GIS Modeling of Sea Level Rise Policies

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Coastal boundaries are in frequent contention due to increasing population and rising land values while the coastal zone is exposed to increased risks such as storm surge, sea level rise, and increased weather events.

My goal is to create a GIS model to simulate the land area and economic losses in three scenarios which counties can use to make better policy choices.

Study Area

The study areas were selected to highlight two different types of Florida in terms of deveoplment, terrain and problems facing the community.

Key West amd Pinellas, FL

Methodology

A raster/vector GIS hybrid was created, primarily using Model Builder with integrated Python scripts to simulate the relative differences in three policy scenarios in two large-scale study areas.

Armoring: residents are allowed to armor their properties with status quo subsidies

Armoring Prohibition: residents are not allowed to armor their properties

Rolling Easements: residents not allowed to hold back the sea but will be compensated similar to a conservation easement

All of the data used in this study is publicly available.



County population data from Monroe county, FL_PDF

Monroe county, FL_PDF

Innundation Scenerios

Digital elevation model (DEM) of Key West, FL



Key West is very susceptible to SLR and once it begins, there is very little time to react. Therefore, armoring is only short-term solution and may lead to a a false sense of security.

Pinellas is more resilient to SLR because of the higher beach elevations and larger parcel values so substantial changes to the coastline occur much farther into the future than Key Therefore, rolling easements is a good solution since the county has time to implement the changes.

Future Work

The model is being continually improved using more accurate data and more complex algorithms to better simulate the coastal environment. The next version will predict property values using ranges for the different variables instead of a single number, such as the value per-meter of beach. Another important change will be modeling "buy-in" percentages of citizens in the rolling easements scenarios. Finally, storm surge and flooding are serious short-term issues which are also being considered.

Results

Armoring



New Property Value

Armoring Prohibition

Rolling Easements









