



# A Threshold Approach to Climate Change Vulnerability Assessment

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EPA State and Local Adaptation Webinar Series:  
Overcoming the Uncertainty Barrier to Adaptation

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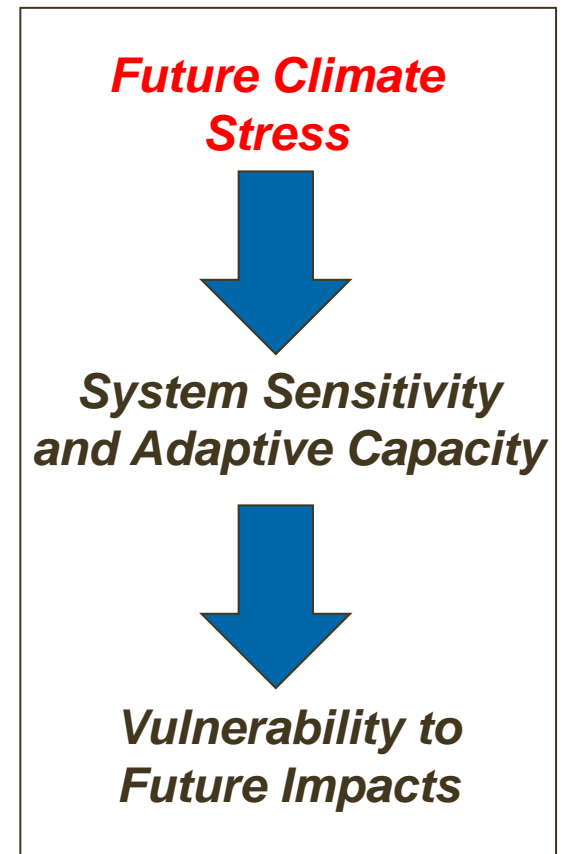
# In the face of uncertainty...what to do...and what NOT to do?



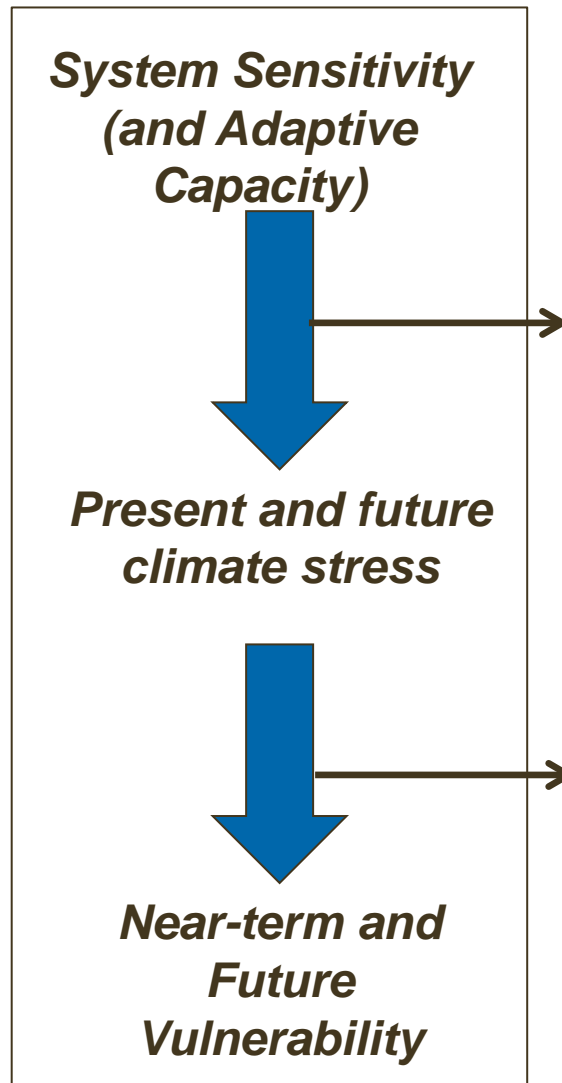
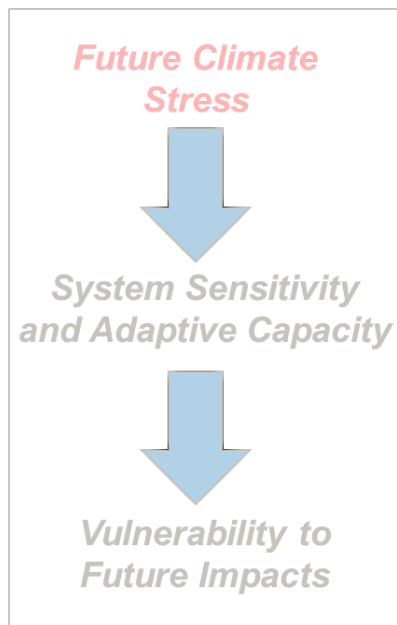
- The sky is NOT falling. We are not all doomed.
- However, the risks are real and cannot be ignored
- **Careful and strategic planning combined with medium and longer-term monitoring and recalibration can lead to more prepared and resilient communities**

# The challenge of adaptation at local scales

- Many impacts assessments “begin” with model-generated projections of future climate conditions
- Projections of **future climate stress** are not “decision-ready,” especially at the local scale
  - Available at coarse geographic scales and can require technical knowledge to interpret
  - Provided on time horizons that do not match the timeframes for planning
  - Described by variables that are often unrelated to the decision-making process
  - Rarely address issues related to current climate variability



# Instead of starting with climate, consider thresholds of sensitivity, then add climate



- Analysis of *current* sensitivity/*current* climate stress eliminates a major source of uncertainty
- Decision makers/stakeholders are familiar with and buy into the results
- Level of effort necessary for model projections is constrained

- Threshold/frequency analysis provides direct estimate of the cost of inaction, highlighting near-term adaptation opportunities
- Cannot overstate the value of advancing the discourse, esp. w/in organizations

# Case Study: Regional Transit Provider

- Southeastern Pennsylvania Transportation Authority (SEPTA)
- Projected supported by a grant from the Federal Transit Administration (US DOT)
- Focus on single regional rail line
- Start with historical disruption data to identify weather/climate-related sensitivities



# Observed weather impacts on transit

## Extreme heat events

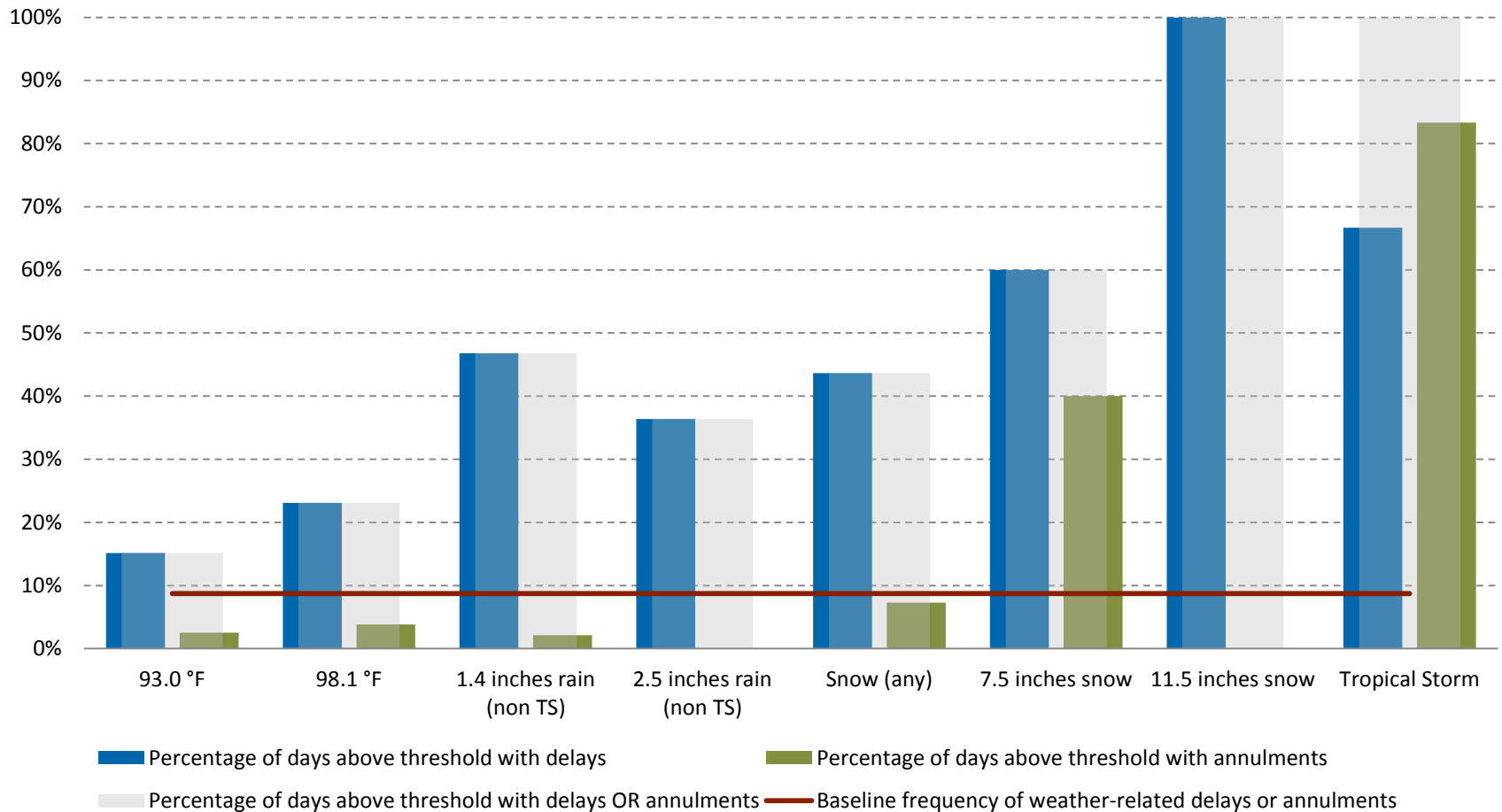
- Supporting equipment (e.g., electrical systems, air conditioning) failures
- Vehicle breakdown
- Catenary sagging
- Acceleration of pavement degradation
- Rail buckling
- Reduction in construction speed

## Heavy rain events / Flooding

- Slowing of bus service due to re-routing
- Flooding of bus or rail right-of-ways
- Flooding of underground tunnels and track
- Flooding of underground equipment rooms
- Disruptions in underground electrical systems due to flooding
- Flooding of track beds

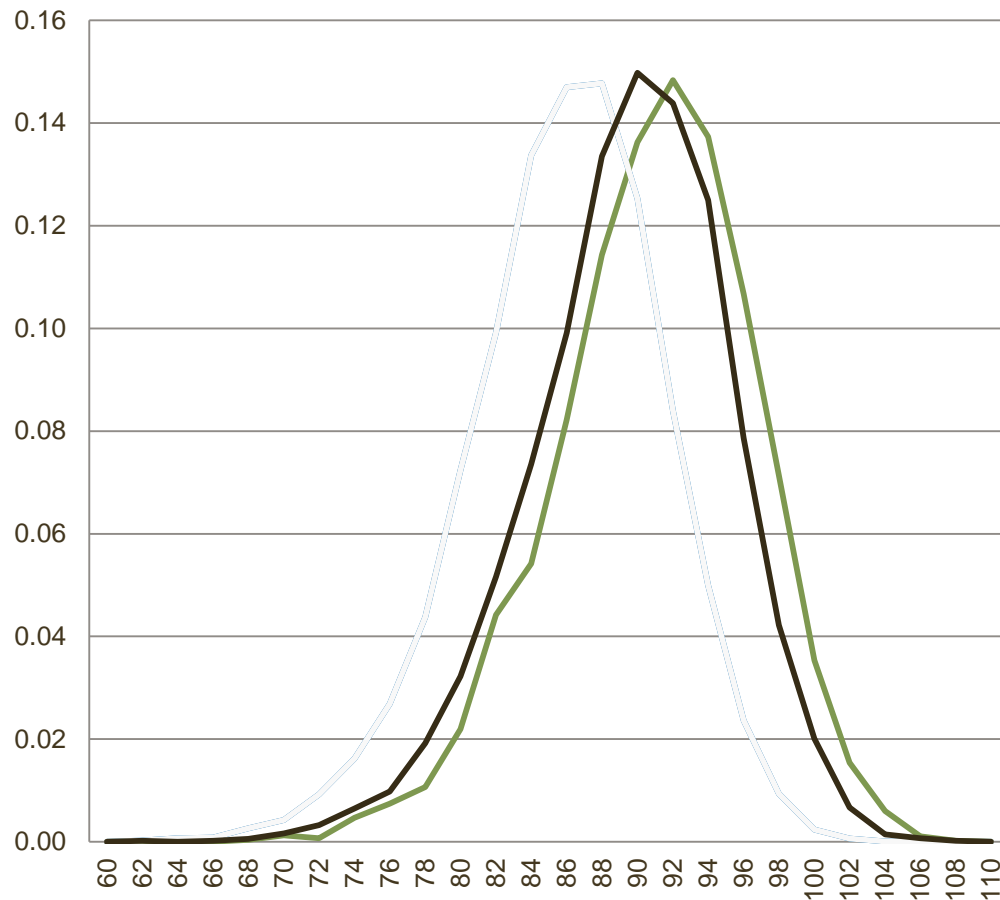
***Snow and wind impacts as well***

# Characterizing sensitivity using delay minutes and weather thresholds



# Applying climate projections to threshold information

## Summer Tmax distribution



**CGCM example results**  
5-percentile (1-percentile) event occurs 2.6 (4.6) times more frequently by mid century under B1 scenario

For A2 scenario, the ratio jumps to 3.0 (6.3).

- Summer tmax cccma\_cgcm3\_sresa2 (1961-2000)
- Summer tmax cccma\_cgcm3\_sresa2 (2046-2065)
- Summer tmax cccma\_cgcm3\_sresb1 (2046-2065)



# Connecting findings to adaptation strategies

## Advantages

- Thresholds enabled a focused analysis of climate data, saving time and resources
- Impacts that have been characterized offer near-term opportunities for adaptation, along with some assessment of the consequences of inaction
- Impact “narrative” has been extremely useful in engaging internal stakeholders. These stakeholders will likely be responsible for adaptation initiatives

## Limitations

- Ignores “novel” impacts, especially those that might be catastrophic
- Not well suited for transformative action
- Inward focused, not integrative across sectors

# Acknowledgments

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