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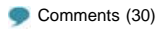


What It Would Take to Hurricane-Proof New York

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Reuters

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Sandy came, ravaged New York City, and then left us with the following question: How can we better prepare the city for future storms? Science [tells us](#) to expect more extreme weather with climate change, so



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investing in infrastructure is a reasonable suggestion. The good news is that, beyond sandbagging (see above), there are technologies out there to better hurricane proof the city for the long term. But, of course, it's more complicated than that. This is an expensive proposition, as [Slate's Matt Yglesias noted yesterday](#), pulling out a \$15 billion figure for just one plan of action. It's a lot of money, but he bets that when it comes to protecting some of the most valuable real estate in the world, the money will come. "The New York Harbor region is almost uniquely lucky in being a place that can feasibly contemplate these kind of costly defenses," wrote Yglesias. But what about the rest of New York? Like [Staten Island](#) or less densely populated beach communities?

Before we divvy up who gets what in this future hurricane-ready version of the city, let's see what it would technically take, how much that might cost, and the possible priority of such a project.

Storm Surge Barriers

How This Would Help: The Netherlands built these along its coast to protect its vulnerable coastline from flooding, one of which you can see in the photo to the right.* The country has a system of them called the [Delta Works](#), which protect the ports, as Yglesias explains. These aren't just dams, but are moving parts that ensure protection without totally ruining the ecosystem or closing off the port to commerce altogether. One engineering company already proposed a plan for something like this, north of the Verrazano bridge, as you can see in these slides obtained by [Business Insider's Henry Blodget and Rob Wile](#).



Cost: Scientists have looked into doing this for New York, estimating [\\$15 billion](#) to protect all of the ports. That Verrazano estimate came in at [\\$7 billion](#). That's a lot less than the estimated \$50 billion in damage that Sandy did, [according to analysts at Eqecat](#).

Priority: High, for certain areas. It makes a lot of sense to spend all that money to protect downtown Manhattan. But, how far out do you go? "Who gets included to be behind the gate, and who doesn't get included? ... How do you make that decision in a fair way?" Robert Swanson, an oceanographer who is Bowman's colleague at Stony Brook, [said in an August interview](#), following Irene.

Underground Power Lines

How This Would Help: Though flooding knocked out a lot of power, so did wind and downed trees in places like [Staten Island](#). It wouldn't fix the situation completely, Manhattan has 21,000 miles of underground cables, [according to Christian Science Monitor's David J. Unger](#). One study found that when these do go out they take 58 percent longer to restore. However, the likelihood of outages is lower. Gale winds can knock out above-ground lines. It takes flooding, which the theoretical surge barriers would theoretically prohibit, to knock the underground lines out.



Cost: A lot. It costs a San Diego community \$54 million per year to bury 20-25 miles of utility lines. Massachusetts governor Deval Patrick said it would be a trillion dollar project for his state.

Priority: Medium to low. The benefits don't really outweigh the costs. Even though the people with

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above-ground lines are estimated to be going without power for a whole week longer than those with underground lines, this time around.

Beach Nourishment

How This Would Help: With each storm, the actual beaches get ruined, [as we explained yesterday](#), and so do the houses along the coast. One way to deal with the beaches is a process called dredging, which takes sand from one location (under the sea) and puts it along the coast. [Dunes](#) can also be built to protect the houses and roads on the coast. "Dunes are the first line of defense for homes, highways and other infrastructure during hurricanes and other storms along the North Carolina coast," said N.C. Cooperative Extension David Nash, who manages North Carolina's coast. "Maintaining a healthy dune system is critical to the overall health of our coastal communities."



Cost: Just one 2010 beach dredging project in New Jersey cost \$1.5 million. Delaware just spent \$30 million on a restoration project to protect shoreline communities, [reported Bloomberg News's Jim Snyder](#).

Priority: Low. Fewer people live in these coastal towns and, as Yglesias puts it. That's the risk you when living there. "But this is an inherent risk of oceanside living. You can enjoy the waves and the view, but the geography won't support robust anti-storm engineering," he wrote.

Levees

How This Would Help: The walls help with storm surges, if they are built well (Katrina, ahem). To protect the whole area would take a system of levees, sea walls, and flood gates, according to research group at the [State University of New York](#), [notes Time's Jeffrey Kluger](#).



Cost: \$10 billion, according to the SUNY research group.

Priority: Medium to high. These sound like they work less well than a storm surge barrier, but again could be used to protect from flooding in areas other than just Lower Manhattan. Hoboken, New Jersey already has levees in place. But, as you can see in the photo to the right, they only worked until the water level got higher. Then levees simply trap water where you don't want it.

**This post originally said Denmark built the Delta Works.*

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