

# Global Resilience Institute's Island Resilience Initiative Overview

Global Resilience Institute  
at Northeastern University

In April 2018, Northeastern University's Global Resilience Institute joined with the Fraunhofer Ernst-Mach-Institut (EMI) in launching the Global Resilience Research Network (GRRN). The following year, this world-wide multidisciplinary community of resilience institutes and universities committed to undertaking an Island Resilience Initiative, with the participants committing themselves to engaging in inter-island research collaborations for developing and sharing best resilience practices. The urgent need for undertaking this effort was highlighted by the devastation wrought to several Caribbean islands in 2017 by Hurricanes Irma and Maria as well as the existential threat that rising sea level presents to the low-lying islands especially in the Asia Pacific region. At the heart of the Island Resilience Initiative is a recognition that institutions of higher education can and must serve as agents of change. They can best accomplish this by working collaboratively on applied research challenges as well as developing and providing the education and training to enable societies to build greater resilience.

As of October 2019, the cohort of island-based research institutions organized under the umbrella of GRRN is comprised of the University of the West Indies, University of Aruba, University of the Bahamas, the Fundación Nunez Jimenez, the University of Puerto Rico, the Autonomous University of the Yucatan the Sustainability and Resilience Institute at the University of Hawaii - Manoa and the Global Resilience Institute at Northeastern University. This cohort has joined together to directly support the U.S.-Caribbean Resilience Partnership, an initiative launched by the United States and 18 Caribbean island nations on April 2019 "to build a strong foundation of partnership and collaboration around disaster risk reduction and response."

The GRRN Island Resilience Initiative creates a network that supports interdisciplinary resilience research across multiple national jurisdictions by facilitating knowledge sharing and capacity building among small island nations facing similar vulnerabilities and management challenges. The initiative takes a bottom-up, 'system-of-systems' approach that recognizes the interdependencies of the built and natural environment and capabilities within civil society. It is animated by a recognition that proposed solutions that focus exclusively on technological and engineering innovation will prove to be insufficient if they do not also address the social structures and governance systems, tailored to local circumstances. Hyperconnected systems, governance, and social and cultural capital must be considered in an integrated way in order to inform resilience policy and accelerate the transformative action urgently required in the context of global climate change, major disasters, and disruptive events.

In the past year, researchers at Northeastern University and the University of Puerto Rico began conducting a study assessing systems resilience by mapping food, energy, and water systems in Puerto Rico. The study will compare two different system of system models informed by interdisciplinary data collection methods including interviews, focus groups, energy technology assessments, and spatial mapping. Hurricane Maria devastated Puerto Rico's energy infrastructure which led to the destabilization of food, water, communications, and health sectors. Characterized by their geographical isolation, post-disaster recovery has proven to be particularly challenging in Puerto Rico. The hurricane resulted in wide-scale loss of access to potable water. Thousands of acres of farmland were washed away by the hurricane's rainfall which amplified food shortages and disruptions in delivery supply.

In another example of interdisciplinary research collaboration focused on critical infrastructure resilience for islands, GRRN researchers are conducting assessments of damaged infrastructure using unmanned aerial vehicles. This research will improve the efficiency, fidelity, and safety of current critical infrastructure inspection methods by using machine intelligence to document damage after extreme events. Building on prior work of the investigators related to automated inspection strategies of intact structures, this research will provide new capabilities for automated damage assessment that can become key to documenting a damaged environment to facilitate a quick return to full functionality.

Aerial robots, coupled with three-dimensional imaging and the state-of-the-art in planning, modeling, and analysis, will provide safe and efficient, high-precision assessment of damaged structures. This work has the potential to be highly impactful but requires significant on-site deployment and field testing in areas with damaged infrastructure.

The institutions of higher education who have agreed to participate in the Island Resilience Initiative have an array of research facilities that can serve as resources for fellow network partners. The shared goal is to foster research collaborations as well as training opportunities and knowledge sharing. The University of the Bahamas unveiled the Small Island Sustainability Complex in October of 2018 on their Nassau campus. The labs house fundamental research in Biology, GIS and informatics, Water Sciences, and Chemical and Environmental Analysis. The University of West Indies' Mona Campus in Jamaica is home to the Global Tourism Resilience and Crisis Management Centre, launched in January 2019. The University of Aruba is supporting the development of resilience in small island states to include educating the workforce through its Sustainable Island Solutions through Science, Technology, Engineering and Mathematics. In Cuba, at the Fundación Antonio Nunez Jimenez, teams of scientific researchers work on applied infrastructure projects and efforts in community education. In Mexico, at the Autonomous University of the Yucatan in the School of Anthropological Sciences, social scientists are working with community organizations to conduct surveys of the impacts of climate change at an individual level. This data is being used to create a platform to empower communities in rural areas of the Yucatan Peninsula to monitor and report issues around land tenure, agriculture, land use, and potable water resources.

Lessons from one island can be transferred globally to partners facing related barriers to action elsewhere. In the Pacific region as well as in the Caribbean, islands are vulnerable to increasingly frequent and severe storms, sea level rise, supply chain disruption and environmental degradation. Research is underway at the University of Hawaii at Manoa's Institute for Sustainability and Resilience (ISR) which is synergistic with work underway at other GRRN Island Resilience Initiative partners. The ISR promotes social and environmental resilience through interdisciplinary teaching and research programs and a pioneering a new role for universities in engaging with government agencies to implement climate change mitigation measures.

Partners within the GRRN Island Resilience Initiative have individually committed resources towards standing up and participating in resilience-related research projects and centers. By connecting and engaging in inter-island research collaboration, the GRRN hopes to be a catalyze for action. Looking ahead, the Island Resilience Initiative is developing a plan for its long-term financial sustainability for building a diverse and impactful program of network activities that will increase the resilience of island communities worldwide.

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**About GRI**

Launched in 2017 with the approval of Northeastern University's Board of Trustees, the Global Resilience Institute (GRI) is the world's first university-wide institute to respond to the resilience imperative. Today, GRI undertakes multi-disciplinary resilience research and education efforts that draws on the latest findings from network science, health sciences, coastal and urban sustainability, engineering, cybersecurity and privacy, social and behavioral sciences, public policy, urban affairs, business, law, game design, architecture, and geospatial analysis.