

changes were unfair to the federal government. FEMA officials argued that most of the hospitals required less rebuilding and structural upgrades than specified in the new codes. But FEMA director James Lee Witt quickly realized the potentially serious nature of this stance. Facing strong political opposition from top state officials and the embarrassment of opposing an admittedly expensive but strong mitigation effort, Witt agreed that FEMA would pay its share—amounting to \$831 million—to rebuild the hospitals.⁷² A press release offered FEMA's new take on the issue:

[T]hrough comprehensive consultation with the state and the hospitals, FEMA provided the most cost-effective funding package that would ensure that these buildings will be able to operate after another major earthquake. This new mitigation effort is providing the means to repair or replace damaged buildings. More importantly, these funds will enable hospitals to build their facilities to stronger structural standards to withstand future earthquakes.⁷³

Improving the ability of hospitals to withstand an earthquake would not only reduce the need to evacuate patients but also improve post-disaster operation by enabling these facilities to continue operation at a time when victims are in most need of help.

Hurricanes

Many nations are vulnerable to tropical windstorms. In the Pacific, these weather disturbances are most often called typhoons; in South Asia, they are called cyclones; in the North Atlantic, they are hurricanes. Hurricanes are huge, cyclonic, low-pressure storms.

Hurricanes are perhaps the type of disaster most familiar to Americans. Hurricane Andrew (1992) taught Florida residents "that hurricanes were not freak instances or random acts of nature: Floridians learned that humans and their institutions made decisions that had an important influence on whether a community did or did not suffer substantial damage from hurricanes."⁷⁴ Hurricanes also have helped to shape federal, state, and local emergency management, particularly in states along the Gulf of Mexico and the Atlantic seaboard.⁷⁵

Before the mid-twentieth century, it was difficult to forecast or track hurricanes. The limits of meteorological analysis and technology also limited hurricane preparedness and response efforts. Since the early 1980s, coastal communities have come to benefit from ever-improving hurricane tracking and landfall projections, as well as from increasingly better scientific information and advice provided to emergency managers. These advances are the result of many factors, including major advances in weather forecasting due in large part to ever-expanding computing capacity, and an improved ability to follow tropical weather systems using

satellites, radar, long-range hurricane reconnaissance aircraft, weather reports from ships at sea, and data from mid-ocean weather-monitoring buoys.⁷⁶

But tracking the storm is just the beginning of preparedness. Emergency managers must decide on, announce, and help manage public evacuation. Part of this requires that they alert people to relocate to shelters. Disaster evacuation and sheltering have been increasingly problematic for emergency managers.

At the local level, pre-disaster hurricane-related politics involve decisions about zoning and setback regulations, code enforcement, beach preservation and dune protection, open space requirements, and a host of other concerns that affect a community's protection from or vulnerability to hurricanes. As a hurricane looms, authorities must decide whether to call for an evacuation and whether this evacuation will be voluntary or compulsory—decisions that have dramatic economic and political implications. The responsibilities of the state include promoting and disseminating hurricane forecasts and tracking information, helping local jurisdictions effect evacuation and sheltering when needed, maintaining utility infrastructures, conducting damage assessment, and facilitating post-hurricane reconstruction.

The Hurricane Preparedness Planning Program, as it was known prior to FY 1994, consisted mainly of support for studies of coastal areas to help state and local emergency management agencies in evacuation planning. In the Disaster Relief Act of 1974, FEMA was authorized to issue grants to state agencies to help them pay for the cost of developing emergency preparedness plans. States were to share some of this funding with their local governments, which would also use it to develop hurricane preparedness plans.⁷⁷ The U.S. Army Corps of Engineers played a role in managing and funding research studies, while the National Weather Service supported the development of hurricane storm-surge models for coastal areas. Overall, the emphasis was on protecting the at-risk population from storm surge and coastal flooding, forces that had historically produced the most hurricane-related deaths.

Over fifteen years, the Hurricane Preparedness Planning Program produced hurricane evacuation studies for most of the nation's coastal areas vulnerable to hurricanes. (Many of these studies need to be updated to take into account population growth and new development.) The evacuation plans that state and localities developed with support of these program funds were used in South Carolina when Hurricane Hugo struck in September 1989 and in Florida for Hurricane Andrew in August 1992.

As in other disasters, hurricanes have proven to be focusing events that have changed public opinion, political priorities, and public policy. For instance, following Hurricanes Hugo, Andrew, and Floyd, the insurance industry and some government officials stepped up their efforts to enact new zoning regulations and strengthen building codes to minimize the damage wreaked by a hurricane. Retrofitting existing structures to better withstand wind and water, and relocating

The National Hurricane Program

The National Hurricane Program (NHP), which was established in 1985, continues to provide support for hurricane research and activities. Housed under FEMA's Mitigation Division, NHP conducts and supports many projects and activities that help protect communities and their residents from hurricane hazards. The program also conducts assessments and provides tools and technical assistance to state and local agencies in developing hurricane evacuation plans.

NHP is a multiagency partnership involving FEMA, the National Oceanic and Atmospheric Administration, the National Weather Service, the U.S. Department of Transportation, the U.S. Army Corps of Engineers, and several other federal agencies. Annual funding goes for FEMA's hurricane program activities and a grant program that subsidizes state funds for hurricane preparedness and mitigation activities.

Sources: FEMA, "National Hurricane Program," [fema.gov/plan/prevent/hip/index.shtm](http://www.fema.gov/plan/prevent/hip/index.shtm).

other structures away from the most hazardous areas, continue to be increasingly attractive tools in hurricane preparedness and mitigation policy.

Hurricane Hugo

In September 1989, millions of people throughout the Caribbean and the eastern United States watched in amazement as Hurricane Hugo traveled thousands of miles without losing intensity. Late at night on September 17, the hurricane slammed into the islands of Guadeloupe and Montserrat with winds of 140 miles per hour, killing twenty-one people and leaving another twelve thousand homeless before heading toward the U.S. Virgin Islands; there, it left thousands more people homeless and resulted in \$2 billion in damages. Widespread looting forced President G. H. W. Bush to dispatch military police to St. Croix to restore order.

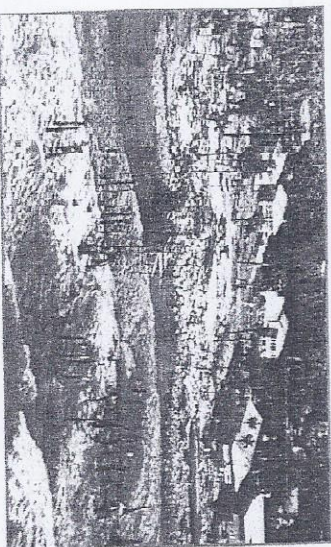
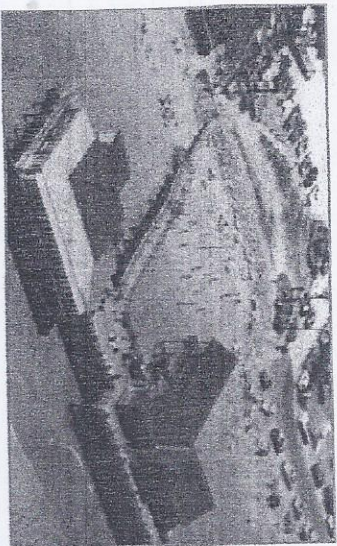
By midday of September 19, Hugo had reached Puerto Rico. High seas and sustained winds of 125 miles per hour resulted in the death of twelve people. More than thirty thousand Puerto Ricans lost their homes. Although Hugo was weakened somewhat as it crossed the mountains of Puerto Rico, it gained in size and intensity as it headed northwest over the warm waters of the Gulf Stream. By the time it hit the U.S. mainland on September 21, it had grown into a Category 4 storm, with sustained winds of 135 miles per hour.

By any estimation, Hurricane Hugo was a devastating storm. But it could have been far worse. Most residents had complied with the mandatory evacuation order issued for the barrier islands. Moreover, the bulk of Hugo's devastation was in relatively rural areas north of Charleston, South Carolina. Unfortunately, despite all media coverage and advanced warnings, Hugo's human toll was high: fifty-seven deaths in the mainland United States and another twenty-nine in

U.S.-owned Caribbean islands. The storm caused \$7 billion of damages in the mainland United States, making it the most costly hurricane up to that time. An additional \$3 billion in damages was reported in the Caribbean.⁷⁸

Sandra K. Schneider examined the response to and recovery from Hurricane Hugo in the Caribbean, South Carolina, and North Carolina and the public's reaction to the federal government efforts. Her review brings to light some organizational failures, most particularly for South Carolina.⁷⁹

The state of North Carolina had engaged in extensive emergency management training before the disaster, employed full-time professionals trained in emergency management, and allocated more state money for disaster management than the other states affected by Hurricane Hugo. Emergency response procedures, which incorporated a bottom-up approach, worked as planned, with FEMA and other federal agencies supplementing local and state efforts, and the state government acting as the liaison between the federal and local levels. North Carolinians generally reacted positively to the management of recovery operations in their state, and state politicians had favorable opinions about FEMA and other federal agencies following the hurricane.



The Atlantic House Restaurant at Folly Beach, South Carolina, before and after Hurricane Hugo. These buildings not withstanding, structures built to National Flood Insurance Program standards performed well. Photo courtesy of the National Oceanic and Atmospheric Administration/National Hurricane Center.

South Carolina's experience was less positive, however. The state allocated proportionally less money to disaster preparedness procedures and staffing than had North Carolina, resulting in problems regarding procedures and duties in the aftermath of Hurricane Hugo. Although a state emergency management team was already in place, shortly before Hugo made landfall Governor Carroll Campbell appointed an ad hoc emergency management team to provide additional knowledge and experience during response and recovery operations. This led to confusion about whom to contact at the state level and proved frustrating for local

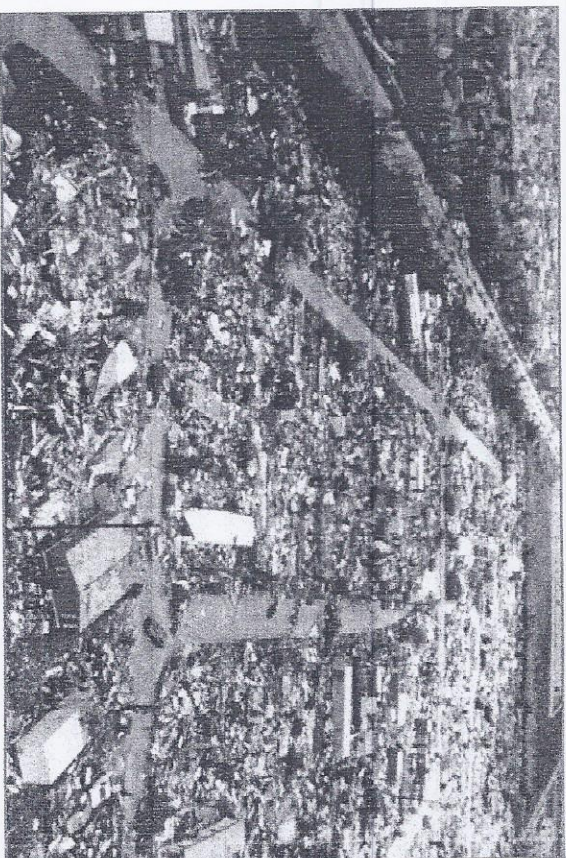
and federal emergency personnel. The two state emergency management groups duplicated efforts and actions.

The bottom-up emergency response plan failed in South Carolina. Many local governments had little knowledge of emergency management procedures. Consequently, some localities improperly reported damage, which delayed the receipt of assistance. State and local government officials joined the public in criticizing response efforts and directed blame to the federal government.

Hurricane Hugo also reinforced the need for and effectiveness of strict building requirements. In the midst of the devastation wrought by the hurricane, the buildings that adhered to NFIP requirements held up well, demonstrating the effectiveness of those requirements.

Hurricane Andrew

In August 1992, just two years after Hurricane Hugo's record-breaking devastation, Hurricane Andrew ripped through the Caribbean and into Florida's Atlantic coast, leaving a path of destruction across South Florida. The U.S. death toll was twenty-three; three other people were killed in the Bahamas. Hurricane Andrew caused \$26.5 billion in damage in the United States, of which \$1 billion occurred in Louisiana and the rest in South Florida. The vast majority of the damage in Florida was due to winds. NOAA's National Hurricane Center measured a peak



Hurricane Andrew, which was one of only three Category 5 hurricanes to strike the United States in the twentieth century, became the most costly hurricane in U.S. history. FEMA's slow response to this event was partly responsible for marked changes in the agency in the following years. Photo courtesy of the National Oceanic and Atmospheric Administration.