# SENTINEL ASIA

# ANNUAL REPORT 2022

# Sentinel Asia

# Annual Report 2022

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- Newsletter (2022)

- List of JPT Members

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- JPT member report "Sentinel Asia Activity in 2022"

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# 1. Introduction

## 1.1. Purpose and Scope of this Document

This document describes the activities of Sentinel Asia (SA) in 2022 for member organizations and external relations.

## 1.2. Structure of this Document

This report follows the following structure:

**Chapter 1 Introduction**

**Chapter 2 Sentinel Asia and Major Disasters**: overview and target disaster events related to Sentinel Asia.

**Chapter 3 Emergency Observation Operations in 2022**: results of emergency observation activities in 2022.

**Chapter 4 External Relations**: explanation of the integration of new members, progress, external relationships and Cooperating Bodies.

**Chapter 5 Conference and Releases**: reports on all communication activities undertaken throughout the reporting period.

**Chapter 6 Assessment of Sentinel Asia Operations**: assessment of the overall impact of Sentinel Asia as a service in supporting disaster response, and of system performance, products and services.

**Chapter 7 Conclusions**: outline of significant achievements and conclusions throughout the reporting period.

## 1.3.   List of Acronyms

| | |
|---|---|
| ADPC | Asian Disaster Preparedness Center |
| ADRC | Asian Disaster Reduction Center |
| AFAD | Turkey Disaster and Emergency Management Presidency |
| AHA Centre | ASEAN Coordinating Centre for Humanitarian Assistance on disaster management |
| AIT | Asian Institute of Technology |
| ALOS | Advanced Land Observing Satellite |
| APRSAF | Asia-Pacific Regional Space Agency Forum |
| ASEAN | Association of South-East Asian Nations |
| BRIN | Badan Riset dan Inovasi Nasional |
| CRISP | Centre for Remote Imaging, Sensing and Processing |
| DAN | Data Analysis Node |
| DHM | Department of Hydrology and Meteorology in Nepal |
| DPN | Data Provider Node |
| DRR | Disaster Risk Reduction |
| EOR | Emergency Observation Request |
| EOS | Earth Observatory of Singapore |
| GISTDA | Geo-Informatics and Space Technology Development Agency |
| ICIMOD | International Centre for Integrated Mountain Development |
| ICT | Information and Communication Technology |
| IDC | International Disaster Charter |
| IFRC | International Federation of Red Cross and Red Crescent Societies |
| ISRO | Indian Space Research Organisation |
| IWMI | International Water Management Institute |
| JAXA | Japan Aerospace Exploration Agency |
| JPTM | Joint Project Team Meeting |
| MBRSC | Mohammed Bin Rashid Space Centre |
| MEXT | Ministry of Education, Culture, Sports, Science and Technology |
| NARL | National Applied Research Laboratories |
| NDRRMC | National Disaster Risk Reduction & Management Council |
| PDMA | Provincial Disaster Management Authority in Pakistan |
| PhilSA | Philippine Space Agency |
| RSO | Regional Support Office |
| SA | Sentinel Asia |

| | |
|---|---|
| SAWG | Space Applications for Societal Benefit Working Group |
| SPC/SOPAC | Secretariat of the Pacific Community |
| UNDRR | United Nations Office for Disaster Risk Reduction |
| UNITAR | United Nations Institute for Training and Research |
| UNOOSA | United Nations Office for Outer Space Affairs |
| VAP | Value Added Product |
| VAST | Vietnam Academy of Science and Technology |
| WINDS | Wideband InterNetworking engineering test and Demonstration Satellite |
| YU | Yamaguchi University |

## 2.  Sentinel Asia and Major Disasters

### 2.1.  Outline of Sentinel Asia

2.1.1.  Background and History of Sentinel Asia

Natural hazards have been on the rise worldwide, including the Asia-Pacific region (Figure 1). The Asia-Pacific region suffers from different types of natural hazards, such as earthquakes, cyclones/typhoons, floods, landslides, droughts, tsunamis, volcanic eruptions and forest fires. Several of them are large-scale, devastating disasters. Given the high population level (about 3 billion) as well as the high frequency and severity of natural hazards in the region, an integrated use of space technology, such as earth observation satellite data and geographic information systems, can be an effective means to reduce the magnitude of the severity, or provide timely management in the event of a large-scale natural hazard or disaster. In light of the increasing frequency of natural hazards and an elevated loss of lives and properties from these events, SA, a collaborative, regional project, was conceptualized in 2005, and began EOR activity in 2007. It is engaged in activities to share and provide disaster-related information, including earth observation satellite images via the internet, in order to contribute toward disaster management in the Asia-Pacific region. Space agencies from the Asia-Pacific Region Space Agency Forum (APRSAF) community, including the Japan Aerospace Exploration Agency (JAXA), and disaster risk reduction agencies in the Asia-Pacific region, such as the Asian Disaster Reduction Center (ADRC), cooperate in forming a Joint Project Team (JPT) and promoting SA. As of December 2022, it consists of 112-member organizations, including 95 agencies from 29 countries/regions, and 17 international organizations. JAXA has been serving as a secretariat of the JPT.
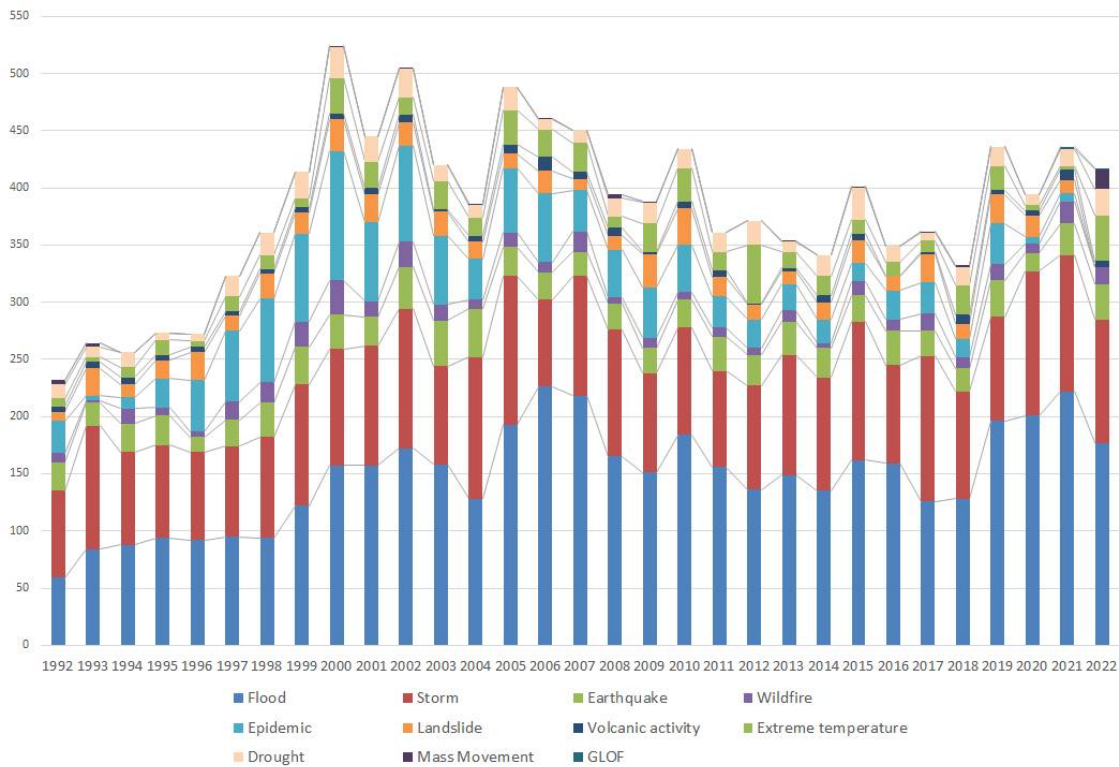
**Figure 1: Incidence of Natural Hazards by Region (in and after 1990)**

A stepwise approach for the implementation of data and information dissemination systems through SA as proposed by the APRSAF was as follows:

**Step 1**: Implementation of the backbone 'Sentinel Asia' data dissemination system and associated Nodes (Feb. 2006–Dec. 2007)

**Step 2**: Expansion of the dissemination backbone with new Satellite Communication Systems (2008–2012)

**Step 3**: Establishment of a comprehensive 'Disaster Management Support System' in the region (2013 onwards)

Sentinel Asia initiated an emergency observation request system in 2007 to provide image data (and analysed images) acquired through the satellites operated by participating space agencies on the internet and via JAXA's Wideband InterNetworking engineering test and Demonstration Satellite (WINDS), also known as Kizuna, in the event of a disaster in the Asia-Pacific region.

5

During that time, Sentinel Asia participated in the International Disaster Charter (IDC) in 2010 to expand its activities and cooperation on a global scale. Sentinel Asia also established the Regional Support Office (RSO) for the United Nations Platform for Space-based Information for Disaster Management and Emergency Response (UN-SPIDER) at the ADRC in June 2009, which serves as a contact (liaison) office for emergency observation requests, to expand the range of its activities and increase international interest.

2.1.2.   Aims and Activities of Sentinel Asia in a Nutshell
The SA aims to: (i) improve safety in society with the use of modern Information and Communication Technology (ICT) and space-based technology; (ii) improve the speed and accuracy of disaster preparedness and early warning; and (iii) minimize the number of victims, as well as social and economic losses. To achieve these goals, various activities have been undertaken.

The main activities of the SA are summarized as follows:
- Emergency observation by earth observation satellites (e.g. ALOS-2, FORMOSAT-5, RESOURCESAT-2, OCEANSAT-2/OCM, CARTOSAT-3,  Thaichote, VNREDSat-1A, TeLEOS-1, and KhalifaSat) in the event of major disasters
- Acceptance of observation requests for major disasters in the Asia-Pacific region from ADRC member organizations and the representative organizations of JPT members to support disaster management in the region
- Working Groups (WGs) for early warning and disaster monitoring: WGs on wildfires, floods, glacial lake outburst floods, and tsunamis are (formed and) in operation
- Capacity building of member organizations (e.g., through training) for the utilization of satellite images for disaster management

The following is an overview of the main data and products provided by SA to its members: (i) satellite imagery (and data permitted by data providers) and value-added images with an extraction of the affected area, etc.; (ii) on-site digital camera images; (iii) wildfire hotspot information and data; (iv) rainfall (short-term and long-term)

information and data; and (v) meteorological satellite imagery and data.

2.1.3.   Framework and Emergency Observation Mechanisms of Sentinel Asia

SA is promoted under cooperation among the following three communities: (i) the Space Community (APRSAF); (ii) the International Community (e.g., UNESCAP, UNOOSA, ASEAN, AIT); and (iii) the Disaster Reduction Community (ADRC and its member countries), as illustrated in Figure 2. The JPT was established to promote the activities of SA, and it is open to all APRSAF member countries, disaster prevention organizations and regional/international organizations who wish to participate in disaster information sharing activities.
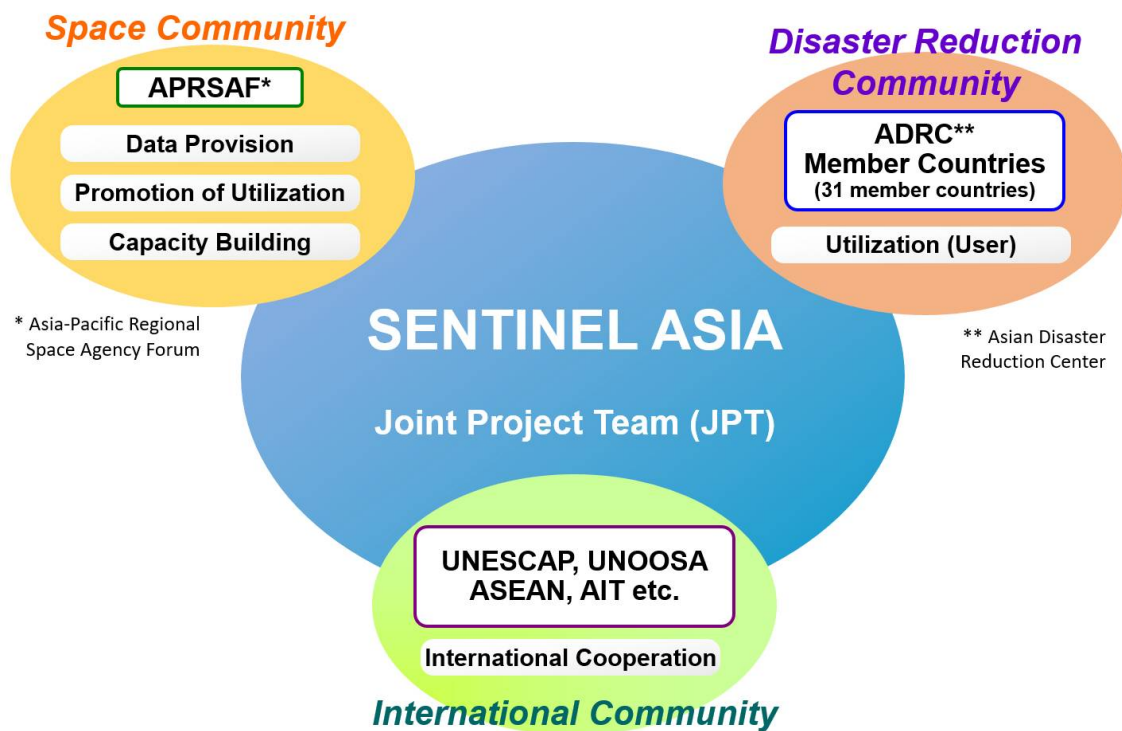
**Space Community**

**APRSAF***

**Data Provision**

**Promotion of Utilization**

**Capacity Building**

\* Asia-Pacific Regional
Space Agency Forum

**Disaster Reduction Community**

**ADRC**\*\*
**Member Countries**
**(31 member countries)**

**Utilization (User)**

\*\* Asian Disaster
Reduction Center

**SENTINEL ASIA**

**Joint Project Team (JPT)**

**UNESCAP, UNOOSA
ASEAN, AIT etc.**

**International Cooperation**

**International Community**

**Figure 2: Framework of Sentinel Asia**

SA is composed of two Nodes (Data Provider, and Data Analysis) and four Working Groups (Wildfire, Flood, Water related disaster and Tsunami). The Data Provider Node (DPN) provides their own satellite imagery and other relevant data to JPT members upon an Emergency Observation Request (EOR) from a JPT member, to the extent permitted by the data policy of each DPN when a disaster occurs; while the Data Analysis

Node (DAN) analyses the satellite data provided by DPN, makes a value-added product and uploads and shares the result through the new Sentinel Asia EOR system "OPTEMIS", which started operation in 2019 (Figure 3). Between 2007 and 2022, 451 EORs have been made or accepted, providing data and products to its members to support disaster management. The four WGs work toward the establishment and improvement of early warning/forecasting systems, as well as monitoring and planning for disaster management in their respective fields.
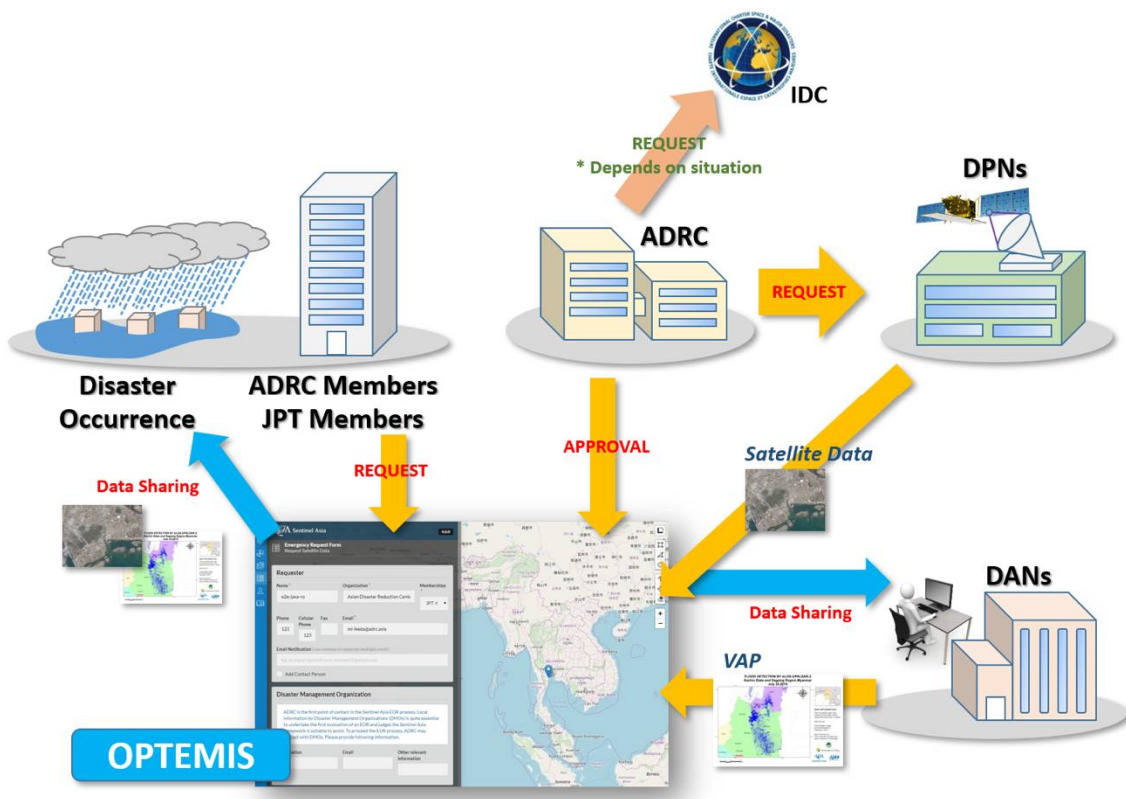


**Figure 3: Flow of Sentinel Asia emergency observation**

2.1.4.  Current Phase (Step 3) and Ongoing Actions of Sentinel Asia

 Out of the 3 Steps employed by Sentinel Asia, the successful completion of Steps 1 and 2 has so far been declared. Step 3 began in 2013, defining its priority areas based on experiences in the earlier Steps and user requests leading to necessary actions as shown in Figure 4.

The key features of Step 3 are:

- Covering all phases in a disaster management cycle

- Employing a wide variety of satellites, including earth observation satellites, communication satellites and navigation satellites

- Being managed as a joint project by participating agencies, through the planned construction of a joint management system

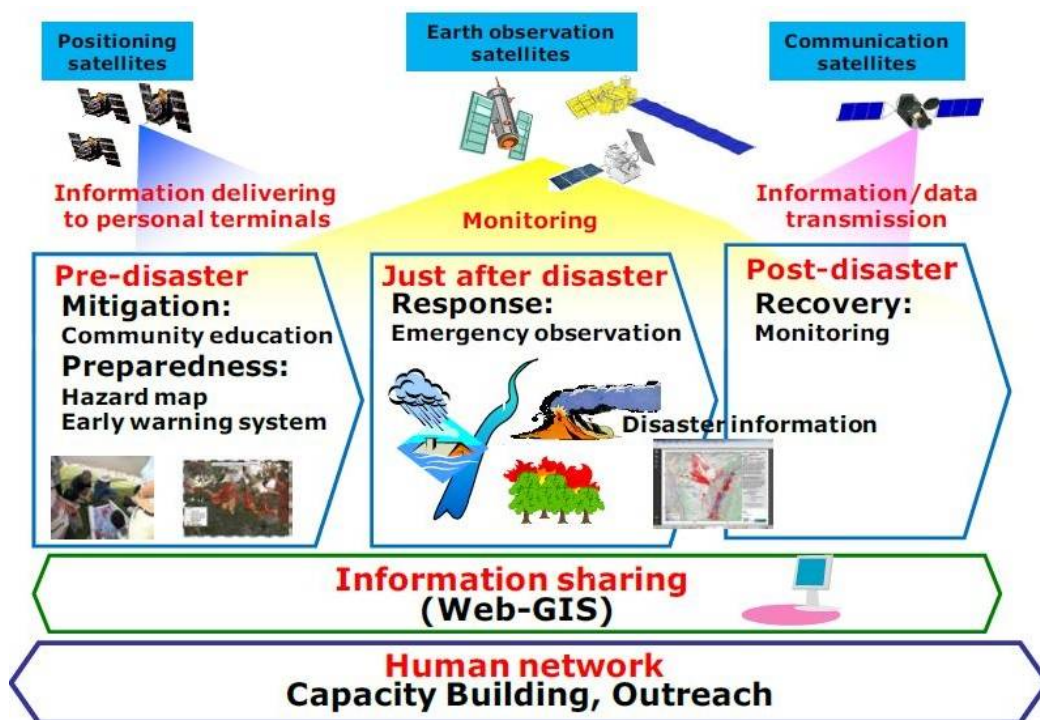- Promoting the use of services by expanding human networks through capacity development and outreach activities



**Figure 4: Current Phase (Step 3) and Actions of Sentinel Asia**

2.2. Major Disasters with Emergency Observation (2007-2022)

Table 1 shows the number of requests, activations, and rejections for each type of disaster. Requests related to floods, earthquakes, landslides, typhoons, volcanoes and cyclones are activated for more than 80% of all requests. However, the activation ratio regarding forest fires is less than 50%. There is no rejection in the past 3 years (2020-2022) due to providing accurate information from requesters and keeping an appropriate communication.

**Table 1: Number of Requests, Activations, and Rejections for Emergency Observations by Disaster (2007 - 2022)**

| | Number of Request | Number of Activation | Number of Rejection | Activation/Request (%) |
|---|---|---|---|---|
| Flood | 230 | 218 | 12 | 94.8% |
| Earthquake | 59 | 54 | 5 | 91.5% |
| Landslide | 29 | 24 | 5 | 82.8% |
| Typhoon / Storm | 36 | 34 | 2 | 94.4% |
| Forest Fire | 18 | 8 | 10 | 44.4% |
| Volcano | 25 | 22 | 3 | 88.0% |
| Cyclone | 25 | 21 | 4 | 84.0% |
| Oil Spill | 7 | 5 | 2 | 71.4% |
| Others | 22 | 18 | 4 | 81.8% |
| **Total** | **451** | **404** | **47** | |

Figures 5 and 6 show a breakdown of emergency observations with requests and emergency observations with activation by disaster. Floods represent the largest number of disasters with 230 requests (51.0%), followed by earthquakes at 59 (13.1%), typhoons at 36 (8.0%), landslides at 29 (6.4%), volcanic eruptions at 25 (5.5%), cyclones at 22 (4.9%), forest fires at 18 (4.0%) and oil spill at 7 (1.6%). Generally, activation is made for around 89.6% of requests for most disasters.
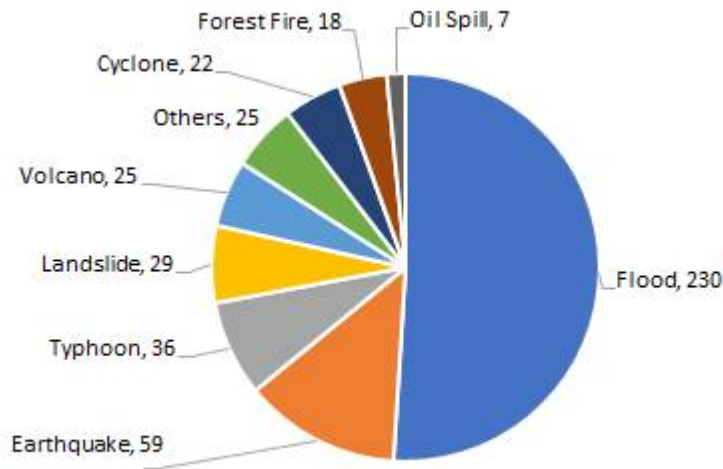
**Figure 5: Breakdown of Emergency Observations by Disaster (2007 - 2022)**
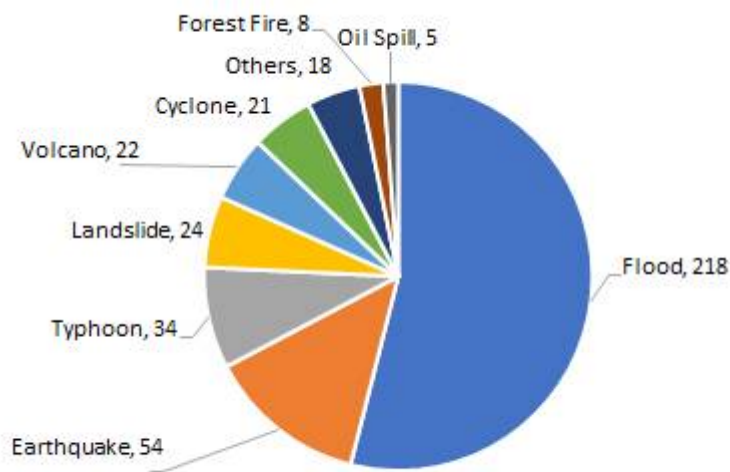
**\*Requests (N=451)**



**Figure 6: Breakdown of Emergency Observations by Disaster (2007 - 2022)**

**\*Activations (N=404)**

## 3. Emergency Observation Operations in 2022

### 3.1. Emergency Observation Requests

Figure 7 shows the number of requests, activations and rejections involving emergency observations from 2007 to 2022. The number of requests and activations peaked in 2010 and 2012, with the number declining subsequently thereafter, but the number increased once again from 2015 to 2016. The number has begun decreasing gradually once more since 2016. And 28 requests were submitted and activated in 2022.
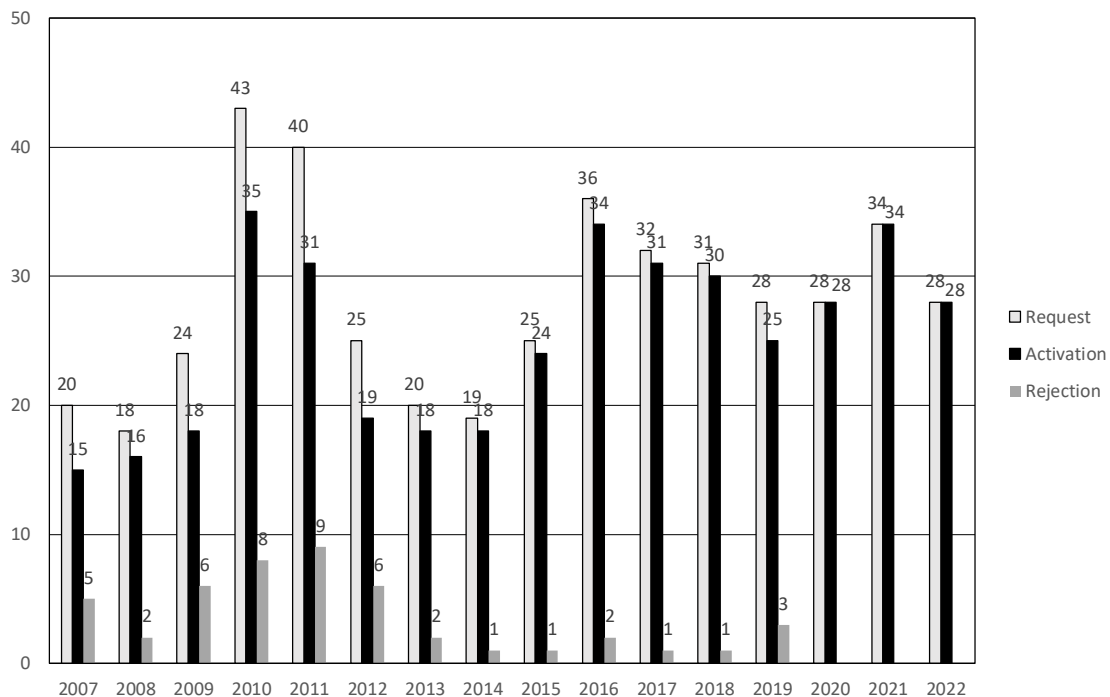


**Figure 7: Comparison of the Number of Requests, Activations and Rejections for Emergency Observations**

Figures 8 and 9 show a breakdown of emergency observations with requests and emergency observations with activation by disaster. On a request basis, floods represented the largest number of disasters, with 18 requests (64.3%), followed by earthquakes at 5 (17.9%), and volcanic eruptions at 3 (10.7%).

**Table 2: List of 2022 Activations**

| Activation Number | Country | Disaster Type | Implementation | Requester |
|---|---|---|---|---|
| 424 | Tonga | Volcanic Eruption | 2022/1/16 | ADRC, SPC |
| 425 | Thailand | Oil spill | 2022/2/11 | GISTDA |
| 426 | Thailand | Flood | 2022/3/3 | GISTDA |
| 427 | Philippines | Flood | 2022/4/12 | MO |
| 428 | India | Flood | 2022/5/20 | ISRO, DMS |
| 429 | Indonesia | Flood | 2022/5/27 | ITB, CoREM |
| 430 | Philippines | Volcanic Eruption | 2022/6/13 | PHIVOLCS |
| 431 | India | Flood | 2022/6/21 | ISRO, DMS |
| 432 | Bangladesh | Flood | 2022/6/23 | ADRC, Bangladesh Water Development Board (BWDB) |
| 433 | Afghanistan | Eartquake | 2022/6/27 | ICIMOD |
| 434 | Vietnam | Flood | 2022/7/7 | MONRE |
| 435 | India | Flood | 2022/7/13 | ISRO, DMS |
| 436 | India | Flood | 2022/7/13 | ISRO, DMS |
| 437 | Philippines | Eartquake | 2022/7/27 | PHIVOLCS |
| 438 | Pakistan | Flood | 2022/8/18 | ADRC, PDMA in Sindh and Balochistan |
| 439 | Philippines | Flood | 2022/8/23 | MO |
| 440 | India | Flood | 2022/8/24 | ISRO, DMS |
| 441 | China | Eartquake | 2022/9/6 | CEA |
| 442 | Taiwan | Eartquake | 2022/9/19 | NARL/NCDR |
| 443 | Philippines | Flood | 2022/9/25 | AHA Center |
| 444 | Vietnam | Flood | 2022/9/26 | MONRE |
| 445 | Nepal | Landslide | 2022/10/9 | DHM |
| 446 | India | Flood | 2022/10/15 | ISRO, DMS |
| 447 | Thailand | Flood | 2022/10/19 | GISTDA |
| 448 | Philippines | Flood | 2022/10/29 | MO |
| 449 | Indonesia | Eartquake | 2022/11/22 | BRIN |
| 450 | Indonesia | Volcanic Eruption | 2022/12/5 | JICA, PUPR |
| 451 | Philippines | Flood | 2022/12/28 | MO |
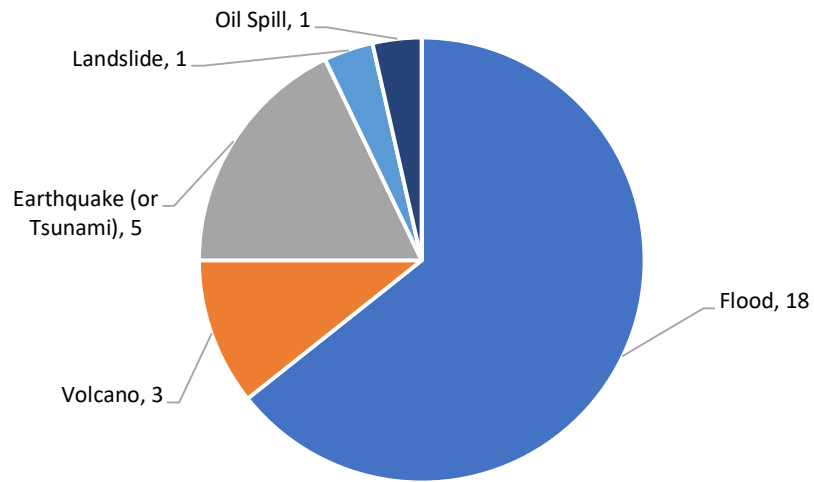
**Figure 8: Breakdown of Emergency Observations by Disaster in 2022**
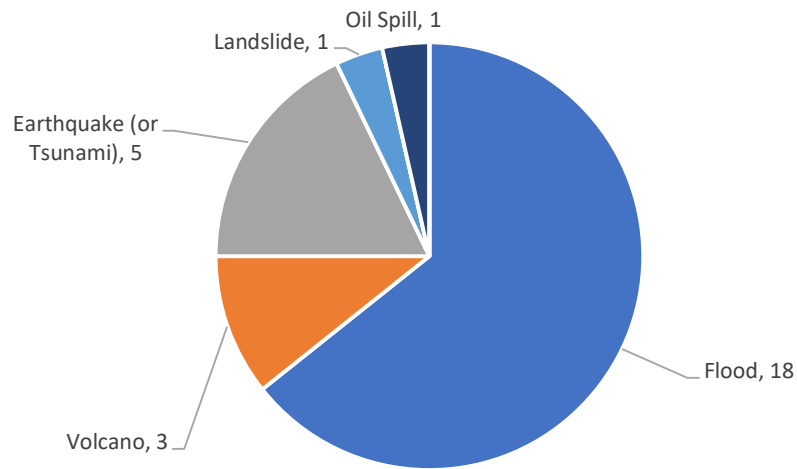**\*Requests (N=28)**

**Figure 9: Breakdown of Emergency Observations by Disaster in 2022**
**\*Activations (N=28)**

3.2.  Results of Emergency Observations

During 2022, the monthly average of activations was 2.3. Figure 10 shows the monthly distribution of activations throughout 2022. The highest number of activations occurred in June to October, corresponding to 67.9% of the total number.
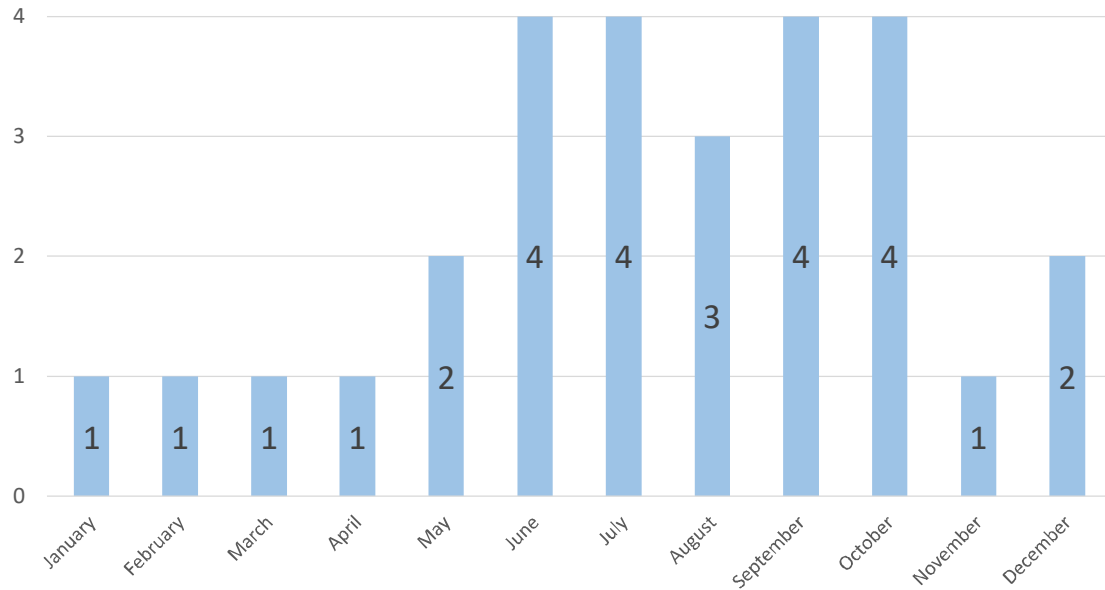


**Figure 10: Number of Monthly Activations in 2022**

Figure 11 shows the number of emergency observations by country. Countries and regions with a large number of requests are mostly located in Southeast Asia and South Asia, including the Philippines, India, Indonesia, Thailand and Vietnam. The country with the highest number of activations was the Philippines, with 7 activations.
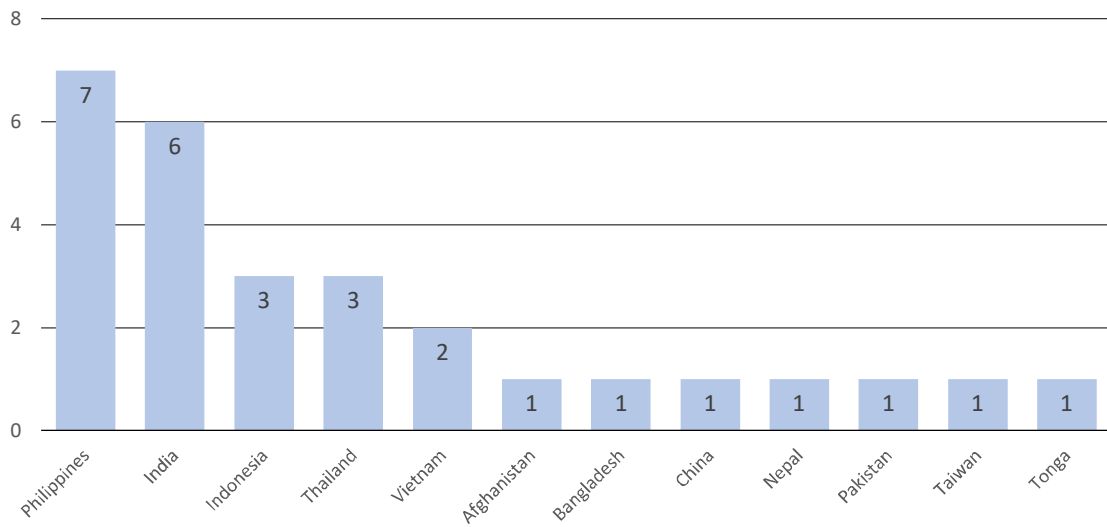
**Figure 11: Number of Activations by Country in 2022**

Figure 12 shows the number of implementations for providing Archive data and New Acquisition by DPN. In total, 37 implementations for providing Archive data and 85 implementations for providing New Acquisition were made in 2022.
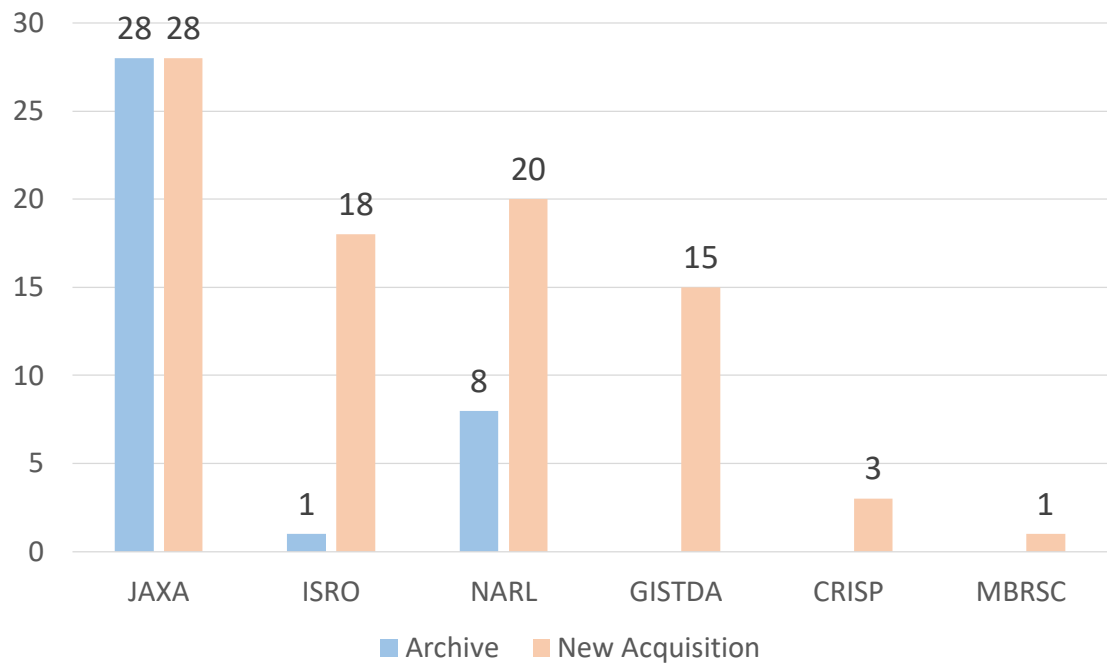


**Figure 12: Number of Responses by DPN in 2022**

DPN has been providing a lot of satellite images, including optical and radar data, when an EOR is activated. DAN have also been supportive by providing Value Added Products (VAP), including KMZ files and shapefiles for GIS. This data is uploaded to OPTEMIS and the SA website (https://sentinel-asia.org/EO/EmergencyObservation.html). Figure 13 shows the quantity of optical and radar data by DPN which was uploaded to the SA website.



**Figure 13: Data Consumption (Archive and New Acquisition) by DPN in 2022**

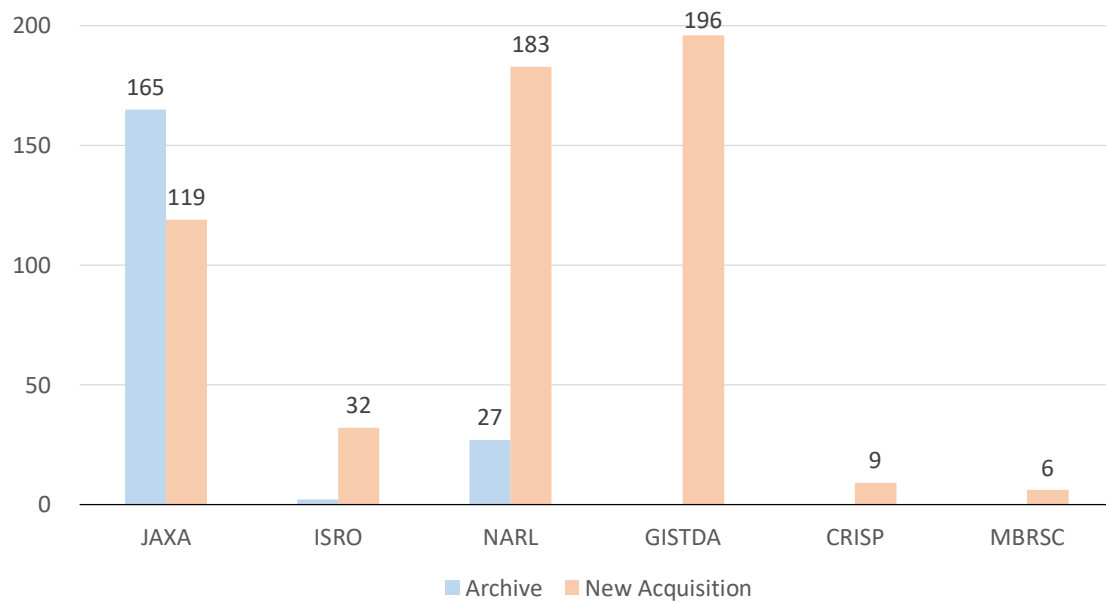Figure 14 shows the number of implementations by DAN in 2022. Figure 15 shows the number of provided VAP in 2022. In total, 62 were implemented, and 360 VAPs were provided to requesters.
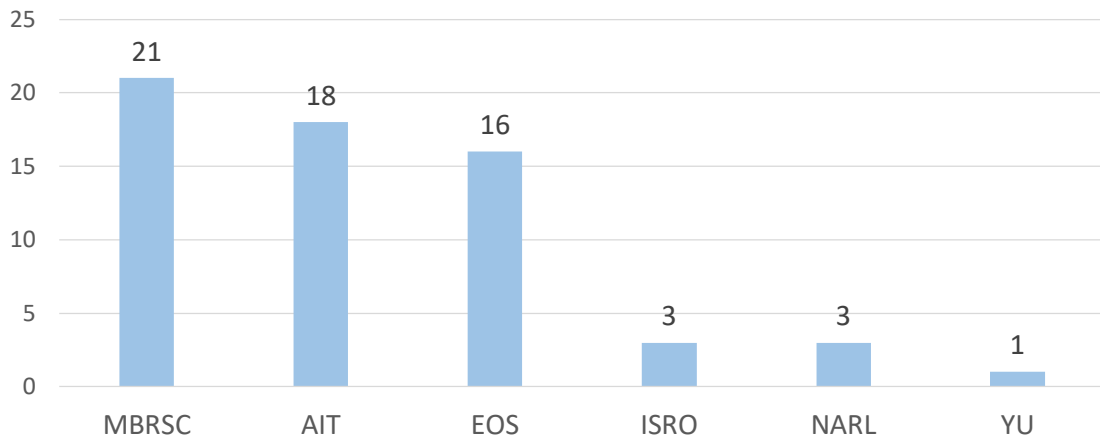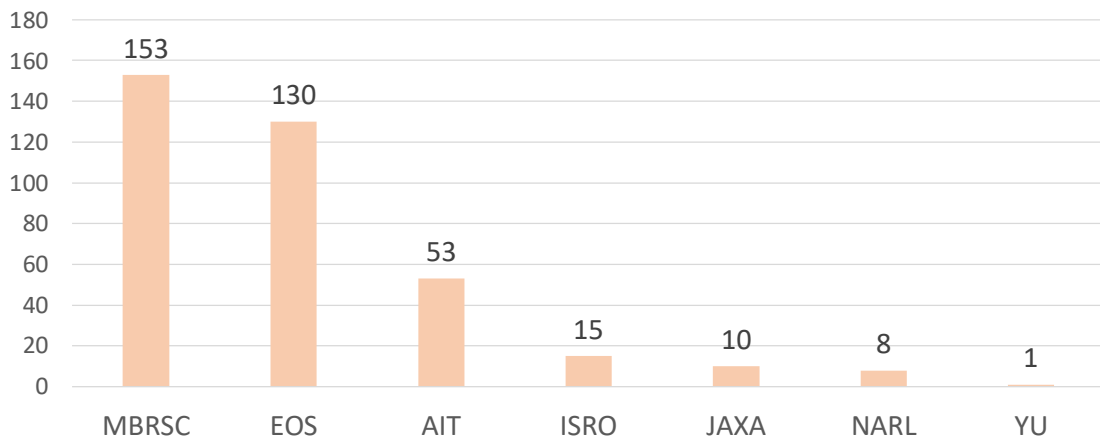
**Figure 14: Number of responses by DAN in 2022**

**Figure 15: Number of VAP by DAN in 2022**

3.3.　Good Practices

3.3.1.　Volcanic Eruption in Tonga (January 2022)

[EOR Requestor] Asian Disaster Reduction Center (ADRC) and Secretariat of the Pacific Community (SPC/SOPAC)

[SA website URL] https://sentinel-asia.org/EO/2022/article20220115TO.html

The Kingdom of Tonga is located in the southwestern Pacific Ocean. It consists of some 170 islands. Also, Tonga is located in the ring of fire which is an earthquake-prone area and has experienced tsunami disasters in the past. In addition, Tonga has a cyclone season from November to April every year, and large cyclones caused a lot of wind and flood damage, including in coastal areas.

The Hunga-Tonga-Hunga-Ha'apai volcano was erupted on 15 January 2022. This eruption was the largest recorded since the eruption of Krakatoa in 1883. The eruption triggered tsunami waves of up to 15m which struck the west coast of Tongatapu, 'Eua and Ha'apai. Ashfall covered an area of at least five square kilometres. Damage to the international and domestic undersea telecommunications meant little information was available from Tonga following the eruption. On 18 January, the Prime Minister of Tonga declared a state of emergency effective from 16 January.

On 16 January, ADRC decided to register EOR information into the OPTEMIS system on behalf of SPC, and activated. The first satellite images from the DPN were provided on 17 January. Finally, 98 satellite images were provided by ISRO, GISTDA, JAXA, and NARL, and the first VAP from the DAN was provided on 18 January. Eight VAPs were provided by EOS, and 14 VAPs were provided by MBRSC. Also, JAXA provided a WEB-GIS service that allows users to compare satellite images before and after the disaster.

SPC/SOPAC used the provided data to confirm areas affected and therefore conduct the field assessment. A number of communities were displaced and relocated to areas on Tongatapu and Eua. The Government of Tonga undertook the field assessment as at the time there were still COVID related travel restrictions in place. SPC/SOPAC provided technical advice to guide the field assessment and once done, reduced the data to provide a consolidated assessment report.
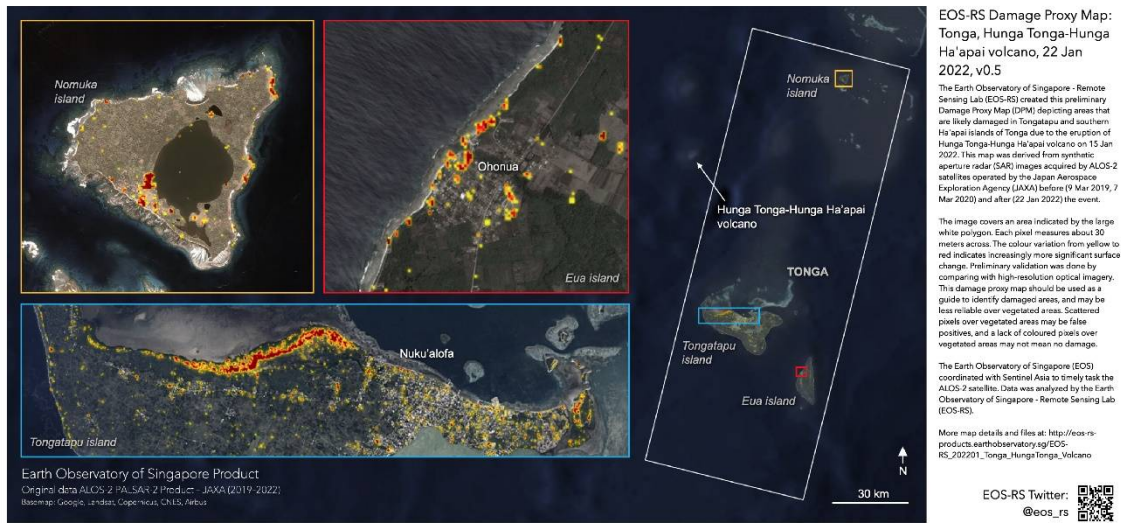
(source: https://reliefweb.int/disaster/vo-2022-000005-ton)

**Figure 16: VAP (provided by EOS)**

3.3.2.  Earthquake in Afghanistan (June 2022)

[EOR Requestor] International Centre for Integrated Mountain Development

[SA website URL] https://sentinel-asia.org/EO/2022/article20220622AF.html

Afghanistan is highly prone to intense and recurring hazards such as flooding, earthquakes, snow avalanches, landslides and droughts due to its geographical location and years of environmental degradation. Also, Afghanistan faces significant impacts of climate change and hazards which impact growth prospects. Since 1980, disasters caused by hazards have affected 9 million people and caused over 20,000 fatalities in this country.

An earthquake of magnitude 5.1 occurred in eastern Afghanistan, near the border with north-western Pakistan, on 18 July. The depth of this earthquake was 10 km and the epicentre was located in the Spera district. As of 20 July, 44 injured people and around 600 destroyed houses across the Spera district and the neighbouring Giya district. On 21 June 2022, the same area has been affected by a magnitude 5.9 earthquake that resulted in more than 1,000 fatalities.

The ADRC received the EOR from ICIMOD and transferred DPNs/DANs on 27 June 2022. The first satellite images from the DPN were provided on 28 June. Finally, 26 satellite images were provided by ISRO, JAXA, and NARL. And the first VAP from the DAN was provided on 28 June. Thirty-eight VAPs were provided by AIT, EOS, and MBRSC. Also, JAXA provided a WEB-GIS service that allows users to compare satellite images before and after the disaster.

ICIMOD used and provided the data to disaster management agencies and international organizations. And these data were utilized for rescue activities for the affected people in Afghanistan.

(source: https://www.worldbank.org/en/programs/afghanistan-disaster-risk-management-and-resilience-program)

(source: https://reliefweb.int/disaster/eq-2022-000232-afg)
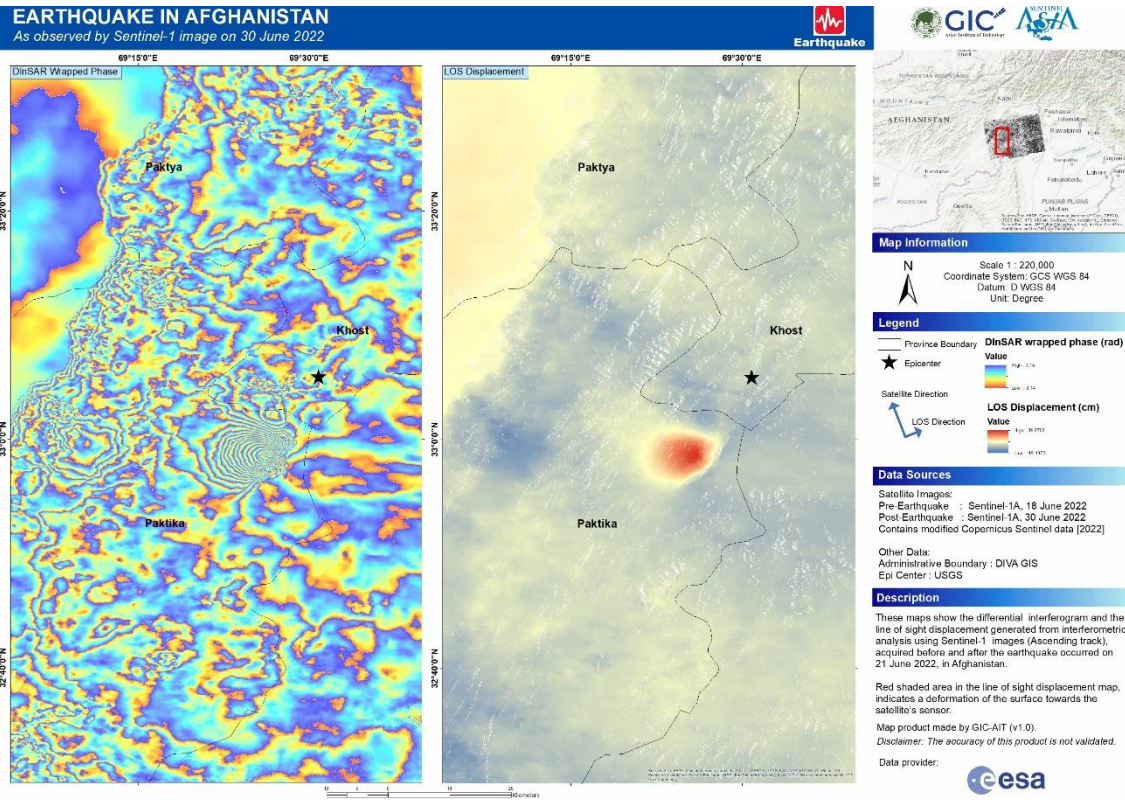
**Figure 17: VAP (provided by AIT)**

3.3.3.  Flood in Pakistan (August 2022)

[EOR Requestor] Asian Disaster Reduction Center (ADRC) and Provincial Disaster Management Authority (PDMA) in Pakistan

[SA website URL] https://sentinel-asia.org/EO/2022/article20220817PK.html

Pakistan shares borders with India, China, Afghanistan and Iran, which faces the Arabian Sea. Its land area is 881,913 square kilometres, and features the Himalayas in the north and the Baluchistan Highlands in the west. The eastern half of the land has the Indus River. Because of the geographical condition of Pakistan, climate varies greatly by region. The capital is Islamabad. Among the 243.8 million population, about half are Punjabi, with the rest being Sindh, Patan and Baluchs. It is densely populated along the Indus River.

Since mid-June 2022, Pakistan has been drenched by extreme monsoon rains that have led to the country's worst flooding in a decade. According to Pakistan's National Disaster Management Authority, the floods have affected more than 33 million people and destroyed or damaged more than 1 million houses. At least 1,100 people were killed by floodwaters that inundated tens of thousands of square kilometres of the country. Across the country, about 150 bridges and 3,500 kilometres (2,200 miles) of roads have been destroyed. More than 700,000 livestock and 2 million acres of crops and orchards have also been lost.

The ADRC received the EOR from PDMA in Pakistan and transferred DPNs/DANs on 18 August 2022. The first satellite images from the DPN were provided on 19 August. Finally, 61 satellite images were provided by ISRO, GISTDA, JAXA, and NARL. And the first VAP from the DAN was provided on 22 August. Thirty-seven (37) VAPs were provided by AIT, EOS, ISRO, MBRSC, and NARL. Also, JAXA provided a WEB-GIS service that allows users to compare satellite images before and after the disaster.

PDMA as requester of this EOR used provided data for emergency response activity, sharing with other DRR organizations, and making report for sharing information. PDMA shared detailed report related to "How was the provided data used?". This report is attached as appendix of this report.
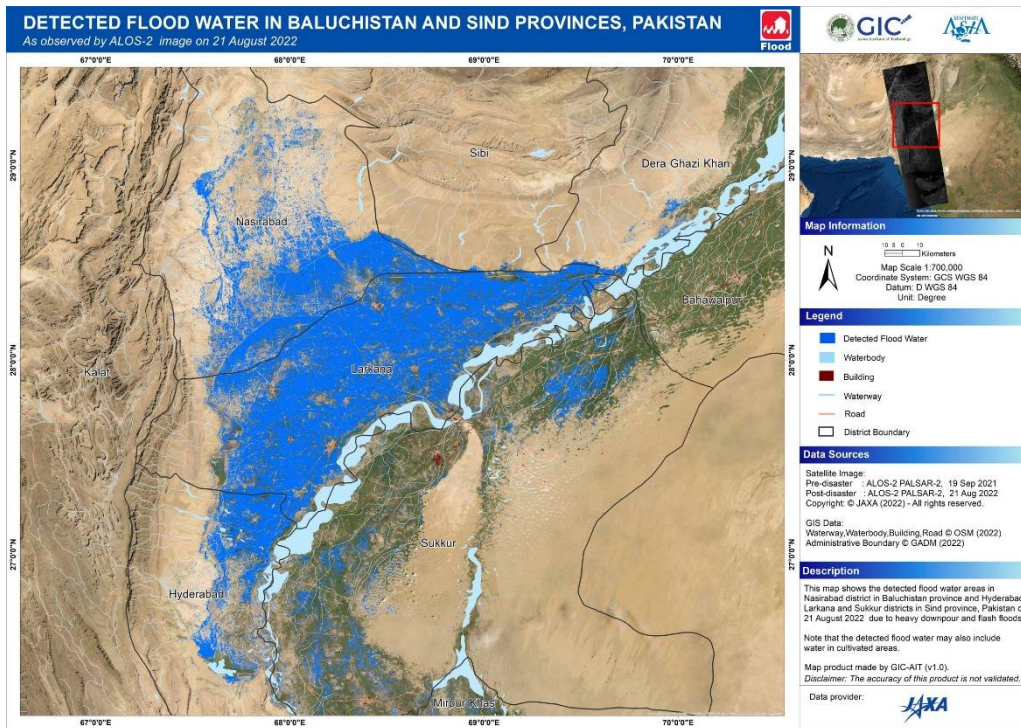
(source: https://www.adrc.asia/)

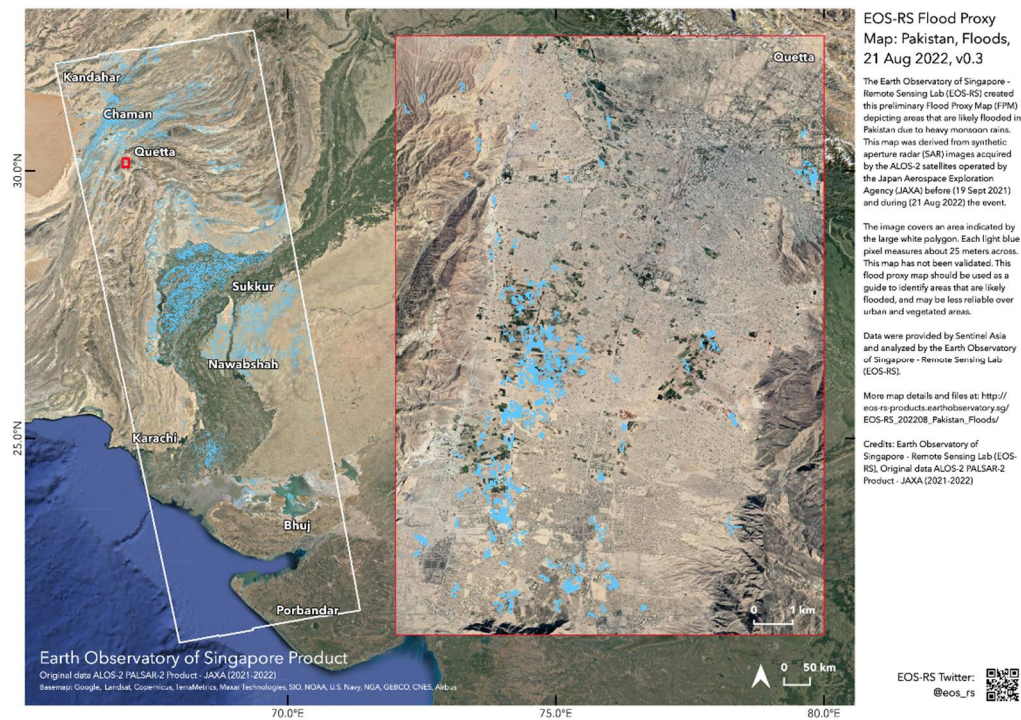**Figure 18: VAP (provided by AIT)**



**Figure 19: VAP (provided by EOS)**

3.3.4.   Manaslu avalanche in Nepal (October 2022)

[EOR Requestor] Department of Hydrology and Meteorology (DHM)

[SA website URL] https://sentinel-asia.org/EO/2022/article20221002NP.html

Nepal is a landlocked country which borders India to the east, west and south, and China to the north. Central and north parts are hilly area with the Himalayas ranges, whereas southern part is covered with the Plain area called 'TARAI'. The total Land area of Nepal is 147,181 square kilometres with 26.6 million people, composed of different ethnicities, races and languages. Nepal has six seasons in total; the famous rainy season is in June to August and the winter is between December to February. The capital city of Nepal is Kathmandu, where about 3 million people are living.

The Manaslu avalanche occurred on 26 September 2022. According to government announcements, at least eight climbers were trapped in the avalanche that occurred on Mount Manaslu.

The ADRC received the EOR from the Department of Hydrology and Meteorology (DHM) on 9 October 2022. The first satellite images were provided on 11 October. Finally, 11 satellite images were provided by GISTDA, ISRO, JAXA, and NARL. And the first value-added product was provided on 13 October. EOS and MBRSC provided 10 VAPs. Also, JAXA provided a WEB-GIS service that allowed users to compare satellite images before and after the disaster.

DHM as the requester of this EOR used provided data for emergency response activity, sharing with other DRR organizations, and making reports for sharing information. And DHM utilized the data for making internal reports.
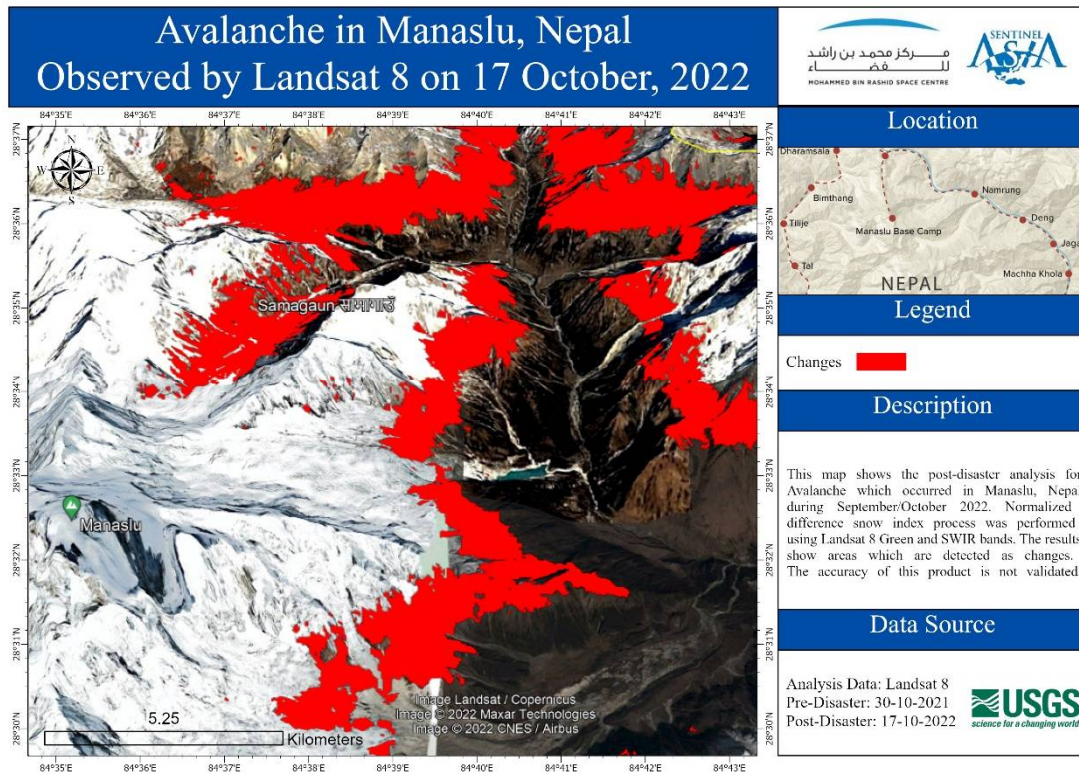
(source: https://www.adrc.asia/)

**Figure 20: VAP (provided by MBRSC)**

# 4.  External Relations

## 4.1.  Accession of New Members

In 2022, the following organization joined SA.

-  Disaster and Emergency Management Presidency (AFAD)

## 4.2.  Collaboration and Cooperation

### 4.2.1  International Disaster Charter

The rollout to IDC began in February 2010 as required. Ten disasters were escalated through SA in 2022. This figure means that 5 out of 28 EORs, corresponding to 17.9%, were referred to IDC via Sentinel Asia.

**Table 3 List of Charter Escalations in 2022**

| Activation Number | Country | Disaster Type | Activation Date | Requester | Project Manager |
|---|---|---|---|---|---|
| 430 | Phillipines | Volcanic Eruption | 13-Jun-22 | ADRC on behalf of PHIVOLCS | PHIVOLCS |
| 443 | Phillipines | Flood | 25-Sep-22 | - UNOOSA/UN-SPIDER on behalf of PhilSA on behalf of NDRRMC<br>- ADRC on behalf of AHA Centre | IWMI |
| 447 | Thailand | Flood | 19-Oct-22 | ADRC on behalf of GISTDA | AIT |
| 449 | Indonesia | Earthquake | 22-Nov-22 | - ADRC on behalf of BRIN<br>- UNITAR on behalf of IFRC | UNITAR |
| 450 | Indonesia | Volcanic Eruption | 5-Dec-22 | ADRC on behalf of JICA | AIT |

# 5. Conferences and Press Releases

## 5.1. Conferences

### 5.1.1 Asia-Pacific Ministerial Conference on Disaster Risk Reduction (APMCDRR) 2022, (19-22 September 2022)

The 2022 Asia-Pacific Ministerial Conference on Disaster Risk Reduction (APMCDRR) was held in Brisbane, Australia, from 19 – 22 September. This conference was hosted by the Australian Government and convened by the United Nations Office for Disaster Risk Reduction (UNDRR).

APMCDRR 2022 presents an opportunity for delegates from across the Asia Pacific to showcase and share experiences, action and innovation to help build a resilient future for the region. The conference also represents a final opportunity ahead of the Mid-Term Review of the Sendai Framework for Disaster Risk Reduction (2015-2030) in 2023, to focus on Sendai Framework progress and commitments in the Asia-Pacific Region.

The Sentinel Asia Secretariat ran an exhibition booth to promote Sentinel Asia's activities during the APMCDRR 2022. The Sentinel Asia booth welcomed more than 100 participants per day. Staff from the Sentinel Asia Secretariat had explained the current Sentinel Asia activities to the participants and discussed the best activities of Sentinel Asia.

5.1.2    21st Steering Committee Meeting of Sentinel Asia (10-11 October 2022)

The secretariat of Sentinel Asia holds a Steering Committee (SC) consisting of key members every year where there are discussions on Sentinel Asia activities and activity reports from the members. This year, SC was held on 10 and 11 October 2022 at the Asian Institute of Technology (AIT).

Targets & Expected Outcomes of this meeting were set as:

✓   Review the current status of the Strategic Plan documents and activities by leading agencies and confirm status.

✓   Improve Sentinel Asia operation from the viewpoint of DPN, DAN and DMO.

✓   Strengthen user interaction within the Sentinel Asia community.

The contents of this meeting were mainly conducted as:

(1)  Progress reports by each leading agency on the 6 categories, including discussion.

- Satellite Data Provisions and Systems (Sentinel Asia Technical Team)

- Value Added Product (Yamaguchi Univ.)

- End User Enhancement (GIC/AIT)

- Step-3 Activities (Complete DRR cycle) (ADRC)

- Communication, Collaboration and Cooperation (ADRC)

- Linking Step 3 to Sendai Framework for DRR (IWMI)

(2)  DMO activity: Interaction with JICA (JAXA)

(3)  DPN improvement (Theme: Realizing Step 3 of SA for entire disaster cycle by space agencies (early warning at the pre-disaster phase, observation at the post-disaster phase, and capacity development)

- GISTDA Activity of Satellite Image Analysis (GISTDA)

- NSPO Activity Report and Recommendations (NSPO)

- Methods and Algorithms in Rapid Flood Mapping (ISRO)

- Autonomous Analysis of JAXA (JAXA)

- Satellite data calibration for Optical Satellites by Mirror Array (Yamaguchi Univ.)

(4)  DAN improvement (Theme: Sharing their experiences, knowledge and technology

with DANs)

- Update of Building Footprint (Univ. of Tokyo)

- CGIAR ClimBeR and South Asia Drought Monitoring System (IWMI)

- PHIVOLCS Role and Experience as DAN Member of Sentinel Asia (PHIVOLCS)

（5）User interaction (Theme: Effective support for Users with VAPs)

- GIC/AIT

- Yamaguchi Univ.



**Figure 21: Group Photo**

5.1.3    28th Asia-Pacific Regional Space Agency Forum (APRSAF), (15-18 November 2022)

The 28th Session of the Asia-Pacific Regional Space Agency Forum (APRSAF) was held from 15 to 18 November 2022 in Hanoi, Vietnam. It was co-organized by the Ministry of Education, Culture, Sports, Science and Technology (MEXT), the Japan Aerospace Exploration Agency (JAXA), and the Vietnam Academy of Science and Technology (VAST). APRSAF was established in 1993 to enhance space activities in the Asia-Pacific region. Attended by space agencies, governments, and international organizations such as the United Nations, as well as companies, universities and research institutes, this forum is the largest space-related conference in the Asia Pacific region. APRSAF has five Working Groups: the (1) Space Applications for Societal Benefit Working Group (SAWG), (2) Enhancement of Space Capacity Working Group (SCWG), (3) Space Frontier Working Group (SFWG), (4) Space Education for All Working Group (SE4AWG), and the (5) Space Policy and Law Working Group (SPLWG). APRSAF participants share information about their activities and future plans for their countries and regions in each working group. APRSAF also supports international projects designed to find solutions to common issues such as disaster management and environmental protection.

Sentinel Asia Session was conducted in the Satellite Applications for Societal Benefit Working Group (SAWG) on 15 November 2022. The following presentations were reported in this session.

-    Sentinel Asia Report (JAXA)
-    Sentinel Asia – Trend of Emergency Observation Request- (ADRC)
-    Practical utilization of Value-added products (VAPs) for JICA operations (JICA)
-    Rapid disaster response using Synthetic Aperture Radar (EOS)
-    The DHARMA Project: Philippine Space Agency (PhilSA)'s contribution on the use of Earth Observation (EO) data for Disaster Risk Reduction and Management (DRRM) in the Philippines (PhilSA)
-    Space+ & Applications for Disaster Risk Reduction in Action by Space Agency (GISTDA)
-    Earth Observation data for climate resilience and strengthening disaster risk

management (IWMI)

- Satellite Report for Disaster and Crisis Management (DC Report) using EWS for the Asia-Pacific region (ADRC)

- Development of Mirror Target Calibration for Multiple Optical Satellite Data (Yamaguchi Univ.)

## 5.2.  Documents, Press Releases and Papers

### 5.2.1  Standard Operating Procedures (SOPs) for making EORs in Cambodia, Lao PDR, Pacific Island countries, and Central Asia and Caucasus

The Standard Operating Procedures (SOPs) for making Emergency Observation Requests (EOR) to Sentinel Asia were established in Cambodia, Lao PDR, Pacific Island countries, and Central Asia and Caucasus in 2022. The establishment of SOPs is the achievement made through online workshops aimed at better use of Sentinel Asia's EOR mechanism for the following stakeholders of each country.

- Cambodia: Ministry of Labour and Social Welfare

- Lao PDR: Ministry of Labour and Social Welfare

- Pacific Island countries: National Disaster Management Office (Fiji), National Disaster Management Office (Solomon Islands), and Secretariat of the Pacific Community (SPC/SOPAC)

- Central Asia and Caucasus: Ministry of Emergency Situations (Kyrgyz Republic), Committee of Emergency Situations and Civil Defence (Tajikistan), Ministry of Emergency Situations (Uzbekistan), and Central Asian Institute of Applied Geosciences (CAIAG)

The common highlights of each SOP include:

(i) the prior definition of organizations primarily responsible for making EORs in case of natural disasters

(ii) the prior definition of criteria under which the organizations in (i) above will make EORs on an "in principle" basis

(iii) support by international organizations including ADRC to make EORs on behalf of the organizations in (i) above, in case EORs are not made promptly or in an opportunity

(iv) the easy and real-time provision of local information on the disaster via web-based mobile application developed by AIT

 (https://survey123.arcgis.com/share/cf15a88094974b5e885d45afe903ba98)

(v) the institutionalized use of Global Satellite Mapping of Precipitation (GSMaP) for monitoring (reference information for making EORs)

(https://sharaku.eorc.jaxa.jp/GSMaP/)

In accordance with these SOPs, in case of disasters, stakeholders of each country will be able to make emergency observation requests to Sentinel Asia promptly, and utilize the information provided by Sentinel Asia for better response and recovery in an interactive manner. Likewise, the Sentinel Asia community will be able to provide better and more effective support than before. This is one of the good examples of Sentinel Asia which is mandated to address the entire disaster management cycle, and it is a significant contribution to the Sendai Framework Priority 4 as well. This joint achievement has significantly enhanced the value of Sentinel Asia.

# 6.   Assessment of Sentinel Asia Operations

## 6.1.   Analysis of Operational Performance

Figure 22 summarizes the number of days from the occurrence of a disaster to the request for each disaster and their respective years. Overall, this shows that it took a number of days from the first occurrence of the disaster to a request for the period between 2011 and 2022.
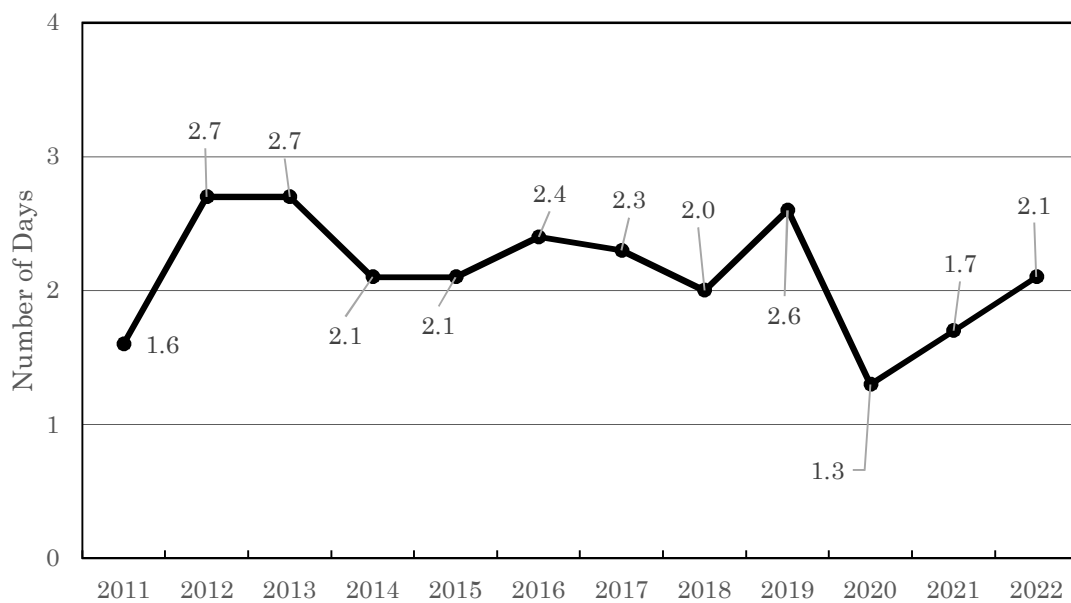


**Figure 22: Number of Days Required from Disaster Occurrence to Request**

Figure 23 shows the number of days that were required from the date the request was received to activation. Overall, it took 0.11 days from request to activation in 2022.
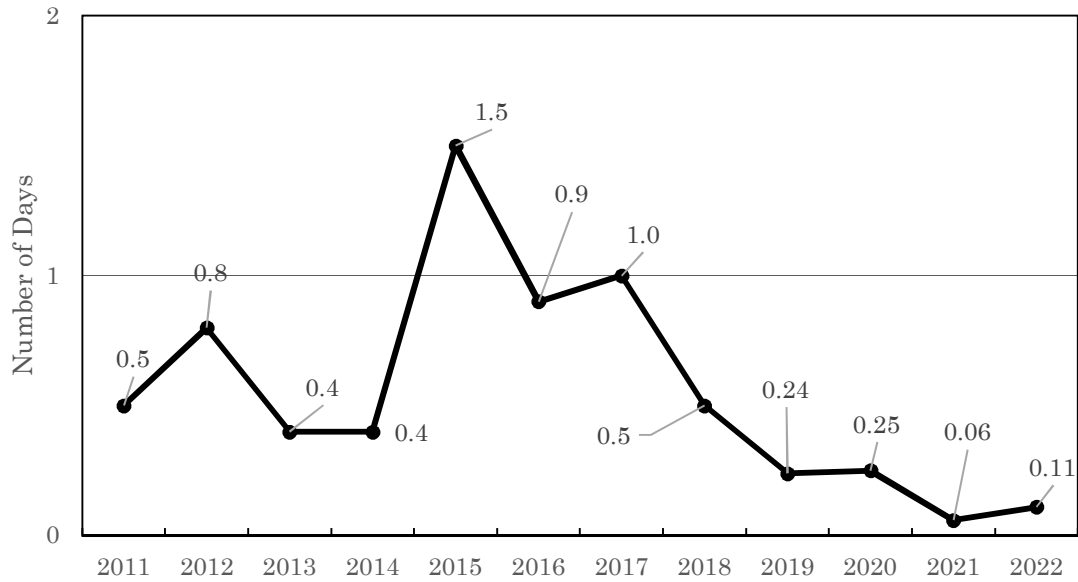


**Figure 23: Number of Days Required from Request to Activation**

Figure 24 shows the average number of days required to provide archive satellite data after activation (shown by the black line), and how often data could be provided relative to the total number of requests (shown by the blue line).

Figure 24's Archive Satellite Data indicates that the percentage of provisions improved from 2016 to 2022. This figure in 2022 was totalling 96.4%. And the average number of days improved to 2.7 days from last year's 4.0.
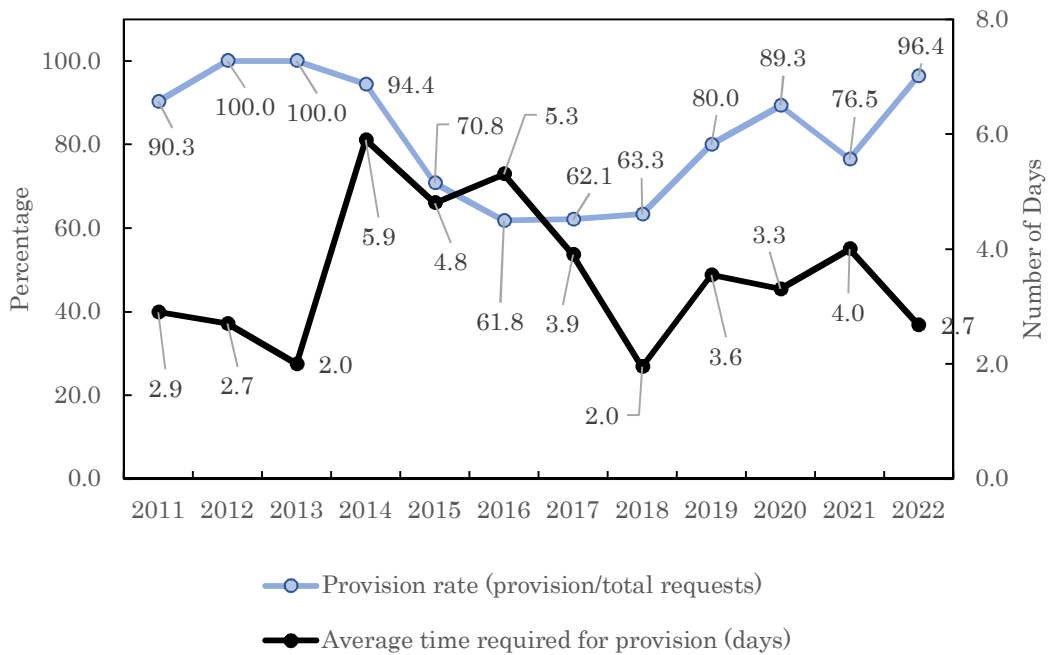


**Figure 24: Average Number of Days Required to Provide Archive Satellite Data and Activation Rate for Each Year**

Figure 25 shows the average number of days required to provide post-disaster satellite data after activation (shown by the black line), and how often data could be provided relative to the total number of requests (shown by the blue line).

Figure 25's Satellite Data after Disaster shows that the percentage of provisions increased sharply from 2014 onward, while the number of days required for data provision has decreased in recent years. The number of average days required for provision in 2022 was 2.6 days. This is improved in 2021 to 2.9 days. And provision rate in 2022 reached 100%.
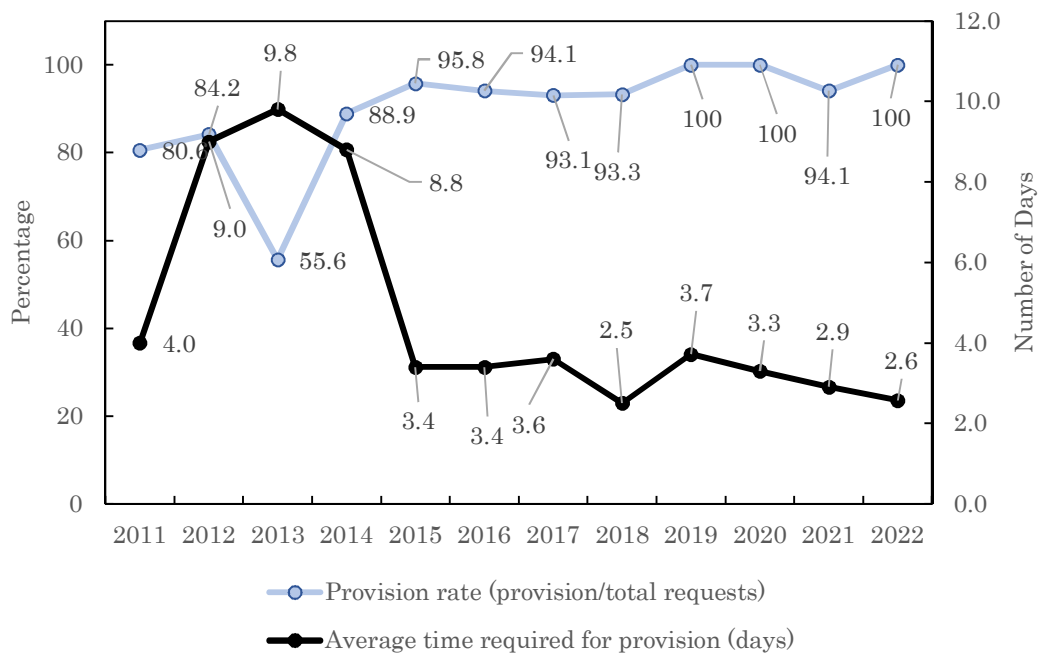


**Figure 25: Average Number of Days Required to Provide Satellite Data After Disaster and Activation Rate for Each Year**

Figure 26 shows the average number of days required to provide products after activation (shown by the black line), and the how often data could be provided relative to the total number of requests (shown by the blue line).

Figure 26's provision rate for products was 100% in 2022. Many DANs supported the provision of products for each EOR. The average number of days required for provision was 5.2 days in 2022.

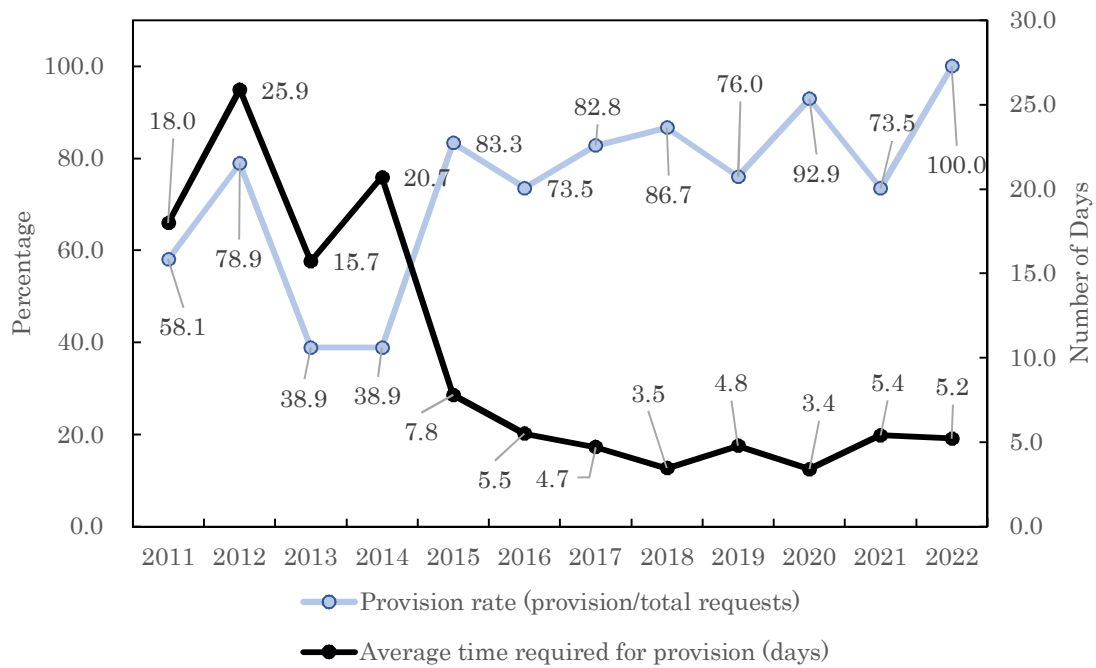**Figure 26: Average Number of Days Required to Provide Products and Activation Rate for Each Year**

# 7. Conclusions

Since the start of 2007, we have accepted 451 EORs and activated 404. In 2022, 28 EORs were requested and all EORs were activated. Also, the impact of COVID-19 still remained in 2022. However, by taking advantage of remote sensing technology, Sentinel Asia was able to contribute their support by providing effective data even in times of disaster. Another major topic in 2022 is that AFAD as a disaster management organization in Turkey has become a new member of Sentinel Asia. Turkey is an earthquake-prone country, so it is expected to contribute to the field of DRR through Sentinel Asia activities.+

The following points are conclusive statements based on activities in 2022.

· In 2022, around 64.3% of the EORs were related to floods.

· The largest number of requests were submitted from the Philippines, with 7 EORs, followed by India, with 6 EORs, in 2022.

· In total, 739 satellite images and 360 VAPs were provided by DPN and DAN in 2022.

· Five (5) out of twenty-eight (28) Sentinel Asia activations were escalated to the IDCs in 2022.

· The provided data was utilized for emergency response, field assessment, making reports, etc (as shown in chapter 3). This feedback information from end-users is consistent with the concept of Sentinel Asia, covering all of disaster management phase (as shown in figure 4).

** January 2022 News from Sentinel Asia Project Office **

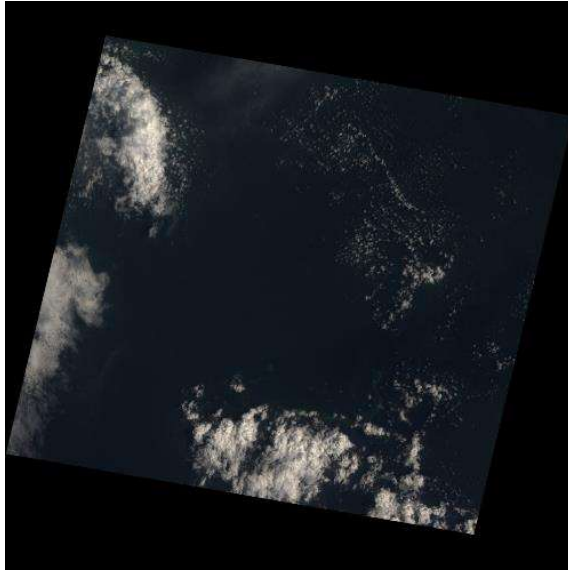- * - * - * - * - * - *- * - * - * - * - *- * - * - * - * - * -*-

Topics:

1. [News] Emergency Observation of Disasters
2. [Interview] Dr. Manzul Kumar Hazarika, Mr. Syams Nashrrullah, and Mr. Chathumal Madhuranga (GIC-AIT)
3. How to Send an Emergency Observation Request
4. Using the Sentinel Asia Operation System, OPTEMIS

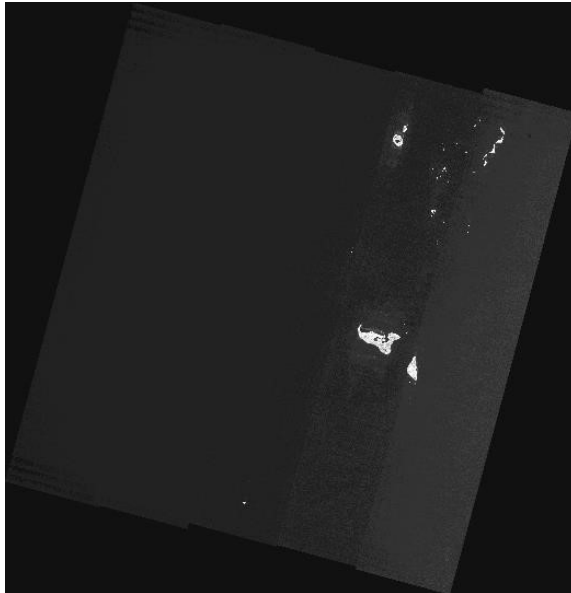- * - * - * - * - * - *- * - * - * - * - * - *- * - * - * - * - * -*-

1. [News] Emergency Observation of Disasters (as of 31 January 2022)

(1) Volcanic eruption in Tonga on 15 January, 2022 (GLIDE Number: VO-2022-000005-TON)
The Hunga Tonga–Hunga Ha'apai volcano, about 30 kilometers southeast of Tonga's Fonuafo'ou island, erupted on 14 January and again on 15 January. The eruption caused tsunami in many places around the world and caused severe damage to the islands of Tonga.
(https://www.aljazeera.com/news/2022/1/21/world-rushes-aid-to-tsunami-hit-tonga-as-drinking-water-food-runs-short)

The Asian Disaster Reduction Center (ADRC) made an EOR to Sentinel Asia on 16 January. Among Data Provider Nodes (DPNs), the Geo-Informatics and Space Technology Development Agency (GISTDA), the Indian Space Research Organization (ISRO), the Japan Aerospace Exploration Agency (JAXA), and the National Applied Research Laboratories (NARL) provided data. Among DANs, the Earth Observatory of Singapore (EOS), and the Mohammed Bin Rashid Space Centre (MBRSC) provided their VAPs. Information on the latest response by Sentinel Asia is available at the following link:
https://sentinel-asia.org/EO/2022/article20220115TO.html

Satellite image (THEOS-1) provided by GISTDA



Satellite image (ALOS-2) provided by JAXA

Satellite image (Resourcesat-2A) provided by ISRO



Satellite image (Formosat-5) provided by NARL



Value-Added Product by EOS

Value-Added Product by MBRSC

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2. [Interview] Dr. Manzul Kumar Hazarika, Mr. Syams Nashrrullah, and Mr. Chathumal Madhuranga (GIC-AIT)

*The Geoinformatics Center of the Asian Institute of Technology (GIC-AIT) is one of the founding members of Sentinel Asia and has worked as one of the leading Data Analysis Node (DAN) members. It has been providing Value-Added Products (VAPs) in response to Sentinel Asia's Emergency Observation Requests (EORs). It also provides valuable inputs to Sentinel Asia in addition to working as Project Manager (PM) when an EOR is escalated to the Disasters Charter. The Sentinel Asia secretariat interviewed GIC-AIT regarding their past and future contributions to Sentinel Asia.*
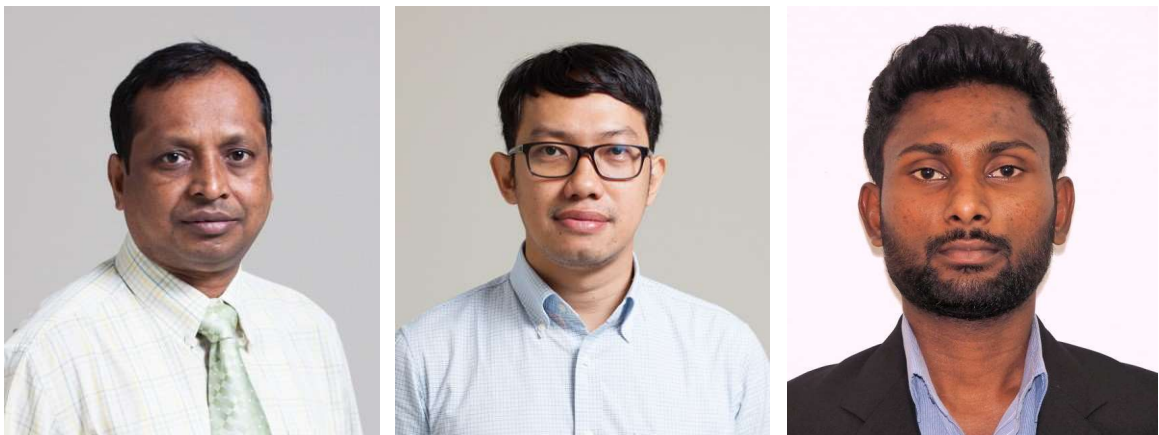


Left to Right: Dr. Manzul Kumar Hazarika, Director, Geoinformatics Center, Mr. Syams Nashrrullah, Program Officer/Team Leader, and Mr. Chathumal Madhuranga, Research Associate

*Sentinel Asia Secretariat:*

GIC-AIT is one of the founding members of Sentinel Asia and continues to contribute to disaster monitoring in the Asia-Pacific region. As an academic institution, could you explain the motivation behind your contribution to Sentinel Asia?

*Dr. Manzul Kumar Hazarika:*

First of all, GIC-AIT has been partnering with JAXA since 1997 to build capacity on applications of satellite data in Asia and the Pacific region. Prior to the launch of Sentinel Asia in 2006, GIC-AIT had a good network of organizations and professionals in the region. Accordingly, GIC-AIT was in an advantageous position to introduce these organizations and professionals to Sentinel Asia from the region.

Disaster Management being one of the major portfolios of GIC-AIT, naturally, GIC-AIT was excited when Sentinel Asia was established, and since then, it has been contributing continuously to the disaster response activities in the region.

*Sentinel Asia Secretariat:*

The Sentinel Asia Secretariat very much appreciates your contribution, including responding to disasters as a Principal Data Analysis Node (P-DAN) and PM when EORs are escalated to the Disasters Charter, negotiating the related institutions, and producing Value-Added Products (VAPs). Could you list some cases that left a strong impression and/or made a significant contribution to the disaster-affected countries/regions?

*Dr. Manzul Kumar Hazarika:*

GIC-AIT has been contributing to the response to about 20 disasters per year through Sentinel Asia and the International Disaster Charter for more than a decade. One of its greatest contributions was the response to the earthquake and tsunami in Sulawesi in Indonesia in 2018. This was a rare opportunity for GIC-AIT to send a team to the ground within a week of the disaster to conduct ground verifications. We visited hundreds of locations and took more than 400 photographs in collaboration with Indonesian agencies and institutes. The developed VAPs were extensively used by the local administration, government agencies, and even donors to assess the extent of the damage. We still have a dedicated website where all these products can be accessed.

In another case, GIC-AIT contributed immensely to the response to the flood disaster in Sri Lanka in 2017, which affected nearly half of the country, including Colombo, by combining information regarding the extent of flooding derived from the satellite data with crowdsourced data from the ground through a mobile application and compiling them into a Web-based

Geographic Information System (WebGIS) platform for wider dissemination. It was very successful.

**Sentinel Asia Secretariat:**

Did you have any direct communication with the local governments in the countries?

**Dr. Manzul Kumar Hazarika:**

Yes. GIC-AIT is in an advantageous position than other organizations in the region because we work very closely with national agencies from the south and south-east Asian countries. Whenever they need help, we are always there to assist to develop value-added products. We have direct communication as well as a good working relationship with them. Providing data or value-added products is not sufficient, and it is essential to get ground information for validating the products. That is important, and this can be accomplished only by working with national agencies.

**Mr. Syams Nashrrullah:**

Just to add to the earthquake case in Sulawesi, the value-added products developed by AIT and other international agencies were used for emergency response by the local government agencies, but thereafter, some of these products are being used for reconstruction monitoring.

**Sentinel Asia Secretariat:**

You have produced many VAPs that clearly show the damage situation. Could you tell us about some key points that have been devised or emphasized in producing VAPs and analyzing data?

**Dr. Manzul Kumar Hazarika:**

One of the essential aspects of producing useful VAPs is to combine information on the disaster-affected areas derived from the satellite data with the building and infrastructure data layers available in open source. This improves the usability of the VAPs.

We have also developed Standard Operating Procedures (SOPs) for efficiently processing optical and SAR data, and some of them are specific to particular hazards. This has improved our response time as well as the quality of VAPs. GIC-AIT can now produce the first product within 24 hours of acquiring data by a satellite.

**Mr. Chathumal Madhuranga:**

One of our key ideas is to identify the extent of a disaster. We mainly focus on data available through the Sentinel Asia community, but sometimes we have difficulties in producing good quality VAPs using a limited number of datasets. As Dr. Manzul mentioned above, we use open-source data such as Sentinel-1 and Sentinel-2 images to dynamically identify a disaster's

extent through time series analysis.

**Sentinel Asia Secretariat:**

GIC-AIT has developed a mobile application called "Disaster Survey" to monitor and collect information on disaster extent and damage. This application has been incorporated into SOPs that were established with Myanmar, Thailand, and Vietnam last year. Could you explain its efficiency and value?

(*Note from the Secretariat: SOPs mentioned here are for making EORs from certain parts of affected countries and regions, which are different from SOPs for making VAPs from the part of AIT as mentioned in the previous question.)

**Dr. Manzul Kumar Hazarika:**

The simplicity of this mobile app is one of the advantages, and it is easily accessible for wider use. The mobile app was successfully used during the recent floods in Thailand, and it will be promoted for wider use among the Sentinel Asia member countries. The collection of real-time ground data through the mobile app provides the necessary information for validation of satellite data-derived disaster extent and damage.

**Mr. Chathumal Madhuranga:**

The mobile app can be accessed through a web link, and no downloading is required.

**Dr. Manzul Kumar Hazarika:**

As I mentioned earlier, ground data are very important for the validation of VAPs. With the mobile app, we can secure in-situ data without going to the field by ourselves.

**Mr. Chathumal Madhuranga:**

The mobile app is very simple and easy to use. We are now trying our best to introduce the app to the Sentinel Asia community through online training opportunities, and the feedback from the participants is quite encouraging. We hope we can acquire more ground information during disasters so that we can make it more accurate and reliable VAPs.

**Sentinel Asia Secretariat:**

What difficulties have you faced in introducing the app to users?

**Mr. Chathumal Madhuranga:**

To get actual ground information, people have to go to disaster-affected areas. In the case of a recent flood in Thailand, we conducted field testing of the mobile app, and it worked well. We expect that in the future, the general public will take advantage of the mobile app and provide us the ground information.

***Sentinel Asia Secretariat:***

What do you envision for Sentinel Asia to further contribute to disaster management activities in the Asia-Pacific region, and what advice or recommendations regarding such activities do you have based on past experiences and lessons learned?

***Dr. Manzul Kumar Hazarika:***

In order to build confidence among the users in the quality and reliability of the VAPs, it is important to promote the mobile app for ground data collection, and wherever possible, ground-truth collection missions should be conducted in the case of major disasters. As for this mobile app, we are currently promoting it among the Sentinel Asia member organizations only. However, in the future, we would like to see that it is used by the public. This will facilitate capturing much more information from the ground to further improve the quality of the value-added products.

Participation of local agencies also should be encouraged in data processing, using the mobile app, and conducting field campaigns for ground-truth collection. Everybody is busy when a disaster strikes, and the national disaster management agencies get too busy to process remote sensing data to develop VAPs. In order to address this issue, organizations and institutions other than disaster management agencies should be encouraged to develop VAPs.

Further, in order to improve the accessibility and data processing time, cloud-based data processing and machine learning should be explored.

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3. How to send an Emergency Observation Request

JPT member organizations are entitled to send an Emergency Observation Request (EOR) for disasters in the Asia-Pacific region. Please refer to https://sentinel-asia.org/e-learning/Emergency_Observation_Request.html.

EOR Order Desk:
Asian Disaster Reduction Center (ADRC)
HP: http://www.adrc.asia/
E-mail: sarequest@adrc.asia
FAX: +81-78-262-5546,
TEL: +81-78-262-5540

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4. Using Sentinel Asia Operation System, OPTEMIS

Sentinel Asia launched a new operation system, OPTEMIS. Please refer to the website on how to create an account for OPTEMIS. https://sentinel-asia.org/e-learning/Emergency_Observation_Request.html

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Sentinel Asia Project Office

Satellite Applications and Operations Center (SAOC)

Japan Aerospace Exploration Agency (JAXA)

Ochanomizu Sola City, 4-6 Kandasurugadai, Chiyoda-ku, Tokyo 101-8008 Japan

E-mail: Z-SENTINEL.ASIA@ml.jaxa.jp

TEL: +81-3-6435-6785

FAX: +81-3-5777-1580

** February 2022 News from Sentinel Asia Project Office **

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Topics:

1. [News] Emergency Observation of Disasters
2. How to Send an Emergency Observation Request
3. Using the Sentinel Asia Operation System, OPTEMIS

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1. [News] Emergency Observation of Disasters (as of 24 February 2022)

(1) Oil spill in Thailand
On 25 January, crude oil leaked from the pipeline into the Gulf of Thailand off Rayong Province, Thailand. Then, during the repair work, second leak occurred on 10 February. (https://www.thaipbsworld.com/oil-unintentionally-left-in-pipeline-off-rayong-blamed-for-thursdays-new-spill/)

Geo-Informatics and Space Technology Development Agency (GISTDA) made an Emergency Observation Request (EOR) to Sentinel Asia on 11 February. Among Data Provider Nodes (DPNs), the Indian Space Research Organization (ISRO), the Japan Aerospace Exploration Agency (JAXA) provided data. In addition, the National Applied Research Laboratories (NARL) planned to provide its data. Among Data Analysis Nodes (DANs), the Mohammed Bin Rashid Space Centre (MBRSC) provided their VAPs. Information on the latest response by Sentinel Asia is available on the following link:
https://sentinel-asia.org/EO/2022/article20220210TH.html
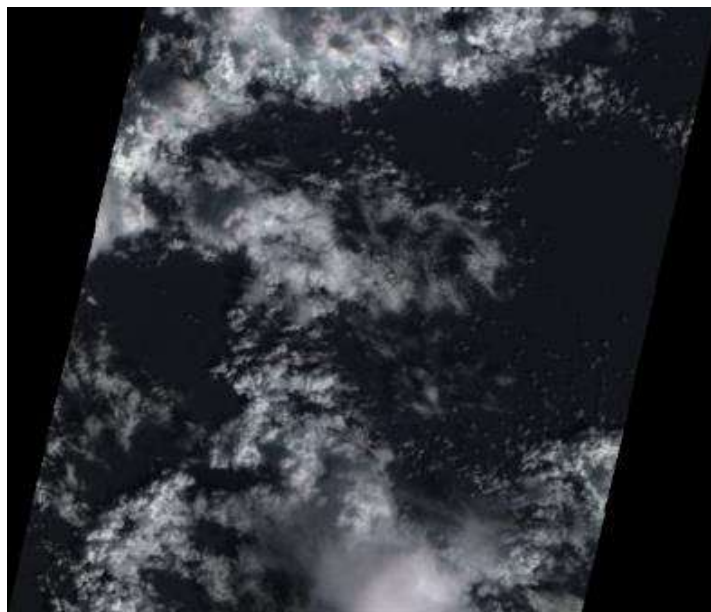


Satellite image (Resourcesat-2) provided by ISRO
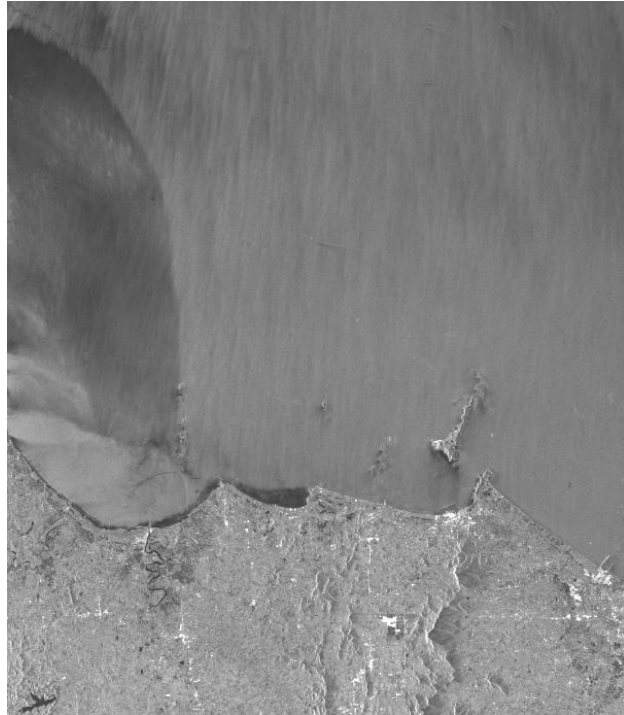
Satellite image (ALOS-2) provided by JAXA
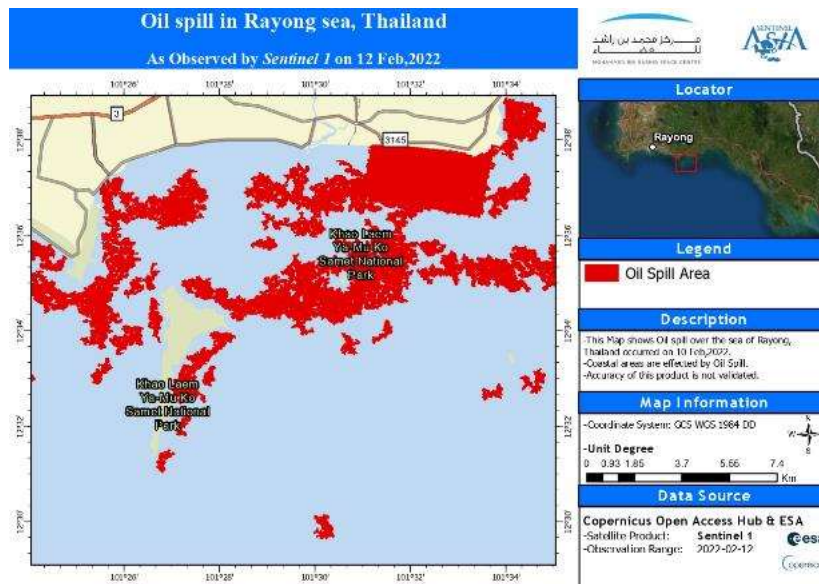


Value-Added Product by MBRSC

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2. How to send an Emergency Observation Request

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EOR Order Desk:

Asian Disaster Reduction Center (ADRC)

HP: http://www.adrc.asia/

E-mail: sarequest@adrc.asia

FAX: +81-78-262-5546,

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3. Using Sentinel Asia Operation System, OPTEMIS

Sentinel Asia launched a new operation system, OPTEMIS. Please refer to the website on how to create an account for OPTEMIS. https://sentinel-asia.org/e-learning/Emergency_Observation_Request.html


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Sentinel Asia Project Office

Satellite Applications and Operations Center (SAOC)

Japan Aerospace Exploration Agency (JAXA)

Ochanomizu Sola City, 4-6 Kandasurugadai, Chiyoda-ku, Tokyo 101-8008 Japan

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TEL: +81-3-6435-6785

FAX: +81-3-5777-1580

** March 2022 News from Sentinel Asia Project Office **

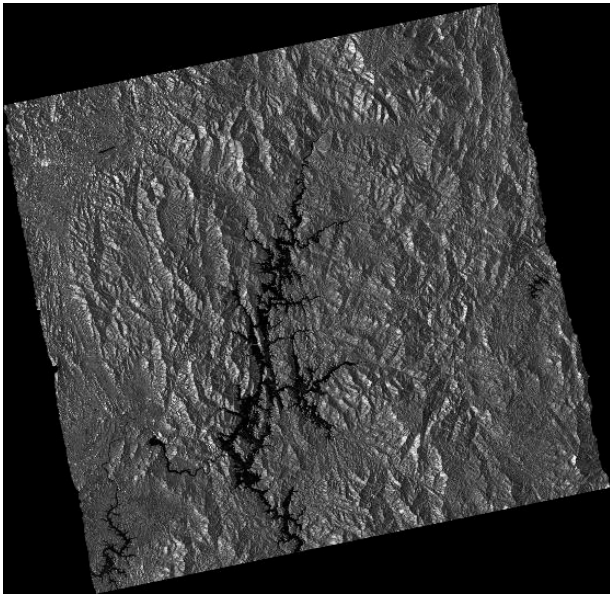- * - * - * - * - * - *- * - * - * - * - *- * - * - * - * - * - *-

Topics:

1.   [News] Emergency Observation of Disasters
2.   [Interview] Mr. Sadhu Zukhruf Janottama, Mr. Keith Paolo Landicho, and Mr. Mohammad Fadli (AHA Centre)
3.   How to Send an Emergency Observation Request
4.   Using the Sentinel Asia Operation System, OPTEMIS

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1.   [News] Emergency Observation of Disasters

(1) Flood in Thailand on 24 February, 2022 (GLIDE Number FL-2022-000180-THA)

Heavy rain over Malay Peninsula in late February brought flooding in southern Thailand. According to ReliefWeb, 12,129 households were affected. The Thaiger reported that a bridge in Narathiwat Province collapsed and six people were killed.

(https://reliefweb.int/report/thailand/thailand-flooding-southern-region-25-feb-2022, https://thethaiger.com/news/national/southern-thailand-flooding-causes-bridge-collapse-6-people-reported-dead)

Geo-Informatics and Space Technology Development Agency (GISTDA) made an Emergency Observation Request (EOR) to Sentinel Asia on 3 March. Among Data Provider Nodes (DPNs), the Japan Aerospace Exploration Agency (JAXA) and the National Applied Research Laboratories (NARL) provided data. Among Data Analysis Nodes (DANs), the Mohammed Bin Rashid Space Centre (MBRSC), the Earth Observatory of Singapore (EOS), and the Asian Institute of Technology (AIT) provided their VAPs. Information on the latest response by Sentinel Asia is available at the following link:

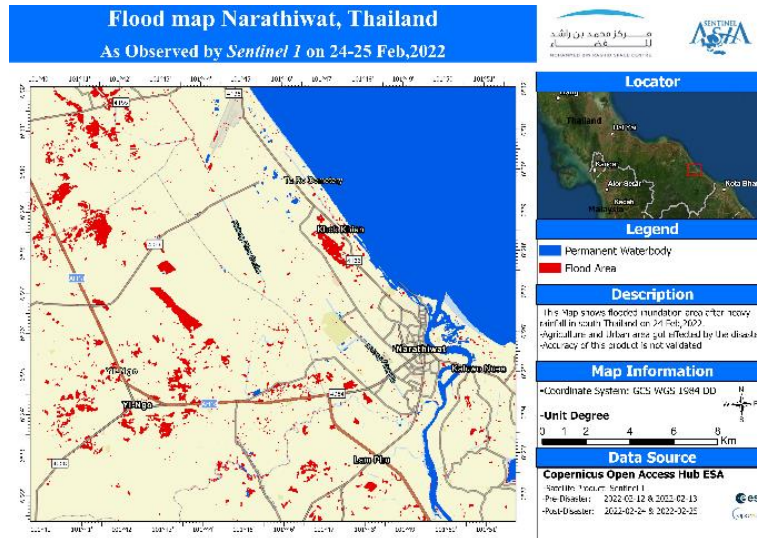https://sentinel-asia.org/EO/2022/article20220224TH.html
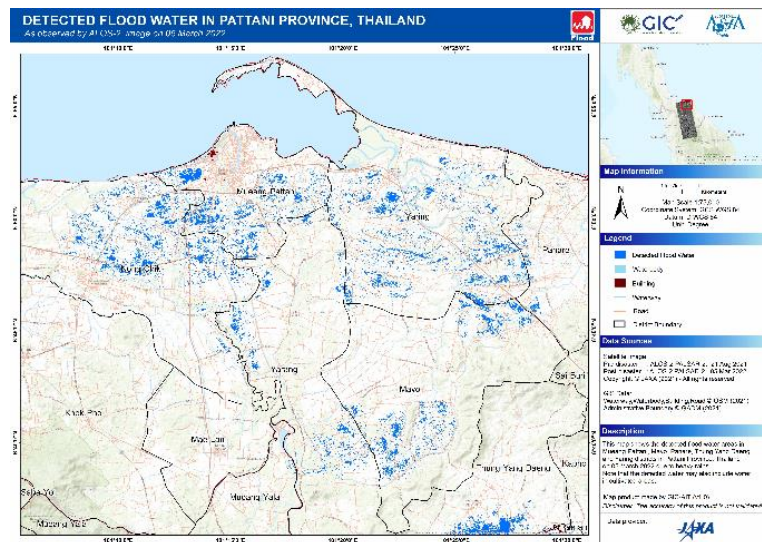
Satellite image (ALOS-2) provided by JAXA
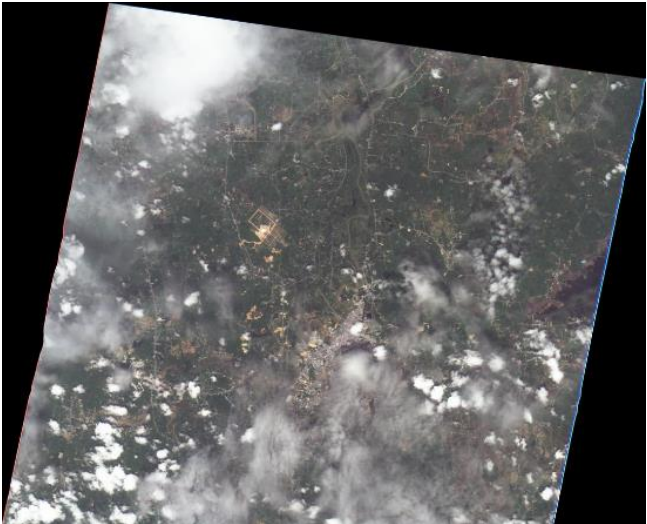


Satellite image (FORMOSAT-5) provided by NARL



Value-Added Product by EOS

Value-Added Product by MBRSC



Value-Added Product by AIT

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2.  [Interview] Mr. Sadhu Zukhruf Janottama, Mr. Keith Paolo Landicho, and Mr. Mohammad Fadli (AHA Centre)

The ASEAN Coordinating Centre for Humanitarian Assistance on disaster management (AHA Centre) is one of the key players in the Sentinel Asia community. Since its establishment in 2011, the AHA Centre has been engaged in monitoring, preparedness, and response related to disasters in the ASEAN Region. While the AHA Centre has been supporting Sentinel Asia with its extensive network and distinguished expertise as an international organization, recently, its support for and partnership with Sentinel Asia has been strengthened further.

The Sentinel Asia secretariat interviewed AHA Centre staff members to introduce their activities reflecting the centre's dedicated support for the ASEAN region through its partnership with Sentinel Asia.



Left to Right: Mr. Sadhu Zukhruf Janottama, Disaster Monitoring and Analysis Officer, AHA Centre; Mr. Keith Paolo Landicho, Disaster Monitoring and Analysis Officer, AHA Centre; Mr. Mohammad Fadli, Pacific Disaster Center, AHA Centre Liaison

*Sentinel Asia Secretariat:*

The AHA Centre lists (1) Disaster Monitoring, (2) Preparedness and Response, and (3) Capacity Building as its activities. Including these points, could you explain your role and mission in ASEAN?

*Mr. Janottama:*

One of the core strategies and pillars that translate the spirit of One ASEAN, One Response into concrete actions is to perform Risk Identification, Early Warning, and Monitoring. Through these activities, the AHA Centre aims to reduce loss of life and damage to property from disasters caused by natural hazards through the identification of risks prior to impacts and by increasing warning time.

The AHA Centre works closely with the national disaster management organizations (NDMOs) of all ten ASEAN member states in monitoring and sharing information about hazards and disasters in the region. The AHA Centre also conducts hazard and disaster monitoring from various verified sources such as hydrometeorological and geological agencies of the ten ASEAN Member States. Information management and dissemination, including information from Sentinel Asia, may help strengthen the coordination efforts of assisting parties when responding to potential as well as actual disasters. The AHA Centre believes that accurate information, shared in a timely manner, might help save lives during critical times.

The AHA Centre, particularly the Disaster Monitoring and Analysis unit, use two primary tools/platforms to perform 24/7 monitoring of hazards and disasters in the ASEAN region, namely the ASEAN Disaster Monitoring and Response System (DMRS) and the ASEAN

Disaster Information Network (ADINet). The DMRS is a tool that shows real-time information of the hazards in the region as they happen, as well as hydrometeorological data, such as wind direction and speed, clouds, sea temperature, etc. The maps can be overlaid with additional information such as population density data, location of critical infrastructures, and other spatial data that can aid decision-making during emergency response operations. The ADINet is a repository of information concerning hazards and disasters that have happened in the region. The platform is open to the public. The AHA Centre verifies and validates any submitted information to ensure the accuracy of the data. ADINet has been recording disaster information in the region since 2012.

*Mr. Fadli:*

DMRS is a derivative product from "DisasterAWARE", which is operated to monitor not only regionally but also globally and consists of multiple layers that include all the required information for disaster monitoring.

*Mr. Janottama:*

Added to the second item of the first question, as a part of its preparedness and response efforts, the AHA Centre develops various tools and guidance to accelerate the mobilization of resources between ASEAN member states and its partners in times of disaster.

For the third item of the first question, about capacity building, the AHA Centre supports the national disaster management authorities across ASEAN member states through capacity building to build a disaster-resilient region. There are two signature courses in the ASEAN region. One is the ASEAN Emergency Response and Assessment Team (ASEAN-ERAT), and the other is the AHA Centre Executive (ACE) Programme that is designed to prepare future leaders of disaster management in ASEAN.

*Sentinel Asia Secretariat:*

How do the DMRS and Sentinel Asia contribute to each other?

*Mr. Fadli:*

We process some of the information gathered from the main system, "DisasterAWARE". The Pacific Disaster Center (PDC) collects and includes information from various sources from other organizations such as Sentinel Asia, the UN, etc. where they publish reports. For any disasters or hazards that happen globally, our team is standing by to make inputs to the system so that we can distribute information to the public soon, and then local governments and organizations can refer to and use the data for disaster responses.

**Mr. Janottama:**

First of all, speaking of EORs, the AHA Centre is working as the coordination centre among ten ASEAN member states. Concerning EORs to Sentinel Asia, the AHA Centre not only works as a requester, but also supports other users from the ten ASEAN member states for EORs to Sentinel Asia. The AHA Centre, in close coordination with national disaster management organisations (NDMO), also checks and monitors the EORs to Sentinel Asia from the other departments or ministries in the ten ASEAN member states to avoid duplication of the EORs.

I would cite the following EORs as particularly important ones to the AHA Centre in recent times. What is significant in these EORs, in my view, is that these EORs are made by the AHA Centre itself and the products and information provided by Sentinel Asia were used in AHA Centre internal meetings/analyses, as well as shared with the 10 ASEAN member states.

1.  [Flooding in Myanmar, 27 July 2021](#)
2.  [Typhoon GONI in the Philippines, 1 November 2020](#)
3.  [Flooding in Cambodia, 17 October 2020](#)
4.  [Flood in Aceh, Indonesia, 8 May 2020](#)
5.  [Flood in Jakarta, Banten, and West Java Province, Indonesia, 1 January 2020](#)

**Mr. Landicho:**

Among the five EORs that Mr. Janottama mentioned, personally, I would cite the case of Typhoon GONI as the best. Back in November 2020, Typhoon GONI hit the Philippines and I myself made an EOR for the Philippines. This EOR stems from lessons learned during an earlier EOR made by myself as well less than a month before Typhoon GONI. In October 2020, Tropical Cyclones LINFA and NANGKA combined with the effects of the Inter-Tropical Convergence Zone (ITCZ) affected Viet Nam and as mentioned, we used data from the Data Analysis Nodes (DANs) and Data Provider Nodes (DPNs) of Sentinel Asia in our information product—Situation update, to aid our emergency response operations back in October (for Viet Nam) and November (for the Philippines). It was the first time for the AHA Centre to respond to disasters in the region during a pandemic and it was advantageous to identify which areas were accessible and which areas were most impacted in such a flood situation using the data from the Sentinel Asia network. We were able to identify priority areas which was crucial for the response. That is one of the best practical cases for us.

**Mr. Janottama:**

Situation Update of the AHA Centre is a disaster information product which specifically provides information related to a disaster that being responded to by the AHA Centre. You can see the details at https://ahacentre.org/situation-updates/.

Flash Update is a disaster information product which provides immediate brief information about an emerging and/or actual significant disaster in the ASEAN region that may be the impetus of a significant impact and/or potential humanitarian operations which does not yet require our response at the time. Most first updates come from the ASEAN member states, and in our experience, data from Sentinel Asia is used for updates. You can see the details at https://ahacentre.org/flash-updates/

*Sentinel Asia Secretariat:*

Were there any cases where you introduced Sentinel Asia EOR statuses or their VAPs in "Situation Update" or "Flash Update" and which resulted in contact/feedback from outside or actual support?

**Mr. Landicho:**

The AHA Centre mostly used the Sentinel Asia EOR products in the Situation Update. Now, speaking of cases which resulted in actual support, as I mentioned earlier, I would cite the case of Typhoon GONI in 2020. The super typhoon affected the Philippines and Viet Nam. In the Situation Update in 2020 for GONI, processed data—detected flooding by the DANs of the Sentinel Asia network—were used in the information products. The series of Situation Updates were circulated within the AHA Centre's network, the governing board (GB) of the AHA Centre - ASEAN Committee on Disaster Management, ASEAN Secretariat and partner non-governmental organizations (NGOs), international non-governmental organizations (INGOs), civil society organizations (CSOs), etc. As mentioned in the Situation Update, Sentinel Asia and Earth Observatory Singapore (EOS) ARIA-SG provided several raw and analysed satellite images that can support the ongoing emergency response.  What is particularly significant is that, since this was one of AHA's first responses amidst the COVID-19 pandemic in which situation monitoring and relief and rescue activities from the ground were severely challenged, the information provided by Sentinel Asia and its dissemination via Situation Update warranted a pandemic-adjusted response. To be specific, we have managed to identify which areas were accessible and which areas were most

impacted in such a flood situation. Thus, we were able to provide relief goods easily and consider which areas should be more prioritized. I think that is one instance where it's really advantageous to have this partnership with Sentinel Asia.

*Sentinel Asia Secretariat:*

In terms of the AHA Centre's role in raising awareness of Sentinel Asia to the public, we also appreciate your introduction of Sentinel Asia activities in "ARMOR" issued by the AHA Centre in March 2019, focusing on the effectiveness and significance of Sentinel Asia's space-based disaster support. Could you explain the purpose of this and its significance for ASEAN disaster management organizations, including the AHA Centre? Also, could you share with us the outcome of this ARMOR, if any?

*Mr. Janottama:*

The ASEAN Risk Monitor and Disaster Management Review (ARMOR) in 2019 aimed at consolidating knowledge related to risk monitoring and disaster management within the ASEAN region, and seeking to provide a mechanism for the sharing of best practices and the latest research and analysis. At the same time, the ARMOR was to showcase innovations and inspire disaster managers and researchers across the region and the world, or what we called bridging science to decision-making. And Sentinel Asia was introduced in Chapter 10 on "Utilization of Space-based Information for Supporting Emergency Response and Recovery", based on actual emergency response experiences in which space-based information was utilized alongside direct field observation to inform operational decision making. This ARMOR underlined the benefit of Sentinel Asia for the ASEAN region and recommended that all national disaster management organisations (NDMOs) of ASEAN member states be exposed to the Sentinel Asia platform. In fact, as the primary target of the ARMOR is the NDMOs of the ten ASEAN member states, they are being effectively exposed to the works and information of Sentinel Asia. This can be helpful for the ten ASEAN member states, as well as the AHA Centre to have smooth and good coordination with Sentinel Asia.

*Sentinel Asia Secretariat:*

In recent Sentinel Asia EORs, the AHA Centre is recognized as a key partner in ASEAN, especially in the "Standard Operating Procedures (SOPs) for Emergency Observation Requests", one established in Myanmar last year, and two others in Cambodia and Lao PDR this year, and you are recognized expressly as a pre-defined active body of EORs. What does the AHA Centre think about this? How do you expect to make disaster management support more efficient through these SOPs?

**Mr. Landicho:**

The Standard Operating Procedures (SOP) for Emergency Observation Requests provides us a clearer role and task to support the national agencies / ASEAN member states. This can allow us to support the ten ASEAN member states especially when they are busy to conduct Emergency Response Operations. This is also in line with the primary mandate of the AHA Centre as a coordinating agency to support the ten ASEAN member states. It will also be advantageous to build on these SOPs for EORs and embed them in the AHA Centre's guidelines like the EOR Guidelines or DMA guidelines. Seeing the speed and scale of the Sentinel Asia network's work, we feel positive about building on these relationships especially for areas in Southeast Asia because there tends to be potential underreporting of disasters.

**Sentinel Asia Secretariat:**

As a cooperative effort between Sentinel Asia and the AHA Centre, upon invitation from the AHA Centre, Sentinel Asia participated in "the AHA Centre Executive (ACE) Programme" organized by the AHA Centre. First, could you tell our readers a little bit about the ACE Programme?

**Mr. Janottama:**

The AHA Centre Executive (ACE) Programme is designed to prepare future leaders of disaster management in ASEAN. I think the ACE Programme is by far the most intensive disaster management training programme in the region. Through cooperation with the Government of Japan, the ACE Programme aims to enhance the capacity of ASEAN member states' disaster managers through the exchange of knowledge and skills amongst them and with other disaster management experts in the region as well as outside the region.

**Sentinel Asia Secretariat:**

In the ACE Programme's 7th batch last year, a special joint session was organized, led by Prof. Mizan Bisri from Kobe University, through cooperation among Sentinel Asia's volunteer Joint Project Team members based in Japan. Young professionals and future leaders of disaster management authorities in ASEAN countries learned about the application of satellite data for disaster management in this area. Could you tell us the significance and outcome of this joint session for the AHA Centre? And if you have any feedback from the participants or reports on the session results, could you tell us about them?

**Mr. Landicho:**

From my point of view, the importance of the joint session with Sentinel Asia in the ACE

programme is to have a good foundation of the theoretical knowledge, especially for those who are still learning, and show the cooperation between Sentinel Asia and the AHA Centre as a practical example.

*Mr. Janottama:*

In fact, the DMA Officers of the AHA Centre also joined this session as participants together with the representatives of the ten ASEAN member states. This session was beneficial for the AHA Centre and NDMOs to understand the work and role of Sentinel Asia, including how we can connect our work and projects to Sentinel Asia. This session also provided useful knowledge and information for the participants, as reflected by the summary of the feedback from the participants below. Thanks to this Sentinel Asia session, they have also learned to relate the session materials that are relevant to what they are doing in the office. More importantly, they feel that the issues raised by the session connect to activities, projects, programmes, and policies in their country.

I think the significance and outcome of this joint session for the AHA Centre would be our exposure to Sentinel Asia's activities and inspiration for future collaboration to raise awareness. We will need to discuss internally first, but we hope to propose projects for the future.

*Sentinel Asia Secretariat:*

Could you tell us how the AHA Centre will contribute to Sentinel Asia in the future, considering the above points?

*Mr. Fadli:*

The ADINet might be useful for DAN to make their data more precise, so I hope Sentinel members take a look of it. It is available for the public at https://adinet.ahacentre.org/.

*Mr. Landicho:*

I think the AHA Centre can contribute to Sentinel Asia in the future by continuing to make emergency observation requests for ASEAN member states as well as providing feedback, and maintaining the partnership between us. The AHA Centre is also at a good vantage point in coordinating not just response and relief efforts but also monitoring efforts in a regional scale. Therefore, our partnership with Sentinel Asia not only strengthens regional preparedness but also the international community of translating the spirit of One ASEAN One Response into action.

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3. How to send an Emergency Observation Request

JPT member organizations are entitled to send an Emergency Observation Request (EOR) for disasters in the Asia-Pacific region. Please refer to https://sentinel-asia.org/e-learning/Emergency_Observation_Request.html.

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4. Using Sentinel Asia Operation System, OPTEMIS

Sentinel Asia launched a new operation system, OPTEMIS. Please refer to the website on how to create an account for OPTEMIS. https://sentinel-asia.org/e-learning/Emergency_Observation_Request.html

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** April 2022 News from Sentinel Asia Project Office **

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Topics:

1.   [News] Emergency Observation of Disasters
2.   How to Send an Emergency Observation Request
3.   Using the Sentinel Asia Operation System, OPTEMIS

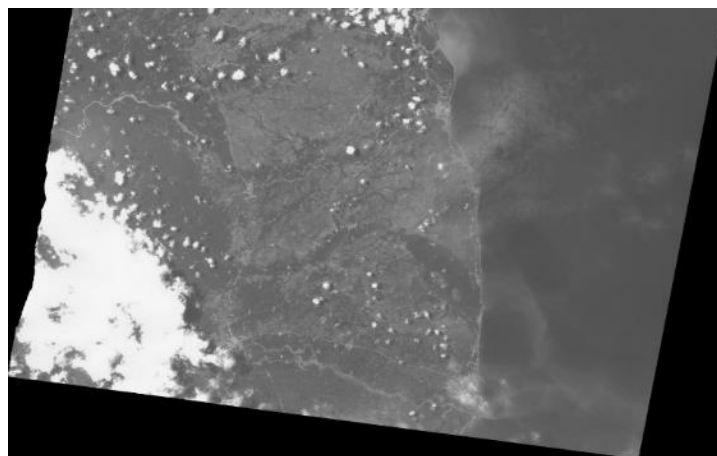- * - * - * - * - *- * - * - * - * - *- * - * - * - * - *-

1.   [News] Emergency Observation of Disasters (as of 27 April)

(1) Flood and Landslide in the Philippines on 12 April, 2022 (GLIDE Number TC-2022-000197-PHL)

Typhoon Megi (Agaton) made landfall in the Philippines on 11 April. CNN reported that 22 people died because of a landslide on Leyte island and three people were found dead on Mindanao island.
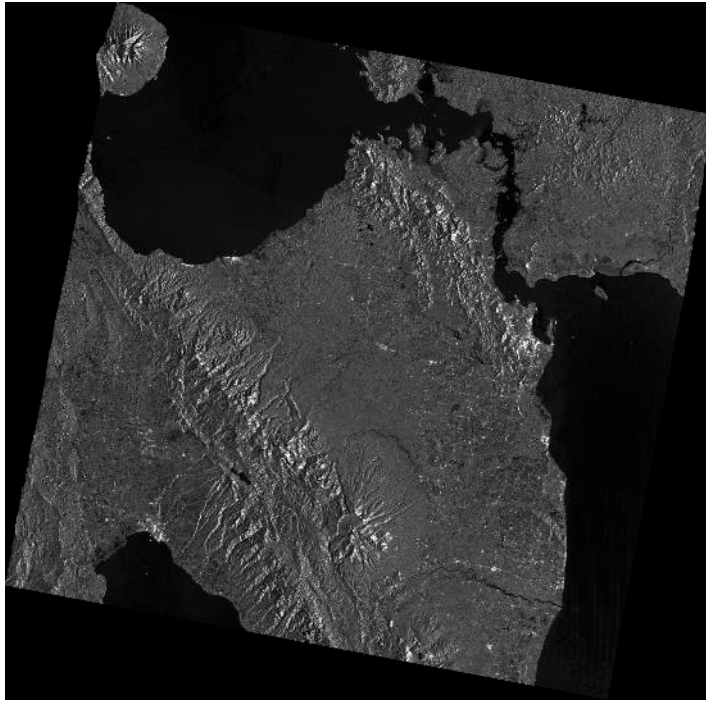
(https://edition.cnn.com/2022/04/11/asia/megi-tropical-storm-philippines-dead-intl-hnk/index.html)

Manila Observatory (MO) made an Emergency Observation Request (EOR) to Sentinel Asia on 12 April. Among Data Provider Nodes (DPNs), the Japan Aerospace Exploration Agency (JAXA), the Mohammed Bin Rashid Space Centre (MBRSC), Indian Space Research Organisation (ISRO), and the National Applied Research Laboratories (NARL) provided data. Among Data Analysis Nodes (DANs), MBRSC, the Earth Observatory of Singapore (EOS), and the Asian Institute of Technology (AIT) provided their VAPs. Information on the latest response by Sentinel Asia is available at the following link:
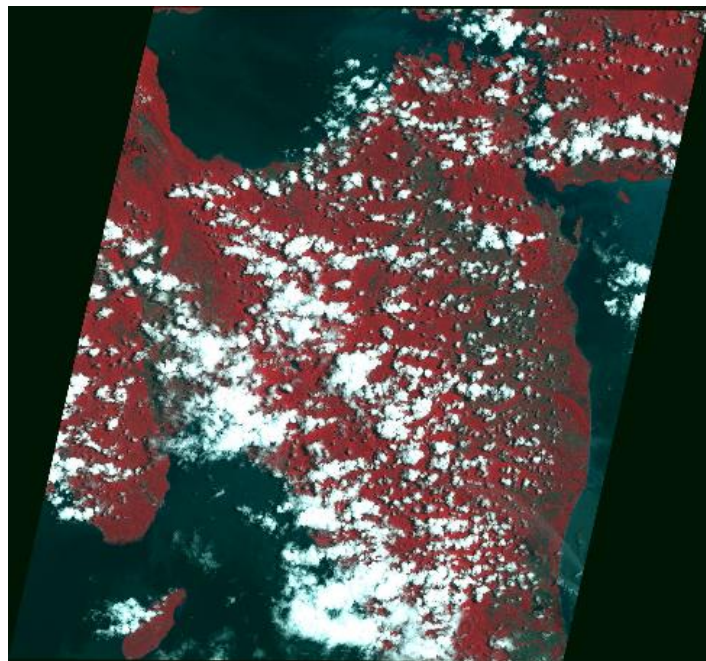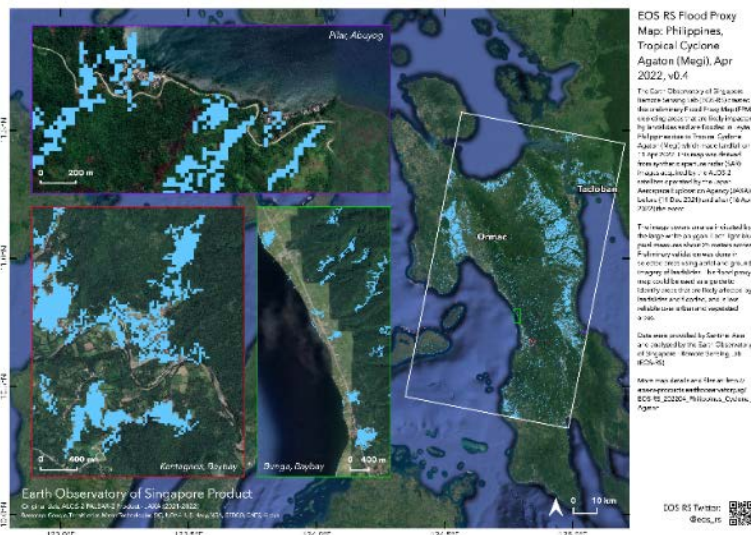https://sentinel-asia.org/EO/2022/article20220224TH.html



Satellite image (FORMOSAT-5) provided by NARL
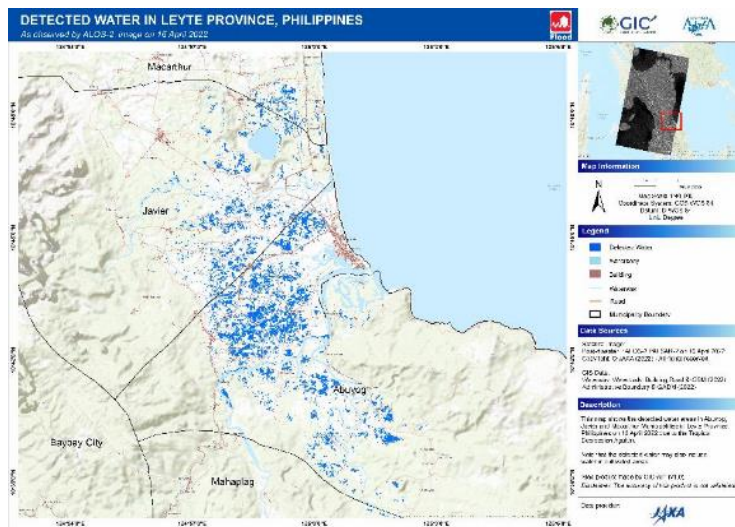
Satellite image (ALOS-2) provided by JAXA



Satellite image (Resourcesat-2a) provided by ISRO

Value-Added Product by EOS



Value-Added Product by MBRSC



Value-Added Product by AIT

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## 3. Using Sentinel Asia Operation System, OPTEMIS

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** May 2022 News from Sentinel Asia Project Office **

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Topics:

1.  [News] Emergency Observation of Disasters
2.  [Interview] Prof. Dr. M. Rokhis Khomarudin, Research Professor of the Remote Sensing Research Center, Research Organization of Aeronautics and Space (ORPA), Indonesia
3.  How to Send an Emergency Observation Request
4.  Using the Sentinel Asia Operation System, OPTEMIS

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1.  [News] Emergency Observation of Disasters (as of 30 May)

    (1) Flood in India on 15 May, 2022 (GLIDE Number FL-2022-000213-IND)

    Heavy rain triggered floods in Assam and neighboring states. According to CNN, 10 people were killed and more than 700,000 were affected by 19 May.

    (https://edition.cnn.com/2022/05/18/india/assam-india-rain-flooding-intl-hnk/index.html)

    The Indian Space Research Organisation (ISRO) made an Emergency Observation Request (EOR) to Sentinel Asia on 20 May. Among Data Provider Nodes (DPNs), the National Applied Research Laboratories (NARL) and the Japan Aerospace Exploration Agency (JAXA) provided data. Among Data Analysis Nodes (DANs), the Asian Institute of Technology (AIT), the Mohammed Bin Rashid Space Centre (MBRSC), and the Earth Observatory of Singapore (EOS) provided their VAPs. Information on the latest response by Sentinel Asia is available at the following link:

    https://sentinel-asia.org/EO/2022/article20220515IN.html
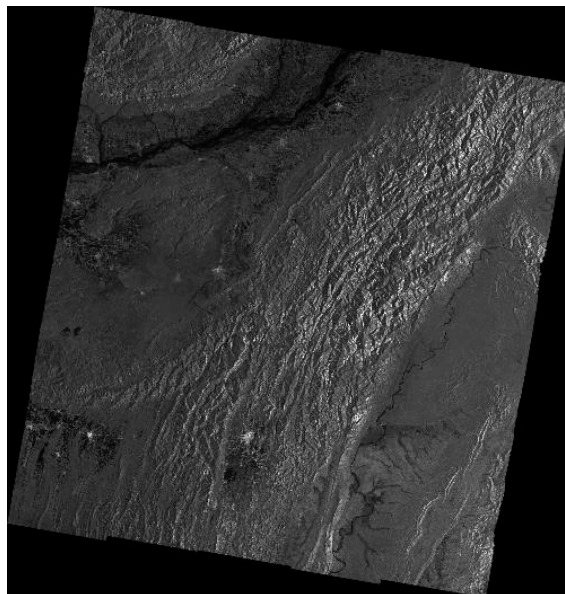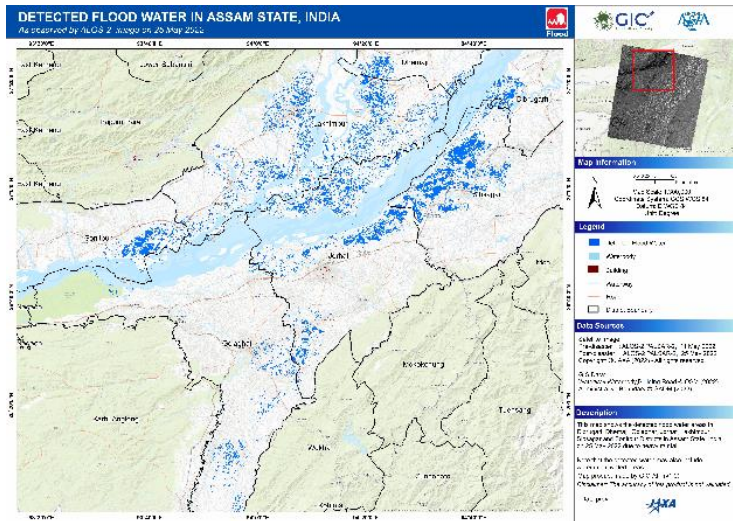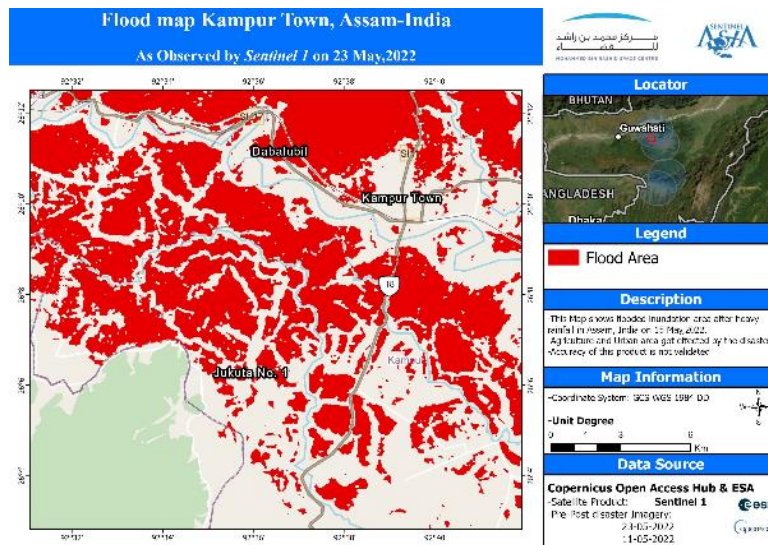


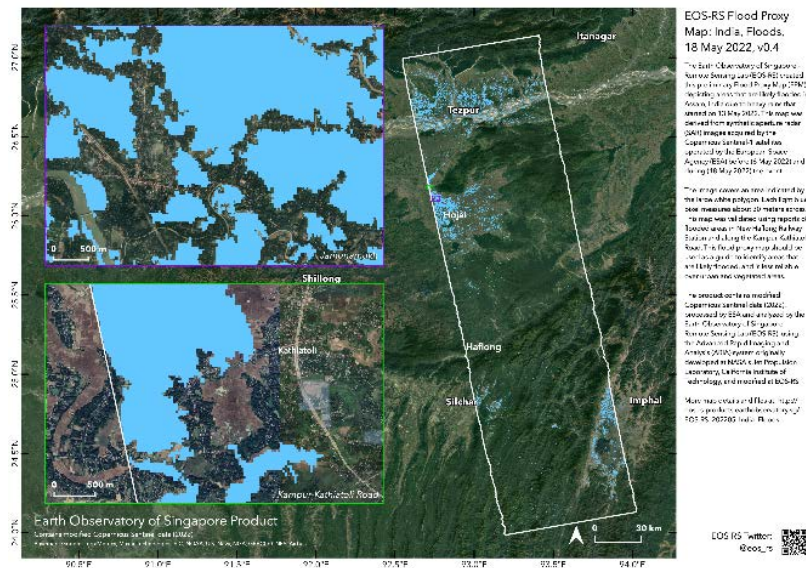Satellite image (ALOS-2) provided by JAXA
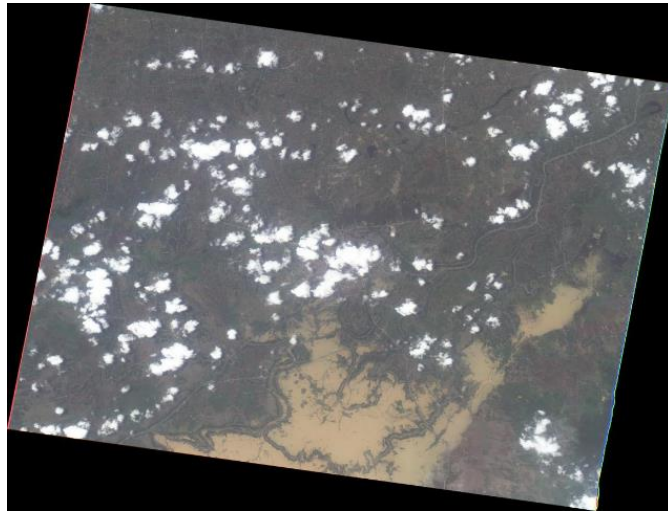
Satellite image (FORMOSAT-5) provided by NARL



Value-Added Product by AIT



Value-Added Product by MBRSC

Value-Added Product by EOS

(2) Coastal Flood in Indonesia on 23 May, 2022 (GLIDE Number SS-2022-000219-IDN)
A tidal wave hit the northern coast of Central Java, Indonesia, and caused coastal floods on 23 May. According to Antara News, wide areas on the northern coast were affected.
(https://en.antaranews.com/news/231369/panturas-most-areas-affected-by-coastal-flooding-tidal-waves-bnpb)

The Institute of Technology Bandung (ITB) made an Emergency Observation Request (EOR) to Sentinel Asia on 27 May. Information on the latest response by Sentinel Asia is available at the following link:
https://sentinel-asia.org/EO/2022/article20220523ID.html

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2. [Interview] Prof. Dr. M. Rokhis Khomarudin, Research Professor of the Remote Sensing Research Center, Research Organization of Aeronautics and Space (ORPA), Indonesia

The Indonesian National Institute of Aeronautics and Space (LAPAN) is a long-time member of Sentinel Asia and Indonesia is one of the countries sending Emergency Observation Requests (EORs) to Sentinel Asia most frequently. It underwent a restructuring of governmental agencies and institutions for research and innovation in 2021. Prof. Dr. M. Rokhis Khomarudin talks about this as well as the use of space technology for monitoring disasters and climate change in response to the Sentinel Asia Secretariat.

Prof. Dr. M. Rokhis Khomarudin
Research Professor of the Remote Sensing Research Center
Research Organization of Aeronautics and Space (ORPA),
National Research and Innovation Agency (BRIN), Indonesia

*Sentinel Asia Secretariat*
First, could you tell us about your organization's recent restructuring? We heard that many research institutions have been combined under the National Research and Innovation Agency (BRIN). What is your current organization exactly? And what is different from the past LAPAN as an individual agency? We also would like to know if there is any change in your position with respect to Sentinel Asia.

*Prof. Dr. M. Rokhis Khomarudin*
In 2021, Indonesia decided to merge all research institutes in Indonesia, not only LAPAN but also other research and technology institutes, such as the Ministry of Research and Technology (RISTEK), BPPT (Agency for the Assessment and Application of Technology Indonesia), LIPI (Indonesian Institute of Sciences), and BATAN (National Nuclear Energy Agency of Indonesia), into one institute, the National Research and Innovation Agency, and we call it BRIN. For example, even a research institute under the Ministry of Agriculture was integrated into BRIN. It is a really big organization. LAPAN itself became one of the research organizations under BRIN and now is called the Research Organization of Aeronautics and Space (ORPA). We still work as a space agency the same as before, but BRIN also created the Secretariat of the Indonesian Space Agency (INASA) to handle international collaboration activities with other space agencies of the world. They have several other duties, such as public service, relations, and cooperation first, and then the duties are handed over to other centers.

Under this new structure, the INASA will be the focal point for the Asia-Pacific Regional Space Agency Forum (APRSAF), and INASA will handle administrative matters for Sentinel Asia, but technically the Remote Sensing Research Center of ORPA will continue to support Sentinel Asia.

For additional information, under BRIN, we have 12 research organizations with 85 research centers. ORPA itself has five research centers, which are the Space Research Center, the Rocket Technology Research Center, the Aerospace Research Center, the Satellite Research Center, and the Remote Sensing Research Center. More than 15,000 people work for BRIN. Now, my position is a research scientist at the Remote Sensing Research Center who focuses on research activities in the field of remote sensing, especially on remote sensing methodology development.

***Sentinel Asia Secretariat***
We think ORPA (formerly LAPAN) will contribute to innovation in your country through your space activities as an agency under BRIN. Is disaster management using space technology included part of that scheme? Do you have any concrete policies/plans in this regard? Please tell us about the role and activities of ORPA on the point of "Space and Disaster Management."

***Prof. Dr. M. Rokhis Khomarudin***
The business process is still under discussion regarding the activities because, as I already mentioned, we have two organizations under BRIN and have not decided yet which organization should take care of specific businesses. However, ORPA has some research on how to use remote sensing for disaster management under the Remote Sensing Research Center. The center has three research programs. The first is related to technology and data and they handle data as input for all remote sensing activities. The second is method development for image processing. The last is platform development. I am responsible for the second one and we have three groups under the program. The first one is related to land resources for agriculture, forestry, mining, etc. The second group is related to disasters and this group will take care of disaster-related issues. The third group is related to marine and fisheries research.

I am sure that ORPA and INASA will continue to contribute to space innovation activities, including disaster management using space technology, and under BRIN, the activities will become stronger because it can involve more of BRIN's resources.

***Sentinel Asia Secretariat***
We appreciate your contribution to Sentinel Asia. The number of EORs from Indonesia is the largest. We think Sentinel Asia is efficiently used in your country. Could you introduce some EORs and other Sentinel Asia activities that made an impression on you?

***Prof. Dr. M. Rokhis Khomarudin***
First of all, I would like to say thank you for your support in providing remote sensing data for disaster emergency response in Indonesia.

Indonesia has suffered various types of disasters such as volcanic eruptions, storms, and tsunamis. So, the emergency observations by the Sentinel Asia satellite fleet are very useful for us for disaster emergency response. One example is flooding in Sulawesi in July 2020 (https://sentinel-asia.org/EO/2020/article20200716ID.html). Around 5,000 households across six districts were affected by this disaster. We sent an EOR to Sentinel Asia and received satellite data from five agencies (CRISP, GISTDA, ISRO, JAXA, NARL) and value-added products (VAPs) from two agencies of Sentinel Asia (AIT and MBRSC). In addition, this EOR was escalated to the International Disasters Charter to have more satellite data, and AIT provided a project manager for this Charter activation. LAPAN itself produced many VAPs, with the data obtained from the Charter satellites as part of Sentinel Asia's escalation.

My impression through Sentinel Asia is to collaborate and work with other people in other institutes, in other words, networking. Sentinel Asia joint project team (JPT) members are given the opportunity to participate in regular meetings such as JPT meetings and capacity-building events such as training workshops and webinars organized by and for JPT members. Also, Data Analysis Nodes (DAN) of Sentinel Asia are very important for us because we sometimes find difficulties processing the data, but Sentinel Asia provide us with support through DANs.

Another important thing for us is the mechanism of "Sentinel Asia Escalation to the Charter." Through this mechanism, we can escalate activations of Sentinel Asia to the International Disasters

Charter (IDC). If no data from Sentinel Asia is available or additional data other than data from Sentinel Asia constellation satellite are desirable, then IDC can support us as well. What is significant and beneficial is that in the case of Sentinel Asia escalation, the Sentinel Asia community provides its total support, conducting the production of VAPs, in terms of roles and responsibilities in the context of IDC, which is also a wonderful support from Sentinel Asia.

***Sentinel Asia Secretariat***
Sentinel Asia's contributions are recognized as a solution to socioeconomic issues under APRSAF's Nagoya Vision. Could you tell us how Sentinel Asia is/will be used as such a solution in Indonesia? Please also advise us regarding what you expect for Sentinel Asia and how you intend to contribute to it.

***Prof. Dr. M. Rokhis Khomarudin***
I also think remote sensing in general will be able to support socioeconomic issues; for example, SDGs, especially SDG 2 (Zero Hunger), SDG 6 (Clean Water and Sanitation), SDG 11 (Sustainable Cities and Communities), SDG 13 (Climate Action), and SDG 14 (Life Below Water). There are still challenges to apply remote sensing, but we have collaborated with the United Nations Climate Change conference (COP) to detect slum areas. Disaster management is, too, one of the big socioeconomic issues and Sentinel Asia can support our disaster management activities with emergency response to disasters and can reduce the impact of the disasters and accelerate the rehabilitation process. This is realized in Sentinel Asia Step 3.

***Sentinel Asia Secretariat***
Speaking of SDG 13 (Climate Action) that you mentioned, disaster management is a climate change-related activity. Does Indonesia conduct disaster management activities in this context? If so, please tell us about your activities and plans.

***Prof. Dr. M. Rokhis Khomarudin***
Climate change and disaster management is important to study, especially using remote sensing. Under the second program I mentioned in the previous question, I conduct research on the prediction of Jakarta sinking* by 2030. Remote sensing supports land use/cover change, land subsidence, coastal change, and deforestation. We use not only climate data but also sea surface data to predict the future condition. Through modelling, we can estimate Jakarta's condition in 2030. I think remote sensing can support such climate applications.

*Note: The surface level of the capital city of Indonesia is subsiding because of the high rate of the use of groundwater while the sea surface rises with the effects of climate change.

***Sentinel Asia Secretariat***
LAPAN developed several of its own satellites and LAPAN-A4 will be launched soon. What are the details of this satellite? Could Sentinel Asia expect the data provision of LAPAN-A4 and/or possibly its future follow-on missions?

***Prof. Dr. M. Rokhis Khomarudin***
We hope that LAPAN-A4 will be launched this year and we will continue to develop satellites. LAPAN-A4 is an experimental satellite. It will not operate on its own, but will be used in combination with LAPAN-A1 to A3. The satellite continues the mission from LAPAN-A3 and will be used to monitor earth surface conditions with AIS and magnetometer sensors. Its sensor is optical, with red, green, blue, and infrared, and the resolution will be 4 meters. Regarding data sharing,

further discussion is needed, but I think it would be possible to share, especially on disaster emergency response for research purposes, and I will make efforts to make this possible.


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3. How to send an Emergency Observation Request

JPT member organizations are entitled to send an Emergency Observation Request (EOR) for disasters in the Asia-Pacific region. Please refer to https://sentinel-asia.org/e-learning/Emergency_Observation_Request.html.

EOR Order Desk:
Asian Disaster Reduction Center (ADRC)
HP: http://www.adrc.asia/
E-mail: sarequest@adrc.asia
FAX: +81-78-262-5546,
TEL: +81-78-262-5540


- \* - \* - \* - \* - \*- \* - \* - \* - \* - \* - \*- \* - \* - \* - \* - \* - \*-

4. Using Sentinel Asia Operation System, OPTEMIS

Sentinel Asia launched a new operation system, OPTEMIS. Please refer to the website on how to create an account for OPTEMIS. https://sentinel-asia.org/e-learning/Emergency_Observation_Request.html


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Satellite Applications and Operations Center (SAOC)
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** June 2022 News from Sentinel Asia Project Office **

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Topics:

1.  [News] Emergency Observation of Disasters
2.  [News] Sentinel Asia Web-GIS has been updated!
3.  How to Send an Emergency Observation Request
4.  Using the Sentinel Asia Operation System, OPTEMIS

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1.  [News] Emergency Observation of Disasters (as of 29 June)

    (1) Coastal Flood in Indonesia on 23 May, 2022 (GLIDE Number SS-2022-000219-IDN)

    A tidal wave hit the northern coast of Central Java, Indonesia, and caused coastal flooding on 23 May. According to Antara News, wide areas on the northern coast were affected. (https://en.antaranews.com/news/231369/panturas-most-areas-affected-by-coastal-floodingtidal-waves-bnpb)

    The Institute of Technology Bandung (ITB) made an Emergency Observation Request (EOR) to Sentinel Asia on 27 May. Among Data Provider Nodes (DPNs), the National Applied Research Laboratories (NARL), the Indian Space Research Organisation (ISRO), and the Japan Aerospace Exploration Agency (JAXA) provided data. Among Data Analysis Nodes (DANs), the Asian Institute of Technology (AIT), the Mohammed Bin Rashid Space Centre (MBRSC), and the Earth Observatory of Singapore (EOS) provided their VAPs. Information on the latest response by Sentinel Asia is available at the following link:

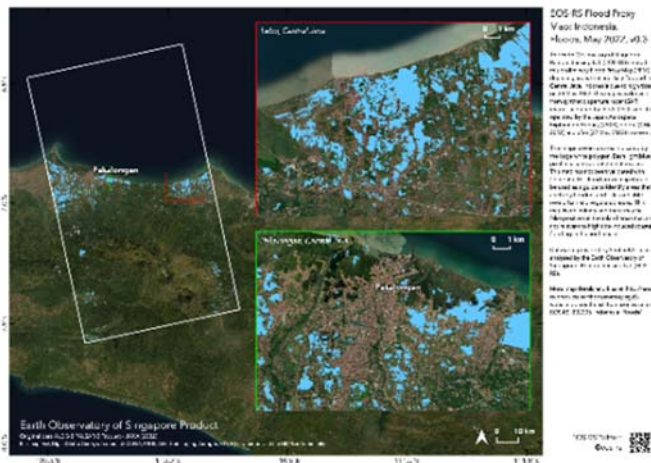    https://sentinel-asia.org/EO/2022/article20220523ID.html



Satellite image (FORMOSAT-5) provided by NARL
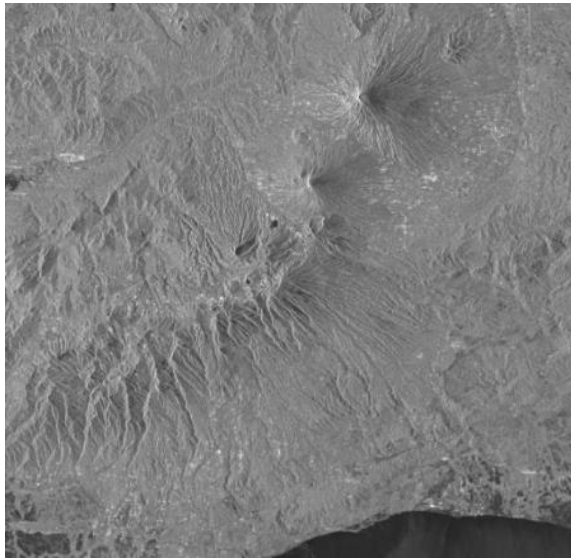
Satellite image (ALOS-2) provided by JAXA
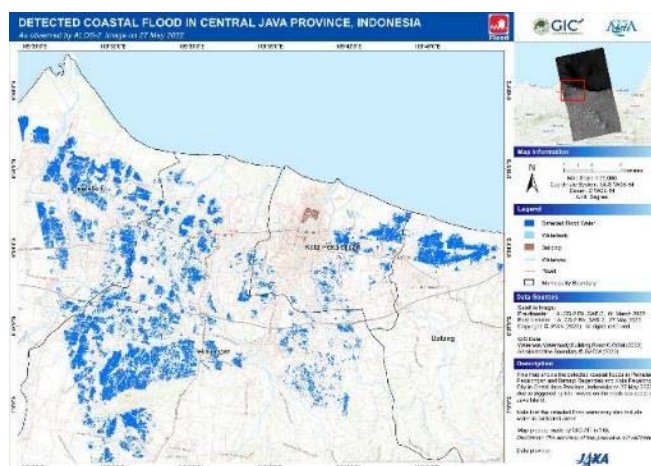


Satellite image (Resourcesat-2a) provided by ISRO



Value-Added Product by EOS

Value-Added Product by MBRSC


Value-Added Product by AIT

(2) Volcano eruption in the Philippines on 5 June, 2022 (GLIDE Number VO-2022-000227-PHL)

On 5 June, Mount Bulusan in the Philippines erupted, followed by another eruption on the 12th. The volcano emitted plumes and ash, according to GMA News.
(https://www.gmanetwork.com/news/scitech/science/834947/10-volcanic-quakes-recorded-in-bulusan-volcano-alert-level-1-remains/story/)

The Philippine Institute of Volcanology and Seismology (PHIVOLCS) made an EOR to Sentinel Asia on 13 June. This EOR was escalated to the International Disasters Charter. PHIVOLCS assumed the role of Project Manager for this Charter activation. Among DPNs, JAXA, ISRO, NARL, and the Geo-Informatics and Space Technology Development Agency (GISTDA) provided data. Among DANs, MBRSC provided their VAPs. Information on the latest response by Sentinel Asia is available at the following link:
https://sentinel-asia.org/EO/2022/article20220605PH.html
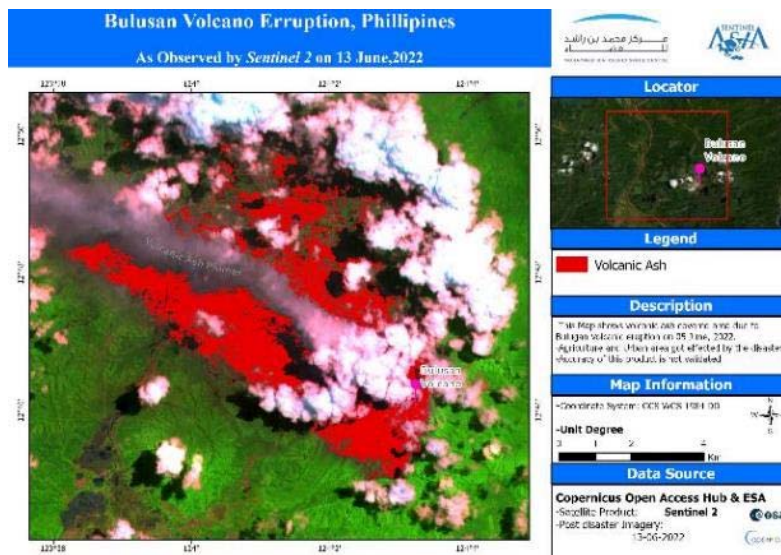
Satellite image (ALOS-2) provided by JAXA


Satellite image (Resourcesat-2a) provided by ISRO
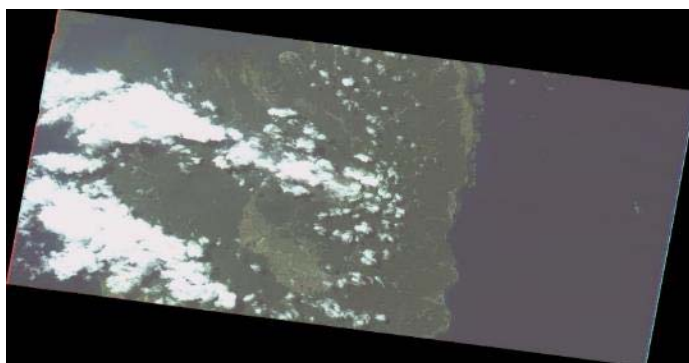

Satellite image (FORMOSAT-5) provided by NARL

Satellite image (THEOS-1) provided by GISTDA
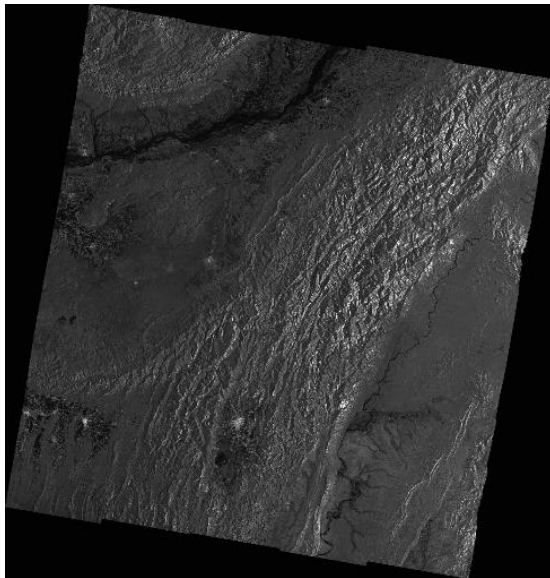

Value-Added Product by MBRSC

(3) Flood in India on 15 June, 2022 (GLIDE Number FL-2022-000213-IND)

Heavy rain continued in Assam, India, and caused massive flooding. According to The Hindu, nearly 2 million people were affected by 18 June.
(https://en.antaranews.com/news/231369/panturas-most-areas-affected-by-coastal-floodingtidal-waves-bnpb)

ISRO made an EOR to Sentinel Asia on 21 June. Among DPNs, JAXA and GISTDA provided data. In addition, NARL planned to provide its data. Among DANs, EOS, ISRO, MBRSC, and AIT provided their VAPs. Information on the latest response by Sentinel Asia is available at the following link:
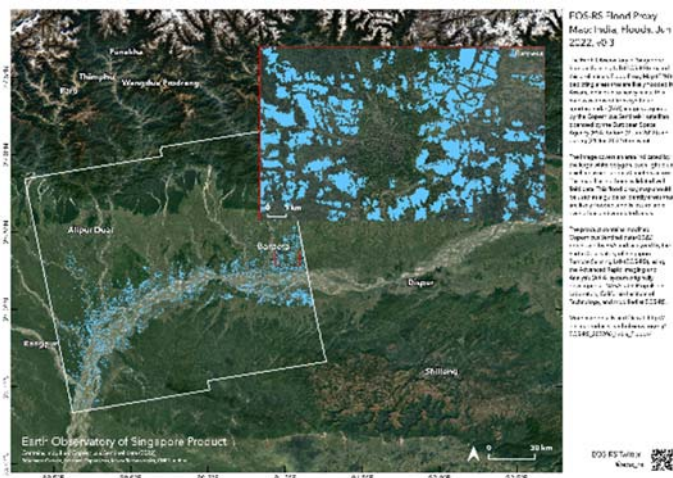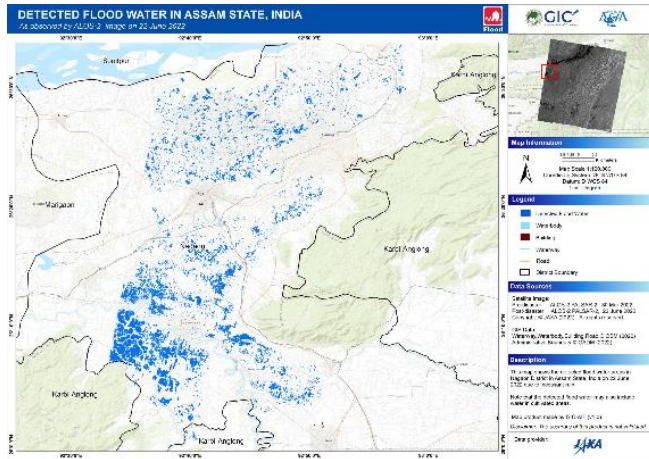https://sentinel-asia.org/EO/2022/article20220615IN.html

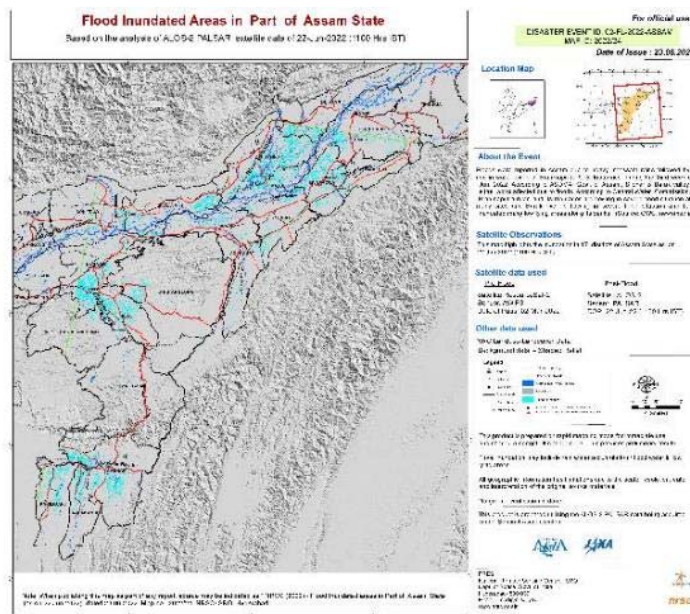Satellite image (ALOS-2) provided by JAXA
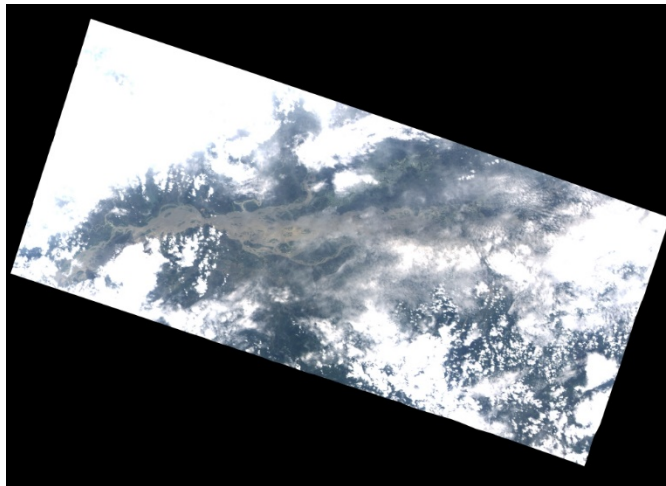

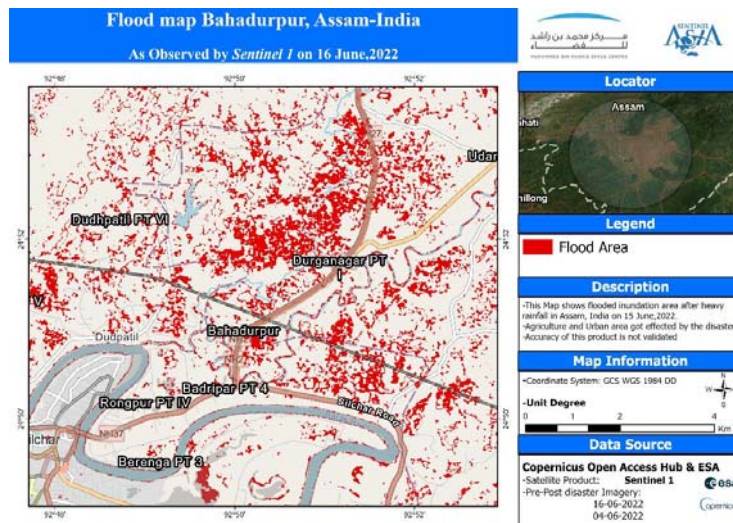Satellite image (THEOS-1) provided by GISTDA


Value-Added Product by EOS

Value-Added Product by AIT


Value-Added Product by ISRO
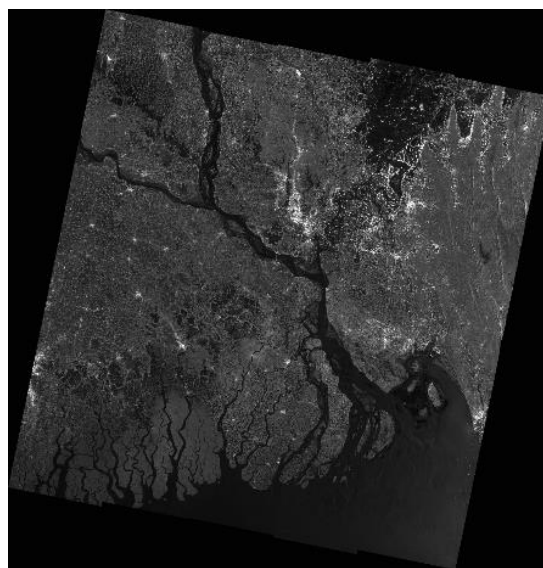

Value-Added Product by MBRSC

(4) Flood in Bangladesh on 18 June, 2022 (GLIDE Number FL-2022-000217-BGD)
The rain also caused flooding in Bangladesh. According to ReliefWeb, around 4 million people (about 40 per cent children) have been affected by the flash flooding in Sylhet Division. (https://reliefweb.int/report/bangladesh/bangladesh-country-office-humanitarian-situation-report-no-2-north-eastern-flash-flood-19-june-2022)

The Department of Disaster Management (DDM) of Bangladesh made an EOR to Sentinel Asia on 24 June. Among DPNs, JAXA provided data. In addition, GISTDA planned to provide its data. Among DANs, AIT provided their VAPs. Information on the latest response by Sentinel Asia is available at the following link:
https://sentinel-asia.org/EO/2022/article20220618BD.html


Satellite image (ALOS-2) provided by JAXA
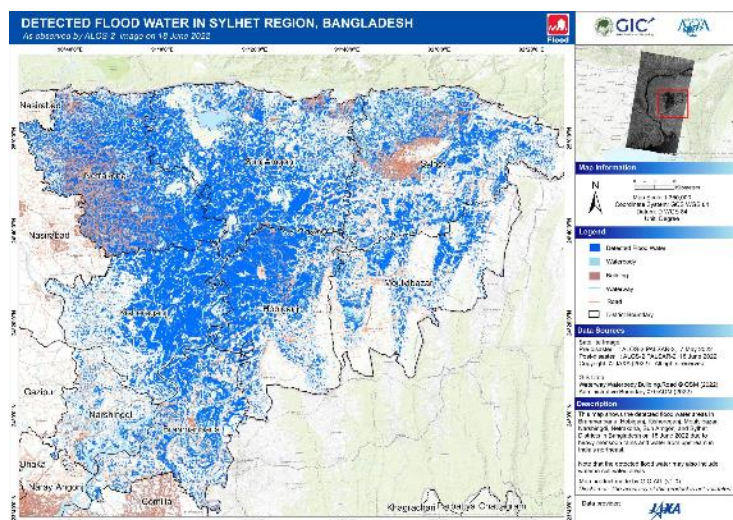

Value-Added Product by AIT

(5) Earthquake in Afghanistan on 22 June, 2022 (GLIDE Number EQ-2022-000232-AFG)
A magnitude 5.9 earthquake hit Afghanistan on 22 June. According to CNN, at least 1,000

people were killed, 2,000 injured, and 10,000 homes destroyed.
(https://edition.cnn.com/2022/06/26/world/afghanistan-disease-outbreak-earthquake-survivors-intl-hnk/index.html)

International Centre for Integrated Mountain Development (ICIMOD) made an EOR to Sentinel Asia on 27 June. Among DPNs, JAXA and ISRO provided data. In addition, NARL planned to provide its data. Among DANs, EOS provided their VAPs. Information on the latest response by Sentinel Asia is available at the following link:
https://sentinel-asia.org/EO/2022/article20220622AF.html
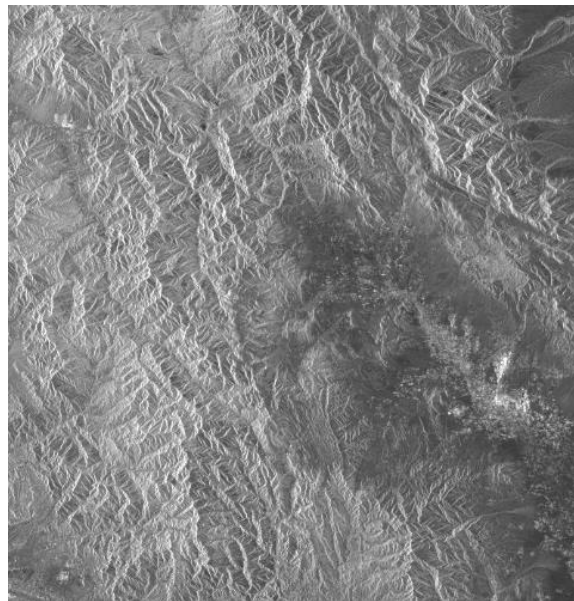


Satellite image (ALOS-2) provided by JAXA



Satellite image (CARTOSAT-2E) provided by ISRO

Value-Added Product by EOS


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2. [News] Sentinel Asia Web-GIS has been updated!

By Yuki TAKAKURA (Sentinel Asia Secretariat / JAXA)
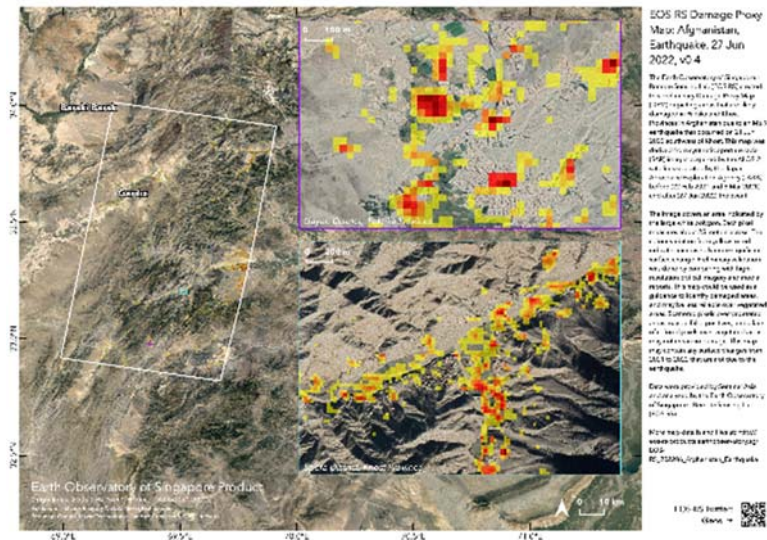
### About Sentinel Asia Web-GIS

Web-GIS is a web-based tool for easy browsing of satellite observation data or processed products with your own web browser, requiring only an internet connection. Sentinel Asia Secretariat launched the Web-GIS service for its Joint Project Team (JPT) members in November 2019 and continues to operate the service. When we receive Emergency Observation Requests (EORs), most of the satellite observation data from Data Provider Node (DPN) and all the processed products from Data Analysis Node (DAN) are displayed on Web-GIS. This service has been developed primarily for the benefit of visitors who are not accustomed to satellite imageries or who want to brows Sentinel Asia data at a glance.

### Web-GIS has been updated!

The secretariat updated the Web-GIS page in December 2021. A sample page of the new Web-GIS is shown below. Please access the page and check the content for yourself.

【NEW Web-GIS URL】
■Flood, Landslide in Timor-Leste on 4 April, 2021
https://storymaps.arcgis.com/collections/0ff1606cecda47de8abbfe7ebeb13a78?item=1

[ID] SA_USER5
[PW] questionnaire2021
*Internet Explorer (IE) is not recommended.
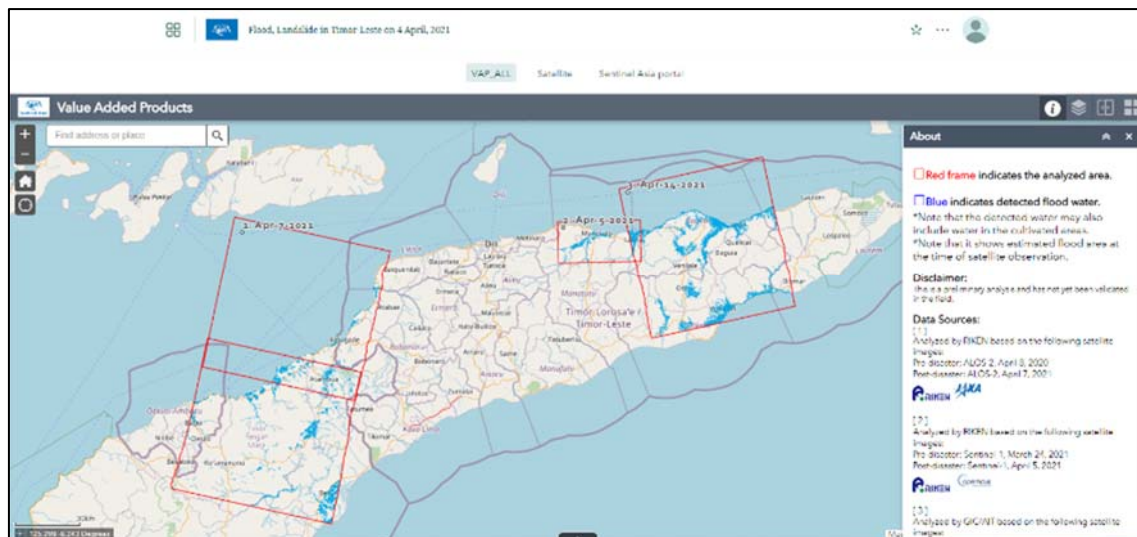
Sample of new Web-GIS page

## Updated contents

1. Summarizing the information on the page

You can change the information being displayed simply by clicking the tabs at the top of the page. The previous version had many tabs showing the data provider organizations. In this updated version, only three tabs are displayed.

When you click the "VAP_ALL" tab on the left, all the Value-Added Products (VAPs) provided by the member organizations are displayed (this is the default status). Clicking the "Satellite" tab in the center, you will see all the satellite observation data provided. For the "Sentinel Asia portal" tab in the right, you will see the page linked to the Sentinel Asia's Emergency Observation Request (EOR). (Please note that an "ALOS-2 RGB composite" tab may also be added in some cases.)
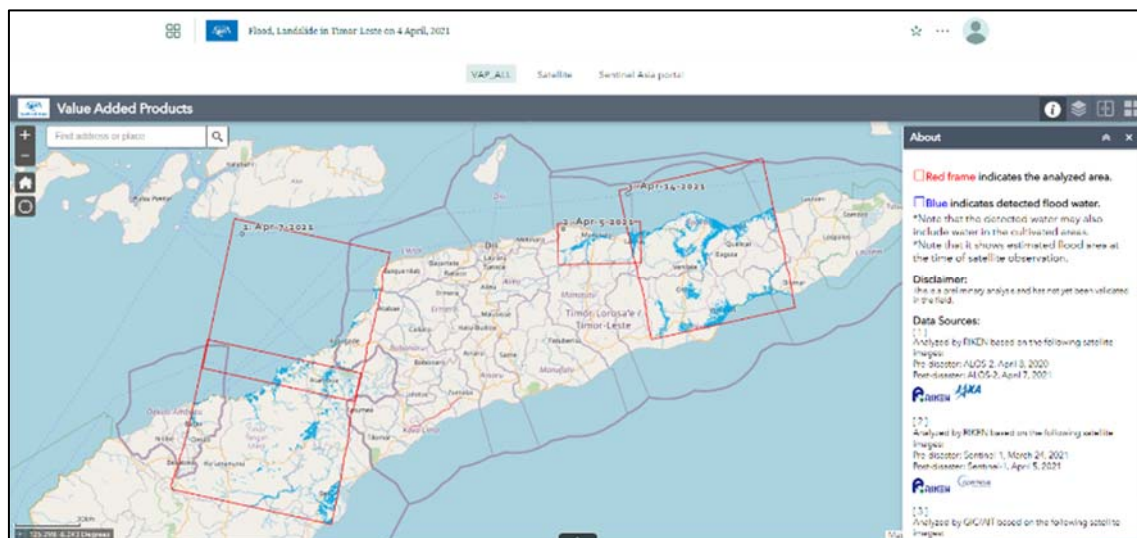


Similar information is now compiled in a single tab to summarize the information, enabling the user to easily compare multiple VAPs and observation data. This also ensures that pages are loaded more quickly when transferring the tabs, guaranteeing a stress-free experience.

2. Simpler with fewer Widgets

Widgets are located in the upper-right section. The previous version displayed many widgets, some of which were not frequently used. This updated version has a simpler presentation, showing only four very useful widgets. The functions of the new widgets are as follows.

· About: Shows a summary of the information displayed.
· Layer List: Selects the information to be displayed.
· Swipe: Enables to hide the information displayed at the top and compare it with the information below it.
· Basemap Gallery: Changes the background map (default map is the Open Street Map).
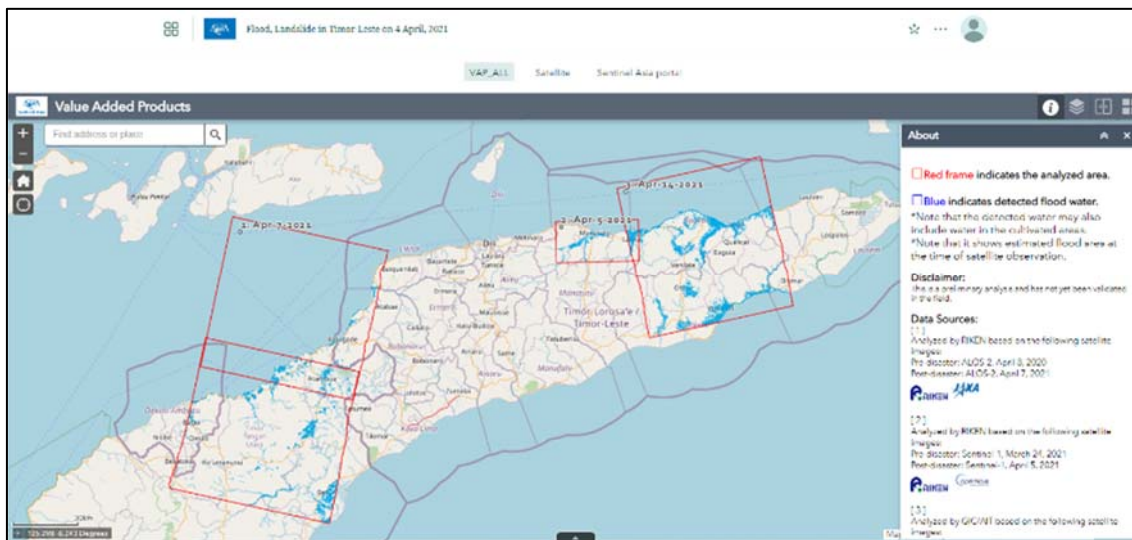


3. Displaying the analysis area of VAPs

The previous version did not display the analysis area of the VAPs. However, the new version shows the analysis area of the VAPs inside a red frame, so when you see that there is no confirmation of damage within the area, this makes it easier to understand that the area is not damaged.

**Questionnaire feedback from Sentinel Asia members**

In January 2022, the Secretariat conducted a questionnaire on the updated version of Web-GIS to obtain feedback from Sentinel Asia members. We appreciate the cooperation of the 18 members who responded. All of the respondents stated that they prefer the updated version and are satisfied with it.



Results of the questionnaire (based on 18 replies)

Here is some of the feedback:
・Very helpful tool for requestor and other JPT members!!
・We are very thankful for the membership.

**Conclusion**

Sentinel Asia Web-GIS will continue to be improved for the benefit of the members. If you have any requests or suggestions for improvements, please do not hesitate to contact the Secretariat.


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3. How to send an Emergency Observation Request

JPT member organizations are entitled to send an Emergency Observation Request (EOR) for disasters in the Asia-Pacific region. Please refer to https://sentinel-asia.org/e-learning/Emergency_Observation_Request.html.


EOR Order Desk:
Asian Disaster Reduction Center (ADRC)
HP: http://www.adrc.asia/
E-mail: sarequest@adrc.asia
FAX: +81-78-262-5546,
TEL: +81-78-262-5540




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4. Using Sentinel Asia Operation System, OPTEMIS

Sentinel Asia launched a new operation system, OPTEMIS. Please refer to the website on how to create an account for OPTEMIS. https://sentinel-asia.org/e-learning/Emergency_Observation_Request.html


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** July 2022 News from Sentinel Asia Project Office **

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Topics:

1. [News] Emergency Observation of Disasters
2. How to Send an Emergency Observation Request
3. Using the Sentinel Asia Operation System, OPTEMIS

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1. [News] Emergency Observation of Disasters (as of 25 July)

   (1) Flood, Landslide and Storm in Vietnam 7 July, 2022 (GLIDE Number FF-2022-000259-VNM)

   A flash flood triggered by heavy rains occurred in Cao Bang Province, a northern area of Vietnam near the border with China, on 7 July. According to VnExpress, four people were swept away.
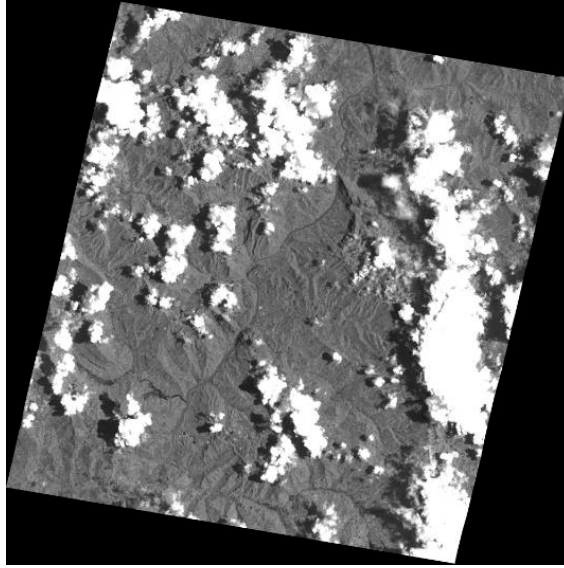
   (https://e.vnexpress.net/news/news/flash-floods-sweep-away-4-in-northern-vietnam-4484240.html)

   The Ministry of Natural Resources and Environment (MONRE) of Vietnam made an Emergency Observation Request (EOR) to Sentinel Asia on 7 July. Among Data Provider Nodes (DPNs), the Indian Space Research Organisation (ISRO), the Geo-Informatics and Space Technology Development Agency (GISTDA), the Japan Aerospace Exploration Agency (JAXA), and the National Applied Research Laboratories (NARL) provided data. Among Data Analysis Nodes (DANs), the Mohammed Bin Rashid Space Centre (MBRSC) provided its VAPs. Information on the latest response by Sentinel Asia is available at the following link:

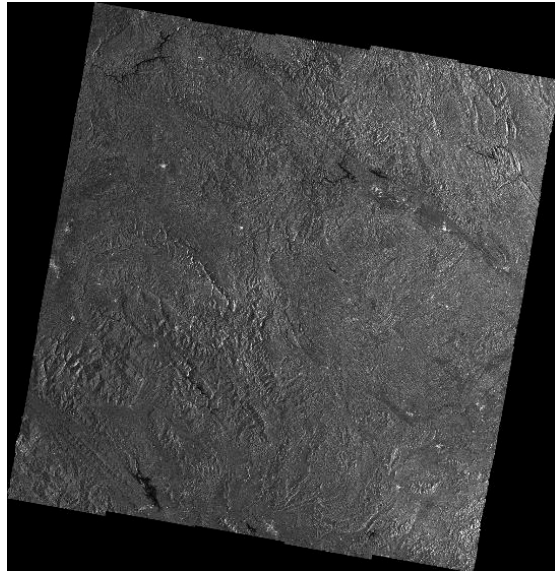   https://sentinel-asia.org/EO/2022/article20220707VN.html
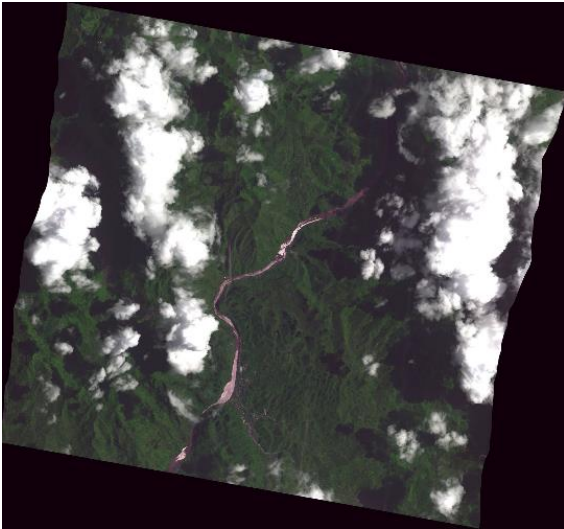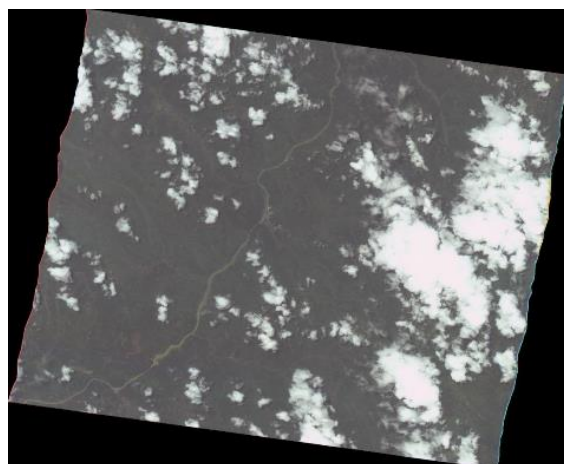
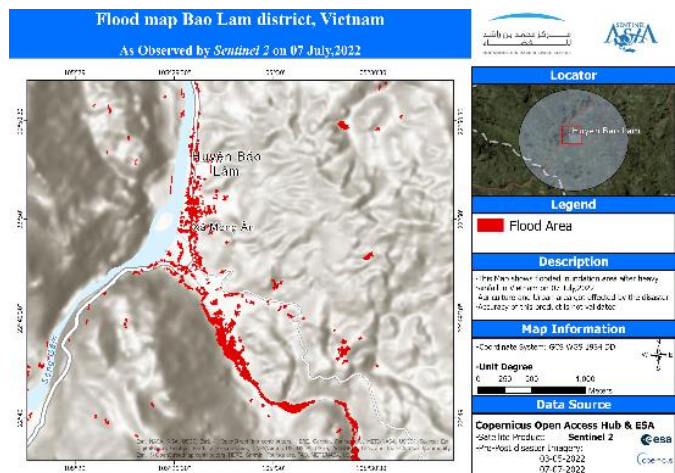

Satellite image (CARTOSAT-2E) provided by ISRO

Satellite image (THEOS1) provided by GISTDA
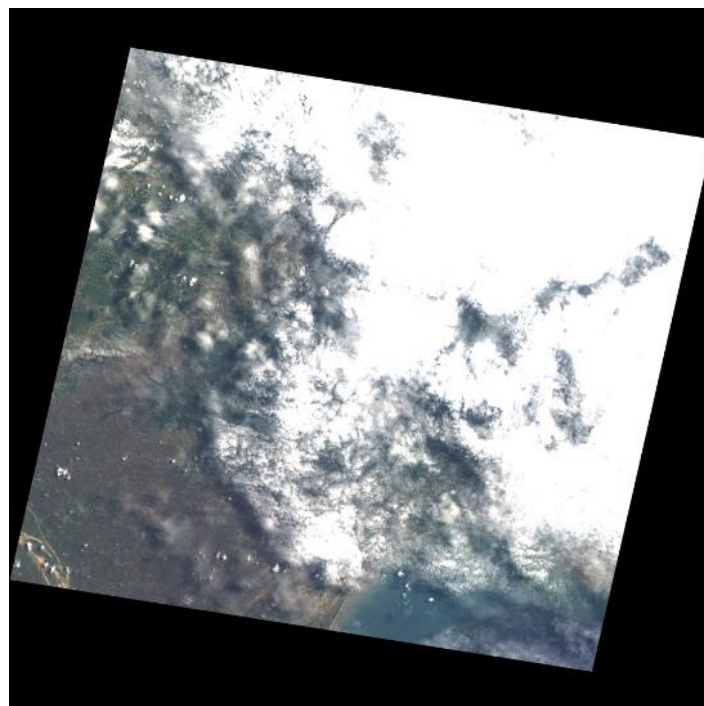


Satellite image (ALOS-2) provided by JAXA



Satellite image (FORMOSAT-5) provided by NARL

Value-Added Product by MBRSC

(2) Flood in Andhra Pradesh, India, on 12 July, 2022 (GLIDE Number FL-2022-000213-IND)
Flooding occurred around Godavari River in early July and caused severe damage in the area.
(https://www.thehindu.com/news/national/andhra-pradesh/andhra-pradesh-flood-situation-turns-grim-as-water-enters-many-habitations/article65636359.ece)

ISRO made an EOR to Sentinel Asia on 13 July. Among DPNs, GISTDA and JAXA provided data. Among DANs, Asian Institute of Technology (AIT) and MBRSC provided their VAPs. Information on the latest response by Sentinel Asia is available at the following link:
https://sentinel-asia.org/EO/2022/article20220712IN.html



Satellite image (THEOS-1) provided by GISTDA
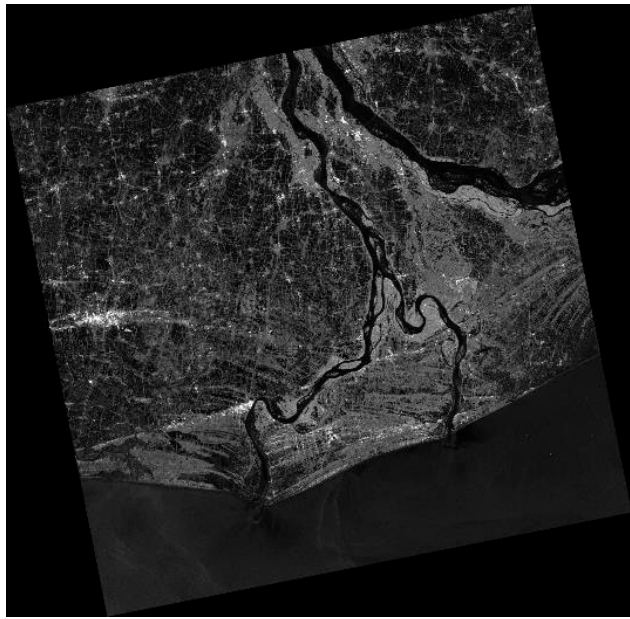
Satellite image (ALOS-2) provided by JAXA
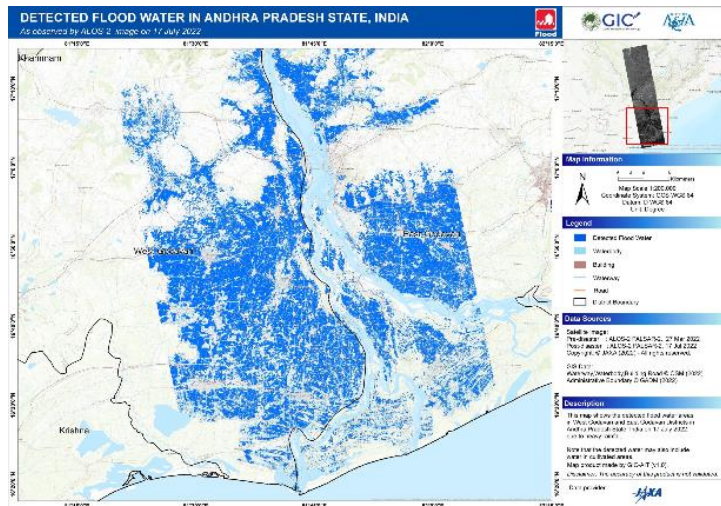

Value-Added Product by AIT
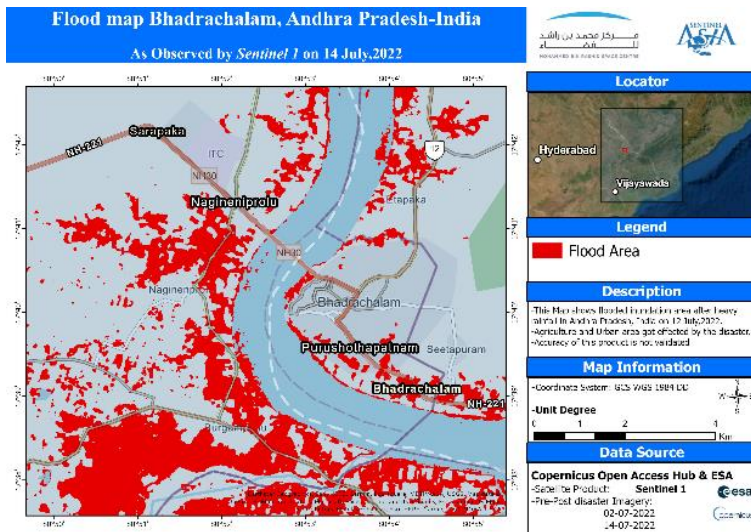

Value-Added Product by MBRSC

(3) Flood in Gujarat, India on 12 July, 2022 (GLIDE Number FL-2022-000213-IND)
Heavy rainfall caused massive flooding in Gujarat, India, in mid-July. According to The Mint, red alerts for heavy rainfall have been announced in eight districts and nearly 811 people have been rescued in the Navsari district of Gujarat in a single day.
(https://www.livemint.com/news/india/gujarat-floods-at-least-811-rescued-as-torrential-rains-hit-several-parts-of-gujarat-11658026853119.html/page-2)

ISRO made an EOR to Sentinel Asia on 13 July. Among DPNs, GISTDA and JAXA provided data. In addition, NARL planned to provide its data. Among DANs, AIT and MBRSC provided their VAPs. Information on the latest response by Sentinel Asia is available at the following link:
https://sentinel-asia.org/EO/2022/article20220713IN.html


Satellite image (THEOS-1) provided by GISTDA

Satellite image (ALOS-2) provided by JAXA


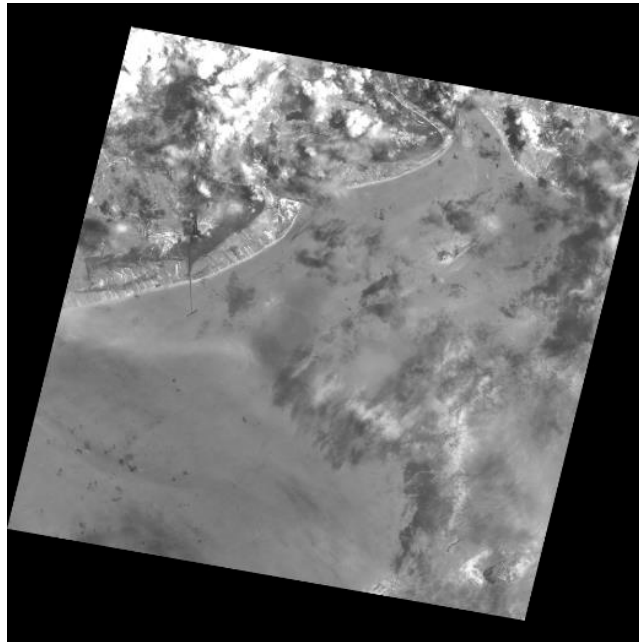
Value-Added Product by AIT



Value-Added Product by MBRSC

(4) Earthquake in the Philippines on 27 July, 2022 (GLIDE Number [EQ-2022-000273-PHL](#))

A magnitude 7 earthquake hit Northern Luzon, Philippines, on 27 July. According to CNN, the National Disaster Risk Reduction and Management Council (NDRRMC) announced that four people, two in Benguet and others in Abra and Kalinga, died.
([https://www.cnnphilippines.com/news/2022/7/27/earthquake-7.3-magnitude-Abra-Luzon.html?fbclid=IwAR11qBYdRXDgv9WhuSlLpH04CSJVg7LBsS76vZSLf6ErcHGgzXtr5tVT3x8](https://www.cnnphilippines.com/news/2022/7/27/earthquake-7.3-magnitude-Abra-Luzon.html?fbclid=IwAR11qBYdRXDgv9WhuSlLpH04CSJVg7LBsS76vZSLf6ErcHGgzXtr5tVT3x8))

The Philippine Institute of Volcanology and Seismology (PHIVOLCS) made an EOR to Sentinel Asia on 27 July. This EOR was escalated to the International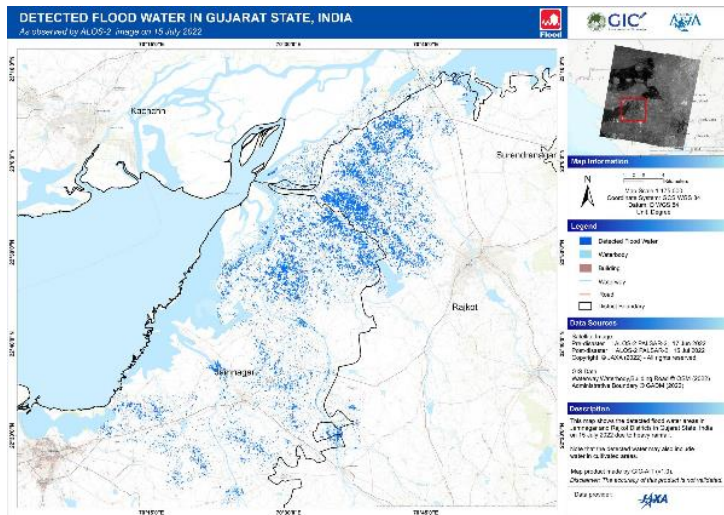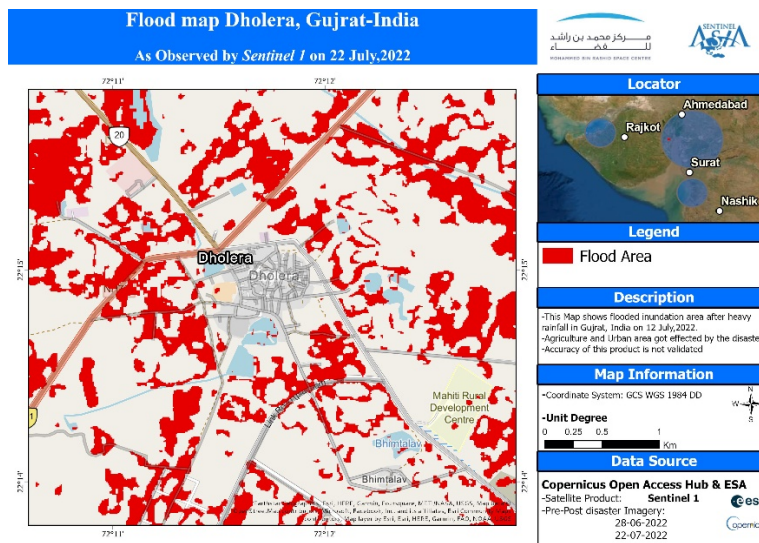 Disasters Charter. PHIVOLCS assumed the role of Project Manager for this Charter activation. Information on the latest response by Sentinel Asia is available at the following link:
[https://sentinel-asia.org/EO/2022/article20220727PH.html](https://sentinel-asia.org/EO/2022/article20220727PH.html)

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2. How to send an Emergency Observation Request

JPT member organizations are entitled to send an Emergency Observation Request (EOR) for disasters in the Asia-Pacific region. Please refer to [https://sentinel-asia.org/e-learning/Emergency_Observation_Request.html](https://sentinel-asia.org/e-learning/Emergency_Observation_Request.html).

EOR Order Desk:
Asian Disaster Reduction Center (ADRC)
HP: http://www.adrc.asia/
E-mail: sarequest@adrc.asia
FAX: +81-78-262-5546,
TEL: +81-78-262-5540

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3. Using Sentinel Asia Operation System, OPTEMIS

Sentinel Asia launched a new operation system, OPTEMIS. Please refer to the website on how to create an account for OPTEMIS. [https://sentinel-asia.org/e-learning/Emergency_Observation_Request.html](https://sentinel-asia.org/e-learning/Emergency_Observation_Request.html)

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Sentinel Asia Project Office

Satellite Applications and Operations Center (SAOC)

Japan Aerospace Exploration Agency (JAXA)

Ochanomizu Sola City, 4-6 Kandasurugadai, Chiyoda-ku, Tokyo 101-8008 Japan

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** August 2022 News from Sentinel Asia Project Office **

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Topics:

1.  [News] Emergency Observation of Disasters
2.  How to Send an Emergency Observation Request
3.  Using the Sentinel Asia Operation System, OPTEMIS

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1.  [News] Emergency Observation of Disasters (as of 31 August)

(1) Earthquake in the Philippines on 27 July, 2022 (GLIDE Number [EQ-2022-000273-PHL](#))
A magnitude 7 earthquake hit Northern Luzon, the Philippines, on 27 July. According to CNN, the National Disaster Risk Reduction and Management Council (NDRRMC) announced that four people, two in Benguet and others in Abra and Kalinga, died.
([https://www.cnnphilippines.com/news/2022/7/27/earthquake-7.3-magnitude-Abra-Luzon.html?fbclid=IwAR11qBYdRXDgv9WhuSlLpH04CSJVg7LBsS76vZSLf6ErcHGgzXtr5tVT3x8](https://www.cnnphilippines.com/news/2022/7/27/earthquake-7.3-magnitude-Abra-Luzon.html?fbclid=IwAR11qBYdRXDgv9WhuSlLpH04CSJVg7LBsS76vZSLf6ErcHGgzXtr5tVT3x8))

The Philippine Institute of Volcanology and Seismology (PHIVOLCS) made an Emergency Observation Request (EOR) to Sentinel Asia on 27 July. This EOR was escalated to the International Disasters Charter. PHIVOLCS assumed the role of Project Manager for this Charter activation. Among Data Provider Nodes (DPNs), the Japan Aerospace Exploration Agency (JAXA) and the National Applied Research Laboratories (NARL) provided data. Among Data Analysis Nodes (DANs), the Asian Institute of Technology (AIT), the Earth Observatory of Singapore (EOS) and the Mohammed Bin Rashid Space Centre (MBRSC) provided their VAPs. Information on the latest response by Sentinel Asia is available at the link below.
[https://sentinel-asia.org/EO/2022/article20220727PH.html](https://sentinel-asia.org/EO/2022/article20220727PH.html)
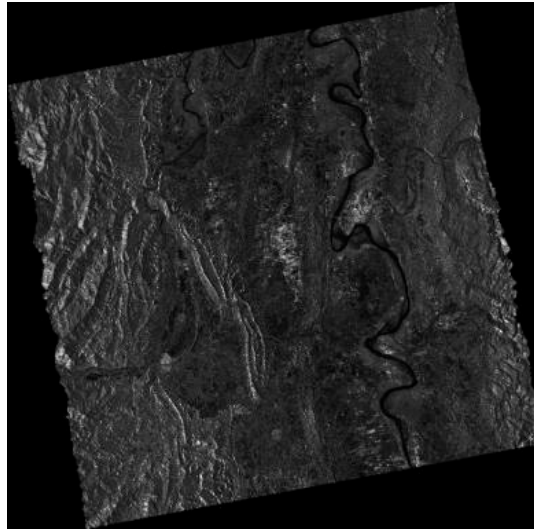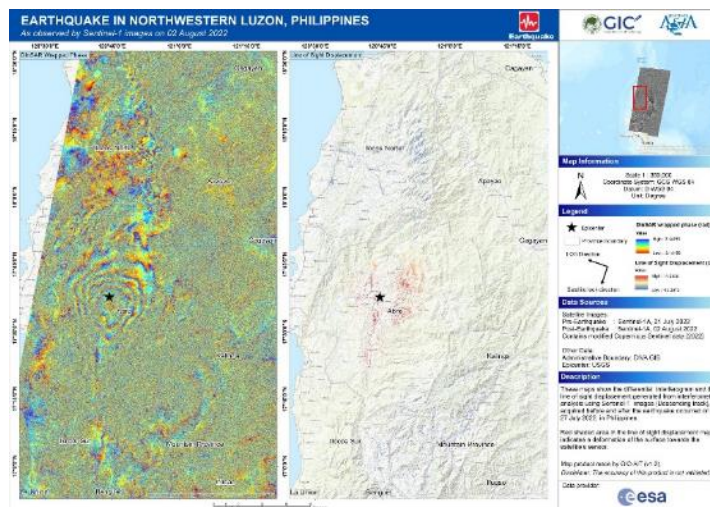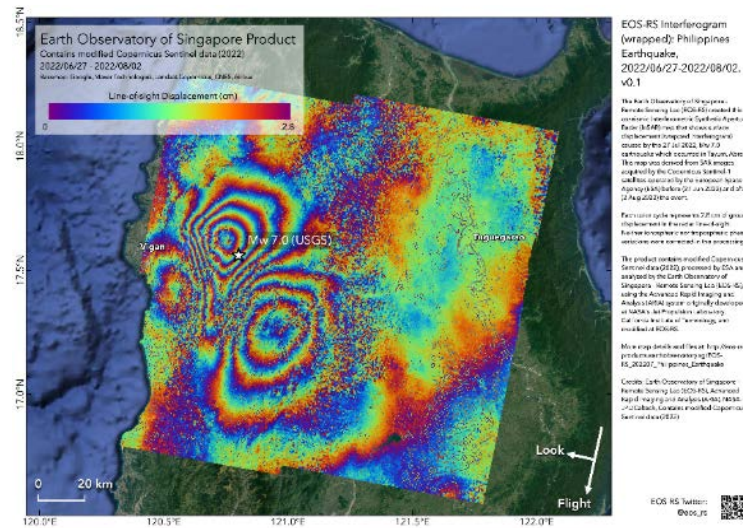
Satellite image (ALOS-2) provided by JAXA
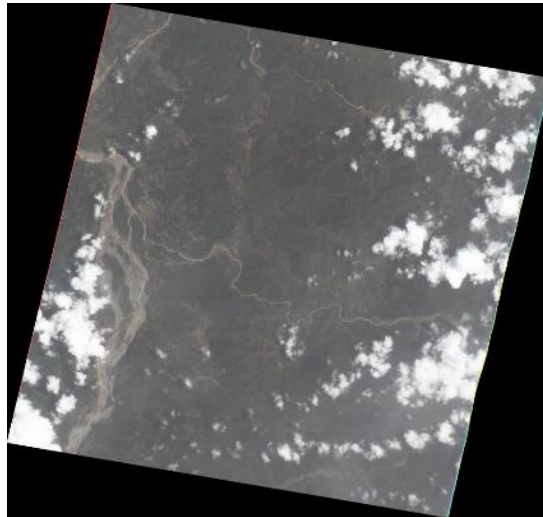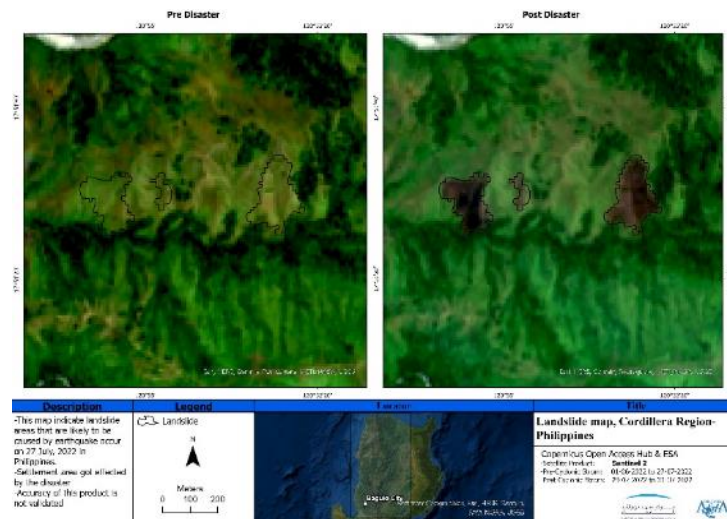


Satellite image (FORMOSAT-5) provided by NARL



Value-Added Product by AIT

Value-Added Product by EOS
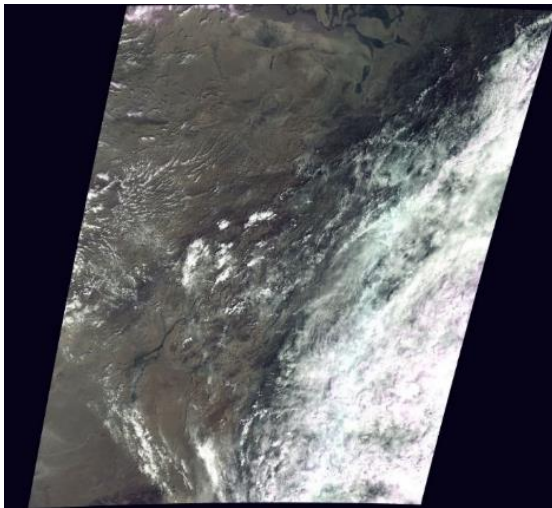


Value-Added Product by MBRSC

(2) Flood in Pakistan on 17 August, 2022 (GLIDE Number FL-2022-000254-PAK)
Heavy rains in Pakistan in July caused flooding. Balochistan province in southwestern part of the country was the hardest hit. According to the Climate Home News, at least 550 people were killed across Pakistan.
(https://www.climatechangenews.com/2022/08/11/pakistan-struggles-to-rebuild-after-deadly-flash-floods/)

The Asian Disaster Reduction Center (ADRC) made an EOR to Sentinel Asia on 18 August. Among Data Provider Nodes (DPNs), the Indian Space Research Organisation (ISRO), JAXA, and NARL provided data. Among Data Analysis Nodes (DANs), AIT and EOS provided their VAPs. Information on the latest response by Sentinel Asia is available at the link below.
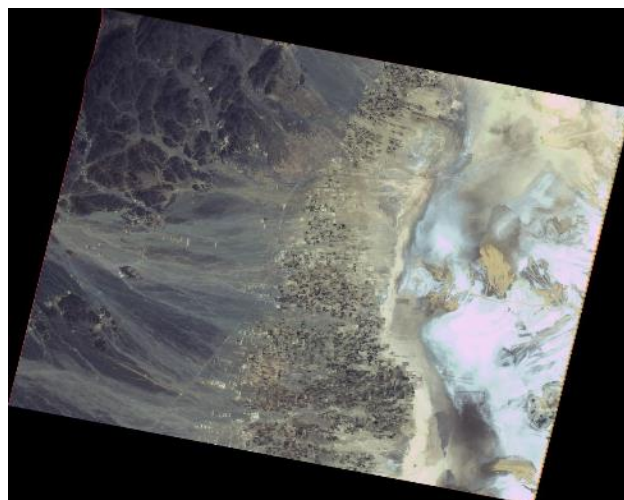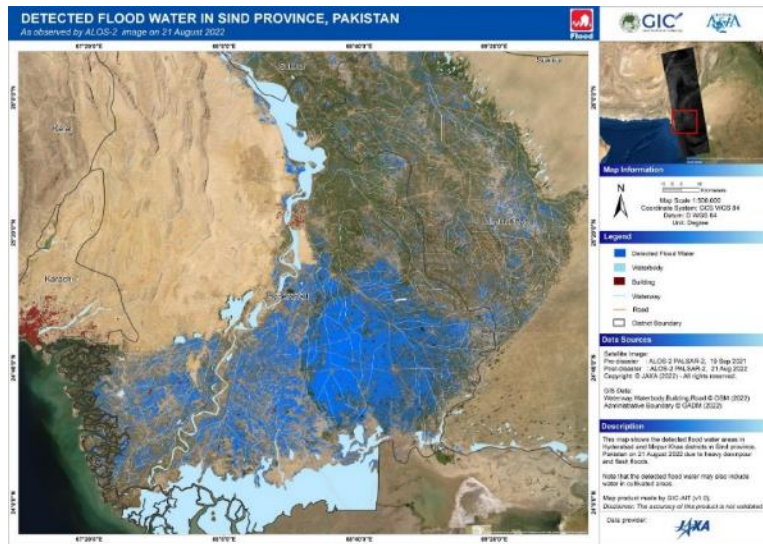https://sentinel-asia.org/EO/2022/article20220817PK.html

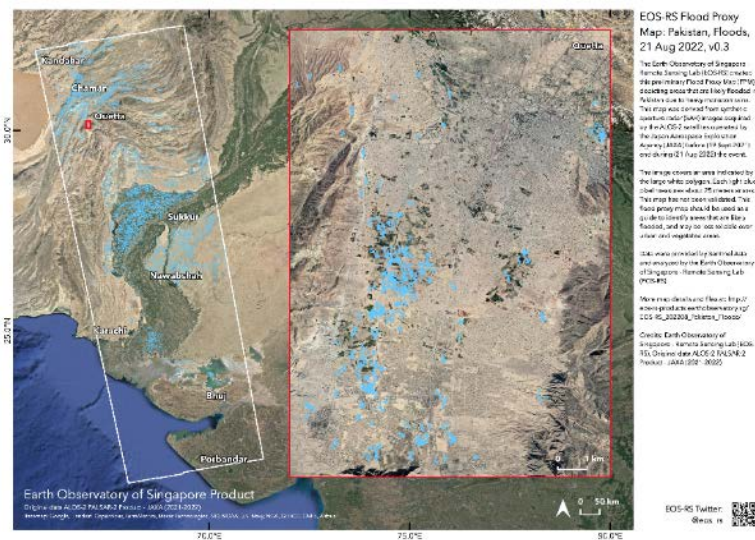Satellite image (Resourcesat-2) provided by ISRO
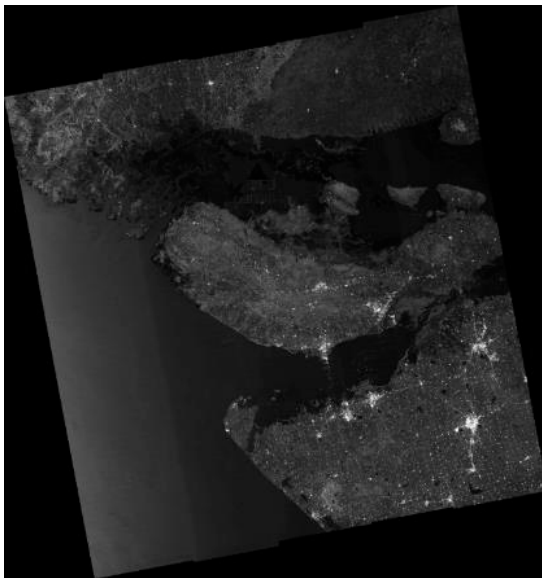

Satellite image (ALOS-2) provided by JAXA


Satellite image (FORMOSAT-5) provided by NARL

Value-Added Product by AIT



Value-Added Product by EOS

(3) Storm, Flood, and Landslide in the Philippines on 23 August, 2022 (GLIDE Number TC-2022-000294-PHL)

Tropical Storm Ma-On (Florita) struck Luzon Island in the Philippines on 23 August. The Business Standard reported that three people died and four were injured, with nearly 50,000 people in almost 400 villages affected.

(https://www.business-standard.com/article/international/3-killed-4-injured-in-philippines-as-tropical-cyclone-ma-on-intensifies-122082500521_1.html)

The Manila Observatory (MO) made an EOR to Sentinel Asia on 23 August. Among Data Provider Nodes (DPNs), Geo-Informatics and Space Technology Development Agency (GISTDA), ISRO, JAXA, and NARL provided data. Information on the latest response by Sentinel Asia is available at the link below.

https://sentinel-asia.org/EO/2022/article20220823PH.html
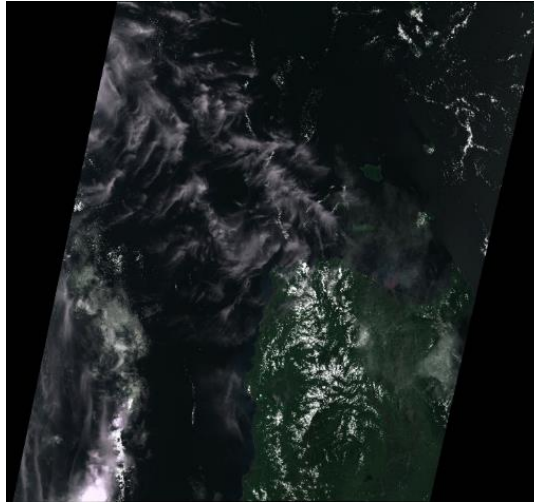


Satellite image (Resourcesat-2A) provided by ISRO

(4) Flood in India on 23 August, 2022 (GLIDE Number FL-2022-000295-IND)
Heavy rain in India caused flooding in several areas of the nation. At least six people were killed and many evacuated, according to Hindustan Times.
(https://www.hindustantimes.com/india-news/heavy-rains-trigger-flood-fury-in-mp-odisha-6-dead-101661195462428.html)

ISRO made an Emergency Observation Request (EOR) to Sentinel Asia on 24 August. Among Data Provider Nodes (DPNs), GISTDA, JAXA, and NARL provided data. Information on the latest response by Sentinel Asia is available at the link below.
https://sentinel-asia.org/EO/2022/article20220823IN.html

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2. How to send an Emergency Observation Request

JPT member organizations are entitled to send an Emergency Observation Request (EOR) for disasters in the Asia-Pacific region. Please refer to https://sentinel-asia.org/e-learning/Emergency_Observation_Request.html.

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HP: http://www.adrc.asia/
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FAX: +81-78-262-5546,
TEL: +81-78-262-5540

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3. Using Sentinel Asia Operation System, OPTEMIS

Sentinel Asia launched a new operation system, OPTEMIS. Please refer to the website on how to create an account for OPTEMIS. https://sentinel-asia.org/e-learning/Emergency_Observation_Request.html

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Japan Aerospace Exploration Agency (JAXA)
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TEL: +81-3-6435-6785
FAX: +81-3-5777-1580

** September 2022 News from Sentinel Asia Project Office **

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Topics:

1.  [News] Emergency Observation of Disasters
2.  [Event] Promoted Sentinel Asia's activities at the Asia-Pacific Ministerial Conference on Disaster Risk Reduction
3.  How to Send an Emergency Observation Request
4.  Using the Sentinel Asia Operation System, OPTEMIS

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1.  [News] Emergency Observation of Disasters (as of 29 September)

(1) Flood in India on 23 August, 2022 (GLIDE Number FL-2022-000295-IND)
Heavy rain in India caused flooding in several areas of the nation. At least six people were killed and many evacuated, according to the Hindustan Times.
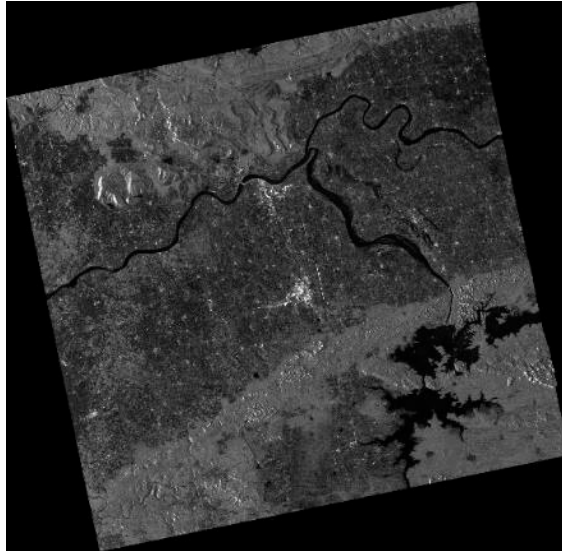(https://www.hindustantimes.com/india-news/heavy-rains-trigger-flood-fury-in-mp-odisha-6-dead-101661195462428.html)

The Indian Space Research Organisation (ISRO) made an Emergency Observation Request (EOR) to Sentinel Asia on 24 August. Among Data Provider Nodes (DPNs), the Geo-Informatics and Space Technology Development Agency (GISTDA), the Japan Aerospace Exploration Agency (JAXA), and the National Applied Research Laboratories (NARL) provided data. Among Data Analysis Nodes (DANs), the Mohammed Bin Rashid Space Centre (MBRSC) provided its VAPs. Information on the latest response by Sentinel Asia is available at the link below.
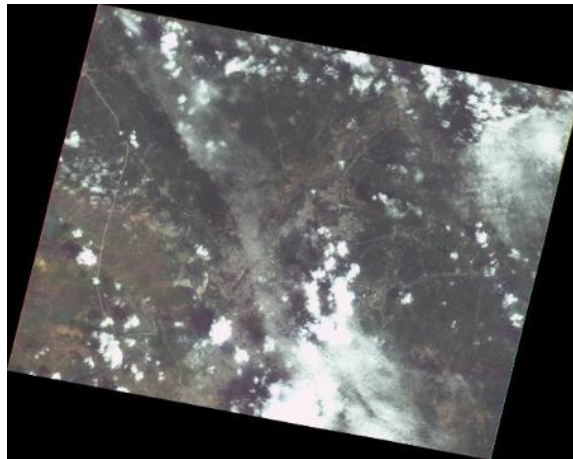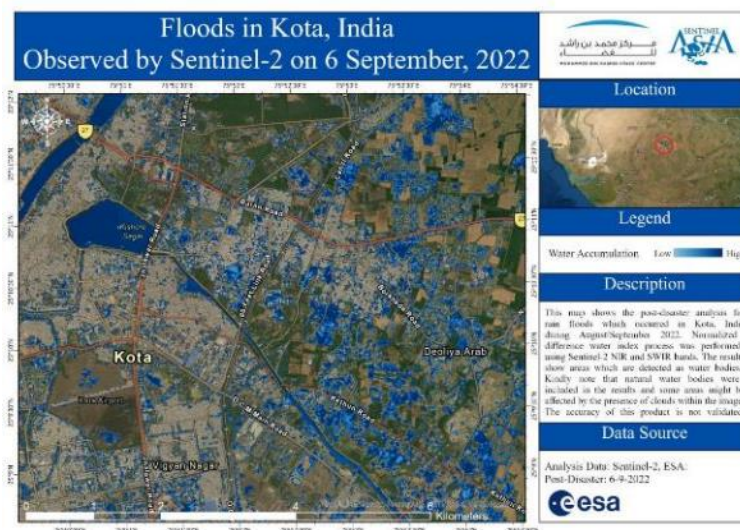https://sentinel-asia.org/EO/2022/article20220823IN.html



Satellite image (THEOS1) provided by GISTDA

Satellite image (ALOS-2) provided by JAXA


Satellite image (FORMOSAT-5) provided by NARL


Value-Added Product by MBRSC

(2) Earthquake in China on 5 September, 2022 (GLIDE Number EQ-2022-000303-CHN)
A magnitude 6.8 earthquake struck China's Sichuan Province on 5 September, killing dozens of the residents, USA Today reported.
(https://www.usatoday.com/picture-gallery/news/world/2022/09/08/6-8-magnitude-earthquake-shakes-china/8022272001/)

The Institute of Geology, China Earthquake Administration (CEA) made an EOR to Sentinel Asia on 6 September. Among DPNs, JAXA provided data. Among DANs, the Earth Observatory of Singapore (EOS) provided its VAPs. Information on the latest response by Sentinel Asia is available at the link below.
https://sentinel-asia.org/EO/2022/article20220905CN.html
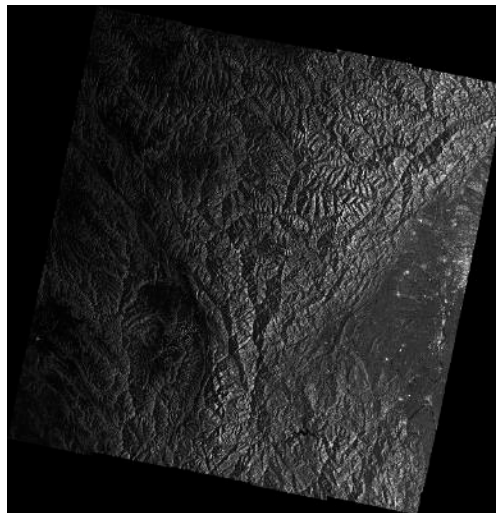

Satellite image (ALOS-2) provided by JAXA
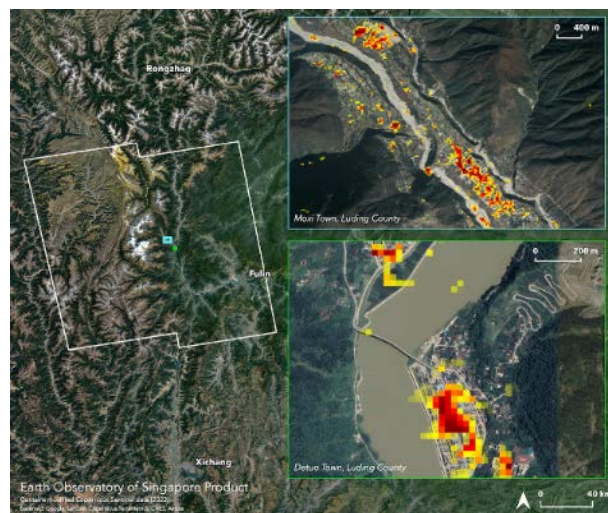

Value-Added Product by EOS

(3) Earthquake in Taiwan on 17 September, 2022 (GLIDE Number EQ-2022-000303-CHN)
On 18 and 19 September, a series of earthquakes including ones at magnitude 6.4 and 6.5 hit Taiwan, leaving one dead and many injured, according to the Guardian.

(https://www.theguardian.com/world/2022/sep/18/taiwan-earthquake-damage-hualien)

The National Applied Research Laboratories (NARL) made an EOR to Sentinel Asia on 19 September. Among DPNs, ISRO and GISTDA provided data. Information on the latest response by Sentinel Asia is available at the link below.
https://sentinel-asia.org/EO/2022/article20220917TW.html
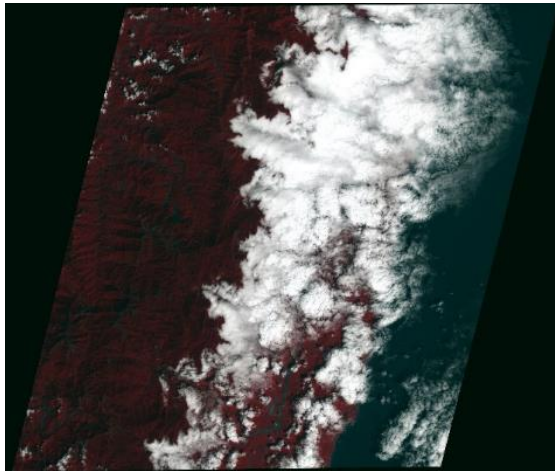


Satellite image (Resourcesat-2A) provided by ISRO
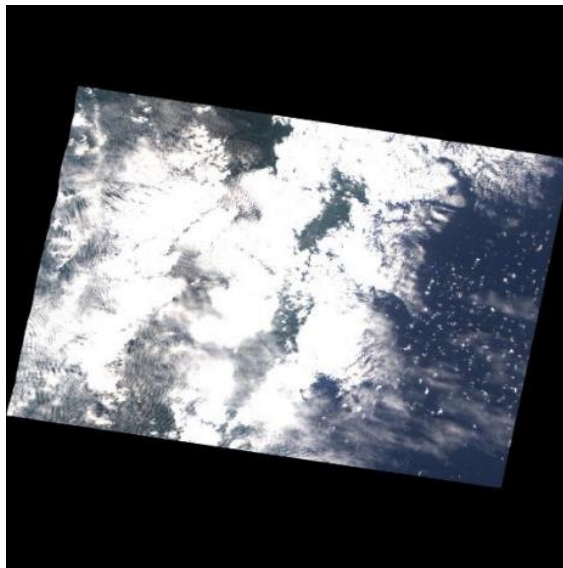


Satellite image (THEOS-1) provided by GISTDA

(4) Storm, Flood, and Landslide in the Philippines on 25 September, 2022  (GLIDE Number TC-2022-000318-PHL)

A strong typhoon Noru (Karding) made landfall in the Philippines and passed over Luzon Island, causing heavy damage, Channel News Asia reported.
(https://www.channelnewsasia.com/asia/typhoon-noru-philippines-marcos-aid-thousands-evacuate-flood-dead-2964846)

The ASEAN Coordinating Centre for Humanitarian Assistance on disaster management (AHA

Centre) made an EOR to Sentinel Asia on 25 September. Among DPNs, ISRO and JAXA provided data. Among DANs, EOS provided its VAPs. Information on the latest response by Sentinel Asia is available at the link below.

https://sentinel-asia.org/EO/2022/article20220925PH.html
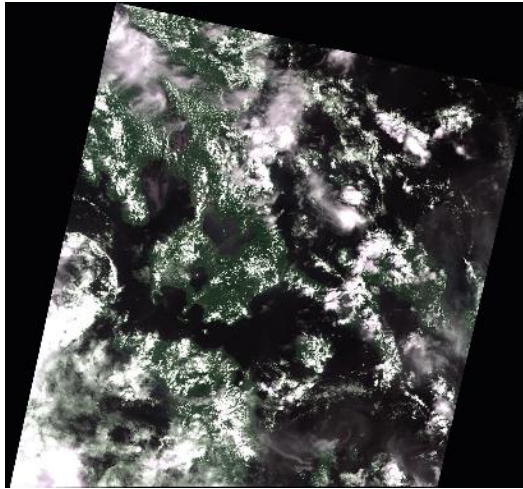


Satellite image (Resourcesat-2A) provided by ISRO
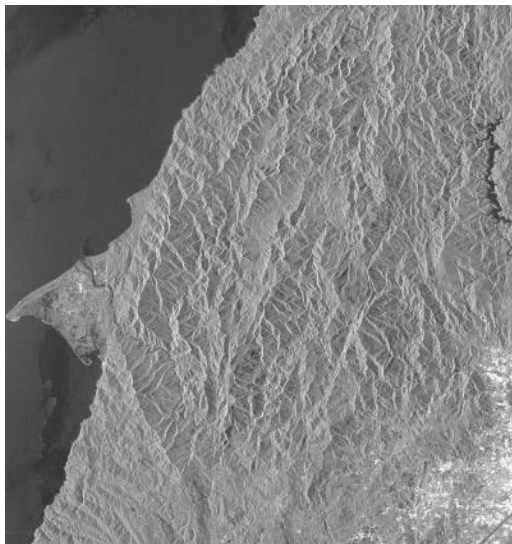


Satellite image (ALOS-2) provided by JAXA
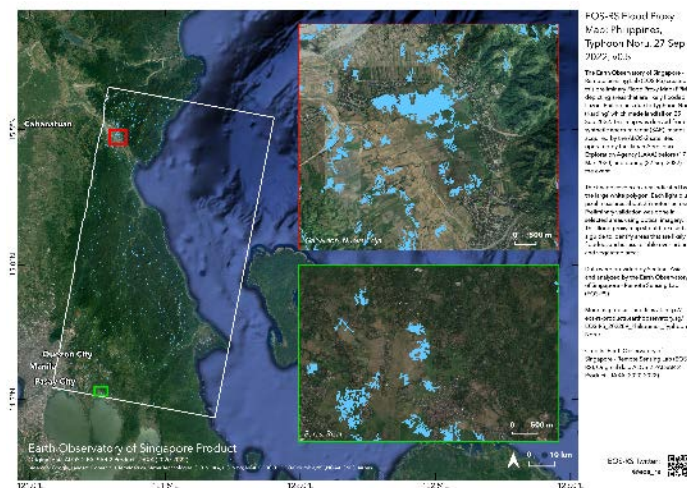


Value-Added Product by EOS

(5) Storm, Flood, and Landslide in Vietnam on 28 September, 2022 (GLIDE Number [TC-2022-000318-PHL](#))

After passing over the Philippines and the South China Sea, Typhoon Noru (Karding) made landfall in Vietnam. According to Channel News Asia, Noru was downgraded to a tropical depression, but there is still risk of flooding and landslides.
([https://www.channelnewsasia.com/asia/typhoon-noru-vietnam-tropical-storm-flood-risk-2969821](https://www.channelnewsasia.com/asia/typhoon-noru-vietnam-tropical-storm-flood-risk-2969821))

The Ministry of Natural Resources and Environment (MONRE) made an EOR to Sentinel Asia on 28 September. Among DPNs, ISRO provided data. Information on the latest response by Sentinel Asia is available at the link below.
[https://sentinel-asia.org/EO/2022/article20220928VN.html](https://sentinel-asia.org/EO/2022/article20220928VN.html)
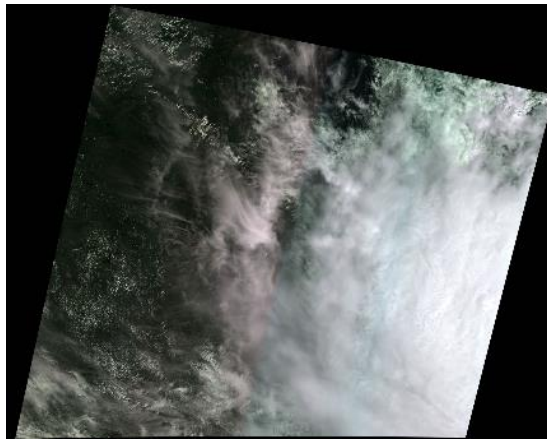


Satellite image (Resourcesat-2) provided by ISRO

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2.  [Event] Promotion of Sentinel Asia's activities at the Asia-Pacific Ministerial Conference on Disaster Risk Reduction (APMCDRR)

The Asia-Pacific Ministerial Conference on Disaster Risk Reduction was held from 19 to 22 September 2022 in Brisbane, Australia.
The Sentinel Asia Secretariat ran an exhibition booth to promote Sentinel Asia's activities during the APMCDRR. The Sentinel Asia booth welcomed more than 100 participants per day.
For more information on APMCDRR 2022, please refer to [https://apmcdrr.undrr.org/](https://apmcdrr.undrr.org/).
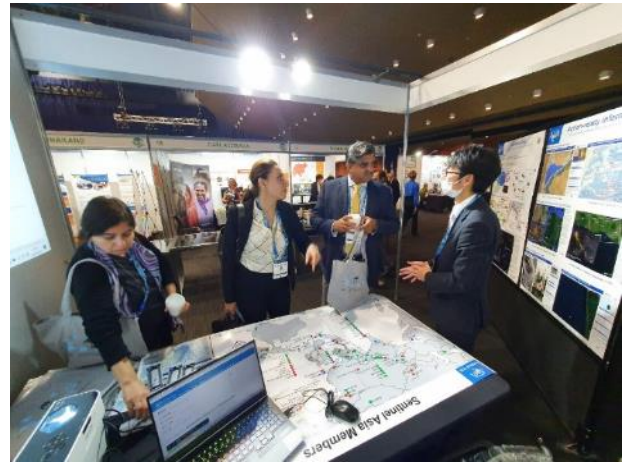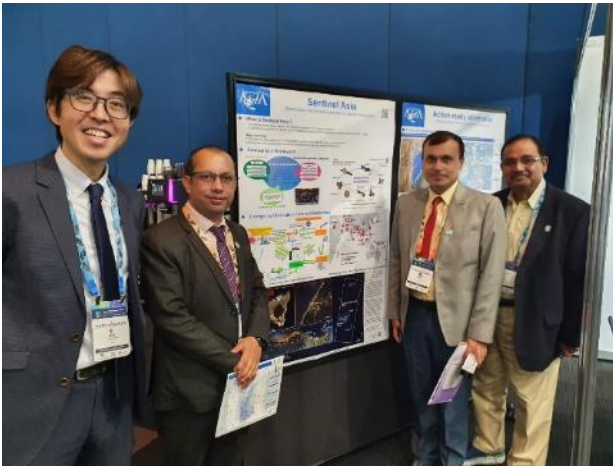
Sentinel Asia exhibition booth

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3. How to send an Emergency Observation Request

JPT member organizations are entitled to send an Emergency Observation Request (EOR) for disasters in the Asia-Pacific region. Please refer to https://sentinel-asia.org/e-learning/Emergency_Observation_Request.html.

EOR Order Desk:

Asian Disaster Reduction Center (ADRC)

HP: http://www.adrc.asia/

E-mail: sarequest@adrc.asia

FAX: +81-78-262-5546,

TEL: +81-78-262-5540

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4. Using Sentinel Asia Operation System, OPTEMIS

Sentinel Asia launched a new operation system, OPTEMIS. Please refer to the website on how to create an account for OPTEMIS. https://sentinel-asia.org/e-learning/Emergency_Observation_Request.html

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FAX: +81-3-5777-1580

** October 2022 News from Sentinel Asia Project Office **

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Topics:

1.  [News] Emergency Observation of Disasters
2.  How to Send an Emergency Observation Request
3.  Using the Sentinel Asia Operation System, OPTEMIS

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1.  [News] Emergency Observation of Disasters (as of 28 October)

    (1) Storm, Flood, and Landslide in Vietnam on 28 September, 2022 (GLIDE Number TC-2022-000318-PHL)

    After passing over the Philippines and the South China Sea, Typhoon Noru (Karding) made landfall in Vietnam. According to Channel News Asia, Noru was downgraded to a tropical depression, but there is still risk of flooding and landslides.
    (https://www.channelnewsasia.com/asia/typhoon-noru-vietnam-tropical-storm-flood-risk-2969821)

    The Ministry of Natural Resources and Environment (MONRE) made an Emergency Observation Request (EOR) to Sentinel Asia on 28 September. Among Data Provider Nodes (DPNs), Indian Space Research Organisation (ISRO), Japan Aerospace Exploration Agency (JAXA), and National Applied Research Laboratories (NARL) provided data. Among Data Analysis Nodes (DANs), the Asian Institute of Technology (AIT) and the Earth Observatory of Singapore (EOS) provided their Value-Added Products (VAPs). Information on the latest response by Sentinel Asia is available at the link below.
    https://sentinel-asia.org/EO/2022/article20220928VN.html
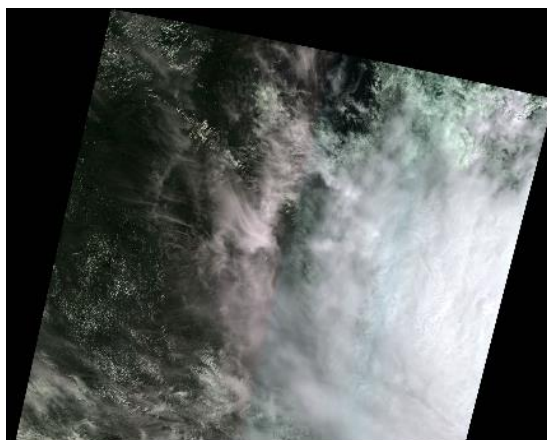


Post-disaster satellite image (Resourcesat-2) provided by ISRO
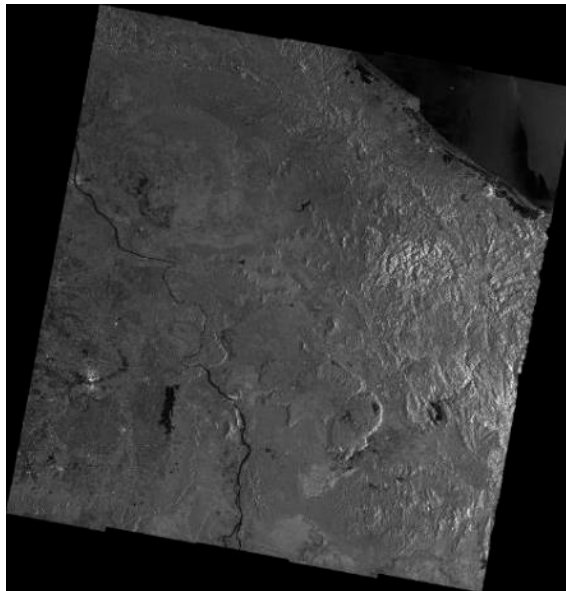
Post-disaster satellite image (ALOS-2) provided by JAXA
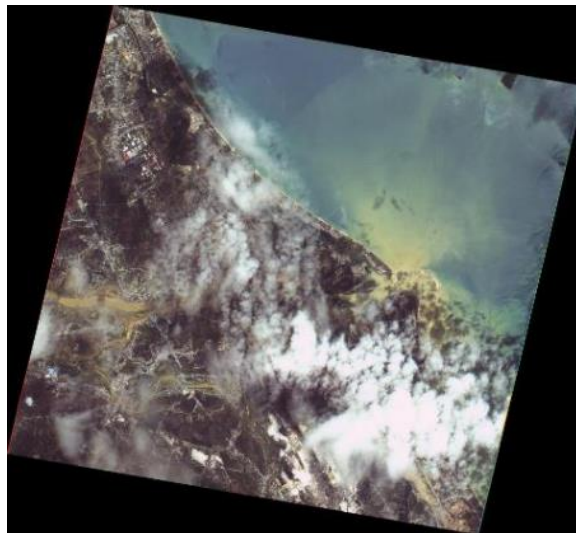


Post-disaster satellite image (FORMOSAT-5) provided by NARL



Value-Added Product by AIT

Value-Added Product by EOS

(2) Manaslu avalanche in Nepal on 2 October, 2022 (GLIDE Number AV-2022-000329-NPL)
On 26 September, a massive avalanche hit the climbing route near camps in the Mount Manaslu area in the Himalayas. One person died and 13 were injured, the Everest Chronicle reported. (https://everestchronicle.com/two-climbers-died-scores-injured-in-manaslu-avalanche/)

The Department of Hydrology and Meteorology (DHM) of Nepal made an EOR to Sentinel Asia on 9 October. Among DPNs, Geo-Informatics and Space Technology Development Agency (GISTDA), ISRO, JAXA, and NARL provided data. Among DANs, EOS provided its VAPs. Information on the latest response by Sentinel Asia is available at the link below. https://sentinel-asia.org/EO/2022/article20221002NP.html


Post-disaster satellite image (THEOS-1) provided by GISTDA

Post-disaster satellite image (Resourcesat-2A) provided by ISRO
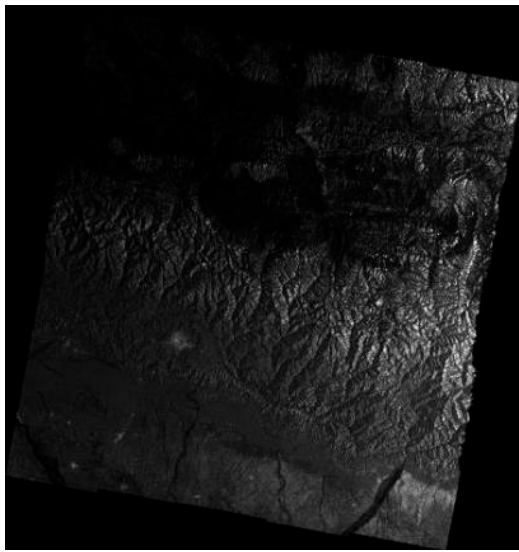

Post-disaster satellite image (ALOS-2) provided by JAXA
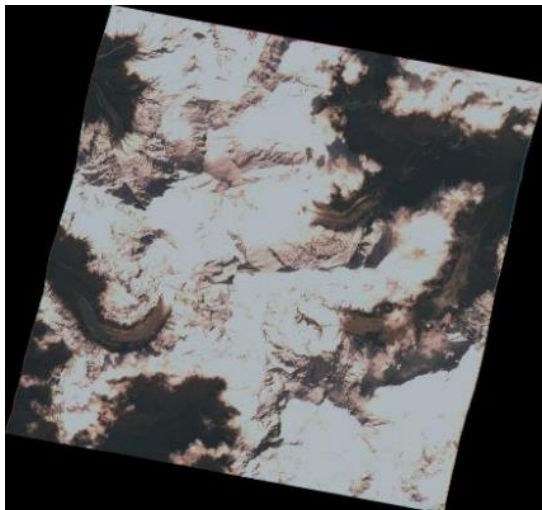

Post-disaster satellite image (FORMOSAT-5) provided by NARL
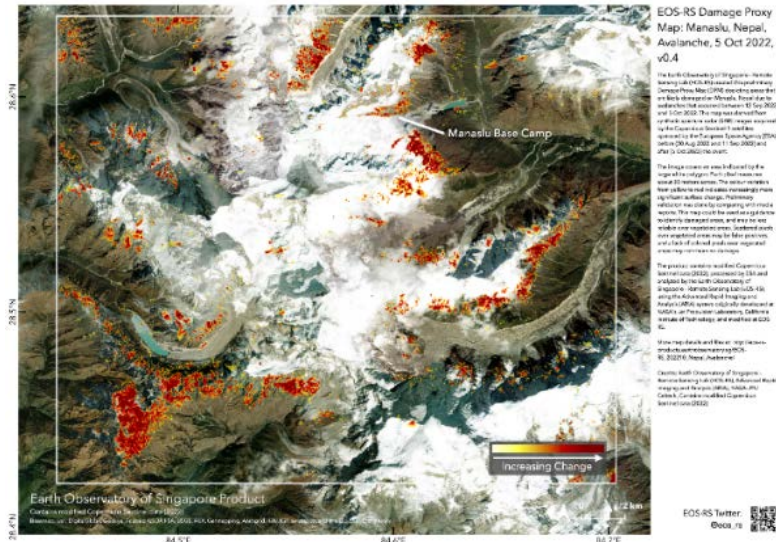
Value-Added Product by EOS

(3) Flood in India on 13 October, 2022 (GLIDE Number FL-2022-000335-IND)
Uttar Pradesh state in northern India suffered a large-scale flood caused by heavy rain.
According to the Hindustan Times, 19,042 people have moved to shelters.
(https://www.hindustantimes.com/cities/lucknow-news/1667-villages-in-21-up-districts-inundated-101665766963350.html)

ISRO made an EOR to Sentinel Asia on 15 October. Among DPNs, GISTDA, JAXA, and NARL provided data. Among DANs, AIT, EOS, and NARL provided their VAPs. Information on the latest response by Sentinel Asia is available at the link below.
https://sentinel-asia.org/EO/2022/article20221013IN.html
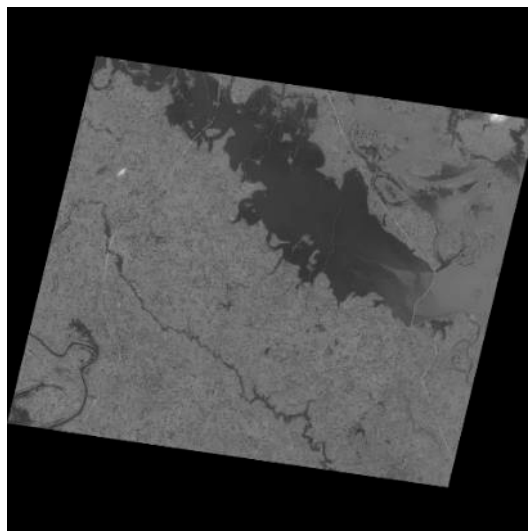


Post-disaster satellite image (THEOS-1) provided by GISTDA
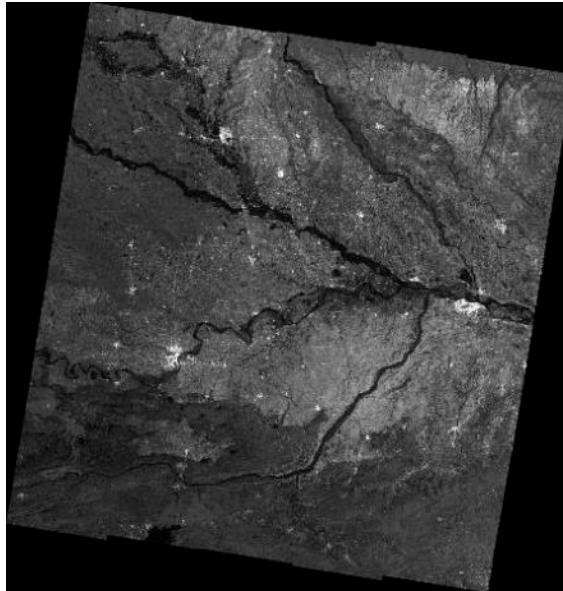
Post-disaster satellite image (ALOS-2) provided by JAXA
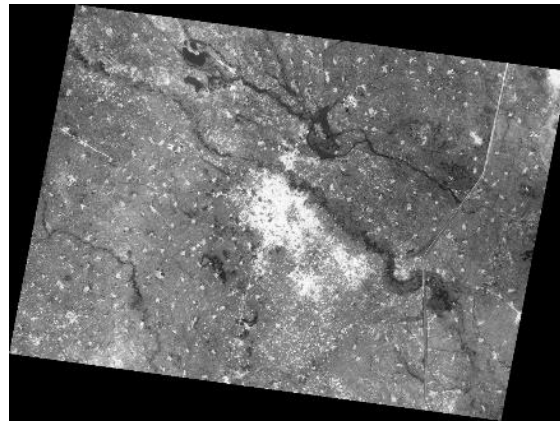


Post-disaster satellite image (FORMOSAT-5) provided by NARL
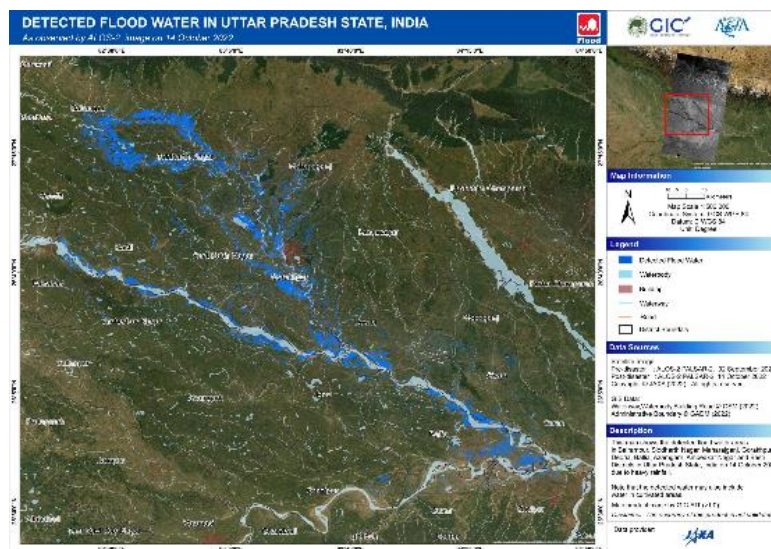


Value-Added Product by AIT
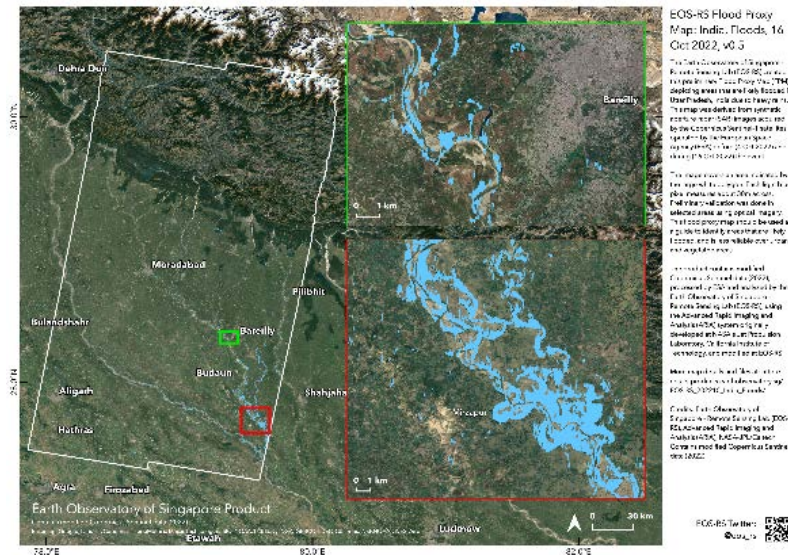
Value-Added Product by EOS
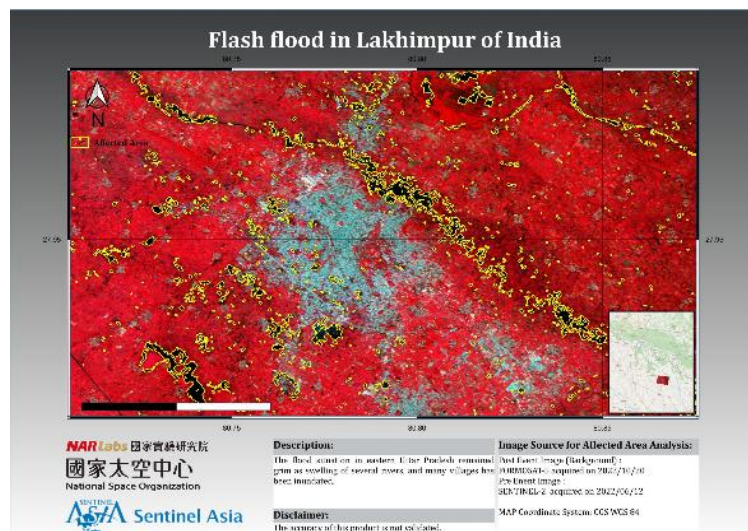

Value-Added Product by NARL

(4) Flood in Thailand on 19 October, 2022 (GLIDE Number FL-2022-000333-THA)
Typhoon Noru (Karding) made landfall in Asian countries on the Pacific at the end of
September. It caused flooding in large areas in Thailand.
(https://www.thaipbsworld.com/flooding-in-thailands-northeast-is-expected-to-improve-next-month)

GISTDA made an EOR to Sentinel Asia on 19 October. Among DPNs, ISRO and JAXA
provided data. Among DANs, AIT and NARL provided its VAPs. Information on the latest
response by Sentinel Asia is available at the link below.
https://sentinel-asia.org/EO/2022/article20221019TH.html

Post-disaster satellite image (Resourcesat-2A) provided by ISRO



Post-disaster satellite image (ALOS-2) provided by JAXA



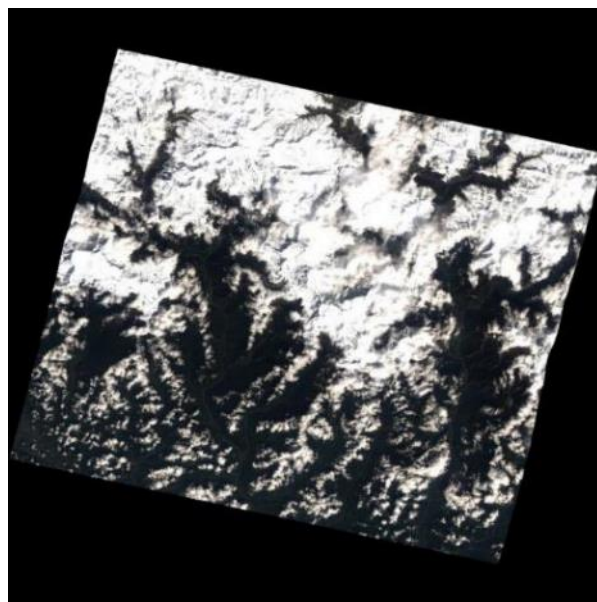Post-disaster satellite image (FORMOSAT-5) provided by NARL
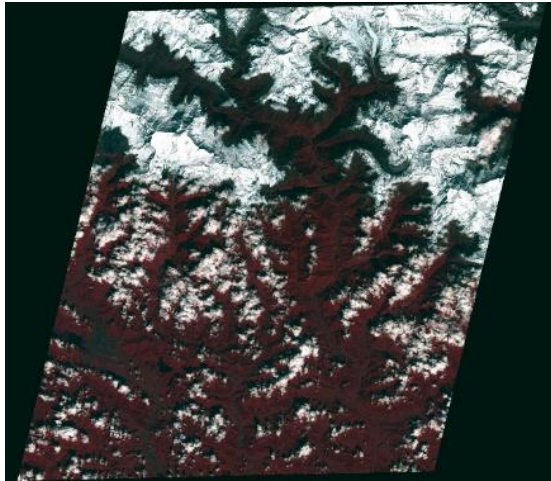
Value-Added Product by AIT


Value-Added Product by NARL

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2. How to send an Emergency Observation Request

JPT member organizations are entitled to send an Emergency Observation Request (EOR) for disasters in the Asia-Pacific region. Please refer to https://sentinel-asia.org/e-learning/Emergency_Observation_Request.html.

EOR Order Desk:
Asian Disaster Reduction Center (ADRC)
HP: http://www.adrc.asia/
E-mail: sarequest@adrc.asia
FAX: +81-78-262-5546,
TEL: +81-78-262-5540

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## 3. Using Sentinel Asia Operation System, OPTEMIS

Sentinel Asia launched a new operation system, OPTEMIS. Please refer to the website on how to create an account for OPTEMIS. https://sentinel-asia.org/e-learning/Emergency_Observation_Request.html

** November 2022 News from Sentinel Asia Project Office **

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Topics:

1.   [News] Emergency Observation of Disasters
2.   Sentinel Asia participated in a session at APRSAF-28
3.   How to Send an Emergency Observation Request
4.   Using the Sentinel Asia Operation System, OPTEMIS

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1.   [News] Emergency Observation of Disasters (as of 28 November)

(1) Earthquake in Indonesia on 21 November, 2022 (GLIDE Number EQ-2022-000363-IDN)
A magnitude-5.6 earthquake hit the island of Java, Indonesia, on 21 November. There were more than 260 casualties, and about 22,200 houses were affected, according to ReliefWeb.
(https://reliefweb.int/disaster/eq-2022-000363-idn)

The National Research and Innovation Agency (BRIN) made an Emergency Observation Request (EOR) to Sentinel Asia on 22 November. Among Data Provider Nodes (DPNs), the Geo-Informatics and Space Technology Development Agency (GISTDA) and the Japan Aerospace Exploration Agency (JAXA) provided data. Among Data Analysis Nodes (DANs), the Earth Observatory of Singapore (EOS), Nanyang Technological University (NTU) provided its Value-Added Products (VAPs). Information on the latest response by Sentinel Asia is available at the link below.
https://sentinel-asia.org/EO/2022/article20221121ID.html
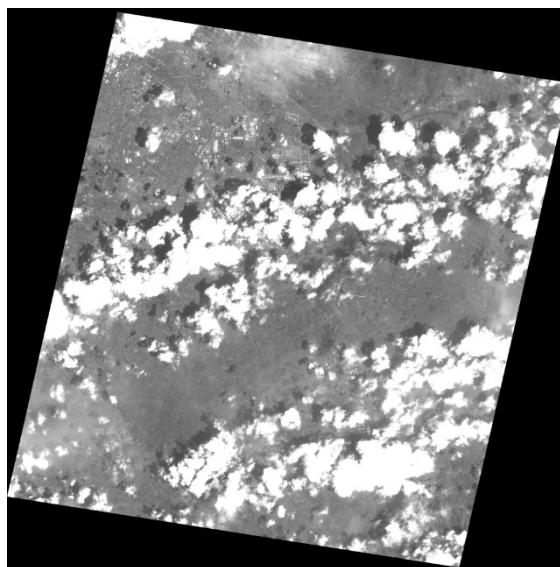

Post-disaster satellite image (THEOS-1) provided by GISTDA
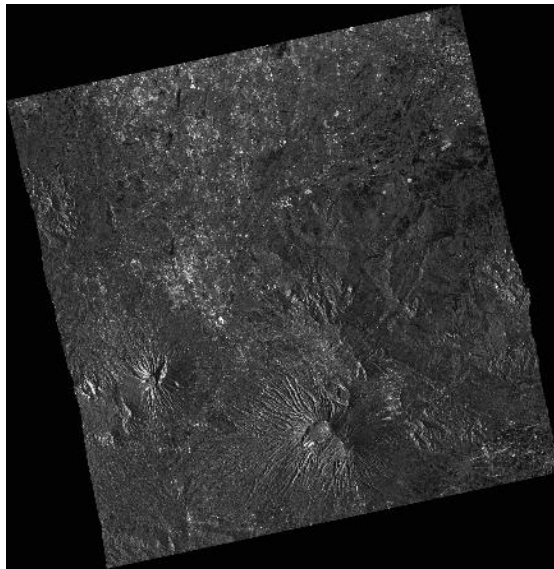
Post-disaster satellite image (ALOS-2) provided by JAXA
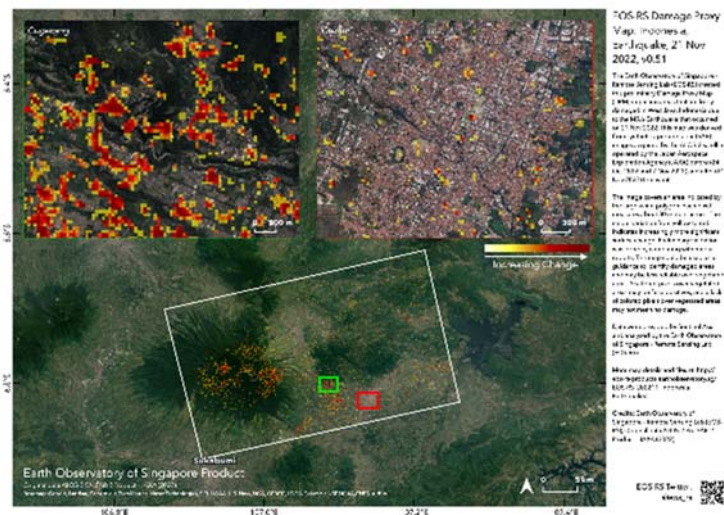


Value-Added Product by EOS

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## 2. Sentinel Asia participated in a session at APRSAF-28

The 28th session of Asia-Pacific Regional Space Agency Forum (APRSAF-28) was held in Hanoi, Vietnam, from 15–18 November, co-organized by the Vietnam Academy of Science and Technology (VAST), the Ministry of Education, Culture, Sports, Science and Technology (MEXT) of Japan, and the Japan Aerospace Exploration Agency (JAXA). At the Satellite Applications for Societal Benefit Working Group (SAWG) session, Sentinel Asia reported its recent activities, and various challenges were discussed by experts from space agencies as well as disaster management organizations, universities, and other agencies related to Sentinel Asia. Some Sentinel Asia members including Yamaguchi University, the International Water Management Institute (IWMI), the Asian Disaster Reduction Center (ADRC), the Geo-Informatics and Space Technology Development Agency (GISTDA), the Japan International Cooperation Agency (JICA), the Earth Observatory of Singapore (EOS) of Nanyang Technological University (NTU), and JAXA

presented their projects supporting Sentinel Asia's activities.


Group photo of SAWG 2022


Plenary session

At the plenary session, Mr. Tatiya Chuentragun, Deputy Executive Director, GISTDA, who also serves as co-chair of the Sentinel Asia Steering Committee, gave a summary report of the Sentinel Asia session. The agenda of the Sentinel Asia session can be found at the link below.
https://www.aprsaf.org/annual_meetings/aprsaf28/pdf/working_groups/Agenda_SAWG.pdf


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3. How to send an Emergency Observation Request

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HP: http://www.adrc.asia/
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TEL: +81-78-262-5540

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4. Using Sentinel Asia Operation System, OPTEMIS

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Satellite Applications and Operations Center (SAOC)
Japan Aerospace Exploration Agency (JAXA)
Ochanomizu Sola City, 4-6 Kandasurugadai, Chiyoda-ku, Tokyo 101-8008 Japan
E-mail: Z-SENTINEL.ASIA@ml.jaxa.jp
TEL: +81-3-6435-6785
FAX: +81-3-5777-1580

** December 2022 News from Sentinel Asia Project Office **

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Topics:
1.  [News] Emergency Observation of Disasters
2.  [Interview] Dr. Lal Samarakoon, PhD; Former Director of GIC-AIT; former co-chair of Sentinel Asia Steering Committee
3.  [Report] Sentinel Asia Annual Report 2021 has been published!
4.  How to Send an Emergency Observation Request
5.  Using the Sentinel Asia Operation System, OPTEMIS

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1.  [News] Emergency Observation of Disasters (as of 26 December)

    (1) Volcano eruption in Indonesia on 04 December, 2022 (GLIDE Number VO-2022-000373-IDN)

    Semeru Volcano on Java Island, Indonesia, erupted on 4 December. ReliefWeb reported that more than 2,000 people were displaced to shelters.
    (https://reliefweb.int/disaster/vo-2022-000373-idn)

    The Japan International Cooperation Agency (JICA) made an Emergency Observation Request (EOR) to Sentinel Asia on 5 December, 2022. This EOR was escalated to the International Disasters Charter. The Asian Institute of Technology (AIT) assumed the role of Project Manager for this Charter activation. Among Data Provider Nodes (DPNs), the Centre for Remote Imaging, Sensing and Processing (CRISP), the Geo-Informatics and Space Technology Development Agency (GISTDA), the Indian Space Research Organization (ISRO), the Japan Aerospace Exploration Agency (JAXA), and the National Applied Research Laboratories (NARL) provided data. Among Data Analysis Nodes (DANs), the Mohammed Bin Rashid Space Centre (MBRSC) provided its Value-Added Products (VAPs). Information on the latest response by Sentinel Asia is available at the link below.
    https://sentinel-asia.org/EO/2022/article20221204ID.html
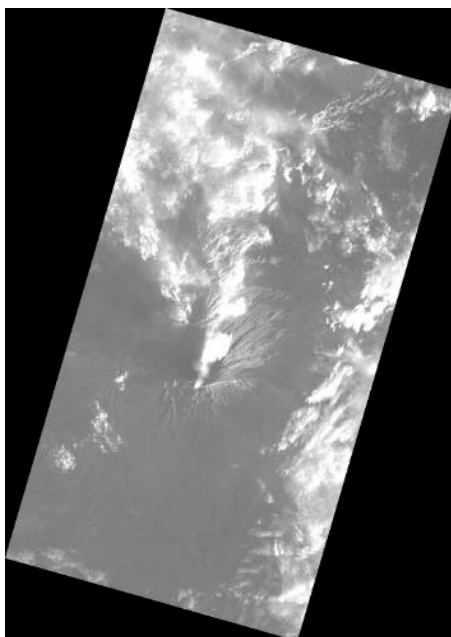
Post-disaster satellite image (TELEOS-1) provided by CRISP



Post-disaster satellite image (THEOS-1) provided by GISTDA
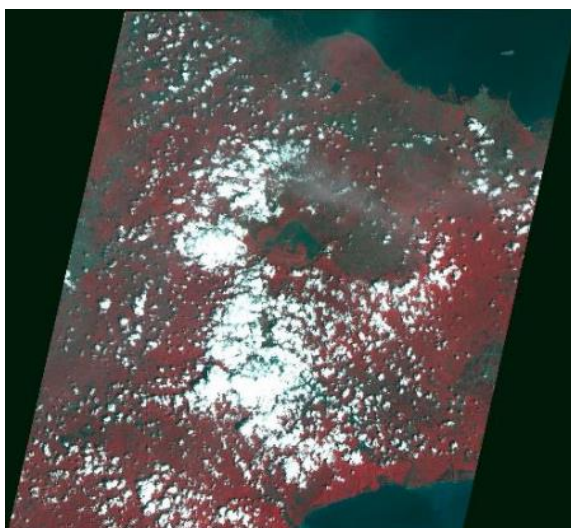


Post-disaster satellite image (Cartosat-3) provided by ISRO
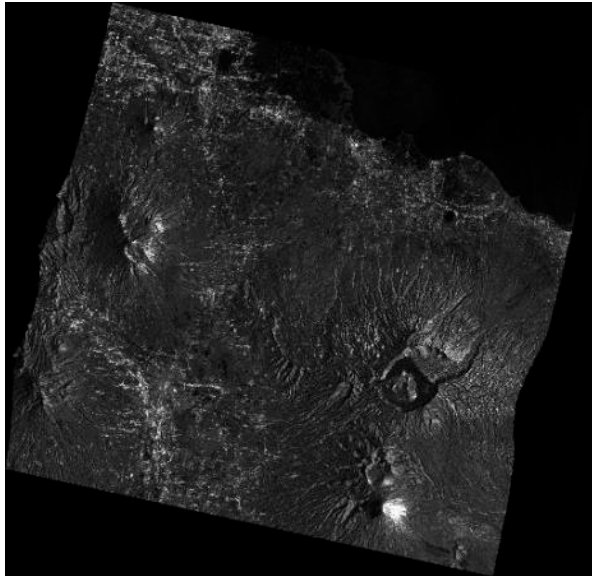
Post-disaster satellite image (ALOS-2) provided by JAXA
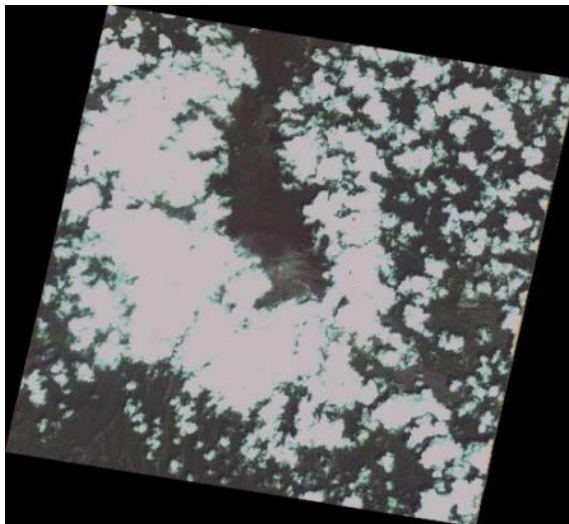


Post-disaster satellite image (FORMOSAT-5) provided by NARL
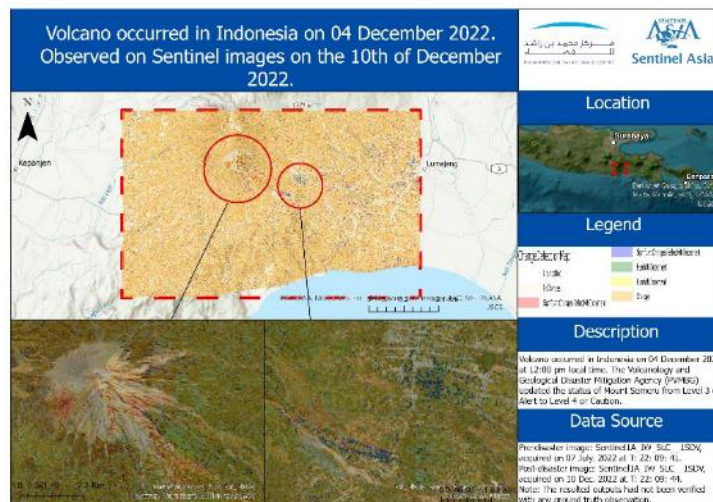


Value-Added Product by MBRSC

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2. [Interview] Dr. Lal Samarakoon, PhD; Former Director of GIC-AIT; former co-chair of Sentinel Asia Steering Committee

Lal Samarakoon, PhD; Former Director of GIC-AIT; former co-chair of Sentinel Asia Steering Committee



Dr. Lal Samarakoon was the first director of the Geoinformatics Center (GIC) of the Asian Institute of Technology (AIT), concurrently holding a position as a Visiting Scientist of JAXA seconded to AIT. He started his space technology career in early 1990 after completing his graduate studies in Japan. He has worked for Japanese industry before leading GIC for about 15 years. He has contributed to Sentinel Asia from the very beginning and was instrumental in establishing GIC as the first Principal Data Analysis Node (PDAN) of SA. He was one of the co-chairs of the SA Steering Committee since its inception in 2017 until 2022.


*Sentinel Asia Secretariat:*
*First, the Sentinel Asia (SA) secretariat would like to express its appreciation for your work as a Co-chair of the Sentinel Asia Steering Committee (SC). AIT participated in Sentinel Asia from the very beginning and has contributed to today's success of SA. With that, could you tell us the story of AIT's participation in SA, as a former director of GIC-AIT?*

*Dr. Lal Samarakoon:*
First of all, let me thank you for giving me this opportunity to discuss my experience of working for SA in the past 15 years. To answer your question, let me give you a background on how GIC-AIT joined SA to work together to improve the SA system.

The idea of the SA was initially proposed at the Asia-Pacific Regional Space Agency Forum (APRSAF) in November 2004 following multiple discussions. I was lucky to be involved in those discussions as one of the pioneer members, as I was a Visiting Scientist of JAXA since 2003. At the same time, I was the director of GIC-AIT established in 2003 combining the GIS Application Center (GAC) and the Asian Center for Research on Remote Sensing (ACRoRS) established by Prof. Shunji Murai and Dr. Kiyoshi Honda, respectively.
The idea of the SA was later approved to be promptly implemented as a pilot project at APRSAF-12

held in Kitakyushu, Japan, in October 2005. My major role as JAXA Visiting Scientist based at GIC-AIT was the promotion of the use of satellite data and capacity building in the Asia-Pacific. I was positioned in an advantageous place at GIC to use the GIC-AIT network to reach various institutes in the region for networking to promote SA activities. Whenever I had a chance to participate in regional meetings such as the United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP) and the International Strategy for Disaster Reduction (ISDR), or during a country visit for research or training activities, I always publicized SA and discussed the benefits of being a user/partner of SA.

After a couple of years of good work, I managed to establish GIC-AIT as the first PDAN of SA. GIC has been given this credential after producing a considerable number of Value Added Products (VAPs), demonstrating the expertise of data analysis in the region and contributing to capacity building. Since then, I believe that GIC is doing a great job supporting the region making timely VAP products and sharing these products with respective user agencies. I am happy for leading GIC as the first PDAN of SA since the early stages of SA and thankful to the staff for their excellent work for the region.

*Secretariat:*
*As we said, we are grateful for your co-chairship at SC. Is there anything that you found impressive at SC?*

*Dr. Samarakoon:*
The SC of the SA is a great idea to enhance the system, to improve its efficiency, to adjust for user and provider needs, and to provide a stage for brainstorming. All the SC members seem to be happy about the discussions and progress of activities; however, I believe that we had more room to improve and that there are still areas to do better in. The idea of an SC, an independent gathering where a few volunteers can sit and chat about ways to improve the system, was brought up during APRSAF meetings and was eventually endorsed at APRSAF 21 in 2014.

The first SC meeting was held in Bangkok in early 2017, hosted by the Geo-Informatics and Space Technology Development Agency (GISTDA), where we started to talk and brainstorm about SA's strategic plan. The ideas that came up during the meeting were documented and I made the first draft of the strategic plan under five thematic areas for consideration at the Joint Project Team Meeting of SA. This provided a platform to share the requirements of SA and share them with the expertise of participating agencies. I believe that SC members who took the leading role did a good job providing essential technical and procedural guidance to improve SA data distribution and VAP creation systems. I am happy to be one of the co-chairs of the SC from its beginning until the 2022 meeting in Bangkok. I enjoyed working with co-chair Mr. Koji Suzuki of Asian Disaster Reduction Center (ADRC) and all the SC members and am thankful for their positive contribution. Having said that, I should also note here that the strategic plan we designed in 2017 needs revisions to adopt new technologies as well as new development in IT technology to strengthen SA.

*Secretariat:*
*Did you have any policy or strategy in supporting SA's operation through your co-chairship?*

*Dr. Samarakoon:*

I was one of the co-chairs since the beginning of SC in 2015. With my experience working with JAXA, other space agencies in Asia, disaster risk reduction (DRR) agencies, and international organizations, it was easy for me to reach out to many experts and DRR- and space-related leaders in the region. One of the discussions and the concerns at the SC was how to get all the participants motivated. I always wanted everyone's participation and collaboration to strengthen the SA. I wanted to be independent while chairing SC meetings so that I would be able to discuss and observe all the discussions from the perspective of other members and partners. I appointed a staff member to represent GIC at SC meetings, as I didn't want to take the floor as the director of GIC. That helped me to be the co-chair even after I left GIC, I believe. So, my strategy as the co-chair was to be proactive, collaborative, and independent.

*Secretariat:*
*During your time at GIC and after that, GIC continues to provide VAPs. Are there any Emergency Observation Requests (EORs) that stand out, and why?*

*Dr. Samarakoon:*

When addressing emergency response, we tried our best to communicate with local agencies for many reasons. One of the main reasons is to determine local agency requirements, what information they would like to have extracted, at what scale, etc.

One interesting case that I can remember was from Myanmar. From the Department of Meteorology and Hydrology (DMH) of Myanmar, a request was submitted to SA to find the reason for a sudden water level increase in a northern city. DMH suspected several possible reasons such as sudden and intensive precipitation in the river basin, excessive snowmelt, burst or breach of a lake, etc. We collected various data including GSMaP, ALOS, etc. and provided DMH various VAPs based on those satellite data. Observation on time series GSMaP showed high-intensity rainfall over the basin and we were happy to provide very good satellite-based products to identify the reason for DMH with evidence. On the other hand, we realized that requirements can be better addressed by combining various observations.

Another interesting case was in Sri Lanka where we could mobilize the local Disaster Management Center (DMC) to visit a few places and check data during flood map creation. We worked closely with a survey group to compare mapping results and then extrapolate them over a large area in Colombo. In this activity, DMC noticed that Synthetic Aperture Radar (SAR) data showed a promising application in flood mapping; particularly in rainy conditions, there are some concerns regarding urban mapping due to the double bounce scatter of radar. Both these cases involved dealing with the crisis as well as developing technological know-how because it was possible to get local agency participation. So, how to get local agencies involved in the VAP creation and sharing process will always be an interesting issue.

*Secretariat:*
*Since the launch of SA, the SA satellite fleet keeps growing. Are there any satellites or data that*

*stand out, and why?*

**Dr. Samarakoon:**
Although for the last few years I do not work directly with satellite data, from my experiences with several flood disasters in the region where we usually have prevailing cloud cover on rainy days, SAR data are more significant than optical data. I don't think it would be good idea to compare agencies that provide satellite data to SA, but I could say that the SAR data of JAXA has many advantages over other optical data in flood inundation mapping or flood dynamics monitoring as well as following the recovery. It would be great if SA-SC could start a discussion on NASA-ISRO SAR mission (NISAR) under the SA program for emergency response.

*Secretariat:*
*We suppose that a certain level of skills is necessary for making VAPs and capacity building is important to keep such engineers. Could we have your opinion on such capacity building?*

**Dr. Lal Samarakoon:**
Typically, we used to teach the principles of remote sensing, sensors, interaction with the atmosphere, energy reactions, etc. while discussing how we could interpret satellite data to ground objects through hands-on training. In today's IT world and given the solution-oriented nature of problem-solving strategies, I believe that typical capacity building may not be necessary. Nowadays, the trend is to create solution-oriented systems and tools that people can access over the internet and cloud systems without any requirements, or with limited knowledge of remote sensing systems. Therefore, guidance and demonstrations on how to use these cloud-based facilities are currently in need to use satellite data more efficiently and in a timelier manner. Developing some tools based on the needs of end users is something that we need to invest time and effort in. I would prefer research by institutes like AIT, the University of Tokyo, and Yamaguchi University with various types of data and come up with solution and tools for end users to use as they wish. Some tools like SAR-Flood, Optical-Flood, Flood-Changes would be ideal for end users to use with SA data over a cloud-based system.

*Secretariat:*
*Cooperation with other countries and other institutions is indispensable to delivering the VAPs to affected areas in a timely manner. Could we have your opinion on maintaining and developing such cooperation?*

**Dr. Lal Samarakoon:**
This is always a challenge. How to bring end-use agencies on board and maintain good collaboration is a topic to continue at SC. SA PDANs and some DANs are working tirelessly to produce VAPs in time and provide them to relevant agencies in a timely manner but always some questions remain regarding the timing of the products, product requirements, product accuracy, etc. Therefore, it is necessary to have end-user agency collaborations within the SA system to make the best use of VAP products.

Although such collaborations are happening in some countries, still we have to make efforts to bring onboard several DRR agencies in the region to better prepare the VAPs for emergency disaster response programs. In this regard, I believe that having collaborators such as ADRC serves to improve and establish a closer relationship with DRR agencies to promote the use of VAPs and find ways to deliver VAPs to the most appropriate user during a given disaster.

*Secretariat:*
*Recently, the number of organizations, from both the public and private sectors, in the field of disaster management is growing, with part of them relating to the Disasters Charter. From a viewpoint of disseminating information to affected areas smoothly, what kind of relations should SA have with these organizations?*

**Dr. Samarakoon:**
Let me start the answer by discussing the public sector. SA has been primarily dealing with public sector agencies in the region, as they have national mandates and obligations to provide assistance during disaster and recovery.
However, reaching out to the end user and DRR agencies is not always an easy task, as we have to follow the national direction of a given country to reach them. Therefore, it is necessary to determine and prepare a structural strategy to reach out to national DRRs in each country.
On that matter, I can remember that we carried out a few successful national-level meetings in Indonesia, Vietnam, and Myanmar during 2014–2015 in which we tried to connect national DRR agencies with space agencies to establish connections based on each country's structure and set the ground for SA activities and support. During those meetings, the value of SA, accessing VAPs, creating VAPs, and using VAPs within their local GIS systems were demonstrated. Those meetings were quite successful in expanding the local network and reaching out to end users. It would be nice if this effort can be further explored.
The private sector does not have any obligation to help in a disaster situation, but they may like to join the system if they can identify direct or indirect benefits. This would be quite true in disaster preparedness activities, as various private sector DRR models can be linked with satellite data for 2D mapping, large-area estimations, verification, visualization, etc. It is good to see them joining even SC.

*Secretariat:*
*Climate change is a part of the causes of the current growth of natural disasters. What should SA do about this?*

**Dr. Lal Samarakoon:**
It is documented and many researchers have demonstrated that climate change would be one of the reasons for an increase in natural disasters. Addressing climate change, observing climate change indicators, or being involved in climate change action plans are beyond the scope of SA. The SA was launched to support disaster risk management where possible. Whether it is due to climate change or not, the task of SA remains unchanged.

If the disaster and hazard frequency increases, the pressure on the system will increase. Handling of EORs, data acquisition, and sharing will require more resources. Therefore, it is more important to have an automated system for the acquisition of data, processing, and distribution that can accommodate the increasing number of requests in a timely manner.

I have some concerns about the data providers. JAXA is very active but data coming from other regional agencies are somewhat limited. There is a need to renew existing data providers' relationships by getting them more committed to providing data, at least for emergency response. Collaboration support could be further enhanced by proactive bilateral discussions rather than leaving open invitations to data providers.

*Secretariat:*
*As the last question, we would like to have your advice on what is necessary for the implementation of SA Step 3 and the further progress of Sentinel Asia.*

*Dr. Samarakoon:*
I know well that SA is moving toward extending the target to cover the total disaster cycle, that is, to support the region with emergency response as well as preparedness and recovery.

Despite discussing this in several SC meetings, I have not seen any tangible effort from participating agencies to materialize this. It is not that they are not supportive to the idea, but there could be many limitations in data provision.

I believe that this is not an easy task to achieve. Will it be possible to obtain satellite data to acquire information on the preparedness or recovery phase? Which space agency is ready to provide tailored and timely satellite data to address these needs? We know there are some satellite data with an open data policy. In the time to come, some satellites will be launched with an open data policy. Though these data are freely accessible, no satellite data service supports particular pre-disaster or post-disaster activities. Those free data systems are not tailor-made to address given hazards and predict disasters. Such a system will not come to exist, as data needs are very diverse, limiting the serving capacity of satellite programs. But I suggest trying it with data other than earth observation data; GSMaP and Global Navigation Satellite System (GNSS) would be worth to try. These two systems combined with earth observation have shown many potential applications that could help in disaster preparedness and recovery stages.

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3. [Report] Sentinel Asia Annual Report 2021 has been published!

Sentinel Asia's activity report for 2021 has been published. The report features, among others, (i) a detailed review on EORs conducted in 2021 including good practices; (ii) external relations such as news, publications, and reports on conferences; and (iii) an analytical survey of Sentinel Asia's operations.

In 2021, like 2020, Sentinel Asia's annual general meeting "Joint Project Team Meeting (JPTM)" was forced to be called off due to the COVID-19 pandemic. In this regard, this Annual Report provided

JPT members with an alternative opportunity to report their Sentinel Asia-related activities, which would have been provided as part of the JPTM. In response to the invitation by the Sentinel Asia secretariat team, 20 JPT members contributed their activity reports, which are printed in the Appendix section of the Annual Report.

The Annual Report is available on the Sentinel Asia webpage at https://sentinel-asia.org/reports/Reports/SA_Annual_Report_2021.pdf

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4. How to send an Emergency Observation Request

JPT member organizations are entitled to send an Emergency Observation Request (EOR) for disasters in the Asia-Pacific region. Please refer to https://sentinel-asia.org/e-learning/Emergency_Observation_Request.html.

EOR Order Desk:
Asian Disaster Reduction Center (ADRC)
HP: http://www.adrc.asia/
E-mail: sarequest@adrc.asia
FAX: +81-78-262-5546,
TEL: +81-78-262-5540

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5. Using Sentinel Asia Operation System, OPTEMIS

Sentinel Asia launched a new operation system, OPTEMIS. Please refer to the website on how to create an account for OPTEMIS. https://sentinel-asia.org/e-learning/Emergency_Observation_Request.html

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Japan Aerospace Exploration Agency (JAXA)
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FAX: +81-3-5777-1580

## List of JPT Members

### 112 JPT members (95 organizations from 29 countries/regions and 17 international organizations)

| No. | Country / Region | No. | Organization | Data Provider Node (DPN) | Data Analysis Node (DAN) |
|---|---|---|---|---|---|
| 1 | Armenia | 1 | Ministry of Emergency Situation (MES) | | |
| 2 | Australia | 2 | CSIRO Office of Space Science and Applications (COSSA) | | |
| | | 3 | Geoscience Australia (GA) | | |
| | | 4 | Bureau of Meteorology (BOM) | | |
| 3 | Bangladesh | 5 | Bangladesh Space Research and remote Sensing Organization (SPARRSO) | | |
| 4 | Bhutan | 6 | Department of Disaster Management, Ministry of Home and Cultural Affairs | | |
| | | 7 | National Land Commission | | |
| | | 8 | Sherubtse College, Royal University of Bhutan | | |
| | | 9 | Department of Geology and Mines (DGM) | | |
| | | 10 | Ministry of Works and Human Settlement (MoWHS) | | |
| 5 | Brunei | 11 | Survey Department (SD), Ministry of Development | | ✔ |
| 6 | Cambodia | 12 | Ministry of Land Management, Urban Planning and Construction | | |
| | | 13 | National Committee for Disaster Management (NCDM) | | |
| 7 | China | 14 | National Disaster Reduction Center of China (NDRCC), Ministry of Civil Affair | | |
| | | 15 | College of Disaster and Emergency Management, Beijing Normal University (BNU) | | |
| | | 16 | Institute of Geology, China Earthquake Administration (CEA) | | ✔ |
| | | 17 | Sichuan University | | ✔ |
| | | 18 | The Chinese University of Hong Kong (CUHK) | | ✔ |
| | | 19 | Institute of Mountain Hazards and Environment (IMHE), Chinese Academy of Sciences (CAS) | | ✔ |
| 8 | Fiji | 20 | National Disaster Management Office, FIJI (NDMO) | | |
| 9 | India | 21 | Indian Space Research Organization (ISRO) | ✔ | ✔ |
| | | 22 | University of Kashmir | | |
| | | 23 | Gauhati University | | |
| | | 24 | Symbiosis Institute of Geoinformatics (SIG) , Symbiosis International University (SIU) | | ✔ |
| 10 | Indonesia | 25 | National Disaster Management Agency (BNPB) | | |
| | | 26 | National Research and Innovation Agency (BRIN) | | ✔ |
| | | 27 | Institute of Technology Bandung (ITB) | | |
| | | 28 | Universitas Jenderal Achmad Yani (UNJANI) | | |
| | | 29 | Center for Remote Sensing and Ocean Sciences (CReSOS) Udayana University | | ✔ |
| | | 30 | Ministry of Marine Affairs and Fisheries | | ✔ |

| | | | | | |
|---|---|---|---|---|---|
| 11 | Japan | 31 | Keio University | | |
| | | 32 | Japan Aerospace Exploration Agency (JAXA) | ✔ | ✔ |
| | | 33 | Infrastructure Development Institute (IDI) Japan (IFNet) | | |
| | | 34 | Hokkaido University | | |
| | | 35 | Yamaguchi University | | ✔ |
| | | 36 | Chubu University | | ✔ |
| | | 37 | Chiba University | | ✔ |
| | | 38 | Hiroshima Institute of Technology | | ✔ |
| | | 39 | Tokyo Institute of Technology (TIT) | | ✔ |
| | | 40 | International Research Institute of Disaster Science, Tohoku University | | ✔ |
| | | 41 | University of Tokyo | | ✔ |
| | | 42 | National Research Institute for Earth Science and Disaster Resilience (NIED) | | ✔ |
| | | 43 | Japan International Cooperation Agency (JICA) | | |
| | | 44 | RIKEN | | ✔ |
| | | 45 | Kobe University | | ✔ |
| 12 | Kazakhstan | 46 | National Center of Space Researches and Technologies (NCSRT) | | ✔ |
| 13 | Korea | 47 | Korea Aerospace Research Institute (KARI) | ✔ | ✔ |
| | | 48 | National Disaster Management Research Institute (NDMI) | | ✔ |
| 14 | Kyrgyz | 49 | Central Asian Institute of Applied Geosciences (CAIAG) | | ✔ |
| 15 | Lao P.D.R. | 50 | Ministry of Labor and Social Welfare | | |
| | | 51 | Natural Resources and Environment Institute (NREI), Ministry of Natural Resources and Environment (MONRE) | | |
| 16 | Malaysia | 52 | National Security Division, Prime Minister's Department | | |
| | | 53 | Malaysian National Space Agency (ANGKASA) | | ✔ |
| 17 | Mongolia | 54 | Information And Research Institute Of Meteorology, Hydrology And Environment (IRIMHE) | | |
| 18 | Myanmar | 55 | Department of Meteorology and Hydrology (DMH) | | |
| | | 56 | Relief and Resettlement Department (RRD) | | |
| | | 57 | Myanmar Earthquake Committee (MEC) , Myanmar Engineering Society (MES) | | |
| 19 | Nepal | 58 | Survey Department (SD) | | |
| | | 59 | Department of Water Induced Disaster Management (DWIDM), Ministry of Irrigation | | |
| | | 60 | Land Management Training Centre | | |
| | | 61 | Department of Hydrology and Meteorology (DHM), Ministry of Population & Environment | | |

| | | | | | |
|---|---|---|---|---|---|
| 20 | Pakistan | 62 | Pakistan Space & Upper Atmosphere Research Commission (SUPARCO) | | ✔ |
| 21 | Papua New Guinea | 63 | National Disaster Centre (NDC) | | |
| 22 | Philippines | 64 | Office of Civil Defense (OCD), National Disaster Risk Reduction and Management Council (NDRRMC) | | |
| | | 65 | National Mapping and Resource Information Authority (NAMRIA) | | ✔ |
| | | 66 | Bureau of Soils and Water Management (BSWM), Department of Agriculture | | |
| | | 67 | Mines and Geoscience Bureau (MGB), Department of Environment and Natural Resources | | |
| | | 68 | Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA) | | ✔ |
| | | 69 | Philippine Council for Industry, Energy and Emerging Technology Research and Development (PCIEERD) | | |
| | | 70 | Philippine Institute of Volcanology and Seismology (PHIVOLCS) | | ✔ |
| | | 71 | Manila Observatory (MO) | | ✔ |
| | | 72 | NOAH Center of the University of the Philippines Resilience Institute | | ✔ |
| 23 | Singapore | 73 | Centre for Remote Imaging, Sensing and Processing (CRISP) | ✔ | ✔ |
| | | 74 | Earth Observatory of Singapore (EOS) | | ✔ |
| 24 | Sri Lanka | 75 | Survey Department of Sri Lanka | | ✔ |
| | | 76 | Ministry of Disaster Management | | ✔ |
| 25 | Taiwan | 77 | Taiwan Space Agency (TASA) | ✔ | ✔ |
| | | 78 | National Applied Research Laboratories (NARL) | | ✔ |
| | | 79 | Center for Space and Remote Sensing Research, National Central University (CSRSR, NCU) | | ✔ |
| 26 | Thailand | 80 | Geo-Informatics and Space Technology Development Agency (GISTDA) | ✔ | ✔ |
| | | 81 | Department of Disaster Prevention and Mitigation (DDPM) | | |
| | | 82 | Department of Water Resources (DWR) | | |
| | | 83 | Royal Forest Department (RFD) | | |
| | | 84 | National Park, Wildlife and Plant Conservation Department | | |
| | | 85 | Royal Irrigation Department (RID) | | |
| | | 86 | Land Development Department (LDD) | | |
| | | 87 | Andaman Environment and Natural Disaster Research Center, Prince of Songkla University (ANED, PSU) | | ✔ |
| 27 | Turkiye | 88 | Disaster and Emergency Management Presidency (AFAD) | | |

| | | | | | |
|---|---|---|---|---|---|
| 28 | United Arab Emirates | 89 | Mohammed Bin Rashid Space Centre (MBRSC) | ✔ | ✔ |
| 29 | Vietnam | 90 | Vietnamese Academy of Science and Technology (VAST) | ✔ | ✔ |
| | | 91 | Ministry of Agriculture and Rural Development (MARD) | | |
| | | 92 | Ministry of Natural Resources and Environment (MONRE) | | ✔ |
| | | 93 | Cartography Department, Ministry of Defense (MOD) | | |
| | | 94 | Ministry of Science and Technology (MOST) | | |
| | | 95 | Vietnam Institute of Geosciences and Mineral Resources (VIGMR) | | |
| 30 | International Organization | 96 | Asian Institute of Technology (AIT) | | ✔ |
| | | 97 | The ASEAN Secretariat | | |
| | | 98 | United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP) | | |
| | | 99 | United Nations Office for Outer Space Affairs (UNOOSA) | | |
| | | 100 | International Center for Integrated Mountain Development (ICIMOD) | | ✔ |
| | | 101 | CSIRO Office of Space Science and Applications (COSSA) | | |
| | | 102 | International Centre for Water Hazard and Risk Management (ICHARM) | | |
| | | 103 | Asian Disaster Reduction Center (ADRC) | | ✔ |
| | | 104 | Secretariat of the Pacific Community (SPC/SOPAC) | | ✔ |
| | | 105 | The World Bank (WB) | | |
| | | 106 | International Water Management Institute (IWMI) | | ✔ |
| | | 107 | Asian Development Bank (ADB) | | ✔ |
| | | 108 | ASEAN Coordinating Centre for Humanitarian Assistance on disaster management (AHA Centre) | | |
| | | 109 | World Wide Fund for Nature (WWF) - Pakistan | | |
| | | 110 | Asian Disaster Preparedness Center (ADPC) | | ✔ |
| | | 111 | Myanmar Information Management Unit (MIMU) | | ✔ |
| | | 112 | UN World Food Programme (WFP) | | ✔ |
| | | | | 8 | 53 |

Emergency Observation Requests (2007 – 2021)

| Country | Request | Activation | Rejection | Percentage of Activation | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | Total | Flood Num | Flood (%) | Earthquake Num | Earthquake (%) | Landslide Num | Landslide (%) | Typhoon Num | Typhoon (%) | Forest fire Num | Forest fire (%) | Volcanic Eruption Num | Volcanic Eruption (%) | Cyclone Num | Cyclone (%) | Oil Spill Num | Oil Spill (%) | others Num | others (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Indonesia | 63 | 56 | 7 | 88.9 | 7 | 2 | 5 | 9 | 2 | 4 | 2 | 4 | 2 | 7 | 3 | 4 | 2 | 4 | 3 | 3 | 63 | 23 | 36.5 | 15 | 23.8 | 4 | 6.3 | | | 2 | 3.2 | 14 | 22.2 | | | | | 5 | 7.9 |
| Vietnam | 58 | 52 | 6 | 89.7 | 2 | 2 | 4 | 7 | 2 | 1 | 2 | | 2 | 3 | 12 | 6 | 4 | 5 | 4 | 2 | 58 | 44 | 75.9 | 0 | 0.0 | 1 | 1.7 | 9 | 15.5 | 1 | 1.7 | | | | | 2 | 3.4 | 1 | 1.7 |
| Philippine | 57 | 55 | 2 | 96.5 | 1 | 1 | 6 | 1 | 4 | 4 | 3 | 1 | 2 | 4 | 4 | 2 | 5 | 4 | 8 | 7 | 57 | 20 | 35.1 | 10 | 17.5 | | | 15 | 26.3 | 1 | 1.8 | 5 | 8.8 | 2 | 3.5 | | | 4 | 7.0 |
| India | 38 | 34 | 4 | 89.5 | | | 1 | 4 | 3 | 1 | 2 | 2 | 1 | 2 | 1 | 3 | 3 | 5 | 4 | 6 | 38 | 25 | 65.8 | 1 | 2.6 | | | 1 | 2.6 | 1 | 2.6 | | | 7 | 18.4 | | | 3 | 7.9 |
| Japan | 26 | 26 | 0 | 100.0 | | 2 | | 1 | 4 | 1 | 3 | 3 | 2 | 1 | | 2 | 3 | 2 | 2 | | 26 | 12 | 46.2 | 5 | 19.2 | 3 | 11.5 | 2 | 7.7 | | | 4 | 15.4 | | | | | | |
| Nepal | 23 | 22 | 1 | 95.7 | 1 | 2 | 2 | 1 | 2 | 1 | 1 | 1 | 4 | 2 | 2 | | 2 | | 1 | 1 | 23 | 14 | 60.9 | 2 | 8.7 | 3 | 13.0 | 1 | 4.3 | 1 | 4.3 | | | | | | | 2 | 8.7 |
| Thailand | 18 | 16 | 2 | 88.9 | 2 | 3 | | 1 | 2 | 1 | 1 | | | | 1 | 2 | 1 | | 1 | 3 | 18 | 15 | 83.3 | 1 | 5.6 | | | | | | | | | | | | | 2 | 11.1 |
| Sri Lanka | 16 | 15 | 1 | 93.8 | | 1 | 2 | 2 | 1 | | 1 | | 1 | 1 | 1 | 2 | | 1 | 3 | | 16 | 12 | 75.0 | | | 1 | 6.3 | | | | | | | 2 | 12.5 | 1 | 6.3 | | |
| Taiwan | 16 | 16 | 0 | 100.0 | | | | 2 | 1 | | | | 2 | 5 | 3 | 2 | | | | 1 | 16 | 4 | 25.0 | 3 | 18.8 | 1 | 6.3 | 6 | 37.5 | | | | | | | 1 | 6.3 | 1 | 6.3 |
| Myanmar | 15 | 13 | 2 | 86.7 | | 1 | | | 2 | | 1 | | 2 | 4 | | 3 | 1 | | 1 | | 15 | 9 | 60.0 | 4 | 26.7 | 1 | 6.7 | | | | | | | | | | | 1 | 6.7 |
| Pakistan | 13 | 9 | 4 | 69.2 | 1 | 2 | | 3 | 1 | | 1 | | 2 | 2 | | | | | | 1 | 13 | 6 | 46.2 | 2 | 15.4 | 4 | 30.8 | | | | | | | | | | | 1 | 7.7 |
| China | 12 | 10 | 2 | 83.3 | | 2 | | 1 | 1 | 2 | 1 | 1 | | | 2 | | 1 | | | 1 | 12 | 2 | 16.7 | 6 | 50.0 | 3 | 25.0 | | | 1 | 8.3 | | | | | | | | |
| Bangladesh | 11 | 11 | 0 | 100.0 | 3 | | | 1 | | | | | 1 | 2 | 2 | | | 1 | | 1 | 11 | 6 | 54.5 | | | 2 | 18.2 | | | | | | | 3 | 27.3 | | | | |
| Tajikistan | 9 | 9 | 0 | 100.0 | 1 | | | 2 | 1 | 1 | | 1 | | 1 | | | | 2 | | | 9 | 4 | 44.4 | 2 | 22.2 | 2 | 22.2 | | | | | | | | | | | 1 | 11.1 |
| Kyrgyzstan | 8 | 5 | 3 | 62.5 | | | | 1 | 3 | 1 | | | | | | | 1 | 2 | | | 8 | 3 | 37.5 | 1 | 12.5 | 2 | 25.0 | | | | | | | | | | | 2 | 25.0 |
| Bhutan | 7 | 5 | 2 | 71.4 | | | | 2 | | 1 | | | 2 | 1 | | | 1 | | | | 7 | 4 | 57.1 | | | | | | | 3 | 42.9 | | | | | | | | |
| Kazakhstan | 6 | 4 | 2 | 66.7 | | | | 1 | 2 | 3 | | | | | | | | | | | 6 | 3 | 50.0 | | | | | | | 2 | 33.3 | | | | | | | 1 | 16.7 |
| Mongolia | 6 | 0 | 6 | 0.0 | 1 | | 2 | 2 | 1 | | | | | | | | | | | | 6 | 2 | 33.3 | | | | | | | 3 | 50.0 | | | | | | | 1 | 16.7 |
| Australia | 5 | 5 | 0 | 100.0 | | 1 | 3 | | 1 | | | | | | | | | | | | 5 | 3 | 60.0 | | | | | 1 | 20.0 | 1 | 20.0 | | | | | | | | |
| Brunei | 5 | 3 | 2 | 60.0 | | | | | 3 | 1 | | 1 | | | | | | | | | 5 | 4 | 80.0 | | | | | | | | | | | | | 1 | 20.0 | | |
| Cambodia | 4 | 4 | 0 | 100.0 | | | | 2 | 1 | | | | | | | | | 1 | | | 4 | 4 | 100.0 | | | | | | | | | | | | | | | | |
| Lao PDR | 4 | 4 | 0 | 100.0 | | 1 | | | | | | | | 1 | | 1 | 1 | | | | 4 | 3 | 75.0 | | | | | | | | | | | | | | | 1 | 25.0 |
| Solomon | 3 | 3 | 0 | 100.0 | 1 | | | | | | 1 | 1 | | | | | | | | | 3 | 1 | 33.3 | 1 | 33.3 | | | | | | | | | | | | | 1 | 33.3 |
| Malaysia | 3 | 3 | 0 | 100.0 | | | | | | | 2 | 1 | | | | | | | | | 3 | 2 | 66.7 | | | | | | | 1 | 33.3 | | | | | | | | |
| Korea | 3 | 3 | 0 | 100.0 | | | | | | | | | | 1 | | 1 | 1 | | | | 3 | | | 2 | 66.7 | | | | | 1 | 33.3 | | | | | | | | |
| Fiji | 3 | 3 | 0 | 100.0 | | | | | | 1 | | | 1 | | | | 1 | | | | 3 | 1 | 33.3 | | | | | 1 | 33.3 | | | | | 1 | 33.3 | | | | |
| Turkey | 4 | 4 | 0 | 100.0 | | | | | | | | | | | | 1 | 2 | 1 | | | 4 | 1 | 25.0 | 2 | 50.0 | 1 | 25.0 | | | | | | | | | | | | |
| Tonga | 3 | 3 | 0 | 100.0 | | | | | | | | 1 | | | | 1 | | | | 1 | 3 | | | | | | | | | | | | | 1 | 33.3 | 2 | 66.7 | | |
| PNG | 2 | 2 | 0 | 100.0 | | | | | | 1 | | | | | | 1 | | | | | 2 | | | | | 1 | 50.0 | | | | | | | 1 | 50.0 | | | | |
| Vanuatu | 2 | 2 | 0 | 100.0 | | | | | | | | | 1 | | | | | 1 | | | 2 | | | | | | | | | | | | | 2 | 100.0 | | | | |
| New Zealand | 1 | 1 | 0 | 100.0 | | | | | 1 | | | | | | | | | | | | 1 | | | 1 | 100.0 | | | | | | | | | | | | | | |
| Iran | 1 | 1 | 0 | 100.0 | | | | | | | | | | | | | 1 | | | | 1 | 1 | 100.0 | | | | | | | | | | | | | | | | |
| Lebanon | 1 | 1 | 0 | 100.0 | | | | | | | | | | | | | 1 | | | | 1 | | | | | | | | | | | | | | | | | 1 | 100.0 |
| United Arab Emirates | 1 | 1 | 0 | 100.0 | | | | | | | | | | | | 1 | | | | | 1 | | | | | | | | | | | | | | | 1 | 100.0 | | |
| Timor-Leste | 1 | 1 | 0 | 100.0 | | | | | | | | | | | | | | | 1 | | 1 | 1 | 100.0 | | | | | | | | | | | | | | | | 0.0 |
| Uzbekistan | 1 | 1 | 0 | 100.0 | | | | | | | | | | | | | | | 1 | | 1 | 1 | 100.0 | | | | | | | | | | | | | | | | 0.0 |
| Afghanistan | 2 | 1 | 1 | 50.0 | | | | | | | | 1 | | | | | | | | 1 | 2 | 1 | 50.0 | 1 | 50.0 | | | | | | | | | | | | | | |
| Total | 451 | 404 | 47 | - | 20 | 19 | 24 | 43 | 39 | 25 | 20 | 19 | 25 | 36 | 32 | 31 | 28 | 28 | 34 | 28 | 451 | 231 | - | 59 | - | 29 | - | 36 | - | 18 | - | 25 | - | 21 | - | 7 | - | 25 | - |

Number of requested EOR (by year)

Number of requested EOR (by each disaster)

## JPT member report "Sentinel Asia Activity in 2022"

| 1 | ADRC | Participation for the meeting and conference |
|---|---|---|
| 2 | AHA Center | AHA Centre Disaster Situation Report on the AHA Centre Response for Tropical Cyclone NORU and Tropical Cyclone NALGAE |
| 3 | BRIN | Summary of the Analysis of the Major Disaster Events in Indonesia in 2022 |
| 4 | CEA | Requested for the Earthquake in Shiuan |
| 5 | Chiba University | EMERGENCY RESPONSE OF THE 2022 TAIWAN EARTHQUAKE |
| 6 | DHM | Requested for GLOF in Nepal |
| 7 | EOS | EOR Responses and Publications from EOS as a Data Analysis Node |
| 8 | GIC/AIT | Activities carried out as Principal Data Analysis Node (P-DAN) for Sentinel Asia |
| 9 | GISTDA | GISTDA continues to support Disaster Management |
| 10 | ICIMOD | EOR: Earthquake in Afghanistan |
| 11 | ITB | Request for EORs, Flood in Indonesia |
| 12 | JAXA | Automatic analysis of flood extent using ALOS-2 data |
| 13 | MBRSC | Sharing satellite images for EOR |
| 14 | MO | Request for EORs |
| 15 | MONRE | Summary of 2022 results through SA system activation |
| 16 | MYSA | Utilization of Sentinel Earth Obeservation Satellite Images |
| 17 | PHIVOLCS | EOR |
| 18 | RIKEN | Global high-resolution land cover mapping |
| 19 | TASA | Responses to EOR (Providing Satellite Data as Data Provider Node) |
| 20 | University of Tokyo | R&D for capacity development on building footprint mapping |
| 21 | Yamaguchi University | Contribution VAPs for EOR activities |

| Organization | Asian Disaster Reduction Center (ADRC) |
|---|---|
| Title | Participation for the meeting and conference |
| Type of Activity | Conference, Meeting |
| Date | 2022 |

**Sentinel Asia Steering Committee**

The secretariat of the Sentinel Asia holds a Steering Committee (SC) consisting of key members every year where discussions on Sentinel Asia activities and activity reports from the members. In this year, SC was held on 10 and 11 October 2022 at the Asian Institute of Technology (AIT).

ADRC reported on the ADRC's areas of responsibility (smooth communication with members and promotion) as described in the Sentinel Asia Action Plan. ADRC also collected opinions on the calibration site that is under development and discussed with space agencies such as NSPO and NARL, which cooperated in the test shooting of satellite images, and consulted with them on future measures.



**The 28th session of the Asia-Pacific Regional Space Agency Forum (APRSAF-28)**

The 28th Session of the Asia-Pacific Regional Space Agency Forum (APRSAF) was held from 15 to 18 November 2022 in Hanoi, Vietnam. It was co-organized by the Ministry of Education, Culture, Sports, Science and Technology (MEXT), the Japan Aerospace Exploration Agency (JAXA), and the Vietnam Academy of Science and Technology (VAST). APRSAF was established in 1993 to enhance space activities

in the Asia-Pacific region. Attended by space agencies, governments, and international organizations such as the United Nations as well as companies, universities and research institutes, this forum is the largest space-related conference in the Asia Pacific region. APRSAF has four Working Groups: the (1) Space Applications Working Group (SAWG), (2) Space Technology Working Group (STWG), (3) Space Environment Utilization Working Group (SEUWG), and the (4) Space Education Working Group (SEWG). APRSAF participants share information about their activities and future plans for their countries and regions in each working group. APRSAF also supports international projects designed to find solutions to common issues such as disaster management and environmental protection.

ADRC participated in the working session of the Space Applications Working Group (SAWG) and gave the first presentation on Sentinel Asia emergency observation requests (EOR) and future action plans. The Sentinel Asia initiative involves the use of space-based information in the form of satellite images for disaster management. ADRC has been tasked with the responsibility of receiving emergency observation requests from ADRC member countries and Joint Project Team (JPT) members. ADRC gave the second presentation on our activities for the "Demonstration Experiment using MICHIBIKI (Quasi-Zenith Satellite System: QZSS)." This activity, which mainly targets the Asia-Pacific region, is to develop early warnings to encourage residents to take prompt evacuation actions.

| Organization | The ASEAN Coordinating Centre for Humanitarian Assistance on disaster management (AHA Centre) |
|---|---|
| Title | AHA Centre Disaster Situation Report on the AHA Centre Response for Tropical Cyclone NORU and Tropical Cyclone NALGAE |
| Type of Activity | Utilisation of satellite data products from Sentinel ASIA for disaster emergency situations |
| Date | 30/09 and 04/11 2022 |

The ASEAN Coordinating Centre for Humanitarian Assistance on Disaster Management (AHA Centre) is an inter-governmental organization which aims to facilitate cooperation and coordination among the ASEAN Member States and with the United Nations and international organizations for disaster management and emergency response in the ASEAN region. One of the main responsibilities for the AHA Centre is to conduct disaster monitoring and analysis in the ASEAN Region. When a significant disaster occurs in one or more of the ASEAN Member States, following the procedure in the Standard Operating Procedure for Regional Standby Arrangements and Coordination of Joint Disaster Relief and Emergency Response Operations (SASOP), in the event that one or more affected member state requests for assistance to the AHA Centre or accepts the offer of assistance from the AHA Centre, the AHA Centre may carry out emergency response operations. During these emergency response operations, the AHA Centre issues situation updates regarding the disaster.

In the year 2022, the AHA Centre published situation reports for Tropical Cyclone NORU in September and Tropical Cyclone NALGAE in November. These situation reports included mapping and analyses of the flooded areas from the Earth Observatory Singapore (EOS) through Sentinel ASIA. The AHA Centre also utilized the other products of Sentinel ASIA for internal correspondence.

In the case of TC NALGAE in November 2022, the AHA Centre and ASEAN-ERAT Members also utilised the flood proxy by EOS for BARMM in the Philippines to develop the deployment plan. During the deployment mission, the flood proxy areas were employed to determine the deployment location for the assessments conducted by ASEAN-ERAT. During the mission, the ASEAN-ERAT was divided into two (2) separate groups: ASEAN-ERAT 1 conducted the assessments in BARMM and ASEAN-ERAT 2 conducted the assessments in Western Visayas. The detailed information about the assessment activities carried out by the ASEAN-ERAT during the response to Tropical Cyclone NALGAE can be found in the AHA Centre Situation Updates for TC NALGAE 2022.
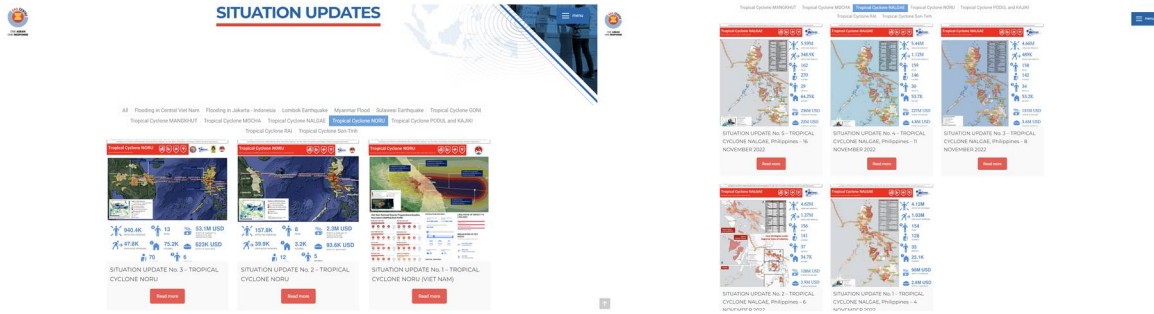
Situation Updates of Tropical Cyclone NORU (left) and Tropical Cyclone NALGAE (right)
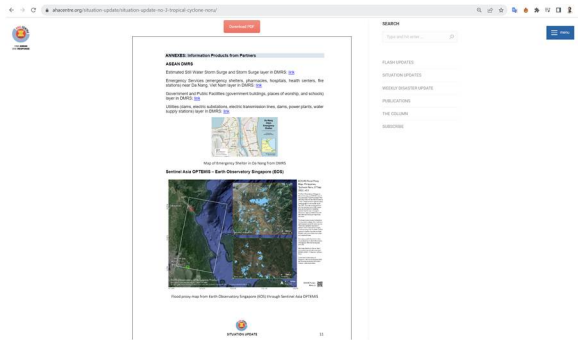


Situation Update #3 of Tropical Cyclone NORU
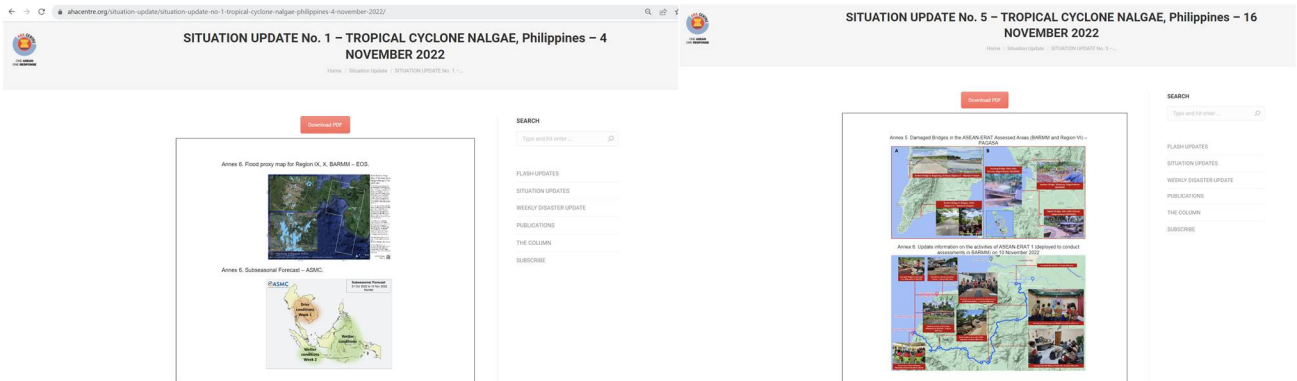


Situation Update #1 (left) and #4 (right) of Tropical Cyclone NALGAE

| Organization | National Research and Innovation Agency (BRIN), Indonesia |
|---|---|
| Title | Summary of the Analysis of the Major Disaster Events in Indonesia in 2022 |
| Type of Activity | EOR |
| Date | November – December 2022 |

The Indonesia Regional Support Office (RSO) UN-SPIDER, under the coordination of the Secretariat of the Indonesian Space Agency (INASA), BRIN, activated two major disaster events in 2022. First, on November 21st, an earthquake with a magnitude of 5.6 hit Cianjur, West Java Province. The day after the catastrophe, the Indonesian National Disaster Management Authority (BNPB or NDMA) reported that 268 people died, 1,083 people were injured, 22,198 building units were destroyed, and 58,362 people were evacuated. This earthquake also caused landslides in two separate locations. BRIN used high-resolution images and also activated an EOR to Sentinel Asia and produced several information releases in response to the earthquake, including the location of epicentrum, areas affected by landslides as well as the information of interferogram and LOS (line of sight) displacement processed using ALOS-2 PALSAR-2 ( provided by JAXA).
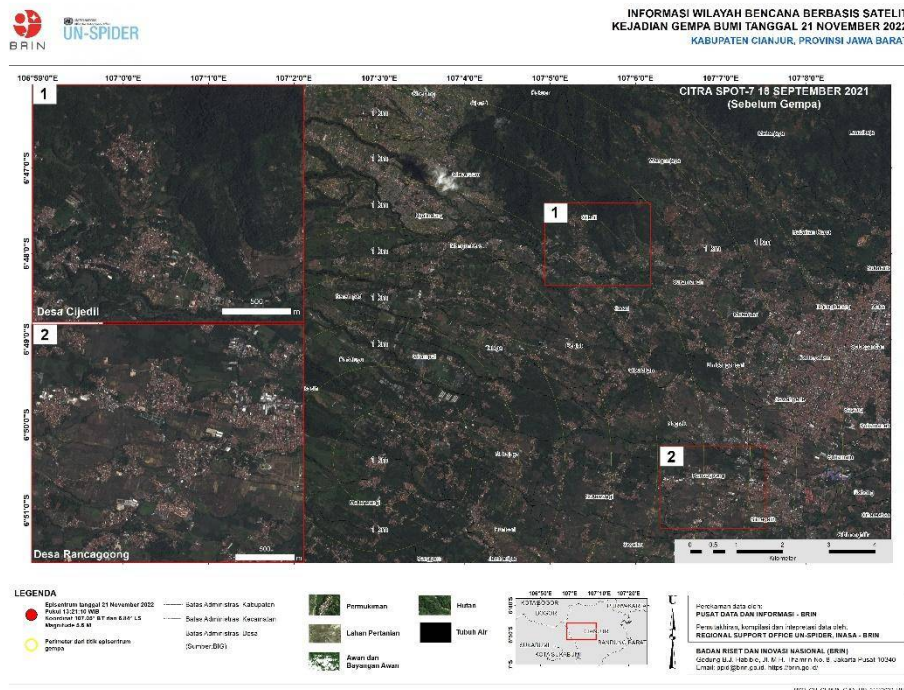


Figure 1 the epicentrum of the earthquake
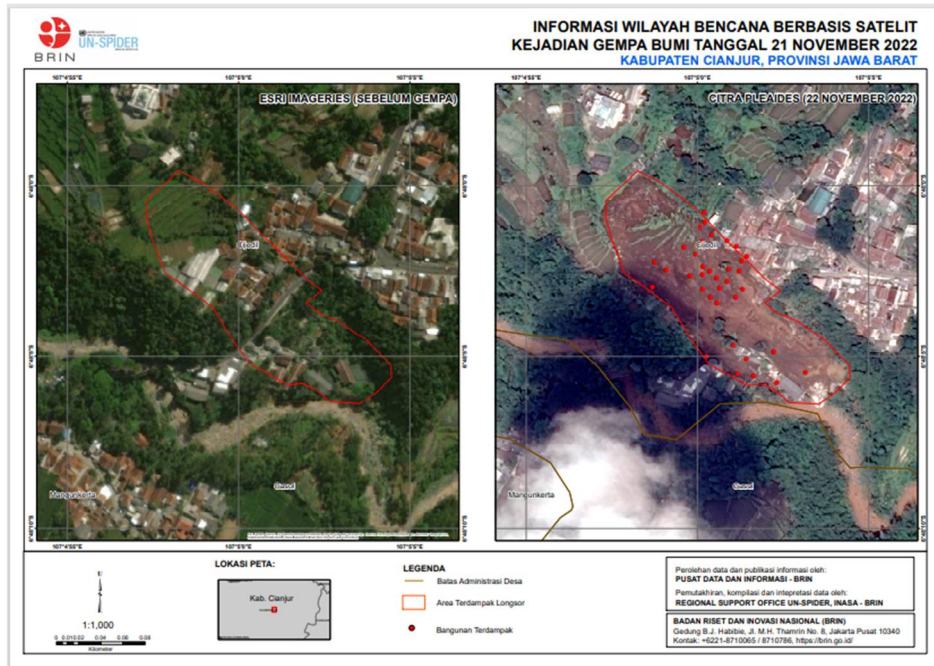
Figure 2  the area affected by landslide (first location)
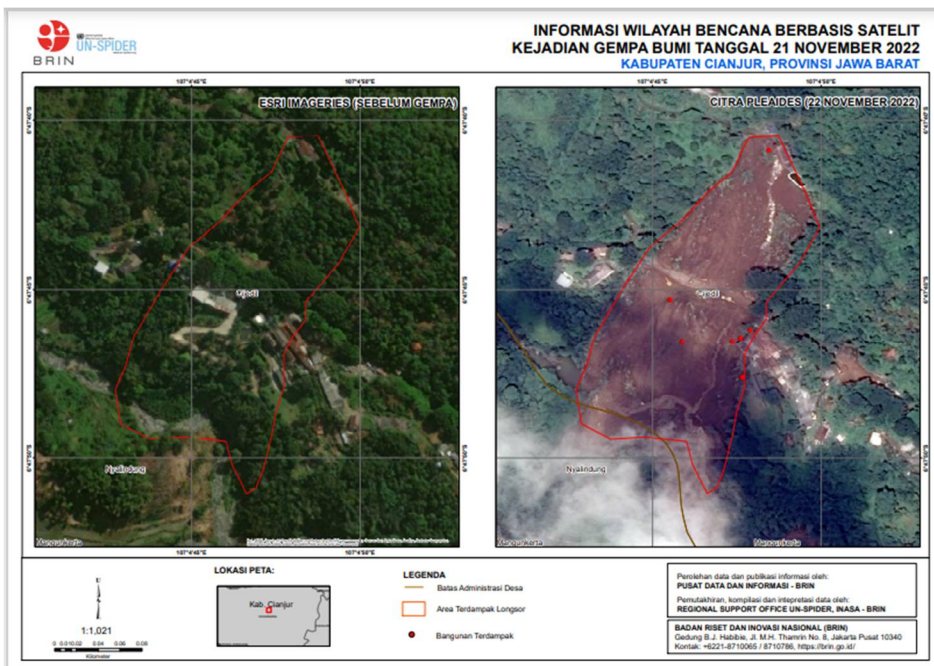


Figure 3 the area affected by landslide (second location)
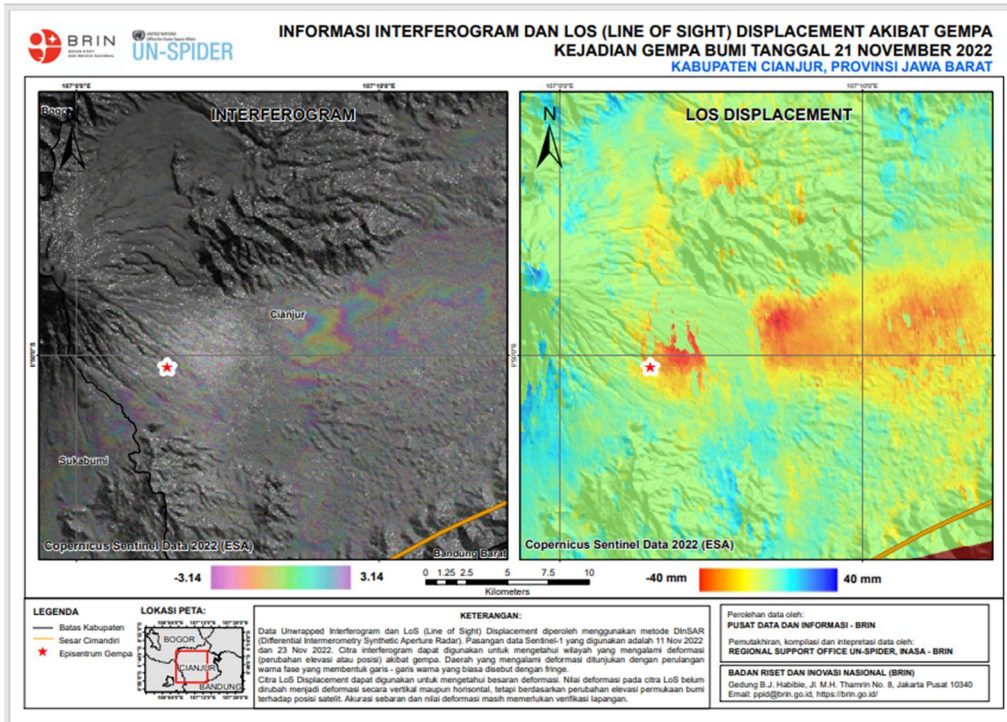
Figure 4  interferogram and LOS (line of sight) displacement
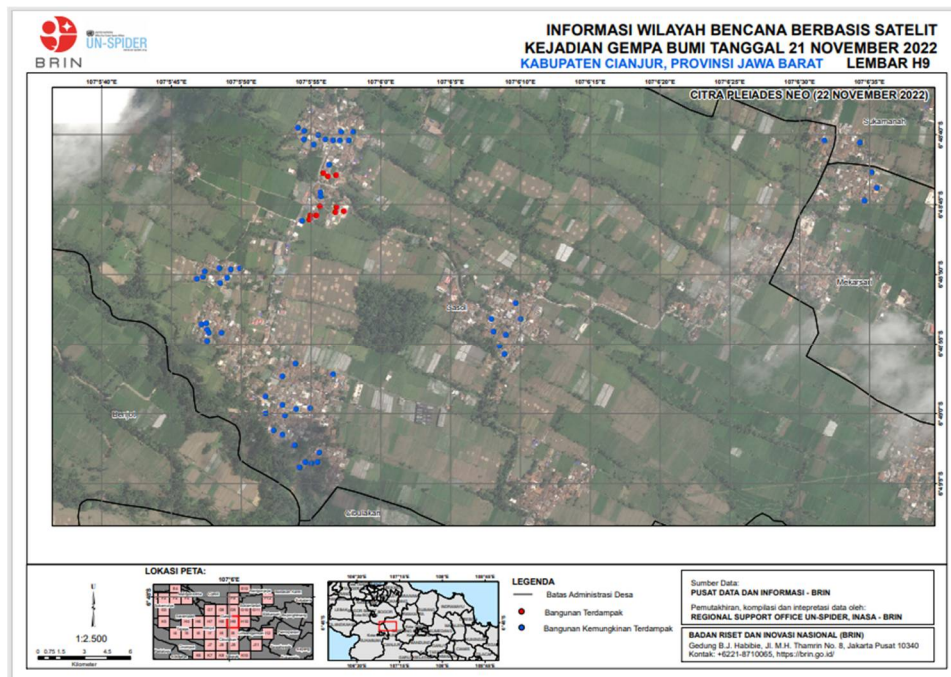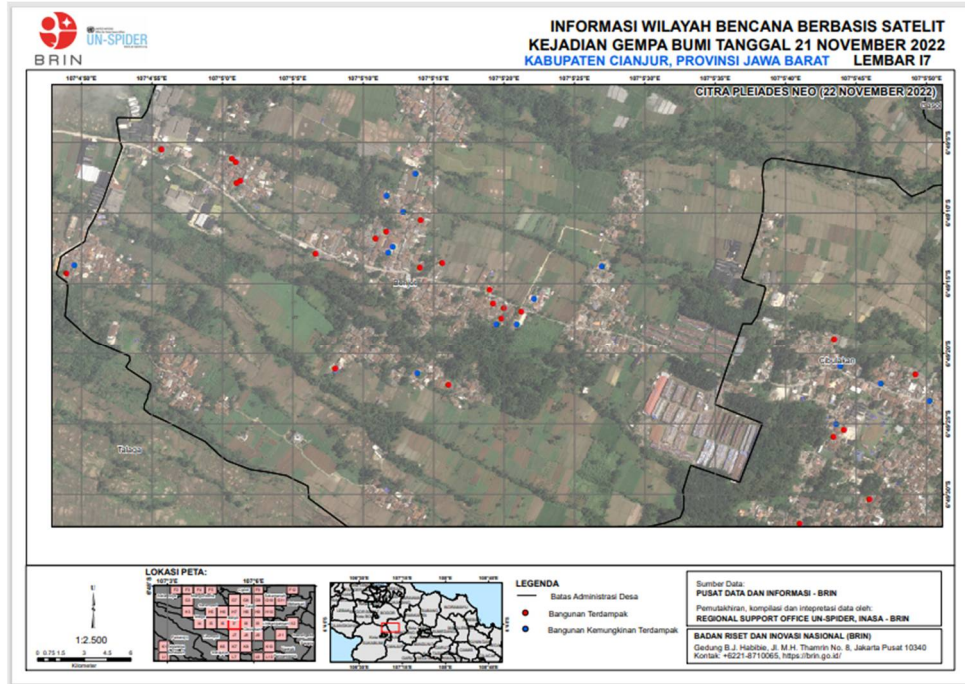
Figure 5 the affected buildings (red and blue dots)

The second event was the eruption of Mount Semeru on December 4, 2022. According to the BNPB, there were no fatalities, but there were 1,979 people relocated across eleven refugee camps. Because the high-resolution imageries of Mount Semeru was mostly obscured by clouds, the analysis of the eruption was limited. BRIN escalated the EOR activation to Disaster International Charter and received some clear satellite imageries to provide information on Mount Semeru's changes prior to and following the eruption.
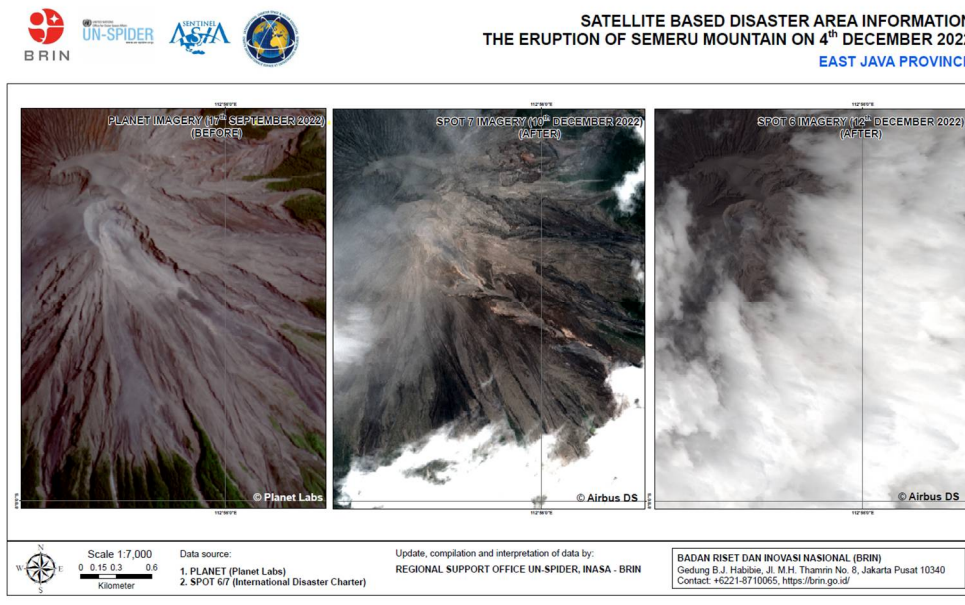


Figure 2.1 Mount Semeru before and after the eruption

| Organization | China Earthquake Administration (CEA) |
|---|---|
| Title | Requested for the Earthquake in Shiuan |
| Type of Activity | EOR activity |
| Date | September 2022 |

The China Earthquake Administration (CEA) is a government agency responsible for earthquake management in China, as mandated by the Law of the People's Republic of China on Protecting Against and Mitigating Earthquake Disasters of PRC under the administration of State Council.

CEA made an EOR for the Earthquake in Shiuan. We received a several products and utilized for our DRR activities such as response on site.
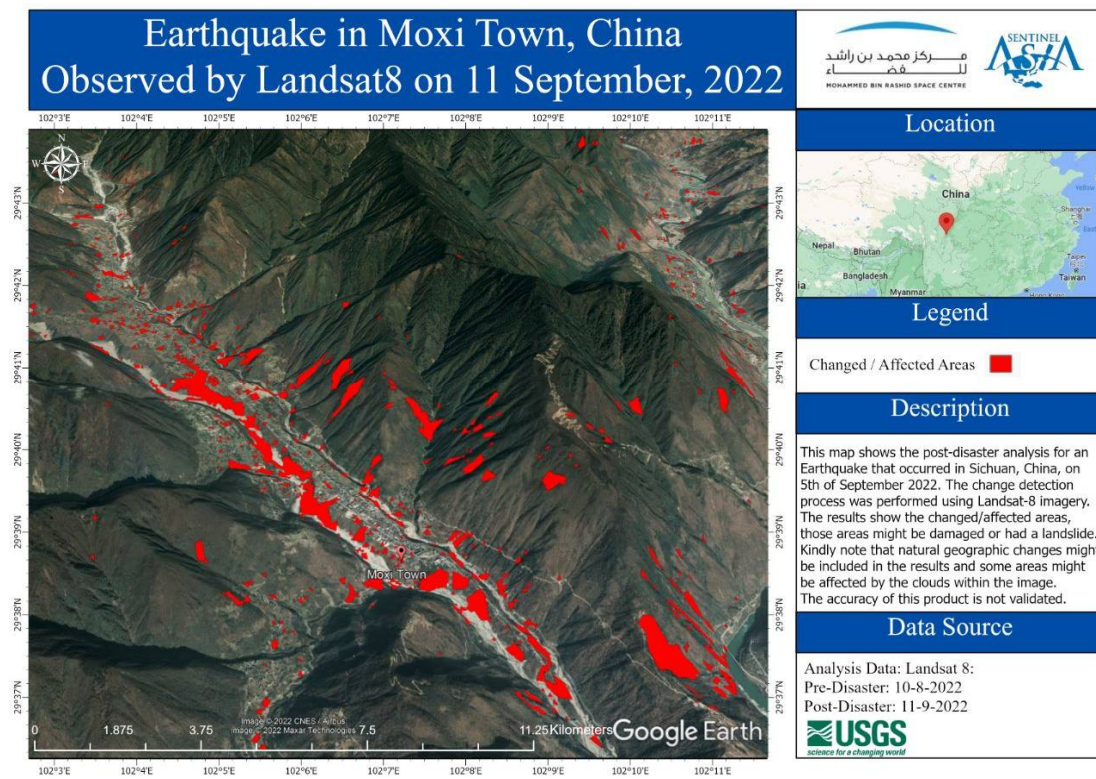
| Organization | Chiba University, Japan |
|---|---|
| Title | **EMERGENCY RESPONSE OF THE 2022 TAIWAN EARTHQUAKE** |
| Type of Activity | **EOR**<br>(e.g., Conference, Workshop, Meeting, Training, EOR, Providing satellite data or VAP) |
| Date | **24/08/2021** |

Mw 6.5 and Mw 6.9 earthquakes occurred in Taiwan on September 17 and 18, 2022 (UTC). Sentinel Asia activated this event on September 19, 2022. To estimate the crustal movements caused by the series of earthquakes, we applied the InSAR analysis to the pre- and post-event ALOS-2 images. The pre-event image was acquired on August 7, 2022, and the post-event image was acquired on September 18, 2022 (UTC). They were taken by the ScanSAR mode in the ascending path with the right look. The incidence angle was 55.1°. The enlarged results are shown in the following figures. According to the InSAR results, the west side of the fault moved more than 1 m close to the sensor direction. The length of the fault was more than 75 km. The obtained maximum of movement was 1.6 m around the middle of the fault.
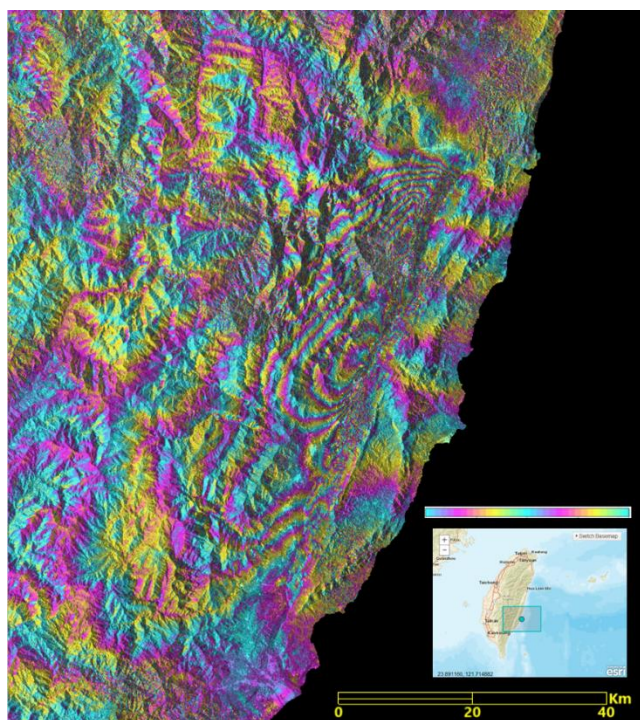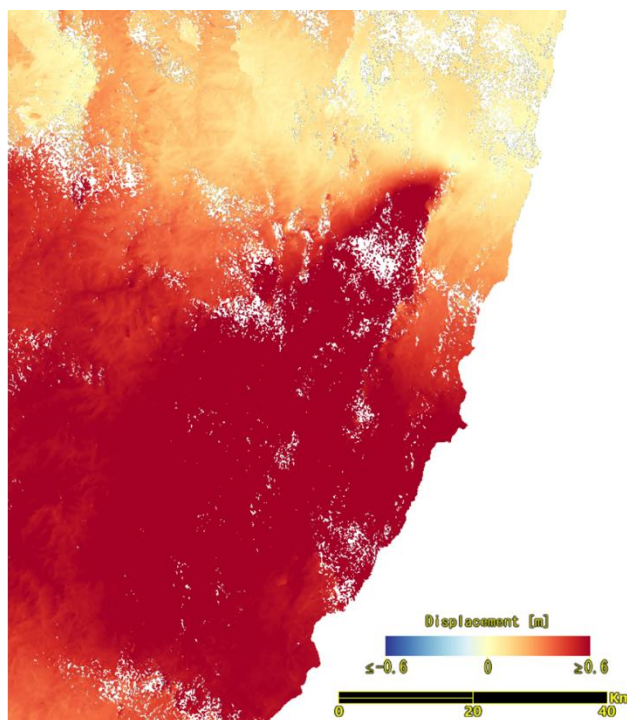


(a) Interferogram        (b) Displacement

Estimated crustal displacements around the fault using InSAR analysis

| Organization | Department of Hydrology and Meteorology (DHM), Nepal |
| --- | --- |
| Title | Requested for GLOF in Nepal |
| Type of Activity | EOR activity |
| Date | September 2022 |

The main objective of DHM is to collect hydrological and meteorological data throughout Nepal, process the data, publish it and disseminate the data to users such as water resource planners, developers, researchers and data seekers for the verification of extreme hydrological and meteorological events required for different purposes. The fundamental goal of DHM is to support for overall development of water resources of the country. Besides, DHM generates information of extreme hydrological and meteorological events and deliver such information publicly in time to save life and property of people.

DHM requested for GLOF in Nepal which was hit in Manaslu area, in October 2023. Provided satellite images and VAPs were utilized information sharing between DRR organization and made a report.
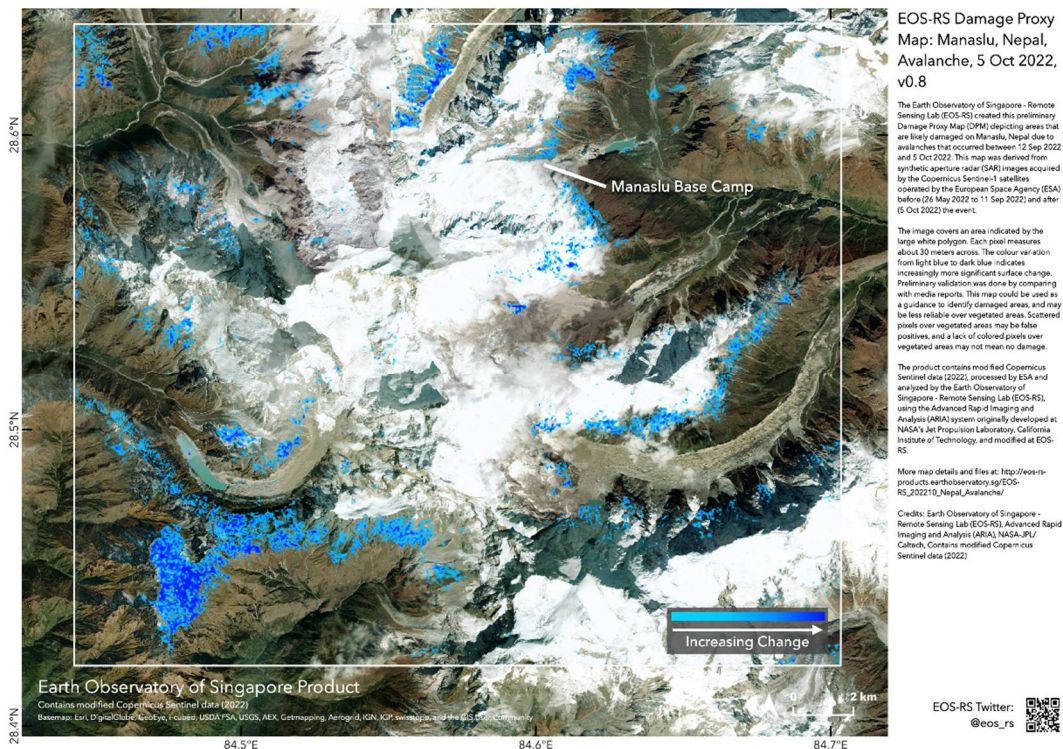
| Organization | Earth Observatory Singapore (EOS), Nanyang Technological University |
|---|---|
| Title | EOR Responses and Publications from EOS as a Data Analysis Node |
| Type of Activity | EOR and Conference |
| Date | Year of 2022 |

2022 marks the first full year of the Earth Observatory of Singapore's Remote Sensing Lab operating with a dedicated team for disaster response. We have also expanded our team with more members and remain committed in supporting Sentinel Asia's efforts in disaster response and recovery. We are continuously innovating and improving our algorithms for more efficient and accurate SAR-based flood extent and damage mapping, and are also continuously upgrading our workflow to facilitate quicker generation of time-sensitive disaster impact maps.

Value Added Products (VAP)

In 2022, we responded to 17 Emergency Observation Requests (EOR) as a Data Analysis Node (DAN) by sharing Value Added Products (VAP), in particular Damage Proxy Maps (DPM) and Flood Proxy Maps (FPM). For some requests, we also shared multiple versions of our DPM for the same event. For example, after sharing a preliminary DPM, we continue to work on generating and sharing updated DPMs using either time-series based analysis and/or improved algorithms requiring further processing and analysis. All of our VAPs are also uploaded to and available on our website: https://eos-rs-products.earthobservatory.sg/



Figure 1: List and distribution of EORs that EOS responded to in 2022.

Notable EORs in 2022

We are always heartened to see our maps being used by and providing useful reference data for responders. For example, the FPMs that we generated from ALOS-2 and Sentinel-1 SAR data in response to Tropical Cyclone Noru (Karding) and Tropical Cyclone Nalgae (Paeng) which made landfalls in the Philippines was used by the ASEAN Coordinating Centre for Humanitarian Assistance (AHA) in their Situation Updates [1,2].

The DPM we produced for the M5.9 earthquake in Afghanistan that occurred on 22 June 2022 (local time) which we shared with the Sentinel Asia network was also highlighted and published by the NASA Earth Observatory [3]. This was an especially devastating earthquake which resulted in more than 1000 casualties due to a combination of factors including but not limited to densely populated regions, non-earthquake resistant houses and heavy rains preceding the earthquake leading to landslides which compounded the effects.
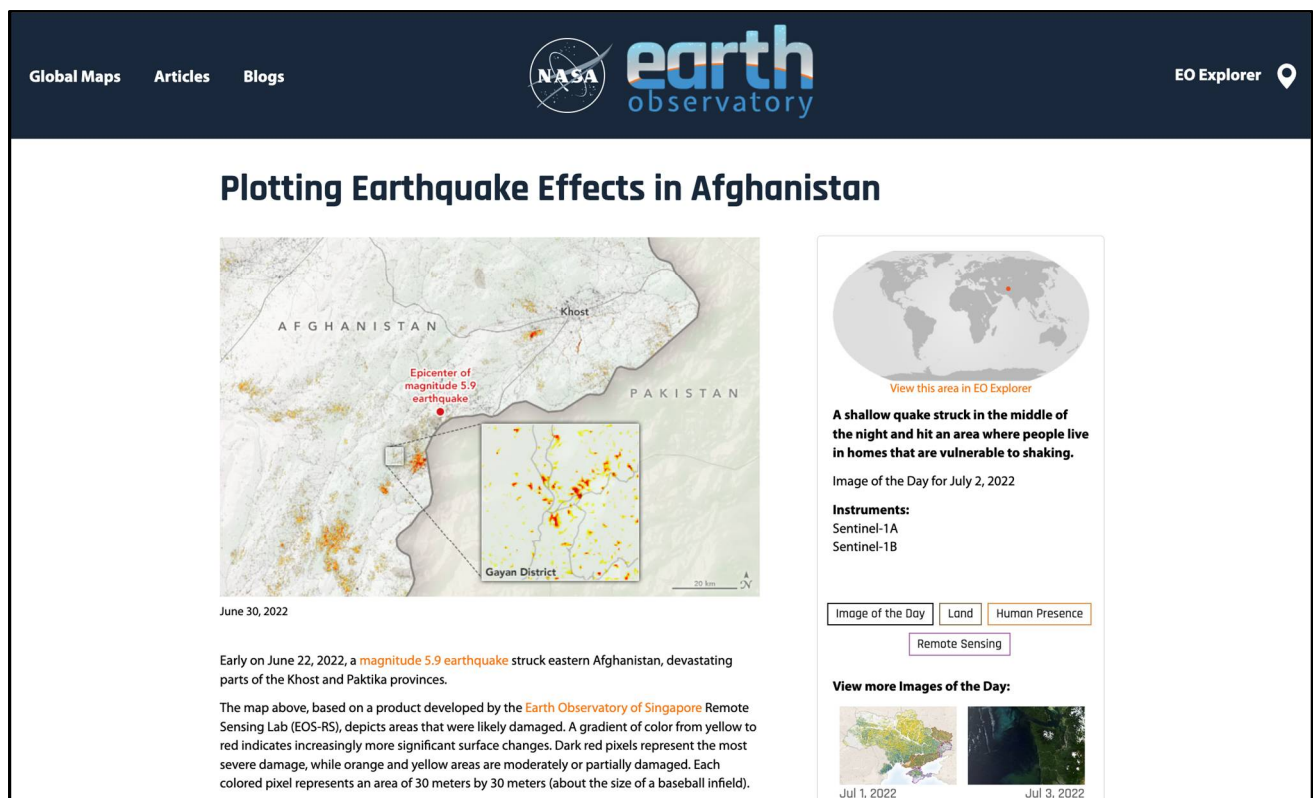


Figure 2: NASA's Earth Observatory web publication [3] of the Damage Proxy Map (DPM) that EOS produced in response to the M5.9 Earthquake in Afghanistan, June 2022.

Participation in APRSAF-28 and international conferences

We participated in the 28th Asia-Pacific Regional Space Agency Forum (APRSAF) held in Vietnam in 2022. As part of the Sentinel Asia session in the Satellite Applications for Societal Benefit Working Group (SAWG), we shared about our recent and significant responses to EORs, in particular the M7.0 Abra Earthquake and Cyclone Nalgae both of which affected communities living in the Philippines. We also highlighted various ways in which we ensure that our maps are accessible, which includes using contrasting colours for our maps so that they are visible to persons

with colour vision deficiency and providing local language translations of our map descriptions.

During the AGU Fall Meeting 2022, EOS-RS had a poster presentation titled "Disaster Response Products from ALOS-2 Synthetic Aperture Radar Observations: Jan 2022 Tonga Eruption" [4] in which we highlighted the maps we produced that showed the wide-reaching impacts of the largest explosion recorded by modern instruments from Hunga Tonga–Hunga Ha'apai's eruption.

References

[1] AHA Centre (30 Sep, 2022). Situation Update No. 3 – Tropical Cyclone Noru. https://ahacentre.org/situation-update/situation-update-no-3-tropical-cyclone-noru/ Accessed 17 Aug 2023.

[2] AHA Centre (4 Nov, 2022). Situation Update No. 1 – Tropical Cyclone Nalgae, Philippines. https://ahacentre.org/situation-update/situation-update-no-1-tropical-cyclone-nalgae-philippines-4-november-2022/ Accessed 17 Aug 2023.

[3] NASA Earth Observatory (1 Jul, 2022). Plotting Earthquake Effects in Afghanistan.
https://earthobservatory.nasa.gov/images/150053/plotting-earthquake-effects-in-afghanistan Accessed 17 Aug 2023.

[4] Yun, SH., Way, L., & Chin, S.T. (Dec 2022). Disaster Response Products from ALOS-2 Synthetic Aperture Radar Observations: Jan 2022 Tonga Eruption, Abstract GC12F-0497 presented at 2022 AGU Fall Meeting.

| Organization | Geoinformatics Center, Asian Institute of Technology |
|---|---|
| Title | Activities carried out as Principal Data Analysis Node (P-DAN) for Sentinel Asia. |
| Type of Activity | Value-Added Product Generation for Disaster Activations, Meetings |
| Date | 01/01/2022 - 31/12/2022 |

## 1. Sentinel Asia

1.1 Activation and Value-Added Products Generation

As the Principal Data Analyses Node (P-DAN) of Sentinel Asia, the Geoinformatics Center of the Asian Institute of Technology (GIC-AIT) produces Value Added Products (VAP) right after disaster occurrences to support disaster response activities of the Sentinel Asia Community.

In 2022, there were 28 emergency observation requests from 12 countries, which mostly coming from the Philippines (7 activations; 25.00%), then India (6 activations; 21.43%), Indonesia and Thailand (3 activations each; 10.71%). Vietnam requested two activations (7.14%), while other countries requested for one activation each (3.57%) including Afghanistan, Bangladesh, China, Nepal, Pakistan, Taiwan and Tonga. Out of these activations, we have created 34 VAPs from 18 activations (*Table 1*). Most products were created for the activation on floods, followed by flood-landslide-storm, and earthquake (*Figure 1*). *Figure 2* shows the number of VAPs created for each of the country that activate the Sentinel Asia. Maps of the VAPs are provided in the *Appendix*.

*Table 1: List of Sentinel Asia activations from 1st of January 2022 to 31st of December 2022, including the date of first created products and the number of VAPs for each of the activations.*

| No. | Activation ID | Occurrence Date | Activation Date | Country | Disaster Type | First Data Availability (SA) | First VAP Generation | No. of Product |
|---|---|---|---|---|---|---|---|---|
| 1 | 434 | 15-Jan-22 | 16-Jan-22 | Tonga | Vocano-Tsumai | 18-Jan-22 | - | - |
| 2 | 435 | 10-Feb-22 | 11-Feb-22 | Thailand | Oil Spill | 13-Feb-22 | - | - |
| 3 | 436 | 24-Feb-22 | 3-Mar-22 | Thailand | Flood | 5-Mar-22 | 7-Mar-22 | 2 |
| 4 | 438 | 12-Apr-22 | 11-Apr-22 | Philippines | Flood-Landslide | 16-Apr-22 | 17-Apr-22 | 1 |
| 5 | 439 | 15-May-22 | 20-May-22 | India | Flood | 26-May-22 | 27-May-22 | 3 |
| 6 | 440 | 23-May-22 | 27-May-22 | Indonesia | Flood | 31-May-22 | 1-Jun-22 | 2 |
| 7 | 441 | 5-Jun-22 | 13-Jun-22 | Philippines | Volcanic Eruption | 16-Jun-22 | - | - |
| 8 | 442 | 15-Jun-22 | 21-Jun-22 | India | Flood | 23-Jun-22 | 23-Jun-22 | 2 |
| 9 | 443 | 18-Jun-22 | 23-Jun-22 | Bangladesh | Flood | 24-Jun-22 | 25-Jun-22 | 1 |
| 10 | 444 | 22-Jun-22 | 27-Jun-22 | Afghanistan | Earthquake | 28-Jun-22 | 1-Jul-22 | 1 |
| 11 | 445 | 7-Jul-22 | 7-Jul-22 | Vietnam | Flood-Landslide-Storm | 12-Jul-22 | - | - |
| 12 | 446 | 12-Jul-22 | 13-Jul-22 | India | Flood | 19-Jul-22 | 19-Jul-22 | 2 |
| 13 | 447 | 12-Jul-22 | 13-Jul-22 | India | Flood | 16-Jul-22 | 16-Jul-22 | 2 |
| 14 | 448 | 27-Jul-22 | 27-Jul-22 | Philippines | Earthquake | 29-Jul-22 | 25-Aug-22 | 1 |
| 15 | 449 | 17-Aug-22 | 18-Aug-22 | Pakistan | Flood | 22-Aug-22 | 24-Aug-22 | 3 |
| 16 | 450 | 23-Aug-22 | 23-Aug-22 | Philippines | Flood-Landslide-Storm | 29-Aug-22 | - | - |
| 17 | 451 | 23-Aug-22 | 24-Aug-22 | India | Flood | 29-Aug-22 | - | - |
| 18 | 452 | 5-Sep-22 | 5-Sep-22 | China | Earthquake | 9-Sep-22 | - | - |
| 19 | 453 | 17-Sep-22 | 18-Sep-22 | Taiwan | Earthquake | 20-Aug-22 | - | - |
| 20 | 454 | 25-Sep-22 | 25-Sep-22 | Philippines | Flood-Landslide-Storm | 27-Sep-22 | 29-Sep-22 | 1 |
| 21 | 455 | 28-Sep-22 | 26-Sep-22 | Vietnam | Flood-Landslide-Storm | 27-Sep-22 | 1-Oct-22 | 2 |
| 22 | 456 | 2-Oct-22 | 9-Oct-22 | Nepal | Ice-Hazard | 11-Oct-22 | - | - |
| 23 | 457 | 13-Oct-22 | 15-Oct-22 | India | Flood | 17-Oct-22 | 18-Oct-22 | 2 |
| 24 | 458* | 19-Oct-22 | 19-Oct-22 | Thailand | Flood | 20-Oct-22 | 21-Oct-22 | 6 |
| 25 | 459* | 29-Oct-22 | 29-Oct-22 | Philippines | Flood-Landslide-Storm | 4-Nov-22 | 4-Nov-22 | 1 |
| 26 | 460 | 21-Nov-22 | 22-Nov-22 | Indonesia | Earthquake | 22-Nov-22 | 26-Nov-22 | 1 |
| 27 | 461* | 4-Dec-22 | 5-Dec-22 | Indonesia | Volcanic Eruption | 7-Dec-22 | - | - |
| 28 | 462 | 27-Dec-22 | 27-Dec-22 | Philippines | Flood-Landslide | 30-Dec-22 | 30-Dec-22 | 1 |

* Escalated to International Disaster Charter (IDC) and project management by GIC-AIT
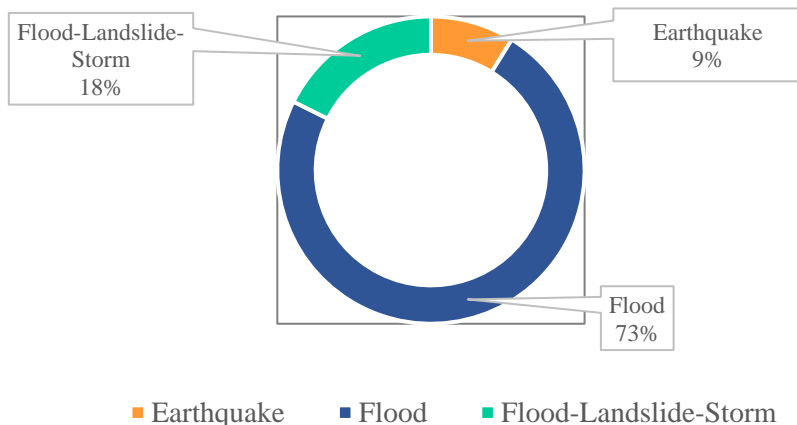
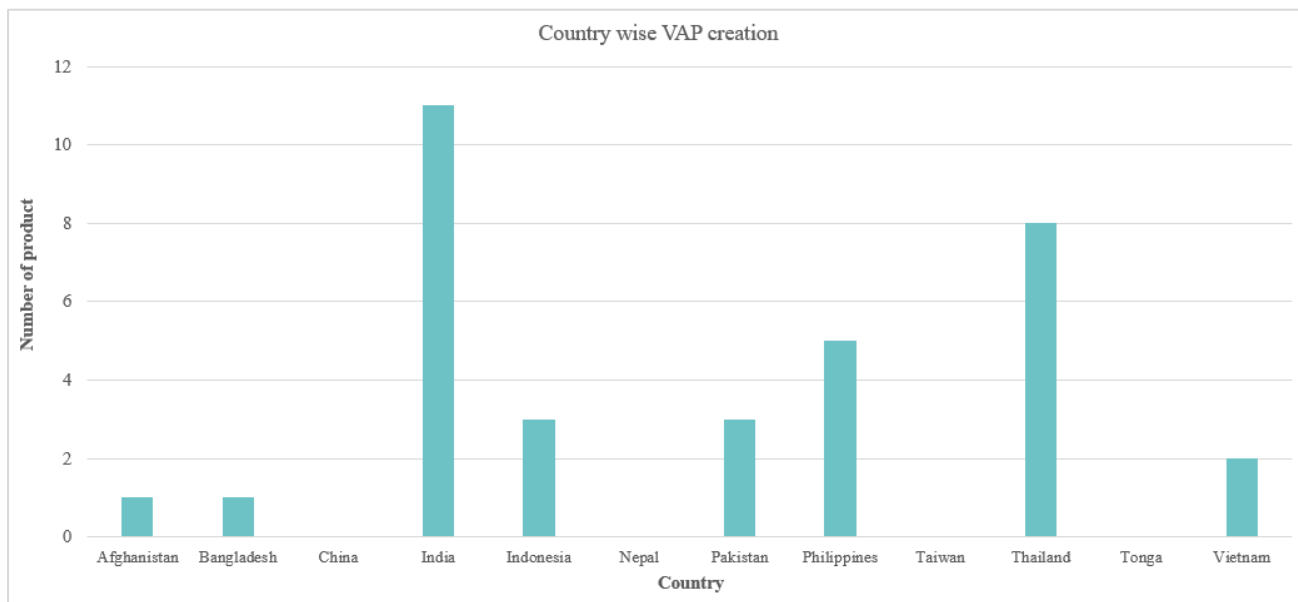*Figure 1: Disaster-wise VAPs created by GIC-AIT (2022/01/02-2022/12/31)*



*Figure 2: Country-wise VAPs created by GIC-AIT (2022/01/01-2022/12/31)*

1.2 Sentinel Asia Meetings

We organized the 21st Steering Committee Meeting of Sentinel Asia at the Asian Institute of Technology (AIT) on 10–11 October 2022, together with ADRC and JAXA. The meeting was attended by several Data Providing Nodes (DPN) and Data Analysis Nodes (DAN), including ADRC, GIC-AIT, JAXA, GISTDA, ISRO, MBRSC (online), IWMI, PHIVOLCS, NARLabs, VAST (online), University of Tokyo, and Yamaguchi University. In this meeting, we made a presentation on the topic of effective support for end-user with VAPs.

Figure 3: Sentinel Asia members in the 21st Steering Committee Meeting

In addition to this, we also attended Steering Committee online meetings on 21 February 2022 and 20 July 2022.

## 2. International Disaster Charter

2.1 Project Manager (PM)

When a major disaster happened, the Sentinel Asia activation can be escalated to International Disaster Charter. In 2022, we were nominated by JAXA as a Project Manager (PM) for three International Disaster Charter activations: Flood and flash flood in Thailand (Charter activation on 19 October 2022), Tropical Storm Nalgae in the Philippines (Charter activation on 29 October 2022) and Semeru volcanic eruption in Indonesia (Charter activation on 5 December 2022). We uploaded 6 products for the Charter activation in Thailand, including one product created by NOAA. Meanwhile, a total of 14 products were uploaded for the Charter activation in the Philippines, in which 8 products were created by UNITAR/UNOSAT and EU Geo-Information Systems. As for the Charter activation in Indonesia, we uploaded 6 products with contribution from UNITAR/UNOSAT and DLR. Maps of the products created by GIC-AIT are provided in the *Appendix*.

*APPENDIX*

**1. Flood in Thailand on 24 February 2022**
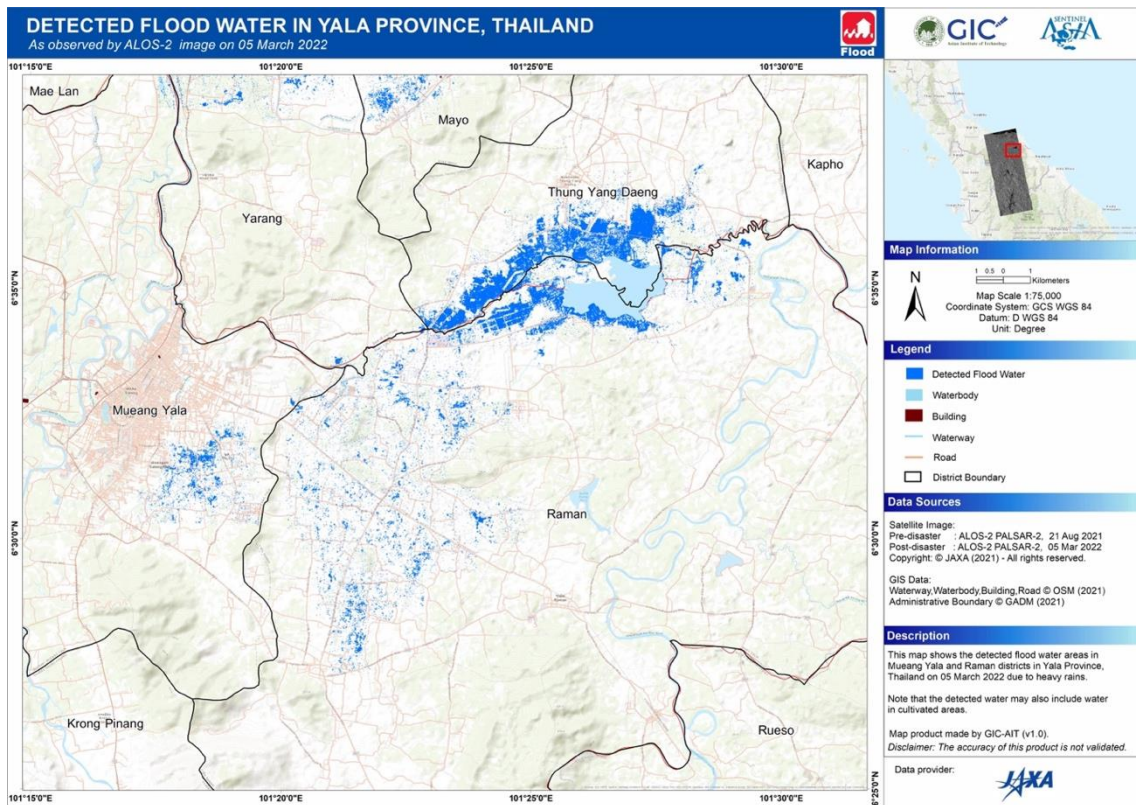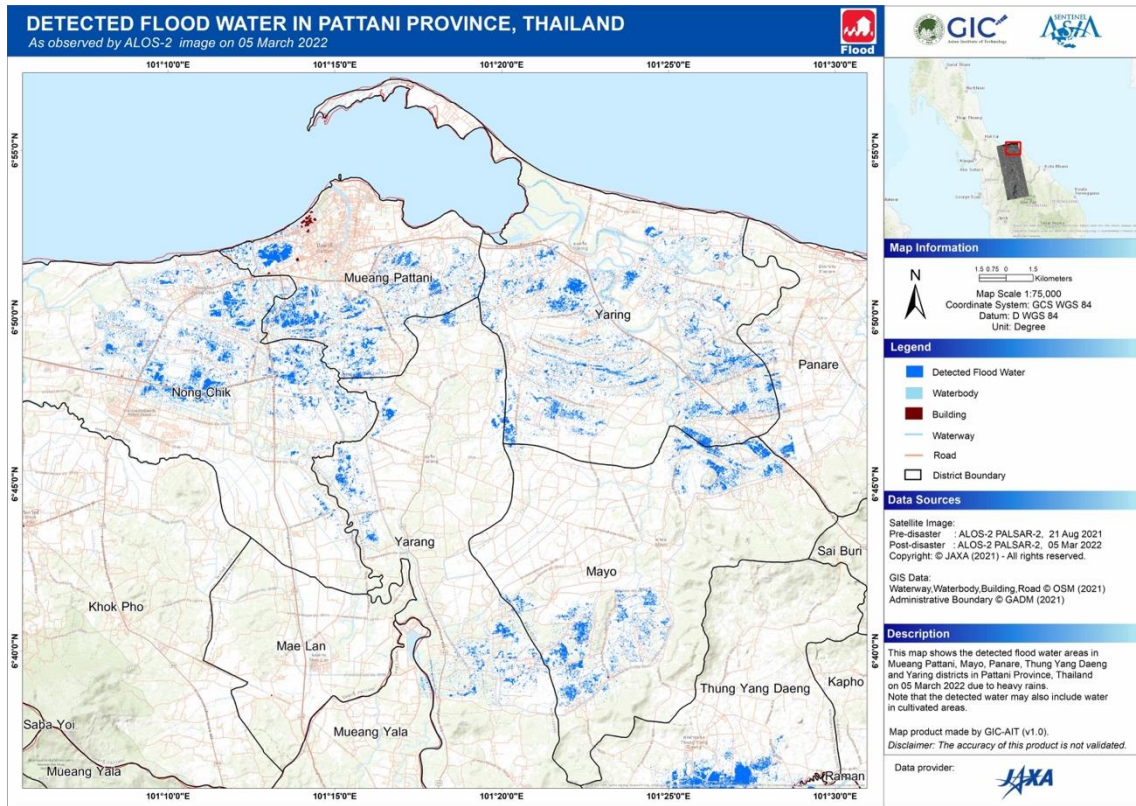
## 2. Flood and Landslide in the Philippines on 12 April 2022
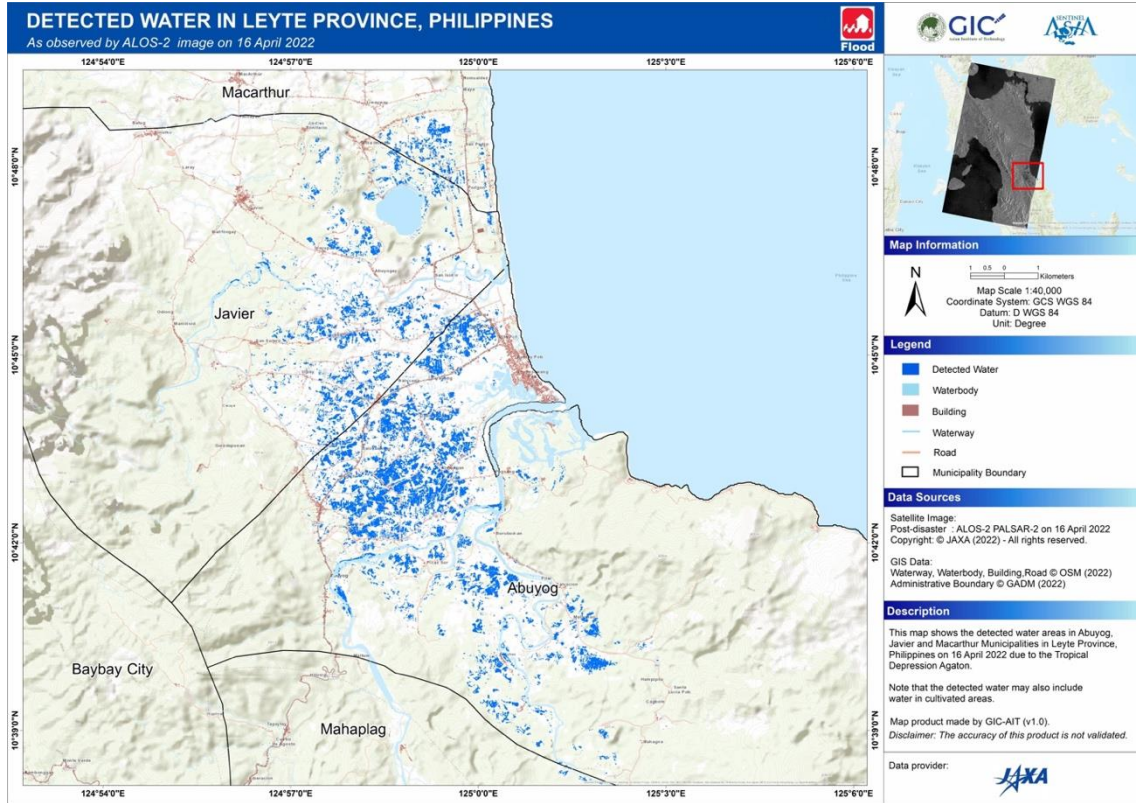


## 3. Flood in India on 15 May 2022
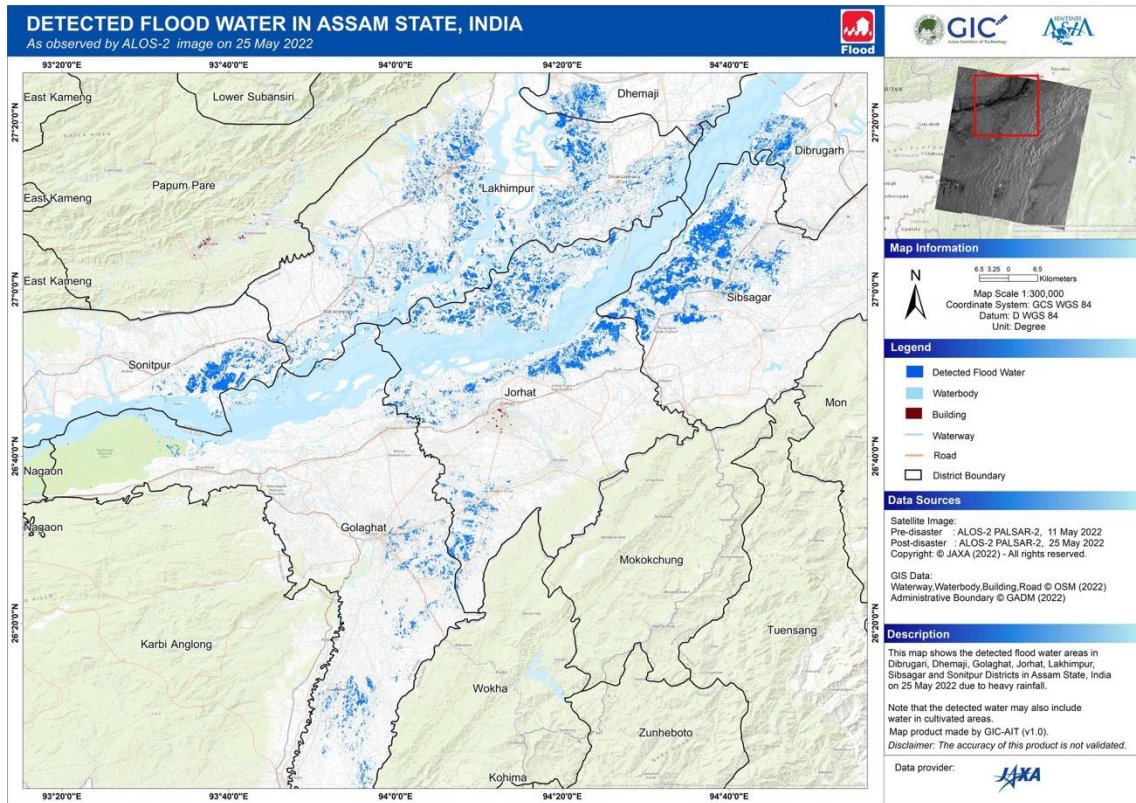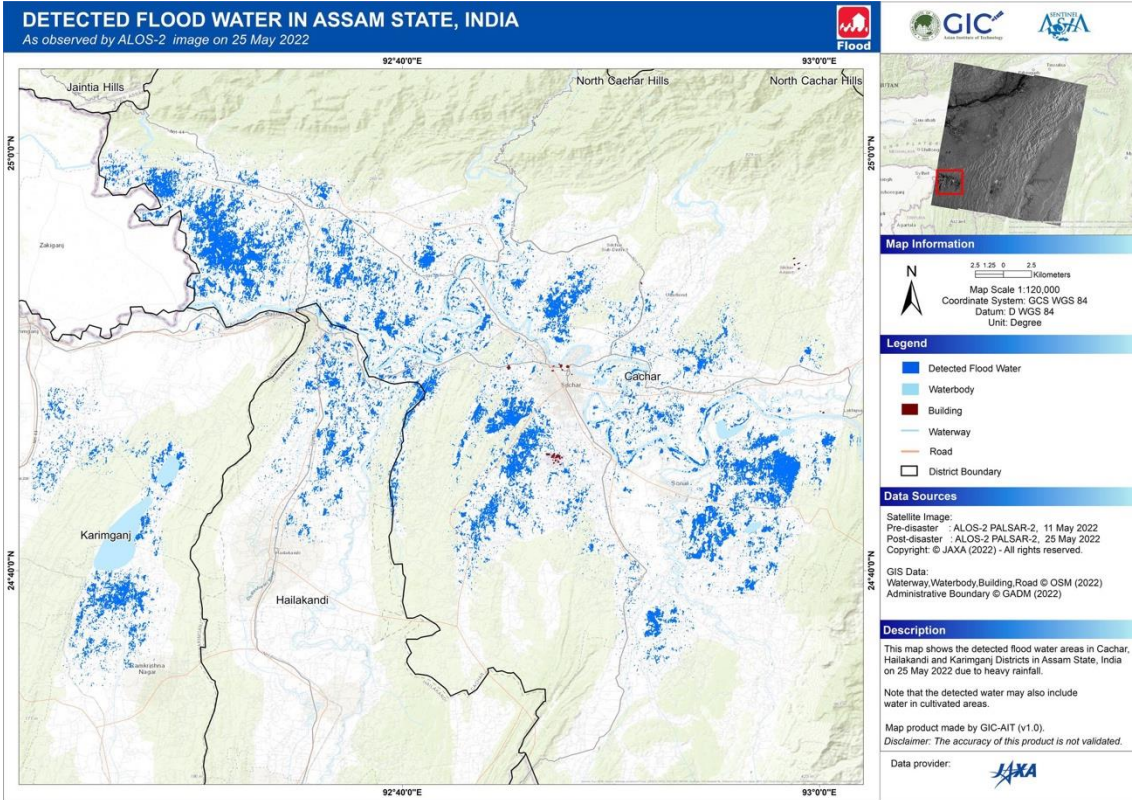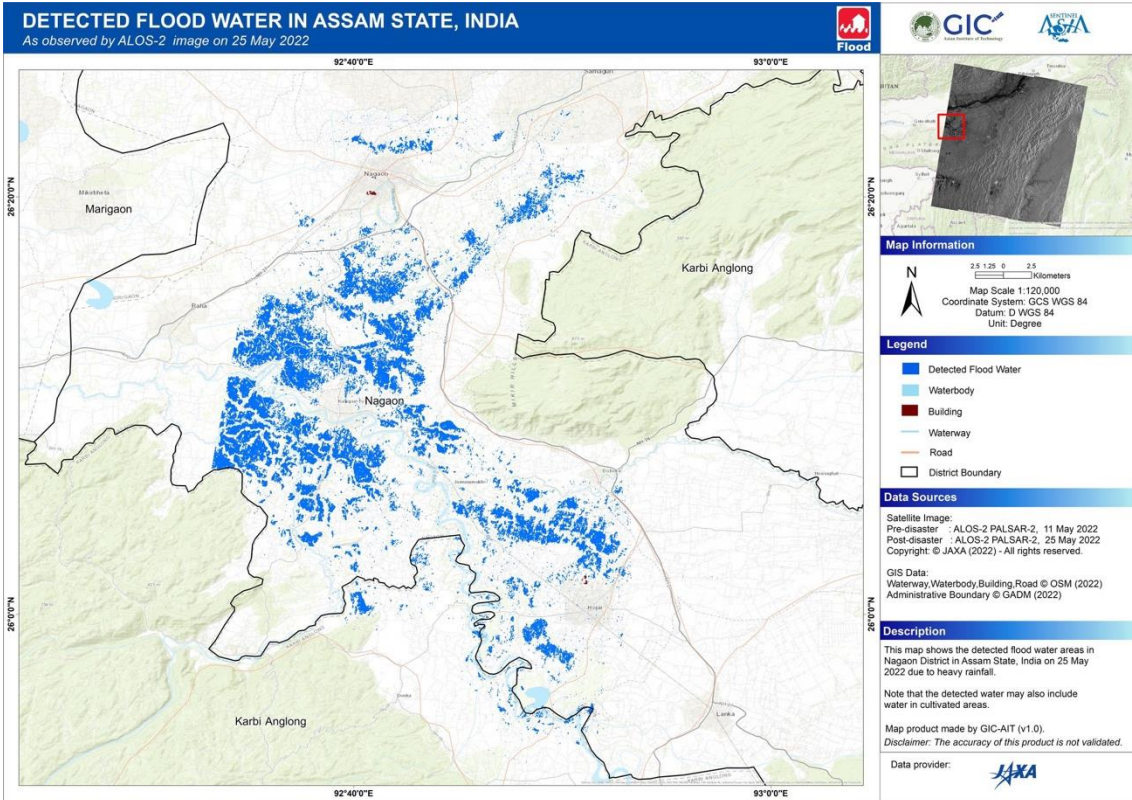
**4. Flood in Indonesia on 23 May 2022**
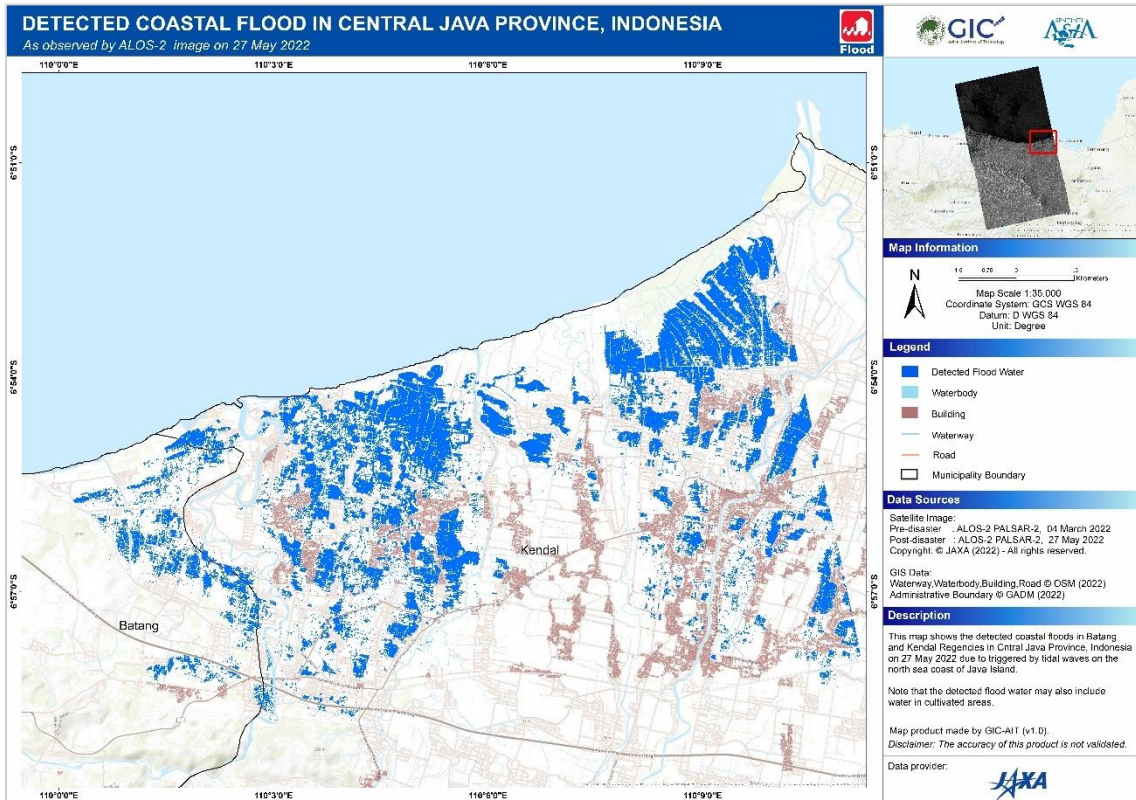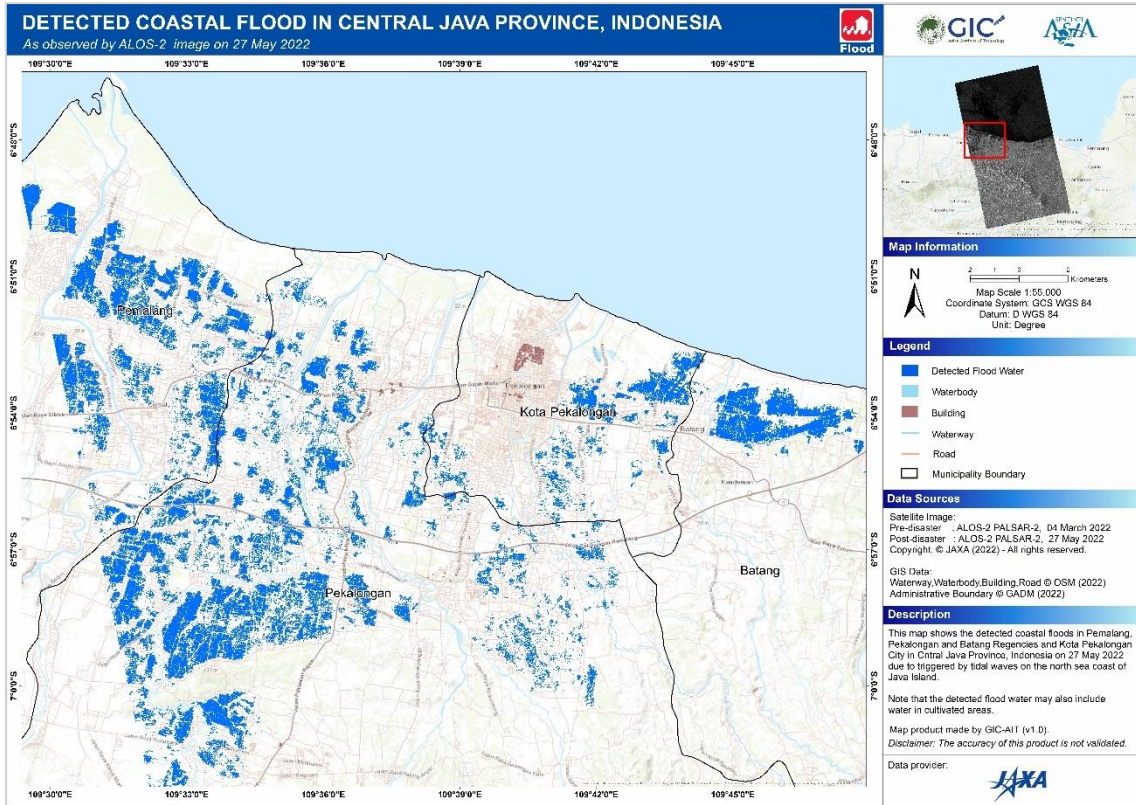
**5. Flood in India on 15 June 2022**
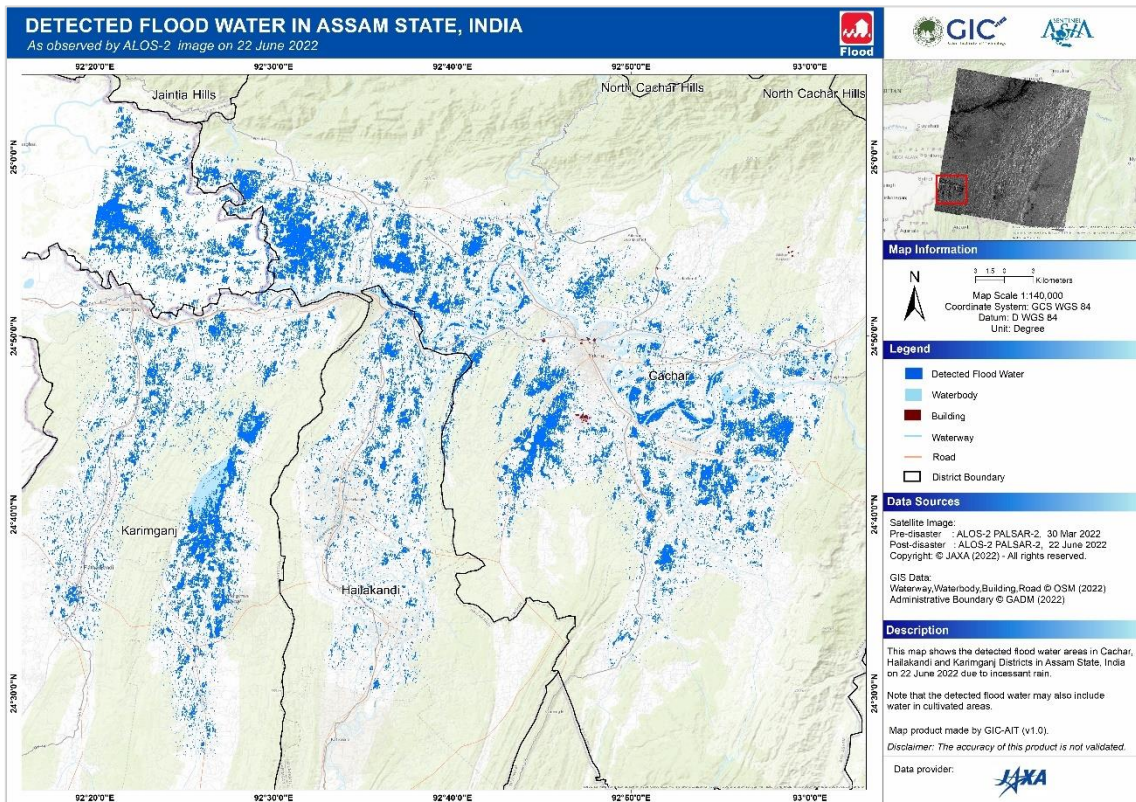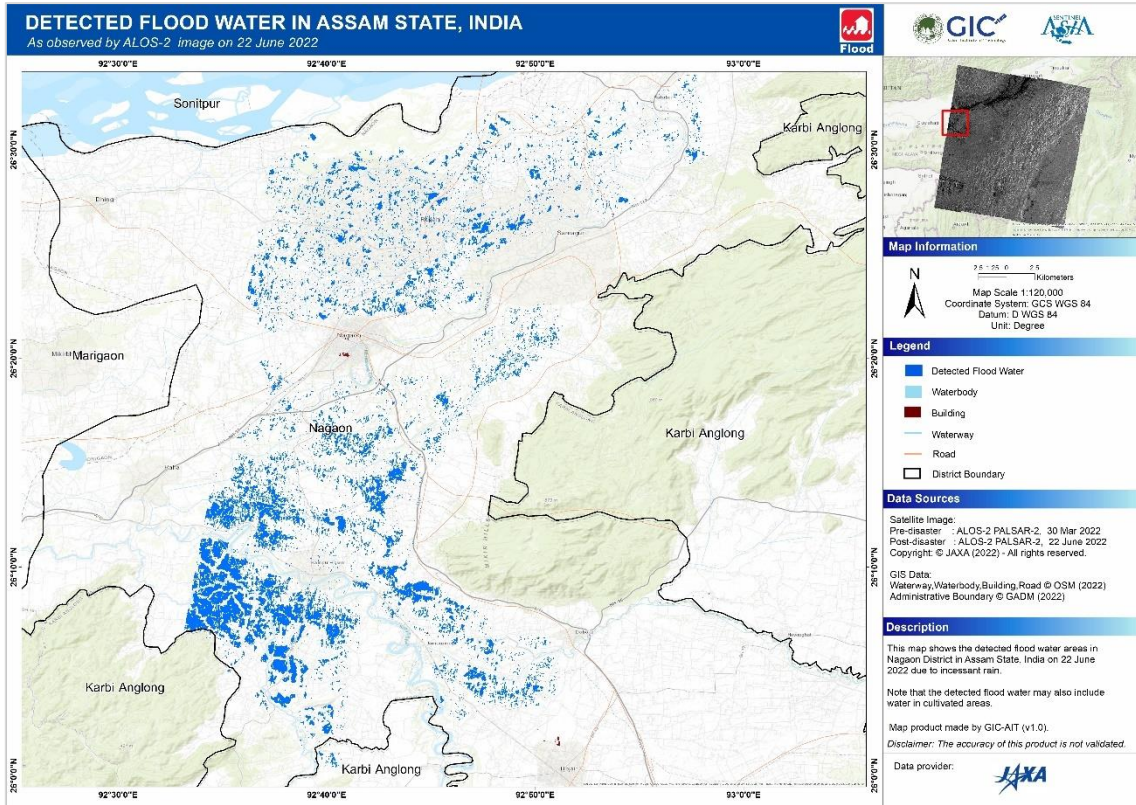
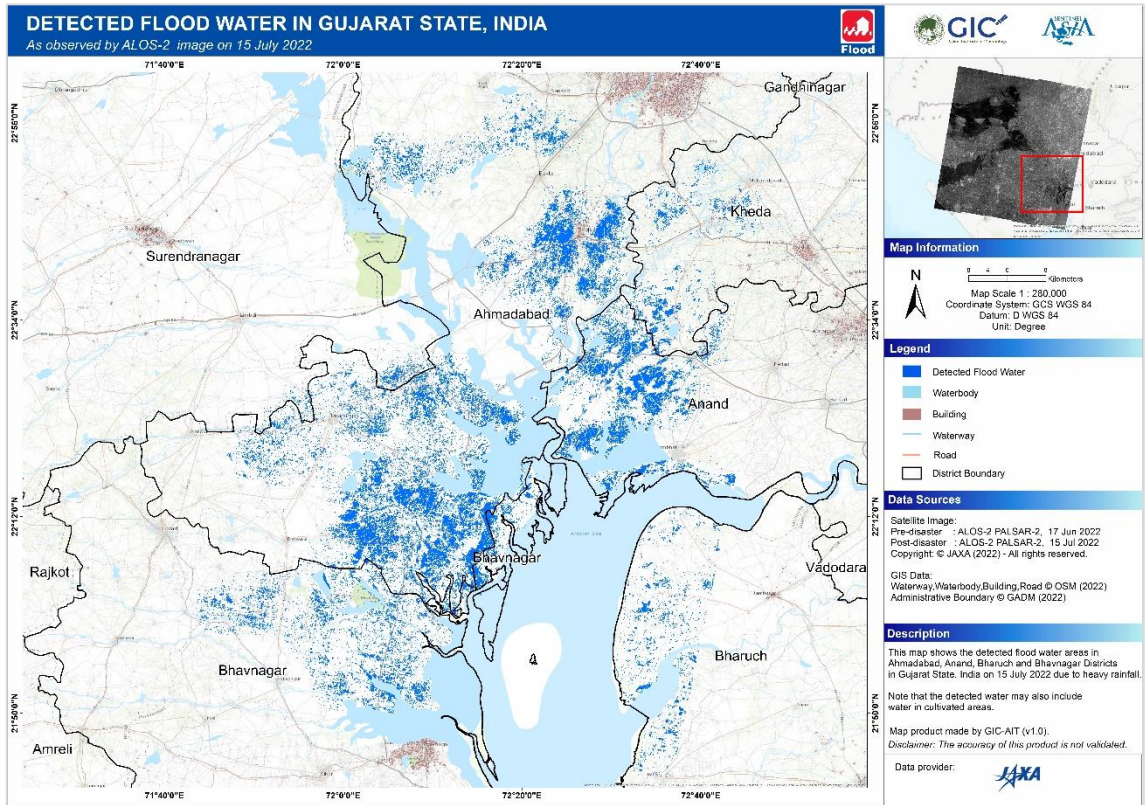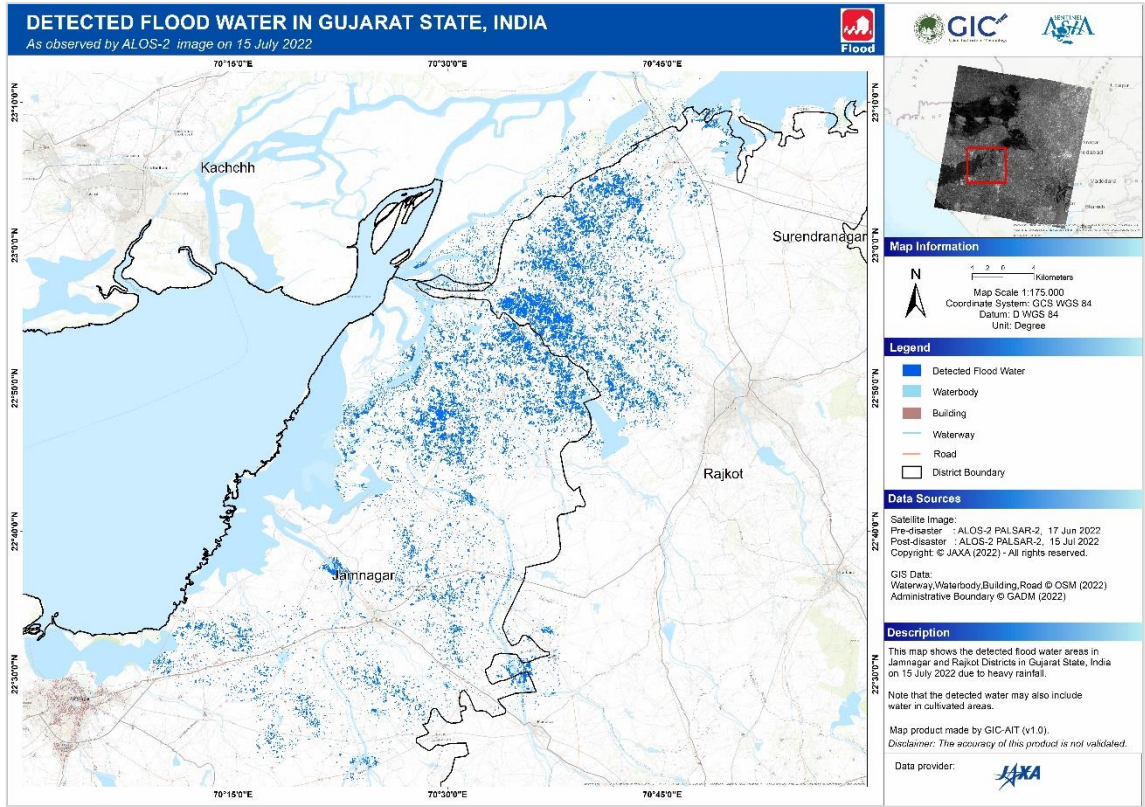### 6. Flood in Bangladesh on 18 June 2022
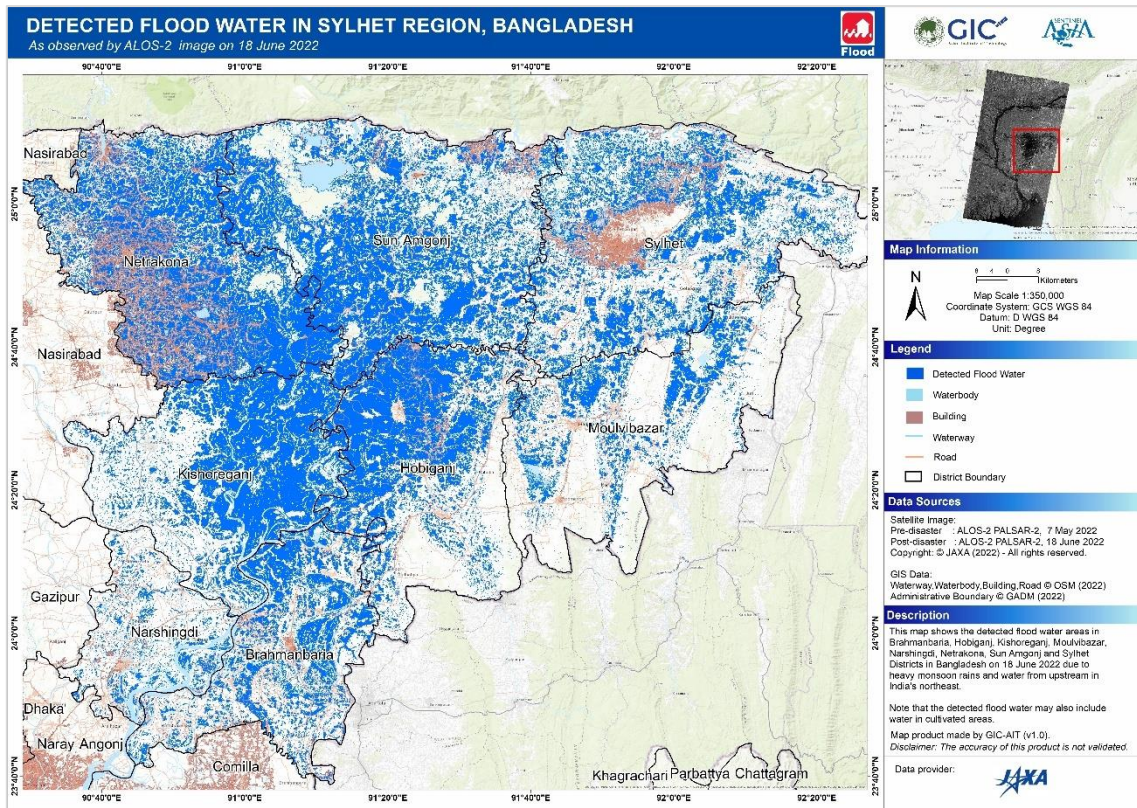


### 7. Earthquake in Afghanistan on 22 June 2022
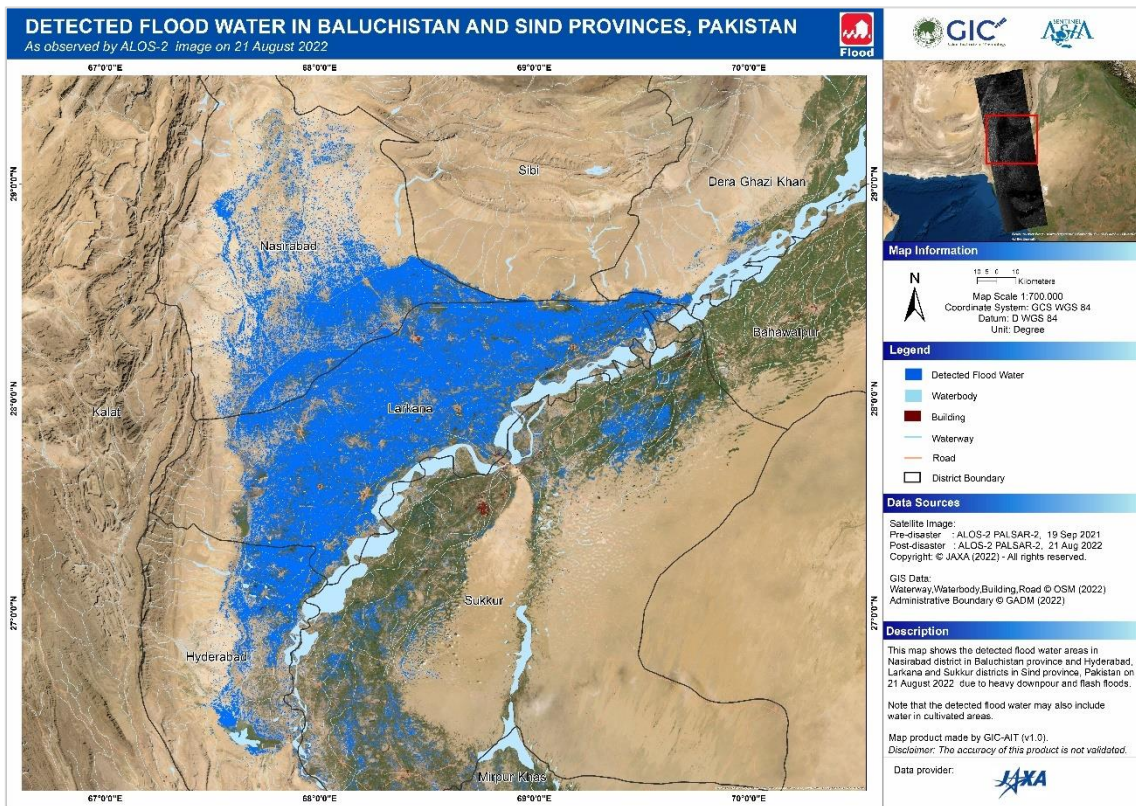
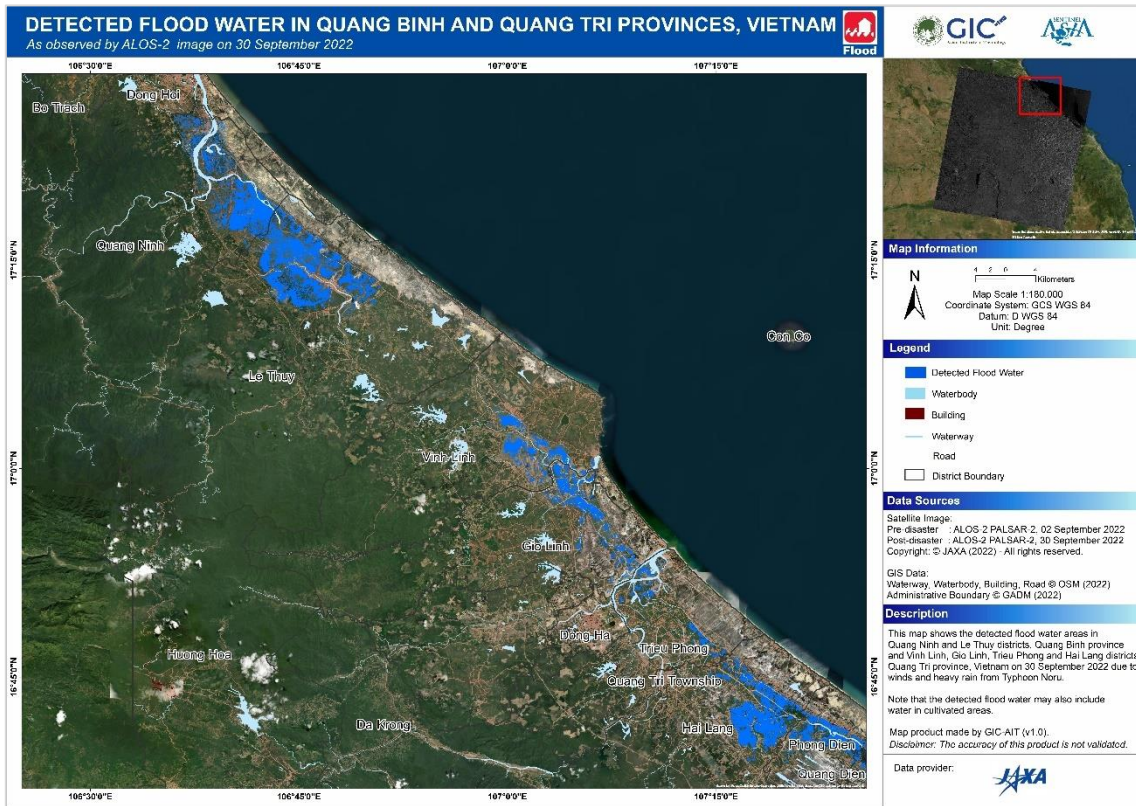## 8. Flood in India on 12 July 2022



DETECTED FLOOD WATER IN ANDHRA PRADESH STATE, INDIA
As observed by ALOS-2 image on 17 July 2022
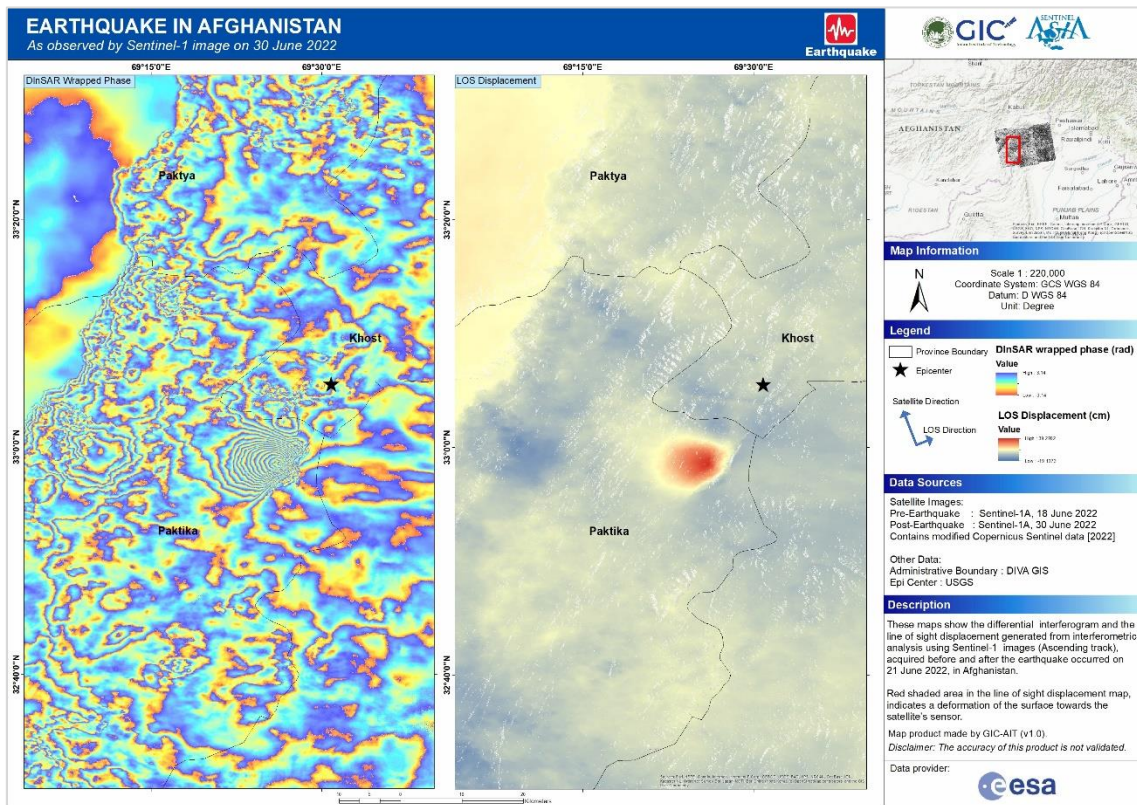


DETECTED FLOOD WATER IN TELANGANA STATE, INDIA
As observed by ALOS-2 image on 17 July 2022
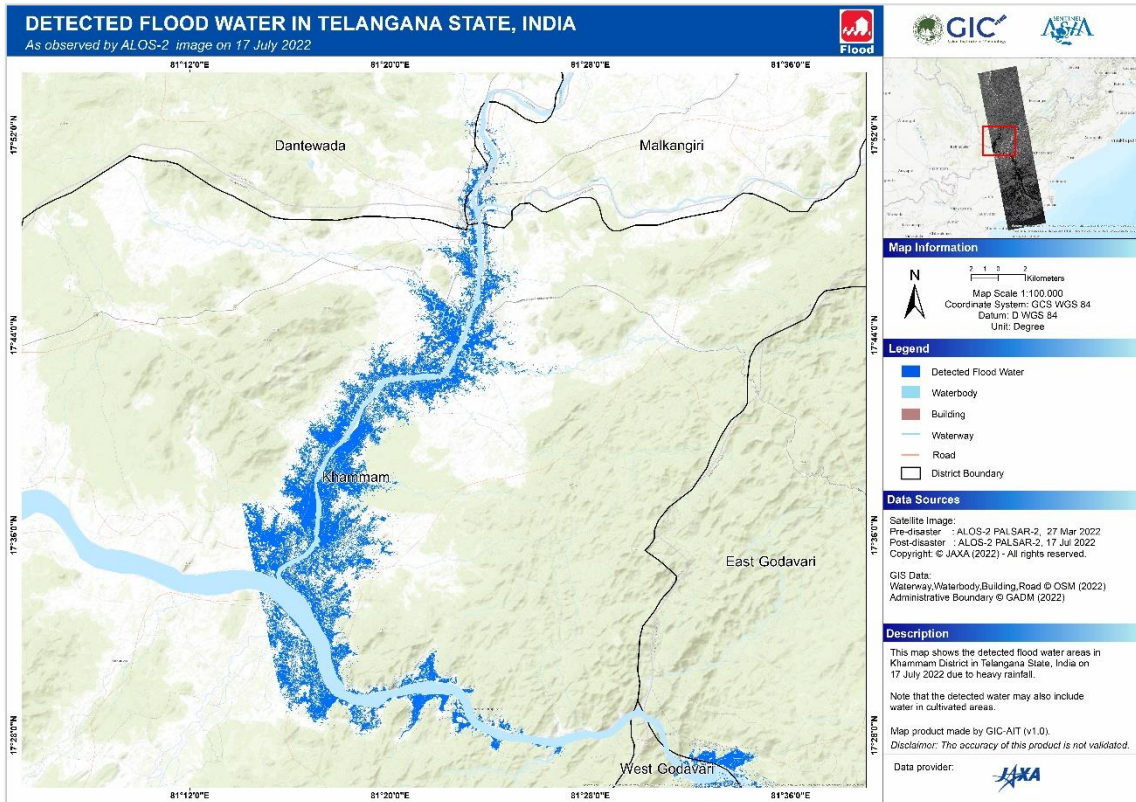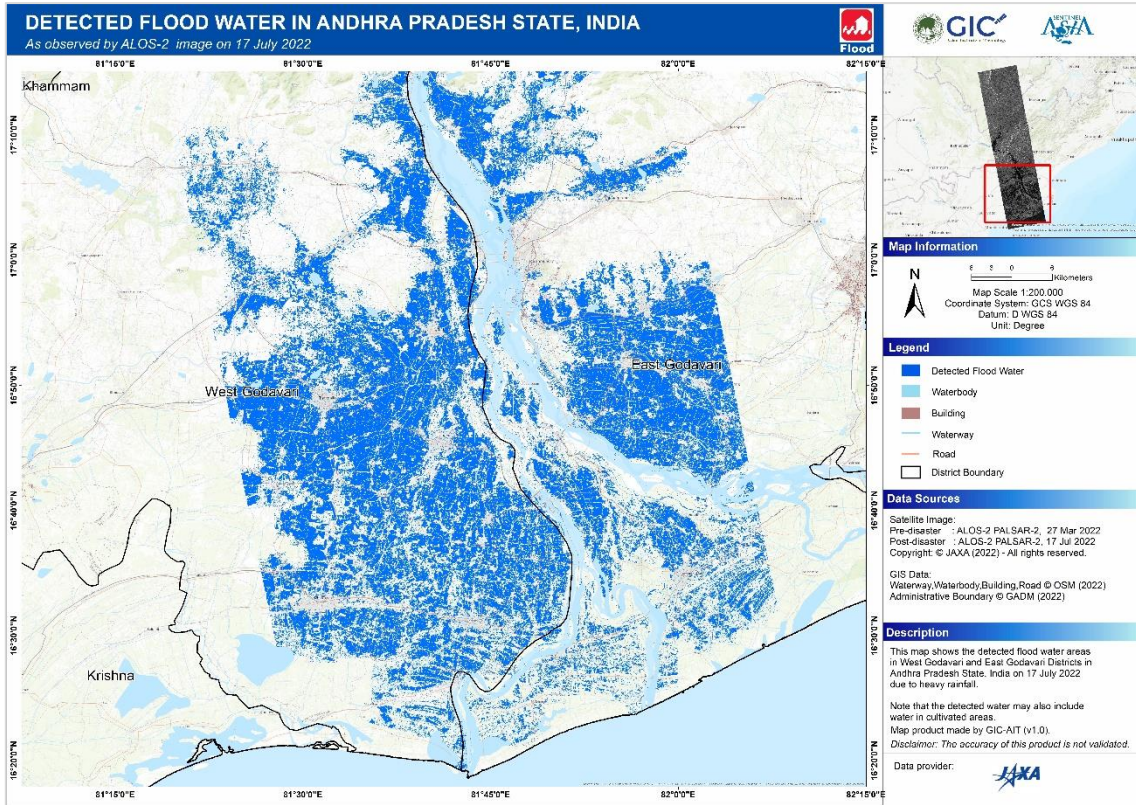
## 9. Flood in India on 12 July 2022

## 10. Earthquake in Philippines on 27 July 2022



## 11. Flood in Pakistan on 17 August 2022

DETECTED FLOOD WATER IN SIND PROVINCE, PAKISTAN
As observed by ALOS-2 image on 21 August 2022
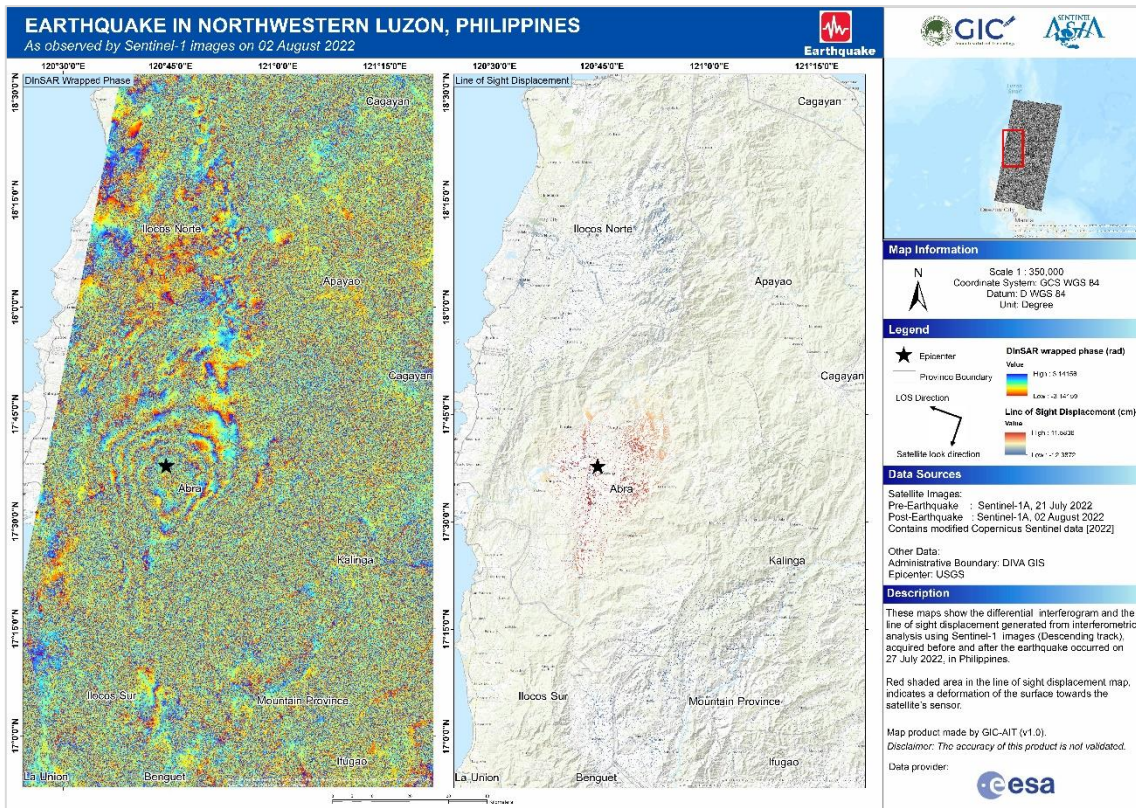


DETECTED FLOOD WATER IN SIND PROVINCE, PAKISTAN
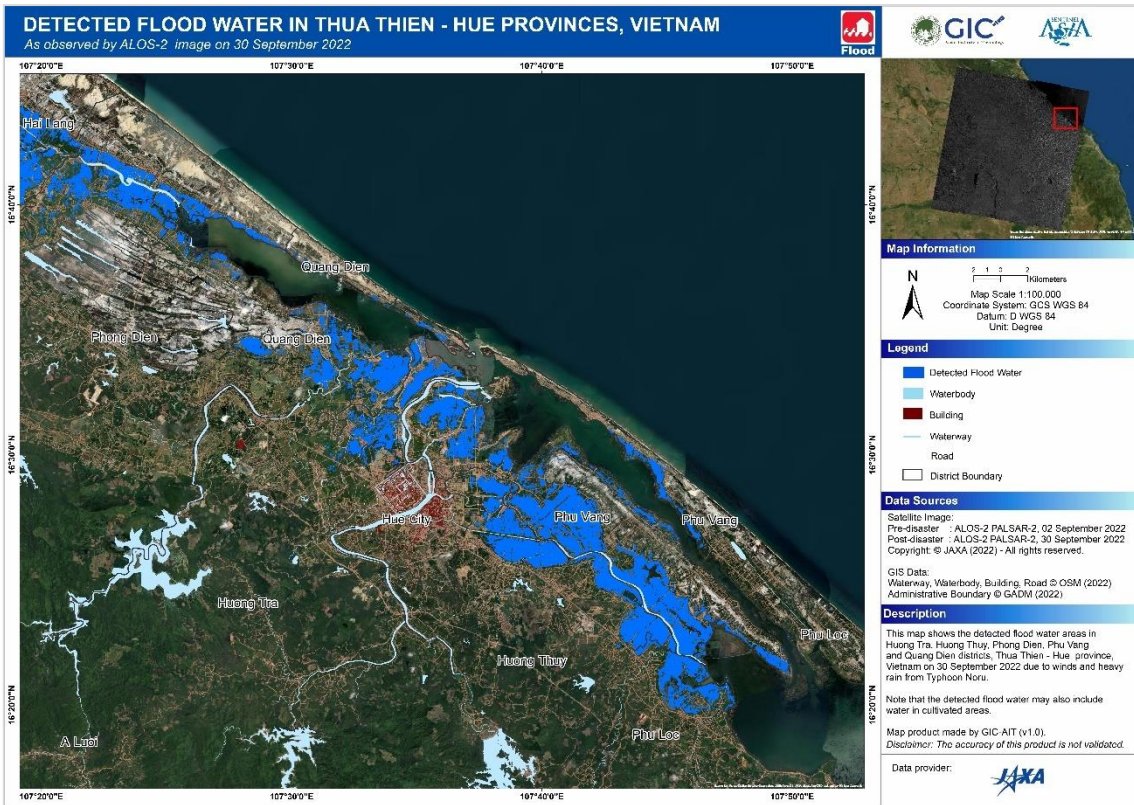As observed by ALOS-2 image on 31 August 2022
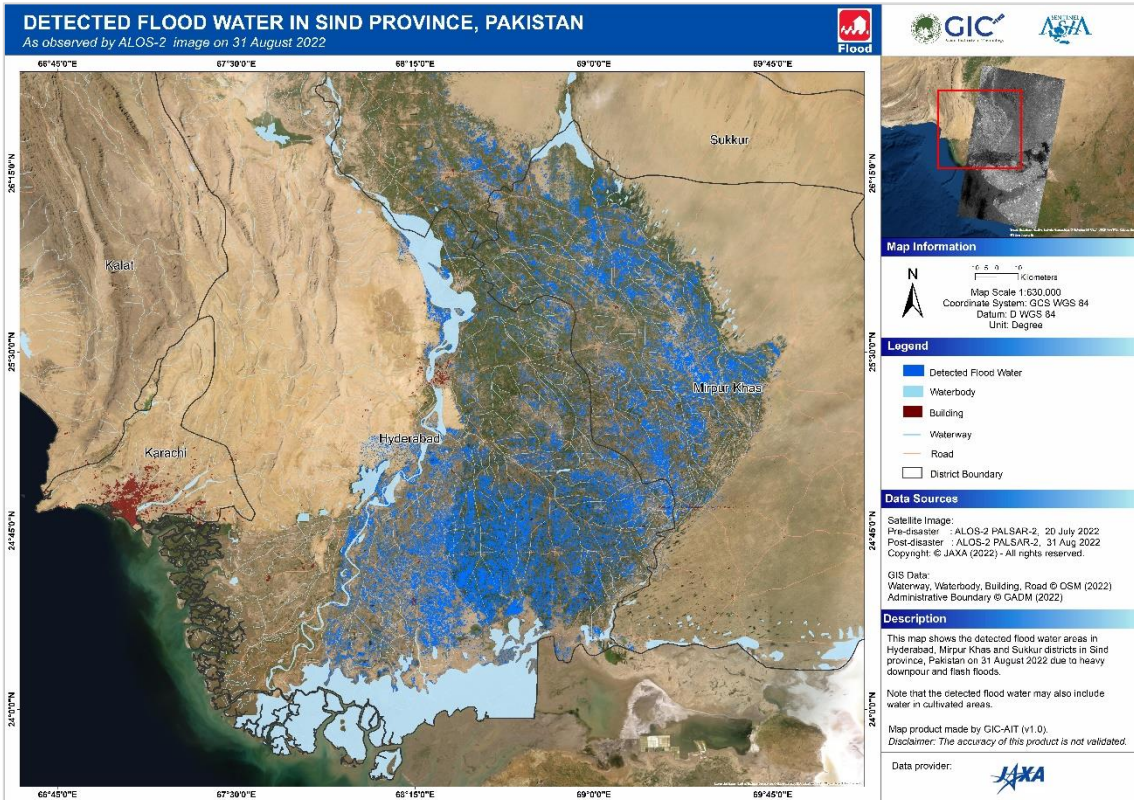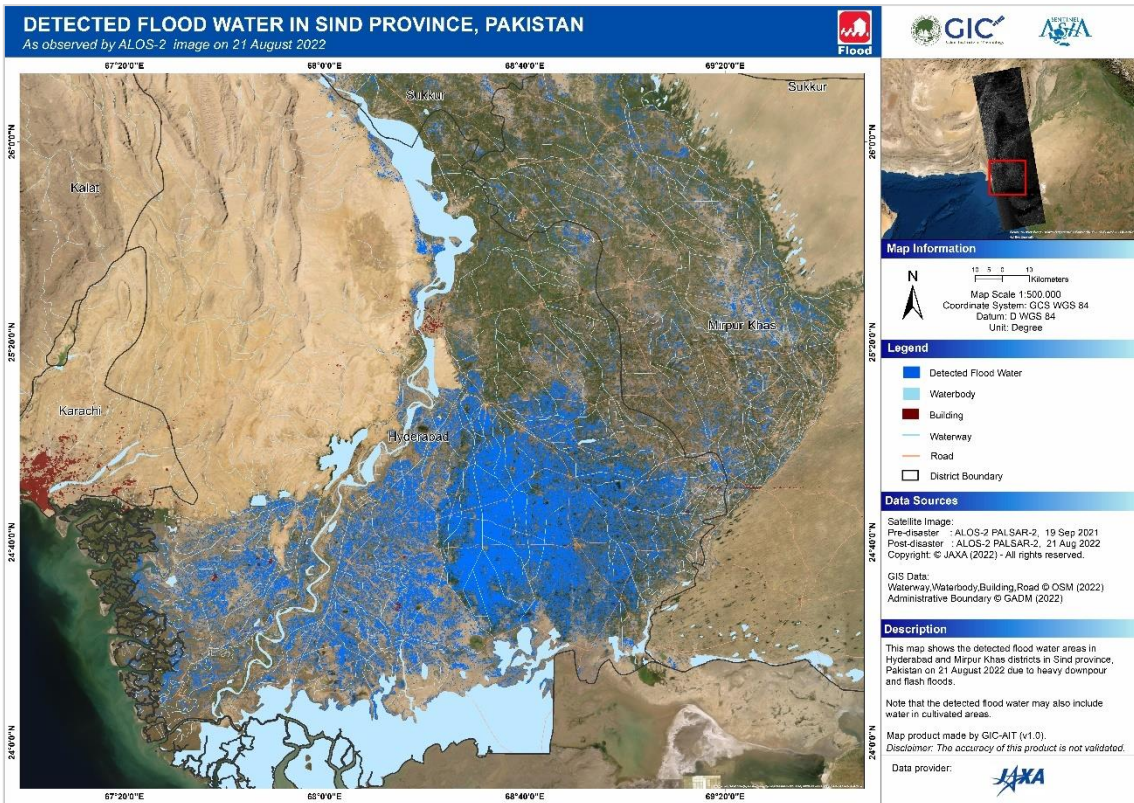
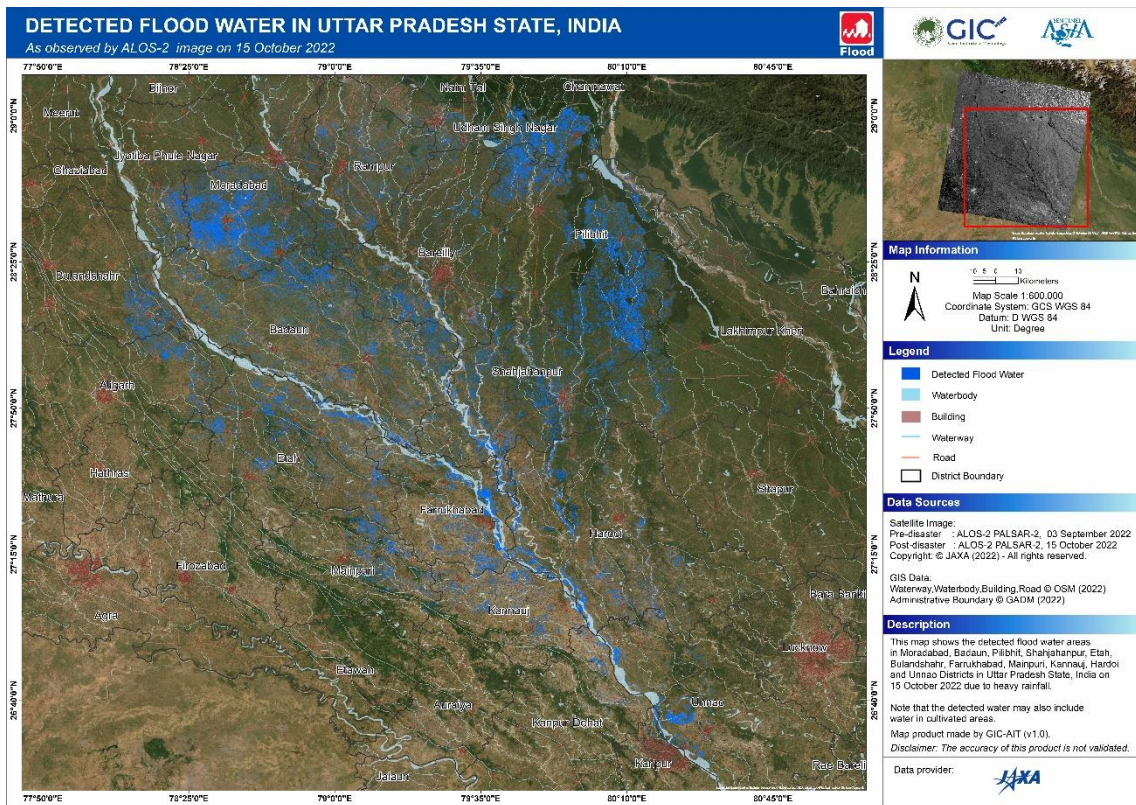## 12. Flood and Landslide in the Philippines on 25 September 2022
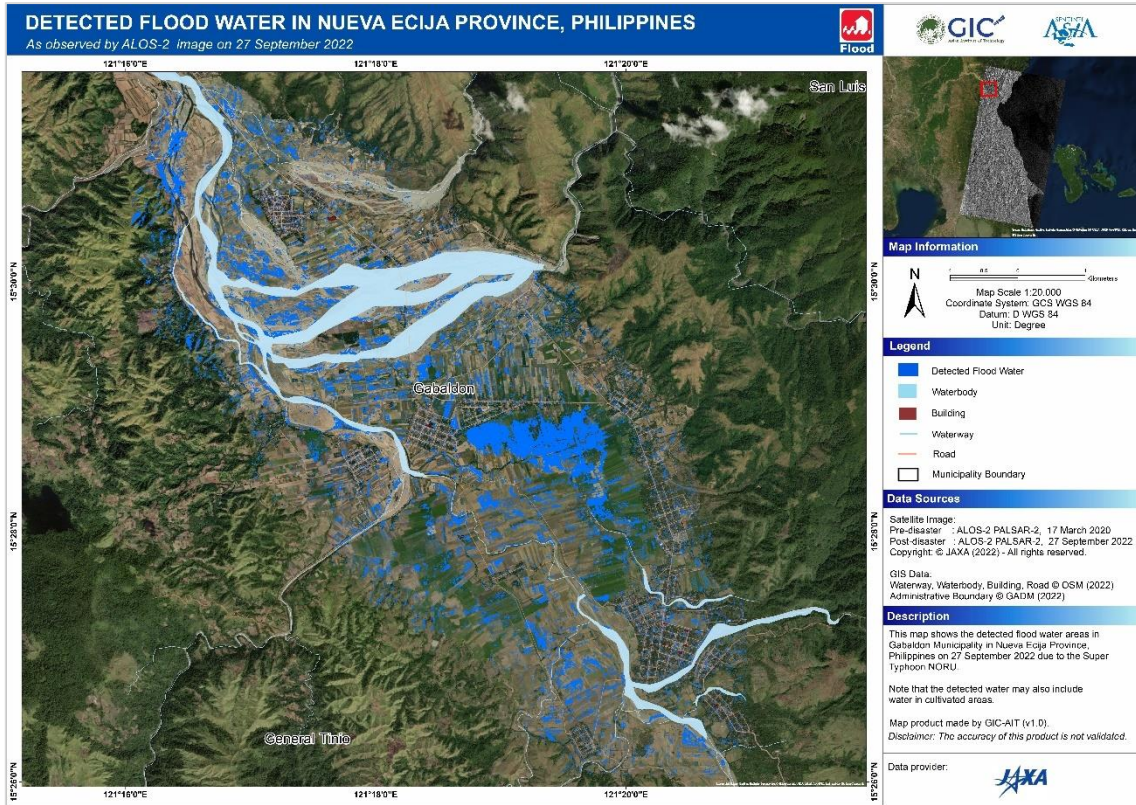


## 13. Flood and Landslide in the Vietnam on 28 September 2022

DETECTED FLOOD WATER IN THUA THIEN - HUE PROVINCES, VIETNAM
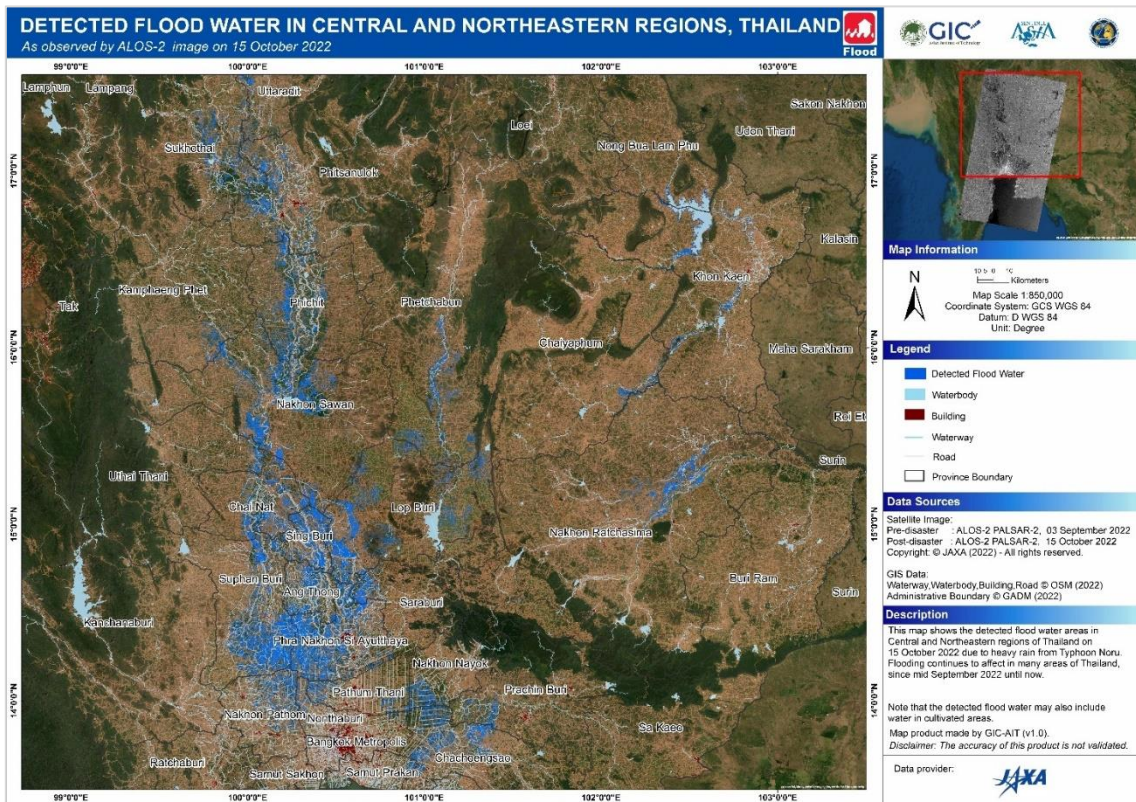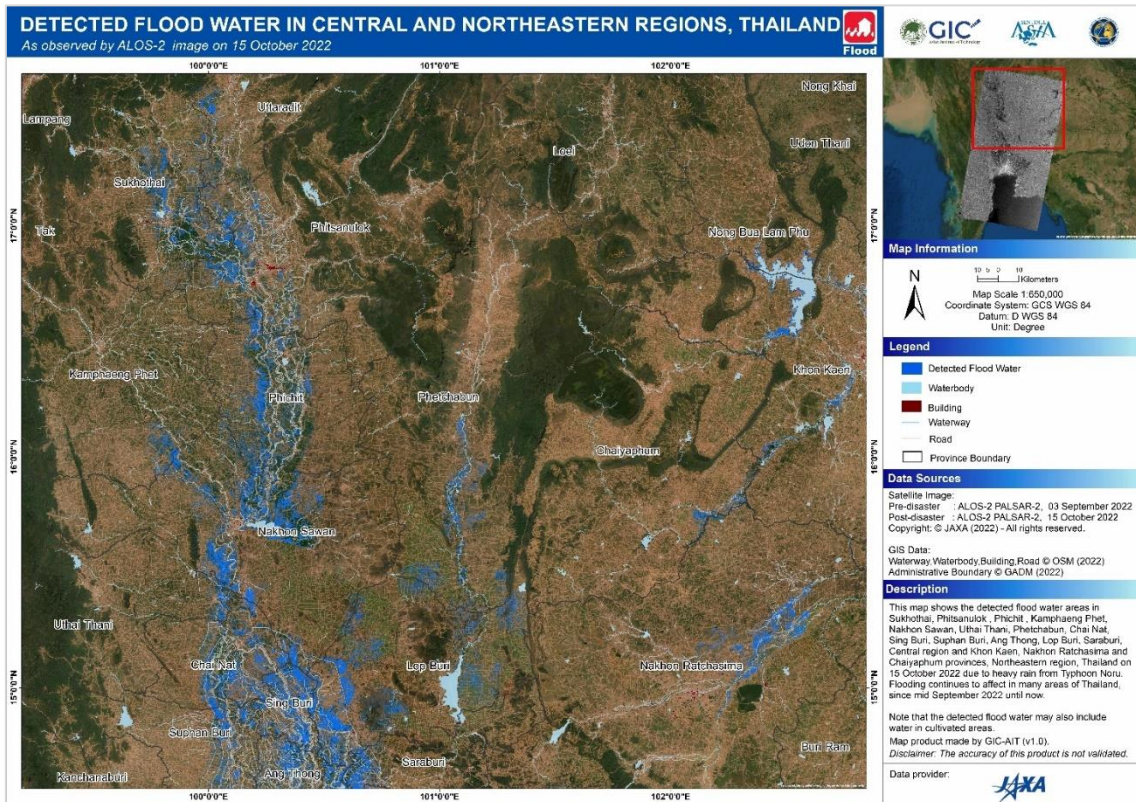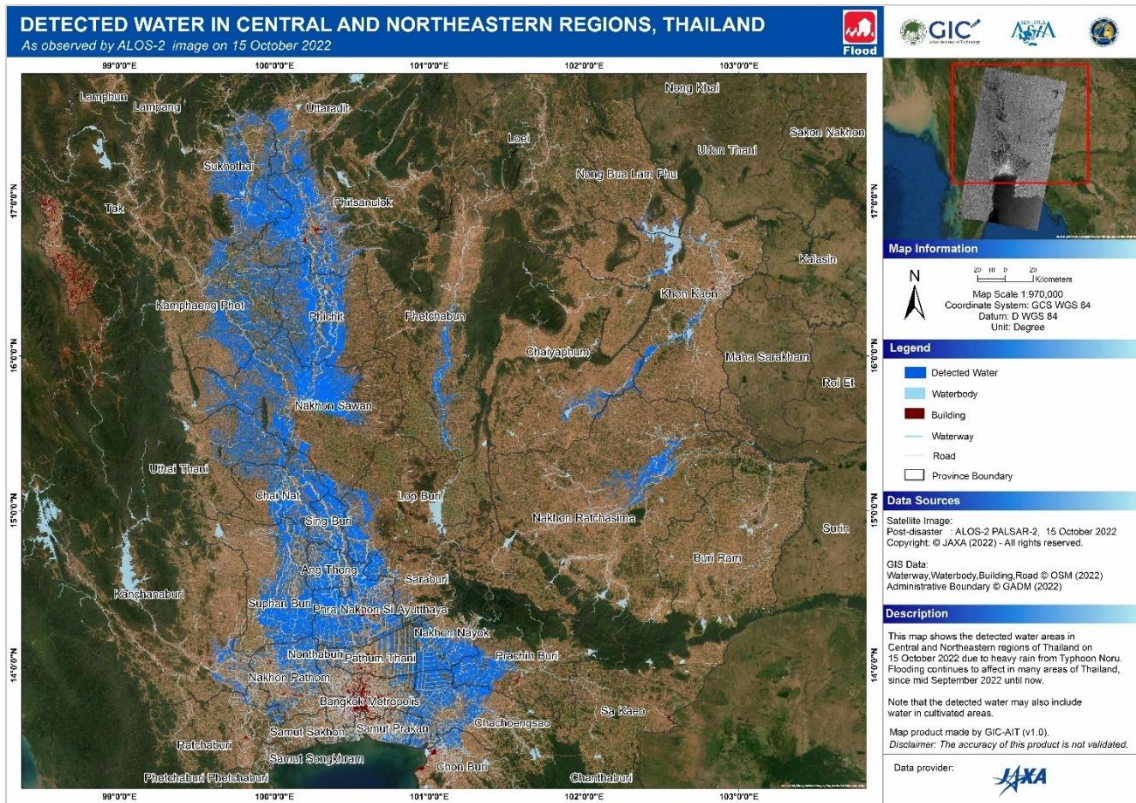As observed by ALOS-2 image on 30 September 2022

**14. Flood in India on 13 October 2022**



DETECTED FLOOD WATER IN UTTAR PRADESH STATE, INDIA
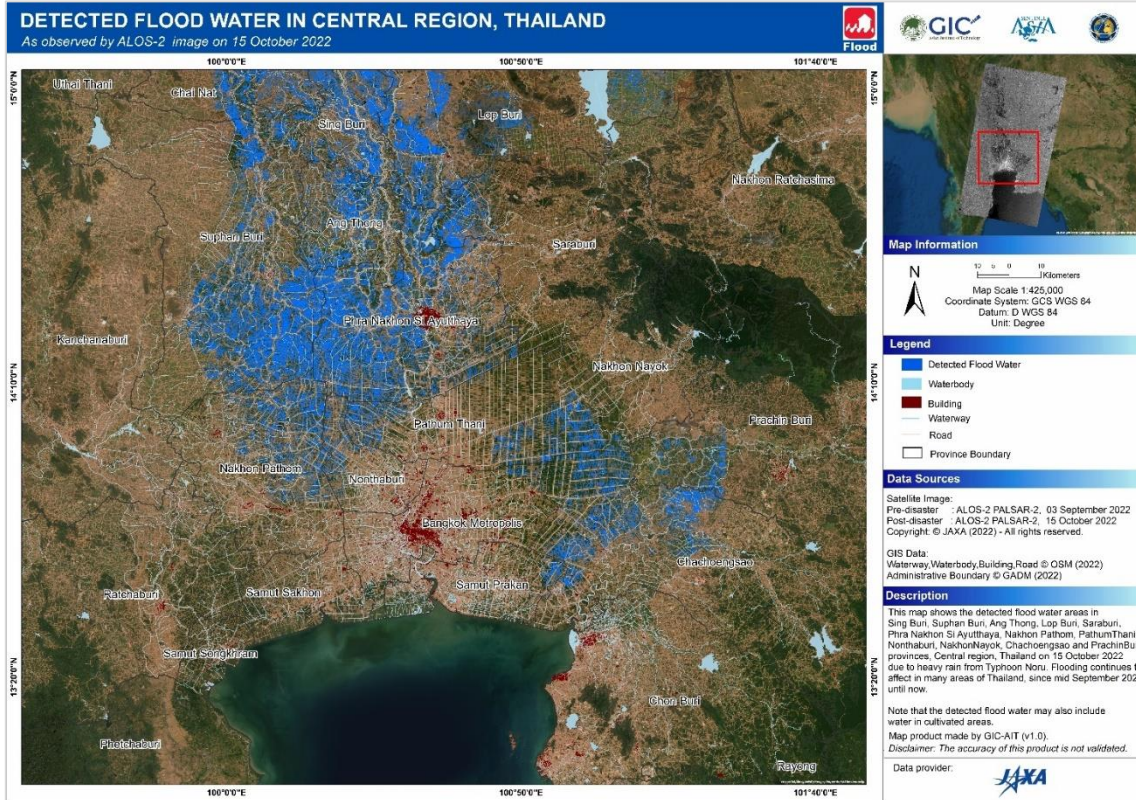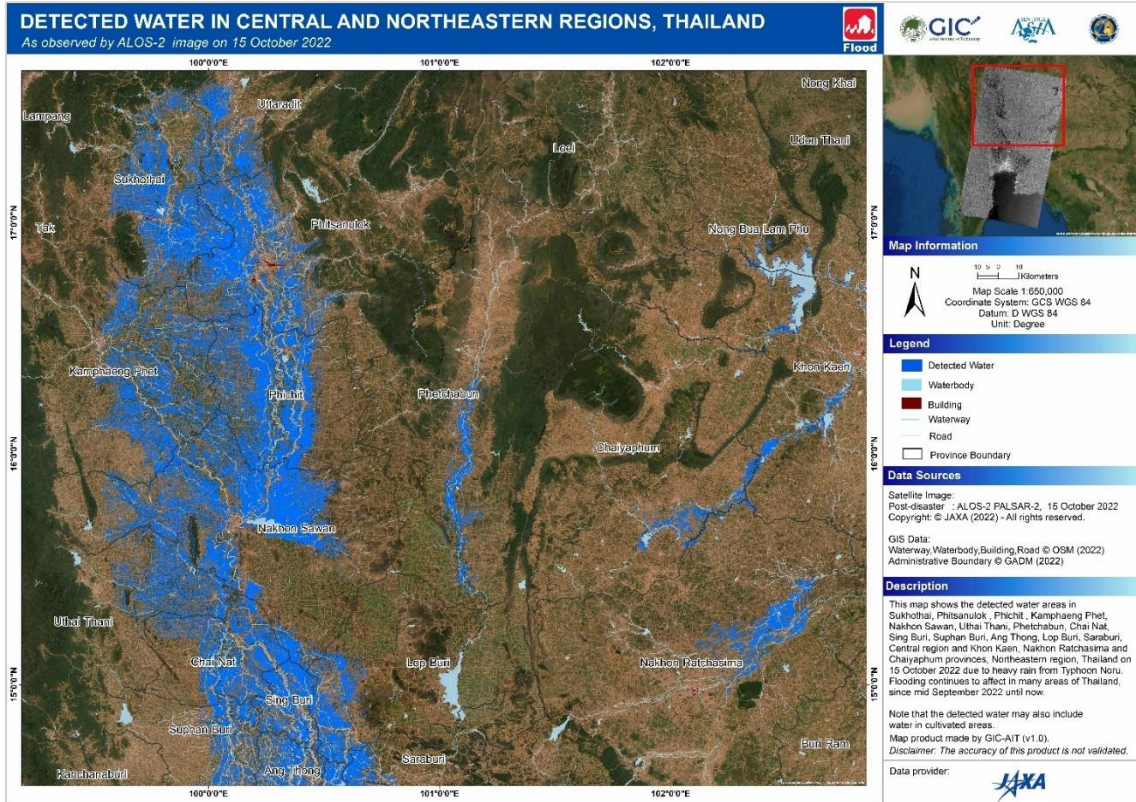As observed by ALOS-2 image on 14 October 2022
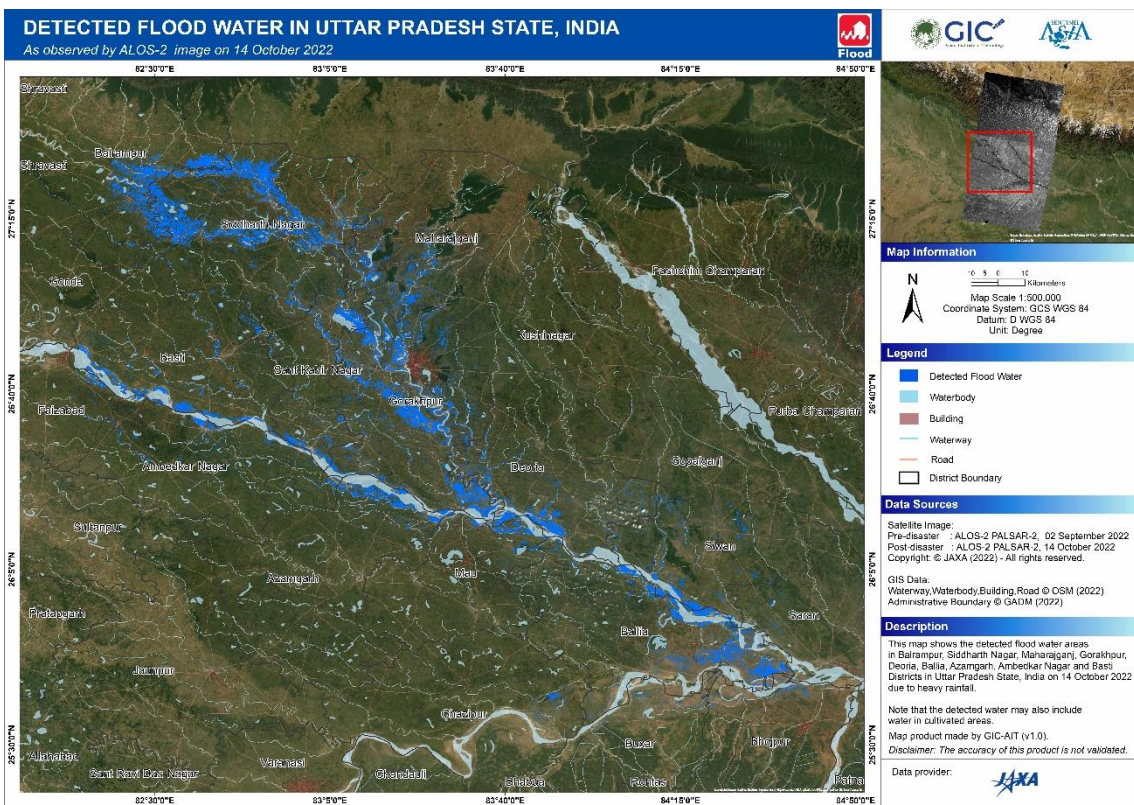
**15. Flood in Thailand on 19 October 2022 (SA was escalated to International Disaster Charter)**
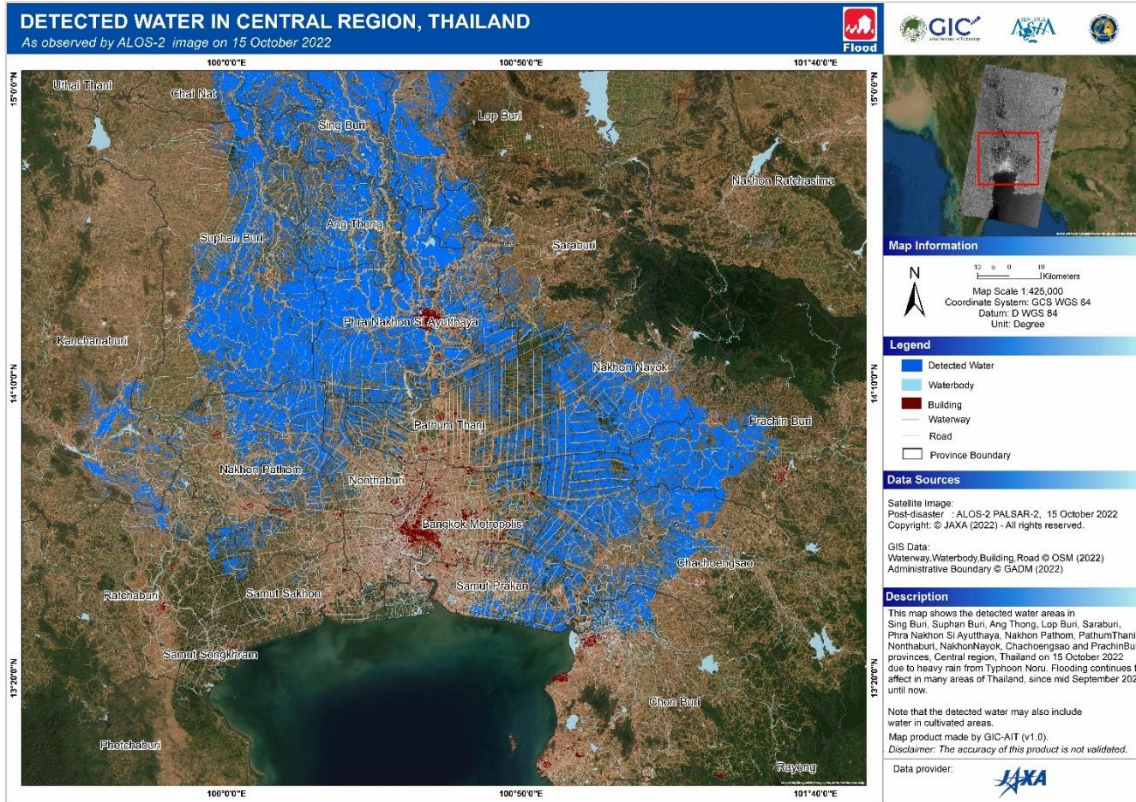
16. **Flood and Landslide in the Philippines on 29 October 2022 (SA was escalated to International Disaster Charter)**

FLOODING IN MAGUINDANAO PROVINCE, PHILIPPINES
As Observed by Worldview-2 Satellite on 12 September 2022 and Pleiades Satellite on 01 November 2022



LANDSLIDES IN MAGUINDANAO PROVINCE, PHILIPPINES
As Observed by Pleiades Satellite on 01 November 2022

**LANDSLIDES IN MAGUINDANAO PROVINCE, PHILIPPINES**
As Observed by Pleiades Satellite on 01 November 2022



**LANDSLIDES/MUDFLOWS IN MAGUINDANAO PROVINCE, PHILIPPINES**
As Observed by Sentinel-2 Satellite on 01 May 2022 and Pleiades Satellite on 08 November 2022

**LANDSLIDES/MUDFLOWS IN MAGUINDANAO PROVINCE, PHILIPPINES**
*As Observed by Sentinel-2 Satellite on 01 May 2022 and Pleiades Satellite on 08 November 2022*



**LANDSLIDES/MUDFLOWS IN MAGUINDANAO PROVINCE, PHILIPPINES**
*As Observed by Sentinel-2 Satellite on 01 May 2022 and Pleiades Satellite on 08 November 2022*

### 17. Earthquake in Indonesia on 21 November 2022
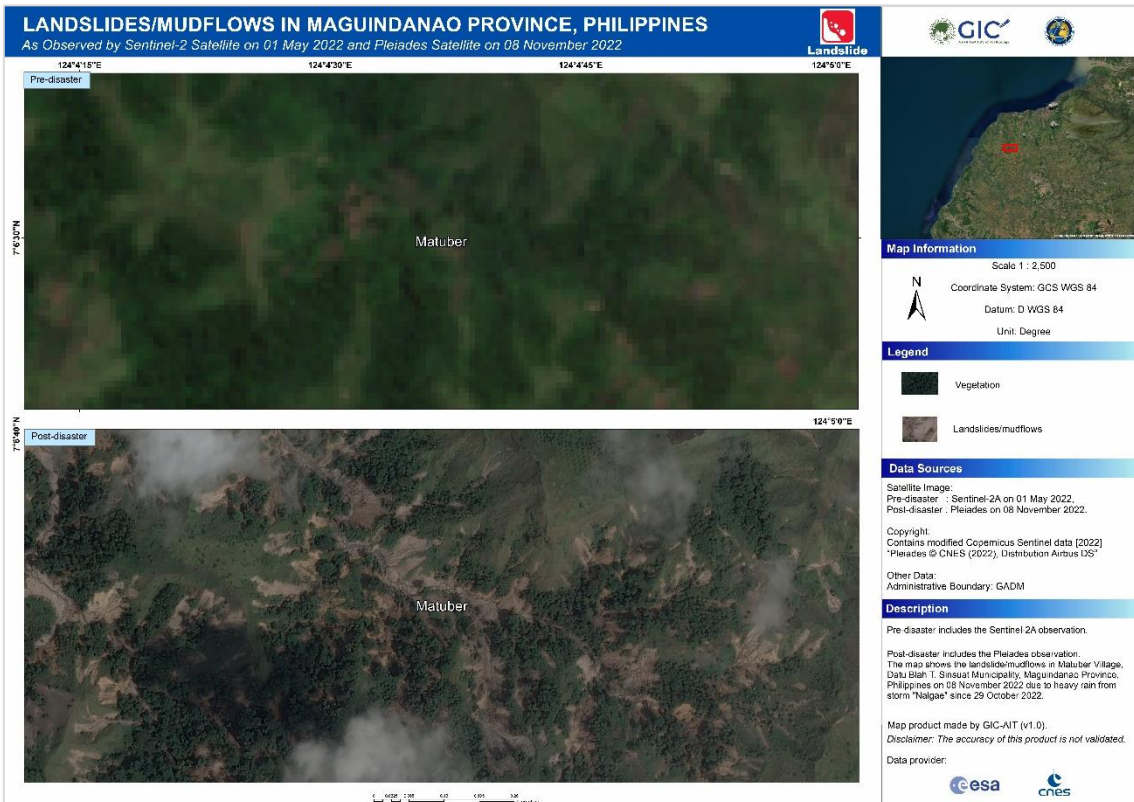


### 18. Flood and Landslide in the Philippines on 27 December 2022
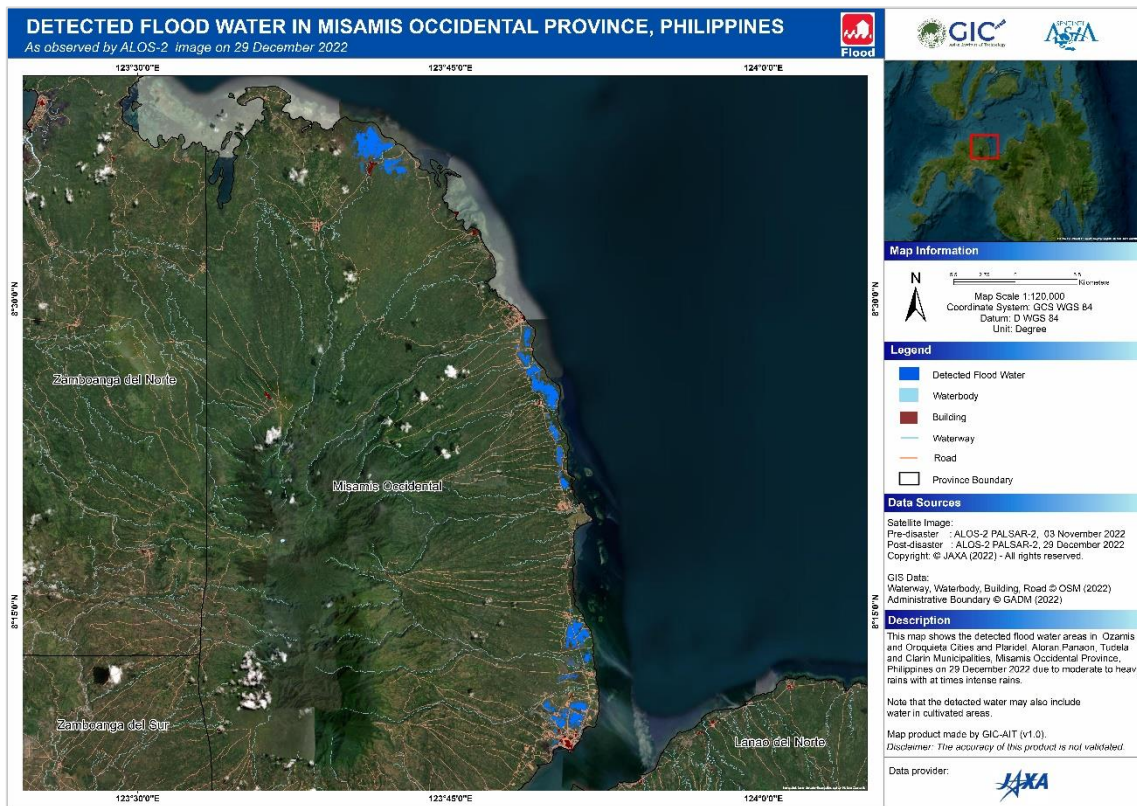
| Organization | Geo-Informatics and Space Technology Development Agency (GISTDA) |
|---|---|
| Title | GISTDA continues to support Disaster Management |
| Type of Activity | Providing satellite data |
| Date | 2022 |

GISTDA supported the disaster management activities by provide satellite images in total of 258 images (71 Multispectral images, 186 Panchromatic images, and 1 Pan Sharpened image) as shown in the picture below;

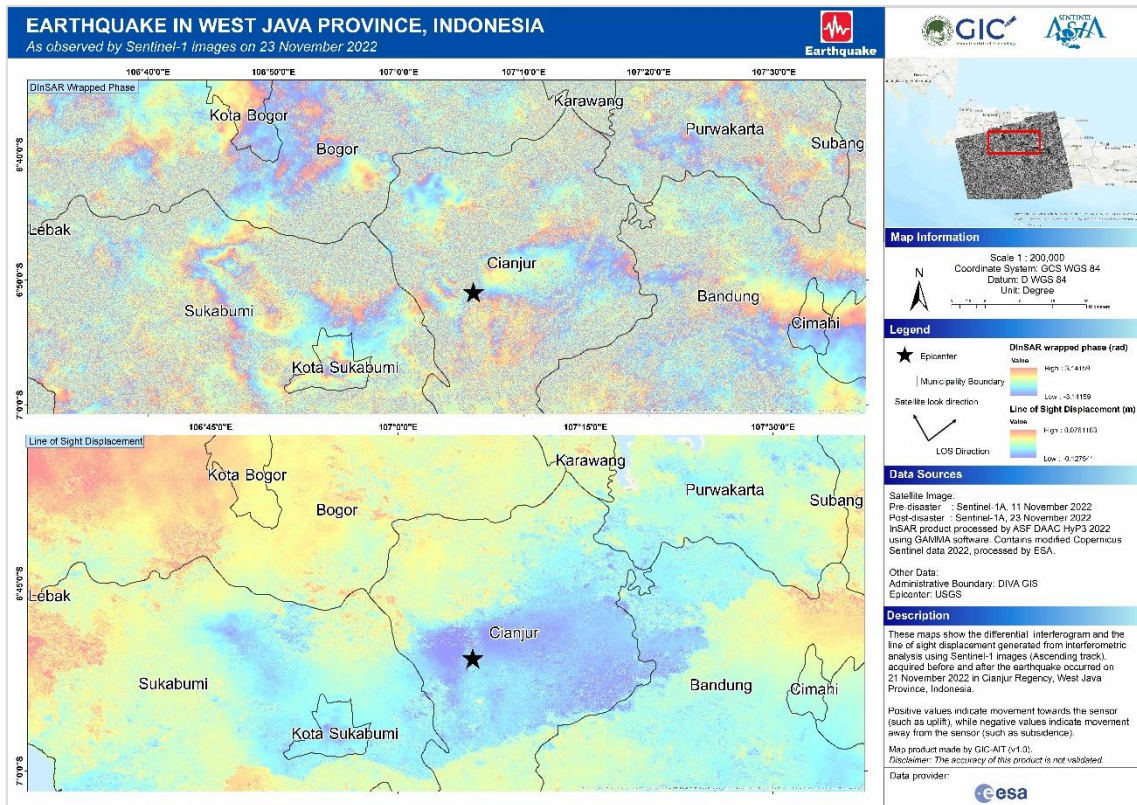| No | ACQ date | Country | Disaster Type | MS | PAN | PS | Mosaic | Note | No. of images |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 17/1/2022 | Tonga | Vacano | 2 | 6 | | | | 8 |
| 2 | 18/1/2022 | Tonga | Vacano | 6 | 15 | | | | 21 |
| 3 | 18/4/2022 | Philippines | Flood | 4 | 10 | | | | 14 |
| 4 | 17/6/2022 | Philippines | Vacano | 2 | 5 | | | | 7 |
| 5 | 20/6/2022 | Philippines | Vacano | 4 | 12 | 1 | | | 17 |
| 6 | 27/6/2022 | India | Flood | 4 | 16 | | | | 20 |
| 7 | 12/7/2022 | Vietnam | Flood | 2 | 2 | | | | 4 |
| 8 | 18/7/2022 | India | Flood | 1 | 3 | | | | 4 |
| 9 | 19/7/2022 | India | Flood | 2 | 6 | | | | 8 |
| 10 | 29/7/2022 | Philippines | Flood | 2 | 6 | | | | 8 |
| 11 | 30/7/2022 | Philippines | Flood | 2 | 7 | | | | 9 |
| 12 | 23/8/2022 | Pakistan | Flood | 4 | 7 | | | | 11 |
| 13 | 25/8/2022 | Philippines | Flood | 2 | 5 | | | | 7 |
| 14 | 26/8/2022 | Philippines | Flood | 3 | 5 | | | | 8 |
| 15 | 26/8/2022 | India | Flood | 1 | 4 | | | | 5 |
| 16 | 29/8/2022 | Philippines | Flood | 1 | 4 | | | | 5 |
| 17 | 29/8/2022 | India | Flood | 2 | 4 | | | | 6 |
| 18 | 30/8/2022 | India | Flood | 1 | 4 | | | | 5 |
| 19 | 20/9/2022 | TAIWAN | Earthquake | 2 | 4 | | | | 6 |
| 20 | 23/9/2022 | TAIWAN | Earthquake | 1 | 5 | | | | 6 |
| 21 | 30/9/2022 | Philippines | Flood | 2 | 4 | | | | 6 |
| 22 | 12/10/2022 | Nepal | Snow | 1 | 4 | | | | 5 |
| 23 | 13/10/2022 | Nepal | Snow | 2 | 4 | | | | 6 |
| 24 | 17/10/2022 | India | Flood | 5 | 17 | | | | 22 |
| 25 | 21/10/2022 | India | Flood | 5 | 7 | | | | 12 |
| 26 | 1/11/2022 | Philippines | Flood | 2 | 6 | | | | 8 |
| 27 | 2/11/2022 | Philippines | Flood | 2 | 4 | | | | 6 |
| 28 | 9/12/2022 | Indonesia | Vacano | 2 | 5 | | | | 7 |
| 29 | 13/12/2022 | Indonesia | Vacano | 2 | 5 | | | | 7 |
| | **Total** | | | **71** | **186** | **1** | | | **258** |

Summary of cooperation SA-GISTDA to cotribute Thaichot Setellites

| Organization | Geo-Informatics and Space Technology Development Agency (GISTDA) |
|---|---|
| Title | GISTDA as a Co-Chair of Sentinel Asia Steering Committee |
| Type of Activity | Providing comments and suggestion in the discussion of Strategic Plan revision |
| Date | 2022 |

GISTDA Deputy Executive Director is currently participating the Steering Committee as a Co-Chair from 2022 to 2024.

GISTDA also gives some comments/ideas/suggestions for the new actions that can help promote Step 3 activities in the Strategic Plan such as;

1. Collaborate with International bodies like UNESCAP and UNITAR could be beneficial for Sentinel Asia as they have mitigation programs.
2. Gathering common interest among members is crucial in order to choose activity to focus on.
3. Sentinel Asia should focus more on attending international/regional conference to present its activities.

| Organization | International Centre for Integrated Mountain Development (ICIMOD) |
|---|---|
| Title | EOR: Earthquake in Afghanistan |
| Type of Activity | EOR activity |
| Date | June 2022 |

ICIMOD is an intergovernmental knowledge and learning centre that develops and shares research, information, and innovations to empower people in the eight regional member countries of the HKH – Afghanistan, Bangladesh, Bhutan, China, India, Myanmar, Nepal, and Pakistan. We serve the region through information and knowledge generation and sharing to find innovative solutions to critical mountain problems. We bridge science with policies and on-the-ground practices. We provide a regional platform where experts, planners, policy makers, and practitioners can exchange ideas and perspectives towards the achievement of sustainable mountain development. We facilitate knowledge exchange across the region, help customize international knowledge and tailor it to the region's needs, and bring regional issues to the global stage.

In June 2023, we requested for the earthquake which hit in Afghanistan. ICIMOD shared provided satellite images and VAPs to the branch office of ICIMOD and DRR international organizations. These data were helped to an emergency response activity at affected area.
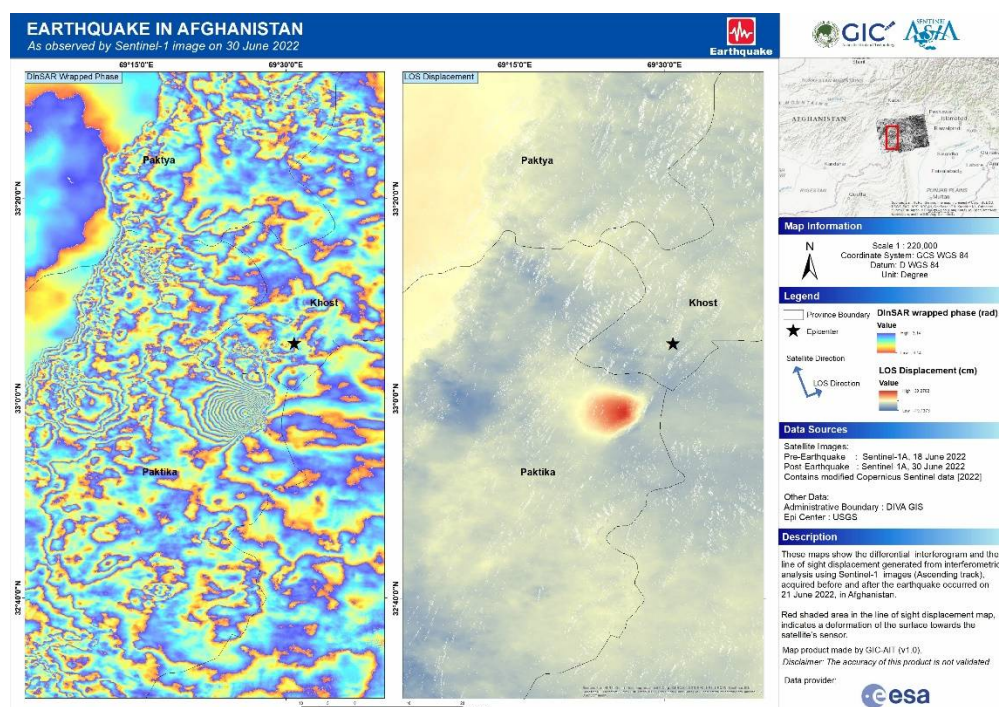
| Organization | Institute of Technology Bandung (ITB) |
|---|---|
| Title | Request for EORs, Flood in Indonesia |
| Type of Activity | Request |
| Date | 2022 |

ITB submitted an EOR, flood in Indonesia, which occurred in May 2022.

We really appreciate for Sentinel Asia support. These data were used for making a report and shared to other DRR agencies in Indonesia.
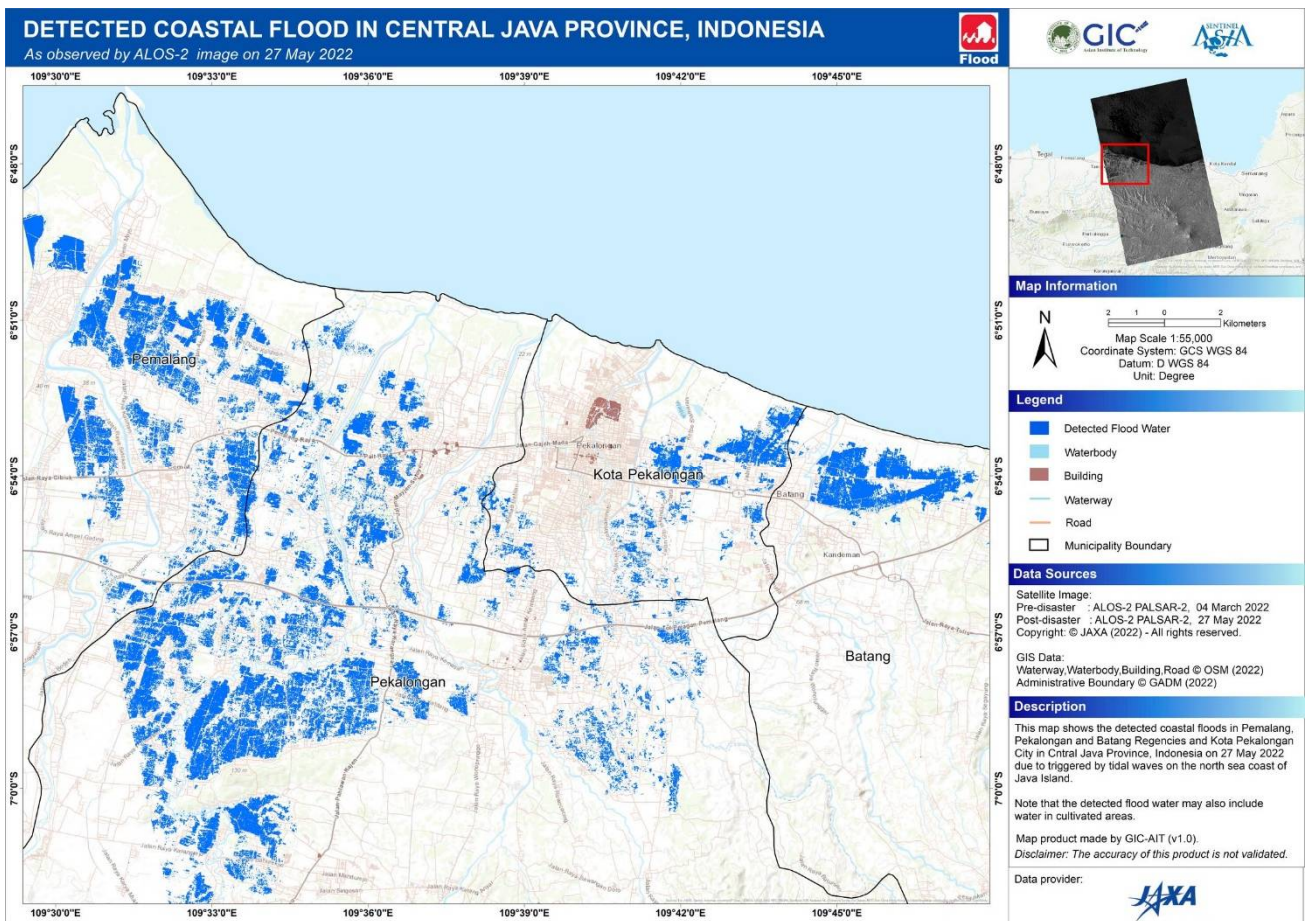
| Organization | Japan Aerospace Exploration Agency (JAXA) |
|---|---|
| Title | Automatic analysis of flood extent using ALOS-2 data |
| Type of Activity | Providing satellite data or VAP |
| Date | 22/06/2022 |

JAXA has developed a fully automated analysis system to extract flood extents using JAXA's ALOS-2 data for Sentinel Asia. We can now provide the estimated flood extent using ALOS-2 data to EOR requesters more quickly; this information is available within 2 hours after ALOS-2 observation.

Figure 1 shows a flowchart of the algorithm for automatic flood extent estimation. This algorithm is very simple and primitive, and it requires three types of data: (1) SAR images of pre- and post-disaster, (2) land use and land cover data (LULC), and (3) a digital elevation model (DEM). JAXA's ALOS-2 is a SAR satellite, which emits microwaves and receives microwaves scattered or reflected by the ground. In flooded areas, microwaves are specularly reflected and hardly return to the SAR satellite, resulting in smaller signal values. Therefore, it can be basically estimated that areas with small SAR signals are flooded areas. Our algorithm estimates the flood extent by automatically determining the water threshold based on the backscatter intensity of the SAR image.

JAXA began providing VAPs analyzed by this system to Sentinel Asis from a flooding case in India on 15 June 2022 (figure 2). And after compering multiple cases (e.g., figure 3-4), it was confirmed that JAXA's analysis results are comparable to other VAPs, despite being fully automated. Currently, JAXA is working on the implementation of a more accurate algorithm and will continue to promptly provide ALOS-2 data and useful VAPs created using ALOS-2 data in the future.
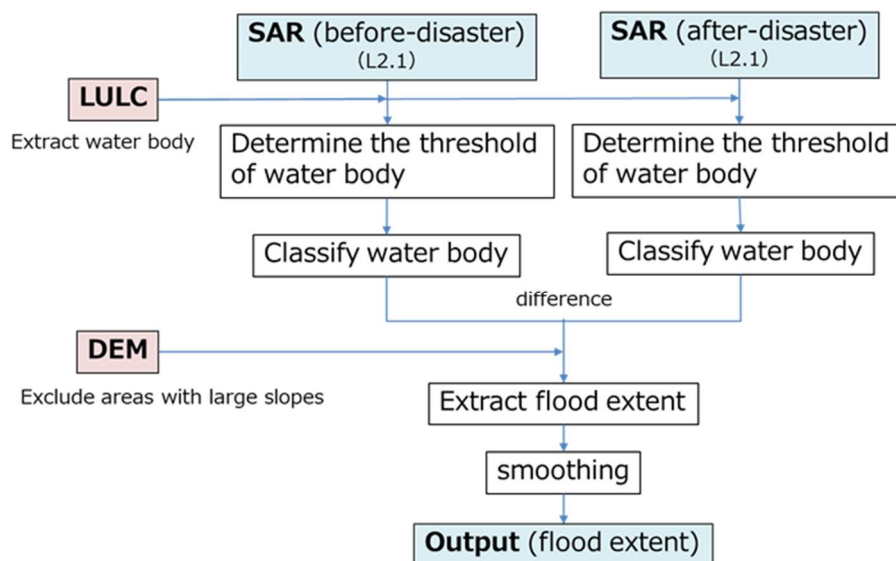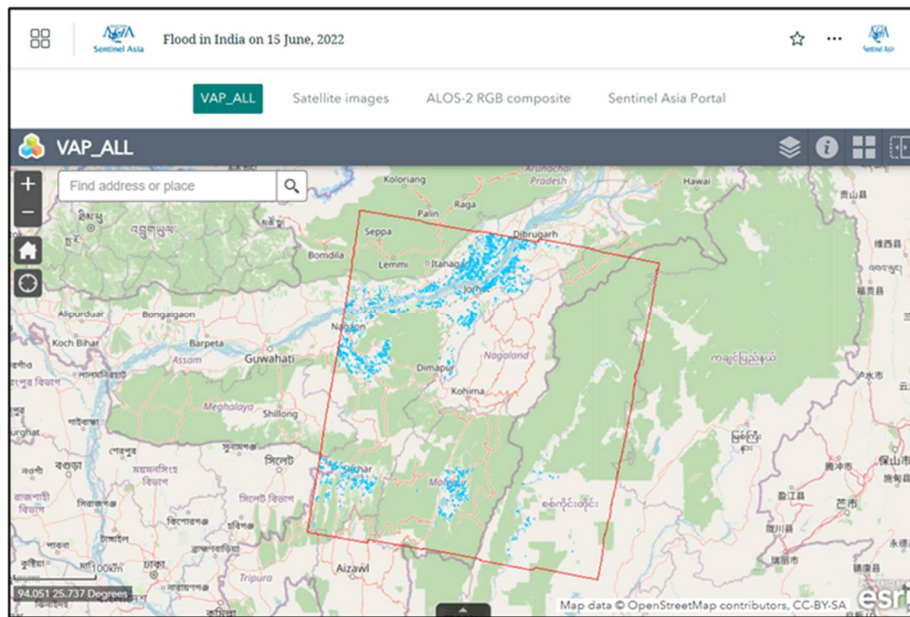


Figure 1. Flowchart of JAXA's algorithm

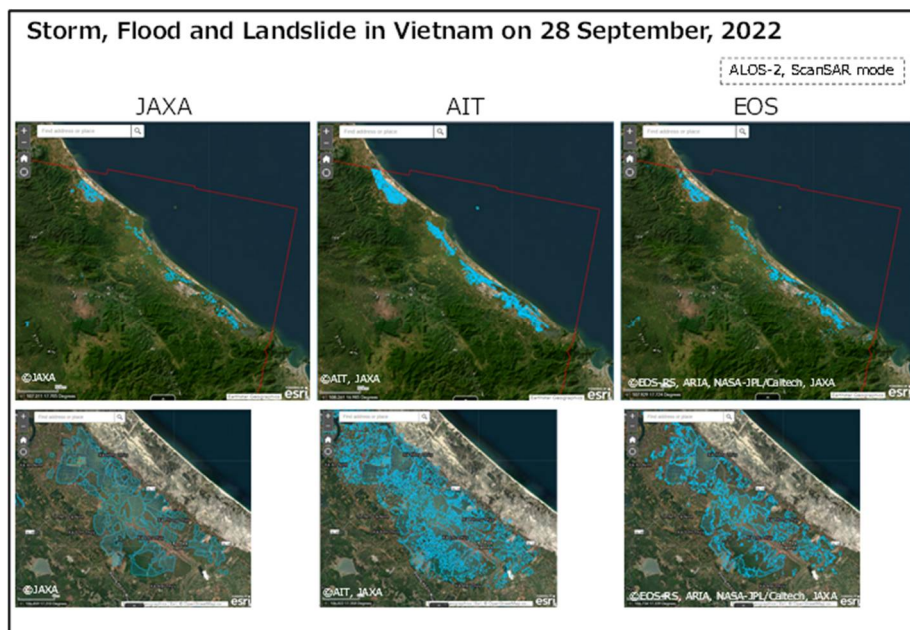Figure 2. Case of Flood in India on 15 June 2022



Figure 3. Comparison of VAPs by JAXA, AIT, and EOS

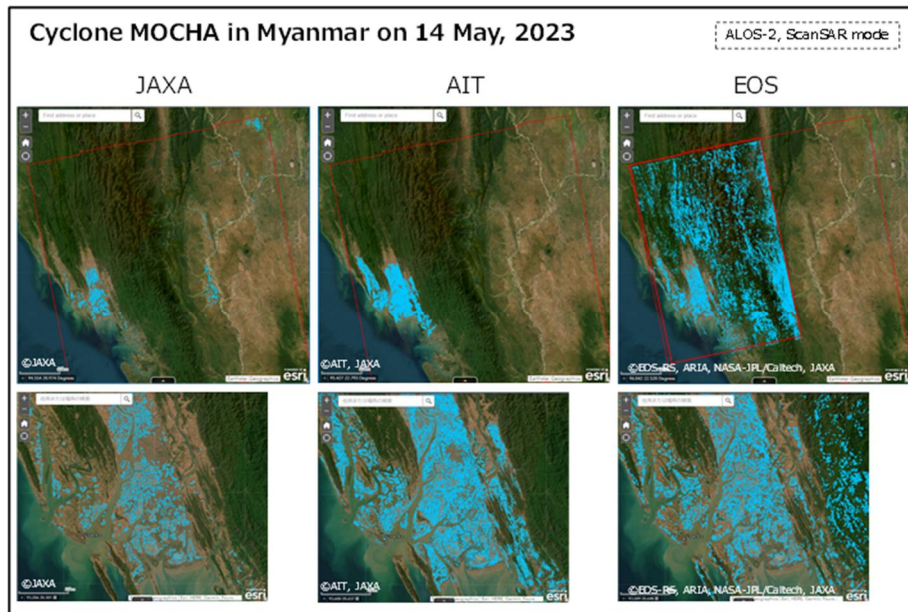in the case of Storm, Flood and Landslide in Vietnam on 28 September 2022

Figure 4. Comparison of VAPs by JAXA, AIT, and EOS
in the case of Cyclone MOCHA in Myanmar on 14 May 2023

| Organization | Mohammed Bin Rashid Space Centre (MBRSC) |
|---|---|
| Title | Date support for EOR (2022) |
| Type of Activity | Sharing satellite images for EOR |
| Date | 2022 |

The Mohammed Bin Rashid Space Centre (MBRSC), is a Dubai government organization working on the UAE National Space Programme, which includes various earth observation satellite projects, the Emirates Mars Mission, the Emirates Lunar Mission, and the UAE Astronaut Programme. MBRSC launched a new earth observation satellite, named "KHALIFSAT", in October 2018. KHALIFSAT is one of the world's most technologically advanced remote sensing observation satellite – and the first 100% designed and manufactured in the UAE. MBRSC supported to provide satellite images and VAP as following EORs in 2022.

MBRSC shared satellite images and VAPS as following disaster events;
- ✓ 2022-09-17: Earthquake in Taiwan on 17 September
- ✓ 2022-09-05: Earthquake in China on 5 September
- ✓ 2022-08-23: Flood in India on 23 August
- ✓ 2022-08-23: Storm, Flood and Landslide in Philippines on 23 August
- ✓ 2022-08-17: Flood in Pakistan on 17 August
- ✓ 2022-07-27: Earthquake in Philippines on 27 July
- ✓ 2022-07-12: Flood in Gujarat, India on 12 July
- ✓ 2022-07-12: Flood in Andhra Pradesh, India on 12 July
- ✓ 2022-07-07: Flood, Landslide and Storm in Vietnam on 7 July
- ✓ 2022-06-22: Earthquake in Afghanistan on 22 June
- ✓ 2022-06-18: Flood in Bangladesh on 18 June
- ✓ 2022-06-15: Flood in India on 15 June
- ✓ 2022-06-05: Volcano eruption in Philippines on 5 June
- ✓ 2022-05-23: Coastal Flood in Indonesia on 23 May
- ✓ 2022-05-15: Flood in India on 15 May
- ✓ 2022-04-12: Flood and Landslide in Philippines on 12 April
- ✓ 2022-02-24: Flood in Thailand on 24 February
- ✓ 2022-02-10: Oil spill in Thailand on 10 February
- ✓ 2022-01-15: Volcano eruption in Tonga on 15 January
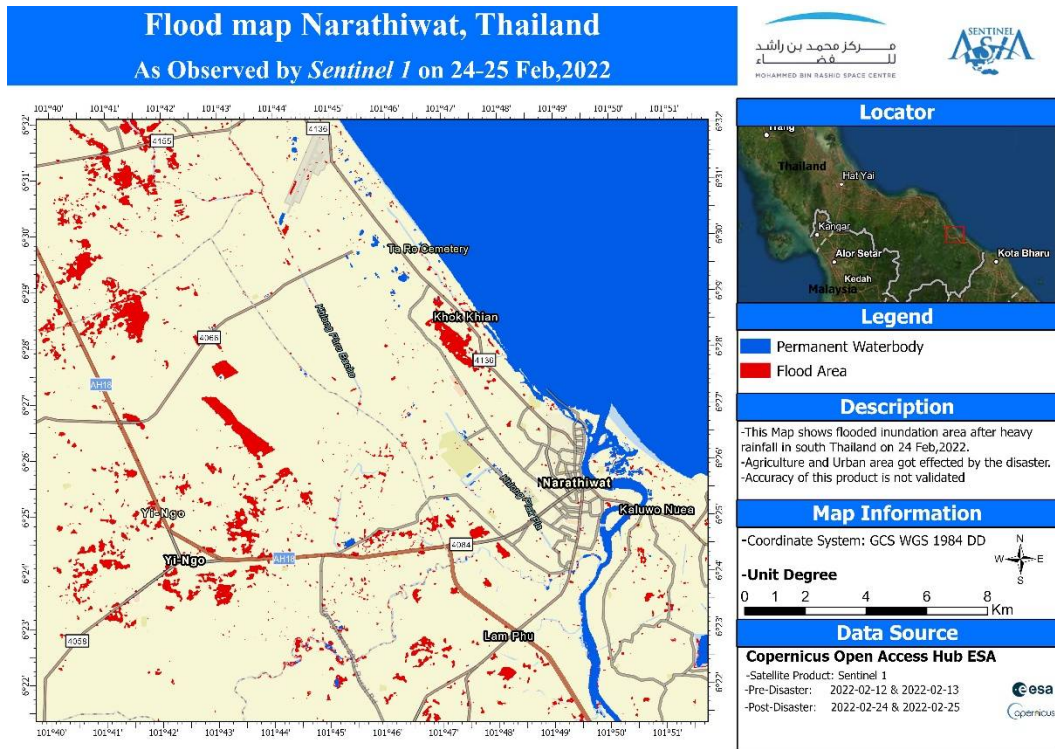
VAP [Flood in Thailand]
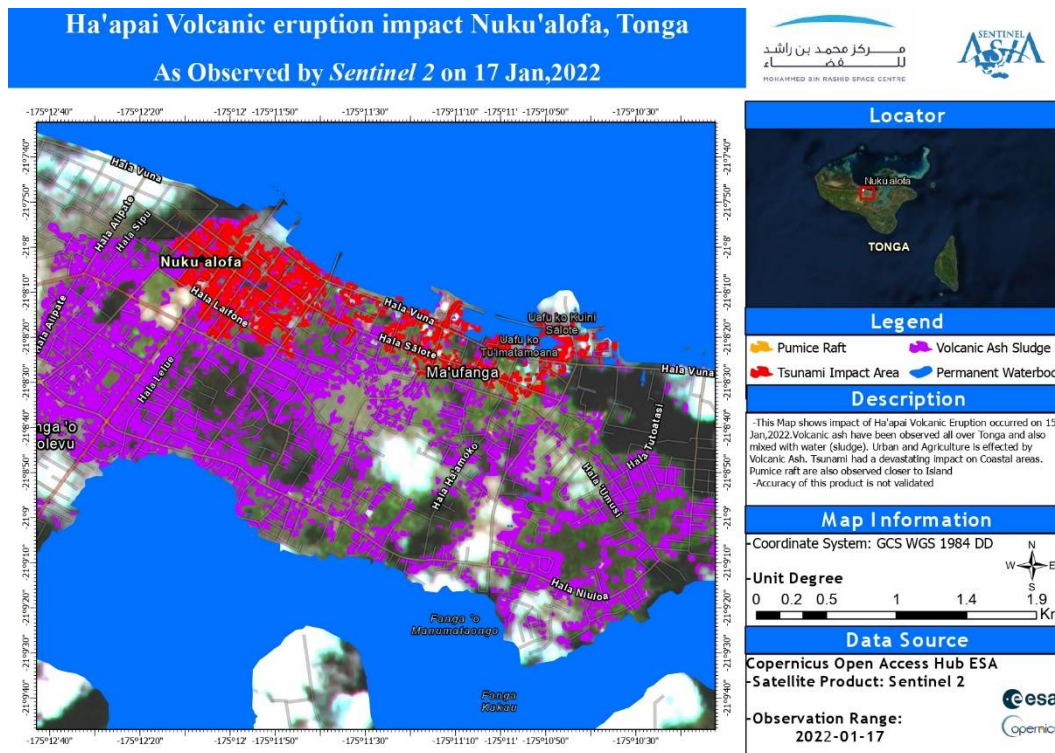


VAP [Volcanic eruption in Tonga]

| Organization | Manila Observatory |
|---|---|
| Title | Request for EORs |
| Type of Activity | Request |
| Date | 2022 |

The Manila Observatory is a research institution that does science to empower communities to take up the urgent challenges of sustainable development and disaster risk resilience. Established in 1865 under the auspices of the Jesuit mission in the Philippines, the Observatory was the official meteorological and seismological agency of the Philippines until operations were handed over to the Philippine government in the aftermath of World War II. Since then, as a non-profit institution, it has been bringing science to bear on various environmental concerns.

These days, the Observatory has been deploying the atmospheric and earth sciences, remote sensing technologies, the instrumentation and data sciences to help communities to respond to the climate emergency.

We, MO requested for following disaster events in 2022. Provided VAP were shared to related DRR organizations and institutions.

➢ Flood and Landslide in Philippines on 12 April
➢ Storm, Flood and Landslide in Philippines on 23 August
➢ Storm, Flood and Landslide in Philippines on 29 October
➢ Flood and Landslide in Philippines on 27 December

| Organization | Department of national remote sensing – VietNam Ministry of natural resources and environment |
|---|---|
| Title | Summary of 2022 results through SA system activation |
| Type of Activity | EOR |
| Date | 07/07/2022: Monitoring flash floods in Bao Lam district, Cao Bang province, Vietnam.<br><br>28/09/2022: Monitoring flooded areas in Thua Thien Hue province, Vietnam |

**07/07/2022:**

On the night of July 5, 2022, in Pac Mau town, Bao Lam district, Cao Bang province, heavy rain caused flash floods, leaving 4 people missing.

Upon receiving information about the disaster in Pac Mau town, Bao Lam district, Cao Bang province, the Center for Monitoring Natural Resources, Environment, and Climate Change (under the National Remote Sensing Department) activated the Sentinel Asia system to receive satellite images for flash flood monitoring.

After activation, the Sentinel Asia system provided the following types of satellite images:

✓ 02 CARTOSAT-2E optical satellite image with numbers 223809811 and 223809821, taken on July 11, 2022, provided by the Indian Space Research Organisation (ISRO), Department of Space, Govt. of India;

✓ 02 ALOS radar satellite images taken on June 15, 2022 (before the disaster) with the number ALOS2435303150-220615 and July 13, 2022 (after the disaster) with the number ALOS2439443150-220713 provided by Japan Aerospace Exploration Agency (JAXA);

✓ 02 FORMOSAT-5 optical satellite images with numbers FS5_G000_MS_L4UTM_20220710_034003, taken on July 11, 2022, and FS5_G000_MS_L4UTM_20220714_033947 taken on July 14, 2022, provided by the Taiwan Space Agency (TASA);

After analyzing the available satellite image data, we hand over these satellite images to the Commanding Committee for Disaster Prevention and Search and Rescue, Ministry of Natural Resources and Environment to assist in the search for missing people.

**28/09/2022:**

Storm Neru caused heavy rain in Thua Thien Hue province on September 28, 2022, with a rainfall of over 200mm. It causes the water level of the Huong River to rise and causes flooding in Thua Thien Hue province, Vietnam.

Upon receiving information about the heavy rain situation in Thua Thien Hue province, the Center for Monitoring Natural Resources, Environment and Climate Change (under the National Remote Sensing Department) activated the Sentinel Asia system to receive satellite images for flood monitoring.

After activation, the Sentinel Asia system provided the following types of satellite images:

- ✓ 01 IRS-R2 optical satellite image with number 225875511 taken on September 27, 2022, provided by the Indian Space Research Organisation (ISRO), Department of Space, Govt. of India;

- ✓ 02 ALOS radar satellite images taken on September 2, 2022 (before the disaster) with the number ALOS2446983300-220902 and September 30, 2022 (after the disaster) with the number ALOS2451123300-220930 provided by Japan Aerospace Exploration Agency (JAXA);

- ✓ 03 FORMOSAT-5 optical satellite image with numbers FS5_G000_MS_L4UTM_20210915_035300 and FS5_G001_MS_L4UTM_20210915_035304 taken on September 15, 2021 (before the disaster), and September 30, 2022, with number FS5_G000_MS_L4UTM_20220930_033937 provided by the Taiwan Space Agency (TASA);

After analyzing the available satellite images, the Center for Monitoring of Environmental Resources and Climate Change decided to use ALOS satellite images to process and extract information about flooded areas. The analysis results of the flooded area from the ALOS image dated September 30, 2022, are included in the database to establish a quick monitoring map of flood areas:
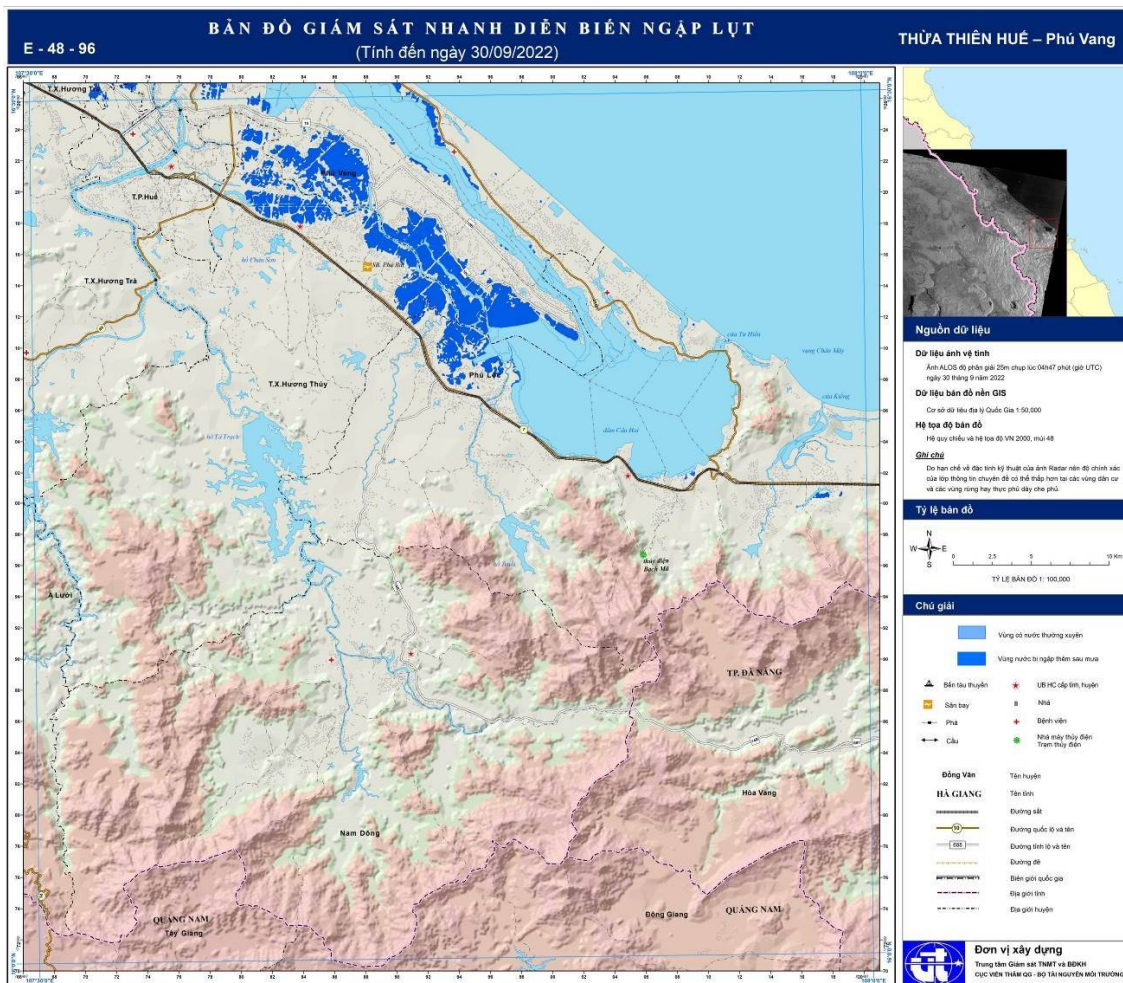


Flood areas on September 30, 2022, in Thua Thien Hue province

The results of analysis and statistics from ALOS satellite images show that Huong Thuy town, Thua Thien - Hue province has the largest flooded area of 4652.4 ha:

| No | Name of district | Name of province | Area (Ha) |
|----|------------------|------------------|-----------|
| 1 | Hue | Thua Thien Hue | 9.5 |
| 2 | Huong Tra | Thua Thien Hue | 1619.2 |
| 3 | Huong Thuy | Thua Thien Hue | 4652.4 |

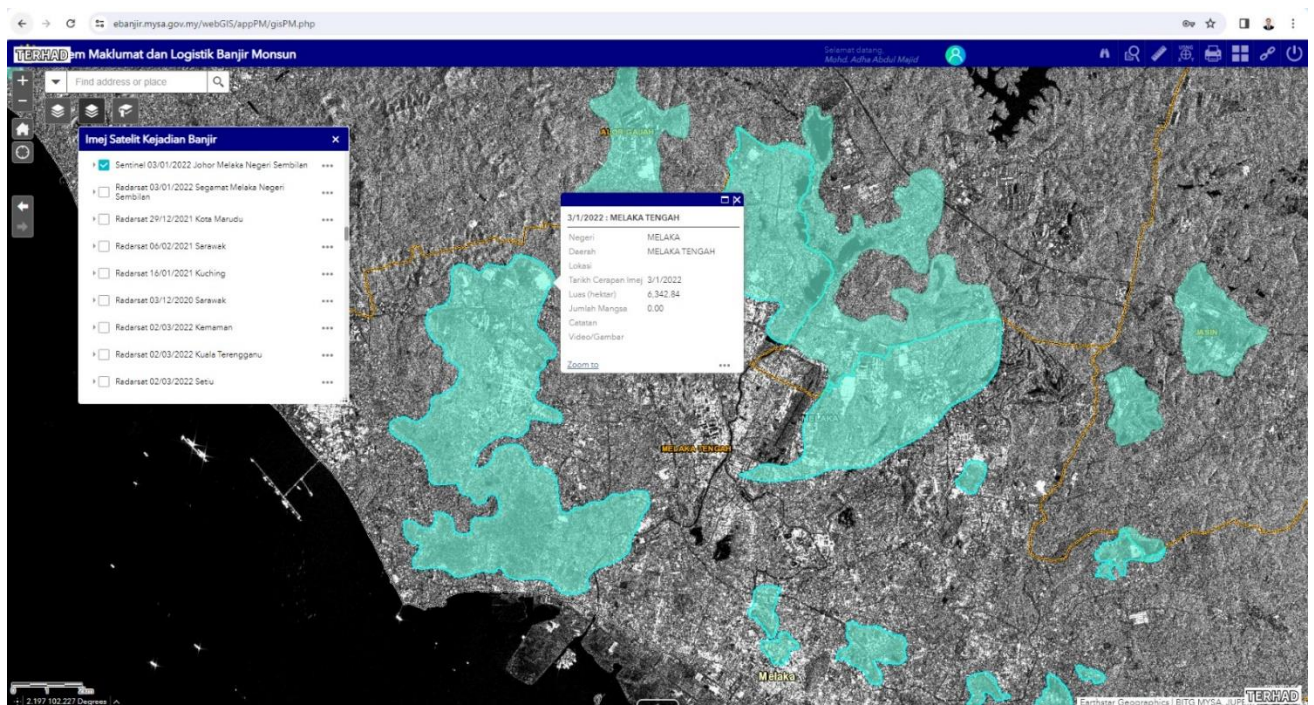| Organization | Malaysian Space Agency (MYSA) |
|---|---|
| Title | Utilization of Sentinel Earth Obeservation Satellite Images |
| Type of Activity | Forest Fire & Flood Monitoring Projects |
| Date | 2022 |

## 1) Forest Fire Information System (ForFIS)

The Sentinel-2 satellite is one of the satellites used in for detecting fire-prone areas, especially for validating daily hotspots clusters generated through thermal infrared satellite images. With a high revisit frequency of every 5 days, it enables monitoring of fire-prone areas across Malaysia and Indonesia, particularly during the dry season when large-scale forest burning episodes occur, contributing to transboundary haze due to the Southwest Monsoon around May-September each year. The satellite's Infrared and Short Wave Infrared bands allow for the periodic analysis of burn scars and land use changes caused by fires, especially in peatland areas with high fire potential. The optimal resolution of 10m to 20m allows detailed and precise extraction of various information, such as fire risk, accessibility, and percentage of destruction, which can be utilized by management agencies for more targeted and efficient firefighting efforts.



Active fire detected in Nenasi, Pahang using Sentinel 2 satellite image dated 4 July 2022

## 2) Monsoon Flood Information and Logistics System (eBanjir)

For several years, the Monsoon Flood Information and Logistics System has been utilising Synthetic Aperture Radar (SAR) data from the Sentinel satellite for water extraction. This approach is particularly useful during monsoon seasons when optical sensors struggle to penetrate cloud cover and accurately delineate flooded areas in near real-time. The Sentinel SAR data plays a crucial role in monitoring emergencies, significantly enhancing the effectiveness of early warning systems. It aids in determining evacuation necessities and assessing the potential impact of future flooding. The Sentinel SAR data, readily accessible on the satellite platform, offers global coverage and is a cost-free data source. Additionally, it has proven to be a valuable supplementary data source, complementing other data acquired by the agency.



Potential flooded area in Melaka Tengah using Sentinel SAR Satellite Imagery dated 3 January 2022

| Organization | Malaysian Space Agency (MYSA) |
|---|---|
| Title | Participation in Committee on Earth Observation Satellites (CEOS) |
| Type of Activity | Plenary Meeting<br>Working Group on Disaster Meeting |
| Date | 2022 |

On 4th - 6th October 2022, MYSA participated in the 18th Meeting of the CEOS Working Group on Disasters virtually. As a new member of the Working Group, MYSA presented on how Malaysia benefitted from remote sensing satellite imagery in disasters management and mitigation such as flood, forest fire, landslide and haze. During the discussion session entitled EO, Big Data and Machine Learning, Philippe Bally of ESA presented on how Sentinel data lead the way of large data flow that needs to be strategically handled.



The 18th Meeting of the CEOS Working Group on Disasters

Meeting on Tuesday – Thursday, 4-6 October 2022, from 9:00 – 18:00 UTC each day.

Day 1 – Tuesday, October 4th 2022

| Time | Agenda Topic | Presenter |
|---|---|---|
| 9:00 | Arrival at UCA Valrose campus (downtown Nice) – Coffee | All |
| 9:30 | Attendance / Adoption of Agenda | Andrew Eddy, Athena Global |
| 9:35 | Welcoming remarks | Sylvain Antoniotti, Vice-Président Idex de l'Université Côte d'Azur |
| 9:45 | Introductory Remarks from WG Chair and Vice Chair | Helene de Boissezon, CNES<br>Laura Frulla, CONAE |
| 10:00 | Telecon #31 MoM: Open Actions Review | Andrew Eddy, Athena Global |
| 10:15 | Agency presentations/updates:<br>• AEM<br>• ASI<br>• NASA<br>• MYSA | |
| 10:45 | CEOS Work Plan:<br>• Overview and activities relevant to WGD<br>• Linkages to other activities, including Ocean activities<br>• Presentation of changes and WGD Deliverables | Marie-Claire Greening, CEOS |

| | | |
|---|---|---|
| 11:15 | Group on Earth Observations (GEO) Updates | Dave Borges, NASA, GEO DRR WG Chair |
| | • UNDRR EO risk toolkit<br>• GEO DRR WG collaboration | Rui Kotani, GEO SEC |
| | Discussion on WGDisasters / GEO DRR/ UN-GGIM linkages | |
| 11:45 | CEOS WGISS Presentation | Makoto Natsuisaka, JAXA, WGISS Chair |
| | WG Collaboration; Discussion | |
| 12:00 | CEOS WGCapD Presentation | Jorge de la Rio Vera, UNOOSA, WGCapD Chair |
| | WG Collaboration (joint actions); Discussion | |
| 12:15 | International Charter / WGDisasters | Dave Hodgson, UKSA |
| | · Observer Status / WG Activities Status/Data exchange agreement | |
| 12:20 | *Lunch Break – restaurants nearby* | |
| 14:00 | Wildfire Pilot : Presentation 1 – Presentation 2 | Joshua Johnston, NRCan |
| | · Activities / Deliverables Updates | Mark de Jong, NRCan |
| | · Implementation Plan Progress | Peter Moore, FAO |
| | | Denis Dufour, CSA |
| | | Jenn Zhu, CSA |
| 15:30 | *Health Break* | |
| 16:00 | Data Coordination Team (DCT) Report | Laura Frulla, CONAE |
| | Pilot / Demo / GEO Quota Status; DINAMIS presentation and future French VHR missions | Delphine Fontannaz, CNES |
| 16:30 | GEO-DARMA | Ivan Petiteville, ESA |
| | • Activities / Deliverables Updates<br>• Perspectives on future activities | Andrew Eddy, Athena Global |
| | | Ricardo Quirogas, NASA |
| 16:45 | *WGD Discussion Session: EO and Big Data – presentation and discussion* | Philippe Bally, ESA |
| | | Dave Borges, NASA |
| 17:30 | *End WGDisasters-18 Day 1* | |

The 36th CEOS Plenary was held from the 29th November 2022 – 1st December 2022 with participation from MYSA representative virtually. There were many discussions related to the usage of Sentinel 1 – 6 on remote sensing applications and reports on numerous projects done by respective Working Groups.

## 2022 CEOS PLENARY AGENDA

**Day 1: Wednesday, November 30**

Location: Atlantique Room

| | | Arrival / Teleconference Open | 30 min before start time |
|---|---|---|---|
| **Session 1: Welcome and Core Business (09:00 – 10:50)** |
| 1.1 | 09:00 | Welcome, Opening Remarks, Agency Introductions, and summary of objectives *(CEOS Chair Team)* [Slides] | 20 min |
| 1.2 | 09:20 | Surface Water and Ocean Topography (SWOT) Mission Pre-Launch Update *(Rosemary Morrow, CNES; Nadya Vinogradova Shiffer, NASA)* [Slides] <br> • *Principal Investigator and project team presentations* | 30 min |
| 1.3 | 09:50 | CEOS Chair Team Review of Matters for Decision or Endorsement *(CEOS Chair Team)* [Slides] | 5 min |
| 1.4 | 09:55 | Agency Nomination for 2024 CEOS Chair *(Eric Laliberté, CSA) (For Endorsement)* [Letter] <br> • Discussion and decision *(5 min)* | 10 min |
| 1.5 | 10:05 | CEOS Executive Officer (CEO) Report *(Marie-Claire Greening)* [Slides] <br> • CEOS Organisation, Roles and Responsibilities <br> • 2022-2024 CEOS Work Plan Progress | 15 min |
| 1.6 | 10:20 | CEOS Executive Officer Continuity *(CEOS Chair Team)* [Slides] <br> • Decision: Long-term and equitable plan for CEOS Executive Officer continuity *(For Endorsement)* [Slides] | 15 min |
| 1.7 | 10:35 | Group on Earth Observations (GEO) Secretariat Report *(Laurent Durieux)* [Slides] <br> • GEO's partnership with CEOS on global action for local impact | 10 min |
| | **10:50: Group Photo + Break** | **30 min** |
| **Session 2: Climate and Carbon (11:20 – 13:10)** |

| 1.8 | 11:20 | SIT Chair Climate & Carbon Priority Synthesis Report *(ESA SIT Chair Team)* [Slides]<br><br>● CEOS Global Stocktake Strategy Action Status<br><br>● CEOS GST Data Portal Updates | 20 min |
|------|-------|---|--------|
| 1.9 | 11:40 | GHG Roadmap Update *(Mark Dowell, EC-JRC)* [Slides] | 20 min |
| 1.10 | 12:00 | AFOLU Roadmap *(Ben Poulter, NASA; Remote)* [Slides]<br><br>● New developments in advancing the AFOLU Roadmap | 20 min |
| 1.11 | 12:20 | CEOS Cooperation with IMEO *(ESA SIT Chair Team)* [Slides] [IMEO-MARS Video]<br><br>● Update on CEOS Agency contributions and actions required | 20 min |
| 1.12 | 12:40 | New GCOS Implementation Plan and Satellite Supplement *(Anthony Rea, WMO)* [Slides] | 10 min |
| 1.13 | 12:50 | CEOS/CGMS Working Group on Climate (WGClimate) *(Albrecht von Bargen, DLR)* [Slides]<br><br>● COP27 and SBSTA Report<br><br>● ECV Inventory<br><br>● GCOS Implementation Plan update<br><br>● Recent activities<br><br>● Decision: Nomination for WGClimate Vice Chair (Wenying Su of NASA; Letter) (For Endorsement) | 20 min |
| 1.14 | 13:10 | Outcomes of the UNOOSA report which has mapped the activities of international organisations doing both space and climate activities *(Beth Greenaway, UKSA)* | 5 min |
| **13:15: Lunch** | | | **85 min** |
| **Session 3: CEOS Working Groups and Virtual Constellations (14:40 – 17:05)** | | | |
| 1.15 | 14:40 | Working Group on Calibration & Validation (WGCV) *(Akihiko Kuze, JAXA)* [Slides]<br><br>● Decision: Nomination for WGCV Vice Chair (Cody Anderson of USGS; Letter) (For Endorsement)<br><br>● Decision: Updated WGCV Terms of Reference [Document] *(For Endorsement)* | 20 min |
| 1.16 | 15:00 | Working Group on Information Systems & Services (WGISS) *(Makoto Natsuisaka, JAXA; Remote)* [Slides] | 20 min |
| 1.17 | 15:20 | Working Group on Capacity Building and Data Democracy (WGCapD) *(Jorge Del Rio Vera, UNOOSA)* [Slides]<br><br>● EOTEC DevNet Sustainability Plan *(For Information)* | 20 min |
| 1.18 | 15:40 | Working Group on Disasters (WGDisasters) *(Helene DeBoissezon, CNES)* [Slides] | 20 min |
| **16:00: Break** | | | **20 min** |

| 1.19 | 16:20 | Virtual Constellation Synthesis Report *(ESA SIT Chair Team)* [Slides]<br><br>● Summary highlights of progress and issues from all CEOS Virtual Constellations<br>● LSI-VC GEOGLAM Subgroup: GEOGLAM Capacity Development Guidance Document<br>*(For Information)* | 35 min |
|---|---|---|---|
| 1.20 | 16:55 | Atmospheric Composition Virtual Constellation (AC-VC) *(Ben Veihelmann, ESA)* [Slides]<br><br>● <u>Decision:</u> Consider endorsement of the whitepaper: *"Monitoring Surface PM2.5: An International Constellation Approach to Enhancing the Role of Satellite Observations"*<br>*(For Endorsement)* | 10 min |
| **Adjournment of Day 1** | | | **17:05** |

**Hosted Dinner**

Location: Casino Municipal

19:00 – 19:30: Welcome Cocktail

19:30: Dinner

**Day 2: Thursday, December 1**

Location: Atlantique Room

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**Joint CEOS & Oceania Geospatial Symposium (OGS) Special Session**

08:00 – 09:00

[Information Note](#)

- Demonstration of CEOS activities applicable to Oceania and the Pacific Islands
- CEOS & GEO Collaboration
- Communication of needs from Oceania Geospatial Symposium (OGS) members
- Understanding observation requirements and user structures in Oceania and the Pacific Islands
- UN Sustainable Development Goals (SDGs)

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Location: Atlantique Room

| Teleconference Open | | | 30 min before start time |
|---|---|---|---|
| **Session 4: New Space and Related Topics (09:00 – 10:20)** | | | |
| 2.1 | 09:00 | SIT Chair 'New Space' Synthesis Report *(ESA SIT Chair Team)* [Slides] <br><br> • Key findings and outcomes from SIT-37 and SIT Technical Workshop 2022 | 20 min |
| 2.2 | 09:20 | SEO Report on the SatSummit 2022 Conference *(Brian Killough, SEO/NASA)* [Slides] | 10 min |
| 2.3 | 09:30 | Proposal for a 'New Space' Task Team *(ESA SIT Chair Team)* <br><br> • Decision: Terms of Reference for a CEOS 'New Space' Task Team *(For Endorsement)* | 20 min |
| 2.4 | 09:50 | CEOS Standards Organisation Engagement *(Andreia Siqueira, LSI-VC Co-Lead)* [Slides] <br><br> • Decision: Action for CEOS to prepare a way forward for increased coordination on standards organisations engagement *(For Endorsement)* [Slides] <br><br> • Update on CEOS involvement in the OGC ARD Standards Working Group *(For Information)* | 20 min |
| 2.5 | 10:10 | CEOS Interoperability Framework *(LSI-VC)* [Slides] <br><br> • Decision: Action for CEOS to develop the concept of a CEOS Interoperability Framework with other interested parties (e.g., WGISS, WGCV) and to come back with a concrete proposal for SIT-38 consideration. *(For Endorsement)* [Slides] | 20 min |

| | | • LSI-VC Interoperability Task Team<br>• CEOS Common Dictionary | |
|---|---|---|---|
| **10:30: Break** | | | **20 min** |
| **Session 5: Sustainable Development, Biodiversity, Oceans    (10:50 – 12:20)** | | | |
| 2.6 | 10:50 | CEOS Sustainable Development Goals (SDG) Coordination Team *(Brian Killough, CEOS SEO)* [Slides]<br><br>• 2022 review<br><br>• 2023+ deliverables, activities, resources | 20 min |
| 2.7 | 11:10 | CEOS & Biodiversity *(Marie-Josée Bourassa, CSA; Gary Geller, NASA/JPL)* [Slides]<br><br>• Decision: CEOS Ecosystem Extent Task Team Terms of Reference (For Endorsement) [CEOS Ecosystem Extent Task Team TOR V20221115]<br><br>• Discussion: Draft proposal for the Ecosystem Extent Task Team activity [Ecosystem Extent Task Team draft proposal] | 20 min |
| 2.8 | 11:30 | Coordination of CEOS Ocean-related Activities *(Ivan Petiteville, ESA SIT Chair Team)* [Slides]<br><br>• Decision: Extension of the Ocean Coordination Group for another 6-12 months *(For Endorsement)* [Slides] | 20 min |
| 2.9 | 11:50 | COVERAGE *(Vardis Tsontos, NASA/JPL)* [Slides]<br><br>• Longer-term sustainability of this CEOS initiative *(For Information)* | 10 min |
| 2.10 | 12:00 | Coastal Observations Applications Services and Tools (COAST) *Ad Hoc* Team (Paul DiGiacomo, NOAA) [Slides]<br><br>• Decision: 1-year extension of the COAST *Ad Hoc* Team [PDF][DOC] *(For Endorsement)* | 20 min |
| **12:30: Lunch** | | | **90 min** |
| **Session 6: CEOS Agency Reports (14:00 – 15:30)** | | | |
| 2.11 | 14:00 | CEOS Agency Reports *(5 minutes each, For Information)*:<br><br>• UKSA (Beth Greenaway)<br><br>• NIER (Jaehoon Jeong)<br><br>• CNES (Selma Cherchali)<br><br>• FAO (Matieu Henry)<br><br>• NOAA (Stephen Volz)<br><br>• GISTDA (Tanita Suepa) | 90 min |

|  |  |  |  |
|---|---|---|---|
|  |  | ● NASA (Julie Robinson) |  |
|  |  | ● ESA (Simonetta Cheli) |  |
|  |  | ● GA (Andreia Siqueira) |  |
|  |  | ● CSIRO (Alex Held) |  |
|  |  | ● EUMETSAT (Phil Evans) |  |
|  |  | ● USGS (Tim Stryker) |  |
|  |  | ● UNOOSA (Jorge Del Rio Vera) |  |
|  |  | ● DLR (Klaus Schmidt) |  |
|  |  | ● CSA (Eric Laliberté) |  |
|  |  | ● JAXA (Takeshi Hirabayashi) |  |
|  |  | ● European Commission (Mauro Facchini) |  |
|  |  | ● NSO (Joost Carpay) |  |
| **Break and CEOS 2022 Year in Review Video** |  |  | **30 min** |
| **Session 7: CEOS Leadership Transitions and Closing Business (16:00 – 17:30)** |  |  |  |
| 2.12 | 16:00 | 2022 CEOS Chair Priorities – Report on Outcomes *(CEOS Chair Team)* [Slides] | 15 min |
| 2.13 | 16:15 | CEOS Systems Engineering Office (SEO) Annual Report *(Brian Killough, SEO/NASA)* [Slides] <br>● SEO activities <br>● CEOS communications | 10 min |
| 2.14 | 16:25 | CEOS Missions, Instruments and Measurements (MIM) Database Report *(Ivan Petiteville, ESA)* [Slides] | 10 min |
| 2.15 | 16:35 | CEOS Chair Transition *(CNES 2022 CEOS Chair Team and GISTDA 2023 CEOS Chair Team)* [Slides] | 10 min |
| 2.16 | 16:45 | GISTDA 2023 CEOS Chair Presentation *(Pakorn Apaphant, GISTDA 2023 CEOS Chair)* [Slides] <br>● Priority themes | 15 min |
| 2.17 | 17:00 | Summary Presentation / Review of Session Outcomes *(CNES 2022 CEOS Chair Team)* [Slides] <br>● Review of Preliminary Action and Decision Record | 20 min |
| 2.18 | 17:20 | Closing Remarks *(CNES 2022 CEOS Chair Team)* [Slides] | 10 min |
| **Adjournment of Day 2 and the 36th CEOS Plenary** |  |  | **17:30** |

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**Meetings Open Only to the CEOS Secretariat and CEOS Troika Members**

Location: Atlantique Room

18:00: 301st CEOS Secretariat Meeting (SEC-301)

*Led by the 2023 CEOS Chair*

18:30: CEOS Troika

*Led by the 2023 CEOS Chair*


19:00: Adjournment

| Organization | The Philippine Institute of Volcanology and Seismology (PHIVOLCS) |
|---|---|
| Title | EOR |
| Type of Activity | EOR |
| Date | June and July/2022 |

The Philippine Institute of Volcanology and Seismology (PHIVOLCS) is a service institute of the Department of Science and Technology (DOST) that is principally mandated to mitigate disasters that may arise from volcanic eruptions, earthquakes, tsunami and other related geotectonic phenomena.

Our vision is;

A leading global science and technology institution of empowered men and women helping develop communities safe from and resilient to volcanic eruptions, earthquakes, tsunamis and other related hazards

And our mission is;

We provide timely, quality and socially-inclusive information and services for warning, disaster preparedness and mitigation. This we do through the development and application of technologies for the monitoring and accurate prediction of, and determination of areas prone to, volcanic eruptions, earthquakes, tsunamis and other related hazards, and gender-responsive capacity enhancement for comprehensive disaster risk reduction.

In the framework of Sentinel Asia, PHIVOLCS requested for following disaster events in 2022. Provided VAP were utilized for our DRR activities.

- Volcano eruption in Philippines on 5 June
- Earthquake in Philippines on 27 July
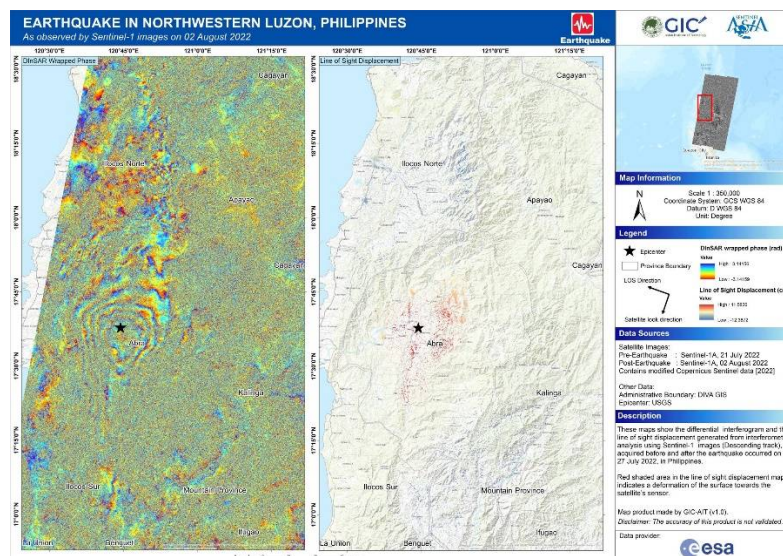
| Organization | Geoinformatics Team, RIKEN Center for Advanced Intelligence Project (AIP) |
|---|---|
| Title | Global high-resolution land cover mapping |
| Type of Activity | Research and development for data preparedness<br>(e.g., Conference, Workshop, Meeting, Training, EOR, Providing satellite data or VAP) |
| Date | Through the year in 2022 |

The Geoinformatics Team at RIKEN AIP has created OpenEarthMap (https://open-earth-map.org/), a groundbreaking benchmark dataset for high-resolution global land cover mapping. OpenEarthMap comprises 5000 manually annotated aerial and satellite images, featuring detailed 8-class land cover labels, and offers a ground sampling distance of 0.25-0.5m. This extensive dataset covers 97 regions across 44 countries on 6 continents. OpenEarthMap has enabled the development of the world's first globally effective model, erasing regional data disparities and enhancing performance by 15-20% in regions like Asia, Africa, and South America, where high-resolution data was previously scarce. Models trained on OpenEarthMap exhibit impressive generalization capabilities worldwide and can be readily applied in various applications, including disaster damage assessment. The following figure shows mapping results over Islahiye, Turkey, both before and after the earthquakes in Turkey and Syria in February 2023.



Imagery © 2023 CNES/Airbus, Maxar Technologies

Land cover mapping results over Islahiye, Turkey, before and after the earthquakes in Turkey and Syria in February 2023 obtained by the OpenEarthMap model.

| Organization | Taiwan Space Agency (TASA) |
|---|---|
| Title | Satellite Imagery Support to Sentinel Asia |
| Type of Activity | Responses to EOR (Providing Satellite Data as Data Provider Node) |
| Date | Year of 2022 |

During 2022, TASA has contributed to the Sentinel Asia activities as Data Provider Node. NSPO has successfully responded to Emergency Observation Requests (EOR's) pertaining to 9 countries ranging from East Asia to South Asia in 21 events with FORMOSAT-5 satellite datasets comprising of pre- and post-disaster events. All these satellite image products were provided right after we acquired cloudless images. According to the statistics, FORMOSAT-5 satellite image products supported various types of applications such as flood and earthquake relief. At the same time, it has also given disaster response assistance to Philippines, India, Thailand and Indonesia for more than one event. It's worth noting that TASA also provided Value-Added Products to assist stakeholders in the rescue, which enabled decision makers to understand the extent and scope of the disaster in intuitive manner.
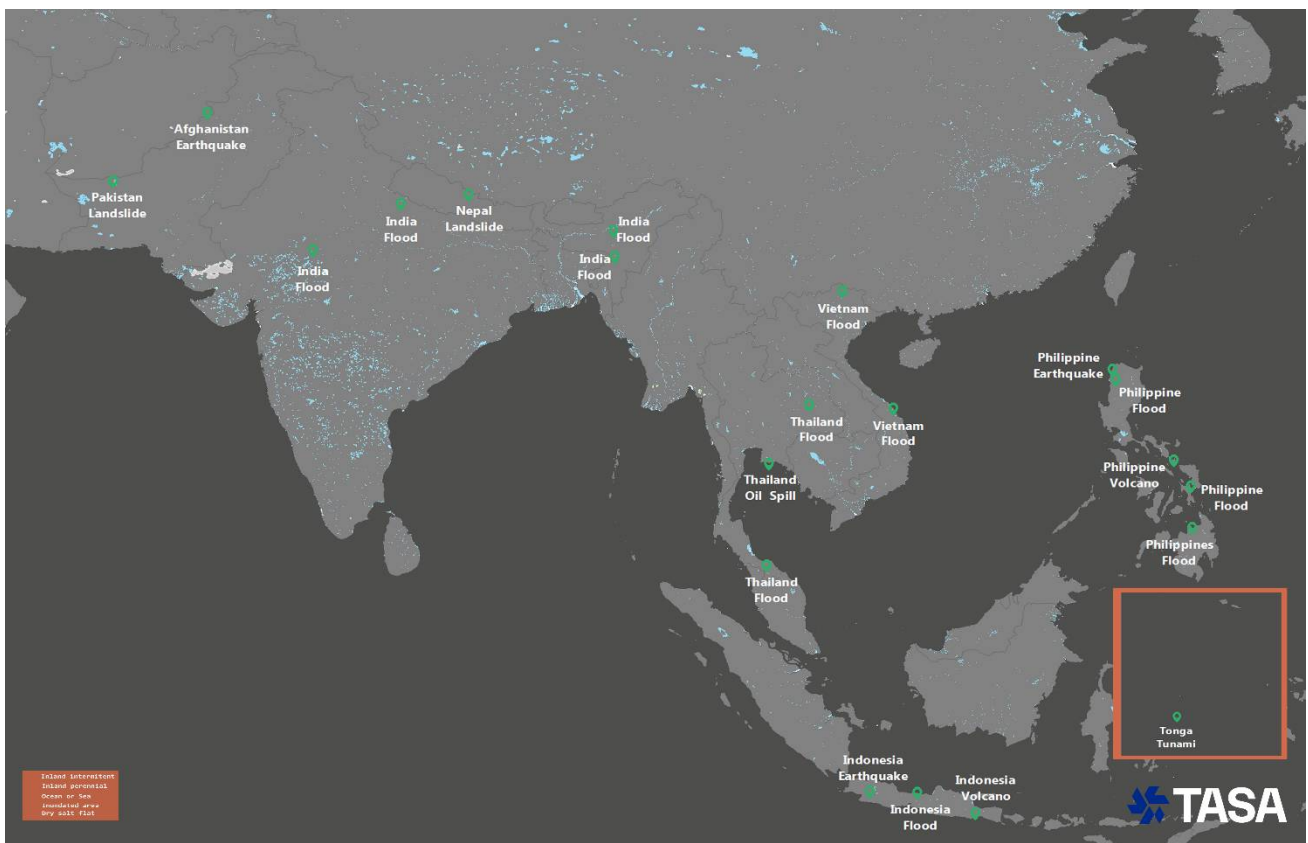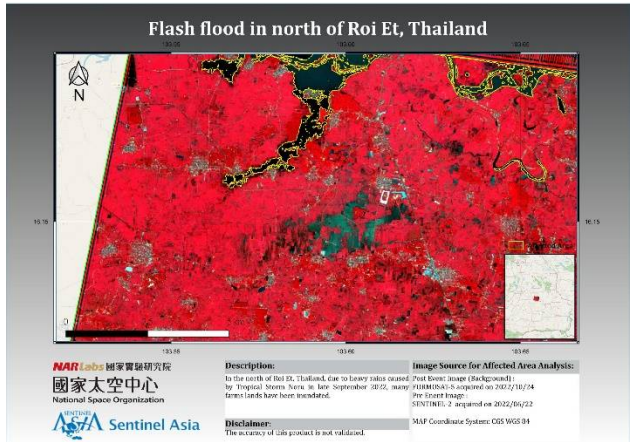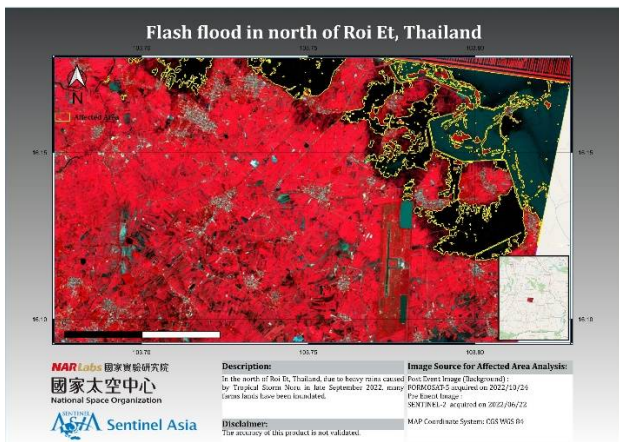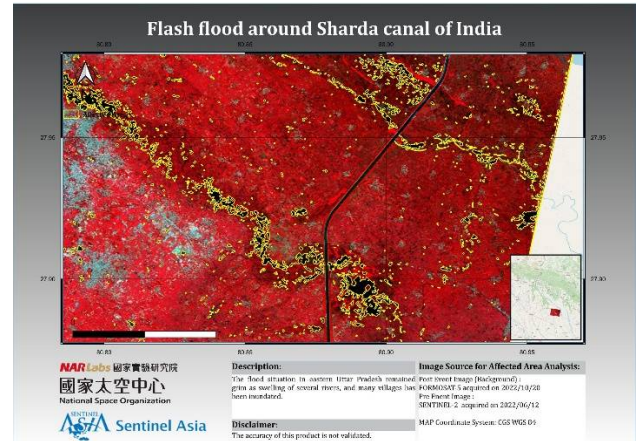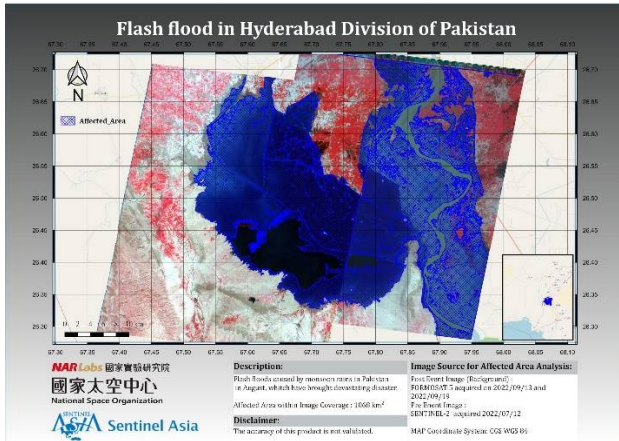
Fig 1 TASA Support to Sentinel Asia Emergency Observation Requests during 2022

| Organization | Academia Sinica Grid Computing Center (ASGC) and TASA |
|---|---|
| Title | Sentinel Asia JPT-3 Cloud Services |
| Type of Activity | Cloud Server Service |
| Date | Year of 2022 |

**Academia Sinica Grid Computing Center (ASGC) and TASA** collaboration with Sentinel Asia Tech Team, supported Sentinel Asia Emergency Observation (EO) online workflow and the integration of WebGIS, EO pipeline, data access of DAN and DPN, as well as distributed cloud platform since Feb. 2020. Reliability of the JPT-3 cloud services is higher than 99.9% on average in year 2022 and 174.4 GB data is downloaded by about 227 accesses from Sentinel Asia members and applications on a monthly average during 2022. The total download data scale has been more than 3.14Terabyte (TB) from Jan. 2022 to June. 2023. NSPO together with Sentinel Asia Tech Team reviewed the status of SA services and technical issues periodically. In the future, TASA will work with the SA technical team to advance the values of satellite resources on disaster management and their applications by designing and prototyping spatiotemporal infrastructures such as Open Data Cube, token-based authentication and authorization infrastructure.
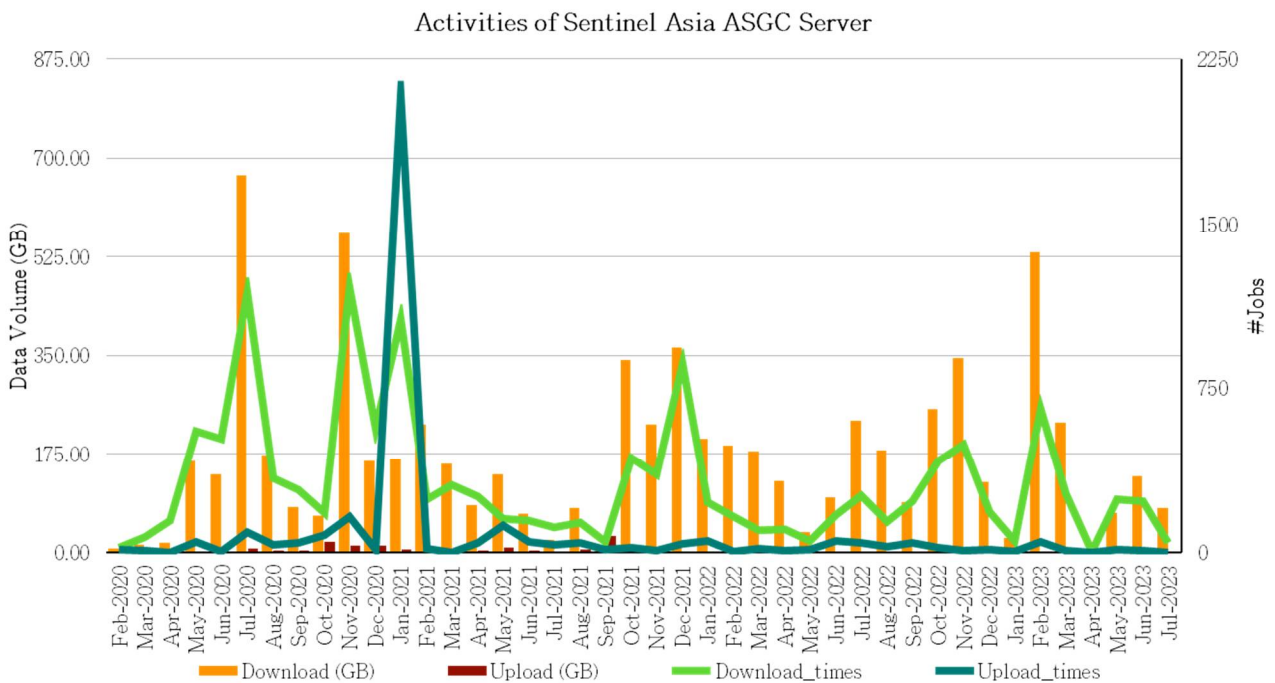


Fig 2 Summary of Sentinel Asia JPT-3 Cloud Services during the period 2022 to 2023.

| Organization | TASA and JAXA |
|---|---|
| Title | APRSAF-28 Side Event: Expanding Open Data Cube (ODC) Applications in Asia-Pacific Region |
| Type of Activity | Workshop and Conference meeting |
| Date | Year of 2022 |

TASA hosted a side event on topic of Expanding Open Data Cube (ODC) Applications in Asia-Pacific Region in APRSAF-28. The objective of this Side Event is to share various countries/regions development status, and to exchange experiences in applying Open Data Cube (ODC) to different societal benefit areas. Invited speakers are from Australia, Japan, Taiwan, Thailand, the US, Vietnam, and international organizations: Committee on Earth Observation Satellites (CEOS) and Asian Development Bank (ADB). In this event, Australia, Taiwan, Thailand, and Vietnam shared their experiences on the national level development as well as applications to SDG of Data Cube. International Organizations of CEOS and ADB presented the development of Open Data Cube and recent Remote Sensing projects from a global point of view. There are approximately 30 participants from Taiwan, Japan, Australia, Thailand, Vietnam, and U.S. This event concluded with a concept to establish a regional Data Cube as an infrastructure to provide integration platforms for long-term and large-scale land management base on multi-sensor resource. It help to validate the results of environmental protection and monitoring. This concept facilitates a starting point for the APRSAF community, especially Sentinel Asia and SAFE within SAWG, to consider the feasibility of a joint effort. Therefore, this event facilitates as the first step in establishing ODC for future APRSAF initiatives. In this cooperation platform, we could work together towards contributions in SDGs.



Fig 3. Group photo of Side Event: Expanding Open Data Cube (ODC) Applications in Asia-Pacific Region
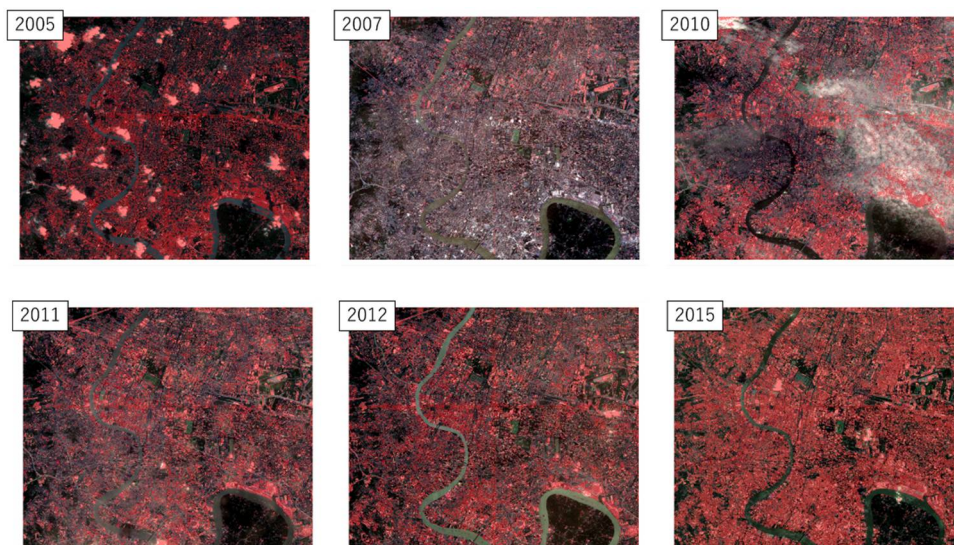
| Organization | University of Tokyo |
|---|---|
| Title | R&D for capacity development on building footprint mapping |
| Type of Activity | Research and development for data preparedness<br>(e.g., Conference, Workshop, Meeting, Training, EOR, Providing satellite data or VAP) |
| Date | Through the year of 2022 |

Building footprint maps are base information for disaster risk assessment and emergency response planning. It is important to have up-to-date building footprint maps for disaster preparedness. We conducted research and development on operational production of building footprint maps with satellite data provided by the Sentinel Aisa partners. The collaboration scheme was designed as below, in which participating institutes will have opportunities of capacity development on satellite-based building footprint mapping for better preparedness.
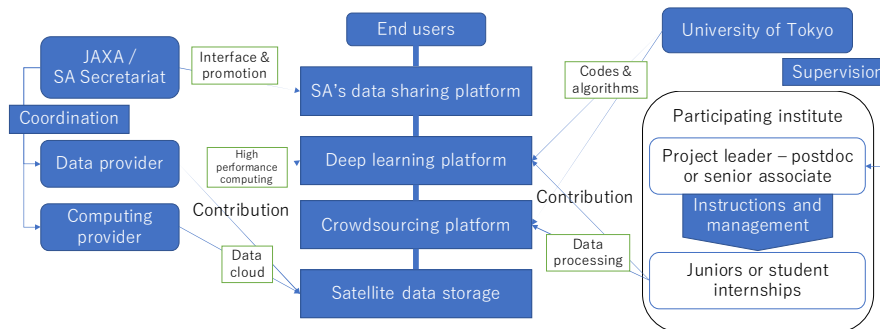


Scheme of capacity development on the building footprint mapping for data preparedness

To facilitate the scheme with the Sentinel Asia partners, we used FORMOSAT-2 satellite data to demonstrate the building footprint mapping with the support of data provision by NSPO. The demonstration is performed for the southern region of Taiwan and Bangkok in Thailand. The demonstration outputs fairly captured built-up areas in the broad scales while missed details such as small buildings. The demonstration proofed potential usefulness of the building footprint maps in disaster operations as well as capacity development on data preparedness.



Demonstration outputs for Bangkok, Thailand

| Organization | Center for Research and Application for Satellite Remote Sensing, Yamaguchi University |
| --- | --- |
| Title | Contribution VAPs for EOR activities |
| Type of Activity | EOR activity (Earthquake in Indonesia) |
| Date | November 2022 |

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 the event of earthquake which hit in November 2022.



Possible Infrastructure Damage Map: Earthquake (Cianjur, West Java), Indonesia on 21 Nov. 2022
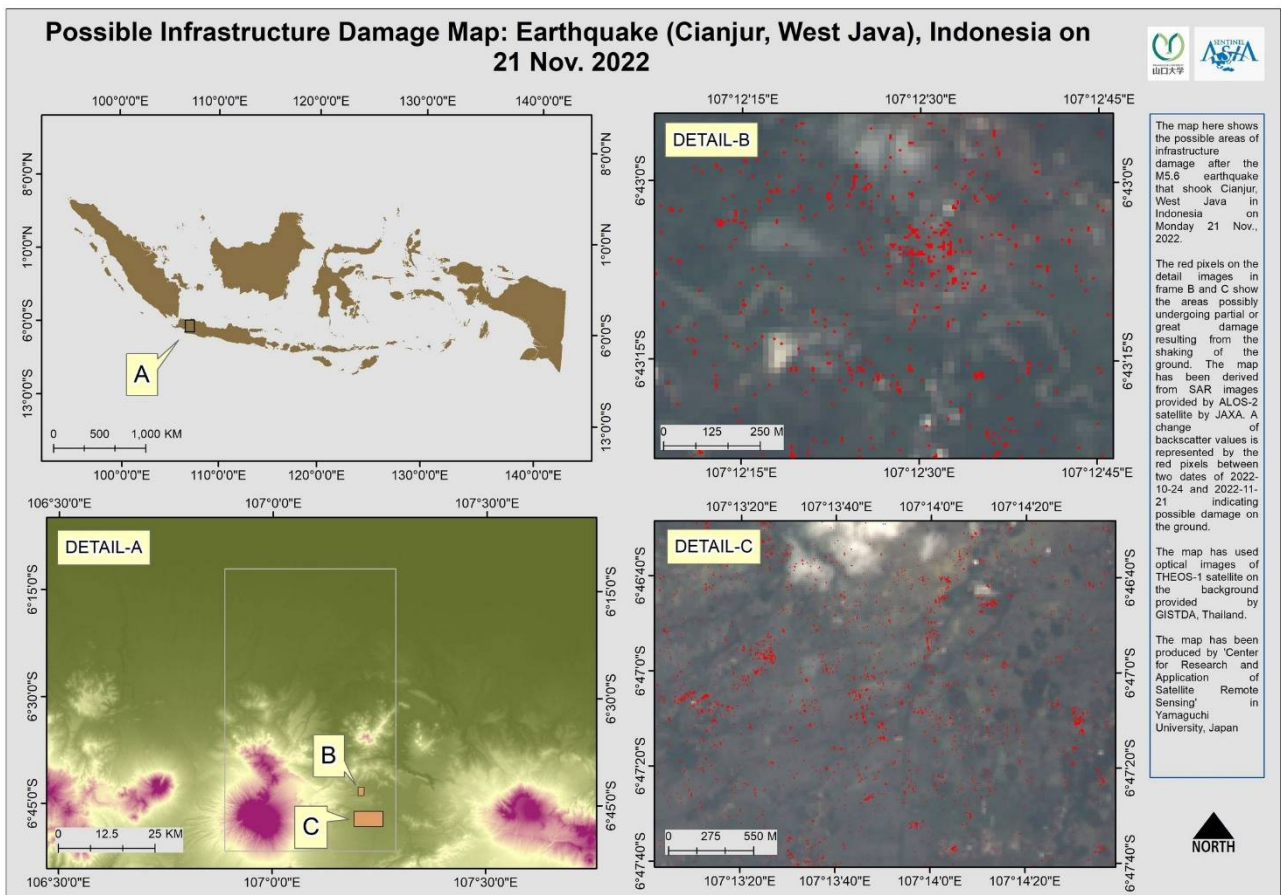
**PROVINCIAL DISASTER MANAGEMENT AUTHORITY**
**REHABILITATION DEPARTMENT**
**GOVERNMENT OF SINDH**
**PLOT NO. 26-C, MAIN KHAYABAN-E-JAMI,**
**DHA PHASE–VII, KARACHI.**
**Phone: 021-99332003-5, Fax: 021-99332007**

**Subject:** **Sentinel Asia Activity: Flood in Pakistan (2022)**

With reference to subject email, answers to your questions asked are appended below;

How did you use these data for your DRR activities?"

- **emergency response?**

Answer: Provincial Disaster Management Authority Sindh (PDMA Sindh) has already developed disaster Management Information System (DMIS), which is a geospatial database with all pertinent spatial and non-spatial layers used in hazard, exposure, vulnerability and risk mapping. This database also covers population and population density, critical infrastructure and elements at risk. As rains during 2022 were unprecedented and very high above the normal therefore lives and livelihood resources were jeopardized and devastation was extensive, extended over almost entire province. In this case preliminary assessment on possible losses and damages was essential to plan, organize and execute disaster response. The inundation maps shared by Sentinel Asia were overlayed on DMIS geospatial data to determine:

  o Calculate inundated area
  o Initial assessment of affected crops
  o Initial assessment of affected villages
  o Initial assessment of affected critical infrastructure and elements at risk
  o Initial assessment of affected population

Further the data shared by sentinel Asia was used for monitoring and situational awareness.

- **sharing with other organizations?**

Answer: With the assistance of data provided by Sentinel Asia, the Provincial Emergency Operation Center (PEOC) developed and prepared flood inundation maps, initial damage assessment maps, thematic losses and damage maps and other valuable products. These maps were prepared for entire duration of emergency situation and were published on

PDMA Sindh website for easy accessibility and mass distribution. These maps were used by different stakeholders and partners for organizing search, rescue and relief operation.

- **making report to sharing information?**

Answer: During the entire course of disaster, disaster response, disaster need assessment, and recovery internal and external briefings and well as reporting was supported with maps and geospatial data. These briefing and reports were prepared for multiple levels of management for informed decision making