# Vulnerability Assessments 101

Basic Components and Key Concepts

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# Overview

1. SE FL Climate Hazards
2. Key Terms Explained
3. Asset Categories
4. Getting Staff Involved
5. Best Practices for SE FL
6. Lessons Learned

# Vulnerable to what?

Southeast Florida Climate Hazards

- Sea Level Rise
- Flooding
- Extreme Heat
- Hurricane Force Winds
- Storm Surge
- Erosion
- Impaired Water Quality/HABs
- Contamination/Pollution
- Vector Borne Diseases
- Saltwater Intrusion
- Drought
- And more…

**Table 6: Storm hazard intensity, selected locations, 2050**

| Location | Intensity, unchecked emissions | Intensity, moderate emissions cuts | Reduction in intensity, unchecked emissions vs. moderate emissions cuts |
|---|---|---|---|
| 1. Miami, FL | 0.54 | 0.254 | 0.287 |
| 2. West Palm Beach, FL | 0.54 | 0.254 | 0.287 |
| 3. Ft Myers, FL | 0.518 | 0.221 | 0.297 |
| 4. Orlando, FL | 0.506 | 0.234 | 0.272 |
| 5. Sarasota, FL | 0.488 | 0.218 | 0.269 |
| 6. Tampa, FL | 0.488 | 0.218 | 0.269 |
| 7. San Juan | 0.396 | 0.238 | 0.159 |
| 8. Gainesville | 0.378 | 0.18 | 0.197 |
| 9. Wilmington, NC | 0.263 | 0.244 | 0.019 |
| 10. New Orleans, LA | 0.253 | 0.131 | 0.123 |

Note: Data represent projected changes in hazard intensity in 2050 relative to 1995 levels. Locations with zero scores may still experience the hazard assessed. Locations with greatest reductions in hazard intensity via moderate emissions cuts are highlighted. Source: Mora et al. 2018.

**Table 9: Heat-wave intensity, selected locations, 2050**

| Location | Intensity, unchecked emissions | Intensity, moderate emissions cuts | Reduction in intensity, unchecked emissions vs. moderate emissions cuts |
|---|---|---|---|
| 1. Miami, FL | 0.370 | 0.325 | 0.045 |
| 2. West Palm Beach, FL | 0.370 | 0.325 | 0.045 |
| 3. Ft. Myers, FL | 0.349 | 0.299 | 0.05 |
| 4. San Juan | 0.347 | 0.218 | 0.129 |
| 5. Orlando, FL | 0.309 | 0.263 | 0.046 |
| 6. New Orleans, LA | 0.295 | 0.258 | 0.037 |
| 7. Sarasota, FL | 0.293 | 0.261 | 0.032 |
| 8. Tampa, FL | 0.293 | 0.261 | 0.032 |
| 9. Gainesville, FL | 0.276 | 0.232 | 0.044 |
| 10. Victoria, TX | 0.272 | 0.239 | 0.033 |

Note: Data represent projected changes in hazard intensity in 2050 relative to 1995 levels. Locations with zero scores may still experience the hazard assessed. Locations with greatest reductions in hazard intensity via moderate emissions cuts are highlighted. Source: Mora et al. 2018.

Tables from "Climate Pile-Up: Global Warming's Compounding Dangers Research Brief by Climate Central (2019).

# Key Terms Explained

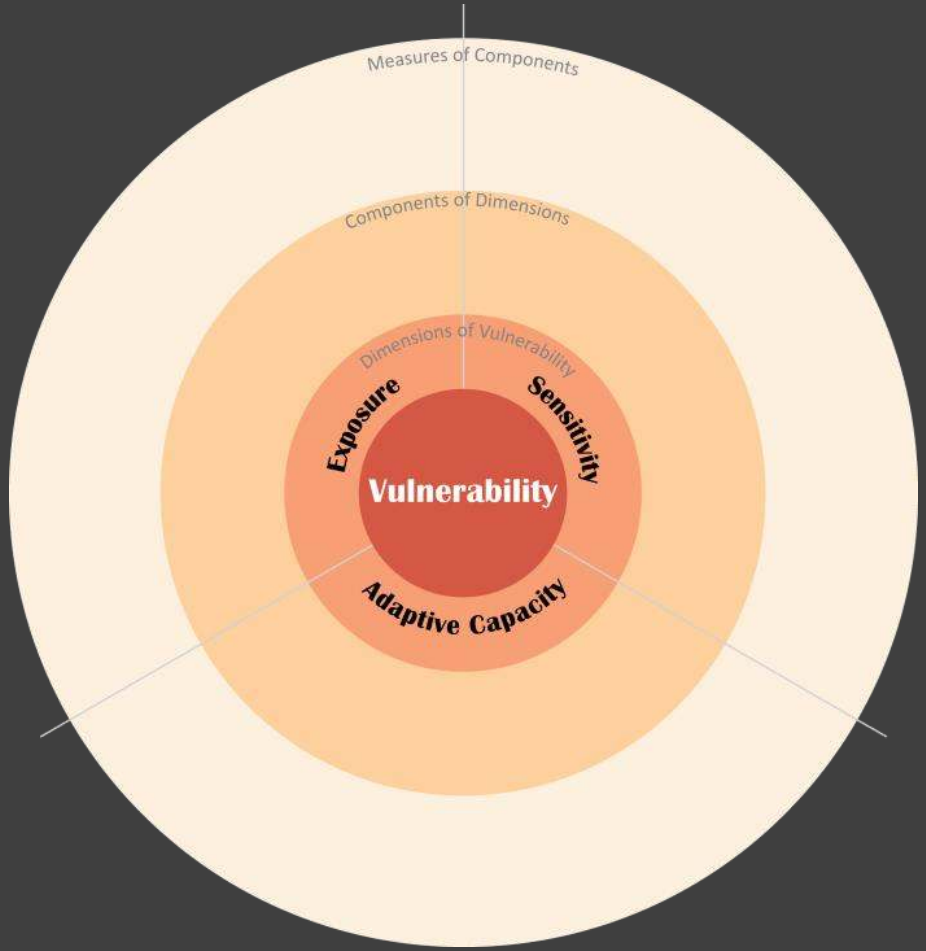
## Vulnerability

Vulnerability is a function of:

*exposure* to specific social and environmental stresses

*Sensitivities* to the exposures*, and*

the ability to adapt to the sensitivities (aka *adaptive capacity).*




FAU
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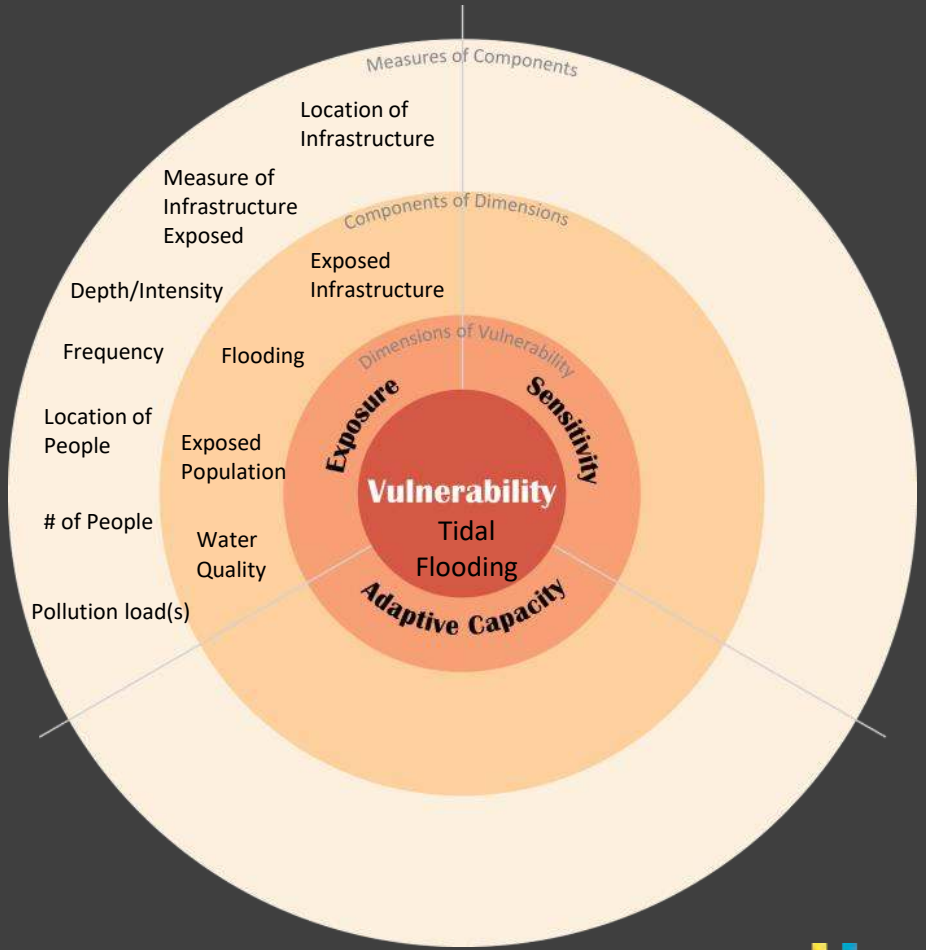
Florida Atlantic University

Polsky, Colin, Rob Neff, and Brent Yarnal. "Building comparable global change vulnerability assessments: The vulnerability scoping diagram." *Global environmental change* 17, no. 3-4 (2007): 472-485.

# Key Terms Explained

## Exposure

Exposure is the degree to which people and the things they value could be affected or “touched” by hazards

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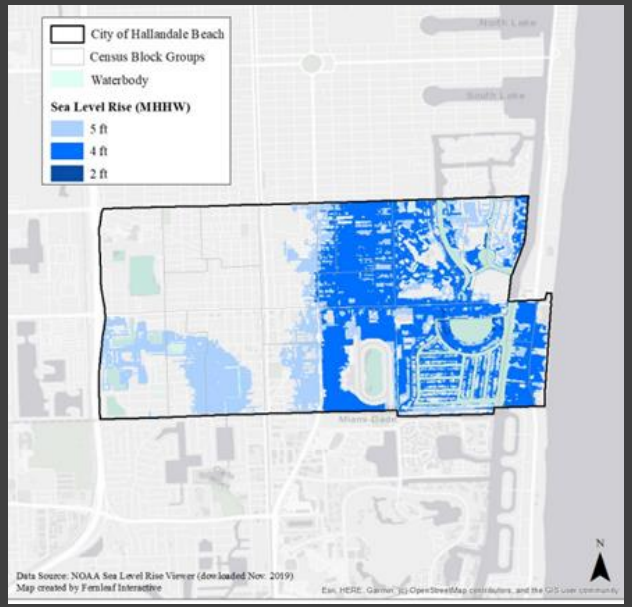


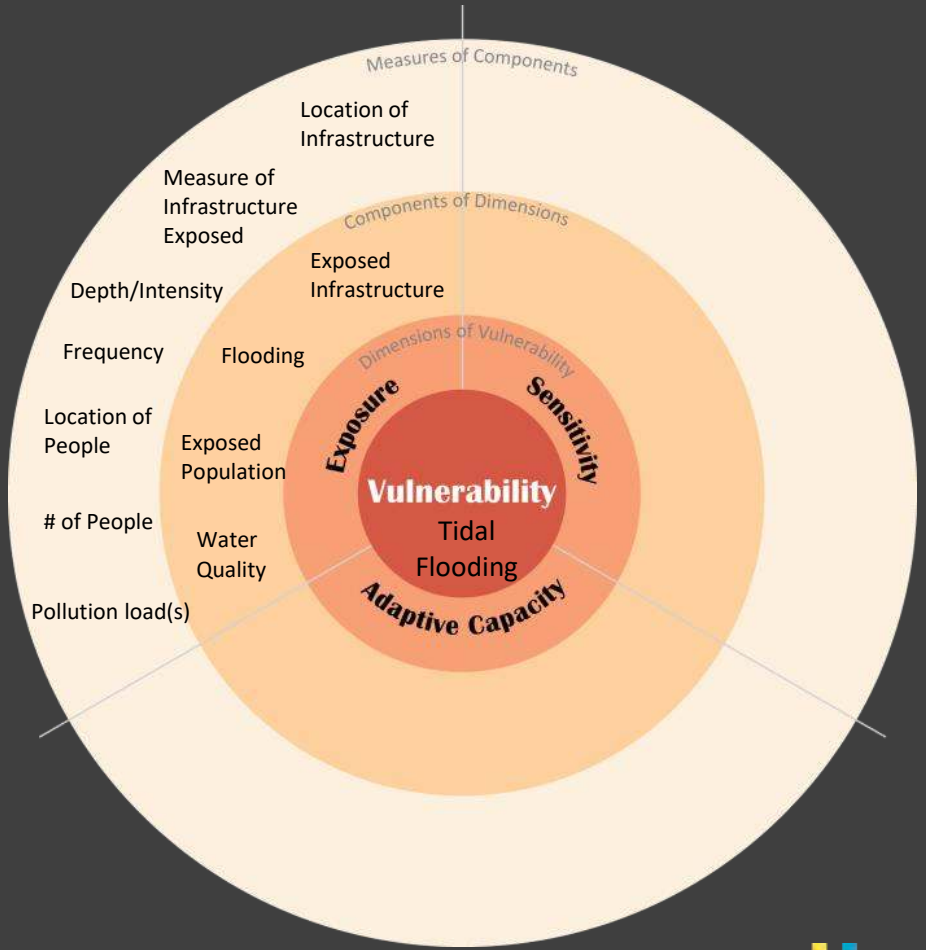


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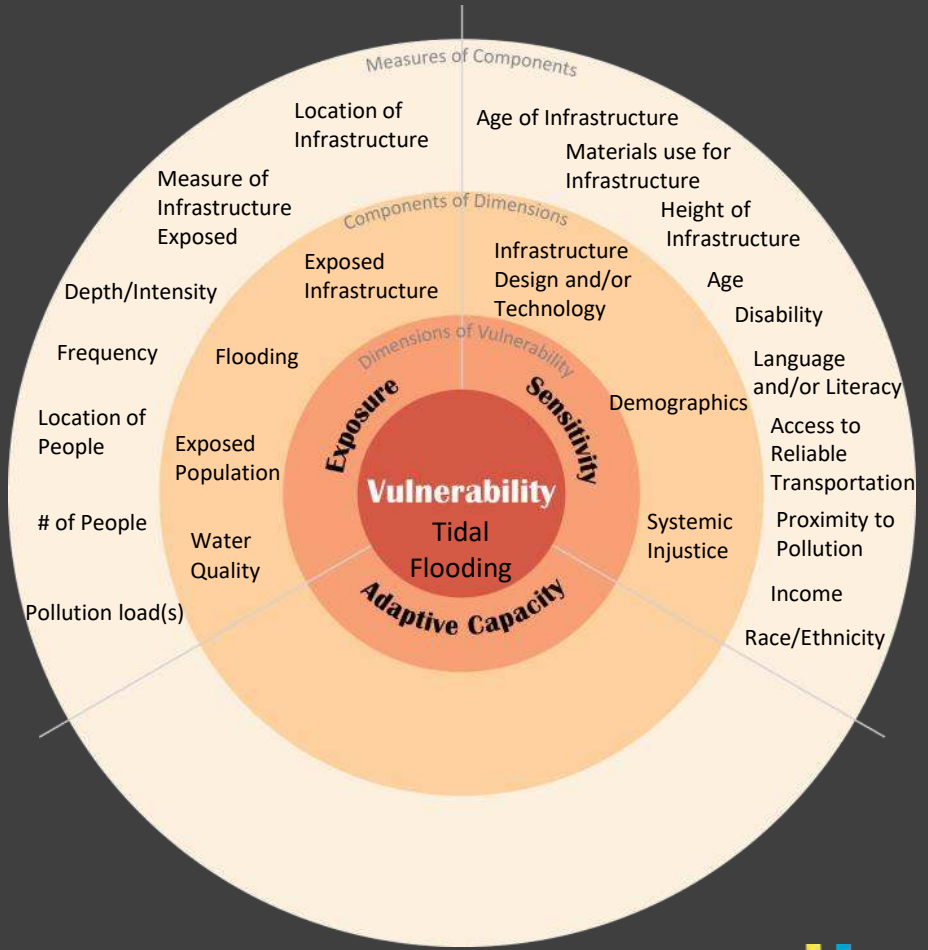
## Sensitivity

Sensitivity is the degree to which people and the things they value are affected, either adversely or beneficially, by a hazard or hazards

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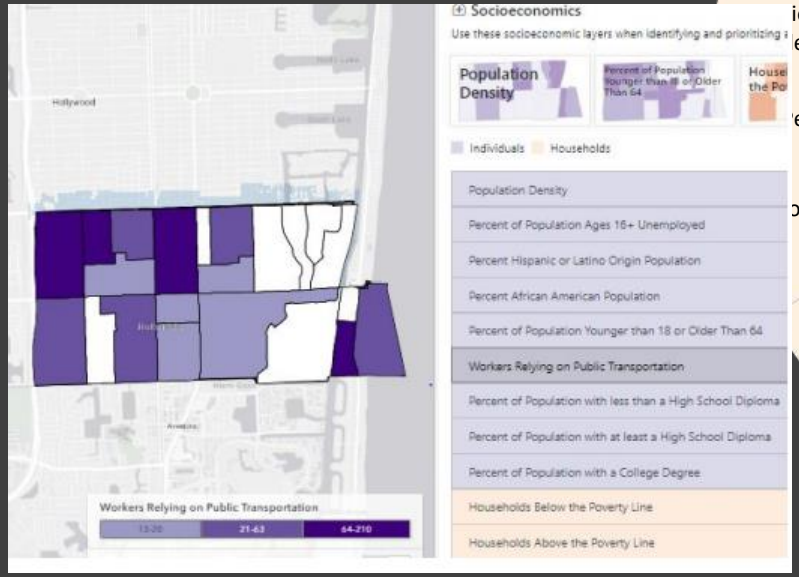


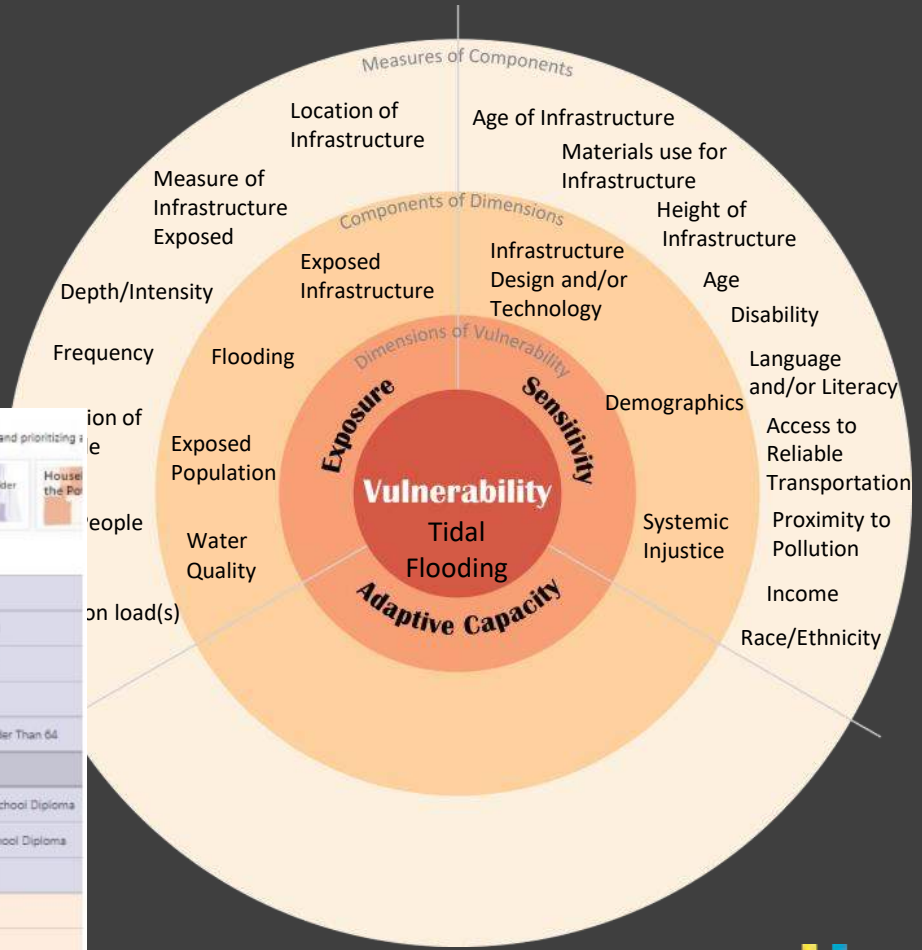


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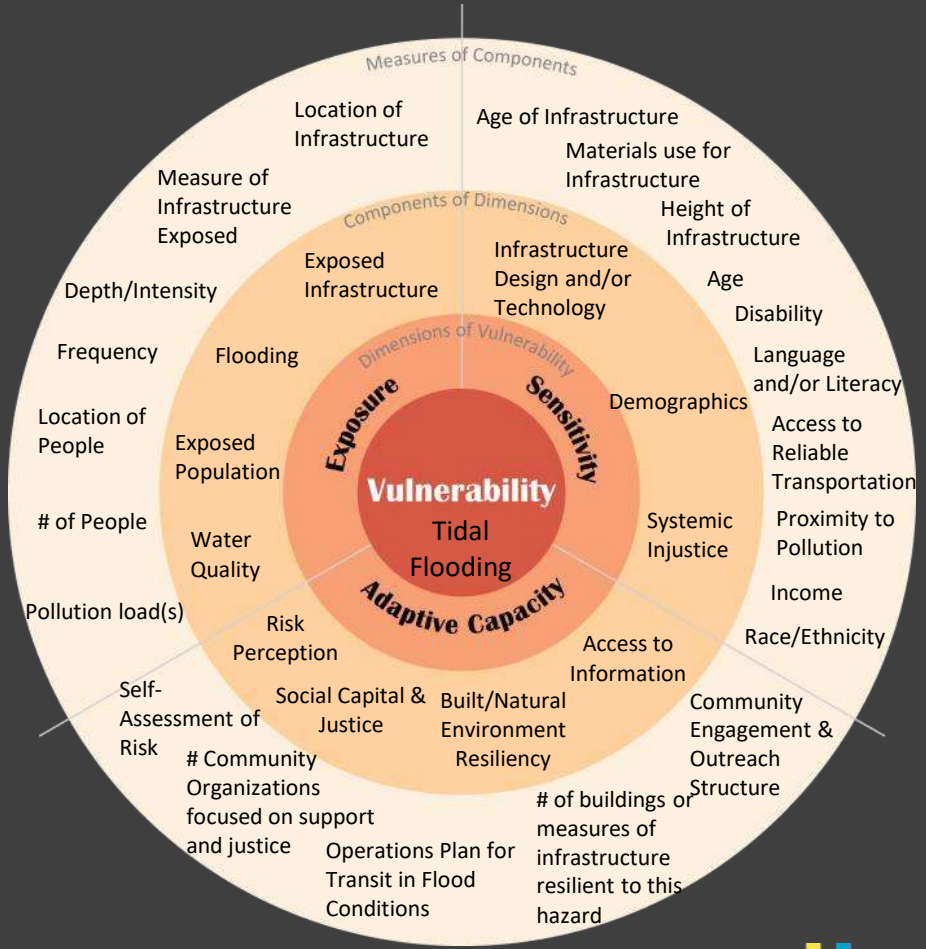
# Key Terms Explained

## Adaptive Capacity

Adaptive Capacity is the degree to which a community could mitigate the potential for harm by taking action to reduce exposure or sensitivity.

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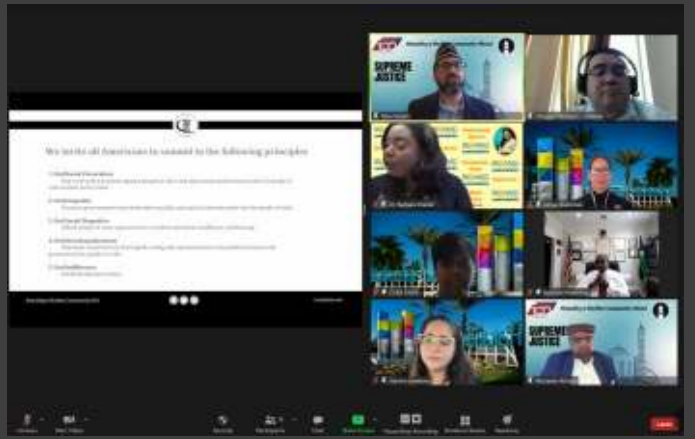
# Adaptive Capacity


| Hazard | Exposure[1] | Risk | | Vulnerability | |
|---|---|---|---|---|---|
| | | Probability | Consequence | Potential Impact | Adaptive Capacity |
| FEMA Flood Zones | Any FEMA flood zone (floodway, and 100-yr and 500-yr) | Levels of flood probability (floodway, 100-yr, 500-yr) | Property value | Criticality of asset based on type and use | Base flood elevation (BFE) |
| Storm Surge | Inundation for Cat 1-5 | Levels of Storm Category (1, 2-3, 4-5). | Property value | Criticality of asset based on type and use | Base flood elevation (BFE) |
| Sea Level Rise (mid/long-term) | Up to NOAA 5 ft SLR | Levels of SLR (2, 4, 5) | Property value | Criticality of asset based on type and use | Base flood elevation (BFE) |

# Key Terms Explained

## Social Vulnerability

- Social Vulnerability is the susceptibility of a given population to harm from exposure to a hazard, directly affecting its ability to prepare for, respond to, and recover.

- Social vulnerability is a function of diverse demographic factors, socio-economic factors, and power structures that influence a community's sensitivity to climate change/hazards.

- Social Vulnerability is often measured as an index (SOVI for example) but data and findings about Social Vulnerability can also be gathered in a qualitative manner.

# Asset Categories

What types of assets should be included in a Vulnerability Assessment?

- Critical Infrastructure
- Hazardous Waste Sites (actively polluting industries, suspected and/or formally designated Brownfields, Superfund Sites, Landfills/Transfer Stations, Hazardous Waste storage locations, etc.)
- Government Operation Facilities/Open Spaces
- People and the things/places they care about

Photo by Sigmund on Unsplash

# Who should be involved in the Process?

- Internal Departments to Engage:
  - Environmental/Resilience
  - Public Works (including key stormwater field staff)
  - Human Services
  - Parks & Open Spaces
  - Development/Planning/Building
  - Attorney/Legal
  - Executive/City Manager
  - Facilities Management
  - Communications
  - Housing
  - IT/GIS
  - Any other staff who are interested to join
- Also, the Public!

# How to Get People Involved

1. Have the City Manager (or equivalent) make attendance mandatory for those important staff members
2. Be mindful of scheduling conflicts i.e. don't kickoff a Vulnerability Assessment at peak budget preparation time
3. Prior to kicking off the Vulnerability Assessment, provide incentivized climate change trainings to staff to pique interest and cover the basics


# What does it look like to engage internally?

- Setting aside time at the beginning to go over key terms, topics, and establish the scope
- **Speaking to how these impacts will impact people's jobs**
- Allowing time for robust discussion that may feel wandering at times
- Lots of clarifying questions and/or questions to keep people engaged
- Unique action recommendations

# Best Practices for Southeast Florida

- **Include all the hazards which may impact your community and don't leave heat out**
- **Look for interactions between those hazards for potential compounding impacts**
- **Utilize the most recent Compact Unified SLR Projections**
- **Also utilize the SLR projections now required by the Always Ready FL Law**
- **Include actions, even just a few, to adapt to the conditions your vulnerability assessment show**
- **For the actions, include basic scope and design cost estimates**

# Include Adaptation Actions

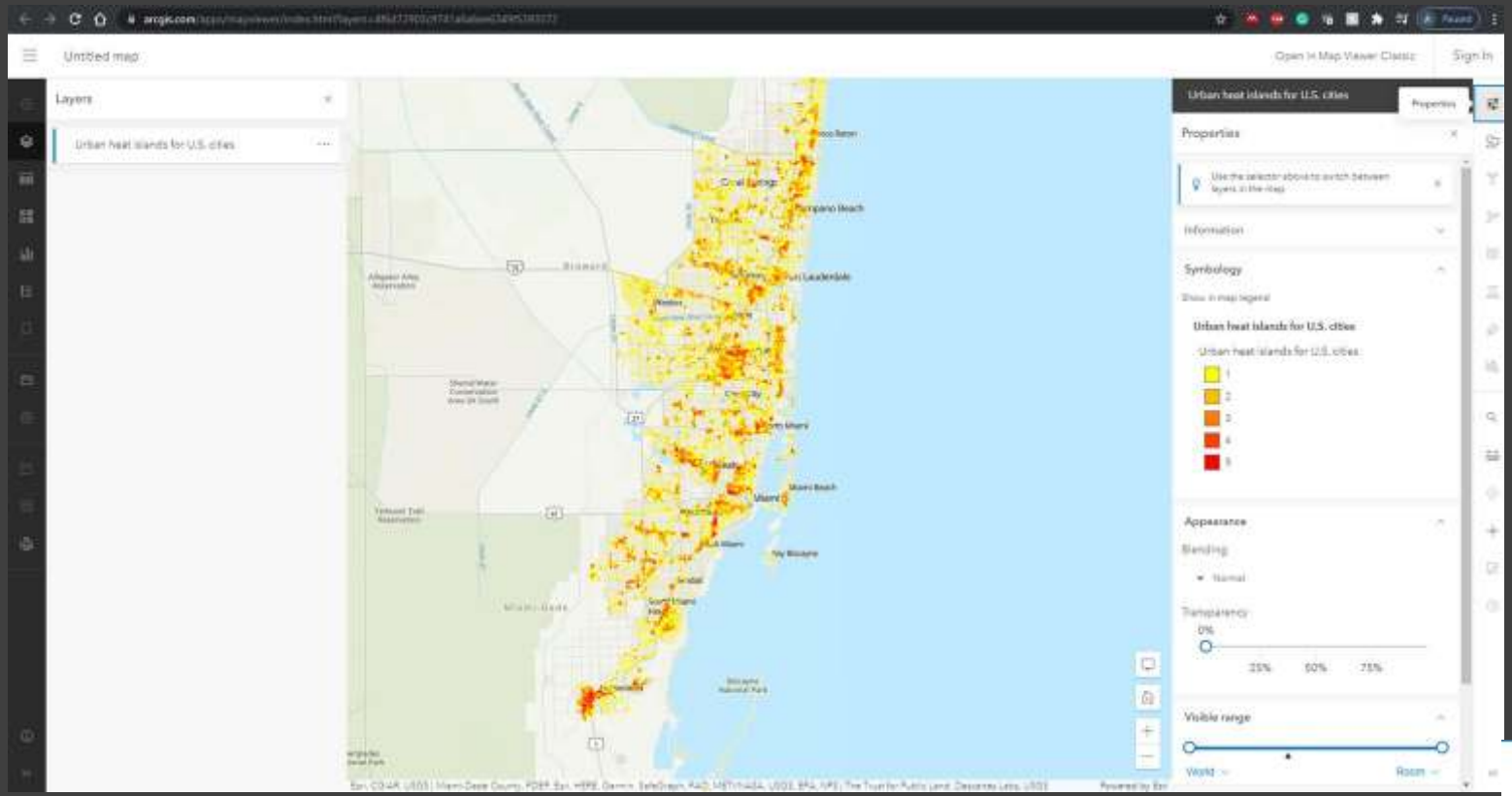
TABLE 3: SHORT TERM ADAPTATION STRATEGIES

| Priority | Strategy | Description |
|---|---|---|
| 1 | Lift station rehabilitation* | Rehabilitate / refurbish one or more lift stations to harden it to flood risks |
| 2 | Flood vulnerability criteria in CIP | Include water level rise vulnerability as an evaluation criterion in Capital Improvement Plan (CIP) and/or budget allocation process |
| 3 | Salt-tolerant landscape code | Change landscape code to require only salt-tolerant native species in high SLR and surge risk areas |
| 4 | Check valves for stormwater outfalls* | Install check valves to prevent backflow in all stormwater outfalls |
| 5 | Resilient beach access* | Pilot a resilient design for beach access points through the dunes |
| 6 | Adaptation action areas | Designate one or more Adaptation Action Areas within the City |
| 7 | Resilience office | Expand the Green Initiatives Coordinator position to a small office of Climate Change, Sustainability, and Resilience |
| 8 | County seawall ordinance | Adopt the Broward county seawall ordinance earlier than within the required two years |
| 9 | City cemetery adaptation* | Suspend ground burial and build a mausoleum to improve flood resilience at the city cemetery |
| 10 | Marina seawall rehabilitation* | Raise the City marina seawall, with the option of a hybrid living shoreline approach with mangroves contained within planter boxes. |
| 11 | Low impact development (LID) at City streets* | Develop a pilot LID project to improve stormwater controls and flood resilience for city streets |

*These strategies were selected for further development and analysis


*Figure 17. | Planting sites in Hallandale Beach that would be inundated if sea level were to rise five feet.*

# 👋Include 👋 heat 👋 as 👋 a 👋 hazard 👋




# Best Practices for Southeast Florida

- **Include social factors in the assessment that contribute to sensitivity such as redlining, LMI populations, energy burden, cost of living burden, languages spoken at home, vehicles per household, age, average year of built housing, tree canopy, etc.**
- **Include an assessment of organizations in the community that may help advance the area's adaptive capacity**
- **Consider all properties, people, and communities. Whatever methodology you're using should not prioritize areas with higher taxable value over those who are most socially vulnerable**
- **Incorporate community feedback via asset-mapping exercises and/or in the prioritization of assets**

## Lessons Learned

- It helps to “warm up” staff to concepts that Vulnerability Assessments require understanding of in the days/weeks/months prior to kicking off a Vulnerability Assessment
- Mandate/Require attendance or incentivize (i.e., provide food) attendance for all necessary staff to show up to meetings
- Don’t rush the process & don’t forget to include people

# Thank you

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Don't forget to include plants in your Adaptation Actions!