



IPU Science for Peace Parliamentary meeting

Planet of water: Earth Observation Programmes as a tool to monitor water

**“Using Earth Observation
for building climate resilience and ensuring water
security.”**

**Presented By,
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Programme Specialist, DRM and Climate Resilience Section**

United Nations Satellite Centre (UNOSAT) of UNITAR



- Division for Satellite Analysis and Applied Research at the **United Nations Institute for Training and Research (UNITAR)**
- Operational since 2001, recognized as the **United Nations Satellite Centre** in June 2021

Mandate:

“provide United Nations funds, programmes and specialized agencies with satellite analysis, training and capacity development, at their request, as well as to continue supporting Member States with satellite imagery analysis over their respective territories and to provide training and capacity development in the use of geospatial information technologies”



Operational Pillars



Training and Capacity Development

Hands-on technical training, awareness raising and technical backstopping



Satellite Analysis

Satellite imagery derived geospatial products



Applied Research and Innovation

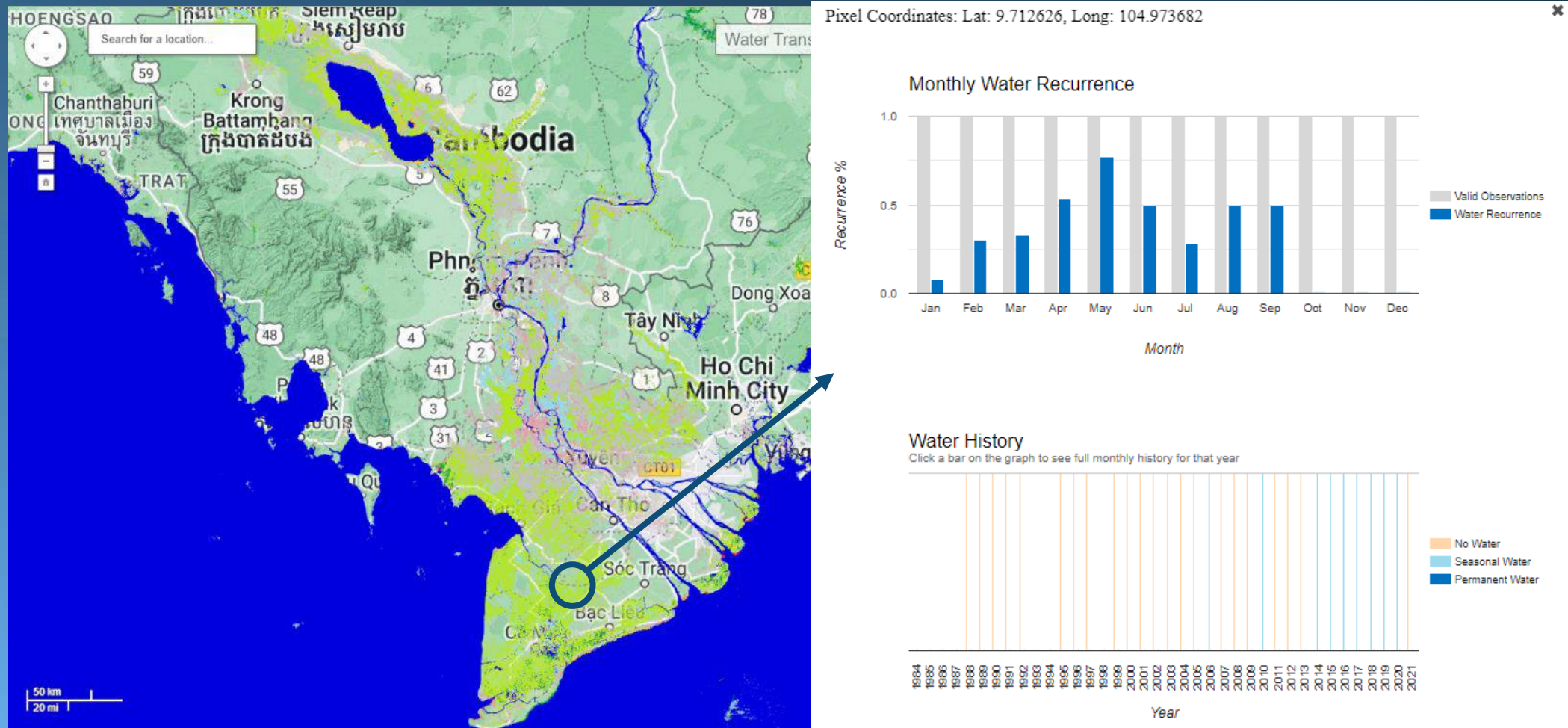
EO, AI, Machine Learning, Big Data Analytics

Golden Age of Earth Observation

- Exponential growth of satellite sensors: more orbiting satellites means more data and applications;
- Cost effectiveness: Faster and cheaper launches mean more satellites in space and at a much cheaper cost;
- Sensor advancements – higher spatial resolution (i.e. 30 / 15 cm) and reduction in revisit time: some constellations are capable of covering the Earth several times a week;
- Shift from data to analytics: Big Data and Cloud Processing technologies allows a huge amount of data to be not only stored but also analyzed online. More companies are offering value-added services;
- Rise of AI/ML: have proved to be a powerful tool for analyzing satellite imagery and providing faster and more insights about economic, social and environmental processes at different scale.

Example: Time Series Earth Observation for Water Monitoring

- Global Surface Water Explorer (Courtesy: JRC)



The Good

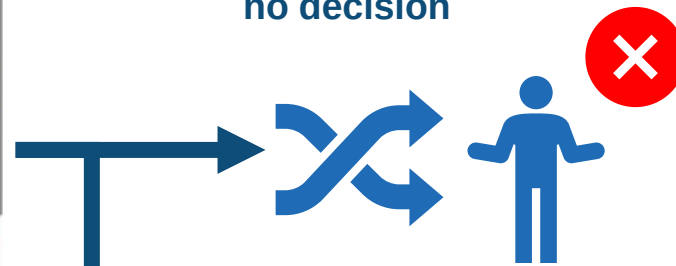
- Open and free data available from 10m resolution to 1km resolution (Sentinel 1,2,3 Landsat 8,9 VIIRS)
- Some satellite sensors can see through clouds, which allows for continuous monitoring (Sentinel 1)
- Daily revisit time for low resolution satellite sensors
- Weekly to few days revisit time for relatively higher resolution satellite sensors.

The Challenge

- Different earth observation dataset fit for different purpose, only experts are able select the most optimal data for answering critical questions.
- User may need to go to several portals for their own analysis.
- Data are often served in raw or semi processed which may answer very specific question for a country.

The Challenge

**“Data to Decisions
for building climate resilience and
ensuring water security.”**



+

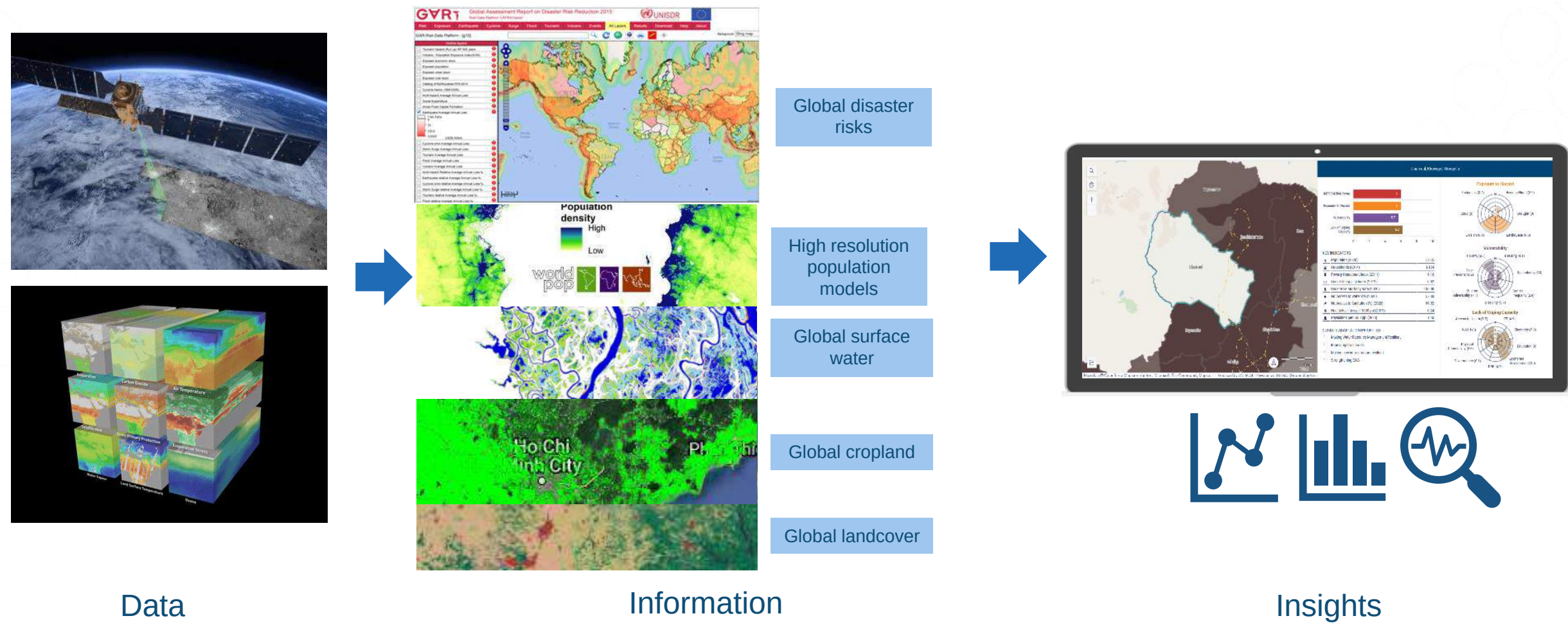
Scientific Information

Easy to interpret, included priorities and recommendation can be used for decision making



From Science to Decision Support Information

A Decision Support Systems provides contextual analyses of a variety of existing issues and guides the decision makers towards the most appropriate interventions.



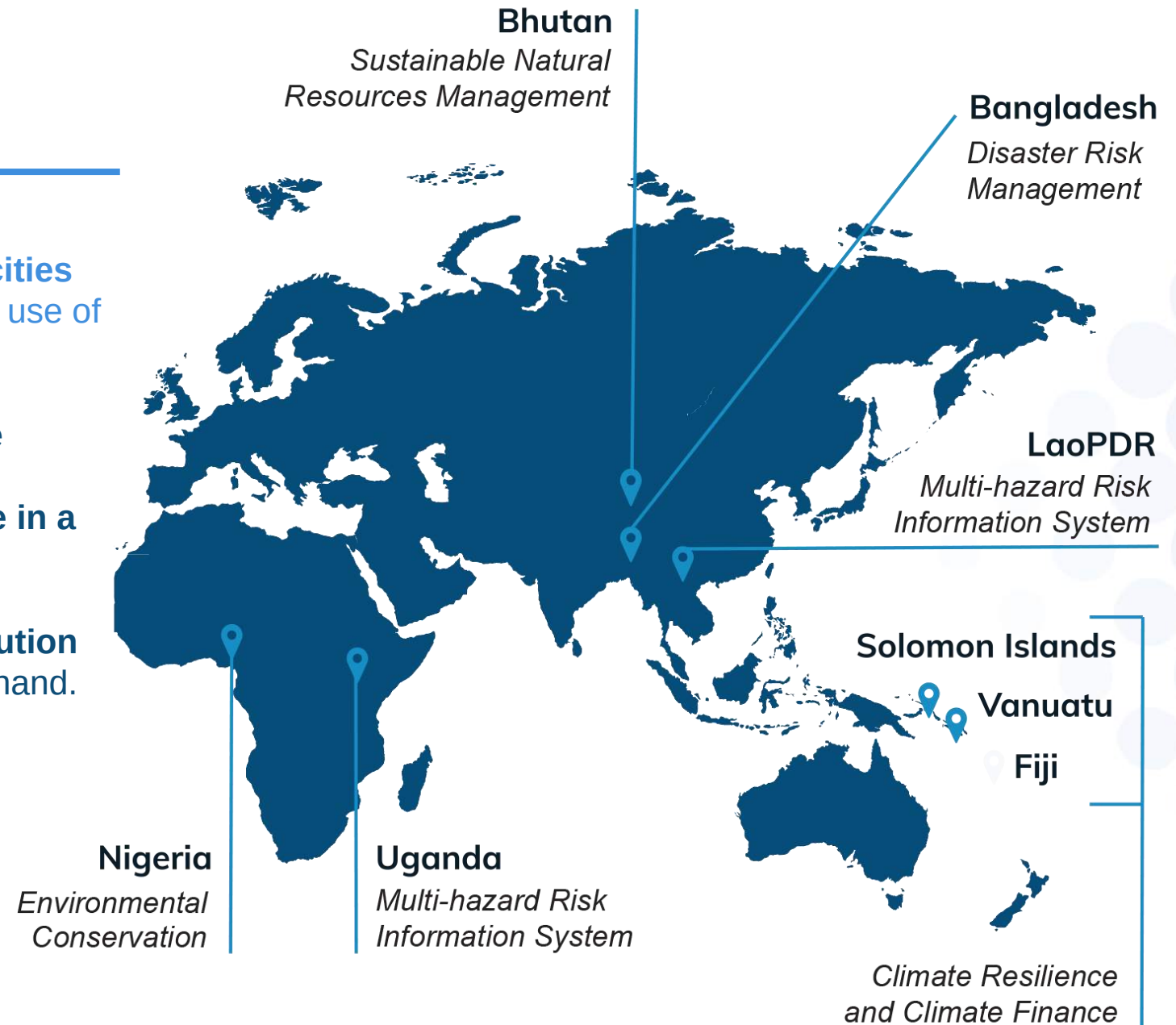
Bridging the Gap

**“STRENGTHENING CAPACITIES IN THE USE OF
GEOSPATIAL INFORMATION FOR IMPROVED
RESILIENCE IN ASIA-PACIFIC AND AFRICA”**

Funded by Norwegian Agency for Development Cooperation (NORAD)

Project scope

- **Develop technical and institutional capacities** of professionals in selected countries on the use of geospatial information technologies.
- Apply geo-information technologies to tackle **disaster risk but also environmental degradation, food security, and resilience in a changing climate.**
- **“End-to-end capacity development” - solution and capacity development** will go hand in hand.
- Funded by the Norwegian Agency for Development Cooperation (NORAD)
- 3-year project (until June 2024)
- 8 target countries



Earth Observation for Managing Water Related Hazards



UNOSAT based Flood Detection Tool (FloodAI)



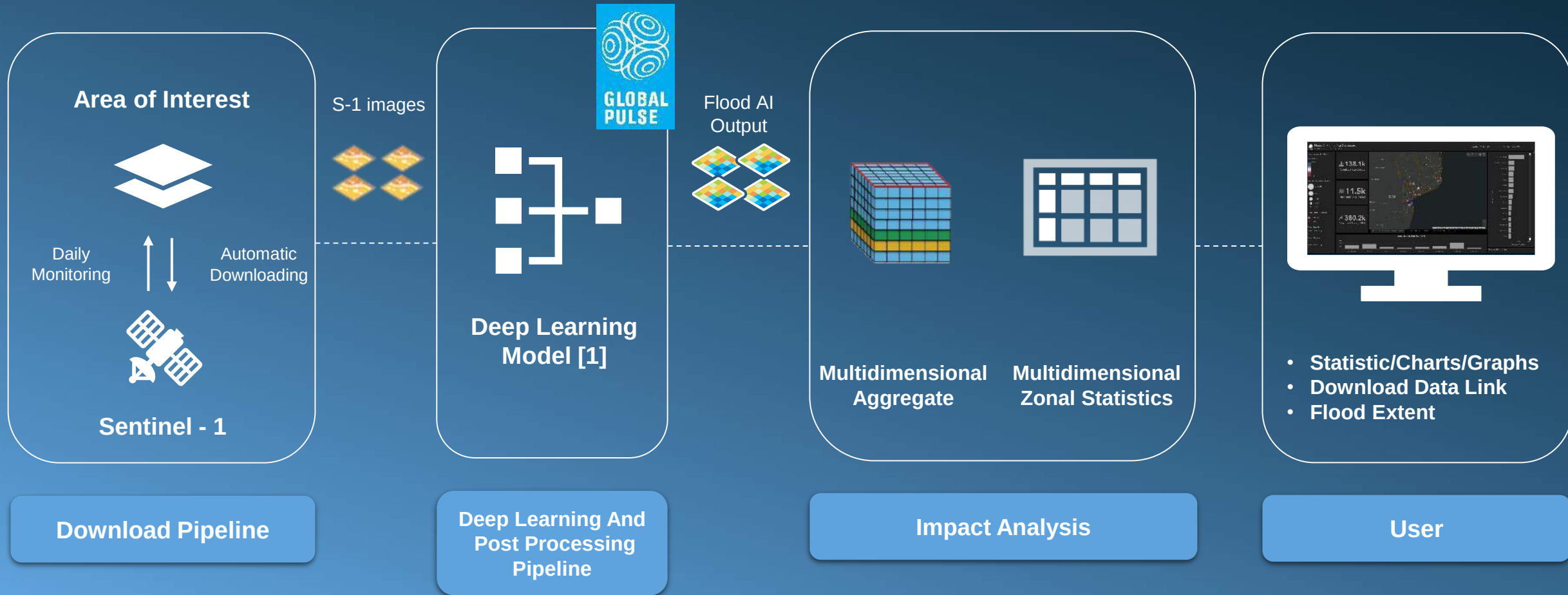
The Copernicus Sentinel-1 mission is designed as a two-satellite constellation. Each satellite carries an advanced radar instrument to provide an all-weather, day-and-night supply of imagery of Earth's surface. The mission ended for Sentinel-1B in 2022.

Sentinel 1 Satellite Observation, Courtesy: ESA



> 1 Peta Byte of Data Collected Per Year

UNOSAT based Flood Detection Tool (FloodAI)



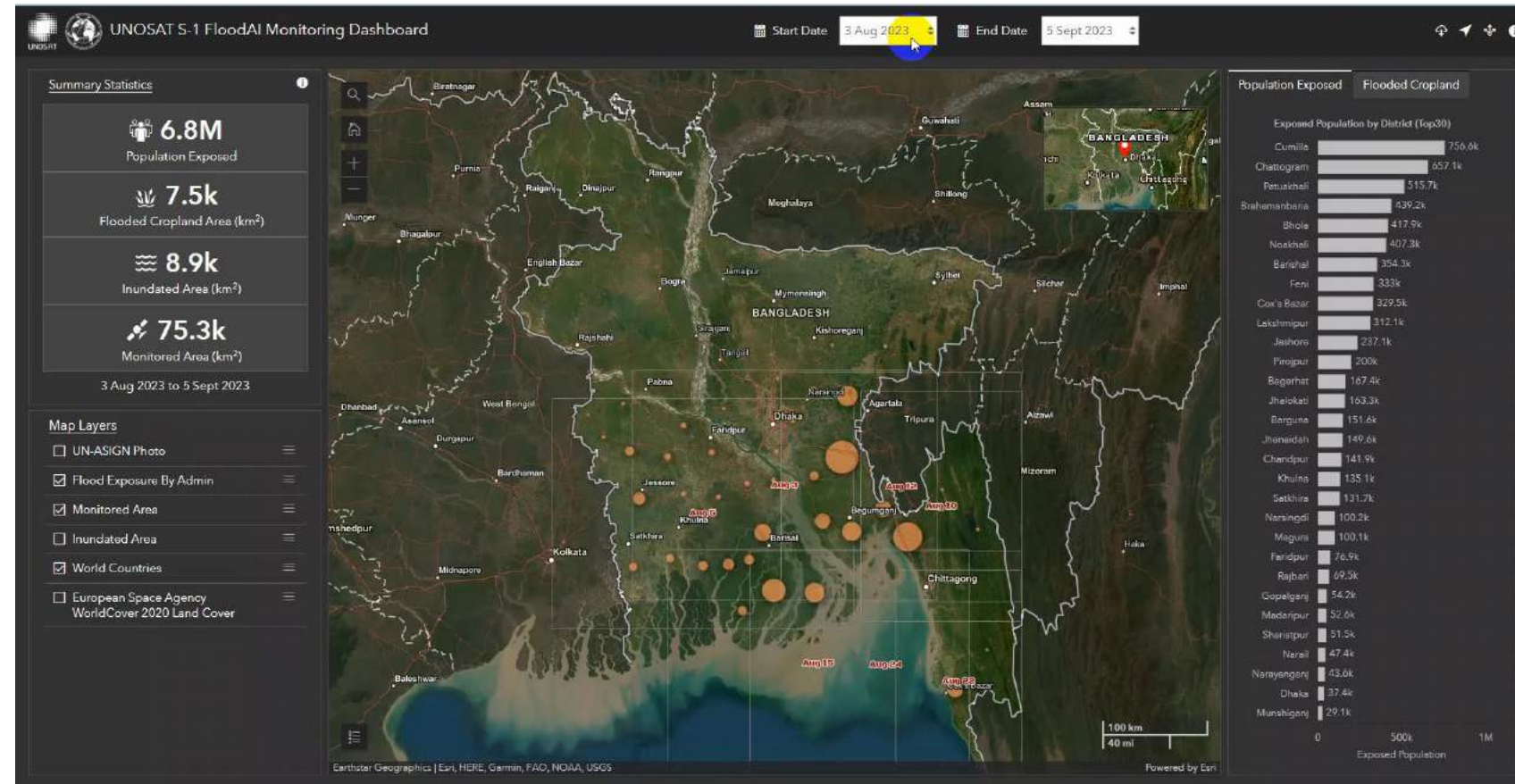
Deployment: NVIDIA V100 and T4 GPUs at CERN. 64 TB data storage server and a high-speed CERN internet connection NVIDIA.

Bangladesh - AI Based Flood Monitoring Dashboard

This app illustrates AI based satellite-detected surface waters as observed from Sentinel-1 images. All statistics are computed based on WorldPop and cover only over Bangladesh.

This is a joint pilot product of UNOSAT together with Department of Disaster Management (DDM), Bangladesh. The results are yet experimental and reflects the need of DDM only.

This dashboard will help the flood emergency managers quickly understand the flood situation and prepare response plan accordingly.



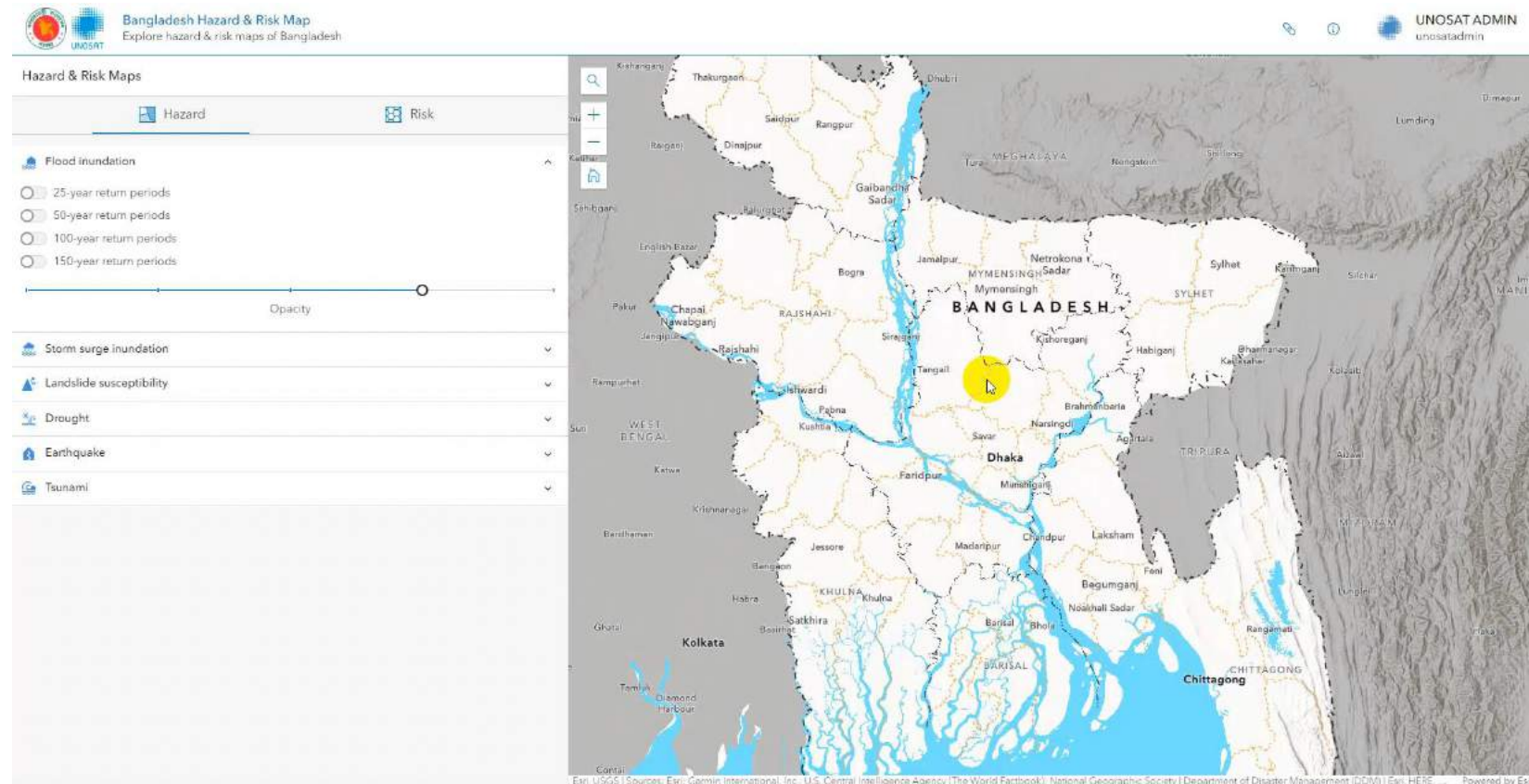
[Go to Dashboard](#)



Bangladesh - Hazard & Risk Map (Beta version)

This is a web app of Department of Disaster Management (DDM) developed with technical support from United Nations Satellite Centre (UNOSAT). The hazard data used here are from the Multi-Hazard Risk and Vulnerability Assessment, Modelling & Mapping Project of DDM.

This semi-automated web application has the capability to analyze risk associated with various natural hazards. This is particularly useful for the users with limited technical knowledge and identifying risk scenario using limited effort. Even the decision makers can understand the risk scenario of the country, by their own, using this application.

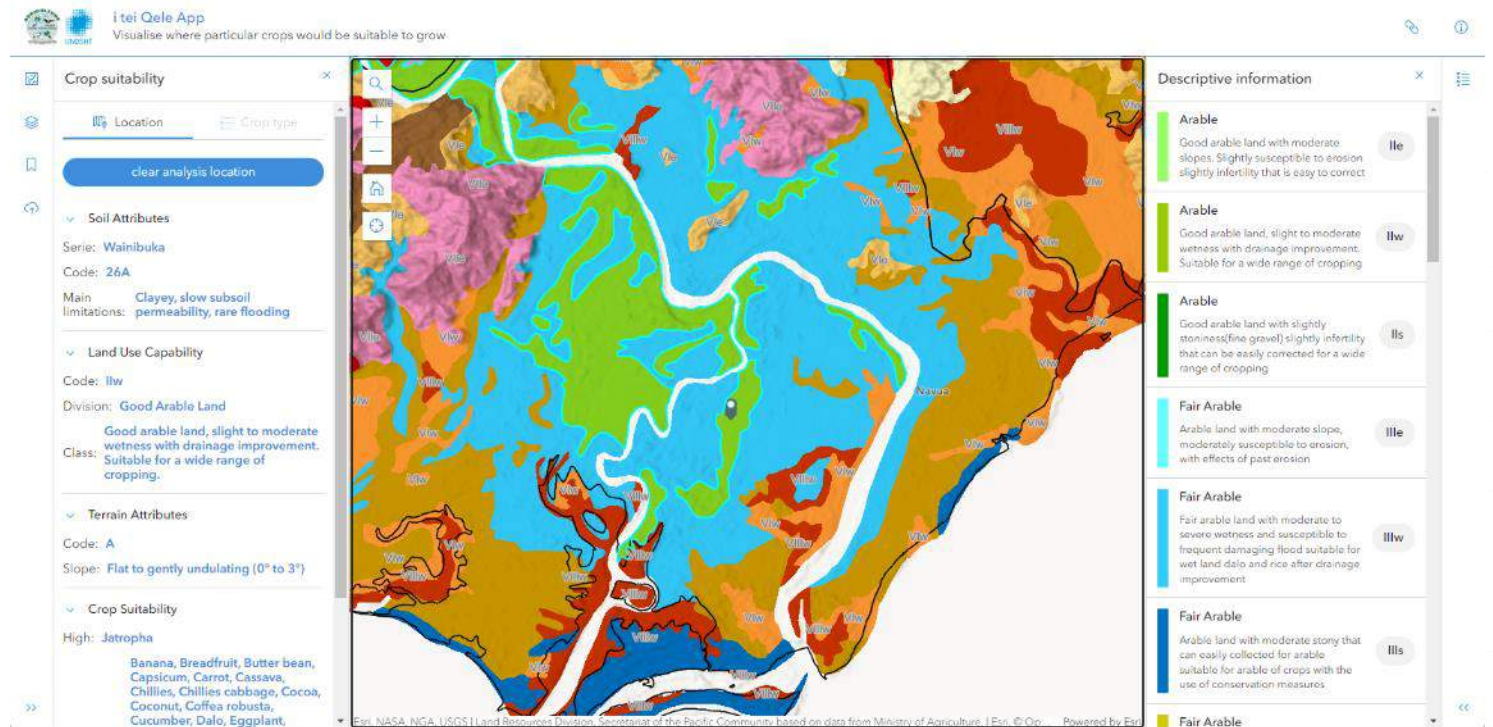


[Go to Application](#)

Fiji – i tei Qele App

The i tei Qele app illustrates crop suitability areas in Viti Levu and Vanua Levu islands in the Republic of Fiji. Crop suitability areas are summarized by Land Resources Division, Secretariat of the Pacific Community based on data from Ministry of Agriculture and Waterways Fiji.

The application allows farmers to visualise where particular crops would be suitable to grow. Users can query by crop type or location and view a summary of soil mapping units, land use capability classes and the main soil limitations for an area of interest. Farmers can use the application to assess the suitability of the land for selected crops the soil attributes and land qualities are compared with the individual crop requirements for optimum growth.



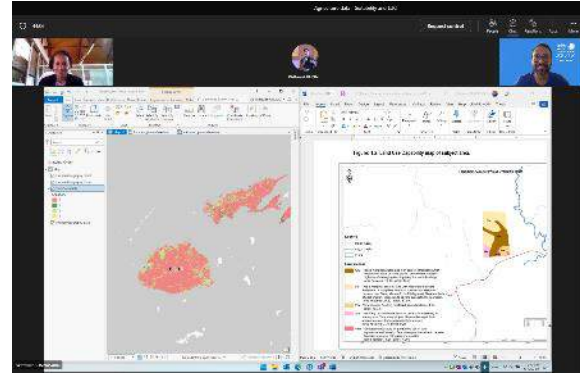
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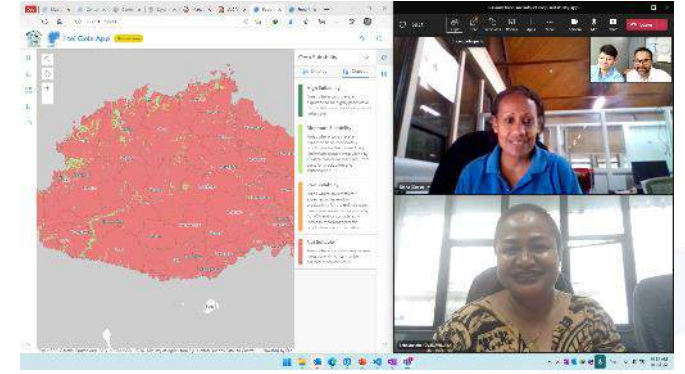
iTei Qele application development process



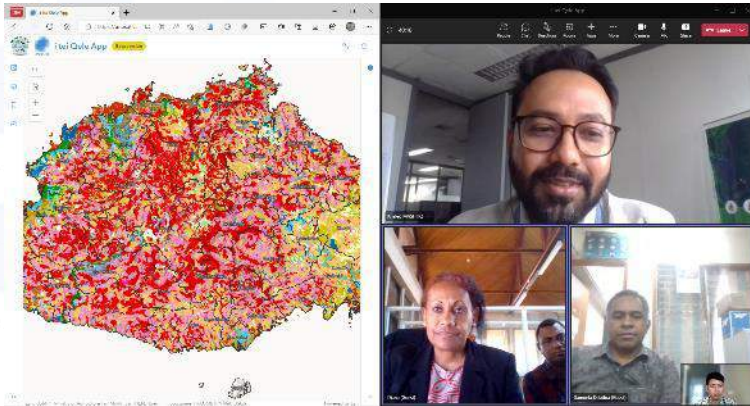
On March 22, 2022, UNOSAT and the Ministry of Agriculture convened in Suva, Fiji to engage in discussions regarding the app's user requirements.



13 May 2022



26 July 2022



10 November 2022



10 February 2023

19

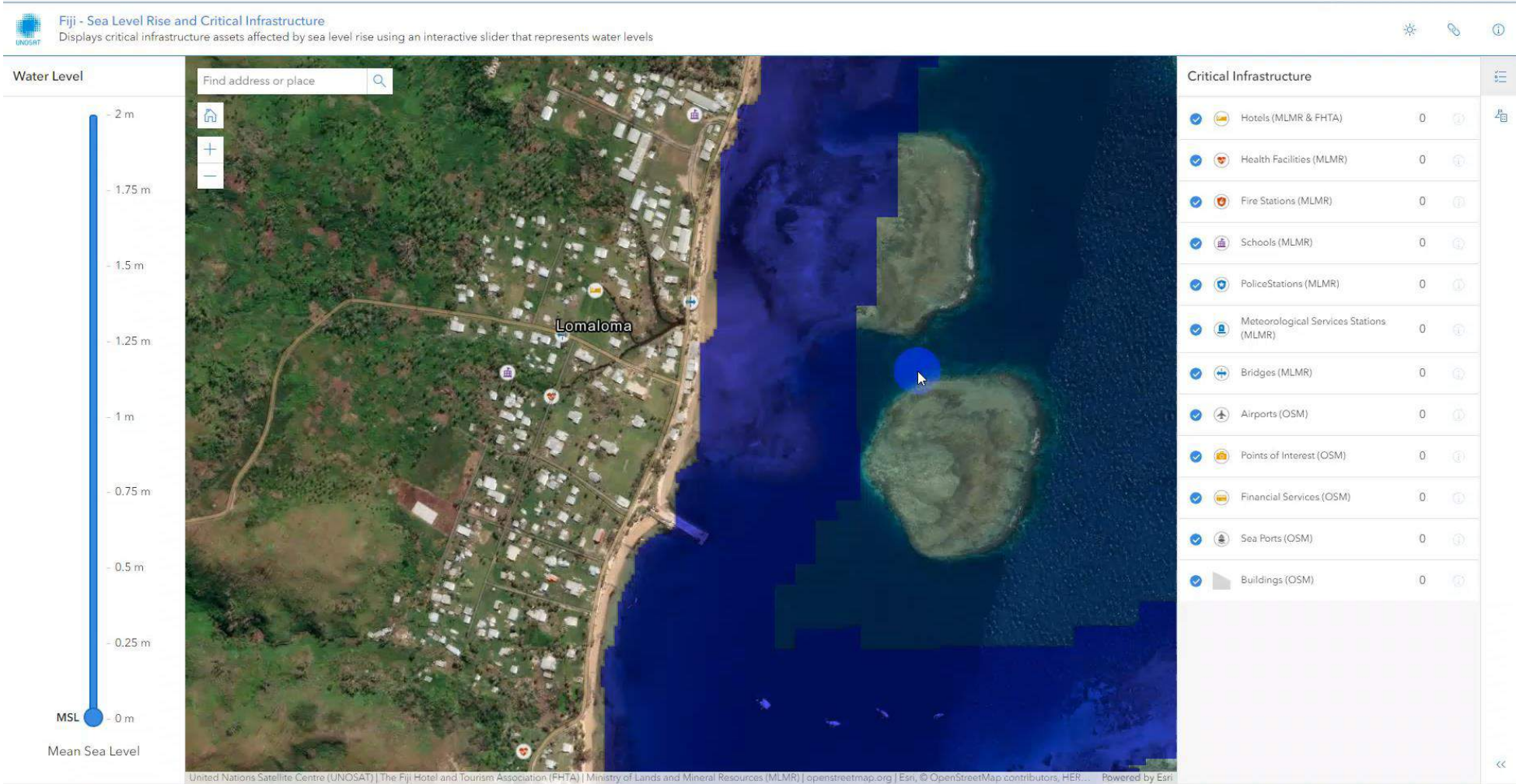
Fiji - Critical Infrastructure and Sea Level Rise (Beta version)



This interactive webapp can measure the impact of different sea level rise scenarios on housing and relevant infrastructure. The elevation dataset was derived from FABDEM (Forest And Buildings removed Copernicus DEM) data.

Decision-makers can use the app to visualise areas highly impacted by projected SLR by 2090, which assists with coastal adaptation planning

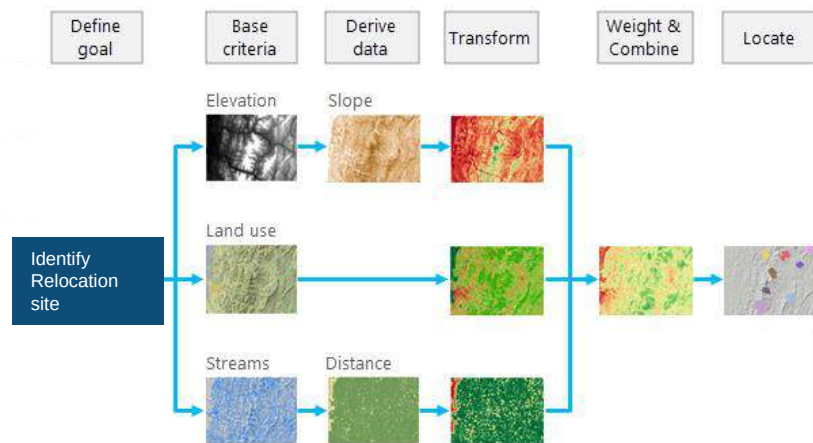
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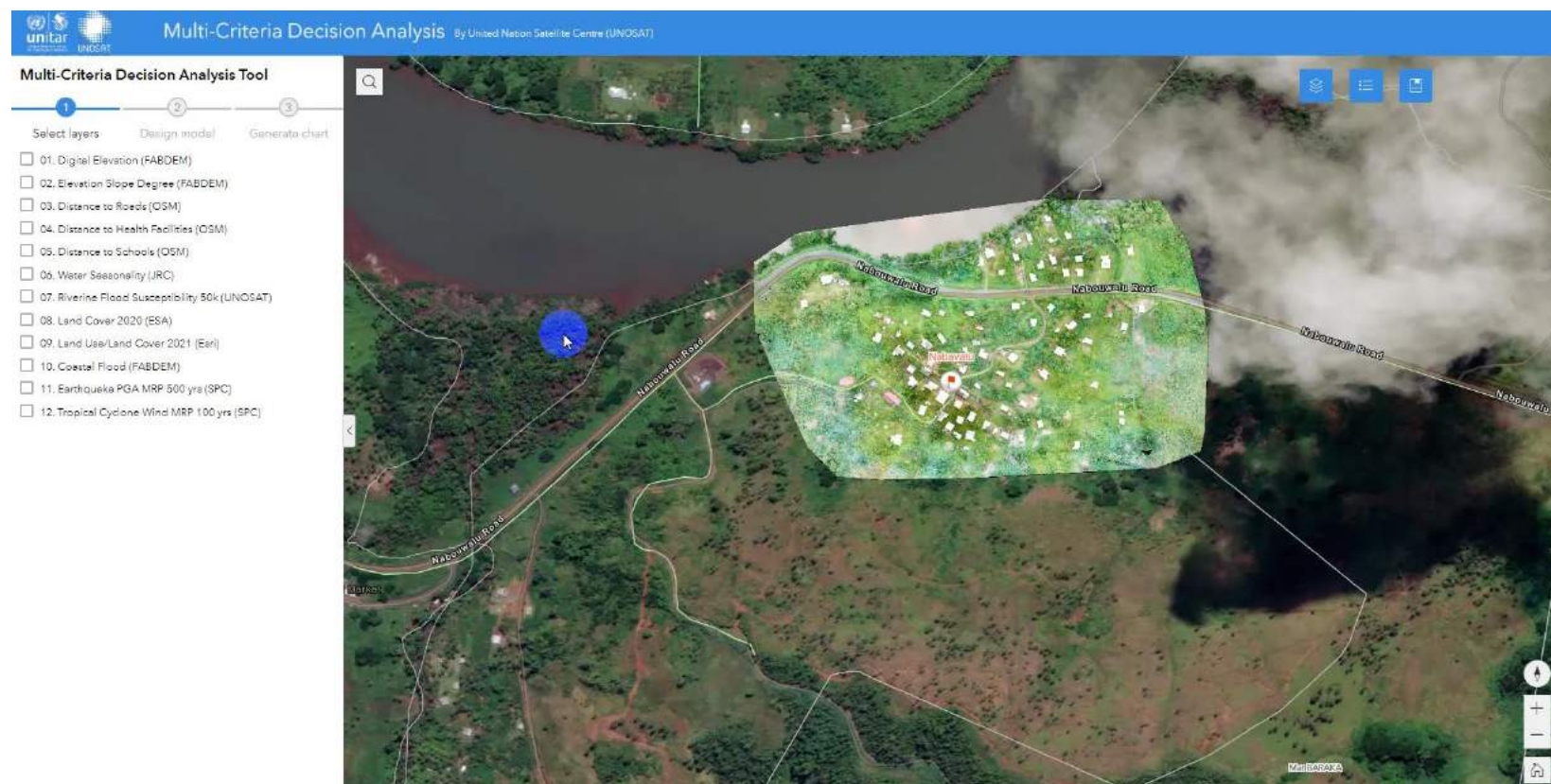
Multi-Criteria Decision Analysis (MCDA)

The **Multi-Criteria Decision Analysis tool (MCDA)** will enable the user to set up their own evaluation criteria's, visualise various options for interventions based on those, and assess the best possible action.

- Fast, web-based weighted raster overlay to generate models from a service.
- Choose layers, assign weights, and adjust layer classification values to define your analysis.
- Then, run the modeler, and visualize results.



Example: Generic suitability analysis workflow, ESRI



Access from here: <https://unosat-geodrr.cern.ch/GRAF/MCDA>

Transferring the Knowledge



16
Total
Training
delivered

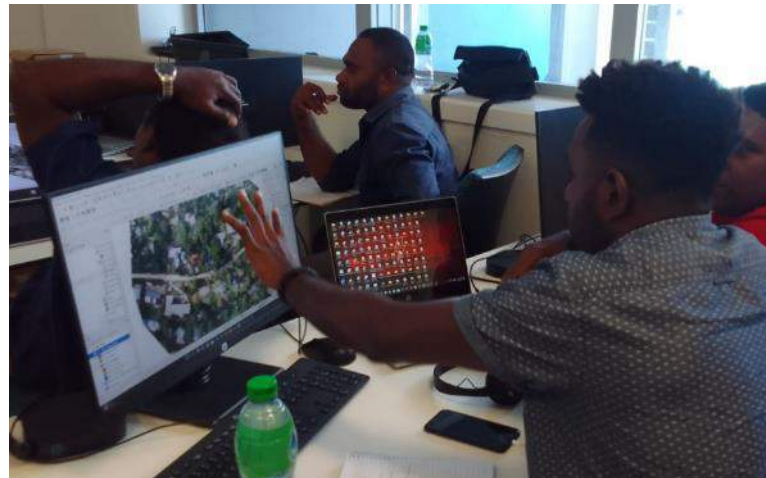
76
Different
Learning
Objectives

215
Participants

80
Organisations

Technical Trainings

- Advance Training on UAV data Collection, Processing, and Mapping, Bhutan, Solomon Islands
- Introductory Course on Strengthening Capacities in the Use of Geospatial Information Technology (GIT) for Disaster Risk Management, Lao PDR, Uganda
- Remote Sensing and LiDAR Data processing for Climate Resilience in Vanuatu
- Introductory Training on Flood Susceptibility Mapping, Fiji, Solomon Islands



Key Lessons

- Data to Decisions
- Problems to Solutions
- User centred applications
- Country ownership building through co-creation

Questions?



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