

# International Charter

## Space & Major Disasters



**Executive Secretariat**

**11<sup>th</sup> Annual Report**

**January-December 2011**

<b>Status</b>	<b>version</b>	<b>Date</b>	<b>author</b>
Draft	1.0	August 2012	Ph Bally, M Viel (ESA)
Completed	2.0	October 2012	
Checked			

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# 1 Introduction

## 1.1 Overview of the International Charter Space and Major Disasters

The Charter is an international collaboration among 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, it was joined by 10 other space agencies between 2000 and 2011, namely (in chronological order):

- US National Oceanic and Atmospheric Administration, NOAA
- Comision Nacional de Actividades Espaciales, Argentina, CONAE
- Indian Space Research Organization, ISRO
- Japanese 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

EUMETSAT's application to become a member of the Charter was accepted in May 2011, this will be formalised in 2012. Final integration of the Russian Federal Space Agency (ROSCOSMOS) is expected to occur in 2012.

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 rapid tasking of satellites for immediate response rather than 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 for supporting immediate response to major natural or man-made disasters.

The Charter has been activated for more than 325 disasters (as at the end of 2011) in over 120 countries since its inception in 2000. In 2011 alone, the Charter was activated 32 times for disasters in 25 countries. These accomplishments can be attributed to its narrowly defined scope.

The Charter gives access to a constellation of satellites equipped with radar and optical sensors. In 2011, the live satellites were the following:

- Radar sensors (high resolution and very high resolution) : ENVISAT, RADARSAT-1 et 2, TerraSAR-X and TanDEM-X.
- Optical sensors (high resolution and very high resolution): SPOT4, SPOT5, IRS-P6, LANDSAT5, LANDSAT7, PROBA 1, UK-DMC 2, KOMPSAT-2.
- Optical sensors (medium resolution): MERIS, POES, GOES, SAC-C.

Operations of ALOS (PALSAR and AVNIR/PRISM sensors) satellite ceased after 22 April 2011. ERS-2 mission also ended on 05 September 2011 after 16 years of operations. ERS's average

altitude was lowered from 785 km to about 573 km to reduce the risk of collision with other satellites or space debris. Archived data from both satellites and others (CBERS, IRS-1C, SPOT 2, UK-DMC, and NigeriaSat) remain available for Charter activations. Archived data can be compared with newly acquired data to prepare damage assessment products.

The first French PLEIADES' satellite was launched in December 2011. Data will be available for use by mid-2012.

Specific agreements with other entities allow the Charter to access additional products (high and very high resolution) from satellite such as RapidEye, Formosat, GeoEye, IKONOS, QuickBird, WorldView.

## **1.2 Purpose and scope of this document**

This document describes the activities of the International Charter "Space & Major Disasters" for the period covering 2011. During this period, the Lead agencies on a six monthly rotational basis have been: the US Geological Survey (October 2010 - April 2011), the UK Space Agency (May 2011-September 2011) and the Canadian Space Agency (October 2011- April 2012).

The report is based on the following:

- Working documents, notes and actions of the Executive Secretariat and Board
- Input from the Communication Group
- Input from each Charter member concerning EO resources
- Project Managers' reports for each activation, and
- Statistical data from EM-DAT.

The report follows the same structure as the work plan of the Executive Secretariat.

Chapter 1 is the present introduction.

Chapter 2 explains integration of new members, external relationships, Cooperating Bodies.

Chapter 3 describes the evolution of the Charter.

Chapter 4 depicts internal business, particularly the operations, anomalies, resource consumption, and technical updates.

Chapter 5 reports on communication activities.

Chapter 6 provides an assessment of the system performance, products and services, user appraisal and communication assessment.

Chapter 7 Conclusions are drawn.

### **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 Reference documents**

[RD1] EM-DAT: The OFDA/CRED International Disaster Database - Université Catholique de Louvain - Brussels – Belgium.

[www.em-dat.net](http://www.em-dat.net)

[RD2] <http://www.cred.be/sites/default/files/CredCrunch27.pdf> ;  
[http://cred.be/sites/default/files/2012.07.05.ADSR\\_2011.pdf](http://cred.be/sites/default/files/2012.07.05.ADSR_2011.pdf)

[RD3] [http://www.munichre.com/en/reinsurance/business/non-life/georisks/natcatservice/annual\\_statistics.aspx](http://www.munichre.com/en/reinsurance/business/non-life/georisks/natcatservice/annual_statistics.aspx)

## 1.5 List of acronyms

AOI	Area of Interest
ADRC	Asian Disaster Reduction Center
AIT	Asian Institute of Technology
APRSAF	Asia-Pacific Regional Space Agency Forum
ASEAN	Association of South-East Asian Nations
AU	Authorised User (of the Charter)
BNSC	British National Space Centre
CAS	Chinese Academy of Science
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 Agency
COGIC	Centre Opérationnel de Gestion Interministérielle des Crises (France)
CONAE	Comision Nacional de Actividades Espaciales (Argentina)
CONIDA	Comision Nacional de Investigacion y Desarrollo Aeroespacial (Peru)
CONRED	Coordinadora Nacional para la Reducción de Desastres (Guatemala)
CRED	Centre for Research on the Epidemiology of Disasters
CRESDA	Center for Resources Satellite Data and Applications
CSA	Canadian Space Agency
CSDP	European Union Common Security and Defence Policy
DDSC	Direction de la Défense et de la Sécurité Civiles
DLR	Deutsches Zentrum für Luft und Raumfahrt (German Aerospace Center)
DMA	Disaster Management Authority
DMC	Disaster Management Constellation
DMCii	Disaster Management Constellation International Imaging
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
EUR-OPA	European Open Partial Agreement
EUSC	European Union Satellite Centre
FASP	European Union Foreign and Security Policy
FTP	File Transfer Protocol
GDACS	Global Disaster Alert and Coordination System
GEO	Group on Earth Observations
GEONETCast	global network of satellite-based data dissemination systems
GEOS	Global Earth Observation System of Systems, GEO
GIO	GMES Initial Operations
GISTDA	Geo-Informatics and Space Development Agency of Thailand
GMES	Global Monitoring for Environment and Security
HDDS	(USGS) Hazards Data Distribution System
HR	High Resolution
ICD	Interface Control Document
ICIMOD	International Center for Integrated Mountain Development
IFRC	International Federation of Red Cross / Red Crescent societies
INGEOMINAS	Instituto Colombiano de Geología y Minería
INPE	National Institute for Space Research (Brazil)
ISRO	Indian Space Research Organization
JAXA	Japanese Aerospace Exploration Agency
JPTM	Sentinel Asia Joint Project Team Meeting
KARI	Korea Aerospace Research Institute
KML	Keyhole Markup Language
MCDM	Ministry of Civil Defence and Emergency Management (New Zealand)

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MR	Medium Resolution
NASRDA	Nigerian Space Agency
NatCatSERVICE	Natural catastrophe know-how for risk management and research
NCDR	National Center for Disaster Reduction
NEMA	National Emergency Management Agency (Nigeria)
NFP	National Focal Point
NOAA	National Oceanic and Atmospheric Administration
NRSC	National Remote Sensing Centre (India)
NSMC	National Satellite Meteorological Center
NSPO	National Space Organization (Taipei)
ODO	On-Duty Operator
ONEMI	Oficina Nacional de Emergencia del Ministerio del Interior (Chile)
PA	Partner Agency
PM	Project Manager (of the Charter)
RCMRD	Regional Center for Mapping of Resources for Development (Kenya)
RESTEC	Remote Sensing Technology Center (Japan)
ROSCOSMOS	Russian Federal Space Agency
SA	Sentinel Asia
SAFER	Services and Applications for Emergency Response
SARE	Semi Annual Refresher Exercises
SASOT	Sentinel Asia System Operation Training
SEGEMAR	Servicio Geológico Minero Argentino
SERTIT	Service Régional de Traitement d'Image et de Télédétection (France)
SIFEM	Sistema Federal de Emergencias (Argentina)
SOPAC	Pacific Islands Applied Geosciences Commission
ToR	Terms of Reference
UA	Universal Access
UKSA	United Kingdom Space Agency
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNESCAP	United Nations Economic and Social Commission for Asia and the Pacific
UNICEF	United Nations Children's Fund
UNITAR/UNOSAT	United Nations Institute for Training and Research/ United Nations Operational Satellite Applications Programme
UNHCR	United Nations High Commissary for Refugees
UNOCHA	United Nations Office for the Coordination of Humanitarian Affairs
UNOPS	United Nations Office for Project Services
UN OOSA	United Nations Office for Outer Space Affairs
UNSPIDER	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
WFP	World Food Programme
WWF	World Wide Fund For Nature

## 2 External relations

### 2.1 *New members accession*

The Korean Aerospace Research Institute (KARI) and Brazil's National Institute for Space Research (INPE) became Members of the Charter on 07 July and 09 November 2011 respectively. With these two new entries, there are now 13 Charter members. KARI has successfully completed all qualification and training requirements, and will provide the ECO (Emergency On-call officer) service in January 2012. INPE training and assessment is planned for next year.

The Charter's membership is growing, EUMETSAT's membership application was accepted in October 2011. EUMETSAT in collaboration with NOAA - among other activities - will contribute to the improvement of data delivery to areas with low internet capacity, particularly in developing countries.

The Russian Federal Space Agency (ROSCOSMOS) participated in the Board meeting in London (May 2011), its integration as a full Charter member is pending clarification from Russian counterparts of their respective roles at an institutional level.

NSPO's (Taipei) membership is under deliberation, the decision made at the Board meetings in London and Montreal was to nominate a national organization from Taipei as an AU. NSPO will be notified of the Charter's decision subsequent to a formalised agreement with China.

Increased membership continues to demonstrate the interest of space agencies in the Charter initiative which is a rather unique worldwide service for disaster response.

### 2.2 *Cooperating Bodies & Charter User Intermediaries*

#### 2.2.1 **Collaboration with UNOOSA and UNITAR/UNOSAT**

Cooperation with the UN has continued based on the arrangements with both UNOOSA and UNITAR/UNOSAT.

22% of Charter requests this year (7 activations of 32) were through UNOOSA (2 activations) and UNITAR/UNOSAT (5 activations). UNOCHA was the main requester with 4 calls, followed by UNICEF and UNDP. In addition, UNITAR/UNOSAT had staff members nominated as Project Managers (PM) for 5 activations (Pakistan, Turkey, Colombia, Cambodia and El Salvador).

The annual meetings with UNITAR/UNOSAT and UNOOSA occurred respectively on 05 and 06 December 2011 at ESA/ESRIN. The main purpose of the meetings was to review the 2011 reports delivered by the two UN bodies. The reports describe each institution's promotional and training activities, and activation requests. The delegation from the Charter comprised of the Canadian Space Agency (CSA), the Centre National d'Etudes Spatiales (CNES), the European Space Agency (ESA), the German Aerospace Center (DLR) and the UK space Agency (UKSA).

Decrease in UN requests to the Charter was discussed with UNITAR/UNOSAT. Two possible causes were suggested:

- A decrease in major disaster events worldwide in 2011. This is reflected in the number of UN Disaster Assessment and Coordination (UNDAC) teams deployed for emergency support in 2011, which also saw a decrease compared to 2010 figures.



- Availability of other EO-based mechanisms triggered by UN agencies for major emergency (e.g. GMES SAFER used by WFP headquarter, Sentinel Asia,).

UNITAR/UNOSAT advocated the use of the GDACS (Global Disaster Alert and Coordination System) as a mechanism for improving Charter access for UN users, particularly through the future installation of an on-line URF. The Charter commended UNITAR/UNOSAT officially through a letter dated 06 July for the additional support provided, particularly the GDACS and on-line URF. However, it was requested that the use of such an on-line tool should be strictly limited to UN users and the URF transmission should be maintained by fax.

UNITAR/UNOSAT has actively promoted the International Charter in international conferences (ESRI User Conference in San Diego, 11-15 July 2011; UNITAR-WMO Symposium on "satellite solutions for global challenges" Geneva, 12 October 2011) and in-country trainings.

The UNOOSA representative reported that they have promoted the Charter and UNOOSA role as a Charter cooperating body in a large number of international conferences, regional and national meetings. Furthermore, UNOOSA publicises the Charter through UNSPIDER monthly updates and quarterly newsletters as well as its twitter account. It was also clarified that UNSPIDER national focal points (NFPs) and regional support offices (RSOs) could be very supportive in contacting national authorities during the implementation of the Universal Access.

In conclusion, the cooperation with the UN continues on the same basis, in particular for promotion and awareness. UNOOSA mentioned that they will keep on collaborating with UNITAR/UNOSAT in order to avoid confusion among UN users on Charter activation mechanism. Both UN agencies declared their availability to support the Charter through their networks in implementing the Universal Access.

### ***2.3 Cooperation with other programmes and initiatives***

During 2011, the Charter continued its collaboration with the intergovernmental Group on Earth Observations (GEO) and cooperation with Sentinel Asia (SA) to improve Charter access world-wide.

In addition, arrangement between the European members of the Charter (CNES, DLR, ESA, UKSA) and the GMES SAFER, as well as collaboration with the Garnet-e project (GMES and Africa programme) progressed in 2011.

#### **2.3.1 Collaboration with GEO**

As a follow on to the request from the GEO Secretariat to improve Charter access world-wide, the activities concerning national users and access modes have progressed in the Asia Pacific region and Africa. For users from the Asia Pacific region, the collaboration with Sentinel Asia continue to be significant for achieving effective results (§2.3.2). For users from Africa, formal user consultations were organized in 2011 in Tanzania, Kenya and Madagascar. The process has facilitated a better understanding of the institutional and operational framework of these countries, and also in determining appropriate activation mechanisms suited for each country's Disaster Management Authority. For instance, the Disaster Management Authority (DMA) of Madagascar – together with the DMAs of Burkina Faso, Mali and Senegal identified the French Civil protection - COGIC – as potential "sponsor AU" for major disasters in the country.

In July 2011, the Board officially informed the GEO Secretariat of the Charter's Universal Access resolution, explaining that Charter members were analyzing the operational implications

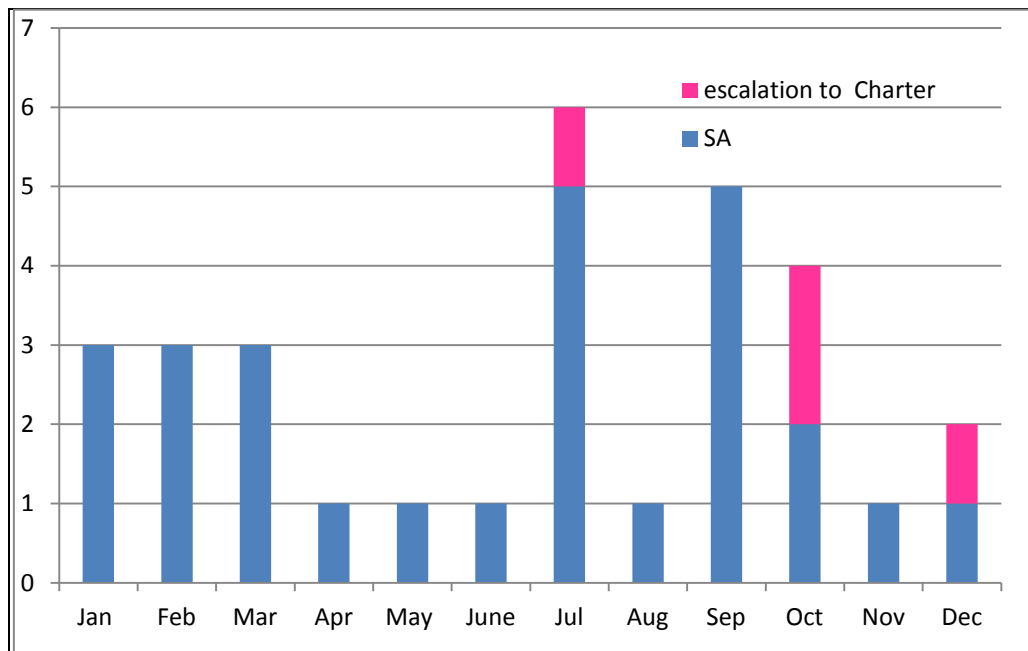
and developing procedures for the implementation of this resolution. The Board re-affirmed the importance of a continued cooperation with GEO for the achievement of the Universal Access process.

### 2.3.2 Cooperation with Sentinel Asia

ADRC provided the Charter with monthly activation status reports and two bi-annual reports (May & September) which included a review of Sentinel Asia (SA) emergency response activities and promotional/ awareness activities.

In 2011, Sentinel Asia (SA) was requested thirty-nine (39) times, eight (8) Emergency Observation Requests (EOR) were rejected and the escalation mechanism to the Charter was used in response to four (4) events: flood in Japan (July), floods in Vietnam and Thailand (October), flood in Philippines (December).

SA was triggered for 25 floods, 4 earthquakes, 1 typhoon and one volcanic eruption.



**Figure 2-1. Sentinel Asia: 2011 monthly activations**  
In pink - the four activations with escalation to the Charter

SA was operated in parallel to the Charter for five events: flood in Australia (Geoscience Australia, GA), earthquake in New Zealand (UNESCAP), earthquake and tsunami in Japan (JAXA), flood in Japan (JAXA), earthquake in Northern India/Nepal (ICIMOD, NRSC/ISRO). The requestors were either national or international SA members.

JAXA is continuing to work with ADRC to avoid procedural errors in using the escalation mechanism and to enhance knowledge at national level. Moreover, it has been discussed and approved at the Board meeting in Montreal to slightly modify the procedure to enable JAXA and ADRC to use the escalation mechanism if they decide that Charter resources are needed (e.g. major disaster, lack of sensors for a given hazard impact) to support national response teams.

In addition, JAXA requested at the Montreal Board meeting (October 2011) to give ICIMOD, SOPAC and UNESCAP the privilege to use the escalation mechanism for their affiliates or members

when the end user is unable to directly initiate the EOR (Emergency Observation Request). The Charter decided to re-examine this issue when starting the Universal Access implementation.

SA – with the involvement of Charter members (JAXA, USGS) – promoted the Charter and explained the escalation mechanism to activate the Charter in several trainings and conferences: Sentinel Asia System Operation Training (SASOT) in February (Nepal); Utilization of Satellite Image on Disaster Management trainings by ASEAN (February, Viet Nam; March, Indonesia ; June, Brunei); Sentinel Asia Joint Project Team Meeting (JPTM) (July, Malaysia); the 18th Asia-Pacific Regional Space Agency Forum (APRSAF) (December ).

### **2.3.3 Collaboration between European members of the Charter and the GMES programme**

- Collaboration with the GMES Emergency Response Service

The European Union initiative, Global Monitoring for Environment and Security (GMES) has a major emergency response component. The SAFER project (January 2009 – December 2011) implemented and validated the pre-operational versions of the GMES Emergency Response Service (ERS). The project focused on rapid mapping for emergency response, early warning and reconstruction phases. The Charter and GMES both offer capacities essential in the domain of EO-based disaster response, but there are fundamental differences. The Charter is an international, neutral and best effort collaboration for humanitarian aid purposes, while GMES is a European Union programme addressing not only emergency response but also the overall risk management hence wider in scope.

The arrangement with SAFER was used in 2011 for three (3) Charter activations outside Europe: two earthquakes respectively in New Zealand (February 2011) and in Turkey (October 2011) and one flooding event in Algeria (October 2011). The activation in New Zealand was requested by the French Civil Security, activations in Turkey and Algeria were made by the relevant Authorized Users.

A meeting took place on 08 July 2011 between EC (European Commission), UKSA, ESA, CNES and DLR to discuss the current agreement between the European Charter Members and GMES, and to define a way forward. It was agreed in principle that collaboration within the existing SAFER project framework will continue until the project closure in March 2012. Short term and long-term actions which will be implemented during the GMES Initial Operations (GIO) period 2012 to 2013 were identified. On 09 September 2011, the Charter lead (UKSA) sent a draft proposal detailing the arrangement with GMES for the GIO period:

- 1) Continue with the current collaboration whereby GMES provides advanced crisis mapping services in response to Charter requests pertinent to Europe's policy sectors. The GIO emergency service will provide maps to the Charter project manager (PM) and to the Charter Authorized User and end users.
- 2) Allow only the European members of the Charter, who are in dialogue with the relevant GMES party, to request the support available through this collaboration.
- 3) Identify a contact point at the GMES EMS, to be defined by the EC, to receive requests to initiate the agreement. This point of liaison will be the contact point for the Charter PM concerning the delivery of services during the activation.

A formal response from the Commission is awaited.

- Collaboration with Garnet-e.

The GMES and Africa: Regional Network for Information Exchange and Training in Emergencies (Garnet-e) kicked off in May 2010. <http://www.gmes-garnete.net/>

Garnet-e is a two-year European Commission project aimed at constructing ‘needs-driven’ activities with GMES and African initiatives in support of enhanced emergency response capabilities in Africa. Within Garnet-e, DMCii is leading the effort for raising Charter awareness. Garnet-e represents an additional platform for increasing awareness about the Charter in Africa and meeting national disaster management authorities as well as regional entities working in that field.

The second Garnet-e workshop was held in South Africa in March 2011. Several disaster management authorities of Central and Southern Africa attended (Botswana, Democratic Republic of Congo, Lesotho, Malawi, Tanzania, and Zimbabwe). The Charter was presented together with the outcomes of the ‘formal consultation in Africa’ concerning Charter access.

## **2.4 Project Manager Training**

One PM training course organised by USGS was held in Nairobi (Kenya) in April 2011. The course was hosted by RCMRD. 22 staff from regional (RCMRD – for consolidation purpose) and national organizations from Kenya & Namibia were trained, increasing the number of PMs in Africa. The participants were from: Kenya Red Cross Society, Kenya Meteorological Department, Department of Resources Survey and Remote Sensing - DRSRS; Kenya National Highways Authority; National Disaster Operations Center; Ministry of Agriculture, Water and Forestry, National Hydrological Services of Namibia).

### 3 Charter Evolution

The Charter Members, conscious of the importance of developing a long-term plan for the evolution of its product and services, started in 2010 to re-examine the Charter's scope, policies, external partnerships within which it operates, so as to remain an effective resource for emergency response.

Discussions in 2011 were centred on three topics: *the Charter's scope and objectives, organization and structure; Data distribution and common archive.*

A key decision was made in 2011 regarding the Universal Access (UA) resolution and the preparation of the UA implementation framework. The formal implementation of the UA is foreseen to commence in 2012. This will require additional resources from member agencies as well as proper communication and awareness plan. The creation of three subgroups to improve Charter operations and external relationship was agreed, namely: Emergency Operations, Training and External Relations subgroups. Formalization of the terms of reference of Emergency Operations and Training subgroups is foreseen in 2012.

The Charter endorsed the use of GEONETCast system for the expansion and facilitation of data delivery to areas with minimal internet capacity and connectivity. This system will appropriately address the policy of the Charter data providers and maintain the current practice of delivering imagery via the Internet.

There have been on-going high-level discussions among Charter members regarding requirements for a data distribution system to improve satellite data access during activation. Analysis of the functional and service capabilities of different systems is being carried out to gauge whether levels of security and licensing restrictions are appropriate. Of importance, is the ability for Project Managers (PM) and Value-Added Providers (VAP) to have a unique entry system for data access.

In details:

**A. Charter scope and objectives** mainly focused on:

- i. Charter activation criteria: *to decide if the Charter's activation criteria should be expanded to provide more data for upcoming disaster preparedness, scientific research, and future disaster mitigation.*

A formal decision was taken by the Charter to retain the activation criteria as currently is and to remain focused on the tasking of satellites for immediate response. However, regular reports from Charter members' disaster watch programs (e.g. CSA's Disaster Watch, ESA's Earth Watch) will be provided to Charter staff for pre-activation readiness. In the long run, it was anticipated that a stronger coordination amongst the various member agency programs will help streamline acquisition planning, avoid duplication and achieve efficiencies.

- ii. Charter Universal Access (UA): *to agree on a common approach to Universal Access and to identify mechanisms and an implementation plan to be put in place to achieve Charter access worldwide.*

In May 2011, UA resolution was formally adopted by the Board in London and a definition of UA was agreed: *"Any national disaster management authority will be*

*able to submit requests to the Charter for emergency response support. Proper procedures will have to followed, but the affected country will not have to be a Charter member”.*

The Charter has worked to define a framework to implement Universal Access. This document establishes:

- a) the admission process for national entities (non-Charter members countries) to be recognised as new users; and
- b) accessibility requirements for new users. “Essential and Desirable” criteria were defined as prerequisites for assessing the qualifications of an applicant.

To commence the Universal Access implementation, the Charter is developing a communication plan and outreach programme which will be discussed at the Board meeting in Tokyo (April 2012).

**B. Charter organization and structure** - *with a focus on member responsibilities. The main question concerns the Charter member agencies’ participation on a generalized or specialized basis.*

The creation of three additional subgroups was agreed at the Board meeting in London (May 2011). Draft Terms of Reference (ToR) for the subgroups were discussed at the Board Meeting in Montreal (October 2011):

- It was recognised that the operation subgroup should focus mainly on ECO operational functions. Existing members have the choice to opt out of the ECO function while the new members do not have to contribute to this function. A revised draft of the ToR will be prepared for discussion and approval at the Board meeting in Tokyo (April 2012).
- The external relation subgroup is intended to coordinate and manage relations with UN Agencies, GEO, CEOS, international (governmental) partners (e.g. European Union), non-governmental organizations (e.g. WWF) and commercial entities (e.g. Google). The draft ToR was approved and the subgroup was officially set. An action plan would be prepared at the beginning of 2012.
- The training subgroup will draw up and standardise the training material for both the PMs and the new national users (UA implementation). Final decision on ToR of the training subgroup and the participating parties was postponed to April 2012.

**C. Data and product distribution & Common Distribution System**

- *to facilitate/expand delivery to areas with minimal internet capacity and connectivity.*
- *to develop a common or virtual archive and distribution of products among the Charter Members during Charter activation to facilitate access for PMs and VAP’s (Value-Added Providers).*
- The GEONETCast proposal was first presented to the Board in May 2011, in an effort to develop mechanisms to expand and facilitate data delivery to areas with minimal internet capacity and connectivity. The Board endorsed the proposed collaboration in Montreal (October 2011), but stressed that GEONETCast will not replace the current practice of delivering Charter imagery via the Internet. In

addition, the limitations imposed by the policy of the data providers should be addressed. It was also agreed that relevant information from GEONETCast will be included in the promotional (outreach/training) material to inform potential users of the different data delivery options.

- The USGS Hazards Data Distribution System's (HDDS) was presented in Montreal as a possible system for the Charter to use as a distribution platform. HDDS will be further developed to support appropriate levels of security and licensing restrictions. USGS was asked to prepare a formal proposal with information on how the system can be tailored to suit the Charter. In the meantime, the other members will conduct an assessment of the possible integration of their data and licensing restrictions with HDDS.

Other alternatives will also be considered by CNES, particularly the use of a single portal and a database distribution system which would allow each data provider to keep control of its own data thus alleviating licensing issues.

## 4 Operations

### 4.1 Charter activations

In 2011, the Charter was activated 32 times (Figure 4-1), the lowest number of activations in the past five years. The decrease in Charter activations from 2010 to 2011 can be attributed to a smaller number of major disasters worldwide and a stronger role played by regional mechanisms, especially in Asia and Europe. The 2011 activations are listed in Table 4-1.

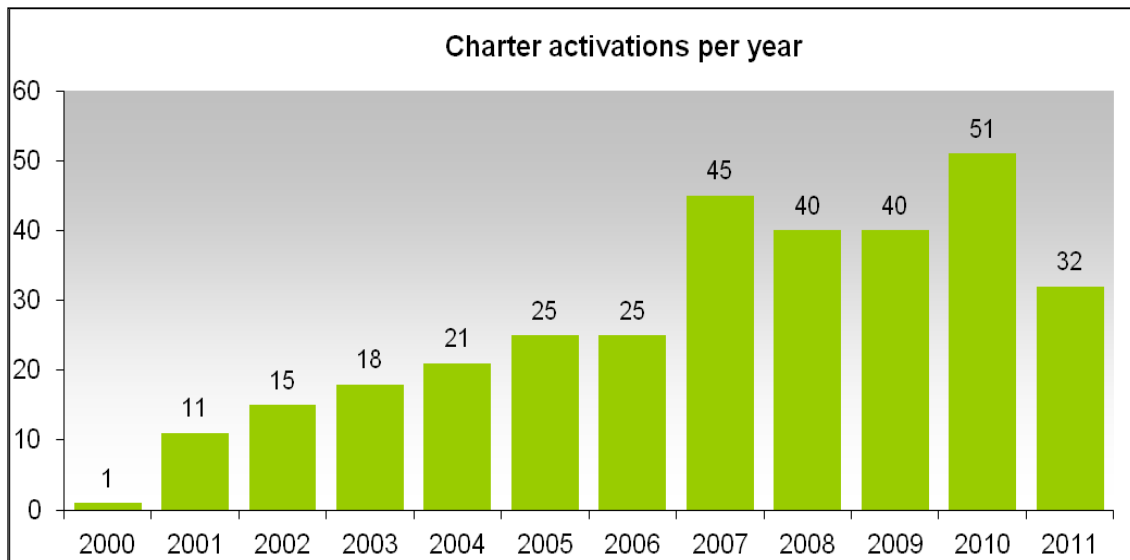


Figure 4-1. Number of Charter activations per year (2000- 2011)

The Call-ID is the unique number assigned by the On-Duty Operator (ODO) to any User Request Form received. The number of the activation ('Activation number') differs from the Call-ID as some Calls are not processed (rejection mechanism) and others are merged. In total, 35 requests were received in 2011.

- Two activations were the result of several calls subsequently merged:
  - o Activation 300: earthquake in New Zealand (2 separate requests from the French Civil Protection-COGIC and USGS to support the Ministry of Civil Defence and Emergency Management – MCDEM).
  - o Activation 307: volcanic eruption in Chile (2 separate requests from SIFEM on behalf of the Chilean Ministry of Interior, Emergency office - ONEMI and UNITAR/UNOSAT on behalf of UNOCHA).

As per the procedure in such cases, results were sent to individual requestors in parallel.

- One call (id: 350) for flooding in Luxemburg was withdrawn by the Authorised User itself.
- One call (id: 383), for search and rescue incident in Ross Sea ice, off the coast of Antarctica, was rejected since it was made by a totally unknown requester and the disaster did not fall within the scope of the Charter.



Activation ID	Hazard type	Country name	Activation Date
293	Flood	Australia	02/01/2011
294	Flood and landslide	Brazil	13/01/2011
295	Earthquake	Pakistan	19/01/2011
296	Flood	Mozambique	29/01/2011
297	Ocean storm (cyclone)	Australia	02/02/2011
298	Snowfalls	South Korea	14/02/2011
299	Slides	Turkey	14/02/2011
300	Earthquake	New Zealand	22/02/2011
301	Earthquake and Tsunami	Japan	11/03/2011
302	Flood	Namibia	01/04/2011
303	Wild Fires	Mexico	12/04/2011
304	Flood	USA	28/04/2011
305	Wild Fires	Canada	15/05/2011
306	Flood	Colombia	21/05/2011
307	Volcano	Chile and Argentina	07/06/2011
308	Flood and landslide	South Korea	27/07/2011
309	Flood and Landslide	Japan	30/07/2011
310	Ocean Storm (Hurricane)	USA	28/08/2011
311	Flood	Nigeria	28/08/2011
312	Ocean storm	Japan	04/09/2011
313	Earthquake and landslide	India	18/09/2011
314	Flood	Algeria	05/10/2011
315	Flood	Cambodia	12/10/2011
316	Oil Spill	New Zealand	12/10/2011
317	Flood	Thailand	17/10/2011
318	Flood	Vietnam	17/10/2011
319	Flood	El Salvador	19/10/2011
320	Earthquake	Turkey	23/10/2011
321	Volcano	Chile	27/10/2011
322	Flood	Ghana	28/10/2011
323	Flood and Landslide	Philippines	16/12/2011
324	Wild Fires	Chile	30/12/2011

Table 4-1. List of 2011 Activations

13 activations were in Asia, 6 in South & Central America, 5 in Africa, 4 in Oceania, 4 in North America (Figure 4-2 & 4-3) with the most frequent hazard type being flooding (53%) and earthquake (16%) (Figure 4-4). In 2011, weather related hazards represent 62% of total calls while solid Earth-related hazards represent 25 %. However, it should be noted that it is not always easy to classify Charter activations by disaster types as there are often combinations of events, such as earthquakes causing tsunamis (Japan), and tropical storms resulting in floods and landslides.

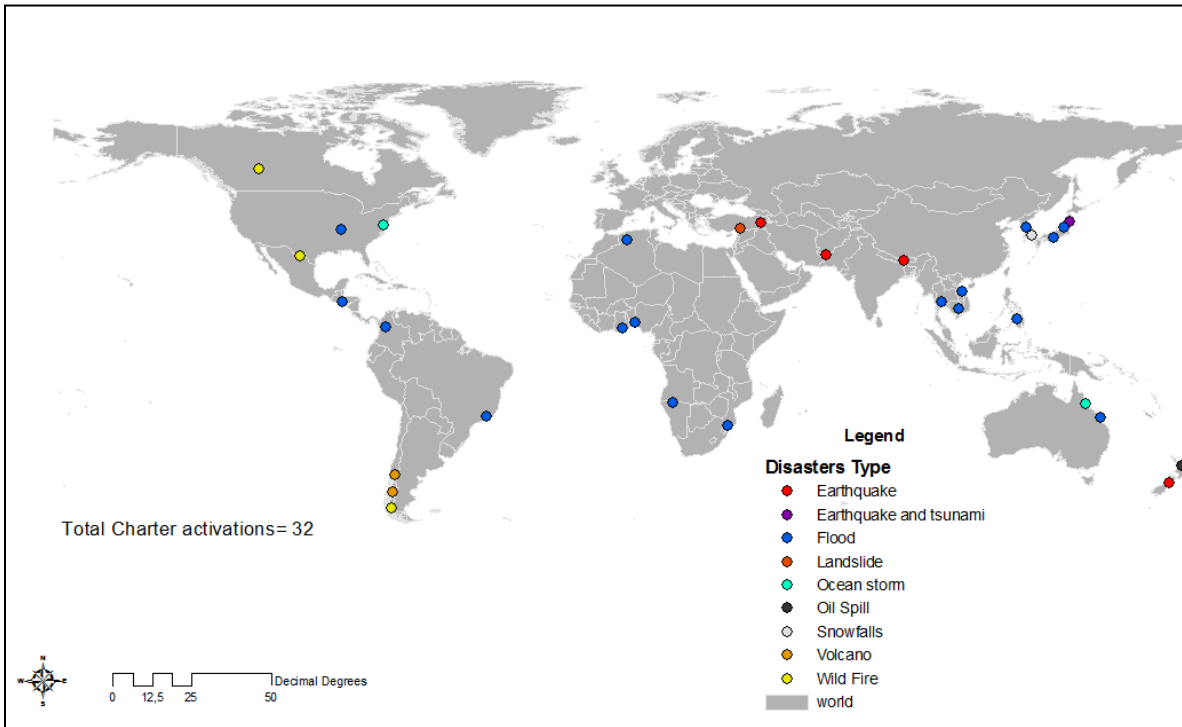


Figure 4-2. Geographic location of the 2011 activations

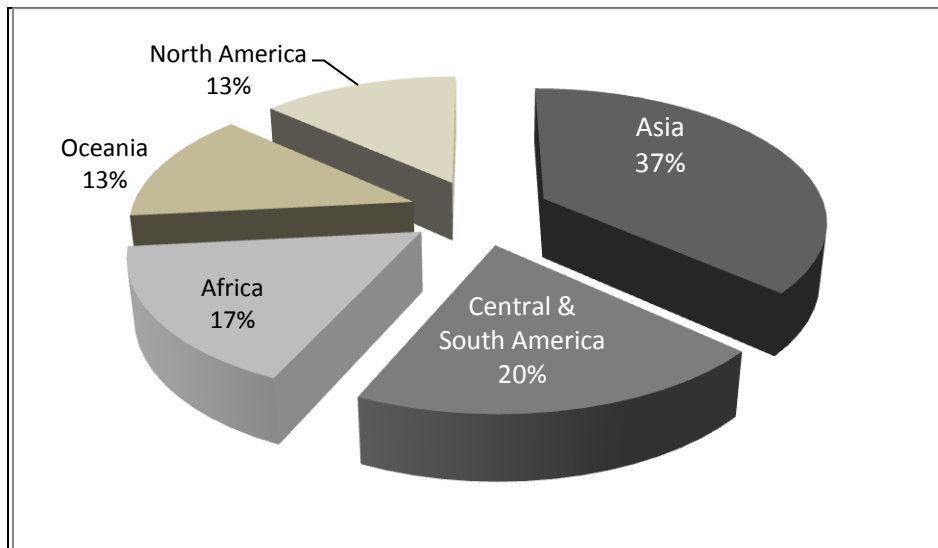


Figure 4-3. Number of activations by geographic area

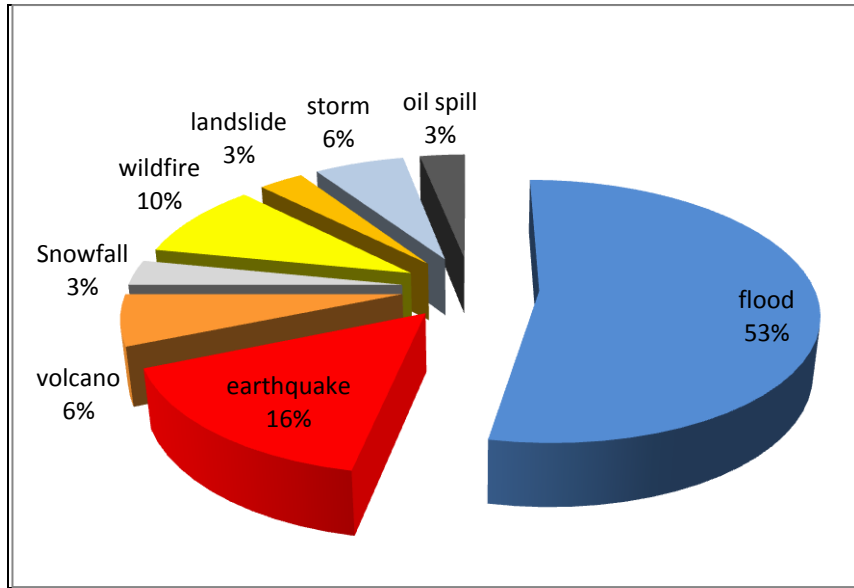


Figure 4-4. Number of activations by hazard type

Figure 4-5 shows the monthly distribution of activations in 2011. The highest number of activations (9) happened in October which corresponded to 28 % of the total. Such remarkable peaks occurred only a couple of times in the history of the Charter, most recently in September 2010 (8 activations in 16 days) and in September 2009 (10 activations). The other months varied from 0 to 4 activations.

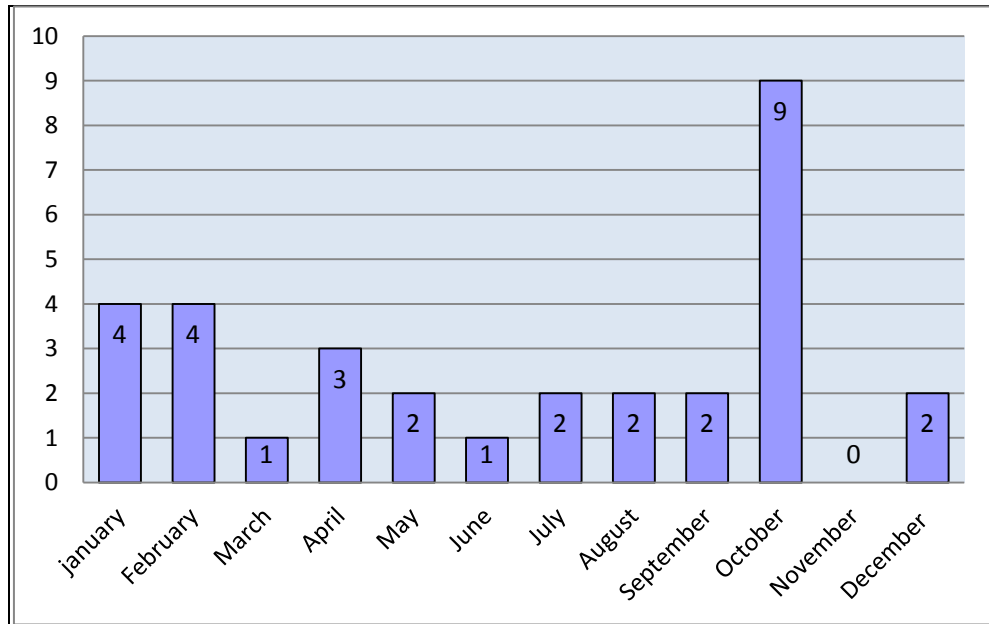


Figure 4-5. Distribution of Charter activations in 2011

The monthly average is 2.7 in 2011, equivalent to 2005 but less than monthly averages of the last four years.

Year	Average # of calls per month
2001	1
2002	1.6
2003	1.6
2004	2.1
2005	2.7
2006	2.3
2007	3.8
2008	3.9
2009	3.9
2010	4.2
2011	2.7

Figure 4-6 shows the geographic distribution of activations by access mode. Since 2010, there are 4 access modes that may be used.

- Mode 1 is direct activation by an Authorized User for his own country.
- Mode 2 is activation by an Authorized User on behalf of another country ('Sponsor AU').
- Mode 3 is activation made by UN OOSA or UNITAR/UNOSAT for UN users.
- In 2010, the Mode 4 was created; it is the activation for national users from the Asia Pacific region via Sentinel Asia's partner, the Asian Disaster Reduction Center.

Mode 1 was used for disasters in Asia, Americas, Africa; mode 2 was used for disasters in North and South America & Oceania. Mode 3 was used mainly for disasters in Africa, Central and South America & Asia. By definition, mode 4 was used in Asia (Figure 4-6). In 2011, activations by AU (mode 1& 2) were the main access mode (66% in total) to the Charter (Figure 4-7) while UN activations decreased with only 22% (mode 3).

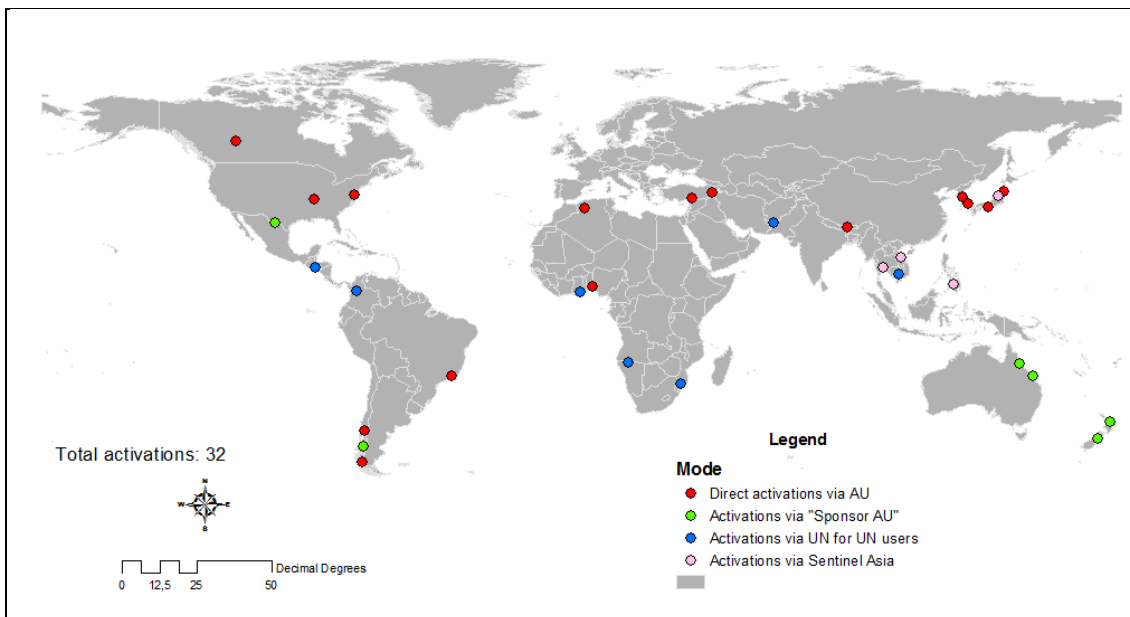


Figure 4-6. 2011 Charter activations per mode

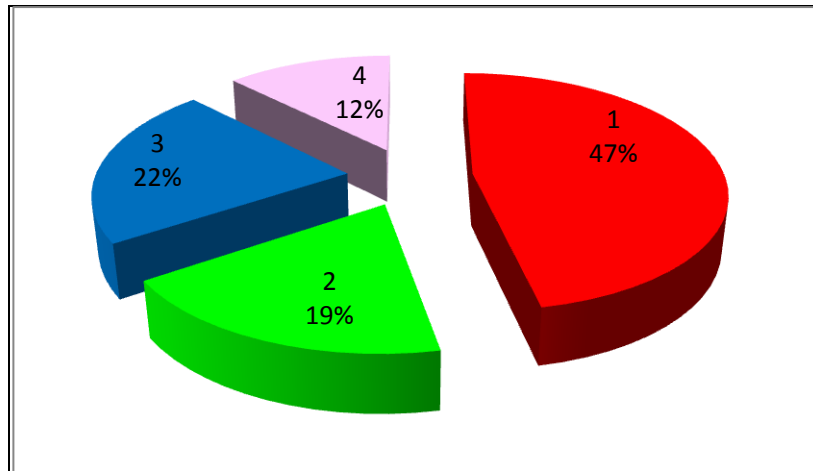


Figure 4-7. Percentage of Charter activations per mode in 2011

## 4.2 Anomaly reports

Four anomaly reports were opened during this period for Calls 367, 368, 383, 384 for which operational procedures were not properly followed:

- Call 367 (Activation 308), Flood and Landslide in South Korea: the ECOs were not included in any of the original emails in which the Project Manager was being nominated.
- Call 368 (Activation 309), Flood in Niigata, Japan: the form submitted by ADRC was incomplete without SA EOR attachment; in addition ODO ticked the AU box rather than "Other" box.
- Call 383 (Activation denied): the call was by un-authorized user and the disaster was a simple search and rescue operation; in addition the Charter data security was compromised since the caller had used the valid URF and had duly filled in the form. It is important that the Executive Secretariat member of each agency (PA) provides specific guidelines to their ECOs on unauthorized calls.
- Call 384 (Activation 324), wild fires in Chile: ECO handover message without copying to ES; AU did not provide Time information in the URF.

The Executive Secretariat analysed all of them and reported to the Board.

## 4.3 FTP site

The FTP site is a facility reserved for Charter members; it is mainly used for daily archiving of reports, procedures and minutes of meetings, and occasionally utilized as a temporary repository for the exchange of raw data amongst space agencies and Project Managers. CSA conducts regular monitoring of the ftp site to ensure that it is used and maintained effectively and appropriately.

#### **4.4 Resource report**

- **EO data consumption in 2011**

There were 1,108 images from Charter constellation satellites and 4,095 images from commercial US satellites (GeoEye, IKONOS, QuickBird, WorldView) and RapidEye satellite. The following total numbers of images/frames were delivered:

- A total of 747 optical data (Figure 4-8, table 4-2).
- A total of 321 radar data including 101 VHR SAR products (TerraSAR-X/TanDEM-X). (Figure 4-9, table 4-3).  
The lowest quantity of optical and radar data compared to 2010 (respectively 1006 and 712 data) could be link to the lowest number of activations.
- A total of 222 HR optical images from RapidEye and 3,873 VHR optical data US commercial satellites. The bulk of the volume of metrics optical data is associated with a limited number of events, in particular, the earthquake and tsunami in Japan (activation 301) for which more than 1,200 images were delivered including RapidEye images, the hurricane Irene in USA (Activation 310), the oil spill in New Zealand (activation 316), and the flood in Thailand (activation 317). (Figure 4.10, table 4-4).

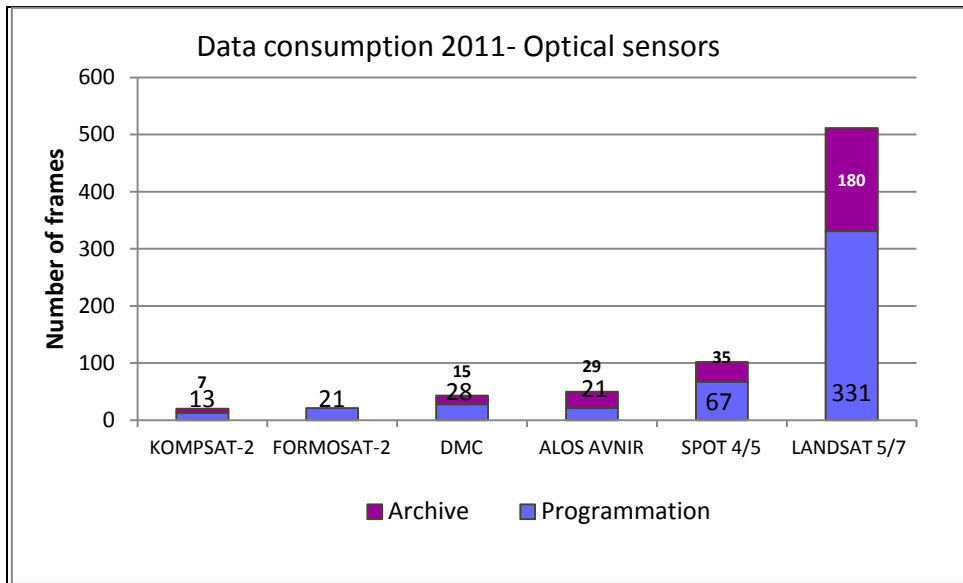


Figure 4-8. 2011 Data Consumption - Optical sensors

Resource	KOMPSAT2	FORMOSAT2	DMC	PRISM/AVNIR2	SPOT	LANDSAT
<b>Total number of Data Products delivered</b>	<b>20</b>	<b>21</b>	<b>43</b>	<b>50</b>	<b>102</b>	<b>511</b>
archive	7		15	29	35	180
New Acquisition	13	21	28	21	67	331
Max # images per Activation	6	9	8	9	26	156
Average # images. per activation	0.6	0.6	1,3	1.6	3.2	16

Table 4-2. Statistics by Optical sensors

A large quantity of Landsat data was provided with a total of 511 mages with 180 archive images and 331 new acquisitions, as of last year (600 images in 2010). In particular, 156 images were provided to follow the large scale flooding in Thailand. SPOT provided a total of 102 images, 26 images were delivered to cover the Japan earthquake and tsunami in March (activation 301).

Landsat images are routinely scheduled in order to cover the originally provided AOI during the whole activation that explain the large number of Landsat data in case of very large AOIs (> 10,000 km<sup>2</sup>) and long activations (> 1month). For instance, a total of 156 Landsat images were recorded for the Charter activation in Thailand which lasted 2 months with an affected area by flood of 100 km size (Figures 4-11 & 4-12). As for the other Charter satellites, data are provided in strict accordance with ECO/PM requests at the beginning of the activation. In case of large disasters (e.g. Japan earthquake & tsunami, Thailand flood) and extension of activation duration, additional data can be also programmed and delivered.

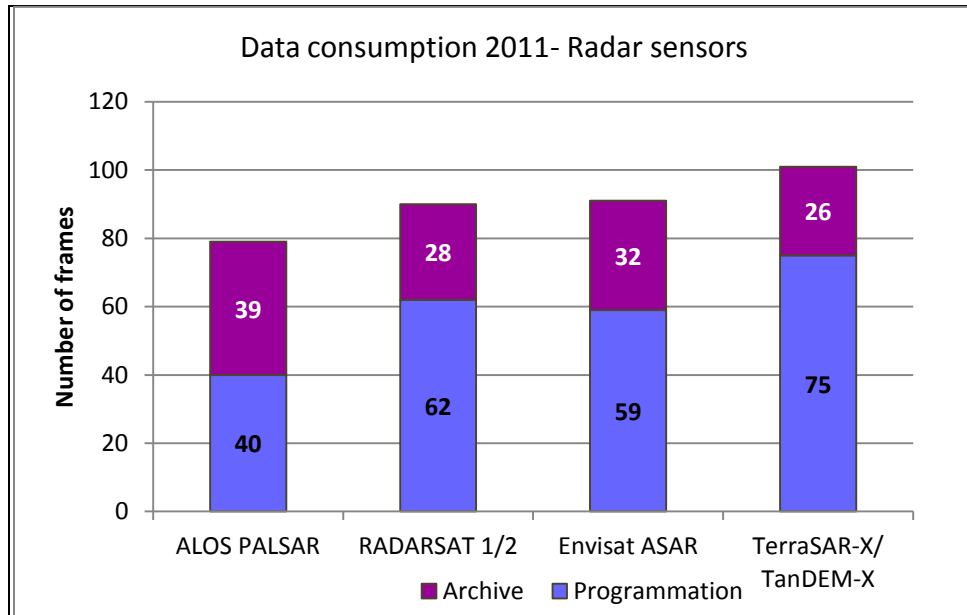


Figure 4-9. 2011 Data Consumption - Radar sensors

Resource	ALOS/ PALSAR	RADARSAT	ENVISAT/ ASAR	TERRASAR-X/ TanDEM-X
<b>Total number of Data delivered</b>	<b>79</b>	<b>90</b>	<b>91</b>	<b>101</b>
Archive	39	28	32	26
New Acquisition	40	62	59	75
Max # per Activation	36	16	20	23
Average # images. per activation	2.5	2.8	2.8	3.1

Table 4-3. Statistics by Radar sensors

The quantity of data by radar sensor is almost equivalent. Quantity of TerraSAR/Tandem-X data provided in 2011 is superior than 2010 while number of ALOS Palsar data is slightly inferior, due to “DAICHI” (ALOS) operation completion in May 2011.



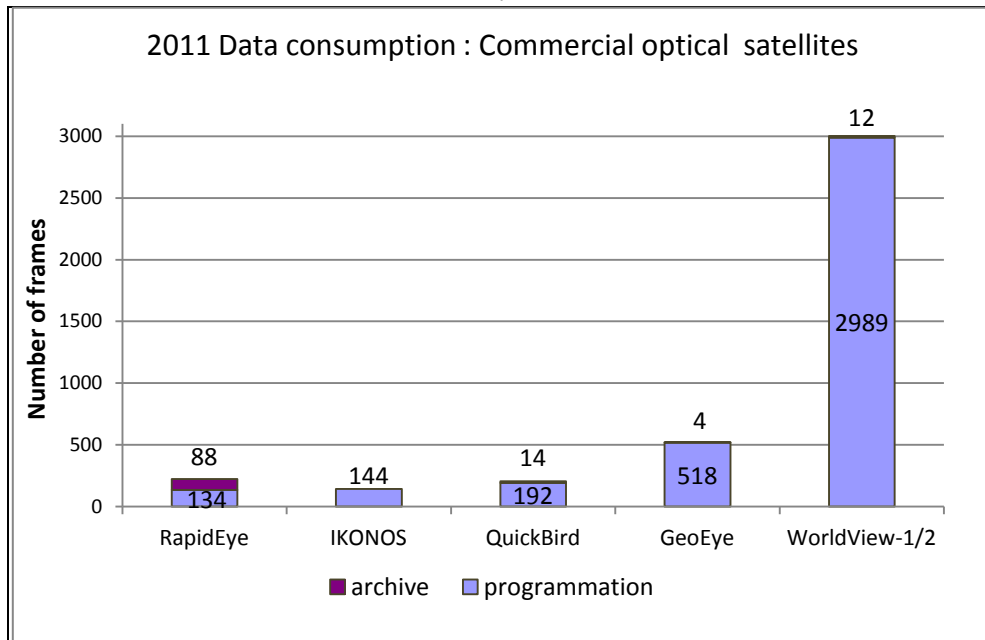


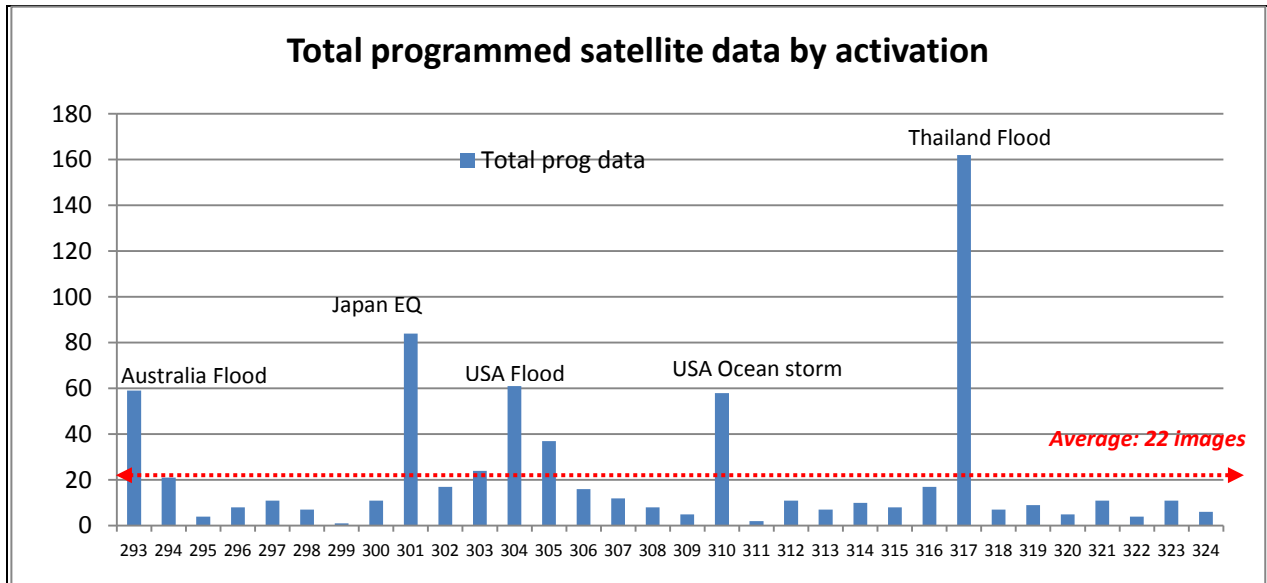
Figure 4-10. 2011 Data Consumption – Commercial optical satellites

Resource	WORLDVIEW	GEOEYE	QUICKBIRD	IKONOS	RAPIDEYE
<b>Total number of Data Products delivered</b>	<b>3001</b>	<b>522</b>	<b>206</b>	<b>144</b>	<b>222</b>
Archive	12	4	14	0	88
Programmation	2989	518	192	144	134
Max images per Activation	854	117	95	50	222
Average images per activation	136	24	9	7	-

Table 4-4. Statistics concerning commercial optical satellites

Maximum of data was provided for the earthquake and tsunami in Japan (activation 301) with 854 WorldView, 95 QuickBird and 222 RapidEye data, and for the Hurricane Irene (activation 310) in USA with 50 Ikonos and 117 GeoEye data. US satellite data was provided for 22 activations out of 32. RapidEye data was delivered only for Japan activation.

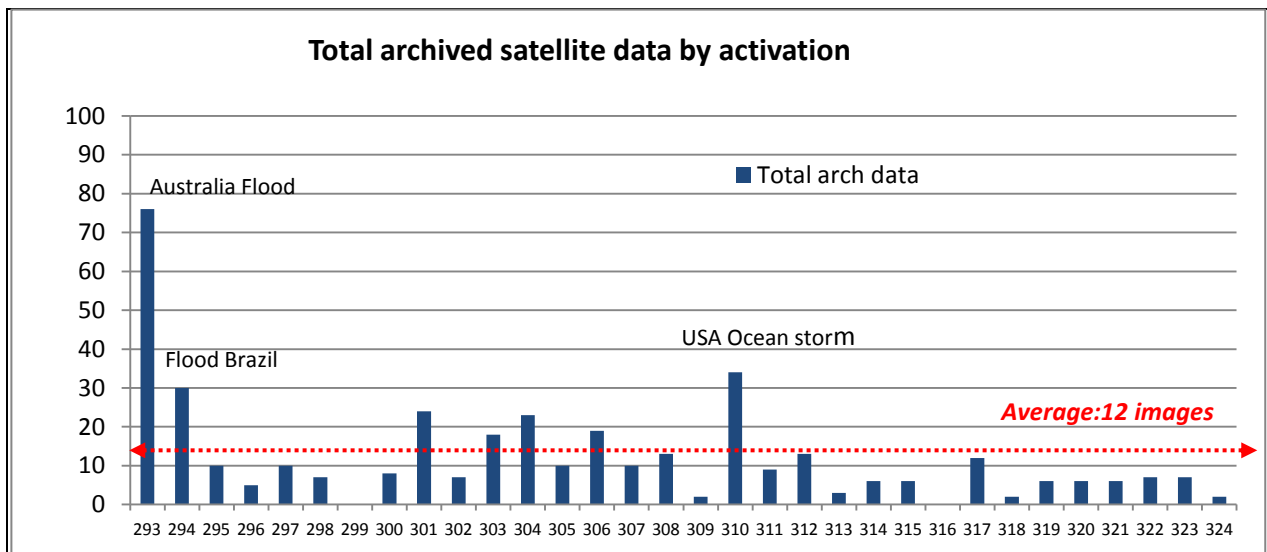
Figures 4-11 to 4.13 show the distribution of number of images by activation.



**Figure 4-11. Number of programmed images provided by activation (all Charter EO sensors)**

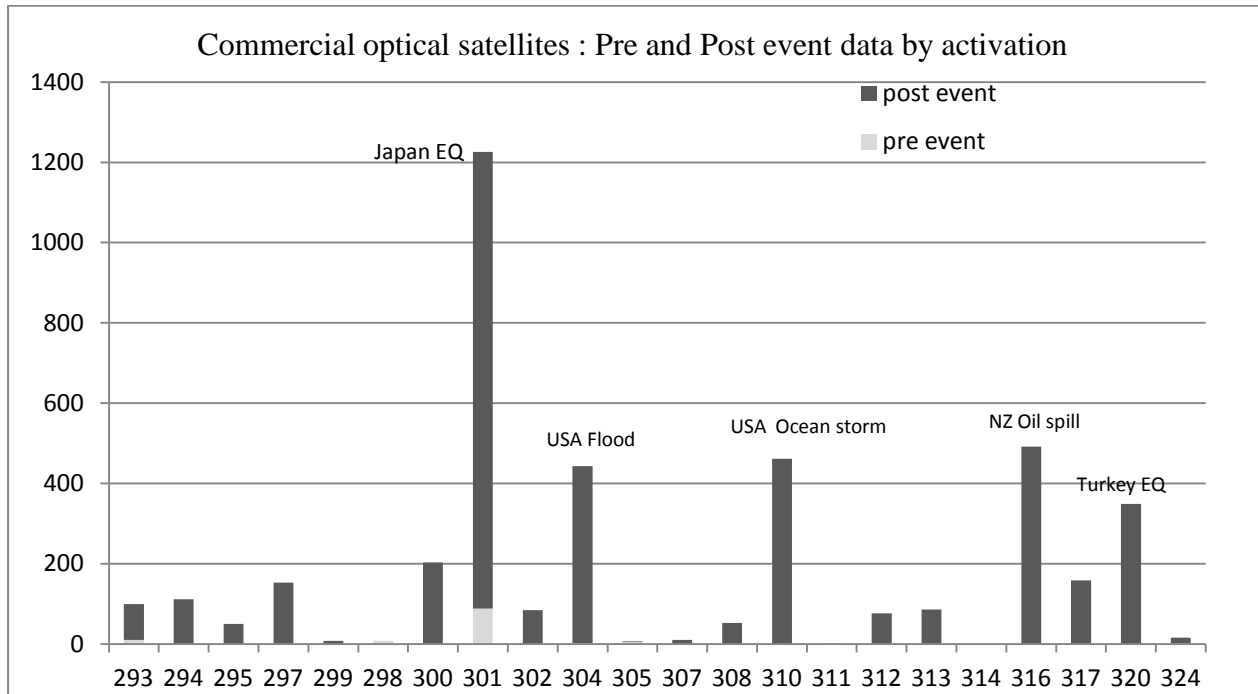
The five activations with the highest number of programmed data (Charter optical & radar sensors) are : Act 317 flood in Thailand, 162 images; Act 301, Japan Earthquake, 84 images; Act 304, flood in USA, 61 images; Act 293, flood in Australia, 59 images, Act 310, USA storm, 58 images.

Landsat images were the primary data delivered for the floods in Thailand and in Australia, the USA storm and flood while SPOT and TerraSAR-X/TanDEM-X data were the primary ones provided for the Japan earthquake and tsunami.



**Figure 4-12. Number of archived images provided by activation (all Charter EO sensors).**

Number of archived data is on average inferior than programmed ones. The four activations with the highest number of archived data are: Act. 293, Flood in Australia, 76 images; Act 294, Flood in Brazil, 30 images; Act 310 USA storm, 34 images. Landsat images were the primary data for these three activations.



**Figure 4-13. Number of images provided by activation (optical commercial satellites).**

The five activations with the highest number of data provided are: Act 301 Japan earthquake and Tsunami; Act 304 USA flood; Act 310 USA Ocean Storm; Act 316, oil spill in New Zealand; and Act 320 Earthquake in Turkey. 22 activations of 32 have benefited of these additional inputs.

The largest amount of data for a single disaster in 2011 was provided for the Japan earthquake and tsunami (activation 301) in March: 108 images from the Charter constellation and 1200 images from US and German commercial satellites. The 9.0-magnitude earthquake - recorded as the Great East Japan Earthquake - was the strongest ever to strike Japan and the fourth largest on record in the world. The earthquake and the subsequent tsunami caused massive destruction along the Tohoku-Kanto Pacific coast. A total of 15,783 people were killed, 4,086 were left missing and 5,932 were injured. The Charter was activated a few hours (11 March) after the earthquake and the activation was closed 4.5 months later (23 August), exceeding the activation duration for the oil spill in the Gulf of Mexico in 2010. A high number of crisis mapping and damage assessment were delivered by the Charter partners providing support for several decision makers in Japan (Cabinet Office, Chief Cabinet, Ministry of Land, Infrastructure, Transport and Tourism; Ministry of Agriculture, Forestry and Fisheries; Ministry of Education, Culture, Sports, Science and Technology; and Miyagi Prefecture).

The US Ocean storm (activation 310) and the flood in Thailand (activation 317) also represented substantial contributions from the Charter.

The data resource analysis for 2011 shows the capacity of the Charter and the power of joining forces to adequately support national authorities involved in disaster response. Overall the large number of data from sensors outside of Charter Parties demonstrates the commitment and support for the Charter from other space agencies and private sector.

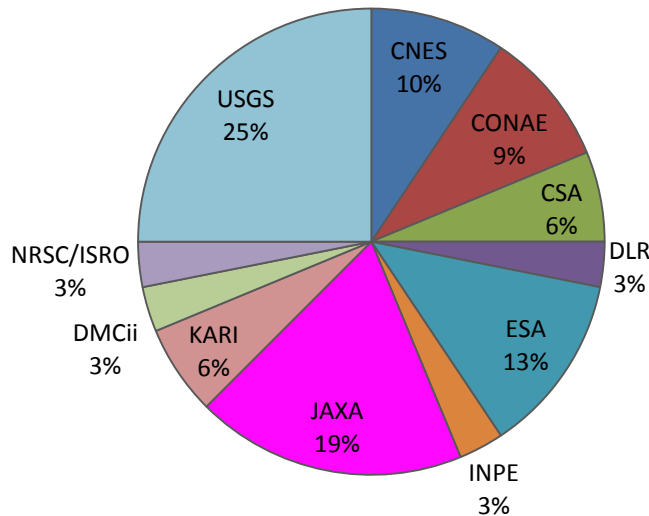
▪ **Human resource contribution (ECO and PM) in 2011**

- *ECO resources in 2011:*

The ECO services were provided on a weekly basis by CONAE, CNES, CNSA, CSA, DMCii, DLR, ESA, ISRO, JAXA, and USGS on an equal footing. The random nature of calls resulted in a rather skewed workload for the members, with DMCii handling nearly one fifth of the calls. There were 7 calls processed by DMCii, 5 calls for CONAE, 4 calls for USGS, CNSA and CSA, 3 calls each for CNES and JAXA, 1 call for DLR, ESA and ISRO. Some ECOs had to handle 2-3 calls during their week on duty, particularly in October.

- *Distribution of Charter members responsible for the PM services delivered in 2011:*

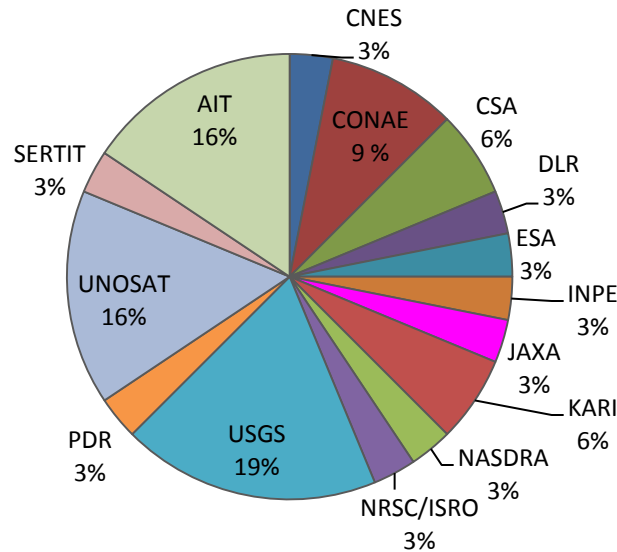
USGS, JAXA, ESA, CNES, CONAE, CSA, and KARI nominated Project Managers for respectively 25%, 19%, 13%, 10%, 9%, 6%, 6%. DLR, DMCii, INPE, and ISRO nominated PM for 3% of activations each (Figure 4-14).



**Figure 4-14. Distribution of Charter Parties responsible for the PM services in 2011**

- Distribution of organizations providing PM resources in 2011:

The PM may come from a Charter Party or a Third Party. Figure (4-15) shows the breakdown of the Project Managers' organizations involved in the processing and interpretation of the satellite imagery.



**Figure 4-15. Distribution of organizations providing PM resources in 2011**

The difference between figure 4-14 & 4-15 is explained in the following.

Difference between figures 4-14 & 4-15: Any organization – Charter member or Third Party - can perform the PM service. In the case of third Party organizations it is required that a Charter member designates them and takes the responsibility of the service they provide. Figure 4-14 represents the breakdown of Charter members who designated PMs in 2011 while Figure 4-15 represents the breakdown of organizations performing the PM work for 2011 activations.

#### Detailed comments:

- USGS provided 25% of the total Project Manager Services from USGS (19%) and PMs from other organizations such as the Pacific Disaster Center (PDC) and UNITAR/UNOSAT (1 event).
- JAXA provided 19% of the total Project Manager services with 1 PM provided internally (3% of activations) and the rest provided by AIT (5 events, 16%), in particular for ADRC/SA requests (4).
- ESA provided 13% of the total Project Manager services with one Project Manager provided internally (3% of activations) and the rest provided by UNITAR/UNOSAT (for 3 events).
- CNES provided 10% of the total Project Manager services with 1 PM from CNES, 1 PM from SERTIT and 1 PM from UNITAR/UNOSAT.

Note that UNITAR/UNOSAT is an external organization engaged as PM by member agencies (CNES, USGS and ESA), in particular the UN activations. UNOSAT contributed to 16% of the totality of activations over 2011.

- CONAE provided internally 3 Project Managers to work on 9% of the activations.
- CSA nominated 2 Project Managers to work on 6% of activations for events in Canada and in Africa.
- KARI nominated 2 Project Managers to work on 6% of activations for events in South Korea.
- Activations (total 9%) by DLR, INPE, and ISRO were managed with internal resources.
- DMCii worked with a Nigerian PM (NASRDA) for the activation in Nigeria.

#### **4.5 SARE – Semi Annual Refresher Exercises**

Following the Charter procedures two Semi Annual Refresher Exercises were performed in 2011:

- SARE-07: flash flood and landslide in India (Doda, Jammu) (from 14<sup>th</sup> to 21<sup>st</sup> June 2011). This exercise was driven by CONAE and ISRO as Training Team (TT). 26 ECOs participated from 8 Charter members: CNES, CNSA/CRESDA, CONAE, CSA, DLR, JAXA, INPE, and ISRO.
- SARE-08: oil spill in Canada (from 28<sup>th</sup> November to 12<sup>th</sup> December 2011). This exercise was driven by ISRO and CSA as Training Team (TT). 40 ECOs participated from 12 Charter members: CNES, CNSA/CRESDA, CONAE, CSA, DLR, DMCii, ESA, JAXA, INPE, ISRO, KARI, and USGS.

A set of common recommendations were issued to improve ECO operations and Charter data management:

- update of the ECO procedures and scenarios;
- update of SAVOIR tool with the latest Charter missions and relevant sensors;
- modification of the Generic ERF to faster the process;
- set up of a single common system to collect AOI and to manage the various Charter data;
- creation of web-based URF and ERF.

All participants recognised that SARE is a good exercise for improving and upholding the knowledge of ECOs. The need of regular participation of ECO staff from the agencies providing ECO service to maintain effectiveness was highlighted. In addition, it was also remarked that organization and management of SARE would be easier if only one rather than two agencies leads the training team (TT).

Updating of ECO procedures is foreseen within 2012. Two SARE are planned in May and October 2012.

#### **4.6 Metadata Catalogue**

The Charter metadata catalogue (renamed “Charter Geographic tool”) is now accessible from the Charter website. Around 400 metadata were collated from most of Charter satellites, in particular from new members: DLR (110 TerraSAR-X/ TanDEM-X) and KARI (KOMPSAT). INPE

successfully developed the interface of CBERS metadata and the catalogue. At the end of 2011, the catalogue contained approximately 3,500 metadata records. In addition, CNES has developed an easy-to-use interface to improve metadata searching capabilities.

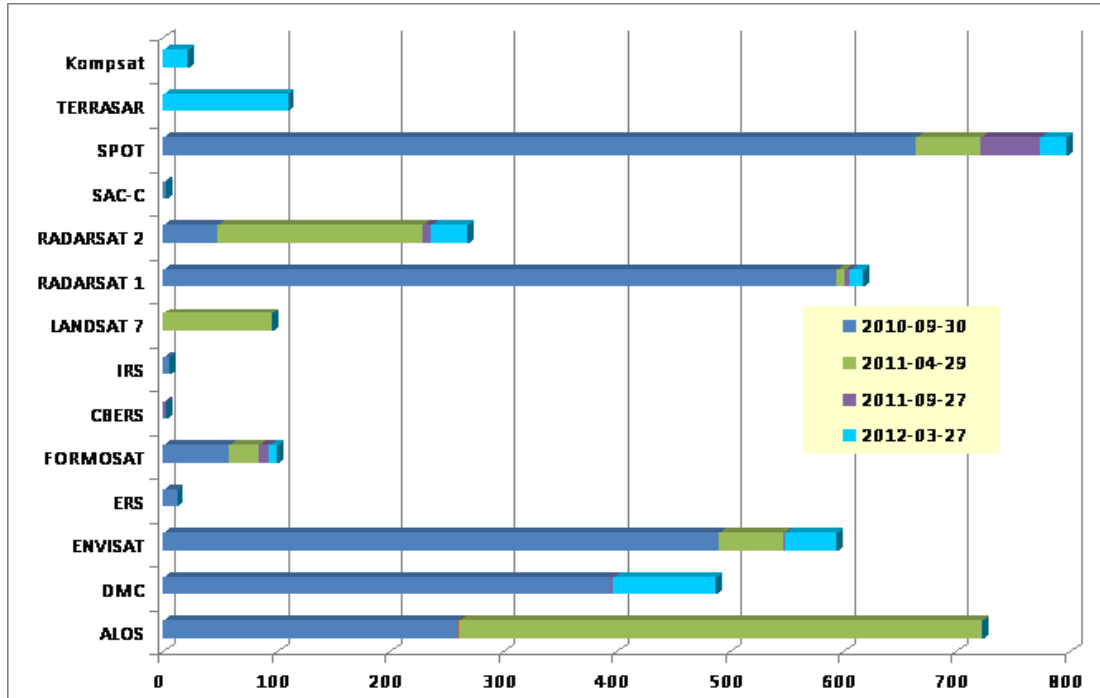


Figure 4-16. Number of stored metadata records by satellite (March 2012)

#### 4.7 On-line URF

CNES developed the on-line URF tool which will allow:

- input of AOI coordinates and centre points of affected areas using webmap facilities or digitization;
- automatic acquisition of date and time;
- selection of disaster typology;
- saving of URF in pdf format and creation of a KML file;
- archiving of URF in a database.

The tool was successfully tested by Charter members. Availability of on-line URF is foreseen in 2012 after further customization and integration with other ESA tools.

**International Charter Space and Major Disasters**  
User Request Form

**User Request Forms** << **User Request Form (Affected area information)**

Submit Cancel Export PDF Export KML Export PDF+KML

**1. Date and time of the call**

Date: 04/10/2011 Time: 16:20:22  
Local Time Zone: UTC Time: 14:20:22

**2. Name of the organisation and caller (to be used for callback)**

Description: French Civil Protection - COGIC  
Phone: +33561273131 Ext.: +33561273131  
Fax: +33561273131 Ext.: +33561273131  
Cellular phone: +33561273131  
E-mail: catherine.proy@cnes.fr

**3. Type of disaster**

Type:  earthquake  ice  ocean wave (tsunami)  
 fire  landslide  oil spill  
 flood  ocean storm  volcano

Terminé Internet | Mode protégé : activé 100%

Figure 4-17. Example of On-line URF page (general information about the disaster)



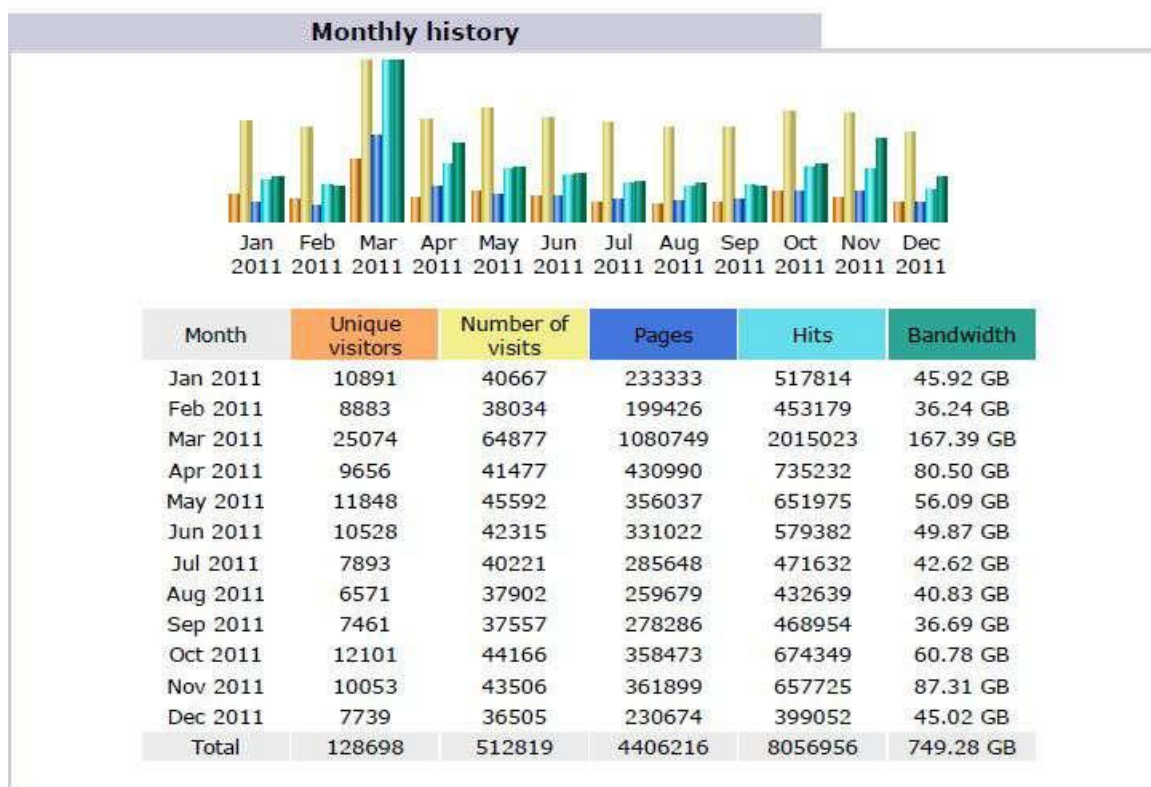
## 5 Communication

### 5.1 Web site

The website is part of the standard communication activities and currently available in five languages (English, Chinese, French, Japanese and Spanish).

Summary					
Reported period	Year 2011				
First visit	01 Jan 2011 - 00:00				
Last visit	31 Dec 2011 - 23:59				
	Unique visitors	Number of visits	Pages	Hits	Bandwidth
Viewed traffic *	<= 128698 Exact value not available in 'Year' view	512819 (3.98 visits/visitor)	4406216 (8.59 Pages/Visit)	8056956 (15.71 Hits/Visit)	749.28 GB (1532.07 KB/Visit)
Not viewed traffic *			2358862	2883421	129.20 GB

\* Not viewed traffic includes traffic generated by robots, worms, or replies with special HTTP status codes.



**Table 5-1. Charter web monthly usage January – December 2011**

The 6 columns respectively represent: month, number of different visitors, and number of visits, number of pages and hits, and bandwidth.

From 1 January to 31 December 2011, the total number of visits was 502,819 (equivalent to 128,700 different visitors). The maximum of monthly activity was registered in March with around 25,000 visits. March was marked by the earthquake and tsunami in Japan. The 2011 total visits increased in comparison with the 2010 and 2009 ones (around 300,000- 350,000).

## 5.2 Charter Newsletter

The first Charter newsletter was issued in November 2011. It represents an additional communication means for regularly informing the users and stakeholders about the Charter's performance, main decisions, members and their satellites.

The newsletter is produced on a quarterly basis; the second issue is planned for release in March 2012. Dissemination of the newsletter is through the Charter website or by e-mail. Each agency deals with its own distribution list.

## 5.3 Conferences and presentations

The following table provides a list of 2011 events or conferences where the Charter was presented.

Event	Venue	Date	Speakers
<b>Sentinel Asia System operation Training (SASOT)</b>	Kathmandu, Nepal	24 Feb. 24 – 4 Mar.	JAXA
<b>Formal national user consultation meeting in Africa</b>	Kinshasa, DRC	15 February	ESA/ARGANS
<b>Garnet-e workshop</b>	Pretoria, South Africa	29 March	DMCii
<b>Formal national user consultation meeting in Africa</b>	Dar-es-Salaam, Tanzania	19 April	ESA/ARGANS
<b>Formal national user consultation meeting in Africa</b>	Nairobi, Kenya	20 April	USGS ESA/ARGANS
<b>Formal national user consultation meeting in Africa</b>	Antananarivo, Madagascar	22 June	ESA/ARGANS
<b>Sentinel Asia Joint Project Team Meeting (JPTM)</b>	Putrajaya, Malaysia	12-14 July	JAXA, USGS
<b>International Astronautical Congress (IAC)</b>	Cape Town, South Africa	October	ESA
<b>UNITAR-WMO Symposium on “satellite solutions for global challenges”</b>	Geneva, Switzerland	12 October 2011	DMCii, ESA
<b>The 18th Asia-Pacific Regional Space Agency Forum (APRSAF)</b>	Singapore	6-9 December	JAXA
<b>1st General Meeting &amp; Special Conference of the IAF Asia-Pacific Regional Group</b>		13 December	KARI

**Table 5-2. List of conferences/workshops with Charter presence.**

In addition, International Charter was presented by ESA at:

- Bourget Air and Space show, 24-26 June 2011
- GEO Plenary exhibit in Turkey, 16-17 November 2011

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

## 5.4 Press releases, articles

Table 5-3 summarises the main press releases, web and paper articles issued by the member agencies or others during this period.

Date	Issuing agency	Title
7 March	CNES	Satellites come to New Zealand's aid. <a href="http://www.cnes.fr/web/CNES-en/9153-gp-satellites-come-to-new-zealand-s-aid.php">http://www.cnes.fr/web/CNES-en/9153-gp-satellites-come-to-new-zealand-s-aid.php</a>
12 March	DLR	DLR releases satellite images of Japanese disaster area <a href="http://www.dlr.de/dlr/en/desktopdefault.aspx/tabid-10460/685_read-759/year-all/">http://www.dlr.de/dlr/en/desktopdefault.aspx/tabid-10460/685_read-759/year-all/</a>
15 March	KARI	Footage of Japanese epicentres of earthquakes and tsunami captured by Arirang 2 <a href="http://www.kari.re.kr/eng/Abbs/bbs_index.asp?ptype=view&amp;code=Press_Release&amp;idx=10722&amp;page=1&amp;catcode=1210000000&amp;depthno=3">http://www.kari.re.kr/eng/Abbs/bbs_index.asp?ptype=view&amp;code=Press_Release&amp;idx=10722&amp;page=1&amp;catcode=1210000000&amp;depthno=3</a>
16 March	ESA	Mapping Japan's changed landscape from space <a href="http://www.esa.int/esaEO/SEMY4M0U5LG_index_0.html">http://www.esa.int/esaEO/SEMY4M0U5LG_index_0.html</a>
March	DLR	International Charter Space and Major Disasters – on the way to operational full membership <a href="http://www.dlr.de/eoc/en/desktopdefault.aspx/tabid-7218/12014_read-29450/">http://www.dlr.de/eoc/en/desktopdefault.aspx/tabid-7218/12014_read-29450/</a>
March	JAXA	Images of Great East Japan Earthquake No.1 ; <a href="http://www.eorc.jaxa.jp/ALOS/img_up/jdis_pal_tohokueq_110313.htm">http://www.eorc.jaxa.jp/ALOS/img_up/jdis_pal_tohokueq_110313.htm</a> Images of Great East Japan Earthquake No.2 <a href="http://www.eorc.jaxa.jp/ALOS/img_up/jdis_terrasarx_tohokueq_110313.htm">http://www.eorc.jaxa.jp/ALOS/img_up/jdis_terrasarx_tohokueq_110313.htm</a>
April	JAXA	2011 Report to the Space Activity Commission(SAC)"JAXA's reaction concerning Great East Japan Earthquake <a href="http://www.jaxa.jp/press/2011/04/20110406_sac_earthquakes.pdf">http://www.jaxa.jp/press/2011/04/20110406_sac_earthquakes.pdf</a>
11 May	DMCii	UK takes the helm of international effort to provide satellite images in times of crisis <a href="http://www.technologynewsroom.com/press_releases/company_releases.aspx?story=1802">http://www.technologynewsroom.com/press_releases/company_releases.aspx?story=1802</a>
15 July	ESA	Korean satellite to aid disaster efforts <a href="http://www.esa.int/esaEO/SEMWVZ9TVP index_0.html">http://www.esa.int/esaEO/SEMWVZ9TVP index_0.html</a>
7 August	KARI	KARI hosted the signing ceremony of the International Charter <a href="http://www.kari.re.kr/eng/bbs/bbs_index.asp?ptype=view&amp;code=Press_Release&amp;idx=10723&amp;page=1&amp;catcode=1210000000&amp;depthno=3">http://www.kari.re.kr/eng/bbs/bbs_index.asp?ptype=view&amp;code=Press_Release&amp;idx=10723&amp;page=1&amp;catcode=1210000000&amp;depthno=3</a>
23 September	CSA	Monitoring disasters with a constellation of satellites – Type examples from the international charter 'space and major disasters', Ahmed Mahmood, <i>Geocarto International</i> . <a href="http://dx.doi.org/10.1080/10106049.2011.622051">http://dx.doi.org/10.1080/10106049.2011.622051</a>
October	JAXA	10 Images of Flood in Thailand <a href="http://www.eorc.jaxa.jp/imgdata/topics/2011/tp111025.html">http://www.eorc.jaxa.jp/imgdata/topics/2011/tp111025.html</a>
8 November	INPE	INPE signs agreement for space data exchange in major disasters <a href="http://www.inpe.br/ingles/news/news_res.php">http://www.inpe.br/ingles/news/news_res.php</a>
10 November	ESA	Brazil joins the International Charter 'Space and Major Disasters' <a href="http://www.esa.int/esaEO/SEMFYDTWLUG_index_0.html">http://www.esa.int/esaEO/SEMFYDTWLUG_index_0.html</a>

Table 5-3. Press releases and publications

## 6 Assessment

This section provides a synopsis of the lessons learned and recommendations to consider for improving Charter operations.

Statistics on 2011 activations were combined with EM-DAT data to evaluate the overall impact of the Charter as a service that supports disaster response. EM-DAT data was downloaded from the EM-DAT website (EM-DAT-CRED: the International Disaster Database - Centre for Research on the Epidemiology of Disasters [RD1]).

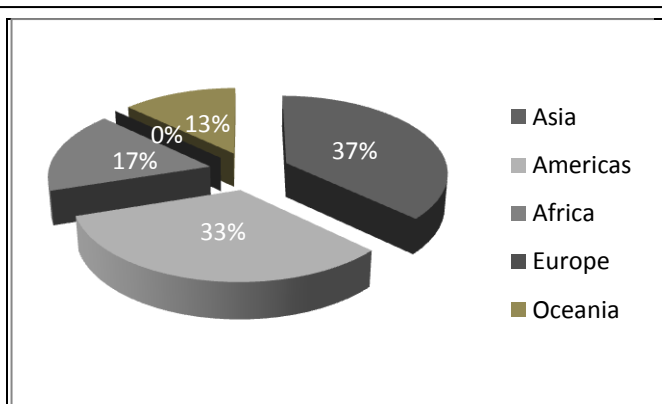
The reports issued by the Project Managers (PM) remain one of the main sources of information for assessing the performance and quality of service provided by the Charter during 2011.

### 6.1 Overall impact

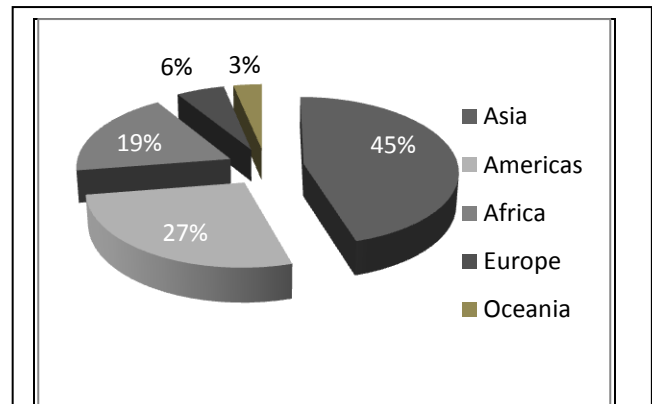
- **Comparison with EM -DAT**

In 2011, the Centre for Research on the Epidemiology of Disasters (CRED) reported 332 natural mass disasters (including droughts, extreme temperature, earthquakes and tsunamis, floods, landslides, storms, volcanic eruptions and, wildfires) less than the average annual disaster frequency observed from 2001 to 2010 (384). Over 29,780 people (296,800 in 2010) were killed and nearly 206 million (208 million in 2010) were affected. Disasters caused record economic damages of US\$366 billion (nearly US\$110 billion in 2010), including cost of US\$210 billion for the earthquake and tsunami in Japan. The economic losses were the largest registered, due mainly to the economic impact of the earthquake and subsequent tsunami in Japan. Asia was hit by 137 disasters, representing a global share of 45% (mainly in Philippines and China). On the other hand, Europe experienced very few disasters and impacts in 2011 (*CRED CRUNCH, Issue N° 27, February 2012 [RD1], Guha-Sapir D, Vos F, Below R, with Ponserre S. Annual Disaster Statistical Review 2011: The Numbers and Trends. Brussels: CRED; 2012*).

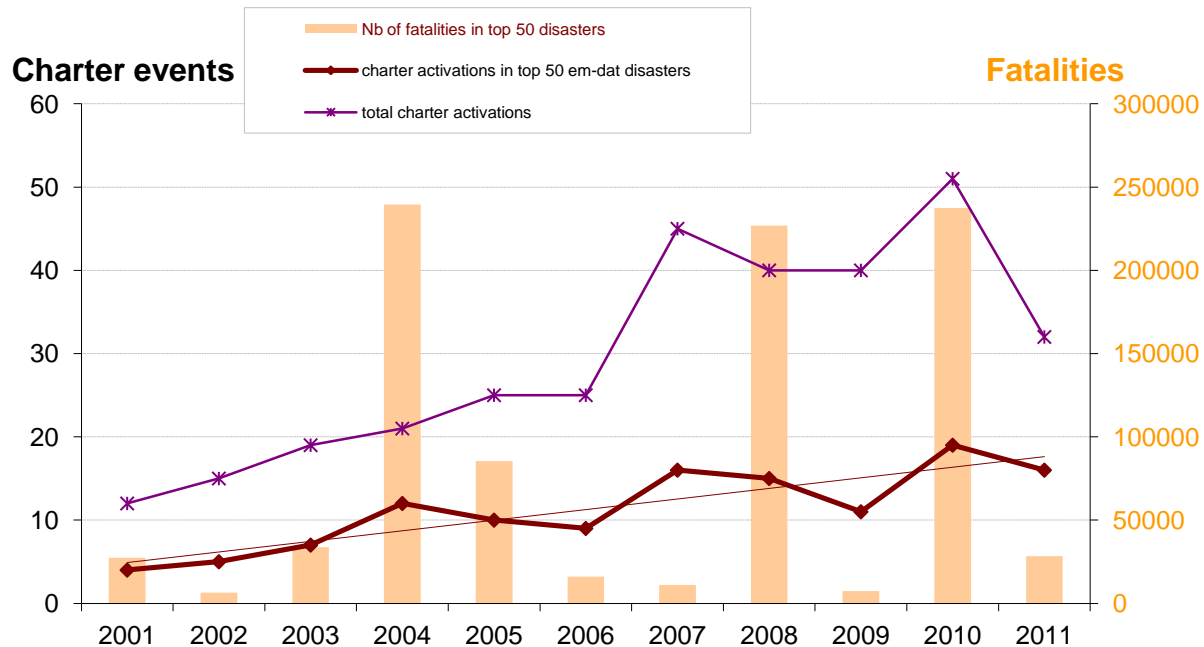
The Charter represents around 10% (13% in 2010) of the total number of natural disasters registered by EM-DAT. For comparison, generally accepted figures concerning the occurrence of natural hazards (not only major disasters) are around 800-1000 per year: the Munich Re NatCatSERVICE reported 820 events in 2011 (970 events in 2010) [*RD3*].(2012 *Münchener Rückversicherungs-Gesellschaft, Geo Risks Research, NatCatSERVICE*).



**Figure 6-1. 2011 distribution of Charter activations by continent.**



**Figure 6-2. 2011 distribution of natural disasters by continent as recorded by EM-DAT.**



**Figure 6-3. Number of Charter events over 2001-2011**

In red the portion of Charter events part of the 50 most severe disasters recorded in EM-DAT each year. The total number of fatalities counted for the 50 main disasters was much lower in 2011 (28,000) compared to 2004, 2008 and 2010 but comparable to 2003 and 2006 numbers. Most of fatalities in 2011 were due to the impact of a single event in March 2011: the Great East Japan Earthquake (20,000 fatalities). EM DAT remarks that major disasters in 2011 in terms of human impact and economic losses occurred in high and middle-income countries.

It is to be noted that number of fatalities alone do not represent the only measure of the severity of an event; there are other criteria used by the Charter: for instance, the service can be triggered for emergencies where there is a significant destruction of property, major environmental impact or threat to human life, for example;

- Wild fire in Alberta, Canada, in May 2011 with very few fatalities but where 7 thousand persons were affected and damage of US\$1.5 billion was registered.
- Eruption of Puyehue volcano in July 2011, at the border of Chile-Argentina, which affected agriculture production and air navigation (ash clouds). In addition, volcanic mudflows and mudslides blocked roads.
- For the first time, the Charter was activated for a snow hazard in South Korea in February 2011. The Charter products were used by the national disaster management entity (NIDP) to assess damage provoked by snow and prepare the recovery plan.

Top 10 Disasters – Number Killed – 2011				
<i>The Text in Italic Indicates Charter Response</i>				
Date	Country	Type	# Killed	#Affected people
<i>11/03/2011</i>	<i>Japan</i>	<i>Earthquake and tsunami</i>	<i>19,848</i>	<i>368,820</i>
<i>15/12/2011</i>	<i>Philippines</i>	<i>Tropical cyclone</i>	<i>1,439</i>	<i>1,150,300</i>
<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>23/10/2011</i>	<i>Turkey</i>	<i>Earthquake</i>	<i>604</i>	<i>32,938</i>
08/2011	Pakistan	General flood	509	5,400,755
01/06/2011	China P Rep	General flood	467	67,900,000
<i>22/04/2011</i>	<i>United States</i>	<i>Local storm</i>	<i>354</i>	<i>17,200</i>
<i>08/2011</i>	<i>Cambodia</i>	<i>General flood</i>	<i>247</i>	<i>1,640,023</i>
23/09/2011	India	General flood	239	3,443,989

**Table 6-1. Ten most severe disasters by number of fatalities in 2011**

Source: EM-DAT [RD1] (*Charter events in italics*)

Looking at Figure 6-3 there has been an increase in the number of Charter events per year between 2001 and 2010. The decrease of requests in 2011 can be explained in part by the decrease of disaster occurrence (as reported by EM-DAT) and by the existence of other EO-based mechanisms triggered by UN agencies or national entities for major emergency (e.g. GMES SAFER, Sentinel Asia). Continuous dialogues between the Charter and other EO-based programmes for emergency response (e.g. GMES ERS and SA) will help streamline the use of EO resources during the response phase of major disasters worldwide.

Seven (7) Charter activations are in the list of the ten most severe disasters of 2011 (Table 6-1). This confirms the fact that the Charter remains focused on major disasters.

Among the 50 most severe disasters that occurred in 2011 (list in Annex) there were 16 Charter activations (50% of 2011 activations). Activations were made by AUs (Brazil, India, Japan(2), Nigeria, South Korea, Turkey, USA(2)) by AUs on behalf other countries (New Zealand), by UN bodies or ADRC (Cambodia, Colombia, El Salvador, Namibia, Philippines, Thailand). A large part (74%) corresponds to hydro-meteorological events (floods and wind storms). There has been an increase in the portion of Charter events as part of the 50 most severe disasters (by fatalities) according to EM-DAT: every year more and more Charter events are part of this segment. This general trend is confirmed this year despite the fact that total of activations is inferior to 2008, 2009 and 2010 numbers.

Looking at 2011, there was no Charter activation for 34 of the 50 most severe disasters events. :

- 10 occurred in countries with an AU (India, China, USA, Turkey, and Nigeria). AUs were able to judge appropriately between triggering the Charter and using an alternative service. It would be important to understand the motivation(s) which guides an AU decision not to activate the Charter. The flood in China in June was very severe and affected up to 68 millions of people.

- 24 of these occurred in countries which have no direct access mechanisms to the Charter. All fall well within the hazard types of the Charter. They all are in the top band of disasters for that year and can be classed as major disasters.
  - 15 on 24 occurred in Asia. Sentinel Asia was activated for 6 events in Sri Lanka, Myanmar, Nepal, Philippines. The large Pakistan flood in August was monitored by UNITAR/UNOSAT, GMES SAFER, Sentinel Asia, in response to different UN bodies (respectively UNOCHA, WFP & UNESCAP, the latter on behalf of Pakistan Meteorological Department (PMD)).
  - 9 on 23 occurred in Africa and Latin America. The tropical cyclone which affected Madagascar in February was covered by GMES SAFER following a WFP headquarter request.

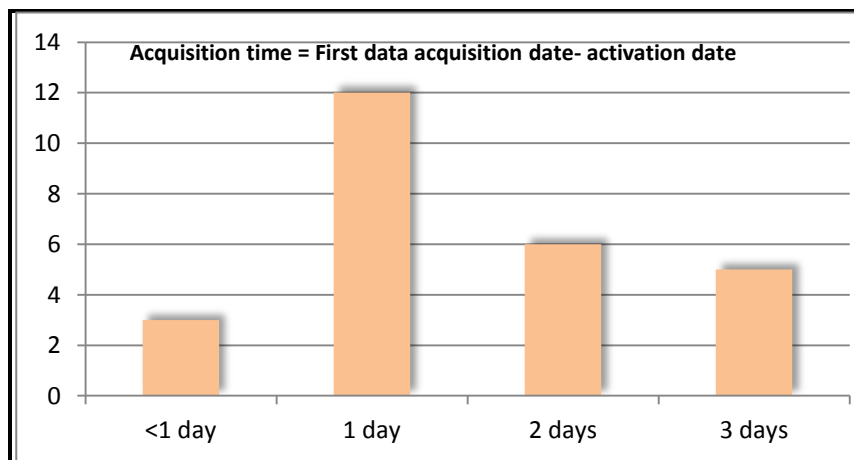
While the Charter continues its efforts to inform national authorities about the Charter, there is still a need to increase awareness in these areas of the world. In the next few years, the implementation of Universal Access should facilitate direct access for national entities that are currently unable to access the Charter directly. This could potentially increase the annual number of activations, and the Charter will need to evaluate carefully the validity of calls to minimise the impact this increase may have.

## 6.2 System performance assessment

- Assessment of timeliness for Charter services provided in 2011

The system performance review confirms that the 2011 response time is equivalent to the ones of 2007, 2008, 2009 and 2010's. The triggering time (ODO receives the URF and the ECO contacts the PM) on an average this is less than one day. The standard average turnaround time is two days.

The histogram in Figure 6-4 indicates the acquisition time of the first satellite images received after the Charter was activated. On average, this is better than two days. Some images are available on the same day as the activation. This is particularly the case when the event occur days before the start of the activation and images are already available through other initiatives such as ESA's Earth Watching project and CSA's Disaster Watch.

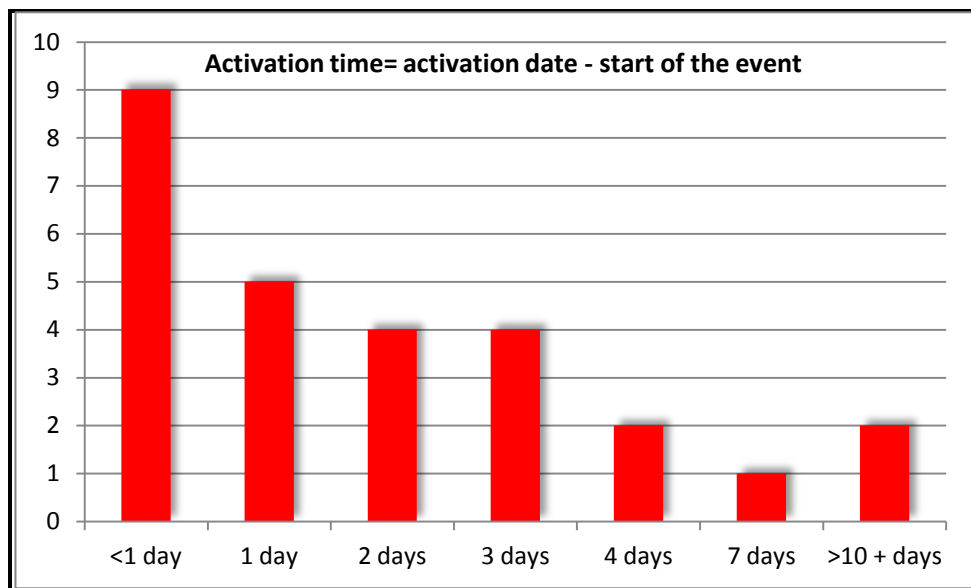


**Figure 6-4. Time interval between Charter activation date and date of first data acquisition (2011).**  
*Statistics generated using PM reports information.*

It is difficult to compare this to user requirements *in general* and EO systems will always be slower than needed for certain users. The driver being the timeliness of access to new

observations in the aftermath of a hazard impact, more satellites will always be needed to reduce this barrier. However 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. In some cases, delay in providing useful crisis mapping based on optical data is due to lack of cloud free images.

It should also be noted that activation of the Charter by an AU or an intermediate Body after a disaster event can fluctuate between < 1 to 2 days, but could be longer as shown in Figure 6-5. That time is mainly depending on users' decisions to activate the Charter. In 2011, in two cases the Charter was activated with a delay of up to 10 days: for the large fire in Mexico and flood in Thailand. In the last case, the Charter was activated by ADRC some days after Sentinel Asia, following a specific request of the end user to obtain radar data.



**Figure 6-5. Time to activate the Charter by an AU or a Charter Cooperating Body (2011).**  
*Statistics generated using PM reports information*

- Assessment of EO data supply chain for Charter services provided in 2011.

The Charter is working to resolve two main issues raised by PM's regarding improvement to the data supply chain:

- 1) Easier access to all Charter EO data by PMs/VARs during activations.
- 2) Find an alternative way to the internet for delivering raw data in case of low internet connection or "black out" after a major disaster.

For 1) the Charter Executive Secretariat is reviewing various solutions that will enable easier access to acquired images during activations (see §3, p.15).

For 2) the Charter will collaborate with GEONETCast to use their system as a data delivery tool to PMs/VARs in countries where GEONETCast stations are in place. This system will not replace the current practice of delivering Charter imagery via the Internet (see §3, p.15).

Other issues such as a better filtering of requests, more flexibility in the course of an activation (e.g. possibility to change the AOI, request of additional data, extension of the activation, provide regular updates concerning the satellite resources available to the PM) are being reviewed to



maintain a high-quality operational service. In addition, the Charter is updating the ECO's scenario guidelines to include commercial HR & VHR optical sensors and changes in the Charter satellites' constellation.

### **6.3 Assessment of products and services**

Although the Charter's mandate is limited to supplying satellite data quickly and at no cost, Charter members invested efforts and resources to provide crisis mapping and damage assessment for most of the Charter activations. Some services were carried out by using in-house or external resources or through dedicated contracts (e.g. cooperation with the GMES SAFER project for 3 activations). The UN provided value-added service through UNITAR/UNOSAT for 5 of the 32 activations.

Value-adding service was particularly relevant in evaluating the impact of earthquake and tsunami in Japan. A large quantity of value-added products from HR and VHR optical and radar data were delivered to the end users. Besides the Charter PM organization (AIT), other institutions (JAXA, DLR, SERTIT, UNITAR/UNOSAT, USGS, Clark Labs, Clark University, etc.) contributed value-adding products during this activation. JAXA has published a report on March 2012 (*Report on JAXA's response to the Great East Japan Earthquake*) which integrates EO analysis performed by the International Charter and Sentinel Asia.

The training of new Project Managers in Africa (Kenya and Namibia) in 2011 is also an important contribution towards the enhancement of the PM network and the Charter services worldwide. For instance, in 2011, two African countries (Nigeria & Namibia) benefited from in-country PM/VA services developed through the Charter's capacity building efforts in the last few years. Furthermore, CONAE strengthened its training/educational activities through the creation of a formal diploma course for PMs at the Gulich Institute of the University of Cordoba.

### **6.4 Users' appraisal**

The feedback received from the users once again highlighted their appreciation of the information obtained from the data accessed through the Charter for map generation. Examples of recurrent users' recommendations reported by the Project Managers are:

- Need for technical training to improve end user awareness (use and exploitation of Charter products).
- Involve specialist partners in further processing and interpretation of data (VA partners, local actors, scientific community, etc.).
- Receive information products as vector data to be directly exploited in GIS. In some activation, PMs/VA organizations already provided GIS layers to the end users.

It can be noted that there is an increase in end users able to perform EO and GIS processing; this is particularly the case of end users in Asia (e.g. Philippines, South Korea, and Vietnam) and Oceania (Australia).

The Charter continued its efforts to increase awareness at the national level in Africa, through Formal Consultation with National Disaster Management Authorities and the contribution of the Garnet-e project. Efforts in Asia have been via regional meetings and conferences organized by Sentinel Asia.

Working at national level helps to develop a network of users with increased awareness. The process helps attain a better understanding of the institutional and operational organization of a given country. This allows the assessment of specific national users' needs and capacity building requirements for EO data processing and interpretation. Information gathered is useful for the Universal Access process.

### **6.5 *Communication assessment***

The first Charter newsletter was published in November 2011, with the goal of providing regular updates to users and stakeholders on Charter activations, members, performance, evolution, etc. The newsletter is issued quarterly and available on the Charter website for download.

Charter members have participated in a significant number of international events all over the world. The commitment of the Charter representatives in promoting this initiative is always high. Charter movie and brochure in English and French are distributed and used as at conferences and workshops both nationally and internationally. Additional material relevant to new members (DLR, KARI & INPE) has been prepared to keep the Charter brochure up to date.

The e-mail notice per Charter activation resumed in December 2011.

## 7 Conclusions

2011 was marked by the official entry of the Korean Aerospace Research Institute (KARI) and National Institute for Space Research (INPE) as Charter members. In addition, EUMETSAT's application was accepted in October 2011.

There were 32 activations with an average of 2.6 per month in 2011, lower when compared to activations in 2010. This is largely due to a reduction in major disasters worldwide, and the stronger role played by regional mechanisms, especially in Asia and Europe. Seven (7) of these activations were among the ten (10) most severe disasters in 2011, confirming the fact that the Charter is firmly focused on major disasters. One of these activations, the earthquake and tsunami in Japan, was remarkable by its duration, the number of products delivered and the synergy with other initiatives. The Charter demonstrated once again its capability to respond to major disasters, by utilising its resources appropriately and collaborating with other programmes to enhance value-added capacity.

Universal Access (UA) resolution was formally adopted in May 2011. The Charter has defined and documented a framework for the Universal Access implementation which addresses the countries without direct access. This document establishes steps and high-level conditions with regards to the admission process of additional national entities as Authorized Users. The Charter is developing a communication plan and outreach programme to support the implementation of the UA which is expected to commence before the end of 2012.

Additional efforts were devoted to the improvement of Charter operations and data management. In particular, development of on-line URF was achieved and will be made available to users in 2012. This tool will facilitate user interaction during the Charter triggering phase. The Charter's metadata catalogue contained around 3,500 records at the end of 2011. The Charter endorsed the proposal to rely on GEONETCast system to facilitate the delivery of EO data to areas with minimal internet capacity and connectivity while maintaining the current practice of delivering Charter imagery via the Internet. Furthermore, the Charter members are examining functional and service capabilities of different systems with appropriate levels of security and licensing restrictions to ensure easier data access and management during activation.

Collaboration with Charter Cooperating Bodies (UNOOSA, UNITAR/UNOSAT, and ADRC) remains one of the major avenues for channelling additional activation requests and improving awareness of the Charter worldwide. In addition, the outreach programme in Africa in the form of formal user consultations continued. The national disaster management authorities in Democratic Republic of Congo, Tanzania, Kenya and Madagascar were visited in 2011.

National organizations from Kenya and Namibia involved in disaster management were trained as Charter Project Managers, increasing the PM pool. Furthermore, a formal diploma course for PMs at the Gulich Institute of the University of Cordoba was created by CONAE to strengthen the PM network in South America.

The first Charter newsletter was issued in November 2011. In addition, promotion of the Charter activities was carried out through the participation of Charter members at international and regional events as well as publications and press releases.

## 8 Annex

List of 50 most severe disasters (by number of fatalities) recorded by EM-DAT (2011).

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

Country	Type of event	Date	Fatalities	Charter	Other EO capacities
Japan	Earthquake & Tsunami	11/03/2011	19846	Yes	Sentinel Asia
Philippines	Tropical cyclone	15/12/2011	1439	Yes	Sentinel Asia (escalation mechanism)
Brazil	General Flood	11/01/2011	900	Yes	
Thailand	General Flood	August- Dec 2011	813	Yes	Sentinel Asia (escalation mechanism)
Turkey	Earthquake	23/10/2011	604	Yes with GMES SAFER	
Pakistan	General Flood	August- Sept 2011	509		UNOSAT, Sentinel Asia, GMES SAFER
China P Rep	General Flood	01/06/2011	467		
United States	Local storm	22/04/2011	354	Yes	
Cambodia	General Flood	August 2011	247	Yes	GMES SAFER
India	General Flood	23/09/2011	239		
India	General Flood	15/08/2011	204		
New Zealand	Earthquake	22/02/2011	181	Yes with GMES SAFER	Sentinel Asia
United States	Local storm	20/05/2011	176		
Myanmar	General Flood	20/10/2011	151		Sentinel Asia
Colombia	General Flood	Apr / July 11	138	Yes	
Colombia	General Flood	Sept 11/Dec-11	135		
Nigeria	General Flood	26/08/2011	120	Yes	
China P Rep	General Flood	Sept. 2011	117		
India	Earthquake	18/09/2011	112	Yes	Sentinel Asia
Philippines	Tropical cyclone	24/09/2011	103		Sentinel Asia
Nepal	General Flood	June 2011	89		Sentinel Asia
Vietnam	Flood (An Giang, Dong Thap, Long, etc)	Sept- Dec 2011	85		
Philippines	Tropical cyclone	26/07/2011	84		Sentinel Asia
Myanmar	Earthquake	24/03/2011	74		Sentinel Asia
Mexico	General Flood	23/08/2011	73		
Japan	Tropical cyclone	02/09/2011	68	Yes	

Namibia	General Flood	01/03/2011	65	Yes	
South Korea	Landslide	26/07/2011	59	Yes	
Bolivia	General Flood	14/02/2011	56		
India	Tropical cyclone	29/12/2011	47		
India	General Flood	10/08/2011	47		
United States	Local storm	15/04/2011	46		
United States	Tropical cyclone	27/08/2011	46	Yes	
Sri Lanka	Flood (Central and Eastern region)	05/01/2011	43		Sentinel Asia
Philippines	Landslide	22/04/2011	43		
Philippines	Tropical cyclone	27/08/2011	43		
Guatemala	Flood (Santa Rosa, Solola, Izaba)	12/10/2011	43		
India	Local storm	20/05/2011	42		
Colombia	Landslide	04/11/2011	40		
Turkey	Earthquake	09/11/2011	40		
South Africa	Flood (Eastern cape, Free State, etc.).	Jan. 2011	40		
Afghanistan	Flood	1/05/2011	37		
Philippines	Tropical cyclone	08/05/2011	37		
Madagascar	Tropical cyclone	14/02/2011	35		GMES SAFER
El Salvador	Flood	19/10/2011	35	Yes	
Haiti	Flood (Port au Prince, Ouest, etc.)	06/06/2011	34		
Indonesia	Landslide	30/11/2011	34		
Uganda	Flood (Bulambuli, Sironko, Kween, etc.)	July 2011	27		
Lesotho	Flood (Thaba-Tseka, Qacha's Nek, etc.)	01/02/2011	26		