International Charter

Space & Major Disasters

Annual Report 2018

V5

CONTENTS

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 2018.

1.2 Structure of the report

This report is based on the following input:

- 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 2018

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
AESTQ	Association pour l'enseignement de la science et la technologie du Québec
AIT	Asian Institute of Technology
APRSAF	Asia-Pacific Regional Space Agency Forum
APSCO	Asia-Pacific Space Cooperation Organization
ASEAN	Association of South-East Asian Nations
AU	Authorized User (of the Charter)
BNGRC	Bureau National de Gestion des Risques et des Catastrophes
BBPT	Agency for the Assessment and Application of Technology (Indonesia)
CATHALAC	Centro del Agua del Trópico Húmedo para América Latina y El Caribe (Panama)
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
CMA	China Meteorological Administration
CNES	Centre National d'Etudes Spatiales
CNSA	China National Space Administration
COGIC	Centre Opérationnel de Gestion Interministérielle des Crises (France)
CONAE	Comisión Nacional de Actividades Espaciales (Argentina)
CONRED	Coordinadora Nacional para la Reducción de Desastres (Guatemala)
COS-2	Charter Operational System-2
CRED	Centre for Research on the Epidemiology of Disasters
CRESDA	China Centre for Resources Satellite Data and Application
CSA	Canadian Space Agency
CVO	Centre for Volcanology and Geological Hazard Mitigation
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
DSCGR	Direction de la sécurité civile et de la gestion des risques
ECO	Emergency On-Call Officer (of the Charter)
EM-DAT	Emergency Events Database
EMERCOM	Ministry of Russian Federation for Civil Defense, Emergencies and Elimination of Consequences of Natural Disasters (Russia)
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
EUSC	European Union Satellite Centre
GDACS	Global Disaster Alert and Coordination System
GEO	Group on Earth Observations
GEONETCast	Global network of satellite-based data dissemination systems
GEOSS	Global Earth Observation System of Systems, GEO
GIO	GMES Initial Operations
GMES	Global Monitoring for Environment and Security
GSCP	General Secretariat for Civil Protection
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
ITB	Institut Teknologi Bandung
IWMI	International Water Management Institute
JAXA	Japan Aerospace Exploration Agency
JPTM	Sentinel Asia Joint Project Team Meeting
JSC	Joint Stock Company
KARI	Korea Aerospace Research Institute

LAPAN	National Institute of Aeronautics and Space (Indonesia)
MALHE	Ministry of Agriculture, Land, Housing and the Environment (Montserrat)
MBRSC	Mohammed Bin Rashid Space Centre
MO	Manila Observatory (the Philippines)
MR	Medium Resolution
MVO	Montserrat Volcano Observatory
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)
NSMC	National Satellite Meteorological Centre
ODO	On-Duty Operator
OFDA	Office of US Foreign Disaster Assistance (USA)
ONEMI	Officia Nacional de Emergencia del Ministerio del Interior (Chile)
PA	Partner Agency
PDC	Pacific Disaster Center (Hawaii, USA)
PHIVOLCS	Philippine Institute Of Volcanology and Seismology
PM	Project Manager (of the Charter)
RFI	Radio France International
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)
SIFEM-DNPC	Sistema Federal de Emergencias - Dirección Nacional de Protección Civil (Argentina)
SIRL	Satellite Information Research Laboratory (SIRL), South Korea
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
USAID/OFDA	United States Agency for International Development's Office of Foreign Disaster Assistance
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
WFP	World Food Programme
WG	Working Group

1.5 Authors of the report

The report has been prepared by CNES (Claire Tinel), ESA (Philippe Bally and Theodora Papadopoulou), DLR (Jens Danzeglocke), EUMETSAT (Sally Wannop), and ROSCOSMOS (Andrey Kuklin) 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:

- US 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 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 montoring 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).

Satellite-based information is provided at no-cost to national disaster management authorities and humanitarian organizations, in order to support the immediate response to major natural or man-made disasters.

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 32 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 594 disasters (as of the end of 2018), in 125 countries. In 2018 alone, the Charter was activated 33 times for disasters taking place in 24 countries.

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

In 2018, 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): 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, 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 2018:

- GF-4 launched in December 2015, GF-3 launched in August 2016, CBERS-4 launched in December 2014 and Kompsat-3A launched in March 2015, and were all added to the Charter constellation at the end of the year.

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
JAXA	ALOS-2
KARI	KOMPSAT-2
	KOMPSAT-3 KOMPSAT-3A
	KOMPSAT-5
NOAA	POES
	GOES
	Suomi NPP
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)]

[optical (in grey) and radar (in light blue)]

2.2 Lead agencies of the Charter in 2018

During this period, the lead agencies on a biannual rotational basis have been the European Space Agency; ESA (October 2017 – April 2018), the European Organization for the Exploitation of Meteorological Satellites; EUMETSAT and the German Aerospace Agency; DLR (April 2018 – October 2018), and the French Space Agency, CNES (October 2018 – May 2019).

Figure 2-1. 39th Charter Board and Executive Secretariat members in Darmstadt, Germany, April 2018.

Figure 2-2. 40th Charter Board and Executive Secretariat members in Toulouse, France, October 2018.

3 Operations

3.1 User base

The Charter user base is comprised of Authorized Users, which can be national disaster management authorities and humanitarian organizations, qualified to activate the Charter for major natural or man-made disasters. At the time this report was published, the Charter has 75 Authorized Users (AU) from 66 countries worldwide, including the European Commission. Furthermore, humanitarian bodies such as UNITAR/UNOSAT and UNOOSA can activate the Charter. A specific mechanism has been established with ADRC to escalate a Sentinel Asia activation to the Charter, for major disasters. Figure 4-2 (see section 4) shows the geographical coverage of countries that have direct access to the Charter.

Countries with Charter Authorized Users		
Algeria	Finland	Norway
Argentina	France	Pakistan
Austria	Germany	Paraguay
Australia	Ghana	Peru
Belarus	Greece	Poland
Belgium	Guatemala	Portugal
Bolivia	Hungary	Romania
Bulgaria	Iraq	Russia
Brazil	Ireland	Spain
Canada	Italy	Slovak Republic
Chile	Japan	Slovenia
China	Korea	Sri Lanka
Colombia	Latvia	Sudan
Cyprus	Lithuania	Sweden
Czech Republic	Luxembourg	Switzerland
Denmark	Madagascar	Tunisia
Dominican Republic	Malawi	Turkey
India	Malta	UAE
Ecuador	Myanmar	United Kingdom

El Salvador	Netherlands	United States of America
Estonia	New Caledonia	Uruguay
Eswatini	Nigeria	Venezuela

Table 3-1. Countries with Charter Authorized Users

3.2 Charter activations

In 2018, the Charter was activated 33 times, covering disasters in 24 countries.

For example, the Charter was triggered for the major earthquake and tsunami in Indonesia on 28 September 2018 that killed 4,929 people. LAPAN requested, through a Sentinel Asia escalation, to receive the Charter products in order to assist operational teams providing aid, and conducting planning and training. Moreover, several organizations provided value-added products (e.g. LAPAN, UNITAR/UNOSAT, Copernicus EMS, ROSCOSMOS, AIT, SERTIT and ITB). The International Charter provided situational maps, flood extent maps and damage assessment maps (e.g. destruction impacts on structures such as houses, buildings, roads, bridges, etc.) to the end users.

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).

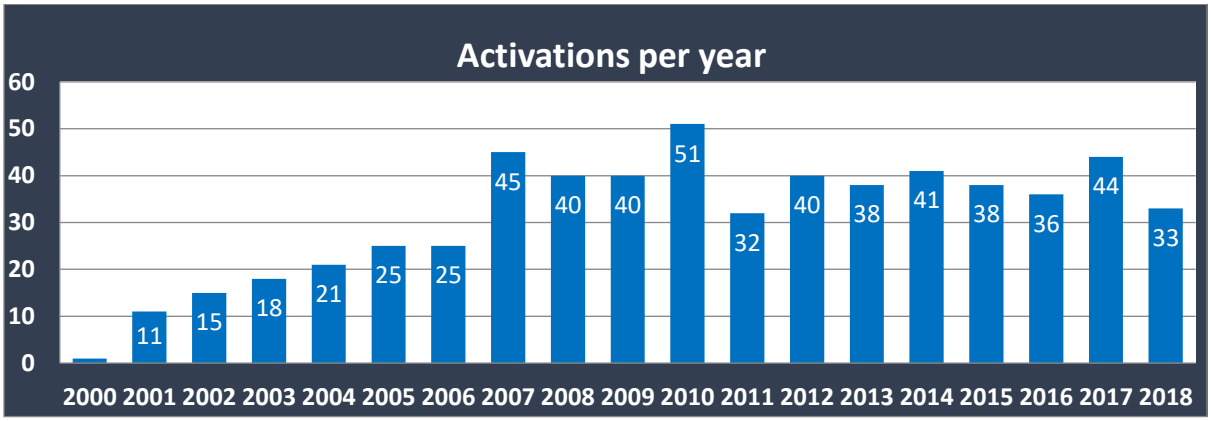


Figure 3-1. Number of Charter activations per year (2000 - 2018)

By the end of 2018, the Charter had been triggered for 594 disasters in 125 countries since 2000 (Figure 3-2 a, b, c).

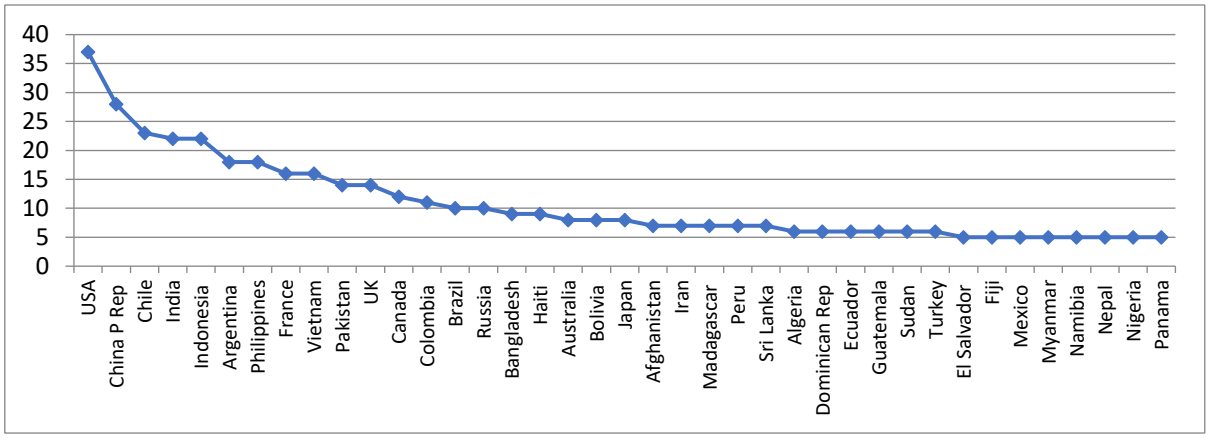


Figure 3-2 a) 2000-2018 breakdown of Charter activations by country (countries with 5 or more activations)

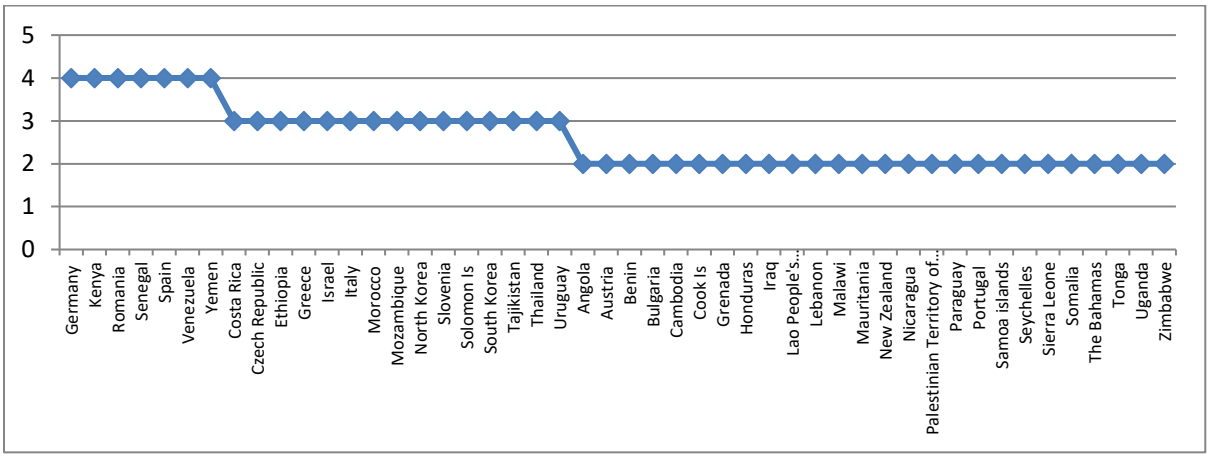


Figure 3-2 b) Continuation of Figure 3-2 a) 2000-2018 breakdown of Charter activations by country (countries with 2 to 4 activations)

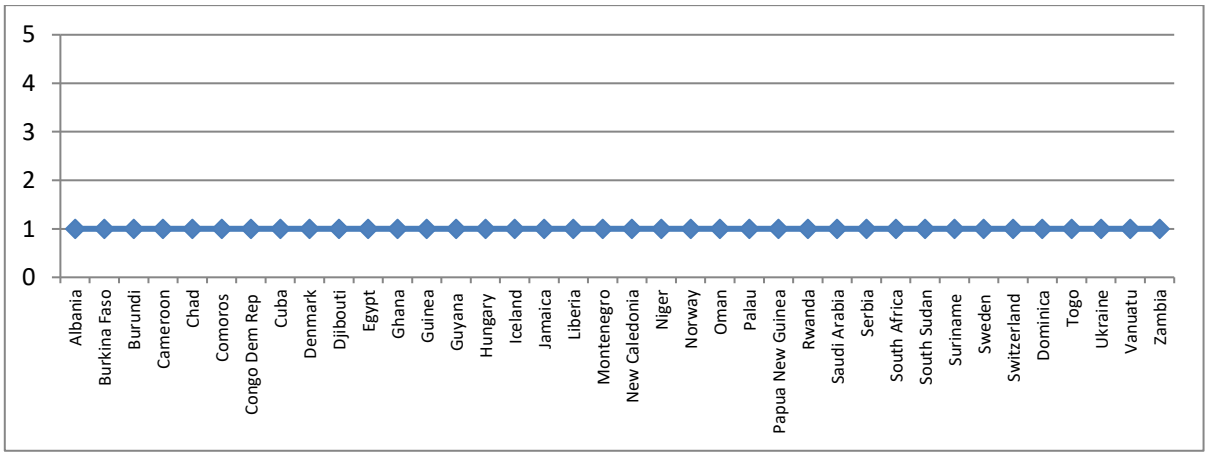


Figure 3-2 c) Continuation of Figure 3-2 b) 2000-2018 breakdown of Charter activations by country (countries with 1 activation)

One hundred twenty-five countries around the world have benefited from the International Charter since 2000. USA, China, Chile, India, Indonesia, Argentina, Philippines, France, Vietnam, Pakistan, UK, Canada, Colombia, Brazil and Russia are the hazard affected countries for which the Charter was activated most often (>10) to cover major disaster events

during these 18 years, while 69% of countries requested the Charter less often (1 to 4 activations in 18 years).

All activations during 2018 are listed in Table 3-2. The Call-ID is the unique number assigned by the Charter's On-Duty Operator (ODO) 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, 42 requests were received in 2018. In five cases, two calls were merged into one activation, respectively, as these requests had been made for the same disaster events:

- Calls 657 and 658 were requested for volcanic eruption in Guatemala by CONRED and by UNITAR/UNOSAT on behalf of UNOCHA.
- Calls 660 and 661 were requested for flood in Lao People's Democratic Republic by UNITAR/UNOSAT on behalf of WFP and by UNOOSA on behalf of the Ministry of Science and Technology and Department of Disaster Management and Climate.
- Calls 663 and 664 were requested for earthquake and tsunami in Indonesia by UNITAR/UNOSAT and by ADRC on behalf of LAPAN.
- Calls 671 and 672 were requested for hurricane in the Philippines by ADRC on behalf of the Manila Observatory and by UNITAR/UNOSAT on behalf of UNOCHA.
- Calls 683 and 684 were requested for tsunami in Indonesia by UNOOSA on behalf of LAPAN and by UNITAR/UNOSAT on behalf of UNESCAP.

Act. No.	Type of disaster	Country	Date of the event
562	**Volcano**	**Philippines**	2018-01-16
563	**Volcano**	**Papua New Guinea**	2018-01-22
564	**Flood**	**Argentina**	2018-02-03
565	**Flood**	**Bolivia**	2018-02-08
566	**Ocean Storm**	**Tonga**	2018-02-12
567	**Search & rescue of aircraft**	**Iran**	2018-02-18
568	**Ocean Storm**	**New Caledonia**	2018-03-08
569	**Flood**	**Russia**	2018-04-04
570	**Flood**	**Somalia**	2018-05-07
571	**Volcano**	**USA**	2018-05-07
572	**Flood**	**Djibouti**	2018-05-20
573	**Flood**	**Sri Lanka**	2018-05-21
574	**Ocean Storm**	**Yemen**	2018-06-02
575	**Wildfire**	**China**	2018-06-04
576	**Volcano**	**Guatemala**	2018-06-05
577	**Flood**	**Japan**	2018-07-07
578	**Flood**	**Lao PDR**	2018-07-24
579	**Wildfire**	**Greece**	2018-07-25
580	**Earthquake**	**Indonesia**	2018-08-06
581	**Flood**	**Venezuela**	2018-08-15
582	**Flood**	**India**	2018-08-16
583	**Flood**	**Vietnam**	2018-08-16
584	**Landslide**	**India**	2018-08-21
585	**Ocean Storm**	**USA**	2018-09-11
586	**Ocean Storm**	**Philippines**	2018-09-17
587	**Earthquake**	**Indonesia**	2018-09-29
588	**Ocean Storm**	**USA**	2018-10-10
589	**Landslide**	**Uganda**	2018-10-12
590	**Flood**	**Russia**	2018-10-25
591	**Wildfire**	**USA**	2018-11-14

592	**Flood**	**Iraq**	2018-11-25
593	**Ocean Storm**	**India**	2018-12-17
594	**Tsunami**	**Indonesia**	2018-12-23

Table 3-2. List of 2018 Activations

3.2.1 Monthly activations

During 2018, the monthly average of activations was 2.7. Figure 3-3 shows the monthly distribution of activations throughout 2018. The number of activations is overall uniformly distributed during the year. The highest number occurred in February, May and August corresponding to 39.4% of the total number of activations. The remaining months of 2018 saw a number of activations that varied from one to three.

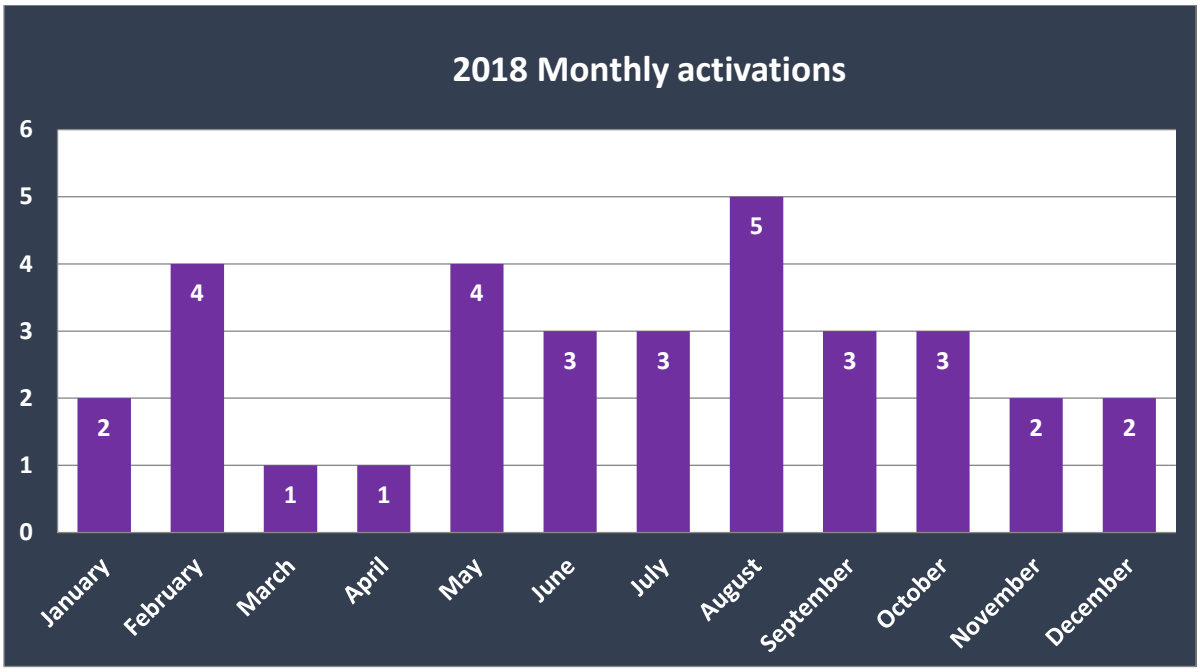


Figure 3-3. Distribution of the Charter activations by month in 2018

Peaks of activations at the end of summer (north-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 and ensuing floods; tropical storms; fire) in Asia, Central and South America. The peak of activations in August 2018 was due to different types of disasters linked to meteorological events (floods in Asia and South America and landslides in Asia) 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 the year 2018 in comparison to the monthly average number of activations for the period 2007-2018. The 2007-2018 diagram clearly shows the peak of activations at the end of the northern hemisphere summer. The 2018 curve generally follows the 2007-2018 average curve, most notably with the highest number of activations being in August.

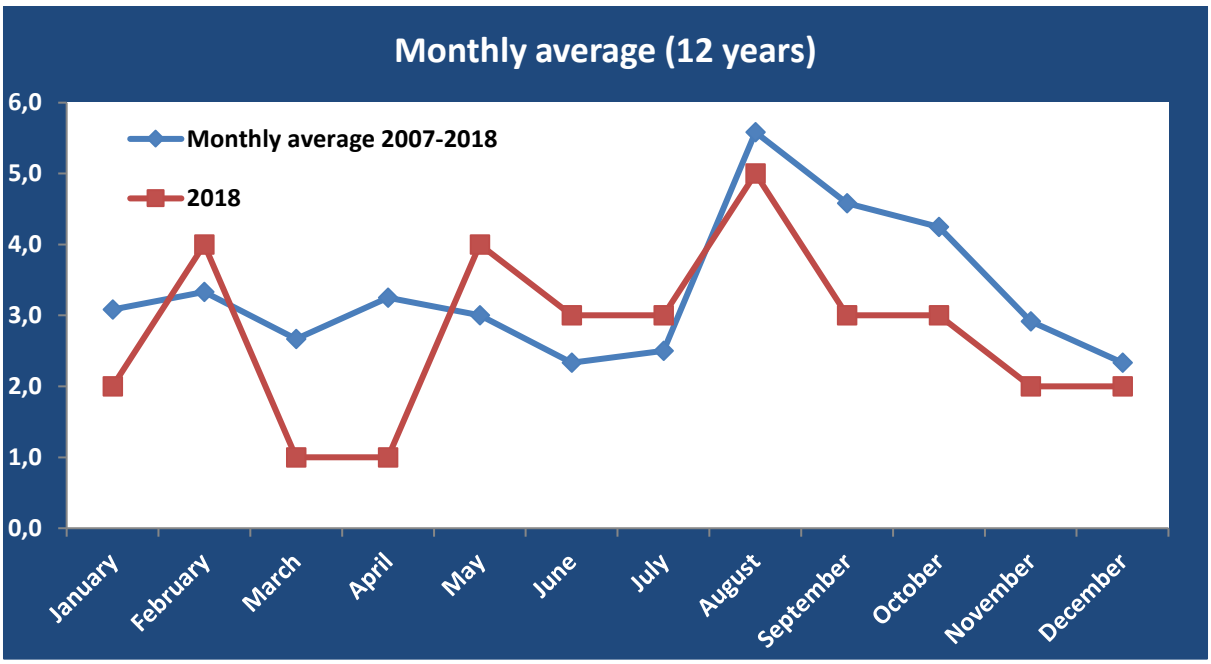


Figure 3-4. Number of 2018 activations per month (in comparison to the average number of activations) for the period 2007-2018

3.2.2 Geographical distribution

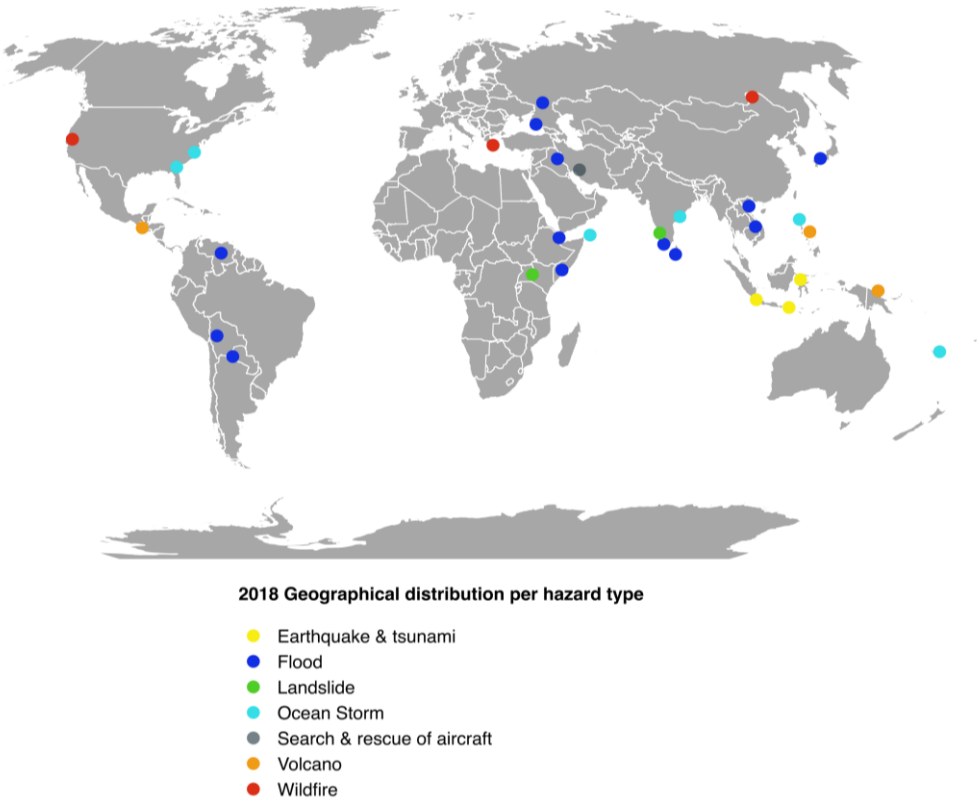


Figure 3-5. Location of the 2018 activations (by hazard type)

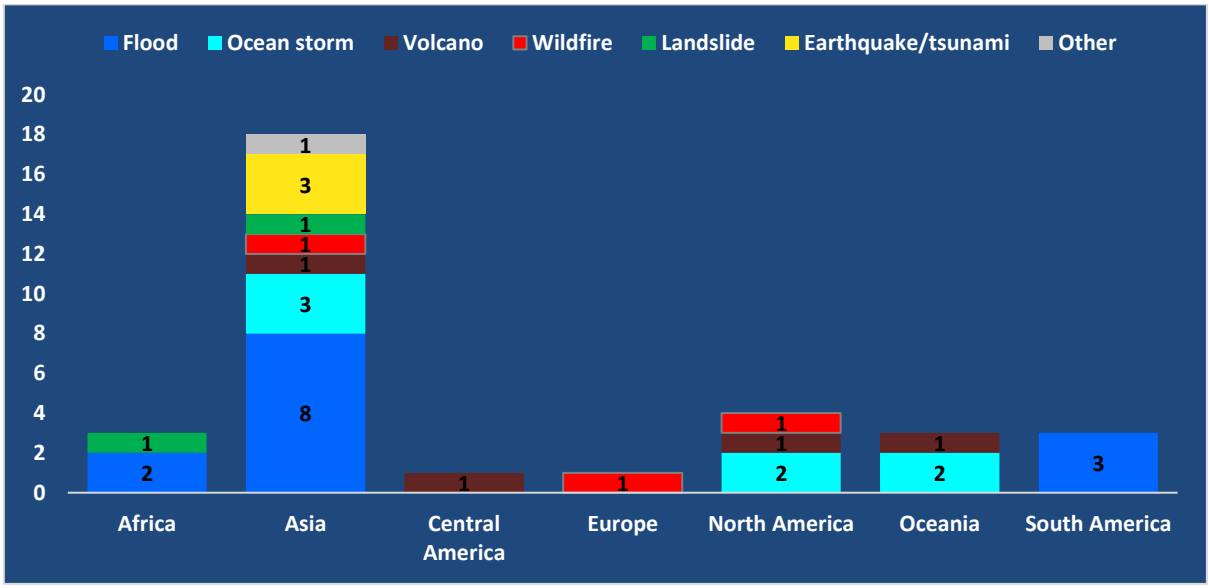


Figure 3-6. 2018 - Number of activations by continent/subcontinent and hazard type

In 2018, the activations breakdown per region was as follows: 18 in Asia; 4 in North America; 3 in South America; 3 in Africa; 3 in Oceania; 1 in Europe; 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 21%, wildfires 9%, landslides 6% and other types of hazards 3% (Figure 3-7). 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.

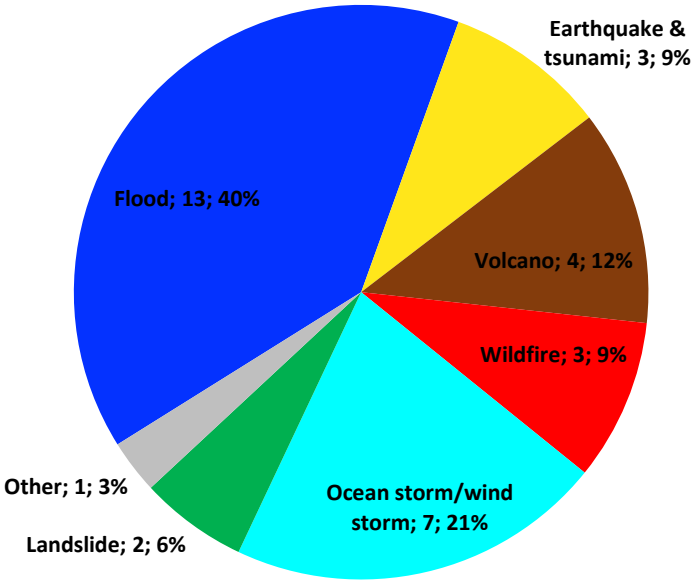


Figure 3-7. Number of activations by hazard type in 2018

As shown below (Figure 3-8), since 2000 the Charter has been frequently activated for hydrometeorological 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 hydrometeorological hazards and solid earth-related hazards for the 2000-2018 period.

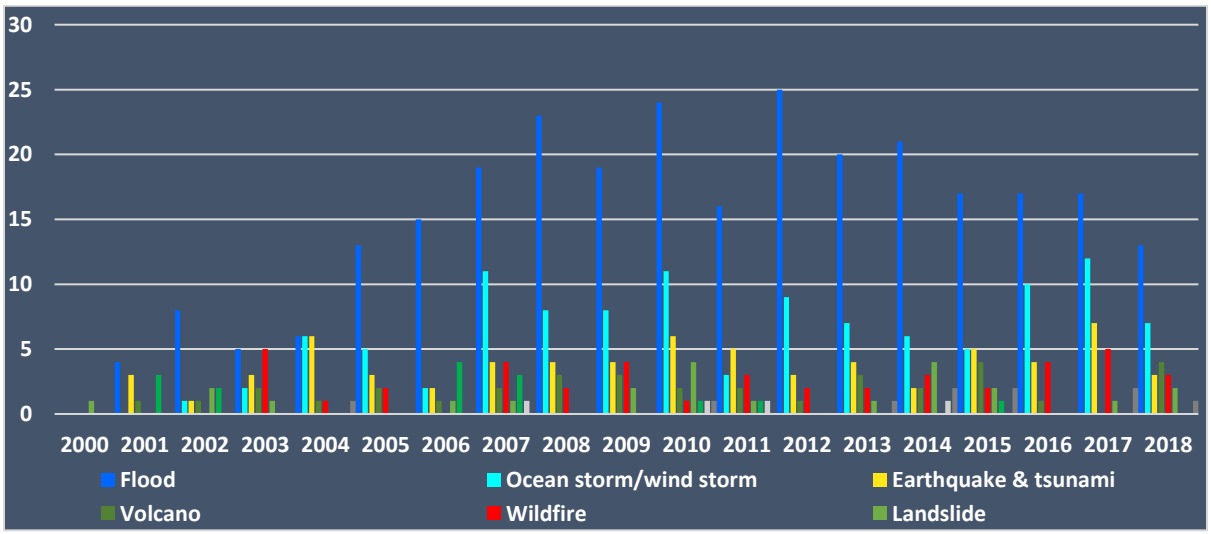


Figure 3-8. 2000-2018 Distribution of activations by hazard type

The following map shows by country the number of Charter activations caused by hydrometeorological related events for the period of 2000-2018 (470 activations out of 594 activations in total = 79%).

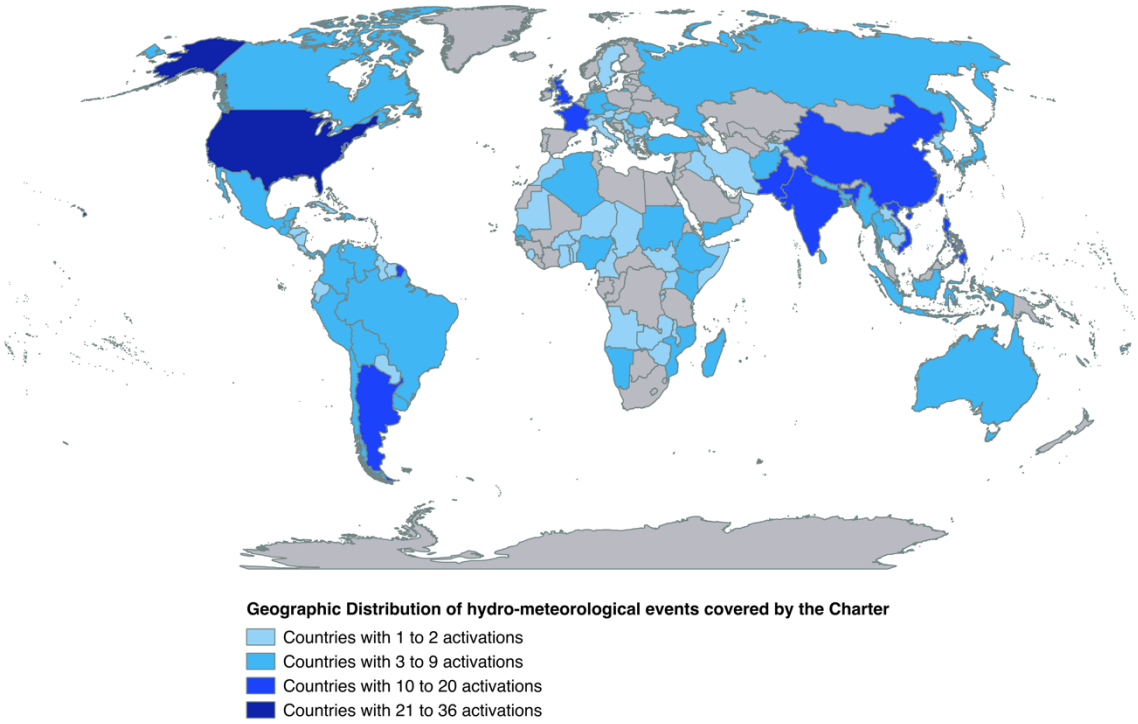


Figure 3-9a. 2000-2018 Number and geographical distribution of Charter activations due to hydrometeorological events (floods, ocean storms, windstorms, landslides caused by heavy rains, wildfires, snowfall and ice jam).

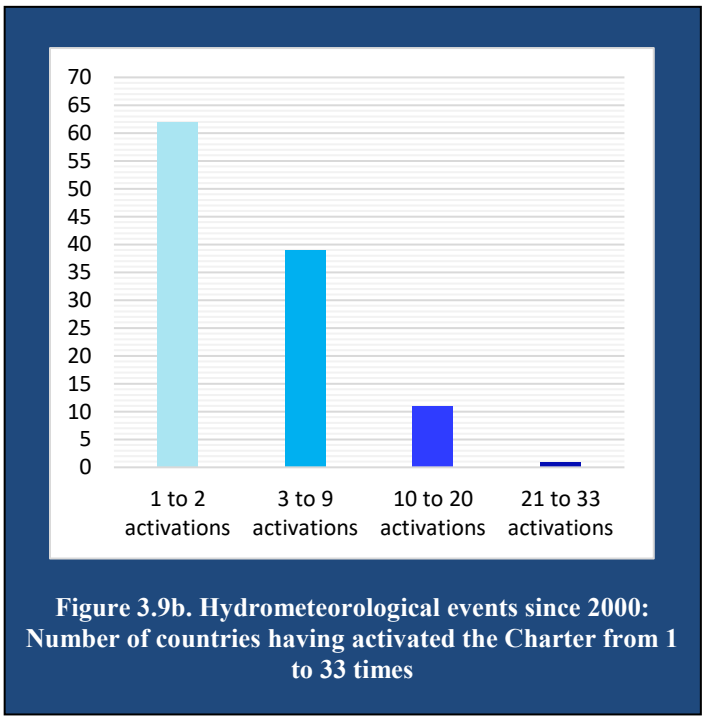


Figure 3.9b. Hydrometeorological events since 2000: Number of countries having activated the Charter from 1 to 33 times

In total 113 countries benefited from the Charter service for hydrometeorological disasters since 2000. USA, India, Argentina, China, France and Vietnam used the service most frequently (Figure 3.9b).

The following map shows by country the number of Charter activations (104 activations out of 594 activations in total = 17.5%) caused by solid-earth-related events for the period 2000-2018.

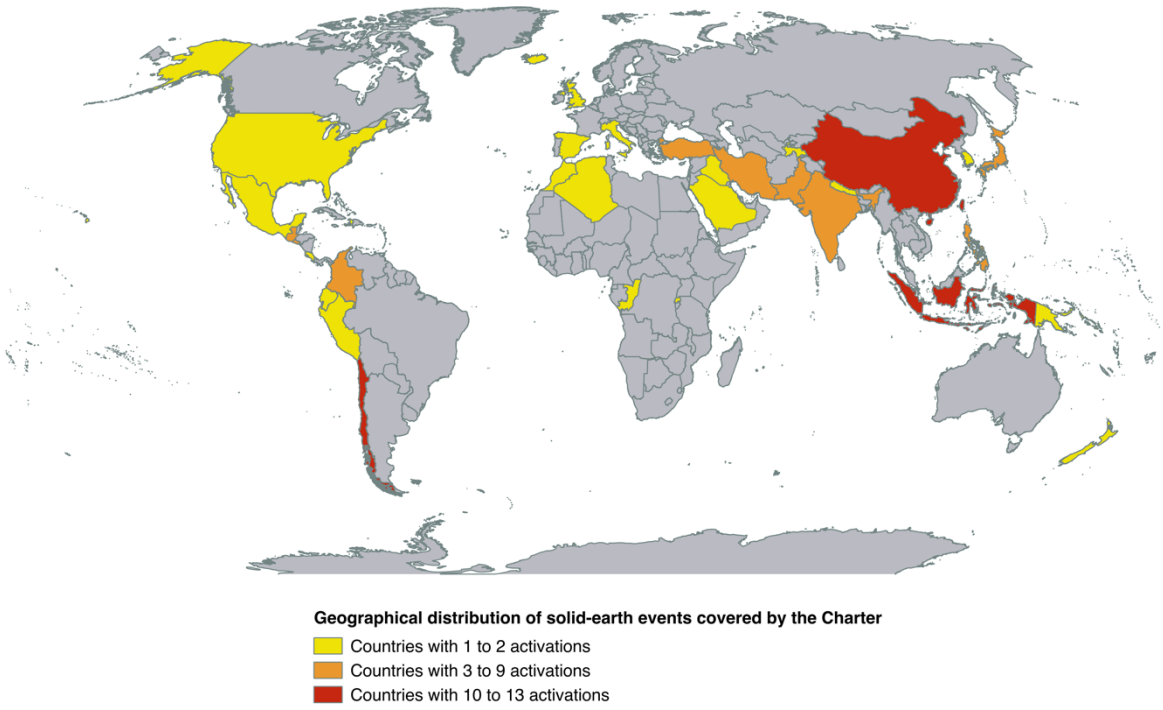


Fig 3-10a. 2000-2018 Number and geographical distribution of Charter activations due to solid earth-related events (earthquakes, tsunamis, volcanic eruptions, landslides caused by earthquake)

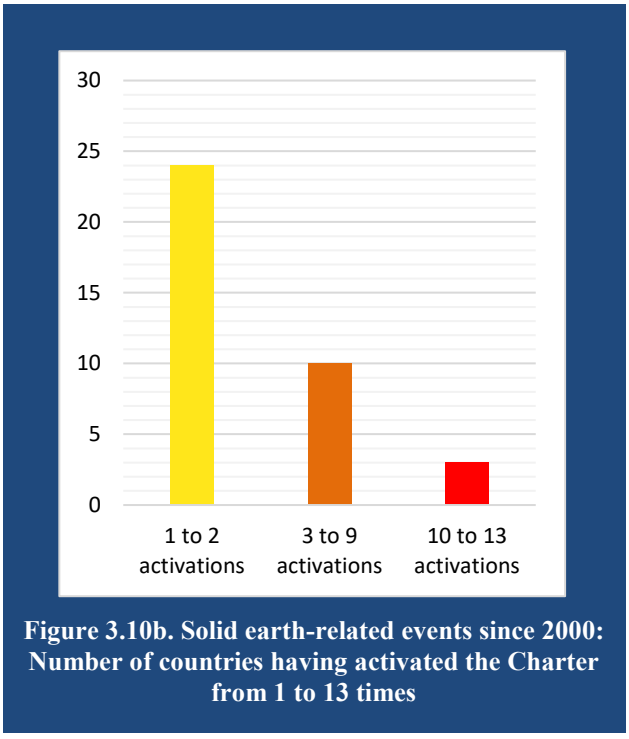


Figure 3.10b. Solid earth-related events since 2000: Number of countries having activated the Charter from 1 to 13 times

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) no doubt because they are located along active faults (Figure 3.10b).

Figure 3-11 shows the geographic distribution of activations by activation mode.

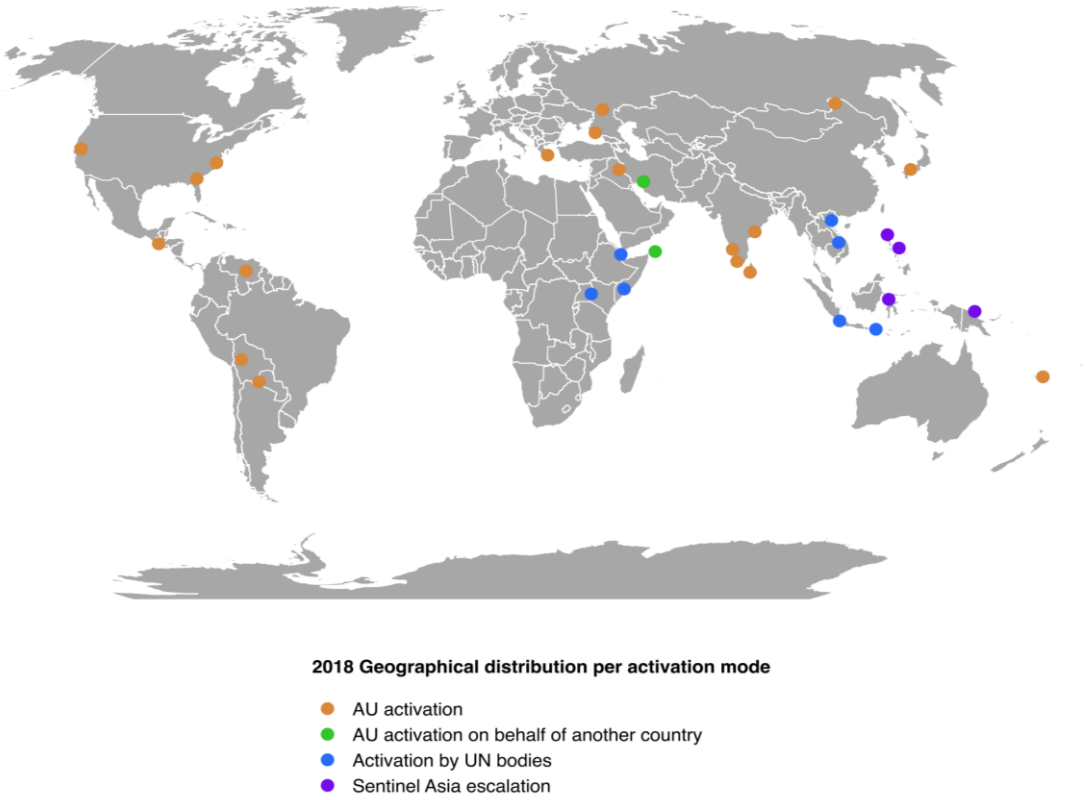


Figure 3-11. Location of the 2018 activations (per Mode)

In 2018, Mode 1 was used for disasters in Asia, South, Central and North America, Europe and Oceania; Mode 2 was used for disasters in Asia; Mode 3 was used for disasters in Africa, Asia and Oceania; and Mode 4 was used in Asia (Figure 3-11). Bolivia, New Caledonia, Sri Lanka, Guatemala and Iraq have activated the Charter for floods, ocean storms and volcanic eruptions in 2018, thanks to their AU status achieved through the Charter's Universal Access initiative.

In 2018, activations by an AU (Modes 1 & 2) were the main access modes (63.64% in total) while UN activations (Mode 3) represented 24.24% and Sentinel Asia activations (Mode 4) represented 12.12% of the total number of activations (Fig. 3-12).

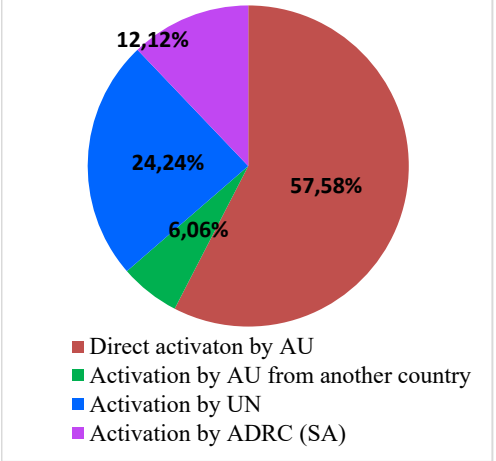
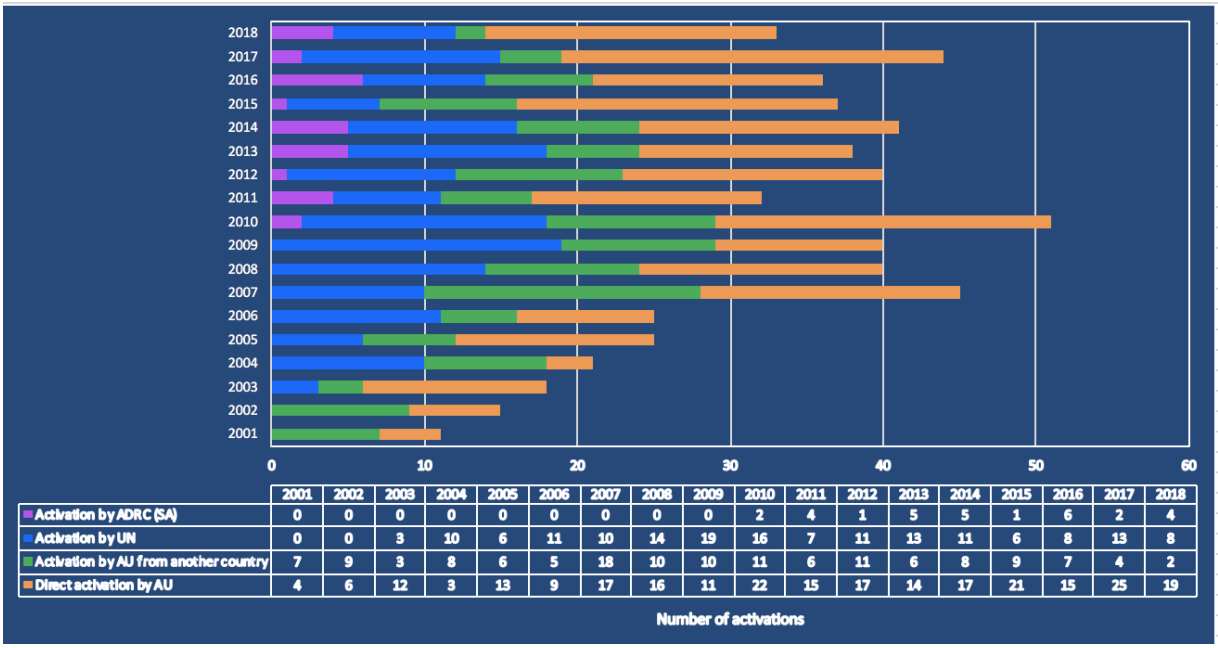


Figure 3-12. 2018 breakdown of Charter activations per mode

The diagram in Figure 3-13 compares the relative weight of the different access mechanisms adopted from 2001 to 2018, used to request the International Charter service. Since its inception, 100 countries without AUs have benefited from the Charter and 56.7% 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 increases thanks to the Universal Access process, which changed the relative weight between the activation modes. By the end of 2018, mandated organizations of 20 countries prone to natural disasters have become AUs after a registration and training process under the Charter's Universal Access initiative.



	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Activation by ADRC (SA)	0	0	0	0	0	0	0	0	0	2	4	1	5	5	1	6	2	4
Activation by UN	0	0	3	10	6	11	10	14	19	16	7	11	13	11	6	8	13	8
Activation by AU from another country	7	9	3	8	6	5	18	10	10	11	6	11	6	8	9	7	4	2
Direct activation by AU	4	6	12	3	13	9	17	16	11	22	15	17	14	17	21	15	25	19

Figure 3-13. 2001-2018 number of Charter activations per mode

3.3 Resource report

3.3.1 EO data consumption in 2018

In 2018, a total of 3,527 optical and radar data images for 33 activations (2017: 3,628 for 44 activations, 2016: 2,958 for 36 activations, 2015: 2,753 for 38 activations) were provided by the Charter members (Figures 3-15 & 3-16, Table 3-3 & Table 3-4) with 2570 Optical images and 981 SAR images. This is complemented by 18,293 images of U.S. VHR optical satellites (GeoEye, WorldView1, 2 and 3) that were supplied (Figure 3-17, table 3-5) (2017: 13,920, 2016: 14,430, 2015: 10,935). Figure 3-14 shows the total number of EO data from the Charter virtual constellation and the U.S. VHR optical data provided in 2018 by disaster type. A high number of the U.S. VHR data was delivered to support the floods in Argentina in February 2018, the floods and damages that occurred after the passage of Hurricanes Florence in September 2018 and Michael in October 2018, and the wildfires in California in November 2018 (64% of US VHR data).

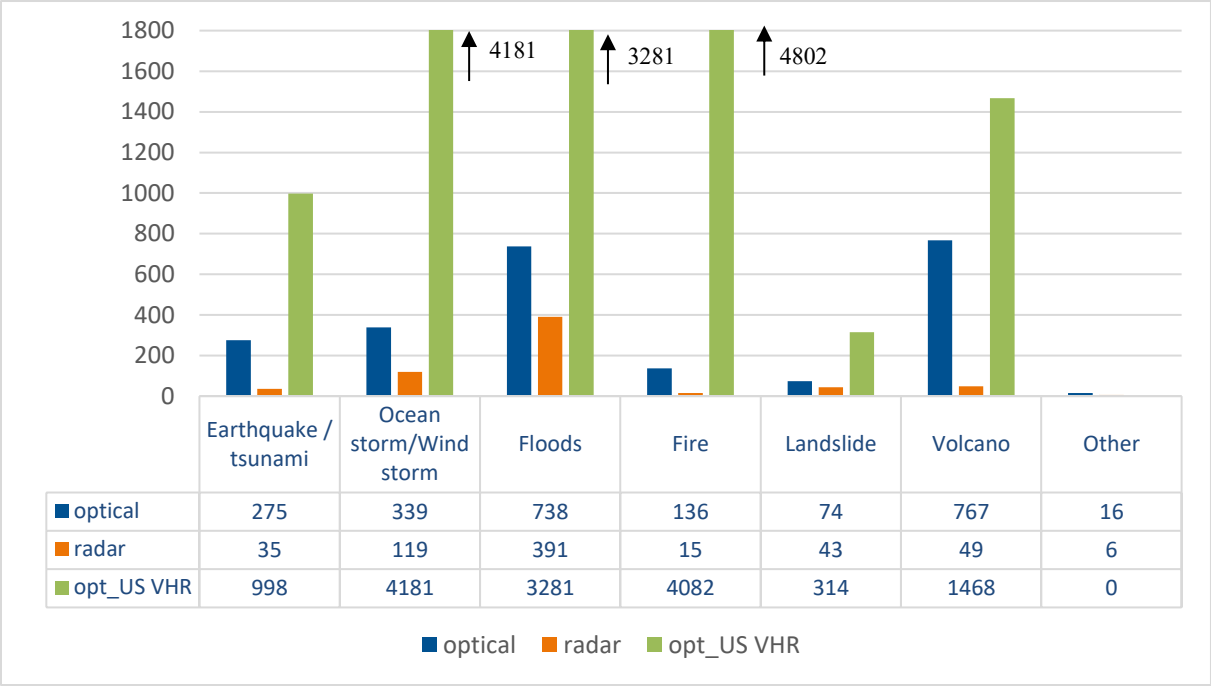


Figure 3-14. 2018 EO data of the Charter virtual constellation and U.S. VHR optical data grouped by disaster type

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.

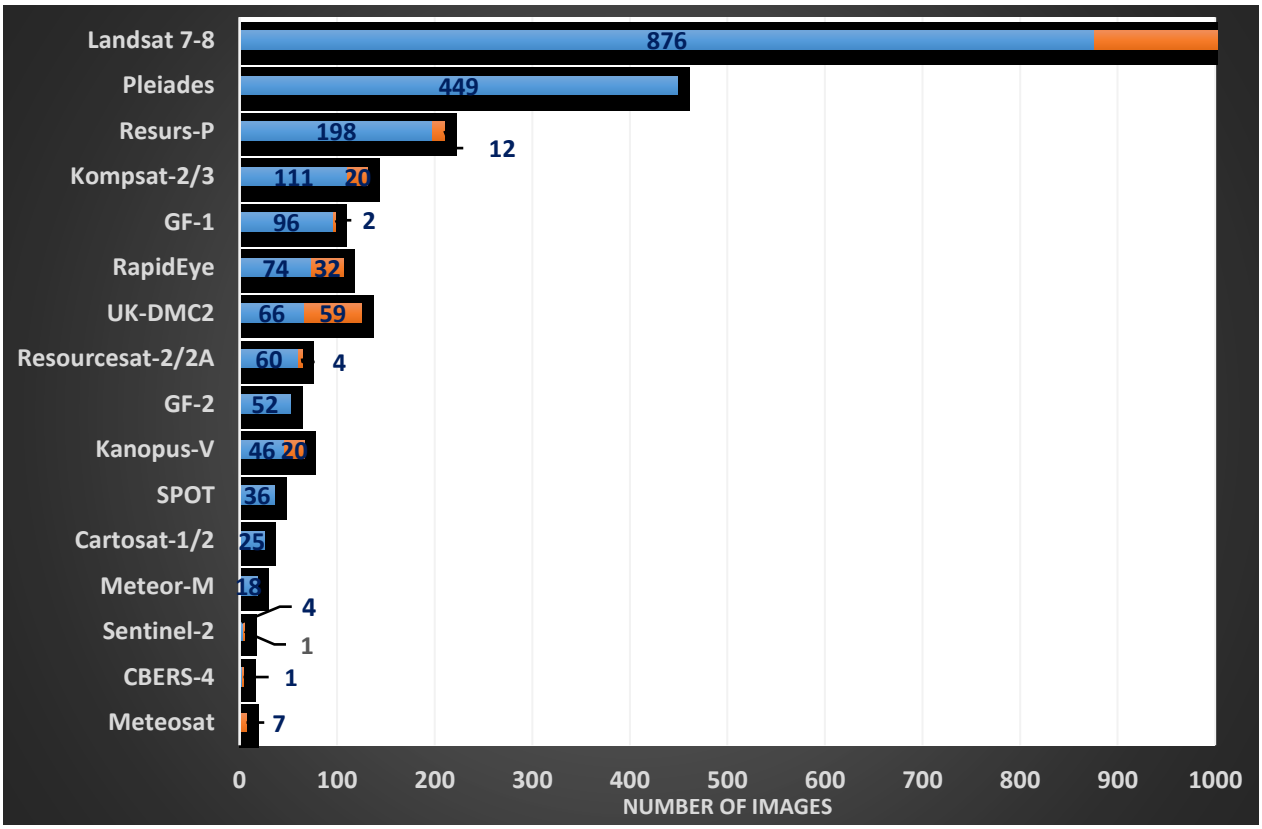


Figure 3-15. 2018 Data Consumption (number of archive images is in orange and number of newly acquired images is in blue) - Optical sensors

A total of 772 archived images were provided by the Charter members, which is less than last year (compared to 966 images in 2017). This decrease is mainly explained by the fact that no VRSS-1 – Venezuelan Remote Sensing satellite, ABAE - archived imagery was provided in 2018 whereas ABAE provided 183 archived VRSS-1 images in 2017.

The total number of newly acquired images provided by the Charter members was about the same in 2018 (2756) and 2017 (2820).

Resource	CBERS-4	Meteosat	Sentinel-2	Meteor-M	Cartosat-1/2	SPOT6/7	GF-2	Ressourcesat-2/2A	Kanopus-V	GF-1	RapidEye	UK-DMC2	KOMPSAT-2/3	Resurs-P	Pleiades	Landsat 7-8
Total number of delivered data	**6**	**7**	**8**	**18**	**25**	**36**	**52**	**64**	**66**	**98**	**106**	**125**	**131**	**210**	**449**	**1174**
Archive (pre-event)	1	7	3	0	0	0	0	4	20	2	32	59	20	12	0	298
Newly acquired (post-event)	3	0	5	18	25	36	52	60	46	96	74	66	111	198	449	876
Max. number of post-event images per activation	*1*	*0*	*1*	*14*	*10*	*13*	*10*	*11*	*8*	*17*	*20*	*17*	*22*	*35*	*40*	*366*

Table 3-3. Statistics for Optical sensors (Charter virtual constellation)

Landsat data (7 and 8) are still a predominant optical resource with a total number of images delivered at 1174 (of that number, 366 images were provided for the volcanic eruption in Hawaii in May 2018).

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 2019 annual report.

Most programmed images are provided by Landsat 7/8 (41%), Pleiades (21%) and Resurs-P (9%). The median contribution taking into account all optical sensors is 1%.

Most archive images are provided by Landsat 7/8 (65%) and UK-DMC2 (13%). The median contribution taking into account all optical sensors is 1%.

Due to technical problems, no VRSS-1 (Venezuelan Remote Sensing Satellite-1, ABAE) images were provided to the Charter in 2018 (compared to 553 images provided in 2017).

Contribution of the other optical sensors (low spatial resolution to high spatial resolution) varies from one to 449 images in total depending on the disaster type, spatial resolution and ground coverage of the images, etc.

RapidEye images are delivered not as full scenes but in the form of image tiles (sub scenes), which leads to relatively large numbers.

Meteor-M, Sentinel-2, GF-1 and Kanopus-V have contributed in the same manner as in 2017. The contributions of Cartosat-1/2, GF-2, Ressourcesat-2/2A, UK-DMC2, Kompsat-2/3 are RapidEye are lower than those in year 2017.

The number of SPOT-6/7 and Pleiades images have highly increased compared to 2017. This is the consequence of the data processing system that makes available each image acquired. As soon as acquired images are not validated (cloud cover higher than 10%), images are acquired daily for a 10-day period. This allows the value adder to use several images over the same area in order to extract the information from non-cloudy parts of the images (even with a 60% cloud cover, useful information can be extracted from the image).

For EO satellite missions with open data policies (e.g. the Copernicus Sentinel-2), the exact number of used images cannot be traced. The actual number of Sentinel-2 images accessed

and used in 2018 is significantly higher than the number in Figure 3-15 (5 is the number of traceable images). ESA is developing a system to account and trace the number of Sentinel images accessed.

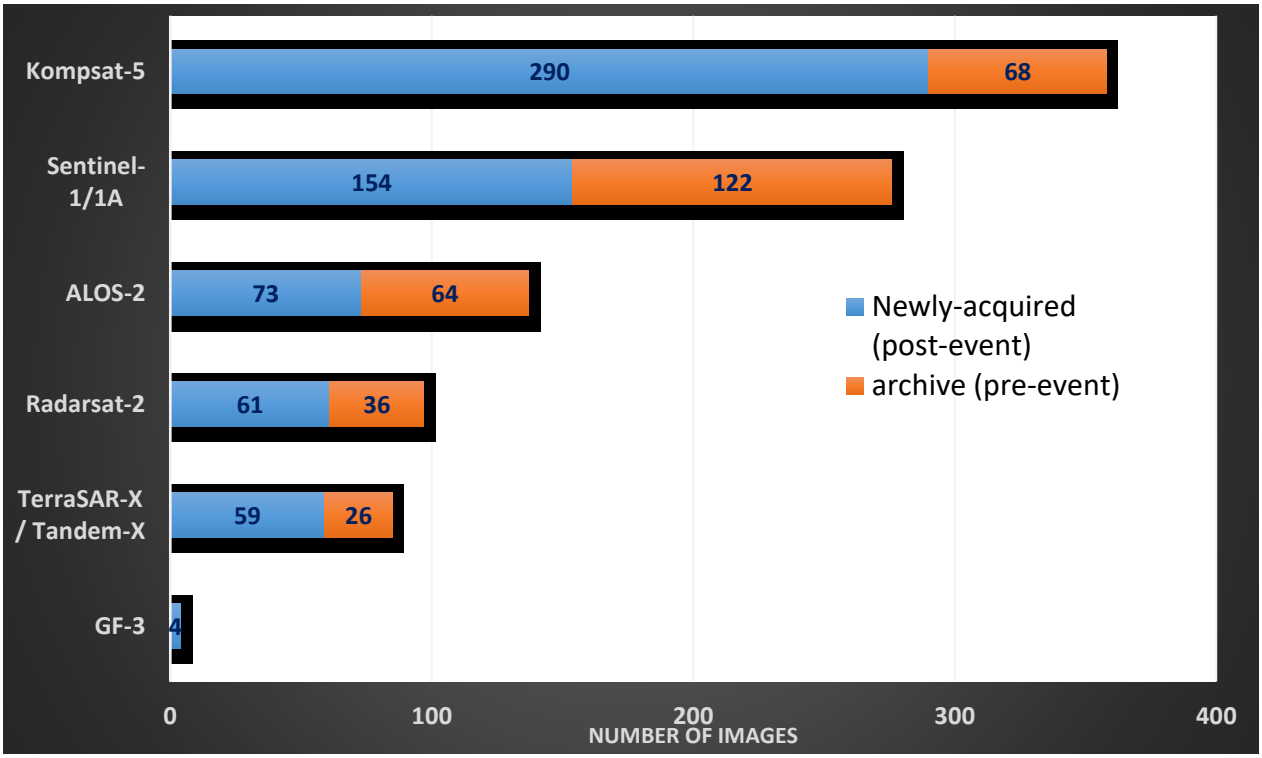


Figure 3-16. 2018 Data Consumption (archive and newly acquired) - Radar sensors

Most programed data were provided by KOMPSAT-5 (46%) and Sentinel-1/1A (24%) radar sensors (the median contribution taking into account all radar sensors is 11%).

Most archived were provided by Sentinel-1/1A (39%) followed by Kompsat-5 (22%) and ALOS-2 (20%) radar sensors (the median contribution taking into account all radar sensors is 16%).

Kompsat-5 data have contributed in the same manner as in 2017.

The contribution of Sentinel-1/1A data is five times higher than in 2017 (and ten times higher than in 2016).

For TerraSAR-X/TanDEM-X, ALOS-2 and RADARSAT-2, the number of scenes delivered has decreased compared to 2017.

GF-3 was added to the Charter constellation in December 2018; the four provided images were acquired during the last Charter activation of 2018.

Fifty-five percent of radar data was used to monitor the 18 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.

Resource	GF-3	TerraSAR-X/ TanDEM-X	ALOS-2	RADARSAT-2	Sentinel-1	KOMPSAT-5
Total number of delivered data	**4**	**85**	**97**	**161**	**276**	**358**
Archive (pre-event)	0	26	36	64	122	68
Newly acquired (post-event)	4	59	61	73	154	290
Max. number of images per activation	*4*	*2*	*4*	*16*	*29*	*49*

Table 3-4. 2018 Statistics for Radar sensors

In total, 18239 images of U.S. VHR optical satellites (GeoEye-1, WorldView-1, 2 and 3) were supplied in 2018. US VHR imagery was delivered to the Charter by the USGS using the HDDS system (Figure 3.17, Table 3-5).

The WorldView-1/2/3 contributions were higher (50% more) than in 2017 (18239 compared to 13144).

The number of GeoEye data delivered is comparable to 2017 (558). Fifty percent of the WorldView data provided were used to support floods and damages caused by both hurricanes Florence in September 2018 and Michael in October 2018. Ten percent of the WorldView data were provided for supporting damages caused by wildfires in California in November 2018.

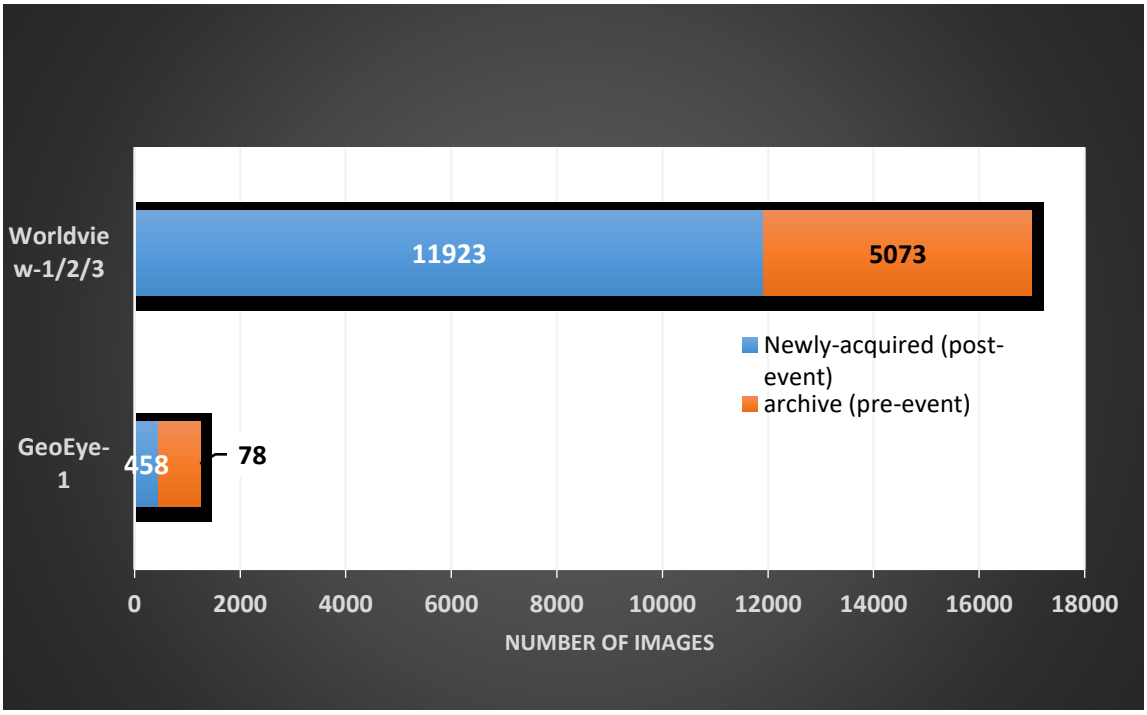


Figure 3-17. 2018 Data Consumption – US Commercial optical satellites

Resources	GEOEYE	WORLDVIEW-1/2/3
Total number of delivered data	**536**	**16969**
Archive (pre-event)	78	5073
Newly acquired (post-event)	458	11923
Max number of post-event images per activation	*106*	*4000*

Table 3-5. 2018 Statistics concerning US commercial optical satellites

Overview of data consumption by 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 3-20 shows the number of archived (pre-disaster) images by activation.

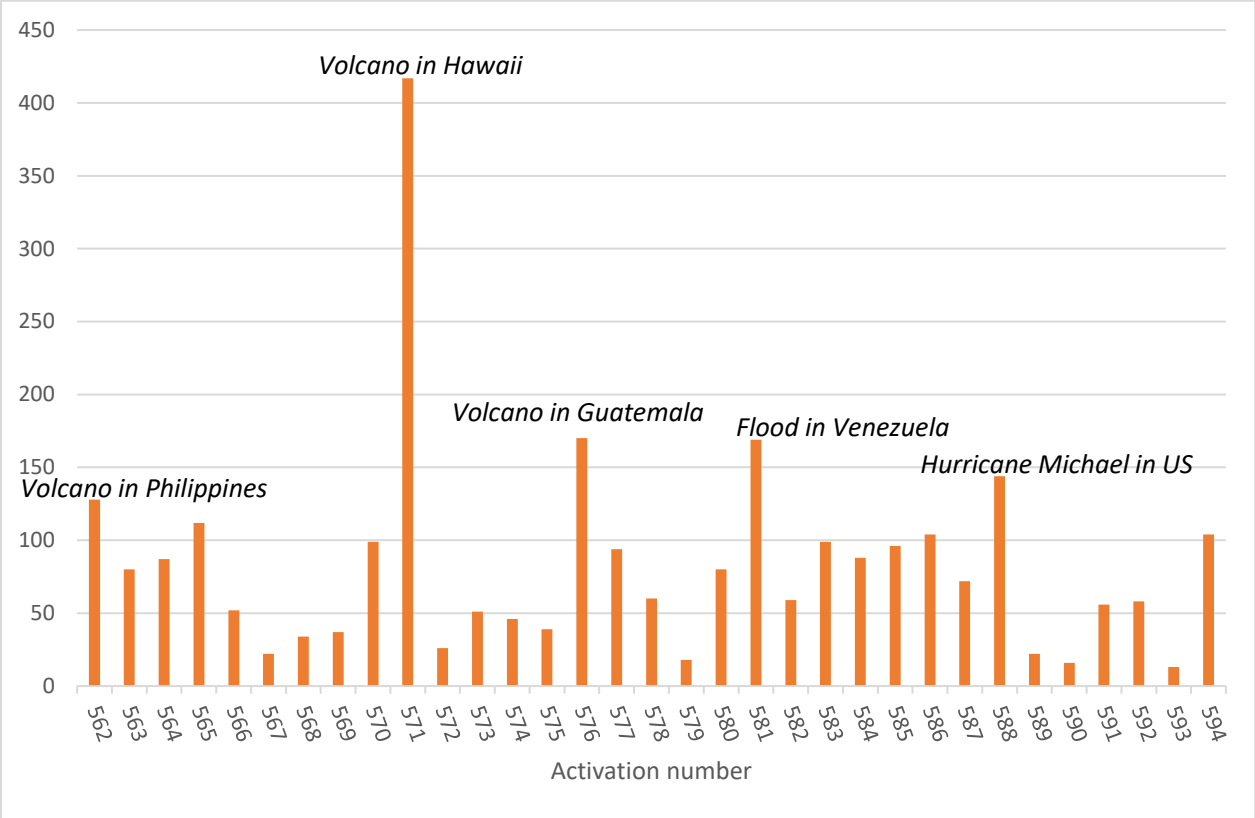


Figure 3-18. Number of delivered post-event i.e., newly acquired images (radar and optical) by activation (Charter EO sensors) in 2018

The median value of images provided by activation is 72 .

There are five activations with a number greater than 110 of programmed data (Charter optical & radar sensors): **Act 562**, volcano in Philippines, 128 images; **Act 571**, volcano in Hawaii, 417 images; **Act 576**, volcano in Guatemala, 170 images; **Act 581**, flood in Venezuela, 169 images; **Act 588**, hurricane Michael in the US, 144 images.

Concernig the five activations cited above, the most supplied sensors are:

- **Act 562,** Volcano in the Philippines: Landsat 7/8 (**34%**), GF-1 (**23%**), Resurs-P (**15%**), Pléiades **(6%)**
- **Act 571,** Volcano in Hawaïi : Landsat 7/8 (**88%**)
- **Act 576**, Volcano in Guatemala : Landsat 7/8 (**78%**), Pléiades (**6%**), Sentinel-1/1A (**5%**) and RapidEye (4%)
- **Act 581**, Flood in Venezuela : Kompsat-5 (**30%**), Landsat7/8 (**18%**), Pleiades (**13%**) and Kompsat-2/3 (**11%**)
- **Act 588**, Hurricane Michael in the US : Landsat 7/8 **(67%),** Kompsat-5 (**17%**) TerraSAR-X/Tandem-X **(6%)** and Sentinel-1 **(5%)**

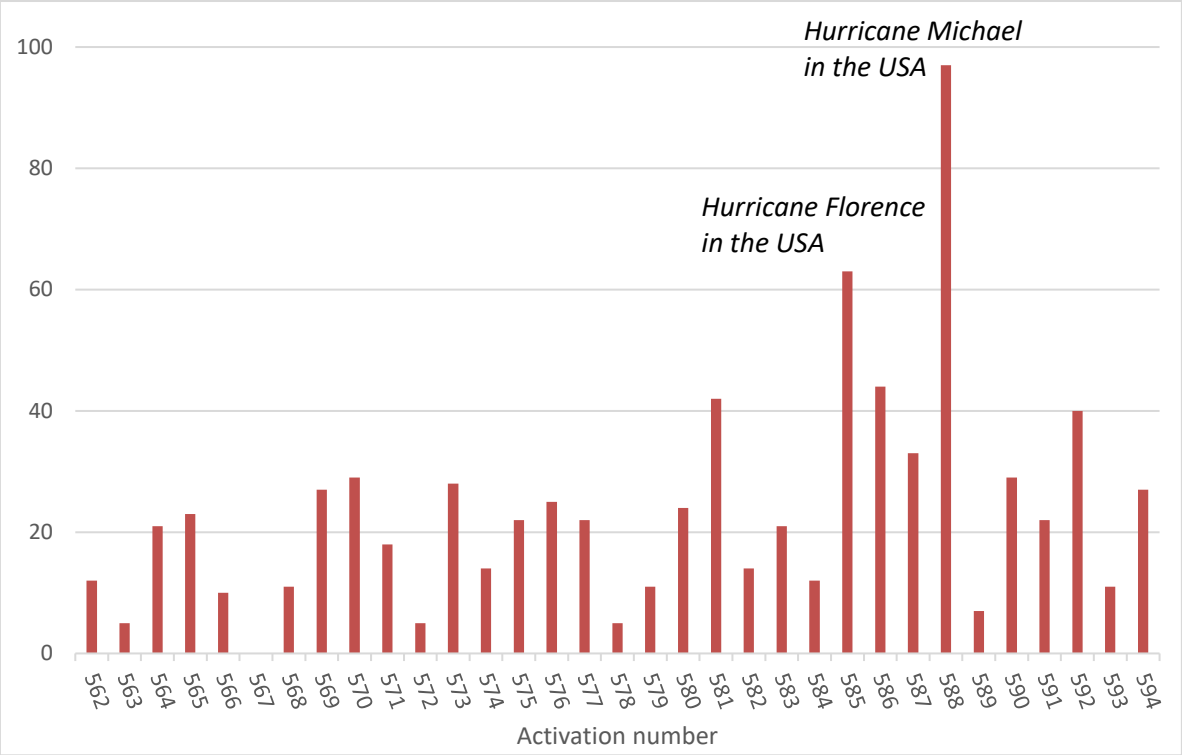


Figure 3-19. Number of delivered pre-event / archived images by activation in 2018 (Charter EO sensors)

Concerning the pre-event /archived images, on average the quantity of images is **24 per activation (27 in 2017)**. In two cases, the number of archive data exceeded 60: **Act 585**, Hurricane Florence in the US, 63 images and **Act 549**, Hurricane Michael in the US, 97 images. For both events, Landsat-7/8 provided 80% of the archives images.

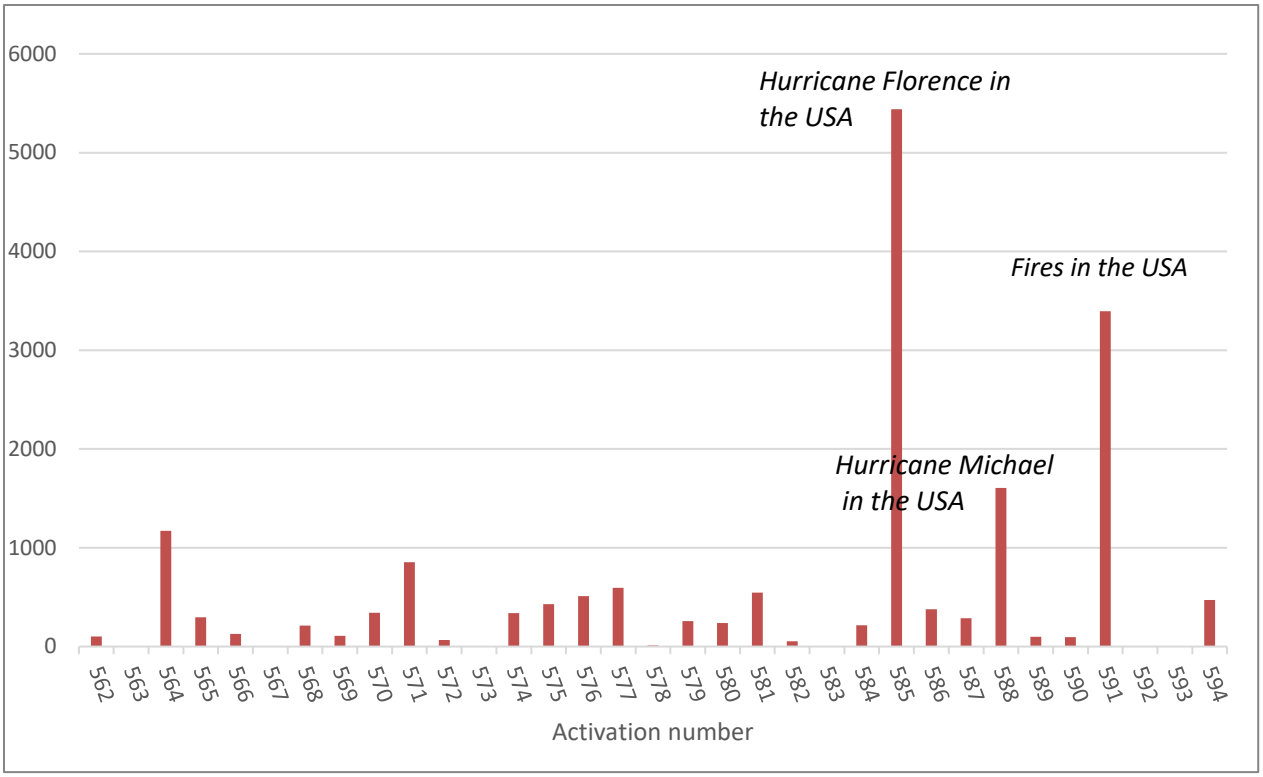
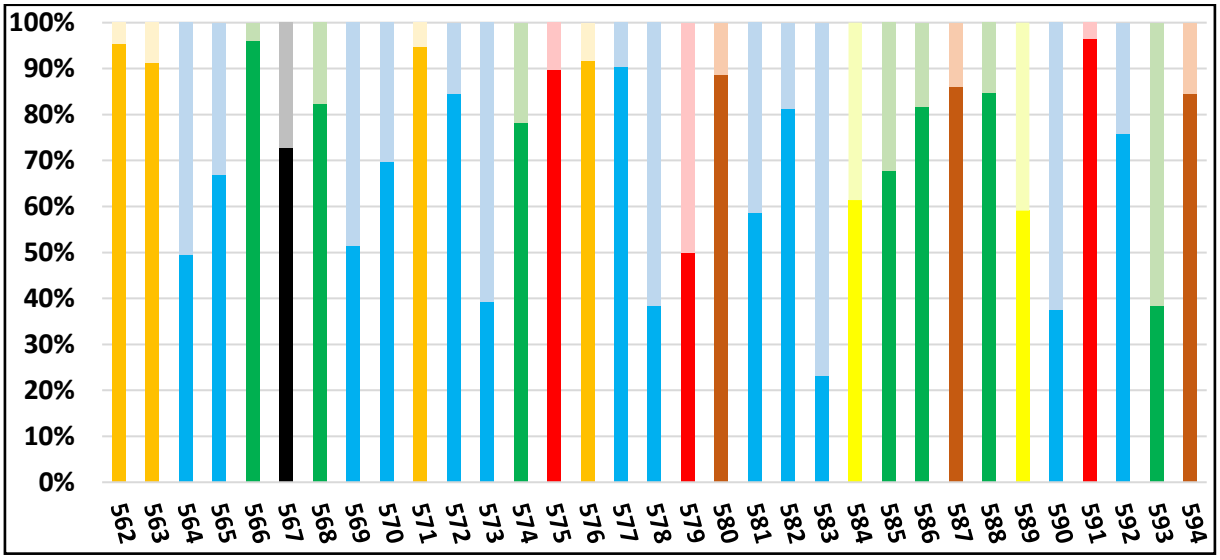


Figure 3-20. Number of delivered post-event / newly acquired images by activation in 2018 (US VHR commercial satellites)

In total, 26 activations out of 33 have benefited from U.S. VHR data. The two situations with the highest number of U.S. VHR data (greater than 3,000 in total and greater than 2,900 for newly acquired images) provided are: **Act 585**, Hurricane Florence in the USA, (5,438 images in total out of which 4,080 newly acquired images, 30% out of all newly acquired US VHR images); **Act 591** for fires in the USA, 3,046 newly acquired images were provided i.e. 20% out of all newly acquired U.S. VHR 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 2018

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.

3.3.2 Human resource contribution (ECO and PM) in 2018

- *ECO resources in 2018*

The Emergency On-Call Officer (ECO) services were provided on a weekly rotational basis by 11 Charter members agencies: CNES, CNSA, CONAE, CSA, DLR, UKSA/DMC, ESA, ISRO, JAXA, KARI, and ROSCOSMOS.

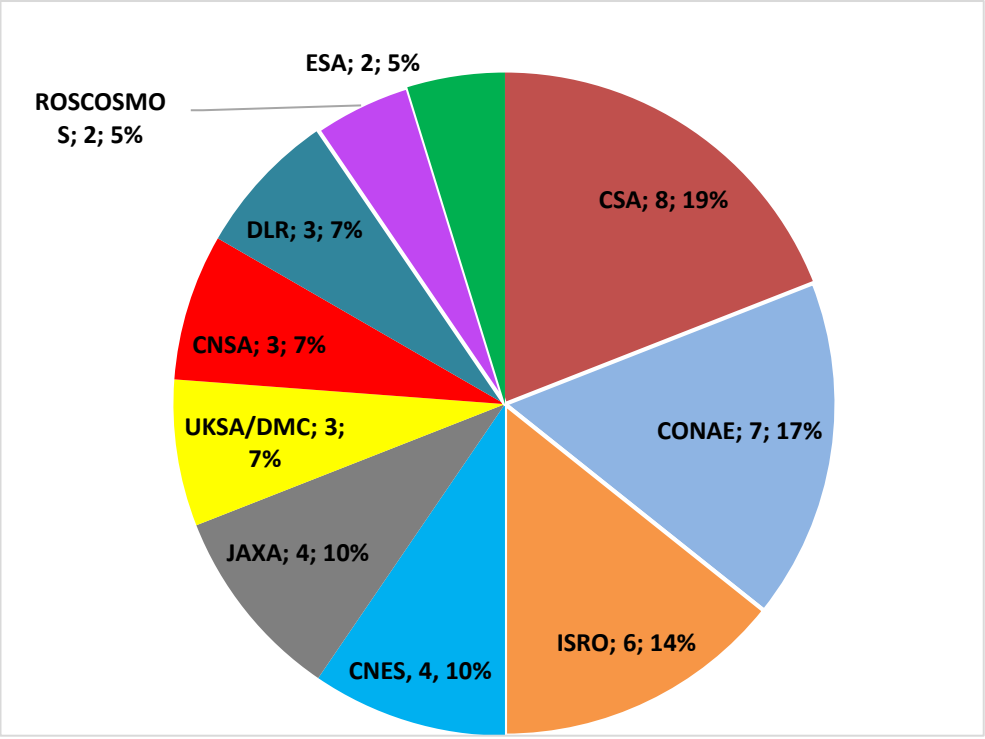


Figure 3-22. Distribution of Charter Parties responsible for the ECO services in 2018

The random nature of calls resulted in an uneven workload distribution for the members, with CSA handling 19% of the calls, as shown in Figure 3-22. There were eight calls processed by CSA, CONAE processed seven calls, ISRO processed six calls, CNES and JAXA processed four calls each, UKSA/DMC, CNSA and DLR processed three calls each, and ESA and ROSCOSMOS processed two calls each. KARI did not receive any calls during its week on duty.

- *Distribution of Charter members responsible for the PM services delivered in 2018*

Project Managers (PMs) were nominated for all 33 activations in 2018. PMs nominated by JAXA and DLR handled 21% (7 activations) of Charter activations each; USGS handled 4 activations; ESA, ISRO and ROSCOSMOS handled 3 activations each; CNES handled 2 activations; CONAE, UKSA/DMC, CNSA and ABAE handled 1 activation each (Figure 3-23).

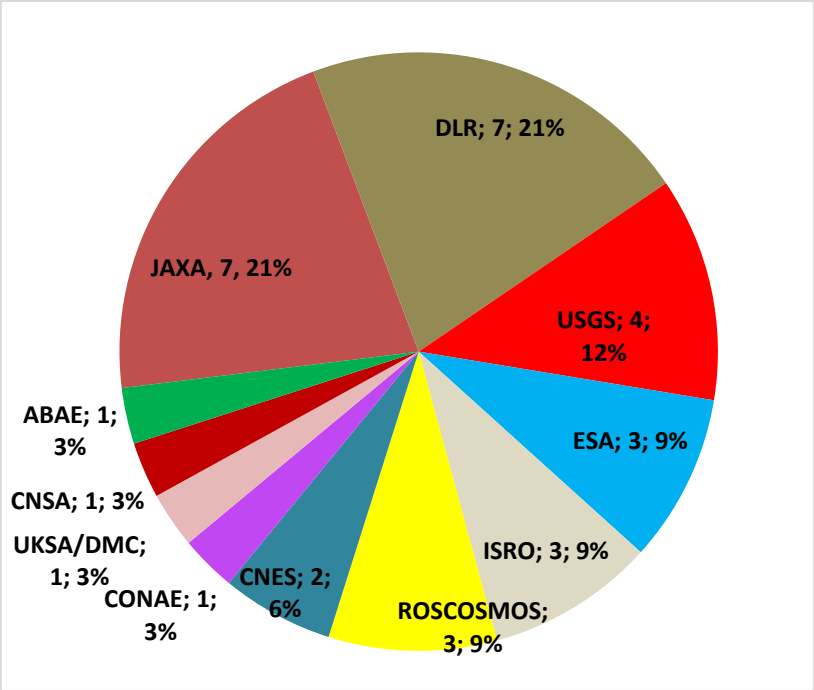


Figure 3-23. Distribution of Charter Parties responsible for the PM services in 2018

- *Distribution of organizations providing PM resources in 2018*

PMs may be sourced from a Charter party or an external entity. Table (3-6) and Figure (3-24) show 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, 17 different organizations contributed their PM services to Charter activations.

Organization (Country)	Number of PM service
UNITAR/UNOSAT (Switzerland)	6
AIT (Thailand)	4
ROSCOSMOS (Russian Federation)	3
NRSC (India)	3
ABAE (Venezuela)	2
DLR (Germany)	2
PHIVOLCS (Philippines)	2
University of Louisiana (USA)	2
CONAE (Argentina)	1
DSCGR (New Caledonia)	1
NDRCC - National Disaster Reduction Centre of China	1
DMC (Sri Lanka)	1
ESA (Italy)	1
IWMI (Sri Lanka)	1
LAPAN (Indonesia)	1
University of Wyoming (USA)	1
USGS (USA)	1

Table 3-6. PM Organizations in 2018

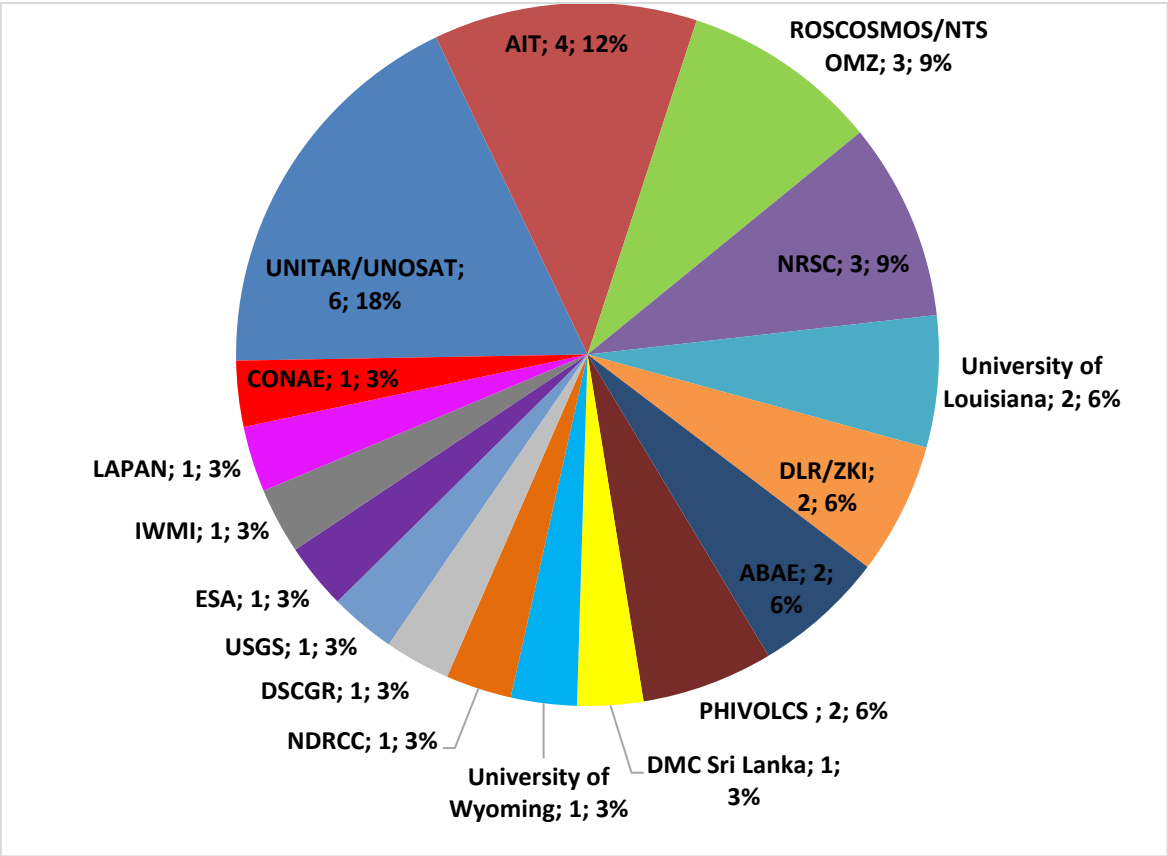


Figure 3-24. Distribution of organizations providing PM resources in 2018

Difference between Figures 3-23 & 3-24: Figure 3-23 represents the breakdown of Charter members who nominated PMs in 2018 (the Charter member responsible for the PM service) while Figure 3-24 represents the breakdown of organizations performing the PM work for 2018 activations.

Detailed comments:

- DLR managed two events with support of internal staff: volcanic eruption in Guatemala and flood in Iraq; Four events with support by UNITAR/UNOSAT: floods in Somalia, Djibouti and Laos and landslide in Uganda; and One event supported by IWMI: flood in Vietnam.
- JAXA managed four events supported by AIT: volcanic eruption in Papua New Guinea, earthquakes (2) in Indonesia and flood in Japan; two events supported by PHIVOLCS: volcanic eruption and ocean storm in Philippines; and one event supported by DMC for flood in Sri Lanka.
- USGS managed one event with support of internal staff: volcanic eruption in the USA; two events supported by the University of Louisiana: ocean storms (2) in the USA; and one event supported by the University of Wyoming: wildfire in the USA.
- ESA managed one event with support of internal staff: wildfire in Greece; One event supported by ABAE: flood in Bolivia; and One event supported by UNITAR/UNOSAT: ocean storm in Tonga.
- ISRO managed three events supported by NRSC: flood, landslide and ocean storm in India.
- ROSCOSMOS managed three events with support of internal staff: search and rescue of aircraft in Iran, floods (2) in Russia.

- CNES managed one event supported by DSCGR: ocean storm in New Caledonia; and one event supported by LAPAN: tsunami in Indonesia.
- CONAE managed one event with support of internal staff: flood in Argentina.
- UKSA/DMC managed one event supported by UNITAR/UNOSAT: ocean storm in Yemen.
- CNSA managed one event supported by NDRCC: wildfire in China.
- ABAE managed one event with support of internal staff: flood in Venezuela.

NITAR/UNOSAT served as PM primarily for UN activations, but also for one activation requested by the UK department of International Development. UNOSAT contributed to 18% of all activations in 2018 (Tonga, Somalia, Djibouti, Yemen, Laos and Uganda), also providing value-adding services.

3.4 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 2018, these exercises took place from 21 May to 30 July 2018 and from 30 November 2018 to 11 January 2019, respectively, and the following scenarios were used:

- SARE-20: hurricane in Germany. This exercise was led by CONAE and DLR training teams; the report was prepared by CONAE and DLR. 39 ECOs from 11 Charter member agencies participated.
- SARE-21: underground coal mining accident in Canada. This exercise was led by DLR and CSA training teams; the report was prepared by DLR and CSA. Thirty-eight ECOs from 10 Charter member agencies participated.

3.5 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. Six PM training sessions were carried out in 2018.

- April (Germany): Held during the 39th Charter Board meeting, led by DLR and ESA. PMs from Germany, Russia, USA, Romania, France, Canada, Brazil and Italy participated.
- June (China): Led by CNSA for Chinese PMs with ESA support.
- September (UK): Three PM training sessions led by UKSA/DMC for UK PMs.
- October (Vietnam): Led by Japan for PMs in Vietnam.

3.6 The Charter Operational System

ESA has developed and continues to develop tools: the web-based Charter Operations System version 2 "COS-2", linked to the Charter Geobrowser and HDDS, to improve Charter operational steps and facilitate the work of the different Charter operational staff (ODO, ECOs and PMs).

COS-2 is operational since the beginning of March 2015. Overall, there have been no major issues with the system. 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 main version (2.3) of the COS-2 system was released in October 2018, improving the user interface (COS-2 dashboards available) and fixing the main system issues.

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. A special instance of COS-2 has been set up in order to support the SARE (the ECO Semi-Annual Refresh Exercise) exercise, with dedicated accounts for each Charter agency.

COS-2 support was provided for the SARE-20 and SARE-21, in which 39 and 38 (respectively) Emergency on-Call Officers (ECOs) participated.

All PM trainings are performed with the support of COS-2 since 2016 and all AU trainings are performed with the support of COS-2 since 2018.

3.7 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

The United Arab Emirate Space Agency (UAESA), supported by the Mohammed Bin Rashid Space Centre (MBRSC), has been fully integrated into the Charter. In April 2018, the integration and operational qualification process was concluded with the official signature ceremony during the 39th Charter Board Meeting in Darmstadt, Germany. This ceremony marked the accession of UAESA/MBRSC to the Charter as its 17th member.

Figure 4-1: Signature ceremony for UAESA's accession to the Charter (photo: EUMETSAT)

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.

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

Figure 4-2: Map showing all 66 countries (in dark blue) with direct access to the Charter as of June 2019.

Significant efforts have been made for promoting the Charter and Universal Access, e.g. at the UNISPACE+50 conference and exhibition and by publishing a new video[1] (see below and chapter on communication).

4.3 Cooperating Bodies

4.3.1 Collaboration with UNOOSA

Active cooperation with UNOOSA has been continuing for many years, and existing arrangements have recently been enhanced.

The UNISPACE+50 event took place in Vienna in June 2018. The Charter was pleased to accept UNOOSA's invitation to present the Charter and Universal Access to representatives of more than 90 UN member states as well as several intergovernmental and non-governmental organizations that attended the event.

In a presentation at the UNISPACE+50 Symposium session "Space and Civil Society", DLR presented the Charter as a success story and referred to the fact that the UNISPACE III conference in 1999 was the starting point for initiating the Charter. Additionally, some examples of countries that received direct access to the Charter through Universal Access and benefited from the Charter afterwards were provided[2].

The Charter also presented its work at the UNISPACE+50 Exhibition where CNES supplied a Charter booth, which was serviced through the whole UNISPACE week with the help of other

[1] https://www.youtube.com/watch?v=ZvExM-Z3E2w
[2] http://www.unoosa.org/documents/pdf/unispace/plus50/Presentations_SYMPOSIUM/Jens_Danzeglocke.pdf

European Charter members.

Figure 4-3: The Charter presented its work and Universal Access in the UNISPACE exhibition as well as in a presentation at the UNISPACE symposium (photos: UKSA, CNES and DLR).

Luc St. Pierre, Chief of the Space Applications Section at UNOOSA, participated in a dedicated session of the 40th Charter Board meeting (Toulouse, October 2018) 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 Conference on Space-based Technologies for Disaster Risk Reduction and several training courses 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, Dominican Republic, and others. In 2018, Technical Advisory Support and/or Institutional Strengthening Missions have been provided by UNOOSA to Sri Lanka and Vietnam and the benefits of UA were presented. In addition, the National Disaster Management Centers of South Africa, Ghana, and Cameroon have been encouraged by UN-SPIDER in their efforts to

become Charter Authorized Users.

Three 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 July 2018, an activation was triggered on behalf of the Laos Ministry of Science and Technology and Department of Disaster Management and Climate, due to flooding in Laos caused by monsoon rain and the collapse of a hydroelectric dam. The Charter merged UNOOSA's activation request with another request received on the same day by UNITAR/UNOSAT on behalf of the World Food Programme;
- In August 2018, an activation was triggered on behalf of Vietnam's Disaster Management Authority in anticipation of severe flooding caused by the tropical cyclone "Bebenca". The International Water Management Institute (IWMI), a UN-SPIDER Regional Support Office, acted as project manager for this activation.
- In December 2018, an activation was triggered on behalf of Indonesian authorities, due to a tsunami that hit coastal towns on the Sunda Strait, caused by the collapse of a flank of the Anak Krakatau volcano. The Charter merged UNOOSA's activation request with another request received on the same day by UNITAR/UNOSAT on behalf of UNESCAP.

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. The agreement on the "Universal Access Trial" mechanism was the result of an earlier UNOOSA request to the Charter to allow them to trigger Charter activations not only on behalf of UN users, but also on behalf of national disaster management authorities with which UN-SPIDER has well-established links.

In its report to the Charter, UNOOSA also highlighted the resolution entitled "Fiftieth anniversary of the first United Nations Conference on the Exploration and Peaceful Uses of Outer Space: space as a driver of sustainable development", which was an outcome of the UNISPACE+50 event to be recommended to the UN General Assembly for adoption. Another outcome was the agreement to further develop a "Space2030" agenda and implementation plan that will promote the role of space science and technology and their applications in meeting challenges to global development, the fostering of regional and interregional cooperation in space activities for sustainable development, and the need for enhanced capacity building in the use of space science and technology for the benefit of all countries. UNOOSA stated that its collaboration with the Charter should be a key element of "Space2030" so that it continues to provide essential and timely delivery of high quality support to responders and national authorities responsible to save lives. Expanding the reach of the Charter and making it even more accessible and responsive will help reduce the vulnerability of populations and infrastructure by strengthening their resilience. With "Space2030" aligned to these crucial aspects of the Sustainable Development Goals, UNOOSA confirmed that it would continue to prioritize its support to the Charter and its members, for the benefits of all nations.

4.3.2 Cooperation with UNITAR/UNOSAT

Active cooperation with UNITAR/UNOSAT has been continuing for many years, and

existing arrangements have recently been enhanced.

Einar Bjorgo, Manager of UNOSAT at UNITAR, participated in a dedicated session of the 40th Charter Board meeting (Toulouse, October 2018) and presented UNOSAT's activities to support the Charter. A report was also delivered which highlights that 2017/18 was a very challenging period for those affected by natural disasters, and that investments in mitigation, adaptation and prevention strategies are now needed more than ever since climate experts predict that the impact and range of catastrophic events will continue to worsen as the effects of climate change intensify in the years to come.

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, which has provided operational services since 2003.

Seven Charter activations were triggered by UNOSAT on behalf of users being part of the UN system, which comprises a significant portion of the overall Charter activations in 2018:

- In February 2018, an activation was triggered on behalf of UNOCHA's Regional Office for Asia and the Pacific (ROAP), due to a tropical cyclone hitting Tonga;
- In May 2018, an activation was triggered on behalf of UNOCHA, due to flooding in Somalia;
- In May 2018, an activation was triggered on behalf of UNOCHA, due to flooding in Djibouti after being hit by a tropical cyclone;
- In July 2018, an activation was triggered on behalf of the World Food Programme, due to flooding in Laos caused by monsoon rain and the collapse of a hydroelectric dam. The Charter merged UNOSAT's activation request with another request received on the same day by UNOOSA on behalf of authorities on Laos;
- In September 2018, an activation was triggered on behalf of UNOCHA, due to typhoon "Mangkhut" hitting the Philippines and causing flooding and landslides. The Charter merged UNOSAT's activation request with another request received by ADRC on behalf of the Manila Observatory;
- In October 2018, an activation was triggered on behalf of UNDP, due to landslides and mudflows in Uganda;
- In December 2018, an activation was triggered on behalf of UNESCAP, due to a tsunami that hit coastal towns on Indonesia's Sunda Strait, caused by the collapse of a flank of the Anak Krakatau volcano. The Charter merged UNOSAT's activation request with another request received on the same day by UNOOSA on behalf of Indonesian authorities.

UNOSAT staff members were nominated as Project Manager (PM) for six activations in 2018. 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 and in addition for the following activations:

- flooding in Bolivia (February 2018);
- tropical cyclone in Yemen (June 2018);
- volcanic eruption of Mount Fuego in Guatemala (June 2018);
- earthquake on the Indonesian island of Lombok (August 2018);

- earthquake and tsunami hitting the Indonesian island of Sulawesi (September 2018).

The most performed type of analysis was impact assessment, followed by exposure analysis, damage assessment and displacement analysis. UNOSAT also made geodata (vector files) and/or statistical results systematically available. A total of 69 products were published and shared with end users. Maps were the main product type delivered by UNOSAT, but also a live web map was created for the Laos activation.

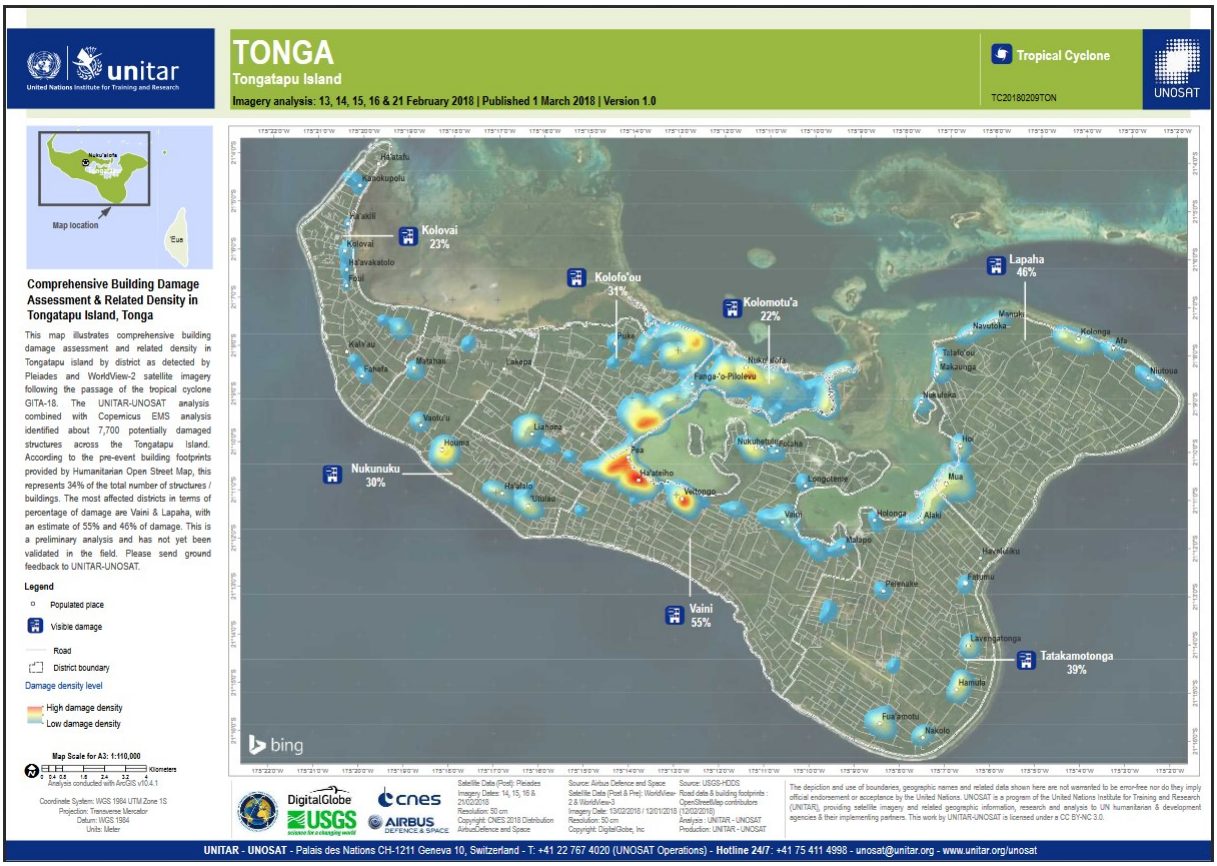


Figure 4-4: Example of a map produced by UNOSAT: Building Damage Assessment & Related Density in Tongatapu Island, Tonga

UNOSAT also highlighted the Charter in numerous fora, such as high-level meetings with the UN and governmental bodies, UNDP trainings and diverse other conferences and symposia.

In 2017, the Charter and UNOSAT 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. In 2018, such an activation did not take place, but UNOSAT confirmed that nonetheless Red Cross and Red Crescent users made use of products generated in the course of Charter activations.

In its report to the Charter, UNITAR/UNOSAT also highlighted that the future of disaster-related rapid mapping will be a collaborative effort, and that it is necessary to continually find solutions and develop mechanisms to add value to the work done and share it widely with operational and non-operational audiences, so that they may reap the benefits.

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 2018, SA was comprised of 92 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 2018, 29 activations were handled by SA. Among these, the escalation mechanism to the Charter was used in response to five events:

- Volcanic eruption of Mt. Mayon in the Philippines, in January 2018;
- Volcanic eruption on Kadovar Island in Papua New Guinea in January 2018;
- Earthquake on Lombok Island in Indonesia in August 2018;
- Typhoon "Mangkhut" in the Philippines in September 2018;
- Earthquake in Sulawesi/Indonesia in September 2018;

The number of escalations to the Charter is higher than in 2017 (2 escalations to the Charter), and in addition there were several Charter activations triggered directly by SA member countries which also have a Charter Authorized User (e.g. Sri Lanka) or by the United Nations cooperating bodies due to disasters in SA member countries.

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 4-5: Charter PM training organised by JAXA in Hanoi, Vietnam, in October 2018 (photo: JAXA).

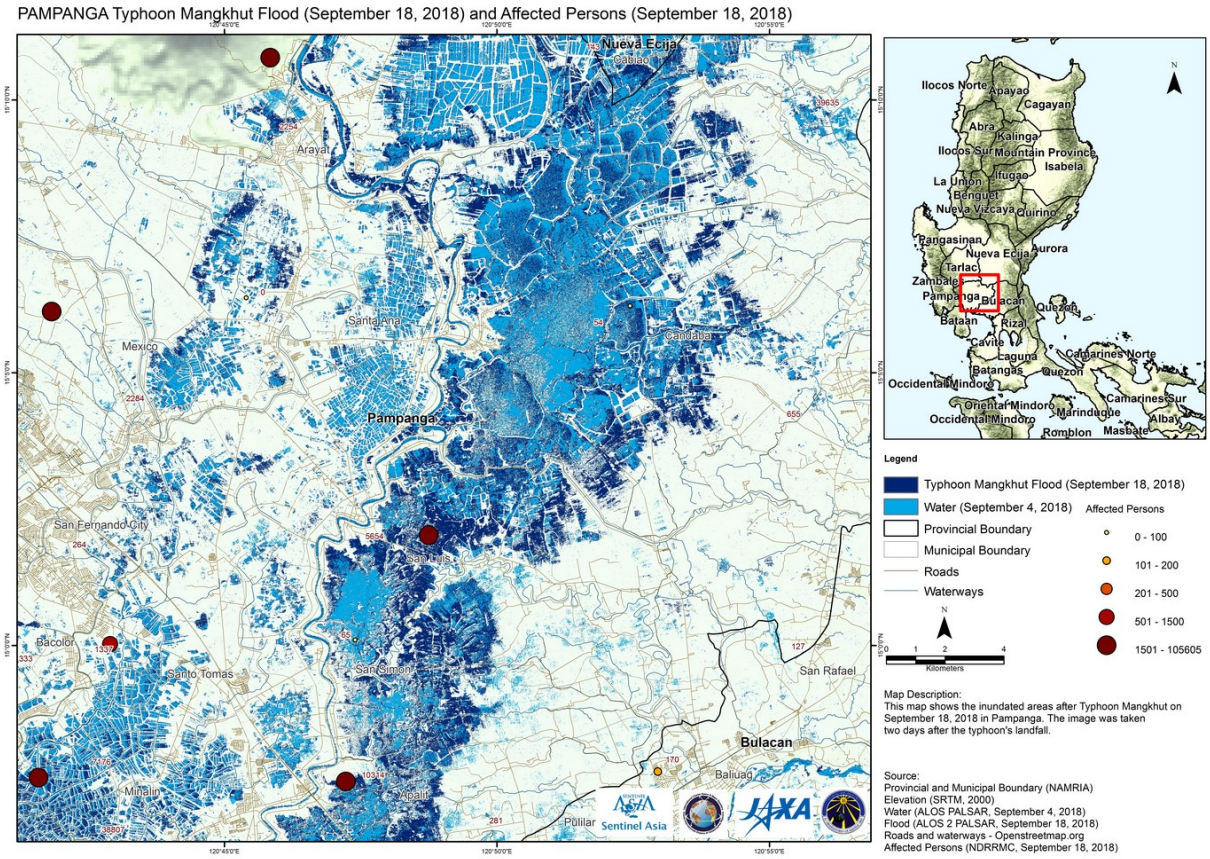


Figure 4-6: Example of a map produced by Sentinel Asia for the activation escalated to the Charter due to typhoon "Mangkhut" in the Philippines in September 2018.

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 reasonable and has taken place in numerous cases in the past.

Towards the end of 2017, procedure documents were prepared by a Charter working group, consisting of the European members' agencies, together with representatives of the CEMS. Considerable effort was made to put collaboration on a systematic and procedural basis. This was built on the understanding that not only duplications should be avoided, where possible, but also considerable synergies could be leveraged - e.g. the Charter could much 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.

In April 2018, the Charter and the CEMS finalised and agreed on procedures for collaboration, resulting in maps that are published by both the CEMS and the Charter and showing that contributions of both parties effectively come together. 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.

Figure 4-7: The European Commission and the Charter sign an agreement on collaboration between the Copernicus EMS and the Charter at the Charter Board Meeting in Germany, April 2018 (photo: EUMETSAT).

Very soon after the April 2018 agreement, 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:

- Volcanic eruption of Fuego in Guatemala in June 2018;
- Fires in Greece in July 2018.

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

- Earthquake in Indonesia in August 2018;
- Hurricane Florence in the US in September 2018;
- Earthquake and tsunami in Indonesia in September 2018;
- Landslides in Uganda in October 2018;
- Tsunami in Indonesia in December 2018.

In 2018, the CEMS Rapid Mapping was activated 71 times, among which many cases of flood and wildfire events in Europe were covered. There were only three Charter activations for disasters in Europe in the same period (two flood events in Russia, and the collaborative activation for fires in Greece, see above).

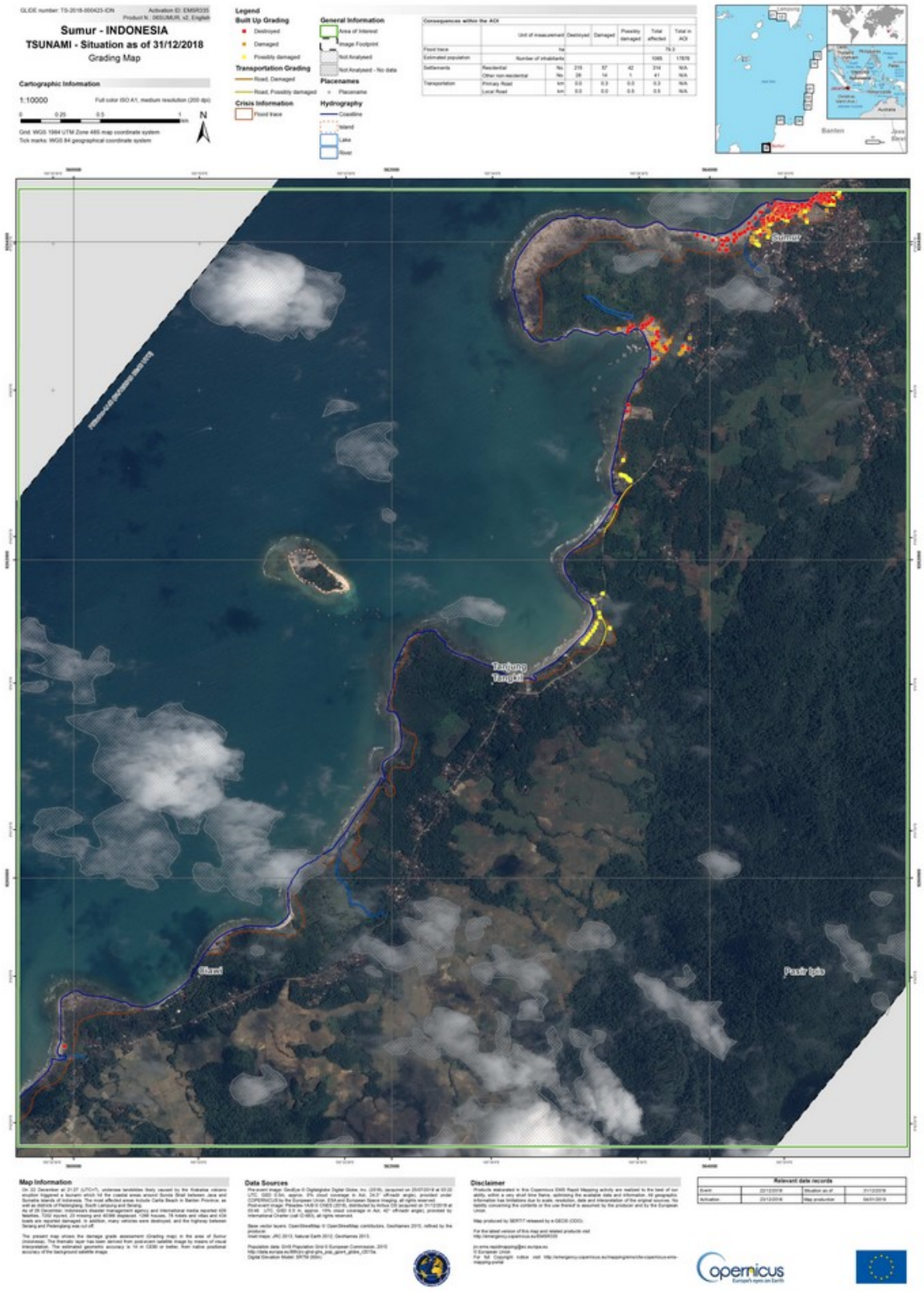


Figure 4-8: Example of a damage grade assessment map produced by CEMS after the tsunami triggered by Anak Krakatau volcano in December 2018.

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.

4.5 Concluding remarks

To ensure efficient disaster response worldwide requires collaboration between a range of different actors concerned with both demand and supply issues. The Charter, while being a collaborative effort itself, also builds on collaboration with external bodies, programs, or initiatives, as described above. The overall goal is to help save lives, property, infrastructure, and the environment by organizing rapid access to images of earth-observing satellites of the Charter member agencies, and by facilitating that crucial information based on satellite imagery reaches disaster management users.

With an increasing number of Authorized Users and cooperating partners, Charter activations for the same event are sometimes triggered by different user organizations with requests taking place in a short period of time. This requires operational coordination concerning both the users and the Value Adding providers supporting the Charter PMs. In addition, the number of partners available for generating value-added products has been regularly increasing over the last years. For large events, there are sometimes several service providers involved. The Charter members try to support coordination of such activations. One way is to expand the pool of Charter PMs and increase the efforts to train them; another one is to further improve the capabilities of the web-based Charter operational system COS-2, which allows coordination between different actors in an easier way and could be used more and more to support the exploitation of EO data by the PM and VA provider. Since no disaster or Charter activation is like any other, there are always challenges to be met and possible improvements to work towards. The Charter is happy to have strong partners, as described above, in order to collaborate towards effective satellite-based support for disaster response worldwide.

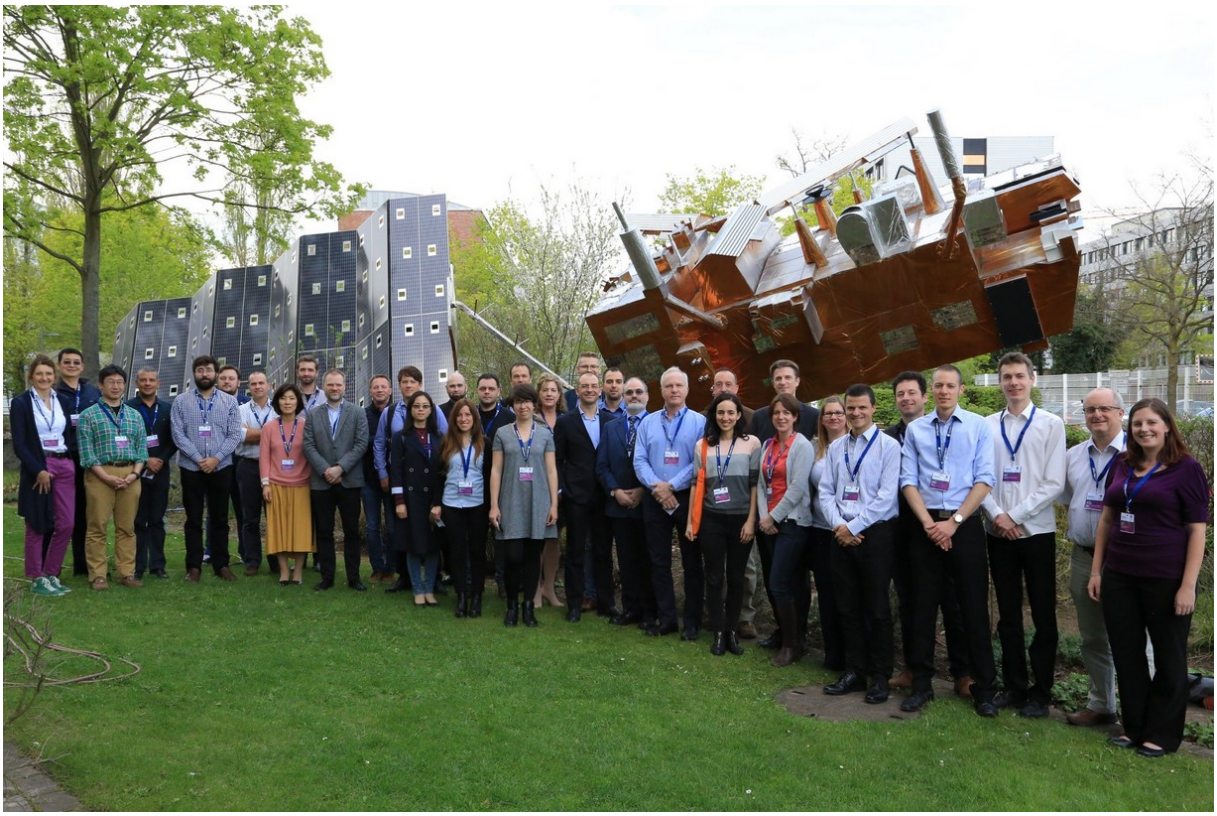


Figure 4-9: Participants of a Project Manager training organised by the Charter in Germany in April 2018 (photo: EUMETSAT).

5 Communication

5.1 Web site

The Charter website is available in English and some pages are available in Spanish, French, Chinese and Japanese and 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.

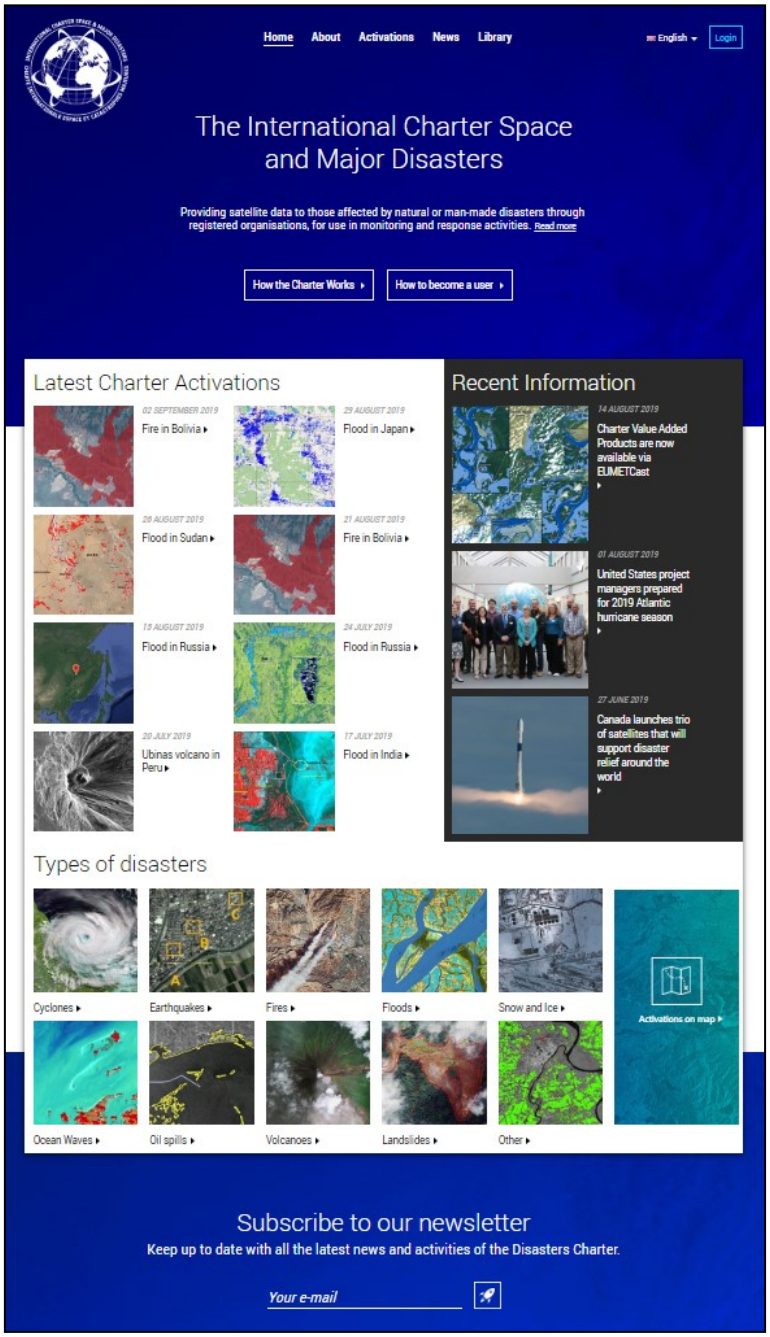


Figure 5-1. Charter website homepage

According to the Charter Website statistics in 2018 there were 113 696 page views, 81 530 of which were unique. The most viewed pages were the home page, the activations page and the charter activations page. Average time spent on a page was 133.29 seconds.

Page	Page Views	Unique Page Views	Avg. Time on Page	Bounce Rate	% Exit
https://disasterscharter.org/web/guest/home	42924	28646	91,81	37,44%	32,57%
https://disasterscharter.org/web/guest/activations/	37771	31160	149,38	78,07%	51,49%
https://disasterscharter.org/web/guest/charter-activations	10663	6725	91,34	57,11%	27,46%
Disaster Types pages	6337	4499	111,68	78,89%	34,34%
https://disasterscharter.org/web/guest/about-the-charter	5599	3478	146,12	54,37%	26,95%
https://disasterscharter.org/web/guest/news	2379	1299	118,03	51,83%	17,74%
https://disasterscharter.org/web/guest/how-the-charter-works	2050	1435	141,75	55,82%	25,41%
https://disasterscharter.org/web/guest/library	1735	967	155,93	58,45%	28,07%
https://disasterscharter.org/web/guest/how-to-register-as-a-user	1320	987	149,97	62,82%	27,05%
https://disasterscharter.org/web/guest/activating-the-charter	1120	864	180,61	66,67%	41,43%
https://disasterscharter.org/web/guest/text-of-the-charter	858	696	123,09	64,85%	34,27%
https://disasterscharter.org/web/guest/news/	535	465	157,02	65,82%	45,42%
https://disasterscharter.org/web/guest/history	405	309	116,09	28,57%	23,70%

Figure 5-2. Charter website views (January-December 2018)

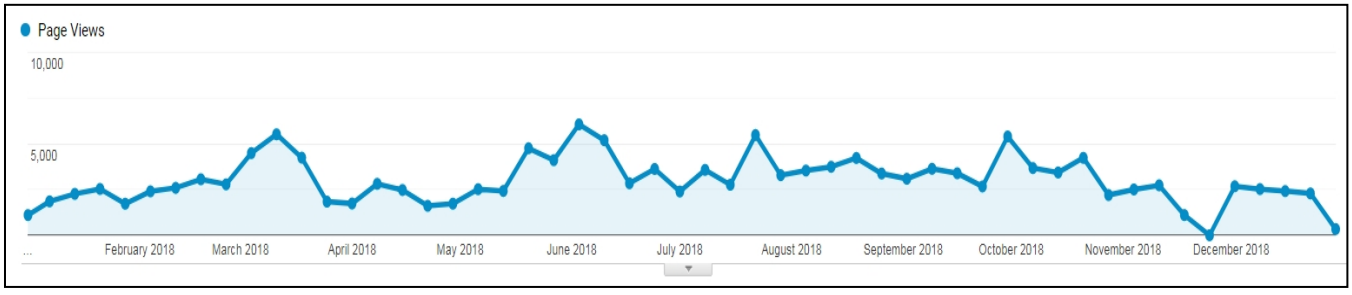


Figure 5-3. Page views (January-December 2018)

March 2018: peak corresponds to Cyclone Hola in New Caledonia.
June 2018: peak corresponds to three activations over a weekend at the beginning of June, one being Fuego Volcano which received a lot of attention.
August 2018: peak at beginning of August corresponds to an Earthquake in Indonesia.
October 2018: peak corresponds to an Earthquake in Indonesia and Hurricane Michael.

The number of users visited the Charter website was 24 720, of which there were 24 231 new users. The total number of sessions was 42 673.

Country	Users	New Users	Sessions	Bounce Rate
United States	10009	9932	13259	76,03%
Japan	2766	2718	5633	57,18%
France	1963	1895	3374	50,41%
United Kingdom	1948	1888	5424	45,46%
Canada	1945	1901	2996	58,11%
India	1686	1679	2441	63,46%
Germany	1586	1507	2840	51,55%
Poland	1112	1076	3792	37,10%
Indonesia	877	870	1207	69,68%
Italy	828	765	1707	41,30%

Figure 5-4. Number of users and sessions (January-December 2018)

There were 26 605 views of the Charter activation pages, 21 791 of which were unique. Average time spent on a page was 182.49 seconds. The most visited were the pages of Charter activations and the earthquake in Indonesia.

Page	Page Views	Unique Page Views	Avg. Time on Page	Bounce Rate	% Exit
https://disasterscharter.org/web/guest/charter-activations	4602	2843	80,83	52,69%	23,49%
https://disasterscharter.org/web/guest/-/article/earthquake-in-indonesia-activation-587-	2710	2371	292,63	84,60%	74,35%
https://disasterscharter.org/web/guest/-/article/earthquake-in-indonesia-activation-580-	1579	1394	244,76	89,91%	71,12%
https://disasterscharter.org/web/guest/-/article/flood-in-lao-people-s-democratic-republic-activation-578-	1546	1286	214,14	79,03%	62,55%
https://disasterscharter.org/web/guest/-/article/flood-in-india-activation-582-	1374	1206	202,29	88,83%	69,43%
https://disasterscharter.org/web/guest/-/article/volcano-in-guatemala-activation-576-	1365	1177	199,03	81,89%	65,27%
https://disasterscharter.org/web/guest/-/article/flood-in-japan-activation-577-	1292	1080	257,28	77,88%	60,76%
https://disasterscharter.org/web/guest/-/article/volcano-in-united-states-activation-571-	1133	991	250,09	85,08%	70,79%
https://disasterscharter.org/web/guest/-/article/flood-in-venezuela-bolivarian-republic-of-activation-581-	1090	981	243,45	92,54%	71,93%
https://disasterscharter.org/web/guest/-/article/flood-in-argentina-activation-564-	1027	689	180,97	43,71%	48,98%
https://disasterscharter.org/web/guest/-/article/flood-in-viet-nam-activation-583-	1010	921	160,25	90,93%	64,16%

Page	Page Views	Unique Page Views	Avg. Time on Page	Bounce Rate	% Exit
https://disasterscharter.org/web/guest/-/article/fire-in-greece-activation-579-	941	776	217,60	68,55%	51,54%
https://disasterscharter.org/web/guest/-/article/cyclone-in-united-states-activation-585-	932	816	157,99	79,23%	62,12%
https://disasterscharter.org/web/guest/-/article/cyclone-in-philippines-activation-586-	835	748	174,10	88,71%	64,19%
https://disasterscharter.org/web/guest/-/article/landslide-in-uganda-activation-589-	640	578	156,91	91,82%	64,84%
https://disasterscharter.org/web/guest/-/article/flood-in-bolivia-plurinational-state-of-activation-565-	604	512	161,33	78,57%	53,15%
https://disasterscharter.org/web/guest/-/article/landslide-in-india-activation-584-	584	516	149,45	65,91%	44,01%
https://disasterscharter.org/web/guest/-/article/cyclone-in-tonga-activation-566-	474	399	178,81	73,81%	53,59%
https://disasterscharter.org/web/guest/-/article/flood-in-somalia-activation-570-	444	407	141,68	91,54%	70,05%
https://disasterscharter.org/web/guest/-/article/flood-in-iraq-activation-592-	439	394	170,31	85,08%	63,33%
https://disasterscharter.org/web/guest/-/article/cyclone-in-united-states-activation-588-	431	376	109,67	77,88%	45,24%
https://disasterscharter.org/web/guest/-/article/passenger-airplane-in-iran-in-iran-islamic-republic-of-activation-567-	421	359	125,50	67,67%	43,94%
https://disasterscharter.org/web/guest/-/article/flood-in-sri-lanka-activation-573-	412	350	183,54	81,91%	44,42%
https://disasterscharter.org/web/guest/-/article/flood-in-russian-federation-activation-569-	364	322	130,12	70,90%	50,00%
https://disasterscharter.org/web/guest/-/article/ocean-wave-in-indonesia-activation-594-	356	299	179,51	77,52%	60,39%

Figure 5-5. Number of Charter activations pages views (January-December 2018)

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

The number of impressions of Charter's followers in January-December 2018 reached 731 997, the following figure shows the top 10 tweets and their statistics:

Tweet permalink	Tweet text	Time	Impressions	Engagements	Retweets	Replies	Likes	User Profile Clicks	URL Clicks	Detail Expands	Media Views	Media Engagements
https://twitter.com/DisastersChart/status/1059475882102931456	We released a new video today providing an overview of what the International Charter is, and how our work benefits users. Watch the video now on our website: https://t.co/CsfNbLjbXq https://t.co/4kFjWtu34V	2018-11-05 16:01 +0000	14979	254	29	2	39	25	67	29	60	60
https://twitter.com/DisastersChart/status/1055102963323203584	Representatives of spaces agencies from around the world discuss the status of the Disasters Charter activities at the 40th meeting in Toulouse. https://t.co/94M60JiN4L	2018-10-24 14:25 +0000	13354	195	19	1	35	19	35	18	67	67
https://twitter.com/DisastersChart/status/1042447251409395713	We now have some maps assessing the #flood extent in North Carolina following #HurricaneFlorence: https://t.co/WLMcoy7kx3 These maps show the situation on 16 September and use #TerraSARX and #Sentinel2 data. https://t.co/jhnuvCwNi0	19.09.2018 16:16	23393	495	33	0	54	8	62	31	292	292
https://twitter.com/DisastersChart/status/1031473155624325121	We now have a series of maps showing the #floods in #Vietnam after Tropical Storm #Bebinca: https://t.co/U3siiJqTWV The maps use radar data from #TerraSARX and #Sentinel1 to detect flood areas. https://t.co/lKMZB6QLqM	20.08.2018 9:28	12999	219	18	1	26	21	27	20	103	103

Tweet permalink	Tweet text	Time	Impressions	Engagements	Retweets	Replies	Likes	User Profile Clicks	URL Clicks	Detail Expands	Media Views	Media Engagements
https://twitter.com/DisastersChart/status/1007265046110572545	We've been working with @CopernicusEMS to monitor the #FuegoVolcano, and they've shared detailed maps of the disaster in #Guatemala: https://t.co/N951lq4L3q See more of their maps at https://t.co/O3mRtWDc1X https://t.co/nGA6Ij1OmH	14.06.2018 14:14	15316	287	23	0	30	16	56	16	140	140
https://twitter.com/DisastersChart/status/1006557874951262209	This damage assessment of San Miguel de Los Lotes, #Guatemala, was produced with #Sentinel2 imagery: https://t.co/N951lq4L3q The map shows #FuegoVolcano in the top left, with the pyroclastic flow highlighted in pink. https://t.co/bipluSs9VD	12.06.2018 15:24	12776	234	28	1	25	5	42	16	110	110
https://twitter.com/DisastersChart/status/1006184651482959873	We now have a series of maps demonstrating different aspects of the #FuegoVolcano eruption in #Guatemala: https://t.co/N951lq4L3q The maps use imagery from a variety of satellites, using optical, radar and atmospheric data. https://t.co/BXQAtoqhoZ	11.06.2018 14:41	25725	771	54	0	46	28	142	48	440	440
https://twitter.com/DisastersChart/status/1003994064339890176	The Charter has been activated to provide satellite imagery of the eruption of #Fuego #Volcano in #Guatemala: https://t.co/N951lpN9EQ	05.06.2018 13:36	16959	207	13	1	30	53	67	35	0	0

Tweet permalink	Tweet text	Time	Impressions	Engagements	Retweets	Replies	Likes	User Profile Clicks	URL Clicks	Detail Expands	Media Views	Media Engagements
https://twitter.com/DisastersChart/status/999661384081313792	We now have a series of maps produced by @USGS assessing the situation at #Kilauea volcano in #Hawaii: https://t.co/y6rDcgq0jB The maps use optical and radar imagery from a range of satellites. https://t.co/Ni6pdCo15y	24.05.2018 14:40	18034	470	32	1	39	26	125	24	218	
https://twitter.com/DisastersChart/status/999620636363370496	The latest issue of the Charter newsletter is now available: https://t.co/TsXhXMk5aD Read all about the latest activities of the Charter and more. https://t.co/LREK5Ee0YG	24.05.2018 11:58	12831	103	11	1	13	7	23	9	39	

Figure 5-6. Top 10 tweets with the most impressions (January-December 2018)

5.2 Charter Newsletters

Charter Newsletters #16 and #17 were issued in May and August 2018 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/documents/10180/14458/International-Charter-Newsletter-Issue-16-21-May-2018

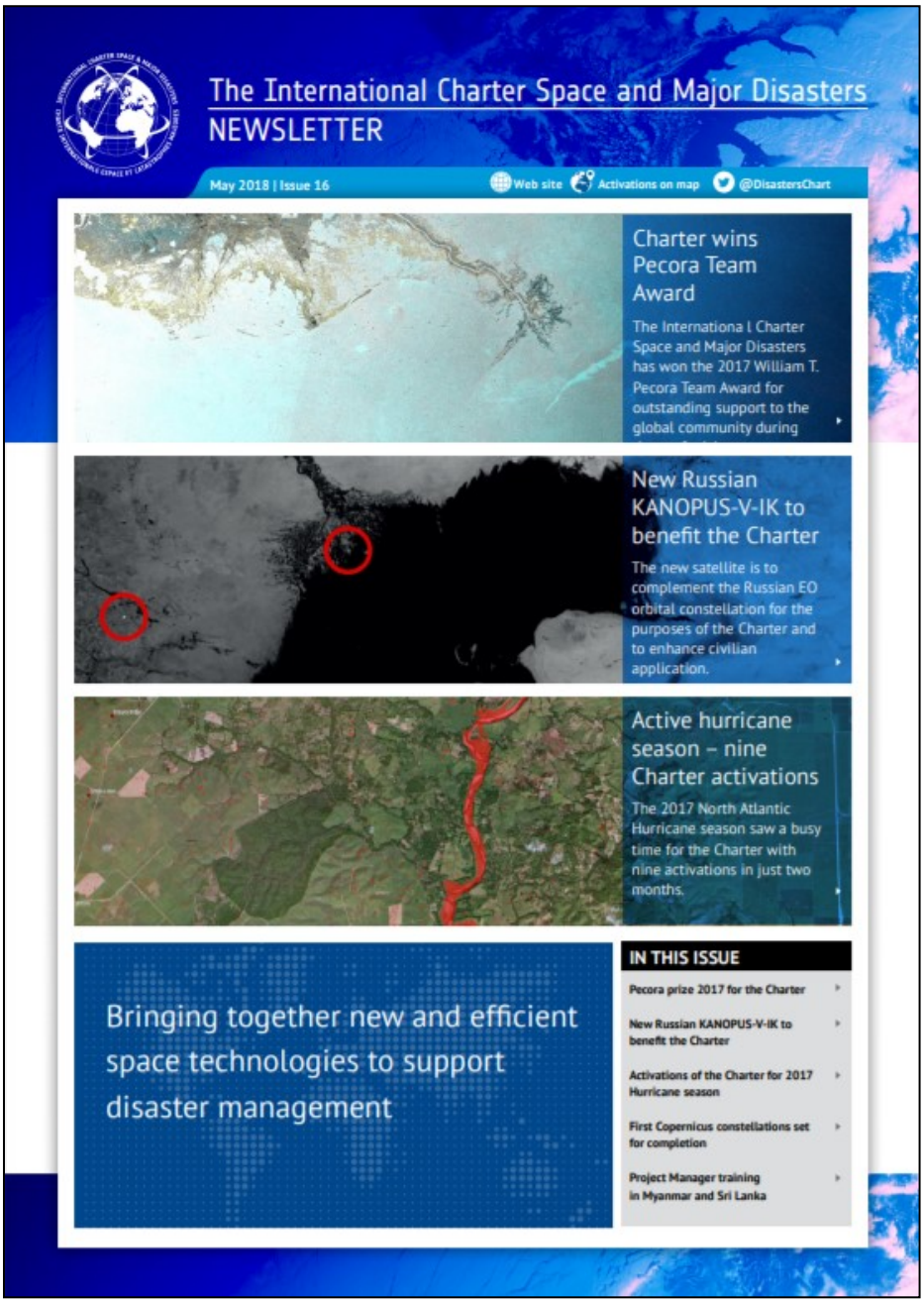


Figure 5-7. Charter Newsletter issue 16

The May issue (16th Newsletter) contained the following articles:

- Pecora prize 2017 for the Charter;
- New Russian KANOPUS-V-IK to benefit the Charter;
- Activations of the Charter for the 2017 Hurricane season;
- First Copernicus constellations set for completion;
- Project Manager training in Myanmar and Sri Lanka.

https://disasterscharter.org/documents/10180/14458/International-Charter-Newsletter-Issue-17-17-August-2018.pdf

Figure 5-8. Charter Newsletter issue 17

The August issue (17th Newsletter) contained the following articles:

- Spotlight on Charter Project Managers
- UNISPACE+50
- New look Charter Website
- Successful Project Manager Training in Beijing
- Eruption of Fuego in Guatemala and the ensuing Charter and Copernicus EMS collaboration
- Charter welcomes new member UAESA.

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

5.3 Conferences and presentations

The following table provides details of the 2018 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
Meeting of ROSCOSMOS and NTs OMZ JSC 'Russian Space Systems' on practical usage of Earth Observation data https://www.roscosmos.ru/24694/ (in Russian)	Moscow, Russia	15 February	ROSCOSMOS
Conference 'Modern challenges of EO system creation' https://www.roscosmos.ru/25042/ (in Russian)	Moscow, Russia	24 May	ROSCOSMOS
Charter 2018 Beijing Project Manager Training	Beijing, China	13 June	CNSA
Charter booth was presented at the UNISPACE+50 Exhibition	Vienna, Austria	18-23 June	CNES, UKSA, DLR, EUMETSAT
Canadian Symposium on Remote Sensing	Saskatoon, Canada	19-21 June	CSA
Charter presentation at the UNISPACE+50 Symposium (http://www.unoosa.org/documents/pdf/unispace/plus50/Presentations_SYMPOSIUM/Jens_Danzeglocke.pdf)	Vienna, Austria	19 June	DLR
CNES internal 'After Launch' conference	CNES HQ, Paris, France	6 September	CNES
Association pour l'enseignement de la science et la technologie du	Quebec, Canada	25-26 October	CSA

Event	Venue	Date	Speakers
Québec (AESTQ)			
Canadian Science Policy Conference	Ottawa, Canada	7-11 November	CSA
NRCan GEO Week	Ottawa, Canada	13-14 November	CSA
Presentation of the new Charter Video by DLR at the United Nations/Germany High-Level Forum: The way forward after UNISPACE+50 and on Space 2030	Bonn, Germany	15 November	DLR
Québec Mines, Centre des congrès de Québec	Quebec, Canada	19-22 November	CSA
ArcticNet Annual Scientific Meeting	Ottawa, Canada	10-14 December	CSA
CNES internal 'After Launch' conference	Toulouse, France	11 December	CNES

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 during this reporting period.

Date	Issuing agency	Title
1 February	ROSCOSMOS	Soyuz-2.1a LV with two Kanopus-v satellites lifts off from Vostochny http://en.roscosmos.ru/20712/
19 April	EUMETSAT	EUMETSAT and the German Aerospace Centre, Deutsches Zentrum für Luft- und Raumfahrt (DLR), have this week taken on the role of co-chairs of the International Charter on Space and Major Disasters. https://www.eumetsat.int/website/home/News/DAT_3893636.html?lang=EN&pState=1
25 April	ROSCOSMOS	Successful Sentinel-3B launch campaign http://en.roscosmos.ru/20724/
4 September	CNES	Live radio show: RFI (Radio France International) – 'How to change our view of Earth's seismic and volcanic activity?' (in French) Link to podcast
26 October	CNES	CNES takes over for next 6 months of the International Charter Space and major disasters

Date	Issuing agency	Title
		https://presse.cnes.fr/en/cnes-takes-over-chair-next-six-months-international-charter-space-and-major-disasters
November 2018	DLR	A new Charter Video was produced by DLR with the help of several Charter colleagues with the aim to explain the Charter and especially to promote Universal Access https://www.youtube.com/watch?v=ZvExM-Z3E2w
26 December	ROSCOSMOS	Kanopus-B ERS Satellites Deployed to Operational Orbit http://en.roscosmos.ru/20765/

Table 5-10. List of 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 2018 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, Brussels, Belgium). Munich RE 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 2018.

6.1 Overall impact

In 2018, the most catastrophic events were by far the catastrophic earthquake and tsunami in Indonesia, affecting more than 800,000 and killing 4,929 people. 2018 was one of the years with a high number of human losses and a very high impact of natural disaster events in terms of damages (see Figure 6-1).

Two hundred and seventy-two 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/). The Charter responded to around 11% of the total number of natural disasters registered by EM-DAT in 2018; this is equivalent to the percentages of previous years (i.e. 13% in 2017, 13% in 2016, 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 Catastrophies 2018 *Analyses, assessments, positions, 2018 issue; Munich RE*) registered 850 catastrophic events. Direct overall losses from natural catastrophes in 2018 amounted to US$ 160 bn, above the overall loss average of US$ 140 bn. 2018 ranks among the ten costliest disaster years in terms of overall losses, mainly due to floods and tropical cyclones in the US and Japan. In particular, Hurricanes Michael and Florence in the Atlantic, and Typhoons Jebi, Mangkhut and Trami in Asia, all left their mark. Overall losses from tropical cyclones in 2018 came to roughly US$ 57 bn. A total of 10,400 people lost their lives globally. 7,750 people out of the 10,400 died in extreme floods, landslides, tropical cyclones and earthquakes that struck Japan and Indonesia. The distribution by continent shows that Asia was again worst affected in 2018, with 43%, followed by North America with 20%, Europe with 14% and Africa with 13%. The distribution of 2018 Charter activations by continent (Figure 3-6) confirms this trend.

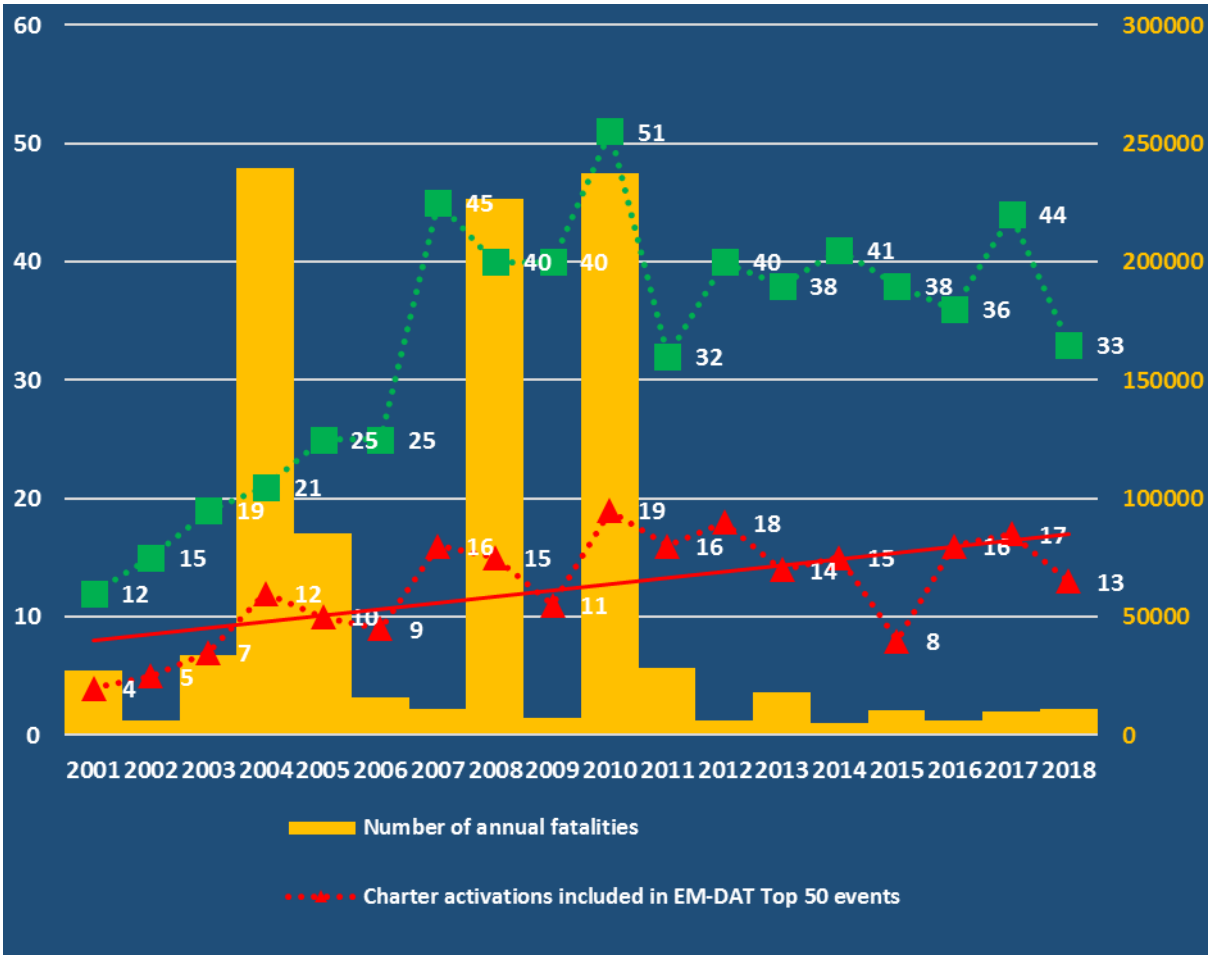


Figure 6-1. Number of Charter events over 2001-2018

Represented in red **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 green boxes are the annual number of Charter activations. 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 13 of the 50 most severe events recorded in EM-DAT in 2018 were covered by Charter activations. In 2018, the number of Charter activations (33) 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 2018, the Charter covered six of the 10 most severe disasters by fatalities (Table 6-1 next page). Among the last eight years (2009-2018), the Charter was triggered for 14 of the 15 most severe natural disasters by fatalities, as reported by EM-DAT (Table 6-2).

Top 10 Disasters – Number Killed – 2018 *The text in italic indicates that the Charter was activated*					
Country	**Disaster type**	**Date**	**#Killed**	**#Affected people**	**Total Damage (000' $)**
Indonesia	***Earthquake***	***28/09/2018***	***4,340***	***845,263***	***2,354,000***
India	***Flood***	***07/08/2018***	***710***	***23,307,698***	***2,864,980***
Indonesia	***Earthquake***	***05/08/2018***	***564***	***220,000***	***-***
Indonesia	***Volcanic activity***	***22/12/2018***	***453***	***97,778***	***250,000***
Guatemala	***Volcanic activity***	***03/06/2018***	***425***	***1,714,414***	***-***
Philippines	Storm	28/12/2018	302	10,937,509	655,253
Nigeria	Flood	02/10/2018	300	1,938,204	275,000
Japan	***Flood***	***29/06/2018***	***246***	***1,500,102***	***9,500,000***
Papua New Guinea	Earthquake	26/02/2018	181	544,300	61,000
North Korea	Flood	24/08/2018	146	581,268	25,000

Table 6-1. Ten most severe natural disasters by number of fatalities in 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, Brussels, Belgium, filtered according to the type of disasters covered by the Charter).***

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

Top 15 Disasters – Number Killed – 2009-2018 *The text in italic indicates that the Charter was activated*				
Date	***Country/District***	***Type***	***# Killed***	***#Affected people***
15/12/2011	***Philippines***	***Tropical cyclone***	***1,439***	***1,150,300***
30/09/2009	***Indonesia***	***Earthquake***	***1177***	***679,402***
14/08/2017	***Sierra Leone***	***Mudslide***	***1102***	***11,916***
07/09/2009	India	Flood	992	1,886,000

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, 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 2018. 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
Indonesia	Earthquake	28/09/2018	4,929	x
India	Flood	07/08/2018	504	x
Indonesia	Earthquake	05/08/2018	564	x
Indonesia	Volcanic activity	22/12/2018	453	x
Guatemala	Volcanic activity	03/06/2018	425	x
The Philippines	Storm	28/12/2018	182	
Nigeria	Flood	20/09/2018	199	
Japan	Flood	29/06/2018	246	x
Papua New Guinea	Earthquake	26/02/2018	145	
North Korea	Flood	24/08/2018	146	
India	Storm	01/05/2018	143	
Laos	Flood	23/07/2018	136	x
China	Flood	05/05/2018	112	
Nigeria	Flood	13/07/2018	101	
Greece	Wildfire	23/07/2018	100	x
India	Storm	13/05/2018	95	
United States of America	Wildfire	08/11/2018	88	x

Country	Disaster type	Start date	Total deaths	Charter activation
North Korea	Storm	23/08/2018	86	
India	Storm	11/10/2018	85	
Taiwan	Earthquake	06/02/2018	84	
The Philippines	Storm	16/09/2018	84	x
China	Flood	07/05/2018	77	
Madagascar	Storm	05/01/2018	73	
Kenya	Flood	14/03/2018	72	
Afghanistan	Flood	09/05/2018	72	
India	Storm	08/06/2018	61	
Pakistan	Flood	07/05/2018	60	
India	Storm	28/05/2018	54	
Somalia	Storm	21/05/2018	53	
China	Storm	15/08/2018	53	
United States of America	Storm	12/09/2018	53	x
India	Flood	22/06/2018	52	
Democratic Republic of the Congo	Flood	03/01/2018	51	
Uganda	Landslide	11/10/2018	51	x
Kenya	Flood	09/05/2018	47	
India	Flood	01/09/2018	46	
United States of America	Storm	10/10/2018	45	x
India	Storm	16/11/2018	45	
Japan	Earthquake	06/09/2018	44	
India	Storm	11/04/2018	42	
India	Storm	01/06/2018	42	
Niger	Flood	01/06/2018	36	
Indonesia	Flood	11/10/2018	35	
Vietnam	Storm	18/07/2018	34	
Ghana	Flood	31/08/2018	34	
Bangladesh	Storm	29/04/2018	33	
Vietnam	Flood	23/06/2018	33	
India	Flood	26/07/2018	33	
Indonesia	Landslide	31/12/2018	33	

Country	Disaster type	Start date	Total deaths	Charter activation
India	Storm	06/05/2018	32	

Table 6-3. Fifty most severe disasters by number of fatalities (listed by total damage) in 2018 ***(Source: EM-DAT: The Emergency Events Database - Université Catholique de Louvain (UCL) - CRED, D. Guha-Sapir - www.emdat.be, Brussels, Belgium, filtered according to the type of disasters covered by the Charter)***

The Charter covered 13 of the 50 most severe natural disasters in terms of fatalities recorded by EM-DAT in 2018, excluding droughts and extreme temperature events (Figure. 6-1 and 6-2).

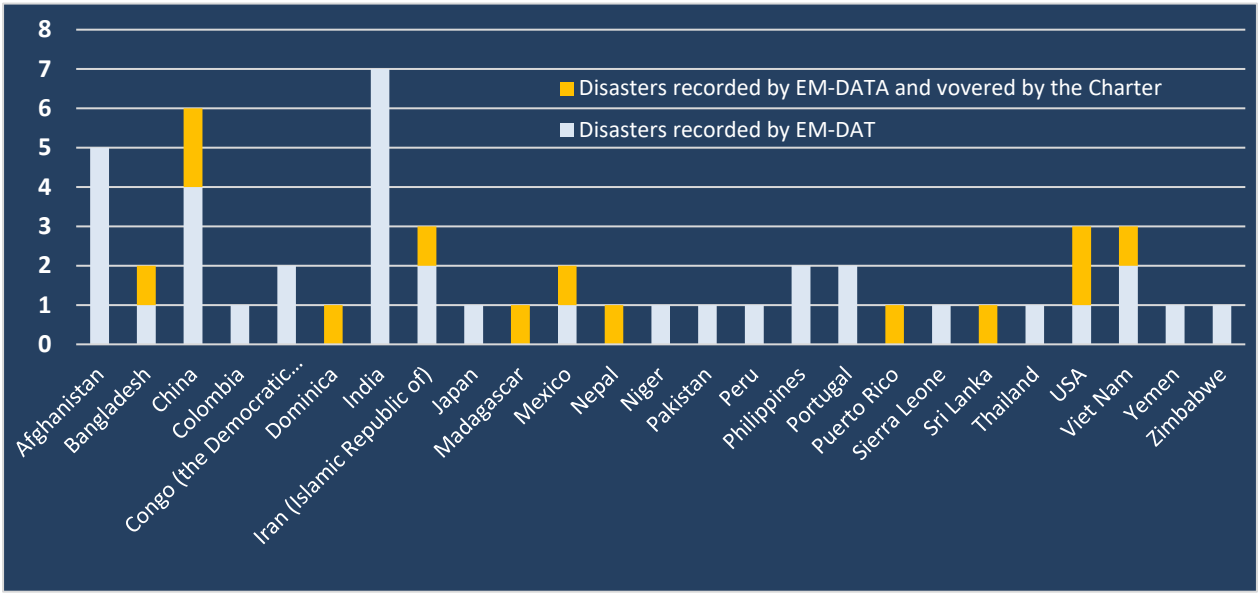


Figure 6-2. 2018 Breakdown by countries of the 50 major natural disasters (by fatalities) recorded by EM-DAT. In orange, the ones covered by the Charter.
(Source: EM-DAT: The Emergency Events Database – Université catholique de Louvain (UCL) - CRED, D. Guha-Sapir - www.emdat.be, Brussels, Belgium, filtered according to the type of disasters covered by the Charter)

For these 13 activations, requests were made by:

- Charter Authorized Users (AUs) for disasters in their countries: 3 activations for ocean storms and wildfire in USA were requested by USGS; 1 activation for flood in India was requested by ISRO; 1 activation for flood in Japan was requested by the Cabinet Office; 1 activation for wildfire in Greece was requested by GSCP; 1 activation for volcano eruption in Guatemala was requested by CONRED.
- Activations from Charter Cooperating Bodies: 1 for flood in Laos, 1 for earthquake in Indonesia and 1 for landslide in Uganda were requested by UNITAR/UNOSAT; 1 for tsunami in Indonesia was requested by UNOOSA; 1 for ocean storm in Philippines and 1 for earthquake and tsunami in Indonesia was requested by Sentinel Asia.

This number is equivalent to the one registered in 2014 and 2015 (Figure 6-1).

The Charter service was not requested for 37 out of the 50 most severe disasters events (by fatalities):

- 24 out of 37 occurred in countries with an AU (India (12), China (4), Republic of Korea (2), Nigeria (2), Ghana (1), Pakistan (1), Madagascar (1) and Japan (1). For some of these events, other satellite EO emergency response mechanisms were activated such as Sentinel Asia.
- 13 out of the 37 occurred in countries without an AU. All fall well within the hazard types of the Charter.
    - 7 occurred in Asia (Indonesia (2), Vietnam (2), Afghanistan, Philippines and Bangladesh).
    - 5 occurred in Africa (Kenya (2), Democratic Republic of Congo, Niger and Somalia).
    - 1 occurred in Oceania (Papua New Guinea).

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

6.2 System performance assessment

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

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.

2018 is the first year that Charter operations have an automated monitoring system and all system performances can be calculated with a better accuracy (hours and minutes). The automated monitoring system is still under validation and only a few parameters have been successfully verified.

The average PM nomination time, 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 2018, which is significantly lower than the year before (on average, 37 hours in 2017). A comparison with previous years is not possible, since up to 2016, all time metrics were measured in days instead of hours.

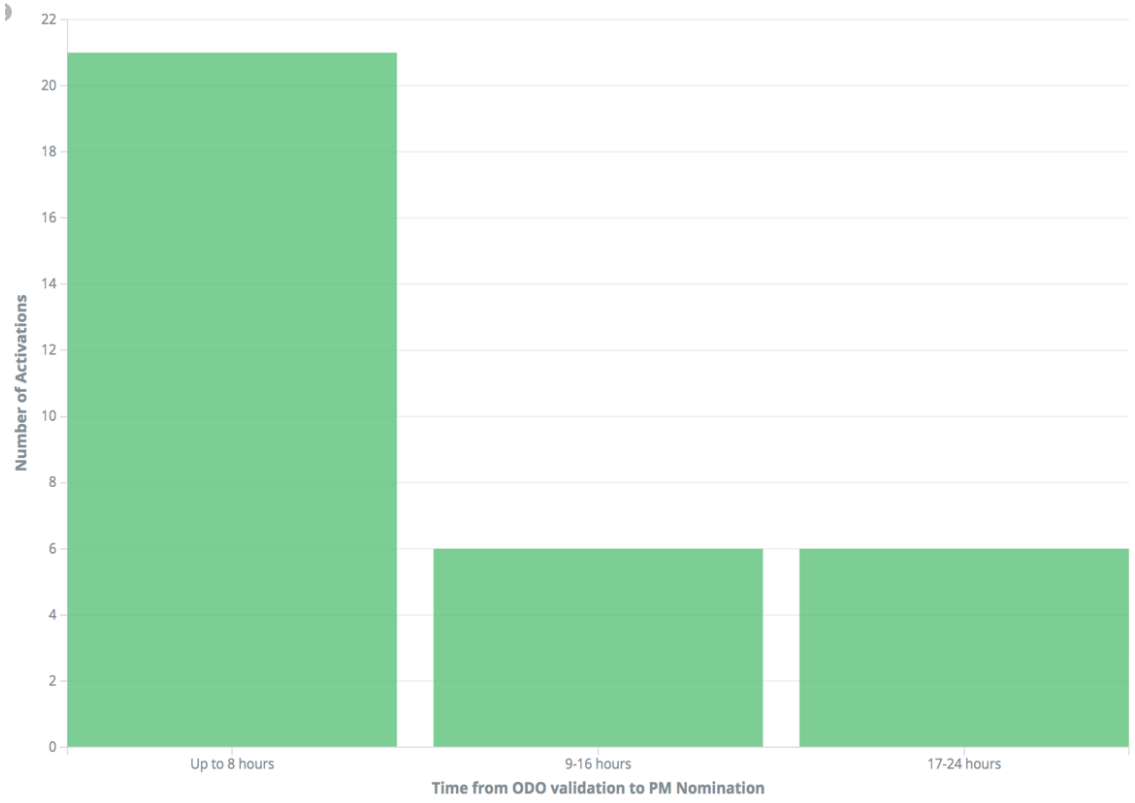


Figure 6-3. 2018 PM nomination time

For 2019, COS-2 will systematically monitor the Charter workflow and most of Charter performance parameters will be generated automatically.

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:

- Two Semi-Annual Refresher Exercises (SARE) supported by COS-2 addressed to ECO staff were held in 2018.
- 6 PM trainings were held for PMs in Germany, Beijing, the UK (3 sessions) and Vietnam. This allows a regular growth and commitment of PMs that will enhance the ability to assign a PM from the geographical region of the disaster.
- 5 AU trainings were organised by CNES, CONAE, CNSA, DLR, INPE, DMC-UKSA and KARI using COS-2 for new user organizations from United Arab Emirates, Madagascar, Paraguay, Peru and Sudan. The first online AU training, including COS-2, was provided by ESA. DMC-UKSA provided a refresher AU training to UK national users.

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

The Charter gathers feedback from end users in order to better understand how the service assists in disaster monitoring, and importantly, to identify possible improvements to the Charter service. End-user feedback is gathered by the PM and included in the PM reports.

The feedback received from activations in 2018 indicate that in general end users are satisfied with the Charter's service. Most of the products received are used in daily monitoring operations and additionally are used to support post-event analysis and training exercises.

On occasion, notably due to cloud cover over the region of interest, image sensor data cannot be used. Where applicable, radar data which are unaffected by local weather conditions, may be used. The Charter aims at providing the right type of data for a given activation scenario. On occasion, due to the specificity of the disaster event, it is not possible to satisfy the user's needs for satellite data. This was true for the volcanic eruption events, which took place in 2018. The Charter's enhanced operational system, COS-2, receives some positive feedback from the PMs.

Below are some examples of comments from PMs and end users:

Activation ID: 578
Event: Flood in Laos People's Democratic Republic, 24 July 2018
Requested by: UNITAR - UNOSAT on behalf of World Food Programme (WFP) and UNOOSA on behalf of the Dept. of Disaster Management and Climate of Laos.

Feedback from WFP:
The data and products were very useful to assess the scale of the flash flood events and support the early recovery activities like rapid food security and agriculture assessments. Volume of images was high and some cloudy scenes. Some issues downloading data due to local bandwidth capacity.

Activation ID: 582
Event: Flood in India, 16 August 2018
Requested by ISRO

Feedback from NRSC/ISRO:
The optical datasets provided were cloudy in the requested area of interest; however, the microwave datasets provided were fully utilised and we were quite satisfied with the quality and the quantity of the data supplied.

Activation ID: 562
Event: Volcanic eruption Philippines, 16 January 2018
Requested by Asian Disaster Reduction Center (ADRC) on behalf of the Philippine Institute Of Volcanology and Seismology (PHIVOLCS)

Feedback from PHIVOLCS:
DEM information is a priority, since PHIVOLCS and other similar agencies worldwide doing volcano monitoring are very keen to understanding ground deformations.

Activation ID: 576
Event: Volcanic eruption Guatemala, 5 June 2018
Requested by CONRED

Feedback from CONRED:
Radar satellites additional phase information (instead of only amplitude) would have been very helpful in order to analyze material depositions.

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 Twitter account. All Charter activations and news are distributed via tweets. Six thousand followers were counted by the end of 2018 (1,000 followers were gained in 2018, 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 2018, the following agencies took the lead function which rotates among Charter members on a six-month basis: the European Space Agency, ESA (October 2017 – April 2018), the European Organization for the Exploitation of Meteorological Satellites, EUMETSAT, and the German Aerospace Agency, DLR (April 2018 – October 2018), and the French Space Agency, CNES (October 2018 – May 2019). With the beginning of the leadership periods, the members of the Charter Board and the Executive Secretariat came together for their biannual meetings in Frascati, Italy in October 2017, in Darmstadt, Germany in April 2018 and in Toulouse, France in October 2018.

In total, the Charter has been triggered for 594 disasters in 125 countries between its inception in the year 2000 and the end of 2018. Throughout the reporting period, there were 33 activations in 24 countries, a figure slightly below the yearly average between 2007 and 2017. August and September were the months with the largest number of activations due to different types of disasters linked to meteorological events as well as solid earth movements. The Charter was triggered for the major earthquakes and tsunamis in Indonesia in August, September and December 2018, for Hurricanes Florence and Michael in the USA in September and October 2018, for the floods in Japan and India in June and August 2018, and for the volcanic eruptions in Guatemala and in Indonesia in June and December 2018.

Six Charter activations were among the 10 most severe natural disasters in 2018 as registered by CRED's EM-DAT. In 2018, the most catastrophic events were the major earthquake and tsunami in Indonesia in September 2018, killing 4,929 people, the floods in India killing 504 people, the earthquake in Indonesia in June 2018 killing 564 people and the volcanic activities in Guatemala and Indonesia respectively killing 425 and 453 people.

Following the request of the UAESA to become Charter member, supported by the MBRSC, representatives from UAESA introduced their organization during the 37th Charter Board meeting in Oxford, UK on 24-28 April 2017. The Charter Board accepted UAESA's application for membership and concluded that the Charter could significantly benefit from the resources offered. UAESA thus became the 17th member of the Charter. The Charter conducted the official signature ceremony, which marked the accession of UAESA to the Charter during the 39th Board meeting in Darmstadt, Germany on 19 April 2018.

Universal Access (UA) is gradually progressing. UA allows disaster risk management organizations worldwide to be granted Authorized User (AU) status. Madagascar, Paraguay, Peru and Sudan national users granted Charter access in 2018. Other candidates are under assessment or training. Sixty-four countries and the EC have dedicated AUs reaching a total of 73 user organizations able to directly request Charter activations by the end of 2018. Charter members have continued to promote UA and the Charter as a whole through their participation in different international events held in 2018.

The Charter also continued its collaboration with the CEOS Working Group on Disasters to allow CEOS Pilot teams to access Charter data in order to support their research, once an activation is closed. The Board requested to receive the activity reports of the CEOS WG Disasters Pilots and

the Recovery Observatory in order to have a better view of the WG activities and revise the existing agreement.

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.

Five Project Manager training sessions were organized by CNSA, DLR, CNES, ESA, and UKSA/DMCii 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 16th and 17th Charter newsletters were issued in 2018. 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.