National Aeronautics and Space Administration

Operational Application of Remote Sensing for Disaster Management

Data, applications, and strategies, for disaster risk reduction, response, and relief operations

July 2019

Overview

- **Part 1:** Who is PDC?
- **Part 2:** DisasterAWARE and application of Remote Sensing
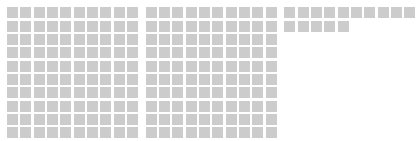- **Part 2:** Application of PDC's Risk Assessment Capabilities

Who is PDC?

More than 60

Staff and Industry Experts

200+

Partner Projects and Engagements

Over 65

Partner Countries
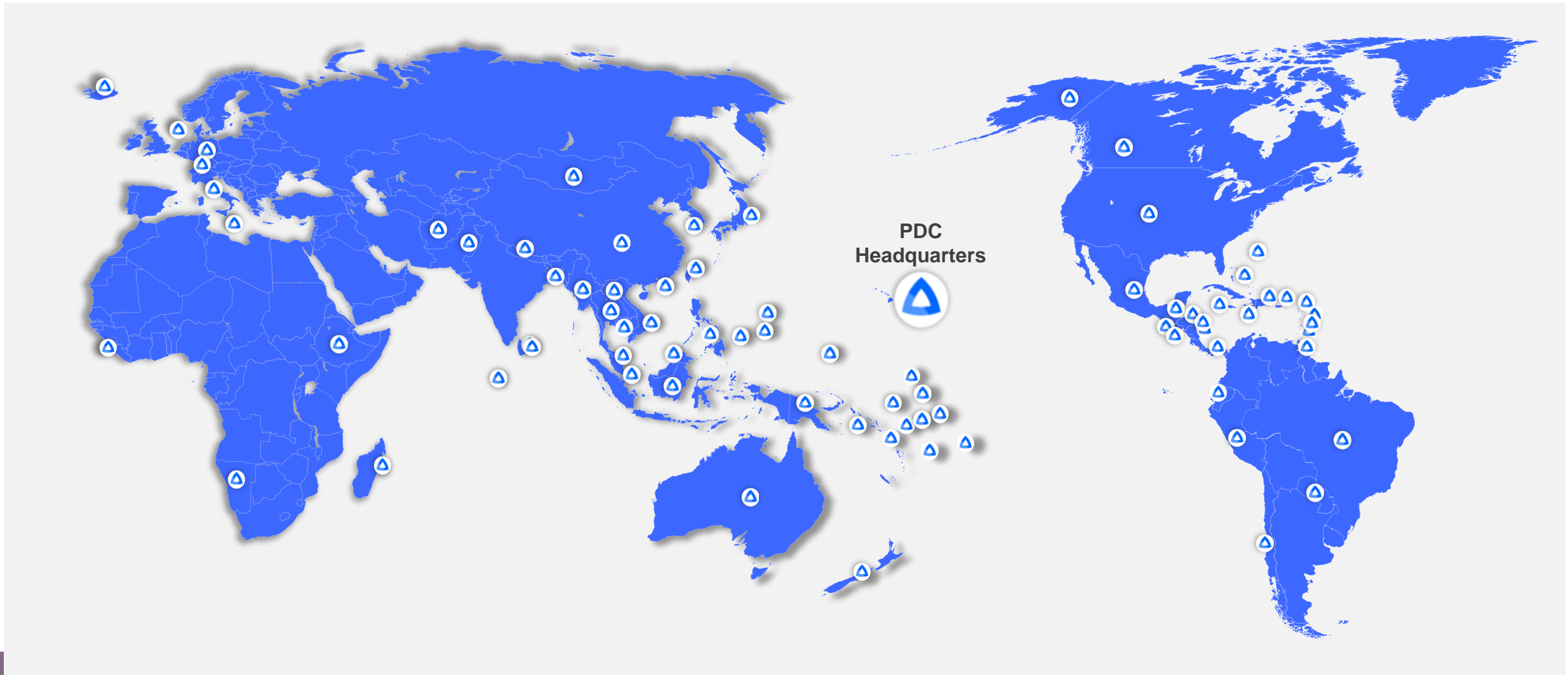
6 Global

Locations

Thousands

of Disasters

Managed by University of Hawaii

Since 2006

20

YEARS

OF SERVICE

Some of the Places We've Worked...

PDC Headquarters

Our Global Mission

To provide **evidence-based** research, applied science, information, and cutting-edge technology solutions for more effective disaster risk reduction (DRR) **policies**, **practices**, and humanitarian assistance and disaster relief (HA/DR) operations in the Asia Pacific region and beyond
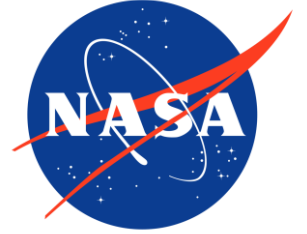
Who is Using Our Systems?

Our Partners at a Glance

We're working hand-in-hand with partners around the globe to reduce disaster risk, prevent losses, and protect the lives and livelihoods of millions of people

United States

- DoD – Pentagon
- COCOMs (PACOM, SOUTHCOM, NORTHCOM)
- White House (EOPUS)
- DHS / FEMA (R IX)
- NASA
- State Department (Global Ops Center, US Embassies, OFDA, USAID)
- Veterans Affairs
- National Guards (HI, RI, NY, NJ, OR…)
- State EOCs

Who is Using Our Systems?

Our Partners at a Glance

We're working hand-in-hand with partners around the globe to reduce disaster risk, prevent losses, and protect the lives and livelihoods of millions of people

1.7 Million Mobile Users Worldwide

Nations

- Indonesia
- Thailand
- Vietnam
- Philippines
- Bahamas
- Peru
- El Salvador
- Cambodia
- Myanmar
- Honduras
- Nicaragua
- Guatemala
- Dominican Republic
- Australia
- China
- Ecuador
- Brazil
- Fiji
- Palau
- Nepal
- Paraguay
- Japan
- Jamaica
- Bangladesh
- Haiti
- More…

International

- United Nations (IAEA, OCHA…)
- ASEAN (AHA Centre)
- CDEMA
- CEPREDENAC
- American Red Cross
- World Food Programme
- Salvation Army
- More…

Public

- International Community
- Friends, family, etc.

Making Information Meaningful

Unparalleled Access to Data

- Media
- Remotely Sensed
- Hazard Advisories
- Observations & Forecasts
- Satellite Imagery
- Historical Data
- GIS data
- Near Real-Time Alerts
- SitReps
- Infrastructure
- Video Feeds
- Statistical Exposure

Information & Insight

Modeling, Analysis, & Assessments

DisasterAWARE® data integration, visualization and mashups

Actionable Risk Intelligence

DECISION MAKERS

- Policymakers and elected officials
- Disaster managers
- Executives

DisasterAWARE Demo

https://www.youtube.com/watch?v=fA-0suStDBc

Need an Account?

Go to emops.pdc.org and select Request Access
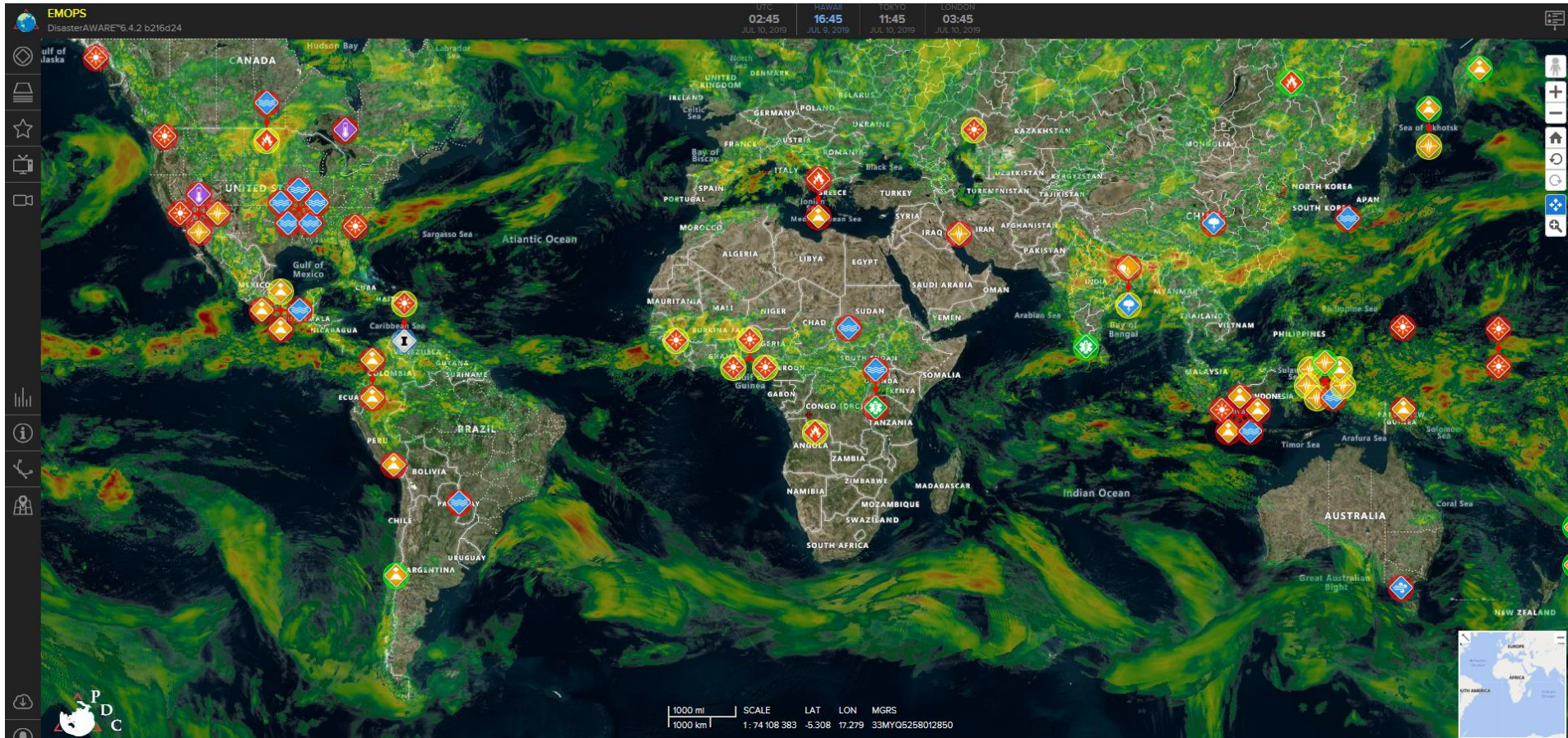
PDC Active Hazards and NASA IMERG

Application of Remotely Sensed Data

- Login to DisasterAWARE today to access data and products (4,000+ layers)

International Charter: Space and Major Disasters

- Worldwide collaboration, through which satellite data are made available for the benefit of disaster management
- PDC is a member and activation manager (e.g., Hurricane Matthew)
- PDC continues to collaborate with international space agencies and satellite data providers to supply remotely-sensed data and derived products in support of humanitarian assistance and disaster relief activities

https://disasterscharter.org/

Application of Remotely Sensed Data

Leverage NASA IMERG rainfall and Global Landslide Nowcast data for exposure analysis and derived products to inform decision-making
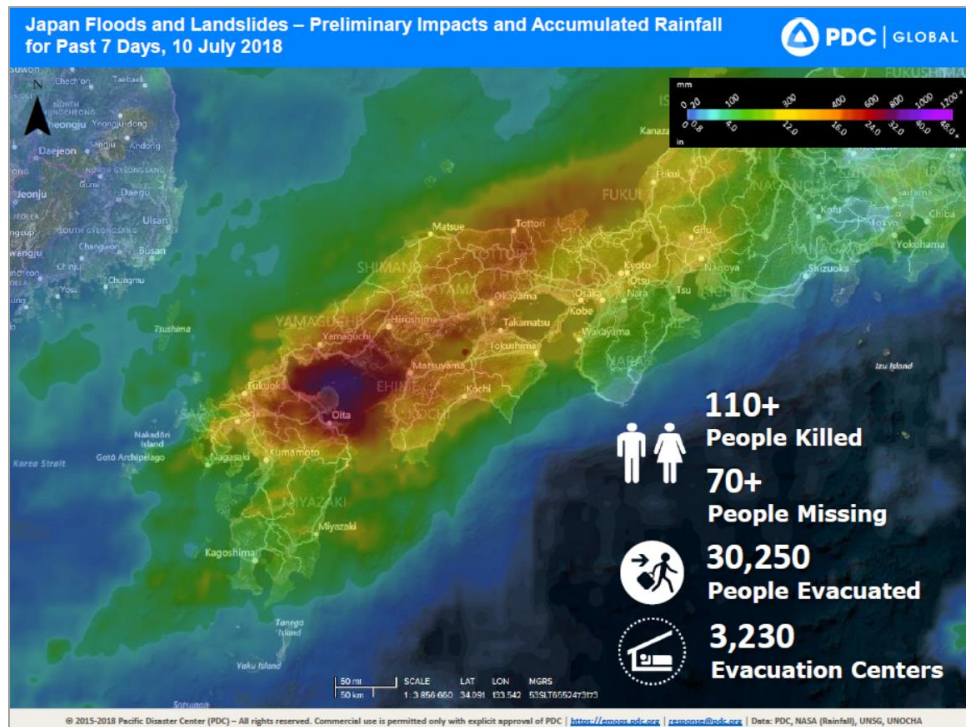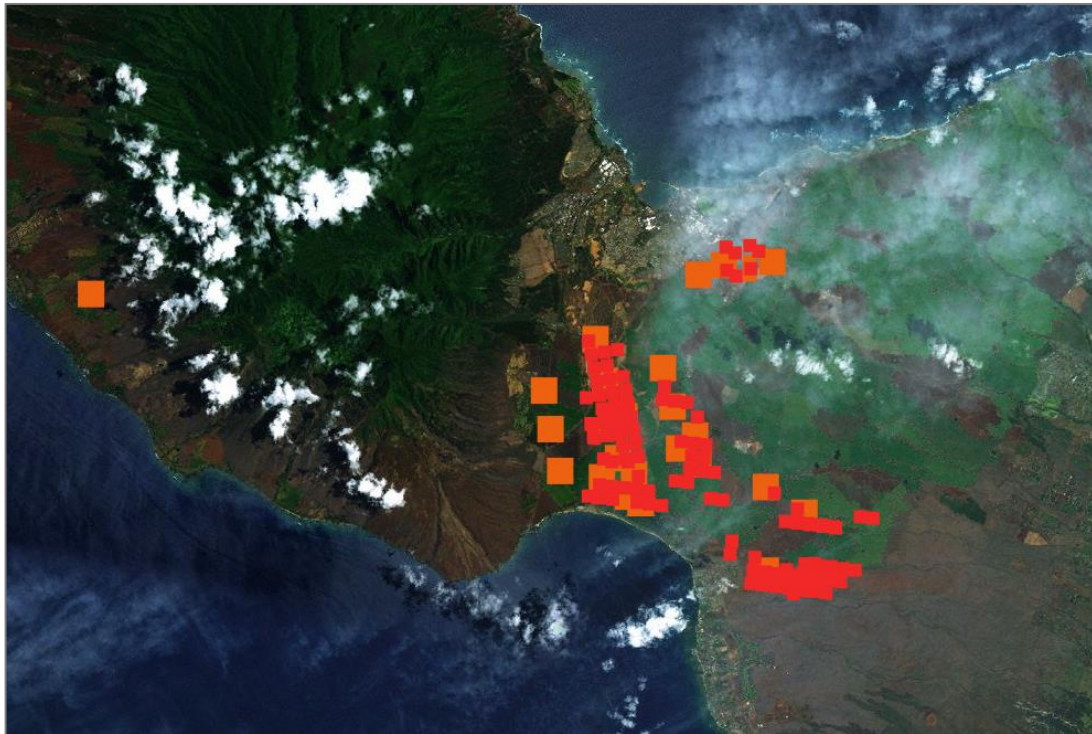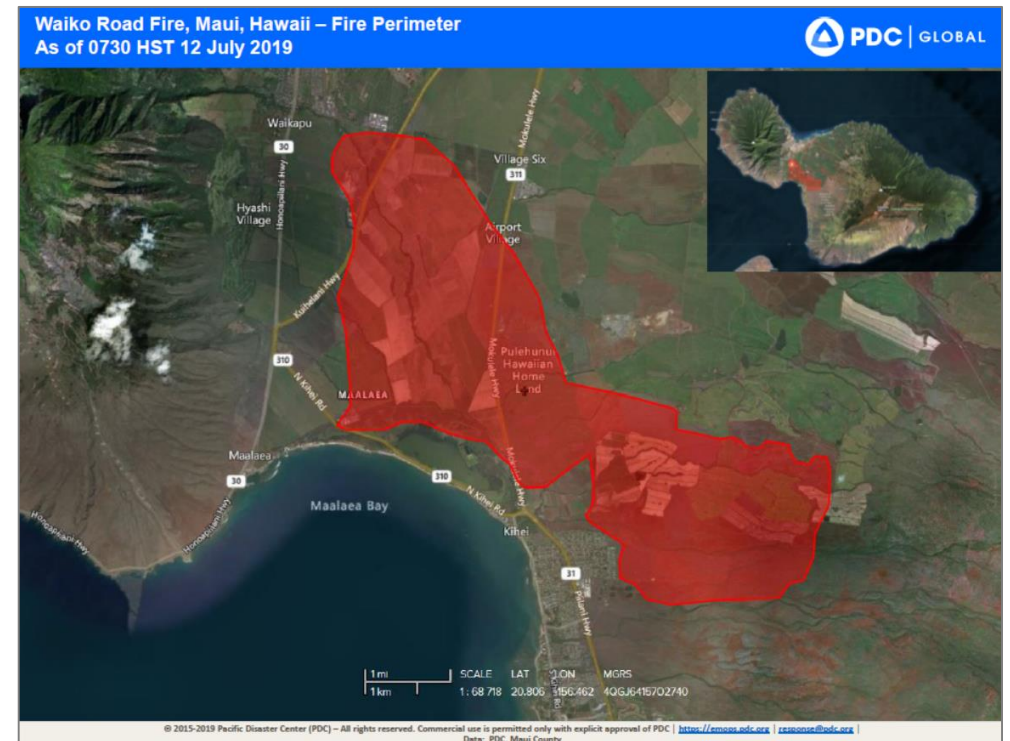

2018 SW Japan Floods
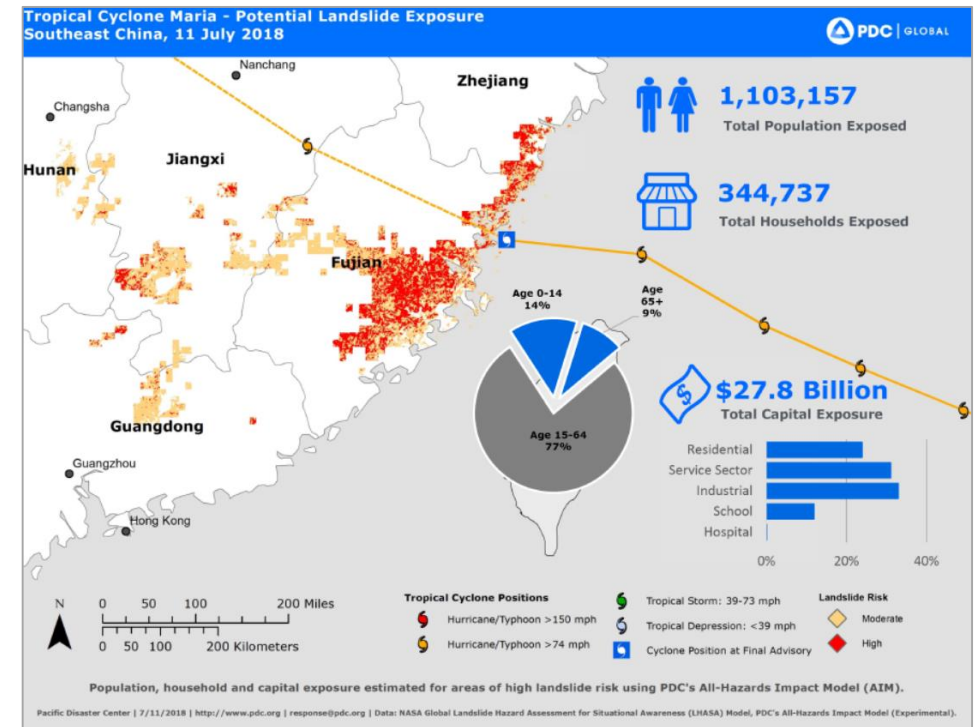
2018 Typhoon Maria Potential Landslide Exposure
(PDC All-Hazard Impact Model - AIM)

Application of Remotely Sensed Data

NASA FIRMS data leveraged between fly-over perimeter updates during the July 2019 Central Maui wildfires
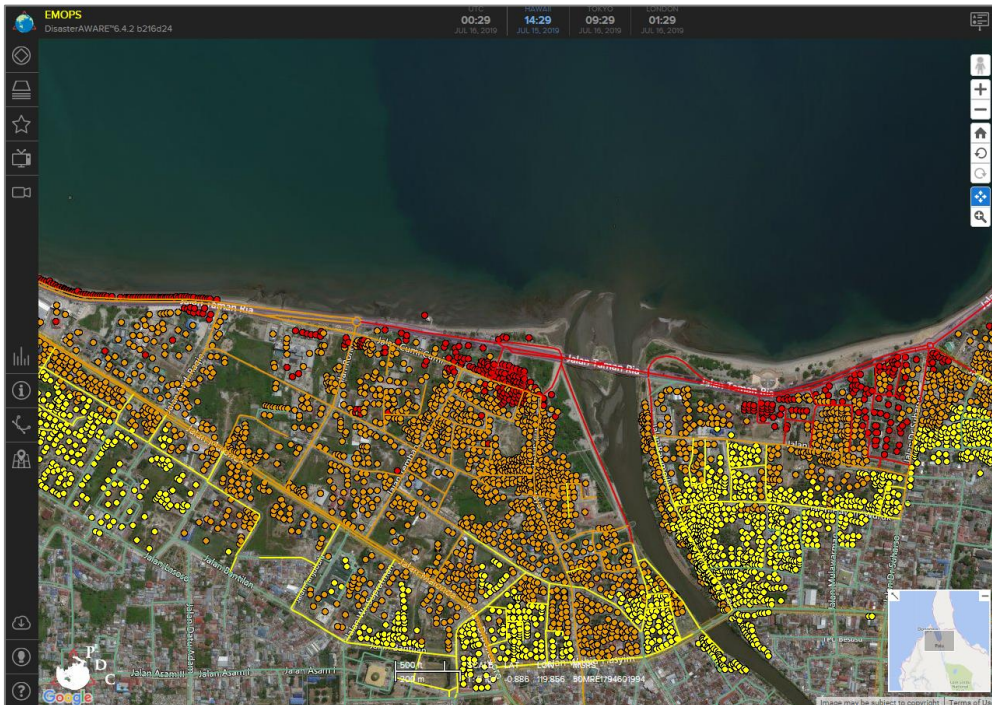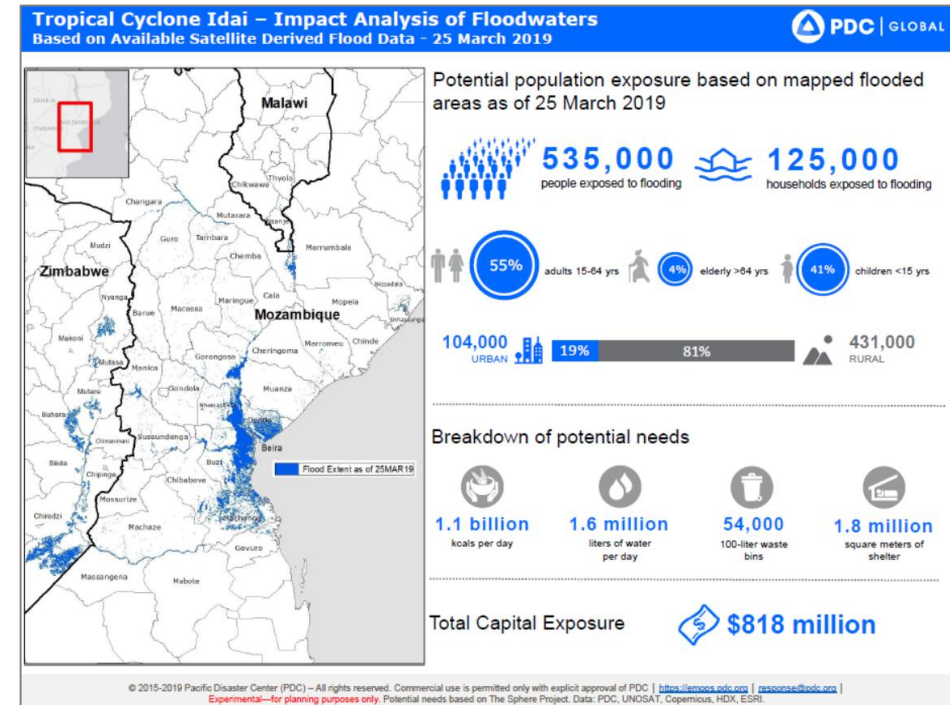

Remotely Sensed Fire Locations

Flyover-Based Perimeter

Application of Remotely Sensed Data

Preliminary impact and hazard zone observation data from PDC remote sensing partners incorporated into DisasterAWARE and products
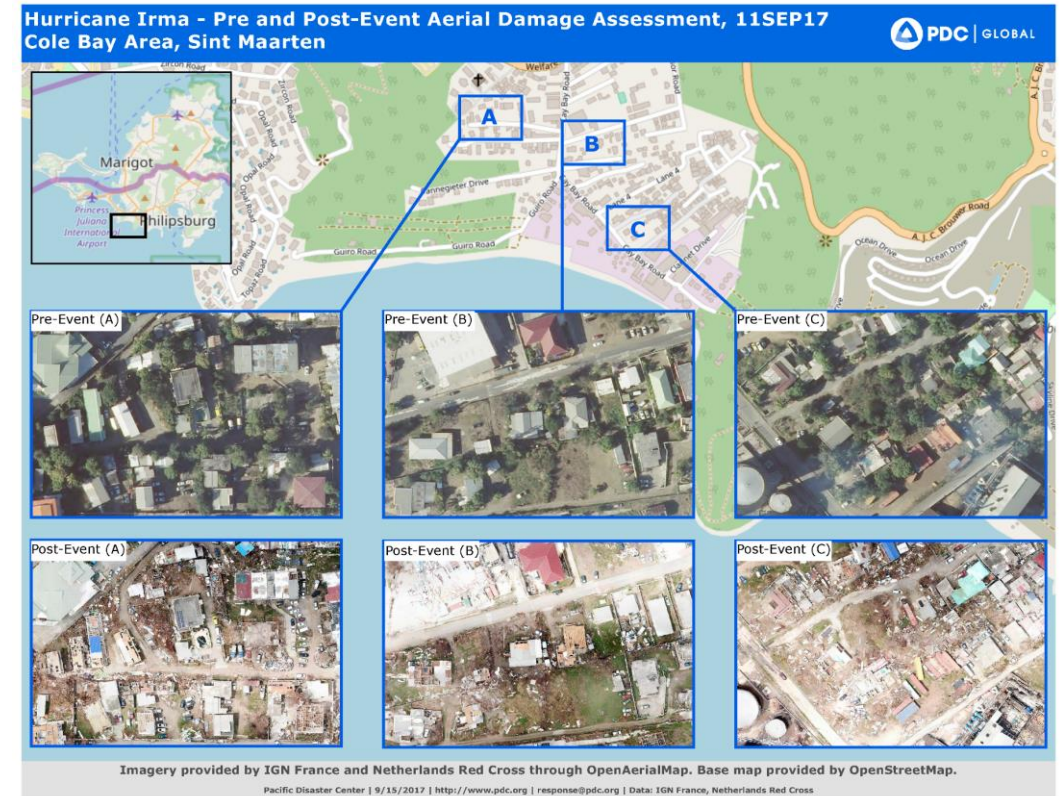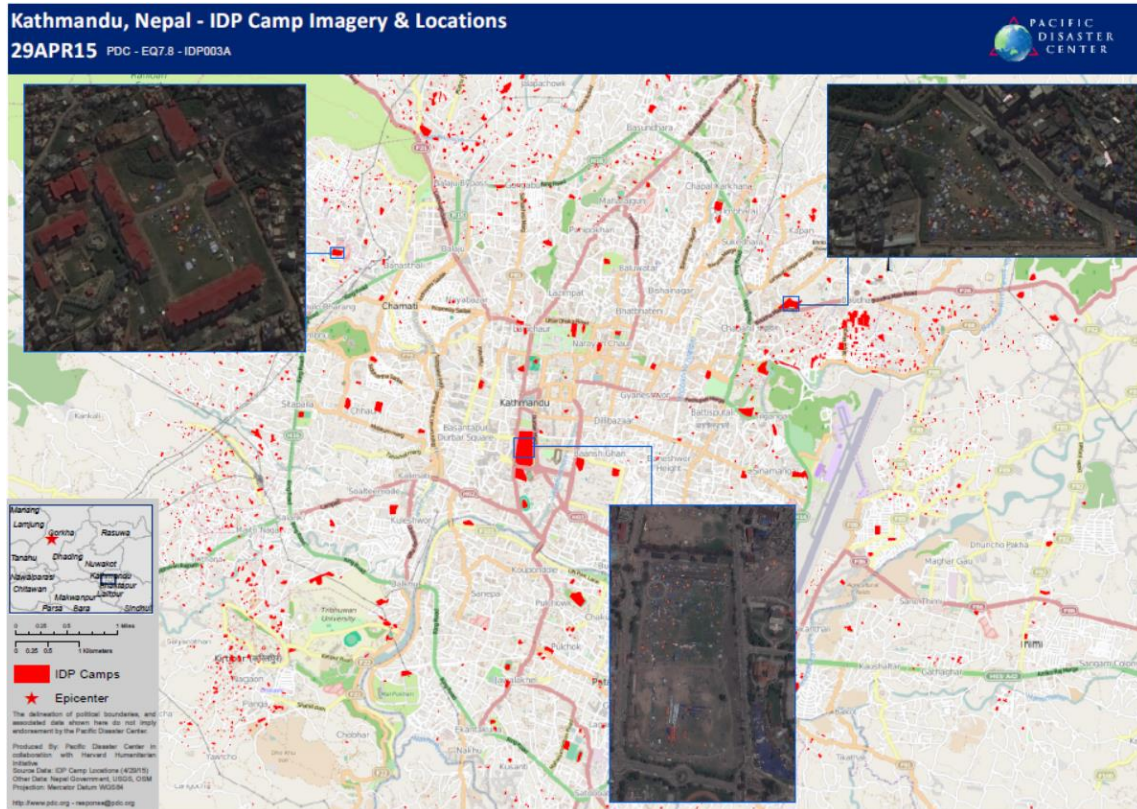

September 2018 M7.5 Earthquake
Sulawesi, Indonesia Damage
(Copernicus EMS & UNITAR)

PDC AIM Exposure modeling of March 2019
Tropical Cyclone Idai, leveraging Copernicus EMS
and UNOSAT Flood Observations

Application of Remotely Sensed Data

Visual pre- and post-impact imagery comparisons and analysis

2015 Nepal Earthquake IDP Camp Imagery and observed location

2017 Hurricane Irma Pre and Post Impact Comparison
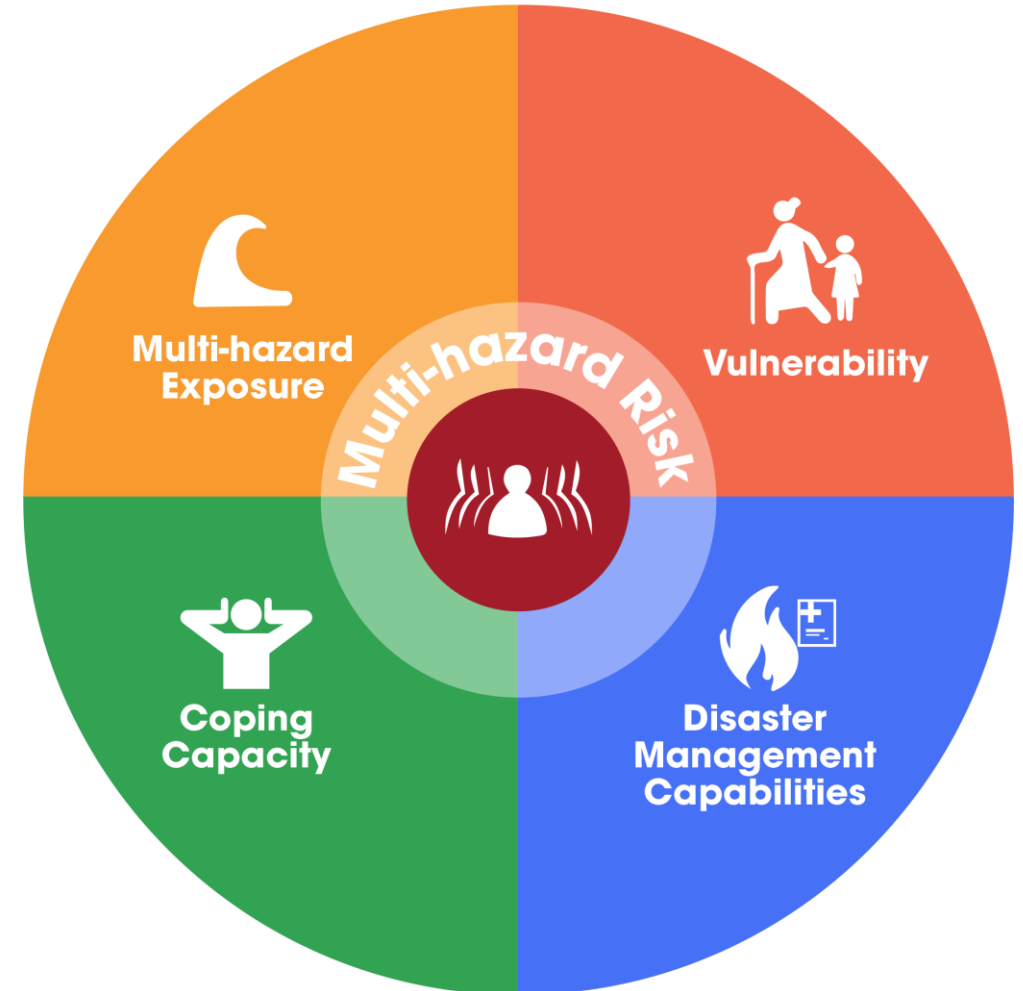
PDC's Risk and Vulnerability Assessment

Purpose

To estimate the likelihood of negative impacts given exposure to natural hazards

Helps to describe the characteristics that shape disaster risk

To provide foundation for future adaptation

COMPONENTS OF RISK

Multi-hazard Exposure

Vulnerability

Multi-hazard Risk

Coping Capacity

Disaster Management Capabilities

Why do we need Disaster Risk Assessments?

- First step in building resilience is to understand disaster risk*

- The results can be used to address disaster risk governance*

- The results can act as a guide for investment in disaster risk reduction for resilience*

- Helps decision makers understand all dimensions of risk

- Creates a foundation for collaboration between agencies

- Helps prioritize investments to reduce risk

- Identifies actions to increase resilience and save lives

*Modification of Sendai Priorities for Action. Source: UNDRR (UNISDR) - https://www.unisdr.org/we/coordinate/sendai-framework

PDC's RVA Framework: Composite Index

COMPONENTS OF RISK

Multi-hazard Risk
- Multi-hazard Exposure
- Vulnerability
- Coping Capacity
- Disaster Management Capabilities
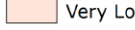
Subcomponents

- Population pressures
- Gender inequality
- Economic constraints
- Information access
- Clean water access
- Health status
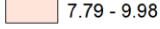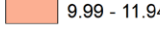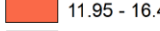- Environmental stress
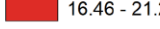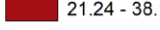- Conflict
- Recent disaster impact

Indicators
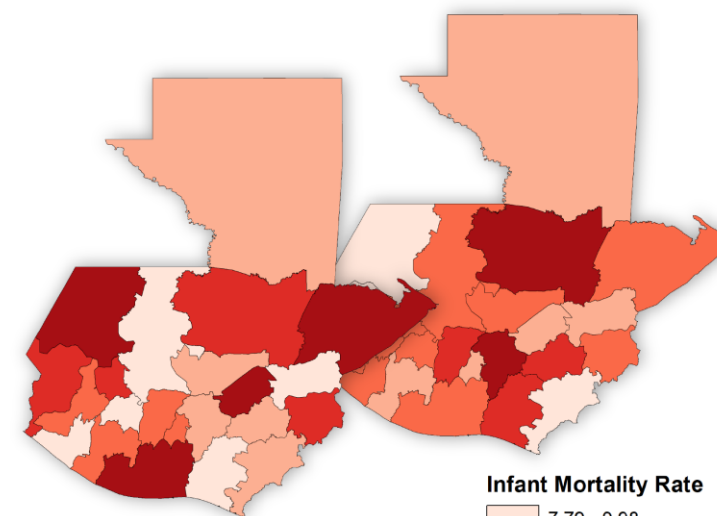
Maternal and Child Health Index
- Very Low
- Low
- Medium
- High
- Very High

Infant Mortality Rate
- 7.79 - 9.98
- 9.99 - 11.94
- 11.95 - 16.45
- 16.46 - 21.23
- 21.24 - 38.16

PDC | GLOBAL

Putting it All Together

Applying Results

Identifies Disaster Risk Reduction Priorities

Supports a culture of evidence-based decision making. Promotes dialogue between all disaster management stakeholders.

Assess Drivers of Risk

Identify which factors are potential drivers of risk or resilience.

Provides Baseline for Resource Distribution

Identify areas that may need additional support before, during, and after hazard events.

DisasterAWARE (EMOPS) And RVA

- Can be utilized for both planning and response
- RVA provides an assessment of risk
- Together these elements provide a powerful tool for disaster risk management
- Each reinforces the other and supplements areas of limitations
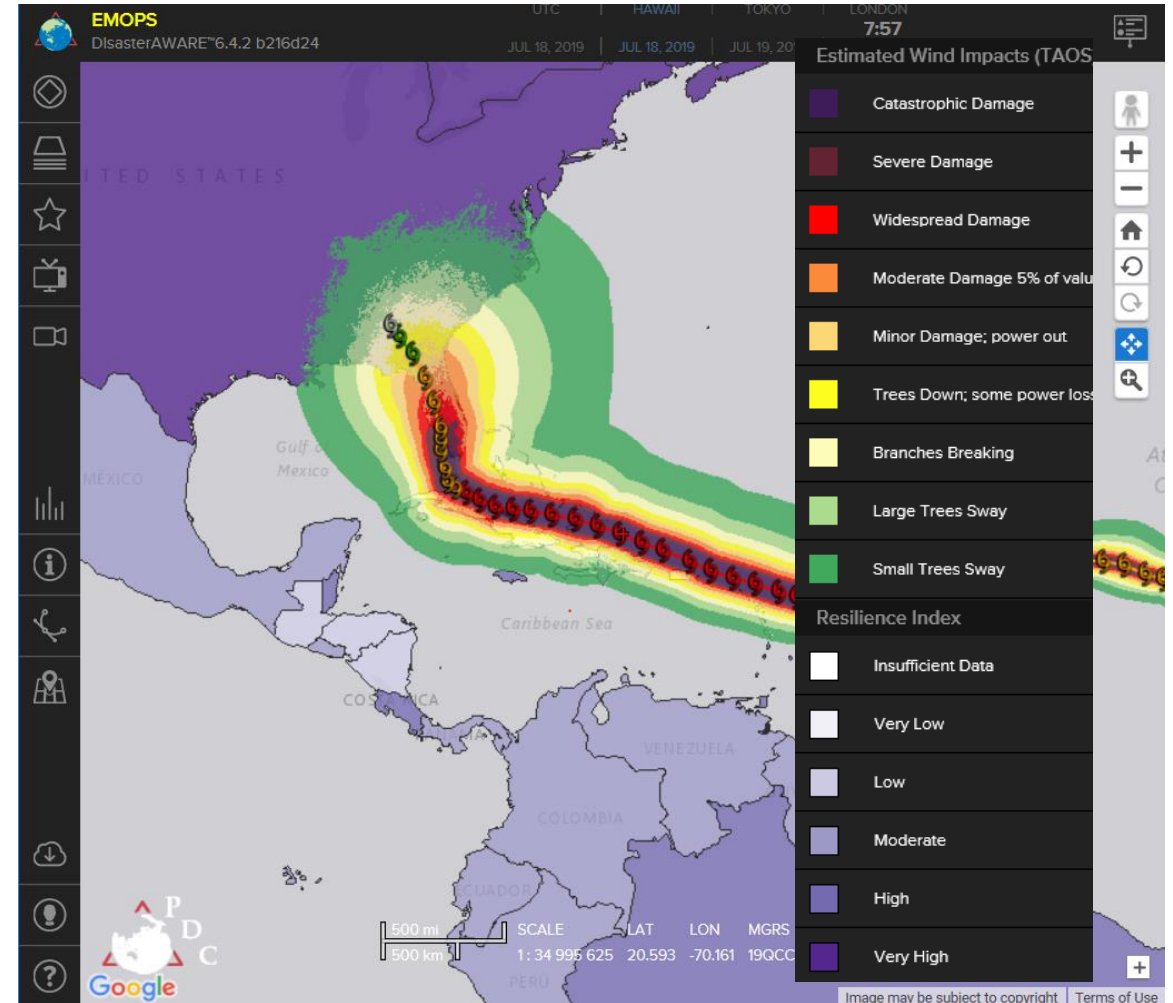
Example (PDC DisasterAWARE): Hurricane Irma modeled wind impacts and PDC RVA Resilience data (country-level).

DisasterAWARE & RVA

Global RVA vs NDPBA (Subnational Risk Assessment)

- **Global** – Valid for country-to-country comparisons. Variables are selected based on conceptual match and global data availability

- **Subnational** – Valid for within country comparisons (Admin 1 or lower). Variables are selected based on conceptual match and country-specific context.
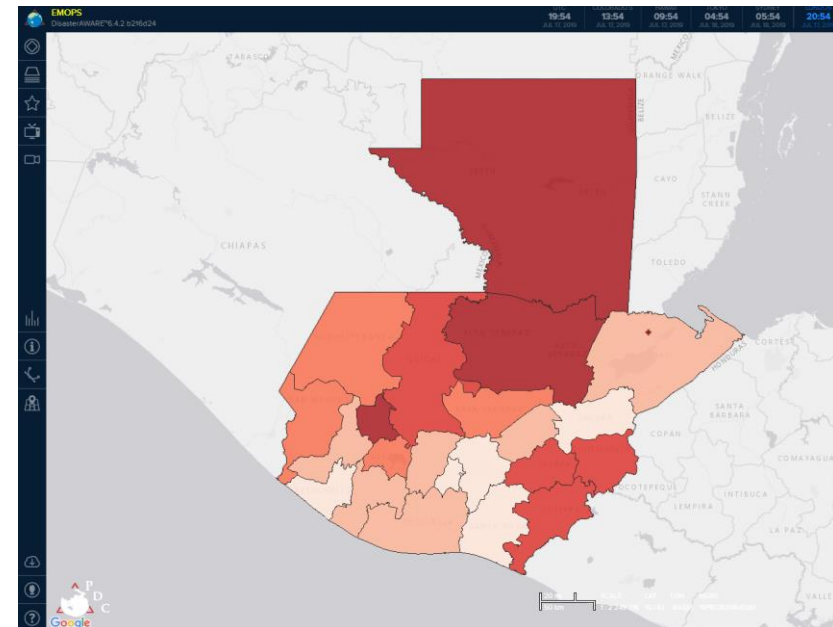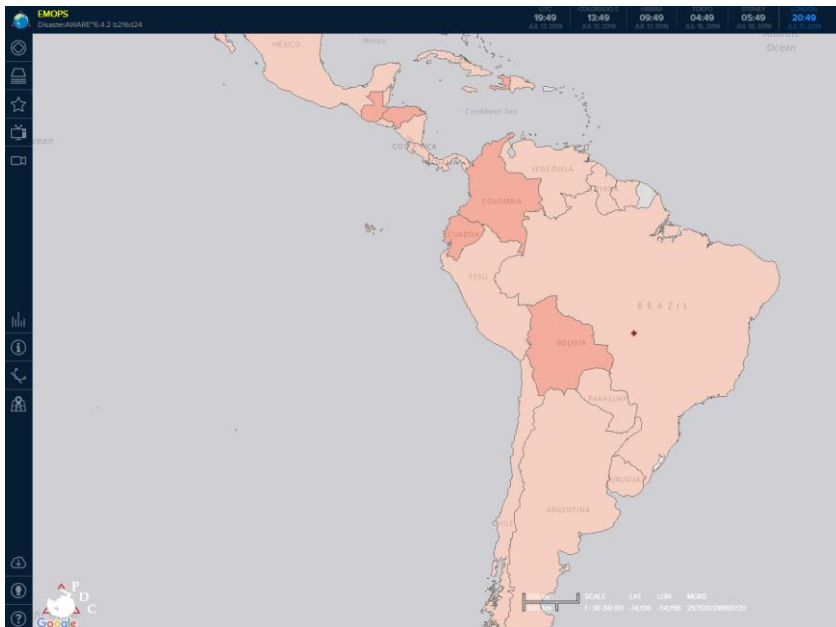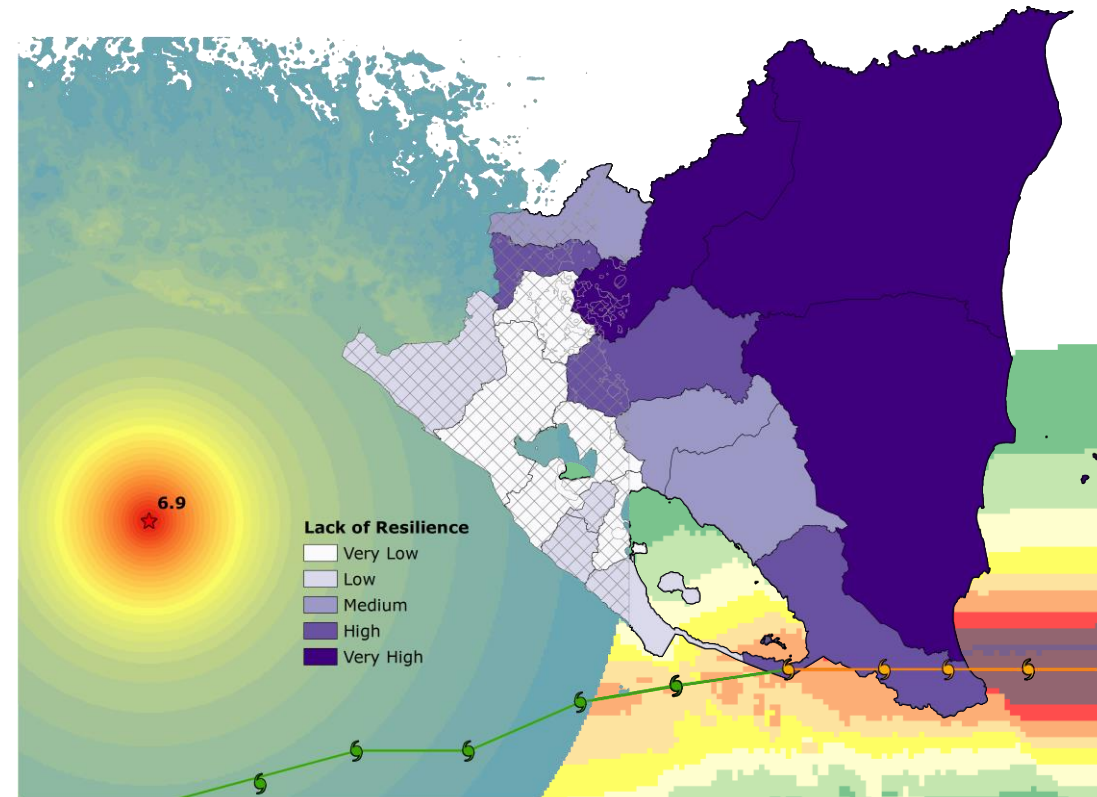
Resilience

In November 2016, Hurricane Otto formed in the Caribbean and threatened Nicaragua. By Nov 23 it had strengthened to a Category 3 storm.

PDC had completed a subnational risk assessment as part of our ongoing NDPBA project. - The data and analysis compiled for Nicaragua was used for planning and prioritization of resources.
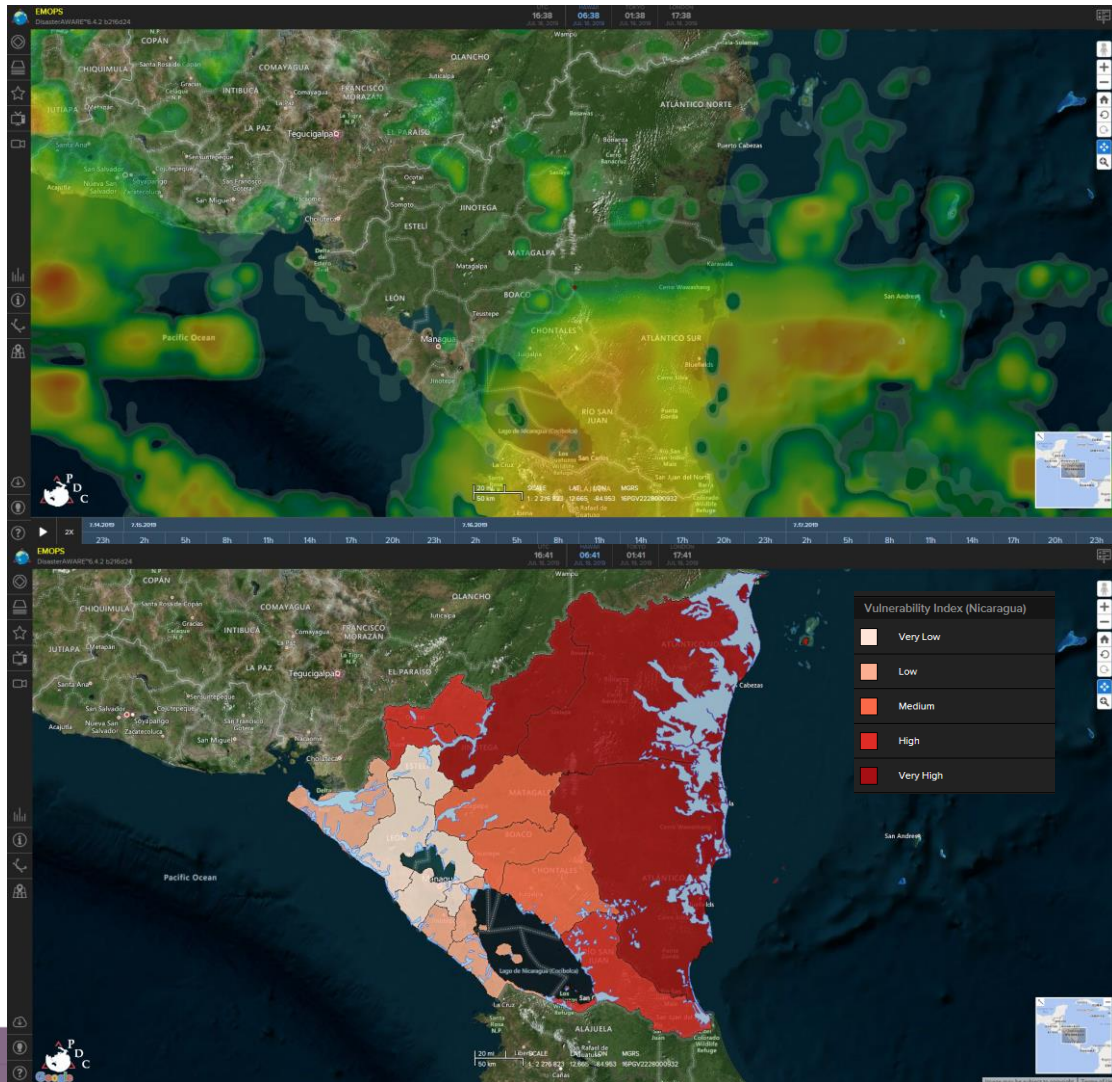
Otto made landfall on the 23 of Nov. A magnitude 6.9 earthquake struck offshore on 24th of November.

The RVA analysis proved to be a useful tool for prioritization of resources during this unprecedented series of event.

Applying Results

Lack of Resilience
- Very Low
- Low
- Medium
- High
- Very High

Response support: RVA

RVA data can provide rapid assessment of resilience for potentially impacted areas.

Combined with remotely sensed data, a more focused picture emerges.
- Where are resources most likely needed?
- What region will likely suffer disruptions?

Example (PDC DisasterAWARE): Leveraging NASA IMERG Rainfall observations (above) and PDC Subnational RVA layers (below) to assess current, potential flood risk in Nicaragua.
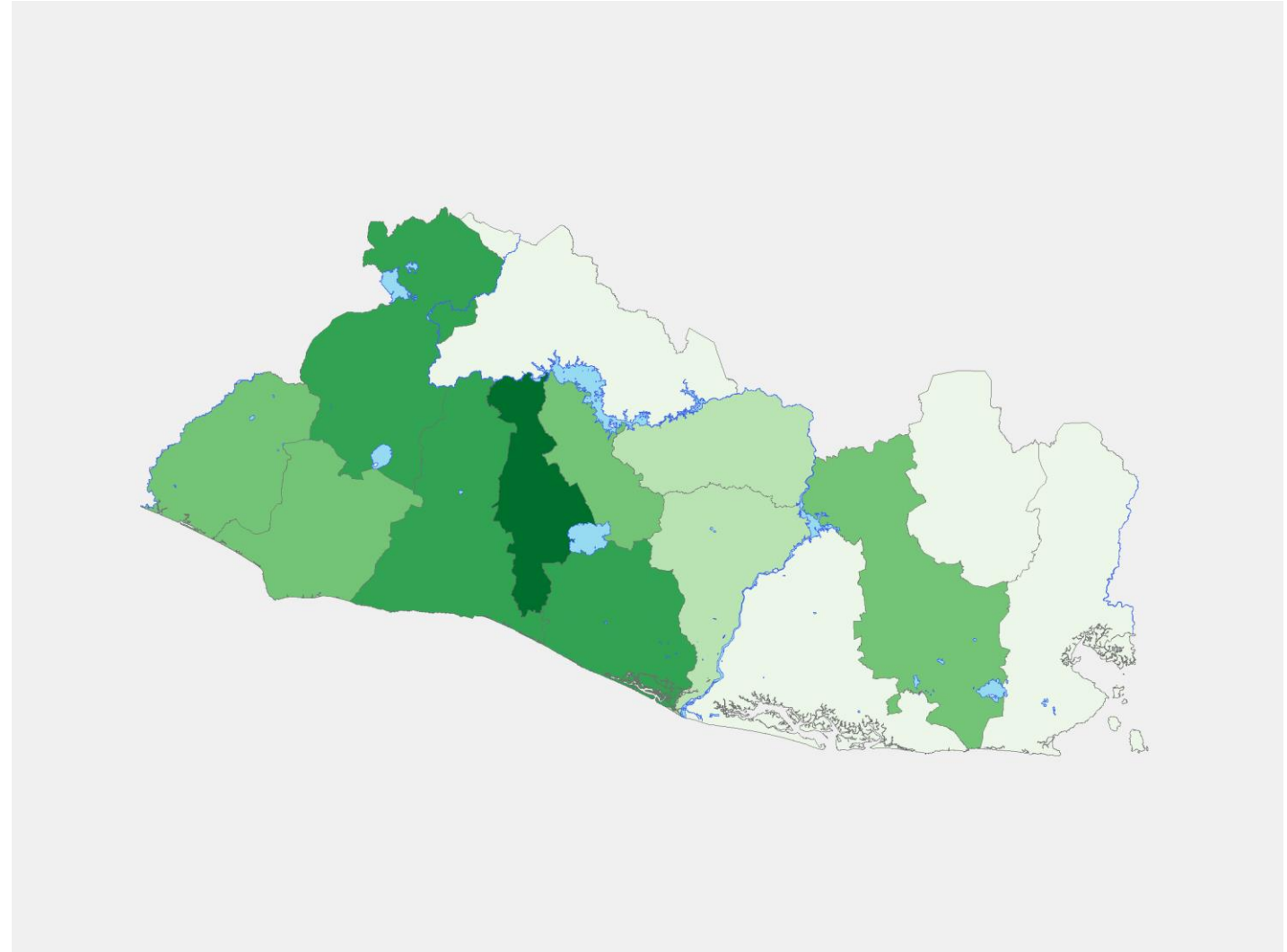
Sector-Specific Analysis

Were Zika cases related to water storage practices?

Populations with piped water/sewer access are less likely to store water.
- Stored water = increased mosquito breeding

Derived products from remotely sensed data (landuse/land cover) demonstrate a correlation between urbanization and case numbers.

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Better solutions.
Safer, more resilient world.

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