



Sentinel Asia

Sentinel Asia Report

September 20, 2023

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Deputy Executive Secretariat of Sentinel Asia

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 and started its activities in accordance with the recommendation at APRSAF-12 in October 2005
- ✓ Sentinel Asia is the first initiative under APRSAF



1.1 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)

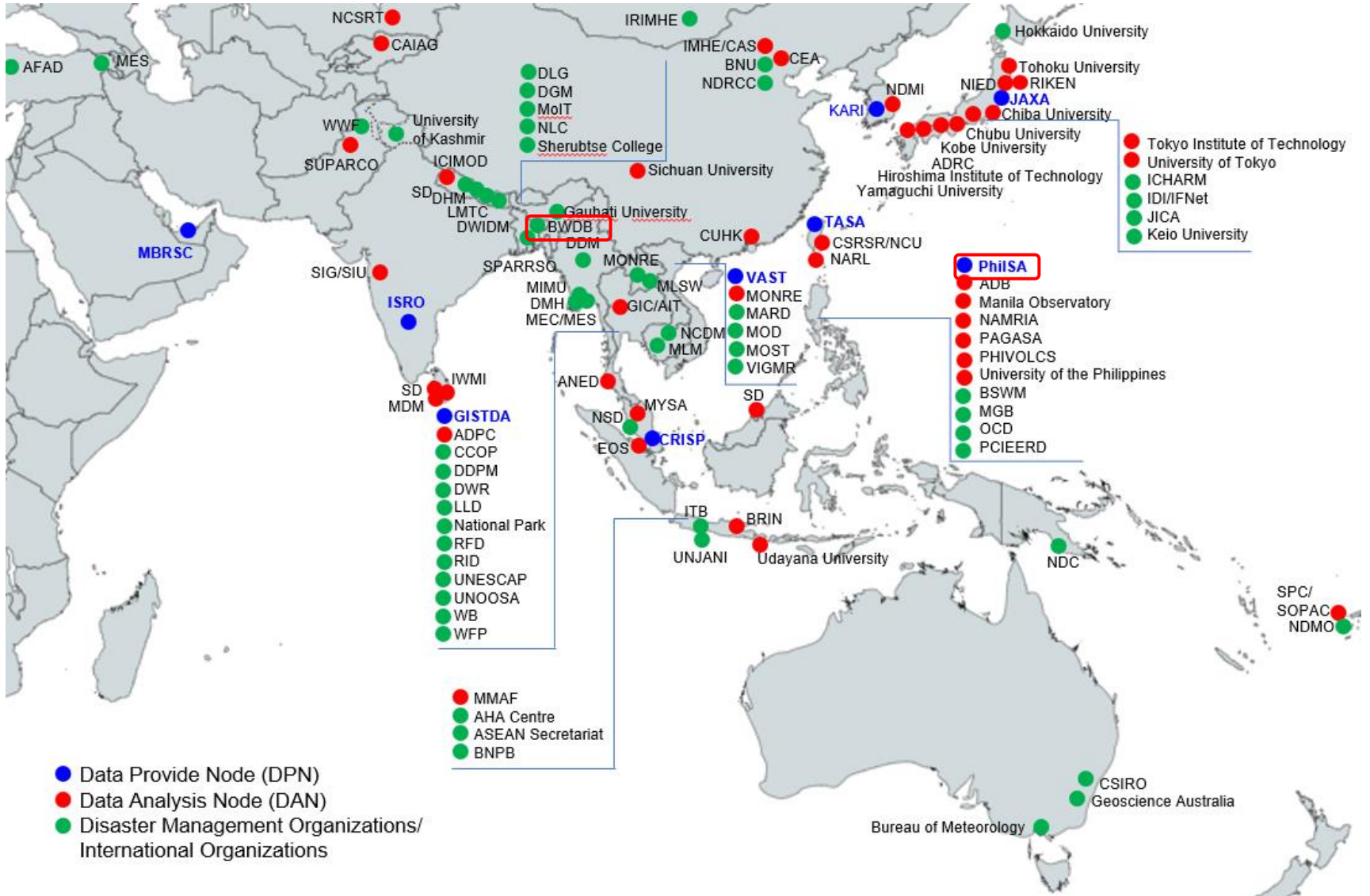
RESPONSE

- Emergency Observation
- Data Analysis
- Damage Assessment

2. Membership Status of Sentinel Asia

In total: **114** organizations. **2** organizations newly joined as below:

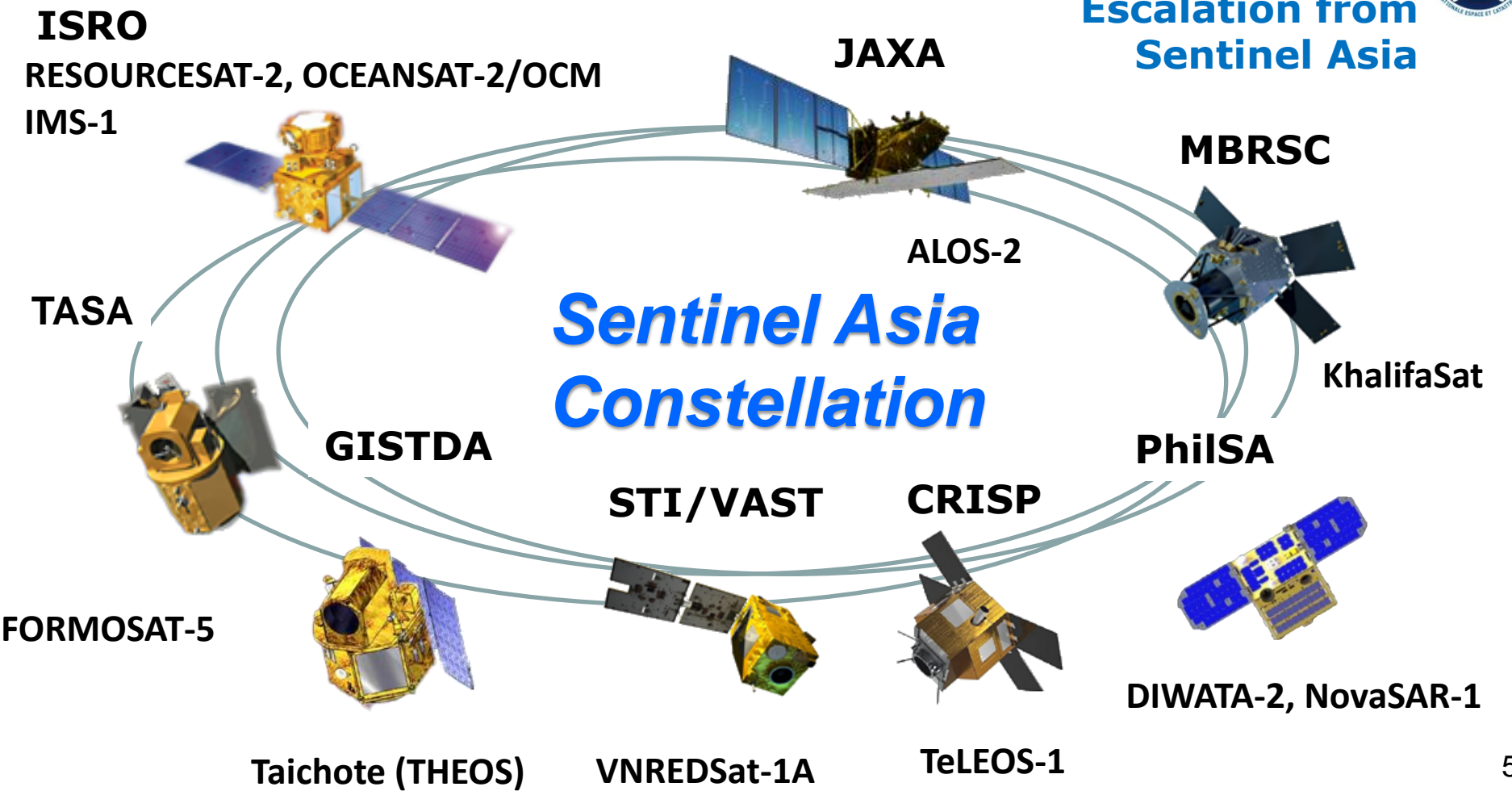
- Philippine Space Agency (**PhilSA**) in January 2023
- Bangladesh Water Development Board (**BWDB**) in May 2023 (As of September 2023)



3. Sentinel Asia “Data Provider Node” (DPN) currently contributing to Emergency Observations

- ✓ 8 space agencies/research institutes currently contributing to emergency observation
- ✓ If necessary, escalate Emergency Observation Request (EOR) to the International Disaster Charter (IDC)

**International Charter
Escalation from
Sentinel Asia**

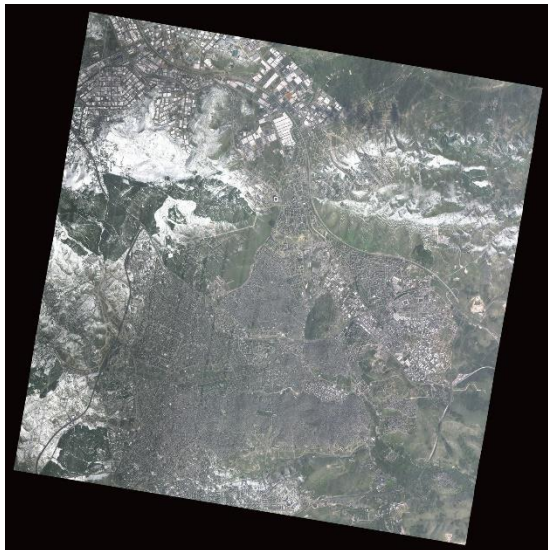


4. Emergency Observation Requests by Geographical Distribution

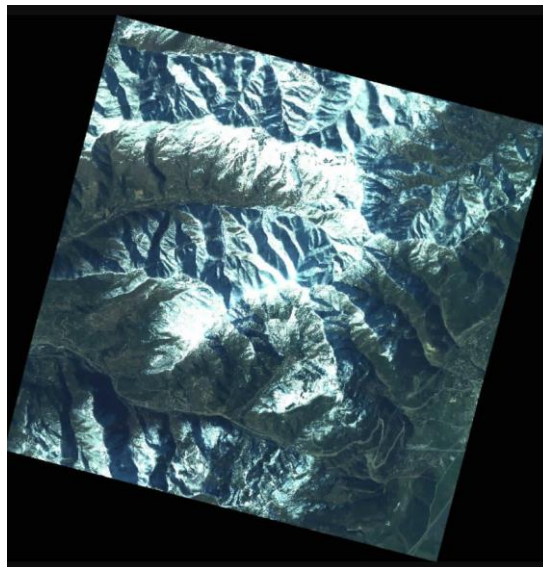


3.4 Earthquake in Turkey in February 2023

- ✓ 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



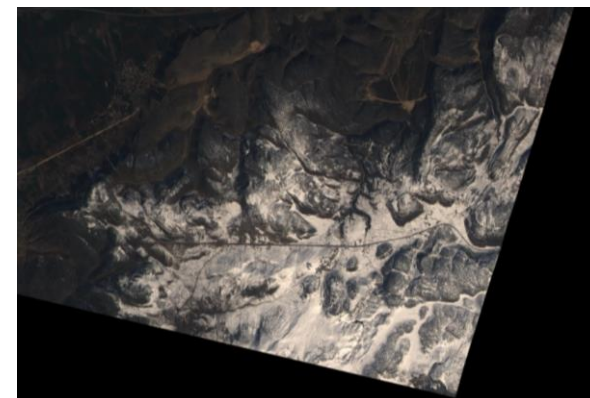
Cartosat3



KhalifaSat

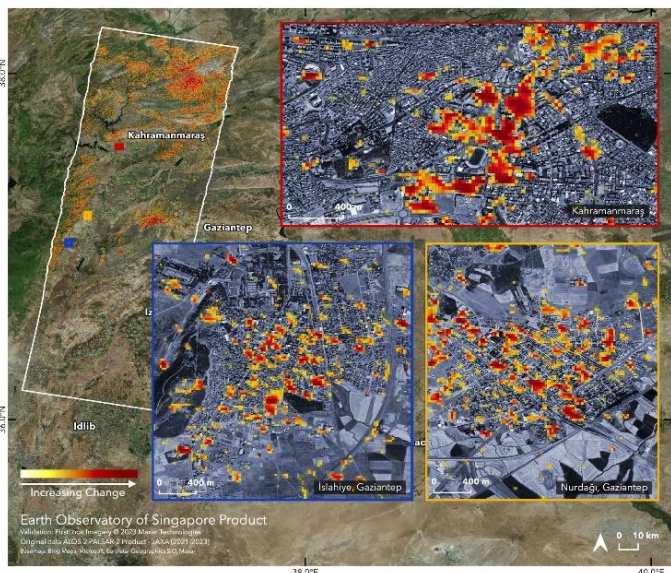


FORMOSAT-5

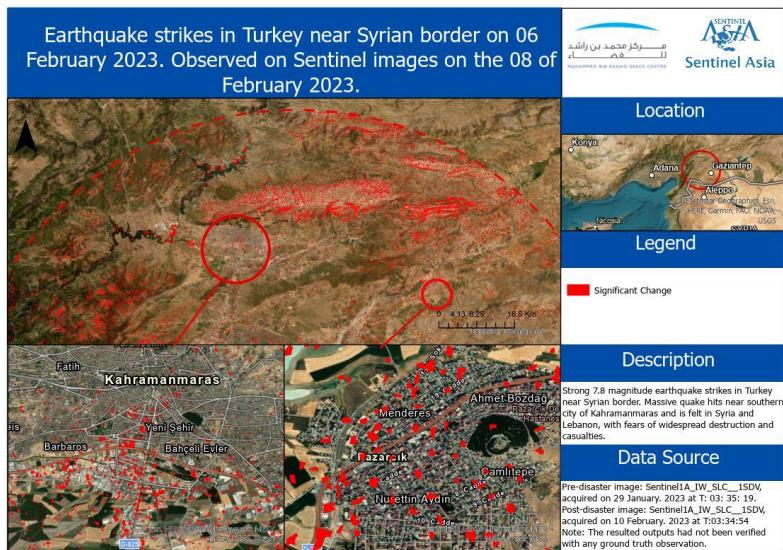


THEOS1

5.1 Earthquake in Turkey in February 2023

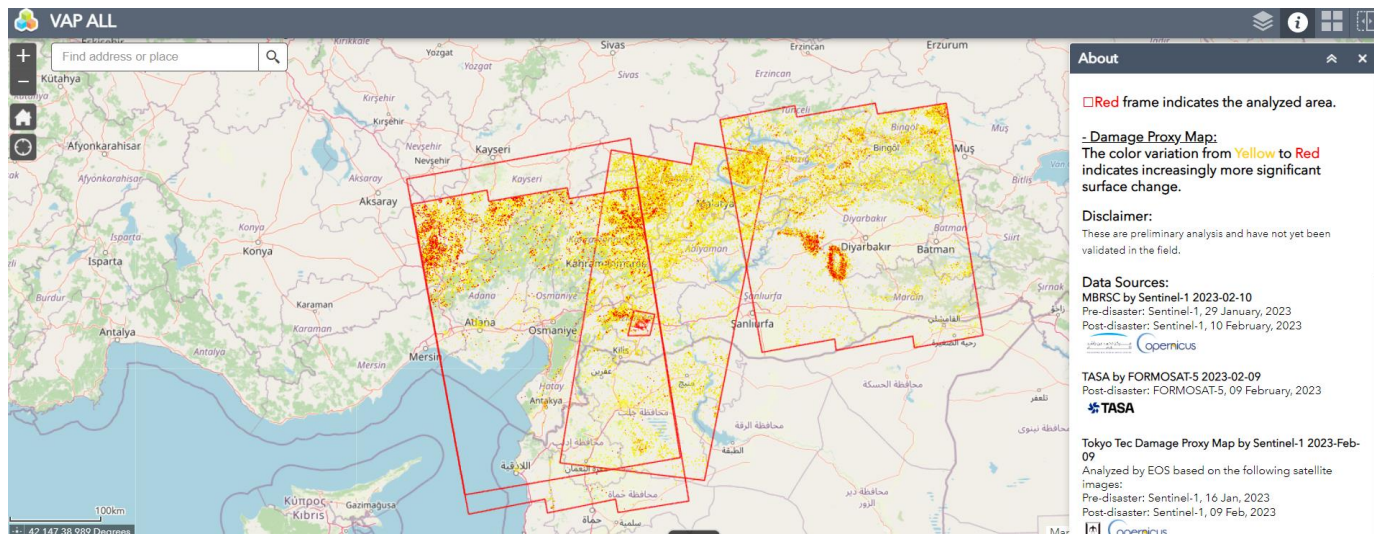


Damage Proxy Map by Earth Observatory of Singapore (EOS)



Significant damage map by Mohammed Bin Rashid Space Center (MBRSC)

Web-GIS overlaying potentially damaged areas and maps

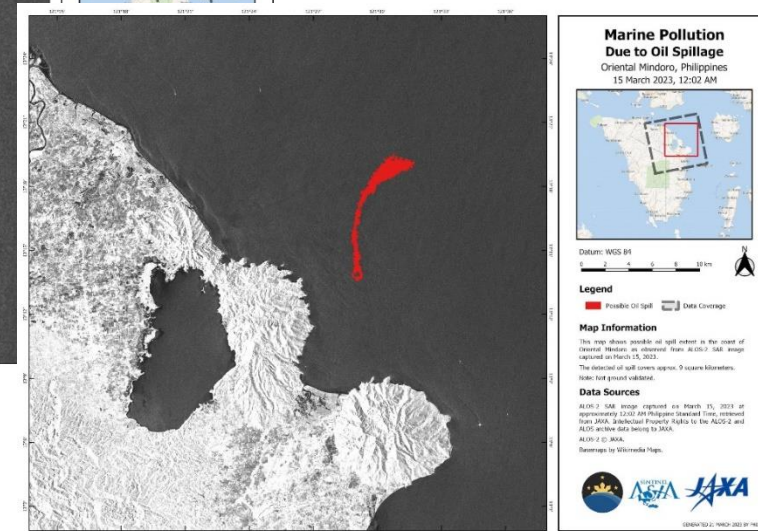
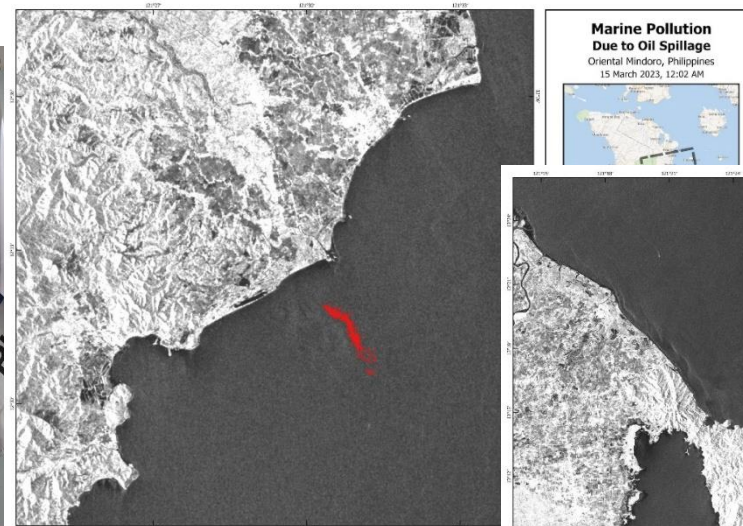
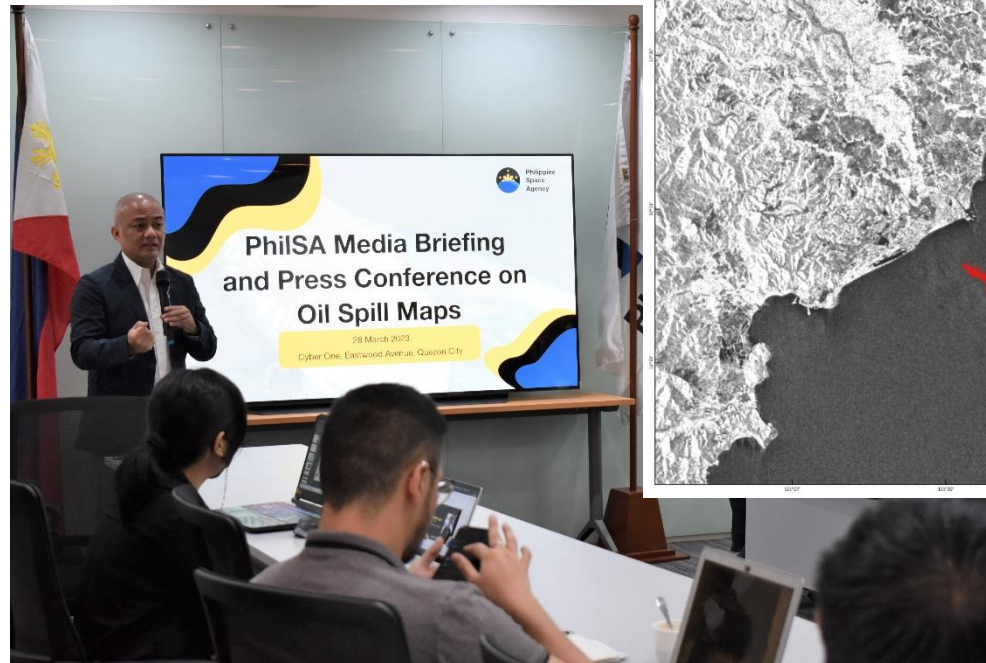


<https://storymaps.arcgis.com/collections/3933d7b09edf4187a2e969e39558aa7f?item=1>

5.2 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

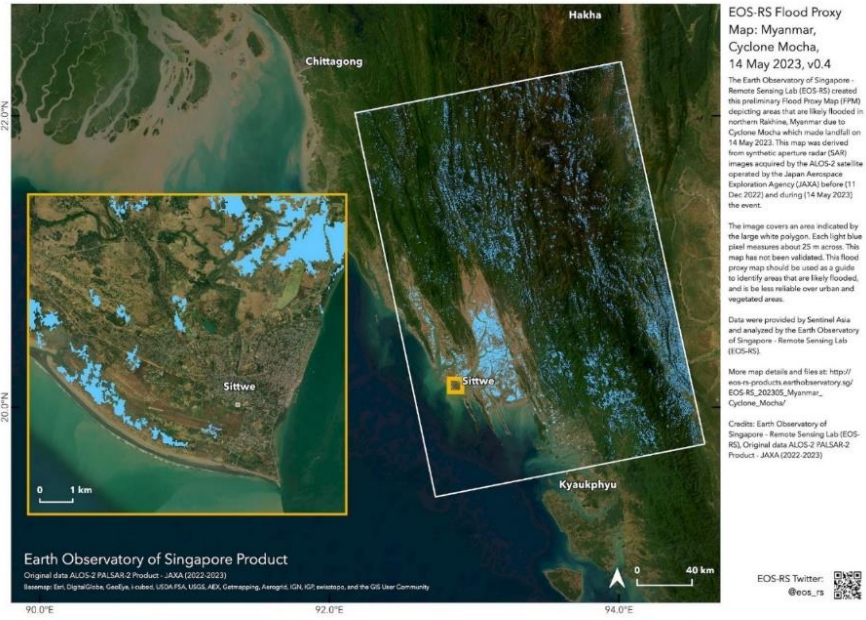


PhilSA showed journalists extent of Mindoro oil spill as captured by satellite images

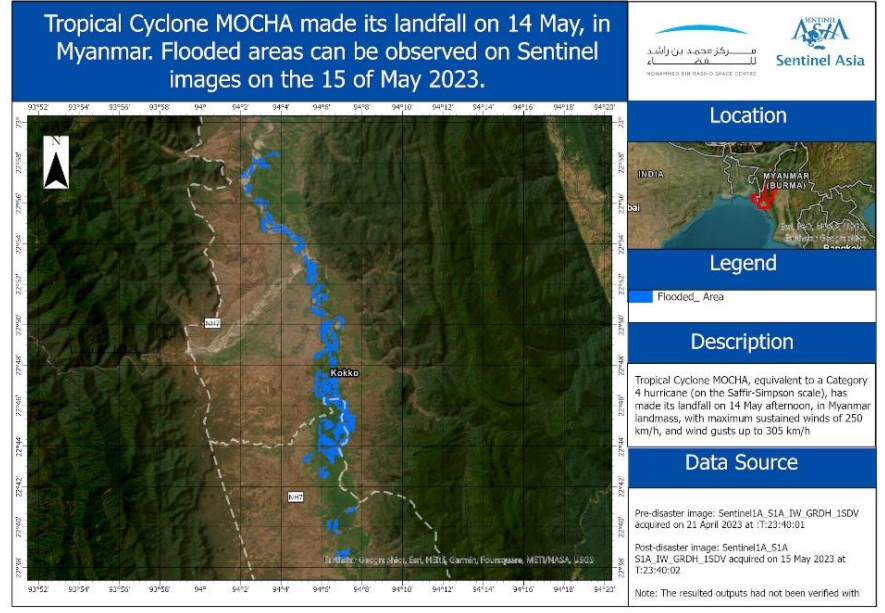
PhilSA showed journalists extent of Mindoro oil spill as captured by satellite images

5.3 Cyclone MOCHA in Myanmar in May 2023

- ✓ AHA Centre requested emergency observation on Cyclone MOCHA in Myanmar in May 2023 utilizing the Standard Operation Procedure (SOP) of SA EOR.
- ✓ 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



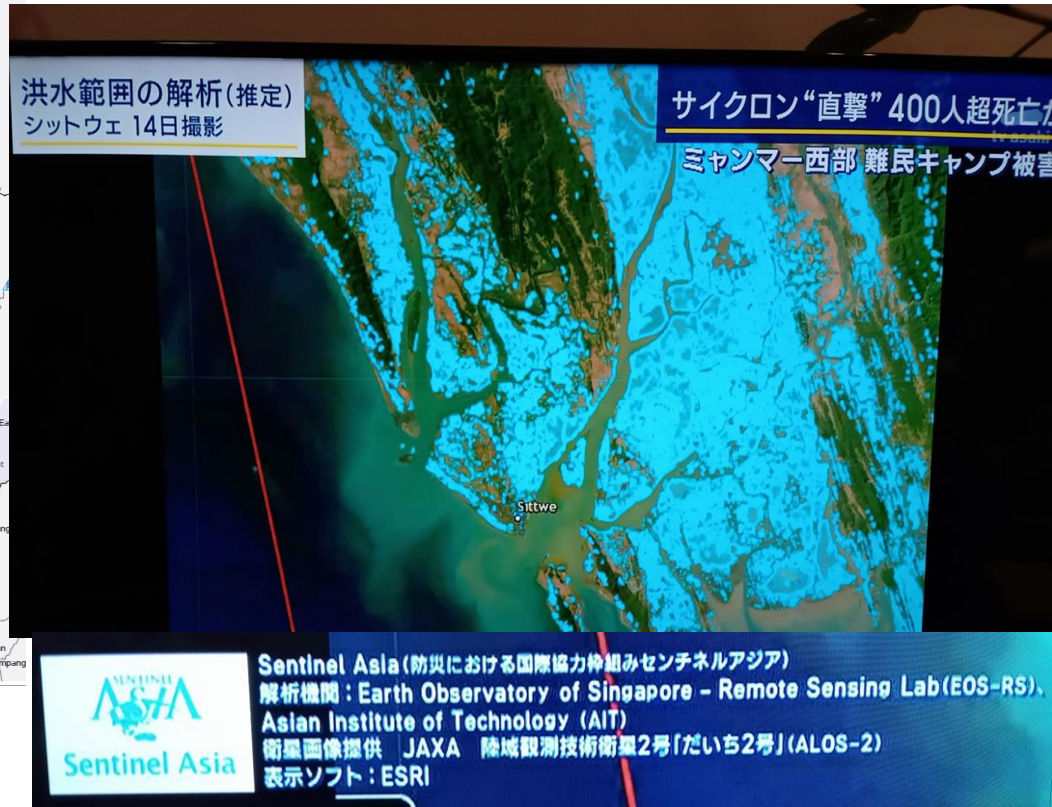
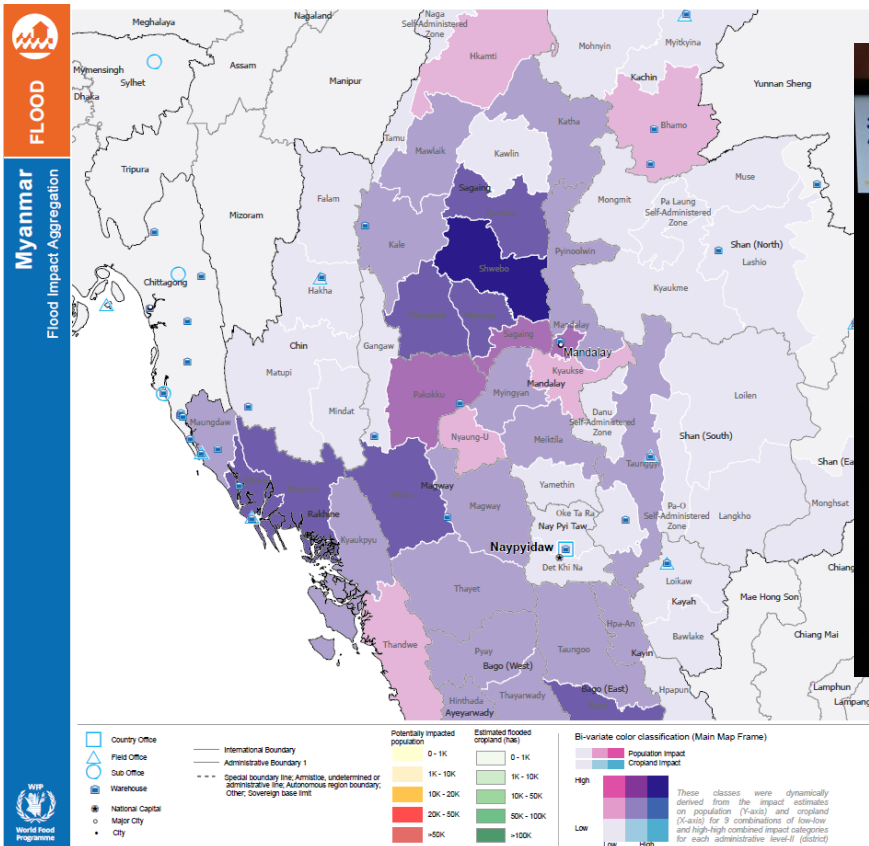
Flood Proxy Map by Earth Observatory of Singapore(EOS)



Flooded area map by MBRSC

5.3 Cyclone MOCHA in Myanmar in May 2023

- ✓ AIT and EOS VAP along with WebGIS was used in the TV News Program in JAPAN
The VAPs were recognized that the area of the flood is easy to grasp to the viewers of the TV program.
- ✓ UNWFP provided statistical information, Population and Cropland Impact Map to display social-economic loss assessment.



Population and Cropland Impact Map
By UNWFP

Japanese TV program, “TV Asahi Hodo Station”

6. 8th Joint Project Team Meeting

- **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



6.1 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. Hadi of **Diponegoro University** shared experiences of providing Value Added Products (VAP) to BNPB and advised the **importance of communication and collaboration with BRIN, BNPB and Universities** to accelerate creation of supportive VAPs.
- 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. 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.

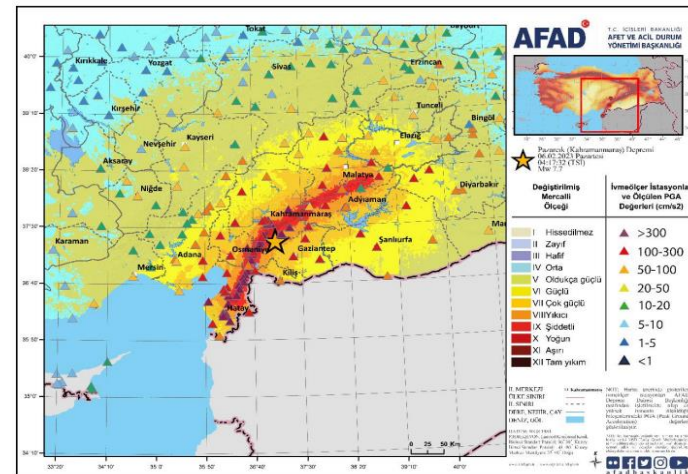
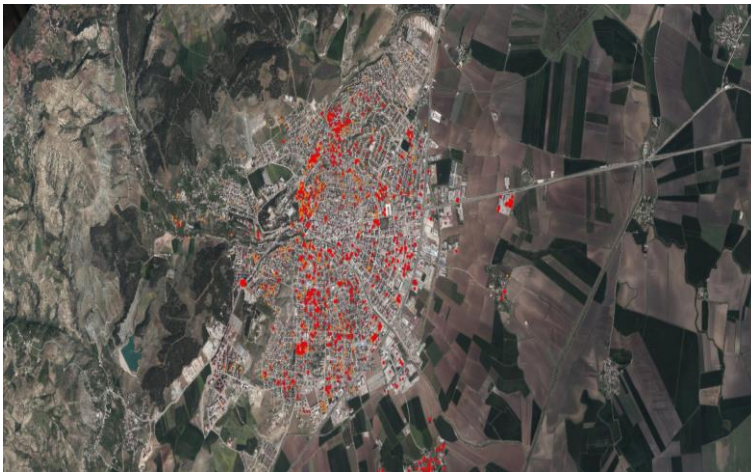


©ESDM



6.2 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.

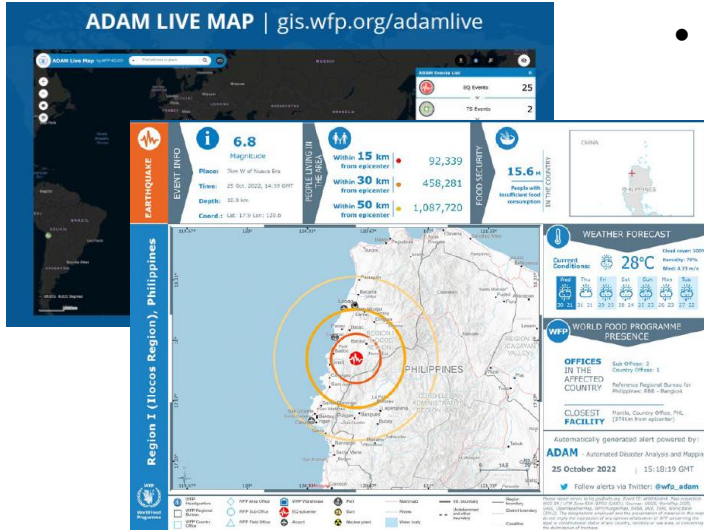


Disaster Management and Decision Support System (AYDES) and AFAD-RED system. ©AFAD

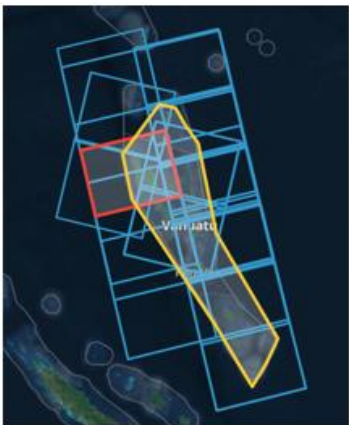
- **AFAD** developed “**RED system**”, integrated in **AYDES**, that provide almost real-time estimation of seismic intensity map of an earthquake and damage assessment map.

6.2 Systems for Disaster Risk Reduction

- 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



©UNWFP



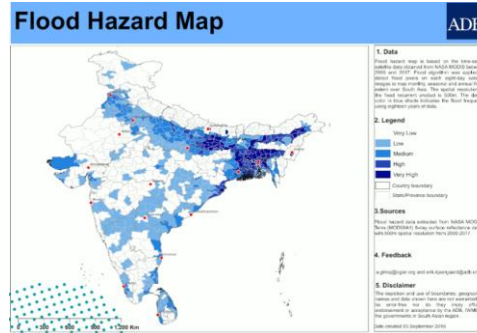
©SPC

- 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

6.3 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...)**

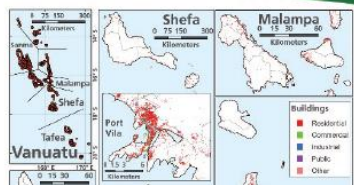


©IWMI



©SUPARCO

Country Risk Profile of Vanuatu



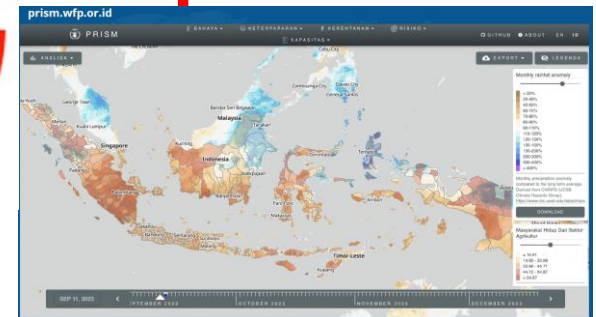
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Mitigation
Recovery



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**



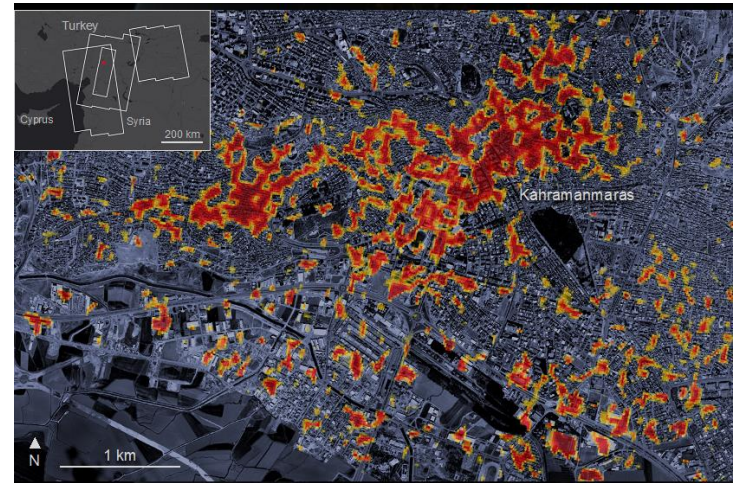
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Estimate affected population and amount of humanitarian aids

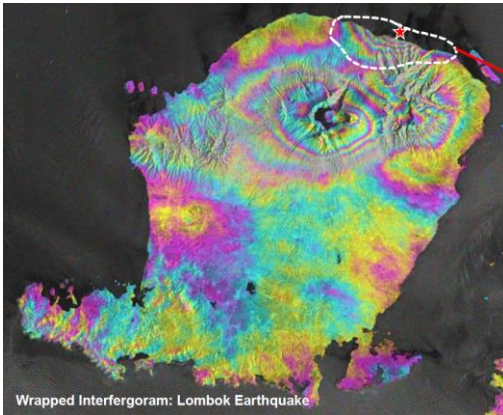
6.4 Data Analysis Session

Technological Knowledge Exchange

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. (Right)



©EOS



Fringe : Repeating color patterns represent phase repetition

★ Earthquake : July 29th 2018
Pair :
July 25th 2018 – July 31th 2018
Descending direction

©BRIN

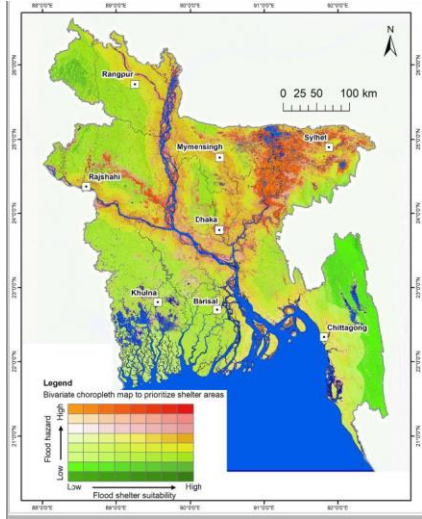
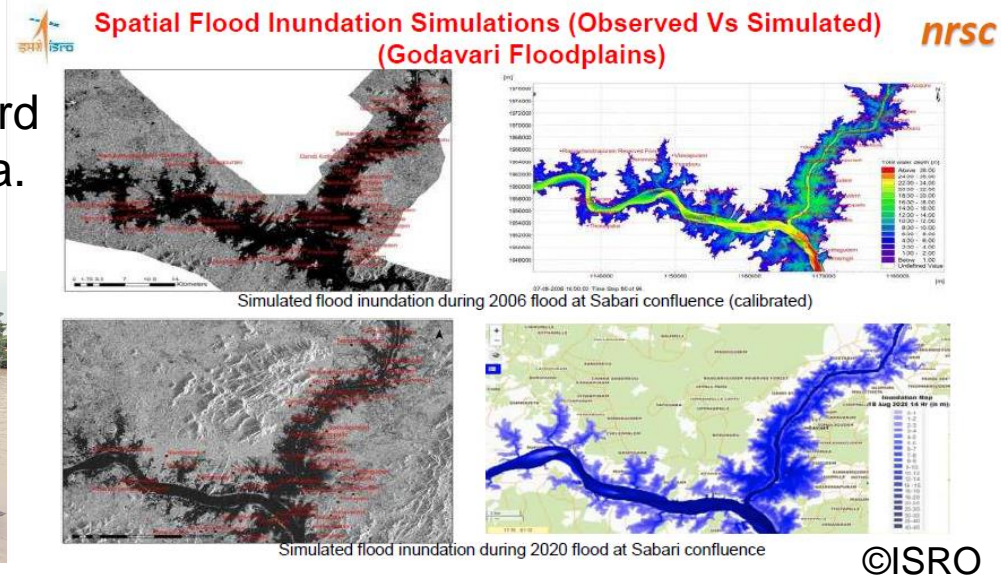
BRIN shared their techniques of Differential Interferometry Analysis of Synthetic Aperture Radar(DInSAR) (Left)

Asian Institute of Technology (**AIT**) demonstrated the **Mobile Application for Ground Data Collection** and Web Viewer to share the photos taken in the disaster area. (Left)

©AIT

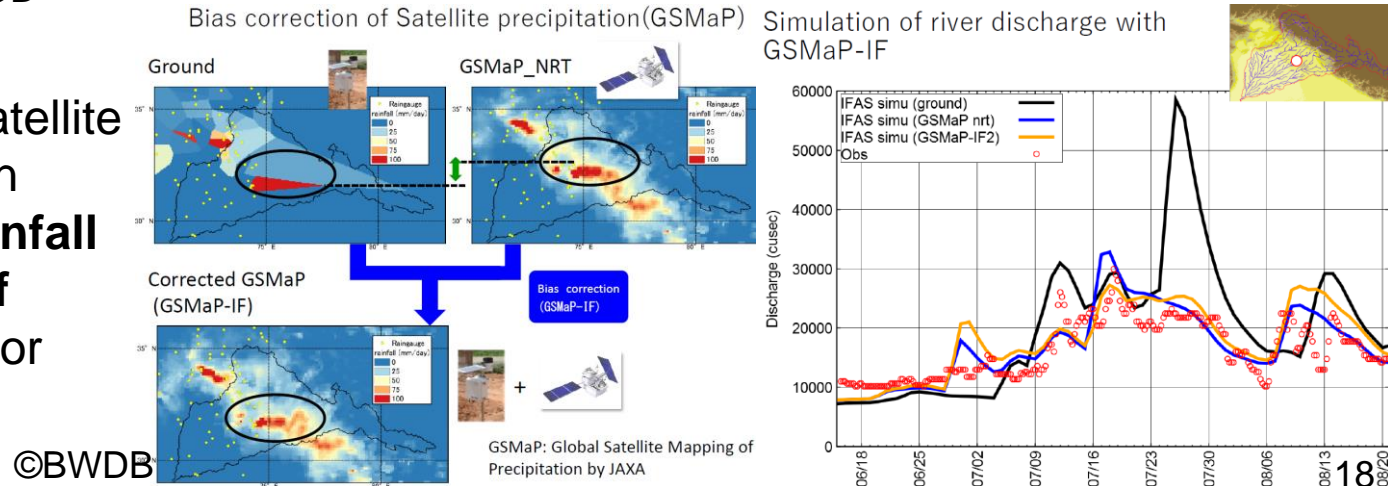
6.5 Water Related Disaster Management

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



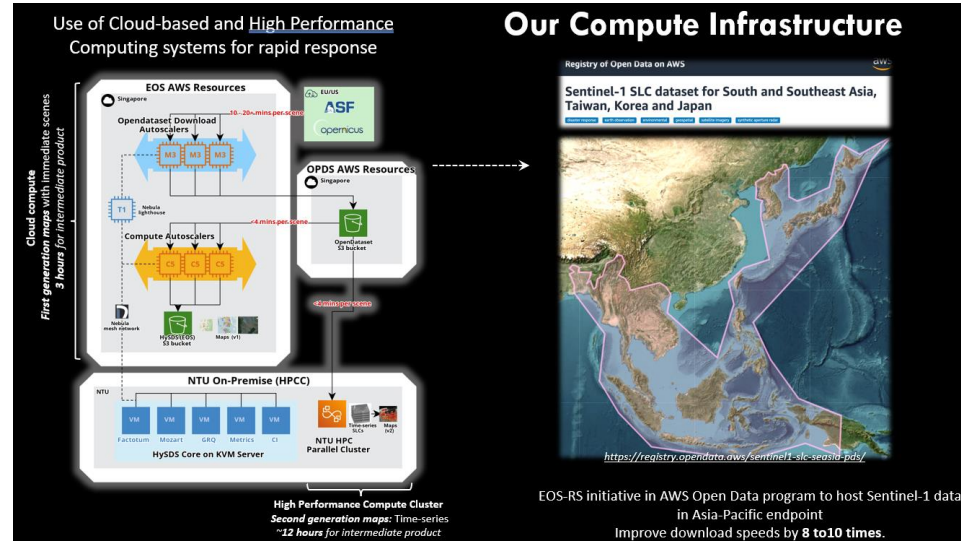
International Center for Integrated Mountain Development (ICIMOD) presented **Flood Shelter Suitability Maps** utilizing flood hazard analysis to select priority area for flood shelter construction in Bangladesh (Left)

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



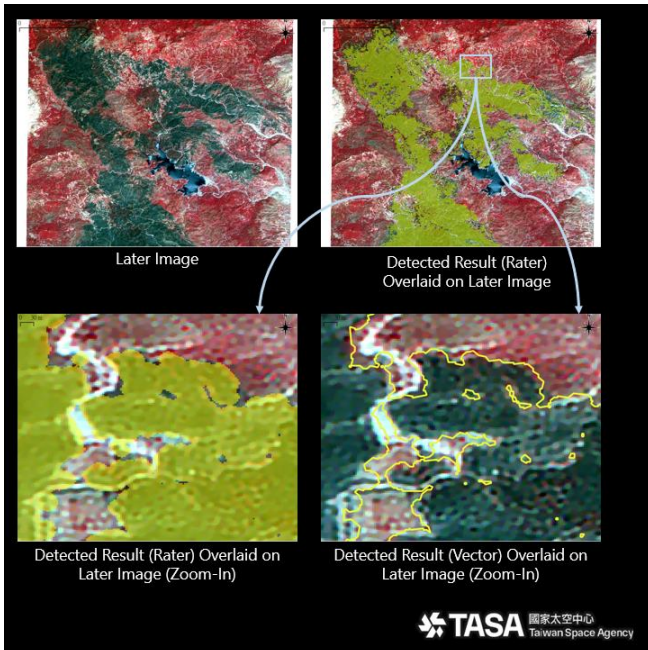
6.6 Solutions to satisfy the demand for Faster Provision of Analyzed Data

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



©EOS

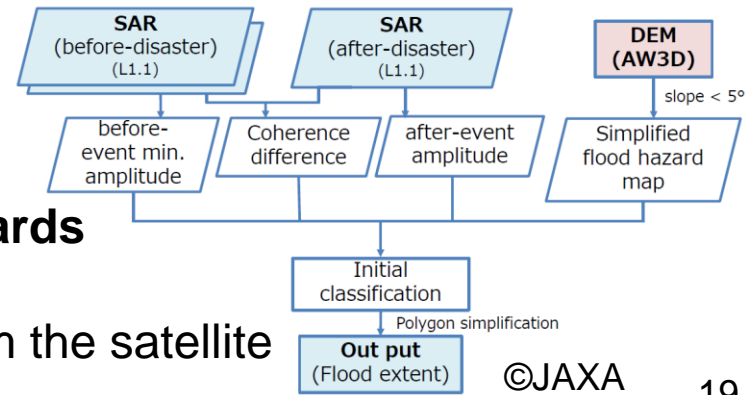
TASA: Emergent VAP (semi-automated analysis and report creation utilizing process automation) (Left)



©TASA

JAXA: Autonomous Analysis for Flood Hazards extracting inundated area

Analyze as soon as the data is downlinked from the satellite (Right)



©JAXA

6.7 Expectations to Sentinel Asia

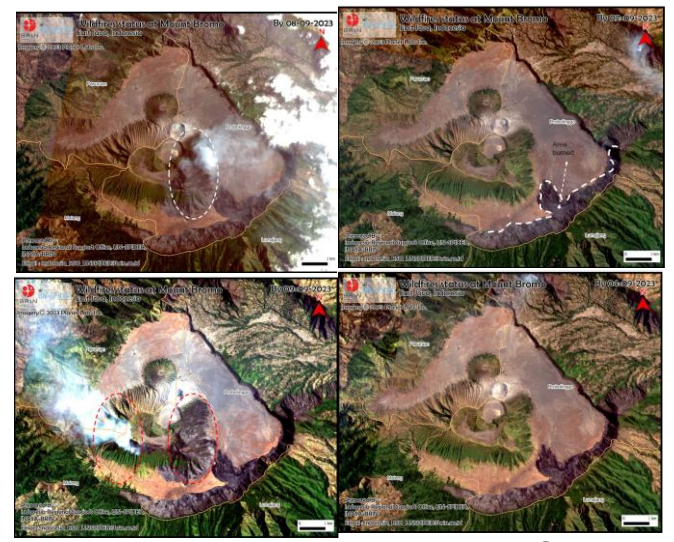
Participants shared **Expectations to Sentinel Asia.**

【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 (**SPARCO**) 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.**

7. Way Forward

- ✓ **Steering Committee meeting** is planned for both online-meeting and Face to Face meeting.



12 Steering Committee Members of Sentinel Asia

- ✓ **Face to Face Meeting with Disaster Management Organizations** of various countries are planned to **collect cases of successful applications of Sentinel Asia** and Validation of Ground Truth data, Local information of **Field Survey for validation of Data Analysis**
- ✓ **9th JPTM of 2024 is planned** and it is to be determined

8. 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.

Terima Kasih