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ODU Researchers Attempt to Forecast Flood Impacts in Real Dollars

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Rising sea levels are a challenge for Virginia today, with nuisance flooding becoming more frequent and the threat of damage from coastal storms becoming more acute.

But how much more acute? And what would it cost the commonwealth and residents of Southeastern Virginia?

Old Dominion University researchers in two disciplines are teaming up to try to make this estimate.

ODU is one of the founding institutions of the Commonwealth Center for Recurrent Flooding Resiliency (CCRFR). Its partners conduct research, provide training and offer policy guidance on recurrent flooding resilience.

CCRFR is funding a study taking flood forecasts produced by ODU's Center for Geospatial Science, Education, and Analytics, and attempting to calculate - in real dollars - the increased costs the region and the commonwealth will face from violent coastal storms. For that expertise, CCRFR has tasked economists from ODU's Dragas Center for Economic Analysis and Policy.

The report, which will be released this fall, will attempt to provide the first empirical forecast of the true cost of coastal flooding - and the potential for exponential increases in those costs by the end of the century.

The Center for Geospatial Science, Education, and Analytics has modeled what sea levels will look like in different intervals throughout the state, in 2040, 2060 and 2080. While exact estimates of sea level rise vary slightly throughout coastal Virginia, owing largely to differences in elevation and offshore water depths, most communities are expected to experience approximately 1.5 feet, 3 feet and 4.5 feet of rise by 2040, 2060, and 2080, respectively.

Those forecasts estimate what the baseline sea level will be and therefore where the future high tide line will be. "They do not include tropical storm events, but do consider moderate storms and the larger 100-year storms and 500-year storms," said Center Director George McLeod. "Our modeling took the 'sunny day' high tide forecast and added storm surge for these different storm levels."

That's where the Dragas Center economic researchers come in.



The report, which will be released this fall, will attempt to provide the first empirical forecast of the true cost of coastal flooding - and the potential for exponential increases in those costs by the end of the century.

Bob McNab, ODU professor of economics and Dragas Center director, said the "slow-moving" impact of sea level rise is a hard concept for citizens to grasp. "But these economic costs accumulate over time, and our work is throwing a spotlight on the costs of unmitigated flooding," McNab said.

However, the ground-level inundation maps that McLeod's team produces are an ideal canvas for economic impact analysis, down to the neighborhood level. "We take their work and ask 'What are the direct economic consequences? What are the total losses associated with each scenario in the future?'" McNab said. The researchers say that direct impact is only the starting point. The indirect impacts of flood damages (or any negative event) can far exceed that direct harm.

"For example, if flooding causes \$1 million in physical damages, these damages ripple throughout a community. Businesses don't buy as many supplies, employees don't earn as much, and, as a result, economic activity goes down by more than \$1 million," McNab said. It is estimated that every dollar of coastal storm damage results in a dollar or more of additional financial impact to the community.

The challenge is to express the direct and indirect impacts of a coastal storm in 2021 dollars if the storm occurs decades in the future. That demonstrates the value of accurate sea level rise forecast maps.

McLeod said these economic impact forecasts are not being prepared to be alarmist. Instead, they can be a decision-making tool in planning local communities.

"When you look at how massive the regionwide numbers are that the models generate, the problem seems nearly insurmountable. Clearly there will need to be adaptation and mitigation for all coastal communities," McLeod said. "The great utility of the information derived from our flood modeling is that it allows us to examine the problem at the neighborhood scale, where we can most effectively evaluate the costs and benefits of protection measures and mitigation strategies."

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