Just Adaptation Planning Under Uncertainty: A Preliminary Case Study of East Boston, Massachusetts



Introduction

The collaborative methodology will be tested and refined in the lower Border Street area of East Boston, Massachusetts. This is a peninsula mainly built on fill in Boston that is home to 40,000 people – many are low-income and recent immigrants. It is rapidly being redeveloped with major local concerns about the associated gentrification. It is also the location of Logan Airport, the major airport in the region. Shown in Figure 1 is the present land use in the area¹. Much of the coastal land except for Boston East Apartment Complex will be redeveloped over the next decade. Figure 2 shows present and future 1 % exceedance coastal flooding under a moderately high sea level rise scenario². This area is also a flood pathway into the interior of East Boston and will eventually lead to the flooding of parts of the subway and highway tunnel systems (important links to the rest of Boston) and other important residential and commercial areas. Figure 3 is a possible adaptation plan designed by local residents with the support of engineers and landscape architects¹.

The objective of the proposed research is to advance adaptation science and climate justice by developing and piloting an analytical methodology using the Dynamic Adaptive Policy Pathways (DAPP) approach. The proposed methodology seeks to identify design options for equitable land use and development and associated adaptation planning in the vulnerable coastal community of Border Street in East Boston that are mutually acceptable to heterogeneous stakeholders and are robust to uncertainties in both sea level and the performance of flood protection infrastructure.

Figure 4 shows a basic framework of the DAPP approach³. The role of nature-based solutions in adaptation will also be included. This poster represents the preliminary outline of our proposed research, which will also be the topic of my PhD thesis.









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Methodology

Our proposed methodology uses measurable thresholds for social and economic benefits of adaptation strategies such as reduction in flood depth, number of people protected based on income rages of residents and building damages among other values to conduct a multi-criteria analysis of the various adaptation pathways. With this information, it is possible to evaluate the performances of development and adaptation options and use them in a collaborative process to seek plans that mutually satisfy the competing needs and values of the heterogeneous set of stakeholders. In addition, though the appeal of nature-based solutions for climate change adaptation is widely acknowledged, there is great uncertainty regarding their performance. Therefore, we will model the performance of all flood protection infrastructure (naturebased and gray) probabilistically and combine those uncertainties with climate change and other uncertainties in a hierarchical, holistic treatment of risk.

Next Steps

We will use the adaptation pathways approach to conduct a cost and benefit analysis of each step of multiple pathways. Figure 5 shows the various adaptation options for Border St. for RCP 2.6 and RCP 8.5 along with their adaptation tipping points, i.e., the point at which these strategies will fail. This was made using the Pathways Generator created by Deltares⁴. The strategies include: doing nothing, flood proofing buildings, and building nature-based solutions of 4 feet and 7 feet. The combination of these actions forms several pathways that could be chosen. The performance of each of the actions and pathways will be assessed in light of the defined objectives to determine its adaptation tipping point. The aim will be to determine the first step that needs to be taken for minimizing the maximum regret that could occur after the first action is taken.

Flood Proof Buildings
Do Nothing
4 ft NBS
7 ft NBS
Feet of SLR
RCP 2.6
RCP 8.5

- 2. Woods Hole Group







References

l. Neighborhood of Affordable Housing (NOAH), Boston

3. Haasnoot, Marjolijn et al. "Dynamic Adaptive Policy Pathways: A Method for Crafting Robust Decisions for a Deeply Uncertain World." Global environmental change 23.2 (2013): 485–498. Web.

4. Deltares. (2015). Pathways Generator.