



# INTERNATIONAL CHARTER SPACE & MAJOR DISASTERS

## International Charter ,Space and Major Disasters'

Space satellite data for relieving organizations  
in the event of disasters

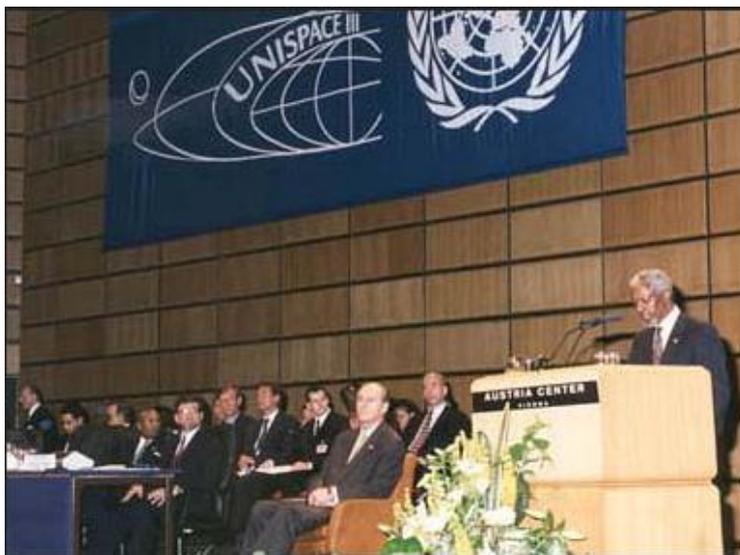
Claire Tinel, CNES (French space agency)  
COPUOS STSC 56<sup>th</sup> session, 20 February 2019



# History

Following **UNISPACE III** in 1999, the **International Charter 'Space and Major Disasters'** was established by the Space Agencies of Europe (ESA), France (CNES), and Canada (CSA).

The Charter was declared operational as of November 2000.





# Purpose and scope

The Charter supports with space-based data and information emergency response after sudden major disasters, such as

- **Natural events:** floods, storms, earthquakes, fires, volcanic eruptions, landslides etc.
- **Man-made events:** large industrial accidents and oil spills

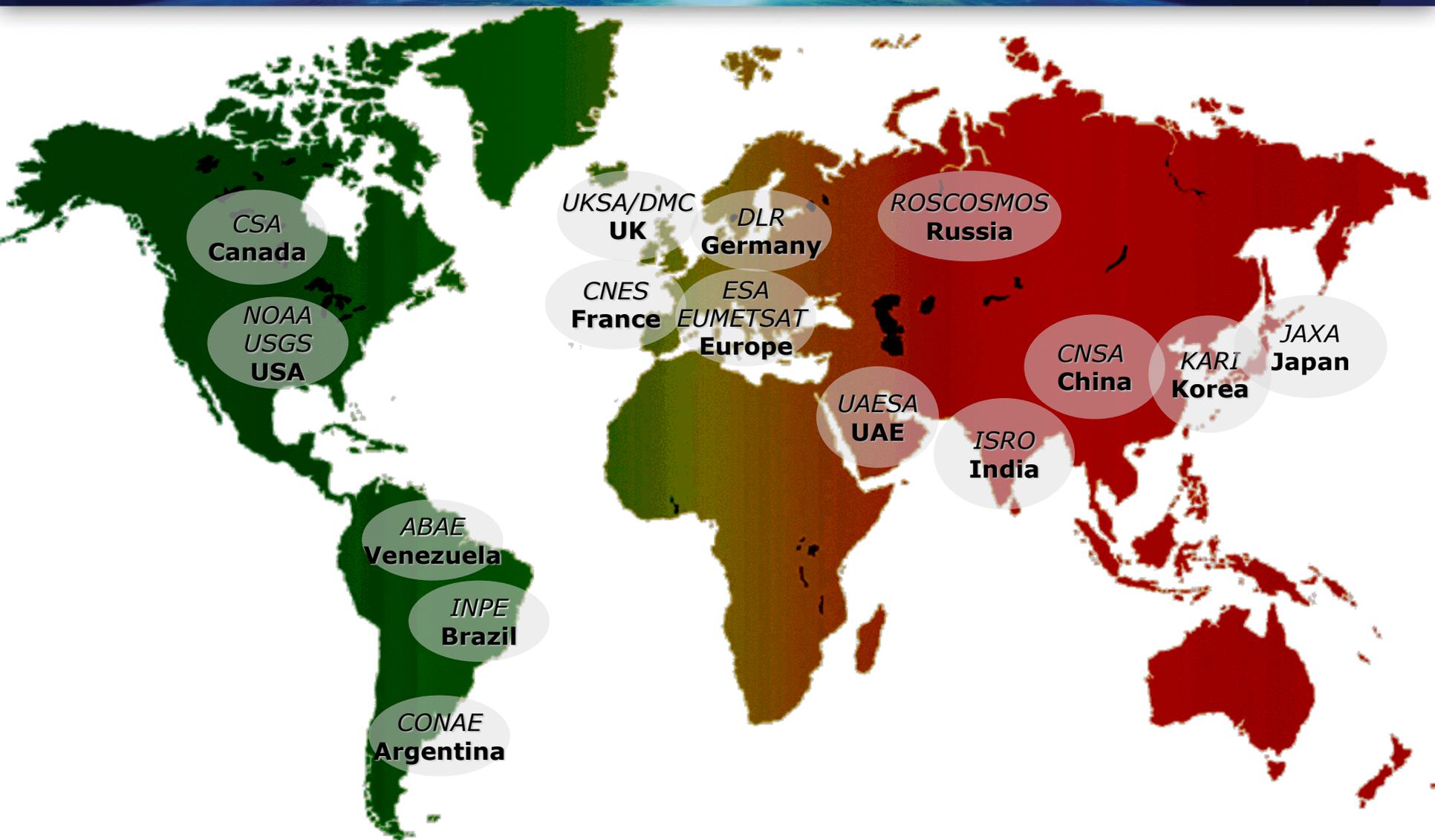
The Charter does not cover emergencies caused by armed conflicts.



The Charter is **available 24/7**. When activated it executes **priority tasking** of numerous Earth-observing satellite missions in a rapid fashion and provides images and/or derived products.

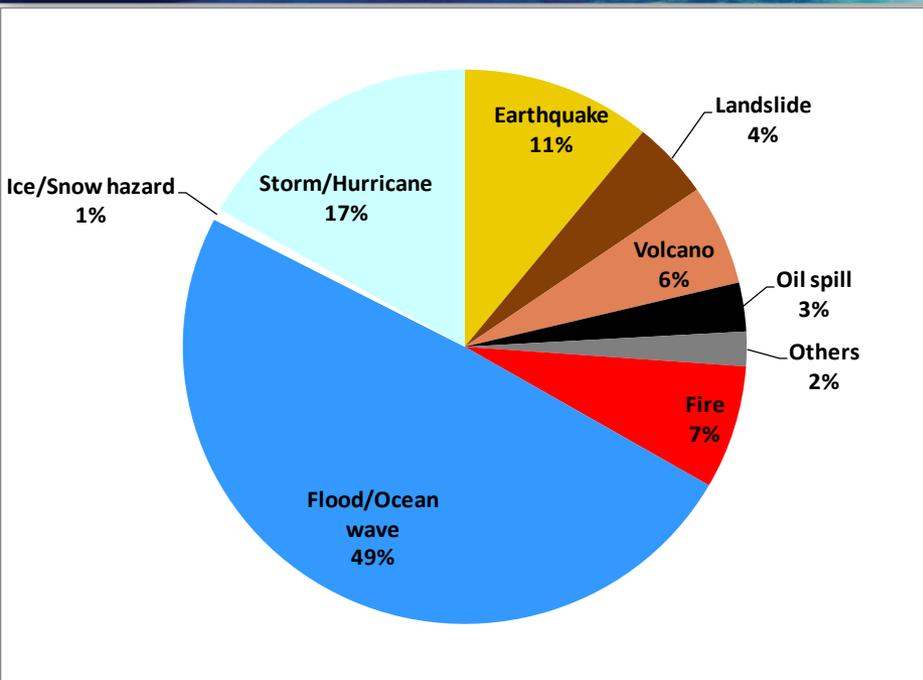


# 2000 – 2019: Growth in Membership

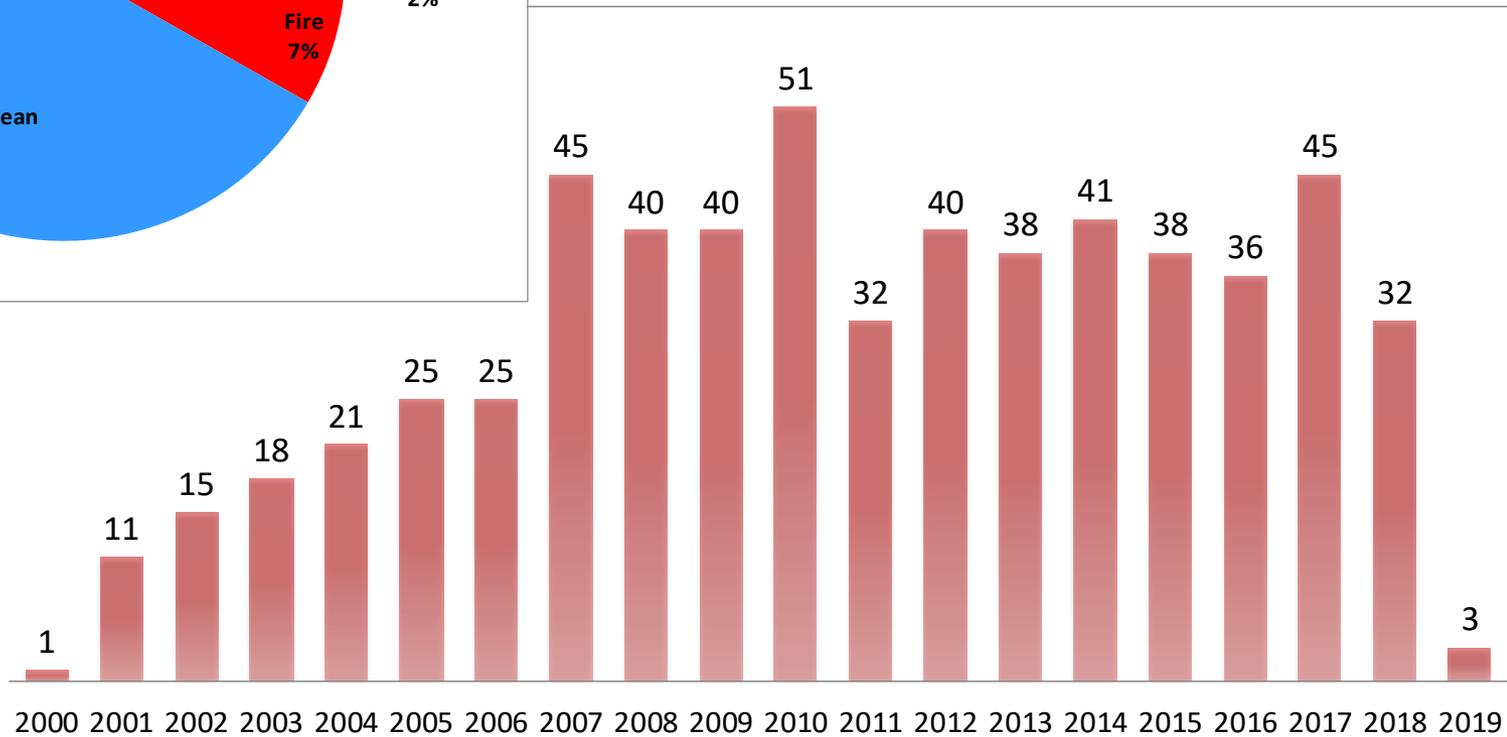




# 2000 – 2019: Activation Statistics



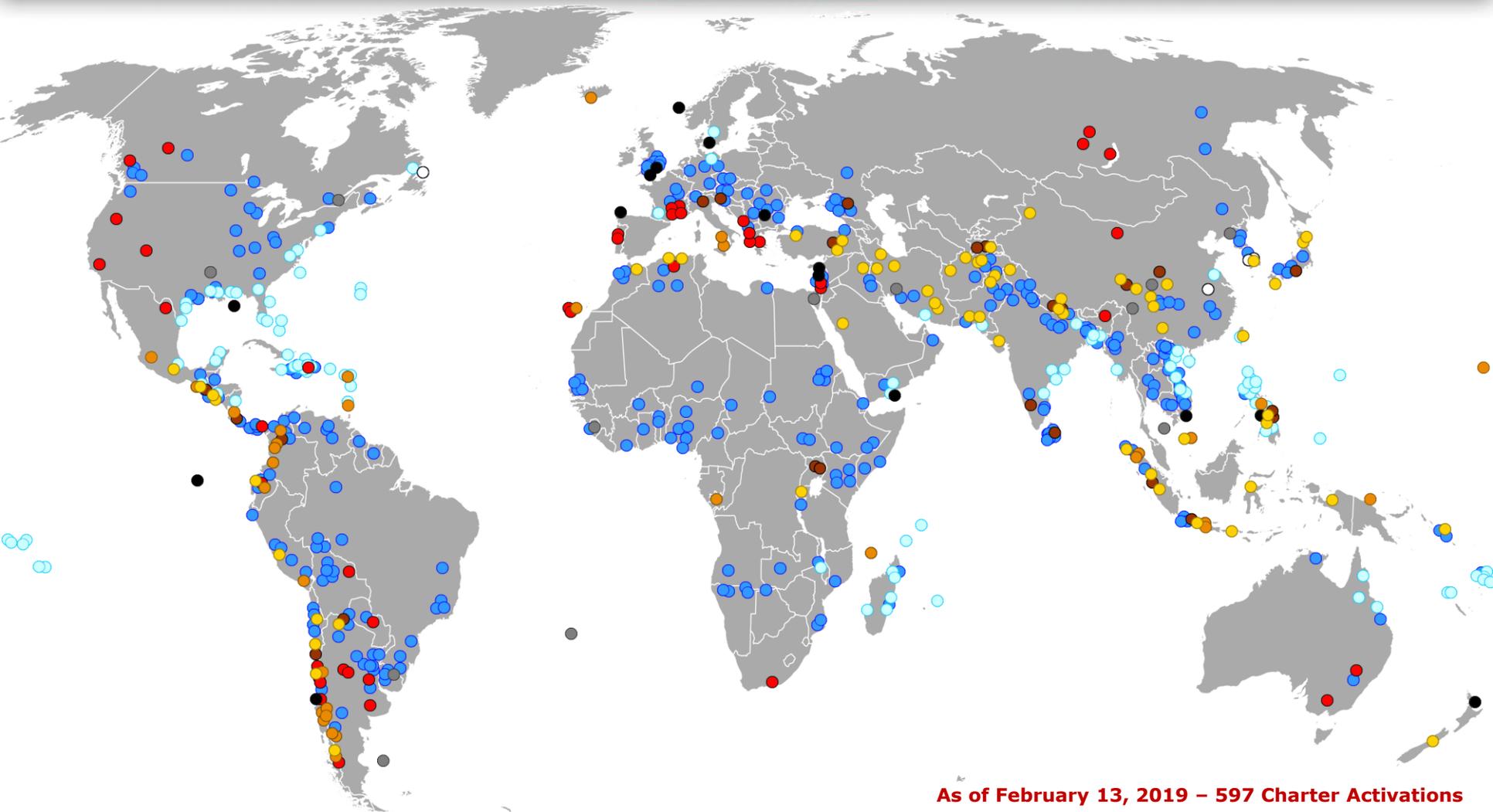
**Activation statistics as of February 13, 2019**





2000 – 2019:

Support to disaster response in more than 120 countries  
597 activations as of today



As of February 13, 2019 – 597 Charter Activations

Legend: ● Earthquake ● Landslide ● Volcano ● Storm/hurricane ● Flood/ocean wave ○ Ice/snow hazard ● Fire ● Oil spill ● Other



# Success in 2000 – 2019: Authorized Users in 65 countries





## Success in 2000 – 2019: Additional Access Mechanisms

In addition, there are agreements with entities allowed to use/trigger the Charter in certain cases:

- UNOOSA
- UNITAR/UNOSAT
- ADRC (Sentinel Asia)
- EC-ERCC / Copernicus Emergency Management Service



# Universal Access (implemented since 2012)

**Any national disaster management authority can become a Charter User!**

**The following conditions apply:**

- The entity must be a **national disaster management authority or its delegated agency** in that country.
- It must have the **capacity to download and use maps.**
- It must be able **to submit and pursue an activation request in English.**

An official letter of the organisation and a filled **Registration Form** ([www.disasterscharter.org](http://www.disasterscharter.org)) needs to be sent to the Executive Secretariat ([ExecutiveSecretariat@disasterscharter.org](mailto:ExecutiveSecretariat@disasterscharter.org)).

Becoming an Authorized User does not happen from one day to the next, but involves an assessment by the Charter members as well as a training and simulation exercise.



# Universal Access Already 21 countries since 2012





# Example: Malawi

Malawi's Department of Disaster Management Affairs became an Authorized User in 2014. It activated the Charter in 2015 due to major flooding impacting half of the country.

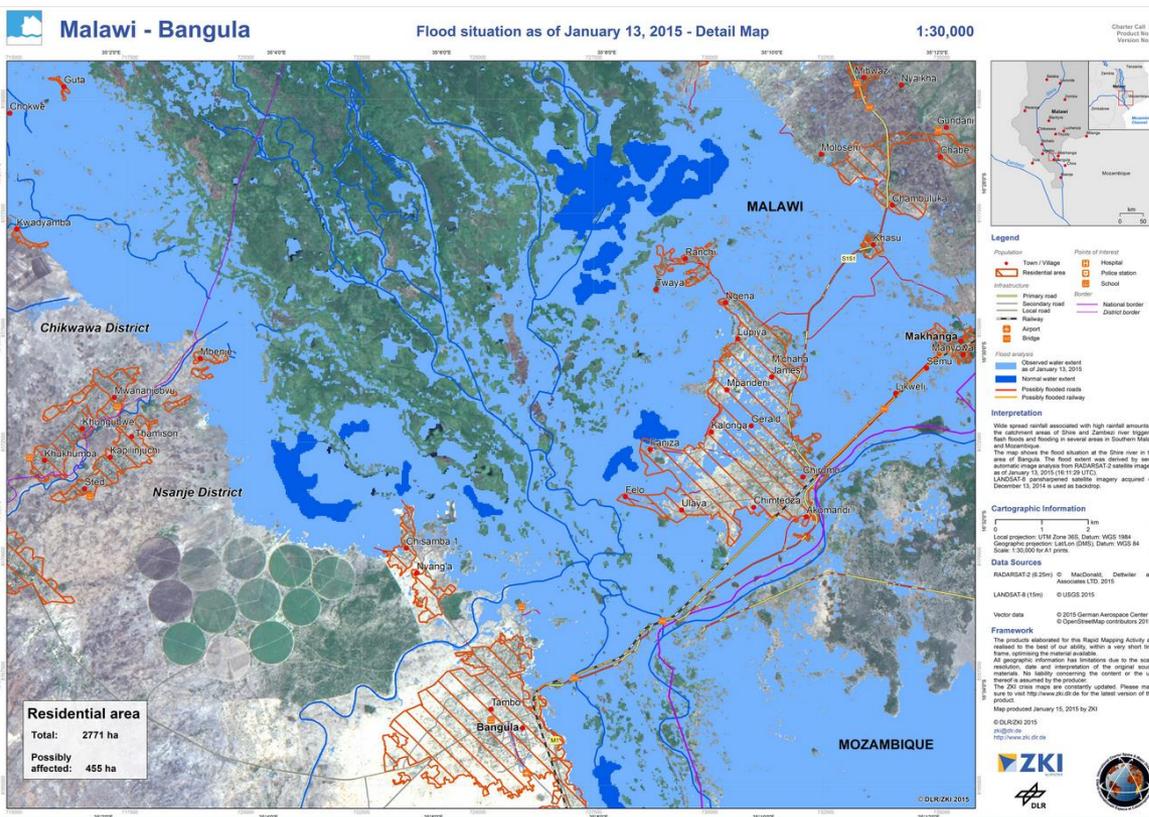


© Shiraz Mohamed/AP



© UNICEF

Left: map based on RADARSAT-2 and LANDSAT imagery



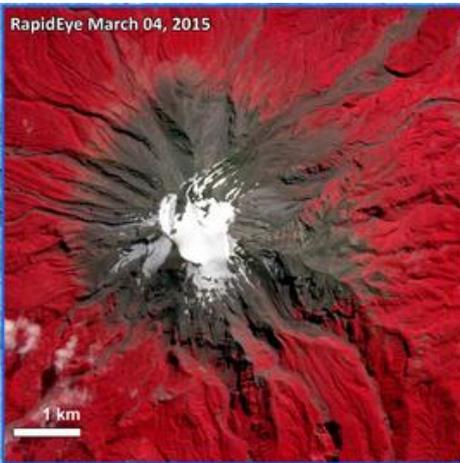


# Example: Chile

The National Emergency Office of Chile became an Authorized User in 2014. The Charter was activated in 2015 due to the eruption of Calbuco Volcano.

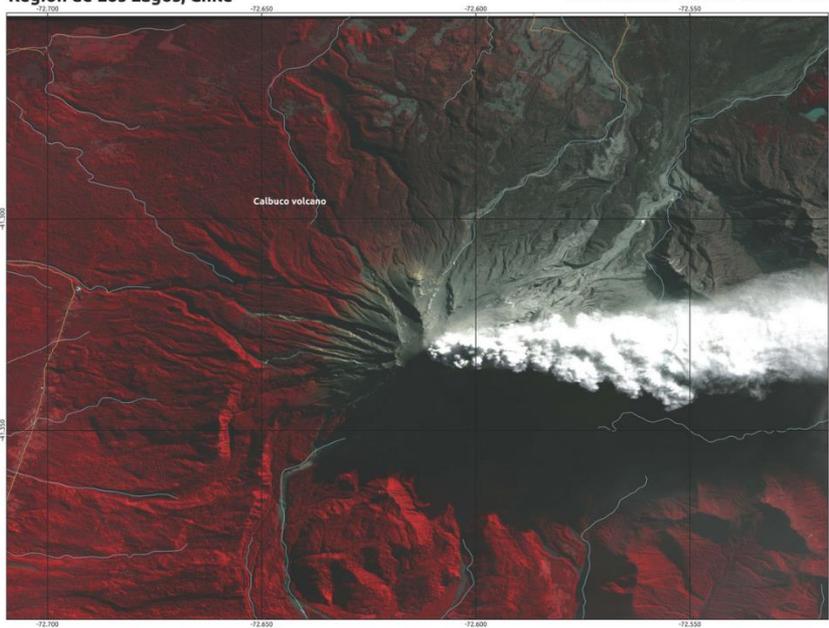


View of the Calbuco volcano in Puerto Varas, Chile on April 24, 2015. / REUTERS



## Eruption of the Calbuco Volcano Región de Los Lagos, Chile

April 24th, 2015 - 14:21 hs UTC  
International Charter Call ID 528



**Description**  
The area shown corresponds to the Calbuco volcano and its surroundings. The volcano is emitting ash with Easterly direction. The image was generated through the merge (image sharpening) of the panchromatic and multispectral bands. The false colour composition (NIR/Red/Green) indicates vegetation with the red colour.

**Legend**  
Hydrography  
Primary roads

**Overview of the event**  
The Calbuco volcano, located in the Región de Los Lagos (Chile), is one of the volcanoes of higher specific risk in Chile. It started a new eruptive cycle on April 22nd, 2015. The sub-plinian eruption consisted of two intense pulses that reached higher than 15 km and lasted for 1.5 and 6 hours respectively, within a range of 14 hours. Six active craters were found inside the old dome and in its surroundings. The ash plume travelled thousands of kilometers with a hot-d-d direction, and affected not only Chilean, but also Argentinian, Uruguayan and Brazilian atmospheres. The volcano activity produced pyroclastic flows that reached 7 km and lahars that travelled 15 km downhill, events. As a consequence of the eruption behavior, more than 4000 people had to be evacuated within a radius of 20 km around the volcano.

**Data source**  
SPOT6 (1.5 m) © CNES2015, distribution Spot Image S.A., all rights reserved.

**Map development**  
This map was developed on 30-04-2015 by the Argentinian Space Agency (CONAE, Argentina). Produced by FGA, CTA, MCG, MIA, © CONAE (2015).

Left: Change Detection based on Sentinel-1 images of 14 and 26 April 2015

Center: RapidEye image of March 2015

Right: SPOT-6 image of 24 April 2015



# Example : interest of satellites images for identifying damages

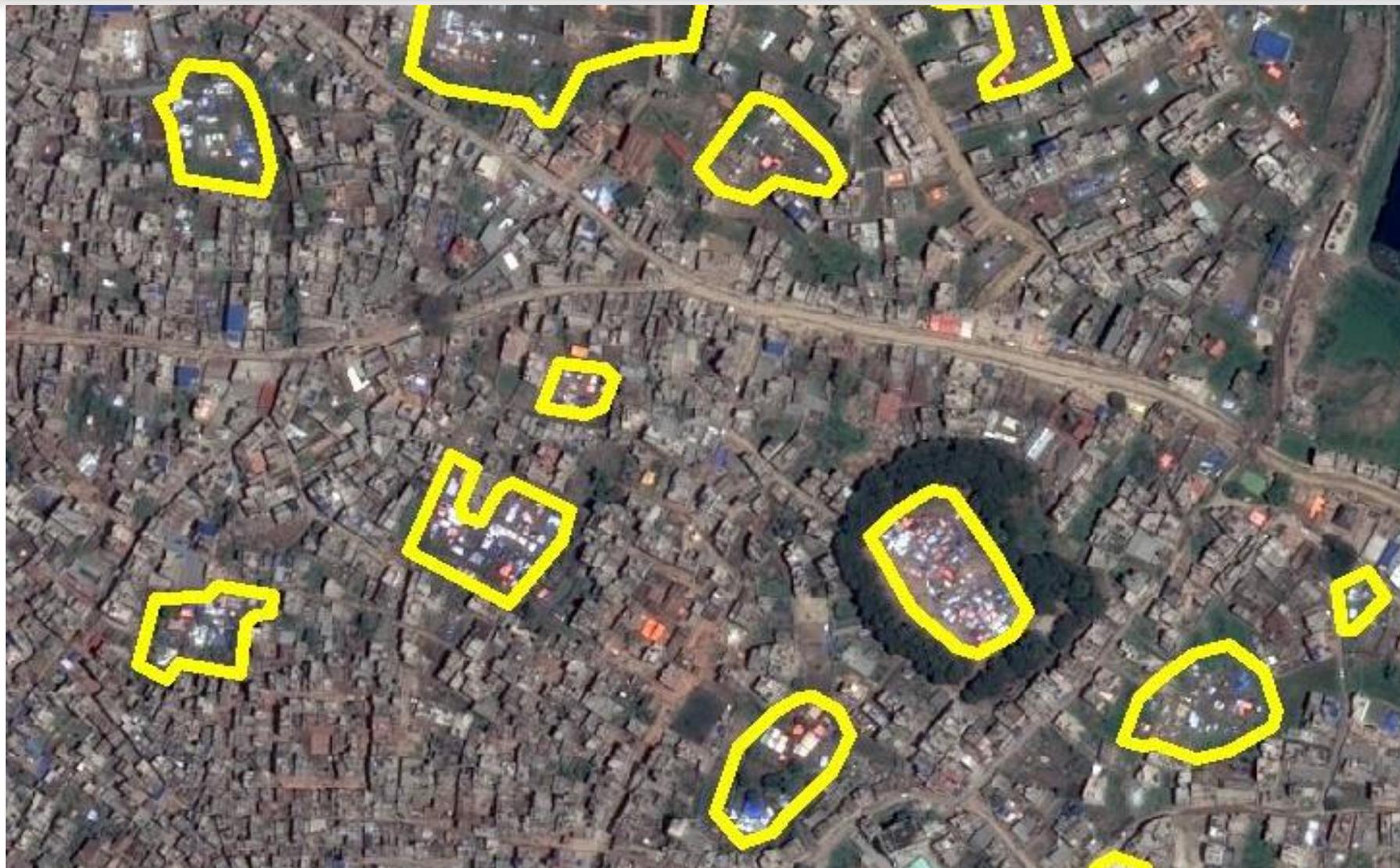
## **Information needed by the relief teams is available from the satellite images:**

- Where is the population?
- Which building/housing are damaged (+ damages intensity)
- How much are the villages/towns affected?
- Is the population reachable by road?



Example : interest of satellites images for identifying earthquake damages

**Population gathering**





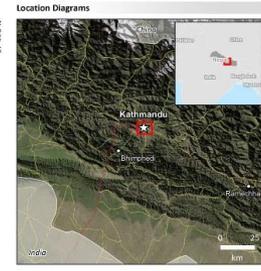
# Example : interest of satellites images for identifying earthquake damages

## Population gathering



Charter Call ID 530-531  
Glide No. EQ-2015-00048-NPL  
Product No. 01

**NEPAL- Kathmandu**  
**Earthquake**  
**spontaneous gathering areas**  
Observed the 27/04/2015



- Legend**
- Important affected buildings (non exhaustive)
  - Visible spontaneous gathering areas
  - Occlusion
  - Road network

**Interpretation**

At midday on the 25th April 2015 Nepal was hit by a magnitude 7.9 earthquake also affecting surrounding countries. The epicentre was less than 30km from Kathmandu, the capital. Strong aftershocks reaching a magnitude of 7.1 have further shook the area. The population has been badly affected and major damage to buildings is reported.

In the Pleiades image used in this map, acquired the 27/04/2015 at 05:03 UTC, building damage is often difficult to see except where complete collapse has occurred. A number of collapsed buildings are highlighted and spontaneous gathering areas are located.

**Cartographic information**

0 0.5 1 km

Local projection: UTM 45 North, Datum: WGS 84  
Geographic projection: Lat/Lon (DMS), Datum: WGS 84  
Scale: 1:15 000 for A1 prints

Geometric references:  
Image Pleiades-1B orthorectified by Airbus DS

**Data Sources**

**Crisis layers**  
Major affected buildings and visible spontaneous gathering areas extracted from Pleiades-1B image acquired the 27/04/2015, © SERTIT 2015

**Background layers**  
Pleiades-1B Image acquired the 27/04/2015  
© CNES 2015 - distribution Airbus DS,  
Roads © OSM, refined by SERTIT  
Toponymy © Google

**Other layers** Digital Terrain Map, © ESR!

**Framework**

The products elaborated for this Rapid Mapping Activity are realised to the best of our ability, within a very short time frame, during a crisis/exercise, optimising the material available.

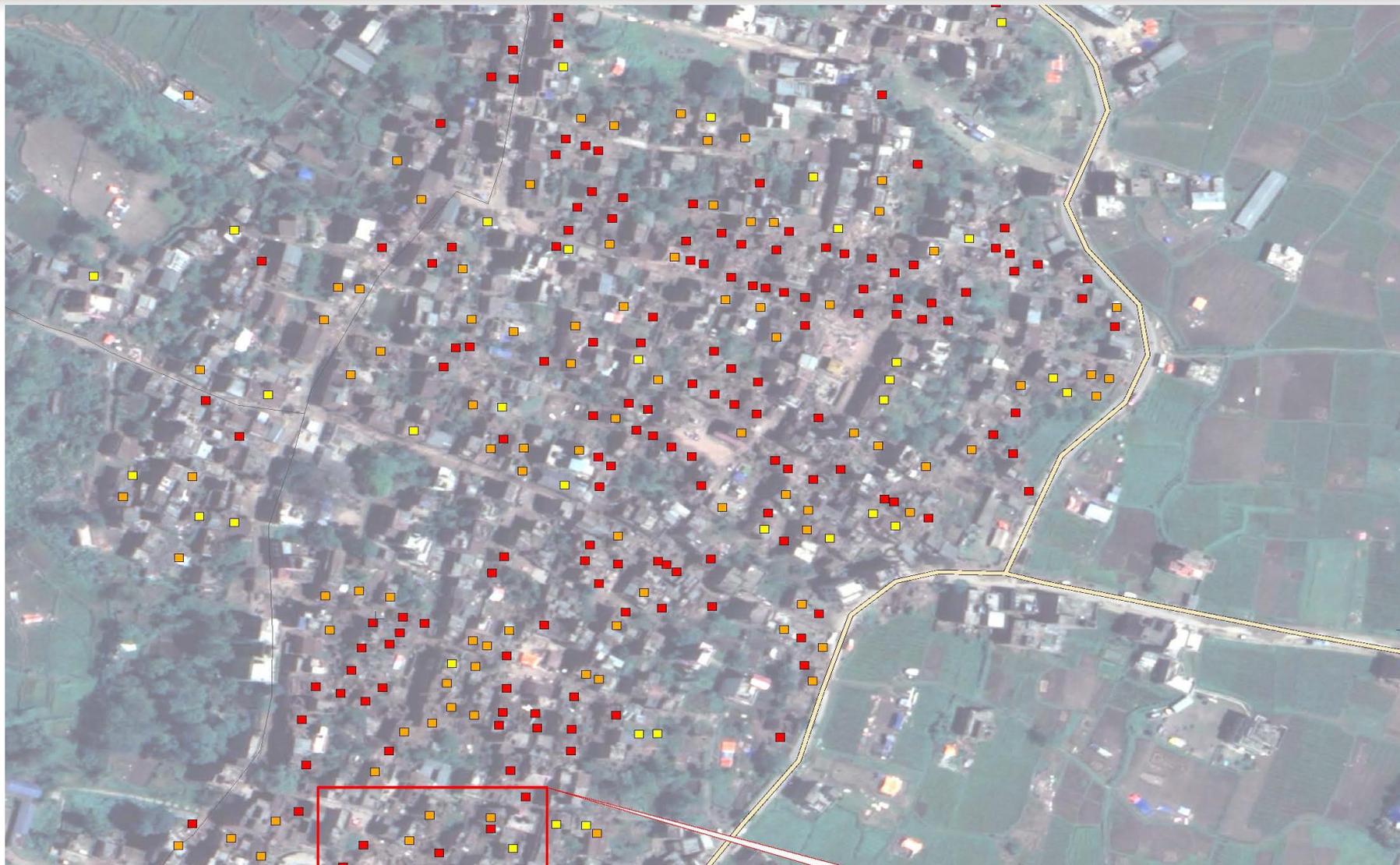
All geographic information has limitations due to the scale, resolution, date and interpretation of the original source materials. No liability concerning the content or the use thereof is assumed by the producer.

Map produced the 27 04 2015 by SERTIT  
© SERTIT 2015  
sertit@sertit.u-strasbg.fr  
http://sertit.u-strasbg.fr



Example : interest of satellites images for identifying earthquake damages

**Damaged housing**





# Example : interest of satellites images for identifying Damaged housing

## DAMAGE ASSESSMENT OF SANKHU, KATHMANDU VALLEY, NEPAL

Analysis with WorldView-3 Data Acquired 27 April 2015

This map illustrates satellite-detected damage and destruction in the town of Sankhu, Kathmandu Valley, Nepal. Located northeast of Kathmandu city, Sankhu was significantly impacted by the 25 April 2015 earthquake in Nepal. Using satellite imagery acquired 27 April 2015 UNITAR / UNOSAT identified a total of 300 affected structures.

Approximately 166 of these were destroyed, 97 severely damaged, and 37 moderately damaged. This is a preliminary analysis and has not yet been validated in the field. Please send ground feedback to UNITAR / UNOSAT.

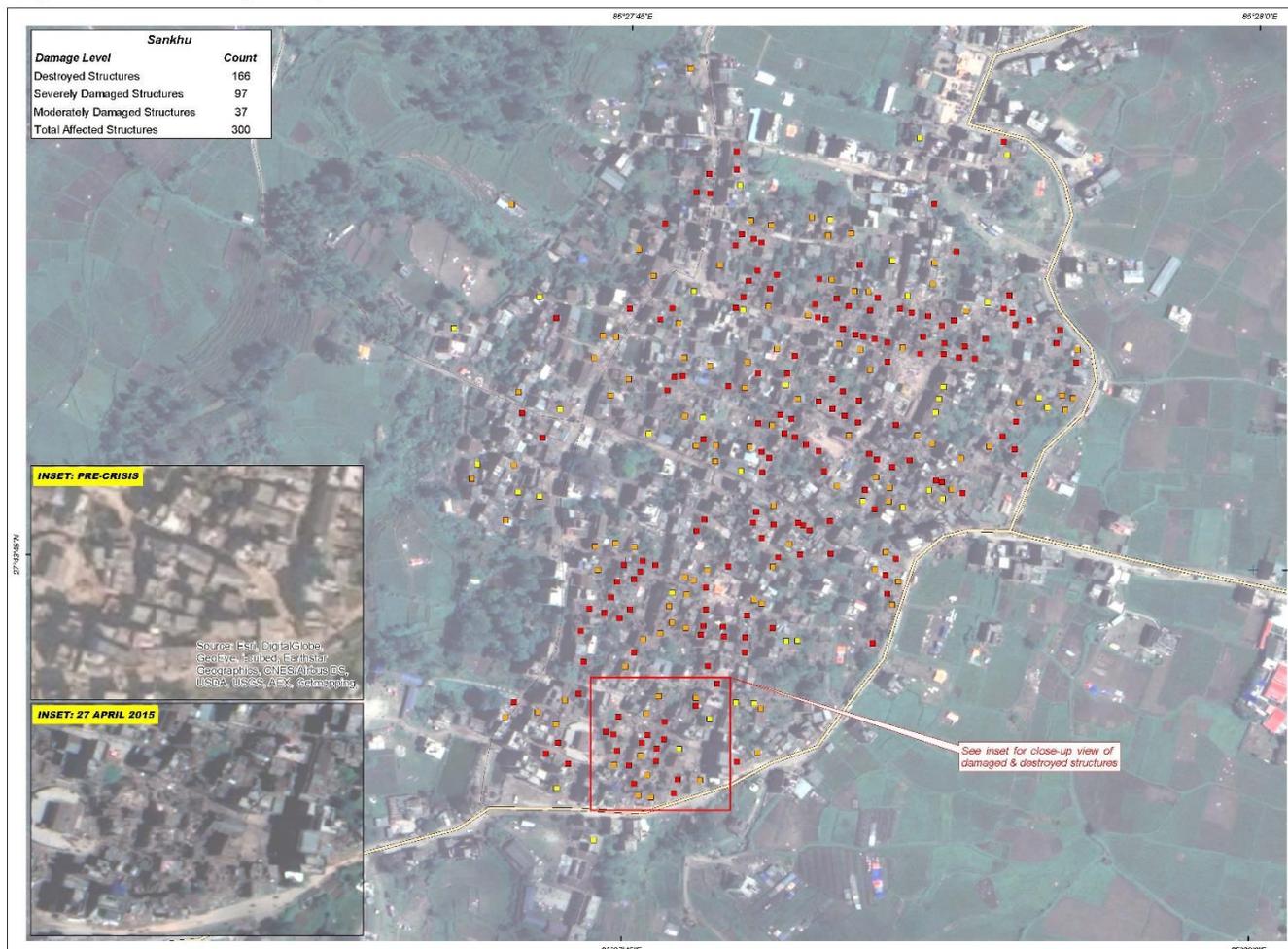
Earthquake



Production Date: 4/30/2015

Version 1.0

Activation Number: EQ20150425NPL



**LEGEND**

- Destroyed Structure
- Severely Damaged Structure
- Moderately Damaged Structure
- Secondary Road
- Local / Urban Road

Map Scale for A3: 1:2,500

Satellite Data : WorldView-3  
 Imagery Date : 27 April 2015  
 Resolution : 50 cm  
 Copyright : DigitalGlobe, Inc.  
 Source : USGS / HDOS  
 Road Data : Google Map Maker / OSM / ESRI  
 Other Data : USGS, UNCS, NASA, NGA  
 Analysis : UNITAR / UNOSAT  
 Production : UNITAR / UNOSAT  
 Analysis conducted with ArcGIS v10.2

Coordinate System : WGS 1984 UTM Zone 45N  
 Projection : Transverse Mercator  
 Datum : WGS 1984  
 Units : Meter

The depiction and use of boundaries, geographic names and related data shown here are not warranted to be error-free nor do they imply official endorsement or acceptance by the United Nations. UNOSAT is a program of the United Nations Institute for Training and Research (UNITAR), providing satellite imagery and related geographic information, research and analysis to UN humanitarian and development agencies and their implementing partners.

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Disaster coverage by the International Charter 'Space and Major Disasters'. For more information on the Charter, which is about assisting the disaster relief organizations with multi-satellite data and information, visit [www.disasterscharter.org](http://www.disasterscharter.org)

unitar  
 United Nations Institute for Training and Research

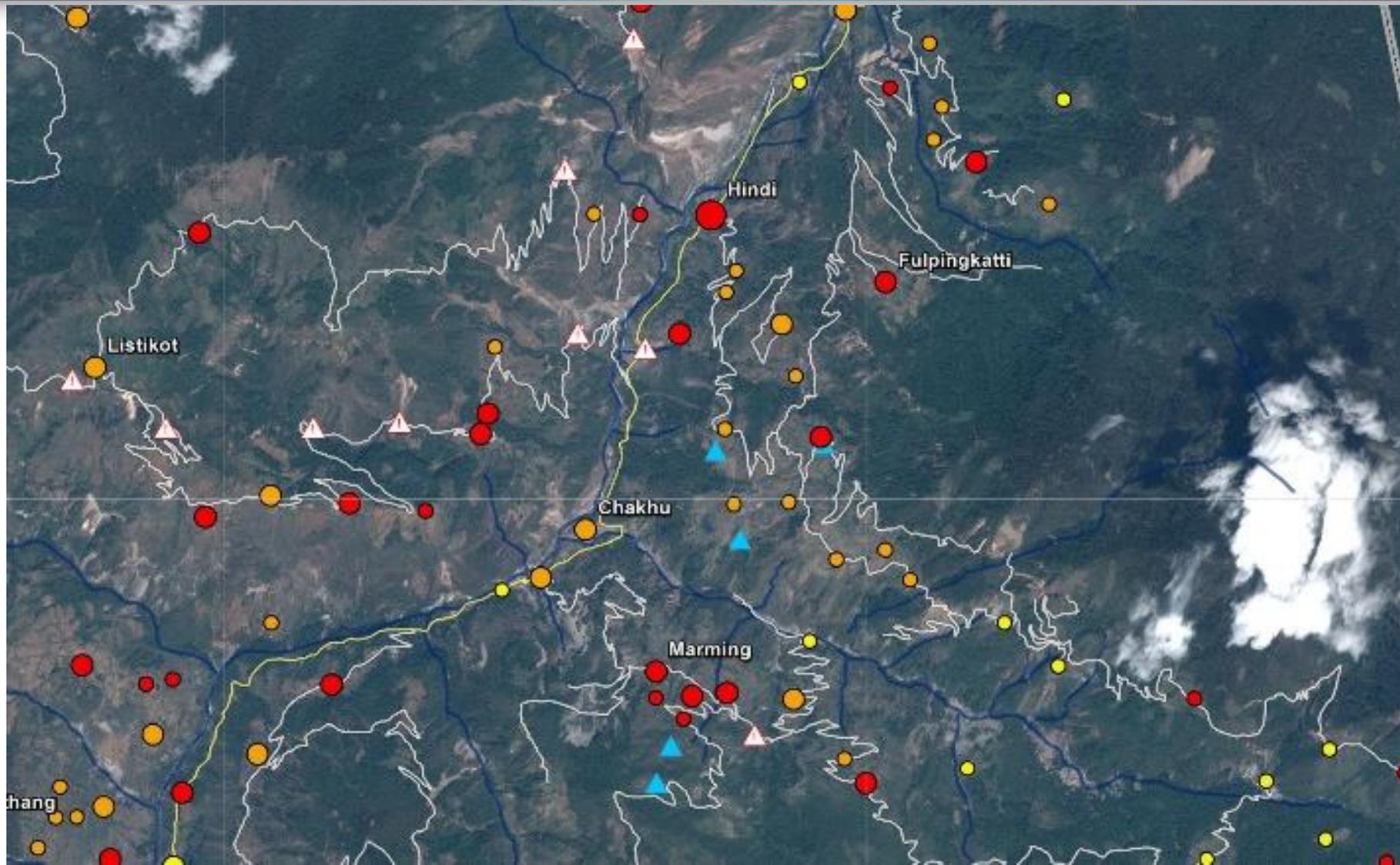
**UNOSAT**

Contact information: [unosat@unitar.org](mailto:unosat@unitar.org)  
 24/7 Hotline: +41 76 487 4998



# Example : interest of satellites images for identifying earthquake damages

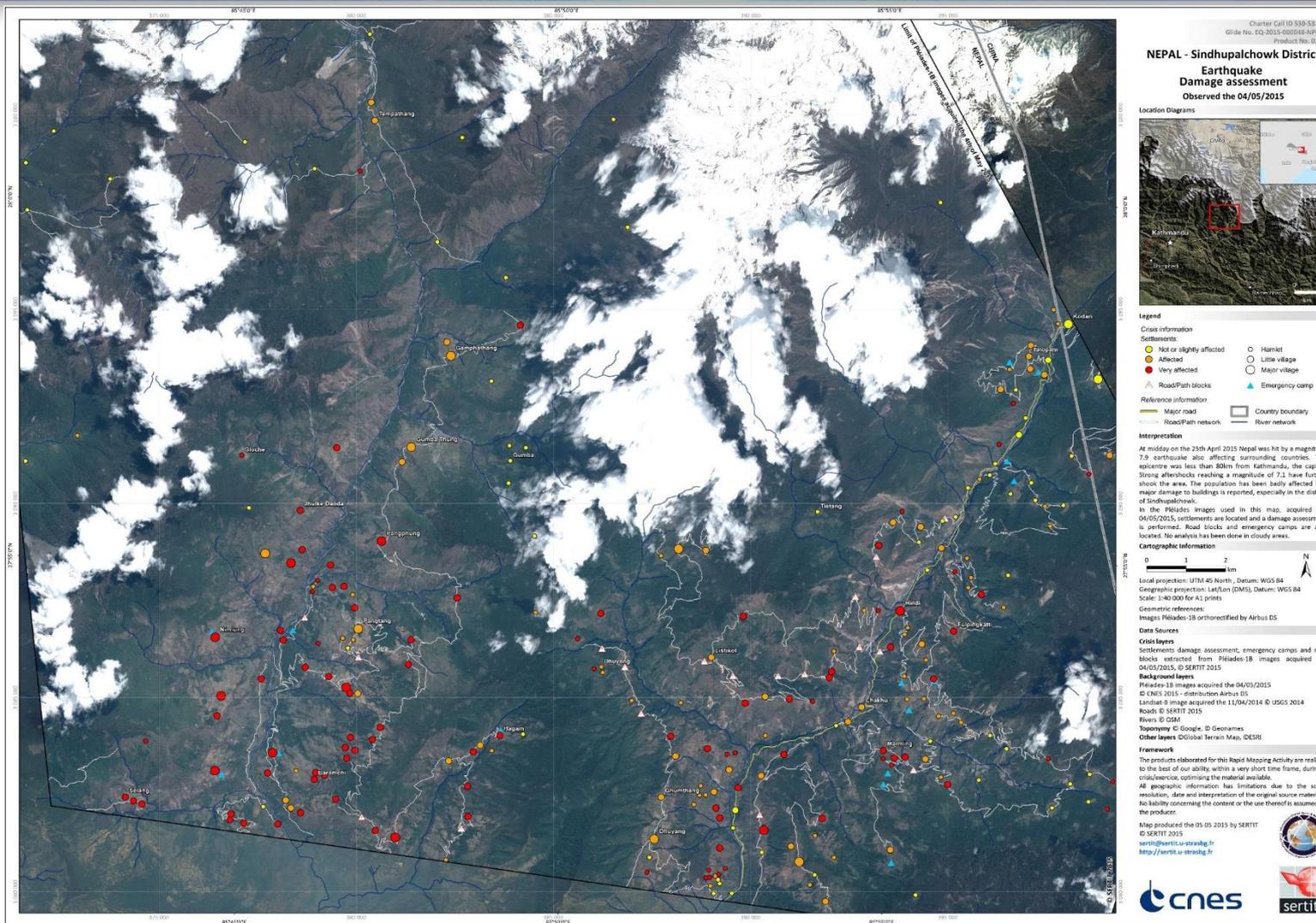
## Damaged villages





# Example : interest of satellites images for identifying earthquake damages

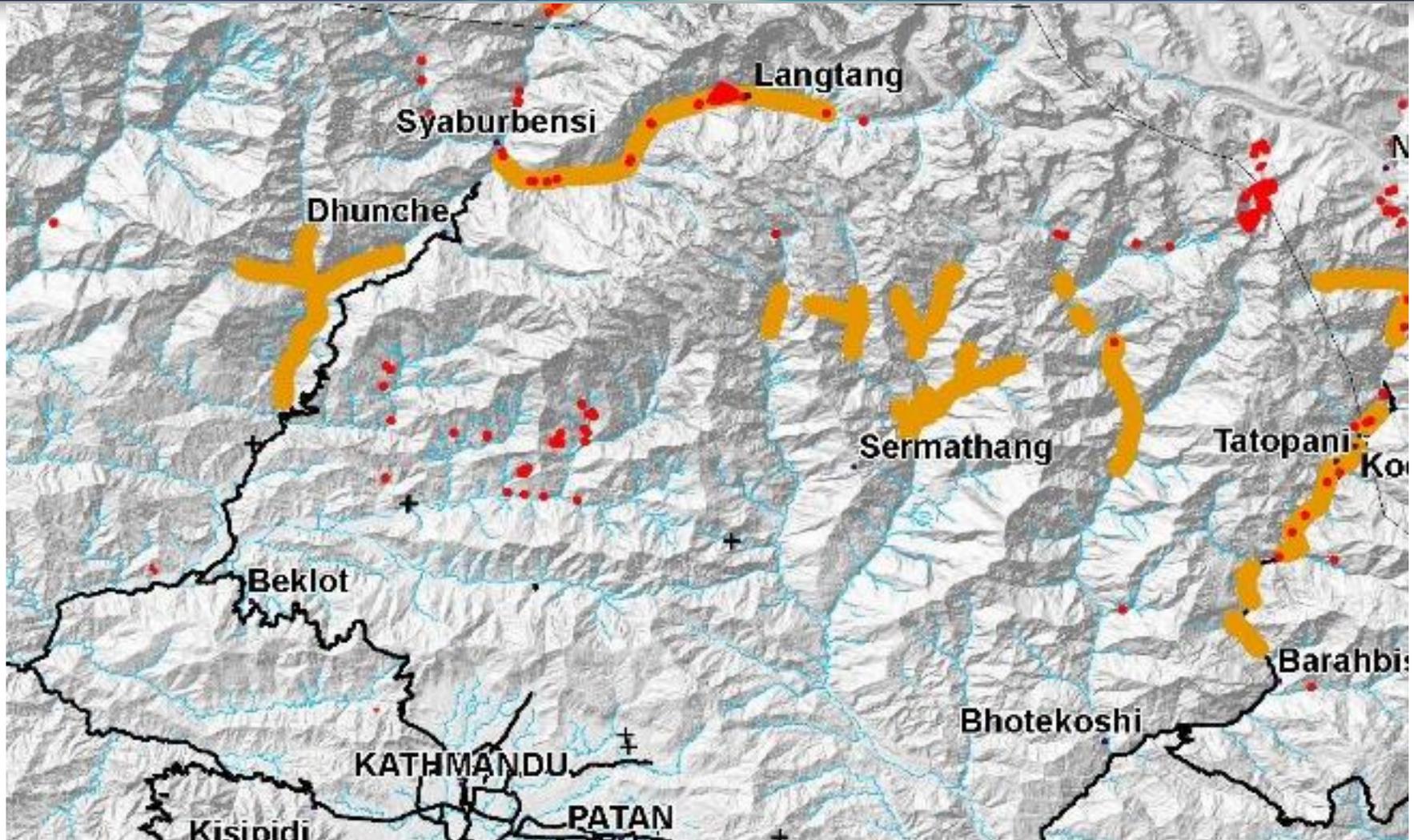
## Damaged villages





# Example : interest of satellites images for identifying earthquake damages

## Landslides

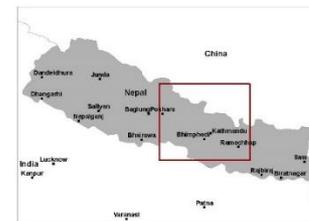
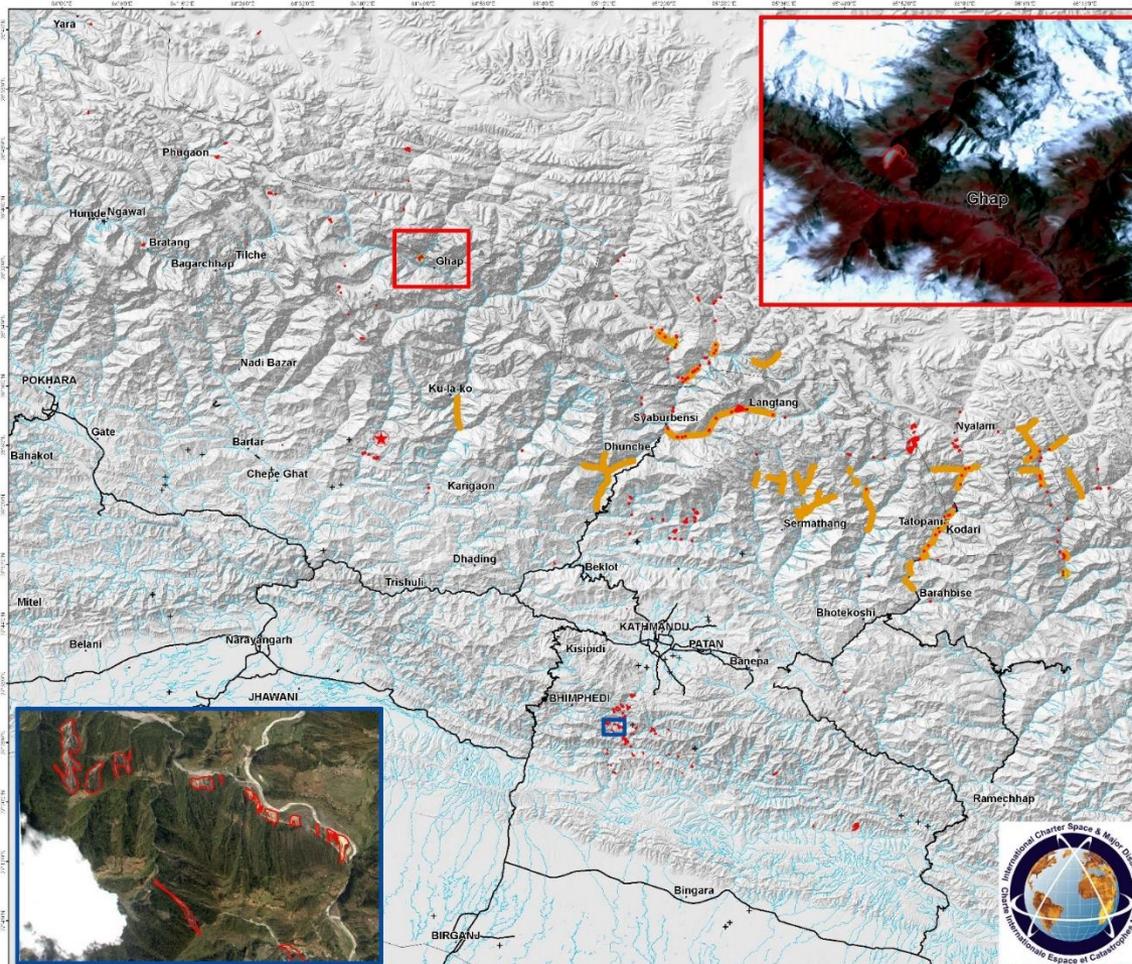




# Example : interest of satellites images for identifying earthquake damages

## Landslides

### Preliminary Landslide Inventory Following 25 April 2015 Nepal Earthquake



**Legend**

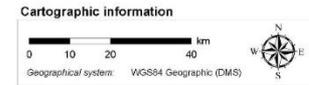
• Cities and towns	■ Landslides active since 25/04/2015
— Main roads	■ Individual landslides
— Rivers	★ Valley blocking
□ Country boundaries	■ Valleys with numerous landslides
★ Epicenter	+ Damaged road

**Interpretation**

This map shows landslides mapped from satellite imagery following the 25 April 2015 Nepal earthquake. The scale of mapping was between 1:5,000 and 1:10,000, therefore the minimum size of feature identifiable on the ground is 5-15 m. Satellite image resolution is between 2.5 m and 22.5 m.

More than 400 new landslides were mapped (by the publication date). Geolocation of landslides may not be accurate.

Top right inset is a DMCI UK-DMC2 satellite image with mapped landslides. Bottom left inset is a DigitalGlobe WorldView-2 satellite image with mapped landslides.



**Data sources**

Satellite data:  
 WorldView © DigitalGlobe (bottom left inset)  
 DMCI © 2015 DMCI (top right inset)  
 SPOT © CNES 2015  
 Pleiades © CNES 2015

Vector data:  
 Cities, Roads, Rivers, Country boundaries © OpenStreetMap

**Framework**

International Charter Disaster Activation 530/531.

This inventory was prepared in rapid mapping mode using a combination of satellite image interpretation and sourcing information from news reports and cross-checking.

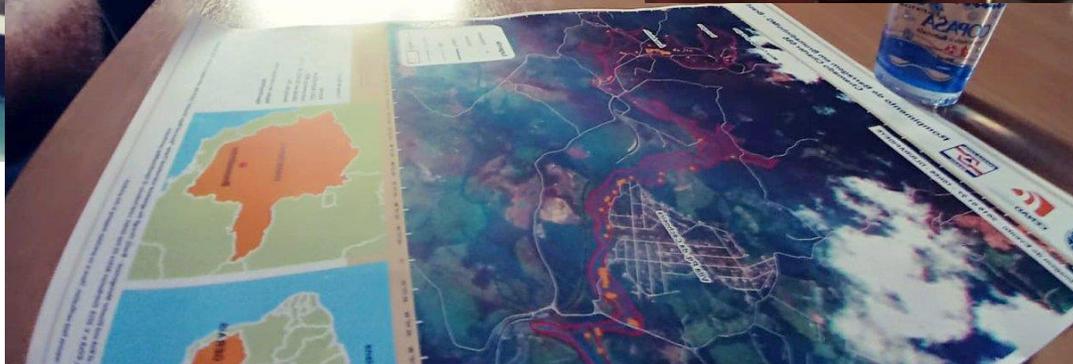
No liability concerning the content or use thereof is assumed by the producer. Product published 5 May 2015 and designed for viewing at A0 paper size.





# Examples: Use of charter maps in the field

## Dam collapse in Brazil in January 2019





# Conclusions / Societal benefit achieved by the Charter

- The International Charter Space and Major Disasters is a rush-mode mechanism **supporting emergency response by providing quick access to satellite data and/or derived products.**
- It is the intention of the Charter members to **help save lives, property, infrastructure, and the environment** in cases of major disasters worldwide in using space technologies.
- The Charter has grown much since 2000, covering almost **600 emergencies** caused by disasters **in more than 120 countries.**
- **Universal Access** encourages disaster management authorities from all countries to become Authorised Users after training.
- The Charter encourages **in-country capacities** to act as “Project Managers” and “Value Adders” (producers of satellite-based maps)
- In fruitful **collaboration with UNOOSA/UN-SPIDER, UNITAR/UNOSAT, Sentinel Asia, and the Copernicus Emergency Management Service,** the Charter intends to help filling the gap between space-faring and space-emerging nations.



**Meet us today !**  
**C0431**  
**2:00 – 3:00 pm**

Find the Charter at

<https://disasterscharter.org>

<https://twitter.com/disastersChart>