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August 2001 from the Woods Hole Oceanographic Institution

Evaluation of Coastal Erosion Hazards:

Results from a National Study and a Massachusetts Perspective

While it may not be surprising to learn that coastal property owners—particularly those with property located within a few hundred feet from shore—face risks from flooding, a recent study found that, nationwide, the risk of damage from erosion is as great as that posed by flooding.

The study, released by the Federal Emergency Management Agency, or FEMA, came about as a result of ongoing debate over how best to manage coastal erosion and whether or not, or how, to use federal programs to address the problem.

There are approximately 350,000 structures located within 500 feet of the nation's 10,000 miles of coastline (this represents both open ocean and Great Lakes shorelines). Over the next 60 years, about 87,000 of these homes or structures located on low-lying land and bluffs are likely to erode into the ocean or the Great Lakes. During the next several decades, roughly 1,500 homes—and the land on which they are built—will be lost to erosion each year. During that same period, costs to coastal property owners will average $530 million per year, in addition to the $80 million per year spent by the National Flood Insurance Program (NFIP) for erosion-related damage.

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The northern area of Humarock Beach (Scituate, MA), where the U.S. Army Corps of Engineers has predicted a potential loss of homes due to chronic erosion.

These and other statistics, along with federal policy recommendations to address the coastal erosion problem, were published in the FEMA report. Titled *Evaluation of Erosion Hazards*, the 2000 report was prepared for FEMA by the Heinz Center for Science, Economics and the Environment. It is the first of its kind to offer a comprehensive national assessment of coastal erosion and its impact on people and property.

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An area of Springhill Beach (Sandwich, MA), where dwellings are at risk due to the episodic storm-induced erosion of coastal dunes.

Coastal Erosion and the National Flood Insurance Program

In response to a request from FEMA in 1988, the National Research Council (NRC) established the Committee on Coastal Erosion Zone Management. The Committee was asked to provide advice on appropriate erosion management strategies, supporting data needs, and applicable methodologies to administer these strategies through the NFIP.

The subsequent NRC report, *Managing Coastal Erosion through the National Flood Insurance Program*, stimulated congressional interest, and led to proposed legislative changes to the NFIP in the early 1990s. Some of the proposed changes included limitations and prohibitions on federal flood insurance for structures in 10-, 30-, and 60-year erosion zones. Several communities, including some in Massachusetts, strongly opposed components of the legislation that would have incorporated land-use regulations and limitations on federal flood insurance for eroding areas, primarily due to concerns about potential depreciation of property values in eroding areas and subsequent reductions in tax revenues to coastal communities.

Lacking clear quantitative answers about the physical extent, predictability, and economic impacts of coastal erosion, Congress was unable to reach agreement on whether to implement erosion management provisions through the NFIP. As a result, Congress passed Section 577 of the National Flood Insurance Reform Act of 1994 (P.L. 103-325), which, in part, asked FEMA to submit a report evaluating the economic impact of erosion on coastal communities and the NFIP and to recommend a series of possible policy options to address coastal erosion hazards within federal programs.

The Heinz Center report lists two recommendations: (1) that Congress instruct FEMA to develop erosion hazard maps displaying the location and extent of coastal areas subject to erosion and make these maps widely available in both print and electronic formats, and (2) that FEMA include the cost of expected erosion losses when setting flood insurance rates for coastal areas. The Heinz Center has determined that these recommendations provide significant benefits, are cost effective, and are acceptable across most of the political spectrum. The independent report also presents nine possible federal policy options, most regarding the use of the NFIP to address the coastal erosion problem.

What is Massachusetts' Erosion Risk?

Based on U.S. Census Bureau population statistics for Massachusetts between 1980 and 1998, excluding major urban areas such as Boston, 36,000 people live within 500 feet of the shore. Massachusetts exhibits a coastwide long-term erosion rate of approximately -0.56 feet per year based on a 140-year average *(see references: O'Connell, 1997)*. However, erosion rates vary considerably along the shore. For example, areas along the open-ocean southwest shore of Nantucket are eroding at an average rate of 10-12 feet per year. The northern area of Humarock Beach in Scituate, Mass., has been documented as eroding at a rate of approximately two feet per year between 1950 and 1998. A 1994 Army Corps of Engineers study in support of a beach nourishment project for Humarock Beach (*see photo, page 1*) estimated that a total of 74 residential structures could potentially be lost over the next 50 years if this rate continues. These properties, located along the 4,300-foot length of study area, have an assessed value of $2.2 million.

Long-term chronic erosion is not the sole issue. Springhill Beach in the Town of Sandwich, Mass. (*see photo above*), while exhibiting a relatively low average annual rate of erosion, is susceptible to episodic storm-induced erosion, which can result in frequent and severe losses of homes along the shore.

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Following the October 1991 northeast storm, for example, many residential structures along the Sandwich shoreline were destroyed or substantially damaged as a result of storm-induced erosion, and nine houses were later relocated landward on the sole remaining dune. Town officials recently received a FEMA Flood Mitigation Assistance grant to generate a comprehensive Shoreline and Floodplain Management Plan with the goal of identifying alternatives that could reduce the potential long-term risk to people and property from coastal storms, flooding, and erosion. The Town of Plymouth recently completed this same process and, according to the town's 1999 Coastal Flood Management Plan, several homes atop coastal bluffs 100 feet or higher are in jeopardy due to erosion. (One home is in danger of loss within one to five years, two homes within six to 10 years, and 26 homes will be in danger of loss due to erosion within 60 years.)

WHOI Sea Grant and the U.S. Geological Survey (USGS) recently completed an update and analysis of long-term shoreline change data for Massachusetts *(see references: Thieler, O'Connell and Schuup, 2001)*. While neither an analysis of the number of structures at risk from erosion nor the economic impacts to property owners and coastal communities have yet been conducted, cases like those described above clearly suggest that Massachusetts' erosion hazard situation supports the findings of the national study.

The Importance of Coastal Erosion

It is important to point out that, while coastal erosion is considered a major economic problem to the developed environment, there are many areas of the U.S., including Massachusetts, where erosion of coastal landforms provides an important benefit: a major source of sand for functioning beaches, dunes, and barrier beaches. Without coastal erosion, many biologically productive bays, estuaries, saltmarshes, and tidal flats would not exist.

Each year, approximately 180 million Americans spend approximately $74 billion on visits to ocean and bay beaches. According to the Heinz study, the estimated loss in property value for the 87,000 houses within the 60-year erosion hazard area, nationwide, is $3.3–4.8 billion. This dichotomy presents a coastal erosion management dilemma: how to balance the use and enjoyment of coastal property while allowing natural processes to provide environmental, economic, recreational, and aesthetic benefits. A combination of proactive planning, improvements in the design and development of structural materials, setback guidelines, and public education is critical to achieving this delicate balance.

Managing Coastal Erosion

The International Panel on Climate Change recently predicted that the rate of sea level rise will likely increase dramatically in the near future, meaning increased rates of shoreline erosion. Although erosion affects every state with a shoreline, there is no comprehensive federal approach to managing coastal erosion.

At the state level, responses vary. While 23 states and territories have some form of shoreline setback policy in place, the stringency of these policies and the degree of enforcement varies both within and across states. Proactive planning to anticipate the relocation of houses landward, thus preventing loss from erosion, is a mitigation approach that can be successful, providing sufficient land is available for the relocation.

The debate on how best to manage coastal erosion will likely continue, regardless of whether Congress directs the federal government to generate a coastal erosion insurance program within the NFIP. Responses to coastal erosion are motivated strongly by the interests of property owners and coastal communities in protecting valuable shorefront property. To have access to the maximum range of options, individuals need to be informed of erosion and flood risks as early and as often as possible.

To obtain a copy of FEMA's *Evaluation of Erosion Hazards* report, visit their website: http://www.fema.gov/nwz00/erosion.html. To obtain information on the importance of coastal erosion, contact the WHOI Sea Grant Program and request a copy of the Focal Point, *Shoreline Change and the Importance of Coastal Erosion*, April 2000, visit their web site, www.whoi.edu/seagrant.

References

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Thieler, E. R, O'Connell, J.F., and Schuup, C., 2001, *Users Guide to Massachusetts Shoreline Change and Analysis Update Project*, U.S.G.S. Administrative Report (in press).

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This *Focal Point* was prepared by WHOI Sea Grant in collaboration with Cape Cod Cooperative Extension. All referenced data except where otherwise noted was obtained from the FEMA *Evaluation of Erosion Hazards* report.

For more information about the research profiled in *Focal Points*, contact WHOI Sea Grant at the address shown above.