

# Building Transdisciplinary Teams and Infrastructure

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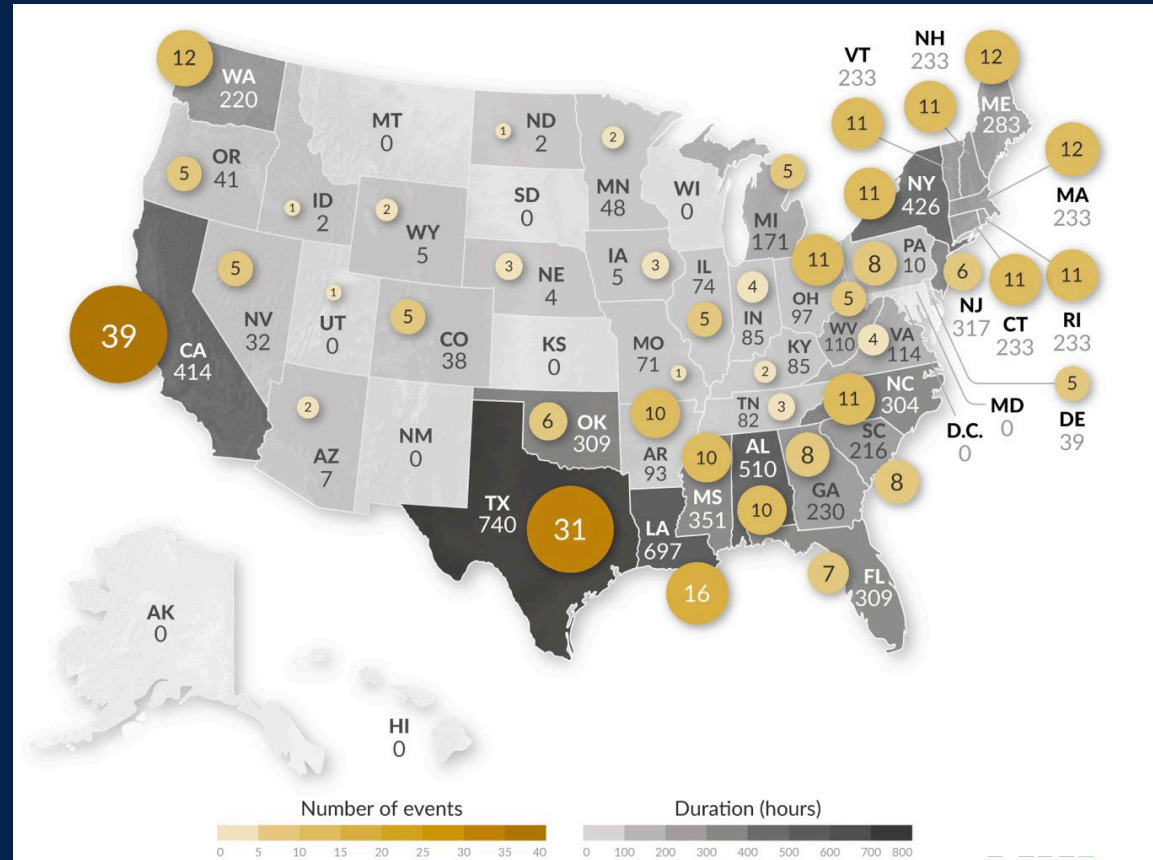


# Outline

- First, some commentary on electrification, decarbonization, and keeping the lights on
- Second, thoughts on helping interdisciplinary teams be successful



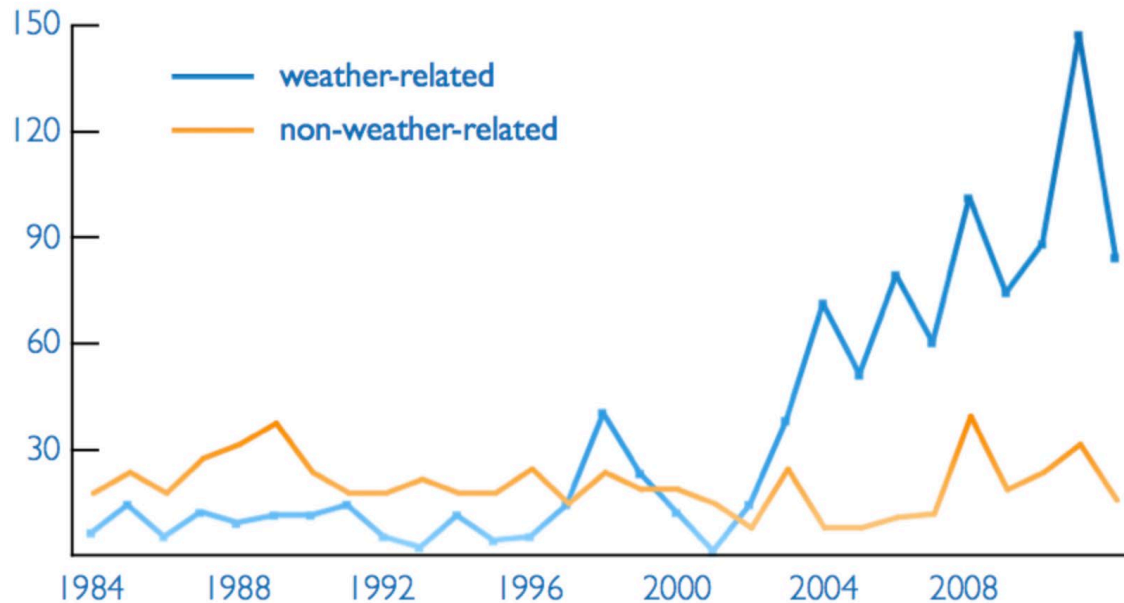
# Reported Outages in 2020



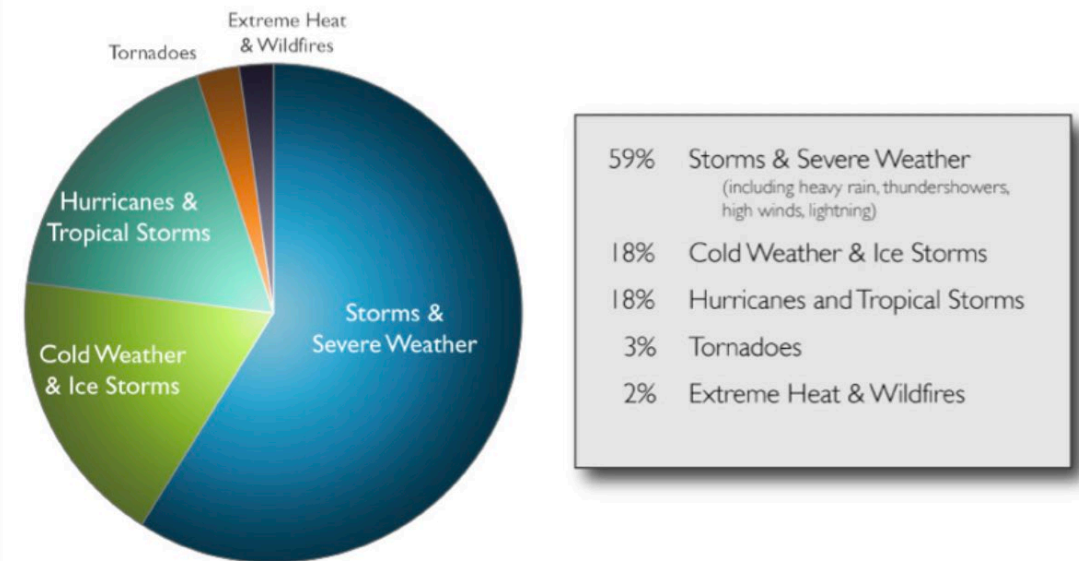
From <https://www.fixr.com/blog/2021/03/10/u-s-power-outages-2020-map-and-solutions-for-homeowners/>  
Based on US EIA 2020 Filings

# Weather is the Dominant Driver of Outages

Weather-Related Power Outages Increased Dramatically in the 2000s



General Storms Caused Nearly 60% of All Weather-Related Outages Between 2003-2012



Source: Climate Central

# How Much Do Outages Cost?

- DOE estimates power outages cost the US economy \$150 billion per year
- Some estimates places outage costs for large manufacturers at \$5 million or more per hour
- One study (Ponemon Institute, 2016) suggested the average cost of an outage to a data center was approximately \$740,000
- Outage costs are very much facility-specific though!



# Electrification & Decarb – Must remember reliability and resilience!

- Power outages are already frequent, disruptive, expensive, and deadly
- As we electrify we increase the impact of outages through increased dependence on electric power
- If we are not careful in *how* we decarbonize we may increase the likelihood and duration of outages, particularly in a climate with intensified and/or more frequent weather events



# Thoughts on Helping an Interdisciplinary Team Succeed



# Story #1

- Hazard-SEES funded project focused on understanding and modeling how repeated hazards change the evolution of a communities and its vulnerability to natural hazards
- Involved 6 research organizations and the following disciplines: engineering (CEE, OR), economics, risk analysis, landscape arch, public health, public policy, behavioral science, climate science, geography, hydrodynamics
- Resulted in publications spanning a range of journals, from coastal engineering to *Nature Sust* to economics journals to OR journals





# Story #2

- Co-led (with Lori Peek), a series of two workshops focused on methods for interdisciplinary hazards research at the request of NSF (HDBE-funded)
- Involved approximately 40 individuals from a range of disciplines – engineering, sociology, geography, public health, climate science, public policy, coastal science, risk analysis, and many more
- Resulted in a special issue of 25 papers in *Risk Analysis* that focused on methodological issues involved in developing and conducting interdisciplinary research



# Some Overarching Keys to Success

- Success in a transdisciplinary team is not about the model or the infrastructure, it is about the people and getting them truly collaborating and working together, driven by commonly-shared research questions and hypotheses
- Language and terminology matter. You won't all agree, but you need to understand each other
- The team needs something – and **integrating boundary object** – to come together around to foster the conversation and research
- A team never has “the answer” – this is a circular, repetitive process of learning and gaining understanding
- Behavior matters in almost every system – and you need strong behavioral scientists to help the team understand it
- Have a real project management plan, not just what you put in the proposal



# Boundary Object

- A boundary object is a “core tool (or “shared space”) that individual researchers can recognize in their own contexts, but is structured enough so that concepts can transcend the disciplines” (quote from Reilly et al. 2018, see also Starr 2010, Star & Griesemer, 1989; Wenger, 1998)
- The goal is to facilitate communication and a shared understanding that disciplines can come together around and to foster iterative, interactive research among the team members
- Examples: ABMs, SD models, GIS, stochastic simulation models, etc.



# Some Suggested Necessary Conditions for a Boundary Object (Reilly et al. 2018)

1. The boundary object must be flexible but grounded in theory
2. The boundary object must allow for inclusion of stochasticity and relevant antecedent events
3. The boundary object must allow for both qualitative and quantitative information
4. The boundary object must allow for temporal dynamics



# Closing Thoughts

- The people, the people, it's about the people
  - The team doing the research
  - The people operating the system(s) of interest
  - The people using the system(s) of interest
  - Any stakeholder with an interest in the outcome
- An integrating boundary object can help foster clear communication and effective research in an interdisciplinary team, but only if used properly. **It's not about the model!** The model is a tool.



# Questions?