



Dissemination of Global Flood Severity and Surface Water Mapping using Remote Sensing Data to Global Stakeholders

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<https://giff.org>

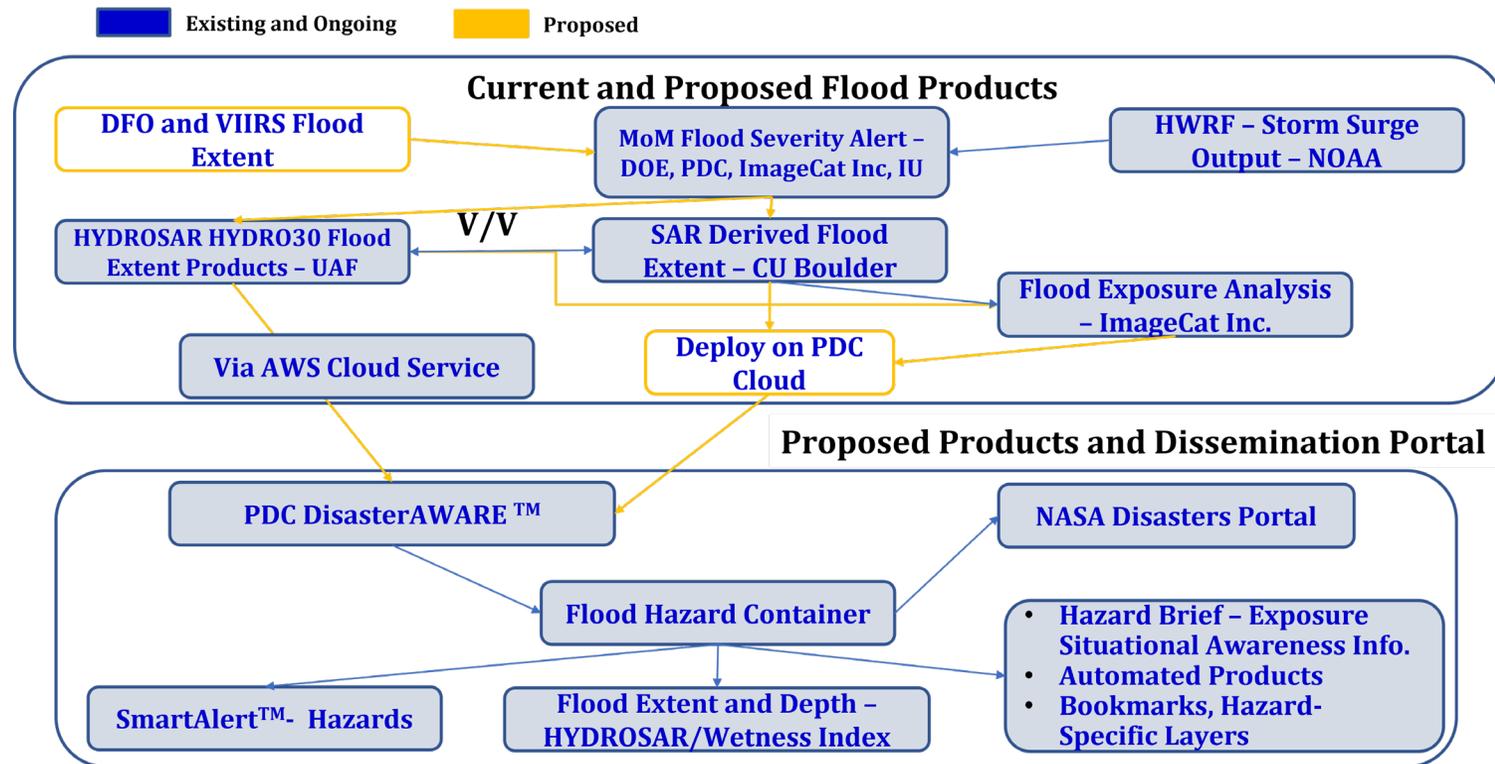
Global Initiative for Flood Forecasting and Alerting (GIFFT)

Several NASA Disasters funded projects generate global surface water products, such as, flood extent and depth, flood severity using SAR and optical imagery.

The objectives of this initiative are to:

- Disseminate these products to global stakeholders - via PDC's DisasterAWARE®, the NASA Disasters Mapping Portal.
- Deploy an ensemble model - Model of Models (MoM) – that integrates hydrologic outputs with SAR and optical imagery derived outputs to forecast flood severity daily across the globe.

Conceptual Diagram - Disseminating Global Flood Monitoring Outputs



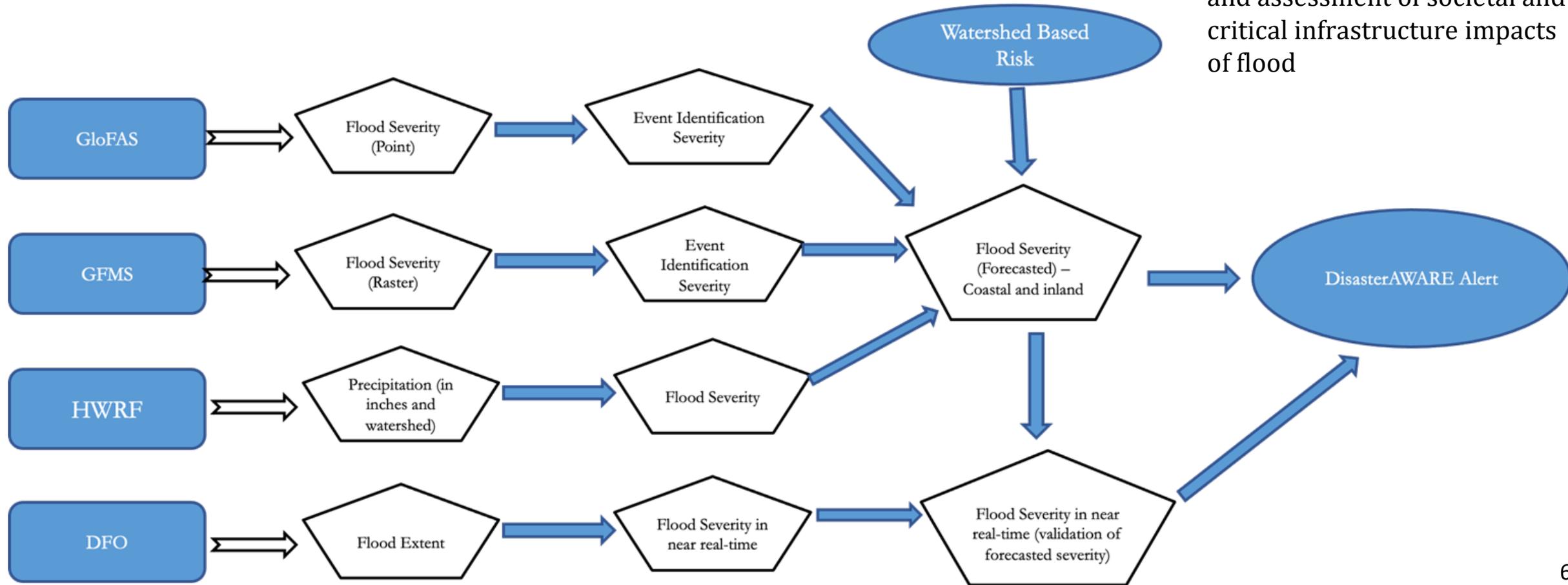


GIFFT Project Components

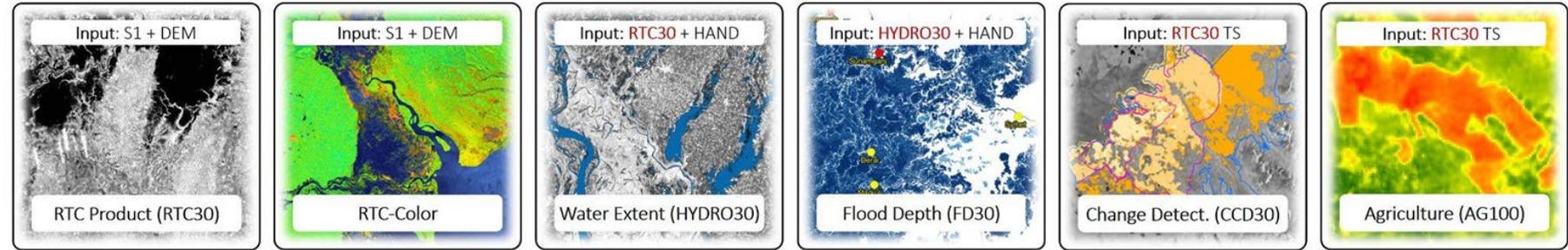
Model of Models (MoM)

- The model of models is an *ensembled model* that forecasts flood severity at sub-watershed level daily.
- It incorporates the GloFAS, GFMS, and HWRF flood models as well as validation by MODIS and VIIRS.

- This allows identifying flood risk at a *regional* level.
- The flood severity information is used to obtain and process *high-resolution* Earth Observation data for determination of flood extent and assessment of societal and critical infrastructure impacts of flood



HydroSAR



HydroSAR has developed a cloud-based pipeline to generate several SAR-derived hazard products automatically for an identified event using Sentinel 1 (C-Band) images. These include

- RTC30: 30-m Radiometrically Terrain Corrected (RTC) SAR product
- RTC30-Color: RGB composites from dual-pol S1 RTC data as visual aids.
- HYDRO30: 30-m surface water extent product
- FD30 - 30-m resolution floodwater depth product

Additionally, we have the following two products in development:

- CCD30 - change detection product expanding the capabilities of HYDRO30, which has limited capability to detect water under vegetation
- AG100 - delineates regions of active agriculture at the 1-ha scale.

HydroSAR sits in the AWS cloud; Data are shared via cloud-based ESRI Image Services

SAR Derived Flood Extent and Depth - Change Detection Using Thresholding Methods for Democratic Republic of Congo (May 2020)

The white box in each frame shows where flooding is occurring north of Lukolela, DRC. A series of outputs comprising of water bodies and areas with standing water were created over the period of the flood event to determine the flood extent using the change detection approach using Sentinel 1A/1B (C-band) images.



03/03/2020



03/15/2020



03/27/2020



Validation/Integration of SAR approaches

The goal is to evaluate the benefits of HydroSAR (from ASF) and 15 meter SAR derived flood outputs using the threshold approach (from CU Boulder) and integrate both products into MoM to optimize their outputs for flood severity detection at a granular level.

- Use the upper Midwest floods of 2019 for comparison and validation of SAR approaches.
- Midwest floods capture flooding due to a combination of spring snowmelt and an intense winter storm that led to record level rise in water by mid-March in streams and rivers in Nebraska, Iowa, South Dakota, and Wisconsin.
- These products will be disseminated via PDC's DisasterAWARE, and will be integrated into MoM.
- MoM derived flood severity will also be used to trigger processing of SAR images for high severity events according to their availability.



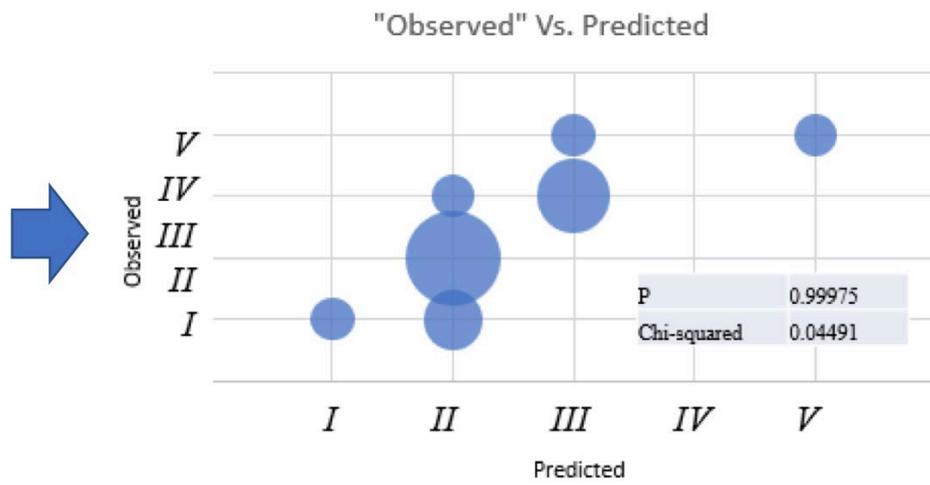
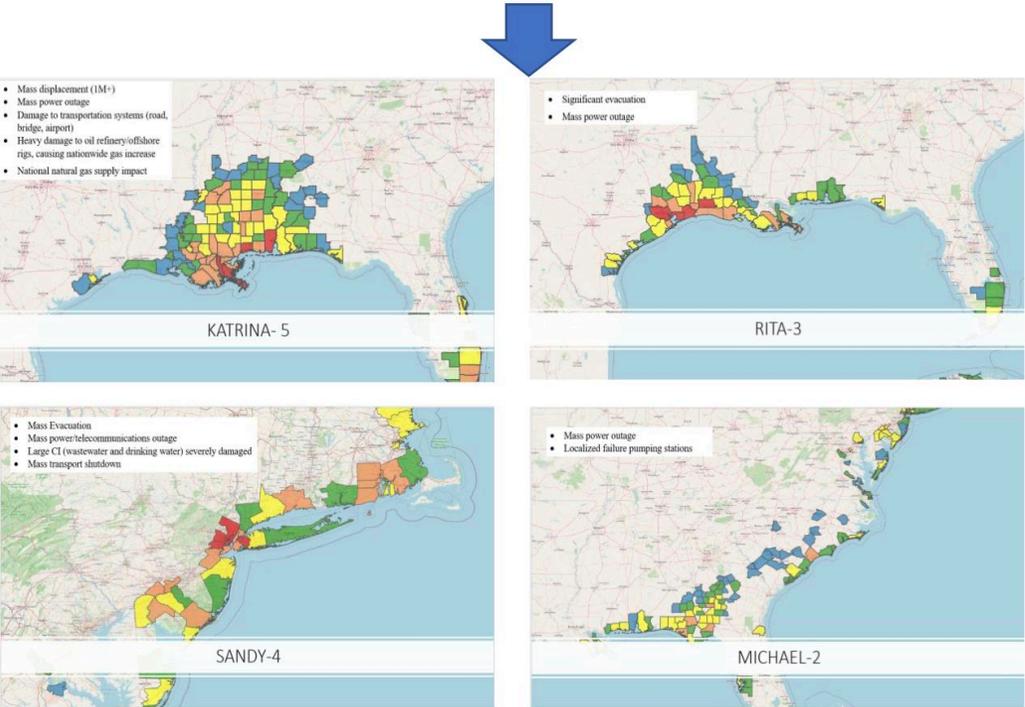
<https://maps.disasters.nasa.gov/arcgis/apps/MapSeries/index.html?appid=c445c4ba6adb476f9b2769070f382309>

Economic Impacts

Global Economic Disruption Index (GEDI)

Rank	Description	Restoration
<i>I</i>	Slight	Rapid restoration on the order of a few hours to a few days expected
<i>II</i>	Moderate	Economic activities typically resume in less than a week
<i>III</i>	Major	Economic activities are likely to rebound on the order of weeks.
<i>IV</i>	Severe	Economic rebound expected after months of restoration.
<i>V</i>	Catastrophic	Major disruption in economic activity requires years of recovery.

- GEDI framework (funded by NASA, GEO and Google) characterizes the broad economic impact of disasters, including economic restoration and critical infrastructure recovery time.
- The framework leverages Earth Observation (EO), Catastrophe (CAT) models, and economic modeling as well as supplemental disaster advisories, Post Disaster Needs Assessment (PDNA) and community resilience assessment to prioritize infrastructure projects.
- Generates outputs compliant with executive initiatives, orders, and regulations and addresses social justice issues.



GEDI will be available to through ImageCat's advisory services and risk platforms Inhance® and FACFinder™.

A pipeline is under development to incorporate GEDI outputs into PDC's DisasterAWARE® flood severity incident reports.



Leveraging PDC's
DisasterAWARE[®] to reach
decision makers globally

Who is PDC?



More than 60

Staff and industry experts

Over 70

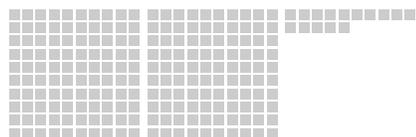
Partner Countries

8 Global

Locations

200+

Partner projects and engagements



25+
YEARS
OF SERVICE
Since 1996

Thousands

of disasters



Managed by University of Hawaii
since 2006

MoM in DisasterAWARE® Oct. 24, 2022

Global Flood Incidents



MoM in DisasterAWARE®

Hazard for specific event with available layers (including GloFAS and GFMS model results and MoM severity alerts)



Global Flood Hazard Layers

Leveraging each outgoing communication item to highlight the Global Flood Model – Model of Models and indicate NASA as the source for the hazard and alerting

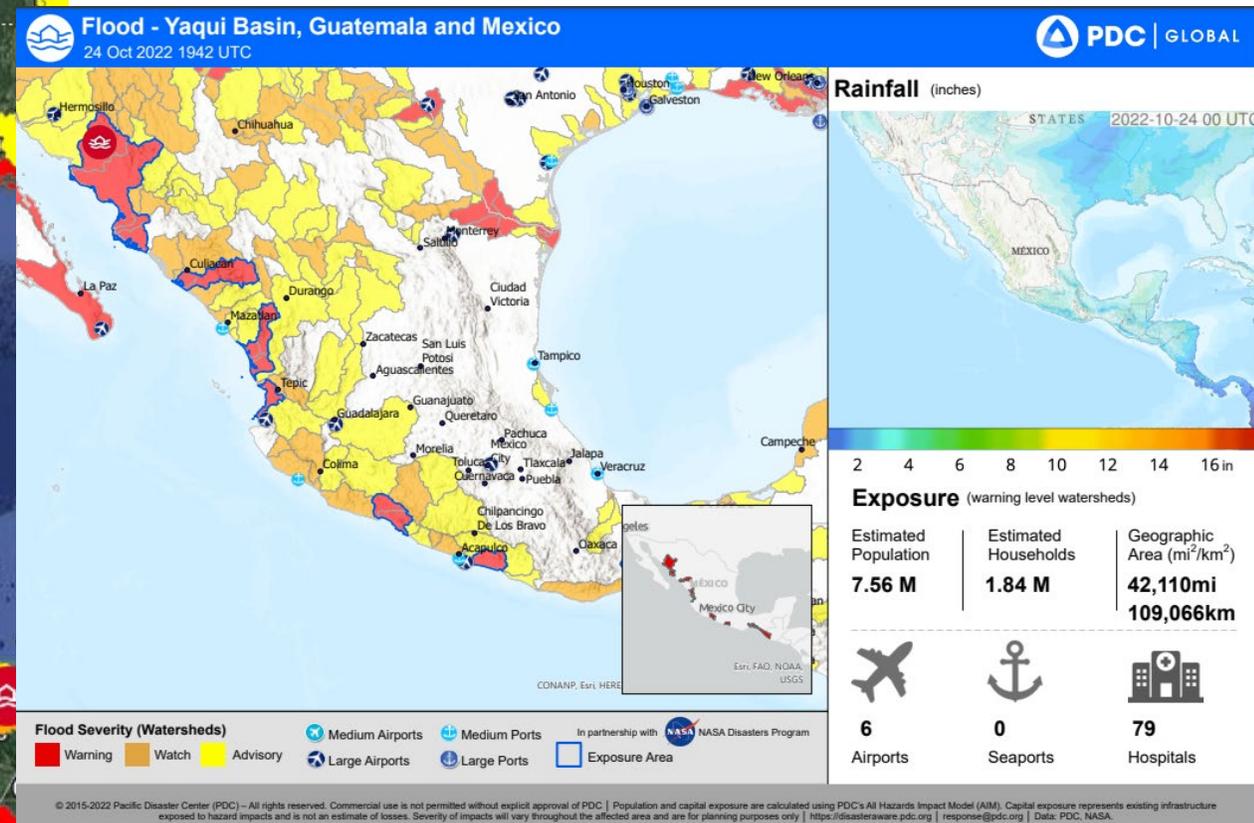
MoM in DisasterAWARE®

Oct. 24, 2022



Left: Map showing severity levels derived from MoM, Yaqui Basin, Guatemala and Mexico

Right: Full Hazard Report

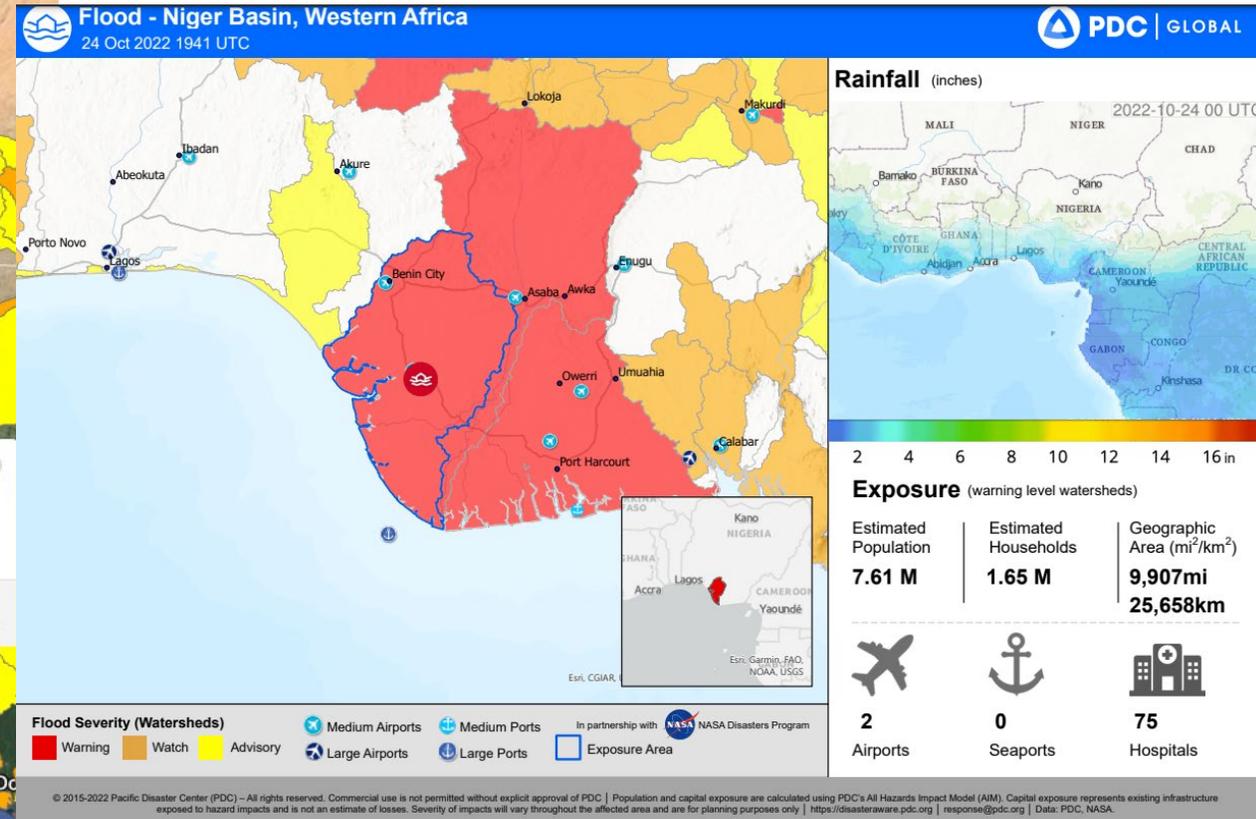
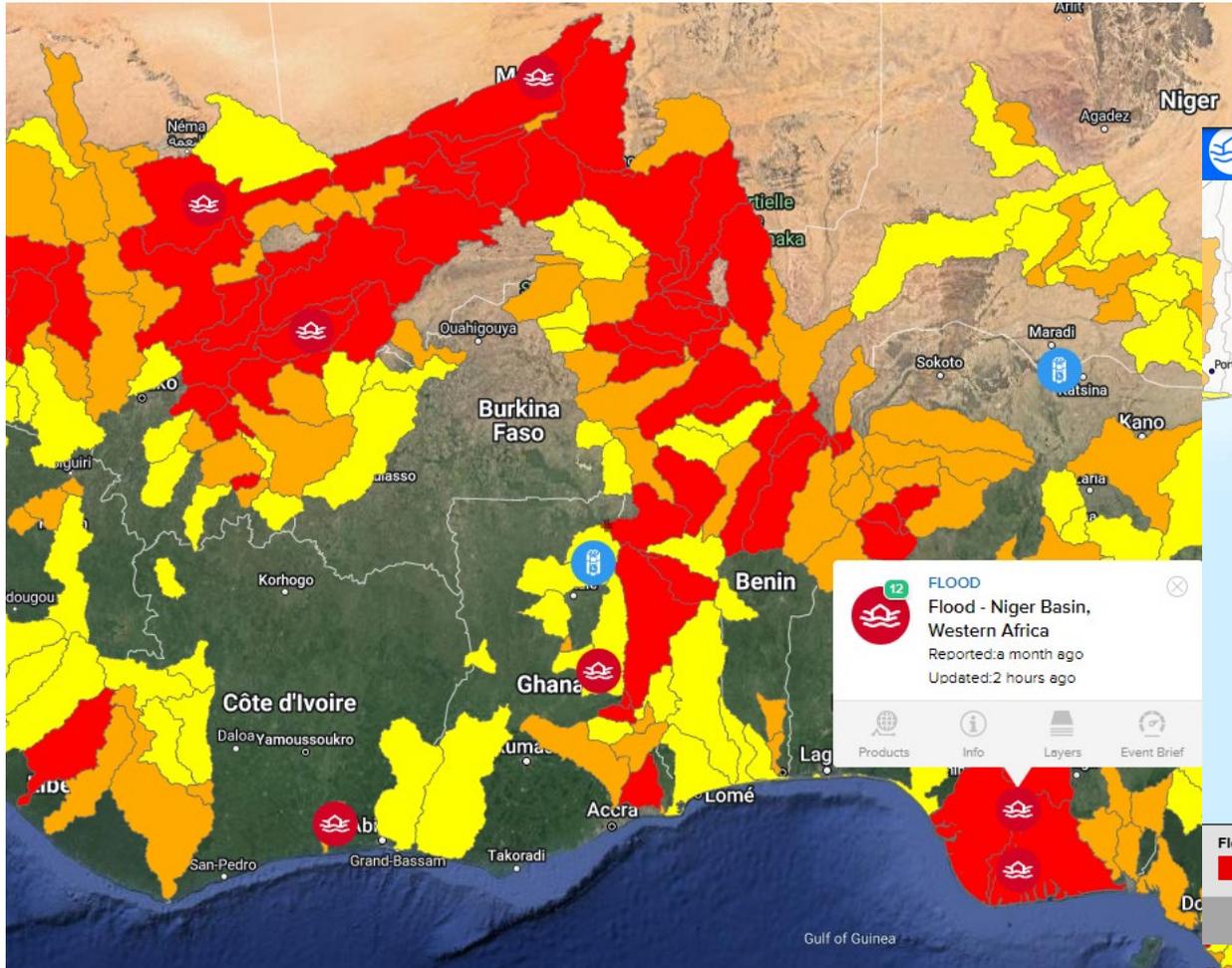


MoM in DisasterAWARE®

Oct. 24, 2022

Left: Map showing severity levels derived from MoM, Niger Basin Flood, West Africa

Right: Full Hazard Report



An aerial photograph of a coastal area that has been severely flooded. The water is a light blue-grey color, covering most of the land. In the center of the image, a large, white, multi-story building with a prominent gabled roof and a central tower-like structure is partially submerged. The surrounding area is filled with green trees and vegetation, which are mostly underwater. The sky is a pale, hazy blue.

Thank you!

Questions?

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<https://gifft.org>

<https://disasteraware.org>

Acknowledgement

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