

# Overview of UNITAR-UNOSAT and GDACS Satellite Mapping Coordination System

**Trainer**  
**Luca Dell'Oro**

21 Feb 2017

# Outline

- **Overview of UNITAR's Operations Satellite Applications Programme (UNOSAT)**
- **UNOSAT Humanitarian Rapid Mapping Framework**
- **Operational Case Studies**
  - Natural Hazards
  - Complex Emergencies
- **UNOSAT Platforms and Tools for Data Sharing And Satellite Mapping Coordination**
  - GDACS Satellite Mapping Coordination System - SMCS
- **Questions and Answers**

The aim of the lecture is to provide participants with an overview of the UNOSAT operational humanitarian rapid mapping service to support planning and coordination of UN agencies and UN Member States during humanitarian crises.

**At the end of the lecture participants should be able to:**

- Describe UNOSAT's operational activities including satellite derived analysis in support of international humanitarian operations.
- Describe how the GDACS-Satellite Mapping Coordination System (SMCS) supports data sharing and satellite mapping coordination during major disasters.

## The Institute Core Functions

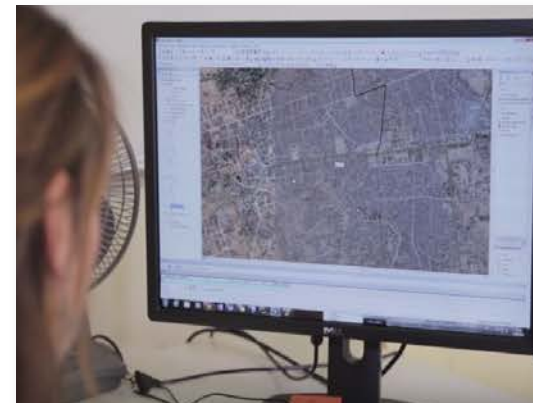
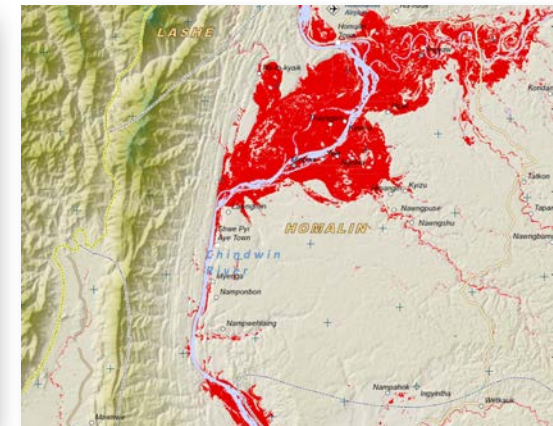
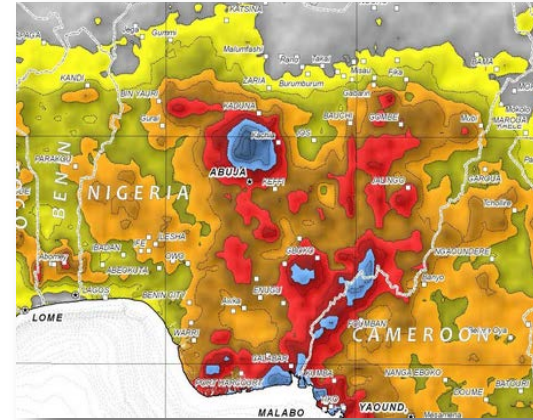
- Design and deliver innovative **training**
- Facilitate **knowledge- and experience-sharing**
- Conduct **research** on and pilot innovative learning strategies
- Advise and support governments, UN and other partners with **technology-based knowledge-related services**
- **9 Programmes** that deliver training and capacity development in specific focus areas

## Thematic Areas

- Capacity for the 2030 Agenda
- Strengthening multilateralism
- Advancing environmental sustainability and green development
- Improving resilience and humanitarian assistance
- Promoting sustainable peace
- Promoting economic development and social inclusion

# UNOSAT: UNITAR Satellite Applications Programme

- An **operational programme** of UNITAR serving the UN, international organizations and governments
- Fully dedicated to **satellite imagery analysis**, applications of geospatial information technologies, **training and capacity development**
- Operational since **2001**
- Currently **30 employees**



[www.unitar.org/unosat](http://www.unitar.org/unosat)



## ANALYSIS & MAPPING

Satellite Analysis, Climate Service, Applied Research and Innovation



## TRAINING AND CAPACITY DEVELOPMENT

Hands on, National and Regional level, Technical Backstopping

Geospatial Support services & Knowledge Transfer



# Training and Capacity Development

# Training & Capacity Development Activities

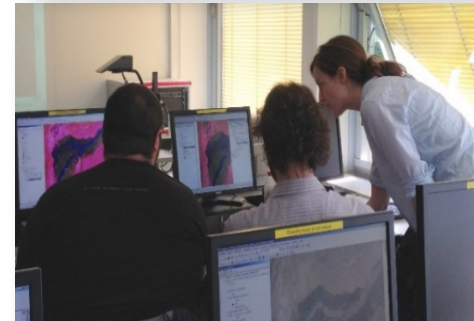
Master level courses

Basic and advanced courses

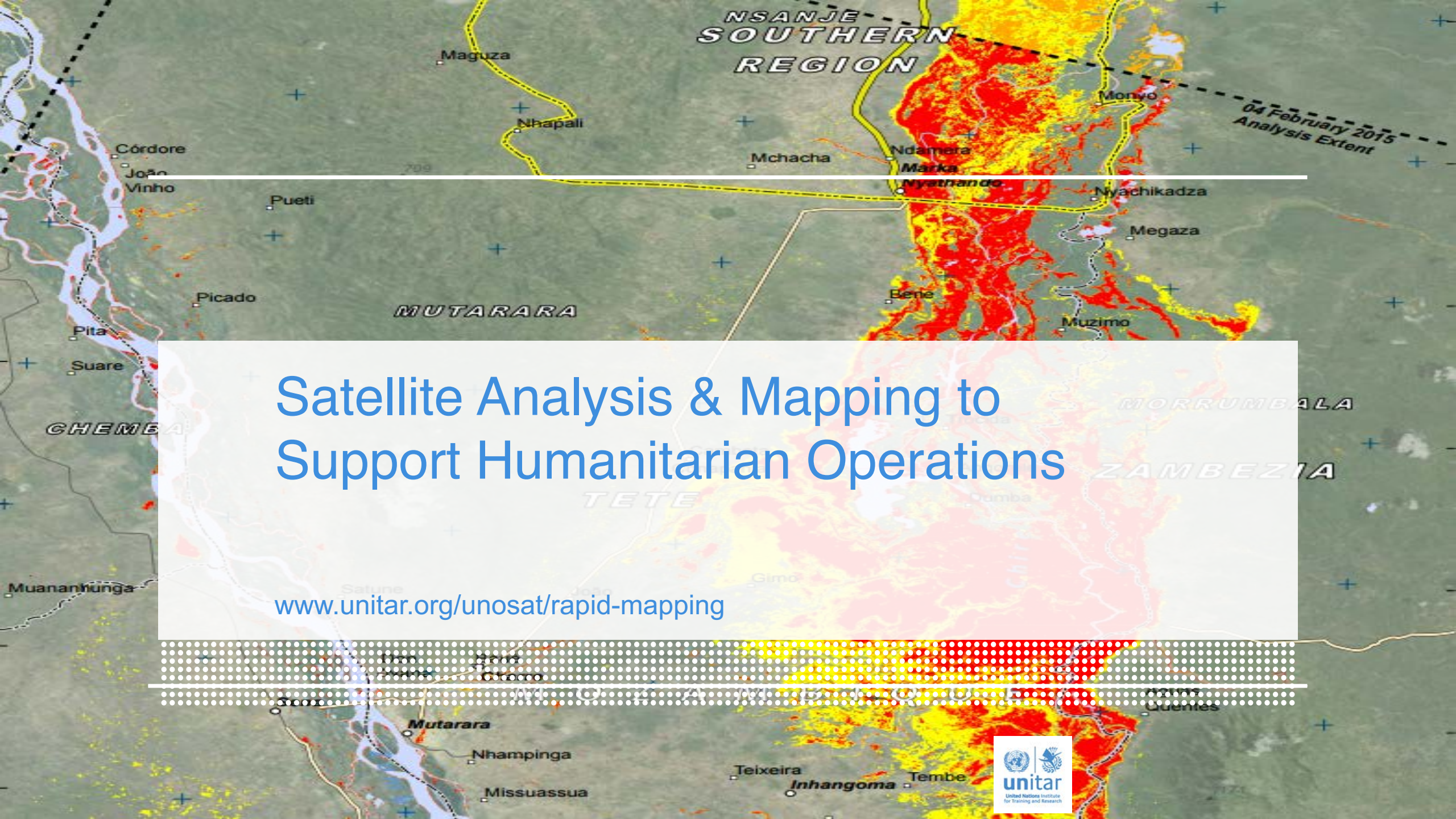
Capacity development programmes

Workshops and information sharing

- We design and deliver (**basic** and **advanced**) training on the use and applications of Geospatial Information Technology (GIT) for disaster risk reduction.
- Courses are delivered face-to-face either in situ or at the headquarters in Geneva, Switzerland, and can be customized to needs.
- **Target Audience: Professionals** from:
  - National governments
  - Regional and international organizations
  - UN agencies
  - Academia
  - The private sector







# Satellite Analysis & Mapping to Support Humanitarian Operations

[www.unitar.org/unosat/rapid-mapping](http://www.unitar.org/unosat/rapid-mapping)



# UNOSAT's Humanitarian Rapid Mapping Service

- UNOSAT provides [Satellite Imagery Analysis](#) during [Humanitarian Emergencies – Natural Disasters and Conflict-Situations](#) (Maps, GIS-ready data, statistics and reports).
- Several hundred-thousands sqkm of satellite images from commercial and scientific sensors are acquired and processed by UNOSAT (per year): from very high resolution (50 cm), to low resolution (1km)

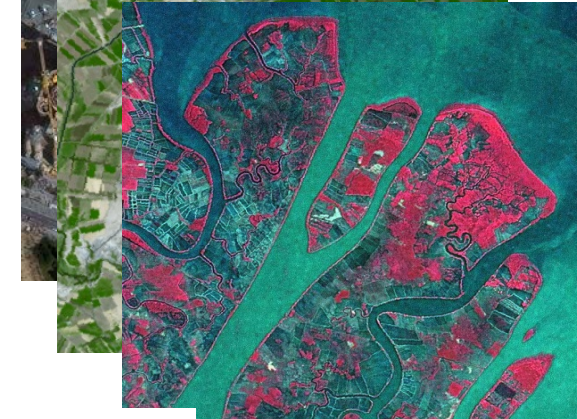
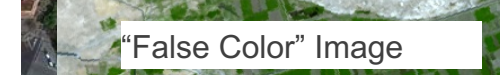
## OPTICAL:

DG (Worlview-1/2/3, GeoEye ) ; Pléiades ; MODIS, Landsat-8 ; Sentinel-1/2, Landsat 8, Deimos, KOMPSAT-2/3

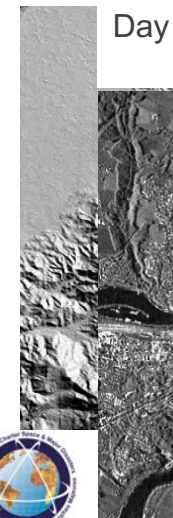
## RADAR :

- Sentinel-1 / Radarsat-2 / TerraSAR-X / CosmoSkyMed/ RISAT, ALOS-PALSAR

Very High Resolution Image

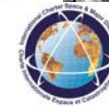
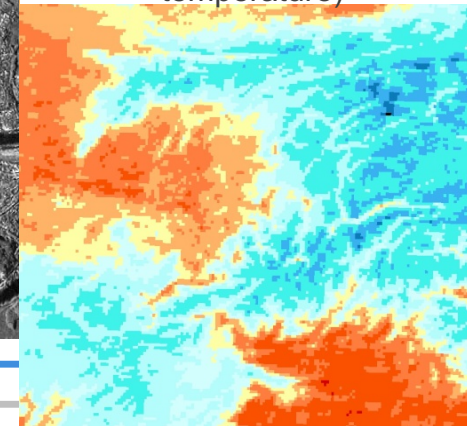


Digital Elevation Models



Day & night – Cloud free radar image

Gridded data  
(e.g., Precipitation, soil/water temperature)

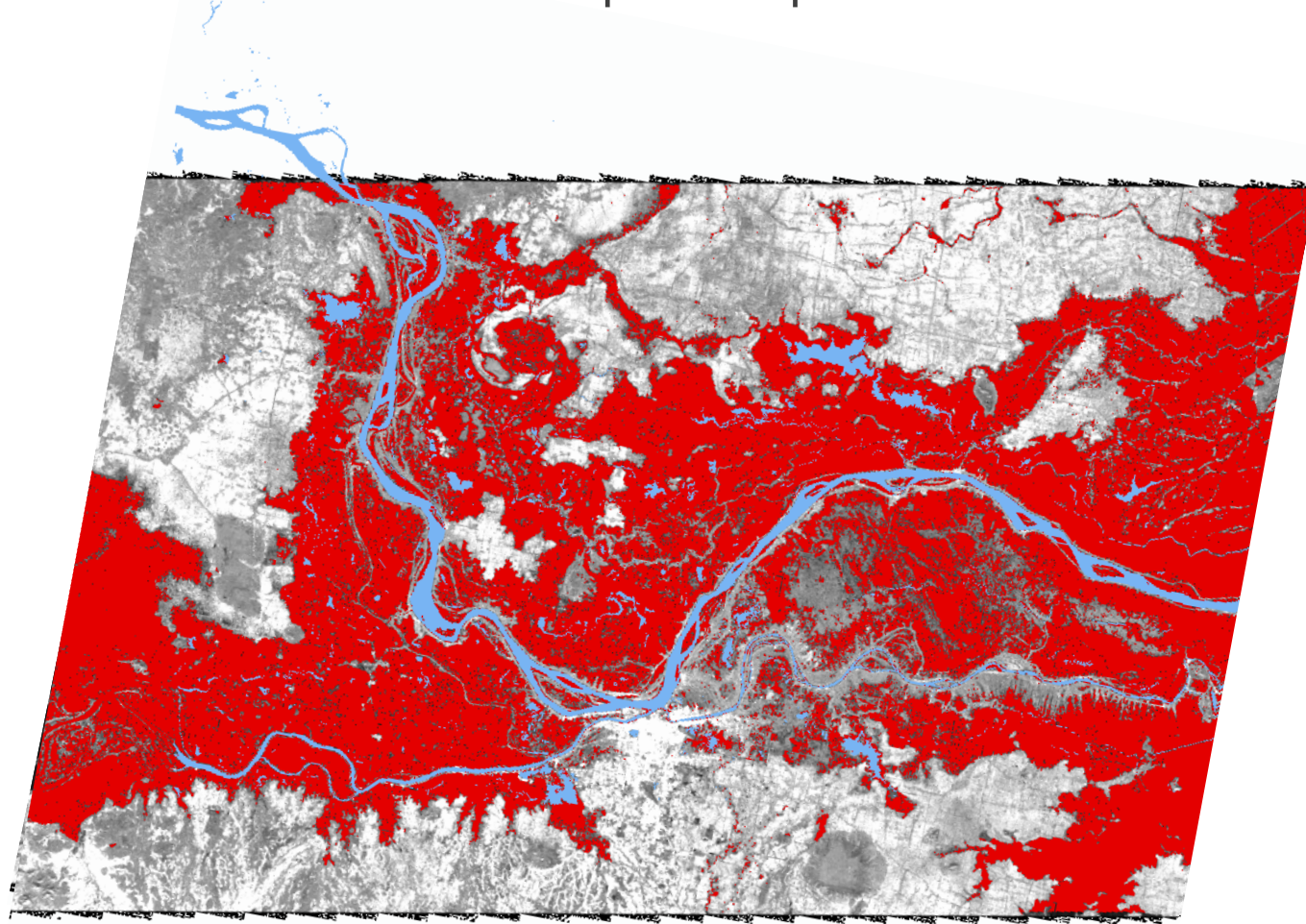


# Benefits of Satellite Imagery in Emergency Response

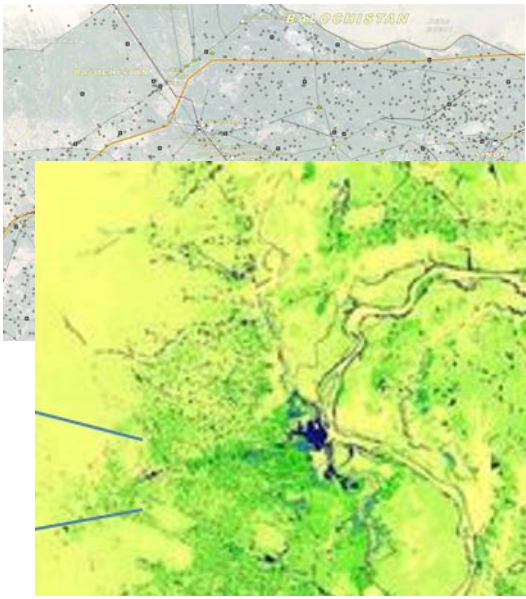
- **Scale flexibility**  
Many different optical and radar sensors orbiting the earth capable to provide evidence based information at global, regional and local scale.
- **Daily to weekly imagery acquisition**  
Capability to monitoring sudden/slow onset disasters as well as protracted crisis worldwide.
- **Multiplicity of spectral bands**  
Fine discrimination of physical and spectral characteristics of objects and features on the ground (to assess impacts and damages: buildings, infrastructures, roads, agricultural areas etc.).
- **Absence of political or physical limits**  
Imagery acquisition covering covering thousands of sqkm. Ideal to get information regarding remote, inaccessible or/and politically sensitive areas..
- **Information-objectivity / evidence based**  
Since satellites record what actually exist on the ground nobody can argue that information has been omitted or changed (common ground for stating facts and framework for negotiations)



Extraction of water extent from pre and post event satellite image



# Preliminary Exposure/Impact Analysis



**Vector  
Baseline  
Data**

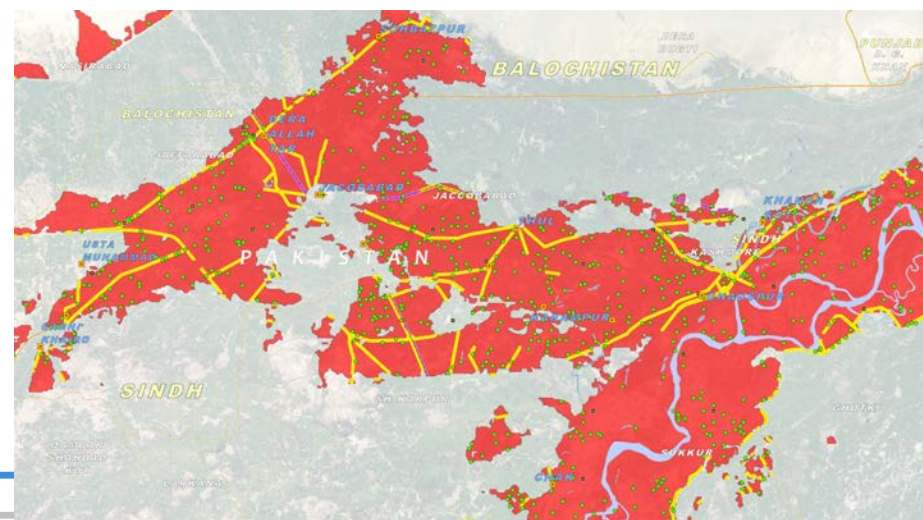
**Population  
distribution**

+

**UNOSAT  
Flood  
Water  
Analysis**



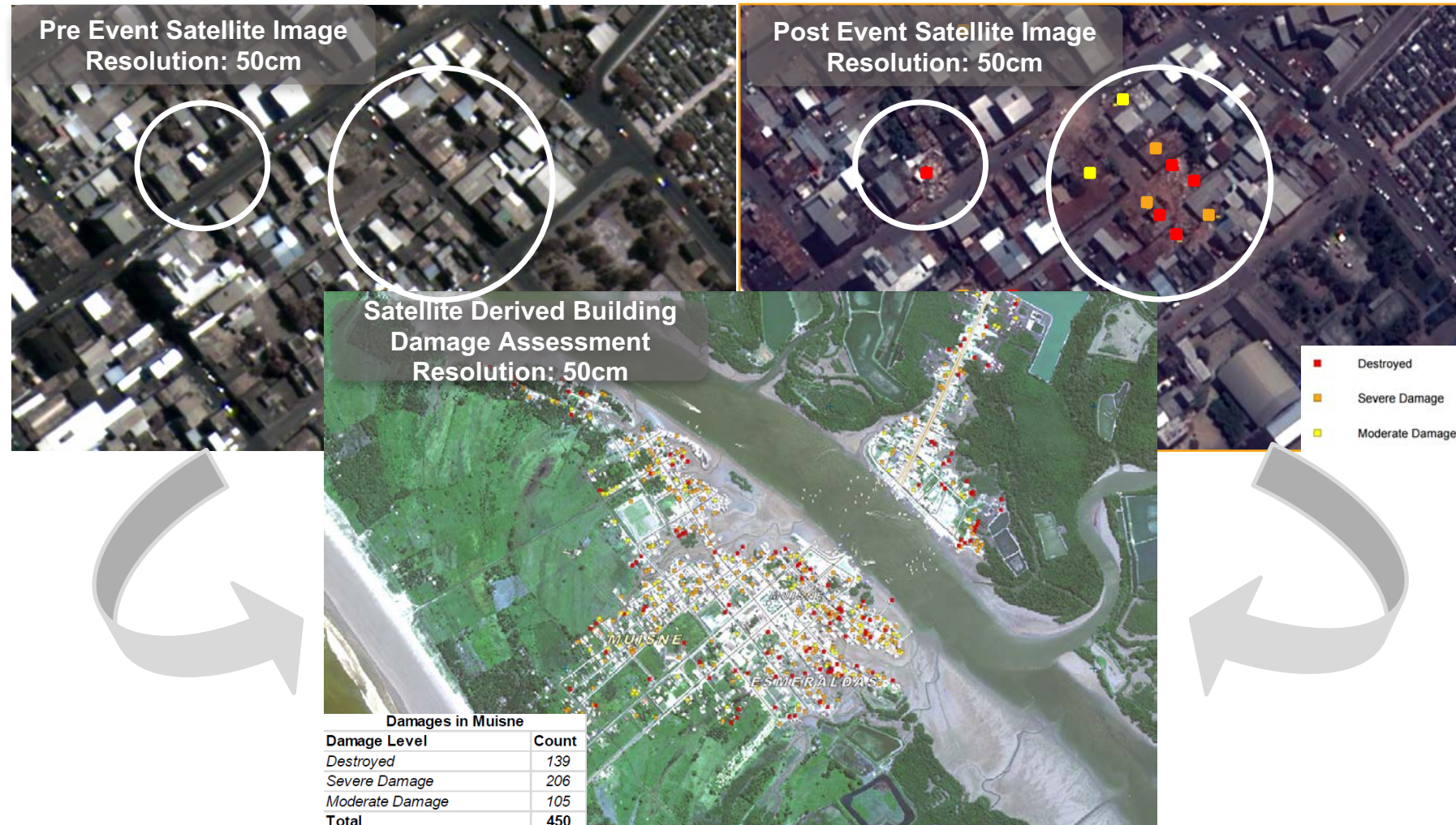
**Combination of data allows for  
detailed and comprehensive  
preliminary exposure analysis**



**Summary of Flood-Affected Populated Places and Infrastructure**

Province	BALUCHISTAN	KHYBER PAKHTUNKHWA	PUNJAB	SINDH	Others	Total
Village Count	174	808	4,037	2,463	10	<b>7,492</b>
Towns / Cities	6	39	54	36	0	<b>135</b>
Health facilities	12	20	70	88	0	<b>190</b>
Bridges	11	183	139	95	1	<b>429</b>
Roads (km)	313	772	1,613	2,331	21	<b>5,051</b>
Railways (km)	10	27	169	199	0	<b>406</b>

## Visual Interpretation of level of building damage from Pre and Post VHR Image

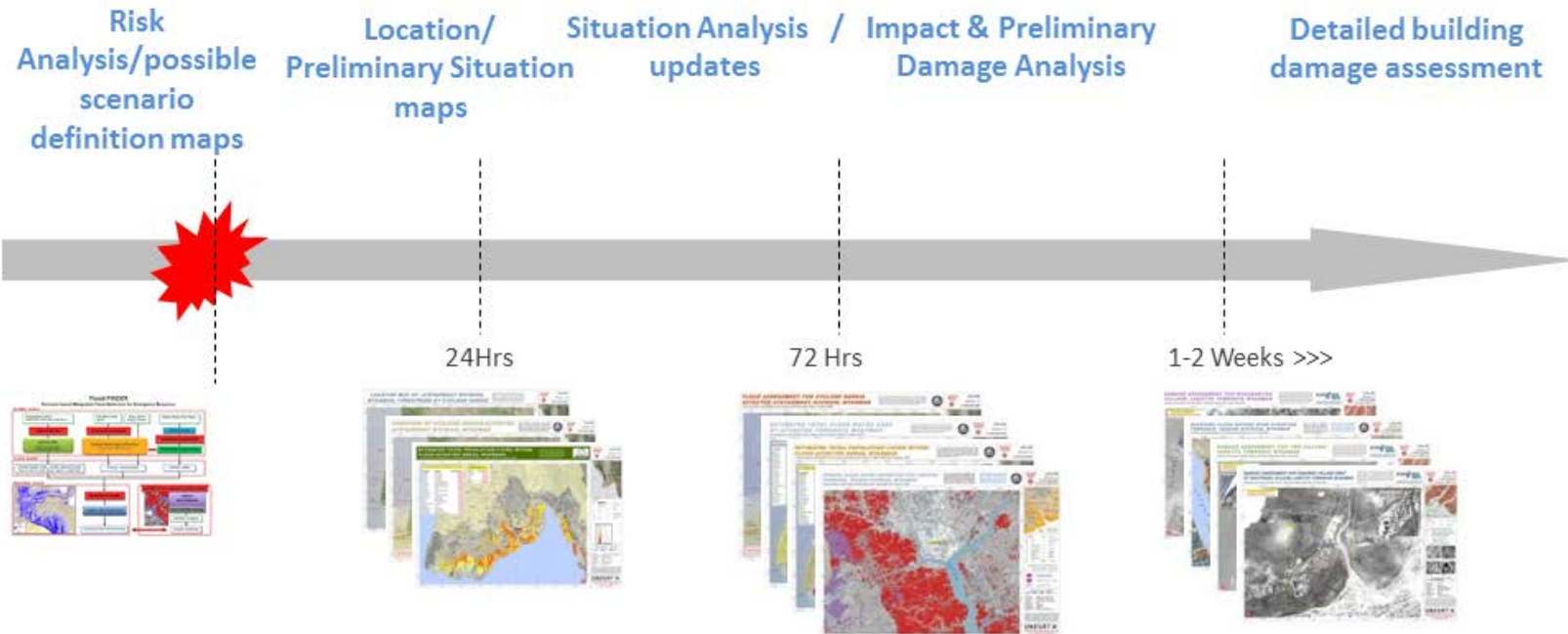
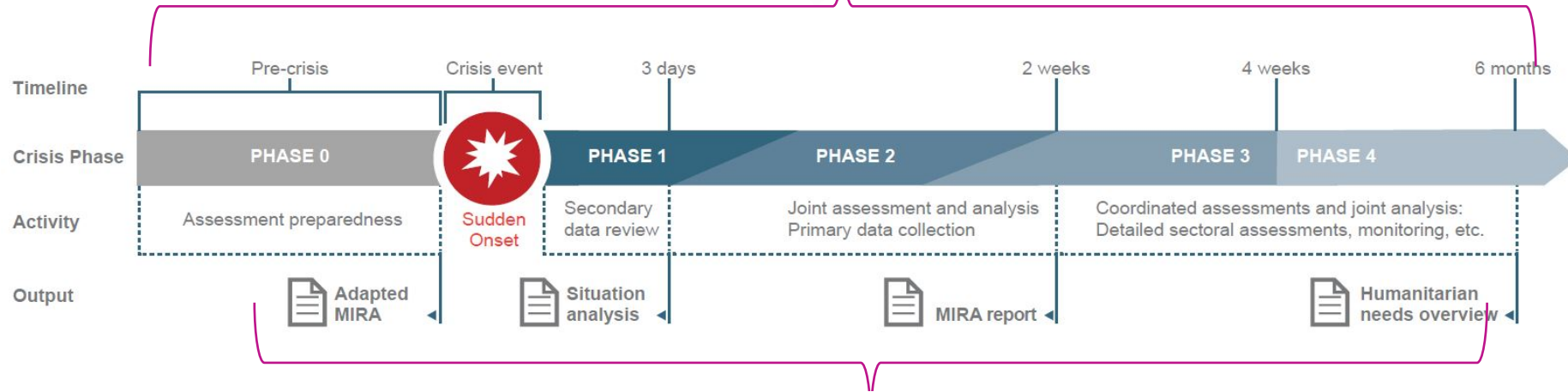


“A complex emergency or **major disaster** is a multifaceted humanitarian crisis in a country, region or society where there is total or **considerable breakdown of authority and response capacity** which requires a multi-sectoral, international response that **goes beyond the mandate or capacity of any single agency and/or ongoing UN country programme**”

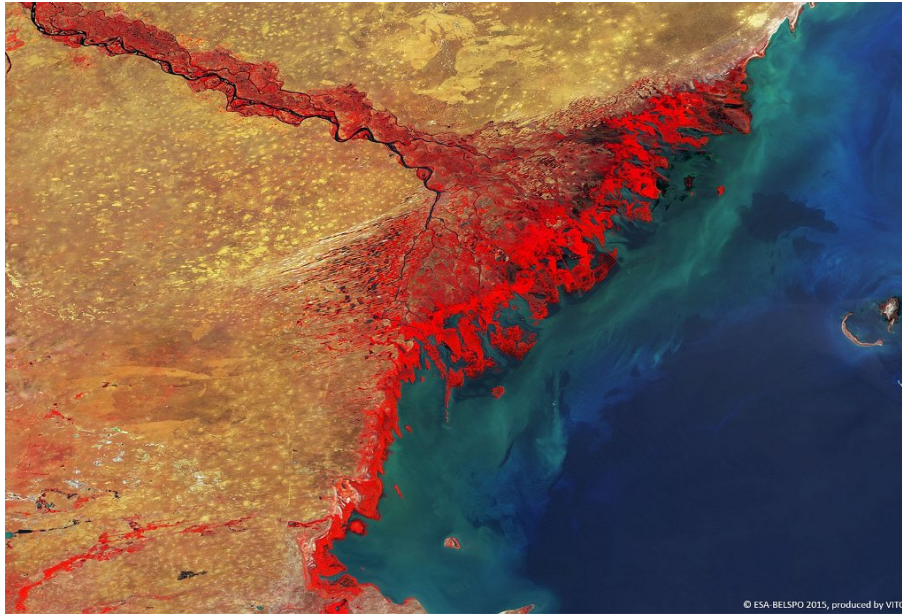
Inter-Agency Standing Committee, Dec 1994.



# UNOSAT'S Rapid Mapping Operational Framework







## Natural Disasters:

- ✓ Floods
- ✓ Drought
- ✓ Cyclones
- ✓ Landslides
- ✓ Earthquakes
- ✓ Volcanic eruptions

## Conflicts:

- ✓ Refugee and IDPs mapping
- ✓ Conflict damage assessment
- ✓ World Heritage Sites
- ✓ And so on..



# Haiti - Hurricane Matthew 2016: Geospatial approach to estimate Population exposure / impact and damage to infrastructures (Natural Disaster)

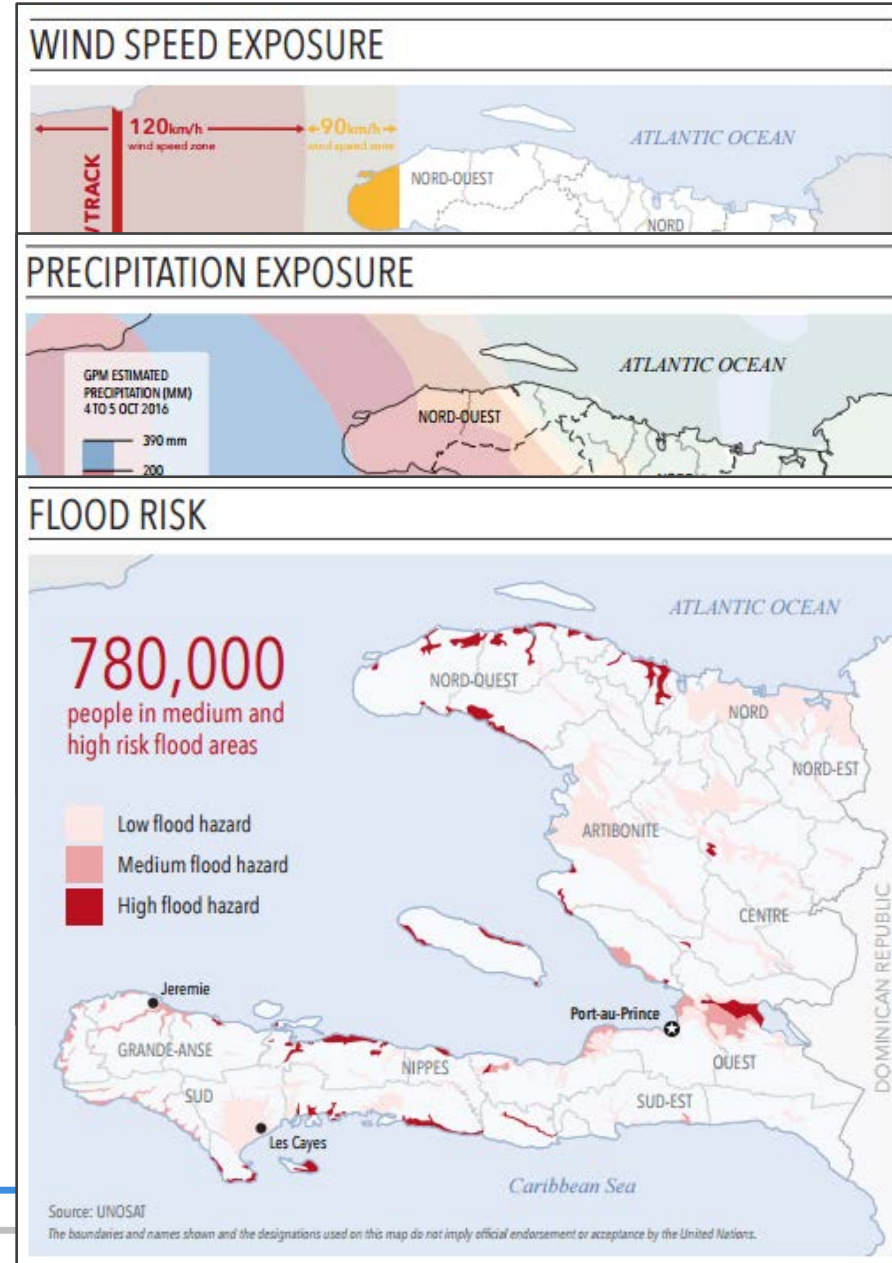
**2016** **FLASH APPEAL**

OCTOBER



**HAITI**

**Hurricane Matthew**, a Category 4 storm with sustained winds of 235 km/h, violently struck south-western Haiti on 4 October causing widespread damage, flooding and displacement.



# Haiti - Hurricane Matthew 2016: Geospatial approach to estimate Population exposure / impact and damage to infrastructures (Natural Disaster)

Building damage analysis, including a rapid assessment of transportation network conditions and locations of spontaneous people gathering sites.

## Analysis Summary: Area 1, Area 2, Area 3 & Area 4



**40,696**

*Buildings/structures damages*



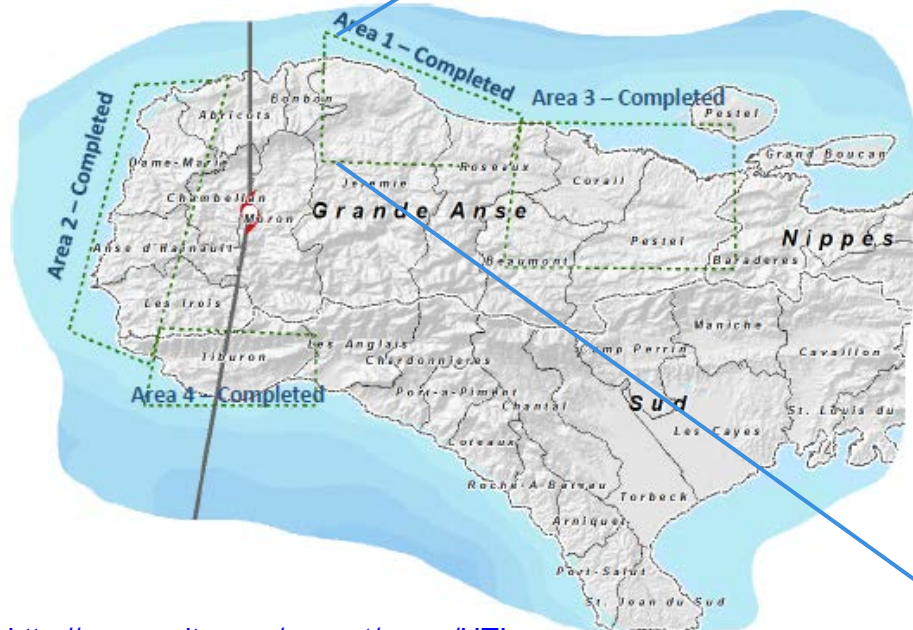
**1,497**

*People gathering sites*



**508**

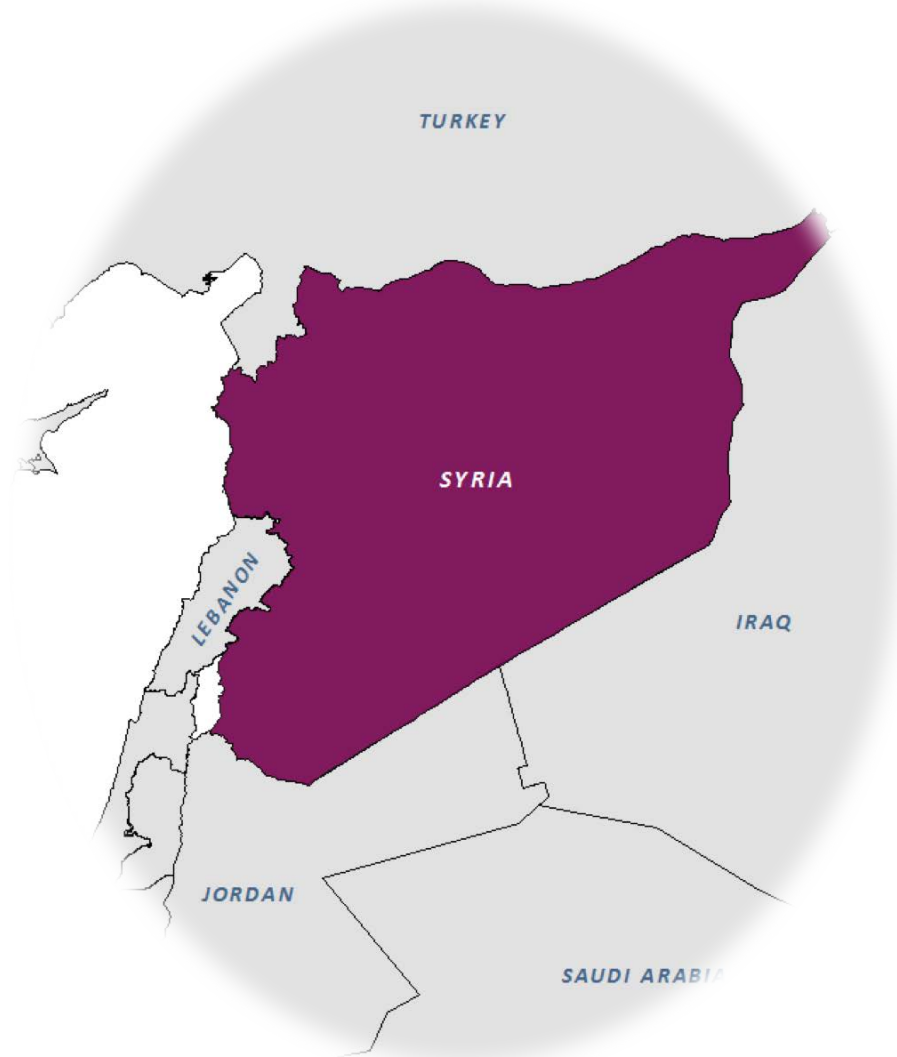
*Road obstacles*



Buildings and/or structures damaged in Marfranc section Cmmunale



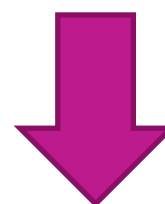
<http://www.unitar.org/unosat/maps/HTI>



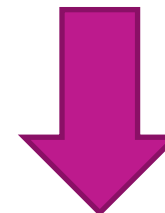
Since the conflict in Syria started in March 2011, Humanitarian Community requires information to plan efficient delivery of humanitarian assistance to affected population and people in needs.

Due to accessibility constrains in conflict areas **UNITAR-UNOSAT has been requested by different humanitarian actors to monitoring conflict situation using satellite imagery and provide evidence based analysis**

## **ESTABLISH A DYNAMIC HUMANITARIAN MONITORING SYSTEM**



**DAMAGE ASSESSMENT  
IN URBAN CENTERS**



**REFUGEE, IDP &  
MIGRANT MAPPING**

Military presence in the outskirts of Jisr Al Shugar, Idlib Governorate

Monitoring Critical Facilities: Damage assessment to Markets

Oil Pipelines

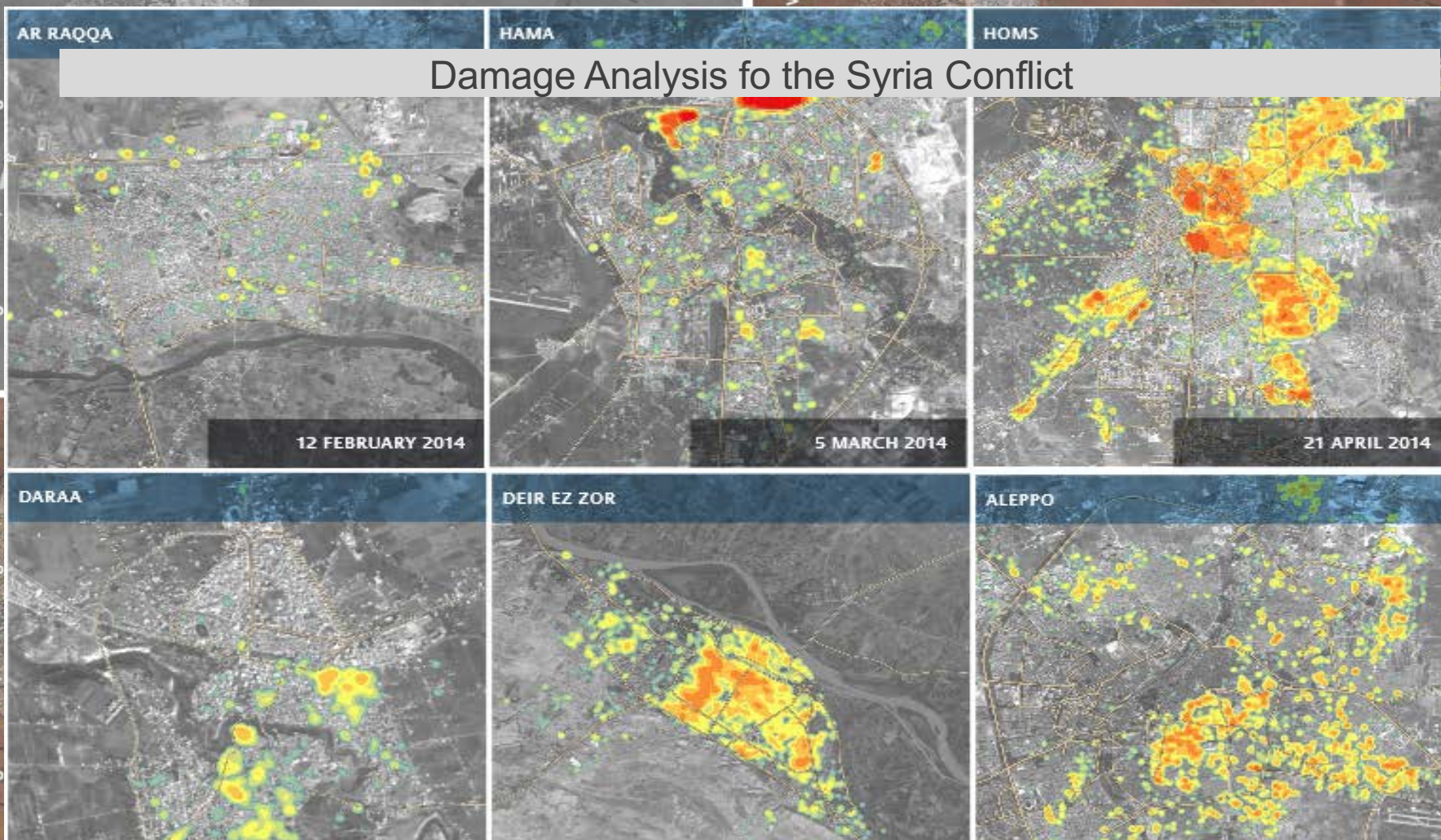
Population Displacement

Monitoring of Refugee Camps

Damage Analysis for the Syria Conflict

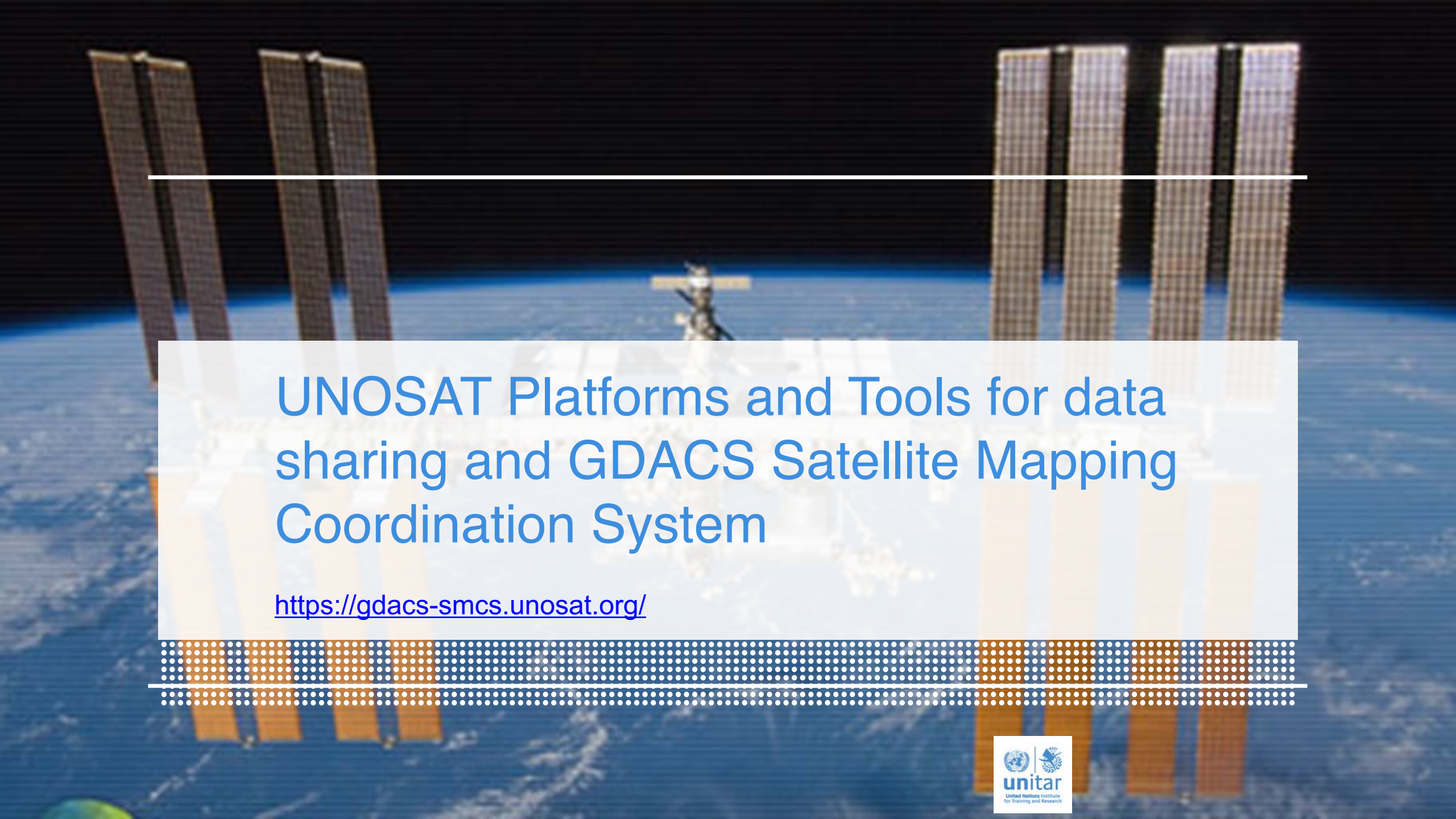
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# UNOSAT Platforms and Tools for data sharing and GDACS Satellite Mapping Coordination System

<https://gdacs-smcs.unosat.org/>


The **Global Disaster Alert and Coordination System (GDACS)** was established in 2003 by the United Nations and the European Commission to fill the information gap in the immediate aftermath of sudden-onset natural disasters.

- GDACS is **designed to alert the international community in the event sudden-onset disasters** that might require international assistance, and to facilitate international information exchange and coordination in the first phase of a disaster.
- GDACS aims at **supporting member states and relief organizations in their decision-making** process through several tools and services provided in real time through the on-line platform.
- The services and tools provided by GDACS are:
  - **Automatic disaster alerts**
  - **Automatic impact estimations**
  - **Real-time coordination platform for disaster managers**
  - **Satellite Mapping Coordination System (SMCS)**
  - **A community of practice**

# Global Disaster Alert and Coordination System (GDACS)





GDACS is a cooperation framework between the UN managers worldwide to improve alerts, information major sudden-onset disasters.



GDACS is a cooperation framework between the United Nations, the European Commission and disaster managers worldwide to improve alerts, information exchange and coordination in the first phase after major sudden-onset disasters.

United Nations and the European Commission

Global Disaster Alert and Coordination System

HOME ALERTS VIRTUAL OSOCC **DATA, MAPS & SATELLITE IMAGERY**





Global Disaster Alert and Coordination System

HOME ALERTS VIRTUAL OSOCC **DATA, MAPS & SATELLITE IMAGERY** SCIENCE PORTAL ABOUT GDACS


Data, Maps and Sat GDACS Platform Satellite Maps IWG-SEM

**Latest disaster alerts**






**EARTHQUAKES**

-  Ecuador (5.5M) 31 Jan 14:22UTC
-  Vanuatu (5.9M) 30 Jan 23:35UTC
-  Southwest Indian Ridge (5.8M) 29 Jan 16:42UTC
-  Kermadec Islands, New Zealand (5.7M) 29 Jan 14:58UTC

**TROPICAL CYCLONES**

-  THREE-17 Australia (83.3km/h) 29 Jan 08:00UTC - GTS

**FLOODS**

-  Honduras 01 Feb 00:00UTC
-  Zimbabwe 01 Feb 00:00UTC
-  Peru 30 Jan 00:00UTC
-  Philippines 31 Jan 00:00UTC FL-2017-000010-PHL
-  Mozambique 30 Jan 00:00UTC FL-2017-000012-MOZ


Disasters in past 4 days.

- [See smaller and archived alerts...](#)
- [Search alerts...](#)
- [About thresholds and models](#)
- [About earthquake selection](#)

**Virtual OSOCC**

RECENT AND OPEN EMERGENCIES

Overview map of latest disaster alerts



Map of disaster alerts in the past 4 days. Last updated: 2017-02-01 10:00:00 UTC. Map produced by the European Union, 2015. Map produced by the European Union.

**Data, Maps and Satellite Imagery**

**Event-based data and information**

Most information in GDACS is organized by event. GDACS collects and organizes several data types:

- **GIS data:** In-situ sensor data, model output data, priority areas, baseline data, satellite image derived data (examples: flood extent, earthquake damage assessment, landslide extent) and more.
- **Media information:** mass and social media, specifically related to events
- **Field data:** reports, photos/videos, GEO-PICTURES and more

**Maps**

GDACS offers automatic links to map products such as baseline maps, situation specific maps, damage assessments and web-maps. These maps are integrated by event in the [VirtualOSSOC](#).

**Satellite imagery**

Satellite imagery is served as web-services when copyright allows for it. Most of the time, satellite image derived products, such as PDF and online web-maps, as well as for example flood extents and earthquake damage assessments derived from satellite imagery are the most useful products for early responders. These products are also served as web-services for in-field or headquarter mapping by UN, NGOs and national entities, in VirtualOSSOC and/or directly from the producing entity.

VirtualOSSOC facilitates on-demand map requests that are handled by UNITAR/UNOSAT, who coordinates the map production and dissemination among map producers worldwide in the early disaster phase. VirtualOSSOC users can also request triggering of the [International Charter - Space and Major Disasters](#) through GDACS/VirtualOSSOC, which then goes for review by OCHA and UNOSAT for potential activation.

**GDACS Satellite Mapping Coordination System (SMCS)** is a tool to inform of on-going and past satellite imagery analyses for specific events. It allows users to see which events are analysed by whom. This contributes to a horizontal (as opposed to top-down) coordination and to reduce duplication of efforts. The SMCS can be seen as a discussion forum and operational coordination tool for satellite image analysis professionals. GDACS encourages all satellite imagery analysis entities to contribute to the SMCS. To contribute please contact [maps@gdacs.org](mailto:maps@gdacs.org)

UNITAR/UNOSAT leads the GDACS working group on maps and satellite imagery and encourages all relevant entities to participate in this work, ensuring a close link to the GDACS user community. The [GDACS Satellite Mapping Coordination System \(SMCS\)](#) is a tool for GIS-experts working with satellite imagery for specific events. It allows users to see which images are collected where and which entity is working on what type of analysis.

**Satellite Mapping Overview**

Title	Modified Date	Clicks
<a href="#">Satellite Mapping Overview</a>	1/31/2017	21
<a href="#">Satellite Mapping Overview</a>	1/24/2017	88
<a href="#">Satellite Mapping Overview</a>	1/17/2017	123
<a href="#">Satellite Mapping Overview</a>	1/10/2017	140
<a href="#">Satellite Mapping Overview</a>	12/19/2016	223
<a href="#">Satellite Mapping Overview</a>	12/6/2016	276
<a href="#">Satellite Mapping Overview</a>	11/29/2016	228
<a href="#">Satellite Mapping Overview</a>	11/4/2016	431
<a href="#">Satellite Mapping Overview</a>	10/25/2016	322
<a href="#">Satellite Mapping Overview</a>	10/20/2016	260
<a href="#">Satellite Mapping Overview</a>	10/13/2016	315
<a href="#">Satellite Mapping Overview</a>	10/13/2016	238
<a href="#">Satellite Mapping Overview</a>	9/27/2016	501
<a href="#">Satellite Mapping Overview</a>	9/23/2016	299
<a href="#">Satellite Mapping Overview</a>	9/14/2016	411
<a href="#">Satellite Mapping Overview</a>	7/12/2016	1026
<a href="#">Satellite Mapping Overview</a>	6/29/2016	514
<a href="#">Satellite Mapping Overview</a>	6/21/2016	505
<a href="#">Satellite Mapping Overview</a>	6/15/2016	491




unitar

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# GDACS - Satellite Mapping Coordination System (SMCS)

GDACS-SMCS Account Create Event View Event

Zoom to Area...

North Pacific North Atlantic South Pacific

NORTH AMERICA SOUTH AMERICA AFRICA EUROPE ASIA AUSTRALIA Indian Ocean

Satellite Mapping Coordination

Only Archived

Only Active

Show Both

Search SMCS Events...

Satellite Mapping Overview Reports

Live Maps

The GDACS Satellite Mapping and Coordination system provides a communication and coordination platform where organisations may monitor and inform stakeholders of their completed, current and future mapping activities for ongoing emergencies. There are three main parts of the GDACS-SMCS:

**Satellite mapping coordination**  
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Request satellite analysis »

Upload field assessments »

Contribute mapping information »

**Satellite mapping overview reports**  
This service summarizes current satellite mapping activities of interest to GDACS stakeholders. It is issued weekly by UNOSAT and based on contributions from map-producing entities and GDACS partners.

View latest reports »

**Live maps**  
UNOSAT Live maps provide an up to date overview of an emergency, bringing together imagery, analysis from different organisations into a single place allowing for a more holistic view of an emergency event.

View Latest Maps »

OCHA Office for the Coordination of Humanitarian Affairs

European Commission

GDACS Global Disaster Alert and Coordination System

unitar United Nations Institute for Training and Research

## Satellite Mapping Coordination System (SMCS)

GDACS-SMCS is a platform for **coordinating satellite imagery analysis & mapping** following **major disaster events** for the benefit of **GDACS stakeholders** and the wider humanitarian community.

The SMCS is a tool used by users working with satellite imagery for specific events that allows to see which images have been collected, their coverage and which entity is working on what type of analysis. In addition to being an operational coordination tool for satellite image analysis professionals, SMCS is also a metadata archive for past events, and a discussion forum.

1. Satellite Mapping Coordination
2. Satellite Mapping Overview Reports
3. Live Maps

<https://gdacs-smcs.unosat.org/>

# Satellite Mapping Coordination – Overview 2016

11 Emergencies  
1 Simulation


6  5  1 

75% Requested  
by UNOCHA



# GDACS - Satellite Mapping Coordination

GDACS-SMCS
Account
Create Event
View Event ▾



**Satellite Mapping Coordination**

- Only Archived
- Only Active
- Show Both

Search SMCS Events...

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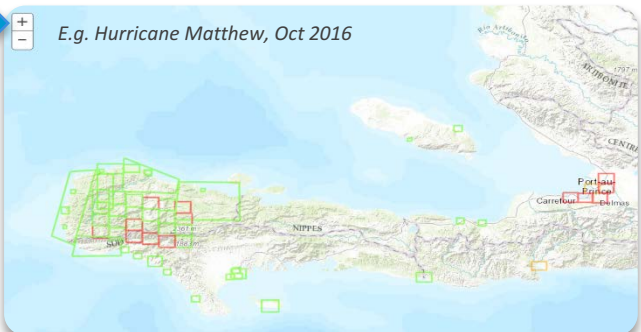
[View Latest Maps](#)

## Satellite Mapping Coordination

- **Who does What, Where in terms of Satellite Analysis & Mapping?**

*E.g. Hurricane Matthew, Oct 2016*



**Analysed by UNOSAT**

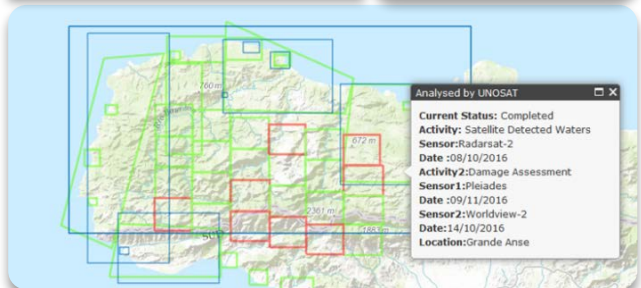
**Current Status:** Completed  
**Activity:** Satellite Detected Waters  
**Sensor:**Radarsat-2  
**Date :**08/10/2016  
**Activity2:**Damage Assessment  
**Sensor1:**Pleiades  
**Date :**09/11/2016  
**Sensor2:**Worldview-2  
**Date:**14/10/2016  
**Location:**Grande Anse

**Imagery Analysis status**

- Planned
- In Progress
- Completed
- All Activities

**Published map products**

- UNITAR-UNOSAT Maps



# GDACS - Satellite Mapping Overview Report

GDACS-SMCS Account Create Event View Event

Zoom to Asia...

**Satellite Mapping Coordination**

- Only Archived
- Only Active
- Show Both

Search SMCS Events...

**Satellite Mapping Overview Reports**

**Live Maps**

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## Satellite mapping coordination

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Input from the field assessments is also made available to help prioritize areas needing further analysis and make available current information to help with decision making

- Request satellite analysis
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- Contribute mapping information

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[View Latest Maps](#)



Global Disaster Alert and Coordination System

## Satellite Mapping Overview Reports

- Narrative overview & summary of ongoing satellite mapping emergencies

*E.g. Hurricane Matthew, Oct 2016*

**GDACS Report for Haiti**

**Title:** Haiti tropical cyclone  
**As of:** 2016-10-24  
**Glide:** TC-2016-000106-HTI  
**Text:** Tropical cyclone Matthew made landfall over the west coast of Haiti on 04 October 2016. The International Charter on Space and Major Disasters was activated on 03 October 2016 by the USGS on behalf of the Pacific Disaster Center, UNITAR-UNOSAT and the Copernicus Emergency Management Service published new products related to the event. UNITAR-UNOSAT recently released an updated satellite based damage assessment report for the Grand South

[Zoom to](#)

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[Zoom to](#)

**Satellite mapping overview**  
 Asia

Philippines tropical cyclone - GLIDE number: TC-2016-000110-PHL  
 On 03 October 2016, tropical cyclone Yaku struck the Philippines and impacted more than 100,000 people. The storm struck only four days after tropical cyclone Sanvu made landfall over the country. The NASA Earth Observatory acquired 18 October 2016 satellite imagery of the situation in the region and created an overview map. All of the data bases were visible approaching the Philippines from the west as a category 4 storm, with maximum sustained winds of approximately 240 kilometers per hour. Almost the same time, tropical cyclone Yaku could be seen tracking over China's Hainan Island, where it made landfall that day. After hitting the Philippines, Yaku also tracked to the west where it ultimately affected the southern part of the country, particularly along Kong. This map product is available for online viewing or download in GeoTIFF and JPEG format on the NASA Earth Observatory website.


Source: NASA Earth Observatory  
 URL: [http://theearthobservatory.nasa.gov/NatImg/imagery/view\\_image.php?id=4856&acc=0&embed=on](http://theearthobservatory.nasa.gov/NatImg/imagery/view_image.php?id=4856&acc=0&embed=on)

Caribbean  
 Cuba tropical cyclone - GLIDE number: TC-2016-000038  
 Cuba was hit with heavy rainfall and strong winds on 04 October 2016 as tropical cyclone Matthew struck the northern coast of the country. The International Charter on Space and Major Disasters was activated on 03 October 2016 by UNOSAT and UNOSAT/UNOSAT and project management was activated by the European Space Agency. UNITAR-UNOSAT published a preliminary satellite based damage assessment report of its findings in Guantánamo Province, as well as new maps of damage in the Baracoa and Cabaiguán areas. Using satellite imagery from 07, 10 and 11 October 2016, UNITAR-UNOSAT identified a total of 1437 damaged buildings in the Baracoa, Cabaiguán, Matanzas and Havana areas of Guantánamo Province. New maps indicate 5,147 of these damaged structures were located in Baracoa and CIG were observed in the Cabaiguán area. Products are available for download in PDF and JPEG format on the International Charter on Space and Major Disasters and UNITAR-UNOSAT website. Accompanying data is also available in GeoTIFF and JPEG geotagged format on the UNITAR-UNOSAT website.

Source: International Charter on Space and Major Disasters, UNITAR/UNOSAT  
 URL: <http://www.spaceandmajordisasters.org/units/unosat/units.html>

# GDACS - Live Maps

GDACS-SMCS
Account
Create Event
View Event ▾



**Satellite Mapping Coordination**

Only Archived

Only Active

Show Both

Search SMCS Events...

**Satellite Mapping Overview Reports**

**Live Maps**

The GDACS Satellite Mapping and Coordination system provides a communication and coordination platform where organisations may monitor and inform stakeholders of their completed, current and future mapping activities for ongoing emergencies. There are three main parts of the GDACS-SMCS:

**Satellite mapping coordination**

The GDACS Satellite Mapping and Coordination system provides a communication and coordination platform where organisations may monitor and inform stakeholders of their completed, current and future mapping activities for ongoing emergencies. Input from the field assessments is also made available to help prioritize areas needing further analysis and make available current information to help with decision making.

Request satellite analysis »

Upload field assessments »

Contribute mapping information »

**Satellite mapping overview reports**


This service summarizes current satellite mapping activities of interest to GDACS stakeholders. It is issued weekly by UNOSAT and based on contributions from map-producing entities and GDACS partners.

View latest reports »


**Live maps**

UNOSAT Live maps provide an up to date overview of an emergency, bringing together imagery, analysis from different organisations into a single place allowing for a more holistic view of an emergency event.


View Latest Maps »




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Humanitarian Affairs



European  
Commission



GDACS  
Global Disaster Alert and Coordination System

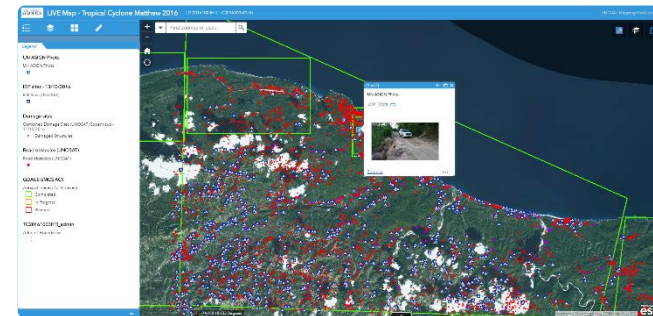


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Training and Research

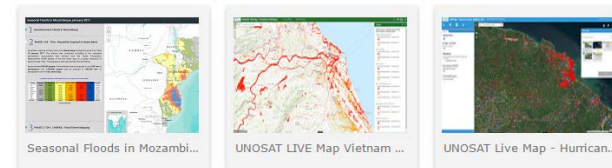
## Live Maps

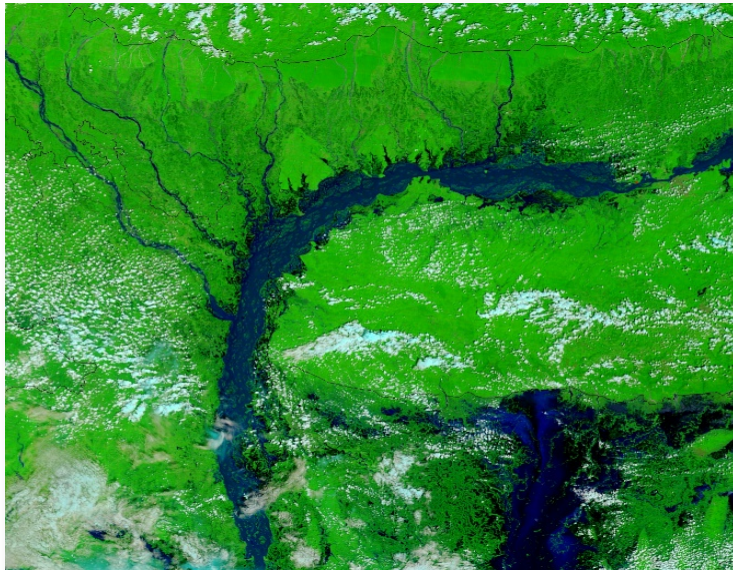
- **UNOSAT LIVE MAP** allows users to interact with satellite imagery analysis in an intuitive and eye-catching manner, allowing easy visualisation of the affected areas, and allowing users to focus on what interests them most, giving a better local understanding of the situation. These maps are updated as new data is available over the course of an event

*E.g. Hurricane Matthew, Oct 2016*



*Latest UNOSAT Live Maps*





UNITAR	<a href="https://www.youtube.com/watch?v=48bSEKW4W3w&amp;feature">https://www.youtube.com/watch?v=48bSEKW4W3w&amp;feature</a>
UNOSAT's Rapid Mapping	<a href="https://www.youtube.com/watch?v=FkR3N5ktt4U">https://www.youtube.com/watch?v=FkR3N5ktt4U</a>
Master level training course with University of Copenhagen	<a href="https://www.youtube.com/watch?v=oXe4aACkvzk">https://www.youtube.com/watch?v=oXe4aACkvzk</a>
Unmanned Aerial Systems for Rapid Mapping	<a href="https://www.youtube.com/watch?v=3IU0-KqGqkg">https://www.youtube.com/watch?v=3IU0-KqGqkg</a>
Growth of AlZaatari Refugee Camp	<a href="https://www.youtube.com/watch?v=g2h-UEdgiQs">https://www.youtube.com/watch?v=g2h-UEdgiQs</a>
UNOSAT at TEDx: There is nothing natural about disasters	<a href="https://www.youtube.com/watch?v=h7fbfZxoWIY">https://www.youtube.com/watch?v=h7fbfZxoWIY</a>
Introduction to International Charter Space and Major Disasters	<a href="https://www.youtube.com/watch?v=dRN1dkHqIPM">https://www.youtube.com/watch?v=dRN1dkHqIPM</a>
NASA Earth Observatory:	<a href="http://earthobservatory.nasa.gov/">http://earthobservatory.nasa.gov/</a>
Advantages and challenges of satellite based response:	<a href="http://www.sciencedirect.com/science/article/pii/S1877042814016449">http://www.sciencedirect.com/science/article/pii/S1877042814016449</a>



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# Questions and Answers



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