EXAMINING INFRASTRUCTURE VULNERABILITY TO WEATHER AND CLIMATE EXTREMES AND ASSESSING RESILIENCE OPTIONS

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Section 4 Symposium
Resilient or Fragile?

Prioritization Frameworks

Fragile < 0
Resilient > 0

Exposure + Sensitivity + Adaptive Capacity

= Fragile < 0

= Resilient > 0

Interdependence

Adaptive Capacity
Climate Risk is a Financial Risk

U.S. 2020 Billion-Dollar Weather and Climate Disasters

This map denotes the approximate location for each of the 22 separate billion-dollar weather and climate disasters that impacted the United States during 2020.
Impact of repeated flooding

One rare event might grab headlines but repeated exposure to “sunny day” floods has a greater cumulative cost

Ageing Infrastructure

- **US infrastructure deficiencies:**
  - 3,571 total power outages in 1 year
  - 6 billion gallons of water lost daily
  - 49% of inland vessels delayed within US waterways
  - Billions of hours of traffic delays

- **Grade C- doesn’t address:**
  - Climate change
  - Population growth
  - Urban development

Implementing the Infrastructure Bill is our chance to address all of these issues!
What is Graceful Failure?

Failure isn’t IF but WHEN and HOW BADLY

- Incorporates redundancy
- Continue operations at reduced level
- Quicker recovery
- Allows for uncertainty
- Failure at ACCEPTABLE risk levels
Risk Informed Design
Balancing the Economic-Social-Environmental Triangle

- Communication:
  - Risk
  - Uncertainty
  - Failure
- Longevity of infrastructure
- Scale Issues and Scientific Uncertainty
- Reframe the adaptation message

Balancing public safety, economics, changing extremes and scientific uncertainty requires broader collaborations
Forthcoming ASCE Report and Webinars

Book Release October 2021
from https://www.asce.org/publications-and-news

Webinars (all at 2pm ET):
9/7 What does Climate Change have to do with Engineering and Design?
9/14 Extreme Events and Systems Thinking
9/21 Application of Climate Change Adaptation Prioritization Framework(s)
Take Home Messages

- Fragility = Exposure + Sensitivity + Interdependency + Low Adaptability
- Increasingly Fragile and Interdependent Systems
- Failure isn’t IF but WHEN and HOW BADLY
- Engineers challenged to accept failure
- Nature based solutions have multiple benefits
- Implementing the Infrastructure Bill is chance to achieve mitigation AND adaptation in one hit
Committee on Adaptation to a Changing Climate

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