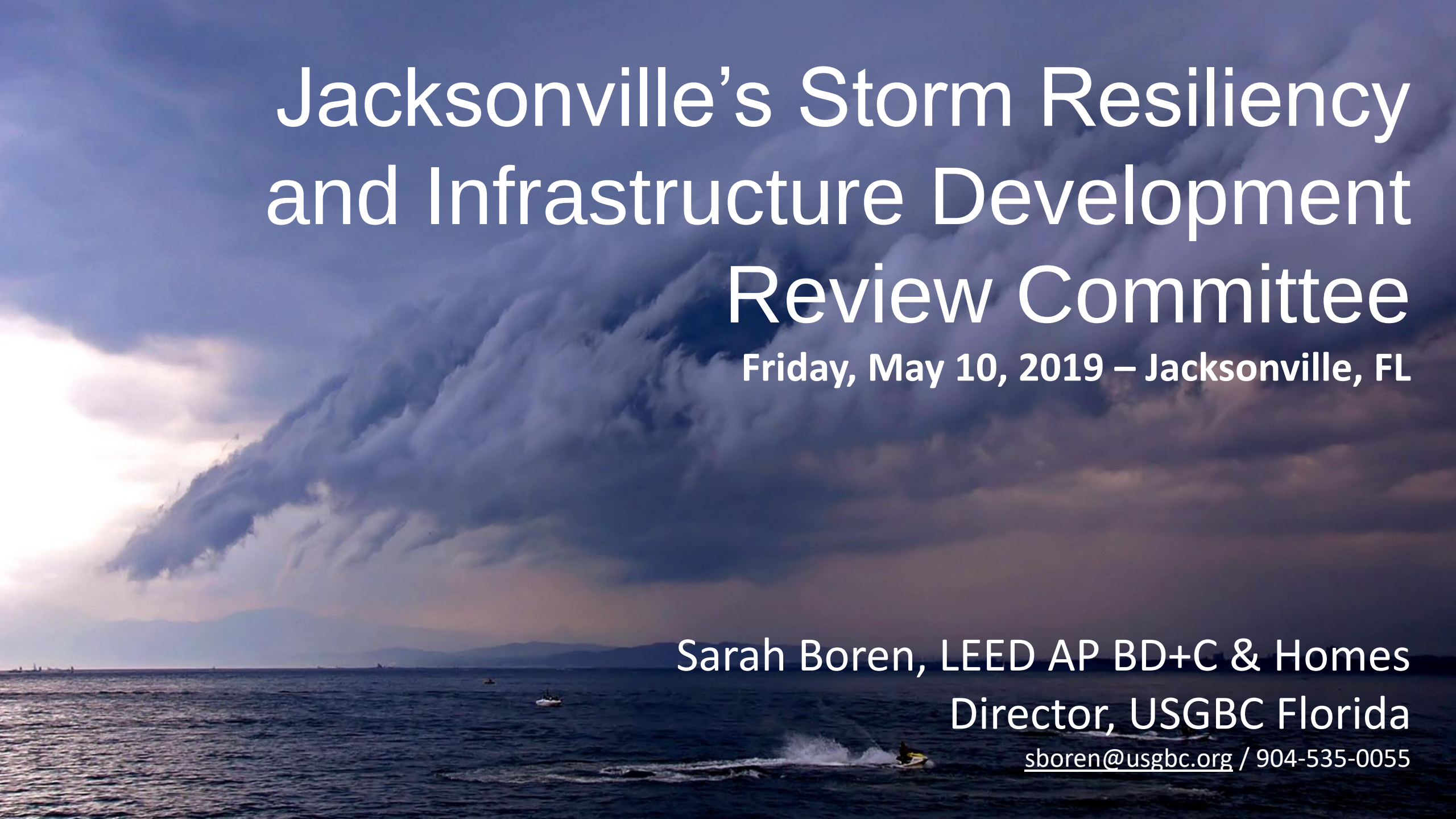


Jacksonville's Storm Resiliency and Infrastructure Development Review Committee

Friday, May 10, 2019 – Jacksonville, FL

Sarah Boren, LEED AP BD+C & Homes
Director, USGBC Florida
sboren@usgbc.org / 904-535-0055

Overview

- About the U.S. Green Building Council
- Resilience in the built environment
- Recommendations for Jacksonville
- Additional considerations and examples

The **U.S. Green Building Council (USGBC®)** and its community are changing the way buildings and communities are designed, built and operated. We believe in better buildings; places that complement our environment and enhance our communities. Places that give people better, brighter, healthier places to live, work and play.

BY THE NUMBERS

12,000 USGBC members

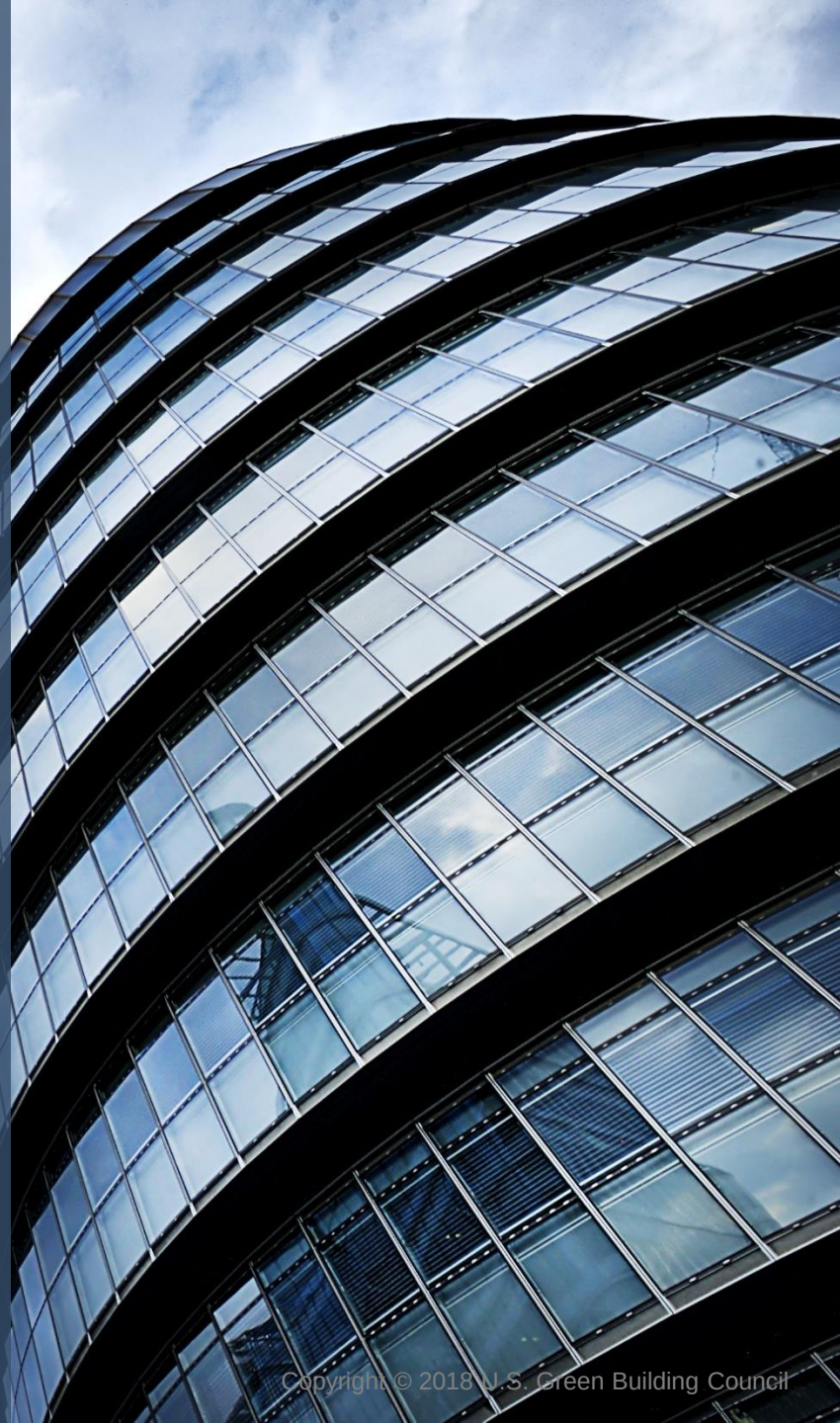
202,000 LEED credentials held

90,100 commercial projects for 17.1 billion sq. ft.

2.2 million sq. ft. certifies each day

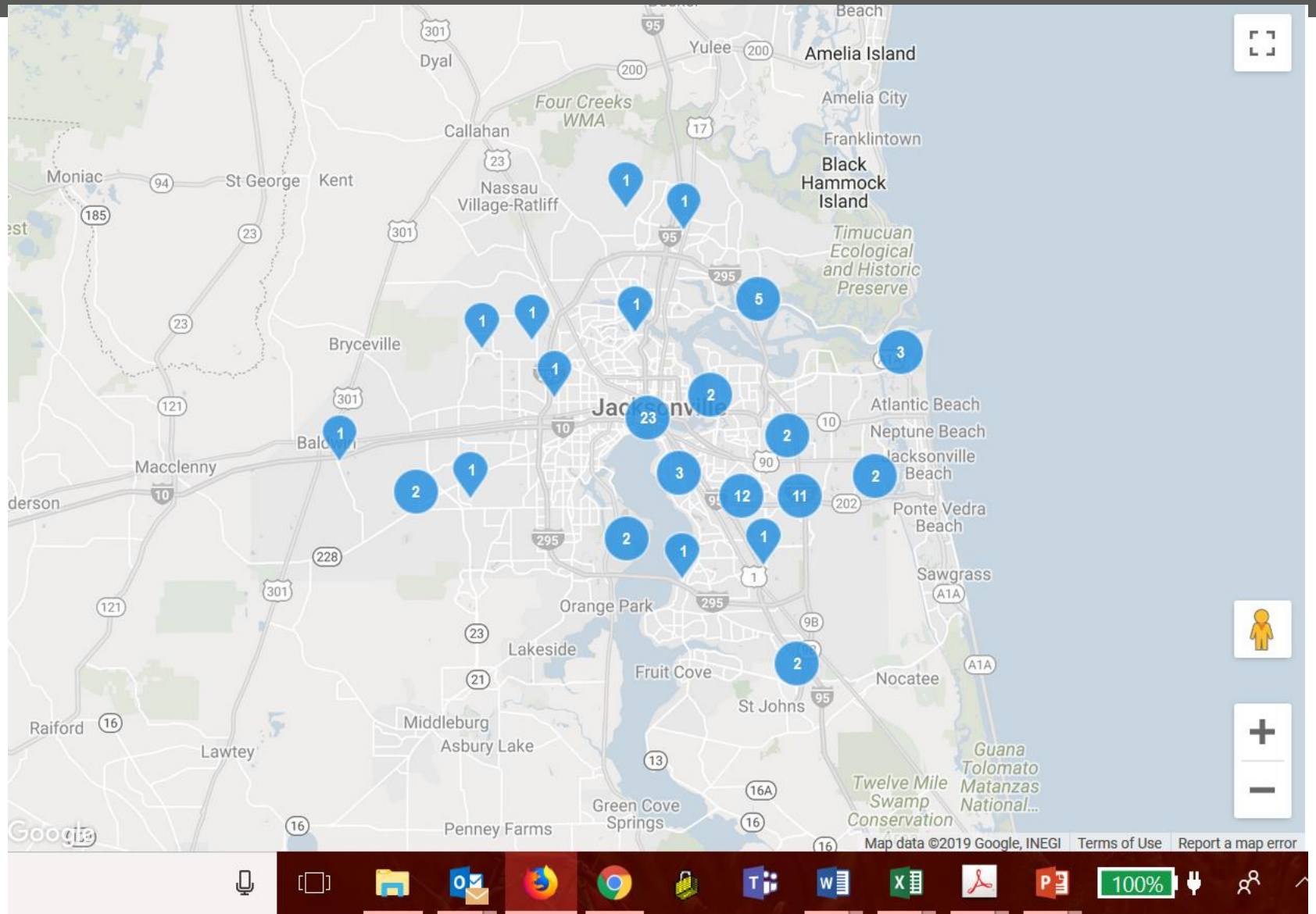
Over 5 billion sq. ft. commercial projects

167 countries and territories




SAFE
HEALTHY
INCLUSIVE
SMART
PRODUCTIVE
EFFICIENT
EQUITABLE
SUSTAINABLE
RESPONSIVE
RESILIENT

LEED Buildings in Jax



Source: Green Building Information Gateway www.gbig.org

What is RESILIENCE?

re·sil·ience
/rəˈzilyəns/

“the ability to prepare and plan for, absorb, recover from, and more successfully adapt to adverse events.”

USGBC joined with other industry leaders to broadly define the term resilience in 2014.

Industry Statement on Resilience

Representing nearly 1.7 million professionals, America's design and construction industry is one of the largest sectors of this nation's economy, generating over $1 trillion in GDP. We are responsible for the design, construction, and operation of the buildings, homes, transportation systems, landscapes, and public spaces that enrich our lives and sustain America's global leadership.

We recognize that natural and manmade hazards pose an increasing threat to the safety of the public and the vitality of our nation. Aging infrastructure and disasters result in unacceptable losses of life and property, straining our nation's ability to respond in a timely and efficient manner. We further recognize that contemporary planning, building materials, and design, construction and operational techniques can make our communities more resilient to these threats.

Drawing upon the work of the National Research Council, **we define resilience as the ability to prepare and plan for, absorb, recover from, and more successfully adapt to adverse events.**

As the leaders of this industry, we are committed to significantly improving the resilience of our nation's buildings, infrastructure, public spaces, and communities.

- **We research** materials, design techniques, construction procedures, and other methods to improve the standard of practice.
- **We educate** our profession through continuous learning. Through coordinated and continuous learning, design, construction and operations professionals can provide their clients with proven best practices and utilize the latest systems and materials to create more resilient communities.
- **We advocate** at all levels of government for effective land use policies, modern building codes, and smarter investment in the construction and maintenance of our nation's buildings and infrastructure.
- **We respond** alongside professional emergency managers when disasters do occur. Industry experts routinely work in partnership with government officials to survey damage, coordinate recovery efforts, and help communities rebuild better and stronger than before.
- **We plan** for the future, proactively envisioning and pursuing a more sustainable built environment.

The promotion of resilience will improve the economic competitiveness of the United States. Disasters are expensive to respond to, but much of the destruction can be prevented with cost-effective mitigation features and advanced planning. Our practices must continue to change, and we commit ourselves to the creation of new practices in order to break the cycle of destruction and rebuilding. Together, our organizations are committed to build a more resilient future.

CULTIVATORS
led the effort to establish and implement the Statement with their industry peers

AIA

FOUNDERS
united to define the goals and objectives of a resilient built environment

ACEC, APA, ASCE, ASHRAE, ASPE, AGC of America, ABC, BONA, IFMA, IIDA, NAHB, RICS, Urban Land Institute

AMPLIFIERS
joined the founding signatories in committing to the advancement of Statement goals

abaa, AIBD, Alliance for Resilience, BUILDSTRONG COALITION, CNU, CRSI, CSI, ERA, FLASH, GREEN BUILDING INITIATIVE, Illuminating, IAPMO, NAMIC, NACE, NIA, NRMCA, NFPA, PCA

Resilience is a focus and feature of many USGBC and GBCI programs:

1. **Standards & Rating Systems** — LEED, PEER, SITES, RELi, GRESB, LEED for Cities... (see brief)
2. **Demonstration Projects** — Project Haiti, NOLA Green Schools Fellow
3. **Thought Leadership** — regular articles and speaker series
4. **Education** (partner education online – see "Road to Resilience", Greenbuild
5. **Events and Summits** — Resilient Cities Summit, Building Back Better after the Storm – a state-focused forum, WaterBuild
6. **Partnerships** — Industry Statement on Resilience, others
7. **Community** — disaster response, local speaker series, regional planning, local initiatives
8. **Advocacy** — federal, state, local opportunities
9. **Research** — Green Building & Climate Resilience (2011), California drought (2015), Achieving Urban Resilience (2018)

LEED Credentials Join

Store Resources Education Directory Articles Account

Search the site

Promoting resilient buildings and communities

USGBC is working to transform the way buildings and communities are designed, built, and operated to encourage green building practices—and resilience is a clear extension of this work. We know that more sustainable buildings are the cornerstone to enhancing community resilience, and our work continues to expand our reach to other sectors of the built environment. The Center for Resilience is a USGBC initiative housing all of the organization's resilience activities. We know that addressing and emphasizing resilience through green building and infrastructure certifications can help ensure a more resilient future for all.

new.usgbc.org/center-for-resilience

Recommendations

1. Prioritize life and property
   - Strengthen current EO 2008-03 to include Chief Sustainability & Resiliency Officer position in the city
   - Craft a regional comprehensive Resiliency Plan
   - Establish Resilience Resource Center
   - Pilot resilient design strategies on City projects
   - Establish Resilience Hubs
2. Enhance Resiliency Requirements for all buildings
   - Require site plans and green infrastructure
   - First floor elevation
3. Incentivize for Expanded Resiliency Features
4. Strengthen current SBO

1. PRIORITIZE LIFE AND PROPERTY

1.1 Strengthen Current EO 2008-03

- Expand stated Sustainability Officer position to Chief Sustainability & Resiliency Officer

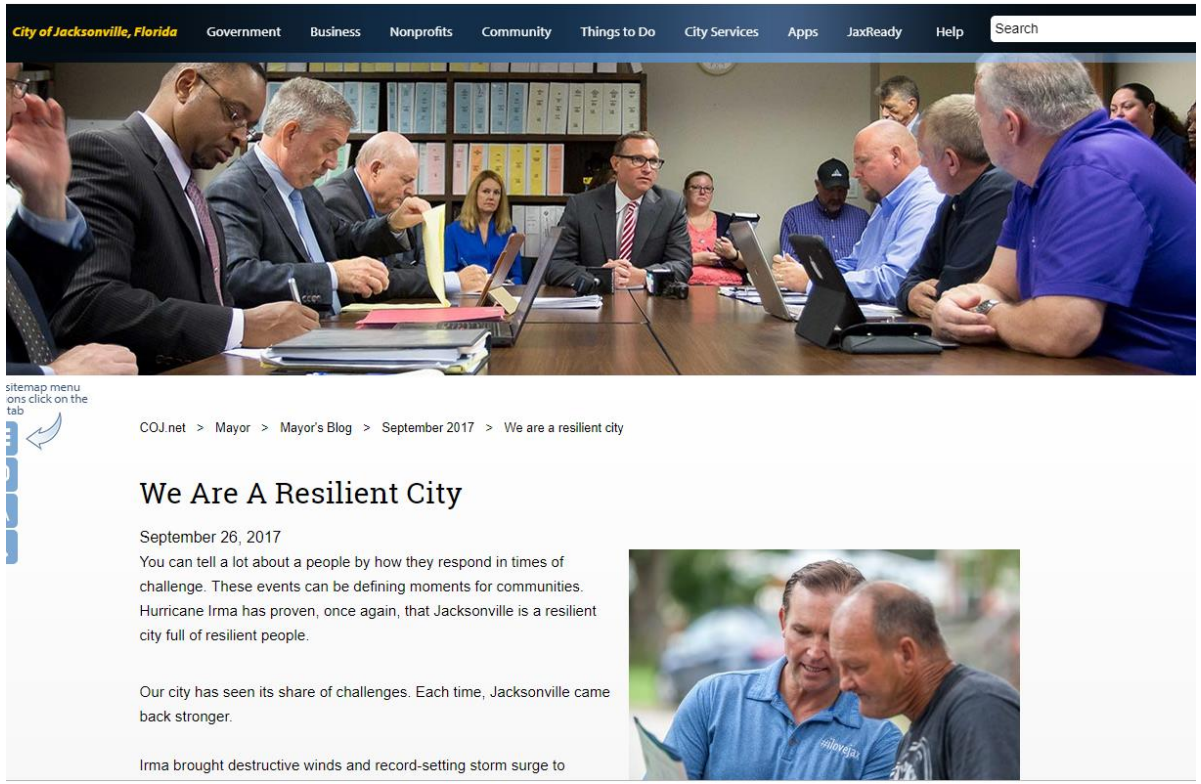
  - Leads the city resilience and sustainability strategy and plan development
  - Convenes a variety of stakeholders
  - Coordinates across government agencies and departments
  - Serves as the resilience and sustainability point of contact, viewing everything through a resilience and sustainability lens

1.2 Craft a Comprehensive Resiliency Plan

- Seek resources from state and regional agencies, nonprofit organizations, and others working on resilience
  - Florida DEP Resilient Coastlines Program
  - Florida Dept. of Economic Opportunity
  - Florida Adaptation Planning Guidebook
  - NE Florida Regional Council
- Engage the public
- Many examples of Resiliency Plans from throughout Florida and the country

1.3 Establish a Resiliency Resource Center

- Both virtual (webpage) and physical centers
- Compile and curate relevant resources from federal, state and regional agencies, nonprofit organizations, and others working on resilience
  - Vulnerability and risk maps
  - Best practices
  - Finance options to implement property improvements
  - City activities
- Hold informational events; engage stakeholders



1.4 Pilot resilient design strategies on City projects

- City of Jacksonville can lead by example and pilot approaches to improving facility resilience
- New construction projects, City can utilize RELi system
  - Specifically focused on developing highly resilient buildings
  - Works in conjunction with LEED
- Landscape and park projects, City can apply SITES system
  - Guides projects to providing ecosystem services with an emphasis on resilience such as flood retention, can provide significant community benefit

1.5 Create Resilience Hubs

Based on models in Puerto Rico, Vancouver, San Francisco and elsewhere

- Resilience Education & Training
- Disaster Preparedness & Climate Resiliency Planning
- Disaster Simulation Exercise
- Emergency Alert System
- Expansion of Emergency Service Centers
- Pre-position Emergency Supplies
- Clean Energy Technical Assistance

2. Enhance Resiliency Requirements for all buildings

2.1 Use local Zoning & Planning power

- Require site plans and green infrastructure for projects over certain size threshold
- Projects could include stormwater infrastructure, including adaptive landscapes, features can include green or cool roofs, tree canopies, etc.
- Avoid building in 100 year flood zone altogether
- Use Resilience Resource Center to provide technical assistance, demonstration projects, recognition, etc.

2. Enhance Resiliency Requirements for all buildings

2.2 Recommendations for Optimizing Adaptation Action Area

- State law allows local government to impose additional requirements once city designates areas (e.g., along the river, ICW, tributaries, beaches) – Example: Miami Beach
- Establish Freeboard Requirement to require buildings/development in the area build so that first floor can be floodable (Ocean City)
- Establish guidelines for stem walls for existing buildings

3. Incentives and Finance for Expanded Resiliency Features

- Evaluate & implement incentives to spur additional resilience investment in private buildings
  - SBO Update is one vehicle
  - Property tax incentive could also be an option (Cincinnati)
  - Transfer of development rights could be an option
- Address financing gaps for private building hardening
  - Work with financial institutions, insurance to identify, improve, and increase awareness
  - C-PACE may be beneficial (Palm Beach County)
- Nurture “Above and Beyond”
  - Reward higher level certifications
  - Incentivize less risk such as ASCE’s recommendation of base flood elevation +3ft + SLR for service life of structure (1st occupied in 2025; may be 2 more feet) ASCE Manual 140 2018

3. Incentives and Finance for Expanded Resiliency Features

- Structural Incentives
  - **Expedited Review/Permitting Processes**
  - **Density, Height and Variance Bonuses**
- Financial Incentives
  - **Tax Credits**
  - **Permit Fee Reduction/Waiver**
  - **Utility Impact Fee** (SJRWMD)
  - **Certification Rebates**
  - **Grants**
  - **Revolving Loan Funds**
- Other Incentives
  - **Technical Assistance**
  - **Recognition**
  - **Marketing Assistance**

NAIOP Incentives That Work

- Priority in building permit processing and plan review, sometimes with a requirement for posting a bond to guarantee the result.
- Tax incentives, particularly property tax abatements, for projects achieving LEED Silver or better certification.
- Increased Floor-to-Area (FAR) ratios, which allow a developer to construct more building area than allowed by applicable zoning.

4. Strengthen Current SBO – 2009-211

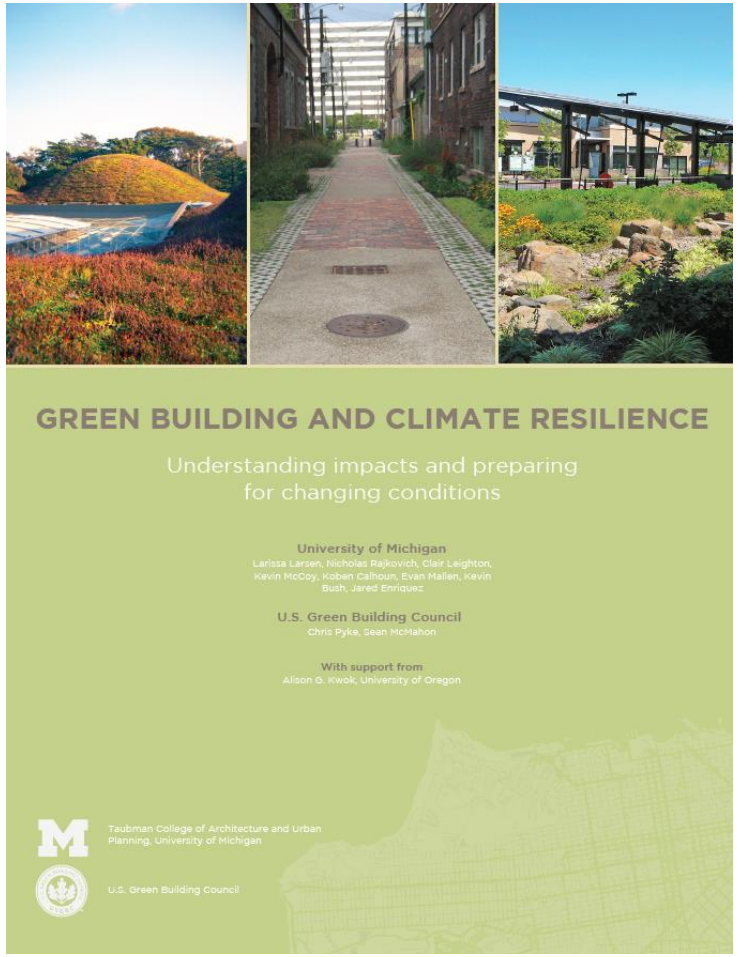
- Expand applicability of ordinance to include any project that gets city money/incentives or other support (intent of EO 2008-03)
- Deepen outcomes from the ordinance by:
  - Update ordinance to require LEED Silver or higher (or equivalent)
  - Require projects to achieve key resiliency credits; reference a list to be maintained and updated from time to time by staff
  - Expand to include existing buildings
  - Enforce ordinance
- Expand incentives for private sector compliance
  - Provide a “kicker” such as requiring 3 out of 5 best practices yet leave flexibility in which ones they choose
  - Increase structural, financial and recognition incentives
- Education campaign to developers

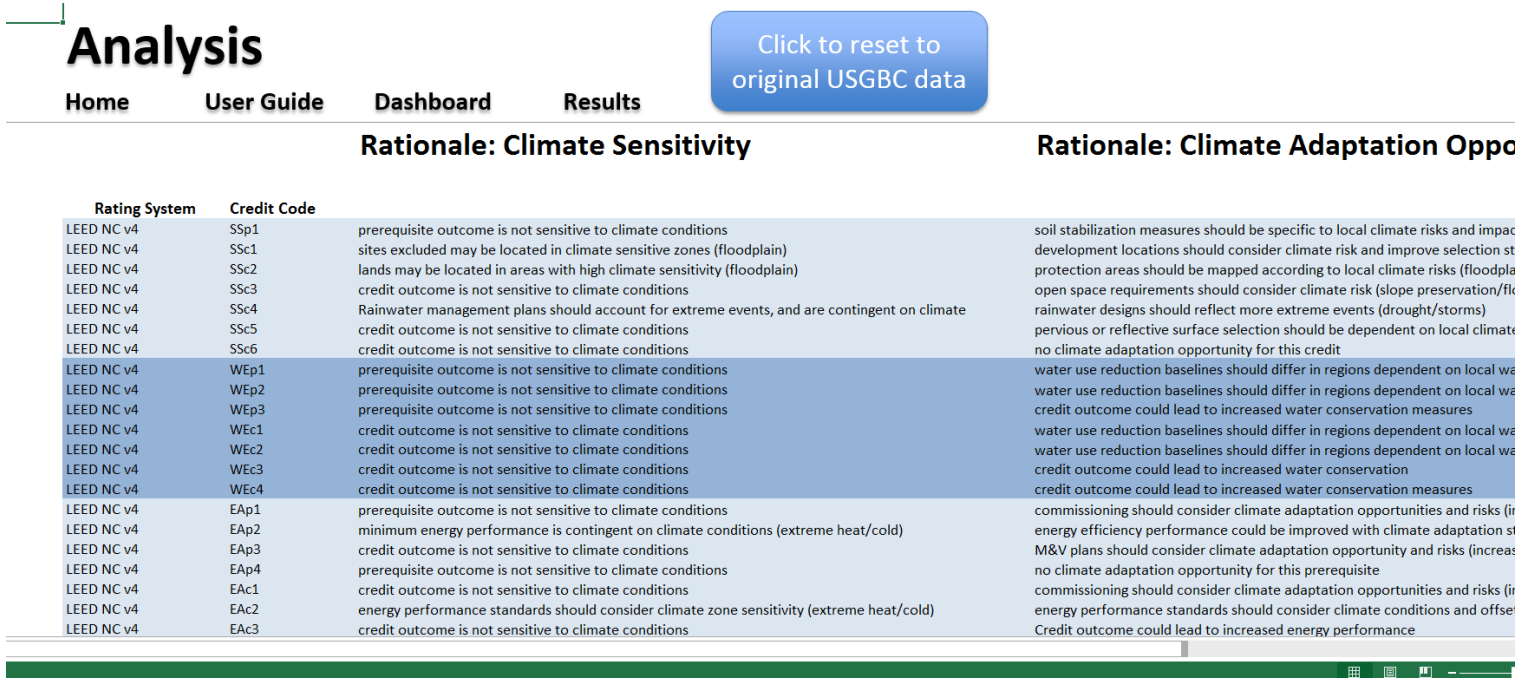

LEADERSHIP IN ENERGY & ENVIRONMENTAL DESIGN
LEED
NASCAR

LEED + Resilience

- LEED promotes resilience in building design, construction and operation.
- LEED Climate Resilience Screening Tool evaluates resilience potential of each credit + identifying potential opportunities.
- UT San Antonio study found that most v4 credits help to increase resilience among several natural disasters
- USGBC's Center for Resilience

LEED + Climate Resilience





Rating System	Credit Code		
LEED NC v4	SSp1	prerequisite outcome is not sensitive to climate conditions	soil stabilization measures should be specific to local climate risks and impac
LEED NC v4	SSc1	sites excluded may be located in climate sensitive zones (floodplain)	development locations should consider climate risk and improve selection st
LEED NC v4	SSc2	lands may be located in areas with high climate sensitivity (floodplain)	protection areas should be mapped according to local climate risks (floodpla
LEED NC v4	SSc3	credit outcome is not sensitive to climate conditions	open space requirements should consider climate risk (slope preservation/fl
LEED NC v4	SSc4	Rainwater management plans should account for extreme events, and are contingent on climate	rainwater designs should reflect more extreme events (drought/storms)
LEED NC v4	SSc5	credit outcome is not sensitive to climate conditions	pervious or reflective surface selection should be dependent on local climate
LEED NC v4	SSc6	credit outcome is not sensitive to climate conditions	no climate adaptation opportunity for this credit
LEED NC v4	WEp1	prerequisite outcome is not sensitive to climate conditions	water use reduction baselines should differ in regions dependent on local wa
LEED NC v4	WEp2	prerequisite outcome is not sensitive to climate conditions	water use reduction baselines should differ in regions dependent on local wa
LEED NC v4	WEp3	prerequisite outcome is not sensitive to climate conditions	credit outcome could lead to increased water conservation measures
LEED NC v4	WEc1	credit outcome is not sensitive to climate conditions	water use reduction baselines should differ in regions dependent on local wa
LEED NC v4	WEc2	credit outcome is not sensitive to climate conditions	water use reduction baselines should differ in regions dependent on local wa
LEED NC v4	WEc3	credit outcome is not sensitive to climate conditions	credit outcome could lead to increased water conservation
LEED NC v4	WEc4	credit outcome is not sensitive to climate conditions	credit outcome could lead to increased water conservation measures
LEED NC v4	EAp1	prerequisite outcome is not sensitive to climate conditions	commissioning should consider climate adaptation opportunities and risks (i
LEED NC v4	EAp2	minimum energy performance is contingent on climate conditions (extreme heat/cold)	energy efficiency performance could be improved with climate adaptation st
LEED NC v4	EAp3	credit outcome is not sensitive to climate conditions	M&V plans should consider climate adaptation opportunity and risks (increas
LEED NC v4	EAp4	prerequisite outcome is not sensitive to climate conditions	no climate adaptation opportunity for this prerequisite
LEED NC v4	EAc1	credit outcome is not sensitive to climate conditions	commissioning should consider climate adaptation opportunities and risks (i
LEED NC v4	EAc2	energy performance standards should consider climate zone sensitivity (extreme heat/cold)	energy performance standards should consider climate conditions and offse
LEED NC v4	EAc3	credit outcome is not sensitive to climate conditions	Credit outcome could lead to increased energy performance

https://www.usgbc.org/resources/leed-climate-resilience-screening-tool

https://www.usgbc.org/resources/green-building-and-climate-resilience-understanding-impacts-and-preparing-changing-conditi

Examples of Resilient LEED Buildings

MARCH 2018

POLICY BRIEF

PROFILES OF RESILIENCE: LEED IN PRACTICE

As part of our commitment to building a more resilient future for the built environment, USGBC defines resilience as "**the ability to prepare and plan for, absorb, recover from, and more successfully adapt to adverse events**." To meet this goal, USGBC is driving resilience in more ways than one by making buildings more sustainable, durable, and functional through the application of LEED. Through integrative design and key credits, LEED guides project teams to invest in climate adaptation strategies to enhance building and community resilience.

This brief dives into several examples of LEED-certified buildings that have been tested and have demonstrated exceptional resilience. These LEED project teams attest that the LEED process – including purposeful design and third-party validation – has helped these projects achieve critical resilience outcomes.

ÁLVAREZ-DÍAZ & VILLALÓN OFFICES

SAN JUAN, PUERTO RICO

Originally built in the early twentieth century, the building that is home to the offices of Álvarez-Díaz & Villalón (AD&V) was renovated in 2013 to maximize sustainability and resilience. In 2014, the AD&V offices became the first architecture and interior design firm in Latin America to earn LEED Platinum certification. The resilient features of both the office space and the building at large (outlined below), contributed to its quick recovery from Hurricane Maria in 2017.

certification. Each energy conservation measure (ECM) implemented as part of the project's renovation helped contribute to overall greater efficiency, cost savings, and a shorter period required to restore building operations.

AD&V Offices

Following the devastation of Hurricane Maria, the AD&V office space returned to a fully functional work space within a few days, a

https://www.usgbc.org/resources/profiles-resilience-leed-practice


LEED®
Zero

LEED Zero Carbon

LEED Zero Energy

LEED Zero Water

LEED Zero Waste

LEED for Cities

LEED for Cities + Resilience

- LEED for Cities tasks cities to set sustainability goals and supporting strategies.
- System is built onto the Arc platform to enable benchmarking.
- LEED for Cities encourages adoption of policies to reduce energy + water use, and waste + pollution output.
- www.usgbc.org/cityperformance

PERFORMANCE EXCELLENCE IN ELECTRICITY RENEWAL

The only comprehensive framework for accessing and verifying the performance of electricity infrastructure and power systems

PEER + Resilience

- PEER aims to improve the resilience of power system performance and electricity infrastructure.
- One of PEER's stated goals is to provide the energy market with a comprehensive roadmap for creating more resilient, reliable, sustainable and economically sound power systems.
- A key example is Hoboken, NJ, which is pursuing PEER certification for its microgrid project, intended to promote community resilience.


Reliability & Resiliency
Energy Efficiency & Environment
Grid Services
Operations, Safety, & Maintenance

PEER & POWER RESILIENCY

- Identify critical & essential needs
- 3-weeks of fuel supply for essential services
- Back start or ride through capability
- Isolation switching, EMS & load shedding
- Power system hardening (e.g. flood)
- Community service


THE Sustainable
SITES
Initiative®
The most comprehensive system for developing sustainable landscapes

Designing for Resilience

SITES + Resilience

- SITES aims to, in part, "create regenerative systems and foster resiliency" of outdoor landscapes.
- To do so, SITES works to protect and restore natural resources – and to mitigate the effects of natural disasters.
- Strategies encouraged throughout the SITES certification system are designed to enhance and strengthen ecosystem services via flood retention, floodplain avoidance, etc.

SITES Resilient Strategies Include:

- Managing stormwater onsite with green infrastructure
- Restoring degraded landscapes with native plants
- Locating a site to protect natural ecosystems

Synergies Between LEED + SITES

RELi 2.0

Rating Guidelines for

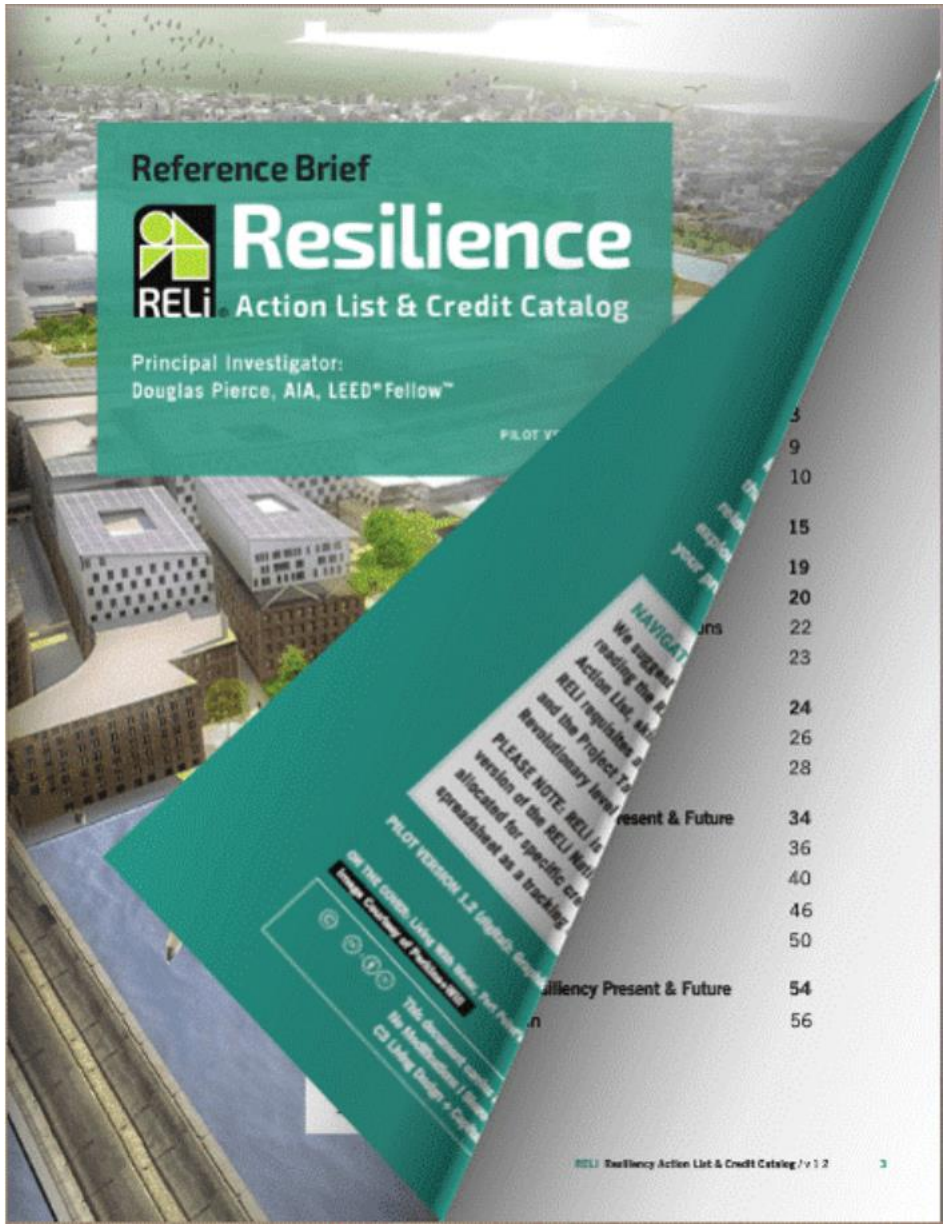
Resilient Design + Construction

December 2018

Scope of RELi

RELi has 8 Categories

- Panoramic Design
- Hazard Preparedness
- Hazard Mitigation
- Community Vitality
- Productivity and Health
- Energy, Water, and Food
- Materials and Artifacts
- Applied Creativity



QUALITIES OF RESILIENT DESIGN

Diverse + Inclusive
- Take Into Account Social Equity

Redundant + Resourceful
- Use Proven Strategies

Adaptive + Flexible
- Responds to New Information and Data

Self-Organizing + Integrative
- Innovative

Cooperative + Nested
- All Parts of the Project Work Together

Foresight + Reflective
- Consider Past and Future Hazards

Healthy + Robust
- Self-Sustaining and Multi-Faceted

Why RELi?

reli@usgbc.org

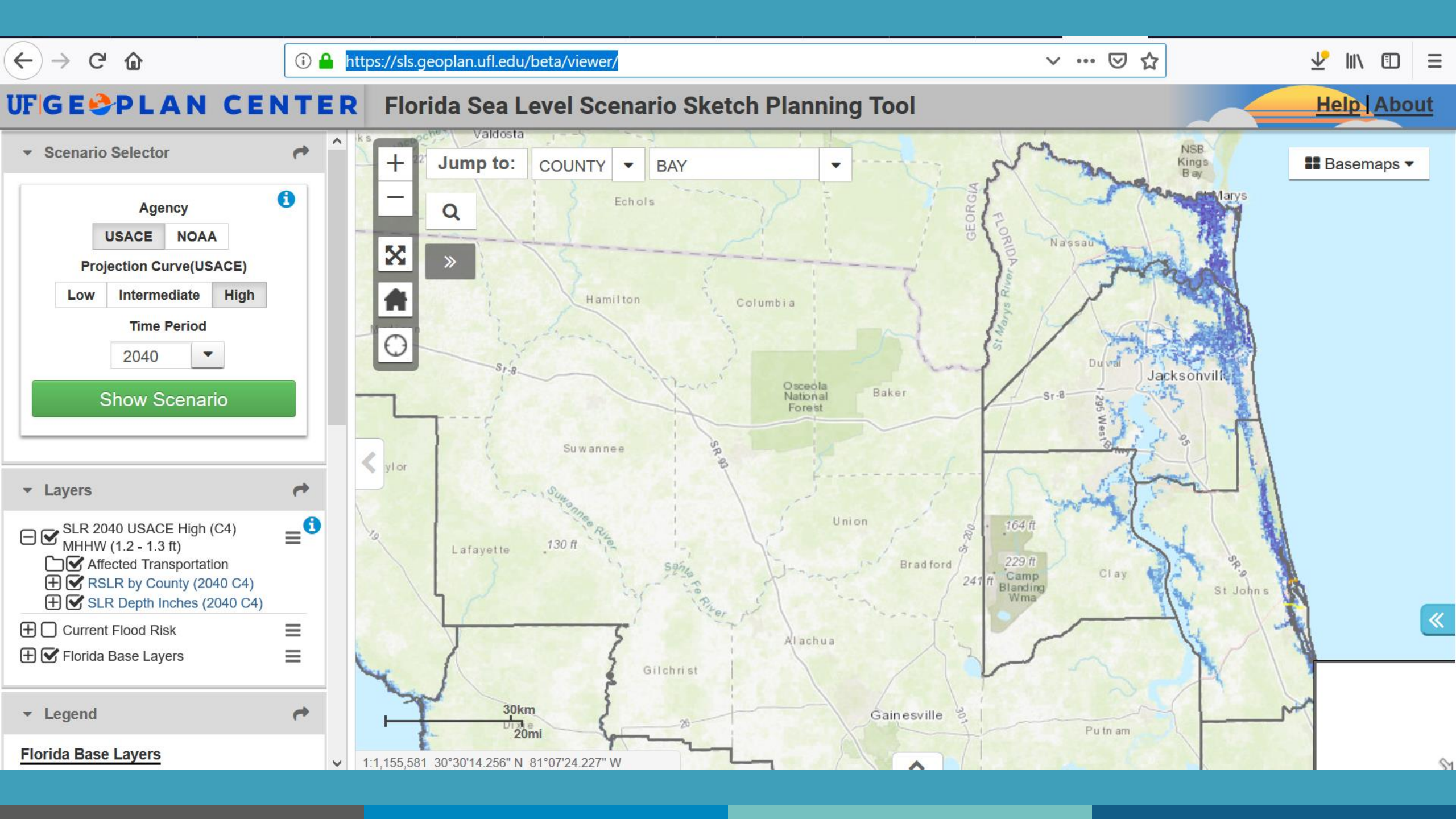
GRESB + Resilience

- GRESB's mission is to enhance and protect shareholder value by assessing and empowering sustainability practices in the **real asset sector**
- GRESB assesses the sustainability performance of real estate and infrastructure portfolios and assets worldwide.
- GRESB matters for buildings because it drives investment and creates capital
- Resilience Module

Resilience Factors in GRESB Assessments

Apart from the new, focused Resilience Module, the base GRESB Real Estate and Infrastructure Assessment includes measures for Real Estate Assessment and Infrastructure Assessment

Quick Examples & Tools from Florida and Elsewhere


https://sls.geoplan.ufl.edu/beta/viewer/
UF GEOPLAN CENTER
Florida Sea Level Scenario Sketch Planning Tool
Help | About
Scenario Selector
Agency
USACE
NOAA
Projection Curve(USACE)
Low
Intermediate
High
Time Period
2040
Show Scenario
Layers
SLR 2040 USACE High (C4)
MHHW (1.2 - 1.3 ft)
Affected Transportation
RSLR by County (2040 C4)
SLR Depth Inches (2040 C4)
Current Flood Risk
Florida Base Layers
Legend
Florida Base Layers
Jump to:
COUNTY
BAY
Basemaps
Valdosta
Echols
Hamilton
Columbia
Suwannee
Lafayette
Osceola National Forest
Baker
Union
Bradford
Clay
Nassau
Duval
Jacksonville
St Johns
Putnam
Gainesville
Alachua
Gilchrist
Levy
Taylor
GEORGIA
FLORIDA
St Marys River
Suwannee River
Santa Fe River
NSB Kings Bay
St Marys
Sr-8
SR-93
Sr-200
I-295 West
SR-9
95
301
164 ft
229 ft
241 ft
130 ft
Camp Blanding Wma
30km
20mi
1:1,155,581 30°30'14.256" N 81°07'24.227" W

HURRICANES MATTHEW AND IRMA (2016, 2017)

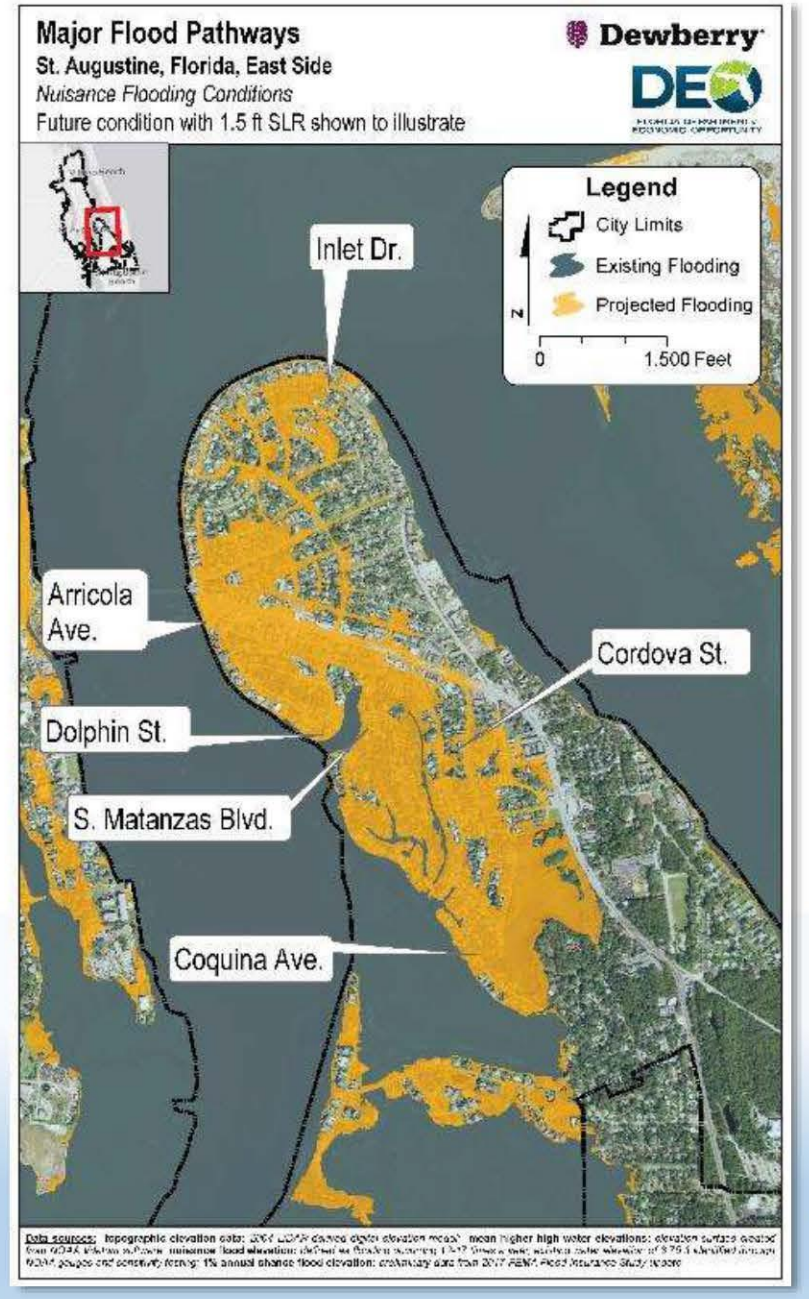
Hurricane	Category	High Water Mark*	Impact to Avenida Menendez Seawall
Matthew 10/7/2016	3	7 NAVD88 (5:48 PM)	Crested (as designed), reduced flooding impacts, no damages reported to the wall
Irma 9/11/2017	1 /TS	6.75 NAVD88 (5:26 AM)	Crested (as designed), reduced flooding impacts, flap gate was removed from outfall (minimal damage)

CITY OF ST AUGUSTINE EST. 1565

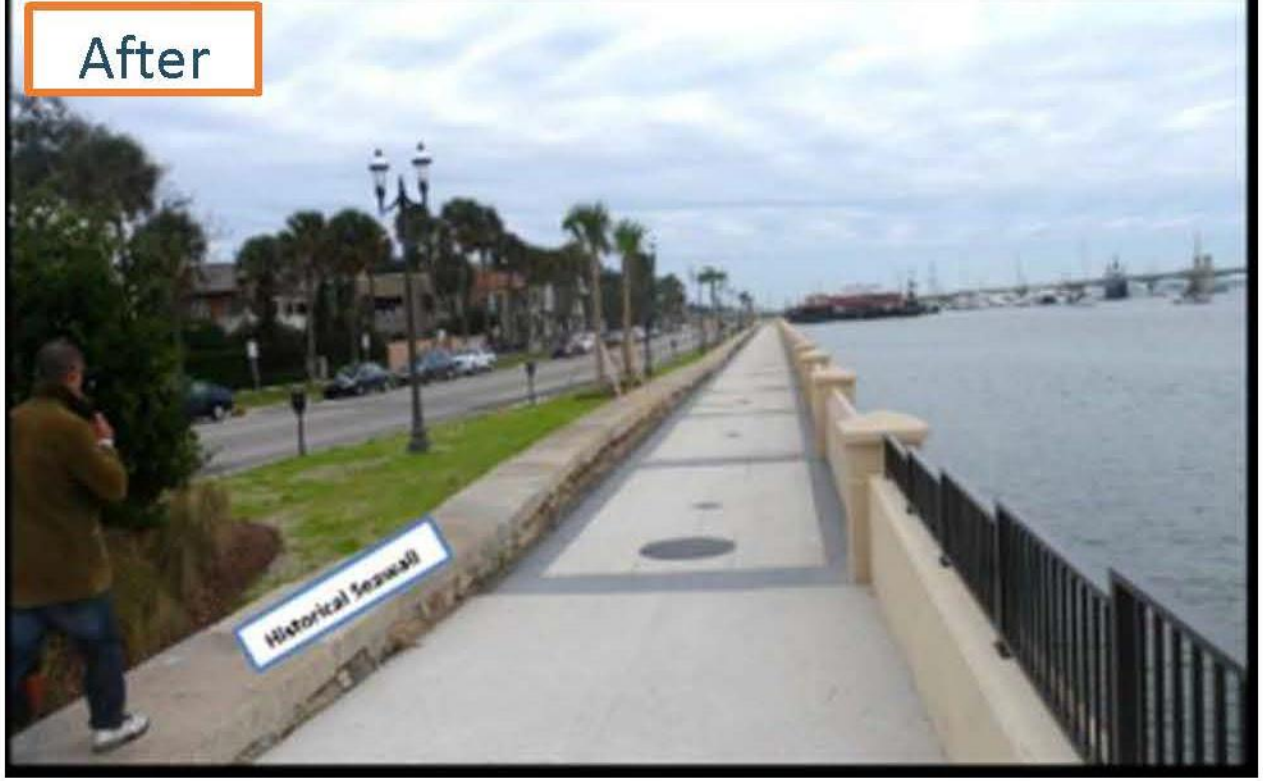
PLANNING EFFORTS:

Strategic Adaptation Plan:

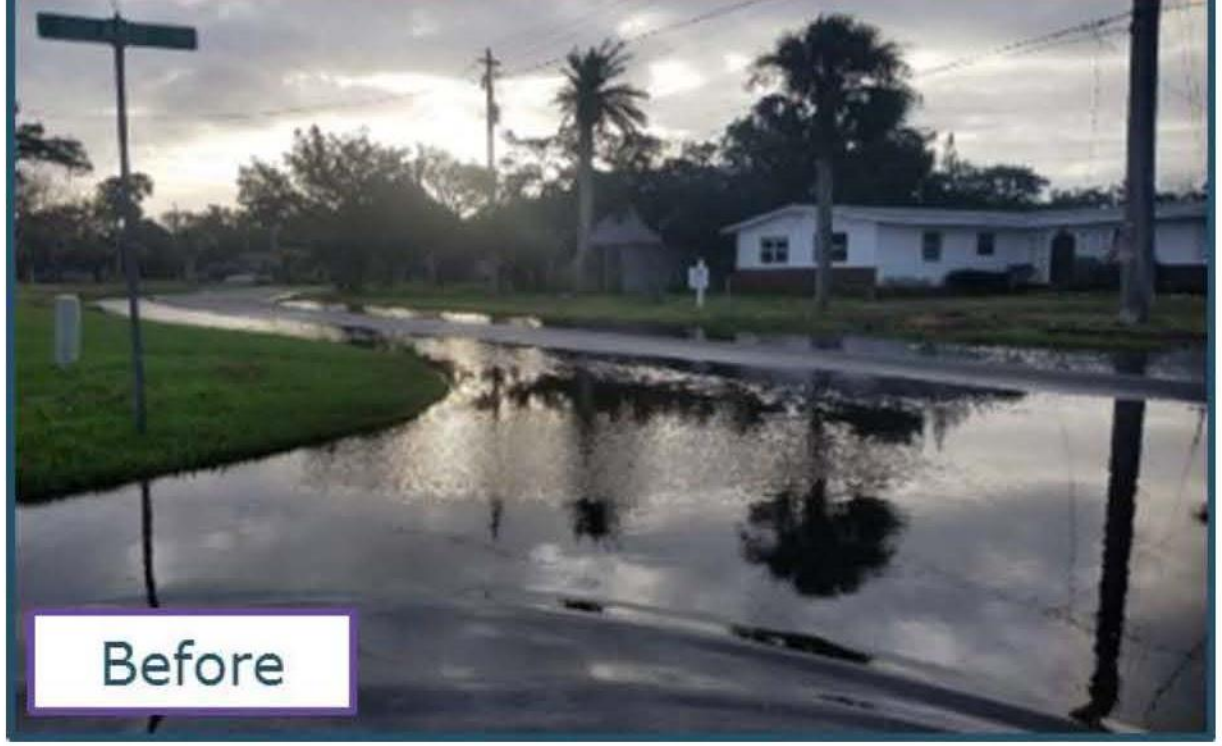
- Educate the public about SLR & policy responses
- Develop baseline budgets
- Adopt policies that limit spending in areas where retreat or re-design are more effective
- Base decisions on FEMA's updated FIRMs
- Install LID/Green infrastructure
- Targeted upgrades to City's stormwater system
- WWTP options
- FDOT roadway improvements for resiliency
- Historic Preservation Comprehensive Plan



CITY OF ST AUGUSTINE EST. 1565



- Constructed to elevation 7.1 (NAVD) = Cat. 1 (view shed limit)
- 1200 linear feet, with promenade and stormwater treatment
- Historic preservation of original seawall



- 23 stormwater outfalls retrofitted with tide check valves (WaPro and Tideflex Checkmate Inline Check Valves)
- Elimination of “sunny day” flooding

Wastewater Treatment Plant Options for Resiliency

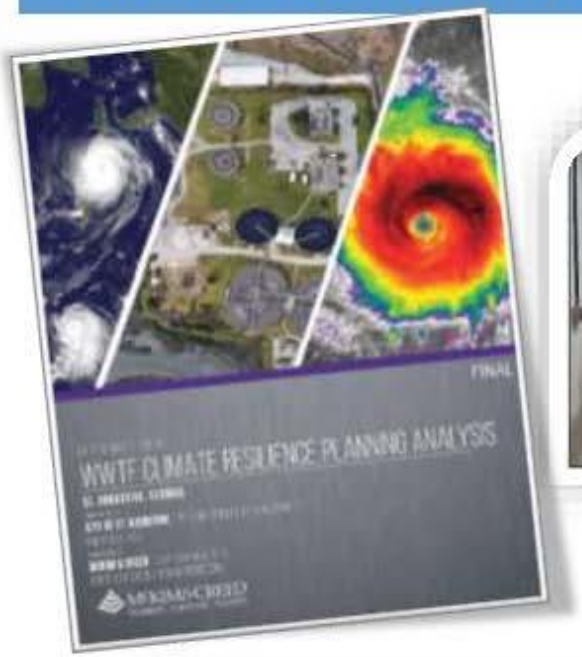


Figure 10: Perimeter Flood Wall and Pump Station

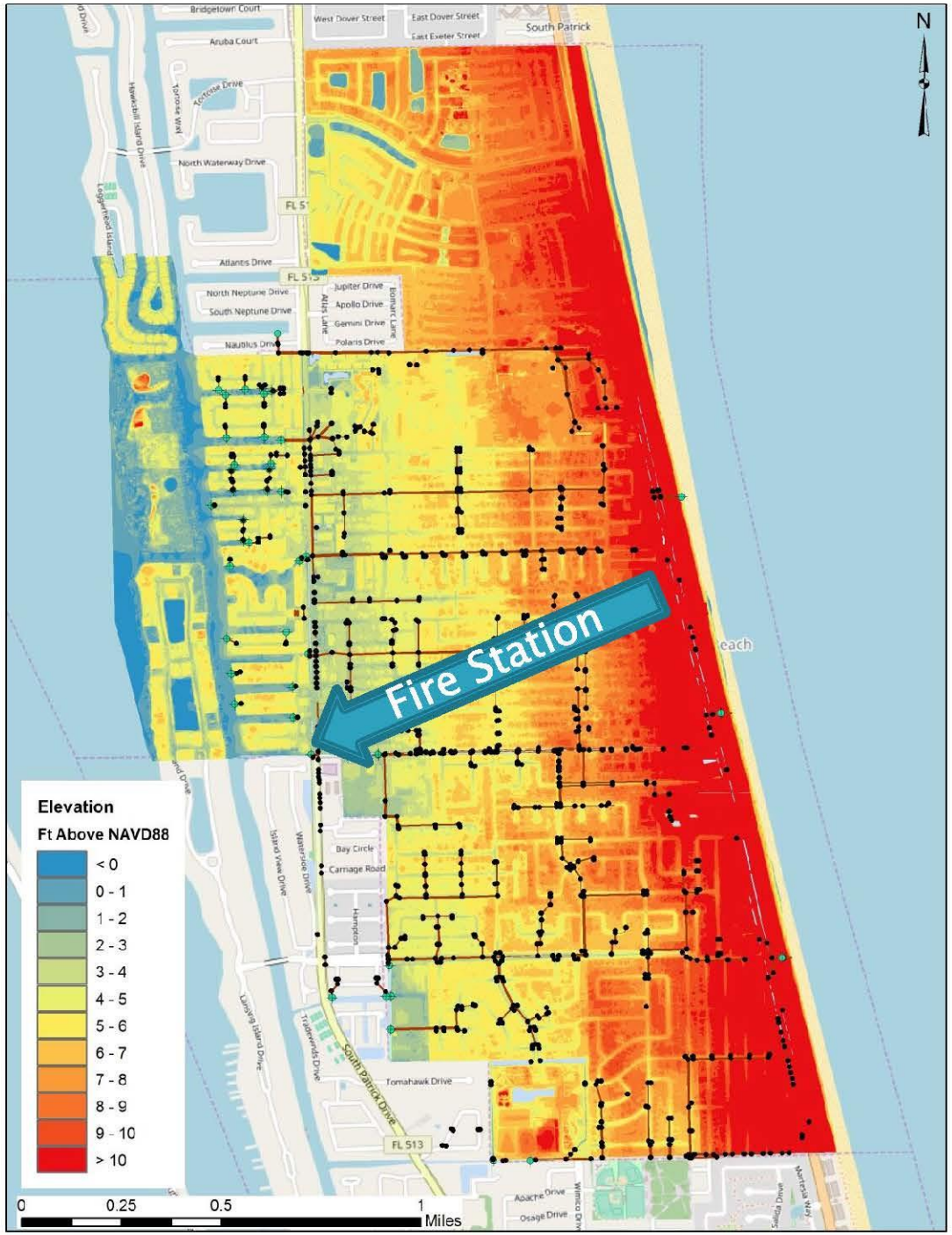
Perimeter Wall and Pump Station Estimated Costs at Multiple Heights for Year 2030 (2018 dollars)						
Type of Wall	Top Elevation (feet NAVD)	Average Height of Wall (feet)	Protection Cost	Category of Hurricane Protection Level (2030)	Preventable Damage Cost	Benefit/Cost Ratio
Sheet Pile	18	11	**$ 3,700,000**	3	$16,000,000	4.3
	20	13	**$ 4,200,000**	4	$21,000,000	5.0
	25	18	**$ 5,300,000**	5	$21,000,000	4.0

CITY OF
ST AUGUSTINE
EST. 1565

CITY OF
STAUGUSTINE
EST. 1565

Satellite Beach Fire Station

Site-level flood assessment requested by city officials in July 2017



Yes, this is one of the lowest lying areas in the City of Satellite Beach

Nothing pictured is currently in a flood zone

Satellite Beach's new firehouse will be higher and drier

Written by: George White November 09 2017

0

Satellite Beach Fire Department officials, surrounded by recent flood waters at their current location at 1390 South Patrick Dr., now know their new home will be located on a two-acre site that was formerly the parking lot of the U.S. Post Office at 210 Jackson Ave.

But it wasn't just Hurricane Irma or the followup Oct. 1 no-name storm that has city officials ready to move the facility built in 1971.

"The building did not flood but all the roads around it did. It's definitely getting worse," said City Manager Courtney Barker.

The city is planning for the eventual expected impact from sea level rise, not coming over the dunes from the Atlantic Ocean, but coming up from the west and rising waters in the Banana River and Indian River Lagoon. The current fire station is shown in recent flood maps to be near the areas to be first impacted by rising waters, areas near canals and low-lying roadways, she said.

Finding an alternative location for the fire station actually involved several different criteria, she said.

"We spent a lot of time looking at different properties at different locations and that (the Jackson Avenue parcel) was definitely the best. It's got the best timing because it's centrally located throughout the city, it's near State Road A1A at a high elevation and it's on a street with a stoplight (at Jackson Avenue and SR A1A and South Patrick Drive). It's definitely the best location," Barker said.

"We're looking more down the road. We're just securing the property now because you know property prices are not going down."

The $730,000 contract for the property contemplates the note being repaid with revenues from a utility tax.

The old fire station will be considered for other city purposes or offered for sale, she said.

It wasn't current or future flooding that prompted the discussions for a new fire station, it was the crowded conditions that originally started the conversation," Barker said.

"We were looking at expanding by adding a floor to the fire station, because they are so cramped in there now, but then we realized, do we really want to invest in a building that will be sitting in a foot of water? We started looking at the elevations and getting the data and deciding whether we wanted to do it," she said.

The city tries to build for 100 years or more, she said.

http://veronews.com/2017/11/09/satellite-beachs-new-firehouse-will-higher-drier/

Risk-averse (and financially sound) decision to move the fire station to higher ground rather than retrofit a low-lying site!

SITES in Practice

Evans Parkway Neighborhood Park, Silver Spring MD

Bartholdi Park at the U.S. Botanic Garden, Washington DC

THE Sustainable SITES Initiative®

Overdiepse Polder | Waspik, Netherlands

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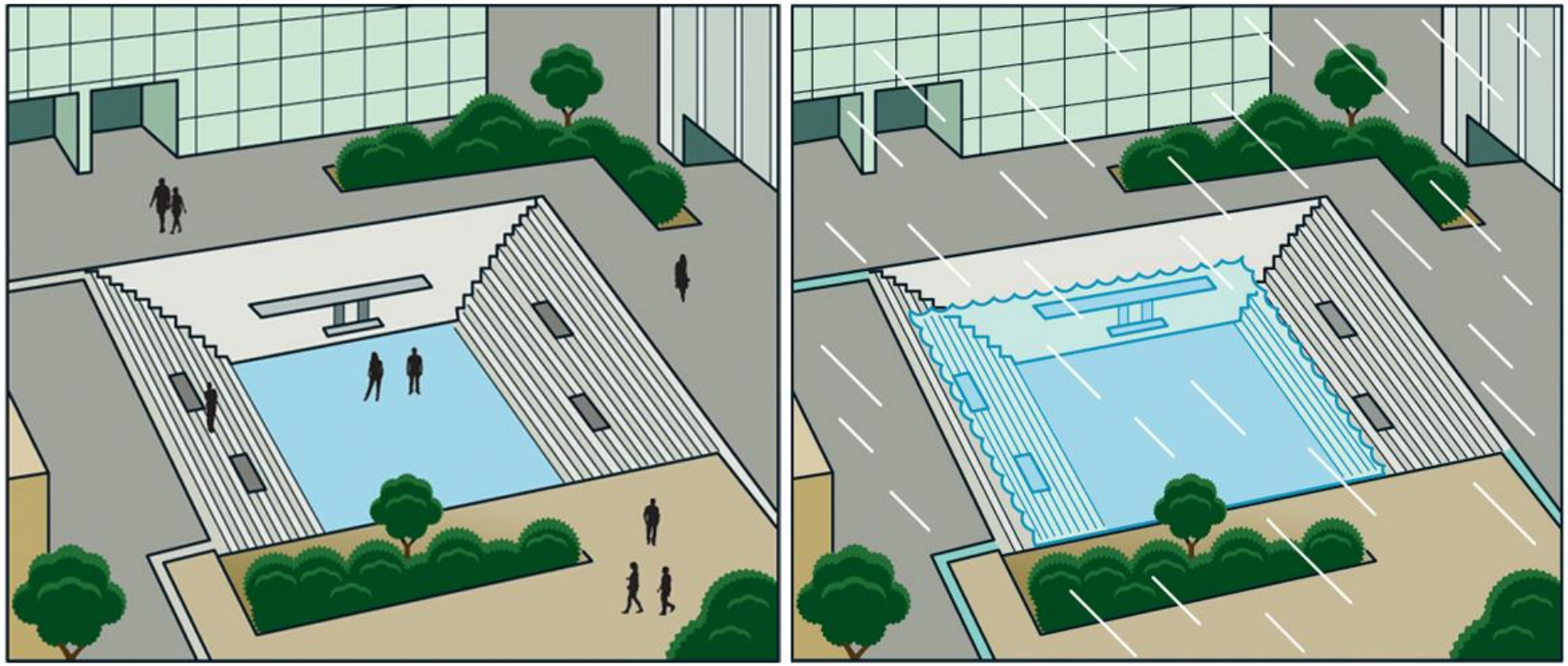
Resilient Stormwater Strategies | Netherlands



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RESILIENCY PROJECT,
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TRINITY BASIN PARK
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RESILIENCY PROJECT,
DALLAS, TX
TRINITY RIVER PARK
AFTER

STREET EDGE ALTERNATIVE PROJECT
SEATTLE, WA


GREEN ROOFS
PHILADELPHIA, PA


GREEN ROOFS
WAYNE COUNTY, NY

Atlanta, 2017, 4” rain - left

3 DAYS LATER

Atlanta, 2017, 4” rain - right

3 DAYS LATER

LIVING SHORELINE
PENSACOLA, FL

Lasalle bioswale, 2010

LASALLE BIOSWALE, 2012

Lasalle bioswale, 2014

LASALLE BIOSWALE, 2018

Lasalle bioswale, 2018

LOOK RIGHT

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Questions?

Thank You

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