

International Charter Space & Major Disasters



Executive Secretariat

14th Annual Report

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based on contributions by all Charter members.*

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1 Introduction

1.1 Overview of the International Charter Space and Major Disasters

The Charter is an international collaboration amongst space agencies – the Charter members. Initiated by the European Space Agency (ESA), the French Space Agency (CNES) and the Canadian Space Agency (CSA) in 2000, 12 other space agencies joined between 2000 and 2013, namely (in chronological order):

- US National Oceanic and Atmospheric Administration, NOAA
- Comision 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), DMC
- China National Space Administration, CNSA
- German Aerospace Center, DLR
- Korea Aerospace Research Institute, KARI
- Instituto Nacional de Pesquisas Espaciais, Brazil, INPE
- European Organisation for the Exploitation of Meteorological Satellites, EUMETSAT
- Russian Federal Space Agency (ROSCOSMOS)

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 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). The Charter provides a mechanism for the rapid tasking of satellites for immediate response rather than for the long-term monitoring of severe environmental hazards such as droughts and non-environment-related humanitarian emergencies (e.g. acts of war, refugee crises 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 Charter has been activated for 443 disasters (as of the end of 2014), in 114 countries, since its inception in 2000. In 2014 alone, the Charter was activated 41 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 2014, active satellites included (Table 1-1):

- Radar (high resolution and very high resolution sensors): Risat-1, RADARSAT-2, TerraSAR-X, TanDEM-X and Sentinel-1A.
- Optical (high resolution and very high resolution sensors): UK-DMC 2, Landsat 7 and 8, SPOT-5, SPOT-6, SPOT-7, PLEIADES 1A and 1B, PROBA 1, SJ-9A, GF-1, KOMPSAT-2, IRS-P5 (Cartosat-1), Cartosat-2, Resourcesat-2, Oceansat-2, RapidEye,

Kanopus-V, and Resurs-P, HDTV camera, mounted on-board the KIBO module of the International Space Station (ISS).

- Optical (medium and low resolution sensors): POES, GOES, FY-3C, Metop series, Meteosat first and second generation and Meteor-M.

Sentinel-1A was launched by ESA on 3rd April 2014 (Sentinel-1B is scheduled for 2016); Sentinel-1A is operated by ESA in the frame of the European Union Copernicus Programme. The first Charter delivery of Sentinel-1A data took place in May 2014 for a flood in Serbia following an activation request by the Russian Authorized User, EMERCOM, to support their relief team in Serbia. The Advanced Land Observing Satellite-2 "DAICHI-2" (ALOS-2) DAICHI-2 was launched by JAXA on 24th May 2014; data will be available for the Charter at the beginning of 2015 after the calibration and validation phases. Specific agreements with other entities allow the Charter to access additional products (both high and very high resolution) from satellites such as, Formosat, GeoEye, IKONOS, QuickBird, WorldView. WorldView3 was launched in August 2014 and some images were made available. SPOT-6 and SPOT-7 images (CNES) were made available from October 2104 (the satellites were respectively launched in September 2012 and June 2104).

| Agency | Satellite (operational) | Agency | Satellite (operational) |
|----------|-----------------------------------|-----------|----------------------------|
| CNES | PLEIADES 1A and 1B | ISRO | Oceansat-2 |
| | SPOT-5 , SPOT-6, SPOT-7 | | Resourcesat-2 |
| | FORMOSAT-2 | | RISAT-1 |
| CSA | RADARSAT-2 | | Cartosat-1 (IRS P5) |
| CNSA | SJ-9A, GF-1, FY-3C | | Cartosat-2 |
| DLR | TerraSAR-X | KARI | KOMPSAT-2 |
| | TanDEM-X | NOAA | POES |
| | RapidEye | | GOES |
| DMCii | UK-DMC2 | ROSCOSMOS | Kanopus-V |
| | Deimos-1 | | Meteor-M |
| | NigeriaSat-2 | | Resurs-P |
| | NigeriaSat-X | USGS | Landsat 7 and 8 |
| ESA | Sentinel-1A* | | QuickBird |
| | PROBA CHRIS | | IKONOS |
| EUMETSAT | Metop Series | | WorldView-1, 2 & 3 |
| | Meteosat Second Generation Series | | GeoEye-1 |
| | Meteosat First Generation Series | | |

* operated by ESA in the frame of the European Union Copernicus Programme

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

Archived data from inactive satellites (ALOS, ENVISAT, ERS, CBERS, IRS-1C,1D, IRS P4, P6, IMS-1, RADARSAT-1, SAC-C, SPOT 1-3 & 4, UK-DMC, Landsat-5 and NigeriaSat remain available for use in Charter activations) (Table 1-2).

| Agency | Satellite (archive only) |
|--------|----------------------------------|
| CNES | SPOT 1-3 |
| | SPOT-4 |
| CNSA | CBERS-2 |
| CSA | RADARSAT-1 |
| CONAE | SAC-C |
| DMCii | AlSat-1 |
| ESA | ERS |
| | ENVISAT MERIS |
| | ENVISAT ASAR |
| INPE | CBERS-2 |
| ISRO | IMS-1, IRS P4,P6; IRS-1C, IRS-1D |
| JAXA | ALOS (PRISM, AVNIR-2) |
| | ALOS Palsar |
| USGS | Landsat-5 |

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

1.2 Purpose and scope of this document

This document describes the 2014 activities of the International Charter “Space & Major Disasters”. During this period, the lead agencies on a six monthly rotational basis have been: the Argentinean Space Agency (CONAE) (October 2013 - April 2014), the China National Space Administration, CNSA (April 2014 – October 2014), the Korean Aerospace Research Institute, KARI (October 2014 – April 2015).



Figure 1-1. 31st Charter Board and Executive Secretariat members in Beijing, China, April 2014.



Figure 1-2. 32nd Charter Board and Executive Secretariat members at KARI's headquarter, Daejeon, South Korea, October 2014.

This report is based on the following:

- 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 same structure as the work plan of the Executive Secretariat:

Chapter 1 - Introduction.

Chapter 2 - External relations; explains the integration of new members, the Universal Access, progress, external relationships and Cooperating Bodies.

Chapter 3 - Operations; depicts internal business concerned with operations, resource consumption and technical updates (in particular the development of COS-2).

Chapter 4 - Communication; reports on all communication activities undertaken throughout the reporting period.

Chapter 5 - Assessment; 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 6 - 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

| | |
|---------------|---|
| 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 |
| 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 |
| CONAE | Comision 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 Center) |
| DMC | Disaster Management Constellation |
| DMCii | Disaster Management Constellation International Imaging |
| DRM | Disaster Risk Management |
| ECO | Emergency On-Call Officer (of the Charter) |
| EM-DAT | Emergency Events Database |
| EO | Earth Observation |
| EOR | Emergency Observation Request |
| ERS | Emergency Response Service |
| ESA | European Space Agency |
| ESRIN | ESA Centre for Earth Observation |
| EUMETSAT | European 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) |
| MO | Manila Observatory (the Philippines) |
| MR | Medium Resolution |
| NatCatSERVICE | Natural catastrophe know-how for risk management and research |
| NDRCC | National Disaster Reduction Centre of China |
| NFP | National Focal Point |
| NOAA | National Oceanic and Atmospheric Administration |
| NRSC | National Remote Sensing Centre (India) |
| NSMC | National Satellite Meteorological Center |
| ODO | On-Duty Operator |

| | |
|---------------|---|
| ONEMI | Oficina Nacional de Emergencia del Ministerio del Interior (Chile) |
| PA | Partner Agency |
| PM | Project Manager (of the Charter) |
| ROSCOSMOS | Russian Federal Space Agency |
| SA | Sentinel Asia |
| SARE | Semi Annual Refresher Exercises |
| SELPER | Remote Sensing Society of Bolivia |
| SERTIT | Service Régional de Traitement d'Image et de Télédétection (France) |
| 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 |
| WCDDR | World Conference on Disaster Risk Reduction |
| WFP | World Food Programme |

The Charter is revising the Universal Access procedures to facilitate and accelerate the process put in place in 2012 to fully accept a national user as AU. The Universal Access Brochure was updated. The UA brochure and the User Registration Form are now available on the Charter website in three languages: English, French and Spanish.

Charter members have continued to promote UA and the Charter as a whole through their participation in different international events held in 2014. (e.g. 11th EUMETSAT User Forum in Africa). Furthermore, Universal Access focused promotional actions - explaining the UA initiative and process promoting the possibility to become AU following the UA procedures - which were conducted in collaboration with Asia-Pacific Space Cooperation Organization (APSCO) and UNOOSA: 1) letters to APSCO membership were sent by CNSA. 6 countries without an AU were contacted: Bangladesh, Indonesia, Iran, Mongolia, Peru, and Thailand; 2) letters were sent to 30 National Focal Points of the UN-SPIDER network, of nations which do not have an Authorized User as of today.

2.3 Cooperating Bodies & Charter User Intermediaries

2.3.1 Collaboration with UNOOSA and UNITAR/UNOSAT

Active cooperation with the UN is continuing on the basis of existing arrangements with UNOOSA and UNITAR/UNOSAT that were confirmed during the Board meeting in Daejeon, South Korea (October 2014). Since mid-2013, most of the Charter activations by UN users were channelled through UNITAR/UNOSAT, which supports Charter operations by providing Project Managers and value-adding services as well as training and awareness activities; UNOOSA supports awareness, training and information activities associated with the Charter worldwide, relying on the network of its programme UN-SPIDER.

All Charter activations and product references are published in the monthly UN-SPIDER Updates, an electronic publication which is posted on the Knowledge Portal (www.un-spider.org) and distributed to nearly 20,000 subscribers worldwide via e-mail. A regular summary of relevant satellite mapping activities including the Charter activations is produced by UNOSAT and is accessible through the Global Disaster Alert and Coordination System (GDACS) portal (<http://portal.gdacs.org/data>).

UNITAR/UNOSAT and UNOOSA continued to promote the UA initiative by giving presentations to numerous audiences at national and international workshops and conferences regarding the objectives and processes involved in becoming a Charter Authorized User. Twitter is the social media tool used by both entities to communicate Charter activations and publicize the Charter.

11 of 41 Charter activations for 2014 (27 %) were requested by UNITAR/UNOSAT on behalf of UN agencies. UNOCHA was the main requestor with 9 calls; the others were initiated by WHO, WFP and UNESCAP.

Throughout the reporting period, UNITAR/UNOSAT staff members were nominated as PM for 7 activations; these PMs also provided value-adding services. In addition, UNITAR/UNOSAT supported the Charter for 4 other activations by providing value-adding services in the delivery of damage and impact assessment maps.

2.3.2 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. In 2014, SA was comprised of 81 organizations from 25 countries and regions including 15 international organizations. There were four new members in 2014: National Committee for Disaster Management (NCDM), Cambodia; Tokyo Institute of Technology, Japan; Tohoku University, Japan; Asian Disaster Preparedness Centre (ADPC), Thailand.

The ADRC provided the Charter with monthly activation status reports and provided two bi-annual reviews presenting Sentinel Asia's emergency response and promotional / awareness activities.

In 2014, 15 activations of SA were requested, one was denied (landslide in Northern Afghanistan). The escalation mechanism to the Charter was used in response to 6 events. The one relevant to a flood in India was merged with the call requested by ISRO for the same event. The number of escalations to the Charter has risen slightly: 2 in 2010, 4 in 2011, 2 in 2012, 5 in 2013 and, 6 in 2014. As in 2013, the escalation mechanism was used for 1/3 of all SA activations in 2014.

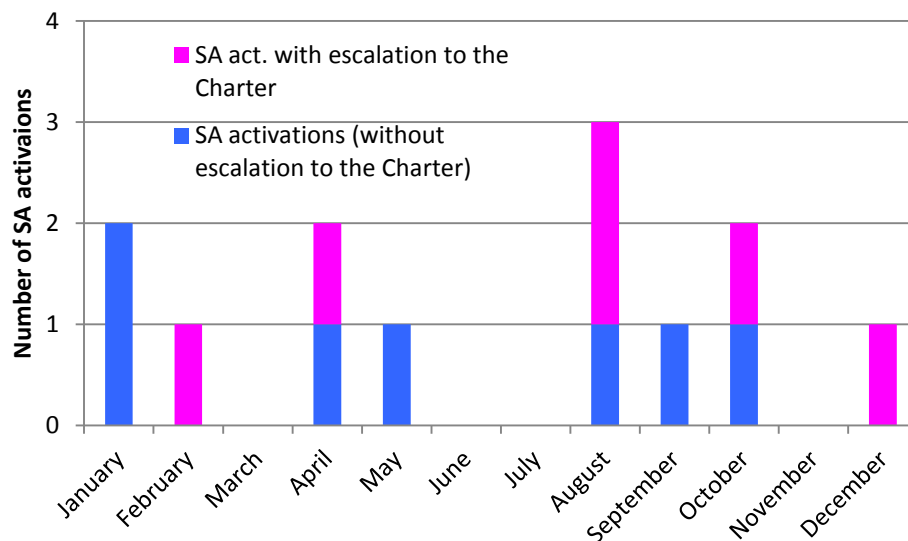


Figure 2-2. Sentinel Asia: 2014 monthly activations

SA – with the support of JAXA– continued to promote the Charter, explaining the escalation mechanism to activate the Charter and the UA initiative at several training workshops and conferences including: Sentinel Asia Joint Project Team Meeting (JPTM) and the Asia Pacific Space Agency Forum (APRSAF).

2.3.3 Collaboration with European Union Satellite Centre

Collaboration activities with the European Union Satellite Centre (EUSC or EU SatCen) are continuing. EUSC acts as a Collaborating Body to raise awareness and promote the Charter amongst their users in the EU Member States and within the context of the European External Action Service (EEAS).

EUSC may activate the Charter for natural and man-made disasters and may in addition provide suitable PMs.

2.4 Cooperation with other programmes and initiatives

2.4.1 Collaboration between European members of the Charter and the Copernicus programme

The two systems are actually complementary with slightly different scope: the Charter is focused on the response phase during a major emergency, while the Copernicus emergency service (EMS) is intended to provide support for all phases of the emergency management cycle in Europe and outside of Europe, according to European policy sectors. In addition, the EMS is not only activated for natural disasters, it can also be triggered for other types of emergency (e.g. humanitarian crises, environmental assessment after a natural disaster or war conflict).

The collaboration agreement was approved in 2013 and continued in 2014. It consists of providing advanced crisis mapping services by GIO-EMS to support specific Charter activations relevant to Europe's policy sectors. Additionally the European Commission, as Authorized User of the Charter, could activate the Charter in the case of a major disaster and the JRC may provide a Charter Project Manager (PM).

In 2014, information on GIO-EMS activations and Charter activations was regularly exchanged to facilitate coordination. GIO-EMS supported the Charter with value-added products in the frame of the flood in Serbia (May) - it was the first delivery of Sentinel-1 data to support a Charter activation - and, of the ocean storm in the Bermuda (July).

2.4.2 Collaboration with CEOS Working Group on disasters

The CEOS Working Group on Disasters is focused on three topics: floods, earthquakes and volcanoes. It aims at increasing and strengthening satellite Earth observation contributions to the various Disaster Risk Management (DRM) phases in these three domains.

Each of these thematic pilots intends to serve as a showcase for the international DRM community, in particular demonstrating a) the added value and uniqueness of increased CEOS coordination in this area; b) the benefits of closer ties to users (decision-makers, major stakeholders, and politicians, and ease of access to data; and c) the potential for the increased roles of space agencies in DRM beyond the current Hyogo Framework for Action for the following 10-year period starting in 2015.

In April 2014, the CEOS Working Group on Disasters requested the possibility to access to the data collection of a Charter activation to be used in their pilots. An agreement was defined by the Board to allow that, once an activation is closed, if access is required from CEOS Pilot users, the Charter agencies could share the data collections acquired, according to data licensing of each agency.

ESA with the support of other ES members prepared an article for publication in the framework of the Special edition of the CEOS Handbook concerning Earth Observation and WCDRR (*Satellite Earth Observations In Support Of Disaster Risk Reduction - Special 2015 WCDRR Edition*. © 2015 European Space Agency). This handbook has been prepared as CEOS contribution to the 3rd UN World Conference on Disaster Risk Reduction to be held in Sendai (Japan) in March next year.

2.5 Project Manager Training

The PM training is aimed at strengthening the network of Charter PMs by preparing for new participants. Five PM training sessions were carried out in 2014.

- March (Bangkok, Thailand): Lead by JAXA. Participants were from GIC/AIT.
- April (Beijing, China): Lead by CNSA in Beijing, China in collaboration with CNES, DMCii, ESA, and USGS ES members. 21 participants were from the National Disaster Reduction Center of China (NDRCC), National Satellite Meteorological Centre (NSMC), China Meteorological Administration (CMA), China Centre for Resources Satellite Data and Application (CRESDA), United Nations Platform for Space-based Information for Disaster Management and Emergency Response (UN-SPIDER) and Asia-Pacific Space Cooperation Organization (APSCO).
- July (Miami, USA): Lead by DMCii and USGS. The participants were from the Caribbean countries. Besides the PM training, an AU training was also performed with the goal of providing the relevant authorities in the region (mainly UK overseas Territories and USAID) with the necessary information to use the International Charter 'Space and Major Disasters' in the event of a natural or man-made disaster in the region.
- September (Jakarta, Indonesia): Lead by JAXA. Participants were from LAPAN.
- September (Toulouse, France): Lead by CNES. Participants were from CNES.

The Charter training course material includes various presentations on the planning and supply of EO data from the Charter members' order desks during an activation, a short presentation of COS-2 (the new Charter Operational System) and the use of on-line User Request Form (URF), the relationship with the AUs and end users, EO capabilities for crisis mapping module by type of disasters (scenarios) and a practical exercise session. Charter tutorials on the history of the Charter and its management structure and an overview of operational roles and procedures are also provided.

USGS is developing an online PM refresher training course to keep PMs up to date on the new members, additional satellites and updated Charter processes. The PM training material was revised to be tailored to this scope.



Figure 2-3. Participants at the Charter PM training in Beijing (China), April 2014



Figure 2-4. Participants at the Charter PM training in Jakarta (Indonesia), September 2014

3 Operations

3.1 Charter activations

In 2014, the Charter was activated 41 times, covering disasters in 30 countries (39 natural disasters, one for the Malaysian airlines aircraft disaster and one for the Ebola virus epidemics in Africa). This is a similar figure to the total activation 'average' between 2007 and 2013 (Figure 3-1). By the end of 2014, the Charter had been triggered for 443 disasters in 114 countries since 2000 (Figure 3-2).

It was the first time the Charter contributed to the search for aircraft debris following the disappearance of Malaysia Airlines Flight 370 and provided imagery for the international emergency teams combating the spread of the Ebola virus in Western Africa.

Since 2007, the annual number of activations has oscillated between 30 and 50. The Charter has effectively managed about 40 activations per year thanks to its distributed operational capacities and human resources.

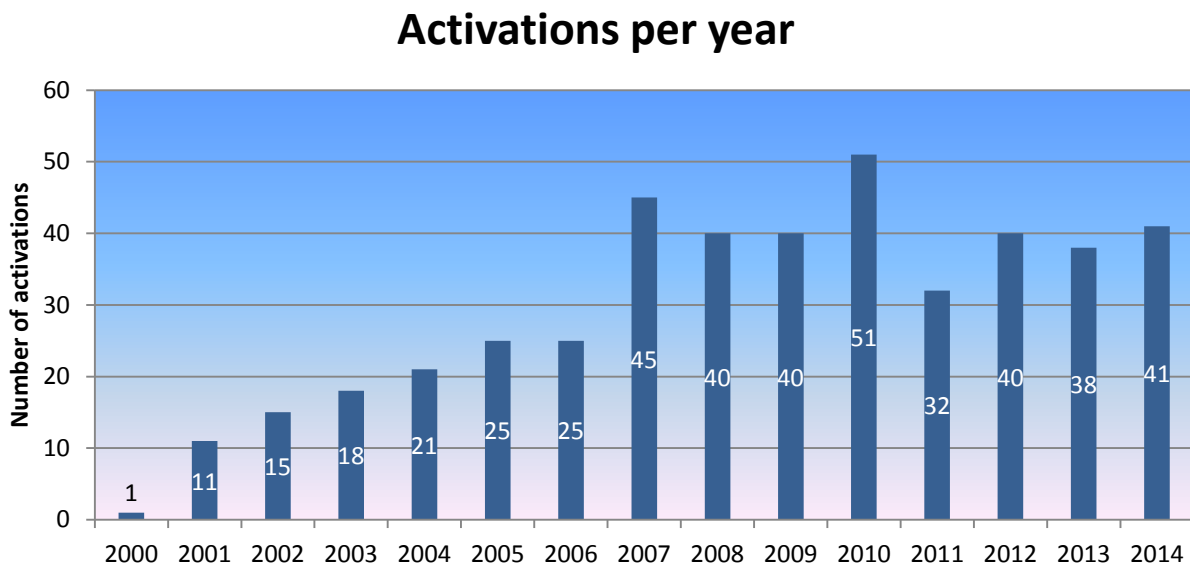
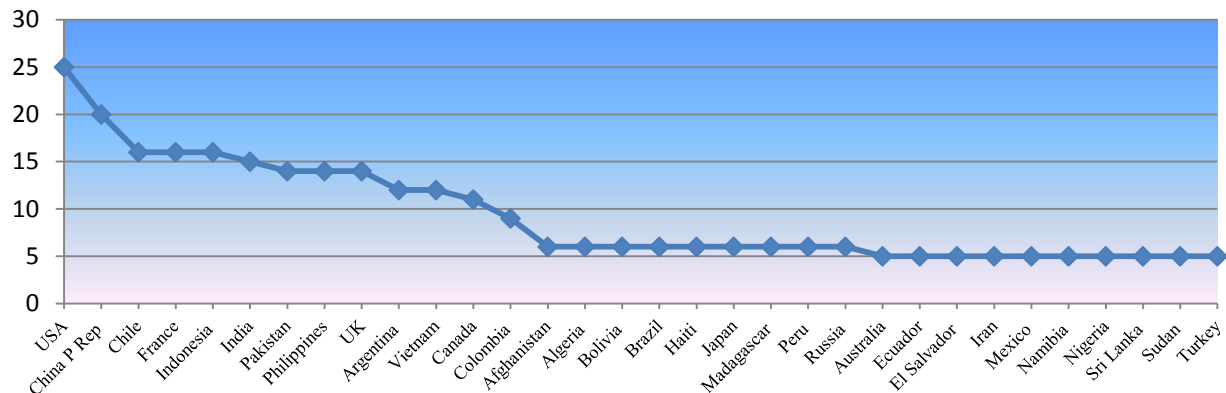
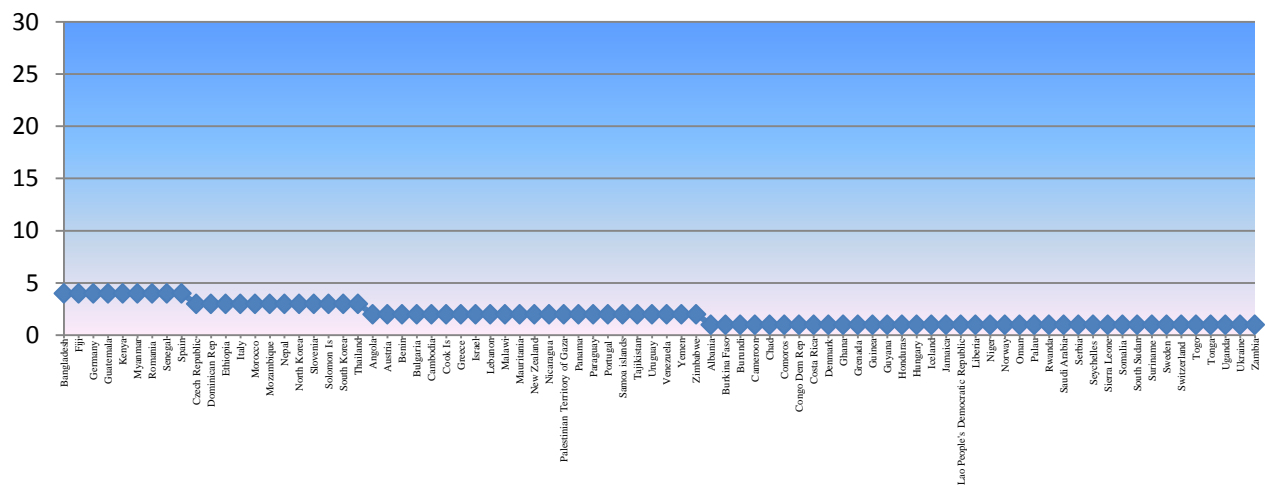


Figure 3-1. Number of Charter activations per year (2000- 2014)



a) 5 to 25 activations (2000-2014)



b) 1 to 4 activations (2000-2014)

Figure 3-2 a) & b). 2000-2014 breakdown of Charter activations by country

114 Countries around the world have benefited from the International Charter.

USA, China, Chile, France, Indonesia, India, Pakistan, Philippines, UK, Argentina and Vietnam are the countries which requested Charter activations most often (>10) to cover major disaster events during these 15 years.

All 2014 activations are listed in Table 3-1. The Call-ID is the unique number assigned by the 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, 43 requests were received in 2014. It is worth noting however, that two activations (432 and 437) were the result of two calls which were subsequently merged:

- Calls 500 and 503 were requested for a flood in India by ISRO and subsequently by ADRC few days after.
- Calls 506 and 507 were requested for the Ebola virus epidemic in Western Africa by USGS and UNITAR/UNOSAT on behalf of two different end-users (National Geospatial Agency/U.S Department of Defense and WHO).

| Activation ID | Disaster type | country | Activation date |
|---------------|-----------------------|-----------------------------|-----------------|
| 403 | Ocean storm and flood | France (la Réunion) | 2014-01-01 |
| 404 | Flood | UK | 2014-01-06 |
| 405 | Volcano | Indonesia | 2014-01-07 |
| 406 | Flood | Peru | 2014-01-21 |
| 407 | Wildfire | India | 2014-02-05 |
| 408 | Flood | UK | 2014-02-06 |
| 409 | Flood | Zimbabwe | 2014-02-07 |
| 410 | Snowfall | South Korea | 2014-02-10 |
| 411 | Flood and landslide | Burundi | 2014-02-11 |
| 412 | Flood and landslide | Bolivia | 2014-02-12 |
| 413 | Volcano | Indonesia | 2014-02-13 |
| 414 | Missing aircraft | China P Rep | 2014-03-11 |
| 415 | Flood | Brazil | 2014-03-21 |
| 416 | Tsunami | Chile | 2014-04-02 |
| 417 | Flood | Solomon Is | 2014-04-05 |
| 418 | Ocean storm | Australia | 2014-04-11 |
| 419 | Wildfire | Chile | 2014-04-14 |
| 420 | Landslide and mudflow | Tajikistan | 2014-04-15 |
| 421 | Flood and storm | Afghanistan | 2014-04-29 |
| 422 | Flood | Serbia | 2014-05-21 |
| 423 | Flood | Argentina | 2014-06-12 |
| 424 | Flood and landslide | Brazil | 2014-06-14 |
| 425 | Flood | Brazil | 2014-07-04 |
| 426 | Flood | Vietnam | 2014-07-18 |
| 427 | Ocean storm | China P Rep | 2014-07-19 |
| 428 | Wildfire | Dominican Rep | 2014-07-30 |
| 429 | Earthquake | China P Rep | 2014-08-03 |
| 430 | Landslide | Nepal | 2014-08-05 |
| 431 | Flood | Sudan | 2014-08-05 |
| 432 | Flood | India | 2014-08-18 |
| 433 | Flood and landslide | Panama | 2014-08-18 |
| 434 | Flood | Bangladesh | 2014-08-22 |
| 435 | Flood and landslide | Pakistan | 2014-09-12 |
| 436 | Flood | France | 2014-09-18 |
| 437 | Ebola virus epidemic | Liberia/Guinea/Sierra Leone | 2014-10-09 |
| 438 | Ocean storm | India | 2014-10-12 |
| 439 | Ocean Storm | UK (Bermuda) | 2014-10-15 |
| 440 | Landslide | Sri Lanka | 2014-10-30 |
| 441 | Flood and ocean storm | Philippines | 2014-12-05 |
| 442 | Landslide | Indonesia | 2014-12-15 |
| 443 | Flood | Sri Lanka | 2014-12-29 |

Table 3-1. List of 2014 Activations

3.1.1 Monthly activations

During 2014, the monthly average of calls was 3.6 and the monthly average of activations was 3.4.

| Year | Average # of calls per month | Average # of activations per month |
|------|------------------------------|------------------------------------|
| 2001 | 1 | 0.9 |
| 2002 | 1.4 | 1.3 |
| 2003 | 1.6 | 1.5 |
| 2004 | 1.9 | 1.8 |
| 2005 | 2.5 | 2.1 |
| 2006 | 2.3 | 2.1 |
| 2007 | 4.1 | 3.8 |
| 2008 | 3.9 | 3.3 |
| 2009 | 3.8 | 3.3 |
| 2010 | 5.3 | 4.3 |
| 2011 | 3 | 2.7 |
| 2012 | 3.7 | 3.3 |
| 2013 | 3.5 | 3.2 |
| 2014 | 3.6 | 3.4 |

Figure 3-3 shows the monthly distribution of activations throughout 2014. The highest number of activations occurred in February, April and August, corresponding to 46 % of the total number. The remaining months of 2014 saw a number of activations that varied from 0 to 4.

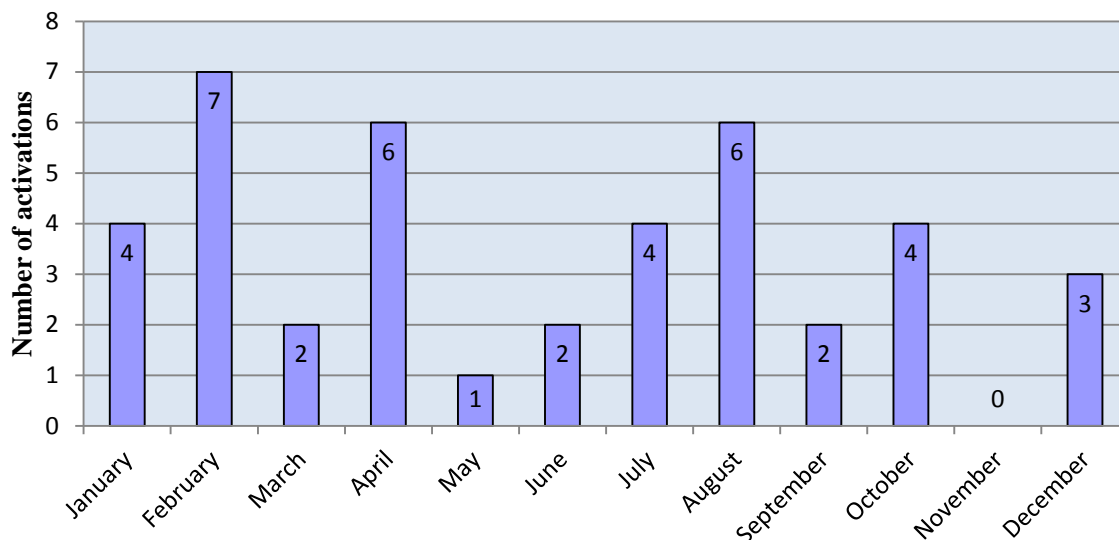


Figure 3-3. Distribution of the Charter activations by months in 2014

Peaks of activations at the end of summer and in autumn have occurred regularly since 2009 (Figures 3-4 and 3-5). Natural disasters occurring throughout that period of the year were found to be mainly attributable to intense rains in Asia, Western Africa and North America. Peak of activations in February in 2014 was due to different types of disasters linked to meteorological events (floods in Southern Africa, South America and Europe; a fire in India and a snow fall in Korea) as well as solid earth movement (volcanic eruption in Indonesia). In April the number of

activations was relatively high to monitor disaster events in Oceania and Asia due to heavy rain falls and tropical cyclone; in addition Chile was affected by two disaster events: an alert of a tsunami (northern coast) that was rapidly withdrawn by the Authorized User since impact was low and, forest fires in the Valparaíso region.

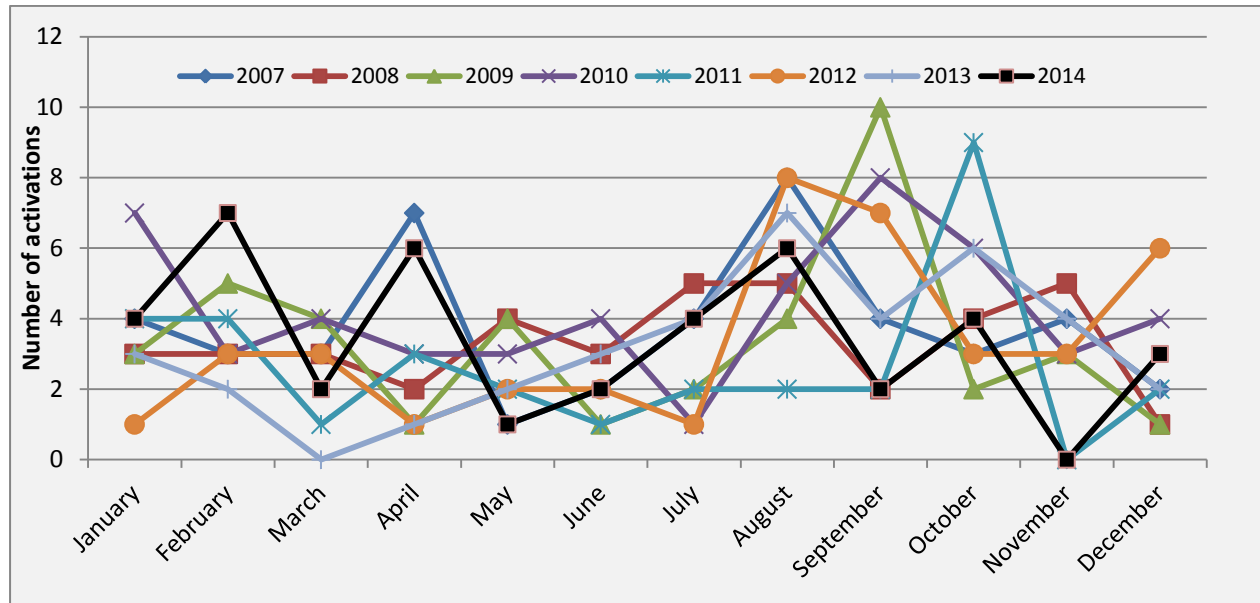


Figure 3-4. Charter activations by months from 2007 to 2014

In order to find an overall trend through the years, the following diagram shows the monthly average of activations as a percentage calculated over 8 years. This diagram clearly shows the peak of activations at the end of summer and in early autumn while the period of January-February is the second time period showing a regular peak of activities.

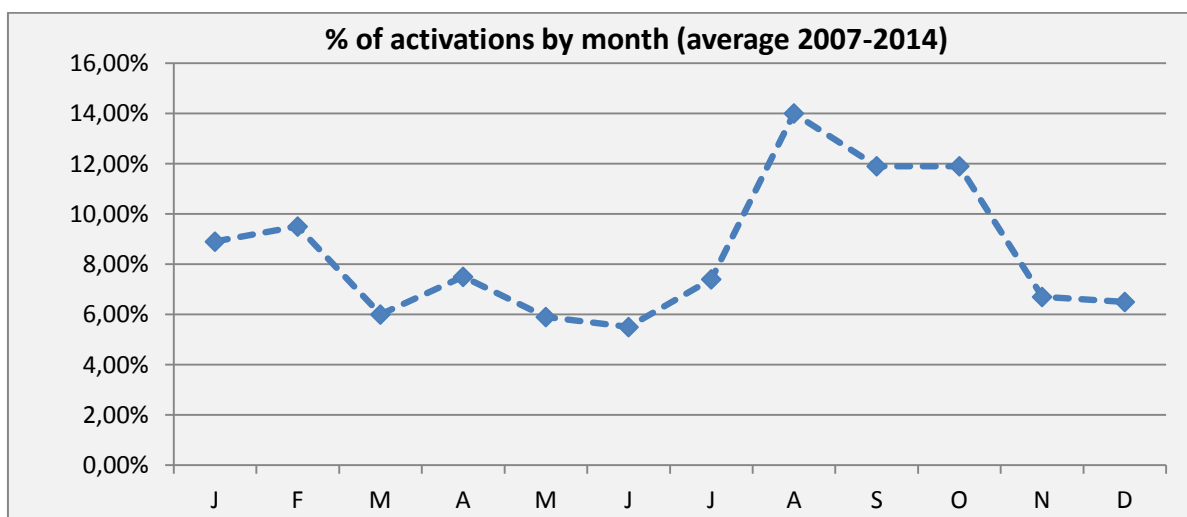


Figure 3-5. Monthly average (in %) of Charter activations (2007 to 2014)

3.1.2 Geographical distribution

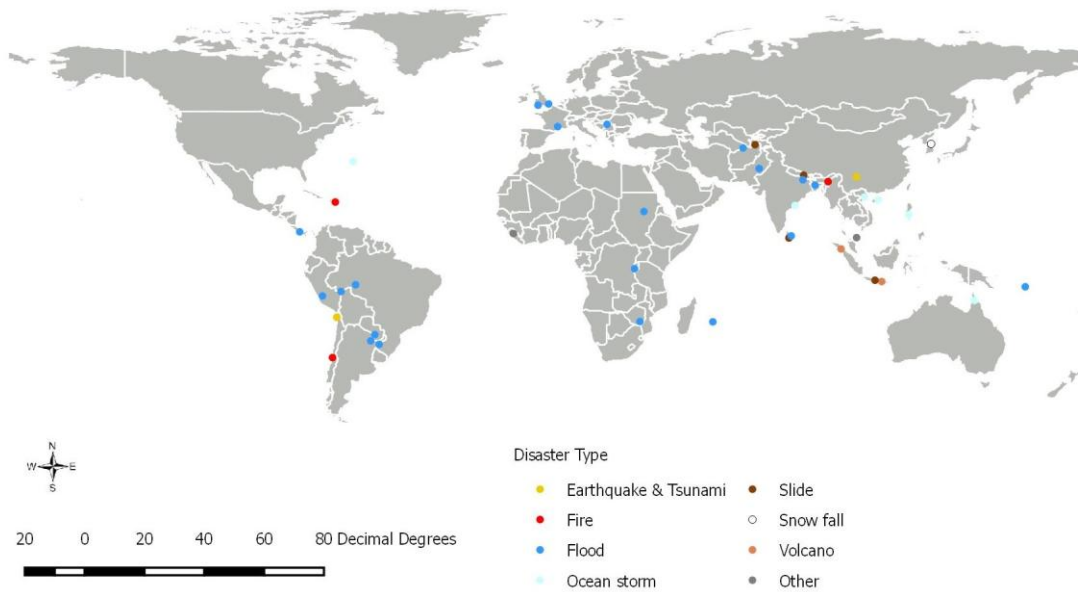


Figure 3-6. Location of the 2014 activations (by hazard type)

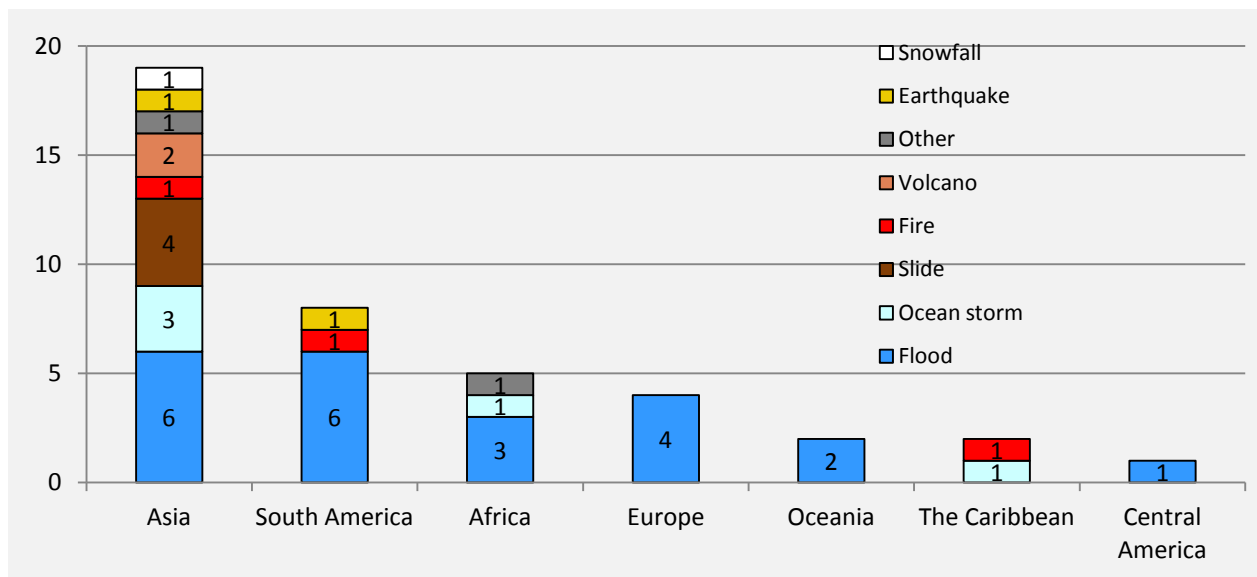


Figure 3-7. Number of activations by continent/subcontinent and hazard type

In 2014, 19 activations occurred in Asia, 8 in South America, 5 in Africa, 4 in Europe, 2 in Oceania, 2 in the Caribbean and 1 in Central America (Figures 3-6 & 3-7) with the most frequent hazard types being floods (51%) and ocean storms (15%) while solid earth-related hazards represented 10% (Figure 3-8). 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, or tropical storms resulting in floods and landslides. The tsunami event in Chile has been integrated in the solid earth-related hazard class.

For the first time, the Charter provided support for:

- Searching for a missing airplane (Malaysia Airlines flight from Kuala Lumpur to Beijing); specific support from the Charter was requested by Chinese authorities. The Charter provided SAR and optical data to be integrated by the China Meteorological Administration who performed the role of PM, while Chinese authorities already had programmed national EO missions.
- A health emergency in Africa caused by the Ebola virus epidemic; the Charter provided up to date reference mapping and situation mapping, rather than hazard impact mapping. Optical satellite imagery was used to provide geocoded products of urban sprawl and infrastructure and helped support planning of evacuation routes and Ebola recovery hospitals in Guinea, Liberia, Sierra Leone, Nigeria and Senegal.

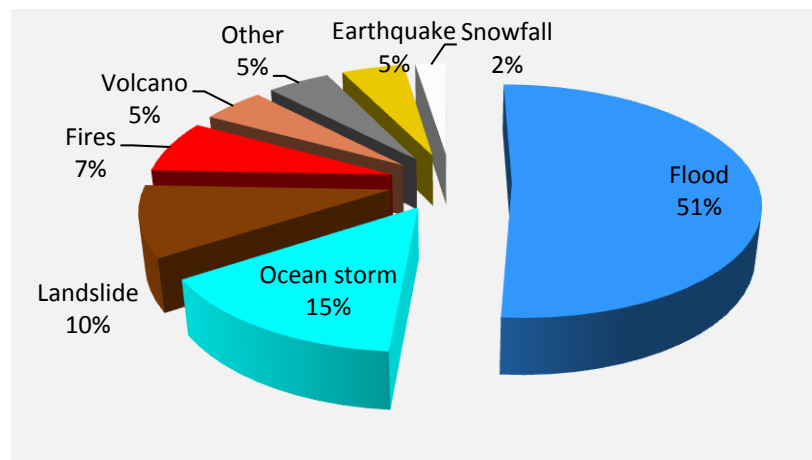


Figure 3-8. 2014 Number of activations by hazard type

As shown in the figure below (Figure 3-9), since 2000 the Charter has been frequently activated for weather-related disasters such as flooding, ocean storms, landslides triggered by heavy rainfall or floods, ice/snow hazard – representing more than 70% of Charter activations - while solid earth-related hazards (e.g. earthquakes, volcanic eruptions) represent 20% of Charter activations. Activations for oil spills and industrial accidents are marginal. See also the maps in figures 3-10 and 3-11 showing the geographical distribution of Charter activations by weather-related hazards and solid earth-related hazards for the 2007-2014 period.

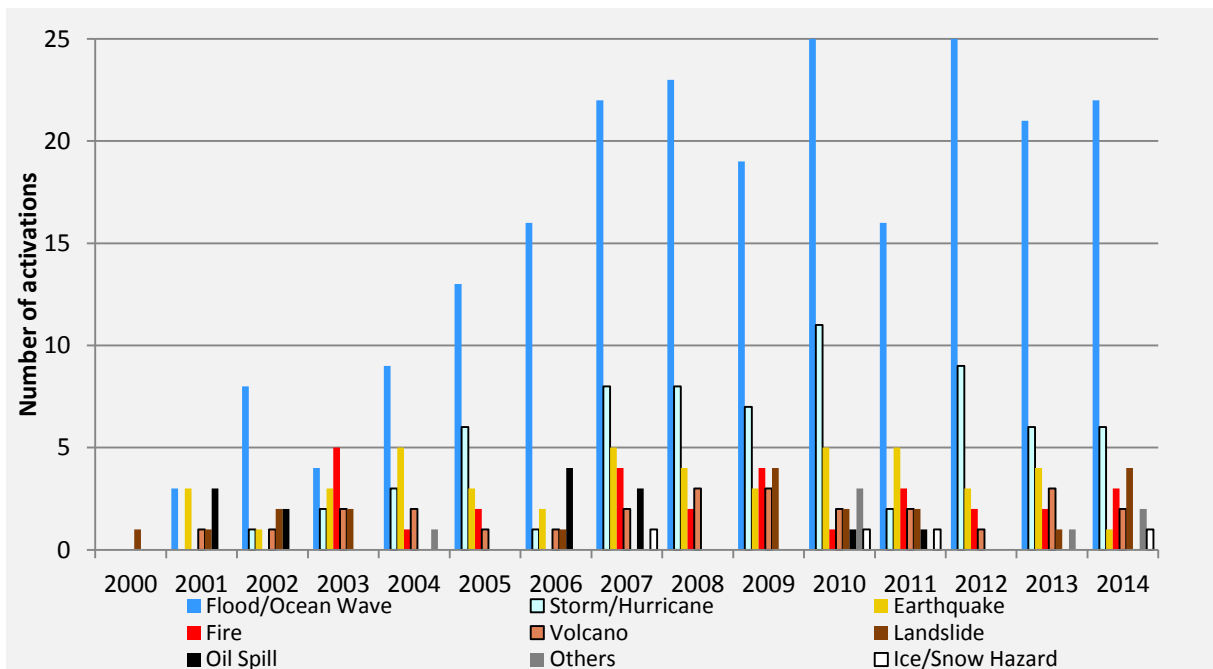


Figure 3-9. 2000-2014 Distribution of activations by hazard type

The following map shows by country the number of Charter activations caused by hydro-meteorological related events for the period of 2007-2014 (270 activations out of 327 activations in total = 82.6 %). In total 90 countries benefited from the Charter service during this 8 years period.

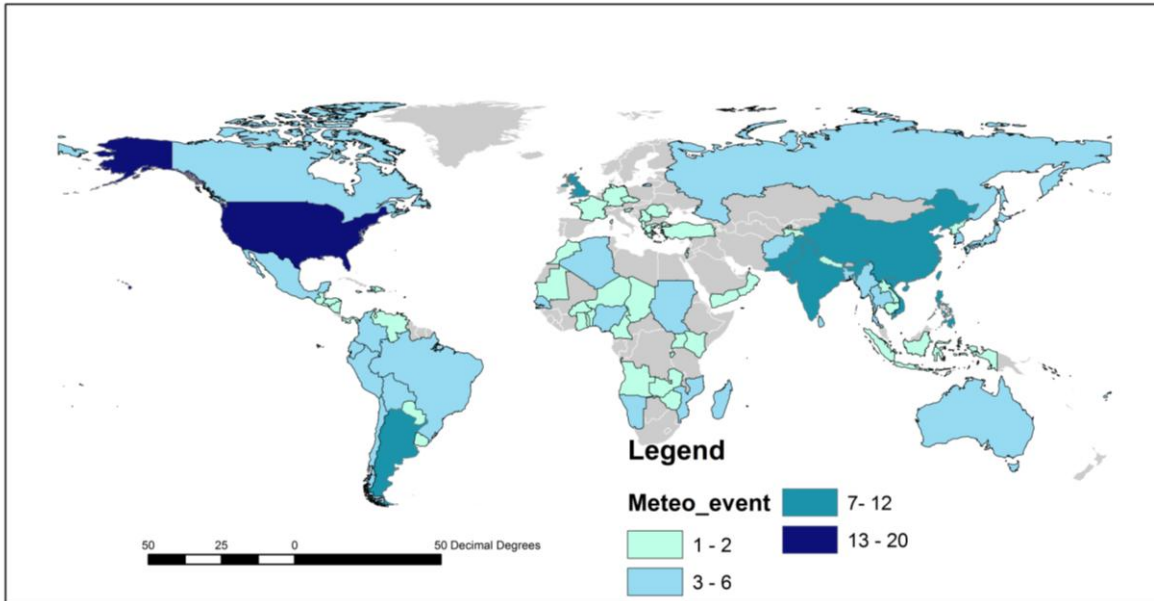


Figure 3-10. 2007-2014 Geographical distribution of Charter activations (270) caused by hydro-meteorological related events (flood, ocean storm, wind storm, landslide caused by heavy rains, wildfire and, snowfall and ice jam).

The following map shows by country the number of Charter activations (48 activations out of 327 activations in total = 14.7 %) caused by solid earth related events for the period 2007-2014. In total 22 countries benefited from the Charter service during this 8 years period.

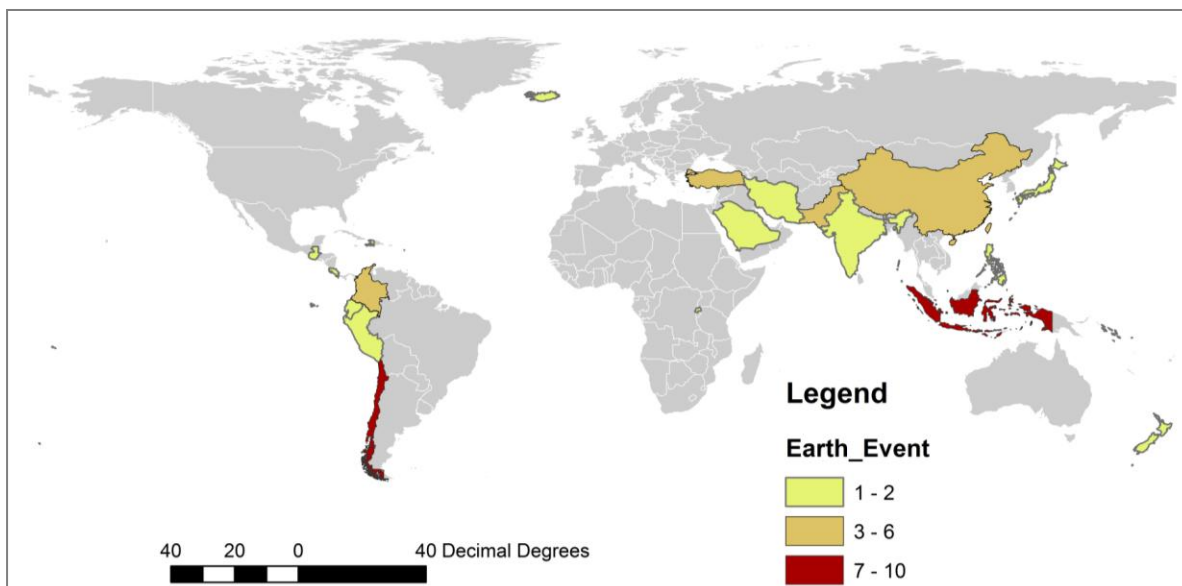


Figure 3-11. 2007-2014 Geographical distribution of Charter activations caused by solid earth related events (earthquake, tsunami, volcanic eruption, landslide caused by earthquake, subsidence).

Figure 3-12 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.

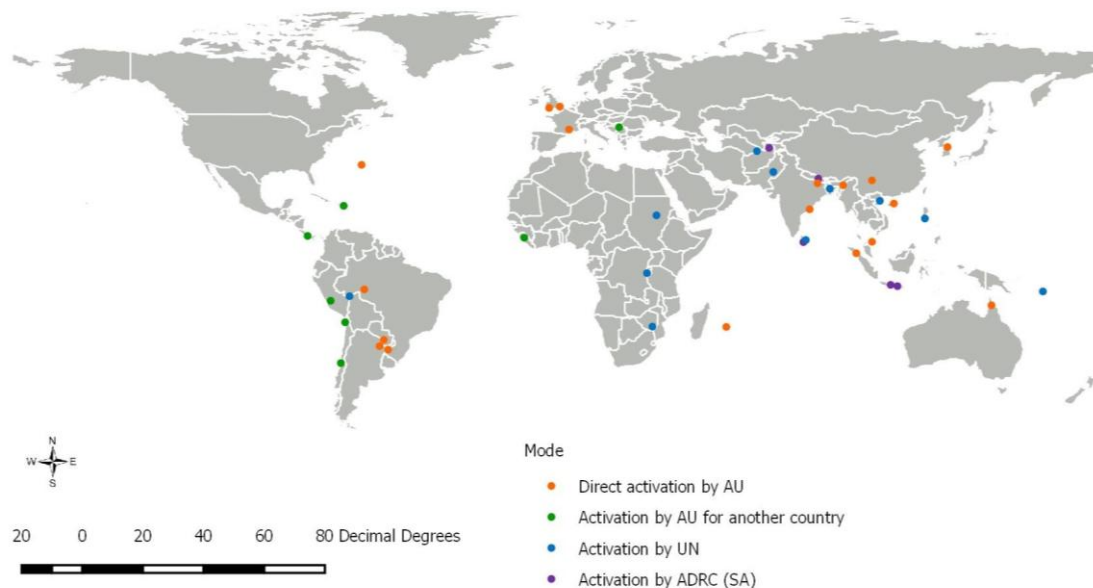


Figure 3-12. Location of the 2014 activations (per mode)

In 2014, mode 1 was used for disasters in Asia, South America, the Caribbean, Europe, Africa and Oceania; mode 2 was used for disasters in Asia, Africa, Europe (non EU), South America, Central America and the Caribbean. Mode 3 was used mainly for disasters in Asia, Africa, Oceania and the Caribbean. By definition, mode 4 was used in Asia (Figures 3-12 and 3-13).

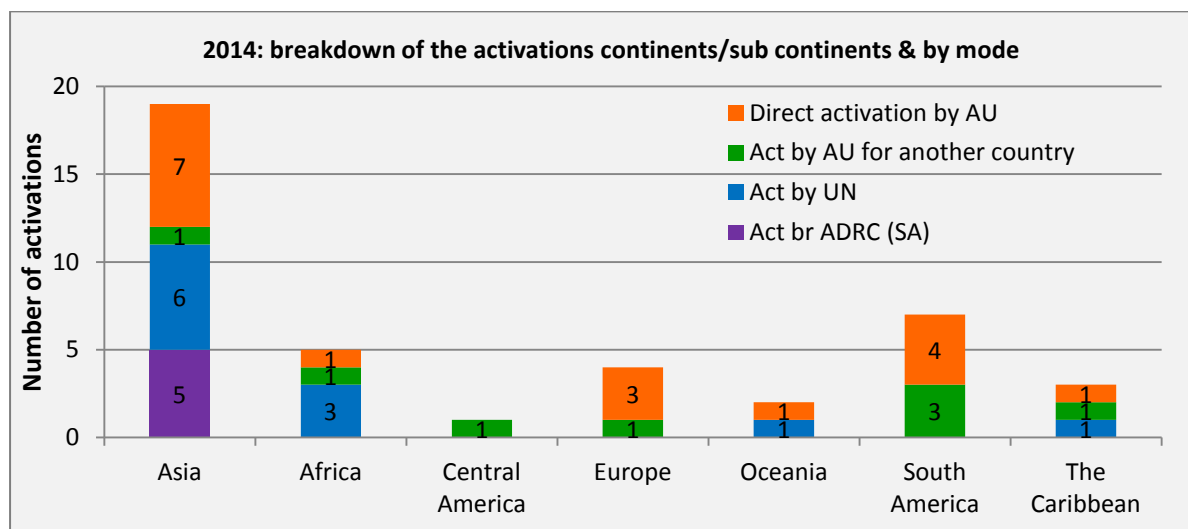


Figure 3-13. 2014 breakdown of Charter activations per continent/sub-continent & per mode

In 2014, activations by an AU (mode 1 & 2) were the main access modes (61% in total) while UN activations (mode 3) represented 27% of the total (Fig. 3-14).

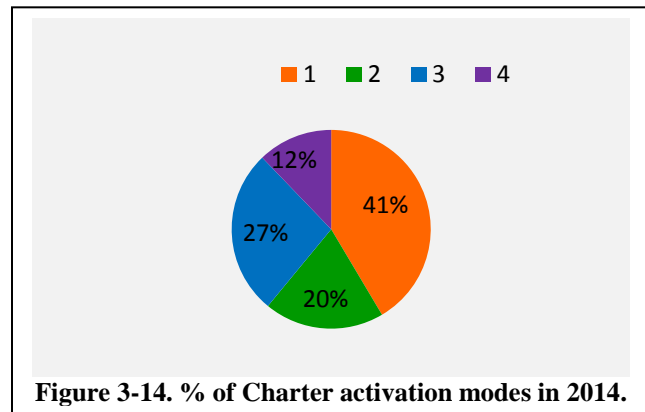


Figure 3-14. % of Charter activation modes in 2014.

The following diagram compares the relative weight of the different access mechanisms adopted from 2001 to 2014, used to request the International Charter service (Fig. 3-15). Since its inception, 83 countries without AUs have benefited from the Charter. For the period of 2007-2014, 60% of the activations were requests on behalf of a user in countries without an AU. The International Charter continues to address more users and it is a service which supports users worldwide, including countries without direct access (through activations by AU for other countries, by UN bodies for UN in-country agencies and through Sentinel Asia).

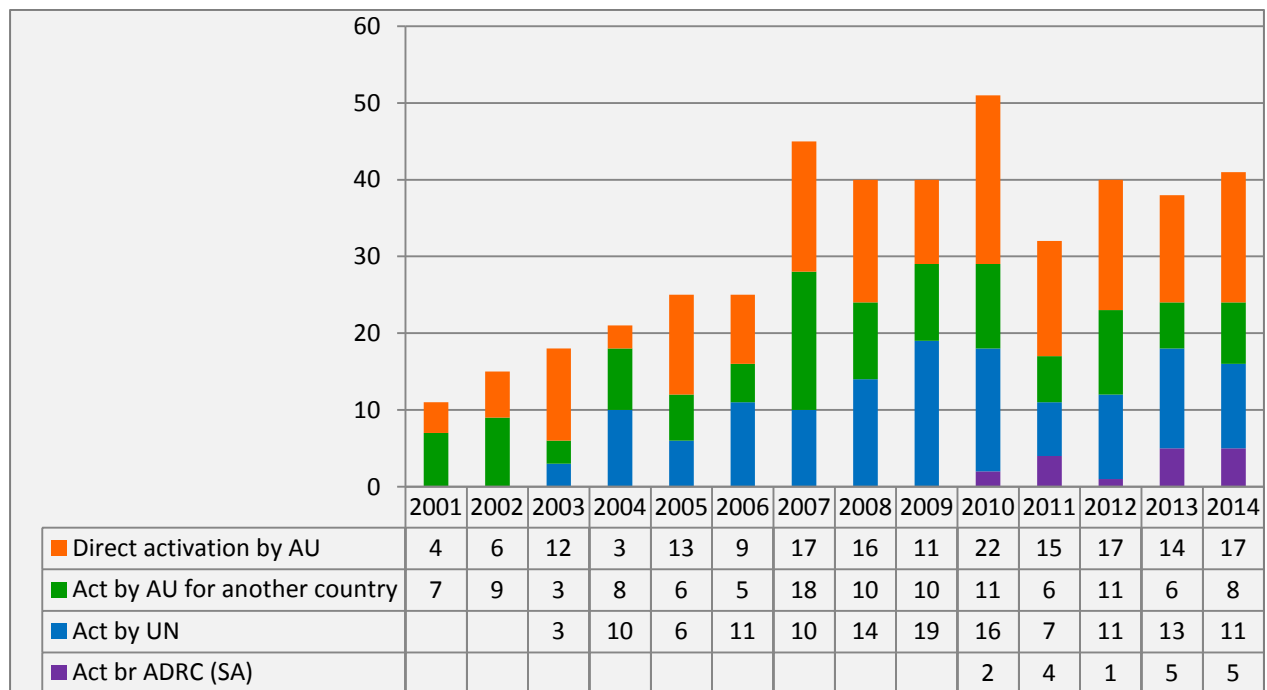


Figure 3-15. 2001-2014 number of Charter activations per mode

3.2 Resource report

3.2.1 EO data consumption in 2014

In 2014, a total of 2,142 optical and radar images (Figures 3-17 & 3-18, table 3-2 & table 3-3) of the Charter members satellites and 12,710 images of US VHR optical satellites (GeoEye, IKONOS, QuickBird, WorldView1, 2 and 3) were supplied (Figure 3-19, table 3-4) for 41 activations in 30 countries.

Figure 3-16 shows the total number of EO data from the Charter virtual constellation and the US VHR optical data provided in 2014 by disaster type. Most of the US VHR data (i.e. 10,662 images) and 65% of Landsat data were delivered to support the searching for a missing airplane and the international emergency teams combating the spread of the Ebola virus in Western Africa. The high number of data used for the Ebola virus epidemic is explained by the fact the activation covered three countries and by its 3 months duration while Charter activations normally last 10 days. Indeed without these two activations (category = Other), the total of optical and radar images is 1,200 and the total of US VHR is 4,110; figures rather equivalent to the last year.

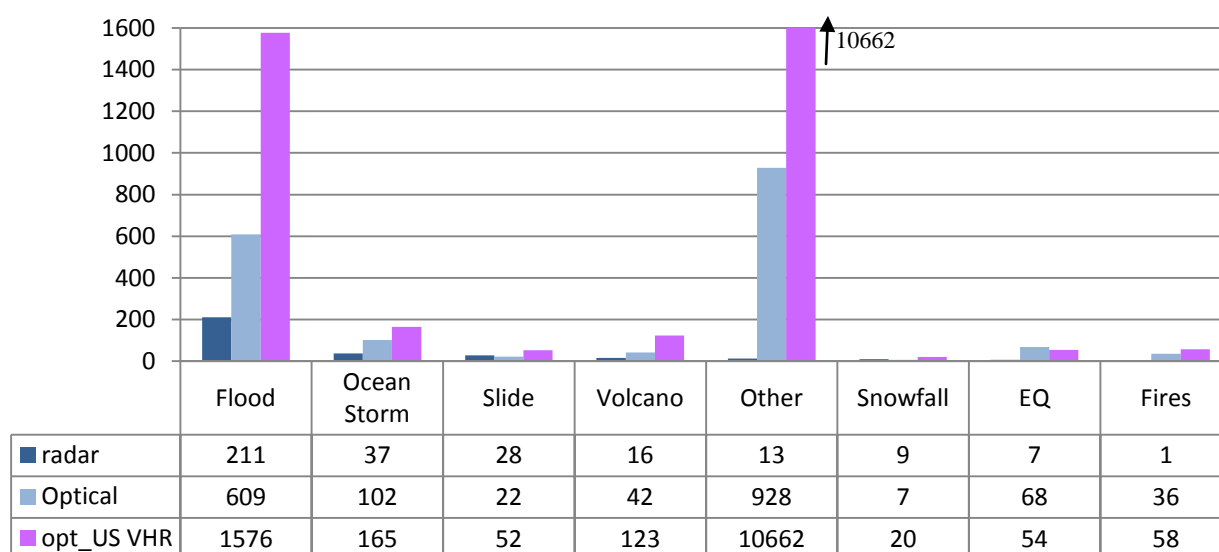


Figure 3-16. 2014 EO data of the Charter virtual constellation and US VHR optical data grouped by disaster type.

Other class regroups missing aircraft and Ebola virus epidemic activations.

In 2013, 38 activations in 28 countries a total of 1549 optical and radar images were provided by the Charter members and an additional 4,094 images of commercial US VHR optical satellites.

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.

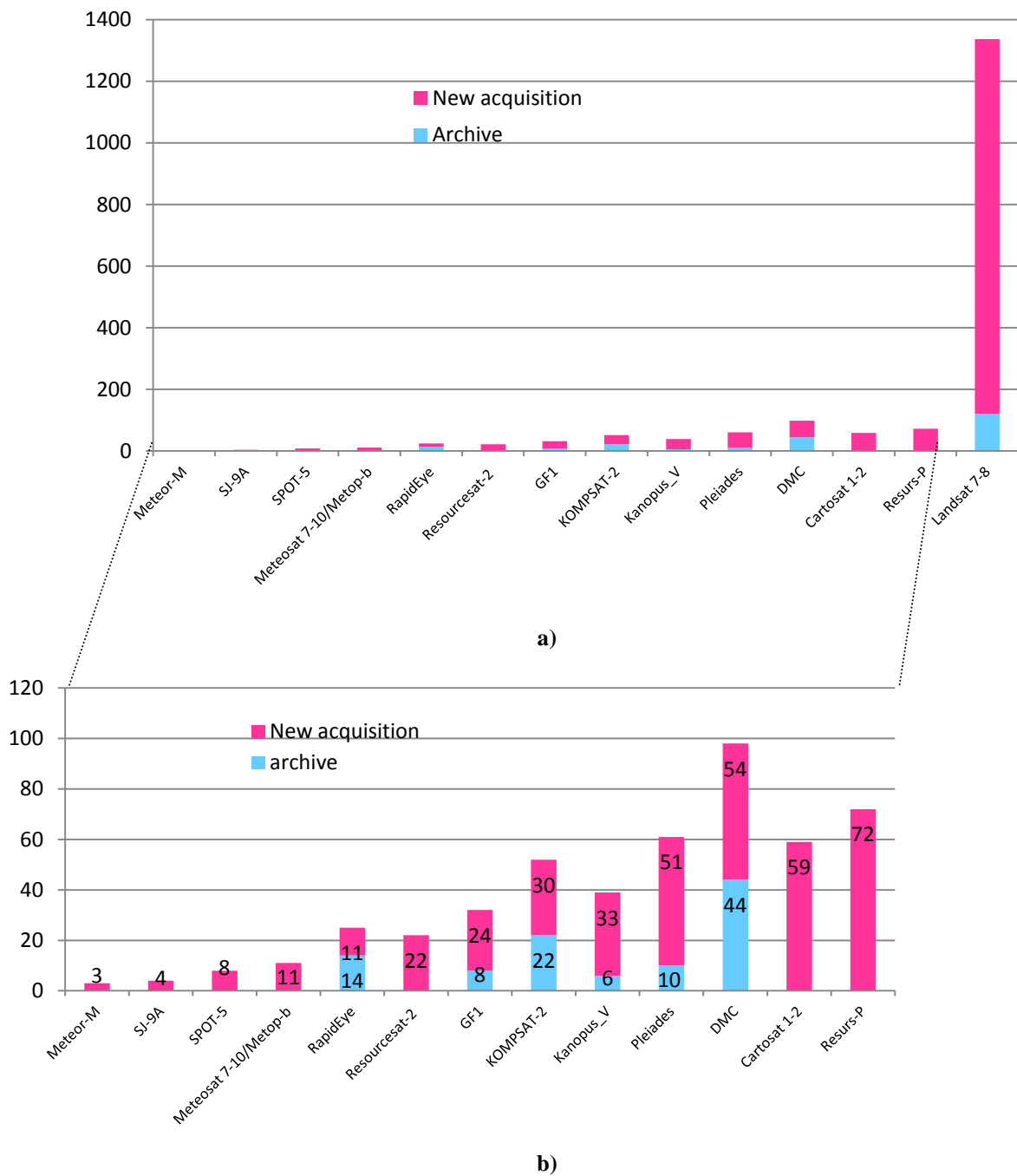


Figure 3-17 (a & b). 2014 Data Consumption (archive and new acquisition) - Optical sensors. a) all sensors; b) All sensors, except Landsat 7-8

| Resource | Meteor_M | SJ-9 A | SPOT 5 | Meteosat 7-10/Metop-b | Resourcesat-2 | RapidEye | GF-1 | Kanopus-V | KOMPSAT-2 | Cartosat 1-2 | PLEIADES 1A-1B | Resurs-P | DMC | Landsat 7,8 |
|---|----------|----------|----------|-----------------------|---------------|-----------|-----------|-----------|-----------|--------------|----------------|-----------|-----------|-------------|
| Total number of delivered data | 3 | 4 | 8 | 11 | 22 | 25 | 32 | 39 | 52 | 59 | 61 | 72 | 98 | 1337 |
| archive | 0 | 0 | 0 | - | 0 | 14 | 8 | 6 | 22 | 0 | 10 | 0 | 44 | 120 |
| new acquisition | 3 | 4 | 8 | 11 | 22 | 11 | 24 | 33 | 30 | 59 | 51 | 72 | 54 | 1217 |
| <i>Max. number of images per activation</i> | <i>3</i> | <i>3</i> | <i>3</i> | <i>2</i> | <i>6</i> | <i>13</i> | <i>18</i> | <i>5</i> | <i>13</i> | <i>10</i> | <i>8</i> | <i>11</i> | <i>14</i> | <i>816</i> |

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

As mentioned before, Landsat data (7 and 8) represents an important optical resource with a total of 1,337 images that was mainly used to support the activation in Western Africa.

Contribution of the other optical sensors (low spatial resolution to high spatial resolution) varies from 3 to 98 images in total depending on the disaster type, spatial resolution and ground coverage of the images, etc. RapidEye data contribution was lower than last year and was provided by DLR to cover the fire event in Dominican Republic and the Ebola Virus Epidemic event in Western Africa.

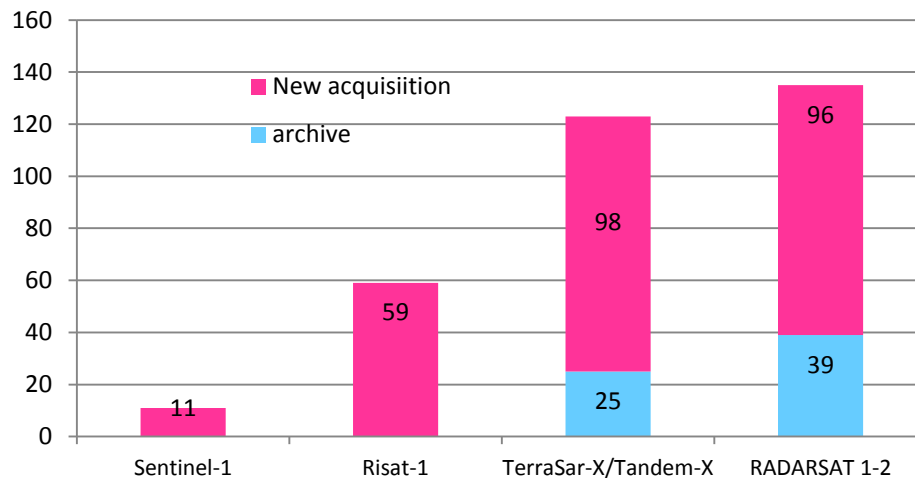


Figure 3-18. 2014 Data Consumption (archive and new acquisition) - Radar sensors

With the successful launch of the Sentinel-1A satellite in April 2014, a new radar data source was added to the Charter constellation. The first Charter delivery of Sentinel-1A data took place in May 2014 for a flood in Serbia following an activation request by the Russian Authorized User EMERCOM to support their relief team in Serbia. Sentinel-1A was used in subsequent Charter Calls over 2014 such as the flooding in Argentina in June, flooding in Brazil in July, and landslides in Sri Lanka in November. The contributions of RADARSAT and TerraSAR-X/TanDEM-X are comparable to last year. Contribution of Risat-1 is slightly inferior than 2013 (80 scenes). 65% of radar data were used to monitor the 22 flood events.

| Resource | Sentinel-1* | RISAT-1 | TerraSAR-X/ TanDEM-X | RADARSAT 1/2 |
|---|-------------|-----------|-------------------------|-----------------|
| Total number of delivered data | 11 | 59 | 123 | 135 |
| archive | 0 | 0 | 25 | 39 |
| new acquisition | 11 | 59 | 98 | 96 |
| <i>Max. number of images per activation</i> | 3 | 5 | 9 | 6 |

Table 3-3. Statistics by Radar sensors. (*Start of Sentinel-1 delivery in May)

In total, 12,710 images of US VHR optical satellites (GeoEye, IKONOS, QuickBird, WorldView1, 2 and 3) were supplied in 2014. US VHR imagery delivered to the Charter by the USGS using the HDDS system (Figure 3.19, table 3-4).

Most of the data provided were used to support the international emergency teams combating the spread of the Ebola virus in Western Africa, with 8500 WorldView 1 and 2 images and 93 QuickBird images. This high amount of data is explained by the fact the activation covered three countries and its 3 month duration while Charter activations normally last 10 days.

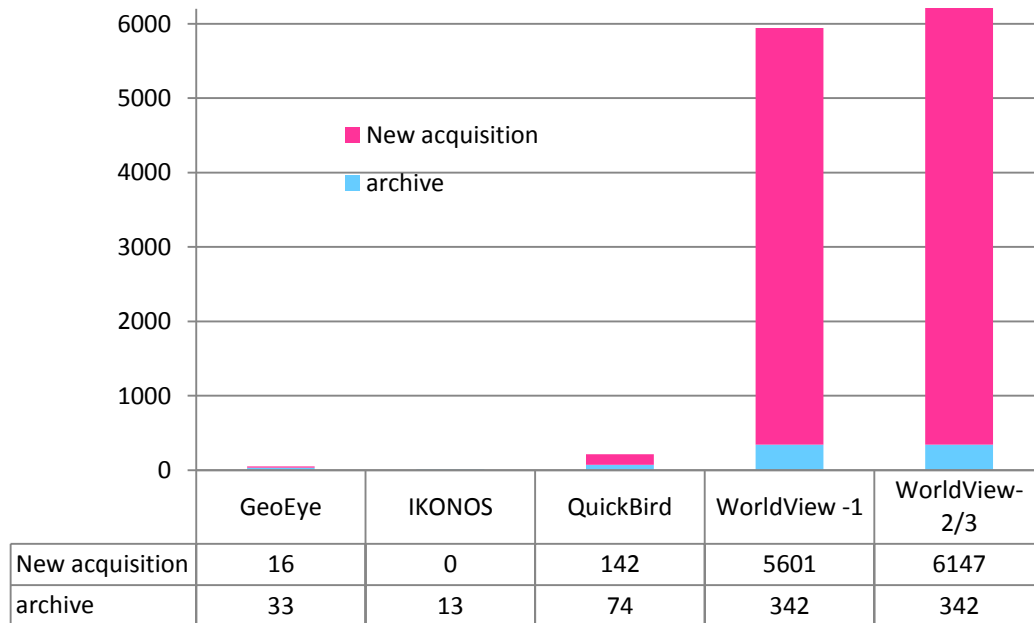


Figure 3-19. 2014 Data Consumption –US Commercial optical satellites

| Resources | IKONOS | GEOEYE | QUICKBIRD | WORLDVIEW-1 | WORLDVIEW-2/3 |
|---------------------------------------|-----------|-----------|------------|-------------|---------------|
| Total number of delivered data | 13 | 49 | 216 | 5943 | 6489 |
| archive | 13 | 33 | 74 | 342 | 342 |
| new acquisition | 0 | 16 | 142 | 5601 | 6147 |
| <i>Max images per Activation</i> | <i>13</i> | <i>28</i> | <i>93</i> | <i>4661</i> | <i>3843</i> |

Table 3-4. Statistics concerning US commercial optical satellites

Overview of data consumption by activation:

Figures 3-20 and 3-21 depict the number of programmed (newly acquired) and archived images by activation and 3-22 shows the number of US VHR new acquisition by activation.

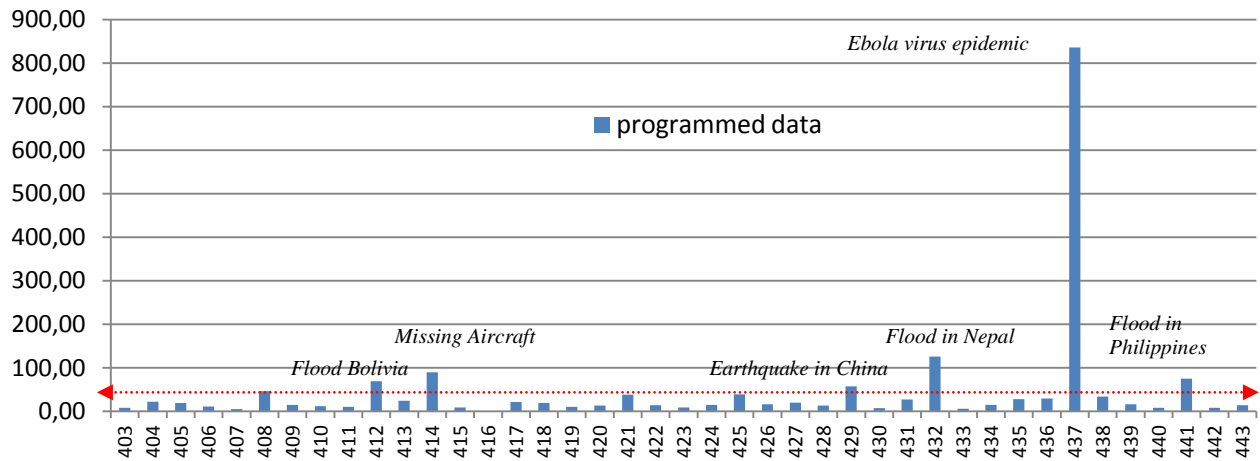


Figure 3-20. Number of programmed images (radar and optical) provided by activation

On average the quantity of images is **45 per activation**. There are six activations with a number greater than 50 of programmed data (Charter optical & radar sensors), these are: **Act 412**, flood in Bolivia, 69 images; **Act 414**, Missing Aircraft in China, 90 images; **Act 429**, earthquake in China, 57 images; **Act 432**, flood in Nepal, 126 images; **Act 437**, Ebola virus epidemic, 836 images; **Act 441**, Ocean storm and flood in the Philippines, 75 images.

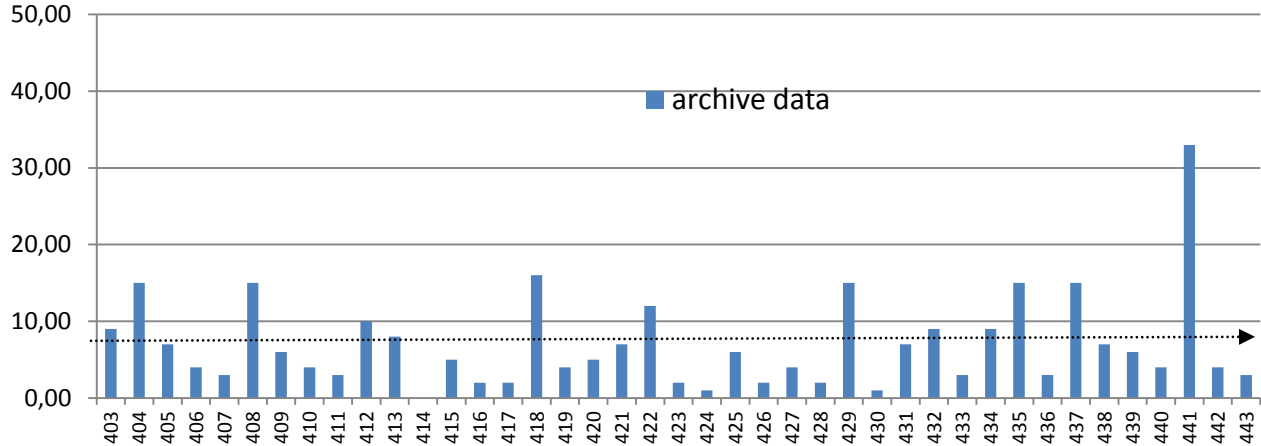


Figure 3-21. Number of archived images provided by activation (Charter EO sensors)

On average the quantity of images is **7 per activation**. A higher number of archive data (33 images) was delivered to cover **Act.441**, Ocean storm and flood in the Philippines.

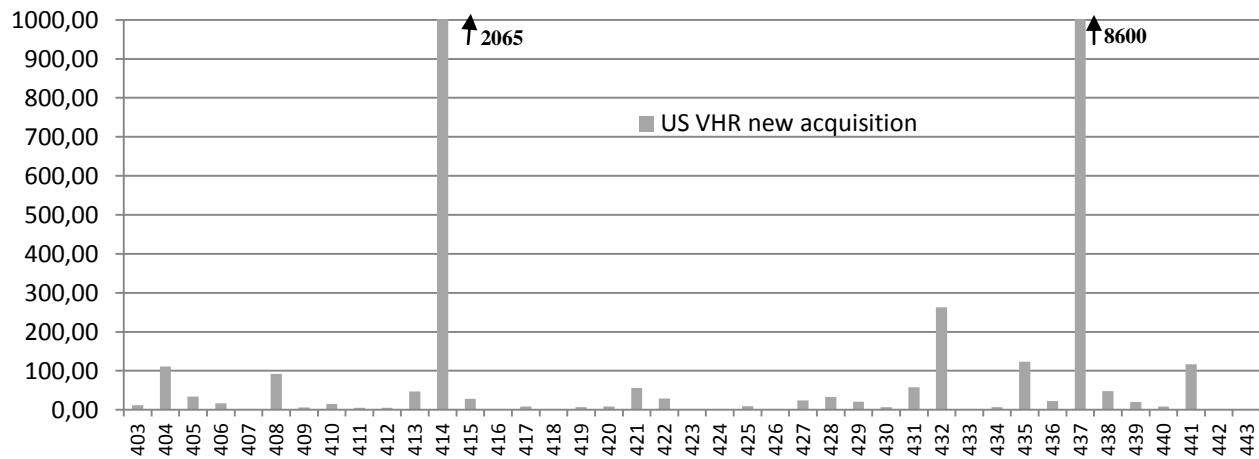


Figure 3-22. Number of new images provided by activation (US VHR commercial satellites)

In total, 34 activations out of 41 have benefited from US VHR data. The two activations with the highest number of US VHR data (greater than 2000) provided are: **Act. 414**, missing aircraft and **Act 437**, Ebola virus epidemic. **Act 404**, flood in the UK; **Act 432** Flood in India, **Act 435**, Flood and landslide in Pakistan, **Act 441** Ocean storm and flood in the Philippines received more than 100 US VHR data (new acquisition).

3.2.2 Human resource contribution (ECO and PM) in 2014

- *ECO resources in 2014*

The Emergency On-Call Officer (ECO) services were provided on a weekly rotational basis by 10 Charter members agencies: CNES, CNSA, CONAE, CSA, DLR, DMCii, ESA, ISRO, JAXA, KARI. The random nature of calls resulted in an uneven workload distribution for the members, with CONAE handling nearly one sixth of the calls. There were 9 calls processed by CONAE, 8 calls by CNES, 5 calls by ISRO and DMCii, 4 calls by JAXA and DLR, 3 calls by CSA and KARI and 1 call by CNSA and ESA. Some ECOs had to handle 2-3 calls during their week on duty, particularly in February, August and October, when the maximum number of calls occurred.

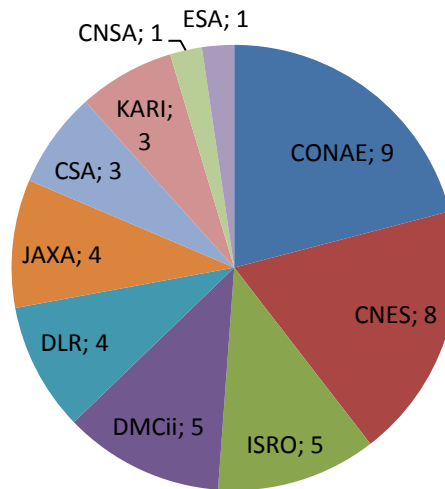


Figure 3-23. Distribution of Charter Parties responsible for the ECO services in 2014

- *Distribution of Charter members responsible for the PM services delivered in 2014*

Project Managers (PMs) were nominated for 40 activations out of 41, since the activation for the tsunami in Chile was rapidly withdrawn and no PM was assigned.

PMs nominated by CNSA handled 17.5%, of the Charter activations, CONAE and JAXA 15% each. USGS nominated PMs that supported 10% of the activations, whereas DMCii, ESA, INPE and ISRO nominated PM for 7.5% each; CNES, KARI for 5% each and ROSCOSMOS for 2.5% of activations (Figure 3-24).

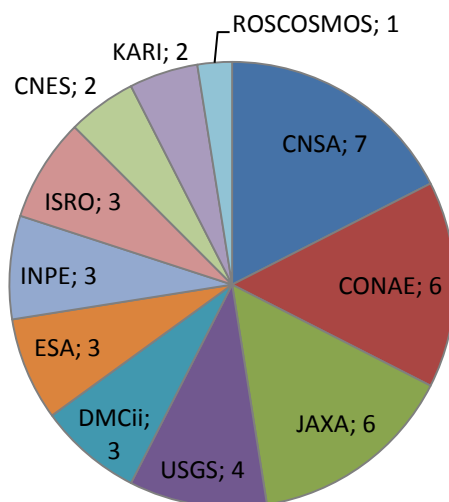


Figure 3-24. Distribution of Charter Parties responsible for the PM services in 2014

- *Distribution of organizations providing PM resources in 2014*

PMs may be sourced from a Charter party or a third party. Table (3-5) and Figure (3-25) show the breakdown of the PM organizations. In the case of third party organizations, it is required that a Charter member nominates them and takes the responsibility for the service they provide. During this reporting period, 22 different organizations contributed their PM services to Charter activations.

| Organisation, Country | Number of PM service |
|---|----------------------|
| UNITAR/UNOSAT, Switzerland | 7 |
| AIT, Thailand | 4 |
| INPE, Brazil | 3 |
| NRSC/ISRO, India | 3 |
| CONAE, Argentina | 2 |
| Environment Agency England & Wales, UK | 2 |
| ESA-ESRIN, Italy | 2 |
| NDRCC, China | 2 |
| LAPAN, Indonesia | 2 |
| CATHALAC, Panama | 1 |
| CRESDA, China | 1 |
| CNES, France | 1 |
| DLR, Germany | 1 |
| Geoscience Australia, Australia | 1 |
| ONEMI, Chile | 1 |
| SERTIT, France | 1 |
| CVO, Indonesia | 1 |
| SIRL, South Korea | 1 |
| SELPER, Bolivia | 1 |
| CMA, China | 1 |
| ROSCOSMOS/NTSOMZ, Russia | 1 |
| Department Land Surveys & Registration, Bermuda, UK | 1 |

Table 3-5. PM Organisations in 2014

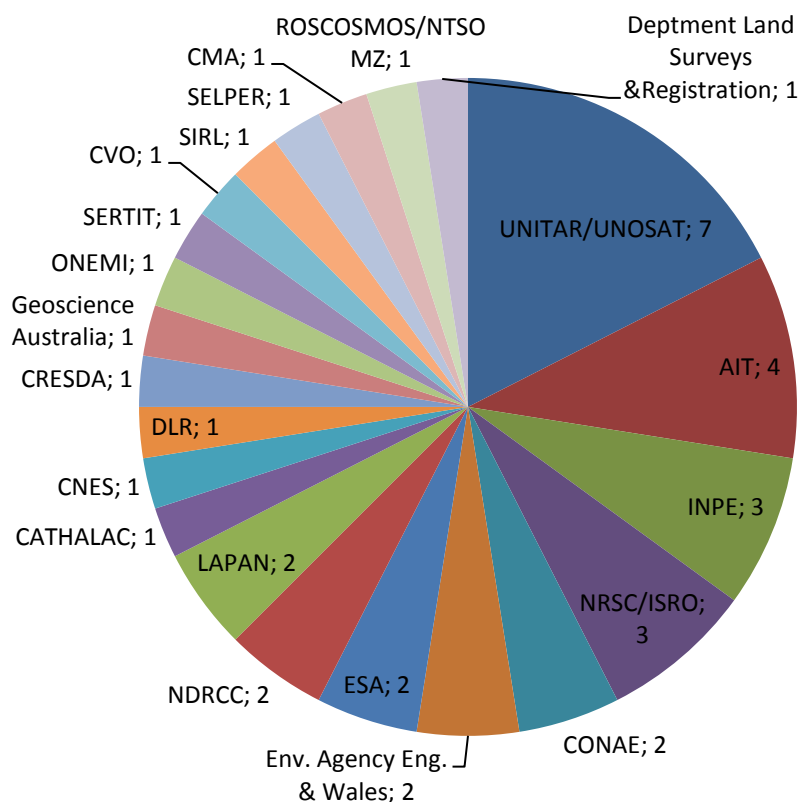


Figure 3-25. Distribution of organizations providing PM resources in 2014

Difference between figures 3-24 & 3-25: Figure 3-24 represents the breakdown of Charter members who nominated PMs in 2014, while Figure 3-25 represents the breakdown of organizations performing the PM work for 2014 activations

Detailed comments:

- CNSA provided 17.5% of the total Project Manager services, with the nomination of two NDRCC personnel, one from CNSA and one from CMA for activations in China and Africa; 3 from UNITAR/UNOSAT to cover floods in Asia and Africa.
- CONAE provided 15% of the total PM services with support from internal staff covering activation in Argentina and third parties: INDECI for one activation in Peru, SELPER for one activation in Bolivia, ONEMI for one activation in Chile, UNITAR/UNOSAT for two activations in Africa and Oceania.
- JAXA provided 15% of the total PM services with support from staff members from the Asian Institute of Technology (AIT) and LAPAN (Indonesia) to cover activations in Asia.
- USGS provided 10% of the total PM services with the support of third parties: one from CVO for one activation in Indonesia, one from CATHALAC to cover event in Central America and one from UNITAR/UNOSAT for the activation in Western Africa for the Ebola virus epidemic. A special case of Charter-internal collaboration was the activation which covered wild fires in the Dominican Republic: DLR acted as PM under USGS,

after USGS had activated the Charter on behalf of a national user in the Dominican Republic.

- DMCii provided 7.5% of the total PM services with the support of the external organisations: the Environment Agency of England & Wales covered the two flood events in UK and the Department of Land Survey and Registration covered the event in UK overseas territory (Bermuda).
- ESA provided 7.5% of the total PM services with the support of internal staff to cover two events in Africa (Burundi) and Asia (the Philippines) and external organisation: Geoscience Australia for one event in Australia.
- INPE provided 7.5% of the total PM services with the support of internal staff to cover 3 events in Brazil.
- ISRO provided 7.5% of the total PM services with the support of internal staff to cover three events in India.
- CNES provided 7.5% of the total PM services with the support of internal staff to cover an event in French overseas territory (La Réunion) and one external support: SERTIT to cover an event in France.
- KARI provided 5% of the total PM services with the support of external organisations: SIRL for one event in Korea and UNITAR/UNOSAT for a flood in Asia (Sri Lanka).
- ROSCOSMOS provided 2.5% of the total PM services with the support of internal staff to cover one event in Serbia.

*Note that UNITAR/UNOSAT is an external organization engaged as PM by member agencies, in particular for UN activations. UNOSAT contributed to 19.5 % of the totality of activations over 2014 (Afghanistan, Vietnam, Pakistan, Zimbabwe, Solomon Islands, the Sri Lanka floods, and the Western Africa Ebola virus epidemic). It provided PMs for seven activations and in addition, it supported the Charter for 4 other activations by providing value-adding services in the delivery of damage and impact assessment maps (Burundi, Vietnam and Sudan floods; ocean storm in the Philippines).

- *Distribution of Charter members responsible for the PM services over the last five years (2010-2014).*

The following graph represents the percentage of PMs nominated by each Charter member in 2010 (51 activations), 2011 (32 activations), 2012 (40 activations), 2013 (38 activations) and 2014 (40 activations).

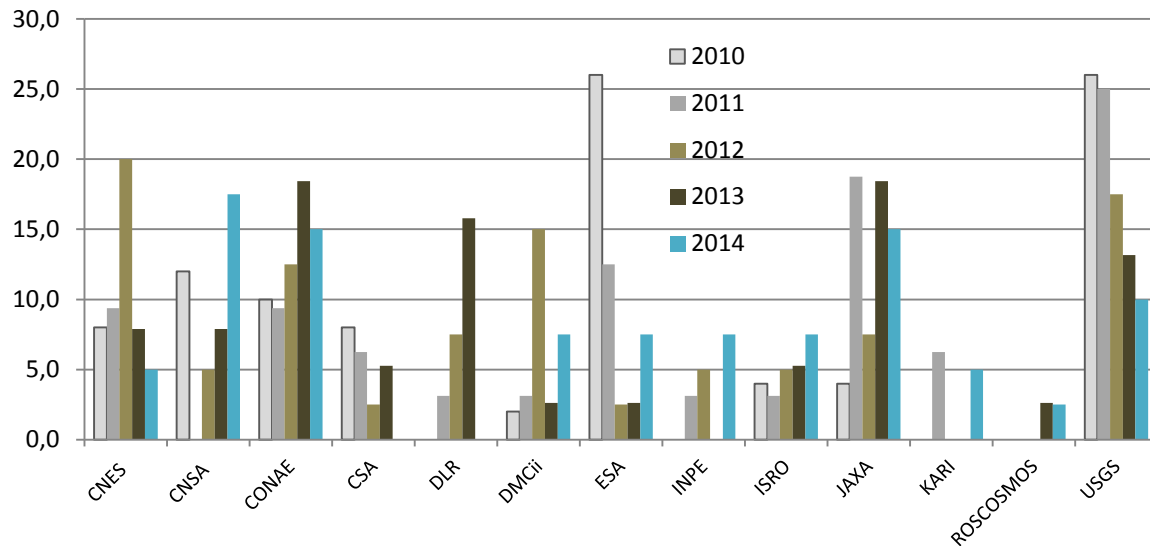


Figure 3-26. 2010-2014 Distribution (%) of Charter Parties responsible for the PM services

Figure 3-26 shows a large variability per agency per year. This breakdown is explained by:

- The annual number of disasters.
- The number of requests by AUs for disasters occurring in their countries. The PM is nominated by the relevant Charter member.
- The number of requests by AUs for another country without AU. The PM is nominated by the relevant Charter member.
- The number of requests by UN bodies. In that case, the current Charter Lead Agency has to nominate the PM. In 2014, CONAE, CNSA and KARI were the Charter Lead.
- The number of requests by ADRC/SA. In that case, the PM is nominated by JAXA.
- The number of requests by Algeria, Nigeria and Turkey. In that case, the PM is nominated by DMCii.
- The number of PMs managed by each agency and their availability.

During the last five years, in total USGS is the member who has nominated/provided the highest number of PMs, followed by CONAE, JAXA, ESA, CNES, and CNSA.

3.3 SARE – Semi Annual Refresher Exercises

One Semi Annual Refresher Exercise was performed in 2014 from 26 May 2014 to 21 July 2014:

- SARE-13: wildfires in South Korea. This exercise was led by KARI and DLR training teams; the report was prepared by KARI. 23 Emergency on-Call Officers (ECOs) from 8 Charter member agencies participated.

A set of common recommendations were issued to improve the Charter's ECOs operations and data management:

- Regularly updating the ECO procedures and scenarios; in particular to add new satellites, such as SENTINEL-1, to the procedures.

-
- Some modifications to Charter-internal forms were suggested in order to accelerate the process of ordering data from the different Charter members.

All participants recognised that SARE is a useful exercise for improving and upholding the knowledge of ECOs. It was highly recommended the participation of all agencies providing the ECO service in these semi-annual exercises for maintaining their ECO staff effectiveness.

3.4 The Charter operational tools

Charter members have developed or are developing tools: COS-2, Charter Geographic Tool (CGT), and HDDS, to improve Charter operational steps and facilitate the work of the different Charter operational staff (ODO, ECOs and PMs).

This year was mainly dedicated to solve COS-2 software issues and to implement relevant agencies' requirements, improving some COS-2 functions. CGT has been integrated in COS-2 that will allow an automatic updating of CGT catalogue and metadata files of EO data acquired for a given activation. COS-2 will be put in operation at the beginning of 2015. Manuals and training material are under preparation.

In order to prepare the Emergency-on-Call (ECO) staff, ESA held three training courses in April (Beijing, China), September (Frascati, Italy) and October 2014 (Daejeon, South Korea) to present ECO operations in COS-2 and to involve the major number of ECOs and agencies. AUs and PMs trainings on COS-2 will start next year.

4 Communication

4.1 Web site

The Charter website is currently available in five languages (English, Chinese, French, Japanese and Spanish).

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

In 2014, the website has been updated with a brand-new design and layout to facilitate user navigation and information search. In addition, it allows direct access to COS-2 to authorized Charter members' personnel.

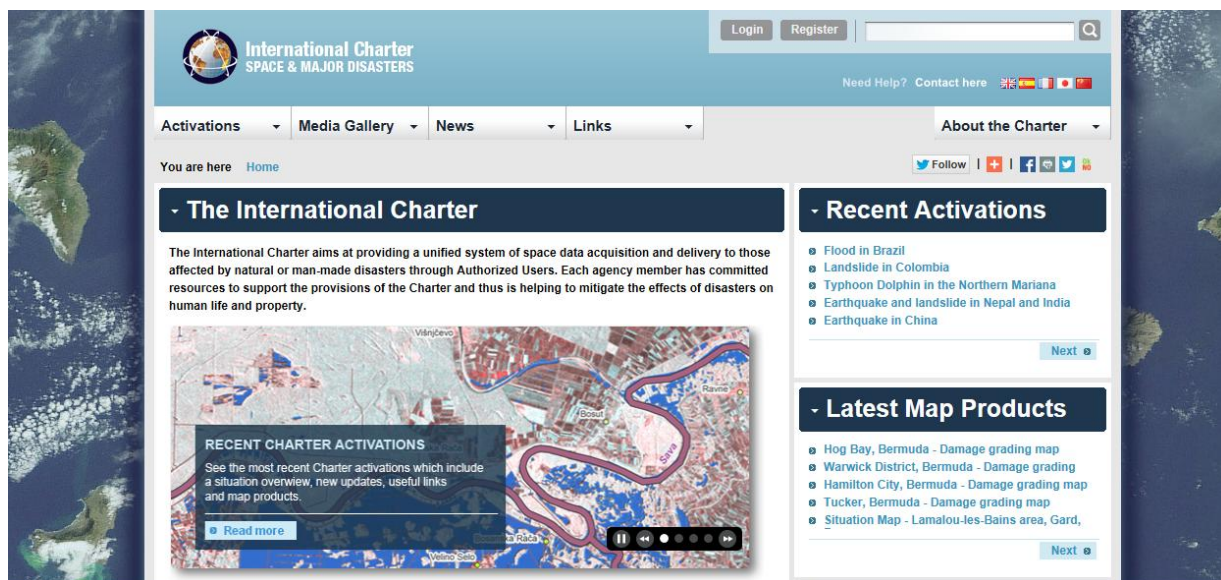


Figure 4-1. Charter website homepage

To illustrate the website visits frequency, the two diagrams below provide an overview of page and sessions views during the last three months of 2014.



Figure 4-2. Breakdown of page views (October-December 2014)

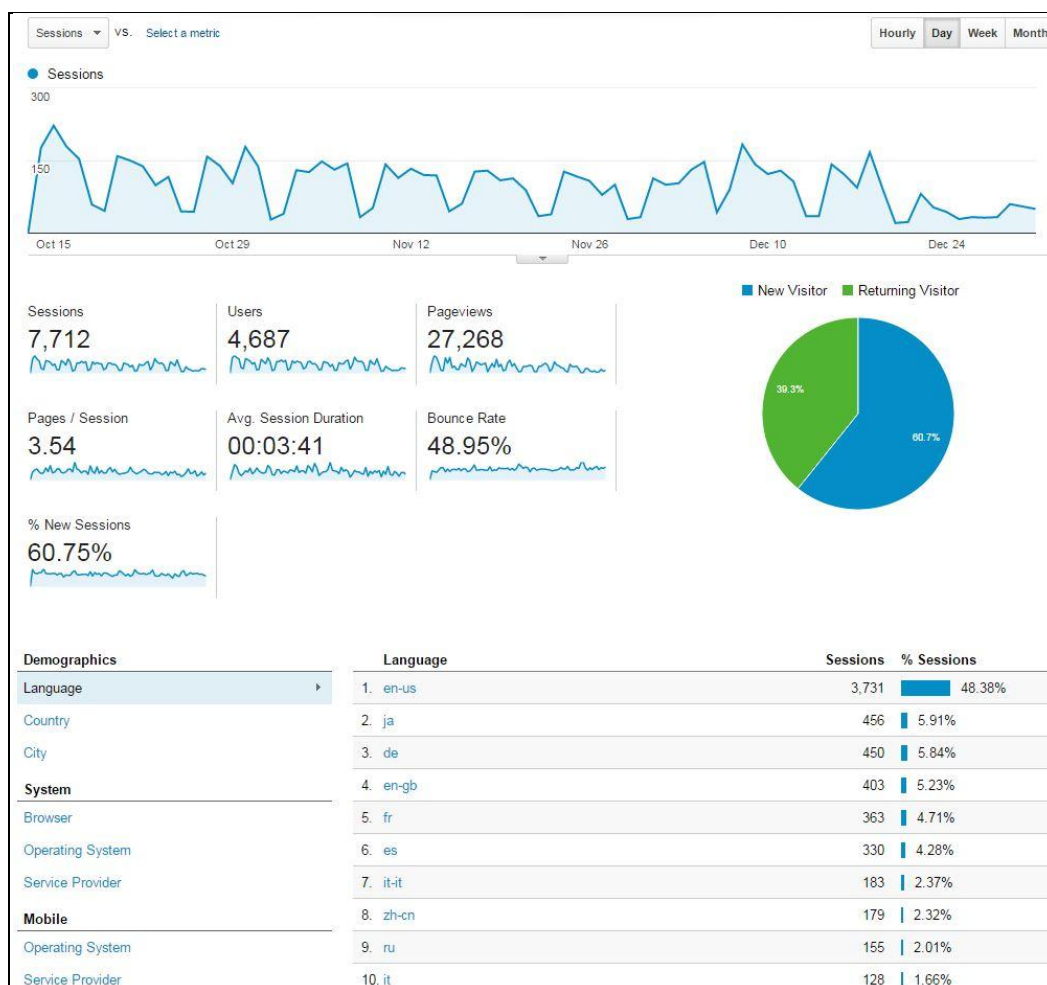


Figure 4-3. Breakdown of sessions views (October-December 2014)

Charter visibility is also ensured through other social media outlets, such as Twitter, which had around 1840 followers by the end of 2014, which is more than double the follower count of 880 that was recorded last year.

The following diagram shows the increase in the Charter's followers between September 2014 and April 2015 (+ 2,250 followers).



Figure 4-4. Breakdown of sessions views (October-December 2014) – processed using Twitter tool “Analytics”

4.2 Charter Newsletters

Charter newsletters were issued in February and July 2014. 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 4-4. Charter newsletter issue 8

The February issue (8th) presented a summary of the outcomes of the International Charter in Argentina, hosted by CONAE as lead agency; the International Charter special side event at GEONETCast 2014; Video Images from International Space Station to be provided to support disaster response and a new TerraSAR-X image mode on duty in the Charter.

The July issue (9th) reported about the CNSA chairmanship of the International Charter 'Space and Major Disasters'; the launch of DAICHI-2 (ALOS-2), the successor of DAICHI; CNSA contributes GF-1 satellite to the Charter; Project Manager Training Course organised in Beijing; Benefitting from Universal Access initiative.

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

4.3 Conferences and presentations

The following table provides details of the 2014 events or conferences where the Charter was represented. On such occasions, presentations were given covering the Charter's role in the acquisition and production of satellite imagery for disaster response together with the UA initiative launched in 2012.

| Event | Venue | Date | Speakers |
|--|---------------------|------------|----------|
| Group on Earth Observations (GEO) Plenary Session and GEO Ministerial Summit (side event) | Geneva, Switzerland | 16 January | EUMETSAT |
| Global Space Applications Conference (GLAC) | Paris, France | 2-4 June | CNES |
| 2014 IEEE International Geoscience and Remote Sensing Symposium (IGARSS) | Québec, Canada | 14-18 July | CNES |

| | | | |
|---|----------------------------|-----------------|-----------|
| 11th EUMETSAT User Forum | Johannesburg, South Africa | 8-10 September | EUMETSAT |
| The 2nd International Symposium on Earth Observation for Arid and Semi-Arid Environments. Central Asia: Looking from Space. ISEO' 2014 | Issyk-Kul, Kyrgyzstan | 10-12 September | ROSCOSMOS |
| Sentinel Asia Joint Project Team Meeting (JPTM) | Yangon, Myanmar | 19-21 November | JAXA |
| Asia Pacific Space Agency Forum (APSAF)-21 | Tokyo, Japan | 2-5 December | JAXA |

Table 4-2. List of conferences/workshops 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.

4.4 Press releases, articles

Table 4-3 summarises the main press releases, web and paper articles issued by the member agencies or others during this reporting period.

| Date | Issuing agency | Title |
|----------|----------------|--|
| 21 April | CNSA | CNSA contributes GF-1 satellite to the Charter https://www.disasterscharter.org/web/guest/news/-/asset_publisher/xg3Vzc7VITN6/content/cnsa-contributes-gf-1-satellite-to-the-charter?redirect=https%3A%2F%2Fwww.disasterscharter.org%2Fweb%2Fguest%2Fnews%3Fp_id%3D101_INSTANCE_xg3Vzc7VITN6%26p_p_lifecycle%3D0%26p_p_state%3Dnormal%26p_p_mode%3Dview%26p_p_col_id%3Dcolumn-1%26p_p_col_count%3D1 |
| 26 May | JAXA | DAICHI-2 (ALOS-2), the successor of DAICHI, launched https://www.disasterscharter.org/web/guest/news/-/asset_publisher/xg3Vzc7VITN6/content/daichi-2-alos-2-the-successor-of-daichi-launched?redirect=https%3A%2F%2Fwww.disasterscharter.org%2Fweb%2Fguest%2Fnews%3Fp_id%3D101_INSTANCE_xg3Vzc7VITN6%26p_p_lifecycle%3D0%26p_p_state%3Dnormal%26p_p_mode%3Dview%26p_p_col_id%3Dcolumn-1%26p_p_col_count%3D1 |
| 28 May | ESA | Sentinel-1 aids Balkan Flood Relief http://www.esa.int/Our_Activities/Observing_the_Earth/Copernicus/Sentinel-1/Sentinel-1_aids_Balkan_flood_relief |
| 3 June | CNSA | CNSA takes over chairmanship of the International Charter 'Space and Major Disasters' https://www.disasterscharter.org/web/guest/news/-/asset_publisher/xg3Vzc7VITN6/content/cnsa-takes-over-chairmanship-of-the-international-charter-space-and-major-disasters-?redirect=https%3A%2F%2Fwww.disasterscharter.org%2Fweb%2Fguest%2Fnews%3Fp_id%3D101_INSTANCE_xg3Vzc7VITN6%26p_p_lifecycle%3D0%26p_p_state%3Dnormal%26p_p_mode%3Dview%26p_p_col_id%3Dcolumn-1%26p_p_col_count%3D1 |
| 9 June | CNSA | Benefitting from Universal Access https://www.disasterscharter.org/web/guest/news/-/asset_publisher/xg3Vzc7VITN6/content/benefitting-from-universal-access?redirect=https%3A%2F%2Fwww.disasterscharter.org%2Fweb%2Fguest |

| | | |
|--------------------|------|--|
| | | %2Fnews%3Fp_p_id%3D101_INSTANCE_xg3Vzc7VITN6%26p_p_lifecycle%3D0%26p_p_state%3Dnormal%26p_p_mode%3Dview%26p_p_col_id%3Dcolumn-1%26p_p_col_count%3D1 |
| 18 December | KARI | KARI takes over chairmanship of the International Charter 'Space and Major Disasters' https://www.disasterscharter.org/web/guest/news/-/asset_publisher/xg3Vzc7VITN6/content/kari-takes-over-chairmanship-of-the-international-charter-space-and-major-disasters?redirect=https%3A%2F%2Fwww.disasterscharter.org%2Fweb%2Fguest%2Fnews%3Fp_p_id%3D101_INSTANCE_xg3Vzc7VITN6%26p_p_lifecycle%3D0%26p_p_state%3Dnormal%26p_p_mode%3Dview%26p_p_col_id%3Dcolumn-1%26p_p_col_count%3D1 |

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.

5 Assessment

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

Statistics on the 2014 activations were compared with EM-DAT data to evaluate the overall impact of the Charter as a service in supporting disaster response – www.emdat.be (*D. Guha-Sapir, R. Below, Ph. Hoyois - EM-DAT: International Disaster Database – Université Catholique de Louvain – 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 2014.

5.1 Overall impact

In 2014, there were no major catastrophes causing extremely high numbers of fatalities. Therefore, 2014 was evaluated as a moderate year concerning the impact of natural disasters events in terms of fatalities and damages, by contrast to years such as 2004, 2008, or 2010 (see Figure 5-1).

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

Munich Re's natural catastrophe loss database (*Topics GEO, Natural catastrophes 2014 Analyses, assessments, positions, 2015 issue; Munich RE*) registered almost 1,000 catastrophe events with the reporting of high number of small and very small events in emerging economies countries (e.g. China and India). Direct overall losses from natural catastrophes in 2014 amounted to US\$ 110bn, well below the average for the last ten years of US\$ 190bn. A total of 7,700 people lost their lives in approximately 460 natural catastrophes, mainly in Asia (75% of total fatalities). Over 1,000 people died in natural catastrophes in both China and India, while Afghanistan and Nepal each accounted for several hundred fatalities. An especially large number of victims (66%) lost their lives in hydrological events. The distribution by continent shows that Asia was again worst affected in 2014, with 37%, followed by North America with 20% and Europe with 16%. Africa, South America and Australia accounted for 10%, 9% and 8% respectively of the registered events. In terms of the long-term average, relative frequency therefore declined in North America and Europe, but was 4 and 3 percentage points higher in Asia and South America respectively. The distribution of 2014 Charter activations by continent (Figure 3.7) reflects in part this distribution with many events in Asia, followed by Africa and South America.

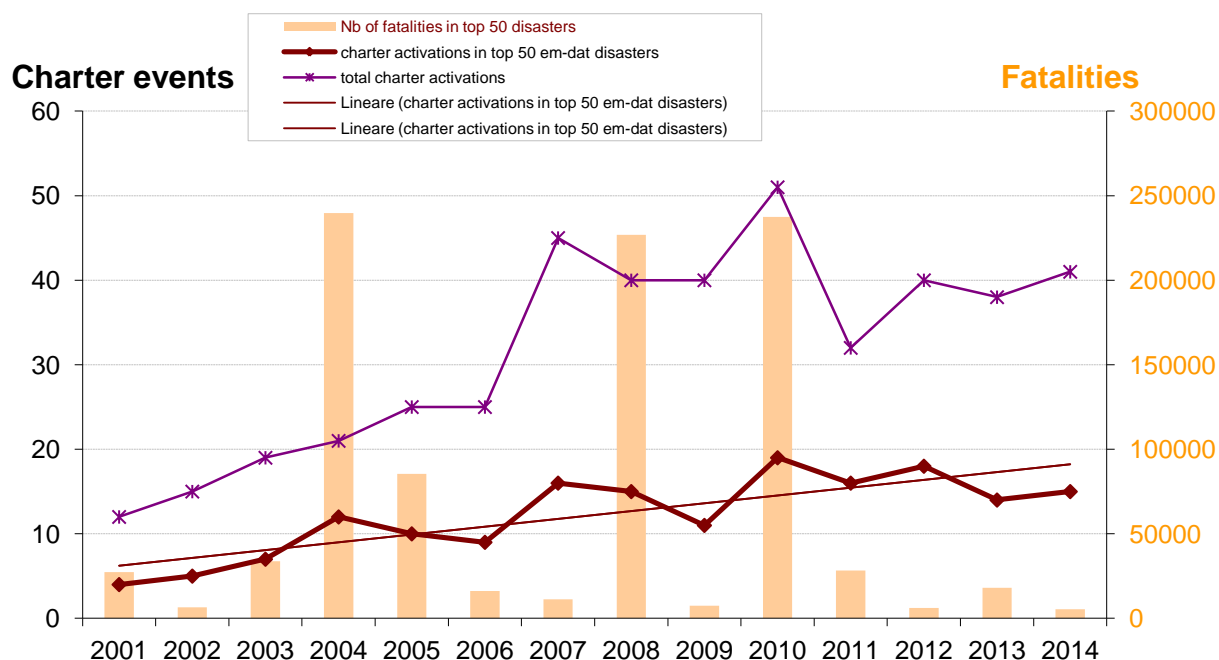


Figure 5-1. Number of Charter events over 2001-2014

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 2009, 2012 numbers.

Figure 5-1 shows that 2014, with some 41 activations, is comparable to recent years, as the number of Charter activations fluctuates between 30 and 50 per year since 2007. Such oscillations can be explained in part by the variability in the number of total natural disasters occurring during the relevant year and by the existence of national EO-based emergency response services as well as other regional EO-based emergency response services (e.g. Copernicus EMS, Sentinel Asia) triggered by national entities in Europe or in Asia Pacific.

In 2014, the Charter covered 7 of the 10 most severe disasters by fatalities (Table 5-1). Indeed, among the last five years (2009-2014), the Charter was triggered for 14 of the 15 most severe natural disasters by fatalities, as reported by EM-DAT (Table 5-2).

In addition, the Charter was activated, for the first time, for aircraft debris research after the disappearance of an airplane of Malaysia Airlines (216 deaths) and, for the case of a virus epidemic (Ebola virus) in Western Africa that caused more than 10,000 deaths in total (mainly in Liberia, Sierra Leone and, Guinea). In this case, the Charter provided satellite imagery to support the production of up-to-date situational maps in order to help the support teams sent to Western Africa.

| Top 10 Disasters – Number Killed – 2014 | | | | | |
|--|--------------------------|--------------------------|-------------------|-------------------------|--------------------------|
| <i>The text in italic indicates that the Charter was activated</i> | | | | | |
| Country | Disaster type | Date | #killed | #Affected people | Total Damage (000' \$) |
| <i>China P Rep</i> | <i>Earthquake</i> | <i>3/8/2014</i> | <i>731</i> | <i>1,120,513</i> | <i>5,000,000</i> |
| <i>Nepal</i> | <i>Landslide</i> | <i>2/8/2014</i> | <i>450</i> | <i>184,894</i> | <i>-</i> |
| <i>Afghanistan</i> | <i>Flood</i> | <i>24/4/2014</i> | <i>431</i> | <i>140,100</i> | <i>-</i> |
| <i>Pakistan</i> | <i>Flood</i> | <i>1/9/2014</i> | <i>367</i> | <i>2,470,673</i> | <i>2,000,000</i> |
| <i>India</i> | <i>Flood</i> | <i>8-9/2014</i> | <i>298</i> | <i>275,000</i> | <i>16,000,000</i> |
| Nepal | Flood | 12/8/2014 | 217 | 28,279 | - |
| India | Landslide | 30/7/2014 | 209 | - | - |
| <i>Sri Lanka</i> | <i>Landslide</i> | <i>29/10/2014</i> | <i>196</i> | <i>-</i> | <i>-</i> |
| <i>China P Rep</i> | <i>Storm</i> | <i>7/4/2014</i> | <i>128</i> | <i>-</i> | <i>-</i> |
| Philippines | Storm | 15/7/2014 | 111 | 4,654,966 | 820576 |

Table 5-1. Ten most severe natural disasters by number of fatalities in 2014 (events covered by Charter activations are indicated in bold and italics. (Source: EM-DAT, filtered according to the type of disasters covered by the Charter).

| Top 15 Disasters – Number Killed – 2009-2013 | | | | |
|--|---------------------------|--------------------------------------|-----------------------|---------------------------|
| <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>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> |
| 07-09 /2009 | India | flood | 992 | 1,886,000 |
| <i>11/01/2011</i> | <i>Brazil</i> | <i>General flood</i> | <i>900</i> | <i>45,000</i> |
| <i>05/08/2011</i> | <i>Thailand</i> | <i>General flood</i> | <i>813</i> | <i>9,500,000</i> |
| <i>3/8/2014</i> | <i>China P Rep</i> | <i>Earthquake</i> | <i>731</i> | <i>1,120,513</i> |

Table 5-2. Fifteen most severe disasters by number of fatalities (2009-2014) (events covered by Charter activations are indicated in bold and italics). (Source: EM-DAT filtered according to the type of disasters covered by the Charter)

The Charter covered 15 of the 50 most severe natural disasters in terms of fatalities recorded by EM-DAT in 2014 (Figure. 5-2, list in Annex 1) (36% of 2014 Charter activations), excluding droughts and extreme temperature events.

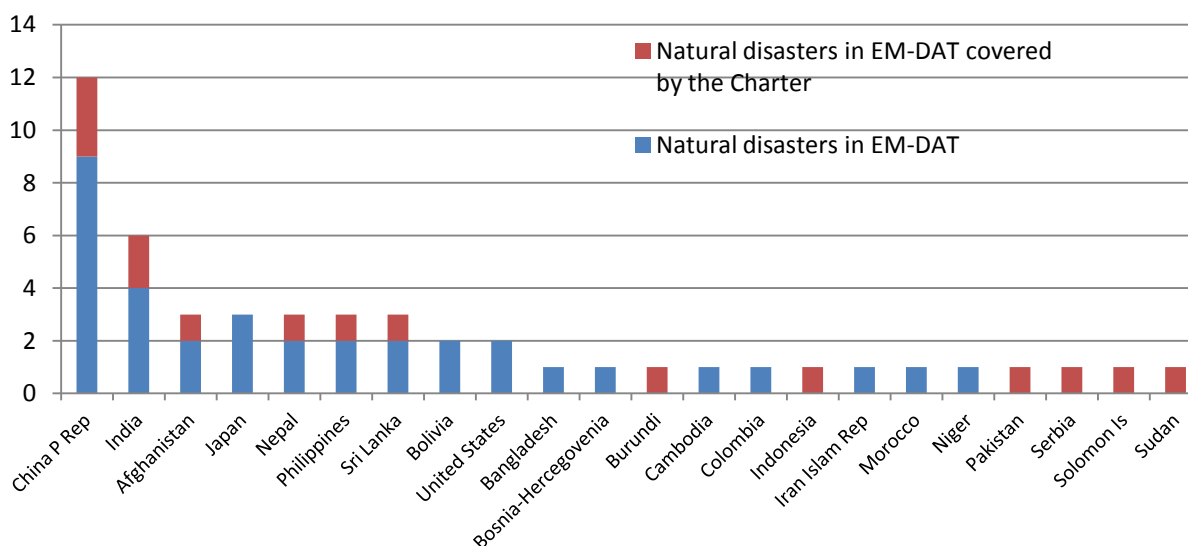


Figure 5-2. 2014 Breakdown by countries of the 50 major natural disasters (by fatalities) recorded by EM-DAT. In red the ones covered by the Charter.

(Source: EM-DAT filtered according to the type of disasters covered by the Charter)

These 15 requests were made by Charter Authorised Users (AUs) for disasters in their countries (China, India), by AUs on behalf of other countries (Serbia) and, by Charter Cooperating Bodies (Burundi, Indonesia, Nepal, Pakistan, Philippines, Solomon Island, Sri Lanka and Sudan). The number of Charter activations that are triggered for disasters in the annual top 50, fluctuates slightly year-by-year but there is a positive trend (Figure 5-1).

The Charter service was not requested for 35 of the 50 most severe disasters events (by fatalities):

- 18 out of 35 occurred in countries with an AU (China, India, Japan and USA). It is assumed that these AUs were able to judge appropriately between triggering the Charter and coping with the disaster without requesting a Charter activation. 2 out of 3 in Japan were covered by Sentinel Asia without escalation to the Charter: Volcanic eruption of Mount Ontake and landslide in the area of Hiroshima.
- 17 happened in countries without direct access to the Charter. All fall well within the hazard types of the Charter.
 - o 11 occurred in Asia (Afghanistan, Bangladesh, Cambodia, Iran, Nepal, Philippines and Sri Lanka).
 - o 2 occurred in Africa (Morocco and Niger), 3 in South America (Bolivia and Colombia) and one in the Balkans (Bosnia-Herzegovina). The flood in Bosnia-Herzegovina was covered by the European Copernicus EMS service.

It is expected that further progress of the Charter's Universal Access (UA) initiative will improve Charter access globally. Indeed, Australia and Malawi have concluded the process of becoming Charter Authorized Users (AU), and Australia directly activated the Charter for an ocean storm in April 2014. In addition, Pakistani, Chilean, Bolivian and Colombian disaster management organizations have requested to become AU for their countries in 2014, and – by the time of

publishing this report - they are also able to directly activate the Charter in case of major disasters in their countries due to their newly achieved Authorised User status. However, thanks to the other arrangements set up to improve Charter access for all countries, the Charter provided regular support to 83 countries without direct access to the Charter through an Authorized User from its inception (2000). In 2014, 22 countries (out of 30) without direct access to the Charter benefited of the Charter service.

5.2 System performance assessment

The triggering time (where the On-Duty Operator, ODO, receives the User Request Form, URF, and the Emergency on-Call Officer, ECO, contacts the Project Manager (PM)) is on average less than one day. This time span includes the process of finding a qualified PM and his nomination by the Charter Executive Secretariat.

The histogram in Figure 5-3 shows the acquisition time of the first crisis satellite images received after Charter activations of the years 2011, 2012, 2013 and 2014. This parameter estimates the rapidity of Charter tasking and relevant image acquisition. It is calculated as [Date of first crisis image acquisition - Date of Charter activation], values extracted from the PM reports when clearly stated. It is also important to note that the PM/Value Adder may not use the first crisis scene to generate the first information product, e.g. if the first scene is too cloudy or too coarse to monitor the impact, etc.

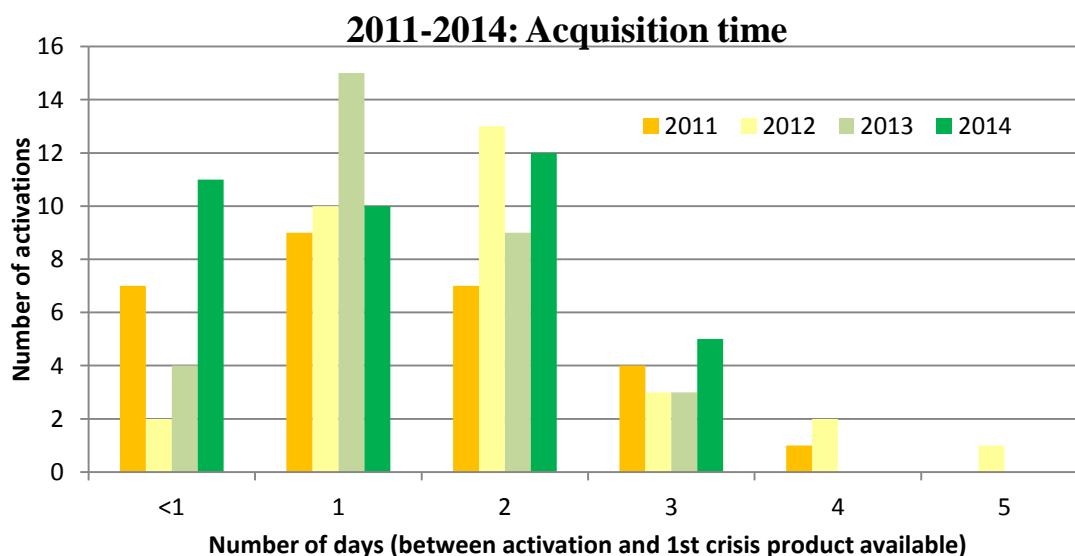


Figure 5-3. Time interval between Charter activation date and date of first data acquisition (2011-2014)
Statistics generated using PM reports information

In average, the acquisition time is inferior to two days. Some images are available within the same day of the activation, as it is often the case when the Charter is triggered in anticipation by the requester (e.g. volcanic eruption, ocean storm). The 2014 acquisition time was equivalent to 2013 one and better than 2011, 2012; the 1st crisis product was available within the same day for 11 activations out of 38 (i.e. number of PM reports available up to June 2015) and in less than 2 days for 21 activations out of 38.

It is difficult to compare such figures to user requirements *in general* and EO systems will always be slower than desired for certain users; a constraint being the timeliness in accessing new observations (and cloud-free observations in the case of optical systems) in the aftermath of a hazard impact; more satellites will be needed to reduce this constraint. More radar satellites, in particular, would reduce the effect of cloudy weather conditions in disaster zones on the Charter's performance. Many users indicated that providing crisis mapping (i.e. based on fresh acquisitions) on a daily basis and starting on Day 1 is an appropriate target and it would facilitate decision making for the affected areas.

In some cases, additional delay is caused by a change of the Areas of Interest or imprecise information given by the requestor of the activation, because this implies a re-tasking of the satellites.

It should also be noted that activation of the Charter by an AU or a Cooperating Body after a disaster event fluctuates mostly between < 1 (activation the same day of the event) to 3 days, but can be longer as shown in Figure 5-4. The quicker the Charter is activated after the occurrence of a disaster, the more effectively it can support emergency response.

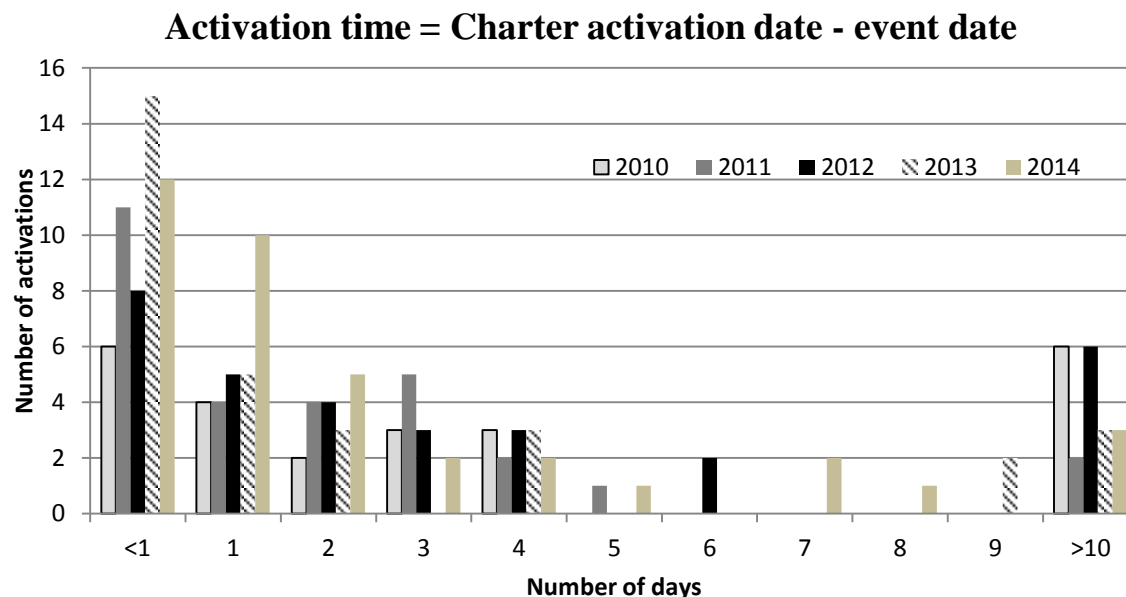


Figure 5-4. Time to activate the Charter by an AU or a Charter Cooperating Body (2010-2014 period)
Statistics generated using PM reports information

In 2014, the activation of the Charter by an Authorised User (AU) or Cooperating Body after a disaster event occurred in average in 2.5 days which is comparable to the 2013 average, while the average activation time was 3.1 days for the period 2010-2012. There is an improvement due to a quicker decision from the AU or end-user to request the Charter activation. Indeed, activation time is mainly linked to the event type and the AU or end user decision process concerning the need for geo-information. In some cases, the delay in activating the Charter has an impact on the usefulness of the Charter products, in particular, after flash flood events or hurricanes.

The implementation of the new operational system COS-2 (in service since Q1 of 2015) will help to improve the speed of some operations and exchanges amongst the different operational staff involved during the activation (ODO - ECO - Charter members' order desks - PM). In addition, COS-2 will systematically monitor the Charter workflow and most of Charter performance parameters will be generated automatically, with the exception of those linked to the PM decisions (e.g. selection of the relevant crisis image to assess damage/extension of the disaster, request of additional EO data in case of event evolution / duration, etc).

5.2 Assessment of services and products

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:

- One SARE addressed to ECO staff and three ECOs training to the use of COS-2 were organised in 2014.
- Five PM trainings were held in Thailand, China, USA, Indonesia and France. That allows a regular growth and commitment of PMs that will enhance the ability to assign a PM from the geographical region of a disaster.

A permanent revision of the different EO scenario procedures for flooding, earthquake, volcanic eruption, etc and definition of new scenario (e.g. tsunami scenario) taking into account every modification in the Charter satellite constellation, as well as ECOs (i.e. SARE exercises) and PMs recommendations, are regularly performed to offer the best background procedures and to make the work of the ECOs and the PMs more efficient and easier.

In addition to the systematic review of the PM training material, an online PM refresher training course is in preparation 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.

5.3 Users' appraisal

It is paramount for the Charter to gather feedback from end-users to understand the utility and to identify possible improvements of the Charter service. End-users feedbacks are gathered by the PM and included in the PM reports.

The Charter's end users are, in general, satisfied by the Charter's service and products that they exploited during the response phase.

Below, examples of comments from end-users

- **Activation 408: Flood in U.K.** *"The Charter activation for this part of the event worked well for the end- user, providing timely data during the ongoing incident management and recovery phases. The data was also combined with other data sources (for example aerial imagery used in mapping urban floods), used by local to national teams for communications and provided to media teams and other government"* **End user:** Environment Agency of England and Wales (U.K.)
- **Activation 424: Flood and Landslide in Southern Brazil** *"For this type of disaster, which is a rapid flood over a huge area, with different flood peak dates along the river, the challenge is to obtain images in the appropriate time and spatial frames. Overall the structure of the Charter operated as expected, in an efficient manner."* **End user:** CENAD and Brazilian Army

However, a few users have remarked that the EO crisis products were too coarse to observe and estimate damages (e.g. wind storms in small islands with traditional habitat). Such cases could be limited by a better filtering of requests to avoid Charter activation for events that are not major or

for events which cannot be efficiently assessed by Charter EO data. Moreover, some end users noted that the products are of good quality but delivered too late to be used as direct support to relief operations; then they are used as products to support damage assessment.

Examples of recurrent users' recommendations reported by the PMs are:

- The need for technical training to improve end user awareness (use and exploitation of Charter products).
- To involve specialist partners in the further processing and interpretation of data (VA partners, local actors, scientific community, etc.).
- To receive information products as vector data files to be directly exploited in Geographical Information Systems (GIS).

It should be noted that there is an increase in AUs and end users able to perform EO and GIS processing and, in some cases, the PMs/VA organizations already provided GIS layers to the end users.

Several AU trainings were held, on site or via teleconference, by ES members (CONAE, DMCii, JAXA and USGS) with the goal of providing the relevant authorities with the necessary information and exercises to use the International Charter 'Space and Major Disasters' in the event of a natural or man-made disaster in the region:

- UK overseas Territories in the Caribbean;
- Chile, Malawi, and Pakistan disaster management organizations (AUs' candidates) as part of the UA procedures.

Efforts to increase awareness of stakeholders went on with the participation of Charter members at international conferences and meetings as well as conferences organized by Sentinel Asia in the Asia-Pacific region. UNOOSA, and UNITAR/UNOSAT also supported the Charter in presenting the Charter and the Universal Access initiative at a number of trainings and international events.

5.4 Communication assessment

The Charter website has been updated with a brand-new design and layout to facilitate 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. 1840 followers were counted by end of 2014 (many more will actually be reached due to re-tweets of Charter messages, e.g. through Charter agency twitter accounts).
- Charter articles published on Wikipedia in several languages (e.g. English, French, German)
- Participation in international/regional events all over the world to promote the Charter and the Universal Access (UA) initiative.
- Letters to APSCO members and the UN-SPIDER network of National Focal Points of

countries without direct access to the Charter, to explain the Charter and the Universal Access initiative and encourage them to benefit from this new opportunity.

The Charter movie, flyer and brochure in English and French are distributed and used regularly at conferences and workshops both nationally and internationally.

6 Conclusions

In 2014, the following agencies took the lead function which rotates among Charter members on a six-month basis: the Comisión Nacional de Actividades Espaciales, CONAE, until the middle of April, the China National Space Administration (CNSA), from April to mid-October, and Korea Aerospace Research Institute (KARI), from mid-October to April 2015. 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 Beijing, China, in April 2014, and in Daejeon, South Korea, in October 2014.

An official request of the Bolivarian Agency for Space Activities (ABAE) of Venezuela to become Charter member was received in May. ABAE operates a high resolution optical satellite (VRSS-1 called Miranda).

Throughout the reporting period, there were 41 activations in 30 countries, a similar figure to the yearly 'average' between 2007 and 2013. In total, the Charter has been triggered for 443 disasters in 114 countries since 2000. The Charter was activated, for the first time, for aircraft debris search after the loss of an airplane (216 deaths), and for EO-based support to international aid measures due to the spread of the Ebola virus in Western Africa that caused more than 10,000 deaths in total. Summer and autumn (in particular August and October) were the periods with the largest number of activations due to intense rains in Asia and Europe. Another peak of activations was registered in February due to different types of disasters mainly linked to meteorological events in Southern Africa, South America and Europe.

Seven Charter activations were among the 10 most severe natural disasters in 2014 as registered by EM-DAT. Compared to other years, there were no extreme natural catastrophes with very high numbers of fatalities in 2014. In fact, 2014 was evaluated as a moderate year concerning the impact of natural disaster events in terms of fatalities and damages. The earthquake in China in August 2014 was the deadliest event with 731 killed persons. A total of 7,700 people lost their lives in approximately 460 natural catastrophes, mainly in Asia (75% of total fatalities).

Universal Access (UA) is progressing gradually allowing new disaster risk management users to be granted Authorized User (AU) status; in 2014, Malawi has had its national disaster management body granted Charter access. With Australia (2013) and Malawi (2014), 43 countries and the EC have dedicated AUs, reaching the total of 51 user organizations able to directly request Charter activations. The Charter is revising the Universal Access procedures to facilitate and accelerate the process put in place in 2012 to fully accept a national user as AU. Charter members have continued to promote UA and the Charter as a whole, through their participation in different international events held in 2014. Furthermore, Universal Access focused promotion actions were conducted in collaboration with APSCO and UNOOSA: 1) letters to APSCO (Asia-Pacific Space Cooperation Organization) membership were sent by CNSA. 6 countries without AU were contacted: Bangladesh, Indonesia, Iran, Mongolia, Peru, and Thailand; 2) letters were sent to 30 National Focal Points of the UN-SPIDER network, in countries which have no Authorized User today. Collaboration with the Charter's Cooperating Bodies (UNOOSA, UNITAR/UNOSAT, and ADRC) and GEO remains one of the major avenues for improving the awareness of the Charter worldwide.

The Charter started collaboration with the CEOS Working Group on Disasters to allow CEOS Pilot teams to access the data collection from a Charter activation in order to support their research, once an activation is closed.

The new Charter Operational System (COS-2) is under improvement and the full release of COS-2 is foreseen beginning of 2015. Three ECO trainings on COS-2 were organized in 2014. The main aim of COS-2 is to increase activation performance (timeliness, best usage of resources) and to provide a single point of entry for operations. In particular, the COS-2 system automates many steps in the Charter workflow, which were performed by email exchanges in the past, and it will generate helpful statistics and thus support Charter reporting.

Five Project Manager training sessions were organised by the Charter members in Thailand, China, USA, Indonesia and France to strengthen the network of Charter PMs. An on-line refresher training course is also in preparation to keep PMs up to date on Charter members, satellites in the Charter constellation and Charter procedures.

In 2014, the website was updated with a brand-new design and layout to facilitate user navigation and information search (<https://www.disasterscharter.org/web/guest/home>). In addition, it allows direct access to COS-2 to authorized staff. Two Charter newsletters were issued in 2014. Twitter is also used as an additional tool to widely publicize Charter activations and other relevant news, as well as to raise public awareness of the comprehensive information available on the Charter's website.

7 Annex

List of 50 most severe natural disasters (by number of fatalities) recorded by EM-DAT (2014) (*D. Guha-Sapir, R. Below, Ph. Hoyois - EM-DAT: International Disaster Database – www.emdat.be – Université Catholique de Louvain – Brussels – Belgium*).

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

| Country | Disaster type | Event name | Start month | Start day | Total deaths | Total affected | Total Damage (000' \$) | Charter activation |
|-------------|---------------|---------------------------------------|-------------|-----------|--------------|----------------|------------------------|--------------------|
| China P Rep | Earthquake | | 8 | 3 | 731 | 1,120,513 | 5,000,000 | x |
| Nepal | Landslide | | 8 | 2 | 450 | 184,894 | - | x |
| Afghanistan | Flood | | 4 | 24 | 431 | 140100 | - | x |
| Pakistan | Flood | | 9 | 1 | 367 | 2,470,673 | 2,000,000 | x |
| India | Flood | | 9 | | 298 | 275,000 | 16,000,000 | x |
| Nepal | Flood | | 8 | 12 | 217 | 28,279 | - | |
| India | Landslide | | 7 | 30 | 209 | - | - | |
| Sri Lanka | Landslide | | 10 | 29 | 196 | - | - | x |
| China P Rep | Storm | | 4 | 7 | 128 | - | - | x |
| Philippines | Storm | Typhoon Rammasun (Glenda) | 7 | 15 | 111 | 4,654,966 | 820,576 | |
| Indonesia | Landslide | | 12 | 12 | 108 | - | - | x |
| Burundi | Flood | | 2 | 19 | 96 | - | - | x |
| India | Flood | | 9 | 24 | 95 | 650,000 | 163,000 | |
| Nepal | Storm | | 10 | 14 | 83 | - | - | |
| Japan | Landslide | | 8 | 20 | 82 | - | - | |
| Afghanistan | Flood | | 6 | 3 | 81 | - | - | |
| Philippines | Storm | Tropical Depression Agaton (Lingling) | 1 | 19 | 79 | 1,148,707 | 12,591 | |
| Sudan | Flood | | 7 | 25 | 77 | 260,227 | - | x |
| Bolivia | Landslide | | 1 | 1 | 74 | - | - | |
| Philippines | Storm | Tropical storm 'Jangmi' (Seniang) | 12 | 28 | 72 | 578,549 | 17,688 | x |
| China P Rep | Storm | Typhoon Rammasun (Glenda) | 7 | 18 | 71 | 9,960,099 | 4,232,973 | x |
| China P Rep | Flood | | 7 | 13 | 66 | - | - | |
| China P Rep | Flood | | 9 | 1 | 65 | 300,000 | 570,000 | |
| Afghanistan | Storm | | 2 | 1 | 63 | - | - | |

| | | | | | | | | |
|--------------------|-------------------|----------------|----|----|----|------------|-----------|---|
| Japan | Volcanic activity | Mount Ontake | 9 | 27 | 62 | - | - | |
| Bangladesh | Flood | | 8 | 11 | 59 | 2,800,447 | 160,000 | |
| China P Rep | Flood | | 5 | 12 | 53 | - | - | |
| Serbia | Flood | | 5 | 13 | 51 | 1,600,000 | 2,172,355 | x |
| China P Rep | Flood | | 9 | 10 | 50 | 1,065,000 | 1,400,000 | |
| Solomon Is | Flood | | 4 | 1 | 47 | - | - | x |
| India | Flood | | 8 | 9 | 47 | 3,600,000 | 100,000 | |
| Cambodia | Flood | | 7 | 30 | 45 | 920,000 | 7,000,000 | |
| India | Storm | Cyclone Hudhud | 10 | 12 | 45 | 530,450 | - | x |
| Colombia | Flood | | 11 | 1 | 44 | - | - | |
| United States | Landslide | | 3 | 22 | 43 | - | - | |
| Sri Lanka | Flood | | 12 | 1 | 41 | 1,100,020 | - | |
| United States | Storm | | 4 | 27 | 40 | - | - | |
| Sri Lanka | Landslide | | 10 | 28 | 38 | - | - | |
| Morocco | Storm | | 11 | 21 | 38 | 117,000 | 450,000 | |
| Japan | Storm | | 2 | 8 | 37 | - | - | |
| Iran Islam Rep | Flood | | 6 | 1 | 37 | 440,000 | 49,000 | |
| China P Rep | Flood | | 5 | 24 | 37 | 475,000 | 1,200,000 | |
| China P Rep | Flood | | 6 | 4 | 37 | 450,000 | 1,100,000 | |
| Niger | Flood | | 6 | | 36 | 165,578 | - | |
| India | Flood | | 8 | 3 | 35 | 179,000 | - | |
| China P Rep | Flood | | 6 | 1 | 33 | 720,000 | - | |
| Bolivia | Flood | | 10 | | 31 | 207,687 | - | |
| China P Rep | Flood | | 8 | 11 | 27 | 150,000 | 487,000 | |
| Bosnia-Herzegovina | Flood | | 5 | 13 | 25 | 720,000 | 677,000 | |
| China P Rep | Flood | | 6 | 17 | 24 | 15,000,000 | 900,000 | |