

Climate Change Information Resources

New York Metropolitan Region

(CCIR-NYC)



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How might climate change affect the coastal environment and coastal communities?

Key Points

Climate change will affect the coastal environments of the New York metropolitan region through sea-level rise and its associated impacts, including more frequent storms and flooding, higher rates of beach erosion, submergence of coastal wetlands, and saltwater intrusion. These stressors will put some coastal developments at increasing risk of damage.

Storm Flooding

Scientists project an increase in the frequency of large storms in the coming century (Table 1). At the same time, sea-level rise would increase the area likely to be inundated by these coastal storms because storm flooding would reach higher inland elevations.

Coastal storms striking the region are of two types: [1] extratropical cyclones ("Nor'easters") and [2] hurricanes. Nor'easters are responsible for major coastal flooding and beach erosion because they cover a larger spatial area than hurricanes and often last longer, so they take place over several tidal cycles at a particular location. Nor'easters are also more common than hurricanes in the New York Metropolitan Region.

High population densities are presently concentrated near the water's edge at several locations throughout the region and coastal populations are growing. Between 1960

	Historical Data	GCM Projections		
	1900 – 1997	2020s	2050s	2080s
Sea-level rise (inches)	+0.09 – 0.15 inches	4.3 – 11.7 in	6.9 – 23.7 in	9.5 – 42.5 in
	+0.09 – 0.15 inches	10.9 – 29.7 cm	17.5 – 60.2 cm	24.1 – 108.0 cm
100-year flood zone (feet)	9.7 feet	9.8 – 11.5 ft	10.1 – 12.4 ft	10.4 – 13.8 ft
	3.0 meters	3.0 – 3.5 m	3.1 – 3.8 m	3.2 – 4.2 m
100-year flood return (years)	Once per 100 years	80 – 43 yrs	68 – 19 yrs	60 – 4 yrs

Table 1. Sea-level rise and associated storm impacts



Figure 1. Areas at risk from a 10-foot flood. Blue represents coastal areas vulnerable to a flood that reaches a height of ten feet. The likelihood of such a flood occurring is increasing. Source: Gornitz, Sea Level Rise and Coasts, in *Climate Change and a Global City*, 2001.

and 1995, populations in coastal counties in New York, New Jersey, and Connecticut grew by around 17%, with seven coastal counties displaying growth rates exceeding 100%.

Because of the highly developed nature of the coast within the region, a large population and considerable private property and public infrastructure are potentially at risk of hazardous events (i.e. inundation and flooding) associ-

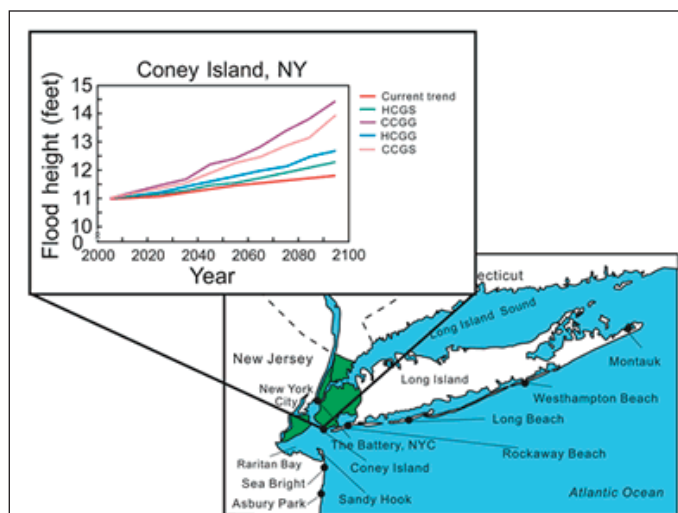


Figure 2. Model projections for flood height at Coney Island. Both the models project that sea level will rise, but the Canadian Centre model (CCGG and CCGS) predicts a greater increase than the Hadley Centre model (HCGS and HCGS). Source: Gornitz, Sea Level Rise and Coasts, in *Climate Change and a Global City*, 2001.

ated with sea-level rise (Figure 1). Land below five feet (1.5 meters), such as Coney Island in New York City, could be permanently lost to inundation (Figure 2). Flood risk zones

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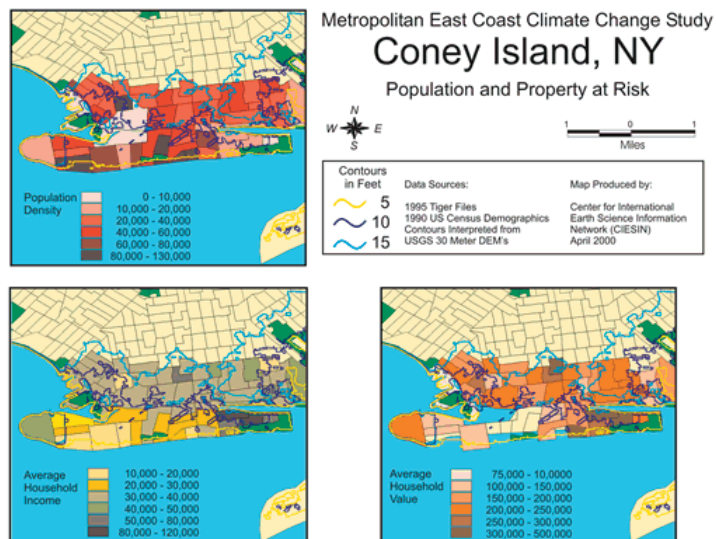


Figure 3. Coney Island population and property at risk from flooding and sea-level rise. Source: Gornitz, Sea Level Rise and Coasts, in *Climate Change and a Global City*, 2001.

at coastal sites cut across a wide range of income and housing values (Figure 3).

If population growth follows present trends, evacuation of vulnerable populations in these high-risk areas during major storms will pose serious problems because many evacuation routes are close to flood prone areas. Although permanently lost land would occupy a relatively narrow coastal strip, flooding due to storms could periodically engulf a much greater area. Suburban and lower density sites such as Westhampton, New York, or Sea Bright and Asbury Park, New Jersey have land-use characteristics that make zoning setbacks and/or relocation to higher ground more feasible than in the intensively urbanized areas of New York City.

Beach Erosion

Beaches are continually changing as sand is shifted by waves, tides, and currents. Sea-level rise and land subsidence contribute to beach erosion and the narrowing or movement of barrier islands. With climate change, rates of beach erosion would double or triple by the 2020s, increasing three to six times by the 2050s, and four to ten times by the 2080s, relative to the first decade of the twenty-first century. Climate models project an increase in storms, which would further contribute to beach erosion.

To compensate for losses from erosion, additional sand

would have to be placed on the beaches. Sand replacement, also called beach nourishment, may remain a viable option through mid-century, but could become significantly more costly, particularly for the high-end warming scenarios, by the end of the century.

Coastal Wetlands

Sea-level rise poses a significant risk of additional losses to the already threatened coastal wetlands in the region. Studies of selected salt-marsh islands in the Jamaica Bay wetland indicate that they have lost roughly 12% of their total area since 1959, with sea-level rise a possible causative factor. The rate of loss is projected to exceed observed historical rates of salt-marsh accretion and will disrupt current habitats of birds, fish and other wildlife. Recreation areas located within wetlands are also threatened by inundation.

Salt Water Intrusion

Another serious impact of rising sea level could be the northward migration of saltwater up the Hudson River. The salt front could reach the Chelsea Pump Station for a major portion of the year. The Chelsea Pump Station provides an emergency source of water for New York City during periods of drought. Saltwater may also seep into Long Island aquifers, compromising this critical water supply.

References

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