

# Averting Unnatural Disasters

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In October 1998, Hurricane Mitch slammed into Central America, pummeling Honduras, Nicaragua, El Salvador, and Guatemala for more than a week. As the powerful storm hung over the region, it dumped as much as two meters (80 inches) of rain. By the time it turned back out to sea, some 10,000 people had died, making Mitch the deadliest Atlantic storm in 200 years. Conservative estimates place the cost of damage to the region at around \$8.5 billion—higher than the combined gross domestic product (GDP) of Honduras and Nicaragua, the two nations hardest hit. The storm set back development in the region by decades.<sup>1</sup>

But Central America is not the only region to experience such devastation in recent years. In fact, the 1990s set a new record for disasters worldwide. During the decade just over \$608 billion in economic losses was chalked up to natural catastrophes, more than during the previous four decades combined.<sup>2</sup>

In 1998–99 alone, over 120,000 people

were killed and millions were displaced from their homes. In India, 10,000 people lost their lives in a 1998 cyclone in Gujarat; the following year as many as 50,000 died when a “supercyclone” hit Orissa. Vast forest fires raged out of control in Brazil, Indonesia, and Siberia. Devastating landslides in Venezuela caused over \$3 billion in losses and took more than 30,000 lives, capping off the deadly decade.<sup>3</sup>

Ironically, the United Nations had designated the 1990s as the International Decade for Natural Disaster Reduction, hoping to stem the rising toll taken by natural disasters. Instead, the 1990s may go down in history as the International Decade *of* Disasters, as the world experienced the most costly spate of floods, storms, earthquakes, and fires ever.

Around the world, a growing share of the devastation triggered by “natural” disasters stems from ecologically destructive practices and from putting ourselves in harm’s way. Many ecosystems have been frayed to the point where they are no

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longer resilient and able to withstand natural disturbances, setting the stage for “unnatural disasters”—those made more frequent or more severe due to human actions. By destroying forests, damming rivers, filling in wetlands, and destabilizing the climate, we are unraveling the strands of a complex ecological safety net. We are beginning to understand just how valuable that safety net is.

The enormous expansion of the human population and our built environment in the twentieth century means that more people and more economic activities are vulnerable. The migration of people to cities and coasts also increases our vulnerability to the full array of natural hazards. And these human-exacerbated disasters often take their heaviest toll on those who can least afford it—the poor.

Ecologically, socially, and economically, many regions are now vulnerable and ill prepared for the onslaught of storms, floods, and other hazards. Hurricane Mitch washed away hillsides, sweeping up homes, farms, roads, bridges, and people in massive mudslides and floods. Given that Central America has some of the highest rates of deforestation in the world—each year it loses 2–4 percent of its remaining forest cover, and Honduras alone has already cleared half its forested land—the tragedy should not really be all that surprising. The pressures of poverty, population growth, and inequitable land rights had forced more and more people into vulnerable areas such as steep hillsides and unprotected riverbanks. Further, when crippling debt burdens consume most of a nation’s budget and stall development, few resources remain to address these problems.<sup>4</sup>

To date, much of the response to disasters has focused on improving weather predictions before the events and providing

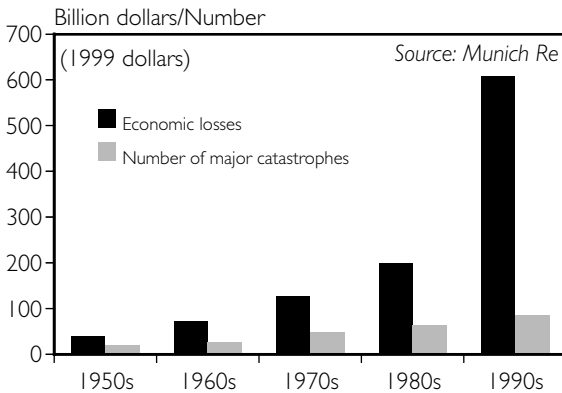
cleanup and humanitarian relief afterwards, both of which have without doubt helped save many lives. Yet much more can be done. On average, \$1 invested in mitigation saves \$7 in disaster recovery costs. Nature provides many valuable services for free; healthy and resilient ecosystems are shock absorbers that protect against coastal storms and sponges that soak up floodwaters, for instance. We should take advantage of these free services rather than undermine them. In order to stem the ever rising social and economic costs of disasters, we need to focus on how to mitigate disasters by understanding our own culpability, taking steps to reduce our vulnerability, and managing nature more wisely.<sup>5</sup>

## Counting Disasters

During the twentieth century, more than 10 million people died from natural catastrophes, according to Munich Re, a reinsurer that undertakes global data collection and analysis of these trends. Its natural catastrophe data include floods, storms, earthquakes, fires, and the like. Excluded are industrial or technological disasters (such as oil spills and nuclear accidents), insect infestations, epidemics, and most droughts.<sup>6</sup>

While some 500–700 natural disaster events are recorded every year, only a few are classified by Munich Re as “great”—natural catastrophes that result in deaths or losses so high as to require outside assistance. Over the past 50 years there has been a dramatic increase in this type of disaster. In the 1950s there were 20 “great” catastrophes, in the 1970s there were 47, and by the 1990s there were 86. (See Figure 7–1.)<sup>7</sup>

During the last 15 years, nearly 561,000 people died in natural disasters. Only 4 percent of the fatalities were in industrial countries. Half of all deaths were due to floods.



**Figure 7-1. Rising Tide of Major Disasters, by Decade**

(See Figure 7-2). Earthquakes were the second biggest killer, claiming 169,000 lives. Between 1985 and 1999, 37 percent of the events were windstorms, 28 percent floods, and 15 percent earthquakes. Events such as fires and landslides accounted for the remaining 20 percent.<sup>8</sup>

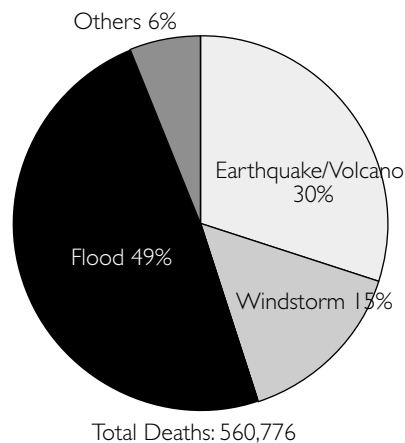
Asia has been especially hard hit. The region is large and heavily populated, particularly in dangerous coastal areas. There is frequent seismic and tropical storm activity. Its natural and social vulnerability is borne out by the statistics. Between 1985 and 1999, Asia suffered 77 percent of all deaths, 90 percent of all homelessness, and 45 percent of all recorded economic losses due to disasters.<sup>9</sup>

As tragic as the death toll of recent years is, in earlier decades and centuries it was not uncommon to lose hundreds of thousands of lives in a single great catastrophe. In the last 20 years, however, there has been only one such event—the cyclone and storm surge that hit Bangladesh in 1991 and took 139,000 lives. Still, in the last decade over 2 billion people worldwide have been affected by disasters.<sup>10</sup>

Early warnings and disaster preparedness

have been a significant factor in keeping the death toll of recent decades from reaching even higher. So, too, have advances in basic services, such as clean water and sanitation. Following disasters, the life-saving benefits are apparent. According to the Chinese government, 90 percent of the 30,000 deaths from floods in 1954 were a result of communicable diseases like dysentery, typhoid, and cholera that struck in the following weeks and months. After the 1998 Yangtze flood, in contrast, no such epidemics were reported (although diarrheal diseases remained a problem).<sup>11</sup>

Worldwide, floods cause nearly one third of all economic losses, half of all deaths, and 70 percent of all homelessness. Damaging floods have become more frequent and more severe. They are the type of disaster that people have the greatest hand in exacerbating. In China's Hunan province, for instance, historical records show that



**Figure 7-2. Global Deaths by Disaster Type, 1985-99**

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whereas in early centuries flooding occurred once every 20 years or so, it now occurs 9 out of every 10 years. In Europe, flooding on the Rhine River has worsened as a result of changes in the way the river is managed. At the German border town of Karlsruhe, prior to 1977 the Rhine rose 7.62 meters above flood level only four times since 1900. Between 1977 and 1995 it reached that level 10 times.<sup>12</sup>

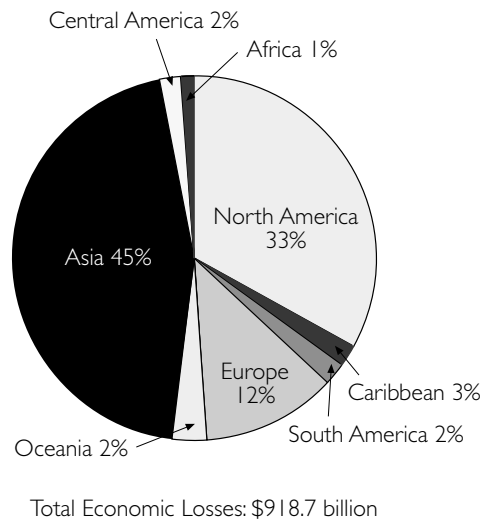
Although there has been some success in reducing the death toll, the financial toll of disasters has reached catastrophic proportions. Measured in 1999 dollars, the \$608 billion in economic losses during the 1990s was more than three times the figure in the 1980s, almost nine times that in the 1960s, and more than 15 times the total in the 1950s. The biggest single year for losses in history was 1995, when damages reached \$157 billion. An earthquake in Kobe, Japan, accounted for more than two thirds of that total. For weather-related disasters, 1998 was the biggest year on record, at nearly \$93 billion in recorded losses, with China's Yangtze river flood absorbing more than a third of this total.<sup>13</sup>

The economic losses measured usually include insured property losses, the costs of repairing public infrastructure like roads and power, and some crop losses. Such direct losses are the easiest to measure. But the tally rarely includes indirect or secondary impacts, such as the costs of business failures or interruptions, suicide due to despair, domestic violence, human health effects, or lost human and development potential. Losses in developing countries are particularly undercounted. Damage figures also exclude the destruction of natural resources.

During the last 15 years, Asia sustained 45 percent of the world's economic losses to disasters, North America 33 percent, and Europe 12 percent. (See Figure 7-3.) Rural

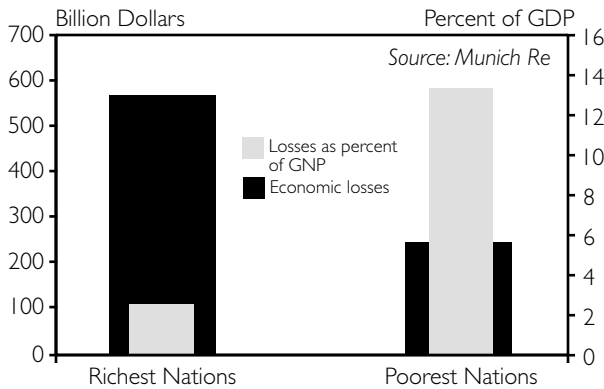
areas and developing nations are in general underrepresented in global disaster data, as reporting systems tend to be weaker. Africa is particularly underrepresented because it is rarely hit by major storms or earthquakes. Most of the disasters in Africa are smaller, or are slow-onset disasters, like droughts, that are not counted in the global tallies. The region also has less infrastructure and capital exposure.<sup>14</sup>

Economic losses can be especially devastating to poor countries. As in Honduras and Nicaragua after Hurricane Mitch, disaster losses often represent a large share of the national economy. While the wealthiest countries sustained 57.3 percent of the measured economic losses to disasters between 1985 and 1999, this represented only 2.5 percent of their GDP. (See Figure 7-4.) In contrast, the poorest countries endured 24.4 percent of the economic toll of disasters, which added up to a whopping



Source: Munich Re

**Figure 7-3. Global Economic Losses from Disasters, by Region, 1985-99**



**Figure 7-4. Disaster Losses, Total and as Share of GNP, in the Richest and Poorest Nations, 1985-99**

13.4 percent of their GDP, further increasing their vulnerability to future disasters. And in the poorest countries, little if any of the losses are insured. Worldwide, only one fifth of all disaster losses were insured. The vast majority of insured losses, some 92 percent, were in industrial nations. Finding a way to provide a financial safety net for developing countries is of critical importance.<sup>15</sup>

The quickly rising economic toll and the troubling increase in the number of major catastrophes that overwhelm nations provide clear evidence that a new way of managing nature and ourselves is in order.

## Ecological Vulnerability

There is an important distinction between natural and unnatural disasters. Many ecosystems and species are adapted to natural disturbance, and indeed disturbances are necessary to maintain their health and vitality, and even their continued existence. Many forests and grasslands, for instance, are adapted to periodic natural fires, and need them to burn off dead vegetation,

restore soil fertility, and release seeds.

Likewise, river systems need periodic flooding, and plants and animals across the landscape are adapted to this regime. Fish use the floodplain as a spawning ground and nursery for their young. Some fish consume and disburse seeds, which can sustain them for an entire year. Many plants need the flood period to germinate and absorb newly available dissolved nutrients. Migratory birds also rely on the bounty that floods bring. Soils, too, benefit from the regular addition of nutrients and organic matter, and

underground aquifers are refilled as floodwaters are slowly absorbed into the ground. By disrupting the natural flooding regime, we cut off the interactions between a river and its surrounding landscape—interactions that make them more diverse and productive. Indeed, natural flooding is so beneficial that some of the biggest fish and crop harvests come the year after a flood. Little wonder that floodplains and deltas have attracted human settlement for millennia and been the cradles of civilizations.<sup>16</sup>

Not every natural disturbance is a disaster, and not every disaster is completely natural. We have altered so many natural systems so dramatically that their ability to bounce back from disturbance has been greatly diminished. Deforestation impairs watersheds, raises the risk of fires, and contributes to climate change. Destruction of coastal wetlands, dunes, and mangroves eliminates nature's shock absorbers for coastal storms. Such human-made changes end up making naturally vulnerable areas—such as hillsides, rivers, coastal zones, and low-lying islands—even more vulnerable to extreme weather events.

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Droughts, and the famines that often follow, may be the most widely understood example of an unnatural disaster. They are triggered partly by global climate variability and partly by resource mismanagement such as deforestation, overgrazing, and the overtapping of rivers and wells for irrigation. Considered slow-onset events, droughts are not as well reported as rapid-onset events like storms and floods, nor are they usually included in disasters data. Yet they affect major portions of Africa and Asia and are likely to continue worsening in the coming years.

Human settlements, too, have become less resilient as we put more structures, more economic activity, and more people in vulnerable places. Our usual approach to natural disturbances is to try to prevent them through short-sighted strategies using methods that all too often exacerbate them. Dams and levees, for example, change the flow of rivers and can increase the frequency and severity of floods and droughts.

China's Yangtze River dramatically shows the consequences of the loss of healthy ecosystems. The flooding in 1998 caused more than 4,000 deaths, affected 223 million people, inundated 25 million hectares of cropland, and cost well over \$36 billion. Heavy summer rains are common in southern and central China, and flooding often ensues. But in 1998, as the floodwater continued to rise, it became clear that other factors besides heavy rains were at play. One influence was the extensive deforestation that had left many steep hillsides bare. Indeed, in the past few decades 85 percent of the forest cover in the Yangtze Basin has been cleared by logging and agriculture. The loss of forests, which normally intercept rainfall and allow it to be absorbed by the soil, permitted water to rush across the land, carrying valuable topsoil with it.

As the runoff raced across the denuded landscape, it caused floods.<sup>17</sup>

In addition, the Yangtze's natural flood controls had been undermined by numerous dams and levees, and a large proportion of the basin's wetlands and lakes, which usually act as natural "sponges," had been filled in or drained. The areas previously left open to give floodwaters a place to go have filled instead with waves of human settlements. All these changes reduced the capacity of the Yangtze's watershed to absorb rain, and greatly increased the speed and severity of the resulting runoff.<sup>18</sup>

Chinese government officials initially denied that the Yangtze floods were anything but natural, claiming that the flooding was caused by El Niño. But as the disaster toll added up, the State Council finally recognized the human element. It banned logging in the upper Yangtze watershed, prohibited additional land reclamation projects in the river's floodplain, and stepped up efforts to reforest the watershed.<sup>19</sup>

Flooding and landslides following deforestation are not limited to developing countries. In the U.S. Pacific Northwest, where hundreds of landslides now occur annually, a study found that 94 percent of them originated from clearcuts and logging roads. The torrents of water and debris from degraded watersheds caused billions of dollars in damage in 1996 alone.<sup>20</sup>

Paradoxically, clearing forests also exacerbates drought in dry years by allowing the soil to dry out more quickly. Such droughts helped fuel the record-breaking fires in Indonesia and Brazil in 1997-98. These massive fires occurred in tropical forests that are normally too moist to burn. But when fragmented by logging and agricultural clearing, the forests dried to the point where fires set deliberately to clear land

were quickly able to spread out of control. In Indonesia, industrial timber and palm oil plantation owners took advantage of a severe El Niño drought to expand their areas and in 1997–98 burned at least 9.8 million hectares, an area the size of South Korea.<sup>21</sup>

The smoke and haze from Indonesia's fires choked neighboring countries, affecting about 70 million people. The economic damage to the region has been conservatively estimated at about \$9.3 billion. Schools, airports, and businesses were shut down. Many crops were lost to the drought and fires, and the haze impaired the pollination of other crops and wild plants, the ecological repercussions of which will unfold for many years. If harm to fisheries, biodiversity, orangutans, and long-term health were included, the damage figure would be far higher.<sup>22</sup>

Sumatra and Kalimantan, the provinces where most of the 1997–98 fires occurred, have lost up to 30 percent of their forest cover to exploitation and fire in just the last 15 years. One of the first smoke signals that indicated that the forests were in trouble due to forest exploitation policies was during another El Niño year, 1982–83, when 3.2 million hectares burned in Kalimantan. In 1991, another half-million hectares burned, and in 1994 almost 4.9 million hectares went up in smoke. As Charles Barber and James Schweithelm put it in *Trial by Fire*, a new study of Indonesia, "the fires of 1997 and 1998 were just the latest symptom of a destructive forest resource management system carried out by the Suharto regime over 30 years."<sup>23</sup>

In contrast to the human-made unnatural disasters that should be prevented but are not, considerable effort is spent trying to stop natural disturbances that are actually beneficial. The result is disasters of unnat-

ural proportions. In the United States, for example, fire suppression has long been the policy, even in ecosystems that are fire-adapted. The result has been the buildup of debris that fuels very hot fires capable of destroying these ecosystems—and the homes that are increasingly built there. The well-publicized 2000 fire season is a telling example of the consequences of such wrongheaded policies.<sup>24</sup>

**Considerable effort is spent trying to stop natural disturbances that are actually beneficial.**

Likewise, a common response to floods is to try to prevent them by controlling rivers. But contrary to popular belief, containing a river in embankments, dams, channels, reservoirs, and other structures does not reduce flooding. Instead, it dramatically increases the rate of flow, and causes even worse flooding downstream. The Rhine River, for example, is cut off from 90 percent of its original floodplain in its upper reaches, and flows twice as fast as before. Flooding in the basin has grown significantly more frequent and severe due to increased urbanization, river engineering, and poor floodplain management.<sup>25</sup>

The Great Midwest Flood of the upper Mississippi and Missouri rivers in 1993 provided another dramatic and costly lesson on the effects of treating the natural flow of rivers as a pathological condition. The flood was the largest and most destructive in modern U.S. history. It set records for amounts of precipitation, upland runoff, river levels, flood duration, area of flooding, and economic loss. Financial costs were estimated at \$19 billion. The floodwaters breached levees spanning nearly 10,000 kilometers. In hindsight, many now realize that the river was simply attempting to

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reclaim its floodplain. Not surprisingly, 1993 was a record spawning year for fish as the river was restored, temporarily, to more natural functioning.<sup>26</sup>

**Bangladesh suffered its most extensive flood of the century in 1998; two thirds of the country was inundated for months.**

Today's problems reflect the cumulative impacts of more than a century of actions by public and private interests to expand agriculture, facilitate navigation, and control flooding on the Mississippi and its tributaries. Nearly half of the 3,782-kilometer-long Mississippi flows through artificial channels. Records show that the 1973, 1982, and 1993 floods were substantially higher than they might have been before structural flood control began in 1927 after a major flood.<sup>27</sup>

Throughout the huge Mississippi River basin, the construction of thousands of levees, the creation of deep navigation channels, extensive farming in the floodplain, and the draining of more than 6.9 million hectares of wetlands (more than an 85-percent reduction in some states) have cut into the ability of the Mississippi's floodplains to absorb and slowly release rain, floodwater, nutrients, and sediments. Separating fish from their floodplain spawning grounds and upstream reaches has virtually eliminated some species and caused many others to decline. The commercial fish catch in the river has fallen 83 percent over the past 50 years.<sup>28</sup>

Flood control and navigation structures have also adversely affected the Mississippi Delta and the Gulf of Mexico. Because these structures trap sediments rather than allow them to be carried downstream to

replenish the delta, as they have done for millennia, the coastal areas are actually subsiding as water inundates wetlands and threatens coastal communities and productive fisheries.<sup>29</sup>

The management and policy changes begun after the 1927 flood have had other perverse effects. One was to shift the cost and responsibility for flood control and relief from the local to the federal level. Another was to encourage people, farms, and businesses to settle in vulnerable areas with the knowledge that they would be bailed out of trouble at taxpayer expense.<sup>30</sup>

The government also fostered settlement in vulnerable areas by providing crop insurance and crop price guarantees, and by paying for most of the cost of levees. The net result is that farming the land in the former river channel is profitable only with regular federal payments for flood damage.<sup>31</sup>

In 1968, Congress created the National Flood Insurance Program (NFIP) to cover flood-prone areas that private insurers deemed too risky. Unfortunately, this led to rebuilding in many of these areas. Nearly half of the payments for flood claims went to the repeat flood victims who account for less than 1 percent of the policyholders. And for those without flood insurance, emergency relief aid was repeatedly provided, further contributing to the cycle of losses.<sup>32</sup>

The 1993 Mississippi flood's human and economic costs, combined with its benefits to the ecosystem's functions, inspired a rethinking of the way large rivers are managed. After the flood, a federal task force recommended ending the nation's overreliance on engineering and structural means for flood control in favor of floodplain restoration and management. It emphasized managing the river as a whole ecosystem rather than as short segments.



Other reforms to the NFIP have been promoted by a wide range of groups (from floodplain managers to insurance companies and environmental groups) to reduce repeated flood losses, save taxpayer dollars, and restore the health of the Mississippi basin.<sup>33</sup>

On the other side of the globe, Bangladesh suffered its most extensive flood of the century in the summer of 1998, when two thirds of the country was inundated for months. Annual floods are a natural and beneficial cycle in this low-lying coastal nation, which encircles the meandering deltas of the Ganges, Brahmaputra, and Meghna Rivers. The people of Bangladesh have long adapted their housing, land use patterns, and economic activities to these “barsha” or beneficial floods. However, 1998 brought a “bonna” or devastating flood. Floodwaters reached near-record levels and did not recede for months. All told, 1,300 people died, 31 million people were left temporarily homeless, and 16,000 kilometers of roads were heavily damaged. Overall damage estimates exceed \$3.4 billion—or 10 percent of the nation’s GDP.<sup>34</sup>

A number of factors precipitated Bangladesh’s bonna flood. Heavy rainfall upriver in the Himalayas of north India and Nepal, some of which fell on heavily logged areas, exacerbated the disaster, as did the runoff from extensive development upstream that helped clog the region’s rivers and floodplains with silt and mud. In the future, rising sea levels due to climate change will make Bangladesh even more vulnerable to flooding. This problem will be made worse because large expanses of stabilizing mangroves have been removed from shores in recent years to make way for shrimp ponds, exposing the coast to more inundation.<sup>35</sup>

Further, a major reason that so much of Bangladesh was submerged for so long was that extensive embankments built in the last 10 years as part of the nation’s Flood Action Plan actually prevented the drainage of water. (The structures also dried out the backwaters that once fertilized fields and provided fish after the floods receded.) While the Bangladeshi peasants look at most floods as beneficial, engineers and donors tend to see all flooding as a problem to be solved by technical measures. As researcher Thomas Hofer has noted, “when it comes to perception of floods and their danger, few heed the wisdom of villagers, even though it is they who have to (mostly) live with the flood.”<sup>36</sup>

## Social Vulnerability

A number of factors make some places and some people more vulnerable to natural hazards. Growing concentrations of people and infrastructure in vulnerable areas like coasts, floodplains, and unstable slopes mean that more people and economic activities are in harm’s way. While poor countries are more vulnerable, in every nation some people and communities—notably the very poor, women, and ethnic minorities—are especially hard hit during and after disasters. For poorer countries and poorer people, disasters can take a disproportionately large share of income and resources. Misplaced development priorities and heavy debt burdens can exacerbate disasters and cripple recovery efforts, further hampering development.

Two major global social trends of recent decades have increased our vulnerability to natural hazards: the migration of people to coasts and cities, and the enormous expansion of the built environment. Approximately 37 percent of the world’s

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population—more than 2 billion people—lives within 100 kilometers of a coastline. Coastal zones are especially vulnerable to storms, high winds, flooding, erosion, tidal waves, and the effects of inland flooding. In the U.S. Gulf and Atlantic coasts, the areas most vulnerable to hurricanes, 47 percent of the population lives in coastal counties. Between 1950 and 1991, a period of relatively few hurricanes, the population of South Florida exploded from under 3 million people to more than 13 million. And 80 percent of this growth occurred in coastal regions.<sup>37</sup>

**A disproportionate number of the world's poor live on the front line of exposure to disasters.**

Similarly, there has been explosive growth of cities. Since 1950, the world's urban population has increased nearly four-fold. Today, the urban population—almost half the people in the world—is growing three times faster than the rural population. Many cities are also in coastal areas, further compounding the risks. Of the world's 19 megacities—those with over 10 million inhabitants—13 are in coastal zones.<sup>38</sup>

As the built environment increases in amount and density, potential losses increase. As the *World Disasters Report* puts it, “growing cities concentrate risk.” Urban areas are dense concentrations of not only people but also buildings, roads, rail lines, pipelines, communications systems, and water and sanitary services. The concentration of these “lifelines” means that a disruption in service can affect a very large share of a region's population and economic activity. The earthquake that rocked Kobe, Japan, in 1995 killed 6,350 people and cost over \$100 billion, making it the most expensive natural disaster in history. It

disrupted economic activity for months, including vital shipping and railway lines.<sup>39</sup>

Urbanization also increases the risk of flooding. When land is covered by impervious surfaces such as roads and roofs, the frequency and severity of flash floods increases. Urbanizing 50 percent of a watershed can increase the frequency of floods from once every 100 years to once every 5 years.<sup>40</sup>

In much of the developing world, urbanization has additional dangers. Up to half the people in the largest cities of the developing world live in unplanned squatter colonies, which are often sited in vulnerable areas such as floodplains and hillsides or even garbage dumps. These poorer communities are far less likely to have public services such as water, sanitation, storm drains, and health and emergency services. As a result, when disasters strike, the residents are even worse off. After disasters they have few, if any, resources to fall back on to survive and rebuild.<sup>41</sup>

Whether in urban or rural areas, the poorest and most marginalized suffer the most. A disproportionate number of the world's poor live on the front line of exposure to disasters. In Nicaragua, 80 percent of those who lost their homes during Hurricane Mitch were living at or below the poverty line even before the storm.<sup>42</sup>

In Central America, the nations most ravaged by Mitch—Guatemala, Honduras, and Nicaragua—have a history of highly inequitable distribution of land and wealth. Such extreme poverty invites disaster. In the Honduran capital of Tegucigalpa, one neighborhood that slid into the Choluteca River was home to vendors from the local market who had cobbled together shanties for lack of affordable housing. In the countryside, where prime agricultural land was being used mostly to produce export com-

modities such as bananas and coffee, subsistence farmers had been forced onto steep hillsides, where they were much more vulnerable to landslides.<sup>43</sup>

After the storm, half the people in Honduras had lost their homes or been evacuated and 70 percent were without clean water. More than 70 percent of the crops were destroyed—in a nation where two thirds of the workers are in agriculture, which accounts for half of export revenue. Nutrient-rich topsoil was also lost, and it will be years before many fields can be rehabilitated and crops can bear fruit. Thousands of land mines, planted during a decade of civil conflict, were washed to unknown locations.<sup>44</sup>

The United Nations estimated that Mitch set the region's development back by 20 years. The cost of rebuilding infrastructure in Honduras and Nicaragua alone was estimated at nearly \$9 billion. But far from starting with a clean economic slate, Central American nations face the impossible task of rebuilding while paying the development debt of previous decades. Already over \$10 billion in debt before the disaster, Honduras and Nicaragua were together paying \$2.2 million a day simply to service their existing debts.<sup>45</sup>

After Mitch, the World Bank quickly arranged a large financial support package, including \$1 billion in new interest-free credits for Nicaragua and Honduras, while some lender countries agreed to forgive all or part of their share of outstanding debt or to delay repayment. Yet with the destruction of much of the infrastructure and export capacity, these nations seem destined to slip further into debt unless there is more debt relief. (See Chapter 8.)<sup>46</sup>

In rich and poor nations alike, people living on the edges of society and the economy may be pushed over the edge when

disaster strikes. Simply put, disasters make poverty worse. Community and family networks, which provide vital social security, may unravel. For subsistence farmers—both men and women—what little “insurance” they have is in the form of seeds, tools, and livestock, which are often lost along with their crops. Laborers lose their incomes. Squatters or illegal immigrants are usually in high-risk locations to begin with. After disasters, they often do not ask for help because they may fear being evicted from their settlement or deported. Illiterates cannot read disaster notices and instructions. Those who were homeless before the disaster have no resources or social networks to rely on, and are often invisible to government agencies. Indigenous people often have poor access to information and services before disasters, and are less likely to receive aid afterwards.<sup>47</sup>

Disasters can weaken the already vulnerable position of women and children. As one flood survivor put it, “life shatters along existing fault lines.” Although needs may differ, relief efforts rarely make distinctions between men and women. Women may need special medical assistance when pregnant or lactating, or protection from the increased male violence and aggression that commonly occurs after disasters. Women usually bear the weight of responsibility for caring for children and the elderly, yet few emergency efforts provide assistance for these tasks. The disproportionate malnourishment of women and children worsens after disasters.<sup>48</sup>

As with development in general, men tend to be seen as the family providers and relief efforts focus on them to the exclusion of women. “Food for work” jobs and agricultural rebuilding often target men, despite evidence that the food does not always reach the home and is sometimes

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sold instead, whereas the food and money that a woman works for are almost universally dedicated to her family's needs. Most relief and rebuilding efforts focus on major infrastructure rather than on the priorities of local people, such as affordable housing or income-generating activities.<sup>49</sup>

Finally, planners rarely recognize that in pre- and post-disaster situations, women have different priorities and coping strategies. They generally have less tolerance for risk than men, so they are more likely to prepare for hazards and to heed disaster warnings and evacuation notices. After disasters they are more likely to mobilize social networks to find ways to meet the needs of their family and the community. Men, on the other hand, often cope by leaving the disaster zone to find employment, in some cases abandoning their families.<sup>50</sup>

**Increasingly sophisticated engineering allows people to wrongly assume that nature can be controlled and they can be protected.**

The tendency to view all disaster victims and their needs alike has a special danger for the disabled and the elderly. In the hurricane-vulnerable coastal communities of North Carolina, for example, 12 percent of residents have a physical or medical condition that impedes their ability to evacuate their homes—a reality that evacuation plans need to prepare for.<sup>51</sup>

While the “tyranny of the urgent” in disasters makes it easy to overlook gender and social issues, doing so makes efforts far less effective than they need be. Understanding social realities and vulnerabilities is as crucial for ensuring success of all phases of disaster management—from preparedness and response to recovery and

mitigation—as it is for achieving truly sustainable development.<sup>52</sup>

## The Politics and Psychology of Disasters

Responding to disasters is a genuine human reaction to the suffering of others. When tragedy strikes, there is an almost reflexive outpouring of help to try to feed, clothe, and house those in distress. Yet long-term rebuilding and disaster prevention efforts rarely elicit the same level of empathy and support. Among donors, governments, and even humanitarian organizations, there is a well-developed culture of response, but not an underlying culture of mitigation. Within the U.S. Office of Foreign Disaster Assistance, for instance, only 11 percent of its meager \$155.4 million 1997 budget went to mitigation and preparedness activities.<sup>53</sup>

When people contemplate the future they “are typically unaware of all the risks and choices they face. They plan only for the immediate future, overestimate their ability to cope when disaster strikes, and rely heavily on emergency relief,” according to Dennis Mileti, Director of the Natural Hazards Center and author of *Disasters by Design*. Even when they are aware of risks, people are generally less likely to expend effort and resources on something that might happen, perhaps sometime in the future, than they are to meet more immediate needs. For the very poor, these day-to-day needs are pressing indeed.<sup>54</sup>

While the improved accuracy and dissemination of warnings has saved countless lives, it can, ironically, foster a false sense of safety, and, along with insurance, can encourage people to build and live in risky places. Increasingly sophisticated engineering allows people to wrongly assume that nature can be controlled and thus they can

be completely protected from hazards. In many wealthy countries, such as the United States, most people—rich and poor alike—who choose not to invest in mitigation measures (or even insurance) can do so with a near certain knowledge that they will be physically and financially rescued in the event of an emergency. All this can lead to unnecessary risk taking.

Just as individuals take calculated risks or risks out of ignorance, so too do governments. In many areas of government, including hazard management, short-term thinking prevails. Preparing for and mitigating hazards often takes a back seat to other priorities. Rescue and relief get much more financial support—and have more political appeal—than preparing for an event that may not happen during a politician's term in office.

And yet the adage “an ounce of prevention is worth a pound of cure” clearly applies to disasters. The World Bank and U.S. Geological Survey calculated that global economic losses from natural disasters could be reduced by \$280 billion if just one seventh that amount were invested in preparedness and mitigation efforts. The costs of disaster preparedness and mitigation can be far less than the costs of disaster relief and recovery.<sup>55</sup>

Disasters can focus attention on the many failures in preparation and response. The aftermath of Hurricane Mitch, for instance, brought to light Central America's inadequate disaster preparedness. Despite the fact that the region has been repeatedly hit by hurricanes, earthquakes, and tidal waves, it seems that none of the lessons of those events were learned and applied before Mitch—or since. Nicaragua's government, especially the president, was criticized for failing to declare a state of emergency in the early

days of the storm. National emergency planning did not start until days after the storm began, during which time the president repeatedly denied there was a crisis. Early warnings and evacuations could have saved people in the villages around the Las Casitas volcano. After seven days of pounding rains the side of the volcano slid away, killing more than 1,400 people—the worst single incident of Mitch.<sup>56</sup>

In India, the cyclone and tidal wave that hit the desert region of Gujarat and killed 10,000 people in 1998 was predicted by the federal government, but the warnings were not disseminated by local authorities. Some have even said that there was little political will to expend effort warning politically powerless people in the region.<sup>57</sup>

When a supercyclone hit Orissa, India, in late 1999, the official response was decidedly mixed. Though some sectors, such as public health, responded admirably, in general the government's reaction was disjointed and often ineffective. The confusion meant that the people hit hardest by the storm suffered for many days without relief. All told, as many as 50,000 died, 20 million were left homeless, and more than 1 million families lost their means of support. The lack of coastal management plans or an effective emergency communication network also help explain why this cyclone was so destructive compared with similar storms that strike elsewhere. Even a neighboring Indian state was more prepared than Orissa—just a month earlier, Andhra Pradesh managed to evacuate 1 million coastal dwellers to 1,000 cyclone shelters during another storm, while for the supercyclone Orissa evacuated only 150,000 people, and had only 21 shelters for evacuees. Andhra Pradesh had applied the lessons learned in three almost equally large cyclones: in 1974, 10,000 people died in a similar

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storm; in 1991, 1,000 people died; in 1996, just 60 people were killed.<sup>58</sup>

The failure of governments to develop or enforce adequate land use plans and building codes, even after multiple disasters, can also have devastating consequences. In earthquake-prone Turkey, as elsewhere, rapid urbanization in recent decades led to a housing crisis. To alleviate the crunch, 15 “building amnesties” were granted since 1950 that legalized illegal construction. Before the 1999 earthquakes, these amnesties were seen as a great populist gesture. Afterward, corrupt building contractors and local officials were denounced as “murderers” in newspaper headlines. While many poorly constructed apartment blocks, some as far away as 100 kilometers, turned into tombs, other properly constructed buildings at the quake’s epicenter survived.<sup>59</sup>

Turkey is not alone in facing this type of problem. In many cities in developing countries, more than half of all homes are technically illegal. They are poorly constructed, sited, and served. In Honduras, the government has failed to enforce zoning laws introduced after Hurricane Mitch. Not all poorly located buildings are inhabited by the poor, either. In Venezuela, the 1999 landslides that claimed 30,000 lives hit luxury apartment high-rises built at the foot of landslide-prone slopes as well as more modest dwellings.<sup>60</sup>

Even in the industrial world, building in risky locations—from the cliffs of California to the barrier islands of the Carolinas and the mountains of Italy—is a widespread practice and problem. Sometimes it is even subsidized. Hazard mitigation codes can make buildings safer, but they must be enforced. If the State of Florida’s codes had been upheld, for instance, more than 25 percent of the damage from Hurricane Andrew in 1992 could have been avoided.

(Most of the damage from the hurricane was not from houses blowing away but from massive water damage due to broken roofs or windows.) For communities that lack the technical expertise to develop their own, model codes and standards can provide guidance.<sup>61</sup>

Ineffective development and enforcement of building codes are not the only governance problems faced by hazard-prone communities. According to the *World Disasters Report*: “Corruption and vested interests in and around government play a large role in many of the long-term precursors to disaster. Mafia organizations have been implicated in the widespread construction of illegal housing in disaster-prone areas of Italy. Timber smuggling cartels with political connections on the porous borders of Pakistan and Afghanistan are denuding and destabilizing mountain slopes in earthquake zones.”<sup>62</sup>

In Indonesia, not only did former president Suharto’s government turn a blind eye to timber and palm oil plantation owners (many of whom were his cronies) who were illegally using fire to clear forest to expand their operations, but some of the 1997–98 fires were set as part of the government’s own misguided program to turn 1 million hectares of peat swamp into an agricultural settlement. Early on, the government tried to blame the rural poor for setting the fires that swept the country, despite satellite images tracing almost all the blazes to corporate plantations and timber concessions. When the government finally admitted who the real culprits were, little or nothing was done to stop them. Nor was anything done to help the millions who lost their homes and livelihoods or were sickened by the haze, while the nongovernmental organizations (NGOs) that stepped in to provide services were criticized.<sup>63</sup>

Governments should beware, as the failure to prepare for and respond to disasters can have political repercussions. In Indonesia, Suharto was finally ousted when outrage over the Asian financial crisis and the massive fires fanned the flames of widespread opposition to the regime's corrupt and authoritarian rule. In the elections following the Orissa disaster in India, the incumbent party was ousted by voters angry over the governments' apathy, bungling, and corruption.<sup>64</sup>

## Fostering Resilience in Nature and Communities

The ever-rising human and economic toll of disasters provides clear evidence that a shift is needed in our coping strategies. This shift is all the more urgent if the current trends that make us vulnerable continue: the concentration of people and infrastructure in cities and along coasts, and growing pressure on ecosystems. The looming prospect of climate change and sea level rise can only exacerbate these troubling trends.

Scientists project that in the future the weather is likely to become more erratic and extreme as a result of climate change. Warmer ocean waters, for example, can fuel stronger storms. Many of today's disasters are also fueling climate change. The fires that ravaged Indonesia's forests and peat swamps in 1997–98 produced a third of the carbon pumped into the atmosphere by human activities during that time.<sup>65</sup>

It is already clear that sea levels are rising. During the last century, they rose about 20 centimeters and they are projected to rise another 50 centimeters by 2100. The British Meteorological Office and others have calculated that with uncontrolled climate change the number of people at risk of flooding "will increase ten-fold by 2080."

Coastal cities, river deltas, and small islands will be especially vulnerable. Major river deltas like Bangladesh, the Amazon, and the Mississippi would be at risk. Some small island nations may see their national territory disappear. Rising sea levels could even flood the New York City subway system and turn parts of the metropolitan area into wetlands.<sup>66</sup>

Many like to blame "the weather" or "the climate," and use them as convenient excuses for inaction. But it is important to recognize that irrespective of any potential climate change dimension, we continue to put more people and more "stuff"—buildings, bridges, cities, and power plants—in harm's way and have weakened nature's ability to mitigate hazards. Equally important is understanding that just as our development choices have made the threats worse, we have the power to make better choices.

There is a growing awareness that disaster response and recovery—the traditional mainstays of past efforts—are not enough, and that mitigation actions are needed to reduce the impacts of natural disasters. The need for a new direction in policies toward disasters is evident in the rising costs of these events to government treasuries. In the United States, for example, between 1970 and 1981 domestic disaster assistance cost the federal government \$3.8 billion. But for 1989–94, a period half as long, the bill topped \$34 billion.<sup>67</sup>

While we cannot do away with natural hazards, we can eliminate those that we cause, minimize those we exacerbate, and reduce our vulnerability to most. Doing this requires healthy and resilient communities and ecosystems. Viewed in this light, disaster mitigation is clearly part of a broader strategy of sustainable development—making communities and nations socially,

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economically, and ecologically sustainable.

How can communities and nations begin to mitigate disasters and reduce the human and economic toll? They can make sure that they understand their risks and vulnerabilities. They can use this knowledge to ensure that their development efforts do not inadvertently increase the likelihood and severity of disasters. To the extent possible, people and structures should be located out of harm's way. When hazards are unavoidable, development can be made to withstand them—for example, buildings in earthquake zones should be designed to weather earthquakes. Disaster preparedness, too, is an integral part of saving lives and lowering the economic toll. And every segment of the community needs to be actively engaged in planning and implementing disaster mitigation efforts.

**Instead of relying on structural engineering, the time has come to use the services provided by healthy and resilient ecosystems.**

Identifying and delineating natural resources (like watersheds and floodplains), hazards (such as flood zones), vulnerable infrastructure (such as buildings, power lines, and bridges), as well as vulnerable communities and resources—and doing so at scales that are meaningful to communities and decisionmakers—is an essential step. Yet hazard mapping is incomplete, outdated, or non-existent in many communities and nations. Even most U.S. flood maps are more than 20 years old, and most other hazards are not mapped at all. Maps do not show the areas that would be flooded in the event of a dam or levee failure, or that are at risk from coastal erosion—despite the fact that in the next 60 years, 25 percent of homes within 500 feet of U.S.

shorelines are projected to be lost to coastal erosion.<sup>68</sup>

A critical part of good land use planning is maintaining or restoring healthy ecosystems so they can provide valuable services. China, for example, now recognizes that the forests are more valuable for flood control and water supply than they are for timber. Ecosystem restoration and rehabilitation can be effective tools in hazard mitigation. An extensive study by the U.S. National Research Council recommended these tools to solve water quality, wildlife, and flooding problems at minimal cost and disruption. Restoring half of the wetlands lost in the upper Mississippi Basin would affect less than 3 percent of the agricultural, forest, or urban land, yet it could prevent a repeat of the flood that drowned the heartland in 1993. Allowing more of the natural floodplain to function can reduce the impact of future floods on human settlements and economic activities.<sup>69</sup>

In the past, making communities safe was seen as the job of engineers, who, for instance, would apply structural solutions to flood control and coastal storms—a costly and often unsuccessful approach. As noted earlier, many of these structures have ironically contributed to a false sense of security and to magnifying the hazard. Many of them are now reaching the end of their life span and should be decommissioned.

Instead of relying on structural engineering, the time has come to tap nature's engineering techniques—using the services provided by healthy and resilient ecosystems. Dunes, barrier islands, mangrove forests, and coastal wetlands are natural shock absorbers that protect against coastal storms. Wetlands, floodplains, and forests are sponges that absorb floodwaters. Nature provides these valuable services for free, and we should take advantage of them



rather than undermining them.

There is still a role for traditional engineering. Buildings and bridges can be made to better withstand natural hazards. By ensuring that structures can withstand earthquakes of a certain magnitude, or winds of a certain speed, many lives and dollars could be saved.<sup>70</sup>

Making communities safer does not have to be high tech or high cost. In Maharashtra, India, “barefoot” engineers and builders helped introduce new and safer building techniques during post-earthquake reconstruction. In many flood-adapted cultures—like in the Amazon or Mekong—houses sit on stilts above the high water mark or float up and down with the water levels. In Bangladesh, communities build and maintain raised mounds where they can go for safety during floods. The mound usually has a safe drinking-water well and a school or other community structure, providing a safe haven and an incentive for the community to maintain it. Active community participation in planning and implementation of all levels of disaster mitigation and recovery is essential.<sup>71</sup>

Basic community services have added benefits during disasters. As noted earlier, China credits improved sanitation with virtually eliminating the post-disaster epidemics of waterborne diseases that frequently used to kill more people than the disaster itself.

Communities can also act to reduce the “hidden hazards” that can create a “disaster after the disaster.” After Hurricane Floyd hit North Carolina in 1999, for example, the contents of open waste ponds of industrial hog farms spread out over the landscape in the floodwaters. Chemical plants and other industrial sites also present special hazards during natural disasters. Ensuring safe containment of these facilities can save many

lives and much money in post-disaster cleanup efforts. Among the most frightening and deadly hidden hazards are the land mines that are washed by floodwaters to new and unmapped locations, as has happened in Mozambique and Central America.<sup>72</sup>

In recent decades, great strides have been made in predicting extreme weather events and disseminating warnings. In 1992, warnings and timely evacuations were a major factor in limiting to 15 the number of deaths caused by Andrew, the costliest hurricane in U.S. history (at \$30 billion). A comprehensive preparedness system has helped reduce the loss of life in Bangladesh, 90 percent of which is vulnerable to cyclones. Tens of thousands of community volunteers, working in teams of 10 men and 2 women, provide warnings, evacuation, search and rescue, and other emergency assistance—often at risk to their own lives. They are credited with saving 30,000 people in the powerful 1991 cyclone and countless others in recent events.<sup>73</sup>

Getting the right information to the right people at the right time remains an enormous challenge. Sometimes information is too technical to be useful or in the wrong language. Radio, television, satellites, computers, and the Internet can be very effective in expanding dissemination, yet much of the world is still without access to many of these technologies. Expanding effective early warning systems should continue to be a high priority.<sup>74</sup>

Sustainable mitigation must be an integral part of local and international development plans. Governments have a role to play in investing in hazard and risk assessments and in developing databases on losses, mitigation efforts, and social data. They can establish land use policies, limit subsidization of risk and destructive activities, use incentives to encourage sound land use

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and sustainable hazard mitigation, and encourage collaboration between agencies and civil society.<sup>75</sup>

Governments and civil society must also ensure the rule of law—without it, the social and ecological unraveling that precipitates and exacerbates disasters is far more likely. The fires in Indonesia provide a textbook case on the consequences of corruption and lawlessness. Russia may be unwittingly setting the stage for future disasters by allowing massive and poorly regulated logging in its Far East. Since China enacted its much needed logging ban in 1998 to restore the health of the flood-ravaged Yangtze basin, the impacts of logging have shifted to neighboring countries like Russia.<sup>76</sup>

Private and public insurers can help reduce hazard losses by providing information and education as well as incentives that encourage mitigation and disincentives to discourage building in hazard-prone places. Insurers have been active participants in the climate change debate, as they recognize the huge potential impacts of climate change on their industry. For most of the developing world, insurance is not available. Providing some sort of financial safety net is a large and unmet need.<sup>77</sup>

The publicly funded U.S. National Flood Insurance Program provides insurance in communities that adopt a set of minimum standards for floodplain management. Reduced insurance premiums are provided for communities that undertake activities (such as flood mapping, preparedness, public information, and so forth) that exceed minimum standards. While there have been some changes in the program, much more could be done. Currently, because erosion hazards are not mapped, homeowners in erosion-prone areas pay the same flood insurance rates as those in no-risk areas. The NFIP also reimburses com-

munities for “beach nourishment”: the costly, futile, and potentially destructive practice of regularly plowing sand from the ocean up to the beach. In the future, NFIP rates could be raised and coupled with land use controls such as mandatory set-backs from hazardous zones.<sup>78</sup>

Donors can provide leverage and resources to promote development policies that include disaster mitigation. As noted, every dollar spent on disaster preparedness saves \$7 in disaster-related economic losses—a great return on investment. Considering the social and ecological losses that are also prevented, the return is far higher.<sup>79</sup>

Unfortunately, overall foreign aid budgets are small, and disaster prevention allocations are minuscule. At the 1992 Earth Summit, the Group of Seven industrial countries made a commitment to provide 0.7 percent of their GDP in aid, yet five years later they had managed to come up with only 0.2 percent. (If they had met their target, it would have added \$155 billion to aid funds.) Of the aid that they do provide, what is spent for emergency assistance is painfully small. In 1997 it was less than 7 percent of bilateral aid. The amount spent for mitigation was far lower.<sup>80</sup>

Better coordination of emergency and development efforts within and among agencies is needed. In the United Nations, for instance, weather forecasting, humanitarian relief, food relief, and disaster preparedness and mitigation are each in separate agencies. Some donors are beginning to integrate these functions, a step that can help mainstream mitigation. The World Bank recently launched the ProVention consortium, in partnership with governments, intergovernmental organizations, private insurance companies, universities, and NGOs. Yet within the Bank, disaster and development are still largely segregated,

and neither seems to influence the onerous debt demands of the World Bank, the International Monetary Fund (IMF), and other lenders on disaster-stricken countries.<sup>81</sup>

Donors and lenders also have the opportunity and the obligation to resolve the debt burden that cripples many nations. (See also Chapter 8.) The huge amount of money needed for both immediate disaster relief and long-term reconstruction in Central America after Hurricane Mitch and in Mozambique after Cyclone Eline focused attention on the growing problem of debt. Many question how these nations can realistically be expected to provide for their citizens and rebuild while repaying mounting foreign debt, especially since much of their capacity to generate revenue was wiped out by the storm. Before the disaster, Honduras owed \$4.7 billion in external debt and Nicaragua owed \$5.7 billion. In Nicaragua, per capita GNP was less than \$400, while even before Mitch, each person's share of foreign debt was nearly three times that.<sup>82</sup>

A few months after floods and cyclones ravaged Mozambique, affecting nearly 5 million people, donor nations pledged \$453 billion to fully fund its reconstruction. While Mozambique has received some measure of debt relief, debt elimination is what is needed.<sup>83</sup>

Much of the heralded post-Mitch "debt relief" involves simply postponing payments and supplying more loans (and therefore debt). The skepticism that met most creditor initiatives was summed up by the Roman Catholic Archbishop of Tegucigalpa, Oscar Andres Rodrigues, who likened the lender's moratorium on debt repayment to a "stay of execution."<sup>84</sup>

Indeed, the debt and structural adjustment programs of recent decades have forced extreme cutbacks in social services, such as health care and education, and in environ-

mental and resource management programs—precisely the kinds of services that are needed to help prevent disasters and respond effectively when they occur. The new loans and structural adjustment programs are accelerating these cutbacks. One year after Hurricane Mitch, Nicaragua had spent almost as much on debt service (\$170 million) as on reconstruction (\$190 million). The IMF explicitly stated that Nicaragua must limit reconstruction spending to \$190 million per year in 1999 and 2000.<sup>85</sup>

**Every dollar spent on disaster preparedness saves \$7 in disaster-related economic losses—a great return on investment.**

What Central America needs for reconstruction, said Archbishop Rodirigues, "is debt cancellation, combined with adequate foreign assistance and with careful oversight by our civil society," an approach championed by the faith-based Jubilee 2000 coalition that applies equally as well in many disaster-stricken nations. Oxfam has proposed that no more than 10 percent of government revenues could be spent on debt payments. Such limits are not without precedent. After World War II, Germany's debt payments were limited to 3.5 percent of export revenues in order to spur peace and development. Yet today the IMF, World Bank, and the Paris Club of government creditors say that 20–25 percent is sustainable, a level far higher than industrial nations deemed sustainable for themselves in the past.<sup>86</sup>

The international community has additional avenues for action. The International Decade for Natural Disaster Reduction that ended in 1999 represented an important opportunity to raise the profile of hazards and disasters, advance science and policy,

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and inspire national action. Yet it may have been “a decade of missed opportunity,” in the words of eminent geographer Gilbert White, as it focused on scientific and technical programs but failed to strengthen local capacity or to address slow-onset events such as those that plague Africa, among other important aspects of disaster reduction. To continue and expand the efforts of the decade, the United Nations has established a follow-up process, the International Strategy for Disaster Reduction. Unfortunately, it has relatively little visibility or political muscle, despite the tremendous challenges ahead.<sup>87</sup>

There is also room for action within the Framework Convention on Climate Change, as there is language that obliges signatories to cooperate in adapting to the impacts of climate change, including land use and water resource planning as well as disaster mitigation.<sup>88</sup>

Many have concluded that the time has come for a profound shift in how we approach disasters. As Kunda Dixit and

Inam Ahmed put it, when writing about floods in the vast Himalayan watershed: “Complete flood control...is impossible. Even partial control is...problematic....So the question arises: Should we try to prevent floods at all? Or should we be looking at what it is we do that makes floods worse? Is it better to try to live with them, and to minimize the danger to infrastructure while maximizing the advantages that annual floods bring to farmers?” The same questions must be asked about natural hazards everywhere.<sup>89</sup>

If we continue on a course of undermining the health and resilience of nature, putting ourselves in harm’s way, and delaying mitigation measures, we set ourselves up for more unnatural disasters, more suffering, more economic losses, and more delayed development. If instead we choose to work with nature and each other, we can reduce the waves of unnatural disasters that have been washing over the shores of humanity with increasing regularity and ferocity.

## Chapter 7. Averting Unnatural Disasters

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