

Could Barriers Protect New York City From Storm Surges?

The hypothesis of a team of New York Sea Grant funded researchers that strategically placed storm surge barriers could protect NYC from storm damage has gained the interest of some decision makers and attention of media.

New York metropolitan area increasingly at risk to storm damage

In an era of rising sea levels and more powerful storms, New York City and the metropolitan region may be increasingly subject to flooding. Much of the region is at a very low elevation, less than three meters above sea level, and the prospect of increased frequency of strong storms such as nor'easters and hurricanes heightens the need for local officials to place attention on the potential impacts of flooding, especially from storm surges. There are several options to protect the region's low lying infrastructure. Specific facilities like sewage or water treatment plants or power plants can be hardened against flooding, or sea walls or breakwaters can be built. Another option is to use storm surge barriers at strategic locations to block incoming storm surges. Would such a system work? Information about whether such barriers would actually prevent flooding would be useful for planning.

Stony Brook Storm Surge system: three choke points hold the key

A research team from the Marine Sciences Research Center at Stony Brook University tackled this question through modeling. The goal was to use existing modeling technology and methods, along with newly developed ones, to test whether storm surge barriers would protect the City from flooding. The working hypothesis for the project team was that storm surge barriers placed at certain "choke points" (the mouth of the Arthur Kill in Perth Amboy, The Narrows, and the upper East River near Whitestone)



The waterways surrounding New York City could potentially be protected from coastal flooding with three barriers (shown in white) located from west to east at Perth Amboy, NJ, the Narrows and the Upper East River.

could prevent flooding of low-lying areas in New York City and nearby New Jersey by protecting them from unusually large storm surges generated by hurricanes and nor'easters.

After two years of intensive work and development, the project team developed a model system that demonstrated that storm surge barriers placed at certain choke points surrounding the metropolitan region would provide effective flood protection for low-lying areas in New York City and New Jersey during storm surge events. This model system, known as the Stony Brook Storm Surge system (SBSS), was developed by adapting two well established models: the Advanced Circulation Model for

Coastal Ocean Hydrodynamics (ADCIRC) and MM5, a regional weather forecasting model. To create this new model, the researchers created a regional database that combined bathymetric and topographic data.

This combined bathymetric-topographic database is a valuable tool that can be used for future modeling and is being updated as new data become available. With this database, calculations and simulations from both models can be used to create a model system that can simulate the impacts of storm surges from major storms and the effectiveness of various storm surge barriers in protecting coastal areas from storm surge flooding.

Project success leads to further funding and influence on decision makers

The project demonstrated the potential of storm surge barriers in protecting the metropolitan area from flooding. A sophisticated near real time modeling system was developed from work on this project. Given rising sea levels, vulnerable populations, and valuable real estate, this model is a valuable tool to aid in deciding whether to build storm surge barriers. In addition, this project has led to further funding for additional investigations, including two subsequent NYSG projects (totaling more than \$170,000 in funding) that are studying additional aspects of implementing storm surge barriers for metropolitan New York.

Together, these projects have influenced the decisions of the NYC Department of Environmental Protection and other agencies to see this as an issue that needs addressing sooner rather than later. The work from this project and later projects is aiding in decision making regarding whether

to pursue barriers or harden individual facilities. The model continues to evolve and be updated, and is available online (at <http://stormy.msrc.sunysb.edu/>) for research use. It has proven to be a useful tool to other researchers, the National Weather Service, and has even been used by Swiss Reinsurance to help with adjusting insurance rates. The work has generated media attention from city newspapers, the *New Yorker*, *New Scientist*, *Christian Science Monitor*, and the New York Academy of Sciences, which has helped increase the visibility of this issue to local residents and officials.

Students

Mr. Peng Cheng was supported as a Sea Grant Scholar on this project and graduated with a PhD in August 2006 from Stony Brook University.

Publications

Bowman, M.J., B. Colle, R. Flood, D. Hill, R.E. Wilson, F. Buonaiuto, P. Cheng, and Y. Zheng. 2004. Hydrologic Feasibility of Storm Surge Barriers to Protect the Metropolitan New York - New Jersey Region. Summary Report. Marine Sciences Research Center, Stony Brook, NY. 27 pp.

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Van Lenten, C. 2005. Storm surge barriers for New York Harbor? *Update New York Academy of Sciences Magazine*: 6-9.