Modeling Land Market Responses to Climate Change in the Coastal Zone

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Introduction

Regional land use patterns influence and are influenced by the climate system in important ways, and the most economically important of these interactions take place in the region's coastal zone.

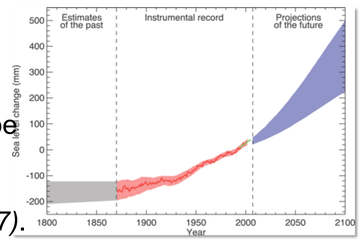
Changing flood risks threaten the value of billions of dollars worth of coastal real estate as well as the viability of coastal communities. We are examining the adaptive responses of real estate markets and municipal governments to sea level rise and changing patterns of flooding.

We are developing a conceptual, agent-based model that simulates the relevant local economic and political decision processes. Later, we will calibrate and validate the model using the case study data. After that, we will develop a basis for scaling the modeling effort up to the regional level.

Sea-Level Rise

•Sea-level rise caused by Global Climate Change creates a displacement of the shoreline at all coastal margins, including those on the barrier islands, the bay sides, and the mainland.

•In 2007, the IPCC estimated the projected median sea-level rise to be on the order of 0.6 to 1.2 meters in the next 100 years *(Bindoff, et al., 2007)*.

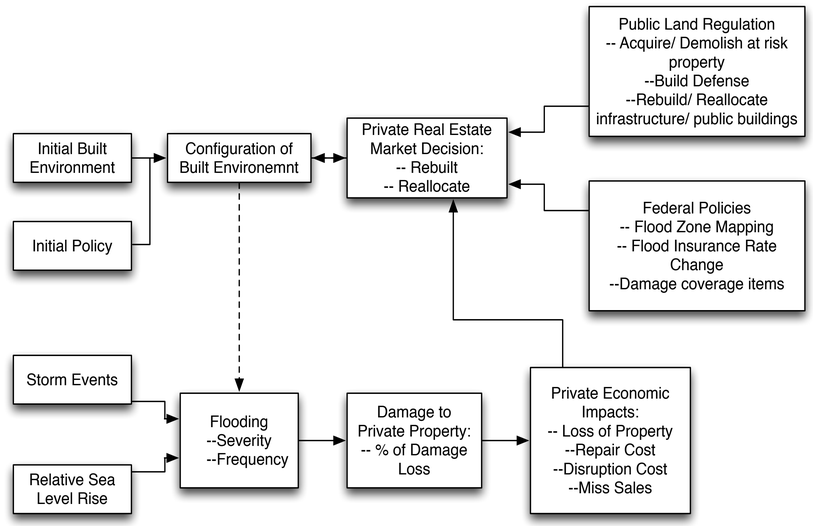


Predicted range of sea-level rise in IPCC report (Bindoff, *et al., 2007).*

•The historic rates of median sea-level rise along the New Jersey coast range from 3-4 mm/yr. Projected rates are expected to increase to 6mm/yr.

•As sea level rises, the effects of storms produce greater inundations and are able to reach farther inland. Smaller storms, which were of little concern before, now reach levels and locations which were attained rarely in the past. (Psuty and Silveira, 2007)

Research Scope



Conceptual Agent-Based Modeling

We use an agent-based model to simulate how local real estate markets respond to flooding events and how local governments choose adaptive actions.

Initial Model

- Start with Empty town: No house, No residents.
- One side of the town is ocean. The landscape is like a slope.
- Use "Elevation" to represent the land Style.

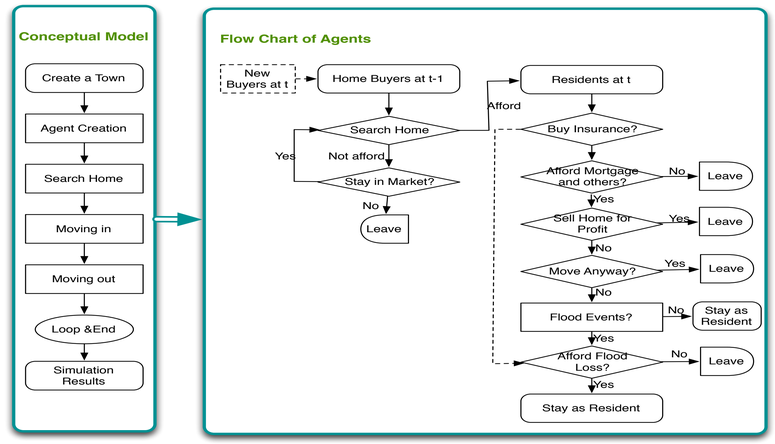
Agents

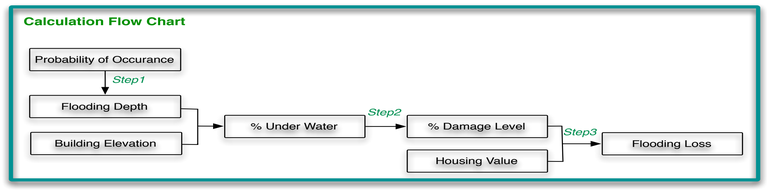
- Types: "Home seekers" and "Residents".
- Moving In and Move Out Rules:

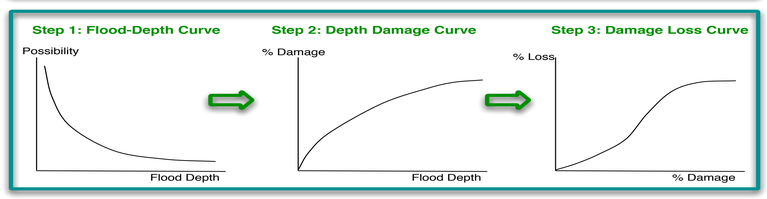
Houses

- Only consider residential buildings, no commercial or public buildings
- All the houses are the same type, size and quality.
- Set average "lifetime" for houses (e.g. 70 years), all house will demolish within lifetime ± 10 years.

Model Framework







Future Scenario Analysis

S1: Free Market Scenario: only home seekers who have "Risk Full Sight" will consider flooding risk in their utility function.

S2: Government Required Scenario: flooding risk is required in the 100 year flooding zone.

S3: Insurance Coverage Rate Scenario: flooding insurance may not cover all the flooding losses. Eg: for damage over 50%, FEMA only pay 80% of the flooding loss;

S4: Insurance Cap Scenario: existing insurance policy has a flooding risk up limit (about $250,000).

REFERENCES & ACKNOWLEDGEMENT

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