

# Modeling the extent of future storm surge inundation under two sea level rise scenarios

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## 1. Introduction

Storm surge is increasingly recognized as a threat to coastal populations and infrastructure (Zachry et al 2015). Projected sea level rise (SLR) will increase the impact of storm surges (Tebaldi et al 2012). Stakeholders in an urban land use change modeling project expressed a desire to include the combined effects of storm surge and SLR, however, datasets are limited in availability and modeled scenarios.

## 2. Research Questions

How will 0.6m and 1.8m of SLR change storm surge inundation extent?

How much urban land in 2070 is threatened by storm surge under the SLR scenarios?

## 3. Methods

Merged SLOSH (Sea, Lake, and Overland Surges from Hurricanes) basins: New York, Delaware Bay, and Chesapeake Bay

- limited to high resolution features
- removed low-accuracy features near basin boundaries to minimize overlap

Created 9 storm surge-SLR surfaces:  
[Cat 1, Cat 2, Cat 4] × [0.0m, 0.6m, 1.8m SLR]

- worst-case scenario: high tide, Maximum of the Maximum Envelope of High Water values
- extended storm surge surface inland using Ordinary Kriging interpolation
- Added SLR to interpolated surface

Calculated inundation extent

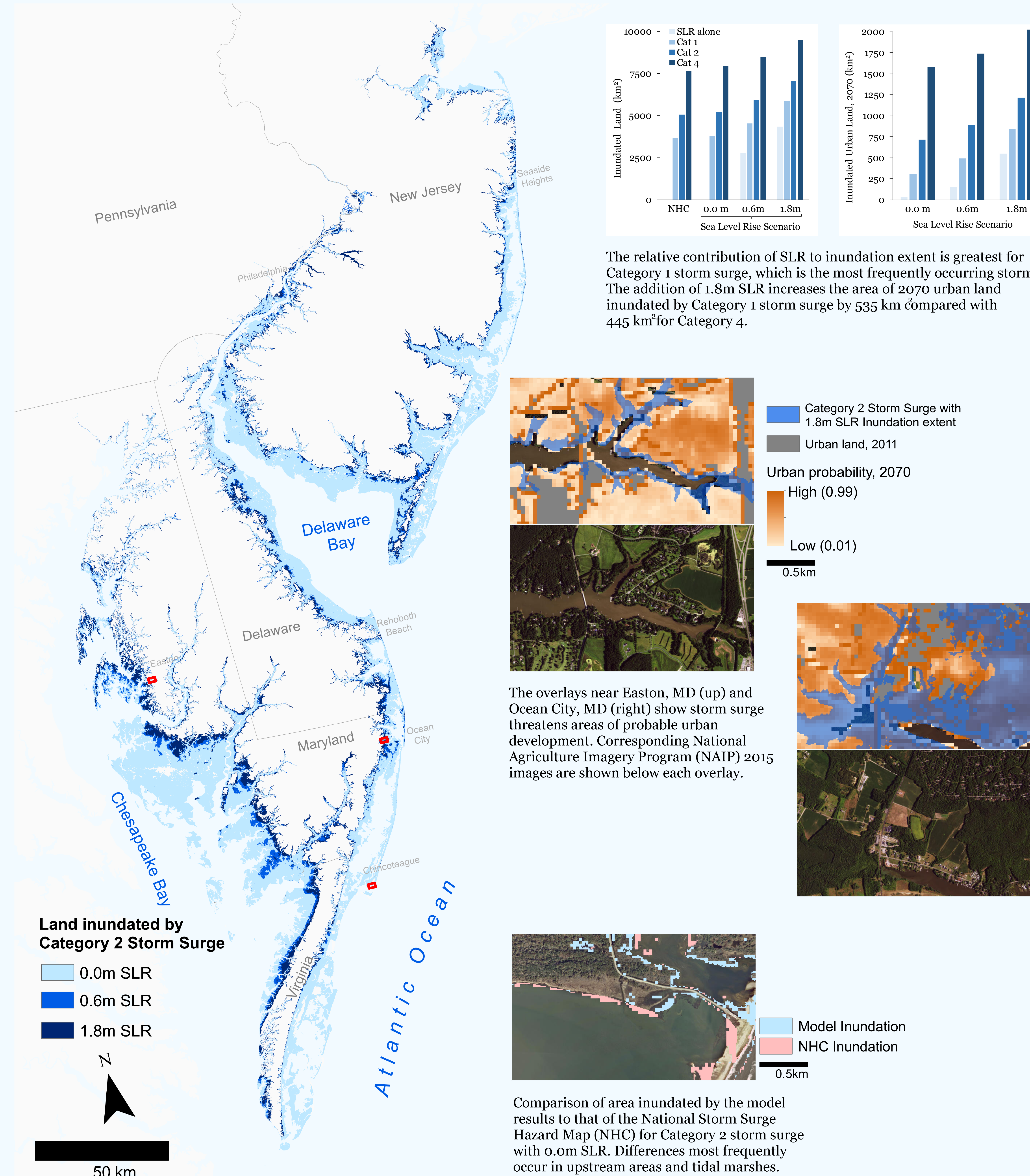
- evaluated inundation areas for connectivity and typically dry land
- retained high confidence (>95%) inundation areas using Equation 1 (NOAA CSC 2010)

$$Z(x,y) = \frac{Inundation(x,y) - Elevation(x,y)}{(RMSE_{elevation}^2 + RMSE_{tidal\ surface}^2)^{0.5}} \quad (1)$$

- compared 0.0m SLR scenario results to the National Storm Surge Hazard Map (NHC) (Zachry et al 2015)

Intersected predicted urban area in 2070 with storm surge-SLR surfaces

## 4. Results



## 5. Discussion

Future storm surge inundation is a substantial threat to coastal areas

- 20% of urban land in 2070 is threatened by Cat 4 storm surge and 1.8m SLR
- 33% of present-day dry land is inundated by Cat 4 storm surge and 1.8m SLR

Total area of modeled inundation agrees with NHC product but differs spatially

Cat 2, 1.8m SLR raster will be used as an exclusion layer in an urban land change model

Storm surge-SLR rasters will be made available as a stand-alone product via the Pennsylvania Spatial Data Access (PASDA) portal

- increases the number of options available to regional planners performing initial assessments of future storm surge inundation scenarios

## References

NOAA Coastal Services Center. 2010. Mapping Inundation Uncertainty.  
Tebaldi C, Strauss B, Zervas C. 2012. Modelling sea level rise impacts on storm surge along US coasts. *Environ. Res. Lett.* 7  
Zachry B, Booth W, Rhome J, Sharon T. 2015. A national view of storm surge risk and inundation. *Weather, Climate, and Society* 7

## Further Information

For more information on the urban land change model or the DRB Project, please attend one of the CLUS presentations in symposium S04. Land-change modeling applied to planning and resource management, or visit our website <http://drbproject.org/>

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