

Issue: VA Sea-Level Rise

Virginia Underwater

Sea-Level Rise in Virginia

Virginia is experiencing the highest rate of sea-level rise on the East Coast and one of the highest rates in the U.S. overall.¹ Flooding from sea-level rise is projected to cause billions of dollars in damage and displace hundreds of thousands of people. As of 2005, Virginia Beach ranked number 10 among cities in the world for value of assets at risk.² Norfolk ranks number 16 among cities in the U.S. for population at risk of flooding by 2050.³ By 2100, 38 communities in Virginia will face chronic inundation—flooding of 10 percent or more of its land area an average of 26 times per year (every other week).⁴

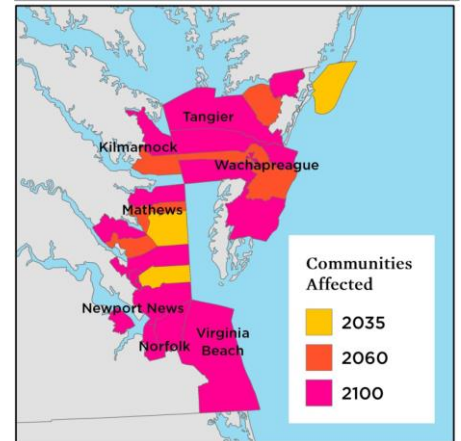


FIGURE 1. Virginia communities facing chronic inundation in the intermediate scenario. <https://www.ucsusa.org/sites/default/files/attach/2017/07/when-rising-seas-hit-home-virginia-fact-sheet.pdf>

Causes

Climate change is the major cause of sea-level rise. Burning fossil fuels (coal, oil, gas) causes global warming. Rising temperatures cause the ocean to swell because water expands when heated. Higher temperatures melt glaciers, ice sheets, and ice caps, thereby adding more water to the ocean. Because the rise in temperature has slowed the Gulf Stream, the ocean current is not moving water away from the coast as quickly.⁵

Land subsidence (the sinking of land surface) also contributes to sea-level rise. Most of Virginia’s land subsidence is due to the extraction of underground water. When groundwater is pumped out of the underground aquifer system, the pressure within the aquifer decreases, the aquifer compacts, and the land sinks. Land subsidence not only causes coastal flooding, but can also alter the flow of rivers, thereby causing flooding in low-lying inland areas, such as the Blackwater River Basin of Virginia. Sinking land can also damage infrastructure (roads, pipes, sewers, power lines, etc.) and harm coastal ecosystems.⁶

As the sea level rises, the tides claim more and more of the coastal land. To make matters worse, climate change seems to be increasing the frequency of hurricanes, and higher sea levels will amplify the storm surge during hurricanes, resulting in more severe flooding.⁷

Forecasts

Scientists have generated a range of sea-level rise predictions based on natural variables and possible human responses to climate change. In a 2013 report, the Virginia Institute of Marine Science (VIMS) at The College of William and Mary forecasted four possible amounts by which ocean waters along the Virginia Coast would rise by the year 2100⁸:

1. Historic—1.5 feet
(Does not account for the accelerated rate of sea-level rise due to climate change)
2. Low—3 feet
(Assumes large-scale reductions in greenhouse gas emissions per the international climate change agreement negotiated in Paris in 2015; however, the current administration has withdrawn the U.S. from that agreement)
3. High—5.5 feet
(Assumes that countries will continue emitting greenhouse gases at current rates)
4. Highest—7.5 feet
(Combines global warming with maximum ice sheet loss and glacial melting)

VIMS recommended planning for a 1.5-foot rise by 2050.

However, accounting for the most recent scientific research on glacier and ice-cap melting, the National Oceanic and Atmospheric Administration has updated the data on which the VIMS report was based. Combining regional factors (such as land subsidence and ocean currents) with the recent ice-melt data, the NOAA forecasts the following range of sea-level rise scenarios in Virginia by 2100⁹:

1. Low—1.75 feet
2. Intermediate—4.38 feet
3. High—9.2 feet
4. Extreme—11.24 feet

Consequences

Sea-level rise will cause permanent flooding, amplified storm surge, shoreline erosion, and saltwater intrusion.¹⁰ Flooding will harm the state of Virginia in a multitude of ways¹¹:

1. **Loss of homes**—A total of 115,000 residential properties worth \$31 billion are at risk. Those properties are home to 258,000 people, many of whom are lower-income families without the resources to relocate. As flooding becomes more frequent, home values will decrease until the property values are less than the mortgages. The cost of flood insurance will increase until homeowners cannot afford the premiums or the cost of repairing damages and making adaptations. Eventually residents will default on their mortgages, abandon their homes, and lose their major asset. Inland

cities will be affected as displaced coastal residents move into other communities and drive up prices in the real estate and rental markets.

2. **Costs to businesses**—A total of 3,000 commercial properties worth \$3 billion are at risk. Besides incurring costs from property damage, business owners will lose revenue when flooded roads prevent customers and clients from reaching stores and offices. Workers will lose income when they cannot reach their jobs.
3. **Costs to investors and banks**—When home and business owners default on loans because their property is subject to chronic flooding, the assets securing the bank loans will be worthless. Financial institutions will be unable to recoup the value of their investments.
4. **Loss of tax revenues**—State and local governments will lose property tax revenues as property values plummet and sales tax revenues as businesses are damaged.
5. **Harm to infrastructure**—Flooding will damage roads, power lines, communication systems, pipelines, and sewers. Saltwater could intrude into groundwater used for drinking and agriculture.
6. **Risk to public safety**—Flooded roads will prevent access to hospitals and to police and fire services. Flooding of refineries and waste disposal sites will expose the public to contaminants and dangerous toxins.
7. **Threat to national security**—Critical military installations are at risk. Hampton Roads includes Norfolk and Newport News, which have the second largest concentration of military bases in the U.S., including major Navy, Air Force, Army, Marine Corps, and Coast Guard facilities. Naval Station Norfolk is the largest naval base in the U.S., and the shipyard in Newport News is the only shipyard in the country that builds American aircraft carriers.
8. **Impact on local economy**—Port activity and the import/export industry are integral to the local economy and jobs. The beach industry contributes billions to the local economy. Forty-six percent of the local economy comes from Department of Defense spending, which would disappear if the military facilities had to be relocated.¹²
9. **Damage to coastal environment**—Chesapeake Bay is the largest estuary in the U.S. More than a dozen wildlife refuges would be affected, and hundreds of plants and animals, including endangered and threatened species, would be impacted.¹³
10. **Destruction of historical sites**—Jamestown and Colonial Williamsburg are threatened.¹⁴

Responses

Because the risks are increasingly imminent and recommended actions will take many years to implement, scientists warn that proactive steps must be taken now. Otherwise, communities will be reacting to flooding crises instead of solving the problems in advance.¹⁵ Crisis response is much more expensive than prevention. Investing in pre-disaster mitigation programs has a four-to-one payoff.¹⁶ Federal and state leadership is necessary because of the magnitude of funding required and because the flooding affects

large regions across jurisdictional boundaries.¹⁷ Small rural communities and vulnerable populations especially need help to make the necessary adaptations.¹⁸

Adaptation strategies fall into three categories¹⁹:

1. Protection—Build seawalls, tide gates, and levees. Large structural projects are costly and legally and logistically complicated. Furthermore, they are not long-term solutions. Hard structures wear out over time, and eventually the sea level will rise above the structures.
2. Accommodation—Make room for the influx of water and find ways to live with the rising tides. Elevating houses and roads, installing large-scale pump systems, and building channels along urban waterfronts are examples. Such projects are costly and have limited effectiveness.
3. Retreat—Relocate residents and businesses further inland. Retreat can be managed or unmanaged, voluntary or mandatory. Abandoning neighborhoods and commercial districts involves difficult social, emotional, and financial adjustments. Low-income populations may lack the resources to move and the ability to secure employment elsewhere. The loss of community ties, support networks, and cultural heritage will be painful. However, managed relocation can minimize the impact not only on those moving, but also on the communities to which the displaced relocate.

Recommended government policies for addressing sea-level rise²⁰:

1. Slow the pace of climate change by reducing carbon emissions from fossil fuels and by developing renewable energy, such as wind and solar.
2. Limit coastal development by adopting appropriate zoning regulations and by not building roads and other infrastructure that would support new development near the coast.
3. Update building codes and infrastructure plans to reflect sea-level rise projections.
4. Reform flood insurance policies so that premium prices reflect the actual risk and discourage investments in areas threatened by sea-level rise.
5. Reform federal aid programs to eliminate the incentive to rebuild after a disaster in risky areas.
6. Enhance emergency preparedness and emergency response/evacuation programs.
7. Fund a large-scale home buyout program.
8. Retreat from risk areas; invest in economic development and new infrastructure in safer locations where businesses and people can relocate.
9. Adopt policies to preserve natural ecosystems and protect cultural heritage sites.

Recommended steps to address land subsidence²¹:

1. Reduce the withdrawal of groundwater.
2. Pump groundwater in areas away from the coast.
3. Recharge the underground aquifer system.

Reducing greenhouse gas emissions is the best way to protect coastal communities from future sea-level rise. Adhering to the emission reduction levels of the Paris agreement and keeping the sea-level rise at the low scenario would spare 16 to 30 of the 38 Virginia communities at risk from chronic flooding²².

Republican Inaction

Republicans have repeatedly defeated bills designed to slow climate change. In fact, Republicans have introduced bills to actively obstruct efforts to limit fossil fuel emissions.

For several years, bi-partisan sponsors have introduced legislation that would have allowed Virginia to join the Regional Greenhouse Gas Initiative (RGGI), a group of nine East Coast states from Maine to Maryland that participate in a market-based cap-and-trade program to reduce carbon emissions. Member states set carbon caps (how many pollution allowances to offer for sale per year), and the states gradually lower the cap each year. Utilities purchase allowances for every ton of carbon pollution they emit. The revenue from the sale of allowances goes back to the states to fund climate change projects. In the bills introduced to the Virginia General Assembly, the revenue generated through membership in RGGI would have gone to coastal communities to help them adapt to sea-level rise, to programs for developing solar and wind power, to programs promoting energy efficiency, and to economically depressed communities in southwest Virginia for education and retraining of workers.²³

From the launch of RGGI in 2008 through the end of the third compliance period in 2017:

- RGGI member states have reduced carbon emissions by 40%.
- Electricity prices in RGGI states have decreased by 6.4%, while electricity prices in non-RGGI states have increased by 6.2%.
- RGGI states have reduced emissions by 15% more than non-RGGI states while experiencing 4.3% more economic growth than non-RGGI states.²⁴

By selling allowances (permits to emit carbon dioxide), RGGI states raise revenue that they then invest in energy efficiency and renewable energy programs. Energy efficiency reduces consumer bills and demand for power. Lower demand means fewer emissions and less money leaving the region to pay for imported fossil fuels. Lower bills mean consumers have more money to spend, which benefits regional businesses.²⁵ From 2008 to 2017, RGGI states have reaped a net economic gain of \$4.3 billion and 44,570 job-years of employment.²⁶

RGGI has also had a significant impact on public health. The economic value of the health and productivity benefits from reduced levels of such toxic pollutants as sulfur dioxide, nitrogen oxides, and mercury has been estimated at \$5.7 billion for the five-year period from 2009 to 2014.²⁷

Despite the effectiveness of RGGI and its many benefits, Republicans have defeated all legislation calling for Virginia to join RGGI.²⁸ In fact, in both 2018 and 2019, the

Republican-controlled House and Senate passed bills specifically forbidding the governor or any state agency from adopting regulations for trading carbon allowances in the RGGI market. The Democratic governor vetoed the 2018 bill; the 2019 bill is expected to meet the same fate.²⁹

Republican state legislators also attempted to block the implementation of the federal Clean Power Plan (Environmental Protection Agency regulations to limit carbon pollution from power plants). In 2015 Republicans introduced into the Virginia General Assembly nine bills attacking the Clean Power Plan; all but one failed.³⁰

In 2016 the Republican-controlled legislature created the Virginia Shoreline Resiliency Fund, which established a low-interest loan program for residents and businesses needing to rebuild after flood damage.³¹ However, more than two years later, no funds have been allocated to this program.³²

Democratic Action

With both houses of the Virginia General Assembly controlled by Republicans, the Democratic executive branch has had to initiate action addressing climate change. In 2016, then Democratic Governor Terry McAuliffe initiated Clean Energy Virginia, a state-level version of the federal Clean Power Plan. He issued Executive Order 57 directing Virginia's Secretary of Natural Resources to formulate recommendations for reducing carbon emissions from electric power utilities and for developing clean energy. In 2017 he issued Executive Order 11 ordering the director of the Virginia Department of Environmental Quality (DEQ) to develop carbon emission regulations based on those recommendations and participation in a multi-state cap-and-trade program.³³

Current Democratic Governor Ralph Northam has continued the work of McAuliffe's executive orders. To that end, the State Pollution Control Board (under the authority of DEQ) drafted new regulations limiting carbon emissions from fossil fuel plants. Because formal membership in RGGI requires an act of the legislature, the regulations can only "link" Virginia to the RGGI cap-and-trade market. The utilities will get their carbon allowances from DEQ for free. The utilities then sell those pollution permits in the RGGI market, buy back what they need, and keep any profits. If the legislature would allow Virginia to join RGGI formally, DEQ would be able to sell the permits to the utilities and use the revenues for coastal adaptation and clean energy purposes.³⁴

Northam also issued Executive Order 24 to help local governments plan for flood protection. The order creates a Virginia Coastal Resilience Master Plan and provides technical assistance for planning, zoning, and funding pre-disaster mitigation measures.³⁵

A bit of bipartisan progress has been made since the 2017 election changed the composition of the House of Delegates from 66 Republicans and 34 Democrats to an almost even split with 51 Republicans and 49 Democrats.³⁶ In 2018 the state enacted legislation providing for investment in energy efficiency programs, clean energy projects (wind and solar), and

modernization of the electrical grid.³⁷ In addition, the legislature created the position of Special Assistant to the Governor for Coastal Adaptation and Protection, a cabinet-level position responsible for developing a statewide coastal flooding and adaptation strategy³⁸.

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