

# **International Charter Space & Major Disasters**



**Annual Report 2019**

**V5**

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# 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 2019.

## **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 Communication 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 (e.g. Munich RE and Swiss RE).

This report adheres to the following structure:

**Chapter 1** - Introduction

**Chapter 2** - The International Charter Space and Major Disasters; overview and lead agencies of the Charter in 2019

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

**Chapter 4** – External relations: explains the integration of new members, the Universal Access process, and relationships with Cooperating Bodies.

**Chapter 5** – Communication: reports on all communication activities undertaken throughout the reporting period.

**Chapter 6** - 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 7** – Conclusions: outlines the significant achievements and outcomes throughout the reporting period.

## **1.3 Applicable documents**

[AD1] Text of the Charter “Space and 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



## 1.4 List of acronyms

ABAE	Bolivarian Agency for Space Activities
AOI	Area of Interest
ADRC	Asian Disaster Reduction Centre
AU	Authorized User (of the Charter)
CEMS	Copernicus Emergency Management Service
CENAD	Centro Nacional de Gerenciamento de Riscos e Desastres (Brazil)
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)
CONRED	Coordinadora Nacional para la Reducción de Desastres (Guatemala)
COPUOS	United Nations Committee on the Peaceful Uses of Outer Space
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)
DMC	Disaster Management Constellation
DMCii	Disaster Management Constellation International Imaging
DRM	Disaster Risk Management
ECO	Emergency On-Call Officer (of the Charter)
EM-DAT	Emergency Events Database
EO	Earth Observation
EOR	Emergency Observation Request
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
GIO	GMES Initial Operations
GMES	Global Monitoring for Environment and Security
HDDS	(USGS) Hazards Data Distribution System
HR	High Resolution
ICT	Information and Communication Technology
INPE	National Institute for Space Research (Brazil)
ISRO	Indian Space Research Organization
ISS	International Space Station
IWMI	International Water Management Institute
JAXA	Japan Aerospace Exploration Agency
KARI	Korea Aerospace Research Institute
LAPAN	National Institute of Aeronautics and Space (Indonesia)
MBRSC	Mohammed Bin Rashid Space Centre
MO	Manila Observatory (the Philippines)
MR	Medium Resolution
NatCatSERVICE	Natural Catastrophe know-how for risk management and research
NDRCC	National Disaster Reduction Centre of China
NFP	National Focal Point
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)
ROSCOSMOS	Russian State Space Corporation
SA	Sentinel Asia
SAR	Synthetic Aperture Radar
SARE	Semi-Annual Refresher Exercise
SELPER	Remote Sensing Society of Bolivia
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	United Kingdom Space Agency
UNESCAP	United Nations Economic and Social Commission for Asia and the Pacific
UNITAR/UNOSAT	United Nations Institute for Training and Research/ United Nations Operational Satellite Applications Programme
UNOCHA	United Nations Office for the Coordination of Humanitarian Affairs
UNOOSA	United Nations Office for Outer Space Affairs
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
VHRO	Very High Resolution Optical
WCDRR	World Conference on Disaster Risk Reduction
WG	Working Group

## ***1.5 Authors of the report***

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

## 2 The International Charter Space and Major Disasters

### 2.1 Overview

The Charter is an international collaboration amongst 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/ Disaster Monitoring Constellation, DMC
- 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 out of 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, and were able to request Charter support for emergencies in their own country or in a country with which they cooperate for disaster relief. In another

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 4.2).

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 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 637 disasters (as of the end of 2019), in 127 countries. In 2019 alone, the Charter was activated 43 times for disasters taking place in 27 countries.

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

In 2019, active satellites included (Table 2-1):

- Radar (high resolution and very high-resolution sensors): RADARSAT-2, TerraSAR-X, TanDEM-X, Sentinel-1A/B, ALOS-2, KOMPSAT-5 and GF-3.
- Optical (high resolution and very high-resolution sensors): PlanetScope, UK-DMC 2, Landsat 7 and 8, VRSS-1, SPOT-6, SPOT-7, PLEIADES 1A and 1B, PROBA-V, GF-1, GF-2, GF-4, CBERS-4, KOMPSAT-2, KOMPSAT-3, KOMPSAT-3A, Cartosat-2, Cartosat-2E, Resourcesat-2, Resourcesat-2a, RapidEye, Kanopus-V, Kanopus-V-IK, Resurs-P 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 2019:

- PlanetScope

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.

Agency	Satellite (operational)
CNES	PLEIADES 1A & 1B
	SPOT-6, SPOT-7
CSA	RADARSAT-2
CNSA	GF-1
	GF-2
	GF-3
	GF-4
DLR	TerraSAR-X / TanDEM-X
	RapidEye
DMCii	UK-DMC2
ESA	Sentinel-1A/B
	Sentinel-2A/B
	PROBA-V
EUMETSAT	Metop Series Meteosat MSG
INPE/CNSA	CBERS-4

Agency	Satellite (operational)
ISRO	Resourcesat-2
	Resourcesat-2a
	Cartosat-2
	Cartosat-2E
JAXA	ALOS-2
KARI	KOMPSAT-2
	KOMPSAT-3
	KOMPSAT-3A
	KOMPSAT-5
NOAA	POES
	GOES
	Suomi NPP
PLANET	PlanetScope
ROSCOSMOS	Kanopus-V
	Kanopus-V-IK
	Meteor-M
	Resurs-P
USGS	Landsat 7 and 8
	WorldView-1/2/3
	GeoEye-1

**Table 2-1. List of Charter operational satellites [optical (in grey) and radar (in light blue)]**

## **2.2 Lead agencies of the Charter in 2019**

During this period, the lead agencies on a biannual rotational basis have been the French Space Agency, CNES (October 2018 – May 2019), the Canadian Space Agency, CSA (May 2019 – October 2019), and the Russian State Space Corporation, ROSCOSMOS (October 2019 – April 2020).



**Figure 2-1. 41<sup>st</sup> Charter Board and Executive Secretariat members in Quebec City, Canada, May 2019.**



**Figure 2-2. 42<sup>nd</sup> Charter Board and Executive Secretariat members in Saint-Petersburg, Federation of Russia, October 2019.**

### 3. Charter operations

#### 3.1 Charter activations

In 2019, the Charter was activated 43 times, covering disasters in 27 countries.

The Charter was triggered for the major bushfires in Australia in June 2019 that killed 34 people, destroyed 5,900 buildings and burnt over 18.6 million hectares of land. The Emergency Management Australia Crisis Coordination Centre (CCC) and the New South Wales Rural Fire Service (NSWRFS) requested, through Geoscience Australia to receive the Charter products in order to assist operation of aid teams, planning and training. The Charter provided more than 2,000 satellite images in response to this activation. Moreover, Copernicus EMS provided value-added products.

Since 2007, the annual number of activations has oscillated between 32 and 51. The Charter has effectively managed an average 40 activations per year thanks to its distributed operational capacities and human resources (Figure 3-1).

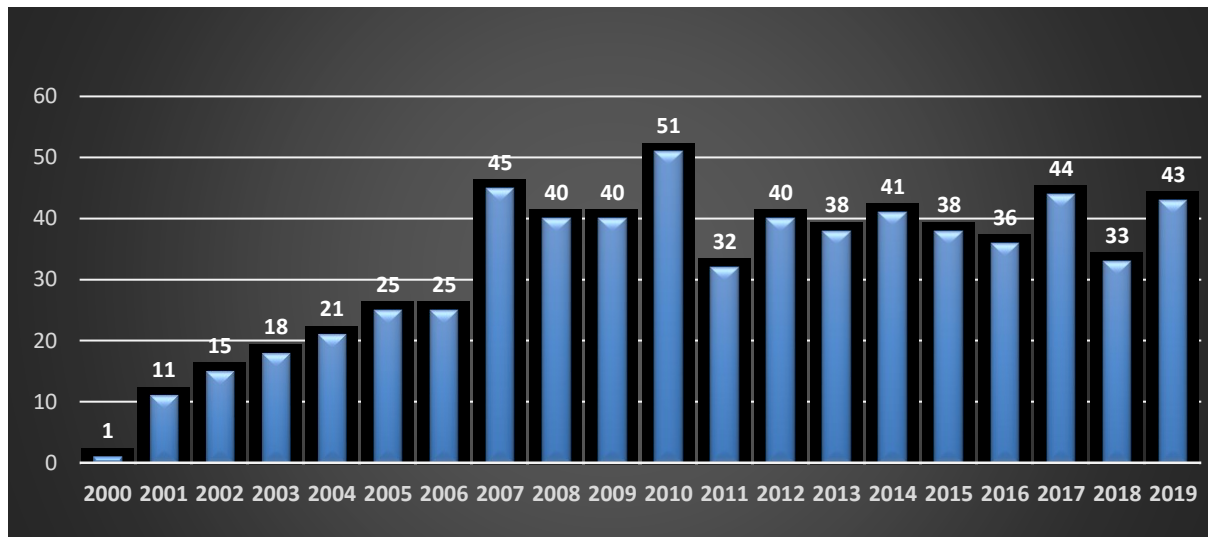
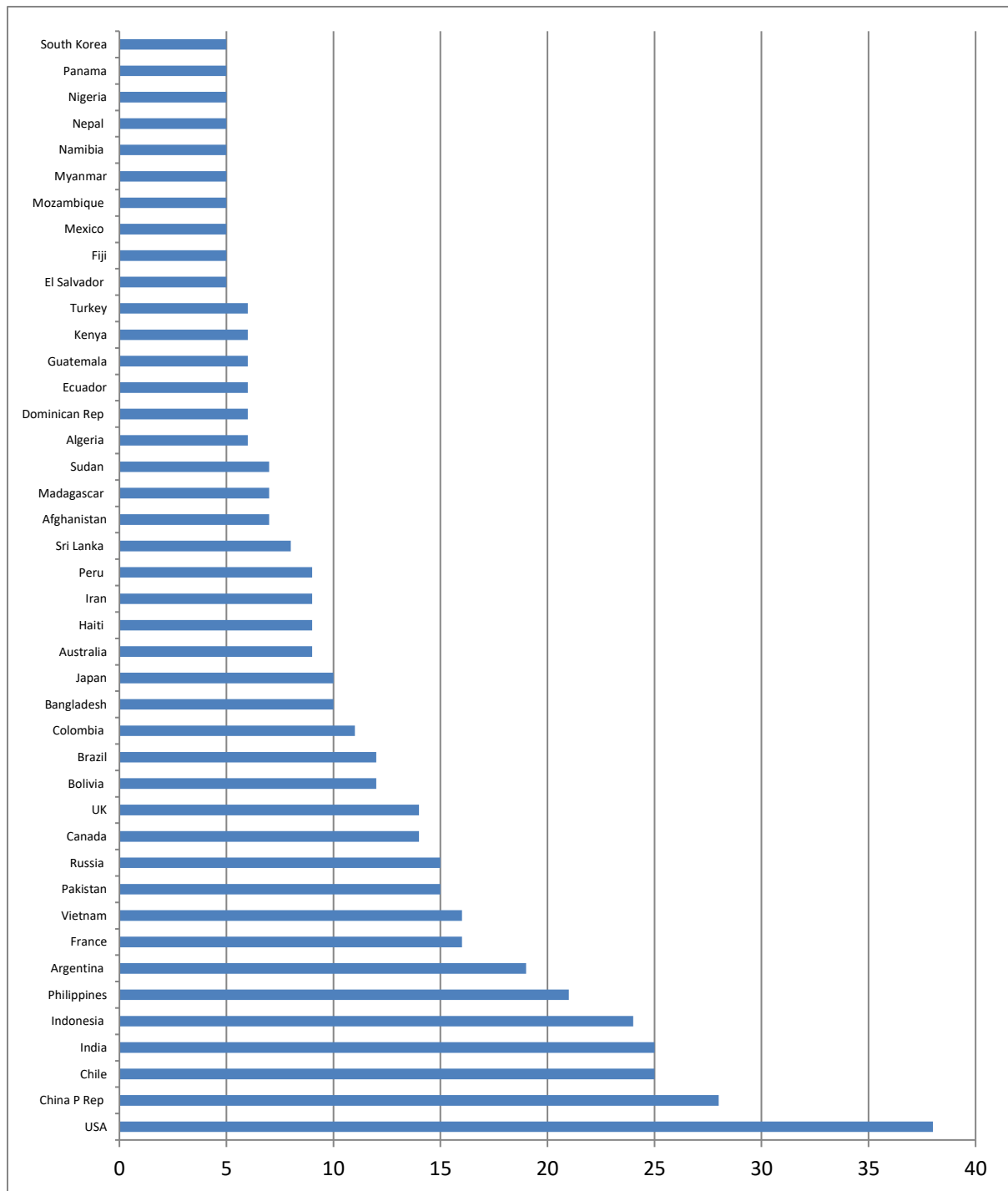


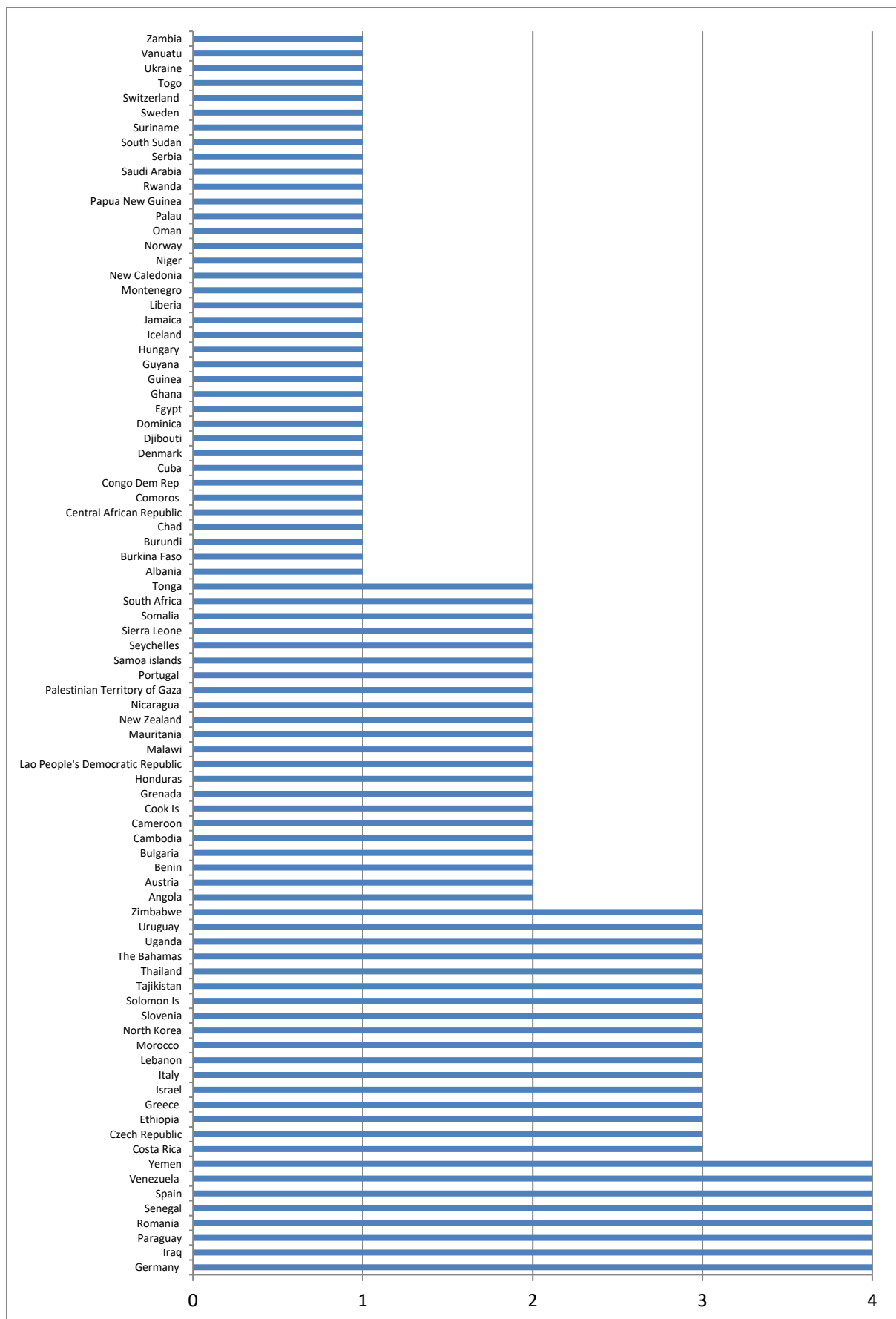
Figure 3-1. Number of Charter activations per year (2000 - 2019)

By the end of 2019, the Charter had been triggered for 637 disasters in 127 countries since 2000 (Figure 3-2 a, b).



**Figure 3-2 a) 2000-2019 breakdown of Charter activations by country (countries with 5 or more activations)**





**Figure 3-2 b) 2000-2019 breakdown of Charter activations by country (countries with up to 4 activations)**

127 Countries around the world have benefited from the International Charter since 2000. The USA, China, Chile, India, Indonesia, Philippines, Argentina, France, Vietnam, Pakistan, Russia, Canada, the UK, Bolivia, Brazil and Colombia are the hazard affected countries for which the Charter was activated most often (>10) to cover major disaster events during these 19 years, while 59% of countries requested the Charter less often (1 to 4 activations in 19 years).

All 2019 activations are listed in Table 3-1. 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, 50 requests were received in 2019. In three cases, two calls were merged in one activation, respectively, as these requests had been made for the same disaster events:

- Calls 688 and 691 were requested for a hurricane in Mozambique by UNITAR/UNOSAT on behalf of IFRC and by CENAD.
- Calls 708 and 709 were requested for wildfires in Bolivia, both requested by SINAGER.
- Calls 710 and 711 were requested for flooding in Sudan, requested by UNITAR/UNOSAT on behalf of UNOCHA and UNICEF and by the Ministry of Agriculture and Forestry.

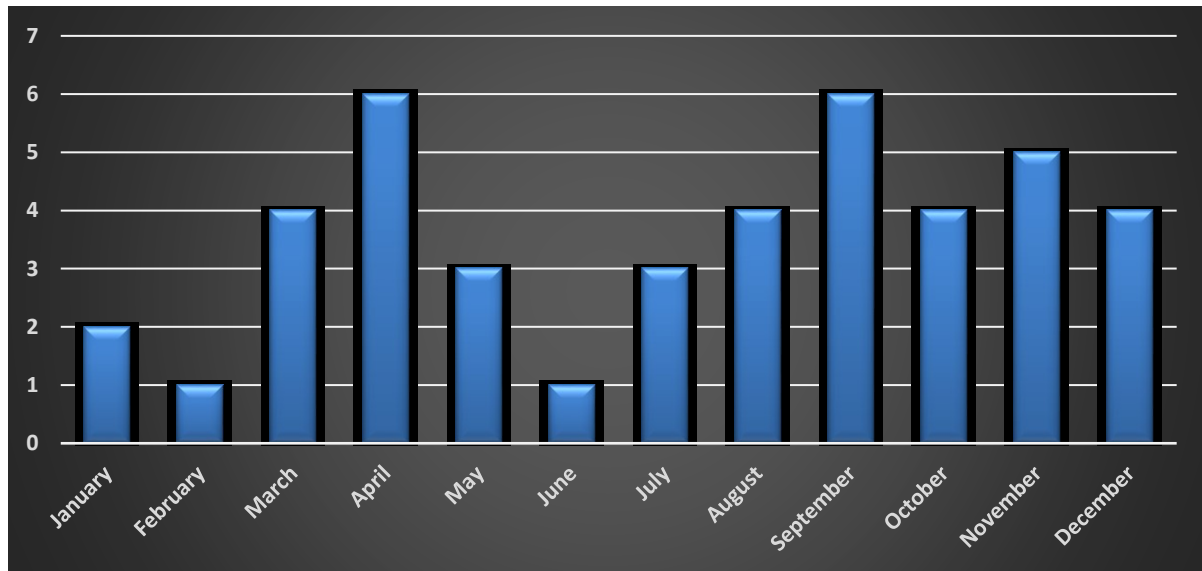
Calls 703 for wildfires in Iraq, 728 for a landslide in Kenya, 732 for search and rescue of aircraft were rejected. Call 733 for search and rescue of aircraft was withdrawn by UNOOSA.

Act. No.	Type of disaster	Country	Date of the event
595	Flood	Brazil	2019-01-13
596	Other (dam collapse)	Brazil	2019-01-25
597	Landslide	Bolivia	2019-02-08
598	Ocean Storm	Mozambique	2019-03-15
599	Ocean Storm	Zimbabwe	2019-03-16
600	Flood	Indonesia	2019-03-19
601	Flood	Iran	2019-03-31
602	Wildfire	South Korea	2019-04-05
603	Flood	Iraq	2019-04-15
604	Flood	Canada	2019-04-19
605	Flood	South Africa	2019-04-25
606	Ocean Storm	Mozambique	2019-04-25
607	Landslide	Bolivia	2019-04-30
608	Ocean Storm	India	2019-05-03
609	Flood	Paraguay	2019-05-17
610	Earthquake and landslide	Peru	2019-05-26
611	Flood	Russia	2019-06-27
612	Flood	India	2019-07-17
613	Volcano	Peru	2019-07-20
614	Flood	Russia	2019-07-24
615	Flood and Ocean Storm	Russia	2019-08-15
616	Wildfire	Bolivia	2019-08-21
617	Flood	Sudan	2019-08-26
618	Flood and Landslide	Japan	2019-08-29
619	Wildfire	Bolivia	2019-09-02
620	Ocean storm and flood	The Bahamas	2019-09-04
621	Wildfire	Paraguay	2019-09-20
622	Earthquake	Pakistan	2019-09-26
623	Flood	India	2019-09-30
624	Earthquake	Indonesia	2019-09-30
625	Ocean Storm	Japan	2019-10-10
626	Wildfire	Lebanon	2019-10-16
627	Flood	Cameroon	2019-10-17
628	Flood	Kenya	2019-10-31
629	Earthquake	Philippines	2019-11-01
630	Ocean Storm	Bangladesh	2019-11-10
631	Wildfire	Australia	2019-11-13
632	Flood	Central African Republic	2019-11-16
633	Landslide	Kenya	2019-11-25
634	Ocean Storm	Philippines	2019-12-02
635	Landslide	Uganda	2019-12-10
636	Search & rescue of aircraft	Chile	2019-12-10
637	Ocean Storm	Philippines	2019-12-31

**Table 3-1. List of 2019 Activations**

### 3.1.1 Monthly activations

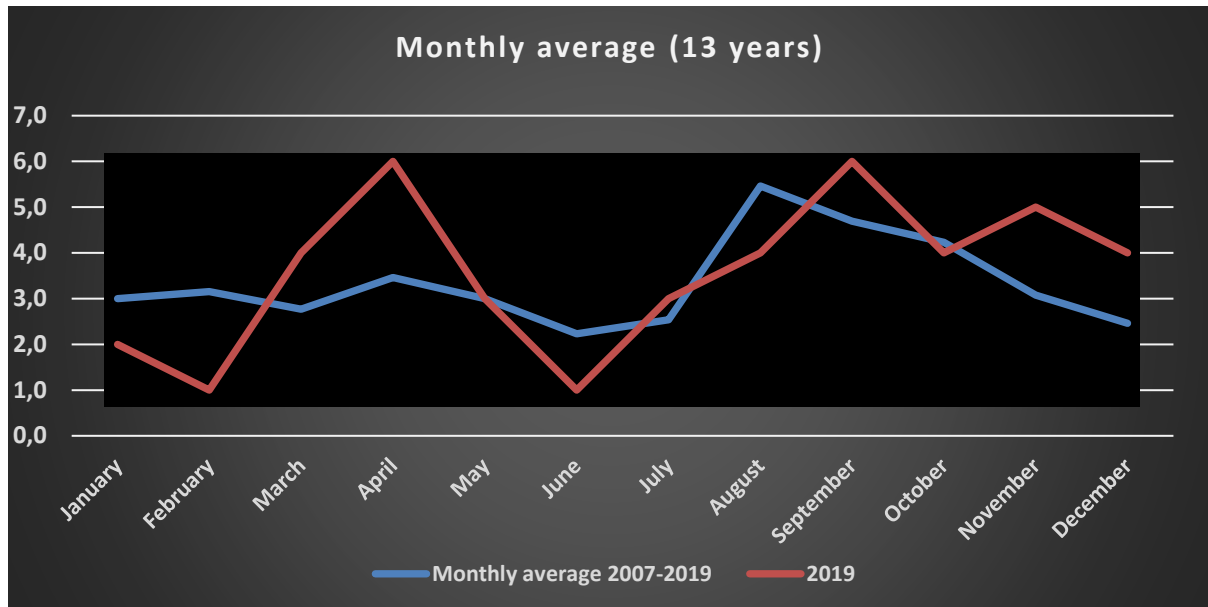
During 2019, the monthly average of activations was 3.5. Figure 3-3 shows the monthly distribution of activations throughout 2019. The number of activations is overall uniformly distributed during the year. The highest number occurred in April, September and November corresponding to 39.5% of the total number of activations. The remaining months of 2019 saw a number of activations that varied from 1 to 4.



**Figure 3-3. Distribution of the Charter activations by month in 2019**

Peaks of activations at the end of summer (northern-hemisphere) have occurred regularly since 2009 (Figures 3-3 and 3-4). Natural disasters occurring throughout that period of the year are mainly attributable to meteorological events (intense rains; ensuing floods; tropical storms; fire) in Asia, Central and South America. The peak of activations in April and September 2019 was due to different types of disasters linked to meteorological events (floods in Africa, Asia and North America, ocean storms in Africa and the Caribbean and fires in South America) as well as solid earth movement (earthquakes in Asia).

In order to find an overall trend through the years, the following diagram shows the number of activations per month for year 2019 in comparison to the monthly average number of activations for the period 2007-2019. The 2007-2019 diagram clearly shows the peak of activations at the end of summer. The 2019 curve follows the 2007-2019 average curve and in particular, it has a great impact on it with the highest number of activations being in April and September and the lowest being in February and June.



**Figure 3-4. Number of 2019 activations per month (in comparison to the average number of activations) for the period 2007-2019**

### 3.1.2 Geographical distribution

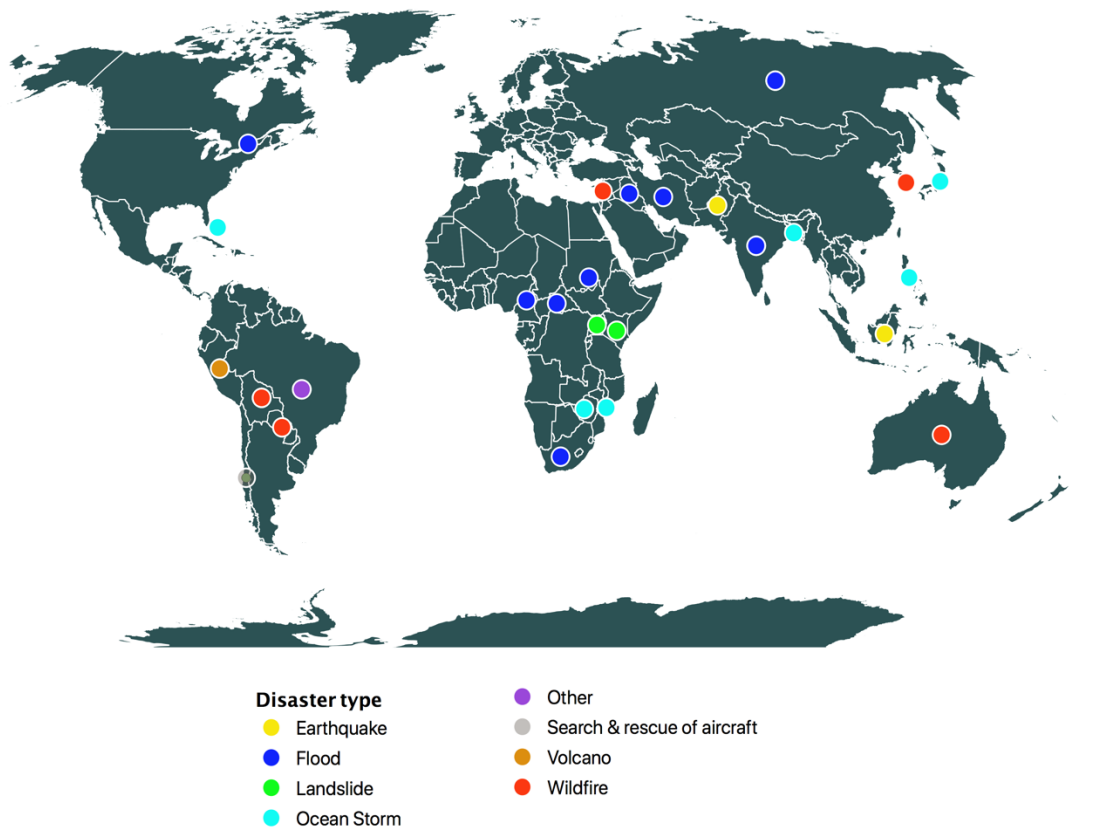


Figure 3-5. Location of the 2019 activations (by hazard type)

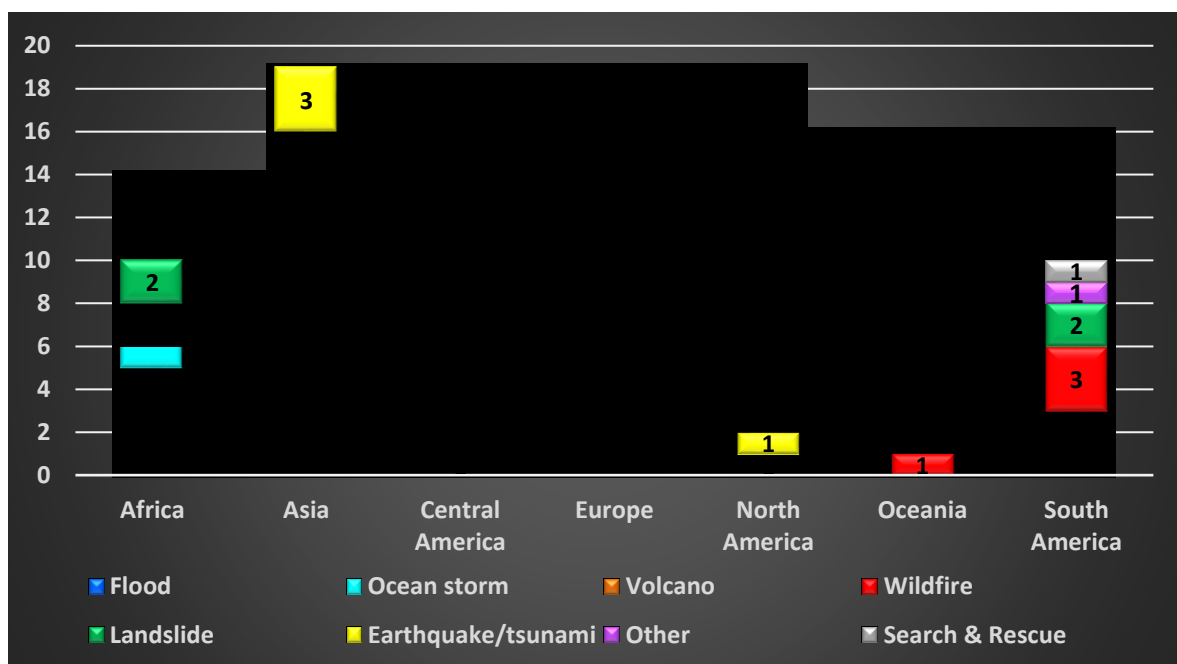


Figure 3-6. 2019 - Number of activations by continent/subcontinent and hazard type

In 2019, the activations breakdown per region was as follows: 19 in Asia; 10 in South America; 10 in Africa; 2 in North America; 1 in Oceania; and 1 in Central America (Figures 3-5 & 3-6)

with the most frequent hazard types being floods (40%) and ocean storms (21%) while solid earth-related hazards represented 12%, wildfires 14%, landslides 9%, search and rescue of aircraft 2% and other types of hazards 2% (Figure 3-7). It is noted that in 2019 the Charter was activated 6 times for wildfires, the highest number of wildfire events within a year since 2000.

However, it should be noted that it is not always a straightforward process to classify Charter activations by disaster types because there are often multi-hazard events, which combine a multitude of sub-hazard events such as floods causing landslides, earthquake causing landslides or tropical/ocean storms resulting in direct damages as wells as floods and landslides, etc.

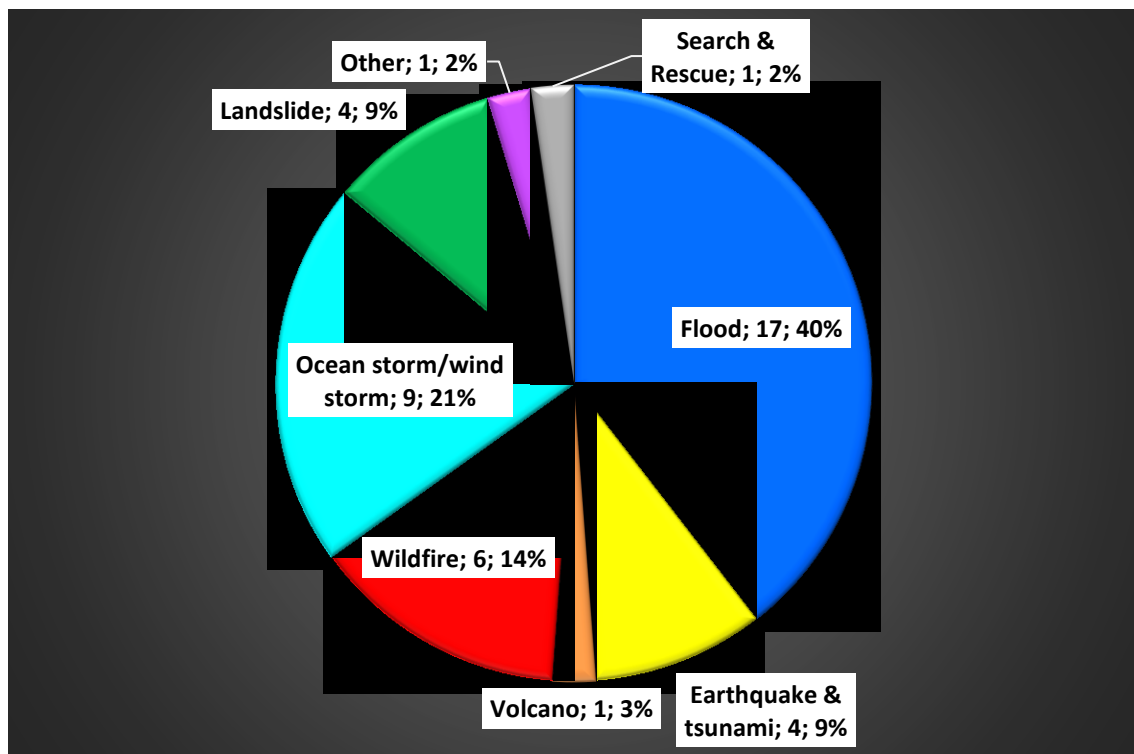
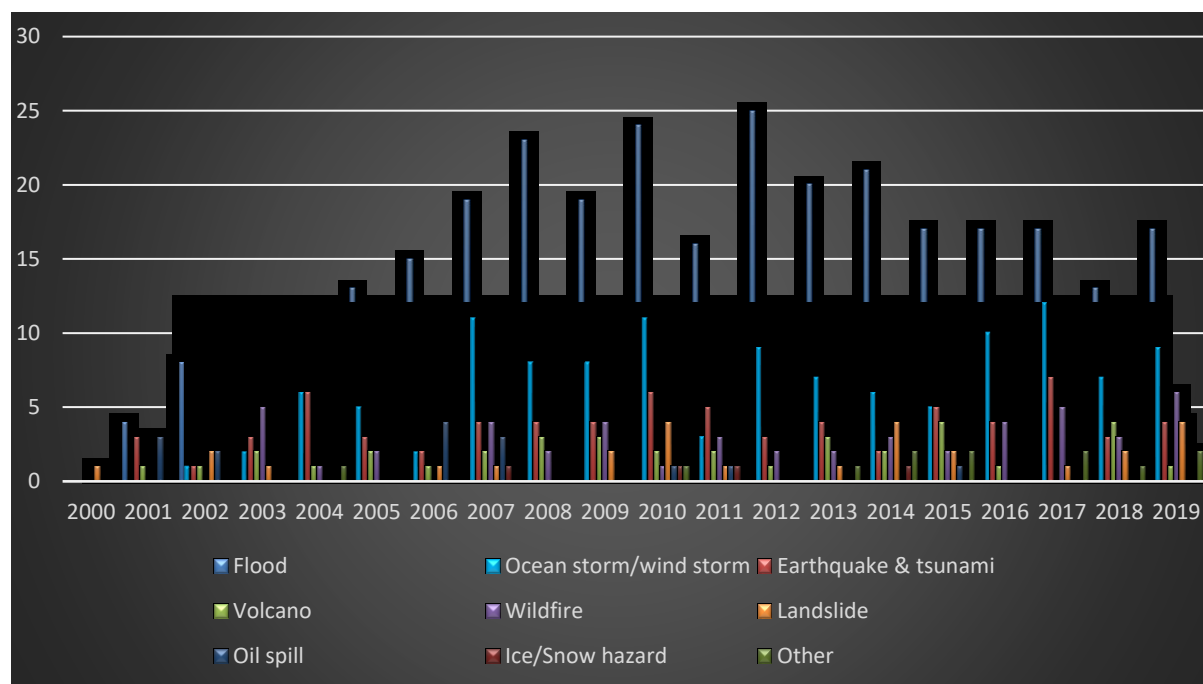


Figure 3-7. 2019 Number of activations by hazard type

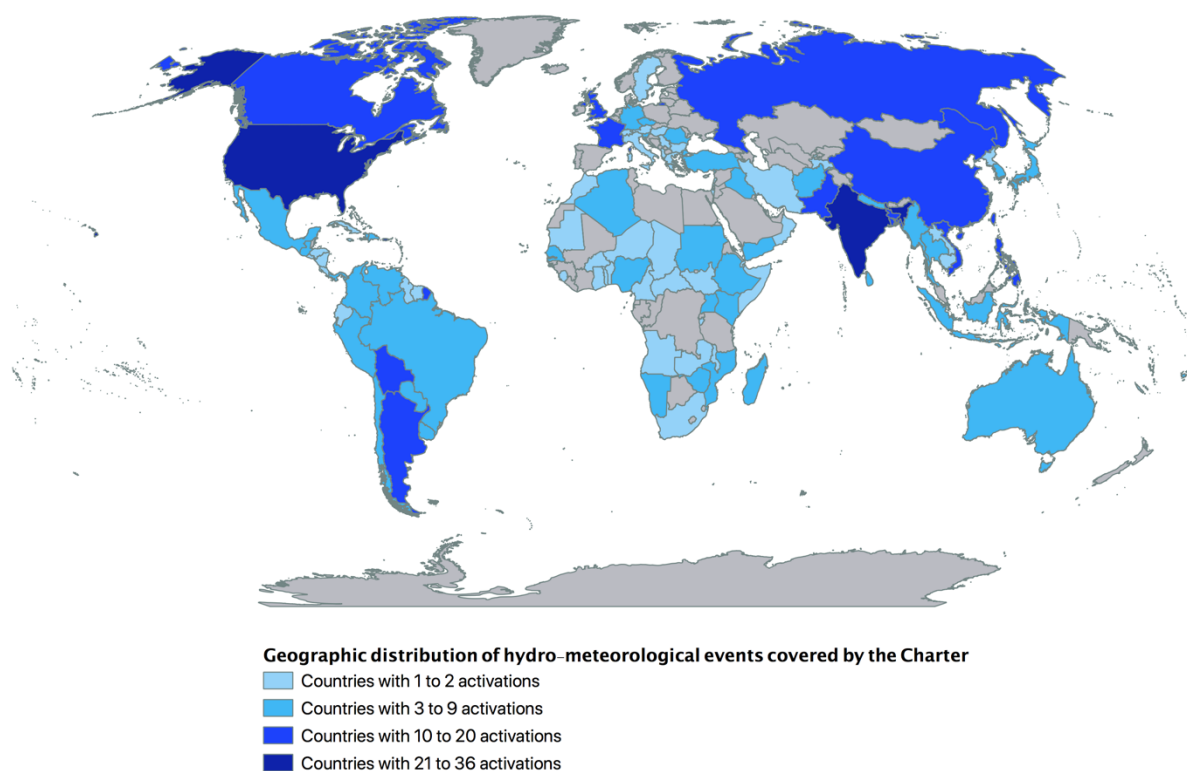
As shown below (Figure 3-8), since 2000 the Charter has been frequently activated for weather-related disasters such as floods, ocean and wind storms, landslides triggered by heavy rainfall or floods, wildfires, ice/snow hazard – representing 78% of all Charter activations - while solid earth-related hazards (e.g. earthquakes, volcanic eruptions) represent 17% of all Charter activations. Activations for oil spills and industrial accidents are marginal. See also the maps in Figures 3-9a and 3-10a showing the geographical distribution of Charter activations by weather-related hazards and solid earth-related hazards for the 2000-2019 period.



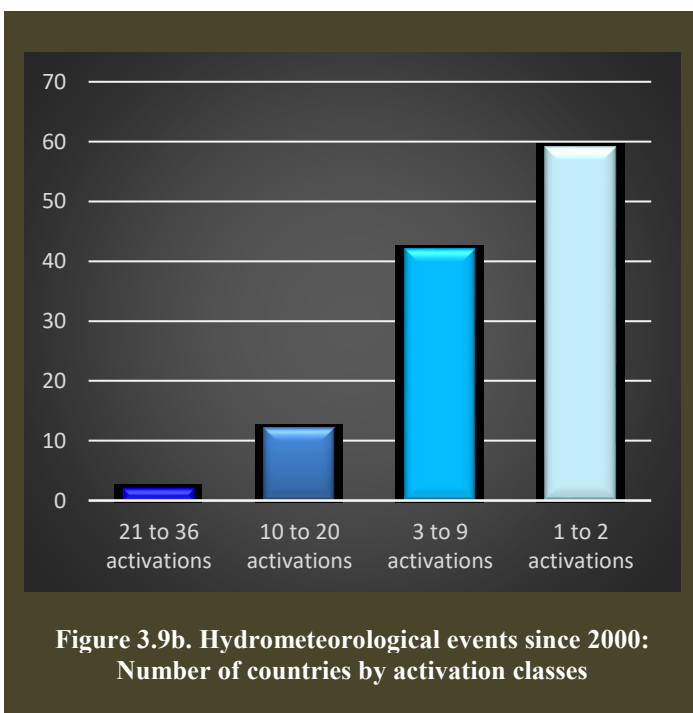
**Figure 3-8. 2000-2019 Distribution of activations by hazard type**



The following map shows by country the number of Charter activations caused by hydro-meteorological related events for the period of 2000-2019 (506 activations out of 637 activations in total = 79.4%).

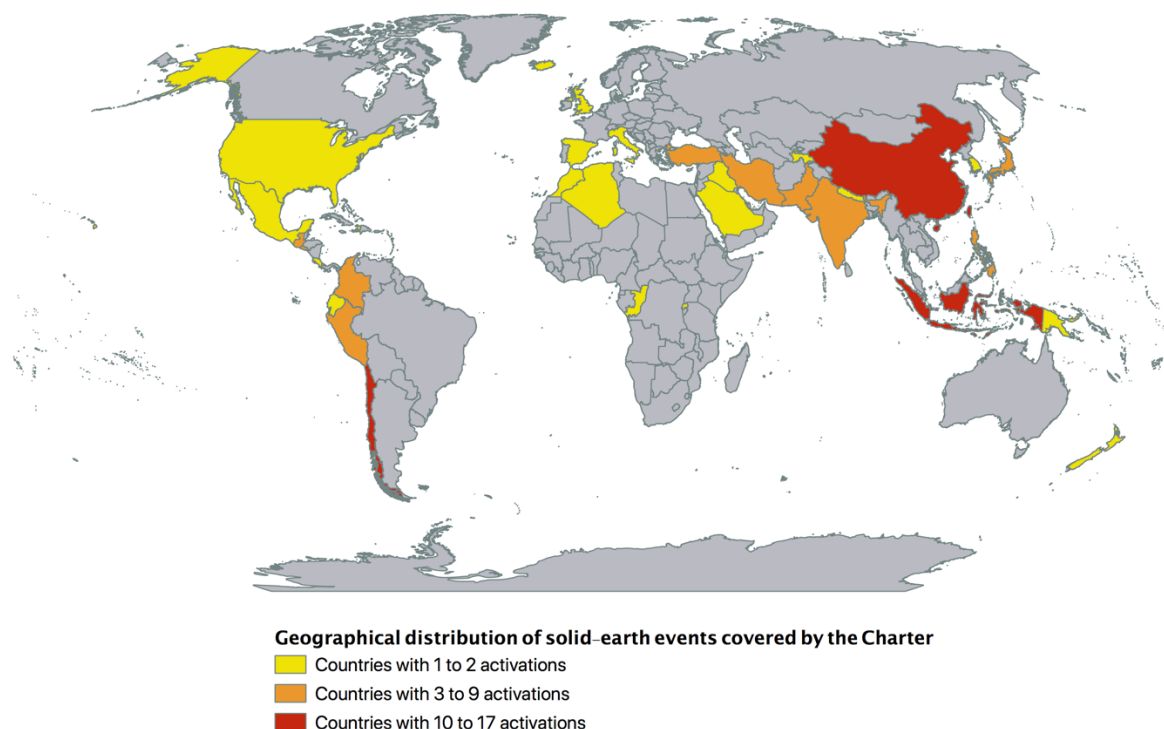


**Figure 3-9a. 2000-2019 Number and geographical distribution of Charter activations due to hydrometeorological events (floods, ocean storms, wind storms, landslides caused by heavy rains, wildfires, snowfall and ice jam).**

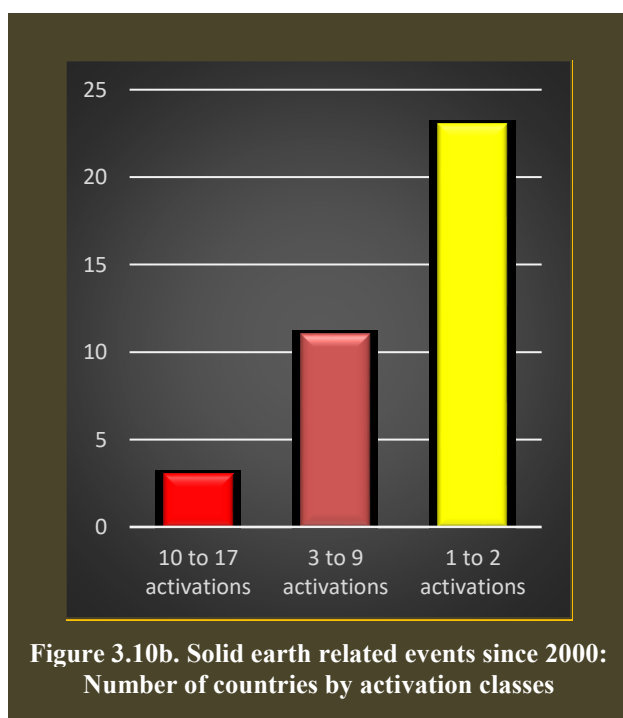


In total 115 countries benefited from the Charter service for hydrometeorological disasters since 2000. USA, India, Argentina, China, France, Philippines and Vietnam used the service most frequently (Figure 3.9b).

The following map shows by country the number of Charter activations (109 activations out of 637 activations in total = 17.1%) caused by solid-earth related events for the period 2000-2019.



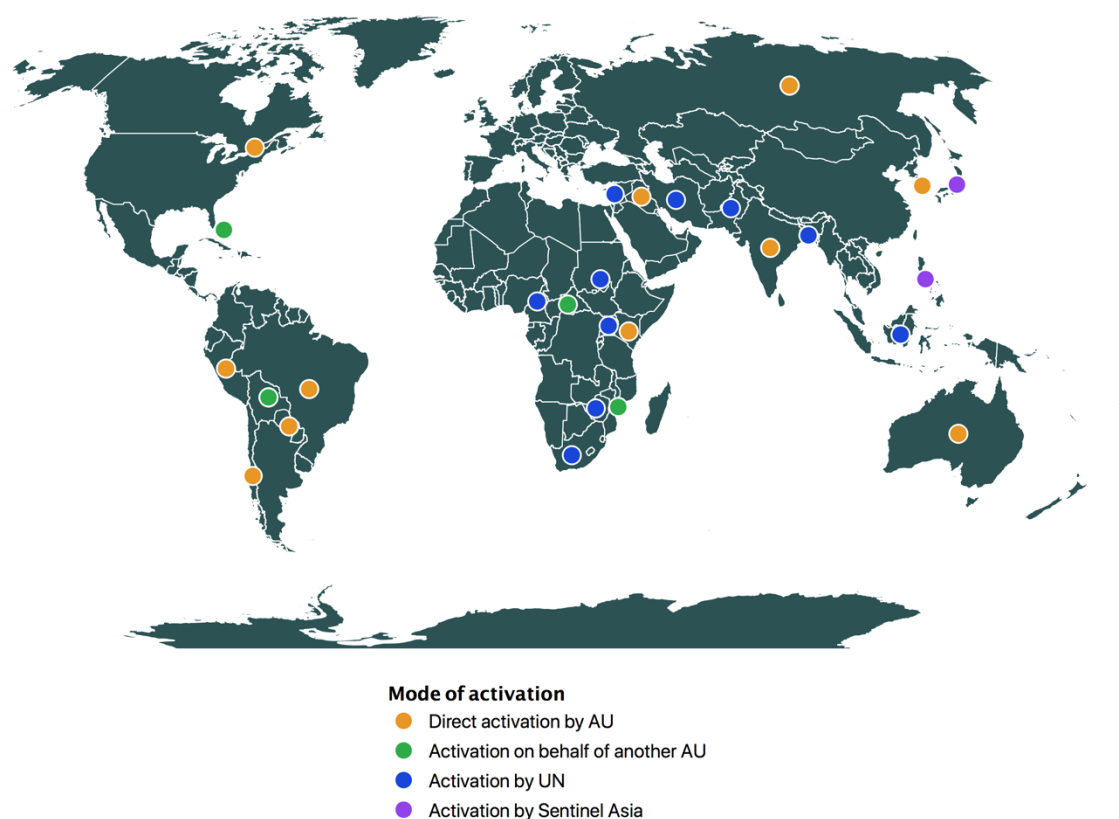
**Fig 3-10a. 2000-2019 Number and geographical distribution of Charter activations due to solid earth related events (earthquakes, tsunamis, volcanic eruptions, landslides caused by earthquake)**



In total 37 countries benefited from the Charter service for solid-earth events since 2000. Indonesia, Chile and China are countries for which the Charter was activated frequently (10-13 activations) and they are located along important active seismic faults (Figure 3.10b).

Figure 3-11 shows the geographic distribution of activations by access mode. Since 2010, there are 4 access modes that have been used:

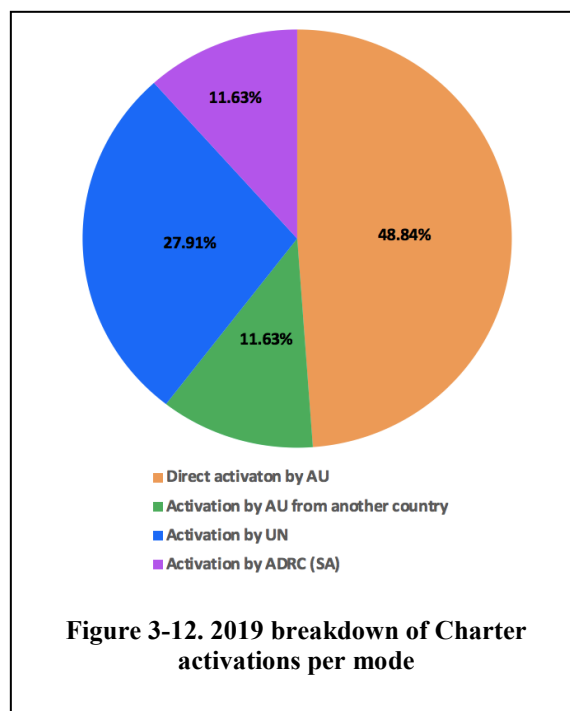
- Mode 1: direct activation by an Authorized User (AU) for a disaster occurring in their country.
- Mode 2: activation by an Authorized User on behalf of a user from another country.
- Mode 3: activation by UNOOSA or UNITAR/UNOSAT for UN users.
- Mode 4: activation for national users from the Asia-Pacific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



**Figure 3-11. Location of the 2019 activations (per Mode)**

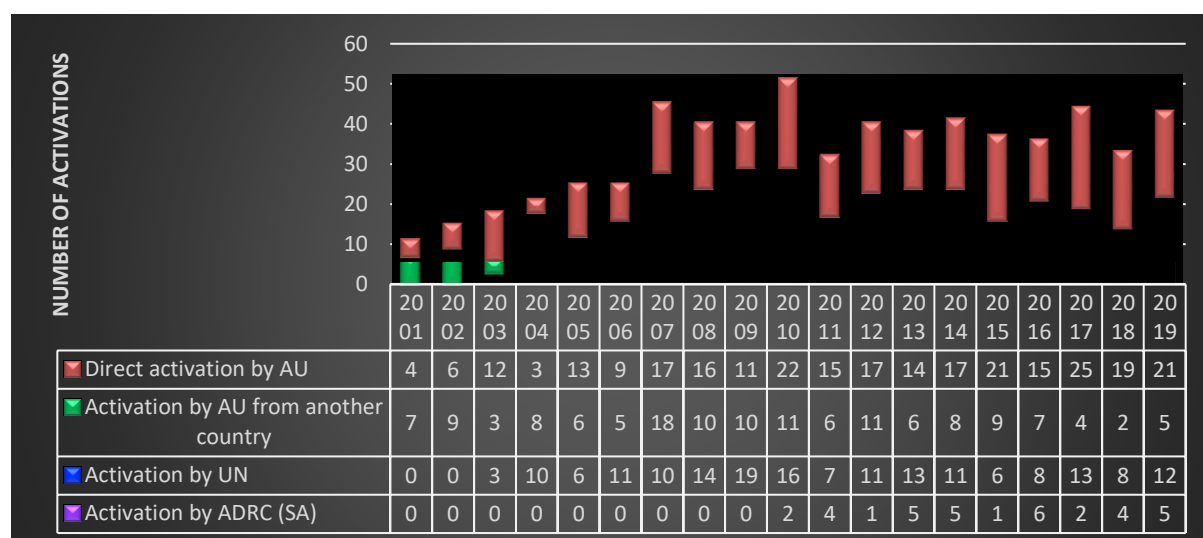
In 2019, Mode 1 was used for disasters in Asia, South and North America, Africa and Oceania; Mode 2 was used for disasters in North and South America and Africa; Mode 3 was used for disasters in Africa, Middle-East and Asia. By definition, Mode 4 was used in Asia (Figure 3-11). Bolivia, Peru, Paraguay, Chile, Australia and Iraq have activated the Charter in 2019, thanks to their AU status achieved through the Charter's Universal Access initiative.

In 2019, activations by an AU (Modes 1 & 2) were the main access modes (60.47% in total) while UN activations (Mode 3) has slightly increased compared to 2018, representing 27.91%. The percentage of Sentinel Asia activations (Mode 4) remained the same as in 2018 (12.12%) (Fig. 3-12).



The diagram in Figure 3-13 compares the relative weight of the different access mechanisms adopted from 2001 to 2019, used to request the International Charter service. Since its inception, 100 countries without AUs have benefited from the Charter and 56.6% of the activations were requests on behalf of a user (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 (through activations in Modes 2, 3, and 4). At the same time, the number of AUs increased thanks to the Universal Access process, which changed the relative weight between the activation modes. By the end of 2019, mandated organisations of 25 countries prone to natural disasters have become AUs after a registration and training process under the Charter's Universal Access procedure.



**Figure 3-13. 2001-2019 number of Charter activations per mode**

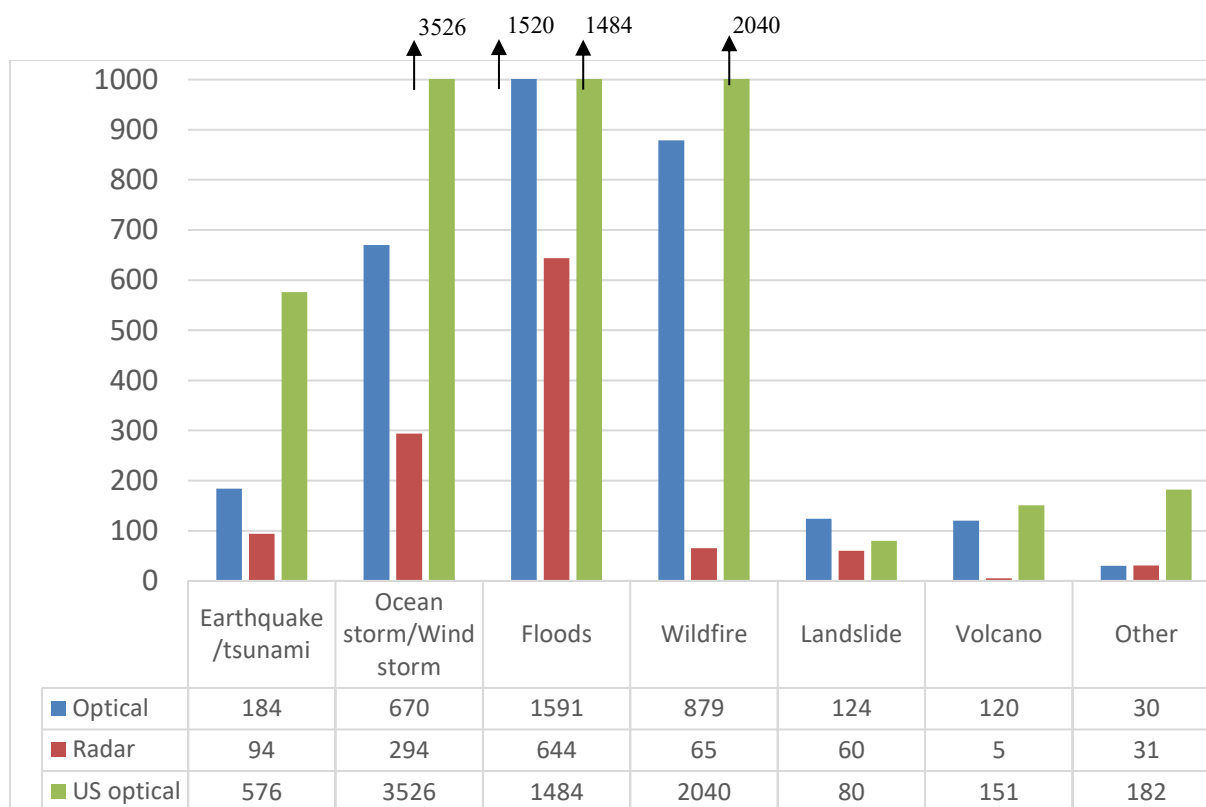
## 3.2 Resource report

### 3.2.1 EO data delivered in 2019

- General information

In 2019, a total of 3,969 optical and radar post-crisis images for 43 activations (2018: 3,527 for 33 activations, 2017: 3,628 for 44 activations, 2016: 2,958 for 36 activations) were provided by the Charter members (Figures 3-15 & 3-16, Table 3-4 & Table 3-5) with 2,776 optical images and 1,193 SAR images. Regarding to the archive images, 822 optical images and 395 SAR images were also provided

This is complemented by 15,031 images (of U.S. VHR optical satellites (GeoEye, WorldView1, 2 and 3) and HR (Planet) optical satellite images that were supplied (Figure 3-17, Table 3-6) (2018: 18,293; 2017: 13,920, 2016: 14,430). Figure 3-14 shows the total number of EO data from the Charter virtual constellation and the U.S. VHR optical data provided in 2019 by disaster type.



**Figure 3-14. 2019 EO post-crisis data of the Charter virtual constellation and U.S. VHR 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, the size of the image tiles, the duration and severity of certain disasters, and the change in the virtual 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 3-3 shows that the distribution of Charter activations and the provision of Charter data is consistent per type of activations. The only differences occur with the U.S. VHR and HR data provided for ocean/wind storms and floods. This is because those data are optical data (floods mainly require radar data).

	Earthquake/ Tsunami	Ocean storm/Wind storm	Floods	Wildfire	Landslide	Volcano	Other
Charter Activations	9 %	21 %	43 %	14 %	9 %	3 %	4 %
Charter data (excluding VHR and HR data)	6 %	20 %	48 %	19 %	4 %	2 %	1 %
Charter U.S. VHR and HR data	7 %	44 %	26 %	18 %	2 %	1 %	2 %

**Table 3-3. Percentage of Charter activations, Charter data (excluding U.S. VHR and HR data) and U.S. VHR and HR data provided per disaster type.**

It is important to note 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. Statistics about used images extracted from COS-2 will be provided in the 2020 annual report.

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

Figure 3-15 and Table 3.4 describe the optical data resources consumption for 2019.

A total of 882 archived images were provided by the Charter members, which is less than last year (compared to 772 images in 2018).

The total number of newly acquired images provided by the Charter members was about the same in 2019 (2776) and 2018 (2756).

Among the 18 satellite constellations, almost most 50% of the programmed images were provided by Kanopus-V (22%), Landsat 7/8 (20%), Pleiades (18%) and KOMPSAT (13,5%). The mean contribution taking into account all optical sensors (except Meteosat and Metop) was 6%.

The number of Kanopus-V, CBERS-4, Sentinel-2, and Kompsat programmed images have greatly increased compared to 2018: multiplied by 11 for Kanopus-V, by 30 for CBERS-4, by 8 for Sentinel-2, by 3 for Kompsat and by 2 for SPOT 6/7.

For EO satellite missions with open data policies (e.g. the Copernicus Sentinel-2), the exact number of used images cannot be traced (39 is the number of traceable images). ESA is developing a system to account and trace the number of Sentinel images accessed. The estimated number for 2020 is more than 1,000 images provided.

Pléiades, Ressourcesat, RapidEye and UK-DMC2 have contributed in the same manner as in 2018.

The contributions of Meteor-M, Cartosat, GF-1/2/4, Resurs-P and Landsat 7/8 are lower than those in year 2018.

Due to technical problems, no VRSS-1 (Venezuelan Remote Sensing Satellite-1, ABAE) images had been provided to the Charter in 2018. Images were provided again in 2019.

DubaiSat-2 provided images for the first time since the insertion of the satellite into the Charter satellites constellation.

Most archive optical images are provided by Landsat 7/8 (~54%).

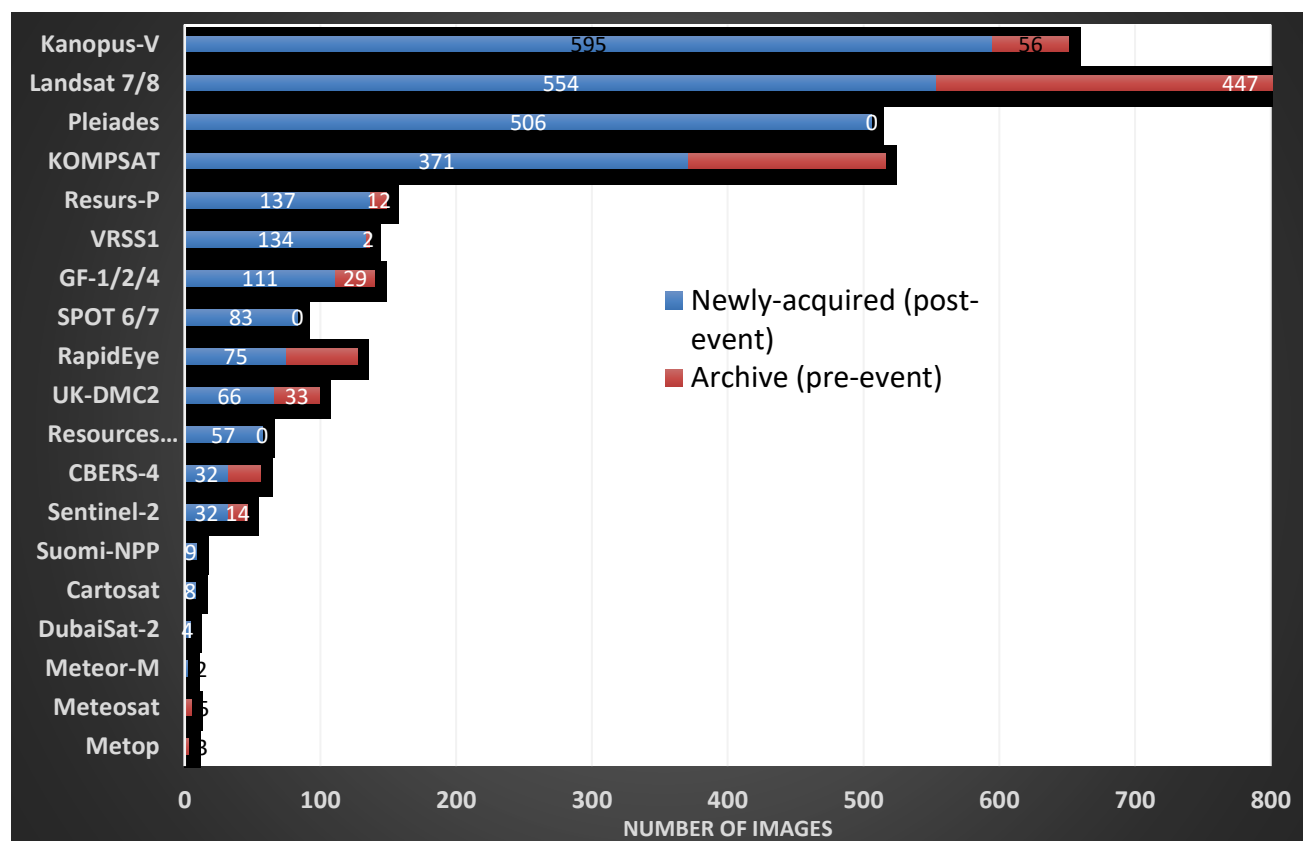


Figure 3-15. 2019 delivered data (number of archive images is in orange and number of newly acquired images is in blue) - Optical sensors

Resource	Meteosat	Metop	Meteor-M	DubaiSat-2	Cartosat-1/2	Sentinel-2	CBERS-4	Resourcesat-2A	UK-DMC2	RapidEye	SPOT 6/7	GF-1/2/4	VRSS1	Resurs-P	KOMPSAT 2/3/3A	Pleiades	Landsat 7/8	Kanopus-V
<b>Total number of delivered data</b>	5	3	2	4	8	39	56	57	99	127	83	140	136	149	516	501	1001	651
Archive (pre-event)	3	5	0	0	0	14	24	0	33	52	0	29	2	12	145	0	447	56
Newly acquired (post-event)	0	0	2	4	8	25	32	57	66	75	83	111	134	137	371	506	554	595
<i>Median number of post-event images per activation</i>	0	0	2	1	4	3	2	4	3	7	13	4	60	4	9	10	9	20
<i>Number of activations with images provided</i>	0	0	2	3	2	9	14	13	19	10	7	20	3	29	27	34	39	23

Table 3-4. 2019 Statistics for Optical sensors

- Radar resources consumption

Figure 3-16 and Table 3.5 describe the radar data resources consumption for 2019.

The total number of newly acquired images (1,193) provided by the Charter members is twice more than in 2018 (627). This increase is mainly explained by the Sentinel-1 contribution.

A total of 395 archived images were provided by the Charter members, which is more than last year (compared to 316 images in 2018).

Indeed the number of Sentinel-1 images has greatly increased compared to 2018 (multiplied by 4).

Kompsat-5 data have contributed in the same manner as in 2018 (282 images compared to 290 images in 2018).

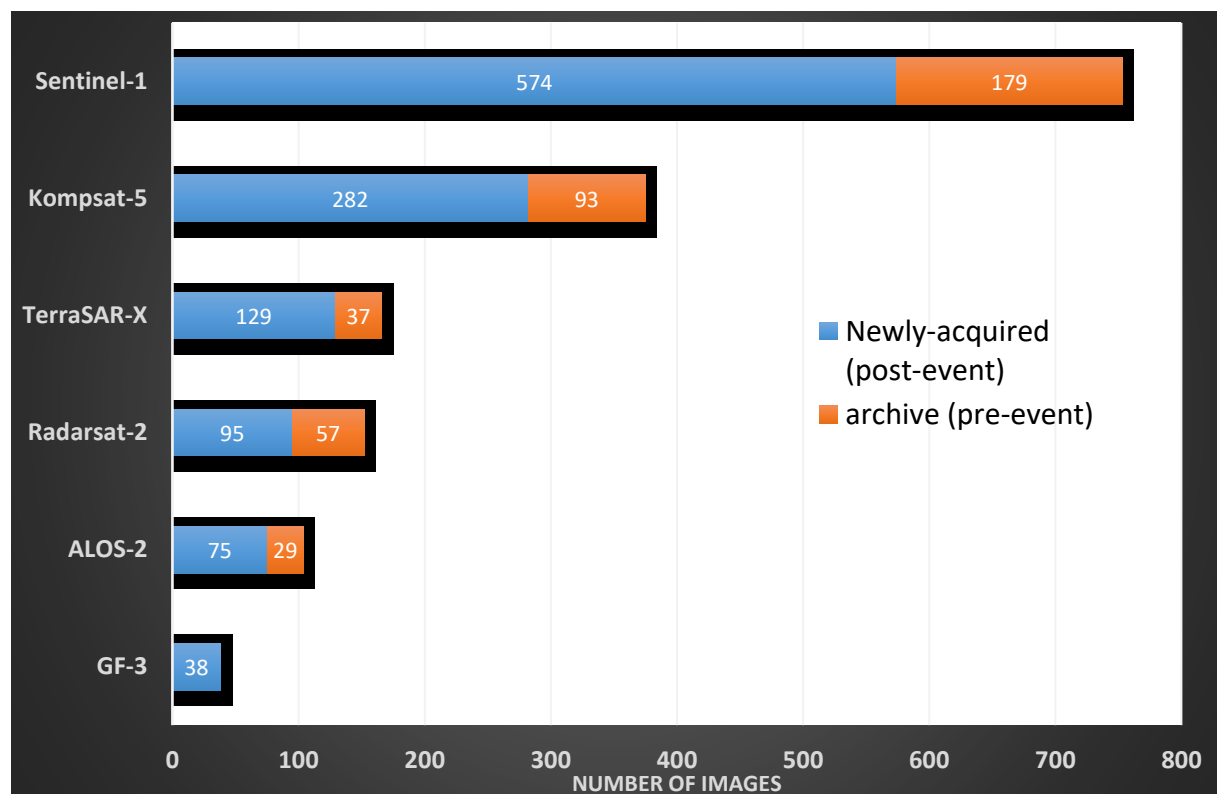
The contribution of TerraSAR-X data is about two times higher than in 2018.

The number of GF-3 images has greatly increased (38 in 2019 compared to 4 in 2018). GF-3 was added to the Charter constellation in December 2018 explaining the low number of 4 images in 2018.

For ALOS-2, the number of scenes delivered in the same manner as in 2017 (61 in 2018, 75 in 2019).

The number of RADARSAT-2 images provided has increased (from 73 in 2018 up to 95 in 2019).

Fifty-four percent of radar data was used to monitor the 17 flood events. In the cases of 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 from the weather conditions.



**Figure 3-16. 2019 delivered data (number of archive images is in orange and number of newly acquired images is in blue) - Radar sensors**



Resource	GF-3	ALOS-2	RADARSAT-2	TerraSAR-X / TanDEM-X	KOMPSAT-5	Sentinel-1
<b>Total number of delivered data</b>	<b>38</b>	<b>104</b>	<b>152</b>	<b>166</b>	<b>375</b>	<b>753</b>
Archive (pre-event)	0	29	57	37	93	179
Newly acquired (post-event)	38	75	95	129	282	574
<i>Median number of post-event images per activation</i>	<i>3</i>	<i>4</i>	<i>4</i>	<i>4</i>	<i>10</i>	<i>14</i>
<i>Number of activations with images provided</i>	<i>4</i>	<i>24</i>	<i>35</i>	<i>36</i>	<i>31</i>	<i>37</i>

**Table 3-5. 2019 Statistics for Radar sensors**

- U.S. VHR and HR data delivered

7,679 newly acquired images were provided by U.S. VHR (GeoEye-1, WorldView-1, 2 and 3) – 5,502 images- and HR (Planet) – 2,837 images - optical satellites in 2019.

6,992 archived images were provided by U.S. VHR (GeoEye-1, WorldView-1, 2 and 3) – 5,202 images- and HR (Planet) – 1162 images - optical satellites in 2019.

In total, 11032 images of U.S. VHR optical satellites (GeoEye-1, WorldView-1, 2 and 3) and 3999 images of U.S. HR optical satellites (Planet) were supplied in 2019. U.S. VHR imagery was delivered to the Charter by the USGS using the HDDS system (Figure 3.17, Table 3-5).

The VHR optical contributions were lower (30% less) than in 2018 (11,032 compared to 18,239). This difference comes from the decrease in the newly-acquired WorldView-1,2 and 3 contributions (4,374 in 2019 compared to 11923 in 2018).

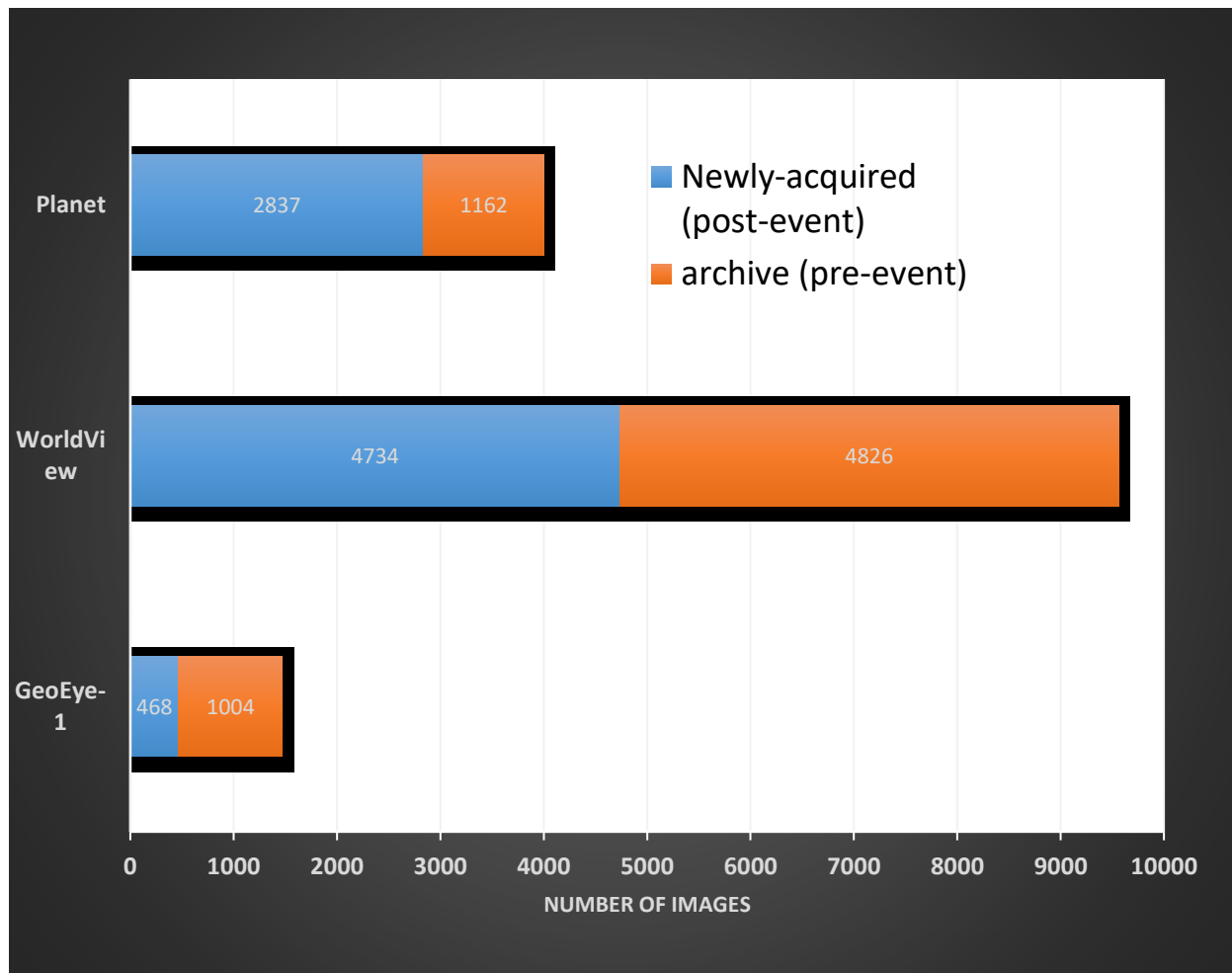
The number of new-acquired GeoEye data delivered is comparable to 2018 (468).

In 2018, sixty percent of the WorldView data provided were used to support floods and damages caused by both hurricanes Florence and Michael in the U.S., and by wildfires in California.

In 2019, about 30% of the newly acquired Worldview and Planet images were provided for Cyclone Idai in Mozambique and in Zimbabwe in March, Hurricane Dorian in Bahamas in September and for Typhoon Hagibis in Japan in October.

Resources	GEOEYE (2018 / 2019)	WORLDVIEW-1/2/3 (2018 / 2019)	PLANET (2019)
<b>Total number of delivered data</b>	536 / <b>1472</b>	16969 / <b>9560</b>	<b>3999</b>
Archive (pre-event)	78 / <b>1004</b>	5073 / <b>4826</b>	1162
Newly acquired (post-event)	458 / <b>468</b>	11923 / <b>4374</b>	2837
<i>Max number of post-event images per activation</i>	<i>106 / 74</i>	<i>4000 / 810</i>	

**Table 3-6. 2018 and 2019 Statistics concerning U.S. commercial optical satellites**



**Figure 3-17. 2019 Data Consumption – U.S. Commercial optical satellites (number of archive images is in orange and number of newly acquired images is in blue)**

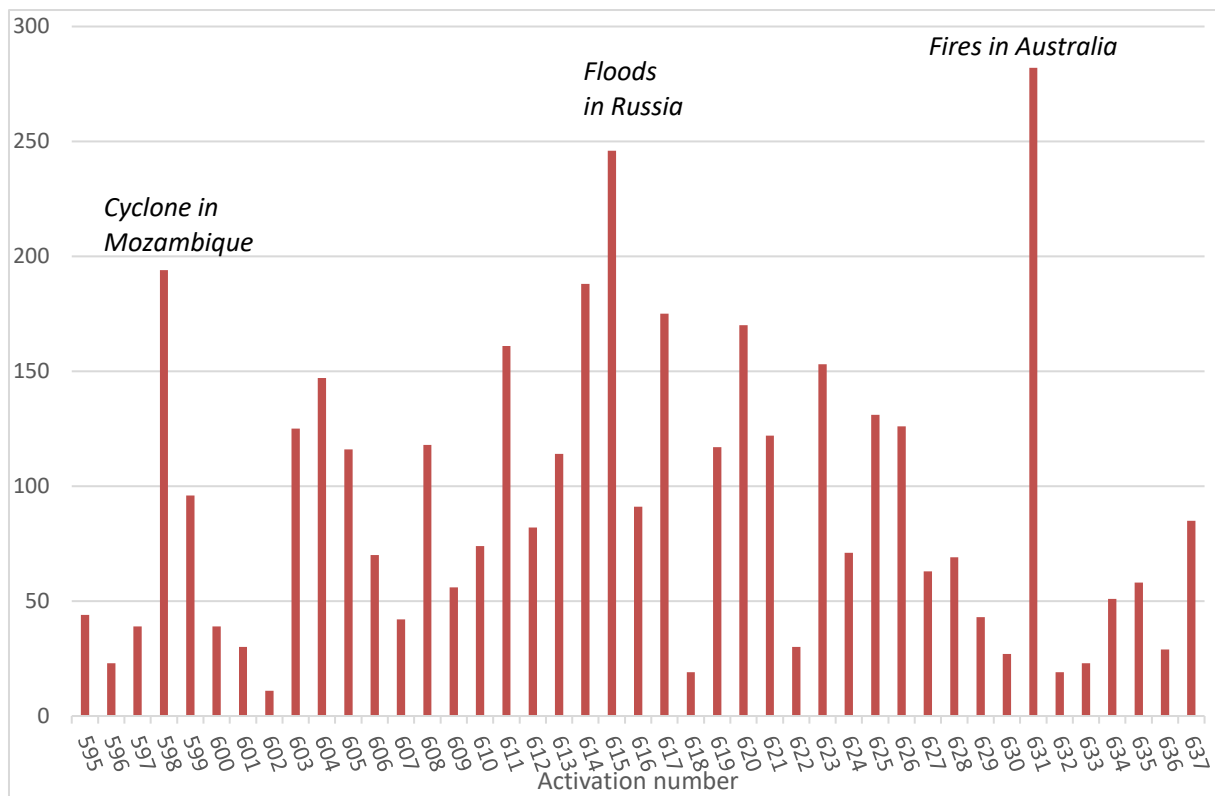
- Overview of data consumption per activation

Figures 3-18 and 3-19 respectively depict the number of newly acquired (post-event) and U.S. VHR new acquisitions by activation, and Figure 3-20 shows the number of archived (pre-disaster) images by activation.

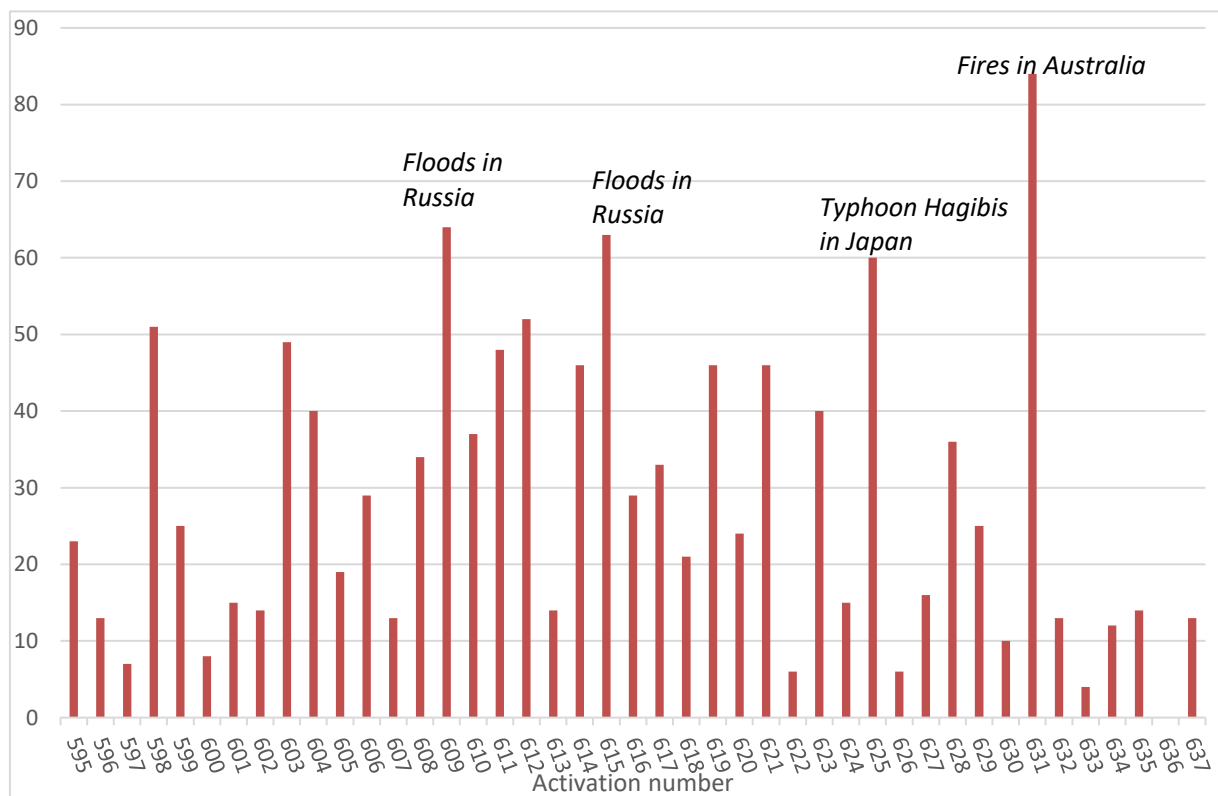
**The mean value of programmed images provided by activation is 92 (72 in 2018).**

Three activations with the highest numbers of programmed data which were provided (Optical & radar sensors) are: **Act 598**, Cyclone in Mozambique, 194 images; **Act 615**, Floods in Russia, 188 images; **Act 631**, Fires in Australia, 282 images.

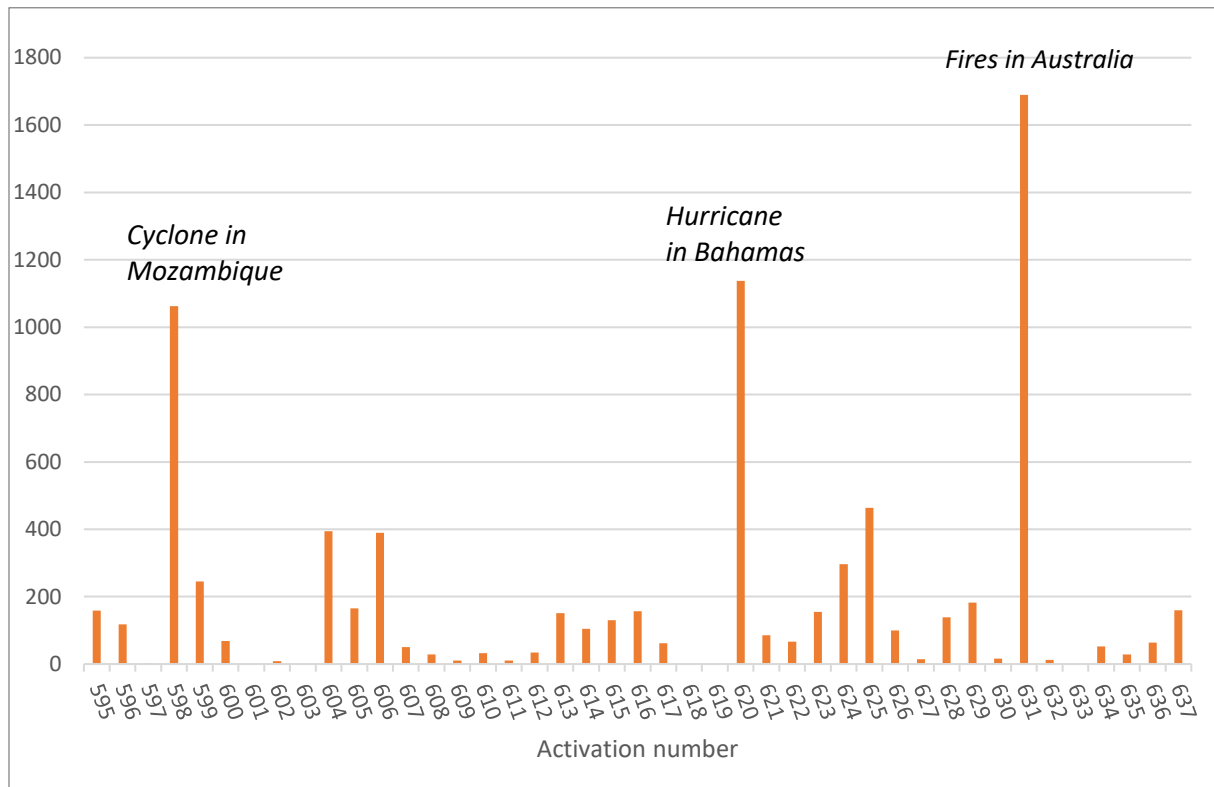
Concerning the pre-event /archived images, on average the quantity of images is **28 per activation** (24 in 2018, 27 in 2017). In four cases, the number of archive data exceeded 50: **Act 609**, floods in Paraguay, 64 images; **615**, Floods in Russia, 63 images; **Act 625**, Typhoon in Hagibis, 60 images; **Act 631**, Wildfires in Australia., 84 images.



**Figure 3-18. Number of delivered post-event i.e., newly acquired images (radar and optical) by activation (Charter EO sensors) in 2019**



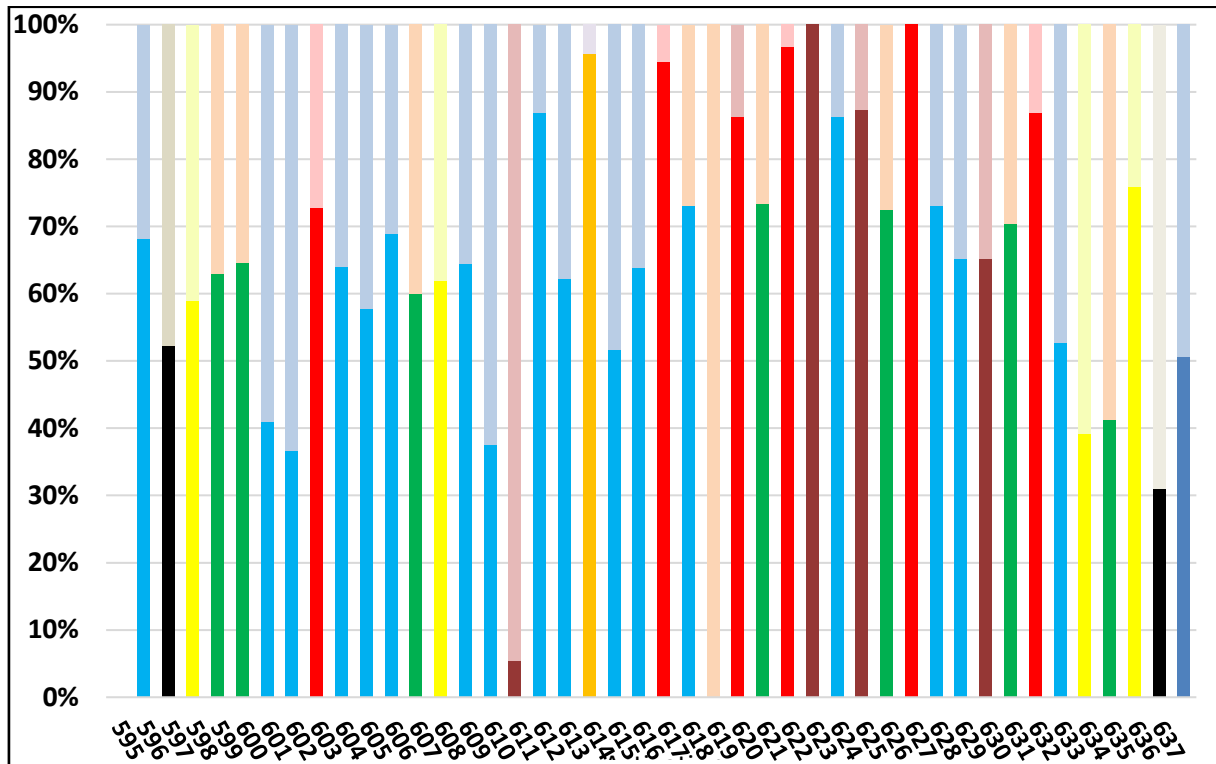
**Figure 3-19. Number of delivered pre-event / archived images by activation in 2019 (Charter EO sensors)**



**Figure 3-20. Number of delivered post-event / newly acquired images by activation in 2019 (U.S. VHR and HR commercial satellites)**

In total, 40 activations out of 43 have benefited from U.S. VHR and HR data. The three cases with the highest number of U.S. VHR and HR newly acquired data (greater than 1,000) provided are:

- **Act 598**, Cyclone in Mozambique, 1,062 images were provided i.e. 13% out of all newly acquired U.S. VHR and HR images;
- **Act 620**, Hurricane in Bahamas, 1137 images were provided i.e. 14% out of all newly acquired U.S. VHR and HR images.
- **Act 631**, Fires in Australia, 1690 images were provided i.e. 21% out of all newly acquired U.S. VHR and HR images.



Type of event:	Optical images	Radar images
Flood		
Ocean storm		
Wildfires		
Volcanoes		
Earthquakes		
Landslides		
Others		

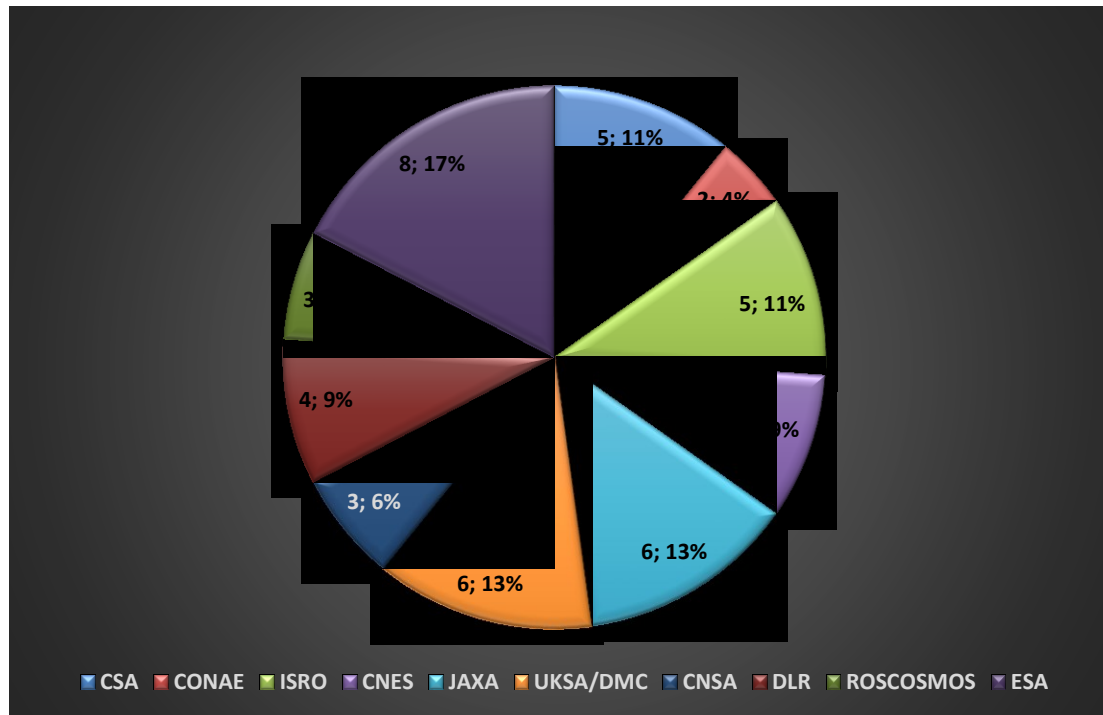
**Figure 3-21. Repartition (in percentage) between newly acquired radar and optical images per activation in 2019**

Figure 3-21 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.

### 3.2.2 Human resource contribution (ECO and PM) in 2019

- *ECO resources in 2019*

The Emergency On-Call Officer (ECO) services were provided on a weekly rotational basis by 10 Charter members agencies: CNES, CNSA, CONAE, CSA, DLR, UKSA/DMC, ESA, ISRO, JAXA, and ROSCOSMOS.

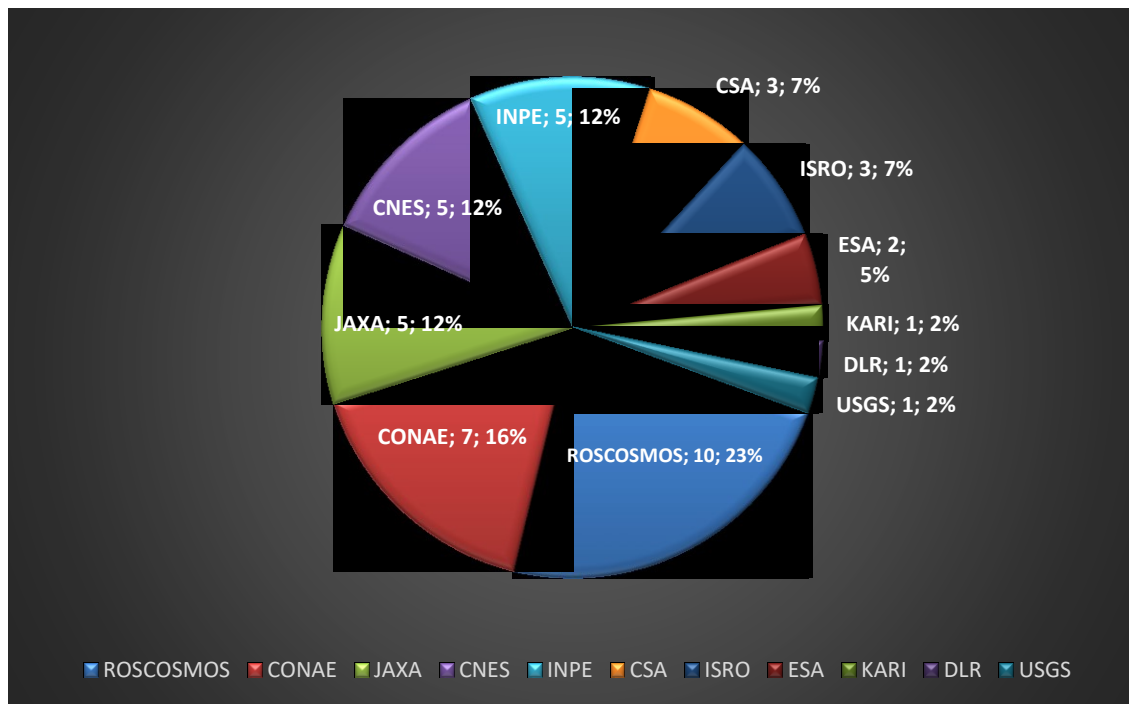


**Figure 3-22. Distribution of Charter Parties responsible for the ECO services in 2019**

The random nature of calls resulted in an uneven workload distribution for the members, with ESA handling 17% of the calls, as shown in Figure 3-22. There were 8 calls processed by ESA, JAXA and UKSA/DMC processed 6 calls each, CSA and ISRO processed 5 calls each, CNES and DLR processed 4 calls each, CNSA and ROSCOSMOS processed 3 calls each, and CONAE processed 2 calls.

- *Distribution of Charter members responsible for the PM services delivered in 2019*

Project Managers (PMs) were nominated for 43 activations. PMs nominated by ROSCOSMOS handled 23% of Charter activations; CONAE handled 16% of activations; CNES, INPE and JAWA handled 12% of activations each; CSA and ISRO handled 7% of activations each; ESA handled 2 activations; and DLR, KARI and USGS handled 1 activation each (Figure 3-23).



**Figure 3-23. Distribution of Charter Parties responsible for the PM services in 2019**

- *Distribution of organizations providing PM resources in 2019*

PMs may be sourced from a Charter party or an external entity. Table 3-5 shows the breakdown of the PM organizations. 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, 21 different organizations contributed their PM services to Charter activations.

Organization (Country)	Number of PMs provided
UNITAR/UNOSAT (Switzerland)	7
INPE (Brazil)	4
SERTIT (France)	4
ROSCOSMOS (Russian Federation)	3
NRSC (India)	3
AIT (Thailand)	2
CONIDA (Peru)	2
SINAGER (Bolivia)	2
NADMO (Ghana)	2
Paraguay Space Agency (Paraguay)	2
University of Yamaguchi (Japan)	2
DLR (Germany)	1
PHIVOLCS (Philippines)	1
ABE (Bolivia)	1
CIREN (Chile)	1
Geoscience Australia (Australia)	1
CSA (Canada)	1
ESA (Italy)	1
Iranian Space Agency (Iran)	1
KARI (South Korea)	1

Organization (Country)	Number of PMs provided
University of Louisiana (USA)	1

Table 3-5. PM Organisations in 2019

### 3.3 SARE – Semi-Annual Refresher Exercises

The Emergency On-Call Officer (ECO) function is of utmost importance for the Charter operations, because the ECO is the person who orders appropriate data from the Charter members within a few hours after an activation request is received. Because some ECO staff might not face “real activations” frequently, two so-called “Semi-Annual Refresher Exercises” are performed every year with all of the ECOs. In 2019, only one exercise, SARE-22, took place from 19 June to 16 August 2019 and the following scenario was used:

Flash flood and landslide in Busnan, Korea. This exercise was led by CSA and KARI training teams; the report was prepared by KARI and CSA. Forty-one ECOs from 11 Charter member agencies participated.

### 3.4 Charter Training

#### 3.4.1 Authorized User Training

The Authorized User training is aimed at training the future Authorized Users and the current AUs in order to train them how and when activating the Charter.

Seven AU training were carried out in 2019:

- February : 2 on-line training led by ESA.
- May : Led by JAXA and CSA for Thailand (new AU) and USGS.
- May : Led by CNES for Haiti new AU.
- July : Two online training led by ESA for Iraq, New Caledonia, Romania and 13 other countries.
- November : Led by USGS and CNES for Togo new AU
- November: Led by UKSA for Caribbean English-speaking countries
- December : Led by ISRO for users from India, Pakistan and Sri Lanka.

#### 3.4.2 Emergency on-Call Officer Training

The ECO training is aimed at strengthening the network of Charter ECOs by providing refresher sessions for current ECOs and training sessions for new ECOs.

Two ECO training took place in 2019:

- June : online COS-2 training led by ESA for CONAE, CSA, CNSA, DMCII, DLR, JAXA
- October (Russian federation) : Led by ROSCOSMOS during the 42<sup>nd</sup> Charter meeting

#### 3.4.3 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 carried out in 2019.

- March (online) : Led by ESA
- April (online) : Led by ESA
- May (USA): Led by USGS and ESA for 13 American PMs.



- August (online): Training led by ESA for 31 PMs and future PMs from 19 countries.
- September (China): Led by CNSA and CNES for 87 risk disaster management and assessment actors from 24 countries.
- November (Germany): Led by DLR and ESA for more than 20 practitioners from several countries, including Tunisia, Ethiopia, Ghana, Sudan, South Africa, Brazil, Belarus, Austria, Kenya, France and Germany.
- December (India): Led by ISRO and organized by SAARC Disaster Management Centre (Interim Unit) & UNSPIDER.
- December (online): Led by ESA for 16 PMs and future PMs from 15 countries

### **3.5 The Charter Operational System**

ESA has developed and continues to develop tools such as the web-based Charter Operations System version 2 “COS-2”, linked to the Charter Geobrowser, to improve Charter operational steps and facilitate the work of the different Charter operational staff (AUs, CBs, ODO, ECOs and PMs).

COS-2 is operational since the beginning of March 2015. Eighty percent of the Charter members have their EO metadata fetching executed on COS-2, allowing automated and on-line cataloguing of Charter acquisitions. The new versions (2.3.4.X) of the COS-2 system were released in 2019, improving the system, allowing to submit requests to Copernicus EMS, more tools for the project managers (allowing an easier filtering/selection of the hundreds of satellite images provided in a single activation). The role of Value Adder has been introduced in order to help the PM in their work. During the wildfire event in Australia COS-2 was able to manage the more than 2000 satellite images provided, with some slowness, even if the system was not designed for that. Improvements in aspect will be carried out in 2020.

A collaboration with JAXA and CSA now allows a better support around the clock to the users (taking advantage of the different time zone), avoiding blockages in the usage of the COS-2 system (unless an engineering support is needed). The COS-2 system was available more than 99% on monthly basis (excluding a couple of planned downtime for the transfer in operation of the new versions).

Since COS-2 entered in operation (March 2015), the system has been used for all Charter activations. All Project Managers (PM) were able to access the information and metadata stored in the COS-2. All ECOs used the system to generate the Activation Dossier. The special instance of COS-2 to support the SARE (the ECO Semi-Annual Refresh Exercise) has been used for SARE-22.

All 2019 AU and PM training are performed with the support of COS-2, including several new AU (Universal Access) integration.

### **3.6 Evolution of Charter operational system**

COS-2 is a tool in constant evolution, new requirements are coming from the Executive Secretariat, and new satellite resources are integrated on a regular basis. Following the release of version 2.3 in Q3 2018 there has been a substantial increase of the number of users accessing the system and the satellite data repository of COS-2 is more and more used. This required the analysis of new functionalities to be implemented in the future. To support performance

monitoring, an internal statistic and reporting tool is under development to provide more accurate figures and performances data.

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. The Charter evaluated the contribution of new ICT approaches (e.g. on-line hosted services) to better support EO data access and exploitation. The initiative of a Charter Processing Platform to support operations with on-line processing was proposed in the frame of the Charter Strategic Plan 2017-2027. In October 2018, the Board agreed that a first processing environment would be implemented to support full-resolution visualization and screening of Charter data to support operations. 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.

## 4 Collaborations and External relations

### 4.1 New members accession

After the accession of the United Arab Emirates Space Agency (UAESA), supported by the Mohammed Bin Rashid Space Centre (MBRSC), in 2018, the Charter is a group of 17 members. No new members have been integrated in 2019, but two new requests for membership are in negotiation.

### 4.2 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 have to be met to become a Charter AU, and a procedure has to be followed which includes a training. The UA process is designed to achieve greater impact in the disaster management worldwide, and is being implemented gradually. See <https://disasterscharter.org/web/guest/how-to-register-as-a-user> for more information.

Universal Access is progressing, resulting in more and more national disaster management users to be granted AU status:

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



Figure 4-1: Map showing all countries (in dark blue) with direct access to the Charter. As of end 2019 there were 73 AUs in 67 countries.

By the time of publishing this report, additional nationally mandated disaster management organizations have also become able to directly activate the Charter in case of a major disaster in their country due to their newly achieved status.

Significant efforts have been made for promoting the Charter and Universal Access, e.g. at the 56<sup>th</sup> Session of the COPUOS Scientific and Technical Subcommittee, at the 9<sup>th</sup> Annual UN-SPIDER conference on space-based technologies for Disaster Risk Reduction in September 2019 in China, and at the UN-SPIDER Bonn International Conference "Space-based Solutions for Disaster Management in Africa: Challenges, Applications, Partnerships" in November 2019 in Germany. 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).

## **4.3 Cooperating Bodies**

### **4.3.1 Cooperation with UNOOSA**

Active cooperation with UNOOSA has been continuing for many years. Shirish Ravan, Programme Officer at UNOOSA and head of the UN-SPIDER Beijing Office, participated in a dedicated session of the 42<sup>nd</sup> Charter Board meeting (St. Petersburg, October 2019) and presented UNOOSA's activities to support the Charter. A report was also delivered. It was reported that the Charter had been presented by UNOOSA in several activities such as the United Nations International Conferences and workshops organized or supported by UN-SPIDER at regional and national levels, as well as through the UN-SPIDER communication channels (Knowledge Portal, monthly UN-SPIDER Updates etc.).

In particular, the Charter's Universal Access (UA) initiative has been facilitated in accordance with the UN General Assembly Resolution 61/110 on UNOOSA's UN-SPIDER program, and success has been reached in several countries, such as Guatemala, Sri Lanka, Myanmar, and more recently Ghana. In 2019, Technical Advisory Support and/or Institutional Strengthening Missions have been carried out by UN-SPIDER to Cameroon, Ethiopia, Vietnam, and Zimbabwe and the benefits of UA were presented. Several National Disaster Management Centers have been encouraged to become Charter Authorized Users.

UNOOSA has also supported the organization of Charter Project Manager trainings. In September 2019, such a training was carried out back-to-back with the 9<sup>th</sup> Annual UN-SPIDER Conference in Beijing. Trainers from CNES and CNSA conducted this training with 60 participants, mainly from Asian countries. Similarly, a PM Training was hosted by UN-SPIDER in Bonn, Germany, in November 2019, on the day before the start of the Bonn International Conference on "Space-based Solutions for Disaster Management in Africa: Challenges, Applications, Partnerships". Trainers from ESA and DLR conducted the training. UN-SPIDER also organized with SAARC Disaster Management Centre (Interim Unit) a AU/PM training conducted by ISRO in India in December 2019.

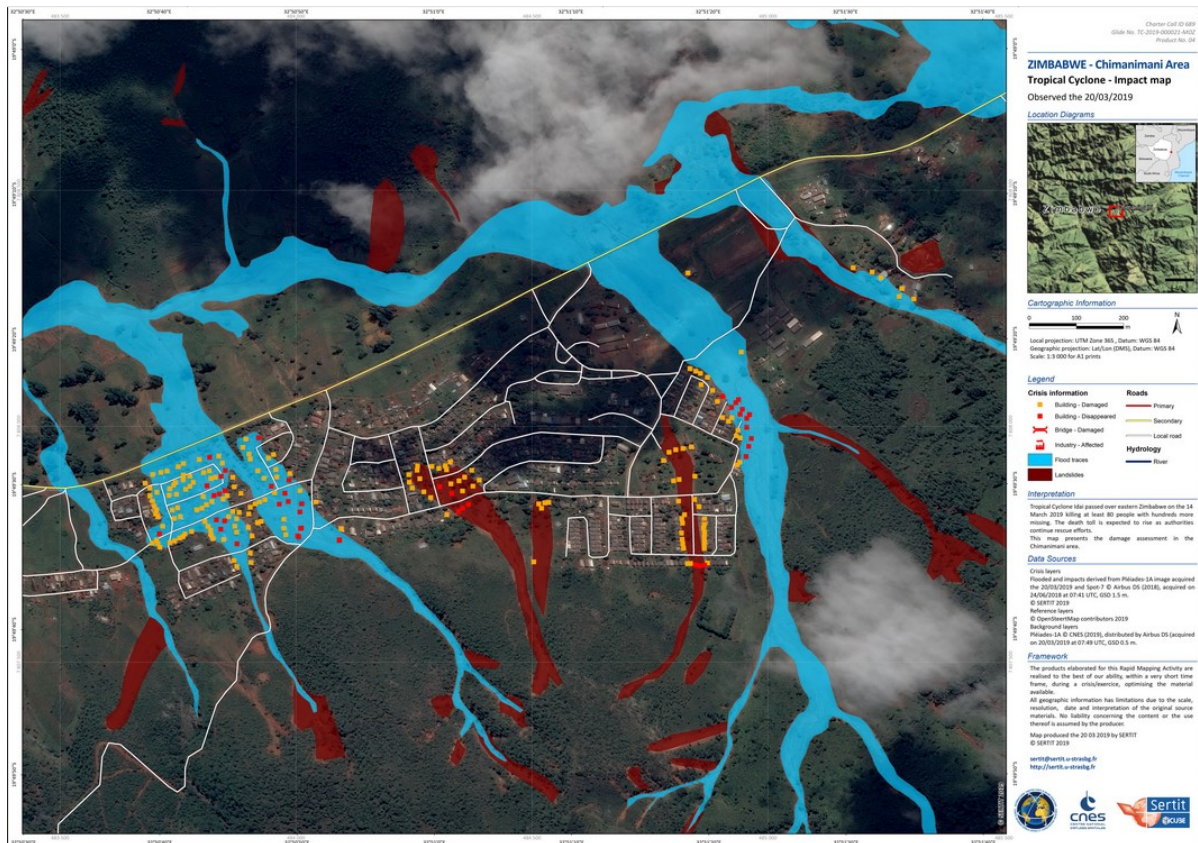


**Figure 4-2: practitioners from several countries, including Belarus, Brazil, Ethiopia, France, Germany, Ghana, South Africa, Sudan, and Tunisia attended the project manager training in November 2019 (photo: UNOOSA).**

Four Charter activations were triggered by UNOOSA, either on behalf of users being part of the UN system or on behalf of national disaster management authorities under the “Universal Access Trial” agreement (see below) between the Charter and UNOOSA:

- In March 2019, an activation was triggered on behalf of UNDP due to the impact of cyclone “Idai” in Zimbabwe, mainly flooding and landslides (Fig. 4.2);
- In March 2019, an activation was triggered on behalf of authorities in Iran due to widespread flooding in the southwestern provinces of Golestan and Mazandaran. The Iranian Space Agency, a UN-SPIDER Regional Support Office, acted as project manager for this activation.
- In April 2019, an activation was triggered on behalf of the National Disaster Management Centre (NDMC) of South Africa due to Floods and mudslides in Durban and the surrounding KwaZulu-Natal province of South Africa. .
- In November 2019, an activation was triggered on behalf of the Department of Civil Protection of Cameroon due to flooding in the north of Cameroon.





**Figure 4-3: Example of a map produced by Sertit: Impacts of flooding (blue) and landslides (brown) in Chimanimani, Zimbabwe, in March 2019 after Cyclone Idai.**

In late 2017/early 2018, a “Universal Access Trial” mechanism had been set up, allowing UNOOSA to trigger 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.

In its presentation to the 42nd Charter Board meeting, UNOOSA reported that they encourage the establishment of national capacities for hazard response and emergency operations. One example mentioned is the Dominican Republic, where such a centre was established as well as an “Inter-institutional Geospatial Team (EIGEO)”. The National Emergency Operations Centre of the Dominican Republic became a Charter Authorized User in 2015, and during a Charter activation for flooding after hurricane Matthew in 2016 EIGEO generated maps based on satellite imagery provided by the Charter. It was highlighted that countries often need local-level baseline data overlaid with Charter data, so national capacity in how to make use of Charter products and ideally also national or regional capacity to work with satellite imagery is important. A facilitating role can be taken by institutions that are part of UN-SPIDER’s network of Regional Support Offices (RSOs). Some of the RSOs have recently contributed as Project Managers and/or Value Adders (rapid mapping providers) to Charter activations.

### 4.3.2 Cooperation with UNITAR/UNOSAT

Active cooperation with UNITAR/UNOSAT has been continuing for many years. Einar Bjorgo, Director of the Division for satellite Analysis and Applied Research at UNITAR, participated in a dedicated session of the 42<sup>nd</sup> Charter Board meeting (St. Petersburg, October 2019) and presented UNOSAT's activities to support the Charter. A report was also delivered which highlights that 2018/19 was a challenging period for those affected by natural disasters.

2019 brought the first cases of the International Federation of Red Cross and Red Crescent Societies (IFRC) requesting an activation of the Charter through UNOSAT. In 2017, the Charter and UNOSAT had agreed that UNOSAT could trigger the Charter not only on behalf of UN users, but also on behalf of national Red Cross or Red Crescent societies.

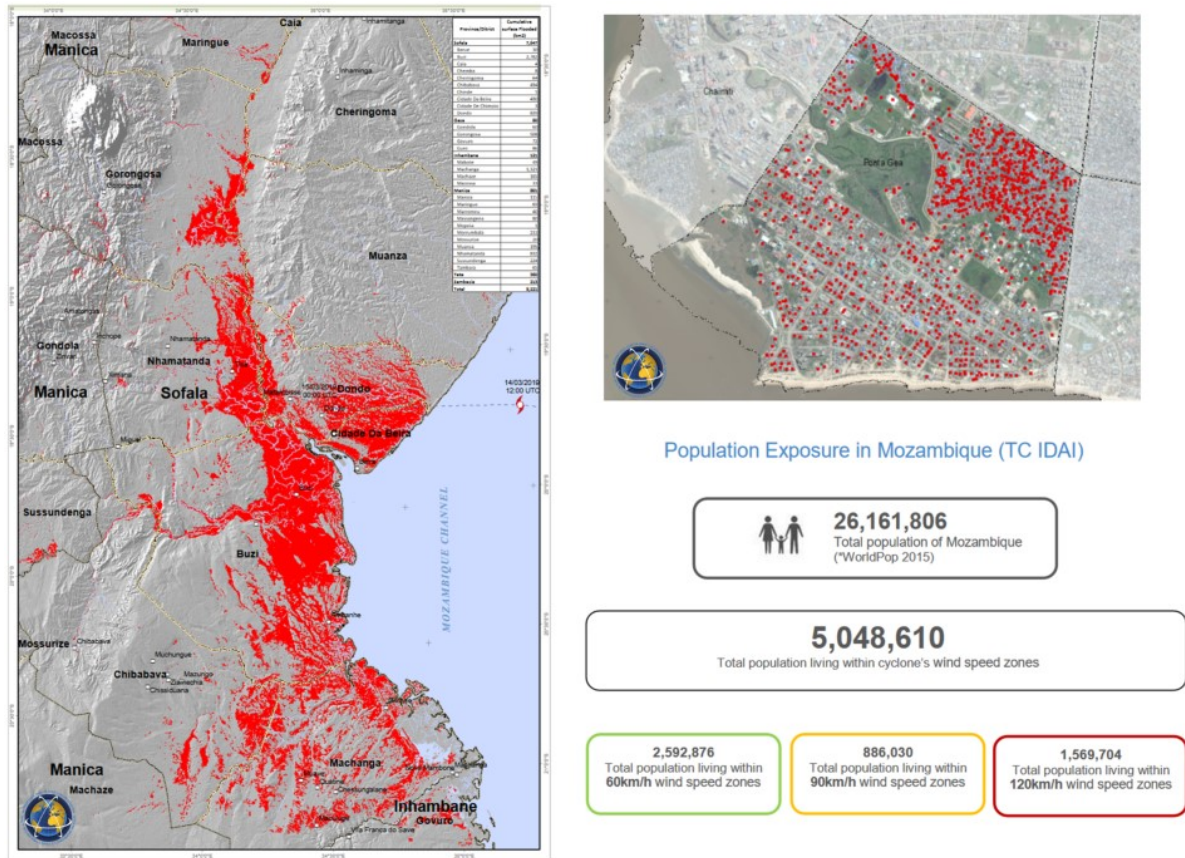
UNOSAT continued triggering the Charter for major disasters, acting as Project Manager (PM), producing products derived from satellite imagery (maps, reports, GIS-ready data and statistics), and raising awareness of the Charter towards the user community and other relevant stakeholders. In addition, UNOSAT facilitated sharing of satellite imagery according to the Charter's rules and procedures. Activities were carried out as part of the UNOSAT Rapid Mapping Service. In February 2019, staff with rapid mapping expertise were stationed in a liaison office at the UN Economic and Social Commission for Asia and Pacific (ESCAP) in Bangkok, Thailand. Moreover, two additional UNOSAT staff have been trained for acting as Charter Project Managers.

Nine Charter activations were triggered by UNOSAT which comprise a significant portion of the overall Charter activations in 2019:

- In March 2019, an activation was triggered on behalf of the IFRC due to the impact of cyclone "Idai" in Mozambique, mainly flooding. The Charter merged UNOSAT's activation request with another request received before by CENAD, the Brazilian Authorized User;
- In August 2019, an activation was triggered on behalf of UNOCHA and UNICEF due to flooding in Sudan. One day later another request was received by the Authorized User of Sudan. The Charter merged both requests to one activation;
- In September 2019, an activation was triggered on behalf of UNOCHA following an earthquake in Pakistan;
- In September 2019, an activation was triggered on behalf of UNESCAP following an earthquake in Indonesia;
- In October 2019, an activation was triggered on behalf of the IFRC due to wildfires in Lebanon and Syria;
- In October 2019, an activation was triggered on behalf of UNOCHA due to flooding in Kenya;
- In November 2019, an activation was triggered on behalf of the UN Resident Coordinator in Bangladesh due to the impact of cyclone "Bulbul" in Bangladesh;
- In December 2019, an activation was triggered on behalf of UNOCHA due to the impact of Typhoon "Kammuri" in the Philippines;
- In December 2019, an activation was triggered on behalf of UNOCHA after landslides and flash floods occurring in Uganda.

UNOSAT staff members were nominated as Project Manager (PM) for seven activations in 2019. In addition, UNOSAT strongly supported the Charter by providing value-added products based on the satellite images made available by the Charter for all the activations listed above. The types of products included impact, exposure, and damage assessments and statistics on

affected populations. UNOSAT also provided access to geospatial data via the Global Disaster Alert and Coordination System (GDACS) Satellite Mapping Coordination System (SMCS).

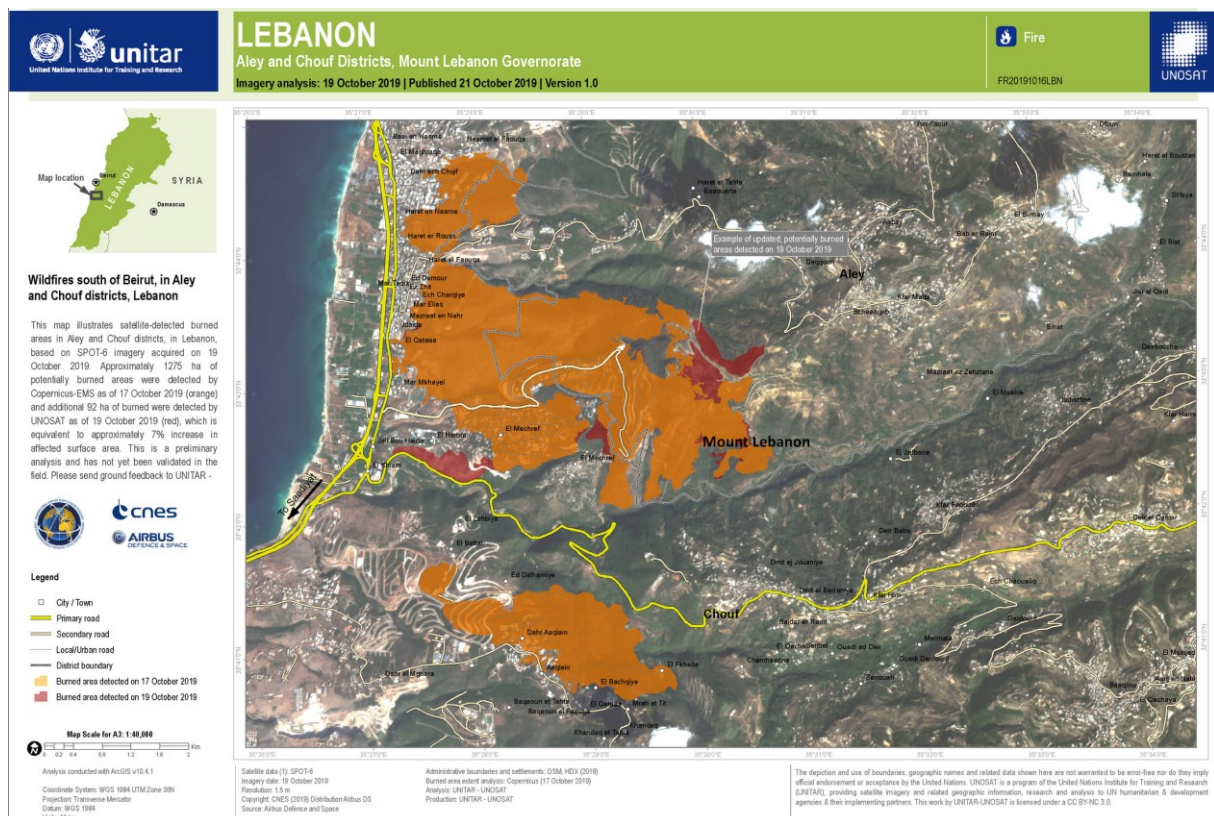


**Figure 4-4: Example of maps and complementary information delivered by UNOSAT in support of the Charter activation after cyclone “Idai” in Mozambique in March 2019.**

UNOSAT also highlighted the Charter in numerous fora, such as high-level meetings with the UN and governmental bodies, e.g. the 23rd Session of the Intergovernmental Consultative Committee (ICC) on Regional Space Applications Programme for Sustainable Development, held at UNESCAP in Bangkok in August 2019.

In its report to the Charter, UNITAR/UNOSAT also highlighted that the increasing ubiquity of mechanisms and platforms to obtain satellite imagery (e.g. freely available data of the European Sentinel satellites) could result in a decrease in overall Charter activations, and activations that are triggered may be retained for more major events. Consequently, the focus could shift more towards streamlining interoperability among users, in addition to the production of data and value-added products and services.





**Figure 4-5: Example of a map produced by UNOSAT: burnt areas detected on 17 and 19 October 2019 in Lebanon.**

### 4.3.3 Cooperation with Sentinel Asia

Since March 2010, the Asian Disaster Reduction Centre (ADRC) has the status of a Charter Cooperating Body and can trigger the Charter in support of requests from national members of Sentinel Asia (SA) and ADRC. By the end of 2019, SA was comprised of 94 organizations from 28 countries and regions and 16 international organizations.

JAXA provides the Charter with monthly activation status reports as well as two biannual reviews presenting SA's emergency response and promotional/awareness activities. In 2019, 8 activations were handled by SA. Among these, the escalation mechanism to the Charter was used in response to five events:

- Flood in Indonesia in March 2019;
- Flood and Landslides in Japan in August 2019;
- Typhoon “Hagibis” in Japan in October 2019;
- Earthquake and landslides in Philippines in November 2019;
- Cyclone Sarai in Fiji in December 2019.

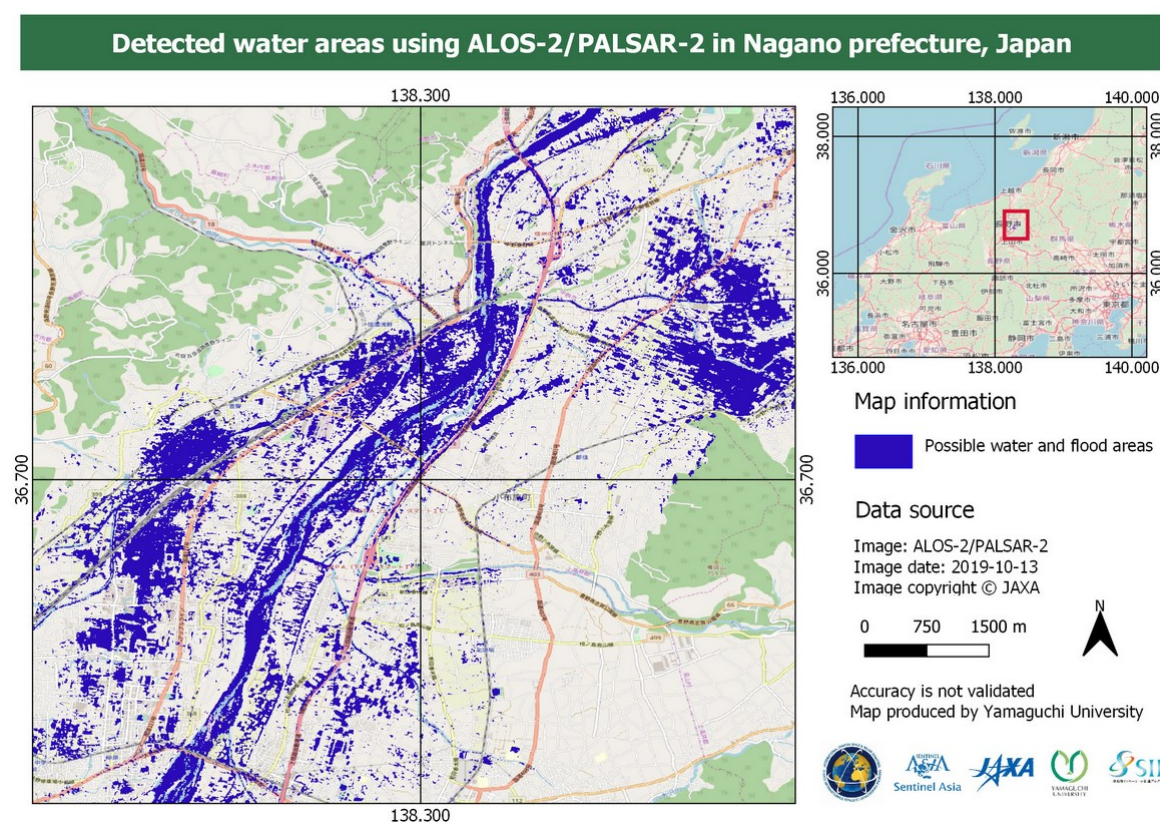
The number of escalations to the Charter was the same as in 2018. In addition, several SA member countries have become Charter Authorized Users in recent years (e.g. Sri Lanka), so they can also trigger Charter activations directly.

JAXA, as the executive secretariat of SA, continued to promote the Charter, explaining the escalation mechanism to activate the Charter and the Universal Access initiative at several

conferences. In addition, JAXA has contributed to increasing Project Manager (PM) resources and to maintaining PM skills by conducting PM trainings, 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 response within the country in case of a Charter activation.



**Figure 4-6: PM Training organized by JAXA at the Asian Disaster Preparedness Center (ADPC) in Bangkok, Thailand.**



**Figure 4.7: Example of a map produced by Yamaguchi University as part of the Sentinel Asia and Charter activation due to typhoon “Hagibis” in Japan in October 2019.**



## **4.4 Cooperation with other programs and initiatives**

### **4.4.1 Cooperation with the Copernicus Emergency Management Service of the European Union**

The Charter and the Copernicus Emergency Management Service (CEMS) are complementary with 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 also for other phases of the emergency management cycle in and outside of Europe. However, significant overlap exists between the Charter and the CEMS Rapid Mapping Service. Therefore, collaboration is mutually beneficial and has taken place in numerous cases 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 more often and efficiently than in the past.

In 2019, the new procedures were used for several successful collaboration cases. The Charter invited Copernicus to contribute to the following Charter activations, which were then supported with maps produced by the CEMS:

- Hurricane “Dorian” in Bahamas in September 2019

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

- Cyclone “Idai” in Mozambique in March 2019
- Cyclone “Idai” in Zimbabwe in March 2019
- Cyclone “Kenneth” in Mozambique in April 2019
- Cyclone “Fani” in India in May 2019
- Earthquake in Indonesia in September 2019
- Wildfire in Australia in November 2019

In 2019, the CEMS Rapid Mapping Service was activated 75 times, among which there was coverage of a remarkably high number of wildfire events in Europe. In the same time period there was no Charter activation for a disaster in Europe at all. It can be concluded that demands in Europe are very successfully covered by the CEMS.



**Figure 4-8: Example of a damage grade assessment map produced by CEMS after the hurricane “Dorian” hit the Bahamas in September 2019.**

#### 4.4.2 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 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 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 shall demonstrate the potential and increase 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.

## 5 Communications

### 5.1 Web site

The Charter website is available in English and some pages are available in Spanish and French, other languages versions are also expected. The website design is being 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.

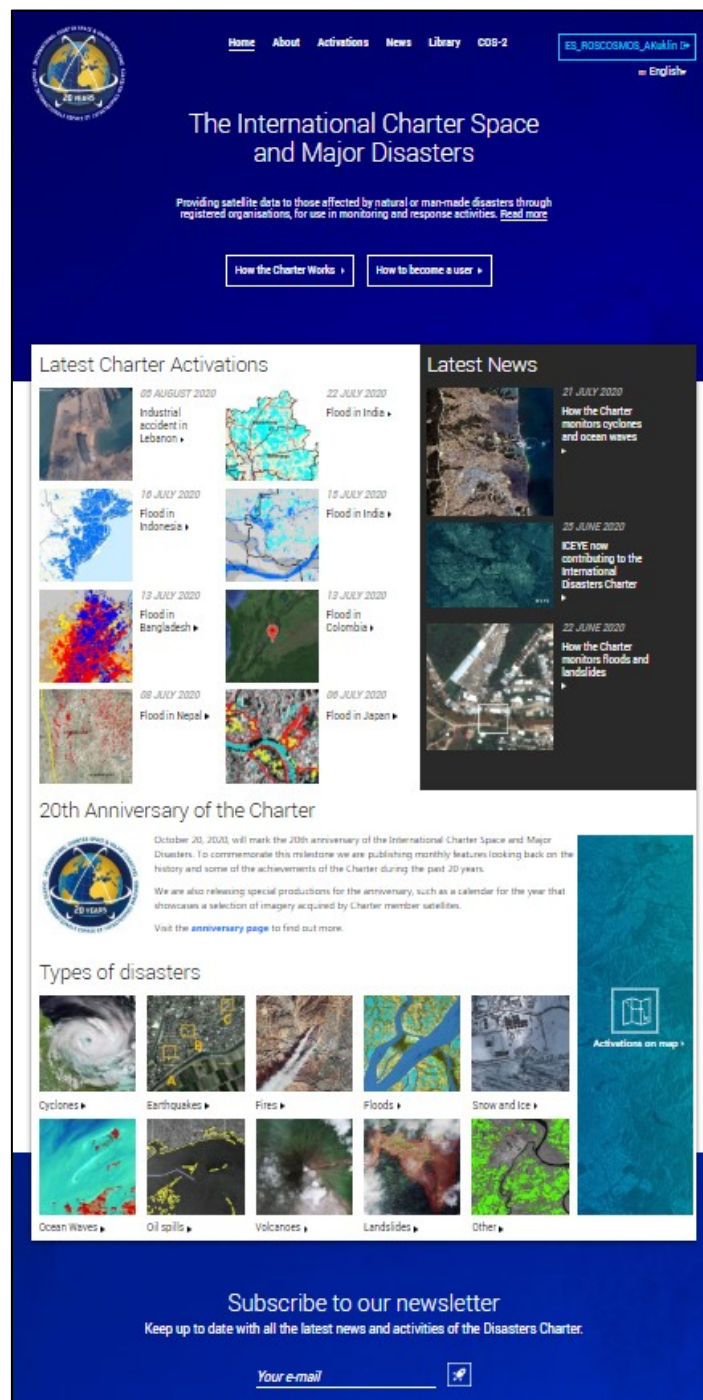
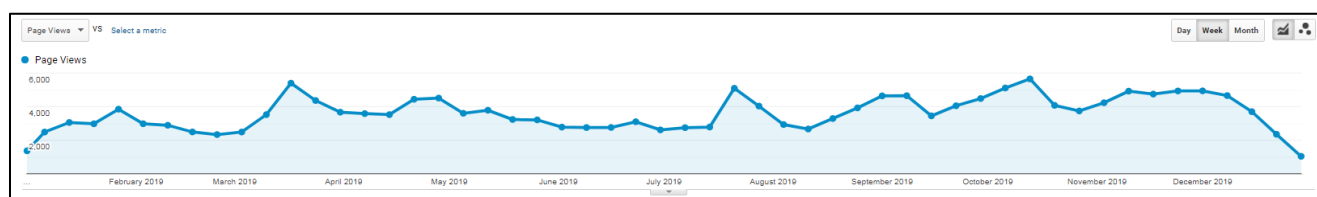


Figure 5-1. Charter website homepage in 2020

According to the Charter Website statistics in 2019 there were totally 175,069 page views, which is more than 50% higher than 2018. 139,185 of these views were unique. The most viewed pages (more than 20 000 views and unique views) were the [home page](https://disasterscharter.org/web/guest/home), [activations page](https://disasterscharter.org/web/guest/activations/) and [disaster types page](https://disasterscharter.org/web/guest/disaster-types). Average time spent on a page comprised 123.37 seconds. Average bounce rate was 63,72% and average exit percentage comprised 37,11%.

Page	Page Views	Unique Page Views	Avg. Time on Page	Bounce Rate	% Exit
<a href="https://disasterscharter.org/web/guest/home">https://disasterscharter.org/web/guest/home</a>	46707	32446	91,49	38,01%	33,99%
<a href="https://disasterscharter.org/web/guest/activations/">https://disasterscharter.org/web/guest/activations/</a>	62032	56646	158,94	90,87%	68,32%
<a href="https://disasterscharter.org/web/guest/disaster-types">https://disasterscharter.org/web/guest/disaster-types</a>	27128	22355	154,94	80,79%	67,13%
<a href="https://disasterscharter.org/web/guest/charter-activations">https://disasterscharter.org/web/guest/charter-activations</a>	16075	10157	70,74	56,03%	27,81%
Disaster Types pages	6337	4499	111,68	78,89%	34,34%
<a href="https://disasterscharter.org/web/guest/about-the-charter">https://disasterscharter.org/web/guest/about-the-charter</a>	6343	4786	146,44	69,45%	39,51%
<a href="https://disasterscharter.org/web/guest/news">https://disasterscharter.org/web/guest/news</a>	1210	984	56,38	74,19%	22,89%
<a href="https://disasterscharter.org/web/guest/how-the-charter-works">https://disasterscharter.org/web/guest/how-the-charter-works</a>	3208	2579	148,61	61,67%	34,01%
<a href="https://disasterscharter.org/web/guest/library">https://disasterscharter.org/web/guest/library</a>	2047	1329	152,50	69,68%	35,37%
<a href="https://disasterscharter.org/web/guest/how-to-register-as-a-user">https://disasterscharter.org/web/guest/how-to-register-as-a-user</a>	1664	1441	141,40	72,46%	38,04%
<a href="https://disasterscharter.org/web/guest/activating-the-charter">https://disasterscharter.org/web/guest/activating-the-charter</a>	40	22	65,78	0,00%	10,00%
<a href="https://disasterscharter.org/web/guest/text-of-the-charter">https://disasterscharter.org/web/guest/text-of-the-charter</a>	617	552	190,53	69,77%	48,46%
<a href="https://disasterscharter.org/web/guest/news/">https://disasterscharter.org/web/guest/news/</a>	1210	984	56,38	74,19%	22,89%
<a href="https://disasterscharter.org/web/guest/history">https://disasterscharter.org/web/guest/history</a>	451	405	181,39	56,10%	36,81%

**Figure 5-2. Charter website views (January-December 2019)**



**Figure 5-3. Page views (January-December 2019)**

March 2019: peak corresponds to Cyclone Idai in Zimbabwe and Mozambique

July 2019: peak corresponds to Ubai earthquake in Peru

August 2019: peak at beginning of August corresponds to Earthquake in Indonesia

October 2019: peak corresponds to Flood in Cameroon and Fires in Syria and Lebanon

2019 showed a tremendous growth of the number of users visited the Charter website, which comprised 136,509 , there were 134,408 new users. Total number of sessions comprised 186,099.

Country	Users	New Users	Sessions	Bounce Rate
United States	30207	29837	33790	87,88%
India	9292	9218	11027	70,91%
United Kingdom	4347	4290	6813	66,81%
Canada	3129	3078	5525	51,35%
Japan	3006	2944	5406	57,47%
Philippines	2207	2199	2524	81,97%
France	2020	1966	3593	45,17%
Germany	1418	1346	2525	48,12%
China	1309	1277	2154	62,86%
Brazil	1170	1155	2247	50,16%

**Figure 5-4. Number of users and sessions (January-December 2019)**

2019 shows an overall increase in the number of visitors to the activations pages. The main Charter Activations page received more than 16,000 page views, in comparison to 2018 in which there were 4,600.

The statistics below show that the top 18 activations visited all received more than a thousand visits, whereas in 2018 it was the top 10 that exceeded a thousand visits.

The two activations for Cyclone Idai received the most visits, then a series of floods, landslides and other cyclones were also among the most visited. Notably, the dam collapse in Brazil - number 5 on the top list - received a high number of visitors, over a quarter of which were from Brazil.

Page	Page Views	Unique Page Views	Avg. Time on Page	Bounce Rate	% Exit
<a href="https://disasterscharter.org/web/guest/charter-activations">https://disasterscharter.org/web/guest/charter-activations</a>	16075	10157	70,74	56,03%	27,81%
<a href="https://disasterscharter.org/web/guest/activations/-/article/cyclone-in-mozambique-activation-598-">https://disasterscharter.org/web/guest/activations/-/article/cyclone-in-mozambique-activation-598-</a>	3305	2982	238,17	93,59%	78,55%
<a href="https://disasterscharter.org/web/guest/activations/-/article/cyclone-in-zimbabwe-activation-599-">https://disasterscharter.org/web/guest/activations/-/article/cyclone-in-zimbabwe-activation-599-</a>	3038	2762	194,89	92,08%	77,95%
<a href="https://disasterscharter.org/web/guest/activations/-/article/landslide-in-bolivia-plurinational-state-of-activation-597-">https://disasterscharter.org/web/guest/activations/-/article/landslide-in-bolivia-plurinational-state-of-activation-597-</a>	2546	2420	154,44	95,04%	83,31%
<a href="https://disasterscharter.org/web/guest/activations/-/article/flood-in-iran-islamic-republic-of-activation-601-">https://disasterscharter.org/web/guest/activations/-/article/flood-in-iran-islamic-republic-of-activation-601-</a>	2215	2098	140,52	96,43%	83,16%
<a href="https://disasterscharter.org/web/guest/activations/-/article/flood-in-indonesia-activation-600-">https://disasterscharter.org/web/guest/activations/-/article/flood-in-indonesia-activation-600-</a>	2116	2030	135,58	96,93%	84,40%
<a href="https://disasterscharter.org/web/guest/activations/-/article/dam-collapse-in-brazil-activation-596-">https://disasterscharter.org/web/guest/activations/-/article/dam-collapse-in-brazil-activation-596-</a>	1978	1729	190,23	81,87%	66,13%
<a href="https://disasterscharter.org/web/guest/activations/-/article/cyclone-in-india-activation-608-">https://disasterscharter.org/web/guest/activations/-/article/cyclone-in-india-activation-608-</a>	1928	1843	179,71	96,32%	83,40%
<a href="https://disasterscharter.org/web/guest/activations/-/article/flood-in-iraq-activation-603-">https://disasterscharter.org/web/guest/activations/-/article/flood-in-iraq-activation-603-</a>	1857	1789	187,11	96,84%	85,35%



<a href="https://disasterscharter.org/web/guest/activations/-/article/flood-in-paraguay-activation-609-">https://disasterscharter.org/web/guest/activations/-/article/flood-in-paraguay-activation-609-</a>	1766	1664	227,66	95,14%	82,11%
<a href="https://disasterscharter.org/web/guest/activations/-/article/cyclone-in-mozambique-activation-606-">https://disasterscharter.org/web/guest/activations/-/article/cyclone-in-mozambique-activation-606-</a>	1756	1697	120,50	98,16%	84,23%
<a href="https://disasterscharter.org/web/guest/activations/-/article/earthquake-in-peru-activation-610-">https://disasterscharter.org/web/guest/activations/-/article/earthquake-in-peru-activation-610-</a>	1730	1646	104,30	95,15%	78,73%
<a href="https://disasterscharter.org/web/guest/activations/-/article/landslide-in-bolivia-plurinational-state-of-activation-607-">https://disasterscharter.org/web/guest/activations/-/article/landslide-in-bolivia-plurinational-state-of-activation-607-</a>	1677	1611	126,98	98,15%	82,71%
<a href="https://disasterscharter.org/web/guest/activations/-/article/flood-large-in-india-activation-612-">https://disasterscharter.org/web/guest/activations/-/article/flood-large-in-india-activation-612-</a>	1593	1490	217,93	96,53%	77,40%
<a href="https://disasterscharter.org/web/guest/activations/-/article/storm-hurricane-urban-in-bahamas-activation-620-">https://disasterscharter.org/web/guest/activations/-/article/storm-hurricane-urban-in-bahamas-activation-620-</a>	1502	1293	173,95	85,07%	64,38%
<a href="https://disasterscharter.org/web/guest/activations/-/article/volcano-in-peru-activation-613-">https://disasterscharter.org/web/guest/activations/-/article/volcano-in-peru-activation-613-</a>	1418	1334	137,46	94,17%	76,02%
<a href="https://disasterscharter.org/web/guest/activations/-/article/fire-in-bolivia-plurinational-state-of-activation-616-">https://disasterscharter.org/web/guest/activations/-/article/fire-in-bolivia-plurinational-state-of-activation-616-</a>	1281	1189	157,99	94,86%	78,45%
<a href="https://disasterscharter.org/web/guest/activations/-/article/storm-hurricane-urban-in-japan-activation-625-">https://disasterscharter.org/web/guest/activations/-/article/storm-hurricane-urban-in-japan-activation-625-</a>	1135	951	225,45	84,00%	63,79%
<a href="https://disasterscharter.org/web/guest/activations/-/article/flood-in-brazil-activation-595-">https://disasterscharter.org/web/guest/activations/-/article/flood-in-brazil-activation-595-</a>	1029	934	161,30	81,76%	57,92%
<a href="https://disasterscharter.org/web/guest/activations/-/article/flood-in-canada-activation-604-">https://disasterscharter.org/web/guest/activations/-/article/flood-in-canada-activation-604-</a>	840	723	172,39	80,75%	56,79%
<a href="https://disasterscharter.org/web/guest/activations/-/article/fire-in-bolivia-plurinational-state-of-activation-619-">https://disasterscharter.org/web/guest/activations/-/article/fire-in-bolivia-plurinational-state-of-activation-619-</a>	758	698	147,79	93,31%	65,04%
<a href="https://disasterscharter.org/web/guest/activations/-/article/earthquake-in-indonesia-activation-624-">https://disasterscharter.org/web/guest/activations/-/article/earthquake-in-indonesia-activation-624-</a>	724	661	87,61	94,16%	64,50%
<a href="https://disasterscharter.org/web/guest/activations/-/article/flood-large-in-japan-activation-618-">https://disasterscharter.org/web/guest/activations/-/article/flood-large-in-japan-activation-618-</a>	693	645	114,08	92,84%	66,52%
<a href="https://disasterscharter.org/web/guest/activations/-/article/flood-large-in-russian-federation-activation-611-">https://disasterscharter.org/web/guest/activations/-/article/flood-large-in-russian-federation-activation-611-</a>	669	557	224,44	68,66%	56,80%
<a href="https://disasterscharter.org/web/guest/activations/-/article/flood-large-in-india-activation-623-">https://disasterscharter.org/web/guest/activations/-/article/flood-large-in-india-activation-623-</a>	655	590	213,67	91,41%	59,69%
<a href="https://disasterscharter.org/web/guest/activations/-/article/flood-large-in-sudan-activation-617-">https://disasterscharter.org/web/guest/activations/-/article/flood-large-in-sudan-activation-617-</a>	617	574	190,36	90,51%	71,47%
<a href="https://disasterscharter.org/web/guest/activations/-/article/fire-in-australia-activation-631-">https://disasterscharter.org/web/guest/activations/-/article/fire-in-australia-activation-631-</a>	542	457	192,46	70,67%	49,63%
<a href="https://disasterscharter.org/web/guest/activations/-/article/flood-large-in-russian-federation-activation-614-">https://disasterscharter.org/web/guest/activations/-/article/flood-large-in-russian-federation-activation-614-</a>	512	438	117,77	59,66%	38,67%
<a href="https://disasterscharter.org/web/guest/activations/-/article/flood-flash-in-cameroon-activation-627-">https://disasterscharter.org/web/guest/activations/-/article/flood-flash-in-cameroon-activation-627-</a>	501	458	160,17	90,08%	63,47%
<a href="https://disasterscharter.org/web/guest/activations/-/article/earthquake-in-pakistan-activation-622-">https://disasterscharter.org/web/guest/activations/-/article/earthquake-in-pakistan-activation-622-</a>	480	437	130,33	91,73%	62,50%

<a href="https://disasterscharter.org/web/guest/activations/-/article/fire-in-korea-republic-of-activation-602-">https://disasterscharter.org/web/guest/activations/-/article/fire-in-korea-republic-of-activation-602-</a>	477	441	97,05	69,79%	38,57%
<a href="https://disasterscharter.org/web/guest/activations/-/article/flood-in-south-africa-activation-605-">https://disasterscharter.org/web/guest/activations/-/article/flood-in-south-africa-activation-605-</a>	446	389	187,57	77,33%	49,33%
<a href="https://disasterscharter.org/web/guest/activations/-/article/earthquake-in-philippines-activation-629-">https://disasterscharter.org/web/guest/activations/-/article/earthquake-in-philippines-activation-629-</a>	441	391	178,81	89,83%	57,37%
<a href="https://disasterscharter.org/web/guest/activations/-/article/flood-large-in-central-african-republic-activation-632-">https://disasterscharter.org/web/guest/activations/-/article/flood-large-in-central-african-republic-activation-632-</a>	426	381	185,41	85,71%	61,50%
<a href="https://disasterscharter.org/web/guest/activations/-/article/fire-in-lebanon-syrian-arab-republic-activation-626-">https://disasterscharter.org/web/guest/activations/-/article/fire-in-lebanon-syrian-arab-republic-activation-626-</a>	408	377	131,40	94,97%	61,52%
<a href="https://disasterscharter.org/web/guest/activations/-/article/fire-in-paraguay-activation-621-">https://disasterscharter.org/web/guest/activations/-/article/fire-in-paraguay-activation-621-</a>	377	335	187,49	79,65%	51,99%
<a href="https://disasterscharter.org/web/guest/activations/-/article/storm-hurricane-urban-in-philippines-activation-634-">https://disasterscharter.org/web/guest/activations/-/article/storm-hurricane-urban-in-philippines-activation-634-</a>	372	325	139,35	88,49%	62,37%
<a href="https://disasterscharter.org/web/guest/activations/-/article/landslide-in-kenya-activation-633-">https://disasterscharter.org/web/guest/activations/-/article/landslide-in-kenya-activation-633-</a>	355	305	205,70	85,53%	58,03%
<a href="https://disasterscharter.org/web/guest/activations/-/article/storm-hurricane-urban-in-bangladesh-activation-630-">https://disasterscharter.org/web/guest/activations/-/article/storm-hurricane-urban-in-bangladesh-activation-630-</a>	337	313	103,21	91,91%	62,31%
<a href="https://disasterscharter.org/web/guest/activations/-/article/flood-large-in-kenya-activation-628-">https://disasterscharter.org/web/guest/activations/-/article/flood-large-in-kenya-activation-628-</a>	292	252	166,54	76,24%	52,40%
<a href="https://disasterscharter.org/web/guest/activations/-/article/lost-aircraft-in-chile-activation-636-">https://disasterscharter.org/web/guest/activations/-/article/lost-aircraft-in-chile-activation-636-</a>	223	186	128,72	66,29%	55,16%
<a href="https://disasterscharter.org/web/guest/activations/-/article/flood-flash-in-russian-federation-activation-615-">https://disasterscharter.org/web/guest/activations/-/article/flood-flash-in-russian-federation-activation-615-</a>	182	159	129,89	69,39%	44,51%
<a href="https://disasterscharter.org/web/guest/activations/-/article/landslide-in-uganda-activation-635-">https://disasterscharter.org/web/guest/activations/-/article/landslide-in-uganda-activation-635-</a>	168	142	208,93	68,85%	55,36%

**Figure 5-5. Number of Charter activations pages views (January-December 2019)**

Charter visibility is also ensured through other social media outlets, such as Twitter, which had almost 8 000 followers by the end of 2019. This trend shows that the Charter audience continues to increase remarkably compared to 2013 (880), 2014 (1,840), 2015 (3,160), 2016 (4,000), 2017 (5,000) and 2018 (6,000).

The number of impressions of Charter's followers in January-December 2018 reached 731,997, the following figure shows the top ten tweets (among the 126 tweets published in 2019).

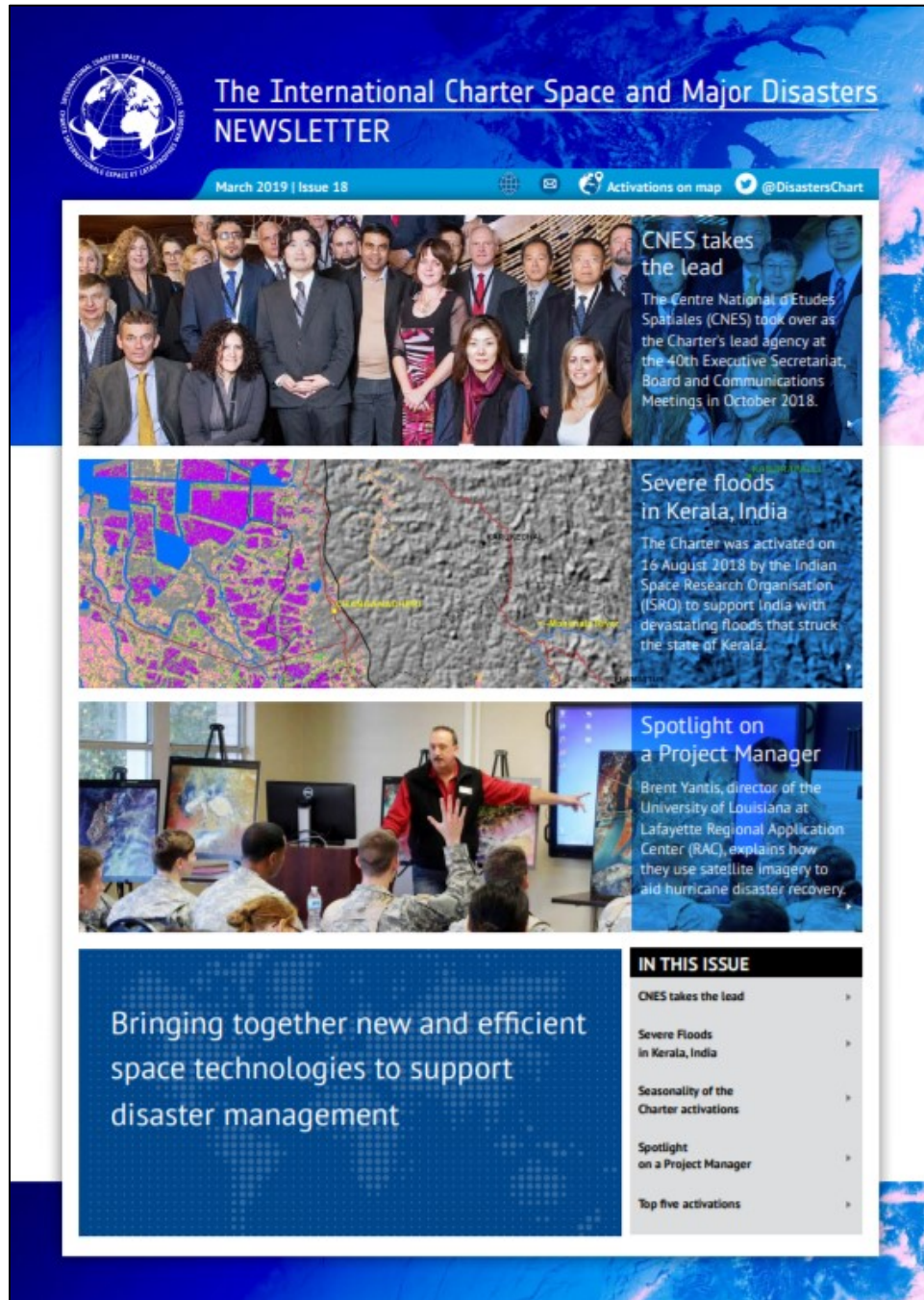
Date (GMT)	Text	URL	Retweet count	Favourite count
19/03/2019 09:44:36	"We have our first maps of #Zimbabwe after #CycloneIdai: <a href="https://t.co/BtqYVEFJdr">https://t.co/BtqYVEFJdr</a>	<a href="https://twitter.com/DisastersChart/status/1107940928298332166">https://twitter.com/DisastersChart/status/1107940928298332166</a>	52	81
28/01/2019 12:23:36	These maps provide a damage assessment of the Chimanimani area, using #Pleiades imagery to highlight areas of flooding and landslides. <a href="https://t.co/NGQEmzAOLg">https://t.co/NGQEmzAOLg</a> "	<a href="https://twitter.com/DisastersChart/status/1089861548691083264">https://twitter.com/DisastersChart/status/1089861548691083264</a>	48	64
14/10/2019 14:06:10	"The Charter has been activated to provide imagery of the #Brumadinho dam collapse in #Brazil: <a href="https://t.co/1C7LxHOaKe">https://t.co/1C7LxHOaKe</a>	<a href="https://twitter.com/DisastersChart/status/1183745818899238913">https://twitter.com/DisastersChart/status/1183745818899238913</a>	37	54
24/05/2019 11:38:37	The iron ore tailing dam collapsed on Friday, causing a mudslide that has left hundreds missing. <a href="https://t.co/MsRyJg8gaT">https://t.co/MsRyJg8gaT</a> "	<a href="https://twitter.com/DisastersChart/status/1131887222339362816">https://twitter.com/DisastersChart/status/1131887222339362816</a>	24	34
18/03/2019 13:37:08	"The Charter has been activated to provide satellite data of #TyphoonHagibis' impact on #Japan: <a href="https://t.co/iFI5EAV9Dr">https://t.co/iFI5EAV9Dr</a>	<a href="https://twitter.com/DisastersChart/status/1107637060792389632">https://twitter.com/DisastersChart/status/1107637060792389632</a>	24	30
04/11/2019 10:07:12	We have our first maps of the disaster already, which use #Sentinel1 to provide an early assessment of potentially flooded areas. <a href="https://t.co/MZMkhd2vF4">https://t.co/MZMkhd2vF4</a> "	<a href="https://twitter.com/DisastersChart/status/1191295825852411904">https://twitter.com/DisastersChart/status/1191295825852411904</a>	20	50
11/01/2019 11:51:14	"These maps of Asunción in #Paraguay estimate the areas of water in the city after the recent #floods: <a href="https://t.co/D8CCUG48pA">https://t.co/D8CCUG48pA</a>	<a href="https://twitter.com/DisastersChart/status/1083692807582351361">https://twitter.com/DisastersChart/status/1083692807582351361</a>	20	33
25/03/2019 15:12:34	The maps use #RADARSAT2, #TerraSARX and Resurs-P data to identify bodies of water (in blue). <a href="https://t.co/HRTxUK3ULg">https://t.co/HRTxUK3ULg</a> "	<a href="https://twitter.com/DisastersChart/status/1110197791249362945">https://twitter.com/DisastersChart/status/1110197791249362945</a>	19	22
21/03/2019 14:57:35	"#ICYMI, last week we were activated for #CycloneIdai's impact on #Mozambique. As part of our collaboration with @CopernicusEMS they've shared some maps of the disaster: <a href="https://t.co/rOavdhzzm3">https://t.co/rOavdhzzm3</a>	<a href="https://twitter.com/DisastersChart/status/1108744470500122626">https://twitter.com/DisastersChart/status/1108744470500122626</a>	18	20
22/03/2019 14:37:12	The maps assess the #flood situation after Idai made landfall. <a href="https://t.co/BxK5b38nlu">https://t.co/BxK5b38nlu</a> "	<a href="https://twitter.com/DisastersChart/status/1109101728081817600">https://twitter.com/DisastersChart/status/1109101728081817600</a>	17	26

**Figure 5-6. Disasters Charter Twitter statistics for 2019**

## **5.2 Charter Newsletters**

Charter Newsletters #18 and 19 were issued in March 2019 and September 2019 respectively. The newsletters represent an additional means of informing users, stakeholders and the public on recent Charter activations, news, events and related activities.

<https://disasterscharter.org/web/guest/-/international-charter-newsletter-march-2019-issue-18>



**Figure 5-7. Charter Newsletter issue 18**

The March issue (18<sup>th</sup>) included the following subjects:

- CNES takes the lead role of the Charter
- Severe floods in Kerala, India
- Spotlight on a Project Manager
- Seasonality of Charter activations
- Five examples of activations in the last six months

<https://disasterscharter.org/web/guest/-/international-charter-newsletter-september-2019-issue-19>

The September issue (19<sup>th</sup>) reported on the following matters:

- CSA takes the lead role of the Charter
- Planet data contribution to the Charter
- KOMPSAT-3A is now available for the Charter
- Universal Access: A great success
- Charter supports relief efforts following floods in Canada
- Contribution of Chinese GF-3, GF-4 to the Charter
- Charter promoted on China's National Disaster Prevention and Reduction Day
- Charter booth attracts attention at ESA's Living Planet Symposium
- Five examples of activations in the last six months

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





Figure 5-8. Charter Newsletter issue 19

### 5.3 Conferences and presentations

The following table provides details of the 2019 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.

Event	Venue	Date	Speakers
<b>Charter presentation to a delegation from GISTDA (Geo-Informatics and Space Technology Development Agency), Thailand</b>	Toulouse	19 February	CNES
<b><u><a href="#">56<sup>th</sup> Scientific and Technical Committee of COPUOS : “International Charter Space and Major Disasters, Space satellite data for relieving organizations in the event of disasters”</a></u></b>	Vienna	20 February	CNES
<b><u><a href="#">ESA Living Planet Symposium : International charter for Space &amp; Major disasters - overview and future</a></u></b>	Milan	13-17 May	CNES
<b>"Hurricane Season Geospatial Data Mining Workshop" jointly hosted by NASA and the University of Louisiana</b>	Lafayette	June	USGS
<b>Charter presentation at 2019 KARI International Space Training Program</b>	Daejeon	12 July	KARI
<b>Charter lecture held by DLR at the summer school „Innovations in Disaster Risk Reduction“, organized by the Central European University and UNDP (<a href="https://summeruniversity.ceu.edu/disaster-2019">https://summeruniversity.ceu.edu/disaster-2019</a>)</b>	Budapest	1-5 July	DLR
<b>Charter promotion at K-GEO booth in 2019 GEO Week</b>	Canberra	3-9 September	KARI
<b>Charter PM Training 2019</b>	Beijing	10 September	CNSA, CNES
<b><u><a href="#">9th Annual UN-SPIDER Conference, ‘The United Nations Conference on Space-based Technologies for Disaster Risk Reduction : ‘International Charter Space and Major Disasters: Outlines’</a></u></b>	Beijing	11-12 September	CNES



<b>33 CEOS Plenary 2019</b> <a href="http://ceos.org/meetings/33rd-ceos-plenary/">http://ceos.org/meetings/33rd-ceos-plenary/</a>	Hanoi	15 October	Roscosmos
<b>International Forum ‘Space days in Kazakhstan’</b> <a href="https://www.gharysh.kz/spacedays2019en/">https://www.gharysh.kz/spacedays2019en/</a>	Nur-Sultan, Kazakhstan	12 November	Roscosmos
<b>Charter PM Training in November 2019 in Bonn, Germany, organized by ESA and DLR and hosted by UN-SPIDER</b>	Bonn	5 November	DLR, ESA
<b>Charter presentation by DLR at UN-SPIDER’s Bonn International Conference "Space-based Solutions for Disaster Management in Africa: Challenges, Applications, Partnerships" (<a href="http://www.un-spider.org/news-and-events/events/bonn-conference-2019">http://www.un-spider.org/news-and-events/events/bonn-conference-2019</a>)</b>	Bonn	5 November	DLR
<b>Canadian Science Policy Conference</b>	Ottawa	13-15 November	CSA
<b>ArcticNet</b>	Halifax	2-5 December	CSA
<b>Natural hazards session at the American Geophysical Union (AGU) Fall Meeting</b>	San Francisco	9-13 December	USGS

**Table 5-9. List of conferences/workshops/presentations with Charter presence**

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.

## 5.4 Press releases and articles

The following table summarises the main press releases, web and paper articles issued by the member agencies or others in 2019.

Date	Issuing agency	Title
29 January	DLR	Dam Collapse in Brazil <a href="https://activations.zki.dlr.de/en/activations/items/ACT141.html">https://activations.zki.dlr.de/en/activations/items/ACT141.html</a>
January	DLR	Article in DLR's magazine "Countdown" (in German and English): HELP FROM SPACE - Satellites supply data for dealing with disasters ( <a href="https://www.dlr.de/rd/PortalData/28/Resources/dokumente/publikationen/countdown/Countdown37_lowres.pdf">https://www.dlr.de/rd/PortalData/28/Resources/dokumente/publikationen/countdown/Countdown37_lowres.pdf</a> )
19 February	CSA	<a href="https://spaceq.ca/rcm-will-assist-canada-with-disaster-charter-monitoring/">https://spaceq.ca/rcm-will-assist-canada-with-disaster-charter-monitoring/</a>
25 March	DLR	Tropical Cyclone Idai hits Mozambique, Zimbabwe and Malawi <a href="https://activations.zki.dlr.de/en/activations/items/ACT142.html">https://activations.zki.dlr.de/en/activations/items/ACT142.html</a>
12 May	CNSA	China National Disaster Prevention and Reduction Day, article on the International Charter
21 June	USGS	Disaster Management Training at EROS Prepares Volunteers for Duty <a href="https://www.usgs.gov/center-news/disaster-management-training-eros-prepares-volunteers-duty?qt-news_science_products=1#qt-news_science_products">https://www.usgs.gov/center-news/disaster-management-training-eros-prepares-volunteers-duty?qt-news_science_products=1#qt-news_science_products</a>
November	ESA	ESA HIGHLIGHTS 2019 - Mapping from satellite to disaster zone <a href="https://esamultimedia.esa.int/docs/corporate/ESA_Highlights_2019_LR.pdf">https://esamultimedia.esa.int/docs/corporate/ESA_Highlights_2019_LR.pdf</a>
December	ESA	White paper on "Satellite mapping in response to the 2016 7.8 magnitude earthquake in Muisne, Ecuador" focusing on CEOS, Charter and Copernicus EMS activations (in collaboration with Copernicus EMS and other CEOS partners) <a href="http://ceos.org/document_management/Working_Groups/WG_Disasters/Pilots/Seismic/2016_earthquake_Muisne_Ecuador_white_paper.pdf">http://ceos.org/document_management/Working_Groups/WG_Disasters/Pilots/Seismic/2016_earthquake_Muisne_Ecuador_white_paper.pdf</a>

**Table 5-10. List of articles and press releases  
articles and press releases**

## 6 Assessment of the Charter operations

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

Statistics on the 2019 activations were compared with EM-DAT data to evaluate the overall impact of the Charter as a service in supporting disaster response – EM-DAT: The Emergency Events Database - Université Catholique de Louvain (UCL) - CRED, D. Guha-Sapir - [www.emdat.be](http://www.emdat.be), Brussels, Belgium. MunichRE as NatCatService and relevant analysis were also consulted (<http://www.munichre.com/natcatservice>).

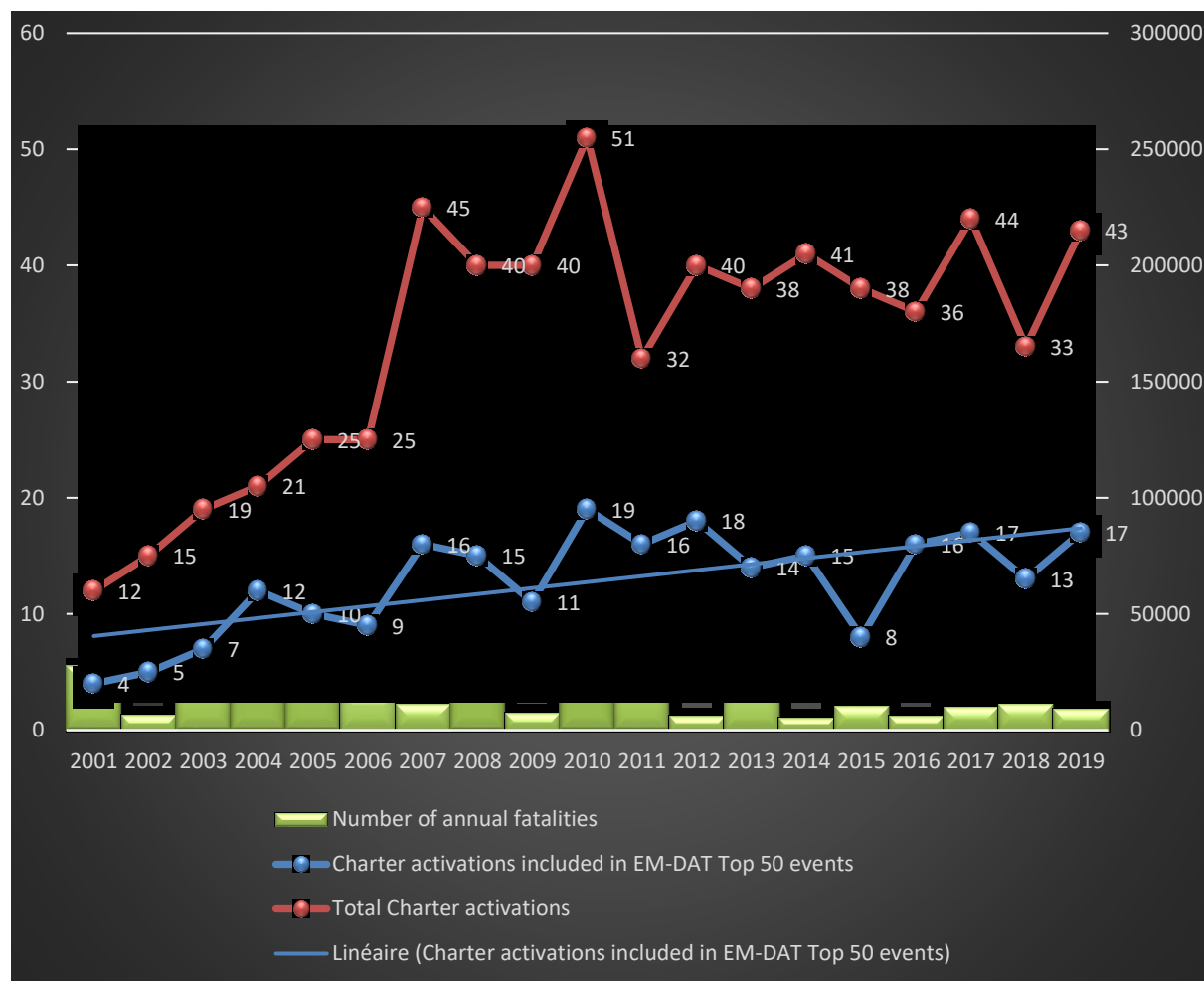
The reports issued by the Project Managers of the Charter activations remain one of the main sources of information for assessing the performance and quality of service provided by the Charter during 2019.

### 6.1 Overall impact

In 2019, the most catastrophic event was the flood in India, affecting more than 3,000,000 and killing 1,900 people. 2019 was one of the years with a low number of human losses and a very high impact of natural disaster events in terms of damages (see Figure 6-1).

376 natural events (excluding droughts, extreme temperature, and including earthquakes and tsunamis, floods, landslides, storms, volcanic eruptions and wildfires) are recorded in the database managed by the Centre for Research on the Epidemiology of Disasters (CRED) ([http://emdat.be/disaster\\_list/](http://emdat.be/disaster_list/)). The Charter responded to around 11% of the total number of natural disasters registered by EM-DAT in 2019; this is equivalent to the percentages of previous years (i.e. 11% in 2018, 13% in 2016 and 2017, 12% in 2015, 13% in 2014, 11% in 2013, 13 % in 2010 and 2012; 10% in 2011).

Munich RE's natural catastrophe loss database (*Topics GEO, Natural catastrophes 2019 Analyses, assessments, positions, 2019 issue; Munich RE*) registered 820 catastrophic events. Direct overall losses from natural catastrophes in 2019 amounted to U.S.\$ 150bn, below the 10-year overall loss average of U.S.\$ 187bn. 2019 contrasted sharply with the years 2014 and 2015 in terms of overall losses, mainly due to floods, tropical cyclones in Japan, China, India, the U.S. and the Caribbean. A total of 9,000 people lost their lives globally. 1,900 people out of the 9,000 died in extreme flood in India. *Natural catastrophes 2019 Analyses, assessments, positions, 2019 issue; Munich RE* The distribution of 2019 Charter activations by continent (Figure 3-6) confirms this trend.



**Figure 6-1. Number of Charter events over 2001-2018**

*Represented in blue* are the number of Charter events per year that are included within the 50 most severe disasters by fatalities recorded in EM-DAT each year. The total number of fatalities counted for the 50 main disasters was much lower than 2004, 2008 and 2010 and equivalent to 2015 and 2017.

Figure 6-1 shows that 17 of the 50 most severe events recorded in EM-DAT in 2019 were covered by Charter activations. In 2019, the number of Charter activations (43) is comparable to recent years, as the number of Charter activations fluctuates between 32 and 51 per year since 2007. Such fluctuations can be explained in part by the variability in the number of total natural disasters occurring during the relevant year, by the occurrence of disasters that cover 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).

In 2019, the Charter covered 6 of the 10 most severe disasters by fatalities (Table 6-1 next page). Among the last nine years (2009-2019), the Charter was triggered for all 15 most severe natural disasters by fatalities, as reported by EM-DAT (Table 6-2).

Top 10 Disasters – Number Killed – 2019				
<i>The text in italic indicates that the Charter was activated</i>				
Country	Disaster type	Date	#killed	#Affected people
<b><i>India</i></b>	<b><i>Flood</i></b>	<b><i>14/07/2019</i></b>	<b><i>1,900</i></b>	<b><i>3,000,000</i></b>
<b><i>Zimbabwe</i></b>	<b><i>Storm</i></b>	<b><i>14/03/2019</i></b>	<b><i>628</i></b>	<b><i>270,186</i></b>
<b><i>Mozambique</i></b>	<b><i>Storm</i></b>	<b><i>14/03/2019</i></b>	<b><i>603</i></b>	<b><i>1,501,500</i></b>
<b><i>Bahamas (the)</i></b>	<b><i>Storm</i></b>	<b><i>01/09/2019</i></b>	<b><i>370</i></b>	<b><i>15,000</i></b>
China	Flood	13/06/2019	300	4,500,000
<b><i>Indonesia</i></b>	<b><i>Flood</i></b>	<b><i>16/03/2019</i></b>	<b><i>206</i></b>	<b><i>59,540</i></b>
Nepal	Flood	08/07/2019	119	82,541
Myanmar	Flood	08/08/2019	115	1,875
Bangladesh	Flood	07/07/2019	114	7,600,000
<b><i>Japan</i></b>	<b><i>Storm</i></b>	<b><i>12/10/2019</i></b>	<b><i>99</i></b>	<b><i>390,470</i></b>

Table 6-1. Ten most severe natural disasters by number of fatalities in 2019 (events covered by Charter activations are indicated in bold and italics. (Source: EM-DAT: The Emergency Events Database - Université Catholique de Louvain (UCL) - CRED, D. Guha-Sapir - [www.emdat.be](http://www.emdat.be), Brussels, Belgium, filtered according to the type of disasters covered by the Charter).

Top 15 Disasters – Number Killed – 2009-2019				
<i>The text in italic indicates that the Charter was activated</i>				
Date	Country/District	Type	# Killed	#Affected people
<b><i>12/01/2010</i></b>	<b><i>Haiti</i></b>	<b><i>Earthquake</i></b>	<b><i>222,570</i></b>	<b><i>3,700,000</i></b>
<b><i>11/03/2011</i></b>	<b><i>Japan</i></b>	<b><i>Earthquake and tsunami</i></b>	<b><i>19,848</i></b>	<b><i>368,820</i></b>
<b><i>25/4/2015</i></b>	<b><i>Nepal</i></b>	<b><i>Earthquake</i></b>	<b><i>8,831</i></b>	<b><i>5,639,722</i></b>
<b><i>8/11/2013</i></b>	<b><i>Philippines</i></b>	<b><i>Tropical cyclone</i></b>	<b><i>7,354</i></b>	<b><i>16,106,807</i></b>
<b><i>12-27/06/2013</i></b>	<b><i>India</i></b>	<b><i>Flood</i></b>	<b><i>6,054</i></b>	<b><i>504,473</i></b>
<b><i>28/09/2018</i></b>	<b><i>Indonesia</i></b>	<b><i>Earthquake</i></b>	<b><i>4,929</i></b>	<b><i>769,109</i></b>
<b><i>14/04/2010</i></b>	<b><i>China P Rep</i></b>	<b><i>Earthquake</i></b>	<b><i>2,968</i></b>	<b><i>112,000</i></b>
<b><i>28/07/2010</i></b>	<b><i>Pakistan</i></b>	<b><i>Flash flood</i></b>	<b><i>1,985</i></b>	<b><i>2,0359,496</i></b>
<b><i>14/07/2019</i></b>	<b><i>India</i></b>	<b><i>Flood</i></b>	<b><i>1,900</i></b>	<b><i>3,000,000</i></b>
<b><i>4-5/12/2012</i></b>	<b><i>Philippines</i></b>	<b><i>Tropical cyclone</i></b>	<b><i>1,900</i></b>	<b><i>6,246,664</i></b>
<b><i>07/08/2010</i></b>	<b><i>China P Rep</i></b>	<b><i>Landslide</i></b>	<b><i>1,765</i></b>	<b><i>4,7200</i></b>
<b><i>29/05/2010</i></b>	<b><i>China P Rep</i></b>	<b><i>General flood</i></b>	<b><i>1,691</i></b>	<b><i>134,000,000</i></b>

<i>15/12/2011</i>	<i>Philippines</i>	<i>Tropical cyclone</i>	<i>1,439</i>	<i>1,150,300</i>
<i>30/09/2009</i>	<i>Indonesia</i>	<i>Earthquake</i>	<i>1177</i>	<i>679,402</i>
<i>14/08/2017</i>	<i>Sierra Leone</i>	<i>Mudslide</i>	<i>1102</i>	<i>11,916</i>

**Table 6-2. Fifteen most severe disasters by number of fatalities (2009-2018) (events covered by Charter activations are indicated in bold and italics). (Source: EM-DAT: The Emergency Events Database - Université Catholique de Louvain (UCL) - CRED, D. Guha-Sapir - [www.emdat.be](http://www.emdat.be), Brussels, Belgium, filtered according to the type of disasters covered by the Charter)**

Table 6-3 is the list of 50 most severe natural disasters by number of fatalities (listed by total damage) recorded by EM-DAT in 2019.

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

Country	Disaster Type	Start Date	Total Deaths	Charter Activation
India	Flood	14/07/2019	1,900	X
Zimbabwe	Storm	14/03/2019	628	X
Mozambique	Storm	14/03/2019	603	X
Bahamas (the)	Storm	01/09/2019	370	X
China	Flood	13/06/2019	300	
Indonesia	Flood	16/03/2019	206	X
Nepal	Flood	08/07/2019	119	
Myanmar	Flood	08/08/2019	115	
Bangladesh	Flood	07/07/2019	114	
Japan	Storm	12/10/2019	99	X
Kenya	Landslide	23/11/2019	97	X
Kenya	Flood	10/10/2019	90	X
Indonesia	Landslide	21/01/2019	84	
Sudan (the)	Flood	01/07/2019	78	
South Africa	Flood	21/04/2019	73	
China	Storm	10/08/2019	72	
Iran (Islamic Republic of)	Flood	19/03/2019	70	X
Indonesia	Flood	31/12/2019	66	
Uganda	Flood	18/12/2019	65	
Pakistan	Flood	16/07/2019	64	
Afghanistan	Flood	02/03/2019	63	
Philippines (the)	Storm	24/12/2019	63	
Uganda	Landslide	04/06/2019	61	
Bolivia (Plurinational State of)	Flood	24/02/2019	60	X
Malawi	Flood	04/03/2019	60	
Cameroon	Landslide	28/10/2019	54	X
Chad	Landslide	27/09/2019	52	
India	Flood	28/06/2019	52	
Niger (the)	Flood	01/09/2019	52	
China	Landslide	23/07/2019	51	

Country	Disaster Type	Start Date	Total Deaths	Charter Activation
Peru	Flood	21/02/2019	51	
Albania	Earthquake	26/11/2019	51	
India	Storm	06/06/2019	50	
India	Storm	16/04/2019	50	
India	Storm	03/05/2019	50	X
South Sudan	Wildfire	08/05/2019	50	
Mozambique	Storm	25/04/2019	45	X
Congo (the Democratic Republic of the)	Flood	19/11/2019	43	
Afghanistan	Landslide	11/12/2019	40	
Bangladesh	Storm	09/11/2019	40	X
Bangladesh	Storm	04/05/2019	39	
Pakistan	Earthquake	24/09/2019	39	X
Pakistan	Storm	15/04/2019	39	
China	Landslide	19/08/2019	38	
Burundi	Landslide	05/12/2019	37	
Uganda	Flood	29/11/2019	36	X
Afghanistan	Flood	18/03/2019	35	
Colombia	Landslide	21/04/2019	32	
India	Flood	12/08/2019	32	
Australia	Wildfire	01/09/2019	32	X

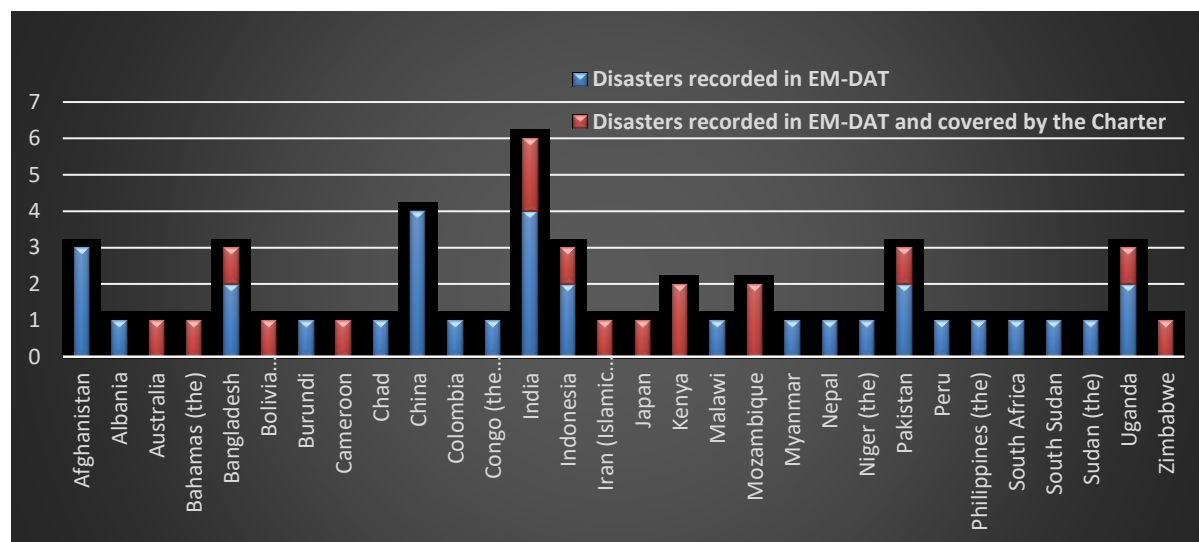
**Table 6-3. Fifty most severe disasters by number of fatalities in 2019** (Source: EM-DAT: The Emergency Events Database - Université Catholique de Louvain (UCL) - CRED, D. Guha-Sapir - [www.emdat.be](http://www.emdat.be), Brussels, Belgium, filtered according to the type of disasters covered by the Charter)

The Charter covered 17 of the 50 most severe natural disasters in terms of fatalities recorded by EM-DAT in 2019, excluding droughts and extreme temperature events (Figure. 6-1 and 6-2).

For these 17 disasters, requests were made by:

- Charter Authorised Users (AUs) for disasters in their countries: 1 activation for landslide in Bolivia was requested by SINAGER; 1 activation for hurricane in Mozambique was requested by CENAD; 1 activation for hurricane and 1 for flood in India were requested by ISRO; 1 activation for hurricane in the Bahamas was requested by USGS; 1 activation for wildfire in Australia was requested by Geoscience Australia; 1 activation for landslide in Kenya was requested by NADMO;
- Activations from Charter Cooperating Bodies: 2 for hurricanes in Mozambique and Bangladesh, 1 for flood in Kenya, 1 for earthquake in Pakistan and 1 for landslide in Uganda were requested by UNITAR/UNOSAT; 2 for floods in Iran and Cameroon and 1 for hurricane in Zimbabwe were requested by UNOOSA; 1 for flood in Indonesia and 1 for hurricane in Japan were requested by Sentinel Asia.

The continuous progress of the Charter's Universal Access (UA) initiative will further improve Charter access globally.



**Figure 6-2. 2019 Breakdown by countries of the 50 major natural disasters (by fatalities) recorded by EM-DAT. In orange, the ones covered by the Charter.**

*(Source: EM-DAT: The Emergency Events Database – Université catholique de Louvain (UCL) - CRED, D. Guha-Sapir - [www.emdat.be](http://www.emdat.be), Brussels, Belgium, filtered according to the type of disasters covered by the Charter)*



## 6.2 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 new operational system COS-2, implemented in March 2015, helps to improve the speed and visibility to all Charter members of some operations and exchanges amongst 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, Charter operations have an automated monitoring system and 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.

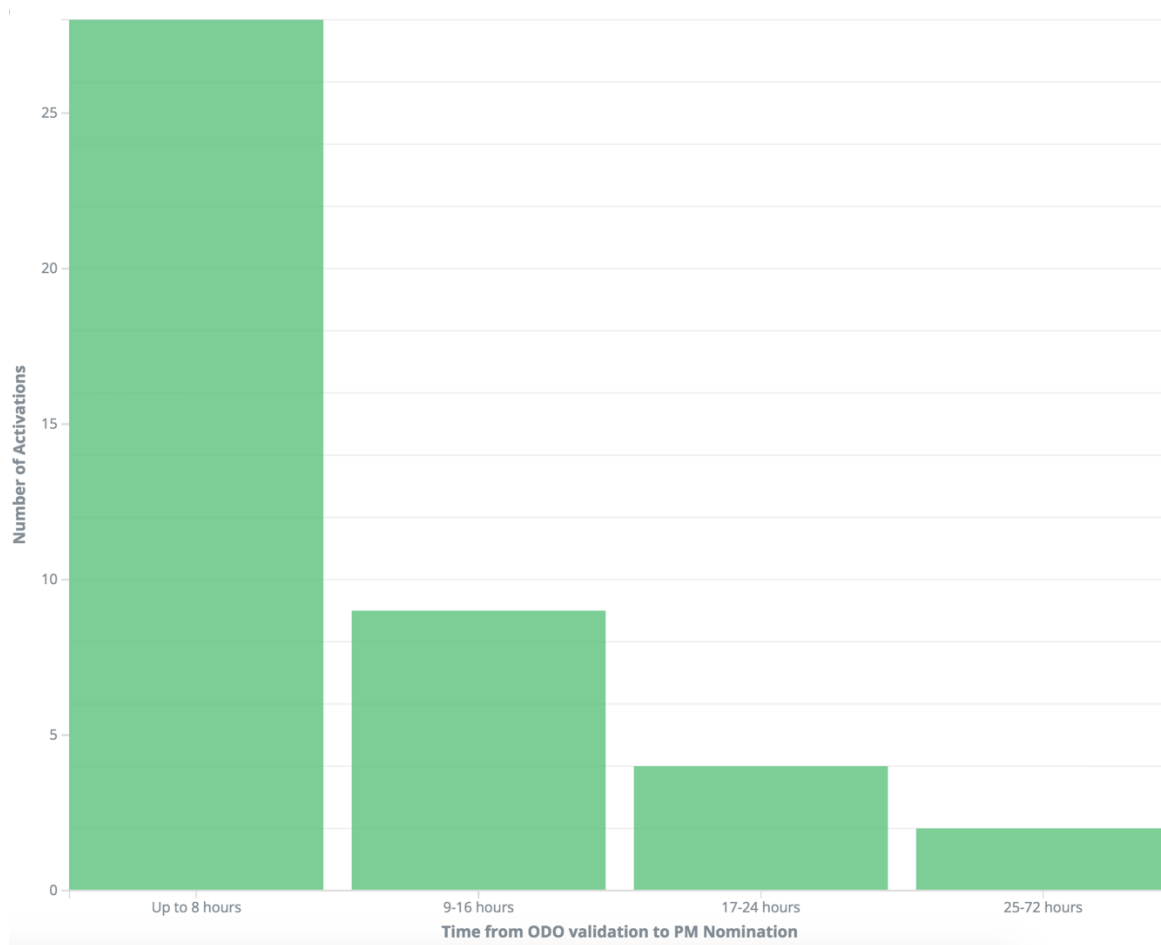


Figure 6-3. 2019 PM nomination time

The PM nomination time is the time between the reception of the User Request Form (URF) by the On-Duty Operator (ODO) and the PM nomination is less than 24 hours for 2019 for more than 95% of activations. This which is higher than the year before (PM nomination was less than 24 hours for all activations in 2018). This is because some calls were merged into a single activation, and a few hours/days were lost between the reception of the call, the decision for merging with another call and the PM nomination.

### ***6.3 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) is 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 definition of new scenarios (e.g. tsunami scenario) 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 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 the 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.

## 6.4 Users' appraisal

To understand how our service assists in disaster monitoring, and more importantly, to identify possible improvements to the Charter service, we gather feedback after each activation. We gather feedback from End Users, the recipients of our value-added products, and from Project Managers, the individuals who coordinate each activation.

The feedback received in 2019 indicates that, in general, end users are satisfied with the Charter's service. During an ongoing disaster, the Charter products support disaster situation awareness, post-event they support post-event analysis and training exercises.

On occasion, due to the specificity of the disaster event, it is not possible to satisfy user's needs for right type of satellite data, for example due to the size of the damaged region, or due to cloud cover. The Charter's enhanced operational system, COS-2, continues to receive positive feedback from the Project Managers along with requests for future enhancements, such as a request for online data processing capabilities.

Here is a selection of comments from Project Managers and End-Users on the Charter process and use of its data:

- An online data processing platform built into COS-2 would be helpful.
- The disaster charter provides an excellent service. The process of initiating the call was simple, teams used the data to understand impacts for defined areas of interest in order to prioritise and coordinate damage assessment teams.
- There was again a great experience where the international cooperation helps an emerging country like us to have high value data and products to support the initiatives of the National Emergency Secretariat to mitigate and better respond to this historical wildfire. We cannot think of working without satellite data.
- The overall Charter Process for this call was very efficiently and professionally managed. The entire charter workflow was very smooth and helped in quick damage assessment of the area. Completely satisfied with the entire data and the workflow.
- As a first experience, I am satisfied with the help provided, there were many products that came to us and analyzing them we saw that not all were applicable, ..... in the next activation of the disaster charter we will be more specific with the type of data that we require according to the event. In synthesis, the disaster charter is of great help ... and the Vice Ministry of Civil Defense is grateful for the many products sent.
- Thank you for the 9 products. Nevertheless, very high-resolution images (better than 5 m) was preferred. In addition, original images in geotiff format could be beneficial, to allow for further processing.
- Would prefer OGC standardised products and coverage across more sites.

## **6.5 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. According to the statistics in 2019 there were totally 175 069 page views, which is more than 50% higher than 2018
- The Charter Twitter account. All Charter activations and news are distributed via tweets. Almost 8,000 followers were counted by the end of 2019 (2,000 followers were gained in 2019, many more will actually be reached due to retweets of Charter messages, e.g. through Charter agency twitter accounts).
- 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 both nationally and internationally.

## 7 Conclusions

In 2019, the following agencies took the lead function which rotates among Charter members on a six-month basis: the French Space Agency, CNES (October 2018 – May 2019), the Canadian Space Agency (May 2019 – October 2019) and the Russian Space Agency, Roscosmos. With the beginning of the leadership periods, the members of the Charter Board and the Executive Secretariat came together for their biannual meetings in Toulouse, France in October 2018, in Quebec City, Canada in May 2019 and in Saint-Petersburg, Federation of Russia in October 2019.

In total, the Charter has been triggered for 637 disasters in 127 countries between its inception in the year 2000 and the end of 2019. Throughout the reporting period, there were 43 activations in 27 countries, a figure slightly above the yearly average between 2007 and 2018. The number of activations is overall uniformly distributed during the year. The highest number occurred in April, September and November corresponding to 39.5% of the total number of activations. The peak of activations in April and September 2019 was due to different types of disasters linked to meteorological events (floods in Africa, Asia and North America, ocean storms in Africa and the Caribbean and fires in South America) as well as solid earth movement (earthquakes in Asia).

Six Charter activations were among the 10 most severe natural disasters in 2019 as registered by CRED's EM-DAT. In 2019, the most catastrophic events were the floods in India, killing 1,900 people, and the storm in Mozambique and Zimbabwe killing 1,231 people.

Universal Access (UA) is gradually progressing. UA allows disaster risk management organizations worldwide to be granted Authorized User (AU) status. Ghana, Eswatini and Tunisia national users granted Charter access in 2019. Other candidates are under assessment or training. Sixty-seven countries and the EC have dedicated AUs reaching a total of 73 user organizations able to directly request Charter activations by the end of 2019. Charter members have continued to promote UA and the Charter as a whole through their participation in different international events held in 2019.

The web-based system COS-2 provides operational support to the Charter since the beginning of March 2015. Overall, it has been used successfully in all Charter calls. Seventy-five percent of the Charter members have their EO metadata fetched on COS-2, allowing automated and on-line cataloguing of Charter acquisitions. The new main version (2.2.1) of the COS-2 system has been in operation since December 2017, improving the user interface (COS-2 dashboard available) and fixing the main system issues. Since September 2017, COS-2 can automatically record metrics and information that is necessary in order to generate system performance statistics.

Seven Authorized Users, 2 Emergency on-Call Officer and 7 Project Manager training sessions were organized by CNSA, CNES, DLR, ESA, ISRO, ROSCOSMOS, UKSA and USGS to strengthen the network of Charter PMs. An on-line refresher training course is also available.

The Charter website is available in English and some pages are available in French, Chinese, Japanese and Spanish. It allows direct access to COS-2 to authorized staff. 2018 is the first year that Charter operations have an automated monitoring system and all system performances can be calculated with a higher accuracy (hours and minutes). In 2018, the website was redesigned to facilitate the user navigation and information search, the new version shall also be available in Spanish and French and other languages versions are also expected <https://www.disasterscharter.org/web/guest/home>. The 18<sup>th</sup> and 19<sup>th</sup> Charter newsletters were

issued in 2019. 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.