



THE
BUSINESS
CASE FOR
RESILIENCE
IN SOUTHEAST FLORIDA

EXECUTIVE SUMMARY



ABOUT THE URBAN LAND INSTITUTE

The Urban Land Institute is a global, member-driven organization comprising more than 45,000 real estate and urban development professionals dedicated to advancing the Institute's mission of shaping the future of the built environment for transformative impact in communities worldwide.

ULI's interdisciplinary membership represents all aspects of the industry, including developers, property owners, investors, architects, urban planners, public officials, real estate brokers, appraisers, attorneys, engineers, financiers, and academics. Established in 1936, the Institute has a presence in the Americas, Europe, and the Asia Pacific region, with members in 80 countries. More information is available at uli.org. Follow ULI on Twitter, Facebook, LinkedIn, and Instagram.

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AECOM is the world's premier infrastructure consulting firm, delivering professional services throughout the project lifecycle—from planning, design, and engineering to program and construction management. We partner with our clients in the public and private sectors to solve their most complex challenges and build legacies for generations to come. On projects spanning transportation, buildings, water, governments, energy, and the environment, our teams are driven by a common purpose to deliver a better world. AECOM is a Fortune 500 firm and its Professional Services business had revenue of approximately \$13.2 billion in fiscal year 2020. See more at aecom.com and [@AECOM](https://twitter.com/AECOM).

ABOUT BRIZAGA

Brizaga is a multi-disciplinary civil and coastal engineering firm built to solve complex problems by strategically leveraging science, communications, and policy. We design, plan, engineer, and communicate innovative and practical adaptation solutions in the face of more frequent flooding, rising tides, and a changing environment. Our team believes in building a lasting relationship with our clients and serving as the partner on their adaptation journey. See more at brizaga.com and [@BrizagaHQ](https://twitter.com/BrizagaHQ).

ABOUT THE COMPACT

The Southeast Florida Regional Climate Change Compact (the Compact) is a partnership among Broward, Miami-Dade, Monroe, and Palm Beach counties to work collaboratively to reduce regional greenhouse gas emissions, implement adaptation strategies, and build climate resilience across the Southeast Florida region.

For more than a decade, the Compact counties have successfully collaborated on mitigation and adaptation strategies, built bipartisan support for climate action, and forged partnerships with key stakeholders including federal, state, and municipal governments and agencies; economic development entities; community-based organizations; and the academic community, enabling the development of a regional voice and vision for future prosperity in Southeast Florida.

ABOUT THIS SUMMARY

This executive summary was created by ULI. Technical support for the underlying study was provided by AECOM's Sustainable Economics Practice and is presented in *The Business Case for Resilience in Southeast Florida*, a technical report prepared for the Urban Land Institute and Southeast Florida Regional Climate Change Compact. Findings from the technical report are distilled here in addition to supplemental content and narrative provided by ULI. The project has been supported by a coalition of local partners, including Broward, Miami-Dade, Monroe, and Palm Beach counties; the Florida Department of Environmental Protection; the Beacon Council Foundation; Broward Workshop; Community Foundation of Broward; Greater Fort Lauderdale Chamber of Commerce; and Greater Miami Chamber of Commerce.

PROJECT PARTNERS



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This report was reviewed for consistency and accuracy of the original economic analysis.

THE BUSINESS CASE FOR RESILIENCE IN SOUTHEAST FLORIDA

QUICK FACTS AND FIGURES FROM THE ECONOMIC ANALYSIS

THE REGION

The Southeast Florida Regional Climate Compact encompasses **4 counties** and is the nation's **7th-largest metro area** with 6,147,269 people.^{a,b}

The **region produces \$359 billion in GDP.**^c

Tourism alone is responsible for contributing **\$91 billion** to the state GDP.^d

Spanning over 6,055 square miles, the region's ranging average elevation falls between **4.8 and 20 ft above sea level.**^e

WHAT IS AT RISK IN 2040?

By 2040, the region could experience **17 inches of sea-level rise.**^f

Daily tidal inundation may result in more than **\$4.2 billion in property value loss.**

Permanent sea-level rise could affect **720 jobs** and cause **\$28 million in sales, property, and tourism tax losses.**

In a 10-year storm tide event, there could be **\$3.2 billion in property damage and \$1.8 million in sales and tourism tax losses.**

WHAT IS AT RISK IN 2070?

By 2070, the region could experience **40 inches of sea-level rise.**^g

Daily tidal inundation may result in more than **\$53.6 billion in property value loss.**

Permanent sea-level rise could affect **17,800 jobs**, and cause **\$384 million in fiscal losses.**


In a 10-year storm tide event, there could be **\$16.5 billion in property damage and \$8 million in sales and tourism tax losses.**

THERE IS A COMPELLING BUSINESS CASE FOR THE REGION TO MAKE INVESTMENTS IN RESILIENT INFRASTRUCTURE NOW

Building-level and community-wide adaptations provide greater benefit than cost to the region. These strategies must be integrated together to safeguard Southeast Florida.

	COMMUNITY-WIDE ADAPTATION	BUILDING-LEVEL ADAPTATION
ECONOMIC BENEFITS THROUGH 2070	\$37.9 billion	\$17.6 billion
JOB YEARS*	85,000	56,000
EXAMPLES	Seawall construction Beach nourishment	Elevating structures Floodproofing
BENEFIT-COST RATIO	2 : 1 \$2 of benefits from \$1 of investments	4 : 1 \$4 of benefits from \$1 of investments

*A job year is one year of work for one person.



The *Business Case for Resilience in Southeast Florida* analysis shows there is a compelling business case for the region to make investments in resilient infrastructure now and continue to coordinate to address flood-related threats.

The regional economic analysis identifies opportunities associated with resilient investment in the face of climate risks to the region due to more frequent flooding and sea-level rise.

MAKING THE BUSINESS CASE

The counties in the Southeast Florida region, including Broward, Miami-Dade, Monroe, and Palm Beach, are among the most proactive in the nation in planning for climate change. Local leadership within the counties created the Southeast Florida Regional Climate Change Compact and has taken a leading role planning for the substantial risk associated with the impacts of climate change, including sea-level rise and stronger storms.

The Compact, along with local business and nonprofit communities, partnered with the Urban Land Institute to comprehensively assess the economic impact of investment in resilience in the region. The findings illustrate the region's vulnerability to the impacts of climate change and the shared interest in action by both the public and private sectors when it comes to investing in proactive flood protection and climate adaptation measures. The economic modeling study found that climate adaptation measures are forecast to offer a significant return on investment for the region, protecting communities, jobs, and properties.

This *Business Case for Resilience in Southeast Florida* analysis presents estimates of the economic consequences to coastal counties in the region if local governments and business communities fail to take action to mitigate the impacts from tidal flooding and frequent coastal storms, compounded by sea-level rise. The analysis takes a regional perspective, considering the impacts to the region given the interconnected economies across all four counties. In addition, the study estimates the economic benefits from certain types of adaptation actions designed to mitigate the coastal hazard risks. These adaptation actions could all make a difference, but some are more suitable for some counties

than others, and each county may need a customized approach to address its own unique resilience challenges.

The research presented in this study builds on past work completed in the region and leverages a robust economic modeling tool, called REMI PI+, to estimate cascading economic impacts at multiple geographic scales. The findings present an important opportunity for the government and business community to contextualize and advance investment in resilience measures.

Coastal storms and sea-level rise have wide-ranging societal, economic, and environmental effects that extend beyond the borders of any one community. Accordingly, this study assesses the four counties and interconnected economies represented by the Compact. This region accounts for about 30 percent of the population of Florida and generates about 35 percent of the state's gross domestic product.¹

To advance economic resilience at the regional scale, the counties should avoid a divided approach to adaptation that fails to account for the complex interdependencies between local and regional economies and the critical role that regional infrastructure plays.

Developing an understanding of the economic consequences from current and predicted coastal hazards is critical to inform decision-making about how to best protect the communities, businesses, and natural resources that make coastal communities in Southeast Florida a strong business environment and world-class leisure destination.

WHAT WAS INCLUDED IN THE ANALYSIS

This study is a regional economic evaluation of flood risk and exposure, with the inclusion of predicted heights of sea level in 2020, 2040, and 2070. Coastal conditions modeled include the average daily high tide, or mean higher high water (MHHW), the king tide (one-year tide), and the 10-year storm tide. More frequent events were also examined as part of this study because those events are more likely to be insurable in the future.

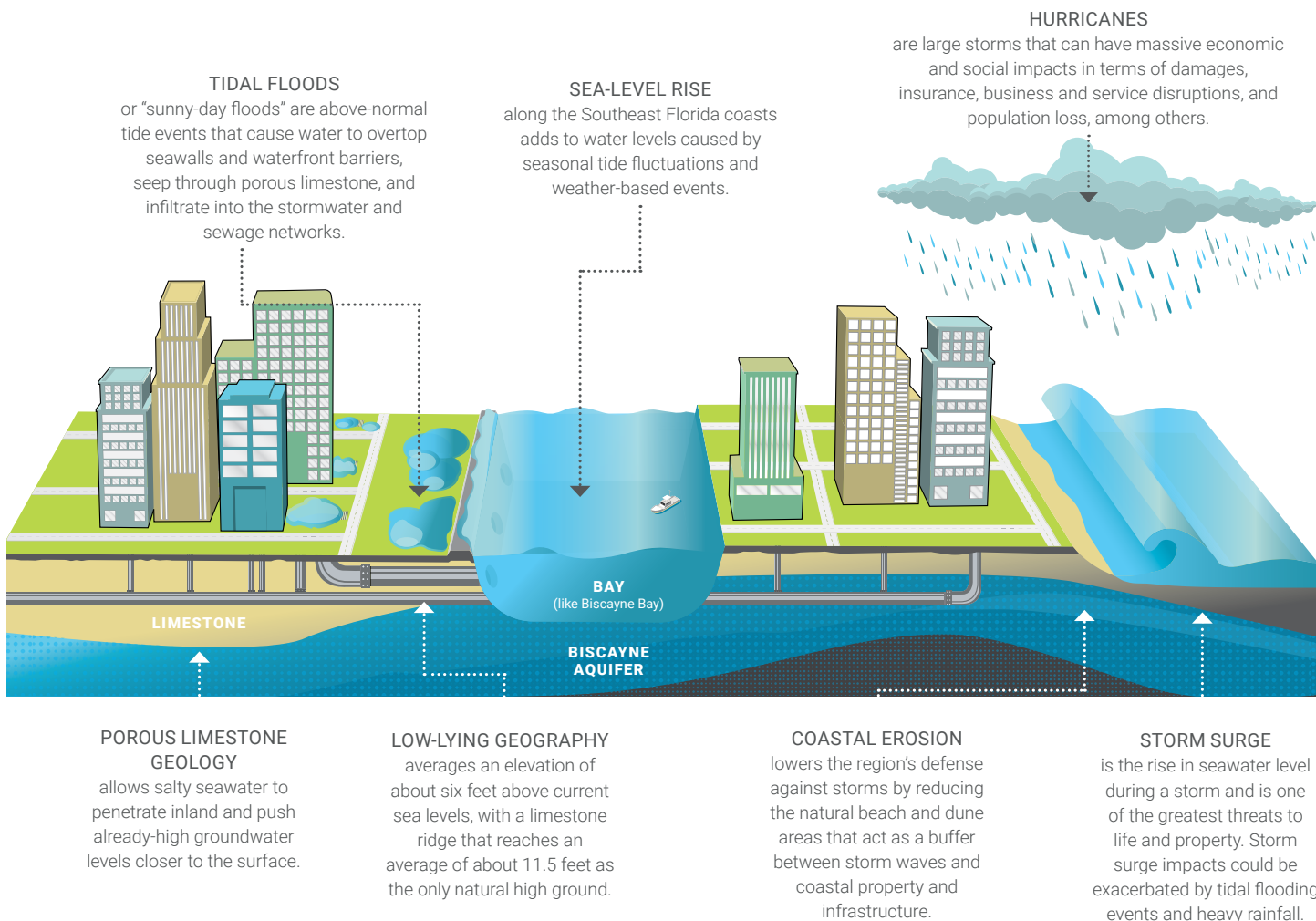
To account for broader regional dynamics, the REMI PI+ modeling platform was used to evaluate the effect of these high-frequency flooding events on the economy of Southeast Florida and the rest of the state.

The study analyzed impacts avoided and cumulative costs of certain adaptation strategies and resulting benefit-cost ratios for both community-wide and building-level adaptation strategies from 2020 to 2070.

UNDERSTANDING THE REGION'S FLOOD RISK

As the Southeast Florida region continues to grow and develop, so too do the region's unique flooding challenges, which are heightened by increasing precipitation rates and storm activity, rising seas and groundwater levels, flat topography, and impervious land uses, as noted in the graphic below. As sea levels rise, it no longer takes a strong storm to cause flooding throughout coastal communities. Flooding now occurs at high tide for many locations due to a combination of sea-level rise, smaller storm events, onshore wind flows, and changing offshore current patterns that cause water to pile up along the shoreline.

Frequent flooding can cause damage, disrupt businesses and transportation, and corrode infrastructure over time. These environmental risks can lead to much broader socioeconomic impacts, such as loss or impairment of public services and infrastructure, decreases in property values and local government tax bases, increases in insurance costs, and displacement of disadvantaged and marginalized frontline communities.



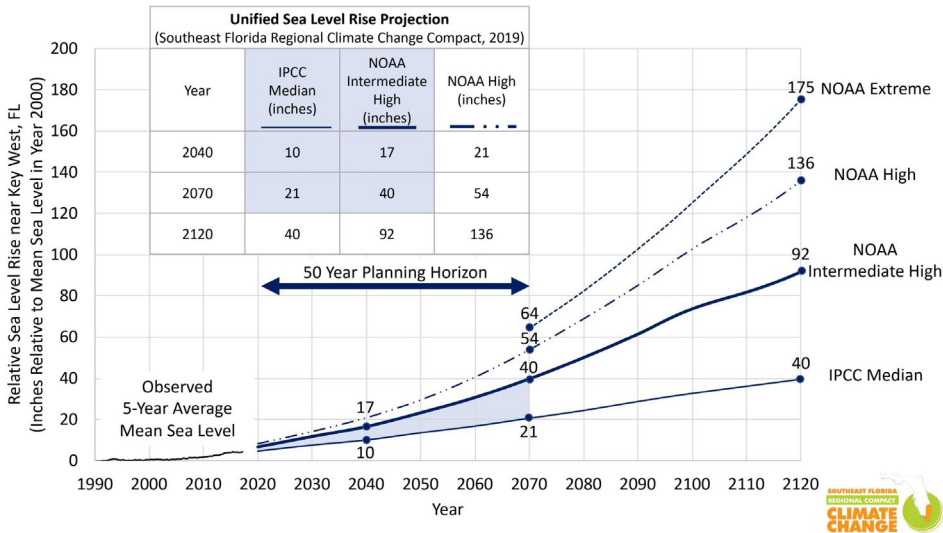
WHY 2020, 2040, AND 2070?

In this analysis, the 2017 National Oceanic and Atmospheric Administration (NOAA) Intermediate-High projections were selected for the planning time horizons of 2020 (existing conditions), 2040, and 2070, which align with the updated Southeast Florida Regional Climate Change Compact recommended regional sea-level rise projections. The Intermediate-High projections are recommended for high-priority projects, including evacuation routes, energy infrastructure, critical government fatalities, and infrastructure that may stay in place beyond a design life of 50 years.

WHAT IS THE SOUTHEAST FLORIDA REGIONAL CLIMATE CHANGE COMPACT?

The Southeast Florida Regional Climate Change Compact is a coalition of the four counties of Southeast Florida—Monroe, Miami-Dade, Broward, and Palm Beach—that advances climate mitigation and adaptation strategies throughout the region.

SOUTHEAST FLORIDA REGIONALLY UNIFIED SEA-LEVEL RISE PROJECTIONS SFRCCC, 2019.



In 2019, the Compact released the third update to its Unified Sea-Level Rise Projections for the Southeast Florida region. (Southeast Florida Regional Climate Change Compact)

THE BUSINESS CASE FOR RESILIENCE: ASSUMPTIONS

In this study, the adaptation strategies evaluated focused only on high-level actions that are applicable across the four counties in Southeast Florida and that provide regional-scale protection from sea-level rise and high-frequency coastal storms. The study does not address the unique coastal hazard flood and stormwater risks and opportunities at a local scale.

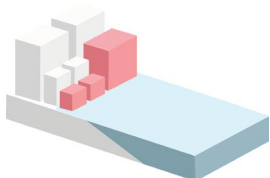
The adaptation strategies selected present a better benefit-cost ratio in certain areas, including dense areas with high-value properties. As such, not every action is viable in each county, but they serve as a test case to determine whether adaptation is cost-beneficial at the regional scale.

UNDERSTANDING AVOIDED DAMAGE

VISUALIZING DAMAGE WITH AND WITHOUT RESILIENT ADAPTATION

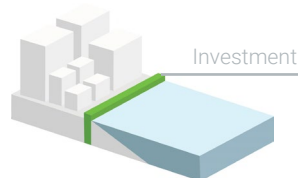
DAILY TIDE IN 2040 Without Adaptation Action

Without adaptation action, rising seas coupled with daily high tides threaten buildings and infrastructure.



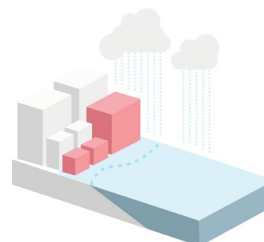
DAILY TIDE IN 2040 With Adaptation Action

With adaptation actions, buildings and infrastructure are more protected from rising seas and daily high tides.



COASTAL HAZARD IN 2040 Without Adaptation Action

Without adaptation action, a coastal hazard (storm) causes widespread damage to buildings and infrastructure.



COASTAL HAZARD IN 2040 With Adaptation Action

With adaptation actions, buildings and infrastructure are more protected from coastal storms.



NO-ADAPTATION-ACTION SCENARIO

Increasing risks from sea-level rise and tidal flooding have the potential to undermine the strength of Florida's real estate market. The study found that \$53.6 billion in regional property value will be exposed to daily tidal inundation under 2070 conditions.

Increasing evidence exists that projected flood inundation can decrease property value.² Previous studies show Miami-Dade properties at higher elevations in flood-risk areas appreciate at a higher rate than than properties at lower elevations.³

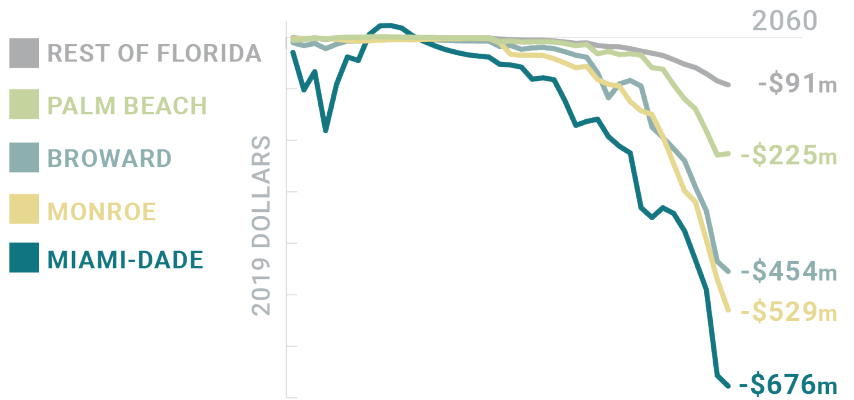
Implementation of the evaluated adaptation measures at both levels can deter flood impacts for the business community, like property damage and employment impacts, and maintain economic health.

The region could lose \$4.4 billion in property tax revenue over the next 50 years if no action is taken.

GDP CHANGES DUE TO SEA-LEVEL RISE

NO-ACTION SCENARIO (MHHW)

If no action is taken, each county in the Southeast Florida region will experience a deterioration in GDP from tidal and storm events by 2060.



TOTAL LOSSES BY COUNTY IF NO ACTION IS TAKEN

2020-2070 CUMULATIVE LOSSES (2019 DOLLARS)

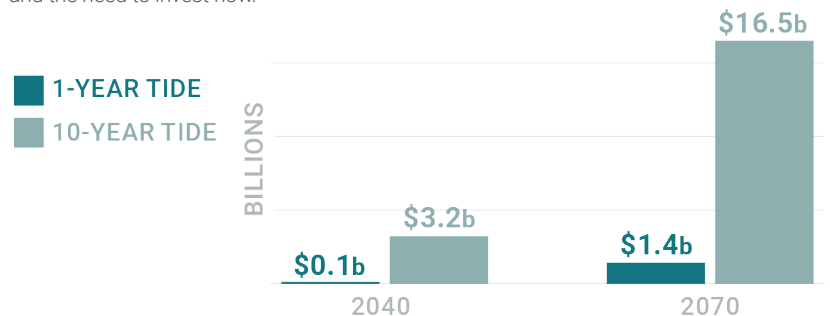
	PROPERTY IMPACTS	SALES OUTPUT IMPACTS	SALES & TOURISM TAX IMPACTS	PROPERTY TAX IMPACTS
BROWARD	\$63.911B	\$5.279B	\$161M	\$825M
MIAMI-DADE	\$106.5B	\$8.354B	\$361M	\$2.388B
MONROE	\$20B	\$8.560B	\$567M	\$674M
PALM BEACH	\$29.6B	\$2.117B	\$82M	\$548M
REGION	\$220.1B	\$24.310B	\$1.171B	\$4.435B

Note: Results are not adjusted to account for financial discounting.

STRUCTURE AND CONTENT LOSSES FROM A SINGLE STORM

NO-ACTION SCENARIO (MHHW) (2019 DOLLARS)

With no action, the current 10-year tide or 10 percent annual chance storm will cause \$16.5 billion in losses by 2070. That's a 500 percent increase from 2040. The current 10-year storm will also occur more frequently. This further makes the case for resilient investment, and the need to invest now.



ADAPTATION STRATEGIES

The physical effects of climate change present grave risks to Southeast Florida residents and communities and to the safety of businesses, property, and infrastructure. Efforts to enhance resilience throughout the region should incorporate principles that consider climate, economic, and social aspects.

CLIMATE RESILIENCE

Climate resilience is the ability to prepare and plan for, absorb, recover from, and more successfully adapt to adverse events related to climate change—from the stresses induced by more gradual changes such as sea-level rise or weather patterns to the acute shocks of intense and frequent weather events including hurricanes, heavy rainfall, and wildfires.

ECONOMIC RESILIENCE

Economic resilience is the capacity to prevent, withstand, recover from, and otherwise bounce back better from natural or human-caused shocks or disruptions to the economy. Economic resilience focuses on ensuring a local economy can survive and thrive during and after a disaster.

SOCIAL RESILIENCE

Social resilience is the ability of a human community to cope with and adapt to stresses such as social, political, environmental, or economic change. Social resilience is critical to addressing climate risk for low-income communities and communities of color, which are disproportionately affected by climate change.

COMMUNITY-WIDE AND BUILDING-LEVEL ADAPTATION

COMBINED ADAPTATION STRATEGIES PRESENT MAXIMUM BENEFITS FOR THE REGION

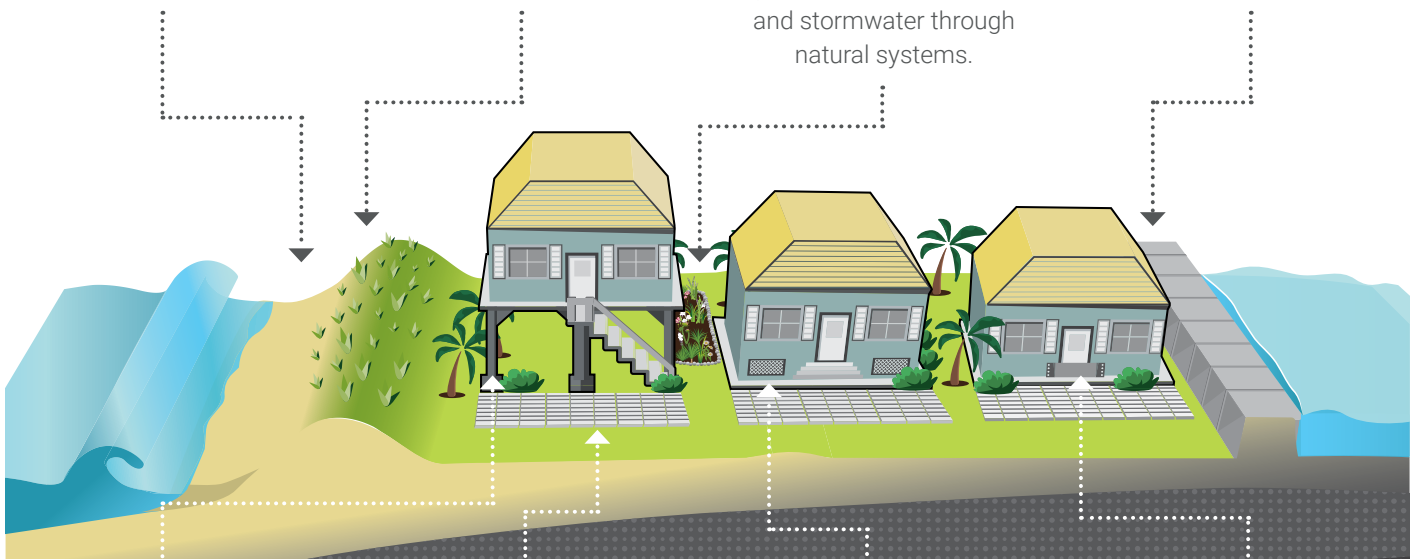
COMMUNITY-WIDE ADAPTATION STRATEGIES

BEACH NOURISHMENT
is the addition of sediment to beaches to replenish land loss from erosion.

SAND DUNES
are natural barriers that protect against coastal storms and beach erosion.

GREEN INFRASTRUCTURE
like bioswales and rain gardens is intended to capture and drain floodwater and stormwater through natural systems.

SEAWALLS
are constructed shoreline structures that protect property from flooding.



BUILDING-LEVEL ADAPTATION STRATEGIES

STRUCTURE ELEVATION
is physically raising a structure above flood-risk levels.

PERMEABLE SURFACES
allow flowing water to infiltrate through the surface into the ground below.

WET FLOODPROOFING
allows uninhabited portions of a structure to permit floodwater to enter and exit.

DRY FLOODPROOFING
is watertight flood protection at the base of a structure to prevent floodwaters from entering.

RETURN ON INVESTMENT IN ADAPTATION

A BUSINESS CASE FOR BUILDING-LEVEL AND COMMUNITY-WIDE ADAPTATION FOR THE REGION

The analysis shows that there is a regional business case for the local governments and business communities of Southeast Florida to start making investments in resilient infrastructure now, with phased investments over the coming decades. To develop an understanding of the costs and benefits of adaptation, the direct impacts on real and personal property under a no-action scenario were estimated and compared with the costs and benefits of community-wide and building-level adaptation strategies. The tables below show estimates for the cumulative impacts avoided and cumulative cost of adaptation, net impacts, and resulting benefit-cost ratios, which range from about 2:1 to 4:1. A benefit-cost ratio greater than 1 implies that the economic benefits outweigh the costs.

The economic benefits from both building-level and community-wide adaptation provide greater benefit than cost to the region. However, these two approaches should generally be integrated to safeguard the region.

RETURN ON INVESTMENT: BUILDING-LEVEL ADAPTATION

CUMULATIVE 2020–2070 (NET PRESENT VALUE)

	CUMULATIVE IMPACTS AVOIDED	CUMULATIVE ADAPTATION COSTS	NET IMPACTS	BENEFIT-COST RATIO
BROWARD	\$4.5 billion	\$1.5 billion	\$3 billion	3.04
MIAMI-DADE	\$9.2 billion	\$1.8 billion	\$7.5 billion	5.18
MONROE	\$459 million	\$598 million	-\$139 million	0.77
PALM BEACH	\$3.3 billion	\$545 million	\$2.8 billion	6.08
FOR THE REGION	Benefits \$17.6bil	Costs \$4.4bil	Benefit-Cost Ratio 3.97	Job Years Supported 56,000

RETURN ON INVESTMENT: COMMUNITY-WIDE ADAPTATION

CUMULATIVE 2020–2070 (NET PRESENT VALUE)



	CUMULATIVE IMPACTS AVOIDED	CUMULATIVE ADAPTATION COSTS	NET BENEFITS	BENEFIT-COST RATIO
BROWARD	\$9.601 billion	\$4.128 billion	\$5.473 billion	2.33
MIAMI-DADE	\$19.461 billion	\$2.101 billion	\$17.360 billion	9.26
MONROE	\$3.182 billion	\$7.669 billion	-\$4.487 billion	0.41
PALM BEACH	\$5.613 billion	\$4.325 billion	\$1.288 billion	1.30
FOR THE REGION	Benefits \$37.9bil	Costs \$18.2bil	Benefit-Cost Ratio 2.08	Job Years Supported 85,000

Notes: Results account for structure, content, land, and relocation impacts. Results are presented in net present value terms using a 5 percent discount rate over the period of the analysis from 2020 to 2070. For both the community-level and building-level adaptation strategies, the benefits outweigh the costs for all counties except Monroe. This does not imply that adaptation is not a cost-effective investment for Monroe County. Rather, the selected adaptation solutions examined in this study would not be the appropriate strategies to apply in Monroe County.

ECONOMIC BENEFITS FROM INVESTMENT IN SELECTED TYPES OF ADAPTATION MEASURES THROUGH 2040 (2019 DOLLARS)

There is a compelling case for investing in both community-wide and building-level adaptation in the Southeast Florida region. The table below shows the economic benefit from investments in community-wide and building-level adaptation strategies in 2020 and 2040, which are the years when investment would take place as part of the phased adaptation approach in this study. Overall, both adaptation scenarios present a general positive impact on GDP and employment for the region.

INVESTMENTS IN:	COMMUNITY-WIDE ADAPTATION INVESTMENT		BUILDING-LEVEL ADAPTATION INVESTMENT	
	2020	2040	2020	2040
Economic Impact	<i>Combined difference from baseline</i>		<i>Combined difference from baseline</i>	
BROWARD				
Job years	6,780	5,280	2,530	15,010
GDP	\$660 million	\$780 million	\$240 million	\$1.97 billion
MIAMI-DADE				
Job years	15,200	9,550	3,190	18,470
GDP	\$1.6 billion	\$1.38 billion	\$350 million	\$2.67 billion
MONROE				
Job years	19,370	9,320	2,560	5,600
GDP	\$1.26 billion	\$810 million	\$180 million	\$530 million
PALM BEACH				
Job years	9,470	9,910	1,270	7,020
GDP	\$730 million	\$1.17 billion	\$120 million	\$880 million
REST OF FLORIDA				
Job years	-15,050	-11,320	300	1,130
GDP	-\$1.34 billion	\$1.23 billion	\$30 million	\$140 million

One Job  X Ten Years  = Ten Job Years **10**

Jobs rounded to nearest 10. GDP rounded to nearest \$10 million. Job years is equivalent to one year of work for one person; for example: a new construction job that lasts two years will equate to two job years. Results are not adjusted to account for financial discounting.

RECOMMENDATIONS

ENHANCING CLIMATE, ECONOMIC, AND SOCIAL RESILIENCE

1. INCREASE CLIMATE RISK AWARENESS

Fundamental to resilience is increasing climate and flood risk awareness. Information about climate-change risks and their knock-on effects is not incorporated into most policies that govern public and private institutions. As a result, risky behavior is often incentivized or subsidized. Both the public and private sectors play a role in risk disclosure, through policies such as mandatory seller disclosure forms, loan terms, and technical assistance programs.

2. DEVELOP ACTIONABLE FUNDING AND FINANCING PLANS TO PAY FOR RESILIENCE

The risks posed by a changing climate are too great for any one sector to take on alone. Therefore, investments in climate resilience should be made by both public- and private-sector actors, with an eye toward ensuring that all entities would benefit from such investments.

3. INVEST IN KEY VULNERABLE AND EMERGING INDUSTRIES

The analysis found that the retail, accommodation and food services, and wholesale industries are particularly vulnerable to coastal hazards. Vulnerabilities can stem from operating near the coast and from the interdependencies between industries. Efforts should be made to protect vulnerable industries like these, and to promote economic diversification and innovation in the region, particularly those industries that operate near the coast. The public sector should identify and invest in economic clusters of businesses and industries that make the region competitive for jobs, private investment, and emerging fields related to adaptation.

4. DEVELOP AN OCCUPATIONAL ROAD MAP TO RESILIENCE

Certain workers may be more vulnerable to coastal hazards, such as workers in vulnerable industries, workers with less adaptable skillsets, lower-wage workers, and workers who travel far to get to work. At the same time, recovery efforts and adaptation investments will favor certain occupations over others, such as emergency responders and construction workers. Business clusters and organizing bodies, such as business improvement districts, should develop coordinated business continuity plans that account for physical and economic impacts, and they should develop workforce and economic development initiatives to grow the local labor pool that provides the services needed to prepare for and recover from coastal hazard events.

5. ENGAGE WITH AND PROVIDE SUPPORT TO THE SMALL-BUSINESS COMMUNITY

When small businesses are subject to the impacts of coastal hazards, they often lack the capital reserves, access to financing, or insurance coverage necessary to absorb a loss of income and the additional expenses that come with rebuilding. Streamlined access to capital and financing is critical to ensuring continued operations and related financial outcomes.

6. MAKE MITIGATING SOCIAL VULNERABILITY A PRIORITY DURING ADAPTATION DECISION-MAKING

Historically marginalized communities, including low-income communities and communities of color, will be most significantly affected by climate change. To advance future infrastructure investments using benefit-cost analysis alone—considering property value, tax dollars at risk, and other monetary factors—would unfairly disadvantage these groups. In addition, the growing income gap in the region and lack of living-wage jobs disproportionately challenge the ability of vulnerable communities to address public and mental health concerns, the threat of pandemics, and the risk from flood events.

7. PRIORITIZE PROJECTS STRATEGICALLY AND MONITOR EQUITY AND EFFICACY

Given the finite financial resources available for adaptation, communities and regions will be faced with difficult decisions regarding where investment should be directed, what types of adaptation projects should be pursued, when these investments should be made, and how much money should be borrowed to accelerate investments in resilience in a way that is commensurate with expected risks. When investments are to be made on adaptation projects, they should be developed through transparent evaluation frameworks that address societal vulnerabilities and ensure that the project plans incorporate a holistic approach to resilience, including offering benefits beyond protection from disruptive events, such as economic development, workforce development, land use, and capital improvements.

8. MAXIMIZE ADAPTATION INVESTMENTS BY COORDINATING BENEFITS

In a best-case scenario, resilient investments should leverage opportunities to maximize benefits for social, environmental, and economic outcomes. For example, investments in physical infrastructure intended to protect a community from hazards should strengthen a community against potential shocks, but also contribute to addressing stresses like flooding and to enhancing the region's economic development potential or social cohesion. Local and regional governments, as well as property and business owners, will eventually need to invest in property development and redevelopment, infrastructure, and related public necessities. Therefore, an opportunity exists to design investments in adaptation to provide co-benefits to people, the economy, and the environment that address current needs.

9. UNDERSTAND AND PREPARE FOR REPUTATION RISKS AND ASSOCIATED ECONOMIC IMPACTS

The Southeast Florida region is already facing reputational risk; coastal hazards and the region's vulnerability to sea-level rise have received significant national coverage in the U.S. popular media.⁴ Vulnerability to coastal hazards now and in the future can result in reputational risks and associated impacts such as property devaluation, insurance premium increases, bond-rating downgrades and increased borrowing costs, decreased tourism and associated spending, decreased public support, and risk from increased liability.

10. CONDUCT FURTHER IN-DEPTH ANALYSES AT THE COUNTY AND PROJECT LEVELS TO OPTIMIZE BENEFITS AND COSTS

This study examined Southeast Florida from a regional perspective, considering interconnected infrastructure systems, economies, and social networks, but also recognizing very specific differences across the four counties. Further studies will be required for more granular assessments of risk at specific sites of interest. Each project or investment has a unique context that should be considered on a project-by-project basis to allow for more specific design considerations and hopefully more optimal return on investment. At the municipal and regional level, future analyses can develop project-level road maps for action at a smaller geographic scale to better formulate adaptation and resilience strategies to meet community needs and to provide optimal returns to all parties.

RESOURCES FOR ENHANCING SOCIAL RESILIENCE IN A CHANGING CLIMATE

Resilience investments can help minimize the shocks from coastal hazards, but they will not address underlying chronic stresses such as social equity, poverty, unemployment, and the lack of industry diversification that affect the capacity of communities to respond to and recover from coastal hazard risks, shocks, and stresses. It is critical to not overlook the value of investing in communities most in need of support—primarily communities of color and those with low income.

The study focused on assessing the economic impacts and the costs and benefits conveyed by certain specific adaptation measures compared to inaction. To broaden decision-making considerations related to investments in adaptation and resilience, communities should consider the use of social vulnerability indices and other tools that can illustrate, in a standardized manner, the relative vulnerability of different populations to a range of shocks and stressors, both natural and caused by humans.

Helpful resources and frameworks include the following:

- Georgetown Equitable Adaptation Toolkit
- Institute for Diversity and Inclusion in Emergency Management (I-DIEM) resources and trainings
- Urban Sustainability Directors Network Resilience Hubs initiative
- Groundworks USA Climate Safe Neighborhoods plans
- Centers for Disease Control and Prevention Social Vulnerability Index



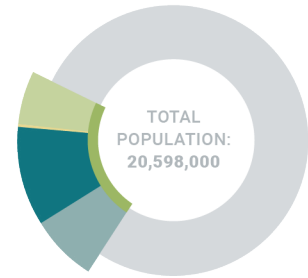
THE REGION'S ECONOMIC AND CLIMATE CONTEXT

Southeast Florida is regarded as a world-class destination for business and leisure purposes alike. Over the past 50 years, the region's diverse and growing population has developed the region into a prosperous hub for tourism, health care, international banking and finance, supply chain and logistics, creative industries, and technology. The region's economy is deeply interconnected among counties, cities, and communities. Southeast Florida's economy has continued to strengthen in the past decade. In 2018, the region generated more than \$350 billion in gross domestic product, contributing 35 percent of the state's total GDP.⁵ In the same year, Miami-Dade, Broward, and Palm Beach represented the top three counties in the state, respectively, for GDP growth.⁶ Compared with the rest of Florida, the Southeast has the largest labor pool and the most cruise and trade ports. Southeast Florida's waterfront is a key part of the economy: home to many residents and attractions, it creates opportunities for many key industry sectors, such as tourism and logistics. In 2016, total trade through the Miami Customs District, which includes seaports and airports, reached a record \$102.18 billion.⁷

POPULATION

STATE VS. SOUTHEAST FLORIDA REGION

SOUTHEAST FLORIDA: 6,147,269
PALM BEACH: 1,446,277
MONROE: 76,325
MIAMI-DADE: 2,715,516
BROWARD: 1,909,151

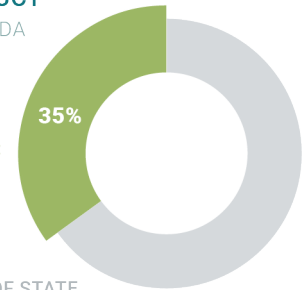


GROSS DOMESTIC PRODUCT

STATE VS. SOUTHEAST FLORIDA REGION

SOUTHEAST FLORIDA: \$359 billion

REST OF STATE



SOUTH FLORIDA'S WORKFORCE

FIRMS AND EMPLOYEES BY COUNTY

BROWARD

259,431 FIRMS
 719,985 EMPLOYEES

MIAMI-DADE

468,185 FIRMS
 1,000,931 EMPLOYEES

MONROE

14,413 FIRMS
 31,065 EMPLOYEES

PALM BEACH

175,919 FIRMS
 539,591 EMPLOYEES

TOURISM AND NATURAL RESOURCES IN THE REGION

Tourism is the state's largest industry and the fourth-largest employment sector, representing 12 percent of all jobs. Driven by Florida's coastline, warm climate, natural landscape, and beaches, tourism benefits the local counties and the state, having a total statewide economic impact of more than \$90 billion, including \$12.3 billion in state and local tax revenue alone (2018).ⁱ

Florida's natural landscape—including beaches, wetland areas, and coastal and ocean habitats—provides opportunities for recreational activities that attract tourists from around the world.

Ecotourism—tourism focused on visiting natural areas, observing wildlife, and supporting conservation—is directly reliant on the health and vitality of these areas, and accounts for a significant portion of the region's tourism. A total of 2.9 million people visited South Florida's national parks in 2019 alone, spending \$242.5 million during their visits and providing a net benefit of \$352 million to the region.ⁱⁱ

Tourism is Florida's top economic driver, contributing

\$91 BILLION

to gross state product in 2018.ⁱⁱⁱ

Ocean-related tourism contributed

\$24.7 BILLION

and over 70 percent of total jobs (about 395,000) in 2018.^{iv}

KEY TERMS

1-YEAR TIDE

The highest annual tide, also referred to as the king tide.

10-YEAR STORM TIDE

A tide with a 10 percent chance of occurring in any given year. This event represents high-frequency conditions of temporarily elevated water levels due to coastal storms.

ADAPTATION

Strategies that anticipate and adjust human and natural systems to moderate the projected or actual impacts of climate change.

AVOIDED IMPACTS

This value represents the difference between the estimated impacts under the no-action scenario to the estimated impacts for the modeled adaptation scenario, essentially reflecting the amount of impact avoided as a result of investment in adaptation.

BEACH NOURISHMENT

The practice of adding sand or sediment to a beach to combat erosion, absorb wave energy, and prevent destructive waves from reaching upland development.

BENEFIT-COST RATIO (BCR)

The total present value of benefits conveyed by adaptation divided by the total present value of costs of adaptation. A ratio greater than 1 implies a return on investment.

BUILDING-LEVEL ADAPTATION

Structural modifications and improvements made to individual properties to protect against the threats of flooding. Examples include elevating structures and floodproofing.

CLIMATE-CHANGE MITIGATION

Strategies that focus on preventing the causes of climate change, specifically reducing or capturing anthropogenic emissions of greenhouse gases.

COASTAL HAZARDS

Physical risks related to coastal conditions, which have the potential to cause harm to humans, ecosystems, and property; the term encompasses different types of flooding, including storm surge, high tides, and sea-level rise.

COMMUNITY-WIDE ADAPTATION

A combination of soft and hard engineering investments made at the shoreline to minimize coastal hazard impacts and provide protection at the community scale. Examples include beach renourishment and seawall raising.

CUMULATIVE IMPACTS

The estimated impacts for each year in the period of analysis, which account for the likelihood of the modeled hazards occurring, are summed to develop an estimate of cumulative impacts. When calculating the benefit-cost ratio for this study, cumulative impacts were discounted to account for the time value of money.

JOB YEARS

Job years is equivalent to one year of work for one person; for example, a new construction job that lasts two years will equate to two job years.

MEAN HIGHER HIGH WATER (MHHW)

Average of the highest daily high tides occurring each day, also referred to as daily tidal inundation.

NET IMPACTS

The net impacts are calculated by subtracting the cumulative present value costs of adaptation from the cumulative present value of benefits (or impacts avoided) conveyed by investing in adaptation. A positive net impact generates a positive return on investment.

UNIFIED SEA-LEVEL RISE PROJECTIONS

Sea-level rise estimates produced by the Compact that are intended to assist decision-makers at the local and regional levels in Southeast Florida, and to ensure that major infrastructure projects have the same basis for design and construction relative to future sea level.

NOTES

This report summarizes the findings from a regional economic analysis conducted by AECOM. The full technical report can be accessed at: AECOM, *Business Case for Resilience in Southeast Florida*, August 2020.

QUICK FACTS & FIGURES

Disclaimer: this study represents a high-level regional analysis, leveraging readily available and regionally standardized physical and economic data, replicable analysis techniques, and generalized assumptions. Parcels impacted by daily tidal inundation are excluded from the one- and 10-year tide damages. Results shown under the "What's at risk" findings are not adjusted to account for financial discounting. The 10-year storm tide results shown account for the impacts of one storm event and are not adjusted for probability of the storm event occurring. "What's at risk" findings were calculated assuming the superimposition of future physical conditions on the existing built environment and economy.

a. Data available at <https://www.statista.com/statistics/183600/population-of-metropolitan-areas-in-the-us/>.

b. 2018 American Community Survey 5-Year Estimates.

c. BEA Regional Data: 2018 Gross Domestic Product summary.

d. BEA Regional Data: 2018 Gross Domestic Product summary.

e. 2018 American Community Survey 5-Year Estimates.

f. Southeast Florida Regional Climate Change Compact Unified Sea Level Rise Projections (2019).

g. Ibid.

Rest of data obtained from AECOM, *Business Case for Resilience in Southeast Florida*, August 2020.

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1. According to 2018 American Community Survey 5-Year Estimates and BEA: Current-dollar gross domestic product (thousands of dollars)/Current-dollar gross domestic product (millions of current dollars) (<https://www.bea.gov/>).

2. S.A. McAlpine and J.R. Porter, "Estimating Recent Local Impacts of Sea-Level Rise on Current Real-Estate Losses: A Housing Market Case Study in Miami-Dade, Florida." *Population Research and Policy Review* 37 (2018): 871–95.

3. S.A. McAlpine and J.R. Porter, 871–95.

4. The Real Deal, "Watch: Developers and Brokers Weigh In on Miami Sea-Level Rise," October 23, 2019, <https://therealdeal.com/miami/2019/10/23/watch-developers-and-brokers-weigh-in-on-miami-sea-level-rise/>.

5. BEA Regional Data: 2018 Gross Domestic Product summary.

6. SmartAsset's interactive investing map: <https://smartasset.com/investing/investment-calculator#florida/GDP>.

7. Beacon Council economic overview (<https://www.beaconcouncil.com/data/economic-overview/trade/>).

TOURISM AND NATURAL RESOURCES IN THE REGION

i. Rockport Analytics, "Picking Up the Pace: Florida's Tourism Performance Jumps into a Higher Gear" (<https://www.visitflorida.org/media/30679/florida-visitor-economic-impact-study.pdf>).

ii. National Park Service (<https://www.nps.gov/bisc/learn/management/statistics.htm>); National Park Service, "2019 National Park Visitor Spending Effects Report: Economic Contributions to Local Communities."

iii. Rockport Analytics, "Picking up the Pace."

iv. Florida Ocean Alliance, "Securing Florida's Blue Economy: A Strategic Policy Plan for Florida's Oceans and Coasts" (draft), 2020.

RISING TO THE CHALLENGE

The Southeast Florida region is a bustling hub for business, tourism, and culture that faces a unique set of coastal hazards and economic challenges. This study identifies opportunities associated with resilient investment in the face of climate risks to the region due to more frequent flooding and sea-level rise. There is a clear shared interest among all stakeholders to take action.

To advance economic development and climate resilience throughout the region, the Compact counties will need to continue to push forward with a coordinated effort among public and private sectors and identify funding for investment in climate adaptation at the building and community scales.

Together, local governments and the business community have an opportunity to build critical physical and social infrastructure that will protect the region's robust economy. Investing in these processes now will not only reduce vulnerabilities, but also grow the economy of Southeast Florida in the years to come.



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