Fighting Back the Waves

Rising sea levels and the soaring value of infrastructure assets under threat of coastal flooding has spurred cities into action

Vivienne Raper, Wall Street Journal, 5-16-11

The challenge is huge. Sea levels could rise by 0.59 meters and storm intensity is set to increase, according to the Intergovernmental Panel on Climate Change's 2007 report. Furthermore, building on flood plains could expose infrastructure valued at $35 trillion (€24.4 trillion) to floods by the 2070s, according to a recent Organization for Economic Cooperation and Development report on port cities.

"Even if sea levels are not rising – the expected annual damage is rising," says Robert Nicholls, a coastal engineer from the University of Southampton and an OECD report contributor.

One solution could be sitting in Rotterdam's Rjinhaven Harbor. A 12 meter tall floating pavilion with three transparent domes was opened in June 2010. The pavilion, which cost €5.6 million to build, is a symbol of flood-resilient building and a laboratory to test floating construction. Around 1,200 floating homes are eventually planned for Rotterdam's Stadshavens district. Stadshavens is among several flood-resistant waterfronts being developed in Europe and the U.S. Another is HafenCity, Hamburg, where the buildings stand more than 7.5 meters above the water. The other side of the Atlantic, New York is planning to redevelop its 520 miles of waterfront over 10 years, with a goal to increase the city's resilience to climate change.

"Investors see an opportunity to combine developing urban areas at the coast with defending the area behind it," says Jeroen Aerts, a flood insurance expert from the Institute for Environmental Studies in Amsterdam.

New York's Vision 2020 plan was launched in March 2011, but the city is already taking action. For example, New York is lifting power generators at wastewater plants above flood level. "We're raising them above future flood levels so, if the plant floods, the infrastructure won't get wet," says Adam Freed from the Mayor's Office of Long-Term Planning and Sustainability.

But is waterfront redevelopment enough to stave off the waves? Not for New York, according to Malcolm Bowman, a storm surge expert from the city's Stony Brook University. Plans to lift generators above flood level are "like patching potholes in the highway," he says. "You reach a point where you can't patch fast enough."

New York is above present-day sea levels, but is vulnerable to flooding from hurricanes and nor' easterly storms. Category three hurricane Donna in 1960 flooded Lower Manhattan almost waist deep. "For a city like New York – it has worldwide consequences if Wall Street floods. The economic damage could be enormous," says Prof. Aerts.

Prof. Bowman wants New York to plan for storm surge barriers like London's Thames Barrier, which could cost a total of $10 billion. The city hasn't gone down this route so far, but Mr. Freed hasn't ruled it out. "We need to look at a whole realm of potential solutions and strategies," he says.

New York may be examining its options for climate change, but other cities without flood defenses are building barriers. Among them is Venice, which floods several times a year, and St. Petersburg, which has been waiting for flood barriers since 1979. Venice is building a flood barrier designed for 60 centimeters of sea level rise, due

to be finished in 2014. St. Petersburg is due to open its flood barrier in 2011. U.K. engineering consultancy Halcrow is the lead designer. The barrier is designed to withstand 100 years of climate change based on pre-2005 estimates, according to a Halcrow spokesperson. New Orleans is probably the most famous example of a city in a hurry. Hurricane Katrina breached New Orleans' levees leaving the city without flood protection.

A 350-mile defense system of levees, floodwalls, surge barriers and floodgates will be completed in June 2011 after less than four years. "It's like a fortress of concrete and steel built around the city," says Piet Dircke, Director of Global Water Management at Arcadis.

The $14.5 billion project includes the largest pump station ever built. But the project will provide only one in 100-year flood protection – the same as pre-Katrina.

"The system has been constructed as an answer to Katrina with one single objective – to give the city back, as fast as possible, an acceptable hurricane protection level," Prof. Dircke says. The new defenses are better than the pre-Katrina defenses, according to Robert Bea, a marine engineer from the University of California and expert on the Hurricane Katrina flooding. But they're inadequate for climate change. "The one in 100-year standards aren't sustainable to 2100," he says. In contrast, the Netherlands and Thames Estuary have recently launched plans for tackling climate change that look forward at least 100 years.

"London and the Netherlands are quite advanced," says Prof. Aerts. The Delta Commission report, published in 2008, examined how to protect the Dutch coast during the next 200 years. Among the recommendations are additional flood barriers for Rotterdam. The Thames Estuary 2100 study, published in 2009, covers London's waterside and the Thames Estuary. A new, taller Thames Barrier will be built downstream in 2070 at an estimated cost of £4.2 billion, the plan says – depending on sea level rise. "It'll take at least 15 years to build a new barrier so we need to make sure we have the plans in place in advance," says Tim Reeder, Regional Climate Change Program Manager for the U.K.'s Environment Agency for the South East. London and Netherlands built their defenses after a catastrophic 1953 flood.

For Prof. Bowman, a similar disaster might prompt New York to build barriers. "Maybe it's going to take drowning 4000 or 5000 people in a freak storm to get anyone to wake up," he says.