



NEWSLETTER

In Focus

Space-based information for disaster response efforts

Nothing can provide a quicker overview than looking at something from a bird's eye view. In a disaster situation, after an earthquake, during a flood or in the middle of a hurricane, satellite images can help us answer the most pressing questions: which roads are still accessible, which houses are damaged, where could a helicopter land?

Satellite-based emergency mapping includes the creation of maps, spatial data products and geo-information using pre- and post-event imagery from satellites: it is essential for situational awareness in case of disasters. The comparison of pre- and post-disaster satellite imagery can identify affected areas and cascading hazards triggered by the initial disaster, such as landslides after an earthquake. In the medium to long term, satellite imagery can be used to identify internally displaced persons (IDP) camps, temporary shelters, and to carry out extensive damage assessments.

Because of its enormous potential to



Flooded villages and farmland on the west bank of the White Nile in the Ad Douiem district of Sudan on 31 August 2019 captured by the Landsat 8 satellite. (© NASA)

help disaster relief operations, UN-SPIDER is striving to enable disaster management agencies in all countries to access, interpret and effectively use the data and information that satellites provide from several hundreds of kilometers above our heads.

To extend the benefits of space data for disaster response, the space community has set up several regional and global emergency mechanisms that provide maps derived from satellite imagery free-of-charge in case of disasters: the International Charter "Space and Major Disasters", the Copernicus Emergency Management Service and Sentinel Asia.

As part of its work, UN-SPIDER supports developing countries in

obtaining maps through these mechanisms, while also strengthening their capacities to use the information products made available during emergency situations. In addition, UN-SPIDER works with the private sector to help developing countries access imagery from companies such as Maxar and Airbus Defense and Space in disaster situations. By connecting end-users to satellite image and service providers, UN-SPIDER also bridges the gap between providers and users.

In this newsletter, we introduce several of these emergency mechanisms, indicate how and who can request their activation, and present some of the information products they develop.

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International Charter Space and Major Disasters

The International Charter “Space and Major Disasters” is a worldwide collaboration through which space-based information products are made available for disaster management. By combining Earth observation assets from different space agencies, the Charter allows resources and expertise to be coordinated to respond rapidly to major disasters. The Charter has been operational since November 2000, and has seen over 620 activations in more than 125 countries.

In addition to the space agencies that form the Charter, national and regional disaster monitoring organisations also support the Charter as co-operating bodies. Members and co-operating bodies join an international initiative to provide support to those in need following major disasters, and benefit from the data that the Charter offers. The United Nations Office for Outer Space Affairs (UNOOSA) has been a

co-operating body of the Charter since January 2003. Through its UN-SPIDER programme, UNOOSA promotes the Charter through its capacity-building and advisory support activities. UNOOSA can also submit activation requests on behalf of national disaster management agencies and in-country relief agencies of the United Nations.

Building on a decade of success in making satellite data progressively more available for disaster response, the International Charter “Space and Major Disaster” recently opened its doors even wider: in September 2012, the Charter Members adopted the principle of Universal Access to further strengthen the Charter’s contribution to disaster management worldwide. Under this principle, any national disaster management authority can register and be incorporated as an authorized user. Subsequently, it can submit requests for emergency

response support. Certain procedures must be followed, but the affected country does not have to be a Charter member. As a result, 73 national authorized users from 67 countries are now able to directly submit requests as Authorized Users.

For each disaster type, the Charter identifies the satellite sensors and their options to be used to obtain the most useful data. For instance, optical images are well suited for damage-mapping while imaging radar has an all-weather capability and is particularly adapted to key hazards types, such as floods, oil spills and landslides, to name a few.

The list of previous Charter activations and their mapping products are freely available at: <https://disasterscharter.org/web/guest/charter-activations>

Map prepared by the International Water Management Institute, a UN-SPIDER Regional Support Office, for an activation of the International Charter for floods and landslides in South Africa in April 2019 (© IWMI)

Sentinel Asia

Sentinel Asia is an international cooperation platform that brings together space, disaster management and other international agencies on a voluntary basis to contribute to disaster management efforts in the Asia-Pacific region through remote sensing and web GIS technologies. Sentinel Asia was established in 2005 as an initiative under the Asia-Pacific Regional Agency Forum (APRSAP). The platform, to which the Japan Aerospace Exploration Agency (JAXA) serves as Executive Secretariat, counts more than 100 members.

When disasters occur, users elevate emergency observation requests to the reception desk, the Asian Disaster Reduction Center (ADRC). After clarifying user needs, the requests are sent to space agencies, so-called “Data Provider Nodes” (DPNs). DPNs then contribute satellite images that are turned into damage maps by data analysis support organizations,

Map developed under a Sentinel Asia activation for an earthquake in North Maluku, Indonesia, in 2019. (© Asian Institute of Technology)

referred to as “Data Analysis Nodes”. These maps are then provided to users through the Sentinel Asia website. Since its establishment, Sentinel Asia has conducted more than 300 emergency observations.

Sentinel Asia provides satellite imagery (to the extent permitted by the imagery provider) and value-added maps highlighting the affected areas as well as on-site digital photos of disaster areas. The mechanism also shares data on wildfire hotspots and rainfall information derived from satellites and meteorological satellite information. This information is then made available on the web or via satellite communication.

Institutional members of ADRC and representative organizations of the Joint Project Team (JPT), including UNOOSA, can elevate requests to Sentinel Asia. Membership of the

JPT is open to all APRSAF member countries, disaster prevention organizations, and regional and international organizations ready to contribute their experience and technical capabilities. They are also encouraged to participate in disaster information sharing activities.

Upon request from users, Sentinel Asia’s emergency observation requests can be promptly escalated to the International Charter Space and Major Disasters by ADRC. This is called “Sentinel Asia Escalation”. As the satellite sources of Sentinel Asia and the International Charter are different, the Sentinel Asia Escalation enables users to benefit the most from both platforms.

The list of previous Sentinel Asia activations and mapping products are freely available at: <https://sentinel.tksc.jaxa.jp/sentinel2/topControl.jsp>

Copernicus Emergency Management Service

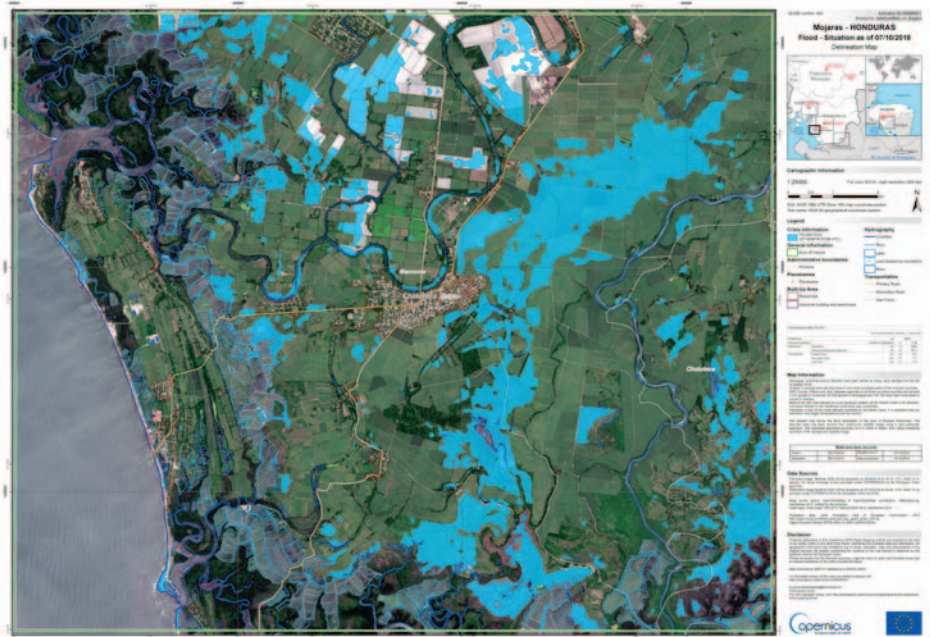
The Copernicus Emergency Management Service (EMS) has been fully in operation since April 2012. The service provides maps and analysis based on satellite imagery and in-situ data (before, during or after a crisis), as well as early warning and monitoring services for floods, fires and droughts, free of charge. Through these services, EMS supports crisis managers, civil protection authorities and humanitarian aid actors worldwide in dealing with large natural disasters, man-made emergencies and humanitarian crises, as well as the entities involved in recovery, disaster risk reduction and preparedness activities.

Copernicus EMS has two main components, Early Warning and Monitoring as well as Mapping.

The Copernicus EMS Mapping component addresses a wide range of emergency situations resulting from natural or human-made disasters, covering in particular floods, earthquakes, tsunamis, landslides, severe storms, fires, industrial accidents (e.g. explosions, oil spills), volcanic eruptions and humanitarian crises (e.g. monitoring refugee and Internally Displaced People (IDP) camps). In 2018, the service produced 1,054 maps. The service is provided in two modules: Rapid Mapping and Risk & Recovery Mapping.

Rapid Mapping (RM) delivers maps and analyses within hours or days immediately following a catastrophic event. The EMS Rapid Mapping service can be used in case of disasters such as those mentioned above. The service is based on the rapid acquisition, processing and analysis of satellite imagery and other geospatial data and provides users with products such as maps and brief analyses.

Risk & Recovery Mapping (RRM) delivers maps and analysis within days, weeks or months, depending



Flood delineation map of the area of Mojaras in Honduras in October 2018 created as part of an activation of Copernicus EMS Rapid Mapping. (© European Union)

on the types of products, in support of activities dealing with the recovery, disaster risk reduction, prevention and preparedness phases. Information for different hazards on the exposure, vulnerability and resilience of people and buildings can be requested. The RRM component can complement a post-disaster needs assessment and assist in the development of recovery plans. By comparing images taken at different points in time, the progress of reconstruction and recovery can be monitored.

EMS Mapping services can be directly activated by Authorised Users to assist countries in distress. All EU Member States, countries participating in the Union Civil Protection Mechanism (UCPM), as well as all EU Delegations in the world are Authorised Users.

The Authorised User must request the activation of the service by filling in a Service Request Form (SRF). There are specific forms for Rapid Mapping and for Risk and Recovery Mapping activations. The Authorised Users can activate the service on behalf of an affected third country anywhere in the world.

In addition, users from international organizations and requestors outside the EU and not participating in the UCPM should contact the EU Emergency Response Coordination Centre (ERCC, ECHO-ERCC@ec.europa.eu) which coordinates EMS mapping requests and may be able to activate the EMS on their behalf.

If the request is accepted, the service provider of the Rapid Mapping module (for Rapid Mapping) or the Joint Research Centre (for Risk and Recovery Mapping) exchanges with the Authorised User to compile, and clarify when necessary, the relevant technical details.

The list of previous EMS activations and their mapping products are freely available on: <https://emergency.copernicus.eu/mapping/list-of-activations-rapid>

Facilitating access to data from the private sector

The 2030 Agenda for Sustainable Development - a key strategy for our common future - acknowledges that sustainable development will depend on the active engagement not only of the public but also of the private sector, which can contribute enormously to achieving the SDGs.

To support developing countries in accessing much-needed geospatial information for the entire disaster management cycle, UNOOSA has signed agreements with private sector companies such as Maxar and Airbus Defense and Space. Under the agreements, the latter can provide high-resolution imagery to Member States hit by disasters, facilitated through the UN-SPIDER programme.

In the case of the earthquake that hit Pakistan in September 2019, UN-SPIDER reached out to Airbus with a request for space-based information covering the affected area. The Pakistan Space and Upper Atmosphere Research Commission (SUPARCO), a UN-SPIDER Regional Support Office, processed the data to develop information products in

support of disaster relief efforts in the country. In addition, Maxar supported disaster response efforts in the Bahamas by providing pre- and post-event imagery and information products to allow damage assessments following Hurricane Dorian.

The partnerships with the private sector also include the development

of step-by-step procedures, so-called UN-SPIDER Recommended Practices, that indicate how to obtain, process and generate space-based information to create mapping products. Using the Airbus WorldDem®, one Recommended Practice describes the process of using digital elevation data for storm surge coastal flood modelling.

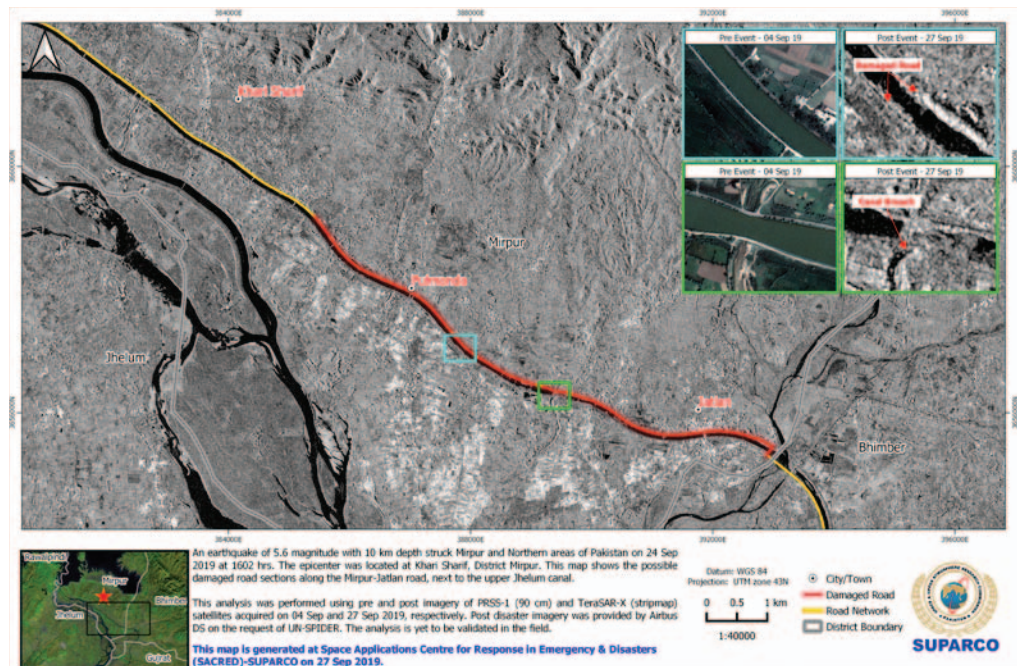


Image caption: In the aftermath of the Mirpur earthquake in September 2019, heavy cloud cover over the area made a satellite-based damage assessment nearly impossible. The only feasible option was the use of Synthetic Aperture Radar (SAR) imagery, thanks to its all-weather capabilities. The very high resolution SAR data from TerraSAR-X, in the form of both strip map and spot light modes provided by Airbus Defence and Space in collaboration with UN-SPIDER, proved useful in damage assessment activities. Using these datasets, SUPARCO was able to quickly identify the destroyed sections of roads, damaged bridges, canal breaches and debris accumulation along the Upper Jhelum canal. The same dataset was also used to identify various early recovery and reconstruction activities using change detection algorithms. (© SUPARCO)

On our Knowledge Portal: Recommended Practices

UN-SPIDER works to ensure that all countries and international and regional organizations have the capacity to use all types of space-based information to support disaster management efforts. When using space technologies for disaster risk management and emergency response, it is not only important to have access to the right data and software, but also to be aware of practices that have proven effective in a specific context.

For this reason, UN-SPIDER and its Regional Support Offices (RSOs) regularly develop Recommended Practices that provide hands-on instructions on how to use satellite information for addressing floods, droughts and other hazards. In line with UN-SPIDER's mandate, the Recommended Practices cover various phases of the disaster management cycle.

Connecting the space and disaster management communities

by Simonetta Di Pippo, Director of the United Nations Office for Outer Space Affairs (UNOOSA)



UNOOSA Director Simonetta Di Pippo
(© UNIS Vienna)

Aware that the use of space technology can play a vital role in supporting disaster management agencies in their efforts, the General Assembly of the United Nations mandated UN-SPIDER, as a programme of the United Nations Office for Outer Space Affairs, to work closely with these emergency mechanisms serving as a bridge to connect them with disaster management agencies. Since its establishment, UN-SPIDER has implemented this mandate in a variety of ways.

UN-SPIDER raises awareness about these emergency mechanisms in international conferences and workshops as well as in expert meetings organized by the programme and its partners. In addition, information about these mechanisms is provided to institutions visited by UN-SPIDER during its technical advisory missions in developing countries. The programme also provides in-depth information to disaster management agencies on the operational procedures employed by these mechanisms.

When disasters strike, UN-SPIDER facilitates the activation of these emergency mechanisms at the request of national disaster management

agencies. For example, in 2019, UN-SPIDER elevated the request for activation of the International Charter Space and Major Disasters on behalf of national disaster management agencies in Islamic Republic of Iran, and the Republics of South Africa and Zimbabwe.

To strengthen the capacities of Member States in using geospatial information provided by these mechanisms, UN-SPIDER regularly conducts simulations and exercises. During the UN-SPIDER Institutional Strengthening Mission to Cameroon in July 2019, as part of the simulation exercise, a request for the activation of the International Charter was simulated in case of floods and landslides. Participants were then introduced to how the mapping products provided by the Charter could inform emergency response efforts.

Through its work with relevant stakeholders in developing countries, UN-SPIDER contributed to several national disaster management agencies being incorporated as Authorised Users of the International Charter Space and Major Disasters. In recent years, UN-SPIDER assisted national disaster management agencies of Colombia, Dominican Republic, El Salvador, Ghana, Guatemala, Myanmar, South Africa, Sri Lanka and Uruguay to become Authorised Users.

In line with its mandate to facilitate access to all types of space-based information for the entire disaster management cycle, UN-SPIDER will continue to help disaster management agencies around the world take advantage of the information provided by these mechanisms to confront the challenges posed by natural and technological hazards.



Participants from the space and disaster management communities at the UN-SPIDER International Expert Meeting "Towards Big (Space) Data in Support of Disaster Risk Reduction and Emergency Response in Africa" (© UNOOSA).



UNITED NATIONS

The United Nations Office for Outer Space Affairs (OOSA) implements the decisions of the General Assembly and of the Committee on the Peaceful Uses of Outer Space and its two Subcommittees, the Scientific and Technical Subcommittee and the Legal Subcommittee. The Office is responsible for promoting international cooperation in the peaceful uses of outer space, and assisting developing countries in using space science and technology. In resolution 61/110 of 14 December 2006 the United Nations General Assembly agreed to establish the "United Nations Platform for Space-based Information for Disaster Management and Emergency Response - UN-SPIDER" as a new United Nations programme to be implemented by OOSA. UN-SPIDER is the first programme of its kind to focus on the need to ensure access to and use of space-based solutions during all phases of the disaster management cycle, including the risk reduction phase which will significantly contribute to the reduction in the loss of lives and property. UN-SPIDER Newsletter, Volume 1/20, January 2020. © United Nations Office for Outer Space Affairs.