

Stakeholder Involvement in Understanding the Economic Impacts of Climate Change and Storm Events on Maritime Infrastructure: Rhode Island Pilot Study

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Introduction

The future of coastal areas is uncertain. Climate change, resulting sea level rise and increased tropical storm activity pose a significant threat to coastal areas of the United States. One of the U.S.'s most critical infrastructure, ports, lie in this vulnerable interface. This project developed and tested a method to assess user concerns for hurricane impacts on RI's coastal-dependent transportation infrastructure. In order to access these concerns, the URI research team developed a storm scenario, as well as developed a portfolio of resilience concepts. The team presented the scenario and strategies to port community stakeholders in a workshop setting. The stakeholder group was made up of representatives of port businesses, federal, state, Providence and East Providence officials, as well as a representative of RI Sea Grant. The storm scenario was used to gain incite on what stakeholders perceive as potential concerns. Decisions software was used to gain insight on port stakeholder goals.

Literature Review

Research suggests that determining the adaptation pathways for a particular community benefits from engaging various stakeholder groups [15,17]. Much research has focused on the local municipality or regional level [2, 16]. In a review of planning documents in three developed countries, Preston et al. (2015) suggest that planning at the local level as opposed to the national or regional level, better addresses adaptation, because community interests, problems, and strategies are more easily defined [17].

Empirical evidence has shown that without support from stakeholders, management decisions are unlikely to be successfully implemented [8,18,19] input helps assess and identify future socioeconomic impacts [21] that can result from hurricanes striking at seaports. Assessment of these types of impacts, as well as the options for adaptation, is the first steps in the adaptation process.

In vulnerability research, impacts are often assessed after impacts occur. This research identifies port stakeholders perceived areas of concern and as well as looks to record initial stakeholder perception of long-term resilience strategies.

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Workshop

Stakeholders were ask to respond on impacts to the business and shared transportation infrastructure. 28 stakeholders participated in the workshop event. The research group identified and recorded common and major concerns as well as un-thought-of-consequences. During the workshop, researchers piloted Wecision, a decision software. Port stakeholders were asked to rank resilience goals. Goals were developed by URI researchers and vetted by a steering committee. Wecision software was piloted for use on future resilience decision research. The goal of the work shop was record stakeholder perceptions of vulnerability for the state's major maritime infrastructure as well as access their initial reactions to port resilience concepts.

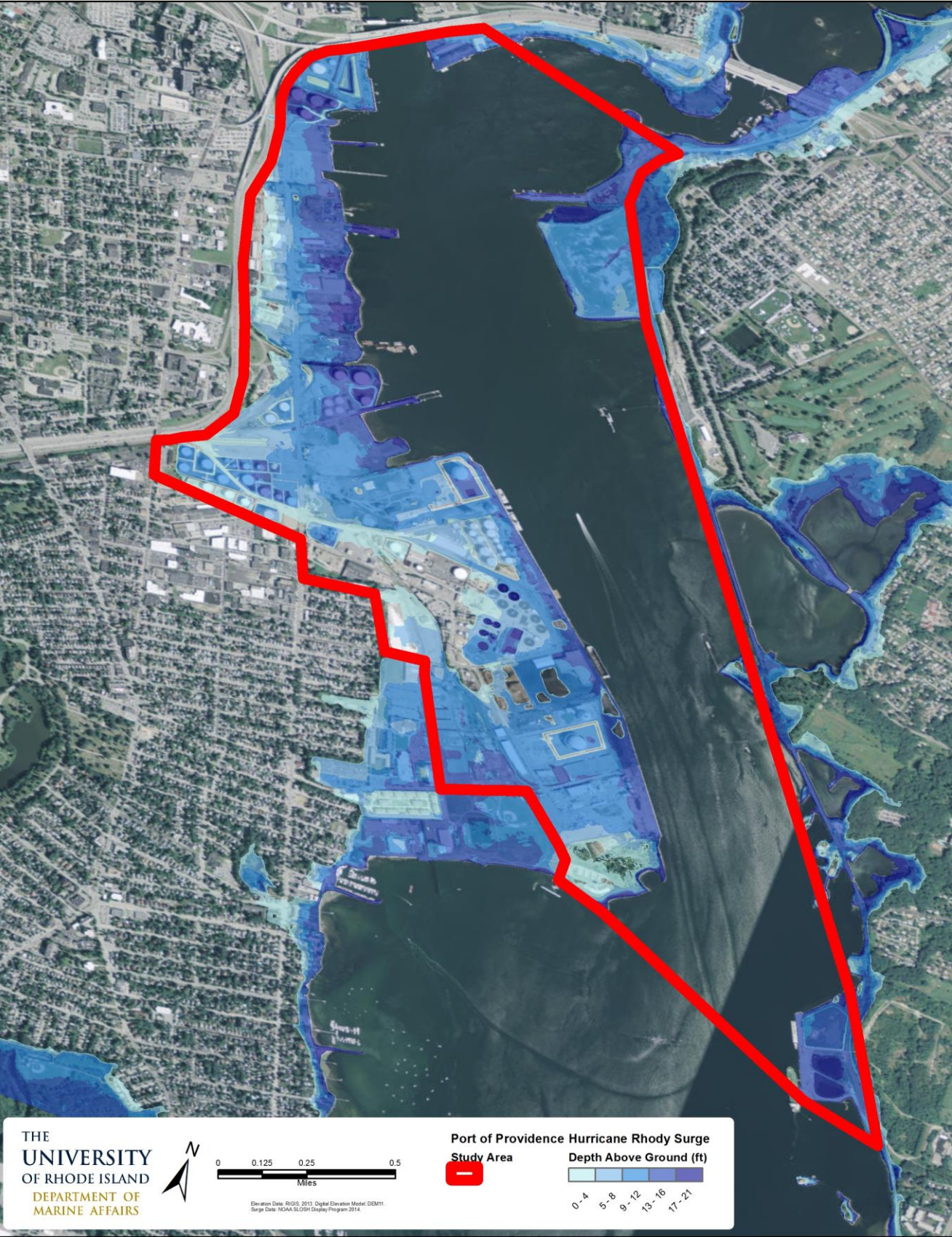


Left: Port stakeholders listen to presentation by Dr. Austin Becker during work shop at Save the Bay in Providence, RI.



Right: Port stakeholders engage in discussion of possible impacts to port infrastructure if storm scenario were to occur.

Methods



Above: This image depicts the flood depths over ground at the port of Providence during our storm scenario. URI Researchers asked stakeholder to respond on perceived impacts to infrastructure located in the study area outlined in red.

Study Area

The port of Providence is located just south of the center of Providence, located on both edges of the Providence river at the head of Narragansett Bay. More than 25 independent companies are involved in the operations at the port. Port land also lies within the regulating authority of Local, State, and Federal Governments. Port generated \$340 Million in economic benefit to the state of Rhode Island. The Port provided 453 direct and 291 indirect jobs totaling \$37 Million in income. These jobs were high paying jobs averaging \$54,000 per year [12]. The Port is critical for regional energy security [21].

Storm Scenario

The storm scenario presented to port stakeholders was a category three hurricane, traveling due north, at 40 mph and made landfall just west of the mouth of Narragansett Bay. This would be considered the worst case scenario for the port of Providence for this category storm. A SLOSH analysis suggested this storm would cause a 21ft storm surge, which is the maximum surge that could be contained by the Providence Fox Point Hurricane Barrier.

Additional images of the surge can be seen on additional panels. These images only represent the change in water level and do not show additional forces from water movement and wave action. These forces will most likely result in extensive destruction of port infrastructure.

Resilience Concepts

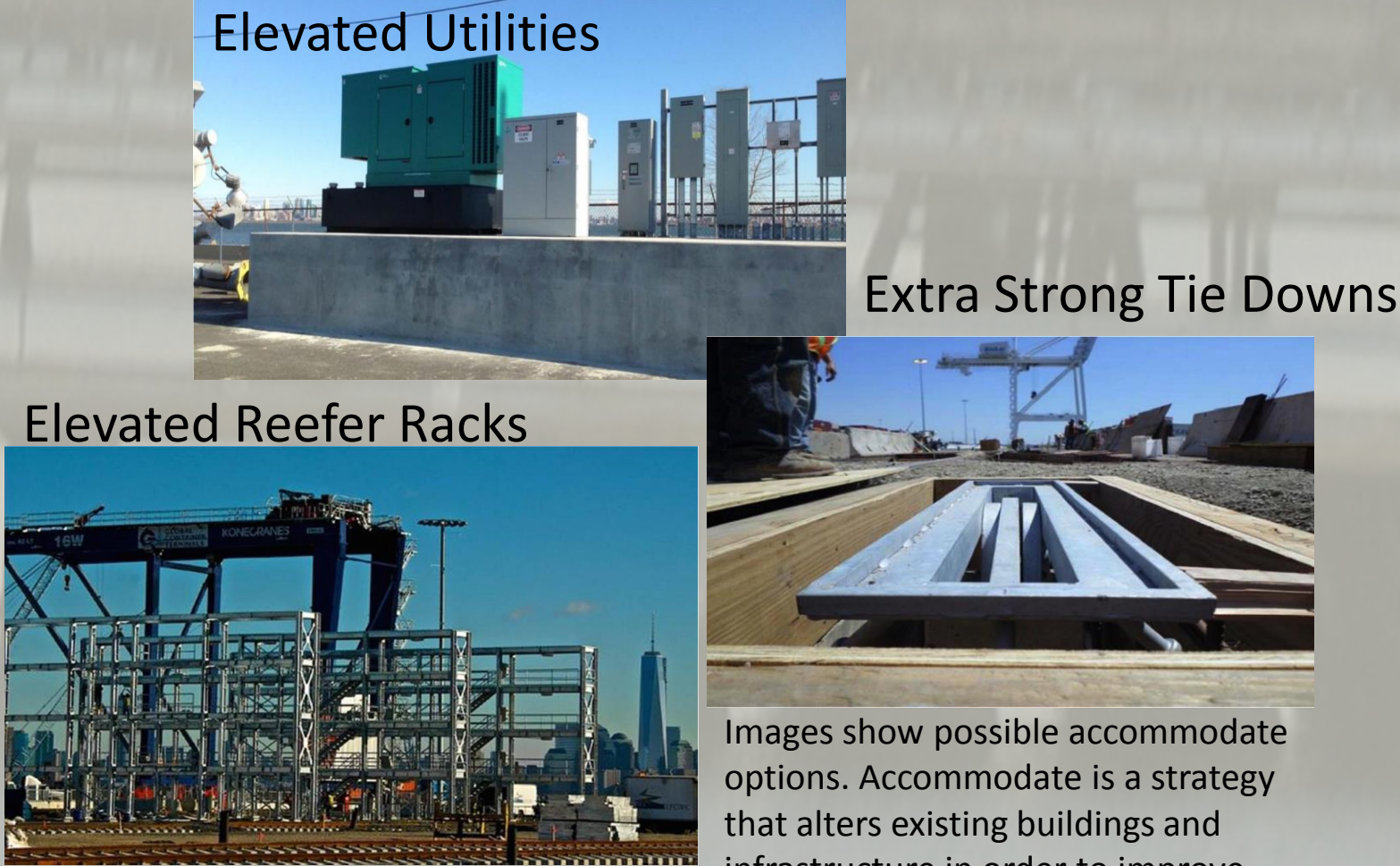
Four resilience concepts were introduced to the participants. The concepts were presented as potential long-term strategies. Resilience is defined here as the ability of the port community to bounce back after a hurricane event. Respondents were asked to discuss the efficacy of potential concepts in relation to the achievement of port community goals. Respondents also participated in goal development.

Protect



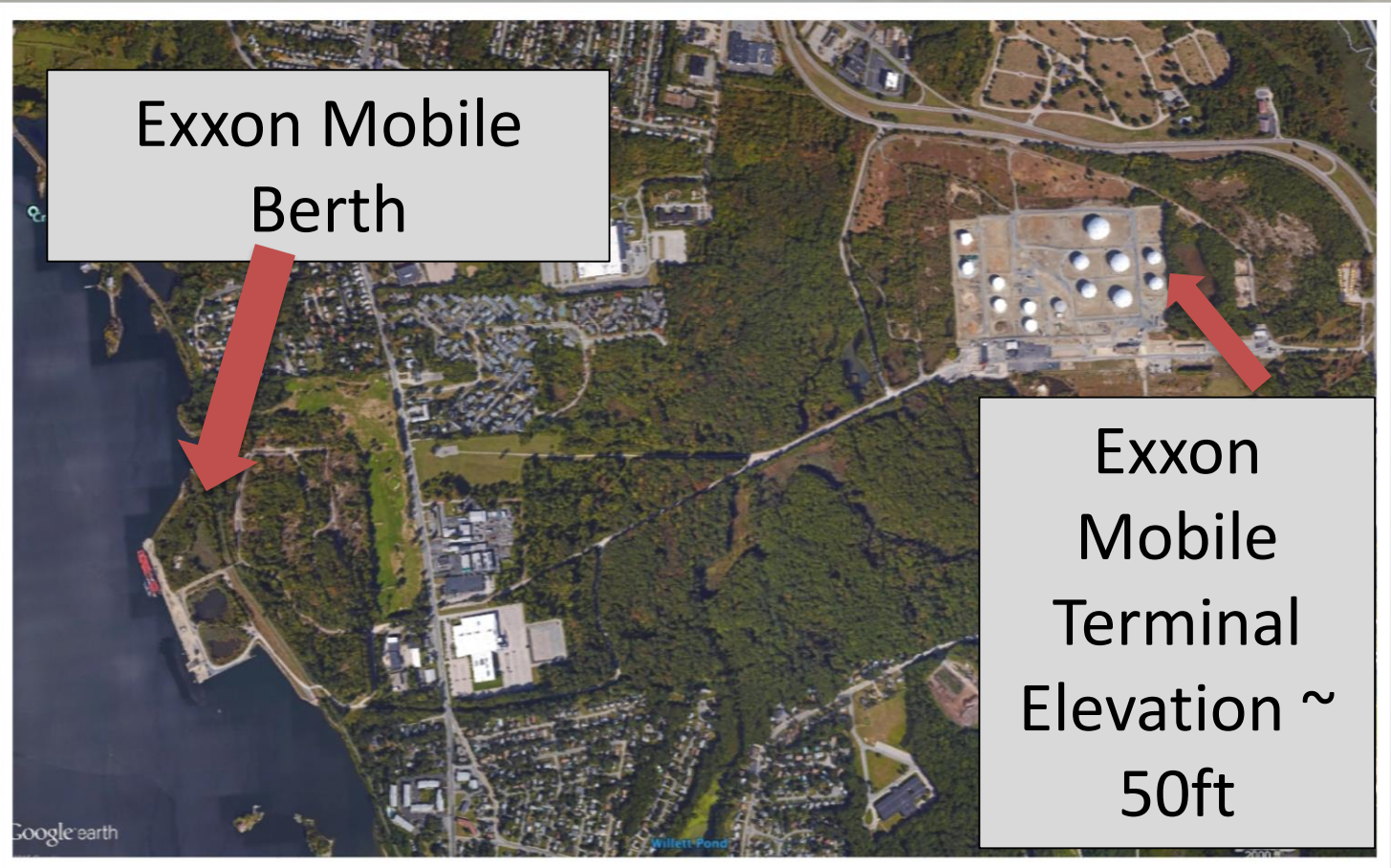
Computer generated image of what a possible hurricane barrier that would protect the port of Providence could look like. The barrier would protect from a 21ft storm surge.

Accommodate



Relocate

East Providence Example



Relocate involves moving port infrastructure out of vulnerable areas. The example above is of the Exxon Mobil Terminal in East providence. The berth is located adjacent to the channel, but the terminal is located inland at 50ft elevation.

Do Nothing



Doing nothing is a strategy. Doing nothing entails that the impacts that result from the storm scenario occur when the next storm happens. The image above shows inundation from a 21ft storm surge at the port to Providence.

Preliminary Results

Results were gathered from reporter notes from conversations at five stakeholder tables. Each table had 5-6 stakeholders that participated in conversation. Notes were qualitatively reviewed for preliminary results. Further qualitative analysis of workshop results will be conducted.

1. Damages that would cause disruption to harbor channel and road infrastructure (access to I-95/I-195) are of great concern to port stakeholders.
2. Stakeholders were concerned about debris and resulting damages from its relocation.
3. Port stakeholders continually mentioned the need for a central organizing group that would help coordinate resilience and improve communication between port community mem.
4. Stakeholder's perceived that any internal firm improvements in resilience would also need to be investments in profit. Needs to be a return (in profit) on their investment.
5. According to stakeholder statements, the use of visualizations helped prompt useful discussion of potential impacts.

Next Steps

Project Related

1. Continue analysis of workshop results.
2. Conduct follow up interviews with port stakeholders to gain information about the role of a central organizing group in communication and implementation.
3. Report to RI Department of Transportation on results of research work.

Future Resilience Research

1. What role can state agencies play in facilitating communication amongst port stakeholders in regards to improving community resilience?
2. Is there enough agreement behind a particular strategy to begin assessing costs and benefits?
3. Where will debris go during hurricanes? Need for modelling of debris relocation and potential damages.

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