STORMWATER RESILIENCY
IN THE BUILT COMMUNITY

Robert Page, PE

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WHAT IS RESILIENCY?

Webster's Dictionary:

- An ability to recover from or adjust easily to adversity or change

Image Source: https://www.ready.gov/floods

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RESILIENCE

A long-term **process** that is a balancing act between risk and resources, that results in the means to be flexibly innovative in **preparing** for, **coping** with, **responding** to, **recovering** from, and **transforming** in anticipation of or in response to events.

- (Comfort et al. 2010)

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WHY?

- Stormwater is a leading and growing cause of water pollution
  - Urban stormwater is a leading source of impairment
    - **22,559 miles** of impaired rivers and streams
    - **701,024 acres** of impaired lakes
  - #1 cause of beach closures and advisory days in 2012

Source: https://www.epa.gov/sites/default/files/2016-11/documents/4-holly_galavotti_0.pdf

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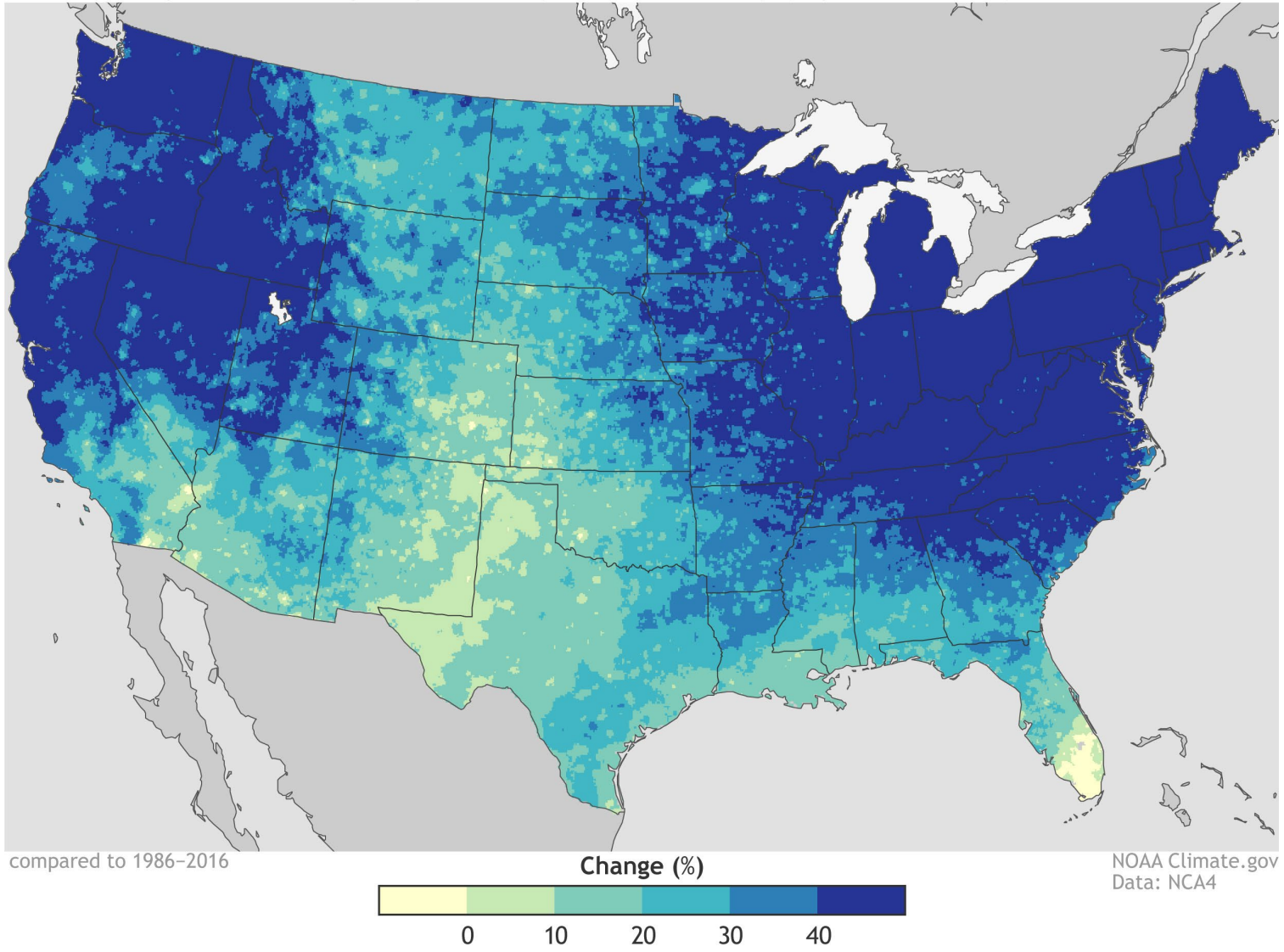
SIGNIFICANT AMOUNT OF UNKNOWNS

Future change in extreme precipitation by late 21st century (higher emissions)



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WHY?

WHAT?

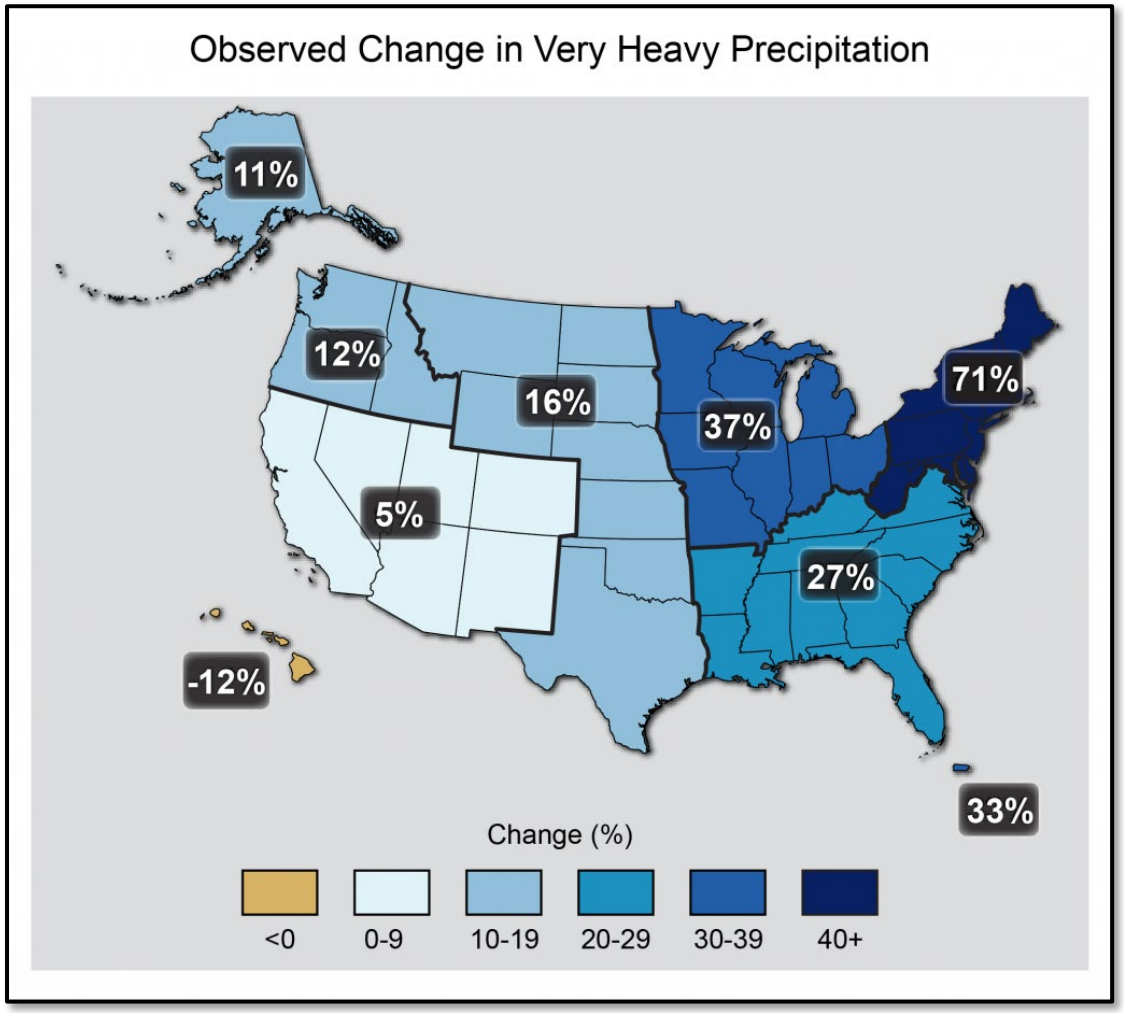

Image Source: https://www.ready.gov/floods

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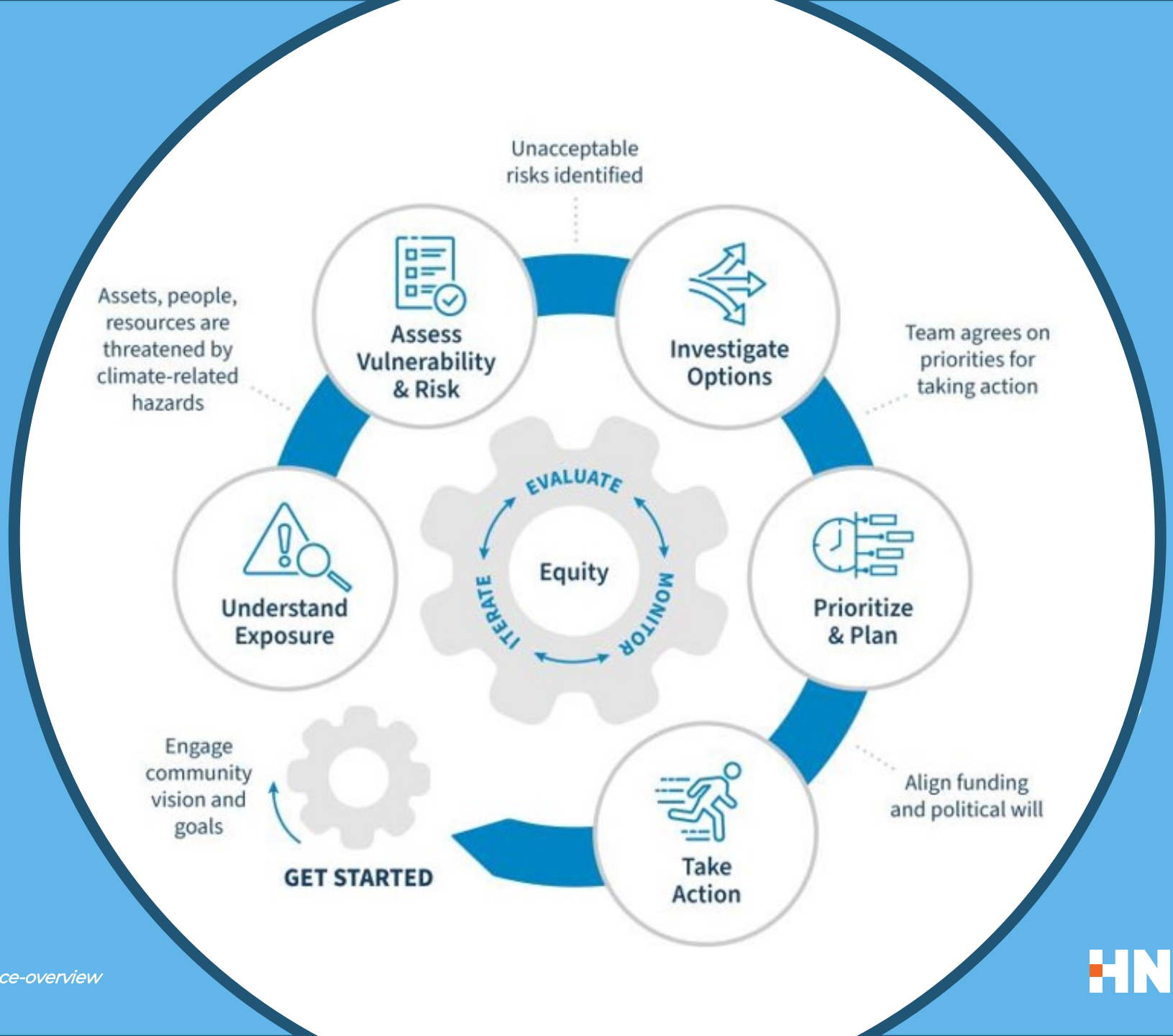
STEPS TO RESILIENCE



https://toolkit.climate.gov/steps-to-resilience/steps-resilience-overview

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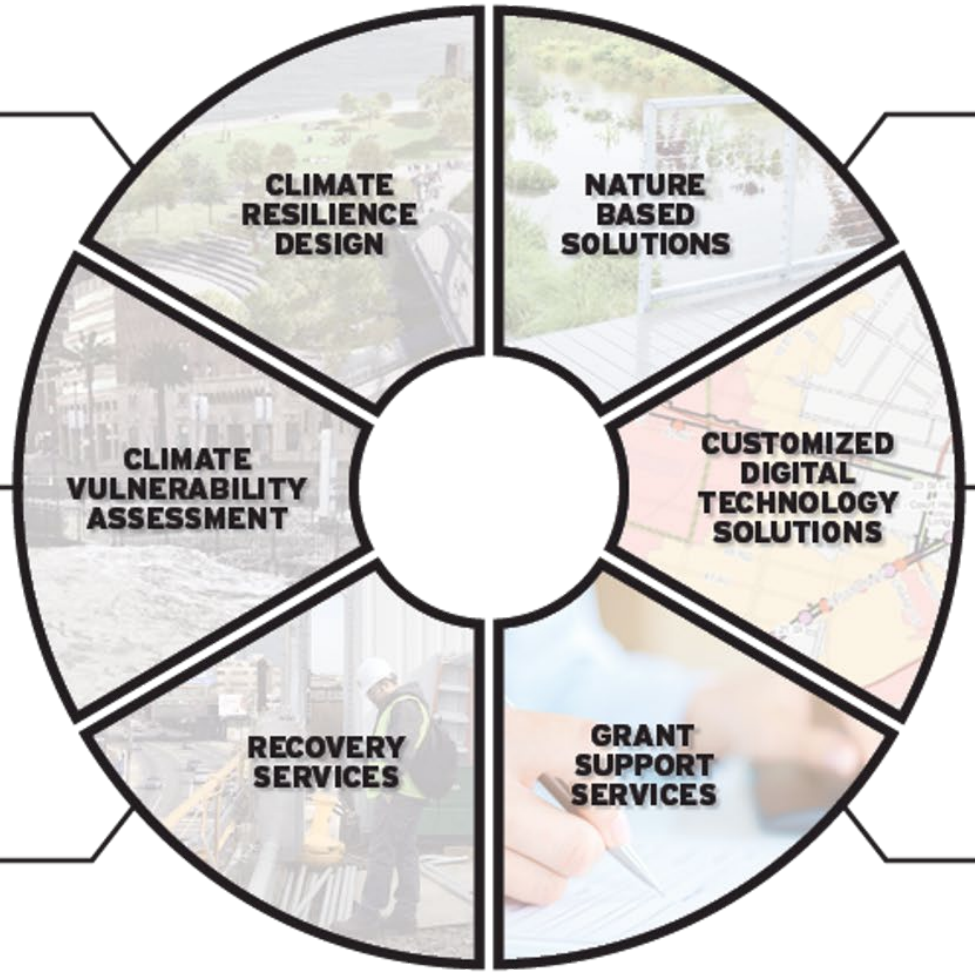

Designing and implementing transportation infrastructure that can withstand and adapt to the impacts of climate change.

Incorporating climate projections into design, using adaptive design, enhancing resilience through maintenance and operations and applying nature-based solutions.

The use of natural systems, processes and materials to address challenges related to transportation infrastructure and mobility.

Green infrastructure, sustainable transportation modes (walking, bicycle, public transit) and ecosystem-based planning.

The process of identifying and analyzing the potential risks and impacts of climate change on transportation infrastructure and services.

Identifying vulnerabilities, collecting climate data and projections, assessing risk and consequences, developing adaptation strategies and prioritizing actions.

Software that provides data-driven insights and decision-making capabilities to improve the planning, design, construction and maintenance of transportation infrastructure.

Geographic information systems (GIS), building information modeling (BIM), asset management systems, predictive analytics and mobile applications.

The process following extreme weather events and climate-related disaters to restore communities and transportation infrastructure.

Damage assessments, emergency repairs, recovery planning, temporary transportation solutions, long-term recovery, and risk reduction measures.

Assistance provided to transportation agencies, organizations and communities to secure grants for projects related to climate resilience and adaptation.

Grant identification and research, grant application and development, grant management and reporting, capacity building and training, and stakeholder engagement.

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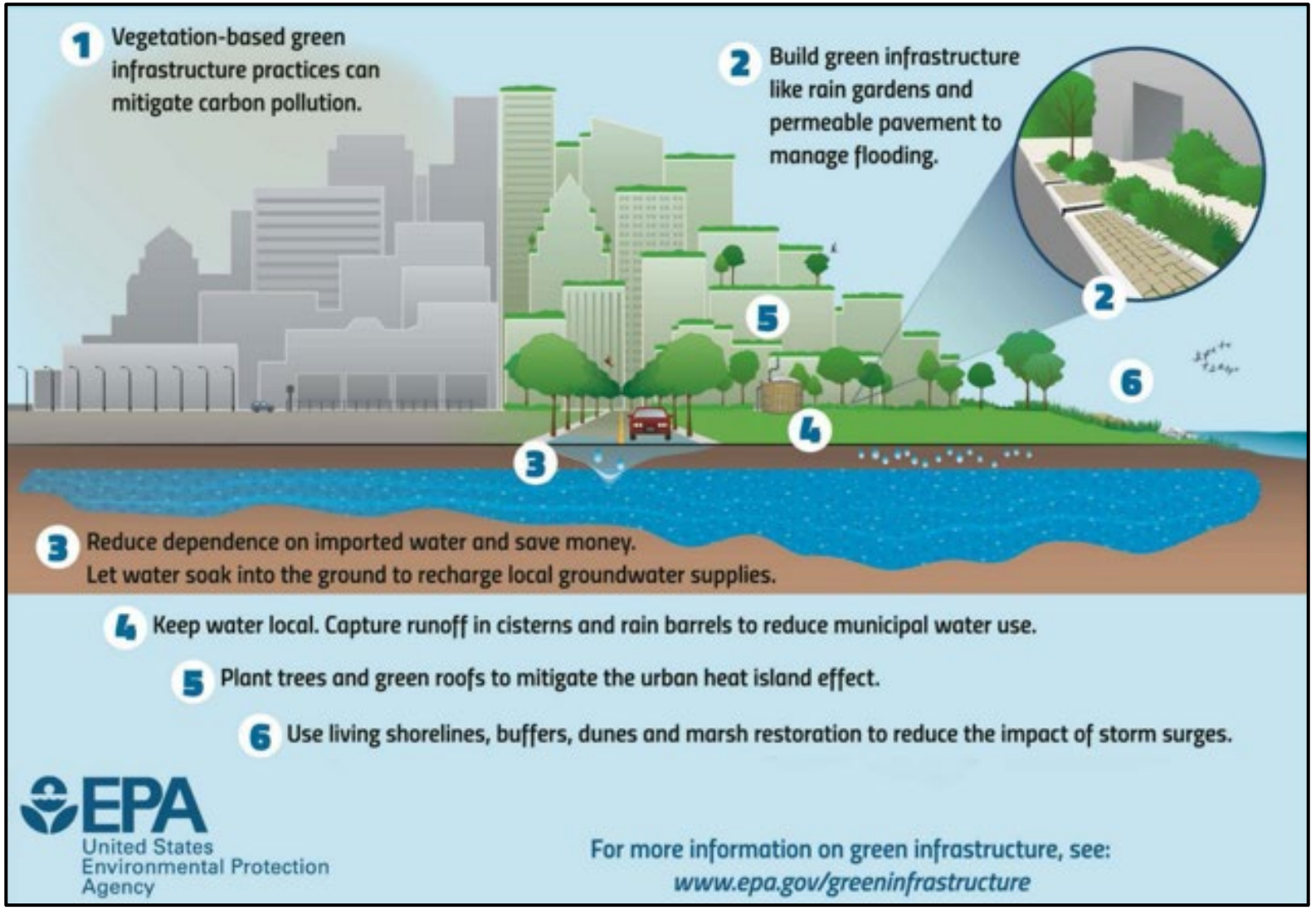
CLIMATE IMPACTS ON WATER RESOURCES

GREEN INFRASTRUCTURE BUILDS RESILIENCY



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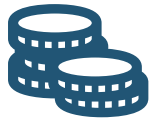
BARRIERS

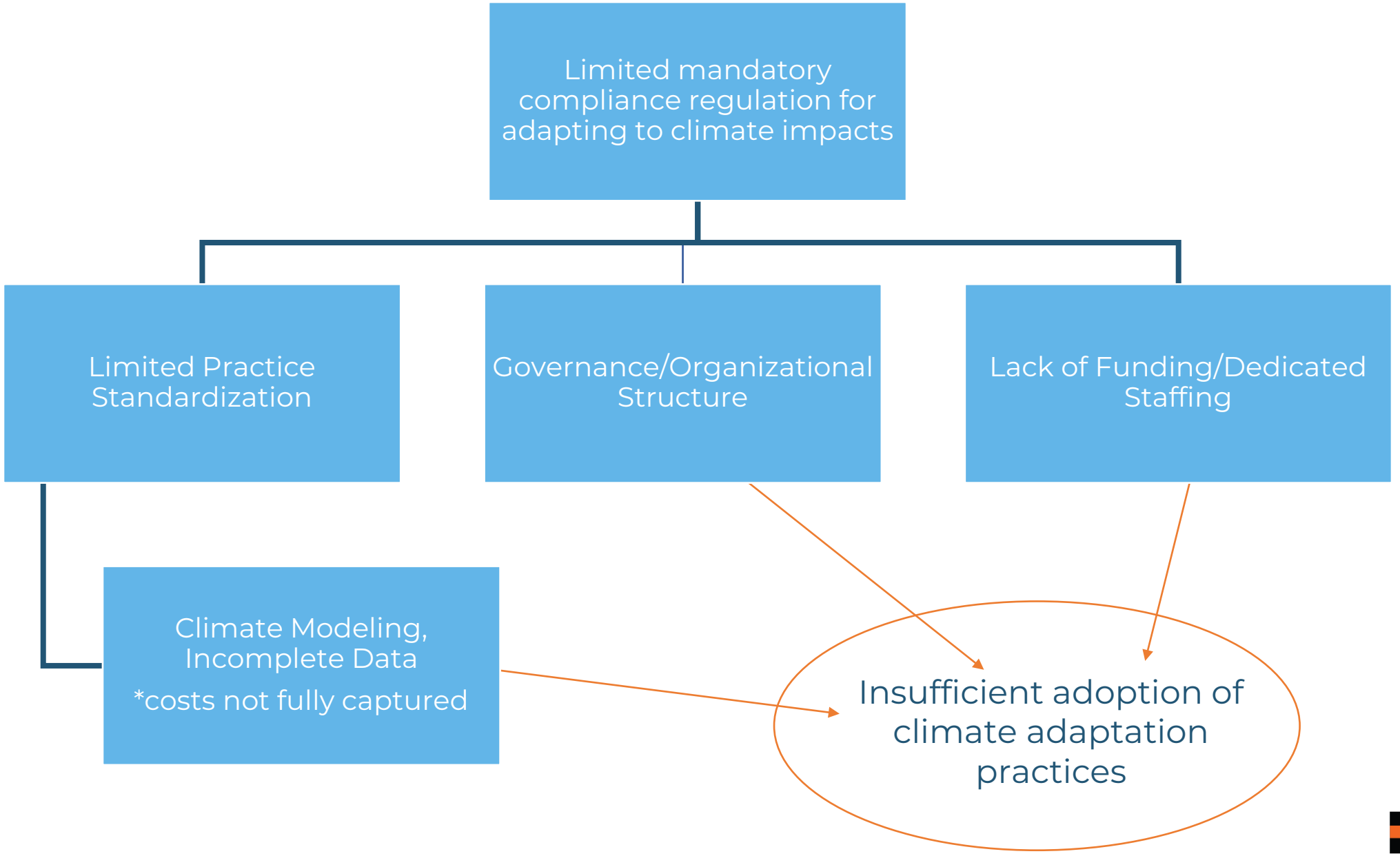
Policy



Funding

Regulatory

Standardization


Limited mandatory compliance regulation for adapting to climate impacts
Limited Practice Standardization
Governance/Organizational Structure
Lack of Funding/Dedicated Staffing
Climate Modeling, Incomplete Data
*costs not fully captured
Insufficient adoption of climate adaptation practices

WE WANT TO PRACTICE CLIMATE RESILIENCE BUT DON'T KNOW HOW……

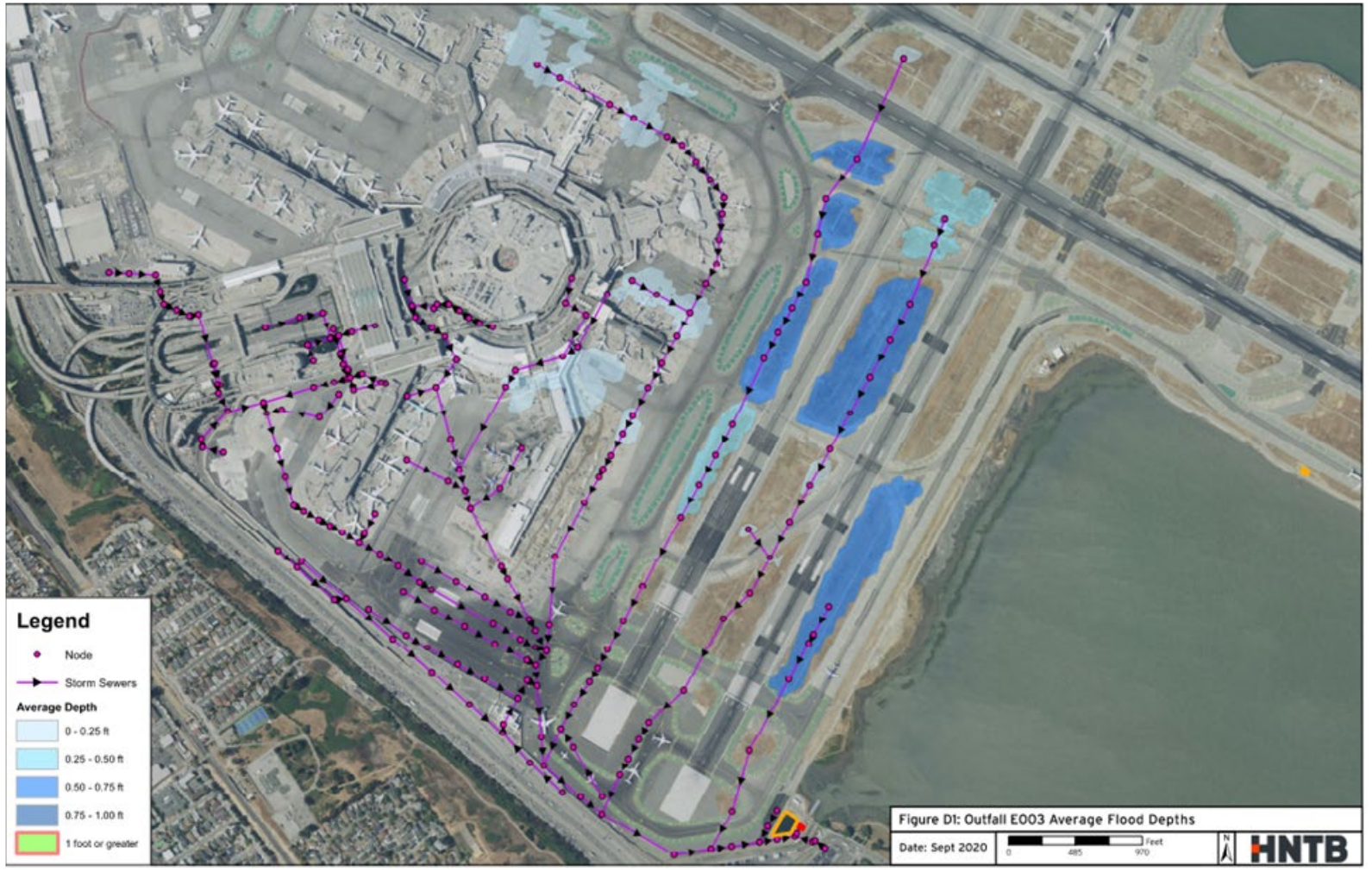
- Limited regulation
- Limited funding
- Added cost to implement resilience
- Uncertainty
- Data Availability/Source Reliability/Conflict
- Carrot & Stick issue
- Limited standardization, performance metrics
- Governance/Organizational structure
- Transformation
- Scale
- Agency Silos
- Transition from planning to implementation

HOW TO ESTIMATE?

- Options
  - Historic Events
  - Theoretical Events

MODELING

- Historic Events
- Theoretical Events



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MODELING

- Can be easy to modify
- Use to predict impacts

MODELING

- Not only for existing infrastructure
- Various scenarios

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Verify Planning Scenarios

- Models developed years ago
- Verification of plans

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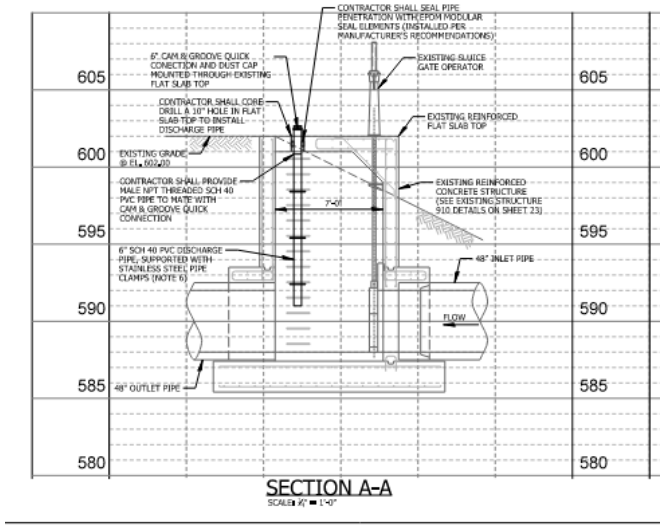
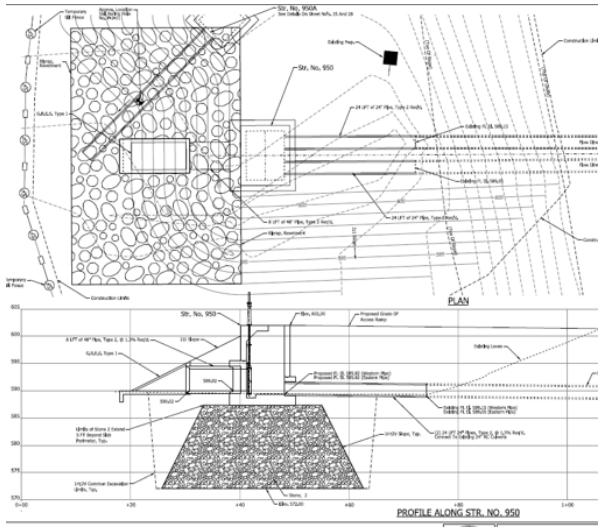
PLAN FOR FUTURE

- Extreme event protection





WHAT TO DO?

- Define boundaries
- Assess and reduce risk
- Plan for and practice responding to emergencies
- Monitor systems

WHAT TO DO?

- Ensure flexibility in infrastructure
- Don’t handcuff ourselves with designs
- Expect the unexpected

Robert Page
Email: rtpage@hntb.com
Phone: 317-917-5307