FEMA AND NOAA

ADVANCEMENTS ACHIEVED DURING 2017 HURRICANE SEASON

FEMA

April 4, 2018

Unprecedented 2017 Hurricane Season

2 First time 2 Atlantic Category 4 **Hurricanes** (Harvey and Irma) made landfall in the continental U.S. in the same year.

Hurricane Harvey grew from a regenerated tropical depression to a Category 4 hurricane in **56 hours.**

Harvey set a new record for the most rainfall from a U.S. tropical cyclone, with more than **50" of rain** and remained a cyclone for nearly 5 days after landfall.

Hurricane Irma became the strongest Atlantic Ocean hurricane on record with winds peaking **over 185mph and remained a hurricane for 11 days.**

Hurricane Irma was **500 miles wide**, more than **130 miles wider than the entire state of Florida.**
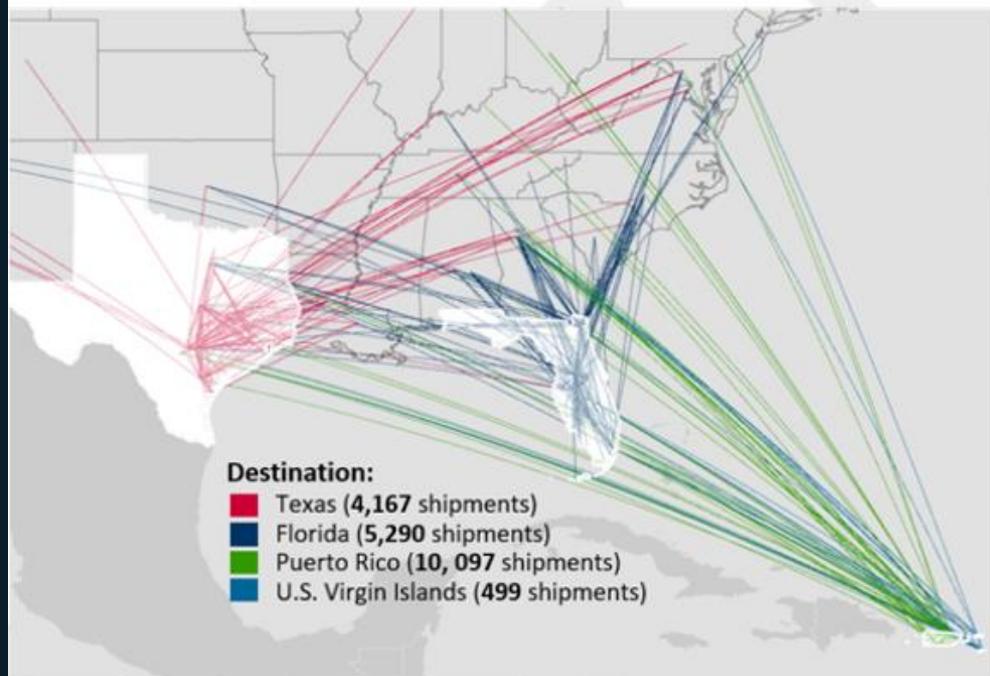
Hurricane Maria was the **First Category 4 hurricane in 85 years** to make landfall on the main island of Puerto Rico.

Over 700 generators installed in Puerto Rico by the USACE.

FEMA-Sourced Commodity Shipments

Destination:
- ▮ Texas (**4,167** shipments)
- ▮ Florida (**5,290** shipments)
- ▮ Puerto Rico (**10, 097** shipments)
- ▮ U.S. Virgin Islands (**499** shipments)

Disaster	Number of Inspections
Katrina	1,385,329
Rita	623,635
Wilma	439,081
Sandy	343,003
Harvey	627,930
Irma	1,073,658
Maria	810,847

Costliest Billion-Dollar Hurricanes On Record

$265 Billion
2017 (Harvey, Irma, Maria)

$209.7 Billion
2005 (Katrina, Rita, Wilma)

$71 Billion
2012 (Sandy)

FEMA By The Numbers

10 — GEOGRAPHIC REGIONS OVER 54 STATES AND TERRITORIES

21,238 — TOTAL FEMA STAFF

5M — NFIP POLICIES

$1.3T — EXPOSURE

$14.9B — FY18 BUDGET

$16.5B — DRF OBLIGATIONS

17 — JFO's OPEN IN 14 STATES

16 — FIRE MANAGEMENET ASSISTANCE GRANTS (FMAG) (AS OF JAN 18, 2018)
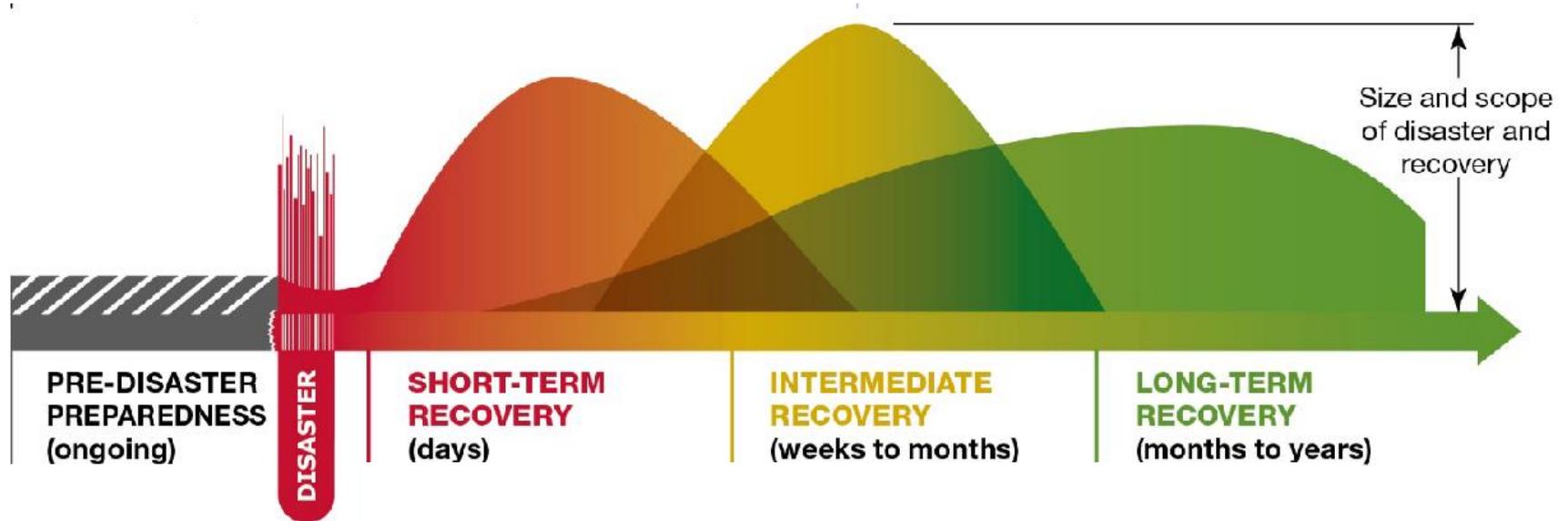
20 — CURRENT FED DISASTER DECLARATIONS (AS OF JAN 18, 2018)

Challenges, Innovation, the Way Forward

Geospatial Analysis Informs Decisions throughout the Disaster Lifecycle

Size and scope of disaster and recovery

PRE-DISASTER PREPAREDNESS (ongoing)

DISASTER

SHORT-TERM RECOVERY (days)

INTERMEDIATE RECOVERY (weeks to months)

LONG-TERM RECOVERY (months to years)

Geospatial analysis is typically delivered within days. Conventional approaches (e.g., site inspections) may take months

- Expedited rental assistance
- Help determine where to deploy Survivor Assistance teams
- Help determine where to locate Disaster Recovery Centers
- Help to allocate shelter and resource needs
- Prioritize and expedite debris removal
- May assist in the Presidential declaration process
- Force allocations and right-sizing

FEMA
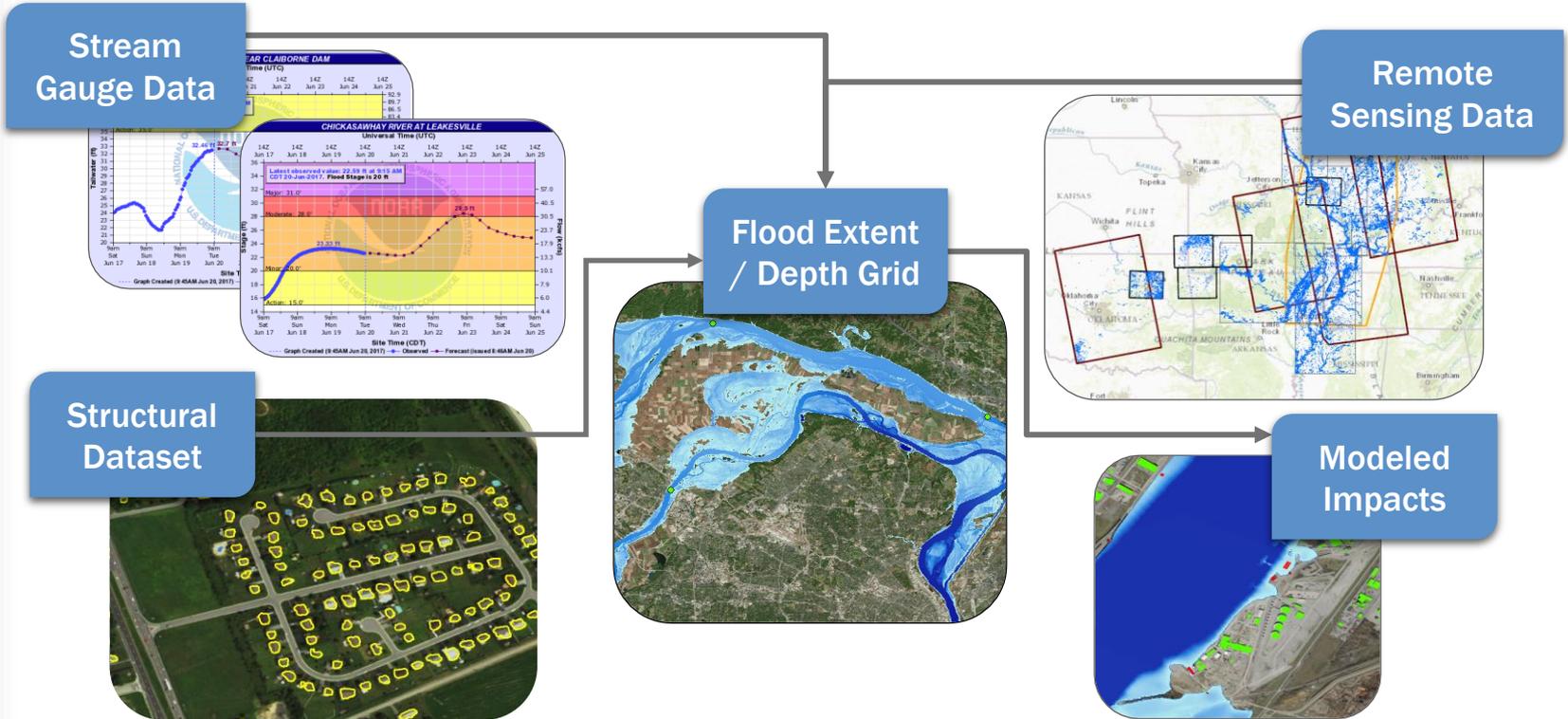
Hurricane 2017 Disaster Cycle
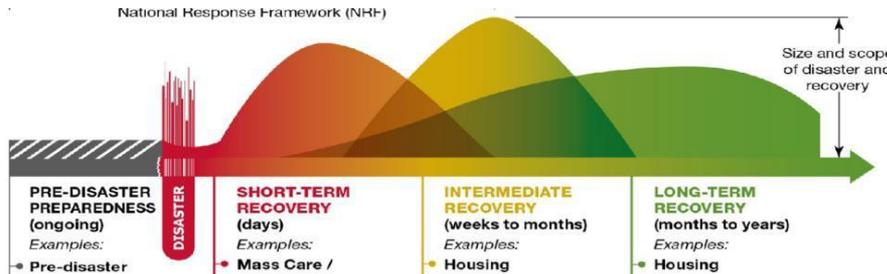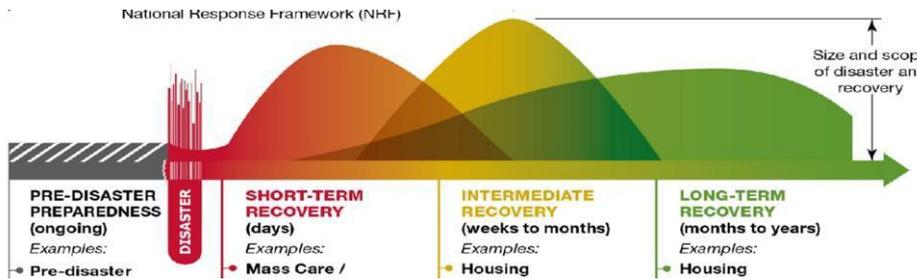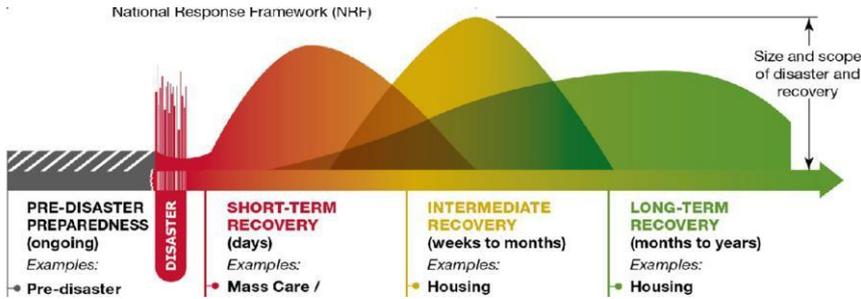
2017 Lessons : DAMAGE ASSESSMENTS

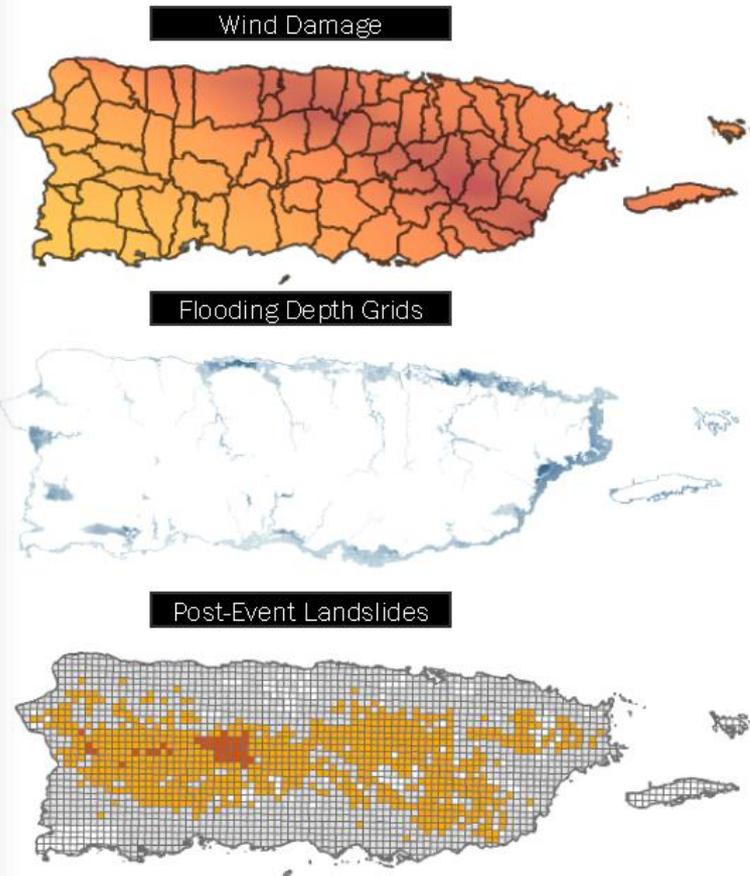## Modeling and imagery helps to determine level of damage
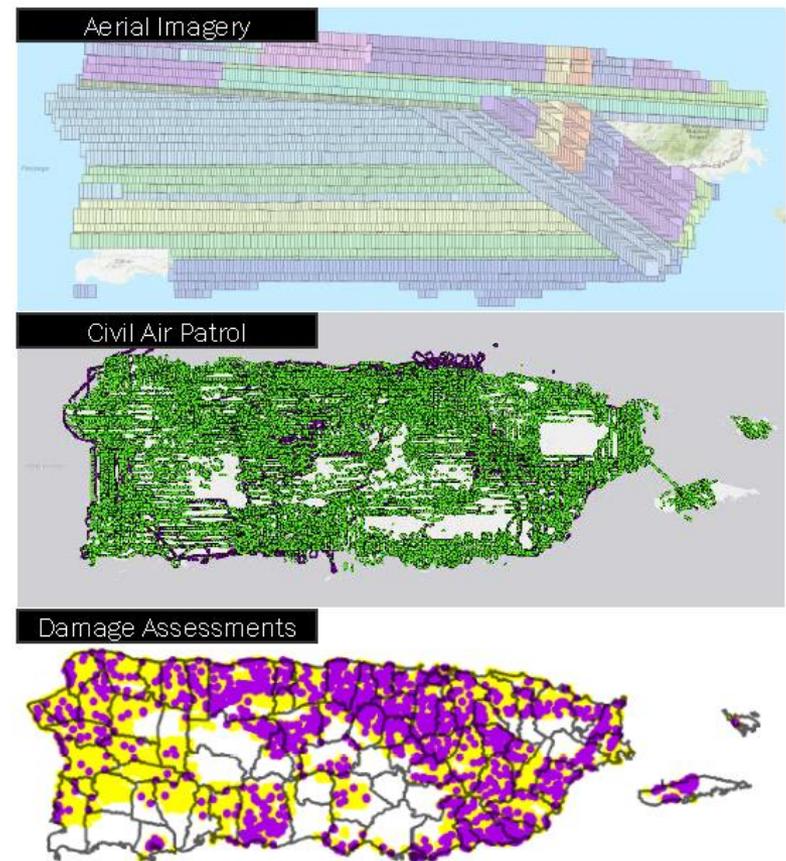
2017 Lessons : DATA ACCESSIBILITY

Data Accessibility
- Homeownership Records
- OCONUS population demographics and infrastructure

**Hazard-based Modeling and Observations**

Wind Damage

Flooding Depth Grids

Post-Event Landslides

Remote sensing-derived damaged assessments

Aerial Imagery
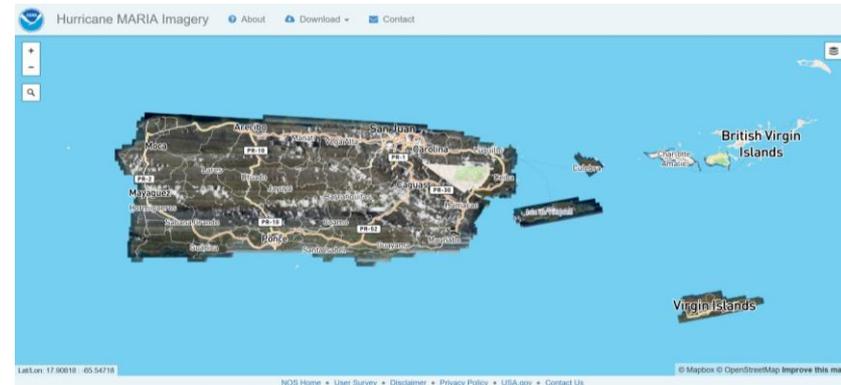
Civil Air Patrol

Damage Assessments

NOAA Aerial Imagery

- Provided support via FEMA Mission Assignment (MA)
- NOAA LNO @ NRCC
- Port and Airport status
- Hospital status
- Road Network analysis/route reconnaissance
- Housing analysis/ preliminary damage assessments
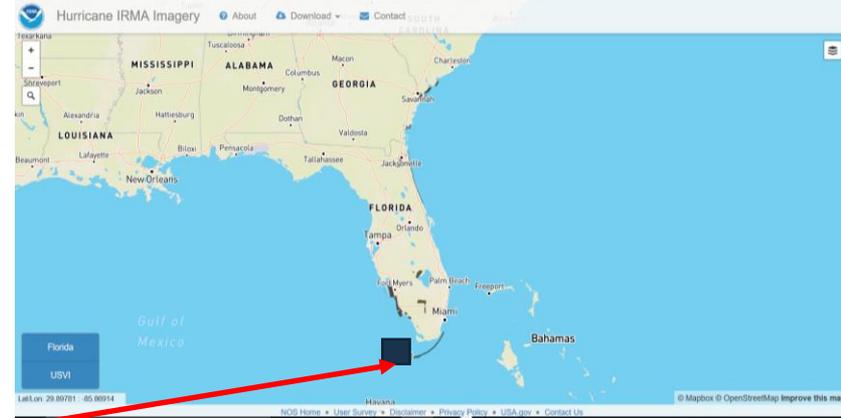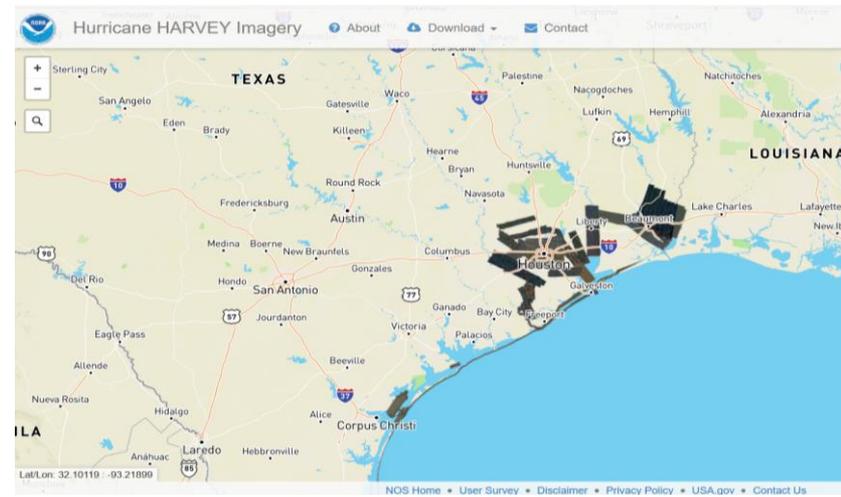- Debris estimates (future work)

Irma: Key West, FL
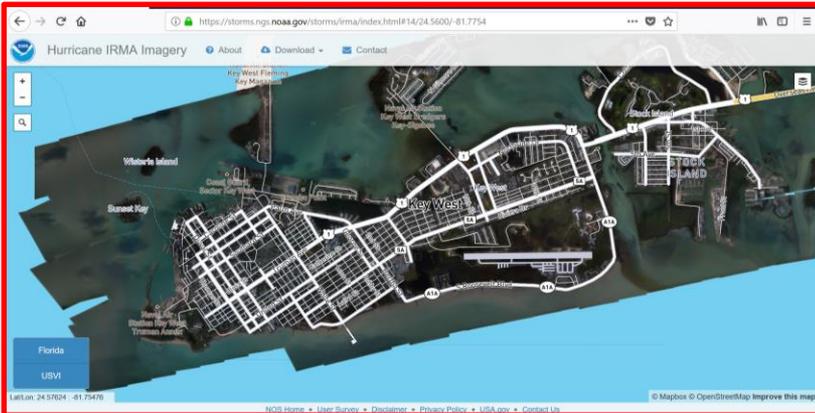
Harvey (Aug 26 – Sep 5)

Irma (Sep 10-17)

Maria (Sep 20-24)

2017 Lessons : SURGE MANPOWER

- Surge staffing from DoD, National Guard, other partner organizations
- Crowdsourcing Applications
- Openly sharing data and operational viewers
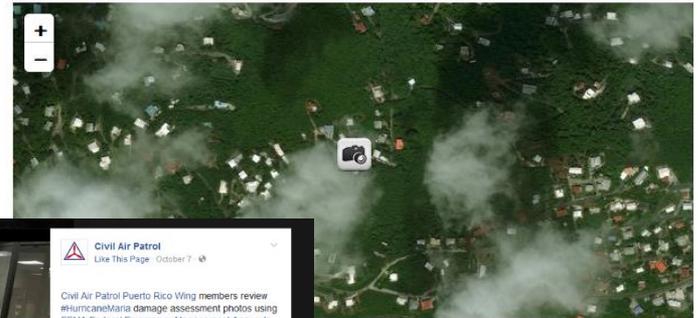
FEMA

Example: Road & Bridge Status with Hospitals Map

PR Road and Hospital Status - SBTF - FEMA Map (1709/1710)   Developed for FEMA by many many volunteers!

Legend

Roads DoD with SBTF Status (10/06/2017)
- ROADS CONTRACTED FOR REPAIRS
- ROADS REPAIR BY PUBLIC WORKS DEPT
- ROADS PARTIALLY OPENED (WORK IN PROGRESS)
- ROADS ALREADY IMPACTED AND OPENED TO TRAFFIC
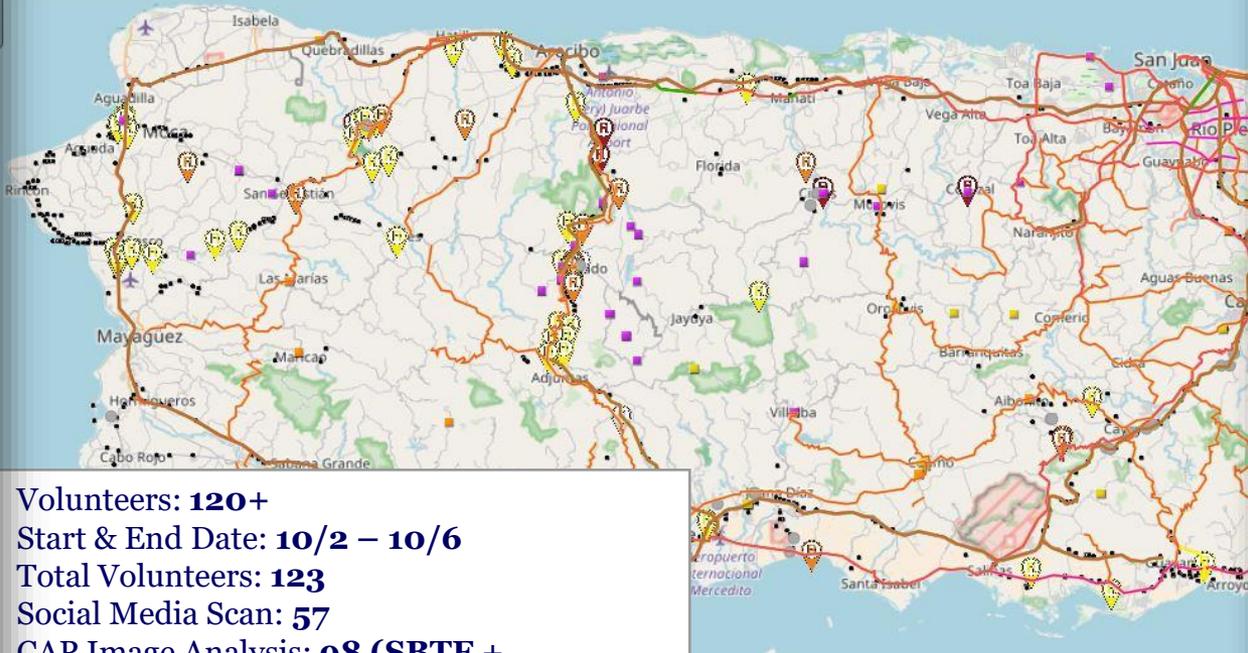- ROADS OPEN TO TRAFFIC
- UNDEFINED

1b. SBTF - Social Media Updates by Damage Type (Live Feed)
- Closed
- Partially Open
- Unknown

2a. Road Damage Type based on CAP Imagery (Live Feed)
- Destroyed
- Major
- Minor
- Damage
- others

3. CAP Imagery - SBTF Reviewed (Live Feed)

Volunteers: **120+**
Start & End Date: **10/2 – 10/6**
Total Volunteers: **123**
Social Media Scan: **57**
CAP Image Analysis: **98 (SBTF + GISCorps)**
Coordinators: **10**
Slack: **# standbytaskforce**

This has been used to compile all the road status data into a single, cross referenced map. Hospital, Road and CAP data are also included in this map and updated daily based on files supplied by FEMA, DoD and CAP respectively.

STANDBY TASK FORCE

http://bit.ly/SBTF-roads

Geospatial Damage Assessment Results and Outcomes

Hurricane Sandy

Expedited $130m in rental assistance to 44k applicants with 99% accuracy
130M

Analysis of NFIP policy exposure and loss potential was used to increase the borrowing limit by $9.7B

Initial damage assessments used to expedite rental assessments were delivered within 5 days of landfall
5

Hurricane Harvey

Modeled damage assessments helped expedited $16 million in rental assistance grants
16M

"Max Grants" were awarded for the first time based on geospatial damage assessments

Geospatial damage assessments were completed within days of landfall. "Traditional" assessments are ongoing.

Louisiana Floods

92% of claims were located inside the modeled flood extent, which was delivered within days of impact

>$10.5m in expedited rental assistance grants provided to >12,500 disaster survivors
10.5M

Geospatial damage assessments were completed within 5 days, where as traditional housing inspections took 73 days to complete
5

Hurricane Matthew

Statewide assessment delivered ~24hrs after landfall

For NC and SC, geospatial assessments were within 1'-2' of IA HWMs

In NC, geospatial damage assessments were 92% accurate and several months faster when compared to IHP referrals

# 2017 Lessons : Infrastructure Interdependencies

- Adapting to a lack of situational awareness across the 16 sectors
- Accounting for Sector capability shortfalls (e.g., lack of bandwidth)
- Accounting for Sector operational adjustments (e.g., work-arounds)
- Supporting resource prioritization
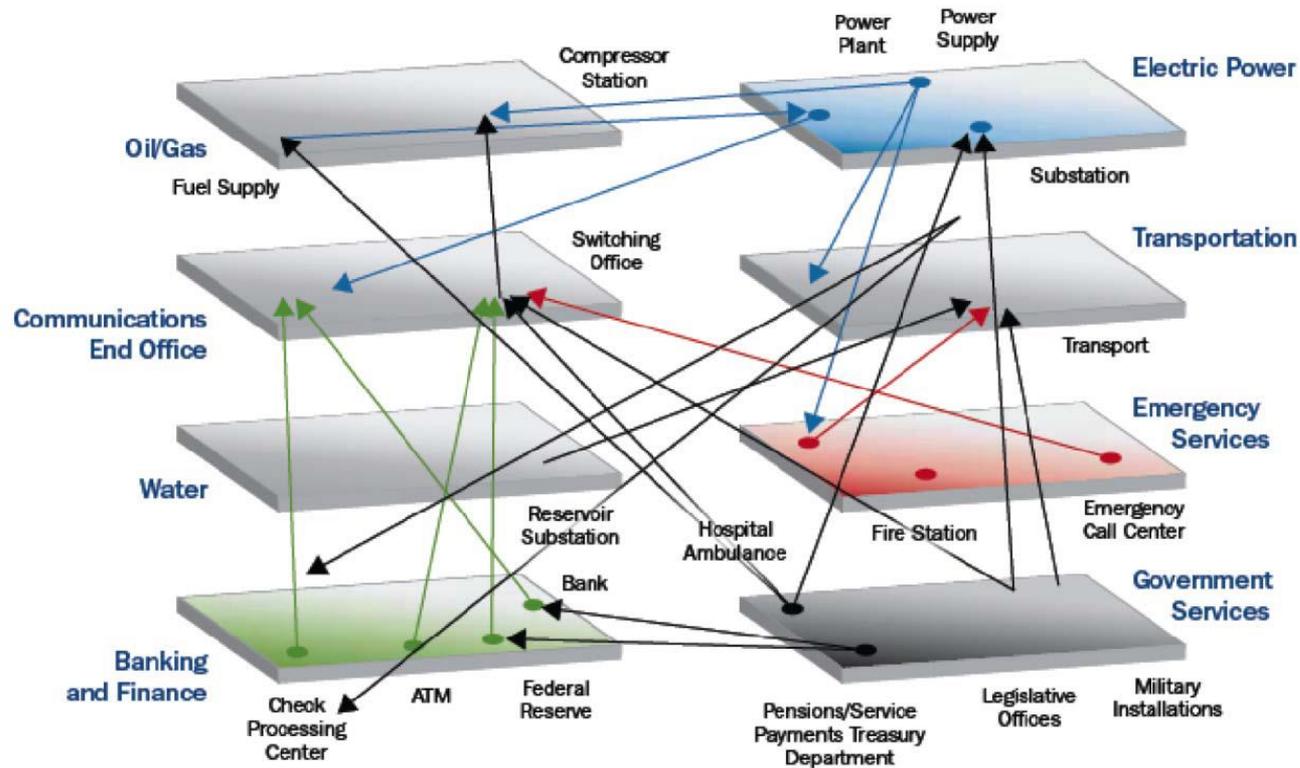
2017 Lessons : OPERATIONS SUPPORT

GIS is increasingly integrated in how we do business

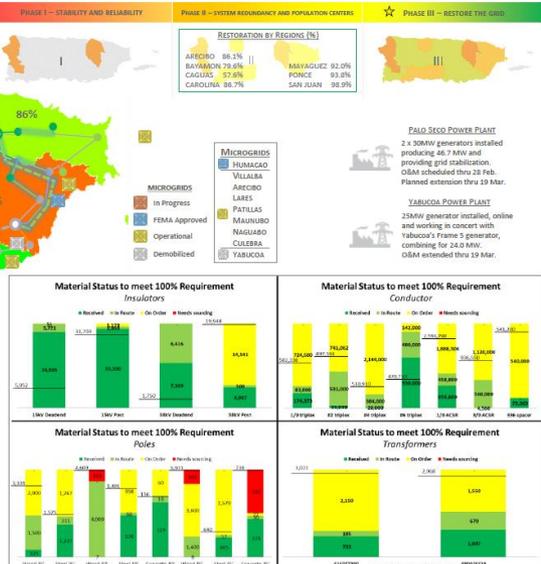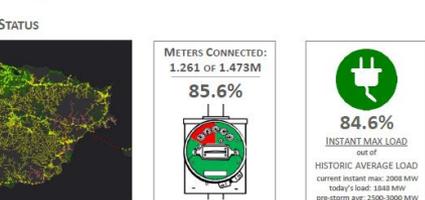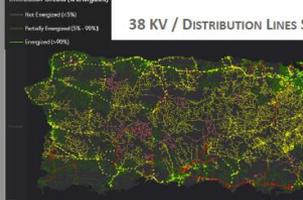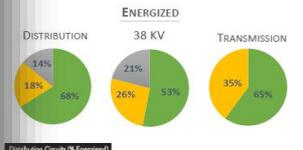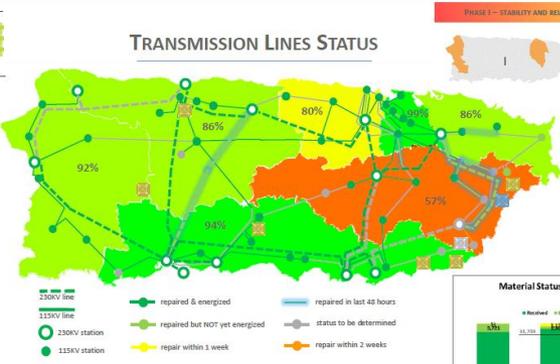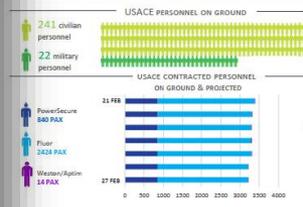Urban Search & Rescue, Disaster Survivor Assistance Teams, and Environmental Historic Preservation use mobile apps to track team movements and receive information in real time
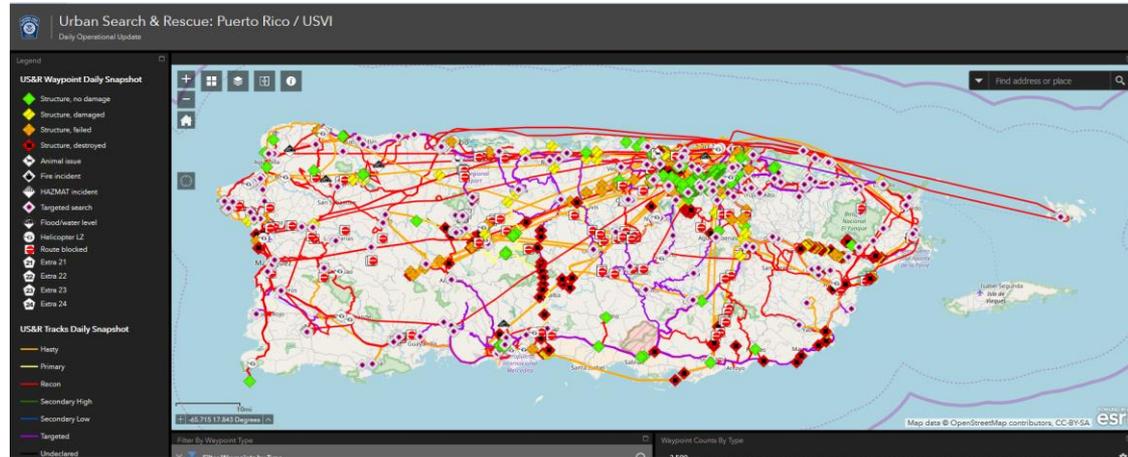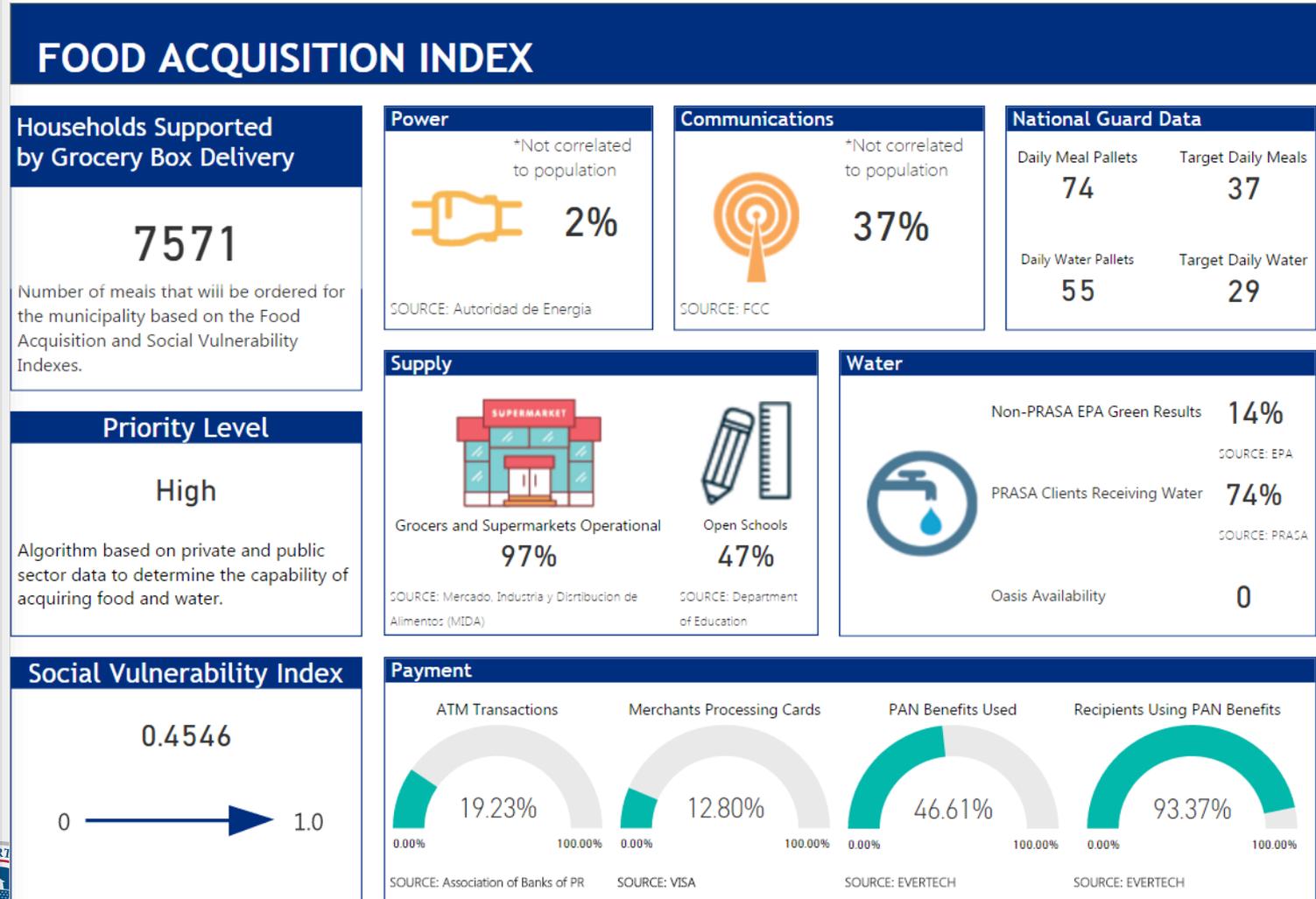

GIS-display of situational awareness and program effectiveness to senior leadership

2017 Lessons : Data Analysis and Integration

Informing the PR Feeding Mission through data from various sources

FOOD ACQUISITION INDEX

Households Supported by Grocery Box Delivery

7571

Number of meals that will be ordered for the municipality based on the Food Acquisition and Social Vulnerability Indexes.

Priority Level

High

Algorithm based on private and public sector data to determine the capability of acquiring food and water.

Social Vulnerability Index

0.4546

0 ———▶ 1.0

Power

*Not correlated to population

2%

SOURCE: Autoridad de Energia

Communications

*Not correlated to population

37%

SOURCE: FCC

National Guard Data

Daily Meal Pallets	Target Daily Meals
74	37

Daily Water Pallets	Target Daily Water
55	29

Supply

Grocers and Supermarkets Operational	Open Schools
97%	47%

SOURCE: Mercado, Industria y Distribucion de Alimentos (MIDA)

SOURCE: Department of Education

Water

Non-PRASA EPA Green Results **14%**

SOURCE: EPA

PRASA Clients Receiving Water **74%**

SOURCE: PRASA

Oasis Availability **0**

Payment

ATM Transactions	Merchants Processing Cards	PAN Benefits Used	Recipients Using PAN Benefits
19.23%	12.80%	46.61%	93.37%
0.00% — 100.00%	0.00% — 100.00%	0.00% — 100.00%	0.00% — 100.00%
SOURCE: Association of Banks of PR	SOURCE: VISA	SOURCE: EVERTECH	SOURCE: EVERTECH

- **Each box contains data from a different source (Federal/Commonwealth/Private sector)**
- **Significant data cleansing, deconfliction, and validation typically required**

Mission Priorities Going Forward

Predictive analytics on requirements

Affirming or adjusting the operational posture

Program speed through visualization and automation

Geospatial data and analysis informs decision-making, reduces duplication, and improves cost efficiency