Puerto Rico...
Challenges Ahead

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2021 CHALLENGES

Natural Multi-Risk Challenges:

- Active Hurricane Season
- Active Seismic Sequence (2019-current)
- COVID-19 Pandemic
- Recovering from Hurricane María (2017)-catastrophic
- Climate Change

Social/Economic Challenges:

- Mental and physical health
- Financial impact
- Reduced capacity to support response (personnel and supplies)
- Rise in food insecurity
Plus... Our Science icon collapsed

The Arecibo Observatory

Another heart wrenching moment
Natural Hazard COMMUNICATION

CHALLENGES

• Warning systems are fragile
• General communication between agencies/municipalities/state govt. can be weak
• New government administration has not been completely trained
• Resources in general are limited

• People are tired and frustrated
• They have become “seismometers”
• Fake news are rising
• General mistrust of response to natural hazards
SOCIAL MEDIA IS STILL A FAVORITE SOURCE OF INFORMATION

Tsunami Advisory – January 9, 2018

- **Advisory** Puerto Rico  Issued at: 1/9/2018, 9:58:39 PM
- **Advisory** Virgin Islands  Issued at: 1/9/2018, 9:58:39 PM
- **Potential Threat** Cayman Islands  Issued at: 1/9/2018, 9:57:25 PM
- **Potential Threat** Cuba  Issued at: 1/9/2018, 9:57:25 PM
- **Potential Threat** Nicaragua  Issued at: 1/9/2018, 9:57:25 PM

Previous 40 Tsunami Messages

<table>
<thead>
<tr>
<th>Issued *</th>
<th>Origin Time *</th>
<th>Mag</th>
<th>Depth</th>
<th>Lat</th>
<th>Lon</th>
<th>Location</th>
<th>Messages</th>
<th>Additional</th>
</tr>
</thead>
<tbody>
<tr>
<td>01-10-2018 02:59:01</td>
<td>01-10-2018 02:51:32</td>
<td>7.8</td>
<td>21 Mi.</td>
<td>17.5° N</td>
<td>83.6° W</td>
<td>IN THE CARIBBEAN SEA</td>
<td>GotEMC East Coast Info #1</td>
<td>Select Rec.</td>
</tr>
</tbody>
</table>
Earthquake and Tsunami

- Social Media audience need quick response
- Messages: calm, normal, if something stronger will follow, deal with myths: fracking, and other fake news through whatsapp
- Focused on Individual response
- Problem of expectations—great interest and anticipation for guidance
Around 50 Facebook Lives – Earthquake Related
Information, Recommended Actions, Education, Community Updates
Balance between Information and Excessive Warning

- Constant process between the media and the recipient
- Based on professionalism and the right information
- Avoiding reviews
- Adding empathy and sensitivity helps carry the message
Natural Multi-Risk Challenges
2020 Atlantic Hurricane Season
by the numbers

13 Hurricanes
Average season has six

6 Major hurricanes
Average season has three

12 Storms hit the U.S. coastline, (5 of which came ashore in Louisiana)
Previous record: 9 in 1916

30 Named storms
- Arthur
- Barty
- Cristobal
- Delta
- Eduard
- Fay
- Gonzalo
- Hanna
- Isais
- Josephine
- Kyle
- Laura
- Marco
- Nana
- Omar
- Paulette
- Renée
- Sally
- Teddy
- Vicky
- Wilfred
- Alpha
- Beta
- Gamma
- Delta
- Epsilon
- Zeta
- Eta
- Theta

NOAA Hurricane Hunters
86 Missions conducted

NOAA underwater hurricane gliders
47 Glider deployments

102 Hurricane eyewall passages

678 Flight hours

1,772 Dropsondes deployed
to gather vital atmospheric data

13,272 Gathered observations

179,401 Temperature and salinity profiles
These help improve forecasts for current storms

16 NOAA weather satellites in operation

5th consecutive above-normal season
Previous record: 4 from 1998 to 2001

86 Facebook Live broadcasts
from the National Hurricane Center
Active Seismic Sequence
SEISMIC SEQUENCE-
December 28th, 2019-current
+13,000 earthquakes
6.4 magnitude (Jan. 7th, 2020)
1 direct death
Strongest shaking likely in your lifetime

Weak  Strong  Violent
III IV V VI VII VIII IX
Modified Mercalli Intensity at 1% per yr

Earthquakes

as of 15:25 UTC 11:25 am AST
Escuela Agripina Seda con daños después de temblor 5.8 1/6/2020 sin colapsar

Después del terremoto 6.4 1/7/2020
GILLIGHAN ISLAND, GUÁNICA NEAR 12” SINKING
COVID-19 Pandemic
SHELTER CHANGES: capacity, tests, using hotels, etc.
Recovering from Hurricane María (2017)-catastrophic
IRMA
Sept. 6, 2017

MARÍA
Sept. 19, 2017

2017
MULTIPLE THREATS
HURRICANE MARÍA - September 20th, 2017

Cat. 4-155 mph, 926 mb
2,975 deaths
70,000 landslides
~$90 billion damages
The Two Most Powerful Hurricanes over Puerto Rico

San Felipe 2do (1928)  
María (2017)
Before

After

UPR Atmospheric Chemistry Lab @ El Yunque Rainforest (2,000’ ft)
Storm Surge
Punta Santiago, Humacao, PR

Measured still water mark inside the houses ~40-55"
Barrio Ingenio, Toa Baja, La Plata River
Map showing concentration of landslides caused by Hurricane Maria, Puerto Rico

Explanation

<table>
<thead>
<tr>
<th>Legal Municipalities</th>
<th>Landslide Density</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not Examined</td>
<td>No Landslides</td>
</tr>
<tr>
<td>Less than 25 per SqKm</td>
<td>More than 25 per SqKm</td>
</tr>
</tbody>
</table>

Climate Change
The coastal city of San Juan in Puerto Rico was flooded after Hurricane Maria hit in September 2017.
COASTAL RESILIENCE

Bouncing back & building beyond.

**PLAN & BUILD RESILIENCE**
- Develop and implement plan to become more resilient.
  - improving forecasts, observation models, computer systems
  - getting information to decision makers faster
  - incorporating green infrastructure

**DISASTER STRIKES**
- Disasters can be imminent or strike unexpectedly.
  - sea level rise
  - tsunamis
  - coastal storms and hurricanes

**RESPOND**
- Immediately take action following a disaster.
  - pollution response
  - damage assessment imagery
  - completing hydrographic surveys to reopen ports

**RECOVER**
- Assess resilience and manage adaptively.
  - assessing damage to communities, economy, and environment
  - issuing grants to rebuild and restore habitat
  - providing data and tools for analysis

Assess resilience and begin planning for the next disaster.

Building resilience is an iterative process.
Social/Economic Challenges
Mental and Physical Health
Experts warn that many of Puerto Rico’s residents have developed mental health complications — prompted both by the present coronavirus (COVID-19) pandemic, as well as previous natural disasters and an economic depression that has been affecting the island for roughly 14 years.

Between 1,700 and 1,800 calls on a daily basis that are related to anxiety, uncertainty and fear- Psychosocial First Aid line (PAS) – AMMSCA 1 800 981 0023.

Detonators for myriad mental health problems like depression and anxiety.
Financial Impact
According to Puerto Rico's General Union of Workers, at least 300,000 people have filed for unemployment benefits during the coronavirus crisis.

Some estimates made by economists say the economic losses related to the pandemic could reach up to $10 billion.

PR’s financial heath was already compromised, and the coronavirus/earthquake/hurricane economic hit is significant.
“The effect of the destructive hurricanes, earthquakes and COVID-19 on the economy is severe and exacerbated the lack of implementation of structural reforms to improve economic growth in Puerto Rico. That is why, with the support of the federal Government, this crisis should be an opportunity to redouble all efforts to reform the economy for the benefit of the people of Puerto Rico.”
FOMB May 26, 2020

“The Oversight Board projects that the Puerto Rico economy will contract by 4.0% in this current fiscal year of 2020, with a mild 0.5% recovery in the coming fiscal year of 2021, supported by federal funds related to COVID-19, and the hurricanes and earthquakes.”
FOMB May 26, 2020
Reduced Capacity
to support response
If a major disaster (flood, hurricane, cyclone) occurs in the next 3 to 6 months, would your organization be able to respond at the same level compared to in previous years?

68%

Our organization’s response to a major disaster would be substantially reduced compared to previous years.

22%

Our organization could respond to a major disaster at the same level compared to previous years.

10%

Our organization would not likely be in a position to respond to a major disaster at this time.
COVID-19 (and other or associated restrictions) present challenges to the delivery of disaster response programs and supplies.

- The vast majority of organizations (80%) have experienced, or expect to experience, challenges in the delivery of one or more Emergency Support Functions (ESFs).

- Organizations that have experienced, or expect to experience, challenges in the delivery of Emergency Support Functions (ESFs) as a result of COVID-19:
  - One or More ESFs: 80%
  - Water, Hygiene, and Sanitation (ESF #3, ESF #8): 36%
  - Health (ESF #8): 36%
  - Long-term Recovery (ESF #14): 33%
  - Food Security (ESF #11): 31%
  - Protection (ESF #6): 30%
  - Logistics (ESF #1, ESF #17): 21%
  - Shelter (ESF #6): 16%
Many organizations are experiencing stock-outs of supplies that are essential to service delivery.

Many organizations have drawn down strategic, prepositioned supply reserves.
Rise in food insecurity
20,000 households don't have a stable roof

43% of Puerto Ricans live under the poverty level.

This could lead to social conflict, misery and more migration.

33% of our adult population suffer from food insecurity.
Extreme Weather Disproportionally Impacts Vulnerable Populations

- CHILDREN
- ELDERLY
- DISABLED
- IMPOVERISHED & DISENFRANCHISED
BE PROACTIVE
NOT REACTIVE
PRIORITIES
for 2021 Natural Hazard Preparation

1- HEALTH (physical and mental)

2- FOOD SECURITY

3- HOMES

4- ENERGY, WATER and COMMUNICATION

5- COMMUNITY RESPONSE
WE ARE RESILIENT
WE ARE COMMITTED TO REBUILDING A STRONGER AND SAFER PUERTO RICO
STEM and Resilience education at @ECOEXPLORATORIO
Museo de Ciencias de Puerto Rico
787-281-9090
info@ecoexploratorio.org

VISIT US: 2nd Floor-Plaza Las Américas
THANK YOU!

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