Study calls for flexible, multi-step approach to deal with flood risk

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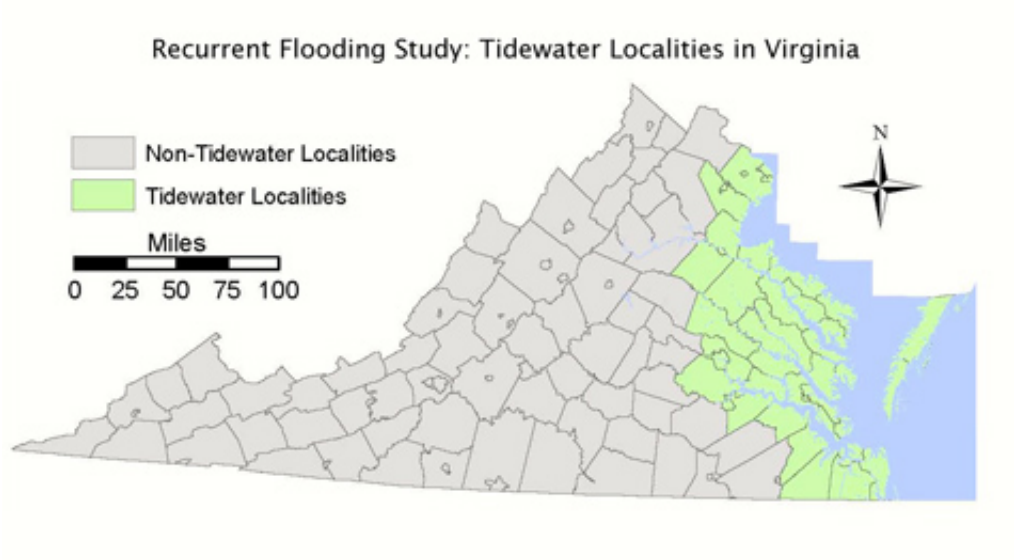

The VIMS coastal flooding study focuses on localities in Tidewater Virginia and the Eastern Shore.

(Phys.org)—Recurrent coastal flooding—think Isabel, Ernesto, Irene, Sandy, the "Son of Ida," and numerous other unnamed nor'easters—is a significant and growing threat to the people and places of Tidewater Virginia.

A new report from the Virginia Institute of Marine Science, College of William and Mary, lays out a detailed plan for how the Commonwealth can best respond to the ongoing challenges that high tides, storm surge,

intense rain storms, sinking land, and rising sea level pose to residents and localities along Virginia's Chesapeake Bay and Atlantic shorelines.

The authors of the report—which was called for by a joint resolution of Virginia's House and Senate in 2012—presented the 135-page document to legislators today for consideration during the General Assembly's 2013 session.

The report makes clear that no single response will fully address the complex web of social, legal, and environmental issues that contribute to Tidewater's vulnerability to coastal flooding. Instead, it calls for a multi-step approach with enough flexibility to allow policymakers to adapt as conditions change and knowledge grows. It also says the time for action is now.

The report—"Recurrent Flooding Study for Tidewater Virginia"—is the result of a yearlong effort by researchers in VIMS' Center for Coastal Resources Management. The study was led by Molly Mitchell and CCRM Director Carl Hershner, with input from an advisory panel that included colleagues at VIMS, Old Dominion University, the W&M Coastal Policy Clinic, the Hampton Roads Planning District Commission, the Accomack-Northampton Planning District Commission, Wetlands Watch, relevant state agencies, as well as cities and counties throughout eastern Virginia.

The study's authors collected data and analyses from agencies at the local, state, and federal levels, as well as from non-governmental organizations and regional authorities such as the Chesapeake Bay Program. They also reviewed a comprehensive list of strategies used in other vulnerable areas around the U.S. and world, including New Orleans, the Netherlands, the United Kingdom, Japan, and other smaller Pacific islands.

Findings and recommendations

"Recurrent flooding is already a significant issue in Virginia's coastal zone, and is predicted to become even worse over reasonable planning horizons," says Mitchell. "Our review of strategies already being used in other vulnerable areas suggests that the Commonwealth can mount an effective response to its increasing flood risk, but that we must start now, as it will take 20 to 30 years to effectively plan and implement many of the adaptive measures."

Hershner says the optimal strategy will be "to develop flexible plans that match adaptation options to the unique circumstances of each coastal locality, and that link the implementation of those options to the changing risks."

Adaptation options and strategies

The report breaks potential adaptation options into three main categories: management, accommodation, and protection. Management includes zoning policies aimed at discouraging development or rebuilding in high-risk areas, and the reclamation of flood-prone lands. Accommodation—currently the most common approach in Virginia—includes raising buildings and roads, establishing evacuation routes and warning systems, and creating or enhancing storm-water systems. Protection measures include levees, seawalls, and tidal gates, as well as "soft-engineering" structures such as living shorelines and created marshes.

The report notes that no single adaptation strategy (other than abandonment) completely removes the risk of flood damage, and thus urges the use of "multi-level adaptation strategies," arguing that this approach would allow the Commonwealth to "decide on priorities and

then 'buy-down' the remaining risk using other options."

This approach can be visualized as a staircase, says Mitchell, with each step raising a locality's resilience to its particular flooding risk.

"In highly developed areas, a storm-surge barrier such as a levee might be the initial adaptation," says Mitchell, "with subsequent steps to elevate structures and invest in emergency management. Each step would reduce risk to some extent, together resulting in lower risk than any single measure."

"In more rural areas," says Hershner, "the initial step might be to regulate new development to keep it away from floodplains, with additional steps to develop an early warning system and a detailed evacuation plan."

They note that combining "hard" infrastructure, like a levee, with "soft" infrastructure, like a created marsh, can protect while adding to the quality of life for local residents. "Created marshes, nourished beaches, and other open spaces can beautify and contribute recreational and economic value while still providing flood protection," says Mitchell.

In sum, the authors note, "Two of the most important lessons that can be learned from a review of global adaptation strategies are that a multi-layered approach to flood prevention is most effective and that when predictions of the future are uncertain, flexible plans for adaptation are imperative."

"The challenge in picking the right time horizon," says Hershner, "is to be sufficiently long-sighted to prevent future problems, but still flexible enough to react as knowledge and circumstances change."

Budgetary, legal and technical issues

In terms of funding the planning and implementation activities needed to reduce Virginia's coastal flooding risk, the report recommends state authorization and support, with cost-benefit studies to help prioritize projects.

"We encourage local cost-benefit studies followed by state prioritization of different strategies," says Hershner. "Questions of state versus local funding should be included as part of the economic analyses."

The report also recommends that the Commonwealth should "request an expert review of local government legal authority to address current and projected flooding risks and what levels of evidence are likely to be required to justify locality action."

Hershner says this recommendation is based on concerns with Virginia's Dillon Rule, which holds that localities only have the authorities specifically given to them by the state.

"The Dillon Rule becomes a significant factor when looking at how local governments can respond to sea-level rise," says Hershner. " As localities attempt to change development patterns through zoning and building codes, their actions may be subject to a constitutional challenge under the Dillon Rule. After expert review, we recommend that the State should enact any enabling authority needed to allow localities to address current and projected flooding issues."

A second concern is that all but one of the agencies involved in planning for sea-level rise currently use past conditions to predict the future—and thus cannot incorporate the growing evidence that the rate of sea-level rise is increasing.

"This is like driving by looking in your rear-view mirror," says Hershner. "With the exception of the U.S. Army Corps of Engineers, all of the

statutes and regulations rely on a retrospective analysis of flooding and sea-level rise. FEMA's 100-year floodplains, rates of shoreline recession under the primary dune regulations, and all of the other regulatory analyses don't anticipate future conditions. Until these statutes and regulations become prospective and look to future conditions, they are of little use in adapting to coastal flooding and sea-level rise."

The report includes numerous maps showing areas of potential flooding in light of sea-level rise. The maps assume a 1.5-foot rise in sea level and a 3-foot storm surge. These represent moderate assumptions, with the value of sea-level rise well within the range of the best available forecasts for Virginia over the next 20 to 50 years.

One way to make these maps more accurate, say the report authors, is to continue to update existing coastal elevation maps using LIDAR, a high-resolution mapping technique that uses laser light to gauge ground elevation.

"LIDAR data allow for more precise estimations of elevation," says Mitchell, "That helps us better visualize the flooding risk, and improve the predictive capability of models."

More information: leg2.state.va.us/dls/h&sdocs.n … 0531e82?OpenDocument

Provided by The College of William & Mary

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