Fourth Edition

Introduction to International Disaster Management

Damon P. Coppola

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Damon P. Coppola

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The Boulevard, Langford Lane, Kidlington, Oxford OX5 1GB, United Kingdom
50 Hampshire Street, 5th Floor, Cambridge, MA 02139, United States

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British Library Cataloguing in Publication Data
A catalogue record for this book is available from the British Library

Library of Congress Cataloging-in-Publication Data
A catalog record for this book is available from the Library of Congress

Library of Congress Control Number: 2020941970

ISBN: 978-0-12-817368-8

Acquiring Editor: Katey Birtcher
Senior Editorial project manager: Susan Ikeda
Production Manager: Janish Paul
Designer: Ryan Cook

Typeset by TNQ Technologies, Chennai, India

For Terry Abbott

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Contents

Foreword

The need for a new edition of this sterling publication reinforces the fact that in a changing world, emergency managers need to work closely with those professionals engaged in the policy and implementation of economic development. Increasing intensity and frequency of disasters experienced in the recent past mean that an approach of simply responding to emergencies will overwhelm emergency services, sooner rather than later. Unless we begin to address the underlying causes of disasters, the costs of response will become prohibitive, denying us the sustained development we all seek.

The Sendai Framework for Disaster Risk Reduction 2015–2030 reminds us of the importance of a systems and multiple-stakeholder approach to reduction of disaster risks, with the aim to reduce current and prevent future risks. This global framework provides simple guidance for policy makers on how to reduce disaster and climate risks.

More and more, reducing disaster risks is about changing human behavior. As more and more people reside on river banks, near the coastline, and in forestlands, we can expect an increase in vulnerability and exposure to disaster risks. This will mean that the workload of emergency managers is going to increase. This also means that the economic costs of response and recovery will trend upward, reducing funds available for social and economic development.

Such a scenario is not acceptable. Human behavior needs to change in response to the trend of increasing disasters, especially those caused by hydrometeorological causes. The first step could be better informed emergency managers, who can guide not only the policy makers and the political leadership, but the communities as well, toward a path focused on better risk assessment, mitigation, and risk reduction. This book explains the means available for assessment of risks, mitigation, preparedness, and recovery, as well as response. The emergency manager of the future needs to see his or her role not only as a responder, but also as a professional well versed in mitigation and recovery. The emergency manager of the future must also be prepared with the economic case for reducing disaster risks, able to compare development proposals and projects based on the potential costs of mitigation vis-à-vis the cost of recovery ex post facto.

We must remember, reduction of disaster risks is common sense and is nothing new. Unfortunately, we often seem to forget what we have learned over the centuries. This book is a good reminder of the pool of knowledge we have that can help an emergency manager guide a policy maker, and a policy maker guide an emergency manager. Damon Coppola's book comes at a critical juncture in time, when the world is debating many aspects of risk reduction and planning for the coming years when business as usual will not be enough.

Well done Damon!

Sanjaya Bhatia
Head, United Nations Office for Disaster Risk Reduction (UNDRR) Global Education and Training Institute and UNDRR Office for Northeast Asia

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Acknowledgments

The author would like to express profound gratitude to George Haddow and Jane Bullock for their willingness to lend freely their invaluable expertise and experience—much of which is captured in the pages of this text—and for their enduring friendship and constant support. Very special thanks also go to Ollie Davidson, Sanjaya Bhatia, Jack Harrald, Greg Shaw, J. René van Dorp, Joseph Barbera, Ryan Miller, Erin Hughey, and Andy Bates. 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. And it is with a heavy heart that I express my sincere appreciation to the late Terry Jeggle, who was always willing to give freely of his experience and expertise to make the world a better place.

I would also like to thank Katey Birtcher and Susan Ikeda at Elsevier for the tremendous assistance they provided in the development of this book. For their contributions to the content of this text, I would like to thank Timothy Wilcox, Ana Lucia Hill, Garrett Ingoglia, Gerry Potutan, Liz Maly, Karl Kim, Caroline Brassard, Leonardo Maldonado, Cristina Ascone, Robert McCreight, Charis Galaraga, Johann Goldammer, Erin Ngo, Ann Patton, David Alexander, Rae Zimmerman, Vicki Bier, George and Sharon Ketchum, Wayne Blanchard, Wendy Walsh, Barbara Johnson, Gunnery Sergeant Shannon Arledge (USMC), Greg Guibert, Claire Reiss, Yuki Matsuoka, Gilbert Burnham, Sascha Peterson, Gaye Cameron, Niels Holm-Nielsen, Juan Edwardo Donoso, Meredith Golden, Erdem Ergin, Amy Sebring, Colin Perry, Avagene Moore, Irmak Renda-Tanali, Sarp Yeletaysi, Louise Comfort, Ali Asgary, Stephen Carter, Eric Holdeman, David Gilmore, Tyson Vaughan, Alan Kirschenbaum, Kay Goss, Sarah Wade-Apicella, Sara Castro de Hallgren, Ana Cristina Thorlund, Cassie Stelow, Chani Goering, Todd Bosse, Scott Kuykendall, Tim Manning, Joe Green, Jared Batzel, Gary and Julie Greenly, Brad Milliken, Joel Myhre, Kalei Miller, Brian Edwards, Ben Ryan, Brian McAdoo, Burcak Basbug Erkan, Jack Suwanlert, Rick Bissell, Cate Moore, Chris Schraders, Caroline McMullan, John Borton, Darcy Whiteside, William Waugh, Jessica Hill, Georg Pflug, Ralph L. Keeney, Clark Chapman, Anatoly Klypin, Eva Coles, Amita Sudhir, Paul Rosenberg, and W. Kip Viscusi.

And finally, I would like to extend a very special thank you to my wife, Mary Gardner, without whose patience, insight, and editorial assistance this book would not have been possible; and to my parents, Eileen and Paul, whose measured risk lessons I use to this day.

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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, 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 often results in disastrous events that overwhelm not only the response capacities of communities but also those of nations and, in the largest events, entire regions. And when this happens, there is an expansive and growing global community of international disaster management stakeholders ready to mobilize.

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

Disaster management as a practice and 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 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 on, 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 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 of 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).

In conclusion, Chapter 11 discusses several special topics that must be considered in the management of international disasters. These include coordination, the media, capacity building, political will, compound emergencies, donor fatigue, corruption, sovereignty, climate change, linking risk reduction and development (and differentiating between recovery and development), terrorism, and emerging epidemics.

CHAPTER

The management of disasters

1

Chapter outline

Introduction to International Disaster Management. https://doi.org/10.1016/B978-0-12-817368-8.00001-4

Introduction

Disasters have adversely affected humans since the dawn of our existence. In response, individuals and societies alike have strived to minimize their hazard exposure and decrease their vulnerability to the consequences of these disasters. Systems, competencies, and resources alike have been developed to manage events from the first recognition to the postdisaster response and long-term recovery needs. Regardless of how these efforts approach the problem, they share a common goal: disaster management.

The motivating concepts that guide disaster management—the reduction of harm to life, property, the economy, society, 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 of addressing the problem. But no nation, regardless of its wealth or influence, is so advanced as to be fully immune from disaster's negative effects. Furthermore, the emergence of an increasingly complex global marketplace has made it almost impossible to contain a disaster's consequences within one country's borders.

This chapter examines basic concepts of disaster management and expands on those concepts specifically to 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 follows. Finally, definitions are provided for several key terms used throughout this text.

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 sizable 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 Akkadians, 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; Fleming, 2019). A worldwide drought

in the 8th and 9th centuries, caused by shifts in the yearly monsoons and resulting in mass crop failure and subsequent starvation, is now believed to have been behind the fall of both the Mayan empire in Mexico and the Tang dynasty in China (Sheridan, 2007). From a modern perspective, each catastrophic event that has occurred since the turn of the century, including the Dec. 26, 2004, earthquake and tsunami (over 230,000 killed), the 2005 Kashmir earthquake (80,000 killed), the 2008 Sichuan earthquake in China (68,000 killed), the 2008 Cyclone Nargis (135,000 killed), the 2010 Haiti earthquake (perhaps as many as 200,000 killed), and the 2011 Great East Japan Earthquake (16,000 killed), might seem anomalous, but these disastrous events are not close to record-breaking, or even unique, in the greater historical context (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 the positive likelihood of affecting humans or possibly have a consequence that may adversely affect humans' existence. Until humans walked the earth, neither the likelihood nor the consequent factors of hazards were calculable; thus, their presence is negated.

With the appearance of our species, 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.

Table 1.1 Selected notable disasters throughout history.

Disaster	Year	Number killed
Mediterranean earthquake (Egypt and Syria)	1201	1,100,000
Shaanxi earthquake (China)	1556	830,000
Calcutta typhoon (India)	1737	300,000
Caribbean hurricane (Martinique, St. Eustatius, Barbados)	1780	22,000
Tambora 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 (2005), NBC News (2008).

These early inhabitants did not, however, sit idly by and become easy victims. Evidence indicates that they took measures to reduce, or *mitigate,* their risks. The fact that they chose to inhabit caves is testament to this theory.

Applications of disaster management appear throughout the historical record and in popular folklore. 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 on 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 by surviving the disastrous flood. The story tells us that those who did not perform similar actions perished.

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 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 important 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. Although Herculaneum, which was at the foot of the volcano and therefore directly in the path of its lava flow, was buried almost immediately, most of Pompeii's population survived. This was because the citizens of Pompeii had several hours to prepare 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, in which a comprehensive approach is applied 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. Whereas the management of disasters during the past few thousand years was limited to single acts or programs addressing individual hazards, many of these accomplishments were organized, comprehensive, and surprisingly effective at reducing both human suffering and damage to the built environment.

Floods have always confounded human settlements. However, historians and archaeologists have found evidence in several distinct and unrelated locations of early civilizations' attempts to address the flood hazard formally. One of the oldest

known examples of large-scale government flood control can be traced to ancient China. King Yu, also known as Yu the Great, was a legendary figure still revered for what were perhaps mythical risk mitigation abilities (Storrie, 2013). Yu abandoned the traditional practices by which rivers and streams were confined and otherwise controlled through the aggressive use of dams and dykes in favor of a planned and coordinated network of irrigation channels. Pressure from heavy precipitation and high-volume runoff was thus relieved by distributing excess volume across wide expanses of farmland and other catchment systems (including the rivers themselves, which were dredged to increase capacity). The prevalence of successful communities that still exist along the Yellow River is a testament to the success of these practices (Reid, 2018).

Perhaps the most celebrated early example of flood control comes from ancient Egypt, during the reign of Amenemhet III (1817–1722 BC). This Pharaoh created what has been described as the first engineered river control project. Using a system of over 200 "water wheels," some of which remain to this day, annual floodwaters of the Nile River were effectively diverted into Lake Moeris, thereby enabling the early Egyptians to reclaim over 153,000 acres of fertile land that would otherwise have served no productive use (Quarantelli, 1995; ESIS, n.d.).

Looking north from Egypt, we find the early roots of modern emergency response. Nearly two centuries ago, after ancient Rome was nearly destroyed by a devastating conflagration, an institutionalized system of fire control was established. Before this event, slaves had been tasked with firefighting, and their poor training, shortage of equipment, and understandable lack of motivation made them highly ineffective. With the great fire in hindsight, Emperor Augustus established a formal citywide firefighting unit from within the Roman army called the Corps of Vigiles. The early success and effectiveness of this unit and those modeled after it allowed the firefighting profession to become highly respected, and it was emulated throughout the vast Roman Empire for the next 500 years. The structure of Augustus' organization was similar to what we see in many fire departments today, where members fill job-specific roles (Exhibit 1.1). Interestingly, with the fall of Rome came the disappearance of the Corps of Vigiles, and organized firefighting did not appear anywhere in the world for another 1000 years.

Exhibit 1.1 Job titles within the Roman Corps of Vigiles.

Aquarius: The firefighter whose main duties were the supply of water to the *siphos* or pumps and the organization of bucket chains.

Siphonarius: The firefighter who was responsible for the supervision and operation of the water pumps.

Uncinarius: The firefighter who was a hook man, who carried a large fire hook for pulling off burning roofs.

Source: *FFCA (2014).*

A third example of emergency management's modern roots, this time of vulnerability reduction and adaptation, comes from pre-Columbian America. The Incas, who lived throughout the Andes region during the 13th to 15th centuries, practiced a form of urban planning that focused on the need to defend themselves from enemy attack. Many of the Incan cities were located at the peaks of rugged, although 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, still more examples emerge 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 a 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. A government study found that sufficient food existed throughout the country to feed the nation's entire population at all times, but insufficient capacity to distribute these resources led to location-specific shortages. To address these problems, planning committees were formed to develop various preventive measures, including rapid expansion of the extensive railway system that crisscrosses the country (to transport food quickly), 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. How much of a positive role was had by India's acclaimed railroad, which connects almost every settlement nationwide, continues to be debated (Keniston, 2007; Sweeney, 2008).

Civil defense: the birth of modern emergency management

There is no standard formula to explain neatly in broad terms how modern nations established the capacity to manage disaster risk. There is, however, one period in recent history particularly notable for the sweeping trend toward centralized safeguarding of citizens that marks it: the Civil Defense era (Fig. 1.1).

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

FIGURE 1.1

Civil defense era poster, Pennsylvania, United States.

Source: Library of Congress (2000).

government had 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 mechanisms, early warning alarms, hardened shelters, search and rescue teams, and local and regional coordination schemes. Nations' legislatures addressed the threat by establishing frameworks to guide both the creation and maintenance of these new systems by passing laws that mandated the creation of national-level civil defense organizations and by formalizing through statutes the allocation of necessary funding and personnel.

As the imminence of nuclear threats subsided, allowing recognition of a broader expanse of natural and technological hazards to emerge, surprisingly few civil defense units evolved into more comprehensive disaster or emergency management organizations (Quarantelli, 1995). But the legal frameworks constructed to support them remained in place and these ultimately served as the basis of the many modern disaster and emergency management arrangements we see in place 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 grew out of the Canadian Civil Defense Organization created in 1948.
- The US Federal Emergency Management Agency (FEMA) 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.

Capacity by demand: the 1970s and 1980s

Centralized emergency management capacity began to take a more prominent role in the 1970s and 1980s as countries focused on creating national-level emergency management systems. Many developed their disaster management capabilities out of necessity and an acceptance of the need to formalize both the authority and budget for an agency to address blatant disaster 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 disaster (e.g., Peru in 1970, Nicaragua in 1972, and Guatemala in 1976 after destructive earthquakes in each country).

And yet others, to a diminishing degree, still have no real emergency management structure to speak of, irrespective of their disaster history.

The International Decade for Natural Disaster Reduction

On Dec. 11, 1987, the United Nations (UN) General Assembly declared the 1990s to be 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 disasters of natural hazard origin, especially in developing countries, through capacity building. On Dec. 22, 1989, through UN Resolution 44/236, the General Assembly set forth the goals they wished to achieve during the Decade. In addition to establishing a special UN office in Geneva to coordinate associated activities, the resolution directed the various UN agencies to:

- improve the capacity of each country to mitigate the effects of disasters expeditiously and effectively, paying special attention to assisting developing countries in the assessment of disaster damage potential and the establishment of early warning systems and disaster-resistant structures when and where needed;
- devise appropriate guidelines and strategies for applying existing scientific and technical knowledge, accounting for the cultural and economic diversity among nations;
- foster scientific and engineering endeavors aimed at closing critical gaps in knowledge to reduce loss of life and property;

- disseminate existing and new technical information related to measures for the assessment, prediction, and mitigation of disasters;
- develop measures for the assessment, prediction, prevention, and mitigation of 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:

- formulate national disaster-mitigation programs as well as economic, land use, and insurance policies for disaster prevention, particularly in developing countries, to integrate them fully into their national development programs;
- participate during the IDNDR in concerted international action to reduce disasters and, as appropriate, establish national committees in cooperation with relevant scientific and technological communities and other concerned sectors with a view to attaining the objective and goals of the Decade;
- encourage their local administrations to take appropriate steps to mobilize necessary support from the public and private sectors and to contribute to the achievement of the purposes of the Decade;
- keep the Secretary General informed of the plans of their countries and of assistance that could be provided so that the UN might 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 the experience of other countries;
- take measures, as appropriate, to increase public awareness of damage risk probabilities and of the significance of preparedness, prevention, relief, and short-term recovery activities with respect to disasters, and to enhance community preparedness through education, training, and other means, considering the specific role of the news media;
- pay due attention to the impact of disasters on health care, particularly to activities to reduce the vulnerability of hospitals and health centers, as well as the impact on food storage facilities, human shelter, and other social and economic infrastructure; and
- 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 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 disasters in terms of their human and economic losses has risen in recent years, and society in general has become more vulnerable to disasters. Those usually most affected by natural and other disasters are the poor and socially disadvantaged groups in developing countries, because they are least equipped to cope with them.
2. Disaster prevention, mitigation, preparedness, and relief are four elements that contribute to and gain from implementing 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, subregional, regional, and international levels.
3. Disaster prevention, mitigation, and preparedness are better than disaster response in achieving disaster reduction goals. Disaster response alone is insufficient because it yields only temporary results at a high cost. We have followed this limited approach for too long. This has been further demonstrated by the 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 should act in a new spirit of partnership to build a safer world based on common interests and shared responsibility to save human lives, because 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. Information, knowledge, and some of the technology necessary to reduce the effects of disasters can be available in many cases at a 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 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 the things that favor and hinder prevention and mitigation or encourage or limit the preservation of the environment for the development of future generations, and 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 disasters;
   b. Will give priority attention to developing countries, in particular the least developed, landlocked 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 nongovernmental organizations (NGOs) and participation of local communities;
   d. Will promote and strengthen subregional, 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, and the collection, dissemination, and use of information; and
      - Mobilization of resources.
8. The international community and the UN system in particular must provide adequate support to disasters reduction.
9. The Yokohama Conference is at a crossroads in human progress. In one direction lie the meagre 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 suffering from disasters. Action is urgently needed.
10. 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 IDNDR 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 10th 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. Development and strengthening of capacities to prevent, reduce, and mitigate disasters [are] top priority area[s] to be addressed during the Decade 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 levels.
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 disaster; 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 disasters.
10. Each country bears the primary responsibility for protecting its people, infrastructure, and other national assets from the impact of 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 disaster risk reduction, bearing in mind the needs of the developing countries, particularly the least developed countries. (ISDR, 1994).

The United Nations International Strategy for Disaster Reduction

The international community, through the efforts of the UN, named the 1990s the IDNDR to increase awareness of the importance of risk reduction. After the positive advances by the UN and member governments during this time, the UN General Assembly voted in Dec. 1999 to further its successes by creating the International Strategy for Disaster Reduction (ISDR).

The ISDR was established to help nations, organizations, and communities become disaster resilient by promoting the axiom that disaster risk reduction and sustainable development are fully interlinked. The ISDR sought to reduce disaster's human, social, economic, and environmental toll, which was plaguing rich and poor countries alike (and continues to do so). To achieve these goals, the ISDR promoted 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, NGOs, 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 disasters will benefit from applied disaster reduction policies and actions. This requires, in part, a grassroots approach in which 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 about 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 better prepared we are to reduce risks. Bringing the scientific community and policy-makers together allows them to contribute to and complement each other's work. (UNISDR, 2001)

The ISDR worked with many different UN agencies and outside organizations, as administered by the Inter-Agency Task Force on Disaster Reduction and the Inter-Agency Secretariat of the ISDR. These two bodies were formed by the UN General Assembly through UN Resolutions 54/219 and 56/195 to implement ISDR.

The Hyogo Framework for Action

In 2005, at the World Conference on Disaster Risk Reduction (WCDR) in Kobe, Japan, the 168 countries in attendance adopted the Hyogo Framework for Action 2005–15 (HFA): Building the Resilience of Nations and Communities to Disasters. This action was endorsed by the General Assembly in UN Resolution 60/195. The HFA outlined a 10-year plan that reflected the intention of the global community to take a more comprehensive, holistic approach to DRR. The HFA called for nations to pursue three strategic goals during the decade of action to bring about a substantial and measurable reduction of disaster losses (fatalities and social, economic, and environmental losses). These goals were intended to be aligned with the Millennium Development Goals (MGDs), signifying the recognition that DRR was closely connected with overall national development. The goals included:

- The integration of DRR into sustainable development policies and planning;
- Development and strengthening of institutions, mechanisms, and capacities to build resilience to hazards; and
- The systematic incorporation of risk reduction approaches into the implementation of emergency preparedness, response, and recovery programs.

The Hyogo Framework also defined five priorities for action and identified the collective and individual roles and responsibilities of key stakeholders in its implementation and follow-up:

1. Ensure that DRR is a national and a local priority with a strong institutional basis for implementation;
2. Identify, assess, and monitor disaster risks—and enhance early warning;
3. Use knowledge, innovation, and education to build a culture of safety and resilience at all levels;
4. Reduce the underlying risk factors; and
5. Strengthen disaster preparedness for effective response at all levels.

Following the WCDR, the UN Undersecretary General for Humanitarian Affairs launched a consultative process to consider practical ways of strengthening the ISDR system and building on existing mandates, institutions, partnerships, and mechanisms, with the key purpose of implementing the HFA. The rationale for strengthening the ISDR and describing it as a system of partnerships was based on the need to make substantial progress in implementing a worldwide DRR agenda, which calls for concerted efforts by all stakeholders. The UN Office for Disaster Risk Reduction (UNDRR) (see Chapter 10) developed a standard set of comprehensive indicators against which regions, nations, and local governments could plan their actions and measure them. In 2-year increments, nations self-assessed their progress against the defined measures of success and reported this progress to the world community. The tool was called the HFA Monitor, and the resulting HFA Progress Reports that were developed using it at the regional, national, and local levels were made (and remain) available on the UNDRR knowledge management portal PreventionWeb (http://bit.ly/1mK0Rwe).

The Sendai Framework for Disaster Risk Reduction

In Mar. 2015, the global disaster risk management community reunited for the Third WCDR, this time in Japan's Miyagi Prefecture. The event planning committee chose Sendai city, which was in the midst of ongoing recovery operations from the Mar. 11, 2011 earthquake and tsunami, to highlight the scope and urgency of efforts required to address global disaster risk. It was hoped that the gathering would result in the identification of novel and perhaps more implementation-based pathways for global DRR efforts. Whereas significant experience and knowledge had been gained vis-à-vis the HFA, participating organizations and member states hoped to address the persistent capacity gaps that remained. The sheer size of this meeting, which included a remarkable 6600 practitioners and decision-makers from 185 countries and 237 intergovernmental organizations and NGOs, as well as 50,000 local and international spectators, served as a testament that DRR had finally earned its place as a leading global policy issue.

Release of the Sendai Framework for Disaster Risk Reduction (Sendai Framework) marked the culmination of an extensive consultative process that began in Dec. 2011.

The UN General Assembly had begun considering what action should follow a coincidental completion of both the HFA and the MDGs, and the result was the adoption of Resolution 66/199 (International Strategy for Disaster Reduction) (United Nations General Assembly, 2012). This proclamation warned in no uncertain terms that achievement of global sustainable development goals would be limited by increasing disaster frequency and severity, and thus called upon the Secretariat of the ISDR to "facilitate the development of a post-2015 framework for disaster risk reduction." This action commenced a high-intensity 30-month period during within there were hundreds of preparatory sessions in all regions of the world covering a broad expanse of risk-reduction topics that far exceeded those of previous efforts. Scores of reports capturing progress to date and defining outstanding needs were issued aimed at ensuring global conference participants would be adequately informed. The goal of all of this work, like efforts that came before, was to create a safer world through DRR. With a greater appreciation of the links that exist not only between DRR and sustainable development but also between those goals and ones associated with climate resilience adaptation, a new era of international cooperation had officially begun. The near-synchronized release of the Sendai Framework (Mar. 2015), the Sustainable Development Goals (Sep. 2015), and the Paris Agreement (Dec. 2015) ensured that drafting of each was done with a great deal of recognition of the interdependencies that exist between them.

It was known from the earliest phases of development that the Sendai Framework would need to be founded on knowledge and practice acquired through implementation of each of the previous DRR efforts, including the IDNDR, the Yokohama Strategy and Plan of Action, the ISDR, and the HFA. Unsurprisingly, the proposed purpose of the intended framework was conceived of as being the management of "disaster and climate risk in development at local, national, regional, and global levels for the resilience of people, communities, and countries" (United Nations General Assembly, 2014).

The new Sendai Framework was adopted on Mar. 18, 2015. Whereas each of its predecessor frameworks was allotted a 10-year time frame, the creators of the new agreement elected to include a 15-year period of performance that was perhaps more realistic given its ambitious goals. Seven global targets were outlined, which taken together provide a more tangible (even if nonspecific) reference of success for the global disaster risk management community:

(a) Substantially reducing global disaster mortality by 2030, aiming to lower the average per 100,000 global mortality rate in the decade 2020–30 compared with the period 2005–15.
(b) Substantially reducing the number of disaster-affected people globally by 2030, aiming to lower the average global figure per 100,000 in the decade 2020–30 compared with the period 2005–15.
(c) Reducing direct disaster economic loss in relation to the global gross domestic product (GDP) by 2030.
(d) Substantially reducing disaster damage to critical infrastructure and disruption of basic services, among them health and educational facilities, including through developing their resilience by 2030.

(e) Substantially increasing the number of countries with national and local DRR strategies by 2020.
(f) Substantially enhancing international cooperation to developing countries through adequate and sustainable support to complement their national actions for implementing this framework by 2030.
(g) Substantially increasing availability of and access to multihazard early warning systems and disaster risk information and assessments to people by 2030.

Like the Hyogo Framework, the Sendai Framework introduced a set of Priorities for Action that characterize in general terms the recommended DRR action areas required to achieve the framework's stated targets. The four priorities and explanations of each include:

- Priority 1: Understanding disaster risk. Disaster risk management should be based on an understanding of disaster risk in all its dimensions of vulnerability, capacity, exposure of persons and assets, hazard characteristics, and the environment. Such knowledge can be used for risk assessment, prevention, mitigation, preparedness, and response.
- Priority 2: Strengthening disaster risk governance to manage disaster risk. Disaster risk governance at the national, regional, and global levels is important for prevention, mitigation, preparedness, response, recovery, and rehabilitation. It fosters collaboration and partnership.
- Priority 3: Investing in DRR for resilience Public and private investment in disaster risk. Prevention, and reduction through structural and nonstructural measures are essential to enhance the economic, social, health, and cultural resilience of persons, communities, countries, and their assets, as well as the environment.
- Priority 4: Enhancing disaster preparedness for effective response and to "build back better" in recovery, rehabilitation, and reconstruction. The growth of disaster risk means there is a need to strengthen disaster preparedness for response, act in anticipation of events, and ensure capacities are in place for effective response and recovery at all levels. The recovery, rehabilitation, and reconstruction phase is a critical opportunity to build back better, including through integrating DRR into development measures.

Recognizing that the pursuit of these targets and the incorporation of these priorities into all of society as prescribed in the framework represent a monumental effort for even the most developed nations, the UNDRR created several programs and published a number of guides to foster success. Examples include:

- The Words Into Action series that provide practical guidance to support implementation efforts: http://bit.ly/2PPAQWY;
- The Strategic Approach to Capacity Development guide, which explains to governments, NGOs, businesses, and other stakeholders how they can go about

ensuring they have the capabilities and resources required to conduct the actions prescribed: http://bit.ly/2OCsmxr; and
- Sendai Framework Custom Indicators, which allowed countries to set targets and define measures of success relevant to their own experience, capacity, and needs: http://bit.ly/2DyJSll.

Modern disaster management: a four-phase approach

Emergency and disaster management are considered *comprehensive* efforts when they address both pre- and postdisaster risk management needs. The actions required are commonly grouped into four distinct areas, or phases, as they are commonly termed: mitigation, preparedness, response, and recovery. Although variance persists in the terminology used to describe these functions, the four areas can be broadly summarized:

1. *Mitigation.* Also called disaster risk reduction (DRR) or Prevention, mitigation involves reducing or eliminating the likelihood or consequences of a hazard, or both. Mitigation seeks to treat the hazard such that it affects society to a lesser degree. See Chapter 4 for more information.
2. *Preparedness.* This involves equipping people who may be affected by a disaster or may be able to help those involved with the tools to increase their chances of survival and to minimize their financial and other losses. See Chapter 5 for more information.
3. *Response.* This involves taking action to reduce or eliminate the impact of disasters that have occurred or are currently occurring, 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.
4. *Recovery.* This involves returning victims' lives to a normal state after the impact of disaster consequences. The recovery phase generally begins after the immediate response has ended and can persist for months or years afterward. See Chapter 7 for more information.

Various diagrams illustrate the cyclical nature by which these and other related factors are performed over time, although disagreement exists concerning how such a disaster management cycle is visualized. These diagrams, such as the one in Fig. 1.2, are generalizations, and 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. Although response is often pictured as beginning immediately after disaster impact, it is common for the actual response to begin well before the disaster actually happens.

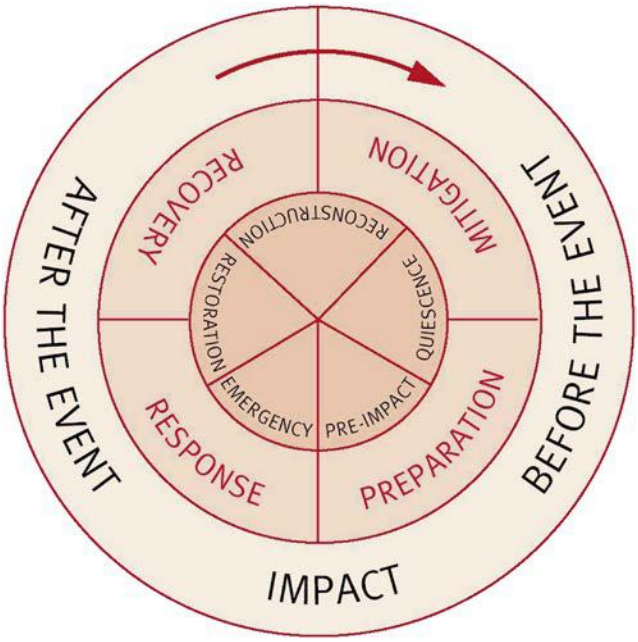

FIGURE 1.2

The disaster management cycle.

Source: Alexander (2002).

What is international disaster management?

Two separate but interrelated concepts are represented by the term "international disaster management": (1) the study of the diverse emergency and disaster management systems and structures that exist throughout the world, and (2) the study of disaster management in scenarios in which the capacity of a single nation's response mechanisms is overwhelmed.

Every country, every government, and every society is unique regarding:

- its vulnerabilities and the root causes of such;
- the perception of risk and the methods used to identify and analyze it;
- the institutions, systems, and structures created to manage risk;
- the statutory authorities that guide the management of risk and the management of events that actually occur; and
- the mechanisms developed to respond to disaster events and the response capacity of those mechanisms.

Several times each year, the response requirements of disaster events exceed the disaster management abilities of the nation or nations that are involved. In these

Exhibit 1.2 International disaster management stakeholders.

- Impacted Population
- Local first responders
- Governments of the affected countries
- Governments of other countries
- International organizations
- International financial institutions
- Regional organizations and associations
- Nonprofit and philanthropic organizations
- Private organizations: business and industry
- Local and regional donors

instances, the governments of the affected countries appeal to the international response community for support. By definition, this cooperative international response is international disaster management.

Over time and through iteration, a recognized and systematic process for responding to international disasters has emerged. Standards of practice linked to positive outcomes have been identified, adopted, and periodically improved. A distinct community of stakeholders drawn from the public, private, and nonprofit sectors has formed and expanded (Exhibit 1.2). Through practice and study, formulaic and methodical processes to assess both the disaster damage and the associated response needs of affected nations have been conceived, applied, and improved using lessons learned and technological advances. The ad hoc, often chaotic efforts that typified international disasters management only a few decades ago have largely been replaced by those that are more organized and multidisciplinary in their approach, and by coordinated efforts.

Disaster events do not automatically rise to an international scope simply because the response capacity of the affected country is overwhelmed. A formal request for assistance must first be made by the involved country, no matter how large the precipitating event. Concurrent to that request, there must be a capacity and a willingness on the part of the many different stakeholders that make up the diverse community of humanitarian agencies to respond. This might seem a straightforward construct, but the truth is that events can differ greatly in terms of the interest they garner and the response they elicit. Whether because of donor fatigue (see Chapter 11), media disinterest, political constraints, conflicting priorities, or many other conditions that dilute or divert resources, some calls do go unanswered. The Mozambique floods of 2000 are but one example of a situation in which the international community was accused of sitting idly by as hundreds of people died (See Exhibit 1.3).

Response and recovery alone, however, are ineffective means of disaster risk management when performed in the absence of a comprehensive regimen of preparedness and mitigation activities (Table 1.2). A focal shift toward DRR ideologies by the global community of disaster management stakeholders (inclusive of national and international government organizations, NGOs, businesses, interest groups, and

Exhibit 1.3 2000 Mozambique floods timeline.

Feb. 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.

Feb. 11: At least 70 people have died as a result of the flooding. The United Nations (UN) reports that 150,000 people are in immediate danger from starvation and disease. Dysentery outbreaks are reported outside the capital.

Feb. 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.

Feb. 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.

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

Mar. 2: Floodwaters have risen by up to 26 feet (8 m) in many parts of the country. International aid workers report that 100,000 people need 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 3 weeks after the crisis began, international disaster management agencies begin to send responders and relief assistance.

Source: *BBC News (2000).*

others) indicates a recognition of this fact. Although many national governments, especially in the developing world, are only just beginning to make dedicated efforts toward initiating or improving their pre-disaster hazard risk management activities, their commitments have been formalized through participation in global frameworks for change. The UN, whose members hail from almost every country in the world, has made a sustained effort to promote a more disaster-resilient world: first by dedicating the 1990s to disaster reduction (and by producing the Yokohama Strategy and the Plan of Action for a Safer World) and then by maintaining forward momentum through the ISDR, the HFA, and the Sendai Framework.

Today, the UNDRR guides the efforts of the international community's overall disaster management mission (see Chapter 10). Specifically, UNDRR 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" (UNDRR, n.d.).

In Jan. 2005, in Hyogo, Japan, the UN held the first World Conference on Disaster Reduction. More than 4000 participants attended, including representatives from 168 governments, 78 UN specialized agencies and observer organizations, 161 NGOs, and 562 journalists from 154 media outlets. The public forum attracted more than 40,000 visitors. The outcome of the conference was the 24-page HFA, adopted by all member countries, which 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."

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

Source: Adapted from Jeggle (2001).

With the adoption of this framework, which coincided with some of the most devastating hazards and disasters in recent memory, international disaster management climbed to the forefront of the international policy agenda. The UNDRR, through the biennial Global Platform for Disaster Risk Reduction, has increased and maintained international activity to address our growing hazard risk (Exhibit 1.4). For years, nations of the world have watched as country after country, both rich and poor, have suffered the consequences of terrible disasters. However, not until recently have world leaders begun to grasp fully 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 positioned to influence these leaders in a way not previously possible.

Exhibit 1.4 Global Platform for Disaster Risk Reduction.

The Global Platform for Disaster Risk Reduction (GP) was established by mandate of the United Nations (UN) General Assembly. The GP is an international meeting that occurs every 2 years and is attended by the international disaster risk reduction community, which includes governments, international organizations (including the UN and other regional organizations and institutions), nongovernmental organizations (NGOs), scientific and academic institutions, and the private sector. By mandate, the GP

- assesses progress made in the implementation of the Hyogo Framework for Action;
- enhances awareness of disaster risk reduction;
- enables the sharing of experiences and lessons from good practice; and
- identifies remaining gaps and recommends targeted action to accelerate national and local implementation.

The first and second sessions of the GP, which occurred in 2007 and 2009, respectively, were attended by more than 152 governments and 137 organizations. These sessions helped to build momentum for national commitments to perform disaster risk reduction, culminating with the May 2011 GP meeting in Geneva, Switzerland. The benchmarks set out in the first two meetings focused on five main areas, including the goals to:

1. harmonize disaster risk reduction and climate change adaptation in the broader context of poverty reduction and sustainable development;
2. reduce community- and local-level risk through partnerships that better recognize the mutual dependence of governments and NGOs, and to promote the role of women as drivers of action (with special consideration to youths' and children's roles);
3. move toward full implementation of the Hyogo Framework for Action through several action targets (e.g., assessments of and mitigation for educational and health facilities);
4. increase the disaster risk reduction component of national budgets and international development funding (including humanitarian relief and recovery expenditures), and to improve measurements of the effectiveness of investment in risk reduction; and
5. continue the efforts of the International Strategy for Disaster Reduction in supporting governments and NGOs in their disaster risk reduction efforts.

Based on PreventionWeb (2011).

Disasters, poverty, and development

Research and practice support the theory that a strong correlation exists between disasters and poverty. It is well-documented that developing countries that are repeatedly subject to disasters experience stagnant or even negative rates of development over time (Fig. 1.3). Hurricane Mitch, which destroyed as much as 70% of the infrastructure in Honduras and Nicaragua (UNISDR, 2004), is a prime example; it was blamed with reversing the rates of development in these 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 has also been witnessed in many areas affected by the 2004 tsunami and earthquake events in Southeast Asia and the 2010 earthquake in Haiti (Exhibit 1.5). For countries with developing economies, the financial setbacks these events inflict can be ruinous, in contrast to their industrialized counterparts, where a robust economy absorbs

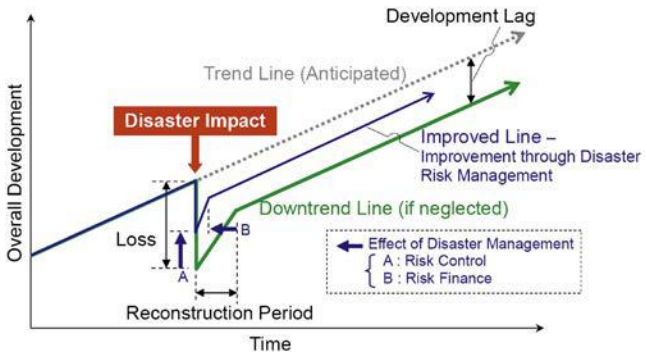

FIGURE 1.3

Impact of disasters on development.

Adapted from ADRC (2005).

Exhibit 1.5 Tsunami sets back development 20 years in Maldives.

Within minutes of the Dec. 2004 tsunami in the Indian Ocean, much of the economic and social progress in the Maldives was washed away.

According to government officials, the tsunami caused a 20-year setback in the development of this small country, an island nation off the coast of India, which only 6 days before the disaster had been removed from the United Nation's list of least-developed countries. In particular, the tsunami and its resulting floodwaters dealt a serious blow to the tourism sector, the country's main source of income. Nearly one-fourth of the 87 resorts in the Maldives were severely damaged and declared unable to operate. Tourism directly accounts for one-third of the country's economy, with the resorts alone providing between 25,000 and 30,000 jobs. When tourism-related tax and customs revenues are included, tourism contributes up to 70% of the economy, with the sector expanding each year. These earnings had helped to improve living standards in the Maldives, including increased school enrollment, lower unemployment, and more students seeking higher education abroad.

Based on UNDP (2005).

such impacts. In 2001, for example, earthquakes occurred in both El Salvador and the United States (Seattle), each causing approximately $2 billion in damage. Although this amount had little or no noticeable impact on the US economy, the financial consequences in El Salvador amounted to 15% of that country's GDP (UNDP, 2004a).

The aftermath of a disaster exacerbates the debilitating causes of poverty in developing countries. Each disaster is unique in its consequences, so no single formula 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:

- National and international development efforts are stunted, erased, or even reversed.
- Sizable portions of GDP often must be diverted from development projects, social programs, or debt repayment to manage the disaster consequences and begin recovery efforts (Fig. 1.4).
- Vital infrastructure is damaged or destroyed—including roads, bridges, airports, seaports, communications systems, power generation and distribution facilities, and water and sewage 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.
- Reconstruction efforts result in shortages of materials and labor, which in turn drive up construction costs, inflate salaries, and draw workers away from other sectors where they are needed.
- Residents are forced or impelled to leave the affected zone, often never to return, extracting institutional knowledge, cultural and social identity, and economic viability from areas that cannot afford to spare such resources.
- Desperation and poverty lead 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 about for decades: the nature of disasters is rapidly changing. These changes are generally regarded as a result of 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 many more people are affected by them either indirectly or directly. Although these disasters are becoming less deadly worldwide, they are causing a much greater financial impact on both affected and unaffected nations. Finally, what may be most disturbing about these trends is that the poor countries of the world and their citizens are assuming a much greater proportion of the impacts of disasters. Ongoing trends indicate that

- the number of people affected by disasters is rising;
- overall, disasters are becoming less deadly;
- overall, disasters are becoming more costly;
- poor countries are disproportionately affected by disaster consequences; and
- the number of disasters is increasing each year.

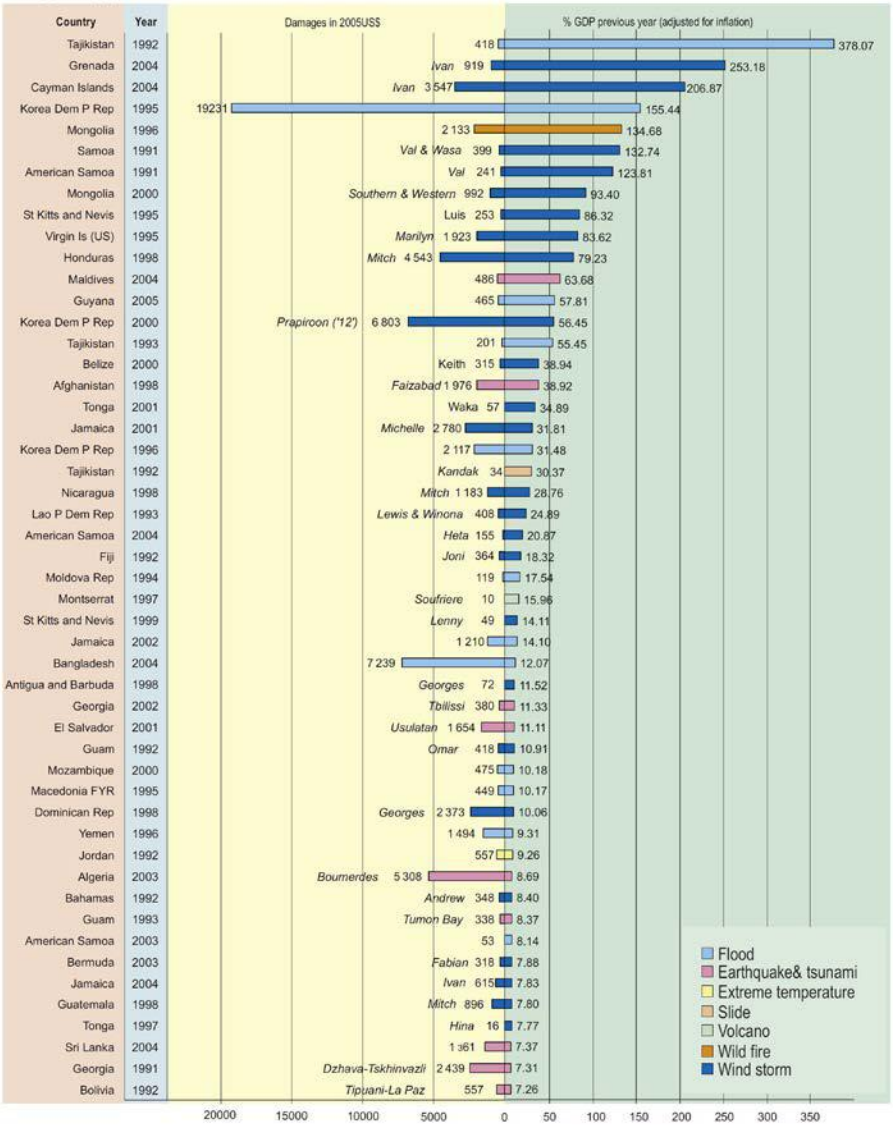

FIGURE 1.4

Selected disasters: total damage and share of gross domestic product (GDP) between 1991 and 2005. *Dominican Rep*, Dominican Republic; *Korea Dem P Rep*, Democratic People's Republic of Korea; *Lao P Dem Rep*, Lao People's Democratic Republic; *Macedonia FYR*, Yugoslav Republic of Macedonia; *Virgin Is*, Virgin Islands.

Source: EM-DAT: International Disaster Database.

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 requirement for food, water, defense, and access to commerce. Almost without exception, increased natural hazard exposure has been assumed in favor of these needs, often as a result of the confidence that elevated risk levels may 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 seacoasts construct seawalls and jetties, and 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 increasingly concentrated. The overall rates by which people are relocating from rural areas into cities (urbanization) have continued to increase over time. Population growth 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. The 2019 estimate of the world population was 7.6 billion (US Census Bureau, 2019), and the UN predicts this will grow to 9.8 billion by 2050 and 11.2 billion by 2100 (United Nations, 2017). More important, the global shift toward city living means that as much as 68% of these people will be urbanized by 2050, up from 55% today (United Nations, 2018).

When humans settle in high-risk urban areas, the hazard risks they face as individuals increase for reasons that extend beyond simple geographic concentration. As of 2000, it was estimated that at least 75% of the world's population lived in areas at risk from a major disaster (UNDP, 2004a). 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 homes, crops, animals, livelihoods, or health affected) is equally high (UNHCR, 2004).

Figs. 1.5 and 1.6 display the observed total number of people annually affected by disasters during the 20th and early 21st centuries. Beginning in 1954, there was a significant rise in the number of people affected. During the 1950s, the mass transition toward urbanization began in the industrialized nations, a trend that most other nations of the world followed soon after.

Trend 2: overall, disasters are becoming less deadly

Although human activity is exacerbating many of the seismic, meteorological, hydrological, and other forces that result in natural hazards, these are each the result of processes that occur irrespective of human existence. Water has overflowed the banks of rivers since before communities settled beside them. Archaeologists 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

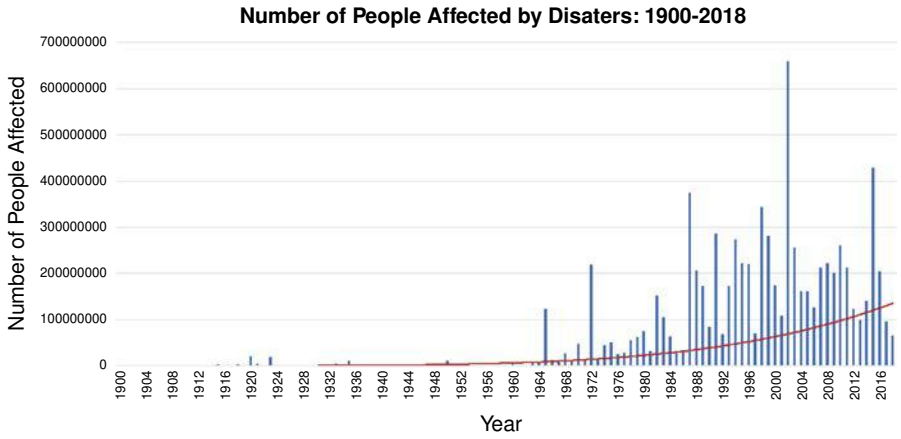

FIGURE 1.5

Total number of people affected by disasters worldwide from 1900 to 2018.

Source: EM-DAT: International Disaster Database.

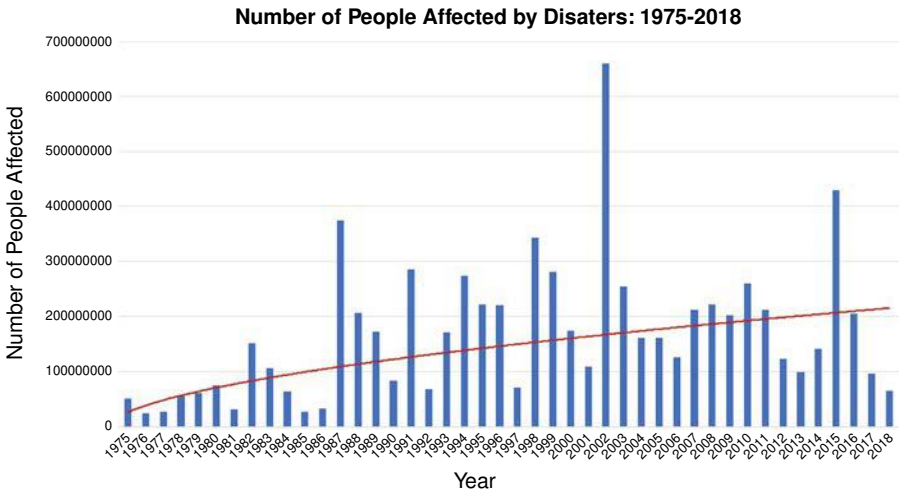

FIGURE 1.6

Total number of people affected by disasters worldwide from 1975 to 2018.

Source: EM-DAT: International Disaster Database.

generating life on earth as it has for destroying it. It has therefore been suggested that disasters are merely the result of humans placing themselves directly into the path of these normal events (Figs. 1.7 and 1.8). US Geological Survey scientists Susan Hough and Lucile Jones aptly captured the spirit of this notion in writing that "earthquakes don't kill people, buildings do" (Hough and Jones, 2002).

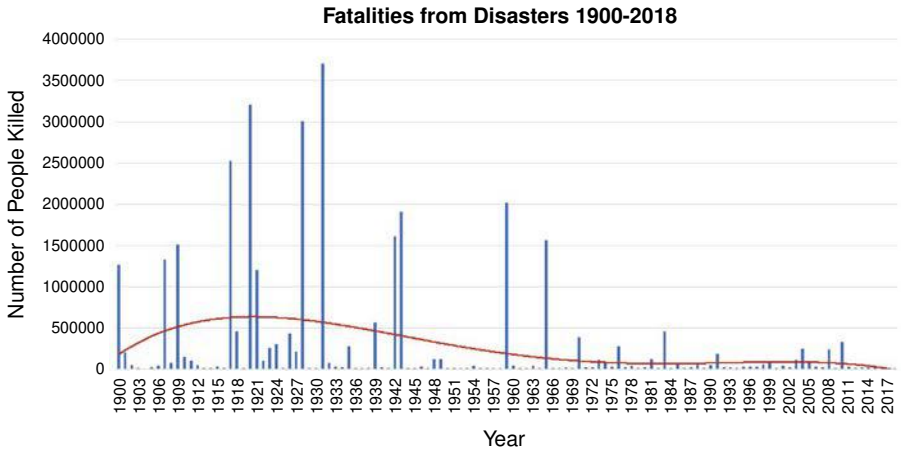

FIGURE 1.7

Total number of disaster-related deaths reported in the world from 1900 to 2018.

Source: EM-DAT: International Disaster Database.

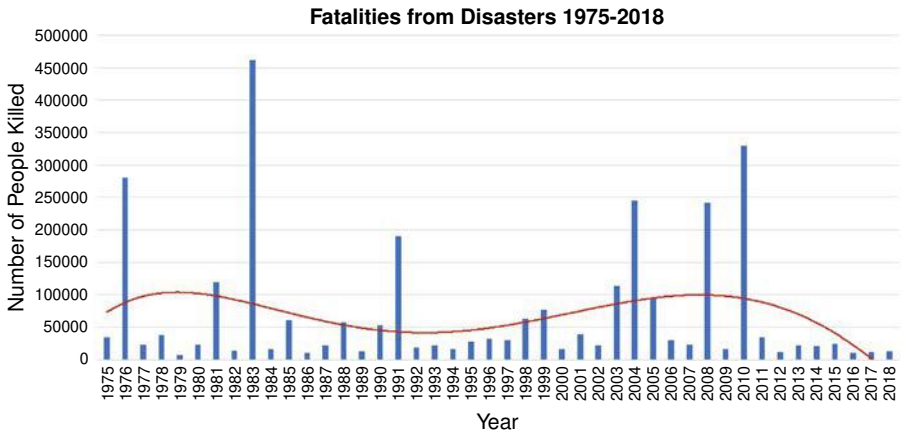

FIGURE 1.8

Total number of disaster-related deaths reported in the world from 1975 to 2018.

Source: EM-DAT: International Disaster Database.

Table 1.3 Deaths attributed to hurricanes in the United States, 1900–2019.

Period	Number killed
1900–19	10,000 (approximate; exact 1900 Galveston death toll is unknown)
1920–39	3192
1940–59	1313
1960–79	1095
1980–99	408
2000–14	5443[a]

Source: Thoreau Institute (2005), FEMA (1997), EM-DAT (2019).
[a]The number of deaths attributed to Hurricane Maria in Puerto Rico is still disputed. A study by the George Washington University used an analysis of excess deaths after the hurricane to estimate that 2975 people died as a direct or indirect result of the hurricane (GW Today, 2018).

Humans are adaptable and quickly adjust to the pressures exerted upon them by nature. People have modified their behaviors and their environments to accommodate their surrounding climate and topography, often proving successful at counteracting the negative consequences of common daily hazards such as rain or fluctuating temperatures. For less predictable and more extreme events, such as earthquakes and hurricanes, humans have had lower levels of success. Fortunately, modern science has bolstered our capacity to improve outcomes significantly, at least in places where the requisite technology and technical expertise are 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, when death rates fell steadily, as explained by several driving forces (including enhanced preparedness, storm monitoring and warning, public education, and response capacity). What is most interesting about this trend is that as the first two decades of the 21st century ended, an obvious trend reversal emerged. In fact, the number of hurricane fatalities in the United States during this 20-year period exceeded the aggregate of the *preceding 60 years*. Although a number of theories explain these changes, what garners the most support is a belief that this is an unintended consequence of a post-9/11 shift in US emergency management policy that boosted terrorism prevention at the cost of natural hazard mitigation and preparedness. Such a consequence only reinforces the theory that global disaster fatality reduction is the result of our risk reduction efforts.

Globalization and increased international cooperation have helped the world community to address risk reduction and limit the human impacts of disasters more effectively. Although the number of disasters has more than tripled since the 1970s, the number of people worldwide who have perished has fallen by almost 50%. Greater recognition of the importance of emergency management and sustainable development is turning the tide on disasters. The efforts of the United Nations vis-à-vis the Sendai Framework, 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 why worldwide disaster fatality rates are falling:

- 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.
- Monitoring and early warning systems are giving potential victims more time to leave the dangerous situations associated with impending disasters.
- Specially engineered protection measures, such as tornado safe rooms and foundation anchors, are mitigating the impact that disasters have on human life.
- Institution and enforcement of hazard-resistant building codes is helping to increase the resilience of the various structures and systems upon which humans depend.
- Secondary, postdisaster consequences, such as famine and disease, are more effectively managed by more efficient supply chains and enhanced epidemiological monitoring and response.
- Proper institution and enforcement of zoning measures are helping to prevent people from moving into the paths of disasters and helping to remove those who are already there.
- Sustainable development processes are helping to reduce population movement into areas of highest risk.
- DRR measures are being incorporated into long-term disaster recovery plans and strategies to reduce the impact of both similar and dissimilar future events.

Trend 3: overall, disasters are becoming more costly

The cost of disasters worldwide is increasing at an alarming rate. Twenty-five years ago, the economic damage from any given disaster rarely topped the billion-dollar mark, even after accounting for inflation. Today, multiple events exceed this threshold each year (Fig. 1.9). By 2000, the cost of disasters worldwide had topped $60 billion per year as measured by the international reinsurance firm Munich Re, and the annual average cost has continued to rise since that time. The most expensive year for disasters was 2011, when over $440 billion in losses were sustained (primarily as a result of the triple earthquake, tsunami, and radiological emergency in Japan) (McCarthy, 2017). In 2013, a new record for the total number of billion-dollar disasters was set, with 41 events exceeding the $1 billion mark. Combined disaster costs for that year totaled $148 billion (World Post, 2014; McCarthy, 2017). The average annual cost of disasters for from 2009 to 2018, which is reported to be $202 billion, indicates a trend toward rapidly rising worldwide disaster costs (Fritz, 2018; McCarthy, 2017).