# CCNY landscape architect offers storm surge defense alternatives

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Artificial reefs built around submerged subway cars are among the soft infrastructure approaches recommended for storm surge protection by Catherine Seavitt Nordenson, associate professor of landscape architecture, Spitzer School or Architecture, City College of New York. Credit: Catherine Seavitt Nordenson

The flooding in New York and New Jersey caused by Superstorm Sandy prompted calls from Gov. Andrew Cuomo and other officials to consider building storm surge barriers to protect Lower Manhattan from future catastrophes. But, such a strategy could make things even worse for outlying areas that were hit hard by the hurricane, such as Staten Island, the New Jersey Shore and Long Island's South Shore, a City College of New York landscape architecture professor warns.

"If you mitigate to protect Lower Manhattan, you increase the impact in

other areas," says Catherine Seavitt Nordenson, associate professor of landscape architecture in CCNY's Spitzer School of Architecture. "Everyone outside of the surge protection zone would be in jeopardy because the water doesn't get reduced, it just goes somewhere else. It's an environmental justice issue. You can't just save Wall Street."

Professor Seavitt calls, instead, for deploying a storm defense strategy that combines elements of soft infrastructure with the hardening of existing infrastructure such as the subway system, highways and power plants.

## 'Techniques from nature and ecology'

"The idea of soft infrastructure is to use techniques from nature and ecology to improve resiliency," she explains. "Environments that are more resilient bounce back faster after storms, and greater resiliency reduces the velocity of and damage caused by the water's surge." Additionally, it would be much less expensive than building storm surge barriers, with costs running to hundreds of millions of dollars instead of billions.

She first proposed development of soft infrastructure in "On the Water/Palisade Bay," a report published in 2010 in collaboration with structural engineer Guy Nordenson and architect Adam Yarinsky, and funded by the Fellows of the American Institute of Architects' biannual Latrobe Prize. Mr. Nordenson is Professor Seavitt's husband.

The team's research focused on New York's Upper Bay, which is bounded by Manhattan, Brooklyn, Staten Island and New Jersey. Its proposal consisted of strategies to adapt to and mitigate the effects of rising sea levels caused by climate change, including increased potential storm surges from hurricanes and nor'easters.

"We wanted to show how soft infrastructure could be used to transform the coastal edge in order to create a healthier ecology and reduce the extent of storm damage," she says. "There are things we can do besides building higher and higher seawalls everywhere. For example, if we replace a wall with a gradient edge that slopes into the water or we give the shoreline a more irregular shape there will be more room to accommodate water."

Among the techniques it proposed were restoring and enlarging wetlands, creating reefs and archipelagoes of artificial islands and seeding oyster beds. Spoils from harbor dredging and deepening, which is regularly performed by the U.S. Army Corps of Engineers, could be used for these beneficial purposes.

Reefs and wetlands would mitigate destruction by absorbing water and dissipating wave energy. Archipelagoes of small, artificial islands would weaken wave energy in the water column. Oysters and other mollusks would biologically filter and help cleanse the water in the bay.

## Improved resiliency

"Through our research we found that improving water quality and wetlands ecology would improve the area's resiliency to storm," she notes. "If you can absorb water in wetland areas, it has a place to go. It can percolate into the earth instead of rebounding from a seawall or overtopping a wall. We can engineer solutions to absorb water and slow its velocity. There may still be flooding, but there will be less damage."

Additionally, the report called for using – and extending – old abandoned piers and extracting slips into the city to allow water to enter flood zones in a more controlled way, thus minimizing damage. Calm water areas could be established behind piers, which would serve as storm surge buffers. Water would still enter some streets, but these could

be engineered as bioswales, incorporating a simple gravity flow system that would enable the waters to be absorbed, and safely and readily recede.

Even if soft infrastructure strategies were implemented, some critical infrastructure would still need to be hardened, i.e. made waterproof, Professor Seavitt notes. Specifically, she recommends protecting subway entrances and sidewalk grates to prevent flooding of the public transit system, relocating or hardening waterfront power plants and moving critical communications and power infrastructure out of the basements of commercial and residential buildings.

Soft infrastructure techniques can be applied, as well, to protect populated areas in the outlying coastal regions that suffered extensive storm damage such as Long Island, Staten Island and the Jersey Shore. Offshore reefs and barrier islands could be created to protect shorelines and inhabited barrier islands. Many of these areas are shallower than the Upper Bay so it may be easier to work in them, she says.

One technology that could play a role in this process is a recent Dutch invention known as a sand motor, in which enormous quantities of sand are deposited offshore. Waves, currents and tides distribute it in a natural way, creating a protective barrier island.

Currently, Professor Seavitt is working with Guy Nordenson & Associates and the Port Authority of New York and New Jersey on a pilot project to create an artificial island at the Gowanus Flats, a shallow section of Upper Bay off Brooklyn's Sunset Harbor waterfront. She also notes that efforts are underway to create new oyster reefs around Governors Island as well as wetland restoration through the reuse of dredged sediment in Jamaica Bay.

Provided by City College of New York