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In Harm's Way: Hurricanes, Population Trends, and Environmental Change

by Roger-Mark De Souza

(October 2004) In September 2004, four devastating hurricanes and tropical storms killed more than 1,500 Haitians, destroyed roughly 90 percent of Grenada, and wreaked billions of dollars of damage on the southern United States.

But such calamities from extreme weather are hardly an accident of nature. Instead, these tragedies highlight when and how environmental hazards combine with socioeconomic conditions—particularly population and environmental trends—to magnify the threat of disaster for tens of millions of people in both the developed and the developing world.

The Factors That Increase Vulnerability to Hurricanes

Hurricanes and tropical storms have always been one of the primary causes of natural disasters in the Caribbean and the coastal southern United States.¹ But the economic impact of hurricanes in these areas is growing far more severe.

The insurance industry in the United States has paid out more than \$39 billion since 2000 to cover hurricanes and other natural disasters—a figure more than half the total of all catastrophic event payments made by the industry in the preceding 30 years.²

This rise in insurance costs reflects not just greater hurricane activity, but people's increased vulnerability to those storms due to three factors: population pressures, the effects of poverty and affluence, and other environmental changes that exacerbate a hurricane's strength and effects.

Vulnerable Locations and Population Pressures

To some extent, human vulnerability to natural disaster is a geographical misfortune. For example, because of their fragile environments and economies, islands are highly vulnerable to devastating hydrometeorological and geological disasters. According to the United Nations Conference on Trade and Development, 13 of the 25 countries that suffered the greatest number of natural disasters during the 1970s and 1980s were small island states.³

But accelerating numbers of people are choosing to live in areas that are at increasing risk for natural devastation. For example, approximately 13 million Floridians now live in coastal counties, up from 200,000 a century ago.⁴ And more people live in South Florida's Dade and Broward counties now than lived in the entire southeastern United States in 1930.⁵

Aggressive coastal development, especially the building of homes and businesses in these fragile areas, is also increasing human vulnerability to natural disasters.

A 2000 study commissioned by the Federal Emergency Management Agency found that Americans have built more than 350,000 structures within 500 feet of U.S. coasts. The study also warned that coastal erosion could claim one in four of those buildings within the next 60 years.⁶

Caribbean countries are equally vulnerable to tropical storms. Major population centers, agricultural areas, ports, and centers of industrial and commercial activity are mostly located in the coastal zone. And tourism—a mainstay of many Caribbean economies—is also largely concentrated in coastal areas.⁷

The vulnerability of these urban coasts is exacerbated by population growth. While fertility rates have fallen nearly everywhere in the developing world, population in the Caribbean will continue to grow as large numbers of young people move into their reproductive years.⁸

On average, roughly one-third of people in the Caribbean are under age 15. (Haiti has the most youthful population in the region, with 43 percent of its population under age 15.) This population growth is particularly acute among the poor, who have traditionally had the least capacity to exercise their reproductive preferences.⁹

Rural-to-urban migration and increasing urbanization has also aggravated the impact of natural disasters among developing countries in the Caribbean. Indeed, the Caribbean is the most urbanized island region in the world, with an urban population that grew an average of 1.58 percent annually from 1995 to 2000.¹⁰ Several islands—such as the Bahamas, Cuba, Dominica, Puerto Rico, and Trinidad and Tobago—are already predominantly urban.¹¹

The trend towards urbanization provides additional pressures on the environment and increases vulnerability to natural hazards, particularly among the poor. The urban poor tend to live in informal settlements, and their housing is often inadequately constructed.¹²

Large urban areas such as Kingston in Jamaica and San Juan in Puerto Rico tend to be more hazardous locations than sparsely populated rural areas because of their population size and the potential scale of damage. In these urban areas, impervious surfaces such as roads and buildings generate more runoff than forested land. And fixed drainage channels may be unable to contain runoff from intense rains.

Poverty and Affluence

Poverty is a central component of vulnerability to tropical storms: Developing countries contain 90 percent of the victims from natural disasters and bear 75 percent of their economic damages.¹³

The World Bank estimates that 80 percent of the poor in Latin America, 60 percent of the poor in Asia, and 50 percent of the poor in Africa live on

marginal lands characterized by poor productivity and high vulnerability to natural degradation and natural disasters.¹⁴

Where the poor live in the developing world contributes enormously to their vulnerability to tropical storms and their aftermath. These people often have no choice but to occupy the least-valued plots of land in disaster-prone areas such as riverbanks, unstable hillsides, deforested lands, or fragile water-catchment areas.

These patterns predetermine not only the poor's susceptibility to natural disasters, but also their capacity to cope with their aftermath. Poorer families may be forced into increased debt in order to rebuild their homes, replace assets, and meet basic needs until they are able to recommence income-generating activities.¹⁵

More affluent societies and individuals also have put themselves at increased risk for natural disasters such as hurricanes, although they have more resources with which to brace for and handle the aftermath of such events.¹⁶

As noted above, disaster-prone areas of the United States are being settled by people with higher-than-average incomes—often to find jobs, to be near to recreation possibilities, or to build secondary homes.¹⁷ In some cases, economic incentives for responsible land use have been curtailed by legislated insurance rates and federal aid programs that effectively subsidize development in hazard-prone areas.¹⁸

Environmental Changes

Environmental degradation also increases vulnerability to tropical storms. Serious coral bleaching and mangrove loss, for example, make coastlines more susceptible to flooding.

Similarly, deforestation contributes to droughts, flash floods, and landslides. For example, rains from Tropical Storm Jeanne pounded land in Haiti that had been cleared for charcoal production, ultimately leading to the death of more than 1,000 people. By contrast, greater land cover buffered the coastline of the Dominican Republic (which shares the island of Hispaniola with Haiti) against widespread flooding from Jeanne as well as subsequent landslides—resulting in significantly less deaths.¹⁹

Global warming could also contribute to a rise in the number and the intensity of hurricanes that will hit the Caribbean and the southern United States, although scientists are still debating the precise impact of such warming.

Recent research suggests that, by 2080, seas warmed by rising atmospheric concentrations of heat-trapping greenhouse gases could cause a typical hurricane to intensify about an extra half-step on the five-step scale of destructive power. Rainfall up to 60 miles from the storm's core would also be nearly 20 percent more intense.²⁰

Moving Out of Harm's Way

Reducing vulnerability to hurricanes in the Caribbean and the southern United States must include an understanding of how population trends and environmental changes interact with geographic predisposition to natural hazards, policy choices, and economic drivers of change.

The upcoming World Conference on Disaster Reduction (WCDR) in Japan (in January 2005) will be an opportunity for world leaders to recognize these important linkages.

In preparation for the conference, the International Strategy for Disaster Reduction (ISDR) Secretariat and the United Nations Development Program have developed five focus areas for understanding, guiding and monitoring disaster risk reduction at all levels. These areas are: governance, risk identification, knowledge management, risk-management applications, and preparedness and emergency management.

Each of these areas carries potential considerations of the population and environment dimensions of disaster mitigation. Specific recommendations for participating nations include:

- Strengthen policy and donor attention on population and environment dimensions of natural hazards. National economic plans should highlight natural hazards as an obstacle to sustainable development. And foreign assistance should better focus on disaster prevention by integrating it into traditional population and environment funding.
- Produce maps that reflect the spatial distribution of risk and the magnitude and frequency of events likely to occur. Analyses of vulnerability should also pay attention to population density and distribution (to determine numbers at risk) and age structure (to determine young and older segments of the population that may be at greater risk).
- Improve information management and communication about population and environment drivers of disaster. Researchers need to more effectively communicate the importance and economic benefits of disaster mitigation to educators, journalists, advocacy groups, and local communities—emphasizing the role of population and environment.

The World Bank and the United States Geological Survey, for instance, calculated that economic losses worldwide from natural disaster in the 1990s could have been reduced by \$280 billion if \$40 billion had been invested in preparedness, mitigation, and prevention strategies:²¹

- Implement risk management interventions that address critical threats. Urban development strategies and sustainable land-use policies should be integrated with the promotion and provision of reproductive health services. Such integration would allow the urban and rural poor both to exercise their reproductive preferences for lesser fertility and to live in safe and secure environments.
- Support formal and informal preparedness and emergency management plans. Formal early warning and preparedness plans should be supplemented by informal local-level preparedness driven by local communities. The people of Igbalangao on Panay Island in the Philippines, for example, make three-dimensional maps of their

village, assessing the vulnerability of each household to disaster.²²

Overall, mitigating vulnerability and promoting sustainability require a proactive approach to the use of space that balances economic benefits with social and environmental concerns.

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