

MIAMI IS SETTING THE EXPECTATION ON HOW COASTAL COMMUNITIES IN FLORIDA SHOULD RESPOND TO PROTECT HOMEOWNERS FROM THE SINKING STATE

*Dayana B. Blanco**

I. INTRODUCTION

When one thinks of Florida, one imagines sunny weather, white sandy beaches, and picturesque sunsets. Florida is a slice of paradise within the United States that drives people to move there and live there indefinitely.¹ Florida's real estate market has grown twenty-three percent within one year, and of the nineteen million, roughly fifteen million people live in coastal communities.² This means that people are mainly moving to coastline areas, which could be because homeowners want the beach in their backyard, or to take advantage of the low tax rate for residents.³ As Florida's economy continues to increase, and its population grows at an unstoppable rate, it is faced with an inevitable natural disaster that it must respond to, the rising sea-levels. The idea that rising sea levels will ruin the value of coastal homes is not a new discussion.⁴ Florida lost about five billion dollars in home values from 2005 to 2017 due to exposure to the rising sea level.⁵ From 2018 to 2020, Florida lost

* Dayana B. Blanco, Juris Doctor Candidate Spring 2023, Barry University School of Law.

¹ Jeff Rohde, *Why Investor Love Florida's Real Estate Market for 2022*, ROOFSTOCK BLOG (Dec. 22, 2021), <https://learn.roofstock.com/blog/florida-real-estate-market>.

² *Id.*

³ *Facts about Florida* (Sept. 24, 2021, 1:24 PM), <https://www.stateofflorida.com/facts/>.

⁴ *Florida Sees Signals of a Climate-Driven Housing Crisis*, N. Y. TIMES, (Oct. 13, 2020), <https://www.nytimes.com/2020/10/12/climate/home-sales-florida.html>.

⁵ Jim Carroll, *The Damage in Florida from Rising Sea Levels Is Already Here*, ORLANDO SENTINEL (Feb. 8, 2021),

another ten percent in property value and exposed homes will continue to lose value as time goes on.⁶ By 2045, thousands of homes will be at risk of flooding regularly which could potentially make properties no longer practical to live in.⁷ For Floridians that hold a thirty-year mortgage on their home, 2045 isn't too far into the future.⁸

A five to six feet level rise by 2100 is very likely, and “an inundation of this magnitude would physically displace around 800,000 residents of Miami-Dade County, nearly a third of Florida’s current population, and render a large portion of the city uninhabitable.”⁹ Federal and State governmental powers have begun planning on how to defend homeowners faced with this environmental disaster. On May 12, 2021, Florida’s legislature passed a statewide flooding and sea-level rise resilience plan, Senate Bill 1954.¹⁰ It requires the Department of Environmental Protection to complete a statewide flood risk and sea level rise data assessment and requires the Department to develop an annual plan to submit to the Governor by a specified date.¹¹ The bill gives tax breaks to homeowners who elevate their homes to prevent flooding and gives \$100 million in grants to aid local governments in combating the

<https://www.orlandosentinel.com/opinion/guest-commentary/os-op-florida-sea-level-rise-damage-here-20210208-3mibpyp6ivhclacigj5pnycqgq-story.html>.

⁶ *Id.*

⁷ Dale White, *Study: As Sea Levels Rise, Florida Property Values Will Sink*, JACKSONVILLE NEWS BLOG (Jun. 18, 2018)

<https://www.jacksonville.com/news/20180618/study-as-sea-levels-rise-florida-property-values-will-sink>.

⁸ *Id.*

⁹ Mario Alejandro Ariza, *As Miami Keeps Building, Rising Seas Deepen Its Social Divide*, YALE

ENV'T. 360 (Sept. 25, 2021, 12:26 PM), <https://e360.yale.edu/features/as-miami-keeps-building-rising-seas-deepen-its-social-divide>.

¹⁰ Resilient Florida Trust Fund, Fla. Stat. Ann. § 380.0935.

¹¹ *Id.*

rising sea levels.¹² The issues posed by rising sea levels are complex, and demand creativity, collaboration, and long-term solutions.

Even though my focus is on Miami, this note will begin by describing how and why rising sea levels are surging at a global level, and then it will describe the damage these surges leave behind. Next, it will explain how this phenomenon is striking Florida families and analyze what Miami is currently doing with Senate Bill 1954 to protect coastal communities. Finally, this note will explore how other parts of the world are responding to the rising sea level, and how feasible it is for coastal communities in Florida to respond in the same way other countries are protecting homeowners living in coastal communities.

II. BACKGROUND: THE RISING SEA LEVEL

A. *Climate Change Is Causing Ice Sheets to Melt Which Is Raising the Sea Level*

Global climate change exists. In 2007, the United Nations' Intergovernmental Panel on Climate Change reported that the warming of the earth is indisputably taking place.¹³ Global warming is causing a gradual increase in the overall temperature of the earth's atmosphere attributed to massive levels of pollutants in the air.¹⁴ Some pollutants that have been exposed to the earth's atmosphere have resulted from human activity which includes greenhouse gases that warm the earth by trapping in heat from the sun, such as carbon

¹² Steve Newborn, *DeSantis Signs Sea Level Rise Bill into Law*, WUSF PUBLIC MEDIA (May 12, 2021), <https://wusfnews.wusf.usf.edu/environment/2021-05-12/desantis-signs-sea-level-rise-bill-into-law>.

¹³ Florida Oceans and Coastal Council, *The Effects of Climate Change on Florida's Ocean & Coastal Resources*, FLORIDA DEPT. OF ENV'T PROT. vi, 30 (2009), https://floridadep.gov/sites/default/files/The%20Effects%20of%20Climate%20Change%20on%20Florida%27s%20Ocean%20and%20Coastal%20Resources_0.pdf.

¹⁴ *Global Warming*, Oxford English Dictionaries (3d ed. 2021).

dioxide from vehicle exhaust or emissions from agriculture.¹⁵ The warming of the earth is a direct result of the sea-level rise because it causes water to expand.¹⁶ This phenomenon is known as thermal expansion and it occurs when the ocean absorbs heat from the atmosphere, causing the temperature of the ocean to become warmer.¹⁷ Since warm seawater has a greater volume than cold seawater, a rise in the temperature of the ocean causes an increase in the total ocean volume.¹⁸ Seventy-one percent of the earth's surface is water, ninety-six percent of that is salt-water contained in the oceans, while the remaining four percent is water frozen in the glaciers.¹⁹

As thermal expansion occurs, it is causing a significant amount of ice sheets to melt that is increasing the volume of the ocean's basin, and causing a rise in water level.²⁰ Ice sheets are masses of permanent layers of ice, extending more than 20,000 square miles that form in areas where snow does not melt in the summer, causing the snow to pile up into thick masses of ice growing thicker and denser over the years.²¹ The Antarctic Ice Sheet, for example, extends almost 5.4 million square miles, roughly the size of the United States and Mexico combined.²² If the Antarctic Ice Sheet were to melt, the consequences would be deadly to homeowners that live in coastal communities because the sea level would greatly rise.²³ Over a trillion pounds of glacial ice is melting

¹⁵ *Air Quality and Climate Change*, UNIV. COOP. FOR ATMOSPHERIC RSCH. (Nov. 12, 2020), <https://scied.ucar.edu/learning-zone/air-quality/air-quality-and-climate-change>.

¹⁶ *Id.*

¹⁷ *Id.*

¹⁸ *Id.*

¹⁹ Matt Williams, *What Percent of Earth is Water?* (Dec. 2, 2014), <https://phys.org/news/2014-12-percent-earth.html>.

²⁰ *How is Sea Level Rise Related to Climate Change?* NAT'L. OCEAN SERV. (Jan. 4, 2021), <https://oceanservice.noaa.gov/facts/sealevelclimate.html>.

²¹ *Id.*

²² *Id.*

²³ *Id.*

into the sea each year.²⁴ For example, Greenland and Antarctica are losing a crucial amount of ice as a result of global warming that is greatly influencing the sea level worldwide.²⁵ Every year, the equivalent of over 800,000 Empire State Buildings made of ice melt into the oceans from Greenland and Antarctica.²⁶ The repercussions are massive because Antarctica is twice as large as the United States and contains about ninety percent of the earth's ice.²⁷

Additionally in Greenland, a large ice sheet is experiencing ice loss because of surface melting due to global warming and in West Antarctica, ocean warmth has caused several glaciers to retreat by tens of kilometers.²⁸ A new study by Harvard researchers states that the possible collapse of the West Antarctic ice sheet has been underestimated, due to the increases in global warming.²⁹ Recent predictions show that if a total collapse of an ice sheet occurs, global sea-level rise is estimated to rise an additional thirty percent compared to what it is now.³⁰

In sum, global warming creates a domino effect when it comes to the worldwide sea level because it causes the sea level to escalate by thermal expansion. Thermal expansion is considered a global issue since the expansion in the volume of the entire ocean ultimately affects coastal communities in a disastrous way.³¹ Governmental and nongovernmental organizations are working toward minimizing global warming, but it is important to understand what global warming is, and the results it has on the sea level rise.

²⁴ *How does Ice Melt Impact Coastal Towns?* SEA LEVEL RISE (Nov. 6, 2021) <https://sealevelrise.org/causes/>.

²⁵ *Id.*

²⁶ *Id.*

²⁷ *Id.*

²⁸ *Id.*

²⁹ Juan Siliezar, *Antarctic Ice Sheet Melting to Lift Sea Level Higher than Thought, Study Says*, THE HARVARD GAZETTE (April 30, 2021), <https://news.harvard.edu/gazette/story/2021/04/study-says-antarctic-ice-sheet-melt-to-lift-sea-level-higher-than-thought/>.

³⁰ *Id.*

³¹ *Global Issues*, UNITED NATIONS (Mar. 17, 2022) <https://www.un.org/en/global-issues>.

B. Stronger Hurricanes Mean Higher Sea Levels

Not only does climate change strongly impact natural disasters, but also hurricanes and storm surges.³² As the temperature rises, evaporation strengthens which causes a transfer of heat from the ocean into the air.³³ If the water rises above normal levels, it will cause heavier rainfall and more flooding inland.³⁴ When that large volume of water is pushed ashore by heavy winds which change the water level, it is known as storm surges.³⁵ How strong a storm surge is, depends on multiple factors. One factor is the depth of the seafloor, which is important to coastal areas if the area has a sea floor that gently slopes away from the coastline since it is more likely to see a higher storm surge than an area with a steeper drop-off slope.³⁶ A great example of how important of a factor the depth of the seafloor is in storm surges is Hurricane Katrina. In Louisiana and Texas, the seafloor gently slopes away from the coastline which contributed to devastating storm surges.³⁷ The storm surge from Hurricane Katrina was twenty feet high.³⁸ Similarly, Hurricane Ike made landfall in Texas and left a seventeen-foot storm surge.³⁹

A second factor that impacts the size and strength of storm surges is ocean tides. Ocean tides are caused by the gravitational

³² *Hurricanes and Climate Change*, ENV'T AND DEFENSE FUND (Nov. 21, 2021), <https://www.edf.org/climate/how-climate-change-makes-hurricanes-more-destructive>.

³³ *Id.*

³⁴ *Id.*

³⁵ Anthony C. Didlake Jr., *What Is A Hurricane Storm Surge and Why Is It So Dangerous?*, BRITANNICA (Nov. 21, 2021), <https://www.britannica.com/story/what-is-a-hurricane-storm-surge-and-why-is-it-so-dangerous>.

³⁶ *Id.*

³⁷ *Id.*

³⁸ *11 Facts about Hurricane Katrina*, DO SOMETHING BLOG (Nov. 21, 2021), <https://www.dosomething.org/us/facts/11-facts-about-hurricane-katrina>.

³⁹ Didlake, *supra* note at 35.

pull of the moon and sun which could strengthen or weaken the impact of a storm surge.⁴⁰ “At high tide, the water is already at an elevated height. If landfall happens at high tide, the storm surge will cause even higher water levels and bring more water further inland.”⁴¹ South Carolina saw this occurrence when Hurricane Isaias storm surge caused the water level to rise more than ten feet.⁴² Lastly, a substantial factor in how strong a storm surge is largely depends on how strong the winds are in a hurricane or tropical storm.⁴³ The wind circulation around the eye of a hurricane blows on a vertical circulation, and when the hurricane is above deep water there is nothing to disturb that circulation.⁴⁴ When the hurricane starts to reach shallower waters near the coast, the circulation becomes disrupted, causing the winds to develop stronger.⁴⁵ Overall, a stronger storm will produce a higher storm surge.

Florida is especially vulnerable to strong storm surges for many reasons, starting with the Coriolis effect.⁴⁶ The Coriolis effect “is the tendency for any moving body on or above the earth's surface, e.g., an ocean current or an airplane, to drift sideways from its course because of the earth's rotation.”⁴⁷ This is relevant to hurricanes because one of the elements of a hurricane is a strong Coriolis effect.⁴⁸ The Coriolis effect is too weak near the equator and too cold near the poles, which makes the temperature of the

⁴⁰ *Id.*

⁴¹ *Id.*

⁴² *Id.*

⁴³ Nat'l. Weather Serv., *Introduction to Storm Surge*, NAT'L. HURRICANE CTR. 2, 5 (2021), https://www.nhc.noaa.gov/surge/surge_intro.pdf.

⁴⁴ *Id.*

⁴⁵ *Id.*

⁴⁶ *What is the Coriolis Effect*, MATH AND SCIENCE ACTIVITY CTR. (Nov. 21 2021), <https://www.edinformatics.com/mathscience/corioliseffect.htm>.

⁴⁷ *What is the Coriolis Effect*, *supra* note at 46.

⁴⁸ Tom Skilling, *Does the Coriolis Force Have Any Effect on Hurricanes?* WGN9 WEATHER BLOG (Nov. 5, 2020), <https://wgntv.com/weather/weather-blog/does-the-coriolis-force-have-any-effect-on-hurricanes/>.

tropical oceans, the Gulf of Mexico, and the Atlantic Ocean, just right to have a strong Coriolis effect.⁴⁹

In addition, Florida is the only state in the United States that is vulnerable on both sides because it has both the Gulf of Mexico on the west and the Atlantic Ocean on the east.⁵⁰ In 2017, Hurricane Irma was a massive hurricane that devastated the entire state of Florida, it changed the environment, and property owners were left to deal with the consequences.⁵¹ Water levels in the Everglades rose to dangerous levels, polluted water entered Lake Okeechobee and wastewater systems were contaminated with sewage spills in some communities.⁵² Hurricane Irma overwhelmed the entire state with heavy rains and powerful winds that left many homes in ruins.⁵³ The Florida Keys suffered a storm surge of five to eight feet above ground level, three to five feet in Naples, and three to five feet in the northern parts of Florida near Georgia.⁵⁴ Six million residents were ordered to evacuate coastal areas, and seven deaths resulted from the deadly hurricanes.⁵⁵ In sum, all of Florida's coastline has been impacted by at least one hurricane, and with Florida's sea level on the rise, in addition to its natural susceptibility to hurricanes, millions of property owners will be left without homes if the state does not do something to protect them.⁵⁶

⁴⁹ Hurricanes: Science and Society, *A Hurricanes Energy Source: The Ocean*, NAT'L. SCIENCE FOUND. (Nov. 21, 2021), <http://www.hurricanescience.org/science/science/development>.

⁵⁰ Jeff Goodell, *Florida's Special Vulnerability to Hurricanes*, CNN (Aug. 30, 2019), <https://www.cnn.com/2017/09/10/opinions/florida-is-vulnerable-to-hurricanes-opinion-goodell/index.html>.

⁵¹ *Id.*

⁵² *Id.*

⁵³ *Id.*

⁵⁴ John P. Cangialosi, Andrew S. Latta & Robbie Berg, *Hurricane Irma*, NAT'L. HURRICANE CTR. TROPICAL CYCLONE REP. 4,88 (2017), <https://www.nhc.noaa.gov/data/tcr/AL112017Irma.pdf>.

⁵⁵ Goodell, *supra* note at 50.

⁵⁶ *Hurricanes*, FLORIDA CLIMATE CTR. (Nov. 21, 2021), <https://climatecenter.fsu.edu/topics/hurricanes>.

III. CONSEQUENCES OF THE RISING SEA LEVEL

A. Homes In the Coastline Are at Risk Because Of Beach Erosion

Beach erosion does not directly have an impact on the rising sea level, rather, the rising sea level accelerates beach erosion.⁵⁷ Beach erosion is a process that causes the removal of natural materials, like sand, along a coastline by forces of the wind, flooding, rising sea level, and other environmental factors.⁵⁸ It is a natural process, constantly shifting sand around which sometimes can occur faster in certain areas depending on if an area is prone to storms because “storms bring larger waves that crash more forcefully onto the beach.”⁵⁹ States have adopted preventative methods to slow down this natural process by creating sand dunes, sandbags, sand fences, vegetation, and sea walls.⁶⁰ These defenses permit water and the land next to it to protect homeowners and habitats when a strong storm occurs, sea-level rise, and erosion.⁶¹

However, even with preventative methods in place, beach erosion is still a concern because human activities have altered the way erosion occurs.⁶² For example, numerous beaches are currently entirely lined by buildings, parking lots, and roads. “The beachfront areas of Miami Beach, Atlantic City, and Honolulu are three

⁵⁷ Rob L. Evans, *Rising Sea Levels and Moving Shorelines*, WOODS HOLE OCEANOGRAPHIC INST. (Nov. 16, 2004), <https://www.whoi.edu/oceanus/feature/rising-sea-levels-and-moving-shorelines/>.

⁵⁸ *Beach Erosion*, ENCYCLOPEDIA (Nov. 24, 2021), <https://www.encyclopedia.com/environment/encyclopedias-almanacs-transcripts-and-maps/beach-erosion>.

⁵⁹ *Id.*

⁶⁰ Helen Robertson, *The Preventative Methods of Beach Erosion*, CHARLOTTE 2, 13 (2010), <https://cstem.charlotte.edu/sites/cstem.charlotte.edu/files/media/SV/2010/QMRM/Helen%20Robertson-%20The%20Preventive%20Methods%20of%20Beach%20Erosion.pdf>.

⁶¹ Jay Ellen Spiegel, *How to Protect Coasts from Sea-Level Rise*, YALE CLIMATE CONNECTIONS (Jul. 12, 2016), <https://yaleclimateconnections.org/2016/07/as-sea-levels-rise-how-best-to-protect-our-coasts/>.

⁶² *Beach Erosion*, *supra* note at 58.

examples of heavily developed beaches in the United States.”⁶³ In Galveston, Texas, twenty-three percent of the homes that are on the coast are in a risk-zone due to coastal erosion.⁶⁴ In Tampa, Florida the city currently has the smallest amount of homes projected to be at-risk to coastal erosion, however, homes in the area are being built in risk zones nearly seven times faster than those being built in safe zones.”⁶⁵

For many, living on the coast is a desirable lifestyle.⁶⁶ Individuals spend millions of dollars on properties to have the luxury of “coastal living.”⁶⁷ However, those exact homes on the coastline could be at risk of beach erosion due to the rising sea level.⁶⁸ Homeowners are at risk because if a severe storm were to make landfall, the storm would cause the coastline to recede and there will not be a natural barrier protecting them from the rising sea level.⁶⁹ A total of thirty-eight percent of U.S. coastlines could be significantly reduced in the next thirty years.⁷⁰ In conclusion, homeowners who are planning to live on the coast or who currently living on the coast should be aware that coastal erosion is a natural process, and the inevitable rising sea level could make it worse.⁷¹

⁶³ *Id.*

⁶⁴ *Id.*

⁶⁵ *Id.*

⁶⁶ Rob Landers, *Buying in Brevard: What Kind of Home does \$1 Million Get You on the Space Coasts Mainland*, FLORIDA TODAY (Sept. 29, 2021), <https://www.floridatoday.com/story/news/local/2021/09/29/buying-brevard-real-estate-home-one-million-get-you-space-coast-mainland/5890332001/>.

⁶⁷ *Id.*

⁶⁸ *The Impact of Coastal Erosion on Seaside Communities*, ONE GREEN PLANET ENV'T. BLOG (Sept. 25, 2021), <https://www.onegreenplanet.org/environment/the-impact-of-coastal-erosion-on-seaside-communities/>.

⁶⁹ *Id.*

⁷⁰ *Id.*

⁷¹ Michael Oppenheimer, et al. *2019: Sea Level Rise and Implications for Low-Lying Islands, Coasts and Communities*, THE INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE (Mar. 10, 2022), <https://www.ipcc.ch/srocc/chapter/chapter-4-sea-level-rise-and-implications-for-low-lying-islands-coasts-and-communities/>.

B. As a Consequence of Hurricanes, Flooding Occurs Which Destroys Homes

Because the temperature of the earth is getting warmer due to climate change, it causes parts of the world to be impacted by hurricanes that accelerate the rising sea level.⁷² The results of the hurricanes ultimately cause severe flooding in coastal communities which leaves homeowners in danger of their homes being destroyed because the flooding is traveling inland.⁷³ South Florida experiences heavy flooding year round, not only because of the storm surges that tropical storms and hurricanes leave behind, but because South Florida experiences king tides.⁷⁴ King tides are usually a foot higher compared to a normal high tide causing flooding.⁷⁵ It occurs even on sunny days because of how low the elevation is in coastal communities in South Florida.⁷⁶ Additionally, the excessive flooding caused by king tides is pushing contaminated water back into the drainage pipes, causing more flooding in community streets, which can cause roads to shut down.⁷⁷

A serious catastrophic example of how flooding can disturb homeowners in coastal communities is the flooding Hurricane Maria left behind in Puerto Rico. In 2017, Hurricane Maria made landfall at 155 miles per hour, drowning weather stations and cell towers, and leaving one hundred percent of the island without electricity.⁷⁸

⁷² Nicholas Kusnetz, *World's Oceans are Warming Faster, Studies Show Fueling Storms and Sea Rise*, INSIDE CLIMATE NEWS BLOG (Jan. 10, 2019), <https://insideclimatenews.org/news/10012019/ocean-warming-accelerating-sea-level-rise-hurricanes-climate-change-science-review/>.

⁷³ Emily Heaslip, *How Does Storm Surge Affect Coastal Communities*, SO FAR OCEAN BLOG (Mar. 10, 2022), <https://www.sofaroccean.com/posts/how-does-storm-surge-affect-coastal-communities>.

⁷⁴ *Florida's Sea Level is Rising, There's a Lot at Risk from Sea Level Rise*, SEA LEVEL RISE (Nov. 26, 2021), <https://sealevelrise.org/risks/>.

⁷⁵ *Id.*

⁷⁶ *Id.*

⁷⁷ *Id.*

⁷⁸ *Hurricane Maria's Effect on Puerto Rico*, MERCY CORPS BLOG (Sept. 9, 2020), <https://www.mercycorps.org/blog/quick-facts-hurricane-maria-puerto-rico>.

Puerto Rico was flooded with six to nine feet of water above ground level, leaving millions of people without homes and clean water.⁷⁹ Since Hurricane Maria passed through the island, clear evidence of the storm remains, and the repairs have been gradual.⁸⁰ It was not until a year after the storm “that Puerto Rico Electric Power Authority (“PREPA”) announced that 100 percent of customers have power restored.”⁸¹ Overall, flooding is estimated to be from 300 percent to 900 percent more frequent within U.S. coastal communities than it was fifty years ago.⁸² Estimating exactly where the sea level rise is likely to cause either permanent or temporary inundation is crucial for coastal planning in order for homeowners on the coast to feel secure that their homes will not be lost due to flooding.⁸³

C. Infrastructure Damage Resulting from Flooding

Infrastructures are the basic systems that support the structure of the economy, such as transportation facilities, telecommunications networks, sewage, water, and electric systems.⁸⁴ Buildings, housing, and land developments near the coastlines are at serious risk due to the rising sea levels.⁸⁵ Some

⁷⁹ Matt Monroe, *Looking Back at Historic Hurricane Maria*, WEATHER NATION BLOG (Sept. 20, 2019), <https://www.weathernationtv.com/news/looking-back-at-historic-hurricane-maria/>.

⁸⁰ *Id.*

⁸¹ *Hurricane Maria's Effect on Puerto Rico*, *supra* Note at 78.

⁸² *Is Sea Level Rising?* NAT'L. OCEAN SERV. (Nov. 26, 2021), <https://oceanservice.noaa.gov/facts/sealevel.html>.

⁸³ *Flooded Future: Global Vulnerability to Sea Level Rise Worse Than Previously Understood*, CLIMATE CENT. NEWS (Oct. 29, 2019), <https://www.climatecentral.org/news/report-flooded-future-global-vulnerability-to-sea-level-rise-worse-than-previously-understood>.

⁸⁴ Michael J. Boyle, *Infrastructure*, INVESTOPEDIA (Mar. 24, 2021), <https://www.investopedia.com/terms/i/infrastructure.asp>.

⁸⁵ Michelle Flanagan, *Studying the Effect of Sea-Level Rise on Infrastructure and Construction*, OLD DOMINION UNIV. BLOG (2021), <https://www.odu.edu/content/dam/odu/col-dept/honors/docs/michelle-flanagan.pdf>.

threats are a nuisance, such as water in a homeowner's basement or disrupted commutes to work.⁸⁶ But other threats are far more severe, such as "road damage requiring emergency repair, underground pressure on sewage systems, and flooding of whole neighborhoods and their homes."⁸⁷ Miami, Florida is especially at risk because the vast majority of buildings are placed three feet above sea level.⁸⁸ Because buildings are not that high above sea level, frequent high-tide flooding deteriorates coastal infrastructure above and below ground.⁸⁹ These consequences are gradually developing into costly burdens on more and more communities around the United States.⁹⁰ Numerous coastal communities in Florida "have raised roads in low-lying areas, installed new drainage and pump systems, and relocated freshwater wells to prepare for inevitable flooding due to sea-level rise."⁹¹

Not only is the rising sea level visible in South Florida, but it is affecting beneath the surface as well due to saltwater intruding into Key Biscayne's aquifer which has been contaminating the community's drinking water.⁹² In 1999, the U.S. Geological Survey installed Miami's first monitoring wells to measure the thickness of intruding saltwater into the Biscayne aquifer which is situated 5 miles from the Atlantic Ocean.⁹³ In 2018, the monitoring well

⁸⁶ Zach Almond, *Lay Groundwork for Action Infrastructure to Fight Rising Sea Levels*, ORLANDO SENTINEL (May 2, 2018), <https://www.orlandosentinel.com/opinion/os-ed-sea-level-rise-new-voices-20180501-story.html>.

⁸⁷ *Id.*

⁸⁸ Lucas Lechuga, *Which Miami Condo Developments Are On Highest Ground*, MIAMI CONDOS BLOG (Aug. 10, 2017), <https://www.miamicondoinvestments.com/climate-change/which-miami-condo-developments-are-on-highest-ground>.

⁸⁹ Rachel Ramirez, *Climate Scientists Say Building Collapse Is a 'Wake-up Call' About The Potential Impact of Rising Sea*, CNN BLOG (Jun. 30, 2021), <https://www.cnn.com/2021/06/30/us/florida-building-collapse-sea-level-rise/index.html>.

⁹⁰ Almond, *supra* note at 86.

⁹¹ *Id.*

⁹² *Id.*

⁹³ *Id.*

measured the saltwater at the bottom of the aquifer which had expanded to a thickness of 20 feet.”⁹⁴ Saltwater intrusion works by being pushed inland by the rising sea level, groundwater pumping through aquifers, and how freely water flows through pores in the sand and limestone layers.⁹⁵

In response to the saltwater growing in the city’s aquifer, Miami-Dade County developed 20-year Water Use Efficiency Plan implementing policies to promote water conservation to residents.⁹⁶ Water conservation is known to preserve the aquifer, and minimize saltwater intrusion.⁹⁷ Some of the policies are financial rebates to homeowners, irrigation restrictions, and the installation of high-efficiency plumbing fixtures in new construction.⁹⁸ All in all, real costs are being incurred because of infrastructure damage due to the rise in sea level, and it is impacting people’s lives because of the life-threatening dangers it is important for the State of Florida to minimize these dangers and protect homeowners.⁹⁹

IV. FLORIDA’S CURRENT STATUS FOR THE SEA LEVEL RISE

A. Florida’s Contribution to Global Warming

The issue for Floridians is not whether they will be affected by climate change; rather, it is how badly. Florida is exceptionally vulnerable to the consequences of climate change because it has thousands of miles of coastlines, filled with residential and business

⁹⁴ *Id.*

⁹⁵ Brett Walton, *Tracking the Atl. Ocean’s Inland Creep in Miami-Dade Cnty*, WATER NEWS WEF (Oct. 3, 2019), <https://www.circleofblue.org/2019/world/tracking-the-atlantic-oceans-inland-creep-in-miami-dade-county/>.

⁹⁶ *Saltwater Intrusion*, MIAMI DADE CNTY (Nov. 21, 2021), <https://www.miamidade.gov/global/water/conservation/saltwater-intrusion.page>.

⁹⁷ *Id.*

⁹⁸ *Id.*

⁹⁹ Almond, *supra* note at 86.

properties, bays, and estuaries that are at risk of the potential dangers of the rising sea level.¹⁰⁰ Those properties are filled with roughly eighteen million residents that live within sixty miles of the Atlantic Ocean or the Gulf of Mexico.¹⁰¹ The residents are at risk if the sea level rises because, in most areas, the elevation is only between six and twenty feet above sea level.¹⁰²

The carbon pollution in Florida specifically, is fueling global warming which is causing the sea level to rise more quickly.¹⁰³ The burning of fossil fuels at coal-fired power plants owned by Progress Energy released more carbon dioxide in 2010 than any other Florida utility company.¹⁰⁴ In 2018, the carbon dioxide emissions were measured at over 200 million tons from Progress Energy, and Tampa Electric Power Station came in second.¹⁰⁵ As carbon pollution is being emitted into the atmosphere, it traps heat from the sun that would otherwise escape which is important in Florida because the state naturally has a warm, tropical climate and the pollution can make the climate hotter from the emissions.¹⁰⁶ A hot climate directly impacts homeowners because they are exposed to rising sea levels, hurricanes, flooding, and infrastructure damage.¹⁰⁷

¹⁰⁰ Florida Oceans and Coastal Council, *supra* note at 13.

¹⁰¹ *Miami Topographic Map*, TOPOGRAPHIC MAPS (Feb. 16, 2022), <https://en-us.topographic-map.com/maps/fcj4/Miami/>.

¹⁰² *Id.*

¹⁰³ *What Global Warming Means for Florida*, ENV'T. FLORIDA RSCH. HAND POL'Y. CTR. (Nov. 6, 2021), <https://environmentfloridacenter.org/page/flc/what-global-warming-means-florida>.

¹⁰⁴ *Id.*

¹⁰⁵ *Id.*

¹⁰⁶ Kris Peter, *Why is Florida so Hot?* SUNLIGHT LIVING (Nov. 6, 2021), <https://sunlightliving.com/why-is-florida-so-hot/>.

¹⁰⁷ *Id.*

B. How The Sea Level in Florida Is Overwhelming Coastal Homeowners

Florida is a unique destination for homeowners because of its pristine beaches, endless sunshine, and special tax benefits.¹⁰⁸ Individuals spend millions of dollars every year to be able to have a postcard view of the ocean in their backyard. For example, in Boca Grande, the average price of a home is two million dollars.¹⁰⁹ Florida's attractive scenery is causing more people to move there, especially after the COVID-19 pandemic.¹¹⁰ The pandemic ultimately accelerated the migration of businesses, families, and individuals from other states.¹¹¹ According to Florida's Office of Economic and Demographic Research, the state of Florida "grew by an estimated 329,717 new residents between April 2020 and April 2021."¹¹² A reason for the massive influx of people is that Florida has no state income tax which can result in significant savings in comparison to the states that have state income taxes.¹¹³

Since the risk of the rising sea level has not stopped Florida's population from growing, Florida's government must act promptly to protect homeowners. "The sunshine state has lost about \$5.4 billion in home value from 2005 to 2017 due to the homes being at risk to the rising sea level."¹¹⁴ Home insurance in Florida is also at an all-time high.¹¹⁵ A recent report by the Insurance Information

¹⁰⁸ Phil Ganz, *Benefits of Living in Florida*, MAKE FLORIDA YOUR HOME BLOG (Oct. 24, 2021), <https://www.makefloridayourhome.com/blog/living-in-florida>.

¹⁰⁹ Aleskia Silverman, *The 10 Richest Towns in Florida*, THE RICHEST BLOG (Oct. 27, 2019), <https://www.therichest.com/luxury/richest-florida-towns/>.

¹¹⁰ Kelly Murphy-Redd, *Florida, Here They Come*, OKALOOSA ECON. DEV. COUNCIL (Sept. 15, 2021), <https://florida-edc.org/blog/september-2021/florida,-here-they-come>.

¹¹¹ *Id.*

¹¹² Murphy-Redd, *supra* note at 110.

¹¹³ Jeff Hammerberg, *Why Are So Many People Moving to Florida, Texas, and Nevada?* WASHINGTON BLADE BLOG (May 13, 2021) <https://www.washingtonblade.com/2021/05/13/why-are-so-many-people-moving-to-florida-texas-and-nevada/>.

¹¹⁴ Murphy-Redd, *supra* note at 110.

¹¹⁵ *Id.*

Institute, “Residents are projected to pay on average \$2,380 in premiums in 2021, a twenty-one percent increase over the \$1,960 paid in 2018.”¹¹⁶ In addition, while people from all socio-economic backgrounds live in Florida, the rising sea level is leaving suburban communities a few miles off the shoreline especially vulnerable.¹¹⁷ According to the 2019 Census, only five percent of Florida’s population of twenty-one million are millionaires, leaving an estimated eighty-three percent of the population as middle-class working individuals earning a median of \$55,000, and twelve percent are in poverty.¹¹⁸ This is especially important because middle-class residents have most of their life savings invested in their homes and are faced with the threat of losing them.

V. LEGAL CHALLENGES AND RESPONSES TO THE RISING SEA LEVEL IN FLORIDA

A. *Introduction to Senate Bill 1954*

With the sea level unstoppably rising, the Florida Legislature is facing a crisis by creating a Resilient Florida Grant Program in the Department of Environmental Protection.¹¹⁹ The bill created the state’s first-ever resilience plan, also known as the “Always Ready” legislation which was passed into law in 2021.¹²⁰ The resilience plan

¹¹⁶ James Benedict & Danny Dougherty, *In Florida, Coastal Counties Fuel Population Rise—and Climate Concerns*, THE WALL ST. J. (Sept. 14, 2021), <https://www.wsj.com/articles/in-florida-coastal-counties-fuel-population-rise-and-climate-concerns-11631631600>.

¹¹⁷ *Id.*

¹¹⁸ *Quick Facts of Florida*, U. S. CENSUS BUREAU (Dec 13, 2021), <https://www.census.gov/quickfacts/FL>.

¹¹⁹ Sun Sentinel Editorial Board, *A Rare Opportunity for Bipartisanship on Florida Sea Level Rise*, SOUTH FLORIDA SUN SENTINEL (Apr. 13, 2021), <https://www.sun-sentinel.com/opinion/editorials/fl-op-edit-resiliency-biden-florida-legislature-20210413-u2t5vq6cmrhspbj5f33cqpruuu-story.html>.

¹²⁰ *Governor Ron DeSantis Announces First Ever Statewide Flooding Resilience Plan*, RON DESANTIS (Feb. 2, 2022), <https://www.flgov.com/2021/12/08/governor-ron-desantis-announces-first-ever-statewide-flooding-resilience-plan/>.

protects coastal and inland communities, shores, and coral reefs against sea-level rise and flooding.¹²¹ Senate Bill 1954 provides funding to local governments to ensure they are prepared to deal “with the impacts of sea-level rise, intensified storms, and flooding.”¹²² The budget includes over \$640 million to be used over a three-year period and will fund thirty-five coastal counties.¹²³ Miami-Dade County has already begun its plans on what to do with the funding, it has four adoption approaches that will be tailored to what specific areas need.¹²⁴

The County’s first approach to adapt to sea level rise is raising the existing land on artificial fill.¹²⁵ Infrastructures such as homes, roads, and sea walls will be raised from mined soil, known as “fill,” which will raise the elevation of the land.¹²⁶ However, the issue with this approach is that since the sea level will continue to rise, areas would need to be repeatedly raised which could potentially cost more money.¹²⁷

Additionally, a group of homeowners has sued the City of Miami for raising nearby roads in front of their homes, due to floodwater running off onto their property.¹²⁸ In *Vamper Camp Properties, LLC & J.V. Holdings, LLC v. City of Miami Beach*, the plaintiffs brought an action for inverse condemnation under the United States Constitution and the takings clause under the State of Florida Constitution.¹²⁹ In Florida, the law establishes that

¹²¹ *Id.*

¹²² *Id.*

¹²³ *Id.*

¹²⁴ Miami Dade Cnty., *Five Adaption Approaches Guide to Our Vision*, MIAMI DADE CNTY. SEA LEVEL RISE STRATEGY (FEB. 26, 2021), <https://storymaps.arcgis.com/stories/3f5b7c0c3db545e4a09dd421f43361a7>.

¹²⁵ *Id.*

¹²⁶ *Id.*

¹²⁷ *Id.*

¹²⁸ Alexis Harris, *Miami Beach is Raising Roads for Sea Rise*, WUSF PUBLIC MEDIA BLOG (Nov. 13, 2021), <https://wusfnews.wusf.usf.edu/environment/2021-11-13/miami-beach-is-raising-roads-for-sea-rise-lawsuits-say-theyre-causing-flooding-too>.

¹²⁹ Complaint for *Varcamp properties, LLC. Et al v. City of Miami Beach*, (No. 1:22CV21371 (S.D. Fla. 2022)).

“construction by the state which causes flooding on abutting private property may constitute a taking where the flooding is a permanent invasion of land amounting to an appropriation.”¹³⁰ Florida law has long held that the construction by the state which causes flooding on abutting private property may constitute a taking where flooding is a permanent invasion of land amounting to an appropriation.

According to the complaint, the plaintiffs argue that “the design and construction of the roadway improvements failed to consider the impacts that drastically change the elevation of the roadway that would have on the Properties’ drainage ability, causing stormwater from 14th Street and West Avenue and adjacent properties to be redirected onto the petitioner’s properties without the ability to redirect excess stormwater back onto 14th Street and West Avenue.”¹³¹ The plaintiffs claim that the City knew or should have known that the properties were “designed to drain onto 14th Street and West Avenue yet took no steps to harmonize the roadway improvements with the properties’ drainage system.” Consequently, the city’s action caused permanent flooding on plaintiffs’ properties, “eliminated the properties’ long-held drainage rights without compensation, and deprived plaintiffs of all beneficial use of their property.”¹³²

The plaintiffs argue that their properties cannot be used for any purpose because the flooding has caused several inches of water to enter their homes and even between flood events, the unpredictability of the next flooding event renders the property virtually useless and without value.¹³³ The homeowners are asking the court to determine the value of the taking, to grant the plaintiff’s claims for inverse condemnation, grant restitution to the plaintiffs for the asserted taking, as well as damages for lost business.¹³⁴ Even though the case is still pending in the District Court, it is my opinion that the District Court will follow Florida court precedent and find

¹³⁰ *State Rd. Dep’t of Fla. v. Tharp*, 146 Fla. 745, 1 So. 2d 868 (1941).

¹³¹ *Varcamp Properties, LLC. Et al*, *supra* note at 129.

¹³² *Id.*

¹³³ *Id.*

¹³⁴ *Id.*

for the plaintiffs. The facts of *Vampercamp Properties* are very similar to *Kendry*; the State of Florida is raising roads that are causing a permanent burden on the homeowner's land that is rendering the land useless for residential use.

In *Kendry v. State Road Department*, the plaintiffs sued the Department of Highway, alleging that the increased highway elevation rendered the plaintiff's property useless after an excessive amount of water flowing onto the plaintiff's property flowing from an adjacent river.¹³⁵ The Department of Highway increased the elevation of the road by four or five feet which affected the drainage facilities of nearby homes.¹³⁶ Like the petitioners in *Varcamp Properties*, the petitioners in *Kendry* also sought restitution for the asserted taking.¹³⁷ The circuit court dismissed the plaintiffs' claim for failure to state a cause of action, and the plaintiffs appealed the circuit court's decision.¹³⁸

The district court addressed the issue of whether a taking has occurred within the meaning of the Florida Constitution where the state constructs a road that causes rainwater and water from other natural sources to flow upon neighboring privately held land and into residences thereon in such quantities that renders the land useless for residential purposes.¹³⁹ The district court held that where a state raises the road four to five feet, is a substantial violation of the restriction, and has the effect of imposing an additional burden on the privately owned land, such conduct has been recognized as involving a taking under the Florida Constitution.¹⁴⁰ The district court cited established precedent, including cases, *Seaboard Air Line Ry. v. S. Inv. Co.*, 53 Fla. 832, 844, 44 So. 351, (1907); *Jarrett Lumber Corporation v. Christopher*, 1913, 65 Fla. 379, 61 So. 831 (1913); and *Moore v. Choctawhatchee Electric Co-operative, Inc.*, 196 So.2d 788 (Fla.App.1967). The Court notes that rainfall is not

¹³⁵ *Kendry v. State Rd. Dep't*, 213 So. 2d 23 (Fla. Dist. Ct. App. 1968).

¹³⁶ *Id.*

¹³⁷ *Id.*

¹³⁸ *Id.*

¹³⁹ *Id.*

¹⁴⁰ *Id.*

“permanent in the sense that it involves a body of water forever present on the plaintiffs' property, but it is permanent in the sense that rain is a condition that is reasonably expected to continually reoccur in the future.”¹⁴¹ The Court held that the plaintiff's complaint clearly alleges that flooding has rendered property useless for residential purposes, and the allegations are significant to indicate that substantial property rights that the plaintiffs are entitled to, have been taken as a direct result of the construction by the State Road Department, and demonstrate a taking under the Florida Constitution.¹⁴²

Today in Miami, the city's solution to mitigate the rising sea level is installing drains in the public stormwater system to provide proper drainage.¹⁴³ This approach is costly; homeowners have already shown reluctance to the project, and raising roads does not promise that flooding from the rising sea level will stop.¹⁴⁴ There are other approaches that are available that the city should consider protecting coastal homeowners.

Miami-Dade County's second approach is a resemblance to the Florida Keys which elevates structures on stilts to allow storm surges to pass beneath buildings without damaging them.¹⁴⁵ In 2011, Key Largo Ocean Resort was built on stilts made of concrete and when Hurricane Irma devastated the town, all of the condominiums were untouched.¹⁴⁶ Private home building companies have adjusted to this approach by building million-dollar homes on platforms and stilts to protect them from the risk of rising ocean levels.¹⁴⁷ Building

¹⁴¹ *Id.*

¹⁴² *Id.*

¹⁴³ Harris, *supra* note at 128.

¹⁴⁴ *Id.*

¹⁴⁵ Stilt Built Homes in Florida Keys Survive Storm, FEMA (Feb. 2, 2022), <https://www.fema.gov/case-study/stilt-built-homes-florida-keys-survive-storm>.

¹⁴⁶ *Id.*

¹⁴⁷ Katie Warren, “An Architect Who Designs Homes for the Wealthy Built a Miami Beach Mansion On a 13-foot Platform to Protect it from The Risk of Rising Ocean Levels” BUSINESS INSIDER (Dec. 12, 2019), <https://www.businessinsider.com/miami-beach-mansion-built-above-sea-level-rising-waters-2019-12>.

homes on stilts was an issue before because the Florida Building Code does not take the sea level rise into account, however, the Florida Legislature took matters into their hands and enacted a new law in 2021.¹⁴⁸ The law prohibits state-financed construction in coastal areas without first taking into consideration how the rising sea level will change the area.¹⁴⁹ Contractors that build with public funding without taking into account the rising sea level, flooding, or potential damage would have to reimburse the state for all the money spent on the project.¹⁵⁰

Third, Miami-Dade County is developing in areas that are naturally on higher ground.¹⁵¹ Four miles inland of Miami Beach lies a neighborhood known as Little Haiti which experiences little to no flooding because it is on the Miami Rock Ridge.¹⁵² The Miami Rock Ridge is a limestone deposit that was formed thousands of years ago which raised the ground's elevation to about fourteen feet above sea level.¹⁵³ Because of this, developers have purchased land in Little Haiti with plans to build high-rise condos, retail space, and residential units naming the project Magic City Innovation District.¹⁵⁴ While there are positives to building on higher land, such as homeowners being protected from the rising sea level, there are also disadvantages. Little Haiti is home to mostly low-income families, and they fear that the project will alter the culture Little Haiti has established and also raise the rent.¹⁵⁵ A solution to this

¹⁴⁸ Fla. Stat. Ann. § 161.551 (West).

¹⁴⁹ *Id.*

¹⁵⁰ *Id.*

¹⁵¹ *Five Adaption Approaches*, *supra* note at 124.

¹⁵² Nano Riley, *Gentrification Strikes Miami's Little Haiti as Beach Residents Flee Rising Water*, EARTH BEAT BLOG (Jul. 21, 2022), <https://www.ncronline.org/news/earthbeat/gentrification-strikes-miamis-little-haiti-beach-residents-flee-rising-water>.

¹⁵³ *Id.*

¹⁵⁴ Oscar Nunez, *New Rendering Revealed for Magic City Innovation District in Little Haiti*, FLORIDA YIMBY (Aug. 15, 2021), <https://floridayimby.com/2021/08/new-renderings-revealed-for-magic-city-innovation-district-in-little-haiti.html>.

¹⁵⁵ Jerry Iannello, *New Report Warns Magic City Developers Displace Thousands of Low-Income Residents*, MIAMI NEW TIMES (Jun. 21, 2019),

problem would be to prioritize affordable housing for low-income families and promote local small business development so all individuals will be protected from the rising sea level.¹⁵⁶

Lastly, the County plans to protect homeowners from the rising sea level using Senate Bill 1954 by creating Blue Green Neighborhoods.¹⁵⁷ This means that the city uses urban green spaces to manage floodwaters.¹⁵⁸ For example, rain gardens are built with trees, gravel, and shells that can create a porous pavement beneath the trees that absorbs and slows down runoff that is caused by flooding.¹⁵⁹ This helps to keep properties dry from being damaged by flooding.¹⁶⁰ In addition, the Blue Green Neighborhood manages the water system and helps the environment by limiting water pollution and by continuously replenishing freshwater; this happens as the sea level rises, and a thin layer of freshwater exists between the surface of the land and the saltwater.¹⁶¹ All in all, the City of Miami took into consideration a thirty-year prediction for how high the sea level will become when it implemented the Blue and Green Neighborhood project, and it is very effective in keeping coastal communities safe from the rising sea level, while also benefiting the environment.

In addition to the four approaches that have already begun in Miami to protect residents using Senate Bill 1954, the U.S. Army Corps of Engineers (“USACE”) has plans of its own. The USACE is proposing to build a twenty-foot sea wall along downtown neighborhoods, high-rise buildings, and the bay.¹⁶² This project will

<https://www.miaminewtimes.com/news/little-haiti-miami-activists-warn-magic-city-innovation-district-could-displace-thousands-11201465>.

¹⁵⁶ David L. Kelly & Renato Molina, *Climate gentrification and affordable housing policies*, THE HILL (Mar. 10, 2022), <https://thehill.com/opinion/energy-environment/520158-climate-gentrification-and-affordable-housing-policies>.

¹⁵⁷ *Five Adaption Approaches*, *supra* note at 124.

¹⁵⁸ *Id.*

¹⁵⁹ *Id.*

¹⁶⁰ *Id.*

¹⁶¹ *Id.*

¹⁶² Landolf Rhode-Barbarigos & Brian Haus, *A 20-foot Sea Wall Won't Save Miami – How Living Structures Can Help Protect The Coast and Keep The*

not be funded by state funding from Senate Bill 1954 since the project is supposed to protect coastal areas across the United States, therefore, it is funded by the federal government.¹⁶³ The sea wall project is already ongoing in Virginia and South Carolina and the USACE has a proposed plan in place to protect 2.8 million Miami residents from coastal flooding and storm surges due to the rising sea level.¹⁶⁴ The twenty-foot sea-wall project has received a lot of criticism from residents within the community, arguing that thousands of homeowners will be outside the wall, leaving them unprotected and at the same time would block the water views the city's economy thrives on.¹⁶⁵ Researchers are also concerned that the USACE has not closely studied what the construction of a high sea wall would do to the water quality from existing water being trapped inside the wall.¹⁶⁶

Since the sea-wall project could compromise the aesthetic of Miami, and possible positive environmental impacts, the city should take advantage of the state funding from Senate Bill 1954 and create natural storm management systems, such as building artificial coral reefs.¹⁶⁷ Miami has an extensive shoreline to its benefit by building healthy coral reefs which disperse strong waves before they reach the shore ultimately protecting homeowners that live on the coast.¹⁶⁸ Additionally, the city of Miami should use the Senate Bill 1954 to build dense mangroves which also aid in dissipating wave energy, but are ideal for absorbing water when it rains reducing the chances

Paradise Vibe, THE CONVERSATION JOURNALISTIC BLOG (Jul. 28, 2021), <https://theconversation.com/a-20-foot-sea-wall-wont-save-miami-how-living-structures-can-help-protect-the-coast-and-keep-the-paradise-vibe-165076>.

¹⁶³ *Planning for Changing Sea Levels*, U.S. ARMY CORPS OF ENGINEERS (Feb. 5, 2022),

https://www.usace.army.mil/corpsclimate/Planning_for_Changing_Sea_Levels/.

¹⁶⁴ Greg Allen, *A \$4.6 Billion Plan to Storm-Proof Miami*, NPR ENV'T (Jun. 13, 2020), <https://www.npr.org/2020/06/13/875725714/a-4-6-billion-plan-to-storm-proof-miami>.

¹⁶⁵ Landolf Rhode-Barbarigos, *supra* note at 162.

¹⁶⁶ *Id.*

¹⁶⁷ *Id.*

¹⁶⁸ *Id.*

of coastal flooding.¹⁶⁹ Mangroves could be highly effective for protecting coastal homeowners in Florida since it rains year-round, and it stabilizes the coastline by reducing erosion caused by storm surges.¹⁷⁰ Furthermore, mangroves benefit the environment because it removes pollutants in the water from stormwater runoff before it reaches coral reefs, provides a natural habitat for fish, and provides nesting areas for coastal birds.¹⁷¹

All in all, Senate Bill 1954 provides state-wide funding for Florida to protect coastline homeowners from the threat of the rising sea level. Miami has already started to implement projects along the coast and should also explore more unique ways that protect homeowners and the environment.

B. Managed Retreat Provides a Solution for At-Risk Coastal Communities

Private property rights play a huge role in the planning and design of any remedial measures Florida may take to minimize the aftermath of the rising sea level.¹⁷² For example, if the City of Miami passed a bill that a sea wall must be built along the Intercoastal Waterway between Miami Beach and the City in order to hold back the rising water, all the homeowners along Miami Beach must agree to a sea wall being built.¹⁷³ If one homeowner does not want a seawall built on their property, it could delay proposed improvements and also bring lawsuits against the city. If the City of Miami were to impose this seawall, it could be considered a taking, which gives private homeowners grounds to sue.¹⁷⁴

¹⁶⁹ *Benefits of Mangroves*, FLORIDA DEPT. OF ENV'T PROT. (Feb. 5, 2022), <https://floridadep.gov/sites/default/files/benefits-of-mangroves-2-8-16.pdf>.

¹⁷⁰ *Id.*

¹⁷¹ *Id.*

¹⁷² *Sea Level Rise and Property Rights*, WGI BLOG (Feb. 22, 2018), <https://wginc.com/sea-level-rise-and-property-rights/>.

¹⁷³ *Id.*

¹⁷⁴ Fla. Stat. Ann. § 74.031 (West).

A taking is when the government trespasses upon private land for its own use without the homeowner's consent; this is known as physical taking.¹⁷⁵ Typically, when the government exercises the taking of property, they do this through the power of eminent domain.¹⁷⁶ The power of eminent domain is a governmental power that allows the government to take property as long as it is for the benefit of the public.¹⁷⁷ In addition, the Fifth Amendment of the U.S. Constitution states that private property shall not be taken for public use, without just compensation.¹⁷⁸ This means that the "owner of the property shall receive at a minimum the fair market value of the property in its best alternative use, independent of the government taking."¹⁷⁹ The compensation may also be in the form of cash, but in some situations, the compensation may come in the form of some returned benefit given to the homeowner, such as the increase in the value of retained land when the government uses the land for public use.¹⁸⁰

Just about 100 million people that live on U.S. coasts are at risk of displacement due to the rising sea level.¹⁸¹ Florida, along with many other states, has used managed retreat as a response to coastal erosion to the rising sea level to help protect homeowners.¹⁸² Managed retreat is not a new concept, it is a coastal management strategy and it has been used for decades to transition people from vulnerable coastal areas to safe inland communities.¹⁸³ The terms

¹⁷⁵ *Id.*

¹⁷⁶ *Id.*

¹⁷⁷ *Id.*

¹⁷⁸ U.S. CONST. amend. V.

¹⁷⁹ Richard A. Epstein & Eduardo M. Peñalver, *The Fifth Amendment Takings Clause*, NAT'L CONSTITUTION CTR (Jan. 23, 2022), <https://constitutioncenter.org/interactive-constitution/interpretation/amendment-v/clauses/634>.

¹⁸⁰ *Id.*

¹⁸¹ Fanilla Cheng, *Is Compulsory Managed Retreat our Future?* NEW AMERICA BLOG (Nov. 17, 2021), <https://www.newamerica.org/future-land-housing/briefs/is-compulsory-managed-retreat-our-future/>.

¹⁸² *Id.*

¹⁸³ *Introduction Managed Retreat Toolkit*, GEORGETOWN CLIMATE CTR. BLOG (Jan. 23, 2022),

“buyout” and “acquisition” are used interchangeably to describe an action in which the government “purchases a property from a willing seller, demolishes existing structures on the property, and prohibits future development through deed restrictions and allows the property to naturally revert to open space in perpetuity.”¹⁸⁴ In regards to how much land could be acquired through a buyout, it could be either parcel by parcel or it could be an entire community.¹⁸⁵

A great historical example of this is The Isle Charles Resettlement Project (“Resettlement Project”). Since 1955, the island south of Louisiana has lost about ninety-eight percent of its land due to environmental factors.¹⁸⁶ In 2016, Louisiana was awarded \$48.3 million in funds to “work with residents of Isle de Jean Charles to develop and implement a structured and voluntary retreat from the island into safer communities.”¹⁸⁷ The Resettlement Project included developing a community about forty miles north of Isle de Jean Charles that will include “more than 500 homes, walking trails, a community center, commercial and retail space and other amenities designed in conjunction with island residents.”¹⁸⁸ With the threat of the rising sea level and flooding affecting the entire coastal line of Florida, buyouts will need to be evaluated on a much larger scale than the Resettlement Project, however, the Resettlement Project is an excellent example of how successful buyout programs are proven to be.

The funding of the buyout program is granted by the federal government, providing three-quarters of the funding leaving state

<https://www.georgetownclimate.org/adaptation/toolkits/managed-retreat-toolkit/introduction.html?chapter>.

¹⁸⁴ *Voluntary Buyouts*, GEORGETOWN CLIMATE CTR. BLOG (Jan. 23, 2022), <https://www.georgetownclimate.org/adaptation/toolkits/managed-retreat-toolkit/voluntary-buyouts.html>.

¹⁸⁵ *Id.*

¹⁸⁶ *The Story of Isle De Jean Charles*, ISLE DE JEAN CHARLES RESETTLEMENT (Jan. 23, 2022), <https://isledejeancharles.la.gov>.

¹⁸⁷ *Id.*

¹⁸⁸ *The Story of Isle De Jean Charles*, *supra* note at 186.

and local governments to fund the balance.”¹⁸⁹ For the last 28 years, The Federal Emergency Management Agency (“FEMA”) financed more than 43,000 buyouts across 49 states, Puerto Rico, Guam, and the Virgin Islands.¹⁹⁰ However, there are a few issues with the buyout program.

First, the program is only eligible for homeowners who have damaged property after a disaster has occurred.¹⁹¹ There is no plan in place to subsidize vulnerable communities before a disaster occurs nor for homeowners who do not want to wait until a natural disaster occurs to act.¹⁹² Secondly, there is no plan in place to fund communities that do not experience a disaster per se but are experiencing one slowly such as the rising sea level or coastal erosion.¹⁹³ Third, FEMA’s low premiums on their National Flood Insurance Program have not been adjusted since the 1970s, which encourages homeowners to rebuild their homes rather than move away.¹⁹⁴ Lastly, some people love where they live. Many Americans have saved their money for decades to buy a home near the water and have no incentive to simply give their property to the government.¹⁹⁵ In Monroe County Florida, the Department of Housing and Urban Development received \$15 million in funding to conduct buyouts after Hurricane Irma in 2017, and only sixty-two people out of the 4,000 people who were affected thus far have applied for the buyout.¹⁹⁶

Even though there are issues with managed retreat, it is less expensive than costly structural stabilization projects that may only

¹⁸⁹ Yuliya Orlinsky, *The Case for Managed Retreat*, POLITICO (Jul. 14, 2020), <https://www.politico.com/news/agenda/2020/07/14/climate-change-managed-retreat-341753>.

¹⁹⁰ *Id.*

¹⁹¹ *Id.*

¹⁹² *Id.*

¹⁹³ *Id.*

¹⁹⁴ *Id.*

¹⁹⁵ *Id.*

¹⁹⁶ *Id.*

be a temporary solution, especially in highly erosive areas.¹⁹⁷ States across the U.S. have encouraged managed retreat. For example, former New York City Mayor Michael Bloomberg has spoken positively about the plan and has offered coastal homeowners a buyout program incentivizing them to move away from the coast, turning the exposed land into greenspace after the destruction caused by Hurricane Sandy in 2012.¹⁹⁸ Additionally, in 2018 the California Coastal Commission updated its Sea Level Rise Guidance heavily encouraging the use of managed retreat.¹⁹⁹ Not only does managed retreat protect homeowners, but it also protects the environment. Managed retreat maintains natural shoreline and aids shoreline habitats to migrate inland as the shoreline erodes to prevent loss of wetlands.²⁰⁰

Possibly the most famous example of managed retreat was the relocation of the Cape Hatteras Lighthouse 2,900 feet inland in 1999.

When constructed in 1870, the lighthouse was 1,500 feet from the shore . . . but by late 1987 the lighthouse stood only 160 feet from the sea and was in danger of collapsing . . . adding additional grains, sea walls and sand to the beach would be more costly and only estimated to last twenty or thirty years.²⁰¹

After several years of debate, the lighthouse was successfully moved back 2,900 feet and now lies 1,500 feet from shore, its original distance from the sea.²⁰² Even though it has been twenty-three years since the relocation of the Cape Hatteras Lighthouse, it sets a great example of how successful managed retreat is. Surfrider Foundation's Beach Preservation Policy highlights managed retreat as a realistic long-term strategy

¹⁹⁷ *Managed Retreat*, BEACHAPEDIA (Jan. 6, 2022), https://beachapedia.org/Managed_Retreat.

¹⁹⁸ *Id.*

¹⁹⁹ *Id.*

²⁰⁰ *Id.*

²⁰¹ *Managed Retreat*, *supra* note at 197.

²⁰² *Id.*

for dealing with coastal erosion, stating, “[i]n areas where erosion threatens existing coastal development, the Surfrider Foundation advocates appropriate long-term solutions that maximize public benefit.”²⁰³

VI. FUTURE SOLUTIONS

A. *Compulsory Managed Retreat Is Not a Viable Solution*

A very important feature of the managed retreat implementation is that the buyouts must be voluntary.²⁰⁴ However, in 2015, the USACE clarified a mitigation policy “conditioning flood . . . funding on municipalities’ agreement to use eminent domain to relocate households, if necessary, in what may be the first compulsory managed retreat policy in the United States.”²⁰⁵

Traditionally, “local governments apply to the Federal Emergency Management Agency (“FEMA”) or the Department of Housing and Urban Development (“HUD”) for funds to implement buy-out programs.”²⁰⁶ The federal government provides three-quarters of the funding, and the state then funds the balance.²⁰⁷ Once local governments receive the funds, they offer property owners the value of their home, and then it is up to the homeowners to accept the money and move away, or deny the money and remain where they are.²⁰⁸

The USACE issued a report defending its position on using eminent domain and making it a condition of managed retreat.²⁰⁹ The USACE also emphasized that a voluntary buyout plan is not sustainable to ensure a complete plan and is forcing states into the

²⁰³ *Id.*

²⁰⁴ *Introduction Managed Retreat Toolkit, supra* note at 183.

²⁰⁵ Cheng, *supra* note at 181.

²⁰⁶ *Id.*

²⁰⁷ *Id.*

²⁰⁸ *Id.*

²⁰⁹ *Id.*

dilemma of either “mandating that residents relocate, or losing out on much-needed federal funds.”²¹⁰

While there are some benefits to compulsory managed retreat, many states are reluctant in implementing it. Monroe County in the Florida Keys partnered with the USACE in 2018 to develop a mitigation plan which included mandatory buyouts of vulnerable homes; however, Monroe County is still awaiting congressional approval after it removed the mandatory provision, refusing to move forward with the plan because it could violate individuals’ property rights.²¹¹ Moreover, there is also a concern about where all the displaced residents will go once they are forced to move. Questions such as “what kind of relocation assistance will be provided, will there be designated communities that displaced households can be permanently relocated to, how will the communities receiving these displaced households be impacted” are all unanswered.²¹²

In 2018, survivors of the Paradise Wildfire in California were relocated to a trailer park with free FEMA housing, however, the survivors were soon evicted when the trailer park closed due to underestimated costs.²¹³ Survivors from the Paradise Fire now make up one-third of Chico’s homeless population.²¹⁴

In conclusion, forcing people out of their homes in widely unpopular by both local governments and homeowners, and it is important to explore other options on how homeowners could be protected by using Senate Bill 1954.

²¹⁰ *Id.*

²¹¹ Cheng, *supra* note at 181.

²¹² *Id.*

²¹³ *California Dramatically Underestimating Costs from Future Wildfires as Housing Shortage and Existing Policies Incentivize Rebuilding in High-Risk Zones*, NEXT10 BLOG (June 10, 2021), <https://www.next10.org/press-releases/rebuilding-resilient>.

²¹⁴ Cheng, *supra* note at 181.

B. How Are Other Parts of The World Responding to the Rising Sea Level

As coastal cities in the United States prepare for the rising sea level, other parts of the world are also implementing protective measures. In China, ninety-eight percent of their large cities are being impacted by regular flooding due to the rising sea level.²¹⁵ To combat this threat and protect its citizens, China launched the Sponge City Initiative in 2014.²¹⁶ The initiative requires that urban land absorbs over seventy percent of stormwater, reducing the impact of flooding.²¹⁷ China is spending its funds on vulnerable cities by creating porous pavement—like the city of Miami is doing with their Blue Green Neighborhoods project—building rain gardens and ponds that store excess rainfall in underground storage tanks, which cities then repurpose the water for their individual needs.²¹⁸

China replicated this innovation from India to collect stormwater to offset water shortages during the planting season and Vietnam also adopted a sponge strategy to lessen the impact of seasonal floods from the rising sea level on vulnerable communities.²¹⁹ The cost of the innovation is very expensive; city authorities in China have entered into partnerships with private investors to cover the costs which Florida could also do.²²⁰ Even if private investors are not willing to partner with coastal city officials in Florida, Florida still has the budget to create natural sponge-like innovations, like mangroves and marshes to protect coastal homeowners.²²¹

²¹⁵ Robert Muggah, *How China's Sponge Cities are Preparing for Sea-Level Rise*, WORLD ECON. FORUM (Jun. 28, 2019), <https://www.weforum.org/agenda/2019/06/how-china-s-sponge-cities-are-preparing-for-sea-level-rise/>.

²¹⁶ *Id.*

²¹⁷ *Id.*

²¹⁸ *Id.*

²¹⁹ *Id.*

²²⁰ *Id.*

²²¹ *Five Adaption Approaches*, *supra* note at 124.

New York is implementing its own strategies to protect their coastal homeowners from the rising sea level. The devastation Hurricane Sandy left behind triggered the State to establish an East Coast Resilience Project along the shoreline of Manhattan with a budget of over a billion dollars, and Congress has agreed to jointly fund the project if needed.²²² The sea wall will contain barriers that will open and close controlling New York's impact on flooding; this swinging-gate structure originated in the Netherlands to curb flooding but has caused environmental damage to estuaries and marshes.²²³ A swinging barrier is not ideal in Florida since a moving barrier has the potential to damage the existing ecology in the ocean, leaving hundreds of species without a habitat.

In conclusion, many problems arise with building a sea wall that is constantly shifting the ocean floor threatening marine life, implementing an environmental-friendly response to the rising sea level that correspondingly protects homeowners is ideal for the State of Florida.

VII. CONCLUSION

The rising sea level is an inevitable crisis leaving coastal communities vulnerable to tragic possibilities, such as total inundation of residential homes, flooding within the community, and a drastic decrease in home value. The sea level is surging globally because of global warming and thermal expansion.²²⁴ Global warming is causing the sea level to rise because as the temperature of the earth grows by trapped greenhouse gases, thermal expansion occurs.²²⁵ Thermal expansion is when a substantial

²²² Ana Fernandez, *Vulnerable to Climate Change, New York Constructs Seawall*, SCIENCE X NETWORK (Dec. 14, 2021), <https://phys.org/news/2021-12-vulnerable-climate-york-seawall.html>.

²²³ Anne Bernard, *the \$119 Billion Sea Wall That Could Defend New York... Or Not*, N.Y. TIMES (Jan. 17, 2020), <https://www.nytimes.com/2020/01/17/nyregion/the-119-billion-sea-wall-that-could-defend-new-york-or-not.html>.

²²⁴ Florida Oceans and Coastal Council, *supra* note at 13.

²²⁵ *Id.*

amount of ice sheets melt into the oceans basin ultimately increasing the volume of water in the ocean.²²⁶ This occurrence eventually affects coastal communities because residential homes could be ruined by the excessive flooding caused by the ocean traveling inland.²²⁷ Moreover, hurricanes are also a contributing factor to the rising sea level.²²⁸ The temperature of the earth rising is causing a sizeable amount of evaporation into the atmosphere, producing heavier and stronger rainfall.²²⁹ When heavy rainstorms make landfall, the water travels inland and causes storm surges.²³⁰ Storm surges leave behind devastating effects in coastal communities, such as loss of electricity, loss of clean water, and homes destroyed.²³¹

The State of Florida is growing in population every year because of its attractive scenery, warm weather, and friendly tax breaks, and, more specifically, people are moving into the coastal areas that are extremely vulnerable to the rising sea level.²³² To protect coastal communities from being impacted by the rising sea level, Florida passed Senate Bill 1954 in 2021.²³³ It provides a statewide flooding and resilience plan that requires the Department of Environmental Protection to complete a statewide flood risk and sea level rise data assessment to submit to the Governor and gives \$100 million in grants to aid local governments in combating the rising sea levels.²³⁴ Miami, Florida has used this funding by raising existing land on artificial fill, elevating structures on stilts to allow storm surges to pass beneath buildings, filling the city with Blue Green Neighborhoods, and developing in areas that are naturally on

²²⁶ *How is Sea Level Related to Climate Change*, *supra* note at 20.

²²⁷ *Id.*

²²⁸ *Hurricanes and Climate Change*, *supra* note at 32.

²²⁹ *Id.*

²³⁰ Didlake, *supra* note at 35.

²³¹ *Id.*

²³² Hammerberg, *supra* note at 113.

²³³ Steve Newborn, *DeSantis Signs Sea Level Rise Bill into Law*, WUSF PUBLIC MEDIA (May 12, 2021), <https://wusfnews.wusf.usf.edu/environment/2021-05-12/desantis-signs-sea-level-rise-bill-into-law>.

²³⁴ Newborn, *supra* note at 233.

higher ground.²³⁵ Other coastal cities in Florida have used the funding for managed retreat and buyout programs to help homeowners who are at risk of losing their homes due to the rising sea level, move to an area that is safe.²³⁶ Other parts of the world have implemented their own protective measures to protect coastal communities, such as China, India, and Vietnam have launched Sponge City Innovations to lessen the impact of seasonal floods and keep communities dry.²³⁷ The issues posed by rising sea levels are complex that mandate resourcefulness, and long-term solutions. With Senate Bill 1954 in place, it provides coastal communities in Florida a chance to create environmentally friendly projects that protect homeowners from the disastrous effects of the rising sea level.

²³⁵ *Five Adaption Approaches*, *supra* note at 124.

²³⁶ *Introduction Managed Retreat Toolkit*, *supra* note at 183.

²³⁷ Muggah, *supra* note at 215.