Collaborative Adaptation Planning for Urban Coastal Flooding

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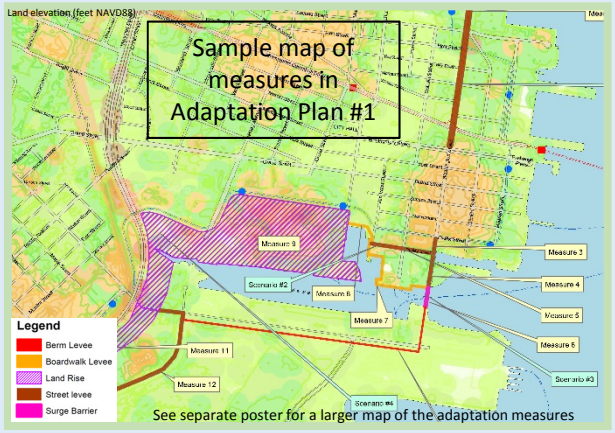
SUMMARY

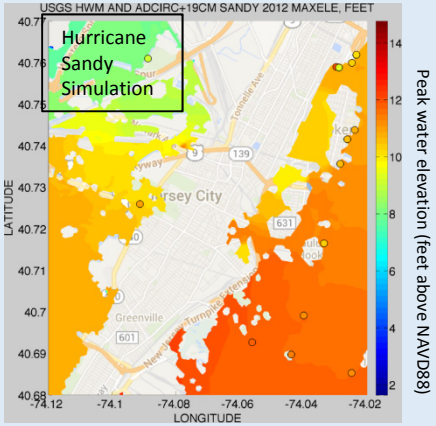
NOAA's Sea Grant is supporting research where Stevens Institute scientists are running computerized storm surge simulations and collaborating with Jersey City planners to develop coastal protection measures and test their efficacy. The primary objectives of the work are to create and verify a simulation of Hurricane Sandy's storm surge, create animations showing floodwater pathways, collaboratively develop a set of realistic coastal adaptation options, and utilize storm surge modeling to evaluate each coastal adaptation, as well as how sea level rise and climate change will affect performance.

ADAPTATION OVERVIEW

There are many adaptation options for reducing flooding, and here we focus only on local **vertical** solutions (e.g. berms, levees). Additional options should also be studied and even used in unison for a layered approach, including: (1) policies and zoning law promoting retreat, consolidation or structure/infrastructure elevation; (2) regional solutions (e.g. harbor-wide barriers) and (3) green infrastructure for reducing rainfall flooding[a].

a: Green shorelines (e.g. wetlands) are only effective for reducing storm surge when there are large regions (many miles) available. Green infrastructure is valuable for reducing rainfall flooding, but our ocean modeling cannot quantify this.

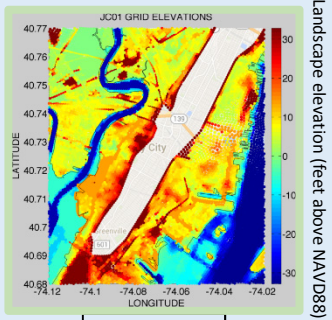




Simulation of modeled peak water levels, with small dots showing actual observations.

See separate poster for more details on the modeling

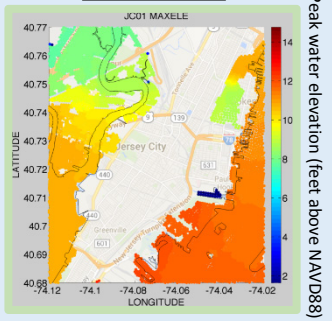
Model Landscape #1



Plan #1 major components:

- Washington Street levee
- Surge barrier at Tidewater Basin
- Levees in Liberty State Park
- Hoboken /Jersey City surge barrier and levee
- Route 440 road levee
- Planned land rise for developments

Result #1



PROJECT LIMITATIONS

- We are performing storm tide modeling only, so:
  - There is no quantification of rainfall, sewer system, land porosity (for rainfall flooding), pumps, sewer blockage
  - There is no quantification of how rainfall drainage will increasingly be blocked by rising sea levels
- There were few (if any) cost-benefit considerations, no quantification; Baker will produce a white-paper on what should be done
- The consideration of socio-political aspects, engineering aspects, etc. are somewhat limited
- Water knows no political boundaries – Integration with Hoboken's plans may be difficult but will be useful

Simulated View:

Surge Barrier at Tidewater Basin

RESULTS

Both protection plans (#2 not shown) function to block surge from central neighborhoods, downtown.

Some waterfront areas are offshore of the protections, and are allowed to flood.

Designs can be located differently to stop all flooding; these are decisions for the community and government leaders. Our goal here is to illustrate a few options, their visual appearance, and flood-related consequences.