DISASTERS BY DESIGN

A Reassessment of Natural Hazards in the United States

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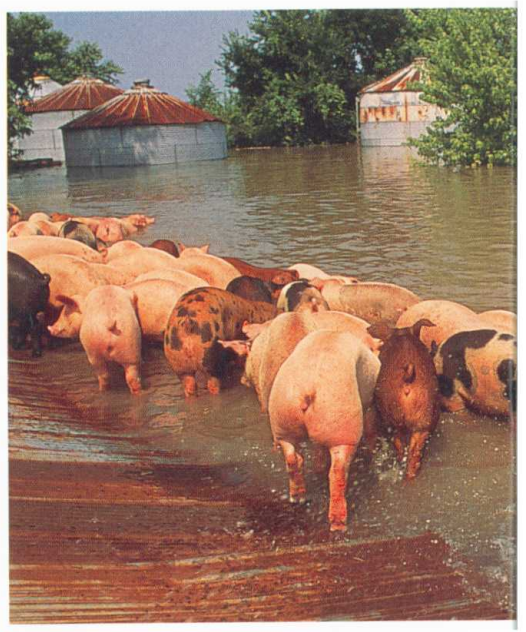
with the contributions of participants in the Assessment
of Research and Applications on Natural Hazards

An Activity of the International Decade for Natural Disaster Reduction

JOSEPH HENRY PRESS | WASHINGTON, D.C. | 1999

A quarter-century ago geographer Gilbert F. White and sociologist J. Eugene Haas published a pioneering report on the nation's ability to withstand and respond to natural disasters. At that time, research on disasters was dominated by physical scientists and engineers. As White and Haas pointed out in their *Assessment of Research on Natural Hazards*, little attempt had been made to tap the social sciences to better understand the economic, social, and political ramifications of extreme natural events.

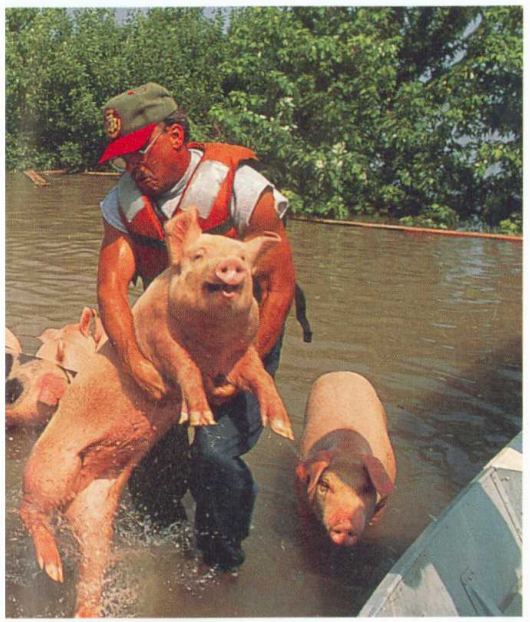
White and Haas attempted to fill this void. But they also advanced the critical notion that rather than simply picking up the pieces after disasters, the nation could employ better planning, land-use controls, and other preventive and mitigation measures to reduce the toll in the first place. Today, at long last, public and private programs and policies have begun to adopt mitigation as the cornerstone of the nation's approach to addressing natural and technological hazards.



The 1975 report also had a profound impact by paving the way for an interdisciplinary approach to research and management, giving birth to a "hazards community"—people from many fields and agencies who address the myriad aspects of natural disasters. Hazards research now encompasses disciplines such as climatology, economics, engineering, geography, geology, law, meteorology, planning, seismology, and sociology. Professionals in those and other fields have continued to investigate how engineering projects, warnings, land-use management, planning for response and recovery, insurance, and building codes can help individuals and groups adapt to natural hazards, as well as reduce the resulting deaths, injuries, costs, and social, environmental, and economic disruption. These dedicated people have greatly improved our understanding of the physical processes underlying natural hazards and the complexities of social decision making before, during, and after disasters. Yet troubling questions remain about why more progress has not been made in reducing dollar losses.

One central problem is that many of the accepted methods for coping with hazards have been based on the idea that people can use technology to control nature to make themselves safe. What's more, most strategies for managing hazards have followed a traditional planning model: study the problem, implement one solution, and move on to the next problem. This approach casts hazards as static and mitigation as an upward, positive, linear trend.

But events during the past quarter-century have shown that natural disasters and the technological hazards that may accompany them are not problems that can be solved in isolation. Rather, they are symptoms of broader and more basic problems. Losses from hazards—and the fact that the nation cannot seem to reduce them—result from shortsighted and narrow conceptions of the human relationship to the natural environment.



To redress those shortcomings, the nation must shift to a policy of "sustainable hazard mitigation." This concept links wise management of natural resources with local economic and social resiliency, viewing hazard mitigation as an integral part of a much larger context. Many aspects of this strategy were implicit in the recommendations formulated by White and Haas a quarter-century ago.

But to head off the continued rise in tolls from disasters, those principles must become more explicit.

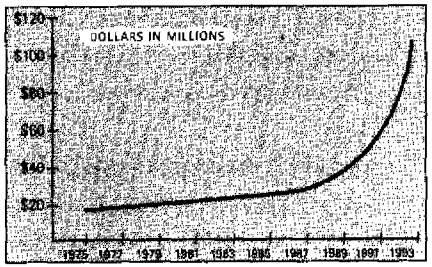
This summary, and the report on which it is based, reflect the efforts of over a hundred experts who have worked and debated since 1994 to take stock of Americans' relationship to hazards past, present, and—most importantly—future. Those contributions have been used to outline a comprehensive approach to enhancing society's ability to reduce the costs of disaster.

THE ROOTS OF THE PROBLEM

Many disaster losses—rather than stemming from unexpected events—are the predictable result of interactions among three major systems: the physical environment, which includes hazardous events; the social and demographic characteristics of the communities that experience them; and the buildings, roads, bridges, and other components of the constructed environment. Growing losses result partly from the fact that the nation's capital stock is expanding, but they also stem from the fact that all these systems—and their interactions—are becoming more complex with each passing year.

Three main influences are at work. First, the earth's physical systems are constantly changing—witness the current warming of the global climate. Scientists expect a warming climate to produce more dramatic meteorological events such as storms, floods, drought, and extreme temperatures. Second, recent and projected changes in the demographic composition and distribution of the U.S. population mean greater exposure to many hazards. The number of people residing in earthquake-prone regions and coastal counties subject to hurricanes, for example, is growing rapidly. Worsening inequality of wealth also makes many people more vulnerable to hazards and less able to recover from them. Third, the built environment—public utilities, transportation systems, communications, and homes and office buildings—is growing in density, making the potential losses from natural forces larger.

Settlement of hazardous areas has also destroyed local ecosystems that could have provided protection from natural perils. The



Annual Average Losses per 1 Million People from Natural Hazards in the United States, 1975–1994 (1994 Dollars)

Disaster Losses Are Growing

From 1975 to 1994, natural hazards killed over 24,000 people and injured some 100,000 in the United States and its territories. About one-quarter of the deaths and half the injuries resulted from events that society would label as disasters. The rest resulted from less dramatic but more frequent events such as lightning strikes, car crashes owing to fog, and localized landslides. • • • The United States has succeeded in saving lives and reducing injuries from some natural hazards such as hurricanes over the last two decades. However, casualties from floods—the nation's most frequent and injurious natural hazard—have failed to decline substantially. And deaths from lightning and tornadoes have remained constant. Meanwhile injuries and deaths from dust storms, extreme cold, wildfire, and tropical storms have grown. • • • The dollar losses associated with most types of natural hazards are rising. A conservative estimate of total dollar losses during the past two decades is $500 billion (in 1994 dollars). More than 80 percent of these costs stemmed from climatological events, while around 10 percent resulted from draining of swamps in Florida and the bulldozing of steep hillsides for homes in California, for example, have disrupted natural runoff patterns and magnified flood hazards. And many mitigation efforts themselves degrade the environment and thus contribute to the next disaster. For example, levees built to provide flood protection can destroy riparian habitat and heighten downstream floods.

Another major problem has become clear over the past 20 years: some efforts to head off damages from natural hazards only postpone them. For example, communities below dams or behind levees may avoid losses from floods those structures were designed to prevent. But such communities often have more property to lose when those structures fail, because additional development occurred that counted on protection. Such a situation contributed to catastrophic damage from the 1993 floods in the Mississippi basin. And many of the nation's dams, bridges, and other structures are approaching the end of their designed life, revealing how little thought their backers and builders gave to events 50 years hence. Similarly, by providing advance warnings of severe storms, this country may well have encouraged more people to build in fragile coastal areas. Such development, in turn, makes the areas more vulnerable by destroying dunes and other protective natural features.

FOSTERING LOCAL SUSTAINABILITY

Sustainability means that a locality can tolerate—and overcome—damage, diminished productivity, and reduced quality of life from an extreme event without significant outside assistance. To achieve sustainability, communities must take responsibility for choosing where and how development proceeds. Toward that end, each locality evaluates its environmental resources and hazards, chooses future losses that it is willing to bear, and ensures that development and other community actions and policies adhere to those goals.

Six objectives must simultaneously be reached to mitigate hazards in a sustainable way and stop the national trend toward increasing catastrophic losses from natural disasters.

- ***Maintain and enhance environmental quality.*** Human activities to mitigate hazards should not reduce the carrying capacity of the ecosystem, for doing so increases losses from hazards in the longer term.
- ***Maintain and enhance people's quality of life.*** A population's quality of life includes, among other factors, access to income, education, health care, housing, and employment, as well as protection from disaster. To become sustainable, local communities must consciously define the quality of life they want and select only those mitigation strategies that do not detract from any aspect of that vision.
- ***Foster local resiliency and responsibility.*** Resiliency to disasters means a locale can withstand an extreme natural event with a tolerable level of losses. It takes mitigation actions consistent with achieving that level of protection.
- ***Recognize that vibrant local economies are essential.*** Communities should take mitigation actions that foster a strong local economy rather than detract from one.