International Charter

Space & Major Disasters

Annual Report 2022

V2

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1. Introduction

1.1 Purpose and scope of this document

This document describes the activities of the International Charter ‘Space & Major Disasters’ that took place in 2022.

1.2 Structure of the report

This report is based on the following inputs:

- Working documents, notes and actions of the Charter’s Executive Secretariat and Board
- Input from the Charter’s Communications Group
- Input from each Charter member concerning EO resources and publications
- Project Managers’ reports for each activation
- Data, statistics and reports from EM-DAT and other reports on disasters prepared by Insurance companies.

This report adheres to the following structure:

Chapter 1 – Introduction

Chapter 2 – The International Charter ‘Space & Major Disasters’; overview and lead agencies of the Charter in 2022

Chapter 3 – Charter operations: depicts internal business regarding operations, resource consumption and technical updates (in particular the development of COS-2).

Chapter 4 – Assessment of the Charter operations: provides an assessment of the overall impact of the Charter as a service in supporting disaster response, and details the operational system performance, including generation of products and services, user appraisal and communication.

Chapter 5 – External relations: discusses the integration of new members, the Universal Access process, and relationships with Cooperating Bodies.

Chapter 6 – Communication: reports on all communication activities undertaken throughout the reporting period.

Chapter 7 – Conclusions: outlines the significant achievements and outcomes throughout the reporting period.

1.3 Applicable documents

[AD1] Text of the Charter ‘Space & Major Disasters’ - http://www.disasterscharter.org
[AD2] Charter Implementation Plan, RSCSA-PL0098
[AD3] Project Manager Procedure, RSCSA-PR0419
[AD4] Emergency On-Call Officer Procedure, RSCSA-PR0418

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1.6 List of acronyms

ABAE	Bolivarian Agency for Space Activities
AOI	Area of Interest
ADRC	Asian Disaster Reduction Centre
AU	Authorized User (of the Charter)
CB	Coordinating Body
CEMADEN	Centro Nacional de Monitoramento e Alertas de Desastres (Brazil)
CEMS	Copernicus Emergency Management Service
CENAD	Centro Nacional de Gerenciamento de Riscos e Desastres (Brazil)
CEPREDENAC	Coordination Centre for the Prevention of Natural Disasters in Central America
CEOS	Committee on Earth Observation Satellites
Charter	The International Charter Space & Major Disasters
CNES	Centre National d’Etudes Spatiales (French space agency)
CNSA	China National Space Administration
CONAE	Comisión Nacional de Actividades Espaciales (Argentina)
CONIDA	National Commission for Aerospace Research and Development (Peru)
CONRED	Coordinadora Nacional para la Reducción de Desastres (Guatemala)
COS-2	Charter Operational System-2
CRED	Centre for Research on the Epidemiology of Disasters
CSA	Canadian Space Agency

DLR	Deutsches Zentrum für Luft und Raumfahrt (German Aerospace Centre)
DLR/ZKI	DLR Zentrum für Satellitengestützte Kriseninformation (Center for Satellite Based Crisis Information)
DRM	Disaster Risk Management
ECO	Emergency On-Call Officer (of the Charter)
EM-DAT	Emergency Events Database
EO	Earth Observation
ERS	Emergency Response Service
ESA	European Space Agency
ESRIN	ESA Centre for Earth Observation
EUMETSAT	European Organization for the Exploitation of Meteorological Satellites
GDACS	Global Disaster Alert and Coordination System
GEO	Group on Earth Observations
GIC	Geoinformatics Center – Asian Institute of Technology
HDDS	(USGS) Hazards Data Distribution System
HR	High Resolution
ICT	Information and Communication Technology
IFRC	International Federation of Red Cross and Red Crescent Societies
INDECI	Instituto Nacional de Defensa Civil (Peru)
INPE	National Institute for Space Research (Brazil)
ISRO	Indian Space Research Organization
JAXA	Japan Aerospace Exploration Agency
KARI	Korea Aerospace Research Institute
MBRSC	Mohammed Bin Rashid Space Centre
MPP	Mission Planning Personnel
MR	Medium Resolution
NADMO	National Disaster Management Organization (Ghana)
NASDRA	National Space Research and Development Agency (Nigeria)
NDRCC	National Disaster Reduction Centre of China
NOAA	National Oceanic and Atmospheric Administration
NRSC	National Remote Sensing Centre (India)
ODO	On-Duty Operator
PA	Partner Agency
PHIVOLCS	Philippine Institute Of Volcanology and Seismology
PM	Project Manager (of the Charter)
RGB	Red-Green-Blue
ROSCOSMOS	Russian State Space Corporation

ROWCA	Regional Office West and Central Africa (UNOCHA)
SA	Sentinel Asia
SAR	Synthetic Aperture Radar
SARE	Semi-Annual Refresher Exercise
SERTIT	Service Régional de Traitement d'Image et de Télédétection (France)
UA	Universal Access
UAESA	United Arab Emirates Space Agency
UCL	Université Catholique de Louvain
UKSA	UK Space Agency
UNITAR/UNOSAT	United Nations Institute for Training and Research/ United Nations Operational Satellite Applications Programme
UNDAC	United Nations Disaster Assessment and Coordination
UNOCHA	United Nations Office for the Coordination of Humanitarian Affairs
UNOOSA	United Nations Office for Outer Space Affairs
UNRCO	United Nations Resident Coordinator Office
UN-SPIDER	United Nations Platform for Space-based Information for Disaster Management and Emergency Response
URF	User Request Form
USGS	United States Geological Survey
VAR	Value-Added Reseller
VAP	Value-Added Provider
VHR	Very High Resolution

1.7 Authors of the report

The report has been prepared by CNES, DLR, ESA, EUMETSAT, and ROSCOSMOS based on contributions and reviews by all the Charter members.

2. The International Charter Space and Major Disasters

2.1 Overview

The Charter is an international collaboration among space agencies and space operators – the Charter members. Initiated by the European Space Agency (ESA), the French Space Agency (CNES) and the Canadian Space Agency (CSA) in 2000, 14 other space agencies joined between 2000 and 2018, named below in chronological order:

- U.S. National Oceanic and Atmospheric Administration, NOAA
- Comisión Nacional de Actividades Espaciales, Argentina, CONAE
- Indian Space Research Organization, ISRO
- Japan Aerospace Exploration Agency, JAXA
- United States Geological Survey, USGS
- UK Space Agency, UKSA
- China National Space Administration, CNSA
- German Aerospace Centre, DLR
- Korea Aerospace Research Institute, KARI
- Instituto Nacional de Pesquisas Espaciais, Brazil, INPE
- European Organization for the Exploitation of Meteorological Satellites, EUMETSAT
- Russian State Space Corporation, ROSCOSMOS
- Bolivarian Agency for Space Activities, ABAE
- United Arab Emirates Space Agency, UAESA / Mohammed Bin Rashid Space Centre, MBRSC

The lead agency function rotates among all Charter members on a six-month basis. The lead agency has the overall responsibility of the implementation of the Charter to oversee and coordinate its operations, administration, communications and external relations. Additionally, at the start of each lead period, the new lead agency hosts the meetings of the Charter Board and Executive Secretariat.

The founding agreement of the Charter is intentionally limited in scope and thus is not intended to serve the entire disaster management cycle (mitigation, preparedness, alert, response and recovery, rehabilitation and reconstruction). Satellite-based information is provided at no cost to nationally mandated disaster management authorities and humanitarian aid organizations to specifically support the immediate response to major natural or man-made disasters. The Charter provides a mechanism for the rapid tasking of satellites for sudden emergencies, including but not limited to earthquakes, storms, landslides, volcanic eruptions, and flooding.

The ability of the Charter to support disaster response with space technology on a global level, when requested by users, is based on carefully defined policies and rules. Natural or man-made disasters that are slow onset events such as droughts are beyond the scope of the Charter; for these events, satellite-based monitoring can be provided with other EO capabilities and services that do not require rapid response. Furthermore, the Charter does not support humanitarian emergencies beyond those related to natural or man-made hazards; for example: acts of war, refugee crises, etc. are not covered.

The Charter can be activated by a predefined list of appointed users, known as 'Authorized Users' (AUs). Before 2013, AUs were typically national disaster management authorities from countries of Charter member agencies. They were able to request Charter support for emergencies in their own country or in a country with which they cooperate for disaster relief. In an effort to expand the number of users who can benefit from the Charter, the Universal Access initiative was created and formally adopted in 2012 (see section 5.2).

The Charter has consistently demonstrated a strong commitment to expanding its number of users. Initiatives include collaboration with UNOOSA and UNITAR/UNOSAT, both of which are active in many disaster-prone countries and can submit requests to support in-country UN relief agencies. Another collaboration is with Sentinel Asia, a regional network for Earth Observation-based Emergency response that is active in 28 countries. Additionally, Sentinel Asia's partner, the Asian Disaster Reduction Centre can submit activation requests on behalf of Sentinel Asia users.

Based on the requester, four activation modes are in place since 2010:

- Mode 1: direct activation by an Authorized User (AU) for a disaster occurring in their country.
- Mode 2: activation by an Authorized User on behalf of a user from another country.
- Mode 3: activation by UNOOSA or UNITAR/UNOSAT for UN users.
- Mode 4: activation for national users from the Asia-Pacific region via Sentinel Asia's partner, the Asian Disaster Reduction Centre.

Since its inception in 2000 the Charter **has been activated for 793 disasters (as of the end of 2022), in 133 countries. In 2022 alone, the Charter was activated 51 times for disasters taking place in 32 countries.**

The Charter provides access to a virtual constellation of satellites equipped with radar and optical sensors.

In 2022, active satellites included (see Table 1):

- Radar (high resolution and very high-resolution sensors): RADARSAT-2, RCM -1/2/3 TerraSAR-X, TanDEM-X, Sentinel-1A/B, ALOS-2, KOMPSAT-5, GF-3, ICEYE-X2, ICEYE-X4, ICEYE-X5, OHS-2A/B/C/D, Iceye-X7, SAOCOM-1A and SAOCOM-1B.
- Optical (high resolution and very high-resolution sensors): NewSat, Planetscope, UK-DMC2, ALSAT-1B, Landsat 7/8/9, WorldView-1, WorldView-2, Worldview-3, GeoEye-1, VRSS-2 SPOT-6, SPOT-7, PLEIADES 1A /B, PROBA-V, GF-1/2/4, FY-3D, FY-3C, FY-2H, FY-4A, CBERS-4, CBERS-4A, KOMPSAT-3, KOMPSAT-3A, Cartosat-2E, Resourcesat-2/2a, Kanopus-V, Kanopus-V-IK, Resurs-P, Dubaisat-2, Khalifasat, VISION-1, BKA, OHS-2A/B/C/D, JILIN-01, OVS-1A/B, OVS-2A, Beijing-2 and Sentinel-2A/B.
- Optical (medium and low-resolution sensors): POES, GOES, Suomi NPP, Metop series, Meteosat Second Generation (MSG) and Meteor-M.

Satellites added in 2022 are:

- Landsat-9
- BlackSky "Global" constellation that consists of 14 commercially operational imaging satellites.

Satellite that ceased operations in 2022 is Landsat-7.

Specific agreements with other entities allow the Charter to access additional products (both high and very high resolution) from satellites such as GeoEye and WorldView.

Table 1. List of Charter operational satellites [optical (in light blue) and radar (in light grey)]

Agency	**Satellite (operational)**	**Agency**	**Satellite (operational)**
ABAE	VRSS-2	ISRO	Resourcesat-2 Resourcesat-2a Cartosat-2E
BLACKSKY	Blacksky Global Constellation		
CNES	PLEIADES 1A/1B SPOT-6, SPOT-7		
CONAE	SAOCOM-1A, SAOCOM-1B	JAXA	ALOS-2
CSA	RADARSAT-2, RCM-1, RCM-2, RCM-3	KARI	KOMPSAT-3 KOMPSAT-3A KOMPSAT-5
CNSA	GF-1 , GF-2, GF-4 FY-3D, FY-3C, FY-2H, FY-4A JILIN-01 3/4/5/6/7/8 OVS-1A/B, OVS-2A Beijing-2 OHS-2A/B/C/D GF-3	NAS	BKA
		NOAA	POES Suomi NPP
DLR	TerraSAR-X / TanDEM-X	PLANET	Planetscope
ESA	Sentinel-1A/1B Sentinel-2A/1B	SATELLOGIC	NewSat
		ROSCOSMOS	Kanopus-V , RESURS-P Kanopus-V-IK Meteor-M
EUMETSAT	Metop Series Meteosat MSG	UAESA	Dubaisat-2, Khalifasat
INPE/CNSA	CBERS-4, CBERS-4A	UKSA	ALSAT-1B, VISION-1
ICEYE	ICEYE-X2, ICEYE-X4, ICEYE-X5, ICEYE-X7	USGS	WorldView-1/2/3 GeoEye-1 Landsat 7, 8 and 9

2.2 Lead agencies of the Charter in 2022

During this period, the lead agencies on a biannual rotational basis have been INPE (October 2021 – May 2022[1]), USGS (May 2022 – October 2022) and KARI (October 2022 – April 2023).

Figure 1. 47th Charter Board and Executive Secretariat members. This meeting was virtually hosted by USGS/NOAA, from 9 to 13 May 2022.

Figure 2. 48th Charter Board and Executive Secretariat members. This meeting was virtually hosted by KARI from 24 to 28 October 2022.

[1] Longer mandate for INPE due sanitary conditions.

3. Charter operations

3.1 Charter activations

In 2022, the Charter was activated 51 times in 32 different countries. This amount of activations is higher than the annual average since 2017: the average is now 42 activations per year and ranges from 33 in 2018 to 55 in 2020 (see Figure 3).

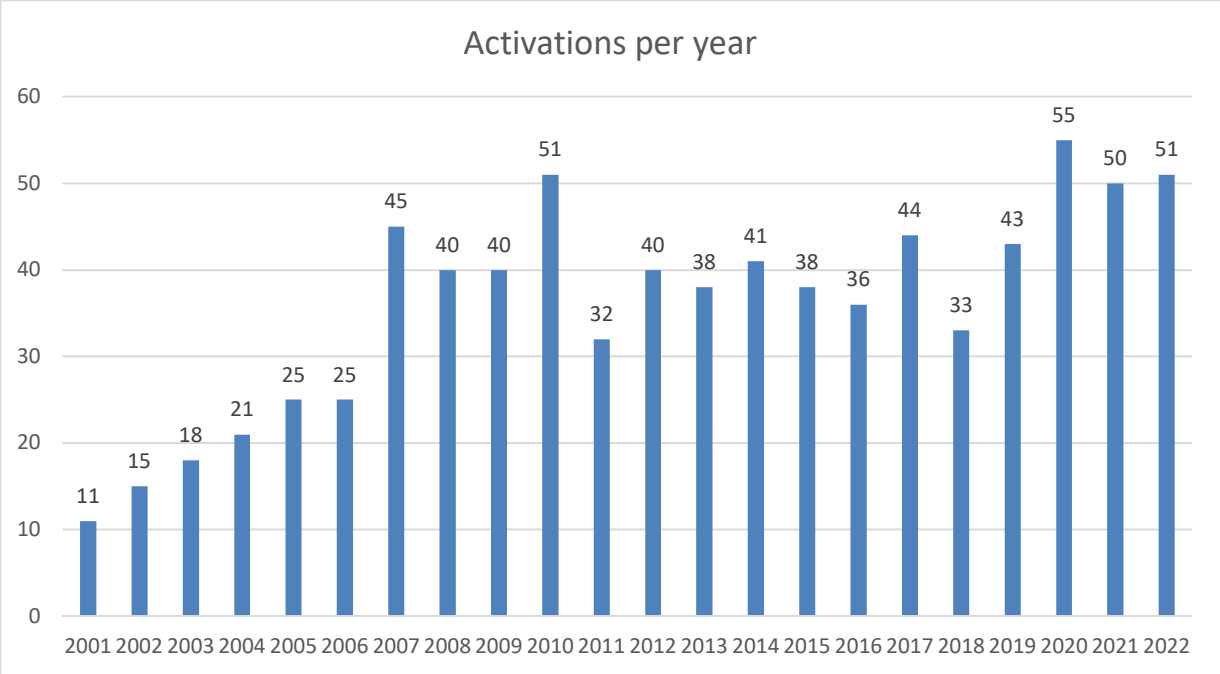


Figure 3. Number of Charter activations per year since 2000

This year, the Charter was triggered three times for man-made disasters:

- Oil spills in Peru, the Gambia, and Mauritius

By the end of 2022, the Charter had been triggered for 793 disasters in 133 countries since 2000 (Figure 4, Figure 5 and Figure 6).

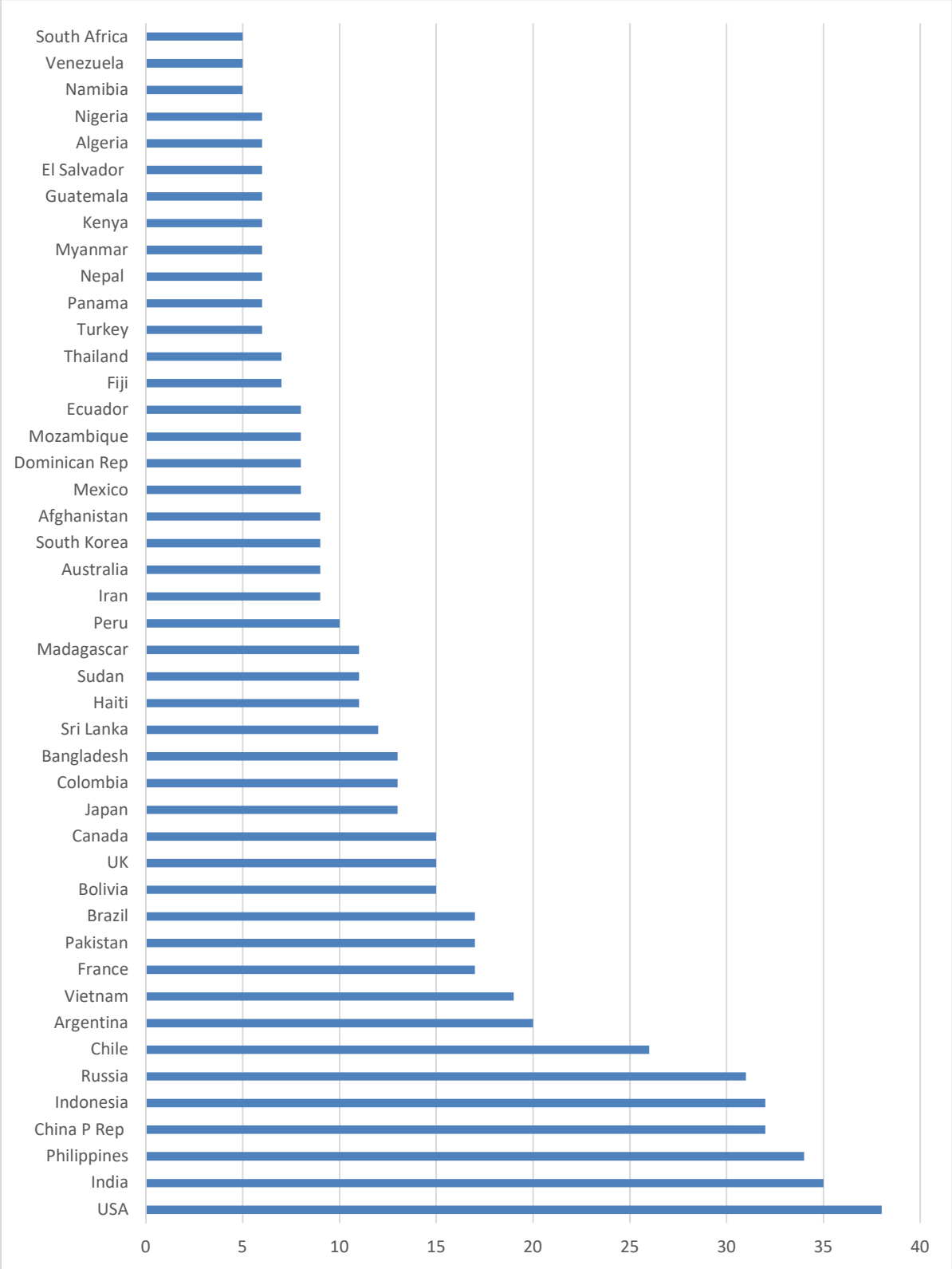


Figure 4. 2000-2021 breakdown of Charter activations by beneficiary country (countries with 5 or more disasters covered by the Charter)

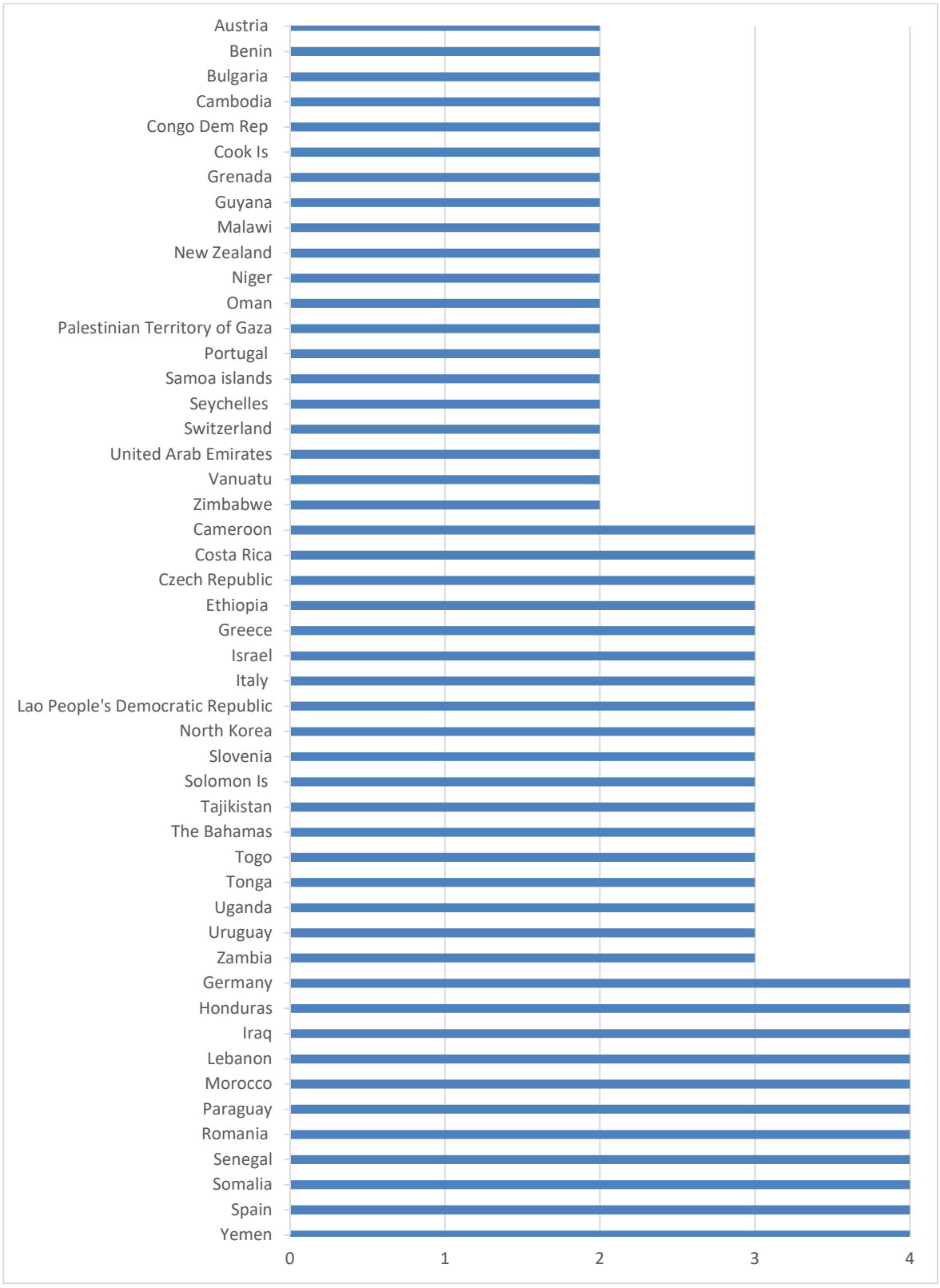


Figure 5. 2000-2021 breakdown of Charter activations by Beneficiary country (countries with 2 to 4 disasters covered by the Charter)

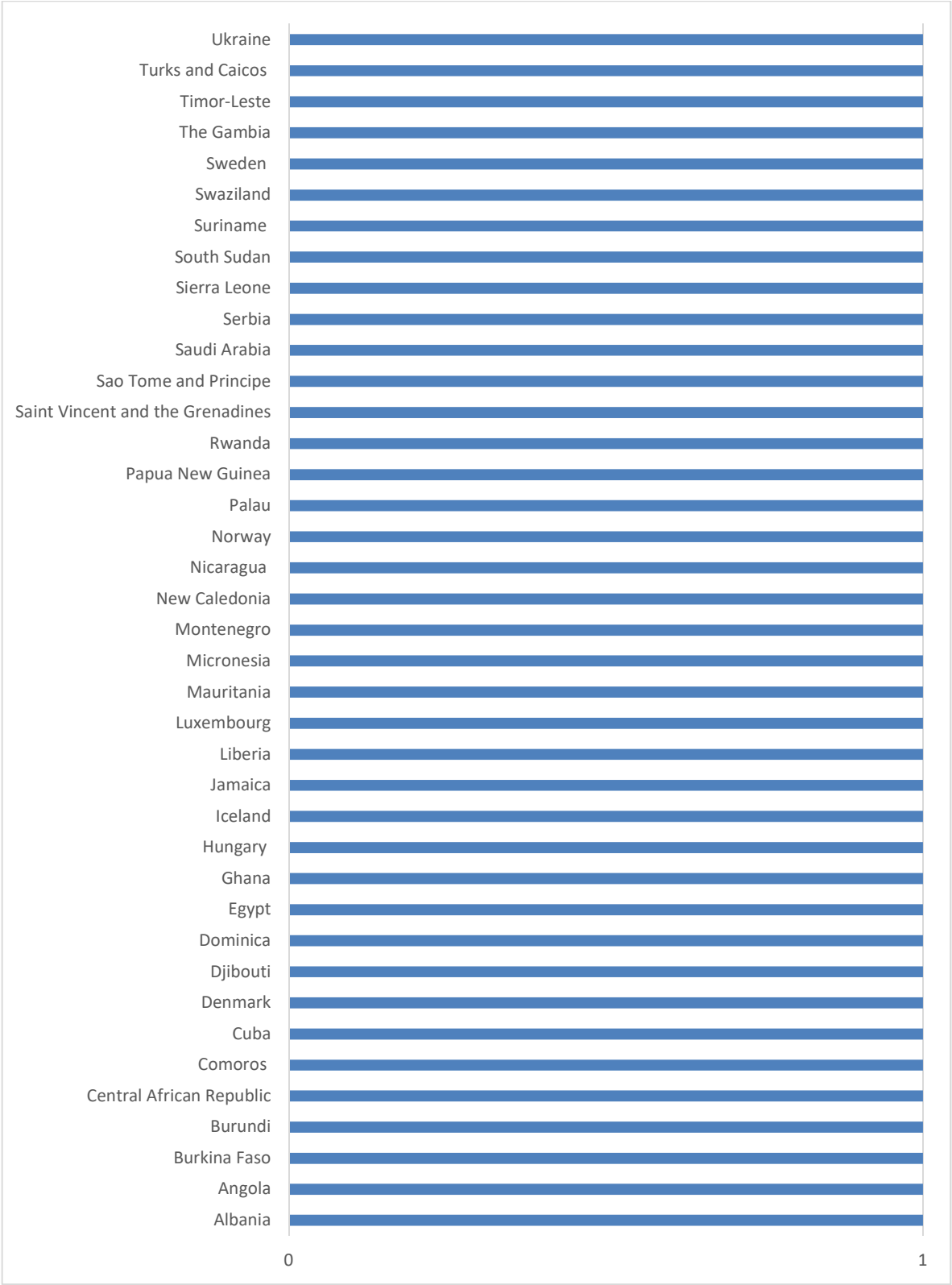


Figure 6. 2000-2021 breakdown of Charter activations by Beneficiary country (countries with one disaster covered by the Charter)

Since 2000, 133 Countries and territories worldwide have benefited from the Disasters Charter. 45 countries have had five or more activations, 49 countries have had between 2-4 activations, and 39 countries have had one activation.

The USA, China, India, Indonesia, Russia, Chile, the Philippines, Canada, France, Bolivia, Brazil, Vietnam, Pakistan, and Argentina are hazard prone affected countries for which the Charter has been activated most often (>15 times) to cover major disasters occurring over the past 21 years.

All 2022 activations are listed in Table 2. The Call-ID is the unique number assigned by the Charter’s COS-2 software to any User Request Form (URF) received. The number of the activation (‘Activation ID’) differs from the Call-ID, as some Calls are not processed (rejection mechanism) and others are merged.

In total, 58 requests were received in 2022. In five cases, calls were merged into one activation, as these requests had been made for the same disaster events:

- Calls 911 and 912 were received for Earthquakes in Indonesia and were merged into a single activation.
- Calls 900 and 901 were received for a Storm in the Philippines and were merged into a single activation.
- Calls 878 and 879 were both requested for Earthquakes in the Philippines and were merged into one activation.
- Calls 862 and 863 were both requested for a Storm in Madagascar and were merged into a single activation.
- Call 859 was received for a Storm in Mozambique and call 860 was received for a storm in Malawi; they were merged into a single activation due to proximity and similar AOIs.

In two other cases, there were calls which were either withdrawn or rejected:

- Call 904 was requested for a non-natural fire in the Russian Federation. It was decided that this activation falls outside the Charter scope.
- Calls 884, 885, 886, and 887 were all for Flooding in Sudan; however, they were withdrawn as the call 883 was already in place. An anomaly report was generated for this activation and the ODO procedure was updated to prevent another occurrence of multiple activations being sent for the same disaster.

Table 2. List of 2022 Activations

Act. No	Type of disaster	Country	Charter Activation Date
743	Volcano	Ecuador	2022-01-07
744	Earthquake and tsunami	Tonga	2022-01-15
745	Oil Spill	Peru	2022-01-20
746	Flood and Landslide	Sao Tome and Principe	2022-01-20
747	Flood and Landslide	Madagascar	2022-01-24

748	Flood, Storm, Hurricane	Mozambique	2022-01-25
748	Flood, Storm, Hurricane	Malawi	2022-01-25
749	Flood and Landslide	Ecuador	2022-02-01
750	Flood	Madagascar	2022-02-04
750	Flood	Madagascar	2022-02-04
751	Flood and Landslide	Brazil	2022-02-16
752	Flood and Landslide	Madagascar	2022-02-25
753	Flood, Storm, Hurricane	Mozambique	2022-03-13
754	Flood and Landslide	Brazil	2022-04-05
755	Flood and Landslide	South Africa	2022-04-13
756	Flood, Storm, Hurricane, Landslide	Philippines	2022-04-13
757	Flood and Landslide	South Africa	2022-05-24
758	Landslide	Brazil	2022-05-30
759	Oil Spill	Gambia	2022-06-04
760	Wildfire	Afghanistan	2022-06-06
761	Volcano	Philippines	2022-06-13
762	Flood	Bangladesh	2022-06-17
763	Earthquake	Afghanistan	2022-06-22
764	Flood	India	2022-07-14
765	Earthquake	Philippines	2022-07-27
766	Wildfire	Tunisia	2022-07-27
767	Flood	Russia	2022-08-08
769	Flood	Sudan	2022-08-21
770	Wildfire	Russia	2022-08-23
771	Flood, Storm, Hurricane	Philippines	2022-08-23
772	Flood	Pakistan	2022-08-30

773	Flood, Storm, Hurricane	Korea (ROK) - South	2022-09-02
774	Flood, Storm, Hurricane	Russia	2022-09-04
775	Earthquake	China P Rep	2022-09-06
776	Flood	South Africa	2022-09-12
777	Flood	Nigeria	2022-09-15
778	Flood	Honduras	2022-09-19
779	Flood, Storm, Hurricane	Dominican Republic	2022-09-20
780	Flood, Storm, Hurricane	Turks-and-Caïcos Islands	2022-09-20
781	Flood, Storm, Hurricane	Canada	2022-09-23
782	Flood and Storm	Philippines	2022-09-26
783	Flood and Storm	Lao People's Democratic Republic	2022-09-28
784	Flood and Storm	Thailand	2022-10-02
785	Flood	Venezuela	2022-10-10
786	Flood, Storm, Hurricane	Honduras	2022-10-13
787	Flood	Thailand	2022-10-20
788	Flood	Chad	2022-10-20
789	Flood and Ocean Storm	Philippines	2022-10-29
790	Flood	UK	2022-11-18
791	Earthquake	Indonesia	2022-11-22
792	Volcano	Indonesia	2022-12-05
793	Oil Spill	Mauritius	2022-12-20

3.1.1 Monthly activations

During 2022, the monthly average of activations was 4.25. Nearly even with 2021 but significantly higher than the average over the last decade (the average was 3.4 activations for the period 2011-2021). Figure 7 shows the monthly distribution of activations throughout 2021. The number of activations is distributed throughout the year in a less uniform way than in previous years. Only one activation occurred in March and the highest number was in September. The period from May to August, generally the peak period, corresponds this year to 31% of the total number of activations while July to October amounted 26 activations (51% of the total).

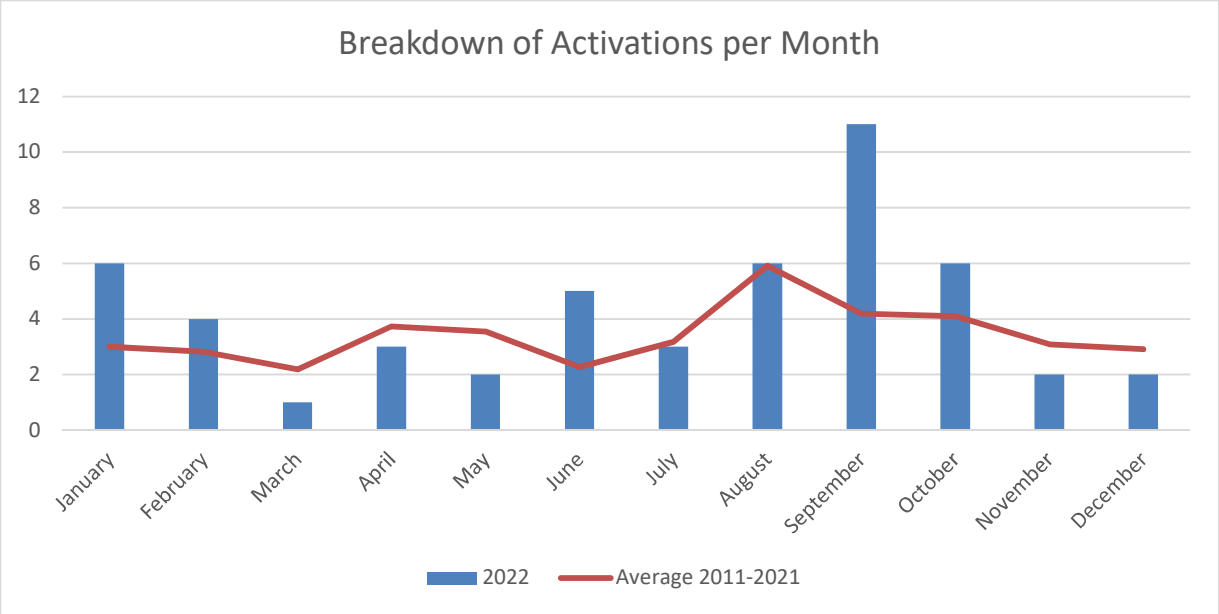


Figure 7. Distribution of the Charter activations by month in 2022 and the monthly average number of activations for 2011-2021

Peaks in activations at the end of summer (northern hemisphere) have occurred regularly since 2007 (Figure 7). Natural disasters occurring during this period of the year are mainly attributed to meteorological events (90% of activations in September) such as intense rains; ensuing floods; tropical storms; in Asia (4), Africa (2), and Latin America and the Caribbean (3). The peakes in activations in January and June of 2022 were mainly due to non-seasonal events occurring in succession coincidentally, such as volcanic eruptions and oil spills.

This figure also shows the overall trend through the years, with the monthly average number of activations for the period 2011-2021. The diagram clearly shows the peak of activations at the end of summer (Aug - October). The 2022 diagram shows few agreements with the average during most months, with large increases in activations for January, June, and September but fewer activations in March, May, November, and December.

3.1.2 Geographical distribution

In 2022, the activation breakdown per region was as follows: 19 activations in Asia (i.e., 37% of 2022 activations); 16 activations in Africa; 6 activations in South America; 5 activations in Central America and the Caribbean; 3 activations in Europe, and 1 in North America (Figure 8 and Figure 9).

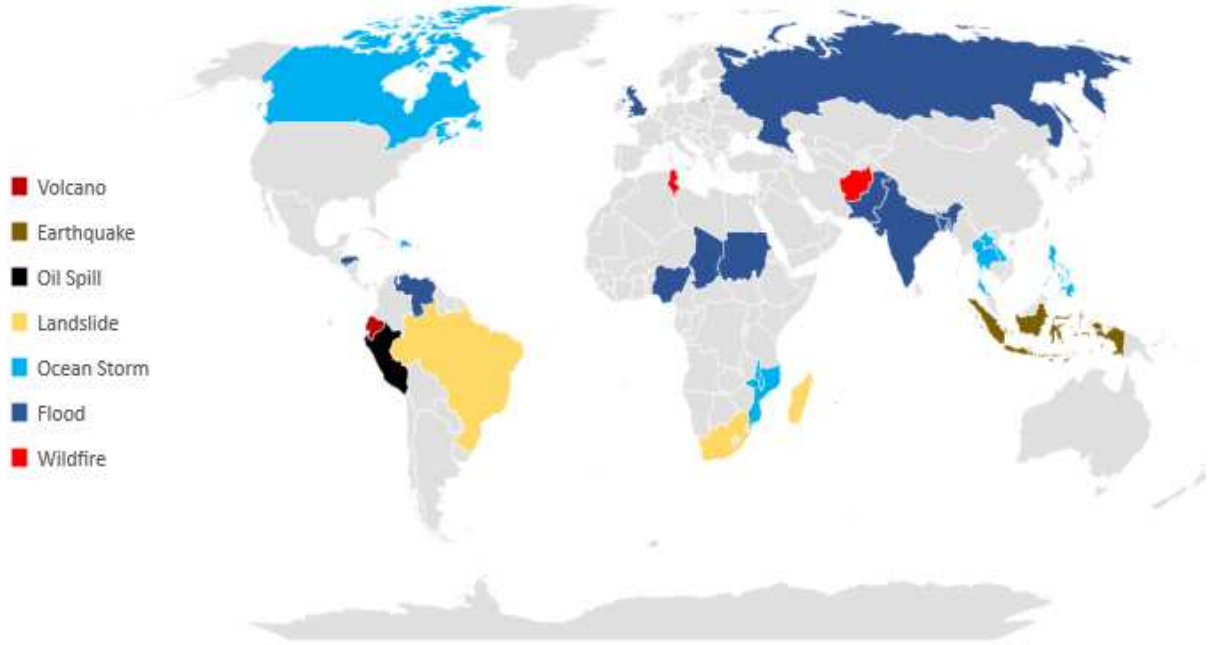


Figure 8. Location of the 2022 activations (by hazard type)

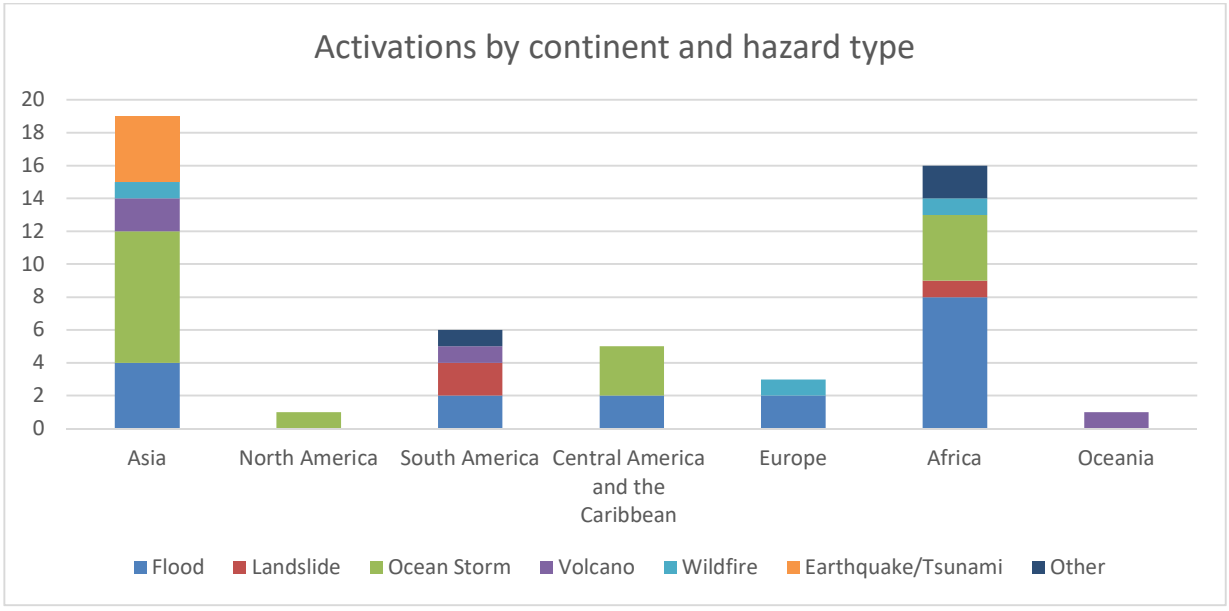


Figure 9. 2022 - Number of activations by continent/subcontinent and hazard type

The most frequent hazard types were floods (35%), and ocean storms (31%) while wildfires landslides and oil spills represented 6% each, earthquakes and volcanoes represented 8% each (Figure 10).

However, it should be noted that it is not always a straightforward process to classify Charter activations by disaster type. Activations are often multi-hazard events, such as floods causing landslides, earthquakes causing landslides or tropical/ocean storms resulting in direct damages as wells as floods and landslides, etc.

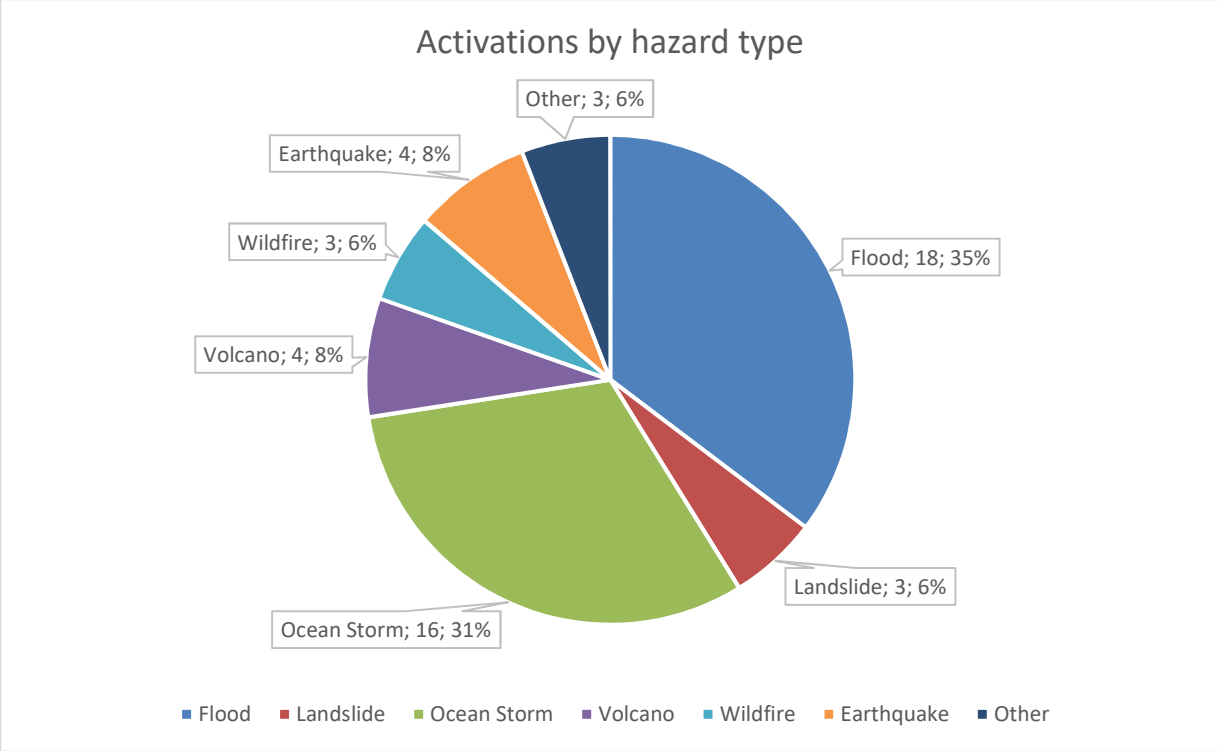


Figure 10. 2022 Number of activations by hazard type

As shown below (Figure 11), since 2000 the Charter has been frequently activated for weather-related disasters such as floods, ocean and wind storms, landslides triggered by heavy rainfall or floods, wildfires, ice/snow hazards – representing 79% of all Charter activations - while solid earth-related hazards (e.g., earthquakes, volcanic eruptions) represent 16% of all Charter activations.

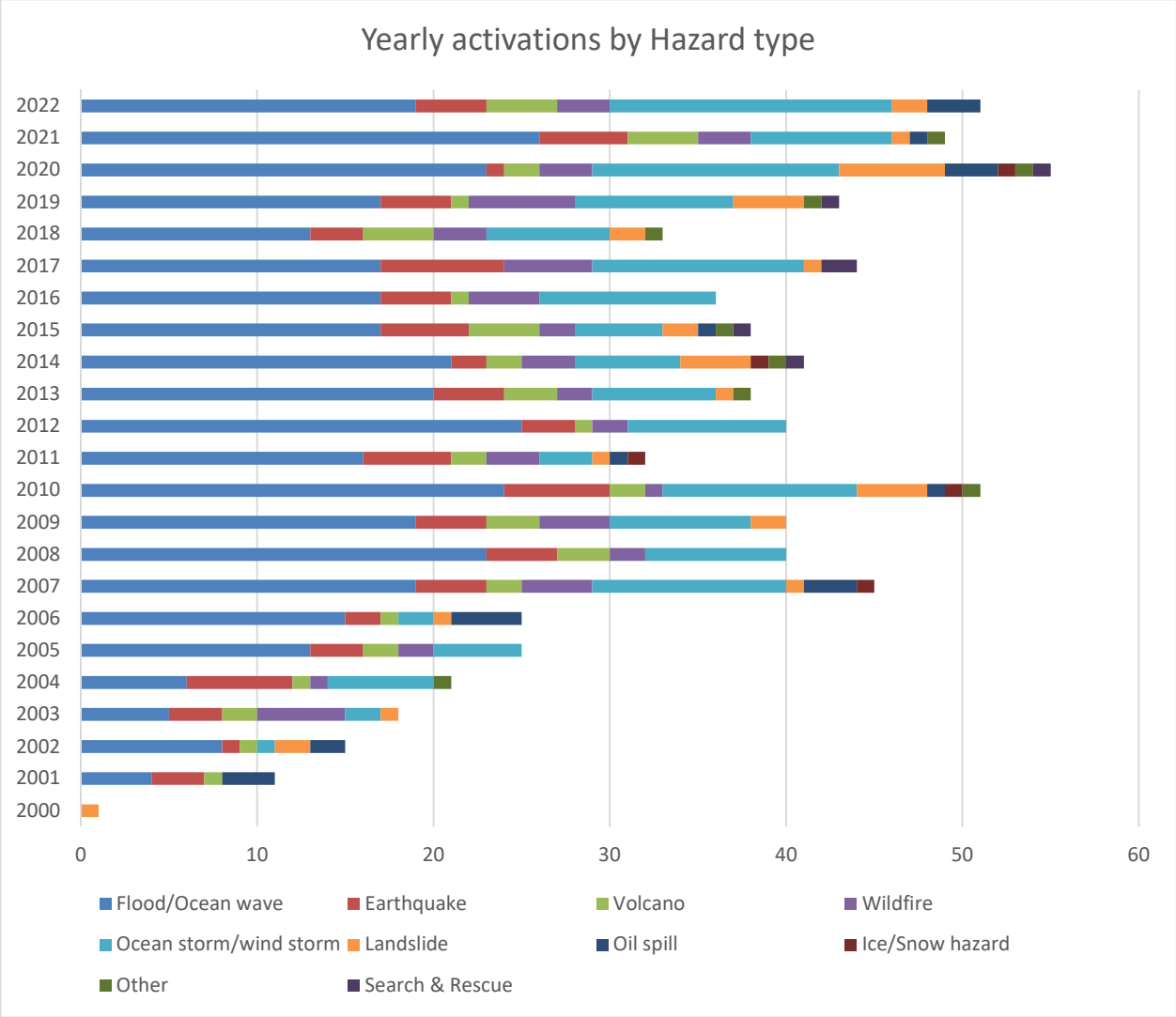


Figure 11. 2000-2022 Distribution of activations by hazard type

Activations for oil spills, search and rescue of aircraft and industrial accidents are marginal. See also Figure 12 and Figure 13 showing the geographical distribution of Charter activations by weather-related hazards and solid earth-related hazards for the 2000-2022 period.

The following map (Figure 12) shows by country the number of Charter activations caused by hydro-meteorological related events for the period 2000-2022 (627 activations out of 793 activations in total = 79%).

In total, 123 countries have benefited from the Charter service for hydrometeorological disasters since 2000. The USA, India, Argentina, China, Russia, France, Philippines, Bolivia, and Vietnam used the service most frequently.

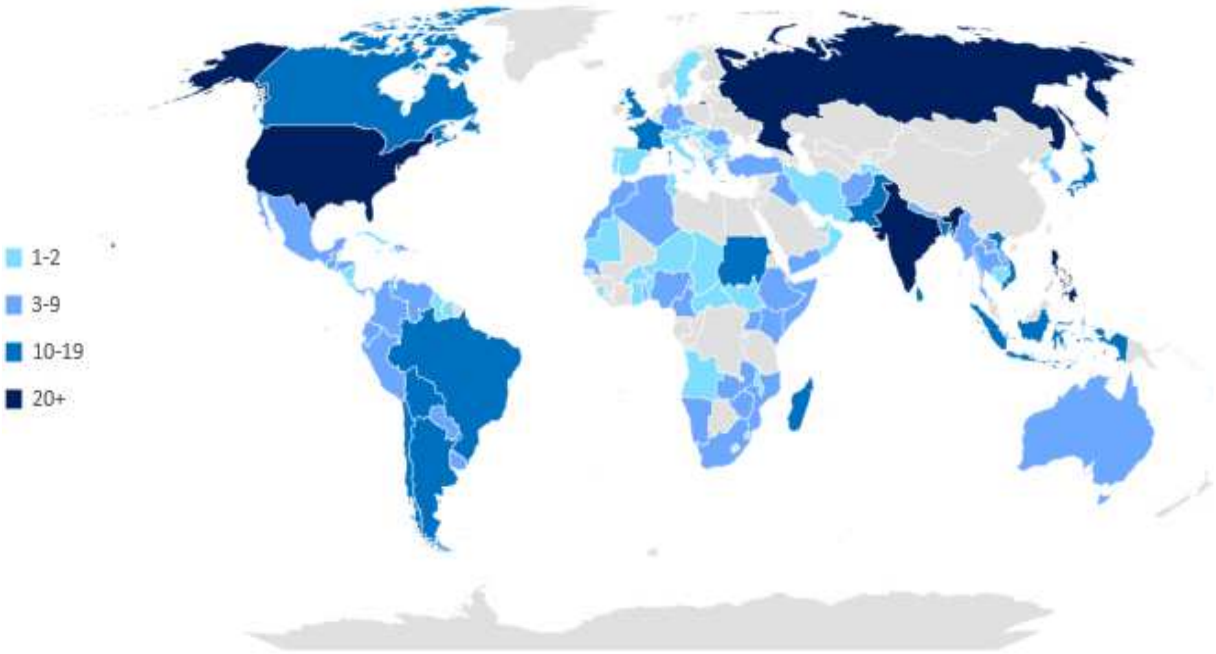


Figure 12. 2000-2022 Number and geographical distribution of Charter activations due to hydrometeorological events (floods, ocean storms, windstorms, landslides caused by heavy rains, wildfires, snowfall and ice jam)

The following map (Figure 13) shows the number of Charter activations by country (128 activations out of 793 activations in total = 16.1%) caused by solid earth-related events for the period 2000-2022.

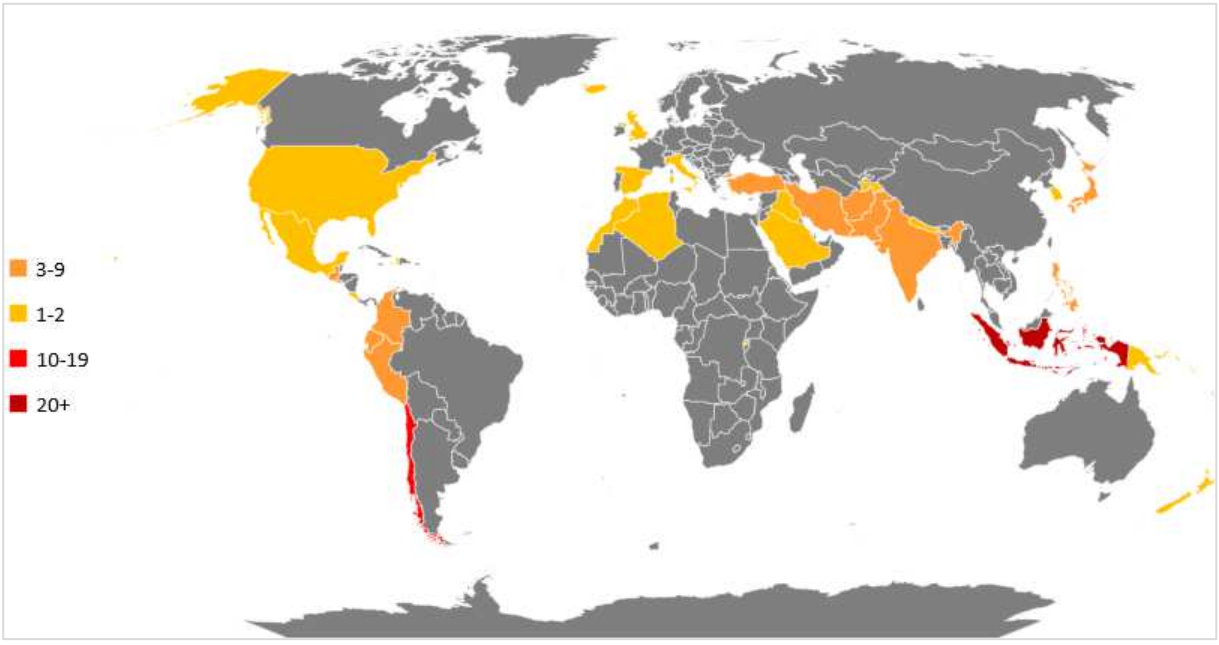


Figure 13. 2000-2022 Number and geographical distribution of Charter activations due to solid earth-related events (earthquakes, tsunamis, volcanic eruptions, landslides caused by earthquake)

In total, 38 countries have benefited from the Charter service for solid-earth events since 2000. Indonesia, Chile, and China are countries for which the Charter was activated the most frequently (13-20 activations) and they are located along important active seismic faults.

Figure 14 shows the geographic distribution of 2022 activations by access mode. Since 2010, there are 4 access modes that have been used:

- Mode 1: Direct activation by an Authorized User (AU) for a disaster occurring in their country.
- Mode 2: Activation by an Authorized User on behalf of a user from another country.
- Mode 3: Activation by UNOOSA or UNITAR/UNOSAT for UN users.
- Mode 4: Activation for national users from the Asia-Pacific region via Sentinel Asia's partner, the Asian Disaster Reduction Centre.

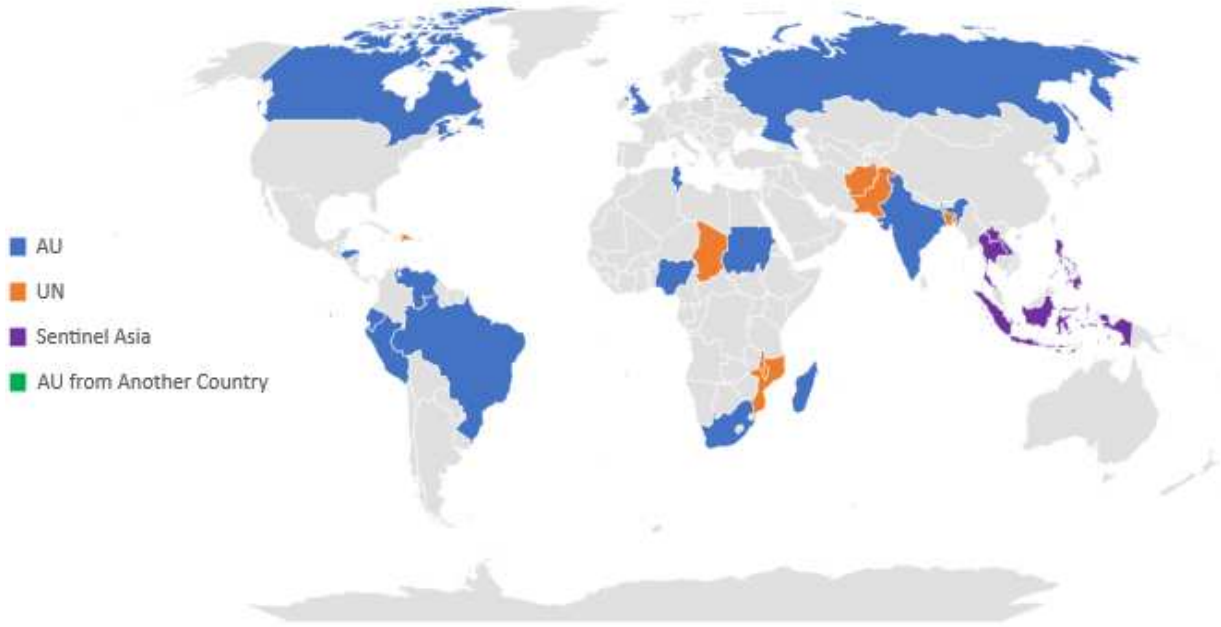


Figure 14. Location of the 2022 activations (by mode)

In 2022, Mode 1 was mainly used for disasters in “Continental” Asia, Europe, South America, and occasionally in Africa; Mode 2 was only used one time for a disaster in the Turks and Caicos Islands; Mode 3 was used for disasters in Africa, South America, The Caribbean, and Asia. By definition, Mode 4 was used mostly in Southeast Asia (Figure 14). South Africa, Nigeria, Honduras, and Ecuador activated the Charter by mode 1 in 2022, thanks to their AU status achieved through the Charter’s Universal Access initiative.

In 2022, activations by an AU (Modes 1 & 2) were the main access modes (49% in total). However, there was only one activation by an AU on behalf of another country in 2022.

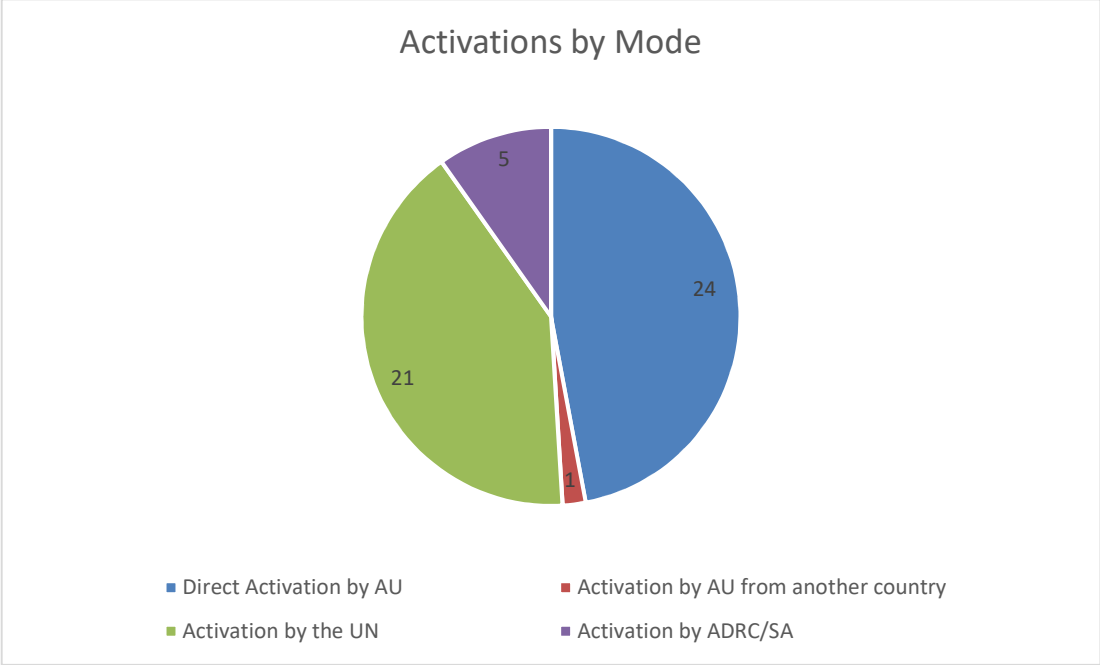
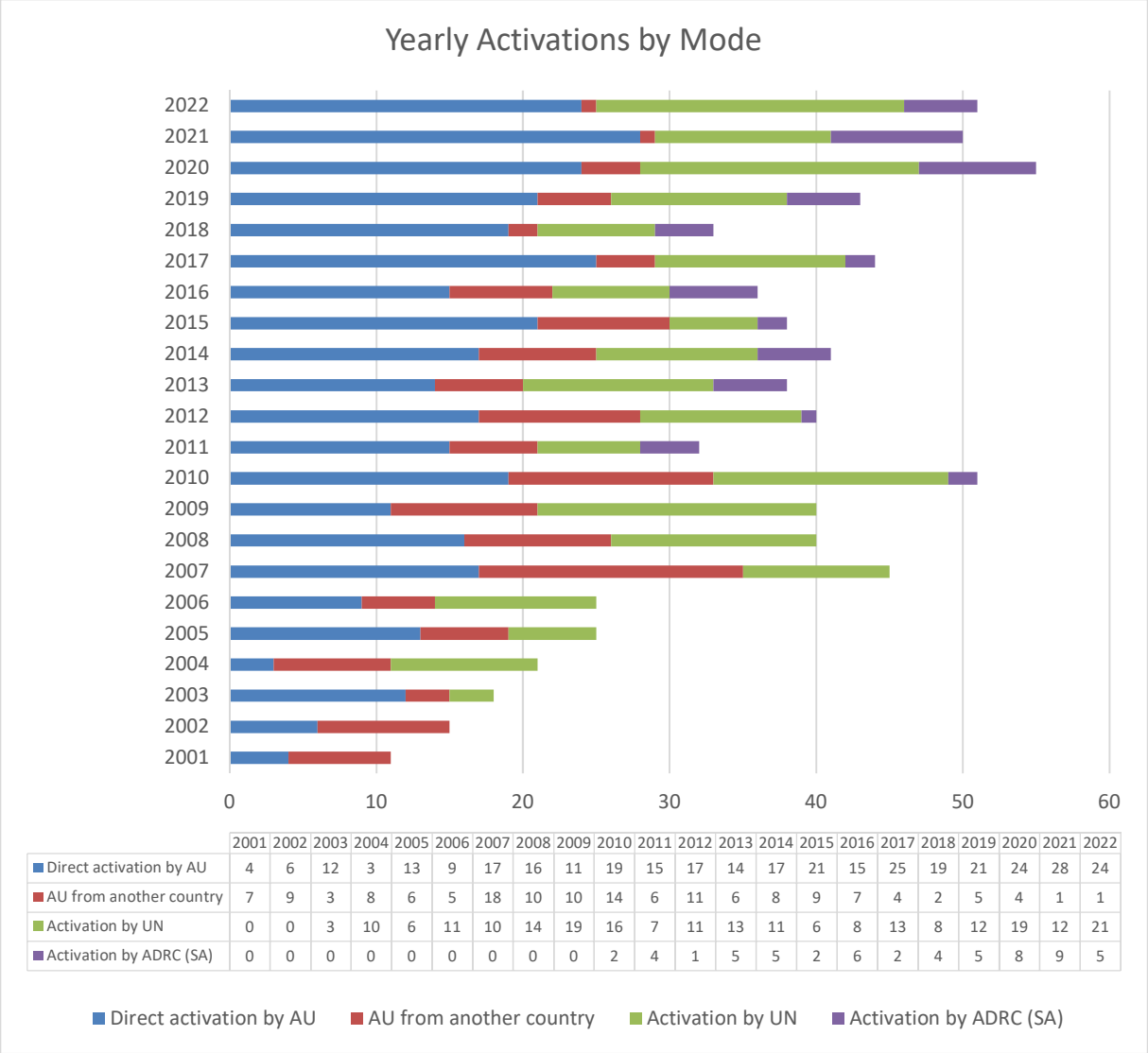


Figure 15. 2022 breakdown of Charter activations by mode

The diagram in Figure 16 compares the relative weight of the different access mechanisms adopted from 2001 to 2022, to request the International Charter Service. Since its inception, 101 countries without AUs have benefited from the Charter and 52% of all activations were requests on behalf of a user (by AUs for another country, UN or Sentinel Asia) in countries without an AU.

The International Charter continues to support users worldwide, including countries without direct access. At the same time, the number of AUs is increasing thanks to the Universal Access initiative, which changed the relative weight between the activation modes. By the end of 2022, mandated organisations of 43 countries prone to natural disasters have become AUs after a registration and training process under the Charter’s Universal Access initiative (see chapter 5.2).



	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Direct activation by AU	4	6	12	3	13	9	17	16	11	19	15	17	14	17	21	15	25	19	21	24	28	24
AU from another country	7	9	3	8	6	5	18	10	10	14	6	11	6	8	9	7	4	2	5	4	1	1
Activation by UN	0	0	3	10	6	11	10	14	19	16	7	11	13	11	6	8	13	8	12	19	12	21
Activation by ADRC (SA)	0	0	0	0	0	0	0	0	0	2	4	1	5	5	2	6	2	4	5	8	9	5

Figure 16. 2001-2022 number of Charter activations per mode

3.2 Resource report

3.2.1 EO data delivered in 2022

- General information

In 2022, **a total of 12,251 images** were provided as shown in Table 3.

In 2022, a total of **7,790 optical and radar post-crisis** images for 51 activations (2021: 10,993 for 50 activations; 2020: 5,877 for 55 activations; 2019: 3,969 for 43 activations) were provided by the Charter members (Table 3, Figure 17 and Figure 18). Regarding EO sensors (without U.S. figures) 3,471 optical programmed images and 1,984 SAR programmed images were provided. Regarding **archive images (pre-event),** 969 optical images and 415 SAR images were also provided **(a total of 1,384).**

Table 3. 2022 Statistics for Charter EO sensors (U.S. comm. sats. separate)

	Optical data	Radar data	U.S. data	Total
Archive (pre-event)	969	415	3077	4461
Programmed (post-event)	3471	1984	2335	7790
Total	**4440**	**2399**	**5412**	**12251**

This is complemented **by 5,412 images (2,335 post-crisis and 3,077 pre-crisis images) of U.S. VHR** (GeoEye, WorldView1, 2 and 3) **and HR** (Planet) optical satellite images that were supplied (Table 4, Figure 17 and Figure 18) (2021: 4,558; 2020: 2,980; 2019: 15,031; 2018: 18,293; 2017: 13,920). These figures were processed out of the general statistics table as the huge difference between the number of products provided prevented from accessing details. More details about U.S. statistics are provided below in paragraph “U.S. VHR and HR data delivered”.

Table 4. 2022 Statistics for U.S. Commercial satellites

	WorldView 1/2/3	Planet	GeoEye	Total
Archive (pre-event)	2198	80	799	3077
Programmed (post-event)	1444	701	190	2335
Total	**3642**	**781**	**989**	**5412**

Figure 17 and Figure 18 show the total number of EO data from the Charter Earth Observation (EO) constellation and the U.S. optical data provided in 2022 by disaster type.

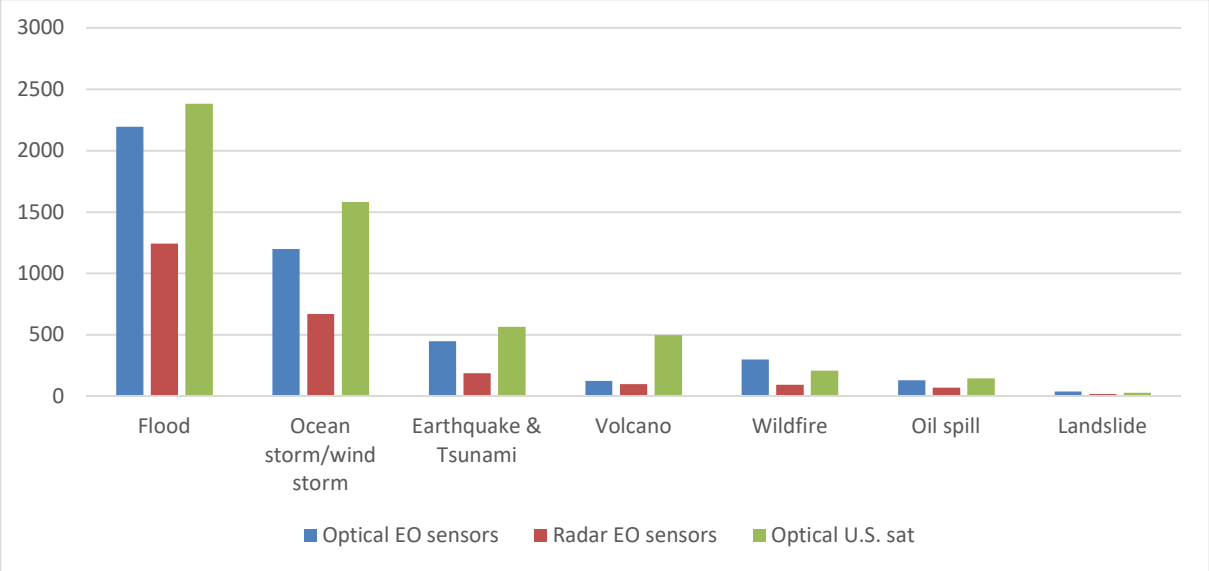


Figure 17. 2022 EO data of the Charter EO constellation (optical and radar) and U.S. optical data grouped by disaster type

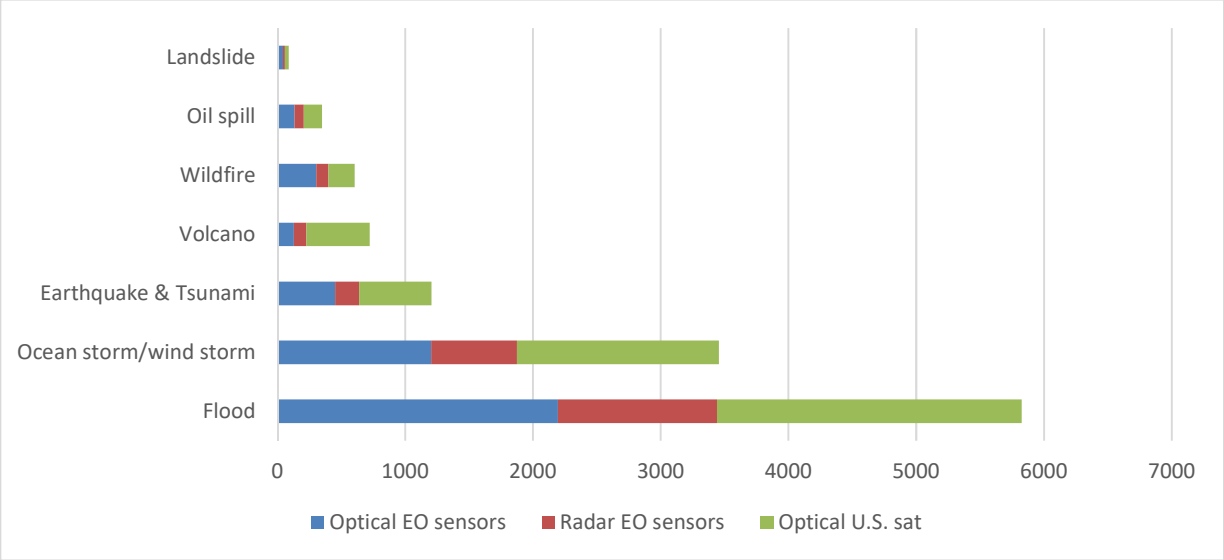


Figure 18. Another representation of 2022 EO data of the Charter EO constellation (optical and radar) and U.S. optical data grouped by disaster type

The amount of EO data delivered by the agencies each year is linked to the annual number of activations, the type of disasters, the sizes of the AOIs (Areas of Interest), the size of the image tiles, the duration and severity of certain disasters, and the change in the Charter constellation (decommissioning of satellites and new satellites entering the constellation). It should be noted that due to different characteristics of EO systems - such as spatial and temporal resolution, cloud screening procedures, etc. – the total number of images of the different satellites alone does not adequately express the relative importance and contribution of a system to the overall capacity provided by the Charter.

Table 5. Number total of images in 2022 (Optical EO sensors, radar EO sensors and U.S. optical sensors) provided per disaster type

	Optical EO sensors	Radar EO sensors	Optical U.S. sat	Total
Flood	2195	1244	2384	**5823**
Ocean storm/wind storm	1202	670	1583	**3455**
Earthquake & Tsunami	451	188	566	**1205**
Volcano	125	99	497	**721**
Wildfire	301	96	208	**605**
Oil spill	130	73	146	**349**
Landslide	40	18	28	**86**

Table 6 aims to show if the distribution of Charter activations and the provision of Charter data are consistent per disaster type. In the end, it is highly dependent on the sensors. Floods are the major disasters covered by all sensors, followed by storms and earthquakes. This is in line with activations repartition but in different proportions.

Table 6. Percentage of 2022 Charter activations and Charter data (Optical EO sensors, U.S. optical sensors and radar EO sensors) provided per disaster type

	Charter activations	Optical EO sensors	Radar EO sensors	Optical U.S. sat
Flood	**47,1%**	38%	21%	41%
Ocean storm/wind storm	**23,5%**	35%	19%	46%
Earthquake & Tsunami	**9,8%**	37%	16%	47%
Volcano	**5,9%**	17%	14%	69%
Wildfire	**5,9%**	50%	16%	34%
Oil spill	**5,9%**	37%	21%	42%
Landslide	**2,0%**	47%	21%	33%

It is important to remember that all provided images are not systematically used, and therefore the image count is not related to the quantity of images used for generating value-adding products.

- Optical resources consumption (excluding U.S. VHR and HR data)

Table 6 and Figure 19 describe the optical data resources consumption for 2022. A total of 4,440 optical images were provided by the Charter members. Figure 20 shows 2021 optical sensors statistics for comparison.

969 archived optical images were provided by the Charter members, which is a slightly more than 2021 (2021: 879; 2020: 1,042; 2019: 882 images).

3,471 programmed optical images were provided by the Charter members, which is stable compared to 2021 (2021: 3,489; 2020: 3,547; 2019: 2,776 images).

Around 65,6% of the total number of optical images (archived and programmed) were provided by 3 satellites: Sentinel-2 (30,2%), Pleiades (21.7%) and Landsat 7/8/9 (13.7%).

Most of programmed optical images are provided equally by Sentinel-2 (26,6%) and Pleiades (26,6%), then by Landsat 7/8/9 (11,6%) and KANOPUS_V/V_IK (11%).

Most of the archive optical images are provided by Sentinel-2 (43,2%) and Landsat 7/8/9 (21%).

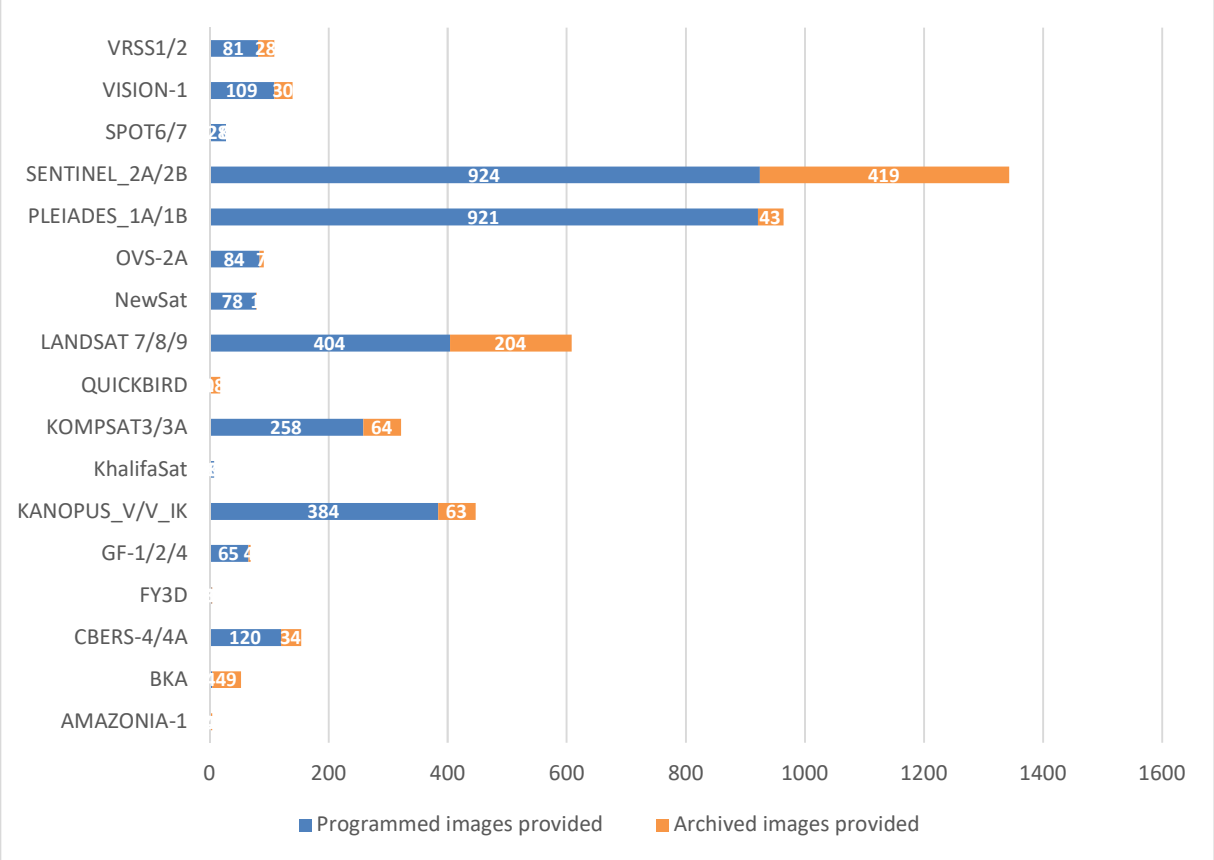


Figure 19. 2022 optical data delivered

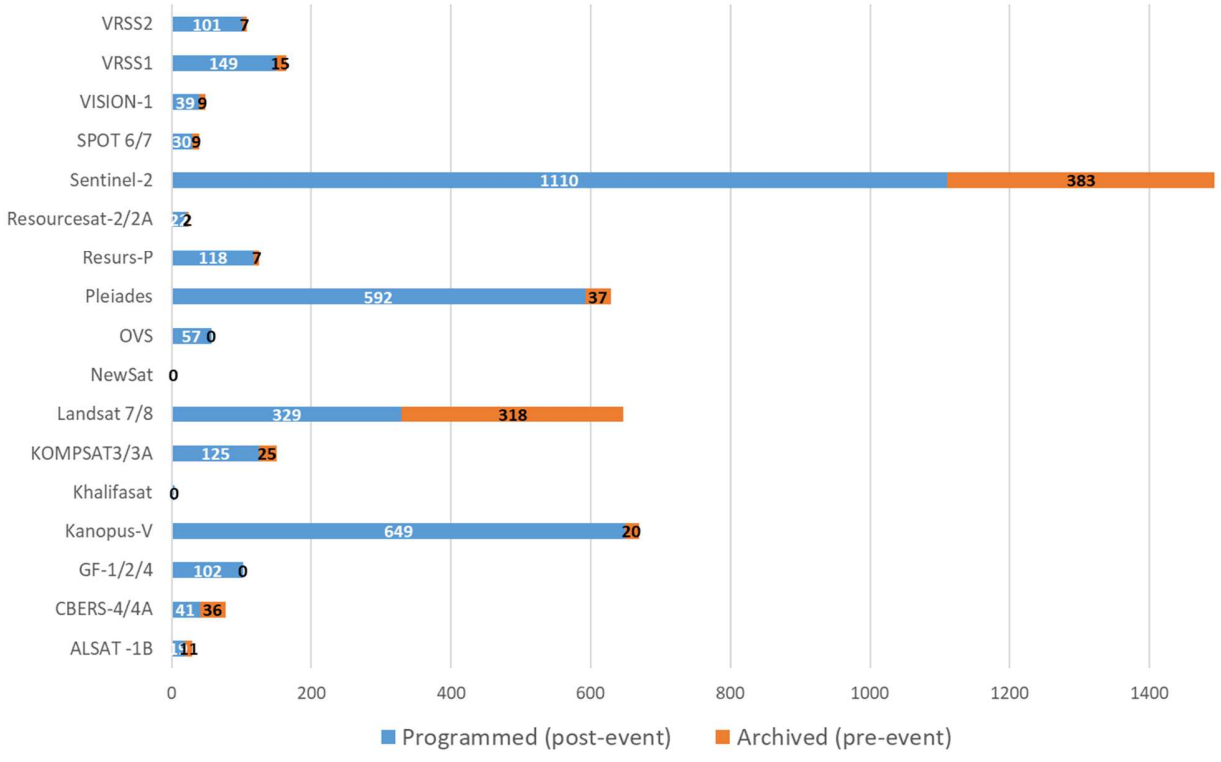


Figure 20. For comparison, 2021 optical data delivered

Table 7. 2021 Statistics for Optical sensors

	AMAZONIA-1	BKA	CBERS-4/4A	FY3D	GF-1/2/4	KANOPUS_V/V_IK	KhalifaSat	KOMPSAT3/3A	QUICKBIRD	LANDSAT 7/8/9	NewSat	OVS-2A	PLEIADES_1A/1B	SENTINEL_2A/2B	SPOT6/7	VISION-1	VRSS1/2
Programmed images provided	0	4	120	3	65	384	8	258	0	404	78	84	921	924	28	109	81
Archived images provided	4	49	34	1	4	63	0	64	18	204	1	7	43	419	0	30	28
Number of activations with programmed images	0	3	22	3	15	41	8	33	0	42	28	10	41	47	5	21	13

Number of activations with archived images	2	14	17	1	1	18	0	12	1	35	1	1	10	47	0	9	6
Total number of images provided	**4**	**53**	**154**	**4**	**69**	**447**	**8**	**322**	**18**	**608**	**79**	**91**	**964**	**1343**	**28**	**139**	**109**

The provision of meteorological satellites (Metop, Meteosat, METEOR-M, SUOMI-NPP) has not been detailed, but imagery is made available to assist in the assessment of cloud cover and to support events, such as storm activations, which are considered useful for the value-adders.

- Radar resources consumption

Figure 21 and Table 8 describe the radar data resources consumption for 2022.

The total number of newly acquired images (1,984) provided by the Charter members is quite stable compared to 2021 (2,067 in 2021; 2,330 in 2020). Figure 22 shows radar sensor 2021 statistics for comparison.

A total of 415 archived images were provided by the Charter members, which is more than last year (210 in 2021; 646 in 2020).

Around 65,7% of the total number of radar images (archived and programmed) were provided by 3 satellites: Sentinel-1A/1B (32,2%), RCM-1/2/3 (17,3%) and Kompsat-5 (16,2%).

Most of the programmed radar images are provided by Sentinel-1A/1B (27,1%), RCM-1/2/3 (19,8%) and Kompsat-5 (17,8%). While most of archived radar images are provided by Sentinel-1A/1B (56,4%), Saocom 1A/1B (12,5%) and TANDEM_X/TERRASAR_X (9,6%).

In the case of a flood disasters, radar satellite imagery often brings the most benefit to emergency response, because radar systems are able to monitor the extent of flooded areas independent off weather conditions. Nevertheless, in 2022, only 37% of radar data (1,036 out of 2,778) were used to monitor 24 flood events (66% in 2021).

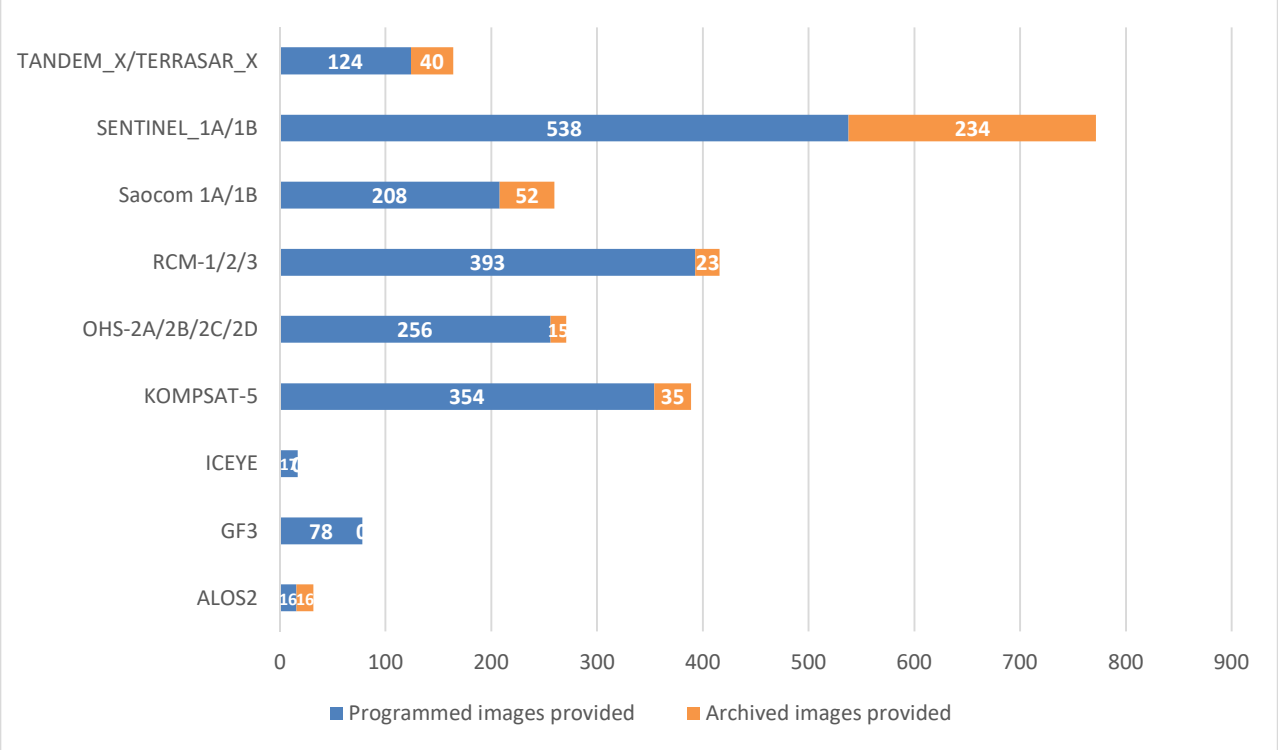


Figure 21. 2022 delivered data (number of archive images (pre-event) is in orange and number of programmed newly acquired images (post-event) is in blue) – Radar EO sensors

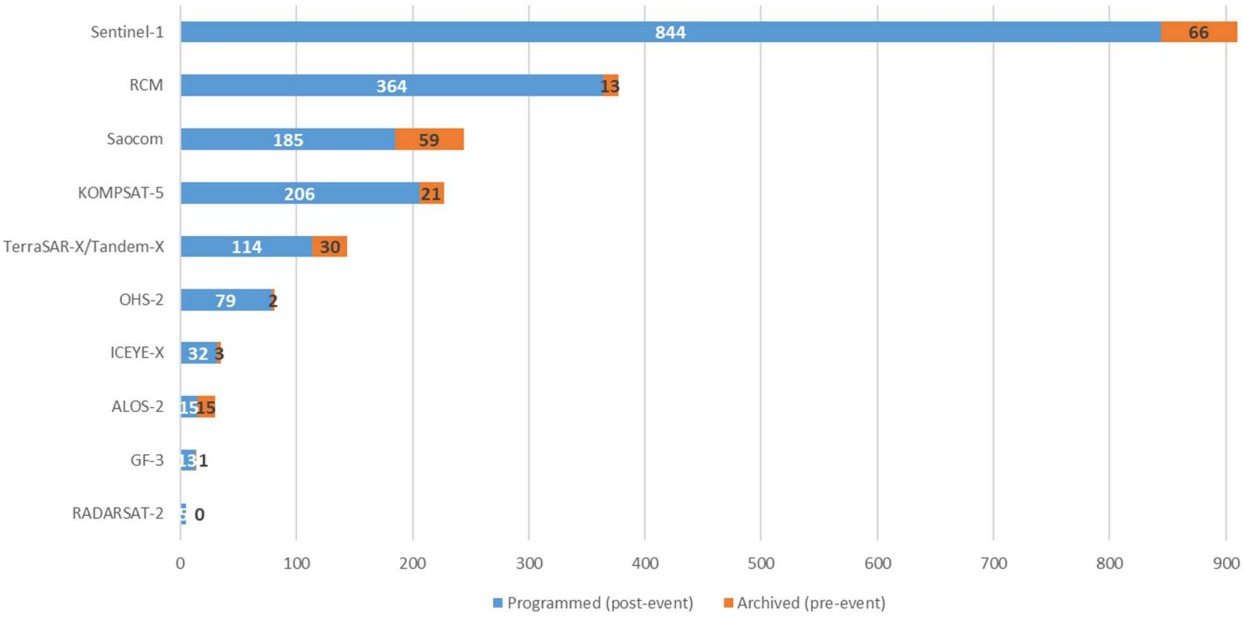


Figure 22. For comparison, 2021 delivered data (number of archive images (pre-event) is in orange and number of programmed newly acquired images (post-event) is in blue) - Radar EO sensors

Table 8. 2022 Statistics for Radar sensors

	ALOS2	GF3	ICEYE	KOMPSAT-5	OHS-2A/2B/2C/2D	RCM-1/2/3	Saocom 1A/1B	SENTINEL_1 A/1B	TANDEM_X/ TERRASAR_X
Programmed images provided	16	78	17	354	256	393	208	538	124
Archived images provided	16	0	0	35	15	23	52	234	40
Number of activations with programmed images	6	16	11	33	14	42	35	47	37
Number of activations with archived images	5	0	0	11	3	4	20	38	25
Total number of images provided	32	78	17	389	271	416	260	772	164

- U.S. VHR and HR data delivered

Table 9. 2022 statistics concerning U.S. commercial optical satellites

	WorldView 1/2/3	Planet	GeoEye	Total
Archive (pre-event)	2198	80	799	3077
Programmed (post-event)	1444	701	190	2335
Total	**3642**	**781**	**989**	**5412**

As already presented, U.S. VHR satellites provided 1,634 newly acquired images (GeoEye-1 – 190 images, WorldView-1, 2 and 3 – 1,444 images) and HR (Planet – 701 images) - optical satellites in 2022.

U.S. VHR provided 2,997 archived images (GeoEye-1 – 799 images, WorldView-1, 2 and 3 – 2,198 images) and HR (Planet) – 80 images - optical satellites in 2022.

In total, **4,631 images of U.S. VHR optical satellites** (GeoEye-1, WorldView-1, 2 and 3) and **781 images** of U.S. HR optical satellites (Planet) were supplied in 2022 (Figure 23). For comparison, in 2021, the figures were: 3,758 images of U.S. VHR optical satellites (GeoEye-1, WorldView-1, 2 and 3) and 800 images of U.S. HR optical satellites (Planet).

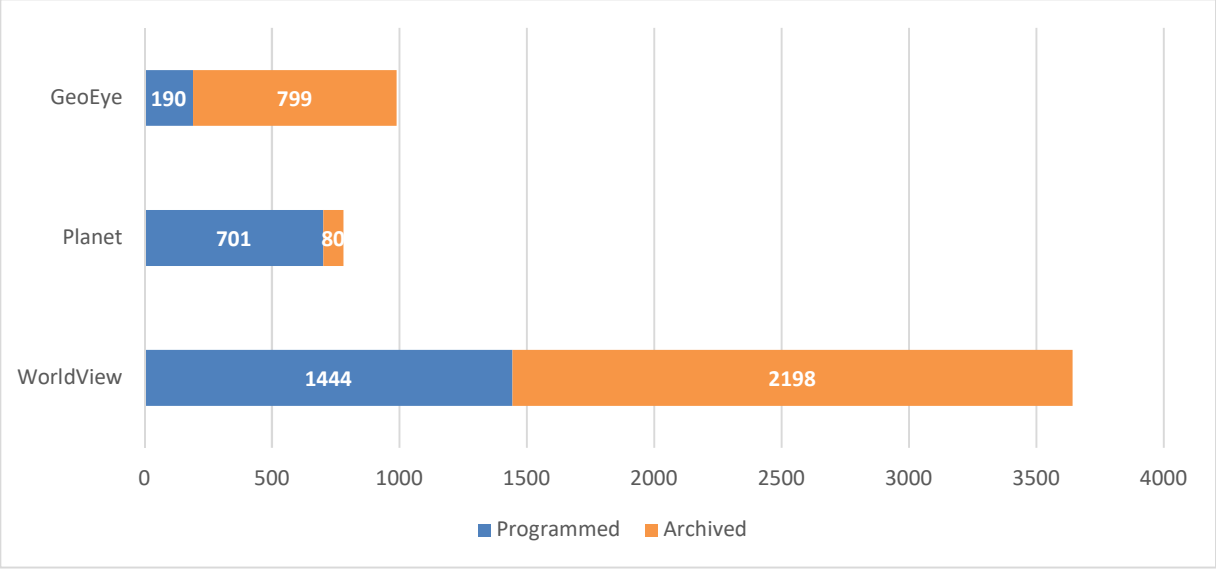


Figure 23. 2022 Data Consumption – U.S. Commercial optical satellites (number of archive images (pre-event) is in orange and the number of programmed images (post-event) is in blue)

- Overview of data consumption per activation

Figure 24 and Figure 25 respectively depict the number of programmed (post-event) and archived (pre-crisis) data for EO Charter sensors (except U.S. VHR and HR data) by activation.

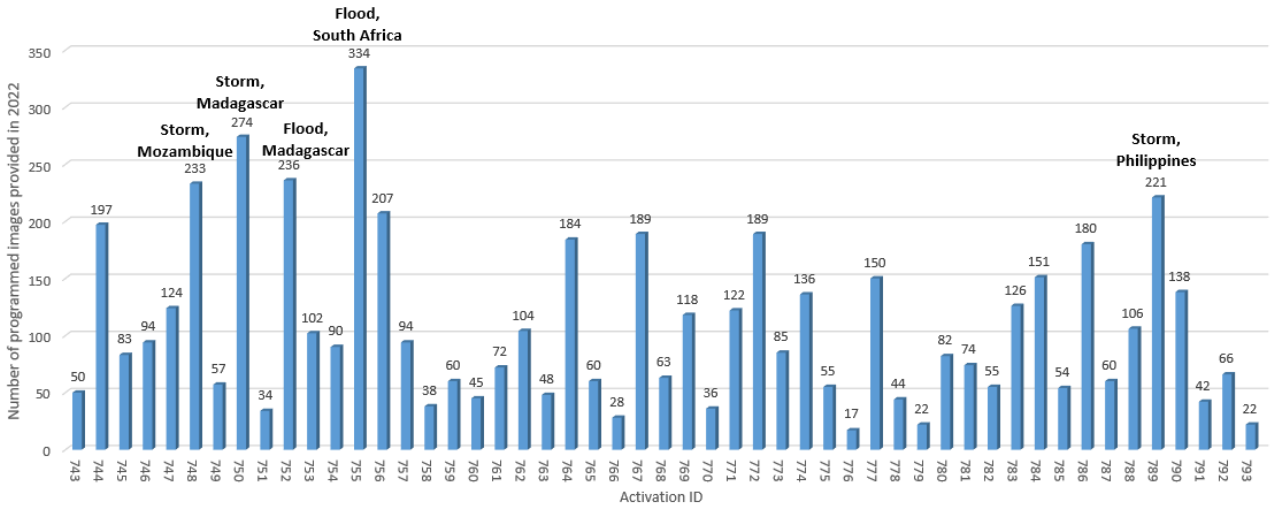


Figure 24. Number of delivered programmed images (radar and optical) by activation in 2022

The average number of programmed images provided by activation in 2022 is 108 (compared to 107 in 2021, 102 in 2020, 92 in 2019).

The activations with the highest number of programmed data provided (Optical & radar sensors) are:

- **Act 748,** Flood (large area), Storm & Hurricane (Urban areas & Infrastructure) in MOZAMBIQUE, MALAWI, 233 images
- **Act 750**, Flood (large area), Storm & Hurricane (Rural area), Storm & Hurricane (Urban areas & Infrastructure) in MADAGASCAR, 274 images
- **Act 752,** Landslide, Flood (large area) in MADAGASCAR, 236 images
- **Act 755**, Landslide, Flood (large area) in SOUTH AFRICA, 334 images
- **Act 789,** Storm & Hurricane (Rural area), Storm & Hurricane (Urban areas & Infrastructure), Landslide in PHILIPPINES, 221 images

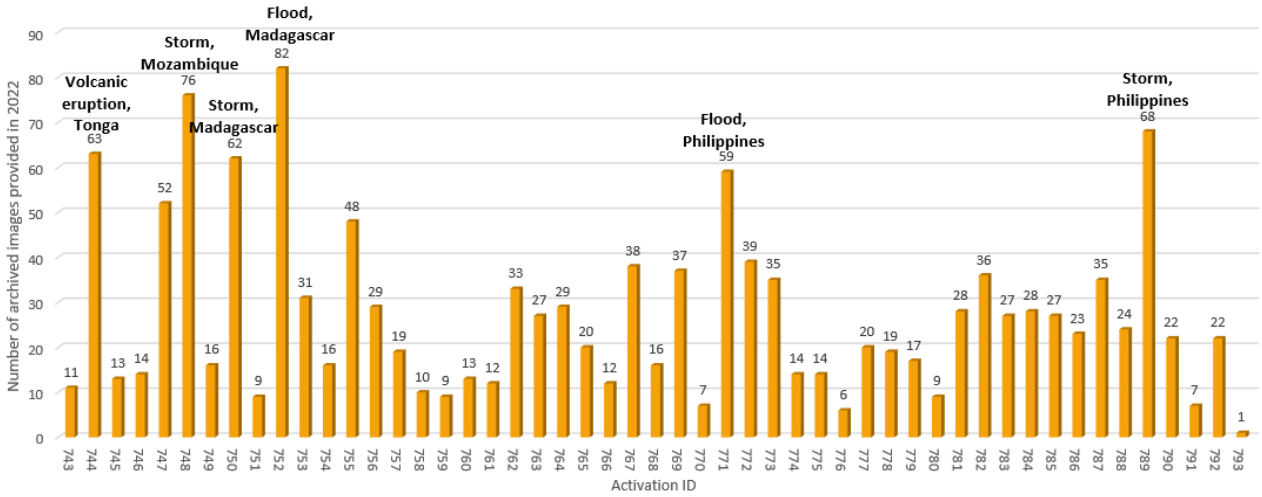


Figure 25. Number of delivered archived images (radar and optical) by activation in 2022

The average number of archived images provided by activation in 2022 is 27 (22 in 2021, 31 in 2020, 28 in 2019). The activations with the highest numbers of archived data which were provided (Optical & radar sensors) are:

- **Act 744,** Tsunami, Volcanic eruptions in TONGA, 63 images
- **Act 748,** Flood (large area), Storm & Hurricane (Urban areas & Infrastructure) in MOZAMBIQUE, MALAWI, 76 images
- **Act 750,** Flood (large area), Storm & Hurricane (Rural area), Storm & Hurricane (Urban areas & Infrastructure) in MADAGASCAR, 62 images
- **Act 752,** Landslide, Flood (large area) in MADAGASCAR, 82 images
- **Act 771,** Flood in Russian Federation, 59 images
- **Act 789,** Storm & Hurricane (Rural area), Storm & Hurricane (Urban areas & Infrastructure), Landslide in PHILIPPINES, 68 images

Figure 26 and Figure 27 respectively depict the number of optical and radar data for EO Charter sensors (except U.S. VHR and HR data) by activation, and Figure 28 shows the number of U.S. VHR and HR programmed images by activation.

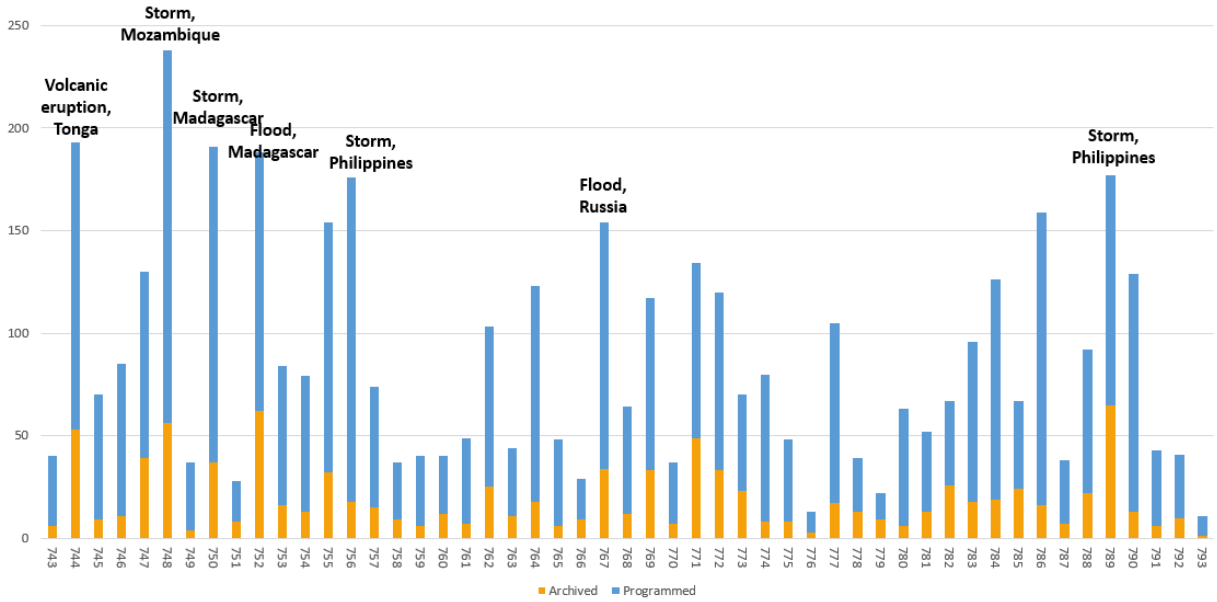


Figure 26. Number of delivered optical images (archived and programmed) per activation in 2022

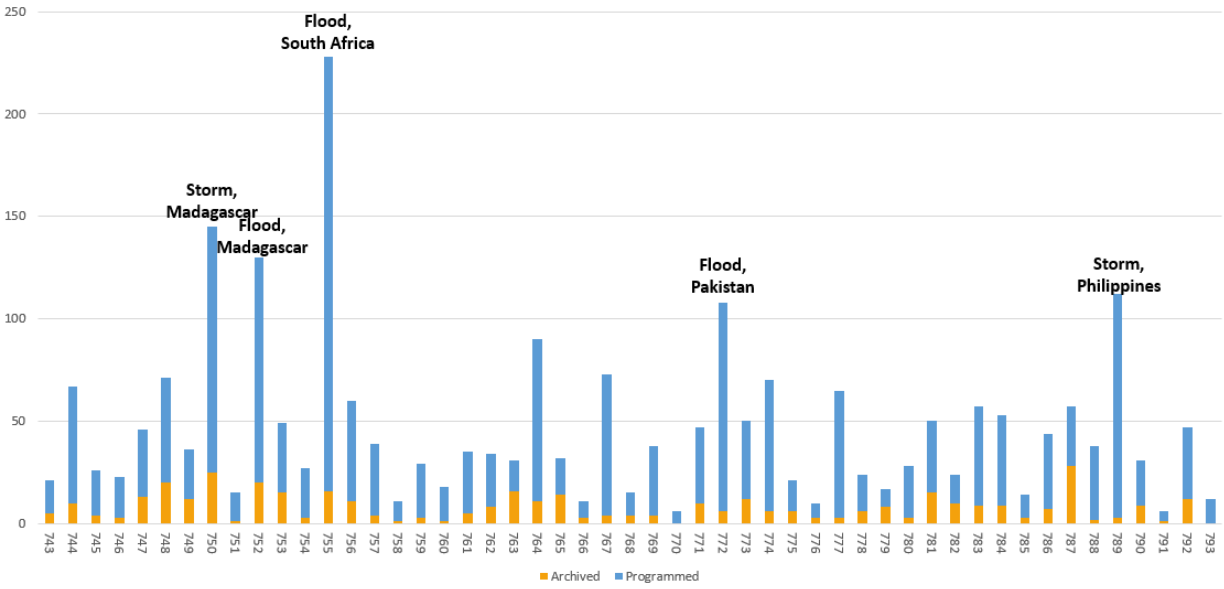


Figure 27. Number of delivered radar images (archived and programmed) per activation in 2022

In total, all the 51 activations have benefited from U.S. VHR and HR data. The three cases with the highest number of U.S. VHR and HR data provided are:

- **Act 743,** Volcanic eruptions in ECUADOR, 1182 images
- **Act 748**, Flood (large area), Storm & Hurricane (Urban areas & Infrastructure) in MOZAMBIQUE, MALAWI, 4593 images
- **Act 773,** Flood (large area), Storm & Hurricane (Urban areas & Infrastructure) in REPUBLIC OF KOREA, 2983 images

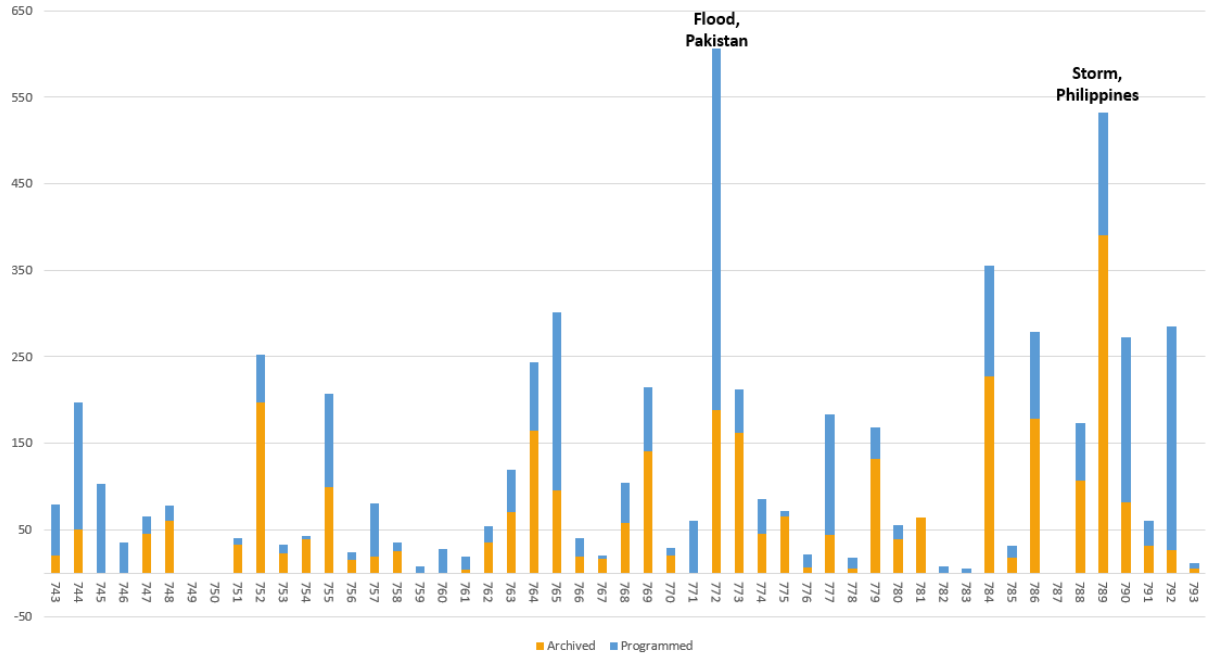


Figure 28. Number of delivered archived / programmed images per activation in 2022 for U.S. VHR & HR commercial satellites.

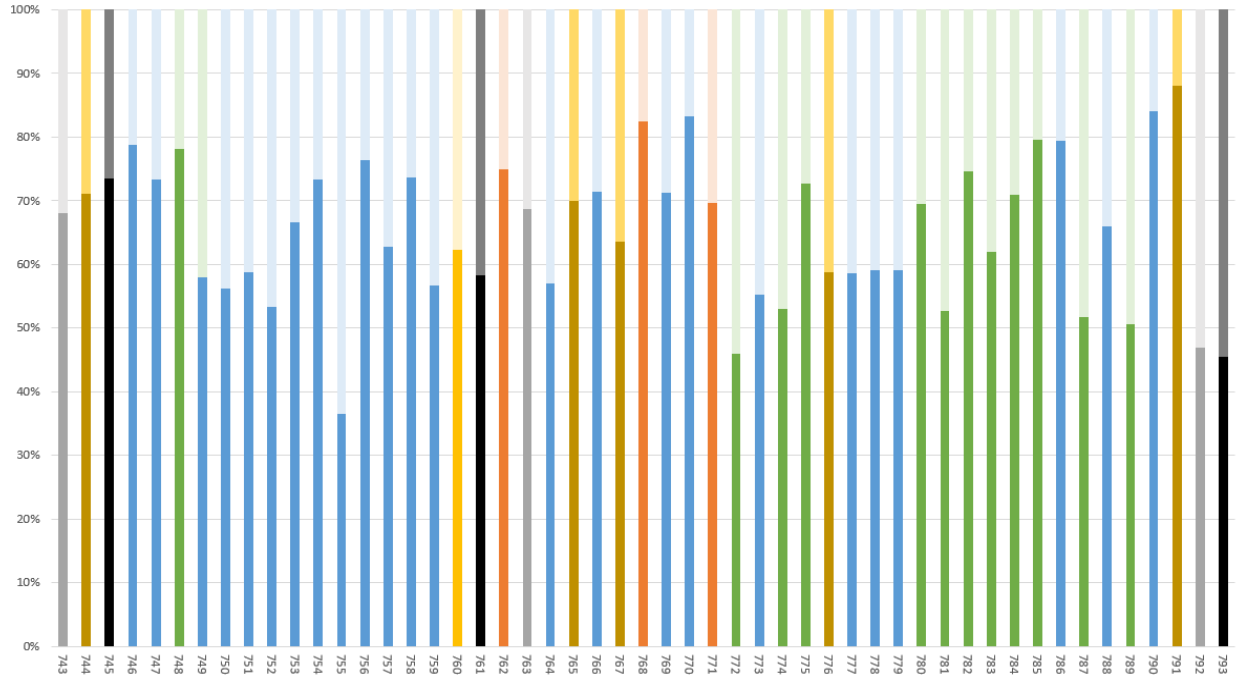


Figure 29. Repartition (in percentage) between optical and radar programmed images for 2022 per activation and disaster type

The legend of the Figure 29 is available below. It describes the radar/optical repartition of newly acquired images by activation. This shows that radar and optical images are provided for all types of events, but more optical data than radar data are provided for earthquakes, landslides, wildfires and to some extent ocean storms events. Radar images are mainly provided for the flood events compared to optical data.

Disaster type	Optical	Radar
Flood		
Wildfires		
Oil Spill		
Storm		
Earthquake		
Landslide		
Volcanic eruption		

3.2.2 Human resource contribution (ECO and PM) in 2022

3.2.2.1 ECO resources

The Emergency On-Call Officer (ECO) services were provided on a weekly rotational basis by 9 Charter members agencies: CNES, CNSA, CONAE, CSA, DLR, UKSA, ESA, ISRO/NRSC, and ROSCOSMOS as shown in Figure 30.

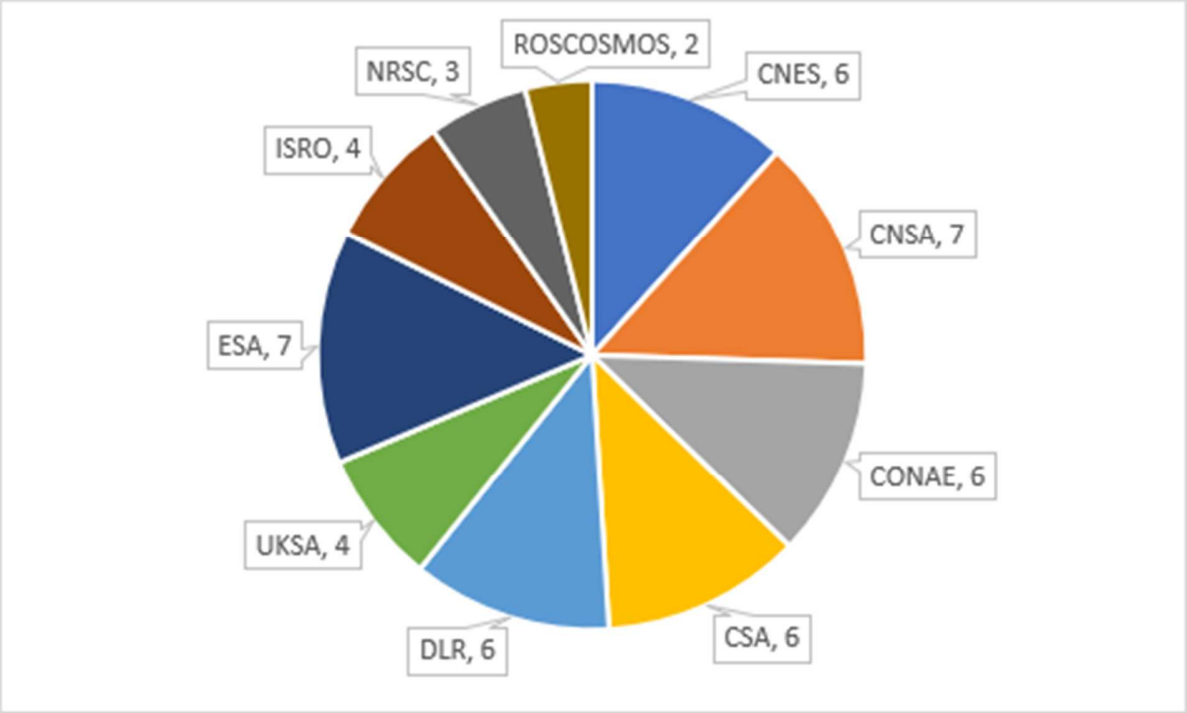


Figure 30. Distribution of Charter Parties responsible for the ECO services in 2022

The random nature of calls usually results in an uneven workload distribution for the members. This year, however, the workload was more evenly dispersed than usual, with four agencies providing 6 ECOs, and two agencies providing seven ECOs. For memory, in 2021, ISRO, CSA and CONAE handled 7 or 8 calls each, (46%).

3.2.2.1 Distribution of Charter members responsible for the PM services delivered in 2022

For each activation, a Project Manager (PM) is required. In 2022, Charter members nominated 51 PMs. As shown in Figure 31, INPE and USGS, as agencies that acted as Charter lead during 2022, were responsible for 13 and 19 PM nominations, respectively. In total, these two agencies covered 62% of activations. Ten other Charter member agencies also took responsibility for PMs nominations in 2022.

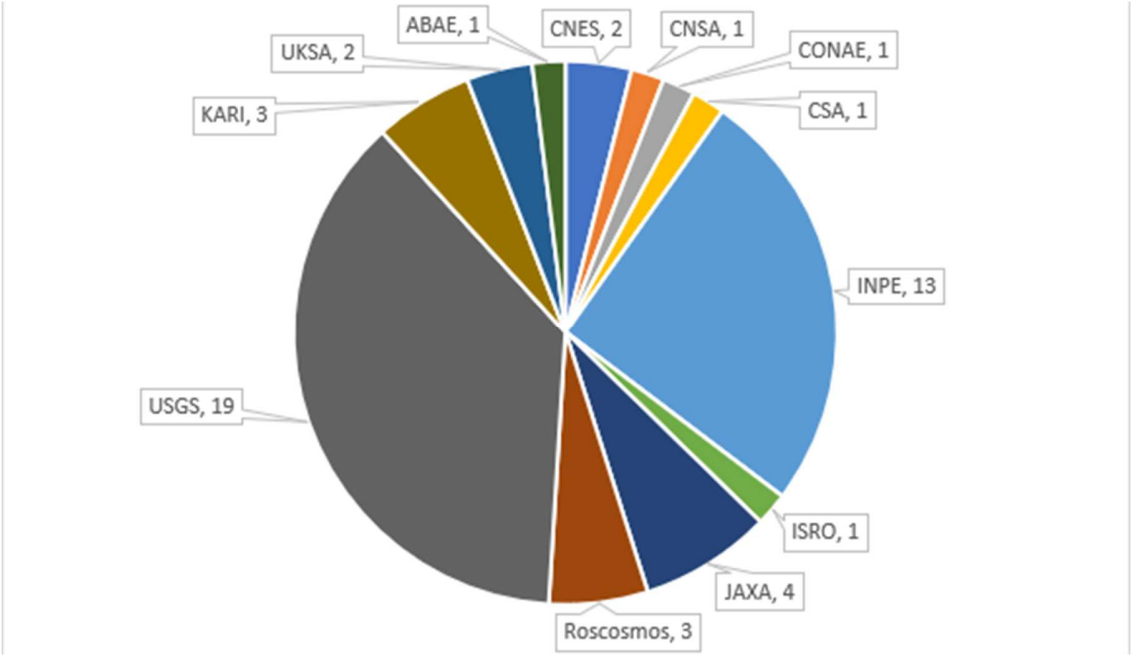


Figure 31. Distribution of Charter Parties responsible for the PM services in 2022

3.2.2.2 Distribution of organizations providing PM resources in 2022

PMs may be sourced from a Charter member agency or an external entity. Figure 32 shows the breakdown of all organizations that have contributed to Charter activations by assuming the PM role in 2022. In the case of external organizations, it is required that a Charter member nominates them and takes the responsibility for the service they provide. During this reporting period, 22 different organizations contributed their PM services to Charter activations.

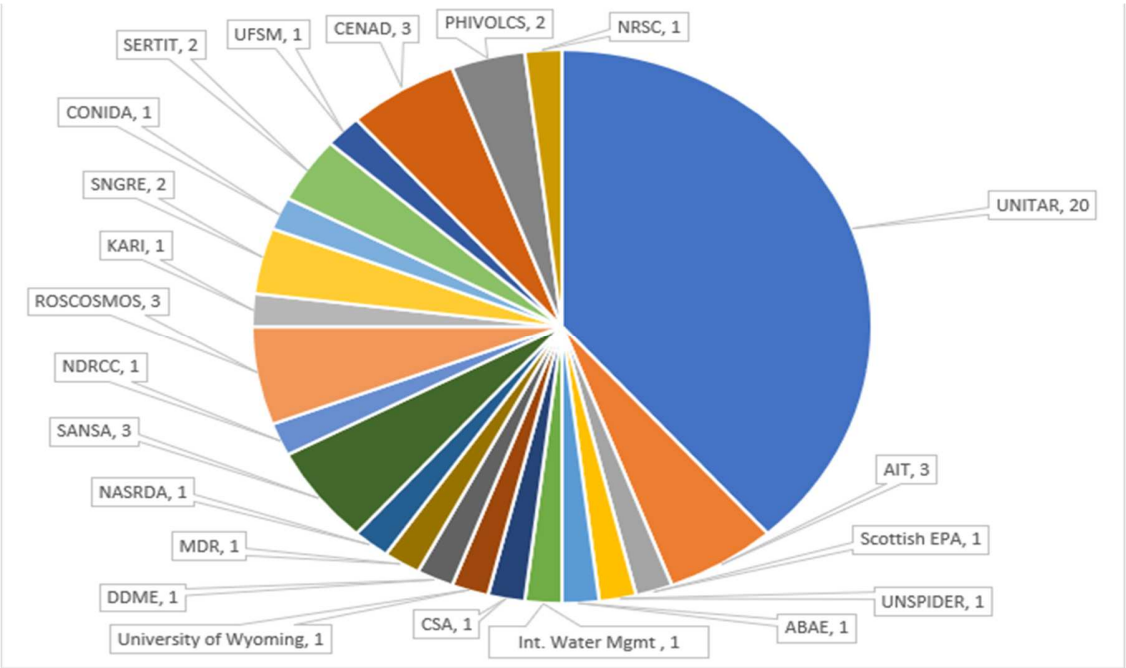


Figure 32. PM Organization breakdown in 2022

3.3 Charter Training

3.3.1 Authorized User Training

The Authorized User training aims to train future and current AUs in order to ensure they are familiar with how and when to activate the Charter.

The following AU trainings were conducted on-line in 2022:

- In January 2022: 2 on-line AU training sessions were organized by ESA (28 participants).
- In February 2022: 2 on-line AU training sessions were organized by ESA (17 participants).
- In March 2022, the AU from Niger was trained by CNES and JAXA.

3.3.2 Emergency on-Call Officer Training

The Emergency On-Call Officer (ECO) function is of utmost importance for the Charter operations, because the ECO is the person who orders the appropriate data from the Charter members within a few hours after an activation request is received.

- No ECO training held in 2022.

3.3.3 SARE exercises

Because some ECO staff might not face “real activations” frequently, two so-called “Semi-Annual Refresher Exercises” are performed every year with all ECOs.

In 2022, there was only one exercise:

- SARE 26: held in February-April 2022, led by USGS and ISRO.

3.3.4 Project Manager Training

The PM training is aimed at strengthening the network of Charter PMs by providing refresher sessions for current PMs and training sessions for new PMs. Seven PM training sessions were conducted in 2022.

- In January 2022: 2 on-line PM training sessions, including the Charter Mapper were organized by ESA (31 participants).
- In February 2022: 2 on-line PM training sessions, including the Charter Mapper were organized by ESA (52 participants).
- On 4 July 2022 a face-to-face meeting with UNITAR was organized in Geneva, mainly focused on the Charter Mapper status and evolution.
- In September, an on-line PM training of the Charter Mapper was provided to Nigeria during a 3-days training organized by UNSPIDER. More than 50 attendees (but not all potential PMs).
- On September 27, an on-line PM training was provided to CONIDA and INDECI.

3.3.5 Joint training

- No joint training in 2022.

3.4 Sentinel Asia training

As for PM trainings for Sentinel Asia members, they are usually carried out once per year in Sentinel Asia member countries. Last year’s training (2021) had to be cancelled due to COVID.

- No Sentinel Asia training in 2022.

3.5 The Charter Operational System (COS-2)

ESA developed, operates, and continues to improve the web-based Charter Operations System second generation “COS-2”, linked to the Charter Geobrowser, to manage Charter operations in one web-based platform and facilitate the work of the Charter operational staff (AUs, CBs, ODO, ECOs, PMs and VAs). Several Charter member agencies support the COS-2 development as part of the “COS-2 Evolution Team”.

COS-2 has been operational since the beginning of March 2015. All Charter members have their EO metadata fetching executed on COS-2, allowing automated and on-line cataloguing of Charter acquisitions. The data available in COS-2 are automatically sent to the Charter Mapper if covering at least one of the areas of interest.

More than 12,500 satellite images were handled by COS-2 in 2022.

The COS-2 development contract its second 3-year phase. A few changes have been introduced with respect to the first 2 years: most notably, the enlargement of the helpdesk (1300 tickets received in one year) and hosting movement to Amazon services.

Two new COS-2 versions were released adding, among all changes, the possibilities for the ECO, PM and ES to add, close and modify the area of interest, allowing a more dynamic management of the call. The ERF generation has been improved and a questionnaire for the Value Adders has been added. Support to BlackSky and Amazonia-1 data has been added.

Larger effort was used to interface the ESA Processing Environment, the Charter Mapper, with COS-2. COS-2 acts as identity management for the Processing Environments, as a security measure. The data uploaded in COS-2 (physically or via link) are passed to the Charter Mapper which imports, calibrates, and displays them in full resolution (see next section). Also, the information about the EULA is transferred in order to grant access to the data.

In 2022, no issues blocking the regular flow of the activations for more than 2 hours were detected in COS-2. All Activations were handled by COS-2.

3.6 The Charter Processing Environment

While COS-2 is focused on the operational steps of the Charter activation workflow, it does not have workflow specifically addressing the generation of geospatial data.

In the frame of the Strategic Plan, 2017-2027 discussions led by the Board identified the need to develop an interface/platform for easy data access and tools and methods for PM/VA and users. Two Charter members (ESA and ISRO) decided to respond to this request and started the development of on-line Processing Environments, to support full-resolution visualization, data screening and basic data manipulation (data comparison, band combinations, etc.). Looking at the longer term, the Board is pursuing a reflection on the benefit of expanding on-line platform capabilities with a Value Adding capability for rapid end-to-end information extraction.

The processing Environment shall be seen as an extension of the COS-2 system, dedicated primarily to PM and VAs.

The ISRO Processing Environment is still under development with promising functionalities.

The ESA Processing Environment, now called the **ESA Charter Mapper**, approved by the Board in July 2021, was operationally released in September 2021. The release of the platform, initially foreseen by end July 2021 was delayed due to the unforeseen handling of EULAs, in order to grant that only users accepting an EULA will be able to handle and download the EO data of the involved agency. This granted VHR data availability of CNES, DLR and USGS in the ESA Charter Mapper.

The ESA Charter Mapper has ingested the majority of data offerings from Charter activations since August 2021. In 2022, data was ingested and calibrated in the Mapper from Charter members: ABAE, CONAE, CNES, CNSA, CSA, DLR, JAXA, KARI, PLANET, ROSCOSMOS, UKSA and USGS, and third-party data contributors ICEYE and Satellogic.

Figure 33 through Figure 37 presented below provide views of some Charter Mapper capabilities in manipulating and analyzing Charter data.

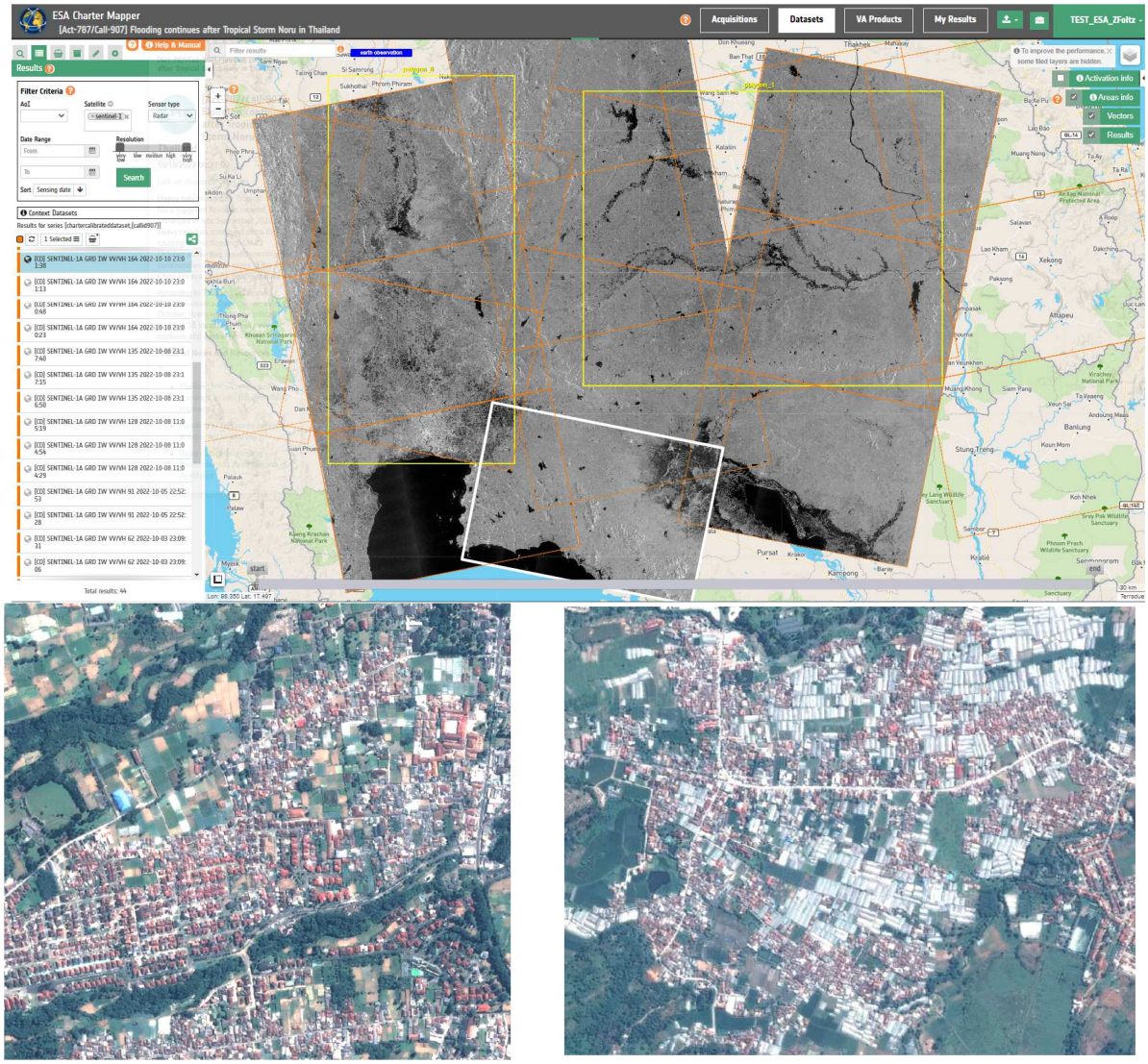


Figure 33. Sentinel-1 data over Thailand for flooding in October 2022 (Top), Pleiades images over Indonesia for earthquake in November 2022 (Bottom)

Imagery received from COS-2 is ingested and transformed automatically in full resolution, irrespective of the original format, so as the user logs in, all available EO data can be viewed on-line. This will allow PM/VAs not familiar with some data formats to see the data without specific software to handle them.

The PM/VA can browse imagery on-line, select the EO data of interest, analyse and process them on-line with EO services and toolboxes to generate geo-information products.

The ESA Charter Mapper presents Activation Workspaces for each Activation. The workspace allows the PM/VA to:

- **Browse** full-resolution satellite data as raster on the map (for some data, the PM/VA shall accept the EULA – the system automatically redirects them)
- **Search and filter** among the available data

- **Upload** external satellite data outside COS-2 from local workstation or free EO Data catalogues;
- Submit **processing jobs** using satellite imagery processors; view the results as part of the Activation Analysis and download the results.
- **Store & share** satellite data and Value-Added Products with other partners involved (e.g., a PM or VA provider with credentials for the same activation)

The PM/VA can access a specific widget that allows to visualize & combine the assets (bands and overviews) derived by the ESA Charter Mapper from the satellite data product:

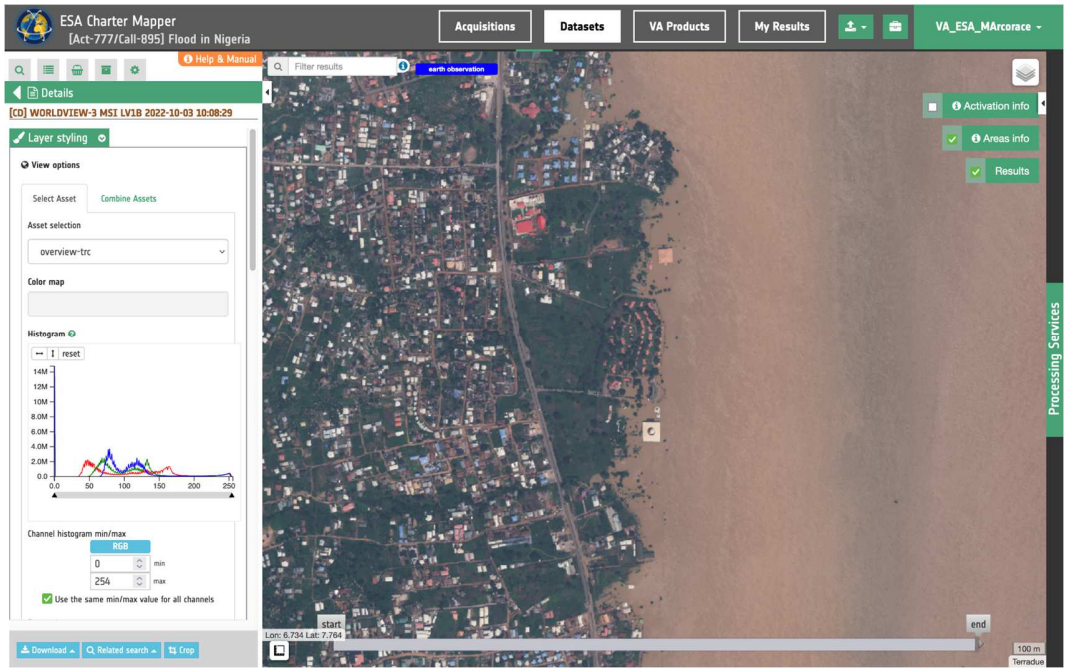


Figure 34. Full Resolution True Color RGB composite using Select asset of Layer Styling in the left panel of the ESA Charter Mapper workspace (image credits: Maxar).

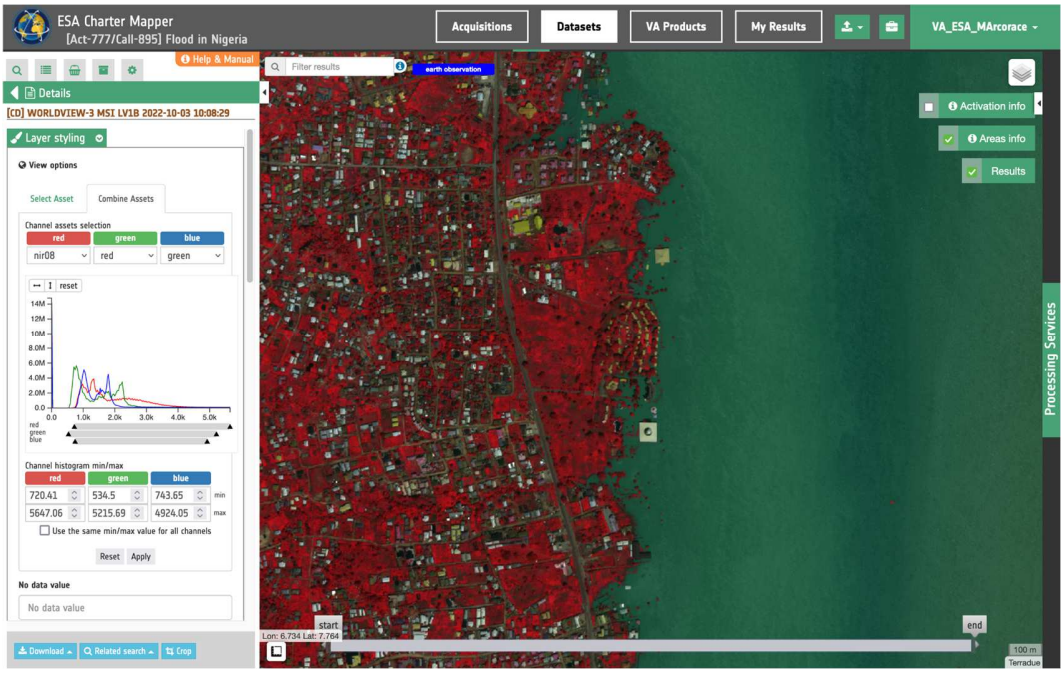


Figure 35. Full Resolution Color Infrared (vegetation) RGB composite on the fly using Combine Assets in Layer Styling in the left panel of the ESA Charter Mapper workspace (image credit: Maxar).

Among the features, it is possible to compare visually two images quickly through a slider:

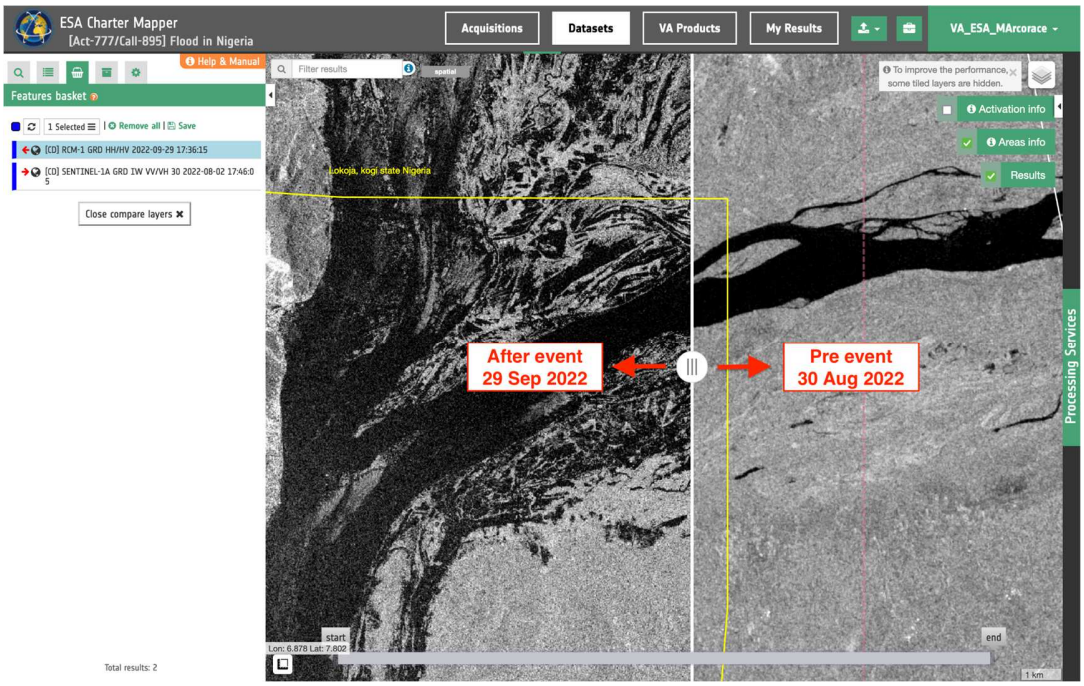


Figure 36. Slider function

It is also possible to view the value-added products which have been uploaded to COS-2 for a specific activation. The footprint of the VAP will appear in the map interface and a quicklook of the VAP will appear in the bottom right of the screen. This allows to view which areas have already been evaluated and which require treatment.

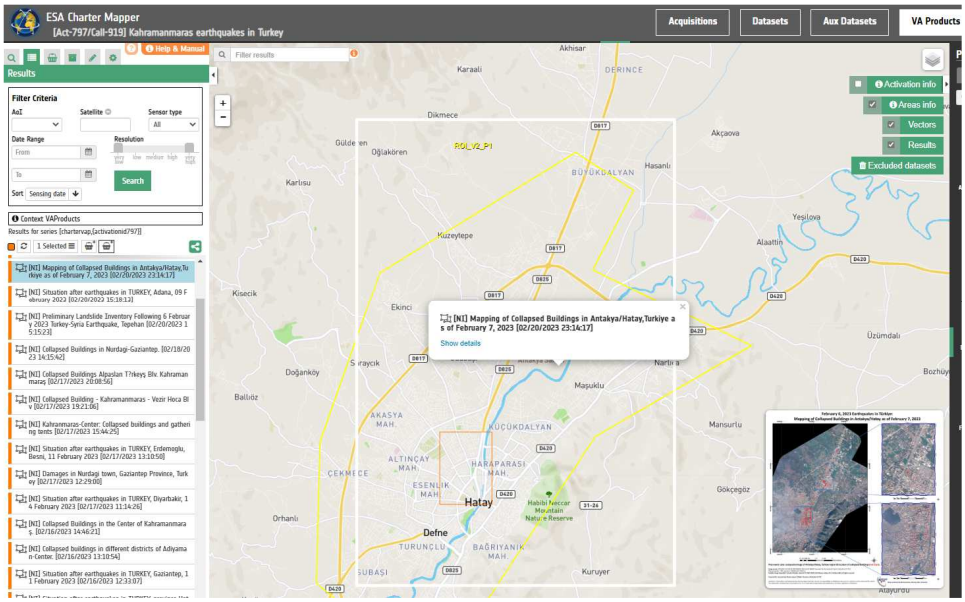


Figure 37. Interface of the ESA Charter Mapper with the “VA Products” tab selected. The list of VAPs is seen on the right and footprints are seen on the map. A quick look of the selected VAP can be seen in the bottom right corner of the screen.

The processing services integrated into the Charter Mapper will be gradually released as they are fully validated, improving the usefulness of the platform. At the end of 2022, the following services were available:

Table 10. ESA Charter Mapper processing services in December 2022

- **COMBI**: Multi-sensor band composite
- **COMBI-Plus**: Advanced multi-spectral band composite
- **OPT-Index**: Optical spectral index
- **Stack**: Co-located Stacking (requires that the images are already georeferenced)
- **SAR-Change**: SAR Amplitude Change (Creates an RGB composite showing changes of backscatter values using a pair of SAR images)
- **Hotspot** Detection
- **BAS**: Burnt Area Severity
- **IRIS**: Change detection analysis
- **HASARD**: Flood extent mapping
- **PAN-SHARP**: Optical Pan sharpened image processing
- **DInSAR**: Displacement Mapping
- **Co-Register**: Co-registered stacking
- **SAR-COIN**: Coherence and Intensity composite

At the end of 2022, the ESA Charter Mapper was able to support the following Charter satellites:

- ALOS-2
- ALSAT-1B
- CARTOSAT-2
- GeoEye-1
- GF-1, 2, 3
- ICEYE-X constellation
- KANOPUS-V, V-IK
- KOMPSAT-3, 3A
- KOMPSAT-5
- LANDSAT-8, 9
- PlanetScope constellation
- Pleiades-1A, 1B
- RCM-1,2,3
- RESOURCESAT-2, 2A
- SAOCOM-1A, 1B

- SENTINEL-1A, 1B
- SENTINEL-2A, 2B
- SPOT-6 & 7
- TanDEM-X
- TerraSAR-X
- UK-DMC-2
- Vision-1
- VRSS-1, 2
- WORLDVIEW-1, 2, 3

The remaining missions will be handled when the complete information for their handling is provided.

From December 2021, the ESA Charter Mapper was enriched by a reporting system allowing an analysis of the data received and processed. In December 2022, the Charter Mapper received 853 satellite data notifications from COS-2. Of these 772 were successfully imported (most of the failures were related to quick looks and metadata only, no products found or broken links). Of these, 98% were successfully calibrated and available to PMs and VAs.

The failure information is very important because, except the data types not yet handled, it is due to issues in the data (lack of metadata, data corruption, not recognised formats), which means that also the PM/VA will not be able to read them.

4. Assessment of the Charter operations

This chapter provides a synopsis of the overall assessment, including recommendations to be taken into consideration for improving Charter operations.

Statistics on the 2022 activations were compared with EM-DAT data to evaluate the overall impact of the Charter as a service to support disaster response – EM-DAT: The Emergency Events Database - Université Catholique de Louvain (UCL) - CRED, D. Guha-Sapir - www.emdat.be, Brussels, Belgium.

The reports issued by the Project Managers of Charter activations and the various performance metrics recorded by COS-2 are the main sources of information for assessing the performance and quality of service provided by the Charter during 2022.

4.1 Overall impact

In 2022, the three most catastrophic events were floods in India that killed 2,035 people and affected 1.3 million, floods in Pakistan that killed 1,739 people and affected 33 million, and the earthquake in Afghanistan that killed 1,036 people and affected 361,000 people. All three of these events were covered by Charter activations.

The EM-DAT database (managed by the Centre for Research on the Epidemiology of Disasters (CRED) (http://emdat.be/disaster_list/)) inventoried 354 natural events in 2022 that killed a total of 11,742 people. These figures do not include droughts and extreme temperature events, since these events are not covered by the Charter, while they do include earthquakes, tsunamis, floods, landslides, storms, volcanic eruptions, and wildfires.

The Charter covered 35 of the 354 total events in 2022 (9.9%). If we consider the 50 most severe disasters in the EM-DAT database (86% of fatalities), the Charter covered 15 of them, accounting for 7,052 fatalities (60% of the total). In comparison, in 2021, the Charter covered 32 of the 411 events registered in the EM-DAT database (7.8%). These 32 events accounted for 4,065 fatalities (43%), 1,377 injuries and approximately 39,697,530 people affected. It can be seen from the previous 2 years of data that the Charter accounts for a much higher percentage of overall fatalities than overall events, meaning that the charter is often activated for the most severe events only.

Figure 38 shows that 15 of the 50 most severe events recorded by the EM-DAT in 2021 were covered by Charter activations. In 2022, the number of Charter activations (51) was almost identical to 2021 (50), falling in the high range of annual activations in recent years, as the number of Charter activations has fluctuated between 32 and 55 per year since 2007. Such fluctuations can be explained in part by several factors such as: the variability in the total number of natural disasters occurring during a given year, the occurrence of disasters covering more than one country (e.g., hurricanes), and by the existence of national and regional EO-based emergency response services (e.g., Copernicus EMS, Sentinel Asia). Figure 39 shows that since 2007, the curve of the Charter activations follows, more or less, the trend of events recorded by EM-DAT.

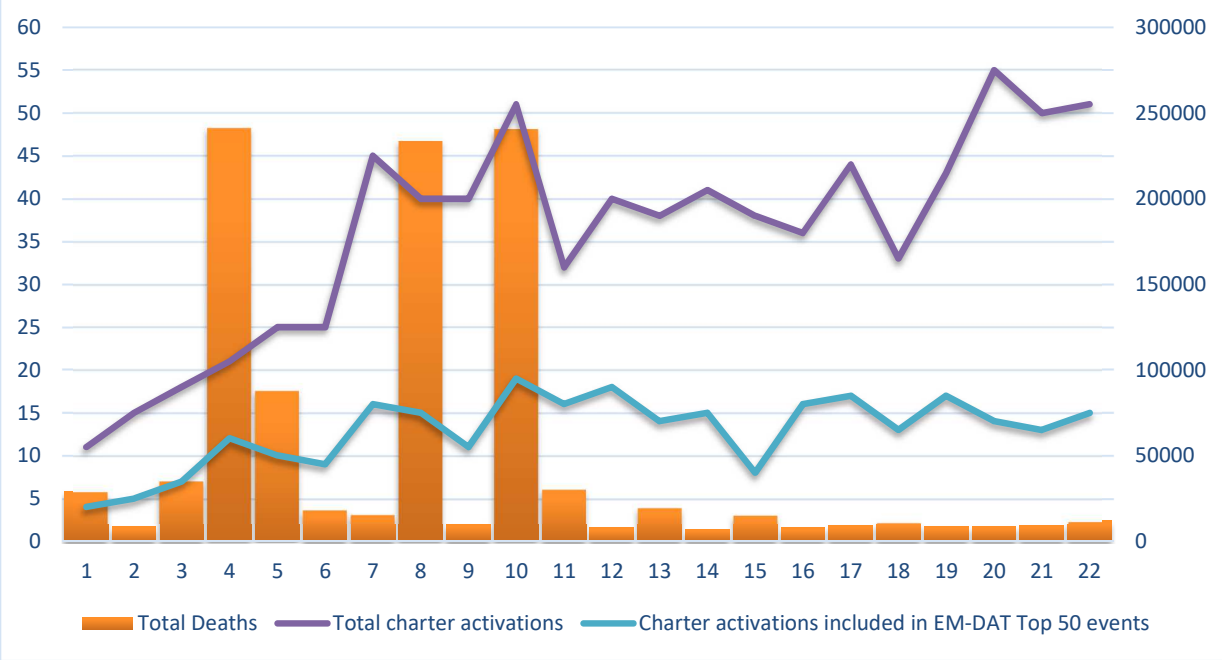


Figure 38. Number of Charter activations from 2001-2022, linked with the number of fatalities from all recorded natural disasters. Represented in blue are the number of Charter events per year that are included within the 50 most severe disasters (by fatalities)

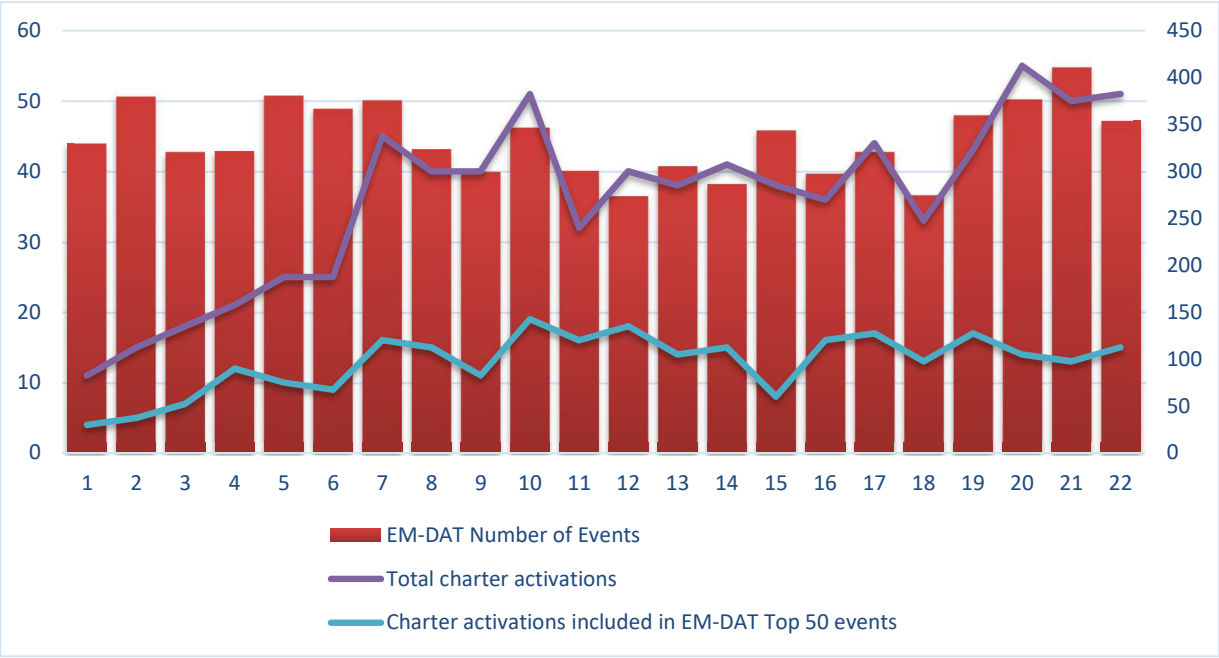


Figure 39. Number of Charter activations from 2001-2022, linked with the total number of natural disasters recorded by the EM-DAT

In 2022, the Charter covered 7 of the 10 most severe disasters by fatalities (see Table 11). Over the last thirteen years (2009-2022), the Charter was triggered for all of the most severe natural disasters by fatalities, as reported by EM-DAT (see Table 11 and Table 12).

Table 11. The ten most severe natural disasters by number of fatalities in 2022 (events covered by Charter activations are indicated in bold). (Source: EM-DAT: The Emergency Events Database - Université Catholique de Louvain (UCL) - CRED, D. Guha-Sap

Top 10 Natural Disasters: 2022 Text in bold indicates that the Charter was activated				
Country	**Disaster type**	**Date**	**Fatalities**	**Affected People**
India	**Flood**	**17-May**	**2035**	**1,300,000**
Pakistan	**Flood**	**14-Jun**	**1739**	**33,000,000**
Afghanistan	**Earthquake**	**21-Jun**	**1036**	**361,634**
Nigeria	Flood	1-Jul	603	2,800,000
South Africa	**Flood**	**8-Apr**	**544**	**135,345**
Philippines	**Storm**	**10-Apr**	**346**	**2,298,780**
Indonesia	**Earthquake**	**21-Nov**	**334**	**2,200,000**
Brazil	**Flood**	**13-Feb**	**272**	**15,000**
Niger	Flood	1-Jun	195	322,000
The Democratic Republic of the Congo	Flood	12-Dec	175	84,624

Table 12. 18 most severe disasters by number of fatalities (2009-2022) (events covered by Charter)

Top 18 Natural Disasters: 2009-2022 *All disasters covered by the Charter* Text in bold indicates occurrence in year 2022				
Date	**Country**	**Type**	**Fatalities**	**Affected people**
12/1/2010	Haiti	Earthquake	222,570	3,700,000
11/3/2011	Japan	Earthquake and tsunami	19,848	368,820
25/4/2015	Nepal	Earthquake	8,831	5,639,722
8/11/2013	Philippines	Tropical cyclone	7,354	16,106,807
12-27/06/2013	India	Flood	6,054	504,473
28/09/2018	Indonesia	Earthquake	4,929	769,109
14/04/2010	China P Rep	Earthquake	2,968	112,000
14/08/2021	Haiti	Earthquake	2,575	702,763
17/05/2022	**India**	**Flood**	**2,035**	**1,300,000**

28/07/2010	Pakistan	Flash flood	1,985	2,0359,496
15/06/2020	India	Flood	1,922	1,300,000
14/07/2019	India	Flood	1,900	3,000,000
4-5/12/2012	Philippines	Tropical cyclone	1,900	6,246,664
7/8/2010	China P Rep	Landslide	1,765	4,7200
14/7/2022	**Pakistan**	**Flood**	**1,739**	**33,000,000**
29/05/2010	China P Rep	General flood	1,691	134,000,000
15/12/2011	Philippines	Tropical cyclone	1,439	1,150,300

Table 13 lists the 50 most severe natural disasters by number of fatalities recorded by EM-DAT in 2022.

Note: EM-DAT events were filtered according to the type of natural disasters covered by the Charter.

Table 13. Fifty most severe disasters by number of fatalities in 2021 (Source: EM-DAT: The Emergency Events Database - Université Catholique de Louvain (UCL) - CRED, D. Guha-Sapir - www.emdat.be, Brussels, Belgium, filtered according to the type of disasters

Top 50 Natural Disasters: 2022				
Text in bold indicates that the Charter was activated				
Date	**Country**	**Type**	**Fatalities**	**Affected people**
17-May	**India**	**Flood**	**2,035**	**1,300,000**
14-Jun	**Pakistan**	**Flood**	**1,739**	**33,000,000**
21-Jun	**Afghanistan**	**Earthquake**	**1,036**	**361,634**
1-Jul	Nigeria	Flood	603	2,800,000
8-Apr	**South Africa**	**Flood**	**544**	**135,345**
10-Apr	**Philippines (the)**	**Storm**	**346**	**2,298,780**
21-Nov	**Indonesia**	**Earthquake**	**334**	**2,200,000**
13-Feb	**Brazil**	**Flood**	**272**	**15,000**
1-Jun	Niger (the)	Flood	195	322,000
12-Dec	Congo (the Democratic Republic of the)	Flood	175	84,624
27-Oct	**Philippines (the)**	**Storm**	**158**	**3,323,188**
16-Aug	Afghanistan	Flood	156	249,900
28-Sep	United States of America (the)	Storm	152	N/A
10-May	Sudan (the)	Flood	146	349,000
17-May	Bangladesh	Flood	141	7,200,000

2-Aug	Nepal	Flood	132	5,500
5-Sep	**China**	**Earthquake**	**118**	**130,000**
24-May	**Brazil**	**Flood**	**116**	**24,300**
9-Oct	**Venezuela (Bolivarian Republic of)**	**Landslide**	**106**	**64,000**
19-Dec	United States of America (the)	Storm	98	N/A
5-Feb	**Madagascar**	**Storm**	**92**	**112,115**
23-Jul	Iran (Islamic Republic of)	Flood	92	126,775
October	Mozambique	Flood	88	78,173
23-Jul	Yemen	Flood	77	175,000
25-Dec	Philippines (the)	Flood	70	600,000
30-Jun	India	Landslide	67	N/A
2-Dec	Malawi	Storm	64	945,728
11-Mar	**Mozambique**	**Storm**	**63**	**736,015**
August	India	Flood	63	800,000
November	Malawi	Flood	62	94,000
20-Feb	Bolivia (Plurinational State of)	Flood	60	375,000
22-Jan	**Madagascar**	**Storm**	**55**	**131,555**
17-Aug	China	Flood	52	6,200
9-May	China	Flood	48	N/A
1-May	Guatemala	Flood	48	2,890,000
30-Jun	Afghanistan	Flood	44	N/A
1-Sep	Benin	Flood	44	73,000
14-Aug	Algeria	Wildfire	44	6,518
21-Jun	Pakistan	Earthquake	43	N/A
26-Jul	United States of America (the)	Flood	42	475
March	Ecuador	Flood	40	26,663
24-Jan	**Mozambique**	**Storm**	**38**	**185,429**
1-Jan	Brazil	Flood	35	3,000
24-Oct	Bangladesh	Storm	35	1,000,000
17-Jan	Madagascar	Flood	34	62,112
24-Jan	Colombia	Landslide	34	N/A
16-Dec	Malaysia	Landslide	33	94
29-Nov	Brazil	Flood	32	17,500
17-Nov	Congo (the Democratic Republic of the)	Flood	32	N/A

The Charter covered 15 of the 50 most severe natural disasters in terms of fatalities recorded by EM-DAT in 2022, excluding droughts and extreme temperature events.

For these 15 disasters, activation requests were made by:

- Charter Authorised Users (AUs) for disasters in their home countries: One activation for an earthquake in China, two for floods in Brazil, two for storms in Madagascar, one for a flood in South Africa, and one for a flood in Venezuela.
- Activations from Charter Cooperating Bodies: Activations requested by UNITAR/UNOSAT were the storm in Mozambique, storm in the Philippines, earthquake in Afghanistan, and the flooding in Pakistan. The earthquake in Indonesia was requested by Sentinel Asia (ADRC).

The Charter continues to make progress with its Universal Access (UA) initiative by granting Charter access to new countries globally each year (refer to chapter 5.2).

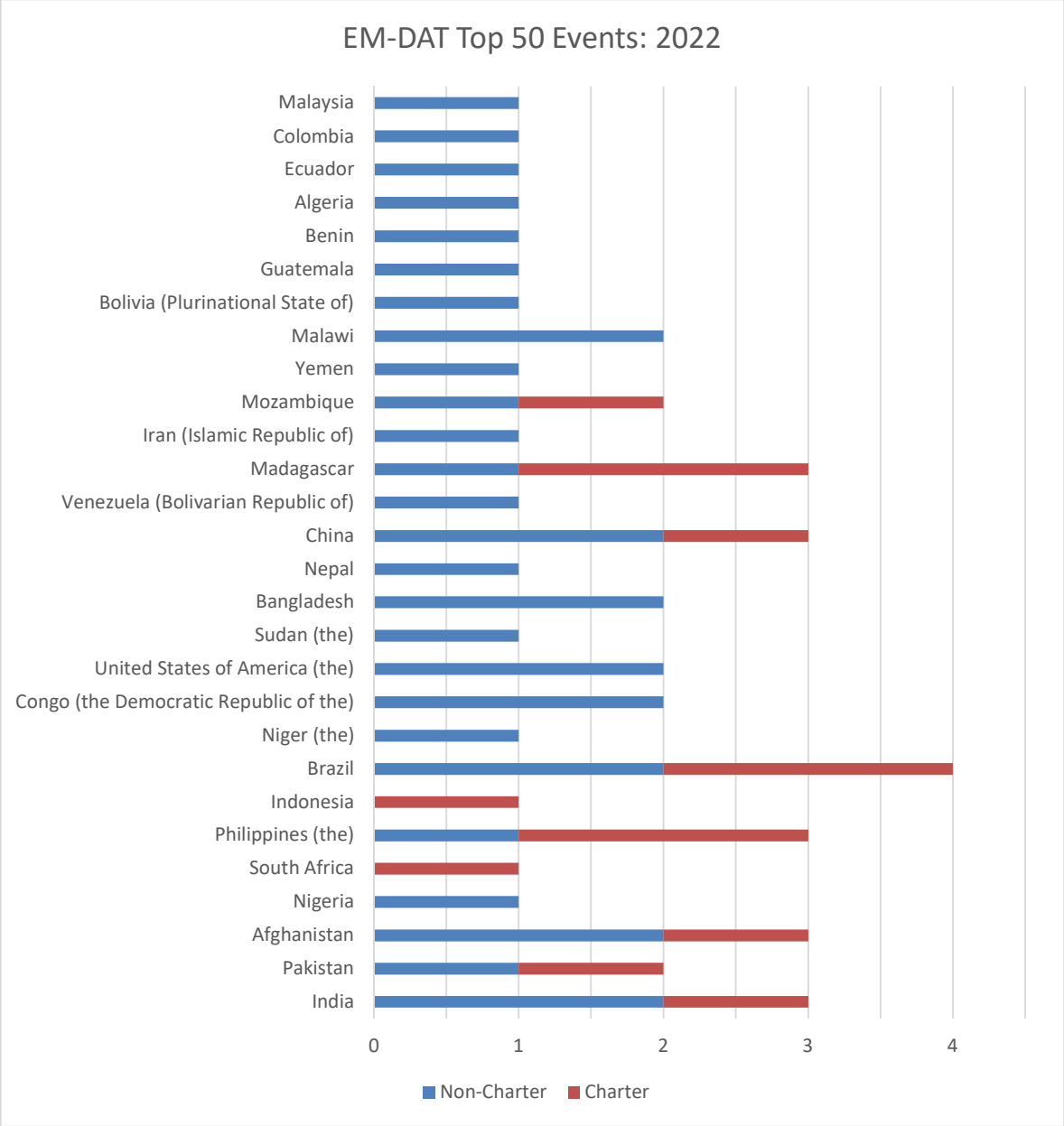


Figure 40. 2022 breakdown by country of the 50 most severe natural disasters (by fatalities) recorded by EM-DAT. Disasters covered by the Charter are shown in red (15 out of 50 disasters).

4.1 System performances assessment

Up to 2016, system performance statistics were gathered and calculated manually. Also, all metrics were calculated with an accuracy of days instead of hours, which sometimes generated huge error margins.

The COS-2 operational system, implemented in March 2015, helps to improve the speed and visibility to all Charter members of some operations and exchanges among the different operational staff involved during the activation. Since September 2017, COS-2 systematically monitors the Charter workflow and most of Charter performance parameters will be generated automatically.

Since 2018, an automated monitoring system is used, where all system performances can be calculated with a higher accuracy (hours and minutes). The automated monitoring system is operational with more than thirty statistic parameters being generated automatically.

4.1.1 Delivery of the first image

The two plots below (Figure 41 and Figure 42) show the performance in the delivery of the first image (split by pre-crisis – green – and crisis – blue –).

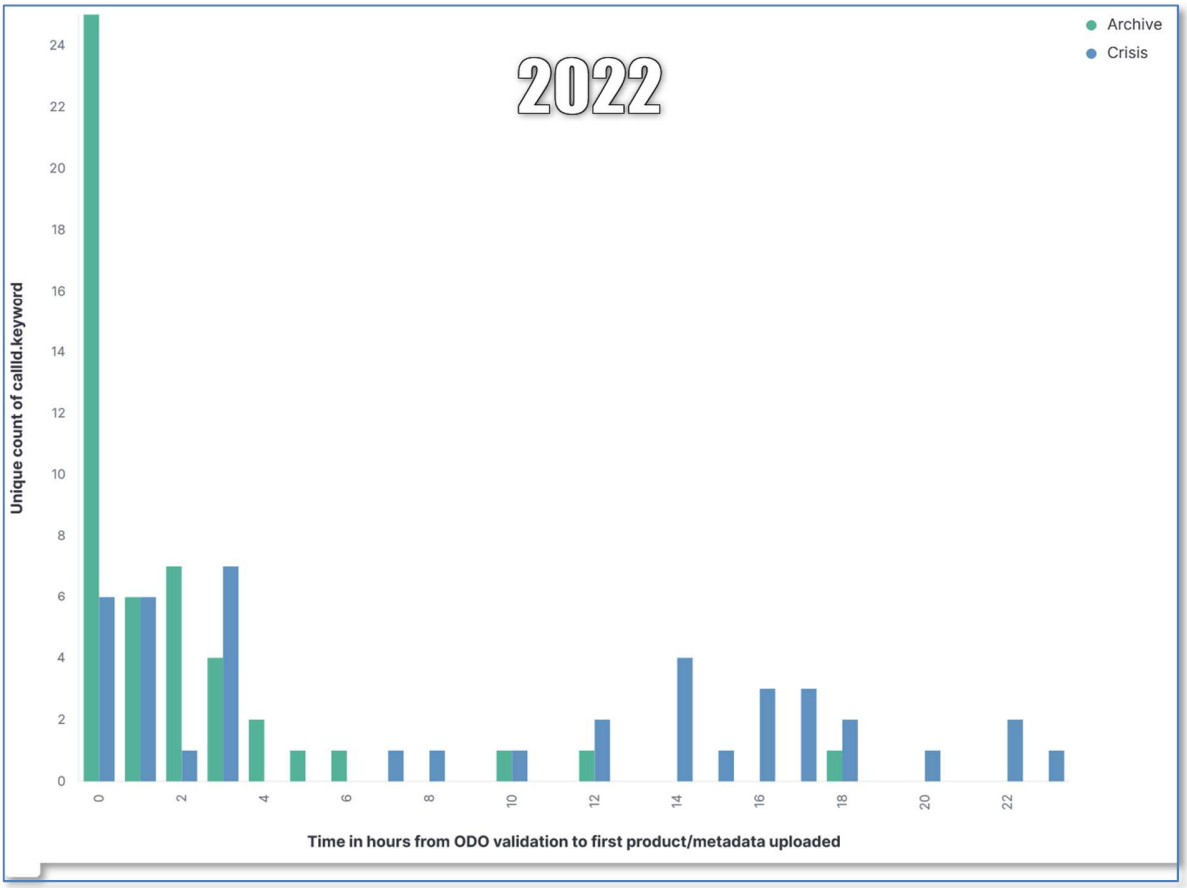


Figure 41. 2022 Delivery time of first image

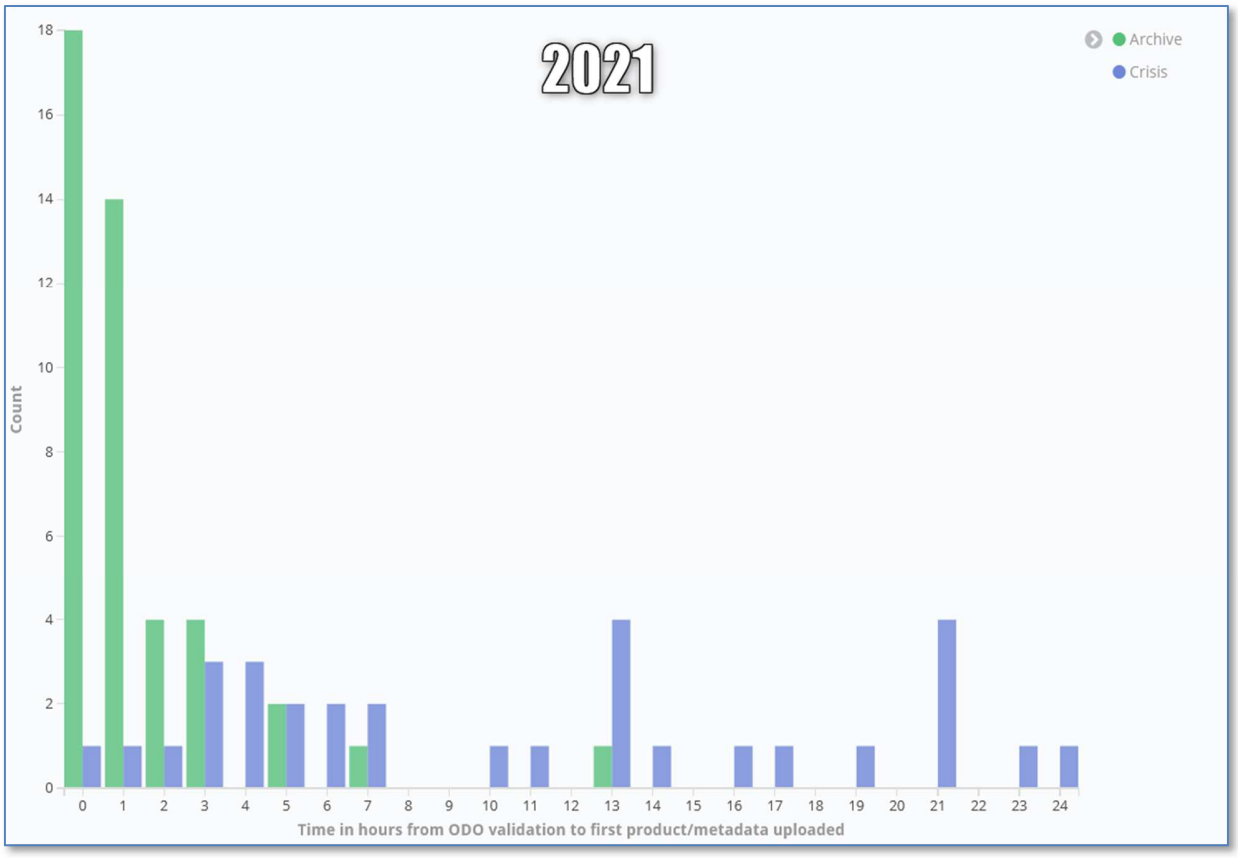


Figure 42. 2021 Delivery time of first image

Most of the calls have a relatively high performance for the delivery of the first archive image, as shown in Figure 41. In Figure 42, we see a slight improvement vs. 2021 performance.
Regarding the crisis image, we can note a stronger improvement in the timeliness, with 20 activations where the data was provided within 4 hours. It is interesting to note that there is always a gap for 13-14 hours before the images will start to flow again.

4.1.2 First image provided vs used

The first image provided is Sentinel-2, as it was for 2021 (the real value is around 50). This is due to the fact that COS-2 is automatically searching in the Copernicus catalogue for archived scenes over the area of interest. Thus in the plots below, we have removed Sentinel 2 from the provided satellites.
It is very interesting to note that the distribution between the 1st image provided and the 1st image used is very different.
The first 4 images used are always Sentinel-2, Pleiades, Sentinel-1, and RCM, but in a different order than in 2021. Interesting to see that Pleiades and RCM, which are never provided as the first image, are often used for the first value added product.

Please note that only items with a real product provided (uploaded in COS-2 or by a link) are considered in the following plots.

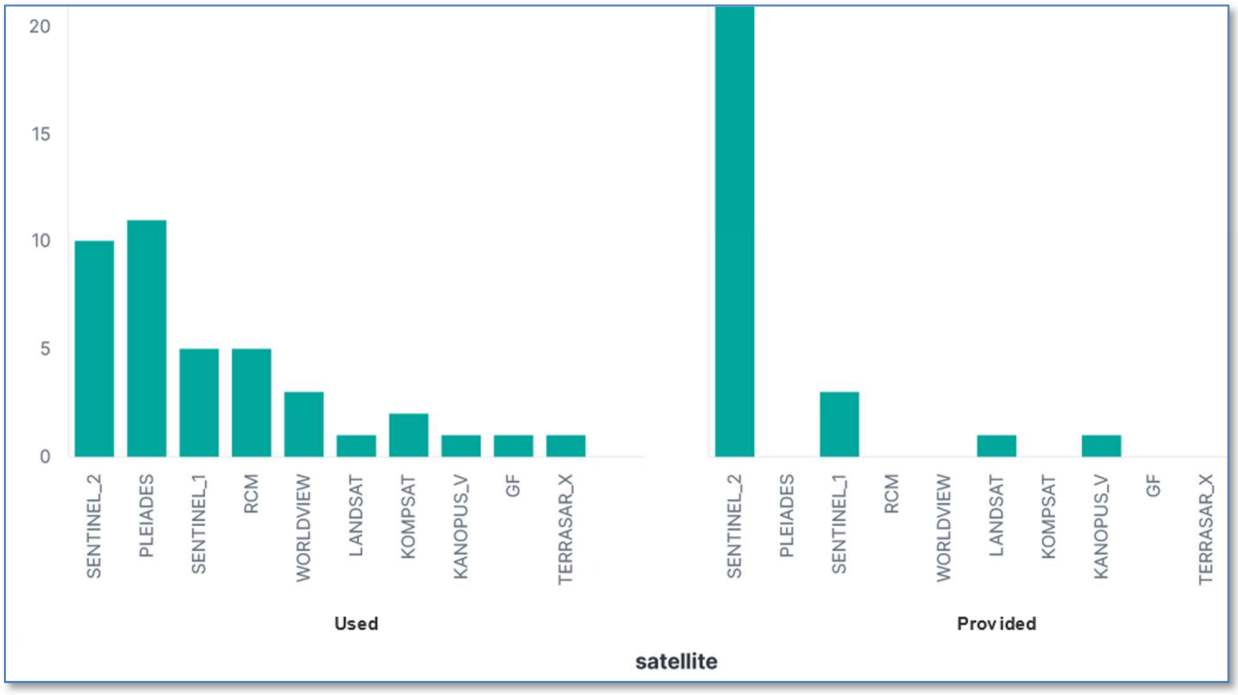


Figure 43. 2022 First image provided vs. used

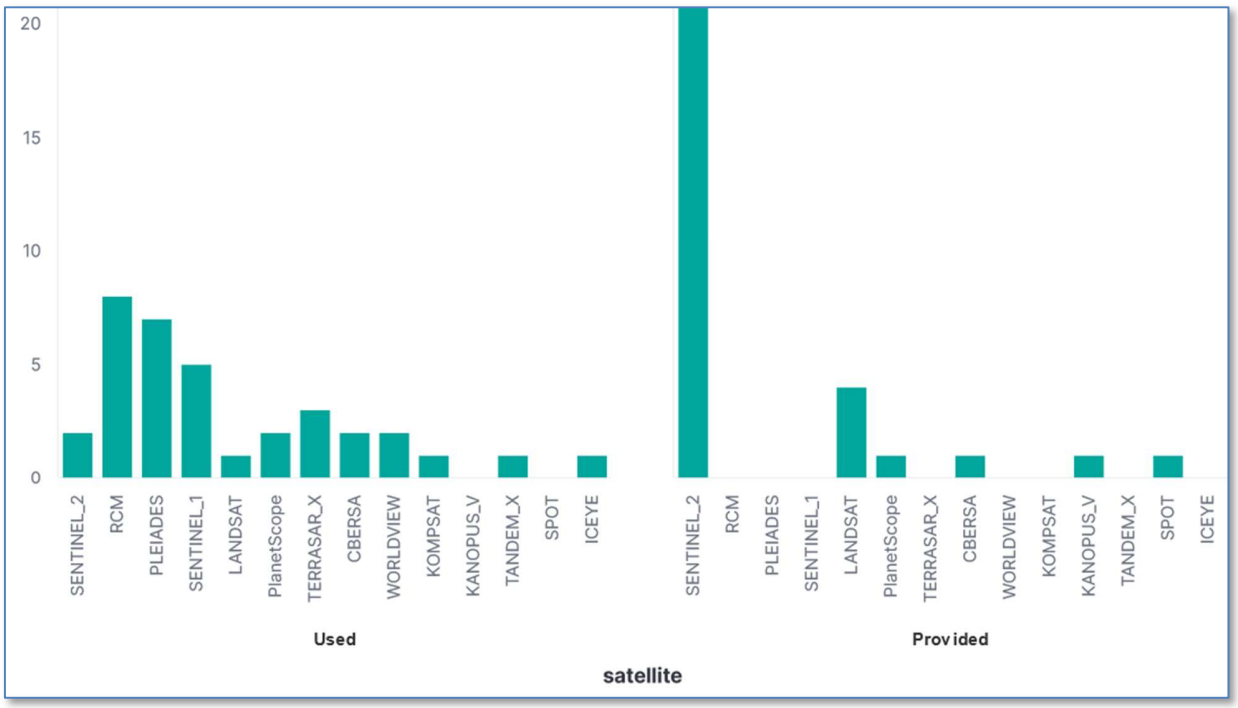


Figure 44. 2021 First image provided vs. used

Optical satellites were preferred over radar in 2022, with 28 first-image used vs. 11 for radar.

4.1.3 Call performance

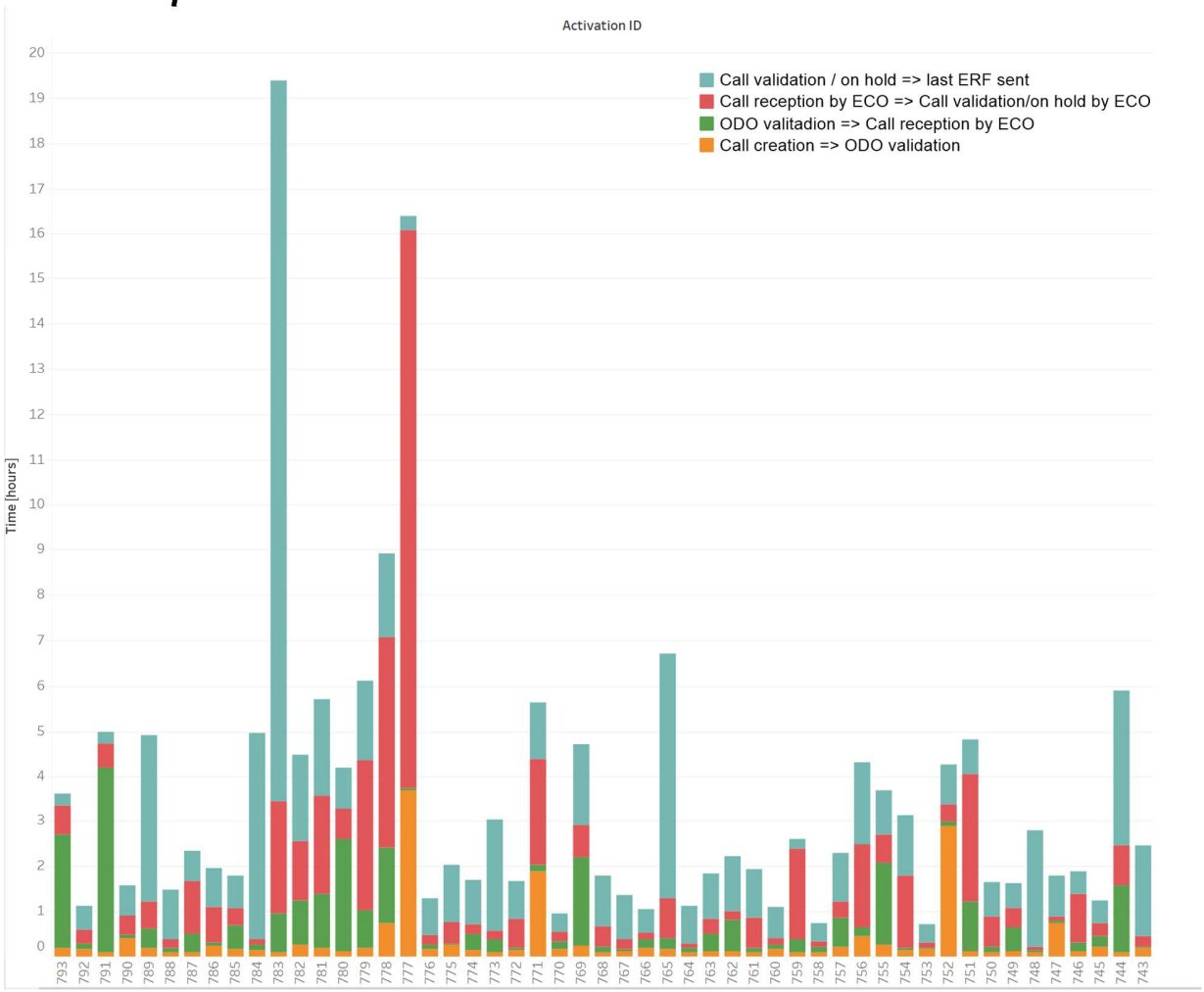


Figure 45. Call performance: time needed for sending all ERFs from call reception

On average, calls are handled within 2 hours from their activation. In 2022, we observed few cases where this timing was largely exceeded. In the case of the first (Activation-783 - Storm & Hurricane and Flood in Lao People’s Democratic Republic) the AU was only able to specify the areas one day later, in the second case (Activation-777 - Flood in Nigeria) there were communication issues with the AU. In both cases, the activation proceeded normally after these initial delays.

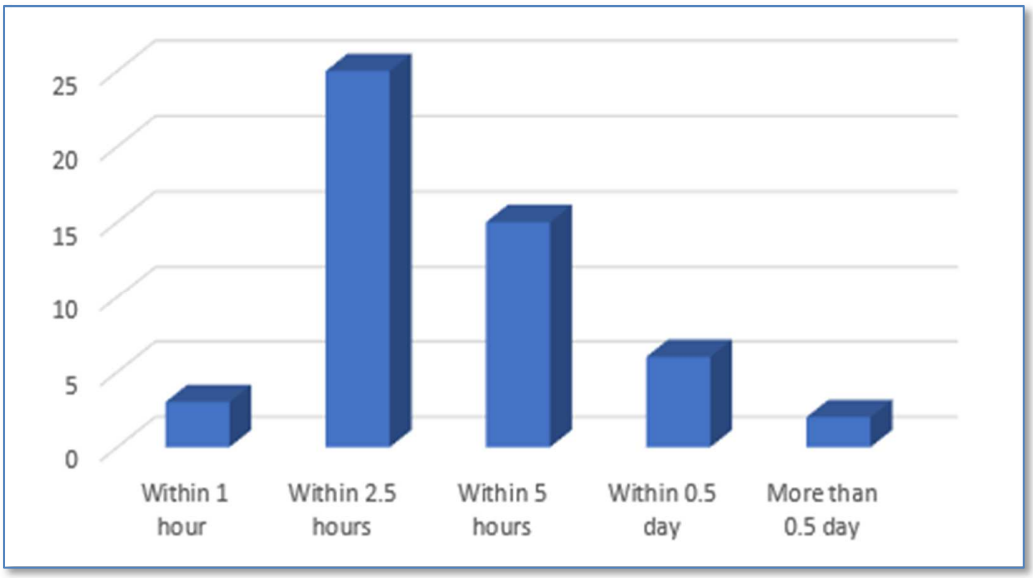


Figure 46. 2022 ECO performance: time needed for sending all ERFs, starting from call reception

The ECO completed their work within half a day for all the 2022 activations (except the 2 previously mentioned), normally within 2.5 hours (see Figure 46). This performance is similar to 2021 (see Figure 47).

In the worst case, the ECO acknowledged the call reception after 4.1 hours, in the best case: in 5 minutes from ODO sending.

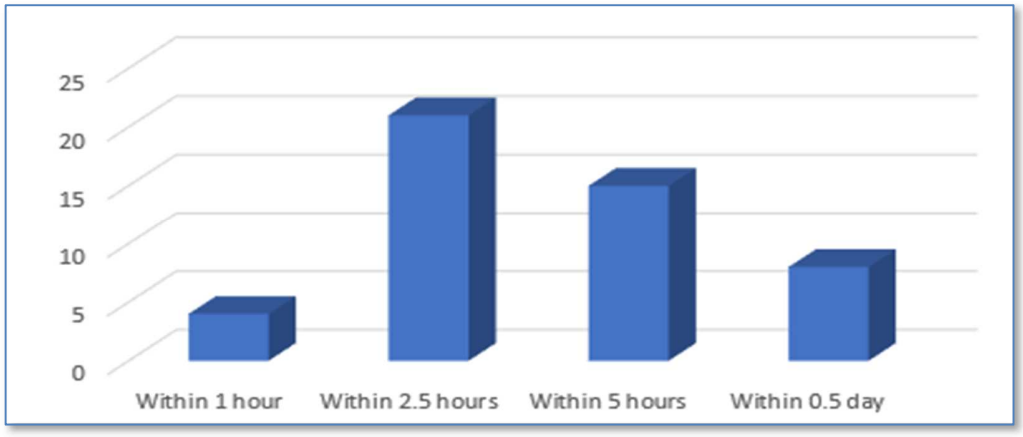


Figure 47. 2021 ECO performance: time needed for sending all ERFs, starting from call reception

The ECO completed their work within half a day for all the 2021 activations, normally within 2.5 hours (see Figure 47). Quite similar profile to 2020. Events in anticipation are removed from this stat because there could be the decision to not immediately task the satellites.

In the worst case, the ECO acknowledge the call reception after 3.2 hours, and the best in 5 minutes.

4.1.4 PM/VA performances

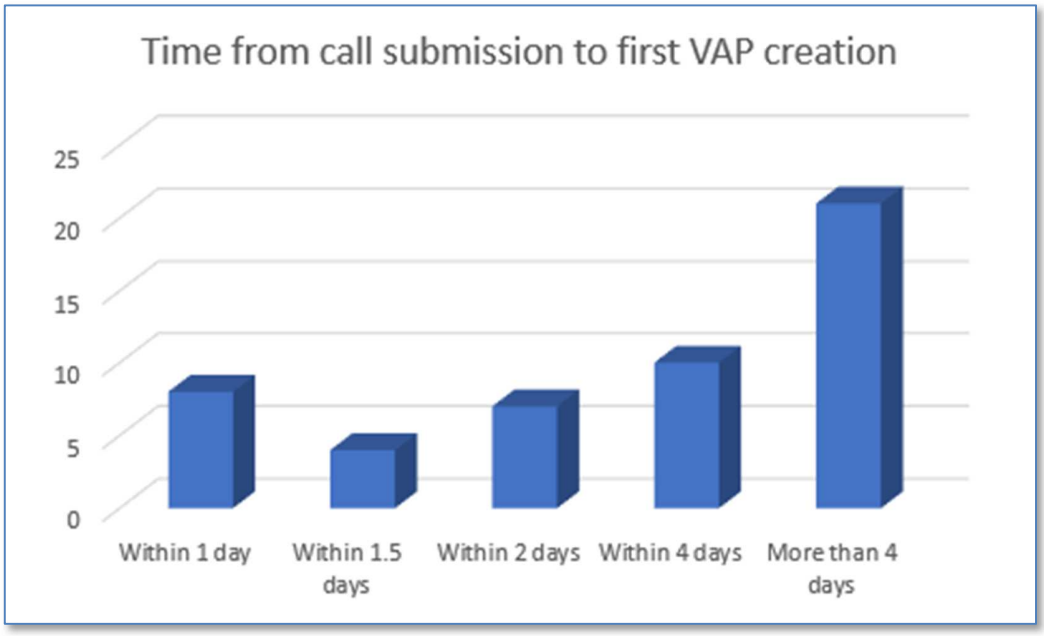


Figure 48. Value-Added Product delivery 2022

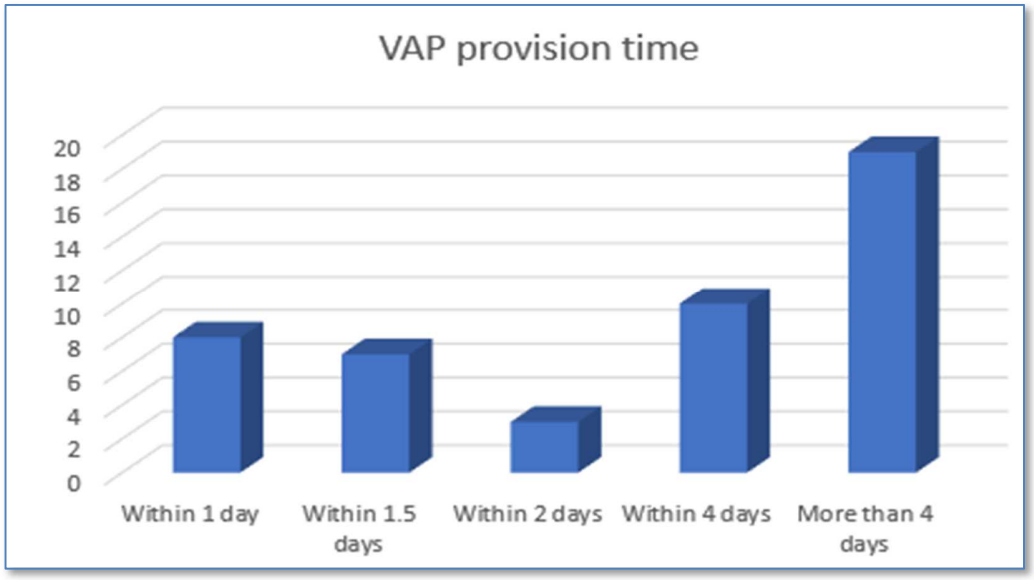


Figure 49. Value-Added Product delivery 2021

The first Value-Added Product was provided within 1 day for 8 activations. The most common case was more than 4 days. These values are taken from the PM Reports, where the PM reports when the VAP has been really sent to the End User, but very often the time of the upload in COS-2 is left blank, which could be longer. Results are very similar to 2021.

4.2 Assessment of products & services

The members of the Charter make a constant effort to ensure that all relevant staff (ODO, ECOs, the member agencies’ order desks, the PMs, and the Executive Secretariat members) are well trained, and that Charter operations are running smoothly in every circumstance:

The different Charter scenarios describing the most appropriate response for the different disaster types, such as flooding, ocean storms, earthquakes, volcanic eruptions, etc. and the definition of new scenarios (e.g., tsunami, explosion) are regularly reviewed by the Charter’s Executive Secretariat, taking into account every modification in the Charter satellite constellation, as well as recommendations by the ECOs and PMs. The objective is to offer optimal background procedures and to make the work of the ECOs and the PMs as efficient and easy as possible. In 2022, we started a discussion for a major update aimed to provide more appropriate data for the different scenarios. Resolution is the key: if the item to be detected is rather small, medium and low resolution data are essentially useless and can unnecessarily overwhelm the PM/VA in the data selection.

In addition to the systematic review of the PM training material, an online PM refresher training course is available to keep PMs up to date on new members, additional satellites, and updated Charter processes.

Although the Charter’s mandate is limited to supplying satellite data quickly and at no cost, Charter members invest a significant amount of effort and resources in providing crisis mapping and damage assessment for most of the Charter activations.

5. Collaborations and External relations

5.1 New members accession

The Charter is a group of 17 members since 2018. No new members have been integrated since 2018.

5.2 Universal Access

In order to improve Charter access globally, the Charter launched its Universal Access (UA) initiative in 2012. UA allows any national disaster management authority to become a Charter Authorized User (AU) and to submit requests to the Charter for support in the case of a major emergency. Some basic conditions must be met to become a Charter AU, and a procedure has to be followed which includes a training session. The UA process is designed to allow the charter to achieve greater impact in the management of disasters worldwide and is being implemented gradually. See https://disasterscharter.org/web/guest/how-to-register-as-a-user for more information.

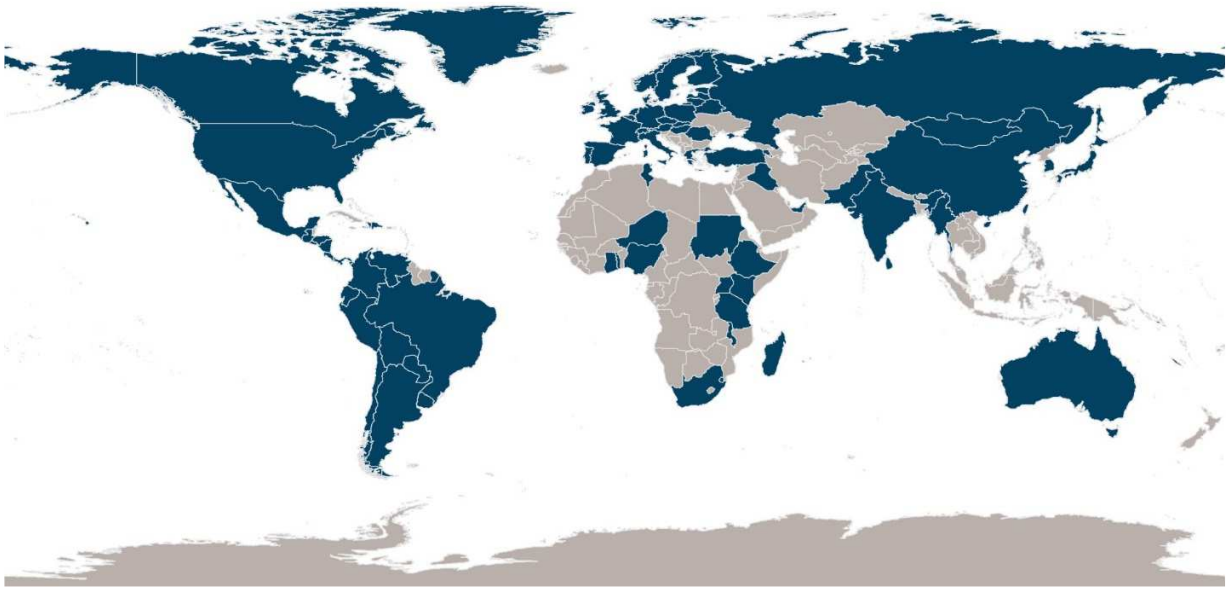


Figure 50. Map showing all countries (in dark blue) with direct access to the Charter as of March 2023

Today, there are 94 Authorized Users in 83 different countries. Universal Access is progressing, with the result of more and more national disaster management agencies being granted AU status:

- Australia in 2013,
- Malawi and Pakistan in 2014,
- Bolivia, Chile, Colombia, and the Dominican Republic in 2015,
- Belarus, El Salvador, Guatemala, Iraq, and Uruguay in 2016,
- Ecuador, Myanmar, New Caledonia, and Sri Lanka in 2017,
- Madagascar, Paraguay, Peru, and Sudan in 2018,
- Eswatini, Ghana, and Tunisia in 2019,

- Cayman Islands, Costa Rica, Ethiopia, Haiti, Tanzania, Togo, Trinidad & Tobago in 2020,
- Uganda, Armenia, Cameroon, Gambia, Mexico, Mongolia in 2021.
- South Africa, Panama, Honduras, Niger, Nicaragua, Kenya and Solomon Island in 2022.

The Charter continues its efforts for promoting the Universal Access policy. Moreover, the Charter frequently offers refresher trainings for Authorized Users with the main focus on activating the Charter via the web-based operational system of the Charter (COS-2).

5.3 Cooperating Bodies

5.3.1 Cooperation with UNOOSA

Active cooperation with UNOOSA has been continuing for many years. In a report in 2020 UNOOSA described its activities to support the Charter, mainly through its programme UN-SPIDER. It was reported that the UNOOSA raised awareness about the Charter in several conferences or events addressing disaster managers and Earth observation experts in Africa, Asia, Europe, Latin America and the Caribbean, as well as within the UN-SPIDER communication channels (Knowledge Portal, monthly UN-SPIDER Updates, etc.).

In particular, the Charter’s Universal Access (UA) initiative has been promoted. Disaster management authorities from several countries have been engaged to get in touch with the Charter. Others are in the process that includes a training that helps understand which sorts of emergencies are covered by the Charter, how an activation is triggered, and what information is crucial for the Charter to be able to support its users in the case of a major emergency caused by a disaster.

Together with the International Charter and other partners, UN-SPIDER organized two simulations to promote the use of the Charter in case of large disasters:

- A simulation of an activation in case of earthquakes was carried out with CEPREDENAC as part of the exercise organized by Guatemala`s CONRED in the first week of February 2022. The simulation benefited from the provision of satellite imagery donated by ROSCOSMOS and INPE, which was processed by the project manager from Guatemala with the support of value-added providers from Mexico and other Central American countries.
- Another simulation of an activation was carried out in Nigeria as part of the *UN-SPIDER/NASRDA/ZFL Interinstitutional Workshop: “The Use of Space-Based Information for Flood Response and Early Warning”*. This workshop was held in Abuja, Nigeria from 12 to 14 September 2022 and addressed interinstitutional coordination to respond to very large floods in Nigeria. The workshop included a simulation of very large floods in the two main rivers of Nigeria (Benue and Niger) and an expert from NASDRA played the role of the project manager. He benefited from value-added services provided by experts from Terradue of Italy (developer of the Charter Mapper), NADMO-Ghana and ZFL of the University of Bonn in Germany.

The cooperation between Charter and UNOOSA was highlighted and detailed in statements and presentations during several international events and conferences. Every opportunity was used by UNOOSA staff to raise awareness of the opportunities offered by the Charter and particular the Universal Access initiative.

In other global or regional events, UNOOSA also presented the benefits of the UA initiative:

- CDEMA Technical Advisory Council (TAC) conference, 29. April 2022
- UN-SPIDER Technical Advisory Mission to Armenia, 27 June to 1 July 2022
- Regional Workshop on Assessing Drought Risks using Earth Observation Data, Ahmedabad, India, 31 August to 2 September 2022
- UN-SPIDER Technical Advisory Mission to the Philippines, 27 June to 1 July 2022

Nine Charter activations were triggered by UNOOSA on behalf of national disaster management authorities under the “Universal Access Trial” agreement (see below) between the Charter and UNOOSA.

- In January 2022, an activation was triggered by UNOOSA/UN-SPIDER on behalf of National Institute for Disaster Risk Reduction of Mozambique (INGD) and UNOOSA/UN-SPIDER on behalf of the Department of Disaster Management Affairs of Malawi due to Tropical storm Ana;
- In January 2022, an activation was triggered by SERVICIO NACIONAL DE GESTIÓN DE RIESGOS Y EMERGENCIAS (SNGRE) due to Flooding in Ecuador. UN-SPIDER contributed to the designation of a project manager for this activation;
- In March 2022, an activation was triggered by UNOOSA/UN-SPIDER on behalf of National Institute for Disaster Risk Reduction of Mozambique (INGD) due to Cyclone Gombe in Mozambique;
- In April 2022, an activation was triggered by UNOOSA on behalf of Philippines Space Agency (PhilSA) on behalf of National Disaster Risk Management Council (NDRRMC) due to Tropical Storm Megi in the Philippines;
- In August 2022, an activation was triggered by UNOOSA/UN-SPIDER on behalf of Philippines Space Agency (PhilSA) on behalf of National Disaster Risk Management Council (NDRRMC) due to Tropical Storm Ma-On in the Philippines;
- In September 2022, an activation was triggered by COPECO due to Flood in Honduras. UN-SPIDER contributed to the designation of a project manager from the National Centre for Disaster Management of Brazil (CEMADEN) and a VAP from Federal University of Santa Maria in Brazil;
- In September 2022, an activation was triggered by UNOOSA/UN-SPIDER on behalf of National Emergency Commision of the Dominican Republic due to Hurricane Fiona in the Dominican Republic;
- In September 2022, an activation was triggered by UNOOSA/UN-SPIDER on behalf of Philippines Space Agency (PhilSA) on behalf of National Disaster Risk Management Council (NDRRMC), Office of Civil Defense and ADRC on behalf of AHA Center due to Typhoon Noru in the Philippines;
- In October 2022, an activation was triggered by UNOOSA/UN-SPIDER on behalf of Philippines Space Agency (PhilSA) on behalf of National Disaster Risk Management Council (NDRRMC) due to Tropical Storm Nalgae in the Philippines.

In most of these cases, UNOOSA also assisted the Charter in finding a Project Manager with the help of the network of Regional Support Offices of UNOOSA’s UN-SPIDER program.

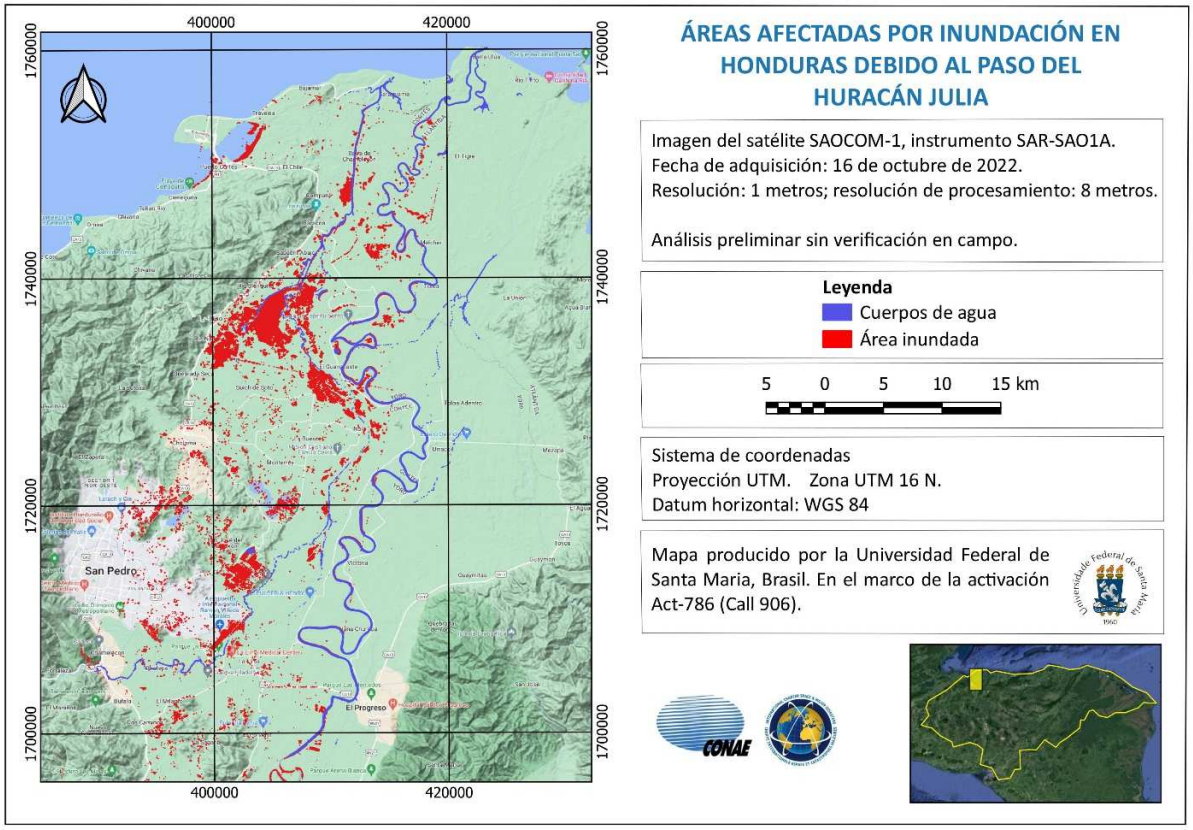


Figure 51. Example of a map produced by Federal University of Santa Maria, Brazil.: Flooded areas (red) in Honduras after Hurricane Julia in October 2022.

In early 2018, a “Universal Access Trial” mechanism was agreed between the Charter and UNOOSA, allowing UNOOSA to elevate requests for activation of the Charter on behalf of disaster management authorities in countries that are not yet Charter Authorized Users (AUs), and using these activations as an opportunity to encourage these authorities to become Charter AUs following the emergency.

5.3.2 Cooperation with UNITAR/UNOSAT

Active cooperation with UNITAR/UNOSAT has been in place for many years. UNOSAT has continued to raise awareness about the Charter among its user community and other relevant stakeholders. The operational rapid mapping service is one of UNOSAT’s key activities and creates added value to information for actors in the field and at headquarters. Since late 2019, UNOSAT has experienced an increase in the number of requests to trigger the Charter.

Fifteen Charter activations were triggered by UNITAR/UNOSAT in 2022 which comprises a significant portion of the overall Charter activations:

- In January 2022, an activation was triggered on behalf of UNOCHA/Regional Office for Asia and the Pacific due to Volcanic eruptions in Tonga and the Pacific.
- In January 2022, an activation was triggered on behalf UNOCHA/Regional Office West and Central Africa (ROWCA) due to Flooding in Sao Tome and Principe.
- In February 2022, an activation was triggered on behalf of UNOCHA/Regional Office for Southern & Eastern Africa due to Tropical Cyclone Batsirai in Madagascar.
- In June 2022, an activation was triggered on behalf of UNOCHA/Regional Office West and Central Africa (ROWCA) due to an oil spill in Gambia.
- In June 2022, an activation was triggered on behalf of The United Nations Disaster Assessment and Coordination (UNDAC) due to Fire in Afghanistan.
- In June 2022, an activation was triggered on behalf of UNOCHA/Regional Office for Asia and the Pacific due to Flooding in Bangladesh.
- In June 2022, an activation was triggered on behalf of UNOCHA/Regional Office for Asia and the Pacific due to Earthquake in Afghanistan.
- In July 2022, an activation was triggered on behalf UNOCHA due to an Earthquake in the Philippines.
- In August 2022, an activation was triggered on behalf UNOCHA/Regional Office for West and Central Africa due to Flood in Gambia.
- In August 2022, an activation was triggered on behalf of UNOCHA/Regional Office for Asia and the Pacific due to Flood in Pakistan.
- In September 2022, an activation was triggered on behalf of UNOCHA/Regional Office for Asia and the Pacific due to Typhoon Noru in Laos.
- In October 2022, an activation was triggered on behalf of UNRCO Thailand due to Typhoon Noru in Thailand.
- In October 2022, an activation was triggered on behalf of UNOCHA due to flooding in Chad.
- In November 2022, an activation was triggered on behalf of International Federation of Red Cross and Red Crescent Societies (IFRC) due to Earthquake in Indonesia.
- In December 2022, an activation was triggered on behalf of United Nations Environment Programme due to an oil spill in Mauritius.

UNOSAT staff members supported the Charter by providing value-added products based on the satellite images made available by the Charter for all the activations listed above.

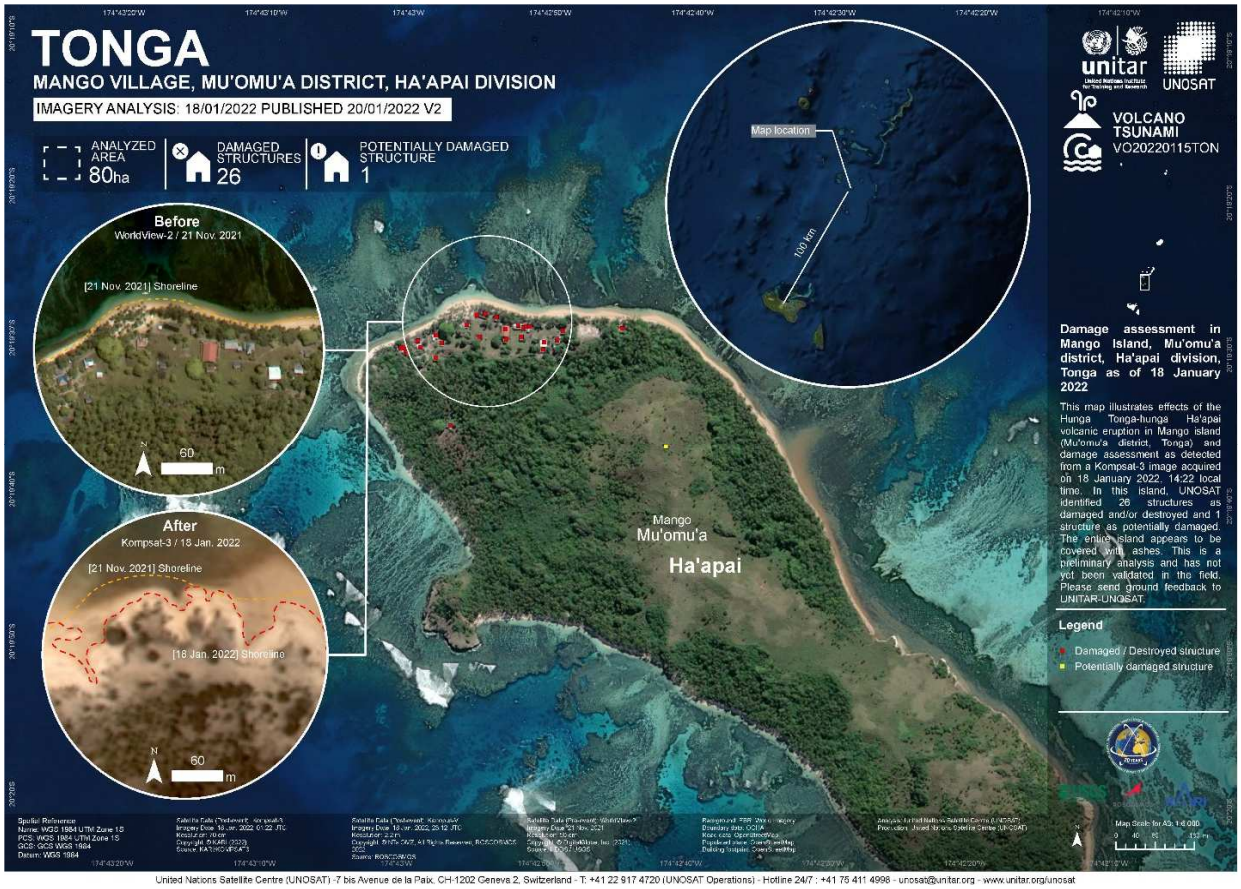


Figure 52. Damage assessment map in Mango Island, Mu'omu'a district, Ha'apai division, Tonga on January 18th, 2022, delivered by UNITAR/UNOCHA in support of the Charter activation concerning the Volcanic eruption in Tonga and the Pacific on January 15th, 2022.

5.3.3 Cooperation with Sentinel Asia

The Asian Disaster Reduction Center (ADRC) has the status of Charter Cooperating Body, allowing it to be able to trigger the Charter in support of requests from national members of Sentinel Asia (SA) and ADRC. By the end of 2022, SA was comprised of 112 organizations from 36 countries and regions and 17 international organizations.

JAXA provides the Charter with monthly activation status reports as well as two bi-annual reviews presenting SA’s emergency response and promotional/awareness activities. At the 48th on-line Charter Board meeting, ADRC reported on their activities including coordinating escalations of SA activations to the Charter and expressed their intent to continue contributing as a hub facility bridging space agencies and disaster management organizations. In 2022, 28 activations were handled by SA. Among these, the escalation mechanism to the Charter was used in response to 6 events:

- Mount Bulusan volcanic eruption in the Philippines in June 2022
- Earthquake in the Philippines in July 2022
- Typhoon Noru in the Philippines in September 2022
- Flooding continues after Tropical Storm Noru in Thailand in October 2022
- Earthquake in Indonesia in November 2022
- Semeru volcano in Indonesia in December 2022

Despite the fact that several SA member countries have become Charter Authorized Users to be entitled to trigger a Charter activation directly, Sentinel Asia’s escalation mechanism is still beneficial in th satellite resources of Sentinel Asia and the Charter are different, and the Sentinel Asia community provide PM and VA in case of Sentinel Asia’s escalation.

JAXA, ES responsible for SA, continued to promote the Charter, explaining the escalation mechanism to activate the Charter and the Charter’s Universal Access policy on several occasions. In addition, JAXA has contributed to increasing Project Manager (PM) resources and to maintaining PM skills, especially for the purpose of making escalations from SA to the Charter effective and beneficial to the SA member countries and regions where disasters occur. Another goal of these efforts is to have trained PMs in SA member countries with a Charter Authorized User for coordinated responses within the country in case of a Charter activation.

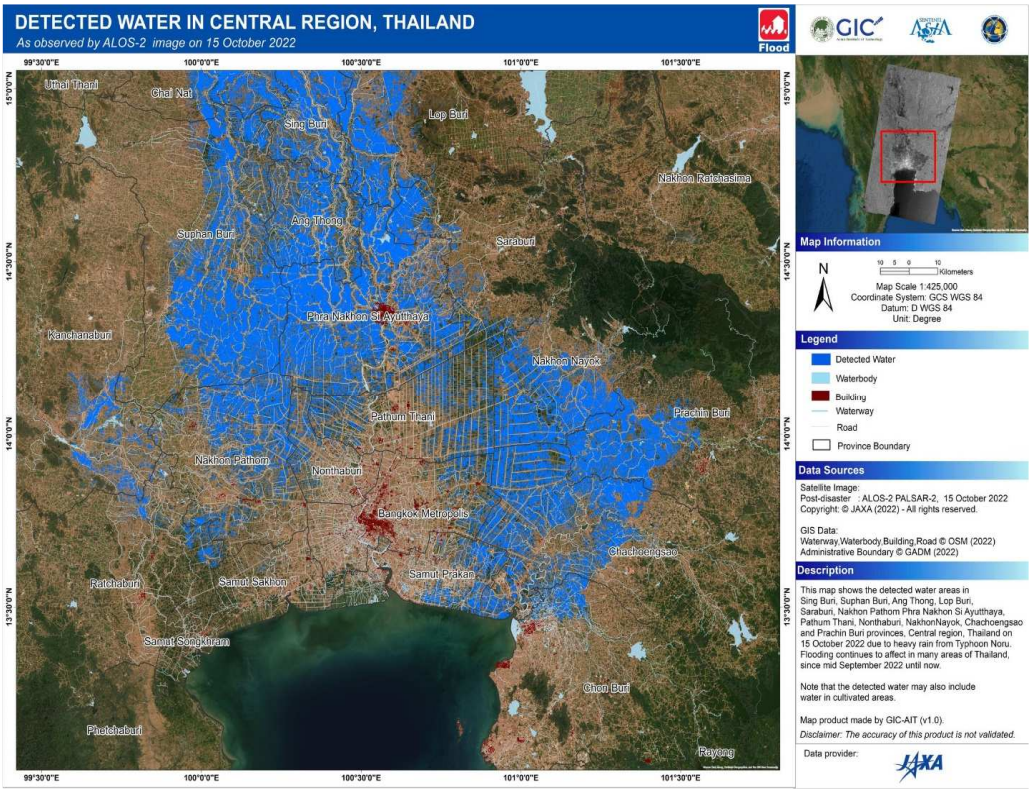


Figure 53. Example of a map produced by GIC-AIT, showing water areas (blue) in Central Region, Thailand on 15th October 2022 after heavy rain from Typhoon Noru.

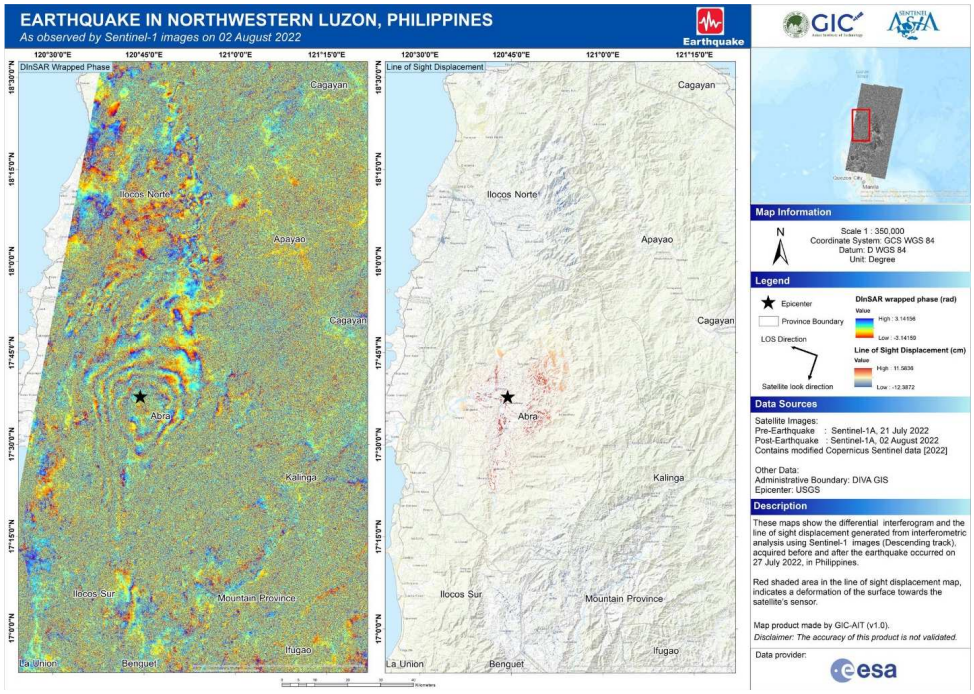


Figure 54. Example of a map produced by GIC-AIT showing a Sentinel-1 Interferogram and detected Line-of-Sight displacements after an earthquake on the Philippines on July 27th 2022.

5.4 Cooperation with other programs and initiatives

5.4.1 Cooperation with the Copernicus Emergency Management Service of the European Union

The Charter and the Copernicus Emergency Management Service (CEMS) are complementary with a slightly different scope: the Charter is strictly focused on the response phase during a major emergency caused by a natural or technical disaster, while the CEMS is intended to provide support for the response and recovery phases of the emergency management cycle within and outside Europe. However, significant overlap exists between the Charter and the CEMS Rapid Mapping Service. Therefore, collaboration is mutually beneficial and has taken place on numerous occasions in the past.

In April 2018, the Charter and the CEMS finalised and agreed on procedures for collaboration, not only to avoid duplications, where possible, but also to leverage synergies. Since then, the Charter could substantially benefit from the mapping capacity of the CEMS on a case-by-case basis, and the CEMS could, especially in cases of large-scale disasters, benefit from satellite data provided by the Charter. Collaboration can be triggered based on these procedures by either the CEMS or the Charter, with the goal to collaborate efficiently.

The new procedures were used for a few successful collaboration cases in the past years. In 2022, the Charter cooperated with CEMS during 6 activations with maps produced by the CEMS.

CEMS was granted access to the data of ongoing Charter activations in the following cases:

- Tsunami, Volcanic eruptions in TONGA in January 2022
- Flood (large area), Landslide in MADAGASCAR in January 2022
- Flood (large area), Storm & Hurricane (Rural area), Storm & Hurricane (Urban areas & Infrastructure) in MADAGASCAR, in February 2022
- Earthquakes in the PHILIPPINES, in July 2022
- Storm & Hurricane (Urban areas & Infrastructure) in the PHILIPPINES, in September 2022
- Storm & Hurricane (Urban areas & Infrastructure), Storm & Hurricane (Rural area) in CANADA in September 2022
- Earthquakes in INDONESIA, in November 2022

In 2022, the CEMS Rapid Mapping Service was activated 86 times. 54 of these activations were due to wildfires, the majority of which took place in European countries. Another 18 activations covered flood events, of which only three were in Europe (including the UK). CEMS was activated 7 times due to storms and four times following earthquakes. Volcanic activities and mass movement each caused one activation. Over the same time period, there were 4 Charter activations for disasters in Europe, two floods, one typhoon, and one wildfire. It can be concluded that demands in Europe are very successfully covered by the CEMS.

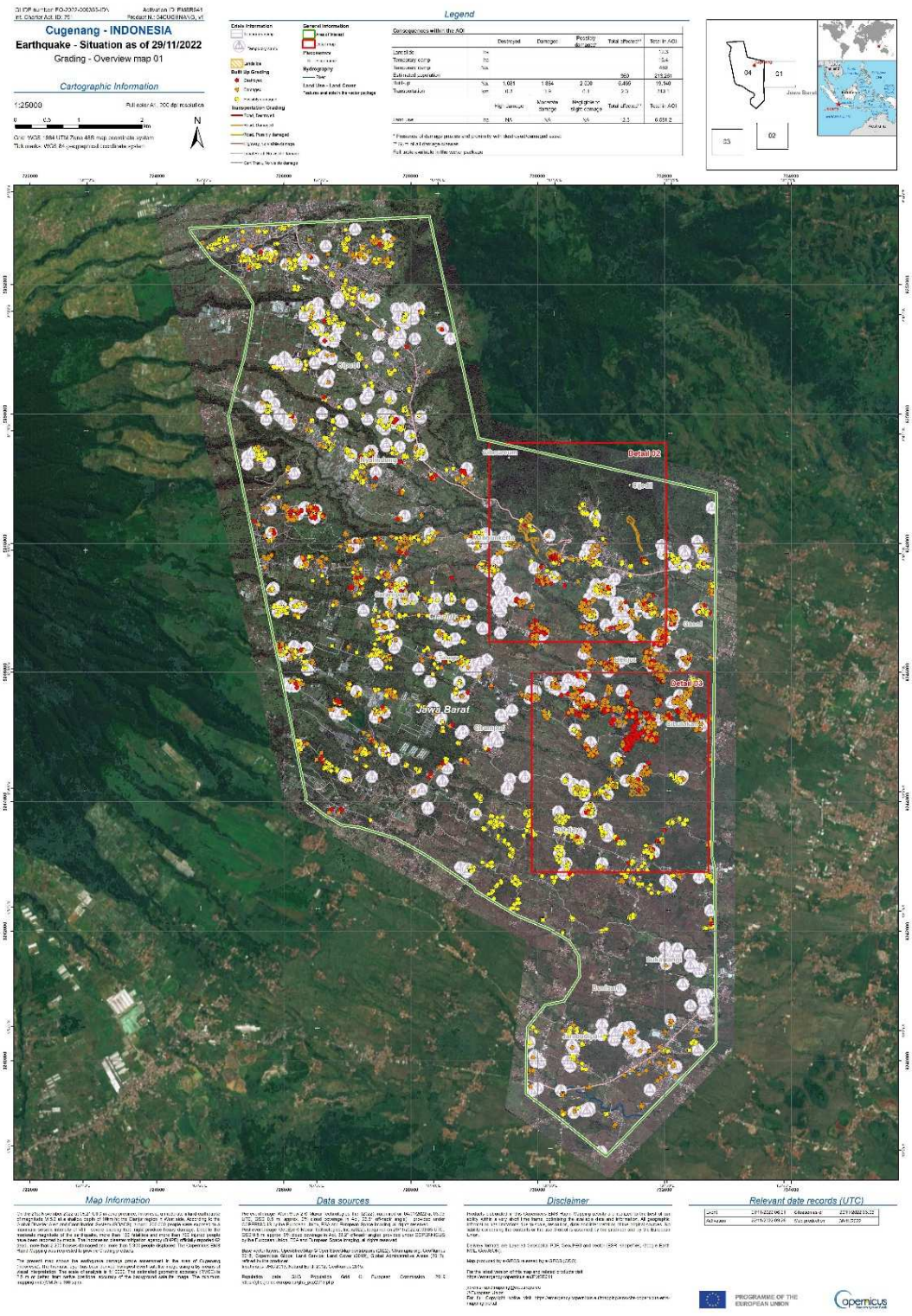


Figure 55. Example of a map produced by CEMS showing a damage grade assessment of the area Cugenang (Indonesia) after an earthquake of 5.6 M hit the Java province, Indonesia, on 21st November 2022.

5.4.2 Collaboration with CEOS Working Group on Disasters

The Committee on Earth Observation Satellites (CEOS) Working Group on Disasters aims at increasing and strengthening satellite Earth observation contributions to the various Disaster Risk Management (DRM) phases in different domains, such as earthquakes, volcanoes, and landslides (http://ceos.org/ourwork/workinggroups/disasters/). A number of thematic demonstrators intend to showcase the following:

- the added value and uniqueness of increased CEOS coordination in these thematic areas;
- the benefits of closer ties to users (decision makers, disaster management stakeholders, and politicians) and ease of access to data;
- the potential for the increased roles of space-based Earth observation under the Sendai Framework for Disaster Risk Reduction 2015-2030 of the United Nations.

In addition to demonstrator projects focusing on certain natural hazards, there is also a “Recovery Observatory” demonstrator focusing on the southwest of Haiti that was devastated by Hurricane *Matthew* in October 2016. The project demonstrated the potential and increased the contribution of satellite-based information to the recovery phase in the years after extreme catastrophic events.

Following an agreement established in 2015, once the peak of a Charter activation is passed, and access to Charter data is required from one of the CEOS demonstrators, Charter agencies may share the data collections acquired during an activation taking into account the respective data licenses. A procedure for requesting such collaboration was established. It was used several times since then by the CEOS group in order to be able to access data acquired by the Charter, e.g., for the area focused by the Haiti Recovery Observatory. More recently, observer access to COS-2 has been granted to lead scientists involved in the above-mentioned demonstrators, so they can more easily follow the status of activations of the Charter.

On 21.07.2022 the Charter Board approved the International Charter ‘Space and Major Disasters’ and CEOS Working Group Disasters Data and Product Exchange Procedures. This document addresses both the procedure for CEOS WGDisasters Projects to access Charter data as well as the procedure for WGDisasters projects to offer CEOS Partner products for Charter Emergency Response to specific Charter activations.

6. Communication

6.1 Website

The Charter website is available in English and some pages are available in Spanish, French, Chinese, Russian, and Portuguese. Other language versions are expected to be added in the near future. The website design is continuously improved to facilitate the user navigation and information search.

https://www.disasterscharter.org/web/guest/home

The Charter website allows direct access to COS-2 for authorized Charter members’ personnel and provides information on how the Charter can be activated by Authorized Users through the Universal Access initiative.

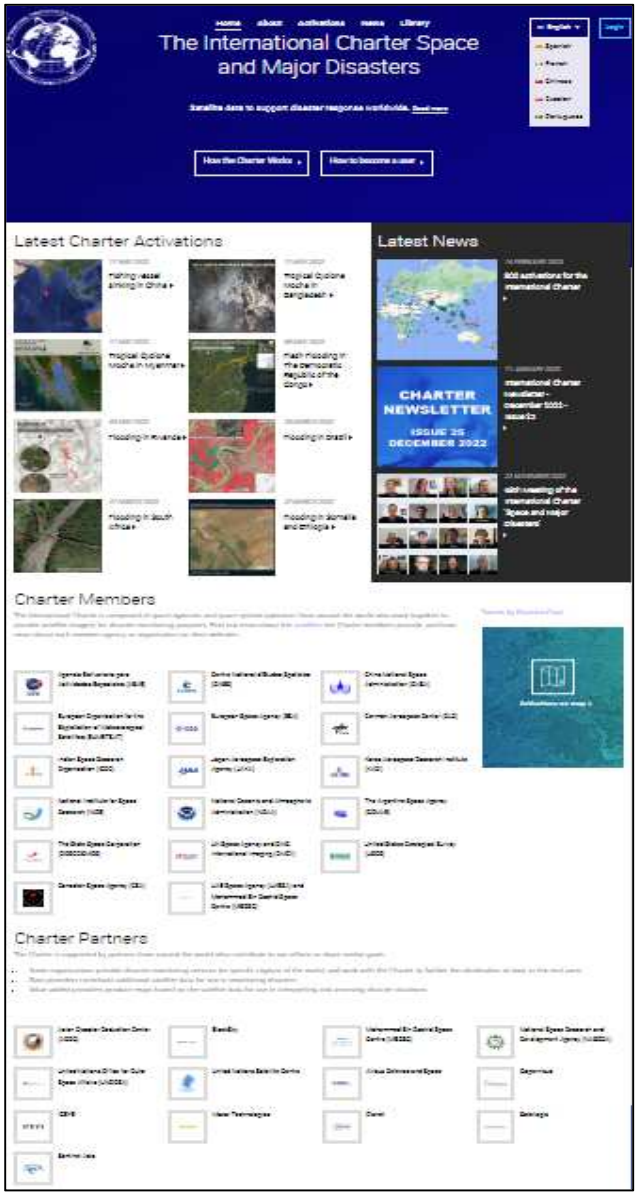


Figure 56. Charter website homepage

According to the Charter Website statistics in 2022 there were a total of 935,414 page views, with 223,380 views being unique (indicating many returning visitors). The most viewed pages (more than 10,000 views and unique views) were the home page, disaster types page and activations page. Average time spent on a page comprised approximately 77 seconds. Average bounce rate was 68%.

Table 14. Charter website main pages views (January-December 2022)

Page	Page Views	Unique Page Views	Avg. Time on Page	Bounce Rate	Exit Rate
https://disasterscharter.org/web/guest/home	49 129	34 805	29 056	56 seconds	https://disasterscharter.org/web/guest/home
https://disasterscharter.org/web/guest/disaster-types/-/article/fires	15 203	12 824	12 142	58 seconds	https://disasterscharter.org/web/guest/disaster-types/-/article/fires
https://disasterscharter.org/web/guest/charter-activations	15 060	9 867	8 658	49 seconds	https://disasterscharter.org/web/guest/charter-activations
https://disasterscharter.org/web/guest/disaster-types/-/article/landslides	5228	4498	4 288	59 seconds	https://disasterscharter.org/web/guest/disaster-types/-/article/landslides
https://disasterscharter.org/web/guest/about-the-charter	4862	3738	3 505	1 minute 23 seconds	https://disasterscharter.org/web/guest/about-the-charter
https://disasterscharter.org/web/guest/disaster-types/-/article/cyclones	3781	3245	3 085	1 minute 4 seconds	https://disasterscharter.org/web/guest/disaster-types/-/article/cyclones
https://disasterscharter.org/web/guest/how-the-charter-works	2450	1941	1 804	1 minute 38 seconds	https://disasterscharter.org/web/guest/how-the-charter-works
https://disasterscharter.org/web/guest/disaster-types/-/article/ice	1623	1387	1344	46 seconds	https://disasterscharter.org/web/guest/disaster-types/-/article/ice
https://disasterscharter.org/web/guest/library	2214	1369	1 227	2 minutes 5 seconds	https://disasterscharter.org/web/guest/library
https://disasterscharter.org/web/guest/how-to-register-as-a-user	1744	1367	1297	1 minute 25 seconds	https://disasterscharter.org/web/guest/how-to-register-as-a-user
https://disasterscharter.org/web/guest/disaster-types/-/article/volcanoes	1240	1111	1076	57 seconds	https://disasterscharter.org/web/guest/disaster-types/-/article/volcanoes
https://disasterscharter.org/web/guest/disaster-types/-/article/earthquakes	1268	1108	1065	1 minute 2 seconds	https://disasterscharter.org/web/guest/disaster-types/-/article/earthquakes
https://disasterscharter.org/web/guest/disaster-types/-/article/oil-spills	1175	1023	986	44 seconds	https://disasterscharter.org/web/guest/disaster-types/-/article/oil-spills

https://disasterscharter.org/web/guest/news	1290	943	892	52 seconds	https://disasterscharter.org/web/guest/news
https://disasterscharter.org/web/guest/disaster-types/-/article/ocean-wave	957	855	816	44 seconds	https://disasterscharter.org/web/guest/disaster-types/-/article/ocean-wave
https://disasterscharter.org/web/guest/disaster-types/-/article/floods	763	654	629	1 minute 20 seconds	https://disasterscharter.org/web/guest/disaster-types/-/article/floods
https://disasterscharter.org/web/guest/text-of-the-charter	532	446	418	1 minute 40 seconds	https://disasterscharter.org/web/guest/text-of-the-charter
https://disasterscharter.org/web/guest/20th-anniversary	313	277	270	57 seconds	https://disasterscharter.org/web/guest/20th-anniversary
https://disasterscharter.org/web/guest/history	331	272	256	2 minutes 2 seconds	https://disasterscharter.org/web/guest/history
https://disasterscharter.org/web/guest/disaster-types/-/article/other	273	224	221	1 minute 8 seconds	https://disasterscharter.org/web/guest/disaster-types/-/article/other
https://disasterscharter.org/web/guest/contact-us	207	173	165	1 minute 35 seconds	https://disasterscharter.org/web/guest/contact-us
https://disasterscharter.org/web/guest/newsletter	190	164	160	1 minute 19 seconds	https://disasterscharter.org/web/guest/newsletter
https://disasterscharter.org/web/guest/universal-access	173	122	117	1 minute 57 seconds	https://disasterscharter.org/web/guest/universal-access

Figure 57. Charter website visits (January-December 2022)

The Figure 57 shows the Charter website visits in 2022. General statistics show a slight increase in visits to the Charter website so there were 149,622 visits in 2022 compared to 145,170 in 2021. According to the traffic monitoring tool, 69% of visitors to the website connect on desktop devices and 31% used mobile devices. A peak in activity occurred in January, which happened on the day after the Charter activation related to the Hunga-Tonga-Hunga-Ha’apai volcano eruption. This activation became the most visited activation page in 2022.

While traffic in the chart for the rest of the year looks low in comparison, it is actually in line with normal traffic and highlights how much activity there was for the Hunga-Tonga-Hunga-Ha’apai activation.

The statistics show that the activations still generally remain one of the most visited parts of the website, but the Disaster Types pages (which are search engine optimization (SEO) friendly), followed by the Library and General pages about how to activate the Charter or register as an AU also attract a significant amount of visitors.

Table 15. Top 10 countries that visited the website (January-December 2022)

Country	Visits
United States	79 912
United Kingdom	15 746
Japan	6 730
Spain	5 820
France	5 486
India	4 202
China	4 056
Russia	3 453
Brazil	3 191
Philippines	1 995

In 2022, there was an increased growth of the visits from the United Kingdom as well as visits from the United States, the two countries comprising the majority of the website visits.

The activations list (Table 16) shows that the top 3 activations which received the most interest in 2022 were ocean wave in Tonga, the oil spill in Peru, and the flash flood in Brazil. All three events were widely featured in the media.

Table 16. Number of Charter activations pages views (January-December 2022)

Page	Page Views	Unique Page Views	Avg. Time on Page (seconds)	Entrances	Bounce Rate
https://disasterscharter.org/web/guest/activations/-/article/ocean-wave-in-tonga-activation-744-	8388	7152	6029	6792	86
https://disasterscharter.org/web/guest/activations/-/article/oil-spill-in-peru-activation-745-	2236	1878	1379	1668	109
https://disasterscharter.org/web/guest/activations/-/article/flood-flash-in-brazil-activation-751-	1771	1471	783	1349	151
https://disasterscharter.org/web/guest/activations/-/article/flood-flash-in-philippines-activation-756-	1540	1396	859	1321	100
https://disasterscharter.org/web/guest/activations/-/article/landslide-in-south-africa-activation-755-	1615	1381	781	1295	135
https://disasterscharter.org/web/guest/activations/-/article/flood-large-in-pakistan-activation-772-	1598	1279	734	1155	115
https://disasterscharter.org/web/guest/activations/-/article/flood-large-in-mozambique-activation-753-	1355	1211	711	1144	96
https://disasterscharter.org/web/guest/activations/-/article/volcano-in-ecuador-activation-743-	1192	1046	585	993	109
https://disasterscharter.org/web/guest/activations/-/article/flood-large-in-mozambique-activation-748-	1163	1022	536	968	96
https://disasterscharter.org/web/guest/activations/-/article/flood-large-in-brazil-activation-754-	1238	1049	555	964	122
https://disasterscharter.org/web/guest/activations/-/article/flood-large-in-bangladesh-activation-762-	1121	1007	722	963	76
https://disasterscharter.org/web/guest/activations/-/article/flood-large-in-south-africa-activation-757-	1046	939	595	902	75

https://disasterscharter.org/web/guest/activations/-/article/landslide-in-brazil-activation-758-	1185	990	472	901	142
https://disasterscharter.org/web/guest/activations/-/article/flood-large-in-madagascar-activation-747-	1096	967	508	899	117
https://disasterscharter.org/web/guest/activations/-/article/volcano-in-philippines-activation-761-	1064	935	625	873	88
https://disasterscharter.org/web/guest/activations/-/article/landslide-in-madagascar-activation-752-	1244	874	441	848	86
https://disasterscharter.org/web/guest/activations/-/article/flood-large-in-sao-tome-and-principe-activation-746-	945	847	572	813	74
https://disasterscharter.org/web/guest/activations/-/article/flood-large-in-venezuela-bolivarian-republic-of-activation-785-	1168	912	507	759	179
https://disasterscharter.org/web/guest/activations/-/article/flood-flash-in-ecuador-activation-749-	884	796	369	748	126
https://disasterscharter.org/web/guest/activations/-/article/flood-large-in-nigeria-activation-777-	861	751	456	698	117
https://disasterscharter.org/web/guest/activations/-/article/flood-large-in-south-africa-activation-776-	798	714	503	681	69
https://disasterscharter.org/web/guest/activations/-/article/storm-hurricane-rural-in-philippines-activation-789-	834	715	340	641	120
https://disasterscharter.org/web/guest/activations/-/article/storm-hurricane-urban-in-turks-and-caicos-islands-activation-779-	687	638	445	601	37
https://disasterscharter.org/web/guest/activations/-/article/flood-large-in-madagascar-activation-750-	682	610	322	579	72
https://disasterscharter.org/web/guest/activations/-	687	592	247	545	96

/article/flood-large-in-chad-activation-788-					
https://disasterscharter.org/web/guest/activations/-/article/flood-large-in-india-activation-764-	655	557	263	529	116
https://disasterscharter.org/web/guest/activations/-/article/fire-in-tunisia-activation-766-	634	545	255	509	108
https://disasterscharter.org/web/guest/activations/-/article/fire-in-afghanistan-activation-760-	590	522	236	500	100
https://disasterscharter.org/web/guest/activations/-/article/flood-large-in-sudan-activation-769-	615	536	275	494	115
https://disasterscharter.org/web/guest/activations/-/article/fire-in-russian-federation-activation-770-	596	510	226	491	114
https://disasterscharter.org/web/guest/activations/-/article/flood-large-in-thailand-activation-784-	591	499	229	470	132
https://disasterscharter.org/web/guest/activations/-/article/flood-large-in-honduras-activation-786-	548	482	211	464	108
https://disasterscharter.org/web/guest/activations/-/article/earthquake-in-afghanistan-activation-763-	600	500	203	453	106
https://disasterscharter.org/web/guest/activations/-/article/flood-large-in-honduras-activation-778-	570	488	241	443	90
https://disasterscharter.org/web/guest/activations/-/article/flood-flash-in-gambia-activation-768-	512	463	246	438	71
https://disasterscharter.org/web/guest/activations/-/article/flood-large-in-thailand-activation-787-	549	474	247	434	122
https://disasterscharter.org/web/guest/activations/-/article/flood-large-in-philippines-activation-771-	535	467	253	412	73
https://disasterscharter.org/web/guest/activations/-/article/storm-hurricane-urban-in-canada-activation-781-	506	429	180	400	107

https://disasterscharter.org/web/guest/activations/-/article/volcano-in-indonesia-activation-792-	500	429	227	396	88
https://disasterscharter.org/web/guest/activations/-/article/earthquake-in-philippines-activation-765-	512	428	178	393	90
https://disasterscharter.org/web/guest/activations/-/article/flood-large-in-russian-federation-activation-774-	449	407	209	385	77
https://disasterscharter.org/web/guest/activations/-/article/storm-hurricane-rural-in-dominican-republic-activation-780-	497	434	255	385	55
https://disasterscharter.org/web/guest/activations/-/article/storm-hurricane-urban-in-philippines-activation-782-	418	364	128	340	102
https://disasterscharter.org/web/guest/activations/-/article/flood-flash-in-russian-federation-activation-767-	414	366	144	339	62
https://disasterscharter.org/web/guest/activations/-/article/earthquake-in-indonesia-activation-791-	399	344	157	304	105
https://disasterscharter.org/web/guest/activations/-/article/storm-hurricane-urban-in-lao-people-s-democratic-republic-activation-783-	378	313	159	293	104
https://disasterscharter.org/web/guest/activations/-/article/oil-spill-in-gambia-activation-759-	309	263	79	251	111
https://disasterscharter.org/web/guest/activations/-/article/flood-large-in-united-kingdom-activation-790-	247	210	69	197	69
https://disasterscharter.org/web/guest/activations/-/article/flood-large-in-korea-republic-of-activation-773-	258	215	59	194	104
https://disasterscharter.org/web/guest/activations/-/article/earthquake-in-china-activation-775-	209	183	55	179	59
https://disasterscharter.org/web/guest/activations/-/article/oil-	179	138	76	124	78

spill-in-mauritius-activation-793-					

Charter visibility is also ensured through other social media outlets, such as Twitter, which gained approximately 1007 new followers in 2022 and had around 9,815 followers on the account by the end of the year. This trend shows that the Charter audience continues to increase compared to 2013 (880), 2014 (1,840), 2015 (3,160), 2016 (4,000), 2017 (5,000), 2018 (6,000), 2019 (7,300), 2020 (8,310) and 2021 (8,810).

The number of impressions garnered by the Charter’s tweets over the course of 2022 increased to 736,844. The Table 17 shows the tweets published in 2022.

The spreadsheet is organised by the Tweets that received the most re-Tweets. Taking this and likes into account, the most popular Tweets were all related to new maps for the Hunga-Tonga-Hunga-Ha’apai volcano in Tonga (most of the Top-10 Tweets). The following Tweets also received a lot of attention:

- Tropical storm in Philippines
- Floods and landslides in Brazil
- Flood in Pakistan
- Flood in Chad

This is common activity for the account, as the products are always the most popular, and even more so when the scope of the disaster is large, or if it is a disaster that’s widely covered in the media.

Table 17. Disasters Charter Twitter statistics for 2022

Tweet permalink	Tweet text	Date and time	Impressions	Engagements	Retweets
https://twitter.com/DisastersChart/status/1483081934238584838	.@UNOSAT produced a preliminary assessment of the impact from #HungaTongaHungaHaapai volcano: https://t.co/hZ4vheqRwg See a few extracts from the report, providing before and after comparisons using #Pleiades, #Sentinel2 and WorldView imagery. #TongaVolcano https://t.co/XgzgPFycC3	17.01.2022 14:21	462835	106223	819
https://twitter.com/DisastersChart/status/1483128027986939907	This map uses #Pleiades imagery to estimate the impact to Nomuka village following the #HongaTongaHongaHaapai eruption: https://t.co/hZ4vheqRwg The image was acquired this morning, local time. #TongaVolcano https://t.co/8asJDnfmZK	17.01.2022 17:24	16782	1540	56
https://twitter.com/Disast	We have a new report for the #HungaTongaHungaHaapai volcano:	19.01.2022 13:51	16484	1054	48

ersChart/status/1483799234851840008	https://t.co/hZ4vheqRwg In these extracts from the report, multiple satellites are used to compare locations before and after the eruption. #TongaVolcano https://t.co/sMNmAVUxfs				
https://twitter.com/DisastersChart/status/1483427361404166144	In this map, #Pleiades imagery is used to estimate the impact of #HungaTongaHungaHaapai volcano on Atata Island: https://t.co/723Ip6Jzdv Ash appears to cover the full island along with damage to structures. #TongaVolcano https://t.co/plwOqpoDvS	18.01.2022 13:13	13654	1062	41
https://twitter.com/DisastersChart/status/1496073987188826112	We have our first maps for the floods and landslides in #Brazil: https://t.co/siWDTSUfqo #Petropolis The maps use #Pleiades imagery to compare locations before and after the disaster, and estimate affected areas. https://t.co/XOCsydus9D	22.02.2022 10:46	5824	582	31
https://twitter.com/DisastersChart/status/1483848374868709389	These latest maps of the #HungaTongaHungaHaapai eruption use #Pleiades and WorldView imagery to compare parts of Nomuka and Nuku Alofa islands before and after the eruption: https://t.co/hZ4vheqRwg #TongaVolcano https://t.co/5w4PEnTMW8	19.01.2022 17:06	8267	766	27
https://twitter.com/DisastersChart/status/1566778611520110594	#VIIRS data is used in this map to estimate the #flood extent in #Pakistan as of 31 August: https://t.co/UgVNUIeL0j Estimates indicate the floods have increased since the previous analysis on 29 August. https://t.co/EqzIFyTXXU	05.09.2022 13:21	3545	318	22
https://twitter.com/DisastersChart/status/1479027270048260103	The Charter has been activated to provide satellite data over #floods in #Bahia, #Brazil: https://t.co/ScZhauiNCc Our first maps for the disaster use optical and radar imagery to monitor the situation and estimate affected areas. https://t.co/E1gcY1j1aS	06.01.2022 9:49	7704	354	20
https://twitter.com/DisastersChart/status/1517107433059106817	In this map, data from #Sentinel1 is used to estimate #flood areas in the #Philippines following Tropical Storm Megi/Agaton: https://t.co/wamZY50s7J https://t.co/htdaEBRoiH	21.04.2022 11:46	10883	309	18
https://twitter.com/DisastersChart/status/1512438	In this map, Landsat 9 and CBERS 4 images are compared to estimate the extent of the #landslide at Praia de ItaguaÃ§u, on Ilhe Grande, in #Brazil:	08.04.2022 14:33	7469	287	17

564365246469	https://t.co/WW5fV0Rtyi https://t.co/t472mO8CSS				
https://twitter.com/DisastersChart/status/1564997423180775424	Our first maps of the #flood in #Pakistan are now available: https://t.co/UgVNUIeL0j #SuomiNPP and NOAA data are used to estimate the flood extent, with imagery from #Sentinel2 used for comparison. https://t.co/JCo7ZmV1sk	31.08.2022 15:23	1793	196	17
https://twitter.com/DisastersChart/status/1566760166342774784	This map uses #Sentinel2 imagery to estimate the #flood extent in Sindh province, #Pakistan: https://t.co/UgVNUIeL0j Red is used to highlight surface water detected by the satellite as of 31 August. https://t.co/E9lNn0aYAO	05.09.2022 12:08	3064	205	17
https://twitter.com/DisastersChart/status/1516364793296338950	We have our first map for Tropical Storm Megi/Agaton's impact to the #Philippines: https://t.co/wamZY50s7J The map uses #TerraSARX and #TanDEMX data to identify water levels before and after the storm, helping estimate flood areas. https://t.co/Si4aTQUEDI	19.04.2022 10:35	8165	147	14
https://twitter.com/DisastersChart/status/1539251171164143616	Our first maps for the #flood in #Bangladesh are now available: https://t.co/0B2td4xfrd In these maps, data from the #RCMSatellites is used to estimate the flood extent and potential impact to Sylhet, Mymensingh, Dhaka, and Chattogram. https://t.co/ndtTV5IAcv	21.06.2022 14:17	2584	230	14
https://twitter.com/DisastersChart/status/1484207593409110029	In these maps, imagery from Kanopus-V, KOMPSAT-3, WorldView-2 and #Pleiades are used to estimate damage to Nomuka and Mango islands, following the #HungaTongaHungaHaapai eruption: https://t.co/hZ4vheqRwg #TongaVolcano https://t.co/FjW9imeBFp	20.01.2022 16:54	2662	198	13
https://twitter.com/DisastersChart/status/1511638372602855425	The Charter has been activated to provide satellite data over #floods in #Brazil: https://t.co/HkNM3n3UXw The floods follow record-breaking rain at the weekend.	06.04.2022 9:34	2000	73	13
https://twitter.com/DisastersChart/status/1580219983300161536	The Charter has been activated to provide satellite data over the #floods in #Venezuela: https://t.co/uIuVOUM8Wl	12.10.2022 15:32	1799	82	13
https://twitter.com/Disast	This map uses #Sentinel2 imagery to estimate the extent of #floods in	24.10.2022 8:08	3287	223	13

ersChart/status/1584456798810931200	N'Djamena, #Chad: https://t.co/JJkd56L472 https://t.co/JFOnSxFyh3				
https://twitter.com/DisastersChart/status/1483034430801391616	The Charter has been activated to provide satellite data over the #HungaTongaHungaHaapai volcano in #Tonga: https://t.co/723Ip6Jzdv The underwater volcano erupted at the weekend and also triggered a tsunami. #Tongavolcano	17.01.2022 11:12	7339	247	12
https://twitter.com/DisastersChart/status/1564912030422810624	These maps assess the #flood situation in #Sudan over Dongola, Algolid, and Alborgag districts: https://t.co/TiL0pvJzeQ The maps use imagery from #Sentinel2, and Landsat 8 and 9 to estimate the extent of flooding. https://t.co/RmipVfMg0f	31.08.2022 9:44	1770	93	12
https://twitter.com/DisastersChart/status/1592084874210562048	These maps use data from several satellites to estimate the #flood extent in the #Philippines following Tropical Storm #Nalgae / #Paeng: https://t.co/i7dhJbmiwk https://t.co/cNkbiqKuBQ	14.11.2022 9:19	5773	343	12
https://twitter.com/DisastersChart/status/1479422604670902274	Our latest maps for the #floods in #Brazil use #Pleiades and CBERS-4 imagery to look at damage in #Bahia state following the disaster: https://t.co/dKWFyEcjmU https://t.co/IeIzyiGGNB	07.01.2022 12:00	3545	271	11
https://twitter.com/DisastersChart/status/1565340025214025730	In these maps, the #flood situation in Al Manaqil, #Sudan is estimated, based on Landsat 8 and #Pleiades imagery: https://t.co/TiL0pw1a6o https://t.co/j6IE7arlUC	01.09.2022 14:05	1872	110	11
https://twitter.com/DisastersChart/status/1569978827522064384	Our first map for the Jagersfontein dam collapse in #SouthAfrica is now available: https://t.co/RauCEz95DG The map uses #Pleiades imagery to estimate the flood area. The break in the dam is visible to the top left of the flood area highlighted in red. https://t.co/S1iemJZwIz	14.09.2022 9:18	2471	1266	11
https://twitter.com/DisastersChart/status/1583382861008150528	The Charter has been activated to provide satellite data over the #flood in #Chad: https://t.co/cdggoy9GD7 Our first map for the disaster uses #SuomiNPP data to estimate the extent of flooding. https://t.co/J0yVYwm4UH	21.10.2022 9:01	3963	182	11
https://twitter.com/Disast	The Charter has been activated to provide satellite imagery following the	28.11.2022 11:07	2911	188	11

ersChart/status/1597185359959711744	#earthquake in #Indonesia: https://t.co/uuCFKwLw1I Our first maps are available and use images from #Pleiades to estimate damage after the event. https://t.co/1152FKoHqv				
https://twitter.com/DisastersChart/status/1486682120328294400	We have a series of maps available for the oil spill in #Peru: https://t.co/1TSIhfHW13 The maps use WorldView-3 imagery to identify potential oil in the ocean. https://t.co/7DuUTO3NNS	27.01.2022 12:46	3141	203	10
https://twitter.com/DisastersChart/status/1492092959860396046	#ICYMI the Charter was activated for last week's floods in Ecuador: https://t.co/jDve81QGao In these maps, radar data from the #RCMSatellites and #Sentinel1 are used to estimate flood areas. https://t.co/tWlSs0V8gp	11.02.2022 11:07	2784	108	10
https://twitter.com/DisastersChart/status/1512072904967565335	We have our first map following the floods and landslides in #Brazil: https://t.co/WW5fV194pQ In this map, false-colour Landsat 9 imagery is used to highlight the estimated location of the landslide at Praia de ItaguaÃ§u. https://t.co/WCYFJIqiUt	07.04.2022 14:20	3968	155	10
https://twitter.com/DisastersChart/status/1526938755881369603	See a summary of the International Charter with facts and figures in our new infographic. https://t.co/Hhbeyrkzof	18.05.2022 14:52	3244	86	10
https://twitter.com/DisastersChart/status/1531601061055709184	Find out about recent activities of the International Charter in the latest issue of our newsletter: https://t.co/Ddtfh8EZpa https://t.co/5YPeSfcvio	31.05.2022 11:38	1879	78	10
https://twitter.com/DisastersChart/status/1572538319376097280	The Charter has been activated to provide satellite data over the Turks and Caicos Islands, following #HurricaneFiona: https://t.co/534noAmqwi	21.09.2022 10:48	1660	80	10
https://twitter.com/DisastersChart/status/1480559532791275531	These maps use #Pleiades imagery to estimate damage to the #Philippines following Typhoon Rai: https://t.co/saXAacBZxT https://t.co/Tu5F6Az9v7	10.01.2022 15:17	7702	458	9
https://twitter.com/Disast	The Charter has been activated to provide satellite data over an oil spill in	21.01.2022 9:09	1969	79	9

ersChart/status/1484453050412675081	#Peru: https://t.co/m1ZMArbBGc The disaster occurred when tsunami waves from the #TongaVolcano impacted an oil tanker unloading at a refinery near Lima.				
https://twitter.com/DisastersChart/status/1484523357538238466	As part of our collaboration with @CopernicusEMS we have a series of damage assessment maps over Nuku Alofa following the #HungaTongaHungaHaapai eruption: https://t.co/hZ4vheqRwg #TongaVolcano https://t.co/53y06TkmMt	21.01.2022 13:48	2868	155	9
https://twitter.com/DisastersChart/status/1493178470158983175	The Charter has been activated for #CycloneBatsirai's impact to #Madagascar: https://t.co/82hfesI8ZL In these maps, #Sentinel1 and #Sentinel2 data are used to estimate the flood extent in different regions. https://t.co/UKE8Aq9YY1	14.02.2022 11:01	2062	144	9
https://twitter.com/DisastersChart/status/1494337747087081472	The Charter has been activated to provide satellite data over the floods and landslides in #Brazil: https://t.co/dKGCKTWNCq #Petropolis	17.02.2022 15:47	2391	116	9
https://twitter.com/DisastersChart/status/1562733879135387648	Our first maps for the #flood in #Sudan are now available: https://t.co/TiL0pw1a6o These maps use Landsat 9 and #Sentinel2 imagery to estimate the extent of flood areas. https://t.co/GQyQYE77oN	25.08.2022 9:29	1538	126	9
https://twitter.com/DisastersChart/status/1513831068817833987	In these maps, #Pleiades and CBERS 4 imagery is used to estimate the area of the #landslides in #Brazil and damage to buildings: https://t.co/WW5fV0Rtyi https://t.co/FF5igiCc0G	12.04.2022 10:47	3193	164	8
https://twitter.com/DisastersChart/status/1539626504681816072	The Charter has been activated to provide satellite data over the 6.1 magnitude #earthquake in #Afghanistan: https://t.co/YRbcWhbRqh Reports indicate at least 1000 casualties so far.	22.06.2022 15:08	921	41	8
https://twitter.com/DisastersChart/status/1541726522649747458	In this map, imagery from WorldView-2 and WorldView-3 are used to estimate damage in Khost province following the #earthquake in #Afghanistan: https://t.co/rjKRuzundo https://t.co/jQhoRygnBI	28.06.2022 10:13	1426	110	8
https://twitter.com/DisastersChart/sta	Though clouds obscure part of the view, this comparison of #Pleiades and WorldView-2 images clearly shows the	20.01.2022 10:59	1028	81	7

tus/1484118 29706702028 8	change to #HungaTongaHungaHaapai island following the eruption on 15 January: https://t.co/hZ4vheqRwg #TongaVolcano https://t.co/TgtFeBD52w				
https://twitte r.com/Disast ersChart/sta tus/1487081 41768741273 6	In these maps, data from WorldView-3 and KOMPSAT-5 are used to identify potential oil following the oil spill in #Peru: https://t.co/1TSIhfHW13 https://t.co/g0CS5hBoEz	28.01.202 2 15:13	2024	150	7
https://twitte r.com/Disast ersChart/sta tus/1496884 65609612903 7	In these maps, #Pleiades and #CBERS4 imagery is used to estimate areas affected by landslides at #Petropolis in #Brazil: https://t.co/siWDTSUfqo https://t.co/3EWXBwCMBS	24.02.202 2 16:28	3920	192	7
https://twitte r.com/Disast ersChart/sta tus/1519248 98643517030 4	In these maps, #Sentinel1 data are used to estimate flood areas in the #Philippines following Tropical Storm Megi / #AgatonPH: https://t.co/wamZY50s7J In the third map, the data indicates decreased water levels between 11 and 23 April. https://t.co/htohxn0liu	27.04.202 2 9:35	4471	165	7
https://twitte r.com/Disast ersChart/sta tus/1554754 22460035072 0	In this map, data from KOMPSAT-3 is used to estimate the burn severity following the fires in Tunisia: https://t.co/DvBRFy1mQv https://t.co/fqvNim2cTz	03.08.202 2 9:01	2052	125	7
https://twitte r.com/Disast ersChart/sta tus/1571866 03079165952 6	Our first map for the floods in Nigeria uses data from #Sentinel1 to estimate the flood extent at Obagaji: https://t.co/XPouitOaKm Flood areas are highlighted in light blue. https://t.co/96upnzhKfT	19.09.202 2 14:17	905	83	7
https://twitte r.com/Disast ersChart/sta tus/1579787 01150619648 0	In these maps, data from #Sentinel1 are used to estimate areas of flooding in Thailand following #TyphoonNoru: https://t.co/v4COI9B1PI https://t.co/xJP6WDGZGV	11.10.202 2 10:52	1043	101	7
https://twitte r.com/Disast ersChart/sta tus/1580846 52815105638 4	The Charter has been activated to provide satellite data following #HurricaneJulia's impact to #Honduras: https://t.co/7u8LS0lGo7	14.10.202 2 9:02	1432	41	7
https://twitte r.com/Disast ersChart/sta tus/1514915	In these maps, imagery from several sources, including CBERS-4A and #Pleiades, are used to estimate the areas affected by #landslides in #Brazil:	15.04.202 2 10:36	1493	115	6

452744572933	https://t.co/WW5fV0Rtyi https://t.co/9z95FikvOk				
https://twitter.com/DisastersChart/status/1517166117822816256	In these maps, #floods and the impact of landslides are shown at settlements and refineries in #SouthAfrica: https://t.co/FoOEgFdgz3 The comparisons use imagery from WorldView satellites to show the locations before and after the disaster. https://t.co/5d0lH2uKMt	21.04.2022 15:39	1112	109	6
https://twitter.com/DisastersChart/status/1517431842349195267	In this map, KOMPSAT-5 and TanDEM-X data are used to assess the #flood situation in the #Philippines following Tropical Storm Megi/Agaton: https://t.co/wamZY50s7J The data suggests that water levels have decreased in this location since 14 April. https://t.co/5tYxvmJ3Lq	22.04.2022 9:15	2450	74	6
https://twitter.com/DisastersChart/status/1536632488990326785	The Charter has been activated to provide satellite data over the #BulusanVolcano eruption in the #Philippines: https://t.co/YWtGSDkHiJ	14.06.2022 8:51	869	34	6
https://twitter.com/DisastersChart/status/1536675324355915777	In these maps, imagery from #Sentinel2 and SPOT-6 are used to estimate areas affected by wildfires in Afghanistan: https://t.co/Dx8mZHRbCC https://t.co/wgtrbPBHmw	14.06.2022 11:42	1151	80	6
https://twitter.com/DisastersChart/status/1552226661881577474	The Charter has been activated to provide satellite imagery following the magnitude 7 #earthquake in the #Philippines: https://t.co/mfjYUclhP1 #Abra #Luzon	27.07.2022 9:37	1061	36	6
https://twitter.com/DisastersChart/status/1562039112928038914	The Charter has been activated to provide satellite data over forest fires in Russia: https://t.co/LtRtVe5Nic	23.08.2022 11:28	771	24	6
https://twitter.com/DisastersChart/status/1583097275496427520	The Charter has been activated to provide satellite data over #floods in #Thailand: https://t.co/E80YP1hT2B These flash floods followed while parts of the country still had floodwater from #TyphoonNoru.	20.10.2022 14:06	1805	53	6
https://twitter.com/DisastersChart/status/1480525	This map used CBERS-4 and #Pleiades imagery to highlight damage in Dario Meira, #Brazil, following the recent #floods: https://t.co/dKWFyEcjmU https://t.co/535MMJlHio	10.01.2022 13:03	1635	78	5

72705755955 3					
https://twitter.com/DisastersChart/status/1497209063708442638	The Charter has been activated to provide satellite data following #CycloneEmnati's impact to #Madagascar: https://t.co/9PaFRjsDLw This marks the fourth storm to affect the island since January.	25.02.2022 13:57	1258	21	5
https://twitter.com/DisastersChart/status/1503388354364198912	The Charter has been activated to provide satellite data following #CycloneGombe's impact to #Mozambique: https://t.co/HDRD5NhMaq	14.03.2022 15:11	7156	52	5
https://twitter.com/DisastersChart/status/1529391549565501442	The Charter has been activated to provide satellite data over the #floods in #SouthAfrica: https://t.co/roBS8uXBh9 This disaster follows just a month after floods struck the same region: https://t.co/1unBqRKRZD	25.05.2022 9:18	718	25	5
https://twitter.com/DisastersChart/status/1531570658089611264	The Charter has been activated to provide satellite data over the #foods and #landslides in #Brazil: https://t.co/u0QsWWtLwd	31.05.2022 9:37	1445	46	5
https://twitter.com/DisastersChart/status/1533793188057604097	The Charter has been activated to provide satellite data over an oil spill in #Gambia: https://t.co/123eBAUVez The oil spill is affecting the Pirang and Gambia Rivers.	06.06.2022 12:49	896	28	5
https://twitter.com/DisastersChart/status/1547871795927126019	The Charter has been activated to provide satellite data over the #floods in #India: https://t.co/XHz8BLVpxd	15.07.2022 9:12	837	27	5
https://twitter.com/DisastersChart/status/1552992194994266115	Our first map of the wildfires in Tunisia uses Landsat 8, Landsat 9 and #Sentinel2 images to estimate the extent of a fire: https://t.co/DvBRFy1mQv The images show the area over the course of five days to monitor the fire. https://t.co/QPZKpl6L52	29.07.2022 12:19	1999	73	5
https://twitter.com/DisastersChart/status/1561713678294073348	The Charter has been activated to provide satellite data over the #flood in #Sudan: https://t.co/JvnKKvSlIE	22.08.2022 13:55	710	25	5
https://twitter.com/Disast	The Charter has been activated to provide satellite data over Tropical Storm	24.08.2022 15:37	690	26	5

ersChart/status/1562464057772220418	#MaOn's (#FloritaPH) impact to the #Philippines: https://t.co/FqyesQ0sM2				
https://twitter.com/DisastersChart/status/1564869339605614592	The Charter has been activated to provide satellite data over the #flood in #Pakistan: https://t.co/fiMHm55v0O	31.08.2022 6:54	874	38	5
https://twitter.com/DisastersChart/status/1565647765912403970	The Charter has been activated to provide satellite data over #TyphoonHinnamnor's expected impact to South Korea: https://t.co/chHPFvDdQ2 Current forecasts suggest it will make landfall on Monday.	02.09.2022 10:28	1911	40	5
https://twitter.com/DisastersChart/status/1565704140600262663	This map uses data from Landsat 8 and 9 to estimate the #flood situation in Al Manaqil, #Sudan: https://t.co/TiL0pvJzeQ The analysis suggests flooded areas have decreased between 23 and 29 August. https://t.co/bcmME0wZJf	02.09.2022 14:12	1857	64	5
https://twitter.com/DisastersChart/status/1569602358232883200	This map assesses the #flood situation in South Korea after #TyphoonHinnamnor: https://t.co/gTk09ZsQzy Data from #Sentinel1 and the #RCMSatellites are used to estimate areas of flooding by comparing the area before and after the typhoon. https://t.co/U1ZeKb42jm	13.09.2022 8:22	1060	49	5
https://twitter.com/DisastersChart/status/1572483280238256129	The Charter has been activated to provide satellite data over the floods in Honduras: https://t.co/ZjMdW2J19q	21.09.2022 7:10	682	25	5
https://twitter.com/DisastersChart/status/1572612826228838402	The Charter has been activated to provide satellite data following #HurricaneFiona's impact to the #DominicanRepublic: https://t.co/mMMMc0LVez	21.09.2022 15:44	683	20	5
https://twitter.com/DisastersChart/status/1574730315645390848	The Charter has been activated to provide satellite data following #HurricaneFiona's impact to #Canada: https://t.co/X8M5Qgdzx0	27.09.2022 11:58	826	42	5
https://twitter.com/DisastersChart/sta	The Charter has been activated to provide satellite data following the impact of Tropical Storm #Nalgae (also	31.10.2022 14:28	2348	54	5

tus/1587089093476892672	known as #Paeng) to the #Philippines: https://t.co/sBx7vfla7B				
https://twitter.com/DisastersChart/status/1594984067992256518	The Charter has been activated to provide satellite data over the #flood in #Scotland: https://t.co/8g1Y9GLMQM	22.11.2022 9:20	2579	73	5
https://twitter.com/DisastersChart/status/1483034923581722630	@exclamatio @ESA_EO @Sentinel_Asia We've been activated for the disaster now and will be releasing maps as they become available. https://t.co/Bv1DDMVNKH	17.01.2022 11:14	648	40	4
https://twitter.com/DisastersChart/status/1483816978880073736	At the start of the year, we took the opportunity to consider the current state of the Charter. In this article we talk about how the Charter has evolved since 2000 and how it continues to grow and develop: https://t.co/nmj23sMyQE	19.01.2022 15:01	1170	43	4
https://twitter.com/DisastersChart/status/1486312445987667973	The Charter has been activated to provide satellite data over #TropicalStormAna's impact to #Mozambique: https://t.co/VbyDlT5PGe	26.01.2022 12:17	1654	29	4
https://twitter.com/DisastersChart/status/1514986573841973249	The Charter has been activated to provide satellite data over Tropical Storm Megi's (also known as Agaton) impact to the #Philippines: https://t.co/GOEoEbJ7GC	15.04.2022 15:18	887	22	4
https://twitter.com/DisastersChart/status/1516796888514768900	We have our first maps of the floods and landslides in #SouthAfrica: https://t.co/FoOEgFdgz3 These maps use WorldView imagery to compare locations before and after the disaster. The impact of floods and landslides are evident in these comparisons. https://t.co/9lHtI5RZPt	20.04.2022 15:12	2151	473	4
https://twitter.com/DisastersChart/status/1536619886868410368	In this article, @CNES describe how satellites help after disasters, using the Charter's response to last year's earthquake in Haiti as an example. https://t.co/ofXAVHi8k8	14.06.2022 8:01	903	16	4
https://twitter.com/DisastersChart/status/1552647408739237889	In these maps, #Pleiades imagery is used to show the water levels at the Polavaram dam project in #India during the #floods on 19 July: https://t.co/DsAlgqmJbk https://t.co/UZdAG4NmFg	28.07.2022 13:29	694	62	4

https://twitter.com/DisastersChart/status/1552918895241170944	The Charter has been activated to provide satellite data over the wildfires in Tunisia: https://t.co/zkhmrZ53ds	29.07.2022 7:28	666	26	4
https://twitter.com/DisastersChart/status/1558035301435572226	Our first map for the floods in Gambia is now available: https://t.co/0h7QgKE2Vp This map uses imagery from #Sentinel2 and KANOPUS-V to estimate the flood extent and impact to Banjul, Kanifing, and Brikama. https://t.co/K6V9yGOSs2	12.08.2022 10:18	596	40	4
https://twitter.com/DisastersChart/status/1566722733081333761	The Charter has been activated to provide satellite data over #TyphoonHinnamnor's expected impact to Russia: https://t.co/ifJhOMcvi4	05.09.2022 9:39	608	16	4
https://twitter.com/DisastersChart/status/1567496922964926467	The Charter has been activated to provide satellite data for the magnitude 6.8 earthquake in China: https://t.co/xt3UmE2j6X	07.09.2022 12:56	713	23	4
https://twitter.com/DisastersChart/status/1571761481552625668	The Charter has been activated to provide satellite data over the floods in Nigeria: https://t.co/LL7MEv6NWy	19.09.2022 7:21	757	27	4
https://twitter.com/DisastersChart/status/1573262555208101889	Our first map for the floods in Honduras is now available: https://t.co/cj5je50DTv This uses imagery from #Pleiades to estimate damage from a landslide at Colonia GuillÃ©n. https://t.co/1MdXIxbHx3	23.09.2022 10:46	876	82	4
https://twitter.com/DisastersChart/status/1574425628476321792	The Charter has been activated to provide satellite data for the impact of #TyphoonNoru (#KardingPH) to the #Philippines: https://t.co/l7ovYTL1c0	26.09.2022 15:48	846	19	4
https://twitter.com/DisastersChart/status/1575055678837731328	These maps use imagery from #Sentinel2 and #Pleiades to estimate flood areas on the UlÃºa River in Honduras: https://t.co/cj5je4IuFn https://t.co/Dlp1n56AZd	28.09.2022 9:31	589	60	4
https://twitter.com/DisastersChart/status/1576953	The Charter has been activated to provide satellite data following the impact of #TyphoonNoru (#KardingPH) on Thailand: https://t.co/v4COI9B1PI	03.10.2022 15:11	807	31	4

1253193482225					
https://twitter.com/DisastersChart/status/1480484058824155137	The Charter has been activated to provide satellite data over the #Sangay volcano eruption in #Ecuador: https://t.co/LGkHtqz6oE	10.01.2022 10:18	1451	25	3
https://twitter.com/DisastersChart/status/1484471262319624196	The Charter has been activated to provide satellite data over floods in SÃ£o TomÃ© and Principe: https://t.co/RrfqYztt5F	21.01.2022 10:21	1635	40	3
https://twitter.com/DisastersChart/status/1485935174684758016	The Charter has been activated to provide satellite data over #floods in #Madagascar: https://t.co/C81B4Xwg0z	25.01.2022 11:18	966	29	3
https://twitter.com/DisastersChart/status/1538862019453014018	The Charter has been activated to provide satellite data over the #flood in #Bangladesh: https://t.co/Qvcg0gTojQ	20.06.2022 12:31	765	28	3
https://twitter.com/DisastersChart/status/1552194442181967872	We have a series of maps showing the impact of the #floods in #India: https://t.co/DsAlgq58jM These maps use different satellites to estimate affected areas in Andhra Pradesh and Telangana. https://t.co/syv4RM8Apm	27.07.2022 7:29	975	80	3
https://twitter.com/DisastersChart/status/1555121579260055552	WorldView-2 imagery is used in this map of the wildfires in Tunisia, estimating the extent of the burnt area: https://t.co/DvBRFy1mQv https://t.co/mVdDxVDUft	04.08.2022 9:20	429	18	3
https://twitter.com/DisastersChart/status/1556974227462541313	The Charter has been activated to provide satellite data over floods in Russia: https://t.co/BYAtrDEviL	09.08.2022 12:02	809	28	3
https://twitter.com/DisastersChart/status/1557319894831595521	The Charter has been activated to provide satellite data over the floods in Gambia: https://t.co/0h7QgKE2Vp	10.08.2022 10:56	627	11	3
https://twitter.com/Disast	The Charter has been activated to provide satellite data following	30.09.2022 8:54	764	20	3

ersChart/status/1575770995516141568	#TyphoonNoru's impact to Laos: https://t.co/dIb7HdW5We				
https://twitter.com/DisastersChart/status/1487018143784521728	This map uses WorldView-2 and #SAOCOM data to estimate #floods in Antananarivo, #Madagascar: https://t.co/aseHOLDzjC https://t.co/FuyH73cfDl	28.01.2022 11:02	1891	86	2
https://twitter.com/DisastersChart/status/1514617276623818775	The Charter has been activated to provide satellite data over floods and landslides in #SouthAfrica: https://t.co/1unBqS2sRb	14.04.2022 14:51	672	25	2
https://twitter.com/DisastersChart/status/1563097868675665920	Flooding at Ivanovka village in Russia is shown in this map: https://t.co/3EaZqu9cxg Kanopus-V and RESURS-P were used to estimate the flood areas, shown in lighter shades of blue. https://t.co/Br36zlXWdc	26.08.2022 9:35	529	50	2
https://twitter.com/DisastersChart/status/1569655959638757376	The Charter has been activated to provide satellite imagery over floods in #SouthAfrica caused by the collapse of a dam at Jagersfontein: https://t.co/RauCEz95DG	13.09.2022 11:55	461	30	2
https://twitter.com/DisastersChart/status/1605516717718835202	The Charter has been activated to provide satellite data over a potential oil spill off the coast of Mauritius: https://t.co/2ntmcp7Oip It follows the grounding of a fishing vessel on a reef earlier this month.	21.12.2022 10:53	1083	44	1
https://twitter.com/DisastersChart/status/1483794613206933504	@SurreySat @QueLotte @AirbusSpace @spacegovuk @SatAppsCatapult Indeed. Radar is very useful for this. We don't have any examples of maps featuring radar data on our page yet, but you can see our maps produced so far for Tonga here: https://t.co/723Ip6Jzdv	19.01.2022 13:32	86	5	0
https://twitter.com/DisastersChart/status/1485965708433440774	This map uses #Pleiades imagery to analyse the impact of landslides at Neves in SÃ£o TomÃ© and Principe: https://t.co/jArfgb4nkb https://t.co/MxI72VlgoK	25.01.2022 13:20	1026	55	0
https://twitter.com/DisastersChart/status/1526905763117015040	At a recent meeting, @CNES and partners discussed the value satellites provide to relief and risk management parties in the event of disasters. https://t.co/sUGMDBpTzh	18.05.2022 12:41	1168	7	0

https://twitter.com/DisastersChart/status/1483081934238584838	.@UNOSAT produced a preliminary assessment of the impact from #HungaTongaHungaHaapai volcano: https://t.co/hZ4vheqRwg See a few extracts from the report, providing before and after comparisons using #Pleiades, #Sentinel2 and WorldView imagery. #TongaVolcano https://t.co/XgzgPFycC3	17.01.2022 14:21	462835	106223	819
https://twitter.com/DisastersChart/status/1483128027986939907	This map uses #Pleiades imagery to estimate the impact to Nomuka village following the #HongaTongaHongaHaapai eruption: https://t.co/hZ4vheqRwg The image was acquired this morning, local time. #TongaVolcano https://t.co/8asJDnfmZK	17.01.2022 17:24	16782	1540	56
https://twitter.com/DisastersChart/status/1483799234851840008	We have a new report for the #HungaTongaHungaHaapai volcano: https://t.co/hZ4vheqRwg In these extracts from the report, multiple satellites are used to compare locations before and after the eruption. #TongaVolcano https://t.co/sMNmAVUxfs	19.01.2022 13:51	16484	1054	48
https://twitter.com/DisastersChart/status/1483427361404166144	In this map, #Pleiades imagery is used to estimate the impact of #HungaTongaHungaHaapai volcano on Atata Island: https://t.co/723Ip6Jzdv Ash appears to cover the full island along with damage to structures. #TongaVolcano https://t.co/plwOqpoDvS	18.01.2022 13:13	13654	1062	41
https://twitter.com/DisastersChart/status/1496073987188826112	We have our first maps for the floods and landslides in #Brazil: https://t.co/siWDTSUfqo #Petropolis The maps use #Pleiades imagery to compare locations before and after the disaster, and estimate affected areas. https://t.co/XOCsydus9D	22.02.2022 10:46	5824	582	31
https://twitter.com/DisastersChart/status/1483848374868709389	These latest maps of the #HungaTongaHungaHaapai eruption use #Pleiades and WorldView imagery to compare parts of Nomuka and Nuku Alofa islands before and after the eruption: https://t.co/hZ4vheqRwg #TongaVolcano https://t.co/5w4PEnTMW8	19.01.2022 17:06	8267	766	27
https://twitter.com/DisastersChart/status/1566778611520110594	#VIIRS data is used in this map to estimate the #flood extent in #Pakistan as of 31 August: https://t.co/UgVNUIeL0j Estimates indicate the floods have increased since the previous analysis on 29 August. https://t.co/EqzIFyTXXU	05.09.2022 13:21	3545	318	22

https://twitter.com/DisastersChart/status/1479027270048260103	The Charter has been activated to provide satellite data over #floods in #Bahia, #Brazil: https://t.co/ScZhauiNCc Our first maps for the disaster use optical and radar imagery to monitor the situation and estimate affected areas. https://t.co/E1gcY1j1aS	06.01.2022 9:49	7704	354	20
https://twitter.com/DisastersChart/status/1517107433059106817	In this map, data from #Sentinel1 is used to estimate #flood areas in the #Philippines following Tropical Storm Megi/Agaton: https://t.co/wamZY50s7J https://t.co/htdaEBRoiH	21.04.2022 11:46	10883	309	18
https://twitter.com/DisastersChart/status/1512438564365246469	In this map, Landsat 9 and CBERS 4 images are compared to estimate the extent of the #landslide at Praia de ItaguaÃ§u, on Ilhe Grande, in #Brazil: https://t.co/WW5fV0Rtyi https://t.co/t472mO8CSS	08.04.2022 14:33	7469	287	17
https://twitter.com/DisastersChart/status/1564997423180775424	Our first maps of the #flood in #Pakistan are now available: https://t.co/UgVNUIeL0j #SuomiNPP and NOAA data are used to estimate the flood extent, with imagery from #Sentinel2 used for comparison. https://t.co/JCo7ZmV1sk	31.08.2022 15:23	1793	196	17
https://twitter.com/DisastersChart/status/1566760166342774784	This map uses #Sentinel2 imagery to estimate the #flood extent in Sindh province, #Pakistan: https://t.co/UgVNUIeL0j Red is used to highlight surface water detected by the satellite as of 31 August. https://t.co/E9lNn0aYAO	05.09.2022 12:08	3064	205	17
https://twitter.com/DisastersChart/status/1516364793296338950	We have our first map for Tropical Storm Megi/Agaton's impact to the #Philippines: https://t.co/wamZY50s7J The map uses #TerraSARX and #TanDEMX data to identify water levels before and after the storm, helping estimate flood areas. https://t.co/Si4aTQUEDI	19.04.2022 10:35	8165	147	14
https://twitter.com/DisastersChart/status/1539251171164143616	Our first maps for the #flood in #Bangladesh are now available: https://t.co/0B2td4xfrd In these maps, data from the #RCMSatellites is used to estimate the flood extent and potential impact to Sylhet, Mymensingh, Dhaka, and Chattogram. https://t.co/ndtTV5IAcv	21.06.2022 14:17	2584	230	14
https://twitter.com/DisastersChart/status/1484207	In these maps, imagery from Kanopus-V, KOMPSAT-3, WorldView-2 and #Pleiades are used to estimate damage to Nomuka and Mango islands, following the #HungaTongaHungaHaapai eruption:	20.01.2022 16:54	2662	198	13

593409110029	https://t.co/hZ4vheqRwg #TongaVolcano https://t.co/FjW9imeBFp				
https://twitter.com/DisastersChart/status/1511638372602855425	The Charter has been activated to provide satellite data over #floods in #Brazil: https://t.co/HkNM3n3UXw The floods follow record-breaking rain at the weekend.	06.04.2022 9:34	2000	73	13
https://twitter.com/DisastersChart/status/1580219983300161536	The Charter has been activated to provide satellite data over the #floods in #Venezuela: https://t.co/uIuVOUM8Wl	12.10.2022 15:32	1799	82	13
https://twitter.com/DisastersChart/status/1584456798810931200	This map uses #Sentinel2 imagery to estimate the extent of #floods in N'Djamena, #Chad: https://t.co/JJkd56L472 https://t.co/JFOnSxFyh3	24.10.2022 8:08	3287	223	13
https://twitter.com/DisastersChart/status/1483034430801391616	The Charter has been activated to provide satellite data over the #HungaTongaHungaHaapai volcano in #Tonga: https://t.co/723Ip6Jzdv The underwater volcano erupted at the weekend and also triggered a tsunami. #Tongavolcano	17.01.2022 11:12	7339	247	12
https://twitter.com/DisastersChart/status/1564912030422810624	These maps assess the #flood situation in #Sudan over Dongola, Algolid, and Alborgag districts: https://t.co/TiL0pvJzeQ The maps use imagery from #Sentinel2, and Landsat 8 and 9 to estimate the extent of flooding. https://t.co/RmipVfMg0f	31.08.2022 9:44	1770	93	12
https://twitter.com/DisastersChart/status/1592084874210562048	These maps use data from several satellites to estimate the #flood extent in the #Philippines following Tropical Storm #Nalgae / #Paeng: https://t.co/i7dhJbmiwk https://t.co/cNkbiqKuBQ	14.11.2022 9:19	5773	343	12
https://twitter.com/DisastersChart/status/1479422604670902274	Our latest maps for the #floods in #Brazil use #Pleiades and CBERS-4 imagery to look at damage in #Bahia state following the disaster: https://t.co/dKWFyEcjmU https://t.co/IeIzyiGGNB	07.01.2022 12:00	3545	271	11
https://twitter.com/DisastersChart/status/1565340025214025730	In these maps, the #flood situation in Al Manaqil, #Sudan is estimated, based on Landsat 8 and #Pleiades imagery: https://t.co/TiL0pw1a6o https://t.co/j6IE7arlUC	01.09.2022 14:05	1872	110	11

https://twitter.com/DisastersChart/status/1569978827522064384	Our first map for the Jagersfontein dam collapse in #SouthAfrica is now available: https://t.co/RauCEz95DG The map uses #Pleiades imagery to estimate the flood area. The break in the dam is visible to the top left of the flood area highlighted in red. https://t.co/S1iemJZwIz	14.09.2022 9:18	2471	1266	11
https://twitter.com/DisastersChart/status/1583382861008150528	The Charter has been activated to provide satellite data over the #flood in #Chad: https://t.co/cdggoy9GD7 Our first map for the disaster uses #SuomiNPP data to estimate the extent of flooding. https://t.co/J0yVYwm4UH	21.10.2022 9:01	3963	182	11
https://twitter.com/DisastersChart/status/1597185359959711744	The Charter has been activated to provide satellite imagery following the #earthquake in #Indonesia: https://t.co/uuCFKwLw1I Our first maps are available and use images from #Pleiades to estimate damage after the event. https://t.co/1152FKoHqv	28.11.2022 11:07	2911	188	11
https://twitter.com/DisastersChart/status/1486682120328294400	We have a series of maps available for the oil spill in #Peru: https://t.co/1TSIhfHW13 The maps use WorldView-3 imagery to identify potential oil in the ocean. https://t.co/7DuUTO3NNS	27.01.2022 12:46	3141	203	10
https://twitter.com/DisastersChart/status/1492092959860396046	#ICYMI the Charter was activated for last week's floods in Ecuador: https://t.co/jDve81QGao In these maps, radar data from the #RCMSatellites and #Sentinel1 are used to estimate flood areas. https://t.co/tWlSs0V8gp	11.02.2022 11:07	2784	108	10
https://twitter.com/DisastersChart/status/1512072904967565335	We have our first map following the floods and landslides in #Brazil: https://t.co/WW5fV194pQ In this map, false-colour Landsat 9 imagery is used to highlight the estimated location of the landslide at Praia de ItaguaÃ§u. https://t.co/WCYFJIqiUt	07.04.2022 14:20	3968	155	10
https://twitter.com/DisastersChart/status/1526938755881369603	See a summary of the International Charter with facts and figures in our new infographic. https://t.co/Hhbeyrkzof	18.05.2022 14:52	3244	86	10
https://twitter.com/DisastersChart/status/1531601	Find out about recent activities of the International Charter in the latest issue of our newsletter: https://t.co/Ddtfh8EZpa https://t.co/5YPeSfcvio	31.05.2022 11:38	1879	78	10

1061055709184					
https://twitter.com/DisastersChart/status/1572538319376097280	The Charter has been activated to provide satellite data over the Turks and Caicos Islands, following #HurricaneFiona: https://t.co/534noAmqwi	21.09.2022 10:48	1660	80	10
https://twitter.com/DisastersChart/status/1480559532791275531	These maps use #Pleiades imagery to estimate damage to the #Philippines following Typhoon Rai: https://t.co/saXAacBZxT https://t.co/Tu5F6Az9v7	10.01.2022 15:17	7702	458	9
https://twitter.com/DisastersChart/status/1484453050412675081	The Charter has been activated to provide satellite data over an oil spill in #Peru: https://t.co/m1ZMArbBGc The disaster occurred when tsunami waves from the #TongaVolcano impacted an oil tanker unloading at a refinery near Lima.	21.01.2022 9:09	1969	79	9
https://twitter.com/DisastersChart/status/1484523357538238466	As part of our collaboration with @CopernicusEMS we have a series of damage assessment maps over Nuku Alofa following the #HungaTongaHungaHaapai eruption: https://t.co/hZ4vheqRwg #TongaVolcano https://t.co/53y06TkmMt	21.01.2022 13:48	2868	155	9
https://twitter.com/DisastersChart/status/1493178470158983175	The Charter has been activated for #CycloneBatsirai's impact to #Madagascar: https://t.co/82hfesI8ZL In these maps, #Sentinel1 and #Sentinel2 data are used to estimate the flood extent in different regions. https://t.co/UKE8Aq9YY1	14.02.2022 11:01	2062	144	9
https://twitter.com/DisastersChart/status/1494337747087081472	The Charter has been activated to provide satellite data over the floods and landslides in #Brazil: https://t.co/dKGCKTWNCq #Petropolis	17.02.2022 15:47	2391	116	9
https://twitter.com/DisastersChart/status/1562733879135387648	Our first maps for the #flood in #Sudan are now available: https://t.co/TiL0pw1a6o These maps use Landsat 9 and #Sentinel2 imagery to estimate the extent of flood areas. https://t.co/GQyQYE77oN	25.08.2022 9:29	1538	126	9
https://twitter.com/DisastersChart/status/1513831	In these maps, #Pleiades and CBERS 4 imagery is used to estimate the area of the #landslides in #Brazil and damage to buildings: https://t.co/WW5fV0Rtyi https://t.co/FF5igiCc0G	12.04.2022 10:47	3193	164	8

0688178339837					
https://twitter.com/DisastersChart/status/1539626504681816072	The Charter has been activated to provide satellite data over the 6.1 magnitude #earthquake in #Afghanistan: https://t.co/YRbcWhbRqh Reports indicate at least 1000 casualties so far.	22.06.2022 15:08	921	41	8
https://twitter.com/DisastersChart/status/1541726522649747458	In this map, imagery from WorldView-2 and WorldView-3 are used to estimate damage in Khost province following the #earthquake in #Afghanistan: https://t.co/rjKRuzundo https://t.co/jQhoRygnBI	28.06.2022 10:13	1426	110	8
https://twitter.com/DisastersChart/status/1484118297067020288	Though clouds obscure part of the view, this comparison of #Pleiades and WorldView-2 images clearly shows the change to #HungaTongaHungaHaapai island following the eruption on 15 January: https://t.co/hZ4vheqRwg #TongaVolcano https://t.co/TgtFeBD52w	20.01.2022 10:59	1028	81	7
https://twitter.com/DisastersChart/status/1487081417687412736	In these maps, data from WorldView-3 and KOMPSAT-5 are used to identify potential oil following the oil spill in #Peru: https://t.co/1TSIhfHW13 https://t.co/g0CS5hBoEz	28.01.2022 15:13	2024	150	7
https://twitter.com/DisastersChart/status/1496884656096129037	In these maps, #Pleiades and #CBERS4 imagery is used to estimate areas affected by landslides at #Petropolis in #Brazil: https://t.co/siWDTSUfqo https://t.co/3EWXBwCMBS	24.02.2022 16:28	3920	192	7
https://twitter.com/DisastersChart/status/1519248986435170304	In these maps, #Sentinel1 data are used to estimate flood areas in the #Philippines following Tropical Storm Megi / #AgatonPH: https://t.co/wamZY50s7J In the third map, the data indicates decreased water levels between 11 and 23 April. https://t.co/htohxn0liu	27.04.2022 9:35	4471	165	7
https://twitter.com/DisastersChart/status/1554754224600350720	In this map, data from KOMPSAT-3 is used to estimate the burn severity following the fires in Tunisia: https://t.co/DvBRFy1mQv https://t.co/fqvNim2cTz	03.08.2022 9:01	2052	125	7
https://twitter.com/DisastersChart/status/1571866	Our first map for the floods in Nigeria uses data from #Sentinel1 to estimate the flood extent at Obagaji: https://t.co/XPouitOaKm	19.09.2022 14:17	905	83	7

030791659526	Flood areas are highlighted in light blue. https://t.co/96upnzhKfT				
https://twitter.com/DisastersChart/status/1579787011506196480	In these maps, data from #Sentinel1 are used to estimate areas of flooding in Thailand following #TyphoonNoru: https://t.co/v4COI9B1PI https://t.co/xJP6WDGZGV	11.10.2022 10:52	1043	101	7
https://twitter.com/DisastersChart/status/1580846528151056384	The Charter has been activated to provide satellite data following #HurricaneJulia's impact to #Honduras: https://t.co/7u8LS0lGo7	14.10.2022 9:02	1432	41	7
https://twitter.com/DisastersChart/status/1514915452744572933	In these maps, imagery from several sources, including CBERS-4A and #Pleiades, are used to estimate the areas affected by #landslides in #Brazil: https://t.co/WW5fV0Rtyi https://t.co/9z95FikvOk	15.04.2022 10:36	1493	115	6
https://twitter.com/DisastersChart/status/1517166117822816256	In these maps, #floods and the impact of landslides are shown at settlements and refineries in #SouthAfrica: https://t.co/FoOEgFdgz3 The comparisons use imagery from WorldView satellites to show the locations before and after the disaster. https://t.co/5d0lH2uKMt	21.04.2022 15:39	1112	109	6
https://twitter.com/DisastersChart/status/1517431842349195267	In this map, KOMPSAT-5 and TanDEM-X data are used to assess the #flood situation in the #Philippines following Tropical Storm Megi/Agaton: https://t.co/wamZY50s7J The data suggests that water levels have decreased in this location since 14 April. https://t.co/5tYxvmJ3Lq	22.04.2022 9:15	2450	74	6
https://twitter.com/DisastersChart/status/1536632488990326785	The Charter has been activated to provide satellite data over the #BulusanVolcano eruption in the #Philippines: https://t.co/YWtGSDkHiJ	14.06.2022 8:51	869	34	6
https://twitter.com/DisastersChart/status/1536675324355915777	In these maps, imagery from #Sentinel2 and SPOT-6 are used to estimate areas affected by wildfires in Afghanistan: https://t.co/Dx8mZHRbCC https://t.co/wgtrbPBHmw	14.06.2022 11:42	1151	80	6
https://twitter.com/DisastersChart/status/1552226	The Charter has been activated to provide satellite imagery following the magnitude 7 #earthquake in the #Philippines: https://t.co/mfjYUclhP1 #Abra #Luzon	27.07.2022 9:37	1061	36	6

661881577474					
https://twitter.com/DisastersChart/status/1562039112928038914	The Charter has been activated to provide satellite data over forest fires in Russia: https://t.co/LtRtVe5Nic	23.08.2022 11:28	771	24	6
https://twitter.com/DisastersChart/status/1583097275496427520	The Charter has been activated to provide satellite data over #floods in #Thailand: https://t.co/E80YP1hT2B These flash floods followed while parts of the country still had floodwater from #TyphoonNoru.	20.10.2022 14:06	1805	53	6
https://twitter.com/DisastersChart/status/1480525727057559553	This map used CBERS-4 and #Pleiades imagery to highlight damage in Dario Meira, #Brazil, following the recent #floods: https://t.co/dKWFyEcjmU https://t.co/535MMJlHio	10.01.2022 13:03	1635	78	5
https://twitter.com/DisastersChart/status/1497209063708442638	The Charter has been activated to provide satellite data following #CycloneEmnati's impact to #Madagascar: https://t.co/9PaFRjsDLw This marks the fourth storm to affect the island since January.	25.02.2022 13:57	1258	21	5
https://twitter.com/DisastersChart/status/1503388354364198912	The Charter has been activated to provide satellite data following #CycloneGombe's impact to #Mozambique: https://t.co/HDRD5NhMaq	14.03.2022 15:11	7156	52	5
https://twitter.com/DisastersChart/status/1529391549565501442	The Charter has been activated to provide satellite data over the #floods in #SouthAfrica: https://t.co/roBS8uXBh9 This disaster follows just a month after floods struck the same region: https://t.co/1unBqRKRZD	25.05.2022 9:18	718	25	5
https://twitter.com/DisastersChart/status/1531570658089611264	The Charter has been activated to provide satellite data over the #foods and #landslides in #Brazil: https://t.co/u0QsWWtLwd	31.05.2022 9:37	1445	46	5
https://twitter.com/DisastersChart/status/1533793188057604097	The Charter has been activated to provide satellite data over an oil spill in #Gambia: https://t.co/123eBAUVez The oil spill is affecting the Pirang and Gambia Rivers.	06.06.2022 12:49	896	28	5
https://twitter.com/DisastersChart/sta	The Charter has been activated to provide satellite data over the #floods in #India: https://t.co/XHz8BLVpxd	15.07.2022 9:12	837	27	5

tus/1547871795927126019					
https://twitter.com/DisastersChart/status/1552992194994266115	Our first map of the wildfires in Tunisia uses Landsat 8, Landsat 9 and #Sentinel2 images to estimate the extent of a fire: https://t.co/DvBRFy1mQv The images show the area over the course of five days to monitor the fire. https://t.co/QPZKpl6L52	29.07.2022 12:19	1999	73	5
https://twitter.com/DisastersChart/status/1561713678294073348	The Charter has been activated to provide satellite data over the #flood in #Sudan: https://t.co/JvnKKvSlIE	22.08.2022 13:55	710	25	5
https://twitter.com/DisastersChart/status/1562464057772220418	The Charter has been activated to provide satellite data over Tropical Storm #MaOn's (#FloritaPH) impact to the #Philippines: https://t.co/FqyesQ0sM2	24.08.2022 15:37	690	26	5
https://twitter.com/DisastersChart/status/1564869339605614592	The Charter has been activated to provide satellite data over the #flood in #Pakistan: https://t.co/fiMHm55v0O	31.08.2022 6:54	874	38	5
https://twitter.com/DisastersChart/status/1565647765912403970	The Charter has been activated to provide satellite data over #TyphoonHinnamnor's expected impact to South Korea: https://t.co/chHPFvDdQ2 Current forecasts suggest it will make landfall on Monday.	02.09.2022 10:28	1911	40	5
https://twitter.com/DisastersChart/status/1565704140600262663	This map uses data from Landsat 8 and 9 to estimate the #flood situation in Al Manaqil, #Sudan: https://t.co/TiL0pvJzeQ The analysis suggests flooded areas have decreased between 23 and 29 August. https://t.co/bcmME0wZJf	02.09.2022 14:12	1857	64	5
https://twitter.com/DisastersChart/status/1569602358232883200	This map assesses the #flood situation in South Korea after #TyphoonHinnamnor: https://t.co/gTk09ZsQzy Data from #Sentinel1 and the #RCMSatellites are used to estimate areas of flooding by comparing the area before and after the typhoon. https://t.co/U1ZeKb42jm	13.09.2022 8:22	1060	49	5
https://twitter.com/DisastersChart/sta	The Charter has been activated to provide satellite data over the floods in Honduras: https://t.co/ZjMdW2J19q	21.09.2022 7:10	682	25	5

tus/1572483 28023825612 9					
https://twitte r.com/Disast ersChart/sta tus/1572612 826228838402	The Charter has been activated to provide satellite data following #HurricaneFiona's impact to the #DominicanRepublic: https://t.co/mMMMc0LVez	21.09.202 2 15:44	683	20	5
https://twitte r.com/Disast ersChart/sta tus/1574730 315645390848	The Charter has been activated to provide satellite data following #HurricaneFiona's impact to #Canada: https://t.co/X8M5Qgdzx0	27.09.202 2 11:58	826	42	5
https://twitte r.com/Disast ersChart/sta tus/1587089 093476892672	The Charter has been activated to provide satellite data following the impact of Tropical Storm #Nalgae (also known as #Paeng) to the #Philippines: https://t.co/sBx7vfla7B	31.10.202 2 14:28	2348	54	5
https://twitte r.com/Disast ersChart/sta tus/1594984 067992256518	The Charter has been activated to provide satellite data over the #flood in #Scotland: https://t.co/8g1Y9GLMQM	22.11.202 2 9:20	2579	73	5
https://twitte r.com/Disast ersChart/sta tus/1483034 923581722630	@exclamatio @ESA_EO @Sentinel_Asia We've been activated for the disaster now and will be releasing maps as they become available. https://t.co/Bv1DDMVNKH	17.01.202 2 11:14	648	40	4
https://twitte r.com/Disast ersChart/sta tus/1483816 978880073736	At the start of the year, we took the opportunity to consider the current state of the Charter. In this article we talk about how the Charter has evolved since 2000 and how it continues to grow and develop: https://t.co/nmj23sMyQE	19.01.202 2 15:01	1170	43	4
https://twitte r.com/Disast ersChart/sta tus/1486312 445987667973	The Charter has been activated to provide satellite data over #TropicalStormAna's impact to #Mozambique: https://t.co/VbyDlT5PGe	26.01.202 2 12:17	1654	29	4
https://twitte r.com/Disast ersChart/sta tus/1514986 573841973249	The Charter has been activated to provide satellite data over Tropical Storm Megi's (also known as Agaton) impact to the #Philippines: https://t.co/GOEoEbJ7GC	15.04.202 2 15:18	887	22	4
https://twitte r.com/Disast	We have our first maps of the floods and landslides in #SouthAfrica:	20.04.202 2 15:12	2151	473	4

ersChart/status/1516796888514768900	https://t.co/FoOEgFdgz3 These maps use WorldView imagery to compare locations before and after the disaster. The impact of floods and landslides are evident in these comparisons. https://t.co/9lHtI5RZPt				
https://twitter.com/DisastersChart/status/1536619886868410368	In this article, @CNES describe how satellites help after disasters, using the Charter's response to last year's earthquake in Haiti as an example. https://t.co/ofXAVHi8k8	14.06.2022 8:01	903	16	4
https://twitter.com/DisastersChart/status/1552647408739237889	In these maps, #Pleiades imagery is used to show the water levels at the Polavaram dam project in #India during the #floods on 19 July: https://t.co/DsAlgqmJbk https://t.co/UZdAG4NmFg	28.07.2022 13:29	694	62	4
https://twitter.com/DisastersChart/status/1552918895241170944	The Charter has been activated to provide satellite data over the wildfires in Tunisia: https://t.co/zkhmrZ53ds	29.07.2022 7:28	666	26	4
https://twitter.com/DisastersChart/status/1558035301435572226	Our first map for the floods in Gambia is now available: https://t.co/0h7QgKE2Vp This map uses imagery from #Sentinel2 and KANOPUS-V to estimate the flood extent and impact to Banjul, Kanifing, and Brikama. https://t.co/K6V9yGOSs2	12.08.2022 10:18	596	40	4
https://twitter.com/DisastersChart/status/1566722733081333761	The Charter has been activated to provide satellite data over #TyphoonHinnamnor's expected impact to Russia: https://t.co/ifJhOMcvi4	05.09.2022 9:39	608	16	4
https://twitter.com/DisastersChart/status/1567496922964926467	The Charter has been activated to provide satellite data for the magnitude 6.8 earthquake in China: https://t.co/xt3UmE2j6X	07.09.2022 12:56	713	23	4
https://twitter.com/DisastersChart/status/1571761481552625668	The Charter has been activated to provide satellite data over the floods in Nigeria: https://t.co/LL7MEv6NWy	19.09.2022 7:21	757	27	4
https://twitter.com/DisastersChart/status/1573262	Our first map for the floods in Honduras is now available: https://t.co/cj5je50DTv This uses imagery from #Pleiades to estimate damage from a landslide at	23.09.2022 10:46	876	82	4

555208101889	Colonia GuillÃ©n. https://t.co/1MdXIxbHx3				
https://twitter.com/DisastersChart/status/1574425628476321792	The Charter has been activated to provide satellite data for the impact of #TyphoonNoru (#KardingPH) to the #Philippines: https://t.co/l7ovYTL1c0	26.09.2022 15:48	846	19	4
https://twitter.com/DisastersChart/status/1575055678837731328	These maps use imagery from #Sentinel2 and #Pleiades to estimate flood areas on the UlÃºa River in Honduras: https://t.co/cj5je4IuFn https://t.co/Dlp1n56AZd	28.09.2022 9:31	589	60	4
https://twitter.com/DisastersChart/status/1576953125319348225	The Charter has been activated to provide satellite data following the impact of #TyphoonNoru (#KardingPH) on Thailand: https://t.co/v4COI9B1PI	03.10.2022 15:11	807	31	4
https://twitter.com/DisastersChart/status/1480484058824155137	The Charter has been activated to provide satellite data over the #Sangay volcano eruption in #Ecuador: https://t.co/LGkHtqz6oE	10.01.2022 10:18	1451	25	3
https://twitter.com/DisastersChart/status/1484471262319624196	The Charter has been activated to provide satellite data over floods in SÃ£o TomÃ© and Principe: https://t.co/RrfqYztt5F	21.01.2022 10:21	1635	40	3
https://twitter.com/DisastersChart/status/1485935174684758016	The Charter has been activated to provide satellite data over #floods in #Madagascar: https://t.co/C81B4Xwg0z	25.01.2022 11:18	966	29	3
https://twitter.com/DisastersChart/status/1538862019453014018	The Charter has been activated to provide satellite data over the #flood in #Bangladesh: https://t.co/Qvcg0gTojQ	20.06.2022 12:31	765	28	3
https://twitter.com/DisastersChart/status/1552194442181967872	We have a series of maps showing the impact of the #floods in #India: https://t.co/DsAlgq58jM These maps use different satellites to estimate affected areas in Andhra Pradesh and Telangana. https://t.co/syv4RM8Apm	27.07.2022 7:29	975	80	3
https://twitter.com/Disast	WorldView-2 imagery is used in this map of the wildfires in Tunisia,	04.08.2022 9:20	429	18	3

ersChart/status/1555121579260055552	estimating the extent of the burnt area: https://t.co/DvBRFy1mQv https://t.co/mVdDxVDUft				
https://twitter.com/DisastersChart/status/1556974227462541313	The Charter has been activated to provide satellite data over floods in Russia: https://t.co/BYAtrDEviL	09.08.2022 12:02	809	28	3
https://twitter.com/DisastersChart/status/1557319894831595521	The Charter has been activated to provide satellite data over the floods in Gambia: https://t.co/0h7QgKE2Vp	10.08.2022 10:56	627	11	3
https://twitter.com/DisastersChart/status/1575770995516141568	The Charter has been activated to provide satellite data following #TyphoonNoru's impact to Laos: https://t.co/dIb7HdW5We	30.09.2022 8:54	764	20	3
https://twitter.com/DisastersChart/status/1487018143784521728	This map uses WorldView-2 and #SAOCOM data to estimate #floods in Antananarivo, #Madagascar: https://t.co/aseHOLDzjC https://t.co/FuyH73cfDl	28.01.2022 11:02	1891	86	2
https://twitter.com/DisastersChart/status/1514617276623818775	The Charter has been activated to provide satellite data over floods and landslides in #SouthAfrica: https://t.co/1unBqS2sRb	14.04.2022 14:51	672	25	2
https://twitter.com/DisastersChart/status/1563097868675665920	Flooding at Ivanovka village in Russia is shown in this map: https://t.co/3EaZqu9cxg Kanopus-V and RESURS-P were used to estimate the flood areas, shown in lighter shades of blue. https://t.co/Br36zlXWdc	26.08.2022 9:35	529	50	2
https://twitter.com/DisastersChart/status/1569655959638757376	The Charter has been activated to provide satellite imagery over floods in #SouthAfrica caused by the collapse of a dam at Jagersfontein: https://t.co/RauCEz95DG	13.09.2022 11:55	461	30	2
https://twitter.com/DisastersChart/status/1605516717718835202	The Charter has been activated to provide satellite data over a potential oil spill off the coast of Mauritius: https://t.co/2ntmcp7Oip It follows the grounding of a fishing vessel on a reef earlier this month.	21.12.2022 10:53	1083	44	1

https://twitter.com/DisastersChart/status/1483794613206933504	@SurreySat @QueLotte @AirbusSpace @spacegovuk @SatAppsCatapult Indeed. Radar is very useful for this. We don't have any examples of maps featuring radar data on our page yet, but you can see our maps produced so far for Tonga here: https://t.co/723Ip6Jzdv	19.01.2022 13:32	86	5	0
https://twitter.com/DisastersChart/status/1485965708433440774	This map uses #Pleiades imagery to analyse the impact of landslides at Neves in SÃ£o TomÃ© and Principe: https://t.co/jArfgb4nkb https://t.co/MxI72VlgoK	25.01.2022 13:20	1026	55	0
https://twitter.com/DisastersChart/status/1526905763117015040	At a recent meeting, @CNES and partners discussed the value satellites provide to relief and risk management parties in the event of disasters. https://t.co/sUGMDBpTzh	18.05.2022 12:41	1168	7	0

6.2 Charter Newsletters

Charter Newsletters #24 and #25 were issued in May 2022 and December 2022 respectively. The newsletters represent an additional means of informing users, stakeholders, and the public on recent Charter activations, news, events and related activities.

The 24th issue is available on the link below and reported on the following matters:

https://disasterscharter.org/web/guest/-/international-charter-newsletter-may-2022-issue-24

- National Institute for Space Research (INPE) lead the Charter for the last six months
- COP26 and the Disasters Charter
- Haiti disaster story
- How space agencies are contributing to relief efforts through the Charter
- WFI sensors from CBERS and AMAZONIA-1 satellites

Figure 58. Charter Newsletter issue 24

The 25th issue is available on the link below and reported on the following matters:
https://disasterscharter.org/web/guest/-/international-charter-newsletter-december-2022-issue-25

- NOAA and USGS Leadership
- Tonga Volcano Activation
- Landsat 50th Anniversary
- Pléiades Neo
- Indigenous Mapping

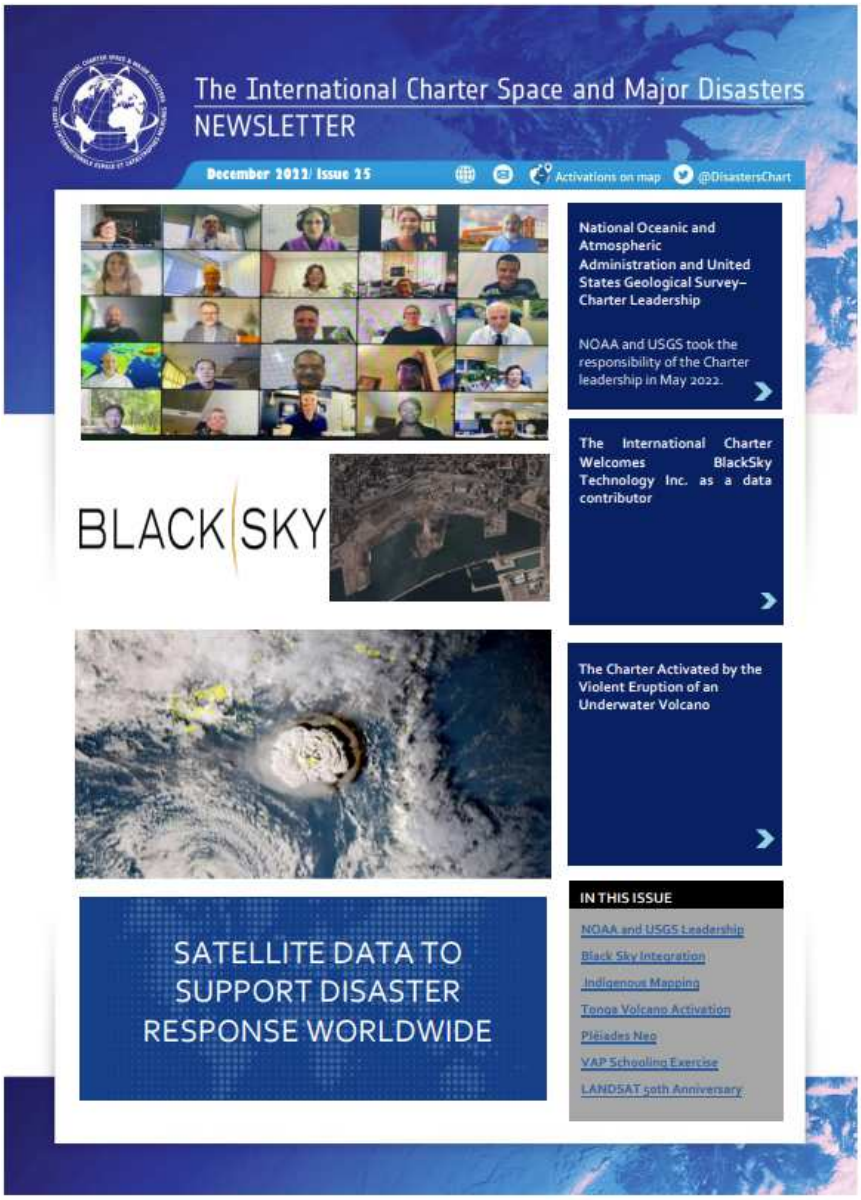


Figure 59. Charter Newsletter issue 25

The dissemination of the newsletters is organised through the Charter website and by e-mail. Each agency deals with its own distribution list.

6.3 Conferences and presentations

The following table provides details of the 2022 events or conferences where the Charter was represented. On such occasions, presentations were given covering the Charter’s role in the acquisitions and production of satellite imagery for disaster response together with the Universal Access initiative.

Table 12. List of conferences/workshops/presentations with Charter presence

Event	Venue	Date	Speakers
CUPEEA (COPUOS) 59 – French Statement	Virtual format	7-18 February 2022	CNES
CUPEEA (COPUOS) 65 – French Statement	Luxembourg	1-10 June 2022	
Exhibition « Space For Our Planet »: this exhibition relates how space technology is being used to achieve the United Nation’s SDGs. The 17th SDG presents the international partnership of the International Charter with two testimonies regarding Haiti activations. Partnerships for the goals – Space for Our Planet (space4ourplanet.org) **This exhibition is available in 8 languages and has toured in 10+ cities with more than 445 000 visitors. In 2022, Space For Our Planet was exhibited in Berlin and Bonn (Germany), Trento and Rome (Italy), Barcelona (Spain), New York (United Nations- U.S.).**	Berlin and Bonn (Germany), Trento and Rome (Italy), Barcelona (Spain), New York (USA)	2022	
Charter presentation to young students in the frame of the Copernicus Challenge "Mettons le plastique à l'index".	Toulouse	30 May 2022	
Live twitch about hydrology and extreme events : Déjeuner thématique : Spatial et phénomènes hydrologiques extrêmes - Twitch	Toulouse	7 November 2022	
CSA president Lisa Campbell remarks at the 13th Australian Space Forum	Adelaide (Australia)	March 3, 2022	CSA
CSA president Lisa Campbell remarks as part of the Heads of Agency Panel at the 37th Space Symposium	Colorado Springs (USA)	April 6, 2022	
ESA Living Planet Symposium “Universal Access to the International Charter ‘Space and Major Disasters’” (by	Germany	May 25, 2022	DLR

Jens Danzeglocke, German Aerospace Center (DLR), Space Agency, Germany)			
ESA Living Planet Symposium "Bridging the Gap: linking the space and the disaster management community" (by Dr. Juan Carlos Villagran De Leon (UNOOSA) & Anne Schneibel (German Aerospace Center)	Germany	May 25, 2022	DLR
"United Nations Workshop on Space-based Technologies for Disaster Risk Reduction" organised by UNOOSA - general presentation of the Charter and a special session "Demonstration of the cloud processing environment of the International Charter Space & Major Disasters"	Bangkok (Thailand)	7-9 December 2022	ESA

UNOOSA and UNITAR/UNOSAT also contributed towards increasing Charter awareness through presentations to a wider public audience, ranging from Ministers and Heads of Agencies to operational entities within the UN system.

6.4 Press releases and articles

The following table summarises the main press releases, web and paper articles issued by the member agencies or others in 2022.

Table 18. List of articles and press releases

Date	Issuing agency	Title
January 2022	CNES	Article on CNES.FR regarding the Tonga Island volcanic eruption – January 2022 Charte Espace et catastrophes majeures | TONGA, éruption violente d'un volcan s (cnes.fr)
June 2022		The Conversation.com – publication of an article in June 2022 Catastrophes majeures : utiliser des satellites pour réagir au plus vite (theconversation.com)
December 2022		Article in magazine Risques infos #44 : « Le spatial au service de la Gestion des risques : réalité opérationnelle et perspectives» (H. de Boissezon, E. Bronner, D. Fontannaz).
January 20, 2022	CSA	Media interview: CSA Guennadi Kroupnik at Les Années Lumière, Radio-Canada (radio)
2022		Earth in Focus exhibition (which presents content on the Charter) reached 130 584 visitors at the Canada Science and Technology Museum, in Ottawa, Ontario, and at the Cosmodome, in Laval, Quebec.

2022	KARI	Introduction and Activities of the International Charter Space and Major Disasters were presented on the KARI Annual Report 2022 and the National Satellite Operation & Application Center Annual Report 2022
2022	UAESA	UAESA launched officially Geo Spatial Analytics Platform – Space Data Center during COP27. Based on this project, UAESA succeed in submitting the following report: Rapid Assessment of Rains and Flood Damage; (Link) Executive Summary: Heavy rain fell over the United Arab Emirates (UAE) in the month of July 2022 which resulted in flooding in the three Emirates, Sharjah, Ras Al Khaimah and Fujairah. UAE Space Agency conducted rapid assessments on the flooding damages based on multiple sources of satellite imagery data. Also, this assessment highlighted the flood extent. The portfolio of imagery data consisted of archive satellite optical data, archive SAR data, newly tasking satellite optical data and newly tasking SAR data. The project has been conducted on an emergency basis considering the analysis was highly time sensitive. Reference List: 1. https://gulfnews.com/uae/uae-space-agency-launches-space-data-centre-to-tackle-challenges-1.92037794 2. http://www.wam.ae/ar/details/1395303102440

6.5 Infographic

A new infographic, validated by the Communications, Executive Secretariat, and Board groups was released on 18 May 2022.

Figure 60. New Charter infographic released in 2022.

6.6 Users’ Appraisal

To understand the value the Charter brings to supporting disaster management teams and, to identify possible improvements to the Charter service, we gather feedback after each activation. This feedback, which comes primarily from End Users (the recipients of our value-added products) and from Project Managers (the individuals who coordinate each activation).

During an ongoing disaster the Charter products are primarily used to support communication, thus assisting in disaster situation awareness. After the event, they can support post-event analysis. Figure 61 indicates how the value-added products are used.

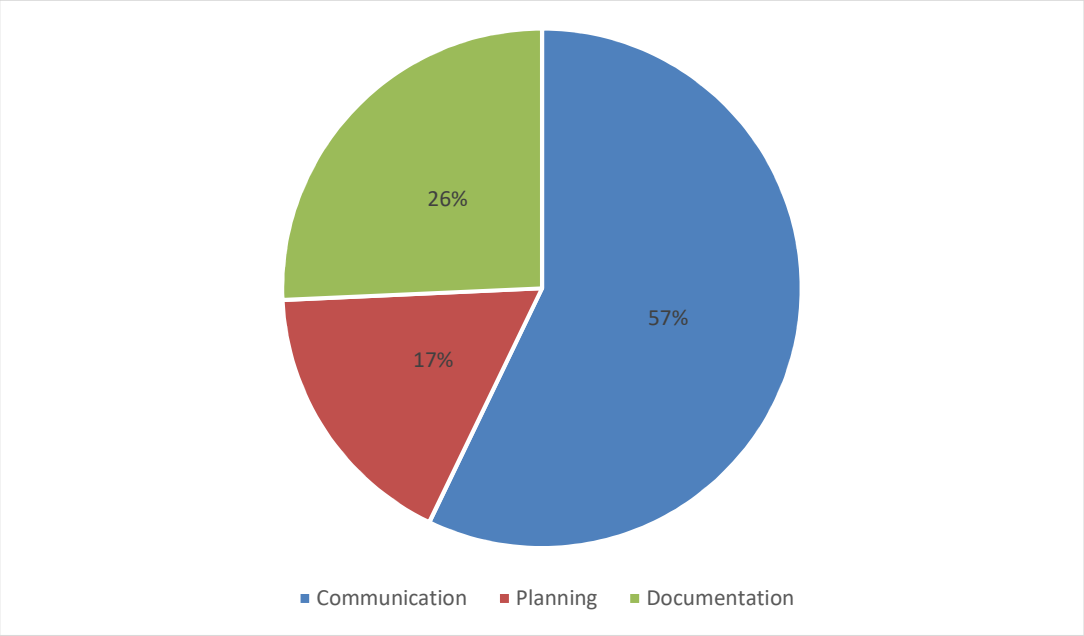


Figure 61. Breakdown of use of Charter value-added products in 2022

The feedback received in 2022 indicates that, end users are in general very satisfied with the Charter’s service, which continues to exceed user expectations. Figure 62 indicates the level of satisfaction based on feedback from end users when asked to rate the contribution made by the Charter service to the emergency events affecting them in 2022.

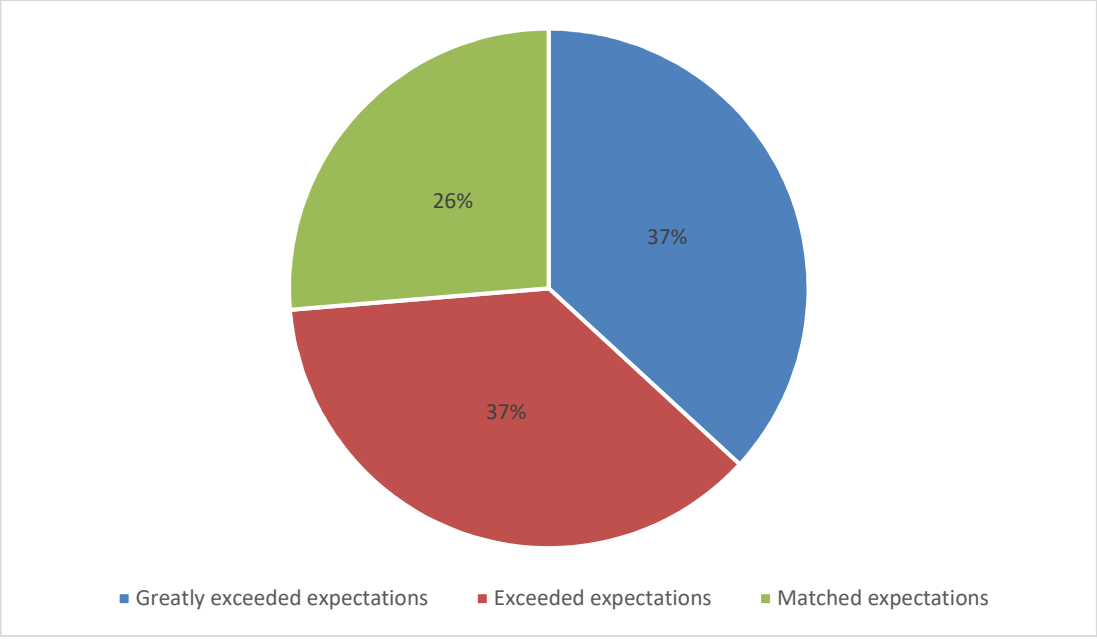


Figure 62. The contribution made by the Charter to emergencies in 2022

Occasionally, it is not possible to satisfy user needs for a specific satellite data type. For example this can happen due to the size of the impacted region, or due to cloud cover. Here is a selection of other feedback, including some suggestions for improvement, received from Project Managers and End Users:

- “It’s great. The use of charter mapper [a processing environment] aids us in processing "unfamiliar" datasets”
- “Make products available through web map services for easy access”
- “Have the ability to display images in other formats (extensions). Google Earth imagery is often useful for comparison with post-event imagery, as well as to generate 3D views of the affected area”
- “Provide more lengthy and specific training for value-added users”
- “Provide post disaster SAR imagery quicker”
- “More clarity on how to activate the charter”
- “Everything went considerably smooth with the call, every question or doubt answered timely by the helpdesk or the Executive Secretariat”.

All feedback is reviewed by the Executive Secretariat. Where possible, enhancements are implemented and service issues remedied.

4.3 Communication assessment

The improved version of the website facilitates the user navigation and information search.

Several channels were used to ensure more comprehensive communication to Charter users, stakeholders, and the general public:

- The publication and distribution of newsletters.
- The Charter website, still well visited.
- The Charter Twitter account. All Charter activations and news are distributed via tweets. Around 10,000 followers were counted by the end of 2022.
- The Charter videos available in the “Library” Section of the Charter Website as well as on YouTube.
- Participation in international/regional events all over the world to promote the Charter and the Universal Access (UA) initiative.
- Press releases and articles mainly via the web and in particular, the Charter website, Charter members’ websites, and UN-SPIDER communication channels.
- The Charter flyer and brochure in English and French are distributed and used regularly at conferences and workshops internationally.

7. Conclusions

In 2022, the following agencies took the lead agency duty, which rotates among Charter members on a six-month basis: INPE (October 2021 – May 2022), USGS/NOAA (May 2022 – October 2022) and KARI (October 2022 – April 2023).

In total, the Charter has been triggered for 793 disasters in 133 countries between its inception in the year 2000 and the end of 2022. Throughout 2022 alone, there were 51 activations in 33 countries, a figure far above the yearly average of 42 activations between 2007 and 2019. The number of activations was not evenly distributed during the year: only one activation occurred in March and the highest number was in September. The four-month period July to October corresponds to 51% of the total number of activations.

Natural disasters occurring during this period of the year are mainly attributed to meteorological events (90% of activation in September) such as intense rains; ensuing floods; tropical storms; in Asia (4), Africa (2), and Latin America and the Caribbean (3). The spikes in activations in January and June of 2022 were mainly due to non-seasonal events occurring in succession coincidentally, such as volcanic eruptions and oil spills. In 2022, the Charter was triggered three times for man-made disasters, three oil spills in Peru, the Gambia, and Mauritius.

15 of the 50 most severe events recorded by the EM-DAT in 2022 were covered by Charter activations. In 2022, the three most catastrophic events were floods in India that killed 2,035 people and affected 1.3 million, floods in Pakistan that killed 1,739 people and affected 33 million, and the earthquake in Afghanistan that killed 1,036 people and affected 361,000 people. All three of these events were covered by Charter activations.

Universal Access (UA) is gradually progressing. UA allows disaster risk management organizations worldwide to be granted Authorized User (AU) status. South Africa, Panama, Honduras, Niger, Nicaragua, Kenya, and Solomon Islands became Authorized Users in 2022. Other candidates are under assessment or training. 83 countries have dedicated AUs able to directly request Charter activations as the end of 2022. Charter members have continued to promote UA and the Charter as a whole through their participation in different international (on-line) events held in 2022.

The web-based system COS-2 has provided operational support to the Charter since the beginning of March 2015. Overall, it has been used successfully in all Charter calls. Most of the Charter members have their EO metadata fetched on COS-2, allowing automated and on-line cataloguing of Charter acquisitions. Since September 2017, COS-2 can automatically record metrics and information that is necessary in order to generate system performance statistics used in this report.

Five Authorized Users, no Emergency on-Call Officer (except one SARE exercise), and seven Project Manager refresher training sessions were organized to strengthen the network of the Charter operation loop. On-line refresher training courses are also available.

The Charter website is available in English and some pages are available in French, Chinese, Japanese, and Spanish. It allows Charter staff and Authorized Users direct access COS-2. The 24th and 25th Charter newsletters were issued in 2022. In addition, Twitter is frequently used as a tool

to increase visibility of the Charter activations and other relevant news and raising public awareness on the Charter.

Successes of the International Charter Space and Major Disasters in 2022, such as improving our operational environment, welcoming additional authorized users, effectively communicating our mission and most importantly, responding to disasters as requested will continue going forward. The Members of the International Charter “Space & Major Disasters” remain dedicated to assisting emergency response efforts and providing improved access and benefit from satellite resources.