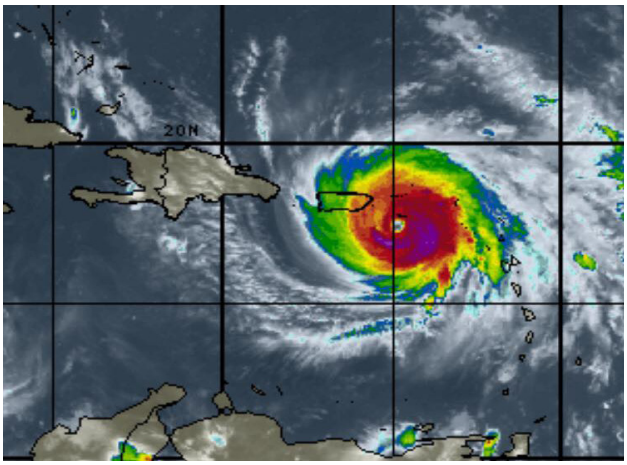
Urban Resilience to Extreme Weather-Related Events Sustainability Research Network (UREx SRN)

Building Resilient Infrastructure to Extreme Weather Events

What is Resilience?

Resilience is commonly defined as the ability—for people, communities, or other systems—to "bounce back", recover, and emerge stronger from a disturbance. In many cases, the common response to build stronger is to focus on robustness by relying primarily on hard, technological solutions alone, such as building flood walls. Approaches to control, resist, and armor against unwanted climate outcomes through technological solutions are proving inadequate to prepare for the increasingly variable, dynamic, and uncertain climate conditions we are now expecting and are resulting in catastrophic failures (e.g., levees failing in New Orleans, destruction of Puerto Rico's electric grid system). In other words, we cannot build back, we must **build for the future.**



Building resilient infrastructure cannot be achieved solely through technological solutions. Instead, infrastructure should be viewed from a social-ecological-technical systems (SETS) perspective in which parts cannot be considered in isolation since they interact to form the whole. In SETS, social dimensions include institutions (both formal and informal), decision-making processes (governance), and outcomes (ways that people are affected by the interactions within a SETS). Ecological dimensions are the natural structures and processes of the non-human system that provide key services (for example, food production, heat mitigation, and flood control). Technological dimensions include the built infrastructure components and processes of the system (for example, the system of roads or public transportation networks, the buildings, and the knowledge embodied in technology).

Resilience as a Design Principle to Build and Transform Infrastructure

A SETS approach to building resilience involves the following design elements,

- *Safe failure*: Allowing for managed failure in one part of the system can avoid cascading failures of other related elements or connected systems.
- *Flexible infrastructure*: Flexibility for the system so that it meets service needs under a wide range of climate conditions, is a precondition for resilience.
- *Proactive maintenance*: Prioritize rehabilitation or upgrading of existing infrastructure.
- *Redesign institutions*: Design more effective institutions to manage complex problems, learn from failures, adapt, and transform.
- *Design for climate*: Design for future conditions, not past climate and weather.
- *Interdependent infrastructure*: Understand that ecological, technological, and human systems interact in increasingly complex ways.
- *Infrastructure for everyone*: We must engage diverse communities and ensure that infrastructure are designed for everyone. We need to ask - resilience for whom?

UREx SRN's Mission

Our mission is to link scholars with city and community practitioners to produce resilient infrastructure data, models, images, maps, stories, and on-the-ground projects in 10 cities, to accelerate innovative urban sustainability knowledge and application.

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