

Building for the Next Big Storm

After Hurricane Sandy, New York Rebuilds for the Future

By ALAN FEUER, OCT. 25, 2014, New York Times



Two years after Hurricane Sandy flooded tunnels and the subway system, New York's infrastructure is still recovering.

“All of this was hit pretty hard,” said Kai-Uwe Bergmann, sweeping his arm from the East River toward the looming sprawl of the Baruch Houses, a public housing complex that sits along the Franklin D. Roosevelt Drive on the Lower East Side. “If another storm hits here in the future, it will be just as bad, probably worse.”

Mr. Bergmann's job is to ensure that it doesn't happen. As a partner at the [Bjarke Ingels Group](#), a Danish architecture firm, he is one in a cast of hundreds trying to fortify New York against another storm like [Hurricane Sandy](#), which ripped through the region two years ago this week. In the storm's aftermath, there were calls for a single big fix, like sea gates that would close off New York Harbor to swells of rising water. But the solutions being tried out now are more widespread, and humbler, including stone revetments on Coney Island Creek to prevent “backdoor” flooding, and solar-powered streetlights on the East 12th Road boardwalk in Broad Channel, Queens, which is often flooded, even by lesser storms.

While only a few of the smallest projects have been finished, the vast constellation of proposals — backed by what one official called a “strange polyamorous relationship” of the city, state and federal governments — will most likely take years and billions of dollars to complete, if indeed that is ever achieved. If there is one guiding principle at work, it is the notion that the city, which has thumbed its nose at the water for 300 years, can no longer keep the sea at bay, but must by necessity invite it in.

“We didn't want to just build barriers; we wanted to build an ecosystem,” said Henk Ovink, a Dutch water-management expert who now serves as a senior adviser to the Presidential [Hurricane Sandy](#) Rebuilding Task Force, a group within the Department of Housing and Urban Development, which has earmarked billions for the program. “For that to happen, we have to live with the water, to understand it, while still understanding our vulnerabilities.”

In the next four decades, scholars say, sea levels are expected to rise by as much as 30 inches, and if the worst projections come to pass, about 800,000 city residents could find themselves living with the threat of being swamped. According to [an insurance report commissioned by the city](#), if New York suffers another storm like Sandy in the early 2050s, when ocean levels and the population are likely to be higher, it could cause \$90 billion in damage — almost five times the cost of the initial storm.



Volunteers planting sea grass on a dune built to protect Breezy Point, Queens, on the first anniversary of Hurricane Sandy. Credit Adrees Latif/Reuters

Mr. Ovink described the effort to rethink New York as “the love child of [Jane Jacobs](#) and [Robert Moses](#),” meaning that it merges the granular approach of Ms. Jacobs, an advocate of small, vibrant neighborhoods, and the sweeping vision of Mr. Moses, an urban planner of Pharaonic scale and scope.

It is, if nothing else, enormous, comprising the construction of sea walls and bulkheads, beach replenishment, the creation of parks as buffer zones, the retrofitting of apartment buildings, commercial structures and single-family homes, and the redesign of power stations, subway tunnels, sewage treatment plants, hospitals, utility poles and even ordinary streets. “In terms of size,” said [Daniel Zarrilli](#), the director of the 8-month-old Mayor’s Office of Recovery and Resiliency, “you’d have to look back to the rebuilding after [the San Francisco earthquake](#) for any real comparison,” referring to the 1906 disaster.

New York has been here before. In the 1960s, after Hurricanes Carol and Donna, the Army Corps of Engineers proposed building barriers at Throgs Neck in the Bronx and at the Narrows. In later years, there were plans for a giant swinging gate at the mouth of Jamaica Bay and a 15-foot, steel-and-concrete wall to run the length of Coney Island. None of these projects was ever undertaken, because of environmental concerns and a lack of financing. But this time, some of the money has already been set aside, suggesting that things might finally be different.

While the state and federal governments have their own plans, the city’s blueprint, the [Special Initiative for Rebuilding and Resiliency](#) report, released last year by Mayor Michael R. Bloomberg, set forth 257 projects to be finished in a decade. In April, the new administration of Mayor [Bill de Blasio](#) updated the so-called SIRR report, announcing that while most of the projects were “in progress,” the city had in the intervening months completed efforts like reinforcing beaches in the Rockaways and had reached an agreement with Consolidated Edison under which the utility would flood-proof its equipment without increasing rates.

The abiding question, of course, is whether the city will really be prepared next time. “The short answer is, we’re getting there in an impressive fashion,” said Richard T. Anderson, president of the [New York Building Congress](#), a construction trade group, which, like many private organizations, issued its own plan on how to make the city more resilient. “Agencies at the federal, state and city levels are all responding, but the deeper issue is how much further we still have to go.”



Part of a proposed eight-mile series of coastline defenses, called the Big U, that would wrap the bottom of Manhattan with 10-foot-tall berms meant to guard the edges of the island, while blending into a newly imagined string of waterfront parks. Credit Rebuild by Design

The Big U

Seven months after Hurricane Sandy, Shaun Donovan, the secretary of Housing and Urban Development, asked Mr. Ovink to oversee an international design competition meant to elicit innovative plans to protect New York against the next big hurricane. What resulted was [Rebuild by Design](#), which this spring awarded money to government officials to implement six plans from architects and engineers chosen from a pool of 148 proposals. Among their proposals: a network of levees, a waterfront greenway and a new power plant to protect the Hunts Point food market in the Bronx, and the planting of oyster beds and reefs off Staten Island's shore to mitigate the destructive force of oncoming waves.

But the most ambitious of the plans is the one put forth by Mr. Bergmann's firm, which proposed constructing an eight-mile series of linked defenses wrapped like a chin strap around the coastline of Manhattan from West 57th Street south to the Battery and up the East Side to 42nd Street. Called [the Big U](#), the project relies mainly on 10-foot-tall slurry-filled, earth-topped berms meant to guard the edges of the island, acting as a barrier to water while blending into a newly imagined string of waterfront parks.

"The idea was to create a public amenity that also had a protective element," Mr. Bergmann said. "We could have built walls, but walls are only used .01 percent of the time, during crises. We wanted something that was aesthetically pleasing, well designed and was useful all the time." In Battery Park, for instance, the plan calls for a series of "upland knolls" where people could sunbathe, garden or even farm most of the time. During a storm, the built-up landscape would fend off the sea.

Could it actually be built? The Big U's first so-called compartment, running along the East River from 23rd Street to Montgomery Street on the Lower East Side, is expected to break ground in 2017 and be finished three years later. The federal government has given the city \$335 million to implement the first section of the BIG U that will serve as a test case for the still-unfunded portions of the project on the West Side and in Lower Manhattan.

90,000 Buildings at Risk



Flood waters at West and Cortlandt Streets in Lower Manhattan in September 1960. Credit Allyn Baum/The New York Times

From seaside bungalows in Staten Island to Wall Street offices with harbor views, nearly 70,000 buildings in New York sit within the 100-year floodplain, meaning that in any given year they have a 1 percent chance of being swamped. According to the city, that total could increase in the next 10 years, because of rising seas, to almost 90,000 buildings, an area encompassing 660 million square feet (almost 24 square miles) and housing more than 440,000 people.

To protect this population, the city late last year introduced 21 changes to the zoning and building codes, 16 of which have been adopted. (Local Law 99, for instance, makes it easier to elevate fuel-storage tanks and telecommunications systems.) Then this month, the City Planning Department published a 57-page guide, [“Retrofitting Buildings for Flood Risk.”](#) with instructional case studies on various building types: bungalows, attached two-family homes with garages, mixed-use mid-rise walk-ups.

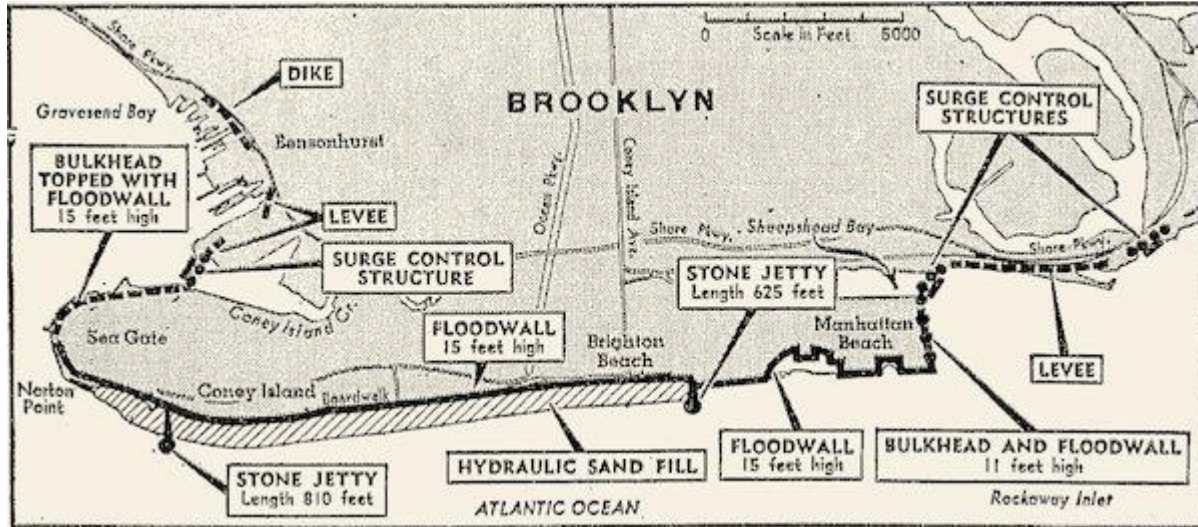
“The mayor and the City Council have been very serious about protecting New York’s building stock,” said Russell Unger, executive director of the [Urban Green Council](#), an advocacy group for sustainable building, which last year helped convene the 200-member [Building Resiliency Task Force](#). “You’d be hard-pressed find any other city responding so quickly to a disaster like this.”

In June 2013, Mr. Unger’s task force issued [a report with 33 recommendations](#) to make the city’s buildings more robust against an event like Hurricane Sandy, including a plan to redesign tall, exposed structures to better handle wind, and proposed legislation to require sinks and toilets in commercial and residential buildings to work without power. Of the 33 suggestions, the city has carried out half. “It’s an extraordinary record,” Mr. Unger said.

In September, Mayor de Blasio announced that the Federal Emergency Management Agency had given the city \$108 million to install backup generators, elevated boilers and new flood-barrier systems at the Coney Island Houses, a five-building public housing project that was inundated during the storm, leaving its 1,400 residents without heat or power for 22 days. The work in Coney Island is meant to serve as the model for a continuing collaboration between FEMA and the New York City Housing Authority to reinforce 15 other public housing projects damaged by the storm.

Plugging the Holes

After Hurricane Sandy dumped untold tons of water into the Montague Tunnel, a subway tube connecting Brooklyn and Lower Manhattan, engineers at New York City Transit faced a daunting problem: how to redesign a subterranean system in a coastal city and keep the water out. The answer, said John O’Grady, vice president for infrastructure and facilities at the transportation agency, was to plug the system’s holes: vent bays, manholes, station entrances, access hatches and emergency exits. At South Ferry alone, Mr. O’Grady said, the agency was forced to design — and will eventually install — coverings for more than 500 openings: from simple sliding panels to custom-made collapsible metal traps.



An Army Corps of Engineers proposal in 1972 for a sea wall.

All told, the Metropolitan Transportation Authority, the parent agency, plans to spend [nearly \\$1 billion on resiliency improvements](#), a rough equivalent of what [Con Edison has earmarked to fortify its own equipment over the next four years](#).

“We had to make some changes,” said Matt Sniffen, the utility’s chief engineer for electrical distribution. Among those changes are plans to build higher walls and flood-proof concrete barriers at its 14th Street-East River substation, which exploded during Sandy; to install submersible equipment in areas prone to floods; to build new utility poles able to withstand winds of up to 110 miles per hour; and to bury more than 30 miles of overhead power lines in the five boroughs and in Westchester County by 2016.

Like Con Ed, the city’s hospitals — both public and private — have undertaken a collage of resiliency efforts. At [NYU Langone Medical Center](#), which suffered nearly \$1 billion in [damage from the storm](#), engineers have already raised the electrical systems out of the reach of floods and plan to protect their underground fuel-oil storage tanks with pumps and waterproofing, said Paul Schwabacher, the senior vice president for facilities management. They are also working on a new emergency generator plant for the hospital’s main building, expected to be ready by 2016.

In July, the hospital announced that [it would receive \\$1.13 billion in recovery aid from FEMA](#), the second-largest award for a single project ever granted by the agency. With some of that money, NYU Langone, whose employees evacuated patients on stretchers during the storm, will soon conduct an executive-level hurricane drill.

Teaching Resiliency

While most of the resiliency projects have focused on hardware — sea walls, bulkheads and the like — officials have not lost sight of the fact that people, too, need help in preparing for the future. A few months after Hurricane Sandy, the state created the [New York Rising](#) program, which called on leaders in hard-hit communities to come up with plans to assist their own residents.

So far, 15 communities have been chosen to receive more than \$200 million in federal money through New York Rising, in grants of between \$3 million and \$25 million each. In the adjoining Brooklyn neighborhoods of Brighton Beach, Coney Island, Manhattan Beach and Sea Gate, for example, community leaders have proposed the creation of a vocational high school that would teach students resiliency, sustainability and emergency preparedness skills. In Howard Beach, Queens, near Kennedy Airport, leaders have recommended creating a public education program to help homeowners and business people get technical training and counseling on how to make their property more resilient.

After determining that nearly all of the businesses affected by Hurricane Sandy were enterprises of 50 employees or fewer, the city gave out \$23 million in loans and grants, and nearly \$3 million in tax breaks to 650 small businesses across the five boroughs. It is now in the final stages of preparing a centralized effort for small commercial ventures: the [Business Resiliency Investment Program](#), a \$110 million plan to help small businesses invest in improvements that could include flood-proofing warehouses, creating emergency plans or devising computerized systems to back up crucial data.

The Next Disaster

Have all these projects truly made New Yorkers safer? Will the city be better able now to withstand a big storm than it was two years ago? The consensus among architects, engineers, academics and urban planners is a qualified yes. “We will do better against the next storm,” said Judith Rodin, the president of the [Rockefeller Foundation](#), which helped to finance the Rebuild by Design competition. “The problem is that the next disaster may be nothing like Hurricane Sandy. It could be an awful heat wave, for example, in which case what we’ve done will do little to protect us.”

Instead of separate, interlocking efforts by city, state and federal officials, Dr. Rodin recommended a single plan that would take advantage of the untapped powers of the city’s business community and capital markets. In San Francisco, she said, municipal officials have developed a broad-based plan against mudslides, drought and earthquakes, involving traditional corporations like Comcast and Pacific Gas and Electric, as well as those from the local sharing economy like Uber, Lyft and Airbnb.

“We haven’t sufficiently engaged the private sector yet, which is a huge piece of the puzzle,” Dr. Rodin said. “As for the markets, there’s a lot of money sitting on the sidelines that could be brought into building resilient infrastructure.” To other experts, the key to making the city more resilient is not more money, but the understanding that disasters like Hurricane Sandy are not caused by nature alone, but by human beings, too.

In the introduction to its [“Post-Sandy Initiative” report](#), the [American Institute of Architects](#) noted that damage from the storm was worsened by “centuries of misguided development policies.” The report contends: “We must recognize that much of the problem lies in our own culpability as a client society — the way we have helped over the years to create a susceptible built environment.”

At the center of this culpability is what Ted Steinberg, a professor of history and law at Case Western University and the author of [“Gotham Unbound: the Ecological History of Greater New York,”](#) calls the “growth imperative” — the misbegotten notion that the city can endlessly expand without repercussion. “The driving force behind New York has always been limitless growth,” Professor Steinberg said. “But the unpleasant truth is that for all its wealth and development, New York is still vulnerable.”

During the Bloomberg era, Professor Steinberg said, almost 40 percent of the city was rezoned for population growth, much of it along the waterfront. Even now, there are ambitious plans afoot to continue building in low-lying areas. The [Hudson Yards project](#), on the Far West Side of Manhattan, has been designed within the 100-year floodplain. And the Two Trees apartment complex in the old Domino Sugar factory in Brooklyn sits directly on the banks of the East River. While city officials say building on the water

can be accomplished safely through the use of new technologies and stringent building codes, Professor Steinberg argued that projects such as these evinced a kind of “environmental machismo.”

“We need to retreat, especially intellectually,” he said, “from the idea that we can keep on building anywhere we want. New Yorkers are tough. They can take whatever nature throws their way. But you just can’t grow forever at the expense of the sea.”

Correction: November 2, 2014

An article last Sunday about New York’s plans for coastal defenses because of Hurricane Sandy described incorrectly the funding for six proposals chosen through Rebuild by Design, an international contest soliciting ways to protect the city. The money for the proposals, including one called the Big U, came from the Department of Housing and Urban Development and was given to government officials. It did not come from Rebuild by Design, and it was not given to the teams behind the winning plans.