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A Picture is Worth a Thousand Roads

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The Hampton Roads region is experiencing the nation's second highest rate of relative sea level rise.

Exacerbated by climate change, the intensity and frequency of storms is expected to increase, making the region even more susceptible to coastal flooding. With the help of two separate U.S. Department of Transportation (DOT) grants, totaling nearly $300,000, Old Dominion University researchers hope to at least ease transportation problems by using real-time and historical modeling as well as image data.

Mecit Cetin

Led by Mecit Cetin, associate professor in civil and environmental engineering and director of the Transportation Research Institute; and Navid Tahvildari, assistant professor of civil and environmental engineering, researchers are creating advanced systems to model, monitor and record road inundations due to recurrent flooding.

The first grant, worth $108,000 for ODU and an additional $42,000 for University of Virginia (UVA) co-collaborators, will help Cetin and his team leverage new and existing surveillance equipment to collect, archive and automatically analyze inundation levels on a large scale.

"If this technology works the way we hope it will, it can be integrated into existing travel information systems, such as Google Maps or Waze," Cetin explained. "Measuring everything from location to how deep the water is, we can help citizens avoid these areas and aid emergency vehicles in rerouting."

Khan Iftekharuddin

The team, which also includes co-principal investigator, Khan Iftekharuddin, associate dean for research in the Batten College of Engineering and Technology, plans to build on their research in the future so that crowdsourced data (images from smartphones and social media) may also be processed automatically. Such systems can eventually be developed for any large-scale urban and rural transportation network to provide real-time, as well as archived, data for road inundations.

Navid Tahvildari

The second grant, worth nearly $67,000 for ODU and an additional $83,000 for collaborators at UVA and Virginia Tech, aims to employ state-of-the-art hydrodynamic and hydrologic models to study the impacts of sea-level rise on transportation infrastructure in flood-prone areas of Norfolk. An objective of the study is to improve inundation estimates and account for the effect of sea-level rise and storm surge on shoreline erosion.

The inundation estimates will then be used in transportation models to assess impacts on rerouting of emergency vehicles and positioning of mobile medical assets. The research team plans to extend this work in the future to include socioeconomic impacts of sea-level rise and recurrent flooding.

"These grants are very timely and relevant to ODU's research priority on sea-level rise, resiliency, and flooding," says Stephanie Adams, dean of the Batten College of Engineering and Technology. "To say that this work is important for the City of Norfolk, the region and even the nation, cannot be overstated. The College of Engineering at ODU is committed to taking an ongoing leadership role in this important work."

According to a recent report by the National Oceanic and Atmospheric Administration (NOAA), flooding caused by sea level rise is increasing along much of the east coast at a rate that projects that the majority of US coastal cities will experience recurrent flooding thirty or more days per year by 2050.