

Resiliency in Puerto Rico: Before, During, and After Hurricane Maria

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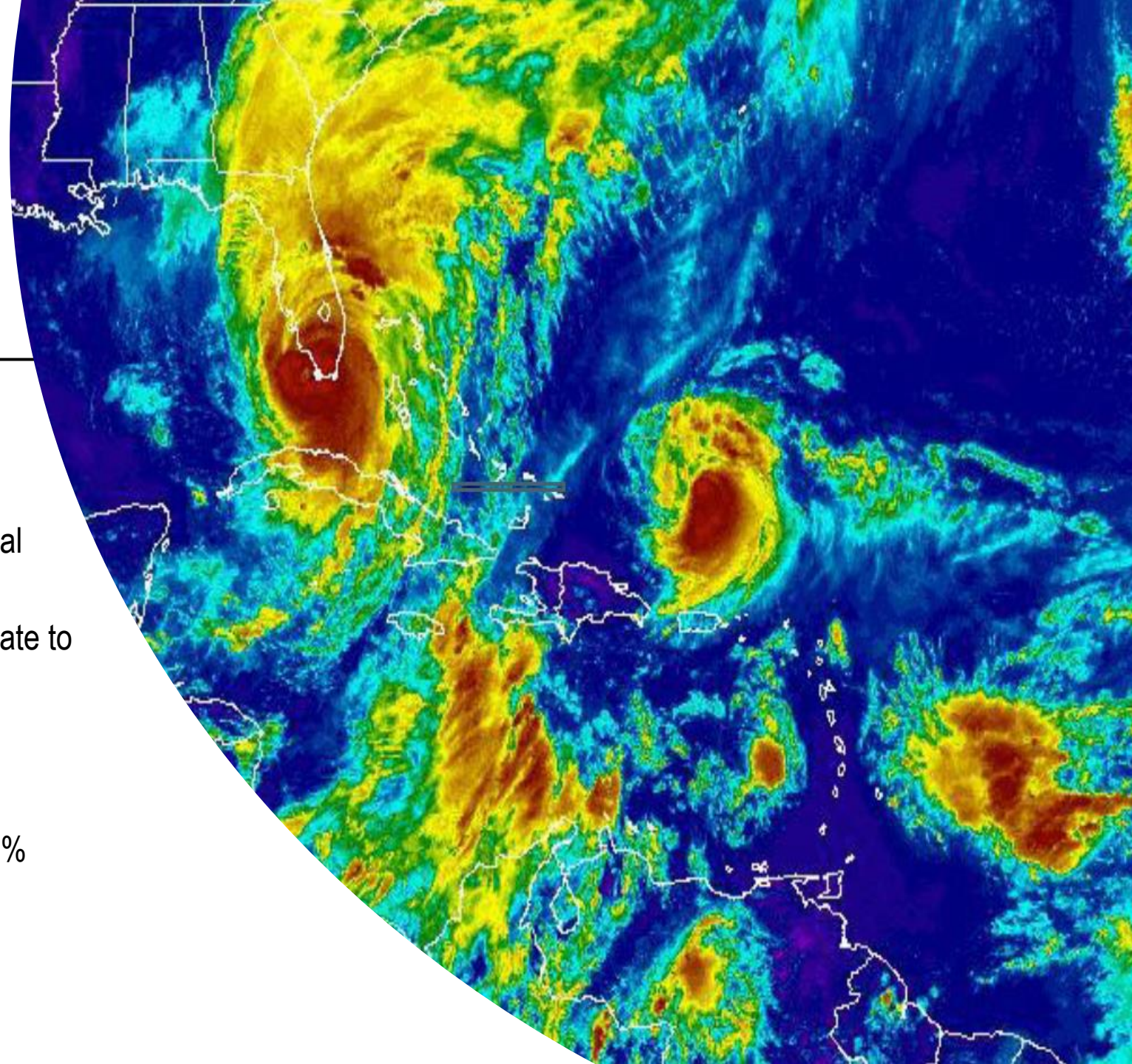
Overview

- Overall History
- Airport Life – My Story
- September 20, 2017
- From Surviving to Resiliency
- Lessons Learned
- PR Climate Change Council
- PR Resiliency Commission
- Moving Forward



Puerto Rico

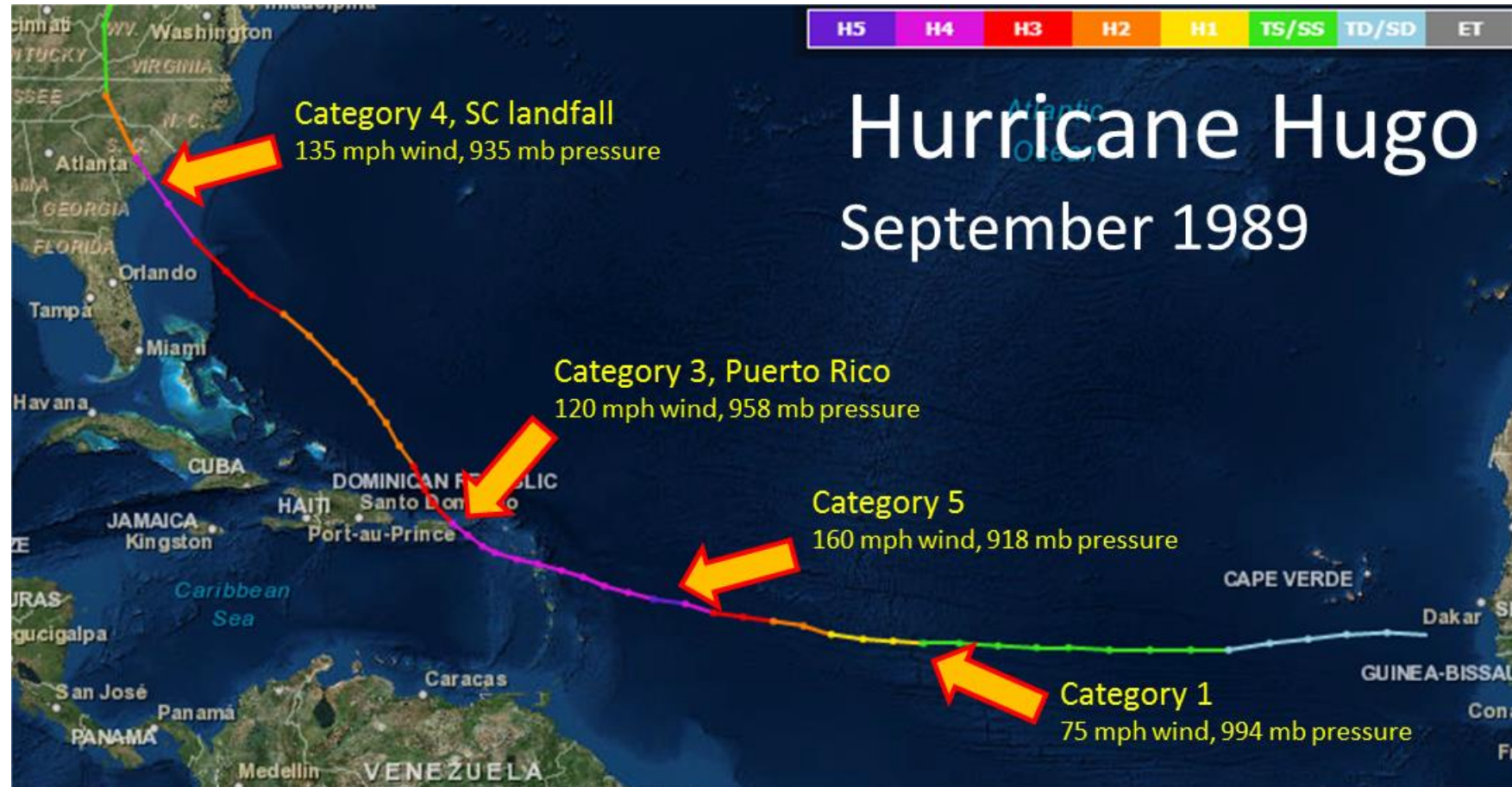
- Located in Caribbean Region
- Commonwealth of the United States
- 3.5 million American Citizens (61% live in coastal communities)
- Coastline: 799 mi / 1,225 beaches (60% moderate to severe erosion)
- Built up coastline: 24%
- 81 industrial parks on the coast
- Shallow coral reef designated for protection: 49%
- Marine protected areas: 27.2%



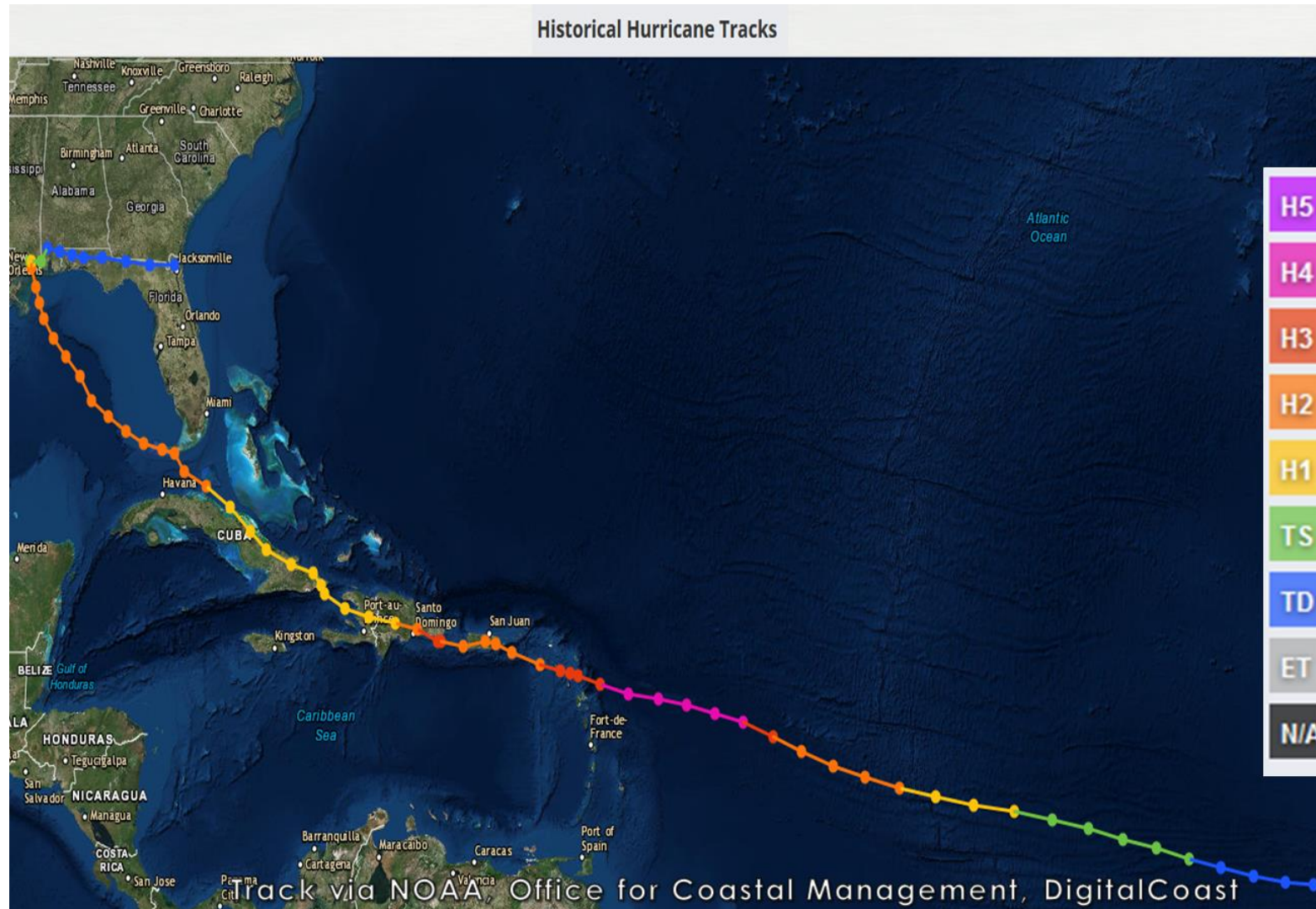
Central Mountain Range (3,500 – 4,300 ft)



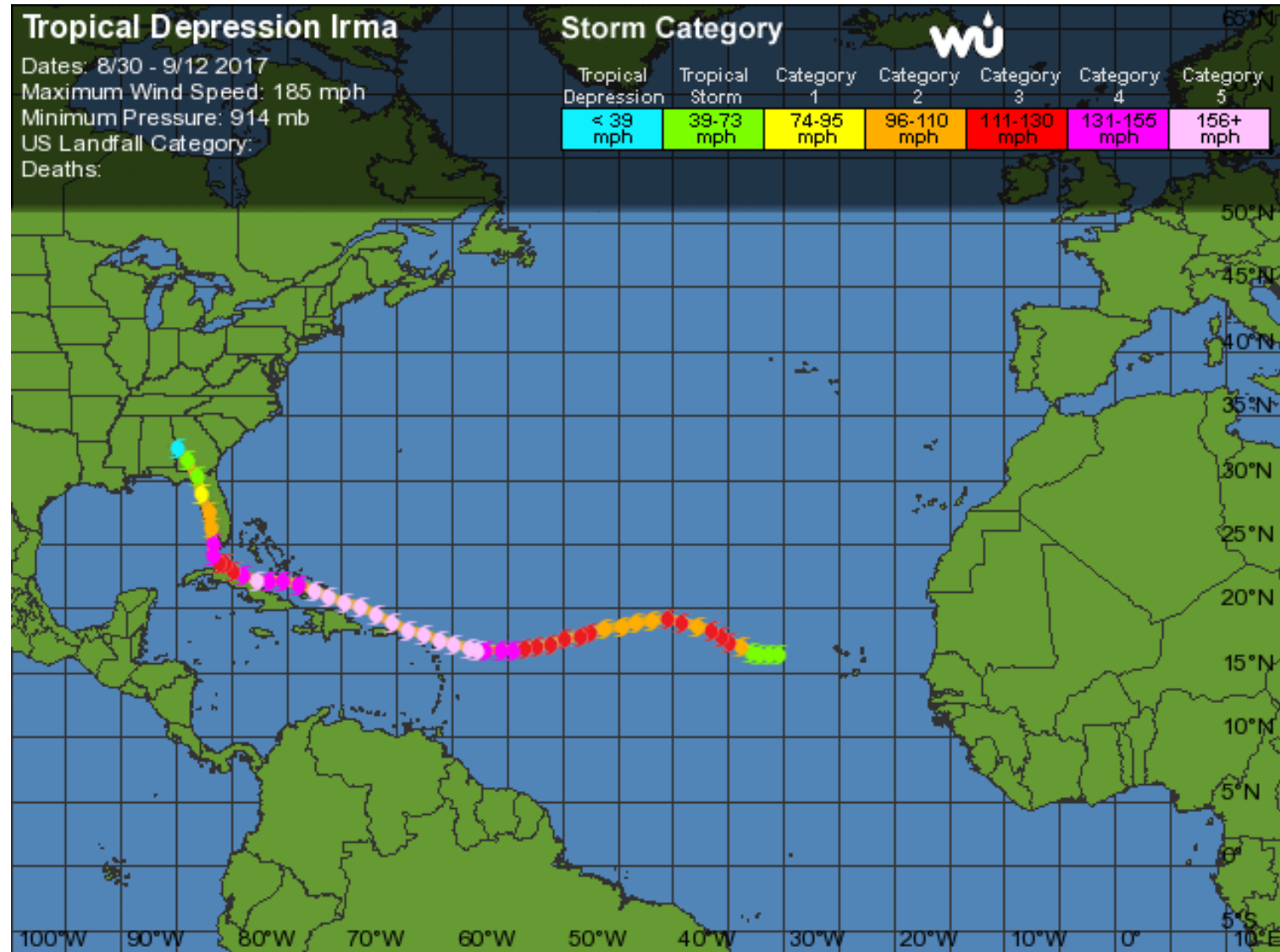
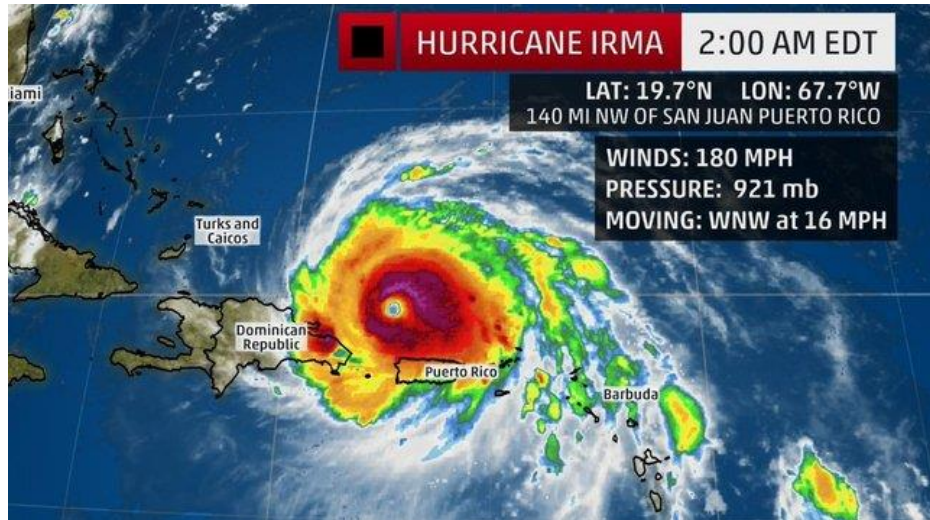
Hurricane Hugo – 1989 (Cat 3-4)



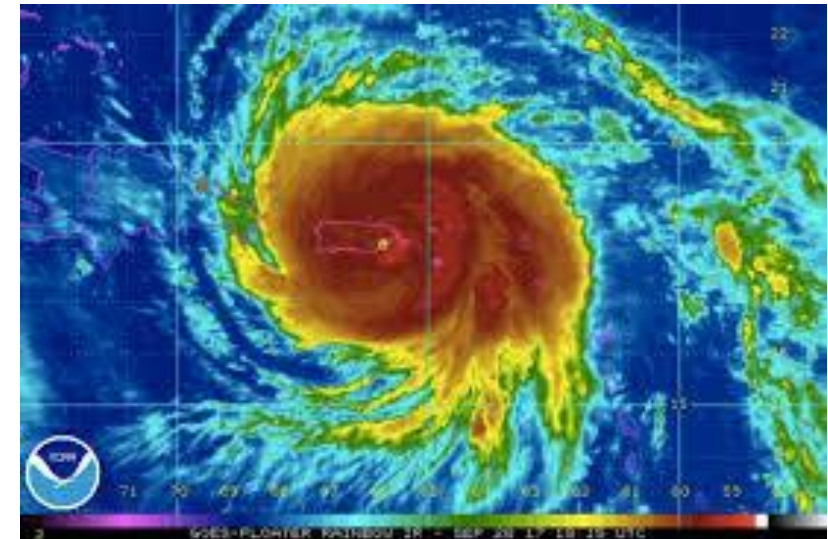
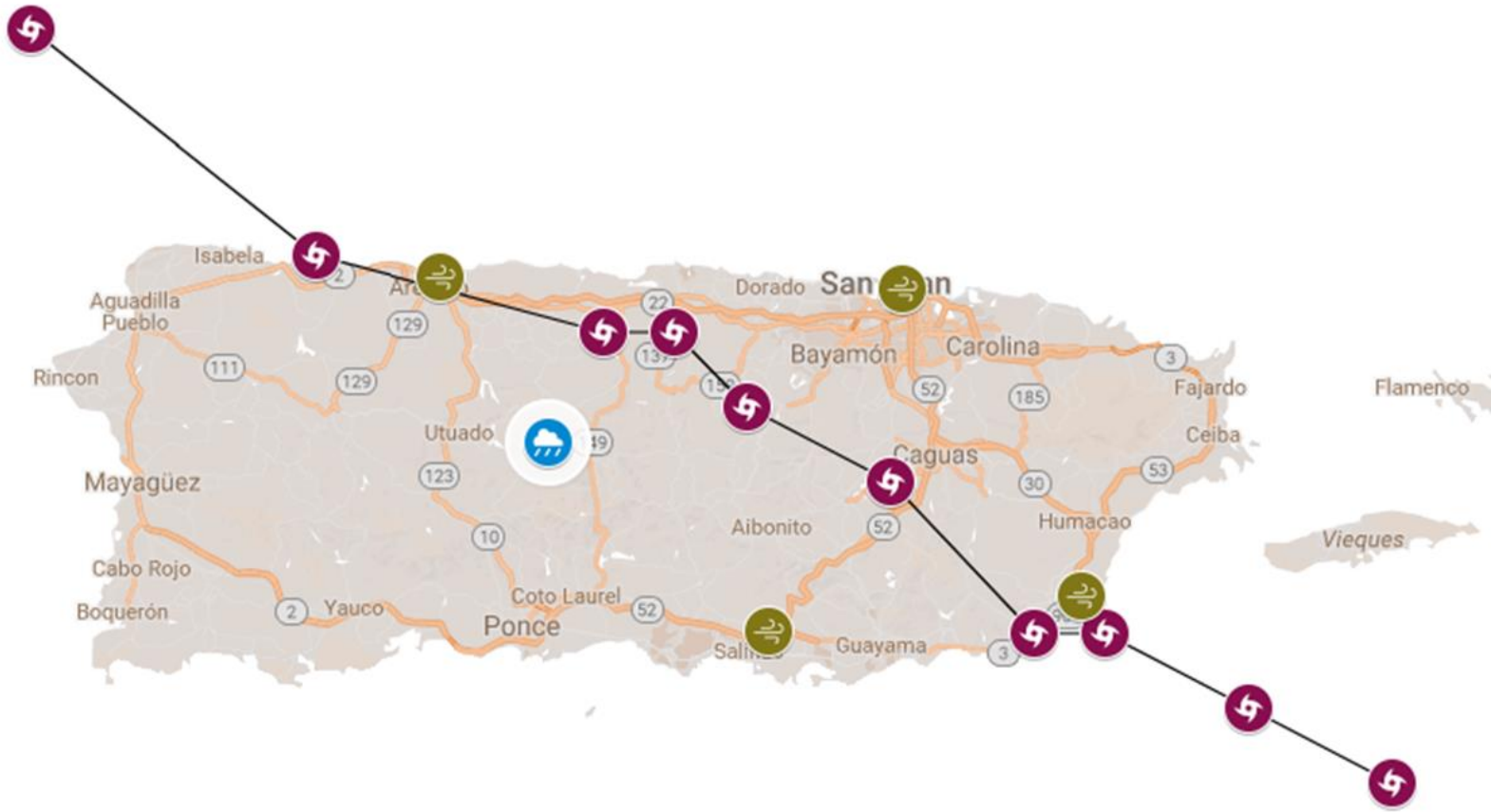
Hurricane Georges – 1998 (Cat 3)



Hurricane Irma – 2017 (Cat 5)



Hurricane Maria – 2017 (Cat 4-5)



An aerial photograph of the San Juan International Airport (SJU) is shown. The image captures the airport's extensive tarmac, multiple runways, taxiways, and terminal buildings. The airport is situated in a coastal area, with a body of water and a highway visible in the background. A large, semi-transparent circular overlay is positioned on the left side of the image, containing the title 'SJU Airport' and a bulleted list of key facts about the airport's operations and management.

SJU Airport

- First major Public Private Partnership in Puerto Rico and of any Category X Commercial Airports in the mainland US
- Managed by Aerostar Airport Holdings, LLC since February 2013
- Approximately 11,000,000 passengers moved per year
- Coastal airport with SLR related impacts

SJU Airport Resiliency Components

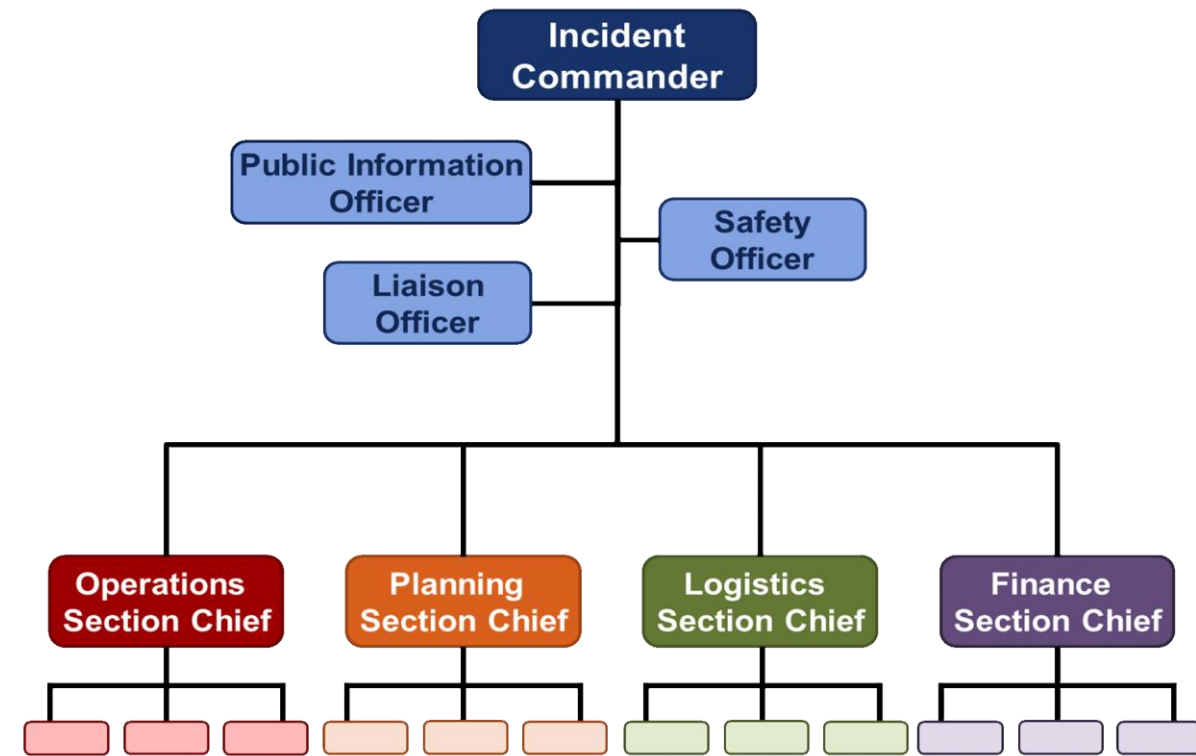
Targeted Plans:

- Emergency Management Plan
- Hurricane Plan
- Operational Areas Inspection Plan
- Spill Prevention Control and Countermeasures Plan
- Stormwater Pollution Prevention Plan
- Business Continuity Plan (In process)

SJU Airport Resiliency Components

Practice, Actions, and Leadership:

- Tabletop Exercises
- Quarterly Drills
- Tri-Annual Live Event
- Monthly Stakeholder Meetings
- Routine Maintenance of Critical Equipment
- Understanding of Critical Infrastructure
- Committed and Organized Team

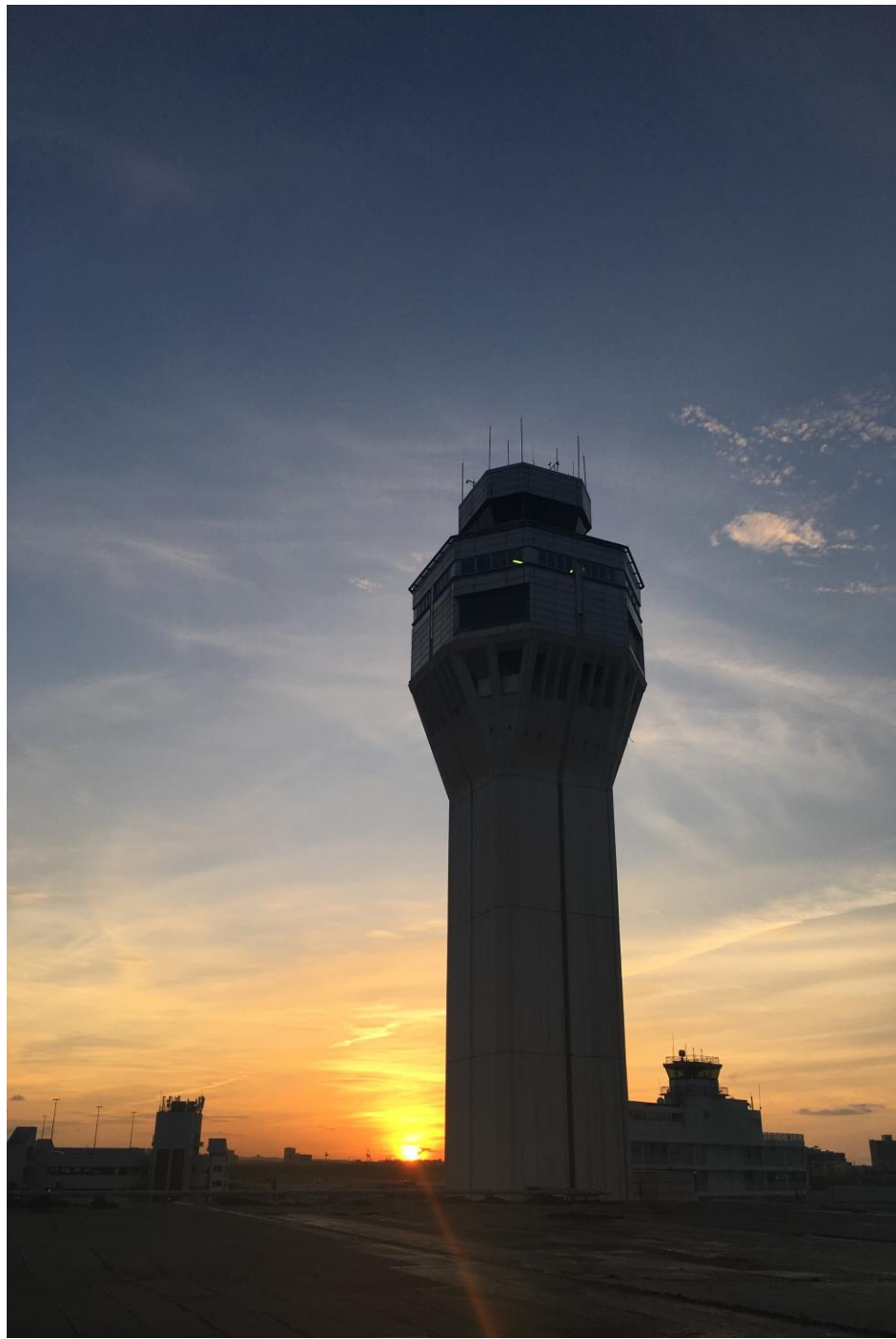
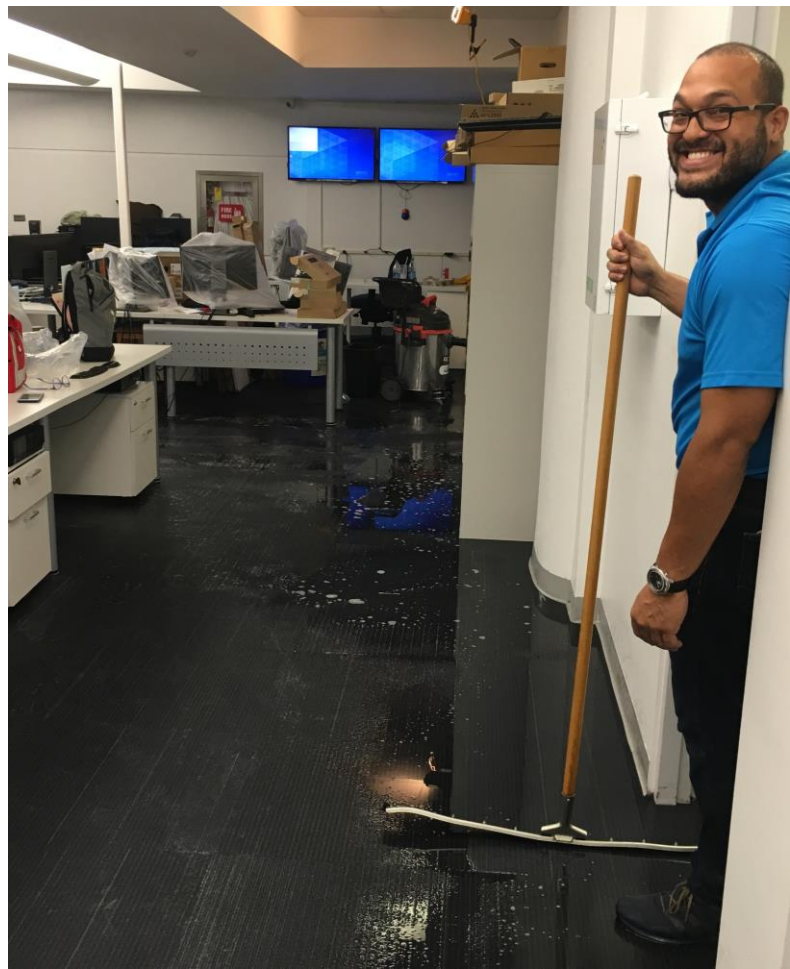


SJU Airport Resiliency Components

Significant Issue	Adverse Effect	Action
Power outage (entire Island)	<ul style="list-style-type: none"> - No HVAC (significant heat) - Limited illumination in areas - TSA Checkpoint failure - Condensation in floor 	<ul style="list-style-type: none"> - Redundancy – emergency generators - Staff assisted passengers - Adaptive management - Safe corridors
Communications failure (FAA radar, radios, mobile phones)	<ul style="list-style-type: none"> - Limited and cancelled commercial flights 	<ul style="list-style-type: none"> - Meetings, meetings, meetings - Continued orientation to passengers
Debris, flooding, and water damage in multiple locations	<ul style="list-style-type: none"> - Limited operational areas - Mold 	<ul style="list-style-type: none"> - Designate priority areas (triage type exercise) - Environmental Assessment
Downed trees and perimeter fence	<ul style="list-style-type: none"> - Security and compliance - Blocked access 	<ul style="list-style-type: none"> - Interagency agreements to address
Waste management	<ul style="list-style-type: none"> - Accumulated waste in sterile areas and in main dumpster zone 	<ul style="list-style-type: none"> - Adaptive management (alternate routes, storage areas, heavy machinery, and “collaboration”

SJU Airport Resiliency Components

Significant Issue	Adverse Effect	Action
Emergency Medical Response	<ul style="list-style-type: none"> - Not enough resources to manage potential threats - Communication limitations - Heat strokes 	<ul style="list-style-type: none"> - Set fixed EMS stations - Law enforcement support
SJU was perceived as a shelter (food and water)	<ul style="list-style-type: none"> - Potential for vandalism - Affected operations 	<ul style="list-style-type: none"> - Proactive communications - Limited water and food provided
Personal matters, emotional health, and physical fatigue	<ul style="list-style-type: none"> - Employee depression and desperation - Potential mistakes / risk - Affected operations 	<ul style="list-style-type: none"> - Teamwork approach and delegation - Aerostar headquarters adopted a “home” environment - Family support (water, gasoline, special assistance, daycare)
Back to “normal” operations	<ul style="list-style-type: none"> - Lack of reliable / stable electricity - Emergency management all over again (2-5 times per week) - Waste management, TSA, access, checkpoint, condensation, etc 	<ul style="list-style-type: none"> - Development of “standard” alternative plans - Adaptive management





Lessons Learned

- Develop Plans
- Study and Understand your Facility (applies also to community and environment)
- Practice, Learn, Modify, and Practice Again
- Adaptive Management (flexible) with Structure (organized)
- Lead by Example and Motivate
- Build strong Teams (internal and external)
- Take Care of Employees and Operational Team
- Celebrate Success (Mission Accomplished 24 / 48)





PUERTO RICO

Puerto Rico Climate Change Council

Mission

...assess the state of Puerto Rico's climate, using the best science and knowledge available, understand our social-ecological vulnerabilities and develop adaptation strategies to build a resilient society.

PRCCC – Volunteer Partners



PRCCC – Before and After Hurricane Maria

- Created in 2009 as a collaborative effort after two failed attempts at high levels of government (Executive Order in 2008 and Law in 2009)
- Led by Ernesto Diaz, CZM Program at PRDNER, and funded by NOAA (vision and initial strategy included NOAA Coastal Fellow to fill information gaps)
- Currently gathers 150 professionals in engineering, architecture, science, sociology, and other, from government, academia, non-profit organizations, and private industry.
- Collaboration via email (daily) and 1 yearly summit
- Small seed investment has achieved documentation equivalent to millions (\$)
- Most recent achievement: US Caribbean to have a “stand alone” section in 4th National Climate Assessment Report

PRCCC – Before and After Hurricane Maria

- Road to Resilience Adaptation Guide – Published in 2014: Focused on Island, Municipal, Community, and Individuals as disaster response and recovery responsible
- Road to Resilience Part 2 – After 2014 extreme drought and 2017 hurricanes: Refocuses on Individuals, Neighborhood, and Community as disaster response and recovery leads (via community based groups, religious organizations, and private industry)

Resilient Puerto Rico Advisory Commission

Created in November 2017 as an independent and inclusive body. Locally led, and supported by [The Rockefeller Foundation](#), the [Open Society Foundations](#), and the [Ford Foundation](#), the Commission's project, Relmagina Puerto Rico (RePR or Relmagina), developed recommendations to help rebuild Puerto Rico in a way that makes the island stronger – physically, economically, and socially – and more prepared to confront future challenges. The intent of the recommendations is to support Congress, federal agencies, and the local government and municipalities in their efforts to drive long term recovery on the island.

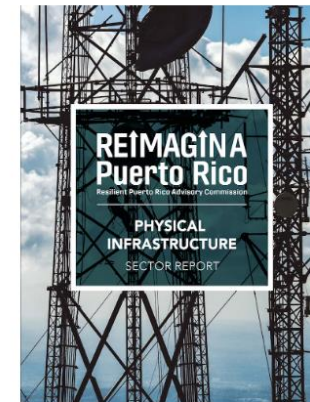
- The Commission is independent, non-partisan, non-governmental, and receives no public funding.
- Working groups were composed of local and external experts focused on strategic matters.



ReImagina Project

- 6 Working Groups:
 - Economic Development
 - Energy
 - Housing
 - Physical Infrastructure
 - Natural Infrastructure
 - Health, Education and Social Services
- 18 Working Group Sessions
- Community Involvement (including children)
- Stakeholder Involvement (Press, Executives, Other)
- Town Hall Meetings

www.resilientpuertorico.org





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