

Emerging Technologies for Better Disaster Risk Management

Episode #33: Disaster risk reduction in the digital transformation age:
Leveraging emerging technologies

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and Resilience (WR2DR)

Innovative water solutions for sustainable development

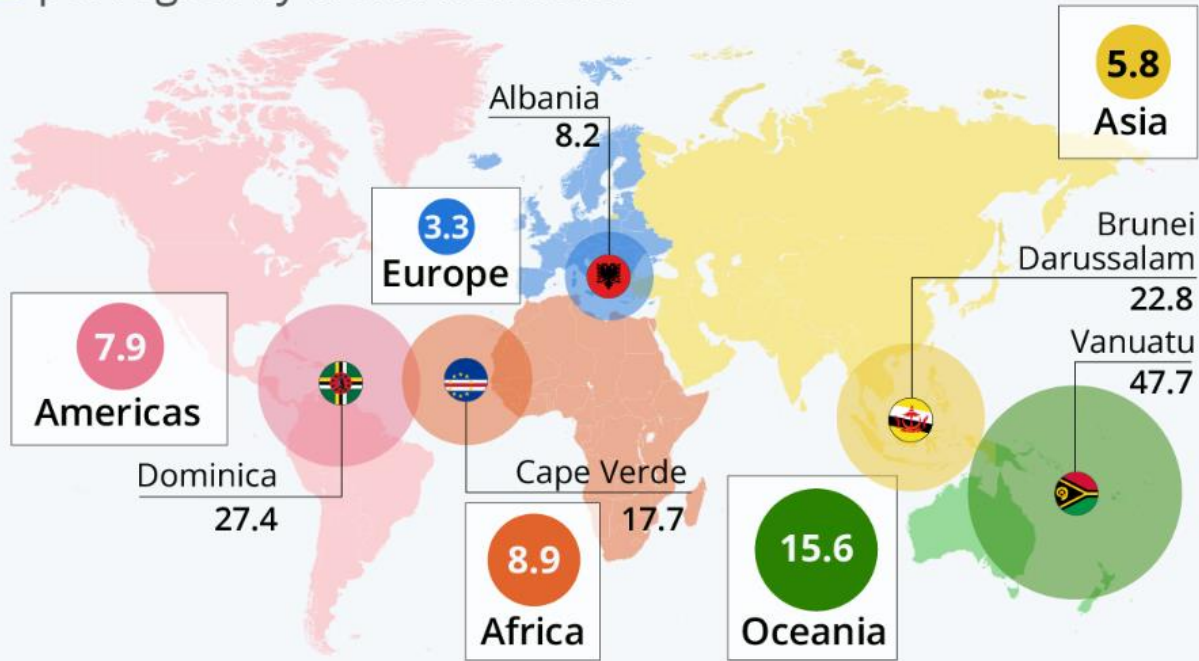
Food · Climate · Growth



Emerging Technologies for Disaster Risk Management

The Places Most Prone to Disaster

Countries most at risk when facing natural disasters per region by World Risk Index*

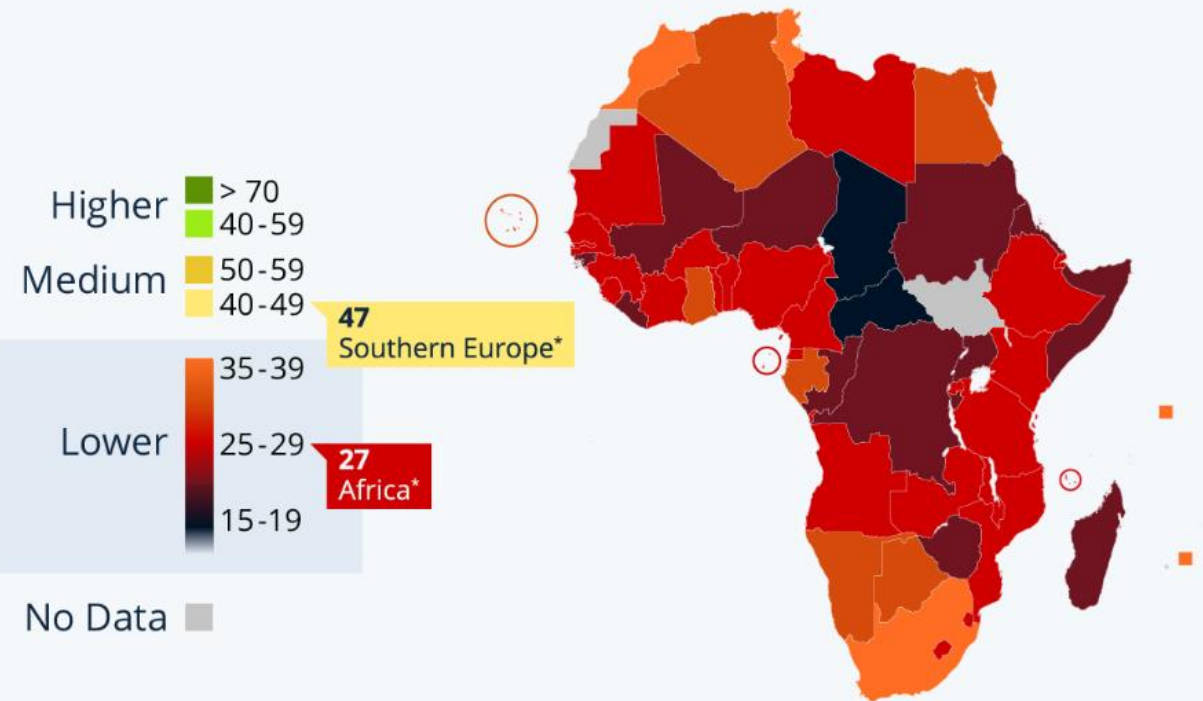


* World Risk Index calculated via exposure, susceptibility, coping and adaptation, 0 = lowest, 100 = highest

Source: World Risk Index 2021

Africa Is on the Frontline of Climate Change

Index scores for climate resilience of African countries in 2022



Based on assessment of 180 countries for readiness, vulnerability and GDP.

* Averages based on 10 countries in Southern Europe, 53 in Africa.

Sources: Henley & Partners, Statista calculations

Africa is among the regions most at risk from climate change.



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The Role of Technology in the Disaster Management Cycle

The role of technology in the disaster management cycle is often under-appreciated. It can be used at every stage of the cycle, from preparedness to response to recovery.

Preparedness

Technology can be used to help create and implement emergency plans. It can also be used to monitor potential threats, such as weather patterns that could lead to a natural disaster.

Response

Technology can be used to help create and implement emergency plans. It can also be used to monitor potential threats, such as weather patterns that could lead to a natural disaster.

01

03

Recovery

Technology can help with the rebuilding process after a disaster. It can be used to assess damage, create reconstruction plans, and coordinate relief efforts.

Mitigation

The cycle's end points out the value of a well-rounded approach. Mitigation, like preparedness, entails doing something to lessen the chances of a disaster happening again. These measures are important at any time, but especially in the wake of a disaster when a community or organisation may still be fragile.

02

04

Big Data approaches

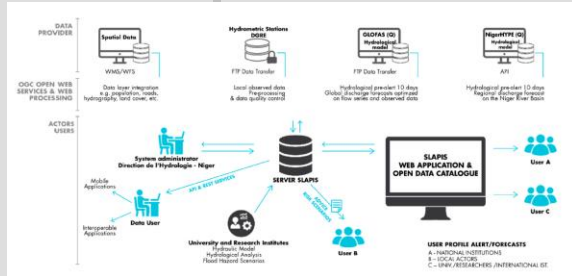
Big data analysis can establish previously unforeseen insights and linkages, which could help create new opportunities for disaster risk management



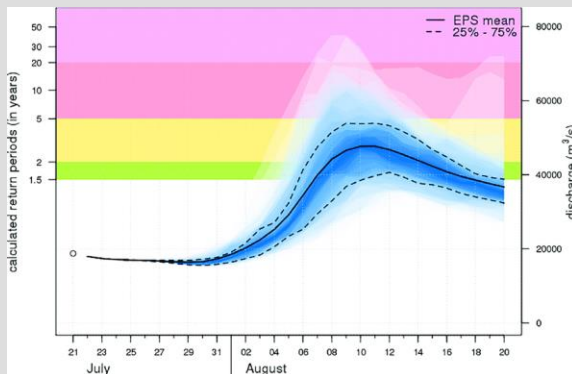
- Hazard and Risk assessment
- Managing floods and drought
- Risk transfer through Insurance
- Digital agriculture risk management
- Post-flood recovery to agriculture

What do the emerging flood risk technologies look like?

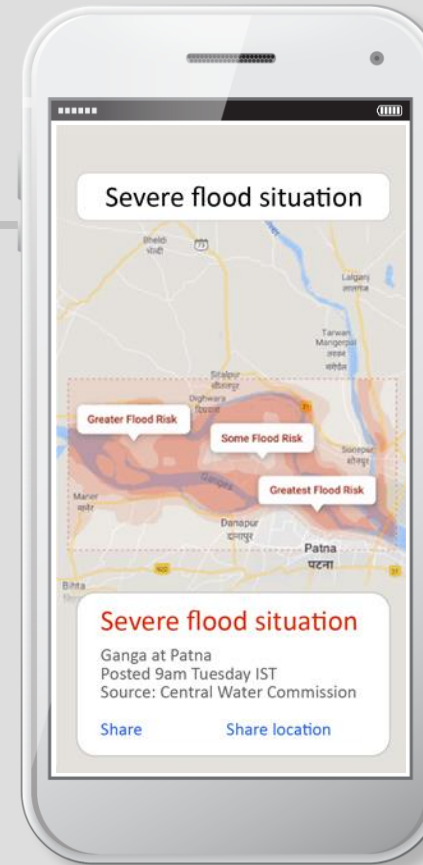
AI-based Prediction System



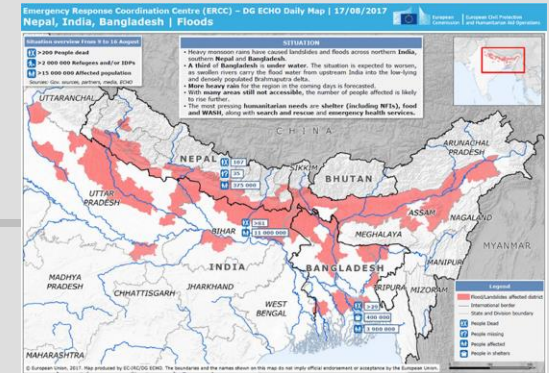
Flood Forecast



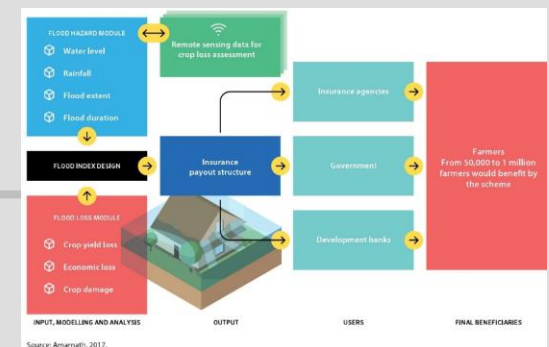
Flood Alert



Emergency maps



Risk-financing instrument

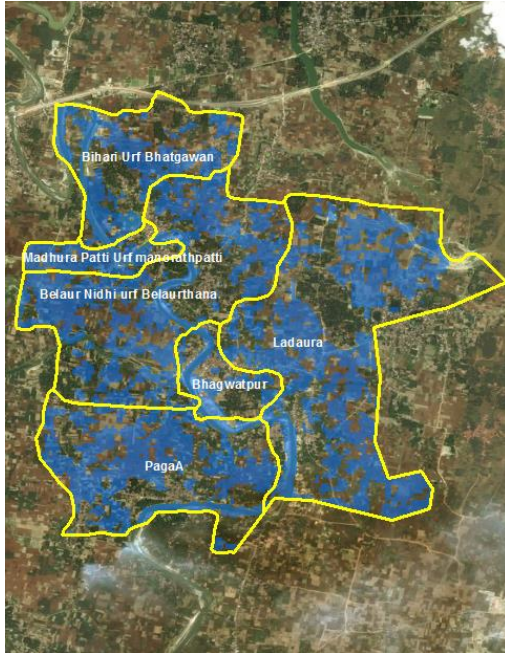


Insuring the uninsured

- Index –based/parametric insurance
- Self-supporting commercial approach
- Subsidized system managed and guaranteed by government
- Data – essential first step for making flood insurance universally accessible among marginal smallholder farmers



Index based flood insurance (IBFI)



Open access earth observation data and modeling tools strengthen scaling risk solutions in protecting poor and vulnerable people in developing countries.

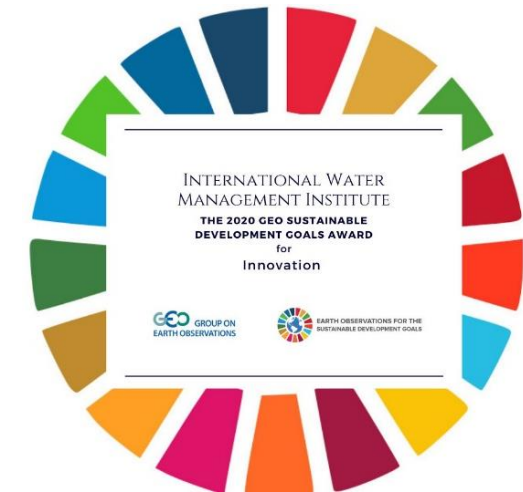
Insurance solutions could help bolster farming livelihoods, reduce post-disaster costs for governments and contribute to reducing poverty, achieving gender equality and underpinning food security.



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Ecosystems



Pilot trials

In India and Bangladesh since 2017



+7,000

Households



\$150,000 USD

Total payout



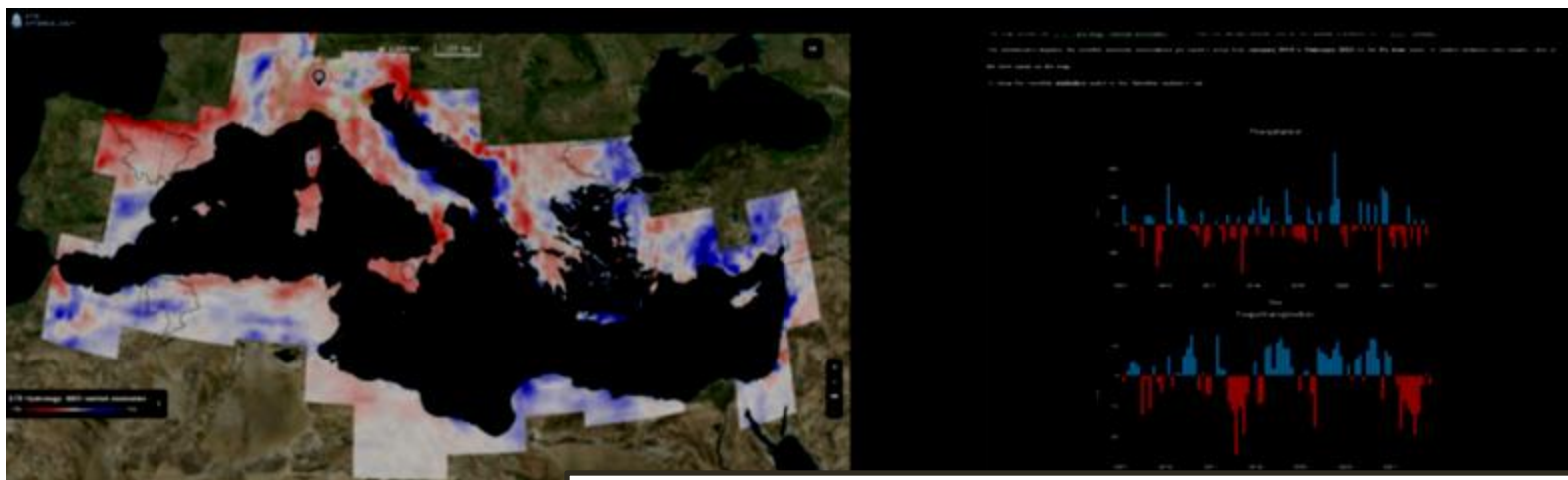
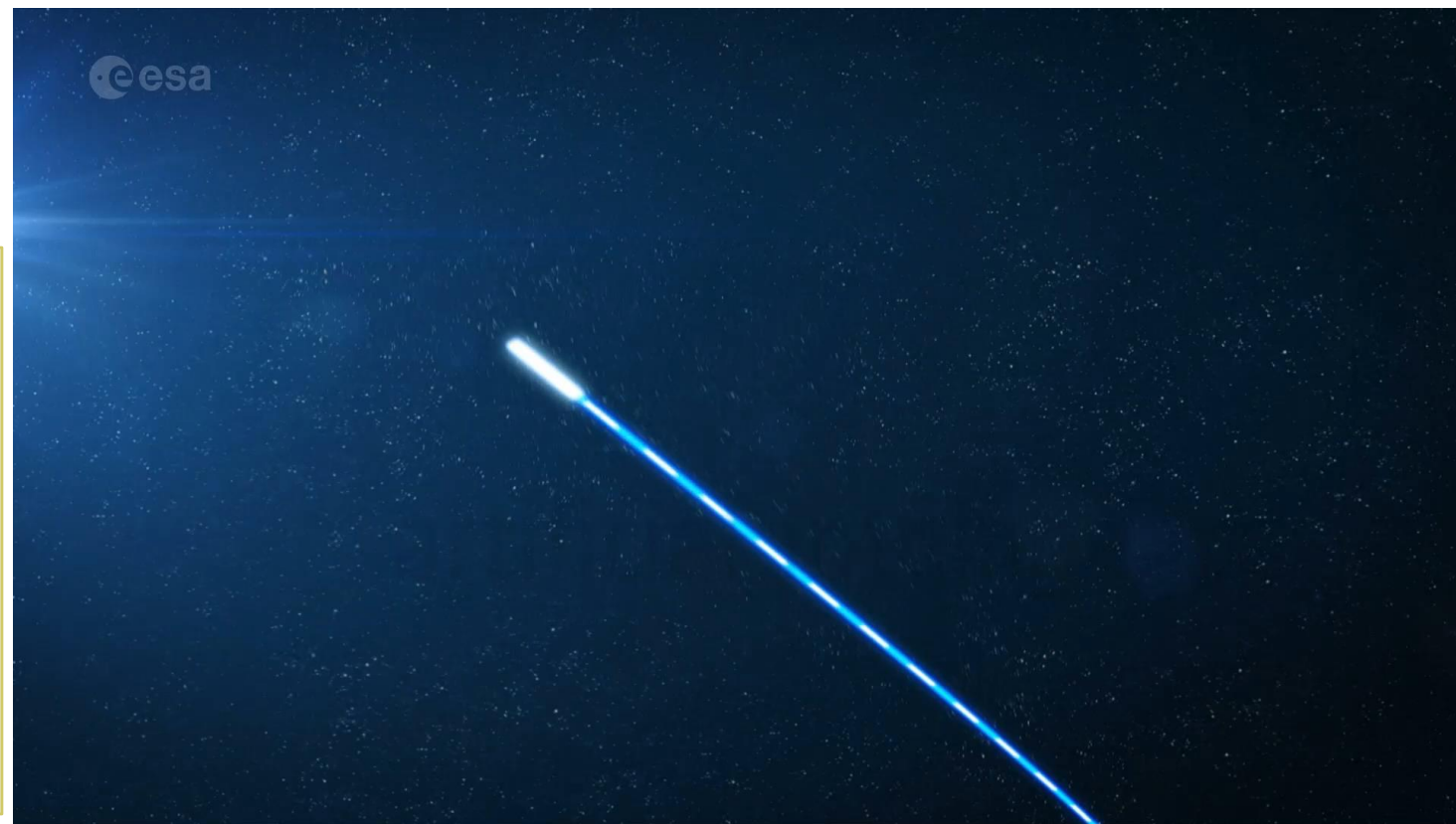
125k HH

Scaling

DITIGAL TWIN

4D reconstruction of the water cycle at the decision making scale (1 km, 1 hour)

To develop and demonstrate a **prototype of Digital Twin Earth with focus on the terrestrial water cycle** and hydrological processes by highlighting the huge potential of high-resolution Earth Observation products for predicting **hydrological extremes** (flood, landslide and drought) and **water resources management**

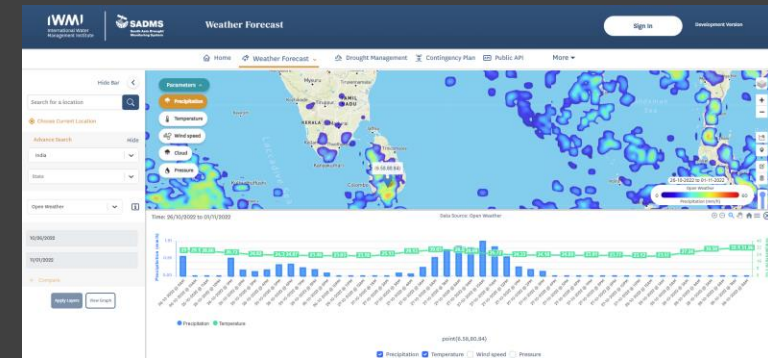


<https://explorer.dte-hydro.adamplatform.eu/>

- # Large scale water balance assessment
- # High resolution flooding
- # What-if scenario for flood risk and water resources management

Source: ESA / IRPI

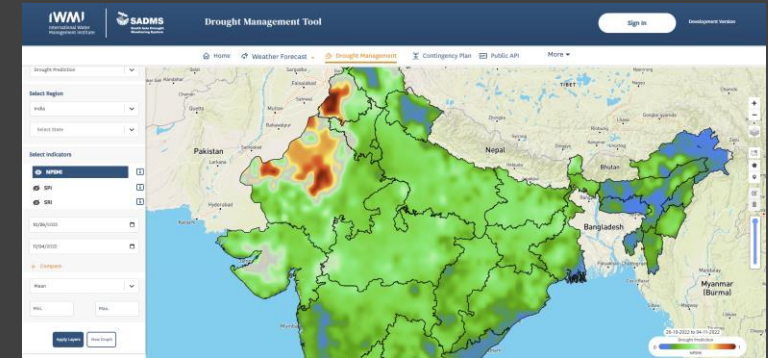
Weather and Climate Monitor



Products: (Sub)seasonal, short-term forecast
Source: IMD, IRI, ECMWF, NOAA

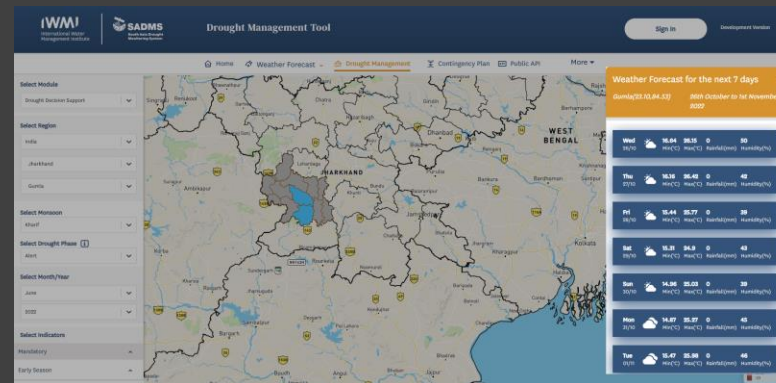


Drought Prediction



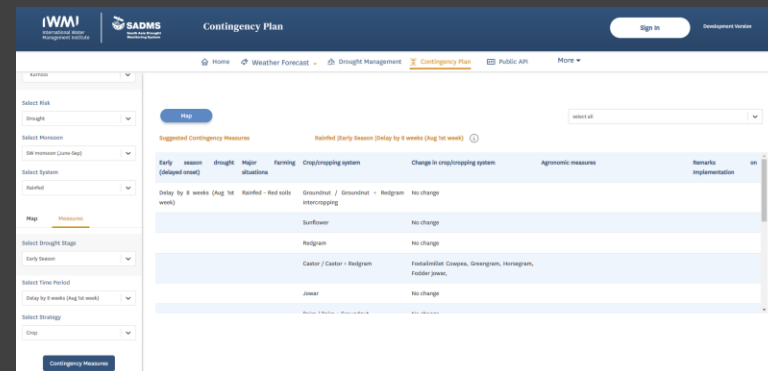
Products: Drought prediction using VIC model
Source: NOAA GEFS, GPM, ERA-5, IMD

Drought Decision Support tool



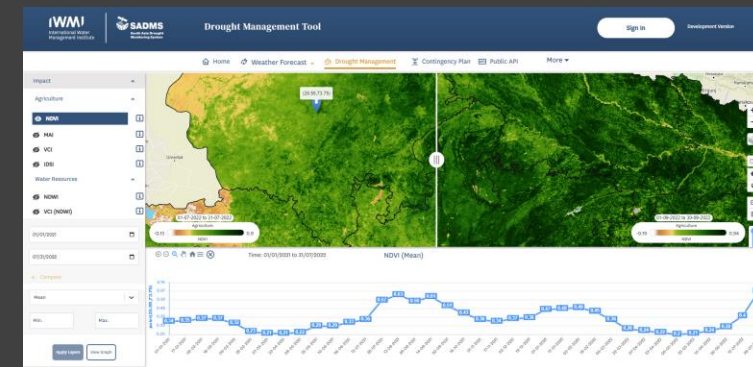
Products: Drought alert and active phase
Source: NASA MODIS, GPM, SMAP

Dynamic Drought contingency plan



Products: Drought phase wise indices to activate contingency plans
Source: NASA MODIS, GPM, SMAP

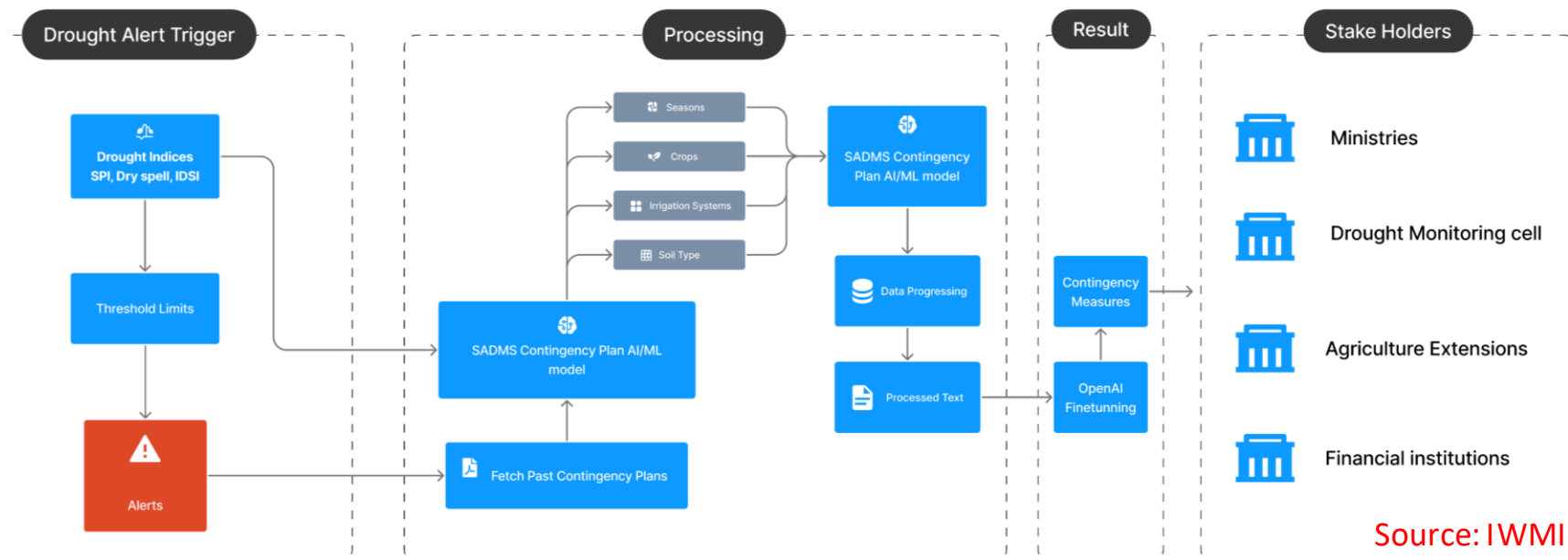
Drought Monitor



Products: Drought indices mandatory and impact indicators e.g. SPI, VCI, VHI, IDIS
Source: NASA MODIS, GPM, SMAP

AI Decision Support System for Drought Mitigation Program

SADMS Contingency Measures Prediction AI/ML Model



- Provides a systematic and transparent approach to visualize, compare drought trigger and contingency planning at the sub-national level.
- Bridges the science-based evidence and decision-makers through a user-friendly platform that allows technical and non-technical audiences to understand drought risk at the subnational level.
- Enables usage of relevant data to support evidence-based decision making for Drought Risk Reduction.

A photograph showing the aftermath of a flood. In the foreground, a muddy, debris-strewn path leads through floodwaters. On the left, a damaged brick building with a collapsed roof stands. In the background, several people are walking away from the camera through the water. One person is wearing a white headscarf and a light-colored tunic, another is in a blue headscarf and yellow tunic, and a child in an orange tunic is carrying a long wooden pole on their back. The background is filled with more damaged structures and lush green trees under a hazy sky.

Global Health Risk

Beyond damaging and destroying physical infrastructure, natural disasters can lead to outbreaks of infectious disease

What are the current gaps and challenges in early warning to early action?

- **Data and Information Gaps:** Insufficient or inaccurate data can compromise the reliability of early warnings.
- **Limited Coverage and Access:** Uneven coverage and communication barriers
- **Risk Perception and Public Awareness:** Complacency can lead to a lack of preparedness and slow response to early warnings
- **Resource Constraints:** Funding and infrastructure
- **Governance and Coordination:** Fragment systems and political factors
- **Cultural and Language Considerations:** Lack of info on multiple languages and culturally relevant can be a challenge
- **Technological Challenges:** reliance on technology for EWS and access to smartphone, internet
- **Response Capacity:** Lack of coordination response plans and resources results in delays or inefficiencies during response efforts.

AWARE Platform

- Interconnectedness of early warning early action
- Near real-time data indicators (Floods, drought) for climate risk preparedness and promote anticipatory response mechanism
- Collaborative platform across multi-institutions, multi-scale, multi-sector
- Promotes inclusive governance and clear roles and responsibilities
- Ability to integrate with existing platform



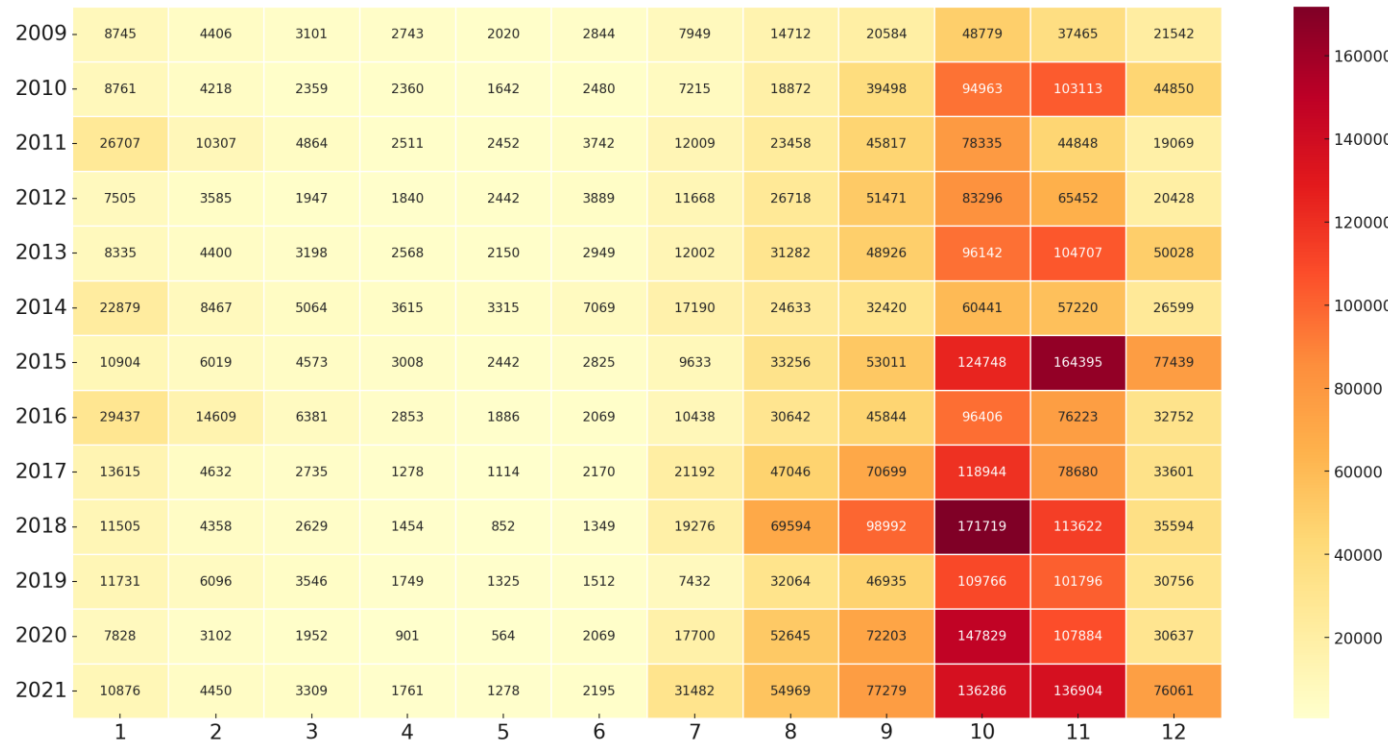
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Health Data Analysis and ML Modelling

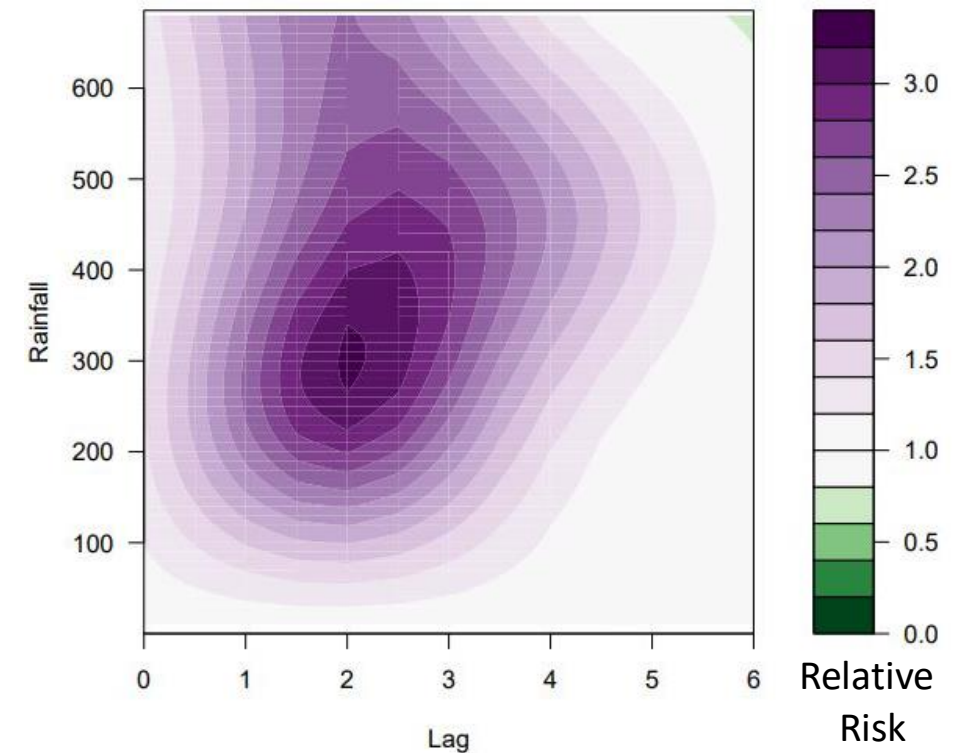


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Heat map of Senegal – Malaria Prevalence

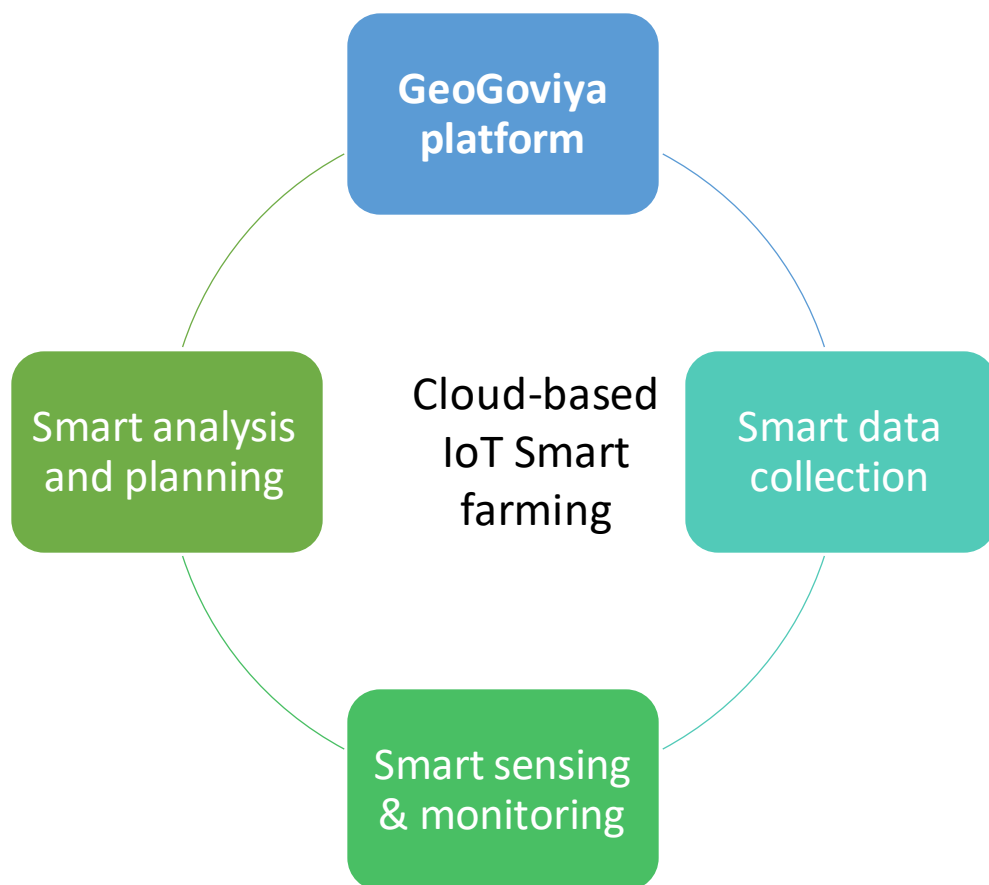


Malaria Lag-time based on Rainfall



- Machine models developed for Malaria prevalence based on rainfall datasets for Senegal
- One technical report on coding and ML model schematics is under preparation – September
- One journal article of Malaria prevalence analysis and ML model is under preparation – September.

GeoGoviya – smart farming platform



What can GeoGoviya offer (Potential applications)



Thank you

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