Climate Change Information Resources
New York Metropolitan Region (CCIR-NYC)

What are the projected costs of climate change in the region's coastal communities and coastal environments?

Key Points

The effects of climate change on the tri-state New York metropolitan area are likely to be costly. The region is already in the process of rebuilding its aging basic infrastructure at costs approaching about $100 billion per decade. Sea-level rise and land subsidence are projected to lead to additional infrastructure losses from coastal floods and to accelerate coastal erosion; the costs associated with these losses may stress the regional economy.

Projected Damages to Infrastructure

As sea level rises, infrastructure losses from coastal floods will increase. The expected annual loss from coastal storms is around $100 to $200 million per year. This loss is small enough to be absorbed by the region's $1 trillion economy. However, losses do not occur with an annual periodicity. Rather, they occur during infrequent extreme events such as the Nor'easter of 1992 (see Question 2D). Figure 1 depicts a flooded PATH station in Hoboken, NJ during that event. Extreme events have the potential to cause the loss of tens and potentially hundreds of billions of dollars. Such large losses could deprive the economy of a large fraction of the gross regional product and negatively affect insurers, policyholders and the noninsured.

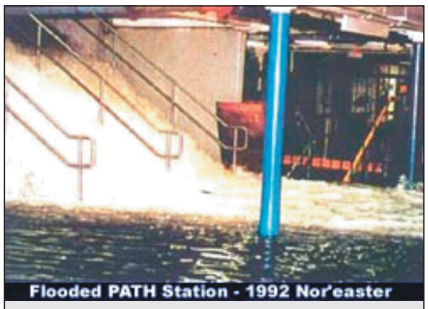

Figure 1. Flooded PATH station in December, 1992. Source: NYC Office of Emergency Management.

Strategies for coping with coastal erosion and flood damages associated with sea-level rise include defending the shoreline by means of protective structures, beach restoration, and ultimately, retreat. Even at present rates of sea-level rise and land subsidence, most of the shoreline of the New York metropolitan region is eroding (Figure 2). In response, existing hard structures – seawalls, groins, jetties, breakwaters – may need to be strengthened and elevated repeatedly and beaches will require additional sand replenishment. The increased costs of retrofitting existing structures or armoring selected portions of the coast may be viable in areas with a high population density or in areas with a high property-value, such as Manhattan, NY or Jersey City/Hoboken, NJ. In some locations, affluent shore property owners or seaside communities may also be willing to incur the additional expenses to save their beaches, as for example in Southampton and Easthampton, Long Island. However, other stretches of the coastline may not be able to command the necessary resources.

Figure 2. Dilapidated sea wall. Source: Gornitz, Sea Level Rise and Coasts, in *Climate Change and a Global City*, 2001.

Projected Damages from Erosion

Over 70% of the world's sandy beaches are retreating. In the New York metropolitan region, beaches and barrier islands are narrowing or shifting landward, in part due to ongoing sea-level rise and land subsidence. Accelerated sea-level rise may intensify the rate and extent of coastal erosion. Many beaches are artificially maintained by the U.S. Army Corps of Engineers. They have spent a cumulative total of $2.4 billion nationally and $884 million within the Tri-State region on beach nourishment projects since the 1920s (Figures 3a, 3b). Over half a billion dollars have been spent in New York State alone, the largest expenditure for any single state.

It is estimated that by the 2080s sand replenishment and associated costs will grow between 5 to 26% due to climate change. The amount of sand needed for replenishment projects is expected to increase in the future and the costs associated with beach nourishment may make retreat an appropriate option. Retreat, or pulling back from the shore, may be most feasible in areas of lower population densities or lower land values, or in high-risk areas subject to repeated storm damage.

Figure 3a. Coney Island before beach nourishment in December, 1992. Source: U.S. Army Corps of Engineers.

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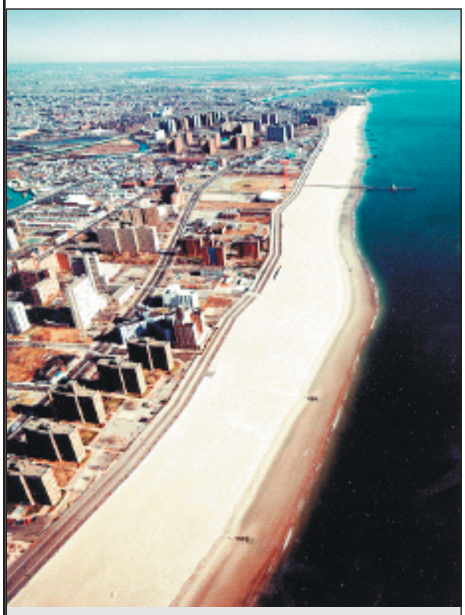

Figure 3b. Coney Island after beach nourishment in March, 1995. Source: U.S. Army Corps of Engineers.

Projected Threats to the Water Supply

Increased sea-level rise could affect the operation of the Chelsea Pump Station, which is located on the east bank of the Hudson River and has a present capacity of 100 million gallons per day (mgd). Increased sea-level rise would bring increased salinity, exacerbating a fundamental conflict, which is that the station is most needed during periods of drought, which is precisely the time when the salt front moves upstream (Figure 4).

A study of the costs associated with increasing the withdrawal capacity of the Chelsea Pump Station system indicated that withdrawing an additional 100 mgd of water could cost $28 million, and an additional 200 mgd of water would cost $86 million; the costs with filtration would be $223.5 million and $327.9 million.

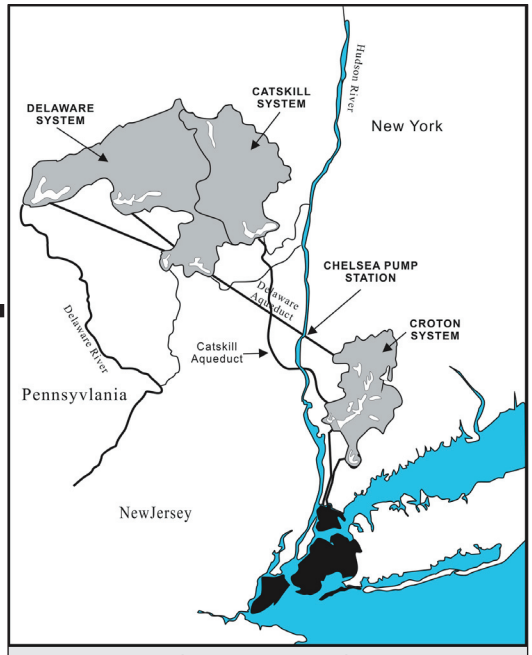

Figure 4. New York City water supply. Source: New York City Department of Environmental Protection

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Cynthia Rosenzweig, Goddard Institute for Space Studies (http://www.giss.nasa.gov/)

William Solecki, Hunter College, City University of New York (http://www.hunter.cuny.edu/)

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