

The Effects of Sea Level Rise on South Carolina

Warming temperatures are threatening South Carolina's coastlines. According to the Intergovernmental Panel on Climate Change (IPCC), global sea levels are predicted to rise between 0.6 and 24 inches within the next century.¹ Sea level rise is caused by expanding ocean water and melting glaciers, which threaten habitats and wildlife, erode beaches and increase flooding. Warmer temperatures from global warming also increase the intensity of storms. According to the U. S. Environmental Protection Agency (EPA), 20th century rates of erosion in South Carolina and adjacent coastal regions varied from 2.4 millimeters to 4.4. millimeters per year, totaling about a foot over the century. In the future, it is almost certain that coastal headlands, spits and barrier islands will erode faster than they have in the past.² As a result, South Carolinians will feel the economic burden of additional conservation measures required to preserve beaches and coastal properties.³

Miles of Coastline at Stake

With 2,876 miles of coastline, South Carolina is particularly vulnerable to sea level rise. There is a pressing need for structures such as dikes to offset beach erosion and storm damage. Hurricane Hugo in 1989 cost North and South Carolina \$7 billion in damage to coastal property, and total cost of property damage is expected to rise as coastal populations grow. South Carolina was one of the first states to implement "rolling easements" requiring structures to be removed or situated further inland, if they are threatened by the rising shoreline⁴

Wetter Wetlands

Coastal wetlands are at risk of erosion from sea level rise because of their proximity to the high water line. As water levels rise, present wetland ecosystems will become open water and low-lying inland areas will become wetlands. The increasing need to manage sea level rises with man-made barriers such as dikes, however, will leave less coastland available for wetlands to form.⁵ As species inhabiting wetlands or using them as breeding grounds are forced to migrate to other areas, their populations could potentially fall.

South Carolina is fortunate to have coastal ecosystems that provide valuable habitat for endangered and threatened species such as the American alligator, Bachman's warbler, brown pelican, loggerhead sea turtles, piping plovers, red-cockaded woodpeckers, shortnose sturgeon and wood storks. Sea level rise under a changing climate could threaten many low-lying coastal ecosystems and the species that inhabit them.⁶

The Cost

According to the U.S. Global Change Research Program, a one-foot rise in sea level could erode a 100–200 foot swath of South Carolina's coastline.⁷ To protect developed coastal areas from encroaching sea levels, more man-made structures such as bulkheads and dikes will be needed.⁸ It currently costs hundreds of millions of dollars to protect low-lying coastal areas, an expense born by states, companies, taxpayers and individuals whose property is affected. Adaptation costs are projected to rise over the coming century.⁹ The EPA has estimated that the cost of

elevating roads, bridges and similar structures a mere 20 inches (50cm) in the South Atlantic states, including South Carolina, would be at least \$4.2 billion. In addition, sand replenishment to preserve beaches would cost these states billions of dollars in the event of a 20-inch sea level rise.¹⁰

At Charleston, South Carolina, the sea level rose by 9 inches during the last century, and it is likely to rise another 19 inches by 2100. The cumulative cost of sand replenishment to protect against a 19 inch (50 cm) sea level rise is estimated at \$1.7–\$8.8 billion.¹¹

Finally, when the EPA calculated the cost of coastal protection in 1991 for the United States, a linear foot of levee cost \$500 and a linear foot of bulkhead was \$30.¹² Today, those prices are \$500 per foot for bulkhead¹³ and up to \$1,200 per foot for levees.¹⁴ The expense of storm cleanup will also increase as coasts erode and storms, unchecked by barriers, become more damaging.

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¹ Intergovernmental Panel on Climate Change, *Fourth Assessment Report*, April, 2007, Working Group II, “Climate Change 2007: Impacts, Adaptation, and Vulnerability.” §14.4.3, <www.ipcc.ch/pdf/assessment-report/ar4/wg2/ar4-wg2-chapter14.pdf>.

² U.S. EPA, January 2009, “*Coastal Sensitivity to Sea-Level Rise: A Focus on the Mid-Atlantic Region*,” <www.epa.gov/climatechange/effects/coastal/sap4-1.html>.

³ U. S.EPA, August 2008, “Coastal Zones and Sea Level Rise,” <www.epa.gov/climatechange/effects/coastal/index.html>.

⁴ NOAA, “Ocean and Coast Resource Management: Erosion Control Easements,” <http://coastalmanagement.noaa.gov/initiatives/shoreline_ppr_easements.html>.

⁵ *Ibid.*

⁶ U.S. EPA, August 2008, “Coastal Zones and Sea Level Rise,” *op. cit.*

⁷ U.S. Global Change Research Program, “U.S. National Assessment of the Potential Consequences of Climate Variability and Change *Educational Resources* Regional Paper: The Southeast,” October 2003, <www.usgcrp.gov/usgcrp/nacc/education/southeast/se-edu-6.htm>.

⁸ *Ibid.*

⁹ IPCC *Fourth Assessment Report*, April, 2007, Working Group II, “Climate Change 2007: Impacts, Adaptation, and Vulnerability.” §6.5.3, <www.gtp89.dial.pipex.com/06.pdf>.

¹⁰ IPCC *Fourth Assessment Report*, April, 2007, Working Group II, “Climate Change 2007: Impacts, Adaptation, and Vulnerability.” *op. cit.*

¹¹ U.S. EPA, August 2008, “Coastal Zones and Sea Level Rise,” *op. cit.*

¹² James G. Titus et al., “Greenhouse Effect and Sea Level Rise: The Cost of Holding Back the Sea,” *Coastal Management*, Vol. 19 (1991), p. 19, <www.epa.gov/climatechange/effects/downloads/cost_of_holding.pdf>.

¹³ Coastal Systems International, Inc., “To Repair or Replace a Bulkhead: That is the Question,” <http://coastalsystemsint.com/media/pop_marina_dock_age.htm>.

¹⁴ Center for Integrative Environmental Research, University of Maryland, College Park, *The US Economic Impacts of Climate Change and the Costs of Inaction*, October 2007, p. 17, footnote 6, <www.cier.umd.edu/documents/US%20Economic%20Impacts%20of%20Climate%20Change%20and%20the%20Costs%20of%20Inaction.pdf>.