



Superstorm Sandy: A *Serious Conversation*
About the Future of Our City

Crain's Rebuilding New York Conference

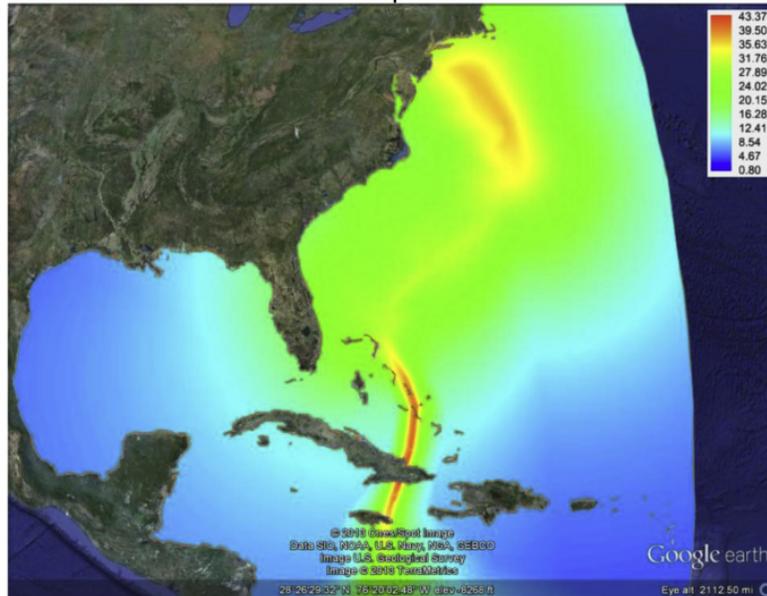
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Introduction

Good morning and thank you for allowing me to speak about what I see as a “*Serious Conversation*” for all New Yorkers. I tend to be a big picture thinker and see a lot of commonality in what we have been hearing this morning. I hope that my remarks may help frame our dialog.

Superstorm Sandy maximum wind speed



Sandy's maximal wind speed along actual hurricane's track. Generated by the CUNY High Performance Computing Center at the College of Staten Island

My main message this morning is about the power of an interdisciplinary approach to formulating a response to natural disasters. Throughout my career when I have worked on natural disasters, scientists made predictions and no one listened. This is because for the message to be received we as scientists need to include politicians, business leaders, social scientists, economists, humanists, and community leaders – this conversation needs to be a

team approach! I think that the stories we have heard this morning underscore the need for coordination.

CSI & SI Partnership

The mission of CSI, the only public institution of higher education and the second largest employer on Staten Island, as well as that of The City University of New York is to be a part of our community, not apart from it. When I convened a group of community leaders on Staten Island and asked them what we should be doing at the College to help improve “Civic Prosperity” on the Island. Their advice was to focus on a response to Superstorm Sandy – to lead an interdisciplinary “*Serious Conversation.*” My speaking here today is a continuation of that “*Serious Conversation*” and the City University’s commitment to partnering with business to make a better NY.

My message is simple -- Irene was a wake-up call, Sandy was even more of a wake-up call to the entire NY Metropolitan area – but especially to Staten Island, The

Rockaways, Breezy Point and other low-lying coastal areas.

IHPCC and Interdisciplinary Applications

For several years, I have been working with an interdisciplinary team using The City University of New York's High Performance Computing Center, housed at the College of Staten Island, to model how storm surges might impact the NY Metropolitan area. Our center houses two of the latest generation Cray Supercomputers and covers all modern computational architecture. In fact, Mike Kress, Director of the Center, VP for Economic Development, and a collaborator on this work is here today.

This facility can handle massive amounts of data. In just two examples, our team combined the 100 million plus taxicab rides in the city for the past two years combined with MTA bus and train routes to model transportation patterns for better traffic flow. We also provided the data to

show the solar energy available to the City of New York so that property owners can understand the potential of solar energy on their rooftops -- calculated for each of the 13 billion square feet in the City!

Storm Surge Applications for NYC

Many teams have modeled potential storm surge impact from North Carolina south. However, few have looked at conditions north of the Carolinas. Because we have information from the seafloor north of the Carolinas, especially for NY Harbor, we formed a partnership with the Renaissance Computing Institute at the University of North Carolina and together have the most complete data set of seafloor type, water depths, topography, and atmospheric conditions from the Gulf of Mexico to Canada. Using the IHPCC we can model vulnerable areas along the entire eastern seaboard – again a massive data set.

Response to Irene

After Irene in August 2011 the CSI team was concerned that many people were lulled into a false sense of security. Because of the eye track, Irene was mostly a rain event with little wind or storm surge. Rain induced flooding generally happens slowly or in stream bottoms where the Blue Belt could not handle the downpour. Concerned that people were not prepared for the onrush of a storm surge from the sea we decided to model what a surge would look like with an eye track a little further north than Irene and one that occurred on a high tide.

In June 2012, five months before Sandy, we wrote that while most people do not think of New York as lying within the hurricane belt, powerful storms have impacted our city before, and we need to safeguard our communities. We used data collected from Irene to model the impact of a storm that might hit at high tide with a slightly different track than Irene and calculated the likelihood of a 12-foot

surge. While we did not predict Sandy, we accurately modeled a scenario very close to that of Sandy.

Sandy and Forward

As a result of Sandy all New Yorkers now realize that we are in the hurricane belt, however, I want to be sure that everyone realizes that this was not a one-time event – we *will* be hit again and next time could be worse. We modeled a 12-foot surge, Sandy produced a 14-foot surge. However, Sandy was not even a hurricane and based on historic records we can reasonably model a 20-foot surge. The possibility of a 30-foot surge or maybe even a 38 foot one, while not very likely, is not impossible.

In 1932 there was a hurricane of unknown strength with a 15+ foot surge (based on our analysis of newspaper photos) and in 1938 an unnamed Category 3 Hurricane, sometimes referred to as the Long Island Express, that produced a surge in the neighborhood of 20 feet. The reason that these

storms went somewhat unnoticed, at least on Staten Island, is because the surges rolled across undeveloped marshland. I like to make the analogy of a very powerful magnitude 7 earthquake in Idaho that is known only to the scientific community while a relatively small earthquake in California gets worldwide attention.

Each storm is different; strength, eye track, tides, and other weather systems all play a factor. The surge starts as a low-pressure bulge in the ocean in the eye of the storm (think of water rising into a vacuum cleaner). Winds pile water on top of the bulge and tide then lifts the water to an even higher level. In NY Harbor, the shoreline focuses the surge even more. The map on the screen shows our modeling of Sandy wind strength -- the bulge is approximated by the yellow and red colors.

Surges are not like slowly rising water in a bathtub with an even level but must be modeled as the compressed splashes

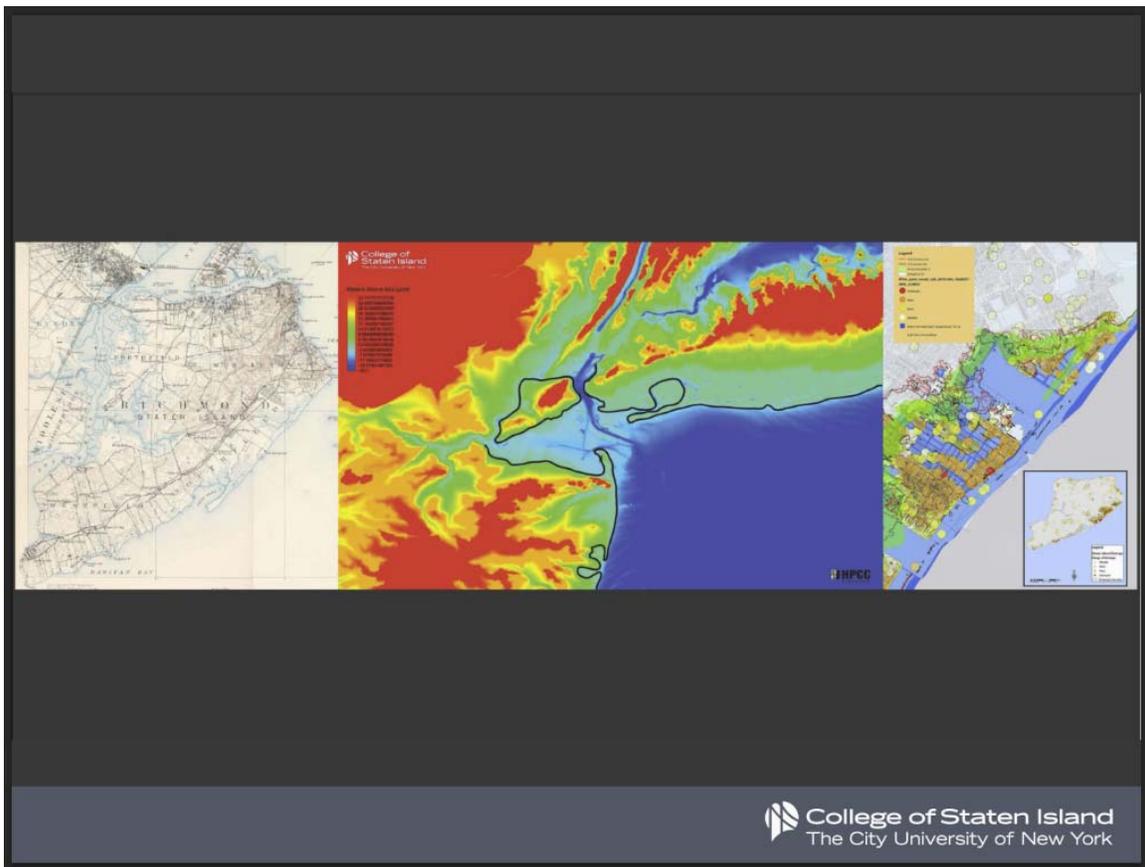
encountered Manhattan in the early 1600's sea level was four feet lower than today. The tunnels would not have flooded if sea level had remained static! This has been masked because as we saw in Howard Glaser's presentation earlier, we have been building up and out faster than the sea level rise. However, this is not sustainable.

The frequency and severity of tropical storms are also likely to increase. Hurricanes are nature's way of balancing hot and cold.

The New York Metropolitan area sits at a particularly vulnerable area. The right angle of the shoreline created by the intersection of the Jersey Shore and Long Island and counterclockwise rotation drives wind and water against Staten Island and up NY Harbor. This surge water is then trapped by wind driving water westward along Long Island Sound.

Within the NY Metropolitan area, Staten Island is particularly vulnerable. The “funnel” created by the Long Island and Jersey shores, in conjunction with a shallowing sea floor ramp, compresses and focuses the water against the South Shore.

Sponges



Barrier Islands, marshes, coastal dune fields, estuaries, and bays are nature’s sponges that absorb the energy of a storm

surge and stores water that mitigates damage and flooding – and we have hardscaped our sponges! For example, the 1880’s mapping on this map to your left shows marshland below sea level on Staten Island when sea level was a foot lower than today.

Sandy was a relatively minor event with a 14-foot storm surge – much higher ones are possible -- maybe even probable. The 1938 hurricane was a Category 3 storm. Some climatologists argue that a Category 4 storm with a 30-foot surge is the strongest we can expect this far north; others suggest that with global warming a Category 5 with a resulting 38-foot surge might be possible.

Five Point Plan

I offer a Five Point Plan to guide the “*Serious Conversation*” going forward:

1. Protect our existing dunes, marshes, wetlands, and barriers whenever possible.

2. Rebuild and restore coastal dune fields and marshes.
3. Consider rezoning high-risk areas for day use and recreational purposes. Even within the flood zone, some areas are more vulnerable than others. For example the old marsh channels shown on the historic map on your left controlled the most severe destruction of homes shown on you right.
4. Consider appropriate use of seawalls, floodgates and other engineering solutions.
 - Understand that engineering solutions almost always protect one area at the expense of another.
5. Above all, we need to educate people, that in storm surges when the water starts to rise, it is too late to escape. Climb to Safety! Evacuation orders must be taken seriously in order to avoid loss of life. Education can also guide appropriate building codes and construction styles when decisions are made to rebuild.

The reason that I am speaking out is to urge New Yorkers to engage in a “*Serious Conversation*” about how we should plan for the future well being of our City.

This conversation must include: scientists, geologists, engineers, social scientists, counselors, political scientists, politicians, economists, community members, city planners, emergency responders, government agencies.

And the business community should be in the forefront of this conversation because issues such as community welfare, rebuilding, financial impact of various solutions, political influence, and funding fall in the business sector. Without your leadership, attempts to address the future will fall short of maximum success. Private/public partnerships with universities and other agencies will be key to our recovery.

In an area as complex as NYC and Staten Island, we are going to have to use all five points that I have outlined. We should not think about choosing rezoning over building smarter over engineering protection but should take advantage of all three. To me it is a question of where is it best to do each one?

And we need to remember that sea level is rising!

We have experienced many large storms in the past – most were not as devastating as Sandy - not because they were smaller but because the natural areas were less developed.

We will experience storm surges in the future. Are we ready?

Summary

Why is it important to protect our wetlands and to rebuild dune fields?

It is important to protect our wetlands and dunes because these act as sponges to absorb the energy of a surge. They may not prevent flooding but they mitigate the damage.

Why is it important to rezone?

I believe it is important to rezone because in the words of Gov. Cuomo, “*there are some parcels that Mother Nature owns. She may only visit only once every few years, but she owns the parcel...*” We can only decide whether the reclaimed land goes completely back to nature or becomes day use recreational areas.

Why should we consider engineering?

Urbanization has moved our cities past the point where natural resources alone can protect populations. Sea walls and other major engineering solutions are being used throughout the world, notably in The Netherlands and Japan, they can be used effectively; however, it is important to understand the differences of our topography scale, cost, long term maintenance, the impacts to the surrounding area, as well as a commitment to long term maintenance.

Why is education important?

Education is important. In order to stay safe, people should understand how storm surges work so that they can protect themselves and their property. Just as each coastal area is unique - each storm is different. Irene was a storm event with wind and rain-induced flooding. Water came up slowly, unless you were down stream from a lake, like Willowbrook, that overflowed. Flooding was mostly inland. Sandy was a storm surge event with little rain or wind. The surges came quickly from the sea.

It is important to understand what is different about SI and Metropolitan NY compared to other coastlines

- Shape of shoreline
- Narrow flood zone. Be mindful of scale.
- Lots of high ground
- What value is the beach??

The real tragedy of Sandy was the loss of life. There was no need for any loss of life or even injury.

We need to learn to "*Climb to Safety.*" Storm surges are not tornadoes where a basement is where we are taught to take shelter. Basements in tsunamis or storm surges are death traps.

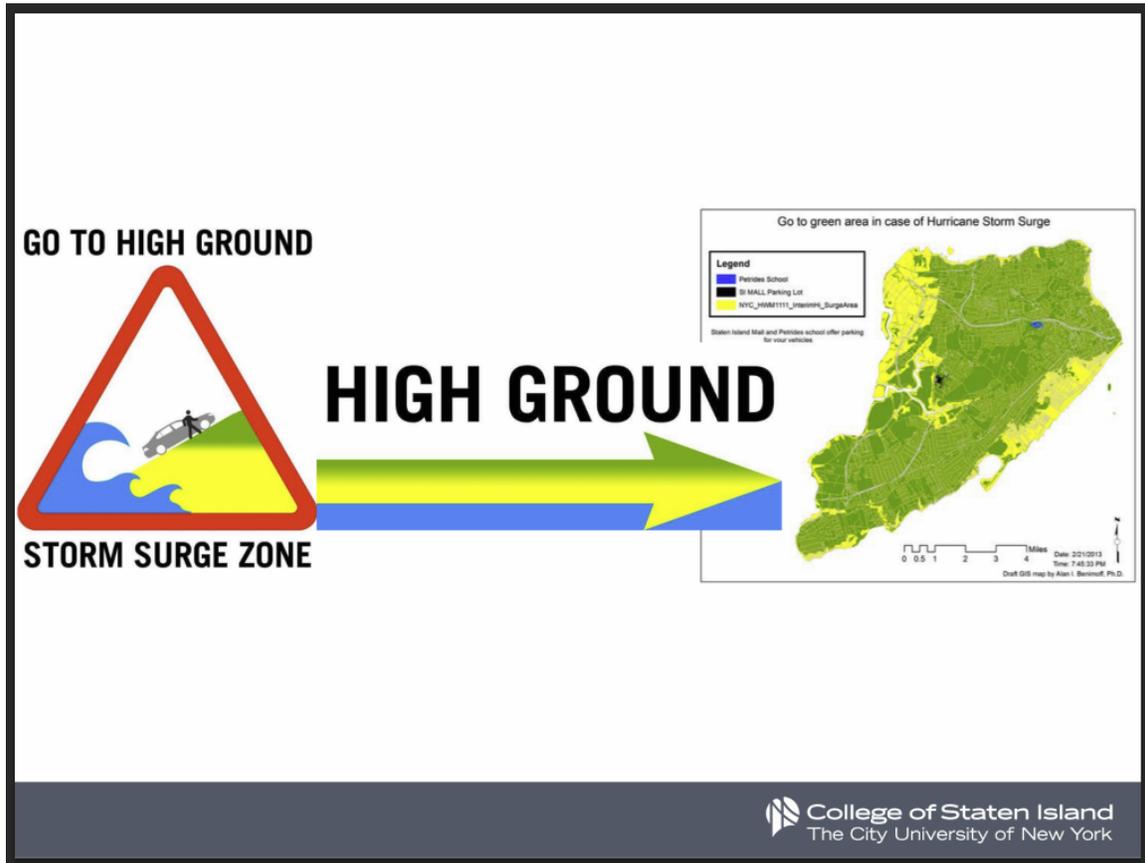
The loss of cars was also a tragedy that could have been avoided. In Boroughs and areas of our City not well served

by public transportation the loss of a car means loss of a job and compounded financial hardship.

Where we cannot rezone or relocate, I urge education and signage.

Recently, I have heard of many solutions - some very expensive. I suggest that at a minimum we do some very low cost things.

Flood Maps and Signage



Imagine the waterfronts of New York and Staten Island with the following ADA compliant maps and signs:

These needed to be produced for each neighborhood to show individual houses. Each resident needs to know the vulnerability of their location. These types of signs and maps have been used in the west coast states and have saved lives. They would save lives on Staten Island. This is a low cost solution and I urge that at a minimum we

quickly introduce these and begin an aggressive education program on how to stay safe.

In addition to making these signs ADA compliant by using appropriate speakers and smart phone technology, we should be mindful of evacuation plans for people with disabilities, the ill, elderly, people in hospice and home care.

Thank you for your time this morning in listening to these suggestions. I am confident that if we continue to have these “*Serious Conversations*” we have many options and a bright future. We are much more fortunate than many coastal cities in that we have a lot of high safe ground. Let’s use it wisely.

Thank you.

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