your insurance agent about earthquake protection.** Different areas have different requirements for earthquake protection. Study the locations of active faults, and, if you are at risk, consider purchasing earthquake insurance.
- **Inform guests, babysitters, and caregivers of earthquake plans.** Everyone in your home should know what to do if an earthquake occurs, even if you are not there at the time.

Protect Your Property

Core Action Messages
- **Secure your home's structure and objects inside and outside.**

If you are at risk from earthquakes, you should:

- **Make sure your home is securely anchored to its foundation.** Depending on the type of construction and the materials used in building your home, you may need to have it bolted or secured in another way to its foundation. If you are not sure that your home is securely anchored, contact a professional contractor. Homes securely attached to their foundations are less likely to be severely damaged during earthquakes, while homes that are not are frequently ripped from their foundations and become uninhabitable.
- **Bolt and brace water heaters and gas appliances to wall studs.** If the water heater tips over, the gas line could break, causing a fire hazard, and the water line could rupture. The water heater may be your best source of drinkable water following an earthquake. Consider having a licensed professional install flexible fittings for gas and water pipes.

- **Bolt bookcases, china cabinets, and other tall furniture to wall studs.** Brace or anchor high or top-heavy objects. During an earthquake, these items can fall over, causing damage or injury.
- **Hang heavy items, such as pictures and mirrors, away from beds, couches, and anywhere people sleep or sit.** Earthquakes can knock things off walls, causing damage or injury.
- **Brace overhead light fixtures.** During earthquakes, overhead light fixtures are the most common items to fall, causing damage or injury.
- **Install strong latches or bolts on cabinets.** The contents of cabinets can shift during the shaking of an earthquake. Latches will prevent cabinets from opening and spilling out the contents. Place large or heavy objects on shelves near the floor.
- **Secure large items that might fall and break** (televisions, computers, etc.).
- **Store weed killers, pesticides, and flammable products securely in closed, latched metal cabinets.**
- **Evaluate animal facilities and places your pets like to hide in, to ensure that any hazardous substances or structures are dealt with.**
- **Consider having your building evaluated by a professional structural design engineer.** Ask about home repair and strengthening tips for exterior features, such as porches, front and back decks, sliding glass doors, canopies, carports, and garage doors. This is particularly important if there are signs of structural defects, such as foundation cracks. Earthquakes can turn cracks into ruptures and make smaller problems bigger. A professional can give you advice on how to reduce potential damage.
- **Follow local seismic building standards and land use codes** that regulate land use along fault lines, in areas of steep topography, and along shorelines. Some municipalities, counties, and states have enacted codes and standards to protect property and occupants in case of an earthquake. Learn about your area's codes before you begin construction.

What to Do During an Earthquake

Core Action Messages
- **If inside when the shaking starts, move no more than a few steps and drop, cover, and hold on.**
- **If outside, find a clear spot and drop.**

If you are inside when the shaking starts, you should:

- **Drop, cover, and hold on.** Move only a few steps to a nearby safe place. Most people injured in earthquakes move more than five feet (1.5 meters) during the shaking.
- **If you are elderly or have a mobility impairment, remain where you are, bracing yourself in place.**
- **If you are in bed, stay there, hold on, and protect your head with a pillow.** You are less likely to be injured if you stay in bed. Broken glass on the floor can injure you.
- **Stay away from windows.** Windows can shatter with such force that you can be injured by flying glass even if you are several feet away.
- **Stay indoors until the shaking stops and you are sure it is safe to exit.** In buildings in the United States, you are safer if you stay where you are until the shaking stops. If you go outside, move quickly away from the building to prevent injury from falling debris.
- **Be aware that fire alarm and sprinkler systems frequently go off in buildings during an earthquake, even if there is no fire.** Check for and extinguish small fires, and exit via the stairs.
- **If you are in a coastal area, drop, cover, and hold on during an earthquake and then move immediately to higher ground when the shaking stops.** Tsunamis are often generated by earthquakes.

If you are outdoors when the shaking starts, you should:

- **Find a clear spot away from buildings, trees, streetlights, and power lines.**

- **Drop to the ground and stay there until the shaking stops.** Injuries can occur from falling trees, streetlights, power lines, and building debris.
- **If you are in a vehicle, pull over to a clear location, stop, and stay there with your seatbelt fastened until the shaking stops.** Trees, power lines, poles, street signs, overpasses, and other overhead items may fall during earthquakes. Stopping in a clear location will reduce your risk, and a hard-topped vehicle will help protect you from flying or falling objects. Once the shaking has stopped, proceed with caution. Avoid bridges or ramps that might have been damaged by the quake.
- **If you are in a mountainous area or near unstable slopes or cliffs, be alert for falling rocks and other debris** that could be loosened by the earthquake. Landslides are often triggered by earthquakes.

What to Do after an Earthquake

Core Action Messages
- **Expect aftershocks.**
- **Check yourself and then others.**
- **Look for fires.**

When the shaking stops, you should:

- **Expect aftershocks.** Each time you feel one, drop, cover, and hold on. Aftershocks frequently occur minutes, days, weeks, and even months following an earthquake.
- **Check yourself for injuries and get first aid if necessary before helping injured or trapped persons.**
- **Put on long pants, a long-sleeved shirt, sturdy shoes, and work gloves** to protect yourself from injury by broken objects.
- **Look quickly for damage in and around your home and get everyone out if your home is unsafe.** Aftershocks following earthquakes can cause further damage to unstable buildings. If your home has experienced damage, get out before aftershocks happen. Use the stairs, not an elevator.

- **Listen to a portable, battery-operated radio or television** for updated emergency information and instructions. If the electricity is out, this may be your main source of information. Local radio and television stations and local officials will provide the most appropriate advice for your particular situation.
- **Check the telephones in your home or workplace.** If a phone was knocked off its cradle during the shaking of the earthquake, hang it up. Allow 10 seconds or more for the line to reset. If the phone lines are undamaged, you should get a dial tone. Use a telephone or cell phone only to make a brief call to your Family Disaster Plan contact and to report life-threatening emergencies. Telephone lines and cellular equipment are frequently overwhelmed in disaster situations and need to be clear for emergency calls to get through. Cellular telephone equipment is subject to damage by quakes and cell phones may not be able to get a signal, but regular "land line" phones may work.
- **Look for and extinguish small fires.** Fire is the most common hazard following earthquakes. Fires followed the San Francisco earthquake of 1906 for three days, creating more damage than the earthquake.
- **Clean up spilled medications, bleach, gasoline, or other flammable liquids** immediately. Avoid the hazard of a chemical emergency.
- **Open closet and cabinet doors cautiously.** Contents may have shifted during the shaking and could fall, creating further damage or injury.
- **Help people who require special assistance**—infants, elderly people, those without transportation, large families who may need additional help in an emergency situation, people with disabilities, and the people who care for them.
- **Watch out for fallen power lines or broken gas lines,** and stay out of damaged areas. Hazards caused by earthquakes are often difficult to see, and you could be easily injured.
- **Watch animals closely.** Keep all your animals under your direct control. Pets may become dis-oriented, particularly if the disaster has affected scent markers that normally allow them to find their home. Pets may be able to escape from your house or your fence may be broken. Be aware of hazards at nose and paw level, particularly debris, spilled chemicals, fertilizers, and other substances that might seem to be dangerous to humans. In addition, the behavior of pets may change dramatically after an earthquake, becoming aggressive or defensive, so be aware of their well-being and take measures to protect them from hazards, including displaced wild animals, and to ensure the safety of other people and animals.
- **Stay out of damaged buildings.** Damaged buildings may be destroyed by aftershocks following the main quake.
- **If you were away from home, return only when authorities say it is safe. When you return home:**
  ◦ Be alert for and observe official warnings.
  ◦ Use extreme caution. Check for damages outside your home. Then, if the structure appears safe to enter, check for damages inside. Building damage may have occurred where you least expect it. Carefully watch every step you take. Get out of the building if you think it is in danger of collapsing. Do not smoke; smoking in confined areas can cause fires.
  ◦ Examine walls, floors, doors, staircases, and windows.
  ◦ Check for gas leaks. If you smell gas or hear a blowing or hissing noise, open a window and get everyone out quickly. Turn off the gas, using the outside main valve if you can, and call the gas company from a neighbor's home. If you turn off the gas for any reason, it must be turned back on by a professional.
  ◦ Look for damage to the electrical system. If you see sparks or broken or frayed wires, or if you smell burning insulation, turn off the electricity at the main fuse box or circuit breaker. If you have to step in water to get to the fuse box or circuit breaker, call an electrician first for advice.

○ Check for damage to sewage and water lines. If you suspect sewage lines are damaged, avoid using the toilets and call a plumber. If water pipes are damaged, contact the water company and avoid using water from the tap. You can obtain safe water from undamaged water heaters or by melting ice cubes.

○ Watch for loose plaster, drywall, and ceilings that could fall.

Media and Community Education Ideas

• Ask your community to adopt up-to-date building codes. Building codes are the public's first line of defense against earthquakes. National model building codes are available to communities and states. These codes identify construction techniques for buildings that help them withstand earthquakes without collapsing and killing people. Codes are updated regularly to make use of information learned from recent damaging earthquakes, so adopting and enforcing up-to-date codes are essential.

• If your area is at risk from earthquakes, ask your local newspaper or radio or television station to:

○ Present information about how to respond if an earthquake occurs.

○ Do a series on locating hazards in homes, workplaces, day care centers, schools, etc.

○ Provide tips on how to conduct earthquake drills.

○ Run interviews with representatives of the gas, electric, and water companies about how individuals should prepare for an earthquake.

Help the reporters to localize the information by providing them with the local emergency telephone number for the fire, police, and emergency medical services departments (usually 9-1-1) and emergency numbers for the local utilities and hospitals. Also provide the business telephone numbers for the local emergency management office, local American Red Cross chapter, and state geological survey or department of natural resources.

Work with officials of the local fire, police, and emergency medical services departments; utilities; hospitals; emergency management office; and American Red Cross chapter to prepare and disseminate guidelines for people with mobility impairments about what to do if they have to evacuate.

Facts and Fiction

Fiction: During an earthquake, you should get into a doorway for protection.

Facts: In modern homes, doorways are no stronger than any other parts of the structure and usually have doors that will swing and can injure you. During an earthquake, you should get under a sturdy piece of furniture and hold on.

Fiction: During an earthquake, the earth cracks open and people, cars, and animals can fall into those cracks.

Facts: The earth does not crack open like the Grand Canyon. The earth moves and rumbles and, during that movement, small cracks can form. The usual displacements of the earth during an earthquake are caused by up-and-down movements, so shifts in the height of the soil are more likely than chasm-like cracks.

Fiction: Animals can sense earthquakes and give advance warning.

Facts: Animals may be able to sense the first low-frequency waves of an earthquake that occurs deep within the earth, but the damage-causing primary and secondary waves follow just seconds behind. Animals do not make good earthquake warning devices.

Fiction: Big earthquakes always happen in the early morning.

Facts: Several recent damaging earthquakes have occurred in the early morning, so many people believe that all big earthquakes happen then. In fact, earthquakes occur at all times of day. The 1933 Long Beach earthquake was at 5:54 p.m. and the 1940 Imperial Valley event was at 9:36 p.m. More recently, the 1989 Loma Prieta event was at 5:02 p.m.

Fiction: It's hot and dry—earthquake weather!

Facts: Many people believe that earthquakes are more common in certain kinds of weather. In fact, no correlation with weather has been found. Earthquakes begin many kilometers below the region affected by surface weather. People tend to notice earthquakes that fit the pattern and forget the ones that do not. In all regions of the world, "earthquake weather" is whatever type of weather prevailed at the time of the region's most memorable earthquake.

Fiction: Someday there will be beachfront property in Arizona.

Facts: The ocean is not a great hole into which California can fall, but is itself land at a somewhat lower elevation with water above it. The motion of plates will not make California sink—California is moving horizontally along the San Andreas Fault and up around the Transverse Ranges (coastal California mountains).

Fiction: We have good building codes so we must have good buildings.

Facts: The tragedy in Kobe, Japan, one year after the Northridge earthquake, painfully reminds us that the best building codes in the world do nothing for buildings built before that code was enacted. In many earthquake-prone areas of the United States, the building codes are out of date and therefore even new buildings are very vulnerable to severe earthquake damage. Fixing problems in older buildings—retrofitting—is the responsibility of the building's owner.

Fiction: Scientists can now predict earthquakes.

Facts: Scientists do not know how to predict earthquakes, and they do not expect to know how any time in the foreseeable future. However, based on scientific data, probabilities can be calculated for potential future earthquakes. For example, scientists estimate that during the next 30 years the probability of a major earthquake occurring is 67% in the San Francisco Bay area and 60% in southern California.

Source: The National Disaster Education Coalition, 2004.

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6

Response

INTRODUCTION

Through the processes of preparedness and mitigation, described in Chapters 4 and 5, individuals, communities, and countries work to reduce their hazard vulnerability and thereby increase their resilience to disasters. Unfortunately, despite even the best-laid emergency plans, the most comprehensive preparedness programs, and the most effective mitigation programs, disasters will still strike, and they do every day of every year. And when hazards strike, individuals, communities, and countries must initiate disaster response, working within the confines of their limited funding, resources, ability, and time to prevent the onset of a catastrophe.

Ultimately, the scale of the disaster dictates the response. Individuals regularly experience emergencies that, in their perspective, are disastrous, such as house fires or car accidents. These events easily can overwhelm their individual capacities to respond, and local response resources such as the fire department or emergency medical units, if they exist, must be dispatched to manage the situation. Communities also experience events that are much larger than they are able to manage and, require them to call upon their regional or central government for assistance. These

are cases of national disaster. The largest events, however, are those disasters that overwhelm even national governments' capacities to respond. In these instances, it is contingent upon a global community of responders to quickly mobilize and assist the affected nation or nations in their disaster response efforts. These international disasters, as they are often called, are the most complex and significant challenges faced by the global emergency management community.

This chapter will focus on response as a disaster management function. The process by which international disasters are recognized, announced, and managed will also be addressed. Though there are disaster management functions common to many disasters, each is unique, drawing upon several, or even all, of the tasks, processes, and systems described in this chapter.

WHAT IS RESPONSE?

The response function of emergency management includes actions aimed at limiting injuries, loss of life, and damage to property and the environment that are taken prior to, during, and immediately after a hazard event. Response processes begin as soon as it

becomes apparent that a hazard event is imminent and lasts until the emergency is declared to be over.

Response is by far the most complex of the four functions of emergency management, since it is conducted during periods of very high stress, in a highly time-constrained environment, and with limited information. During response, wavering confidence and unnecessary delay directly translate to tragedy and destruction.

The task of limiting injuries, loss of life, and further damage to property and the environment is diverse. Response includes not only those activities that directly address these immediate needs—such as first aid, search and rescue, and shelter—but also includes systems developed to coordinate and support such efforts. Response involves the rapid resumption of critical infrastructure (such as opening transportation routes, restoring communications and electricity, and ensuring food and clean water distribution) to allow recovery to take place, reduce further injury and loss of life, and speed the return to a normally functioning society.

Though exercises and training may improve responders' skills, many unknown variables are unique to each hazard that confound even the most well-planned response. Further, especially during response to disasters that are international in scope, many groups and individuals from all over the world suddenly converge upon the affected area, each with their own expectations, equipment, and mission.

Disaster response is centered upon information and coordination. Unique to each event are the participants, victims' and community needs, the timing and order of events, and the actions and processes employed. This section will approach the various functions and processes associated with response in a general sense, as they would apply to all hazards and all nations.

RESPONSE—THE EMERGENCY

Hazard events, regardless of whether they turn into disasters, are emergencies. They are situations in which the split-second thinking of both trained and untrained individuals must address conditions outside of normal life. The emergencies continue until these extraordinary needs have ceased and the danger to life and property no longer persists.

Emergencies occur in three phases, with different response activities applying to each:

1. *Prehazard.* During this period of the emergency, the hazard event is impending and may even be inevitable. Recognition of the impending hazard event may or may not exist.

2. *The emergency: Hazard effects ongoing.* This period begins when the first damaging effects begin, and extends until all damaging effects related to the hazard and all secondary hazards cease to exist. It may be measured in seconds for some hazards, such as lightning strikes or earthquakes. However, for others, such as floods, hurricanes, wildfires, or droughts, this phase can extend for hours, days, weeks, or even years. During this time, responders address the needs of people and property as well as the hazard effects.

3. *The emergency: Hazard effects have ceased.* During this final phase of the emergency, the hazard has exerted all of its influence, and negligible further damage is expected. Responders are no longer addressing hazard effects, so their efforts are dedicated to addressing victims' needs, managing the dead, and ensuring the safety of structures and the environment. The emergency still exists and the situation still has the potential to worsen, but the hazard or hazards that instigated the emergency are no longer present.

RECOGNITION—PREDISASTER ACTIONS

Response to a disaster begins as soon as the imminence of a hazard event is recognized by officials with the authority to commence the response effort (often designated in the Emergency Operations Plan). Recognition may occur via one or more routes, depending upon the hazard's characteristics and the

available technology. Each disaster has specific indicators, and prior to the onset of the disaster, governments must have established means of detecting those indicators or received assurance of assistance from other governments with the ability to detect them.

While hazards such as wildfires, droughts, and cyclones may have a significant lead time (measured in hours, days, or even weeks), hazards like earthquakes can strike with almost no advance notice—that is, recognition does not occur until the actual event begins. Advances in technology continue to increase the amount of notice that disaster managers may have to issue a hazard warning. Though the availability of this technology is often limited to developed countries, international cooperation can expand its reach.

Unfortunately, technology is not a "silver bullet" solution, because a nation must be able to act on the information for it to be of any use. For instance, tsunami detection systems alerted the U.S. government of the 2004 tsunami events more than an hour before they struck, which in turn alerted many of the countries in the tsunami's path. However, these countries lacked the ability to warn their populations and initiate evacuation to higher ground.

If recognition occurs in advance of the disaster, several predisaster response processes are available to disaster managers. The specific actions that may be employed, which serve to limit the consequences of the hazard once it does arrive, depend upon the disaster's characteristics, the systems available to emergency managers, and the ability to communicate with a ready public. Although advance public education is not mandatory for proper functioning of predisaster actions, it significantly increases their effectiveness. The following lists the three types of response actions that may take place during the predisaster period:

- *Warning and evacuation.* If a warning system has been established, the public may have time to make last-minute preparations or evacuate away from the area, move into personal or established community shelters, or take other protective actions in advance of the hazard's arrival. As described in Chapters 4 and 5, in order for warnings to work effectively, the systems require the

technology to detect the hazard and relay the warning, and the public must be trained to correctly translate and react to the issued warning. Though experience has shown that not everyone will evacuate or shelter themselves even in the most dangerous situations, protecting any significant portion of the population can drastically reduce overall vulnerability and make the postdisaster response easier.

- *Pre-positioning of resources and supplies.* Depending upon a country's size, responders, equipment, and supplies may be dispersed across a wide area prior to disaster recognition. Advance warning of the disaster allows officials to transport those supplies into the affected site before hazard conditions and consequences make such movement more difficult, dangerous, or even impossible. Pre-positioning of response supplies can also decrease the waiting time after the disaster begins for victims whose survival will depend on these items and services. To further simplify pre-positioning, many countries have created easily transportable disaster equipment kits for items such as pharmaceutical and medical supplies, food, clothing, and shelter. These kits can be stored in trailers, train cars, or moveable shipping crates (see Figures 6-1a and 6-1b).
- *Last-minute mitigation and preparedness measures.* Mitigation and preparedness are most effective when they are performed far in advance of a disaster. However, actions often may be taken in the few hours or days before a disaster occurs to further limit the hazard's consequences. For instance, before a flood, sandbags may be used to increase the height of levees or to create barriers around buildings and other structures. Windows and doors may be boarded up or shuttered before a windstorm. Vaccines and other prophylaxis may be used to minimize infection rates with epidemics. For many hazard types, the public may be reminded of stockpiling and other preparedness actions they still have time for (such as purchasing extra water, food, batteries, and candles).

(a)   (b)
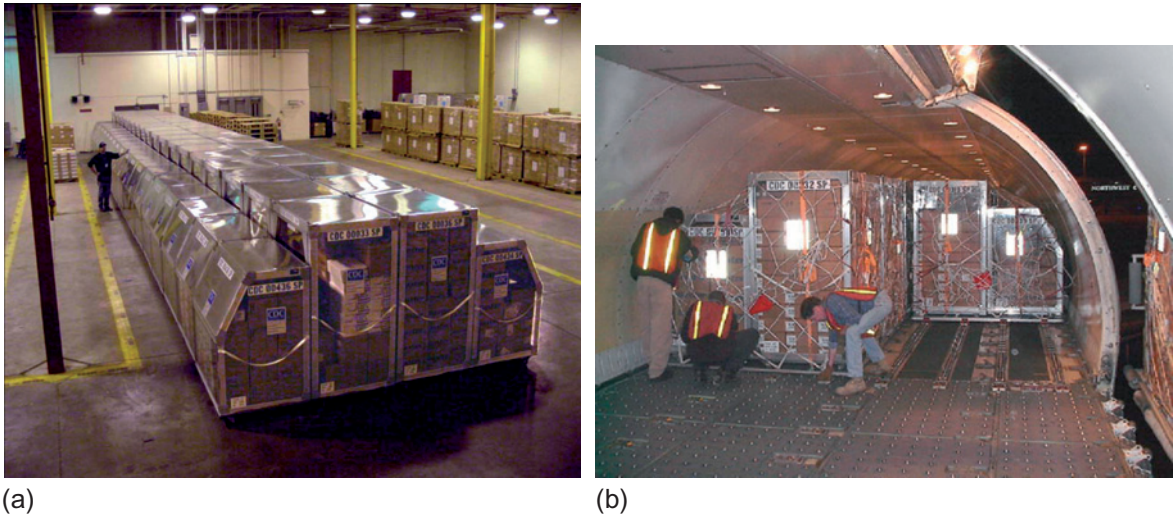
FIGURE 6-1 (a and b) US Strategic National Stockpile "12-Hour Push Packages," designed for rapid transport within cargo planes to anywhere in the nation within 12 hours. (*Source:* U.S. Department of Health and Human Services.)

In rare instances, most notably with intentional hazards and technological hazards, completely reducing or eliminating the likelihood of the event may be possible. By their very nature, these hazards are created by humans and thus are more likely to be corrected by humans, unlike natural hazard events, which are mostly unstoppable once recognition of the event occurs. For example, when the Y2K computer bug threatened systems failures around the world, many nations took measures to correct the problem before it materialized.

When predisaster hazard recognition is possible, it spurs existing local response resources into action, especially if appropriate tasks have been outlined previously in an EOP. If, based upon knowledge or experience, the hazard is predicted to cause widespread damage, regional or national governments be called in or may self-deploy to begin mobilizing response resources—including declaring a national disaster, if such a distinction is necessary according to legal requirements.

International aid is rarely deployed before a disaster occurs, and two reasons help to explain why. First, most governments prefer to maintain the image that they are able to manage the situation without outside assistance for as long as possible (and occasionally long after their abilities have been exceeded, as will be explained in Chapter 11). The affected country's government must invite international response agencies before these organizations may participate in any response, and because of governments' face-saving needs, they are unlikely to extend such invitations prior to a disaster actually striking. The second reason that international aid is rarely deployed in advance of a disaster is that international assistance is generally provided in proportion to the perceived seriousness of the disaster as well as to the perceived ability of the local government to manage those consequences. Most countries and organizations do not have stores of spare resources they can dedicate or deploy without absolute justification.

RECOGNITION—POSTDISASTER

Once a hazard event begins and is recognized by response officials, response efforts may commence in earnest. Note, however, that the occurrence of a haz-

ard emergency does not automatically translate to recognition. The affected are the most likely to be the first to know that a hazard has struck and a disaster event is in progress, especially with rapid-onset disasters such as flash floods and landslides. Local, regional, and national response agencies become aware of the disaster by means of first-hand experience, detection systems, and notification from others.

Reasons that emergencies may not be recognized immediately include:

- The scope of the unfolding event is underestimated, and insufficient response is mounted as a result.
- The hazard's initial effects are unrecognizable or undetectable, such as the spraying of a biological weapon in a public area.
- The hazard's initial effects are kept hidden from response officials.
- Disruptions of, inefficiencies in, or a lack of communications infrastructure prevents the affected from reporting an emergency in progress.
- Response officials are fully engaged in response to another hazard and are unable to receive information about a new, secondary hazard.

Once disaster response begins, the first priority is saving lives. This activity, which includes search and rescue, first aid, and evacuation, may continue for days or weeks, depending upon the disaster's type and severity (people have been rescued from rubble as long as two weeks after they were buried). As response resources are mobilized, additional functions will be added to the list in increasing priority, to include:

- Assessing the disaster
- Treating remaining hazard effects
- Providing water and food
- Shelter
- Fatality management
- Sanitation
- Security
- Social services

- Resumption of critical infrastructure
- Donations management

SEARCH AND RESCUE

Many disasters result in victims being trapped under collapsed buildings, debris, or by moving water. Earthquakes, hurricanes, typhoons, storms, tornadoes, floods, dam failures, technological accidents, terrorist attacks, and hazardous materials releases, for example, all may result in the need for organized search and rescue. Search and rescue involves three distinct but interrelated actions: locating victims; extracting (rescuing) victims from whatever condition has trapped them; and providing initial medical first-aid treatment to stabilize victims so that they may be transported to regular emergency medical practitioners.

Average citizens, victims' friends, family, and neighbors, perform the majority of search and rescue in the initial minutes and hours of a disaster. These people locate victims by listening for calls for help, watching for other signs of life, or using information to estimate where the trapped person may be (such as knowing that someone would have been at home at a certain time of day). It has been estimated that half of those rescued are rescued in the first six hours after a disaster happens (with only 50% of those that remain trapped beyond six hours surviving) (BBC, 1999), so the contribution of ordinary citizens is significant. These untrained responders, operating without adequate equipment or expertise, often place themselves at great risk. But despite the incidence of rescuers being injured or killed, many more lives are saved than lost.

For more organized and technical search-and-rescue effort needs, where average, unequipped citizens are unable or unwilling to go, exist formal search-and-rescue teams. These teams train regularly and operate with a full cache of equipment, supplies, and animals. The teams may focus on general search and rescue or have specialty areas such as wilderness rescue, urban search and rescue, or swift water rescue.

Their equipment, which includes medical equipment, rescue equipment (ropes, saws, drills, hammers, lumber), communications equipment (phones, radios, computers), technical support (cameras, heat and movement detectors), and logistics equipment (food, water, special clothing), greatly increases their ability to locate and save victims.

Many nations train, equip, and maintain search-and-rescue teams that are deployable anywhere in the world, with all of their equipment, at a moment's notice. These teams are able to perform several or all of the following tasks:

- Search collapsed buildings for victims, and rescue them
- Locate and rescue victims buried in earth, snow, and other debris
- Rescue victims from swiftly moving or high water
- Locate and rescue victims from damaged or collapsed mines
- Locate and rescue victims lost in wilderness areas
- Provide emergency medical care to trapped victims
- Provide dogs trained to locate victims by sound or smell
- Assess and control gas, electric service, and hazardous materials
- Evaluate and stabilize damaged structures

One recognized setback to the deployment of search-and-rescue teams is that it often takes days before team members can begin searching for victims, despite the importance of their arrival very soon after the disaster has occurred. The governments of the affected countries cause the greatest delays. These governments may downplay the severity of the disaster from the outset (making recognition by search-and-rescue teams more difficult), can deny or delay the rapid passage of equipment through customs or borders, and can deny team members access to the affected area, for example. Despite these delays, team members often deploy anyway, knowing that there is always a chance that victims remain alive under debris or in confined spaces, even though significant time may have elapsed.

More information on search and rescue can be found at:

FEMA Search and Rescue: www.fema.gov/usr/about.shtm

U.S. National Association for Search and Rescue: www.nasar.org/nasar/

Canada National Search and Rescue Secretariat: www.nss.gc.ca/site/index_e.asp

South African Search and Rescue: www.sasar.gov.za/index.html

Australia Search and Rescue: www.ema.gov.au/agd/ema/emainternet.nsf/Page/USAR

FIRST AID MEDICAL TREATMENT

While accidents and emergencies commonly involve wounded people, the number of injured victims from disasters exceeds any amount considered normal. The quantity of victims may be so great that they completely overwhelm the capacity of local clinics or hospitals to care for them all (termed a "mass casualty event"). Disaster managers must find a way to quickly locate these injured victims, provide them with the first aid required to stabilize their condition, and transport them to a facility where they can receive the medical assistance necessary to save their lives.

Onsite first aid, like fire suppression, is a regular function familiar to local first responders. However, basic first aid practice assumptions can be completely undermined in a disaster's aftermath. Victims can quickly outnumber the medical technicians responding to the disaster scene. Supplies are rapidly depleted. Transportation to more adequate facilities, which is vital for the most severely wounded, may be delayed, obstructed, or simply impossible. And, even if the responders are able to move victims away from the disaster area, there may not be anywhere to bring them, if other victims from throughout the greater disaster area occupy all nearby hospital beds.

One of the first steps that responders, medical or other, take to manage disaster first aid is triage. Triage is a system by which many victims are ranked according to the seriousness of their injuries, thereby ensuring that the highest priority cases are transported to medical facilities before less serious ones. It is, in essence, a needs assessment. By triaging patients, responders maximize their time and resources, and prevent nonurgent cases from being double- or triple-checked unnecessarily.

Triage tagging involves marking patients with a symbol on their forehead or a color-coded tag. It is done primarily according to two established systems. The first, called START (Simple Triage and Rapid Transport), is used when onsite medical resources are scarce and victims will be transported to more adequately staffed and prepared facilities. START tagging categories include:

- D—Deceased
- I—Immediate (Victim needs advanced medical care within one hour)
- DEL—Delayed (Victim needs medical care, but can wait until after I victims)
- M—Minor (Victim can wait several hours before nonlife-threatening injuries are treated)

Advanced triage is the second system, commonly used when sufficient emergency medical care exists onsite. Advanced triage categories include:

- Black—Expectant (Victims' injuries are so severe they are expected to die)
- Red—Immediate (Victims are likely to survive their injuries, but only with immediate surgery or other life-saving treatment)
- Yellow—Observation (Victims are injured and need emergency medical care, but current condition is stable; must be monitored for change in condition)
- Green—Wait (Victims need medical care within several hours or even days, but will not die of their injuries if left untreated in the immediate future)

FIGURE 6-2   Field hospital established in the United States to treat the injured following Hurricane Francis in 2004. (*Source:* FEMA/Andrea Booher.)

- White—Dismiss (Victims need little more than minor first aid treatment or basic care not requiring a doctor)

When large numbers of injured victims are present, establishing field hospitals may be necessary. Field hospitals are temporary facilities constructed at or near the source of victims where surgical and other complex medical equipment and staff is available (see Figure 6-2). They can be set up from scratch inside large tents or undamaged buildings, relying on equipment and staff transported in from distant hospitals, for instance, or they can be constructed from "kits" designed especially for rapid deployment to disaster zones. Finally, transportable hospitals, such as the USNS *Comfort* pictured in Chapter 5, may be brought in.

EVACUATION

Before, during, or after a disaster occurs, it is often necessary to move populations away from the hazard and its consequences. This can reduce the effect of many disasters, whether natural, technological, or intentional, by simply removing potential victims from risk.

Despite evacuation orders that come in advance of a disaster, many people refuse to evacuate or are unable to for a range or reasons (including poverty, disability, fear, or inability to receive or understand warning communications). Once the disaster begins and conditions worsen, however, these same people may still need to be evacuated, and they may even begin evacuating on their own in such a way as to place themselves at increased risk.

Evacuations are most effective when they are limited to only those areas facing risk. This could be a single building, a neighborhood, or a whole city or region. Once it has been deemed necessary, only government officials may order an evacuation. Fire or police officials may instigate and facilitate the evacuation of single buildings or neighborhoods, but, for larger jurisdictions, the call usually comes from the chief executive. Depending upon a nation's laws, these evacuations may be recommended or forced. Legal issues arise if statutory authority is not in place outlining how and when forced evacuations may be performed.

To be effective, evacuations must be facilitated. Evacuation routes able to convey evacuees all the way out of danger and to a safe destination should be predetermined according to hazard. Many people will need transportation, such as buses, boats, or trains, which must be resistant to the hazard's effects to be effective. Special needs populations, such as the elderly, the sick, children, the disabled, the illiterate, and others, should be pre-identified so that specific resources may be used to locate and extract them on an individual basis (many religious, community, or charitable groups organize this function).

DISASTER ASSESSMENTS

As soon as possible after the disaster has begun, response officials must begin collecting data, which is then formulated into information to facilitate the response. Responders must be able to know at any given time or at short intervals what is happening, where it is happening, what is needed, what is

required to address those needs, and what resources are available. This data collection process, which is called disaster assessment, increases in difficulty and complexity with the size and scope of the disaster.

Disaster assessment efforts can be grouped into two general categories, defined by the type of data they seek:

1. *Situation assessment.* This assessment, also called a damage assessment, seeks to determine what has happened as a result of the hazard. Situation assessments can help determine the geographic scope of the disaster, and how it has affected people and structures. It is, in essence, a measure of the hazard's consequences. Data sought may include:
   - Area affected by the disaster (location and size—can be plotted onto a base map or described in words)
   - Number of people affected by the disaster
   - Number of injured (morbidity) and killed (mortality)
   - Types of injuries and illnesses
   - Description of the characteristics and condition of the affected
   - Description of the medical, health, nutritional, water, and sanitation situation
   - Ongoing or emerging hazards and hazard effects
   - Damage to infrastructure and critical facilities
   - Damage to residences and commercial structures
   - Damage to the agricultural and food distribution systems
   - Damage to the economic and social status of the affected area
   - Vulnerability of the affected population to ongoing disaster effects or to expected related or unrelated hazards
   - Current response effort in progress
2. *Needs assessment.* This assessment involves gathering data on the services, resources, and other assistance that will be required to address the disaster. It is used to determine what is

needed to both save and sustain lives. Disaster managers may use a range of methods to conduct this assessment, which could include:

- *Gathering of internal information.* This entails gathering and reporting all information known by staff or affiliates.
- *Visual inspection.* This involves using various methods of observation, including satellite imagery, aerial flyovers, and drive or walk-through surveying.
- *Sample surveys.* Information gathered by interviewing representative segments of the affected population, usually by one of the following four methods:
  - *Simple random sampling.* Members of the population are selected purely at random.
  - *Systematic random sampling.* Members of the affected population are sampled according to a pre-set pattern, such as every fifth house, every tenth name on a list, etc.
  - *Stratified random sampling.* The affected population is first divided into demographic groups (strata), and then members of each strata are randomly selected for sampling.
  - *Cluster sampling.* Affected people are sampled in groups or clusters, arranged geographically within the affected area, representative of the different geographic areas affected by the disaster.
- *Sentinel surveillance.* Certain disaster characteristics or "early warning signs," which tend to be indicative of larger problems, are monitored and reported when found.
- *Detailed critical sector assessments by specialist.* Experts in various sectors, such as transportation, energy, health, or water supply, make targeted surveys of the infrastructure component for which they are specially trained.
- *Ongoing interviews.* People are designated to gather information on an ongoing basis to support updating the assessments.
- *Interviewing of informants.* Members of the affected population who are identified as being able to provide useful information regarding the situation and needs are contacted on a regular basis to report any findings they may have.

Appendix 6-1, found at the end of this chapter, provides an example of a checklist used to conduct assessments (in this case, by the U.S. Agency for International Development, Office of Foreign Disaster Assistance).

Reporting must be conducted in order for anything to be gained from the disaster assessment process. Effective reporting involves analyzing all of the collected data to create a clear and concise picture of what responders are dealing with. To increase its effectiveness, standardized formats, terminology, and collection systems have emerged throughout the disaster management world that, while not uniform across all agencies, offers greater ease of use by many recipients.

The overall assessment process is methodical. Several sequential steps are required if the information collected is to be of any use to responders; neglecting such an approach can result in incorrect or inaccurate information that ultimately may hurt response efforts. The general process by which assessment and reporting are conducted entails the following:

1. *Planning.* In order to conduct assessments, a systematic approach must be taken throughout the process by which data is collected, analyzed, utilized, and reported. During planning, disaster managers will decide what information will be collected and how it will be collected, with what instruments and by what staff, under what time frame, and in how much detail, among other factors.
2. *Data collection.* Data describing the disaster at hand is gathered using the methods mentioned above. This information must be verified to be true and relevant.
3. *Data analysis.* By looking at all of the information and pulling out what is important in terms of the response, including patterns, trends,

problem areas, and critical activities, the data's usefulness emerges.

4. *Forecasting*. Using information collected over time, disaster managers must try to estimate how the disaster will progress, taking into account any response efforts that currently are underway. They must use this information to predict potential future problems so that they can take advance action to prevent such problems before they start.

5. *Reporting*. The assessment is of no value unless it is distributed to those officials whose work depends on it. Systematic reporting allows all users to receive the information in a timely manner, and ensures that everyone who needs updates receives them.

6. *Monitoring*. The emergency situation changes from minute to minute, so assessments are soon out of date. Periodic updates, scheduled at a pace that accommodates the speed of change (usually every 12 or 24 hours), increase the chances that everyone is acting on timely information.

Several different types of assessment reports, often called "situation reports," may be used to broadcast the analyzed information to users. These reports are distinguished by what they contain, when they are released, and their level of detail. The following list explains several of the most common report types:

- *Flash report*. Also called an "SOS report," this is designed for quick release. Its main purpose is to provide expanded recognition that the disaster has occurred, explain what is being done, and request assistance or report on expected assistance.
- *Initial assessment report*. This report may be the first assessment distributed or may follow the flash report, if one has been distributed. The initial assessment provides a more detailed description of the disaster's effect on the impact area and provides the condition of the affected population. Food, water, and other supply needs are

identified, as are vulnerable populations that need the most urgent care. The local government's capacity to manage the disaster is described, and information to guide external assistance is proposed. Finally, any forecasts or expected issues are listed.

- *Interim report*. This builds upon information listed in the initial assessment or previous interim reports to relay changes in the situation and its needs. Disaster assessments are iterative, and reported information needs to be updated every 12 hours, 24 hours, or longer, as is required or is feasible. Each interim report is merely a moment in time captured on paper that guides responders, not something that should be taken as flawless and complete information. Information in interim reports is not repeated unless required to illustrate changes.
- *Specialist/technical report*. This supplements the information in the initial or interim reports by providing information needed only by a particular person or small group within the greater body of responders.
- *Final report*. The final report is a summary, reporting the conclusion or response and recovery operations and describing the event, the response, and any lessons that were learned.

Reports are generally presented in a numbered, sectioned format that describes specific response tasks within separate sections. This format makes it easy for responders to find and use the information that pertains specifically to their needs, and all subsequent interim reports will display information related to those response functions in the same numbered category. Examples of the category headings used in these reports include:

Situation
    Background (a brief overview of original disaster or emergency situation, including the who, what, when, where of the event)
    Current situation (brief summary of what is in the report)
    Casualties and damages

Search and Rescue
Evacuation
Protection
Shelter
Health and Nutrition
Water and Sanitation
Communications
Transportation
Power

TREATING THE HAZARD

Each hazard has its own mechanism by which it creates negative consequences. For instance, cyclonic storms wreak havoc on the human and built environment with high winds, heavy rains, and powerful storm surges, and earthquakes do so through violent ground movements. While some hazards unleash these effects over a very short time frame, others, including many secondary hazard effects, persist much longer.

Three types of hazard effects may occur, as identified during the hazard assessment process described in Chapter 2:

1. Effects that are over before any response activities may be initiated to treat them
2. Effects that persist, but for which no response actions exist that can limit or eliminate them
3. Effects that persist that may be limited or eliminated completely through existing response actions

For the first set—which includes effects such as the ground shaking associated with earthquakes, the energy release from a strike of lightning, and the damaging force of a landslide—responders only deal with the aftermath and any secondary hazards.

For the second set of effects—which include the strong winds of a cyclonic storm or periods of extreme heat or cold—responders can only take actions that protect themselves and the public from further injury. Over time, the effects will diminish, though the emergency may continue.

The third and final group of hazard effects is those that responders are able to limit or eliminate. Using special equipment and training, responders reduce the existing hazard risk during the disaster itself by reducing the hazard's ability to exist at all. Though the range of disaster-causing hazards for which this is possible is narrow and the expense great, many developed countries (as well as many developing ones) have dedicated considerable resources to this group. Examples of response activities that may be performed to limit the ongoing effects of hazards include:

- Fire suppression
- Flood fighting
- Hazardous materials containment and decontamination
- Arrest of lava flows
- Snow and ice removal
- Epidemic public health efforts
- Law enforcement to curtail rioting or civil unrest

PROVISION OF WATER, FOOD, AND SHELTER

After disasters strike, people's homes may be destroyed or uninhabitable. Transportation routes and communication may be completely cut off, and whole regions may be completely isolated. Victims, however, must still drink, eat, and find shelter if they are to survive. As normal supply lines will likely be interrupted and victim's access to provisions limited or nonexistent, disaster management officials need to begin assisting them immediately.

Food, water, and shelter options must be located and acquired, and then somehow transported to the victims. Generally, two separate phases in the postdisaster response include this measure. The first phase is the short-term, immediate response. While systematic delivery of aid is optimal, the confusion that exists in the first hours and days of the disaster contributes to haphazard responder actions and decisions, with needs addressed as they are perceived. In the event that the disaster response moves into the second phase, the long-term provision of aid, camps of

displaced people likely will be established to increase the efficiency of aid. The establishment of camps is described later in this chapter.

Water

Though many other basic needs, such as clothing, shelter, and even food, may go unmet for one or more days at a disaster's onset, both people and animals need a constant supply of water in order to survive. Water is used for hydration (drinking), for hygiene, and for food preparation (cooking and cleanup).

During times of disaster, it is not uncommon for regular water sources to become interrupted or contaminated, thereby leaving disaster victims without usable water. Even those who have stockpiled water could be left without it if they are forced to leave their homes in a hurry. Water needs are urgent and must be addressed very early in the disaster response. Without water, people will begin to fall ill, disease will quickly spread, and unrest will grow.

Using assessments, disaster managers must first determine the water needs of the affected population. They must find out if the needs are a result of displacement, damage to infrastructure, contamination, or a range of other problems. Managers must also determine how many victims are without water and where they are located. Finally, they must create an inventory of what water sources still exist, and which of those can be used to supply either drinking water or water for other uses.

Immediate water needs can be met through a range of methods, including:

- Trucking in water in tanker trucks, ships, railcars, or other large storage devices
- Transporting bottled or bagged water
- Locating and tapping unexploited water sources within the community
- Providing access to a functioning but restricted water source within the community
- Pumping water from a nearby source into the community

FIGURE 6-3   USAID Office of Foreign Disaster Assistance water purification unit that produced 78,000 liters of water per day for families affected by the January 2001 earthquake in India. (*Source:* Michael Ernst, USAID/OFDA.)

- Providing filters or other treatments to clean contaminated water (see Figure 6-3)
- Moving the population to another location where water is available

In a disaster's immediate aftermath, managers will make every effort to provide what water they can, even though the population needs will probably outweigh what they can feasibly supply from the outset. However, as the response begins to organize and assessments provide more information, disaster managers will need to begin a more technical analysis of the population needs for long-term aid. The following factors are commonly investigated as water relief is established:

1. *Needs.* Studies have determined the average amount of water needed by the individual victim, which can be used for planning purposes in disaster response. The actual needs of each individual will be unique, and will depend upon such factors as the local climate, the availability of sanitation facilities, religious and cultural customs, and food preferences, among other issues. The U.S. Agency for International

Development (USAID) developed the following guidelines upon which water provision may be based:

- Drinking—3 to 4 liters per day
- Cooking and cleanup—2 to 3 liters per day
- Hygiene—6 to 7 liters per day
- Washing of clothes—4 to 6 liters per day
- Total water needs, per person, per day—**15 to 20 liters**

The Sphere Project determined that 7.5–15 liters per day, per person, is sufficient.

2. *Source.* The chosen source of water will play a large part in determining how much water is available, how it may be extracted, and how much treatment must be applied to the water to make it safe for drinking. Sources that require the least technology for extraction (gravity flow rather than electric pumps, for example) and require the least amount of treatment are preferred. In general, groundwater sources are the cleanest. The three main sources of water are:
   ◦ Surface water (rivers, lakes, streams, ponds)
   ◦ Groundwater (groundwater, springs, aquifers)
   ◦ Rainwater

3. *Flow.* The amount of water that flows from a source will determine how many individuals may be associated with that source. For instance, if a tap has a flow of 10 liters of water per minute, no more than 300 people (with a total need of 4500 to 6000 liters per day) should depend upon that tap. Although the tap has a daily flow of 14,400 liters, people should only be expected to go to the source during daylight hours, the time lost between individuals using the tap is significant in sum, and higher dependence on the tap may lead to surges at certain times of the day.

4. *Quality.* The water that is provided must be healthy to drink. Many sources of groundwater appear to be clean because they are free from sediment, but they may contain harmful bacteria (such as E. coli), viruses, or other pathogens that can cause diarrhea and other diseases. Regular testing must be performed to monitor any changes that may result from the heavy use of the single source. While water does not need to be 100% free from pathogens, certain pathogens must be avoided. It is believed that a large quantity of near-clean water is better than a small quantity of pure water. Water may be purified through the following means:

◦ *Storage.* Water that is left in a covered, protected container improves over time. This is because many pathogens have only a limited time before they must infect a host or die. It also allows for many of the larger, heavier, suspended pathogens and other impurities to settle out of the water, thereby making it clearer. Storage cannot completely clean water, but it can improve its quality drastically.

◦ *Sand filtration.* Sand filters are specially designed containers through which water is passed before being stored or distributed. The sand filters clean the water by physically obstructing pathogens and other impurities as they pass through. A layer of algae and other live organisms forms on the top of the sand bed, feeding on the harmful bacteria in the water as it passes through.

◦ *Coagulation and flocculation.* Through the use of certain chemicals and organic compounds, impurities in the water can be caused to coagulate (join together), making it easier for them to either precipitate or be filtered out of the water.

◦ *Chemical treatment.* Water can be disinfected with commonly available chemicals, such as chlorine or iodine. Chemical treatment requires a certain amount of expertise, as too little chemical will not treat the water, while too much could make the water undrinkable or unhealthy. Chemical treatment can help ensure that water is not recontaminated once brought home and stored by the disaster victim.

◦ *Boiling.* Boiling is highly effective at killing pathogens in water, but it is not always

possible because the materials, such as metal pots, wood for fires, or electricity, may not be available. Also, while other forms of purification take place at the source, guaranteeing that disaster victims are provided with clean water from the start, boiling depends upon adherence to the process by individuals.

5. *Wait time.* The time available to disaster victims may be constrained by many concurrent needs. The time they have available to wait in a line for water is likely limited, and therefore it is important that waiting is minimized as much as possible. Long wait times can be indicators of other problems, such as low water flow, too few water sources, and too many people using the same pump. Not addressing this issue could result in a lower amount of water used by each person, the desire to seek alternate, likely unsafe, water sources, and stress related to the reduced amount of time available to perform other needed tasks.

6. *Distance.* It is important that no victims need to travel too far to reach the water source. Many, if not all, will be without transportation and will need to carry a large volume of water by hand. Additionally, long distances directly translate to an increased burden on their limited time.

7. *Storage.* Individuals will need a way to store the water that they collect. Many people may have no possessions left or own nothing suitable for large amounts of water, and will need to be given containers to safely collect, transport, and store water. If using their own containers, these containers must be cleaned prior to use. Special needs populations, such as children, the elderly, or the disabled, should be equipped with appropriate containers for their abilities (containers with wheels, for instance). Families or households should have enough containers to transport at least as much water as the family needs (15–20 liter containers per person), and an additional storage container at the house or shelter to store unused water when they return to the water source for more.

8. *Taste (palatability).* Water must be palatable for people to be expected to drink it. Too much of a certain chemical (such as chlorine, iodine, or another chemical) or other minerals or materials, such as salt, may result in victims seeking other, less safe, though more palatable, water.

9. *Equity.* It is important that disaster managers setting up water sources for disaster victims understand the demographics of that population to ensure that all victims may use it—and that alternate options exist for those who may not. For instance, there may be situations in which men and women should not use the same pump. Other factors that could affect access include education, ethnicity, age, religion, health, physical ability, and social stratification.

People without water are likely to seek it wherever they can, even after more formal camps have been set up. In many cases, especially when flooding is present, water may be available in great quantity, but its quality is what causes the need for clean water. For this reason, it is of vital importance that any effort to provide water is conducted in concert with a public education campaign that informs victims about where to get water, the dangers of using unsafe water, and how to ensure that the water they are using is safe. They also must be told how to prevent contaminating those sources that remain available or that have been provided.

If plenty of untreated water is available but supplies of safe drinking water are not meeting current needs, then nondrinkable water may be recommended or required for anything other than cooking or drinking. Even brackish water or seawater may be used for bathing or washing dishes and clothes, for example.

As quickly as possible after the disasters, water reserves should be created in large holding tanks. These reserves help to ensure distribution in case problems arise from other, established sources. Storage tanks already containing water may be brought in, or they may be filled from sources established within the affected zone during periods when victims are not using them (such as late at night). Stored water has the

added advantage that sedimentation can precipitate out, thereby increasing the water's palatability.

Food

Like water, local stores of food will quickly be depleted in the aftermath of most large-scale disasters. Regular channels for acquiring food, whether subsistence farming, local markets, or some other means, will be severely disrupted or halted entirely. The normal means by which food is replenished from outside sources may be severely affected by the disaster, either directly (food production and distribution facilities hit) or indirectly (transportation routes blocked). Even if food is available within the affected area, many victims may not have the physical or economic means to acquire it. Thus, food provision to victims must begin very shortly after a disaster.

From the start, even before accurate assessments are performed, disaster managers must make every effort to supply food to the affected. Reaching people may be difficult, so creative methods of transport—including food drops—may be required before more dependable routes can be established. People will be desperate, and rioting or other violence is likely if food is not provided quickly.

Organized mass feeding cannot begin until accurate assessments have taken place. Those making the assessment must be aware of how many people are in need of food, how those people normally acquire their food (produce or purchase), and how those methods of acquisition have been affected. For some disasters, the shortage should only be expected in the short term (especially in wealthier nations), while for others, as is often the case with complex humanitarian emergencies, chronic food shortages will be expected to persist for weeks or even months.

Food aid must be formulated to suit the needs of the population being fed. The food must conform to local diets, preferably using local ingredients that are similar to or the same as what people would eat during nondisaster times. Many special needs populations, such as the sick, elderly, very young, and pregnant or lactating mothers, must have their nutri-

tional needs addressed. The equipment used to transport, store, cook, and eat food must also conform to the needs of each of these groups for mass feeding to be effective.

Food storage is an important issue as well. Food stocks can become damaged by the weather, pillaged by looters or desperate victims, invaded by vermin, or may spoil. Storage areas, therefore, must be clean, dry, secure, and accessible to the various forms of transport that will be used to distribute food around the affected area.

There are two ways in which food may be distributed to disaster victims in the aftermath of a hazard, "wet" and "dry" distribution. Dry distribution, also called "ration distribution" or "take-home," refers to the provision of uncooked ingredients, usually in bulk (a week's or month's worth of supplies, for example), that victims take back to their homes or shelters to cook. The advantages of dry distribution are that victims can use only as much as they need at a time that is most convenient to them. Social units, such as families, are more likely to be able to eat together, which will likely benefit mental health and increased time available to perform other tasks (because of shorter time waiting in lines). However, dry distribution depends on ensuring that victims have proper cooking and eating utensils, as well as ample supplies of safe water. It also opens up the opportunity for the abuse of supplies, which may be hoarded or sold for a profit. Additionally, local markets may suffer from decreased demand.

Wet distribution involves providing victims with prepared meals, usually two or three times per day. To perform such a task, large-capacity, centralized cooking facilities (kitchens) must be located or established and stocked with adequate serving and eating utensils and staff. Wet distribution provides greater control of food stocks and increases the chance that meals are eaten regularly. However, victims lose a certain amount of independence and may need to skip meals if they have other pressing needs during meal times.

Public education is an important part of mass feeding, as most people will not be cooking or eating according to their normal routines or with their usual

ingredients and, as result, may not be supplying themselves with the minimum basic nutritional requirements. They also are likely to be expending more energy and may be dealing with sick family members, and they may not know how to address those needs using the food they have been provided with. Finally, public health issues they do not normally confront, such as vermin, contamination, and disease, will need to be addressed to ensure that they do not harm themselves unwittingly through unsafe practices. Cooking fuel, such as wood or carbon (charcoal), may need to be provided with the food to ensure that families are able to prepare meals.

For long-term emergencies, in which food must be provided over a period of weeks or months, nutritional assessments may be necessary to ensure that widespread malnutrition within the population is not occurring. Research has found that it is suitable to perform the assessment on children between the ages of 1 to 5 years, as their condition is generally representative of the population at large. Measurements are taken either from a random representative sample of all victims or by measuring "clusters" of victims if victim distribution is not uniform (see section on "Assessments"). There are two primary methods by which malnutrition is measured for children under 5. The first method measures the victims' weight as a ratio to their height. This compares each victim (primarily children) to a normal child with the same height or length, and expresses his or her case as a percentage of normal. For instance, the average weight in kilograms of a child one meter in height is 15.6 kilograms. Therefore, a child weighing only 10.9 kilograms would have only 70% of the weight of a normal child (and would be considered severely malnourished). The second method is to measure the child's mid-upper-arm circumference (MUAC method). For normal children between the ages of 1 and 5, this measure will be almost uniform. This area of the arm loses circumference quickly when a child is malnourished, however, so it is a fast way to measure for trends among populations. A child with a MUAC of less than 12.5 cm would be considered moderately to severely malnourished.

For certain members of the population, including pregnant or lactating mothers, severely sick or malnourished people, children, and the elderly, the general rations provided may not meet needs and supplemental feeding programs may need to be established. Supplemental programs are targeted, and consist of foods with very high energy content or foods appropriate for the specific group (such as formula for babies whose mothers cannot breast-feed). For extreme cases of malnutrition in the overall population, blanket supplemental feeding programs are conducted.

Shelter

After food and water, the next vital need that responders must address is emergency shelter. Without shelter, survivors, the injured and the well alike, will soon become further victimized by the elements and by insecurity and psychological stress. For large, destructive events, like earthquakes, hurricanes, and floods, the number of people requiring shelter may be in the tens or hundreds of thousands.

Though disaster managers will eventually need to assess whether the emergency shelter needs of the population will exist for the short or long term, victims' immediate needs must be met in any way possible with what exists in the community. The best choice for immediate shelter is public or private facilities within the community (which should have been identified before the disaster occurred) that were not damaged by the hazard. Common examples include covered stadiums, schools, auditoriums, warehouses, and airport hangars. Tent villages may be set up in the short term, but doing so greatly increases the chance that the displaced will later need to be moved if their shelter needs are long term. Long-term shelter needs require a more thorough assessment, as is described in the section below on setting up camps.

Various shelter options, and the period for which they are appropriate, include:

- Hosting by family, friends, or others within the community (short term)

- Placement in suitable public or private structures, such as large halls, churches, warehouses, schools, covered sports stadiums, or theaters (short term)
- Placement in organized camps of tents or trailers, or other light housing options set up to accommodate victims' needs (short to medium term)
- Placement in sturdy but temporary newly constructed houses (medium to long term)

As early on in the response as possible, disaster managers will need to decide whether they will need to establish long-term shelter options. Displaced people may need shelter for months if their home villages or cities were completely destroyed. In refugee situations, the average amount of time spent in a camp is seven years (some Palestinian refugee camps set up over 50 years ago still exist today). The logistical requirements of these facilities, often referred to as "camps," go far beyond what is typically seen at shelters or other short-term relief efforts. Camps, which are typically seen as a last-resort option, present disaster managers with a full range of problems that must be addressed if the facilities are to be at all sustainable, manageable, and beneficial to the people they are designed to assist.

The first issue in choosing a camp is site selection. This selection is difficult, because most sites suitable for habitation have likely already been settled. Large, open spaces suitable for a dense population are rare, and any that are discovered need to be investigated as to why settlement has not yet occurred there. Because it is very difficult to change or move a site once the affected population has settled into it, it is important that a full assessment be made to ensure the site is appropriate. The following are the main considerations managers must address in choosing a site:

- *The social needs of the affected population*. Disaster managers may not immediately know victims' cultural, religious, and social attachments to the land. Victims may feel uncomfortable living on certain land. They may not want to venture too far away from the devastated area if they have strong cultural or social ties to it. In areas of political conflict or war, the site should be sufficiently far away to ensure the security of those who will be living in the camp.
- *Access to water*. The displaced population will need to use significant amounts of water, so the site chosen should accommodate this need. The water supply should be available year round, and not depend upon weather or climactic patterns. In addition, there should be no threat of too much water at certain times of the year, which would result in flooding of the camp. Drainage, which is associated with the use of water resources by the displaced population, must be sufficient to ensure that wastewater can easily be transported away from the camp using natural or mechanical processes.
- *Space per person*. The selected site must be able to accommodate the number of displaced people that are slated to be located there. The World Health Organization established 30 square meters as the minimum amount of space that any person be allocated for long-term shelter. If the camp is to exist for longer than a year, it should be expected that the population would grow at a rate of at least 4% each year.
- *Accessibility of the camp*. The logistics of the camp will depend on a significant amount of transportation. The site should be in a place that can be reached by buses, trucks, and helicopters.
- *Environmental considerations*. The site should allow for safe, healthy operation. Sites that are subject to frequent natural or technological disasters are likely to create a second disaster for the displaced population. The environment should be resistant to the drivers of public health problems, such as mosquitoes, rodents, and flies. Sloping terrain is preferable because it allows for natural drainage. If at all possible, the site's climate should closely match what is considered normal by the population that will be living there, so that the conditions do not cause undue stress.
- *Soil and ground cover*. Certain soil conditions are unsuitable for human habitation, which may be why the site was available in the first place.

The safety and success of latrines, for instance, depend upon the ability of the soil to contain human waste. Sandy or rocky soils will make subsistence gardening or farming impossible. Excessively dusty soils will cause health and other problems. Impermeable soils will result in flash flooding if heavy rains occur. Soil and environmental experts may need to be consulted about this factor before choosing a site.

- *Land rights.* Several problems can result if the land that is chosen is under private ownership or has been allocated by the government for grazing, mining, or other usage rights. The local population may resent the displaced people and may lash out or try to pressure them to leave. Cooperation with the surrounding, unaffected populations is vital to the success of the camp, so this factor must be investigated fully.

Once a site has been selected, the camp must be pre-planned to ensure that the population can function effectively after settlement. Like a small city, the camp will have infrastructure needs, which include:

- *The physical layout.* The physical layout of the camp, as with a normal city, will play an important role in the camp's success.

   A nondescript grid pattern is often used, because it is easy to design (and map), easy to set up, and is the most efficient pattern for using every available space within the camp (see Figure 6-4). However, much practical experience has shown that the grid system is not ideal. It causes several problems for the population, including the loss of community identity, a higher incidence of communicable disease (due to very high population densities), inconsistencies in services and security (especially for those on the outer perimeter), and stress of the population, who are likely to find themselves lost and uncomfortable in the rectangular repeating pattern.

   A more appropriate layout is based upon decentralized "neighborhoods" that are distributed around more centralized facilities. Services
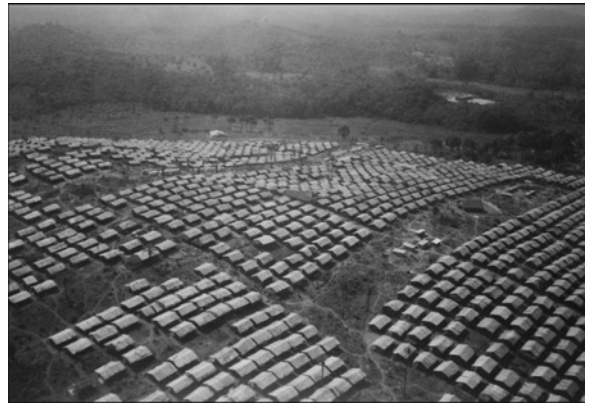
FIGURE 6-4   Grid pattern used in camp for internally displaced persons in Sierra Leone. (*Source:* Sureka Khandagle, USAID/OFDA.)

are divided among those that can be decentralized to the neighborhoods (such as washing, bathing, education, health centers, or supplementary feeding stations) and those that are common to the camp as a whole (such as registration areas, administrative centers, and warehouses).

- *Shelter options.* Shelter is the primary reason that the displaced people are in the camp. When deciding on shelter options, camp planners must consider many factors including the type of material used, the structure style, who constructs the shelters, and the expected length of time the structure will need to last. These shelters are where the displaced are likely to spend the most time, and therefore should be the most appropriate for the specific population being addressed. For that reason, housing that is most similar to how people live under normal conditions will be most widely accepted.

   More than anything, shelters must be able to protect the inhabitants. Though the roof is the most important consideration, the shelter must also be appropriate for the climate. For instance, it should allow for a fire or other heat source if cold is expected for any part of the year, it should be able to resist the weight of snow on the roof if

FIGURE 6-5 Shelters being constructed by displaced persons in a camp in Liberia, 2001. (*Source:* Fiona Shanks, USAID/OFDA.)

heavy snow is probable, and it should resist wind pressure if the selected site is subject to heavy winds.

Many of the most successful sheltering projects were conducted by the displaced people themselves. When involved from the planning process, displaced people can communicate to planners the correct materials that should be acquired, can help to appropriately site the structures and divide the population into appropriate social groups, can build the structures to their liking, and will have more "ownership" of the project when it is finished (which, in turn, increases acceptance and satisfaction) (see Figure 6-5).

- *Latrines*. Proper planning is necessary to ensure that people find latrines convenient and use them. Recommendations for the distance from any person to a latrine have been established as a minimum of 6 meters and a maximum of 50 meters. Improper placement will cause problems with use, and the latrines may be inaccessible by maintenance crews and may contaminate water sources. More information on latrines is found in the section on "Sanitation" below.
- *Water distribution*. The access points for water, as described above, are a vital component in any response and relief operation. Important factors in the choice of water distribution include the number of people using any single access point and the amount of water provided.
- *Internal and external access routes*. Access to the camp and intracamp travel must be effective. It is important that roads and access ways are accessible year round, despite seasonal variations that may cause flooding or snow cover. To prevent accidents within the camp, separate roads for foot traffic and automobile traffic may be necessary along the most heavily traveled routes.
- *Firebreaks*. Because of the population's high density and their dependence upon fires for cooking and heat, fire can be a major problem in camps. A fire in one shelter can quickly spread to nearby shelters. To limit the chance that an out-of-control fire will affect a large portion of the camp, planners can design firebreaks, large designated spaces between communities where no structures may be built, which will prevent rapid spreading. This space can be used for alternate activities, such as recreation or farming. Firebreaks are normally at least 50 meters wide.
- *Administration and community services*. Camps, like regular communities, have many administrative and social requirements that must be addressed. Failure to plan these services and facilities into the layout of the camp from the outset could result in inefficient provision of services. Adequate space must be set aside for facilities housing various offices, meeting spaces, activity spaces, and other administrative functions. If there is any chance that the camp will expand, the central administrative facilities must have the ability to expand as well.

Administrative and community services to consider include:
  ◦ Check-in and administration buildings
  ◦ Bathing and washing areas
  ◦ Schools and training centers
  ◦ Clinics, healthcare offices, and pharmacies
  ◦ Food storage and distribution
  ◦ Kitchens and feeding centers
  ◦ Supplies storage (wood, blankets, clothes)

- ○ Vehicle and equipment storage (warehousing)
- ○ Tracing services
- ○ Daycare services
- ○ Religious centers
- ○ Waste storage or disposal
- ○ Markets
- ○ Cemeteries

The website www.refugeecamp.org provides information and photographs describing the construction of and life in the camps.

HEALTH

Even in normal times, a population will need health facilities to manage illnesses and injuries. In times of disaster, those same injuries and illnesses exist and will likely increase. However, many of the facilities that normally manage health issues may be full, overtaxed, damaged, or nonexistent. Disaster managers thus must establish emergency healthcare operations to accommodate the health needs of the affected population.

As described above, the immediate health needs are likely to be emergency first aid. The population's injuries will be serious, possibly life threatening, and they will need stabilization and immediate medical treatment that may not be available locally because of a complete lack of services. However, as the disaster progresses and the emergencies are managed, other healthcare issues will need to be addressed, with disease being the primary concern.

The level of healthcare that is established in the affected area will depend upon the condition of the affected population. This health assessment data is gathered as part of the overall disaster assessment process. Most countries and agencies use morbidity rates and the Crude Mortality Rate (CMR) as an indicator of the general health of the affected population.

The CMR is a measure of the number of people who die each day per 10,000 people. Though this figure does not tell responders what may be causing problems, it provides them with greater awareness that one or more problems exist. What is important to disaster managers is how much greater than normal the CMR within the affected area has become. In most poor countries, the CMR of the total population is around 5 deaths per 10,000 people per day. For young children, the normal rate may be as high as 2 per 10,000.

The morbidity rate is somewhat harder to measure because, unlike deaths, detecting if a person is injured or sick may not be possible. Morbidity rates measure the frequency of various illnesses or injuries, often within specific demographic groups, and include measures of prevalence, incidence, and attack rates. Prevalence is a measure of the number of people who have a given condition at a given time, usually reported as a number per 1000 victims. Incidence is a measure of the probability that people without the condition will develop it during a specified period of time. Finally, the attack rate is an incidence rate given as a percentage.

Communicable diseases are commonly the most dangerous postdisaster threat. Exacerbated by the close quarters of victims, the lack of hygiene, poor water and food quality, deteriorating environmental conditions, and inadequate health care, communicable diseases can spread at rates many times higher than normal and greatly increase both mortality and morbidity. Diseases spread because of specific interactions between hosts (the victims), agents (the diseases), and the environment (the conditions that affect the potency of the disease, the ability to fight it, and the routes by which diseases are maintained and passed among victims). The greatest disease risks in the response and recovery phase of disasters are diarrheal diseases, acute respiratory infections, measles, and malaria.

The fundamental tasks necessary to prevent outbreaks from disease include:

- *Rapid assessment*. This involves identifying the communicable disease threats faced by the affected population, including those with epidemic potential, and defining the population's health status.

- *Prevention*. Communicable diseases may be prevented by maintaining healthy physical, environmental, and general living conditions.
- *Surveillance*. Rapid response to disease outbreaks is only possible if a strong disease surveillance system is set up and is designed with an early warning mechanism to ensure the early reporting of cases and the monitoring of disease trends.
- *Outbreak control*. Ensuring that outbreaks are rapidly detected and controlled through adequate preparedness (i.e., stockpiles, standard treatment protocols, and staff training) and rapid response (i.e., confirmation, investigation, and implementation of control measures) can help to ensure that outbreaks are contained and brought under control.
- *Disease management*. Prompt diagnosis and treatment, with the help of trained staff using effective treatment and standard protocols at all health facilities, will ensure that the ill are given the best chances for survival, thereby limiting the risk of further transmission (WHO, 2005a).

Surveillance programs are established to detect signs that an outbreak of a disease is beginning or already exists among the population at large. Once victims are found infected with a particular disease, monitoring programs are established to watch those individuals and quickly detect spreading that originates from them. Eradication programs are set up after an outbreak is detected to control the outbreak and remove the agent from the population if possible. Immunization programs, which can be launched before or during an outbreak, help to increase the victims' resilience to specific forms of disease. Finally, behavior modification programs teach people how to avoid behaviors or actions that increase their risk of becoming sick. Disease prevention can only be effective if performed in concert with a sanitation program, described below.

Common diseases among disaster victims include:

- Respiratory infections
- Cholera
- Conjunctivitis
- Dengue fever
- Diarrheal diseases
- Diphtheria
- Tetanus
- Pertussis
- Intestinal parasites
- Lassa fever
- Leprosy
- Malaria
- Measles
- Meningitis
- Malnutrition (marasmus, kwashiorkor, scurvy, pellagra, anemia, beriberi)
- Polio
- Shigellosis
- Skin infections (scabies, impetigo)
- Tuberculosis
- Typhoid fever
- Typhus fever
- Yellow fever

Effective healthcare among disaster victims will include treatment and preventive care to stop outbreaks or other health problems before they become unmanageable. Public education is a major part of this effort, as the population is most effective at limiting disease when they do it themselves. Clinics should be established, with recommended coverage rates averaging around one per 5000 victims to ensure adequate care. Medical staff drawn from local resources and the various responders will be needed at rates of approximately 2 doctors and 10 nurses per 20,000 sick (USAID, n.d.). Medical supplies will also be needed, including surgical and treatment tools and supplies, sterilization supplies and equipment, vaccines, and drugs.

SANITATION

The affected population's safety is dependent upon the ability of disaster managers to keep their living conditions relatively clean. From the emergency's

onset, a considerable challenge will be achieving proper sanitation. There may be human and animal remains, hazardous materials pollution in the air, water, and on the ground, and debris may be significant and widely dispersed. If flooding exists, standing water will become a toxic soup of all of these materials in a very short time.

Humans also create waste through natural and social processes. Byproducts of food preparation, packaging, and human wastes (urine and feces) present a major health hazard if not removed properly. Not only are these removal systems often disrupted in a disaster's aftermath, but they may even reverse their course, spewing large amounts of waste back into the human environment. Victims, who may be crowded together in camps or in shelters, produce the same human waste, but in more concentrated quantities.

The following are the primary sanitation issues that must be addressed by disaster managers in the aftermath of a disaster:

- *Collection and disposal of human waste*. Many diseases that are most infectious among disaster victims, including those caused by bacteria, viruses, protozoa, and worms, are passed from the body in feces and urine. People cannot hold off from expelling feces and urine; unless they are provided with adequate sanitary facilities, excreta will soon become a public health hazard. Without sanitary facilities, victims will contaminate their water and shelter.

  Latrines are the most common solution to excreta disposal. Because of time constraints, two different types of systems normally are used. As soon as the emergency begins, viable short-term solutions must be sought. If public bathrooms are working, they must be identified, and an orderly system by which people may use them must be established. These facilities will also need to be cleaned regularly and stocked with any required materials (water, sanitary paper, etc.). Shallow trench latrines or pit latrines, which are quickly dug into the ground, are a second option, though they can only be used for a short time before they are exhausted.

  If the population will be sheltered for a considerable amount of time, more permanent disposal systems will need to be built, such as deep trench latrines. Public education to instruct people how to use and clean the latrines will be necessary. Any system must take into account the social customs of the population, including the toilet type (sitting or squatting), cleaning methods (paper or water), privacy, and segregation of sexes, among other issues.

- *Wastewater*. Significant amounts of wastewater are generated during cooking, washing, and bathing. In the absence of functioning infrastructure to manage this wastewater, disaster managers must devise a system that safely removes from where victims reside. Failure to do so will result in stagnant, unsanitary pools that become breeding grounds for mosquitoes.

  Generally, wastewater problems are managed by establishing special areas based on the land's topography and hydrology, selected both for their ability to ensure that wastewater is drained from the inhabited land and because the risk of contaminating drinking water sources is negligible.

- *Garbage*. Like wastewater, garbage generated by victims must be collected, stored, and disposed of on a regular basis to avoid negative public health consequences. In the absence of such systems, garbage quickly accumulates into a malodorous, unsightly habitat in which rodents and insects will thrive. Victims will often attempt to burn the garbage piles, thereby creating more contamination, as well as secondary fire hazards.

  To manage garbage, families are often provided with collection points, such as barrels or half barrels, at a distance close enough to their shelter that use is convenient. Garbage collection from these established storage points must occur regularly, daily if possible, or people may cease to use them. Garbage disposal must be planned so it does not interfere with the victims' lives. It should be buried or burned far from any shelters,

with special treatment given to any medical waste collected.

- *Dust*. Sites that shelter many victims can quickly become engulfed in dust. People congregating in a confined area quickly results in damage to dust-controlling ground vegetation, as does the construction associated with altering the landscape to accommodate people (building houses and roads). If left unmanaged, airborne dust can cause significant health problems among victims, contaminate food and water supplies, and damage electrical and mechanical equipment.

  By managing actions that result in destruction of ground vegetation, dust can be controlled. In areas where damage has already occurred, such as temporary roads that have been cut, spraying water or oil is effective at preventing dust from becoming airborne.

- *Vector control*. Insects and animals will thrive in postdisaster conditions if left unmanaged. The presence of garbage, wastewater, solid waste, corpses, and spoiled food all facilitate the breeding cycle of these diseases-spreading creatures. Victims' close living quarters only exacerbates the problem.

  Failing to eliminate or control vectors may have catastrophic consequences. Mosquito-, louse-, and rodent-borne diseases will spiral out of control. Food and water stocks will quickly become contaminated and lost. The overall conditions within the shelter or camps will rapidly deteriorate until the problem is brought under control.

  The options available to disaster managers are diverse, but must be practiced in a manner that is appropriate for the existing conditions. Chemicals, for instance, while highly effective in killing vectors, can harm humans, contaminate food and water, and cause environmental harm if not used correctly. Additionally, resistance to chemicals and other treatments can arise, requiring a range of approaches. Soap and other implements of personal hygiene can be effective at controlling some vectors, but only if proper education is provided in concert. Proper sanitation measures (garbage removal, wastewater removal, and solid waste management) are highly effective. Repellents and mosquito nets are a good option if people can be convinced to use them and trained in their proper use.

The most common vectors found in postdisaster conditions and the diseases they commonly transmit include (USAID, n.d.):

- Flies (eye infections, diarrhea)
- Mosquitoes (malaria, filariasis, dengue fever, yellow fever, encephalitis)
- Mites (scabies, scrub typhus)
- Lice (epidemic typhus, relapsing fever)
- Fleas (plague, endemic typhus)
- Ticks (relapsing fever, spotted fever)
- Rats (rat bite fever, leptosirosis, salmonellosis)

- *Fatality management*. Disasters result in a great many deaths worldwide each year. During the 1990s, the annual number averaged close to 62,000. In the 1970s, this number was more like 200,000. Unlike forms of death that are uniformly spread across time and place, such as chronic disease and automobile accidents, disaster deaths occur in clusters. An earthquake may kill 20,000 in seconds. A flood may drown thousands in just days. The 2004 tsunami is but one example of a single event that resulted in hundreds of thousands of deaths in mere hours.

  Because people die every day, communities have established methods by which the dead are collected, identified if need be, honored, and buried or cremated. Other than register the death, the government normally plays a very minor role in this process. During times of disaster, however, the number of dead may surge, and established systems of fatality management can be quickly overwhelmed, requiring outside assistance. In these times, it becomes the government's responsibility to manage fatalities (see Figure 6-6).

  Three factors contribute to human fatality during the emergency period of a disaster. First, direct injuries from the hazard's consequences result in both immediate death of some victims

Search and Recovery	Identification	Final Arrangements	Assistance for Family Members
- Civil defense agency - Fire department - Red Cross - Public prosecutor's office	- Interior ministry - Health ministry - Public ministry - Legal medicine institute - Attorney general's office	- Municipality - Cemetery - Mortuary - Church - Central government	- Health ministry - Legal medicine institute

FIGURE 6-6   Fatality management tasks, and examples of agencies typically responsible for each. (*Source:* PAHO, 2004.)

and subsequent death of other victims whose lives could not be saved. Second, the extraordinary conditions that arise as a direct result of the disaster, including a sudden lack of shelter, poor hygiene, deprivation of food and water, violence, and accidents, causes abnormally high mortality rates. And finally, those natural causes of death, such as chronic disease and old age, which would have occurred regardless of the disaster, continue.

Although it is not an immediate priority like search and rescue, a system to manage the collection, storage, and burial of the dead must be established as soon as possible after the disaster begins. Bodies left untreated can lead to disease, distress among survivors, and become a breeding ground for vectors. Management of the dead, however, is a sensitive issue that must be approached with care. It is also an area in which incorrect assumptions and myths, such as the actual danger corpses pose, can hamper responder efforts.

The primary duties related to fatality management (see Exhibit 6-1) include:

○ *Search and recovery of corpses*. Corpses may be buried under rubble, soil, sediment, snow, water, or other debris. Retrieving them may take days, weeks, or even months. The search area may range from a single building to whole cities to hundreds of square miles of land. Special teams with imaging equipment and ani-

> **EXHIBIT 6-1   The Objectives of Medicolegal Work**
>
> - Legally determine or pronounce death
> - Recover the remains of the dead
> - Establish identity of the dead
> - Estimate the time of death
> - Determine the cause of death
> - Explain the possible circumstances of death
> - Prepare the remains for final disposal
> - Study the event to assist in prevention in the future
>
> *Source:* Pan American Health Organization, 2004.

mals trained in cadaver location may be used to locate the more difficult cases, but a majority of the bodies will be found as rescuers and responders canvass the disaster zone.

○ *Transportation of the bodies to a centralized facility*. As bodies are recovered, their characteristics, location, and condition must be recorded to assist later identification. In cases where a criminal investigation is likely, such as with terrorist attacks, this information will be crucial to investigators. A means by which the body can be associated with the written data, such as a hospital bracelet, is often used. The

body must then be removed from the disaster site to an established area where the subsequent steps may take place unhindered. If possible, the bodies are wrapped in sealed bags and transported in refrigeration.

○ *Examination and identification of the body*. A central fatality holding facility, or several regional holding facilities, is normally established. Here, medical experts can begin the process of photographing, describing, identifying, and preserving the victims. Identification almost always requires the help of family members, and a viewing area is usually established to facilitate this process.

○ *Final disposal of the body*. After the victim has been positively identified, the body may be disposed of by the family or by the government. This may include burial or cremation. Myths that corpses lead to widespread disease among the living have resulted in the use of mass graves, sometimes even before definitive identification. However, unless the victim dies from a disease, a cadaver is unlikely to pose a major public health risk. For victims' psychological well-being, disaster managers should take every effort to ensure that proper body disposal, according to the religious and cultural beliefs of the region, are respected.

Many individuals and groups are involved in the process of fatality management. For instance, religious institutions and other community interest groups are often very helpful in working with families to identify bodies and facilitate the final disposal process. Health personnel can perform autopsies and body preservation and preparation actions. First responders recover many of the bodies and transport them to the holding facility. Criminologists may be needed in terrorist or crime-based disasters. Morticians and gravediggers will surely be tapped to lend their specialties. Diplomats are required if a victim was from another country. And of course, a full support staff to supplement these efforts is needed as well.

SAFETY AND SECURITY

In the response period of a disaster, the entire social order of the affected area is disrupted. Police and fire officials who are not disaster victims are taxed to their organizational limits, focusing most or all of their time and resources on managing the hazard's consequences. However, many of the same security needs of the population remain during this period, and in many cases, they even increase. Emergency managers must be able to quickly ensure the safety and security of victims, people unaffected by the disaster but within the jurisdiction, and outside responders.

Looting is one of the most common security problems that follow major, disruptive disasters. Criminals become empowered by the lack of police presence, and take advantage of the confusion to steal from businesses and homes. The threat of looting has been found to be a major factor contributing to the failure of some evacuation attempts.

Assaults on victims or on response and recovery officials may occur, at times to such a severe degree that response activities must be called off until security is resumed. In New Orleans, response officials had to suspend all search and rescue efforts for Hurricane Katrina after snipers fired upon rescuers in the air and on the ground (CNN, 2005). Like looting, postdisaster assaults are generally committed by opportunistic criminals, not the population at large.

Security is also an issue within shelters and resettlement camps. Victims' vulnerability is especially increased when they are removed or forced out of the protective environment of their home and are living in the high-density, close-quarters environment of the camps. Rapes, robberies, and assaults are common when proper preventative measures are not taken. Displaced persons can become victims not only of other displaced persons but also of people from outside the camp.

Domestic violence increases after disasters. Disaster victims face a complete loss of control over their personal lives and are exposed to extreme stress. Posttraumatic stress disorder occurs for many victims. Some will abuse their spouse, parent, or child. The

World Health Organization found that child abuse after Hurricane Floyd increased fivefold in the affected areas.

To ensure security, outside law enforcement resources often must be brought in to supplement what exists locally. Military police or other regional and national police resources usually have the training and expertise to limit looting and violence. Social and medical services will be needed to treat and counsel victims of assault, rape, and other violence.

The function of security also includes limiting access to areas where responders are working. Unsolicited volunteers, criminals, and others, who only hamper response efforts, must be kept out of the way of response operations. Perimeter control is performed by law enforcement officials as part of overall security operations. Many different systems have been developed to establish and maintain onsite credentialing of the hundreds, at times thousands, of response officials that may need to pass through the established security perimeters.

CRITICAL INFRASTRUCTURE RESUMPTION

Infrastructure includes the basic facilities, services, and installations required for the functioning of a community or a society (American Heritage Dictionary, 2000). Since these facilities, services, and installations are spread throughout the community and country, they are normally impacted to some degree when disasters strike. Of the many components of a country's infrastructure, a select few are vital to both disaster response and to the overall safety and security of the affected population. These components are referred to as "critical infrastructure."

While all infrastructure damaged or destroyed in the disaster will eventually require rebuilding or repair, critical infrastructure problems must be addressed in the short term, while the disaster response operation is ongoing (see Figure 6-7). The repair and reconstruction of critical infrastructure requires not only specialized expertise but also equipment and parts that may not be easily obtained during

FIGURE 6-7   Crews of specialists repair electrical transmission lines damaged during a tornado in 2004. (*Source:* David Lawrence, Cindy Fay, and Rick Ewald, NOAA, 2004.)

the emergency period. However, without the benefit of certain infrastructure components, performing other response functions may be impossible. Examples of critical infrastructure components include:

- Transportation systems (land, sea, and air)
- Communications
- Electricity
- Gas and oil storage and transportation
- Water supply systems
- Emergency services
- Public health
- Continuity of government

Other forms of infrastructure, often not considered critical, are provided for comparison. Keep in mind that, for various reasons, a jurisdiction may consider any of the following to be critical and determine any of the above to be noncritical.

- Education
- Prisons
- Industrial capacity
- Information systems
- Mail system
- Public transportation
- Banking and finance

EMERGENCY SOCIAL SERVICES

The psychological stresses that disaster victims face are extreme (see Exhibit 6-2). In an instant, often with little or no warning, people's entire lives are uprooted. They may have lost spouses, children, parents, or other family members or friends. They may have just found themselves homeless and jobless, with no apparent means to support their families. Without proper psychological care, victims may slip into depression.

If severe, depression can have extreme consequences for disaster victims. Rates of suicide and violence tend to rise many times over what is normal for the affected population. Depressed victims may begin to neglect the tasks they depend on to survive, such as cooking, acquiring food and water, bathing, and maintaining adequate healthcare. Proper counseling services can limit these effects.

Disaster responders also need counseling services. They are exposed to the emotional pain and suffering

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EXHIBIT 6-2   Possible Reactions to the Trauma of a Disaster Situation, Considered Normal

Emotional Effects

- shock
- terror
- irritability
- blame
- anger
- guilt
- grief or sadness
- emotional numbing
- helplessness
- loss of pleasure derived from familiar activities
- difficulty feeling happy
- difficulty experiencing loving feelings

Cognitive Effects

- impaired concentration
- impaired decision-making ability
- memory impairment
- disbelief
- confusion
- nightmares
- decreased self-esteem
- decreased self-efficacy
- self-blame
- intrusive thoughts/memories
- worry
- dissociation (e.g., tunnel vision, dreamlike or "spacey" feeling)

Physical Effects

- fatigue, exhaustion
- insomnia
- cardiovascular strain
- startle response
- hyperarousal
- increased physical pain
- reduced immune response
- headaches
- gastrointestinal upset
- decreased appetite
- decreased libido
- vulnerability to illness

Interpersonal Effects

- increased relational conflict
- social withdrawal
- reduced relational intimacy
- alienation
- impaired work performance
- impaired school performance
- decreased satisfaction
- distrust
- externalization of blame
- externalization of vulnerability
- feeling abandoned/rejected
- over-protectiveness

Source: U.S. Department of Veterans' Affairs, n.d.

associated with death, injury, and destruction as regular victims, and may even be victims themselves if they are from the affected area. Responders often have the added psychological pressure of feeling responsible for saving lives and protecting the community at a time when both tasks are extremely challenging.

DONATIONS MANAGEMENT

Donations of all kinds are provided in the aftermath of large disasters. Individuals, governments, private and religious groups, and businesses all tend to give generously to disaster victims, who may have lost everything they own. Without an effective mechanism to accept, catalogue, inventory, store, and distribute those donations, however, their presence can actually create what is commonly called "the second disaster."

Cash donations tend to be the most appropriate, for a range of reasons. First, they allow disaster managers and relief coordinators to purchase from the depressed local economy the food, clothing, and building materials most appropriate for the disaster victims. Second, cash is available immediately, avoiding the delay related to shipping and sorting donated goods. Third, cash incurs no additional costs or logistical issues related to shipping and customs. Fourth, no storage space or other logistical needs arise, as occurs when goods are donated. Before cash can be accepted, systems must be in place to receive it, account for it, and distribute it in a transparent manner.

Donations of goods can be beneficial if the proper systems have been established to ensure that the goods are donated in an appropriate, systematic way. Goods must:

- *Address the actual needs of the affected population*. For instance, winter coats do very little for disaster victims in the tropics. Disaster managers must be able to quickly assess needs and communicate those needs to the world community or to the community of response agencies that collects such donations (such as the International

Red Cross and the Salvation Army, for instance). Managers must be aware that a single request can result in a deluge of donations. In the aftermath of the 2001 terrorist attacks in New York City, a donations manager mentioned on a radio station that search-and-rescue dogs needed protective booties. The operation was soon inundated with over 30,000 pairs of booties, donated from around the world (Kim, 2004).

- *Be appropriate for the cultural setting into which they are donated*. When people have been victimized by a disaster, asking them to change their cultural clothing or food preferences to accommodate what has been donated only adds insult to injury. Victims need the comfort of what is normal to them, and food and clothing are one of the easiest ways to fulfill this need.

- *Be in good condition*. Some commonly donated goods in past disasters have included expired medications, spoiled food, and broken household goods. These items cause increased logistical problems for disaster managers, who have wasted their valuable time inspecting the goods and must figure out how to safely dispose of them.

- *Be able to clear customs*. It may seem logical that governments would allow donated items to pass through their borders in times of disaster, but the opposite is very often the case. Without previously established agreements, holdups of disaster goods, including the equipment of search-and-rescue and other teams, may be held up so long that it is no longer needed by the time it is released. Perfectly good food has often spoiled while awaiting clearance. Even much-needed donated blood has expired while held up for clearance (Kim, 1999). Emergency and donations managers must set up agreements with host governments to manage such materials before the disaster occurs in order to prevent such situations from occurring.

Donations management capabilities must be established early in the response process to ensure that

appropriate, needed donations are collected and inappropriate donations are avoided. The official, agency, or team in charge of donations management must work closely with the media and with the various response and relief organizations to ensure that they all are operating under the same assumptions and in concert with each other. Coordination can avoid situations in which too much of one item is provided while another need goes unfulfilled. In appropriate situations, the UN can perform the Consolidated Appeals Process (CAP), under which all involved response agencies together form a single list of needed items and resources that is provided to the international community to ensure targeted, managed donations. This process is described in Chapter 10. Exhibit 6-3 details items requested by FEMA from the

world community through the U.S. Department of State in the aftermath of Hurricane Katrina. Items not found on this list were considered on a case-by-case basis.

COORDINATION

Coordination is a vital and immediate component of international disaster response because of the sheer numbers of agencies that quickly descend upon the impacted areas. It is not uncommon in larger disasters to see, in addition to the local, regional, and national government response agencies, several hundred local and international NGOs, each offering a particular skill or service. This massive conglomeration of resources presents a challenge for disaster management that has been compared to herding cats. While successful coordination and cooperation can and often does lead to many lives saved, much suffering alleviated, and the safe and efficient use of response resources, the common emergence of infighting, turf battles, and nonparticipation can lead to confusion, inefficient use or duplication of resources, and even greater disaster consequences.

Coordination has been found to be most effective when local government administrators, emergency managers, or chief executives of either the fire or police department maintain leadership at the most local level. These local response officials have the distinct advantage of being the most familiar with the affected area, including its people, geography, infrastructure, and important issues. However, unless they have had previous experience or training in large-scale disaster response, they will probably lack the ability to carry out the exceptionally challenging role of coordinator.

In those situations in which local coordination is impossible or is not authorized by statutory authority, it is preferable that the national government of the affected nation (or nations) assumes this role. National emergency management agencies are typically set up in this fashion in centralized government structures. In poor countries, however, especially those in which

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EXHIBIT 6-3   Items Requested by the U.S. Government in the Aftermath of Hurricane Katrina

- Cash
- Meals Ready to Eat (MREs)
- Water and ice
- Generators (large and small; 110 and 220 acceptable; 60 hertz required)
- Tarps and plastic sheeting
- Bedding (sheets and pillows)
- Medical supplies (first aid kits, bandages, crutches, wheelchairs, not pharmaceuticals)
- Comfort kits
- Baby formula and diapers
- Coolers
- Large tents
- Logistics crews
- Forklifts, pallets, and other shipping/logistical supplies
- Veterinarian supplies
- Cleaning supplies

Source: United States Department of State, 2005.

government authorities or abilities are weak or absolute changes in government personnel regularly occur, officials in charge may not be capable of performing this extreme leadership task.

The sad reality is that most of the world's poor countries will not be able to coordinate well during large-scale disasters, and most organizations and agencies that descend upon the disaster scene will not proactively coordinate with each other. If this is the case, coordination is left to the international community, and that role is normally (and most appropriately) assumed by the United Nations through the United Nations Office for the Coordination of Humanitarian Affairs (UNOCHA), United Nations Disaster Assessment and Coordination (UNDAC) team (as described in Chapter 10). It is important to note that any official coordination mechanism other than the host country government must be requested by that host government to have any legal authority to lead.

Coordination is most effective if it is built around an organized, established structure. Many agencies and governments have begun to design coordination structures as part of their emergency and disaster planning operations. Though different terminology is used for various aspects of the system, the fundamental building blocks of an effective coordination system are fairly similar among most existing systems. The U.S.-based Incident Command System will be presented to describe these structures of coordination.

The Incident Command System

The Incident Command System (ICS) was first developed over 30 years ago in California to address the growing problem with fighting wildfires. These large-scale events often involved resources from the local, state, and federal levels, and the challenge of coordination was seen as an ongoing problem. Issues that exist in multi-organizational disaster responses were recognized as being the root of these coordination problems, which are universal to disaster responses anywhere in the world. The issues include:

- The use of nonstandard terminology among a diverse range of responding agencies
- A lack of capability to expand and contract the disaster response as required by the situation
- The existence of nonstandard and nonintegrated communications
- A lack of consolidated action (emergency operations) plans
- A lack of designated facilities
- Competing organizational structures
- Inconsistent or nonexistent information about the disaster
- Unclear designations of authority
- Competing objectives

The Incident Command System was designed to be a model tool for the "command, control, and coordination" of a response, and to provide a means to coordinate the efforts of individual agencies as they work toward the common goal of stabilizing the incident and protecting life, property, and the environment. The system was so effective in coordinating wildfire response that it was soon applied to other incidents, such as hazardous materials accidents, large structure fires, and even major disasters. Over time, the system was adopted by other states and then by other countries. Today, the Incident Command System is the most widely used system of disaster event coordination in the world (International Forest Fire News, 2003).

The Incident Command System is based upon a five-component model that includes (see Figure 6-8):

1. Command
2. Planning
3. Operations
4. Logistics
5. Finance and Administration
   - *Command.* The command function establishes the framework within which a single leader or committee can manage the overarching disaster response effort. The "Incident Commander" is responsible for directing the response activities that take place throughout the entire emergency incident. There is only
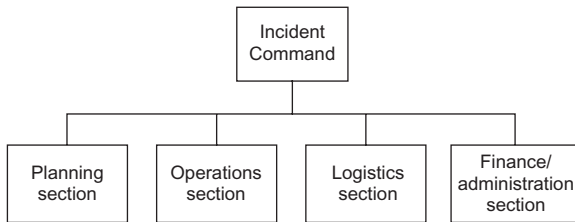
FIGURE 6-8   Incident Command System Organizational Chart. (*Source:* FEMA, 1998.)

one Incident Commander. However, as incidents grow in size and extend throughout many jurisdictions, the leadership authority of the single Incident Commander becomes insufficient, and expanding the command function becomes necessary. A Unified Command is then established, which allows for several Incident Commanders to operate together within a common command structure. Of this group, a single Incident Commander is normally singled out to lead the group as a "first among equals."

The Unified Command allows for the establishment of a common set of incident objectives and strategies, without requiring local emergency response officials to give up authority, responsibility, or accountability within their individual jurisdictions. Within the command structure, representatives from all of the major agencies and organizations should be present, including the private and nonprofit agencies such as the Red Cross and local hospitals, so these organizations do not operate alongside but outside of the centralized command structure.

- *Planning*. The planning section of the Incident Command System supports the disaster management effort by collecting, evaluating, disseminating, and using information about the development of the emergency and the status of all available agencies and resources. This section creates the action plan, often called the "Incident Action Plan" (IAP), by which the overall disaster

response is managed. There are six primary activities performed by the planning section, including:
  - Collecting, evaluating, and displaying incident intelligence and information
  - Preparing and documenting IAPs
  - Conducting long-range and/or contingency planning
  - Developing plans for demobilization
  - Maintaining incident documentation
  - Tracking resources assigned to the incident
- *Operations*. The operations section is responsible for carrying out the response activities described in the IAP. This section coordinates and manages the activities taken by the responding agencies and officials that are directed at reducing the immediate hazard, protecting lives and property, and beginning the process of moving beyond the emergency into the recovery phase. The operations section manages the tactical fieldwork and assigns most of the resources used to respond to the incident. Within operations, separate functional sections are established to handle the various response needs, such as emergency services, law enforcement, and public works.
- *Logistics*. To be effective, all response agencies depend on a wide range of support and logistical factors that must be initiated as soon as they deploy. The engine of response includes personnel, animals, equipment, vehicles, and facilities, all of which will depend upon the acquisition, transport, and distribution of resources, the provision of food and water, and appropriate medical attention. The logistics section is responsible for providing these facilities, services, and materials, including the personnel to operate requested equipment for the incident and perform the various logistical tasks required. This section takes on increasing significance as the disaster response continues.
- *Finance and administration*. The finance and administration section, which does not exist in all Incident Command System structures, is responsible for tracking all costs associated with the

response and beginning the process for reimbursement. The finance and administration section is especially important when the national governments have emergency funds in place that guarantee local and regional response agencies that their activities, supply use, and expenditures will be covered.

Command and coordination of disaster response and recovery activities is best facilitated from a centralized location, called an Emergency Operations Center (EOC). The EOC is normally established away from the disaster scene or in a safe part of the affected area if that area is exceptionally large, close to government offices. The EOC is a central command center through which all communications and information is gathered, processed, and distributed. For large-scale or widespread disasters, separate command posts may be set up throughout the affected area to manage the actual response operational activities.

Of course, the coordination mechanism described above portrays a best-case scenario, with systems established and exercised long before a disaster occurs, such that little or no confusion results. However, the mere presence of an ICS structure, even if imperfect, will likely increase the likelihood that the overall disaster response will be performed in a more organized and efficient manner.

THE DISASTER DECLARATION PROCESS

The disaster declaration is a way for governments to acknowledge that response resources have become overwhelmed and to announce that additional assistance is required and, likewise, requested. The legal mechanisms established to guide how disaster declaration takes place depend upon the nation's form of government and the rules outlined in any established emergency operations planning. In general, however, the process adheres to the following pattern.

In countries of decentralized governing authority, where local responders have primary responsibility to respond to emergencies, the disaster declaration process takes a step-by-step approach. The affected local government will first attempt to manage the hazard consequences, until it reaches a point at which it is no longer able to do so effectively. This information is communicated to the local chief executive, who then decides whether to declare a disaster and appeal to the next level of government (usually a state, regional, or provincial leader) for assistance.

If the government executive to whom the appeal was made determines that assistance is warranted upon assessing the information, he will recognize the disaster declaration and dedicate response resources. If, however, he finds that those levels of resources are insufficient in managing the event's consequences, he will appeal to the national leadership for additional assistance. The national chief executive, usually the president or prime minister, must assess the situation using the provided information and decide whether the event merits characterization as a national disaster. If the situation is declared a national disaster, national government resources from various departments, agencies or ministries will be dedicated to the disaster response as dictated in the national disaster plan. Additionally, any money from a dedicated disaster response fund will be freed up for spending on the various costs associated with the disaster response.

In the rare event that the disaster is so great in scope that it overwhelms even the national government's capacity, the chief executive may issue an international appeal for assistance. This appeal is either made through the nation's established diplomatic channels to mutual aid partners, or through the United Nations Resident Representative posted in the country. In most cases, where the world community has recognized the disaster before a formal appeal for assistance, countries will offer various forms of assistance to the affected country or countries, consisting of cash, response and relief services, and supplies.

Recognition of the event by the world community is contingent upon the transfer of information and images. If other nations maintain diplomatic missions within the affected country, an immediate assessment of the disaster may be possible, though this is more difficult for events that occur far away from large cities

(where embassies and consulates are not located). The primary means by which international recognition occurs, however, is through the news media. Because of the growing so-called "CNN effect," in which information can now be relayed in real time from almost any point in the world in a matter of seconds, large-scale disasters rarely go unrecognized.

CONCLUSION

Response is the most visible disaster management function at the international level. Media images and video footage depicting disaster victims being rescued by the international disaster response community are never in short supply. The response needs generated by disasters are complex and are heavily interconnected with the actions associated with preparedness, response, and recovery. However, for many countries, especially the poor nations of the world, the actions associated with disaster response may be the only actions that are taken to address the causative hazards. And it is the ability of the responding agencies to carry out this function that most often determines how severely the affected area is impacted, and how quickly it can move on to recovery.

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APPENDIX 6-1
Sample of a Checklist to be Used for Assessments

A. INTRODUCTION

The following assessment checklists are intended to assist the Assessment Team in planning, formatting, and conducting a complete initial assessment. The answers to the checklist questions will provide the information needed to complete the disaster cable formats outlined in the previous section on cable formats. These assessment checklists are divided into major areas. They are meant to be as inclusive as possible of the types of questions that need to be answered in initial assessments of various disasters. To be answered completely, some of the questions would require extensive survey work, which the team may or may not have the capacity to perform. However, the information may already exist, and the task of the team may be only to gather assessment information assembled by others and evaluate the information for accuracy, timeliness, and completeness. An Assessment Team may also find it necessary to develop new or expanded questions to gather the required information for specific disasters.

B. VICTIMS/DISPLACED POPULATION PROFILE

1. GENERAL CHARACTERISTICS

- Determine the approximate number of displaced people.
- Determine their locations. Are they moving? To where? How many?
- Determine how many are arriving per week. How many more could come?
- Determine how they are arriving. Are they scattered individuals or families, or clans, tribal, eth-

nic, or village groups? By what means are they traveling? How did those already there arrive? What is the average family size?
- Determine the approximate numbers and ages of men, women, and children.
- Identify ethnic/geographic origin (urban or rural).
  - Sedentary or nomadic background?
  - What is the average family/household size?
  - How many households do females head?
  - What are their customary skills?
  - What is the language(s) used?
  - What is the customary basic diet?
  - What is the customary shelter?
  - What are the customary sanitation practices?
  - What is the general distribution of socioeconomic statuses (poor, middle class, wealthy) within the population?

2. PRIORITY HEALTH STATUS CONDITIONS

- Determine how many deaths occurred in the past week.
- Determine how many children under 5 died in the same period, disaggregated by sex.
- Determine the main cause of death for each group.
- Determine the crude mortality rate.
- Determine whether measles vaccinations have been or will be provided. If provided, give dates of vaccinations.
- Determine the percentage of children vaccinated.
- Determine the incidence of diarrhea among adults and children.
- Determine the most common diseases among children and adults.

3. CAPACITIES AND ASSETS

Capacities

- What percentage of male and female population is literate?
- What emergency-related skills (for example, health workers, individuals with logistics/organizational relief skills) are represented within the population that could be drawn upon by relief organizations?

Physical Assets

- Determine what the displaced population has as personal property and what was lost as a result of the disaster.
- Estimate the number and types of blankets needed (according to climatic conditions).
- Identify what blankets are available within the country from personal, commercial, UN/PVO/NGO/IO, or government stocks.
- Determine what is needed from external sources for blankets.
- Describe the clothing traditionally worn, by season and area.
- If clothing is needed, estimate the amount by age group and sex. Determine if used clothing is acceptable, and if so, for which groups.
- Describe normal heating/cooking practices.
- Determine whether heating equipment and/or fuel is required.
- Estimate the types and quantities of heating equipment and fuel needed over a specific time period.
- Determine appropriate fuel storage and distribution mechanisms.
- Identify what fuel is available locally.
- Identify what is needed from external sources.
- Determine if other personal effects, such as cooking utensils, soap, and small storage containers, are needed.
- Determine if the DPs brought any financial assets. Would those assets be convertible to local currency?

- Determine if livestock was brought along.
- Determine if shelter materials were brought along.
- Determine if other possessions, such as cars, bicycles, or boats, were brought along.

C. HEALTH AND NUTRITION

1. HEALTH

- Ascertain demographic information:
  - Total number affected.
  - Age-sex breakdown (under 5, 5–14, 15 and over).
  - Identification of at-risk population (that is, children under 5 years of age, pregnant and lactating women, disabled and wounded persons, and unaccompanied minors).
  - Average family or household size, and number of female-headed households.
  - Rate of new arrivals and departures.
- Determine background health information:
  - Main health problems in home area.
  - Previous sources of healthcare (for example, traditional healers).
  - Important health beliefs and traditions (for example, food taboos during pregnancy).
  - Social structure (for example, whether the displaced are grouped in their traditional villages and what type of social or political organization exists).
  - Strength and coverage of public health programs in home area (immunization, reproductive health, etc.).
- Mortality rate:
  - Determine the crude mortality rates.
- Morbidity rate:
  - Determine the age- (under and over age 5) and sex-specific incidence rates of diseases that have public health importance. Document the method of diagnosis (clinical judgment, laboratory test, or rumors).
- Immunization programs:

- Determine the need for immunization programs or the effectiveness and coverage (percent of children under age 5 and between ages 5–14) of those in place, especially measles vaccinations.
  - Dates of vaccinations.
  - Determine the capability of relief officials to begin or sustain a program (for example, logistics, infrastructure, and cold chain availability).
- Determine or estimate the number of major injuries and the rate for each type of injury. Specify traumatic injuries requiring surgery or hospitalization (for example, fractures, head injuries, internal injuries).
- Determine the number and locations of health facilities that existed prior to the disaster.
- Determine the number of facilities that are still functioning and the total number of usable beds.
- Determine the number of indigenous health personnel who are available.
- Determine the amount and type of medical supplies and drugs that are available onsite or in country.
- Determine additional amounts and types of medical supplies and drugs needed immediately from sources outside the stricken area.
- Determine what additional medical equipment is needed and can be readily obtained to deal with major injuries. Suggested data sources:
  - National/provincial health officers.
  - Hospitals.
  - Clinics.
  - Traditional healers.
  - Local leaders.
  - Fly-over.
  - Walk-through surveys.
- Environmental conditions:
  - Determine climatic conditions.
  - Identify geographic features and influences.
  - Identify water sources.
  - Ascertain the local disease epidemiology.
  - Identify local disease vector.
  - Assess local availability of materials for shelter and fuel.

  - Assess existing shelters and sanitation arrangements.
- Determine if a health information system is in place to monitor the affected population and provide surveillance and intermittent population-based sample surveys that should:
  - Follow trends in the health status of the population and establish health care priorities.
  - Detect and respond to epidemics.
  - Evaluate program effectiveness and coverage.
  - Ensure that resources go to the areas of greatest need.
  - Evaluate the quality of care delivered.
- Determine if the affected country has in place or plans to begin programs in:
  - Health information systems.
  - Diarrhea disease control.
  - Expanded programs on immunization (EPIs).
  - Control of endemic diseases.
  - Reproductive health programs.
  - Nutrition programs.
  - Continuing education programs for health workers.
  - Vector control.

2. NUTRITION

- Determine the prevalence of protein energy malnutrition (PEM) in population less than 5 years of age.
- Ascertain the prior nutritional status.
- Determine the prevalence of micronutrient deficiencies in the population less than 5 years of age (for example, scurvy, anemia, pellagra).
- Determine the percentage of children under 5 years of age with either moderate or severe acute malnutrition.
- Determine the average daily ration (food basket and calories/person/day) and method and intervals of distribution (for example, wet/dry on a daily/weekly/monthly basis).
- Determine the length of time the above ration level has been available.

- Determine the attendance and effectiveness of supplementary and therapeutic feeding programs.
- Determine the incidence of low birth weight.
- Determine rate of weight gain or loss of children registered in Mother-Child Health (MCH) clinics.
- Determine oral rehydration salt (ORS) needs and distribution system.

D. WATER

1. DISPLACED POPULATION SITUATION

- Determine the amount of water available per person per day.
- Determine the source and quality of the water.
- Determine how long the daily amount has been available.
- Determine the evidence of water-related diseases.
- Determine the length of time users wait for water.
- Determine whether there is safe access to water for vulnerable groups.
- Determine the types of wells, transportation, and/or storage systems used.
- Determine if there are problems with well repair/rehabilitation.
- Determine if there is equipment/expertise onsite, on order, or available if needed.
- Determine the availability of additional sources of safe water if required.
- Determine the need for water engineers to assist with evaluating requirements.

2. FUNCTIONING WATER SYSTEM DISRUPTION

- Describe the types of systems and sources that existed prior to the disaster in the affected areas.
- Specify how many people have been deprived of a functional water supply.

- Determine who is in charge of the local water system(s) (community group, committee, and national authority).
- Determine whether the system is still functional or what the requirements for repair are.
- Determine the need for an engineering specialist to assist with evaluating requirements.

E. FOOD AND AGRICULTURE

1. FOOD

Baseline Data

- Describe the normal consumption pattern (food basket) of the affected population, any taboos, and acceptable substitutes.
- Describe the normal food marketing system (including government involvement, imports, subsistence).
- Indicate what food aid programs, if any, exist and describe them.
- Outline the indigenous food processing capacity.

Effect of the Event on Food

- Ascertain the disaster's effect on actual food stocks and standing crops (damaged/destroyed).
- Determine if access to food (for example, roads, milling facilities) has been disrupted and, if so, how long it is likely to remain disrupted.
- Check market indicators of food shortages, such as:
  - Absence or shortage of staple grains and other foods on the market.
  - Price differential.
  - Change in supplies on the market (for example, an increase in meat supplies may indicate that people are selling animals to get money).
  - Change in wholesale grain availability.
  - Unusual public assembly at a warehouse or dockside when grain is being unloaded.
  - Changes in warehouse stocks.

- ○ Black market price changes or increase in black market activities.
- ○ Commercial import changes or proposed changes.
- ○ Sale of land, tools, draft animals, etc.
- Check nutritional indicators of food shortages by sex, such as:
  - ○ Signs of marasmus, kwashiorkor, or other signs of malnutrition.
  - ○ Increased illness among children.
  - ○ Change in diet (that is, quantity, quality, type).
- Check social indicators of food shortages, such as:
  - ○ Increased begging/fighting/prostitution.
  - ○ Migration from rural to urban areas.

Food Availability

- Determine how much food can be expected from future and/or specially planted, quick-maturing crops. Where in the production cycle was the affected area when the disaster struck?
- Estimate the local government stocks on hand and those scheduled to arrive. Is borrowing of stocks on hand a possibility?
- Estimate the local commercial stocks on hand and scheduled to arrive.
- Estimate the local PVO/NGO/IO stocks on hand and scheduled to arrive. Is borrowing a possibility?
- Estimate local personal stocks on hand and those scheduled to arrive.
- Determine regional availabilities.
- Canvass other donors to find out what they expect to contribute.
- Estimate how much food aid would be required during specific time periods.

Distribution Systems

- Describe existing food aid distribution systems (for example, government rationing, PVO/NGO/IOs).

- Describe the effectiveness of the distribution system.
- Describe the role of women in the distribution system.
- Describe government-marketing mechanisms.
- Judge the capacity of the above to expand/begin emergency aid. What is their record of accountability?
- Describe potential alternatives.
- Explain the country's (agency's) previous experience with mass feeding.
- Determine the availability of facilities and materials, including fuel.
- Determine whether repackaging facilities exist.

Social and Market Impact of Food Aid

- Analyze the likely price impact on normal food suppliers. Describe the suppliers.
- Decide whether food aid would free cash and labor for other aspects of relief, or divert labor and create a dependent attitude.

Other

- Research any legal impediments to importation of certain foods.

2. AGRICULTURE

Baseline Data

- Describe crops grown in the affected area following the points listed below:
  - ○ Crop name.
  - ○ Average area planted (per data available).
  - ○ Average production (per data available).
  - ○ Planting season(s) (dates) and time to maturity.
  - ○ Are crops climate-specific? If so, identify the climatic requirements.
  - ○ Are hybrid seeds being used in the area? If so, identify them.
  - ○ Are they cash or subsistence crops?

- Describe domestic animals present in each affected area following the points listed below:
  - Approximate number of animals in the area.
  - Value of individual animals.
  - Use of animals for food.
  - Use of animals for work.
  - Use of animals for cash production.
  - Are bred stocks used in the area?
- Describe the agricultural system, including the following:
  - Main agriculturist in family units (male/female).
  - Land-use systems.
  - Agricultural labor system/land tenure.
  - Crop preferences.
  - Inputs.
  - Seeds (reserved or purchases): Is treated seed used?
  - Fertilizer.
  - Machinery/tools.
  - Pesticides.
  - Storage (farm, government, private).
  - Agribusiness facilities, processing of local or imported commodities.
- Describe the local fishing industry.

Effect of the Event on Agriculture

- Effect of the event on agriculture/livestock/fisheries.
- Ascertain the extent of damage to crop/livestock/fisheries by area, noting at what point in the production cycle the event occurred. State the source of the information.
- Estimate the loss in production (tonnage/head) by crop/livestock/fisheries and by zone within the affected area.
- Analyze whether losses will increase over time and state why.
- Describe the damage to agricultural machinery.
- Describe the damage to irrigation systems.
- Describe the damage to seed, fertilizer, and pesticide stocks.
- Describe the damage to fishing gear.

- For a drought, compare the current rainfall to the normal or recent past precipitation.
- Identify any unusual or untimely grazing changes.
- Describe any threats from insects or disease that might follow the disaster.

Agricultural Production Capabilities

- Availability of inputs by type (for example, seed, fertilizer, pesticides, tools, machinery, veterinary medicines, fishing boats, nets, breeding stock).
- Estimate the local government stocks on hand and when they are scheduled to arrive.
- Estimate the local commercial stocks on hand and when they are scheduled to arrive.
- Estimate the local personal stocks on hand and when they are scheduled to arrive.
- Ask the victims how they plan to cope with losses.
- Determine regional availabilities and elasticity of supplies.
- Ascertain what other donors plan to supply.
- Outline what further inputs would be required to restore minimum productivity.
- Find out if repackaging facilities for seed, fertilizer, and pesticides exist.
- Distribution systems/technical infrastructure.
- Outline host government (Ministry of Agriculture) operations in the affected area. Does it provide:
  - Extension service?
  - Crop storage/silos?
  - Veterinary services?
  - Irrigation services?
  - Research facilities?
  - Hybrid seed?
  - Fertilizer?
  - Other plants (fruit trees)?
  - Pesticides?

Other

- Describe any agricultural projects and inputs provided by foreign organizations/governments.

- Describe the operations of rural or agricultural credit organizations, cooperatives, or credit-sharing organizations that exist in the affected area.
- Judge the capacity of the above to incorporate rehabilitation disaster assistance.

F. SHELTER

1. AFFECTED POPULATION PROFILE

- Determine the number of people requiring shelter and whether the need for shelter is temporary (a few weeks), or if it is a displaced population requiring shelter for an indeterminate time.
- Determine the average number of people in an individual dwelling.
- Identify obstacles that prevent victims from meeting their own needs, both for temporary and permanent shelter.
- Determine the area affected (for example, portion of city, several villages, large area of a country).
- Approximate the number of private dwellings (single-family, attached, low-rise and high-rise multiple family) and public buildings (schools, churches, hospitals) damaged or destroyed by city, village, or region.
- Determine the number of damaged dwellings that are habitable without immediate repair, that are habitable only after repair, and that are not habitable and must be destroyed.
- Inventory existing structures and public facilities that can be used as temporary shelters, giving careful consideration to access to sanitation and water.

2. MATERIALS

- Identify the construction styles and materials normally used in the affected structures.

- Determine the availability and costs of indigenous materials to meet both cultural and disaster-resistance requirements.
- Identify any suitable material substitutes, locally or externally available, that would meet the cultural and disaster resistance requirements.
- Identify the type and quantity of building materials that the victims can provide for themselves for temporary or permanent shelter.
- Identify the type and quantity of building materials that the affected government can provide for the victims for temporary or permanent shelter.
- Determine the type and quantity of materials needed from external sources for temporary or permanent shelter.
- Assess the suitability (that is, infrastructure support) of available sites for both temporary and permanent shelters, including, where necessary, mass sheltering.
- Determine if relocation is necessary due to the nature of the disaster. Identify the problems this may cause with the local population.
- Assess the potential hazard and security vulnerabilities of available sites for both temporary and permanent shelters.
- Assess the environmental conditions that would impose constraints on temporary shelters or camps, such as all-season accessibility, proximity to sources of essential supplies (shelter materials, cooking fuel, water, etc.), soil, topography, drainage, and vegetation.
- Identify any problems related to land use, such as grazing, cultivating, sanitation, and land tenure issues.

3. DISTRIBUTION

- Determine the accessibility to the affected areas for both assessment and delivery.
- Determine the availability of a distribution mechanism (local, regional, national, international) to distribute shelter materials (temporary or permanent) to the victims.

- Identify committees, credit unions, government agencies, or co-ops that can mobilize forces to help implement a shelter program.
- Determine if an equitable means of allocation and an appropriate medium of exchange for the building materials can be implemented.

G. SEARCH AND RESCUE (SAR)

- Determine how many collapsed structures in an urban area have been affected. What types?
  ○ Hospitals, multistory public housing units, schools.
- Buildings constructed of reinforced concrete or other materials that would leave voids where trapped victims could survive (not adobe or mud bricks):
  ○ Apartment buildings.
  ○ Industrial buildings.
  ○ Office buildings.
  ○ Hazardous installations creating secondary risks.
- Predominant building types and construction material:
  ○ Wattle and daub.
  ○ Masonry buildings (adobe, brick, concrete blocks, stone masonry).
  ○ Reinforced concrete structures (frames with brick infill, frames with load-bearing masonry walls, bearing walls, prefabricated structures).
  ○ Steel structures (multistory steel structures, steel frames in an enfilade arrangement with reinforced concrete).
  ○ Timber structures.
  ○ Other.
  ○ Type of roof (reinforced concrete, steel, wood, grass, etc.)
- Determine if the local authorities request search and rescue (SAR) assistance.
- Type of assistance needed:
  ○ Search with technical equipment and/or dogs.
  ○ Rescue with lifting, pulling, cutting, digging, and lighting equipment.
  ○ Medical to oversee and aid in victim extraction.
  ○ Special operations for removing hazardous materials, demolition, shoring of dangerous structures, or damage and emergency repair.

H. SANITATION

1. DISPLACED POPULATION SITUATION

- Determine the placement, number, and cleanliness of latrines.
- Determine if the design and placement of latrines are affecting their use because of cultural taboos.
- Determine if there is a sanitation plan if the population increases.
- Determine if there is safe access to latrines for women and girls.
- Determine the evidence of water-related diseases.
- Determine the proximity of latrines and refuse areas to water sources, storage areas, and distribution points. Determine the placement and plan for the disposal of corpses.
- Determine if there is a plan for the collection and disposal of garbage.
- Determine if there is an insect- and rodent-control plan.
- Determine the need for a specialist to assist with evaluating requirements.

2. NONDISPLACED POPULATION SITUATION

- If the disaster occurs in a rural area, waste disposal is usually not a problem unless sewage "ponds" in a public area. Determine if this is occurring.
- If you are on an island affected by a hurricane or in an area affected by flooding, determine if the sewage drainage system is still open. (See also **Infrastructure**.)

- Determine the adequacy of sewage disposal facilities in any public buildings or other areas being used to temporarily shelter homeless people.

I. LOGISTICS

1. Airports

- Identify the airport being assessed by:
  ○ Name.
  ○ Designator.
  ○ Location.
  ○ Elevation.
- Describe the current condition of facilities.
- Ascertain whether the airport is fully operational. Daylight hours only?
- Furnish information on usable runway lengths and location(s).
- Determine whether taxiways, parking areas, and cargo handling areas are intact.
- Establish whether runway and approach lights are operating.
- Specify which navigational aids are operating.
- Describe available communications facilities.
- Determine whether the terminal building is operating.
- Check the availability and cost of aviation fuel.
- Find out if facilities exist for mandatory aircrew rest.
- Explore whether the cargo handling area can be lit for night cargo operations.
- Determine what cargo handling equipment is available, including fuel and operators:
  ○ Forklifts (number, capacity).
  ○ Scissors lift (capacity).
  ○ Cargo dollies (number).
  ○ Trucks with drivers and laborers for hand unloading
- Determine what start-up equipment is available, including fuel and operators.

- Describe maintenance operations (facilities, personnel, hours).
- Outline what storage is available:
  ○ Covered?
  ○ At the airport? Off airport? How far?
  ○ Capacity and suitability for storage of foods or other perishables.

2. Civil Aviation

- Find out whether arrangements can be made for prompt over flight and landing clearances.
- Ascertain that the air controller service is functioning.
- Specify working hours for airport personnel.
- Explore having no-objections fees or royalty fees waived or paid locally.
- Find out if arrangements can be made to work around the clock, including customs.
- Identify personnel to tally and document cargo as it is received and transshipped.
- Ascertain that the host government will accept deliveries by means of military as well as civil aircraft.
- Describe security arrangements.
- Determine what repairs and/or auxiliary equipment would be needed to increase airport capacity. How soon can local authorities be expected to restore service?
- Determine if there are any local air carriers, their availability, and their rates.

3. Alternative Aircraft

- Identify any usable airports or suitable helicopter landing sites in the disaster zone.
- Determine the local availability and cost of helicopters and/or fixed wing aircraft.
- Estimate their capacity.
- Identify the owners/agents.
- Determine the availability and cost of fuel.

4. Seaports

- Identify the port being assessed by:
  - Name and location.
  - Current description of the condition of the facilities.
  - Whether the port is fully operational. Daylight hours only?
  - Security fences/facilities.
  - Percentage of port losses reported.
  - Collection for port losses possible?
- Determine whether the disaster has altered any of the following physical characteristics of the port:
  - Depth of approach channels.
  - Harbor.
  - Turning basin.
  - Alongside piers/wharves.
  - Availability of lighters.
- Determine whether the disaster has blocked or damaged port facilities:
  - Locks.
  - Canals.
  - Piers/wharfs.
  - Sheds.
  - Bridges.
  - Water/fuel storage facilities.
  - Communications facilities.
  - Customs facilities.
- Describe the berths:
  - Number.
  - Length.
  - Draft alongside (high tide and low tide).
  - Served by rail? Road? Sheds? Lighters only?
  - Availability.
  - Check the availability and cost of fuel.
  - Determine what cargo handling equipment is available, including condition, fuel, and operators.
  - Heavy lift cranes (number, capacity).
  - Container and pallet handling (with port equipment? with ship's gear only?).
- Outline what storage is available:
  - Covered?
  - Hardstand space?
  - Capacity?
  - Quality?
  - Security?
- Find out if pilots, tugs, and line handlers are available.
- Specify the working hours for the port.
- Specify the working hours for customs.
- Determine whether arrangements can be made with the port and host-country authorities to obtain priority berthing for vessels delivering disaster relief shipments.
- Identify an adequate number of personnel to tally and document cargo as it is received and transshipped.
- Check the history of turnover time. What effect has the disaster had on turnover time?
- Determine what repairs and/or auxiliary equipment would be needed to increase the port's capacity. How soon can local authorities be expected to restore service?

5. Transfer Points

- Identify transfer points by location.
- Determine whether surface transportation for cargo is available from airports and seaports:
  - Road?
  - Railroad?
  - Canal/river?
- Estimate the capacity of transfer points, including handling.
- Outline what storage is available.
- Describe security arrangements.
- Identify an adequate number of personnel to receive and document cargo for transshipment.

6. Trucking

- Describe damage to the road network as it relates to the possibility of delivering relief supplies by truck.

- Indicate any restrictions, such as weight, width, length, or height limitations at bridges, tunnels, etc.
- Determine whether it is possible to bypass damaged sections of the road network and what weight restrictions would apply.
- Determine whether containers can be moved inland.
  - 20-foot or 40-foot container sizes?
  - To the disaster site or to a transfer point?
- Check the availability and cost of trucks owned by the government of the affected country.
- Check the availability and cost of UN/PVO/NGO/IO-owned or operated vehicles.
- Check the availability and cost of commercial vehicles.
- Determine the types, sizes, and number of commercial vehicles available.
- Judge whether the relief program could or should contract for any of the above trucks. What would be the freight rates per ton? What about collection for losses?
- Ascertain that maintenance facilities and spare parts are available.
- Outline measures to provide for security of cargo in transit.
- Check the availability and cost of fuel.

7. Railroads

- Identify and locate any railroads in the disaster-stricken area. Assess their current condition.
- Describe any damage to the electrical power system.
- Identify any interdictions—damaged bridges and tracks, fallen trees, etc.
- Judge the reliability of the rail system.
- Determine whether cars can be made available for relief shipments on a priority basis.
- Determine the capacity and cost of rail shipments.
- Outline security measures to protect cargo in transit.

8. Warehousing

- Identify undamaged or damaged but usable warehouses located in reasonable proximity to the disaster site.
- Determine the capacity of these warehouses.
- Determine their availability over a specific period of time.
- Specify whether the warehouses are government-, UN/PVO/NGO/IO-, or privately owned.
- Determine whether they are staffed or not.
- Determine the cost per square meter.
- Assess the adequacy of the warehouses' construction:
  - Ventilation.
  - Lighting.
  - Hard floor.
  - Fireproofing.
  - Loading docks.
  - Condition of roof (check during day).
- Describe loading/unloading equipment that is available:
  - Pallets.
  - Forklifts and fuel for them.
- Ascertain that adequate security exists:
  - Perimeter fence.
  - Lighting.
  - Guards.
- Determine whether any refrigeration is available.
- Determine whether sorting and repackaging facilities exist.
- Determine whether fumigation is necessary and if it is available for food, medicines, etc.
- If assessing a functioning warehouse, determine:
  - Accounting and record-keeping procedures.
  - Bin/stock cards on piles (they must match the warehouse register).
  - Physical inventory checks at random intervals.
  - Use of waybills.
  - Stacking methods.
  - Spacing system between rows.
  - Cleanliness.
  - Commodity handling system.
  - Reconstitution of damaged goods.

- ○ Prompt disposal of damaged goods.
- ○ First in/first out system.

J. COORDINATION CAPACITY

- Evaluate the coordination capacity of the following by identifying qualified personnel, reviewing program descriptions, and evaluating past performance:
  - ○ Affected country government. Describe coordination operation among various levels of government and their ability to provide liaison with outside donors.
  - ○ UN/PVO/NGO/IOs. Do UN/PVO/NGO/IOs have sufficient experienced field staff to carry out their present activities effectively and expand them if required? What is their coordination link with the affected government?
  - ○ Local service agencies, for example, credit unions, cooperatives.
- Describe coordination mechanisms in use, including meetings.
- Determine whether a lead agency has been designated.

K. INFRASTRUCTURE

- Determine the predisaster condition of the infrastructure.
- Ascertain from the affected government the minimum needs for infrastructure recovery.

1. COMMUNICATIONS

- Describe where the system's facilities are located.
- Determine the broadcast/reception area or zone of influence (for example, towns serviced by the system).
- Identify the organization/firm that is responsible for operation and maintenance of the system. Is there a disaster response plan with identification of priority facilities, material supply, and priority screening of messages?
- Obtain technical information, such as:
  - ○ Broadcast power.
  - ○ Operating frequencies, call signs.
  - ○ Relay/transmission points.
  - ○ Hours of operation.
  - ○ Standby power sources.
  - ○ Mobile capability.
  - ○ Repair/maintenance facilities, including capabilities of manufacturer's local agent.
  - ○ Language of transmission.
- Identify key personnel (owners, management, operations, maintenance).
- Determine the degree of integration of military and civilian communications networks.
- Note the source(s) of the above information.
- Determine what communications facilities exist that are operable or easily repaired and could be used to pass on assessment information and assist in coordination of lifesaving responses.
- Identify the type of system assessed:
  - ○ Radio.
  - ○ Private ownership.
  - ○ Commercial.
  - ○ Broadcast.
  - ○ 2-way.
  - ○ Amateur.
  - ○ Citizens band.
  - ○ Public systems.
  - ○ Police.
  - ○ Armed forces.
  - ○ Government agencies (which ministries have communications facilities?).
  - ○ Telephone.
  - ○ Cable and wireless.
  - ○ Television.
  - ○ Newspaper.
  - ○ Other.
- Describe specific reasons why a system is not operating.
  - ○ Unavailability of:
    - ▪ Personnel.

- ▪ Power.
- ▪ Fuel.
- ▪ Access to facilities.
- ○ Damage to system:
  - ▪ Broadcast/transmission equipment.
  - ▪ Antennae.
  - ▪ Buildings.
  - ▪ Transmission lines.
  - ▪ Relay facilities.
  - ▪ Power source.
  - ▪ Other.
- • Note source(s) of the above information.
- • Outline options for restoring minimum essential services.
- • Identify local/regional suppliers of communications equipment and materials available for repair. Check cost and availability.
- • Determine the local/regional availability of technical services available for repair.

2. ELECTRIC POWER

- • Describe the power system, including:
  - ○ Baseload facility.
  - ○ Peaking facility.
  - ○ Number of units.
  - ○ Fuel source.
  - ○ Plant controls.
  - ○ Output capability (specify voltage and cycle).
  - ○ Mobile plants.
  - ○ Other standby capability.
  - ○ Switching facilities.
  - ○ Transmission facilities.
  - ○ Distribution facilities (number of substations).
  - ○ Interconnections.
- • Inventory auxiliary equipment that may be available locally (for example, from construction companies).
- • Determine why power is not available (that is, at what point the system has been damaged).

- • Ascertain the condition of generating units.
- • Check the integrity of the fuel system.
- • Determine whether towers, lines, and/or grounding lines are down.
- • Assess the condition of substations.
- • Outline the impact of power loss on key facilities, such as hospitals and water pumping stations.
- • Describe the options for restoring minimum essential services.
- • Ascertain whether load shedding and/or switching to another grid can restore minimal services.
- • Identify local/regional suppliers of equipment and materials.
- • Check the cost and availability.
- • Determine the local/regional availability of technical services available for repair.

3. WATER/SEWAGE

- • Describe the preexisting systems: that is, for water, the source, treatment facilities, mains, pump stations, and distribution network; for sewage, the treatment facilities and pump stations.
- • Estimate the number of people who depend on the water sources by type (for example, river, city water system).
- • Determine why water (especially potable water) is not available (that is, at what point the system has been damaged).
- • Check the integrity of the water source.
- • Assess the condition of water and sewage treatment facilities and of the distribution network. Are pump stations operational?
- • Determine whether water mains are broken. Are leaks in the sewage system contaminating the water supply?
- • Outline the impact of water loss on key facilities and on individual users. How quickly can the responsible ministries be expected to restore services?

- Describe options for restoring minimum essential services.
- Evaluate the possible alternative water sources.
- Identify local/regional suppliers of equipment and materials.
- Check cost and availability.
- Determine the local/regional availability of technical services available for repair.

4. HYDRO FACILITIES (HYDROELECTRIC, IRRIGATION)

- Describe the function of the facilities, their proximity to the stricken area, and their relationship to the disaster itself.
- Identify the host country organization that controls and operates the facilities.
- Identify the suppliers, contractors, and/or donors that built the facilities (that is, what were the equipment and technical sources?).
- Describe any damage to systems.
- Check the soundness of the structures and outlet works.
- Are the reservoirs watertight?
- Identify any immediate or near-term safety risks (generating and control machinery, structural defects, power to operate gates, etc.).
- Assess the condition of canals or downstream channels.
- Identify any changes in watershed conditions (for example, saturation, ground cover, streambed loading, new impoundments).
- Determine whether water is being contaminated.
- Evaluate the management of the facilities.
- Determine whether storage and outflow quantities are being managed in accordance with prescribed curves.
- Identify preparations for follow-on storm conditions (for example, emergency drawdown of reservoirs).

- Describe the probable impact of discharging on downstream damage and/or relief efforts (for example, depth at river crossings, releases into damaged canals). Is there a need to impound water until downstream works can be repaired?
- Outline the options for restoring minimum essential services.
- Outline the repair plans of the responsible host country officials.
- Check on any proposed assistance from the original donors of the facilities.
- Identify local/regional sources of equipment and technical expertise.

5. ROADS AND BRIDGES

- Describe the road networks in the affected area by type.
- What is the load capacity of the bridges?
- Identify the responsible ministries and district offices and constraints on their operations.
- Describe any damage to the network.
- Determine which segments are undamaged, which can be traveled on with delays, and which are impassable.
- Describe any damage by type:
  - Blockage by landslides, fallen trees, etc.
  - Embankments.
  - Drainage structures.
  - Bridges/tunnels.
  - Road surfaces.
- Identify alternate crossings and/or routes.
- Evaluate the importance of the road network to the relief effort and rehabilitation.
- Outline the options for restoring minimum essential service.
- Determine which elements must be restored first.
- Describe the need for traffic control (police, military, other) on damaged or one-way segments.

- Determine how long the emergency repairs can accommodate relief traffic (size, weight, volume?). Will emergency maintenance and fuel points be needed in remote areas?
- Identify the host country agencies, military, and/or civilian forces that are available to make repairs. Do they have equipment, spare parts, and maintenance support?
- Check whether local or expatriate construction companies can loan equipment and/or expertise.

- Check regional sources of equipment and/or expertise that are available for repair.
- Ascertain that arrangements can be made for standby forces at damaged sections to keep roads open.

Source: USAID, n.d.

7

Recovery

INTRODUCTION

Disasters wreak havoc on the living, on built structures, and on the environment, but preparedness and mitigation reduce vulnerability to disasters, and response minimizes the loss of life and property. However, even with the best mitigation, preparedness, and response, there will almost always be some level of environmental damage, destruction of property and infrastructure, disruptions of social and economic systems, and other physical and psychological health consequences. The process by which all of these are rebuilt, reconstructed, repaired, and returned to a functional condition is called recovery.

This chapter will explain what the recovery function is and what actions are taken to fulfill the recovery needs of communities affected by disasters.

OVERVIEW OF RECOVERY

Disaster recovery is the emergency management function by which countries, communities, families, and individuals repair, reconstruct, or regain what has been lost as result of a disaster and, ideally, reduce the risk of similar catastrophe in the future. In a compre-

hensive emergency management system, which includes predisaster planning, mitigation, and preparedness actions, recovery actions may begin as early as during the planning processes and activities, long before a disaster occurs. Once the disaster strikes, planned and unplanned recovery actions are implemented and may extend for weeks, months, or even years.

The actions associated with disaster recovery are the most diverse of all the disaster management functions. The range of individuals, organizations, and groups that are involved is also greater than in any other function (though these participants are much more loosely affiliated than in other disaster management functions). Because of the spectacular nature of disaster events and because disaster consequences affect so many peoples' lives, recovery generates the greatest amount of interest and attention from the world community as a whole. In relation to the other disaster management functions, it is by far the most costly. Disaster recovery is also the least studied and least organized of all of the disaster management functions, and therefore the most haphazardly performed.

The most visible activity associated with the recovery function manifests at about the same time that

formal emergency response measures are declared complete. Having taken the appropriate actions to save as many lives possible and having limited any further damage to the environment and to property, communities must face the long process to regain what was lost. But, as this chapter will show, recovery involves much more than simply replacing what once existed. It is a complex process, closely intertwined with the other three phases of emergency management, and requires great amounts of planning, coordination, and funding.

Actions and activities commonly performed in the recovery period of a disaster include:

- Ongoing communication with the public
- Provision of temporary housing or long-term shelter
- Assessment of damages and needs
- Demolition of damaged structures
- Clearance, removal, and disposal of debris
- Rehabilitation of infrastructure
- Inspection of damaged structures
- Repair of damaged structures
- New construction
- Social rehabilitation programs
- Creation of employment opportunities
- Reimbursement for property losses
- Rehabilitation of the injured
- Reassessment of hazard risk

THE EFFECTS OF DISASTERS ON SOCIETY

Disasters disrupt society in many ways. Most people are familiar with disaster statistics that relate to people killed and injured, buildings damaged and destroyed, and the monetary values of property loss. News media focus on images of destroyed homes, flooded streets, and downed trees, among other physical manifestations of the disaster. However, disaster consequences have a much greater effect on victims' overall quality of life than these statistics, pictures, and videos can show. This is because communities develop sociocultural mechanisms that allow them to function, and the countless individual components of

these systems steadily become dependent on each other. Thus, the loss of any one component may affect many others.

When minor incidents occur in which people are killed or injured, buildings or infrastructure are destroyed, and lifelines are cut, components of society can break down on a small scale, but the community is likely to have the capacity to contain the loss and withstand any greater impact. During disasters, however, these damaging effects are spread across a much greater geographical range, affecting more people, more structures, more industries, and many more interconnected societal components. The secondary effects affect not only the disaster area but also can extend far beyond the actual physical range of the disaster and result in much wider logistical and economic impacts.

Examples of disaster consequences that disrupt the community and reduce the quality of life of individuals in that community include:

- A reduced ability to move or travel due to damaged or destroyed transportation infrastructure
- Interrupted educational opportunities due to damages to schools, loss or injury of teachers, student injuries, or inability to attend school because of added pressures of recovery
- Loss of cultural heritage, religious facilities, and communal resources
- Economic losses due to the loss of customers, employees, facilities, inventory, or utilities
- Communications difficulties due to infrastructure damage or loss
- Homelessness caused by housing and property losses
- Hunger and starvation due to breaks in the food supply chain that cause shortages and price increases
- Unemployment due to job cuts, damage to place of work, or conflicting recovery needs (loss of day care services, for instance)
- Loss of community tax base
- Environmental loss, damage and pollution

The primary goal of the recovery process is to reverse these damaging effects and, in doing so,

restore victims' lives. Clearly, this is a monumental task.

PREDISASTER RECOVERY ACTIONS

Like response, recovery is a process that is performed within a time-constrained setting and on which victims' lives directly depend. To be performed well, recovery and response require special skills, equipment, resources, and personnel. Unlike response, however, disaster planning very rarely includes disaster recovery operations.

The recovery period follows the emergency phase of a disaster and is one in which confusion is likely to reign. There may be people displaced from their homes, business owners anxious to resume operations, and government offices that must restart service provision, among other pressures. As will be described below, to ensure that overall vulnerability is reduced, rebuilding without considering the disaster's effects as well as any new hazards is unwise and irresponsible. Unfortunately, decisions are often made with little or no planning or analysis, and opportunities for improvement can be lost.

In the planning process, described in previous chapters, disaster managers identify hazards, analyze risk, and determine ways to reduce those risks. In doing so, they gain a much greater understanding about how each of those hazards would affect the community if they were to strike. This information can be effective if used to plan the community's recovery from a disaster.

Predisaster planning—sometimes referred to as "Pre-Event Planning for Post-Event Recovery (PEPPER)—can reduce the risk of haphazard rebuilding. Though nobody can predict exactly how a disaster will affect a community, many processes are common to all disaster types (such as hurricanes, for example), and they may be identified and studied in advance. Many decisions will have long-term repercussions and, as such, are better made in the relaxed, rational environment that only exists before the disaster occurs.

Examples of recovery decisions that may be made before a disaster include:

- The site selection for long-term temporary housing (which is often maintained for a period much longer than originally expected)
- The site selection for temporary business activity
- The site selection for the disposal of debris
- Contractors from around the country that could be called upon to assist in infrastructure and housing repair and reconstruction
- Coordination mechanisms, including leadership, membership, and information sharing, for example
- Volunteer and donations management
- Mitigation measures and other hazard reduction actions that may be too expensive or unfeasible before a disaster, but that may be more opportune if existing structures were damaged or destroyed (such as relocating power lines underground)

It has been postulated that disaster recovery based upon predisaster planning is much more organized, is more likely to result in community improvement, and is more likely to result in a reduction of future disaster losses. Because nobody knows for sure exactly how and where the disaster consequences will manifest themselves, recovery plans are hypothetical, focusing more on broad goals and ideals than on specific actions and procedures. For instance, they may include "Reduce vulnerability to electrical transmission wires" or "Revise building codes to address new seismicity estimates." During much of the actual recovery period, many decisions will require split-second action, with little or no time for analysis. A plan outlining overarching goals and objectives can help guide those decisions. Decisions made without considering these goals can drastically limit opportunities to rebuild the community to be more resilient and disaster resistant.

Through the hazard identification and analysis process; communities that have performed adequate hazards risk planning will have determined what consequences they should expect to occur. Using this information, they will have created a mitigation plan outlining the possible options for disaster risk reduction. In the postdisaster recovery period, when many decisions are being made about construction and

repair of structures, zoning of land, and new development, this mitigation plan can be used to ensure that proper action is taken to minimize risk. For example, if the community had explored strengthening building codes, those codes would be likely to pass in light of the recent disaster, and all new construction could be required to follow the new codes. Planners may find that many of the measures deemed unfundable or impossible before the disaster are now perfectly acceptable.

SHORT- AND LONG-TERM RECOVERY

Recovery can be divided into two distinct phases, each with very different activities: short-term and long-term. The specific conditions and consequences surrounding the disaster aftermath, the capabilities of the affected government(s), and the capabilities and resources of the participating agencies all determine how quickly recovery can transition from the short-term to the long-term phase.

The short-term recovery phase immediately follows the hazard event, beginning while emergency response operations are ongoing. Short-term recovery activities seek to stabilize the lives of the affected people in order to prepare them for the long road toward rebuilding their lives. These actions, which are often considered response actions or termed "relief", include the provision of temporary housing, distribution of emergency food and water, restoration of critical infrastructure, and clearance (but not removal or disposal) of debris. Short-term recovery actions tend to be temporary and often do not directly contribute to the community's actual long-term development. Short-term recovery operations also tend to be guided by response plans and are often uncoordinated.

Long-term recovery, on the other hand, does not begin in earnest until after the emergency phase of the disaster has ended. In long-term recovery, the community or country begins to rebuild and rehabilitate. For major disasters, it lasts for years. A community's or country's economic renewal may take even longer, making a return to predisaster conditions a challenge.

In many cases, the community will need to be reinvented, accommodating the new information about the disaster while maintaining as much of its original culture and predisaster composure as possible. The greatest opportunities for projects addressing vulnerability reduction are possible during long-term recovery. More funding is dedicated to recovery than to any other emergency management phase (for a given disaster), and more players from all sectors are involved. Long-term recovery operations thus require a significant amount of coordination and planning if they are to be successful.

COMPONENTS OF RECOVERY— WHAT IS NEEDED, AND WHERE DOES IT COME FROM?

The long-lasting period of recovery following major disasters requires a tremendous supply of resources. Each resource category is dependent on the others, and thus a short supply of one resource could impact the others. Over time and with experience, the recovery function has become more practiced, more systematic, and better able to work toward the goal of setting the affected population back upon their own two feet, though that goal may not always be reached.

The following section details the general components of disaster response.

PLANNING

Though predisaster planning is logical, relatively easy to perform, and costs very little, most communities will likely have done little or nothing to directly prepare for recovery after a disaster. Postdisaster planning, as it is called, while entirely necessary, is performed in a much different environment than predisaster planning—one that is less favorable to success. Disaster managers in California addressing the aftermath of an earthquake described the differences between pre- and postdisaster recovery planning as follows:

- After a disaster, planning for rebuilding is a high-speed version of normal planning, as well as a dynamic cyclical process. Local communities faced with disaster recovery will not have the luxury of following normal procedures for development review and approval.
- After a disaster, planning for rebuilding is more sharply focused. This is not the time to begin a regional planning process.
- After a disaster, planning for rebuilding is more realistic. Planners must avoid raising false expectations by unrealistic planning schemes and, instead, strive to build public consensus behind appropriate redevelopment approaches. Comprehensive evaluation of funding sources for implementation is essential. (Spangle and Associates 1991)

What is most important when planning for recovery from a disaster is that as little construction or other action that could affect the long-term sustainability of the community is performed before being considered by the planning process. Several options can assist disaster managers with this, such as imposing a moratorium on new construction. However, the public and business owners place a lot of pressure on disaster managers and politicians to rebuild as quickly as possible. Demands will increase as victims grow impatient with temporary relief provisions (shelter, food, etc.) and businesses begin to fail. Recovery organizations add to this stress because of their workers' needs and donors' expectations to initiate and complete their projects as soon as possible. Without rapid and proper coordination mechanisms, many projects will begin on their own, irrespective of any central plans that are being drawn to guide the recovery.

Several different activities may (and should) be initiated during the planning period. Many of these activities will already have begun due to their interconnectedness with response, such as the repair and recovery of critical infrastructure, the site selection for temporary housing, medical facilities, and hospitals, the resumption of education, and the clearance of debris. William Spangle, author of several texts on postdisaster recovery, describes two lessons that planners should consider during the planning process:

1. Planning and rebuilding can occur simultaneously; some rebuilding takes place before master plans are completed. Although building moratoria may be appropriate after a disaster, streamlined decision-making procedures for those land-use questions that can be resolved quickly might help demonstrate good faith on the part of local officials. As soon as possible, local officials need to determine areas of the community that can be rebuilt under existing plans and regulations and provide for rapid processing of permits for repairs and rebuilding in those areas. In the other, more problematic areas, clear procedures and time schedules for planning, making decisions, and getting information are needed. In this higher-speed version of normal planning, decisions might be phased so that planning and rebuilding can proceed in tandem.
2. Defining urban expansion areas helps. After a disaster, planners usually have the information needed to plan for urban expansion while avoiding clearly unsafe ground. By quickly defining such areas, planners can speed up the relocation of people and businesses from heavily damaged areas that may be a long time in rebuilding. (Spangle and Associates, 1991)

Luckily, even if most disaster managers are facing the postdisaster recovery period without any recovery plans, they may not need to start from scratch (Patterson, 1999). Existing plans and regulations may be acceptable for many parts of the city, especially where buildings failed because they were not designed or built to modern codes (as opposed to having failed *despite* being up to code). Additionally, despite managers' best efforts to conduct planning as quickly as possible, some construction is likely to begin immediately. Existing building and development plans, zoning regulations, and land use regulations can all help to guide the fragmented groups of players involved.

COORDINATION

Coordination during the recovery phase is extremely difficult to achieve, but it is vital to successful accomplishment of its goals and, more importantly, in achieving reduced risk. Though a majority of the actual recovery actions taken are likely to occur at the local level, managed by local officials, regional or national coordination mechanisms will be required to ensure proper distribution of the many resources, technical assistance, internal and external financial assistance, and other special programs that will fuel the process. Recovery of major disasters is a patchwork of local level efforts feeding from and guided by larger, centralized resources.

The success of postdisaster recovery coordination depends on planners' ability to achieve wide representation within the coordination structure. For the recovery plans to address the community's demographic and sociocultural needs and preferences, all representative community groups must be involved—including businesses, religious and civil society organizations, emergency managers, representatives from various government agencies, public advocacy groups, and the media. There may be considerable interaction between local and regional or national levels throughout the recovery process as well, so inclusion of these outside groups is vital. By involving all of these stakeholders, a highly organized recovery operation is possible that ensures lessons learned, best practices, and efficiency of labor are maximized. In the absence of full coordination and communications, recovery assistance likely will not be able to meet the needs at the local level (Patterson and Associates, 1999).

If structured correctly, the resulting coordination mechanism will become a central repository of information and assistance for all groups and individuals involved. The structure may be formed around an existing community group or government agency, or it may be a new representative committee. The committee may be elected, a public-private partnership, or any other appropriate format for the community or country it is serving. Officials who may be included in the recovery coordination structure include:

- Environmental officers
- Floodplain manager
- Building officials
- Rural and urban planners
- Zoning administrators
- Public works directors—city engineer
- Parks and recreation director
- Stormwater manager
- Economic development officer
- Finance officer
- Transportation officer
- Housing department officer
- Regional planning organization or officer
- Local and regional emergency management (police, fire, EMS)
- Public information officer
- Chamber of commerce representatives
- Public and private utility representatives
- Neighborhood organizations
- Homeowners associations
- Religious or charitable organizations
- Social services agencies
- Red Cross/other NGO recovery officials
- Environmental organizations
- Private development and construction agencies

Statutory authority must be granted to this committee to ensure that they have adequate power to enforce their actions and recommendations. This group will perform many of the following functions:

- Collate damage and needs assessment data
- Guide and facilitate the recovery planning process
- Establish recovery and risk-reduction goals
- Centralize information on relief and recovery resources
- Minimize duplication, redundancy, or inefficiencies in services
- Gather and disseminate aid information for victims

In many developing countries, where the knowledge, experience, and expertise required to lead the planning and operation of recovery does not exist at

any level of government, external coordination of technical assistance will be necessary. Generally, organizations such as the United Nations, which most likely already have had a relationship with the country's government, will assume such a role. The process by which this is done is described in greater detail in Chapter 10.

The disconnect that often exists in planning for and coordinating recovery often stems from inaccurate understandings of what is best for the individual communities. National officials, multilateral organization representatives, and national and international nonprofit agencies may all be working under assumptions that, albeit educated and informed, are incorrect in light of specific social and cultural conditions on the ground. Jim Rolfe and Neil Britton, of the Wellington, New Zealand Earthquake Commission and the Centre for Advanced Engineering, write, "The need for achieving consistency between a community's recovery and its long-term vision is perhaps one of the biggest reasons for placing management of the recovery process in the hands of local government" (Rolfe and Britton, 1995). The victims should be active participants in the recovery period, helping to define that local vision, outlining the overall recovery goals, and taking ownership of recovery projects, rather than be left on the sidelines to receive free handouts.

INFORMATION—THE DAMAGE ASSESSMENT

Before any effective recovery planning is possible, disaster managers must have access to accurate and timely damage assessment information. This will help identify the best strategy for employing available resources and setting action priorities. In the response phase, as described in Chapter 6, assessments are conducted in order to guide the various response activities needed. The information from those assessments is fully transferable for use in the recovery phase, as the information requirements are virtually identical.

Damage assessments can help planners identify the number and types of buildings damaged and destroyed

as well as the spatial extent of the hazard consequences (land that was inundated, areas of strong seismic shaking, the location of failed slopes, the number and location of displaced people, and the loss of farmland, among other information dependent upon hazard type and intensity). During the recovery planning process, these assessments will act as the primary guide to determine areas that require attention and in what priority, and how to effectively distribute available resources.

Unfortunately, the assessments generated in the response phase will probably not contain *all* of the information recovery planners require, especially if they are intent on reducing future disaster risk. Further assessment will be necessary for these information needs, and that assessment will need to be performed by various subject experts as defined by the actual recovery needs. For instance, in many cases a more technical inspection of damaged buildings will need to be performed in order to determine which need to be demolished, which are repairable, and which can be re-occupied immediately. Also, in light of all the new, event-specific hazard and disaster information that will suddenly be available, experts dedicated to specific disaster impacts (such as geologists, meteorologists, or hydrologists) will be needed to create more accurate hazard risk maps. For instance, after an earthquake, new faults may be discovered, and better information about maximum ground-shaking potential for specific geographic regions may have been acquired. Planners can use this information to ensure that any reconstruction or repair fully incorporates those findings.

As was true in the response phase, recovery planners will need to periodically reassess the affected area to determine the pace of recovery. Using these assessments, resources may be reallocated and problems discovered before it is too late to correct them. With a strong coordination mechanism, maximizing the number of organizations participating in the coordination group, assessment will be much easier to conduct. In these cases, establishing a central information repository is desirable for collecting regular progress updates.

MONEY AND SUPPLIES

Unfortunately, without ample funding, very little may be done to help a disaster-struck region rebuild. Even with local and foreign volunteers and abundant donations of equipment and supplies, simply too many resources and services must be purchased. Financial investment in community reconstruction is necessary to complete each recovery goal, whether to repair and rebuild infrastructure, restart the economy, repair and reconstruct housing, or any other activity.

Responsibility for reconstruction costs is divided between various sectors of the community. The government is generally responsible for rebuilding public facilities and much of the infrastructure in the public domain. The private sector, including industries, individuals, and families, will lead the rebuilding of houses and businesses, helping to restore overall economic vitality. The public and private sectors will frequently work together and share reconstruction costs. For example, although an electric company is privately owned, a government-run water treatment plant may not be able to function until its access to power is returned. Likewise, private landowners may not be able to rebuild their houses if the government agency in charge of construction permits has not yet returned to servicing customers.

How quickly the affected country can organize financial and other types of resources will determine how quickly and how effectively that nation recovers from the disaster. A nation has several options for disaster response funding: insurance, government-based emergency relief funds, donations, loans, catastrophic bonds and weather derivatives, private development funding, incentives, and tax increases.

Insurance

If insurance was purchased prior to the disaster and the insurance industry is legitimate and able to sustain the disaster's financial impact, then settlements will be provided as defined in each customer's insurance policy. Insurance policies may cover a full range of losses, including building repair or reconstruction, replacement of building contents or other property, lost employment or business opportunities, and medical bills, among other costs. Individuals, businesses, and even public and nonprofit entities may purchase insurance policies. Most relief programs require that insurance payments be exhausted on any given project before providing any other funding.

Unfortunately, insurance is not common in developing countries. The UN found that less than one-quarter of all disaster losses is covered by insurance (ISDR, 2005). There are a variety of reasons for this, including a lack of insurance offered, low understanding among the population of its benefits, premiums that are restrictive to tight budgets, and a lack of faith that companies will pay in the event of a disaster.

Government-Based Emergency Relief Funds (Reserve Funds)

Disasters place a heavy burden on all levels of governments: national, regional, and local. The government almost certainly will be required to pay for a wide range of relief expenses on top of the additional expenses incurred as result of the response costs. Many governments have set aside in their budgets an emergency relief fund designed to allow for financial liquidity to cover anticipated expenses associated with disasters. Generally, these kinds of funds are created in the aftermath of a previous catastrophic disaster as a part of a more comprehensive statutory authority designed to increase overall disaster preparedness. Examples include:

- The Disaster Relief Fund (United States)
- FONDEN (Mexico)
- Disaster Financial Assistance Arrangements (Canada—see Exhibit 7-1)
- Sonderfonds Aufbauhilfe (Germany)
- National Calamity Fund (Philippines)
- National Calamity Contingency Fund (India)

One of the main advantages of emergency relief funds is that they are available immediately. Almost all other forms of funding require a waiting period,

EXHIBIT 7-1   The Canadian "Disaster Financial Assistance Arrangements"

Overview

When response and recovery costs exceed what individual provinces or territories could reasonably be expected to bear on their own, the Disaster Financial Assistance Arrangements (DFAA) provide the Government of Canada with a fair and equitable means of assisting provincial and territorial governments.

Since the inception of the program in 1970, the Government of Canada has paid out more than $1.6 billion in post-disaster assistance to help provinces and territories offset the costs of response and of returning infrastructure and personal property to pre-disaster condition. Examples of payments include those for the 2003 British Columbia forest fires, the 1998 ice storm in Quebec and Ontario, and the 1997 Red River flood in Manitoba.

Roles and Responsibilities

The provincial or territorial governments design, develop and deliver disaster financial assistance, deciding the amounts and types of assistance that will be provided to those that have experienced losses. The Government of Canada places no restrictions on provincial or territorial governments in this regard—they are free to put in place the disaster financial assistance appropriate to the particular disaster and circumstances. PSEPC works closely with the province or territory to assess damage and review claims for reimbursement of eligible response and recovery costs. Other federal departments and agencies are sometimes asked to assist in determining what constitutes reasonable costs for recovery and restoration.

Eligibility and Reimbursement of Expenses

Through the DFAA, assistance is paid directly to the province or territory—not directly to the individuals or communities. The percentage of eligible costs reimbursed under the DFAA is determined by the cost-sharing formula outlined in the arrangements (a factor of the extent of damage and the population of the affected area). The Government of Canada may provide advance payments to provincial and territorial governments as the reconstruction of major infrastructure proceeds and funds are expended under the provincial/territorial disaster assistance program.

A province or territory may request Government of Canada disaster financial assistance when eligible expenditures exceed $1 per capita (based on provincial or territorial population). Payments are made after provincial/territorial expenditures have been audited.

Eligible expenses include, but are not limited to, rescue operations, restoring public works and infrastructure to their pre-disaster condition, as well as replacing or repairing basic, essential personal property of individuals, small businesses and farmsteads. Examples of expenses that may be eligible for reimbursement:

- Rescue, transportation, emergency food, shelter and clothing
- Emergency provision of essential community services
- Security measures including the removal of valuable assets and hazardous materials from a threatened area
- Costs of measures taken in the immediate pre-disaster period intended to reduce the impact of the disaster
- Repairs to public buildings and related equipment
- Reparis to public infrastructure such as roads and bridges
- Removal of damaged structures constituting a threat to public safety
- Restoration, replacement or repairs to an individual's dwelling (principal residence only)

- Restoration, replacement or repairs to essential personal furnishings, appliances and clothing
- Restoration of small businesses and farmsteads including buildings and equipment
- Costs of damage inspection, appraisal and clean up

Examples of expenses that would NOT be eligible for reimbursement:

- Repairs to a non-primary dwelling (e.g. cottage, ski chalet or hobby farm)
- Repairs that are eligible for reimbursement through insurance

- Costs that are covered in whole or in part by another government program (e.g. crop insurance)
- Normal operating expenses of a government department or agency
- Assistance to large businesses and crown corporations
- Loss of income and economic recovery
- Forest fire fighting

Source: Public Safety and Emergency Preparedness Canada, 2005.

including donations from other national governments and insurance.

Unfortunately, many poor countries whose budgets are already stretched thin do not have the luxury of "setting aside" funding, and must find the money through some other means. Generally, this is performed through cutting or tapping into other government programs' funding. In many countries in which disasters are common and international relief assistance has been given, an attitude of "why reserve money for disaster relief if the international community is going to help us anyway" begins to form. Recent research has found that many of the poorest disaster-prone countries go as far as to concentrate their predisaster efforts upon maximizing their ability to garner postdisaster international aid (Miller and Keipi, 2005).

Ways do exist in which governments, both within the affected nation and abroad, can use current budgetary spending to supplement disaster recovery and place little or no additional pressure upon the current budget (i.e., not simply reallocating money within the budget). This is achieved through offering services that carry a monetary value but would have been utilized regardless of the disaster. For example, militaries often support relief efforts with their manpower, equipment, and/or supplies, with the operations falling within their general budget appropriations. Emergency food stocks that may have been set aside throughout the country or the world may be available

for transport to the affected region. Government employees may be able to set aside their regular duties in order to supplement the needs of the relief effort. Intelligence and other information-gathering agencies may be able to provide imagery and other data they gather as a regular part of their work.

Donations

The majority of relief effort funds often are philanthropic in origin. The world community as a whole is much better able to absorb the impacts of individual disasters than any single community (which is related to the concept of risk spreading, explained in Chapter 4). Even the United States, the world's richest nation, depended heavily on donated funds (measured in the billions of dollars) in the recovery for both the September 11th terrorist attacks in 2001 and Hurricane Katrina in 2005. The sources of donated funds are varied, and include:

- Other governments
- Multilateral organizations
- Nonprofit organizations (national and international)
- Businesses (national and international)
- Private citizens (national and international)

Goods and services, or "in-kind donations," are another common form of recovery support in place of or

in addition to cash. Governments, organizations, or individuals may choose to send supplies, services, or manpower that they already possess in ample quantity to assist the affected region. In times of disaster, these supplies and services are desperately needed, as even the most well-funded governments may find themselves unable to acquire items such as tents, food, and building supplies; logistical needs such as flights, ships, and trucks to transport goods; or professional experts such as engineers, physicians, and public works contractors. Exhibit 7-2 details the humanitarian assistance donated by the U.S. government to the response and recovery following the 2001 earthquakes in El Salvador.

Figure 7-1 illustrates the flow of money from donors to recipients in the response and recovery to international disasters.

EXHIBIT 7-2   U.S. Government Assistance to the Government of El Salvador Following the Earthquakes of January 13 and February 13, 2001

On January 13, 2001, at approximately 11:35 a.m. local time, an earthquake with a magnitude of 7.6 on the Richter scale and a depth of 60 km occurred off the coastline of El Salvador, some 105 km southwest of the town of San Miguel. A second earthquake struck El Salvador on February 13, 2001, at 8:22 a.m. local time with a magnitude of 6.6 on the Richter scale and a depth of about 13 km. The second earthquake's epicenter was located some 30 km east of San Salvador in San Pedro Nonualco in the department of La Paz. Both the January and February earthquakes were felt throughout El Salvador and in neighboring Guatemala and Honduras.

The National Emergency Committee for El Salvador (COEN) reported that as a result of both earthquakes, 1159 people died, 1,582,428 people were affected, 185,338 houses were damaged, and 149,528 houses were destroyed. In total, the Government of El Salvador (GOES) estimated that the cost of rebuilding damaged areas would be more than $2.8 billion.

The January Earthquake

On January 14, U.S. Ambassador Rose Likins declared a disaster due to the damage caused by the earthquake on January 13. USAID/OFDA responded by providing $25,000 to USAID/El Salvador for the purchase of tools, hard hats, gloves, goggles, flashlights, lighting, fuel, and related supplies or equipment required for the search and rescue activities.

At the time of the earthquake, three USAID/OFDA personnel were in San Salvador and immediately began liaising with the El Salvadoran Red Cross, COEN, the U.S. Embassy, and USAID/El Salvador to assess damages and relief needs and to begin to coordinate the USAID/OFDA response. On January 14, 11 additional USAID/OFDA personnel arrived in San Salvador to assist in the response effort. The USAID/DART also included a Miami-Dade Fire Rescue component, which assisted the GOES in developing site strategies for search and rescue activities, safety measures for rescue workers, security plans for search sites, and training on the construction of temporary shelters.

During the disaster response, USAID/OFDA conducted a total of six relief commodity airlifts to El Salvador. These airlifts included one prepackaged GO kit containing medical supplies to treat 1000 people for one week, 6008 hygiene kits, each with supplies sufficient for a family of five for two weeks, 3,600,000 sq. ft. of plastic sheeting, 2400 five-gallon water containers, and 1000 wool blankets. All of the relief commodities were consigned to COEN, except the medical supplies and plastic sheeting.

The medical supplies went directly to hospitals in the affected areas and the plastic sheeting to NGOs in support of their temporary shelter construction activities. In addition to the commodities that were airlifted to El Salvador, USAID/OFDA

provided $215,000 through USAID/El Salvador for the local purchase and transport of relief supplies and for USAID/DART support.

In order to support temporary shelter needs in the affected areas, USAID/OFDA provided $4,787,000 in grants to the Cooperative Housing Foundation (CHF), CARE, and Samaritan's Purse to construct temporary shelters using plastic sheeting provided by USAID/OFDA. The three NGOs constructed a total of 13,061 temporary shelters for earthquake-affected families in the departments of Usulutan, La Libertad, and La Paz.

USAID/OFDA also provided plastic sheeting in support of SC/US's temporary shelter activities that were conducted through a partnership between SC/US and local Peace Corps volunteers who trained members of their communities on basic temporary shelter construction techniques.

USAID/OFDA funded the services of three Blackhawk and two Chinook helicopters and 46 support personnel provided by DOD's Southern Command (SOUTHCOM) in support of humanitarian relief missions from January 14 to 19. The total cost of SOUTHCOM's assistance was $450,000.

The February Earthquake

On February 13, a second disaster declaration was issued by U.S. Chargé d'Affaires Mark Boulware due to the damage caused by the February earthquake. USAID/OFDA provided $25,000 to USAID/El Salvador for the local purchase of emergency relief supplies.

A USAID/OFDA assessment team was deployed to El Salvador from February 13 to March 3 and coordinated relief efforts with the El Salvadoran Red Cross, COEN, the U.S. Embassy, and USAID/El Salvador. Based upon the assessment team's evaluation, USAID/OFDA provided $2,688,000 to USAID/El Salvador for grants to CHF, CARE, Samaritan's Purse, PCI, SC/US, and LWF for the construction of 8,944 temporary shelters in the departments of Ahuachapan, Cuscatlan, La Paz, and San Vicente. These shelters also utilized USAID/OFDA plastic sheeting in the construction.

USAID/OFDA provided $730,000 for the local purchase of relief supplies, administrative support, the establishment of 18 temporary health posts, and the construction of 50 permanent houses for single mothers. USAID/OFDA funds also supported the temporary provision of potable water to three hospitals to meet interim needs until water tanks were installed. The relief supplies, consisting of 10,000 blankets, 10,000 mattresses, 14,000 five-gallon water containers, and 15,035 three-gallon water containers, were consigned to CARE, SC/US, and Samaritan's Purse for distribution to earthquake-affected families in the departments of Cuscatlan, La Paz, and San Vicente.

USAID/OFDA airlifted an additional 13,824,000 sq. ft. of plastic sheeting to El Salvador for consignment to local and international NGOs for the construction of emergency shelters following the February earthquake. The total cost of the plastic sheeting and other commodities airlifted by USAID/OFDA in response to the two earthquakes was more than $2.1 million, including transport.

In addition to the emergency relief assistance, USAID/OFDA provided $3 million and USAID/OTI provided $2 million to USAID/El Salvador as a portion of USAID/BHR's contribution to earthquake reconstruction activities. This assistance was part of the USG's overall pledge of $110 million for a reconstruction program in El Salvador.

USAID/FFP contributed 1750 metric tons of emergency food commodities, valued at $926,100, to WFP. SOUTHCOM provided the services of one Chinook helicopter and two Blackhawk helicopters to respond to requests and priorities established by COEN and the El Salvadoran armed forces. The helicopters were in El Salvador from February 14 to 16 at a cost of $116,000.

Source: U.S. Office of Foreign Disaster Assistance, 2001.
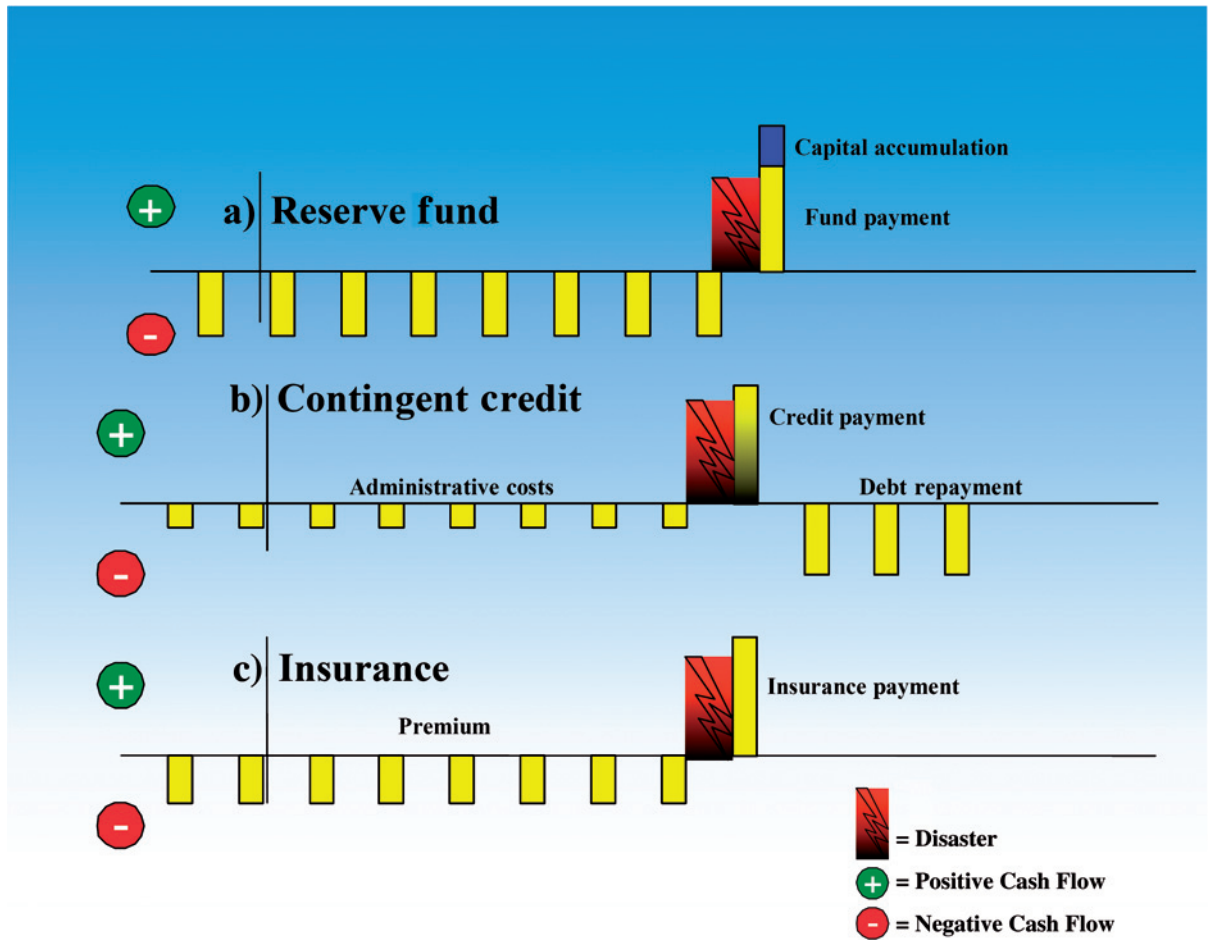
FIGURE 7-1   Illustration of expenditures and payouts for reserve funds, contingent credit, and insurance. (*Source:* Pflug, 2002.)

Loans

Because most governments and communities will be unable to fully fund their recovery efforts through emergency funds and donations, it may be necessary to secure loans to cover what costs remain. There are a number of ways in which money can be borrowed by governments in times of emergency. The most common source of funding in developing countries are the International Financial Institu-

tions (IFIs), detailed in Chapter 10. Private loans may have prohibitively high interest rates or may be difficult for the affected country to secure. Emergency loans from the IFIs, for which systematic processes have been developed, involve a much faster and easier approval process and may feature a delayed payment schedule and lower interest rates. Unfortunately, these emergency loans may be made on top of a heavy existing loan burden, so the affected government may eventually find itself

cutting other programs in order to cover the future loan payments.

Another form of loan is **contingent credit**. With this form of borrowing, governments pay creditors (usually private or international banks) a regular periodic fee that guarantees them the right to draw down emergency funds in the event of a disaster. The funds are pre-approved and rapidly disbursed to the affected government. With contingent credit, governments do not need to pay any interest or principal payments until after the funds are actually drawn down (as opposed to other loan forms, where these payments are likely to begin immediately upon approval of the loan). This loan form is most effective for countries with low risk for catastrophic disaster.

A third option for countries that already have loans for other development projects is **loan diversion**. In loan diversion, money that has already been disbursed for other projects may be used to pay for postdisaster recovery expenses. The advantage of this option is that the country does not incur any additional debt as result of the action. The disadvantage is that whatever development project the money was diverted from will probably not be completed on time, if at all.

It is important to note that loans present a unique opportunity in that the lender may impose restrictions on how the funds may be used. This is significant in that it can help to increase disaster resilience within the affected nation. For example, the World Bank may require that construction to rebuild damaged or destroyed hospitals adhere to the most current building codes and use the most advanced mitigation technologies.

Many of the poorest nations affected by disasters are already so burdened with debt that they are unable to assume any additional loans. These countries, many of which expend a substantial percent of annual GDP on repaying international debt, literally have no room to expand their budgets. Despite the occurrence of the disaster, they are still liable for pre-existing debt payments while they are trying to manage the current situation. The option of **debt relief** has been explored for

countries facing this predicament rather than have the international community supply these countries with more money, proponents of debt relief argue that it would make more sense to cancel or reduce their debts so the money earmarked for debt repayment could now be transferred to funding recovery. The counter-argument is that many of these countries are in such grave debt in the first place because of corruption and poor financial management, which would only increase following debt relief, and the affected population would never enjoy the true benefits from relief measures.

Catastrophe Bonds and Weather Derivatives

Catastrophe (CAT) bonds are special high-return bonds issued before a disaster occurs. Some CAT bonds pay interest rates as high as 15%, which greatly exceeds most bonds on the international market. What makes a CAT bond relevant to disaster management is that the bond issuer may be freed from paying either the interest or the principal of the bond if the issuer suffers the consequences of a major disaster. Selling CAT bonds began in 1992, after Hurricane Andrew in the United States, when especially hard-hit insurance companies saw them as an option to spread risk across an even wider area (Kahn, 2004). International development banks and national governments have also begun to explore the CAT bond market, though not to any significant degree.

Weather derivatives are investment instruments that can be used to protect against adverse climate effects, such as extreme temperatures, heavy rainfall, or drought. An investor, who agrees to pay a claimed amount if a condition stipulated in the derivative occurs, buys the derivative. For instance, farmers can sell a derivative that covers their losses if lower-than-optimal rainfall results in low crop yields. Weather derivatives are related to insurance, but cover higher-probability events than insurance usually does (Investopedia.com, n.d.). As with CAT bonds, the purchaser receives an agreed-upon amount if no disaster befalls the entity selling the derivative.

Private Development Funding

Much of the disaster recovery burden will fall on the shoulders of private businesses and individuals. Those who haven't been provided with insurance or recovery funds will have to spend their own money to repair or rebuild their home or business. Many who do receive funding are likely to receive it in the form of a loan, which they will ultimately be required to repay. These private expenditures are the greatest cause of economic hardship following disasters. Businesses may fail or be required to lay off employees to cover expenses, and citizens may have drastically reduced expendable income to inject into the local economy.

What is most difficult for recovery planners is ensuring that private expenditures for development funding, which are likely to be completely independent of any coordination mechanism, support disaster risk reduction. Unfortunately, most people will not understand or know how to reduce their future risk to similar hazards. And, even if they do understand how, it will be difficult to convince them to spend their already-strained resources on mitigation measures that only increase the cost of rebuilding their lives. Public education and increased legal restrictions on minimum construction standards are often the only ways of reading this goal.

Incentives

Local or regional governments often offer incentives for private development in order to speed up the rate at which private relief funding is applied and to attract external funding from other parts of the country, region, or world. A number of options are open to governments to lure private investment, all of which are based on the fact that demand for real estate will always exist among businesses and homeowners, and the competition between possible locations often boils down to the amenities each offers. By providing incentives such as tax breaks for homeowners, business and employees, tax-exempt bond financing, and

other measures, businesses and individuals may be more likely to take a risk and invest in the affected area over other less risky areas with fewer financial incentives.

Tax Increases

It is possible to spread the cost of refinancing among the affected population, or across all of those affected or unaffected within the tax base, by increasing tax revenues to cover some of the recovery expenses. Unfortunately, many victims are likely to find themselves without any spare cash, so an increase in taxation is likely to be very unfavorable to them, and therefore, politically unattractive to those elected officials who would be responsible for passing the tax increase legislation.

Allocation of Relief Funds

How government emergency relief funds and supplies are disbursed is wholly dependent upon the affected government's preferences and abilities. In most cases, the national government will be given international funding in addition to whatever funding it has in reserve or has reappropriated. While some governments do allow funding to go directly to the victims to cover housing or other personal expenses, they may choose to keep the money at the government level to spend on large-scale projects. Alternatively, these funds may be disbursed as direct grants or as loans that must be repaid. In other cases, international funds will be given to international relief agencies operating in the affected zone, such as Feed the Children, CARE, or Médecins Sans Frontièrs (see Figure 7-2).

Because international relief funding averages close to $10 billion each year, the potential for corruption exists and is relatively common (Willits-King and Harvey, 2005). The speed with which humanitarian relief must be provided often makes monitoring and auditing of funds more difficult than in more traditional devel-

opment processes. For this reason, humanitarian aid is not often given directly to governments that are labeled as excessively corrupt by international groups like Transparency International, but rather to multilateral organizations or to the relief providers themselves.

Personnel

In the recovery period following a disaster, personnel needs for cleanup, repair, and development will be excessive. These range from unskilled or untrained laborers and volunteers to experts in technical fields relating to infrastructure, construction, planning, logistics, and specialized equipment. Without ample personnel, the community may find itself with enough

funding and materials to rebuild but without the personnel to support the workload.

The most important personnel source is the affected region itself. These individuals, whether personally affected by the disaster or not, have the most vested interest in the outcome of the recovery effort and are most in tune with the community's character. Many are likely to need immediate employment. As recovery efforts often require long-term commitments, locally hired workers are more likely to be able to commit to the full course of the reconstruction effort and are less likely to suffer from recovery and reconstruction "burn-out." Using workers from the local economy has the added benefit of ensuring that more recovery funding stays within the community,
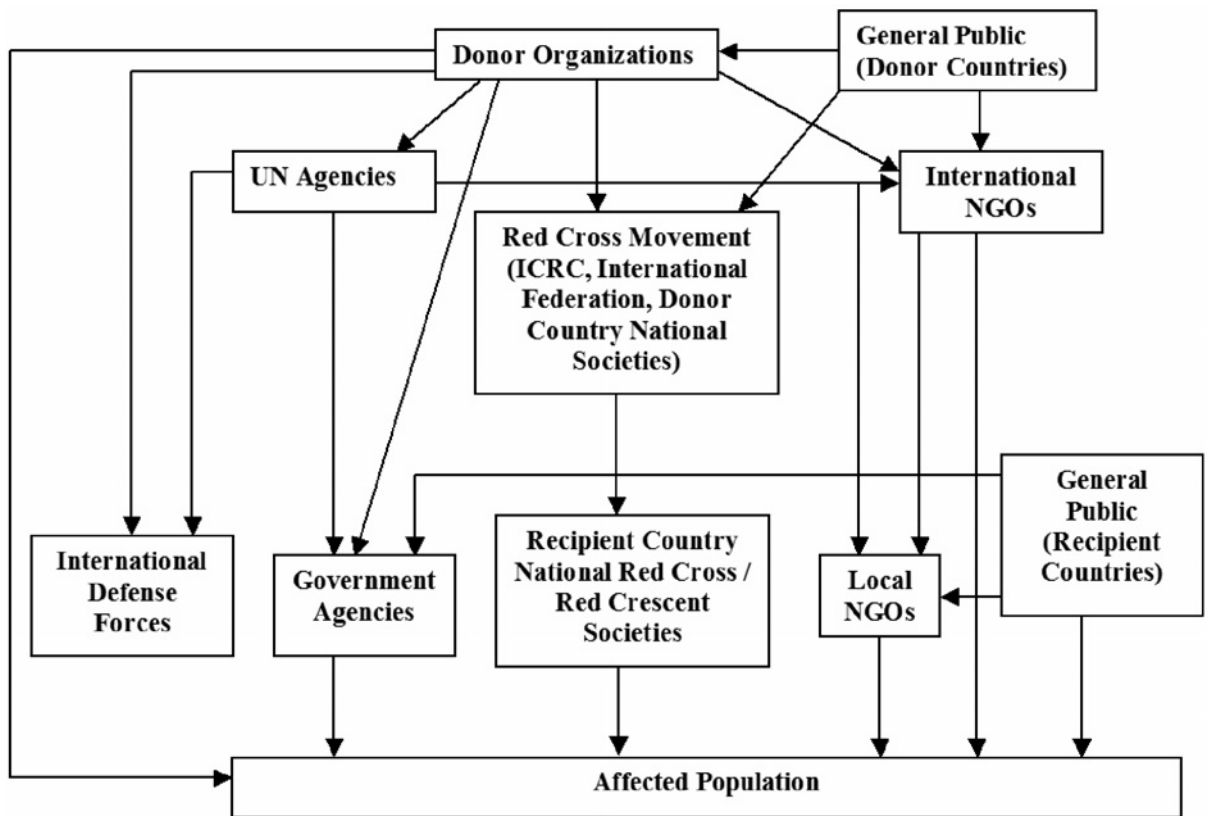
FIGURE 7-2   Common routes of relief and recovery funding from donors to recipients. (*Source:* Borton, 1996 and Macrae, 2002.)

EXHIBIT 7-3   Food for Work Programs

Food for work programs are recovery programs that provide food aid for victims in exchange for work on repair and reconstruction projects. The basic tenet of these programs are that victims are provided with a much-needed resource (food), while the community directly benefits from the work that they conducted. When successful, these programs are effective in reducing the feeling among victims that they are merely begging for handouts, and they help recovery planners to increase the feeling among victims that they have an active stake in how their community recovers. Food aid programs must be designed such that they do not benefit individuals in good health and physical condition over those who are unable to work.

which in turn helps to spur long-term economic recovery. Wages must be set competitively, but not set at a level so high as to draw workers out of other jobs, destabilizing any remaining balance in the local workforce (see Exhibit 7-3).

A second source of personnel is the many national and international nongovernmental agencies that assist in development and recovery. These groups provide funding, personnel, and expertise for any number of recovery components. For instance, Habitat for Humanity provided all needed materials and personnel to build over 5000 houses in Central America and the Caribbean after Hurricane Mitch.

Military forces, both local and from other countries, are often called upon to rebuild disaster-stricken areas. As disasters have become progressively more destructive, the military has been called upon for humanitarian assistance to a greater degree. The military can be ideal for such projects because of their sheer numbers, maneuverability, technical expertise, equipment, manageability, and relatively low cost.

Finally, private contractors from around the country and the world may be lured to work in the affected area. Local contractors will quickly find themselves overbooked. Technicians with equipment needed to repair infrastructure components, such as electrical lines, communications systems, or water pipes, will have much more work than they can handle. Therefore, outside assistance may need to be called on to speed up the pace of recovery.

TYPES OF RECOVERY

Countries and communities are comprised of diverse levels of organization, from the individual to the central government body. In a disaster's aftermath, a great many of these societal components probably will have sustained some form of injury, damage, or other negative consequence that collectively result in a greater need for recovery. Though the range of activities required to address these needs is as varied as if one were building the community from scratch, specific categories of assistance are common after almost all forms of disaster: public assistance, housing, economic recovery, and individual, family, and social recovery. Each category is described below.

PUBLIC ASSISTANCE

Public assistance recovery includes all aspects of recovery that fall within the public domain. Generally, these are the structures, systems, and services related to government. Because the government is ultimately responsible for its protection, the environment is also included in this category.

Disasters impact a government's operational capacity as a result of:

- Damage or destruction of government facilities
- Loss or injury of government employees
- Loss of government files and other important information
- Lack of resources (e.g., electricity, water, communications)
- Political instability

Reconstruction of government infrastructure and resumption of a government's operational capacity are vital to establishing a setting in which recovery is possible. Many actions that facilitate recovery functions require approval or assistance from government officials or facilities. The government's return to some level of operational effectiveness signals to victims that they will receive disaster assistance and that safety and security will be provided. In a complex humanitarian emergency, however, resumption of government may not be possible, especially if no accepted government exists.

In most countries, infrastructure is publicly owned and maintained. It is the government's responsibility, therefore, to fund and oversee its repair and reconstruction. When infrastructure components are privately owned, it still may fall upon the government to fund or support repair and reconstruction, as security and recovery of the affected area will depend heavily on such measures.

Many disasters produce a large quantity of debris, including trees, mud, rock, destroyed housing, damaged property and possessions, automobiles, boats, and other material. All of this material, much of which is cleared in the response phase, also must be removed and disposed of. Government agencies responsible for debris removal and disposal need to identify appropriate disposal sites based on estimates of the type and quantity of debris (taking into account the hazardous nature of certain types). Next, they must collect and clear the debris, which usually requires private contractors because regular garbage and debris clearance capacities will be quickly overwhelmed. Hurricanes and earthquakes, for example, regularly generate as much debris in a few hours as a municipality normally collects over five or more years.

Debris clearance must be coordinated with the public in order for it to be successful. Public education efforts that explain where debris may be left for collection, what may be disposed of, and when it will be collected will help facilitate the cleanup effort. Many houses and buildings will need to be demolished, adding to the total volume of debris that must be accommodated in the disposal sites. Much of the debris

material, such as bricks, wood, and plastics, for example, are often recyclable for use in the reconstruction process. When proper planning accounts for sorting and recycling, the overall need for reconstruction resources can be greatly reduced.

Finally, it is the government's responsibility to address the recovery of the environment, which tends to suffer greatly during times of disaster. Much of the undeveloped environment falls under the government's ownership and care. As was noted in Chapter 6, the environment has many features that contribute to a community's resilience to certain hazards. For example, wetlands, mangrove swamps, and dunes all offer protection from hazards such as cyclonic storms, floods, and severe weather storms. These environmental features may be destroyed during a disaster and require rebuilding to ensure that their protection is regained. Failure to address these losses will result in an increase in future risk.

Pollution is another common consequence of disasters. Hazardous materials will have been released from a variety of sources (e.g., flooded cars, damaged holding tanks, leaking pipes) and may now pose a great threat to people, animals, agriculture, and the environment. Floods may have polluted groundwater, wells, and bathing sites. Mud may be contaminated with fuels, bacteria, and chemicals. The air may have toxic particulates, vapors, and smoke. It will be contingent upon the government to monitor the land, air, and water and treat any pollutants discovered to be at unacceptable levels.

THE HOUSING SECTOR

Housing throughout the affected area will exhibit differing levels of damage and destruction due to its composition, location, elevation, and proximity to the hazard, among other factors. The government's first priority will be to supply housing inspectors, who can determine which structures are capable of repair, which must be demolished, and which require no work at all. There likely will not be enough locally trained and hired inspectors to quickly perform

this task, so outside assistance will be required immediately.

The actual cost of housing repair and reconstruction ultimately falls on the homeowners. Many victims will lack the financial resources to rebuild, and will therefore need to turn to outside assistance. Unfortunately, this assistance is not always available, and there have been situations, such as after the 1985 earthquake in Mexico City, in which victims were still without permanent housing almost 15 years after the disaster occurred.

Housing reconstruction is most successful when it is performed by or with input from the recipient population. Housing constructed by resources from within the community, as opposed to external contractors, tends to cost less and is more acceptable to the recipients. It also ensures that relief funding and locally secured funds remain within the local economy.

Victims who are able to reconstruct immediately will want to begin as soon as possible. Although the speed at which they are able to commence will impact morale, planners must ensure that vulnerabilities are not repeated. To manage this problem, planners must quickly identify which areas are able to begin reconstruction without significant reengineering and which require further evaluation. This will reduce dependence on temporary housing and provide a "sense of progress while other housing rebuilding issues are deliberated" (Patterson, 1999). For those areas that require further evaluation and analysis, a construction moratorium may be imposed and building permits denied. Using information gained through these further evaluations, the government can require mitigation measures to reduce future risk, such as measures that call for raising houses above flood levels or strengthening them from wind or shaking. While incorporating hazard-resistant design into construction plans is important, it is equally important that the resulting house is not built in a way that is culturally unacceptable to the recipient.

For areas where the risk of rebuilding is too great, it is best that the homeowners abandon their plans and seek alternative sites to construct their new homes. Forcing these people from their land may be legally impossible, so incentive programs must be created. The most popular are housing buyout schemes, where homeowners in a highly risk-prone area are given fair market value for their homes. As the new property owner, the government can reserve the risk-prone area for parks or other non-structure-dependent uses.

In informal settlements, which are common on the outskirts of cities in developing countries, it may be difficult for victims to prove ownership of the land or show title for a damaged or destroyed house. Most informal settlements exist because the land was originally left undeveloped due to an existing hazard risk. In a disaster's aftermath, governments have a unique opportunity and ample assistance to move entire populations out of these high-risk areas into safer zones with supplied public housing and access to resources. The "Special Considerations" section at the end of this chapter expands on this issue.

Economic Recovery

Disasters place pressure on local, national, and, in the largest disasters, international economies. Lost resources, lost production, lost jobs, lost business opportunities, and heavy government expenditures all contribute to economic downturns that must be stabilized and then reversed.

Individual local economies are sustained by a unique set of drivers, which might include tourism, mining, manufacturing, crafts, services, agriculture, or education. Communities grow around and become dependent on the success of these industries, and their citizens acquire skill sets and training tailored to these industries. Support and service industries, such as transportation, communications, public relations, and shipping, will have developed around these core industries as well. Thus, economic recovery must begin with the recovery of these local economic drivers.

Revitalizing the local economy must be a priority for recovery planners. It is vital that local businesses return to full capacity, especially in the immediate

recovery period when significant amounts of recovery funding are injected into the affected area. If local businesses are unable to capitalize on that funding, outside contractors are sure to step in and reap the monetary benefits. The ultimate consequence of such an outcome will be that the injected cash is not used to support the local economy.

If large amounts of funding and investment have been collected in the early periods of recovery, it may be possible to revitalize the economy by improving previously existing business infrastructure. Almost all damaged or destroyed infrastructure components, such as communications, facilities, Internet access, and equipment, can and should be rebuilt to the most modern standards, so the overall economic potential is greater than predisaster conditions. Preexisting problems that may have prevented economic expansion, such as a lack of useable industrial or office space or poor transportation options, may be easier to resolve in the postdisaster climate (Spangle and Associates, 1991).

How well a community recovers tends to directly follow how well that community was doing economically before the disaster occurred. Businesses that had previously enjoyed success are much more likely to have the reserves to carry them through the difficult period of recovery than businesses that were operating on the brink of bankruptcy even before the disaster occurred. Successful communities are more likely to have the levels of civic pride and cohesion necessary to collectively move forward and even exceed predisaster prosperity levels, while communities that had been failing will only deteriorate further (Spangle and Associates, 1991).

Unemployment is a common disaster consequence. Job loss comes as a double blow to victims, who must not only dip into any savings they may have to support their families in the short term but also attempt to recoup their home and property losses. Unemployed victims are more likely to depend on handouts rather than purchase items from the local market, which may further slow the local economy. And without adequate jobs, psychological stresses and depression quickly increase. Fortunately,

boosting employment in the affected region can address each of these needs, allowing for victims to regain their sense of independence and pride while injecting much-needed money into the damaged local economy. Because most of the initial recovery needs, such as demolition and debris clearance, are labor intensive, this process can begin almost immediately.

The quality of recovery planning and coordination will affect employment in several ways. First, only efficient provision of recovery services, including the distribution of relief (goods and water, for instance) will allow residents time to dedicate to a job. Poor relief distribution that requires victims to wait in line for hours or travel long distances prevents them from being able to take advantage of job opportunities. Second, victims must be provided with the means to accept jobs that are created, including any needed training, transportation, or application assistance. Employers must consider the extra commitments that victims may have outside of work, such as rebuilding their homes, ensuring their children attend school or have adequate day care, or attending medical appointments.

Many businesses affected by the disaster will ultimately fail, resulting in a loss of long-term jobs. This is especially true with small businesses. Statistics in the United States have shown that 25% of small businesses forced to close as a result of a disaster never reopen and 40–60% will close permanently within two years of the disaster. Recovery funding can address this problem and, in doing so, retain jobs that would otherwise be lost. Microcredit and "start-up" business grant schemes have been found to be successful after disasters in many countries for helping small businesses to stay in business and helping new businesses get off to a stronger start.

INDIVIDUAL, FAMILY, AND SOCIAL RECOVERY

A community's recovery is closely tied to the physical and mental health of its individuals, families, and social groups. Even if every building, infrastructure

component, and house is repaired, the community will continue to suffer unless its social needs are addressed. While this need exists after any disaster, the degree of need grows incrementally with the number of injured and killed. Social recovery from complex humanitarian emergencies, where a full breakdown in security is also likely to have occurred, often requires considerable attention.

Regardless of the level of injury or loss sustained, all people in the affected area will face a certain amount of emotional distress and anxiety. Disasters are stressful and troubling because they force people to confront their vulnerabilities and may shatter any assumptions people have had about their ability to avoid catastrophe. Those who are injured, lose family members or friends, or lose a job, home, or property experience this to an even greater degree. Their lives are disrupted and dislocated, and their future may suddenly seem very uncertain. Research has shown that children are especially susceptible to emotional distress.

The emotional pain, suffering, and loss during and following disasters can lead to psychosocial problems, including post-traumatic stress disorder in the most severe cases (detailed in Exhibit 7-4). Victims coping with the aftermath of a disaster exhibit a wide range of reactions, most of which are normal given the circumstances. Most of these victims (including first responders) will fail to consider themselves in need of mental health services and therefore are unlikely to request them. Both a cadre of counselors and a community outreach program must be established to ensure that help is available and that victims know why and how to get help.

Physical disability is another problem exacerbated by disasters. First, disaster-related injuries cause an increased need for physical rehabilitation over the affected communities normally handled. Second, those with prior disabilities will find themselves at a great disadvantage when the social and physical infrastructure upon which they depend is damaged or destroyed. The following list details ways in which disasters may affect the physically injured and disabled (adapted from WHO, 2005):

- For victims with existing disabilities:
  - In comparison to their nondisabled peers, persons with disabilities can be more at risk of disasters.
  - Many people with disabilities lose their assistive devices, such as artificial limbs, crutches, hearing aids, and eyeglasses.
  - Persons with disabilities can have greater difficulty accessing basic needs, including water, food, shelter, latrines, and healthcare services.
  - Rehabilitation infrastructure may suffer damage or destruction and rehabilitation personnel, including primary caregivers, may be killed, injured, or diverted to other tasks.
- For victims with injuries and/or newly acquired disabilities:
  - Untreated or inadequately treated fractures and infected wounds may lead to severe and long-lasting disabilities.
  - Referral of victims to appropriate health facilities may become difficult or impossible.
  - There may exist a scarcity of locally available health and rehabilitation personnel to deal with the "new generation" of people with disabilities.
  - Those who are injured will be at a distinct disadvantage in receiving aid and recovery assistance compared to their noninjured peers, and may be at greater risk of developing mental health issues.

Cultural Recovery

After disasters, communities often find that their cultural heritage has been devastated or completely destroyed. Historic buildings and other structures, art, items of clothing, and landmarks may have been lost. The loss of these cultural components may result in a loss of identity for the community, who are now residing and functioning in buildings that do not address their cultural needs, customs, or preferences. They may be wearing donated clothing that is not normal for them, and eating food they are not used to.

EXHIBIT 7-4   Post-Traumatic Stress Disorder

What Is Post-Traumatic Stress Disorder?

Post-traumatic Stress Disorder, or PTSD, is a psychiatric disorder that can occur following the experience or witnessing of life-threatening events such as military combat, natural disasters, terrorist incidents, serious accidents, or violent personal assaults like rape. People who suffer from PTSD often relive the experience through nightmares and flashbacks, have difficulty sleeping, and feel detached or estranged, and these symptoms can be severe enough and last long enough to significantly impair the person's daily life.

PTSD is marked by clear biological changes as well as psychological symptoms. PTSD is complicated by the fact that it frequently occurs in conjunction with related disorders such as depression, substance abuse, problems of memory and cognition, and other problems of physical and mental health. The disorder is also associated with impairment of the person's ability to function in social or family life, including occupational instability, marital problems and divorces, family discord, and difficulties in parenting.

How Does PTSD Develop?

Most people who are exposed to a traumatic, stressful event experience some of the symptoms of PTSD in the days and weeks following exposure. Available data suggest that about 8% of men and 20% of women go on to develop PTSD, and roughly 30% of these individuals develop a chronic form that persists throughout their lifetimes.

The course of chronic PTSD usually involves periods of symptom increase followed by remission or decrease, although some individuals may experience symptoms that are unremitting and severe. Some older veterans, who report a lifetime of only mild symptoms, experience significant increases in symptoms following retirement, severe medical illness in themselves or their spouses, or reminders of their military service (such as reunions or media broadcasts of the anniversaries of war events).

How Is PTSD Assessed?

In recent years, a great deal of research has been aimed at developing and testing reliable assessment tools. It is generally thought that the best way to diagnose PTSD—or any psychiatric disorder, for that matter—is to combine findings from structured interviews and questionnaires with physiological assessments. A multi-method approach especially helps address concerns that some patients might be either denying or exaggerating their symptoms.

Who Is Most Likely to Develop PTSD?

1. Those who experience greater stressor magnitude and intensity, unpredictability, uncontrollability, sexual (as opposed to nonsexual) victimization, real or perceived responsibility, and betrayal
2. Those with prior vulnerability factors such as genetics, early age of onset and longer-lasting childhood trauma, lack of functional social support, and concurrent stressful life events
3. Those who report greater perceived threat or danger, suffering, upset, terror, and horror or fear
4. Those with a social environment that produces shame, guilt, stigmatization, or self-hatred

What Are the Consequences Associated with PTSD?

PTSD is associated with a number of distinctive neurobiological and physiological changes. PTSD may be associated with stable neurobiological alterations in both the central and autonomic nervous systems, such as altered brainwave activity, decreased volume of the hippocampus, and abnor-

mal activation of the amygdala. Both the hippocampus and the amygdala are involved in the processing and integration of memory. The amygdala has also been found to be involved in coordinating the body's fear response.

Psycho-physiological alterations associated with PTSD include hyperarousal of the sympathetic nervous system, increased sensitivity of the startle reflex, and sleep abnormalities.

People with PTSD tend to have abnormal levels of key hormones involved in the body's response to stress. Thyroid function also seems to be enhanced in people with PTSD. Some studies have shown that cortisol levels in those with PTSD are lower than normal and epinephrine and norepinephrine levels are higher than normal. People with PTSD also continue to produce higher than normal levels of natural opiates after the trauma has passed. An important finding is that the neurohormonal changes seen in PTSD are distinct from, and actually opposite to, those seen in major depression. The distinctive profile associated with PTSD is also seen in individuals who have both PTSD and depression.

PTSD is associated with the increased likelihood of co-occurring psychiatric disorders. In a large-scale study, 88% of men and 79% of women with PTSD met criteria for another psychiatric disorder. The co-occurring disorders most prevalent for men with PTSD were alcohol abuse or dependence (51.9%), major depressive episodes (47.9%), conduct disorders (43.3%), and drug abuse and dependence (34.5%). The disorders most frequently comorbid (occurring together) with PTSD among women were major depressive disorders (48.5%), simple phobias (29%), social phobias (28.4%), and alcohol abuse/dependence (27.9%).

PTSD also significantly impacts psychosocial functioning, independent of comorbid conditions. For instance, Vietnam veterans with PTSD were found to have profound and pervasive problems in their daily lives. These included problems in family and other interpersonal relationships, problems with employment, and involvement with the criminal justice system.

Headaches, gastrointestinal complaints, immune system problems, dizziness, chest pain, and discomfort in other parts of the body are common in people with PTSD. Often, medical doctors treat the symptoms without being aware that they stem from PTSD.

How Is PTSD Treated?

PTSD is treated by a variety of forms of psychotherapy and drug therapy. There is no definitive treatment, and no cure, but some treatments appear to be quite promising, especially cognitive-behavioral therapy, group therapy, and exposure therapy. Exposure therapy involves having the patient repeatedly relive the frightening experience under controlled conditions to help him or her work through the trauma. Studies have also shown that medications help ease associated symptoms of depression and anxiety and help with sleep. The most widely used drug treatments for PTSD are the selective serotonin reuptake inhibitors, such as Prozac and Zoloft. At present, cognitive-behavioral therapy appears to be somewhat more effective than drug therapy. However, it would be premature to conclude that drug therapy is less effective overall since drug trials for PTSD are at a very early stage. Drug therapy appears to be highly effective for some individuals and is helpful for many more. In addition, the recent findings on the biological changes associated with PTSD have spurred new research into drugs that target these biological changes, which may lead to much increased efficacy.

Source: National Center for PTSD. n.d.

Cultural recovery must come from within the community, though outside assistance may be able to facilitate it. Festivals and observances must be restarted as soon as possible. A return to normal dress and food must take place. Preserving and repairing historic structures that are salvageable, as well as collecting building materials from those destroyed, can signal to victims that their community spirit has been retained. These structures will often become the centerpieces around which social recovery is achieved. All external recovery officials must recognize, respect, and even celebrate local cultural and associated customs. Doing so will help not only to speed up the community's social recovery but to ensure that the community is able to accept their community in its recovered state.

Education

It is often said that the youth are a community's future. This cliché takes on new meaning when a community is faced with repairing a damaged or destroyed education infrastructure. Schools may be unusable, teachers may have been injured, killed, displaced, or have conflicting responsibilities, educational materials may have been lost or destroyed, and students may have been relocated far away from their schools.

According to Article 26 of the Universal Declaration of Human Rights adopted by the UN in 1948, everyone has a right to education. This right is not suspended during times of disaster. In fact, the need for education goes even further in times of disaster. Schools may be the best way to ensure that children remain safe. They are the most effective way to teach children new skills that are necessary in the postdisaster period, such as hygiene and safety. Schools help to free up parents so that they can either go to their job or attend to other relief needs. Finally, children are most likely to feel a sense of normalcy and therefore stay mentally healthy if they are given the chance to participate in something as familiar as school.

Governments have a responsibility to help provide temporary facilities, educators, and materials during the short term and to rebuild permanent facilities for the long term. Many nonprofit and multilateral agencies specialize in providing disaster education while long-term facilities are designed and constructed. Disasters may provide an opportunity for education to be modernized and otherwise improved, as there will be the chance to review and update the curriculum, to incorporate modern technology and practice into school design, and to provide occupational training to teachers.

SPECIAL CONSIDERATIONS IN RECOVERY

RESISTING THE URGE TO RETURN TO "NORMAL"

The greatest obstacle that disaster managers face in the recovery phase is the community's urge to rebuild and return to its predisaster status—often referred to by victims as "normal." This sentiment will first emerge in the short-term phase as a drive to prove that, despite its consequences, the disaster did not defeat the victimized communities. Then, in the long-term recovery phase, as victims continue to live in a state of reduced quality of life (usually as a result of temporary housing, dependence on aid, and/or lost income, among other factors), they will want to return to their old life as quickly as possible simply to put an end to the inconveniences they are experiencing.

This overarching public sentiment will create tremendous pressure for disaster managers. The public outcry will be echoed, and even amplified, by the news media, which will focus on the most extreme cases of victim discomfort and state that disaster recovery is taking too long. Businesses that are losing valuable opportunities soon will join the chorus of disapproval. Pressure will begin to build on the shoulders of politicians at all government levels, who will respond by placing additional demands on the disaster managers.

Many people victimized by disasters feel that the answer to the recovery problem is simple—replace what was destroyed. The "lightning never strikes twice" mentality may tell them that they no longer

need to worry, since the disaster finally occurred. However, the fact that the hazard event did occur and that a disaster did result is evidence that the community as previously existed was ill-prepared. Therefore, simply rebuilding to predisaster specifications would only retain any preexisting vulnerabilities the disaster exposed.

RECOGNIZING THAT RECOVERY IS AN OPPORTUNITY IN DISGUISE

Despite the misery, destruction, and disruption disasters cause, it is often said that the recovery period presents an opportunity in disguise. This relates not only to the chance of increasing community resilience to future disasters but also to economic revitalization, urban improvement, rezoning, modernization, and many other areas. The spectacular nature of a disasters aftermath, the wide scope of elements affected, and the attention and need placed upon recovery and reconstruction present a real opportunity to create a better, more resilient, and more successful community, an opportunity that would rarely exist otherwise. However, as was mentioned earlier, the pressure to rebuild as quickly as possible makes such an opportunity difficult to exploit.

During the predisaster period, the community may have analyzed their risk and even come up with a broad range of mitigation options. Due to expense or feasibility problems, they may have discarded many of these options. After a disaster, conditions change considerably. Budgets may swell with relief funding. Buildings that required very expensive retrofitting may have been destroyed, allowing for much cheaper "mitigation through design" to be performed. Residents of high-risk areas where housing should never have been built in the first place and subsequently was destroyed by the disaster, may be more easily convinced to relocate or may be prevented from rebuilding. Unknown risks from unmapped or poorly understood hazards will now be easier to incorporate into development plans and thus avoid.

The postdisaster period can be one of the best times for a community to enhance its risk- and disaster-related statutory authority. During the recovery period, when the disaster is still confronting victims or is fresh in their memory, leaders will enjoy much greater success in enacting legislation and policy decisions that help the community to increase resilience and decrease vulnerabilities. The community may be willing to agree to new building code, zoning, and environmental policies that might result in higher building costs or taxes during this period, when the proverbial window of opportunity is "open."

Throughout the recovery process, recovery planners must be sure to align any recovery efforts with the community's needs and goals. This also is true for new opportunities. Communities may have already been planning improvements before the disaster occurred. In communities that developed with little or no planning, recovery can provide the rare opportunity to apply lessons learned on a grand scale, creating an end product that is much more conducive to the community's social and commercial activities and needs. Planners who apply the philosophy of letting community members guide themselves through recovery and reconstruction will likely find a great deal of acceptance, enthusiasm, and success.

Examples of changes to community design that can reduce hazard vulnerability and be made in the recovery period include:

- Redistribute emergency resources (fire, police, emergency medical)
- Rezone to account for new hazard information
- Adjust building codes and ensure that all repairs and reconstruction are made to code
- Restrict building within zones of greatest risk (e.g., in the floodplain, on unstable ground, below landslide risk zones)
- Create natural fire breaks
- Design adequate evacuation routes
- Construct public buildings that can double as shelters
- Reduce population density

- Widen primary roads to alleviate pressure (for evacuation or emergency response)
- Address problems related to informal settlements in high risk zones

Disaster managers and recovery planners can only capitalize on opportunities to reduce risk and improve the community if they are able to recognize their value and exploit them quickly. Examples include:

- The public, media, and government are likely to be much more receptive to information detailing disaster prevention, regardless of whether they were directly impacted themselves. The chance for policy, spending, and action on disaster mitigation and prevention measures is never as great as in the immediate aftermath of a disaster. The community, for the short term at least, will be very aware of their vulnerability and will be more likely to take action to reduce it than at any other time.
- The consequences of disasters initiate certain aspects of construction and community revitalization projects that previously may have been decided against or delayed due to cost or for other reasons. For instance, many old buildings slated for replacement may be destroyed or damaged beyond repair. Old infrastructure, which had been in need of updating, may be completely destroyed (such as aboveground power lines, old roads and bridges, or water and sewer pipes).
- The immediacy of victim needs will essentially "force" community leaders and other stakeholders to make difficult decisions about development that otherwise may have taken years to settle. This includes decisions related to disaster mitigation, such as buying out or relocating structures in the floodplain or building a new emergency management facility, for example.
- More accurate hazard information becomes available from a variety of academic and professional sources that otherwise might not have been interested in the region. These experts will likely conduct their assessments with their own funding, but share results among planners.

- Technical assistance provided by the various national and international relief agencies that respond to the disaster will allow for more accurate assessments, and will increase the chance that newly constructed building stock and infrastructure will adequately handle future disaster events.
- Financial assistance, whether from government, private, or international sources, may be available to fund construction to a level of safety that might not be possible using regular, local funds.
- Land use regulations may help to prevent reconstruction on areas that previously had been found unsafe but upon which structures had already been built and could not legally be removed.
- Damaged or destroyed infrastructure, such as roads, utilities, or government buildings, may be rebuilt in safer locations, and with modern hazard-resistant design (Natural Hazards Research and Application Information Center, 2001).

Disaster managers and recovery planners must have the ability to recognize what is possible regarding risk reduction and must quickly apply these new lessons learned to the overall recovery guidance they develop. The Natural Hazards Research and Application Information Center (NHRAIC) (2001) report that the ideal disaster recovery process is one in which the community proactively manages:

- Recovery and redevelopment decisions to balance competing interests so constituents are treated equitably and long-term community benefits are not sacrificed for short-term individual gains
- Multiple financial resources to achieve broad-based community support for holistic recovery activities
- Reconstruction and redevelopment opportunities to enhance economic and community vitality
- Environmental and natural resource opportunities to enhance natural functions and maximize community benefits
- Exposure to risk to a level that is less than what it was before the disaster

As mentioned, the recovery period is not limited to risk reduction alone. This period presents a perfect opportunity to right past wrongs, to fix existing problems, to rejuvenate old, failing, and dilapidated infrastructure and neighborhoods, and to inspire the community to take action like never before. Other quality of life issues that may be addressed include:

- Improving housing stock, increasing the safety of affordable housing, and increasing the overall value of property in the community
- Increasing the efficiency of transportation routes and traffic flow
- Increasing the quality of available healthcare within the community
- Greater public involvement in community planning and development
- Rebuilding schools, government buildings, utilities, and other facilities within the community to accommodate changes that have occurred since those facilities were first constructed
- Creating new green spaces by preventing reconstruction in high-risk areas, thereby creating new areas for recreation and public enjoyment
- Reducing unemployment, at least in the short term, by hiring victims to participate in the reconstruction effort, and revitalizing the community through development so long-term unemployment is reduced as well
- Improving the quality of education, including facilities, staff training, curriculum, equipment, and student materials

For more examples of ways in which the quality of life of the community or country can be improved in the recovery period of a disaster, see Exhibit 7-5. For obstacles to recovery, see Exhibit 7-6.

Ensuring Equity in Recovery

In studying how communities recover from disasters, it has been discovered that in the vast majority of situations the poor will bear a greater brunt of the disaster consequences and face much greater difficulty recovering than the wealthy. This is not much of a surprise, considering the resources available to the wealthy to ensure that risk is reduced before the disaster. For instance, the wealthy are much more likely to have purchased insurance, to have used disaster-resistant construction, to live in lower-risk neighborhoods, and/or to be educated in how to reduce risk and acquire recovery benefits if needed.

In the recovery period, it will be contingent upon disaster managers and recovery planners to ensure that disaster recovery assistance is distributed equitably, and that opportunities are spread evenly throughout the community. Planners must take an active role in this effort, as the wealthy often have the means and know-how to receive their share of what is available, while the poor are much more likely to lack these qualities, preventing them from accessing all available assistance benefits.

Inequity in recovery goods and services is not limited to inequities in wealth, however. Cultural beliefs and practices may place certain groups at a disadvantage. Racism, caste systems, and bigotry can cause groups to suffer disproportionately. The disaster providers themselves may contribute to these discrepancies if they knowingly or unknowingly follow the cultural or other beliefs that cause them.

Examples of situations where inequity in recovery can occur include:

- Although the rich may be able to afford to rebuild according to new standards and regulations, the poor may not be able to afford the higher construction costs.
- The poor may not have the time to wait in line for goods and services or have access to information about available goods and services.
- Racism, poverty, or other social discriminations may prevent groups from access to goods and services. Locally hired disaster relief and recovery employees may discriminate against victims and give preferential treatment to some groups over others.
- Newly built communities may require higher rents, property values, or property taxes, such

EXHIBIT 7-5   Recovery Strategies for Enhancing Quality of Life

Enhancing quality of life can start during disaster recovery. A community can start with the *situations* that exist after a disaster, pick and choose among the *options* for improving its quality of life and among the implementation *tools* available to help pursue each of those options, to develop *strategies* that are specially tailored to its own needs. The situations and options listed below are not exhaustive; rather, they are meant to give an idea of the range of possibilities. Likewise, the sample strategies below suggest ways in which some options and disaster-induced situations could be combined to help a community improve its quality of life.

Situation: Damaged transportation facilities
Recovery Strategies to Enhance Quality of Life:

- Rebuild to increase mobility. Circulation patterns should allow efficient and safe movement between home, work, and recreation, as well as effective evacuation. Rebuilding efforts should not threaten neighborhood integrity, historic and cultural resources, or environmental quality.
- Allow for alternative modes of transit such as walking and cycling. Create connecting paths and greenways for pedestrians and cyclists, with some common nodes for social interaction.
- Beautify the parking lots of public facilities. Upgrade outdoor parking lot facilities to integrate greening concepts and improve aesthetics. Community residents can be asked to compete in design competitions or tree planting and tree maintenance programs.
- Rebuild to enhance capacity. Increase the ability to bring people into a business district, and to move goods in and out of a community.

- Rebuild to improve functionality. Create a different circulation pattern; create and/or expand transit.
- Undo past mistakes and support redevelopment. Demolish an unneeded overhead freeway to re-establish a stronger urban pattern as a key element of economic revitalization of a district.
- Rebuild to promote more sustainable transportation systems. Change land use to promote higher density, mixed uses, and/or concentrated development in support of less auto-dependent transportation systems.
- Ask: Where are roadways and bridges being built? Will moving a road displace a neighborhood?
- Rebuild to improve resistance to damage. Older transportation facilities can be upgraded to more modern standards that make them more resistant to damage from floods, earthquakes, and other risks.
- Relocate, where feasible. In some cases, transportation facilities could be relocated or rerouted around hazard-prone areas.
- Reduce adverse impacts caused by transportation facilities. For example, certain roads and highways can act as dams during periods of flooding, obstructing the flow of runoff or floodwaters.
- Examine the impact of such facilities on encouraging development in hazard-prone locations. For instance, widening roads may actually stimulate additional development in risky areas.

Situation: Damaged public facilities
Recovery Strategies to Enhance Quality of Life:

- Make public facilities less vulnerable to future hazards. Move public facilities out of known

hazard zones but first study the impact of their new locations on future growth and transportation patterns in the community.

- Enhance educational opportunities by rebuilding or upgrading schools. Repairs, modernization, and upgrades should focus not only on structural safety but also on energy efficiency.
- Enhance public facilities and access to them by designing or redesigning schools to be magnets for recreation, sports, and meetings. Ensure that schools have recreational facilities and meeting rooms to host sports tournaments and other activities.
- Rebuild to transform/expand school facilities in support of economic strategies.
- Upgrade public spaces to support economic revitalization. Create new sidewalks and street furniture and plant street trees to create a downtown "civic living room" to enhance the pedestrian experience and increase commercial activity.
- Locate new public uses into a damaged area. Establish a community college branch in a downtown to expand activity and population. Establish a community center for displaced families and others to meet social goals and create higher activity level in support of economic goals.
- Rebuild key economic facilities to improve economic and environmental functionality. Rebuild a port facility with state-of-the-art characteristics resulting in greater capacity, reduced energy consumption, restoration of environmental features, enhanced pollution controls, and disaster-resilient design.
- Ask: What are the impacts of redevelopment decisions on vulnerable populations? Does a setback mean the loss of land?
- Protect against future damage by making such facilities more resistant to damage. For example, elevate buildings above the flood height or build a berm to help keep out floodwaters.

- Relocate to a less vulnerable area.
- Avoid building new public facilities in hazard-prone areas.

Situation: Damaged utilities
Recovery Strategies to Enhance Quality of Life:

- Relocate critical facilities and equipment out of known hazard zones or retrofit the facilities so that hardship and disruption of services is avoided.
- Create new infrastructure that supports economic growth while incorporating sustainable features. Rebuild a damaged telecommunications system for increased capacity; establish stormwater systems where none existed; increase capacities of water, wastewater, or power facilities to meet future economic needs; use disaster-resilient designs.
- Form partnerships with utility companies to upgrade the system. Add fiber optics or other advanced technologies in infrastructure when it is rebuilt.
- Safeguard power lines from damage by fallen trees by putting the lines underground.
- Move water or gas lines out of harm's way. For example, re-route utility lines around earthquake fault zones or floodplains.
- Protect existing facilities from damage, for example, by constructing berms around sewage treatment facilities located in floodplains.
- When planning to install new lines, identify the location of hazard-prone areas and try to avoid them.
- Build redundancy into the system. For example, be able to shift water or wastewater treatment capacity to treatment plants not located in hazard-prone areas.
- Develop plans to contain and treat spills from existing gas or wastewater treatment lines that may be damaged by natural disasters.

Situation: Damaged housing

Recovery Strategies to Enhance Quality of Life:

- Create disaster-resilient, affordable housing. Rezone parts of the community for affordable housing.
- Inventory damaged housing that has a history of abandonment and tax delinquency. Consider buyouts of these properties to eliminate eyesores and to reduce potential negative impacts on property values and potential health threats.
- Move toward energy-efficient buildings. Provide education forums and advice for home and business owners on techniques and funding sources to replace aging, damaged heating and cooling equipment with the latest techniques and equipment to lower costs.
- Provide public spaces for social interaction and recreation. Buy out homes in known danger zones and utilize the space as parkland, community gardens, or other public open spaces that will promote social interaction and recreation for all residents.
- Upgrade building codes so that new construction will be done to a higher standard.
- Create new housing opportunities to support area redevelopment. Establish new housing stock in a rebuilding area to support neighborhood-serving businesses.
- Create new housing stock to serve specialized needs in the economy.
- Create housing to attract or retain businesses. Establish housing near job centers and in keeping with the housing needs and preferences of workers.
- Improve neighborhoods to attract or retain businesses. Establish new schools or parks to improve neighborhood vitality. Upgrade housing that was not damaged but could benefit from higher levels of mitigation or quality.

- Relocate housing out of hazard zones. Create new public attractions such as parks and recreation facilities in flood-prone areas to mitigate a hazard and attract people into a business district.
- Ask: Has the community replaced a devastated section of housing (trailers, for example) with the same, vulnerable housing?
- Ask: Is overcrowding resulting?
- Buy out or relocate damage-prone properties. Acquiring or relocating homes or businesses located in hazard-prone areas, particularly structures that have been damaged repetitively, can help reduce the public costs of disasters, which include emergency services, evacuation, emergency shelters, debris removal, and the loss of tax revenues.
- Acquire vacant, hazard-prone property. Buying vacant property and prohibiting its development permanently reduces the risk of damage to those properties while providing additional open space, wildlife habitat, and recreation areas.
- Rebuild according to modern building codes; upgrade the local code if necessary. Typically, older buildings not built to modern standards are the ones that suffer the most from natural disasters. When rebuilding, make sure that structures comply with modern building codes that specify how to make buildings more resistant to damage from hurricanes, floods, wildfires, wind, or earthquakes. Educate builders about hazard-resistant provisions in the codes.

Situation: Damaged commercial/industrial facilities

Recovery Strategies to Enhance Quality of Life:

- Maintain employment opportunities and minimize economic disruption.
- Rebuild commercial buildings with enhanced business-supporting features. Rebuild retail

buildings to have increased floor-to-ceiling ratios, window/display area, and better floor layouts.

- Create interim commercial facilities. Build temporary retail spaces consolidating multiple businesses in shared facilities.
- Establish and/or improve mitigation features. Rebuild commercial/industrial facilities in flood-prone areas with elevated electrical elements and ability to seal water out in floods.

Situation: Environmental damage
Recovery Strategies to Enhance Quality of Life:

- Create or enhance natural resources and environmental features.
- Restore damaged environmental features in ways that support other economic goals. Consider adding improved public pedestrian access along the coastline to encourage tourism while repairing coastal erosion damage.
- Integrate natural features into business district recovery. Upgrade damaged river levees with improved walkway connections and linkages with a downtown commercial area.
- Establish new tourism opportunities based on interest in understanding natural systems. For instance, create an "earthquake park" focused around dramatic examples of faulting, liquefaction, or landslides.
- Establish memorials or tributes. Memorialize people or events in new green areas.
- Relocate and prohibit land use activities that are not safe for hazard-prone areas, including, for example, animal waste lagoons, animal production facilities, septic systems, hazardous waste facilities, junkyards, and sewage treatment plants.
- Maintain and restore mitigation functions of the natural environment. The natural environment can help mitigate the impacts of natural

hazards. For example, wetlands and flood-plains slow down and absorb excess water during storms, then slowly release the stored water, thus reducing flooding downstream. Similarly, dunes help protect inland areas from the onslaught of storm-driven waves, and dense forests on steep slopes can reduce the risk of landslides.

- Protecting natural areas keeps people and buildings out of the path of natural hazards and maintains the natural capacity of the environment to attenuate disasters. In addition, protecting natural areas serves other purposes, such as preserving open space and wildlife habitat.

Situation: Disruption of health and safety
Recovery Strategies to Enhance Quality of Life:

- Use the opportunity to identify gaps in family services, social services, and healthcare facilities and ensure that emergency plans have defined strategies and policies for short-term and long-term sheltering for residents with special needs.
- Create or update the community's inventory of housing locations of most vulnerable populations for evacuation and rescue purposes. Create maps that show locations of different population segments and their potential vulnerability to future hazards.
- Consider whether staff in the health and social service sectors is representative of the wider community, especially with regard to spoken languages.
- Relocate and reuse medical facilities to support economic as well as health objectives. Relocate a damaged hospital while repairing and reusing the previous structure for mixed-use housing, commercial, or office uses.

Source: NHRAIC, 2001.

EXHIBIT 7-6   Nine Obstacles to Holistic Recovery

There are lots of obstacles to a successful recovery. Although they will not necessarily prevent recovery, they can slow the process down, and create sidetracks for the unaware. If they are ignored they can become barriers to achieving success.

The degree of damage inflicted upon the community. Decisions on whether to repair or replace buildings, and the processes by which each of these actions is conducted, will determine how disaster risk reduction is achieved. When facilities require full replacement there are often more alternatives to correct poor decisions in the past than there would be if only slight repairs are needed.

Rules, regulations, and policies. Many times, disaster relief funding is provided contingent upon several rules. It will often be the planners' duty to work within the limits of those rules in such a way as to maximize recovery potential. The rules, regulations, and policies that often accompany funding can alter priorities, limit opportunities, and curtail creative solutions.

Other "money" issues, such as property rights, development, insurance, land use, and substandard housing. These broadly connected issues can affect how and when communities make recovery decisions. For example, after a flood, a community may identify an opportunity to enhance economic development, natural resource protection, and the quality of life by limiting redevelopment in certain areas. The idea of establishing a riverfront park that combines flood loss reduction with a pedestrian/bicycle corridor and public access for picnicking, fishing, and boating is becoming commonplace. But communities are often surprised to discover that many owners of flooded homes not only want to return to their riverfront vistas, but also intend to take the opportunity to replace the structures with larger, more modern units. In other cases, damaged flood-prone property often represents the least desirable housing in the community due to its location, repetitive damage, and decreasing property values. Here, otherwise unaffected property owners may choose to "fight" any redevelopment plan, arguing that government should not help those that knowingly chose that risk to begin with.

The propensity to strive for "a return to normal." Proposed postdisaster changes in land use, building codes, densities, infrastructure, property ownership, and redevelopment plans always take time. This is often seen as an unnecessary delay in what otherwise would be a recovery "back to normal," and can be an obstacle to utilizing recovery opportunities for community improvement. It is at this point that the concept of predisaster planning for postdisaster redevelopment makes the most sense to everyone involved. People say, "If we'd only figured this out *before* the disaster, it would be so easy to rebuild and recover to an improved state—but now, since this all takes so long, maybe we'd be better off if we just put things back the way they were. Then we can look at making plans for recovering from the next disaster if we still want to."

A lack of awareness of what the true redevelopment possibilities are. People are not aware of how other communities have made substantial community improvements by using a disaster to initiate the process. Others are more concerned with their own personal world than with the "bigger picture" of community betterment, and it is difficult to change their primary focus without significant preplanning, coordination, leadership, political will, and some vision of an improved future.

The immediate change in the roles and procedures of local government officials. Postdisaster government roles, procedures, and priorities change, often requiring different mixes of skills than those to which officials are accustomed. Job functions change, workloads increase dramatically,

and the work involves new players, new terminology, and even new structures, such as will likely be outlined in disaster response and recovery plans. Additionally, public scrutiny and political pressure reach new plateaus as local officials try to maintain the day-to-day functions that government normally provides. Confidence in government may be eroded during times of recovery as well, especially if the response was considered inadequate or slow, and such sentiment can be detrimental when planners attempt to guide risk reduction in private redevelopment.

Searching for the extraordinary solution to what appears to be an extraordinary problem. Most "extraordinary problems" are actually problems that governments deal with routinely: picking up debris, conducting building inspections, planning, permitting new development, managing grants and loans, and providing public information. The situation becomes extraordinary only because all these functions are happening at the same time, and with greater demands. Communities need to break down the problems into those that they are already accustomed to resolving, and then use the standard procedures to do so. Otherwise, the search for the extraordinary solution will only slow them down.

The lack of systematic communication between decision makers, various departments and agencies, and stakeholders. Communities can develop a mechanism that ensures that the principles of sustainability are incorporated into each and every decision faced every day by communities.

There needs to be a comprehensive, ongoing, systematic series of checkpoints at which every decision is weighed against its impact on hazard vulnerability, economic vitality, environmental preservation, quality of life, and social justice. Unless this occurs, few decisions are analyzed to the extent that their direct and indirect consequences can be foreseen.

The lack of political will to "do the right thing." Addressing the needs of those impacted by disaster and determining methods to prevent a recurrence are often goals unintentionally sacrificed for the lack of appropriate support. When public decisions are swayed by the immediacy of constituent needs, preexisting conditions are often reestablished. Local leaders must define a vision of the future, provide the direction to get there, and establish the priorities to make it happen. They must develop and create a will that is infectious among community politicians and constituents alike. Disaster recovery managers must juxtapose short-term and long-term community needs against the "quick and easy fix" or the perceived rights of select property owners. They must protect the health, safety, and welfare of the community from the desires, power, and influence of those who promote shortsighted solutions. They need to foster personal and community responsibility for recovery decisions that will affect their community for years to come.

Source: Natural Hazards Research and Application Information Center, 2001.

that the displaced can no longer afford to live where they did before.
- Certain groups, such as single women, the elderly, or the disabled, may be subject to cultural norms that prevent them from being able to access goods and services.

Planners must be aware of the causes of inequity in order to prevent such practices. Simply hiring or working with a member of the local population is not enough to prevent these activities, because this local representative may believe in the views that cause the inequality. Only a wide, representational

participatory process can ensure that relief and recovery resources are spread equitably across the affected population. The following groups tend to be particularly susceptible to inequity in relief (NHRAIC, 2001):

- *Low-income households.* How much money people have influences what type of housing they live in, whether they can engage in mitigation actions, and how long they take to recover. Income is probably the most difficult challenge to address because it is not based solely on an individual but is influenced by the larger economy, the availability of jobs, educational opportunity, and much more. Expenses also vary by location: rural places are cheaper to live in but have fewer job opportunities, while urban areas may be exceptionally costly, even for renters.
- *Single parents.* Single parents tend to have lower incomes and greater constraints placed upon their time. These constraints often restrict the family's access to many community recovery activities and resources.
- *Medically dependent (physical and psychological) or disabled.* People who rely on certain types of machinery (ranging from life support to oxygen) are often unable to participate in many recovery programs or access relief, thereby being at increased risk. The mentally ill may experience increased fear and confusion due to increased stress or inability to access needed medication or treatment. In their altered mental state, they may be helpless and unable to access recovery assistance. The disabled are often marginalized in relief efforts when systems of relief distribution do not accommodate their special needs. For instance, shelters may not be built with ramps, limiting the movement of wheelchair-bound victims.
- *Language minority and illiterate.* Countries often have many languages but operate in a chosen or established "official language." Relief and reconstruction activities and information may all be conducted in that official language, or in a common international language such as English or Spanish. Those who are unable to speak that language will be at a disadvantage in regards to warnings, relief information, instructions, and other factors (such as job opportunities). The same problem exists for the illiterate, who will not be able to benefit from any printed material describing benefits or providing instructions, nor fill out application forms or register for assistance.
- *Elderly.* The elderly may be overlooked in considering holistic recovery because of the stereotypical notion that they are not producers for a community but burdens. They may experience difficulty with bureaucratic regulations after a disaster, not qualify for loans, or become disabled as a result of the event itself.
- *Homeless and street children.* The most rapidly growing homeless group is families. Little is known about what happens to them after disasters, although some researchers have found that familiar places (doorways, traditional shelters) are often ruined or permanently altered, further displacing the homeless. After housing stock is depleted by disaster, the homeless get pushed further back in the line for a place to live. And, although some homeless persons may find temporary shelter in disaster facilities, they typically go back to the streets when the facilities close.
- *The marginally housed.* People in informal settlements or living in doubled, tripled, or greater occupancy in a building may find themselves unable to benefit from relief and recovery because of their inability to prove residence.
- *Immigrants.* Residents without legal status or those with legal status but newly arrived in the country often face a complex array of obstacles, including language barriers, bureaucratic rules and regulations, fear of military assistance, fear of deportation, and not being included in long-term recovery efforts. Lack of respect for religious customs can also contribute to social

inequities. Recent immigrants from the Middle East, for example, may follow religious norms of modesty and separation of the sexes that usually are not accommodated in emergency shelters and may influence who participates in community activities.

- *Transients, newcomers, and tourists.* People who pass through, stay temporarily, or have recently arrived in a community may not hear warnings, know where to take shelter, or have resources immediately available to them. Communities must plan to reduce the vulnerability of this population, particularly in communities with large tourism industries.

- *Isolated households, farms, and ranches.* Families living in remote and/or rural areas often face great difficulty receiving information about relief assistance or acquiring the actual assistance and supplies. Farmers and ranchers may face continued stock mortality after an event and may find themselves caring not only for themselves and their family but also for their animals that need food, water, and medical treatment.

- *Racial and ethnic minorities.* An extensive review of research studies on race, ethnicity, and disasters found that minorities experienced longer recoveries due to lower incomes, savings, and insurance; experienced differences in access to insurance; and used aid and relief organizations differently than was expected by the predominantly Anglo emergency management sector (Fothergill, 1999). Lower-class members within formal or informal caste systems have also been shown to be affected by disaster relief and recovery operations, even when efforts to circumvent class issues are conducted. Recovery organizations must be certain that they have a strong grasp of these culturally based issues and are able to plan accordingly.

- *Children.* Society tends to be adult-oriented. Children are completely dependent upon adults for their safety and security, as well as for their feeding, care, and education. Many relief and recovery systems assume that children will be cared for by the parents and neglect to directly consider their needs. However, the care system for many children breaks down during disasters, and they are left to fend for themselves in a system that does not account for their needs. Involving children and teenagers in community recovery activities and planning not only helps to ensure they receive adequate services and care but also facilitates healing and promotes lifelong civic participation.

- *Lesbian and gay households.* Little is known about homosexual families after disasters other than to speculate that the hostility they experience every day may be exacerbated. Some groups and organizations may deter aid because of a person's sexual orientation. It may not be safe for a local teacher, for example, to be open about his sexual orientation even if his lifetime partner was killed or injured in the disaster.

- *Battered women.* Incidents of relationship violence may increase after disasters. Certainly, shelters report higher numbers of and increased inabilities to deal with post-traumatic stress.

- *Future generations.* It goes without saying that the people of the future are not able to voice their needs and desires in today's communities. But the components and characteristics of social and intergenerational equity rest on "not precluding a future generation's opportunity for satisfying lives by exhausting resources in the present generation" (Mileti et al., 1999).

Moving the Whole Community

On a number of occasions, it has been determined in a disaster's aftermath that the only viable option for reducing future disaster risk was to relocate the entire community. Examples of cities that have been moved in the past and are doing fine today, include:

- Chernobyl, Ukraine—nuclear accident (1986)
- Wurang and Babi Islands, Indonesia—earthquake and tsunami (1992)

- Valdez, Alaska—earthquake (1967)
- Valmeyer, Mississippi—flood (1993)
- Gediz, Turkey—earthquake (1970)
- Dagara, India—earthquake (2001)

Such a measure may seem like an appealing solution in any situation in which a catastrophic disaster has occurred and it is expected to reoccur. However, moving an entire community is a complicated undertaking. The following lists several reasons why this measure is so rarely employed:

- It is extremely difficult to locate safer sites within close proximity to the original community.
- Substantial infrastructure may still be intact or repairable.
- The cost to relocate is usually higher than the cost to rebuild.

- People have strong attachments to a specific location and refuse to move.

CONCLUSION

Disaster recovery is almost always a long and arduous process that is more often measured in decades than in months or years. As this chapter described, communities may never recover if not provided proper assistance. Fortunately, with predisaster preparedness measures and ample postdisaster international assistance, even countries that experience the most catastrophic damages can enjoy some level of recovery. And those that are able to recover in such a way as to reduce the original hazard risk may even find themselves stronger as a result.

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8

Participants: Governmental Disaster Management Agencies

INTRODUCTION

Citizens throughout the world look to their governments—elected or not, nationally, regionally, or locally based—to provide safety and security. Chapter 1 described how communities and governments have developed systems and structures to fulfill this responsibility as it pertains to disaster management, utilizing mitigation, preparedness, response, and recovery. The success with which governments are able to perform these functions determines to what extent they can reduce hazard risk for their citizens.

In general, the evolution of emergency management capacity in any country begins with the most pressing need—response. Response, at least in the short term, is distinguished among the four emergency management functions as having the greatest immediate potential for saving lives and for being the most time-sensitive. Even in the smallest village, spontaneous response mechanisms will arise as a result of people's survival instinct and collective community concern. Almost all nations have at least a limited emergency response capacity that presumably can address the most common hazard risks affecting their citizens. Unfortunately, outside of the industrialized world, very few nations have developed the capacity

to address the more comprehensive needs of hazard and risk management. Whether through sheer negligence, ignorance, or conflicting priorities, many developing countries take little or no emergency planning and preparedness actions, disregard recognized mitigation opportunities, and take no measures to consider how they would recover from major events. What ultimately results is an elementary and, thus, inadequate emergency management capacity that is quickly overcome by even minor disaster events.

Thanks to international advocacy and the actions of the United Nations, national government development agencies, and many nongovernmental organizations, recognition of the importance of mitigation, preparedness, and recovery planning is rapidly growing. Both rich and poor countries are working hard to increase their ability to reduce their hazard risk before emergencies begin and are educating their citizens to take action on the personal level. National governments are even partnering to increase their collective hazard risk reduction potential. But, as events like the December 26, 2004 tsunami in Asia and the 2005 Hurricane Katrina in the United States have shown, there is still a long way to go before governments, rich or poor, have fully tackled the emergency management problem.

This chapter will explore governmental emergency management structures from two very different vantage points. First, it will explain how government emergency management agencies address disasters within their own borders, and how they ensure their citizens' safety and security. Several of the many ways in which this capacity may be structured within individual countries will also be detailed. Second, it will look at the tools and processes through which governments lend assistance to each other in times of need; in other words, the point at which disasters become international.

GOVERNMENTAL EMERGENCY MANAGEMENT STRUCTURES

The systems and tools that governments have available to address hazard risks in their communities are relatively universal throughout the world. Although each country's emergency management organizations and systems have developed independently from a variety of sources, vast institutional sharing between countries has created an overall standardization of types of emergency management organizations, most notably in the area of first response. Additionally, globalization has facilitated the standardization of practices, protocols, and equipment used by emergency management organizations.

This section will define and detail the various components of emergency management systems that exist in most countries of the world. Although certain factors, including wealth, technical expertise, government type, and specific risk profile, contribute to defining how each agency is organized and equipped, their fundamental missions are almost identical. These agencies include:

- Fire departments
- Law enforcement agencies
- Emergency management (civil protection) agencies
- Emergency medical services
- The military

A range of other peripheral organizations and agencies also participate in emergency management activities to a varying degree, and these will be discussed at the end of this section.

EMERGENCY MANAGEMENT PARTICIPANTS

FIRE DEPARTMENTS

Fire departments (also known as the "fire brigade" or "fire service") are the most common emergency management structure in local communities throughout the world. This makes perfect sense, since fires are the most common hazard communities face on a daily basis, (FEMA, 2004). The earliest fire suppression services were singular in function, but over time, many nations' fire departments have expanded their abilities to address a wider range of both regular and rare hazards, including:

- Fire suppression (structural, brushfire, wildfire, hazardous material fire)
- Fire and arson investigation
- Rescue (urban, swift water, wilderness, cave, airborne, alpine, dive, crack and crevice)
- Vehicle extraction
- Warning issuance
- Terrorism (actual or threatened) response
- Hazardous materials response and cleanup
- Fire and structural safety inspections
- Permits
- Prevention
- Training
- Public relations
- Disaster response coordination
- Emergency medical services
- Emergency management

Fire departments may be organized at either the local, regional (county or province, for example), or national level. How a fire department is structured often depends on whether the fire service personnel are paid and what kind of government exists. The

three kinds of fire department organizational levels, and examples of countries employing each type, are provided below:

- Local organizational structure (Canada, Germany, United States)
- Regional organizational structure (Australia, United Kingdom)
- National organizational structure (Spain, France, Hong Kong)

Fire departments's needs are driven by both community risk and funding access. The following factors determine fire risk likelihood: individual cooking and heating practices; outdoor burning practices; housing materials and design; population density; industrial activities; climate; vegetation; availability of water; and topography. Funding sources and levels differ from country to country, but rarely exist at levels sufficient to fully address recognized fire risk and meet all of a fire department's needs, including:

- *Personnel*. A fire department depends on an available staff of dedicated, trained employees. Fire departments may be all volunteer, part paid, or fully paid. Most countries do not have paid volunteer fire services outside of larger urban centers because of light demand for emergency services. Most firefighters work part time, often reporting to work only when called in for emergencies. In the United States, for example, over 70% of firefighters work on a volunteer basis (US Dept. of Labor, 2004). In cities, however, the number of emergency events is much greater and more involved training is required to address the variety of emergencies seen on a regular basis, so full-time, paid fire departments are the norm.
- *Training*. To be effective, firefighters must be trained to address the community's recognized hazards. Many governments operate regional or national training centers to ensure a national standard of proficiency, though the majority of firefighters train locally. Websites of various national firefighter academies include:

  ○ Australia (Queensland): www.fire.qld.gov.au/about/training.asp
  ○ Chile: www.bomberos.cl/academy.asp
  ○ United States: www.usfa.fema.gov/training/nfa/

- *Equipment*. Fire departments depend on a wide range of basic and technical equipment to conduct fire suppression, rescue, emergency medical, and other services. The primary categories of equipment used by fire departments include:
  ○ *Apparatus*. A fire apparatus is a vehicle specially designed for the firefighters' needs. There are several different categories of fire apparatuses, including the fire engine, which is designed to pump water; a fire truck, which fights fires but does not contain onboard water; a ladder truck, which allows access above fires or to high-rise structures; a snorkel truck, which raises hoses high above fires; a floodlight truck, which provides illumination for nighttime emergencies; a search-and-rescue truck; a paramedic (medical) truck; a command vehicle; a hazardous material response truck; a mobile laboratory; and an equipment (mostly hoses) transport vehicle.
  ○ *Firefighting equipment*. In addition to the apparatus, firefighters depend on a full range of equipment to suppress fires. This equipment includes extinguishers, axes, hooks, ladders, chemical suppressants, breathing apparatus, emergency alarms, and illumination.
  ○ *Personal protective equipment (PPE)*. Firefighters must regularly enter very hazardous environments. Several types of personal protective equipment have been developed to protect them. PPE can be used to protect against extreme temperatures (high or low); a lack of oxygen; smoke; chemical, biological, or radiological hazards; noise; or caustic liquids.
  ○ *Rescue equipment*. A major part of most firefighters' duties includes rescue from vehicles, structures, water, and other wilderness or outdoor locations. Rescue equipment includes cutting tools, spreading tools, impact tools,

ladders, ropes, harnesses, shoring equipment, and illumination.

- *Communications*. Effective fire departments rely upon three different forms of communication. The first is the emergency notification system, which enables the public to inform the fire department of an emergency. The most commonly used system is an emergency telephone number, so the public can dial a simple, well-publicized number to quickly reach emergency services. In Europe this number is 1-1-2; in Canada and the United States it is 9-1-1. (See Appendix 8-1 for a list of emergency numbers from around the world.) Unfortunately, these systems can be costly to establish and maintain, and so many poor cities and countries are unable to utilize this efficient emergency management resource. The second communications system is the use of radios, which allow responders to talk to each other and to their command center. The third system is one that allows responders to communicate with the public. This may be as simple as a megaphone or as complex as a reverse emergency telephone system or a system of radios that can be remotely activated by fire department officials.
- *Facilities*. Fire department facilities are strategically placed buildings where personnel and equipment are located until called on to respond to an emergency. Fire department equipment requires a considerable amount of maintenance and cleaning, as well as safe storage, and the facility must be designed to accommodate these needs. The facility's location will determine response times to various points throughout the community, and its selection must take into consideration point-to-point travel impediments such as topographical or hydrological obstacles.
- *Information*. Fire department information needs are extensive and range from notification to assessment of risk and damages to demographic and settlement change within the community. The utility of this information depends on the quality of the source, which may be poor in many developing countries.
- *Authority*. Fire department officials need the statutory authority to prevent and respond to fires. Fire officials may be given the power to close down businesses that do not comply with accepted fire codes or to refuse occupancy to public or private structures that have not been constructed to fire safety standards. Firefighters may need to impose restrictions on movement or facilitate evacuations, both of which require pre-existing statutory authority.

LAW ENFORCEMENT

Police departments (or "constabularies") are government-sanctioned entities responsible for maintaining law and order within the community. Police (and other law enforcement departments) are often part of the emergency management function at the local level. Though crime fighting is the police's primary responsibility, they are often an integral component of a community's emergency response system. Law enforcement emergency management responsibilities may include:

- Disaster scene security
- Warning issuance
- Security at critical facilities
- Search and rescue
- Crime fighting
- Crowd control
- Traffic control
- Bomb removal and disposal
- Assessment
- Investigations

Although police departments are often centralized and managed at the national government level (as in France), many governments (especially federalized systems, such as in the United States) maintain local police forces. Still others, such as Canada, maintain a mix of organizational police forces (the Royal Canadian Mounted Police have national jurisdiction,

while three provinces and several cities maintain their own local forces). In centralized systems, police officers may be based within their local communities or assigned to communities other than their own.

Police forces have traditionally enjoyed more secure and greater funding than other first-response officials, including the fire and emergency medical departments.

EMERGENCY MANAGEMENT (CIVIL PROTECTION)

Emergency management performs mitigation, preparedness, response and recovery planning and coordination for large-scale events. The field of emergency management was practically nonexistent until the civil defense days of the 1950s, when many industrialized countries' governments began to make formal preparations for nuclear war. These systems, often called "Civil Protection," helped to prepare communities by building shelters, educating the public, and training first responders.

Over time, offices of civil protection began to address other catastrophic hazards. A few agencies even began to assume response and recovery coordination functions. Today, most countries maintain some form of civil protection or emergency management office at the central government level, which addresses mitigation of and preparedness for major disasters. Several of these national-level offices have developed the capacity to offer response and recovery assistance to disasters as well, usually in a supportive fashion rather than leading the response, as long as local agencies can to do so. All smaller, more routine emergency events almost always are left to police, fire, and emergency medical responders designated to a specific area.

At the local and regional levels, the fire department or the police department handles emergency management planning and coordination, though many major cities have created government offices dedicated to emergency management practice. The field of emergency management has experienced tremendous "professionalization" in the past two decades, as prac-

titioners have gone from having little formal education to earning specialized master's and doctorate degrees in the field.

EMERGENCY MEDICAL SERVICES

Emergency medical services, often called "EMS" or "ambulance service," is a specialized form of medical care performed at the scene of the disaster or emergency event. EMS personnel (or emergency medical technicians [EMTs]) are highly trained professionals who offer medical assistance greatly exceeding basic first aid. EMTs stabilize victims for transport to a hospital, where better equipment and conditions are present.

Though many police and fire officials are trained to provide first aid and medical assistance, EMS organizations are usually trained and equipped to go beyond the basics, and may even be certified to perform invasive procedures or to administer a range of drugs. Two levels of care may be offered by EMS agencies: basic life support (BLS—usually noninvasive) and advanced life support (ALS—certified to perform invasive procedures).

Nations' EMS systems differ in their level of training, availability of funding, and quality of equipment. A further difference is the general mode of operation the organizations assume in response to emergency events. Two general philosophies guide the actions EMS officials take when they encounter a victim in the field and, likewise, guide their levels of training and equipment. These two philosophies are known as:

- *Stay and play ("pre-hospital advanced life support")*. In this form of treatment, EMTs provide as much medical assistance as possible to stabilize and treat victims before transporting them to the appropriate facility. Vehicles and teams are heavily equipped with much of what would be found in a hospital emergency room to limit the amount of time between the event and when victims receive medical care.

- *Scoop and run*. Agencies that employ "scoop and run" treatment try to get victims to the hospital or other medical facility as quickly as possible. They believe that the victims' best chance of survival depends on reaching an emergency room within one hour of the actual accident. The goal is to have victims in transit to the hospitals within ten minutes of their arrival.

In most countries, EMS services are private and charge victims a fee for their services. They may be publicly funded and associated with a hospital or a fire department, or be an independent public service. The vast majority of EMS officials are volunteers.

THE MILITARY

Almost every country includes the military in their overall disaster management planning and operations process. Though most democratic governments hesitate to utilize their military resources to address domestic issues, these national defensive forces are best suited in many ways to meet the needs required when responding to disasters. They have secure budgets, specialized equipment, and a trained and quickly deployable workforce, are self-sufficient, and have a highly organized, hierarchical structure.

The connection between the military and emergency management goes beyond mere coincidence or convenience for many countries. As will be described in greater detail in the section on "Organizational Structures," many modern emergency management structures that exist today have their roots or are still rooted in civil defense. Emergency management grew out of a defensive need, and the military has been involved throughout the course of that evolutionary process. As such, their status as a valuable resource is widely recognized and often seen as the ultimate last resort.

Nations' primary concern when involving military assets in disaster response is that of authority. Military forces work with a command structure that can be at odds with the chain of command outlined in most emergency response plans. Military training optimizes behavior appropriate in hostile, foreign environments, so civilian-military interface during disasters can quickly become contentious if the proper mechanisms and training are not in place to guide such action and prevent conflict.

The University of Wisconsin's Disaster Management Center (1987) has identified several issues that must be addressed when disaster response involves the armed forces. These issues include:

1. Military resources are best suited for high-intensity, short-term assignments. Military departments often will be unwilling to dedicate their forces for extended periods because of conflicting defense-related activities.
2. The military is likely to adapt disaster response and recovery needs to fit more closely with its own training, abilities, and operations. Actions that may be more appropriate but are not a normal function of the military (such as building temporary housing, as opposed to creating a tent city) are likely to be disregarded in favor of the actions that the military is most well-suited to perform.
3. Emergency managers may be unable to maintain control of the situation if military commanders begin to guide forces according to their own agenda (rather than that of the emergency management agency). The military may be unwilling to take certain orders and, likewise, may be unwilling to participate in a consensus-based process.
4. In countries where military personnel have a reputation for corruption or abuse of power, or have not had adequate training in humanitarian operations, disaster victims may be unreceptive, distrustful, or fearful of them, which may lead to response inefficiencies or secondary disasters (see Exhibit 8-1).

In countries where a complex humanitarian emergency is unfolding due to internal conflict or where a natural disaster has occurred in the midst of an active war, the military's involvement in the response may

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EXHIBIT 8-1   2004 Tsunami Gives Aceh (Indonesia) Troops New Role

In the Indonesian province of Aceh, military personnel start their days on the parade ground, preparing for action. Each soldier has a rifle slung across his back. But the rubber boots and facemasks are not exactly standard military issue. These men are not planning an offensive strike, but leading the cleanup operation in the wake of the earthquake and tsunami that devastated this region on 26 December.

And even for these battle-hardened troops—more used to fighting separatist Acehnese rebels than carrying out aid work—it is a harrowing task. Sergeant Joko Songkono was out on patrol when the earthquake hit. His truck was almost turned over by the force of the tremor, but he survived. Many of his friends were not so lucky. Like most of the soldiers in Aceh, Joko Songkono was sent to the province to fight separatist rebels from the Free Aceh Movement (Gam), but he has spent most of the past three weeks collecting dead bodies. "Even now the rebels are still a threat. They have bases in the hills over there. We need to be careful—they are still around," he said. "Our mission was to fight the rebels, not to do humanitarian work. I never expected to be doing this," he said.

The latest phase of what has been a long-running separatist conflict in Aceh began in May 2003, when an internationally backed peace process fell apart. The fighting since then has been brutal, and both sides have committed abuses. Indonesian soldiers are feared and mistrusted by local people in Aceh—an image that the military is now trying to change. One soldier, Renaldi, his camouflage uniform spattered with dirt, said he was proud of the work he was doing to clear wreckage from a school. "Now we're helping people directly. I hope this disaster will bring us closer to the locals," he said.

So could this catastrophe be a chance for the military to improve its image? Opinions seem to be divided.

"I've changed my opinion of the army," one woman said. "Before things were bad because of the fighting. But now we see that the soldiers have come forward to help Aceh." But other Acehnese are more sceptical. "It's all just the same, there's no change at all," one man said. "They just walk about the city, but still shops are being looted all the time. It's like the soldiers are just pretending." Cynicism runs deep in this traumatized province. Before the earthquake struck, Aceh was virtually cut off from the outside world. The Indonesian military was in control and it did not want outsiders scrutinizing the way it conducted its war with the rebels.

But now, the air is filled with the noise of helicopters flown in by foreign troops. On the ground, foreign aid workers and journalists roam areas which used to be off-limits. Indonesian soldiers may be at the forefront of humanitarian operations for now, but many local people are already wondering what will happen when the eyes of the world finally turn away.

Source: Harvey, 2005.

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be either positive or negative. If the affected population is considered the enemy, the military may take action to prevent humanitarian assistance from reaching them. This is especially true in situations of genocide or ethnic cleansing, because any humanitarian assistance would fundamentally oppose the belligerent goals of that military force. The UN Office for the Coordination of Humanitarian Affairs writes:

> The suffering inflicted on innocent civilians is aggravated by restrictions on humanitarian access. Indeed, humanitarian access to aid-dependent civilian populations is often restricted or denied altogether as a political bargaining

chip and means of imposing even greater suffering on civilians. There is an increasing need to re-examine approaches to security of humanitarian activities in light of the changing environment. The targeting of aid workers, which is often planned and deliberate, closes humanitarian space and jeopardizes relief programmes. In twenty current conflict zones, humanitarian access is restricted, condemning civilian populations to protracted and unmitigated suffering. The risks for civilians are exacerbated even further by the proliferation of small arms and light weapons and their illicit sale or supply to armed groups or militias via porous borders and lax regulations, combined with the attractive economies of war that control of rich natural resources offers. (UNOCHA, 2005b)

However, if the military is willing to cooperate in the humanitarian efforts, especially in situations of cross-border conflict, they may be the only source of much-needed physical protection for humanitarian workers, in addition to the source of information about dangerous territory. More information on civil-military cooperation will be provided in Chapter 9.

OTHER RESOURCES

A full range of players work alongside the traditional disaster management agencies discussed above. The ability or appropriateness of these actors to participate in the process is closely connected to the individual characteristics of each community. Governments use a range of titles to describe these departments, many of which perform the same or similar activities despite differences in nomenclature. These offices may exist at the local, regional, or national levels.

These other resources include:

- *Department (Ministry) of Public Works.* This department often has responsibility for publicly owned utilities. It may be involved in decreasing utility companies' vulnerability to disasters, preparing citizens for accidents that involve utilities (e.g., loss of services; secondary negative consequences if the utilities themselves were damaged), responding to incidents that affect the utilities, or helping to rebuild infrastructure after a disaster. Because of its regular use of tractors and other heavy machinery, public works is often involved in postdisaster debris clearance, cleanup, and disposal.

- *Transportation Department (Ministry) or Authority.* Transportation routes are often adversely affected in disasters. They are also depended upon heavily for evacuation, mobilization, and other response activities. Transportation authorities may be called upon to ensure transportation viability before and after disasters strike and/or to repair damaged transportation infrastructure.

- *Department (Ministry) of Public Health.* This agency may be involved in disasters generated by biological pathogens or chemical agents, or ones that involve illness as a secondary effect. The public health department monitors public health before disasters to allow for early intervention and prevents disasters through education and regulatory mechanisms. During disasters, it works alongside responders to reduce the incidence of illness and injury and responds to epidemics. In mass casualty incidents, which are those that exceed the local or regional capacity to respond to victims' health and medical needs, this department may be called upon to assist in accommodating the increase in service demand.

- *Building or Housing Department (Ministry) or Authority.* The building or housing department may be involved in any or all of the four emergency management phases. Before disasters occur, this department may work to reduce risk by conducting building safety or passing regulations that guide building occupancy limits and use. During the emergency phase of a disaster, this department may be involved in providing emergency shelter and housing or relocating people whose homes are damaged or destroyed. Finally, in the recovery phase, the building or housing department will likely be heavily involved in the reconstruction or repair of damaged and destroyed housing infrastructure.

- *Office of the Coroner.* Most communities will have an office of the coroner, which becomes

integral in the response phase of the disaster. Employees from the coroner's office may assist in the process of collecting, safely storing, identifying, and disposing of victim's bodies or body parts. The coroner is also involved in notifying next of kin when a death has occurred and issuing death certificates, which may be required before certain forms of aid may be received. In the predisaster phase, coroners are involved in planning for mass-fatality events, and may have specific responsibilities and authorities as outlined in the Emergency Response Plan.

- *Department (Ministry) of the Environment*. The department that handles environmental issues may be involved in both pre- and postdisaster activities. Before disasters occur, this department may be involved in activities to monitor environmental health, including monitoring the degradation of disaster reduction environmental features such as dunes, forests, and wetlands. This department is also integral to the monitoring of air and water quality and pollution on land, each of which become an acute issue in the emergency period of a disaster, when they may present a health hazard. Finally, this department may assist during the reconstruction period by helping to guide the use of environmental practices that increase disaster resilience. In countries where flooding is a problem, this department is likely to be heavily involved in management of the floodplain.

- *Department (Ministry) of Public Affairs*. This department is the public face and voice of government. In the predisaster phase, it may work closely with the public to provide risk-reduction education and other materials. This department may also be involved in both pre- and postdisaster emergency warnings, and is likely to be the agency that informs the public about what has happened, what they can do to protect themselves, how they may seek assistance, and where they can acquire recovery resources.

- *Department (Ministry) of Development*. This department is most likely to be involved in the recovery phase, offering guidance and assistance as the affected areas recover. If external development agencies are involved, this department will help to coordinate activities and may work to ensure that recovery actions will reduce overall hazard risk.

- *Department (Ministry) of Education*. In the predisaster phase, the department of education is often involved in developing disaster-related curriculum and guides exercises and drills to prepare students, teachers, and administrators for emergency procedures that may be necessary if a sudden-onset disaster occurs when children are in school. In the disaster aftermath, this department will work to help children return to school as quickly as possible, whether to their own school or to an alternate one, and will help to guide the reconstruction or repair of damaged facilities.

- *Department (Ministry) of Energy*. Nations have become highly dependent on their energy resources. In the aftermath of a disaster, when energy resources may be in short supply or damaged by the hazard's consequences, the Department of Energy may be involved in acquiring and transporting emergency energy reserves and in repairing the energy infrastructure. It may also be involved in assessing damages to the energy infrastructure. Before disasters occur, this department may be called on to strengthen energy infrastructure and resources against the impacts of hazard events.

- *Department (Ministry) of Agriculture, Forests, Fisheries, and Food*. This department may assume many roles in both the pre- and postdisaster phases, depending on its regularly assigned responsibilities. In the predisaster phase, it may be responsible for monitoring food safety and food supply. It may be involved in surveillance of animal or crop epidemics and manage them before a food-related disaster occurs. It also may provide assistance to farmers and other workers in the food industry to help them mitigate or prepare for various hazard consequences. In the

postdisaster phase, this department may be intimately involved in the distribution of food resources. Disasters, especially floods, can destroy millions of hectares of agricultural land, which ultimately affects both the food supply and the economy. In the recovery phase, this department may work closely with farmers or fishermen to help them to rebuild.

- *Department (Ministry) of Public Safety*. This office conducts activities aimed at increasing public preparedness in the predisaster phase through public education and other means. Following disasters, this department may be involved in helping to ensure the safety and security of the affected areas, working with the police or other law enforcement agencies.
- *Department (Ministry) of Civil Defense*. In many countries in which the emergency management function is vested within a department of civil defense, officials from this department will be involved in the coordination of all four phases of emergency management.
- *Department (Ministry) of the Interior or Home Affairs*. In many countries, the emergency management infrastructure at the national level falls within the national department or ministry of the interior, or home affairs, as it is often called. This department, which maintains general responsibility for the country's domestic well-being, will likely be very involved in the coordination and dedication of disaster response and recovery resources. In the predisaster phase, it may be involved in many preparedness and mitigation activities, including emergency management, guidance of emergency management planning, and hazard risk reduction.
- *Department (Ministry) of Labor*. Many people are unemployed following a disaster, either because their place of employment has been damaged or destroyed, insufficient demand for the service or task that they conducted before the disaster, or a whole range of other reasons. In a disaster's aftermath, the Department of Labor may work to help the unemployed find jobs via

job creation programs, job training, or other technical assistance.

- *Department (Ministry) of Communications*. Communications systems are vital to all phases of emergency management. These systems may be heavily damaged by a disaster's consequences, and this department may be called on to assess damages and to restore communications infrastructure quickly. During the emergency phase of the disaster, information exchange is intimately linked to responders' ability to quickly and effectively communicate, and the communications department will be critical in facilitating such exchanges despite any disaster consequences. In the recovery phase, this office may be responsible for rebuilding and improving damaged or destroyed communications infrastructure.
- *Department (Ministry) of Foreign Affairs, State, or the Exterior*. When governments request assistance from the international community, they will likely engage other countries through the department that normally handles international relations.
- *Office of the lead government executive*. This official and his staff will inevitably become heavily involved in the response to and recovery from disasters. With respect to emergency management, whether this official is the president, the prime minister, the governor, the mayor, the administrator, the commissioner, or the bearer of another title will be defined by that nation's emergency management statutory authority. In a highly centralized system, it may be the president of that country, while in decentralized systems, the lead emergency manager is usually a local or regional official. These officials are normally tasked with declaring a state of emergency and may also be involved in guiding the response activities that follow (as defined by the Emergency Operations Plan, if one exists). Another key member of the office of the lead government executive is the city manager, who is likely to be involved in all aspects of reconstruction.

Government executives must always be given their due respect and consideration for the jurisdictional authority they maintain over an affected area. All emergency response agencies ultimately report to them unless directed otherwise. Though less common, these officials also may be involved in predisaster activities (mitigation and preparedness), especially if these activities involve large amounts of funding or if politically charged, as large mitigation and preparedness projects often fail without the support of the chief executive.

ORGANIZATIONAL STRUCTURES

Agencies and individuals involved in international emergency management efforts will encounter a full range of national and local government structures with whom they will have to interface and cooperate. There is no overarching style when it comes to emergency management, and therefore no single approach that any agency can use. Each government and each emergency management structure will require a unique management approach that suits the specific organizational framework in the country being assisted. Except for an absolute failure or erosion of the affected nation's governmental capacity (such as during a CHE), all agencies must remember that the supporting external emergency management agency will be required to work under the direction and authority of the national government and, likewise, within the bounds of their institutional framework.

While it is impossible to predict exactly how each government will perform and what they will expect, there are general structures for which specific interfaces are likely and may reasonably be expected. The ultimate determinant in regards to what type of structure is employed within each country often is the form of government in power (ranging from autocratic totalitarianism to a democratic republic). Of course, many other influential factors help to define not only what type of framework exists but how effective it is and what functions it addresses, including risk profile, social structure, risk perception, level of development,

wealth, access to technical expertise, and where within the structure of government the emergency management agency has been placed (which will be discussed later in this chapter).

In attempting to understand how the organizational framework of emergency management has developed throughout the world, it is important to remember that the concept of comprehensive emergency management is relatively new. Historically, as described in Chapter 1, very little has been done to address risk reduction, with any formalized emergency management structures focusing solely on emergency response. It was not until well into the 20th century that the intrinsic value of comprehensive emergency management was recognized on a global scale, and risk reduction and more formalized emergency planning emerged.

In the past, most nations left the responsibility for managing the consequences of emergencies and disasters on the shoulders of local government. For the most part, these communities had little power or resource backing to fully assess their risks, and therefore prepared only for those events they were aware of because of previous experience (such as fires or annual floods). If they had the means, they would develop the capacity to target these hazards through designing or purchasing equipment and training responders. With only isolated exceptions, very little action was taken to reduce the likelihood or consequence components of these hazards before they struck.

Local communities became adept at handling common, everyday hazards. However, in any situation that went beyond these simple events, the local government was quickly overwhelmed. With no formal national framework, higher levels of government could do little other than provide funding, equipment, technical assistance, or manpower during recovery. Because only during the past few decades has the value of mitigation and preparedness come to light, governments did not normally dedicate funds to these practices. Those that did allocated funds only to those areas that had already sustained disaster damage, as there were few ways to determine risk other than

historical incidence. The resulting pattern was one in which communities were unable to adequately prepare for a disaster until a disaster had occurred.

During World War II and the Cold War era, several national governments (including the United Kingdom, Canada, Australia, the United States, and the Soviet Union) perceived what they believed to be a significant risk of nuclear or other attack. In a move that was seen as addressing a national security concern rather than one of public safety, several of these nations set out to prepare their citizens for this singular hazard. National civil protection agencies were established to instruct local and regional governments in the importance and methodology of building community shelters, to provide public preparedness education (see Figure 8-1), to conduct air-raid exercises, and to create squads of medical and other response crews, among other activities. The civil protection organizations created during this time are seen as the root of many of the more advanced emergency management organizations that exist today.

The perceived risk from these threats began to dissipate during the 1970s and 1980s. At the same time, several governments in the industrialized world began to notice a sharp increase in the human and

FIGURE 8-1 Duck and cover civil defense drills of the 1950s. (*Source:* City of Grand Forks, North Dakota. November 21, 1951.)

financial cost consequences of disasters and began seeking ways to reduce risk before disasters happened. Recognizing that an effective framework existed at all levels of government, many of these nations, including those mentioned above, began to pass legislation expanding the role of the civil defense organizations such that their responsibilities would include all hazards.

Outside of the industrialized world, very little was done to address emergency management on a national level. Developing countries had little or no organized emergency management capacity at the local level due to lack of resources, and this reality continues today. Only the largest towns and cities in these nations tend to develop an emergency response capacity; even there, equipment is often outdated, insufficient for recognized needs, and in poor condition. Little funding is available to pay full-time first responders, and responders often lack even the most fundamental training required to safely and efficiently manage emergency and disaster situations.

By the 1990s, many developed countries had made significant advancements in their emergency management structures at the national and the local levels, and the result was clearly illustrated in the trend of disaster deaths disproportionately moving to developing countries (see Figure 1–10, "Number of People Killed by Disasters by Income Class, 1973–2002"). To reverse this trend, the UN named the 1990s the International Decade for Natural Disaster Reduction. During this decade, the UN worked with member countries to design institutional emergency management frameworks and to introduce the basic concepts of hazards risk management and risk reduction. Their goal was to transfer the postdisaster response focus in those countries to that of comprehensive pre- and postdisaster emergency management.

In 1994, during the World Conference on Natural Disaster Reduction, developing countries lacking any organized disaster management capacity presented action plans for developing a formalized emergency management structure. This meeting culminated with the famous Yokohama Strategy and Plan of Action for a Safer World (see Exhibit 8-2). Most of these

EXHIBIT 8-2   Activities Tasked to Community and National Governments through the 1994 Yokohama Strategy and Plan of Action for a Safer World

1. Express the political commitment to reduce their vulnerability, through declaration, legislation, policy decisions and action at the highest level, which would require the progressive implementation of disaster assessment and reduction plans at the national and community levels;

2. Encourage continued mobilization of domestic resources for disaster reduction activities;

3. Develop a risk assessment program and emergency plans focusing efforts on disaster preparedness, response and mitigation, and design projects for subregional, regional and international cooperation, as appropriate;

4. Develop documented comprehensive national disaster management plans with emphasis on disaster reduction;

5. As appropriate, establish and/or strengthen National Committees for the Decade or clearly identified bodies charged with the promotion and coordination of disaster reduction actions;

6. Take measures to upgrade the resistance of important infrastructure and lifelines;

7. Give due consideration to the role of local authorities in the enforcement of safety standards and rules and strengthen the institutional capacities for natural disaster management at all levels;

8. Consider making use of support from non-governmental organizations for improved disaster reduction at the local level;

9. Incorporate disaster reduction prevention or mitigation in socioeconomic development planning based on the assessment of the risk;

10. Consider the possibility of incorporating in their developmental plans the conducting of Environmental Impact Assessments with a view to disaster reduction;

11. Clearly identify specific disaster prevention needs which could use the knowledge or expertise that may be available from other countries or from the UN system, for instance, through training programs designed to enhance human resources;

12. Endeavour to document all disasters;

13. Incorporate cost-effective technologies in reduction programs, including forecasting and warning systems;

14. Establish and implement educational and information programs aimed at generating general public awareness, with special emphasis on policy makers and major groups, in order to ensure support for, and effectiveness of, disaster reduction programs;

15. Enroll the media as a contributing sector in awareness raising, education, and opinion building in order to increase recognition of the potential of disaster reduction to save human lives and protect property;

16. Set targets which specify how many distinct disaster scenarios can reasonably be given systematic attention by the end of the Decade;

17. Stimulate genuine community involvement and empowerment of women and other socially disadvantaged groups at all stages of disaster management programs in order to facilitate capacity building, which is an essential precondition for reducing vulnerability of communities to natural disasters;

18. Aim at the application of traditional knowledge, practices, and values of local communities for disaster reduction, thereby recognizing these traditional coping mechanisms as a valuable contribution to the empowerment of local communities and the enabling of their spontaneous cooperation in all disaster reduction programs.

Source: IDNDR, 1994.

countries subsequently took legislative action to establish a separate agency within their central government structure dedicated expressly to addressing hazard risk. Unfortunately, many countries have found it difficult to extend this effort much further because any effective emergency management function must have three things: an ample budget, an appropriately sized and trained staff, and statutory authority.

There is one major exception to this pattern of emergency management development in developing countries. Several developing countries were struck by major disasters during this decade that significantly strained their economies and reversed many years of development. These countries, which needed to borrow significant amounts of funding from international financial institutions and required assistance from countless emergency management experts, were rebuilt in a manner that promoted the importance of disaster risk reduction and were motivated to take the necessary legislative actions to strengthen their emergency management capacity at the national and local levels. This happened in many countries in Central America devastated by Hurricane Mitch and also in the Ukraine following the Chernobyl nuclear accident.

The evolution of emergency management within a country is a process that can move in a circular fashion. It begins with forming elementary response mechanisms at the local level, inspired through mutual concern and civic involvement. Next, the national government is called on or is inspired to accommodate for the lack of a comprehensive risk reduction mechanism (mitigation, preparedness, response, and recovery) by developing capacity at the national level. And, finally, as resources and expertise permit, this central authority works over time to develop communities' capacity to perform all these tasks at the local level.

If a government structure is so centralized that there is virtually no local capacity to build upon, it may be impossible for local communities to ever fully assume any emergency management responsibilities. This is especially true in authoritarian regimes, which resist transferring power to the local level because that is seen as surrendering central govern-

ment control. Otherwise, and often through the guidance of the UN and other development agencies, most governments are able to gradually transfer these skills and assets to the local level, where they are most effective. The most successful emergency management systems are those in which local emergency management agencies maintain operational control of all phases of emergency management, with regional and national authorities only intervening in a supportive role and never assuming any leadership control. Many countries do not yet have the institutional capacity at the local level to assume these responsibilities, but the UN and other development agencies are working to help these nations gradually develop such capacity.

The following section describes the various frameworks that support emergency management throughout the world. External agencies performing international emergency management, whether response, recovery, or mitigation and preparedness, must be able to identify and cooperate with each type of emergency management structures.

LOCALLY BASED STRUCTURES

There is a saying that "all disasters are local." Nobody knows a community's needs, capacities, and risks as well as the community members themselves. When disasters do strike, the victims are friends, neighbors, employees, colleagues, and families. Damaged and destroyed structures are community buildings, schools, markets, and homes. And although the consequences of a hazard may affect a whole region, a whole nation, or even several nations, the individual losses have profound effect at the local community level.

Emergencies occur every day in almost every community. The vast majority are minor, involving few victims and minimal property, and are considered routine by the responding agencies or individuals. Although local governments differ considerably in regards to their emergency management capacity, each community maintains a minimum capacity pro-

portional to its risk complexity and need. In small towns and villages, where populations are much smaller and where fires and other accidents rarely occur, it might not make sense to have a fully equipped fire department idly waiting for weeks on end; even in developed countries, rural communities may have no dedicated emergency services of their own. On the other hand, a minimum of tens of thousands of fire, police, and emergency medical technicians may be necessary in large cities to meet the emergency needs of millions of residents.

Many governments that have developed strong multi-tiered emergency management systems have recognized the value of a prepared, equipped, and trained local emergency management capability, and have worked to support that capacity through funding, technical assistance, and operational support in times of disaster. Their response agencies, including fire departments, police departments, emergency medical services, and offices of emergency management, are staffed by local officials (even if their administrative framework is national).

Local emergency management agencies are most effective when they conduct the full range of emergency management functions, including pre- and postdisaster activities. Mitigation and preparedness activities tend to enjoy the greatest impact when they are conducted locally, as these practices require a significant amount of local knowledge, input, and dedication to be accurate or effective.

When local response agencies become overwhelmed, regional or national resources may be brought in to assist in response and recovery. Even then, these functions are often most effectively performed when a local executive remains in command of all resources dedicated to the disaster.

Locally based response agencies may involve several or all of the following:

- Fire department
- Police department
- Emergency medical services
- Office of emergency management
- Emergency call center

Countries that utilize locally focused emergency management (regardless of the existence of regional or national organizations) include Brazil, New Zealand, Switzerland, the United Kingdom, and the United States.

REGIONALLY BASED STRUCTURES

Local government authority is regionally based in several countries. Countries may be subdivided into a whole range of administrative and political divisions, including counties, parishes, cantons, territories, districts, provinces, and states. How much authority and administrative power is granted to government officials at each level is primarily a factor of the form of the country's national government.

In those countries with a federal or federated system of government, the primary power structure is one of decentralization. Regional governments within these systems have broad discretionary power to make laws, spend resources, and impose restrictions or requirements on communities. In some of these systems, the United States being a perfect example, the regional (state) level government extends primary emergency management authority to local authorities. This is not always the case, however. In Australia, for example, the regional government retains the authoritative base of comprehensive emergency management.

In these cases, many first-response agencies, including the fire and police departments, are likely to be organized, funded, and dispatched from the regional level. Local officials have very little decision-making power over actions taken in any of the four emergency management phases. They also have very little or no control over the actions of the emergency management agencies.

In many large countries, regional emergency management structures have emerged even when the administrative base of emergency management has been granted to the local government agencies. These regional offices usually focus on policy setting, funding, and direction, rather than actually taking

operational measures in response to or in preparation for disasters. Functions commonly assumed by these regional offices include:

- Setting standards for emergency management based upon recognized needs within the region, and monitoring adherence to those standards
- Providing grants for funding projects that enhance local agency response, mitigation, preparedness and/or recovery capacity
- Establishing programs that address the training and other technical assistance needs of local agencies, including developing regionally based training academies
- Maintaining specialized teams of responders or specialized equipment that is deployable throughout the administrative region in times of need

When they exist in concert with local agencies, regional agencies may be called in when local resources are overwhelmed. Regional agencies may either provide the assistance themselves or coordinate a response that involves resources from neighboring jurisdictions. Many regional governments have at their disposal dedicated military, police, or other similar assets that may be brought in to assist the affected local populations. Belarus, France, and Germany are three examples of countries with regionally based emergency management structures.

NATIONALLY BASED STRUCTURES

Largely as a result of UN efforts, almost all countries have developed an office at the national government level that manages emergency situations. These offices are not uniform, and differ most in the following:

- Where within the national government they are situated
- What authority (statutory or otherwise) they have to manage, assume responsibility for, or assist in disaster response

- The size of their budget (including ability to acquire funds in response to unforeseen emergencies)
- How well trained their staff is in the practice of emergency management
- What assets they may bring to bear in the event of an emergency

Nationally based structures are most effective when their role is purely supportive, leaving the actual decision making to local or regional government authorities. Few national government–based emergency management structures have the staff or budget to effectively address the particular needs of every community in their country. National government authorities are not direct community stakeholders and therefore do not have the same knowledge or concern for the community's safety as local officials do and are not likely to promote important risk reduction preparedness and mitigation measures with the same enthusiasm or effectiveness. Further, experience shows that when emergency management authority and funding are controlled at the highest levels of government, the local ability to respond quickly and effectively in the face of disaster becomes severely impeded by both bureaucracy and reduced capacity.

Even though they are not suited for the day-to-day emergency management activities of every community, national government emergency management structures are necessary. For instance, national government emergency management agencies are the best placed to:

- Provide emergency management priorities, standards, direction, and goals to guide local emergency managers
- Provide training and expertise in the field of emergency management
- Provide funding to support mitigation, preparedness, response, and recovery
- Provide technical support, in the form of imagery, information, assessment, early warning, and engineering, for example

- Assist in the coordination and facilitation of external assistance, whether from within or outside of the country
- Organize and facilitate hazard-based insurance programs that may not be offered by private insurance providers
- Provide specialized assets, which could include urban search and rescue (USAR) teams; hazardous materials detection, containment, cleanup, and decontamination; heavy lifting and debris removal equipment; and infrastructure repair teams and equipment

Examples of international offices of emergency management include:

- Armenia Emergency Management Administration: www.ema.am/En/index_en.html
- Emergency Management Australia: www.ema.gov.au/
- Public Safety and Emergency Preparedness Canada: www.ocipep.gc.ca/home/index_e.asp
- Belarus Ministry of Emergency Situations: www.rescue01.gov.by/eng/
- Dominican Republic Office of Civil Defense: www.defensacivil.gov.do/
- Japan Fire and Disaster Management Agency: www.fdma.go.jp/en/
- Mexico System of Civil Protection: www.proteccioncivil.gob.mx
- New Zealand Ministry of Civil Defence & Emergency Management: www.mcdem.govt.nz/memwebsite.nsf
- Panama Civil Protection: www.sinaproc.gob.pa/index.php?option=com_frontpage&Itemid=1
- Civil Protection Switzerland: www.bevoelkerungsschutz.admin.ch/internet/bs/en/home.html
- U.K. Civil Contingencies Secretariat: www.ukresilience.info/home.htm
- U.S. Federal Emergency Management Agency: www.fema.gov

One of the most important factors in determining both the focus of the national emergency management function and its level of funding and authority is where that function is located within the overall government structure. In a best-case scenario, the emergency management structure is its own department, ministry, or agency, reporting directly to the most senior executive in the country. However, in most countries, the emergency management function lies buried below one or more bureaucratic organizational levels. This may be because of how the government perceives emergency management in relation to other government functions, such as the U.S. government locating FEMA within the Department of Homeland Security, or it may be a sign that there is not enough institutional support for emergency management to give it a high status in government. Examples of where emergency management functions are located within national government structures can be found in Exhibit 8-3.

No Capacity or No Recognized Government Exists

Under certain circumstances, there may be no national government emergency management structure with which external agencies may interface in their efforts to offer assistance. When this occurs because a government has not established a national emergency capacity but maintains most other regular government services, it is often possible to establish a working relationship and offer support through another function of government that is equipped to serve as an intermediary. However, in situations where absolutely no government capacity exists, either because of ongoing or recently ended conflict, because a disaster has completely obliterated all national government capacity, or because the existing government is unable to offer any useful assistance, an external improvised coordination framework must be established. Under these circumstances, the UN most often assumes the role of coordinator. How this is done will be explained in greater detail in Chapter 10. Exhibit 8-4 lists some decentralized and centralized governments.

EXHIBIT 8-3   Placement of Various National Emergency Management Functions

- Albania: Ministry of Internal Affairs
- Algeria: Ministry of the Interior
- Austria: Federal Ministry of the Interior
- Azerbaijan: Ministry of Defense
- Bahrain: Interior Ministry
- Belarus: Ministry of Emergency Situations
- Belgium: Ministry of the Interior
- Benin: Ministry of the Interior, Security and Territorial Administration
- Bolivia: Ministry of Defense
- Brazil: Ministry of National Integration
- Burkina Faso: Ministry of Territorial Administration and Decentralization
- Canada: Department of National Defense
- Cape Verde: Ministry of Defense
- Central African Republic: Fire Brigade Battalion of Central Africa
- Chad: Ministry of the Interior
- China: Ministry of Civil Affairs
- Colombia: Committee led by the President of the Republic
- Cote d'Ivoire: Spread among several ministries
- Croatia: Ministry of the Interior
- Cyprus: Ministry of the Interior
- Czech Republic: Ministry of the Interior
- Denmark: Ministry of Interior and Health
- Democratic Republic of the Congo: Ministry of the Interior
- Djibouti: Ministry of the Interior and Decentralization
- Ecuador: National Civil Defense Directorate
- Egypt: Ministry of the Interior
- Estonia: Spread among several ministries
- Ethiopia: Disaster Prevention & Preparedness Commission
- Finland: Ministry of the Interior
- France: Ministry of the Interior
- Gabon: Ministry of the Interior

- Georgia: Ministry of Internal Affairs
- Germany: Federal Ministry of the Interior
- Ghana: Ministry of the Interior
- Greece: Ministry of Interior Public Administration and Decentralization
- Guatemala: National Committee for the Reduction of Natural or Man-made Disasters (CONRED)
- Guyana: Civil Defense Commission (Office of the President)
- Haiti: Spread among several ministries
- Hungary: Ministry of the Interior
- Iceland: Minister of Justice
- India: Ministry of Home Affairs
- Indonesia: Ministry of Home Affairs
- Iran: Ministry of the Interior
- Iraq: Transition Government (formerly Ministry of the Interior)
- Ireland: Department of Defense
- Isle of Man: Ministry of Home Affairs
- Japan: Ministry of Internal Affairs and Communications
- Jordan: Ministry of the Interior
- Kazakhstan: Spread among several ministries
- Kiribati: Ministry of Home Affairs and Rural Development
- Laos: Ministry of Labor and Social Welfare
- Latvia: Ministry of the Interior
- Lebanon: Ministry of the Interior
- Liberia: Ministry of National Defense
- Libya: Ministry of the Interior
- Lithuania: Ministry of National Defense
- Luxembourg: Ministry of the Interior
- Malawi: No formal national structure—there exists a Commissioner for Disaster Preparedness, Relief, and Rehabilitation in the Office of the President.
- Maldives: Ministry of Home Affairs

- Mali: Ministry of Security and Civil Defense
- Malta: Minister of Home Affairs
- Mauritania: Ministry of the Interior, Post, and Communications
- Moldova: State Department of Emergency Situations
- Monaco: Ministry of State
- Mongolia: Spread among several ministries
- Morocco: Ministry of the Interior
- Myanmar (Burma): Ministry of Home and Religious Affairs
- Namibia: Inter-ministerial Committee operating under the Office of the Prime Minister
- Nepal: Ministry of Home Affairs
- Netherlands: Ministry of Home Affairs
- New Zealand: Ministry of Civil Defense
- Niger: Ministry of the Interior
- Norway: Spread among several ministries
- Oman: Sultanate of Oman Police
- Pakistan: Ministry of the Interior
- Panama: Ministry of Interior and Justice
- Papua New Guinea: Spread among several ministries
- Paraguay: Ministry of the Interior
- Philippines: Ministry of Defense
- Poland: Spread among several ministries
- Portugal: Ministry of the Interior
- Qatar: Ministry of the Interior
- Romania: Ministry of the Interior
- Russian Federation: Ministry for Civil Defense
- St. Lucia: Spread among several ministries
- Saudi Arabia: Ministry of the Interior
- Senegal: Interior Ministry
- Singapore: Ministry of Home Affairs
- Slovakia: Ministry of Interior
- Slovenia: Ministry of Defense
- South Africa: Spread among several ministries
- Spain: Ministry of the Interior
- Sri Lanka: Ministry of Social Affairs and Housing Development
- Swaziland: ad hoc committee within the Deputy Prime Minister's Office
- Sweden: Ministry of Defense
- Switzerland: Federal Department of Defense
- Thailand: Ministry of the Interior
- The Former Yugoslav Republic of Macedonia: Ministry of Defense
- Togo: Ministry of the Interior and Security
- Trinidad and Tobago: Ministry of National Security
- Tunisia: Ministry of the Interior
- Turkey: Ministry of the Interior
- Ukraine: Ministry of Ukraine of Emergencies and Affairs of Population Protection from the Consequences of Chernobyl Catastrophe
- United Arab Emirates: Directorate General of Civil Defense
- United Kingdom: Cabinet Office
- United States: Department of Homeland Security
- Venezuela: Spread among several ministries
- Yemen: Ministry of the Interior
- Zambia: National Disaster Management Committee, Office of the Vice President
- Zimbabwe: Minister of Local Government and National Housing

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EXHIBIT 8-4 **List of Decentralized and Centralized Governments throughout the World**

Decentralized (Federal) Systems

Argentina, Australia, Austria, Bosnia and Herzegovina, Brazil, Canada, Comoros, Ethiopia, Germany, India, Mexico, Micronesia, Nigeria, Pakistan, Russia, Serbia and Montenegro, Switzerland, United States, Venezuela

Centralized (Unitary) States

Afghanistan, Albania, Algeria, Andorra, Angola, Antigua and Barbuda, Armenia, Azerbaijan, Bahamas, Bahrain, Bangladesh, Barbados, Belarus, Belize, Benin, Bhutan, Bolivia, Botswana, Brunei, Bulgaria, Burkina Faso, Burundi, Cambodia, Cameroon, Cape Verde, Central African Republic, Chad, Chile, China, Colombia, Congo, Costa Rica, Cote d'Ivoire, Croatia, Cuba, Cyprus, Czech Republic, Denmark, Djibouti, Dominica, Dominican Republic, East Timor, Ecuador, Egypt, El Salvador, Equatorial Guinea, Eritrea, Estonia, Fiji Islands, Finland, France, Gabon, Gambia, Georgia, Ghana, Greece, Granada, Guatemala, Guinea, Guinea-Bissau, Guyana, Haiti, Honduras, Hungary, Iceland, Indonesia, Iran, Iraq, Ireland, Israel, Italy, Jamaica, Japan, Jordan, Kazakhstan, Kenya, Kiribati, Kuwait, Kyrgyzstan, Laos, Latvia, Lebanon, Lesotho, Liberia, Libya, Liechtenstein, Lithuania, Luxembourg, Macedonia, Madagascar, Malawi, Maldives, Mali, Malta, Marshall Islands, Mauritania, Mauritius, Moldova, Monaco, Mongolia, Morocco, Mozambique, Myanmar, Namibia, Nauru, Nepal, Netherlands, New Zealand, Nicaragua, Niger, North Korea, Norway, Oman, Pakistan, Palau, Panama, Papua New Guinea, Paraguay, Peru, Philippines, Poland, Portugal, Qatar, Romania, Rwanda, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Samoa, San Marino, Sao Tome and Principe, Saudi Arabia, Senegal, Seychelles, Sierra Leone, Singapore, Slovakia, Slovenia, Solomon Islands, Somalia, South Africa, South Korea, Sri Lanka, Sudan, Suriname, Swaziland, Sweden, Syria, Taiwan, Tajikistan, Thailand, Togo, Tonga, Trinidad and Tobago, Tunisia, Turkey, Turkmenistan, Tuvalu, Uganda, Ukraine, United Kingdom, Uruguay, Uzbekistan, Vanuatu, Vatican City, Vietnam, Yemen, Zambia, Zimbabwe

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BILATERAL DISASTER MANAGEMENT ASSISTANCE

International development assistance is an ongoing activity involving many national government donors and an even greater number of recipients. The value of international development assistance grows each year, with a record high in 2004 of over $78 billion (see Figure 8-2). A significant portion goes to activities rooted in emergency management, many of which have been described in previous chapters. Through the support of the UN and many regional organizations and the work of individual governments and non-governmental agencies, development focuses more and more closely on global disaster risk reduction. Many mitigation and preparedness activities are considered "dual-benefit solutions," serving two or more goals, such as building a school using modern disaster-resistant design, thereby concurrently creating a community shelter. This makes it difficult to separate the amount of funding spent on disaster management activities from overall development assistance (ODA) figures. However, postdisaster support is much easier to distinguish and track.

When disasters become international in scope, unaffected national governments often join the assortment of players providing assistance to the affected nations. Their options for assistance range from direct cash donations to sending equipment and teams for any of the many tasks related to preparedness, mitigation, response, and recovery. While it is true that almost any government may be able to contribute cash (even the impoverished nation of Sri Lanka, devastated by the 2004 tsunami disaster, pledged $25,000 to
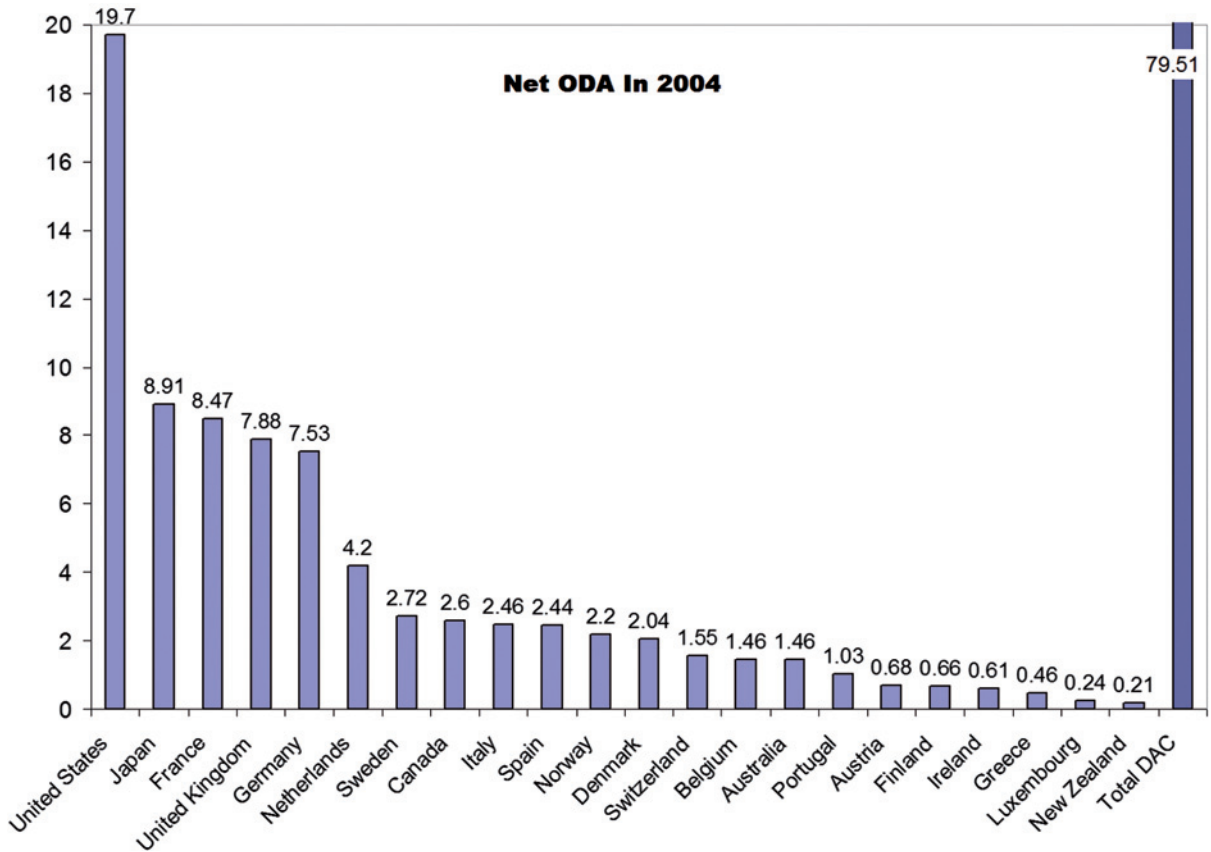
FIGURE 8-2   Overseas development assistance from the Organization for Economic Cooperation and Development (OECD) Development Assistance Committee (DAC) member countries, 2004. (*Source:* OECD, 2005.)

the U.S. government following Hurricane Katrina in 2005), a number of national governments are in the position to provide much more.

The many governments that provide international humanitarian assistance and whose disaster management capacity is well developed and regularly maintained may have much to offer to fulfill response and recovery needs. Their disaster management assets may be able to deploy throughout the world almost as easily as within their own territory and with little advance warning. Such assistance may be the fulfillment of a preestablished mutual assistance agreement or an opportunity for the responders to practice their skills in a real-world scenario.

When reporting the amount of money a government spends on humanitarian assistance, it is important to consider how those monetary values are calculated. While a percentage of that amount is likely to be in the form of direct cash transfers, the majority will be measured as a value of goods or services provided. Every transport flight, tent, and food ration has a set value, and each amount is added to the total calculated amount of assistance provided. Figures 8-3 to 8-5 illustrate trends in donor giving over time and show the amount of giving by country in the latest year of record. Many developed countries, most notably the United States, are criticized because, despite giving much more in absolute dollar amounts
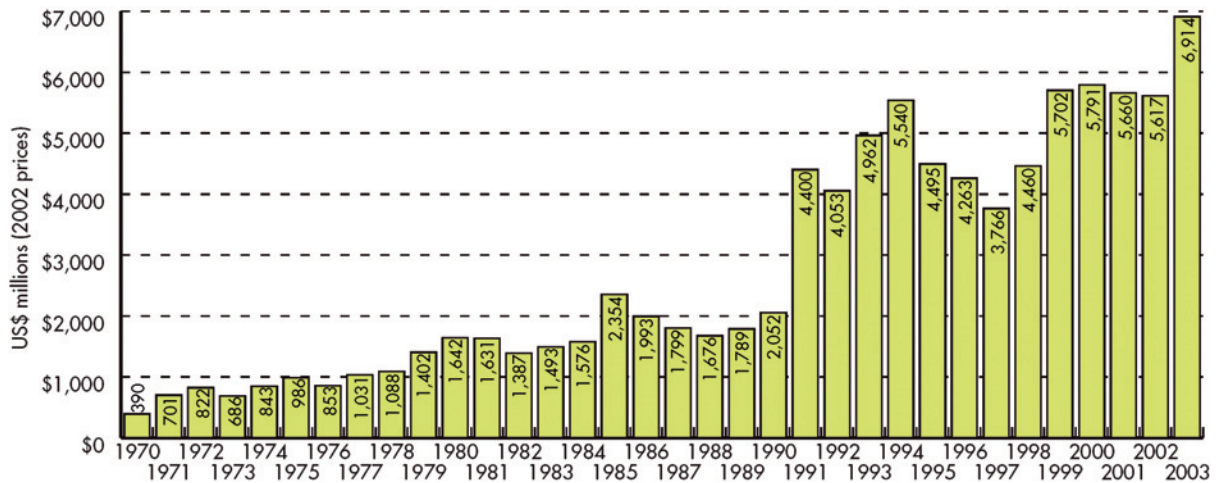
FIGURE 8-3 Bilateral humanitarian assistance from the OECD DAC countries, 1970–2003. (*Source:* Development Initiatives, 2005.)

than other countries, their giving as a percentage of annual national income is lower. A counterargument is that private citizens in many of these countries (the United States included) give a much higher percentage of their personal wealth to humanitarian and development assistance. (For more information about humanitarian assistance related to these figures, see www.devinit.org.)

In pure dollar figures, the greatest amount of bilateral humanitarian aid is provided to meet the needs of CHEs, where there exists an absolute lack of all services and complete dependence of the population on assistance. Table 8-1 lists the top 10 recipients of humanitarian assistance from the OECD Development Assistance Committee (DAC) countries in 2003, each of which is listed because of an ongoing CHE. Figure 8-6 shows the amount of funding over $1 million provided for humanitarian assistance in response to all natural disasters in 2004. Aid for only one of these events exceeds $100 million.

Of course, the 22 OECD DAC countries are not the only ones that contribute to international humanitarian assistance. Between 2002 and 2004, 61 other coun-

TABLE 8-1 Top 10 Recipients of Humanitarian Assistance from OECD DAC Countries, 2003

Country	Humanitarian Assistance in 2003, $ m
Iraq	834.92
Ethiopia	602.06
Afghanistan	336.53
Sudan	253.63
Angola	203.68
Congo Dem. Rep. (Zaire)	158.55
Eritrea	111.77
Burundi	91.07
Uganda	84.05
Somalia	83.67

Source: Development Initiatives, 2005.

tries provided humanitarian assistance in some form, though the majority of the total amount was provided in the form of a very few large donations. Figure 8-7 illustrates the amount that many of these non-OECD DAC countries donated in 2004.

Country	2002	2003
United States	1,824	2,796
United Kingdom	553	666
France	385	510
Sweden	366	402
Norway	312	362
Netherlands	313	316
Germany	368	313
Canada	238	253
Japan	280	223
Italy	185	181
Denmark	189	179
Switzerland	163	153
Australia	123	121
Spain	76	121
Belgium	51	116
Finland	62	62
Austria	41	45
Ireland	32	36
Greece	19	19
Luxembourg	15	16
New Zealand	13	15
Portugal	9	9

US$ millions (2002 prices)

FIGURE 8-4   Total humanitarian assistance by donor, 2002 and 2003. (*Source:* Development Initiatives, 2005.)
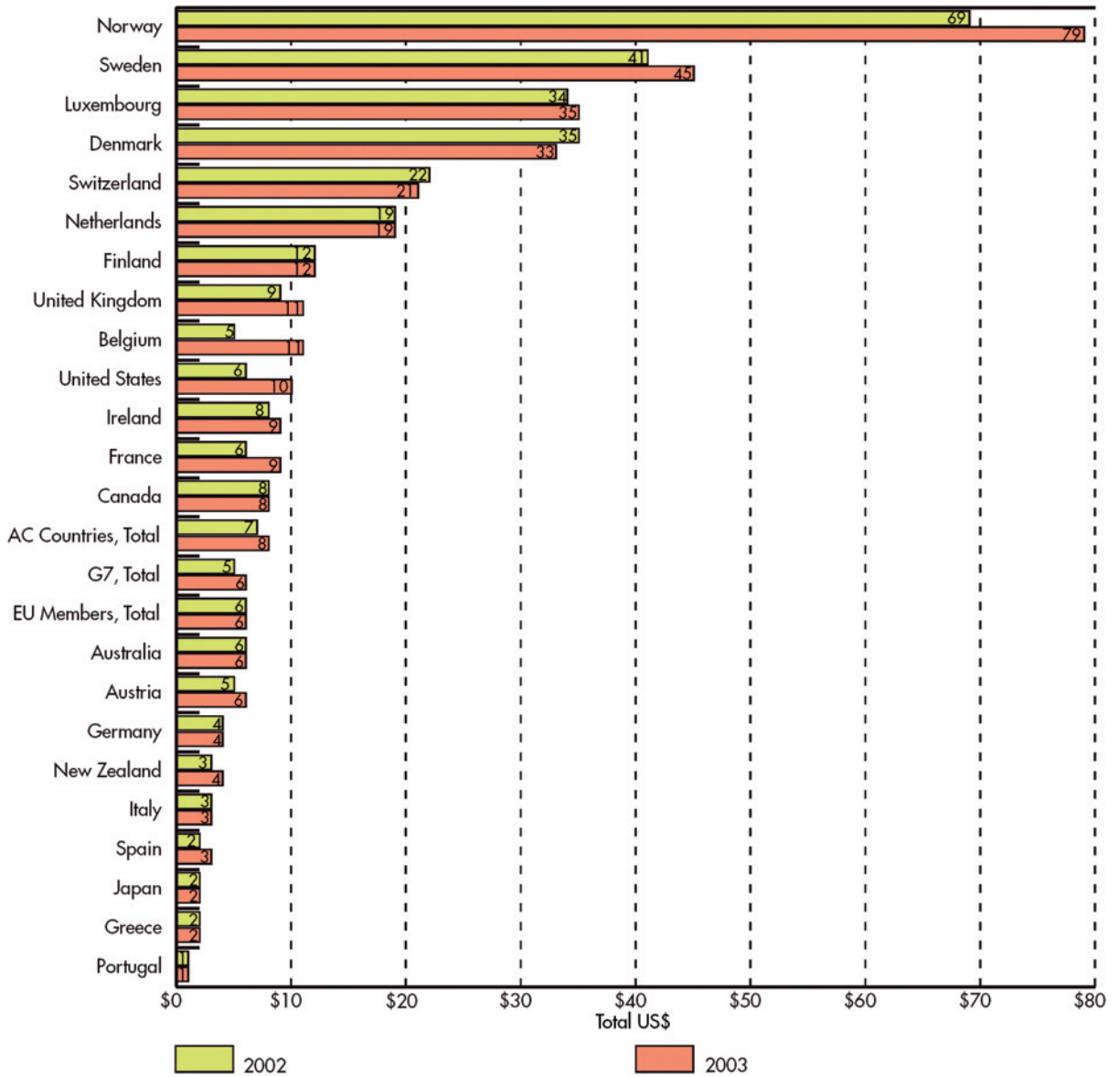
FIGURE 8-5   Total humanitarian assistance per capita, 2002 and 2003. (*Source:* Development Initiatives, 2005.)
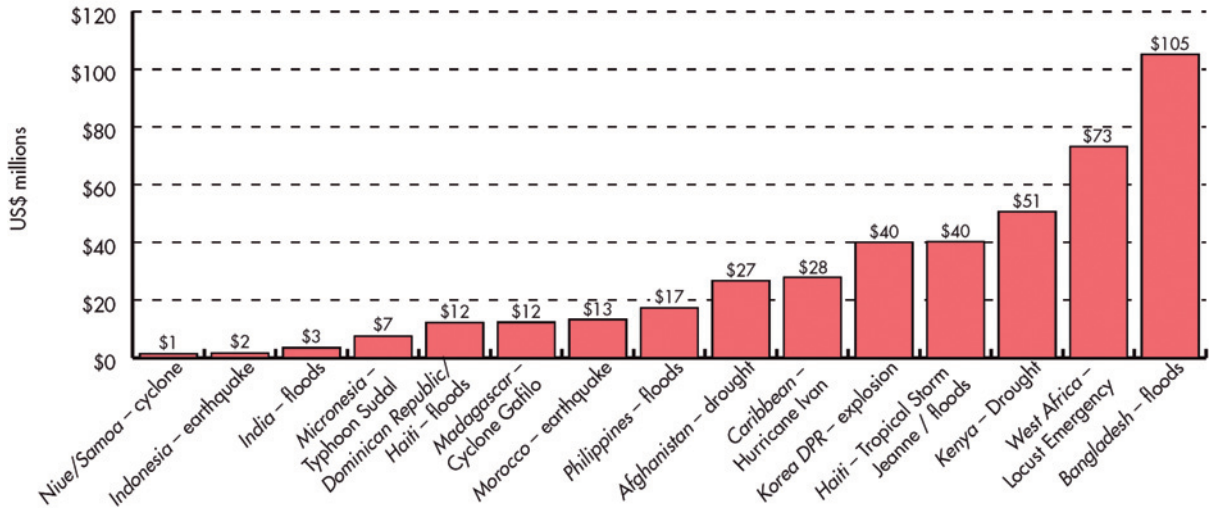
FIGURE 8-6   Natural disasters for which over $1 million in international humanitarian aid was provided, 2004. (*Source:* Development Initiatives, 2005.)
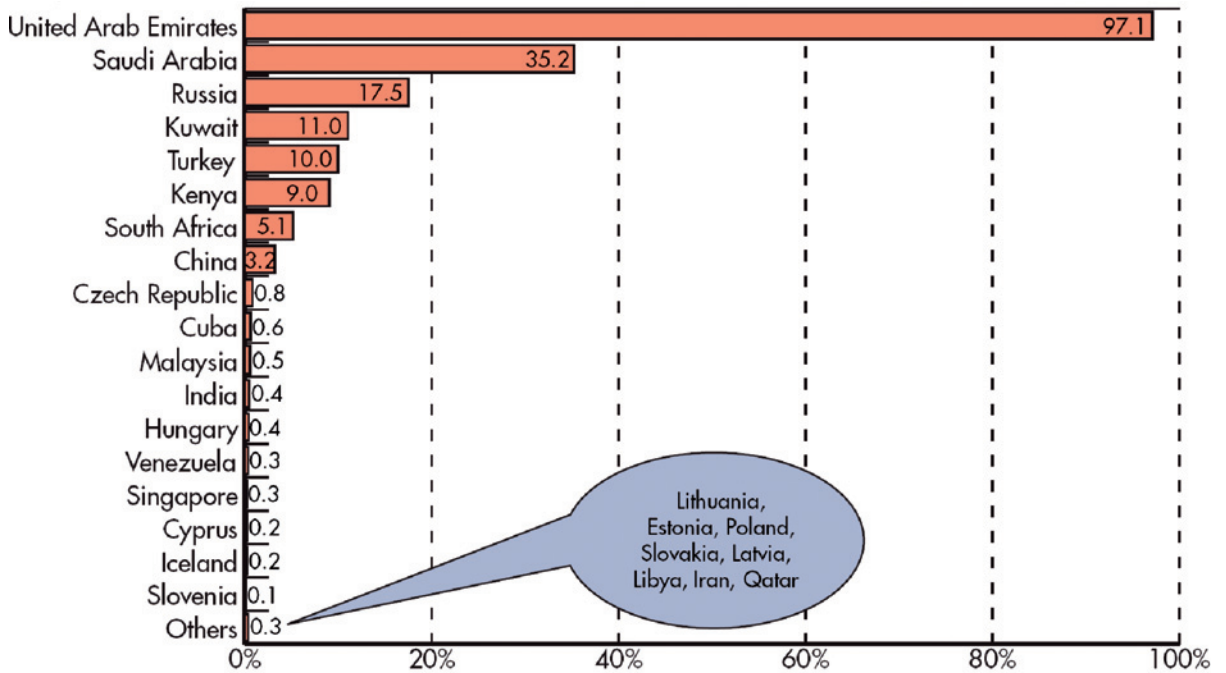
FIGURE 8-7   Non-OECD DAC country humanitarian aid, 2004. (*Source:* Development Initiatives, 2005.)

HOW GOVERNMENTS PROVIDE ASSISTANCE

The figures and table detailing bilateral government humanitarian assistance portray only the value of the assistance. In reality, direct cash donations are a small percentage of the actual assistance included in those figures. National governments provide assistance in myriad ways, depending on the disaster type, the needs of the recipient government, and the capacity of the donor. These donations may come in the form of consumable products, equipment, building materials, transportation, labor, technical assistance, or debt relief, among other forms. Table 8-2, compiled by the UN, lists the various donation sectors.

Donor governments provide this funding in a range of ways other than a direct handover of cash or provision of supplies. The UN often is the central recipient of donated funds, goods, and services through the Consolidated Appeals Process (CAP) described in Chapter 10. Assistance may be provided through a regional multilateral organization, such as the Organization of American States or the African Union, which may coordinate the response to one or more of the affected countries within its field of influence. Finally, governments may donate directly to nongovernmental organizations that in turn provide the services or deliver the goods required to carry out the disaster response and recovery.

TYPES OF BILATERAL ASSISTANCE

MONETARY ASSISTANCE

Monetary assistance is the easiest, and often the most needed, form of assistance in a disaster's aftermath. It requires the least amount of effort for the donor nation and can help offset much of the cost of

TABLE 8-2   Types of Humanitarian Assistance Provided by Sector, 2004

Donor	Commitments/ contributions USD	% of grand total
Multisector	1,281,554,309	27.8%
Food	1,266,100,255	27.4%
Sector not yet specified	417,284,975	9.0%
Health	414,777,227	9.0%
Coordination and support services	320,882,938	6.9%
Agriculture	244,516,162	5.3%
Shelter and non-food items	160,488,529	3.5%
Economic recovery and infrastructure	140,049,632	3.0%
Water and sanitation	131,828,231	2.9%
Protection/human rights/rule of law	83,883,991	1.8%
Mine action	69,696,264	1.5%
Education	66,721,718	1.4%
Security	20,315,652	0.4%
Grand total, USD	**4,618,099,883**	**100%**

Source: UNOCHA, 2005.

EXHIBIT 8-5   U.S. Trade and Development Agency Provides Grant to Indonesia for Tsunami Warning System

On September 22, 2005, the U.S. Trade and Development Agency (USDTA) awarded a $650,000 grant to Indonesia to provide strategic, technical, and operational assistance to implement the design of an emergency communications warning system. "This technical cooperation will help Indonesia to integrate and modernize its disaster management programs as it seeks to implement a comprehensive tsunami early warning system," U.S. Ambassador to Indonesia B. Lynn Pascoe said at the grant award ceremony. The USTDA grant is part of a $16.6 million U.S. initiative to support the development of an Indian Ocean Tsunami Warning System.

Indonesia was the epicenter for the December 2004 tsunami, as well as the most heavily impacted country. It lies along the intersection of several tectonic plates, and the danger of seismic activity and tsunamis remains high. To prevent human and economic losses in the future, the Indonesian government plans to develop a comprehensive disaster management program and tsunami early warning system.

The USTDA grant provides the Indonesian Meteorological and Geophysical Society (BMG) with strategic, technical, and operational assistance to implement key aspects of the national program, allowing it to expedite response time to destructive seismic and oceanographic events and integrate state-of-the-art technologies and data and communications systems into Indonesia's disaster management strategies. The USTDA assistance also includes the deployment of a limited pilot disaster management system, as well as training and capacity building for officials involved in the implementation of the tsunami early warning system.

As of September 2005, USTDA had identified 17 projects related to tsunami reconstruction efforts in Indonesia, Thailand, Sri Lanka and India that are eligible for potential grant funding by the agency. These projects amounted to over $6 million in collaborative efforts in energy, emergency communication, transportation, and environmental projects that offer significant opportunities for U.S. commercial involvement.

The U.S. Trade and Development Agency advances economic development and U.S. commercial interests in developing and middle-income countries. The agency funds various forms of technical assistance, feasibility studies, training, orientation visits, and business workshops that support the development of a modern infrastructure and a fair and open trading environment. USTDA's strategic use of foreign assistance funds to support sound investment policy and decision making in host countries creates an enabling environment for trade, investment, and sustainable economic development. In carrying out its mission, USTDA gives emphasis to economic sectors that may benefit from U.S. exports of goods and services.

Source: USDTA, 2005.

response efforts and supplies, as well as repair and reconstruction expenditures, which can be staggering and add up to a significant percentage of a country's annual income. (See Chapter 7 for more on this issue, and see Exhibit 8-5.)

As described above, donor governments offering cash to affected nations have a range of ways to deliver this form of assistance. If the recipient country has a recognized and strong government known to be relatively free from corruption and found to be able to carry out the necessary tasks involved in response and recovery, the funds may be given directly to the recipient government. However, this is not always the wisest or most efficient choice.

In countries where the UN has a strong presence and history of development work, one of the UN agencies (most commonly the UN Office for the Coordination of Humanitarian Affairs or the UN Development Programme) usually assumes the coordination role and manages the collection and disbursement of donated funds. Multilateral regional organizations may play the same role.

Finally, many nations give their humanitarian assistance cash donation directly to the nongovernmental organizations, whether local or international, that will carry out the humanitarian work in the affected country. These organizations are described in more detail in Chapter 9.

Bilateral loans are another option for governments that do not wish or cannot afford to give grants with no repayment obligations. Though affected nations borrow money from international financial institutions (IFIs) in a disaster's aftermath, this option might not be available or it may not cover enough financial needs. In these situations, other nations will often step in to provide for these shortfalls (usually at a higher interest rate than might be possible with the IFIs).

EQUIPMENT/SUPPLIES

A second common form of bilateral disaster assistance is donated equipment or supplies. In times of disaster, many items are needed in much greater numbers than during nonemergency times, and local supplies are quickly exhausted. Examples include:

- Food
- Water
- Medical tools and supplies
- Vaccines
- Pharmaceuticals
- Clothing
- Housing materials/tents
- Plastic sheeting
- Blankets
- Cooking/cleaning/water storage/hygiene supplies
- Fuel
- Ice
- School supplies

Certain types of equipment are also needed in much greater supply for response actions and for recovery. Donor governments often send experts to operate the equipment during the emergency period of the disaster and train citizens of the affected nation to operate the equipment so that it can be left behind for reconstruction efforts. Examples of equipment commonly lent or donated in the response and recovery to disasters include:

- Short-range transportation equipment (helicopters, trucks, tankers)
- Long-range transportation equipment (airlifts, charter flights)
- Moving/loading equipment (forklifts, cranes, tractors)
- Generators
- Refrigerators
- Utility repair equipment
- Field hospitals/morgues
- Water purification equipment
- Water pumps (see Figure 8-8)

EXPERTISE

Experts are needed in postdisaster settings to save lives, limit property damage, and reconstruct the affected community. While much of this expertise is directly associated with emergency and disaster management, some skills and talents are used in nondisaster times but are in greater demand in the mass casualty, mass damage setting of disaster response and in the construction and planning needs of the recovery phase (see Exhibit 8-6).

In the emergency phase that immediately follows many sudden-onset disasters, the most celebrated and well-known group of experts that respond to disasters worldwide are the search-and-rescue teams (see Figure 8-9). Following earthquakes in which many buildings have collapsed, or following many landslides in populated areas, the affected government may lack adequate resources to reach all survivors in the critical first hours and days, when chances for survival are greatest. The assistance of these international teams

- Medical response
- Public health
- Transport and heavy lifting
- Engineering
- Mass feeding
- Coordination support
- Utility repair and reconstruction
- Security (usually military)
- Damage and needs assessment
- Mortuary affairs

TYPES OF NATIONAL GOVERNMENT AGENCIES INVOLVED IN INTERNATIONAL DISASTER MANAGEMENT

Any national government may have several agencies involved in international emergency and disaster management efforts. Many agencies have a specific focus or expertise to assist in humanitarian efforts or to help another nation reduce their hazard risk, either before or after a disaster occurs. This section details the most common types of national agencies involved in international disaster management.

OVERSEAS DIPLOMATIC MISSIONS (EMBASSIES AND CONSULATES)

Often, a donor country's first contact with an affected country is through their embassy in that country. The embassies or consulates themselves may have been directly affected by the consequences of the disaster. Embassies provide assessment of the situation on the ground to their government, and the donor government may extend its offer of humanitarian assistance to the affected government through its ambassador. Embassies assist citizens of their own countries who are traveling or living in the affected country. They also assist in the logistics and coordination of donated goods and services. In many cases, high-ranking political figures from the donor country will make a humanitarian visit to the affected country, and the embassy staff organizes these visits.

FIGURE 8-8 US military personnel unload a diesel powered water pump flown in by a Russian AN-124 Condor aircraft to Naval Air Station Joint Reserve Base New Orleans, LA, September 12, 2005, in support of Hurricane Katrina relief efforts. The water pump was used to help pump out the water from New Orleans left over from Hurricane Katrina. (*Source:* U.S. Navy photo by Photographer's Mate 2nd Class Dawn C. Morrison.)

has been instrumental in saving many lives that otherwise might have been lost. Search-and-rescue teams, described in detail in Chapter 6, are active in dozens of countries throughout the world, and can deploy around the world, with all of their equipment, within 12 to 24 hours.

Other expertise provided by national governments in a disaster's aftermath include teams specializing in the following:

EXHIBIT 8-6 **International Disaster Management Resources of the Danish Emergency Management Agency (DEMA)**

Search and rescue unit

To be deployed in earthquakes, landslides, flooding and other natural disasters. Contains advanced electronic search and listening equipment, canine search teams, heavy break-through tools, advanced winch gear for rescue operations from tall, collapsed buildings or mountain slopes. The unit is furnished with satellite equipment and GPS for communication and work in deserted areas. A medical team accompanies the SAR team.

Management and communication module

To be deployed for the support of the UN and other organizations in disaster coordination tasks at natural or manmade disasters. Contains computer equipment, including PCs, printers and networks for handling large amounts of data. There are mobile phones and satellite telephones, which can also transmit electronic mail and fax.

Telephone networks can be established from portable local telephones. Via satellite they have direct access to worldwide databases, the Internet and to DEMA itself or its partners. The module also has radio stations for both short- and long-wave transmissions of electronic mail and voice calls.

Transport module

To be deployed for the transport of emergency relief to victims of famines, civil war, or other crises. The module is particularly useful in difficult terrain and consists of 18-ton four-wheel driven trucks, a complete repair workshop and spares, workshop vehicles for the repair of immobilized trucks, four-wheel drive escort vehicles with protection gear against Anti-Personnel mines, as well as washing and maintenance facilities.

Logistics module

To be deployed in establishing large relief supply stocks. The module contains storage tents—Rubb Halls—each with a storage capacity of $550\,m^2$. The module also has forklift trucks, telescope loaders, four-wheel drive Toyota pick-ups, and other equipment for handling large amounts of food, accommodation equipment, and other relief deliveries.

Camp module

Units dispatched to disaster areas are self-supplying through the use of a camp module. It works as office for the unit's management and administration and contains accommodation as well as recreational and eating facilities for the units. The camp module comprises the following elements: sleeping and day facilities for up to 100 people—kitchen and eating facilities with a large cooling and freezing capacity—toilets and showers—recreation and welfare facilities—own supply of drinking water and electricity—own logistic and supply unit for local transport, fuel, food, spare parts, and maintenance. The camp module functions as a small town, with heating and air conditioning enabling it to function optimally in cold winters and hot summers as well as in tropical climates.

Environment and chemical module

DEMA can render support in cases of environmental disasters, monitoring and cleaning at nuclear, biological, and chemical disasters, water transport for wilderness fires, pumping of large amounts of water in flooding, water cleaning and drinking water supply in case of contamination or in desert areas.

Supply module

In addition to its own trucks on 24-hour call, DEMA co-operates with various suppliers, enabling

the agency to pack and ship off equipment units and supplies by truck, ship, or aircraft at a few hours' notice.

Training and counseling module

Know-how and training is available for the many different areas of relevance to international disaster situations. In addition to courses in fire and rescue service, various professional groups are trained in basic international work to fill positions as support staff, managers and administrators, technicians, and disaster management.

Emergency Mobile Hospital

The Danish Emergency Mobile Hospital is a unique modular medical facility which can be configured to accommodate different types of medical needs. The 72-bed Emergency Mobile Hospital, equipped with two operating theatres, is entirely self-contained. It can be deployed for natural disasters, as well as extended relief operations. A core staff of Danish doctors, nurses, and volunteer specialists support the facilities, augmented by local medical staff in most cases. The hospital is operated by The Emergency Management Organization of Greater Copenhagen, and has previously been deployed in Bosnia 1993–96 and Gujarat, India, after the 2001 earthquake. In August of 2002 it commenced operations in Kabul, Afghanistan on behalf of UNFPA.

Human resources

Staff available for international tasks can be emergency management officers with expertise in the areas of disaster management, logistics, and administration, middle managers with experience in a broad range of disaster-related areas, and conscripts with experience in practical tasks. Finally, human resources can be staff from the municipal rescue services that can be available on short notice through co-operation agreements. In special situations, DEMA co-operates with external specialists.

Source: DEMA, 2003.

FIGURE 8-9   Australian search and rescue team. (*Source:* South Australian State Emergency Service (SA SAS) and Trevor Arnold, photographer, SA SAS Noarlunga Unit, 2005.)

INTERNATIONAL DEVELOPMENT AGENCIES

Many developed countries have been involved in international assistance for decades. Although disaster management and risk reduction have never been these agencies' primary focus, many governments have come to realize that their projects would enjoy much more sustainable outcomes if they could account for the various risk factors affecting the recipient country, and that disasters very often impeded and even reversed development in poor countries. More and more, disaster resilience has come to be viewed as a component of a nation's overall development (see Chapter 1).

Development agencies have several options to help poor nations decrease their hazard risk. These options fall primarily under the emergency management functions of mitigation, preparedness, and recovery, and include:

- Projects addressing issues that are not disaster related per se but include the condition that a full hazard assessment be performed and that the project design fully address disaster resilience enhancement based on the assessment's findings
- Funding for projects that directly address specific mitigation and preparedness needs, such as developing early warning systems, strengthening building stock and infrastructure, and educating the public about actions to reduce their personal risk
- Technical assistance and funding to national and local governments to help develop disaster management frameworks and increased capacity
- Postdisaster recovery assistance requiring that any reconstruction must directly address hazard risk reduction

Examples of international development agencies that incorporate disaster management into their development activities include:

- United States Agency for International Development (USAID)—www.usaid.gov
- British Department for International Development (DFID)—www.dfid.gov.uk/
- Canada International Development Agency (CIDA)—www.acdi-cida.gc.ca/index-e.htm
- Australian Agency for International Development (AusAID)—www.ausaid.gov.au/
- Swedish International Development Cooperation Agency (SIDA)—www.sida.se/
- New Zealand International Aid and Development Agency (NZAID)—www.nzaid.govt.nz/

In most cases, a country's international development agency has the lead responsibility for their government's response to an international disaster. Designated offices of humanitarian assistance within these agencies, such as the USAID Office of Foreign Disaster Assistance (OFDA), respond to appeals for aid from affected countries. These international development agencies normally have a preestablished working relationship with either the affected nation's government or the UN and other nongovernmental and international organizations working in the country. Exhibit 8-7 is provided as an example of how international development agencies operate in this area.

NATIONAL DISASTER MANAGEMENT AGENCIES

Governments also can offer assistance to disaster-affected countries through their national disaster management agencies. As with international development agencies, national disaster management agencies may offer assistance in any of the four phases of emergency management. Their exact role depends on their country's statutory authority guiding who has jurisdiction for providing international assistance.

In general, national disaster management agencies do not provide as much assistance as development agencies do. They may provide operational assistance in the form of specialized teams (such as search and rescue, emergency medical, assessment, and other teams) during disaster response. But they primarily offer technical assistance to help other countries to establish their national disaster management capability during the mitigation and preparedness phases (see Exhibit 8-8).

OTHER GOVERNMENT AGENCIES INVOLVED IN INTERNATIONAL DISASTER MANAGEMENT

In addition to those agencies with a direct link to international disaster management, a number of government entities, while not primarily focused on disaster or emergency management, have various skills and expertise that could assist in any of the four disaster management components. The international collaboration between the departments and ministries of public health of the nations threatened and affected by the SARS and avian influenza viruses is one example, as is the increased cooperation between allied governments' intelligence agencies aimed at limiting terrorism. Through international cooperation, many of these government agencies regularly provide technical assistance to their counterparts in other national governments. They also support

EXHIBIT 8-7   U.S. Government International Disaster Management Assistance

The Office of U.S. Foreign Disaster Assistance (USAID/OFDA) is responsible for providing humanitarian assistance in response to international crises and disasters. The USAID Administrator is designated as the President's Special Coordinator for International Disaster Assistance and USAID/OFDA assists in the coordination of this assistance. USAID/OFDA is part of the Bureau for Democracy, Conflict, and Humanitarian Assistance. Figure 8-10(a) illustrates where OFDA falls within the USAID organizational structure.

USAID/OFDA is organized into three divisions, under the management of the Office of the Director, shown in Figure 8-10(b).

- The Disaster Response and Mitigation (DRM) division is responsible for coordinating with other organizations for the provision of relief supplies and humanitarian assistance. DRM also devises, coordinates, and implements program strategies for the application of science and technology to prevention, mitigation, and national and international preparedness initiatives for a variety of natural and man-caused disaster situations.
- The Operations (OPS) division develops and manages logistical, operational, and technical support for disaster responses. OPS maintains readiness to respond to emergencies through several mechanisms, including managing Urban Search and Rescue (USAR) Teams, Disaster Assistance Response Teams (USAID/DART), and Washington-based Response Management Teams (RMT).
- The Program Support (PS) division provides programmatic and administrative support, including budget and financial services, procurement planning, contracts and grants administration, general administrative support, and communication support for both USAID/OFDA and its field offices.

USAID/OFDA provides humanitarian assistance in response to a declaration of a foreign disaster made by the U.S. Ambassador or the U.S. Department of State. Once an event or situation is determined to require USG assistance, USAID/OFDA can immediately provide up to $50,000 to the U.S. Embassy or USAID Mission to purchase relief supplies locally or to give a contribution to a relief organization in the affected country. USAID/OFDA can also send relief commodities, such as plastic sheeting, tents, blankets, and water purification units, from its five stockpiles in Guam, Honduras, Italy, Maryland (US), and the United Arab Emirates, as well as from a smaller cache in Florida. Increasingly, USAID/OFDA deploys short- or long-term field personnel to countries where disasters are occurring or threaten to occur, and in some cases, dispatches a Disaster Assistance Response Team (DART) to assess the damages and recommend the level of assistance that should be provided by the U.S. Government.

OFDA recently developed the Technical Assistance Group (TAG) to increase its capabilities in planning and programming. TAGs consist of scientists and specialists in agriculture and food security, emergency and public health, water and sanitation, geoscience, climate, urban planning, contingency planning, cartography, and so on. TAGs work with DARTS in response, as well as USAID development missions in preparation and mitigation for future disasters.

A large percentage of USAID/OFDA's assistance goes to disaster relief and rehabilitation projects managed by NGOs (including U.S. private voluntary organizations [PVOs] registered with USAID), U.N. organizations, and international organizations. . . . Relief projects include airlifting supplies to affected populations in remote locations, managing primary healthcare and supplementary feeding centers, and providing shelter materials to disaster evacuees and displaced persons. A

rehabilitation project might immunize dislocated populations against disease, provide seeds and tools to farmers who have been adversely affected by disasters, drill water wells, or rehabilitate water systems in drought-stricken countries. USAID/OFDA carefully monitors the organizations implementing these projects to ensure that resources are used wisely and to determine if the project needs to be adapted to changing conditions. The goal of each project is to meet the humanitarian needs of the affected population, with the aim of returning the beneficiaries to self-sufficiency.

USAID/OFDA also oversees a portfolio of mitigation projects designed to reduce the impact of disasters on victims and economic assets in disaster-prone countries. USAID/OFDA has invested in a number of programs in partnership with the U.S. Geological Survey (USGS), the Pan American Health Organization (PAHO), the Asian Disaster Preparedness Center, the World Environment Center, and other offices within USAID. These programs not only enhance a country's capacity to manage its own disasters and hazards, but also promote the transfer of technology, goods, and services between the United States and the host country. USAID/OFDA mitigation-related programs range from investing in drought early warning systems that can possibly head off a famine to training local relief workers to manage the response to a disaster more effectively. USAID/OFDA is increasingly investing in programs designed to prevent, mitigate, prepare, and plan for complex emergencies.

USAID/OFDA is not the only USAID office that provides humanitarian aid to foreign countries. US Office of Food for Peace (USAID/FFP) provides food aid donations to cooperating sponsors (NGOs, cooperatives, the World Food Programme, and other IOs) to address both emergency food needs (targeting vulnerable, food-insecure populations affected by natural disasters, civil conflict, and other crises) and food security development activities. The USAID Office of Transition Initiatives (USAID/OTI) is the office responsible for provid-

ing assistance to countries that are in a stage of transition from crisis to recovery. Its assistance is designed to facilitate the transition to peace and democracy by aiding in the demobilization of combatants or developing democratic governance and media structures within the affected country. Other parts of USAID, such as the regional bureaus, provide development aid, which often complements humanitarian relief programs or can be regarded as disaster rehabilitation or reconstruction assistance.

Other major providers of USG foreign humanitarian assistance include the U.S. Department of Agriculture (USDA), the U.S. Department of State's Bureau of Population, Refugees, and Migration (State/PRM), and the U.S. Department of Defense's Office of Stability Operations (DOD/SO). Food aid that is administered by USDA has often been used for emergency feeding programs in countries experiencing food shortages due to drought and civil strife. USDA also provides international food assistance through the McGovern-Dole International Food for Education and Child Nutrition program and the Food for Progress program. State/PRM provides multilateral grants to international relief organizations in response to refugee emergency appeals and contributes to the regular program budgets of organizations such as the U.N. High Commissioner for Refugees (UNHCR) and the International Committee of the Red Cross (ICRC). DOD/SO, in collaboration with USAID/OFDA, coordinates with other DOD offices to direct the utilization of DOD assets for humanitarian assistance overseas. The U.S. Geological Survey (USGS), the Centers for Disease Control and Prevention (CDC), the U.S. Forest Service (USFS), the National Oceanic and Atmospheric Administration (NOAA), and the Environmental Protection Agency also provide technical assistance, in coordination with USAID/OFDA, in response to disasters and potential hazards overseas.

Source: OFDA, 2004.

U.S. Agency for International Development

(a)

(b)
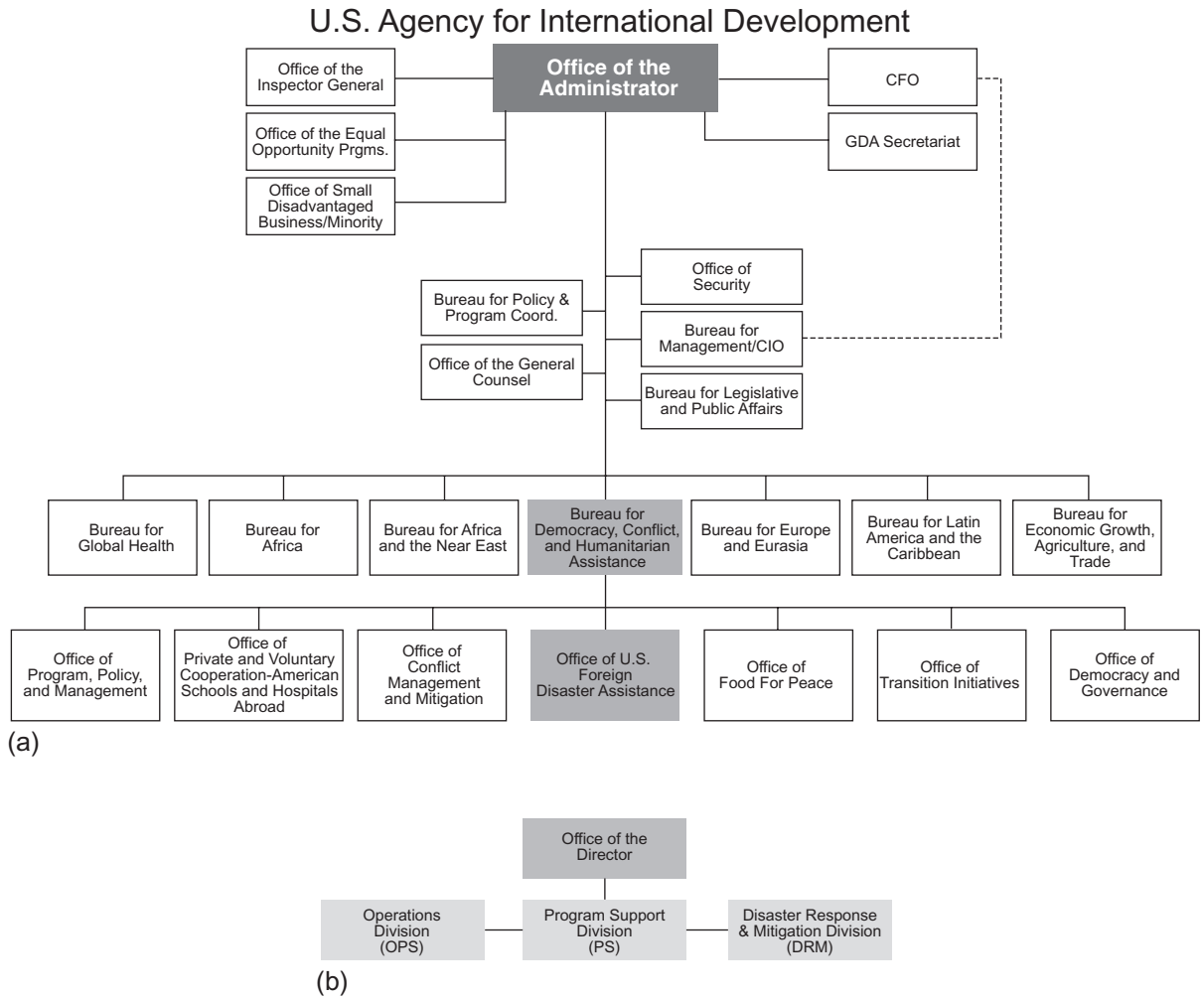
FIGURE 8-10 (a and b)

disaster response efforts in their own countries and abroad. Exhibit 8-9 discusses this international co-operation in more detail.

MILITARY RESOURCES

Military resources may be involved in international disaster or humanitarian missions for many different reasons. It often is argued that nobody is better equipped to handle disasters than the military because of their wide assortment of heavy equipment, enormous reserve of trained personnel, and common culture of discipline and mission-oriented standard operation. However, some believe that the military is a war agency, not a humanitarian assistance agency, and that these two organizational ideals are too fundamentally and diametrically

EXHIBIT 8-8   U.S. Federal Emergency Management Agency (FEMA) Post-Hurricane Mitch Assistance in Central America and the Caribbean

Following the devastation in Central America caused by Hurricane Mitch, the U.S. Federal Emergency Management Agency (FEMA) became involved in sharing many of their emergency management principles with Honduras, El Salvador, Nicaragua, Guatemala, Haiti, and the Dominican Republic through various development projects. FEMA's involvement came only after an agreement between it and USAID, following passage of a law in the U.S. Congress that directed FEMA's participation in the reconstruction efforts in Central America and the Caribbean and provided FEMA with $3 million over two years.

FEMA's involvement in the reconstruction efforts involved work at all levels of government. At the local level, FEMA conducted pilot versions of its risk reduction program Project Impact: Building Disaster-Resistant Communities in each affected country. In-country assistance by nongovernmental organizations (NGOs) trained in Project Impact strategies as well as visits from U.S. experts served to implement Project Impact initiatives. At the national government level, technical assistance was provided by sharing FEMA's experience in the planning and execution of emergency management functions. This included the establish-

ment of a national emergency plan, emergency operations centers, state and local partnerships, and capacity building for each country.

While the specific projects that emerged varied between countries, FEMA's major goals were to help enhance the role, authority, and capabilities of each country's emergency management agencies; analyze and refine national emergency management plans coordinating the activities of the different agencies in each national government; design efficient emergency operations centers capable of processing the information received from the new equipment; and initiate the pilot projects.

Through its disaster management university, FEMA helped to train emergency management executives from the six affected countries as well as representatives from NGOs. The training allowed FEMA to efficiently provide these countries with direct access to its knowledge base and its emergency management experts. It also allowed the country representatives to further refine their goals and the methods of achieving them, and gave them an opportunity to continue to work with their neighbors to share their experiences and lessons learned.

Source: ISDR, 2001.

EXHIBIT 8-9   U.S. Weather Service Helps Tunisia Update Forecasting Abilities

Scientists from the U.S. National Weather Service (NWS) and the National Institute of Meteorology (NIM) in Tunisia are working together to modernize weather forecasting and services in the North African country, whose regions range from the Mediterranean in the northwest to the Sahara Desert in the south. The collaboration—made possible by a June 2004 science and technology agree-

ment between the U.S. and Tunisia—began in April of 2005, when scientists from the NWS, part of the National Oceanic and Atmospheric Administration (NOAA), traveled to Tunisia for a workshop on hydrometeorological data collection and forecasting. Hydrometeorology is a branch of meteorology that deals with the occurrence, motion, and changes in water (rain, snow) in the atmosphere.

"The primary purpose of the workshop was to talk about what the National Institute of Meteorology does and how it goes about its operations," said Robert Jubach, project coordinator for the NWS International Activities Office. It was also a fact-finding mission, he said, to learn what the Tunisian Weather Service does and to learn more about its capacities and interests. "We got to know them and they got to know us," he said in an interview.

The meetings emphasized the NIM institutional structure, the Tunisian agency's vision for the future, NWS meteorological and hydrologic forecasting technologies that could be transferred to and applied in Tunisia, NWS technical assistance areas, and potential collaborations. Severe weather, flooding, locust swarms, and tornadoes prompted the Tunisians to modernize their weather system. In November 2004, a rare but powerful tornado swept through Kelibia, Tunisia, killing 12 people and causing extensive destruction.

"Tunisia has a strong climate gradient," Jubach said. "In the north part on the Mediterranean it's not wet but they get ample rainfall, and in the southern part you're in the Sahara. In a very short distance of several hundred miles you go from a very green fertile area and dry out as you head south. Each region has unique issues."

In the semi-arid area between the desert and the Mediterranean, heavy rainfall can cause flooding, and the desert and semi-arid areas have problems with locusts. In a locust attack, up to 80 million insects may descend over a square kilometer and can devour twice their weight in crops in a day. "Locusts wreak havoc on agriculture," Jubach said, "and weather plays an important role because locusts only come out of the ground under certain humidity and temperature conditions." After the locusts come out of the ground, they hover in the air at a certain altitude until they get the scent of plants and feed, so winds are also important, he said.

Accurate weather forecasts can help target locust spraying, which can only be done when the locusts are on the ground.

"We talked quite a bit about how we could work together to help them with their weather prediction models, to be able to more accurately predict the right weather conditions for locusts," Jubach said. One of the technologies critical for forecasting severe weather events is weather radar. "Weather radars cover almost every square mile of the United States," Jubach said. The Tunisians would like to upgrade their weather radar and add more radars throughout the country. "A lot of heavy rain falls toward the south in the semi-arid regions," he said. "They're worried about flooding and radar would help them with that."

Workshop discussions also included remote sensing capabilities and satellites. During the workshop, scientists described the National Weather Service's own modernization over the last 10 years—consolidating weather forecast offices, automating the collection of weather data, and installing modern weather radars. The NWS has helped other countries modernize aspects of their weather services—flood forecasting and warning capabilities in Mexico, an early warning system for severe weather in Central America, hydrometeorological services in Russia, disaster-management capabilities in India, and others.

The next step, Jubach said, is to complete a bilateral agreement with the Tunisians under the main science and technology agreement signed in June 2004. After the agreement is signed, work can begin. "I think a long-term goal is to work with them on weather forecast modeling improvements overall," he said. "They've asked if we could send a visiting scientist there to work with them on the weather forecast model."

Source: Pellerin, 2005.

opposed in practice to allow for effective military involvement.

Apart from fighting wars, military resources traditionally were only used in peacekeeping operations. But it is becoming more and more common for governments to lend their military resources, including troops, equipment, and information, to assist a nation or nations affected by a major disaster. This government entity is very well trained and equipped to work in the high-intensity and high-stress environment of a disaster's aftermath and recovery. Military assistance may include providing food, technical assessment, medical treatment, transportation logistics, assistance with a refugee crisis, search and rescue, stabilization of infrastructure, security, sheltering, or engineering, among many other tasks (see Exhibit 8-10).

The U.S. Military

The U.S. military is frequently involved in natural and technological disaster and CHE relief efforts. Military assistance is normally requested by USAID OFDA through the U.S. Department of Defense (DoD) Office of Political/Military Affairs. U.S. military participation in international disaster response is carried out by organized operations, termed foreign humanitarian assistance (FHA) or humanitarian assistance operations (HAO). The chain of command for military operations begins with the president of the United States and the Secretary of Defense, collectively referred to as the National Command Authority (NCA). The NCA, which directs all functions of the U.S. military, is advised by the Joint Chiefs of Staff of the Army, Navy, Air Force, and Marines. The entire military force is divided into six geographic areas of responsibility (AORs) and two functional commands, as follows:

- U.S. Atlantic Command (USACOM): Norfolk, VA headquarters
- European Command (EUCOM): Stuttgart, Germany headquarters
- Pacific Command (PACOM): Honolulu, HI headquarters

- Central Command (CENTCOM): Tampa, FL headquarters
- Southern Command (SOUTHCOM): Miami, FL headquarters
- Northern Command (NORTHCOM): Colorado Springs, CO headquarters
- Special Operations Command (SOCOM): In command of special operations, including Special Forces, Civil Affairs, and Psychological Operations; Tampa, FL headquarters
- Transportation Command (TRANSCOM): Provides management for all air/sea/land transportation; Scott Air Force Base, IL headquarters

Assistance may be provided in the form of physical or technical support, such as logistics, transportation, communications, relief distribution, security, or emergency medicine. In natural or man-made emergencies that do not involve conflict, the military's role is to provide support, not leadership, to the affected national government and the overall relief community.

The military is known for its self-contained operational abilities, arriving on the scene with everything it needs. Once in country, it works under the strict guidelines of force protection (enforced security of all military and civilian personnel, equipment, and facilities associated with its mission) and Rules of Engagement (ROE, a structured, pre-established guideline of "circumstances and limitations under which the military will initiate or continue combat engagement" (Aid Workers Network, n.d.)). The ROE dictates military action in both peacekeeping and disaster operations.

If a particular command unit is tasked with assisting a relief operation, it may deploy a humanitarian assistance survey team (HAST) to assess what the military is best suited to address. These assessments tend to focus on different issues than those handled by humanitarian-based organizations, such as the UN or the Office of Foreign Disaster Assistance (OFDA), because the military operates fundamentally differently. HAST concentrates on the military support and logistical requirements related to the deployment of its troops. Following the HAST assessment, a joint task

EXHIBIT 8-10   Canadian Military Involvement in International Disaster Management Operations

The Canadian government has consistently demonstrated strong support for humanitarian assistance and disaster-relief operations throughout the world. Nationally and internationally, the Canadian Forces (CF) has deployed to disaster-stricken regions to conduct humanitarian relief operations. International missions since 1990 include relief operations in Rwanda, Haiti, Honduras, and Turkey.

In 1994, the CF deployed two field ambulances to Rwanda to provide medical relief to the refugees suffering from the many ill effects of the conflict in that country. Despite the best efforts of all concerned, the relief effort arrived after the peak of a cholera epidemic that brought great suffering. This experience convinced the Canadian government of the need to create a rapid-response capability to provide effective humanitarian aid. The concept of the CF Disaster Assistance Response Team (DART) was born.

The DART is a military organization designed to deploy rapidly anywhere in the world to crises ranging from natural disasters to complex humanitarian emergencies. The DART:

- responds rapidly, in conjunction with national and regional governments and nongovernmental agencies, to stabilize the primary effects of an emergency or disaster;
- provides purified drinking water and medical aid to help prevent the rapid onset of secondary effects of a disaster; and
- gains time for the deployment of national and international humanitarian aid to facilitate long-term recovery in a disaster-stricken community.

Comprising about 200 CF personnel ready to deploy quickly to conduct emergency relief operations for up to 40 days, the DART can either enhance emergency relief efforts or bridge the gap until members of the international community arrive to provide long-term help. The DART is designed to deploy only to permissive environments—that is, locations where it will not encounter any organized resistance or threat.

For international missions, the DART can be activated by a request from either an individual country or from the UN. Regardless of the source of the request, the final decision to deploy the DART rests with the Canadian government, based on advice from Foreign Affairs Canada, the Department of National Defence, and the Canadian International Development Agency.

In a UN operation, the DART is required to coordinate its work with the UN-appointed humanitarian coordinator. The DART also cooperates with international agencies on site to achieve the maximum positive impact. The DART serves four critical needs in emergencies, namely:

- primary medical care;
- production of safe drinking water;
- a limited specialist engineer capability; and
- a command and control structure that allows for effective communications between the DART, the host nation, and the other agencies involved in the relief effort, including international organizations, nongovernmental organizations, and UN aid agencies.

The DART is composed of highly trained military personnel drawn mostly from Land Force units. It comprises the following main elements:

- **DART Headquarters**, consisting of about 45 personnel drawn mainly from the Canadian Forces Joint Headquarters and the Canadian Forces Joint Signal Regiment, both based in Kingston, Ontario. DART Headquarters is

responsible for command and control in theatre, and for the strategic-level liaison required to determine and coordinate the DART's humanitarian response with the governments of Canada and the host nation, and officials of international organizations and nongovernment organizations operating in the theatre.

- A **logistics platoon** of about 20 personnel, responsible for the logistical support services essential to sustaining DART, such as maintenance, transport and movements control, supply, procurement and contracting, and food services.
- The **headquarters of the various DART sub-units** deployed on the mission, each comprising about nine personnel, to coordinate on-site tasking priorities and provide a command capability for split operations when required. These headquarters provide the day-to-day command and control of the following DART sub-units:
  - An **engineer troop** of about 37 personnel, including both field and construction engineers. The field engineer element consists of a water supply section, a field engineer section, and a heavy equipment section. The construction engineer element provides limited construction and utility services. The engineer troop produces bulk and bagged water from its Canadian-built Reverse Osmosis Water Purification Unit (ROWPU), which can produce purified drinking water for use by medical services and for distribution to disaster victims. Once it has completed the DART camp—an austere facility—the engineer troop can take on other tasks in support of the host nation and humanitarian aid agencies.
  - A **medical platoon** of approximately 40 personnel is able to provide support to area hospitals or to operate a small medical aid station, a tented facility capable of providing care for 200 to 250 outpatients and 10 inpatients per day, depending on the requirements of the mission. The medical aid station currently includes a laboratory, a pharmacy, limited obstetrics services, and rehydration and preventive medicine sections; it has no surgical or trauma-care capabilities. The medical platoon provides treatment of minor injuries, disease control, and routine healthcare services to relieve the host nation's medical facilities of these responsibilities.
  - A **defense and security platoon** of about 45 personnel to provide camp security and general support for DART operations.

Following the earthquake-generated tsunamis that devastated coastal regions of Southeast Asia on December 26, 2004, Canada sent an interdepartmental reconnaissance team to assess the requirement for assistance to the region. Using commercial aircraft, the team left Ottawa for Colombo, Sri Lanka, on December 30. The team was comprised of an 11-member Canadian Forces (CF) advance party—mostly from the Disaster Assistance Response Team—three representatives from Foreign Affairs Canada, two from the Canadian International Development Agency, and one from the Public Health Agency.

The aim of the CF members on the reconnaissance team was to assess the potential requirement for military assistance to the humanitarian effort while staying within the Government of Canada guidelines on civil–military coordination and humanitarian action.

On January 2, 2005, the Prime Minister announced the imminent deployment of the DART, pending receipt of the final recommendation from the deployed reconnaissance team. The recommendation was delivered that same day. The

following day, the Minister of National Defence announced the DART would begin deploying to the Ampara region of Sri Lanka. Ampara, a district of approximately 600,000 people, was one of the districts worst affected by the tsunamis, with an estimated 10,400 people killed. Approximately 180,000 people have been displaced, and damage to hospital infrastructure and water supplies is significant.

A 21-member advance party deployed to Sri Lanka via commercial aircraft on January 4 and 5. Five chartered Antonov-124 flights are being used to carry the DART's equipment. DART personnel deployed on two CF CC-150 Polaris flights. The first group of 137 personnel left on January 6, and the second group of 33 personnel departed on January 9.

The DART moved into the Ampara region on January 10 with tents, food, and four water purification systems capable of producing 150,000 to 200,000 litres of water per day. The water purification units and medical platoon supported local hospitals until normal services could be restored. The DART set up its main camp at a former sugar factory located about six kilometres south of Ampara, which allowed the DART to bring assistance to several nearby communities simultaneously.

Source: Canadian National Defense, 2005.

force (JTF) is established to handle the management and coordination of military personnel activities, with a JTF Commander designated as the on-site officer in charge of the operation; however, if an operation involves only one branch of the military or is minimal, a JTF may not be needed.

One of the main roles of the JTF is to establish a civil military operations center (CMOC). This center coordinates military support with all others involved in the response and/or recovery. The CMOC mobilizes requests for assistance from OFDA, the UN, NGOs, and the host government. All intermilitary planning is conducted through this center, including operations involving cargo transportation and food logistics. This center is the primary node of information exchange to and from the JTF. In recent years, CMOCs have taken on expanded responsibility, including the reestablishment of government and civil society and the repair or rehabilitation of critical infrastructure.

CONCLUSION

Responsibility for disaster management ultimately rests with the local and national governments of the affected country or countries. Citizens expect their governments to provide both pre- and postdisaster assistance, regardless of the disaster's cause. But all too often, local and national governments are unable to manage the preparedness, mitigation, response, and recovery needs of large-scale disasters, and must turn to other governments for assistance. As this chapter explained, the mechanisms by which governments participate in international disaster management are diverse. Unfortunately, this support is not always sufficient. But where government assistance leaves off, multilateral and nongovernmental organizations pick up. The next two chapters will detail international disaster management support by these entities.

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APPENDIX 8-1
Emergency Numbers of the World

Country or region	EMS	Fire	Police
Afghanistan		no national system	
Albania	17	18	19
Algeria	21606666	14	17
American Samoa		911	
Andorra	118	118	110
Angola		no national system	
Anguilla		911	
Antarctica		911	
Antigua & Barbuda		999/911	
Argentina	101	107	101
Armenia	103		

APPENDIX 8-1   (*continued*)

Country or region	EMS	Fire	Police
Aruba		911	
Ascension Island	6000		
Australia		000	
Austria		112/122	
Azerbaijan (Baku)	03	01	02
Azores	112		
Bahamas		911	
Bahrain		999	
Bali	112		118
Bangladesh (Dhaka)	199	9 555 555	866 551-3
Barbados	115/119	113/119	112/119
Belgium		112/100	
Belarus	03	01	02
Belize		911	
Benin		no national system	
Bermuda		911	
Bhutan		no national system	
Bolivia (La Paz)	118		
Bonaire	14 or 5997 8004	5997 8004	11 or 5997 8004
Bosnia-Herzegovina	124		
Botswana		997/911	
Brazil		911	
Bosnia	94	93	92
British Virgin Islands		999	
Brunei	991		
Bulgaria	150	160	166
Burkina Faso		no national system	
Burma/Myanmar		999	
Burundi		no national system	
Cambodia (Phnom Penh)		119	
Cameroon		no national system	
Canada (AB, MB, NB, NS, ON, PE, QU)		911	
Canada (BC, NF, SK)		911 (only in major cities)	
Canada (NT)		3 dig + 2222	3 dig + 1111
Canada (NU)		local only	

(*continues*)

Country or region	EMS	Fire	Police
Canada (YK)	3 dig + 3333	3 dig + 2222	3 dig + 5555
Canary Islands	112		
Cape Verde	131		87
Cayman Islands		911	
Central African Republic		no national system	
Chad		no national system	
Chile	131	132	133
China	999/120 (Beijing)	119	110
Colombia		119	
Comoros Islands		no national system	
Congo		no national system	
Cook Islands	998	996	999
Costa Rica		911	
Côte d'Ivoire		no national system	
Croatia		112	
Cuba		26811	
Curaçao	112	114	444444
Cyprus		112	
Czech Republic	112/155	150	158
Congo		no national system	
Denmark		112	
Djibouti		no national system	
Dominica		999	
Dominican Republic		911	
East Timor		112	
Ecuador	131		101
Egypt	0	03180	0
El Salvador		911	
England		112/999	
Equatorial Guinea		no national system	
Eritrea		no national system	
Estonia	112	112	110
Ethiopia		no national system	
Faeroe Islands		112	
Falkland Islands		999	
Fiji		000/911	

APPENDIX 8-1   (*continued*)

Country or region	EMS	Fire	Police
Finland		112	
France		112/18	
French Guiana	11215	11218	11217
Gabon		no national system	
Gaborone	997/911	998	999
Gambia	16		17
Gaza Strip	101	101	100
Georgia	03	01	02
Germany	112	110	
Ghana		no national system	
Gibraltar		999	
Greece	112/166	112/199	112/100
Greenland		no national system	
Grenada	434	112	911
Guadeloupe	18	18	17
Guam		911	
Guatemala	123	123	110
Guernsey		999	
Guinea Bissau		no national system	
Guinea Republic		no national system	
Guyana		999	
Haiti	118		114
Honduras	195/37 8654	198	119
Hong Kong		999	
Hungary		112	
Iceland		112	
India	102	101	100
Indonesia	118	113	110
Iran	115	125	129
Iraq		no national system	
Ireland, Republic of		112/999	
Israel	101	102	100
Italy	118	115	112
Jamaica	110	110	119
Japan	119	119	110
Jersey		999	

APPENDIX 8-1   (*continued*)

Country or region	EMS	Fire	Police
Jordan	193	193	192
Kazakhstan		03	
Kenya		999	
Kiribati	994		
Kosovo	94		
Korea (North)		no national system	
Korea (South)	119	119	112
Kuwait	777		
Kyrgyzstan		103	
Laos		no national system	
Latvia	03/112	01/112	02/112
Lebanon	140	175	112
Lesotho	121	122	123/124
Liberia		911 (cell phones only)	
Libya	119		
Liechtenstein		112	
Lithuania		112	
Luxembourg		112/113	
Macau		999	
Macedonia	94	93	92
Madagascar		no national system	
Madeira	112		
Malawi	998	999	997
Malaysia	999	994	999
Maldives Republic	102	118	119
Mali	15	17	18
Malta		112	
Marianas Island	911		
Martinique	18	18	17
Mauritania		118	117
Mauritius	114		
Mayotte	15		
Minorca	112	112	112/091
Mexico		066	
Micronesia		no national system	
Moldavia	903	901	902

APPENDIX 8-1   (*continued*)

Country or region	EMS	Fire	Police
Monaco		112	
Mongolia	103	101	102
Montserrat	911		999
Morocco	15	15	19
Mozambique	117	198	119
Namibia	2032276	2032270	1011
Nauru		no national system	
Nepal	228094 (in cities)		100
Netherlands		112	
Netherlands Antilles	912		
New Caledonia	18	18	17
New Zealand		111	
Nicaragua	265 1761	265 2373	118
Niger		no national system	
Nigeria	199		
Northern Ireland		112/999	
Norway		112/110	
Oman		999	
Pakistan	115	16	15
Palau		911	
Panama	269-9778	103	104
Papua New Guinea (Port Moresby)		110 (cities)	000 (cities)
Paraguay		00	
Peru		011/5114	
Philippines		166/117	
Pitcairn Islands		no telephone system	
Poland		112/999	
Portugal		112 (115 for forest fires)	
Puerto Rico		911	
Qatar	999/118		
Réunion	15/112	18	17
Romania	961/962	981	955
Russia		112	
Russian Federation	03	01	02
Rwanda		no national system	

(*continues*)

APPENDIX 8-1   (*continued*)

Country or region	EMS	Fire	Police
Saba	912		5994 63237
Sabah (Borneo)		999	
Samoa		999	
San Marino	113	116	112
São Tomé and Principe		no national system	
Sarawak	994		
Saudi Arabia	997	998	999
Scotland		112/999	
Scilly, Isles of		999	
Senegal		no national system	
Serb Republic	94		
Seychelles		999	
Sierra Leone	999	019	999
Singapore	995	995	999
Slovak Republic (Slovakia)	155	158	150
Slovenia		112	
Solomon Islands		911	
Somalia		no national system	
South Africa	10177	10111	10111
South Africa (Cape Town)		107	
S. Georgia Islands/ S. Sandwich Islands		no telephone system	
Spain		112/061	
Sri Lanka		1 691095/699935	
St Helena		911	
St Kitts & Nevis		911	
St Lucia		999/911	
St Maarten	911/542-2111	911/120	911/542-2111
St Vincent & the Grenadines		999/911	
Sudan		no national system	
Suriname		no national system	
Swaziland		no national system	
Sweden		112	
Switzerland	144	118	117
Syria	110	113	112
Tahiti (French Polynesia)	15		

APPENDIX 8-1   (*continued*)

Country or region	EMS	Fire	Police
Taiwan	119	119	110
Tajikistan	03		
Tanzania		112/999	
Thailand	191	199	191
Tibet		unknown	
Togo			101
Tonga		911	
Trinidad & Tobago	990	990	999
Tunisia	190		
Turkey	112	110	155
Turkmenistan		03	
Turks and Caicos Islands		999/911	
Tuvalu/Ellice Islands		911	
Uganda		112 (mobile)/999 (fixed)	
Ukraine	03/118	01	02
United Arab Emirates (Abu Dhabi)		998/999	
United Kingdom		112/999	
United States		911	
Uruguay		999/911	
U.S. Virgin Islands		911	
Uzbekistan		03	
Vanuatu	22 100	22 333	22 2222
Vatican City	113	115	112
Venezuela		171	
Vietnam	15	14	13
Wake Island		no telephone system	
Western Sahara	150		
Western Samoa		999	
Yemen		no national system	
Yugoslavia (Serbia & Montenegro)	94		
Zambia		999	
Zimbabwe	994/999	993/999	995/999

Adapted from "International '911' and Emergency Numbers", Santa Clara County Fire Department, 2005.

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9

Participants: Nongovernmental Organizations (Including the Private Sector and Academia)

INTRODUCTION

A nongovernmental organization (NGO) is an organization independent of the government whose primary mission is not commercial, but focuses on social, cultural, environmental, educational, and other types of issues. These organizations often work locally and internationally in the field of development. There are hundreds of thousands of NGOs worldwide.

With the increasing recognition of the plight of disaster victims and the vulnerability of nations, the number of NGOs focusing on international humanitarian relief and development has grown exponentially. These organizations have asserted their position as a primary component of disaster response and recovery through the vital role they have assumed in filling the many gaps left unattended by national and multilateral organizations. NGOs have significantly improved national and international relief agency efforts's ability to address the victims' needs with their diverse range of skills and supplies. Outdated stereotypes of NGOs as made up of idealists who merely interfere with the "official" responders have been replaced by a collective and genuine appreciation for their invaluable and irreplaceable capability and professionalism. Some larger NGOs, like the

International Federation of Red Cross/Red Crescent Societies (IFRC), have established an international presence similar to that of the United Nations, which has allowed them to develop strong local institutional partnerships and a capacity to provide immediate and highly effective response services.

As a group, NGOs tackle an incredibly wide range of response and recovery needs. Individually, they tend to address single needs or sets of related needs around which they have focused and refined their abilities. Their organizational structure may be adapted to best address those needs in as short a time and with as little administrative cost as possible. These organizations overall have enjoyed such great success in performing their humanitarian assistance tasks that major humanitarian aid organizations such as USAID, OFDA, and the UN now provide a majority of their relief assistance by directly funding the responding NGOs, rather than doing the same work using their own staff and resources. Through their focus and dedication, NGOs have been able to greatly improve upon the governments' ability to address specific humanitarian tasks, and in doing so have greatly improved the success of international disaster management.

In any large-scale, internationally recognized disaster, it is not uncommon to see hundreds of

individual NGOs working side-by-side to address the needs of the affected population. These organizations are the workhorses of response, rapidly assessing and addressing the needs of the hundreds, thousands, or even millions of victims affected by the disaster before the resources of the affected government arrive. And after most other responders, government or otherwise, have concluded their actions at the disaster scene, the same NGO community remains working for years and decades to help the affected communities and countries rebuild what was lost and reduce future disaster vulnerability.

This chapter will discuss the various types of NGOs involved in international disaster management, and describe the kinds of activities they often perform throughout the four phases of the disaster management cycle. Their operatations, including the funding they receive, the ways they coordinate, and how they interact with the military, will be addressed. Various "standards of conduct" by which NGOs have come to operate will be presented. The role of the private sector and academia in disaster management will be addressed as well. Finally, two examples of successful disaster management–focused NGOs will be provided.

WHO ARE THE NGOs?

In the field of disaster management, NGOs are commonly defined as nonprofit, civilian-based and staffed organizations that depend on outside sources of funding and materials (including funding from governments) to carry out a humanitarian-based mission and associated goals in a target population. Individually, they tend to perform unique tasks, while collectively addressing all facets of predisaster development and postdisaster response and recovery. The majority of NGOs that work in development and disaster management are small, though the most well known, such as the Red Cross and Catholic Relief Services, are very large.

NGOs in the field of disaster management and humanitarian assistance tend to have two defining characteristics. First, their members generally have a common background, whether religious, technical (doctors or engineers, for instance), national, regional, or otherwise. Second, they have a defined mission that guides their actions, such as to build housing, address medical needs, provide counseling, build wells, etc. Their area of operations—where they perform their work—may be global, regional, or national. And within each community, one or more "local" NGOs may be willing to respond to a disaster, even if their primary purpose is other than disaster management.

Several classifications of humanitarian-based NGOs are described below. These broad definitions are widely accepted among the international relief community and, while not every organization will neatly fit into one of these categories, they have become part of the standardized disaster response nomenclature:

- *Nongovernmental organization (NGO).* The general term for an organization made up of private citizens, with no affiliation with a government of any nation other than support from government sources in the form of financial or in-kind contributions. These groups are motivated by greatly varying factors, ranging from religious beliefs to humanitarian values. NGOs are considered "national" if they work in one country, "international" if they are based out of one country but work in more than four countries, and "multinational" if they have partner organizations in several countries. Oxfam and the IFRC are examples of multinational NGOs. NGOs can be further defined according to their functionality: religious groups, such as the Catholic Church; interest groups, such as Rotary International; residents' organizations; occupational organizations; educational organizations, and so on.
- *Private voluntary organization (PVO).* An organization that is nonprofit, tax-exempt, and receives at least a part of its funding from private donor sources. PVOs also receive some degree of voluntary contributions in the form of cash, work, or in-kind gifts. This classification is

steadily being grouped together under the more general NGO classification. It should be mentioned that although all PVOs are NGOs, the opposite is not true.

- *International organization (IO)*. An organization with global presence and influence. The Union of International Organizations lists over 50,000 international organizations in their online registry (UIO, 2005). Although both the UN and the International Committee of the Red Cross (ICRC) are IOs, only the ICRC is an NGO. International law provides a legal framework under which these organizations function.

- *Donor agencies*. Private, national, or regional organizations whose mission is to provide the financial and material resources for humanitarian relief and subsequent rehabilitation. These donated resources may go to NGOs, national governments, or private citizens. Examples of donor agencies are USAID, the European Community Humanitarian Organization (ECHO), and the World Bank.

- *Coordinating organizations*. NGO associations that coordinate the activities of tens to hundreds of preregistered member organizations to ensure response with maximized impact. They can decrease the amount of overlap and help distribute need to the greatest range of victims. They also can analyze immediate needs assessments and recommend which member organizations would be most effective to respond. Examples of coordinating organizations include InterAction and the International Council for Voluntary Agencies (ICVA).

Although these organizations differ in many ways, they can be characterized by several traits they share almost without exception:

1. *They value their independence and neutrality.* Especially in situations of civil conflict or government oppression, being perceived as independent is vital to both safety and success. Employees of an NGO could become targets if they are associated with an enemy group. They may be denied access to victims located in territory under the control of a certain faction. And finally, the victims themselves may refuse assistance due to fear of government or other influence. NGOs thus often are unwilling to cooperate with government and military organizations when conflict exists. They also are unwilling to share assessment and other information gathered through their work at the field level—including reporting observed war crimes to international tribunals—for fear that this would be seen as assisting one group over another. A perception of independence has other advantages outside of conflict situations. For instance, in disaster situations where an affected national government does not want to be perceived as needing the assistance of other national governments, they may be willing to accept the help of autonomous bodies.

2. *Their organizational structure tends to be decentralized.* NGOs will often carry out their work without any binding or definitive hierarchy, succeeding in their actions through field-level management. Ground-level units or teams are given much more flexibility and decision making power than military and government organizations, which primarily use the opposite approach.

3. *They are committed.* NGOs have been called the "arms and legs of disaster response" (ICDF, 2004). They deploy to disaster and conflict zones with great speed and efficiency, risking life and limb to provide humanitarian assistance. NGOs are involved not only in short-term disaster relief but also in the long-term recovery efforts, which may follow for months, years, or even decades—long after most other organizations have given up.

4. *They are highly practice-oriented.* As is true in many ways with military resources, NGOs are very "operational" in nature. However, teams tend to improvise in the field as necessary and provide on-site training as part of their regular procedures. They rarely use field guides to

direct their work, relying instead on the individual experience of employees and volunteers. (CDMHA, Center for Disaster Management and Humanitarian Assistance. n.d.)

Because NGOs depend on outside funding for their operations, they must spend a significant amount of effort on public relations, fundraising, and outreach. For this reason, locating detailed information about these organizations can easily be done by accessing their websites. The various coordinating agencies, of which many NGOs are members, maintain contact lists of associated nongovernmental organizations. The following lists some websites that provide NGO listings and contact information:

- InterAction—www.interaction.org/members/
- Relief Web—www.reliefweb.int/rw/rwc.nsf/doc 202?OpenForm
- NGO Voice—www.ngovoice.org/members/index.html
- Alert Net—www.alertnet.org/member_directory.htm
- International Council for Voluntary Organizations—www.icva.ch/cgi-bin/browse.pl?doc=members
- One World—www.oneworld.net/section/partners

WHAT DO THEY DO?

NGOs that focus on disaster management provide a great many required resources and services. For instance, NGOs are well regarded for their information-gathering abilities, which are used to create and verify damage and needs assessments. Rather than try to address all aspects of disaster management, they focus their efforts upon individual skill sets or technical services—such as the medical abilities of Medicin sans Frontiers (MSF, or Doctors without Borders) or Oxfam's ability to address nutritional needs—thereby providing a much higher level of service than otherwise would be available and increasing the overall effectiveness of response and recovery. Through their sheer numbers, NGOs allow for a greater capability to reach a larger population in less time. And finally, the amount of financial support that is dedicated to disasters through these NGOs' fundraising efforts greatly increases the amount of humanitarian work that is performed.

Disaster management is an ever-improving science, growing in efficiency and efficacy through the shared knowledge base augmented by each successive disaster response. One of the most notable changes over the past several decades that continues today is governments' and multilateral organizations' increasing dependence on NGOs to execute much of the actual humanitarian work. These same organizations that not long ago were regarded as obstacles are now being entrusted with the bulk of the funding that allows for response, relief, reconstruction, and recovery. The result is that NGOs have begun to develop an enormous institutional base of educated, experienced staff, located in all parts of the world, who are seen in many ways as the authorities in the functions they perform. Governments often no longer need to dedicate and transport specialized teams of response and recovery officials, because they are confident that NGOs will provide equal or even better levels of quality.

The primary goal of NGOs involved in disaster management and humanitarian operations is to reduce victims' pain and suffering. How they do this depends on their mission, goals, and focus. Some NGOs may provide food, while others may provide shelter or medical assistance. All of these actions can be grouped into four over-arching objectives:

1. Reduce the crude mortality rate observed among disaster victims
2. Reduce or minimize the incidence of disease and disability, while stabilizing public health conditions
3. Assist in the reconstruction and repair of infrastructure that has been damaged or destroyed
4. Protect displaced populations, and provide for their safe return once the emergency has passed (Frandsen, 2002).

Examples of areas in which NGOs focus their efforts include:

- Safe water
- Addressing the concerns of special groups (children, elderly, women)
- Agriculture
- Animal rescue and care
- Clothing
- Community development
- Coordination of NGO action
- Cultural preservation
- Disarmament
- Disaster mitigation, preparedness, and education
- Education
- Emergency response
- Employment and skills training services
- Food provision and nutrition
- Health education
- Human rights
- Microfinance
- Peace building/conflict resolution
- Protection of the environment
- Psychological counseling
- Refugee and internally displaced persons care
- Sanitation
- Shelter
- Short- and long-term medical assistance
- Victim security and safety

Because development and disaster management are so closely linked, as was described in Chapter 1 and will be further addressed in Chapter 11, many NGOs operate in developing countries irrespective of the presence of a disaster. Although smaller NGOs do not always deploy to a disaster scene until after they have been alerted to the need, a great many organizations invariably will long have had a presence in the affected country by the time the disaster strikes. They thus have trust established with the people and government of that country, and they hold a unique understanding of the specific problems of the affected population, as well as how best to address them. They are also able to commence their operational work almost immediately and with little or no additional, site-specific employee training. They are familiar with cultures, languages, governance structures, economies, social networks, climates, and geographies. The Red Cross, for example, has operating chapters in almost every country of the world, and has built strong partnerships with many local and national agencies that may be lead the response to a crisis. By the time their services are called on in response to a disaster, they may have all the personnel, equipment, and resources in place to begin work without hesitation.

NGO disaster management work, like all other disaster management work, falls under the four functions of the emergency management spectrum: preparedness, mitigation, response, and recovery. Governments and multilateral organizations almost always provide the greatest amount of operational and financial support to achieve the "predisaster" activities of preparedness and mitigation. While many "development NGOs"—those that have a longstanding presence in the country before the disaster occurs—do address mitigation and disaster management capacity through their overall efforts, it is rarely central to their mission. On the other hand, NGOs play a very large part in the response and long-term recovery from disaster events in all nations, rich or poor.

Some NGOs' organizational efforts and actions focus almost entirely on the disaster's short-term response needs. Involvement may include actual emergency response activities equivalent to or in support of those performed by local fire, police, emergency medical, and emergency management agencies (as described in previous chapters), or they may offer comfort to victims by providing much-needed food, water, clothing, and shelter. One of their greatest strengths is that they do not suffer from bureaucracy and therefore are able to deploy on very short notice. They may have pre-established teams, as well as caches of equipment and supplies, all of which are on standby 24 hours per day (in fact, it is not uncommon for many NGOs to be operating in the affected area within 12 hours' notice alongside the local first responders, long before donor government and other responders have arrived). Once the emergency phase of the disaster is over, most NGO volunteers and employees will return home, often to a full-time job

that they temporarily vacated. Examples of organizations in this category include:

- Doctors Without Borders (Medecins Sans Frontieres)
- Doctors of the World (Medecins du Monde)
- International Medical Corps
- Mercy Corps
- Air-Serv International

In contrast to these rapid-deployment, rapid-return organizations are the development organizations that address the actual recovery and longer-term reconstruction needs, including the preexisting vulnerability issues. Rather than provide for victims' individual needs, they tend to work on enhancing the community's overall capacity to provide these services for themselves. For instance, they will help a community rebuild a hospital, rather than offer medical care themselves. In cases of complex humanitarian emergencies, involving refugees and internally displaced persons, the agencies will work with these people to help them survive while displaced, and then provide them with the skills and resources necessary to reintegrate into an independent life after the emergency phase has ended. These NGOs have a deep institutional knowledge and understanding of the customs, language, politics, and other general characteristics of a society, making their operations more finely tuned to the special needs of the affected area. They may also have an infrastructure already in place before the disaster occurs from which to launch relief and recovery operations. Because of their development mission, however, these organizations may be unable to offer much in the form of short-term response assistance. Examples of this kind of organization include:

- Habitat for Humanity
- Health Volunteers Overseas
- Heifer International
- World Learning
- Synergos

Of course, some organizations that blur these lines, supporting both long- and short-term activities in disaster response. Large organizations that have been working in the country or community for a long time will, as mentioned above, maintain a strong and established presence. Likewise, they have the infrastructure and knowledge necessary to either put other projects on hold to address emergency needs or to add response activities to their regular range of services. These organizations have an intrinsic ability to gather timely and accurate assessment data on both the local population and the condition of the existing response and recovery systems, upon which data almost all other response actions will hinge. The numerous external response agencies that descend on a disaster scene, including other NGOs, will often heavily rely on this expertise and knowledge in order to launch their own disaster response more effectively. Examples within this category of NGO include:

- International Federation of Red Cross and Red Crescent Societies
- Adventist Development and Relief Agency
- Americares
- Concern Worldwide
- Latter-Day Saint Charities
- Relief International

Appendix 9-1 lists many of the NGOs that responded to the 2004 Asian earthquake and tsunami disasters and details the different kinds of activities performed by each.

NGO OPERATIONS

FUNDING

Unlike governments and businesses, which have a fairly constant flow of money, NGOs must either conduct fundraising campaigns or apply for competitive grants in order to sustain their mission and activities. Each organization is unique in how it supports its financial requirements. For instance, NGOs that focus on emergency response activities may have few opportunities apart from defined emergencies to apply for grants or funding to support their emergency management-related work because governments, multilat-

eral organizations, and private donors do not perceive an imminent need. These organizations may operate on very low administrative budgets at such times to compensate. The development organizations, on the other hand, whose activities are ongoing regardless of the presence of a disaster, must constantly seek grants and solicit funds—and request with supplemental funds to address the increased demands resulting from the added disaster responsibilities.

Most organizations other than the larger, more established NGOs must quickly raise funds for response or recovery activities. Though they may be able to manage a few weeks or even months of operation by tapping into funding reserves, they must soon either generate funding from private or public donors or cease operations entirely. Wide recognition of the plight of the affected countries is key to the success of these organizations, because only through public knowledge of the disaster can they effectively tap into a philanthropic funding base. The expansion of media coverage has definitely helped in this regard, but NGOs must still campaign to raise awareness about the specific needs of the affected population they serve.

Several sources of funding exist for humanitarian and development NGOs. The United States Agency for International Development (USAID), most notably its Office of Foreign Disaster Assistance (OFDA), provides a significant amount of the funding used to support primarily U.S.-based NGOs in disaster response and recovery operations. Other important sources of funding include the various OECD countries described in Chapter 8 and the United Nations through its various operational offices. NGOs also receive support in the form of in-kind assistance, such as equipment, supplies, and food aid. Many NGOs have preestablished relationships with corporations or other organizations (trade, religious, civic, or other) that can quickly mobilize extensive resources. The various forms of funding that NGOs may tap into include:

- Philanthropic giving from private citizens (cash or in-kind)
- Corporate ongoing or one-time support (cash or in-kind)
- Religious organizations
- Civic organizations
- Government contracts
- Government grants
- International organization contracts
- International organization grants

NGOs compete to secure grants, contracts, or other funding for disaster management work using various proposal systems, defined by each donor agency. These agencies may solicit a request for proposals (RFP) from agencies that can perform highly specific humanitarian work to address pre-assessed needs. Depending on the size and scope of the emergency and the work required, an individual donor may choose to fund one NGO to perform all the necessary work or fund several to perform various tasks. Due to the time constraints of humanitarian emergency work, the bidding process is compressed and fast-paced, requiring NGOs to produce proposals in much less time than in other fields. Funded NGOs may perform all of the work themselves or may subcontract out specific tasks to other (often smaller) NGOs (local, national, or international) as required and allowed by their grant proposal or contract.

COORDINATION

Coordination is vital to every emergency situation. Disaster response and relief organizations and agencies working in concert clearly provide a greater sum benefit than they could working on their own. This applies to NGO agencies just as much as any other type—if not more. For years, the NGO community has resisted widespread coordination for many reasons, including fear of external control, their territorial nature concerning their mission objectives and goals, and a desire to avoid the bureaucracy that often accompanied formal coordination mechanisms. However, this trend has reversed in the past two decades.

NGOs are under no obligation to work with each other or with any other organization involved in response and recovery. However, many have recognized that they can benefit significantly from each other's expertise, equipment, information, access, and skills to further their own mission and goals, and have realized that they are likely to surpass these benchmarks if they successfully coordinate their actions. NGOs have found that they can share valuable resources, such as vehicles, air transport, supply transport, office and warehouse space, and information on dangers, damages and needs, and benefit from the information and logistical support of the governmental resources responding to the disaster. Additionally, the very nature of their funding—from national governments and the international organizations, for instance—often *requires* that they coordinate their actions on cooperative projects and tasks to cut costs and increase capacity. Coordination is now an important topic of development study and of NGO non-emergency collaborative industry efforts (such as meetings and conventions).

There are several forms of coordination and, likewise, several mechanisms that have developed to accommodate these needs. NGOs must often coordinate with other NGOs and with local, national, or international government response and recovery organizations or military resources operating in the affected area. This coordination could range from the very informal, including teleconferences or meetings in temporary headquarters, to established systems that exist solely to monitor NGO activity and centralize information and resources. The coordination mechanism may originate within the NGO community itself or may be an office established by the affected government, an outside donor government, or an international organization such as the UN.

Depending on the disaster's size, onset speed, and scope, the range of agencies involved in response, and the emergency management capacity, NGOs may coordinate under several different locations, mechanisms, and situations. These include, but are not limited to:

- Local/national government emergency operations center
- Formal NGO coordination mechanisms established, maintained, and populated by only non-governmental organizations participating in the humanitarian response
- NGO field coordination meetings (formal or informal)
- Conference calls and teleconferences
- Designated coordination websites
- NGO-established permanent or temporary offices or operations centers
- UN-established coordination mechanism (such as a UN Inter Agency Standing Committee [IASC])
- Civil-military operations center (CMOC) (see Chapter 8)
- Humanitarian information center (HIC) (see Exhibit 9-1)
- On-site operations coordination center (OSOCC), created to assist the local authorities of the affected country with managing the disaster, in particular coordinating international search and rescue teams. The OSOCC can be established by the first international SAR teams to arrive in cooperation with national authorities, or by resources mobilized by the International Search and Rescue Advisory Group (INSARAG) Secretariat in Office for the Co-ordination of Humanitarian Affairs-Geneva and the United Nations Disaster Assessment and Coordination (UNDAC) team. The OSOCC will assess the need for and use of international resources and provide support to the affected country by managing operations and logistical support for international SAR teams and registering their operational capabilities. The OSOCC provides a platform for national and international relief agencies to exchange information and coordinate their activities. In the OSOCC, international relief teams are registered and are provided with basic information about the situation, operations of national authorities, and logistics arrangements.

EXHIBIT 9-1   Humanitarian Information Centers

Humanitarian Information Centers (HICs) support the coordination of humanitarian assistance through the provision of information products and services. The HIC supports the decision-making process at headquarters and field level by contributing to the creation of a common framework for information management within the humanitarian community.

Background

Accurate and timely information is crucial to the effective provision of humanitarian assistance. HICs aim to ensure that individuals and organizations at field and strategic levels have access to the benefits of information management tools to assess, plan, implement, and monitor humanitarian assistance. HICs are an interorganizational resource, reporting to the Humanitarian/Resident Coordinator, whose products and services are available to the entire humanitarian community. HICs provide surge capacity to the humanitarian community, and particularly to the coordination function, usually (but not exclusively) in the context of complex emergencies.

Role of the HIC

- A space where the humanitarian community can share and access information resources in order to improve the planning and delivery of humanitarian assistance.
- A provider of information products and services that enable the humanitarian community to deliver assistance more effectively, following principles of good practice in information management.
- A focal point for data collection, analysis, and dissemination in support of the provision of humanitarian assistance, developing and supporting data standards.
- A facilitator for initiatives and activities related to information management in the field, particularly in collaboration between other humanitarian actors in support of existing coordination structures.
- An advocate for a culture of information-sharing in the humanitarian community, generating awareness of good practice and making it possible for agencies to develop common standards and practices in the field.

Characteristics of the HIC

- HICs are a common resource of the humanitarian community.
- HICs must be an integral part of the coordination structure, seeking to avoid duplicating existing initiatives and maximizing resources.
- HICs must work in partnership with specialized agencies to support, if required, sector-specific work.
- HICs must be demand driven. They must serve operational and strategic needs and seek feedback from users to ensure that products and services meet the needs of customers, and adapt those outputs accordingly.
- HICs must be service-oriented, open-access projects that create a link between technical staff and nontechnical users.
- HICs should encourage participation by local, national, and international actors.
- HICs and its partners will develop a phase-out and transition strategy from the onset of its operation to link with reconstruction, rehabilitation, and development activities.

Activities of the HIC

The HIC's work may include, but will not be limited to, the following activities:

- Provide orientation material to humanitarian actors, either in written, graphic, and/or verbal form

- Provide a range of information services such as maps, contacts lists, meetings, schedules, etc.
- Develop and promote standards to facilitate data and information sharing
- Collect and maintain data on who's doing what where in the humanitarian community
- Collect, maintain, and make available a range of data sets from all sources, processing and disseminating this data as appropriate to support humanitarian operations
- Collect and maintain data for a Survey of Surveys to develop a master list of assessments planned, underway, and completed by all partner agencies
- Establish document management and archive facilities for the storage and retrieval of relevant documentation relating to the emergency and the humanitarian response

- Develop and deploy Geographic Information Systems in key humanitarian sectors
- Create a framework and strategy for information management in the field, liaising with other organizations
- Advise other organizations on information management issues
- Provide technical support to improve the information management capacity of the humanitarian community, including working with key partner organizations
- Provide physical space for the humanitarian community (include meeting space, mailboxes, noticeboards, and connectivity for humanitarian actors)
- Engage with local actors to support and develop existing information infrastructures

Source: HumanitarianInfo.org, 2005.

- Humanitarian assistance coordination center (HACC), usually created by a military organization participating in the humanitarian assistance operation. The HACC assists with interagency coordination and planning, providing the critical link between the military commander, other government agencies, and nongovernmental, international, and regional organizations that may participate in a humanitarian assistance operation at the strategic level.
- Humanitarian operations center (HOC), an interagency policy-making body that coordinates the overall relief strategy among all participants in a large foreign humanitarian assistance operation. It is normally established under the direction of the affected country's government, the UN, or a U.S. government agency during a unilateral U.S. operation. The humanitarian operations center should consist of representatives from the affected country, embassies or consulates, military forces, the UN, NGOs, inter-

national organizations, and other major players in the operation.
- Civil/military coordination center (CMCC), located inside the military operational compound for planning, coordinating, and conducting civil/military operations. In principle, the CMCC is only accessible to designated key representatives of the civil authorities and the heads of civilian agencies such as UNHCR, United Nations High Commissioner for Human Rights, UN International Organization for Migration, UNDP, ICRC, and Red Crescent that are involved in planning, conducting, and coordinating the humanitarian operation.
- Civil/military information center (CIMIC), equivalent to a U.S. CMOC, but established outside the designated military compound. It is essentially a humanitarian assistance coordination center, providing information about and coordination of plans and joint projects with civilian agencies, civil authorities, contractors,

and the local population. A CIMIC will usually provide civilian authorities, IOs, NGOs, UN agencies, and the civilian population with information on the prevailing operational situation and plans and minor/major projects, either planned or ongoing.

Despite the advances in coordination among the responding NGOs and the other responding agencies, there is often a lack of cooperation between the local and international NGOs operating within the disaster response. In several humanitarian emergencies, two entirely separate NGO coordination mechanisms have developed, one for local NGOs and one for international NGOs, rather than one single coordination mechanism to address the needs of all NGOs involved. Fortunately, this is not always the case, and there are several recognized examples of effective NGO coordination mechanisms, including:

- Committee for Coordination of Services to Displaced Persons in Thailand (CCSDPT)
- NGO Coordination Committee in Iraq (NCCI)
- NGO Coordinating Committee for Northern Iraq (NCCNI)
- NGO Co-ordination committee for the Maharashtra flood relief efforts (India)
- Coordination Committee of the Women NGOs (Bam, Iran earthquake)

NGOs also maintain permanent associations that serve as coordination mechanisms both outside of and during disaster operations. These permanent associations primarily enable member NGOs to share ideas and lessons learned, and act as a collective advocacy body that pools the influence of all members. They provide much of the funding for, or even conduct, research aimed at improving overall NGO participation and coordination in global humanitarian efforts. Examples of NGO associations include:

- InterAction
- International Council of Volunteer Agencies (ICVA)
- International Network of NGOs for Emergency and Development (INNED)

- Steering Committee for Humanitarian Response (SCHR)
- Voluntary Organizations in Cooperation in Emergencies (VOICE)
- Dóchas—The Irish Association of Non-Governmental Development Organisations

NGO/MILITARY COOPERATION

Over time, the military (from the affected country and outside donor countries) and NGOs have emerged as the two most significant operational humanitarian response participants. These organizations are conceptually and idealistically very different, presenting a formidable coordination challenge. Their organizational structures are very different (centralized vs. decentralized), as are their operations (top-down vs. bottom-up), and length of commitment (short-term vs. long-term). As international disaster management has become more complex, these two important players are interacting and cooperating to an ever-increasing degree, for the mutual benefit of both.

NGOs traditionally have resisted direct cooperation with military organizations. First and foremost, NGOs have feared that such cooperation would compromise the core values that allow them to perform their work, including the perception of impartiality (neutrality) and independence. They believe it is vital that the host population view their actions as entirely independent of any government or military interference, thereby securing both the acceptance of their actions and the safety of their employees. Second, NGOs have a long-standing fear that military organizations will attempt to take over the humanitarian operation, thereby impeding or preventing them from serving their target populations. And finally, some NGOs simply are biased against working with the military, whether based on ideological or political differences, negative past experiences, or, specifically in reference to CHEs, the perception that military organizations are ultimately to blame for the disaster.

On the other hand, many NGOs have recognized that there are valuable resources and services that only

the military can offer, each of which can be used to increase the NGO's ability to achieve its humanitarian goals. For instance, the military is often the only source of heavy equipment to transport response and recovery supplies and materials, as well as NGO employees, to the affected areas. The military also has the technological resources to generate more broad-reaching damage assessment data (satellite and aerial imagery, for example), and can offer highly special-ized technical and logistical assistance. In particular, NGOs rely on their advanced mobile communications capacity in situations where infrastructure is damaged or destroyed. Finally (and in many cases, most signif-icantly), the military can offer protection from vio-lence. Besides actual physical protection, they have highly specific information on mines and dangerous territory. Though protection is often required in CHEs, this need has become more widespread in recent years as attacks on NGO personnel have increased (see Exhibit 9-2). In both the 2004 Asian earthquake and tsunami events in Aceh Province, Indonesia and the 2005 Asian earthquake in Kashmir, humanitarian assistance was required in areas of ongoing fighting, illustrating the importance of military protection in international disaster management.

In turn, the military is coming to accept the value of their NGO counterparts, recognizing that NGOs are not uninformed, ineffective "do-gooders" that merely interfere without actually performing any useful ser-vice, but quite the opposite. Besides their vital role in providing humanitarian assistance to the affected pop-ulation, NGOs have unique access to the affected indi-viduals themselves. The military is often unable to or prevented from making local assessments, which are required to develop true needs assessments and status reports. NGO workers tend to be much more trusted by victims, and are therefore better positioned to per-form the kind of face-to-face interaction required to assess the situation on the ground and meet individual needs. NGOs also have the specific training to address disaster victims' less tangible needs, including mental health issues and public education to prevent sec-ondary public health disasters. A good example of the synergy that has developed between military and

NGO participants is the IDP or refugee camp—the military is best suited to build it quickly, while the NGOs are better at administrating.

Several militaries, including the U.S. Military, the Canadian Military, and members of the North Atlantic Treaty Organization (NATO), among others, have developed formal coordination mechanisms within which cooperation with nongovernmental organiza-tions may be carried out more systematically (and, hopefully, more effectively.) Examples of these coor-dination mechanisms, as described above, include the CMOCs, CIMICs, HACCs, and CMCCs. These systems are by no means perfect, however, because the NGOs and military groups have no obligation to cooperate with each other, and they often have differ-ent and conflicting goals and priorities. Some NGO advocacy groups have gone as far as to say that these military coordination mechanisms are designed only to accommodate the needs of the military partners, not of the NGOs. Coordination mechanisms do serve a useful purpose, though, as they allow for a much higher level of cooperation than is possible in their absence.

STANDARDS OF CONDUCT

Unlike governments and multilateral organiza-tions, NGOs are accountable only to themselves and their donors. As mentioned, they have no obligation to coordinate with other NGOs or with official govern-ment responders. Further, they are subject only to the laws of the affected countries in terms of what they can and cannot do. Such independence influences NGO humanitarian response operations in both posi-tive and negative ways.

In the early years of international disaster manage-ment, when each successive disaster resulted in the creation of and participation by new NGOs, a great deal of competition existed among the NGOs. Inter-national disaster management as a practice was still in its formative stages, and very little coordination of activities was attempted. Because these NGOs were often resource poor, operating on shoestring budgets

EXHIBIT 9-2   Chronology of Humanitarian Aid Workers Killed in 2003

12 January, **Côte d'Ivoire**—Four volunteers of the Red Cross Society of Côte d'Ivoire were abducted and killed by armed men while carrying out their duties.

17 January, **Democratic Republic of the Congo**—A Red Cross vehicle was ambushed by unidentified assailants near Uvira, leaving one of its passengers dead and five injured. The vehicle was clearly marked with Red Cross flags and stickers, and was fired on with no warning, no advance sign of hostilities, nor any attempt to stop it.

28 February, **Liberia**—The Adventist Development and Relief Agency (ADRA) Country Director, the acting ADRA Liberia director, and chief driver for ADRA Liberia were killed on their way to visit ADRA's Ronda Shelter project when they inadvertently came in contact with an outbreak of fighting in rebel territory.

27 March, **Afghanistan**—An ICRC field delegate and a water and habitat engineer were shot and killed by a group of unidentified assailants who stopped the vehicles in which they were traveling.

8 April, **Iraq**—A delegate of the ICRC was killed in Baghdad when the two vehicles he and other ICRC staff members were traveling in were caught in crossfire.

15 April, **Afghanistan**—A de-miner with the UN Mine Action Program for Afghanistan was killed in a mine explosion 110 kilometers (70 miles) east of Kabul.

26 April, **Democratic Republic of the Congo**—A MONUC military observer was killed and another injured when their vehicle drove over a mine near Bunia.

2 May, **Uganda**—A World Vision coordinator in the Karamoja region was killed when suspected warriors ambushed and fired on the vehicle carrying him and others.

3 May, **Afghanistan**—An anti-landmine staffer traveling in a car clearly marked with the Afghan Development Association (ADA) logo was killed and another seriously injured after their car was attacked

11 May, **Democratic Republic of the Congo**—Two volunteers from the Red Cross Society of the Democratic Republic of the Congo were killed while carrying out humanitarian duties during fighting in Bunia. Both were wearing tabards that clearly identified them as Red Cross personnel.

12 May, **Sudan**—A Jesuit Refugee Service vehicle was ambushed and hit by a rocket propelled grenade, killing three people.

18 May, **Democratic Republic of the Congo**—Two observers from the UN Mission in the Congo (MONUC) were killed.

29 June, **Russian Federation**—A Chechen worker of the Czech humanitarian organization People in Need Foundation was shot and killed in Chechnya.

19 July, **Liberia**—A mortar strike on a Medecins Sans Frontieres (MSF) worker's home killed the employee.

20 July, **Iraq**—An International Organization for Migration driver was killed and another injured in a drive-by shooting.

22 July, **Afghanistan**—An agricultural extension worker for Ockenden International was shot dead by a single gunman.

22 July, **Iraq**—An ICRC employee was shot and killed while traveling on the road from Hilla to Baghdad in a vehicle clearly marked with highly visible Red Cross emblems.

24 July, **Democratic Republic of the Congo**—A Tearfund staff member was killed while working on a water sanitation project.

3 August, **Federal Republic of Yugoslavia**—A UN police officer was killed in an attack on a police vehicle in Kosovo.

7 August, **Afghanistan**—A Mercy Corps driver was among seven people killed in an ambush in the Deshu district.

10 August, **Eritrea**—Two U.S. Mercy Corps workers were killed and a third injured by unidentified gunmen.

13 August, **Afghanistan**—Two Afghan Red Crescent workers were killed and three wounded while they were on a mission to distribute aid to flood victims. Their convoy of two trucks and a four-wheel-drive vehicle was ambushed.

14 August, **Uganda**—The rebel group Lord's Resistance Army attacked three WFP trucks carrying WFP food, killing two truck drivers.

19 August, **Iraq**—The worst attack in United Nations history, carried out by a suicide truck bomber against the United Nations headquarters in Iraq at the Canal Hotel, killed the top United Nations envoy, as well as 21 others.

4 September, **Iraq**—An international bomb disposal expert for the UK-based Mines Advisory Group (MAG) was shot dead and his colleague seriously injured while driving along a main road towards Mosul. Their vehicle was clearly marked.

8 September, **Afghanistan**—Four employees of the Danish Committee for Aid to Afghan Refugees (DACAAR) were killed and a fifth wounded when their car was ambushed 150 miles south of Kabul. The victims were told to get out of the car, their hands were tied, the group was tied together, and then shot.

14 September, **Somalia**—A security guard for the Adventist Development and Relief Agency was shot and killed while traveling with coworkers from El Wak, Kenya to a project site.

25 September, **Afghanistan**—Two Afghans working for the Voluntary Association for the Rehabilitation of Afghanistan were shot and killed near Kandahar.

5 October, **Somalia**—Unidentified gunmen shot and killed award-winning Italian aid worker Annalena Tonelli in the west of the self-declared republic of Somaliland.

21 October, **Somalia**—Two British international aid workers of the organization SOS Kinderdorf International were killed by unknown gunmen.

27 October, **Iraq**—Two Iraqi employees of the ICRC were killed in a bomb explosion outside the organization's office in Baghdad.

7 November, **Burundi**—A WFP staff member was shot dead at close range by unknown armed men at his home in Ngozi town.

16 November, **Afghanistan**—A UNHCR official traveling in a clearly marked UNHCR vehicle was killed in a drive-by assault.

4 December, **Afghanistan**—At least one Afghan working in a UN-sponsored program was killed and 11 wounded in an ambush by suspected members of the ousted Taliban.

12 December, **Angola**—Six staff members of the international humanitarian agency CARE International were killed after a landmine explosion.

Source: King, 2004.

and reaching only small pockets of need, government responders regarded their actions as benevolent, small-scale operations that merited little scrutiny. The NGOs themselves had almost no professional foundation to guide their actions or professional associations to share their experiences and ideas. As a result, certain services and resources were duplicated, while other needs remained unmet.

Beginning in the 1980s and 1990s, NGOs significantly expanded their role in international disaster

management and in the amount of funding they brought to the scene. As often occurs with rapid, unchecked growth, some instances of corruption and misuse of funds, among other problems, tarnished the reputation of the industry as a whole. Donors, whose generous philanthropic contributions the NGOs depended on, began losing confidence in NGOs ability to carry out their mission. Meanwhile, the lack of coordination and effective management among the NGOs put the victims at risk as well.

Recognizing the need for self-discipline and organization, several NGOs set out to create codes of conduct and standards of service to regulate and guide their actions in humanitarian response. In 1994, eight of the largest NGOs involved in humanitarian response—the International Federation of Red Cross and Red Crescent Societies, Caritas Internationalis, Catholic Relief Services, International Save the Children Alliance, Lutheran World Federation, Oxfam, The World Council of Churches, and The International Committee of the Red Cross—developed "The Code of Conduct" and agreed to abide by its policies. This code formalized the actions of the growing number of NGOs involved in humanitarian assistance. They then extended the Code to serve as a general guideline to be followed by all organizations involved in international disaster management.

The Code was written to address the actions of any NGO, no matter its size, background, or affiliation, or whether it is local, national, or international in scope. It mentions "10 Points of Principle" that NGOs may apply to their humanitarian work (see Exhibit 9-3). The Code helps to guide successful working relationships between NGOs and the other actors commonly engaged in disaster response and recovery operations. Today, there are over 350 signatories of this self-regulating code.

While the Code of Conduct prescribed general, overarching guidelines to direct NGOs' actions, it still left open to interpretation what constituted acceptable care and action in responding to the needs of disaster victims. There was no system by which NGOs could hold each other accountable for the *quality* of assistance provided, or allow them to gauge the effective-

ness and fairness of their actions. As it stood, victims could receive a range of service quality, ranging from excellent to wholly ineffective.

To address the need for an improvement in both the effectiveness and accountability of NGOs operating in disaster response, a group of NGOs came together in 1997 and developed the *Sphere Project Humanitarian Charter and Minimum Standards in Disaster Response* handbook. This guide, which has since been revised, expanded, and updated with input from thousands of representatives from over 400 NGOs, UN agencies, and academic institutions, was created to serve as a guideline for all NGOs working in the field of humanitarian assistance. The handbook has been made available to all interested NGOs or other organizations or individuals on the Sphere Project website (www.sphereproject.org). The handbook addresses the standards by which humanitarian organizations can conduct operations in eight sectors:

- Water supply and sanitation
- Nutrition
- Food aid
- Shelter
- Health services
- Food security
- Process standards
  - Participation
  - Assessment
  - Response
  - Targeting
  - Monitoring
  - Evaluation
  - Staff competencies and management
- Cross-cutting issues
  - Children
  - Older people
  - Disabled people
  - Gender
  - Protection
  - HIV/AIDS
  - The environment

Taken together, the Humanitarian Charter and the Minimum Standards create an operational framework

EXHIBIT 9-3   The Code of Conduct

1. **The humanitarian imperative comes first.**

   The right to receive humanitarian assistance, and to offer it, is a fundamental humanitarian principle which should be enjoyed by all citizens of all countries. As members of the international community, we recognize our obligation to provide humanitarian assistance wherever it is needed. Hence the need for unimpeded access to affected populations is of fundamental importance in exercising that responsibility. The prime motivation of our response to disaster is to alleviate human suffering amongst those least able to withstand the stress caused by disaster. When we give humanitarian aid it is not a partisan or political act and should not be viewed as such.

2. **Aid is given regardless of the race, creed, or nationality of the recipients and without adverse distinction of any kind. Aid priorities are calculated on the basis of need alone.**

   Wherever possible, we will base the provision of relief aid upon a thorough assessment of the needs of the disaster victims and the local capacities already in place to meet those needs. Within the entirety of our programs, we will reflect considerations of proportionality. Human suffering must be alleviated whenever it is found; life is as precious in one part of a country as another. Thus, our provision of aid will reflect the degree of suffering it seeks to alleviate. In implementing this approach, we recognize the crucial role played by women in disaster-prone communities and will ensure that this role is supported, not diminished, by our aid programs. The implementation of such a universal, impartial, and independent policy can only be effective if we and our partners have access to the necessary resources to provide for such equitable relief, and have equal access to all disaster victims.

3. **Aid will not be used to further a particular political or religious standpoint.**

   Humanitarian aid will be given according to the need of individuals, families, and communities. Not withstanding the right of Non-governmental Humanitarian Agencies (NGHAs) to espouse particular political or religious opinions, we affirm that assistance will not be dependent on the adherence of the recipients to those opinions. We will not tie the promise, delivery, or distribution of assistance to the embracing or acceptance of a particular political or religious creed.

4. **We shall endeavor not to act as instruments of government foreign policy.**

   NGHAs are agencies which act independently from governments. We therefore formulate our own policies and implementation strategies and do not seek to implement the policy of any government, except in so far as it coincides with our own independent policy. We will never knowingly—or through negligence—allow ourselves, or our employees, to be used to gather information of a political, military, or economically sensitive nature for governments or other bodies that may serve purposes other than those which are strictly humanitarian, nor will we act as instruments of foreign policy of donor governments. We will use the assistance we receive to respond to needs and this assistance should not be driven by the need to dispose of donor commodity surpluses, nor by the political interest of any particular donor. We value and promote the voluntary giving of labor and finances by concerned individuals to

support our work and recognize the independence of action promoted by such voluntary motivation. In order to protect our independence we will seek to avoid dependence upon a single funding source.

5. **We shall respect culture and custom.**

    We will endeavor to respect the culture, structures, and customs of the communities and countries we are working in.

6. **We shall attempt to build disaster response on local capacities.**

    All people and communities—even in disaster—possess capacities as well as vulnerabilities. Where possible, we will strengthen these capacities by employing local staff, purchasing local materials, and trading with local companies. Where possible, we will work through local NGHAs as partners in planning and implementation, and co-operate with local government structures where appropriate. We will place a high priority on the proper co-ordination of our emergency responses. This is best done within the countries concerned by those most directly involved in the relief operations, and should include representatives of the relevant UN bodies.

7. **Ways shall be found to involve program beneficiaries in the management of relief aid.**

    Disaster response assistance should never be imposed upon the beneficiaries. Effective relief and lasting rehabilitation can best be achieved where the intended beneficiaries are involved in the design, management, and implementation of the assistance program. We will strive to achieve full community participation in our relief and rehabilitation programs.

8. **Relief aid must strive to reduce future vulnerabilities to disaster as well as meeting basic needs.**

    All relief actions affect the prospects for long-term development, either in a positive or a negative fashion. Recognizing this, we will strive to implement relief programs which actively reduce the beneficiaries' vulnerability to future disasters and help create sustainable lifestyles. We will pay particular attention to environmental concerns in the design and management of relief programs. We will also endeavor to minimize the negative impact of humanitarian assistance, seeking to avoid long-term beneficiary dependence upon external aid.

9. **We hold ourselves accountable to both those we seek to assist and those from whom we accept resources.**

    We often act as an institutional link in the partnership between those who wish to assist and those who need assistance during disasters. We therefore hold ourselves accountable to both constituencies. All our dealings with donors and beneficiaries shall reflect an attitude of openness and transparency. We recognize the need to report on our activities, both from a financial perspective and the perspective of effectiveness. We recognize the obligation to ensure appropriate monitoring of aid distributions and to carry out regular assessments of the impact of disaster assistance. We will also seek to report, in an open fashion, upon the impact of our work, and the factors limiting or enhancing that impact. Our programs will be based upon high standards of professionalism and expertise in order to minimize the wasting of valuable resources.

10. **In our information, publicity, and advertising activities, we shall recognize disaster victims as dignified humans, not hopeless objects.**

    Respect for the disaster victim as an equal partner in action should never be lost. In our

public information we shall portray an objective image of the disaster situation where the capacities and aspirations of disaster victims are highlighted, and not just their vulnerabilities and fears. While we will co-operate with the media in order to enhance public response, we will not allow external or internal demands for publicity to take precedence over the principle of maximizing overall

relief assistance. We will avoid competing with other disaster response agencies for media coverage in situations where such coverage may be to the detriment of the service provided to the beneficiaries or to the security of our staff or the beneficiaries.

Source: The International Federation of Red Cross & Red Crescent Societies, 2005.

for accountability in disaster assistance efforts. They have received wide endorsement by the most prominent humanitarian aid agencies, and are regularly referenced in the management of actual disasters. While these two initiatives are the most widely recognized and accepted standards and conduct codes developed by NGOs, there are other collaborative agreements, including:

- Active Learning Network for Accountability and Performance in Humanitarian Action (www.alnap.org/)
- Oxfam Code of Conduct for NGOs (www.oxfam.org)
- People In Aid Code of Good Practice (www.peopleinaid.org/code/index.htm)
- Projet Qualité (www.projetqualite.org/)
- Synergie Qualité Project (www.coordinationsud.org/rubrique.php3?id_rubrique=278)
- The Humanitarian Accountability Project (www.hapinternational.org/en/)

THE ROLE OF THE PRIVATE SECTOR

Businesses have a major role to play in overall disaster management—one that they have only recently begun to recognize. As a large and influential component in every community, their ability to prepare for and recover from disasters plays a major, defining part

in determining a community's resilience. Businesses are more than physical structures—they represent jobs, community income, vitality, and identity. In times of disaster, businesses are exposed to the damaging consequences of hazards just like any other component of society. If they are unable to withstand these impacts and survive the disaster, the whole community's economic and social recovery could be difficult, or even impossible.

To a growing degree, businesses have begun to subscribe to the self-preservation practice of business continuity planning (BCP). BCP is defined as the process by which companies of any size design plans and procedures to ensure that their critical business functions are maintained during emergencies or disasters, whether internal or external. Statistically, 20–30% of businesses suffer major disruptions each year. Any disruption will adversely impact a business, most notably those functioning on the brink of survival, a condition that is true of most small businesses, especially those in developing countries. Following disasters, businesses often have insufficient time to respond to the needs of customers, creditors, and suppliers, while also trying to recover from physical damages and possible human losses. Recovery time and cost can be significantly reduced by preparing before a disaster happens and training employees in how to respond. Especially for small businesses, this planning may be the only difference between surviving and going under.

Businesses control a significant amount of the nation's infrastructure in many countries, particularly electrical, water treatment, and communications systems, as well as public transportation networks. Following a disaster, both response and recovery success depend on their ability to quickly and effectively repair damaged infrastructure. If the disaster is particularly devastating, governments and international organizations must contribute to this effort, providing heavy equipment, manpower, and financial assistance.

All businesses, regardless of whether they control critical infrastructure or are corner markets, play an important role in their community. Whole communities have been uprooted when employers were unable to reopen, leaving residents with no means of income and the local government with no revenue or resources. Businesses are the source of vital goods, such as food, gasoline, banking, and construction supplies. Until these services return, the quality of life in the affected region suffers. If the affected businesses are regional or national suppliers or customers, the disaster's economic impacts can extend far beyond the directly affected area. The consequences of the September 11, 2001 terrorist attacks in New York City and Washington, D.C. extended across the globe, with effects being felt in nearly every country when air travel and tourism fell significantly.

Businesses also play an active role in disaster management activities that extend beyond the company property. Many companies, especially large multinational corporations, increase their philanthropic giving in the aftermath of a disaster (see Exhibit 9-4) providing in-kind donations of their products (such as heavy lifting equipment, medical supplies, and food), as well as direct cash donations. Service industries applicable to response and recovery may provide assistance in the form of supply or human transport, technical assistance, medical and engineering expertise, search and rescue (as with the mining industry), and many other services. Businesses further increase community resilience by providing first aid and other response education for their employees, which serves as a com-

munity resource for the many hours each day that these employees are outside their offices. Examples of private sector organizations that often partake in disaster response efforts include:

- Hospitals (privately owned)
- Ambulance companies
- Private search and rescue teams
- Veterinarians
- Private hazardous materials teams
- Poison control centers
- Private utilities' emergency response units
- Private funeral businesses
- News media outlets

One particular program noted for its success in involving businesses in comprehensive disaster management was a U.S. government initiative called Project Impact: Building a Disaster Resistant Community. Under Project Impact, private businesses assumed an active role in increasing disaster resilience at the local level. Through private/public partnerships, the project created a more comprehensive approach to emergency management by bringing all community stakeholders together into a single planning structure for disaster risk reduction. Businesses accepted their responsibility as members of the community, recognizing that a more resilient community worked in their favor by increasing the chance that they would survive a disaster event. Project Impact was discontinued in 2001, though several Project Impact communities maintain the program using local funds:

- Seattle, WA (www.ci.seattle.wa.us/project impact/)
- Evansville, IN (www.vanderburghgov.org/home/index.asp?page=1023)
- Tulsa, OK (www.tulsapartners.org/)
- Arkadelphia, AR (www.arkadelphia.org/pi/pi.html)

Unfortunately, businesses are also a major source of hazard and disaster. A majority of the man-made disasters that occur each year, many of which result in

EXHIBIT 9-4   Private Sector to Adopt Islands in the Maldives

Big businesses are readying to adopt small islands in the Maldives through a pioneering effort aimed at helping people affected by the tsunami to rebuild their homes. The ADOPT AN ISLAND initiative was officially launched in the Maldives today by the United Nations Development Programme (UNDP) at precisely 9:30 am, the exact time the gigantic tsunami devastated one-third of the Maldives' inhabited islands, just over a month ago.

The new initiative invites private donors to ADOPT AN ISLAND and thereby directly help one or more among the worst-affected communities to rebuild or repair their houses.

In the Maldives, the tsunami forced thousands of people from their homes and, in some cases, their communities. Thirteen islands had to be completely abandoned as all the buildings and infrastructure were smashed and fresh water sources contaminated by the sea. Now, for the first time in its history, the Maldives has internally displaced people, numbering in the thousands. "While everyone in the Maldives has made great efforts to rebuild their shattered communities, outside assistance is needed if the challenge of rebuilding one-third of the countries' inhabited islands is to be met," UNDP Resident Representative Moez Doraid said.

Earlier, the UN made an appeal to donor countries for funds to support critical relief and recovery efforts in the Maldives but, despite the overwhelming generosity for tsunami-affected people, until now only half the money needed by the UN has been secured. Critical areas such as rebuilding homes and helping people get back to work are still seriously underfunded. The ADOPT AN ISLAND initiative provides a new avenue for private donors to help some of the worst-hit communities in the Maldives. "Recovery begins with a home," Mr. Doraid said. He explained that ADOPT AN ISLAND was part of a programme to address the immediate and now urgent need for shelter in the Maldives.

Companies or donors who ADOPT AN ISLAND directly support some of the most devastated communities to rebuild or repair their homes. Adoptions would cover the cost of purchasing and delivering essential construction materials like cement, steel, timber, and tin. Island rebuilding teams would be established and paid through the program, generating much-needed income opportunities for many islanders. The most expensive adoption (US$4.4 million) would enable more than a thousand people to rebuild and move back into their homes. At the other end of the scale, $95,000 would help 58 families mend their dwellings. Mr. Doraid said the ADOPT AN ISLAND initiative had generated great interest from the private sector even before the official launch, and several companies were within days of adopting an island.

Source: UNDP, 2005.

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fatalities and significant injury, are the result of business negligence or malevolence. The Union Carbide accident in Bhopal, India, was the direct cause of at least 3000 deaths. Examples such as this illustrate the preventive and mitigative responsibility that many businesses must assume in light of their community's overall risk profile.

THE ROLE OF ACADEMIA

Academia, namely universities and independent research institutions, have played an integral role in advancing emergency management as a profession. Their work has contributed to the reduction of hazard risks through a deeper understanding of the threats

hazards pose and the actions that may mitigate them. Furthermore, academia has fostered greater institutional knowledge transfer, thus improving emergency management practices and applications.

Working with the UN and other multilateral organizations, universities are helping to create a "culture of disaster prevention" (Blanchard, 2004). Their research tracks disaster events and analyzes the consequences, helping disaster management organizations learn from their mistakes and capitalize on their successes. As a result, academic institutions have become the central repositories for hazards and disaster knowledge. This knowledge can be distributed through the Internet among an ever-expanding audience.

In addition to the many emergency- and disaster management-specific programs that have appeared in universities throughout the world, other traditional disciplines have sought to address the issue, including:

- Engineering (structural mitigation design)
- Geology (earthquake prediction)
- Meteorology (cyclonic storm forecasting)
- Sociology (risk perception and disaster behavior)
- Medicine (mass-casualty disaster response protocols)
- Public health (epidemic recognition and control)
- Political science (emergency management institutional framework design)
- Development studies (sustainability through disaster resilience)

- Computer science (hazard and disaster imagery)
- Public affairs (risk and disaster communications)

See Appendix 9-2 for a list of academic and professional institutions that focus on disaster management.

CONCLUSION

The vast NGO community has revolutionized management of international disasters. From their diverse predisaster development and public education projects to their response and recovery actions, they work with dedication and conviction. The humanitarian NGOs have elevated their disaster management role from supplemental to central. The capacity and influence that the International Federation of the Red Cross and Red Crescent Societies has assumed, including their inclusion in many nations' internal disaster management structures and their leadership in international disaster response and recovery operations, is indicative of the direction the entire NGO sector will be taking in the future. Without NGOs, international disaster management as we know it today would not be possible. The private and academic sectors also have begun to recognize their role in international disaster management, and are working to limit vulnerabilities by performing business continuity planning and conducting valuable disaster-related research.

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APPENDIX 9-1
Profile of an NGO: The IFRC

The International Federation of Red Cross and Red Crescent Societies (IFRC)

The International Red Cross and Red Crescent Movement (www.redcross.int) is comprised of three distinct but interrelated components:

- *International Committee of the Red Cross (ICRC).* The ICRC is an impartial, neutral, and independent organization with a humanitarian mission to protect the lives and dignity of victims of war and internal violence and to provide them with assistance. It directs and coordinates the international relief activities conducted by the Movement in situations of conflict. It also endeavors to prevent suffering by promoting and strengthening humanitarian law and universal humanitarian principles. Established in 1863, the ICRC is the foundation of the International Red Cross and Red Crescent Movement.

- *Red Cross and Red Crescent Societies.* These Societies embody the work and principles of the International Red Cross and Red Crescent Movement in 181 countries around the world.

National Societies act as auxiliaries to the public authorities of their own countries in the humanitarian field and provide a range of services, including disaster relief, health, and social programs. During wartime, National Societies assist the affected civilian population and support the army medical services where appropriate.

- *International Federation of Red Cross and Red Crescent Societies (IFRC).* The IFRC works on the basis of the Principles of the Red Cross and Red Crescent Movement to inspire, facilitate, and promote all humanitarian activities carried out by its member National Societies to improve the situation of the most vulnerable people. Founded in 1919, the Federation directs and coordinates international assistance of the Movement to victims of natural and technological disasters, to refugees, and in health emergencies. It acts as the official representative of its member Societies in the international field. It promotes cooperation between National Societies and works to strengthen their capacity to carry out

effective disaster preparedness, health, and social programs.

The ICRC, National Societies, and the IFRC are independent bodies. Each has its own individual status and exercises no authority over the others. Like the UN, the IFRC has a presence in most countries throughout the world and as such is well poised to assist in the event of a disaster. Volunteers are continually trained and engaged at the most local levels, providing a solid knowledge base before the organization's services are needed. Cooperation among the bodies through the federation provides an enormous pool of people and funds from which to draw when local resources are exhausted.

History

In 1859, Henry Dunant came up with the concept of the Red Cross, following a particularly brutal battle he witnessed in Italy. Bringing together a group of locals, Dunant began providing the wounded with medical assistance, food aid, and ongoing relief. After returning to his native Switzerland, he led a campaign to form the International Committee for Relief of the Wounded. He succeeded in 1863, and by World War I, the organization had mobilized millions. His initiative eventually evolved in to the ICRC. The Committee, recognized best by their symbol of a red cross on a white background, is now the standard provider of neutral wartime medical care for wounded combatants and civilians.

The IFRC was founded in 1919 following World War I. After World War I, U.S. Red Cross War Committee president Henry Davison proposed the creation of a League of Red Cross Societies, so that the expertise of the countless volunteers from the wartime efforts of the ICRC could be garnered for peacetime activities. Originally this new organization was called the League of Red Cross Societies, but it changed its name to the League of Red Cross and Red Crescent Societies in 1983, and then to the IFRC in 1991. Today the IFRC is the world's largest humanitarian organization, with 181 member societies, a Secretariat in Geneva, and more than 60 delegations dispersed throughout the world.

IFRC Mission and Role

The IFRC does not discriminate on the basis of nationality, race, religious belief, class, or political opinions. The Federation's mission is "to improve the lives of vulnerable people by mobilizing the power of humanity." The IFRC considers vulnerable people to be "those who are at greatest risk from situations that threaten their survival, or their capacity to live with an acceptable level of social and economic security and human dignity." This can include victims of natural disasters, victims of poverty brought about by socio-economic crises, refugees, and victims of health emergencies.

The IFRC combines relief operations to assist victims of disasters with development work to strengthen the capacities of its member National Societies. Their work focuses on four core areas:

- Promoting humanitarian values
- Disaster response
- Disaster preparedness
- Health and community care

The National Societies, present in almost every country in the world, cooperate to give the IFRC greater power to develop capacities and assist those most in need. Their community-based format allows the IFRC to reach the most local levels of society. National Societies act as auxiliaries to the public authorities of their own countries in the humanitarian field and provide a range of services, including disaster relief, health and social programs, and assistance to victims of war. Together, the National Societies have 97 million members and volunteers and 300,000 employees, assisting some 233 million beneficiaries each year. National Society programs and services address both immediate and long-term needs:

- Emergency shelter, food, and medicine
- Water and sanitation
- Restoring family contact for disaster victims
- Disaster preparedness
- Community-based health and care

- First aid training and activities
- Control and prevention of diseases
- HIV/AIDS prevention
- Blood donor recruitment, collection, and supply
- Youth and volunteer activities

A list of all National Societies and their contact information, including email addresses and websites (where available), can be found on the IFRC website at: www.ifrc.org/ADDRESS/directory.asp

The Secretariat in Geneva coordinates and mobilizes relief assistance for international emergencies, promotes cooperation between National Societies, and represents these National Societies in the international field. Field delegations assist and advise National Societies with relief operations and development programs and encourage regional cooperation. While the Secretariat is responsible for the day-to-day running of the Federation, the decisions on its direction and policy are made by governing bodies. These bodies define a framework of purpose, policies, goals, and programs, and provide a mechanism for accountability and compliance.

The General Assembly is the highest decision-making body of the Federation. It meets every two years and comprises representatives from all member National Societies. It met last in Seoul, Korea in November 2005. A Governing Board gathers between general assemblies, meeting twice a year with the authority to make certain decisions.

The IFRC works through its National Societies and with the ICRC, but it also collaborates with many other organizations in order to carry out its work more effectively. Since 1994, the Federation has had Observer status with the UN General Assembly, giving it the opportunity to take part in international debates at the highest level and access to negotiations and deliberations within the structures of almost all international organizations. In addition, the Federation has utilized its international legal personality to build working agreements with a wide range of international partners, focusing on the priorities it has set in its "Strategy 2010," namely:

- *Promotion of fundamental principles and humanitarian values.* National Societies have traditionally worked to spread knowledge of the Fundamental Principles and international humanitarian law. To facilitate the dissemination and the understanding of the principles and values, at the international level the Federation has developed working relations with other organizations, such as the International Olympic Committee, UN Children's Fund, the Office of the UN High Commissioner for Human Rights, UN Volunteers, the UN Population Fund, UNAIDS, and many others.
- *Disaster response.* The Federation collaborates with international bodies and many NGOs and intergovernmental organizations to improve the effectiveness of its assistance and to help establish standards and procedures for its humanitarian work. Partners include the European Union (ECHO) and members of the Inter-Agency Standing Committee (IASC), such as the UN Office for the Co-ordination of Humanitarian Affairs (OCHA), the UN High Commissioner for Refugees (UNHCR), the World Health Organization (WHO), the World Food Programme (WFP), and UNICEF. Collaborative work with OCHA is a key element in the furtherance of the Federation's International Disaster Response Law project (IDRL). The Federation, together with ICRC, is one of the standing invitees of the Inter-Agency Standing Committee (IASC), which brings together all the major agencies involved in emergency response.
- *Disaster preparedness.* The IFRC aims to ensure that assistance not only is for immediate relief but that it also contributes to sustainable development. This includes capacity building in infrastructure and nonstructure sectors for disaster reduction and mitigation. The Federation, together with the Netherlands Red Cross, works closely with the UN Inter-Agency Secretariat of the International Strategy for Disaster Reduction, the UN Environment Program, the ProVention Consortium, the Asian Disaster Preparedness Centre, and others.

- *Health and care in the community.* The Federation continues to build partnerships with regional and international institutions to address global health issues and to build on National Societies' comparative advantages and capacity to complement their national and local efforts. The International Partnership against AIDS in Africa and the WHO-led "Stop TB" and "Roll Back Malaria" campaigns will be used as frameworks for joint experiences in pilot countries. The Federation also has formal agreements with several organizations for cooperation, such as with the Joint UN Programme on HIV/AIDS, WHO's Eastern Mediterranean Regional Office, WHO's South-East Asia Regional Office, the Pan American Health Organization, UN Population Fund, as well as organizations like GNP+ and the OPEC Fund. The Federation's Observer status with the UN General Assembly has resulted in active cooperation with many other relevant organizations, such as the UN Office on Drugs and Crime (UNODC).

The Seven Fundamental Principles

Proclaimed in Vienna in 1965, the seven Fundamental Principles bond together the National Red Cross and Red Crescent Societies, the International Committee of the Red Cross, and the International Federation of the Red Cross and Red Crescent Societies. They guarantee the continuity of the Red Cross Red Crescent Movement and its humanitarian work:

- *Humanity.* The International Red Cross and Red Crescent Movement, born of a desire to bring assistance without discrimination to the wounded on the battlefield, endeavors, in its international and national capacity, to prevent and alleviate human suffering wherever it may be found. Its purpose is to protect life and health and to ensure respect for the human being. It promotes mutual understanding, friendship, cooperation, and lasting peace among all peoples.
- *Impartiality.* It makes no discrimination as to nationality, race, religious beliefs, class, or polit-

ical opinions. It endeavors to relieve the suffering of individuals, being guided solely by their needs, and to give priority to the most urgent cases of distress.
- *Neutrality.* In order to continue to enjoy the confidence of all, the Movement may not take sides in hostilities or engage at any time in controversies of a political, racial, religious, or ideological nature.
- *Independence.* The Movement is independent. The National Societies, while auxiliaries in the humanitarian services of their governments and subject to the laws of their respective countries, must always maintain their autonomy so that they may be able at all times to act in accordance with the principles of the Movement.
- *Voluntary service.* It is a voluntary relief movement, not prompted in any manner by desire for gain.
- *Unity.* There can be only one Red Cross or one Red Crescent Society in any one country. It must be open to all. It must carry on its humanitarian work throughout its territory.
- *Universality.* The International Red Cross and Red Crescent Movement is worldwide, and all Societies have equal status and share equal responsibilities and duties in helping each other.

The Federation's Approach to Disaster Preparedness: Being Proactive

Readiness to reduce the impact of disasters and, where possible, predict and even prevent disasters from occurring are central to the work of the IFRC and its member Societies. Mitigation programs developed with vulnerable groups that complement national development strategies are the most effective at lessening disasters' impact while at the same time raising the capacities of at-risk groups. The organization has identified the following four approaches to achieve their goals:

- Reducing the vulnerability of households and communities in disaster-prone areas and improving their ability to cope with the effects of disasters

- Strengthening the capacities of National Societies in disaster preparedness and postdisaster response
- Determining a role and mandate for National Societies in national disaster plans
- Establishing regional networks of National Societies that will strengthen the Federation's collective impact in disaster preparedness and response at the international level

Disaster Response

The IFRC is well placed to assist victims of disasters thanks to its network of National Societies. Almost every country in the world has a Red Cross or Red Crescent society, each with branches and trained volunteers at the community level. Cooperation among these societies provides additional capacity, solidarity, and financial and human resources to the Federation and its members. The response system is based on the right of National Societies to request support from the Secretariat during a crisis. The Secretariat's role is that of coordinator; it launches international appeals to raise funds for the relief operations, and then mobilizes personnel and relief goods. Through its regional and country field offices, the Federation can also provide managerial, technical, and administrative expertise to National Societies. On average, the Federation launches 30 new emergency appeals each year as disasters strike, and supports smaller operations from its disaster relief emergency fund.

With increasing needs and decreasing resources in many disaster-prone countries, the Federation finds its National Societies engaged well beyond the initial response into long periods of rehabilitation and reconstruction work. This work is also supported by the Federation, as it plays an important role in decreasing people's vulnerability and strengthens their coping capacities.

Emergency Response Units (ERUs)

In 1994, following a spate of notably severe disasters and humanitarian emergencies (i.e., the Armenian earthquake, the Gulf War Kurdish refugee problem, and the African Great Lakes Region crisis), the IFRC began to develop an Emergency Response Unit (ERU) program to increase disaster response efficiency and efficacy. ERUs are made up of preestablished supplies, equipment, and personnel, and act as a quick-response unit trained and prepared to handle a wide range of disaster scenarios. This concept, similar to the UNDP Emergency Response Division (ERD), has already proven effective in making the IFRC response mechanism faster and better, with successful deployments to Hurricane Mitch in Honduras and the Gujarat, India earthquake in 2001. Upon completion of their response mission, the teams remain in country to train locals in water and sanitation issues, thus further ensuring the sustainability of their efforts. ERU teams are most effective in large-scale, sudden-onset, and remote disasters.

ERUs are now a crucial part of the IFRC's disaster response and their integrated disaster management programming (which deals with emergency response, preparedness, and recovery/rehabilitation). The IFRC is responsible for the coordination, technical monitoring, and evaluation of ERU deployments. Together with the various ERU National Societies, the IFRC ERU focal point and technical advisors have developed standard operating procedures and technical specifications for the different ERUs. Regular consultative ERU working group meetings are held to further refine standards and rapid response mechanisms.

Field Assessment and Coordination Teams (FACT)

Depending on the complexity of the required response, one or more Field Assessment and Coordination Teams (FACTs) may be deployed to assist a local chapter in determining event support needs. The teams, which are deployable to any location with only 12–24 hours' notice, consist of Red Cross/Red Crescent disaster managers from throughout the IFRC, who bring with them skills in relief, logistics, health, nutrition, public health, epidemiology, water and sanitation, finance, administration, and psychological support.

In the case of a humanitarian emergency, the National Society in the affected country may request assistance from the IFRC. In such cases, FACT members around the world are alerted using automated systems requesting availability within 12–24 hours. A team is organized by the Operations Support Department in consultation with the Regional Department at the Secretariat and is deployed immediately to the disaster area. The FACT team works with counterparts from the local National Society, members of Regional Disaster Response Teams (RDRT), members of the IFRC regional and/or country delegation, and the ICRC.

These teams work in conjunction with local counterparts and host government representatives to assess the situation and determine the IFRC response. An international appeal for assistance is then drafted and launched by the Secretariat in Geneva. These teams stay in country to coordinate the initiation of relief activities. Once the effort has stabilized and has become locally manageable, the FACT cedes its control to the local Red Cross headquarters.

Disaster Relief Emergency Fund

The IFRC Disaster Relief Emergency Fund (DREF) represents a pool of money for immediate emergency response funding. The fund is managed by the IFRC Secretariat Disaster Management and Coordination Division and is a valuable part of the organization's overall disaster response capacity. Financial assistance is allocated through the DREF as follows:

- DREF funds are sought through a Federation annual appeal.
- Contributions against the DREF appeal are received from National Societies and other sources.
- The DREF is an un-earmarked fund with allocations provided on a recoverable basis. It allows immediate release of funds and start of emergency operations prior to any donor response to emergency appeals.
- The majority of funds are used to start operations in major disasters. Up to 30% of the available funds may provide support to small-scale or less

visible emergencies, as well as to forgotten disasters where emergency appeals are either not appropriate or donor interest is not forthcoming, but the Red Cross and Red Crescent response to specific humanitarian needs is required.
- Requests for DREF allocations are reviewed on a case-by-case basis. Allocations to start operations in major disasters do not exceed 15% of an emergency appeal or 2 million Swiss Francs.
- Allocation reimbursements are made from contributions received against relevant emergency appeals.
- Minor emergencies are often fully funded by DREF. The Federation increasingly encourages National Societies, through its information bulletins, to cover the cost and thus facilitate the recovery of funds.
- Standard program support recovery (PSR) of 6.5% is applied, as the same Secretariat services are required as for any other operation.

The IFRC is committed to maintaining the DREF at the target level of 10 million Swiss Francs in order to be able to respond to the increasing number of emergency requests. Upon request, a maximum of 500,000 Swiss Francs annually can be allocated from DREF for disaster/emergency preparedness activities in disaster-prone countries.

IFRC Disaster Preparedness Policy

Central to the IFRC's disaster preparedness policy is maintaining a readiness to predict and where possible prevent disasters, reduce their impact, and respond to and cope with their consequences at international, national, and local levels. With this in mind, the IFRC believes that the following measures are key to development:

- A reduction in household and community vulnerability in disaster-prone areas and improvement of their ability to cope with the effects of disasters
- Strengthening of the capacities of National Societies in disaster preparedness and postdisaster response

- Determination of a National Society role and mandate in national disaster plans
- Establishment of regional networks of National Societies that will strengthen the Federation's collective impact in disaster preparedness and response at the international level

This policy applies to all types of disaster preparedness activities at local, national, regional, and international levels, whether carried out by a branch of a National Society, an individual National Society, or by the International Federation.

The IFRC proclaims that it and each National Society will:

- Recognize that disaster preparedness should be one of the primary activities of the International Federation and each National Society
- Recognize disaster preparedness as an effective link between emergency response, rehabilitation, and development programs
- Recognize the Red Cross/Red Crescent role in disaster preparedness as complementary to government
- Advocate the need for and effectiveness of disaster preparedness with government, donors, nongovernmental organizations, and the public as needed
- Strengthen the organizational structures at international, national, and local levels, as required for effective disaster preparedness
- Improve coordination by promoting better cooperation and partnerships between National Societies, ICRC, governments, nongovernmental organizations, and other disaster response agencies at local, national, regional, and international levels
- Identify those persons, communities, and households most at risk to disaster
- Raise awareness of disaster hazards through public education
- Improve the ability of vulnerable communities to cope with disasters through community-based disaster preparedness strategies that build on existing structures, practices, skills, and coping mechanisms

- Strive to provide the financial, material, and human resources required to carry out appropriate and sustainable disaster preparedness activities

IFRC Emergency Response Policy

The IFRC emergency response policy states that the Red Cross and Red Crescent must be able to act in all life-threatening situations regardless of the scope of the emergency, and that its actions must be governed by the same policy regardless of the size and level of the response. To do this, the IFRC proclaims that it and each National Society will:

- Seek to assist the most vulnerable people in emergencies to protect life and health and to ensure respect for the individual through assisting those most affected in obtaining adequate access to basic life support needs, which include at a minimum:
  - Adequate safe water and sanitation
  - Adequate food
  - Adequate healthcare, including psychological support
  - Adequate shelter
- Recognize the Red Cross Red Crescent role as auxiliary to government in humanitarian services
- Undertake emergency response according to the Fundamental Principles of the Red Cross and Red Crescent and apply the principles and spirit of the Code of Conduct for the International Red Cross and Red Crescent Movement and NGOs in Disaster Relief
- Work within the competence of the Operating National Society
- Base their actions on appropriate disaster preparedness programming and planning
- Work towards self-reliance and sustainability of programming by both the Operating National Society and the assisted population
- Continue until the acute threat to life and health has abated
- Maximize the strategic advantage of the IFRC by "working as a Federation" to mobilize all appropriate resources

IFRC operations depend upon four primary resources, including:

- *Financial resources.* The primary tool for IFRC emergency response fundraising is the Emergency Appeal. The National Society of the affected country launches national Appeals. International Appeals are launched by the Federation Secretariat.
- *Human resources.* Recognizing the vital role of human resources in emergency operations, the IFRC ensures the proper identification, placement, retention, development, support, administration, and management of suitably qualified, trained, and experienced personnel.
- *Information resources.* Data and information are key resources in emergency response. The IFRC has committed to making the Red Cross and Red Crescent a reliable and timely source of disaster-related information. Information systems have been and continue to be designed and implemented in order to maximize:
  - The speed, efficiency and effectiveness of emergency response
  - The security and safety of beneficiaries, staff, volunteers, and fixed assets
  - The timeliness, accuracy, and clarity of reporting and accountability systems
  - The involvement of beneficiaries and local organizations
- *Physical resources.* IFRC policy dictates that the need for physical resources is well defined, that quality standards are ensured, that delivery is timely, that stocks are adequately maintained, and that distribution is controlled. Physical assets not used in the emergency response program or surplus to operational requirements as the program scales down are deployed to support other emergency programs whenever possible. The impact of local purchase upon the local economy and well-being of the population is always assessed to ensure that such actions do not cause undue harm. Program officials are always urged to refrain from creating duplicate infrastructures when existing National Society or commercial enterprises can provide the necessary support.

IFRC Recovery and Rehabilitation Policy

Once emergency needs have been met following a disaster and the initial crisis is over, the affected populations and communities may still be in a state of heightened vulnerability. The country and the National Society, from branch to national level, may have been weakened by the disaster. It is in these situations that post-emergency rehabilitation programs should be considered. IFRC action for recovery and rehabilitation, including all National Society and IFRC assistance targeted to disaster-affected communities in the post-emergency phase of disaster response, is designed to reduce immediate vulnerability to disaster or to address the root causes of those vulnerabilities. It also includes action taken specifically to rebuild and strengthen the capacity of the disaster-affected National Society. The IFRC proclaims that it and each National Society will:

- Undertake rehabilitation activities with the active participation of the community in the planning and implementation of the activities on the basis of a timely and thorough assessment of unmet needs and available response capacity
- Engage in active dialogue with local authorities over the priorities and focus of rehabilitation
- Prioritize community services
- Enhance capacity building
- Consider gender and environment factors
- Effectively coordinate rehabilitation activities
- Coordinate with national and local authorities and other agencies
- Develop advocacy for disaster mitigation
- Develop an exit strategy

See Table 9-1 for a list of Red Cross humanitarian beneficiaries by region, 1998–2004, and see Table 9-2 and Exhibit 9-5 for more information on specific Appeals.

TABLE 9-1   Red Cross Humanitarian Assistance Beneficiaries by Region, 1998–2004

Target Benef. Region	Year 1998	1999	2000	2001	2002	2003	2004
Middle East and North Africa	160,000	500,000	2,578,000	2,508,000	2,359,800	4,458,000	6,487,856
Europe	6,798,500	6,583,000	4,657,700	4,555,500	5,055,221	1,424,000	2,088,512
Americas	480,434	818,880	2,936,300	958,000	522,150	231,000	1,379,600
Asia Pacific	7,709,000	14,529,200	17,351,000	15,818,959	17,675,581	30,834,000	22,965,492
Africa	4,350,920	7,682,500	8,910,500	10,481,375	27,457,614	31,415,500	10,787,491
Multi region			14,000,000	2,133,500	5,900,000		
Grand Total	**19,498,854**	**30,113,580**	**50,433,500**	**36,455,334**	**58,970,366**	**68,362,500**	**43,708,951**

Source: International Federation of Red Cross and Red Crescent Societies, 2005.

TABLE 9-2   IFRC Appeals, 1919–2005

Country	Number of appeals	Country	Number of appeals
Afghanistan	30	Bolivia	17
Africa	7	Bosnia and Herzegovina	11
Albania	11	Botswana	7
Algeria	23	Brazil	3
Americas	13	Bulgaria	9
Angola	19	Burkina Faso	12
Antigua and Barbuda	1	Burkina Faso, Mali, Mauritania, Niger	1
Argentina	10	Burundi	11
Armenia	5	Cambodia	23
Asia	6	Cameroon	4
Asia and Pacific	3	Cape Verde	7
Australia	1	Caribbean	21
Austria	3	Caucasus	10
Azerbaijan	5	Central Africa	20
Bahamas	3	Central African Republic	11
Bangladesh	42	Central America	13
Belarus	1	Central Asia	14
Belgium	3	Central Europe	20
Belize	2	Chad	12
Benin	10	Chernobyl region	13

TABLE 9-2   (*continued*)

Country	Number of appeals	Country	Number of appeals
Chile	6	Great Britain	5
China	24	Greece	17
Colombia	9	Guatemala	9
Comoros	2	Guinea	11
Congo Republic	13	Guinea Bissau	4
Costa Rica	7	Guyana	2
Côte d'Ivoire	5	Haiti	26
Croatia	2	Honduras	17
Cuba	14	Horn of Africa	1
D.R. Congo	14	Hungary	5
Djibouti	5	Iceland	1
Dominica	1	India	48
Dominican Republic	4	Indian Ocean	2
DPR Korea	16	Indonesia	26
East Africa	25	Iran	36
East Asia	8	Iraq	20
East Timor	5	Israel	1
Eastern Europe	16	Italy	9
Ecuador	8	Jamaica	2
Egypt	5	Japan	3
El Salvador	6	Jordan	6
Equatorial Guinea	1	Kazakhstan	3
Eritrea	12	Kenya	28
Ethiopia	35	Korea Rep.	11
Europe	1	Kuwait	2
Fed. States of Micronesia	1	Laos	8
Fiji	10	Lebanon	17
Finland	1	Lesotho	6
France	5	Liberia	7
FYR Macedonia	4	Libya	1
Gabon	3	Liechtenstein	1
Gambia	10	Madagascar	12
Georgia	7	Malawi	21
Germany	2	Malaysia	5
Ghana	8	Mali	8
Global	79	Mano River region	2

(*continues*)

TABLE 9-2   (*continued*)

Country	Number of appeals	Country	Number of appeals
Mauritania	17	Serbia, Montenegro, Kosovo	3
Mauritius	1	Sierra Leone	9
Mexico	8	Solomon Islands	1
Middle East	1	Somalia	28
Middle East, North Africa	41	South Africa	4
Moldova	2	South America	13
Mongolia	11	South Asia	12
Morocco	20	South East Asia	14
Mozambique	25	Southern Africa	21
Multiple regions	5	Spain	4
Myanmar (Burma)	27	Sri Lanka	35
Namibia	7	Sudan	42
Nepal	30	Swaziland	8
Netherlands	4	Syria	8
New Zealand	1	Taiwan	1
Nicaragua	13	Tajikistan	12
Niger	11	Tanzania	18
Nigeria	11	Thailand	5
Nigeria subregion	2	Togo	7
North Africa	1	Tonga	1
Norway	1	Trinidad and Tobago	1
Pacific	13	Tunisia	9
Pakistan	47	Turkey	35
Panama	3	Uganda	20
Papua New Guinea	20	Ukraine	1
Paraguay	9	Uruguay	1
Persian Gulf region	1	Uzbekistan	1
Peru	19	Vanuatu	2
Philippines	28	Venezuela	2
Poland	7	Vietnam	37
Portugal	7	West Africa	36
Romania	6	Western Samoa	1
Russian Federation	21	Yemen	19
Rwanda	22	Yugoslavia	25
Sahel	5	Zambia	13
Sao Tome and Principe	4	Zimbabwe	12
Senegal	14	**Grand Total**	**2120**

Source: IFRC, 2005b.

EXHIBIT 9-5   **IFRC Appeal Number 05EA022: South Asia Earthquake, October 12, 2005**

Appeal history:

- Preliminary Emergency Appeal launched on 9 October, 2005 for CHF 10,793,000 (USD 8,438,294 or EUR 6,957,415) for four months to assist 30,000 families (some 120,000 beneficiaries).
- As an increasingly serious situation has unfolded, the Preliminary Appeal budget has today been revised to CHF 73,262,000 (USD 56,616,692 or EUR 47,053,307) for six months to assist up to 150,000 families (some 750,000 beneficiaries).
- Disaster Relief Emergency Funds (DREF) allocated: CHF 200,000.

Outstanding needs:

- Whilst the initial Preliminary Emergency Appeal for CHF 10.7 million has been almost completely covered, now that the budget has been revised to CHF 73.3 million, the new appeal total is only 6.7% covered. Cash and in-kind contributions are very urgently needed, in order to facilitate the rapid start up of the emergency operations.
- Relief needs: Large-scale mobilization of relief items is needed; details are on the Federation's Mobilization Table posted on DMIS. On 13 October, the Mobilization Table will be updated to reflect much larger and more comprehensive needs.
- Human resource needs: For Pakistan, a health coordinator, a reporting delegate, and information delegate, and for the South Asia Regional Delegation in Delhi, a regional disaster response delegate, a reporting delegate, and information delegate. For Geneva Secretariat, a desk officer, desk assistant, and a press officer. A further, more comprehensive list of human resource needs will be available very shortly.

Related Emergency or Annual Appeals: Pakistan Annual Appeal 05AA049, Afghanistan Annual Appeal 05AA045, India Annual Appeal 05AA047, South Asia Regional Annual Appeal 05AA051.

Operational Summary:

This Operations Update announces a revision of the Preliminary Emergency Appeal to CHF 73,262,000, to support the emergency phase of the disaster response for a period of six months, assisting up to 150,000 families (some 750,000 beneficiaries). Meanwhile, as the Red Cross and Red Crescent disaster response gets underway, needs assessments are being undertaken, and a comprehensive Emergency Appeal plan and budget will be drawn up in the coming days, and will be issued in the near future. It is estimated that the disaster has affected 4 million people (1 million severely), and 500,000 people have been displaced. The official death toll in Pakistan is now 23,000, and in India 1300 people have died in Jammu and Kashmir. It is feared that the actual number of deaths could be much higher. With winter approaching, the most urgent need is for winterized shelter. The worsening weather and colder nights are making already vulnerable populations' lives more miserable. Many people continue to live in the open and with the oncoming winter, there is an even more urgent race against time to assist affected people. There are enormous humanitarian needs.

All International Federation assistance seeks to adhere to the Code of Conduct and is committed to the Humanitarian Charter and Minimum Standards in Disaster Response in delivering assistance to the most vulnerable. For support to or for further information concerning Federation programs or operations in this or other countries, or for a full description of the national society profile, please access the Federation's website at http://www.ifrc.org.

Background

An earthquake with magnitude of 7.6 on the Richter scale centered 95 kilometers northeast of the Pakistan capital Islamabad struck at 0350 GMT on 8 October 2005. The quake severely affected northern areas of Pakistan and northern India. Since Saturday, there have been 140 aftershocks, 21 of which were over 5.0 on the Richter scale.

The UN estimates the disaster has affected 4 million people (1 million severely) and displaced 500,000. The official death toll in Pakistan remained at 23,000 while Indian authorities say 1300 people have died in Jammu and Kashmir.

An aerial survey of the Muzaffarabad district which has a population of 1 million has revealed 70% damage. Damage to property in the town of Chivas Khas is 60%, in Bagh 70% and Rawalakot 50%.

The International Federation has launched this Emergency Appeal (no. 05EA022) in response to a request from the Pakistan Red Crescent Society. CHF 200,000 has been allocated from Federation's DREF Fund to mount the initial response. Given the size, scope, and geographic location of the disaster, and the difficulty in accessing the area to gather detailed damage information and humanitarian relief needs, this appeal is being launched on a preliminary basis with a focus on action in Pakistan.

Operational Developments

The emergency operation is being significantly scaled up. The budget has been increased from CHF 10.8 million (USD 8.4 million or EUR 6.9 million) to CHF 73.2 million (USD 56.6 million or EUR 47 million). The number of targeted beneficiaries has been increased from 120,000 for four months to 750,000 for six months. . . .

The funds will be used to provide food, tents, blankets, cooking sets, healthcare, etc. for survivors. Many people continue to live in the open and with the oncoming winter, there is an even more urgent race against time to assist affected people. Items such as winterized tents, stoves, and warm clothing will be vital to survival of people as they combat the elements.

Heavy rain and hail across affected areas in Pakistan on Tuesday 11 October hampered relief efforts. The worsening weather and colder nights are making already vulnerable populations' lives more miserable. There continues to be a desperate humanitarian need.

A Field Assessment Coordination Team (FACT) has been deployed to Pakistan, comprising 16 members: team leader, disaster management and coordination, health, water and sanitation, relief, shelter, logistics, reporting/information, telecommunications, Emergency Response Unit (ERU) coordination, Regional Disaster Response Team (RDRT) coordination, Red Cross and Red Crescent Movement Coordination, finance and administration. FACT team members are from American Red Cross, Australian Red Cross, Austrian Red Cross, British Red Cross, Danish Red Cross, Finnish Red Cross, Norwegian Red Cross, Spanish Red Cross, Swiss Red Cross, Turkish Red Crescent, and the Federation. A primary role for the FACT deployment is coordination and liaison, and supplementing the Federation's Pakistan country delegation, which prior to the disaster comprised a head of delegation and five national staff. Nearly all FACT team members have arrived in Islamabad, and the remainder will all arrive very shortly.

A total of eleven Emergency Response Units (ERUs) that have been deployed so far are:

On behalf of the ICRC:

- Field hospital (Norwegian/Finnish Red Cross) —first shipment began Tuesday and the remainder on Thursday
- Logistics (British Red Cross)—has already arrived in Pakistan
- Two basic healthcare (Spanish Red Cross and Japanese Red Cross)—en route.

For the Federation:

- Logistics (Danish Red Cross/Spanish Red Cross)—has arrived in Islamabad
- IT/Telecommunications (Danish Red Cross)—has arrived in Islamabad
- Two basic healthcare (French Red Cross and Spanish Red Cross)—en route.
- Water treatment and supply (Swedish Red Cross/Austrian Red Cross), mass sanitation (Swedish/Austrian Red Cross) and specialized water (German Red Cross) are currently being prepared for departure to Pakistan.

Furthermore a base camp for accommodating Red Cross/Red Crescent staff as well as making office facilities available will be deployed by the Danish Red Cross to Pakistan within the next days.

A regional disaster response team (RDRT) is being formed. Two staff from the Bangladesh Red Crescent Society and one from the Bangladesh Federation country delegation are due to arrive in Islamabad on Friday 14 October. Two staff from Afghanistan (one each from the National Society and the country delegation) will arrive early next week. The RDRT may be further bolstered with personnel support from the Nepal Red Cross Society and from the national societies in Southeast Asia.

Transportation of personnel and relief supplies is a major challenge. The destruction of infrastructure and the lack of preexisting infrastructure in some areas is a significant constraint. Today the Iranian Red Crescent gave this situation a major boost with the approval to utilize two of their helicopters. There is a desperate need for more trucks, and the Norwegian Red Cross is now mobilizing 40 trucks to be used for the relief operations.

A Japanese Red Cross/Danish Red Cross assessment team has returned from Abbottabad and Mansehra and details of its findings are in the health section below. The team found urgent needs and has made a series of recommendations which are highlighted in the health section.

In other operational developments in Pakistan today:

- The International Committee of the Red Cross (ICRC) will work in Pakistan-administered Kashmir in food, shelter, and medicine.
- The Federation will distribute relief items through the Pakistan Red Crescent Society and on a stand-alone basis.
- The Federation has an agreement with the World Food Programme (WFP) to distribute from its stocks.
- There are now 12 medical teams in the field.

The WHO says the widespread destruction of hospitals in affected areas and loss of many health personnel along with a shortage of surgical supplies and medicines are major concerns. It further says that water-borne diseases are an increasing public health concern due to extensive damage to water and sewerage systems.

The Indian Red Cross Society is responding to the emergency situation in Jammu and Kashmir but is not seeking any funding under this appeal at this stage. It is resourcing its operation through existing stocks, existing Federation in-country budgets, and support from in-country partner national societies. Indian Red Cross state branches today launched a public fundraising campaign in India.

The Indian Red Cross Society and ICRC reports from the field in Jammu and Kashmir indicate that food and medical care is being well resourced by the government. The most pronounced need and where the Indian Red Cross is concentrating its efforts is shelter, particularly emergency shelter.

Assessing the impact of the disaster in Pakistan and India, the WHO says a mass measles vaccination program will need to be undertaken urgently in affected areas in order to protect the displaced population from outbreaks.

**Red Cross and Red Crescent Action—
Objectives, Progress, Impact Emergency Relief
(Food and Basic Non-Food Items)**

**Objective: To meet the immediate shelter and
supplementary food needs of 150,000 vulnerable
families (some 750,000 beneficiaries) in affected
areas in Pakistan-administered Kashmir, North
West Frontier Province, and Islamabad.** *(Note
this amends the previous objective which targeted
30,000 families, covering 120,000 beneficiaries,
i.e., four people per family. The average family size
is amended to five for this new objective.)*

**Progress/Achievements (activities implemented
within this objective)**

Eleven truckloads of Pakistan Red Crescent
relief supplies were today reaching Muzaffarabad
(four truckloads) in Pakistan-administered Kashmir
and Rawalakot in North West Frontier Province
(three truckloads).

The breakdown of the assistance provided is as
follows:

Item	Muzaffarabad	Rawalakot	Total
Tents	200	150	350
Blankets	840	630	1,470
Flour (kgs)	8,000	6,000	14,000 kgs
Ghee (kgs)	2,000	1,500	3,500 kgs
Mineral water (bottles)	816	612	1,428 bottles
Food pack*	400	300	700
Used clothing (400 kg bales)	20	15	35 bales
Salt (kgs)	2,400	1,800	4,200 kgs

*The food packs consist of 5 kgs rice, 5 kgs sugar, 3 kgs daal
channa, 400 gms tea, 1 kg milk powder.

Another four trucks were due to head out to
Muzaffarabad from the Pakistan Red Crescent
Society (PRCS) headquarters in Islamabad today.
This would bring to 15 the planned total of truck-
loads which the National Society was aiming to
achieve today. A problem has been a shortage of
vehicles to transport the goods.

As outlined in [previous Operations Update 2],
earlier there had been distributions in Mansehra of
150 tents, 700 blankets, 12 cartons of medicines,
and 400 food packs.

Four assessment teams have been deployed to
the North West Frontier Province. The teams which
incorporate a doctor and a general relief person
are examining relief, health, and shelter needs and
will assist with relief distribution. The teams are
hoping to report back to headquarters by Friday and
their findings will be incorporated into the detailed
and comprehensive revised Emergency Appeal
expected to be finalized next week.

As outlined in [previous Operations Update 2],
the following items are in the supply pipeline:

- 20,000 tents
- 100,000 blankets
- food
- helicopter (ICRC support)
- trucks

As noted in the operational developments sec-
tion above, the Iranian Red Crescent has today
approved the use of two of its helicopters for use in
the operation in Pakistan.

The following immediate needs have been
identified:

- at least five Rubb halls (temporary ware-
houses)
- 20,000 jerry cans
- blankets and tents
- generators of all sizes
- electric cables
- lighting equipment
- one blood bank specialist to support the PRCS
blood bank
- 10 ambulances for the operation

The Indian Red Cross Society today told the
Federation India delegation and in-country partner

national societies that it would welcome support for the immediate procurement of the following to assist in the relief effort in Jammu and Kashmir:

- 5000 tents
- 30,000 blankets
- 5000 kitchen sets
- 5000 meters of cloth

These are in addition to the Indian Red Cross Society distributions that are already underway. To date this has included the distribution of 1,000 blankets and 500 kitchen sets from ICRC stocks utilizing 400 Jammu and Kashmir branch volunteers. The Indian Red Cross headquarters and state branches have supplied the following for distribution:

- 21,000 blankets
- 1500 tents
- 1000 family packs.

Constraints

The road to Muzaffarabad from Islamabad is now choked with aid convoys. Ironically, the large emergency response is leading to delays of supplies getting through. The 180-kilometer trip would normally take six to seven hours by truck, but the journey is now at least 10–11 hours.

A potential supply bottleneck is forming, with stocks outstripping available transport. It is estimated a further 40 trucks are required and there is a shortage of vehicles available for hire/leasing.

Torrential rain and hail on Tuesday led to some flights having to be grounded while the bitterly cold conditions added to the extreme vulnerability of those still without shelter and sufficient warm clothing.

Health

Objective: To meet the basic healthcare and first aid and emergency transport needs of 150,000 vulnerable families (some 750,000 beneficiaries) in Pakistan-administered Kashmir, North West Frontier province, and Islamabad.

(Note this is amended from the previous objective which targeted 30,000 families.)

Progress/Achievements (activities implemented within this objective)

A Japanese Red Cross/Danish Red Cross assessment team has returned from a visit to North West Frontier Province. It made the following findings with regards to health facilities:

- Balakot: District hospital totally destroyed (originally a 12-bed district hospital)
- Mosefarabat: Health facilities totally destroyed
- Batagram: 50-bed district hospital totally destroyed
- Naran Karam: No access to the area . . . totally stranded
- Ghani: 50-bed district hospital destroyed
- Mansehra: The hospital building is unstable and unsafe. However, staff are in place and are operational through mobile units
- Abbottabad: Facilities in place, partly operational, and overloaded

Among the recommendations is an urgent need for establishing an ERU hospital and 2–4 primary care units as soon as possible. The team also says there is an immediate need for tents and kitchen sets while water and sanitation needs to be improved urgently to avoid epidemics (this concurs with WHO findings).

The procurement process for medicines, etc. for establishing medical camps in affected areas will commence immediately once detailed assessments have been received.

Items will include water purification stocks, supplies for first aid, and medicines for treatment of common ailments related to postdisaster situations such as respiratory diseases and water-borne-related illnesses.

The PRCS headquarters has set up a blood camp and has to date collected 380 units in Islamabad and

125 units of this have now been utilized. As outlined in [previous Operations Update 2], 38 units of blood from PRCS blood banks had been utilized in Muzaffarabad. The Pakistan Red Crescent Punjab branch has sent three medical teams to the Kashmir region. The logistics base will be set up in Abbottabad in neighbouring North West Frontier Province.

As outlined in [previous Operations Update 2], the National Society is operating a dozen medical camps in affected areas. Details of deployment to date are:

- Islamabad: One medical camp staffed by three doctors and six paramedics
- North West Frontier Province: Two medical camps staffed by two PRCS doctors, three volunteer doctors, and one paramedic
- Mansehra district: One medical camp
- Punjab province: Eight medical camps staffed on a rotating basis by four doctors and six paramedics

Federation/ICRC Joint Logistics Operation in Pakistan

In order to ensure a most efficient and effective coordination of logistics efforts in Pakistan, the ICRC and the International Federation will establish a joint logistics structure to support the operations of the Red Cross and Red Crescent Movement. There will be daily coordination of activities at Geneva and field levels and regular updates will be communicated to all parties involved.

Supply Chain Management

Mobilization tables for relief goods have been issued individually by ICRC and the International Federation (available on DMIS). The mobilization tables will be adjusted according to needs identified in the field. Each institution should be contacted for donations towards their respective mobilization table. In-kind donations in response to the Federation mobilization table should be negotiated and agreed upon with the Federation's Logistics Department in Geneva, prior to shipment of goods and all consignments should be delivered to Islamabad.

Logistics Structures

Islamabad: The International Federation and the ICRC will set up a logistics hub in Islamabad to ensure efficient handling and storage of all accepted Red Cross and Red Crescent Movement goods routed to Islamabad. The Federation team will receive goods at the airport (where a warehouse has already been established), ensure handling and customs procedures, and provide appropriate storage facilitation. Goods Received Notes will be issued at this point. The ICRC will handle the dispatch of goods via all means to the next delivery or distribution point. This logistics hub is not meant to handle the food pipeline. All incoming goods from Nation Societies for PRCS or the Federation should be dispatched to Islamabad.

Peshawar: The ICRC has already an existing logistics and procurement center in Peshawar to support ICRC operations in Afghanistan and Pakistan. This structure will support ICRC operations in Pakistan. Some procurement officers from National Societies could be hosted in this procurement structure and have access to ICRC suppliers to undertake their local purchase in Pakistan. All incoming goods for ICRC should be dispatched to Peshawar.

Abbotabad: The ICRC is setting up a logistics structure in Abbotabad to support operations.

Logistics Personnel in the Field

The International Federation logistics structure in Islamabad is already in place and fully operational to handle the receipt and storage of all accepted goods. The Senior Field Logistics Officer from Geneva arrived in Islamabad on 10 October to coordinate the Federation's overall logistics effort. Danish Red Cross and Spanish Red Cross Logistics

ERUs have also arrived in Islamabad. The Federation Logistics Delegate in Maldives has been relocated to Pakistan to support the logistics operations.

For ICRC: The Peshawar structure is already in place and will support the Abbotabad setup. The British Red Cross Logistics ERU arrived on 11 October to set up the ICRC logistics structure in Abbotabad and they will be supported by Peshawar employees. In Islamabad the logistician in charge of the dispatch in the joint logistics structure is expected to arrive on 12 October. The deputy Head of Logistics Division arrived on 11 October to support the ICRC Islamabad delegation and overall ICRC logistics activities. The logistician for logistics assessment arrived on 10 October and is moving towards Mussafarabad with the first convoy. The air operation manager is scheduled to arrive on 12 October together with another ICRC logistician.

Air Operations

Air operations will be fully handled by ICRC. Several ICRC helicopters are on their way to Islamabad.

Coordination

The Federation's Pakistan Delegation is attending coordination meetings with UN and other agencies on a daily basis, including meetings relating to specific sectors such as health, water, and sanitation and shelter. The in-country Red Cross and Red Crescent Movement partners—the Pakistan Red Crescent, the Federation country delegation, and the ICRC—are working in close cooperation.

The Federation's South Asia Regional Delegation in Delhi is providing reporting, information, disaster management, health, and administrative support.

The Indian Red Cross Society held a coordination meeting in Delhi today, attended by representatives from the Federation India delegation, the ICRC South Asia regional head of delegation, as well as representatives from in-country partner national societies from the American, Canadian, and Spanish Red Cross. A visiting United Arab Emirates Red Crescent team also attended.

The IFTC and the ICRC have been working in close collaboration from the start, with the respective officials in contact early Saturday morning, followed by attendance at each institution's planning meetings from Day One of the disaster. Work on a document delineating the modalities of the cooperation is nearing completion. Discussions center on geography and sectoral responsibilities. In the field, there is regular contact and cooperation between the ICRC and Federation offices in Islamabad and Delhi.

The Geneva Secretariat on October 12 attended the second Inter-Agency Standing Committee on the South Asia earthquake. The other participants were WFP, UNITAR, UNHCR, WHO, UNICEF, UNDP, WFP, UNFPA, HABITAT, ILO, IOM, MSF, ICVA, and the ICRC.

Communications—Advocacy and Public Information

The Pakistan Federation delegation, the South Asia Regional delegation (Delhi), and the Geneva Secretariat are profiling the Red Cross and Red Crescent Movement disaster response. All parties are fielding and dealing with numerous national and international media queries. Two information bulletins have been issued and three Operations Updates, while three media releases have been issued by the Geneva Secretariat.

With delegates from more than 10 nationalities, regular media interviews are being conducted with CNN, BBC, and other various media organizations including those in the Netherlands, UK, Japan, Norway, Germany, Mexico, Sweden, Switzerland, France, New Zealand, Australia, Denmark, Israel, Canada, and Malaysia.

Source: IFRC, 2005d.

APPENDIX 9-2
NGOs Involved in the December 26, 2004 Asia Tsunami Disaster Response and Recovery Operations As of January 1, 2006

Academy for Educational Development— United States

Established a Global Disaster Fund to provide assistance to community-based organizations with which they work in Sri Lanka and India, to be used to support counseling and anti-trafficking efforts in India and local rebuilding projects in Sri Lanka.

Action Against Hunger (ACH)—Spain (Acción contra el Hambre)

Has teams in Sri Lanka building latrines and analyzing drinking water supplies. Recovering bodies and distributing mosquito nets, blankets, towels, and mattresses to survivors.

Action Against Hunger (AAH)—United Kingdom

Providing relief to survivors in Batticaloa, Trincomalee, and Jaffna in Sri Lanka, constructing latrines, trucking in water, and ferrying bodies to hospital for identification. Has sent water and sanitation equipment to Sri Lanka. Conducting further needs assessments in Indonesia.

Action Against Hunger (AAH)—United States

Responded by providing immediate assistance to the tsunami victims of Sri Lanka in Batticaloa, Trincomalee, and Jaffna. This included construction of temporary latrines, trucking in water, and transportation of bodies to hospitals for identification. Conducted needs assessments in Indonesia and Burma, and assisted with relief efforts in that region. Shipped emergency water and sanitation materials (water tanks, pumps, and treatment supplies) to Sri Lanka.

ActionAid—Spain (Ayuda en Acción)

Providing medical and psychosocial assistance in Tamil Nadu, India.

ActionAid—United States

Distributing medical supplies, food items, and shelter material, as well as providing psychosocial support and helping restore livelihoods in India. In Thailand, working to provide fishing boats and rebuild homes. Activities in Sri Lanka include help with restoring livelihoods, providing shelter, psychosocial rehabilitation, and training local educators in counseling, getting schools running again, and training local educators in counseling.

ActionAid—United Kingdom

Distributing posters and leaflets in Tamil on how to beat trauma and providing a training program on psychosocial recovery in Chennai.

Action Medeor—Germany

Sent medical equipment, mosquito nets, and water purification systems to Indonesia, Maldives, Sri Lanka, and Thailand.

Adventist Development and Relief Agency (ADRA) International—United States/Canada

ADRA has opened two clinics in Lhokseumawe, northern Aceh, and sent supplies to Banda Aceh. Sent equipment to treat respiratory infections and damaged lungs to Meulaboh and supplied tents for temporary schools. A medical team is in Kalmunai, eastern Sri Lanka, and the organization is disinfecting temples used as temporary morgues. Setting up shelters and providing health education for children in the Andaman Islands, assessing the needs of fishing villages in Andra Pradesh. In Thailand, ADRA is planning to work on water systems and boats on the islands of Phrathong and Surin.

Adventist Development and Relief Agency (ADRA)—Germany

Together with Johanniter International, the organization is purifying water in Kudawella, a Sri Lankan fishing village.

Agence d'Aide à la Coopération Technique et au Développement (ACTED)—France

Activities include water and sanitation, economic revitalization programs in agriculture and fishing, and distributing mosquito nets in Sri Lanka, Indonesia, and India.

Air Serv Interational—United States

Sent a fleet of aircraft to provide transport for assessment teams, project managers, and relief teams throughout the impacted region.

American Friends Service Committee (AFSC)—United States

Supporting local and international organizations in Indonesia with money from its Crisis Fund. The funds will help send 40 doctors to Aceh. Grants from the AFSC Crisis Fund were wired to the Society for Health, Education and Environment for Peace (SHEEP), a local Indonesian organization, and to the Mennonite Central Committee (MCC) for relief work in Indonesia with staff on the ground. A delegation of medical personnel sponsored by AFSC and SHEEP traveled to Aceh Province. An AFSC assessment team, in partnership with MCC was sent to Indonesia.

American Jewish Joint Distribution Committee, Inc.—United States

Worked with partners (such as Caritas/Catholic Relief and the Disaster Mitigation Institute in southern India), with local NGOs in Sri Lanka, with International Rescue Committee in Indonesia, and with Chabad in Thailand to provide emergency supplies to victims of the tsunamis. Longer-term initiatives, including infrastructure rehabilitation, are being conducted.

American Jewish World Service (AJWS)—United States

Working with 24 local NGOs to assess needs in the region and provide food, water, shelter, and medicine as well as long-term support. Partnered with Direct Relief International to provide shipments of donated medical supplies to local aid groups in India and Sri Lanka, and with Church World Service and International Rescue Committee to provide emergency relief in Indonesia.

American Red Cross—United States

After immediate relief, the organization plans long-term food and safe water projects, healthcare, and disease prevention, mental health counseling, and disaster preparedness and prevention measures. ARC continues to support the affected Red Cross and Red Crescent national societies in Asia working through the International Federation of Red Cross and Red Crescent Societies. In Sri Lanka, the American Red Cross Relief Emergency Response Unit established distribution systems that provided more than 150,000 people with non-food relief items, and Indonesia, distribution of these items reached 50,000 families. In the Maldives, American Red Cross psychosocial support teams provided training to staff at virtually every school in the country. Tens of thousands of hygiene kits, kitchen sets, and family tents were distributed in the affected region. In total, 32 American Red Cross personnel were deployed to the Maldives, Sri Lanka, and Indonesia, focusing efforts on water and sanitation, restoring family links, logistics, and distribution of relief supplies.

American Refugee Committee—United States

ARC provided relief specialists and supplies to affected regions in southern Thailand, Indonesia, and Sri Lanka. ARC delivered life-saving medical supplies and performed rapid assessments in southern Thailand. ARC hired a medical professional to provide trauma counseling and first-aid to victims of the disaster in Indonesia.

AmeriCares—United States

AmeriCares delivered more than $12 million in relief aid to Indonesia, India, and Sri Lanka. In Indonesia, AmeriCares provided 45 tons of emergency relief materials, including water purification, essential medical supplies, and rapid diagnostic tests and medicines for malaria. Long-term health projects include re-equipping Banda Aceh's Public Health Laboratory. In India, AmeriCares delivered 36 tons of essential medicines and water purification treatments based on area health assessments. Working with the Sri Lankan Ministry of Heath, AmeriCares delivered 75 tons of medical aid and water purification treatments to the tsunami-affected country. In Sri Lanka, eight immediate and long-term water quality improvement projects have also been initiated.

Ananda Marga Universal Relief Team (AMURT)—United States

AMURT sent a team of 50 volunteers to Nagapattinam District, Tamil Nadu, India. In Phase I AMURT located and buried/cremated 322 corpses. In Phase 2 AMURT cleaned and repaired partially damaged houses and ran three counseling centers for traumatized survivors, primarily women and children. Another AMURT team was based in Banda Aceh, Indonesia, providing food and water to the survivors and helping the military locate and bury the dead.

AUSTCARE—Australia

Working with partners in the hardest-hit areas of Sri Lanka and Indonesia's Aceh to provide emergency relief, including water, sanitation, food, shelter, fuel, and medical supplies.

Baptist World Aid (BWA)—Australia

Has been working in conjunction with other NGOs in supporting a rapid response medical team sent to the east coast of Sri Lanka, and distribution of medical kits in North Sri Lanka. Partner organizations are helping with the construction of temporary and permanent housing and water storage facilities, provision of education and recreational kits for children, and replacement of fishing nets for local fisherman. Baptist World Aid Australia has committed to distribution of donated funds over the next 3–5 years in reconstruction and community development activities.

Baptist World Aid (BWAid)—United States

Baptist World Aid worked with Baptist groups in India, Sri Lanka, Thailand, and Indonesia to provide funds for the immediate purchase of shelter, food, clean water, and medication. BWAid is also working on long-term rehabilitation in these areas. BWA sent its Hungarian Rescue/Medical team to Sri Lanka to coordinate relief there. A second medical team was sent to Banda Aceh, Sumatra. Other Baptist groups sent their own specialist teams to assist with mass feeding and water purification, etc., to other tsunami-affected countries.

B'Nai B'Rith International

B'nai B'rith International Disaster Relief Fund received over $820,000 from donors. $200,000 was given to IsraAid, which sent an immediate humanitarian team comprised of medical and logistical personnel to provide aid and assess the situation in Sri Lanka. They set up emergency feeding stations and care centers for homeless children and families. They are working with the ministries of health, education, and social affairs as well as with local NGOs in the field. $50,000 was sent to the Brothers Brother Foundation in Pittsburgh, which collected medicines and medical supplies from pharmaceutical companies. B'nai B'rith's donation will provide the funds needed to ship these medicines, such as antibiotics, to the countries in this area. $50,000 was sent to the Jewish Coalition for South Asia Tsunami Relief, established by the Jewish Coalition for Disaster Relief to fund projects that are submitted via proposals from major international relief agencies. $10,000 was given to the Chabad of Thailand who has developed a support project for a village in Thailand. The funds provided a month's assistance to purchase fresh food, household items, clothing, supplies for personal hygiene, and toys for the children.

Brother's Brother Foundation (BBF)—United Sates

BBF, working with Operation USA, Sri Venkateswara Temple (Pittsburgh, PA), and others, provided requested medications such as pediatric and adult antibiotics and drugs for malaria to those in need in India and Sri Lanka.

British Red Cross—United Kingdom

The organization has chartered seven cargo flights with relief items and sent its delegates to the affected region to help aid programs. It sent 400 tons of goods to Sri Lanka, including kitchen sets, blankets, hygiene sets, tarpaulins, and jerry cans.

Canadian Baptist Ministries—Canada

CBM raised more for the tsunami disaster effort (over US$750,000) than any other relief effort in their history. Collected funds were used as follows:

- *India.* Over $360,000 to CCDP (Council of Christian Hospitals Community Development Program) for distributing rice, dal, and oil to families; replacing damaged or lost household goods; repairing fishing boats to restore the livelihoods of fishing households; providing funds to widows for de-silting salt fields; reconstructing 160 damaged or destroyed homes; repairing three cyclone shelters which also function as schools; repairing a road; and providing funds to households who incurred heavy debts from moneylenders as they tried desperately to reestablish their livelihoods during the first few days following the disaster. These rehabilitation efforts are concentrated in Vuyyuru, Pithapuram, and Akiveedu. $25,000 to EFICOR (Evangelical Fellowship of India Commission on Relief) through the Canadian Foodgrains Bank. EFICOR is assisting 15,000 families in coastal villages of Tamil Nadu, Andaman, and the Nicobar Islands. They are providing food, utensils, clothes, bedding, educational kits for children, tarpaulins, potable water, hygiene kits, and livelihood materials. CFGB is contributing some of the food sup-

port towards this effort. The number of food beneficiaries will be 15,000.
- *Indonesia.* Over $200,000 to the KGBI (Convention of Baptist Churches in Indonesia) for food and medical supply and trauma counseling in the island of Nias. Efforts are concentrated on the construction of wells for clean water supply, the repair of roads and houses, and agricultural training so that households can learn how to produce food despite their ruined farm lands.
- *Sri Lanka.* $25,000 to HBAid (Hungarian Baptist Aid). 5000 liters of high quality drinking water were distributed daily to individuals living in refugee camps during the month of January. This relief effort focused on remote Eastern provinces which did not receive much attention from the media.
- *Southeast Asia.* $25,000 through BWAid for trauma counseling, emergency medical care and emergency food and water supply. In partnership with other organizations, over 2,000 patients were treated for injuries, over 3000 individuals were immunized against typhoid, 800 children were immunized against the measles, and rice and water were distributed to affected areas.

Canadian Food for the Hungry International (FHI)—Canada

Volunteer distribution teams from various collaborating churches prepared food ration packs for more than 15,000 families. FHI activities included short-term medical teams and food and relief distributions to the homeless, refugee camp or temporary housing construction, and potable water projects. In Thailand, volunteers provided food, water, and medical care to 2500 people in Phang-nga Province. FHI supported partner organizations EFICOR and ESAF in India via cash grants and consultants in situation assessment and proposal writing. Cash grants were provided for partner LEADS in Sri Lanka to help provide relief food to 10,000 families. Additionally, FHI's U.S. partner office provided a relief shipment of clothing and personal hygiene kits to the Pentecostal Church of Sri Lanka.

Canadian Red Cross—Canada

The CRC long-term recovery and rehabilitation programs are expected to continue for up to 10 years. The CRC has sent more than 1 million kilograms of urgently needed relief items to tsunami-affected regions and continues to support the immediate and long-term needs of affected communities. Over 45 CRC relief workers have been sent to Indonesia, Sri Lanka, India, and the Maldives to work in the areas of health, nursing, disaster management, water and sanitation, finance, and logistics. CRC received $199 million in donations from generous individuals and corporations and $19.5 million from provincial governments. Over $141 million of these donations have been spent and committed to tsunami aid and recovery in affected areas. The following describes CRC's aid by country:

- *Indonesia.* 618,060 kilograms of aid, which in part includes: 60,000 infant care kits, 29,448 thermal blankets and 13,400 bedsheets, 107,920 water containers and buckets with lids, 23,640 plastic tarps for shelters and 6000 tents, 12,700 rolls of 25-meter rope, 800 medical treatment kits

    Recovery and rehabilitation programs include: Plans underway to build 10,000 homes in Aceh and 2500 homes in Nias; a rehabilitation program for mangroves—these groves of coastal trees provide protective shelter belts that could help save lives in future disasters, as well as creating underwater habitats for certain food fish, which can be harvested; and establishing a community-based livelihood recovery program.
- *Sri Lanka.* 268,830 kilograms of aid, which includes: 50,000 hygiene kits for a family of six, 37,440 water containers, 17,713 kitchen sets, 40,000 rolls of 25-meter rope, 770,000 water purification sachets, able to treat over 15 million liters of water

    Recovery and rehabilitation programs include: Plans to rebuild or repair five hospitals that were damaged or destroyed by the tsunami in the districts of Kalutara, Galle, and Jaffna;

training community health workers in psychosocial assistance to provide support to traumatized survivors; refurbishing the Kilinochchi hospital in northern Sri Lanka, a hospital where much of the medical personnel was impacted by the tsunami—over the next year, a Canadian team of doctors, nurses, and healthcare workers will provide medical services, as well as providing training to new staff; establishing nationwide Red Cross Health Centres staffed with a health promoter and volunteers to serve vulnerable communities; additional relief distribution with a focus on hygiene kits to people who remain displaced; enhancing disaster preparedness and mitigation measures; and capacity building of the Sri Lanka Red Cross.

- *Maldives.* 4980 kilograms of aid, which in part includes: 50,000 water purification sachets, 5040 thermal blankets, 600 flashlights, and 1392 batteries

    Recovery and rehabilitation programs include: The CRC is about to begin cleanup and waste management operations with the Australian Red Cross to clear 290,000 m^3 waste left behind by the tsunamis in the country's 70 affected islands; repairing and rebuilding community infrastructure; and developing a wind power pilot project to provide electricity to 600 homes on Dhuvaafaru Island.
- *Myanmar.* 68,430 kilograms of aid, which includes: 32,432 water containers, 7440 thermal blankets, 4700 plastic tarps for shelters, 2 Land Cruisers, 1 diesel generator.

Catholic Agency for Overseas Development (CAFOD)—United Kingdom

Working with Caritas International, a global alliance of Catholic aid agencies, through local partners to provide relief and rehabilitation in Sri Lanka, India, and Indonesia.

CARE International

CARE had operations in the affected countries of India, Indonesia, Sri Lanka, and Myanmar for years

and were on the spot when the earthquake and deadly tsunami struck. CARE staff distributed food, clean water, shelter, clothing, soap, and other hygiene products and basic medicines. Care distributed chlorine solution for disinfecting contaminated water and 20-liter jerry cans in Aceh. CARE is also addressing women's issues in the camps, providing prenatal care, teaching women about reproductive health, and delivering hygiene kits, condoms, and oral contraceptives.

Caritas—Australia

Has well-established local partnerships in many of the areas affected by the Asian tsunami. Caritas Australia's focus on the postdisaster stage will focus efforts through local partners in rehabilitation and reconstruction for many years, in some cases to 2010. Key focus areas include: ongoing access to water and sanitation for 450,000 people in Indonesia; long-term trauma counseling and care for 80,000 people in Indonesia, communities in Sri Lanka, and communities in Thailand; livelihood restoration for 20,000 households in Indonesia, affected coastal communities including fishing equipment in Sri Lanka, around 25,000 families in India; construction of permanent shelters, capacity building, and vocational training programs for communities in Sri Lanka, around 25,000 families in India; and provision of education assistance for 1000 people in Indonesia.

Caritas—Germany

Caritas Germany has made 300,000 euros (US$395,000) available to support relief efforts in southern India and Sri Lanka and is also coordinating with Diakonie Emergency Aid—Germany.

Caritas Internationalis

Caritas member organizations are working to provide immediate relief and long-term recovery assistance in India, Sri Lanka, Indonesia, and Thailand, providing water purification and sanitation, school supplies, shelter, medical care, and trauma counseling. Caritas is also distributing food, clothing, and other essential non-food items. More than $42.5 million is available within the Caritas network to respond to immense needs.

Catholic Medical Mission Board (CMMB)—United States

Assessing immediate needs of partners in Indonesia and Malaysia for medical volunteers, medical supplies, and small program grants. Collaborating with partners in Bangladesh, India, Sri Lanka, and Thailand to set up healthcare programs for orphans, young people, and women.

Catholic Relief Services (CRS)—United States

CRS has committed at least $25 million to provide shelter and immediate healthcare needs. CRS and local partners mobilized to the hardest-hit areas of India, Sri Lanka, Thailand, and Indonesia.

Christian Aid—United Kingdom

Has an ongoing relationship with Indian partner Christian Auxiliary for Social Action (CASA) and is working through them in Tamil Nadu to provide blankets, medicine, clothing, and plastic sheeting. An assessment team is working in Sri Lanka, where local partners are the National Christian Council of Sri Lanka and the Holistic Health Centre, based in Jaffna.

Christian Blind Mission Australia (CBMI)—Australia

A specialist development agency working with people with disabilities and their families in regions where the Asian tsunami struck. CBMI have trained staff on the ground in India, Sri Lanka, and Indonesia who will provide long-term assistance for people to reestablish their futures, offering expert trauma counselling, specialist medial care; support in learning to live with emotional and physical disabilities; rebuilding houses; training survivors in vocational skills; and distributing small personal loans to enable the reestablishment of businesses.

Christian Children's Fund (CCF)—Australia

Has been working through its international affiliates to distribute emergency food, medical supplies, water, and clothes in Sri Lanka, India, and Indonesia

in the immediate aftermath of the disaster. CCF Australia is also funding long-term community redevelopment programs in Sri Lanka, India, and Indonesia, such as establishment of Child Centered Spaces with development activities for all ages, school reconstruction and water and sanitation facilities and training, teacher, parent, and community-leader training, and training other agencies in integrating child-protection elements into humanitarian assistance and reconstruction efforts.

Christian Children's Fund (CCF)—United States

Has emergency teams on the ground in Sri Lanka, India, and Indonesia. Distributing blankets, utensils, and food, while assessing the special needs of children. May also set up child centers to provide children with a safe place to play.

Christian Reformed World Relief Committee (CRWRC)—United States/Canada

CRWRC provided $60,000 for emergency food, water, shelter, and medicine to survivors in India, Indonesia, and Sri Lanka. Long-term plans in these three countries include the continual provision of food, water, and medicine, education programs, and housing and community rebuilding projects, as well as continuing existing community development programs. Considering previous activities in the area, CRWRC anticipates a long-term presence in Asia of at least five years.

Church's Auxiliary for Social Action (CASA)—India

Has mobilized 12 relief teams in India, setting up five operational units in Tamil Nadu, Andhra Pradesh, and Kerala. Emergency aid includes food, drinking water, plastic sheeting, and household items. Also aims to build 40 multipurpose disaster shelters in coastal villages and provide building materials.

Church World Service (CWS)—United States

Planning a recovery program in the Indonesian provinces of Banda Aceh, Aceh Besar, Aceh Barat, and Nagan Raya, including health and nutrition pro-

grams, distribution of food and cooking materials, livelihoods recovery, capacity building, psychosocial support, and water and sanitation. Distributing food in Sri Lanka through CWS Pakistan. Financing the programs of its partner in India, Church's Auxiliary for Social Action (CASA). In Thailand, CWS donated 100 medicine boxes. Church World Service sent more than $1 million in cash grants and initial emergency material assistance shipments of family shelter kits, emergency medical supplies, blankets, and health kits.

Clear Path International—United States

Sending hospital beds and mattresses to Chennai and working through local contacts to identify medical equipment and supply needs in Sri Lanka and Indonesia.

Concern Worldwide—United States

Distributing emergency kits including shelter materials, rice, oil, spices, utensils, blankets, towels, and clothes and offering cash-for-work schemes in Indian Tamil Nadu. In Indonesia, Concern is also implementing cash-for-work programs and supplying computers and science kits for schools planned to reopen. Designing culturally appropriate sanitation facilities in the camps for the displaced. Working with Sri Lankan partner Project Galle 2005 to distribute emergency kits containing blankets, shelter materials, and cooking implements. Concern is assisting another local partner, Sewalanka, in temporary housing, water and sanitation, and livelihood projects in Galle, Matara, and Hambantona.

Counterpart International, Inc.

Counterpart International, in partnership with its long-standing network of partners in the U.S. and in the disaster area, assisted survivors with acquisitions, transportation and distribution of pharmaceuticals and essential humanitarian commodities.

Development and Peace—Canada

Development and Peace coordinated its efforts with its partners in Caritas Internationalis and the partners with whom the organization works as part of its

regular international development program. Development and Peace raised $18.6 million in funding for humanitarian relief. They sent $400,000 during the initial emergency phase of its Tsunami Relief program, allotted as follows:

- $50,000 CAD for India (to Caritas India);
- $250,000 CAD to Indonesia ($200,000 for Catholic Relief Services and $50,000 for the Koalisi Perempuan Indonesia women's coalition);
- $100,000 CAD to Sri Lanka (for Caritas Sri Lanka, the Social Economic Development Centre, SEDEC).

Direct Relief International—United States

Direct Relief sent over 20 shipments to support emergency and intermediate health efforts in India, Indonesia, and Sri Lanka. These air cargo shipments to relief workers and indigenous facilities and organizations contained over 49 tons of specifically requested medicines, medical supplies, and equipment and sufficient courses of treatment to serve an estimated 1.8 million people. The wholesale value of this material assistance is more than $11 million.

Disaster Mitigation Institute (DMI)—India

A team is assessing needs for food, water, shelter, and work in Chennai and Cuddalore districts of Tamil Nadu and Union Terrory in Pondicherry.

Doctors of the World (MdM)—Spain (Médicos del Mundo)

Planning to establish a psychiatric unit in Trincomalee in cooperation with the Sri Lankan government, and has distributed hygiene kits. Operating a basic healthcare unit in Indonesia, and staff have organized a mobile clinic to the villages of Sayam, Gelumpang, and Rigah.

Doctors of the World (DOW)—United States, United Kingdom

The International Network of Doctors of the Word/Medecins du Monde provided direct assistance to the survivors of the earthquake and tsunami disasters. DOTW sent teams to deliver medical assistance and emergency relief to Sri Lanka and Indonesia. Healthcare workers were deployed to Sri Lanka and Banda Aceh (Indonesia) to provide emergency aid, restore healthcare systems, and reduce the growing risk of epidemics. Each DOTW team assessed the situation to establish priorities for further aid, and to enable a rapid response to new crises including the outbreak of disease. Teams distributed chlorage kits and food, set up shelters for families, established medical care units, and administered vaccinations as indicated.

Episcopal Relief and Development (ERD)

Episcopal Relief and Development provided initial emergency assistance such as food, medicines, and shelter to people in Sri Lanka, India, Thailand, and Indonesia. In Sri Lanka, ERD supplied temporary shelter and tents as well as basic supplies, including food and health kits, to families. In India, ERD provided critical aid such as medicine boxes, food, and water to devastated communities. ERD provided emergency assistance to remote villages in coastal communities of Thailand. In Indonesia, ERD partnered with an ecumenical organization to provide medical assistance and food to displaced people in the Aceh province and other affected communities.

Evangelical Fellowship of India Commission on Relief (EFICOR)—India

EFICOR, together with Emmanuel Hospital Association and Discipleship Centre, is working in camps for displaced people in the Nicobar and Andaman Islands. In Kanyakumari district, it is distributing school material and books. In Colachel, Maraimadi, and Vaniyakudi, it is handing out hygiene kits and household items.

FOCUS Humanitarian Assistance—Canada

FOCUS mobilized staff, volunteers, and resources to provide humanitarian aid in the state of Andhra

Pradesh in India. FOCUS supplemented the aid being provided by the government and other organizations through the distribution of food kits comprising rice, lentils, oil, and other nutrients. In addition, non-food items such as blankets, tarpaulins, bed sheets, ground sheets, towels, kitchen utensils, and clothing were distributed to just under 4000 people. FOCUS' local operations in India were instrumental in allowing for the immediate delivery of assistance to those affected. At the request of the Government of Maharashtra (India), FOCUS donated 170 tents, 200 torches, 800 battery cells, 220 blankets, and 20,000 liters of drinking water, which was airlifted by the Government to the Andaman and Nicobar Islands. The tents shelter approximately 8000 people. FOCUS distributed fishing nets and boat repair kits to help restore livelihoods of the people affected by the disaster. A FOCUS team performed a needs assessment to determine emergency relief, health, water and sanitation, shelter, and livelihood needs.

Food for the Hungry—United States

Food for the Hungry provided relief in Indonesia (Meulaboh community) with six medical teams, trauma counselors, water specialists on the ground, and food distributions; in India with food rations, hygiene supplies, clothes, utensils, bedding, and tarps for 20,000 families; in Thailand with water, food, clothing, and cash distributions and mobile medical clinic; in Sri Lanka with medical assistance and emergency food and water. Longer-term reconstruction efforts are being provided.

Gifts In Kind International—United States

Gifts In Kind International coordinated the delivery of medical supplies, personal care and hygiene products, clothing, water, appliances, and cleaning supplies to nonprofit organizations located in affected areas. Newly manufactured products were collected from corporations including water, medical supplies, personal care and hygiene supplies, clothing, appliances, and cleaning supplies. Gifts In Kind International also managed the processing of requests for UPS shipping to the area.

GOAL—Ireland

Assisting people in Sri Lankan districts of Ampara, Hambantota, and Matara by supplying clean water, constructing latrines, temporary accommodation, non-food items, providing cash-for-work schemes, implementing fisheries programs, and carrying out clearing operations. In India, GOAL is providing food and non-food items in Nagappatinum and Andaman Islands, resources for medical and counseling centers in Karaikal, livelihood recovery and cash-for-work projects in Karaikal and Nagappatinum. Also responding to health, immunization, and sanitation needs in Indonesian Banda Aceh province.

Habitat for Humanity International (HFHI)

Habitat for Humanity plans to house up to 25,000 families in a first-phase response in tsunami-affected countries. Habitat for Humanity will also develop Disaster Response Technical Centers in the affected countries to provide technical expertise and assistance to families, Habitat affiliates, and partners in the first stages of construction. Eventually, the centers could become permanent training centers to teach people how to make their own homes and how to make and use affordable building materials such as earth blocks, roofing tiles, and doors, windows and frames.

Handicap International (HI)—United Kingdom

Was already working in the Batticaloa and Ampara districts of Sri Lanka, and HI is now concentrating on posttrauma treatment, after initial involvement in transporting victims and providing first aid equipment.

Health Partners International of Canada (HPIC)—Canada

Sending several million dollars' worth of WHO-standard medical donations from Canada's healthcare industry.

Heart to Heart International

Heart to Heart responded to the disaster in Sri Lanka with humanitarian assistance, including

transportation to ship humanitarian relief items, including medicines, medical supplies, and personal hygiene items.

Heifer International—United States

Heifer committed $1 million for programs to provide training, livestock, and related help to victims on the coast of the Indonesian island of Sumatra and elsewhere in the region to rebuild lives and farms over the next few years. The effort will focus on sustainable, long-term development.

Helen Keller International

Provided nutritional supplements to children, assessing living conditions and directing clean water, shelter, food, sanitation, and medical care to those in need in Aceh and other affected areas in Indonesia.

HELP (Hilfe zur Selbsthilfe e.V.)—Germany

Sending emergency specialists to Sri Lanka. Supporting a local organization of volunteers in Banda Aceh, Indonesia, to bury the dead and distribute food and shelter.

HelpAge International (HAI)—United Kingdom

Distributing vitamins, dietary supplements, clothes, cooking utensils, fishing nets, carpentry tools, hand looms, sewing machines, glasses, walking sticks, wheelchairs, and frames for older people in Sri Lanka. Building temporary and permanent housing and offering social and psychological support for older people. In India, it is providing fishing boats and equipments, homes for families headed by older people, counseling and medical care, and lobbying governments to grant pension benefits to older people.

Holt International Children's Services

Holt has programs in two of the impacted countries: Thailand and India. They first identified children who have been separated from their parents and reunited them with their families. As other needs are identified, HSF works with partners to design appropriate responses.

humedica e.V.—Germany

Has sent a medical team and supplies to Sri Lanka. Distributing food and blankets and setting up several mobile clinics operated by local doctors.

Interchurch Medical Assistance, Inc. (IMA)—United States

IMA provided emergency medicines and medical supplies to Sri Lanka and Indonesia with distribution in the affected countries coordinated by local partners, the National Christian Council of Sri Lanka, and Church World Service Indonesia.

International Aid—United States

International Aid responded to threat of outbreaks of highly communicable diseases with $4.6 million in vital pharmaceuticals. The pharmaceuticals were used in conjunction with medical clinics International Aid has provided and will help to meet community healthcare needs.

International Aid Services (IAS)—Sweden

Helping local partners and NGOs provide clean water on Sri Lanka's eastern coast.

International Committee of the Red Cross (ICRC)—Switzerland

ICRC has provided medical supplies to hospitals in Aceh and restored some access to clean water. A logistics centre has been set up in Singapore to support relief operations in Aceh. ICRC has opened a new medical clinic in Eachchilampattai on Sri Lanka's eastern coast, with the Norwegian Red Cross in charge.

International Development and Relief Foundation—Canada

When the tsunami hit, IDRF raised $1,000,000 to help survivors. The funding was used in the reconstruction efforts in the Aceh province of Indonesia. IDRF staff treated the injured and built homes for the

homeless. Orphanages and medical clinics were built as well.

International Federation of the Red Cross and Red Crescent (IFRC)—Switzerland

The IFRC will be assisting over two million people. Receiving assistance in Aceh from staff of the International Committee of the Red Cross (ICRC)–Switzerland. In Indonesia, different European national societies are helping with water and sanitation and health issues. The Indonesian Red Cross is sending two five-ton trucks with relief items to Meulaboh. The Thai Red Cross is assisting affected communities with food, clothes, shelter, and fishing nets and has deployed a mobile clinic. Many African national societies have launched appeals to help the affected region.

International Medical Corps (IMC)—United States

IMC deployed rapid response teams to Aceh, Indonesia within 24 hours of the tsunami, and initiated relief efforts in Sri Lanka's Eastern Province within one week. Teams in Indonesia focused on delivering primary health services via mobile and fixed clinics, and also conducted needs assessments, distributed hygiene kits and other non-food items, provided psychosocial support, collected and reported disease surveillance data, provided nutritional support, and helped to implement and deliver a mass measles vaccination campaign. IMC's long-term commitment to tsunami recovery in Indonesia includes medical education support, health-facility renovation, health service provision, livelihood support through cash-for-work and microcredit programs, and psychosocial activities. In Sri Lanka, IMC's emergency response included the operation of four mobile clinics in Trincomalee District and the reestablishment of Kinniya Hospital's emergency response capacity. IMC's long-term programs in Sri Lanka will provide training, technical assistance, psychosocial programs, microcredit and cash-for-work programs, and clinic/hospital rehabilitation in Sri Lanka's Eastern Province.

International Orthodox Christian Charities (IOCC)—United States

IOCC developed a regional response to the crisis, focusing initially on hardest-hit areas in Sri Lanka, Indonesia, India, and elsewhere. As part of this effort, IOCC supported Church World Service airlifts of critical medical and shelter supplies valued at $4 million to the region, including shipments of supplies from the Church of the Brethren warehouse facility in New Windsor, Maryland. IOCC also worked with His Eminence Metropolitan Nikitas of the Orthodox Metropolitanate of Hong Kong and Southeast Asia to extend the network of church-based humanitarian relief in the region.

International Reading Association (IRA)—United States

IRA collected cash donations in support of children and schools in the disaster area.

International Relief and Development, Inc. (IRD)—United States

IRD supplied over $5.7 million in assistance to disaster areas in Indonesia and Sri Lanka. IRD, together with the U.S. Department of Agriculture, diverted 15,000 metric tons of rice valued at $4.875 million to the World Food Program for immediate distribution to survivors in North Sumatra. IRD also dispatched over $1.2 million in relief supplies, reaching over 35,000 people. In addition to these relief supplies, IRD sent containers with medical supplies, food, water, and other relief items.

International Relief Teams (IRT)—United States

IRT sent five air shipments of emergency medicines and relief supplies worth more than $2 million to India, Indonesia, and Sri Lanka, and deployed teams of medical volunteers to Indonesia to assist tsunami survivors, deliver medicines to remote regions of the Aceh province, and assist the World Health Organization in preparing for a mass measles and Vitamin A immunization program for children. IRT also provided essential materials and supplies to sustain health for thousands of displaced families living in camps

and other temporary shelters. In addition, IRT helped hundreds of families rebuild their livelihoods by providing the necessary materials for people to return to work, and rebuilt over 150 homes. IRT also conducted post-trauma stress training to teachers working with tsunami-affected children, and to local professional counselors to better prepare them to work with severe cases of post-traumatic stress. IRT sent two medical teams to Nias island to provide medical care to the earthquake survivors.

International Rescue Corps—United Kingdom

Helping coordinate relief supplies donated in Britain in conjunction with the Disasters Emergency Committee.

International Rescue Committee (IRC)—United States

The IRC has been operating relief programs in Northern Sumatra Province of Aceh since 2001. In response to the 2004 tsunami, IRC's staff delivered emergency water and sanitation interventions to prevent the spread of water-borne diseases and provide emergency supplies and materials to people most affected by the crisis. IRC mobilized an initial $7 million relief effort to Aceh with a 41-member Emergency Response Team and over 130 Acehnese staff.

International Women's Development Agency (IWDA)

Building a five-year reconstruction fund to support the work of local Sri Lankan groups. This fund will support traumatized communities in Southern Sri Lanka, specifically in the badly affected Matara and Hambaniota Districts, by employing and providing transport for five skilled local counselors for a year, and providing revolving loans, livelihood/vocational skills development, and financial resources.

INTERSOS—Italy

Providing water purification chemicals, water tanks, health kits, tents, blankets, tools and generators on Sri Lanka's Kinniyai island.

Islamic Relief (IR)—United Kingdom

Planning to build emergency family latrines and has already installed latrines and purchased water storage tankers in Banda Aceh. The organization is distributing food, drinking water, oil, disinfectants, and baby milk. In Sri Lanka, IR is focusing on the Ampara district: building temporary houses; distributing hygiene kits, underwear, soap, towels, pillows, mosquito nets, clothing, and special food packs for widows; focusing on livelihood security in fishing, weaving, and construction; and offering a one-to-one orphan sponsorship program.

Jesuit Refugee Service (JRS)—United States

Prior to the devastation caused by the December 26 tsunami, Jesuit Refugee Service teams had been working with displaced Sri Lankan and Achenese communities in these conflicted areas. In response to the tsunami, these same JRS teams in both Sri Lanka and Aceh responded by providing emergency relief to some of the most devastated areas. JRS Sri Lanka conducted relief operations in the Sri Lankan towns of Jaffna, Mullaitheevu, Trincomalee, and Batticloa. The JRS team in Aceh helped to coordinate delivery of survival kits that include kitchen utensils, hygiene items, blankets, sleeping mats, water storage cans, and plastic sheeting.

Latter-Day Saint Charities—United States

Latter-Day Saint Charities provided food, medical supplies, hygiene kits, kitchen sets, body bags, and other emergency relief supplies to disaster victims in Indonesia, Sri Lanka, India, Thailand, Myanmar. Air freight shipments of relief supplies from Salt Lake City to Sumatra, Indonesia were provided.

Life For Relief & Development (LIFE)—United States

LIFE coordinated efforts with international relief agencies, and provided emergency relief items including clean water, food, blankets, and temporary shelter to tsunami disaster survivors.

Lutheran World Relief (LWR)—United States/Canada

LWR launched an appeal to fund a long-term rebuilding effort, "Wave of Giving," for those affected by the tsunamis. LWR is programming at least $6.5 million for recovery and development efforts that would span the next 5 to 10 years. LWR has released over $756,000 to local partners for initial and immediate relief from the tsunamis. These funds will be used to provide up to 150,000 families with clean water and food in southern India, Sri Lanka, and Indonesia. LWR has staff in India, Sri Lanka, and Indonesia engaged in assessments for the rehabilitation and recovery stages.

MAP International—United States

MAP International prepared a shipment of medicines and medical supplies for the communities devastated by the tsunami. Medical relief targeted areas affected in Sri Lanka and southern India.

Malteser Germany (Foreign Aid Department)—Germany

Rehabilitating several health centers in the Banda Aceh region of Lhokseumave in Indonesia and planning to provide fishing equipment and boats. In cooperation with UNICEF, vaccinating children against measles. In the Indian district of Kanya Kumari, Malteser is supporting fishermen. In Thailand, it is providing relief for a mother-child day-care center.

Medair—Switzerland

Responding in the Sri Lankan district of Ampara by training local staff to clean contaminated wells and purify water supplies. The organization's staff built eight latrines, drilled one water point, and distributed water purification chemicals, buckets, jerry cans, soap, and mosquito nets.

Medical Assistance Programs (MAP) International—United States

Shipping medical supplies and other relief items in coordination with its partners for distribution in south-ern India, Banda Aceh, and Sri Lanka. Helping vaccinate children in southern India against measles.

Mennonite Central Committee (MCC)—Canada

MCC has begun or completed the following assistance for tsunami survivors:

- *Indonesia*. $152,183 given to Ummul Aiman Foundation (YUA) to clean some 600 wells of debris, to clean and repair river and canal drainage areas, and to rebuild 17 bridges; $35,313 to Syiah Kuala University (UNSYIAH) for research on challenges affected farmers are facing; $309,980 to Forum for Humanity and Peoplehood (FK&P) for a trauma healing program; $50,000 to YEU to expand medical services; $100,000 to YEU to increase medical response; $64,360 to FK&P to provide prostheses for 200 amputees and to train 4 technicians to make prostheses; $53,100 to Center for Education and Development (PKPM) to provide school uniforms and supplies to some 2,000 students; $32,150 to BEM-Politekes, a student organization of a university in Banda Aceh, to provide clothing, shoes, and school supplies to 700 students; $39,580 to UNSYIAH to provide funds for farmers in 79 households to plant onions and to drill three wells to provide irrigation; $21,000 UNSYIAH to clean and rehabilitate 100 hectares of rice fields for 250 families; $800,000 for over 22,000 relief kits for tsunami survivors in Aceh province; $9,290 to Pustaka Muria to translate, adapt, print, and distribute some 2,000 copies of a manual on stress and trauma healing; $26,580 FK&P to train volunteers in trauma counseling techniques; $21,300 to provide tools and pay workers to clear tsunami debris from land on the northeast coast of Sumatra; $210,000 to YEU to provide mobile health clinics, medical staff, water and sanitation equipment, food, transportation, and trauma counseling; $10,000 to support a Church World Service (CWS) airlift of medical supplies and blankets to Indonesia; $25,000 to an ecumenical consortium of Indonesian and

international agencies that gave rapid medical and material aid to Indonesian tsunami survivors; $25,000 for local purchase of food for tsunami survivors in Aceh province, Indonesia, through CWS; 1,512 relief kits ($60,000) airlifted to Indonesia by CWS

- *India*. $2.9 million to restore communities through Church's Auxiliary for Social Action (CASA) and a Presbyterian, United, Mennonite, and Anglican coalition called PUMA; $512,000 to the Henry Martyn Institute to help rebuild devastated communities; $34,000 to Matilda Education Society to provide 200 fishing nets, repair 60 fishing boats, and to give school supplies, plates, and drinking glasses to 1,000 children; $283,850 Modern Architects for Comprehensive Rural Development (MACORD) and HELP to rehabilitate 25 tsunami-affected coastal villages in Prakasam district of Andhra Pradesh; $125,800 to Mennonite Christian Service Fellowship of India (MCSFI) to repair or replace boats, nets, and housing material; $156,450 to Villages in Partnership (VIP) to help villagers in devastated coastal communities to recover; $110,000 to West Bengal Volunteer Health Association (WBVHA) to provide vocational training and small business grants; $51,000 to WBVHA to provide trauma counseling; $22,000 for locally purchased rice, blankets, clothing, and other items for 1,400 families in Tamil Nadu state; $25,000 for immediate food needs in Tamil Nadu state, India, through CASA; $7,000 for a medical response through West Bengal Volunteer Health Association
- *Sri Lanka*. $30,000 to Gospel House to build boats and establish income generation projects; $30,000 to Y-GRO to begin rebuilding a village
- *Somalia*. $53,100 to 500 families in seaside communities in the Kismayo and Badade districts of Somalia to rehabilitate boats, and provide food aid and fishing twine for nets; $51,860 SAACID to provide food for families in the Adale district and to help replace fishing equipment for some 50 families

Mercy Corps—United States

Over 100 Mercy Corps staff developed long-term recovery programs in India, Indonesia, and Sri Lanka to assist people in reestablishing their lives, and continue projects to address immediate needs such as food, water, temporary shelter, and clothing. Mercy Corps' Cash-for-Work programs in Indonesia and Sri Lanka are empowering people to reconstruct their communities while generating income for survivors and reestablishing economic opportunities through programs that begin long-term recovery.

**Mercy-USA for Aid and Development—
United States**

Mercy-USA for Aid and Development (M-USA) sent an emergency response team to Indonesia and Somalia to assess the needs and determine the best way to meet them. Through their local partner in India, M-USA distributed food packages (containing rice, lentils, oil, sugar, etc.), clothes, plastic tarpaulins (for emergency shelter), and blankets to 1,000 homeless families in India's state of Andhra Pradesh.

Merlin—United Kingdom

Planning to rebuild seven health facilities in the Sri Lankan provinces of Batticaloa and Amapara and construct a maternity ward at Kattankudy. Merlin is also repairing other, partially damaged medical centers. It has distributed family hygiene kits and emergency delivery kits for midwives. It has provided spraying equipment and continues to improve water and sanitation facilities and hygiene conditions in the camps. Merlin is implementing health and hygiene education and is distributing insecticide-treated bed nets.

Médecins Sans Frontières (MSF)—International

Planning to help Burmese migrants to get better access to health care in Thailand, where it supplied several hospitals with medical material in the Phang Nai province. In southern India, MSF is starting psychosocial support. The organization's efforts in Aceh and Sri Lanka focus on supporting local health structures and running mobile clinics; setting up emergency water and sanitation systems; providing

essential relief items and psychosocial assistance. MSF has reached its target for funds in this emergency but welcomes donations for its activities in other crises.

Mines Advisory Group (MAG)—United Kingdom

In addition to assessing the tsunami's effect on mines in Sri Lanka, used their vehicles to assist in the response operation to ferry the dead and transport food resources.

Muslim Aid—United Kingdom

Has set up a field hospital in Aceh in Indonesia, and is working with partner NGOs in Thailand's Phuket, Phi Phi, and Ranoog near the Burmese border. Also providing emergency relief to survivors in Somalia.

Muslim Hands—United Kingdom

Muslim Hands and its partners have set up distribution centers in Medan and Banda Aceh and continue to bury the dead and provide medical supplies to nine medical centers in Aceh. Distributing food and water to 30 small and medium refugee camps, building water purification units in Aceh province, and identifying and assisting orphans in the area. In the Andaman and Nicobar Islands, Muslim Hands has provided medical and food aid, and set up a temporary school and a relief camp.

National Peace Corps Association—United States

NPCA affiliate group Friends of Thailand established Project Restore to rebuild and support Ban Bang Sak Elementary School and Ban Bang Muang Middle School in Phuket, Thailand. In addition, NPCA assisted Peace Corps in its efforts to recruit Crisis Corps volunteers to be mobilized in the affected region.

Northwest Medical Teams—United States

Northwest Medical Teams deployed emergency medical professionals to provide direct healthcare services in Thailand, Sri Lanka, and Indonesia. Each medical team was self-contained, hand-carrying essential drugs based on the WHO essential drug list for relief operations.

Norwegian Church Aid—Norway

Providing tents, water and sanitation equipment, and emergency ration packs which will be distributed through Church World Service in Indonesia. Sent six water engineers to Meulaboh. In India, local partner CASA is working on behalf of NCA in Tamil Nadu, Pondicherry, Kerala, and Andra Pradesh, providing warm food, dry ration kits with rice, lentils, cooking oil, and other essentials and building semi-permanent housing. In Sri Lanka, NCA is setting up temporary housing and is doing assessments in Somalia.

Norwegian People's Aid (NPA)—Norway

NPA has had nine programs in the Vanni district of Sri Lanka since 2002. After providing food, now providing electricity and building latrines in camps for the homeless.

Operation USA—United States

Operation USA's Tsunami Relief Program included both emergency and long-term projects. The initial response consisted of sending medical and trauma counseling teams, air and sea shipments of emergency supplies, and cash grants to long-time partner agencies in India, Sri Lanka, Thailand, and Indonesia. Operation USA's longer-term recovery programs focus on community rebuilding, healthcare, water resources, counseling, and economic reintegration. Bulk amounts of new emergency relief supplies from corporate donors are accepted as gifts in kind.

Oxfam America—United States

Oxfam and its local partners provided water and sanitation and distributed relief supplies in India, Indonesia, and Sri Lanka. Oxfam America is also involved in rehabilitation and reconstruction.

Oxfam Community Aid Abroad (Oxfam CAA)

An affiliation of 12 organizations around the world working together to assist approximately 500,000 people in Indonesia, Sri Lanka, and India. The current focus of Oxfam is on providing food, water, and sanitation; shelter for the homeless; and preventing the outbreak of diseases and infections. Over the long

term, Oxfam will invest in rebuilding essential infrastructure and rebuilding livelihoods as part of an ongoing commitment to the communities we work with. Oxfam will continue to assist, listen to, and support the communities who are the hardest hit by the tsunami for many years.

Oxfam International—United States, Canada, Belgium, Australia, Germany, United Kingdom, Hong Kong, Spain, Ireland, Netherlands, New Zealand, Quebec

In Indonesia, Oxfam is providing sanitation services and distributing household and hygiene kits in camps. It is offering cash-for-work schemes in Aceh Besar and Meulaboh and planning to build houses in Lampaya and temporary shelters in Leupung. In India, some of its projects include organizing cash-for-work programs in the Cuddalore and Nagapattinam districts, repairing boats in Pudukuppam village, and assessing the needs of non-fishing groups in the Kannyakumari district. The organization is providing water and sanitation and promoting public health in camps in Sri Lanka.

Peace Winds Japan (PWJ)—Japan

PWJ's emergency relief team in Medan, the capital of North Sumatra province, has begun delivering critical provisions to survivors in Meulaboh on the western coast of Aceh.

Plan UK—United Kingdom

Focusing on housing construction, livelihoods, education, and water and sanitation needs in Sri Lanka, mainly in Hambantota district. Providing nutrition supplements to the most vulnerable children and pregnant women in Indonesia, in partnership with CARE. In the Indian state of Tamil Nadu, the organization is working with local organizations to provide children's food, milk, vitamins, micronutrients, hygiene kits, and educational materials. Working on child care centers, rebuilding schools, teacher training in counseling and child trauma healing in Chennai, Cuddalore, and Naggapattina.

Plan USA—United States

Plan USA collected funds for disaster relief efforts in devastated areas of India, Sri Lanka, and Indonesia. Plan was especially active in responding to the devastation in Hambantota District on the southern coast of Sri Lanka, where 28,000 people lost their homes and 4,500 were reported killed, many of them children. With preexisting operations in Hambantota, Plan has a strong working relationship with the government of Sri Lanka on the District Relief Committee.

Première Urgence (PU)—France

Launching an emergency mission in Indonesia. Teams will set up water purification facilities, distribute food aid, and build shelters.

Presbyterian Disaster Assistance (PDA)—United States

Presbyterian Disaster Assistance (PDA) committed an initial response of $200,000 to support long-term regional church partners CASA (Church's Auxiliary for Social Action), the National Council of Churches of Sri Lanka (NCCSL), and their relief organizations. CASA deployed 12 teams in India to assist people and assess needs in the coastal areas. Four strategic operational points were set up and an emergency feeding program started. In Sri Lanka, three pastoral teams were sent to the affected regions. Food distribution was performed and church members worked to transport people to safe areas. PDA supported children's homes run by the churches, which support children who have lost their parents or families in the war and will now help those affected by this disaster.

Project HOPE—United States

In Thailand, Project HOPE purchased locally necessary medical supplies to distribute to district hospitals in Phang Nga Province and addressed supply needs of the region. In Indonesia, in partnership with Uplift International, Project HOPE sent medicines and medical supplies requested locally. In addition to providing immediately needed medical supplies, Project HOPE is committed to a longer-term response, working with local counterparts and partnering with other

NGOs, to identify short and long-term resources needed to rebuild the healthcare delivery system.

RedR—International

Providing technical assistance to UN Standby Partners and Australian & International NGOS. RedR is maintaining a register of selected and trained personnel specializing in engineering, logistics, and humanitarian management for deployment to the region.

Refugees International—United States

Missions in Sri Lanka and Aceh concentrated on advocacy to promote a smooth transition from relief to development.

Relief International (RI)—United States

RI emergency relief worked in Sri Lanka's hard-hit eastern and southern provinces, providing direct assistance through mobile medical services as well as trucking and distributing drinking water, food, and emergency shelter to thousands of families. RI initiated a livelihoods rebuilding program, providing loans to fishermen for repair of fishing boats, provision of fishing nets, and repair of housing. Provision of "Kid Kits" benefit and help children prepare for return to school. The organization is planning long-term rehabilitation programs over the next three to five years.

Salvation Army World Service Office (SAWSO)—United States/Canada

The Salvation Army (TSA) emergency relief team distributed food and other essentials for survival along the tsunami-devastated coastal areas of India. Caterpillar Inc. made available to TSA, free of charge, its heavy lifting equipment already in the Sri Lanka area. The Salvation Army team in Meulaboh, Indonesia was able to move deeply into the ravaged coastal areas. TSA plans to remain in the tsunami-damaged areas performing long-term reconstruction.

Save the Children Australia—Australia

Members are providing an immediate relief response to the Asian tsunami. Assessments have been undertaken in Indonesia, Sri Lanka, India, the Maldives, Myanmar (Burma), Thailand, and Somalia. Response is currently focused on the three most severely affected countries of Indonesia, Sri Lanka, and India. In Indonesia, Save the Children have deployed volunteer doctors and nurses to field sites, provided medical kits, conducted training of personnel on child tracing and registration procedures, and opened a Child-Friendly Space Banda Aceh. Save the Children is planning to set up a youth group and a women's group in the camp as well. Save the Children in Sri Lanka have supported the distribution of relief family packs, plastic sheeting to 4,500 families, and play materials for about 3,525 children in four centers. Save the Children is planning to provide semi-permanent shelter kits to 10,000 families. Livelihood activities are expected to concentrate on support to fishermen with boats and rope-making equipment. In India, Save the Children staff are developing program plans for child protection, early childhood nutrition and care, livelihoods, shelter rehabilitation, and education.

Save the Children UK—United Kingdom

In Sri Lanka, Save the Children distributed food, medical supplies, cooking utensils, water purification tablets, and hygiene items in Batticaloa, Trincomalee, Matara, Galle, Jaffna, Ampara, Mullaitivu, and Kilinochchi; registered separated children and provided play activities and counseling in Batticaloa, Ampara, and Kilinochchi; carried out a livelihood assessment in Galle, Matara, Ampara, and Batticaloa; and participated in a health assessment in Ampara. The organization sent tarpaulins, tents, cooking utensils, plastic sheeting, children's clothing and mosquito nets, trucks, and satellite phones to Indonesia. Set up mobile health units in Aceh and is coordinating the working group on separated children. Save the Children has provided emergency relief in Andhra Pradesh, Tamil Nadu, and Pondicherry, and plans to carry out child-focused relief and emergency education activities in the Andaman and Nicobar Islands. Planning long-term community-based interventions in psychosocial support, livelihoods, child protection,

reconstruction of children's centers, health promotion, and support to nutritional care for infants.

Save the Children USA—United States

Save the Children worked to meet the immediate health and nutrition needs of thousands of children impacted by the disaster while expanding efforts to identify and protect children who suddenly found themselves alone, without parents or relatives to care for them. In Aceh province of Indonesia, where Save the Children has worked since 1976, hundreds of thousands of children and adults were sheltered in temporary camps. Save the Children has provided water, food, shelter, and medicines to children and adults in many of these temporary camps. In addition, staff members completed interviewing and registering children in 17 camps near the province capital of Banda Aceh and have begun registering children in more than 60 camps in the Pidie district of Aceh province, an area on the east coast hit hard by the earthquake and tsunami.

Stop Hunger Now (SHN)—United States

SHN worked to channel aid to several partner organizations throughout the hardest-hit regions. When requested by implementing partners, SHN coordinated shipping emergency food and needed relief commodities.

Sustainable Environment and Ecological Development Society (SEEDS)—India

SEEDS has established three relief camps in Port Blair, in Andaman and Nicobar islands. The organization is now moving towards the rehabilitation and reconstruction phase and is running a helpline to locate people missing from the islands.

Swiss Foundation for Mine Action (FSD)—Switzerland

The organization has distributed food, built latrines, cleaned wells, helped to repair fishing boats, and assessed mine threats in villages in Sri Lanka. FSD has now ceased relief operations in the Ampara district and will be resuming its regular de-mining activities.

Tearfund—United Kingdom

Tearfund partners EFICOR, the Discipleship Centre, and the Emmanuel Hospital Association are providing food, water, and medical assistance for up to 40,000 families and distributing emergency relief packs in Kanniyakumari, southern India. The Emmanuel Hospital Association has sent medical staff and supplies to the Andaman and Nicobar islands. Tearfund's partner in Sri Lanka, LEADS, is providing food, water, water purification tablets, clothes, and blankets. In Indonesia, Tearfund is part of a joint operation program with other agencies.

Terre des Hommes (Tdh)—Swizerland

Terre des Hommes was already present in eastern Sri Lanka, and is providing food and psychosocial support and operating eight clinics. The organization is coordinating aid to Batticaloa.

Trickle Up Program—United States

Trickle Up currently works in both South and Southeast Asia, and has experience working in the three countries most affected by the disaster—Indonesia, Sri Lanka, and India. Trickle Up provides microenterprise development supports, including business development training, microgrants, and supporting services to help capitalize microbusinesses and anticipates the need for two levels of assistance around livelihood redevelopment among the most vulnerable: the first being short-term assistance to capitalize microbusinesses providing for immediate income needs and the second is to plan for longer-term supports to ensure the establishment and sustainability of stable enterprises.

Unitarian Universalist Service Committee (UUSC)—United States

UUSC addressed the dangers faced by survivors of the earthquake and tsunami and helped restore the livelihoods they have lost. They channeled funds to grassroots organizations providing assistance to marginalized, neglected, and politically oppressed populations who do not have access to traditional aid distribution. UUSC worked to help marginalized

groups regain their livelihoods. They also provided aid to fishing communities, landless farm workers, and to groups that offer job training, women's empowerment, trauma counseling, alternative employment skills, and human rights education. The Service Committee is continuing to assess reports from the region and is committed to providing long-term relief and rehabilitation to where we can be most effective in helping poor and marginalized populations to rebuild their shattered lives.

United Methodist Committee on Relief (UMCOR)—United States

UMCOR launched operations in Sri Lanka, Indonesia, and India. In Sri Lanka an integrated reconstruction project for 2,000 people focused on housing and livelihoods. Work in Indonesia included housing and income-generation projects in Banda Aceh and Meulaboh. UMCOR conducted short-term employment generation or cash-for-work projects, such as cleaning up debris. UMCOR also provided relief work on the small island of Nias, which had more tsunami damage than first reported. UMCOR released grants to the local Indian organization CASA for the distribution of food, emergency supplies, and tarpaulins; a grant to the Christian Medical Association of India to deploy teams that provide healthcare and trauma counseling; a grant to CWS for the shipment of shelter kits to Sri Lanka; and a grant to the Methodist Church of Singapore to assist in the delivery of antibiotics.

United Way International—United States

United Way International, United Way of America, and United Way affiliates in India, Indonesia, Malaysia, Thailand, and east Africa are working together to respond to the communities affected by the earthquakes and tsunamis. The United Way South Asia Response Fund is focused on long-term recovery efforts such as rebuilding the infrastructure in the impacted region. United Way supported the emergency relief phase by assisting with clean water, food, and shelter but the primary focus will be long-term reconstruction and recovery when United Way and their community partners will aid in rebuilding homes, schools, public works, and health facilities; restore destroyed fisheries and farms, replant crops, and reforestation; provide for mental health assistance and support of at-risk populations; and participate in strategic planning/mitigation management and more.

USA for UNHCR

USA for UNHCR supported the UN Refugee Agency's (UNHCR) relief effort throughout the tsunami-affected region. UNHCR provided emergency shelters to 100,000 people in Indonesia's Aceh province who lost their homes in the devastating earthquake and tidal waves. The agency also provided shelters and other emergency items such as blankets, clothing, and cooking kits to survivors in Sri Lanka, Thailand, and Somalia.

U.S. Committee for Refugees and Immigrants (USCRI)—United States

USCRI's Refugee Tsunami Victims Fund was used to assist Burmese refugees in southern Thailand who are victims of the tsunami disaster but are not receiving disaster relief assistance.

U.S. Fund for UNICEF—United States

U.S. Fund for UNICEF supported UNICEF, whose immediate priority is the health, well-being, and protection of children, and will work with recovery and rehabilitation in the long term. UNICEF shipped relief items, pre-positioned supplies, and distributed materials to affected communities and relief camps. UNICEF also conducted rapid and thorough assessments of the situation and needs of children in each affected country by working with governments and other organizations.

War Child—Canada

In Sri Lanka, providing food, water, shelter, sanitation, and healthcare; psychosocial support to help children cope with the effects and aftermath of the tsunami; and financial support for rehabilitation and reconstruction through its local partner Butterfly Peace Garden in the eastern coastal city of Batticaloa.

World Concern—United States

World Concern helped to move 10,000 families from schools in Sri Lanka to temporary housing so that the schools could reopen. Air shipment of 10 tons of tents, large collapsible water tanks, blankets, cooking kits, and medical supplies were sent. World Concern was the only international organization that made an assessment and was capable of responding to the tsunami victims in southern Somalia. World Concern also provided medical supplies, medicines, mosquito nets, and food, and is now helping to rebuild the fishing fleet to restore the livelihood of the fishermen.

World Emergency Relief (WER)— United Kingdom

Through ADRA Sri Lanka, the organization is distributing boxes containing basic medical supplies for use in rural and mobile medical facilities. Has sent emergency relief such as food, blankets, water purification items, and medicines, as well as assessment teams to Sri Lanka and Thailand. It has established supply pipelines for two local NGO partners and provided grants for NGOs on the ground in Aceh.

World Emergency Relief (WER)—United States

WER provided tsunami relief to the victims in South Asia. WER has shipped much-needed items, including hand sanitizer, food, water, medicine, clothing, cleaning supplies, blankets, and baby supplies. Total assistance totaled over $10.4 million. WER also dispatched a disaster team to give hands-on assistance and assess the damage.

World Hope International—United States

World Hope provided emergency relief through local partners in Sri Lanka and Indonesia (Sumatra). Local staff conducted assessments to determine long-term strategic action.

World Relief—United States

World Relief worked alongside a coalition of church networks, representing 25,000 churches in Indonesia, to provide emergency aid. The coalition established five bases to accommodate and coordinate volunteers, distributed essential supplies at several of the hardest-hit locations, and helped with mud and debris cleanup. World Relief supplied five water purification plants each capable of serving 3,000 people per day, and provided 1,000 family tents with long-term rehabilitation plans including construction of homes and schools. World Relief is providing organizational and monetary resources to partners in India and Sri Lanka as well.

World Vision International (WVI)—United States

World Vision provided relief to over 500,000 people in Indonesia, Sri Lanka, India, Thailand, and Myanmar during the acute emergency phase following the earthquake and subsequent tsunamis. Emergency supplies, including tents, medicines, survival kits, food, clothing, hygiene items, water, water purification equipment, etc. were delivered by 18 airlifts. In Sri Lanka, WVI distributed household items, repaired damaged houses and schools, and provided school uniforms and other school materials in the Kalutara district. In Thailand, the organization set up two training and service centers for counseling in Ranong and Phuket. WVI continues to build shelters and food-for-work schemes. The organization has begun its relief activities in the Indonesian town of Meulaboh and opened a child-friendly space there. Rehabilitation programs are underway to focus on social/community recovery, economic development, and infrastructure rehabilitation interventions. WVI is planning to work on the development of settlements and child-friendly spaces, and distribute essential items, playground equipment, boats, nets, and maternal screening in India.

Source: Reuters Foundation AlertNet, 2005; InterAction, 2005.

APPENDIX 9-3
Academic and Professional Disaster Management Institutions

American Association of Wind Engineering, USA—www.aawe.org

American Avalanche Association, USA—www.avalanche.org/~aaap

American College of Emergency Physicians, Section on Disaster Medicine, USA—www.acep.org

American Psychological Association, Disaster Response Network, USA—www.apa.org

Arkansas Center for Earthquake Education and Technology Transfer, USA—http://quake.ualr.edu

Asian Disaster Preparedness Center (ADPC), Thailand—www.adpc.net/

Asian Disaster Reduction Center, Japan—www.adrc.or.jp

Benfield Hazard Research Centre, UK—www.benfieldhrc.org

California Specialized Training Institute (CSTI), USA—www.csti.ca.gov

Canadian Center for Emergency Preparedness (CCEP), Canada—www.ccep.ca.

Cascadia Region Earthquake Work Group (CREW), USA—www.crew.org

Center for Disaster Management, Turkey—www.cendim.boun.edu.tr

Center for Disaster Research and Education, Millersville University, USA—http://muweb.millersville.edu/~CDRE

Center for Earthquake Research and Information (CERI), University of Memphis, USA—http://www.ceri.memphis.edu/

Center for Earthquake Studies, Southeast Missouri State University, USA—www2.semo.edu/ces

Center for Hazards and Risk Research, Columbia University, USA—www.ldeo.columbia.edu/CHRR/

Center for Hazards Research, University of California, Chico, USA—www.csuchico.edu/geop/chr

Center for Public Health and Disasters, USA—www.ph.ucla.edu/cphdr/

Center for Technology, Environment, and Development (CENTED), Clark University, USA—www.clarku.edu/departments/marsh

Center of Excellence in Disaster Management and Humanitarian Assistance, USA—http://coe-dmha.org/

Central United States Earthquake Consortium (CUSEC), USA—www.cusec.org

Centre for Disaster Management, India—www.yashada.org/centre/cdm.htm

Centre for Disaster Studies, James Cook University, Australia—www.tesag.jcu.edu.au/cds/cdsweb.htm

Centre for Environmental Strategy, UK—www.surrey.ac.uk/CES/

Centre for Research on Epidemiology of Disasters, Belgium—www.cred.be/

Climatic Research Unit, UK—www.cru.uea.ac.uk.

Consortium of Universities for Research in Earthquake Engineering (CUREE), USA—www.curee.org

Cooperative Institute for Research in Environmental Sciences (CIRES), University of Colorado, Boulder, USA—http://cires.colorado.edu/

Cooperative Institute for Research in the Atmosphere (CIRA), Colorado State University, USA—www.cira.colostate.edu

Disaster Management Center (DMC), University of Wisconsin, USA—http://dmc.engr.wisc.edu

Disaster Management Information Project, Zimbabwe—www.sardc.net/Imercsa/Environment.htm

Disaster Mental Health Institute, University of South Dakota, USA—www.usd.edu/dmhi/

Disaster Mitigation for Sustainable Livelihoods Programme (DiMP), South Africa—www.egs.uct.ac.za/dimp

Disaster Mitigation Institute, India—www.southasiadisasters.net

Disaster Preparedness & Emergency Response Association (DERA), USA—www.disasters.org

Disaster Preparedness Resource Centre, Canada—www.chs.ubc.ca/

Disaster Prevention Research Institute (DPRI), Japan—www.dpri.kyoto-u.ac.jp

Disaster Recovery Information Exchange (DRIE), Canada—www.drie.org

Disaster Recovery Institute International (DRII), USA—www.drii.org

Disaster Research Center (DRC), University of Delaware, USA—www.udel.edu/DRC/

Disaster Research Unit, Germany—www.kfs.uni-kiel.de/impr.html

Earthquake Disaster Mitigation Research Center, Japan—www.edm.bosai.go.jp/english.htm

Earthquake Education Center, Charleston Southern University, USA—www.csuniv.edu/Academics/Quake/index.htm

Earthquake Engineering Research Institute (EERI), USA—www.eeri.org

Earthquake Hazard Centre, New Zealand—www.ehc.arch.vuw.ac.nz

Emergencies Research Center, Greece—www.erc.gr

Emergency Administration and Planning, University of North Texas, USA—www.unt.edu/eadp/info.html

Emergency Health Services Department, University of Maryland Baltimore County, USA—http://ehs.umbc.edu/

Emergency Management Australia Institute (EMAI), Australia—www.ema.gov.au

Environmental Change Institute, UK—www.eci.ox.ac.uk

Environmental Social Science Research Institute, University of New Orleans, USA—www.uno.edu/%7Eesscri

European Centre for Disaster Medicine, Italy—www.omniway.sm/cemec/

Flood Hazard Research Centre (FHRC), UK—www.fhrc.mdx.ac.uk/

Global Earthquake Safety Initiative, USA—www.geohaz.org/project/gesi/GesiIntro.htm

Global Fire Monitoring Center (GFMC), Germany—www.uni-freiburg.de/fireglobe

Global Volcanism Program, USA—www.volcano.si.edu

Hazards Reduction & Recovery Center, Texas A&M University, USA—http://archone.tamu.edu/hrrc

Hazards Research Laboratory (HRL), University of South Carolina, USA—www.cla.sc.edu/GEOG/hrl/

Humanitarian Practice Network, UK—www.odihpn.org.

Hydrologic Research Center (HRC), USA—www.hrc.lab.org

Incorporated Research Institutions for Seismology (IRIS), USA—www.iris.edu

Institute for Business and Home Safety (IBHS), USA—www.ibhs.org

Institute for Catastrophic Loss Reduction, Canada—www.iclr.org

Institute for Crisis, Disaster, and Risk Management (ICDRM), George Washington University, USA—www.gwu.edu/~icdrm/

International Center for Urban Safety Engineering/International Center for Disaster Mitigation Engineering (ICUS/INCEDE), Japan—www.iis.u-tokyo.ac.jp/english/index.html

International Hurricane Center (IHC), Florida International University, USA—www.ihc.fiu.edu/

International Institute for Disaster Risk Management, Philippines—www.idrmhome.org

International Institute of Earthquake Engineering and Seismology (IIEES), Iran—www.iiees.ac.ir

International Society for the Prevention and Mitigation of Natural Hazards, UK—www.es.mq.edu.au/NHRC/NHS

International Tsunami Information Center (ITIC), USA—www.prh.noaa.gov/itic/.

John A. Blume Earthquake Engineering Center, Stanford University, USA—http://blume.stanford.edu

Louisiana State Hurricane Center, USA—www.hurricane.lsu.edu/

Mid-America Earthquake Center (MAE), USA—http://mae.ce.uiuc.edu

Multidisciplinary Center for Earthquake Engineering Research (MCEER), University at Buffalo, USA—http://mceer.buffalo.edu

National Center for Atmospheric Research (NCAR), Environmental and Societal Impacts Group (ESIG), USA—www.isse.ucar.edu

National Drought Mitigation Center, University of Nebraska, USA—http://drought.unl.edu

National Institute for Urban Search and Rescue (NI/USR), USA—www.niusr.org

National Institute of Building Sciences (NIBS), USA—www.nibs.org

National Lightning Safety Institute (NLSI), USA—www.lightningsafety.com

National Research Institute for Earth Science and Disaster Prevention (NIED), Japan—www.bosai.go.jp/index_e.html

Natural Hazards Research and Applications Information Center (NHRAIC), University of Colorado, Boulder, USA—www.colorado.edu/hazards

Natural Hazards Research Centre, Australia—www.es.mq.edu.au/NHRC

Natural Hazards Research Centre, New Zealand—www.nhrc.canterbury.ac.nz/

Oregon Natural Hazards Workshop, University of Oregon, USA—http://darkwing.uoregon.edu/~onhw

Overseas Development Institute (ODI), Humanitarian Policy Group, UK—www.odi.org.uk/hpg/index.html

Pacific Disaster Center (PDC), USA—www.pdc.org

Pacific Earthquake Engineering Research (PEER) Center and National Information Service for Earthquake Engineering (NISSE), University of California, USA—http://peer.berkeley.edu/

Pacific Marine Environmental Laboratory (PMEL), USA—www.pmel.noaa.gov/

Program for the Study of Developed Shorelines, Duke University, USA—www.nicholas.duke.edu/psds

ProVention Consortium, Switzerland—www.proventionconsortium.org/

Public Entity Risk Institute (PERI), USA—www.riskinstitute.org

Regional Disaster Information Center for Latin America and the Caribbean (CRID), Costa Rica—www.crid.or.cr

Research Center for Disaster Management, Guatemala—www.uvg.edu.gt

Society for Risk Analysis (SRA), USA—www.sra.org/

Southern California Earthquake Center (SCEC), USA—www.sced.org/

The James and Marilyn Lovell Center for Environmental Geography and Hazards Research, Texas State University, USA—www.geo.txstate.edu/lovell

The Tornado Project, USA—www.tornadoproject.com/

Tsunami Society, USA—www.tsunami.org

University of Geneva, Section of Geosciences and Environment, Switzerland—www.unige.ch/hazards

Urban and Regional Information Systems Association (URISA), USA—www.urisa.org

World Association for Disaster and Emergency Medicine (WADEM), USA—http://wadem.medicine.wisc.edu/

World Institute for Disaster Risk Management, USA—www.drmonline.net

World Seismic Safety Initiative (WSSI), Singapore—www.wssi.org/

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10

Participants: Multilateral Organizations and International Financial Institutions

INTRODUCTION

A multilateral organization is an organization composed of the central governments of sovereign nations. Member states come together under a charter of rules and responsibilities they have drawn up and agreed upon. Multilateral organizations may be regionally based (e.g., the European Union [EU]), organized around a common issue or function (e.g., the North Atlantic Treaty Organization [NATO] or the Organization of the Petroleum Exporting Countries [OPEC]), or globally based (e.g., the United Nations [UN]). Like sovereign states, they are recognized as having an established legal status under international law. The United Nations is the most well known and largest of all of the multilateral organizations because its membership is drawn from almost every nation, and because it covers a wide range of issues.

The first international organization to address the topic of disaster management was the International Relief Union (IRU), which was founded in Italy in 1921 and later integrated into the League of Nations, which then became the United Nations. Since that time, a number of international organizations have addressed disaster management as a part of their general operation.

International financial institutions (IFIs) are international banks composed of sovereign member states. They use public money from the member states to provide technical and financial support for developing countries. IFIs were first developed to help restore peace in the wake of conflict, but their mission and purpose has expanded greatly. Today, IFIs seek to provide development and emergency assistance to stabilize local and world economies. As part of this mission, IFIs have become heavily involved in the reconstruction of nations affected by large-scale disasters and in funding mitigation and preparedness measures that prevent recurrent disasters.

This chapter will discuss the various forms of multilateral organizations involved in international disaster management. The United Nations and its individual offices, agencies, and organizations working in mitigation, preparedness, response, or recovery will be described, followed by a description of other multilateral organizations, including NATO, the European Union, the Organization of American States, and the Southern African Development Community, among others. Finally, the international financial institutions that fund much of the world's development, as well as recovery from disasters of all kinds, will be addressed. Although this chapter will touch upon some

issues required in managing complex humanitarian emergencies, it will not address the peacekeeping and peacemaking operations of the United Nations or any other international organization.

THE UNITED NATIONS

BACKGROUND

The United Nations was established in 1945, when representatives from 51 countries converged in San Francisco to establish the UN Charter as a commitment to preserve peace in the aftermath of World War II. Later that year, the Charter was ratified by the five permanent members, China, France, the Soviet Union, the United Kingdom, and the United States, as well as several other countries. Today, 191 countries are members of the UN, and the Charter (which is similar to a sovereign state's constitution and establishes the rights and responsibilities of member states) continues to be amended to reflect the changing needs of world politics.

The UN itself is not a government body, nor does it write laws; however, member states can use the UN to resolve conflict and create international policy. While the UN cannot force a sovereign country to comply with its decisions or actions, the organization's global stature and collaborative nature give weight to its resolutions.

The UN has six main organs. Five of these—the General Assembly, the Security Council, the Economic and Social Council, the Trusteeship Council, and the Secretariat—are based in New York City at the UN Headquarters. The sixth, the International Court of Justice, is located at The Hague in the Netherlands. The UN also maintains operational and program offices throughout the world (see Figure 10-1). Through these major bodies and their associated programs, the UN has established a presence in most countries and has fostered partnerships with member state governments.

The General Assembly

All of the UN member states are represented in the General Assembly, which is considered a "parliament of nations" that meets to address issues of global significance. Each member state is given a single vote, with key issues decided by two-thirds majority (less significant matters are decided by simple majority). As mentioned above, the General Assembly cannot force its decisions on a sovereign state, though they generally receive wide support. The Assembly holds regular sessions from September to December, though special/emergency sessions may be called at any time. When not in session, the Assembly's work is carried out by its six main committees, other subsidiary bodies and the Secretariat.

The Security Council

The UN Security Council has primary responsibility for maintaining international peace and security in accordance with the UN Charter. This council, which convenes at will, consists of 15 members, five of which (China, France, the Russian Federation, the United Kingdom, and the United States) are permanent members. All UN member states are obligated to carry out the Council's decisions. Decisions require nine affirmative votes, including all five votes of the permanent members. When the Council considers threats to international peace, it first explores peaceful settlement options. If fighting is underway, the Council will attempt to secure a ceasefire, and it may send a peacekeeping mission to help the parties maintain the truce and keep opposing forces apart. The Council can take measures to enforce its decisions, such as imposing economic sanctions or arms embargoes. On rare occasions, the Council has authorized member states to use "all necessary means," including collective military action, to see that its decisions are carried out—referred to as "peacemaking operations".

The Economic and Social Council

The Economic and Social Council is the central mechanism by which international economic and social issues are addressed and by which policy recommendations are created. It also consults with NGOs to create and maintain working partnerships between

The United Nations System

PRINCIPAL ORGANS

| Trusteeship Council | Security Council | General Assembly | Economic and Social Council | International Court of Justice | Secretariat |

Subsidiary Bodies
Military Staff Committee
Standing Committee and ad hoc bodies
International Criminal Tribunal for the Former Yugoslavia
International Criminal Tribunal for Rwanda
UN Monitoring, Verification and Inspection Commission (Iraq)
United Nations Compensation Commission
Peacekeeping Operations and Missions

Subsidiary Bodies
Main committees
Other sessional committees
Standing committees and ad hoc bodies
Other subsidiary organs

Functional Commissions
Commissions on:
  Human Rights
  Narcotic Drugs
  Crime Prevention and Criminal Justice
  Science and Technology for Development
  Sustainable Development
  Status of Women
  Population and Development
Commission for Social Development
Statistical Commission

Regional Commissions
Economic Commission for Africa (ECA)
Economic Commission for Europe (ECE)
Economic Commission for Latin America and the Caribbean (ECLAC)
Economic and Social Commission for Asia and the Pacific (ESCAP)
Economic and Social Commission for Western Asia (ESCWA)

Other Bodies
Permanent Forum on Indigenous Issues (PFII)
United Nations Forum on Forests
Sessional and standing committees
Expert, ad hoc and related bodies

Specialized Agencies[6]

ILO International Labour Organization
FAO Food and Agriculture Organization of the United Nations
UNESCO United Nations Educational, Scientific and Cultural Organization
WHO World Health Organization

WORLD BANK GROUP
  IBRD International Bank for Reconstruction and Development
  IDA International Development Association
  IFC International Finance Corporation
  MIGA Multilateral Investment Guarantee Agency
  ICSID International Centre for Settlement of Investment Disputes

IMF International Monetary Fund
ICAO International Civil Aviation Organization
IMO International Maritime Organization
ITU International Telecommunication Union
UPU Universal Postal Union
WMO World Meterological Organization
WIPO World Intellectual Property Organization
IFAD International Fund for Agricultural Development
UNIDO United Nations Industrial Development Organization
WTO[3] World Tourism Organization

Departments and Offices
OSG Office of the Secretary-General
OIOS Office of Internal Oversight Services
OLA Office of Legal Affairs
DPA Department of Political Affairs
DDA Department for Disarmament Affairs
DPKO Department of Peace-keeping Operations
OCHA Office for the Coordination of Humanitarian Affairs
DESA Department of Economic and Social Affairs
DGACM Department for General Assembly and Conference Management
DPI Department of Public Information
DM Department of Management
OHRLLS Office of the High Representative for the Least Developed Countries, Landlocked Developing Countries and Small Island Developing States
UNSECOORD Office of the United Nations Security Coordinator
UNODC United Nations Office on Drugs and Crime

UNOG UN Office at Geneva
UNOV UN Office at Vienna
UNON UN Office at Nairobi

Programmes and Funds

UNCTAD United Nations Conference on Trade and Development
  ITC International Trade Centre (UNCTAD/WTO)
UNDCP United Nations Drug Control Programme[1]
UNEP United Nations Environment Programme
UNICEF United Nations Children's Fund

UNDP United Nations Development Programme
  UNIFEM United Nations Development Fund for Women
  UNV United Nations Volunteers
  UNCDF United Nations Capital Development Fund
UNFPA United Nations Population Fund

UNHCR Office of the United Nations High Commissioner for Refugees
WFP World Food Programme
UNRWA[2] United Nations Relief and Works Agency for Palestine Refugees in the Near East
UN–HABITAT United Nations Human Settlements Programme (UNHSP)

Research and Training Institutes

UNICRI United Nations Interregional Crime and Justice Research Institute
UNITAR United Nations Institute for Training and Research

UNRISD United Nations Research Institute for Social Development
UNIDIR[2] United Nations Institute for Disarmament Research

INSTRAW International Research and Training Institute for the Advancement of Women

Other UN Entities

OHCHR Office of the United Nations High Commissioner for Human Rights
UNOPS United Nations Office for Project Services
UNU United Nations University
UNSSC United Nations System Staff College
UNAIDS Joint United Nations Programme on HIV/AIDS

Related Organizations
WTO[3] World Trade Organization
IAEA[4] International Atomic Energy Agency
CTBTO PREP.COM[5] PrepCom for the Nuclear-Test-Ban-Treaty Organization
OPCW[5] Organization for the Prohibition of Chemical Weapons

NOTES: Solid lines from a Principal Organ indicate a direct reporting relationship; dashes indicate a non-subsidiary relationship. [1]The UN Drug Control Programme is part of the UN Office on Drugs and Crime. [2]UNRWA and UNIDIR report only to the GA. [3]The World Trade Organization and World Tourism Organization use the same acronym. [4]IAEA reports to the Security Council and the General Assembly (GA). [5]The CTBTO Prep.Com and OPCW report to the GA. [6]Specialized agencies are autonomous organizations working with the UN and each other through the coordinating machinery of the ECOSOC at the intergovernmental level, and through the Chief Executives Board for coordination (CEB) at the inter-secretariat level.

FIGURE 10-1 UN organizational chart. (*Source:* UN, 2004.)

the UN and civil society. The Council has 54 members, elected by the General Assembly for three-year terms. It meets throughout the year, but its main session held in July, during which major economic, social, and humanitarian issues are discussed. The Council has several subsidiary bodies that regularly meet to address issues such as human rights, social development, the status of women, crime prevention, narcotic drugs, and environmental protection.

The Trusteeship Council

The Trusteeship Council originally provided international supervision for 11 trust territories administered by seven member states and ensured that adequate steps were taken to prepare the territories for self-government or independence. By 1994, all trust territories had attained self-government or independence. Its work completed, the Trusteeship Council now consists of the five permanent members of the Security Council. It has amended its rules of procedure to allow it to meet as and when the occasion may require.

The International Court of Justice

The International Court of Justice, also known as the World Court, is the UN's main judicial organ. The World Court consists of 15 judges elected jointly by the General Assembly and the Security Council. It serves to settle disputes between countries. Participation is voluntary, but when a state agrees to participate, it must comply with the Court's decision. The Court also provides advisory opinions to the General Assembly and the Security Council upon request.

The Secretariat

The Secretariat carries out the day-to-day work of the UN as directed by the General Assembly, the Security Council, and the other organs. At its head is the Secretary General, who provides overall administrative guidance. The Secretariat is made up of various departments and offices, and maintains a total staff of about 15,000 people throughout the world. Duty stations include the UN Headquarters in New York, offices in Geneva, Vienna, Nairobi, and other locations.

The Secretariat's functions are diverse, ranging from "administering peacekeeping operations to mediating international disputes, from surveying economic and social trends and problems to preparing studies on human rights and sustainable development (United Nations, 2004)" Secretariat staff also work to publicize the UN's work through the world media and to organize conferences on issues of global concern. Secretariat staff are considered international civil servants and answer only to the UN for their activities.

The UN System

The system known as the UN includes many integrated and related offices and agencies that work around the world. There are 14 independent organizations known as "specialized agencies" linked to the UN through cooperative agreements. These agencies are autonomous bodies created by intergovernmental agreement. They maintain broad international responsibilities in economic, social, cultural, educational, health, and related fields. Additionally, a number of UN offices, programs, and funds work to improve the economic and social condition of people around the world. These agencies report directly to the General Assembly or to the Economic and Social Council (see Figure 10-1). Each organization has its own governing body, budget, and secretariat. Together with the UN bodies listed above, they are known as the UN family or the UN system.

UN ROLE IN DISASTER MANAGEMENT

The UN is the organization most involved in the mitigation, preparedness, response, and recovery of disasters around the world. It is considered the best equipped to do so because of its strong relationships with most countries, especially developing countries, where such assistance is most needed. Through its many offices, agencies, and programs, it helps nations to reduce hazard vulnerability by increasing the capacity of their institutions and their citizens. The UN is one of the first organizations to mobilize when disasters strike, and it remains in the affected countries during the recovery period for many years.

When a disaster occurs, the UN responds immediately and on an ongoing basis with relief aid such as food, water, shelter, medical assistance, and logistical support. The UN Office of the Coordination of Humanitarian Affairs (UNOCHA) Emergency Relief Coordinator heads UN response to emergency situations. The coordinator works with a committee of several UN humanitarian agencies, including the UN Children's Fund (UNICEF), the UN Development Programme, the World Food Programme, the UN High Commissioner for Refugees, and other associates as needed, depending on the problems specific to the event.

The UN promotes prevention and mitigation activities through development projects. Long before disasters strike, the UN works with governments, organizations, and citizens to address disaster risk reduction measures by ensuring that appropriate measures are included in development activities. The UN has helped to map risk throughout the world and has assisted national governments to create the institutional frameworks to reduce or respond to those risks. By encouraging the building of early warning systems and monitoring and forecasting routines, the UN is boosting local and regional preparedness capacity. At the end of the International Decade for Natural Disaster Reduction (which strove to shift from disaster response–oriented projects to disaster mitigation), the UN adopted its International Strategy for Disaster Reduction to promote disaster reduction and risk mitigation as part of its central mission. This initiative seeks to promote global resilience to the effects of natural hazards and reduce human, economic, and social losses by:

- Increasing public awareness
- Obtaining commitment from public authorities
- Stimulating interdisciplinary and intersectoral partnership and expanding risk-reduction networking at all levels
- Enhancing scientific research on the causes of natural disasters and the effects of natural hazards and related technological and environmental disasters on societies

These strategies are carried out through UN Country Offices and local governments in the most vulnerable communities. Mitigation and preparedness strategies are implemented at all levels of society via public awareness campaigns, commitment from public authorities, cooperation and communication between various government and nongovernmental sectors, and technical knowledge transfer.

Because the UN is such a complex organization, it can be difficult to illustrate the myriad ways in which it addresses disaster management other than to describe the role of each organization and agency in this area.

The General Assembly

The UN General Assembly does not partake in any operational disaster management activities. However, as the main deliberative organ of the UN, it is responsible for launching many influential and effective disaster management programs that are carried out by the various UN offices and by the UN member state governments themselves. Examples include the endorsement of the UNDP Disaster Management Training Programme (DMTP) and the launching of the International Decade for Natural Disaster Reduction and its subsequent International Strategy for Disaster Reduction. The General Assembly is also responsible for organizing and reorganizing the UN system to maximize its disaster management capabilities, as in 1997 under the UN Program for Reform (1997), which created the Office for the Coordination of Humanitarian Affairs (see below).

The Secretariat

Within the UN Secretariat are several departments and offices that address pre- and postdisaster management activities. These include the Office for the Coordination of Humanitarian Affairs, the Inter-Agency Task Force for Disaster Reduction (IATF/DR), and the Department of Economic and Social Affairs (DESA).

The UN Office for the Coordination of Humanitarian Affairs (OCHA)

"OCHA's mandate is to ensure that the relief provided is effective, not to provide effective relief."

—UNDAC, 2000

UN Resolution 46/182, adopted in December 1991 by the UN General Assembly, was passed to bolster

the UN's ability to respond to disasters of all types (including complex humanitarian emergencies) and sought to improve how the UN addresses humanitarian operations at the field level. Before 1991, the UN Disaster Relief Coordinator managed natural disasters, and special representatives of the UN Secretary General coordinated CHEs. This resolution merged these two roles to create the Emergency Relief Coordinator (ERC).

The Department of Humanitarian Affairs was created soon after, with the ERC elevated to the status of Under Secretary General for Humanitarian Affairs. The Inter-Agency Standing Committee, the Consoli-

dated Appeals Process, and the Central Emergency Response Fund also were created to increase the humanitarian assistance abilities of the ERC.

The UN Office for the Coordination of Humanitarian Affairs (OCHA) replaced the Department of Humanitarian Affairs under the UN Secretary General's Program for Reform in 1998. It was established to accommodate the needs of victims of disasters and emergencies. Its specific role in disaster management is to coordinate assistance provided by the UN system in emergencies that exceed the capacity and mandate of any individual agency. OCHA response to disasters can be categorized under three main groupings:
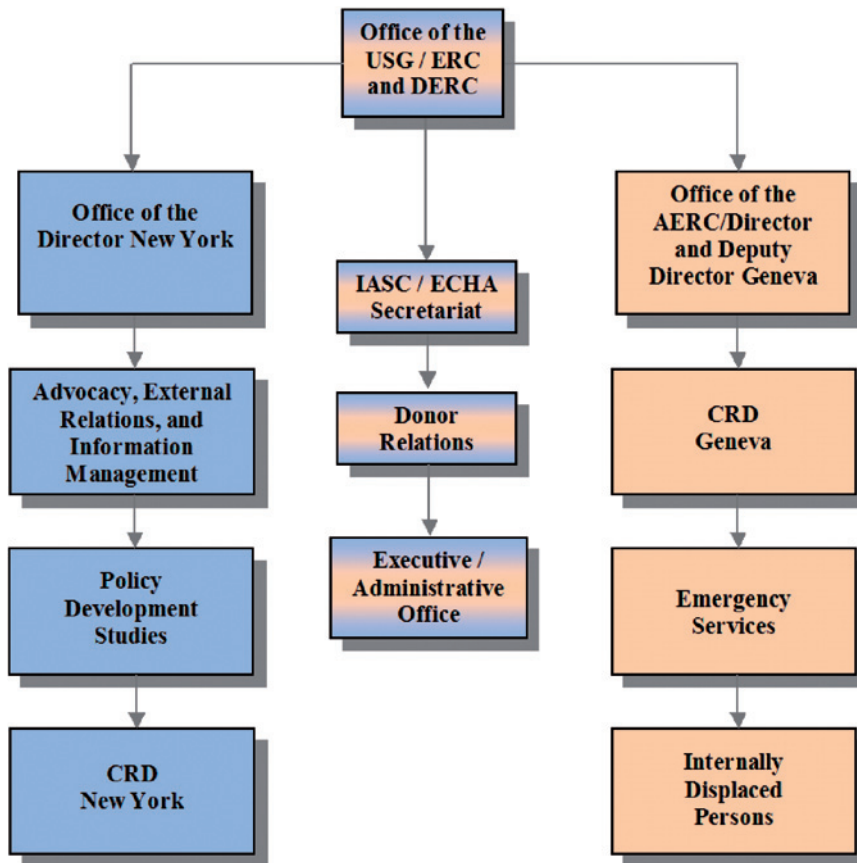
FIGURE 10-2 OCHA organizational chart. (*Source:* OCHA, 2005.)

- Coordinating the international humanitarian response
- Providing support and policy development to the humanitarian community
- Advocating for humanitarian issues to ensure that the overall direction of relief reflects the general needs of recovery and peace building

OCHA operations are carried out by a staff of approximately 860 people in New York, Geneva, and in the field (see Figure 10-2). OCHA's 2005 budget was $110,551,973, of which only slightly more than 10% was from the regular UN budget. The remaining 90% is from "extra-budgetary resources," which is primarily donations from member states and donor organizations.

As head of OCHA, the Under Secretary General for Humanitarian Affairs/UN Emergency Relief Coordinator is responsible for the coordination of UN response efforts through the Inter-Agency Standing Committee (IASC). The IASC consists of UN and outside humanitarian organization leaders, and analyzes crisis scenarios to formulate joint responses that maximize effectiveness and minimize overlap. The ERC works to deploy appropriate personnel from throughout the UN to assist UN resident coordinators and lead agencies to increase on-site coordination. In September 2003, the Secretary General appointed Jan Egeland of Norway to replace Kenzo Oshima of Japan as Under Secretary General for Humanitarian Affairs/UN Emergency Relief Coordinator.

OCHA's Disaster Response System monitors the onset of natural and technological disasters. This system includes training assessment teams before disasters strike, as well as conducting postdisaster evaluations. When a disaster is identified, OCHA activates a response and generates a situation report to provide the international response community with detailed information (including damage assessment, actions taken, needs assessment, and current assistance provided). If necessary, OCHA may then deploy a UN Disaster Assessment and Coordination (UNDAC) team to assist relief activity coordination and assess damages and needs.

If a disaster appears inevitable or is already significant, the ERC in consultation with IASC may designate a humanitarian coordinator (HC), who becomes the most senior UN humanitarian official on the ground for the emergency. The HC is directly accountable to the ERC, thereby increasing the likelihood that the humanitarian assistance provided is quick, effective and well coordinated. The HC appointment generally signals that the event merits a long-term humanitarian presence. The criteria used by the ERC in deciding whether to appoint an HC is based upon recognition of a need for:

- Intensive and extensive political management, mediation, and coordination to enable the delivery of humanitarian response, including negotiated access to affected populations
- Massive humanitarian assistance requiring action by a range of participants beyond a single national authority
- A high degree of external political support, often from the UN Security Council

An On-Site Operations Coordination Center (OSOCC) may be set up in the field to assist local first-response teams to coordinate the often overwhelming number of responding agencies. Finally, OCHA can set up communications capabilities if they have been damaged or do not exist at an adequate level, as required by the UN responding agencies. OCHA generally concludes its responsibilities when the operation moves from response to recovery.

Overall, OCHA coordinates humanitarian affairs to maximize response and recovery operations and minimize duplications and inefficiencies through established structures and policies set forth by the IASC (adapted from OCHA, 2005):

- *Developing common strategies*. OCHA recognizes that humanitarian assistance is most effective when the actors involved define common priorities, share goals, agree on tactics, and jointly monitor progress. OCHA works with both internal and external partners to develop a common humanitarian action plan and to establish clear divisions of responsibility.

- *Assessing situations and needs*. Throughout a crisis, OCHA is responsible for identifying overall humanitarian needs, developing a realistic plan of action for meeting these needs (avoiding duplication), and monitoring progress. It must adjust its response if necessary and analyze any resulting changes. Ongoing analysis of political, social, economic, and military environments and assessing humanitarian needs help response and recovery agencies to better understand disasters' causes and impacts.
- *Convening coordination forums*. In its role as coordinator, OCHA holds a wide range of meetings to bring together the various disaster management players for planning and information exchange. These meetings help the participants to more accurately analyze the overall status of humanitarian relief efforts as well as network and share lessons learned/best practices.
- *Mobilizing resources*. Through the Consolidated Appeals Process, OCHA is able to raise humanitarian assistance funds cost-effectively. Allocation of funds has been found to be more efficient within this centralized system.
- *Addressing common problems*. Because every crisis is unique, both new and old problems are bound to arise. These issues may affect several agencies and NGOs but might also exist outside of any particular agency's mandate. As coordinator, OCHA analyzes and addresses problems common to humanitarian actors, such as negotiating with warring parties to gain access to civilians in need or working with UN security officials to support preparedness and response measures in changing security situations.
- *Administering coordination mechanisms and tools*. OCHA, and the UN in general, have several tools with which they can better address the humanitarian needs of disaster victims. These include the IASC; rapid-response tools, such as the UN Disaster Assessment and Coordination Teams and the International Search and Rescue Advisory Group; and smaller forums such as the Geographic Information Support Team. OCHA also assists with civil–military cooperation, ensuring a more efficient use of military and civil defense assets in humanitarian operations.

The Field Coordination Support Unit in Geneva manages the human, technical, and logistical resources OCHA uses. These resources are primarily provided by the Danish and Norwegian Refugee Councils, the Danish Emergency Management Agency, the Swedish Rescue Services Agency, and the Emergency Logistics Management Team of the United Kingdom Overseas Development Administration.

The Emergency Relief Coordinator

The Under Secretary General for Humanitarian Affairs/Emergency Relief Coordinator advises the UN Secretary General on disaster-related issues, chairs the Executive Committee on Humanitarian Affairs (ECHA), and leads the IASC. The coordinator is assisted by a deputy, who holds the position of Deputy Emergency Relief Coordinator (DERC) and is responsible for key coordination, policy, and management issues.

The Inter-Agency Standing Committee (IASC)

The IASC was established in 1992 under UN Resolution 46/182. It serves as a platform within which the broad range of UN and non-UN humanitarian partners (including UN humanitarian agencies, the International Organization for Migration, three consortia of major international NGOs, and the Red Cross movement) may come together to address the humanitarian needs resulting from a disaster. The IASC's primary role is to formulate humanitarian policy that ensures a coordinated and effective response to all kinds of disaster and emergency situations. The primary objectives of the IASC are to (OCHA, 2005):

- Develop and agree on systemwide humanitarian policies
- Allocate responsibilities among agencies in humanitarian programs
- Develop and agree on a common ethical framework for all humanitarian activities

- Advocate common humanitarian principles to parties outside the IASC
- Identify areas where gaps in mandates or lack of operational capacity exist
- Resolve disputes or disagreement about and between humanitarian agencies on systemwide humanitarian issues

IASC members (both full members and standing invitees) include:

- Food and Agriculture Organization
- InterAction
- International Committee of the Red Cross
- International Council of Voluntary Agencies
- International Federation of Red Cross and Red Crescent Societies
- International Organization for Migration
- Office for the Coordination of Humanitarian Affairs
- Office of the High Commissioner for Human Rights
- Office of the Special Representative of the Secretary General on Internally Displaced Persons
- Steering Committee for Humanitarian Response
- The World Bank
- United Nations Children's Fund
- United Nations Development Fund
- United Nations High Commissioner for Refugees
- United Nations Population Fund
- World Food Programme
- World Health Organisation

The Executive Committee on Humanitarian Affairs (ECHA)

ECHA was created by the UN Secretary General to enhance coordination among UN agencies working on humanitarian affairs issues. ECHA meets on a monthly basis in New York to add a political and peacekeeping dimension to humanitarian consultations. Its members include:

- United Nations Development Program
- United Nations Children's Fund
- United Nations High Commission for Refugees
- World Food Programme

- Office of the High Commissioner for Human Rights
- Department of Peace-keeping Operations
- Department of Political Affairs
- United Nations Relief and Works Agency for Palestine Refugees in the Near East
- Office of the Special Representative of the Secretary General for Children and Armed Conflicts
- World Health Organization
- Food and Agriculture Organization

The OCHA Donor Relations Section

The OCHA Donor Relations Section (DRS), separated from the Consolidated Appeals Process in 2003, is the focal point for all relations with donors, particularly for funding-related issues. DRS advises the senior management team on policy issues related to interaction with donors and resource mobilization. In addition, it plays a key role in facilitating the interaction of all OCHA entities with donors, both at headquarters and in the field level.

The Coordination and Response Division

The Coordination and Response Division (CRD) was created in 2004 by joining the former New York–based Humanitarian Emergency Branch and the Geneva-based Response Coordination Branch. CRD is responsible for providing disaster-related direction, guidance, and support to the ERC, the UN Resident/Humanitarian Coordinators, and OCHA's field offices (including the deployment of extra personnel as necessary or emergency cash grants).

The OCHA Emergency Services Branch (ESB)

Based in Geneva, the ESB was created to expedite the provision of international humanitarian assistance. ESB develops, mobilizes, and coordinates the deployment of OCHA's international rapid response "toolkit"—the expertise, systems, and services that aim to improve humanitarian assistance in support of disaster-afflicted countries. ESB's humanitarian response activities include the coordination of disaster response and assessment (UNDAC—see below), the

setting of international urban search and rescue standards (INSARAG—see below), and the establishment of OSOCCs. ESB supports OCHA field offices through the following:

- Surge capacity and standby partnerships
- Military and civil liaison and mobilization of military and civil defense assets
- Dispatch of relief supplies and specialized assistance in environmental emergencies
- Dissemination of disaster-related information by means of Reliefweb, the Central Register of Disaster Management Capacities, and the Virtual On-Site Operations Coordination Centre

Within the ESB are three separate sections, established to manage particular aspects of disaster response:

1. Field Coordination Support Section
2. Military and Civil Defense and Logistics Support Section
3. Environmental Emergencies Section

The Field Coordination Support Section (FCSS) was established within ESB in 1996 to support national governments and the UN Resident Coordinators in developing, preparing, and maintaining "standby capacity" for rapid deployment to sudden-onset emergencies to conduct rapid needs assessments and coordination. FCSS manages several programs and offices to improve international disaster coordination and cooperation, including:

- *The United Nations Disaster Assessment and Coordination (UNDAC) Team*. The UNDAC team is made up of disaster management specialists selected and funded by the governments of UN member states, OCHA, UNDP, and operational humanitarian UN agencies (such as WFP, UNICEF, and WHO). It provides rapid needs assessments and supports national authorities and the UN Resident Coordinator in organizing international relief. UNDAC teams are on permanent standby status so that they can deploy within hours.

- *The International Search and Rescue Advisory Group (INSARAG)*. INSARAG is an intergovernmental network within the UN that manages urban search-and-rescue (USAR) and related disaster-response issues. It promotes information exchange, defines international USAR standards, and develops methodologies for international cooperation and coordination in earthquake response.

- *The Virtual On-Site Operations Coordination Centre (Virtual OSOCC)*. The Internet has made it possible for humanitarian relief agencies to share and exchange disaster information continuously and simultaneously, and between any locations where Internet access can be obtained. The Virtual OSOCC is a central repository of information maintained by OCHA that facilitates this exchange of information with NGOs and responding governments. The information is stored on an interactive web-based database, where users can comment on existing information and discuss issues of concern with other stakeholders.

- *The Surge Capacity Project (including the Emergency Response Roster)*. OCHA's Surge Capacity Project seeks to ensure that OCHA always has the means and resources to rapidly mobilize and deploy staff and materials to address the needs of countries affected by sudden-onset emergencies. The Emergency Response Roster (ERR), which became active in June 2002, aims to rapidly deploy OCHA staff to sudden-onset emergencies to conduct assessments and establish initial coordination mechanisms. Staff included in the ERR are deployable within 48 hours of a request for their services through a deployment methodology based on the UNDAC model. Staff serve on the roster for two months at a time.

Established by the IASC in 1995, the **Military and Civil Defense Unit (MCDU)** supports humanitarian agencies by providing military and/or civil defense assets. The MCDU conducts civil-military coordination courses and coordinates UN participation in major humanitarian emergency exercises. MCDU also main-

tains the UN's Central Register, which is a database of noncommercial, governmental, and other resources that may be called on for humanitarian response and includes a full range of equipment and supplies, teams of experts, and disaster response contacts.

The **Logistics Support Unit (LSU)** manages stocks of basic relief items that can be dispatched immediately to disaster- or emergency-stricken areas. The stockpile, which is located at the UN Humanitarian Response Depot in Brindisi, Italy, includes non-food, non-medical relief items (such as shelter, water purification and distribution systems, and household items) donated by UN member governments. The LSU is also involved in other logistical challenges, such as designing contingency plans for the rapid deployment of emergency relief flights and providing interface on logistical matters with other humanitarian agencies (such as WFP, WHO, UNHCR, IFRC, and ICRC). The LSU participates in the operation of a UN Joint Logistics Center (see Exhibit 10-1), and has cosponsored an effort to adopt a UN-wide system for tracking relief supplies and common procedures for air operations. Finally, the LSU contributes information to the CRR related to stockpiles and customs facilitation agreements (which helps speed up the delivery of relief items).

The Environmental Emergencies Section, or the Joint UN Environmental Programme (UNEP)/OCHA Environment Unit, serves as the integrated UN emergency response mechanism that provides international assistance to countries experiencing environmental disasters and emergencies. The joint unit can rapidly mobilize and coordinate emergency assistance and response resources to countries facing environmental emergencies and natural disasters with significant environmental impacts. The unit performs several key functions geared toward facilitating rapid and coordinated disaster response, including:

- *Monitoring*. The unit performs continuous monitoring and ongoing communication with an international network of contacts and permanent monitoring of news services and websites for early notification of environmental occurrences.

- *Notification*. When disasters strike, the unit alerts the international community and issues Information and Situation Reports to a comprehensive list of worldwide contacts.
- *Brokerage*. The unit is able to quickly establish contact between the affected country and donor governments ready and willing to assist and provide needed response resources.
- *Information clearinghouse*. The unit serves as an effective focal point to ensure information on chemicals, maps, and satellite images from donor sources and institutions are channeled to relevant authorities in the affected country.
- *Mobilization of assistance*. The unit mobilizes assistance from the international donor community when requested by affected countries.
- *Assessment*. The unit can dispatch international experts to assess an emergency's impacts and to make impartial and independent recommendations about response, clean-up, remediation, and rehabilitation.
- *Financial assistance*. In certain circumstances, the unit can release OCHA emergency cash grants of up to $50,000 to meet immediate emergency response needs.

OCHA Preparedness and Mitigation Measures

Although OCHA's efforts primarily focus on coordinating humanitarian emergency response, the agency also serves a risk-reduction function. For instance, OCHA representatives work with operational humanitarian agencies to develop common policies aimed at improving how the humanitarian response network prepares for and responds to disasters. It also works to promote preparedness and mitigation efforts in member states to decrease vulnerability. CRD and ESB work closely with the UN Development Programme, other UN programs as necessary, and outside organizations on various projects and activities to increase working relationships with national governments and apply lessons learned from completed disaster responses.

EXHIBIT 10-1   The UN Joint Logistics Center

The UN Joint Logistics Center (UNJLC) is an interagency facility reporting to the Humanitarian Coordinator within a CHE, and overall to the IASC. Its mandate is to coordinate and optimize the logistics capabilities of humanitarian organizations in large-scale emergencies. UNJLC operates under the direction of the World Food Programme (WFP), which is responsible for the administrative and financial management of the Centre. UNJLC is funded from voluntary contributions channeled through WFP.

The need to establish the UNJLC was realized during the humanitarian response to the 1996 Eastern Zaire crisis, which demanded intensified coordination and pooling of logistics assets among UNHCR, WFP, and UNICEF. This interagency logistics coordination model was applied on subsequent UNJLC interventions in Somalia, Kosovo, East Timor, Mozambique, India, and Afghanistan. In March 2002, the Inter-Agency Standing Committee Working Group institutionalized the UNJLC concept as a UN humanitarian response mechanism. The UNJLC core unit was established in Rome.

In a major disaster with substantial humanitarian multisector involvement during the immediate relief phase, the UN agencies involved may decide that establishing a Joint Logistics Centre would contribute to the rapid response, better coordination, and improved efficiency of humanitarian operations. A standby capacity will be developed for facilitating, if required, the UNJLC's timely activation and deployment in the field. The UNJLC will support the UN agencies and possibly other humanitarian organizations that operate in the same crisis area. The capacity includes the option to establish satellite Joint Logistics Centers (JLC) at critical locations in the affected area to offer logistics support on a reduced scale.

Upon UNJLC activation, agencies will establish a Deployment Requirements Assessment (DRA)

Team to carry out a quick evaluation of the logistics situation and determine the requirements to deploy the UNJLC in the crisis area. This DRA Team will work closely with the humanitarian authorities and, if deployed, with the UNDAC Team. It will take all necessary measures for installing the UNJLC and draft Ad Hoc Terms of Reference for endorsement by the relevant humanitarian authorities. In case of peacekeeping operations or in a complex environment, the UNJLC activation will be coordinated with the Department of Peacekeeping Operations or the relevant military entities.

UNJLC Role and Scope of Activities

- The role of the UNJLC will be to optimize and complement the logistics capabilities of cooperating agencies within a well-defined crisis area for the benefit of the ongoing humanitarian operation.
- The UNJLC will provide logistics support at operational planning, coordination, and monitoring levels. Unless specified otherwise, the UN agencies and other humanitarian bodies established in the area will continue to exercise their normal responsibilities. As a result, the UNJLC will not be involved in policy and establishment of humanitarian needs and priorities.
- Responsibilities will be defined as per the requirements on a case-by-case basis but will, in principle, be limited to logistic activities between the points of entry and distribution in the crisis area. Detailed responsibilities would be:
  - Collecting, analyzing, and disseminating logistics information relevant to the ongoing humanitarian operation
  - Scheduling the movement of humanitarian cargo and relief workers within the crisis

area, using commonly available transport assets

- Managing the import, receipt, dispatch, and tracking of non-assigned food and non-food relief commodities
- Upon specific request, making detailed assessments of roads, bridges, airports, ports, and other logistics infrastructure and recommending actions for repair and reconstruction
- The scope of the UNJLC activities may vary with the type of emergency, the scale of involvement of the cooperating partners, and the humanitarian needs. In general terms, the UNJLC would:
  - Serve as an information platform for supporting humanitarian logistics operations
  - Upon specific request, coordinate the use of available warehouse capacity
  - Coordinate the influx of strategic humanitarian airlift into the crisis area

- Serve as an information platform for recommending the most efficient modes of transportation
- Identify logistical bottlenecks and propose satisfactory solutions or alternatives
- Serve as the focal point for coordinating facilitation measures with local authorities for importing, transporting, and distributing relief commodities into the country
- Provide reliable information regarding the logistics capacity in meeting the prioritization of targets
- Be the focal point to coordinate humanitarian logistics operations with the local emergency management authorities or, in a peacekeeping or complex environment, with the Department of Peace Keeping Operations or the relevant military entities

Source: UNJLC, 2005.

OCHA's Geneva offices are continually monitoring geologic and meteorological conditions, as well as major news services, for early recognition or notification of emerging disasters. Working with UN resident coordinators, country teams and regional disaster response advisers, OCHA maintains close contact with disaster-prone countries in advance of and during disaster events. OCHA's Regional Disaster Response Advisers work with national governments to provide technical, strategic, and training assistance. They also provide this assistance to other UN agencies and regional organizations to improve international disaster management capacity.

OCHA Information Tools and Services

Clearly, information is key to disaster management, and information must be timely and accurate to be useful. This is especially true in the case of early warning and disaster prevention initiatives. OCHA maintains several information management activities in support of its humanitarian efforts, and provides systems to collect, analyze, disseminate, and exchange information. These functions are performed jointly by the Early Warning and Contingency Planning Unit, the ReliefWeb project, the Field Information Support Project, and the Integrated Regional Information Networks.

Department of Economic and Social Affairs (DESA)

DESA is another component within the Secretariat that addresses disaster management, primarily in regards to predisaster capacity building. DESA addresses a full range of issues under three general areas:

- It compiles, generates, and analyzes a wide range of economic, social, and environmental data and information from which member states draw to

review common problems and evaluate policy options.

- It facilitates the negotiations of member states in many intergovernmental bodies on joint courses of action to address ongoing or emerging global challenges.
- It advises national governments on translating UN-developed policy frameworks into country-level programs and, through technical assistance, helps build national capacities.

This final area is where DESA addresses disaster management activities within its Division for Sustainable Development. As part of this effort, DESA launched a plan of action during the 2002 World Summit on Sustainable Development in Johannesburg, South Africa, that included commitments to disaster and vulnerability reduction. See Exhibit 10-2 for more information on this plan of action.

The UN Centre for Regional Development (UNCRD) is another component of DESA that addresses disaster management issues. Through its headquarters in Nagoya, Japan, and its regional offices in Nairobi, Kenya and Bogotá, Colombia, UNCRD supports training and research on regional development issues and facilitates information dissemination and exchange. UNCRD maintains a Disaster Management Planning Office in Hyogo, Japan that researches and develops community-based, sustainable projects for disaster management planning and capacity-building in developing countries. The Hyogo office also runs the Global Earthquake Safety Initiative, designed to improve risk recognition and reduction in 21 cities around the world, and the Patanka New Life Plan, which provides affordable risk reduction means for the earthquake-stricken communities in Gujarat, India (where an earthquake killed over 20,000 people in 2001).

The Regional Commissions

Five regional economic commissions are within the Economic and Social Council. The secretariats of these regional commissions are part of the UN Secretariat and perform many of the same functions (including the disaster management functions listed above). The five commissions promote greater economic cooperation in the world and augment economic and social development. As part of their mission, they initiate and manage projects that focus on disaster management. While their projects primarily deal with disaster preparedness and mitigation, they also work in regions that have been affected by a disaster to ensure that economic and social recovery involves adequate consideration of risk reduction measures. The five regional commissions are:

- The Economic and Social Commission for Asia and the Pacific (ESCAP)—www.unescap.org
- The Economic Commission for Latin America and the Caribbean (ECLAC)—www.eclac.cl/
- The Economic Commission for Europe (ECE)—www.unece.org/
- The Economic Commission for Africa (ECA)—www.uneca.org/
- The Economic and Social Commission for Western Asia (ESCWA)—www.escwa.org.lb

UN AGENCIES AND PROGRAMS

The UN Development Programme (UNDP)

In response periods of disasters, the UNDP sees that development does not cease during emergencies. If relief efforts are to contribute to lasting solutions, sustainable human development must continue to be vigorously supported, complementing emergency action with new curative initiatives that can help prevent a lapse into crisis.
—The UN General Assembly, 56th Session

The UNDP was established in 1965 during the UN Decade of Development to conduct investigations into private investment in developing countries, to explore the natural resources of those countries, and to train the local population in development activities (such as mining and manufacturing). As the concept and practice of development expanded, the UNDP assumed much greater responsibilities in host countries and in the UN as a whole.

The UNDP was not originally considered an agency on the forefront of international disaster management and humanitarian emergencies because, while it addressed national capacities, it did not focus

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EXHIBIT 10-2   Chapter IV, Section 37 of the Johannesburg Plan of Implementation

An integrated, multi-hazard, inclusive approach to address vulnerability, risk assessment and disaster management, including prevention, mitigation, preparedness, response and recovery, is an essential element of a safer world in the twenty-first century. Actions are required at all levels to:

a. Strengthen the role of the International Strategy for Disaster Reduction and encourage the international community to provide the necessary financial resources to its Trust Fund

b. Support the establishment of effective regional, subregional, and national strategies and scientific and technical institutional support for disaster management

c. Strengthen the institutional capacities of countries and promote international joint observation and research, through improved surface-based monitoring and increased use of satellite data, dissemination of technical and scientific knowledge, and the provision of assistance to vulnerable countries

d. Reduce the risks of flooding and drought in vulnerable countries by promoting wetland and watershed protection and restoration, improved land-use planning, improving and applying more widely techniques and methodologies for assessing the potential adverse effects of climate change on wetlands and, as appropriate, assisting countries that are particularly vulnerable to those effects

e. Improve techniques and methodologies for assessing the effects of climate change, and encourage the continuing assessment of those adverse effects by the Intergovernmental Panel on Climate Change

f. Encourage the dissemination and use of traditional and indigenous knowledge to mitigate the impact of disasters and promote community-based disaster management planning by local authorities, including through training activities and raising public awareness

g. Support the ongoing voluntary contribution of, as appropriate, nongovernmental organizations, the scientific community, and other partners in the management of natural disasters according to agreed, relevant guidelines

h. Develop and strengthen early warning systems and information networks in disaster management, consistent with the International Strategy for Disaster Reduction

i. Develop and strengthen capacity at all levels to collect and disseminate scientific and technical information, including the improvement of early warning systems for predicting extreme weather events, especially El Niño/La Niña, through the provision of assistance to institutions devoted to addressing such events, including the International Centre for the Study of the El Niño Phenomenon

j. Promote cooperation for the prevention and mitigation of, preparedness for, response to, and recovery from major technological and other disasters with an adverse impact on the environment in order to enhance the capabilities of affected countries to cope with such situations.

Source: UNDESA, 2004.

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specifically on the emergency *response* systems (previously considered to be the focal point of disaster management). However, as mitigation and preparedness received their due merit, the UNDP gained increased recognition for its vital risk reduction role.

Capacity building has always been central to the UNDP's mission in terms of empowering host countries to be better able to address issues of national importance, eventually without foreign assistance. International disaster management gained greater

attention as more disasters affected larger populations and caused greater financial impacts. Developing nations, where the UNDP worked, faced the greatest inability to prepare and/or respond to these disasters, largely as a result of the development trends described in Chapter 1. UNDP's projects have shifted toward activities that indirectly fulfill mitigation and preparedness roles. For instance, projects seeking to strengthen government institutions also improve those institutions' capacities to respond with appropriate and effective policy, power, and leadership in the wake of a disaster.

The UNDP now recognizes that disaster management must be viewed as integral to their mission in the developing world, as well as to civil conflict and CHE scenarios. As excerpts from the UNDP mission show, there are implicit similarities between UNDP ideals and those of agencies whose goals specifically aim to mitigate and manage humanitarian emergencies. For instance: (Source: UNDP, n.d.)

- [The UNDP] is committed to the principle that development is inseparable from the quest for peace and human security and that the UN must be a strong force for development as well as peace.
- UNDP's mission is to help countries in their efforts to achieve sustainable human development by assisting them to build their capacity to design and carry out development programs in poverty eradication, employment creation and sustainable livelihoods, the empowerment of women and the protection and regeneration of the environment, giving first priority to poverty eradication.
- UNDP strives to be an effective development partner for the UN relief agencies, working to sustain livelihoods while they seek to sustain lives. It acts to help countries to prepare for, avoid and manage complex emergencies and disasters.
- UNDP supports [development] cooperation by actively promoting the exchange of experience among developing countries.

The UNDP links disaster vulnerability to a lack of or weak infrastructure, poor environmental policy, land misuse, and growing populations in disaster-prone areas. When disasters occur, a country's national development, which the UNDP serves to promote, can be set back years, if not decades. Even small- to medium-size disasters in the least developed countries can "have a cumulative impact on already fragile household economies and can be as significant in total losses as the major and internationally recognized disasters" (SARPN, n.d.). It is the UNDP's objective to "achieve a sustainable reduction in disaster risks and the protection of development gains, reduce the loss of life and livelihoods due to disasters, and ensure that disaster recovery serves to consolidate sustainable human development" (UNDP, n.d.b).

In 1995, as part of the UN's changing approach to humanitarian relief, the Emergency Response Division (ERD) was created within the UNDP, augmenting the organization's role in disaster response. Additionally, 5% of UNDP budgeted resources were allocated for quick response actions in special development situations by ERD teams, thus drastically reducing bureaucratic delays. The ERD was designed to create a collaborative framework among the national government, UN agencies, donors, and NGOs that will immediately respond to disasters, provide communication and travel to disaster management staff, and distribute relief supplies and equipment. It will also deploy to disaster-affected countries for 30 days to create a detailed response plan on which the UNDP response will be based.

In 1997, under the UN Programme for Reform, the mitigation and preparedness responsibilities of the OCHA Emergency Relief Coordinator were formally transferred to the UNDP. In response, the UNDP created the Disaster Reduction and Recovery Programme (DRRP) within the ERD. Soon after, the UNDP again reorganized, creating a Bureau of Crisis Prevention and Recovery (BCPR) with an overarching mission of addressing a range of non-response-related issues:

- Natural disaster reduction
- Recovery
- Mine action

- Conflict prevention and peace building
- Justice and security sector reform
- Small arms and demobilization

BCPR helps UNDP country offices prepare to activate and provide faster and more effective disaster response and recovery. It also works to ensure that UNDP plays an active role in the transition between relief and development.

UNDP's disaster management activities focus primarily on the development-related aspects of risk and vulnerability and on capacity-building technical assistance in all four phases of emergency management. It emphasizes:

1. Incorporating long-term risk reduction and preparedness measures in normal development planning and programs, including support for specific mitigation measures where required
2. Assisting in the planning and implementation of postdisaster rehabilitation and reconstruction, including defining new development strategies that incorporate risk reduction measures relevant to the affected area
3. Reviewing the impact of large settlements of refugees or displaced persons on development, and seeking ways to incorporate the refugees and displaced persons in development strategies
4. Providing technical assistance to the authorities managing major emergency assistance operations of extended duration (especially in relation to displaced persons and the possibilities for achieving durable solutions in such cases)

UNDP has created the Disaster Reduction Unit (DRU) within BCPR, which includes a team of seven Geneva-based professionals and four regional disaster reduction advisors located in Bangkok, Nairobi, New Delhi, and Panama. DRU works to reduce disaster risk and increase sustainable recovery in countries where UNDP operates. It strengthens national and regional capacities by ensuring that new development projects consider known hazard risks, that disaster impacts are mitigated and development gains are protected, and

that risk reduction is factored into disaster recovery. DRU provides the UNDP Country Offices with technical assistance and financial support for the design and implementation of disaster reduction strategies and capacity-building programs to carry out these goals. DRU focuses their support to developing countries in the following areas:

- Increasing capacity for disaster risk reduction
- Mainstreaming disaster risk reduction into development
- Increasing investment in disaster risk reduction

The UNDP Recovery Unit

Following conflict, crises, and disasters, countries must transition from response to recovery. Many countries are unable to manage the difficult and widespread needs of recovery on their own, as they may have experienced widespread loss of infrastructure and services. Displaced persons and refugees may have little to return to, and economies may be damaged or destroyed. The Recovery Unit (under the BCPR) operates during the period when the response or relief phase of the disaster has ended but recovery has not fully commenced (sometimes referred to as the "early recovery period").

The Recovery Unit addresses problems normally encountered in this postcrisis period through its Transition Recovery Programme. This program works to restore government and community capacities to rebuild and recover so as to prevent a return to a crisis situation. Sustainable risk reduction as a component of recovery is central to this mission. The UNDP has recognized that local expertise in risk management and reduction may not be available, and that the technical assistance they provide may be the only option these communities have to increase their resilience to future disasters. This program has proven effective in many recovery operations, including Cambodia after three decades of civil war, Afghanistan after the 2001 conflict, and Gujarat, India after the 2001 earthquake. Specific activities of the UNDP Recovery Unit include:

- Performing early assessments of recovery needs and designing integrated recovery frameworks
- Planning and assistance in area-based development and local governance programs
- Developing comprehensive reintegration programs for former IDPs, returning refugees, and ex-combatants
- Supporting economic recovery both at the local and national levels
- Supporting in-country capacity building, UN system coordination, resource mobilization, and partnerships

To meet these recovery priorities, five support services have been developed within the Recovery Unit to assist the UNDP Country Offices and other UNDP/UN agencies to identify areas where BCPR and the Recovery Unit can provide assistance. These support services include:

- *Early assessment of recovery needs and the design of integrated recovery frameworks.* This includes assessing development losses caused by conflict or natural disaster, the need for socioeconomic and institutional recovery, identification of local partners, and the need for capacity building and technical assistance.
- *Planning and assistance in area-based development and local governance programs.* Area-based development and local governance programs play key roles in recovery from conflict because they tailor emergency, recovery, and development issues across a country area by area, based on differing needs and opportunities. Area-based development helps bring together different actors at the operational level, promoting enhanced coordination, coherence, and impact at field level. Area-based development is often seen as the core mechanism that most benefits reintegration.
- *Developing comprehensive reintegration programs for IDPs, returning refugees, and ex-combatants.* Internal displacement, returning refugees, and demobilized former combatants

create a huge need for in-country capacity building on different levels. Protection and security becomes a serious issue, and efforts to sustainably reintegrate these populations into their host communities are critical. The Recovery Unit provides expertise on reintegration of IDPs, returnees, and ex-combatants, including capacity building benefiting both the returnees and formerly displaced as well as their host communities through activities such as income generation, vocational training, and other revitalization activities.

- *Supporting economic recovery and revitalization.* One main characteristic of disasters and conflict is their devastating impact on the local and national economies. Livelihoods are destroyed through insecurity, unpredictability, market collapse, loss of assets, and rampant inflation. For recovery to achieve success, these issues need to be well understood from the outset and addressed accordingly.
- *Supporting capacity building, coordination, resource mobilization, and partnerships.* Protracted conflict and extreme disasters tend to create political stressors that temporarily exceed the capacities of UN Country Offices and other NGO partners. However, many recovery needs must be addressed right away to ensure that recovery sets out on a sustainable course. The Recovery Unit offers several services to accommodate the needs of this intense phase through the provision of surge capacity and short- to medium-term staff, assistance in resource mobilization within specific fundraising and coordination frameworks (such as the Consolidated Appeals Process), and partnership building.

When required to assist in recovery operations, the Recovery Unit may deploy a special Transition Recovery Team (TRT) to supplement UNDP operations in the affected country. These teams' focus varies according to specific needs. For instance, when neighboring countries have interlinked problems (such as crossborder reintegration of ex-combatants

and displaced persons), the TRT may support a sub-regional approach to recovery.

It is important to note that the UNDP has no primary role in the middle of a CHE peacekeeping response, only a supportive one in helping to harmonize development with relief. During recovery and reconstruction, together with others, they take the lead.

In addition to the above-mentioned roles and responsibilities, the UNDP leads several interagency working groups. One such group (which consists of representatives from the World Food Programme, the World Health Organization, the Food and Agriculture Organization, the UN Populations Fund, and the UN International Children's Emergency Relief Fund) develops principles and guidelines to incorporate disaster risk into the Common Country Assessment and the UN Development Assistance Framework. The International Strategy for Disaster Reduction Working Group on Risk, Vulnerability and Disaster Impact Assessment sets guidelines for social impact assessments. UNDP also coordinates a Disaster Management Training Programme in Central America, runs the conference "The Use of Microfinance and Micro-Credit for the Poor in Recovery and Disaster Reduction," and has created a program to elaborate financial instruments to enable the poor to manage disaster risks.

The UNDP has several reasons for its success in fulfilling its roles in the mitigation, preparedness, and recovery for natural and man-made disasters. First, as a permanent in-country office with close ties to most government agencies, activities related to coordination and planning, monitoring, and training are simply an extension of ongoing relationships. The UNDP works in the country before, during, and long after the crisis. It is able to harness vast, first-hand knowledge about the situations leading up to a crisis and the capacity of the government and civil institutions to handle a crisis, and can analyze what weaknesses must be addressed by the responding aid agencies. In addition, its neutrality dispels fears of political bias.

Second, the UNDP functions as a coordinating body of the UN agencies concerned with develop-ment, so when crisis situations appear, there is an established, stable platform from which it may lead. From this leadership vantage, it can (theoretically) assist in stabilizing incoming relief programs of other responding UN bodies, such as the World Food Programme, the UN International Children's Emergency Fund, the Department of Humanitarian Affairs, and the UN High Commissioner for Refugees. Once the emergency phase of the disaster has ended and OCHA prepares to leave, UNDP is in a prime position to facilitate the transition from response efforts to long-term recovery.

And third, the UNDP has experience dealing with donors, be they foreign governments or development banks, and therefore can handle the outpouring of aid that usually results during the relief and recovery period of a disaster. This contributes greatly to reducing levels of corruption and increasing the cost-effectiveness of generated funds. In several recent events, the UNDP has established formalized funds to handle large donor contributions, which have been used for long-term postdisaster reconstruction efforts (see Exhibits 10-3 and 10-4).

When a major disaster operation requires extended efforts, the UNDP may accept and administer special extra-budgetary contributions to provide the national government with both technical and material assistance, in coordination with OCHA and other agencies involved in the UN Disaster Management Team (DMT). An example of such assistance includes the establishment and administration of a UN DMT Emergency Information and Coordination (EIC) Support Unit. Special grants of up to $l.l million also may be provided, allocated from Special Programme Resources funds for technical assistance to post disaster recovery efforts following natural disasters. See Exhibit 10-5 for information about the UNDP Disaster Management Training Programme.

The UN Children's Fund (UNICEF)

Like most major UN agencies, the UN Children's Fund (UNICEF, formerly known as the United

EXHIBIT 10-3   UNDP in Rwanda—A Recovery Operation

As a result of the large-scale genocide in 1994, more than 2.8 million refugees fled Rwanda, mainly to the Democratic Republic of the Congo, Tanzania, and Burundi. Over 90% of the population was forced from their homes. The country's professionals (lawyers, doctors, teachers, and businesspeople) and government officials either were killed or fled the country. When refugees began returning in late 1996, they found basic infrastructure destroyed and found that they possessed few of the skills needed to reintegrate into the community. Food was scarce, many refugees were disabled, and the sheer number of returnees was staggering. This situation led to one of history's greatest challenges for humanitarian workers.

Though much has been written criticizing the general reaction of the entire UN body to the crisis in Rwanda, these critiques focus primarily on neglected peacekeeping roles. However, the UNDP's role as a disaster management agency deserves much praise. Though the conflict has long been considered over, the UNDP is still in Rwanda, striving to remedy the consequences in a sustainable fashion. The two main themes the UNDP focuses on concern the reintegration and reconciliation of returnees and capacity building for good governance.

The UNDP, the WFP, and the UNHCR formed the Joint Reintegration Programming Unit to "to consolidate, in a sustainable manner, the access of returnees and survivors in new settlement sites with a view to making them as much as possible sustain-

able and self-reliant[,] includ[ing] primarily assistance in agriculture and community development" (Bakhet, 1998). Project activities included building houses, education, income generation, clean water access, and sanitation. UNDP and United Nations Development Fund for Women (UNIFEM) worked together to ensure that women's issues played a formal role in the reintegration projects. (Gender issues are integral to most UNDP project development, and relief and recovery efforts are no exception.)

The UNDP also supported human resource development efforts in Rwanda. The lack of skilled human resources is one of the most serious challenges toward sustainable development in any scenario, and this situation was no exception. Skills training and job creation were necessary to get the economy back on track and increase the country's stability, thus reducing the chance of a relapse into crisis.

Most significantly, the UNDP, in collaboration with the Government of Rwanda, established the Trust Fund for Rwanda in 1995. This fund centralized the process by which donor nations could provide economic assistance to support rehabilitation. It was vital that this be done to help prevent situations where money was misused or "ignored the embedded causes of the genocide (Briggs, 2001)." This trust fund supported many national projects to reintegrate and stabilize governance.

Source: UNDP, 2005.

Nations International Children's Emergency Fund) was established in the aftermath of World War II. Its original mandate was to aid children suffering in postwar Europe, but this mission has been expanded to address the needs of women and children throughout the world. UNICEF is mandated by the General Assembly to advocate for children's rights,

to ensure that each child receives at least the minimum requirements for survival, and to increase children's opportunities for a successful future. Under the Convention on the Rights of the Child (CRC), a treaty adopted by 191 countries, the UNHCR holds broad-reaching legal authority to carry out its mission.

EXHIBIT 10-4   Role of UNDP in the Gujarat Earthquake of 2001

On January 26, 2001, an earthquake of magnitude 6.9 on the Richter scale occurred in central Gujarat, India, with the epicenter in the city of Bhuj. The casualties included over 20,000 killed and almost 200,000 injured. In addition, almost 1,000,000 homes were damaged or destroyed. Two district hospitals were destroyed, while 1200 clinics and over 11,600 schools were damaged or destroyed. Infrastructure was severely affected, most significantly with damage to communications facilities, electricity flow, access to safe water, and over 240 dams. Estimates of economic impact were in the neighborhood of $2.1 billion.

Immediately, the UN agencies responded. Supported by $2.75 million from the governments of the United States, the United Kingdom, and Italy, the UNDP coordinated needs assessments, activity identification, project proposal design and implementation, monitoring, and quality control, "thus establishing the necessary bridge between relief and development" (UNDP, n.d.c). These projects were created with a decentralized approach so each site's coordinators could have greater autonomy in project implementation, thus reducing the standard bureaucracies.

UNDP, the UN volunteers they oversee, and the NGO Habitat worked to address the issue of the houses destroyed in the quake. Using "roaming teams," they developed and funded projects with local communities for the distribution of building materials and the construction of temporary shelters. These teams also monitored the progress of the project. It had to progress rapidly because of the impending arrival of the monsoon season. They approached the permanent rebuilding of housing with sustainable development in mind. Using consultants from Latur, India, which had suffered a devastating earthquake in 1993, 150 demonstration houses were built using earthquake- and monsoon-proof design and construction. Based upon these initial designs, the task of rebuilding was expected to take three years.

The UNDP provided $100,000 for immediate relief through a project in partnership with two of the leading women's organizations in Gujarat, the Self-Employed Women's Association (SEWA) and the NGO Kutch Mahila Vikas Sangthan, which put together "survival kits" for families in addition to helping with the housing issues. The UNDP also sent 35 UN volunteers into several regions where no other NGOs had initiated work or provided assistance. The UNDP planned to eventually have 5000 volunteers working on the recovery effort.

Considering the future disaster risk for the region, the need for disaster-resistant construction is quite high. Unfortunately, anticipated costs for such an effort exceed $2.3 billion and will require an extraordinary level of long-term coordination. The UNDP is the agency that assumes this role, and it has already begun working with the central government of India and the state government of Gujarat. As there has been a long history of cooperation in that nation, this should prove to be an effective effort.

As of early 2006, UNICEF maintained country offices in 158 different nations. This is probably its greatest asset in terms of the agency's disaster management capacity. Preparedness and mitigation for disasters among its target groups is a priority, with programs able to address both local-level action and national-level capacity building. In keeping with the recommendations laid out by the Yokohama Strategy and Plan of Action for a Safer World, UNICEF incorporates disaster reduction into its national development plans. It also considers natural hazard vulnerability and capacity assessments when determining overall development needs to be addressed by UN country teams.

EXHIBIT 10-5   The UNDP Disaster Management Training Programme (DMTP)

The DMTP was developed by UNDP and other agencies in 1990. Its purpose is to increase the institutional understanding and awareness of disaster management within the UN system. It seeks to reduce the impact of disasters in countries where the UN conducts development operations by developing and promoting national and regional strategies that address the full gamut of disaster management functions. It supports institutional capacity building within the UN, NGOs, other international organizations, and member country governments (both donors and recipients).

In 1997, under the UN Programme for Reform, the preparedness and mitigation responsibilities of the ERC were transferred to the UNDP. At that time, the DMTP was moved into UNDP's Bureau for Crisis Prevention and Recovery. It has conducted more than 70 training workshops since its inception, which have reached over 6,000 officials on several continents. These workshops have resulted in development of and revision to national disaster management plans, and the cre-ation of appropriate statutory authorities to guide national disaster management capacity and capability. They have also served to increase the technical skills of UN and outside disaster management teams.

Training modules fall under the categories of:

- General disaster management
- Disaster preparedness
- Disaster response
- Disaster risk reduction
- Conflict mitigation

Organizations that are members of the DMTP include: FAO, IBRD, ICRC, ICVA, IFRC, ILO, IOM, NRC, OCHA, OHCHR, SCHR, UNCHS, UNCTAD, UNDP, UNEP, UNESCO, UNFPA, UNHCR, UNICEF, UNITAR, UNOPS, UNSC, UNV, WFP, WHO, and WMO.

The DMTP training modules may be accessed at www.undmtp.org/modules_e.htm

Source: UNDP, 2001

Through public education campaigns, UNICEF works to increase public hazard awareness and knowledge and participation in disaster management activities. UNICEF country offices include activities that address these predisaster needs in their regular projects. For example, they develop education materials required for both children and adults and then design websites so educators and program directors can access or download these materials for use in their communities.

In situations of disaster or armed conflict, UNICEF is well poised to serve as an immediate aid provider to its specific target groups. Its rapid-response capacity is important because vulnerable groups are often the most marginalized in terms of aid received. UNICEF works to ensure that children have access to educa-tion, healthcare, safety, and protected child rights. In the response and recovery periods of humanitarian emergencies, these roles expand according to victims' needs. (In countries where UNICEF has not yet established a permanent presence, the form of aid is virtually the same; however, the timing and delivery are affected, and reconstruction is not nearly as comprehensive.)

The UNICEF Office of Emergency Programmes (EMOPS), which has offices in New York and Geneva, maintains overall responsibility for coordinating UNICEF's emergency management activities. EMOPS works closely with the UNICEF Programme Division, managing the UNICEF Emergency Programme Fund (EPF—see below) and ensuring close interagency coordination with other participating

humanitarian organizations. In this role, UNICEF is also in the position to act as coordinator in specific areas in which it is viewed as the sector leader. For instance, UNICEF was tasked with leading the international humanitarian response in the areas of water and sanitation, child protection, and education for the 2004 Asia tsunami and earthquake response (in Aceh province alone, over 250 agencies addressed water and sanitation issues). UNICEF maintains that humanitarian assistance should include programs aimed specifically for child victims. Its relief projects generally provide immunizations, water and sanitation, nutrition, education, and health resources. Women are recipients of this aid as well because UNICEF considers women to be vital in the care of children (see Exhibit 10-6).

In order to facilitate an immediate response to an emergency situation, UNICEF is authorized to divert up to $50,000 from country program resources to address immediate needs. If the disaster is so great as to affect existing UNICEF programs operating in the country, the UNICEF representative can reprogram these programs' resources once permission is received from the national government and UNICEF Headquarters. UNICEF also maintains a $25 million global Emergency Programme Fund (EPF), which provides funding for initial emergency response activities.

THE WORLD FOOD PROGRAMME (WFP)

The World Food Programme (WFP) is the UN agency tasked with addressing hunger-related emergencies. The WFP was created in 1961 by a resolution adopted by the UN General Assembly and the UN Food and Agriculture Organization (FAO). Today, the program operates in 85 countries and maintains eight regional offices. In the year 2004 alone, the WFP provided food aid to 89 million people through its relief programs. Over the course of its existence, the WFP has provided more than 50 million metric tons of food to countries worldwide.

Since 2000, the WFP has been an active member of the Inter-Agency Task Force on Disaster Reduction (see below). WFP has identified mitigation as one of its five priority action areas, with focusing on reducing the impact of natural hazards on food security, especially for the vulnerable. WFP has established a steering committee for disaster mitigation to help its offices integrate these activities into regular development programs. Examples of mitigation projects that focus on food security include water harvesting in Sudan (to address drought), the creation of grain stores and access roads in Tanzania, and the creation of early warning and vulnerability mapping worldwide.

Because food is a necessity for human survival and is considered a vital component of development, a lack of food is, in and of itself, an emergency situation. The WFP works throughout the world to assist the poor who do not have sufficient food so they can survive "to break the cycle of hunger and poverty." Hunger crises are rampant—more than 800 million people across the globe receive less than the minimum standard requirement of food for healthy survival. Hunger may exist on its own, or may be a secondary effect of other hazards, including drought, famine, and displacement.

WFP constantly monitors the world's food security situation through its international food database INTERFAIS. Using this system, WFP tracks the flow of food aid around the world (including emergency food aid), and provides the humanitarian community with an accurate inventory and assessment of emergency food stock quantities and locations. The database also includes relevant information that would be needed in times of emergency, such as anticipated delivery schedules and the condition and capabilities of international ports.

In rapid-onset events such as natural disasters, the WFP is a major player in the response to the immediate nutritional needs of the victims. Food is transported to the affected location and delivered to storage and distribution centers (see Figure 10-3). The distribution is carried out according to preestablished needs assessments performed by OCHA and the UNDP. The WFP distributes food through contracted NGOs that have the vast experience and technical

EXHIBIT 10-6   UNICEF Operations in Indonesia Following the 2004 Asia Tsunami and Earthquake Events: Six-Month Update

Key Results Attributable to UNICEF Action:

- To prevent malaria, nearly 200,000 women and children provided with almost 100,000 mosquito nets
- Almost 1,100,000 children aged 6 months to 15 years (91% of target) vaccinated against measles
- Nearly 400,000 children aged 6 months to 59 months (91% of target) received Vitamin A
- 2.6 million iron tablets distributed to 26,000 pregnant women
- 10,000 pregnant women benefited from 500 safe-delivery kits
- 1 million sachets of oral rehydration salts distributed to potentially treat 216,800 cases of diarrhea
- 28,000 people reached with 15 L drinking water per day, and 84,000 reached with 5 L per day
- More than 53,000 people in displacement camps, hospitals and schools benefiting from safe excreta disposal facilities
- More than 83,000 families received hygiene kits (consisting of bath soap, toothbrush, toothpaste, bucket, washing soap, towel, sarong, and sanitary napkins)
- Nearly 500,000 children benefited from school-in-a-box kits
- Almost 17,000 children benefiting from psychosocial support and care
- More than 1000 separated children and 70 unaccompanied children registered through child centers (separated children are those who are no longer in the care of their parents, while unaccompanied children are those not in the care of an adult)

UNICEF'S Plans for Recovery:
Health and Nutrition

Program Objectives: To support disease control and prevention, immunization, maternal and child health, nutrition, and early childhood centers in the tsunami-affected areas of Aceh and North Sumatra. UNICEF plans to implement comprehensive malaria prevention and control activities in target areas, including mosquito net distribution, spraying, and distribution of diagnostics and drugs.

By mid-2006, new permanent premises with annexed cold room facilities will be established at the provincial level to strengthen the immunization program. UNICEF will provide support to programs aimed at the elimination of maternal and neonatal tetanus, the control of measles, and "catch-up" or supplementary activities for polio eradication. UNICEF will work in partnership with provincial and district health authorities, UNFPA, JHPIEGO, and other agencies to ensure there are adequate levels of trained staff available to provide prenatal and maternity services in all tsunami-affected districts. Supplies will be provided to midwives and hospitals, and a center for midwife training will be established similar to other centers elsewhere in Indonesia. UNICEF will support a medium-term project to establish 200 community-level health facilities offering prenatal, midwifery, postnatal, early child development, nutrition, immunization, and other maternal and child health services. These facilities will be designed to host other community development activities as well, including psychosocial services where possible. Initial activities will take place in areas not completely destroyed by the tsunami, where communities are still present. A second phase, occurring in those communities being rebuilt from the ground up, is envisaged in 2006 and beyond. Staffing of these facilities will include local midwives and other medical personnel trained and supported by UNICEF for the first year. Once completed, the project will result in one new health facility for every 1000 people. In nutrition, UNICEF will continue to provide the material and human resource support necessary to implement a

comprehensive program of malnutrition prevention and management at the community level. Staff appointed with UNICEF's financial support in 2005 will continue to be supervised by district-level nutrition specialists, and supplied with equipment (scales, height boards, tapes) to enable ongoing monitoring of children under the age of five.

UNICEF'S Plans for Recovery: Water and Sanitation

UNICEF plans to improve access to safe water and sanitation for at least 80% of the population in selected districts of Aceh and North Sumatra, and to undertake hygiene promotion among communities. Yayasan Dian Desa (YDD), a UNICEF-supported NGO, provides technical support for water installation and sanitation points in communities, IDP camps, and health centers. YDD has completed the construction of water and sanitation facilities in 12 Aceh province locations, and will involve communities in the planning, operation and management of these and future facilities to be provided by UNICEF. UNICEF will promote hygiene messages through schools by training students to inform their peers and parents about good hygiene practices. A total of 250 students will be trained as trainers, who will in turn train students in peer and parent communication. This program will be conducted in 105 existing schools (not damaged in the tsunami) and 500 new schools. The students will also be trained in water quality surveillance, allowing regular monitoring of water quality at the community level, and ensuring that the community is informed about the proper operation and maintenance of the water facilities.

UNICEF'S Plans for Recovery: Education

UNICEF's main goal in the Education sector is to improve both access to, and quality of, basic education services, including through the rehabilitation and reconstruction of damaged schools. In order to improve the quality of education, UNICEF will support training programs for teachers, administra-

tors, students, and other education officials. For example, they have planned to train 1200 teachers and principals from 80 schools in Aceh and Nias on emergency preparedness. Training on peace education and life skills will be provided for 1000 students, teachers, and principals from 40 schools. In order to support the planning, management, and implementation of education programming, refresher training on the Education Management Information System (EMIS) for provincial and district education officials will be conducted in all 21 districts in Aceh and 2 districts in Nias. And over the next three years, UNICEF will support training on trauma counseling and teaching according to the minimum standards for education in emergencies promoted by the Interagency Network for Education in Emergencies (INEE). This training will be provided to provincial and district education officials, as well as principals and teachers from preschool to secondary school levels in 15 districts. UNICEF and IOM are collaborating to build 200 temporary schools in preparation for the new school year, which commences 18 July. These schools will bridge the gap until permanent schools are completed. UNICEF plans to construct 300 permanent schools in Aceh and Nias, and to rehabilitate 200 more. In cooperation with the Ministry of National Education (MoNE) and UNOPS, we will ensure that these schools are designed and constructed to be earthquake-resistant and "child-friendly," making them safer, more stimulating for students, and accessible to children with disabilities. We will provide the schools with equipment and furniture, and will supply basic learning materials for students. Furthermore, to promote universal attendance among children of primary school age, UNICEF will supply textbooks to all primary schools in Aceh and Nias this year, and will continue this support on a smaller scale in future. In light of the continued seismic instability in Aceh, UNICEF is supporting structural engineers from UNOPS to survey 182 schools categorized as "lightly damaged" or "moderately damaged," in order to ensure that these

structures are safe for children. Thus far, eight schools have been identified as unsafe; UNICEF has supported the demolition of one such school. UNICEF will support the implementation of the Creating Learning Community for Children (CLCC) model in selected primary schools in 13 affected districts in Aceh. Starting in 200 schools, CLCC activities should gradually be introduced throughout Aceh and Nias from early 2006. Approximately 8000 teachers will be trained in psychosocial healing and interactive teaching-learning models over the next three years. For young children, we will introduce affordable community-based early learning activities for children between the ages of 2 and 6 in 200 village health centers in Nias and Aceh.

UNICEF'S Plans for Recovery: Child Protection and Psychosocial Support

With the majority of separated/unaccompanied children registered, UNICEF's strategy toward these children has shifted to facilitating long-term care arrangements. Informal care arrangements with extended families will be formalized, and UNICEF will assist the Indonesian government to develop foster care systems. UNICEF and other agencies will help support the most vulnerable families, including those that are caring for separated children. UNICEF is concurrently assessing alternative care models and systems with the help of the International Social Service (ISS), Geneva, to help the Indonesian government formulate appropriate policies and programs to support children without primary caregivers.

UNICEF's Child Centers, through which registration of children has been conducted, will gradually be transformed into youth clubs, providing life skills training, peer education, vocational training and learning libraries. Psychosocial activities, which were also being conducted through Child Centers, will be "mainstreamed" through the Ministry of Education, allowing the psychosocial well-being of teachers and students to be addressed in schools through education, peer counseling, and other measures. UNICEF will support the Government and other partners to develop practical and appropriate psychosocial policies, as well as a framework for their implementation. At the same time, we will help local communities to develop systems to address their own psychosocial well-being. Many Civil Registrars Offices were damaged during the tsunami, compromising their ability to provide essential services, including birth registration. To address this, UNICEF will provide equipment and supplies for these offices. More broadly, the Ministry of Home Affairs, UNICEF, and GTZ (a German NGO) are developing a common strategy to promote civil registration in Aceh. This strategy will combine local legislation, training of service providers, and an information campaign to promote the importance of birth registration to local communities.

UNICEF will assist local law enforcement in its efforts to improve interaction with children. Law enforcers will be trained on child-sensitive procedures for children who come into contact with the law, whether as victims or as offenders. They are also supporting the establishment of women's and children's desks in provincial and district police stations, and of child-friendly rooms in courts and prosecutors' offices. An assessment on sexual abuse, exploitation, and trafficking is being conducted, and will be used to support awareness-raising activities on abuse, exploitation, and trafficking at the community level through a youth empowerment and communication campaign. UNICEF will also support the implementation of community-based reporting and referral mechanisms for child victims of abuse, exploitation, and trafficking. Finally, we will provide training for humanitarian workers, military, law enforcers, service providers, and all UNICEF staff on the UN Code of Conduct for the protection of children from abuse and exploitation.

Source: UNICEF, 2005.

FIGURE 10-3 Rice donated by Japan is loaded by the World Food Programme onto 72 WFP trucks to feed survivors of the 2004 Asia tsunami and earthquake events. (*Source:* Rein Skullerud, WFP, 2005.)

skills to plan and implement transportation, storage, and distribution. The principal partners in planning and implementation are the host governments (who must request the WFP aid, unless the situation is a CHE without an established government, in which case the UN Secretary General makes the request). The WFP works closely with all responding UN agencies to coordinate an effective and broad-reaching response because food requirements are so closely linked to every other vital need of disaster victims (see Exhibit 10-7).

During the reconstruction phase of a disaster, the WFP often must continue food distribution. Rehabili-tation projects are implemented to foster increased local development, including the provision of food aid to families, who as a result will have extra money to use in rebuilding their lives, and food-for-work programs, which break the chains of reliance on aid as well as provide an incentive to rebuild communities.

WFP administers the International Emergency Food Reserve (IEFR), which is designed to store a minimum of 500,000 tons of cereals. IEFR also man-ages separate resources provided by donors to address long-term operations such as CHEs. The Programme annually reserves $15 million from its general resources for emergency assistance, in addition to $30 million for long-term emergency assistance. The Immediate Response Account is a cash account estab-lished within the IEFR for rapid purchase and delivery of food in emergency situations. These resources are bought from local markets whenever possible, and taken from regional or international sources if neces-sary, thereby ensuring their arrival before food aid that moves through regular channels.

The World Health Organization (WHO)

The World Health Organization (WHO) was proposed during the original meetings to establish the UN system in San Francisco in 1945. In 1946, at the United Health Conference in New York, the WHO constitution was approved, and it was signed on April 7, 1946 (World Health Day). The WHO proved its value by responding to a cholera epidemic in Egypt months before the epidemic was officially recognized.

The WHO serves as the central authority on sanita-tion and health issues throughout the world. It works with national governments to develop medical and healthcare capabilities and assist in the suppression of epidemics. The WHO supports research on disease eradication and provides expertise when requested. It provides training and technical support and develops standards for medical care. The WHO became a mem-ber of the Inter-Agency Task Force on Disaster Reduction in 2002, and continues to assist local and

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EXHIBIT 10-7   WFP Disaster Response System

WFP response begins at the request of the affected country's government.

1. Emergency Assessment teams are sent in to ask the key questions: How much food aid is needed for how many beneficiaries, and for how long? And how can the food be delivered to the hungry?
2. Equipped with the answers, WFP draws up an Emergency Operation (EMOP), including a plan of action and a budget. The EMOP lists who will receive food aid, what rations are required, the type of transport WFP will use, and which humanitarian corridors lead to the crisis zone.
3. WFP launches an Appeal to the international community for funds and food aid. The agency relies entirely on voluntary contributions to finance its operations, with donations made in cash, food, or services. Governments are the biggest single source of funding. More than 60 governments support WFP's worldwide operations.
4. As funds and food start to flow, WFP's logistics team works to bridge the gap between the donors and the hungry. In 2004, the agency delivered 5.1 million tons of food aid by air, land, and sea.

Ships carry the largest WFP cargo, their holds filled to the brim with 50,000 tons or more of grain, cans of cooking oil, and canned food; the agency has 40 ships on the high seas every day, frequently rerouting vessels to get food quickly to crisis zones. In extreme environments, WFP also uses the skies to reach the hungry, airlifting or airdropping food directly into disaster zones. Before the aid can reach its country of destination, logistics experts often need to upgrade ports and secure warehouses. Trucks usually make the final link in WFP's food chain, transporting food aid along the rough roads that lead to the hungry. Where roads are impassable or nonexistent, WFP relies on less conventional forms of transport: donkeys in the Andes, speedboats in the Mozambique floods, camels in Sudan, and elephants in Nepal. At this stage, local community leaders work closely with WFP to ensure rations reach the people who need it most: pregnant mothers, children, and the elderly.

Source: WFP, 2005

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national governments as well as regional government associations with health-related disaster mitigation and preparedness issues. It does this primarily by providing education and technical assistance to government public health officials about early detection, containment, and treatment of disease and the creation of public health contingency plans. WHO activities address primary hazards, such as epidemics (avian influenza, malaria, Dengue fever, and SARS, for example), and the secondary health hazards that accompany most major disasters. Through their web-site and collaboration with various academic institutions, WHO has also worked to advance public health disaster mitigation and preparedness research and information exchange.

The WHO Director-General is a member of the IASC and the IASC Working Group. In those capacities, the WHO recommends policy options to resolve the more technical and strategic challenges of day-to-day emergency operations in the field. In order to incorporate public health considerations in UN interagency contingency planning and preparedness activi-

ties, the WHO also participates in the IASC Taskforce on Preparedness and Contingency Planning.

The WHO Health Action in Crisis (HAC) department was designed to "reduce avoidable loss of life, burden of disease and disability in crises" (WHO, n.d.). In the event of a disaster, WHO responds in several ways to address victims' health and safety. Most importantly, it provides ongoing monitoring of diseases traditionally observed within the unsanitary conditions of disaster aftermath. WHO also provides technical assistance to responding agencies and host governments establishing disaster medical capabilities and serves as a source of expertise. WHO assesses the needs of public health supplies and expertise, and appeals for this assistance from its partners and donor governments. The key functions of HAC in times of crises are:

- Measure health-related problems, and promptly assess health needs of populations affected by crises, identifying priority causes of disease and death
- Support member states in coordinating action for health
- Ensure that critical gaps in health response are rapidly identified and filled
- Revitalize and build capacity of health systems for preparedness and response

When other government or NGO agencies cannot meet the public health needs of the affected population, WHO's mobile response teams bring together expertise in epidemics, logistics, security coordination, and management, collaborating with UN agencies participating in response and recovery. WHO has several bilateral agreements with other UN agencies and NGOs (including the Red Cross/Red Crescent Movement) and coordinates the Inter-Agency Medical/Health Task Force (IMTF), an informal forum that provides guidance on technical and operational health challenges in humanitarian crises. HAC secures funding for its humanitarian action through three primary sources:

1. The regular budget, which is approved by the World Health Assembly biannually
2. General voluntary contributions to WHO; donors spell out a share for emergency activities in their funding agreements or lists of priority allocations
3. Broadly or specifically earmarked voluntary contributions for the Voluntary Fund for Health Promotion for Catastrophes and Disasters

Since its inception, six regional offices have been established. These offices focus on the health issues in each region:

- Regional Office for Africa
- Pan American Health Organization
- Regional Office for South-East Asia
- Regional Office for Europe
- Regional Office for Eastern Mediterranean
- Regional Office for the Western Pacific

Food and Agriculture Organization (FAO)

The FAO was established as a UN agency in 1945 in Quebec City, Canada. The organization's mandate is to "raise levels of nutrition, improve agricultural productivity, better the lives of rural populations and contribute to the growth of the world economy" (FAO, 2006). It provides capacity-building assistance to communities that need to increase their food output potential. In 2000, FAO pledged to help current and future generations achieve food security by 2015. With headquarters in Rome, Italy, FAO maintains five regional, five subregional, and 80 country offices, each of which works with UN member countries and other partners to coordinate various activities, including disaster management.

FAO is a member of the Inter-Agency Task Force on Disaster Reduction. The 1996 World Food Summit mandated FAO to assist UN member countries develop national food security, vulnerability information, and specialized mapping systems in order to cut worldwide malnutrition in half by 2015. A key component of this strategy is strengthening the

capacity of communities and local institutions to prepare for natural hazards and respond to food emergencies during disasters and crises. This objective focuses on:

- Strengthening disaster preparedness and mitigation against the impact of emergencies that affect food security and the productive capacities of rural populations
- Forecasting and providing early warning of adverse conditions in the food and agricultural sectors and of impending food emergencies
- Strengthening programs for agricultural relief and rehabilitation and facilitating the transition from emergency relief to reconstruction and development in food and agriculture
- Strengthening local capacities and coping mechanisms by guiding the choice of agricultural practices, technologies, and support services to reduce vulnerability and enhance resilience

Within FAO, the Emergency Coordination Group is the organizational mechanism for the overall coordination of emergency and disaster reduction issues. This group has strengthened FAO's capacity to address disaster preparedness, mitigation, relief, and rehabilitation together with member countries and partners in a more integrated way through:

- Preparation of a disaster management database
- Development of a guide for emergency needs assessment and guidance on management of food and agricultural emergencies
- Development of strategies and capacity building for drought mitigation

FAO also maintains a website of disaster reduction information through its World Agricultural Information Centre. This center has garnered international support through a Global Information and Early Warning System that monitors food supply and demand around the world, provides information on crop prospects, and gives early warning on imminent food crises. FAO also works to help countries adopt sustainable agricultural and other land-use practices. Its land and water development division has helped to

reverse land loss, thus increasing disaster resilience, by promoting the development of disaster-resistant agro-ecosystems and the sound use of land and water resources.

In times of disaster, the Emergency Operations and Rehabilitation Division helps communities recover. While other agencies, such as WFP, address immediate food needs by providing the actual food aid to victims, FAO provides assistance to restore local food production and reduce dependency on food aid.

FAO's first action following disasters, in partnership with WFP, is to send missions to the affected areas to assess crops and food supply status. The Emergency Operations Service of the Emergency Operations and Rehabilitation Division leads these missions, sending FAO experts to consult with farmers, herders, fisheries, and local authorities to gather disaster and recovery data. Using their assessment, FAO designs an emergency agricultural relief and rehabilitation program and mobilizes the funds necessary for its implementation. The Emergency Operations and Rehabilitation Division distributes material assets, such as seeds, fertilizer, fishing equipment, livestock, and farm tools. In a CHE, FAO helps affected communities bolster overall resources and restore and strengthen agricultural assets to make them less vulnerable to future shocks. For example, FAO has been working in regions outside government authority in the Sudan to conduct community-based training of animal health workers aimed at keeping their livestock—a vital part of local livelihoods—from dying.

FAO also plays an important coordination role. When a disaster occurs, the Emergency Operations and Rehabilitation Division establishes an emergency agriculture coordination unit consisting of a team of technical experts from a wide range of fields (including crop and livestock specialists). This field-level team provides information and advice to other humanitarian organizations and government agencies involved in emergency agricultural assistance in the affected area. FAO coordination units also facilitate operational information exchange, thereby reducing duplications of and eliminating gaps in assistance.

FAO's primary beneficiaries include:

- Subsistence farmers
- Pastoralists and livestock producers
- Artisan "fisherfolk"
- Refugees and internally displaced people
- Ex-combatants
- Households headed by women or children and/or afflicted by HIV/AIDS

The Special Emergency Programmes Service (TCES), also within the Emergency Operations and Rehabilitation Division, is responsible for the effective implementation of specially designed emergency programs. These programs require particular attention due to the political and security context surrounding their interventions and the complexity of the institutional setup. TCES was responsible for FAO's intervention in the framework of the Oil for Food Program in Iraq and FAO's emergency and early rehabilitation activities in the West Bank and Gaza Strip.

The Rehabilitation and Humanitarian Policies Unit (TCER) is the final component of the Emergency Operations and Rehabilitation Division. TCER is responsible for making recommendations regarding disaster preparedness, post-emergency, and rehabilitation initiatives. The Unit coordinates FAO's position on humanitarian policies and ensures that FAO addresses the gap between emergency assistance and development. The Unit also liaises with other UN entities dealing with humanitarian matters.

The FAO's disaster- and emergency-related projects are funded by contributions from governmental agencies, NGOs, other UN agencies, and by the FAO Technical Cooperation Programme (TCP). Each year, approximately 75% of FAO emergency funds are raised through the Consolidated Appeals Process. FAO expenditure on emergency efforts have grown significantly during the past few years, indicative of the greater role the organization has assumed in disaster management. Current emergency-related projects include:

- Improved food security for HIV/AIDS-affected households in Africa's Great Lakes Region
- Rehabilitation of destroyed greenhouses in the West Bank and Gaza Strip

- Land-tenure management in Angola
- Emergency agricultural assistance to food-insecure female-headed households in Tajikistan
- Consolidation of peace through the restoration of productive capacities of returnee and host communities in conflict-affected areas in Sudan
- Rehabilitation of irrigation systems in Afghanistan
- Rehabilitation of farm to market roads in the Democratic Republic of the Congo

UN High Commissioner for Refugees (UNHCR)

UNHCR was created by the General Assembly in 1950 to provide protection and assistance to refugees. The agency was given a three-year mandate to resettle 1.2 million European World War II refugees. Today, UNHCR is one of the world's principal humanitarian agencies, operating through the efforts of 6,540 personnel and addressing the needs of 19.2 million people in 116 countries.

UNHCR promotes international refugee agreements and monitors government compliance with international refugee law. UNHCR programs begin primarily in response to an actual or an impending humanitarian emergency. In complex humanitarian disasters and in natural and other disasters that occur in areas of conflict, there is a great likelihood that refugees and IDPs will ultimately result. The organization's staff work in the field to provide protection to refugees and displaced persons and minimize the threat of violence many refugees are subject to, even in countries of asylum. The organization seeks sustainable solutions to refugee and IDP issues by helping victims repatriate to their homeland (if conditions warrant), integrate in countries of asylum, or resettle in third countries. UNHCR also assists people who have been granted protection on a group basis or on purely humanitarian grounds, but who have not been formally recognized as refugees.

UNHCR works to avert crises by anticipating and preventing huge population movements from recognized global areas of concern ("trouble spots"). One

method is to establish an international monitoring presence to confront problems before conflict breaks out. For example, UNHCR mobilized a "preventive deployment" to five former Soviet republics in Central Asia experiencing serious internal tensions following independence. UNHCR also promotes regional initiatives and provides general technical assistance to governments and NGOs addressing refugee issues.

In times of emergency, UNHCR offers victims legal protection and material help. The organization ensures that basic needs are met, such as food, water, shelter, sanitation, and medical care. It coordinates the provision and delivery of items to refugee and IDP populations, designating specific projects for women, children, and the elderly, who comprise 80% of a "normal" refugee population. The blue plastic sheeting UNHCR uses to construct tents and roofing has become a common and recognizable sight in international news.

UNHCR maintains an Emergency Preparedness and Response Section (EPRS), which has five emergency preparedness and response officers (EPRO) who remain on call to lead emergency response teams into affected areas. The EPROs may be supported by a range of other UNHCR human resources, including:

- Emergency administrative officers and emergency administrative assistants, for quickly establishing field offices
- The 130 members of the Emergency Roster, which includes staff with diverse expertise and experience who are posted throughout the world but available for rapid emergency deployment
- Staff (by existing arrangement) from the Danish Refugee Council, the Norwegian Refugee Council, and UN volunteers to provide specialized officials on short notice as needed (over 500 people are available at any given time)
- Individuals registered on a roster of "external consultant technicians," who are specialized in various fields often required during refugee and IDP emergencies (including health, water, sanitation, logistics, and shelter)

- Select NGOs that have been identified as capable of rapid deployment to implement assistance in sectors of need (health, sanitation, logistics, and social services, for example)

The staff mentioned above may be supported under an agreement with the Swedish Rescue Services Agency, which is prepared to establish a base camp and office in affected areas within 48 hours' notice. Other supplies and resources, such as vehicles, communications equipment, computers, personal field kits, and prepackaged office kits, are maintained for rapid deployment to support field staff.

UNHCR maintains stockpiles of relief aid, including prefabricated warehouses, blankets, kitchen sets, water storage and purification equipment, and plastic sheeting. These are stored in regional warehouses or may be obtained on short notice from established vendors that guarantee rapid delivery. UNHCR also maintains agreements with stockpiles outside the UN system from which they may access items, such as the Swedish Rescue Board and various NGOs.

UNHCR developed a Quick Impact Project (QIP) initiative. QIPs are designed to bridge the gap between emergency assistance provided to refugees and people returning home and longer-term development aid undertaken by other agencies. These small-scale programs are geared toward rebuilding schools and clinics, road repair, and bridge and well construction.

UNHCR is funded almost entirely by voluntary contributions from governments, intergovernmental organizations, corporations, and individuals. It receives a limited subsidy of less than 2% of the UN budget for administrative costs and accepts "in-kind" contributions, including tents, medicines, trucks, and air transportation. As the number of persons of concern to UNHCR jumped to a high of 27 million in 1994, its budget rose accordingly, from $564 million in 1990 to more than $1 billion annually for most of the 1990s.

Although UNHCR does not often become involved in natural disaster response, rather focusing on areas of conflict, its expertise and assistance was required in

the aftermath of the October 2005 earthquake that severely impacted South Asia. During the response phase of this disaster, UNHCR provided 12 flights loaded with supplies from its global and regional stockpiles and contributed 15,145 family tents, 220,000 blankets, 69,000 plastic sheets, and thousands of jerry cans, kitchen sets, stoves, and lanterns. The aid items were drawn from its existing warehouses in Pakistan and Afghanistan, as well as other locations throughout the world. Due to the earthquake, roads used to access 45,000 Afghan refugees affected by the quake were severely damaged, but UNHCR was able to quickly assess damages and needs and meet those needs through their existing networks (UNHCR, 2005).

UN Disaster Management Team (UN DMT)

In the event of a large-scale disaster, the UN may form a Disaster Management Team (UN DMT) in the affected country. If the disaster clearly falls within the competence and mandate of a specific UN agency, that organization will normally take the lead, with the UN DMT serving as the forum for discussing how other agencies will work to support that lead agency.

The UN DMT is convened and chaired by the UN Resident Coordinator and is comprised of country-level representatives of FAO, UNDP, OCHA, UNICEF, WFP, WHO, and, where present, UNHCR. Specific disaster conditions may merit participation by other UN agencies. The leader of the UNDAC team, assigned by OCHA, automatically becomes a member of the UN DMT. A UNDP official called the Disaster Focal Point Officer often serves as the UN DMT secretary, but the team is free to choose another person if necessary. UNDP is also responsible for providing a venue for the team and any basic administrative support needs.

UN DMT's primary purpose is to ensure that in the event of a disaster, the UN is able to mobilize and carry out a prompt, effective, and concerted response at the country level. The team is tasked with coordinating all disaster-related activities, technical advice, and material assistance provided by UN agencies, as well as taking steps to avoid wasteful duplication or competition for resources by UN agencies. The UN DMT interfaces with the receiving government's national emergency management team, from which a representative may, where practical, be included in the UN DMT.

Central Emergency Response Fund (CERF)

The Central Emergency Response Fund (CERF) was created in 1991 through UN General Assembly Resolution 46/182 to allow for faster operational action by UN agencies. The Fund, which was originally called the Central Emergency Revolving Fund, but renamed in 2005 under resolution 60/124, is administered on behalf of the UN Secretary-General by the Emergency Relief Coordinator. During times of disaster, CERF provides agencies involved in the humanitarian response with a constant source of funding to cover their activities. Its purpose is to shorten the amount of time between the recognition of needs and the disbursement of funding. Agencies that have received pledges from donors but have not yet received actual funds, or agencies that expect to receive funds from other sources in the near future, can borrow equivalent amounts of cash, interest free, through CERF.

Voluntary contributions of 54 donor nations and two nongovernmental entities have allowed CERF to have almost 50 percent of its ultimate goal of $500 million in accessible reserves (see Table 10-1). At the outset, CERF was designed only for CHEs, but in 2001 the General Assembly voted to expand CERF to cover all types of disaster situations. Up to two thirds of the CERF can be allocated to rapid response with the other third devoted to addressing under-funded emergencies.

The following illustrates how CERF funds are used by a UN organization during an emergency:

1. The lending agency submits a request for an advance to the ERC, which includes a descriptive justification on the project or activities to be

TABLE 10-1   CERF Donor Nations, Pledged Donations as of March 9, 2006, and original pledges under the 1991 Central Emergency Revolving Fund (in US$, with original donations to the Central Emergency Revolving Fund listed in parentheses)

Donor nation	Pledged donation	Original pledges under 1991 CERF	Donor nation	Pledged donation	Original pledges under 1991 CERF
Algeria	0	130,000	Mauritius	0	10,000
Armenia	5,000	0	Mexico	50,000	0
Australia	7,328,894	744,000	Monaco	0	140,000
Austria	0	500,000	Morocco	0	11,000
Belgium	1,190,336	327,000	Namibia	0	1,000
Canada	17,240,000	2,195,000	Netherlands	23,867,200	3,083,000
China	1,000,000	0	New Zealand	0	137,000
Colombia	0	10,000	Nigeria	100,000	0
Croatia	5,000	0	Norway	30,000,000	1,850,000
Denmark	8,100,000	2,000,000	Pakistan	20,000	0
Egypt	15,000	0	Philippines	0	20,000
Estonia	24,000	0	Qatar	5,000	0
Finland	4,900,000	1,534,000	Russian Federation	0	250,000
France	1,190,336	5,480,000	San Marino	0	10,000
Germany	0	5,000,000	South Africa	300,000	0
Granada	10,000	0	Spain	10,000,000	760,000
Greece	100,000	9,000	Sri Lanka	10,000	0
Iceland	150,000	10,000	Sweden	41,093,249	2,409,000
India	2,000,000	0	Switzerland	4,018,000	2,000,000
Indonesia	25,000	0	Thailand	10,000	0
Ireland	11,903,360	100,000	Turkey	0	25,000
Italy	0	4,284,000	United Kingdom	70,000,000	5,000,000
Japan	0	5,000,000	United States	10,000,000	6,200,000
Kazakhstan	25,000	0	Vatican City	0	70,000
DPR Korea	5,000,000	50,000	**Other Organizations**		
Kuwait	200,000	0	Hyogo Prefecture, Japan	850,211	0
Libya	0	5,000			
Liechtenstein	100,000	7,000	Disaster Resource Network	10,000	0
Luxembourg	4,000,000	100,000			
Malaysia	0	20,000	**Total Pledges**	**254,845,586**	

Source: Central Emergency Response Fund, 2006. (For current information on CERF donations, visit http://ochaonline2.un.org/Default.aspx?tabid=7483.)

funded. If a future pledge for funding has been promised by a donor or if the agency has other means for repaying the loan, this information is included in the request.

2. An OCHA officer reviews the request. If it is accepted (statistics show that the majority are accepted), the ERC informs the agency and sets out the loan use and repayment terms.

3. Disbursement usually occurs within 72 hours. Payment is made through an internal UN "voucher."

4. Loans must be repaid within six months.

This entire process is conducted at OCHA's New York office. Between 1992 and 2005, $337.4 million was borrowed from CERF, of which $308.1 million has so far been repaid. The fund has been accessed over 200 times by 18 UN agencies. Figure 10-4 illustrates patterns of use by these agencies.

THE CONSOLIDATED APPEALS PROCESS (CAP)

The Consolidated Appeals Process (CAP), which began in 1991, allows humanitarian aid organizations to plan, implement, and monitor their activities. These organizations can work together to produce a Common Humanitarian Action Plan (CHAP—see below) and an appeal for a specific disaster or crisis, which they present to the international community and donors.

The CAP fosters closer cooperation between governments, donors, aid agencies, and many other types
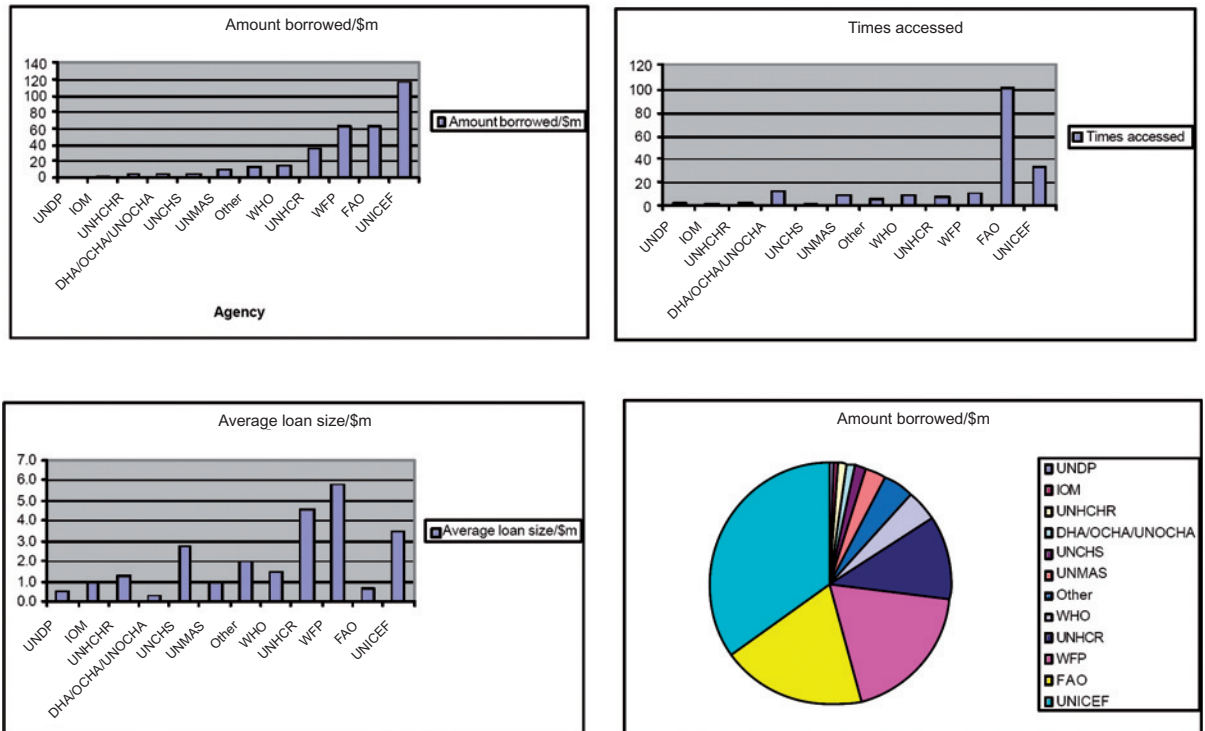
FIGURE 10-4   Use of CERF, 1992–2005. (*Source:* Willits-King and Faint, 2005.)

of humanitarian organizations. It allows agencies to demand greater protection and better access to vulnerable populations, and to work more effectively with governments and other actors. The CAP is initiated in three types of situations:

1. When there is an acute humanitarian need caused by a conflict or a natural disaster
2. When the government is either unable or unwilling to address the humanitarian need
3. When a single agency cannot cover all the needs

The CAP is led by the Humanitarian Coordinator (HC), who triggers the interagency appeal and collaborates with the IASC Country Team at the local level and the Emergency Relief Coordinator (ERC) at headquarters. Participants in the process include:

- *IASC.* Although all team members are encouraged to participate in CHAP development, some members may make appeals for funding outside of the UN and its CAP (as is often the case with the Red Cross).
- *Donors.* Donors participate in CHAP development by committing to "Good Humanitarian Donorship principles."
- *Host government(s).* The CAP is best prepared in consultation with the host government, in particular the ministries the UN operational agencies are working with on a day-to-day basis.
- *Affected population(s).* Whenever possible, it is always advantageous to include the affected populations' perspective into relief and recovery planning.

A Consolidated Appeal (CA) is a fundraising document prepared by several agencies working to outline annual financing requirements for implementing a CHAP. Although governments cannot request funding through the CA, NGOs can as long as their proposed project goals are in line with CHAP priorities. The CA is usually prepared by the HCs in September or October, and then launched globally by the UN Secretary General at the Donor's Conference held each November. The CA lasts as long as is nec-

essary for funding purposes, usually one year or more. The sectors that may be considered by the CA include:

- Agriculture
- Coordination and support services
- Economic recovery and infrastructure
- Education
- Family shelter and non-food items
- Food
- Health
- Mine action
- Multisector
- Protection/human rights/rule of law
- Security
- Water and sanitation

The process for filing a CA is as follows:

1. At the onset of the emergency, a Situation Report is issued (can cover from day 1 to week 2).
2. In the meantime, a Flash Appeal may be prepared and launched (covers week 2 to month 6).
3. Finally, a Consolidated Appeal may be issued.

If the situation and needs in the field change, a revision to any part of an appeal can be issued at any time. Additionally, projects can be added, removed, or modified within the appeal at any time.

Approximately 80% of 2004 and 2005 CAP and Flash Appeal funding came from a small group of wealthy nations, including Canada, the European Community Humanitarian Office (ECHO) and the European Commission, Germany, Japan, the Netherlands, Norway, Sweden, the United Kingdom, and the United States. In addition, private donors constituted a large percentage of 2005 donations due to the high-profile nature of the tsunami disaster (see Figures 10-5 and 10-6). The United States was by far the largest supporter in both 2004 and 2005 in pure dollar terms, contributing 24% and 33% during the two years.

The **Common Humanitarian Action Plan (CHAP)** is a strategic plan developed by agencies working together at the field level that assesses needs in an emergency and coordinates response. The CHAP
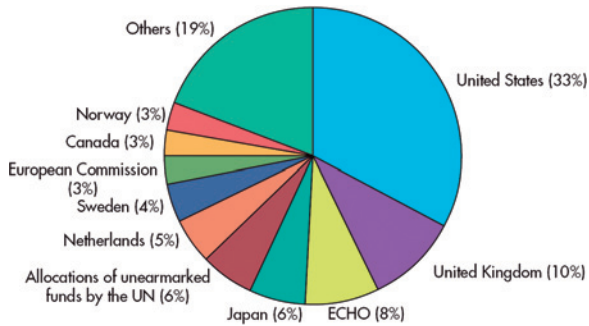
FIGURE 10-5   CAP appeals by donor, 2004. (*Source:* Development Initiatives, 2005.)
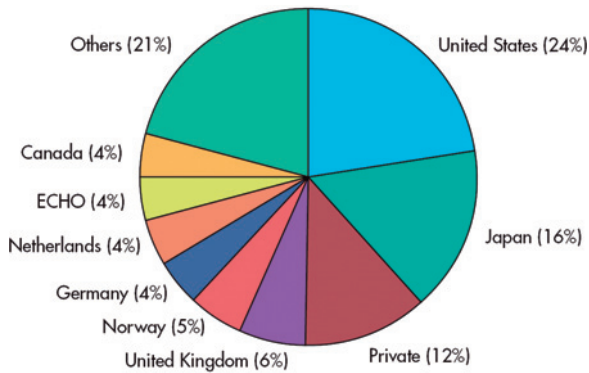
FIGURE 10-6   CAP appeals by donor, 2005. (*Source:* Development Initiatives, 2005.)

acts as the foundation for a CA, and includes the following information:

1. Common analysis of the context for humanitarian assistance
2. Needs assessment
3. Best, worst, and most likely scenarios
4. Identification of roles and responsibilities (who does what, and where)
5. Clear statement of long-term objectives and goals
6. Framework for monitoring strategy and revising as necessary

A flash appeal is a special kind of CA, designed for structuring a coordinated humanitarian response for the first three to six months of an emergency. Whenever a crisis or natural disaster occurs, the UN HC may issue a Flash Appeal in consultation with all stakeholders involved in the humanitarian response (including the affected government). It is normally issued between the second and fourth weeks of the response, and provides a concise overview of urgent life-saving needs. It may also include early recovery projects if they can be implemented within the appeal's time frame.

Since 1992, over 240 consolidated and flash appeals have been launched, collectively raising over $29 billion for NGOs, IOM, and UN agencies (see Exhibits 10-8 and 10-9).

EXHIBIT 10-8   CAP Quick Facts

1. The CAP is an inclusive and coordinated program cycle to analyze context, assess needs, and plan prioritized humanitarian response, under the leadership of Humanitarian Coordinators and in close consultation with governments.
2. The IASC Sub-Working Group on the CAP has now developed policy and guidance to strengthen the analysis of needs and to prioritized projects. Guidance on strategic monitoring is now being elaborated.
3. Over 100 NGOs, IFRC, IOM, and 20 UN agencies were part of the CAP in 2005.
4. By citing their activities and budgets in appeals, aid agencies can enhance advocacy on behalf of people in need.
5. The Financial Tracking Service enables the aid community—agencies and donors—to be more accountable.
6. 240 Consolidated Appeals and Flash Appeals have helped raise almost $29 billion for NGOs, IOM, and UN agencies since 1992.

Source: UNOCHA, 2005.

EXHIBIT 10-9   **2004 Asia Tsunami Flash Appeal Donors Conference News Release, January 11, 2005**

Representatives from 70 countries, both donors and victims of last month's devastating Indian Ocean tsunami, met in Geneva today to allocate the nearly $1 billion UN flash appeal, with top emergency officials pleading with contributors to stand by their pledges while not forgetting the world's other crises.

The conference will determine priority needs for the next six months and UN Emergency Relief Coordinator Jan Egeland told a news briefing the UN already had concrete commitments today from donors for $717 million out of the $977 million appeal. "This has never ever happened before that two weeks after a disaster, we have $717 million that we can spend on the immediate emergency relief effort," he said. "I expect from hearing the very generous pledges additionally that we will have 100 per cent coverage of this emergency appeal."

But he stressed that the world needs to agree that it is as terrible to starve in Darfur, Sudan, as it is to starve on the beaches of a tsunami-stricken nation, referring to the Sudanese region where conflict over nearly two years has displaced 1.65 million people in what the UN has called the world's worst humanitarian crisis.

Pledges so far for overall tsunami relief are put at between $3 billion and $4 billion for a disaster that has killed 160,000, injured more than a half million people, and left up to 5 million lacking basic services in a dozen countries, with hundreds of thousands at risk of deadly epidemics due to lack of clean drinking water, medicines, and sanitation. "There was also a very strong commitment by the conference, not only the affected countries but also the donor countries, to strengthen early warning, preparedness, and prevention efforts," Mr. Egeland said. "We can never ever again have this kind of a catastrophe in the world where a dozen countries were taken aback and millions of people were taken aback in this manner. We have to get a system going to avoid a repeat of such a disaster."

Noting that today was also the start of the UN's overall 2005 humanitarian appeals, Mr. Egeland called these, if anything, even more important than the one for the tsunami since they involved life-saving assistance to more than 20 million people in disaster-stricken areas around the world. If it is agreed that human life is worth the same, then there should be the same generosity to all in need, he said. The world has never been richer and it should thus be possible to feed those 20 million people as well.

Returning to another theme that UN officials have been stressing almost since the tsunami disaster occurred on 26 December, Mr. Egeland appealed to donors to deliver all the money they have pledged, aware that this has not been the case in previous disasters such as Hurricane Mitch in Central America in 1998, when billions of dollars were pledged but much less actually received. He said that during dramatic natural disasters, there was a disproportion between generous pledges and actual money delivered to the victims. The UN wants to be held accountable as agencies working on the ground and it wants donors to be held accountable for the promises made, he added.

Source: UN News Center, 2005.

OTHER UN AGENCIES INVOLVED IN DISASTER RESPONSE

In addition to the UN agencies discussed above, which tend to be the primary agencies involved in all forms of disaster management, a handful of organizations provide more focused assistance as deemed necessary in most disasters that require international participation. As illustrated in Figure 10-7, which details UN assistance to the various countries affected by the December 2004 Asian tsunami and earthquake events, a different mix of UN assistance is needed in each country, even within the same international disaster scenario. Several of these organizations are detailed below.

- *International Labour Organization (ILO).* Works with the affected population to address issues related to employment, including job creation, skills training, employment services, small business assistance, and other functions (see Exhibit 10-10) www.ilo.org
- *International Organization for Migration (IOM).* Provides rapid humanitarian aid to displaced populations by supplying emergency shelter,
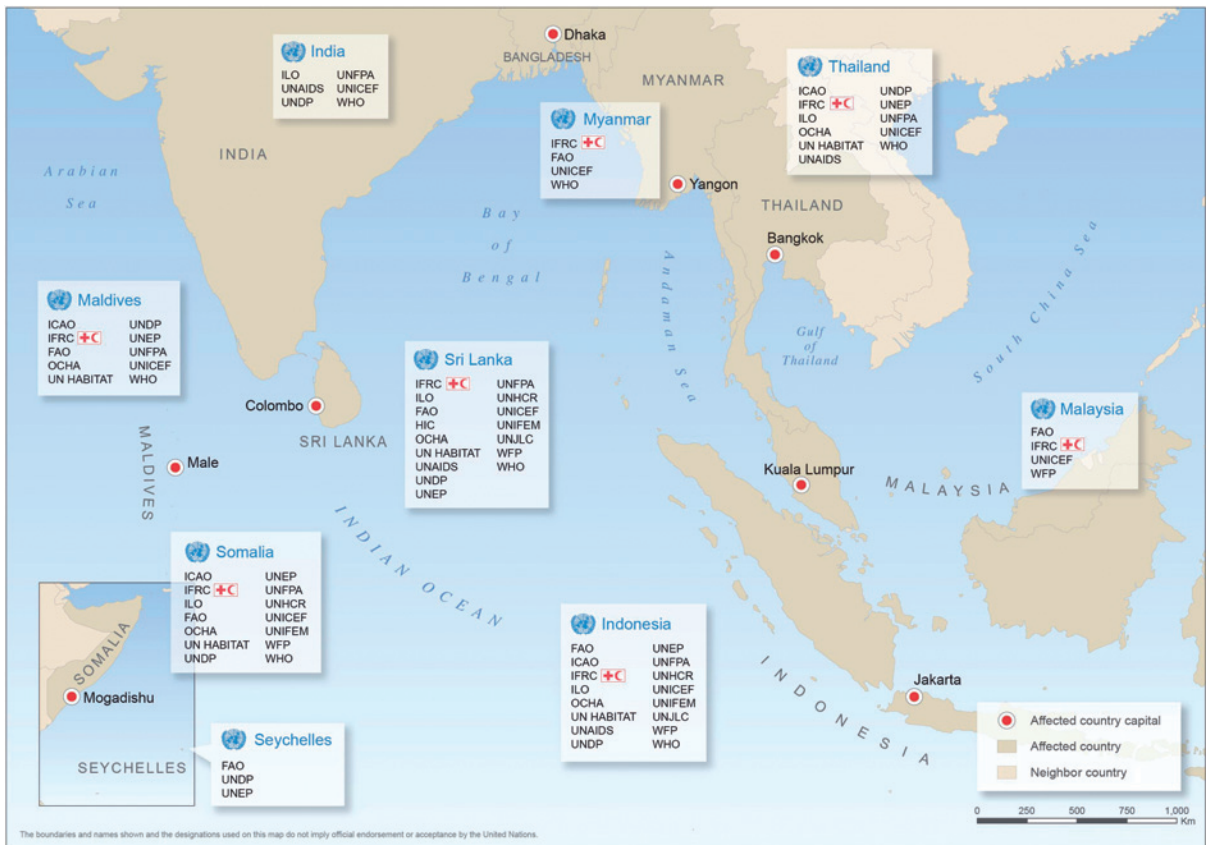
FIGURE 10-7   UN assistance to countries affected by the December 2004 Asian tsunami and earthquake events. (*Source:* ReliefWeb, 2005.)

EXHIBIT 10-10   ILO Press Release—"Some 1.1 Million Jobs May Have Been Lost in Pakistan Due to Quake"

More than 1.1 million jobs may have been lost as a result of the south Asian earthquake that devastated parts of Pakistan, the International Labour Office (ILO) said today, adding that productive and labor-intensive job creation programs are urgently needed to lift millions of people out of poverty that has been aggravated by quake damage.

"Reports of widespread destruction show that the livelihoods of millions of people are threatened or have been destroyed," said ILO Director-General Juan Somavia. "As humanitarian and reconstruction efforts proceed, we must begin working immediately to ensure that initiatives are established to monitor and create decent and productive employment and rebuild peoples' livelihoods."

An initial assessment conducted in the days following the south Asian earthquake on 8 October indicated that it caused the widespread destruction of most infrastructure and shops in the affected towns in the region—including the North West Frontier Province (NWFP) and Pakistan-administered Kashmir, with heavy loss of livestock and agricultural implements required for income generation in the rural areas. The assessment added that residents of the badly afflicted parts of Pakistan would require "substantial support to rebuild their income-generating prospects."

Compounding the devastation was the fact that the areas affected are amongst the poorest in Pakistan, the ILO said. The ILO estimates that total employment in the affected areas was around 2.4 million at the time of the disaster and that over 2 million of these workers and their families were living below the poverty line of less than US $2 per person per day before the disaster struck.

Prior to the earthquake, each employed person in the region also supported on average more than two additional dependents, the ILO said, adding, "this means that the 1.1 million workers who lost their employment not only provided their own livelihoods, but also the livelihoods of an additional 2.4 million people, over half of whom were estimated to be under the age of 15."

"Reviving the rural economy where most people in the affected areas live and work is both urgent and challenging," the initial assessment said. "Prior to the earthquake, over 1.4 million workers in the area were engaged in agricultural activities, an estimated 40% or more of whom are now without work. Livestock which provides essential dairy products and the animal power to cultivate the land has also suffered badly."

The ILO assessment also noted that while the medium- and small-sized towns in the area that provided jobs and incomes to almost a third of the population lie in ruins, the informal economy where most people worked in the urban areas had also been destroyed. Rebuilding the minimum of assets to revive the urban informal economy requires urgent support, the ILO said.

In total, the ILO estimates that around 730,000 workers were employed in the service sector (many in the informal economy), while 230,000 worked in industry (comprised of construction, manufacturing, utilities, and mining). Taken together, more than half of these workers have likely lost one of their primary sources of income.

In order to meet the needs of the population in the afflicted areas, the ILO urged that programs aimed at generating new employment and other income-producing opportunities be incorporated into the rehabilitation and reconstruction programs that will need to be immediately undertaken following the relief efforts now underway.

These would include employment support services to provide both information and short-term training for the jobs that will be generated through the reconstruction effort; financial and institutional

support to rebuild small businesses and income-generating assets in both the rural and urban areas; channeling of financial support from the outside world, including remittances from overseas toward meeting urgently needed basic services; and the creation of institutional mechanisms to ensure that this happens.

"Rebuilding the basic infrastructure—roads, utility services, schools and hospitals—can create employment," Mr. Somavia said. "This means ensuring that decent and productive yet labor-intensive methods are utilized."

Such programs would include:

- Identifying and registering the affected population who have lost their livelihoods
- Recording and classifying job seekers and allocating workers to reconstruction efforts in need of skilled labor
- Developing local capacities to implement emergency employment services
- Linking unemployed people with available work opportunities
- Assisting in restoring the capacity of local government to provide basic services needed by the population and to coordinate rebuilding efforts during both emergency and post-emergency phases
- Assisting in the rehabilitation and reconstruction of public infrastructure with focus on employment-intensive approaches to maximize job opportunities for local population
- Providing short-term skills training for men and women from severely affected households to be able to be engaged in reconstruction effort

- Providing skills training and micro-business management training to regenerate immediately needed employment and livelihood opportunities for severely affected households

Proposals covering all these elements have been included in a US$272 million flash appeal launched by the UN.

The ILO also cautioned that the earthquake could aggravate the already vulnerable position of children, many of whom may be left orphaned, homeless, and out of school in the wake of the disaster, and force them to seek alternative forms of support. In addition, women and youth in the region have traditionally found it particularly difficult to find decent employment opportunities and to secure a life outside of poverty. Without immediate help, poverty among these groups will grow, leaving thousands more young people and women with little hope for the future, the assessment report said.

"Working in the aftermath of this earthquake is not going to be easy," Mr. Somavia said. "These are proud people who have over generations fought against the region's difficult terrain to earn for themselves and their families a better living. Much of their hard-won assets have been destroyed. What is needed urgently is to monitor and support the creation of decent jobs and livelihoods in the future. The ILO stands ready to play its part in a global effort, along with the national authorities, to assist families and communities in rehabilitating the region, rebuilding lives, and restoring hope."

Source: ILO, 2005.

transporting relief materials, and assisting in medical evacuations. Stabilizes populations through the provision of short-term community and microenterprise development programs. IOM also actively supports governments in

the reconstruction and rehabilitation of affected communities by being the lead service provider of
◦ Transitional shelters
◦ Healthcare services

○ Countertrafficking activities
○ Psychosocial activities
○ Capacity building for disaster
○ Transportation and logistics
○ Registration and information management of affected populations

Finally, IOM returns and reintegrates both internally displaced persons and demobilized combatants. www.iom.int

- *International Telecommunications Union (ITU).* Concerned with increasing the role of telecommunications in disaster situations. www.itu.int

- *World Meteorological Organization (WMO).* The specialized UN agency for meteorology, operational hydrology, and related geophysical sciences. WMO plays a leading role in international efforts to monitor and protect the environment. For instance, in collaboration with UN agencies and the National Meteorological and Hydrological Services, WMO supports the implementation of relevant conventions such as the UN Framework Convention on Climate Change, the International Convention to Combat Desertification, and the Vienna Convention on the Protection of Ozone Layer and its Protocols and Amendments. In the specific case of weather-, climate-, and water-related hazards, which account for nearly 90% of all natural disasters, WMO's programs provide advance warnings to help save lives and reduce damage to property and the environment. WMO also contributes to reducing the impacts of man-made disasters, such as those associated with chemical and nuclear accidents, forest fires, and volcanic ash. Several of WMO's scientific and technical programs related to disaster management include:
  ○ *The WMO World Weather Watch Programme.* Coordinates the preparation and distribution of weather, climate, and hydrological data, analyses, and forecast products to all nations
  ○ *The WMO Tropical Cyclone Programme.* Promotes the establishment of national and regionally coordinated systems to ensure effective preparedness so that the loss of life and damage caused by tropical cyclones and associated phenomena are reduced to a minimum
  ○ *The WMO Public Weather Services Programme.* Supports national meteorological and hydrological services in disaster reduction planning by providing routine forecasts and information to enhance nations' social and economic well-being.
  ○ *The World Climate Programme.* Provides an authoritative international scientific voice on climate, climate variations, and climate change. It has provided advanced climate database management systems to many countries, with applications in several areas of disaster mitigation, especially drought.
  ○ *The WMO World Weather Research Programme.* Aims to develop improved and cost-effective techniques for forecasting high-impact weather and promote their applications among countries
  ○ *The Hydrology and Water Resources Programme.* Assists the national hydrological services of member countries to assess risk and forecast water-related hazards, in particular major floods and droughts
  www.wmo.ch/

- *Joint United Nations Programme on HIV/AIDS (UNAIDS).* The mission of UNAIDS is to lead, strengthen, and support an expanded response to HIV and AIDS, including preventing the transmission of HIV, providing care and support to those already living with the virus, reducing the vulnerability of individuals and communities to HIV, and alleviating the impact of the epidemic. In times of humanitarian crisis, whether natural, man-made, or conflict-related, UNAIDS works with victims to protect them from the kinds of violence and activity that spreads HIV. In 2001, the UN General Assembly held a special session on HIV/AIDS and declared that the UN would,

through UNAIDS, "develop and begin to implement national strategies that incorporate HIV/AIDS awareness, prevention, care, and treatment elements into programs or actions that respond to emergency situations, recognizing that populations destabilized by armed conflict, humanitarian emergencies, and natural disasters, including refugees, internally displaced persons, and in particular, women and children, are at increased risk of exposure to HIV infection; and, where appropriate, factor HIV/AIDS components into international assistance programs" (PAHO, n.d.) www.unaids.org

• *United Nations Population Fund (UNFPA).* UNFPA works to "promote the right of all individuals to develop to their fullest potential" (UNFPA, n.d.) by providing access for all people, especially women, to information and services on reproductive health, including family planning and sexual health, with the goal of helping them to make informed and voluntary choices and decisions. During humanitarian crises, there is often a demand for reproductive health services although distribution and healthcare systems have broken down. UNFPA works closely with its humanitarian relief partners to support early and effective action to meet the reproductive health needs of refugees, internally displaced persons, and others caught in crisis situations. Supply shortages compound health risks in already dangerous situations and are a major obstacle to reproductive health in emergencies. Existing supplies may fall far short of demand when large numbers of people move into a safer location. Supplies, equipment, and medicine are organized and stored by UNFPA for immediate distribution when an earthquake, flood, violent conflict, or other crisis arises. A rapid-response fund enables UNFPA to mount a quick response to emergencies, especially in the initial stages. Supplies are packaged in 12 different emergency reproductive health kits. Once an emergency situation stabilizes, the procurement of repro-

ductive health materials becomes a regular part of a more comprehensive healthcare program. www.unfpa.org

• *United Nations Human Settlement Programme (UN-HABITAT).* UN-HABITAT is mandated by the UN General Assembly to "promote socially and environmentally sustainable towns and cities with the goal of providing adequate shelter for all" (UNHABITAT, 2003). UN-HABITAT is mandated through the Habitat Agenda (a global settlement plan adopted in June 1996 by the international community) to take the lead in mitigation, response, and postdisaster rehabilitation capabilities in human settlements. The Habitat Agenda clearly outlines the link between human settlement development and vulnerability to disasters. In addition, it emphasizes the need for coordination and close partnerships with national and local governments, as well as civil society. Finally, the Habitat Agenda recognizes the strong impact disasters have on women, and affirms the need for women's active involvement in disaster management. These steering principles underpin all normative and operational activities of the UN-Habitat Disaster Management Programme (DMP). DMP operates under the Disaster, Post-Conflict and Safety Section, Urban Development Branch. It was created to marshal the resources of UN-HABITAT and other international agencies to provide local government, civil society, and the private sector with practical strategies for mitigating and recovering from conflicts and natural disasters in the context of human settlements. Specific areas of attention include:

  ○ Protecting and rehabilitating housing, infrastructure, and public facilities
  ○ Providing technical and policy support to humanitarian agencies before and after crisis in the context of human settlements
  ○ Building partnerships and providing complementary expertise in resettlement of displaced persons and refugees

○ Restoring local social structures through settlement development
○ Rehabilitating local government structures and empowering civil society
○ Land and settlements planning and management for disaster prevention

UN-HABITAT has created a new Disaster, Post-Conflict and Safety Section (DPCSS) to address the increasing demand from countries for technical support, policy tools, and field operational capacity in disaster prevention, mitigation, and rehabilitation of human settlements and issues related to urban safety. The risk and disaster management program was established to strengthen UN-HABITAT's abilities to deliver technical cooperation and capacity-building services. The focus is on direct country support, with the objective of helping human settlements reduce their vulnerability and better manage the effects of disasters and conflict. It provides support to national governments, local authorities, and communities in close cooperation with technical cooperation units and other specialized programs. Specific program activities deliver direct support to national and local partners through:

○ Technical advisory missions responding to requests by governments and external support agencies
○ Execution of assessments in disaster-prone countries and postconflict situations
○ Identification, design, technical support, and follow-up of operational projects in response to country requests
○ Participation in donor consultations for the provision of external support to disaster-affected countries
○ Assessment of global and regional expressions of need related to hazardous conditions or disaster risks and human settlements management, including the design and implementation of global and regional projects
www.unhabitat.org

• *United Nations Environmental Program (UNEP).* UNEP is the UN agency focused on the protection of the environment and wise use of natural spaces. UNEP has several divisions that address global emergency and disaster management needs, such as the Division of Early Warning and Assessment, the Post Conflict Assessment Unit, the Collaborating Centre on Water and Environment, and the Global Reporting Initiative. Together, these offices provide the UN system with a comprehensive environmental monitoring and hazard safety capability. In particular, UNEP's Division of Technology, Industry, and Economics has a designated disaster management function. The goal of its International Environmental Technology Center (IETC) disaster management efforts is to strengthen the relationships between environmental management and disaster preparedness. IETC's objectives are to:

○ Identify the causes and effects of disaster with specific reference to the environment
○ Develop environment management strategies that will help reduce the vulnerability of high-risk communities to disasters
○ Mainstream environmental management practices for disaster mitigation within the overall perspective of poverty alleviation
○ Implement pilot projects and demonstrations of effective strategies in developing countries

• One of the key themes that IETC focuses upon is disaster debris and waste management strategies.

UNEP maintains a program called Awareness and Preparedness for Emergencies at a Local Level (APELL), which is based out of the UNEP Industry and Environment Office in Paris. It serves as a tool for disaster prevention and preparedness and raises public awareness of the need to reduce environmental emergencies and damage. It seeks to minimize the occurrence and harmful effects of technological accidents and emergencies resulting from human activity or as the consequence of natural disasters, particularly in developing countries. www.unep.org/

- *United Nations Educational, Scientific, and Cultural Organization (UNESCO).* UNESCO's goal is to contribute to the peace and security of the world through education, science, and culture. UNESCO has been involved in disaster management for decades. The organization advocates for the need for a shift in emphasis from relief and emergency response to prevention and increased preparedness and education of potentially affected populations. It strongly supports the design and dissemination of mitigation measures, as well as public education and awareness. UNESCO works to increase the role of academic and research sectors in creating risk and vulnerability reduction measures, and supports existing and new institutions through financial and material support. UNESCO proclaims that their function in regards to disaster management is "to promote a better understanding of the distribution in time and space of natural hazards and of their intensity, to set up reliable early warning systems, to devise rational land-use plans, to secure the adoption of suitable building design, to protect educational buildings and cultural monuments, to strengthen environmental protection for the prevention of natural disasters, to enhance preparedness and public awareness through education and training communication and information, to foster post-disaster investigation, recovery and rehabilitation, to promote studies on the social perception of risks" (UNESCO, 2004) www.unesco.org
- *United Nations Development Fund for Women (UNIFEM).* UNIFEM provides financial and technical assistance to innovative programs and strategies to foster women's empowerment and gender equality. During times of disaster, UNIFEM helps to provide for the unique needs that women normally experience as a vulnerable population (see Exhibit 10-11). www.unifem.org
- *United Nations Institute for Training and Research (UNITAR).* UNITAR was created to provide training and research within the UN system, with the goal of increasing the effectiveness

of all UN programs. In recent years, more of these efforts have focused upon the four phases of disaster management, addressing many related topics such as climate change, hazardous materials and pollution, land use, and biodiversity. www.unitar.org

THE UN INTERNATIONAL STRATEGY FOR DISASTER REDUCTION (ISDR)

The international community, through the efforts of the UN, named the 1990s the International Decade for Natural Disaster Reduction in order to increase awareness of the importance of risk reduction. Following the positive advances by the UN and member governments during this time, the UN General Assembly voted to further their successes by creating the International Strategy for Disaster Reduction (ISDR).

ISDR helps nations and organizations design communities to be "disaster resilient" by espousing the idea that disaster reduction must be fully interlinked with development. ISDR seeks to reduce disasters' human, social, economic, and environmental toll that plagues rich and poor countries. In order to achieve these goals, the ISDR promotes four objectives as tools toward reaching "disaster reduction for all":

- *Increase public awareness about risk, vulnerability, and disaster reduction*. The more people, regional organizations, governments, nongovernmental organizations, UN entities, representatives of civil society, and others know about risk, vulnerability, and how to manage the impacts of natural hazards, the more disaster reduction measures will be implemented in all sectors of society.
- *Obtain commitment from public authorities to implement disaster reduction policies and actions*. The more decision makers at all levels commit themselves to disaster reduction policies and actions, the sooner communities vulnerable to natural disasters will benefit from applied

EXHIBIT 10-11   UNIFEM Press Release—"Asian Tsunami: UNIFEM Calls for Greater Role of Women in Recovery and Reconstruction Efforts"

Women survivors of the tsunami that struck in December 2004 are demanding a greater role in the recovery and reconstruction efforts underway in the affected countries. For years at the forefront of survival strategies that sustained their families and communities during conflict, women assumed critical roles in the tsunami emergency response effort, taking in relatives and children orphaned by the tsunami, offering care and support within camps and shelters for grieving survivors, and participating in aid and healthcare distribution and evacuation of the dead. As tsunami-affected communities transition from the emergency to the reconstruction phase, however, women's participation is lacking in the planning and implementation of recovery and rebuilding processes.

In two of the severely affected areas, Aceh, Indonesia, and Sri Lanka, UNIFEM and its local partners have been working to mobilize women's networks to identify the needs and concerns of women survivors and ensure that a gender perspective is incorporated in reconstruction processes. Two major women's meetings, one in Aceh and the other in Colombo, Sri Lanka, have taken place in the last two months, gathering hundreds of women to discuss their concerns and articulate their role in the recovery and rebuilding phase. The meetings follow on visits by Noeleen Heyzer, executive director of the UN Development Fund for Women (UNIFEM), to Aceh and Sri Lanka to hold consultations with various women's groups at the grassroots level in preparation for the meetings.

"Women must be at the heart of the recovery process. For decades, they have been the lifeline of their communities, leading survival systems and mutual-aid networks, including among the internally displaced and refugee communities. Women are not just victims, they are survivors, and they

need to be part of the solution," she said. "The reweaving of the social fabric of life is the foundation for reconstruction and a necessary part of the healing process. It is women, in their families and their communities, who are playing this role."

According to Heyzer, women on the ground identified four critical issues: the urgent need to reestablish livelihoods; the issue of land titles and ownership, including inheritance rights, particularly in the case of children who lost their entire family; the creation of adequate settlements and housing, and the lack of gender sensitivity in the planning and management of temporary barracks; and the need for more opportunities for women to interact with local and national authorities and participate in decision making to engage with the reconstruction process.

Recommendations put forward at the meetings are being submitted at the highest policy levels with the support of UNIFEM and other partners. At the same time, women's groups are being supported to undertake advocacy activities, to ensure that their voices are heard at local and national decision-making levels, especially in critical policy decisions affecting livelihoods, land rights, shelter, and recovery.

Sri Lankan women stressed the need to address access to recovery programs—in many instances, although they received relief supplies in the form of goods, they were not able to get access to recovery grants since these were only provided to men as heads of households. Without cash to start over, it would be difficult for them to rebuild their livelihoods. Many also complained of a lack of access to information, and the threat of losing land or property rights given the loss of deeds and personal documents during the tsunami. In the eastern part of Sri Lanka, women are particularly concerned that customary laws that give women equal rights to land

and inheritance may be lost in the new legal regime being designed.

In Aceh, women put at the top of their list of recommendations the reestablishing of Balai Inong, or "women's house." Before the tsunami, every village in Aceh had a Balai Inong where women could meet to network, convene, and work together on projects. According to the women, starting up these women's houses in villages again would be an effective way to ensure that women's concerns were being heard, while also providing a safe space for women to grieve, share experiences, and develop skills to sustain their livelihoods.

Based on the priorities and concerns identified by women, UNIFEM is concentrating its efforts in the tsunami-affected areas on leadership, livelihoods, and protection. Activities include identifying the specific needs of women, and female-headed households in particular, and advocating for an adequate response to these within the reconstruction process; supporting women's organizations in their efforts to engage in the reconstruction process; and building the capacity of partners to include a gender perspective in program design and implementation by national authorities, the UN system, international NGOs, and multilateral and bilateral organizations.

Source: UNIFEM, 2005.

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disaster reduction policies and actions. This requires, in part, a grassroots approach whereby communities at risk are fully informed and participate in risk management initiatives.

- *Stimulate interdisciplinary and intersectoral partnerships, including the expansion of risk reduction networks*. The more disaster reduction entities share information on their research and practices, the more the global body of knowledge and experience will progress. By sharing a common purpose and through collaborative efforts, the world's nations will be more resilient to natural hazards impacts.
- *Improve scientific knowledge about disaster reduction*. The more we know about the causes and consequences of natural hazards and related technological and environmental disasters on societies, the more we are able to be better prepared to reduce risks. Bringing the scientific community and policy makers together allows them to contribute to and complement each other's work (ISDR, 2001).

The ISDR works with many different UN agencies and outside organizations, as administered by the Inter-Agency Task Force on Disaster Reduction (IATF/DR) and the Inter-Agency Secretariat of the ISDR (UN/ISDR) (see Figures 10-8 and 10-9). These two bodies were formed by the UN General Assembly through UN Resolutions 54/219 and 56/195 to implement ISDR.

Inter-Agency Task Force for Disaster Reduction (IATF/DR)

The **IATF/DR** is the principal body for the development of disaster reduction policy. The Task Force is led by the UN Under Secretary General for Humanitarian Affairs and is composed of representatives from 25 UN, international, regional, and civil society organizations. Task force working groups bring together specialists and organizations to address issues relevant to disaster management, such as climate change, early warning, vulnerability, and risk analysis, among many others. In 2005, the IATR/DR task force

International Strategy for Disaster Reduction
(see next page)
The strategy should be implemented in a cross-sectoral and inter-disciplinary way and serve as an international platform for disaster reduction

IMPLEMENTATION

INTER-AGENCY TASK FORCE:
- *To serve as the main forum within the UN System for devising strategies and policies for the reduction of natural disasters;*
- *To identify gaps in disaster reduction policies and programmes and recommend remedial action;*
- *To ensure complementarity of action by agencies involved in disaster reduction;*
- *To provide policy guidance to the secretariat; and,*
- *To convene ad hoc meetings of experts on issues related to disaster reduction.*

ISDR SECRETARIAT:
- *To serve as the focal point within the UN system for the coordination of strategies and programmes for natural disaster reduction, and to ensure synergy between disaster reduction strategies and those in the socio-economic and humanitarian fields;*
- *To support the inter-agency task force in the development of policies on natural disaster reduction;*
- *To promote a worldwide culture of reduction of the negative effects of natural hazards, through advocacy campaigns;*
- *To serve as an international clearing house for the dissemination and exchange of information and knowledge on disaster reduction strategies; and*
- *To backstop the policy and advocacy activities of national committees for natural disaster reduction.*

WORKING GROUPS

ANNUAL STRATEGIC PLANS OF ACTION / WORKPLANS

INITIATIVES BY TASK FORCE MEMBERS

ACTIVITIES OF A SUBSTANTIVE NATURE BY THE ISDR SECRETARIAT

FIGURE 10-8   Overall structure of the ISDR. (*Source:* UNISDR, 2001.)

VISION
To enable all societies to become resilient to natural hazards and related technological and environmental disasters, in order to reduce environmental, human, economic, and social losses

Objective 1:
Increasing **public awareness**

Objective 2:
Obtaining **Commitment from public authorities**

Objective 3:
Stimulating interdisciplinary and inter-sectoral **partnership** *and expanding risk reduction* **networking** *at all levels*

Objective 4:
Improving further the **scientific knowledge** *of the causes of disasters and the effects of natural hazards and related technological and environmental disasters on societies*

ISSUES TO BE ADDRESSED:
1. *Public information*
2. *Education*
3. *Training*

ISSUES TO BE ADDRESSED:
1. *Allocation of resources*
2. *Funding mechanisms*
3. *Agenda 21*
4. *Natural resources management*
5. *Risk-management strategies*
6. *Inter-sectoral coordination at all levels*

ISSUES TO BE ADDRESSED:
1. *Coordination mechanisms*
2. *Sustainable Development*

ISSUES TO BE ADDRESSED:
1. *Allocation of resources*
2. *Funding mechanisms*
3. *Agenda 21*
4. *Natural resources management*
5. *Risk-management strategies*
6. *Inter-sectoral*

AREAS OF COMMON CONCERN
- *Recognition of the special vulnerability of the poor;*
- *Environmental, social and economic vulnerability assessment;*
- *Ecosystems management;*
- *Land use management and planning;*
- *National, regional and international legislation with respect to disaster reduction.*

MODALITIES
- *Advocacy;*
- *Coordination;*
- *Horizontal exchanges of information, knowledge and experiences;*
- *Mainstreaming disaster reduction in sustainable development and in national planning process;*
- *Regional and national capacity building with special emphasis on developing countries.*

MANDATED TASKS: EL NINO AND EARLY WARNING

FIGURE 10-9   Detail of the ISDR. (*Source:* UNISDR, 2001.)

working groups included Climate and Disasters (chaired by WMO); Early Warning (chaired by UNEP); Risk, Vulnerability and Impact Assessment (chaired by UNDP); and Wildland Fires (chaired by the Global Fire Monitoring Center, Freiburg, Germany).

The mandated functions of IATF/DR are:

- To serve as the main forum within the UN system for devising strategies and policies for the reduction of natural hazards
- To identify gaps in disaster reduction policies and programs and recommend remedial action
- To ensure complementarities of action by agencies involved in disaster reduction
- To provide policy guidance to the ISDR Secretariat
- To convene ad hoc meetings of experts on issues related to disaster reduction

The Inter-Agency Secretariat of the ISDR (UN/ISDR)

The **UN/ISDR** serves as the UN system's focal point for disaster reduction activities in the socioeconomic, humanitarian, and development fields, as well as supporting policy integration. It functions as a clearinghouse for disaster reduction information, campaigns to raise hazard awareness, and produces articles, journals, and other publications and promotional materials related to disaster reduction. The functions and responsibilities of UN/ISDR are:

- To serve as the focal point within the UN system for the coordination of strategies and programs for natural disaster reduction, and to ensure synergy between disaster reduction strategies and those in the socioeconomic and humanitarian fields
- To support the interagency task force in the development of policies on natural disaster reduction
- To promote a worldwide culture of reduction of the negative effects of natural hazards, through advocacy campaigns
- To serve as an international clearinghouse for the dissemination and exchange of information and knowledge on disaster reduction strategies

- To support the policy and advocacy activities of national committees for natural disaster reduction.

REGIONAL INTERNATIONAL ORGANIZATIONS

The UN is the only global international organization of its kind. It is not, however, the only governing organization made up of several national governments. Many of the world's regions have pooled their collective resources and services to create large, influential organizations.

Like the UN, these organizations address issues of regional and global importance, many of which focus on or peripherally address disaster management. In times of disaster, both within and outside of their regions of concern, they bring much of the same financial, technical, and equipment resources discussed throughout this book. This section will identify and briefly describe the largest of these organizations.

North Atlantic Treaty Organization (NATO)

NATO is an alliance of 26 countries from North America and Europe, formed by a treaty signed April 4, 1949. Its fundamental goal is safeguarding its members' freedom and security using political and military means. Over the years, NATO has taken on an increasing role in international disaster management and peacekeeping missions.

NATO maintains a military force made up of member country's troops. Though they work in concert, troops always remain under the control of their home nation's government. NATO has helped to end violent conflicts in Bosnia, Kosovo, and the Former Yugoslav Republic of Macedonia. In 2005, NATO forces were operating in Kosovo, Afghanistan, Iraq, and Sudan.

NATO's disaster and crisis management activities, which extend beyond its typical military operations, are geared toward protecting populations. As part of the worldwide civil protection drive described in Chapter 8, NATO began developing measures to

protect member nation citizens from nuclear attack as early as the 1950s. As elsewhere, NATO member countries soon realized that these capabilities could be used effectively during disasters induced by floods, earthquakes, or technological incidents and during humanitarian disasters.

NATO's first involvement in disaster operations came in 1953, following devastating floods in northern Europe. In 1958, it established detailed procedures for the coordination of assistance between NATO member countries in case of disasters. These procedures remained in place and provided the basis for NATO's civil emergency planning in subsequent years. In 1998, NATO established the Euro-Atlantic Disaster Response Coordination Centre to coordinate aid provided by member and partner countries to a disaster-stricken area in a member or partner country.

It also established a Euro-Atlantic Disaster Response Unit, which is a non-standing, multinational mix of national civil and military elements volunteered by member or partner countries for deployment to disaster areas.

Civil emergency planning has become a key facet of NATO involvement in crisis management. In recent years, NATO has assisted flood-devastated Albania, Czech Republic, Hungary, Romania, and Ukraine, supported the UN High Commissioner for Refugees in Kosovo, sent aid to earthquake-stricken Turkey, helped to fight fires in the former Yugoslav Republic of Macedonia and in Portugal, and supported Ukraine and Moldova after extreme weather conditions destroyed power transmission capabilities. NATO has taken an active role in the response to the 2005 South Asia earthquake, as described in Exhibit 10-12. NATO

EXHIBIT 10-12   NATO Press Release—Statement by the NATO Secretary General on Enhanced NATO Assistance for Pakistan

Today, the Alliance has decided to enhance its assistance to Pakistan, in the wake of the devastating earthquake. NATO has, from the beginning, been doing what we can to help Pakistan deal with this disaster, as part of the overall international effort.

We have set up a major strategic airlift operation of relief supplies to Pakistan—something unprecedented in NATO's history. This airlift is taking over one thousand tons of relief supplies to Pakistan, provided by UNHCR, NATO nations, and other countries as well. The airlift began last week, and is well under way, using NATO 707s, an Antonov carrying a UNHCR base camp, and C-130 transport aircraft from Incirlik, which have moved 75 tons already, with more constantly on the way; 2 C-130 flights are expected to land today. Twelve C-17 flights are to begin as soon as possible from the two NATO airfields in Germany and Turkey.

Pakistan needs more help. And today, NATO agreed to do more, as part of the overall international effort, by deploying a land element as well. NATO will deploy a battalion of engineers, with equipment, to help clear roads and set up facilities. We will send a mobile, multinational medical unit, to supplement the UN hospitals there. We will also send a deployable headquarters, which will, as part of its duties, help the UN with planning, command and control, and logistics for this massive effort the UN is leading.

NATO will also send 3 water purification plants, to help meet that pressing need as well. A number of helicopters will be added to the approximately 40 already in theatre from NATO nations. This is the second element of NATO support, alongside the airlift of relief supplies. The Alliance will also consider a sealift operation, if necessary, to take oversized goods and equipment. All of this is being done in response to the request from the Government of Pakistan.

Source: NATO, 2005.

also regularly conducts civil emergency planning exercises.

The European Union (EU)

The roots of the European Union date back to May 1950, when six European countries (Belgium, Germany, France, Italy, Luxembourg, and the Netherlands) joined to collaborate on the coal and steel industries. Today, following four rounds of reform and expansion, the EU represents 25 member states and is about to allow several other eastern and southern European countries to join. The EU considers itself to be a "family of democratic European countries, committed to working together for peace and prosperity (Europa, n.d.)" Like the UN, it is not a government, nor does it have any authority over its members; it is an organization established for increased regional cooperation.

The European Union Environmental Department addresses regional cooperation on disaster management (civil protection) activities. Its overall objective is to improve levels of protection for people, the environment, property, and cultural heritage in the event of major disasters inside or outside of the EU. Through mutual cooperation, EU members have agreed to (EU, 2005):

- Support and supplement efforts at national, regional, and local levels with regard to disaster prevention, preparedness of those responsible for civil protection, and intervention in the event of disaster
- Establish a framework for effective and rapid cooperation between national civil protection services when mutual assistance is needed
- Set up and implement training programs for intervention and coordination teams as well as for assessment experts, including joint courses and exchange systems among different member states
- Enhance the coherence of actions undertaken at international level in the field of civil protection, especially in the context of cooperation with the candidate Central European countries in view of

enlargement and with the partners in the Mediterranean region
- Contribute to public information in view of increasing the level of self-protection of European citizens
- Collect and disseminate validated emergency information
- Pool information on national civil protection capabilities, military, and medical resources
- Ensure efficient information sharing between the Commission and the competent authorities in the member states
- Facilitate the rapid mobilization of intervention teams, experts, and other resources on request in the event of major emergencies in order to alleviate the effects of a disaster during the first days
- Offer technical support, including satellite images
- Share lessons learned from interventions
- Grant financial assistance via the Solidarity Fund (see Exhibit 10-13).

EXHIBIT 10-13   The EU Solidarity Fund

Established by the EU Council Regulation on November 11, 2002, the main purpose of the Fund is to grant financial assistance to help EU Member States and Candidate Countries who are hit by a major disaster and faced with serious repercussions on living conditions, the natural environment, or the economy in one or more regions of the affected country. The total amount that can be mobilized in a given year is €1 billion. Items and actions that are considered eligible for compensation under the Solidarity Fund Regulation are those necessary to address the emergency situation, including operations and equipment necessary to combat the disaster, action to restore infrastructure to working order, and rescue services, among others.

Source: Europa, 2006.

The EU developed two mechanisms to facilitate cooperation between member states and increase civil protection structures: the Community Action Programme and the Community Civil Protection Mechanism.

The Community Action Programme supports and supplements member states' national, regional, and local efforts to protect citizens, property, and the environment in the event of a disaster. It also facilitates cooperation, exchange, and mutual assistance between member states. With a budget of €2 million, it supports major projects, workshops, and training courses in the field of prevention, preparedness, and response to natural and man-made disasters at land and at sea.

The Community Civil Protection Mechanism pools the civil protection capabilities of the 30 participating states (the EU-25 core members plus Bulgaria, Romania, Iceland, Liechtenstein, and Norway). It may be called on by a country overwhelmed by a disaster that requires immediate assistance. The Community Civil Protection Mechanism's purpose is twofold. First, it facilitates and supports disaster management assistance to disaster-affected countries. The Monitoring and Information Centre (MIC) is at its heart, giving countries access to a common platform for mutual aid assistance. Any country affected by a major disaster—within or outside the Union—can request assistance through the MIC. The MIC immediately forwards the request to participating states, which then decide whether they will offer assistance. The MIC has been called a "one-stop shop for assistance," because it reduces the burden on states requesting aid. The MIC can mobilize (within a few hours) small teams of experts to assess specific needs, to coordinate assistance operations, and to liaise with authorities and other international organizations. It also acts as an information center, collecting validated information throughout the emergency and disseminating regular updates to all participating countries.

Second, the Community Civil Protection Mechanism enhances preparedness. Using a database of national civil protection capabilities, experts and team leaders are invited to participate in a comprehensive disaster management training program that includes training courses, exercises, and an expert exchange program. A Common Emergency Communication and Information System is being developed to ensure efficient and secure information sharing between the MIC and the national contact points.

Since inception, the Community Civil Protection Mechanism has provided disaster management assistance for many disasters, including forest fires in France and Portugal (summer 2003), floods in southern France (December 2003), earthquakes in Algeria (May 2003), Iran (December 2003), and Morocco (February 2004), the 2004 tsunami in South Asia, and the 2005 earthquake in Kashmir. The Community Civil Protection Mechanism allows disaster managers from across Europe to meet regularly, exchange views, and learn from one another's best practices to contribute to advancement in the EU community's disaster-response strategies.

The EU addresses humanitarian affairs through its **European Commission Humanitarian Aid Department (ECHO)**. ECHO was established in 1992 to provide fast and effective emergency assistance and relief to victims of natural disasters or armed conflict outside the EU. It has funded humanitarian aid in more than 85 countries (see Exhibit 10-14). Its annual grants of $600 million cover emergency aid, food aid, and aid to refugees and displaced persons. ECHO also performs the following disaster-related services:

- Conducts feasibility studies for its humanitarian operations
- Monitors humanitarian projects and sets up coordination arrangements
- Promotes and coordinates disaster prevention measures by training specialists, strengthening institutions, and running pilot microprojects
- Provides partners with technical assistance
- Raises public awareness about humanitarian issues in Europe and elsewhere
- Finances network and training study initiatives in the humanitarian field

To provide formalized mitigation and preparedness assistance, ECHO launched its disaster preparedness

Funding—€6.998 million

The previous year's drought heightened vulnerability in Ethiopia, where new needs emerged rapidly in 2004. A lack of rain in areas such as the Somali region resulted in water supplies being exhausted. The amount of pasture available was greatly reduced and livestock losses of 60% were recorded in some areas. This led to shortages of milk, a staple food item for marginalized pastoralist populations.

ECHO relief was directed at improving the pastoralists' access to water as well as boosting healthcare and providing complementary and therapeutic feeding for malnutrition victims. ECHO funded livestock vaccinations to maintain a basic stock of healthy animals capable of providing milk. Emergency water and nutritional assistance was also provided for drought-affected areas together with medicines to address a malaria epidemic and other diseases.

Source: ECHO, 2005a.

program, Disaster Preparedness ECHO (DIPECHO), in 1996. DIPECHO attempts to reduce population vulnerability in disaster-prone regions. Between 1996 and 2004, DIPECHO provided more than $90 million for 319 projects worldwide. DIPECHO-funded projects are implemented by aid agencies working in the region of concern, and support training, capacity building, awareness raising, and early-warning projects as well the organization of relief services.

ECHO disaster preparedness efforts, however, extend beyond DIPECHO. Many of ECHO's major humanitarian financing decisions, for example, include disaster preparedness or prevention as an objective. Even postdisaster emergency responses can seek to reduce future risk. Examples of ECHO risk reduction activities include livestock shelters built after extreme cold snaps to protect against further herd depletion (Peru); training and equipping of community-based fire brigades in forest fire risk zones (Indonesia); cholera preparedness and health information (Malawi); and anti-rust measures to prevent water pollution and protect pipes from the effects of volcanic ash (Ecuador).

Organization of American States (OAS)

The Organization of American States (OAS) was established in 1948 by 21 nations located in North, Central, and South America and the Caribbean to strengthen cooperation and advance common interests in the Western Hemisphere. The OAS Charter affirmed the commitment of these nations to common goals and to their respect for each nation's sovereignty. Today, all 35 independent countries of the region have ratified the Charter and belong to the organization, though the government of Cuba has been excluded from participation since 1962.

The OAS is heavily involved in disaster mitigation and preparedness to reduce hazard risk in the region. The vast majority of these projects are carried out via the Office for Sustainable Development and Environment (OSDE), which supports individual and multi-country activities in several intersecting areas:

- Supporting the management of transboundary water resources
- Improving information for decision making in biological diversity
- Establishing land-tenure reform and property rights
- Supporting the exchange of best practices and technical information in environmental law and enforcement, renewable energy, water management, and biodiversity
- Improving management systems to reduce the impacts of natural disasters
- Understanding climate-related vulnerabilities affecting small island states

Several projects illustrate the range of activities in mitigation and preparedness carried out by OAS:

- The Natural Hazards Project lends support to member states to assess their vulnerability to natural hazards and to mitigate the effects of disasters. Its activities include technical assistance, training and technology transfer through intervention in development planning, and project formulation. Among its current areas of interest are floods, school buildings, and transportation corridors.
- Completed in 1999, the Caribbean Disaster Mitigation Project was a joint effort with USAID to establish sustainable public/private disaster mitigation mechanisms that measurably lessen loss of life, reduce potential damage, and shorten the disaster recovery period.
- In response to Hurricane Georges damage, the Hurricane Georges Reconstruction and Recovery in the Eastern Caribbean Project, targeting Antigua and Barbuda and St. Kitts and Nevis, was developed by OAS and several partners. OSDE implemented the disaster mitigation capacity–building component of the project, under the title Post-Georges Disaster Mitigation (PGDM). The PGDM included four primary objectives:
  1. Develop national hazard mitigation policies and plans
  2. Strengthen building practices
  3. Strengthen national emergency shelter policies and programs
  4. Support public information programs on hazard mitigation
- The OAS and the Caribbean Disaster Emergency Response Agency created the Caribbean Hazard Mitigation Capacity Building Program. The three-year program assisted countries in the Caribbean region to develop comprehensive, national hazard vulnerability reduction policies and associated implementation programs, and develop and implement safer-building training and certificate programs.

- The National Research and Development Foundation created the Hurricane-Resistant Home Improvement Program with assistance from OAS to offer hurricane-resistant home improvement options to low-income families. This program trains local builders in safer construction, offers small loans to families wishing to upgrade their homes, and provides the services of a trained building inspector who approves materials to be purchased and checks minimum standards.

In addition to the OSDE, the OAS addresses disasters through its Inter-American Committee for Natural Disaster Reduction (IACNDR). IACNDR is the main forum of the OAS and the Inter-American System for analyzing policies and strategies aimed at natural disaster reduction in the context of sustainable development. The OAS General Assembly established the IACNDR to strengthen its role in natural disaster reduction and emergency preparedness.

Southern African Development Community (SADC)

The Southern African Development Community (SADC) began in 1980, when a loose alliance of nine southern African states formed (then known as the Southern African Development Coordination Conference, or SADCC). The organization's aim was to coordinate development projects in order to decrease economic dependence on South Africa. In 1992, it shifted from a "coordination conference" to a development community, known as the SADC. SADC member states are Angola, Botswana, the Democratic Republic of Congo, Lesotho, Malawi, Mauritius, Mozambique, Namibia, South Africa, Swaziland, United Republic of Tanzania, Zambia, and Zimbabwe.

SADC's primary mission is to help define regional priorities, facilitate integration, assist in mobilizing resources, and maximize regional development. It approaches problems and national priorities through regional cooperation and action. Several SADC

programs address the region's safety and security, primarily through risk reduction mechanisms that include disaster preparedness and mitigation. The following are some examples of SADC disaster-related programs:

- Food, Agriculture, and Natural Resources Directorate
- Regional Early Warning Unit
- Regional Remote Sensing Unit

Coordination Center for Natural Disaster Prevention in Central America (CEPREDENAC)

CEPREDENAC was established in 1988 as a coordination center to strengthen the Central American region's ability to reduce their population's vulnerability to natural disasters. In May 1995, CEPREDENAC became an official organization to foster regional cooperation among the governments of Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, and Panama. The organization's headquarters are in Panama City.

Since its founding, CEPREDENAC has coordinated several international assistance projects and provided significant disaster management–related technical assistance to its members. It currently is managing the coordination of three projects financed by Sweden, Germany, and Norway:

- *Strengthening of Local Structures for Disaster Mitigation (Fortalecimiento de Estructuras Locales Para la Mitigación de Desastres— FEMID).* A regional program supported by Germany to strengthen local capacity to mitigate the disasters' impacts
- *Strengthening Local Structures and Early Alert Systems (Reforzamiento de Estructuras Locales y Sistemas de Alerta Temprana—RELSAT).* A program supported by Sweden that focuses on development of CEPREDENAC and its affiliated institutions and seeks to increase CEPREDENAC's ability to manage disaster management projects

- *Reduction of Natural Disasters in Central America, Earthquake Preparedness and Hazard Mitigation (Mitigación del Riesgo Sísmico y Preparativos para Terremotos—RESIS).* A project, supported by Norway to strengthen seismological institutions and national projects, including seismic microzonation and risk analysis

Caribbean Disaster Emergency Response Agency (CDERA)

CDERA is an inter-governmental agency established in September 1991 by an agreement of the Caribbean Community governments to address the region's disaster management needs. There are presently 16 participating states within CDERA: Anguilla, Antigua and Barbuda, Bahamas, Barbados, Belize, British Virgin Islands, Dominica, Grenada, Guyana, Jamaica, Montserrat, St. Kitts and Nevis, Saint Lucia, St Vincent and the Grenadines, Trinidad and Tobago, and Turks and Caicos. CDERA is comprised of the following components:

- The Coordinating Unit, which is the CDERA Secretariat, headquartered in Barbados
- Sixteen National Disaster Organizations, one in each participating state
- A Board of Directors, comprising the 16 National Disaster Coordinators (the head of each National Disaster Organization)
- A Council, which is the supreme policy-making body, made up of the government heads of each member nation, that meets annually to review the agency's work, approve its work program and budget, and make any other major policy decisions required

CDERA activities focus on the four phases of emergency management, and involve all sectors of society:

- Training for disaster management personnel
- Development of model training courses and products

- Institutional assistance for disaster management organizations
- Development of model disaster legislation for adaptation and adoption by participating states
- Development of model policies and guidelines for use in emergencies
- Contingency planning assistance
- Resource mobilization for strengthening disaster management programs in participating states
- Improving emergency telecommunications and warning systems
- Development of disaster information and communication systems
- Education and public awareness
- Establishment of a CDERA website to allow information dissemination

A participating state may request disaster response assistance once its capabilities have been overwhelmed. CDERA solicits and coordinates the assistance offered by other governments, organizations, and individuals, both within and outside the region. This is CDERA's primary function. Other functions include:

- Securing, collating, and channeling disaster information to interested governmental and nongovernmental organizations as needed
- Mitigating disaster consequences affecting participating states
- Establishing and maintaining sustainable disaster response capabilities among participating states
- Mobilizing and coordinating disaster relief from governmental organizations and NGOs for affected participating states

INTERNATIONAL FINANCIAL INSTITUTIONS

International financial institutions (IFIs) provide loans for development and financial cooperation throughout the world. They exist to ensure financial and market stability and to increase political balance. These institutions are made up of member states, arranged on a global or regional basis, which work together to provide financial services to national governments through direct loans or projects.

In a disaster's aftermath, nations with low capital reserves often request increased or additional emergency loans to fund the expensive task of reconstruction and rehabilitation. Without IFIs, most developing nations would not have the means to recover. Several of the largest IFIs, including the World Bank, one of its subsidiaries, the International Monetary Fund, the Asian Development Bank, and the Inter-American Development Bank, are detailed below.

The World Bank

The World Bank was created in 1944 to rebuild Europe after World War II. In 1947, France received the first World Bank loan of $250 million for postwar reconstruction. Financial reconstruction assistance has been provided regularly since that time in response to countless natural disasters and humanitarian emergencies.

Today, the World Bank is one of the largest sources of development assistance. In the 2004 fiscal year, it provided more than $20.1 billion in loans, funding 245 projects in scores of developing countries. The World Bank is owned collectively by 184 countries and is based in Washington, D.C. It comprises several institutions referred to as the World Bank Group (WBG):

- International Bank for Reconstruction and Development
- International Development Association
- International Finance Corporation
- Multilateral Investment Guarantee Agency
- International Centre for Settlement of Investment Disputes

The World Bank's overall goal is to reduce poverty, specifically, to "individually help each developing country onto a path of stable, sustainable, and equitable growth, [focusing on] helping the poorest people and the poorest countries" (Source Watch, n.d.). As disasters and CHEs take a greater and greater toll on the economic stability of many financially struggling

countries, the Bank is taking on a more central role in mitigation and reconstruction.

Developing nations, which are more likely to have weak disaster mitigation or preparedness capacity and therefore little or no affordable access to disaster insurance, often sustain a total financial loss. In the period of rehabilitation that follows the disaster, loans are essential to the success of programs and vital to any level of sustainability or increased disaster resistance. The Bank lends assistance at several points along this cycle.

First, for regular financial assistance, the Bank ensures that borrowed funds are applied to projects that give mitigation a central role during the planning phase. It utilizes its privilege as financial advisor to guide planners, who otherwise might forego mitigation measures in an effort to stretch the loaned capital as far as possible. Ensuring that mitigation is addressed increases systems of prediction and risk analysis in World Bank–funded projects.

Once a disaster occurs, the Bank may be called on for help. Because it is not a relief agency, the Bank will not take on any role in the initial response; however, it works to restore damaged and destroyed infrastructure and restart production capabilities. A World Bank team may assist with initial impact assessments that estimate financial losses resulting from the disaster and estimated costs of reconstruction, including raised mitigation standards. The Bank also could restructure the country's existing loan portfolio to allow for expanded recovery projects. In addition, Bank projects that have not yet been approved but are in the application process can be redesigned to account for changes caused by the disaster.

Finally, an Emergency Recovery Loan (ERL) can be granted to specifically address recovery and reconstruction issues. ERLs restore affected economic and social institutions and reconstruct physical assets such as essential infrastructure. It is important to note that ERLs are not designed for relief activities. They are most appropriate for disasters that adversely impact an economy, are infrequent (recurrent disasters are accommodated by regular lending programs), and create urgent needs. The ERL is expected to eventually produce economic benefits to the borrowing government. ERLs usually are implemented within three years and are flexible, to accommodate the specific needs of each unique scenario. Construction performed with ERLs must use disaster-resistant standards and include appropriate mitigation measures, thus providing overall preparedness for the country affected. Once an ERL has been granted, the Bank coordinates with the IMF, the UNDP, NGOs, and several other international and local agencies to create a strategy that best utilizes these funds within the overall reconstruction effort.

The World Bank has established a Hazards Risk Management Team, also called the Hazard Management Unit (HMU), to address disasters and risk management within the context of development lending. This unit was originally created in 1998 as the Disaster Management Facility. The HMU promotes effective consideration of hazard risk in project design and incorporation of mitigation measures into overall disaster management effort. The HMU also works to provide a more strategic and rapid World Bank response to disasters. The specific objectives of the HMU are to:

- Improve the management of disaster risk in member countries and reduce vulnerability in the World Bank portfolio
- Promote sustainable projects and initiatives that incorporate effective prevention and mitigation measures
- Promote the inclusion of risk analysis in World Bank operations, analysis, and country assistance strategies
- Promote training in the areas of disaster prevention, mitigation, and response
- Identify policy, institutional, and physical interventions aimed at reducing catastrophic losses from natural disasters through structural and nonstructural measures, community involvement, and partnerships with the private sector

The Bank works to increase resistance to repeat natural disasters through lending programs that include mitigation and preparedness. The nature of its

mission—alleviating poverty—is itself a mitigation measure. As part of its lending process, the Bank conducts vulnerability and risk assessments, which necessitate the subsequent consideration of any findings in future Bank loans. The Bank is also a source of information on current hazard-resistant technology and provides the expertise for establishing and enforcing more effective building codes. As countries develop, they increase their capacity to prepare for and respond to disasters and establish the legal and political institutions that guide construction and settlement practices to ensure greater overall resilience. The Bank is one of the most important player in ensuring that countries are able to do this.

The two lending arms of the World Bank are the International Bank for Reconstruction and Development and the International Development Association.

- *International Bank for Reconstruction and Development (IBRD).* Established in 1945, the IBRD reduces poverty in middle-income and creditworthy poorer countries. The IBRD attempts to promote sustainable development activities through its loans. It also provides guarantees and other analytical and advisory services. Following disasters, countries with strong-enough credit can borrow or refinance their existing loans from the IBRD to pay the often-staggering costs of reconstruction.
- *International Development Association (IDA).* The IDA lends to the world's poorest countries, classified as those with a 2004 income of less than $965 per person. Eighty-one countries currently are eligible to borrow from the IDA. It provides interest-free loans and grants for programs aimed at boosting economic growth and improving living conditions. This need is almost always present in the aftermath of disasters, including those caused by violent conflict.

The International Monetary Fund (IMF)

The International Monetary Fund (IMF) was established in 1946 to promote international monetary cooperation, exchange stability, and orderly exchange arrangements; to foster economic growth and high levels of employment; and to provide temporary financial assistance to countries to help ease balance of payments adjustment. It carries out these functions through loans, monitoring, and technical assistance.

Since1962, the IMF has provided emergency assistance to its 184 member countries when they have been affected by natural disasters. IMF assistance is designed to meet immediate foreign-exchange financing needs that arise from shortfalls in export earnings and/or increased imports, among other things. Its assistance also helps the affected countries avoid a serious depletion of external reserves.

In 1995, the IMF began to provide this emergency assistance to postconflict situations to reestablish macroeconomic stability and the basis for long-term sustainable growth. This is particularly important when a country must cover costs associated with an "urgent balance of payments need, but is unable to develop and implement a comprehensive economic program because its capacity has been damaged by a conflict, but where sufficient capacity for planning and policy implementation nevertheless exists" (IMF, 2005). IMF support must be part of a comprehensive international effort to address the aftermath of a conflict. Its emergency financing is provided to assist the affected country and to gather support from other sources.

In the event of an international disaster or CHE in a member country, the IMF utilizes its Emergency Assistance Specific Facility to provide rapid financial assistance. It is not uncommon for a country to severely exhaust its monetary reserves in response to an emergency situation. In the event of a natural disaster, funding is directed toward local recovery efforts and any needed economic adjustments. The IMF will lend assistance only if a stable governing body is in place that has the capacity for planning and policy implementation and can ensure the safety of IMF resources. After stability has been sufficiently restored, increased financial assistance is offered, which will be used to develop the country in its post-emergency status.

TABLE 10-2 IMF Emergency Assistance Provided in Response to Natural Disasters, 1995–2005

Country	Year	Hazard	Amount ($mil)	% of Quota
Bangladesh	1998	Floods	138.2	25
Dominican Republic	1998	Hurricane	55.9	25
Haiti	1998	Hurricane	21.0	25
Honduras	1998	Hurricane	65.6	50
St. Kitts & Nevis	1998	Hurricane	2.3	25
Turkey	1999	Earthquake	501.0	37.5
Malawi	2002	Food shortage	23.0	25
Grenada	2003	Hurricane	4.0	25
Grenada	2004	Hurricane	4.4	25
Maldives	2005	Tsunami	6.3	50
Sri Lanka	2005	Tsunami	158.4	25

Source: Bretton Woods Project, 2005.

When a country requests emergency assistance, it must submit a detailed plan for economic reconstruction that will not create trade restrictions or "intensify exchange." If the country is already working under an IMF loan, assistance may be in the form of a reorganization of the existing arrangement. Separate emergency assistance loans are also available, and these do not involve the regular criteria under which the countries must normally operate. These loans are set at 25% of a country's preestablished lending quota, but have gone as high as 50% of the lending quota in extenuating circumstances. This funding is provided only when the member country is "cooperating with the IMF to find a solution to its economic problems." Tables 10-2 and 10-3 list IMF emergency assistance from 1995–2005 for natural disasters and CHEs.

Emergency assistance loans are subject to regular IMF interest rates, and must be repaid within three to five years. In certain cases, as decided by the IMF and according to specific criteria, recipients of emergency funding may benefit from the IMF Poverty Reduction and Growth Facility (PRGF). The PRGF is the IMF's low-interest lending facility for low-income countries.

PRGF-supported programs are underpinned by comprehensive country-owned poverty reduction strategies. Under this program, the interest rate on loans is subsidized to 0.5% per year, with the interest subsidies financed by grant contributions from bilateral donors. This program has been available for postconflict emergencies since 2000, but in January 2005, following the South Asia tsunami events, the IMF Executive Board agreed to provide a similar subsidization of emergency assistance for natural disasters upon request.

The government of a country devastated by disaster often requires technical assistance or policy advice because it has no experience or expertise in this situation. This is especially common in postconflict situations, where a newly elected or appointed government has been established and officials are rebuilding from the ground up. The IMF offers technical assistance in these cases to aid these countries in building their capacity to implement macroeconomic policy. This can include tax and government expenditure capacity, the reorganization of fiscal, monetary, and exchange institutions, and guidance in the use of aid resources.

TABLE 10-3   IMF Emergency Assistance Provided in Response to Complex Humanitarian Emergencies, 1995–2005

Country	Year	Amount ($mil)	% of Quota
Bosnia and Herzegovina	1995	45.0	25
Rwanda	1997	12.2	15
Albania	1997	12.0	25
Rwanda	1997	8.1	10
Tajikistan	1997	10.1	12.5
Tajikistan	1998	10.0	12.5
Republic of Congo	1998	9.6	12.5
Sierra Leone	1998	16.0	15
Guinea-Bissau	1999	2.9	15
Sierra Leone	1999	21.4	15
Guinea-Bissau	2000	1.9	10
Sierra Leone	2000	13.3	10
Republic of Congo	2000	13.6	12.5
FR of Yugoslavia	2000	151.0	25
Burundi	2002	12.7	12.5
Burundi	2003	13.4	12.5
Central African Republic	2004	8.2	10
Iraq	2004	435.1	25
Haiti	2005	15.5	12.5

Source: IMF, 2005.

The Asian Development Bank (ADB)

The Asian Development Bank (ADB) is a multilateral development finance institution whose primary mission is reducing poverty in Asia and the Pacific. ADB was established in 1966 by 31 countries from both within and outside the region, and has grown to include 64 members as of 2006. Its clients are the 64 member governments, who are also the Bank's shareholders.

ADB provides emergency rehabilitation loans to its member countries following disasters. ADB determined that its assistance in this critical phase of recovery would allow an affected developing country to maintain its development momentum. Bank analysts found that, without such assistance, the affected country may reallocate its scarce budgetary resources away from development issues to cover disaster-related expenses, thereby sidetracking development progress. Additionally, they found that the production of goods and services would quickly suffer or fail completely if the country could not perform adequate rehabilitation following a disaster.

ADB assistance in emergencies began in 1987, but was initially extended only to smaller, developing countries (such as the Maldives, Papua New Guinea, and the smaller Pacific island states). Loans were limited to $500,000 (increased to $2 million in 1997), with funded projects to be completed within 12 months of disbursement. The funding was designed to address only simple repair and rehabilitation activities as needed in the immediate aftermath of a disaster, with more comprehensive repair being covered by regular bank lending programs. Lending was designed to be provided within six weeks of being requested.

In 1989, emergency lending was extended to all developing member countries regardless of their size. This change included a fundamental shift in what the emergency loans would cover, from simple repairs to more comprehensive, informed rehabilitation activities. Most importantly, ADB wanted to ensure that projects funded by its loans reduced overall risk to the affected nation and its population. Other major changes in ADB emergency lending policy follow:

- Introducing a typology of the causes and effects of disasters
- More clearly defining the ADB's response during various phases of postdisaster situations
- Identifing the nature, focus, and coverage of rehabilitation projects
- Introducing detailed, yet simplified, guidelines for processing rehabilitation projects
- Targeting rehabilitation loans toward restoring infrastructure and production activities, including capacity building and modernization
- Mandating that risk analysis and disaster prevention measures be included in all ADB projects in disaster-prone developing member countries

- Closely coordinating disaster responses at all levels (local, national, and international) with those of other external funding agencies, NGOs, and community groups
- Specifying that disaster prevention and mitigation activities were to be promoted along with regional cooperation
- Including nonnatural disasters, e.g., wars, civil strife, and environmental degradation (ADB, 2005a)

The vast majority (83%) of ADB emergency loan services from 1989–2002 were provided in response to natural disaster events. The remaining 17% was dedicated to postconflict situations. These loans rarely averaged more than 6% of the total annual lending by

ADB and were concentrated primarily in South Asia. (See Exhibit 10-15 for a discussion of the Bank's response to the 2004 tsunami and earthquake events.)

ADB also provides mitigation-related project loans and Regional Technical Assistance (RETA), aimed at reducing member countries' overall disaster vulnerability (see Exhibit 10-16). Mitigation and preparedness projects are not considered "emergency" in nature, and are therefore funded through its regular lending activities. Because mitigation and preparedness activities are most often included as components within larger development projects, ADB does not maintain records of its total financial risk reduction–based lending. Projects may include resilience-increasing activities such as reforestation, watershed management, coastal protection, agricultural diversifi-

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EXHIBIT 10-15   ADB Response to the 2004 Asian Tsunami and Earthquake Events

ADB responded rapidly to those countries most affected by the tsunami disaster. It established a $600 million Asian Tsunami Fund and identified $175 million in funding to be redirected from ongoing projects and programs, making ADB's immediate financial commitment $775 million. ADB has also committed $1 million toward the development of an early warning system for the Indian Ocean, which could be linked to other regional and global warning systems. As of March 2006, ADBs total approved funding for tsunami-affected countries was $859.9 million.

Indonesia, Maldives, Sri Lanka, and India requested ADB's assistance in their rehabilitation and reconstruction efforts. Below is the summary of ADB assistance (US$ million) to the tsunami-affected countries as of October 2005 (see Table 10-4)

In Indonesia, ADB's multisector tsunami assistance package will cover agriculture, fisheries, irrigation, livelihoods, housing, water and sanitation, health, transport, power, spatial planning, and fiduciary oversight. A $290 million grant assistance will finance the Earthquake and Tsunami Emergency

Support Project to support disaster management, reconstruction, and rehabilitation in affected areas of Aceh and North Sumatra.

In Maldives, ADB's tsunami assistance package of $23.45 million will help restore infrastructure (transport, water supply/sanitation/solid waste management, power, agriculture, and fisheries). About one-half of the total funds had been disbursed by the end of March 2006.

In Sri Lanka, ADB's $221.95 million assistance package will help rehabilitate and reconstruct roads, railways, and livelihoods. Disbursement priority areas include housing reconstruction, microfinance for livelihoods, and coastal protection.

In India, ADB's $200 million loan and grant assistance package will help restore livelihoods and rehabilitate and reconstruct damaged infrastructure in Tamil Nadu and Kerala. Of the total amount, $143.75 million is allocated to Tamil Nadu and $56.25 million to Kerala.

Source: ADB, 2006

TABLE 10-4   Caption missing. Have queried author

Country	Grants ($million)	Loans	Total
Indonesia	329	64.60	393.60
India	100	100	200
Maldives	21.65	1.8	23.45
Sri Lanka	226.93	14	240.93
Thailand	2	0	2
Total	**679.58**	**180.40**	**859.98**

Source: Summary of ADB Assistance (US $million) to select tsunami-affected countries as of October 2006.

cation, slope stabilization, and land use planning, although the project's overall goal is more development oriented. RETA and single-country technical assistance activities have included hazard management and disaster preparedness software programs and infrastructure protection assistance. The Bank has developed disaster management guidebooks and distributed them to members to help them apply the lessons to their development projects.

Finally, ADB assists countries to restart rehabilitation and overall development in the aftermath of armed conflict. In the past, ADB postconflict intervention focused almost exclusively on infrastructure rehabilitation, an area in which the Bank has extensive experience. Its focus in this area began to shift in the 1990s to preventing conflicts and helping postconflict countries move along a solid path of economic and social development. ADB is now committed to assisting affected member countries develop mechanisms to effectively manage conflict, including addressing the problems of poor governance and corruption.

The Inter-American Development Bank (IADB)

Established in December 1959, the Inter-American Development Bank (IADB) is the oldest and largest regional multilateral development institution. It was first created to help accelerate economic and social development in Latin America and the Caribbean. The Bank has been a pioneer in supporting social programs, developing economic, social, educational, and health institutions, promoting regional integration, and providing direct support to the private sector, including microenterprises.

The IADB addresses disaster and risk management through its Sustainable Development Department. Through the efforts and actions of this department and its Disaster Risk Management policy, the IADB addresses the root causes of the region's high vulnerability to disasters. Building on its mandate to promote sustainable development in Latin America and the Caribbean, the Bank works with countries to integrate risk reduction into their development practice, planning, and investment, and to increase their capacity to manage risk reduction. It also provides funding that directly or indirectly supports disaster mitigation and preparedness (including hazard risk management capacity development at the government level) (see Exhibit 10-17). In their "Plan of Action: Facing the Challenge of Natural Disasters in Latin America and the Caribbean," (IADB, 2000) the IADB outlined their six strategic areas of assistance:

1. *National systems for disaster prevention and response.* Building national legal and regulatory frameworks and programs that bring together the planning agencies, local governments, and civil society organizations; developing national strategies for risk reduction, and assessing intersectoral priorities, backed by separate budgets
2. *Inserting prevention into the culture.* Developing and disseminating risk information, and empowering citizens and other stakeholders to take risk reduction measures
3. *Reducing the vulnerability of the poor.* Supporting poor households and communities in reducing their vulnerability to natural hazards and recovering from disasters through reconstruction assistance
4. *Involving the private sector.* Creating conditions for the development of insurance markets; encouraging the use of other risk-spreading

EXHIBIT 10-16 ADB Addresses the Growing Global Avian Flu Threat, October 21, 2005

ADB is planning $58 million in grant projects to help stem the growing avian influenza threat in Asia and the Pacific before it grows into a human pandemic that costs the region millions of lives and tens of billions of dollars. ADB has already prepared for consideration by ADB's Board of Directors in November a $30 million grant project for regional communicable disease control in Cambodia, Lao People's Democratic Republic, and Viet Nam. "The planned project will help the region improve control of various endemic and emerging communicable diseases—including avian flu—within the framework of the Greater Mekong Subregion cooperation program," explains Vincent de Wit, an ADB Senior Health Specialist.

But with increasing risk of a pandemic, more efforts are necessary and another $28 million grant project to specifically address the avian flu problem will be prepared in close coordination with technical agencies, including the WHO, FAO, the World Organization for Animal Health (OIE), and other development partners. It will support countries in controlling and managing existing outbreaks of avian flu, prepare the region to effectively cope with a potential human pandemic, and strengthen regional cooperation to fight the epidemic (including more effective sharing of information). The planned project will support the regional effort to improve disease surveillance systems, strengthen countries' response to outbreaks between the animal and human population, and boost health systems' readiness. Stockpiles of necessary drugs and equipment may need to be created, and logistics for the supply and using of the drugs has to be planned. ADB is already involved in combating the bird flu epidemic, in particular through its support to WHO's Manila office, covering the Western Pacific region, under a regional technical assistance project that was established to address the SARS outbreak in 2003. ADB plans to allocate an extra $600,000 to continue its support and extend this cooperation to WHO's Southeast Asia office, based in Delhi.

The current outbreak, which began at the end of 2003, has already had an impact on poor and rural communities. Almost 140 million domestic birds have either died or been destroyed, and more than 60 people are known to have died. According to ADB preliminary estimates, the various stages of a growing human pandemic would have widespread and serious implications for economic development and the welfare of people in the region and beyond. As demonstrated by the SARS crisis in 2003, the present outbreak may evolve and have a devastating effect. ADB estimates that even a relatively mild pandemic could cost the region around $90 billion to $110 billion due to the effects of reduced consumption, investment, and trade. The loss of workers due to death and incapacity could cost an additional $15 billion. A more severe outbreak would likely lead to a global recession, costing the region $250 billion to $290 billion in the short run. Many economic activities would be brought to a halt, while the health systems of most countries would be overwhelmed.

"It is critical that prevention activities are undertaken in a coordinated manner, since epidemics such as this one do not respect national boundaries," says Jacques Jeugmans, an ADB Principal Health Specialist. "It is also important to share information about outbreaks to ensure an effective and quick response. If we want to contain the avian flu epidemic and prevent a pandemic, we need to work with local communities, where farmers who observe their chickens dying in the backyards are on the front line, but also most at risk." Countries need significant support—both financial and technical—to strengthen animal and human epidemiological surveillance systems, develop effective and safe systems for rapid response to reported outbreaks, and treat the disease. "ADB is well placed to play an important role in strengthening a regional response to prevent and control the potential pandemic," Mr. Jeugmans adds. "We are based in the region, are already working with all the countries that have experienced outbreaks, have the ability to take the multisectoral approach that this challenge needs, and have the experience of undertaking complex projects."

Source: ADB, 2005b.

EXHIBIT 10-17   Principal Disaster-Related IADB Loans, 2001–2005

Principal Loans Approved during 2001

- The Bank approved a binational loan operation for a total of $21.8 million for Honduras and Guatemala in order to help the sustainable development of renewable resources and reduce the impact of natural disasters.
- A $32.7 million loan was approved for a socioenvironmental and forestry development program in Nicaragua, with an important disaster prevention and rehabilitation in rural areas component.
- The Bank approved a $25 million loan, the first stage of a financing operation for a total of $69 million, to promote the sustainable development of the economically and environmentally vulnerable basins of Honduras.
- A $70 million loan to El Salvador was approved to help reconstruct the infrastructure harmed in low-resources communities affected in 2001 by two earthquakes.
- The Bank approved an emergency loan to Peru for $20 million in order to temporarily recover and rehabilitate the communities affected by the earthquake that took place in Southern Peru.

Principal Loans Approved during 2002

- The Bank approved a $40 million loan to handle natural resources in high basins in Guatemala through the conversion of production technologies for small farmer enterprises.

- In Guatemala, a $46.6 million loan for the reduction of urban poverty was approved. The loan includes a water-channeling component to prevent landslides in marginal and vulnerable areas.
- The Bank approved a loan to Bolivia for $2.8 million to install warning systems and an emergency plan in case of natural disasters, and another one for $2.5 million to restore water production for the city of Tarija in the biological and land reserve harmed by a forestry fire.
- The Bank approved a $20 million loan destined for the emergency situations caused by flooding in Jamaica and to restore basic services.

Principal Loans Approved or under Review during 2005

- IADB approved a $16 million loan to Costa Rica for a sustainable development program in the Atlantic Region. The program will support economic and social projects, disaster risk mitigation, and local governance.
- In Ecuador, the Bank has prepared a $5 million loan for disaster prevention and early warning at the Cotopaxi volcano.
- $5 million has been designed to improve early warning systems for flooding in Haiti.
- The Bank is preparing a $17.7 million loan for Bahamas to restore services after the Hurricanes Frances and Isabel.

Source: IDB, 2005b.

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financial instruments where appropriate; and designing economic and regulatory incentives for risk reduction behavior

5. *Risk information for decision making.* Evaluating existing risk assessment methodologies; developing indicators of vulnerability; and stimulating the production and wide dissemination of risk information

6. *Fostering leadership and cooperation in the region.* Stimulating coordinated actions and mobilizing regional resources for investments in risk mitigation

The IADB created two mechanisms to allow for rapid loan disbursement in times of disaster: the Disaster Prevention Sector Facility and the Facility for the Immediate Response to Natural and Unexpected Disasters (formerly the Immediate Response Facility).

In 2001 the IADB established the Natural Disaster Network, represented by each of the Bank's borrowing member countries. Network members meet annually to discuss topics related to disaster management, such as "National Systems for Risk Management" (2001) and "The Macroeconomic Financial Consequences of Natural Disasters" (2002). In 2003, they published the book *Disaster Risk Management* based on the 2002 and 2003 meetings. Other meetings, for which subsequent disaster management guides were created, include "Risk Management at the Local Level" (2003), "Environmental Management and the Use of Economic Instruments for the Reduction of Disaster Risk" (2004), "Cost-Benefit Analysis of Mitigation Investments" (2004), and "The Role of the Private Sector in Disaster Risk Management" (also in 2004).

The IADB is in the process of revising its disaster risk management policy. The new policy is designed to improve the IADB's ability to assist member countries in reaching their development goals by supporting their disaster risk management efforts. Once approved, the new policy document (which is under review as of early 2006) will replace the current natural and unexpected disasters policy approved in 1999. (See Appendix 10-1 for the full text of the 1999 policy.)

The IFIs described above, while among the largest in existence, are but a sample of the international financial institutions and development banks that exist worldwide. For reference, other banks include:

- African Development Bank (AfDB)—www.afdb.org
- Bank for International Settlements (BIS)—www.bis.org
- Black Sea Trade and Development Bank (BSTDB)—www.bstdb.org
- Caribbean Development Bank (CDB)—www.caribank.org
- Council of Europe Development Bank (COEB)—www.coebank.org
- Development Bank of Southern Africa (DBSA)—www.dbsa.org
- European Bank for Reconstruction and Development (EBRD)—www.ebrd.com/
- Islamic Development Bank (IDB)—www.isdb.org
- North American Development Bank (NADB)—www.nadbank.org

CONCLUSION

Through their efforts to mitigate, prepare for, respond to, and recover from natural disasters, multilateral organizations have a major role in international disaster management. All nations are at risk from disasters and, likewise, all nations face the prospect of one day finding themselves requiring help from one or more of these organizations. Multilateral organizations direct the collective experience and tools of their member states to benefit all nations in need of assistance—even the wealthiest ones. The progress witnessed by the international disaster management community in recent years can be directly traced to the work of these multilateral organizations, especially focused initiatives like the International Strategy for Disaster Reduction.

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APPENDIX 10-1

IDB Draft Disaster Risk Management Policy. Source: IDB, 2005. http://www.iadb.org/
sds/doc/ENV-DraftDRMPolicy-12-21-05.pdf. Reprinted with permission*

INTRODUCTION

This Disaster Risk Management Policy has been
developed in the context of an increase in the number
and seriousness of natural hazards resulting in disas-
ters in Latin America and the Caribbean, and the
awareness that disasters have significant bearing on
the economic and social development of most coun-
tries in the region, affecting disproportionately the
poorest countries and people.

This policy, which emphasizes risk reduction, is
intended to improve the institutional and policy
framework of the Bank to support disaster risk man-
agement in order to help protect the socioeconomic

development of borrowing member countries and
improve the effectiveness of the Bank's assistance.

A proactive stance to reduce the toll of disasters in
the region requires a comprehensive approach with an
emphasis on actions taken before a hazard results in a
disaster rather than on post disaster recovery. This
approach seeks to make disaster risk prevention an
integral part of governance. It involves the following
set of activities: risk analysis to identify the types and
magnitude of potential impacts faced by member
countries and that affect development investments;
prevention and mitigation measures to address the
structural and nonstructural sources of vulnerability;
financial protection and risk transfer to spread finan-

*The following does not represent the official position of the bank and can only be considered as a technical proposal at this time. Please
consult the corresponding official document in due time at: www.iadb.org.

cial risks over time and among different actors; emergency preparedness and response to enhance a country's readiness to cope quickly and effectively with an emergency; and post-disaster rehabilitation and reconstruction to support effective recovery, and to safeguard against future disasters.

The Bank recognizes that adequate institutional capacities are particularly important to manage risks related to natural hazards at the regional, national and local levels and for the successful achievement of this policy's objectives. The Bank will make an additional effort to take into account: the incentive structures and competing priorities influencing investment decisions for disaster risk management by national, regional or local governments; the increased role of private sector investment and public/private sector partnerships; improvements in the quality of and access to information through research and new technologies; and the growing importance of regional and global challenges and opportunities.

The Bank acknowledges that development processes such as rapid urbanization and environmental degradation may influence vulnerability to natural hazards and that vulnerability is often gender and poverty specific.

OBJECTIVES

The purpose of the Bank's disaster risk management policy is to guide the Bank's efforts to assist its borrowers in reducing risks emanating from natural hazards and in managing disasters, in order to support the attainment of their social and economic development goals.

The policy has two interrelated specific objectives:

1. To strengthen the Bank's effectiveness in supporting its borrowers to manage risks related to natural hazards by reducing vulnerability, and by preventing and mitigating related disasters before they occur; and
2. To facilitate rapid and adequate assistance by the Bank to its borrowing member countries in

response to disasters in an effort to efficiently revitalize their development efforts.

SCOPE

AREA OF COVERAGE

The Disaster Risk Management Policy applies to the Inter-American Development Bank (IDB), in both its public and private sector activities, and to the Multilateral Investment Fund (MIF).

Activities and instruments subject to this policy include the development and implementation of country strategies and country program dialogues, financial and nonfinancial products, public and private sector operations, financial intermediation, and relevant aspects of the Bank's project procurement practices.

This policy provides two lines of action addressing: (i) the prevention and mitigation of disasters that occur as a result of natural hazards, through programming and proactive project work; and (ii) post disaster response to the impacts of natural hazard events, and physical damage (such as structural collapse and explosions) resulting from technological accidents or other types of disasters resulting from human activity.

With respect to natural hazards, this policy covers two kinds of events: (i) *low frequency/high consequence hazards* and (ii) *high frequency/low consequence hazards*. Low frequency/high consequence hazards typically result in a "declared" disaster that exceeds the coping ability of the affected country or community using its own resources. When high frequency/low consequence hazards (such as frequent floods, forest fires or droughts) are poorly managed they can have significant cumulative impacts on a country's efforts to reduce poverty and attain social equity objectives, as well as on its economic development.

The Bank does not have a comparative advantage in the area of humanitarian assistance. Such assistance should only be addressed through emergency technical cooperations (as described in "Humanitarian Assistance") or through non-IDB sources.

To support this policy, Bank management will issue specific guidelines on how to apply the policy's principles and each of its directives. The guidelines may be updated by management from time to time as necessary to reflect lessons learned and emerging good practices. The guidelines and the companion paper to this policy will include a complete list of definitions.

KEY DEFINITIONS

"*Disaster*," as used in this policy, refers to a serious disruption of the functioning of a society, community or project causing widespread or serious human, material, economic or environmental losses, which exceed the coping ability of the affected society, community or project using its own resources.

"*Natural hazard*" refers to natural processes or phenomena affecting the biosphere that may constitute a damaging event. Such hazards include: earthquakes, windstorms, hurricanes, landslides, tidal waves, volcanic eruptions, floods, freezes, forest fires and drought, or a combination thereof. Hazards emanating from climatic variations such as those linked to the El Niño phenomenon are covered by this policy.

"*Vulnerability*" is a condition determined by physical, social, economic and environmental factors or processes, which increase the susceptibility of a community to the impact of hazards.

"*Disaster risk management*" is the systematic process that integrates risk identification, mitigation and transfer, as well as disaster preparedness, emergency response and rehabilitation or reconstruction to lessen the impacts of hazards.

AREAS OUTSIDE THE PRESENT POLICY

The prevention and mitigation of disasters caused by social and political violence (also referred to as conflict-driven disasters) will be treated separately from this policy since the planning and application of policies, strategies and measures that identify and reduce risks associated with these events are very different than those necessary to prevent and mitigate natural hazards.

The prevention of technological hazards will be managed as part of the Bank's regular project design and implementation process in accordance with applicable sector policies. Environmental degradation, which may be an underlying reason for increased vulnerability to natural hazards, will be managed through the Bank's Environment and Safeguards Compliance Policy (2005 draft), which also provides safeguards to ensure that all Bank operations and activities are environmentally sustainable.

Epidemics and pandemics such as HIV/AIDS are outside the policy scope. These are covered by the Bank's Public Health Policy.

Risk management related to the Bank's personnel and installations is covered in the Bank's Business Continuity Plan.

Lending operations to address financial emergencies are treated through the Bank's Emergency Lending Guidelines.

DIRECTIVES

The following directives provide the principles that the Bank will follow to manage disaster risk related to programming and project work, and the Bank's response to a disaster.

GENERAL DIRECTIVES

Programming

Dialogue with borrowing member countries. The Bank will seek to include the discussion on proactive disaster risk management in the dialogue agenda with borrowing member countries. The Bank will give due consideration to vulnerability related to natural hazards and risk management in relation to the priority areas of intervention discussed and agreed with the borrowers for the development of country strategies and operational programs.

The Bank will identify countries according to their level of exposure to natural hazards based on existing indicators and Bank experience. For countries that are highly exposed to natural hazards the Bank will identify their potential vulnerability as a major development challenge and propose a country level disaster risk assessment. When the assessments identify that potentially important disruptions in the country's social and economic development could be caused by disasters resulting from natural hazards, the Bank will encourage the inclusion of disaster risk management activities in the country strategy and operational program agreed with the borrower. These may include policy reforms, specific institutional strengthening activities and investment projects conducive to reducing vulnerability at the national, regional and municipal levels. The Bank will promote the use of the Disaster Prevention Sector Facility described in Section V of this policy and other means it offers to finance the recommended actions resulting from the assessment process.

Risk and Project Viability

Identification and reduction of project risk. Bank-financed projects will include the necessary measures to reduce disaster risk to acceptable levels as defined by the IDB. The Bank will not finance projects that, according to its analysis, would increase the threat of loss of human life, significant human injuries, severe economic disruption or significant property damage related to natural hazards.

During the project preparation process project teams will identify if the projects have high exposure to natural hazards or show high potential to exacerbate risk. The findings will be reported to the Bank through the social and environmental project screening and classification process. Project teams should consider the risk of exposure to natural hazards by taking into account the projected distribution in frequency, duration and intensity of hazard events in the geographic area affecting the project.

Project teams will carry out a natural hazard risk assessment for projects that are found to be highly exposed to natural hazards or to have a high potential to exacerbate risk. Special care should be taken to assess risk for projects that are located in areas that are highly prone to disaster as well as sectors such as housing, energy, water and sanitation, infrastructure, and industrial and agricultural development, as applicable. In the analysis of risk and project viability, consideration should be given to both structural and nonstructural mitigation measures. This includes specific attention to the capacity of the relevant national institutions to enforce proper design and construction standards and of the financial provisions for proper maintenance of physical assets commensurate with the foreseen risk.

When significant risks due to natural hazard are identified at any time throughout the project preparation process, appropriate measures should be taken to establish the viability of the project, including the protection of populations and investments affected by Bank financed activities. Alternative prevention and mitigation measures that decrease vulnerability must be analyzed and included in project design and implementation as applicable. These measures should include safety and contingency planning to protect human health and economic assets. Expert opinion and adherence to international standards should be sought, where reasonably necessary. In the case of physical assets, the Bank will require that, at the time of project preparation, the borrower establish protocols to carry out periodic safety evaluations (during construction as well as during the operating life of the project) and appropriate maintenance of the project equipment and works, in accordance with generally accepted industry norms under the circumstances.

The Bank's social and environmental project screening and classification process will evaluate the steps taken by project teams to identify and reduce natural hazard risk.

POST DISASTER OPERATIONS

In order to provide timely assistance at different stages after a disaster, the Bank may employ special procedures for processing and reformulating loans

to streamline preparation and expedite execution, including the Bank's Special Procurement Procedures for Emergency Situations.

Loan Reformulation

Redirecting resources from existing loans. The Bank may approve the reformulation of existing loans in execution in response to disasters if: (i) a state of emergency or disaster has been officially declared by the government; (ii) the impact of the loan reformulation has been estimated taking into account the intended uses and project objectives of the loan or loans to be reformulated relative to the proposed use of the funds, thereby creating the conditions for more informed decisions on the part of the approving authorities; (iii) adequate transparency and sufficient mechanisms for monitoring, auditing and reporting the use of the redirected funds is in place, while taking into account the need of a timely response given the nature of the situation; and (iv) a significant share of the redirected funds will be earmarked to reduce the borrower's vulnerability to future disasters and improve the country's capacity for comprehensive disaster risk management.

Reconstruction

Avoiding rebuilding vulnerability. Operations that finance rehabilitation and reconstruction after a disaster require special precautions to avoid rebuilding or increasing vulnerability. These include the precautions mentioned in "Risk and Project Viability", as well as correcting deficiencies in risk management policies and institutional capacity as reflected in "Programming". A significant share of the new investment will be earmarked to reduce vulnerability to future disasters and improve the country's capacity for comprehensive disaster risk management. Particular attention must be given to lessons learned from recent hazard events. The Bank will not assume that pre-disaster conditions persist in whole or in part in the affected area. Disaster risk assessment of the recon-

struction project should be carried out taking into account the specifics of the area, the sector and the infrastructure concerned, as well as the current environmental, social and economic situation and any changes in the affected area as a result of the disaster.

Humanitarian Assistance

Limited Bank role. Humanitarian assistance with Bank funding may be granted only if a state of emergency or disaster has been officially declared by the government. This funding will be provided only through emergency technical cooperations, to be implemented during or immediately after a disaster. The resources should be administered by international or local aid organizations specialized in humanitarian assistance and should be used exclusively for relief activities. The Bank's representative, in coordination with the government of the beneficiary country, is responsible for identifying the aid organizations that will receive the funding and administer the assistance. In the event that the Bank enters into a future agreement to administer resources provided by outside sources that include humanitarian assistance among the activities eligible for financing, this assistance should be designed in a manner that is consistent with the principles set out in the present policy.

POLICY IMPLEMENTATION

This policy enters into effect six months after its approval by the Board of Executive Directors. This will allow sufficient time to implement administrative changes and procedures within the institution. The policy will apply to operations that enter the Bank's pipeline after the date the policy enters into effect.

The Bank will use its standard procedures including those of the environmental classification and screening process for monitoring performance and evaluating compliance with the directives set out in this policy. The Bank will have an independent evaluation carried out five years after the policy enters into effect, to assess its impact on Bank activities, particu-

larly concerning the integration of disaster risk management in the programming process as outlined in "Programming" and disaster risk management in the project cycle as outlined in "Risk and Project Viability". The Bank will publicly report its experience with the implementation of this policy and the achievement of its objectives.

The Bank has several specialized instruments at its disposal that contribute to the implementation of this policy. These instruments may be used to assist its borrowing member countries in managing disaster risk, in addition to the Bank's regular lending and technical cooperation mechanisms. The Disaster Prevention Sector Facility provides financing for the identification, prevention or mitigation of risk, and preparation for disasters. Instruments for post disaster operations include the Immediate Response Facility, the Emergency Technical Cooperation, and the Special Procurement Procedures for Emergency Situations. The Bank may review existing instruments or establish new instruments to increase the efficiency of the implementation of the policy.

The policy cannot specifically encompass all circumstances, and consequently, it is conceivable that departures from one or more of the directives in the policy may need to be considered. In such circumstances, proposals advocating a departure in either programming activities or in project development and execution must demonstrate the exceptional characteristics of the situation that justify the departure. Project proposals with deviations from the policy should include the measures to mitigate the associated effects and formally request any specific exceptions to the policy.

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11

Special Considerations

INTRODUCTION

International disaster management has become increasingly diverse, encompassing new areas of technical expertise not traditionally considered relevant. Specialists in many fields, including development, economics, public health, political science, communications, and engineering, just to name a few, are finding that their experience and knowledge are being called upon as nations continue to address the snowballing issues of global disaster risk.

Hazard vulnerability, disaster risk, and the management of humanitarian emergencies have risen to the top of the global policy agenda in recent years, and have remained there due to the persistence of catastrophic disasters. The disaster events of the 21st century have already shattered any assumptions that some nations have solved the disaster risk problem. Through their awesome and destructive fury, they have proven that all nations, rich and poor, have much to learn about preparing and mitigating for, responding to, and recovering from the many forms of disasters that continue to plague us.

Chapter 1 described the increasing incidence of disasters throughout the world, and the growing hazard risk faced by the world's population. These trends continue despite considerable efforts to counter them and, without a more concerted effort to incorporate the global disaster risk reduction recommendations of the ISDR and other movements, nothing will change. During a recent 12-month period, from December 2004 through November 2005, the world community was confronted with a notably severe wave of disasters, indicative of what may be expected without greater disaster management efforts by governments around the world. Exhibit 11-1 lists a sample of these events.

As shown by the efforts of governments, NGOs, and multilateral organizations to find solutions to the skyrocketing financial and human losses of disasters, disaster management will remain a global topic of concern for many decades to come. Through the efforts of the IDNDR and the ISDR, as well as by NATO, the EU, governments such as Canada, the United States, Australia, and New Zealand, the Red Cross/Red Crescent Movement, and other NGOs, more has been done in the past decade to reduce this threat than has occurred throughout all history. And in response to the outpouring of concern by the world's population to the recent great loss of life and property resulting from the disasters listed in Exhibit 11-1, world leaders are beginning to take disaster threats even more seriously.

EXHIBIT 11-1   Major Forms of Disaster Experienced between December 2004 and November 2005, and Countries That Experienced Them

- Avalanches (India, Pakistan, Nepal, Greece, United States, Austria)
- Commercial airplane accidents (Afghanistan, Russia, Canada, Italy, Greece, Venezuela, Peru, Indonesia, Equatorial Guinea, Nigeria, United States)
- Complex humanitarian emergencies (Sudan, Uganda, Afghanistan, Somalia, Colombia, Iraq, Chechnya, Ivory Coast, DR of the Congo, Guinea, West Africa, Eritrea)
- Epidemics and pandemics (avian influenza [global], Marburg virus [Angola], plague [Congo])
- Explosions (China, United States, Turkey, Pakistan, United Kingdom)
- Extreme heat (United States, Bangladesh, Nepal, Pakistan)
- Extreme meteorological storms (South Asia, Chile)
- Famine (Malawi, Niger, North Korea, West Africa, Lesotho)
- Flooding (Vietnam, India, China, Canada, Austria, Bulgaria, Germany, Romania, Switzerland, United States)
- Hurricanes (United States, Guatemala, Mexico, Iran, El Salvador, Indonesia, Haiti, Cuba, Jamaica, Nicaragua)
- Landslides (United States, El Salvador, Nicaragua, Honduras, Indonesia, Guatemala)
- Major bus accidents (United States, India, China, Russian Federation, Nepal, Yemen, Peru, Sri Lanka)
- Maritime disasters (Ecuador, United States, Bangladesh, India, Nepal, Pakistan)
- Mass drowning (India)
- Mass poisoning (Philippines)
- Mining accidents (China, United States)
- Rail accidents (Japan, Sri Lanka, Pakistan, India)
- Severe drought (Paraguay, United States, Australia, Botswana, Bolivia, Cambodia)
- Stampedes (Iraq, India)
- Strong earthquakes (Peru, Pakistan, Japan, Chile, Iran, South Africa, China)
- Structural failures (Bangladesh, India, Russian Federation, Australia, China, Spain, France)
- Structure fires (France, Egypt, Argentina)
- Terrorist attacks (Indonesia, United Kingdom, Iraq, Russian Federation, Pakistan, Egypt, Iran, Israel, Palestinian Territories, Lebanon, India, Thailand)
- Tornadoes (United States, Bangladesh)
- Tsunamis (Thailand, Indonesia, Sri Lanka, India, Somalia, Maldives, Myanmar, Malaysia, Kenya, Tanzania, South Africa, Madagascar)
- Typhoons (China, Japan, Philippines, Thailand, Nepal)
- Volcanoes (El Salvador, Ecuador)
- Widespread civil unrest (France, Haiti, Iraq, Afghanistan, Ecuador)
- Wildfires (Spain, Portugal, United States, India, Russian Federation, Brazil, South Africa, Peru, Ukraine, Madagascar, Argentina)
- Windstorms (Pakistan, United States, South Africa)

In coming years, as the international community seeks to control increasing global risk, and as the international disaster management community begins to assume a more central and organized stance, several key issues must be addressed. While many of these problems have long existed without being adequately addressed, others are newly discovered and will require new solutions. In either case, these issues stand as challenges to the progress of international disaster management. This chapter presents several of these new and existing problems, which are certain to remain on the forefront of international disaster management for quite some time.

COORDINATION

Disaster response is becoming increasingly complex with each new event. Whereas dozens of agencies used to converge upon the scene of an earthquake or flood, there are now hundreds, and occasionally thousands. In response to the December 2004 tsunami events, for example, over 200 organizations addressed the single issue of water quality, while thousands more provided food aid, shelter, medical assistance, and many other victim and rehabilitation needs. Studies have found that despite coordination attempts, these responding agencies tend to work independently and in an uncoordinated manner, resulting in unnecessary delays and inefficiencies in the distribution and provision of relief. Lags, gaps, and inaccuracies persist in the vital information upon which coordination depends. Even when the NGOs and local community organizations involved in response would like to work together, they are often left out of the coordination planning processes before and during disaster response.

Coordination in disaster response has always been difficult, especially in terms of civil–military cooperation. As the scope of disaster management grows, coordination will only grow in complexity until a suitable mechanism is agreed on by all actors. Previous shortfalls contributed to the creation of coordination mechanisms like UNOCHA (see Chapter 10).

UNOCHA has proven effective as a coordinator in several disaster responses because of its close relationship to the overall UN system, whose agencies maintain long-standing relationships with developing country governments, where the most catastrophic disasters are likely to occur. However, OCHA lacks the authority to ensure all participating response and recovery agencies operate "on the same page." While such authority is unlikely to be granted to any single national, international, or nongovernmental organization, greater trust in, understanding of, and positive experiences with organizations like OCHA may lead to increased participation in their coordination structures.

Increased coordination has been shown to reduce the period of time between when the disaster occurs and when relief is provided. It also helps to increase the area covered by assistance efforts, decreases costs associated with the provision of supplies and assistance, and standardizes the quality of relief, among many other positive results. Effective disaster response coordination is the foundation on which increased international disaster response capacity will be built.

THE MEDIA

It is well known that the news media capitalizes on the spectacular nature of crises and disasters, broadcasting vivid images, heartbreaking tragedies, harrowing tales of survival, and public accusations of blame. This kind of reporting attracts viewers or readers and increases ratings. For centuries, the news media has exploited death, destruction, and victimization, first in newspapers, and later on the radio and the television. Today, thanks to technological advances, the media has found access to once-unimaginable places. Because of nonstop news coverage and the expansion of Internet- and wireless-based news services (such as cellular or handheld computer systems), the world today receives real-time disaster information, which only a decade ago would have been "old news" by the time it reached consumers.

Disaster management officials and the news media have traditionally enjoyed a love/hate relationship, with disaster management agencies viewing the media more as an adversary than an ally. The media, likewise, viewed responders as "standoffish," untrusting, and secretive. With the advent of effective media partnerships and increased disaster-specific education for members of the press, however, the news media is beginning to be recognized for the significant benefits they may offer disaster management. For instance:

- Through media partnership, more effective risk communication is possible. Chapter 5 described studies that identified the media as the primary source of risk reduction information for many significant hazards. The media is able to reach individuals and households in ways risk managers could never do on their own or through alternate sources.
- No system has proved more effective than the news media in alerting emergency management organizations and citizens alike about the onset of sudden disasters. Early warning messages broadcast by emergency managers via television, radio, and the Internet have proven highly effective. The news media has proven capable of transmitting messages about evacuation, medical assistance, and other emergency-related information. Additionally, emergency managers often learn of impending disasters by watching or listening to media outlets. The news media maintains some of the most effective methods for recognizing events in progress and transmitting that information rapidly. For instance, it was discovered in the after-action reporting on the response to the September 11, 2001 terrorist attacks in the United States that many, if not most, U.S. government officials first learned of the attacks from media giant CNN.
- The media is effective at alerting the world to slow-onset disasters that may otherwise go unnoticed until becoming a full-fledged catastrophe. Drought, famine, and many complex humanitar-

ian emergencies develop over a long period of time, during which intervention is much more effective. Even where knowledge of certain slow-onset emergencies exists, the media provides images and stories that allow citizens to understand and prioritize the events in relation to other existing issues. The media thus can mobilize concerned citizens, who pressure governments and multilateral organizations to take proper action. This coverage is also effective in motivating the same concerned citizens to increase philanthropic giving, on which humanitarian organizations depend.
- The news media is effective at identifying corruption and mismanagement, and thereby helps to reduce both. In their investigative role, they help raise awareness about unethical and inappropriate forms of response and recovery that often stymie disaster management efforts. The information they gather proves valuable long beyond the disasters themselves, as it is later used to guide the improvement and restructuring of future response and recovery efforts.
- The media is able to act as a member of the emergency management team if provided the tools to do so. The media relies on accurate data and informed officials to provide viewers with useable information. By providing the media with these resources, and helping them to understand the dynamics of disaster management, disaster managers can increase the likelihood that the public is well informed.

Of course, many of the grievances emergency managers have against the media are based in part on truth and experience—and many of these problems persist. For instance, the media is not consistently accurate in their emergency assessments, and has made some situations appear worse than they actually are. The media often select "experts" who are likely to provide alarmist viewpoints that reflect worst-case scenarios and extreme predictions. As a result, resources can be directed away from more important but less publicized issues.

The media can cause donor fatigue because of the excessive coverage of disaster after disaster. This blanket coverage can result in lower concern for the plight of disaster victims, which can negatively impact philanthropic giving. Donors may feel that the world's problems are so extreme that their individual efforts are meaningless, which leads them to decrease or even cease their giving.

Accuracy of information is also an issue of concern in relation to the media. Even when treated as a partner, the media may produce ill-informed messages that cause problems for both responders and citizens alike. Once a message has been broadcast, countering its negative consequences is very difficult.

And, finally, the media's tendency to inject immediacy and consequence into every story can incite the public into pressuring officials to make hasty decisions when proper (though time-consuming) assessment and consideration is required. This is most often the case in the disaster recovery period, when risk reduction measures must be incorporated into reconstruction.

The news media is an important partner to the disaster management community and possesses many highly refined tools that emergency managers could better utilize. With technological advancements the news media have increased their ability to gather information and report it to ever-wider audiences in real time, enhancing their value as a partner. It is in the best interest of all emergency management organizations to work with the media, not against them, and to treat them as an effective component of the greater effort to tackle emergency management problems.

INSTITUTIONAL CAPACITY DEVELOPMENT

In recent years, two earthquakes occurred of almost equal magnitude and depth. However, one caused tens of thousands of deaths in India, while the other resulted in less than 60 deaths in the United States. The disheartening though obvious explanation is that these two countries differ significantly in regards to their institutional disaster management capacity. At the time of the Gujarat earthquake, India not only lacked mitigation and preparedness programs, such as effective building code enforcement that could have prevented many of the fatal structural failures, but it also had not yet developed an effective response framework. The opposite could be said for the Northridge earthquake in California, which was more costly in financial terms but was a clear example of lives saved through effective disaster management. Nations need comprehensive emergency management capacities to protect themselves from the consequences of disasters—not just one or two emergency management components.

The United Nations, through its International Strategy for Disaster Reduction, has made institutional capacity building central to its risk reduction efforts. While many nations have developed these necessary frameworks in recent years, as espoused by ISDR, they have done little to institutionalize emergency management at all government levels. Moreover, the mechanisms supported by those emergency management frameworks are rarely given adequate staff or funding to prove effective should a disaster actually occur. It is evident from the continued need for international intervention in disasters, despite these early improvements, that most nations have a long way to go.

POLITICAL WILL

Disasters are political events—they can either glorify a politician or destroy him. Their spectacular nature demands the involvement of these chief executives and tests them for their leadership merit. How politicians manage these rare events can frame how their entire term in office is judged.

In the absence of disaster events, however, the field of emergency management falls low on many policy agendas. All governments operate on limited budgets, making it particularly difficult for poor nations' leaders to choose mitigation for disasters that may never occur during their tenure over projects that

will generate instant gratification and recognition. A U.S. politician captured this sentiment when he said, "I won't lose my job for failing to mitigate, but I might lose my job if I botch a response" (Haddow, 2005).

The United Nations has identified increased political commitment to emergency management as one of the four principal objectives of the ISDR. Public officials must be convinced of the extensive benefits of comprehensive emergency management, including how much more cost effective mitigation and preparation efforts are as compared to disaster recovery and response.

COMPOUND EMERGENCIES

Disasters do not occur in a vacuum in the real world. However, many disaster management-planning efforts approach each hazard as if it will occur in the absence of all other hazards. Unfortunately, it is not uncommon for two or more disasters to occur in succession or concurrently, resulting in what is termed a "compound emergency." Mudslides in the midst of hurricanes, for example, is a compound emergency that has become commonplace in Central America during the past decade. The victims of the 2005 earthquake in South Asia experienced another form of compound emergency when they found themselves without adequate shelter or clothing in the midst of snowstorms and extreme cold following the destruction of their homes. The Indonesian victims of the 2004 tsunami events in Asia were still in the immediate aftermath of an earthquake as the waves of the tsunami crashed over them. And in Louisiana, New Orleans residents had just endured a powerful hurricane when levees broke and a technologically induced flood inundated 80% of the city.

Compound emergencies stretch the emergency management capacities of even the most prepared nations. They are as much a real hazard as many other more common, individual hazards. By considering these multihazard disasters, both affected governments and responding international relief agencies can better address the consequences of each unique disaster that is guaranteed to occur, regardless of whether it is compound, complex, or simple.

DONOR FATIGUE

The engine that drives international emergency management is fueled by the philanthropic actions of nations, corporations, and individuals. Donors give generously each year in response to the collective catastrophic damage caused by disasters of all forms, in all parts of the world. The December 2004 tsunami alone generated over $7 billion in international donations from a full range of public and private sources. In August 2005, when Hurricane Katrina caused widespread destruction across the southeastern parts of the United States, international donors responded again, providing over $1 billion in financial and other assistance. But less than two months later, a 7.6 magnitude earthquake struck South Asia, leaving almost 80,000 people dead and over 3 million homeless. Donors did not respond with such generosity. In fact, three weeks later, the UN Flash Appeal of $312 million for Pakistan had received only $90 million (less than one-third)—compared with over $800 million pledged within one week in response to the tsunami. (The overall UN Flash Appeal in response to the earthquake was $978 million, later revised to $1.293 billion.)

In light of the growing number and size of disasters throughout the world, nations, corporations, and citizens are finding that they are running out of funds to dedicate to humanitarian assistance. With more disasters happening concurrently throughout the world, donors are having difficulty concentrating on more than one humanitarian effort at a time, with the more spectacular events receiving priority both in the press and from donors' pockets. Many humanitarian agencies and NGOs are finding that their response and recovery funding for certain disasters is not meeting needs. Whether the disasters of 2004–2005 are trendsetting or anomalous remains to be seen, but future humanitarian assistance funding clearly stands to suffer from the growing number of disasters.

Donors and recipient agencies must reassess how disaster funding is collected for and disbursed to emergency situations. The American Red Cross attempted to divert some of the billions of dollars it received in response to the September 11, 2001 terrorist attacks to allow the funding to address a much wider range of disaster-related needs, but the public attacked them severely for doing so. In light of this experience, industrywide consideration of how to fund multiple disasters is necessary.

CORRUPTION

Corruption exists to a varying degree in all countries' governments, businesses, and general populace. Widespread corruption often leads to the kinds of vulnerabilities that cause humanitarian emergencies. A short list of examples of how corruption may increase vulnerability include:

- Building inspectors accepting payment to overlook violations
- Construction contractors substituting approved building materials for substandard materials that may result in structural weaknesses
- Government employees embezzling or sidetracking funding earmarked for disaster mitigation or preparedness
- Government executives misusing loans from the international community, resulting in underdevelopment coupled with high indebtedness
- Certain local leaders with political ties to the central government being able to secure funding for emergency management activities, while those without political favor being unable to secure sufficient funding
- Transportation carriers failing to follow government safety regulations in order to cut operating costs: failing to properly train employees, neglecting maintenance, or failing to install proper safety equipment

Once a disaster occurs, existing corruption patterns do not vanish. Humanitarian emergencies are characterized by huge inflows of cash and supplies, both of which present new opportunities for corruption. Power has been abused in diverse ways in these situations, ranging from simple theft to systemic rape and murder. Disaster victims have been required to pay assessors to be included on relief and recovery registries; others have had to pay or offer other favors to receive supplies and assistance that had been donated for uncommitted distribution. At times, relief supplies have simply disappeared, presumably into some official's personal possession. International NGOs and governmental agencies inadvertently contribute to this corruption by not fully understanding how such matters affect local politics and society. Ongoing discussions seek ways to reduce or prevent such actions in the future. Corruption not only undermines the work of response and recovery agencies but it also causes additional suffering for victims.

STATE SOVEREIGNTY

International law states that nations retain their sovereignty even in the event of disasters or complex humanitarian emergencies. Accordingly, affected governments must invite international response agencies to participate in response efforts before these organizations can provide humanitarian assistance. While most countries in need do not balk at requesting outside help, in some situations, much needed international assistance is not requested or is turned away at the border. The reasons why sovereignty may be invoked to prevent access by relief agencies are diverse. Aid refusal occurs in both rich and poor countries and for national, technological, and intentional disasters.

One of the most common reasons is that the affected country is concerned with "saving face," and believes that refusing assistance or failing to share information will help downplay the disaster and give the illusion of control. Because of this, China kept its disaster fatality information classified until September 2005—a practice that made the assessment of disaster magnitude almost impossible for outside response

agencies. Another notorious example of face-saving occurred in Japan following the 1995 Kobe earthquake, when international search-and-rescue teams were denied entry for many days, closing the window of time when they could have been most effective. Nations that are oppressive and maintain closed borders may also refuse assistance for fear of the outside influence rescuers may introduce. This is said to be the reason why Russia denied the entry of Japanese rescuers after the 1995 Sakhalin Island earthquake. (Russia was reputedly afraid that Japan would use its access to take control of the island.) It exhibited similar behavior in 2000, after the Kursk submarine disaster, when 118 sailors perished after Russia refused all international assistance.

Nations with a history of political rancor also have been known to refuse assistance from each other. Cuba and the United States regularly offer each other assistance in the aftermath of hurricanes, without any of this assistance ever having been accepted. A surprise reversal in behavior took place following the 2005 South Asian earthquake, when longtime rivals India and Pakistan allowed binational assistance in the disputed Kashmir region, despite decades of ongoing violence in the affected area.

Finally, governments of nations entrenched in violent conflict often refuse international assistance due to fears that responding governments or agencies will meddle in political affairs. Similarly, no viable government may exist, as in Somalia in 1993.

EQUALITY IN HUMANITARIAN ASSISTANCE AND RELIEF DISTRIBUTION

Monetary value cannot be placed on human life. Equally, all people have the same unalienable rights regardless of their age, race, gender, religion, social class, or nationality. Unfortunately, however, common inequalities and inconsistencies exist in the provision and distribution of humanitarian assistance by donors and relief and recovery personnel. These inequalities are persistent and follow many of the same patterns seen in development. As such, certain regions,

nations, and populations receive less assistance than others in the aftermath of disasters.

At the victim level in the relief and recovery phases of disaster management, it is not uncommon for existing bigotries to influence the distribution of emergency assistance, and for certain groups in need of aid to be favored over others. In societies in which people are discriminated against or placed at a general disadvantage due to their race, gender, age, religion, social class, caste, physical ability, appearance, or other distinguishing characteristic, these already vulnerable populations become even more vulnerable.

One of the most typical forms of discrimination is gender bias, which is most commonly found in societies in which gender roles are strictly defined and women are traditionally tasked with duties related to the home and children (duties that tend to increase in times of crisis). In these cultures, men are more likely to wait in relief lines for supplies, while women (as well as children and the elderly) become increasingly dependent on them for survival. This situation is exacerbated when a woman is a widow or single parent and is unable to compete for aid.

Another common form of discrimination is class bias. Though most obvious in social systems based on caste identity, underlying ethnic and racial divides often present similar problems. Avoiding these forms of bias can be difficult because the disaster management agencies involved in response must be aware of the discrimination in order to counteract its influence. For example, when host country nationals are hired by humanitarian agencies to assist in relief distribution, as is often the case, they can inadvertently inject existing ethnic or cultural biases into their efforts. Humanitarian agencies thus must be careful to balance the makeup of their employees in such situations.

Many NGO and governmental response agencies are continuously developing systems of relief and distribution that counteract the complex problems associated with discrimination. However, the difficult nature of this issue is highlighted by the fact that targeting specific groups, such as women or children, can lead to reverse discrimination. Any such bias can result in a decline in perceived legitimacy or impartiality of the

assisting agency and/or exacerbation of the needs being addressed (Maynard, 1999).

Inequality in humanitarian assistance also occurs on a more global scale at the donor level. The reasons for this phenomenon, illustrated by the levels by which Flash Appeals are funded in comparison to each other, are less understood. Table 11-1 shows the highest and lowest levels of funding for CAP appeals from 2003–2005 (the five lowest and five highest of each year).

Through its Flash and Consolidated Appeals Processes, the UN tasks the world community to assume the costs of response and recovery for the many international disasters that occur each year. Unfortunately, these appeals go largely unmet. Worse yet, there is significant irregularity in how these appeals are responded to, with some receiving significant donations and others receiving almost nothing. While 83% of the tsunami Flash Appeal was met within weeks of the event, the South Asian earthquake Flash Appeal only raised 13% in the same time frame. Despite pleas by UN Secretary General Kofi Annan and Under Secretary General for Humanitarian Affairs Jan Egeland during the UN Annual Donors Conference in October 2005, donor nations only contributed an additional $15.9 million to the South Asia Flash Appeal, bringing the total amount of the appeal covered to 16%.

Part of the reason for this inequality is the inconsist level of international attention to certain disasters, regardless of their severity. Some say that the 2004 tsunami events in Southeast Asia garnered so much international attention only because they struck tourist centers and therefore affected a more international range of victims. In stark contrast, the 2005 earthquake in South Asia fell off the international media agenda within days, while the emergency phase of the disaster was still ongoing. Presumably this was because the affected area was a war-torn region not very well known by the general global audience, and therefore unable to attract wide media attention (CNN, 2005b). Hurricane Katrina in the United States, on the other hand, which caused far fewer deaths (about 1000, as compared to

TABLE 11-1   **Levels of Funding for CAP Appeals, 2003–2005**

2003		
Country	Appeal	% Covered
Top Five:		
Zambia	$14,503,757	22
Zimbabwe	$92,266,198	24
Malawi	$10,792,293	24
Mozambique	$20,060,140	26
Central African Republic	$9,100,864	39
Bottom Five:		
Africa Great Lakes region	$115,327,113	121
Sierra Leone	$125,772,687	95
Chechnya	$30,270,494	91
Iraq	$2,223,143,026	91
Uganda	$148,135,670	83
2004		
Country	Appeal	% Covered
Top Five:		
Zimbabwe	$90,045,002	11
Philippines	$6,395,635	23
Grenada	$27,640,760	24
Indonesia	$40,448,236	30
Bangladesh	$209,905,410	31
Bottom Five:		
Angola	$136,020,262	96
Africa Great Lakes region	$85,461,521	96
Chad	$165,478,646	88
Tanzania	$38,766,187	83
Uganda	$142,880,013	79
2005		
Country	Appeal	% Covered
Top Five:		
West/Central Africa	$3,241,637	0
Nepal	$64,506,025	2
South Asia earthquake	$549,585,941	13
Central African Republic	$27,515,987	31
Malawi	$98,260,869	32
Bottom Five:		
Indian Ocean tsunami	$1,293,723,533	83
Africa Great Lakes region	$115,020,820	77
Angola	$4,027,000	72
Guatemala	$24,670,000	67
Benin	$5,951,780	66

Source: UNOCHA, 2003, 2004, 2005.

over 70,000 in Pakistan and almost 300,000 in the tsunami events) received 24-hour news coverage for several weeks.

CLIMATE CHANGE AND THE ENVIRONMENTAL IMPACT OF DISASTERS

Statistical data give clear signs that Earth's climate is changing rapidly—at a rate possibly exceeding. 2 degrees Celsius per decade. Whether these changes are part of a natural cycle or induced by human activities is still a major point of contention, but the fact that such change is occurring is undeniable. These climatic changes have been correlated with overall increases in sea and air temperatures, changes in the speed and direction of wind and sea currents, alterations to the polar ice caps and glacial ice, and variances in precipitation patterns, among other effects. One of the more troubling consequences of these changes has been a shift in the types and severity of hazards throughout the world.

The UN in particular, and the global community in general, have recognized that nations must adapt to these changes and prepare for a possible increase in catastrophic hazards. Several nations may already have had a hint of what may come. In 2005, for instance, the United States experienced a record year in terms of both the number of hurricanes that struck and the maximum recorded strength of a hurricane (Wilma), resulting in the costliest disaster season yet. Klaus Topfer, the executive director of the UN Environmental Program (UNEP), officially blamed climate change for the record flooding and fires in Europe during the summer of 2005.

Climate change is an especially divisive topic because of its implications on global trade and the cost of business. Some nations are reluctant to formally agree with observed climate change data or accept that human activities influence such change, because they would be pressured to drastically alter their industrial behavior. Their production costs presumably would increase, possibly causing them to lose a certain amount of business competitiveness.

As part of the January 2005 World Conference on Disaster Reduction, recognition that the world's nations must address climate change as part of a greater risk reduction effort was reflected in the resulting Hyogo Framework for Action, which tasked signatories with:

> Promot[ing] the integration of risk reduction associated with existing climate variability and future climate change into strategies for the reduction of disaster risk and adaptation to climate change, which would include the clear identification of climate related disaster risks, the design of specific risk reduction measures and an improved and routine use of climate risk information by planners, engineers and other decision-makers. (UNISDR, 2005)

However, because of the objections of several countries (including the United States) to prescriptive language in the document, as well as to the number of times the term "climate change" appeared in the framework, the only general, widely interpretive outcome likely to result is in terms of how nations actually prepare for the prospect of a future change in the world's climate. While some may see the devastating year endured by the United States following this conference as due justice, it remains to be seen whether any countries will have learned from the experience.

EARLY WARNING

Systems that allow for early warning are expensive, complex, and require active maintenance, traditionally making them a luxury for only the wealthiest nations. This disparity in early warning capacity became apparent in the minutes and hours before the December 2004 tsunamis struck, when the United States and other industrialized nations were fully aware of what was to come but were unable to turn that information into action due to a lack of early warning infrastructure in the affected nations.

Early warning, as described earlier in this book, requires much more than the equipment and expertise to recognize disasters before they happen. To be effective, an early warning mechanism must include public

education, accurate risk perception, a communications system to relay the message, and an emergency management system to adequately coordinate the response. Even if the wealthy nations of the world offer to share their early warning technology, only one piece of the puzzle will have been put in place. Until at-risk nations can fill in the gaps, they will remain at risk from future preventable disasters. Early warning is one of the primary topics addressed by the Hyogo Framework for Action created at the 2005 World Conference on Disaster Reduction.

LINKING RISK REDUCTION AND DEVELOPMENT

The practice of integrating disaster management and risk reduction into overall development activities was detailed in Chapter 1 and subsequently touched upon in other chapters. Only those countries that are able to reduce their disaster vulnerability will ever achieve sustainable development. Disasters reverse development progress by years or even decades and leave countries facing monumental debt for projects that were destroyed.

Development organizations are responsible for ensuring that the projects they fund or conduct reflect an effort to increase local resilience. The international donor community must not only continue to insist that development projects fully accommodate disaster risk reduction but also institute monitoring mechanisms to ensure that such standards are abided by. Additionally, the international donor community must assess risk before disasters occur, so that risk reduction measures may be adequately tied to development activities prior to devastating events.

Of course, these standards of development practice depend on the availability of accurate disaster-specific information, including hazard risk assessments, viable mitigation options, and the full range of alternate projects and project locations. Efforts to map the world's risk zones for this purpose have been made by many organizations, including the World Bank Group, the UN, the Pan American Health Organization, and others, but all of these projects remain in their infancy.

TERRORISM

As described in Chapter 2, terrorism is a hazard that has existed for centuries. Some nations, such as Israel, the United Kingdom, Turkey, Colombia, and Spain, have dealt with the scourge of terrorism for decades. Others, due to a real or perceived lack of risk, have done little or nothing to address this hazard. However, since the turn of this century, the desire to address the terrorism hazard has increased substantially in terms of national and international spending and cooperation. This new direction for emergency management may end up increasing vulnerability in other hazard areas that traditionally are more likely to occur.

Hazards are managed according to the two component factors of risk: the likelihood that the hazard will strike, and the expected consequences if it does. However, since September 11, 2001, when the United States fell victim to a terrorist attack, a third element has been introduced into this equation: risk perception (specifically, the irrational fear associated with terrorist attacks). The result, it seems, is that disaster management resources are now not doled out according to proportional or measured risk, but rather concentrated on this newly recognized (but in reality, age-old) hazard. Not only the United States has responded this way, but many other nations have as well.

In reality, the statistics related to terrorism risk do not support the disproportionate amount of funding and effort that recently has been dedicated to its treatment. In 2001, terrorists killed 3646 people worldwide (a number four times greater than the average toll of terrorism each year between 2002 and 2004), with almost 3000 of those deaths in the United States. But that same year, and measured over the past decade, and even the past century, terrorists have done very little in comparison to nature's fury. Heat waves killed over 20,000 people in the past decade alone— 15,000 in one year—while earthquakes have claimed

tens of thousands of lives on multiple occasions. Annual hurricanes, floods, and earthquakes kill tens of thousands and cause economic damages that overshadow those of 9/11. Just two of the natural events listed in Exhibit 11-1, the 2004 tsunami and the 2005 South Asian earthquake, resulted in more deaths than all terrorist attacks ever recorded. Add to these deaths the injuries, unemployment, and homelessness that accompany natural disasters, and the number of people affected rises to a staggering 170,000,000 each year.

The consequences of focusing too much on a single, low-likelihood threat like terrorism became apparent to the United States in August and September of 2005 when Hurricane Katrina struck. The United States' disaster management agency, FEMA, had been retooled as a terrorism-response agency since 2001 and had lost the ability to adequately respond to a large-scale natural disaster like Katrina, which only years before it would likely have had no problem handling. Other nations should learn from the United States' mistake and ensure that their emergency management systems are based upon risk and not political pressures or misguided perceptions.

GLOBAL DISASTERS: SARS, AVIAN INFLUENZA, AND OTHER EMERGING EPIDEMICS

Many of history's most devastating disasters, in terms of fatalities, have been pandemics. The 20th century alone saw three major pandemic events (in 1918–19, 1957, and 1968), the first of which resulted in as many as 50 million deaths before being brought under control. While public health facilities and capacities in many of the world's wealthier countries have come a long way since 1968, the ease and speed of modern global air travel and the interconnectedness of international commerce could lead to many more fatalities in an even shorter amount of time should an equivalent pandemic arise. And the poor countries of the world still lack even the basic infrastructure to contain such a hazard on their own.

The global potential of a modern pandemic was first recognized in 2002 and 2003 when SARS suddenly emerged, quickly spreading to 8100 people in dozens of countries on six continents. Many countries acted individually in their approach to limiting the virus, and there were many inconsistencies in response actions. While some nations were able to fully limit the disease's fatality rate, others experienced fatality rates as high as 17%. (Several countries did experience even higher fatality rates but did not have enough cases to constitute an acceptable sample size.)

Following the narrowly averted SARS pandemic, world leaders called for greater international cooperation in tackling preparedness for and planned response to the next pandemic threat. Like many other disasters, however, once the SARS emergency was brought under control and no longer an emergency, it quickly fell off the media agenda. Little has been done to address the need for an international monitoring, detection, and management capacity for future pandemics. For instance, questions regarding how individual sovereign nations could or would apply quarantines and other disease control mechanisms have not yet been addressed. Furthermore, although the public health response to the spread of transmissible pathogens is wholly dependent on established and accurate identification and reporting mechanisms, no such global information management and sharing systems have been developed—making disease containment extremely difficult.

Discussions about global capacity reemerged in mid-2005 when an Asian epidemic of bird flu began spreading outside the region. Because of the recent SARS events, the groundwork had already been laid for both rational discussion and action and irrational hysteria and hype. What is clear despite either extreme is that no viable international public health capacity yet exists to contain this disease should it mutate and spread, as it is feared to do. The need for such a system was portrayed in November 2005, when the Asian Development Bank estimated that an avian influenza pandemic would cost the countries of Asia over $280 billion in losses (over 6% of GNP)—and

the World Bank added that these losses would come "not from death or sickness but from people and governments responding in an uncoordinated way" (CNN, 2005a).

The UN has estimated that the avian influenza virus could kill as many as 150 million people worldwide if it mutated into a form easily transmissible between humans. The U.S. government was the first to formally begin developing a mitigation and preparedness program geared towards the pandemic hazard, with a $7.1 billion program that includes detection and containment systems, laboratory research into pathogens and the development of treatments and vaccines, and preparedness for government officials at all administrative levels. While this program includes approximately $250 million for a "global surveillance and preparedness network," which presumably will help the international community to more quickly recognize an emerging epidemic through the coordination efforts of the World Health Organization, it clearly focuses upon the needs of one nation. Each nation must develop a domestic capacity that allows it to effectively use the information from any detection system. Otherwise, they will remain as defenseless as they currently are.

CONCLUSION

The future of international disaster management is bright. The 21st century has so far been marked by a succession of disaster events so devastating that the weaknesses they have exposed are impossible to ignore. These illuminating events have coincided with the culmination of the International Decade for Natural Disaster Reduction (IDNDR) and the commencement of the International Strategy for Disaster Reduction (ISDR)—and their timing has served to justify the need for both.

All evidence points to a worldwide recognition that more effort is required by all nations to reduce global vulnerability. The most notable of these forward steps is the Hyogo Framework for Action 2005–2015: Building the Resilience of Nations and Communities to Disasters. This framework, adopted by the member states of the United Nations, outlines the disaster management priorities of the coming decade as:

1. Ensuring that disaster risk reduction is a national and a local priority with a strong institutional basis for implementation
2. Identifying, assessing, and monitoring disaster risks and enhancing early warning
3. Using knowledge, innovation, and education to build a culture of safety and resilience at all levels
4. Reducing the underlying risk factors
5. Strengthening disaster preparedness for effective response at all levels

Although these priorities may appear elementary, they are the foundation of emergency management practice upon which every lesson included in this text is built. Unfortunately, this foundation is still lacking in many, if not most, countries of the world.

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