Impact of Sea Level Rise and Coastal Flooding on Road Infrastructure in Charlestown and South Kingstown, RI: Incentives For Road Abandonment

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Introduction

In recent years, storms and flood-related events have caused major infrastructural and economic losses along the Atlantic coastline. In the aftermath of Hurricane Sandy in 2012, FEMA paid over $35.8 million to flood insurance policy holders in Rhode Island alone. The RI government has also devoted millions of dollars to repairing roadways and utilities. According to a 2013 study from the University of Rhode Island, the state should anticipate a 3- to 5-ft. rise in its sea level by 2100. Therefore, RI should explore policies for addressing sea level rise (SLR) and discouraging development of private property in flood-prone zones. A possible solution is for the government to establish policies limiting road repairs in the most flood-prone areas. A road abandonment policy would incentivize smarter coastal development while preserving valuable state funds.

Questions

- To what extent are publically-owned roads in Charlestown and South Kingstown, RI projected to be inundated by flooding in the next 100 years?
- How much does the amount of inundated road change between 1-ft., 3-ft., and 5-ft. of SLR?
- Is the amount of road inundated in a model using FEMA Flood Insurance Rate Maps (FIRMs) more or less than the amount of road inundated in a model using 1-ft., 3-ft., and 5-ft. SLR projections?

Methodology

In order to address the feasibility of road abandonment, this project focuses on RI towns that experience flooding and are not major tourist centers. The map above highlights Charlestown and South Kingstown in Washington County, RI.

- **Charlestown:** According to the 2010 Census, Charlestown has about 7,800 residents, but 32 percent of the homes are registered for “seasonal, recreational, or occasional use.” Using state money to repair roads only used by wealthy homeowners is not the most equitable use of resources.
- **South Kingstown:** With over 30,000 residents, South Kingstown is the largest incorporated town in RI. Many coastal residents were subject to a mandatory evacuation during Hurricane Sandy; the storm swept away multiple homes and left 5 feet of sand in many of the main roads.

VE Zone: An Alternative Model to the SLR

FEMA assigns flood insurance rates based on Flood Insurance Rate Maps (FIRMs). In FIRMS, Special Flood Hazard Areas (SFHAs) are where homeowners have an annual flood risk of 1 percent or more. The VE zone represents “areas subject to inundation by the 1 percent-annual-chance flood event with additional hazards due to storm-induced velocity wave action” (FEMA website). Homeowners in this area are required to buy flood insurance.

SLRS: Predicting Roads’ Future Flood Vulnerability

ArcScene map of the Charlestown and South Kingstown coastline and public roads. The pictured area’s low elevation (all land is < 50 ft. above SL) increases flood vulnerability.

Conclusion

According to the data, the proportion of public roads impacted by a 1-ft. SLR is extremely small. In contrast, a 3- to 5-ft. SLR would impact a large amount of public roads that lead to private homes. The state of RI should investigate which roads have required the most state funds to repair damage from flooding; if an abandonment policy is drafted, these roads could be used to test the policy. In terms of measuring flood vulnerability, there is a noticeable difference in the amount of inundated roads in an SLR model versus a VE model. The model of a 5 ft. SLR projects an inundation of almost twice as many feet of public roadway (~38,000 ft. versus 66,000 feet). RI should note that FIRMs often do not fully reflect road inundation risks, and should consider favoring SLRs in assessments of road vulnerability to inundation.

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