

**Our Ocean Backyard — *Santa Cruz Sentinel* columns by Gary Griggs, Director, Institute of Marine Sciences, UC Santa Cruz.**

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**Walls Around Our Coastal Cities?**

Hurricane Sandy has come and mostly gone, but the devastation left behind will take years to clean up and repair. There are new estimates of damage and recovery costs (\$79 billion for New York and New Jersey alone), requests for federal disaster aid from FEMA (lots), and also the inevitable Monday morning quarterbacks who are now devising all of the possible solutions for protecting the coastal areas of New Jersey, New York City and Long Island in the future.

The total damage figures, when we have them, will undoubtedly be huge, but the meteorological figures are in some ways, more alarming. Sandy produced the highest storm surges ever to hit New York City, nearly four feet higher than the previous highest water levels during Hurricane Donna in 1960.

New York City is particularly exposed to the sea with water coming in through the Hudson and East rivers, and with a meandering total of hundreds of miles of exposed shoreline, much of it just a foot or two above sea level. Sea level is also now about a foot higher here than it was in 1900.

You might think that New York City would have thought about these things many decades ago, but sea-level rise and storms probably weren't as pressing in the 17th century when the city was first laid out. The early settlers were Dutch, who knew a thing or two about living very close to sea level. But the founding fathers must have felt that a few feet of freeboard was enough, or simply had other issues to deal with.

To add insult to injury, sea level along the Atlantic coast is likely to rise 3 to 4 feet or more by 2100, as the oceans continue to warm and ice sheets continue to retreat and melt. Sadly, the worst isn't over and it's not likely to get better any time soon. So despite the energetic calls to re-build and armor against future disasters, there is wisdom in pausing for contemplation before jumping to employ the first band-aid from the bandwagon of ideas to come along.

There are a lot of greenhouse gases already in the atmosphere that we can't get back, and we don't have a switch in place to turn off what we are putting in every day now. Emissions continue to rise. In 2008, the last year with available records, the Earth's nearly 7 billion people dumped 92 million tons of carbon dioxide in the atmosphere every day. Every day! And the emissions continue to rise each year. Although China has now surpassed the USA in total carbon dioxide emissions, there really isn't much comfort in this statistic as we all share the same atmosphere.

So what are the planners, designers and engineers coming up with for New York City? There is the \$6 billion system of floodgates that has been proposed, using Venice, The Netherlands, and London as examples. This approach raises some important questions about who or what gets to be protected and which neighborhoods are on their own.

Ten years ago, a research team from the State University of New York at Stonybrook, working with the state's Environmental Protection Agency, put together a complex plan of levees, seawalls and floodgates for protecting most of New York City from storm surges. The estimated price tag of \$10 billion at that time ground the plan to a halt.

Some are calling for a mix of hard structures, whether seawalls or storm barriers of some sort, combined with "soft strategies", like constructing urban wetlands, tidal marshes, even artificial reefs intended to nurture oysters, which has been referred to as a blending of urbanism and ecology.

The hope here is that these engineered green spaces would absorb and reduce the force of incoming water, thereby protecting the shoreline. Porous streets of concrete have been proposed to soak up excess water like giant sponges, while other new streets would be designed to drain the surging water back into the harbor.

If Manhattan was a sparsely inhabited rural area, these ideas might be considered practical, but this is New York City - protecting it with oyster reefs and some wetlands? When everything - streets, subways, and underground parking garages - are all completely underwater with a storm surge of nearly 14 feet, porous concrete is not going to soak up the excess water, or drain the water back into the harbor. There is a need to be creative but also a need to be realistic and fully consider the forces and water levels we are seeking to control.

It's also important to come to grips with the reality that New York City isn't the only large city in the United States (forget the rest of the world for a moment) that lies very close to sea level and is exposed to hurricanes, extremely high tides and storm surges, or a rising sea. There are a few others to consider, in no particular order: Miami, Newark, New Orleans, Tampa, Boston, Wilmington, Virginia Beach, Charleston, Galveston, and on the west coast, Long Beach and parts of many of the low-lying communities surrounding San Francisco Bay, including San Francisco, Oakland, and San Jose.

Dr. John Holdren, Director of the White House Office of Science and Technology and former Professor of Environmental Policy at Harvard University, has said "With climate change we basically have three choices: mitigation, adaptation and suffering. We are going to do some of each. The question is what the mix will be. The more mitigation we do, the less adaptation and suffering there will be". We need to start making some very serious commitments to significantly reducing the emissions of greenhouse gases if we are to avoid a future that is not going to be pleasant for any of us.