Facilitating the Application of Space-based Technology for Typhoon DRR

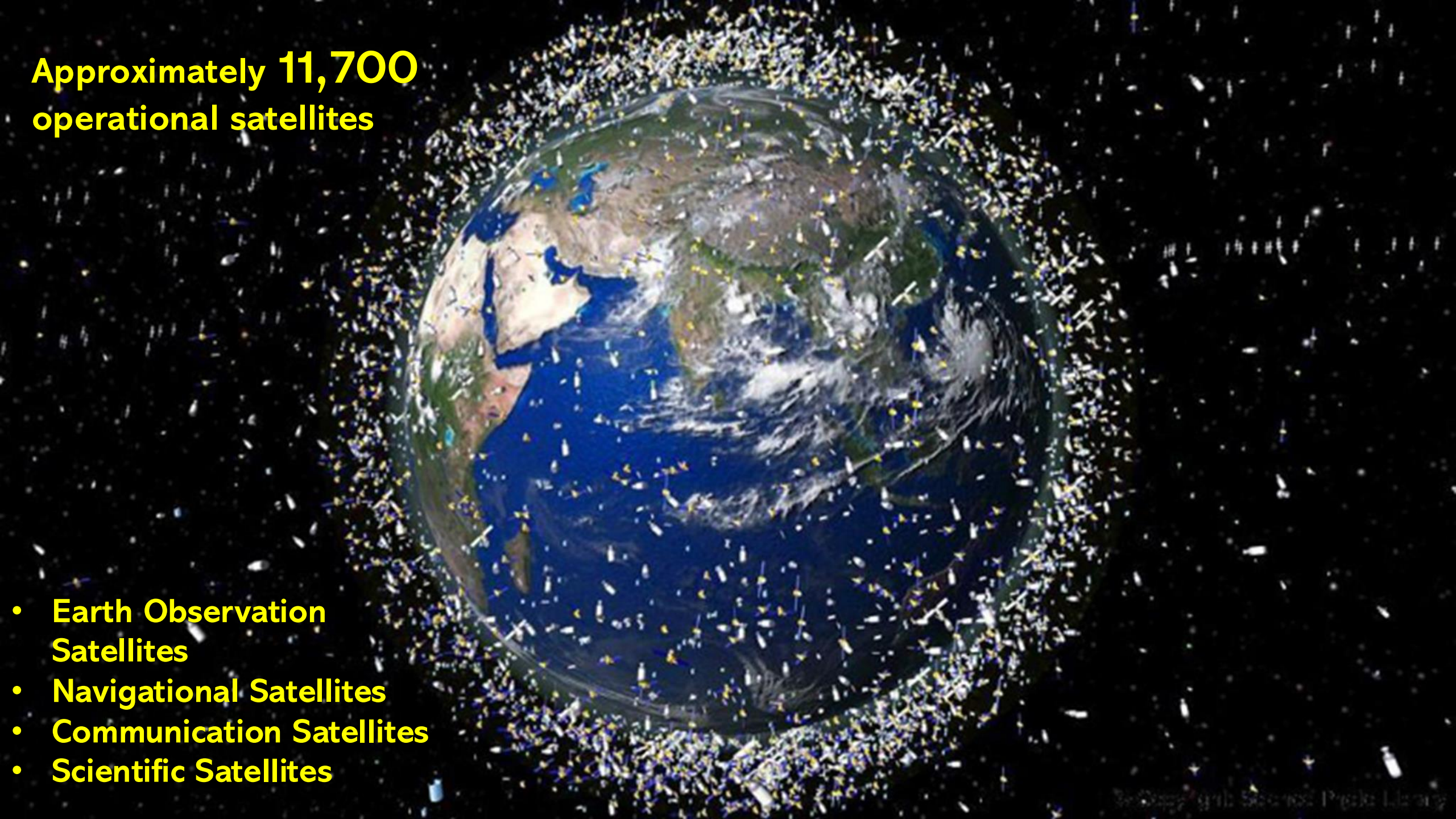
~ The Sentinel Asia Initiative ~

The 58th Session of the ESCAP/WMO Typhoon Committee
Jeju Island, Republic of Korea

10-13 March 2026

Mr. Gerald Potutan

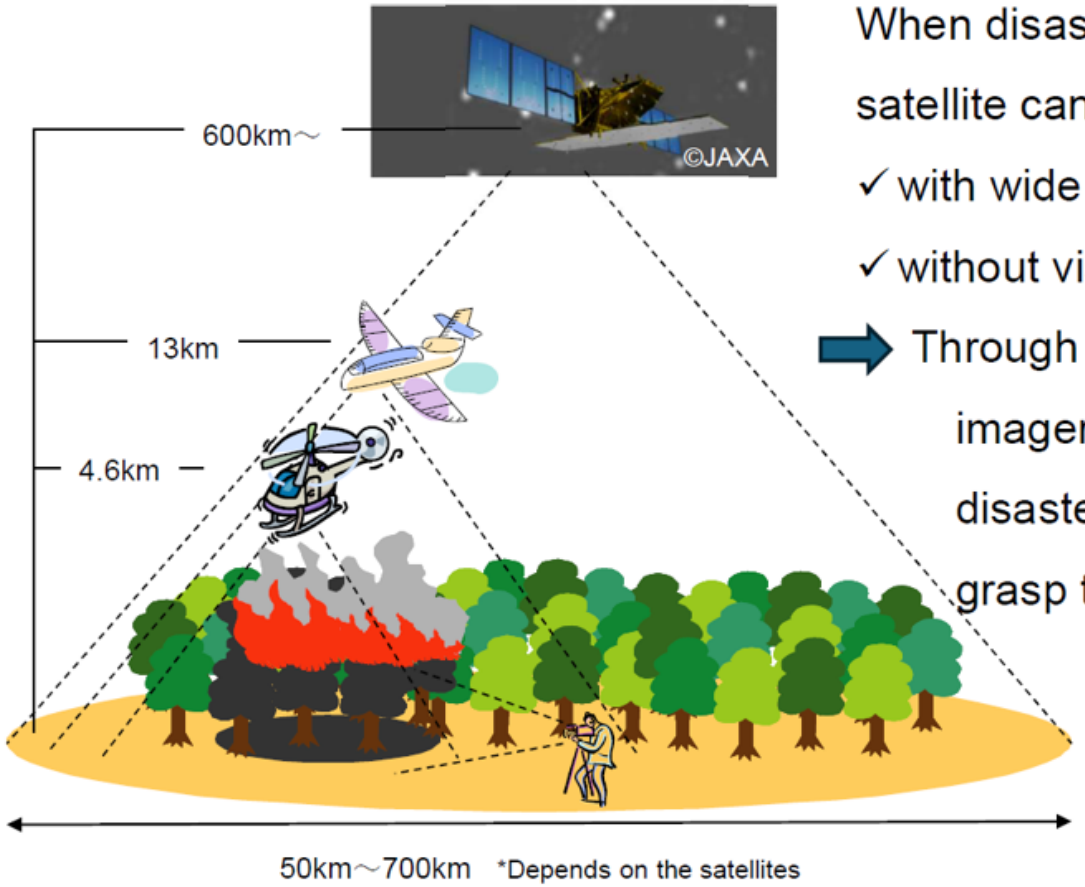
Asian Disaster Reduction Center


Approximately 11,700
operational satellites
• Earth Observation Satellites
• Navigational Satellites
• Communication Satellites
• Scientific Satellites

1. Application of Satellite in Typhoon DRR

Emergency Observation

Provision of satellite data (imageries)



When disaster happens, Earth observation satellite can observe disaster affected area:

✓with wide coverage

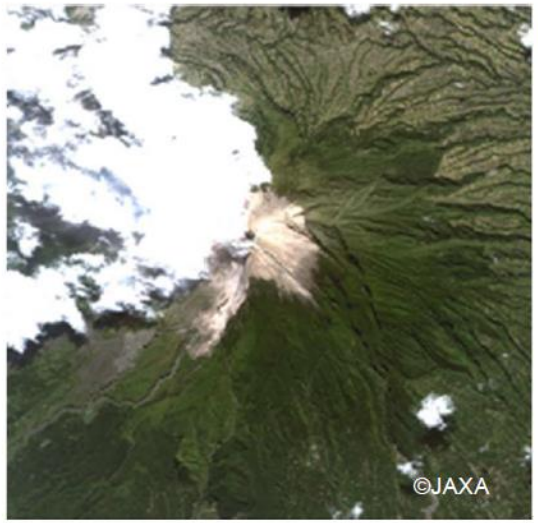
✓without visiting the site (safely)

➡ Through providing disaster affected area imagery, space technology supports disaster management activities to grasp the disaster situation

Reference: First image of ALOS-4

https://earth.jaxa.jp/files/earthview/2024/alos4-first-image/

Satellite Data



(1) Optical satellite data

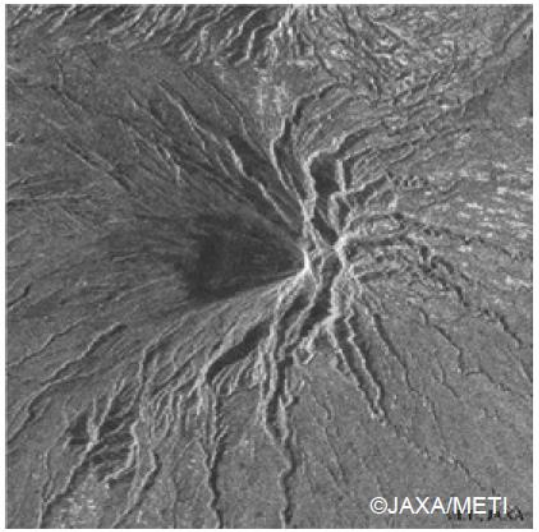
Advantage

✓ The imagery looks like a photograph

→ Easy to understand the ground surface situation, good to find landslide, damaged area by earthquake

Disadvantage

✓ If there are clouds or at night, it is hard to observe the disaster affected area



(2) Radar satellite data

Advantage

✓ Even there are clouds or at night, it can observe the disaster affected area

→ Good to detect flood area, damaged area by earthquake

Disadvantage

✓ Only the imagery, it is hard to understand the impact of disaster

→ It needs analysis using data of before/after disaster

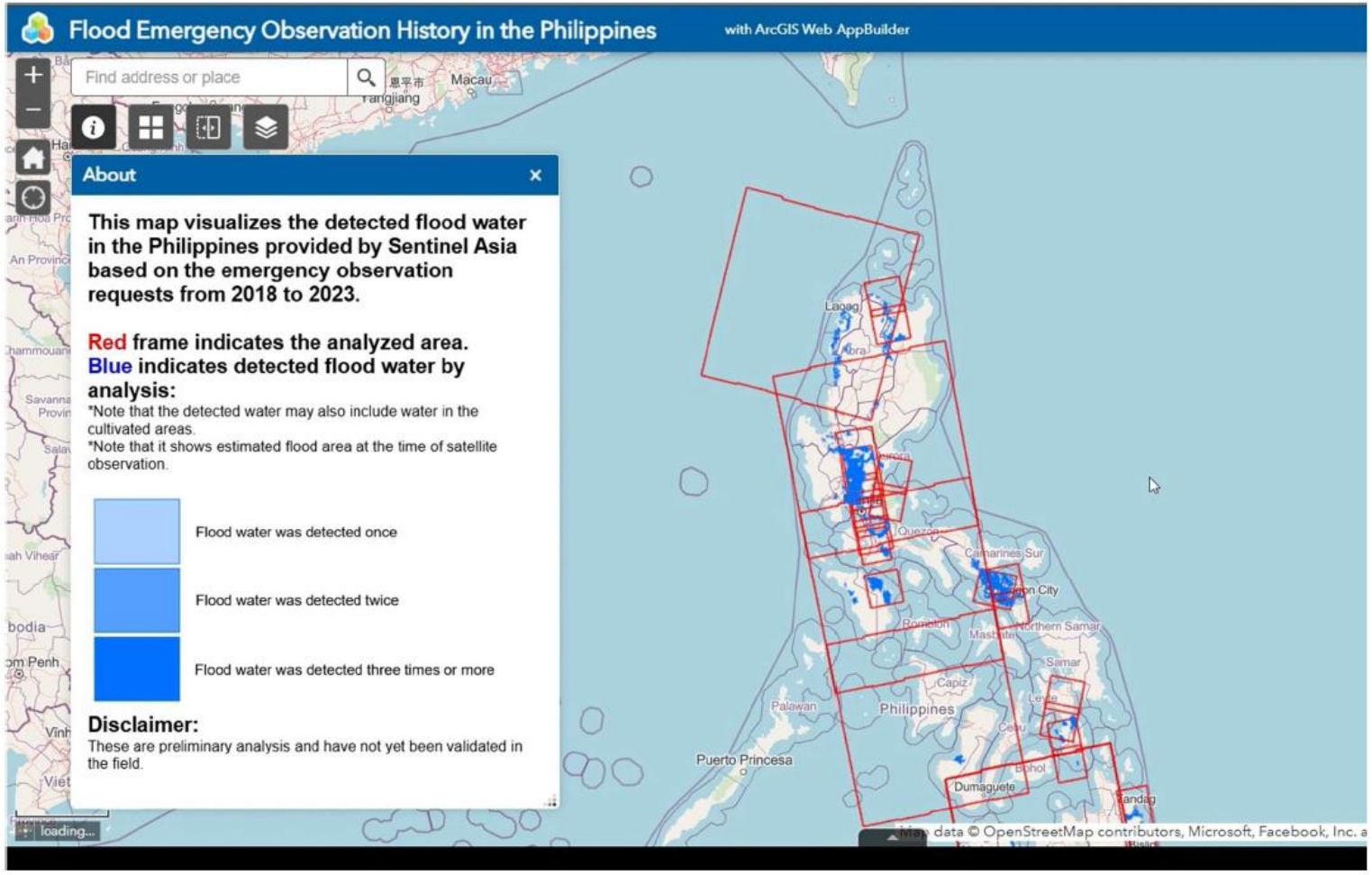
Example of satellite data application in DRR

✓Philippine Space Agency (PhilSA) activated Sentinel Asia on November 4, and flood detected map was provided by Asian Institute of Technology on November 10

Monitoring / Recording

History Map

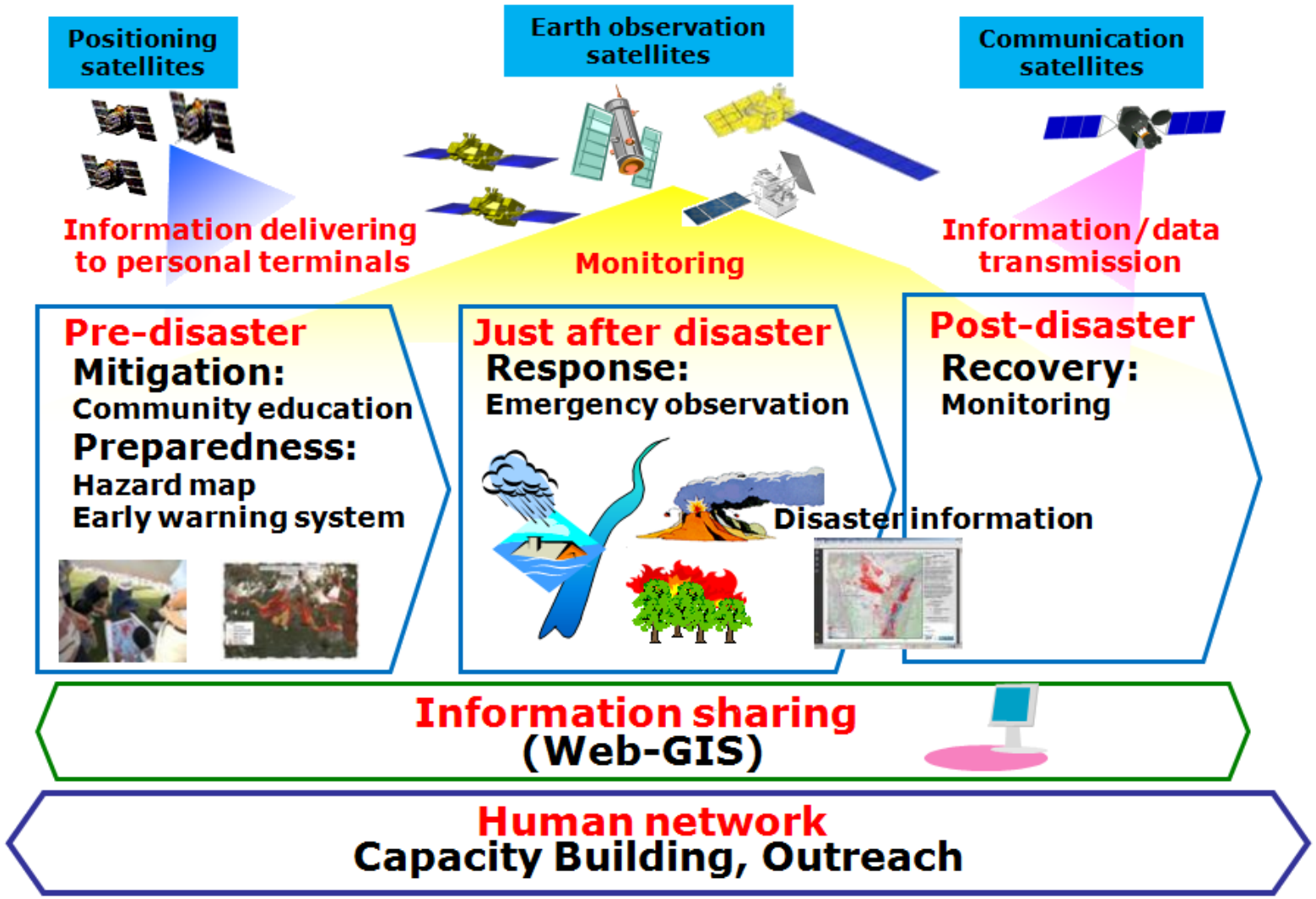
- ✓ Sentinel Asia Secretariat started producing Emergency Observation History Map to visualize potential disaster risks with high resolution



2. Systematic access to satellite data (by NDMOs / ADRC members)

The Sentinel Asia Initiative

Basic Concept



Contributions

- improve **safety** in society through the application of information and communication technologies (ICT) combined with **space technologies**
- improve the **speed** and **accuracy** of disaster preparedness and early warning
- **minimize** the number of victims and social/economic **losses** resulting from disasters
- contribute to the development of rehabilitation/**recovery plans**

Members

Joint Project Team (JPT)

Sentinel Asia organizes Joint Project Team (JPT), and JPT consists of **126 organizations including 107 agencies from 30 countries/region and 19 international organizations (as of February 2026)**
JAXA is the secretariat of JPT. Sentinel Asia cooperates with ADRC and their members closely, and they are also member of Sentinel Asia.

JPT members

+

ADRC members

Ten (10) space agencies as Data Provider Node (DPN) will support to provide satellite images when member make a request (e.g., JAXA, ISRO, GISTDA, TASA, MBRSC, PhilSA, etc.).

Membership

STEP1
- Submit application form to Sentinel Asia Secretariat

STEP2
- Secretariat share the application form to all Sentinel Asia members and ask their review for two weeks

STEP3
- Approval at unanimous consent by all Sentinel Asia members

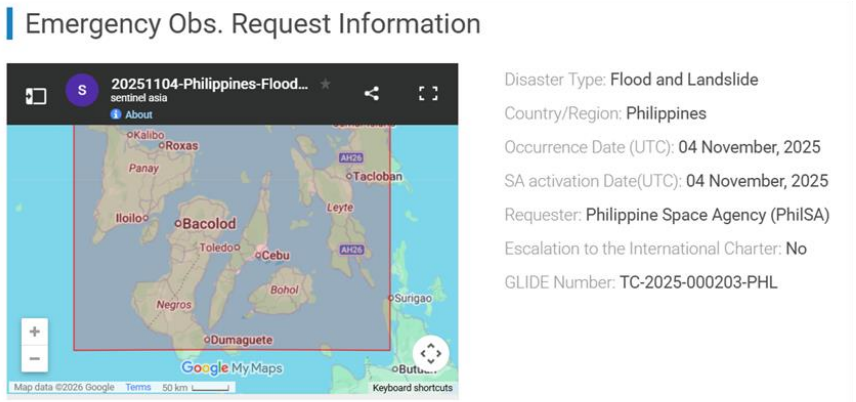
STEP4
- Secretariat will send the official letter to the new member

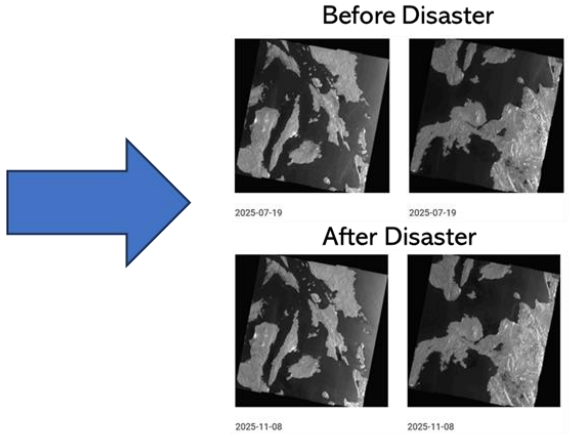
STEP5
- New member will participate in the annual meeting of Sentinel Asia and be welcomed as a new member

3. Facilitating EORs
by ADRC

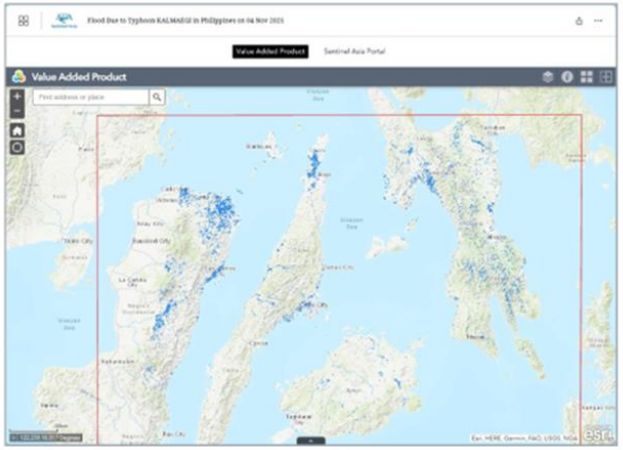
Emergency Observation Request (EOR)

JPT members, including ADRC member-countries' counterparts/NDMOs, are entitled to make EORs to Sentinel Asia. DPN, DAN, and the Secretariat team support to provide satellite data.

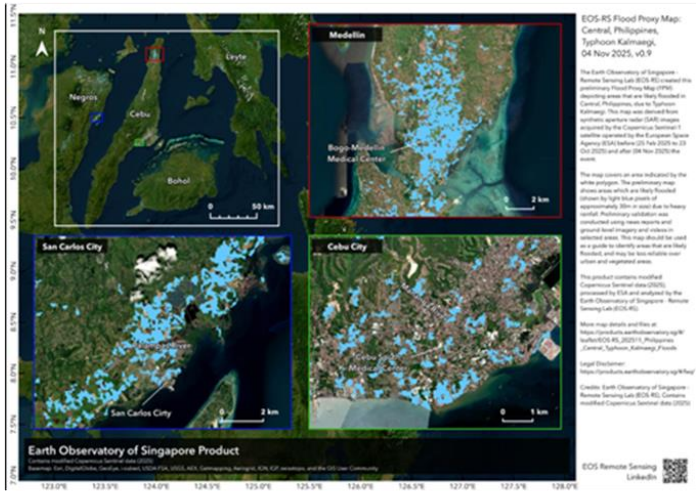




Satellite image (provided by DPNs)

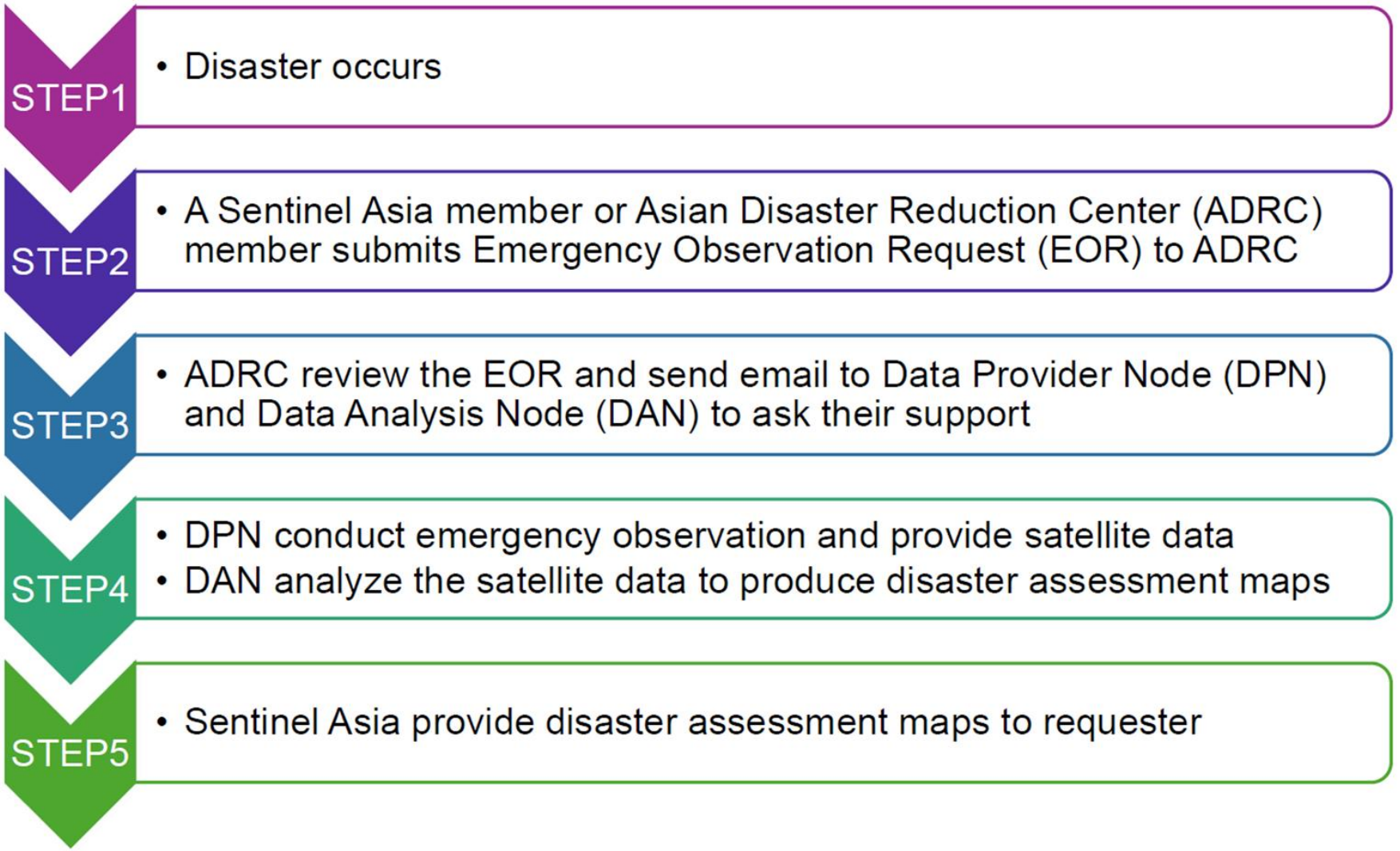


WEB-GIS (provided by the Secretariat team)



VAP (provided by DANs)

EOR Flow


STEP1
• Disaster occurs
STEP2
• A Sentinel Asia member or Asian Disaster Reduction Center (ADRC) member submits Emergency Observation Request (EOR) to ADRC
STEP3
• ADRC review the EOR and send email to Data Provider Node (DPN) and Data Analysis Node (DAN) to ask their support
STEP4
• DPN conduct emergency observation and provide satellite data
• DAN analyze the satellite data to produce disaster assessment maps
STEP5
• Sentinel Asia provide disaster assessment maps to requester

Emergency Observation Request Information

2025-11-04

Flood Due to Typhoon KALMAEGI in Philippines on 04 November, 2025

Emergency Obs. Request Information

Disaster Type: Flood and Landslide

Country/Region: Philippines

Occurrence Date (UTC): 04 November, 2025

SA activation Date(UTC): 04 November, 2025

Requester: Philippine Space Agency (PhilSA)

Escalation to the International Charter: No

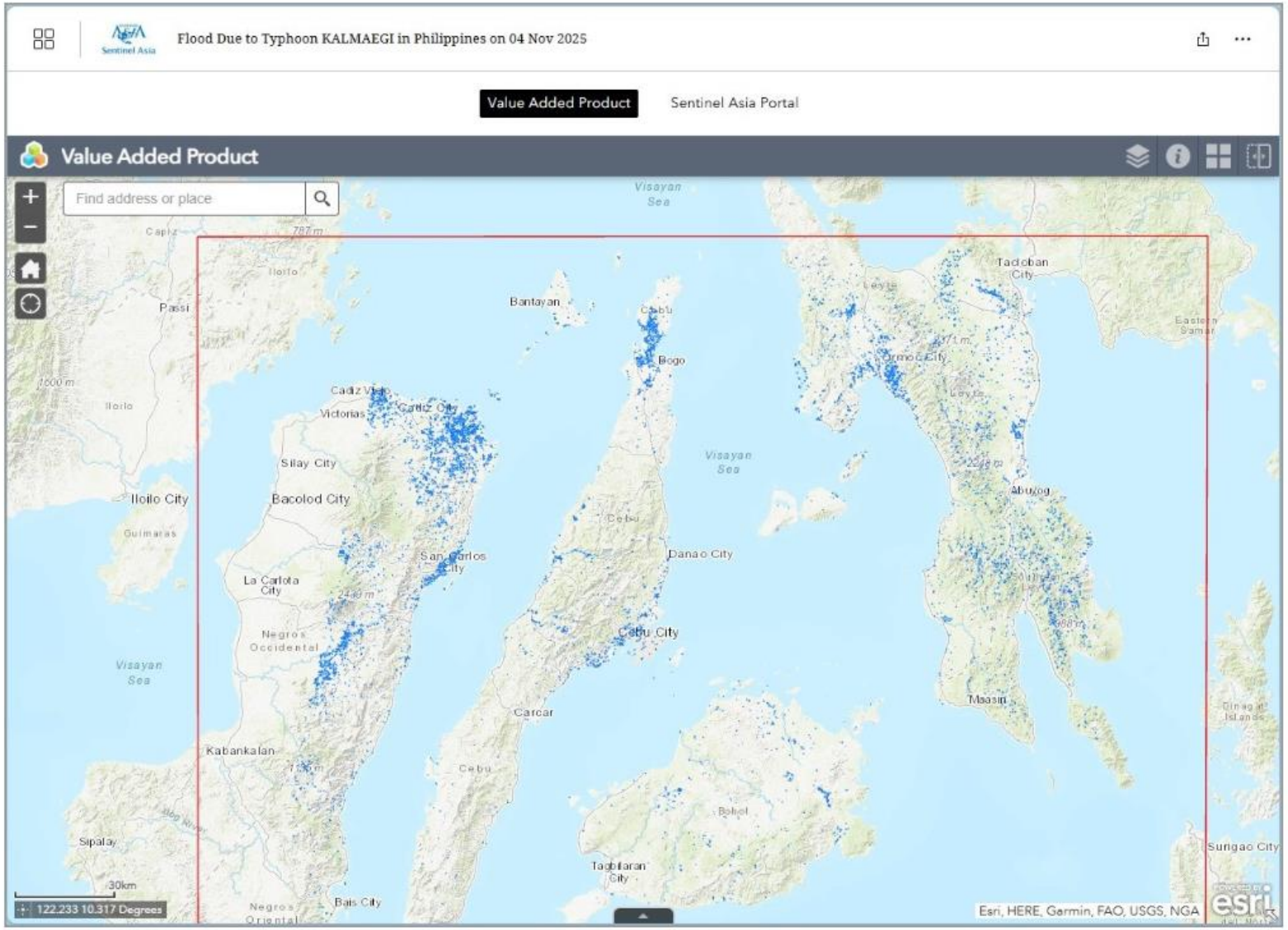
GLIDE Number: TC-2025-000203-PHL

Disaster Situation

https://www.abs-cbn.com/news/regions/2025/11/4/typhoon-tino-wallops-cebu-signal-no-4-in-several-areas-0705
https://newsinfo.inquirer.net/2133760/fwd-typhoon-tino-makes-landfall-in-leyte-cebu-early-tuesday-morning
https://www.rappler.com/philippines/weather/tropical-cyclone-tino-forecast-track-wind-signals-rain-damage-relief-updates-november-2025/

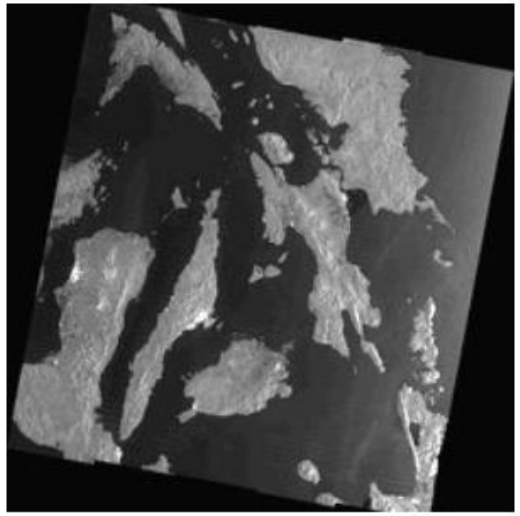
Web GIS

- **Flood Due to Typhoon KALMAEGI in Philippines on 04 November, 2025**

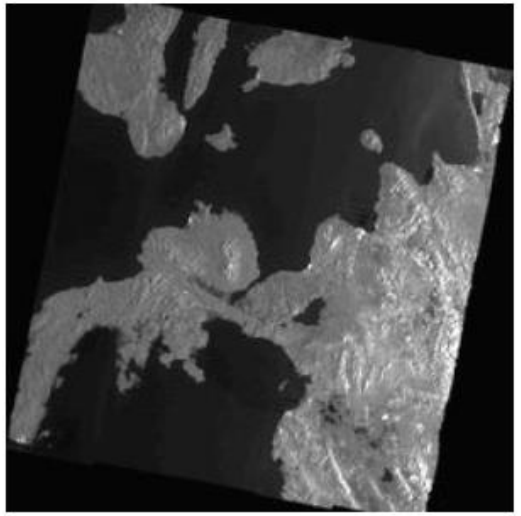


Before/After Satellite Imageries

Before Disaster

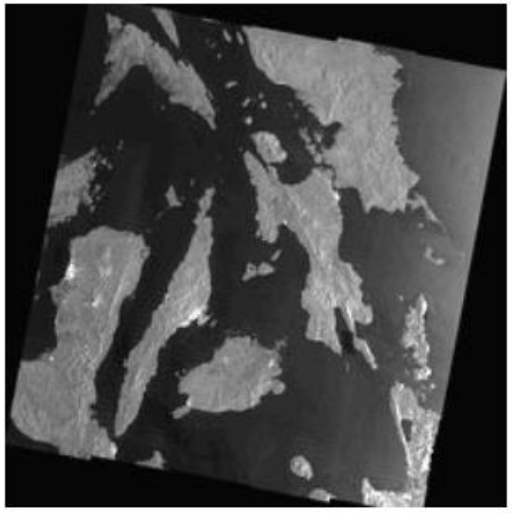


2025-07-19

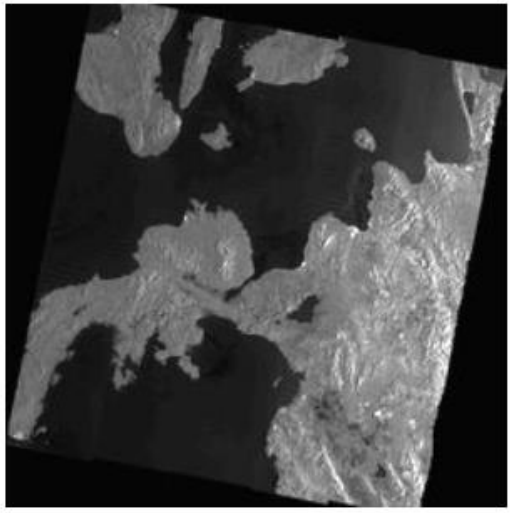


2025-07-19

After Disaster

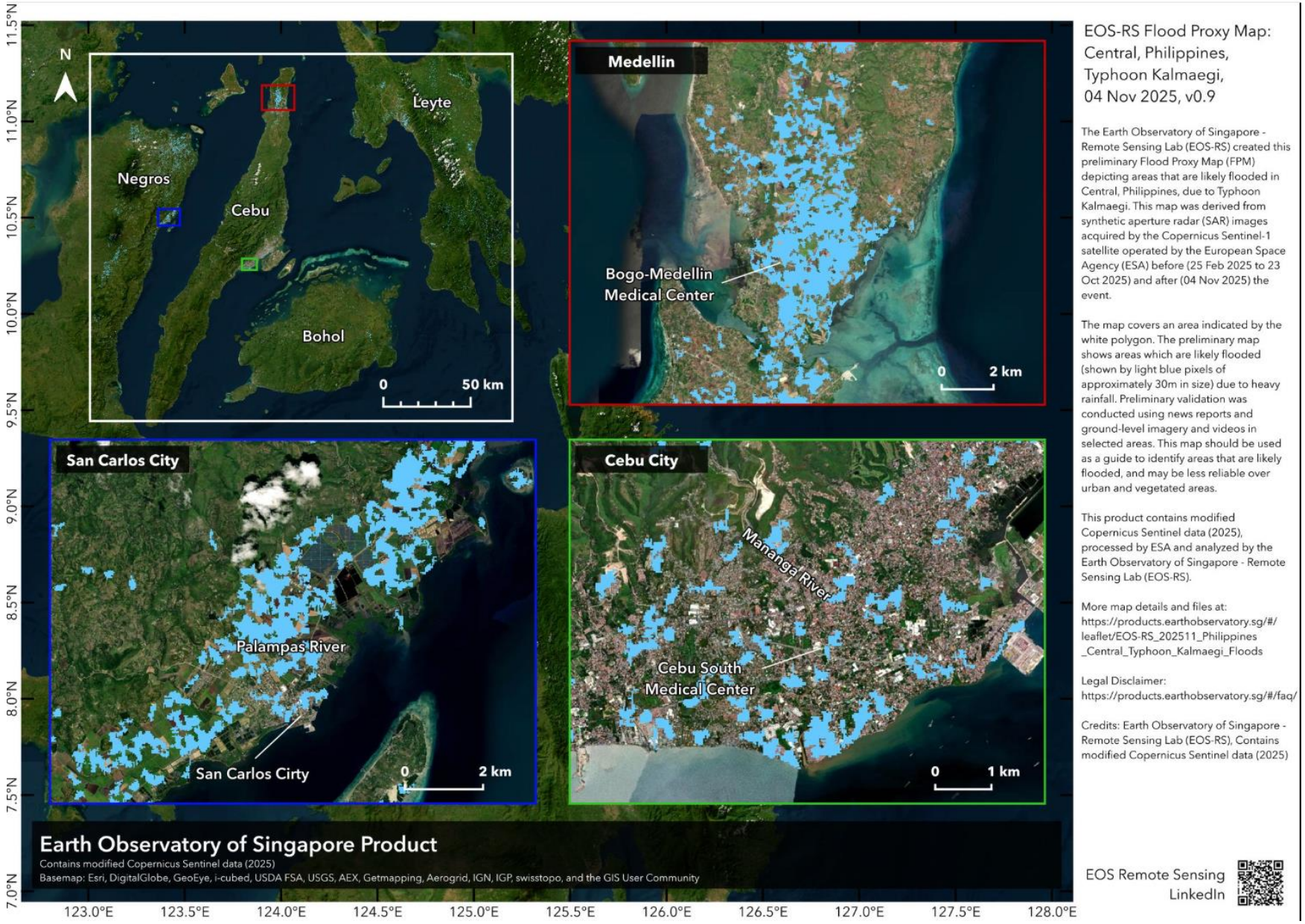


2025-11-08



2025-11-08

Value Added Products (VAPs)



EOS-RS Flood Proxy Map: Central, Philippines, Typhoon Kalmaegi, 04 Nov 2025, v0.9

The Earth Observatory of Singapore - Remote Sensing Lab (EOS-RS) created this preliminary Flood Proxy Map (FPM) depicting areas that are likely flooded in Central, Philippines, due to Typhoon Kalmaegi. This map was derived from synthetic aperture radar (SAR) images acquired by the Copernicus Sentinel-1 satellite operated by the European Space Agency (ESA) before (25 Feb 2025 to 23 Oct 2025) and after (04 Nov 2025) the event.

The map covers an area indicated by the white polygon. The preliminary map shows areas which are likely flooded (shown by light blue pixels of approximately 30m in size) due to heavy rainfall. Preliminary validation was conducted using news reports and ground-level imagery and videos in selected areas. This map should be used as a guide to identify areas that are likely flooded, and may be less reliable over urban and vegetated areas.

This product contains modified Copernicus Sentinel data (2025), processed by ESA and analyzed by the Earth Observatory of Singapore - Remote Sensing Lab (EOS-RS).

More map details and files at: https://products.earthobservatory.sg/#/leaflet/EOS-RS_202511_Philippines_Central_Typhoon_Kalmaegi_Floods

Legal Disclaimer: https://products.earthobservatory.sg/#/faq/

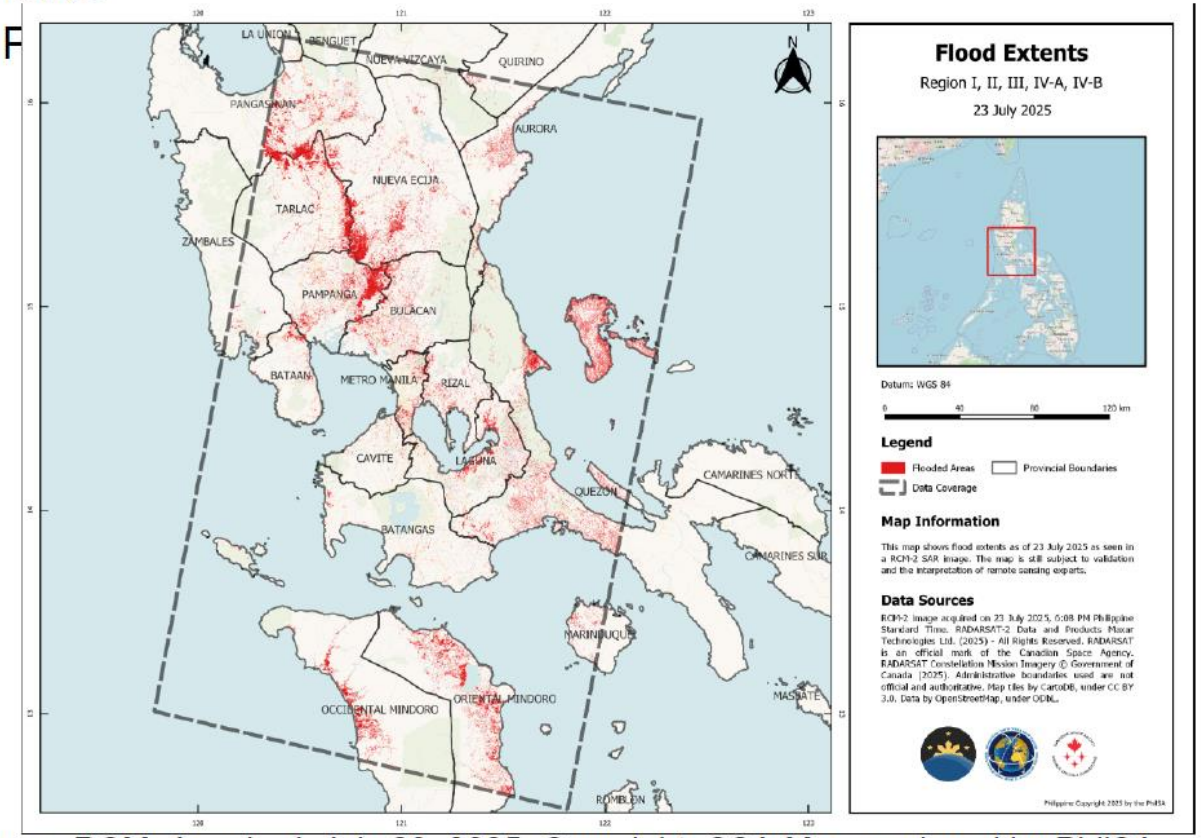
Credits: Earth Observatory of Singapore - Remote Sensing Lab (EOS-RS), Contains modified Copernicus Sentinel data (2025)

EOS Remote Sensing LinkedIn

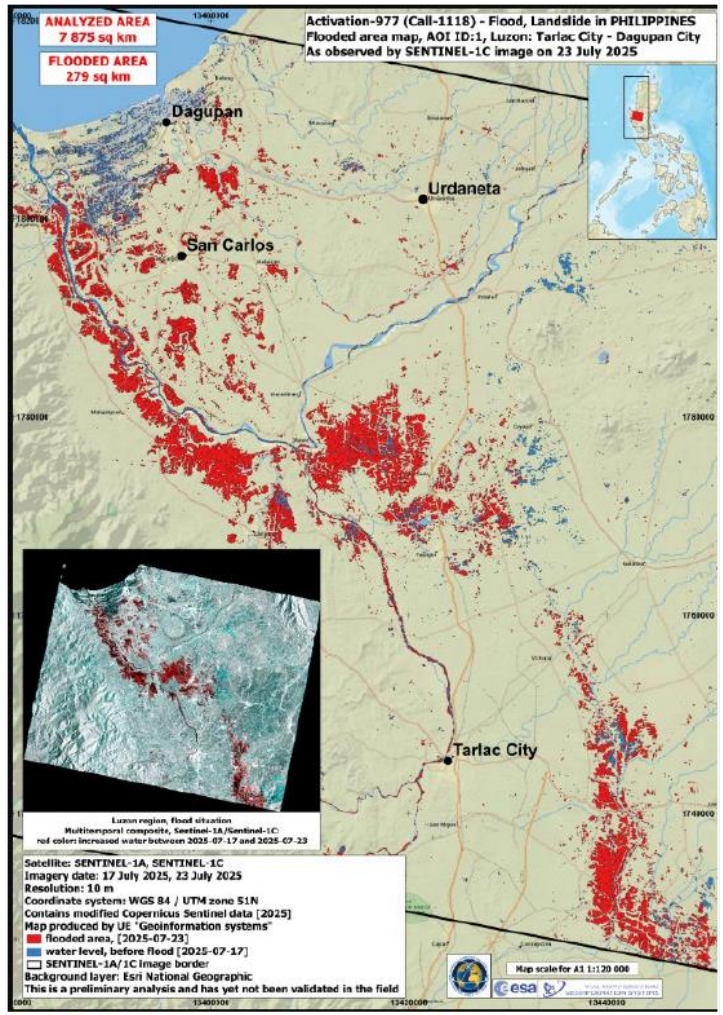
Escalation

International Charter

- ✓ PhilSA requested emergency observation to Sentinel Asia on the flood in Philippines, and it was escalated to the Charter by request.
- ✓ 483 images were provided from CNSA, CONAE, CSA, DLR, ESA,INPE, ISRO
- ✓ P



Source: RCM Acquired: July 23, 2025 Copyright: CSA Map produced by PhilSA



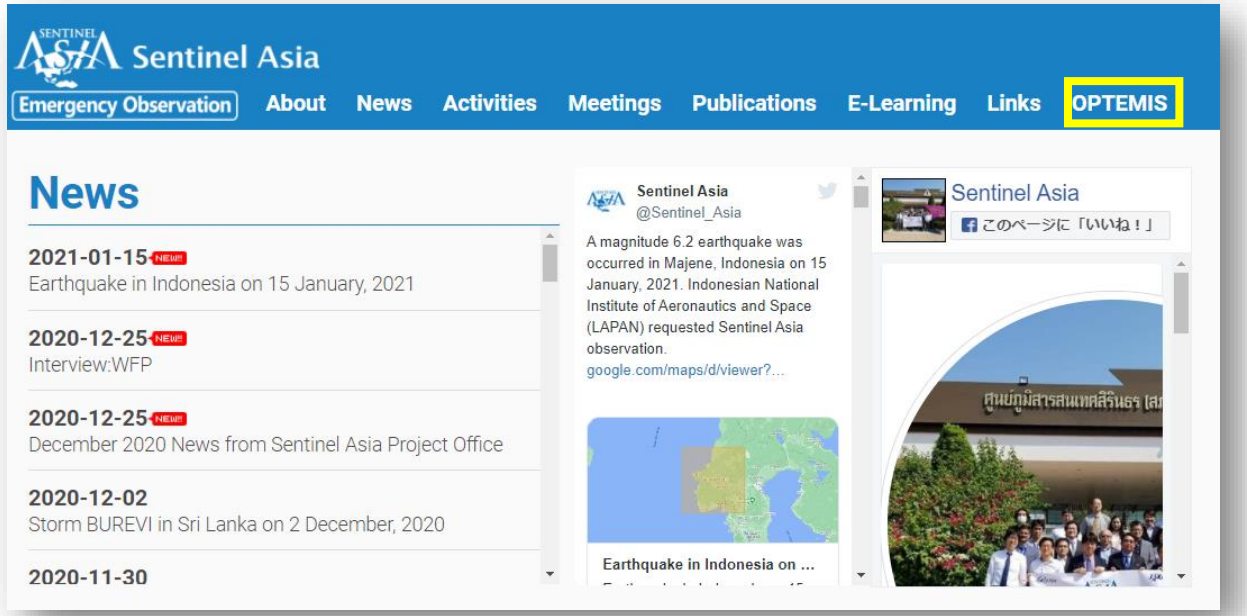
Source: Sentinel1 Acquired: July 23, 2025 Copyright: ESA Map produced by Geoinformation Systems

OPTEMIS

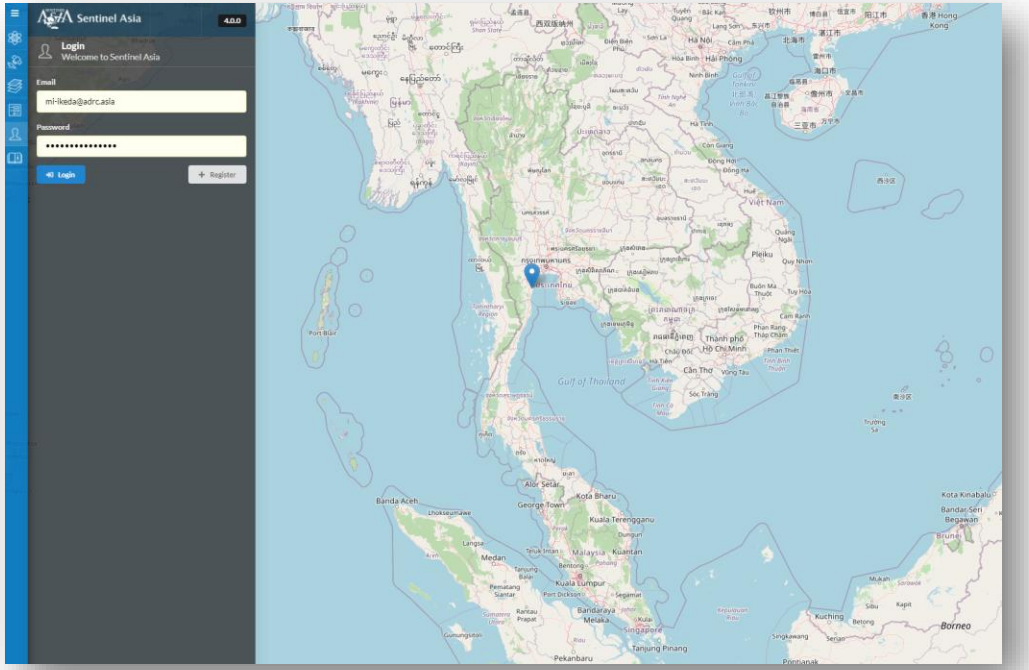
Optimizing the EOR process

The new system for EOR, named “OPTEMIS”, was developed through the collaboration of JAXA, GISTDA, and NARL started its operation on 28 October 2019. “OPTEMIS” enable easy-registration for making EOR.

[Access]



SA Website (https://sentinel-asia.org/index.html)



OPTEMIS (https://optemis.sentinel-asia.org/)

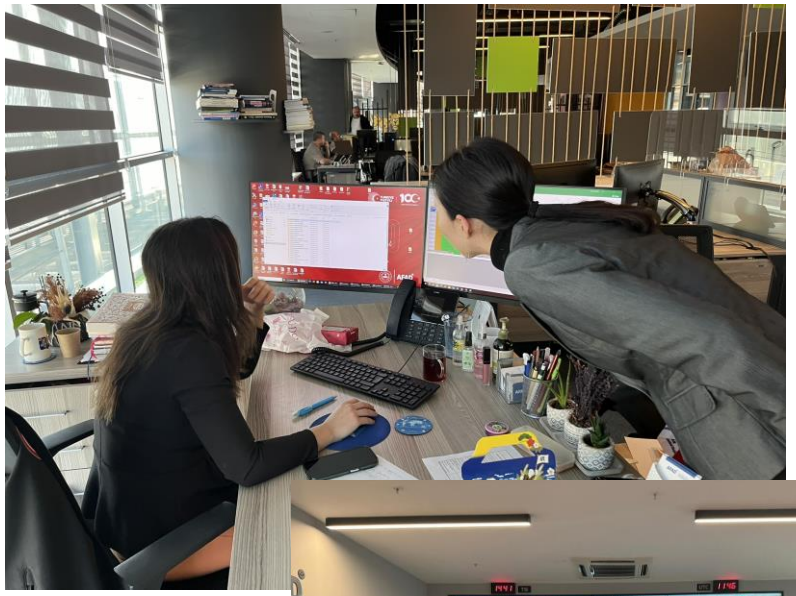
4. Facilitating Capacity Building by ADRC

Nepal (Nov 2023)

Interview at DHM, ICIMOD, and NDRRMA (before WS)

Turkiye (Dec 2023)

Interview at AFAD and METU (before WS)



Kyrgyz Republic (Oct 2024)

Interview at MoES and training for CAIAG staffs

Pacific Island Countries (Jan and Nov 2025)

(January 2025)

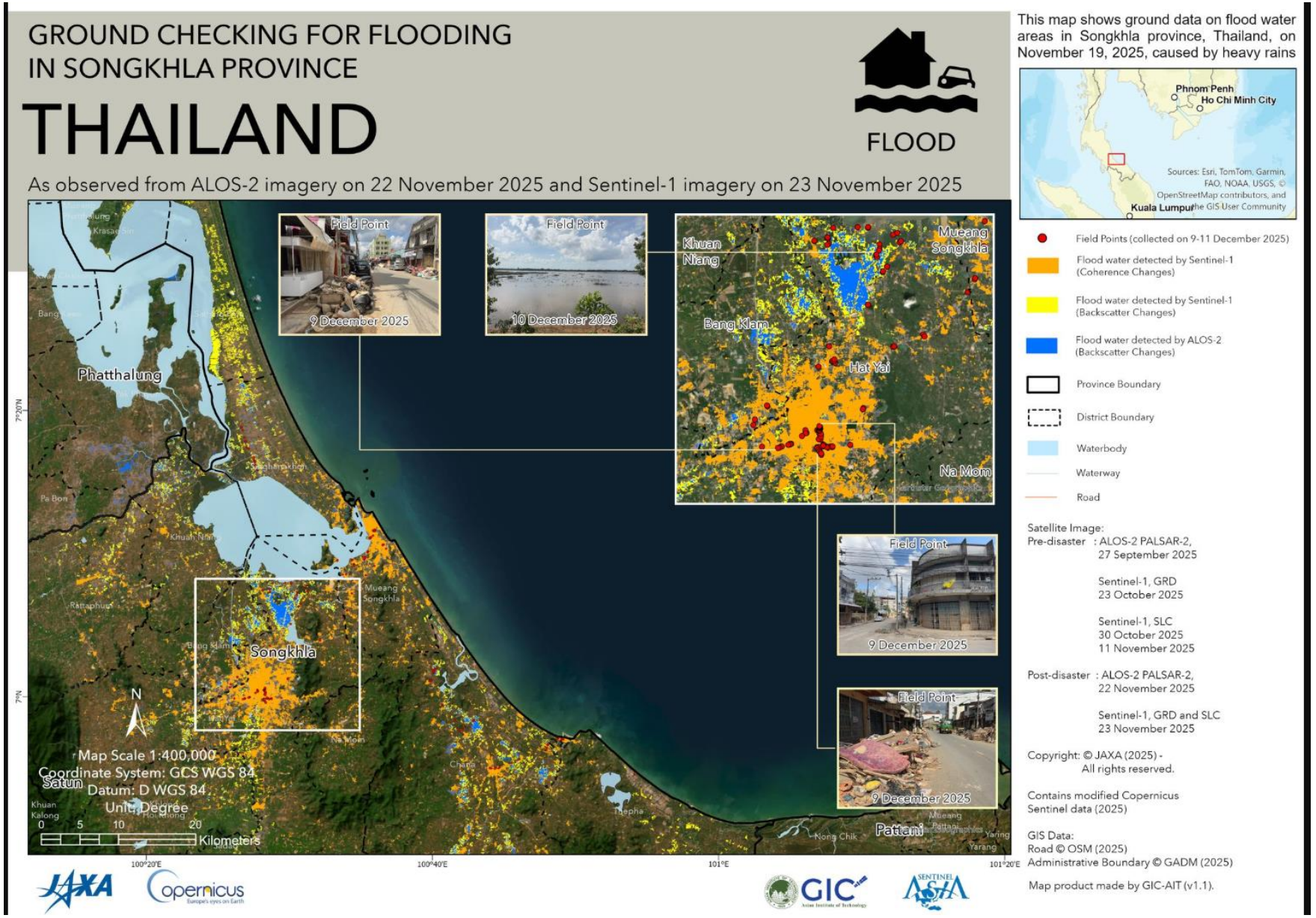
- Training for Fiji members
- Interview at SPC

(November 2025)

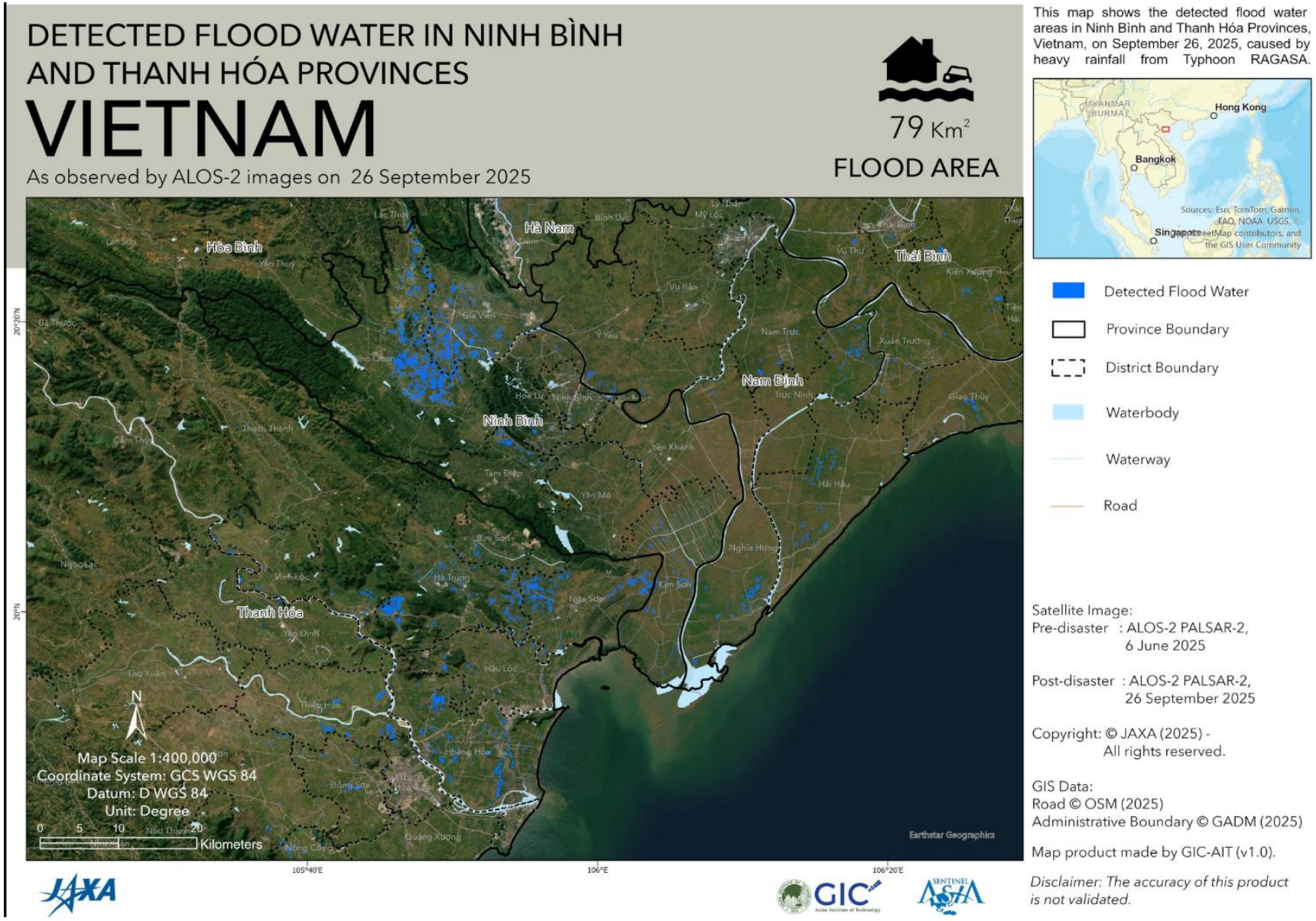
- Training for Pacific Island Countries
- Interview at University of the South Pacific

5. Typhoon Disaster Assessment Maps Cases

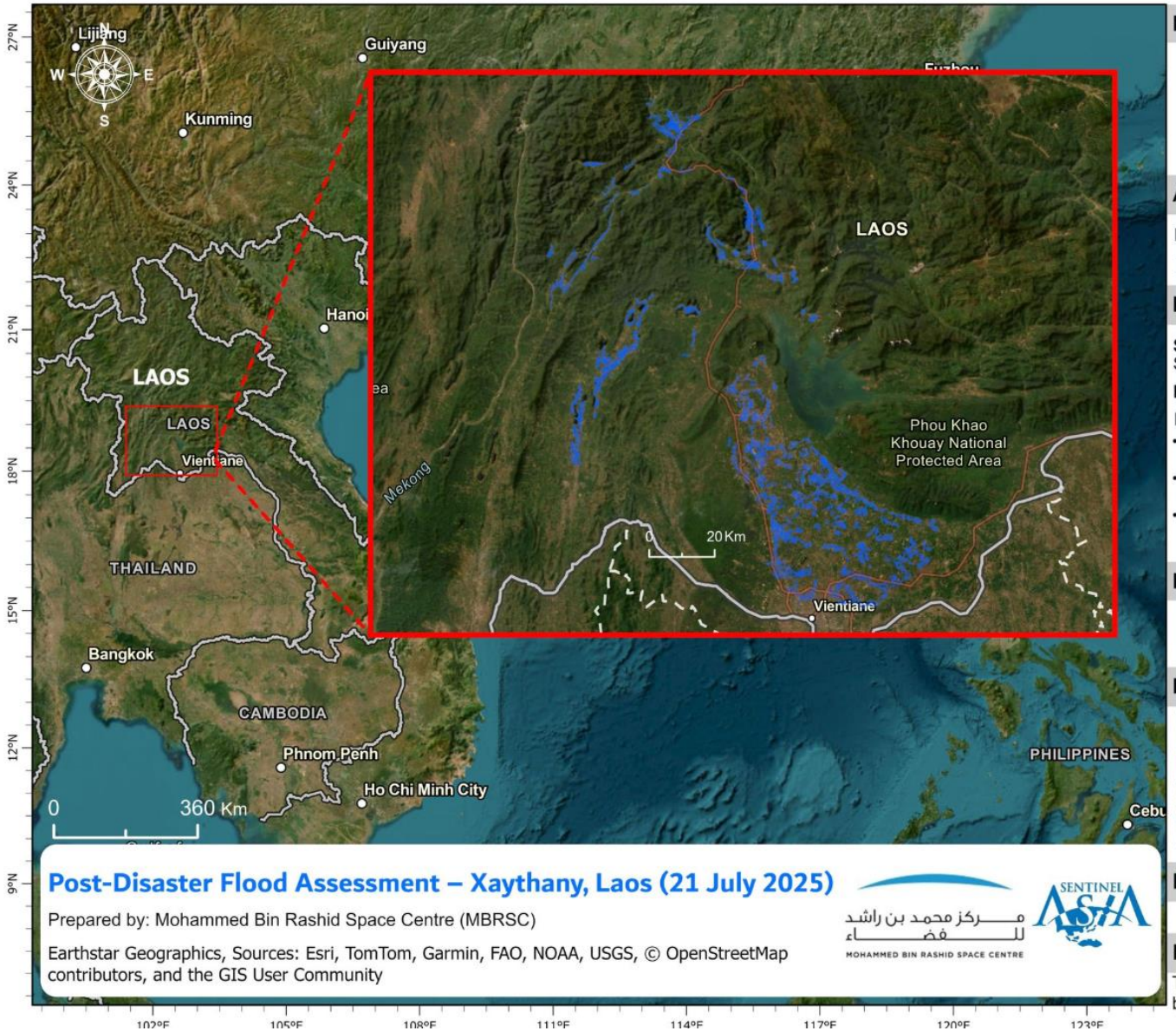
Thailand (2025 Nov 19)



Vietnam (2025 Sep 26)



Laos (2025 Jul 21)



Description

The Mohammed Bin Rashid Space Centre (MBRSC) prepared this map to support post-disaster assessment efforts following the flood in Xaythany, Laos, on the 21st of July 2025.

Area of Interest (AOI)

Longitude: 101.793°E **to** 102.990°E

Latitude: 19.3123°N **to** 18.1741°N

Methodology

Satellite Sensor Used:
Sentinel 1C (SAR imagery)

Polarization: VH Band

Methodology:

- Comparison of pre- and post-disaster SAR images
- Radar backscatter analysis to detect flood affected areas
- Preprocessing applied for accuracy and clarity

Imagery Dates

Pre-Disaster: 19-10-2024

Post-Disaster: 22-07-2025

Impact Statistics

40
Families Evacuated

Reference:

02
Bridges Collapsed

Legend

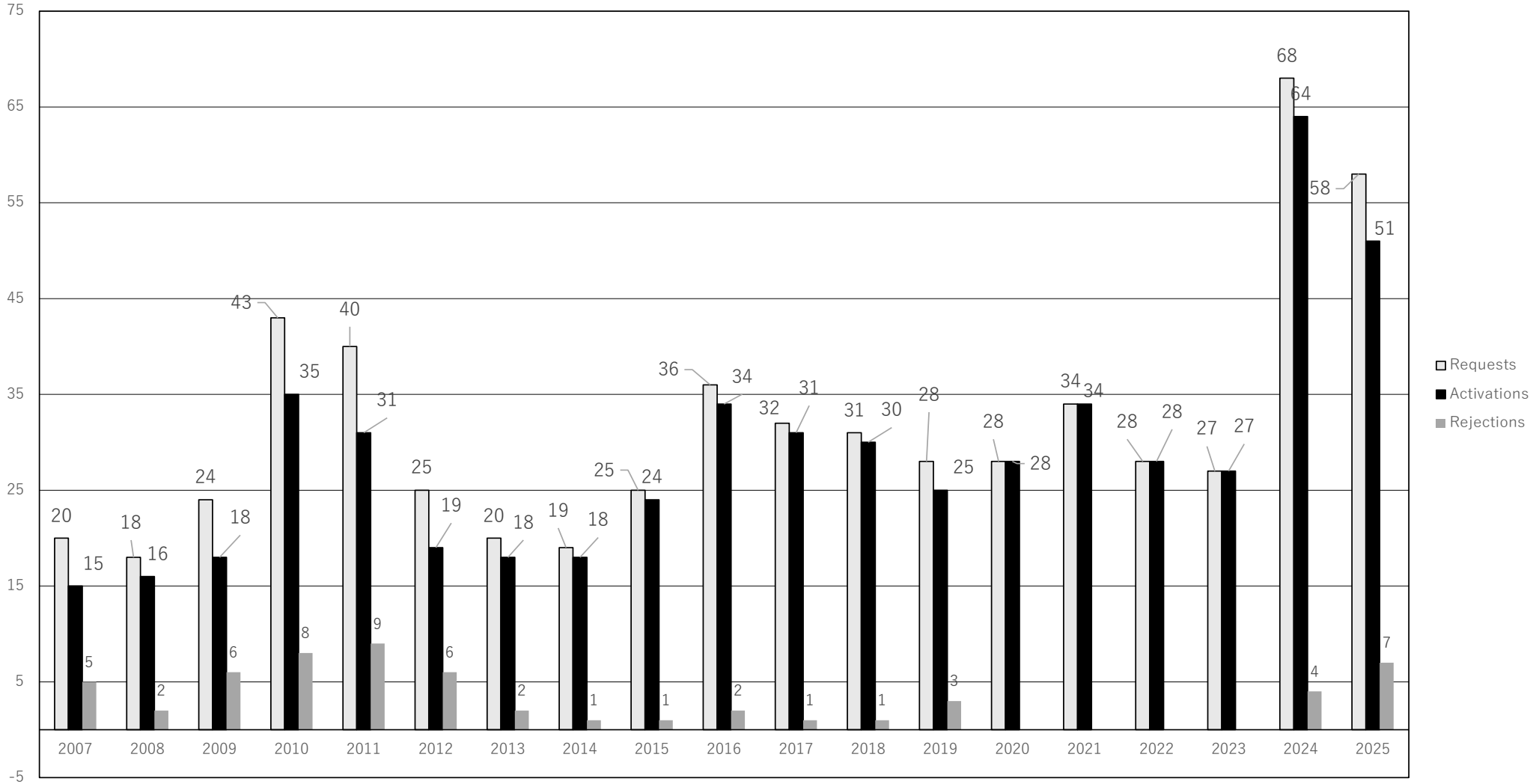
Flooded Areas

Remark(s)

The accuracy of this product has not been validated

EOR activation since (2007 - 2025)

Totally 604 requests were submitted and 546 were activated.



Type of request, activations, and rejections for EOR (2007 – 2024)

	Number of Requests	Number of Activations	Number of Rejections	Activations/Requests (%)
Flood	274	259	15	94.5%
Earthquake	69	64	5	92.8%
Typhoon	46	44	2	95.7%
Landslide	35	30	5	85.7%
Volcano	29	26	3	89.7%
Cyclone	28	24	4	85.7%
Forest Fire	19	9	10	47.4%
Oil Spill	9	7	2	77.8%
Others	37	32	5	86.5%
Total	**546**	**495**	**51**	

Contact:

https://www.adrc.asia

https://www.facebook.com/ADRC.KOBE

Asian Disaster Reduction Center