

International Charter Space & Major Disasters



Annual Report 2017

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1 Introduction

1.1 Purpose and scope of this document

This document describes the 2017 activities of the International Charter “Space & Major Disasters”.

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 follows the following structure:

Chapter 1 - Introduction

Chapter 2 - The International Charter Space and Major Disasters; overview and lead agencies of the Charter in 2017

Chapter 3 – Charter operations; depicts internal business concerned with 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, progress, external relationships and 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, of system performance, products and services, user appraisal and communication.

Chapter 7 – Conclusions; outlines the significant achievements and conclusions 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
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	Authorised 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)
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)
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
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 Organisation 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
HDDS	(USGS) Hazards Data Distribution System
HR	High Resolution
INPE	National Institute for Space Research (Brazil)
ISRO	Indian Space Research Organization
ISS	International Space Station
JAXA	Japan Aerospace Exploration Agency
JPTM	Sentinel Asia Joint Project Team Meeting
KARI	Korea Aerospace Research Institute
LAPAN	National Institute of Aeronautics and Space (Indonesia)
MALHE	Ministry of Agriculture, Land, Housing and the Environment (Montserrat)
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 U.S. Foreign Disaster Assistance (USA)
ONEMI	Oficina Nacional de Emergencia del Ministerio del Interior (Chile)
PA	Partner Agency
PDC	Pacific Disaster Center (Hawaii, USA)
PM	Project Manager (of the Charter)
ROSCOSMOS	Russian State Space Corporation
SA	Sentinel Asia
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
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

1.5 Authors of the report

The report has been prepared by ESA (Philippe Bally and Theodora Papadopoulou), CNES (Claire Tinel), 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, 13 other space agencies joined between 2000 and 2017, namely (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 Organisation for the Exploitation of Meteorological Satellites, EUMETSAT
- Russian State Space Corporation, ROSCOSMOS
- Bolivarian Agency for Space Activities, ABAE

The lead 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 Charter provides a mechanism for the rapid tasking of satellites for immediate response after sudden major disasters, such as floods, earthquakes, tropical storms etc. Free satellite-based information is provided to national disaster management authorities and humanitarian organizations in order to support the immediate response to major natural or man-made disasters. The founding agreement of the Charter is intentionally limited in scope and thus not intended to serve the entire disaster management cycle (mitigation, preparedness, response and recovery). Long-term monitoring of severe environmental hazards such as droughts and non-environment-related humanitarian emergencies (e.g. acts of war, refugee crises etc.) are not covered.

The Charter has been activated for 561 disasters (as of the end of 2017), in 122 countries since its inception in 2000. In 2017 alone, the Charter was activated 44 times for disasters in 30 countries. These accomplishments are possible in part because of its narrowly defined scope.

The Charter gives access to a virtual constellation of satellites equipped with radar and optical sensors. In 2017, 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 and KOMPSAT-5.
- Optical (high resolution and very high-resolution sensors): UK-DMC2, Deimos-1, Landsat 7 and 8, VRSS-1, SPOT-6, SPOT-7, PLEIADES 1A and 1B, PROBA-V, SJ-9A, GF-1, GF-2, FY-3C, CBERS-4, KOMPSAT-2, KOMPSAT-3, IRS-P5 (Cartosat-1), Cartosat-2, Resourcesat-2, Resourcesat-2a, RapidEye, Kanopus-V, Kanopus-V-IK, Resurs-P, Suomi NPP and Sentinel-2A/B.
- Optical (medium and low-resolution sensors): POES, GOES, Metop series, Meteosat Second Generation (MSG) and Meteor-M.

In 2017:

- The second mission of the Sentinel-2 constellation (Sentinel-2B) was launched in March 2017.
- Kanopus-V-IK was launched in July 2017 and was added to the Charter constellation.
- Meteosat-7, the last mission of the Meteosat First Generation constellation was decommissioned in April 2017.

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)
ABAE	VRSS-1
CNES	PLEIADES 1A & 1B
	SPOT-6, SPOT-7
CSA	RADARSAT-2
CNSA	GF-1
	GF-2, SJ-9A, FY-3C
DLR	TerraSAR-X / TanDEM-X
	RapidEye
UKSA/DMC	UK-DMC2
	Deimos-1
ESA	Sentinel-1A/B
	Sentinel-2A/B
	PROBA-V
EUMETSAT	Metop Series Meteosat MSG
INPE	CBERS-4

Agency	Satellite (operational)
ISRO	Oceansat-2
	Resourcesat-2
	Resourcesat-2a
	Cartosat-1 (IRS P5)
	Cartosat-2
JAXA	ALOS-2
KARI	KOMPSAT-2
	KOMPSAT-3 KOMPSAT-5
NOAA	POES
	GOES
	Suomi NPP
ROSCOSMOS	Kanopus-V Kanopus-V-IK
	Meteor-M
	Resurs-P
USGS	Landsat 7 and 8
	WorldView-1/2/3/4
	GeoEye-1

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

Archived data from inactive satellites (ALOS, RADARSAT-1, Resurs-DK) remain available for use in Charter activations (Table 2-2).

Agency	Satellite (archive only)
CSA	RADARSAT-1
JAXA	ALOS (PRISM, AVNIR-2)
	ALOS Palsar
ROSCOSMOS	Resurs-DK

Table 2-2. List of satellites archives available for the Charter [optical (in grey) and radar (in light blue)]

2.2 Lead agencies of the Charter in 2017

During this period, the lead agencies on a biannual rotational basis have been the Russian State Space Corporation, ROSCOSMOS (October 2016 – April 2017), the UK Space Agency, UKSA (April 2017 – October 2017), and the European Space Agency, ESA (October 2017 – April 2018).



Figure 2-1. 37th Charter Board and Executive Secretariat members in Oxford, UK, April 2017.

3 Charter operations

3.1 Charter activations

In 2017, the Charter was activated 44 times, covering disasters in 30 countries.

The Charter was triggered for the major earthquake in Iran and Iraq on 12 November 2017 that killed 630 people. Also, it was triggered for Hurricane Irma in Haiti, Dominican Republic, USA and the British Virgin Islands / Anguilla (in total 4 activations) in early September 2017 and for Hurricane Maria in Dominica, Dominican Republic, Puerto Rico / US Virgin Islands and Martinique / Guadeloupe (in total 4 activations) in mid-September 2017. Besides USA, Dominican Republic, France and UN, several other Charter AUs and end users e.g. the Governor's Texas Emergency Management Council, the Federal Emergency Management Agency (FEMA), the Civil Protection Directorate of Haiti, United Nations Disaster Assessment and Coordination (UNDAC), the Deputy Special Representative of the Secretary General (DSRSG) Office in Haiti, the United Nations Office for the Coordination of Humanitarian Affairs (UNOCHA) requested to receive the Charter products in order to assist their aid teams send to the affected areas. Moreover, several organizations provided value-added products (e.g. UNITAR/UNOSAT, SERTIT, EIGEO, ROSCOSMOS). 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).

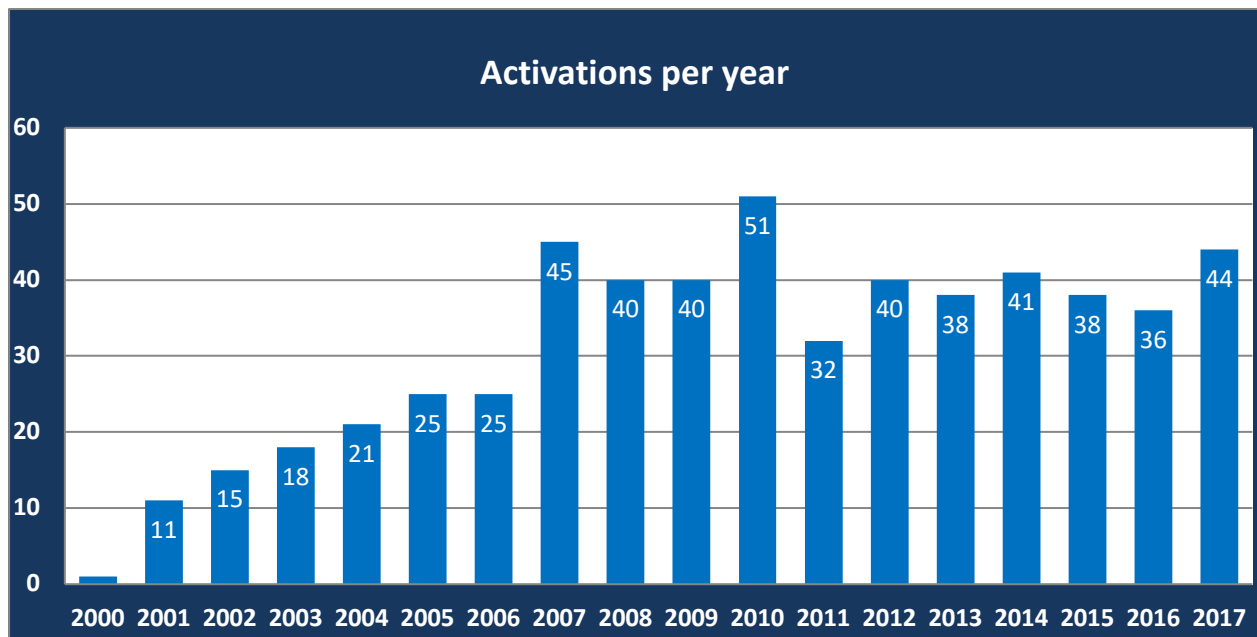


Figure 3-1. Number of Charter activations per year (2000 - 2017)

By the end of 2017, the Charter had been triggered for 561 disasters in 122 countries since 2000 (Figure 3-2 a, b, c).

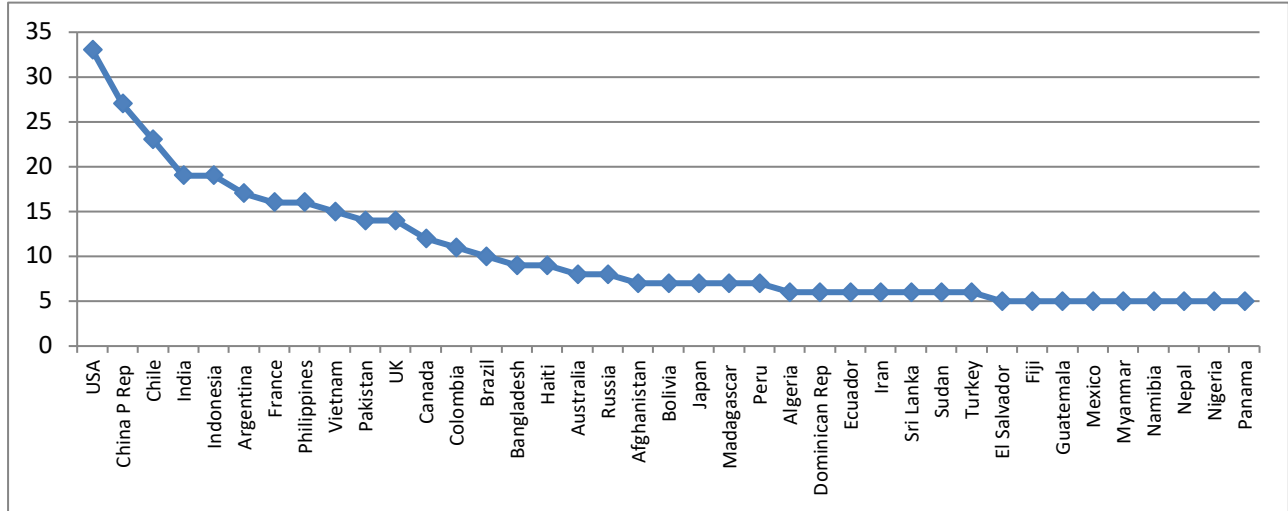


Figure 3-2 a) 2000-2017 breakdown of Charter activations by country (countries with 5 or more activations)

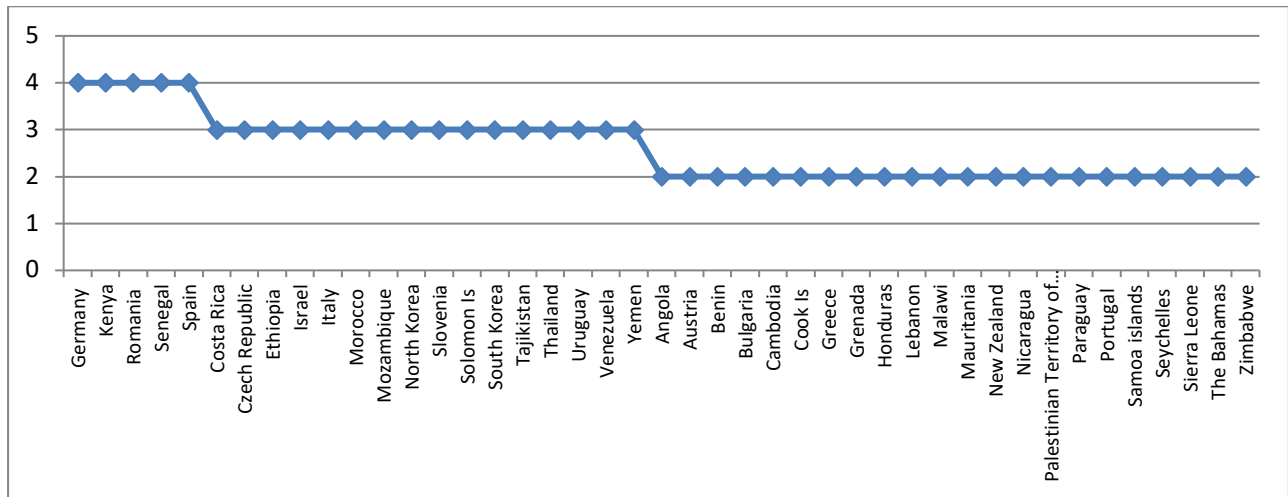


Figure 3-2 b) Continuation of Figure 3-2 a) 2000-2017 breakdown of Charter activations by country (countries with 2 to 4 activations)

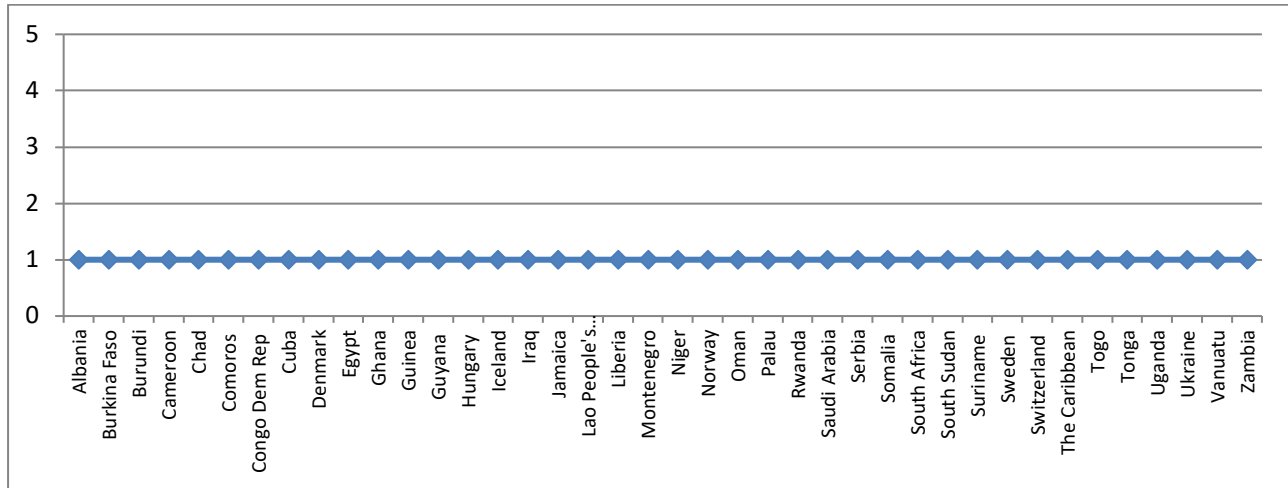


Figure 3-2 c) Continuation of Figure 3-2 b) 2000-2017 breakdown of Charter activations by country (countries with 1 activation)

122 Countries around the world have benefited from the International Charter since 2000. USA, China, Chile, France, India, Indonesia, Argentina, France, Philippines, Vietnam, Pakistan, UK, Canada, Colombia and Brazil are the hazard affected countries for which the Charter was activated most often (>10) to cover major disaster events during these 17 years, while 68 % of countries requested the Charter less often (1 to 4 activations in 17 years).

All 2017 activations are listed in Table 3-1. 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, 46 requests were received in 2017:

In two cases, two calls were merged in one activation, respectively, as these requests had been made for the same disaster events:

- Calls 630 and 631 were requested for Hurricane in Haiti by UNOOSA on behalf of UN Haiti and also by the Deputy Special Representative of the Secretary General (DSRSG) Office and COGIC.
- Calls 636 and 637 were requested for earthquake in Mexico by UNITAR/UNOSAT on behalf of UNOCHA and by USGS on behalf of the Centro Nacional de Prevención de Desastres (CENAPRED).

Act. No.	Type of disaster	Country	Date of the event
518	Wildfire	Argentina	2017-01-05
519	Wildfire	Chile	2017-01-24
520	Earthquake	Philippines	2017-02-13
521	Flood	Madagascar	2017-03-06
522	Ocean Storm	Australia	2017-03-29
523	Flood	Peru	2017-03-31
524	Flood	Colombia	2017-04-01
525	Flood	Argentina	2017-04-12
526	Flood	Dominican Republic	2017-04-24
527	Flood	Haiti	2017-04-25
528	Other (missing vessel)	Brazil	2017-04-26
529	Flood	Canada	2017-05-06
530	Flood	Chile	2017-05-13
531	Wildfire	Russia	2017-05-25
532	Flood	Russia	2017-05-26
533	Flood	Sri Lanka	2017-05-27
534	Flood	Bangladesh	2017-05-30
535	Flood	Uruguay	2017-06-06
536	Wildfire	South Africa	2017-06-12
537	Flood	Honduras	2017-06-13
538	Landslide	China P Rep	2017-06-24
539	Wildfire	Montenegro	2017-07-25
540	Flood	Venezuela	2017-08-06
541	Flood	Vietnam	2017-08-07
542	Earthquake	China P Rep	2017-08-09
543	Earthquake	China P Rep	2017-08-09
544	Flood	Nepal	2017-08-15
545	Flood	Sierra Leone	2017-08-15
546	Flood	Bangladesh	2017-08-15
547	Ocean Storm	USA	2017-08-24
548	Ocean Storm	The Caribbean	2017-09-05
549	Ocean Storm	Dominican Republic	2017-09-05
550	Ocean Storm	USA	2017-09-06
551	Ocean Storm	Haiti	2017-09-07
552	Ocean Storm	France	2017-09-18
553	Ocean Storm	Dominica	2017-09-18
554	Ocean Storm	USA	2017-09-19
555	Ocean Storm	Dominican Republic	2017-09-19
556	Earthquake	Mexico	2017-09-20
557	Ocean Storm	Vietnam	2017-11-06
558	Earthquake	Iran	2017-11-12
559	Earthquake	Iraq	2017-11-12
560	Earthquake	South Korea	2017-11-15
561	Detect and rescue of submarine	Argentina	2017-11-17

Table 3-1. List of 2017 Activations

3.1.1 Monthly activations

During 2017, the monthly average of activations was 3.6. Figure 3-3 shows the monthly distribution of activations throughout 2017. The highest number occurred in August and September corresponding to 42.5% of the total number. The remaining months of 2017 saw a number of activations that varied from 1 to 6, while in October and December there were no activations.

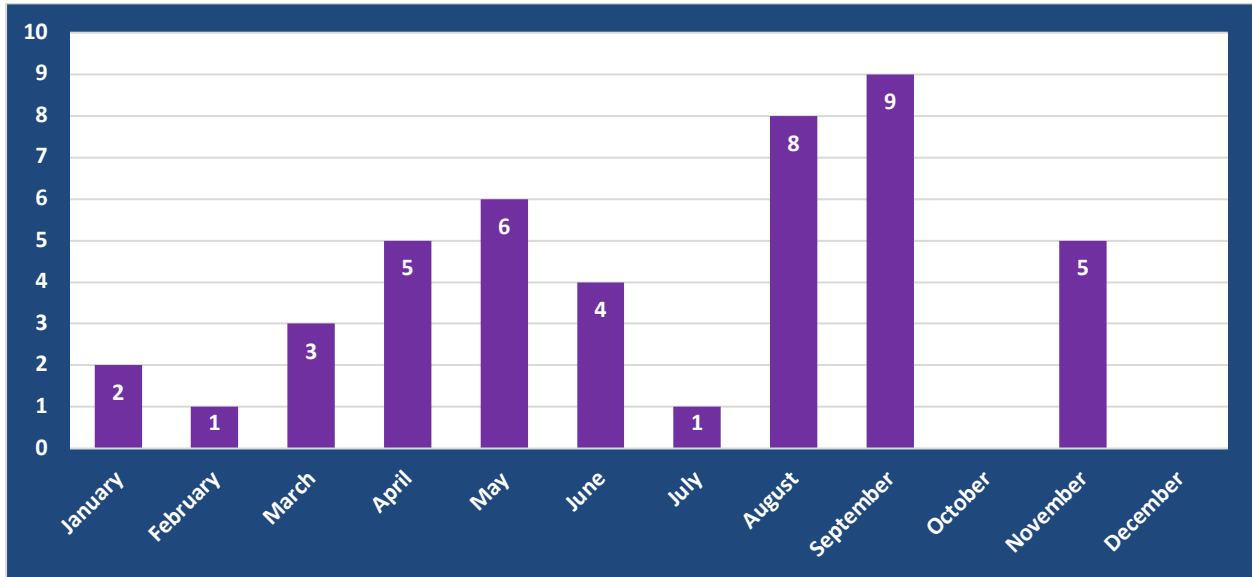


Figure 3-3. Distribution of the Charter activations by month in 2017

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; consecutive floods; tropical storms; fire) in Asia, Central and South America. The peak of activations in August 2017 was due to different types of disasters linked to meteorological events (floods in Asia, Africa, South and North America) as well as solid earth movement (earthquakes in Asia). Peaks of activations in September 2017 were linked to meteorological events and in particular, the Charter was activated 8 times for hurricanes Irma (4) and Maria (4) in Central America.

In order to find an overall trend through the years, the following diagram shows the number of activations per month for year 2017 in comparison to the monthly average number of activations for the period 2007-2017. The 2007-2017 diagram clearly shows the peak of activations at the end of summer and in early autumn. The 2017 curve follows the 2007-2017 average curve and in particular, it has a great impact on it with the highest number of activations being in August and September. In contrast, lack of activations in October 2017 is noted for the first time since 2000. This is maybe due to the fact that the hurricane season in the Caribbean began earlier in 2017 than in previous years.

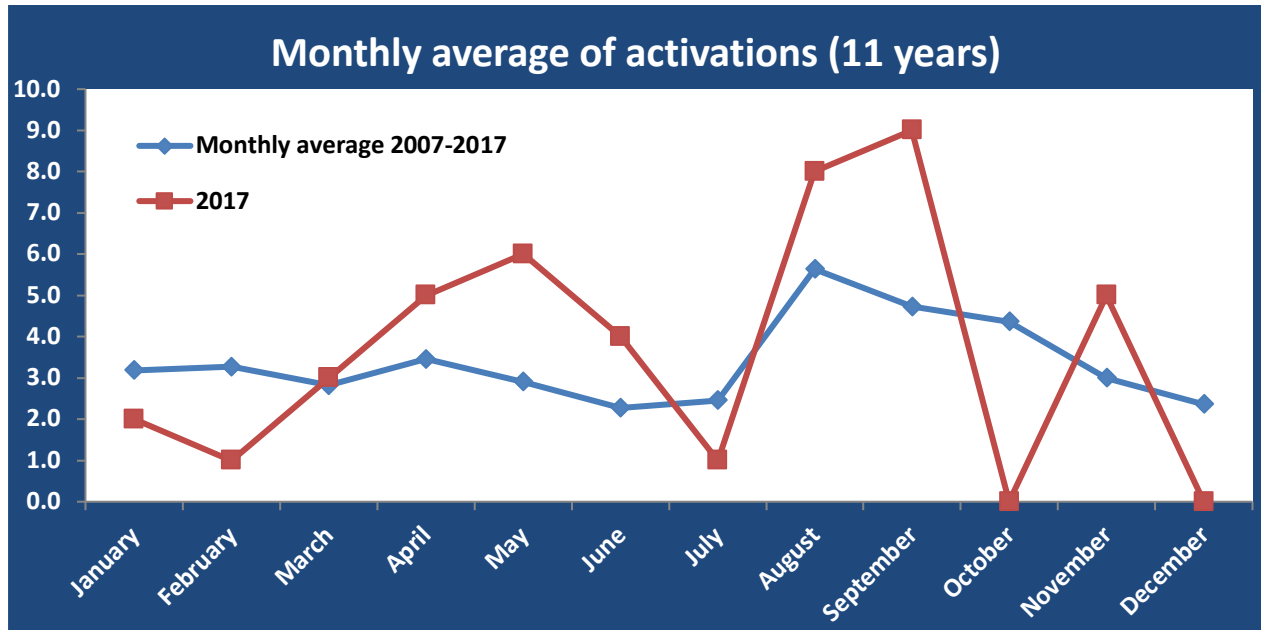


Figure 3-4. Number of 2017 activations per month (in comparison to the average number of activations) for the period 2007-2017

3.1.2 Geographical distribution

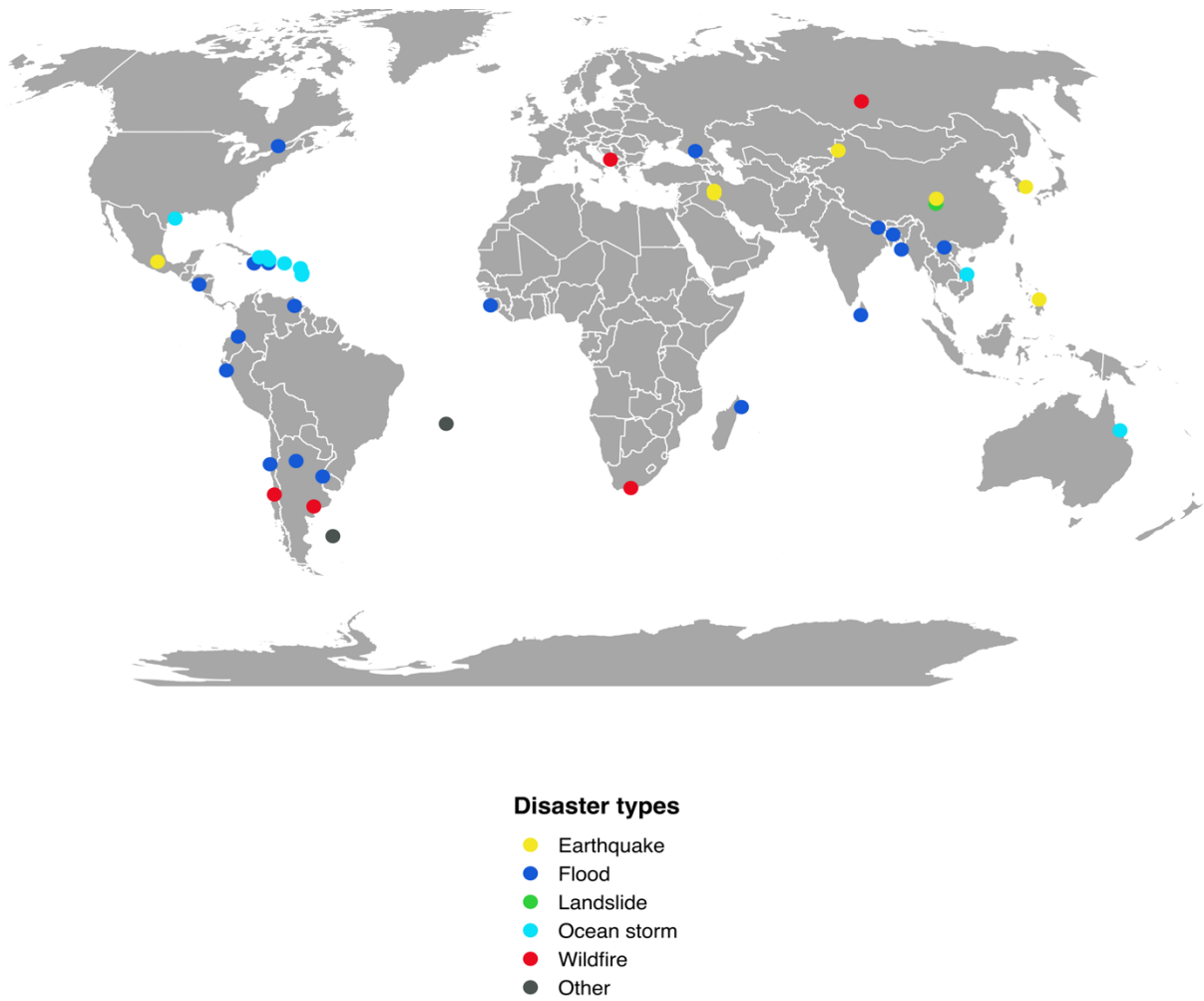


Figure 3-5. Location of the 2017 activations (by hazard type)

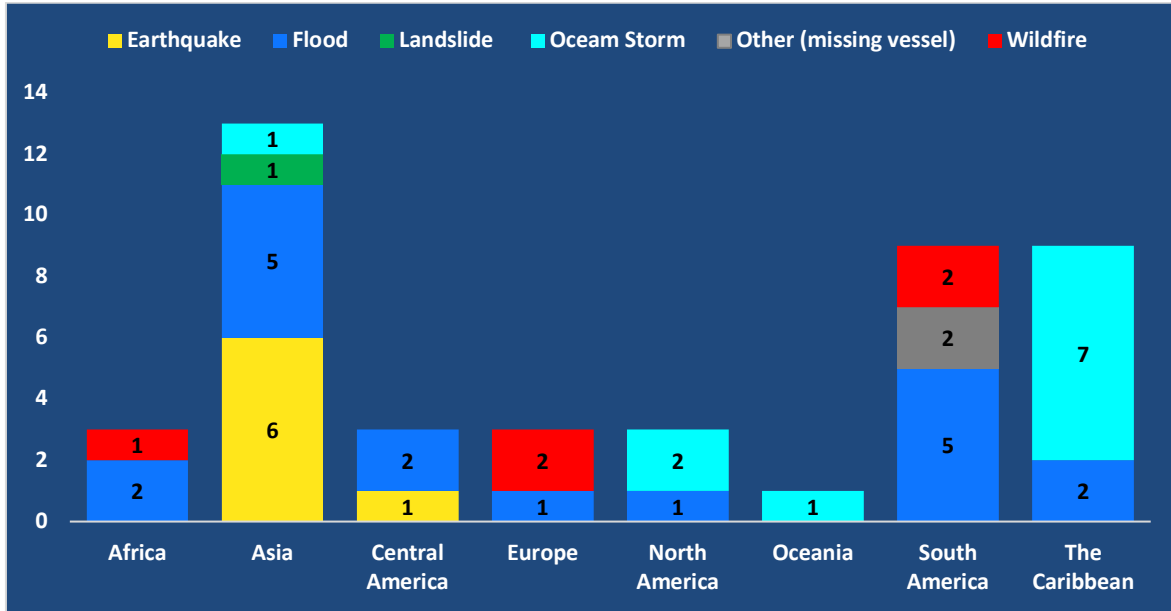


Figure 3-6. 2017 - Number of activations by continent/subcontinent and hazard type

In 2017, the activations breakdown per region was as follows: 13 in Asia; 9 in South America and 9 in the Caribbean; 3 in Africa, 3 in Central America, 3 in North America and 3 in Europe; 1 in Oceania (Figures 3-5 & 3-6) with the most frequent hazard types being floods (39%) and ocean storms (27%) while solid earth-related hazards represented 18%, wildfires 11% and other types of hazards 5% (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 well as floods and landslides, etc.

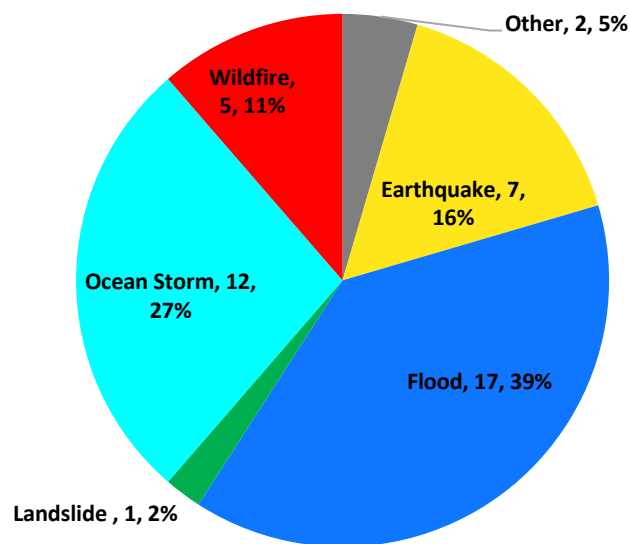


Figure 3-7. 2017 Number of activations by hazard type

As shown below (Figure 3-8), since 2000 the Charter has been frequently activated for weather-related disasters such as floods, ocean and wind storms, landslides triggered by heavy rainfall or floods, wildfires, ice/snow hazard – representing 78% of all Charter activations - while solid earth-related hazards (e.g. earthquakes, volcanic eruptions) represent 17% of all Charter activations. Activations for oil spills and industrial accidents are marginal. See also the maps in Figures 3-9a and 3-10a showing the geographical distribution of Charter activations by weather-related hazards and solid earth-related hazards for the 2000-2017 period.

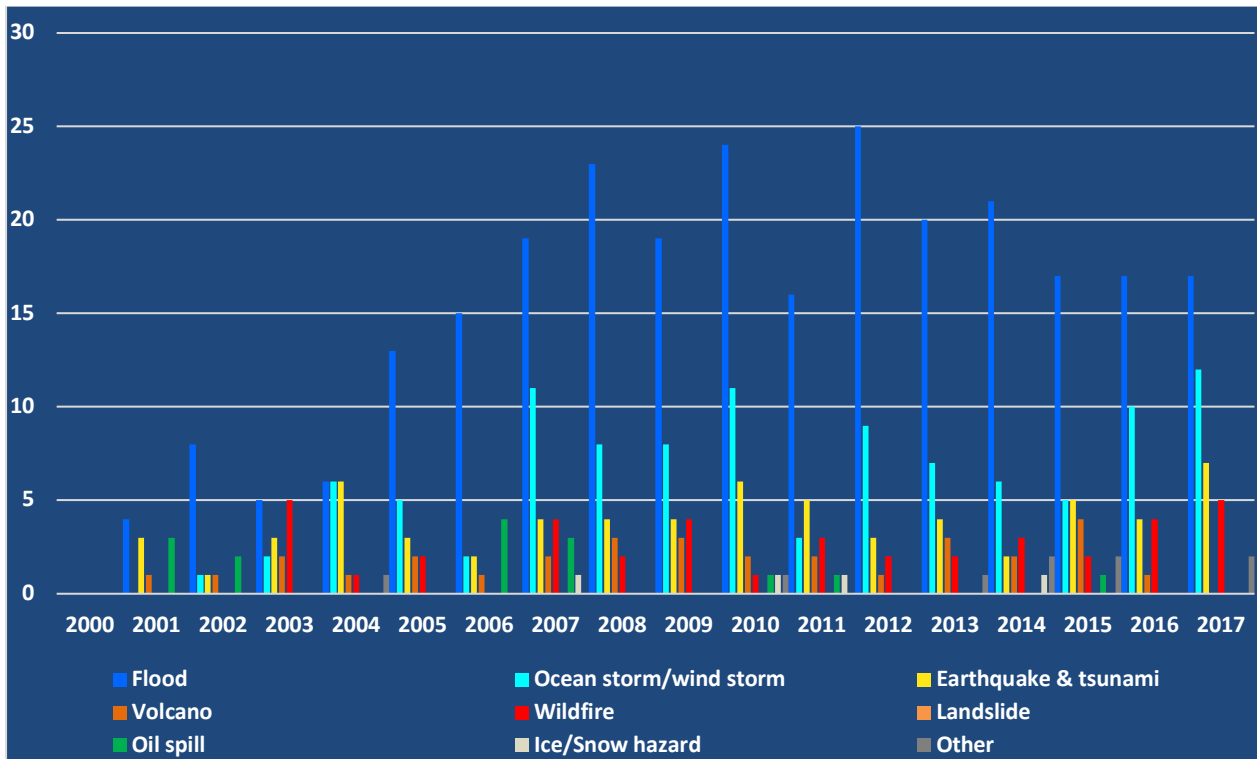


Figure 3-8. 2000-2017 Distribution of activations by hazard type

The following map shows by country the number of Charter activations caused by hydro-meteorological related events for the period of 2000-2017 (436 activations out of 561 activations in total = 78 %).

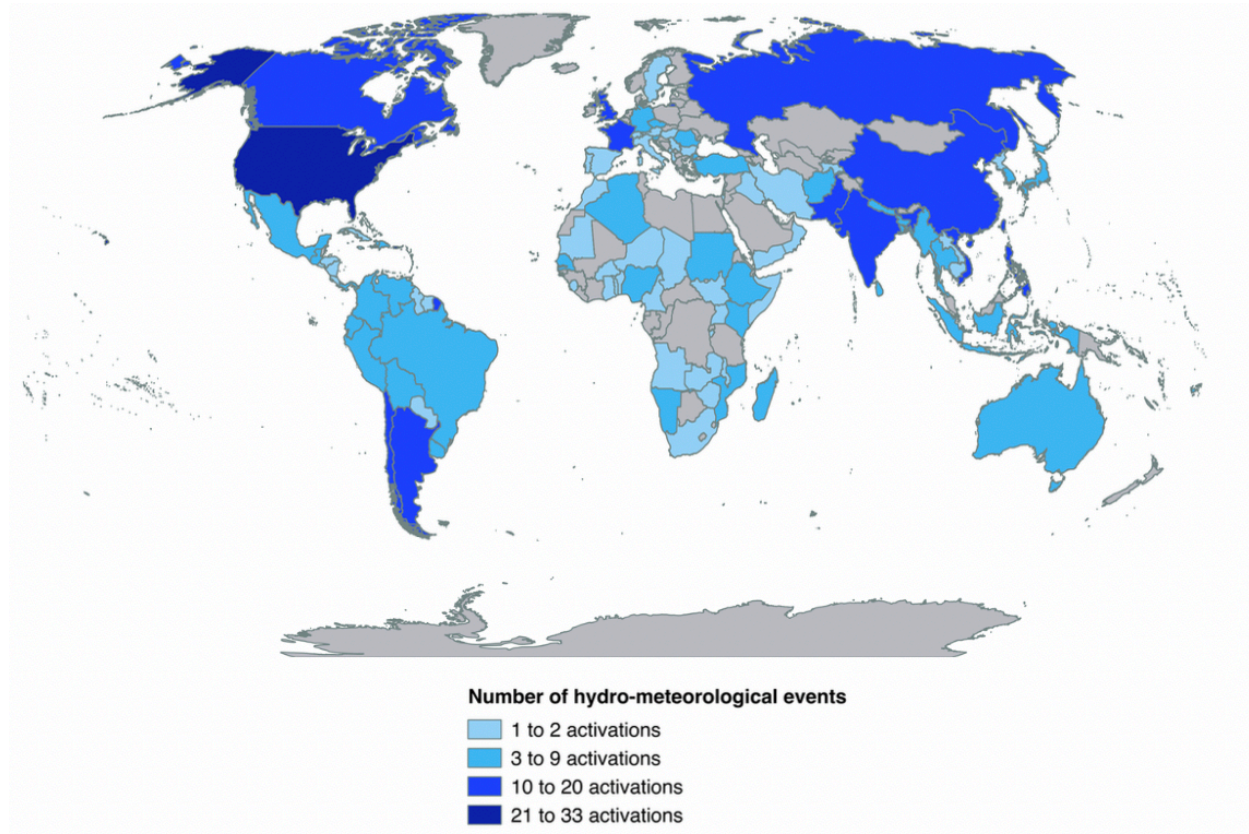


Figure 3-9a. 2000-2017 Number and geographical distribution of Charter activations due to hydrometeorological events (floods, ocean storms, wind storms, landslides caused by heavy rains, wildfires, snowfall and ice jam).

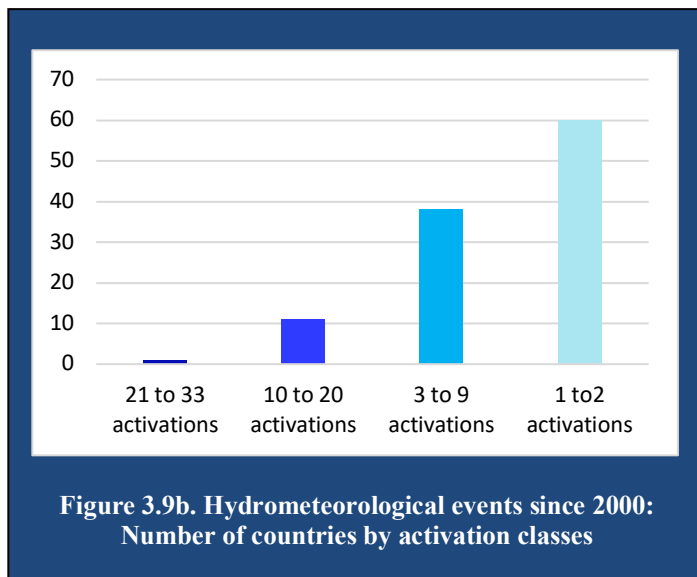


Figure 3.9b. Hydrometeorological events since 2000: Number of countries by activation classes

In total 110 countries benefited from the Charter service for hydrometeorological disasters since 2000. USA, Argentina, France, China, India and Vietnam used the service most frequently (Figure 3.9b).

The following map shows by country the number of Charter activations (97 activations out of 561 activations in total = 17 %) caused by solid-earth related events for the period 2000-2017.

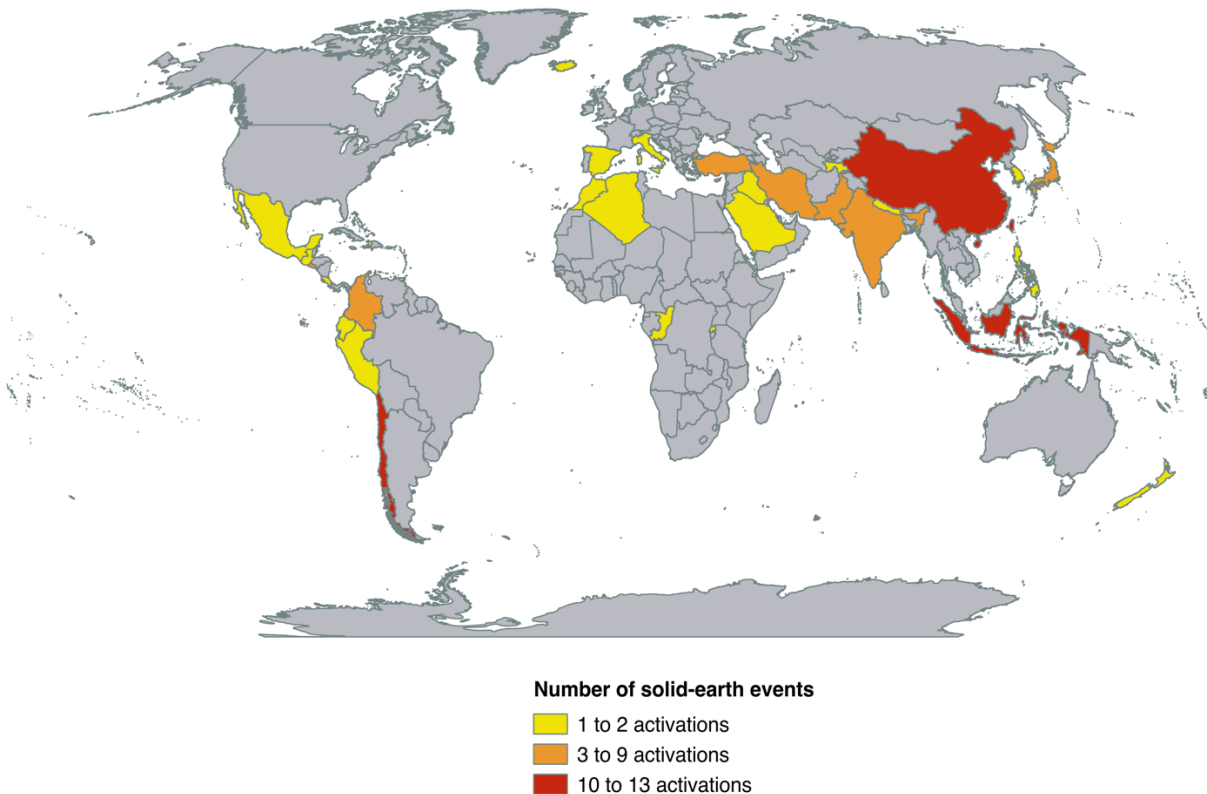
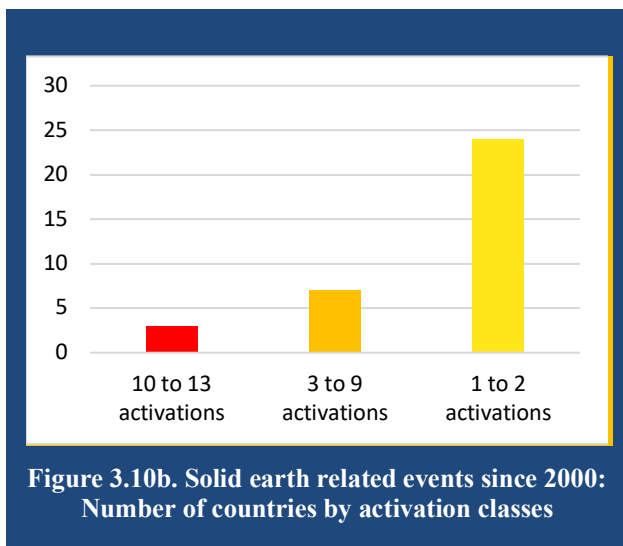


Fig 3-10a. 2000-2017 Number and geographical distribution of Charter activations due to solid earth related events (earthquakes, tsunamis, volcanic eruptions, landslides caused by earthquake)



In total 34 countries benefited from the Charter service for solid-earth events since 2000. Chile, Indonesia and China are countries for which the Charter was activated frequently (8-13 activations) and they are located along important active faults (Figure 3.10b).

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

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

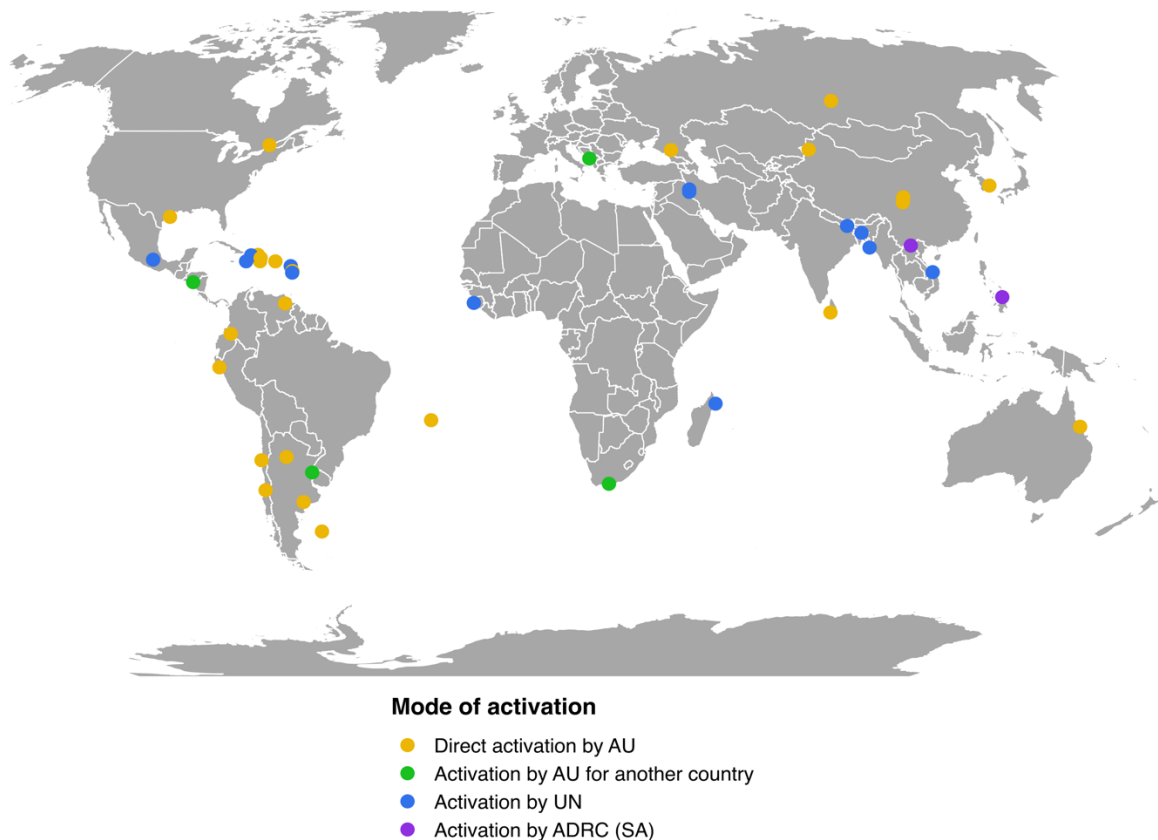


Figure 3-11. Location of the 2017 activations (per Mode)

In 2017, Mode 1 was used for disasters in Asia, South, Central and North America and Oceania; Mode 2 was used for disasters in Africa, Europe, South and Central America; Mode 3 was used for disasters in South and Central America, Africa and Asia. By definition, Mode 4 was used in Asia (Figure 3-11). Australia, Dominican Republic, Colombia, Chile and Sri Lanka have activated the Charter for floods, ocean storms and wildfires in 2017, respectively, thanks to their AU status achieved through the Charter's Universal Access initiative.

In 2017, activations by an AU (Modes 1 & 2) were the main access modes (65.9% in total) while UN activations (Mode 3) represented 29.55% and Sentinel Asia activations (Mode 4) represented 4.55% of the total number of activations (Fig. 3-12).

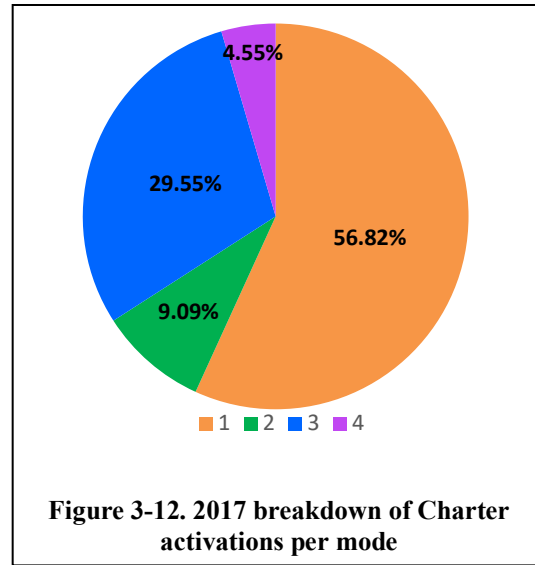


Figure 3-12. 2017 breakdown of Charter activations per mode

The diagram in Figure 3-13 compares the relative weight of the different access mechanisms adopted from 2001 to 2017, used to request the International Charter service. Since its inception, 97 countries without AUs have benefited from the Charter and 57.6% of the activations were requests on behalf of a user (AUs for another country, UN or Sentinel Asia) in countries without an AU.

The International Charter continues to support users worldwide, including countries without direct access (through activations in Modes 2, 3, and 4). At the same time, the number of AUs increases thanks to the Universal Access process, which changed the relative weight between the activation modes. By the end of 2017, mandated organisations of 16 countries prone to natural disasters have become AUs after a registration and training process under the Charter’s Universal Access procedure.

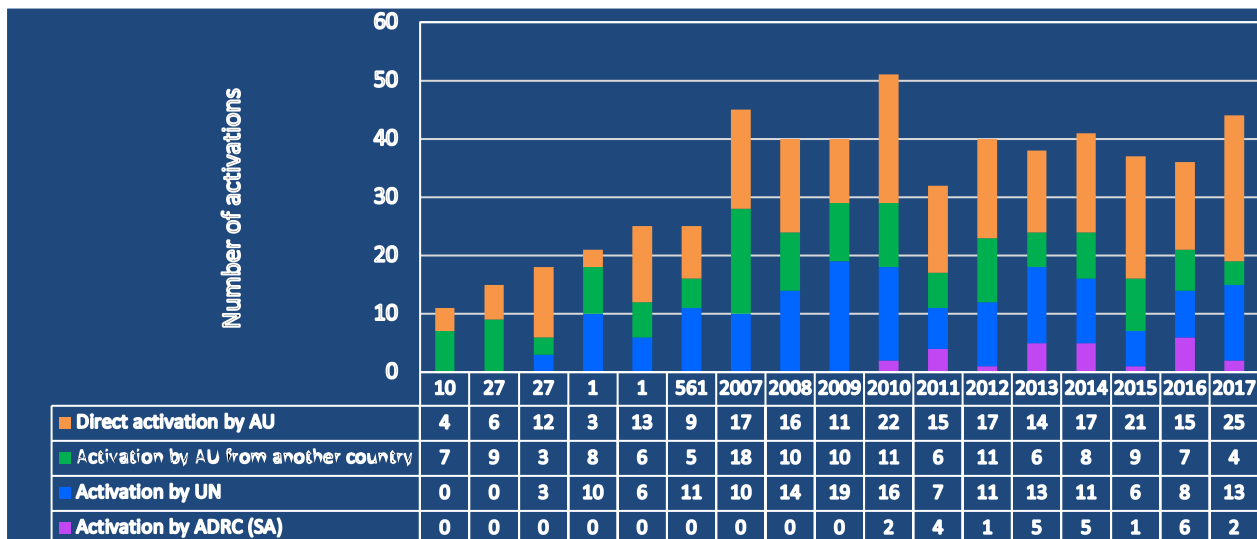


Figure 3-13. 2001-2017 number of Charter activations per mode

3.2 Resource report

3.2.1 EO data consumption in 2017

In 2017, a total of 3,628 optical and radar data images (2016: 2,958 for 36 activations, 2015: 2,753 for 38 activations) were provided by the Charter members (Figures 3-15 & 3-16, Table 3-2 & Table 3-3) with 2774 Optical images and 854 SAR images; this is complemented by 13,920 images of US VHR optical satellites (GeoEye, WorldView1, 2 and 3) that were supplied (Figure 3-17, table 3-4) for 44 activations in 29 countries (2016: 14,430, 2015: 10,935). Figure 3-14 shows the total number of EO data from the Charter virtual constellation and the US VHR optical data provided in 2017 by disaster type. A high number of the US VHR data was delivered to support the floods and damages that occurred after the passage of Hurricanes Harvey in August 2017 and Irma and Maria in September 2017 (25% of US VHR data).

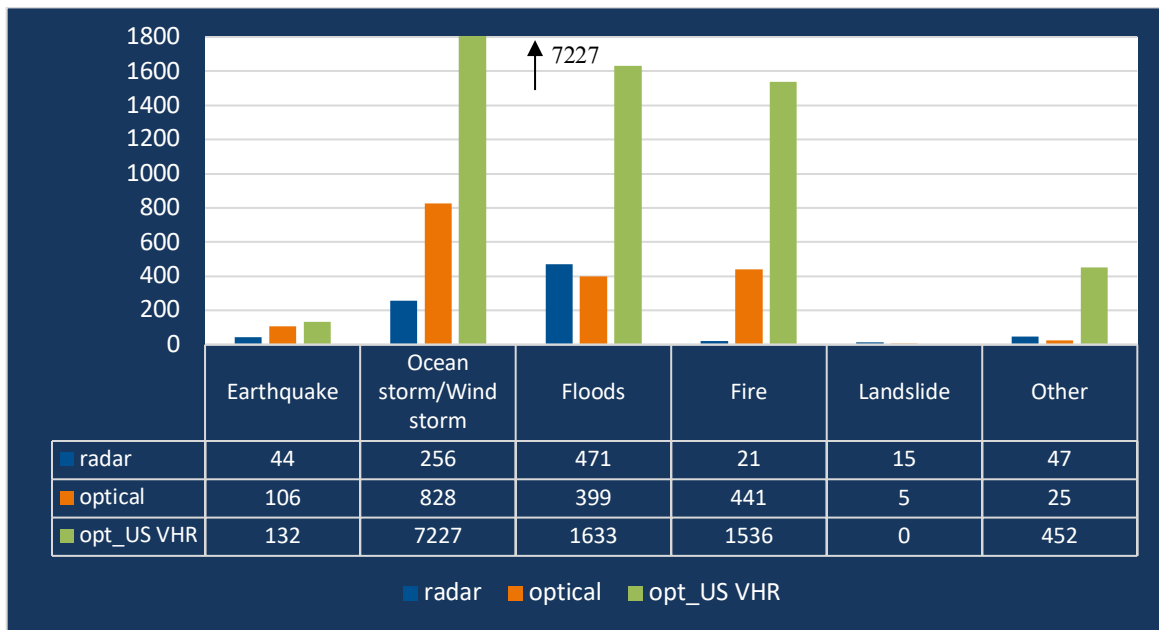


Figure 3-14. 2017 EO data of the Charter virtual constellation and US VHR optical data grouped by disaster type

Differences in the amount of EO data delivered by the agencies year by year are linked to the annual number of activations, the type of disasters, the sizes of the AOIs, 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 resulting from the very different characteristics of different EO systems - such as the spatial resolution, ground coverage of the images, cloud screening procedures, time performance etc. – the total numbers of images of the different satellites alone do not adequately express the relative importance and contribution of a system to the overall capacity provided by the Charter.

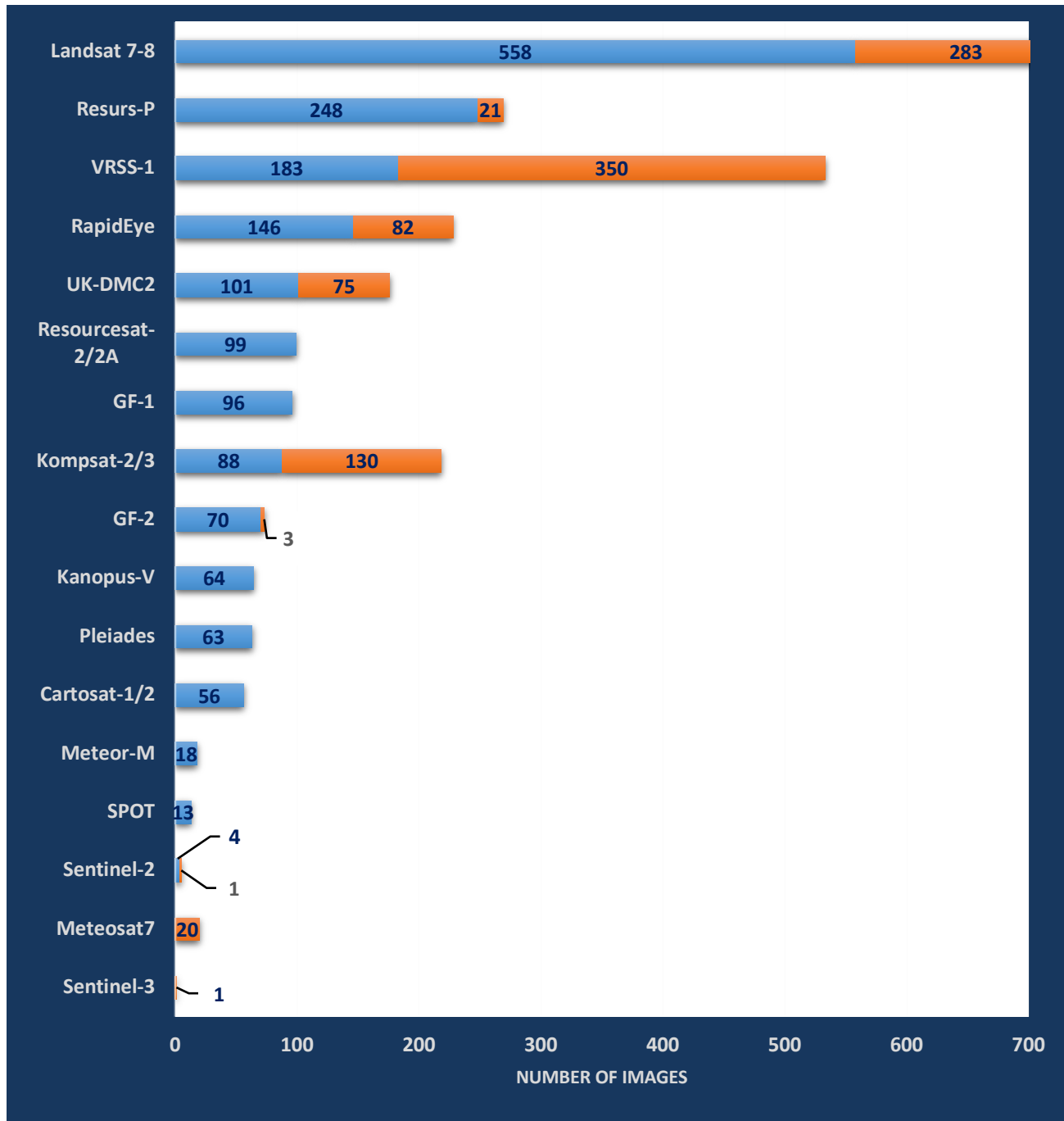


Figure 3-15. 2017 Data Consumption (number of archive images is in orange and number of newly acquired images is in blue) - Optical sensors

A total of 966 archive images were provided by the Charter members, this is twice higher than last year (compared to 515 images in 2016, RapidEye, KOMPSAT-2/3 and VRSS-1 have considerably increased their providing of archive images).

The total of newly acquired images providing by the Charter members was about the same in 2017 (1820) and 2016 (1808).

Resource	Sentinel-3	Sentinel-2	SPOT-6/7	Meteor-M	Meteosat-7	Pleiades	Cartosat-1/2	Kanopus-V	GF-2	GF-1	Ressourcesat-2/2A	UK-DMC2	KOMPSAT-2/3	RapidEye	Resurs-P	VRSS-1	Landsat 7-8
Total number of delivered data	1	5	13	18	20	46	56	64	73	96	99	176	218	228	269	533	841
Archive (pre-event)	1	1	0	0	20	0	0	0	3	0	0	75	130	82	21	350	283
Newly acquired (post-event)	0	4	13	18	0	46	56	64	70	96	99	101	88	146	248	183	558
<i>Max. number of images per activation</i>	1	2	5	14	20	4	11	8	20	30	17	14	36	58	35	69	401

Table 3-2. Statistics for Optical sensors (Charter virtual constellation)

Even with a lower total of images compared to 2016, Landsat data (7 and 8) still represents an important optical resource with a total of 841 images.

VRSS-1 data also represents an important optical resource with a total of 533 images (compared to 242 images provided in 2016), contributing to 4 of the 44 activations (activations for Hurricanes Irma and Maria in September 2017).

Contribution of the other optical sensors (low spatial resolution to high spatial resolution) varies from 1 to 269 images in total depending on the disaster type, spatial resolution and ground coverage of the images, etc.

The first Sentinel-3 satellite was launched in June 2016 and was integrated in the Charter constellation in 2017. The first Sentinel-3 images provided through the Charter supported the activation for flood in Peru in March.

GF-2 was launched in August 2014 and was added to the Charter constellation in 2107. The first Charter delivery of GF-2 data took place in May 2017 for the damages caused by tropical cyclone MORA-17.

Almost half of the RapidEye images were provided for the Charter activation due to widespread Fires in Chile in January 2017). RapidEye images are delivered not as full scenes but in the form of image tiles (sub scenes), which leads to relatively large numbers.

Also, GF-1 and Resourcesat-2/2a were to a large extent provided for the Chile Fire activation in January 2017. Contributions of UK-DMC2 and Kanopus-V are two times higher than in 2016.

SPOT-6/7, Meteosat7, Cartosat-1/2 and Resurs-P have contributed in the same manner as in 2016. It is worth-noting that RapidEye, Resurs-P and KOMPSAT-2/3 contributions have exceeded 200 images. The contributions of Pléiades, KOMPSAT-2/3, Landsat7-8, Meteosat 7-10 and Metop-B are slightly lower than those in year 2016. Despite those lower contributions, Pléiades, KOMPSAT-2/3 and Landsat7-8 images respectively supported for 33, 26 and 36 activations out of 44.

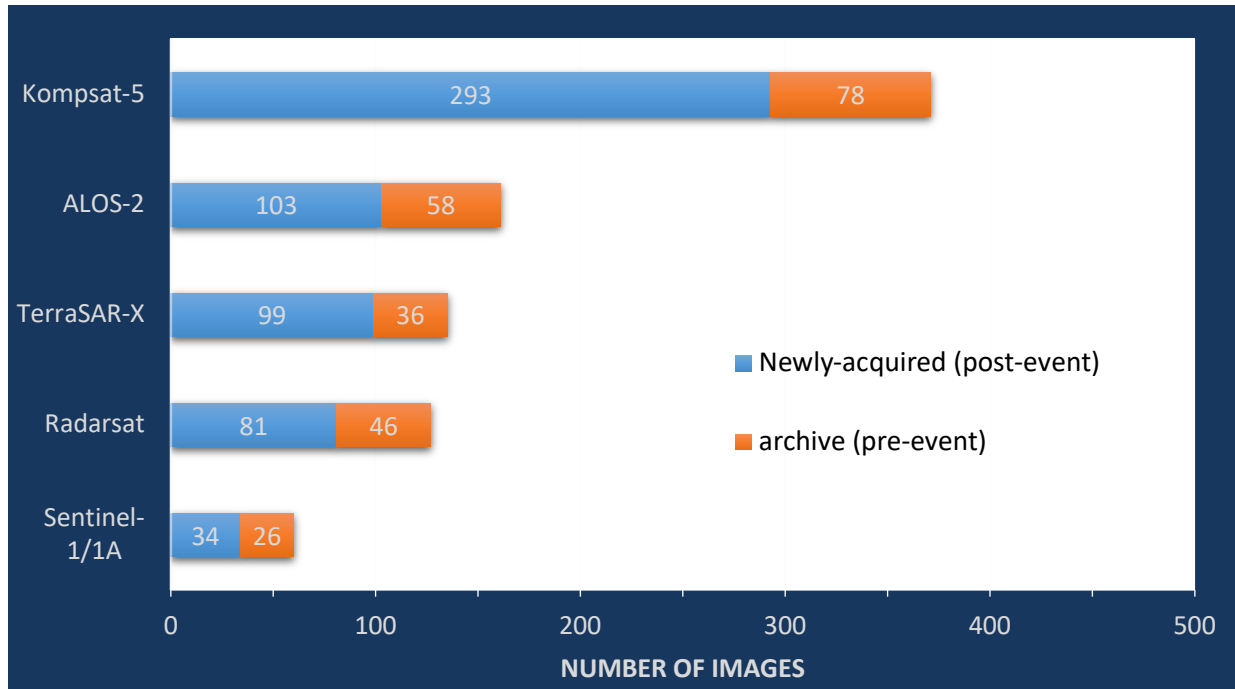


Figure 3-16. 2017 Data Consumption (archive and newly-acquired) - Radar sensors

Kompsat-5 data contribution (added to the Charter constellation in August 2016) was significantly higher than last year (almost 10 times higher for archive images, and 1.5 times higher for newly-acquired images; it is worth-noting that the numbers of 2016 concerns a 6-month period).

The contribution of Sentinel-1/1A data is two times higher than in 2016 (25 images).

The contribution from ALOS-2 has increased in terms of newly-acquired images (72 in 2016).

For TerraSAR-X/TanDEM-X and RADARSAT-2, the number of scenes delivered has slightly increased compared to 2016.

55% of radar data was used to monitor the 18 flood events. In the cases of flood disasters, radar satellite imagery often brings most benefit to emergency response, because radar systems are able to monitor the extent of flooded areas independent from the weather conditions.

Resource	Sentinel-1	RADARSAT - 1/2	TerraSAR-X/ TanDEM-X	ALOS-2	KOMPSAT-5
Total number of delivered data	60	127	135	161	371
Archive (pre-event)	26	46	36	58	218
Newly-acquired (post-event)	34	81	99	103	293
<i>Max. number of images per activation</i>	<i>2</i>	<i>4</i>	<i>16</i>	<i>29</i>	<i>49</i>

Table 3-3. 2017 Statistics for Radar sensors

For EO satellite missions with open data policies (e.g. the Copernicus Sentinel-1, Sentinel-2), the exact number of used images cannot be traced. The actual number of Sentinel-1 images accessed and used in 2017 is significantly higher than the number figuring in 3-16 (60 is the number of traceable images). ESA is developing a system to account and trace the number of Sentinel images accessed.

In total, 13920 images of US VHR optical satellites (GeoEye-1, WorldView-1, 2 and 3) were supplied in 2017. US VHR imagery was delivered to the Charter by the USGS using the HDDS system (Figure 3.17, table 3-4).

The WorldView-1/2/3 contributions were higher (26% more) than in 2016 (13344 compared to 10354).

There was no contribution from neither IKONOS nor QuickBird data.

The number of GeoEye data delivered is slightly higher compared to 2015 (516). 34% of the WorldView data provided were used to support floods and damages caused by both hurricanes Irma and Maria in September 2017. 19% of the WorldView data were provided for supporting floods caused by Hurricane Harvey in August 2017.

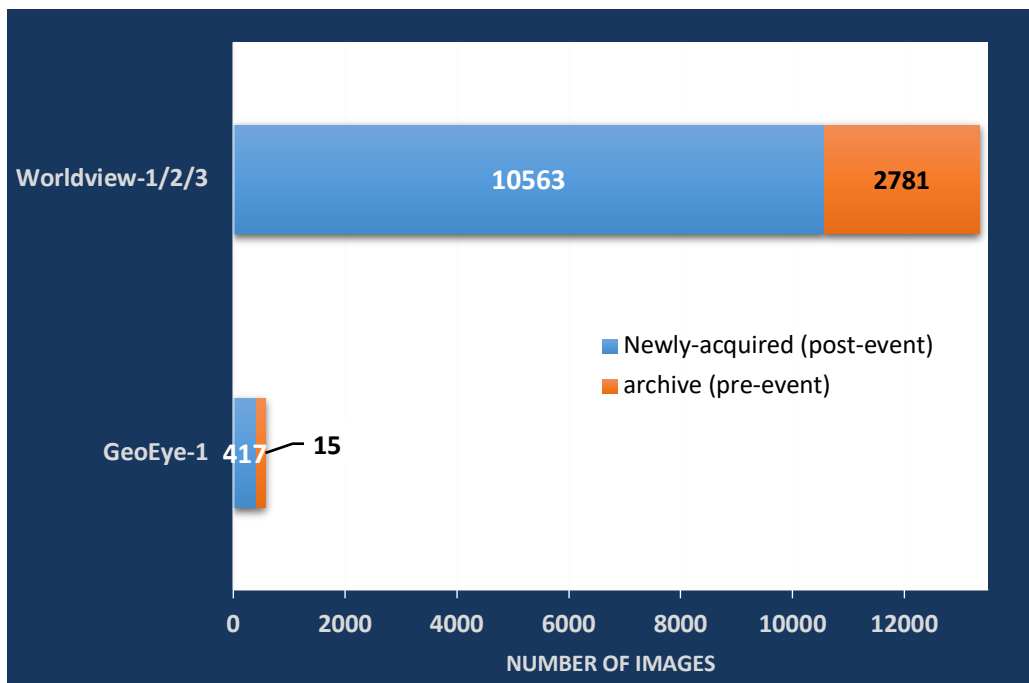


Figure 3-17. 2017 Data Consumption –US Commercial optical satellites

Resources	GEOEYE	WORLDVIEW-1/2/3
Total number of delivered data	576	13344
Archive (pre-event)	159	2781
Newly-acquired (post-event)	417	10563

<i>Max number of images per activation</i>	<i>104</i>	<i>542</i>
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Table 3-4. 2017 Statistics concerning US commercial optical satellites

Overview of data consumption by activation:

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

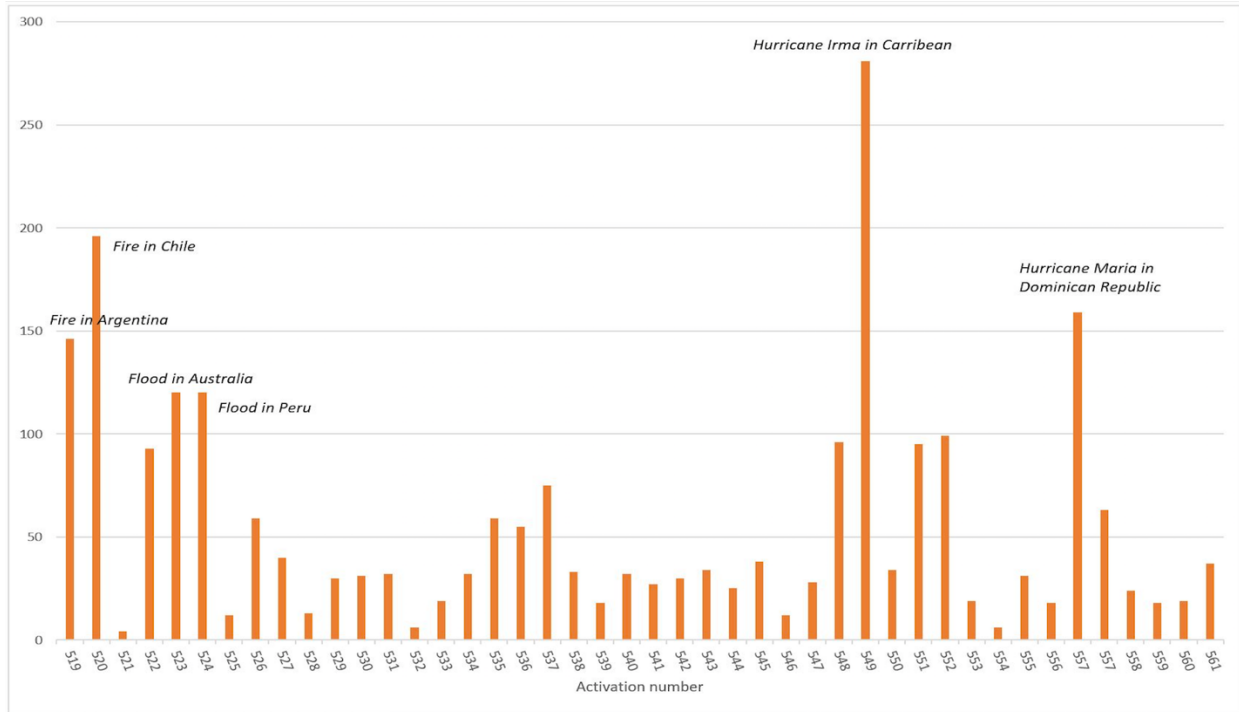


Figure 3-18. Number of delivered post-event i.e. newly-acquired images (radar and optical) by activation

On average the quantity of images is **81 per activation**. There are six activations with a number greater than 80 of programmed data (Charter optical & radar sensors), these are: **Act 519**, fire in Argentina, 144 images; **Act 520**, fire in Chile, 194 images; **Act 523**, flood in Australia, 162 images; **Act 524**, flood in Peru, 120 images; **Act 549**, hurricane Irma in Caribbean, 281 images; **Act 557**, Hurricane Maria in Dominican Republic, 159 images.

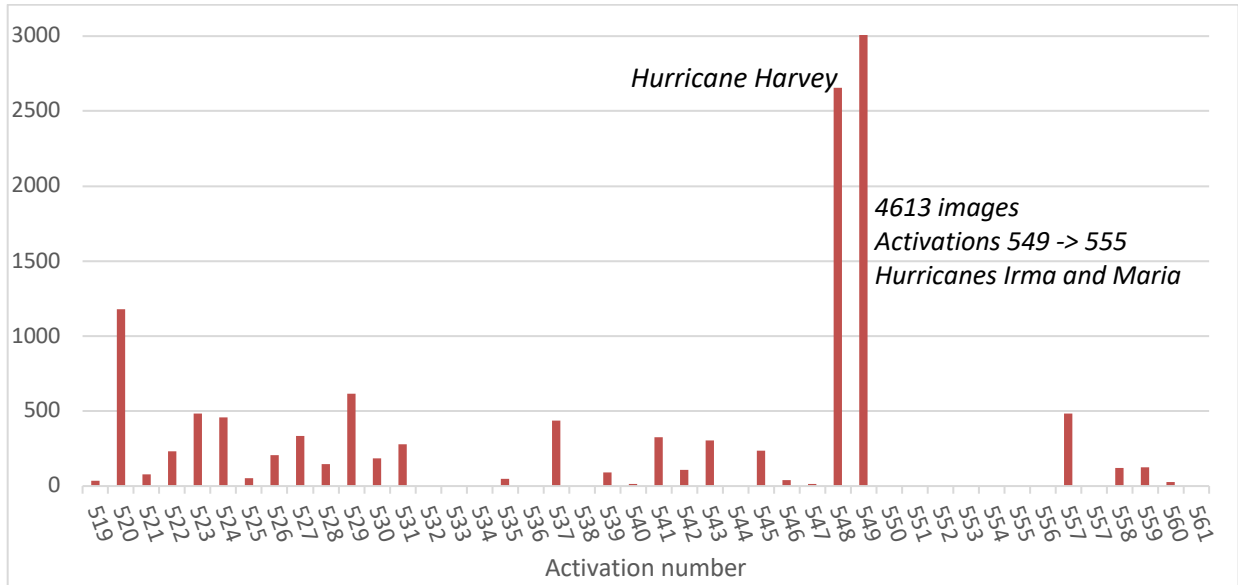


Figure 3-20. Number of delivered post-event i.e. newly-acquired images by activation (US VHR commercial satellites)

In total, 27 activations out of 44 have benefited from US VHR data. The two situations with the highest number of US VHR data (greater than 1800 in total and greater than 100 for newly-acquired images) provided are: **Act 526, Hurricane Harvey in USA**, (1964 images in total out of which 10,980 newly-acquired images); **Act 549 to Act 555 for Hurricanes Irma and Maria in Caribbean, Dominican Republic, Haiti, USA, Antilles and Puerto Rico** (4,437 newly-acquired images were provided i.e. 40% out of all newly-acquired US VHR images).

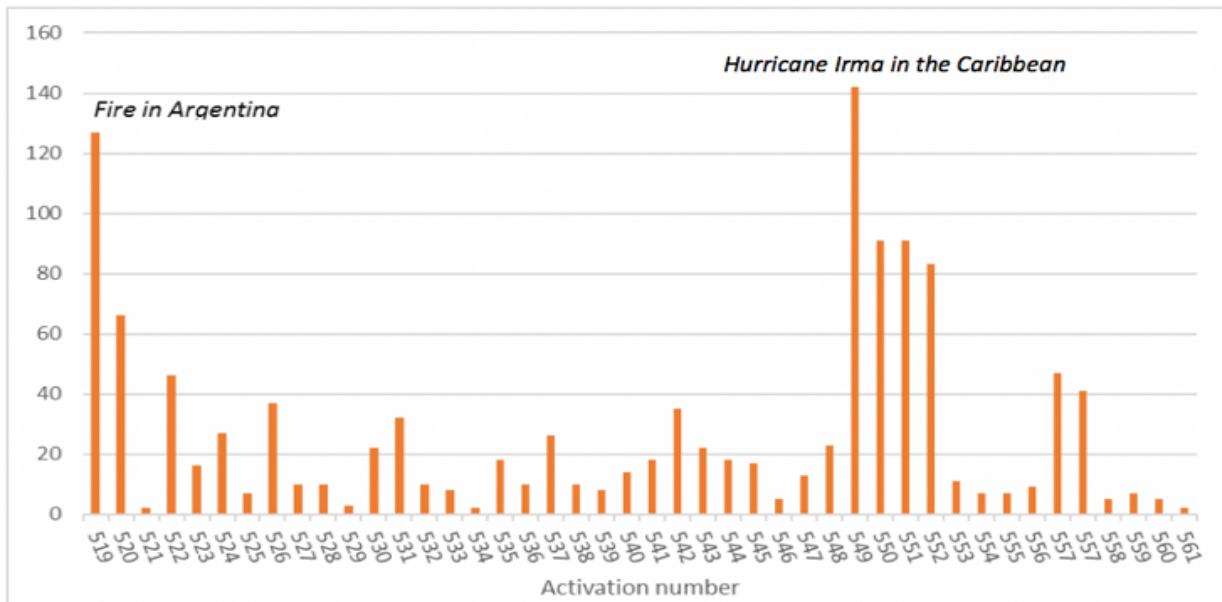
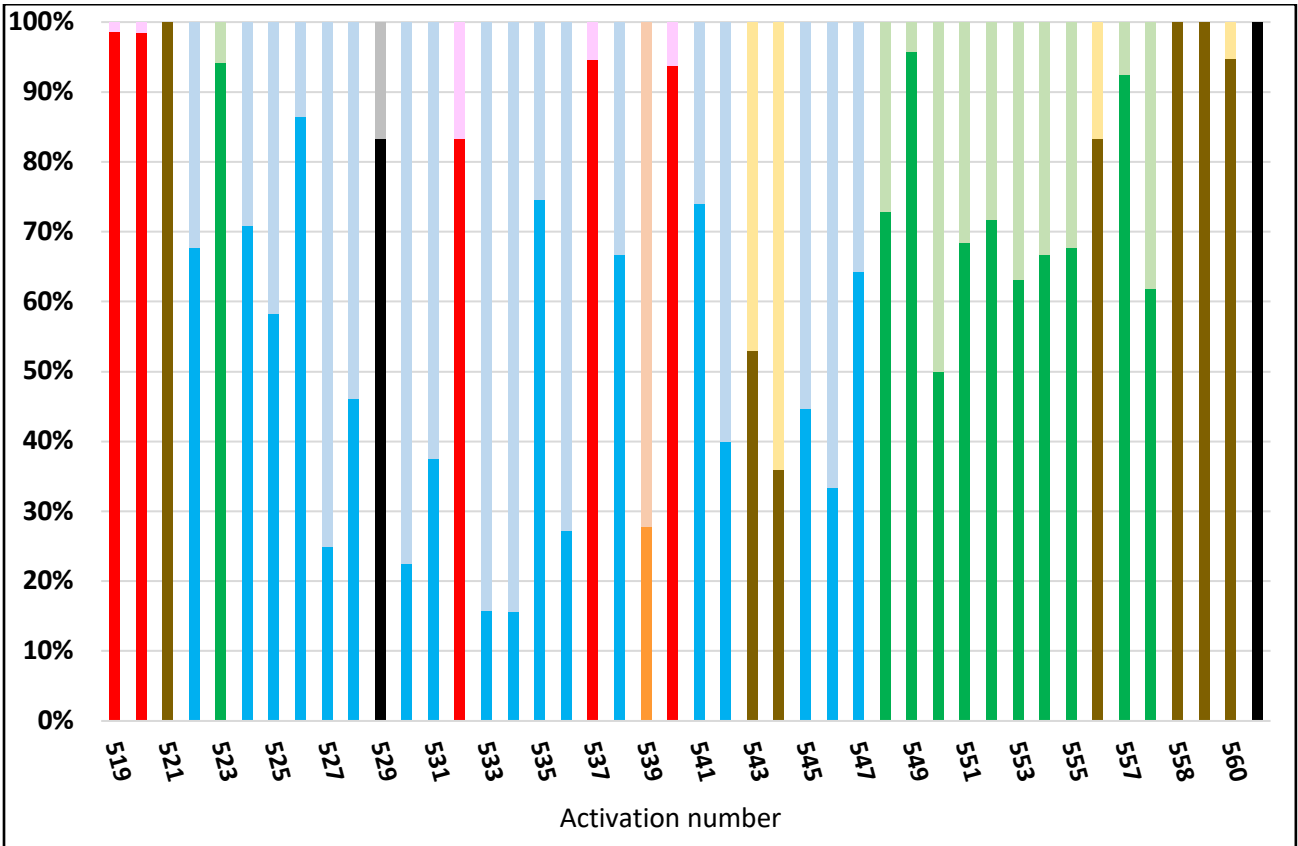


Figure 3-19. Number of delivered pre-event i.e. archived images by activation (Charter EO sensors)

Concerning the pre-event /archive images, on average the quantity of images is **27 per activation (18 in 2016)**. In two cases, the number of archive data exceeded 100: **Act 519, fire in Argentina**, 127 images and **Act 549, Hurricane Irma in Caribbean**, 142 images.



Type of event:	Optical images	Radar images
Flood	Blue	Light Blue
Ocean storm	Green	Light Green
Wildfires	Red	Pink
Earthquakes	Orange	Yellow
Landslides	Yellow	Light Orange
Others	Black	Light Grey

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

Figure 3-21 describes the radar/optical repartition of newly-acquired images by activation. This shows that optical images are mainly provided for earthquakes, landslides, wildfires and to some extent ocean storms events, and radar optical images are used for most of the flood events.

3.2.2 Human resource contribution (ECO and PM) in 2017

- *ECO resources in 2017*

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, ROSCOSMOS.

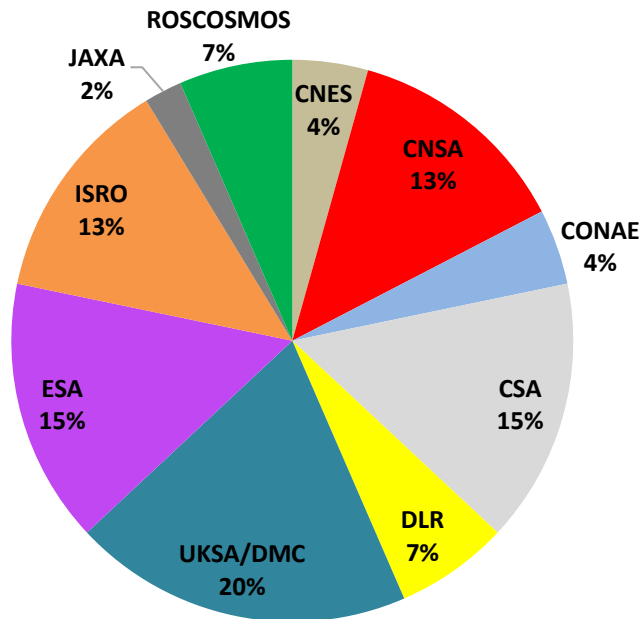


Figure 3-22. Distribution of Charter Parties responsible for the ECO services in 2017

The random nature of calls resulted in an uneven workload distribution for the members, with UKSA/DMC handling 20% of the calls, as shown in Figure 3-22. There were 9 calls processed by UKSA/DMC, CSA and ESA processed 7 calls each, CNSA and ISRO processed 6 calls each, DLR and ROSCOSMOS processed 3 calls each, CNES and CONAE processed 2 calls each, and JAXA processed 1 call. KARI did not receive any calls during its week on duty.

- *Distribution of Charter members responsible for the PM services delivered in 2017*

Project Managers (PMs) were nominated for 44 activations. PMs nominated by CONAE and ESA handled 16% (7 activations) of Charter activations each; UKSA/DMC and USGS handled 6 activations each; ROSCOSMOS handled 4 activations; CNES, CNSA and JAXA handled 3 activations each; KARI handled 2 activations; and ABAE, CSA and DLR handled 1 activation each (Figure 3-23).

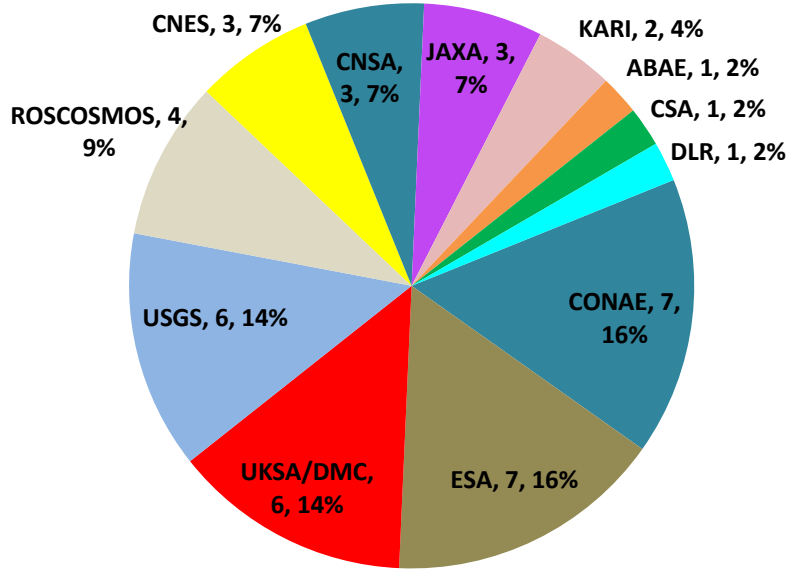


Figure 3-23. Distribution of Charter Parties responsible for the PM services in 2017

- *Distribution of organizations providing PM resources in 2017*

PMs may be sourced from a Charter party or an external entity. Table (3-5) 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, 25 different organizations contributed their PM services to Charter activations.

Organization (Country)	Number of PM service
UNITAR/UNOSAT (Switzerland)	11
CONAE (Argentina)	4
AIT (Thailand)	2
CNES (France)	2
KARI (South Korea)	2
NDRCC - National Disaster Reduction Centre of China (People's Republic of China)	2
Purdue University (USA)	2
ROSCOSMOS (Russian Federation)	2
ABAE (Venezuela)	1
Comisión Nacional de Emergencias (CNE) (Dominican Republic)	1
CNSA (People's Republic of China)	1
CONIDA (Peru)	1
CSA (Canada)	1
Directorate of DRR, Western Cape Government (South Africa)	1
DLR (Germany)	1

DMC (UK)	1
ESA (Italy)	1
Geoscience Australia (Australia)	1
ICIMOD (Nepal)	1
IWMI (Sri Lanka)	1
MUGOLFO (Honduras)	1
Oxfam Intermon (Dominican Republic)	1
PHIVOLCS (Philippines)	1
SERTIT (France)	1
University of Texas (USA)	1

Table 3-5. PM Organisations in 2017

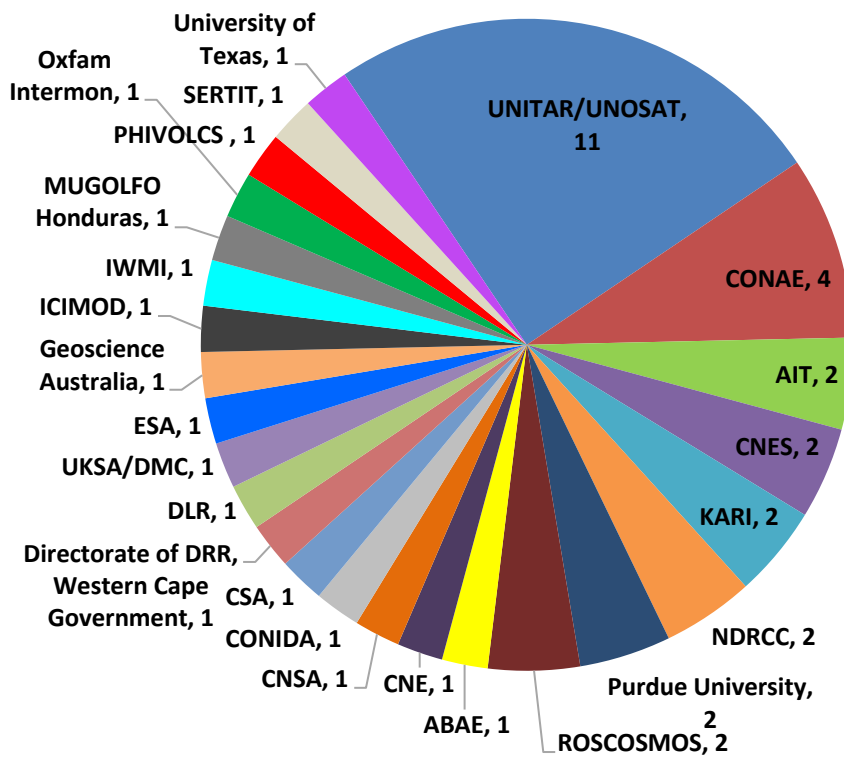


Figure 3-24. Distribution of organizations providing PM resources in 2017

Difference between Figures 3-23 & 3-24: Figure 3-23 represents the breakdown of Charter members who nominated PMs in 2017 (the Charter member responsible for the PM service) while Figure 3-24 represents the breakdown of organizations performing the PM work for 2017 activations.

Detailed comments:

- CONAE managed 4 events with support of internal staff: wildfire in Argentina; floods in Argentina and Uruguay; search and rescue of a missing vessel in Argentina; 1 event supported by CNE: ocean storm in Dominican Republic; 1 event supported by CONIDA: flood in Peru; 1 event supported by Oxfam Intermon: ocean storm in Dominican Republic.

-
- ESA managed 1 event with support of internal staff: flood in Colombia; and 6 events supported by UNITAR/UNOSAT: floods in Dominican Republic, Haiti and Sierra Leone; ocean storm in Vietnam; and earthquake in Iran and Iraq.
 - UKSA/DMC managed 1 event with support of internal staff: wildfire in Montenegro; 1 event supported by ICIMOD: flood in Nepal; and 4 events supported by UNITAR/UNOSAT: flood in Bangladesh, ocean storms in Dominica and UK overseas territories (British Virgin Islands and Turks and Caicos) and earthquake in Mexico.
 - USGS managed 1 event supported by IWMI: flood in Sri Lanka; 1 event supported by the Directorate of DRR of the Western Cape Government: wildfire in South Africa; 1 event supported by MUGOLFO: flood in Honduras; 1 event supported by University of Texas: ocean storm in USA; and 2 events supported by Purdue University: oceans storms in USA.
 - ROSCOSMOS managed 2 events with support of internal staff: wildfire and flood in Russian Federation; 1 event supported by Geoscience Australia: ocean storm in Australia; and 1 event supported by UNITAR/UNOSAT: flood in Madagascar.
 - CNES managed 2 events with support of internal staff for 2 events: flood in Chile and ocean storm in Haiti; and 1 event supported by SERTIT: ocean storm in French overseas territories (Martinique).
 - CNSA managed 1 event with support of internal staff: landslide in People's Republic of China; and 2 events supported by NDRCC: earthquakes in People's Republic of China.
 - JAXA managed 1 event with support from PHIVOLCS: earthquake in Philippines; and 2 events supported by AIT: floods in Bangladesh and Vietnam.
 - KARI managed 2 events with support of internal staff: search and rescue of missing Korean vessel in Brazil and earthquake in South Korea.
 - CSA managed 1 event with support of internal staff: flood in Canada.
 - DLR managed 1 event with support of internal staff: wildfire in Chile.
 - ABAE managed 1 event with support of internal staff: flood in Venezuela.

*UNITAR/UNOSAT served as PM primarily for UN activations, but also for one activation requested by CNE. UNOSAT contributed to 25% of all activations in 2017 (Madagascar, Dominican Republic, Haiti, Sierra Leone, Bangladesh, UK overseas territories, Dominica, Mexico, Vietnam, Iran and Iraq), also providing value-adding services.

3.3 SARE – Semi Annual Refresher Exercises

The Emergency On-Call Officer (ECO) function is of outmost importance for the Charter operations, because the ECO orders appropriate data from the Charter members within a few hours after an activation request comes in. Because some ECO staff might not face “real activations” frequently, two so-called “Semi-Annual Refresher Exercises” are performed every year with all the ECOs. In 2017, these exercises took place from 1 June to 27 July and from 4 December to 18 December, respectively, and the following scenarios were worked with:

- SARE-18: forest fire in Russian Federation. This exercise was led by ROSCOSMOS and ESA training teams; the report was prepared by ROSCOSMOS and ESA. 40 ECOs from 10 Charter member agencies participated.
- SARE-19: flood and landslide in Argentina. This exercise was led by CONAE and ROSCOSMOS training teams; the report was prepared by CONAE. 46 ECOs from 10 Charter member agencies participated.

3.4 Project Manager Training

The PM training is aimed at strengthening the network of Charter PMs by providing refresher sessions for current PMs and training sessions for new PMs. Six PM training sessions were carried out in 2017.

- February (Kobe, Japan): On-site training led by JAXA. Participants were from ADRC.
- September (Myanmar): On-site PM training led by JAXA.
- October (New Caledonia): Remote PM training sessions organised by CNES.
- November (UK): Led by UKSA/DMC for UK PMs.
- November (Sri Lanka): On-site training led by JAXA.
- December (Paraguay, Uruguay, Chile and Peru): Remote PM training sessions were organised by CONAE.

3.5 The Charter operational tools

ESA has developed and continues to develop tools: the web-based Charter Operations System “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, it has been used successfully in all Charter calls. 75% 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 (2.2.1) of the COS-2 system has been operational since December 2017, improving the user interface (COS-2 dashboard available) and fixing the main system issues.

Since COS-2 entered in operation (March 2015), the system was used for all Charter activations. All Project Managers (PM) were able to access to 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 setup 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-18 and SARE-19, in which 40 and 46 (respectively) Emergency on-Call Officers (ECOs) participated.

Charter members performed trainings to the AUs of Paraguay, Uruguay, Chile, Peru and United Arab Emirates using COS-2.

Since January 2016, all PM trainings are performed with the support of COS-2.

4 External relations

4.1 New members accession

The United Arab Emirate Space Agency (UAESA), supported by the Mohammed Bin Rashid Space Centre (MBRSC), had requested to become a Charter member in 2016. Representatives from UAESA were invited to introduce their organization and intended contributions during the 37th Charter Board meeting in Oxford, UK, on 24-28 April 2017. UAESA presented their Space programme including two VHR optical satellites operated by MBRSC. It was explained that UAESA intends to provide the role of a Charter Board member while the role of the Charter Executive Secretariat member and other operational tasks would probably be taken by MBRSC. The Charter Board accepted UAESA's application for membership and concluded that the Charter could significantly benefit from the resources offered.

In the course of 2017, UAESA provided an Implementation Plan and Data Policy for its Charter membership, and on 1-2 November 2017, a Charter Site Visit & Training took place at MBRSC in Dubai with participants from UAESA, MBRSC, the National Emergency, Crisis and Disaster Management Authority (NCEMA) as well as a Charter training team represented by ESA, CSA, and UKSA. Training was provided alongside a detailed list of next steps and actions. The visit and training were successful with a high degree of engagement. Following training, the Charter Executive Secretariat approved UAESA's/MBRSC's readiness for membership and proceeded with their operational integration.



Figure 4-1: Photos of MBRSC and the training participants made at the site visit in November 2017.

4.2 Universal Access

In order to improve Charter access globally, the Charter had 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 an 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 further strengthen the Charter's contribution to 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.

By the time of publishing this report, the national disaster management organizations of Paraguay, Peru and Madagascar 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 countries (in dark blue) with direct access to the Charter as of September 2018.

Significant efforts have been expended for promoting the Charter and Universal Access, e.g. at the American Disaster Summit in Buenos Aires in September 2017, and at the UNISDR Technical Workshop related to the Sendai Framework monitoring process in December 2017 (see also the chapter on communication).

4.3 Cooperating Bodies & Charter User Intermediaries

4.3.1 Collaboration with UNOOSA

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

Mr. Shirish Ravan, Senior Programme Officer at UNOOSA, participated in a dedicated session of the 38th Charter Board meeting (Italy, October 2017) and presented UNOOSA's activities to support the Charter. A report was also delivered.

UNOOSA reported that the Charter had been presented in several activities such as the training programs and workshops organized 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 UN-SPIDER, and success has been reached in several countries, such as Guatemala, Sri Lanka, Myanmar, Dominican Republic, and others.

In 2017, Technical Advisory Support and/or Institutional Strengthening Missions have been provided by UNOOSA to Nepal, Myanmar, Solomon Islands, Sri Lanka, and Mexico, and the benefits of UA were presented.

Three Charter activations were triggered by UNOOSA on behalf of users being part of the UN system:

- In August 2017, an activation was triggered on behalf of UN Resident Coordinator's (UNRC) office in Kathmandu, due to flooding in Nepal;
- In August 2017, an activation was triggered on behalf of UN FAO Sierra Leone Office and UN Country Team, due to flooding and mud slides in Sierra Leone;
- In September 2017, an activation was triggered on behalf of UN Haiti, DSRSG/RC/HC Office, due to Hurricane "Irma".

The UNISPACE+50 event scheduled for June 2018 was highlighted by UNOOSA as a unique opportunity for the Charter to present itself to a wide range of country representatives, users and providers of space applications etc.

Furthermore, UNOOSA shared a number of "lessons learnt" with the Charter highlighting:

- UN-SPIDER's direct links to national disaster management authorities,
- the relevance of availability of local/regional providers of value-added information based on satellite imagery in the case of an emergency,
- appropriate education of the disaster management and UN communities in the countries,
- continued outreach activities to raise awareness of the Charter and UA, and
- the availability of UN-SPIDER to support trainings for Charter Project Managers and Authorized Users.

UNOOSA requested the Charter to consider allowing them to trigger the Charter also on behalf of national disaster management authorities with which UN-SPIDER has established links. This was presented as a means to improve efficiency in emergency situations in these countries. The Charter Board appreciated this proposal but emphasized its intention to create direct links between disaster management authorities and the Charter following its Authorized Users concept. In late 2017/early 2018, a "Universal Access Trial" mechanism was developed by the Charter, 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 facilitate AU status of these authorities following the emergency. By the time of publishing this report, this enhancement of the collaboration agreement between UNOOSA and the Charter has been put in place.

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.

Dr. Einar Bjorgo, Manager of UNOSAT at UNITAR, participated in a dedicated session of the 38th Charter Board meeting (Italy, October 2017) and presented UNOSAT's activities to support the Charter. A report was also delivered.

UNOSAT continued triggering the Charter for major disasters, acting as Project Manager (PM), producing satellite image derived products (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.

Ten Charter activations were triggered by UNOSAT on behalf of users being part of the UN system which comprise a significant portion of the overall 44 Charter activations in 2017:

- In March 2017, an activation was triggered on behalf of UNOCHA, due to flooding in Madagascar;
- In April 2017, an activation was triggered on behalf of UNOCHA Haiti, due to flooding in Haiti;
- In May 2017, an activation was triggered on behalf of UNOCHA Regional office for Asia and the Pacific, due to flooding in Bangladesh;
- In August 2017, an activation was triggered on behalf of UNOCHA Regional office for Asia and the Pacific, due to flooding in Bangladesh;
- In Sept. 2017, an activation was triggered on behalf of UNDAC, due to hurricane "Irma" in the Caribbean, concerning Barbuda, Saint Martin, Anguilla, Turks & Caicos etc.;
- In Sept. 2017, an activation was triggered on behalf of UNOCHA Field Coordination Support Section, due to hurricane "Maria" in Dominica;
- In Sept. 2017, an activation was triggered on behalf of UNOCHA, due to an earthquake in Mexico;
- In Nov. 2017, an activation was triggered on behalf of UNOCHA, due to flooding in Vietnam;
- In Nov. 2017, an activation was triggered on behalf of UNOCHA, due to an earthquake in Iran;
- In Nov. 2017, an activation was triggered on behalf of UNOCHA, due to an earthquake in Iraq.

UNOSAT staff members were nominated as Project Manager (PM) for 10 activations in 2017. In addition, UNOSAT provided value-adding service for all the activations triggered by them, and in addition for flooding and debris flow in Colombia (April 2017), flooding in the Dominican Republic (April 2017), and flooding and mud slides in Sierra Leone (August 2017).

A regular summary of relevant satellite mapping activities including the Charter activations is produced and made accessible through the Global Disaster Alert and Coordination System (GDACS) portal (<http://portal.gdacs.org/data>), which is provided by UNOSAT and the European

Commission. UNOSAT emphasized the GDACS Satellite Mapping Coordination System (SMCS) which could contribute to coordination and predictability in the production process during Charter activations.

UNOSAT, together with the Red Cross and Red Crescent Societies (IFRC), requested the Charter to consider allowing UNOSAT to trigger the Charter also on behalf of national Red Cross or Red Crescent users. This request relates to a Memorandum of Understanding signed by UNITAR and IFRC in September 2017 including the use of UNOSAT Rapid Mapping Service. The Charter Board agreed with this proposal and appreciated that this will be another step to effectively reach disaster management users worldwide. It was clarified, however, that the Charter intends to create direct links between national disaster management authorities and the Charter following its Authorized Users concept. UNOSAT assured that it will pursue promoting Universal Access to help ensure that nationally mandated disaster management authorities become aware of the Charter. Also, it was assured that the Charter Project Management (PM) and Value adding (VA) functions will be assumed by UNOSAT in all Charter activation cases triggered on behalf of Red Cross/Red Crescent societies.

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 2017, SA was comprised of 91 organizations from 28 countries and regions and 15 international organizations.

JAXA provided the Charter with monthly activation status reports as well as two bi-annual reviews presenting SA's emergency response and promotional/awareness activities. In 2017, 31 activations were handled by SA. The escalation mechanism to the Charter was used in response to 2 events for:

- Earthquake in the Philippines in February 2017;
- Flooding in Vietnam in August 2017;

The number of escalations to the Charter is lower than in 2016 (6 escalations to the Charter), however, in addition there were several Charter activations triggered by SA member countries also having a Charter Authorised User (e.g. Sri Lanka) or by the UN cooperating bodies due to disasters in SA member countries (e.g. Nepal, Bangladesh, and Vietnam).

JAXA, as the executive secretariat of Sentinel Asia, continued to promote the Charter, explaining the escalation mechanism to activate the Charter and the Universal Access initiative at several conferences. Also, 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. Some training also aims to have PMs in the countries with an Authorized User under the Charter's Universal Access initiative for coordinated response within the country in case of the Charter activation.



Figure 4-3: Charter PM training organised by JAXA in Myanmar (September 2017)



Figure 4-4: Charter PM training organised by JAXA in Sri Lanka (November 2017)

4.4 Cooperation with other programmes and initiatives

4.4.1 Collaboration between the Charter and the Copernicus Emergency Management Service of the European Union

The two systems 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 Copernicus Emergency Management Service (EMS) is intended to provide support also for other phases of the emergency management cycle in and outside of Europe. However, overlap exists between the Charter and the EMS Rapid Mapping Service. Collaboration has taken place in numerous cases in the past.

The EMS Mapping Service has been an operational activity since April 2012 (<http://emergency.copernicus.eu/>). It supports emergency management activities immediately following an emergency event with fast provision of geospatial information based on satellite imagery. More specifically, three different map types (reference, delineation, and grading maps) can be requested. The products are standardized following a set of parameters the user can choose when requesting the service.

In 2017, the EMS Rapid Mapping was activated 63 times with a notable high number of Wildfires in Southern Europe being covered. There were only two Charter activations for disasters in Europe in the same time period (Fire in Montenegro, and flooding in Stavropol Krai, Russia). In a few cases there were activations of both the Charter and the EMS for the same disaster outside of Europe, but not necessarily requested by the same user and with the same areas of interest and requirements.

Considerable effort was made throughout 2017 to put collaboration on a more 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 EMS on a case-by-case basis, and the EMS could, especially in cases of large disasters, benefit from satellite data provided by the Charter.

Towards the end of 2017, procedure documents were prepared by a Charter working group, consisting of ESA, CNES, UKSA, DLR, and EUMETSAT, together with representatives of the Copernicus EMS. These procedures aim to streamline the cooperation between the two mechanisms allowing: (i) Copernicus EMS to access Charter data and (ii) the Charter to access the value adding capability of Copernicus EMS. By the time of publishing this report, the Charter and the EMS have finalised, agreed, and already followed these procedures, resulting in maps that were published by both the EMS and the Charter and showing that contributions of both the Charter and the EMS came together to achieve these results.

In the future the majority of Charter activations will still be handled without the help of the Copernicus EMS, e.g. by using value-adding capacities in the country or region of the disaster. However, it is foreseen that there will also be more cases of collaboration than in the past, being triggered as needed by either the EMS or the Charter, and following the procedures recently established between both sides.

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 the following domains: floods, earthquakes, volcanoes and landslides (<http://ceos.org/ourwork/workinggroups/disasters/>). Each of these thematic demonstrators intends to showcase a) the added value and uniqueness of increased CEOS coordination in these thematic areas; b) the benefits of closer ties to users (decision-makers, disaster management stakeholders, and politicians), and ease of access to data; and c) 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 the thematic activities described above, there is also a “Recovery Observatory” demonstrator focusing on the southwest of Haiti that was devastated by Hurricane “Matthew” in October 2016. It shall demonstrate the potential and increase the contribution of satellite-based information to the recovery phase 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 might be able to share the data collections acquired during an activation taking into account the data licensing of each data source. A procedure for requesting such collaboration was established in 2015. 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. During the 38th Charter Board meeting in Frascati, Italy, the Board decided to request 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.

5 Communications

5.1 Web site

The Charter website is available in English and some pages are available in Spanish, French, Japanese, Chinese and Russian. In 2018, the website shall be 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 Charter website allows direct access to COS-2 for authorized Charter members' personnel and provides information on how the Charter can be activated and how disaster management agencies can become Charter Authorized Users through the Universal Access initiative.



Figure 5-1. Charter website homepage

According to the Charter Website statistics in 2017 there were 49,582 sessions, 27,776 of which were unique. Top 10 countries with the biggest number of sessions are USA (7,005), UK (3,818), Japan (3,713), Canada (2,909), Germany (2,657), France (2,655), Poland (1,864), Argentina (1,784), Netherlands (1,525) and South Korea (1,134).

The amount of total page views comprised 139,236, the most popular pages of the Website were Charter Activations, Charter members, Activating the Charter, Examples of Charter Satellite Imagery and Text of the Charter. The most popular Charter activation was an earthquake in Mexico with 890 page views.

An overview of page and sessions views during 2017 is provided in the next four Figures, to illustrate the Charter website visits frequency.

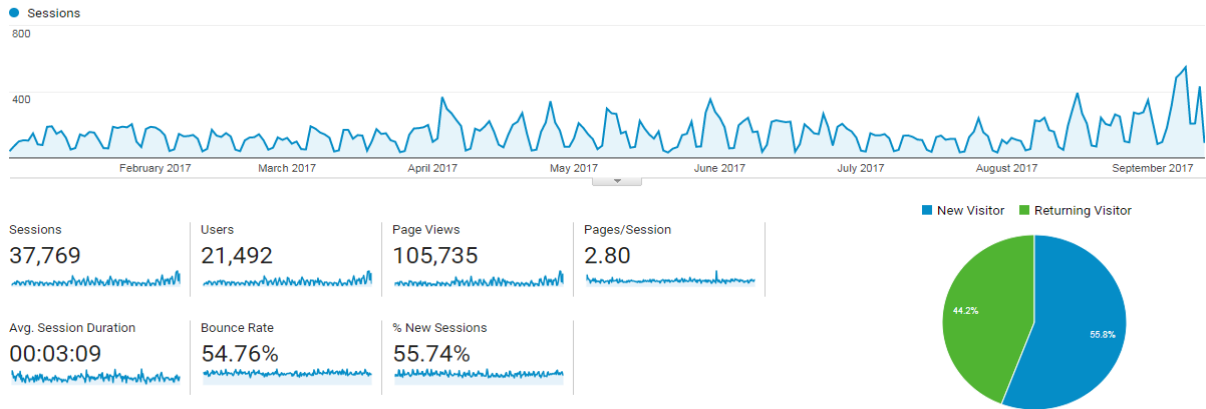


Figure 5-2. Breakdown of sessions views (January-September 2017)

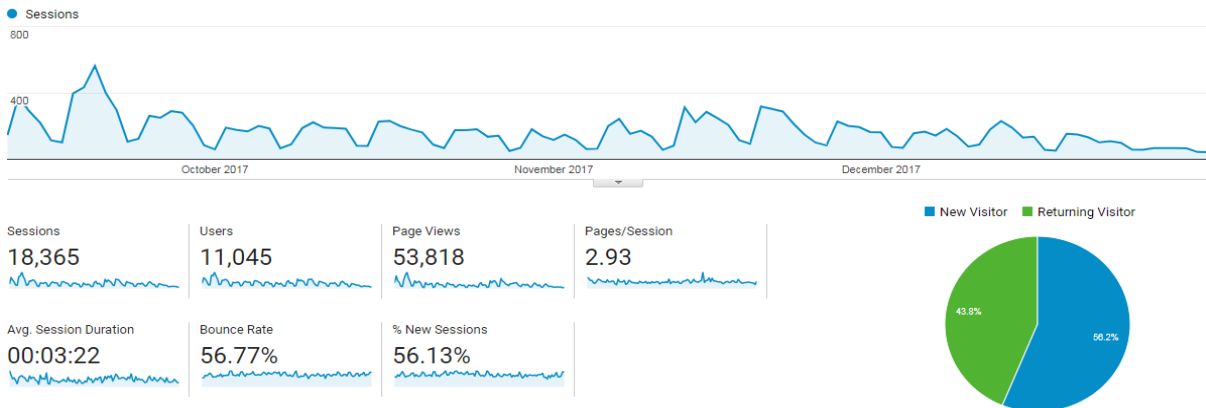


Figure 5-3. Breakdown of sessions views (October-December 2017)

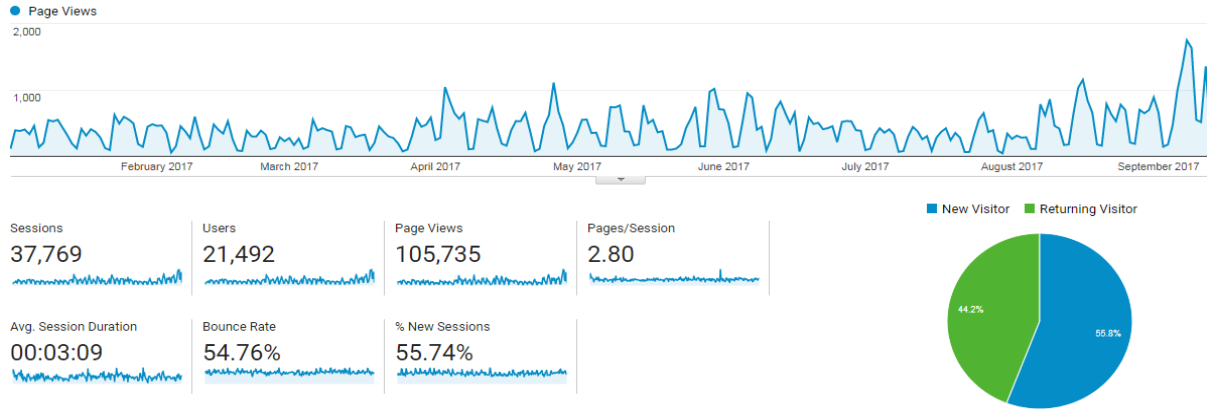


Figure 5-4 Breakdown of page views (January-September 2017)

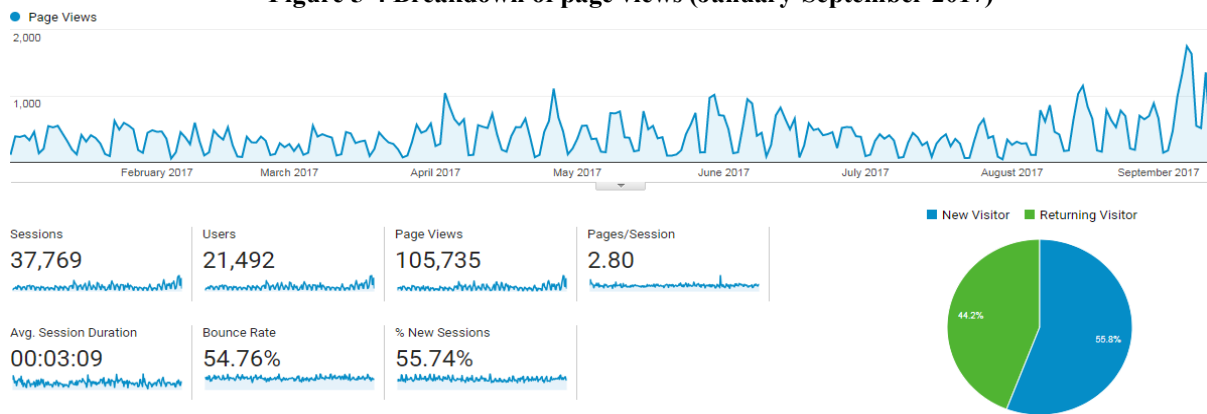


Figure 5-5. Breakdown of page views (October-December 2017)

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

The following diagrams show the number of impressions of Charter’s followers in January-December 2017, in the period of July-October it reached 362,700 (top tweets being images from the flood in Bangladesh and in Venezuela as well as Irma hurricane impact on the Caribbean).

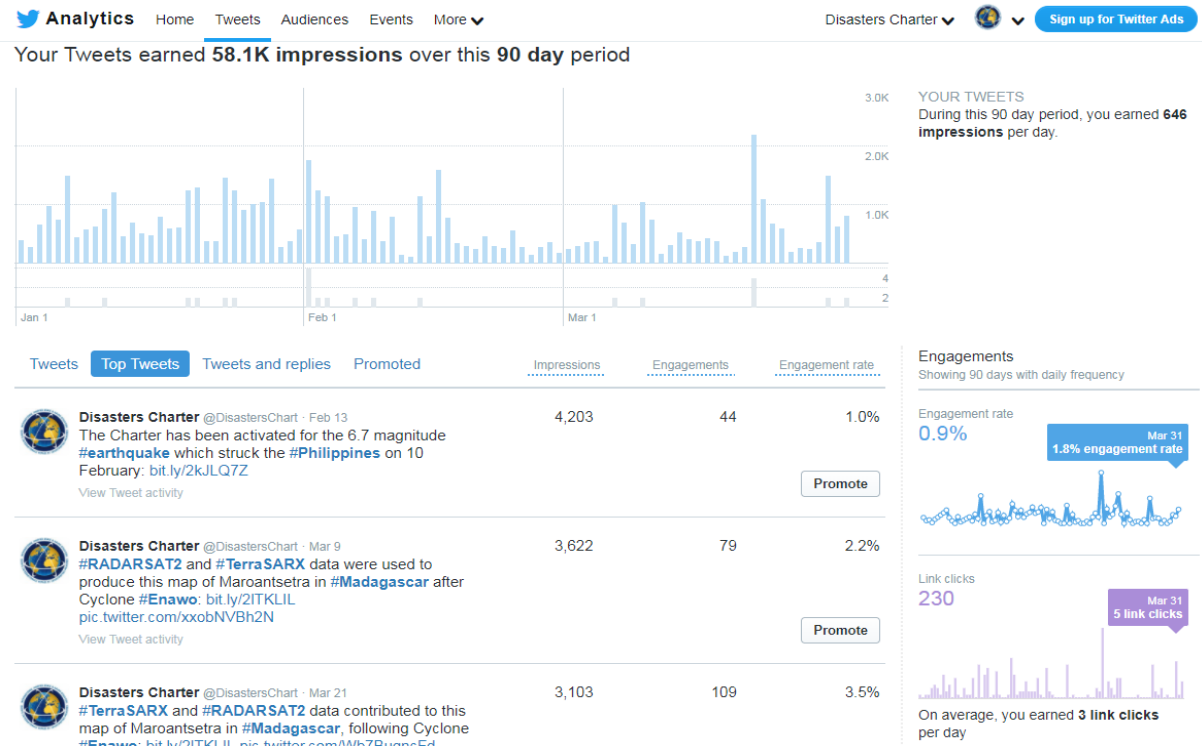


Figure 5-6. Number of impressions (January-April 2017)

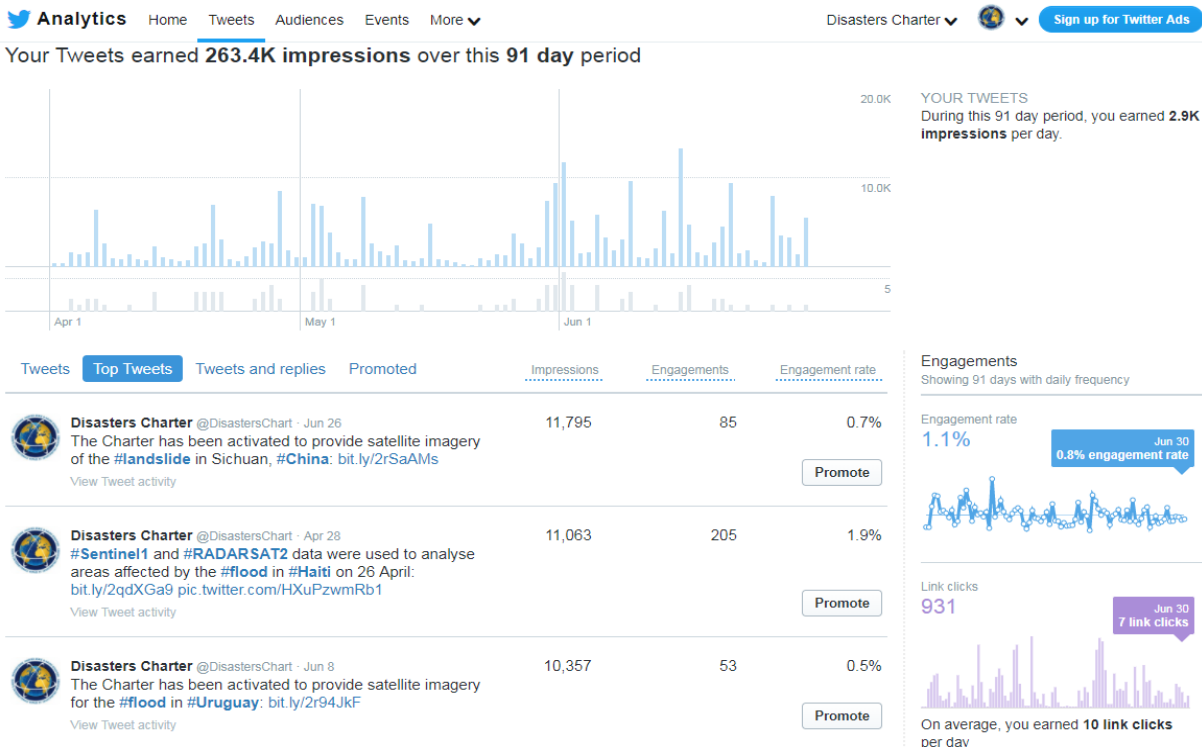


Figure 5-7. Number of impressions (April-July 2017)

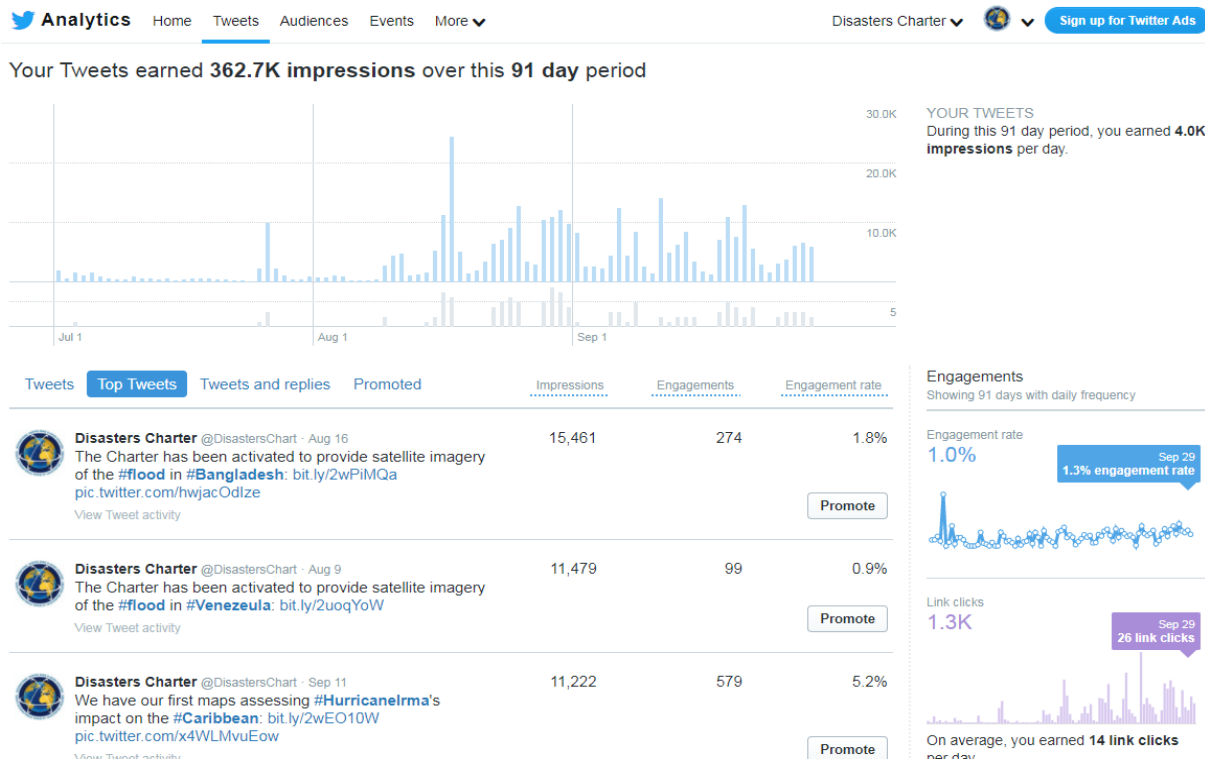


Figure 5-8. Number of impressions (July-October 2017)

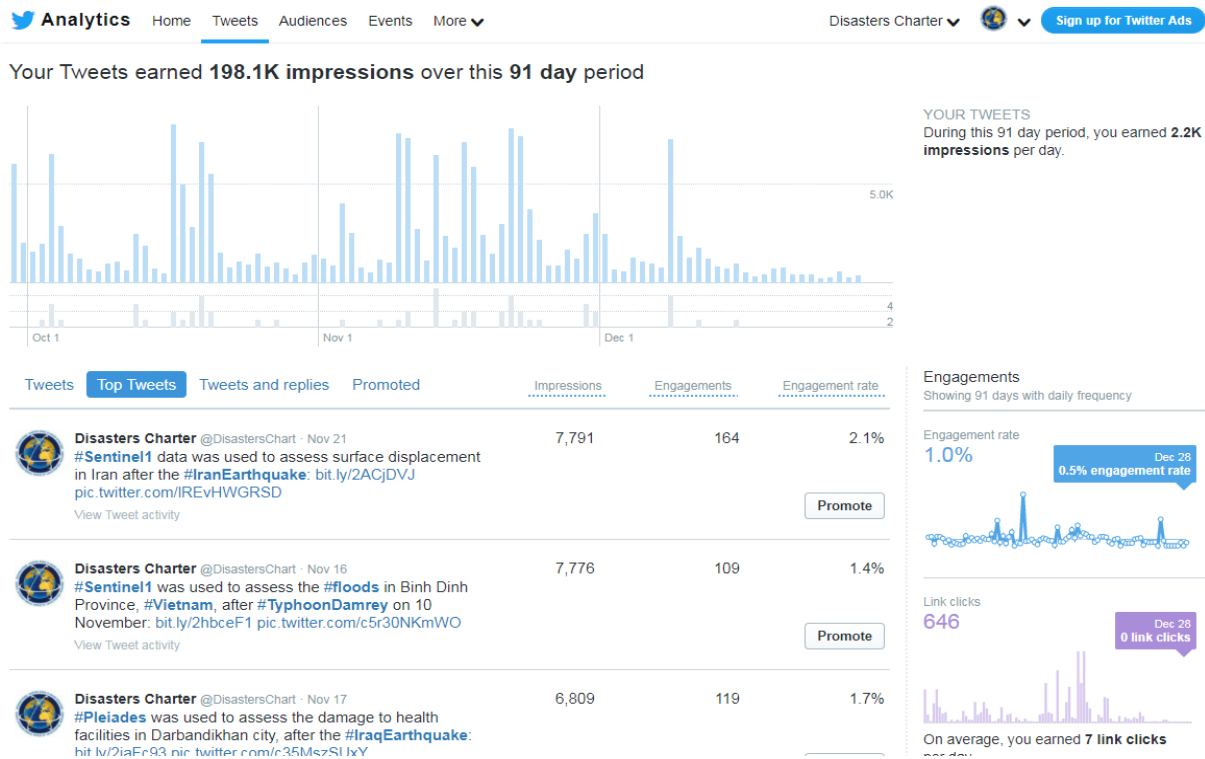


Figure 5-9. Number of impressions (October-December 2017)

5.2 Charter Newsletter

The 15th Charter Newsletter was issued in January 2017. The newsletter represents an additional means of informing users, stakeholders and the public on recent Charter activations, news, events and related activities.

<https://www.disasterscharter.org/web/guest/news/newsletter>



Figure 5-10. Charter Newsletter issue 15

The January issue (15th) reported on the following matters:

- ROSCOSMOS assumes chairmanship of the International Charter 'Space and Major Disasters';
- ABAE (Agencia Bolivariana para Actividades Espaciales) of Venezuela joins the Charter;
- Five activations for Hurricane Matthew;
- The Dominican Republic benefits from the activation after Hurricane Matthew;
- The Charter participates and promotes Universal Access at the Inter-governmental Consultative Committee (ICC);

The dissemination of the newsletter 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 2017 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
Fourth Joint Project Team Meeting for Sentinel Asia Step3 (JPTM2017)	Hanoi, Vietnam	8-9 March	JAXA

Demonstration with the Charter Tool (French ministry of the Environment and Dural Development)	Toulouse, France	10 March	CNES
Demonstration with the Charter Tool (Vice-president of the European Commission)	Toulouse, France	5 July	CNES
Regional Expert Meeting for promoting the use of space-based technologies in disaster risk reduction in Latin America and the Caribbean	Mexico City, Mexico	11 July	CONAE
The International Conference of Women Scientists and Engineers (BIEN 2017)	Seoul, South Korea	31 August – 2 September	KARI
"Disaster Risk Reduction across the Americas Summit" by NASA with GEO	Buenos Aires, Argentina	4-8 September	CONAE and DLR
Demonstration with the Charter Tool (JPL/NASA delegation)	Toulouse, France	7 September	CNES
Presentation on RADARSAT and the International Charter "Space and Major Disasters"	Saint-Hubert, Canada	19 September	CSA
Demonstration with the Charter Tool (UKSA delegation and UK ambassador)	Toulouse, France	12 October	CNES
Satellite Services for Disaster Response Event	Edinburgh, UK	19 October	UKSA/DMC
United Nations International Conference on Space-based Technologies for Disaster Management: Building Resilience through Integrated Applications	Beijing, China	23-25 October	CNSA
Space for Smart Government Showcase event	London, UK	23 November	UKSA/DMC
The 2nd Conference of Digital Belt and Road (DBAR 2017) and the 3rd International Conference on Remote Sensing Applications in Tropical and Subtropical Areas (RSATSA 2017)	Hong Kong, China	3-5 December	CNSA
"UNISDR Technical Workshop on Sendai Monitoring"	Bonn, Germany	8 December	DLR

Demonstration with the Charter Tool (CNSA delegation)	Toulouse, France	13 December	CNES
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Table 5-1. 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 International Charter Space and Major Disasters received a Pecora Award for providing free satellite imagery, data and information to the global community during times of crises.

<https://disasterscharter.org/web/guest/-/international-charter-wins-prestigious-pecora-award>

Table 5-2 summarises the main press releases, web and paper articles issued by the member agencies or others during this reporting period.

Date	Issuing agency	Title
5 January	CONAE	"Satellite Images of fires in Río Negro, La Pampa and Buenos Aires". http://www.conae.gov.ar/index . Activation of the International Charter and CONAE's National Emergency Unit/CAEARTE for monitoring fires in 3 provinces of Argentina.
31 January	CONAE	"Fire in Chile seen by satellites". http://www.conae.gov.ar/index . Activation of the International Charter and CONAE's National Emergency Unit/CAEARTE for monitoring fires in Chile.
1 February	CNES	Activation of the International Charter for monitoring fires in Chile https://presse.cnes.fr/en/forest-fires-chile-cnes-activates-spot-satellites-aid-firefighters
3 May	Roscosmos	Summary of Roscosmos chairmanship in the International Charter 'Space and Major Disasters' in Oct 2016 – Apr 2017 https://www.roskosmos.ru/23523/
30 August	DLR	DLR provides satellite data for Hurricane Harvey https://www.dlr.de/dlr/en/desktopdefault.aspx/tabid-10080/150_read-23898/#/gallery/28054
7 September	CNES	Activation of the International Charter for Hurricane Irma in Caribbean https://presse.cnes.fr/en/hurricane-irma-eastern-caribbean-cnes-activates-pleiades-satellites-coordinate-assistance-affected

8 September	CNES	Activation of the International Charter for Hurricane Harvey in US https://charte.cnes.fr/fr/les-satellites-pleiades-mettent-en-evidence-les-zones-inondees-au-texas
9 September	CNES	After Hurricane Irma the satellites in support of the rescue teams https://www.sciencesetavenir.fr/nature-environnement/apres-le-passage-de-l-ouragan-irma-les-satellites-en-soutien-des-secours_116212
12 September	CONAE	"Satellite Products for Emergency Management: Floods and Fires seen from Space". http://www.conae.gov.ar/index . Activation of the International Charter and CONAE's National Emergency Unit/CAEARTE for monitoring floods in Buenos Aires and fires in Cordoba province, Argentina.
18 September	Roscosmos	Roscosmos cooperation with foreign partners in sphere of Earth Observation imagery. https://www.roskosmos.ru/24095/
13 October	UKSA/DMC	International Charter space data to support Red Cross and Red Crescent disaster relief efforts. https://www.gov.uk/government/news/international-charter-space-data-to-support-red-cross-and-red-crescent-disaster-relief-efforts
21 November	DLR	The International Charter 'Space and Major Disasters': DLR's Contributions to Emergency Response Worldwide http://doi.org/10.1007/s41064-017-0032-1
14 December	CNES	"A charter for managing climate change" Video: https://cnes.fr/en/media/une-charte-face-au-changement-climatique

Table 5-2. List of articles and press releases

In addition, Charter activations and product references are published in the monthly UN-SPIDER Updates (www.un-spider.org) and on the GDACS portal (<http://portal.gdacs.org/data>) where a regular summary of relevant satellite mapping activities including the Charter activations is published by UNITAR/UNOSAT.

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 2017 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. MunichRE as NatCatService and relevant analysis were also consulted (<http://www.munichre.com/natcatservice>).

The reports issued by the Project Managers of the Charter activations remain one of the main sources of information for assessing the performance and quality of service provided by the Charter during 2017.

6.1 Overall impact

In 2017, the most catastrophic events were the devastating floods in India, Nepal and Bangladesh triggered by powerful monsoon rains, affecting more than 22.5 million and killing 2,700 people, the mudslides in Sierra Leone killing 1102 people, and the earthquake in Iran killing 660 people. 2017 was one of the years with the highest number of natural disasters and a very high impact of natural disaster events in terms of damages (see Figure 6-1).

316 natural events (excluding droughts, extreme temperature, and including earthquakes and tsunamis, floods, landslides, storms, volcanic eruptions, wildfires, and mass movement) 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 13.6% of the total number of natural disasters registered by EM-DAT in 2017; this is equivalent to the percentages of previous years (i.e. 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 catastrophes 2017 Analyses, assessments, positions, 2017 issue; Munich RE*) registered 730 catastrophic events. Direct overall losses from natural catastrophes in 2017 amounted to US\$ 340bn, far greater than those in the extreme years of 2005 and 2008. 2017 was the second-costliest year ever for natural disasters mainly due to the hurricane season in the North Atlantic, accounting for US\$ 220bn in overall losses (2011 being the first with US\$ 350bn mainly due to the Tohoku earthquake, the following tsunami in Japan and floods in Thailand). A total of 10,000 people lost their lives globally. 2,700 people out of the 10,000 died in extreme flood events that struck in India, Nepal and Bangladesh during the monsoon season. A large number of victims (65%) lost their lives in hydrological events. The distribution by continent shows that Asia was again worst affected in 2017, with 65%, followed by North America, Central America and the Caribbean with 12% and Africa 12%. South America, Europe and Oceania accounted for 7%, 4% and <1% respectively of the registered events. The distribution of 2017 Charter activations by continent (Figure 3-6) confirms this trend.

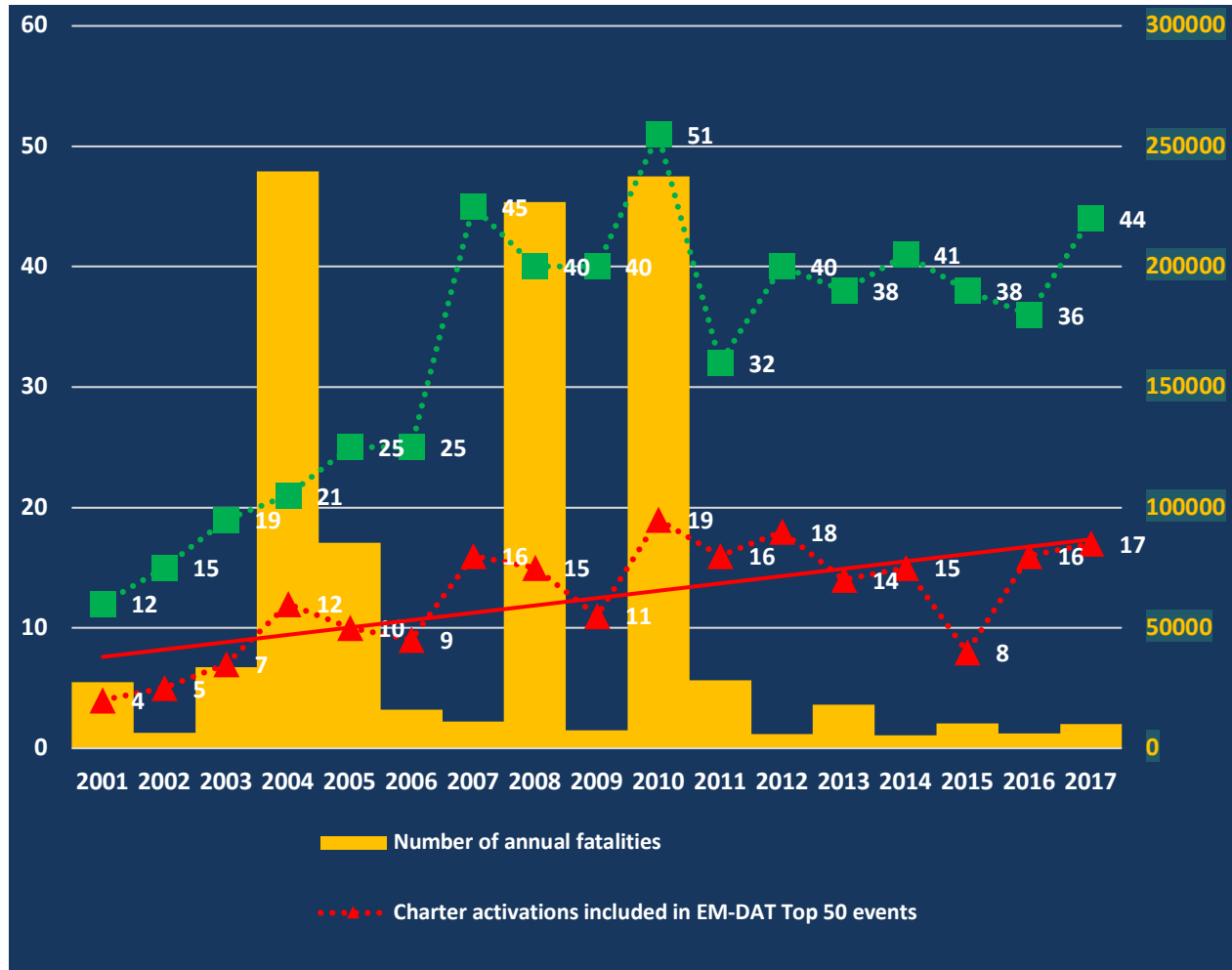


Figure 6-1. Number of Charter events over 2001-2017

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 total number of fatalities counted for the 50 main disasters was much lower than 2004, 2008 and 2010 and equivalent to 2002, 2012, 2014 and 2016.

Figure 6-1 shows that 17 of the 50 most severe events recorded in EM-DAT in 2017 were covered by Charter activations. In 2017, the number of Charter activations (44) 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 countries (e.g. hurricanes) and by the existence of national and regional EO-based emergency response services (e.g. Copernicus EMS, Sentinel Asia).

In 2017, the Charter covered 6 of the 10 most severe disasters by fatalities (Table 6-1 next page). Among the last eight years (2009-2017), the Charter was triggered for 13 of the 15 most severe natural disasters by fatalities, as reported by EM-DAT (Table 6-2).

Top 10 Disasters – Number Killed – 2017					
<i>The text in italic indicates that the Charter was activated</i>					
Country	Disaster type	Date	#killed	#Affected people	Total Damage (000' \$)
<i>Sierra Leone</i>	<i>Landslide/mudslide</i>	<i>14/08/2017</i>	<i>1102</i>	<i>11,916</i>	<i>30,000</i>
India	Storm	02/12/2017	884	60,000	0
India	Flood	11/08/2017	514	17,200,000	1,567,000
<i>Iran</i>	<i>Earthquake</i>	<i>12/11/2017</i>	<i>444</i>	<i>209,000</i>	<i>740,000</i>
<i>Mexico</i>	<i>Earthquake</i>	<i>19/09/2017</i>	<i>369</i>	<i>256,000</i>	<i>6,000,000</i>
<i>Colombia</i>	<i>Landslide</i>	<i>31/03/2017</i>	<i>329</i>	<i>45,360</i>	<i>100,000</i>
<i>Sri Lanka</i>	<i>Flood</i>	<i>25/05/2017</i>	<i>293</i>	<i>879,932</i>	<i>389,000</i>
India	Flood	20/06/2017	284	520,000	250,000
Zimbabwe	Storm	20/01/2017	251	113,023	189,000
<i>Peru</i>	<i>Flood</i>	<i>15/03/2017</i>	<i>184</i>	<i>1,800,505</i>	<i>3,100,000</i>

Table 6-1. Ten most severe natural disasters by number of fatalities in 2017 (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 – 2009-2017				
<i>The text in italic indicates that the Charter was activated</i>				
Date	Country/District	Type	# Killed	#Affected people
<i>12/01/2010</i>	<i>Haiti</i>	<i>Earthquake</i>	<i>222,570</i>	<i>3,700,000</i>
<i>11/03/2011</i>	<i>Japan</i>	<i>Earthquake and tsunami</i>	<i>19,848</i>	<i>368,820</i>
<i>25/4/2015</i>	<i>Nepal</i>	<i>Earthquake</i>	<i>8,831</i>	<i>5,639,722</i>
<i>8/11/2013</i>	<i>Philippines</i>	<i>Tropical cyclone</i>	<i>7,354</i>	<i>16,106,807</i>
<i>12-27/06/2013</i>	<i>India</i>	<i>Flood</i>	<i>6,054</i>	<i>504,473</i>
<i>14/04/2010</i>	<i>China P Rep</i>	<i>Earthquake</i>	<i>2,968</i>	<i>112,000</i>
<i>28/07/2010</i>	<i>Pakistan</i>	<i>Flash flood</i>	<i>1,985</i>	<i>2,0359,496</i>
<i>4-5/12/2012</i>	<i>Philippines</i>	<i>Tropical cyclone</i>	<i>1,900</i>	<i>6,246,664</i>
<i>07/08/2010</i>	<i>China P Rep</i>	<i>Landslide</i>	<i>1,765</i>	<i>4,7200</i>
<i>29/05/2010</i>	<i>China P Rep</i>	<i>General flood</i>	<i>1,691</i>	<i>134,000,000</i>
<i>15/12/2011</i>	<i>Philippines</i>	<i>Tropical cyclone</i>	<i>1,439</i>	<i>1,150,300</i>
<i>30/09/2009</i>	<i>Indonesia</i>	<i>Earthquake</i>	<i>1177</i>	<i>679,402</i>

<i>14/08/2017</i>	<i>Sierra Leone</i>	<i>Mudslide</i>	<i>1102</i>	<i>11,916</i>
07/09/2009	India	Flood	992	1,886,000
02/12/2017	India	Flood	884	60,000

Table 6-2. Fifteen most severe disasters by number of fatalities (2009-2017) (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 2017.

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

Country	Disaster type	Start date	Total deaths	Total affected	Total damage ('000 US\$)	Charter activation
Sierra Leone	Landslide	14/08/2017	1102	11916	30000	x
India	Storm	02/12/2017	884	60000	0	
India	Flood	11/08/2017	514	17200000	1567000	
Iran (Islamic Republic of)	Earthquake	12/11/2017	444	209000	740000	x
Mexico	Earthquake	19/09/2017	369	256000	6000000	x
Colombia	Landslide	31/03/2017	329	45360	100000	x
Sri Lanka	Flood	25/05/2017	293	879932	389000	x
India	Flood	20/06/2017	284	520000	250000	
Zimbabwe	Storm	20/01/2017	251	113023	189000	
Peru	Flood	15/03/2017	184	1800505	3100000	x
Nepal	Flood	10/08/2017	176	1700134	595000	x
Congo (Democratic Republic of the)	Landslide	16/08/2017	174	10	0	
Pakistan	Flood	26/06/2017	164	2367	110000	
Bangladesh	Landslide	12/06/2017	160	80187	0	
Bangladesh	Flood	10/08/2017	144	8000000	500000	x
Viet Nam	Storm	04/11/2017	123	4330000	1000000	x
Congo (Democratic Republic of the)	Flood	19/09/2017	105	500	0	
Viet Nam	Flood	08/10/2017	103	40038	88000	

India	Flood	16/08/2017	101	2700000	0	
Mexico	Earthquake	08/09/2017	98	1200250	2300000	
Thailand	Flood	01/01/2017	96	1800000	1000000	
Philippines	Storm	16/12/2017	91	1861328	71901	
USA	Storm	25/08/2017	88	582024	95000000	x
China	Landslide	23/06/2017	83	400	0	x
Madagascar	Storm	07/03/2017	81	434253	20000	x
India	Flood	25/06/2017	75	1735000	0	
Afghanistan	Landslide	05/02/2017	73	0	0	
Dominica	Storm	18/09/2017	64	71393	380490	x
Portugal	Wildfire	17/06/2017	64	704	232000	
Philippines	Storm	21/12/2017	58	923757	50000	
USA	Storm	10/09/2017	58	70000	57000000	x
China	Flood	22/06/2017	56	12000008	6000000	
Niger	Flood	26/08/2017	56	206513	10000	
Afghanistan	Landslide	05/02/2017	50	363	0	
Yemen	Flood	29/08/2017	50	8	0	
India	Landslide	13/08/2017	46	100	0	
Portugal	Wildfire	15/10/2017	45	2771	500000	
Puerto Rico	Storm	20/09/2017	44	5700	68000000	x
Iran (Islamic Republic of)	Flood	15/04/2017	42	0	353000	
China	Flood	08/08/2017	40	45000	315000	
Viet Nam	Flood	03/08/2017	39	4161	88000	x
Japan	Flood	06/07/2017	37	2944	700000	
China	Storm	13/07/2017	36	174300	3400000	
Afghanistan	Storm	17/02/2017	36	9055	0	
Afghanistan	Flood	17/07/2017	36	1822	0	
China	Landslide	28/08/2017	35	758	2300	
Afghanistan	Storm	24/01/2017	31	0	0	
India	Flood	01/06/2017	31	0	0	
USA	Wildfire	08/10/2017	30	9185	13000000	
China	Earthquake	08/08/2017	29	218325	500000	x

Table 6-3. Fifty most severe disasters by number of fatalities (listed by total damage) in 2017 (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 17 of the 50 most severe natural disasters in terms of fatalities recorded by EM-DAT in 2017, excluding droughts and extreme temperature events (Figure. 6-1 and 6-2).

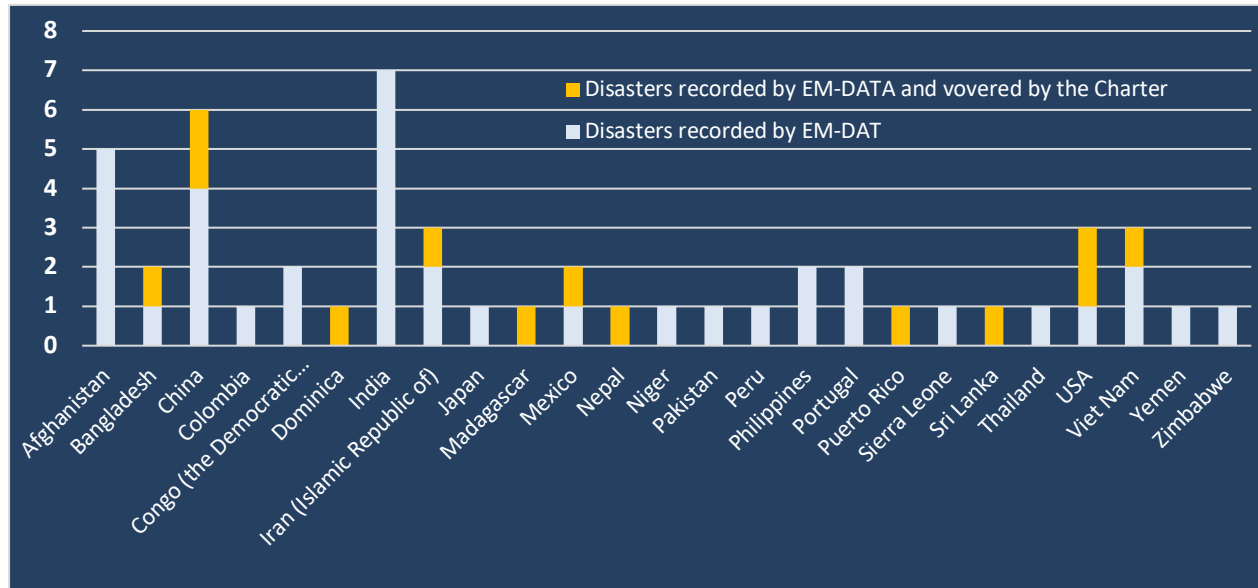


Figure 6-2. 2017 Breakdown by countries of the 50 major natural disasters (by fatalities) recorded by EM-DAT. In red, the ones covered by the Charter.

(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 17 activations, requests were made by:

- Charter Authorised Users (AUs) for disasters in their countries: 3 activations for ocean storm in USA (one of them being for Puerto Rico and US Virgin Islands) were requested by USGS; 2 activations for landslides, respectively in China were requested by NDRCC; 1 activation for flood in Sri Lanka was requested by DMC.
- Charter Authorized Users (AUs) for disasters in other countries: 1 activation for flood in Peru was requested by SIFEM.
- Charter Cooperating Bodies: the activations for flood in Madagascar, floods (2) in Bangladesh, ocean storm in Dominica, earthquake in Mexico, flood in Colombia, ocean storm in Vietnam and earthquake in Iran were requested by UNITAR/UNOSAT; the activation for landslide in Sierra Leone was requested by UNOOSA; the activation for flood in Vietnam was requested by Sentinel Asia.

This number is three times higher the number registered in 2015 and equivalent to the ones registered in 2010-2014 and 2016, where the number ranged from 14 to 19 (Figure 6-1).

The Charter service was not requested for 33 out of the 50 most severe disasters events (by fatalities):

- 16 out of 33 occurred in countries with an AU (India (7), China (4), Portugal (2), Pakistan (1), USA (1) and Japan (1)). For some of these events other satellite EO emergency

response mechanisms were activated e.g. forest fires in Portugal in June 2017 were covered by the European Copernicus EMS service and floods in China in June 2017 were covered by Sentinel Asia.

- 17 out of the 33 occurred in countries without an AU. All fall well within the hazard types of the Charter.
 - o 12 occurred in Asia (Afghanistan (5), Philippines (2), Vietnam (1), Bangladesh, Thailand, Yemen and Iran).
 - o 4 occurred in Africa (Democratic Republic of Congo (2), Niger and Zimbabwe).
 - o 1 occurred in Central America (Mexico).

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

6.2 System performances assessment

Up to 2016, system performance statistics have been gathered and calculated manually. Also, 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.

Starting in 2018 shall be the first year that the Charter operational system will be fully monitored and all system performances will be calculated with a higher accuracy (hours and minutes).

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 2017.
- Six PM trainings were held for PMs in Japan, Myanmar, New Caledonia, Sri Lanka, UK, Paraguay, Uruguay, Chile, and Peru. That allows a regular growth and commitment of PMs that will enhance the ability to assign a PM from the geographical region of the disaster.
- 4 AU trainings were organised by JAXA, CNES, CONAE, USGS and CNSA using COS-2 for new user organisations from New Caledonia, Myanmar, Sri Lanka and Paraguay.

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 2017 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 PMs work closely with the end users trying to ensure that the products derived from the satellite data meet the needs of the end user. This important relationship is often reflected in the positive feedback received from end users.

Below, some examples of comments from end-users:

Activation ID: 520**Event: Earthquake in the Philippines, 13 February 2017****Requested by: DSWD on behalf of ADRC****Feedback:**

Communication with the Charter Officers and the Project Manager was very efficient. However, due to cloud cover the provided satellite images were of poor quality, so did not successfully fulfil the request.

Activation ID: 529**Event: Flood in Canada, 6 May 2017****Requested by Public Safety Canada****Feedback:**

Communication between the Charter Officers and the Project Manager ran smoothly. We were able to use the imagery provided to see the extent of the flooding along the Ottawa River. The images were used to show senior officials and decision makers the extent of the flooding. However, the only way to access the data was via ftp.

Activation ID: 545**Event: Flood in Bangladesh, 15 August 2017****Requested by UNITAR/UNOSAT on behalf of United Nations Office for the Coordination of Humanitarian Affairs | Regional Office for Asia and the Pacific. Project management: UNITAR/UNOSAT****Feedback:**

Charter Officer and Project Managers were really efficient and supportive. A flood inundated analysis map was developed, based on the provided images to support emergency response decision-making. The Charter's products were used as important information related to the situation in the affected districts, and also in refugee camps located in the southern part of the country.

However, a few AUs have remarked that some EO based damage mapping products were sometimes too coarse to observe and estimate damages (several hazard types) and some products were not able to capture the hazard impact (e.g. in case of flash floods). Such cases could be reduced by a better filtering of requests to avoid Charter activation for events for which the contribution of satellite imagery is too limited with current EO missions. In a few cases, some data were not used due to cloud coverage.

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. 5,000 followers were counted by end of 2017 (many more will actually be reached due to re-tweets of Charter messages, e.g. through Charter agency twitter accounts).
- 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 movie, flyer and brochure in English and French are distributed and used regularly at conferences and workshops both nationally and internationally.

7 Conclusions

In 2017, the following agencies took the lead function which rotates among Charter members on a six-month basis: the Russian State Space Corporation, ROSCOSMOS (October 2016 – April 2017), the UK Space Agency, UKSA (April 2017 – October 2017) and the European space Agency, ESA (October 2017 – April 2018). With the beginning of the leadership periods, the members of the Charter Board and the Executive Secretariat came together to their bi-annual meetings in Moscow, Russia in October 2016, in Oxford, United Kingdom in April 2017 and in Frascati, Italy in October 2017.

In total, the Charter has been triggered for 561 disasters in 122 countries between since 2000 and the end of 2017. Throughout the reporting period, there were 44 activations in 30 countries, a similar figure to 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 activated for the major earthquake in Iran and Iraq on 12 November 2017, for Hurricane Irma in Haiti, Dominican Republic, USA and the British Virgin Islands / Anguilla (in total 4 activations) in early September 2017 and for Hurricane Maria in Dominica, Dominican Republic, Puerto Rico / US Virgin Islands and Martinique / Guadeloupe (in total 4 activations) in mid-September 2017.

Six Charter activations were among the 10 most severe natural disasters in 2017 as registered by CRED’s EM-DAT. In 2017, the most catastrophic events were the devastating floods in India, Nepal and Bangladesh triggered by powerful monsoon rains, affecting more than 22.5 million and killing 2,700 people, the mudslides in Sierra Leone killing 1,102 people, and the earthquake in Iran killing 660 people. 2017 was one of the years with the highest number of natural disasters and a very high impact of natural disaster events in terms of damages.

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 became the 17th member of the Charter. The Charter conducted the official signature ceremony, that marked the accession of UAESA to the Charter, after the reporting period 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. Ecuador, Myanmar, New Caledonia, and Sri Lanka have had their national users granted Charter access in 2017. Other candidates are under assessment or training. 58 countries and the EC have dedicated AUs reaching a total of 67 user organizations able to directly request Charter activations by the end of 2017. Charter members have continued to promote UA and the Charter as a whole through their participation in different international events held in 2017.

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. 75% 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 transferred 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.

Six Project Manager training sessions were organized by JAXA, CNES, UKSA/DMC and CONAE 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. In 2018, the website shall be 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 15th Charter newsletter was issued in 2017. 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.