Advancing Access to Global Flood Modeling and Alerting using the PDC DisasterAWARE® Platform and Remote Sensing Technologies

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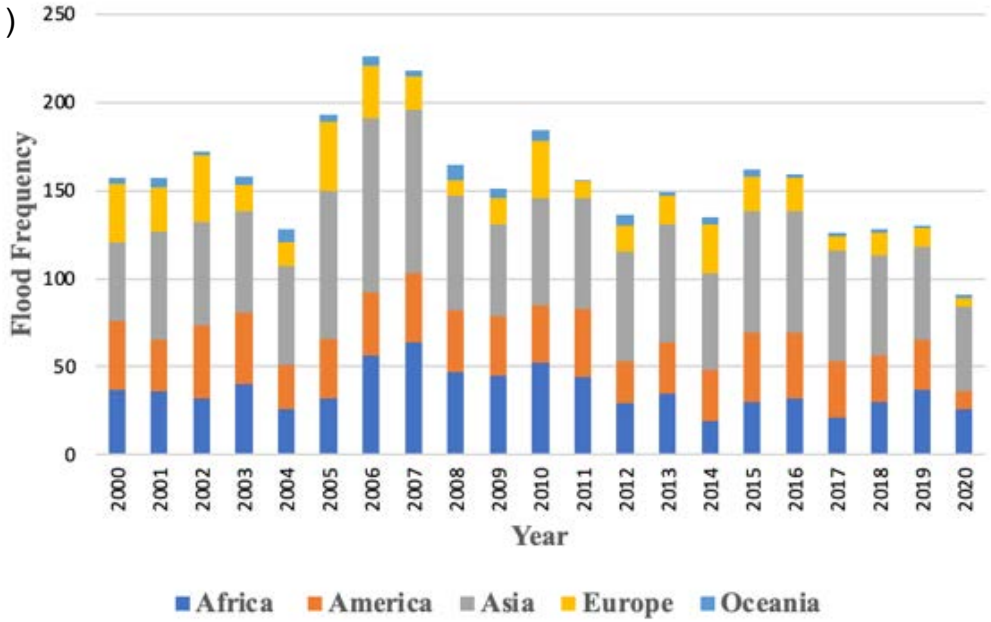
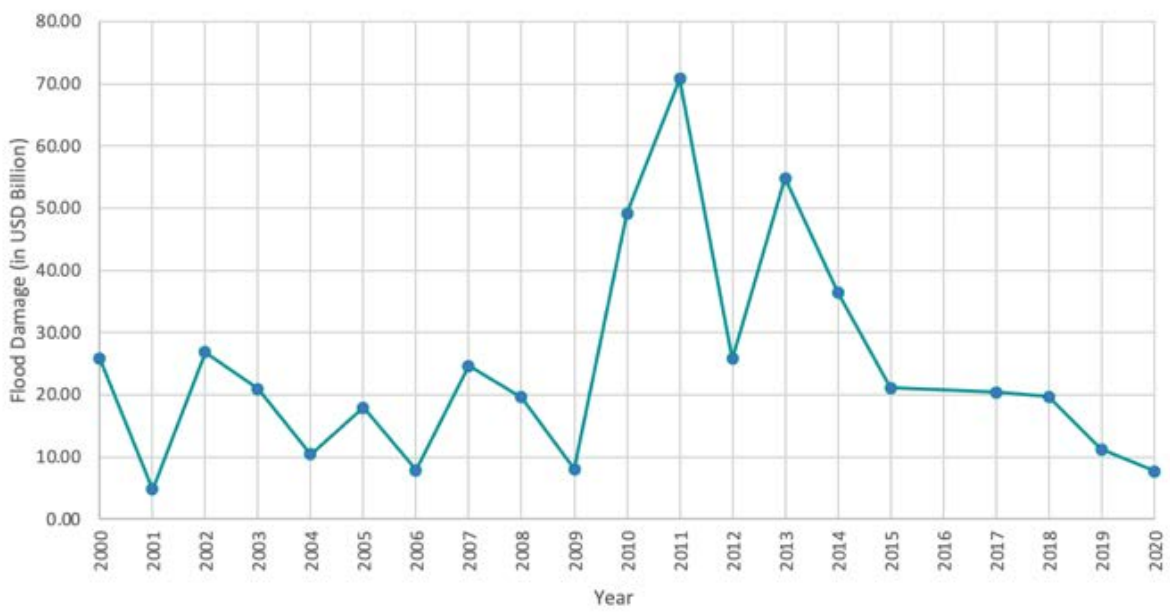
- Flooding is a frequent event responsible for significant societal and economic impacts worldwide.
- As of September 2020 there have already been 91 flooding events globally of varying intensity.
- Since 2000, on average, 100 floods annually have occurred worldwide (Figure 1) that have caused about $10 billion (USD) financial loss per annum (Figure 2).

(1)



(2)



Global Flood Statistics During 2000 – 2020. (1) Annual Flood Frequency; (2) Annual Flood Induced Financial Damage

Source: EM-DAT: The Emergency Events Database; Université Catholique de Louvain (UCL) – CRED, Online, http://www.emdat.be/.

Project Components

Project Focus

Using DisasterAWARE® - an open access, global flood alerting system – for effective dissemination of flood risks and potential impacts to aid with emergency response.

Central to the project is the incorporation of flood model outputs and remote sensing derived products from multiple platforms to help with flood risk mitigation and increase resilience of impacted communities.

Project Tracks

Track 1

- Model of Models for Flood Forecasting and Severity Based Alert Dissemination

Track 2

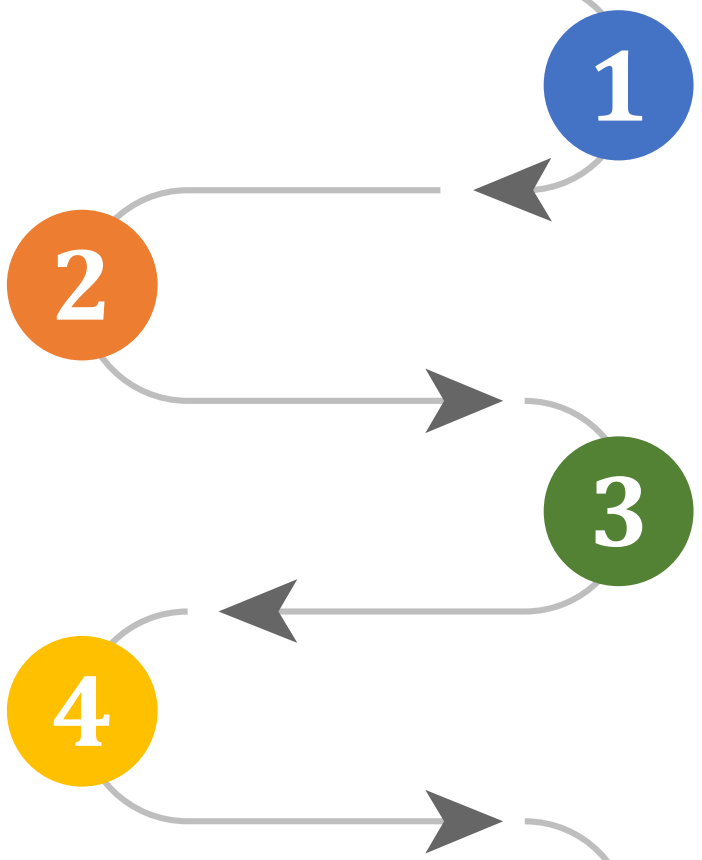
- Earth Observation Based Flood Extent Extraction

Track 3

- Machine Learning Based Damage Assessment Model Using EO Data

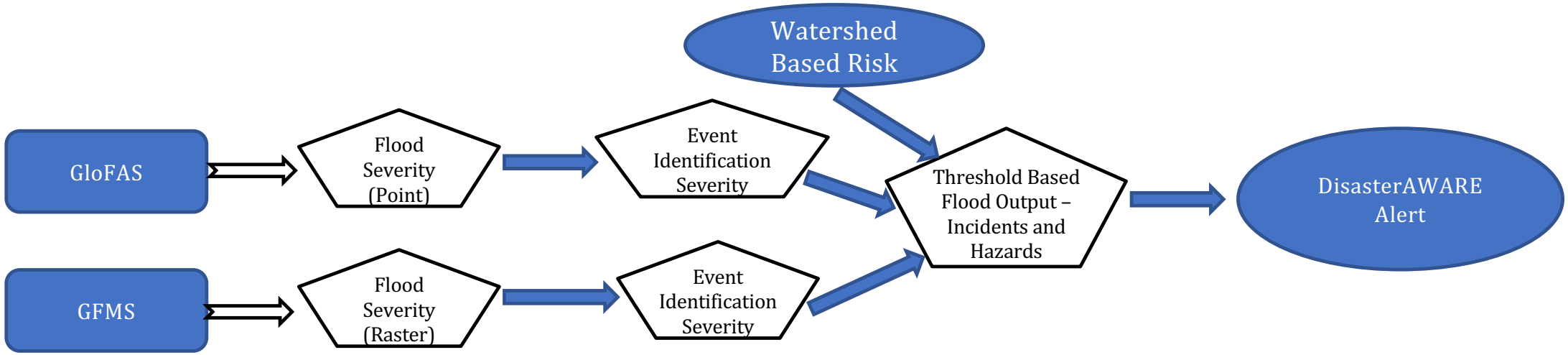
1. Model of Models

MoM Objectives



Purpose: Develop and deploy a Model of Models (MoM) approach integrating hydrodynamic models and remote sensing derived products for flood forecasting.

Model of Models Components and Weighting Criteria



GloFAS

Weighting Factors

1. 20yr %(20 year level)
2. 5yr% (5 year level)
3. 2yr% (2 year level)
4. Alert Level (Med., High, Severe)
5. Days Until Peak

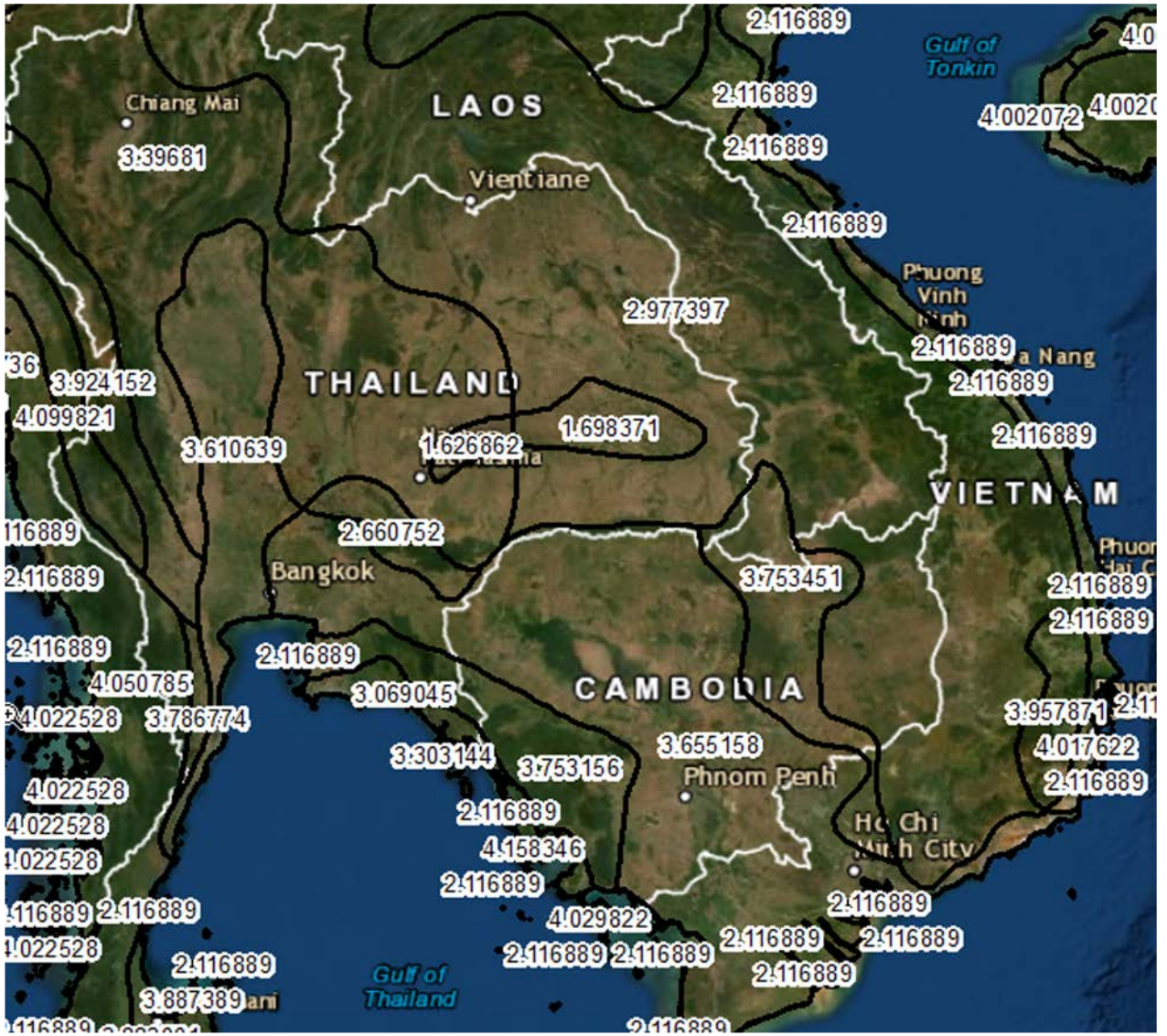
GFMS

Weighting Factors

1. Total Area (km)
2. Percent Area
3. Mean Depth
4. Max Depth
5. Duration of Flooding

Watershed Risk (WRI) Riverine Risk Score

- Provides information for (~16,000 basins)
- Considers 9 event return periods
- Incorporates current levels of flood protection (FLOPROS model)
- Expected annual affected population



Global Flood Monitoring System (GFMS)

- Uses real-time precipitation information from NASA Global Precipitation Mission (GPM) satellites and implements a hydrologic runoff and routing model for flood detection
- GFMS is functional at a quasi-global (50°N - 50°S) scale and the hydrologic model is implemented at a 1/8th degree lat/long grid.
- Following outputs generated at every 3-hour interval at 0.125 degree grid resolution are used in MoM: size (area and % area in a watershed impacted by a flood), depth above baseline (mean and max) and duration (days).

Global Flood Awareness System (GloFAS)

- A global hydrological forecast and monitoring system independent of administrative and political boundaries
- The system couples state-of-the art weather forecasts with a hydrologic model to provide downstream countries with information on upstream river conditions.
- Produces daily flood forecasts and monthly seasonal streamflow outlooks
- Following hazard severity indicators from GloFAS were used (obtained daily) for MoM: probability of return period events (2, 5 and 20 year), alert level (Medium, High, Severe) and peak forecast (days).

Australia: Basin:Fortescue: Station:Jimbegnyinoo Pool: CLOSE

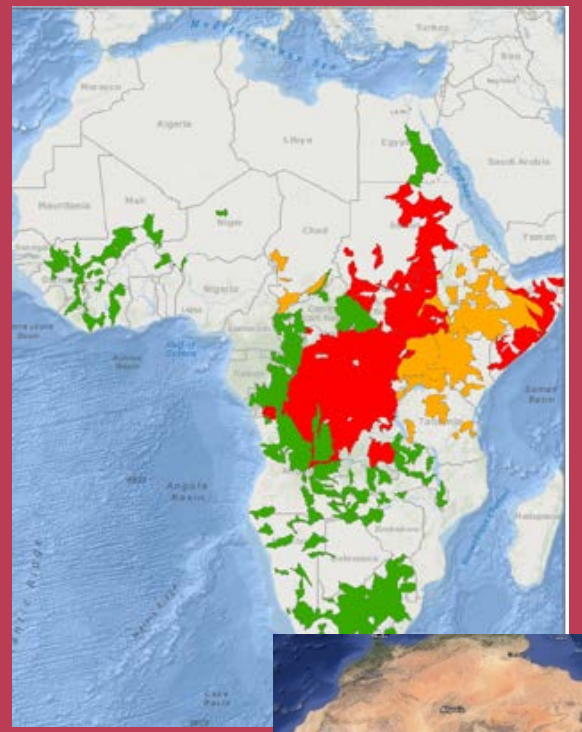
Country	Basin	Station	Lon	Lat	Upstream area (LDD)	Upstream area (Provider)
Australia	Fortescue	Jimbegnyinoo Pool	119.65	-22.45	18,300	18,400

Point Forecast

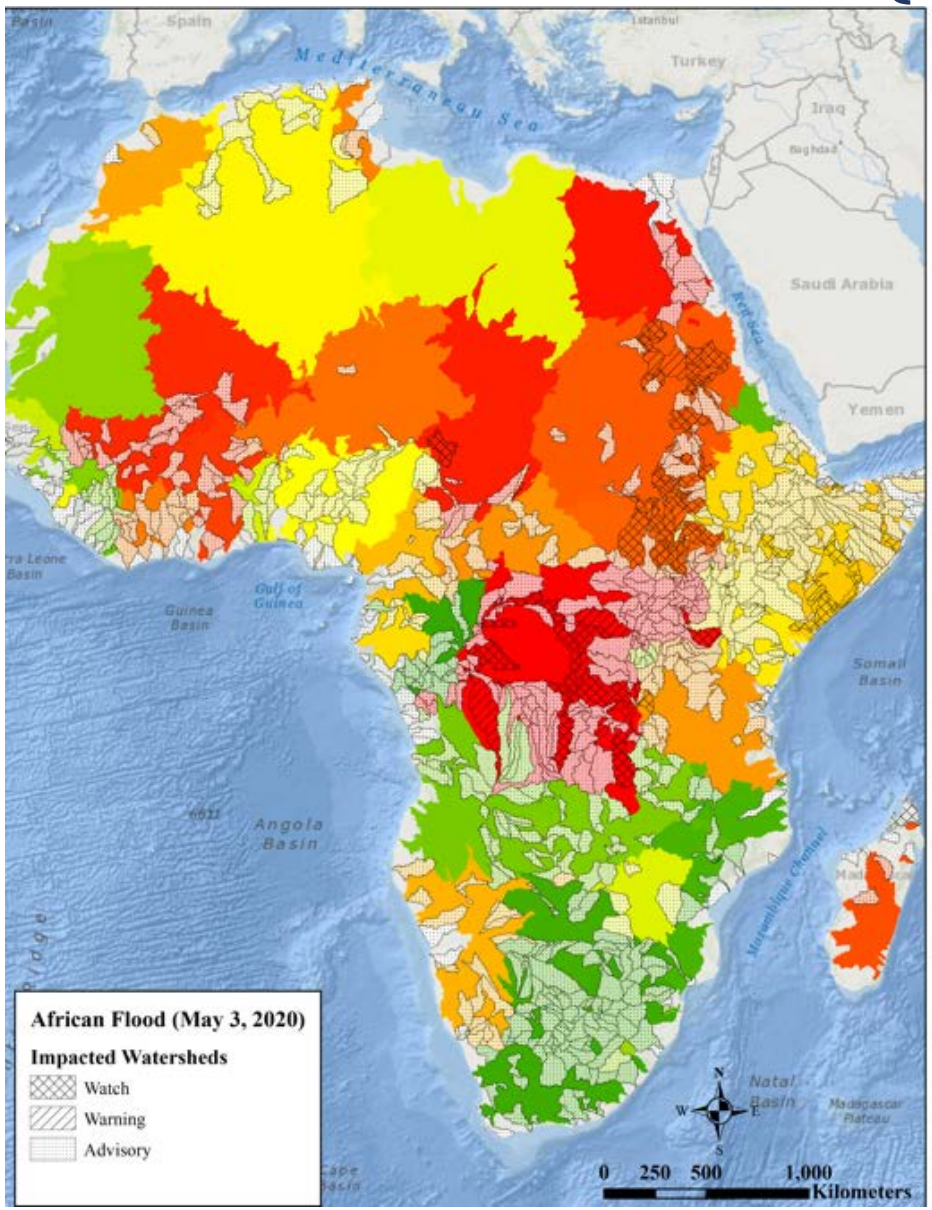
Forecast Date	Point No.	max. EPS > threshold [%]	Alert level	Probability tendency	Peak forecasted in
2020-01-13 00:00	2091	100/0/0	1	Probability tendency	< 3 days

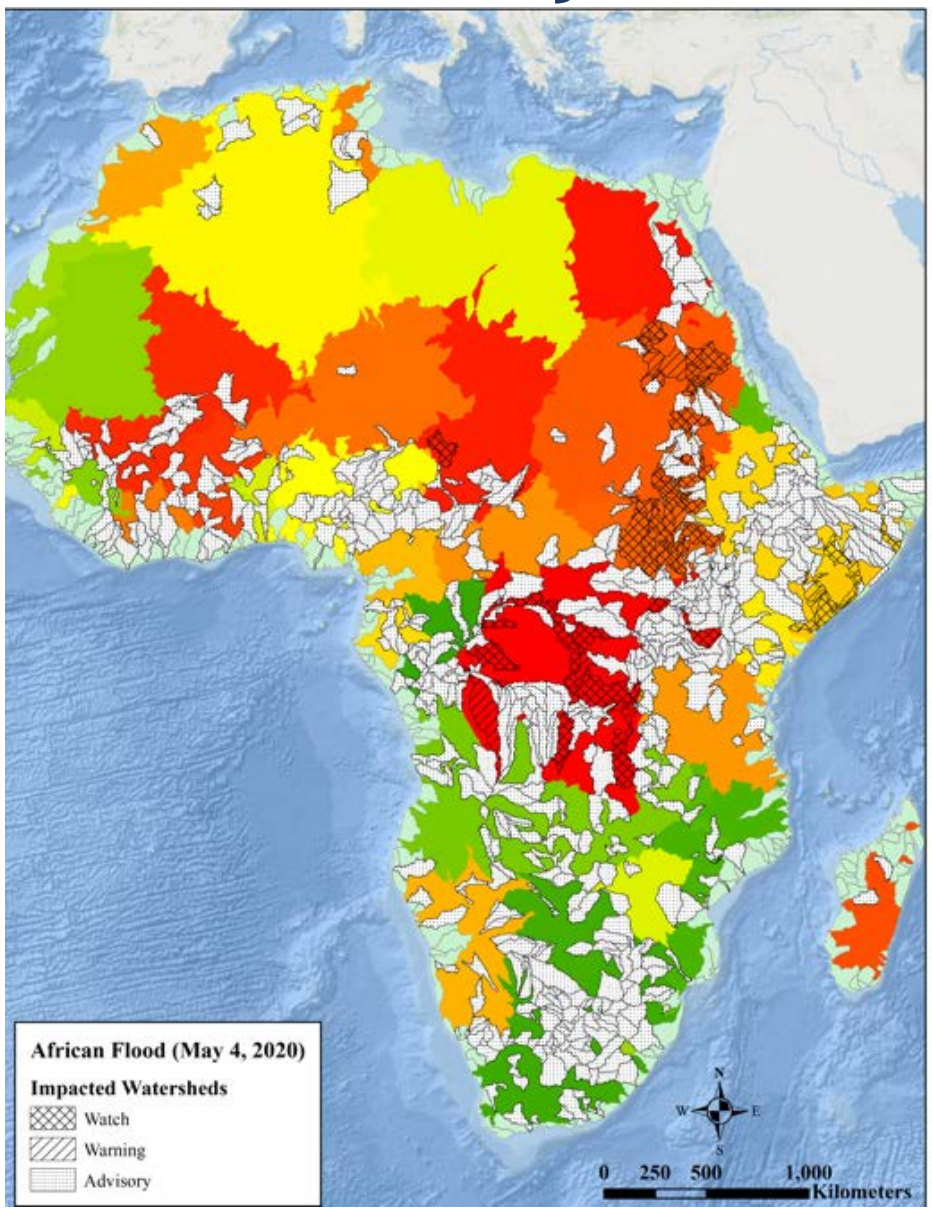
FLOODING IN EAST AND CENTRAL AFRICA SPRING 2020

- Central and east Africa, particularly the countries of Kenya, Somalia, Sudan, South Sudan, and the Democratic Republic of the Congo, experienced severe flooding this past spring as greater and more widespread than normal rainfall occurred during their “long rains” season.
- Flooding in Africa led to exposure/risk to vulnerable populations and infrastructure
- Oftentimes these risks are compounded by multiple associated events – heavy rainfall causing both flooding and landslides
- https://disasters.nasa.gov/africa-flooding-2020

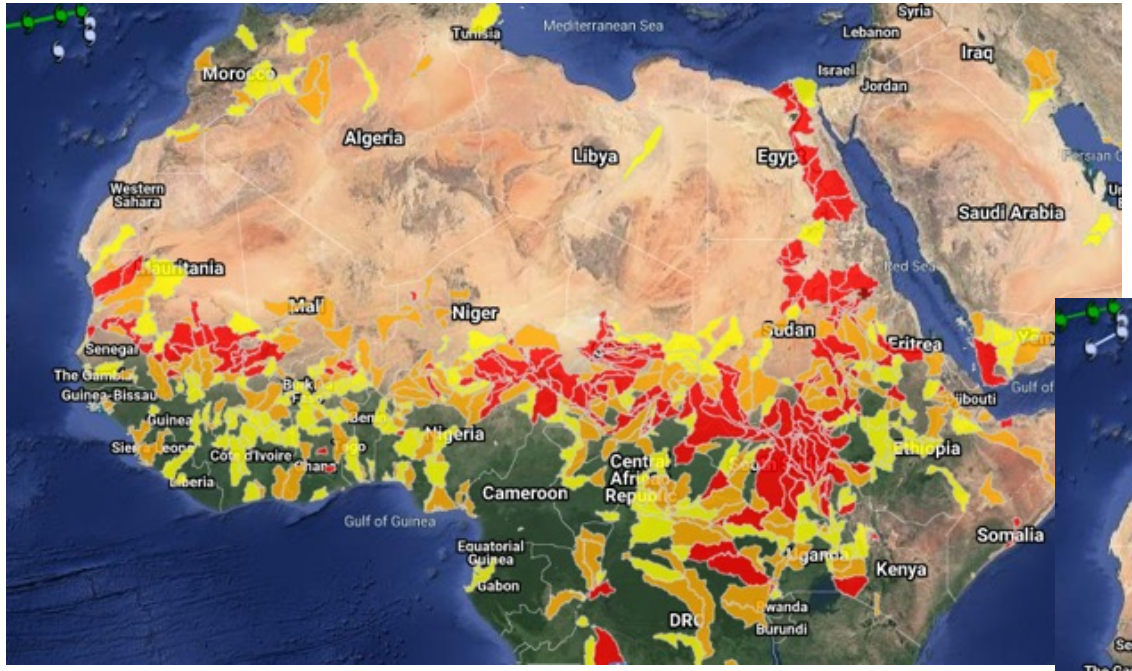


African Flood (May 3rd and 4th, 2020)





Comparison of MoM Output and DisasterAWARE Manual Alert Locations (September 21st, 2020)

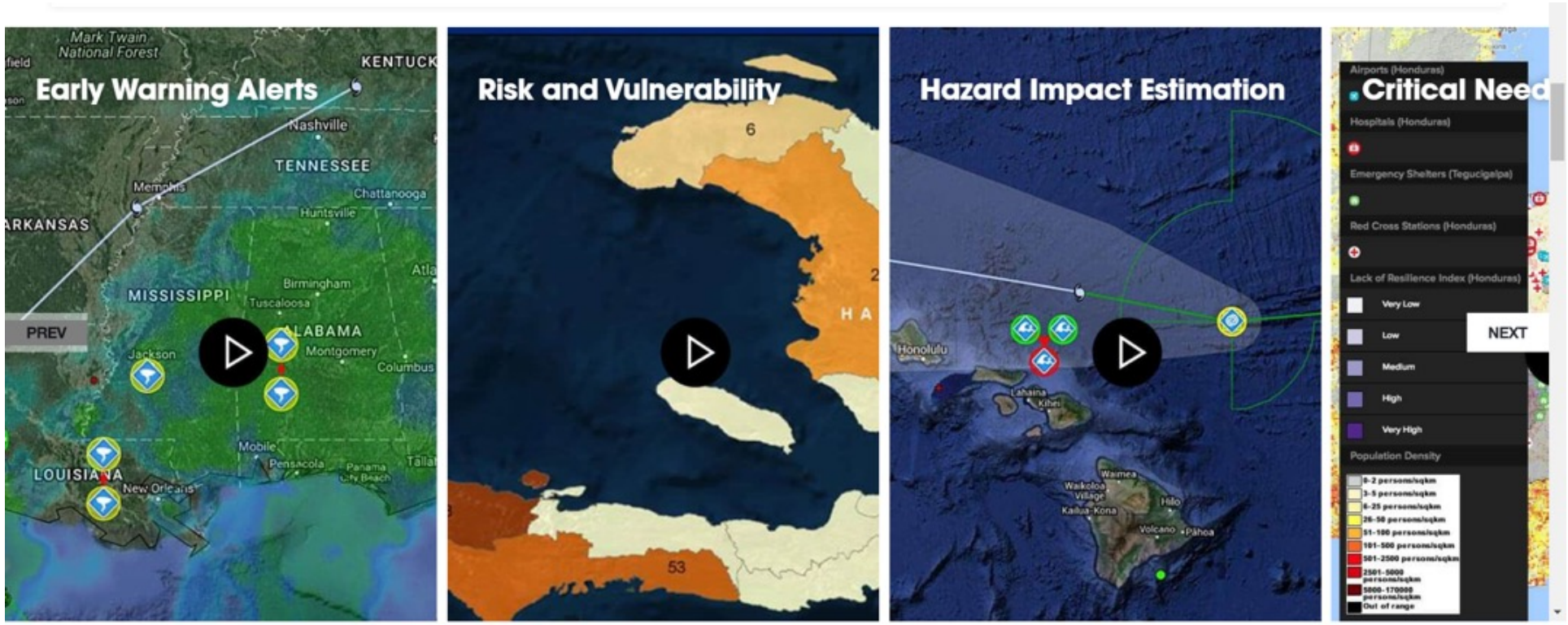


MoM Output

DisasterAWARE Manual Alert Locations

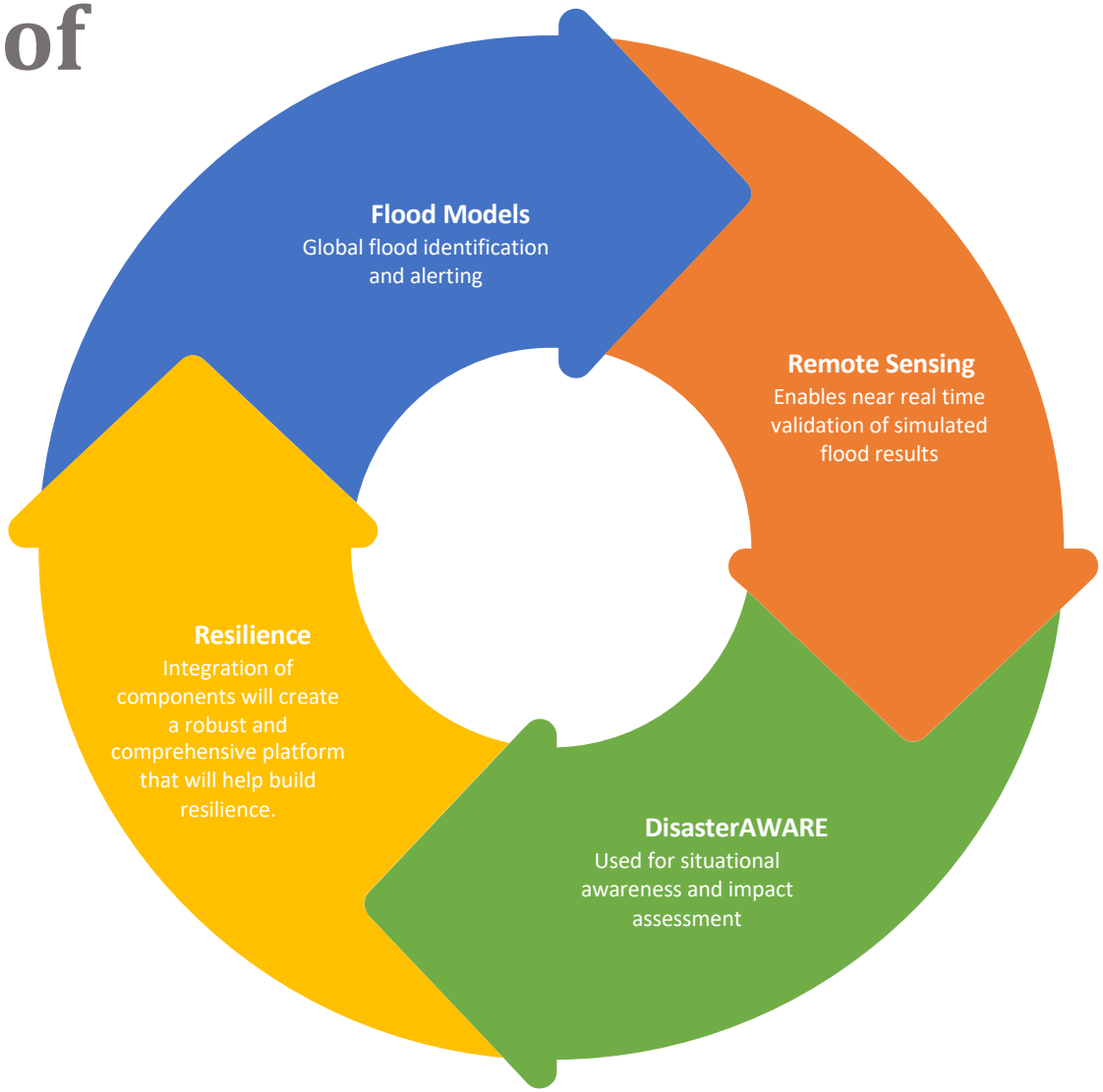
DisasterAWARE® Platform

- DisasterAWARE® is maintained by PDC, a University of Hawaii Applied Research Center.
- Provides multi-hazard warning and situational awareness information through mobile apps and web-based platforms.
- Operational version is used by multiple national and international agencies including UN.



Current Capabilities of DisasterAWARE®

DisasterAWARE currently lacks a global flood identification and alerting component and does not integrate remote sensing components to enable near real-time validation of simulated flood modeling results. The use of remote sensing images and derivative products will enable users (domestic and global) to validate in near real-time the results of flood models (e.g. flood depths and boundaries) that will be incorporated into DisasterAWARE and used for situational awareness and impact estimation (e.g., Hazus) to quantify disaster impacts. The integration of publicly available global flood modeling sources with available remote sensing platforms (satellite and airborne) will create a robust and comprehensive platform for flood damage assessment and alerting that will help communities build their resilience.



PDC Users

Currently, the DisasterAWARE platform has over 7K users globally and the Disaster Alert app more than 1.4 M.

Thank you!

Questions?

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