Sentinel Asia Report

15 November 2022

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Deputy Executive Secretariat of Sentinel Asia

1. Overview of Sentinel Asia

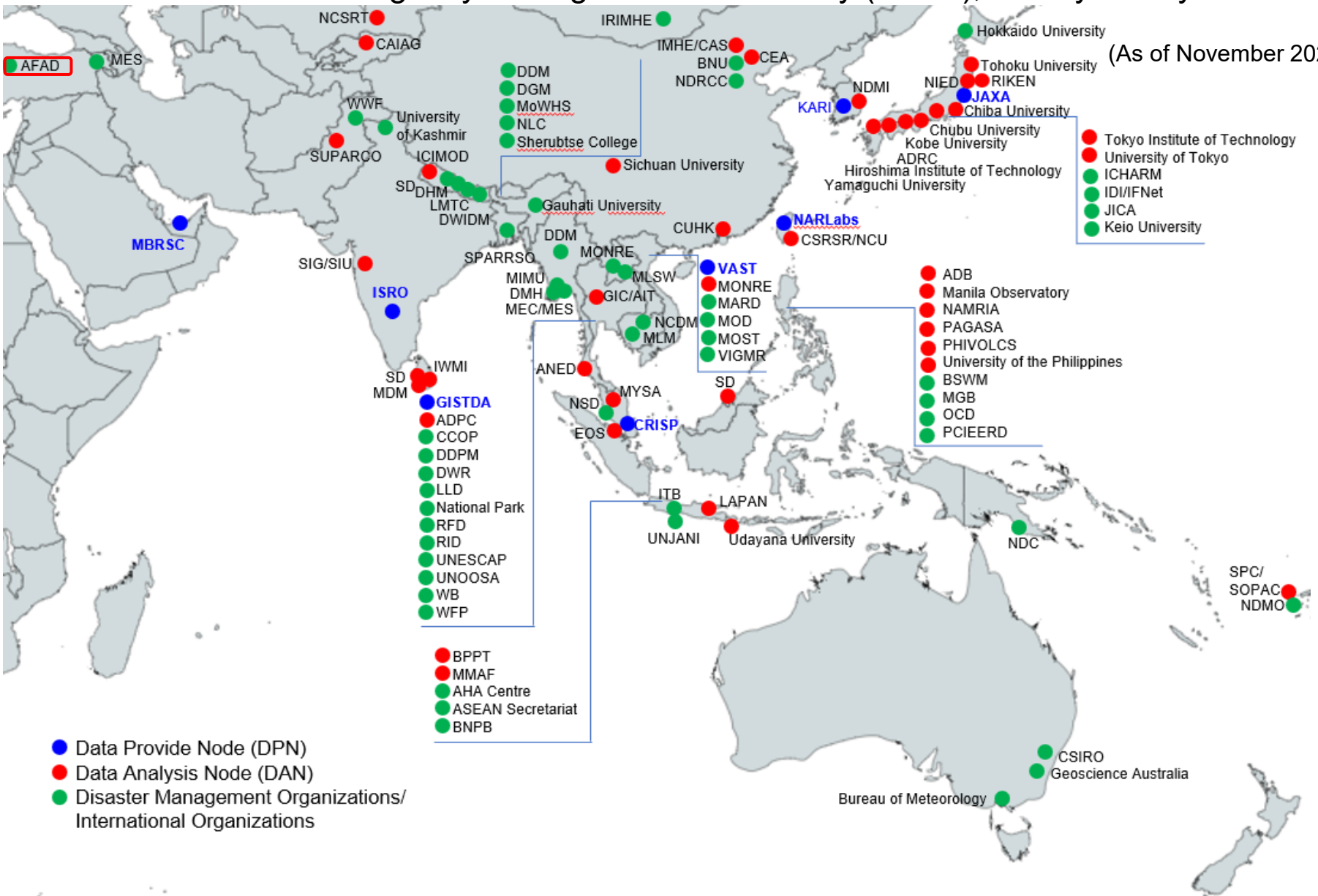
- ✓ Sentinel Asia is an initiative aiming space-based international cooperation for disaster management in the Asia-Pacific region
- ✓ In February 2006, Sentinel Asia was established and started its activities in accordance with the recommendation at APRSAF-12 in October 2005
- ✓ Sentinel Asia is the first initiative under APRSAF

Steering Committee Meeting in October 2022
Co-organized by GIC-AIT and JAXA

2. Membership Status of Sentinel Asia

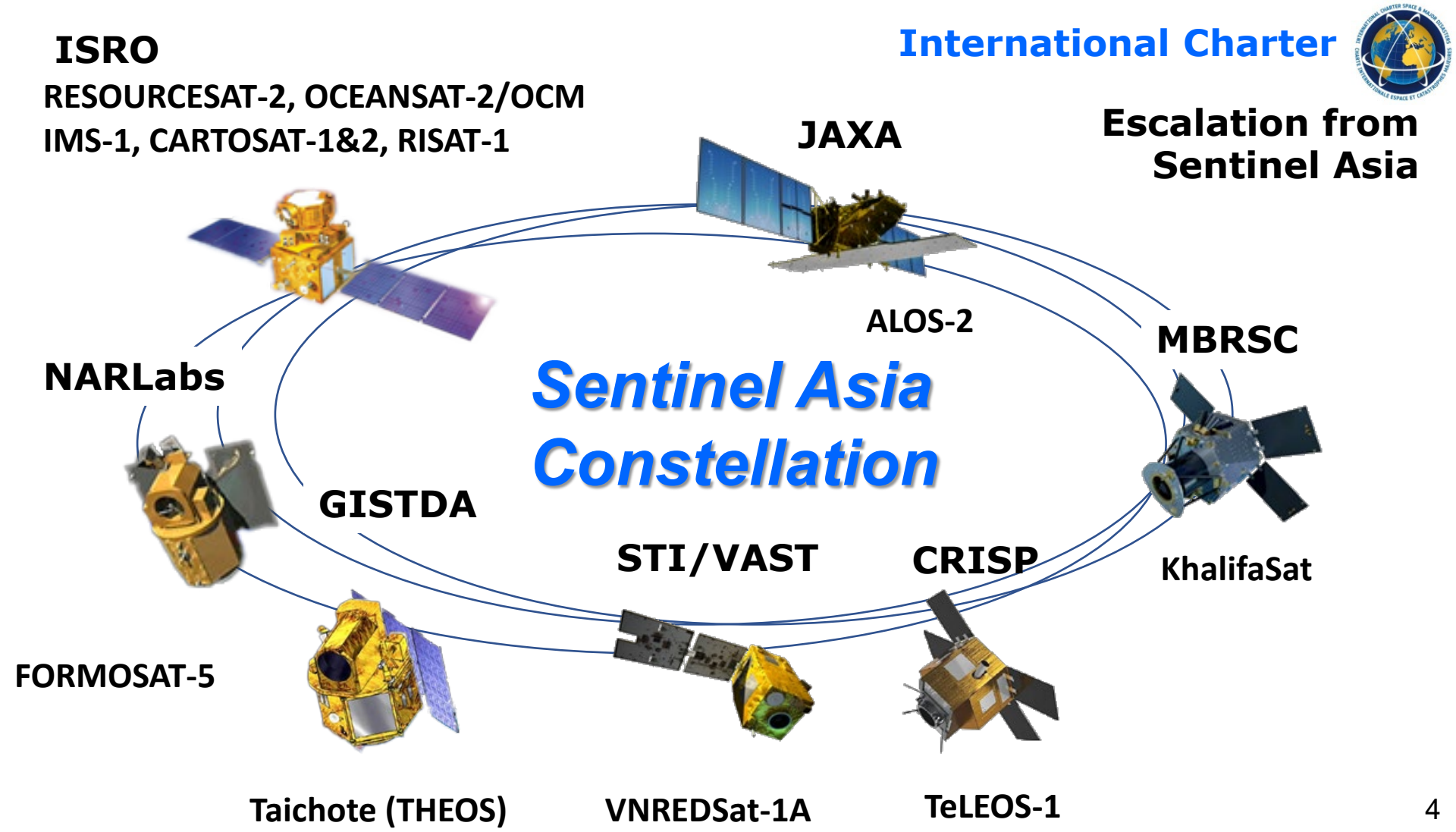
In total: **112** organizations. **1** organizations newly joined as below:
- Disaster and Emergency Management Presidency (AFAD), Turkey in July 2022

(As of November 2022)



3. Sentinel Asia Constellation "Data Provider Node" currently contributing to Emergency Observations

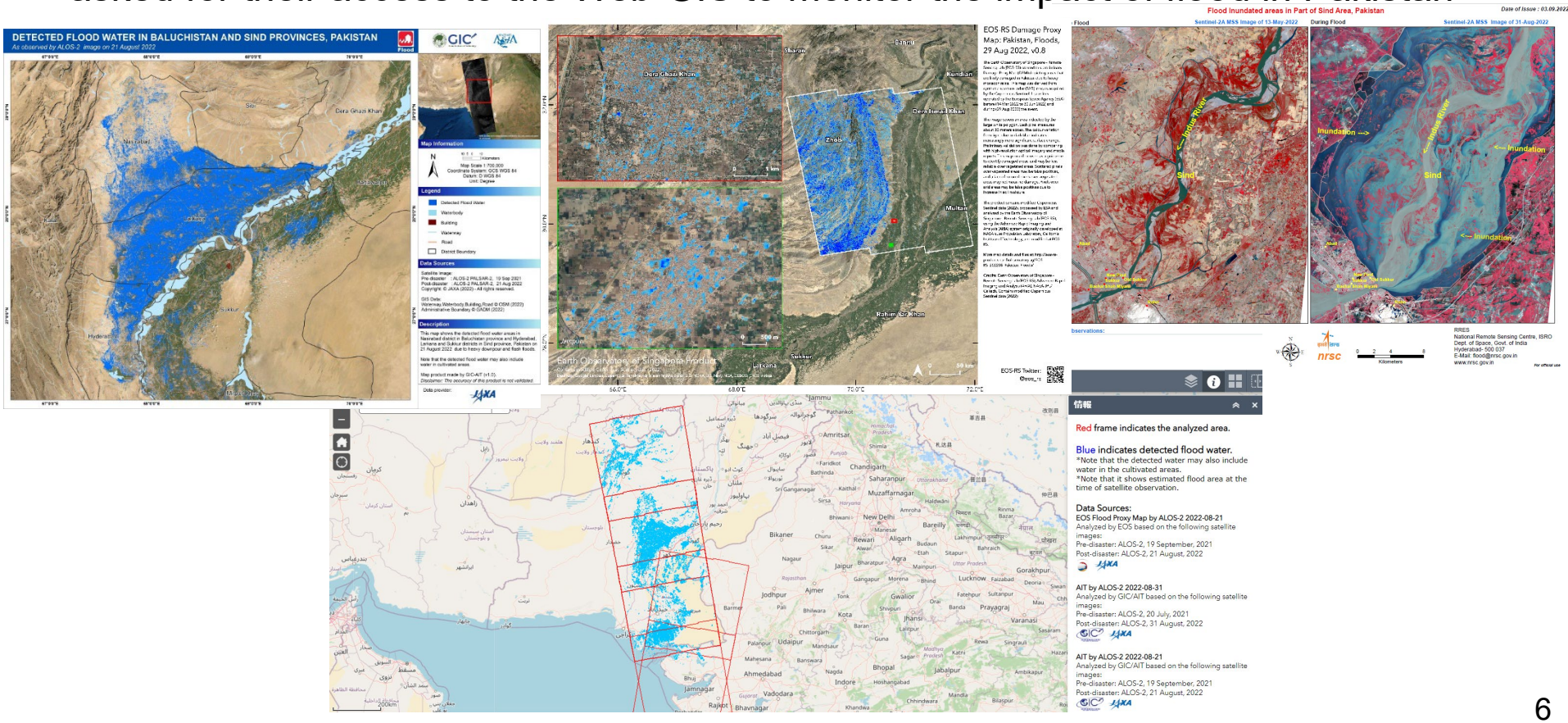
- ✓ 7 space agencies/research institutes currently contributing to emergency observation
- ✓ If necessary, escalate emergency observation request to the International Charter



4. Emergency Observation Review by Geographical Distribution

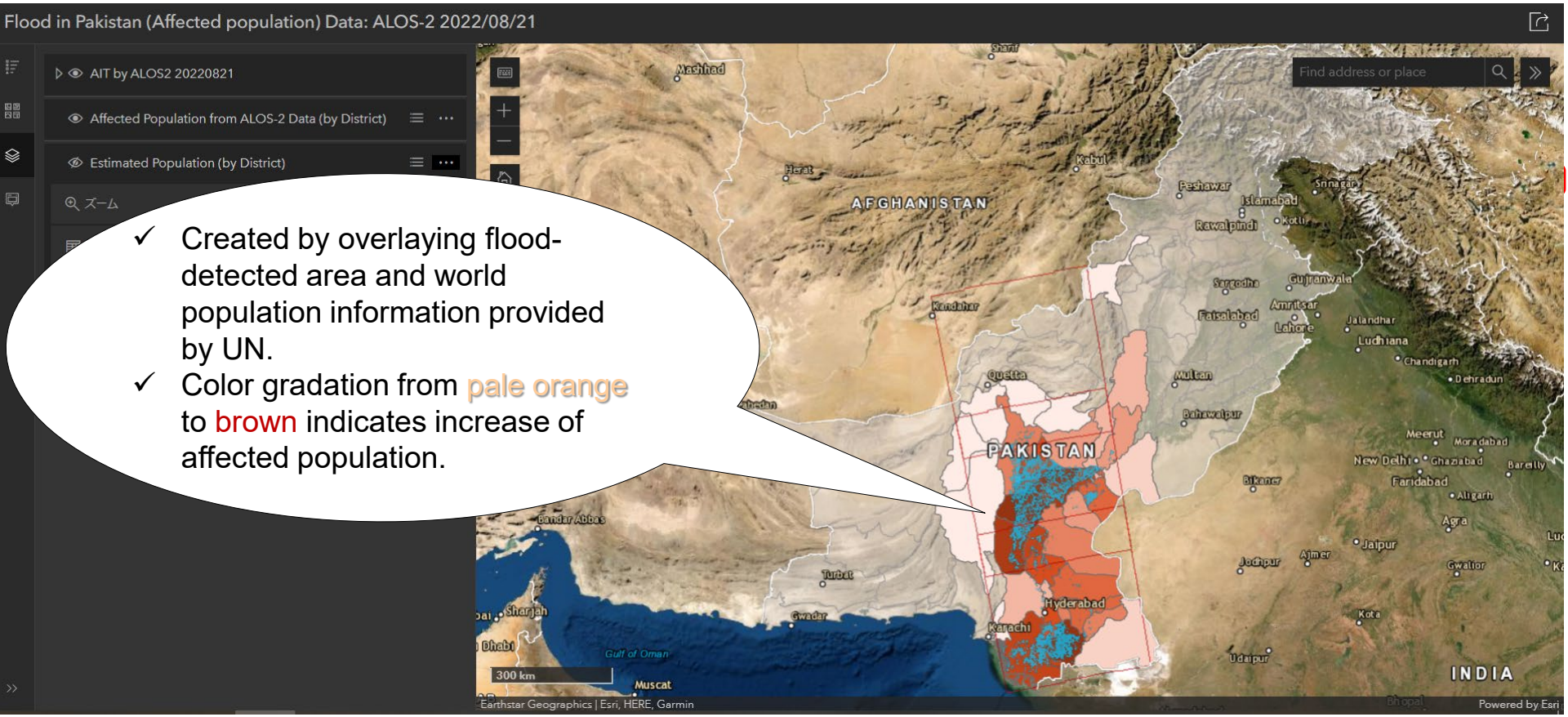
5.1 Flood in Pakistan in August 2022

- ✓ Provincial Disaster Management Authority (PDMA) of Pakistan requested emergency observation through Asia Institute of Technology (AIT) and Asia Disaster Reduction Center (ADRC) activated
- ✓ Japan International Cooperation Agency (JICA), United Nations World Food Program (UNWFP), a Consultant of a World Bank project, and a disaster response NGO asked for their access to the Web-GIS to monitor the impact of flood in Pakistan



2.1.3 Flood in Pakistan : Statistic information

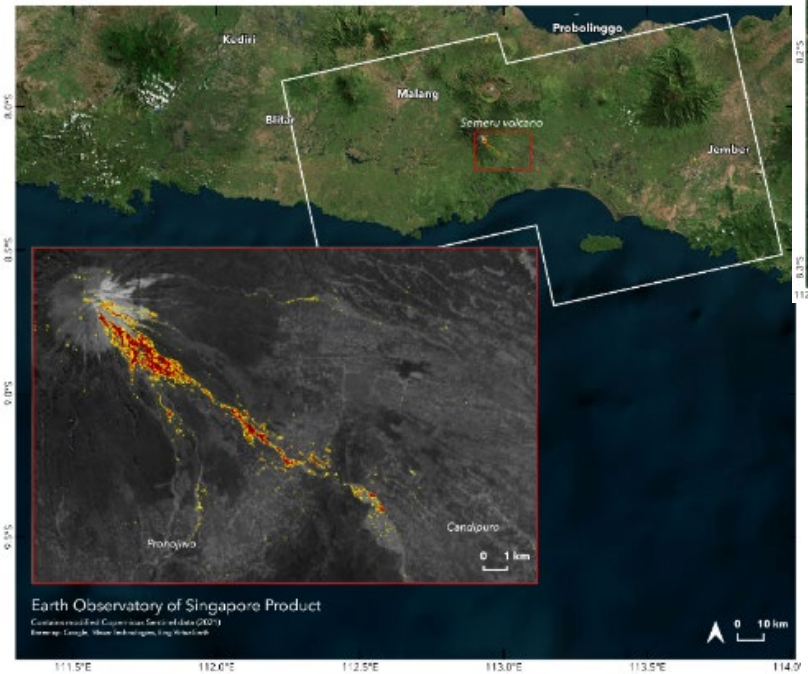
- ✓ JICA expected the statistic information such as affected population to understand the scale of the food impact
- ✓ In this regard, JAXA created below affected population information as sample and introduced it to JICA

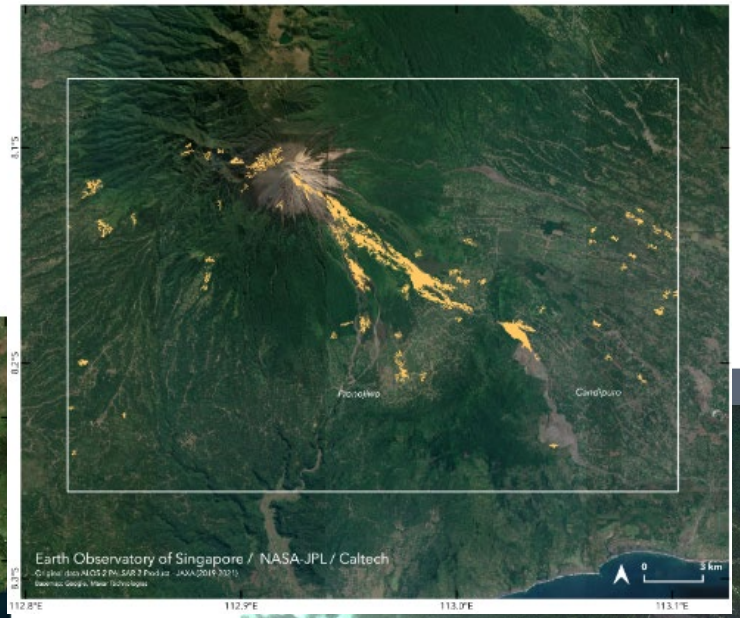


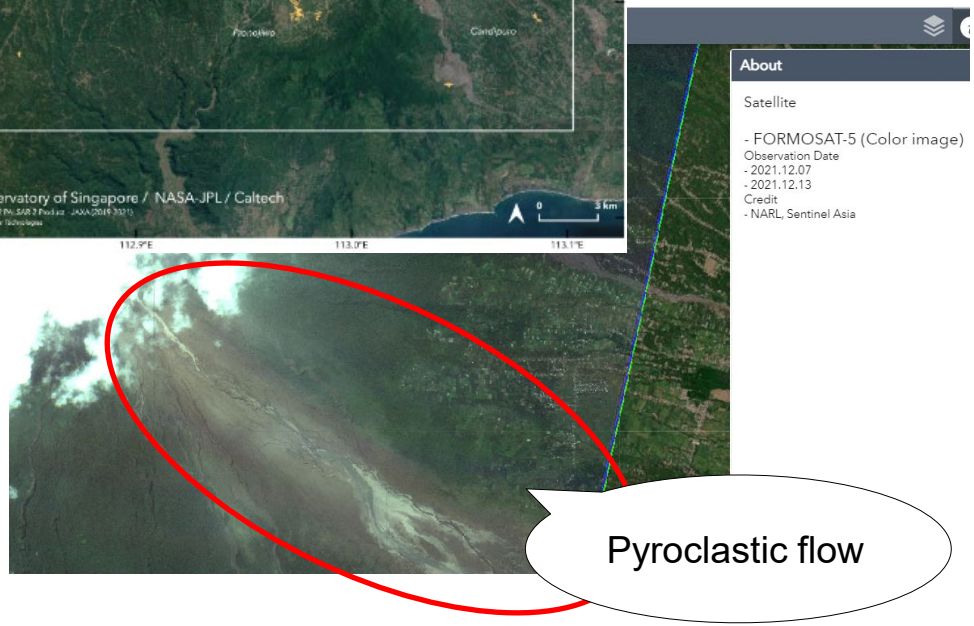
https://sentinelasia.maps.arcgis.com/apps/instant/sidebar/index.html?appid=d5ae4fbba046423892df17cad7da40b3

5.2 Volcano Eruption in Indonesia in December 2021

- ✓ JICA requested emergency observation on Volcano Eruption of Mt. Semeru
- ✓ Thanks to disaster information provided by Earth Observatory of Singapore (EOS), Nanyang Technological University and optical satellite data from FORMOSAT-5 by National Applied Research Laboratories (NARLabs)/ National Space Organization (NSPO) on Web-GIS, JICA found potential landslide risk information that was hard to acquire from the field survey

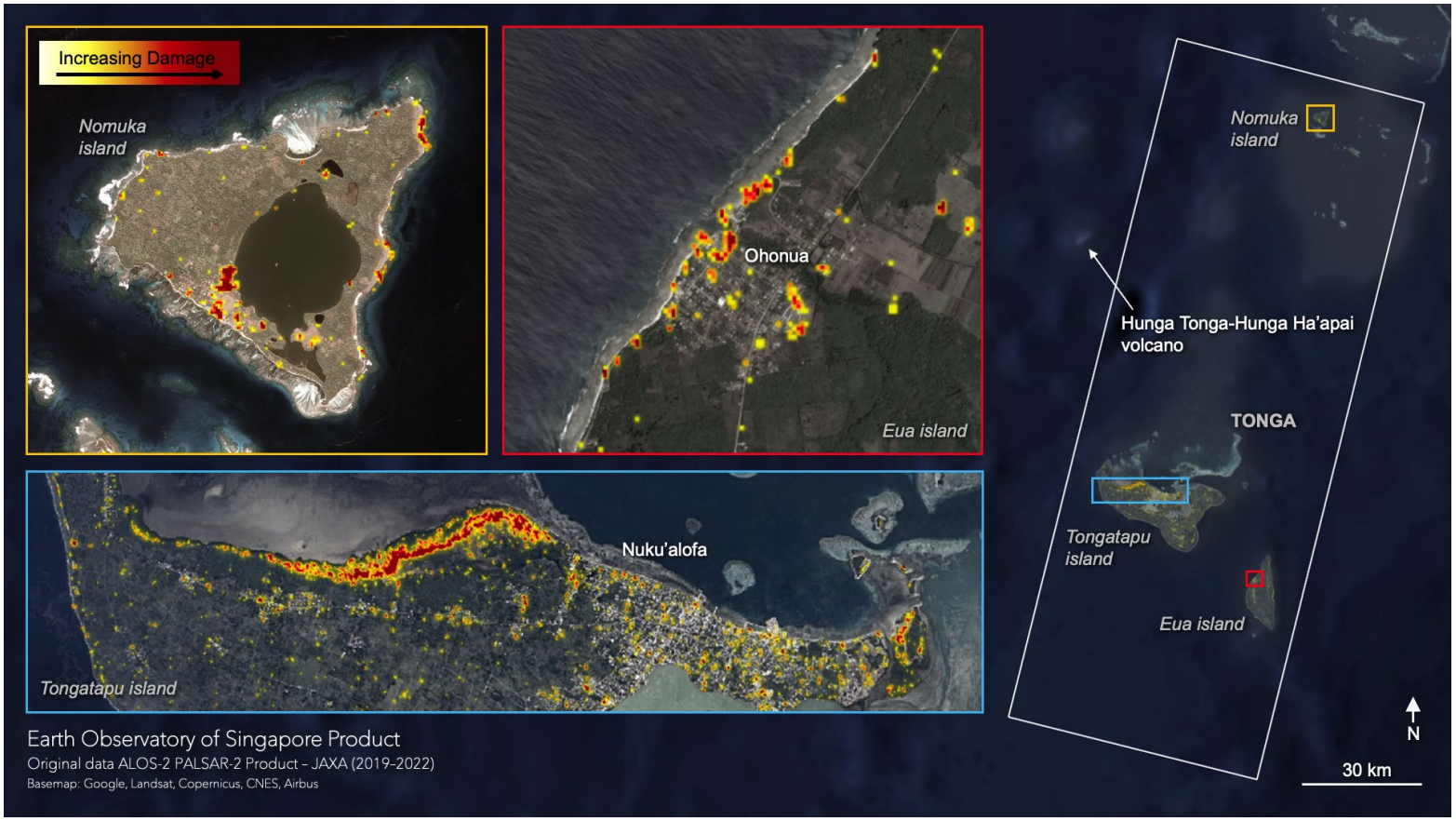






5.3.1 Volcano Eruption in Tonga in January 2022

- ✓ ADRC requested emergency observation on Volcano Eruption in Tonga
- ✓ JICA HQ shared the disaster information provided by Sentinel Asia to JICA Fiji Office, that oversees surrounding islands including Tonga



EOS-RS Damage Proxy Map: Tonga, Hunga Tonga-Hunga Ha'apai volcano, 22 Jan 2022, v0.5

The Earth Observatory of Singapore - Remote Sensing Lab (EOS-RS) created this preliminary Damage Proxy Map (DPM) depicting areas that are likely damaged in Tongatapu and southern Ha'apai islands of Tonga due to the eruption of Hunga Tonga-Hunga Ha'apai volcano on 15 Jan 2022. This map was derived from synthetic aperture radar (SAR) images acquired by ALOS-2 satellites operated by the Japan Aerospace Exploration Agency (JAXA) before (9 Mar 2019, 7 Mar 2020) and after (22 Jan 2022) the event.

The image covers an area indicated by the large white polygon. Each pixel measures about 30 meters across. The colour variation from yellow to red indicates increasingly more significant surface change. Preliminary validation was done by comparing with high-resolution optical imagery. This damage proxy map should be used as a guide to identify damaged areas, and may be less reliable over vegetated areas. Scattered pixels over vegetated areas may be false positives, and a lack of coloured pixels over vegetated areas may not mean no damage.

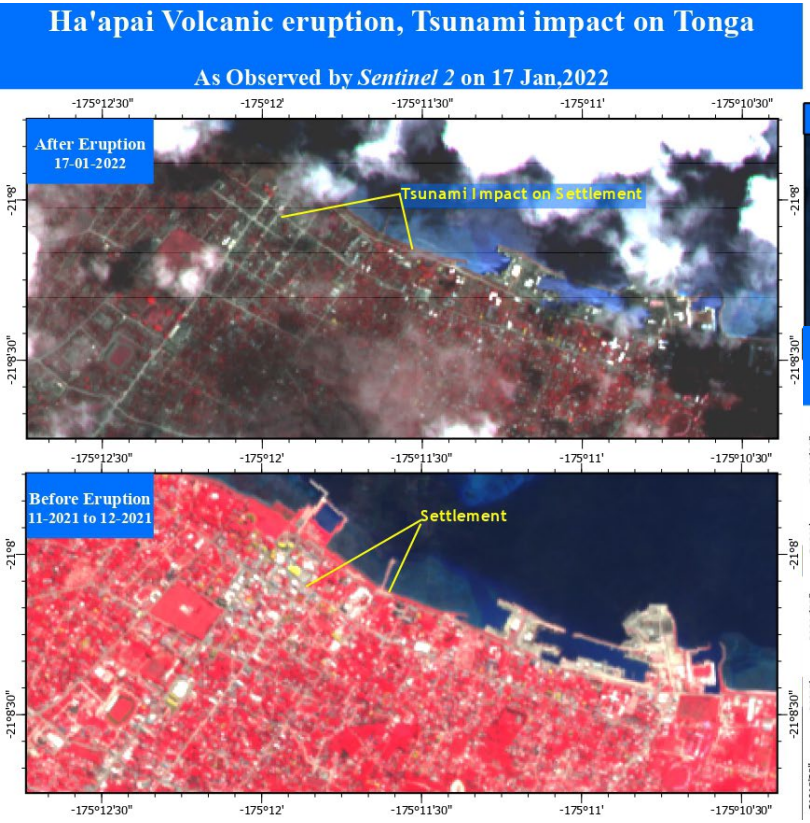
The Earth Observatory of Singapore (EOS) coordinated with Sentinel Asia to timely task the ALOS-2 satellite. Data was analyzed by the Earth Observatory of Singapore - Remote Sensing Lab (EOS-RS).

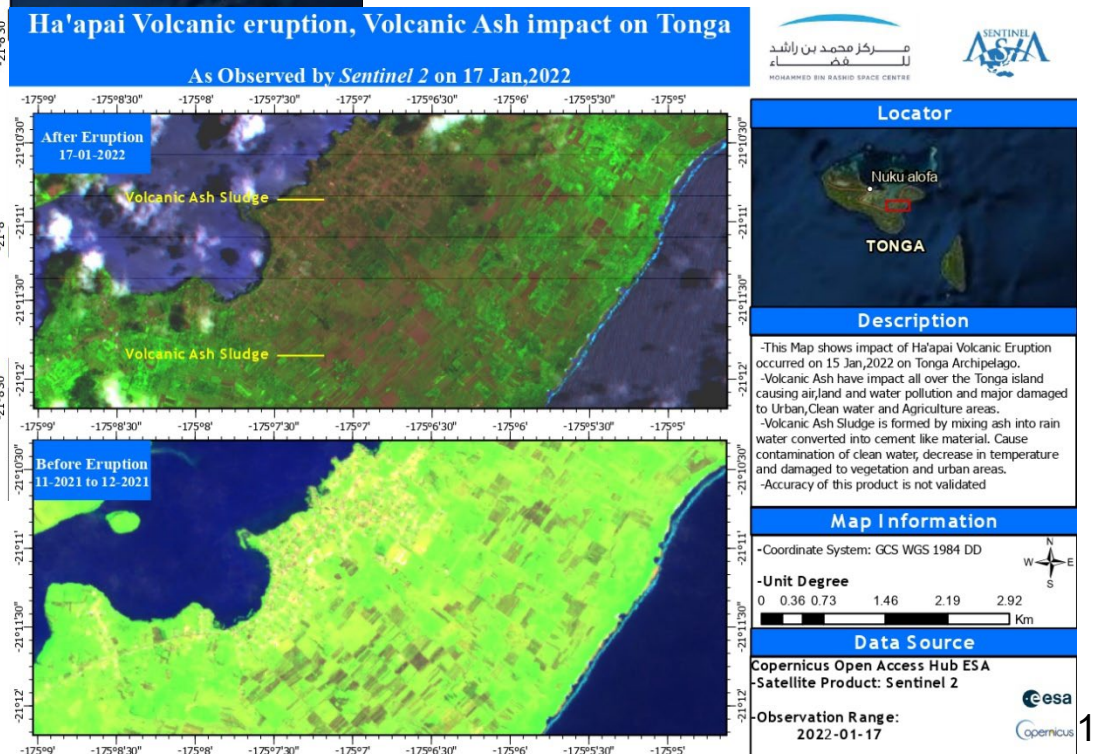
More map details and files at: http://eos-rs-products.earthobservatory.sg/EOS-RS_202201_Tonga_HungaTonga_Volcano

EOS-RS Twitter: @eos_rs

5.3.2 Volcano Eruption in Tonga in January 2022

- ✓ JICA appreciated the disaster information provided by Mohammed Bin Rashid Space Centre(MBRSC), which indicates the potential impact of the Tsunami and Ash since there was no information from Tonga due to the communication issues





Disaster information provided by MBRSC

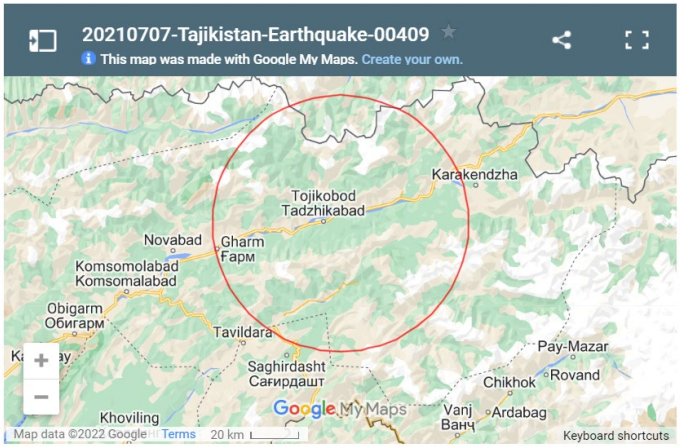
6.1 Establishment of the Standard Operating Procedures (SOPs)

- ✓ SOPs for making Emergency Observation Requests (EORs) to Sentinel Asia were established in below regions:
  - Central Asia and Caucasus (In December 2021)
  - Pacific Islands (In February 2022)

- ✓ For prompt EORs to Sentinel Asia including escalation to the Charter, Central Asian Institute of Applied Geosciences (CAIAG) and Pacific Community (SPC) are to play hub roles in making EORs through close communication with local Disaster Management Organizations

Ex. CAIAG made EOR for Tajikistan Earthquake in July 2021

Emergency Obs. Request Information



Disaster Type: Earthquake

Country: Tajikistan

Occurrence Date (UTC): 7 July, 2021

SA activation Date(UTC): 14 July, 2021

Requester: Central Asian Institute of Applied Geosciences (CAIAG)

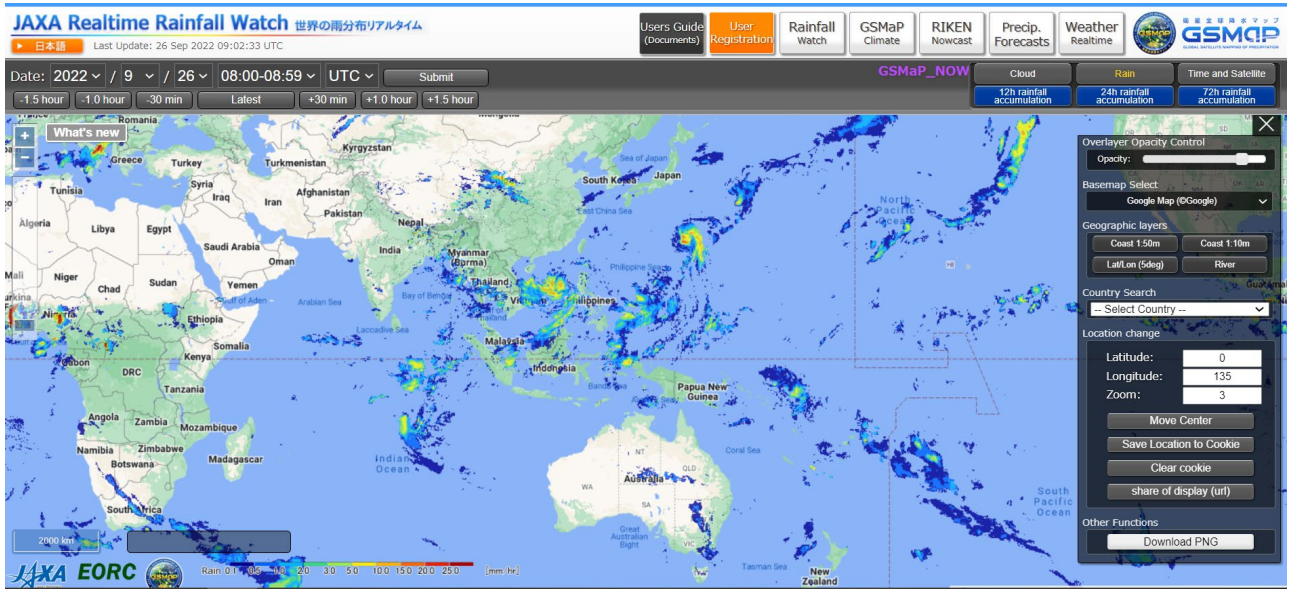
Escalation to the International Charter: No

GLIDE Number:

6.2 Establishment of the Standard Operating Procedures (SOPs)

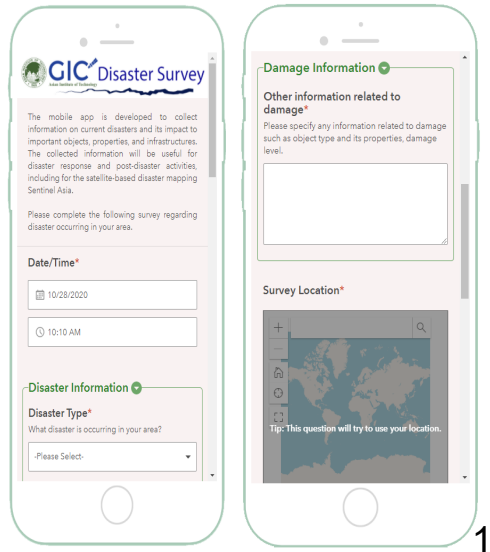
- ✓ Institutionalized use of Global Satellite Mapping of Precipitation (GSMaP) as reference information for making EORs

- ✓ Easy and real-time provision of local information on the disaster via web-based mobile application developed by AIT to calibrate accuracy of disaster information provided by Sentinel Asia



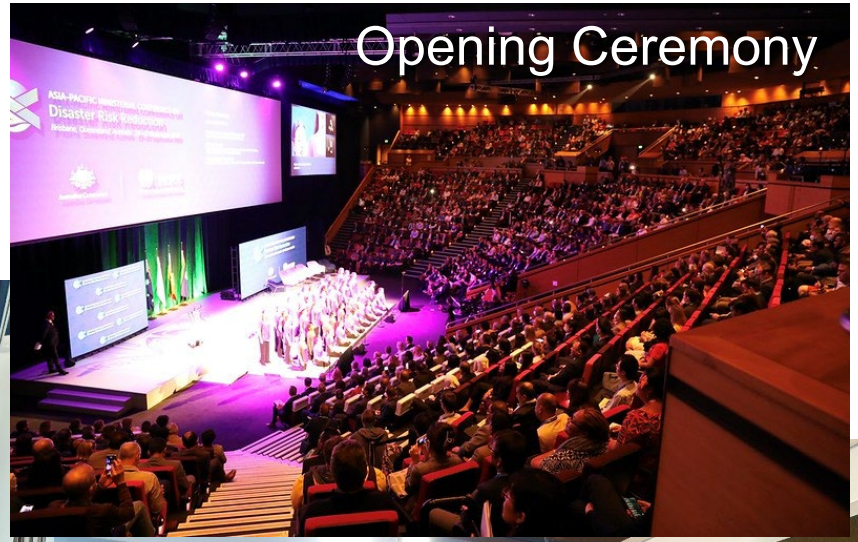
Mobile application developed by AIT

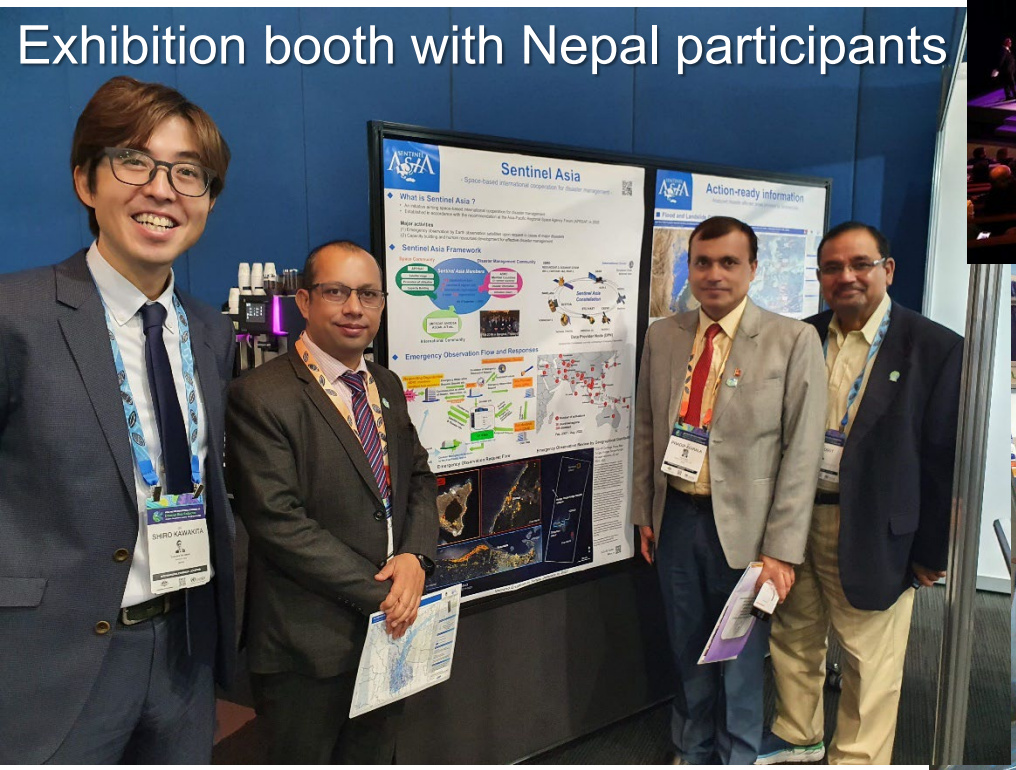
- Web link: https://arcg.is/1HWGWX0
- QR Code:

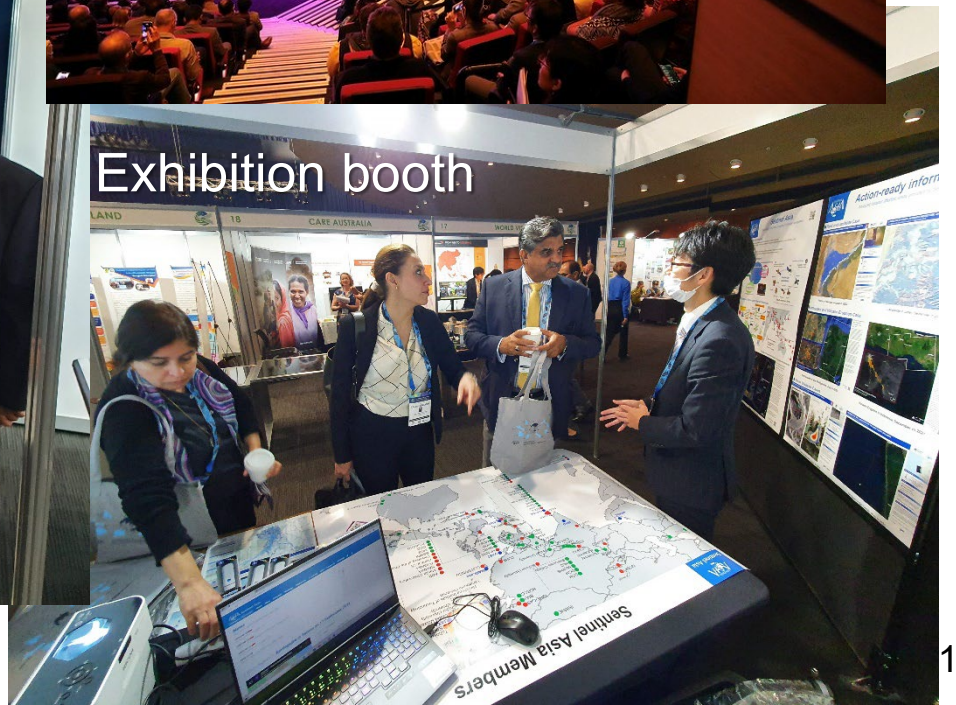


7. Asia-Pacific Ministerial Conference On Disaster Risk Reduction

- ✓ Promoted Sentinel Asia's activities at the exhibition 19 to 22 September 2022 in Brisbane, Australia
- ✓ More than 100 participants visited Sentinel Asia booth per day







8. Published Sentinel Asia Annual Report

✓ Successfully published annual report 2020

SENTINEL ASIA
ANNUAL REPORT 2020

Organization	**Geo-Informatics and Space Technology Development Agency**
Title	**GISTDA Contribution in supporting Disaster Management**
Type of Activity	**Provide Satellite Data and Software** (e.g., Conference, Workshop, Meeting, Training, EOR, Providing satellite data or VAP)
Date	**2020**

GISTDA supported the disaster management activities by

1. Providing hundreds of satellites images 195 images as following.
2. Provide OPTEMIS system for making EOR

Summary of cooperation SA-GISTDA to contribute Thaichote Satellite

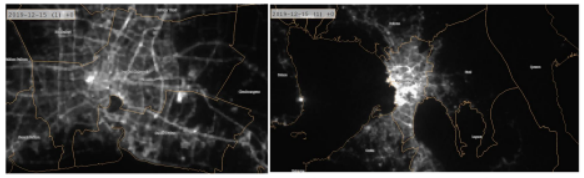
No	ACQ date	Country	Disaster Type	MS	PAN	PS	Mosaic	No. of Images
1	20/02/2020	Indonesia	Flood	1	5	0	0	6
2	23/02/2020	Indonesia	Flood	2	4	0	0	6
3	29/02/2020	Indonesia	Flood	4	7	0	0	11
4	01/03/2020	Indonesia	Flood	4	8	0	0	12
5	04/08/2020	Lebanon	Explosion (Building Damage)	4	8	3	0	15
6	18/08/2020	Philippines	Earthquake	2	7	0	0	9
7	22/09/2020	Vietnam	Flood-Landslide	2	5	0	0	7
8	23/09/2020	Vietnam	Flood-Landslide	2	5	0	0	7
9	24/09/2020	Vietnam	Flood-Landslide	4	5	0	0	9
10	10/10/2020	Vietnam	Flood-Landslide	1	4	0	0	5
11	03/11/2020	Philippines	Flood-Landslide-Storm	3	4	0	0	7
12	4/11/2020	Philippines	Flood-Landslide-Storm	1	2	0	0	3
13	07/11/2020	Philippines	Flood-Landslide-Storm	2	6	0	0	8
14	07/11/2020	Turkey	Earthquake-Tsunami	1	4	0	0	5
15	09/11/2020	Cambodia	Flood	5	15	0	0	20
16	10/11/2020	Cambodia	Flood	5	16	0	0	21
17	11/11/2020	Philippines	Flood-Landslide-Storm	2	4	0	0	6
18	11/11/2020	Turkey	Earthquake-Tsunami	2	6	0	0	8
19	12/11/2020	Philippines	Flood-Landslide-Storm	2	6	0	0	8
20	12/11/2020	Turkey	Earthquake-Tsunami	2	6	0	0	8
21	17/11/2020	Philippines	Flood-Landslide-Storm	2	4	0	0	6
22	18/11/2020	Philippines	Flood-Landslide-Storm	2	6	0	0	8
			Total					195

Courtesy of GISTDA

Organization	**The University of Tokyo**
Title	**R&D on applications of large-scale building mapping and night-time light observation for socioeconomic monitoring**
Type of Activity	**Research and development for data preparedness** (e.g., Conference, Workshop, Meeting, Training, EOR, Providing satellite data or VAP)
Date	**Through the year in 2020**

The University of Tokyo proceeded on research and development of 1) large-scale building mapping from satellite images using deep learning, and 2) socioeconomic monitoring using night-time light observations. The building maps are expected useful for strengthening disaster preparedness of public agencies and, if the data is openly available, also of private sectors and communities. We developed a pilot system of on-demand automated building mapping from high-resolution satellite images of web map services by deep learning techniques. The system demonstrated large-scale building mapping for some cities, such Sri Lanka, Bangkok, and Maputo. We also demonstrated socioeconomic monitoring from night-time light observation during the COVID-19 crisis, focusing the impact of state of emergency. The activities will be extended to collaborations with JPT members for applications in practice.

Examples of automated building mapping (left: Bangkok; right: Maputo)



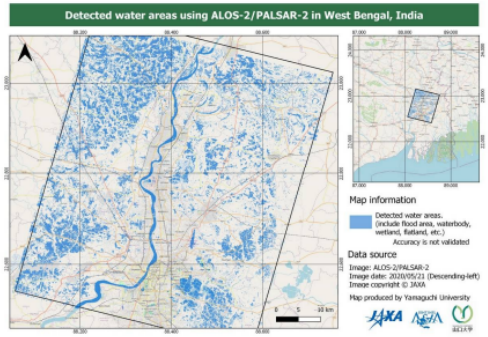
Examples of night-time light observation (left: Bangkok; right: Metro Manila)

Courtesy of the University of Tokyo

Organization	**Center for Research and Application for Satellite Remote Sensing, Yamaguchi University**
Title	**Contribution VAPs for EOR activities**
Type of Activity	**EOR activities**
Date	**August 2020**

Yamaguchi University, Center for Research and Application of Satellite Remote Sensing, was established in February 2017. There are 4 missions at this center; (1) to promote world-class research in satellite remote sensing, (2) to cultivate human resources capable of promoting a wide range of research in satellite remote sensing and space technology, (3) to contribute to disaster information analysis and improve public safety and security, and (4) to promote local industry and create new industry/business for space utilization technology. Yamaguchi university provided VAPs for following EORs in 2020.

- India: Cyclone, May 2020
- Cambodia: Flood, October 2020
- Philippines: Typhoon GONI, November 2020



India: Cyclone, May 2020

Courtesy of Yamaguchi University

https://sentinel-asia.org/reports/Reports.html

Please click and read them!

9. Face-to-Face Steering Committee 10-11 Oct 2022 in AIT, Thailand

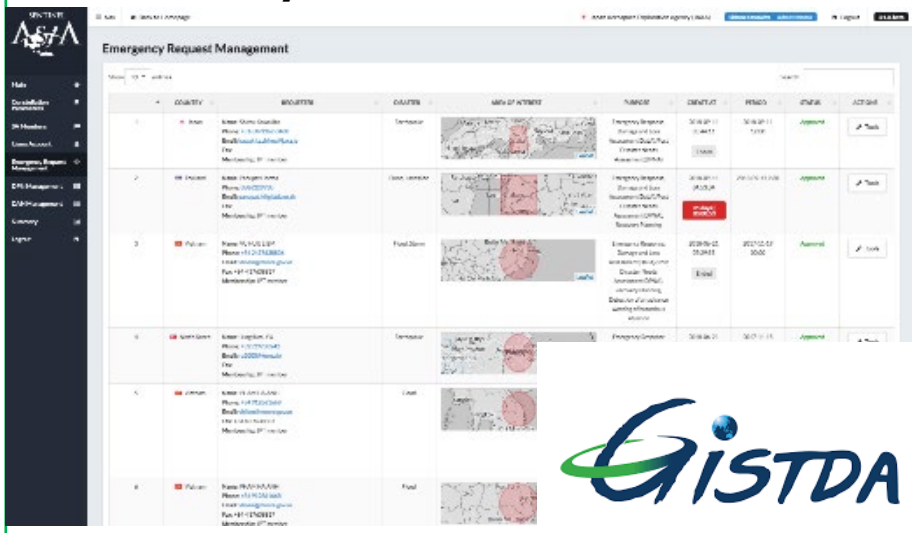
- ✓ Composed of 29 dedicated experts from the Sentinel Asia community
- ✓ Mr. Tatiya Chuentragu, Deputy Executive Director, GISTDA welcomed as a new co-chair succeeding Dr. Lal Samarkoon
- ✓ The importance of feedback from end users and designing a road map to implement the Sentinel Asia Strategic Plan was acknowledged

Steering Committee Meeting, Co-organized by GIC-AIT and JAXA

10. New Version of OPTEMIS Emergency Observation Request Management Application

- ✓ OPTEMIS, developed by GISTDA, is an application with User Friendly Interface, managing data regarding EORs (such as User requests of Emergency Observation, Area of Interests, Observation Plan, Observation data, Value Added Products). New Version of OPTEMIS is being prepared for release.
- ✓ Academia Sinica Grid Computing（ASGC）provided data storage of 20TB.

OPTEMIS by GISTDA



Sentinel Asia Cloud Storage
(SFTP in Taipei and Mumbai)

NARLabs 國家實驗研究院 National Applied Research Laboratories

JAXA

11. 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

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

RECOVERY
- Mid/Long-term monitoring
- Recovery Status

RESPONSE
- Emergency Observation
- Data Analysis
- Damage Assessment

12. Summary

- ✓ Sentinel Asia is an initiative aiming space-based international cooperation for disaster management in the Asia-Pacific region
- ✓ Sentinel Asia has responded over 400 emergency observation request since 2007
- ✓ 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
- ✓ As one of the end users, Japan International Cooperation Agency, JICA actively sharing their feedback and promote their use of disaster information provided by Sentinel Asia
- ✓ Steering committee of Sentinel Asia have discussed the importance of feedback from end users and designing a road map to implement the Sentinel Asia Strategic Plan