



Sentinel Asia

# Sentinel Asia Report

21 September 2023

Mr. SUZUKI Koji  
Co-Chair of Sentinel Asia Steering Committee

# 1. Overview of Sentinel Asia

- ✓ Sentinel Asia is an initiative aiming space-based international cooperation for disaster management in the Asia-Pacific region
- ✓ In February 2006, Sentinel Asia was established in accordance with the recommendation at APRSAF-12 in October 2005
- ✓ Sentinel Asia is expected to implement not only emergency observation but activities covering entire disaster management cycle including mitigation/preparedness and recovery phase after a disaster

## Concept of Sentinel Asia Strategic Plan

“Challenges for Disaster Risk Reduction by a Collaboration between Space and Disaster Management Agencies”

### MITIGATION

- Hazard Map
- Early Warning
- Success Story
- Pre-disaster monitoring

### RECOVERY

- Mid/Long-term monitoring
- Recovery Status



### PREPADNESS

- Training
- Capacity Building
- Standard Operation Procedure (SOP)

### RESPONSE

- Emergency Observation
- Data Analysis
- Damage Assessment

# 2. Membership Status of Sentinel Asia

(As of September 2023)

In total: **114** organizations.

Since APRSAF-28, newly welcomed

**2** organizations as below:

- Philippine Space

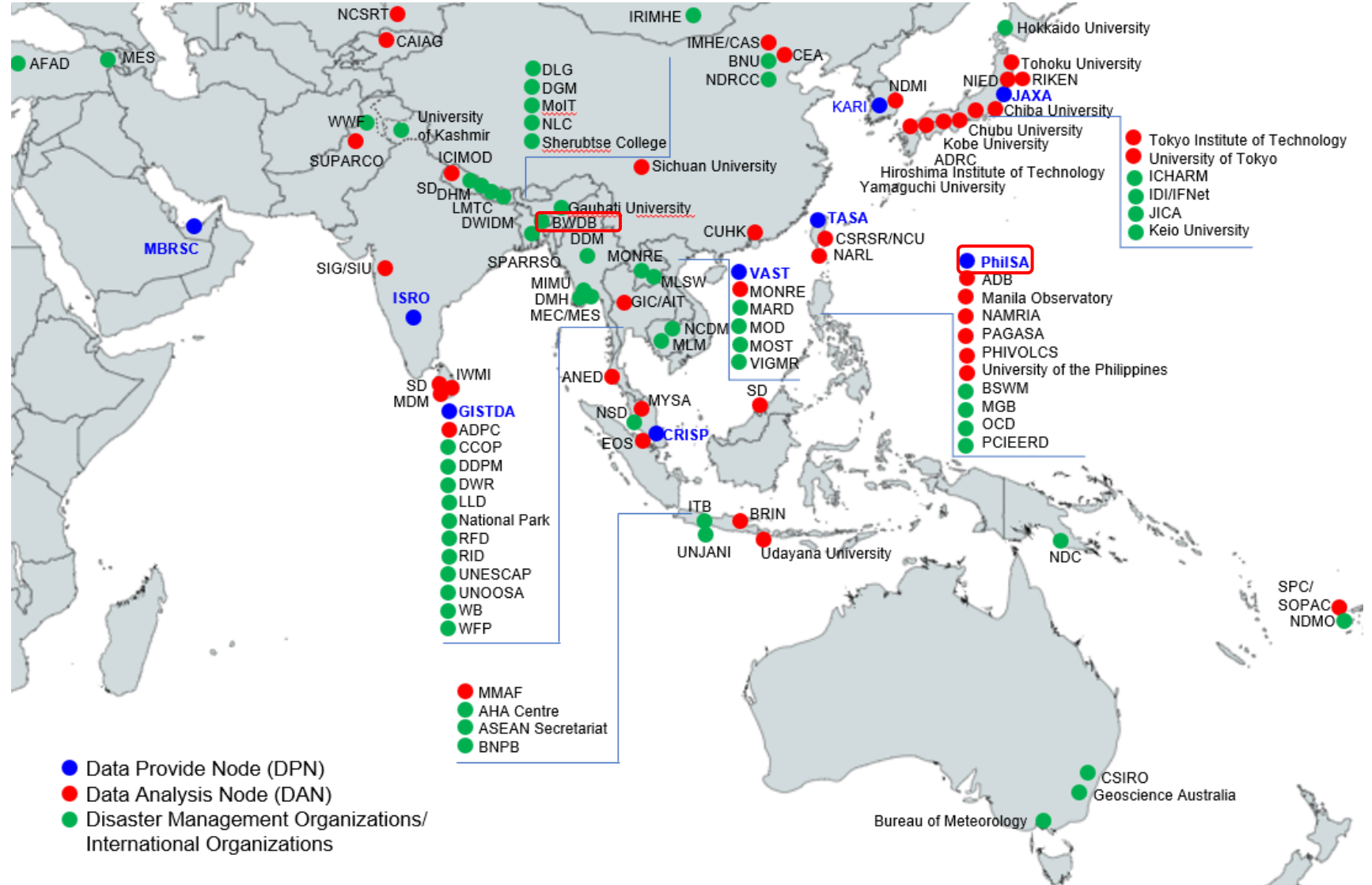
Agency (**PhilSA**) in

January 2023

- Bangladesh Water

Development Board

(**BWDB**) in May 2023



# 3. Emergency Observation Review by Geographical Distribution

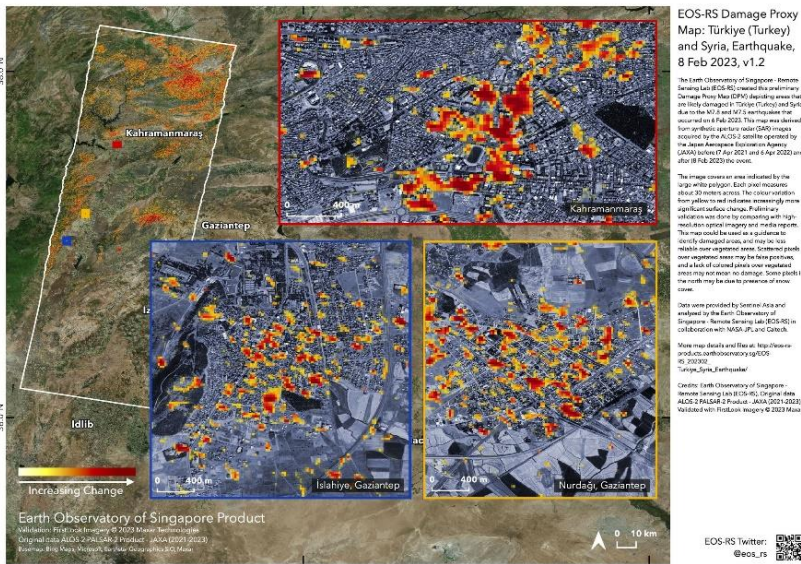


19 activations since last APRSAF

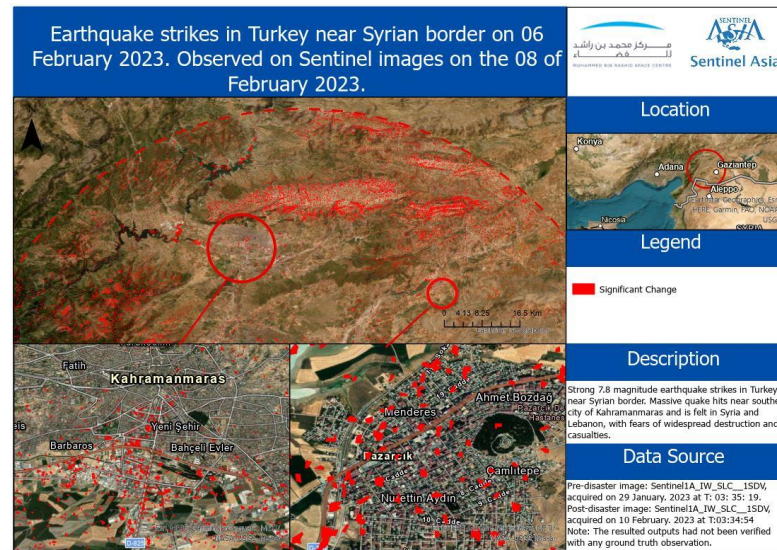
# Number of activations  
 36 countries/regions  
 422 disasters  
 Feb. 2007 - Sep. 2023

# 4.1 Earthquake in Turkey in February 2023

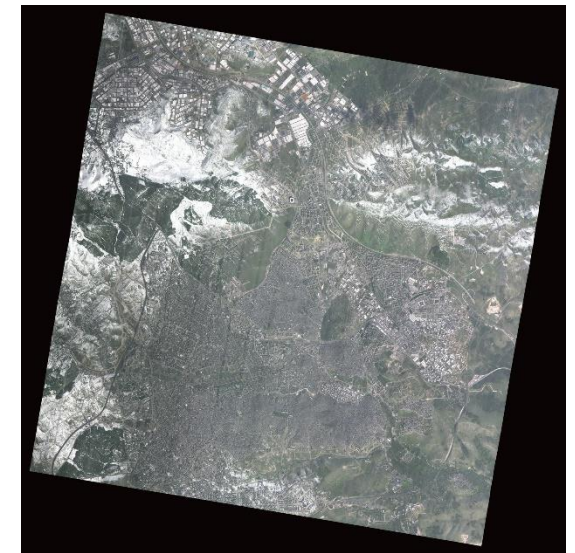
- ✓ Disaster and Emergency Management Presidency of Turkey (AFAD) requested emergency observation
- ✓ AFAD, disaster relief team and UNWFP used disaster assessment map to monitor the impact of the earthquake
- ✓ 5 organizations provided satellite data and 8 organizations provided analyzed disaster assessment maps



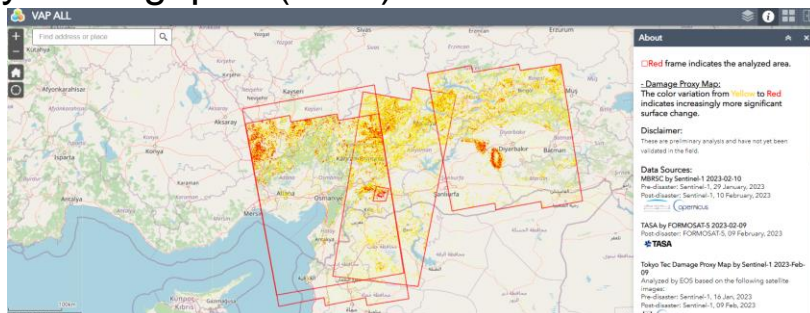
Damage Proxy Map by Earth Observatory of Singapore(EOS)



Significant damage map by MBRSC



Cartosat3 data by ISRO



Web-GIS overlaying potentially damaged areas and maps

<https://storymaps.arcgis.com/collections/3933d7b09edf4187a2e969e39558aa7f?item=1>

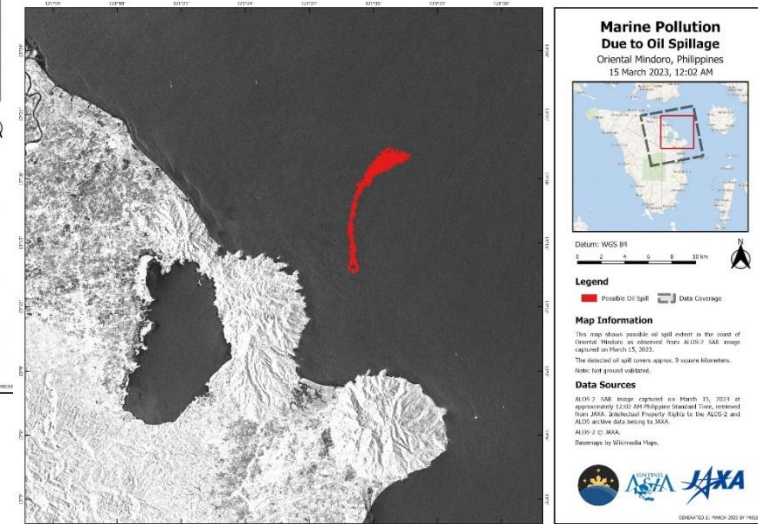
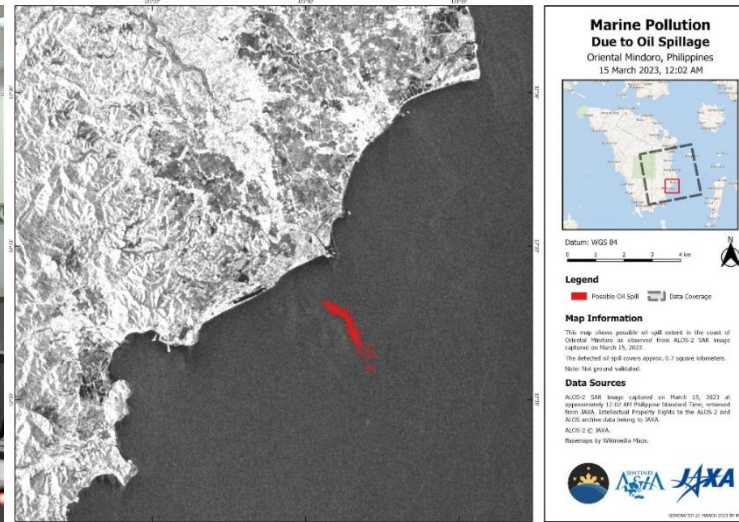
## 4.2 Oil Spill in the Philippines in March 2023

PhilSA requested emergency observation on oil spill, and held media briefing/press conference with estimated extent of oil spill maps provided by Sentinel Asia

- ✓ In response to this incident, the Japan Disaster Relief (JDR) Expert Team was dispatched for gathering information on the oil spill situation, checking oil removal and control activities and technical advisory
- ✓ JDR Expert Team used estimated extent of oil spill maps provided by Sentinel Asia
- ✓ 4 organizations provided satellite data and 2 organizations provided estimated extent of oil spill maps



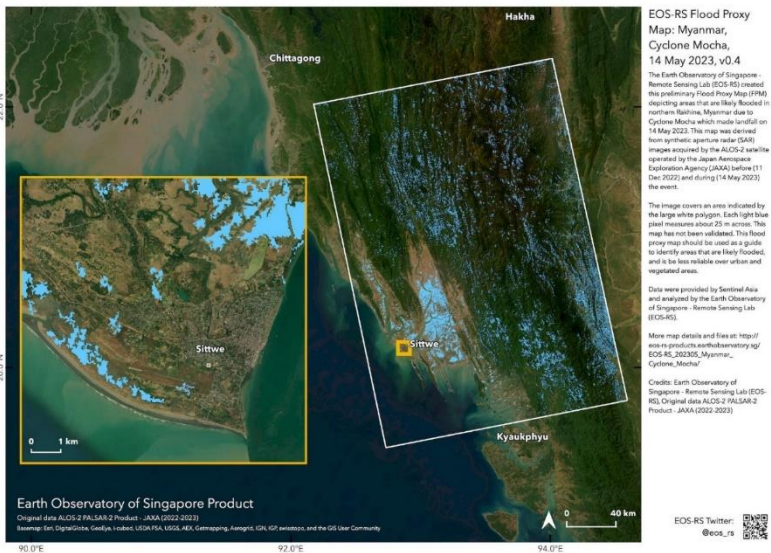
PhilSA showed journalists extent of Mindoro oil spill as captured by satellite images



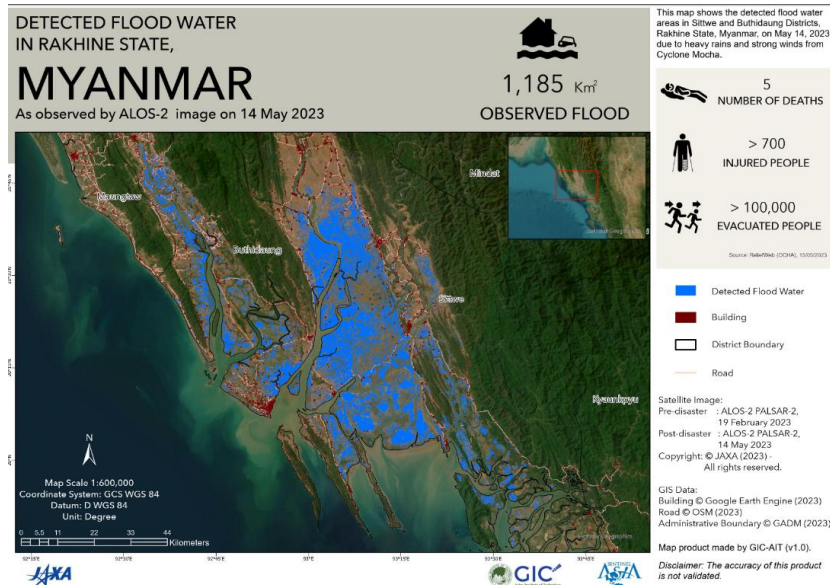
Estimated extent of oil spill maps analyzed by PhilSA

# 4.3.1 Cyclone MOCHA in Myanmar in May 2023

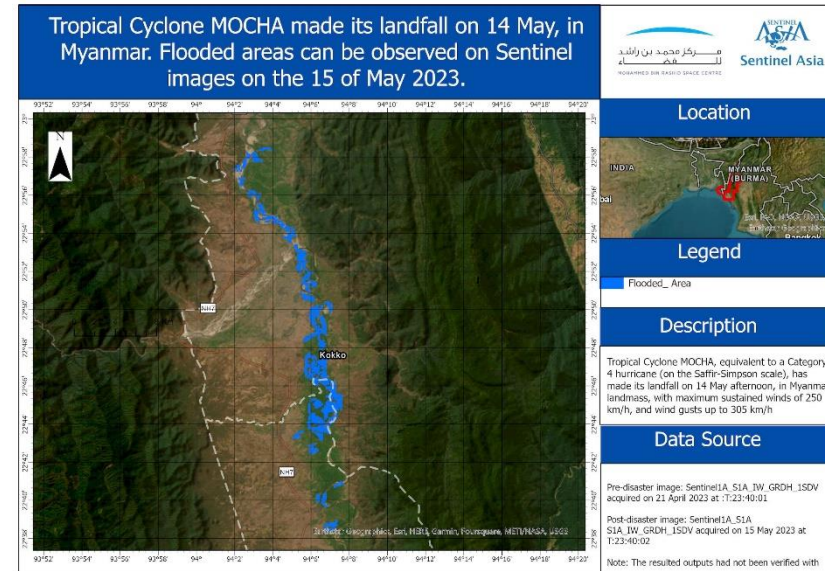
- ✓ AHA Centre requested emergency observation on Cyclone MOCHA in Myanmar in May 2023
- ✓ Thanks to disaster information provided by Earth Observatory of Singapore (EOS), Nanyang Technological University, Asian Institute of Technology (AIT) and MBRSC, AHA Centre could monitor the impact of the cyclone
- ✓ The flood proxy map provided by EOS was introduced on the report of AHA Centre



Flood Proxy Map by Earth Observatory of Singapore (EOS)



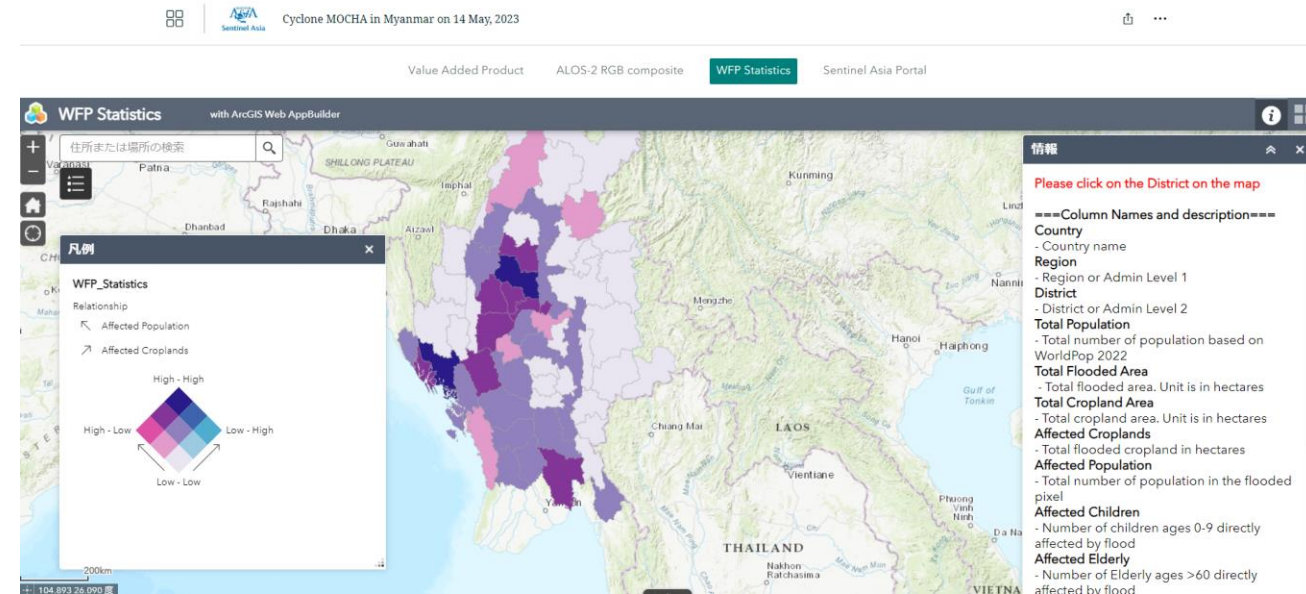
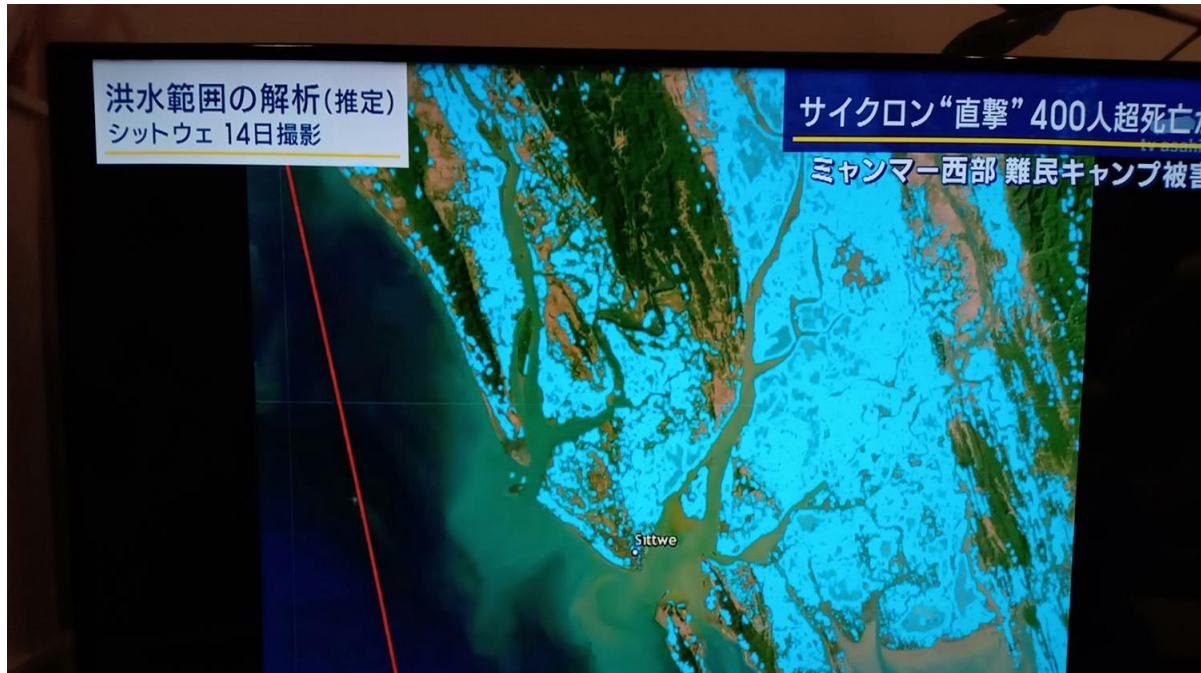
Detected water area map by Asian Institute of Technology (AIT)



Flooded area map by MBRSC

# 4.3.2 Cyclone MOCHA in Myanmar in May 2023

- ✓ Japanese TV program, “TV Asahi Hodo Station” broadcasted flood detected area map provided by Sentinel Asia
- ✓ UNWFP provided statistical information, Population and Cropland Impact Map to display social-economic loss assessment.



Population and crop impact map produced by UNWFP

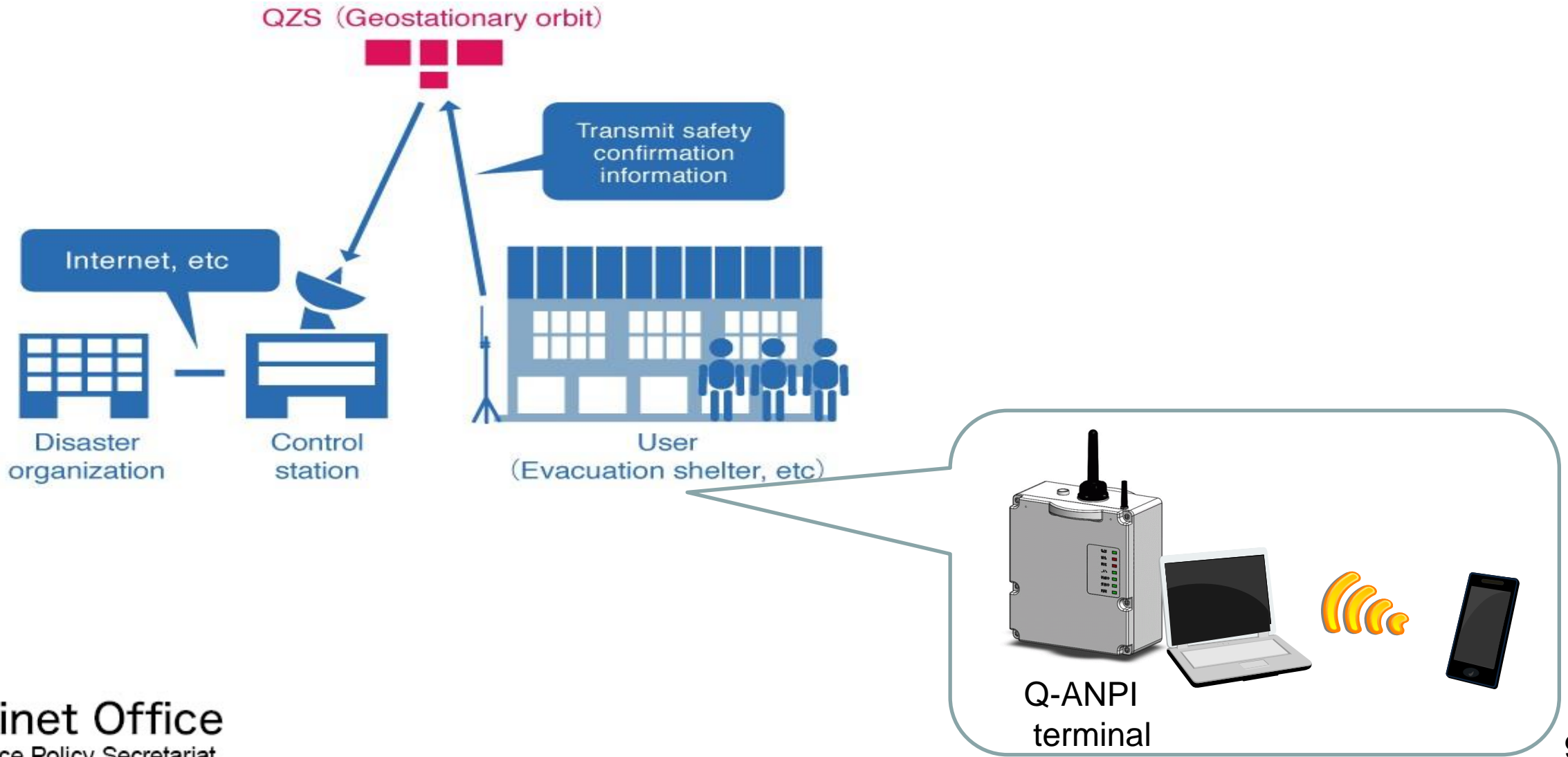
<https://storymaps.arcgis.com/collections/c2091e9c7da5416789f5291e790b0e48?item=1>

Sentinel Asia (防災における国際協力枠組みセンチネルアジア)  
 解析機関: Earth Observatory of Singapore - Remote Sensing Lab (EOS-RS),  
 Asian Institute of Technology (AIT)  
 衛星画像提供 JAXA 陸域観測技術衛星2号「だいち2号」(ALOS-2)  
 表示ソフト: ESRI



# 5.1 Messaging services

## QZSS Safety Confirmation Service (Q-ANPI)

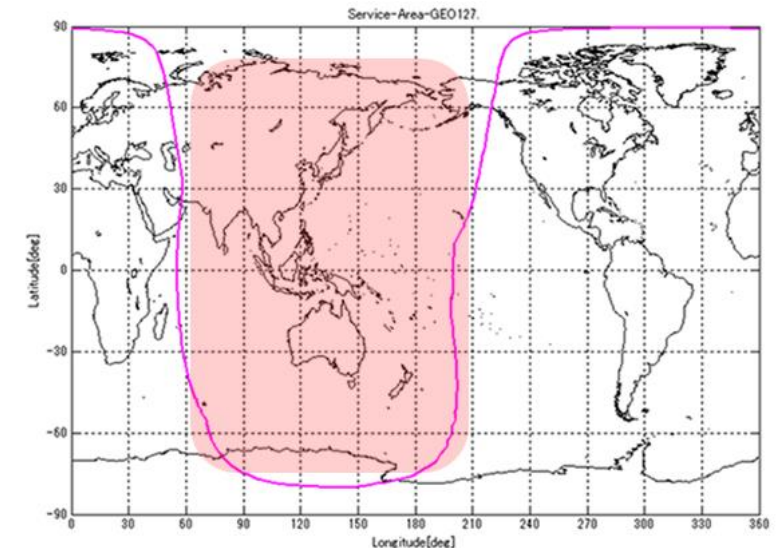
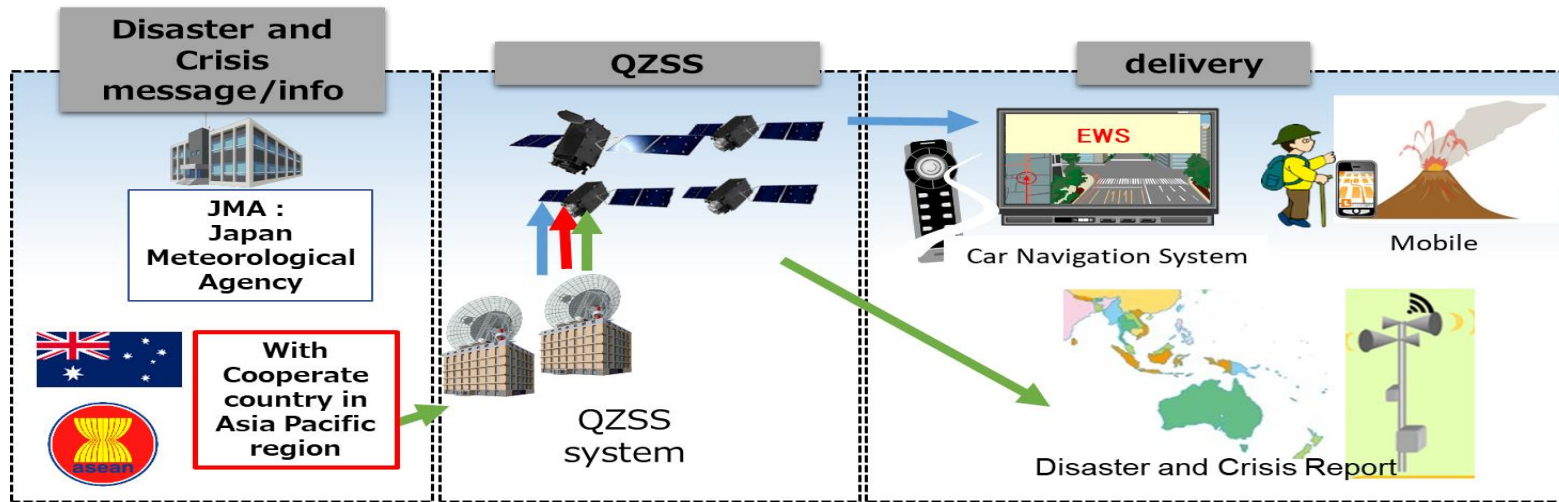


# 5.2 Messaging services

## Early Warning Service (EWS)



- QZSS L1S signal is sharing 250 bps data stream with SLAS(\*1) and Disaster and Crisis Report (DCR) service.
- DCR service is currently providing weather information generated by JMA for domestic users in Japan.
- Common EWS format collaborate with Galileo (EC/EU).
- **QZSS EWS system will be enhanced to Asia Pacific region in 2024-2025.**
- **Demonstration will be conducted for Australia , Thai and Fiji.**



Receivable area of the crisis management information by QZSS 10

# 5.3 Demonstration Projects for EWS

◆ QZSS EWS demonstrations are conducted in Asia Pacific region

First demonstration in Thailand; demonstration of evacuation notification of **forest fires and air pollution** to residents and fire notification to rangers (Fire extinguishing) was conducted in January 2023. Second demo is planned to be conducted in early 2024.

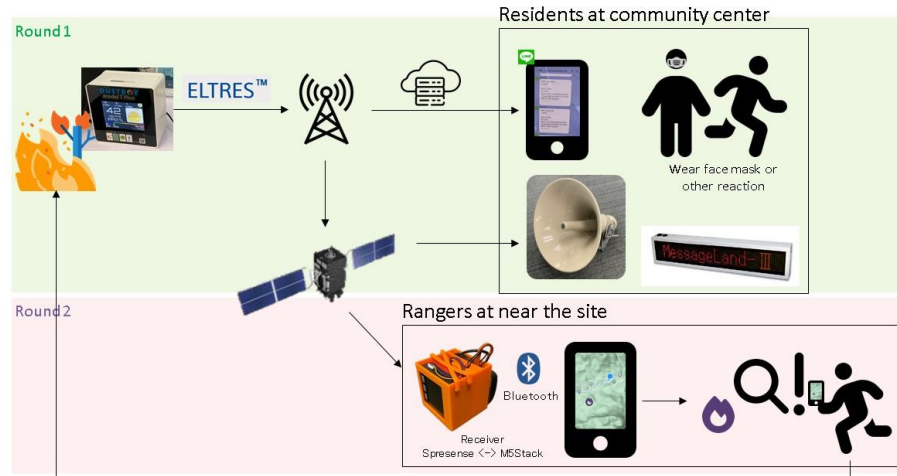
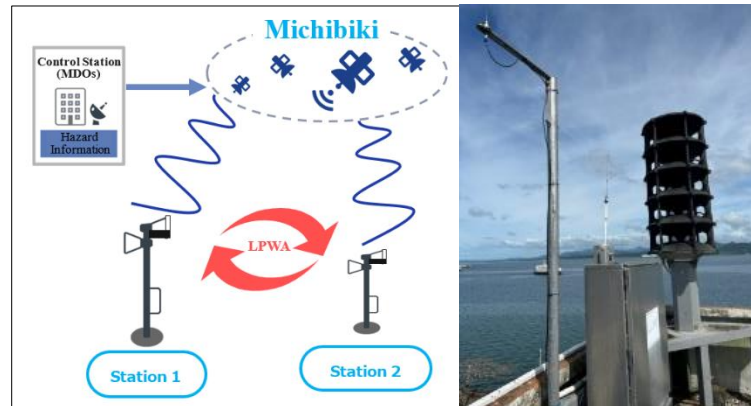


Image of demonstration



Site of demonstration (Chang Mai, Silanna National Park)

Demonstrations of evacuation notification for Tsunami in Fiji and bushfire in Australia were also conducted between February and March of 2023.



Fiji(Tsunami warning)



Australia (Bushfire warning)

# 6.1 8<sup>th</sup> Joint Project Team Meeting (JPTM)

- September 17-18, 2023
- 85 participants from 35 organizations

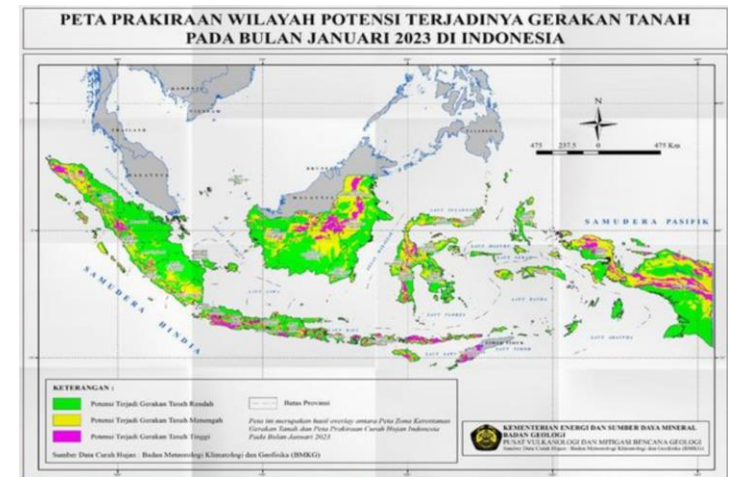
- ✓ Presentations from new Sentinel Asia members, Users, Data Analysis Nodes
- ✓ Indonesia Session: Accelerating satellite-based data and information for disaster risk management in Indonesia
- ✓ Discussion session to further promote the STEP-3 Strategic Plan of Sentinel Asia
- ✓ Training workshops for Capacity Building



# 6.2 Indonesia Session

## Special Session “Accelerating Satellite-based Data and Information for Disaster Risk Management in Indonesia”

- ✓ Dr. Udrekh and Mr. Putra of National Disaster Management Authority (BNPB) introduced the application of **satellite data for Indonesian Disaster Risk Reduction.**
- ✓ Dr. Jamal of Center for Geological Survey, Ministry of Energy and Mineral Resources (ESDM) emphasized the importance of **Satellite Data be used to accelerate updating Geological Mapping** to 127 active volcanoes which only 69 is currently covered by conventional methods.
- ✓ Dr. Hadi of **Diponegoro University** reported his experience at GIC-AIT on the assessment of the disasters and **emphasized the importance of continuous engagement between all stakeholders** involve in disaster event.
- ✓ Dr. Yenni of **BRIN** expressed the **importance of high temporal/spatial/spectral resolution images for regular monitoring of volcanoes** with the example of Mt. Semeru erupted repeatedly in recent years.

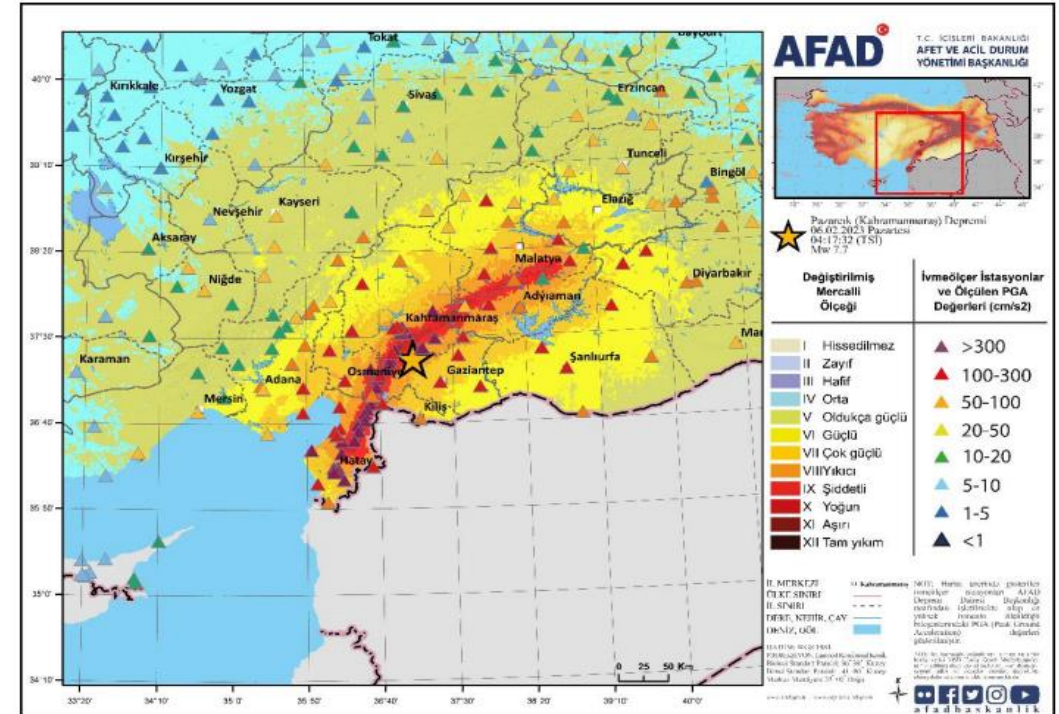


©ESDM



## 6.3 Systems for Disaster Risk Reduction

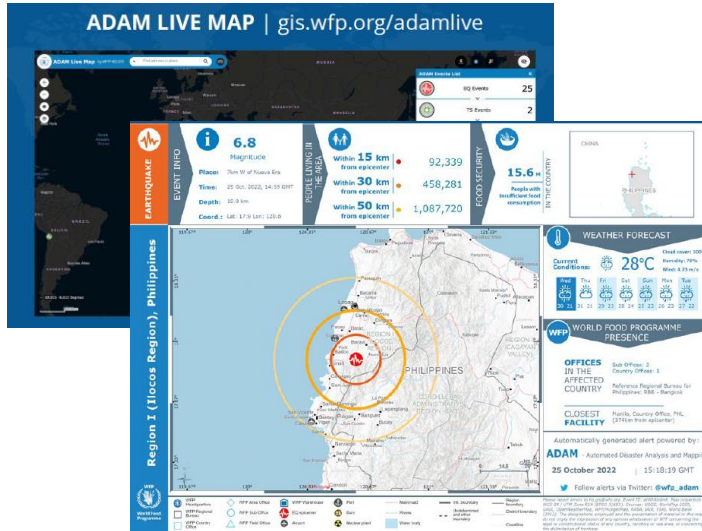
Several organizations shared their Web-Geographic Information Systems (Web-GIS) to share satellite images, value added products, and disaster related information.



Disaster Management and Decision Support System (AYDES) and AFAD-RED system. ©AFAD

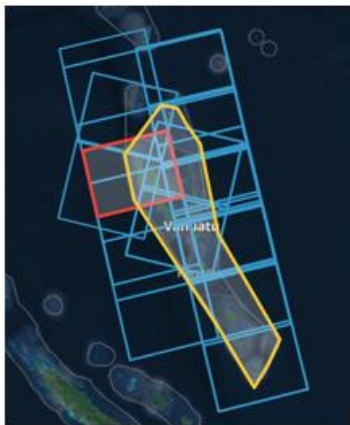
- **AFAD** developed “**RED system**”, integrated in **AYDES**, that provide **almost real-time estimation of seismic intensity map** of an earthquake and **damage assessment map**.

# 6.4 Systems for Disaster Risk Reduction



©UNWFP

- For UNWFP, damage assessment, affected population estimate, road clearance information, etc. are crucial for delivering the relief food supply within 72 hours after occurrence of disaster.
- **Advanced Disaster Analysis and Mapping (ADAM)** provide **The Shake Intensity Map, Epicenter Map, Population Impact Table** for earthquakes provided shortly after the event
- For Flood, **Population and Cropland Impact Map** and Flood Map/Forecast are provided

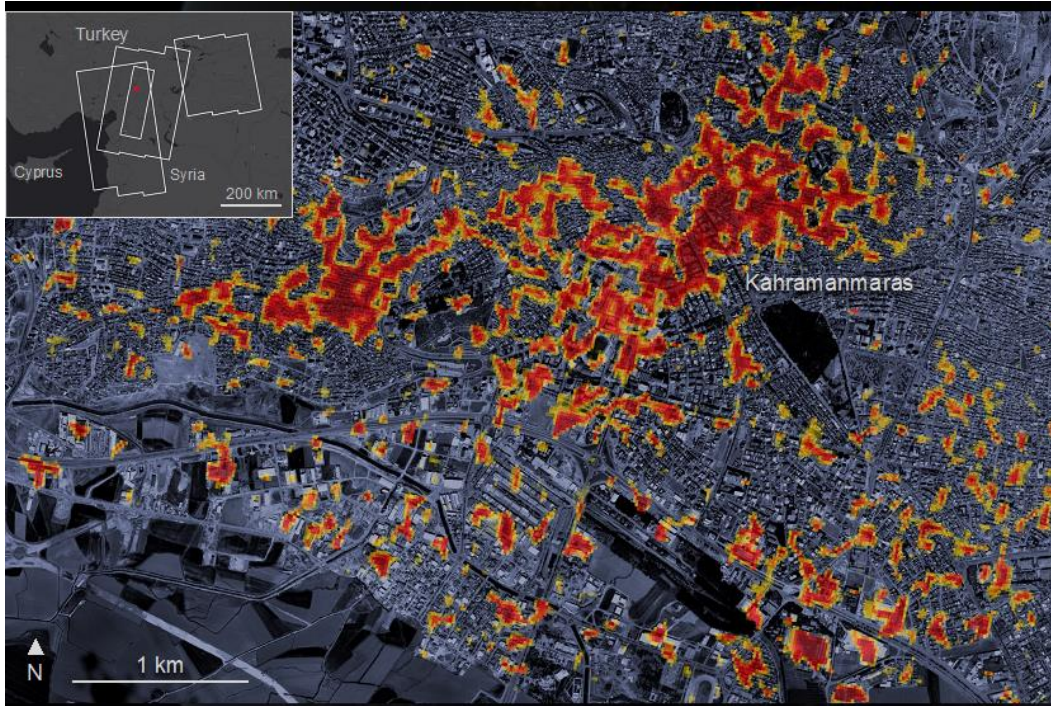


©SPC

- For Pacific Islands, lack of data sharing infrastructure is challenging issue.
- Pacific Community (**SPC**) developed **Digital Earth Pacific** which will allow the **Pacific Community's 27 member states to share the disaster related information.**
- The application may be also used for climate change and food security purposes

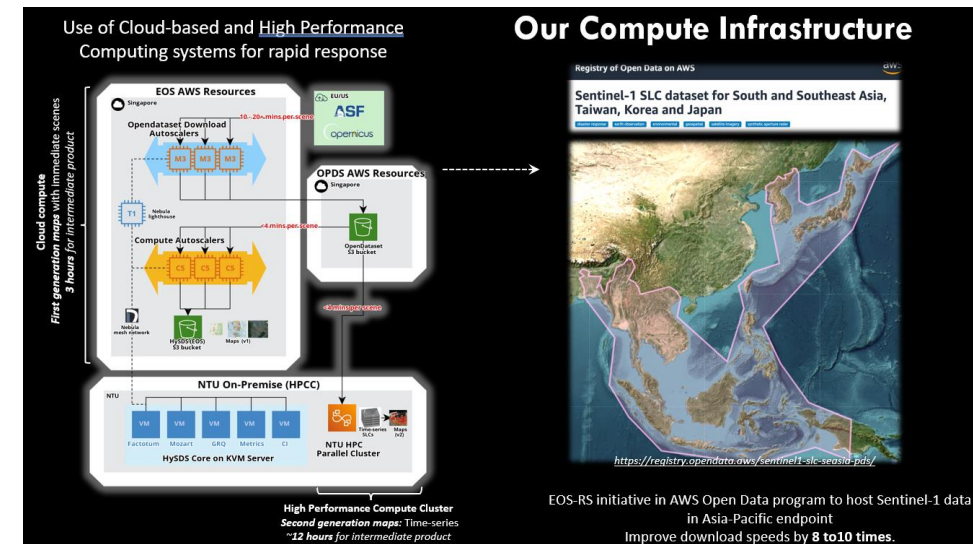
# 6.5 Solutions to satisfy the demand for Faster Provision of Analyzed Data

**EOS:** gaining reputation for their unique technology of building damage detection from SAR images. Emergency Management Center in Ankara, Turkey utilized for planning ground observations.

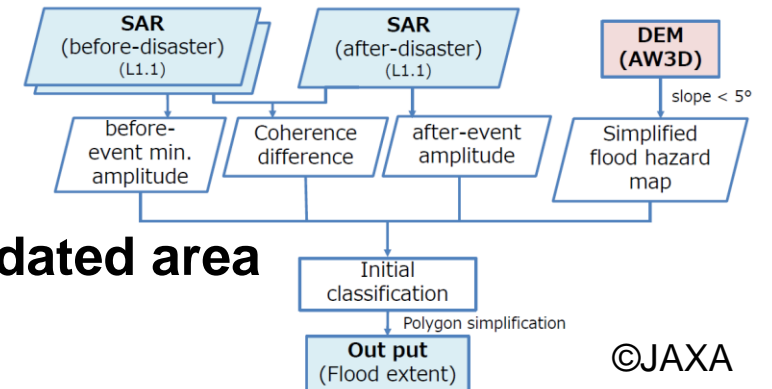


©EOS

**EOS: Cloud-based and High Performance Computing systems:**  
(omitting time for downloading huge satellite image data)



©EOS



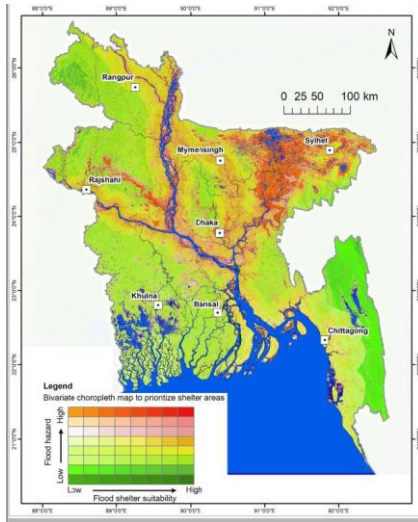
©JAXA

**JAXA: Autonomous Analysis for Flood Hazards extracting inundated area**  
Analyze as soon as the data is downlinked from the satellite (Right)



# 6.6 Water Related Disaster Management

Indian Space Research Organization (**ISRO**) demonstrated their Flood Hazard Early Warning System operation in India. (Right)



People take shelter at Shikha Government Primary School in Coxsbazar, Sylhet. (Photo credit: Dhaka Tribune)

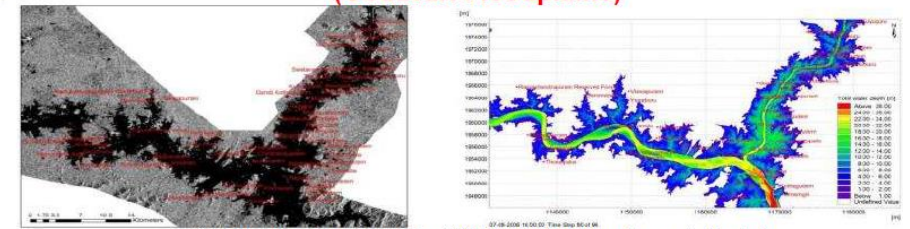
International Center for Integrated Mountain Development (**ICIMOD**) presented **Flood Shelter Suitability Maps** utilizing flood hazard analysis to select priority area for flood shelter construction in Bangladesh (Left)

©ICIMOD

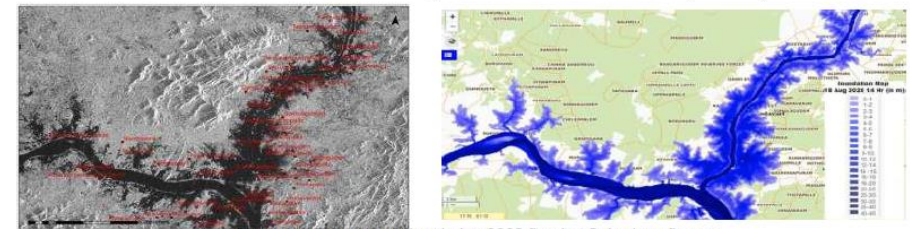
**BWDB** introduced the application of Global Satellite Mapping of Precipitation (**GSMaP**) to collect rainfall information outside of observation network for flood information management. (Right)

©BWDB

Spatial Flood Inundation Simulations (Observed Vs Simulated) (Godavari Floodplains) **npsc**



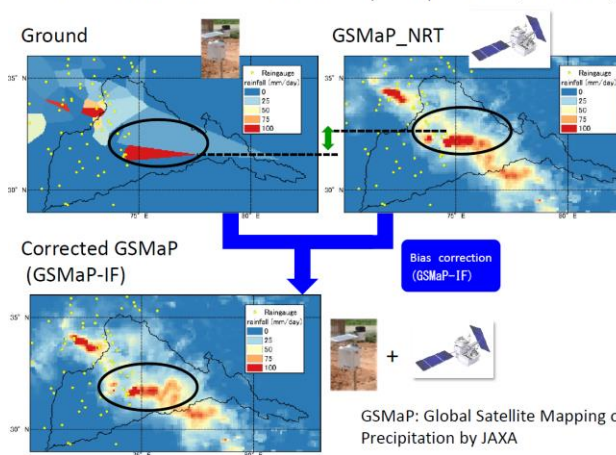
Simulated flood inundation during 2006 flood at Sabari confluence (calibrated)



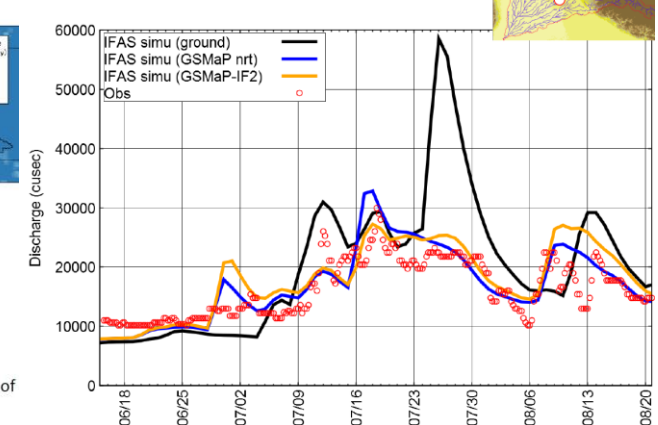
Simulated flood inundation during 2020 flood at Sabari confluence

©ISRO

Bias correction of Satellite precipitation (GSMaP)



Simulation of river discharge with GSMaP-IF



## 6.7 Expectations to Sentinel Asia

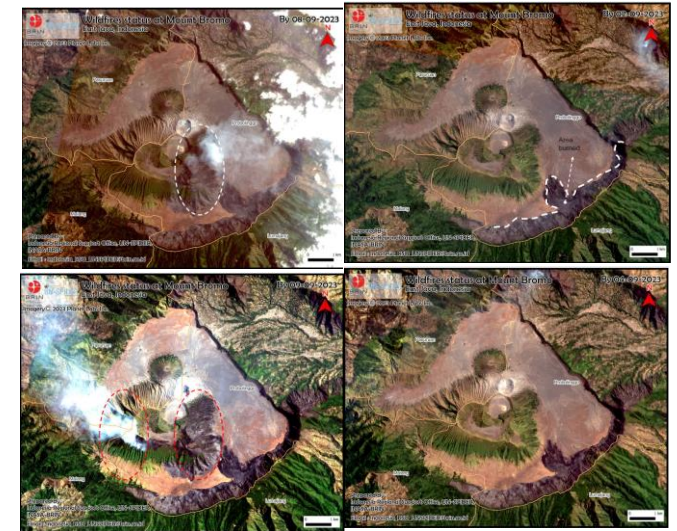
### Participants shared **Expectations to Sentinel Asia**

#### 【For Satellite Data】

- **AFAD** showed the necessity for **More High Resolution Optical Images**. In the case of **Turkey Earthquake** in Feb. 2023, they provided valuable information for **damage mapping**. (ex building destruction).
- **BRIN** emphasized the importance of **high temporal/spatial/spectral resolution images for regular monitoring of volcanoes**
- **BNPB** requesting **Real-time or Near-real-time observation** is crucial for early warnings and rapid response in cases of **earthquake and tsunami for immediate evacuation**



©AFAD



©BRIN

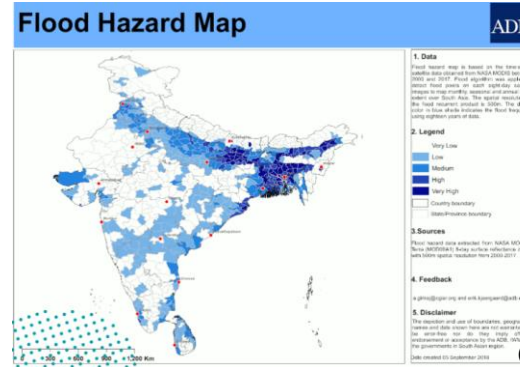
#### 【End User Recognition】

- Central Asian Institute for Applied Geosciences (**CAIAG**) and Space and Upper Atmosphere Research Commission (**SUPARCO**) shared their experience of interactions with the DMO that, **more recognition towards benefits and potential** of Space Applications to DRR is crucial for **Capacity Building and Collaborative Disaster Risk Reduction Network**.

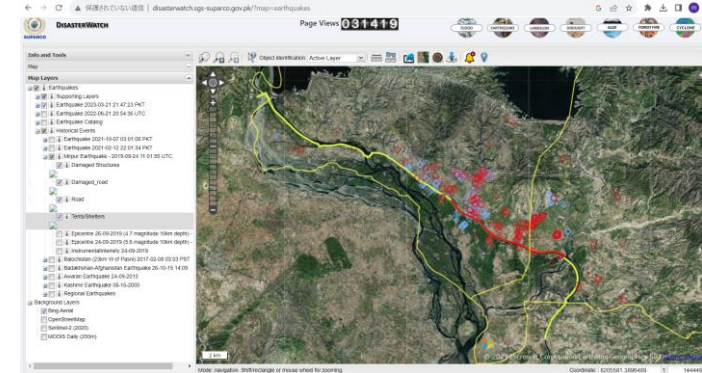
# 6.8 Applications of Sentinel Asia by End Users

Participants shared their **applications** utilizing Sentinel Asia’s data in various phases of disaster risk reduction cycle such as **mitigation, preparedness, response and recovery.**

- **Flood forecasting**
- **Drought monitoring/ forecasting**
- **Hazard Map** (Flood, wildfire, tsunami...)
- **Disaster Watch**

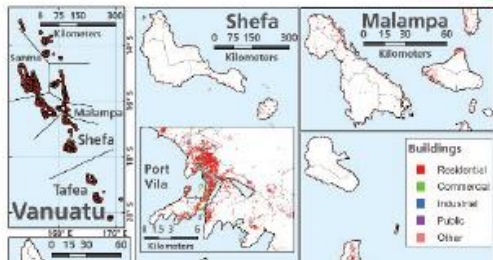


©IWMI



©SUPARCO

Country Risk Profile of Vanuatu



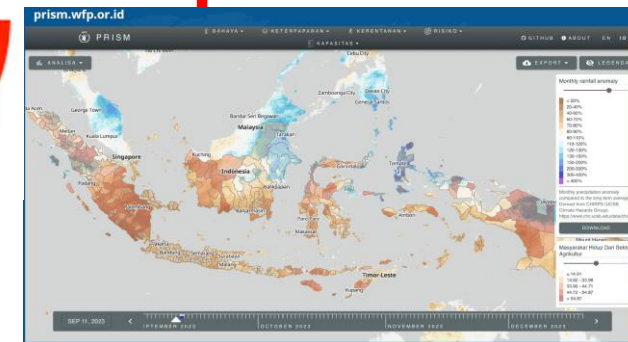
©SPC

**Mitigation**  
**Recovery**



**Preparedness**  
**Response**

- **Identify the suitable areas for relocation**
- **Validate the impact of disaster and implement to the urban planning**
- **To estimate the replacement cost of the buildings and infrastructures to inform risk financing** aspect of the country



©UNWFP

**Estimate affected population and amount of humanitarian aids**

## 7. Summary

- ✓ Sentinel Asia is an initiative aiming space-based international cooperation for disaster management in the Asia-Pacific region
- ✓ Sentinel Asia has responded over 420 emergency observation request since 2007
- ✓ Sentinel Asia is expected to implement not only emergency observation but activities covering entire disaster risk reduction cycle including mitigation/preparedness and recovery phase after a disaster
- ✓ In the 8th JPTM of 2023, Sentinel Asia members shared their applications that covers all cycles of disaster risk reduction.
- ✓ Participants of JPTM have discussed the importance of higher recognition among the Disaster Management Organization and their feedback after using Sentinel Asia's data.