

# COASTAL NATURAL HAZARDS

*“To enhance preparedness and reduce losses of human life, property and environmental resources from coastal natural hazards”*

## Problem Statement

U.S. coastlines are at risk from coastal natural hazards - the winds, waves and floods generated by hurricanes and other major storms, the physical impacts caused by earthquakes and tsunamis, and the threats to coastal development due to short- and long-term shoreline change. Risks to life and property from these hazards will increase as coastal population expands from 110 million people today to an estimated 177 million by the year 2010. Over the last few decades, property losses from coastal disasters have skyrocketed, reaching more than \$150 billion in the 1990s. This upward trend is likely to continue as investments in vulnerable coastal property increase rapidly.

Coastal natural hazard risks are compounded by sea level rise, land subsidence, unfamiliarity of coastal residents with local hazards, and an increasing development along the nation’s coastline. These factors underscore the need for a dedicated national effort to reduce the economic, social, and environmental costs of natural hazards. Research and outreach programs are needed to help states and localities create an aware and prepared citizenry capable of employing the most effective means to reduce these risks. The nation’s Sea Grant College Program and its existing networks of universities, laboratories, and outreach programs contribute considerable expertise and capability to the national coastal natural hazards mitigation effort.

## The Role of Sea Grant

The goal of the Sea Grant Coastal Natural Hazards Initiative is to enhance preparedness and reduce losses of human life, property and environ-



Hurricane winds are a typical natural hazard risk.

mental resources from coastal natural hazards in the United States. Sea Grant is united in this objective with many public and private interests, including NOAA’s National Ocean Service and National Weather Service, Federal Emergency Management Agency, United States Geological Survey, Institute for Business and Home Safety, and U.S. Army Corps of Engineers. Sea Grant’s strong connections with its universities and coastal constituencies, and its capabilities in the areas of basic and applied multidisciplinary research, education and technology transfer, enable it to contribute critical information and assistance to the national effort. Overall, Sea Grant efforts will foster the:

- Development of new technologies for remediation and disaster prevention
- Development of methodologies and techniques for risk assessment and cost-benefit analysis
- Generation of methods for restoration of natural habitats (e.g., barrier islands, dunes, beaches, marshes) that play an important role in minimizing damage from coastal hazards
- Establishment of a clearinghouse of university-generated information on coastal hazard events and mitigation strategies
- Transfer of information and technologies to coastal constituents on the predicted risks, expected impacts and effective methods for pre-event preparation and post-event recovery
- Development and transfer of economic evaluation techniques to state and local officials seeking to develop more effective mitigation, evacuation and recovery plans

## Weather-related Hazards

Over the past 20 years, 44 weather-related disasters with overall damage costs exceeding \$1 billion each struck the United States. Thirty-eight of these occurred during the 1988-1999 period with total damage costs exceeding \$170 billion. Insurance companies

paid out more than \$91.8 billion in losses from weather-related natural disasters in the 1990s, close to four times the weather-related claims settled during the 1980s. Even so, some \$2 trillion in insured property currently lies within 30 kilometers of just the Atlantic coast, exposed to the threat of hazard damage. Sea Grant will support efforts to:

- Develop hazard-resistant retrofit alternatives for existing buildings and structures

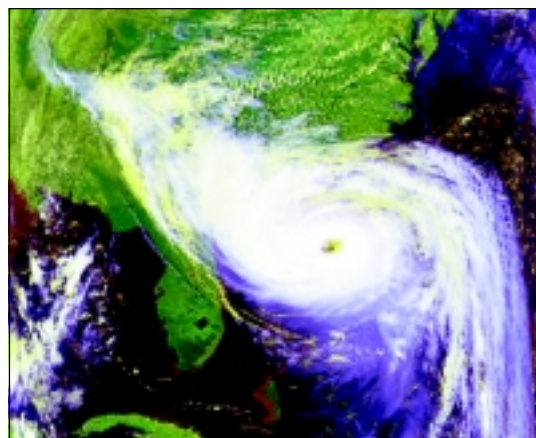


PHOTO COURTESY NOAA

Hurricane Hugo bears down on the South Carolina coast.

- Evaluate and improve mitigation tools and techniques related to building construction and land use
- Develop, refine, and demonstrate community risk and vulnerability assessment methods and standards, leading to improved methods for cost-benefit analysis for use by local officials
- Provide information for use in developing more effective building codes
- Improve hurricane management for ports and harbors

## Earthquakes and Tsunamis

Earthquakes and tsunamis are infrequent but very dangerous natural hazards that threaten the coasts and inland waters of California, Oregon,



Huge waves destroy property.

Washington, Alaska, Hawaii, and territories in the Pacific region, as well as Puerto Rico and the Virgin Islands in the Caribbean. The Cascadia Subduction Zone (CSZ) just offshore in the Pacific Northwest and the Aleutian Seismic Zone are of particular concern, given the potential there for very large, destructive events. U.S. seismologists put the probability of a major Alaskan earthquake of magnitude 7.4 or greater in the next decade at 84 percent. Along the CSZ, the probability of a magnitude 8-9 event is 10 to 20 percent in the next 50 years. Tsunamis generated by such events will reach coastlines in as few as 15 minutes. Sea Grant, through public and private partnerships, will:

- Reconstruct historical earthquake/tsunami events and impacts through examination of the geological record
- Contribute to more timely and more accurate tsunami warnings and prediction of post-event flooding potential

- Evaluate potential economic, social, and environmental impacts and costs of earthquakes, tsunamis, other coseismic hazards, and of evacuation and recovery strategies
- Develop tools to assist port and harbor communities in assessing earthquake/tsunami risk, vulnerability, and mitigation options

## Shoreline Change

Nationwide, coastal erosion is responsible for approximately \$500 million per year in property loss to coastal property owners, including damage to structures and loss of land. To mitigate coastal erosion, the federal government spends an average of \$150 million every year on beach nourishment and other shoreline erosion

control measures. Despite these efforts, over the next 60 years, erosion may claim one out of four houses within 500 feet of the U.S. shoreline.

Experts predict increasing sea level rise this century, accelerating coastal erosion and property loss. Sea Grant activities will:

- Improve shoreline mapping and change analysis methodologies

• Document and evaluate the influence of the regional and local geological framework on current sedimentary processes



Changing shorelines threaten development.

- Examine beach and coastal ocean processes, particularly to establish sand "budgets"
- Identify and evaluate sustainable erosion control techniques and technologies that take into account environmental considerations
- Improve understanding and assessments of the relationship between shoreline change and environmental effects
- Assist local governments and developers in incorporating water availability limitations, erosion rates and setbacks, and coastal building codes into development activities

## Anticipated Benefits

Sea Grant will join with federal and state agencies, coastal communities, and the private sector to accurately assess the threats to the coast from natural hazards, generate and modify technologies to minimize damage, and develop education and public awareness programs to transfer research information to all those who live, work and play along the nation's coastlines. This proactive, partnership effort will reduce property damage and loss of life can be reduced, saving the federal and state governments, taxpayers, business and industry, and the insurance community billions of dollars annually.

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