

RESILIENT AND SUSTAINABLE INFRASTRUCTURE

Organizers: Seth Guikema, Johns Hopkins University, and Patrick O'Mara, STV

America's infrastructure, consisting of highways, bridges, mass transit, fresh water supply, wastewater treatment, telecommunication, energy, dams, and schools to name a few, are often taken for granted, and overlooked, until something is wrong. The importance of these "invisible systems" becomes quite apparent when they are not working, especially when:

- Power outages darkened an entire region (2003 Northeast US Blackout)
- Communication lines are disrupted and prevent email, cell phone, or telephone transmissions
- Interstate highway bridges collapse and minimize transportation access (2007 Minnesota's I-35W)
- Aging power supplies systems fail and disrupt transportation and energy availability (2007 NYC steam pipe explosion), or
- Levees collapse and flood entire neighborhoods/communities (2005 New Orleans, Hurricane Katrina).

Potentially increasing susceptibility to failures and compounding recovery efforts is the interconnectedness between individual infrastructure systems. For example, an earthquake may damage buildings, bridges, or roadways, which may hamper emergency access to fires caused by ruptured gas lines that cannot be extinguished due to downed transmission lines that provide power to the local water pump station.

The multiple natural and man-made disasters that have occurred within the last decade highlight the vulnerability of our nation's interdependent infrastructure system. This technical session will focus on research efforts to increase the long-term resiliency and sustainability of our infrastructure systems that we so often take for granted, but are critical for our society to function. This research includes examining solutions to increase infrastructure resiliency to withstand natural disasters and/or return to full operations soon after catastrophes occur. Similarly, techniques to create a more sustainable infrastructure through reduced energy requirements, use of recycled materials, and/or better decision-making via life-cycle assessments are being studied.

This first presentation of this session will examine the state of our nation's infrastructure, as outlined in the American Society of Civil Engineer's Infrastructure Report Card, highlight possible causes of infrastructure deterioration, and propose possible solutions. The second presentation focuses on research efforts to assess the vulnerability of urban infrastructure systems when threatened by natural disasters, so as to maximize preparation efforts and properly allocate resources.

The final presentation will focus on environmental life-cycle assessment modeling of infrastructure systems, focusing on the environmental and energy use implications of different design and material choices.