

Climate Resilience, Coastal Protection and Adaptation

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Civil and Architectural Engineering





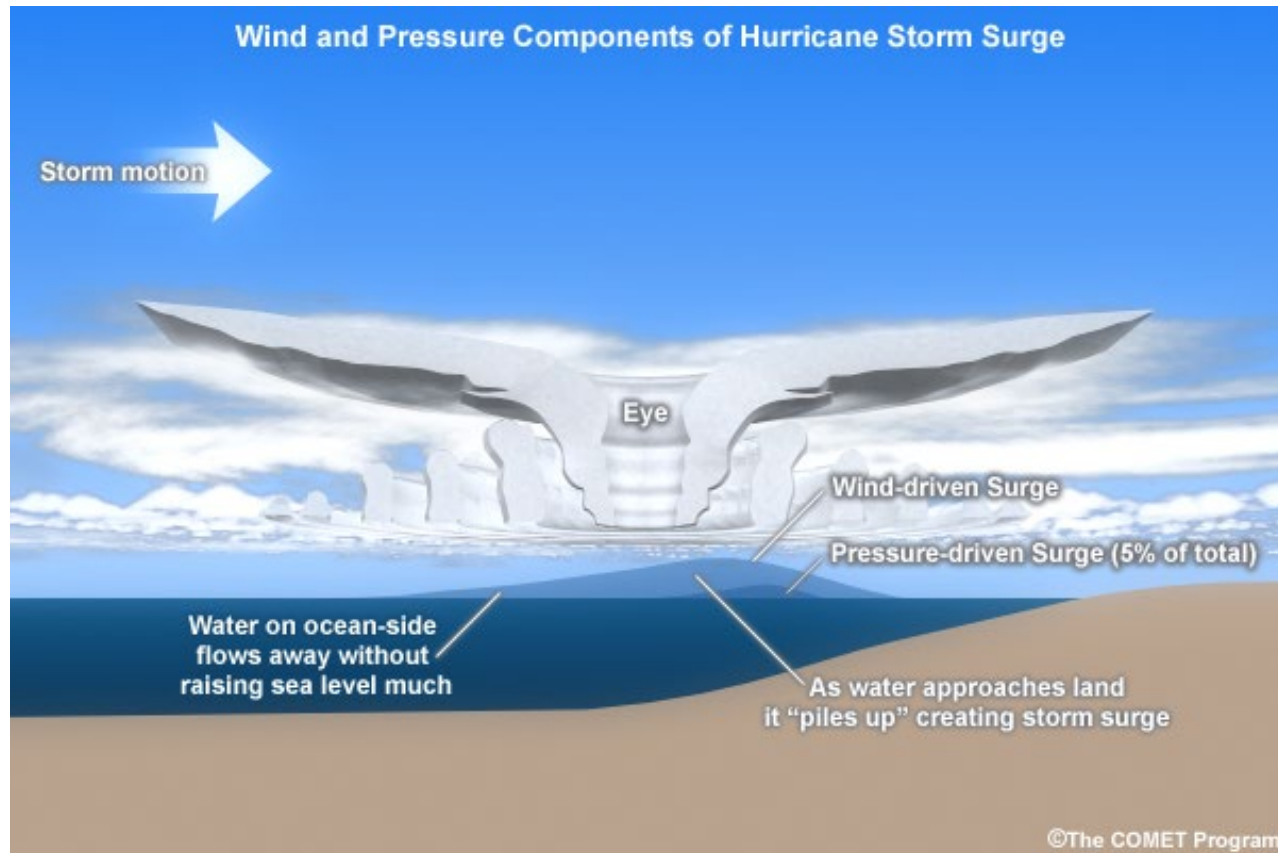
Engineering Strategies

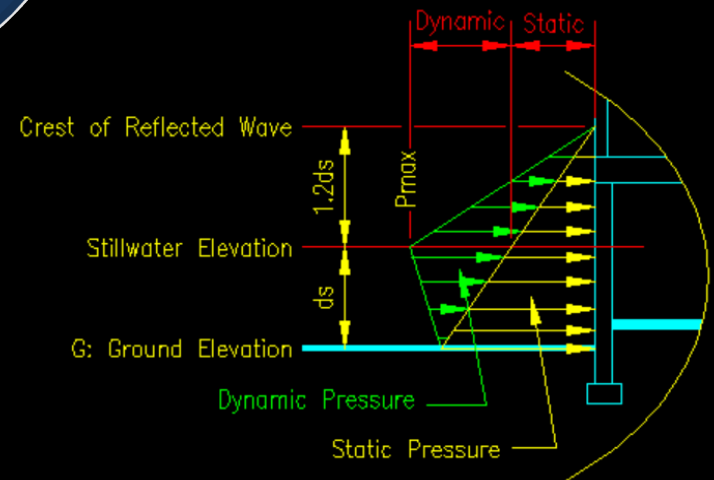
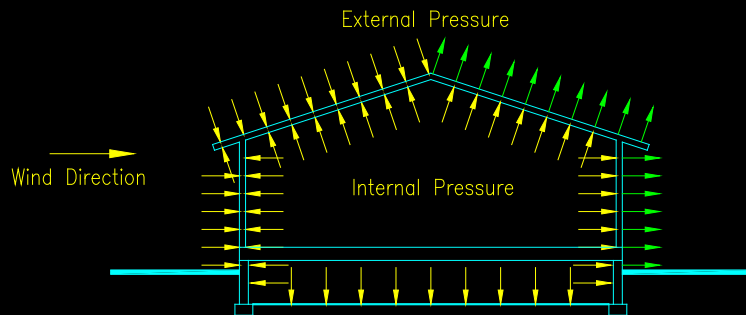
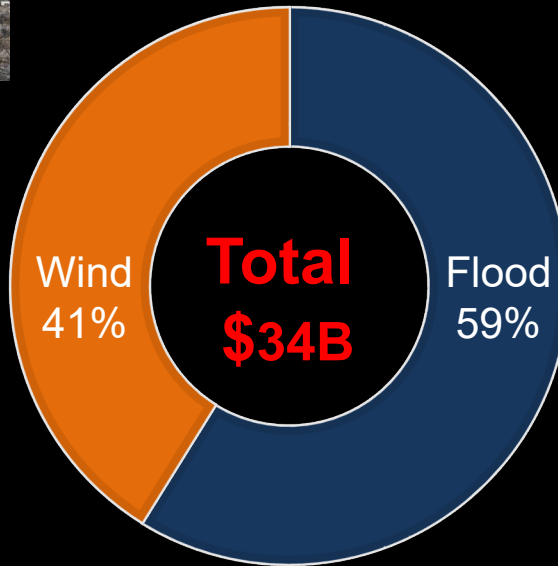


Source: www.nae.edu

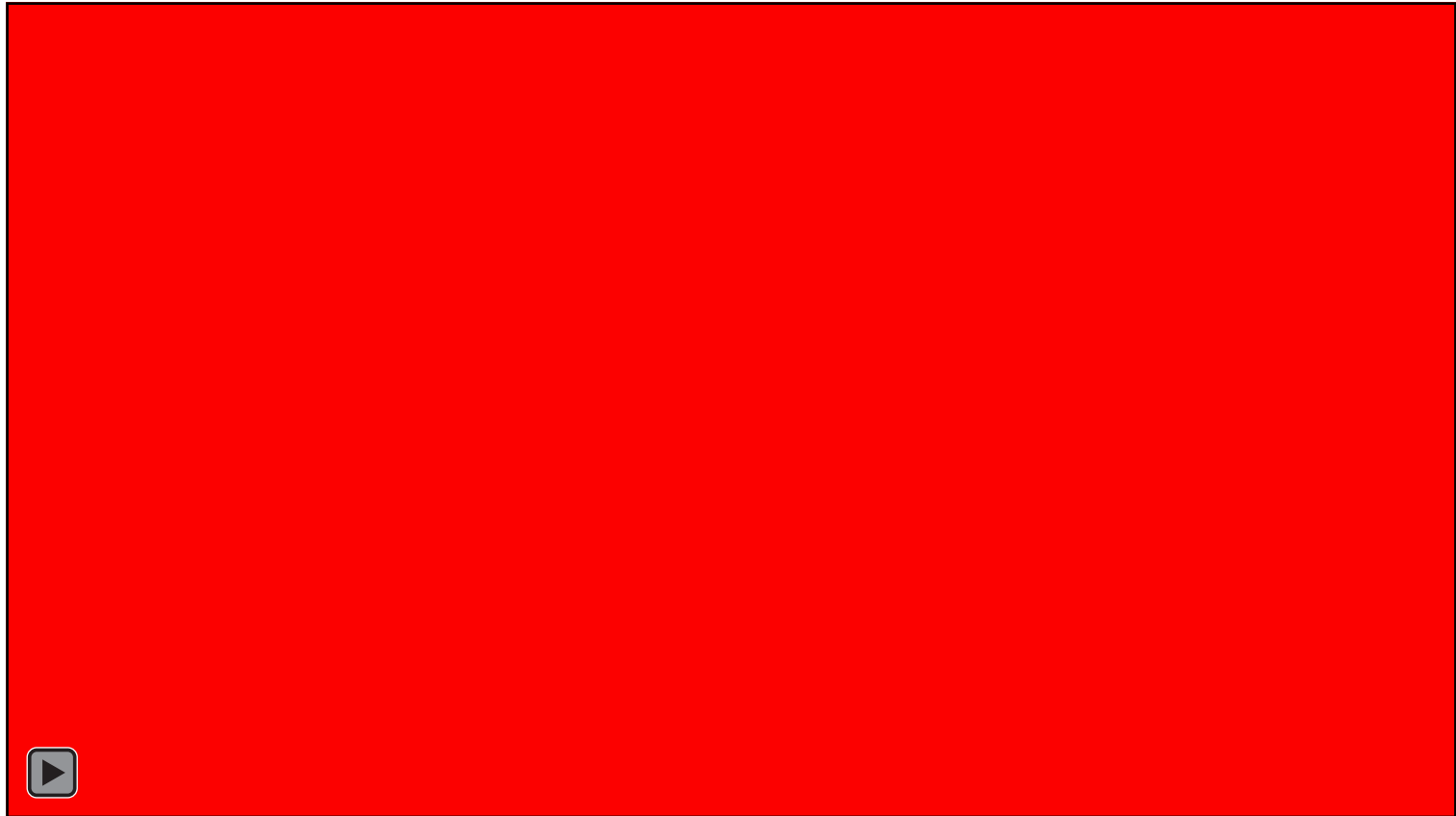
1. Mitigate or remove Emissions
2. Enhance our understanding of climate
3. Adapt to the impacts of climate change

Hurricane Action

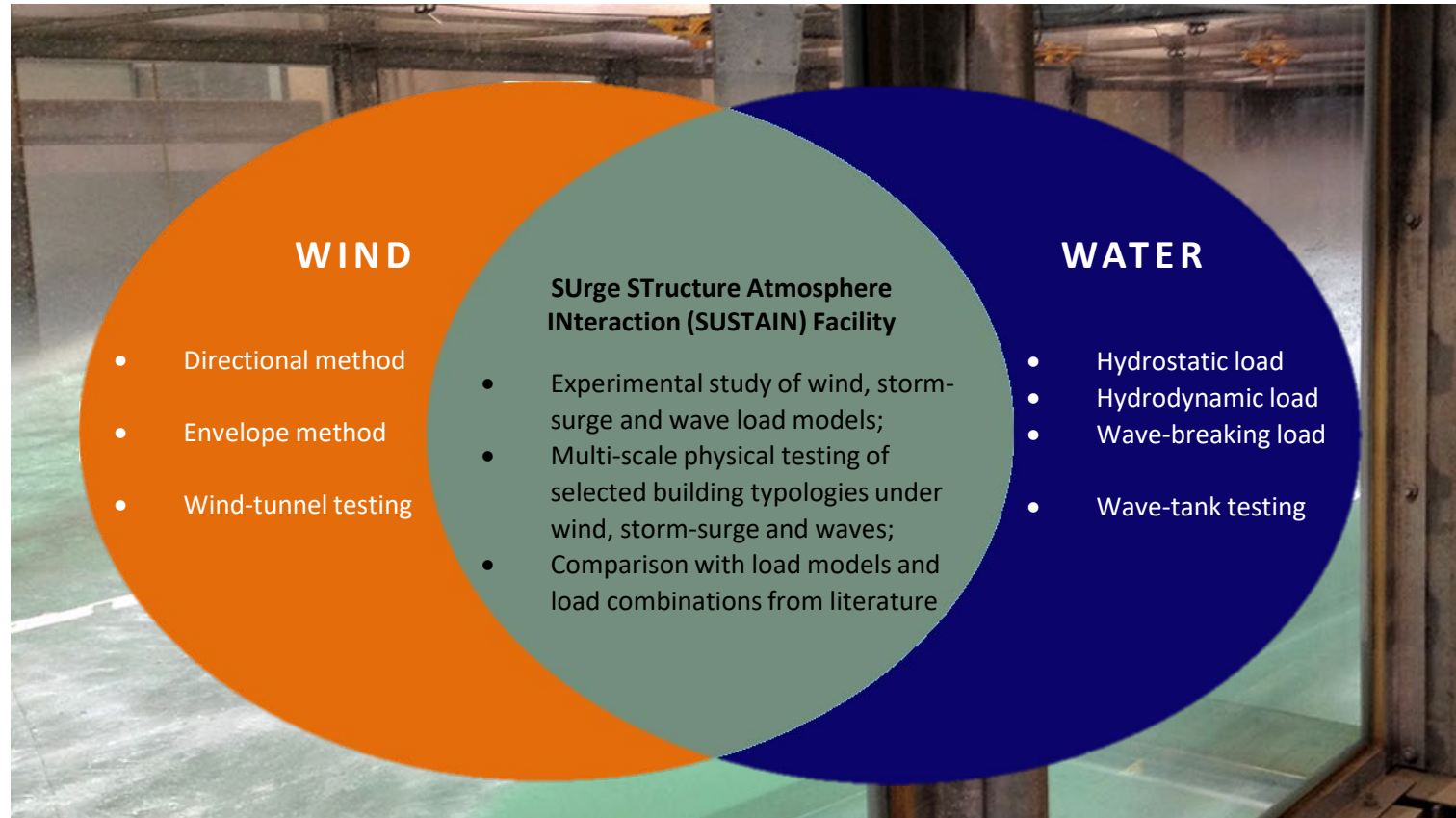




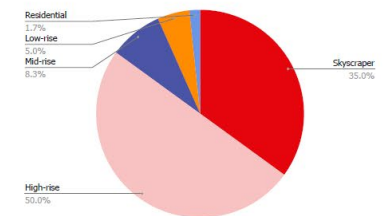
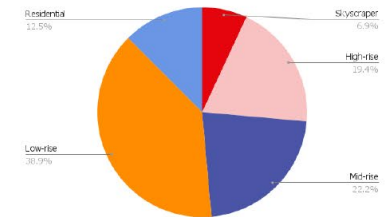
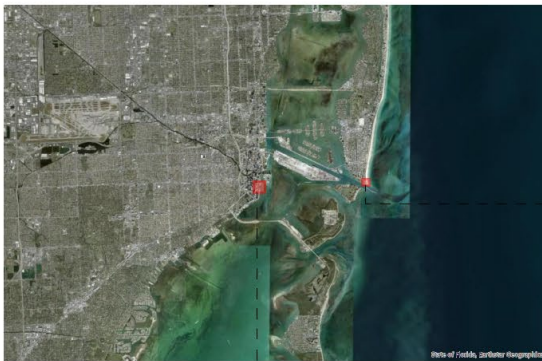
The Alfred C. Glassell, Jr. SUSTAIN Laboratory



The Alfred C. Glassell, Jr. SUSTAIN Laboratory



Research on Coupled Wind and Wave Loads



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Research on Coupled Wind and Wave Loads

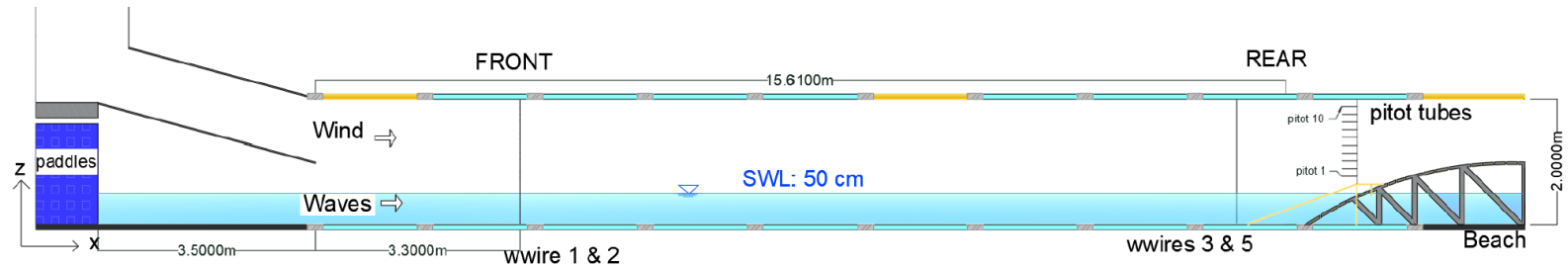
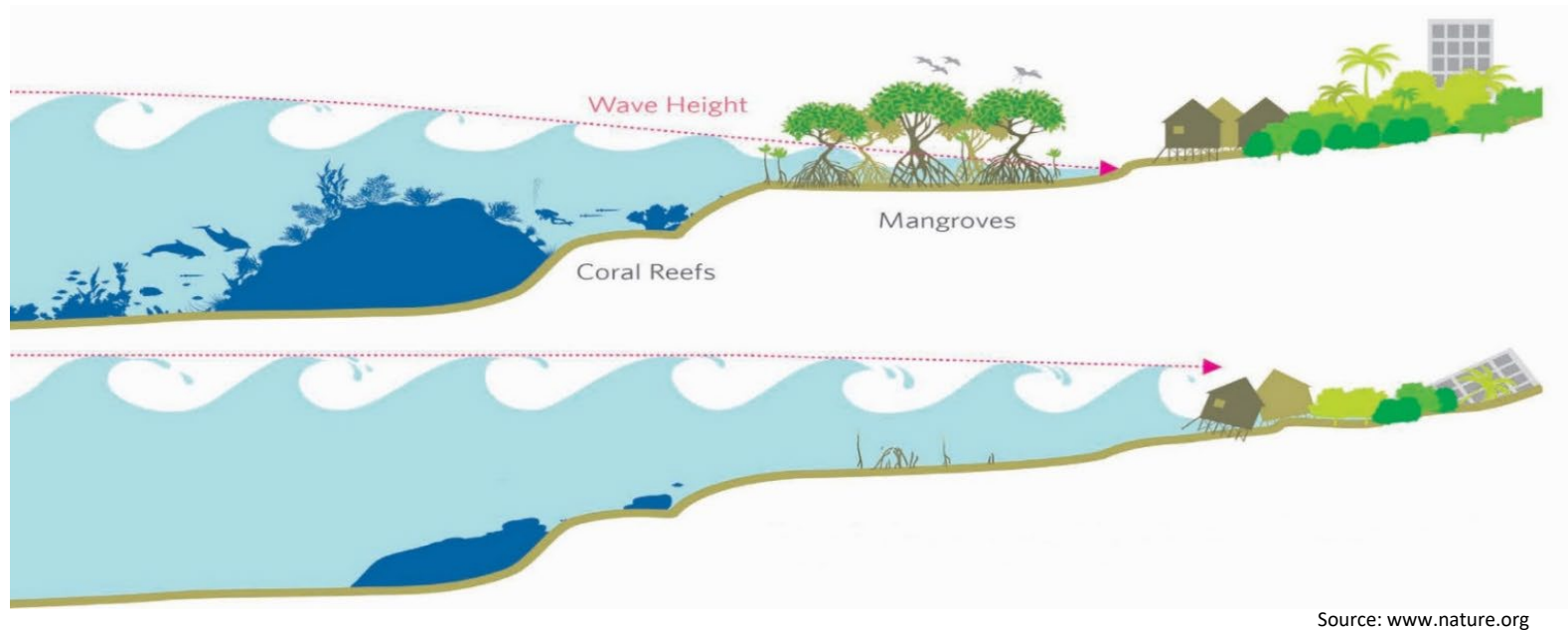


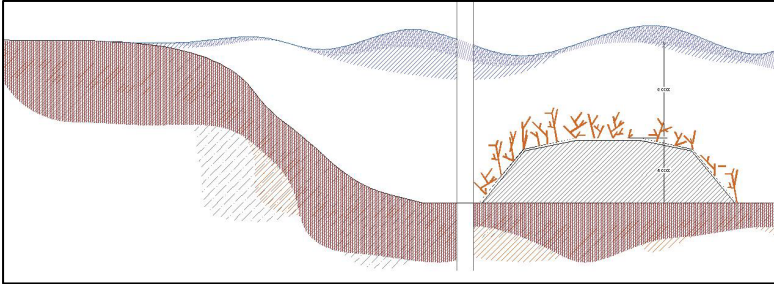
Figure 1. Elevation view of SUSTAIN and Phase II instrument location.



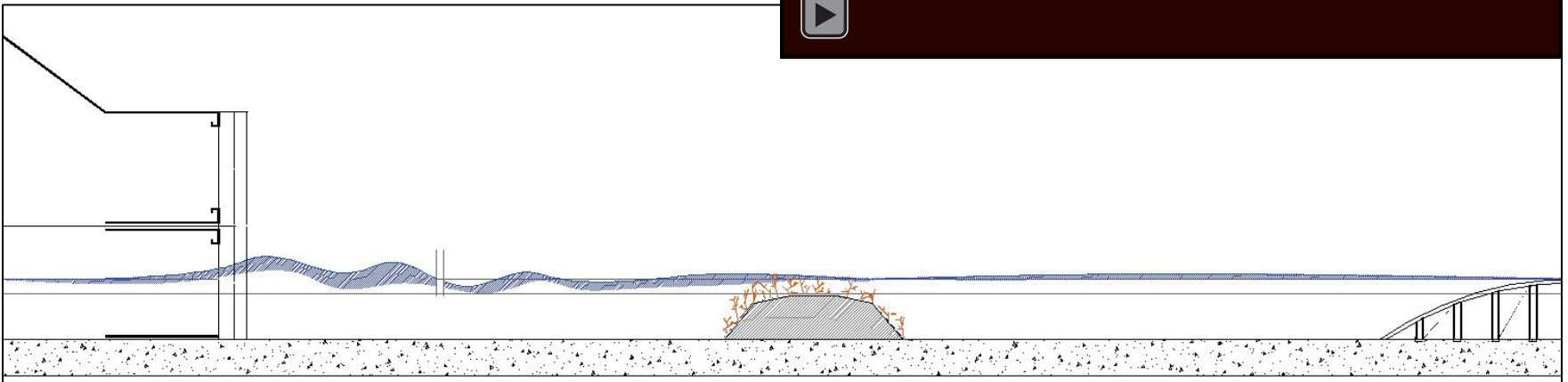
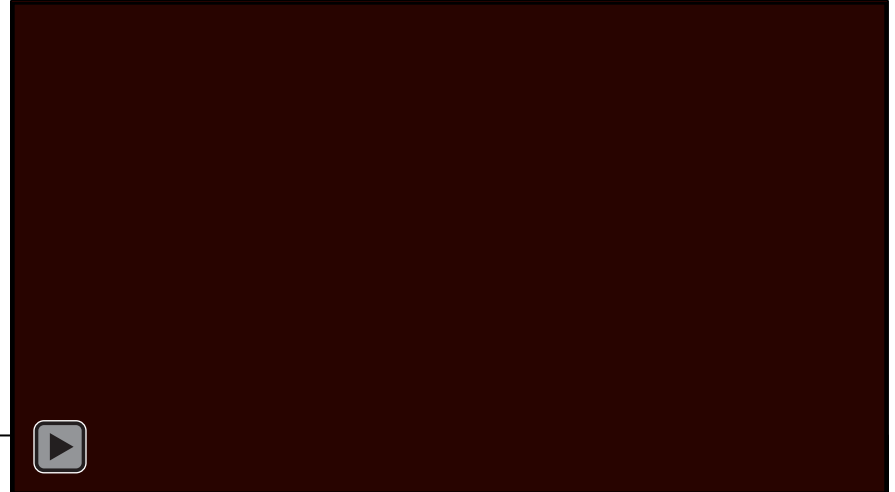
Nature-Based Solutions



Coral Reefs

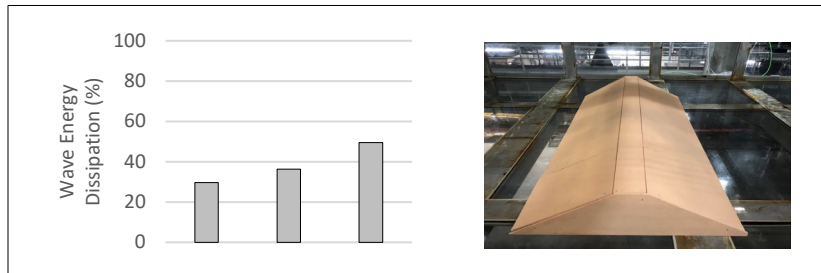
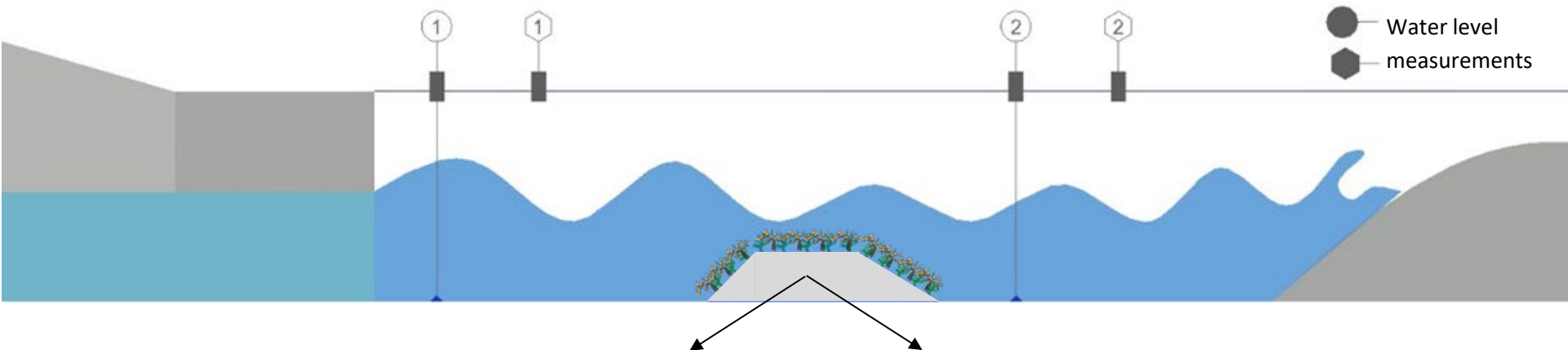


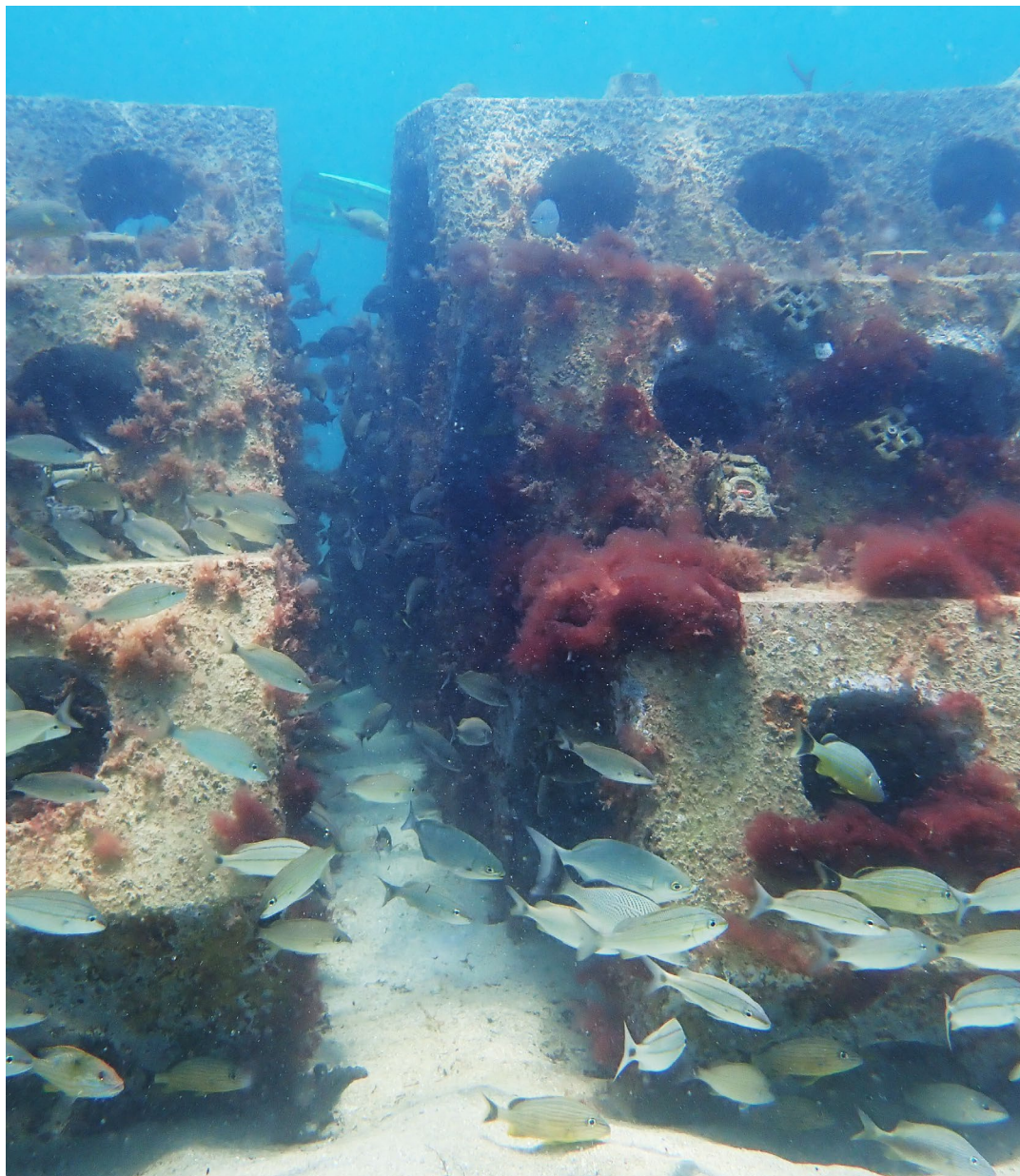
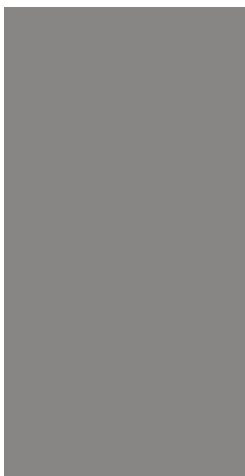
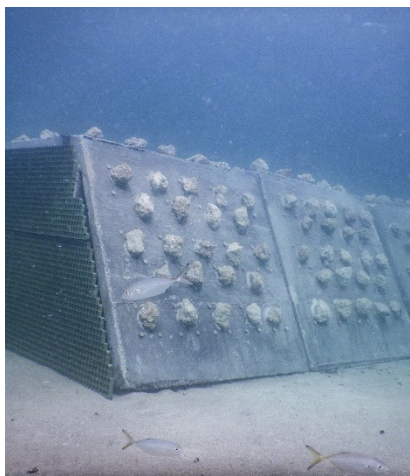
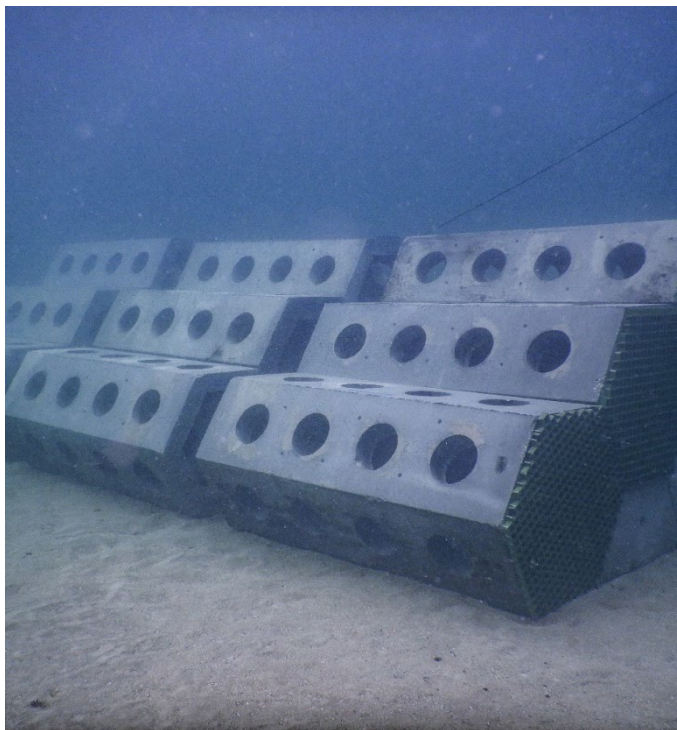
Staghorn corals



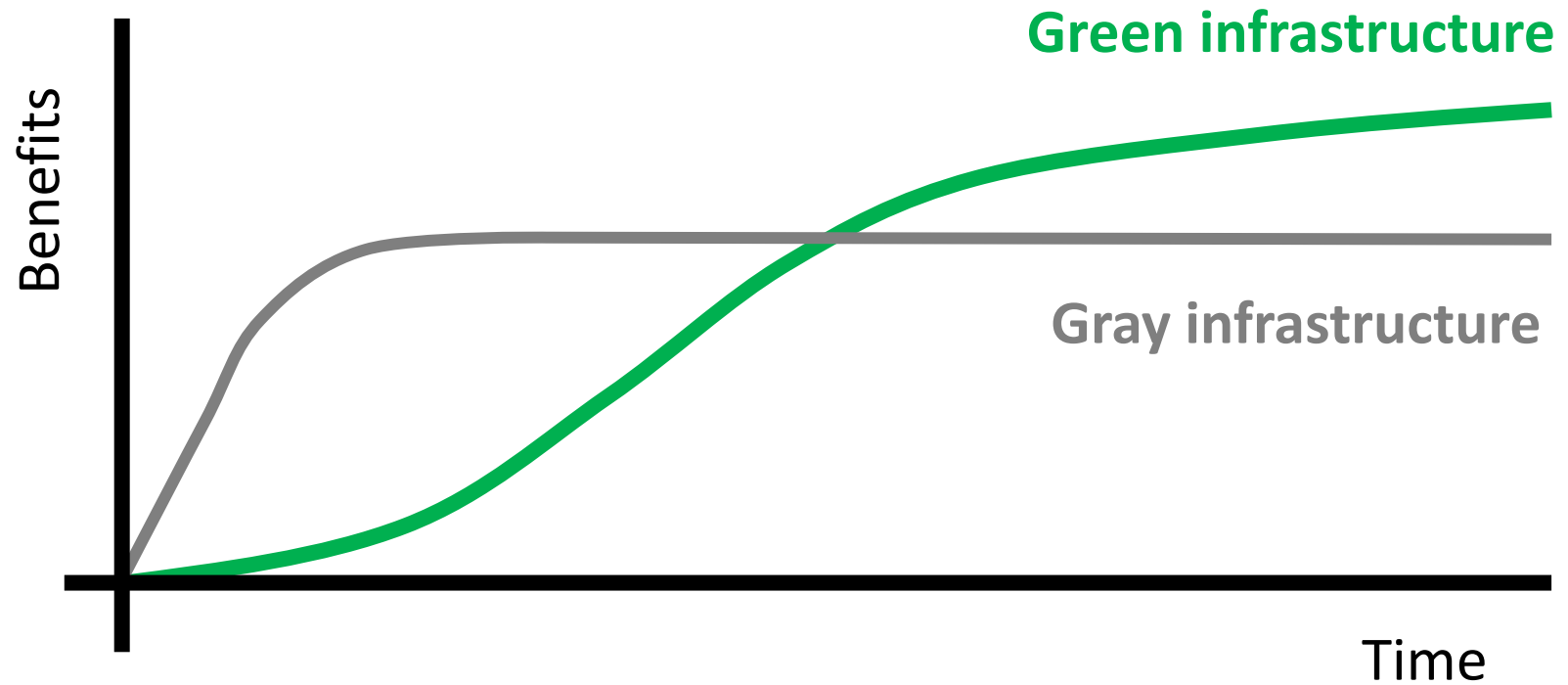
Laboratory Testing

SUSTAIN Facility





Nature-Based Solutions



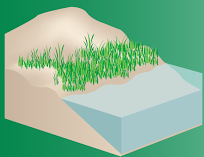
Source: World Bank and World Resources Institute; adapted Bloomberg and Holloway 2018

Coastal Protection

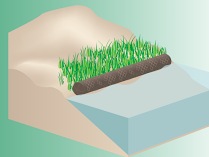
GREEN - SOFTER TECHNIQUES

GRAY - HARDER TECHNIQUES

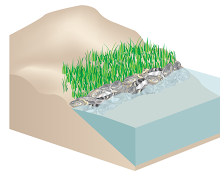
Living Shorelines



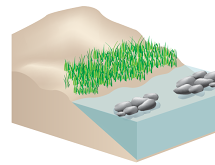
VEGETATION ONLY -
Provides a buffer to upland areas and breaks small waves. Suitable for low wave energy environments.



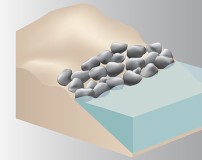
EDGING -
Added structure holds the toe of existing or vegetated slope in place. Suitable for most areas except high wave energy environments.



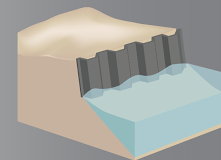
SILLS -
Parallel to vegetated shoreline, reduces wave energy, and prevents erosion. Suitable for most areas except high wave energy environments.



BREAKWATER -
(vegetation optional) - Offshore structures intended to break waves, reducing the force of wave action, and encourage sediment accretion. Suitable for most areas.



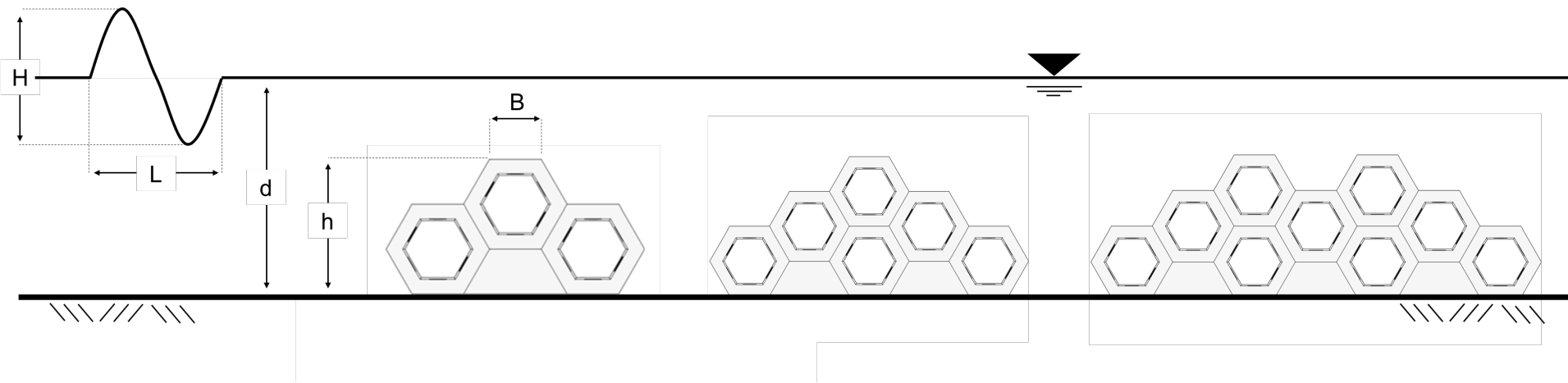
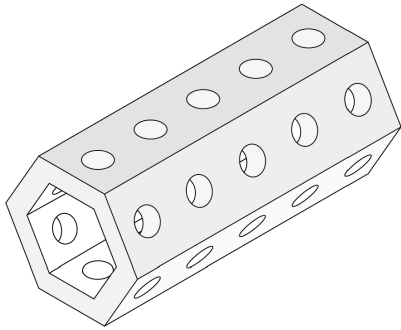
REVETMENT -
Lays over the slope of the shoreline and protects it from erosion and waves. Suitable for sites with existing hardened shoreline structures.



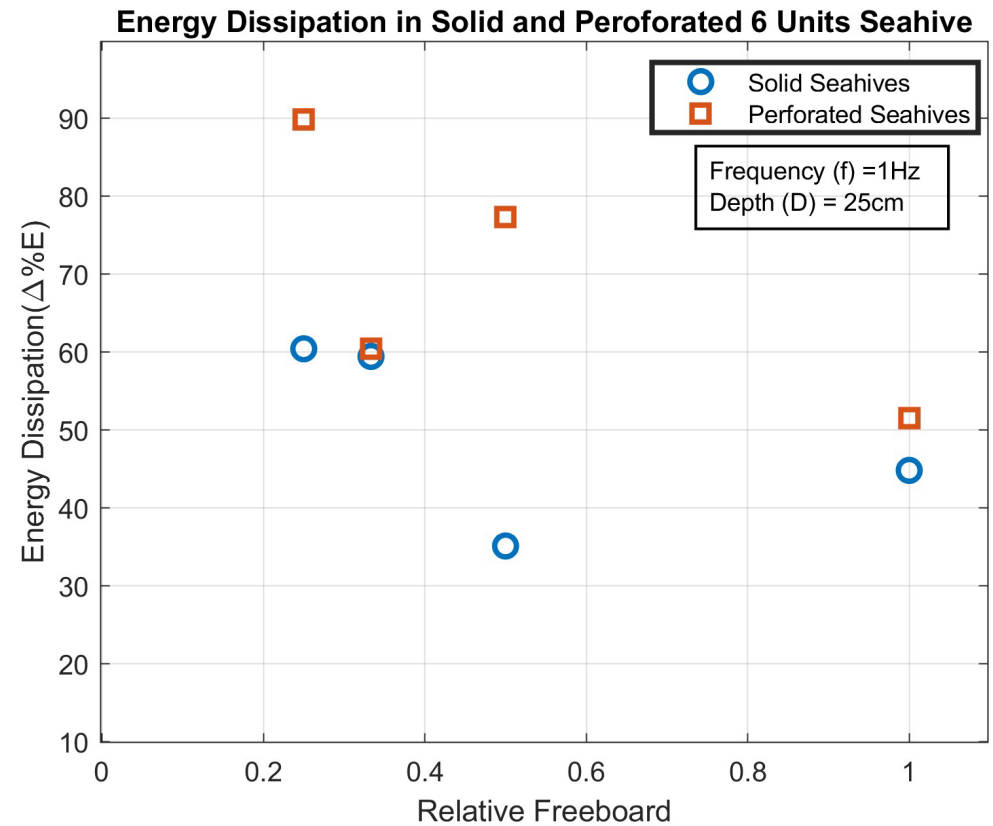
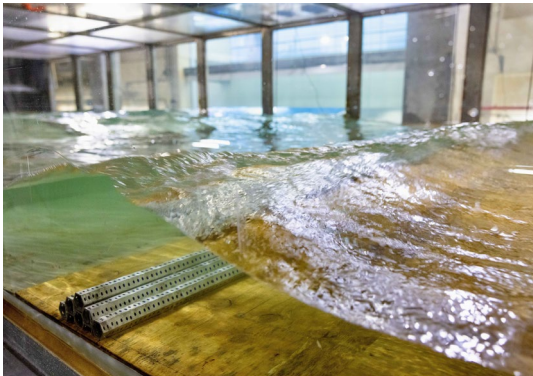
BULKHEAD -
Vertical wall parallel to the shoreline intended to hold soil in place. Suitable for high energy settings and sites with existing hard shoreline structures.

Source: NOAA Living Shorelines

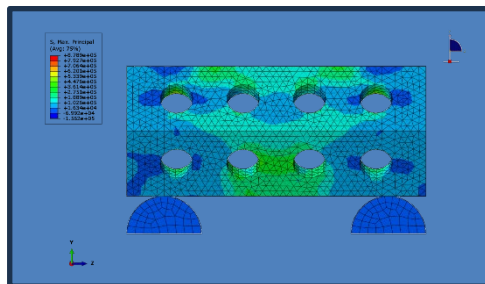
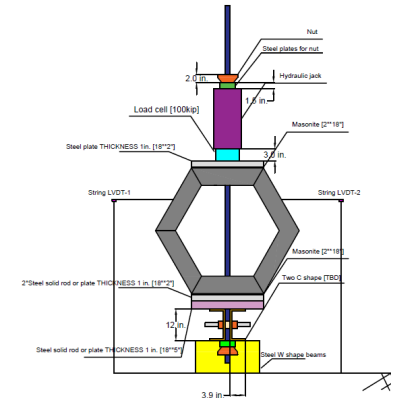
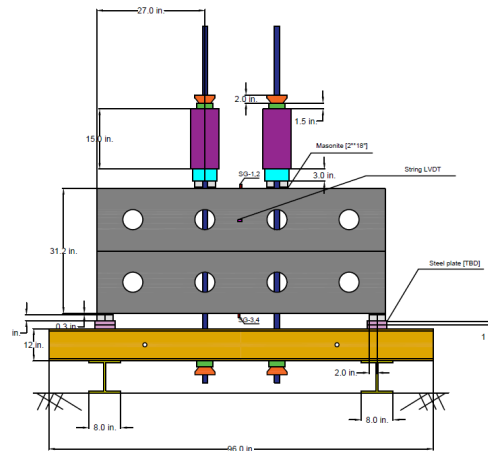
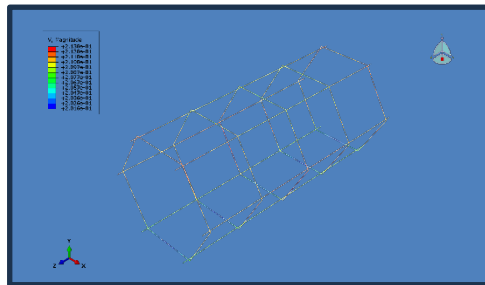
SEAHIVE[®]



SEAHIVE®



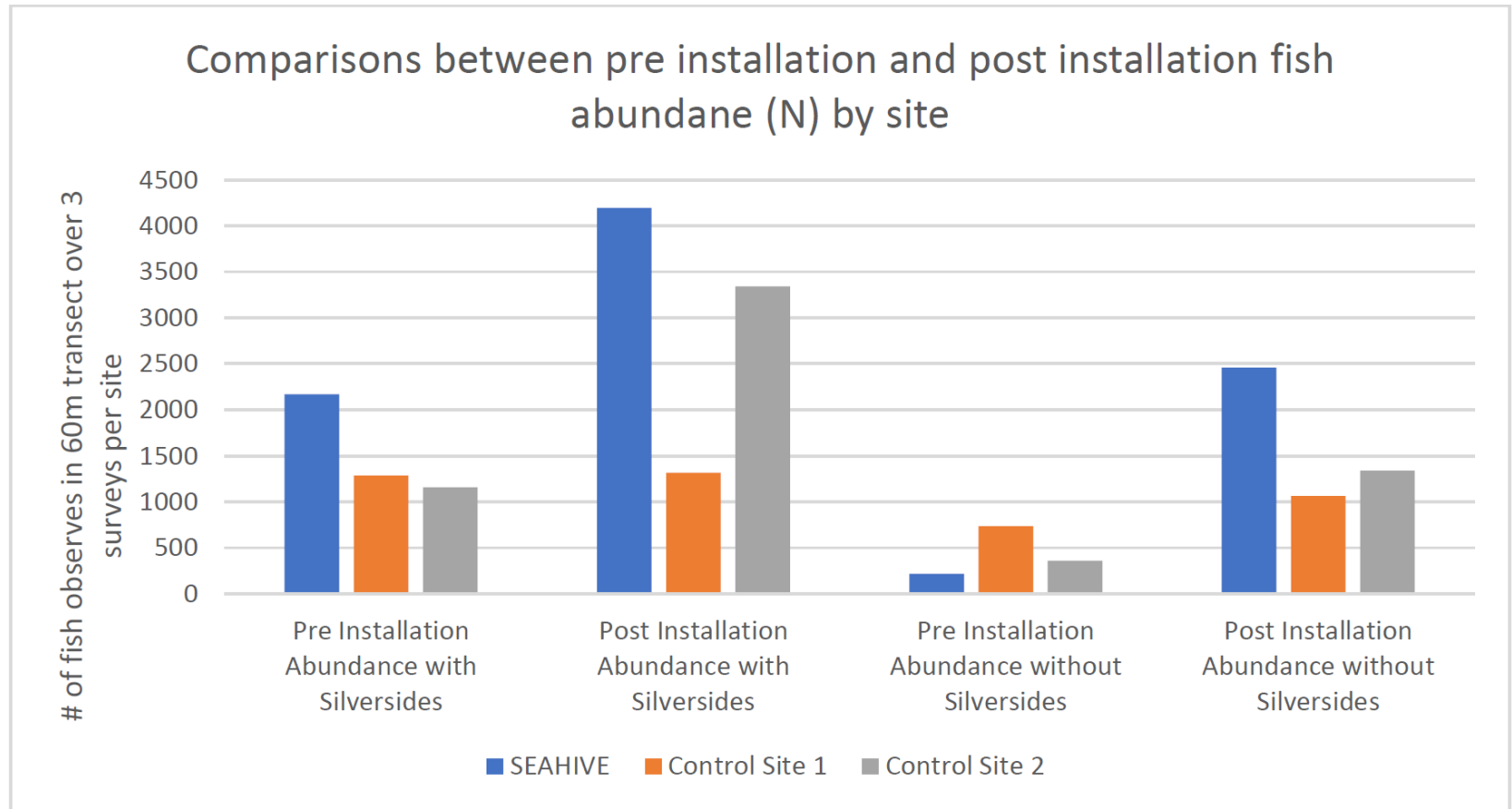
SEAHIVE®





Environmental and Educational Marine Park
POMPANO BEACH, FLORIDA









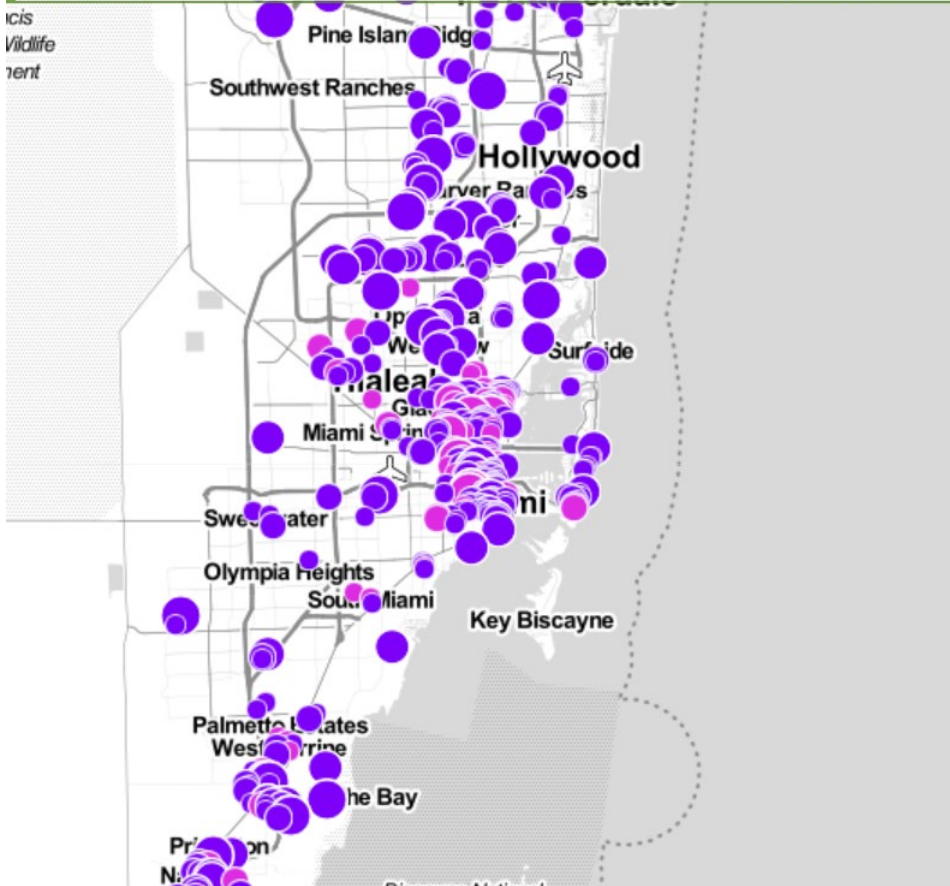
PLAN OF ACTION:

5 OPTIONS FOR HOME OWNERS + PROPERTY OWNERS

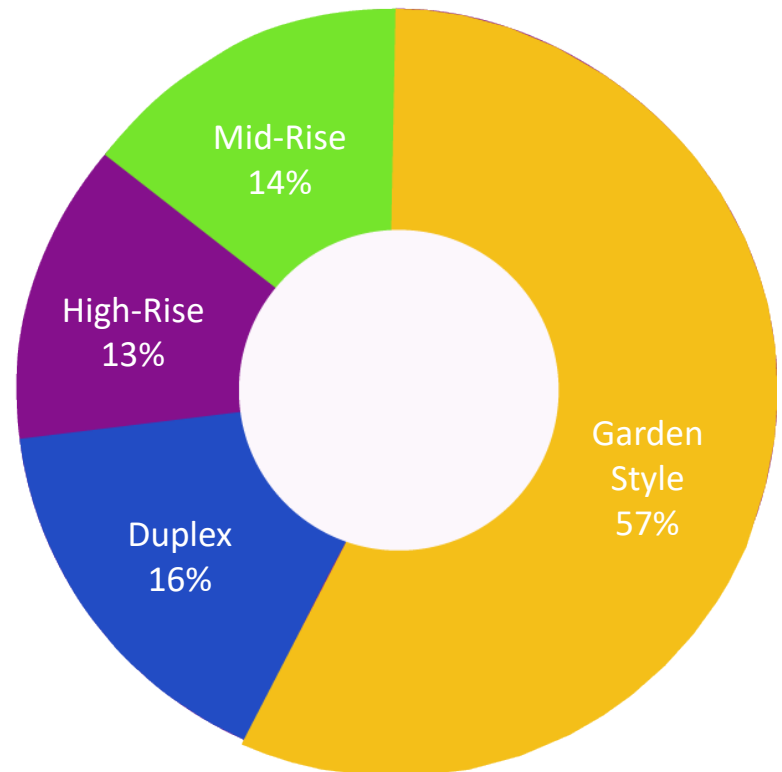
1. **PREPARE:** Identify Flood Risks, Regulations, & Assess My Property
2. **DEFEND:** Protect My Home Today from Possible Flooding
3. **ADAPT:** Elevate My House or Entire Lot Above the DFE
4. **MITIGATE:** Make My House Sustainable & Improve Its Performance
5. **RELOCATE/REBUILD:** Find a New House or Start from Scratch

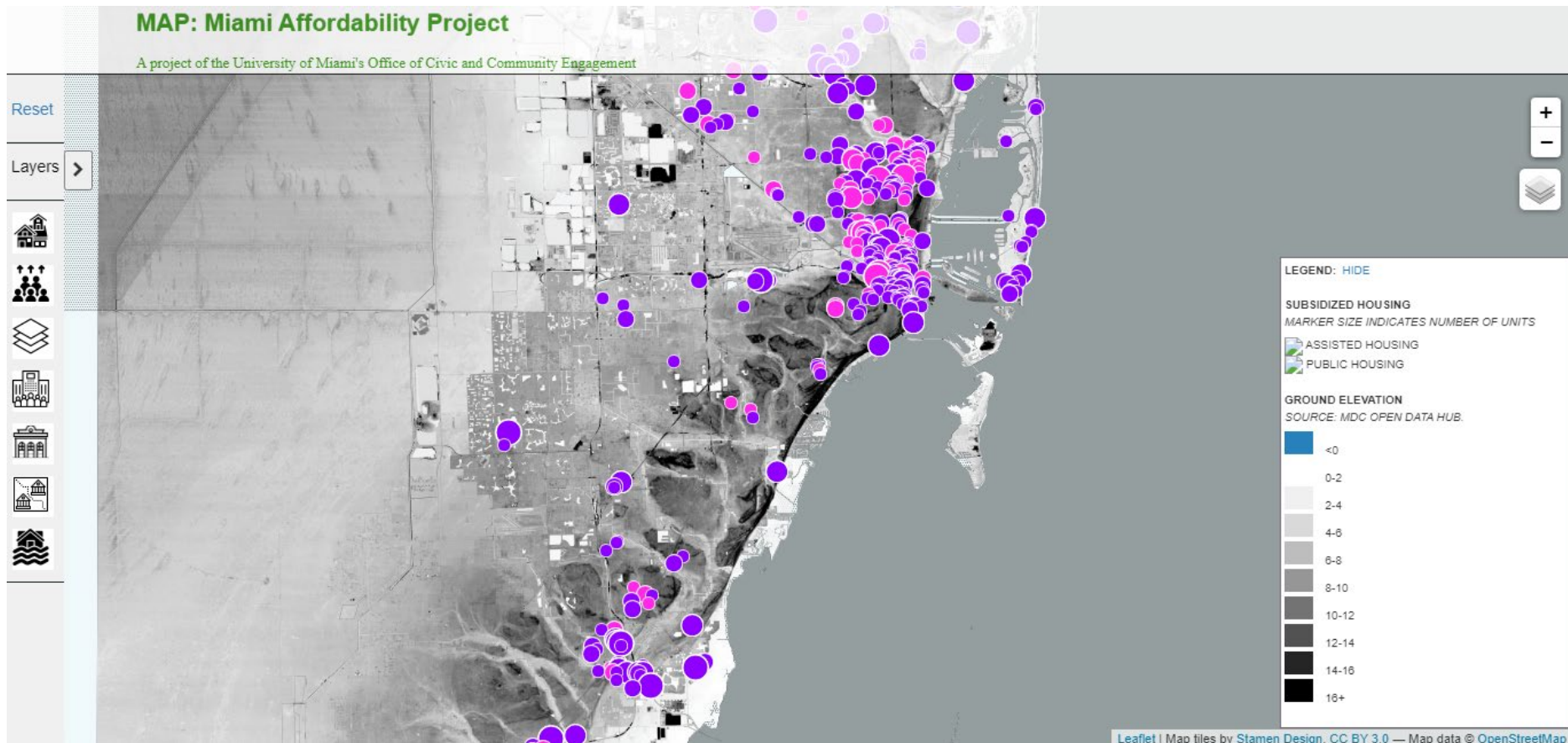
MAP: Miami Affordability Project Home About Map Help

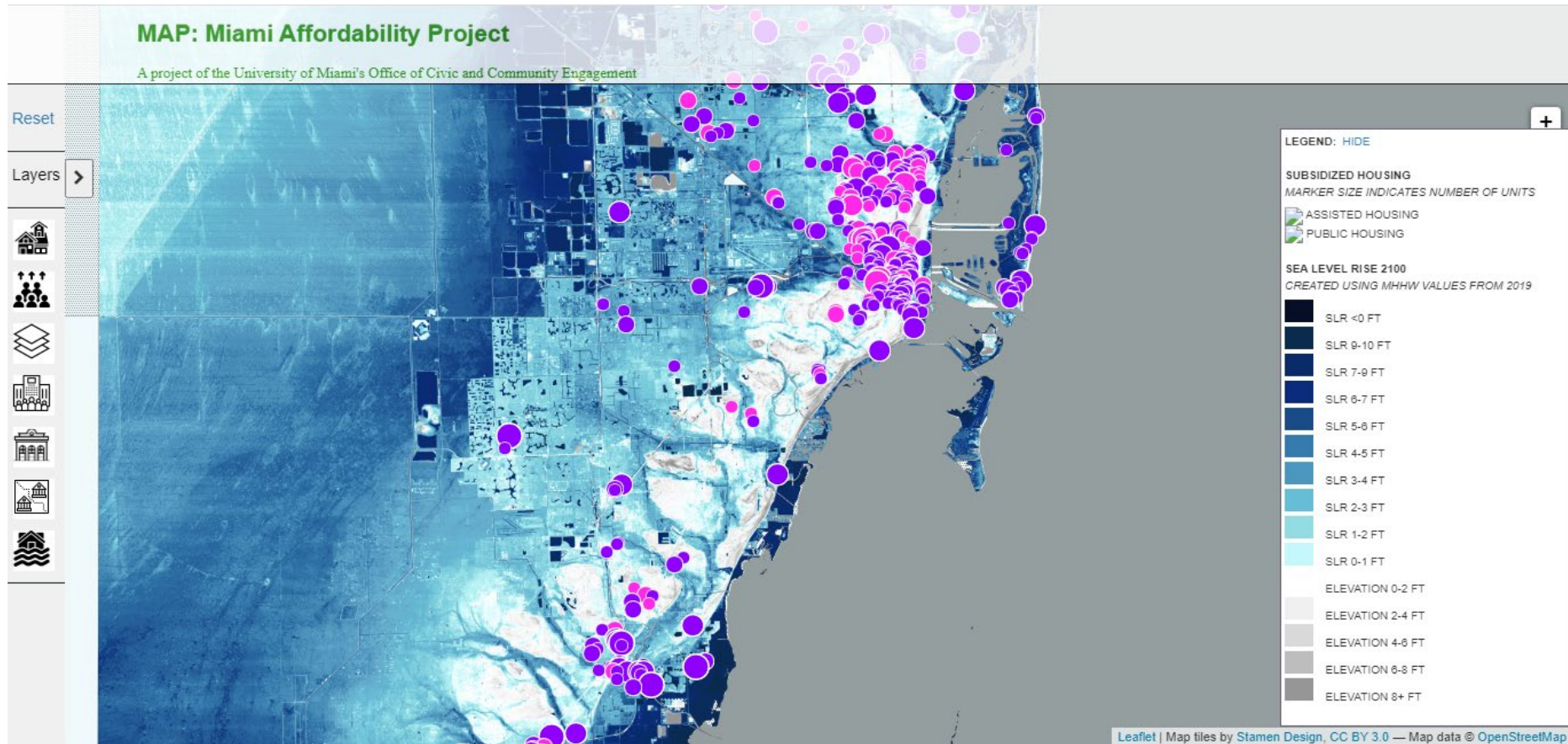
A project of the University of Miami's Office of Civic and Community Engagement



UM Office of Civic Community Engagement (CCE)







Example: a garden style building in Overtown

Total area: 34,000 sqft with 3 floors (footprint of ~10,000 sqft)

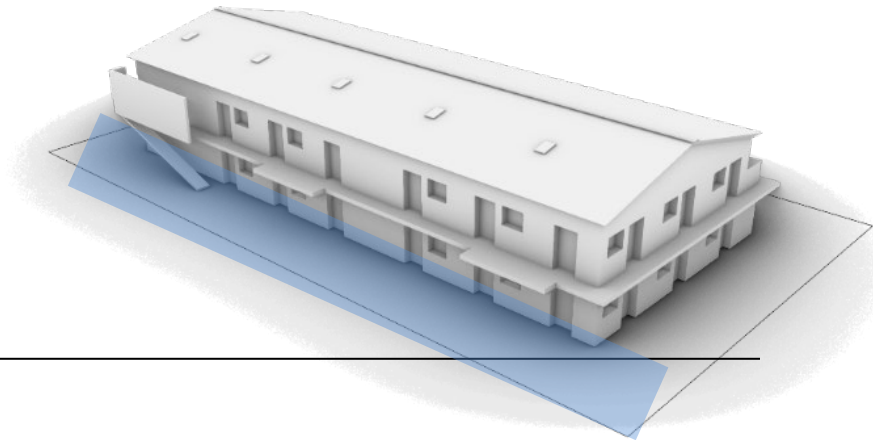
Flood zone AE (1%); FFE of 9 ft with a ground elevation of ~8 ft

SLR and storm surge projections: 10.5 ft (100-yr) and 11.6 ft (500-yr)

⇒ Flood depths: 3 ft (100-yr) and 4 ft (500-yr)

Solutions available and cost:

1. Dry-proofing (100-yr): \$74,000
2. Wet-proofing (100-yr): \$42,000
3. Wet-proofing (500-yr): \$57,000

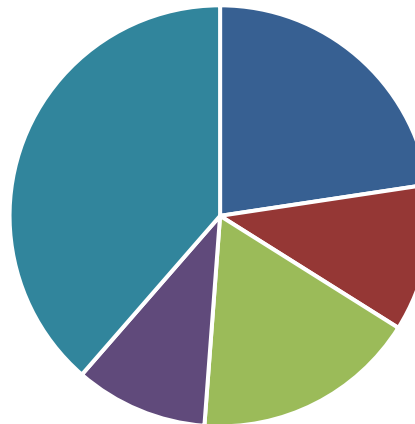


Example: a garden style building in Overtown

Benefit estimates:

	Physical	Full
1. Dry-proofing (100-yr):	\$461,092	\$3,180,027
2. Wet-proofing (100-yr):	\$376,000	\$1,456,000
3. Wet-proofing (500-yr):	\$382,000	\$717,000

Benefit distribution:



- Building Damages
- Contents Damages
- Displacement
- Mental stress
- Lost productivity



UNIVERSITY OF MIAMI
**CLIMATE RESILIENCE
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- Help communities build resilience to the climate shocks and stresses of the 21st century
- Make South Florida a center of excellence for climate-resilience innovation
- Support faculty and students across UM Schools and Colleges to cultivate the next generation of climate resilience leaders

***Transforming lives through
education, research, innovation,
and service***

