



HURRICANE MARIA

September 20, 2017

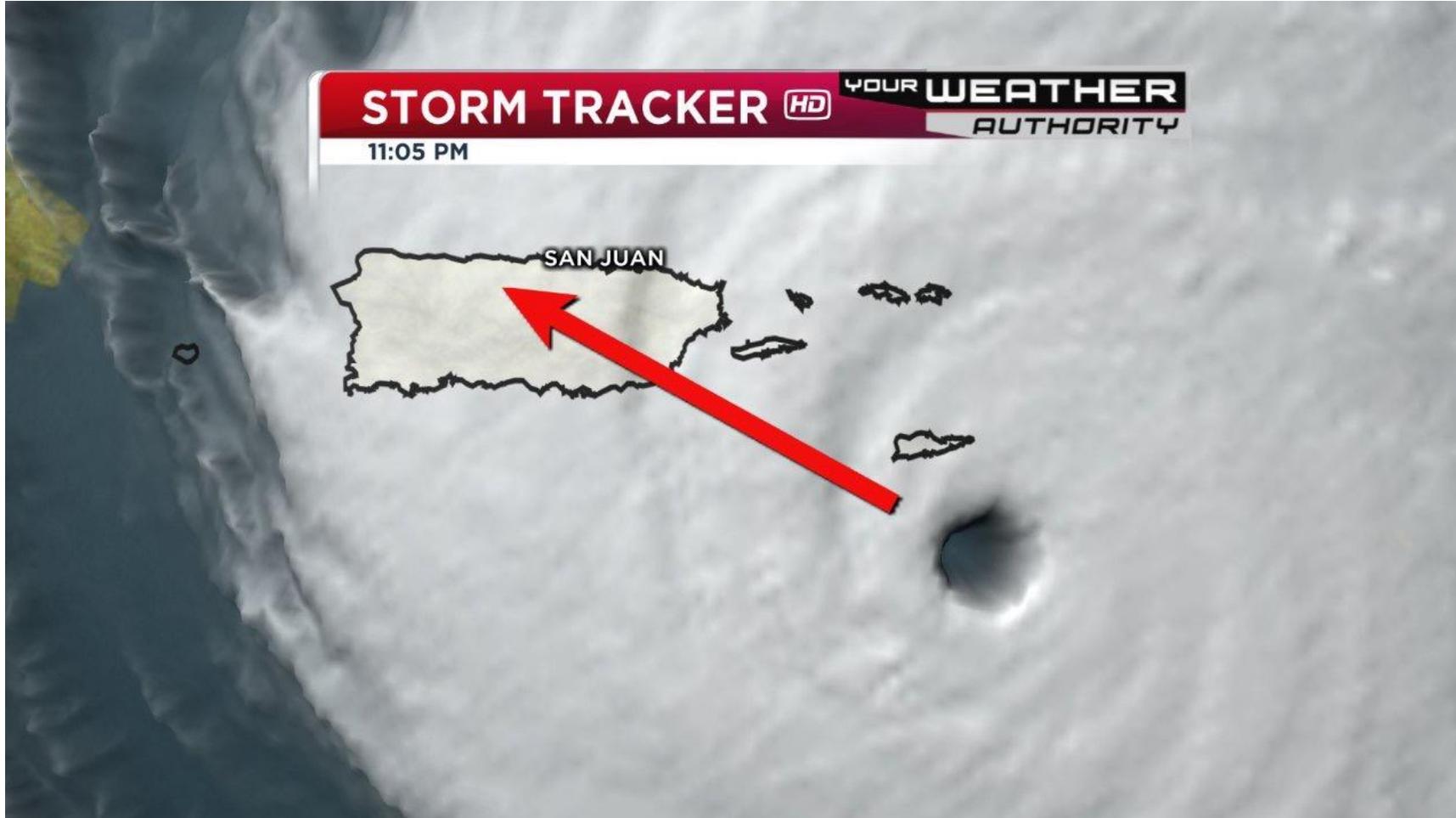
155 MPH Sustained winds
Puerto Rico



PORTICUS CSP
INGENIERIA

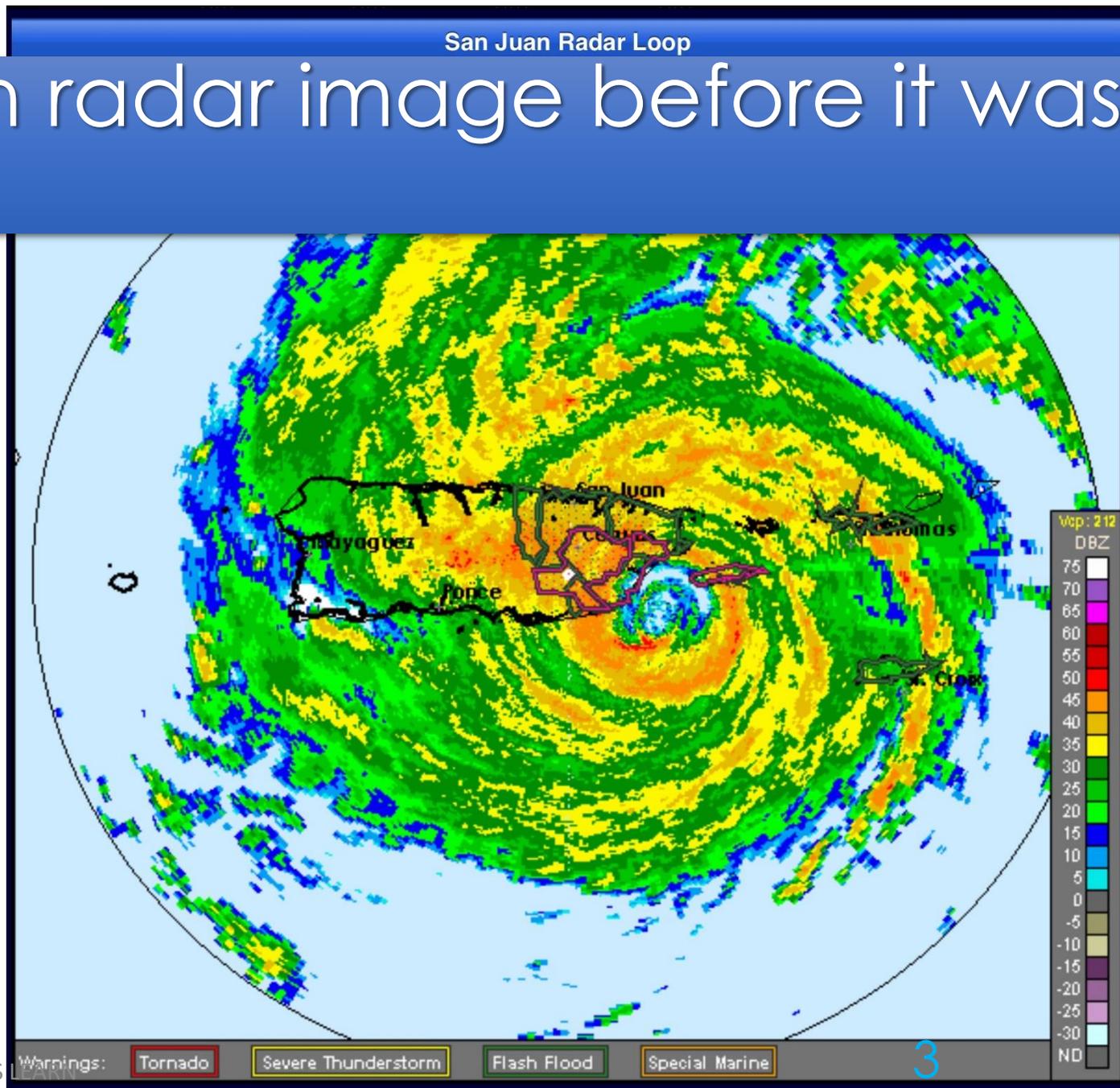


Visual Image





Last San Juan radar image before it was knock down





Actual pass thru Puerto Rico



ac



Winds



The estimated windspeeds in this map represent the estimated peak winds within each census tract. Local effects (e.g., topography, buildings, trees, open terrain) will impact speeds locally. These speeds provide a general sense for the potential for damaging winds.

Dr. Shane Hubbard
 Space Science and Engineering Center
 Cooperative Institute for Meteorological Satellite Studies
 University of Wisconsin - Madison
 e-mail: shane.hubbard@ssec.wisc.edu

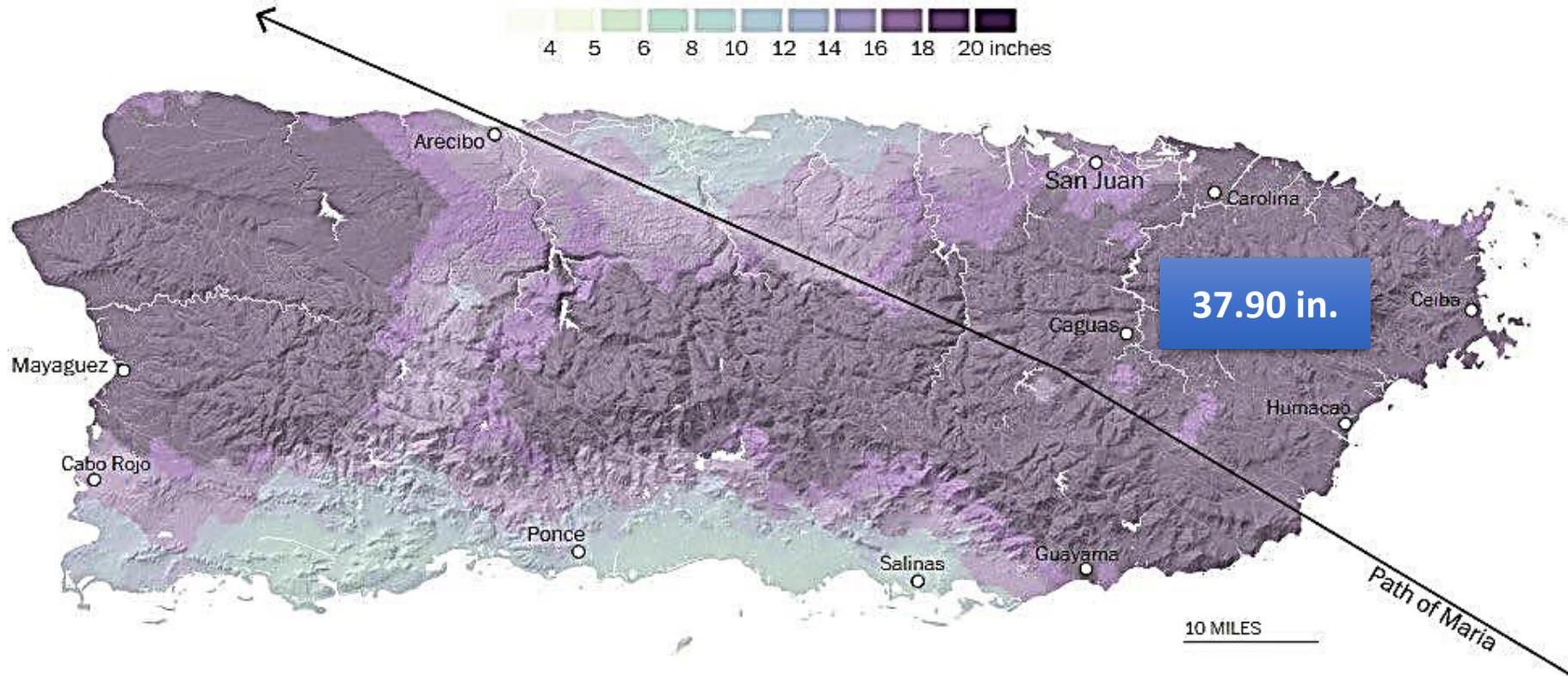
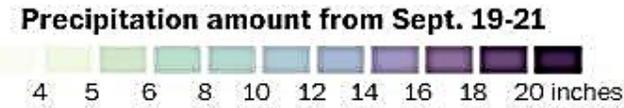


Water

Maria's deluge on Puerto Rico

As winds fade, flooding becomes a danger

By Laris Karklis and Tim Meko





Initial Challenges

1. 100% loss of electrical power
2. 95% loss of mobile phone signal, therefore no communications
3. 100% loss of running water.
4. Airport Close because Radar was lost and no power.
5. Roads blocked due to electrical poles and trees, preventing reaching out to remote areas and preventing the distribution of goods.
6. Hospital Diesel reserve was mostly 3 days.



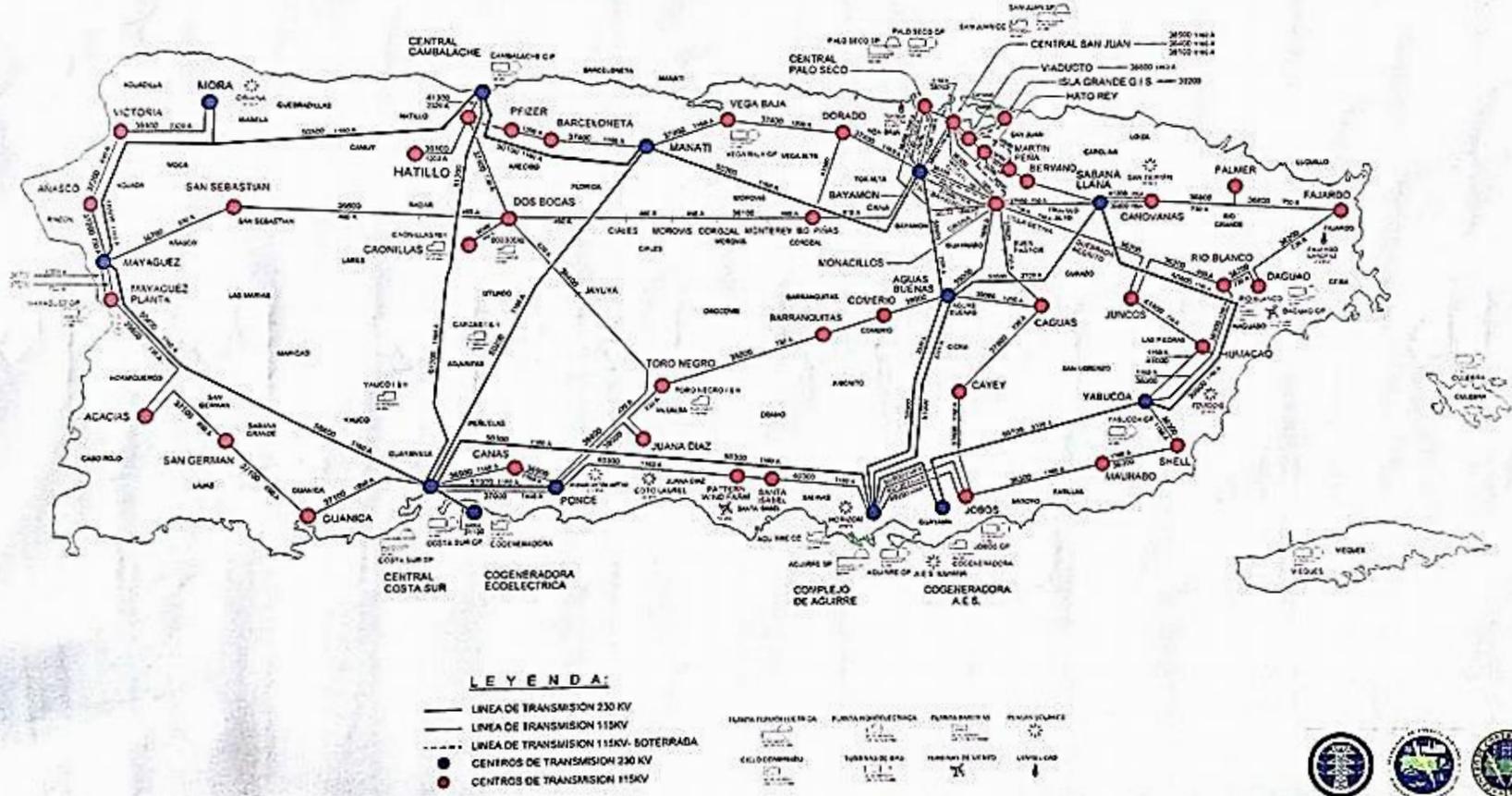
100% loss of electrical power





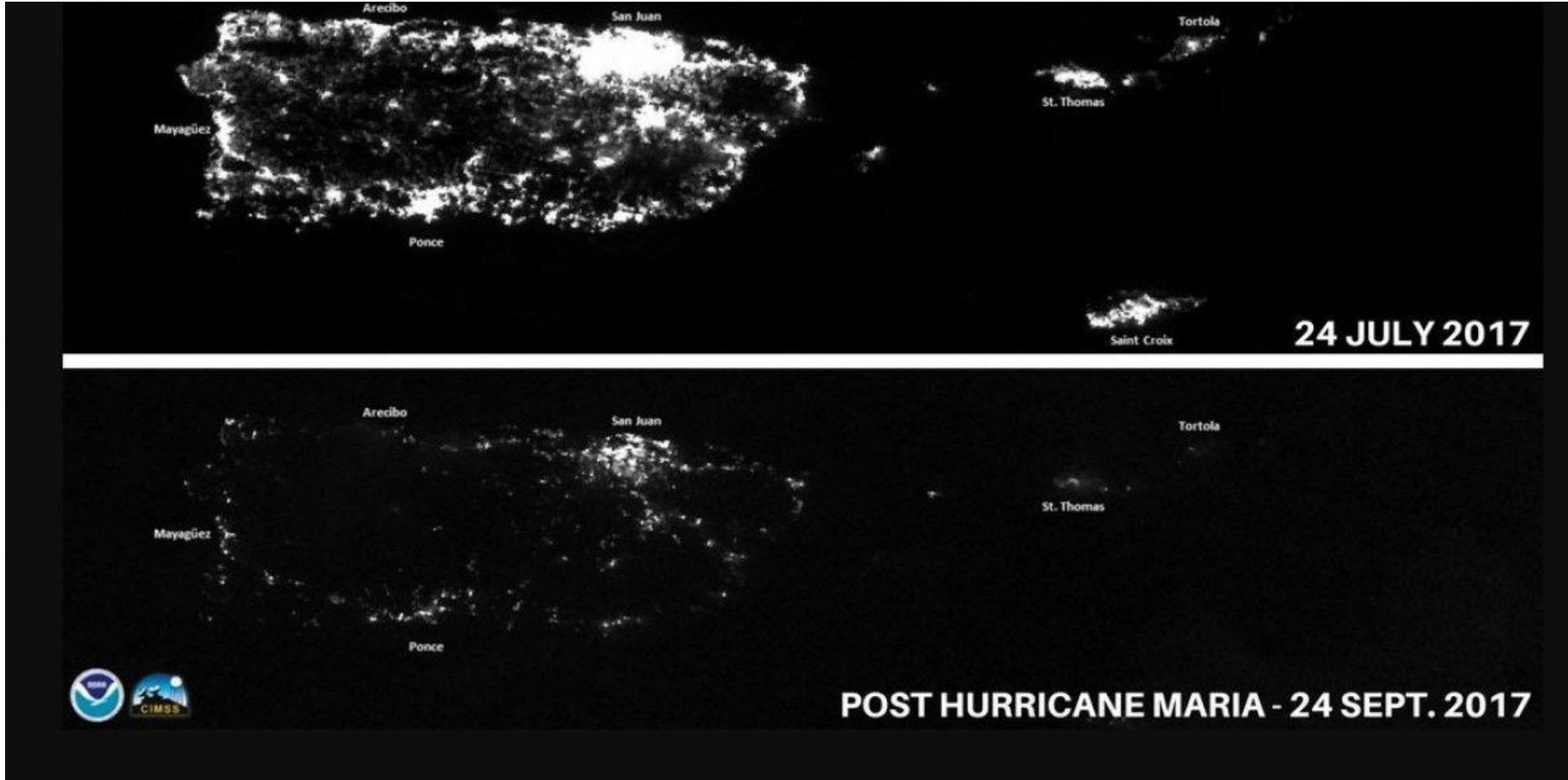
Power grid

Autoridad de Energía Eléctrica de Puerto Rico División Operación Sistema Eléctrico Líneas de Transmisión 115 kV - 230 kV





After Hurricane Maria





Transmission towers





6% power after 10 days, 9% today

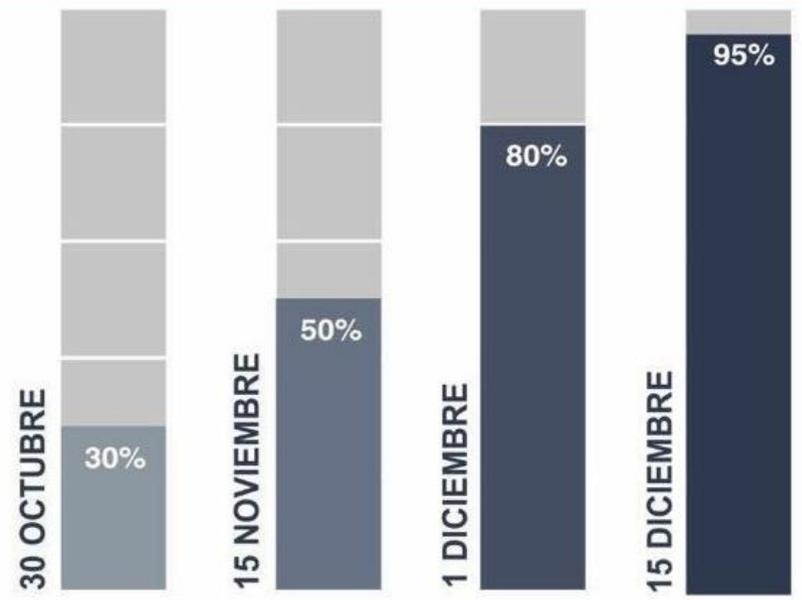




Inner mountain towns

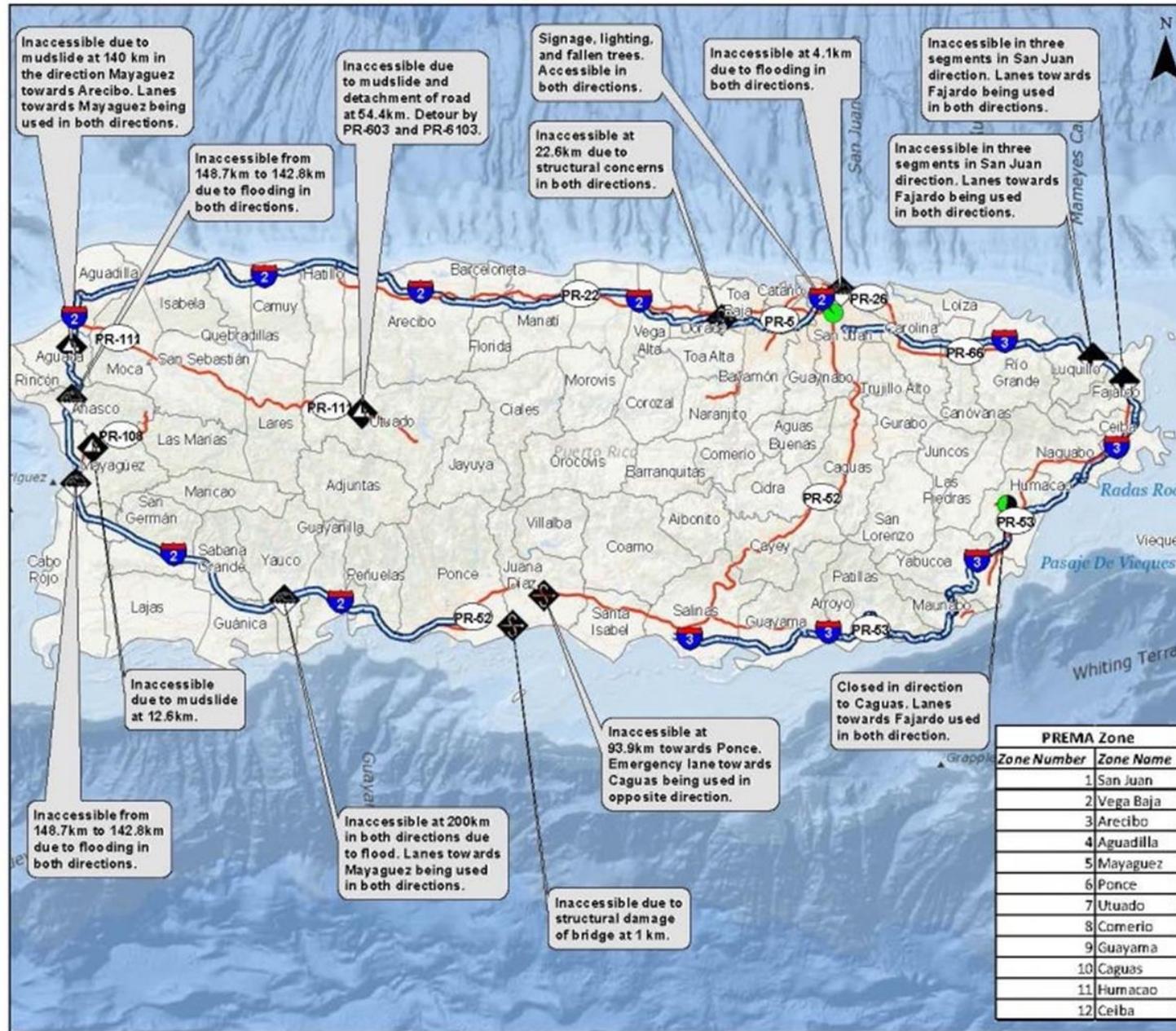


Status





Roads



Puerto Rico Road Status

As of September 26, 2017

Road Type

- Eisenhower Interstate System
- Puerto Rico Highway

Highway Status

- Accessible
- Partial Accessible (1 Lane, both direction)
- Inaccessible (Debris)
- Inaccessible (Flooded)
- Inaccessible (Mudslide)
- Inaccessible (Structural Damage)





Bridges & Roads



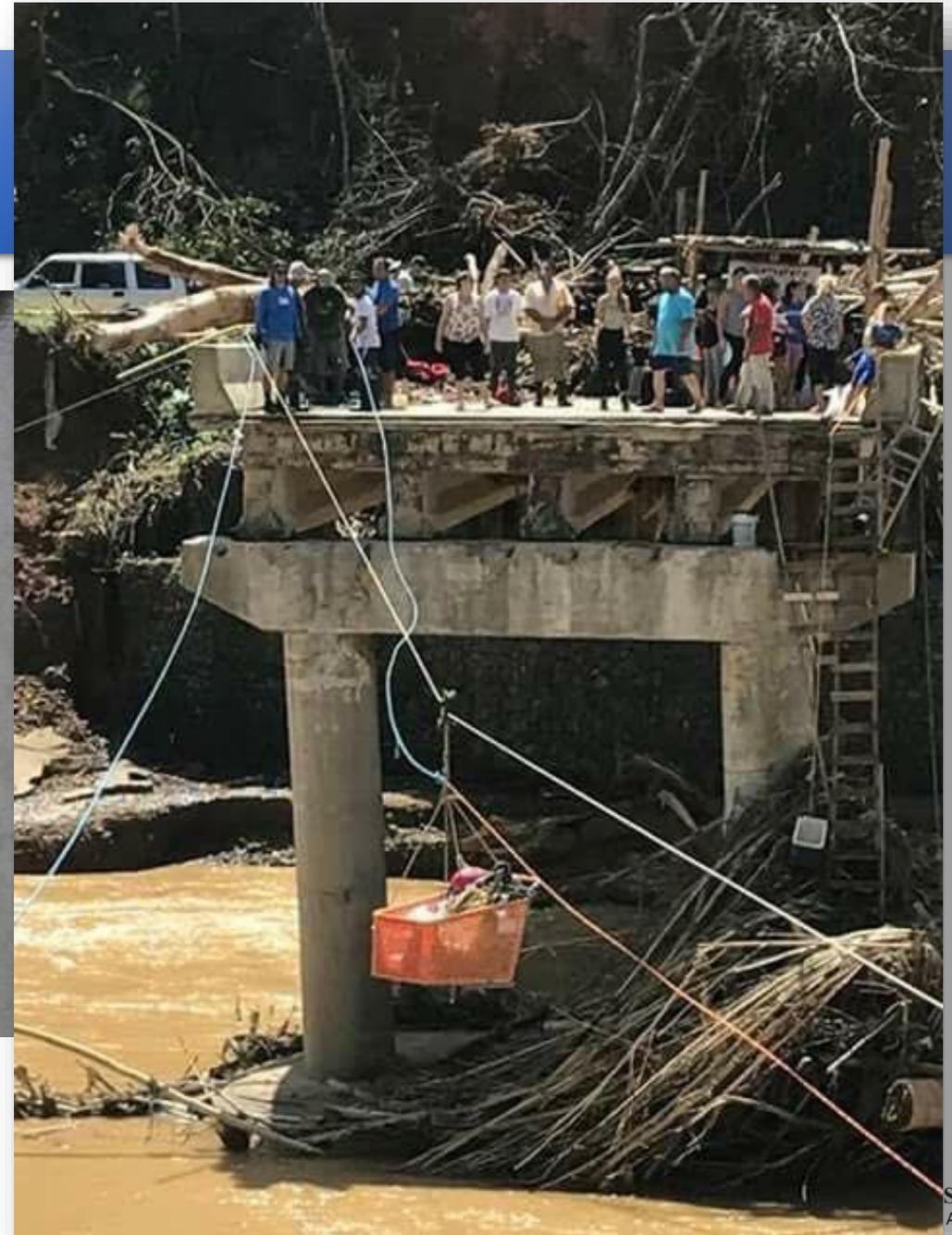


Bridges & Roads





Bridges & Roads





Bridges & Roads





Imagine a world without mobile phones





Imagine a world without mobile phones

GOOGLE PROJECT LOON BALLOONS





Floods





RN





2017 FALL CONVENTION & EXPOSITION - HURRICANE MARIA, LESSONS LEARN



Flooding in urban areas





Agriculture – 100% of crops lost



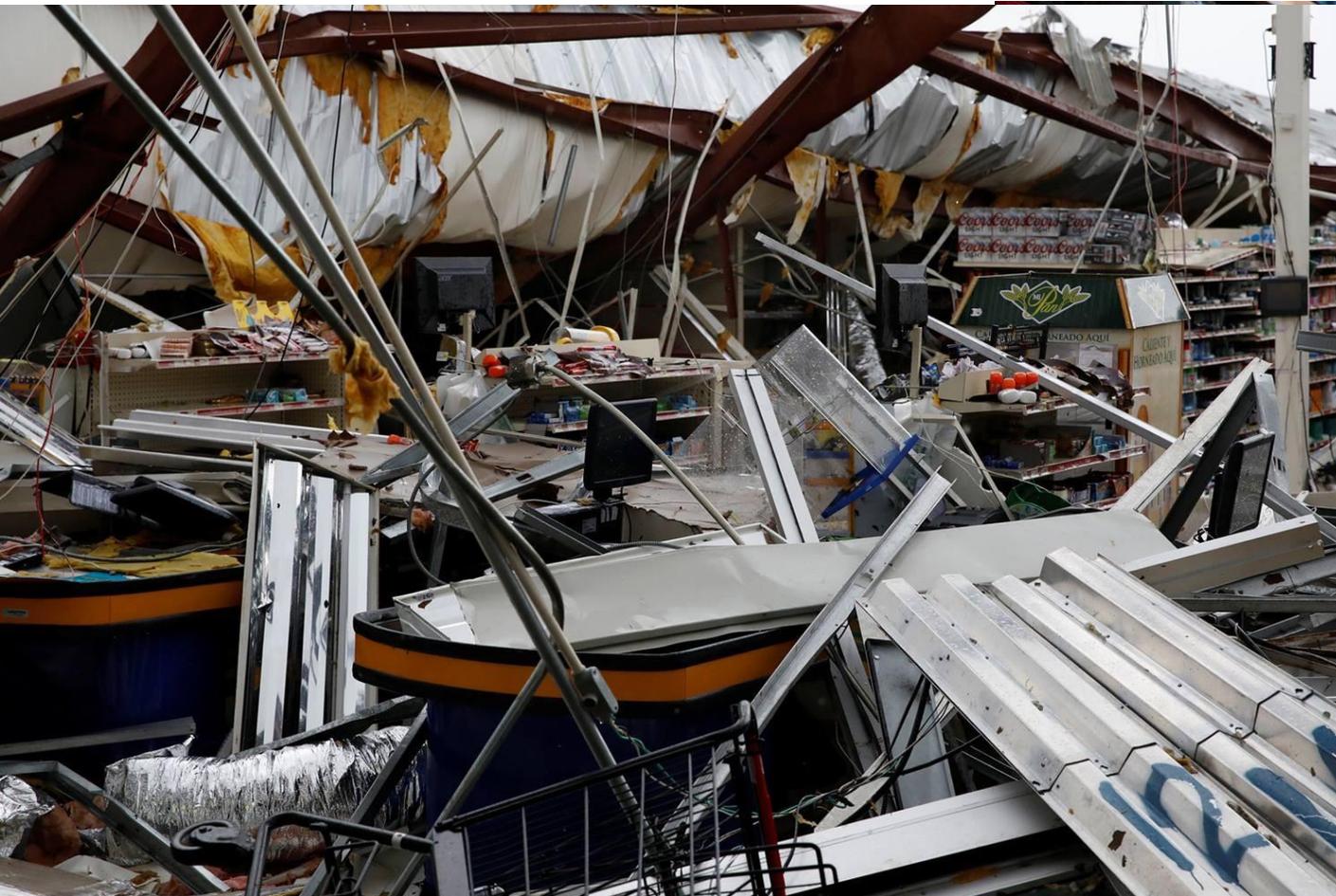


Dairy industry operational



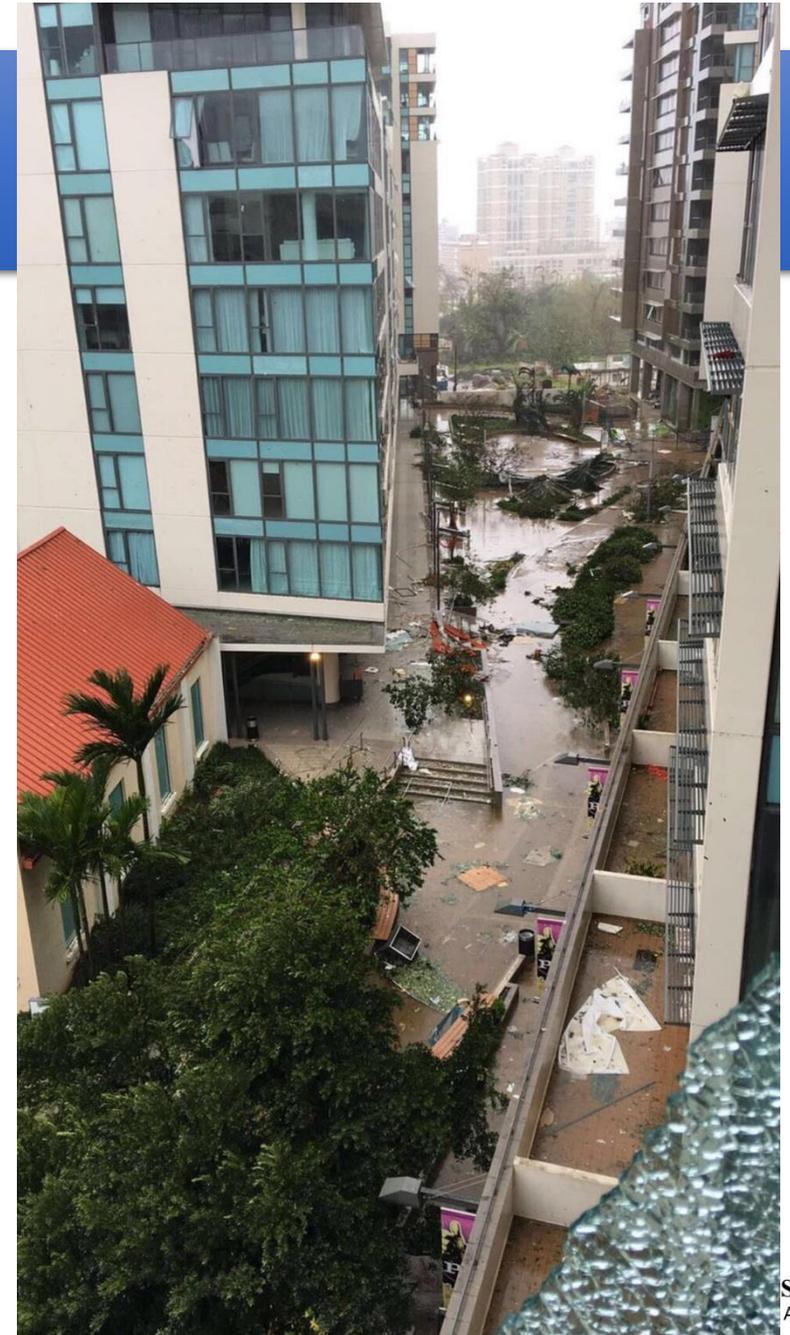


Commercial Steel Building





Faccades





Poor wood houses



Poor wood houses





Commercial Steel Buildings





Concrete Buildings





Concrete Poles





Random damages...





Gasoline anyone?





Cash crisis



Less than a week into the massive blackout that followed Hurricane Maria and essentially turned Puerto Rico into a cash-only economy, one top local banker became so concerned about the supply of bills that he called the Federal Reserve.

William Dudley, the New York Fed president, put the word out within minutes, and ultimately a jet loaded with an undisclosed amount of cash landed on the stricken island, according to Richard Carrion, the Popular Inc. executive chairman who made the call.



Water and Food Shortage

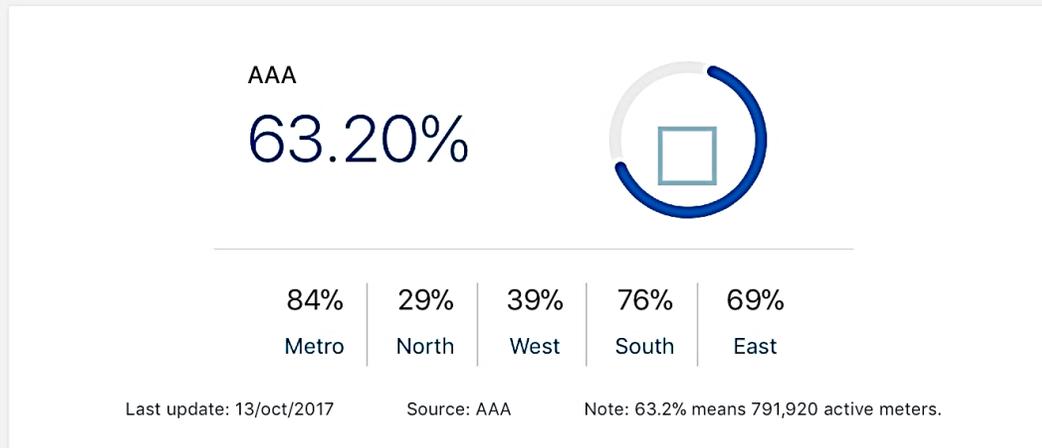
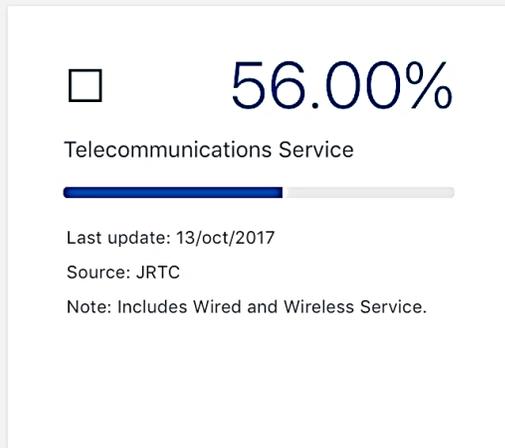
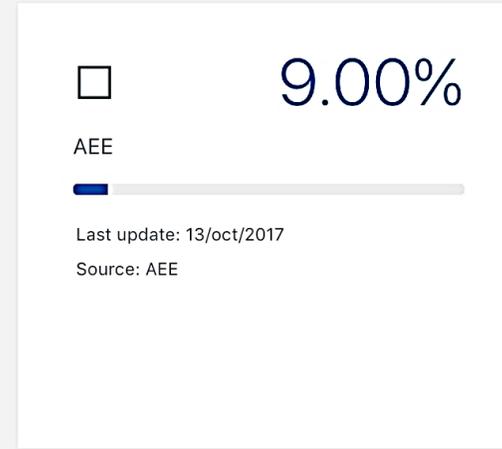
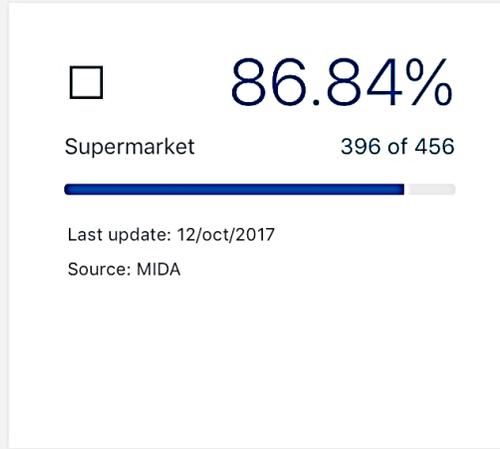
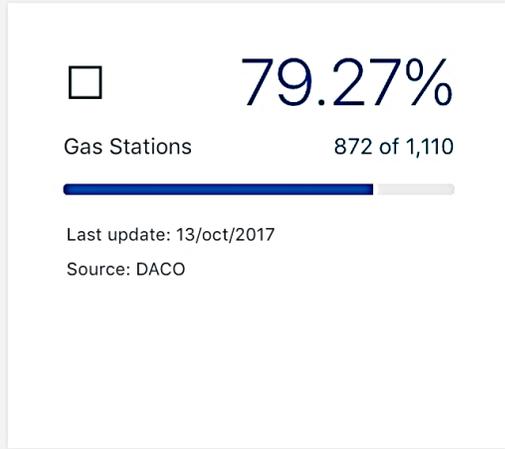


20

N

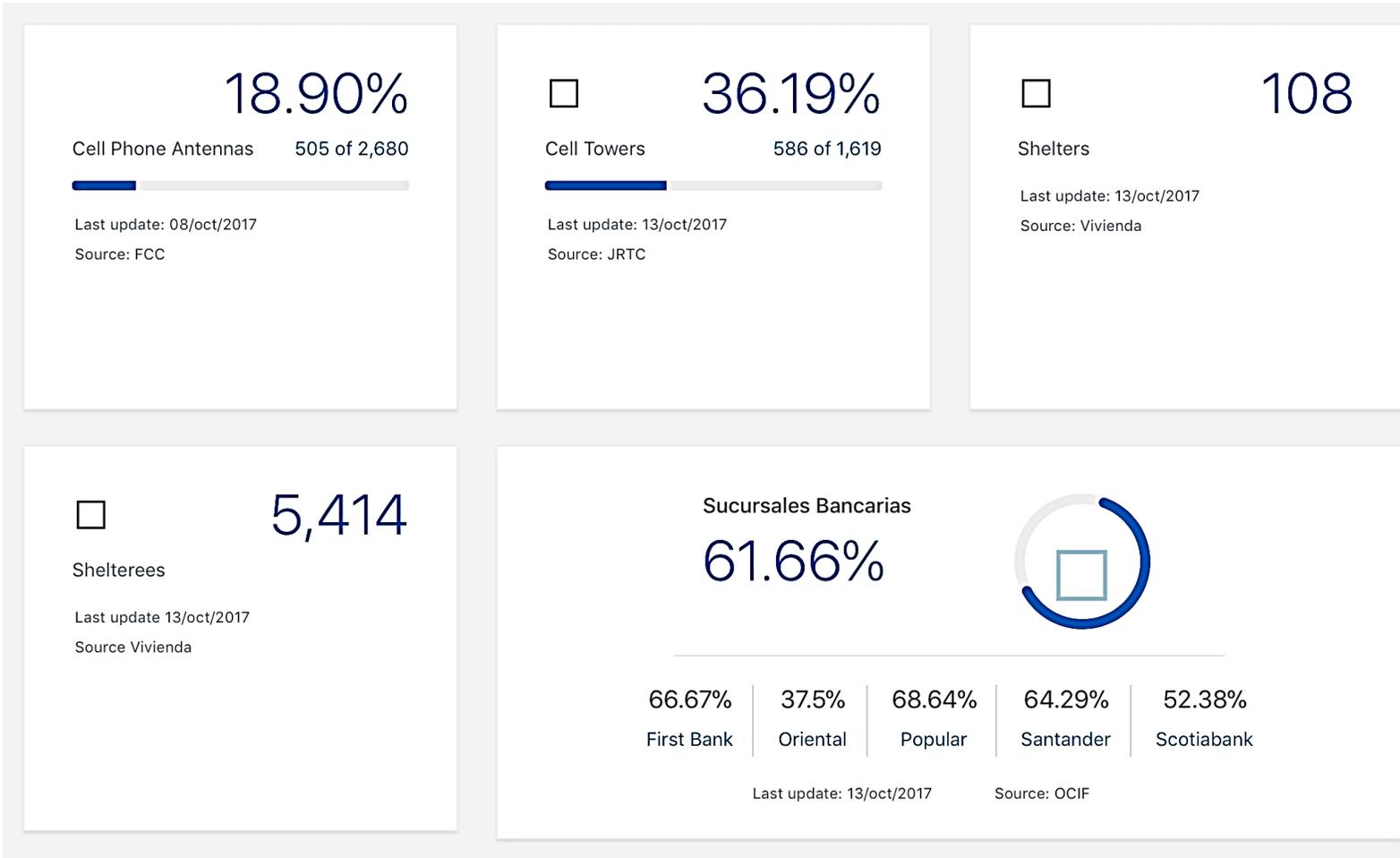


Where are we now?





Where are we now?





Lessons learned

1. Require essential facilities to have 1 week diesel reserve.
2. Develop underground communication network.
3. Increase PR Code wind design speed to 175 mph
4. Increase PR Code wind design speed to power and communications facilities to 200 mph.
5. Require ductility in Concrete Power Poles.
6. Develop a certification program for windows, doors and facades similar to Miami-Dade County.
7. Require emergency generators in water pumping stations with a minimum 1 week diesel reserve.
8. Eradicate informal housing construction by providing strict inspection of all types and budget housing const.

