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Minimizing damage on Staten Island from the next Sandy

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on December 10, 2012 at 2:03 AM, updated December 10, 2012 at 2:41 AM

Dr. William Fritz is trying to find ways to lessen the devastation caused by storms like Sandy.
Staten Island Advance/Jillian Jorgensen

STATEN ISLAND, N.Y. -- In the wake of Hurricane Irene, College of Staten Island Interim President Dr. William Fritz and other faculty members got to asking themselves a question.

"What would happen if we had a hurricane hit, on a high tide, a little bit larger, with the eye path a little different?" Fritz, a geologist, asked.

In June, Fritz and colleagues made good use of the school's Interdisciplinary High-Performance Computing Center to model what would happen if a storm surge hit our shores. Along with Engineering Science and Physics Professor Dr. Alan Benimoff, Vice President for Technology Systems Dr. Michael E. Kress and other colleagues, they published a storm surge model for the tri-state area, and were set to present it early in November.

"A week before we were to make our presentation, we had an actual event happen that was very, very, close to the "what-if model that we had put together," Fritz said of Hurricane Sandy.

Now, Fritz and his colleagues are harnessing their research to look at what future, stronger storms could mean for the borough -- and how to lessen their impact on lives and property.

That last part is key, Fritz said, because he's certain the storms and surges will keep coming and get worse, thanks to the rise of sea levels and warmer temperatures caused by human-induced global warming.

"We're going to get hit again. I can't tell you if its going to be next year or 50 years from now, but we're going to

be hit again," Fritz said.

FIVE-POINT PLAN

But beyond predicting the impact of future storms, Fritz is also trying to find ways to lessen their devastation by reacting to Sandy. He offered a "5-point-plan" for protecting the borough from future severe weather.

1. Protecting the barrier islands, dunefields and marshes that remain on Staten Island. Those marshes act as "nature's sponges."

2. Rebuilding those coastal dunefields damaged by Hurricane Sandy.

3.Re-zoning. A difficult topic of conversation, Fritz admits, but "This way when they flood, there is less cost to human life, property and the economy."

4. Engineering solutions -- but Fritz cautioned some of them don't help matters. A gate across the harbor will protect the inside but could damage the outside, and sea walls can protect homes behind one beach but cause the damage to nearby beaches to be worse, he said. The force of hitting the wall actually increases the energy of the waves, Fritz said.

5. Education. If people must continue to live in areas vulnerable to surge, they should know how the storm works and how to stay safe -- climbing up in their homes as high as possible and realizing the surge can come rapidly.

"The flooding from the rain comes up very, very slowly," Fritz said. "When a flood is from a storm surge, it comes up so fast you can't get out of the basement."

DEVELOPMENT ON

THE COAST

The areas hit hard by the surge weren't always populated with homes -- and the effect of that development is something Benimoff has been studying since before Sandy struck. He created maps showing the development on Staten Island over time, since 1901 -- when much of the shoreline was a tidal marsh. By 1930, that had begun to change.

"We've taken those marshes we showed you before, and now we started to fill them in with asphalt and concrete and roads and houses and roofs and things," Benimoff said.

Over the next few decades, the map shows more and more structures and roads in the area -- despite a category three hurricane hitting the area in 1938.

In the wake of Sandy, Benimoff decided to take his research further. He plotted every house damaged by Sandy

on a map. Then he plotted the now-gone streams from the 1901 map.

Outside the immediate shoreline, the damage is clustered around spots that were once streams and marshes, Benimoff's maps show -- and Fritz thinks they should be taken into consideration when redrawing the city's coastal evacuation zones. On existing emergency maps, many of those areas were only slated to flood in the event of a category two storm.

"Mapping the destruction of the houses, it's the same as the old stream channel," Fritz said.

The building boom after the 1938 hurricane is something Fritz hopes the borough can avoid this time around. When it comes to rezoning areas to make them non-residential, Fritz said it doesn't have to happen all at once. He cited the model of the National Parks Service in acquiring land, and said we could start piece-by-piece of property.

"They started buying up land and you do it in a patchwork, and even if you protect 50 percent of the area, that's 50 percent lower rebuilding costs and loss of life when the next hurricane happens," he said.

MODELING STORMS

Fritz said the computer model they used to so accurately predict the surge of a storm like Sandy depends on millions of data points -- from the contours of the sea floor to the geography of the coastline to the roughness of the water.

Kress said these types of more accurate hydrodynamic models is just one benefit of having the high-performance computing center on campus.

"We'll be able to get a better sense of what storm surges we should get from such and such a type of hurricane," he said.

Several key factors determine how high water will rise in a storm, Fritz said. First, a hurricane creates a bulge of water by acting as a vacuum, piling water up to 20 feet high. Then, strong winds blowing counter-clockwise pile more water on top. In addition, tides play a role -- so at high tide, the water is that much higher.

Finally, the geometry of the coastline can focus energy in one area. In New York, that geometry includes the right angle made by the New Jersey Coast and Long Island.

"This area is just acting like a funnel, with New Dorp, Midland Beach, in Staten Island really being there where all of that energy is focused," Fritz said, pointing a map showing the coastline ringed in red.

Kress hopes to plug even more data into the models -- like city infrastructure data, to see how certain storms would affect transportation systems, cell phone networks and more.

"There's many different underlying infrastructure pieces that will be effected" by storms, Kress said.