



**unitar**

United Nations Institute for Training and Research

# **Knowledge transfer: Geographic information technologies in support of resilience to climate change and disasters in Small Island Development States**

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Milan, Italy, 14 October 2015

Einar Bjorgo, UNOSAT manager



# Introduction to UNOSAT

- A programme in the Research Department of United Nations Institute for Training and Research (UNITAR)
- UNOSAT established in 2000
- Fully dedicated to satellite imagery analysis, applications of geospatial information technologies, training and capacity development
- 30 people
- Geneva (hosted at CERN), N'Djamena, Nairobi, Bangkok



50%

## MAPPING

Research, Analysis &  
Applications

50%

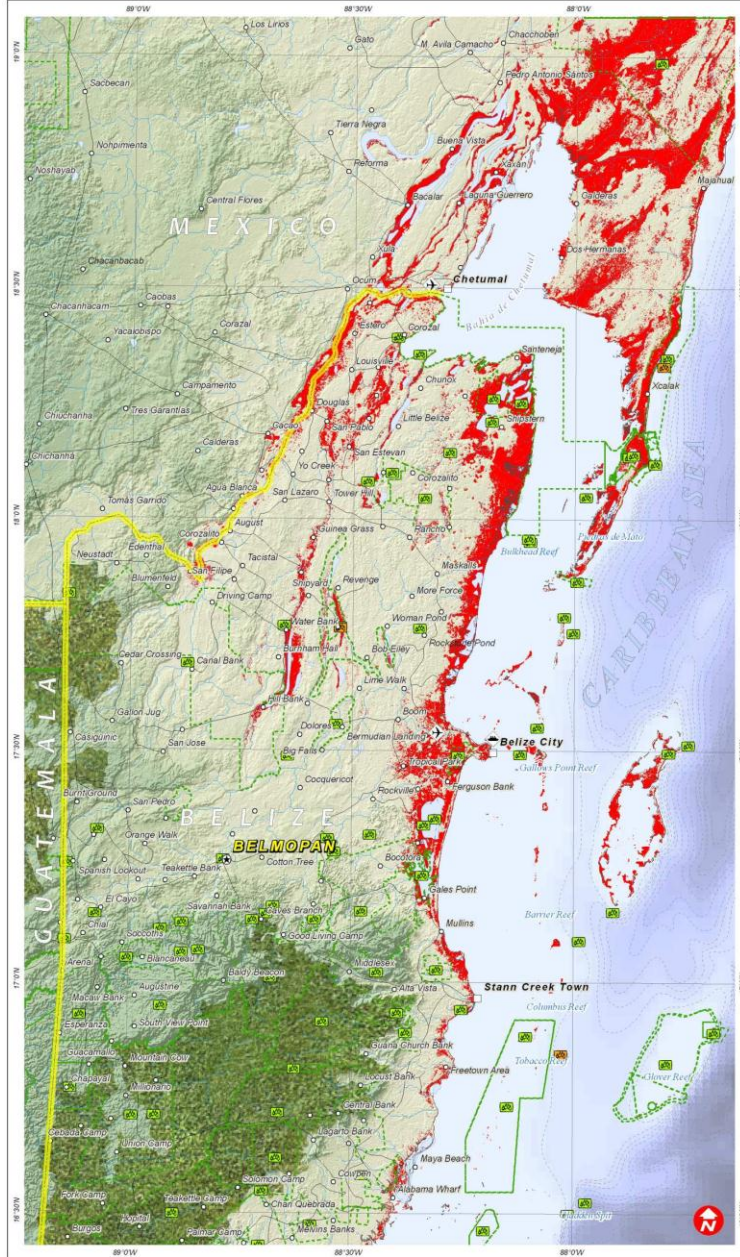


## Training & Capacity Development

Hands-on, Data and  
Knowledge Transfer



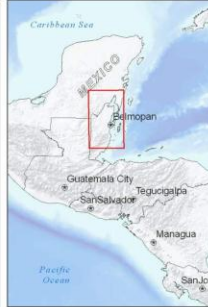
# BELIZE: MAP OF LAND SURFACE AREAS UNDER 4 METERS IN ELEVATION



Hurricane 19-22 August 2007

Version 1.0

Glide No: TC-2007-000135



### Map Information

This map identifies (in red) those land surface areas in northern Belize under 4 meters in elevation, as measured from the SRTM 30m dataset. This represents an approximated upper limit for the NOAA anticipated storm surge of Hurricane Dean which made landfall near Belize on 21 August 2007. This is a preliminary analysis and has not yet been verified in the field.

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. This map was produced by the United Nations Institute for Training and Research (UNITAR) Operational Satellite Applications Programme (UNOSAT). UNOSAT provides satellite imagery and related geographic information to UN humanitarian and development agencies and their implementing partners.

**Map Legend**

- Land under 4m Elevation
- Capital
- City or Main Town
- Village or Town
- Port Facility
- Airport / Airfield
- World Heritage Site
- Protected Natural Site
- International Border
- Drainage Line (SRTM)
- Road
- Lake / Main River
- Protected Natural Area
- Intact Forest Area

**PLACE NAMES**

- BELIZE** ..... Country
- BELMOPAN** ..... Capital
- Belize City** ..... City / Large Town
- Stann Creek** ..... Town or Village
- Glover's Reef** ..... Reef / River

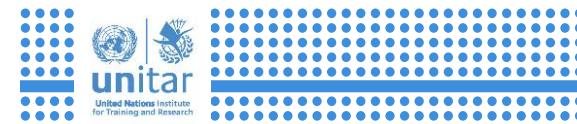
**Map Scale for A3: 1:820,000**

0 4.5 9 18 27 36 Kilometers

Population Data ..... LandScan-2004 CNL  
 Elevation Data ..... SRTM-NAO (2000)  
 Boundary Data ..... SALB-WHO  
 Forest Data ..... GreenPestic WIF (2007)  
 Park Data ..... UNEP-WDPA (2006)  
 Other GIS Data ..... NOAA, NGA, OCECO  
 Map Production ..... UNOSAT (22 August 2007)  
 Projection ..... UTM Zone 18N  
 Datum ..... WGS 1984

**UNOSAT**

satellite imagery for all  
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# FLOOD AFFECTED AREAS ALONG MATANIKAU RIVER, HONIARA, GUADALCANAL, SOLOMON ISLANDS



Production Date:  
09.04.2014  
Version 1.0  
Glide Number:  
FL20140405SLB

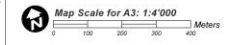
Analysis with Resurs-P Data Acquired 08 April 2014 and Kompsat-2 Data Acquired 16 January 2012



This map illustrates satellite-detected urban areas that were affected by flash flooding along the Matanikau River in Honiara, capital city of the Solomon Islands. Analysis was conducted using a Resurs-P panchromatic image. Traces of waters can be seen in urban areas along the Matanikau River and several houses seem to have been washed out and/or flooded by the flash flooding event. A bridge in the Chinatown neighbourhood appears to be totally destroyed, however the main bridge further north seems intact. The exact limit of flood affected zones is uncertain because of the sensor characteristics of the satellite data and the nature of the event (flash flood). This is a preliminary analysis and has not yet been validated in the field. Please send ground feedback to UNITAR / UNOSAT.

**LEGEND**

- Affected Bridge
- Bridge
- Secondary Road
- Local/Urban Road
- Flood Affected Zone



Satellite Data (1): Resurs-P  
Imagery Dates: 08 April 2014  
Resolution: 1 m  
Copyright: Roscosmos  
Source: Roscosmos  
Satellite Data (2): KOMPSAT-2  
Imagery Dates: 16 January 2012  
Resolution: 1 m  
Copyright: KARI  
Source: KARI  
Road Data - OSM (via bbkai)  
Other Data: USGS, UNCS, NASA, NGA  
Analysis: UNITAR / UNOSAT  
Production: UNITAR / UNOSAT  
Analysis conducted with ArcGIS v10.1

Coordinate System: WGS 1984 UTM Zone 57S  
Projection: Transverse Mercator  
Datum: WGS 1984  
Units: Meter

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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)

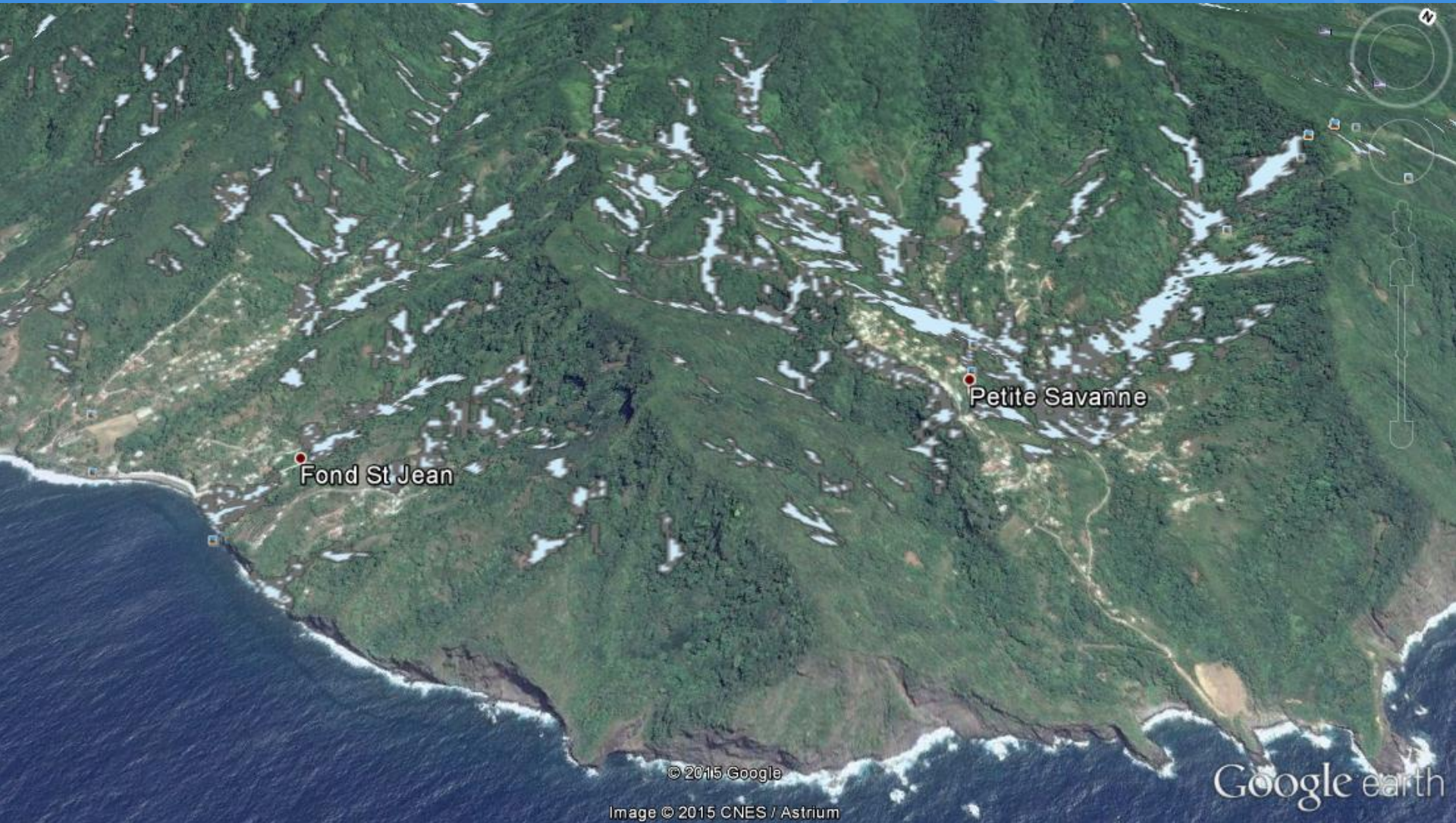
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# Dominica landslides following tropical storm Erica, August 2015



© 2015 Google

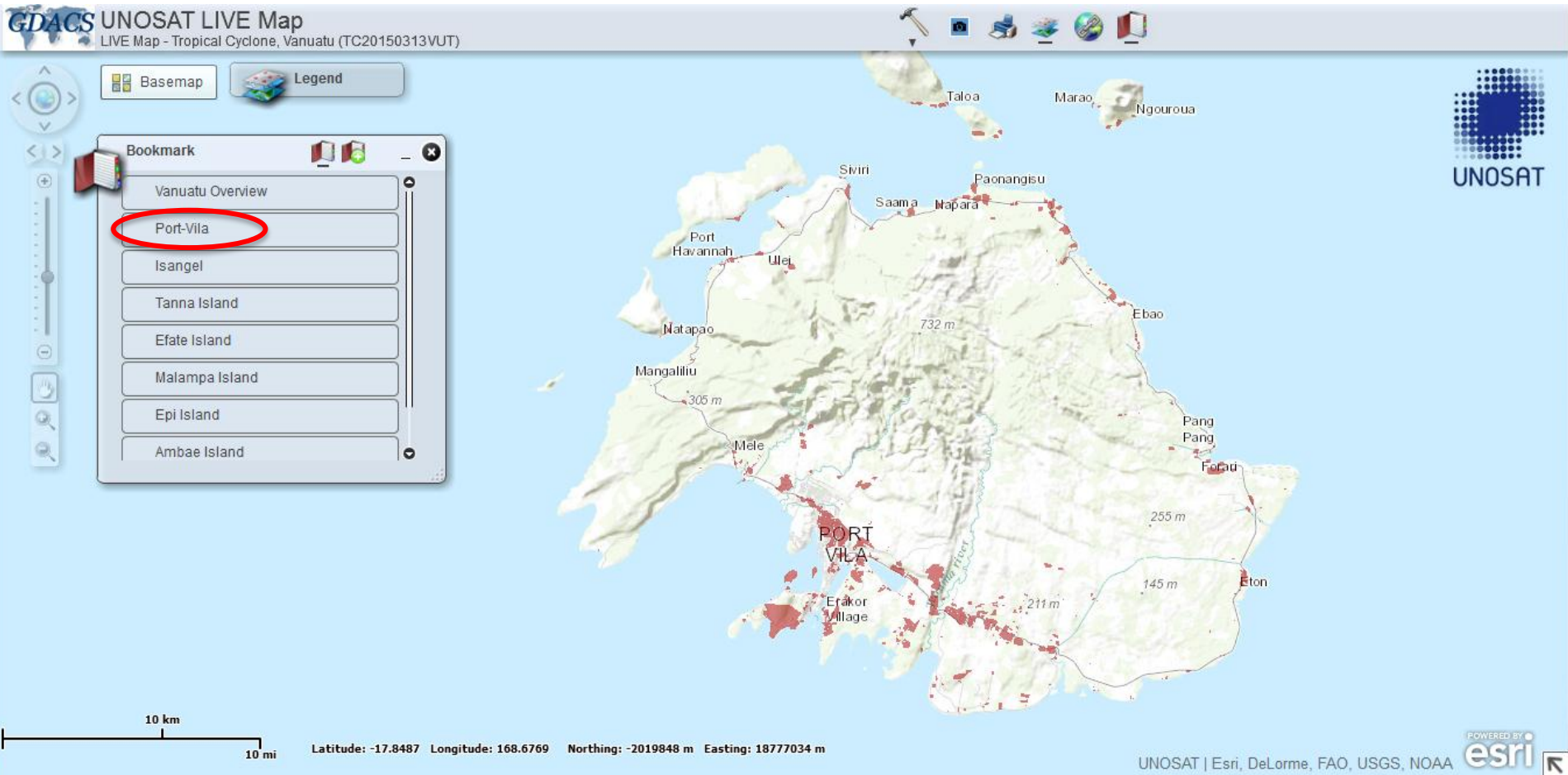
Image © 2015 CNES / Astrium

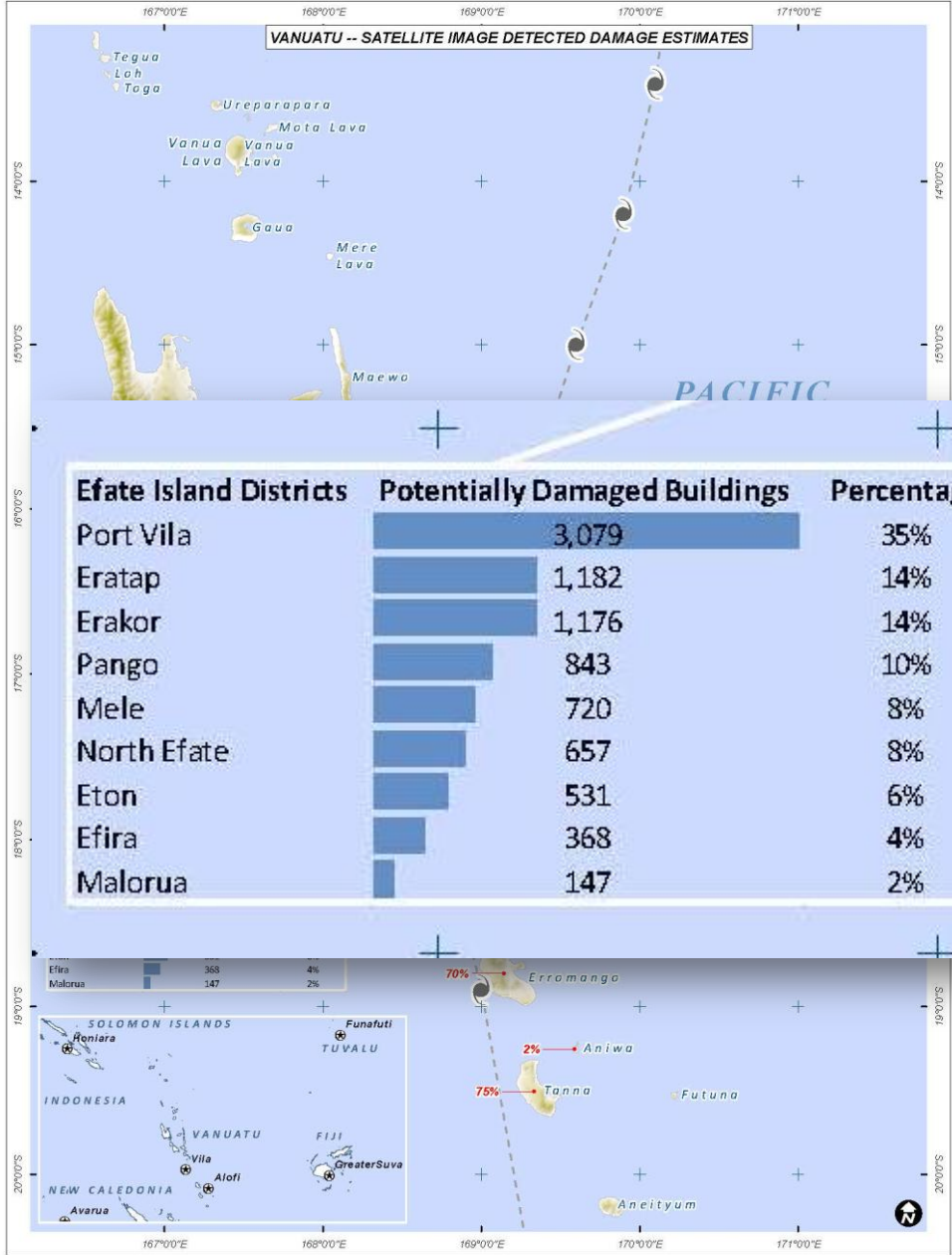
Google earth



# Vanuatu infrastructure damage

## Tropical cyclone Pam, March 2015





**LEGEND**

- Tropical Cyclone Track
- Percentage of potentially affected buildings in damaged zones
- Capital City

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# OVERVIEW OF EVAN TROPICAL CYCLONE DAMAGES, TUAMASAGA DISTRICT, UPOLU ISLAND, SAMOA

Analysis with Post-Crisis Pleiades Image Data Acquired 19 Dec 2012 & Pre-Crisis GEOEYE-1 Image Data Acquired 08 Oct 2012

This map illustrates satellite-detected areas of building damage, road obstacle damage to other infrastructure, tree fall areas due to tropical cyclone Evan in southern part of Upolu island in Samoa as of 19 Dec 2012. Damages were detected using high resolution satellite image Pleiades taken on 19 Dec 2012. The damages visible from the satellite are roof damage and complete destruction of the buildings which was detected comparing to pre disaster GEO-

EYE image taken on 8 Oct 2012. It is likely that damages have been underestimated in places where damages did not occur in the roof but other parts of the structure. Road obstacles, tree fall and other infrastructure damages were detected in a similar manner comparing pre and post disaster images. This analysis has not yet been validated in the field. Please send ground feedback to UNITAR /UNOSAT.

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)



Tropical Cyclone

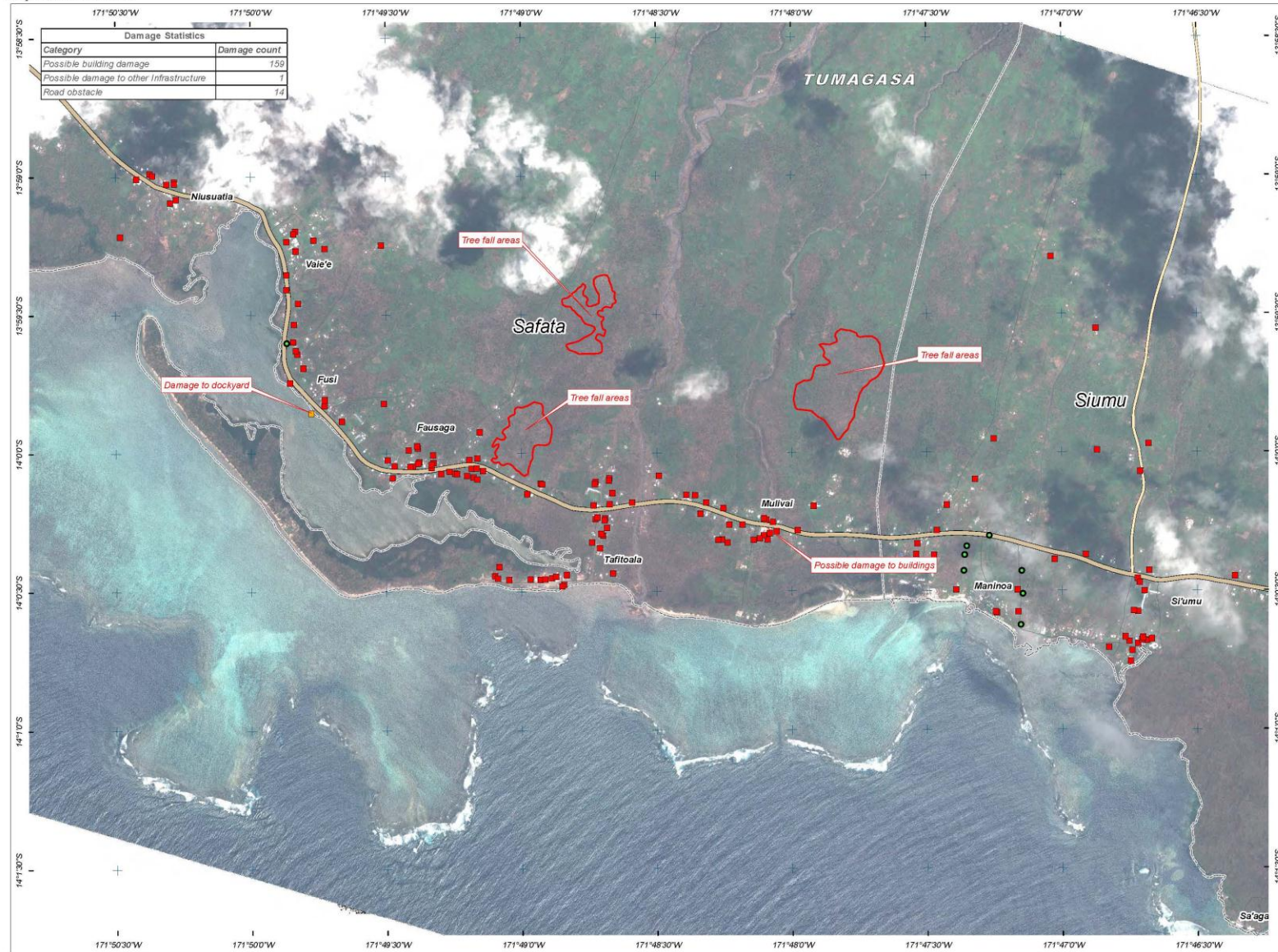


Production Date: 24/12/2012

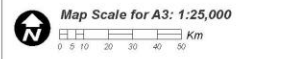
Version 1.0

Activation Number:

GLIDE - TC-2012-00021-WSM



- LEGEND**
- CYCLONE DAMAGE ANALYSIS**  
(Satellite-Based Damage Identification)
- Possible Building Damage
  - Possible Damage to other Infrastructure
  - Road Obstacle
  - Tree Fall Area
  - Primary Road



Satellite Data (1): Pleiades  
Imagery Dates: 19 Dec 2012  
Resolution: 0.5 m  
Copyright: 2012 Astrium GEO-Information Services  
Source: CNES  
Satellite Data (2): GEOEYE-1  
Imagery Date: 08 Oct 2012  
Resolution: 2.0 m  
Copyright: GEOEYE  
Source: HDDS,USGS  
Road Data : Google Map Maker / OSM / ESRI  
Other Data : USGS, UNOSAT, NASA, NGA, FAIRIS, UNISYS  
Analysis : UNITAR / UNOSAT  
Production : UNITAR / UNOSAT  
Analysis conducted with ArcGIS v10.1

Coordinate System: WGS 1984 UTM Zone 2S  
Projection: Transverse Mercator  
Datum: WGS 1984  
Units: Meter

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# POTENTIALLY DROUGHT AFFECTED AREAS IN THE HIGHLANDS REGION, PAPUA NEW GUINEA

Analysis with MODIS Data Acquired 20-27 August 2001 to 2011 and 2015

This map illustrates possible drought conditions in parts of highland areas of Papua New Guinea. Normalized Differential Vegetation Index (NDVI) anomaly depicts the difference in vegetation by comparing the current values to the mean value from 2001-2011. The darker red areas indicate the regions with the most deviation from the average

values. Approximately 800,000 hectares of land have negative change from the mean NDVI in the provinces of Enga, Western Highlands, Jiwaka, Chimbu and Eastern Highlands. It is to be noted that NDVI anomaly is not a direct representation of drought but an index that indicates the vegetation variation which could be the result of existing drought conditions.

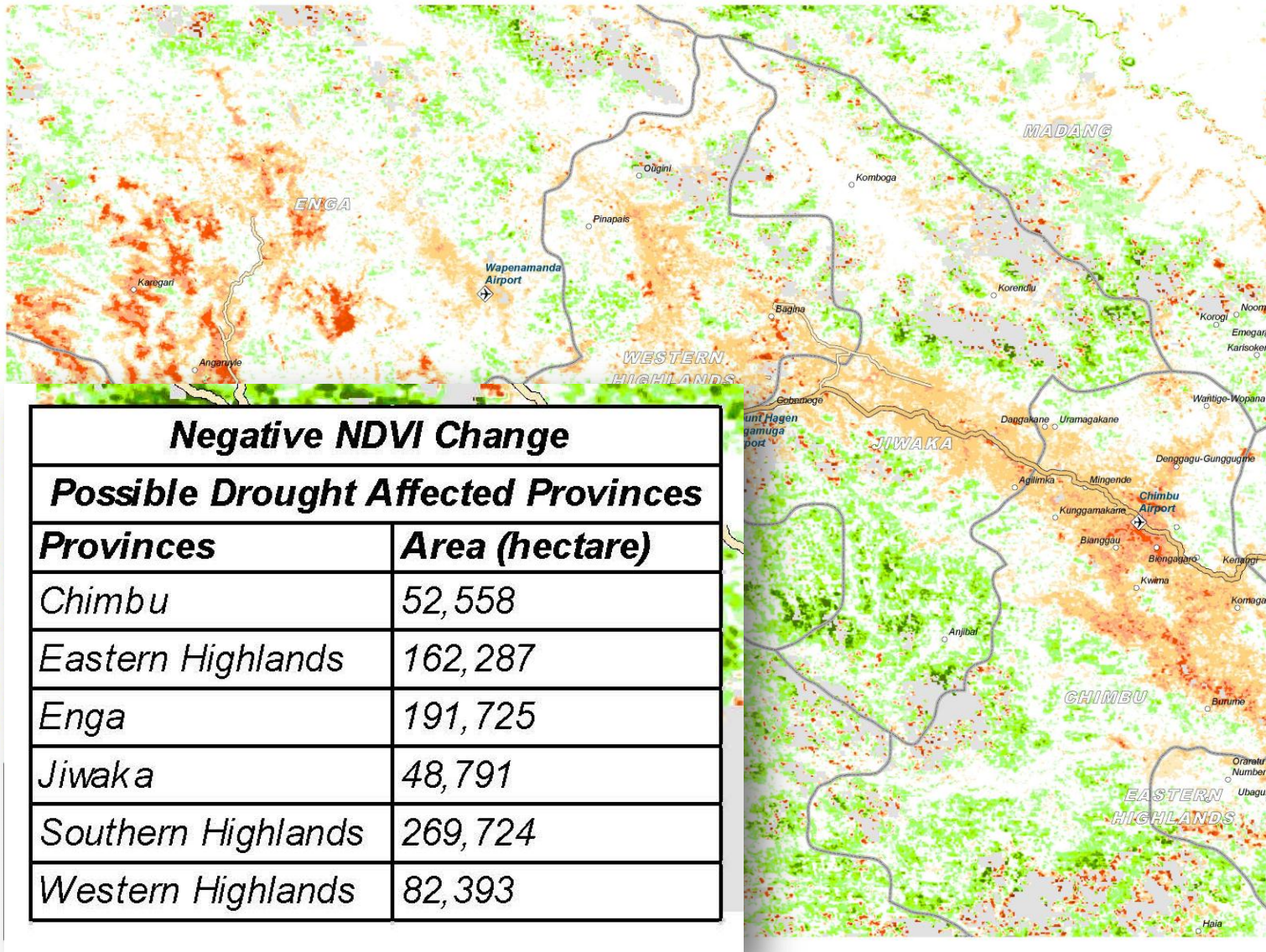
**Drought**



Production Date: 9/3/2015

Version 1.0

Activation Number: DR20150828PNG

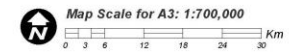


**LEGEND**

- Populated Place
- ✈ Airport
- Highway/Primary Rd.
- Secondary Rd
- ▭ Province Boundary

NDVI Anomaly from 20 to 27 August 2015

- Above Normal
- Normal
- Below Normal (dry)
- Missing Data



Satellite Data : MODIS  
 Imagery Dates: 20-27 August 2015 and Average NDVI for 20-27 August from 2001-2011  
 Resolution: 250m  
 Copyright: NASA  
 Source: GIMMS (NASA GSFC) and GLAM (USDA)  
 Road Data : Open Street Map  
 Other Data: USGS, NASA  
 Analysis : UNITAR-UNOSAT  
 Production: UNITAR-UNOSAT  
 Analysis conducted with ArcGIS v10.3

Coordinate System: WGS 1984 UTM Zone 55S  
 Projection: Transverse Mercator  
 Datum: WGS 1984  
 Units: Meter

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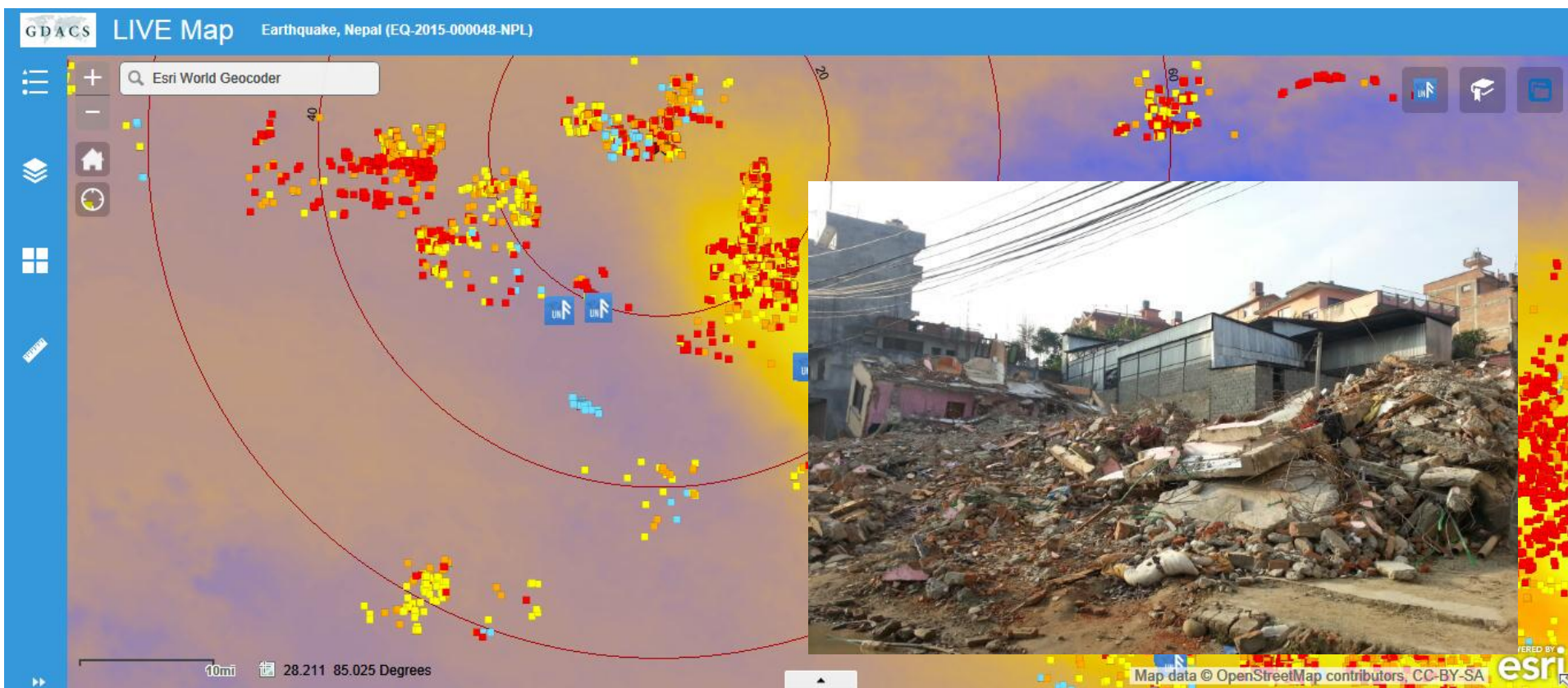
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Negative NDVI Change	
Possible Drought Affected Provinces	
Provinces	Area (hectare)
Chimbu	52,558
Eastern Highlands	162,287
Enga	191,725
Jiwaka	48,791
Southern Highlands	269,724
Western Highlands	82,393



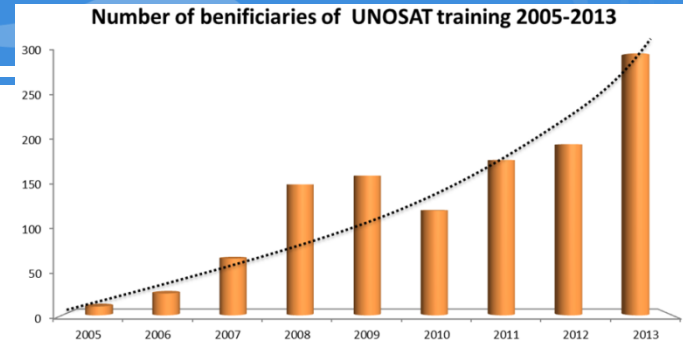
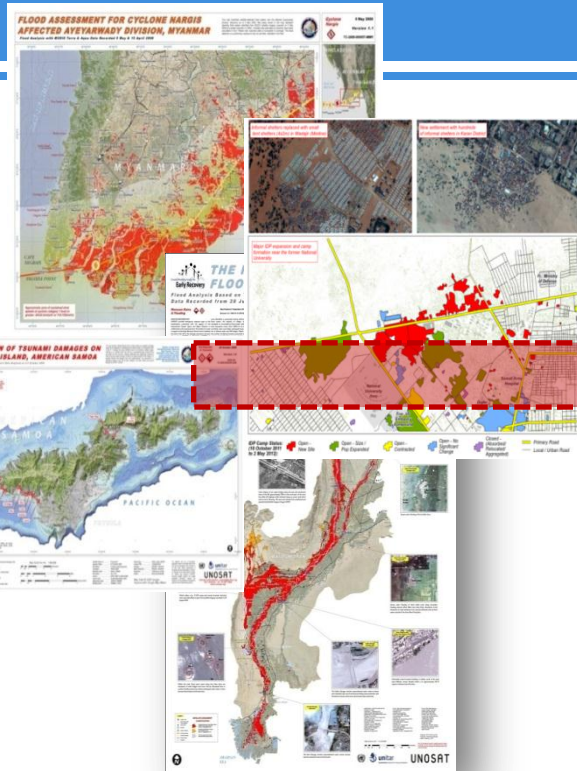
# Nepal earthquake

## Data integration with UN-ASIGN app



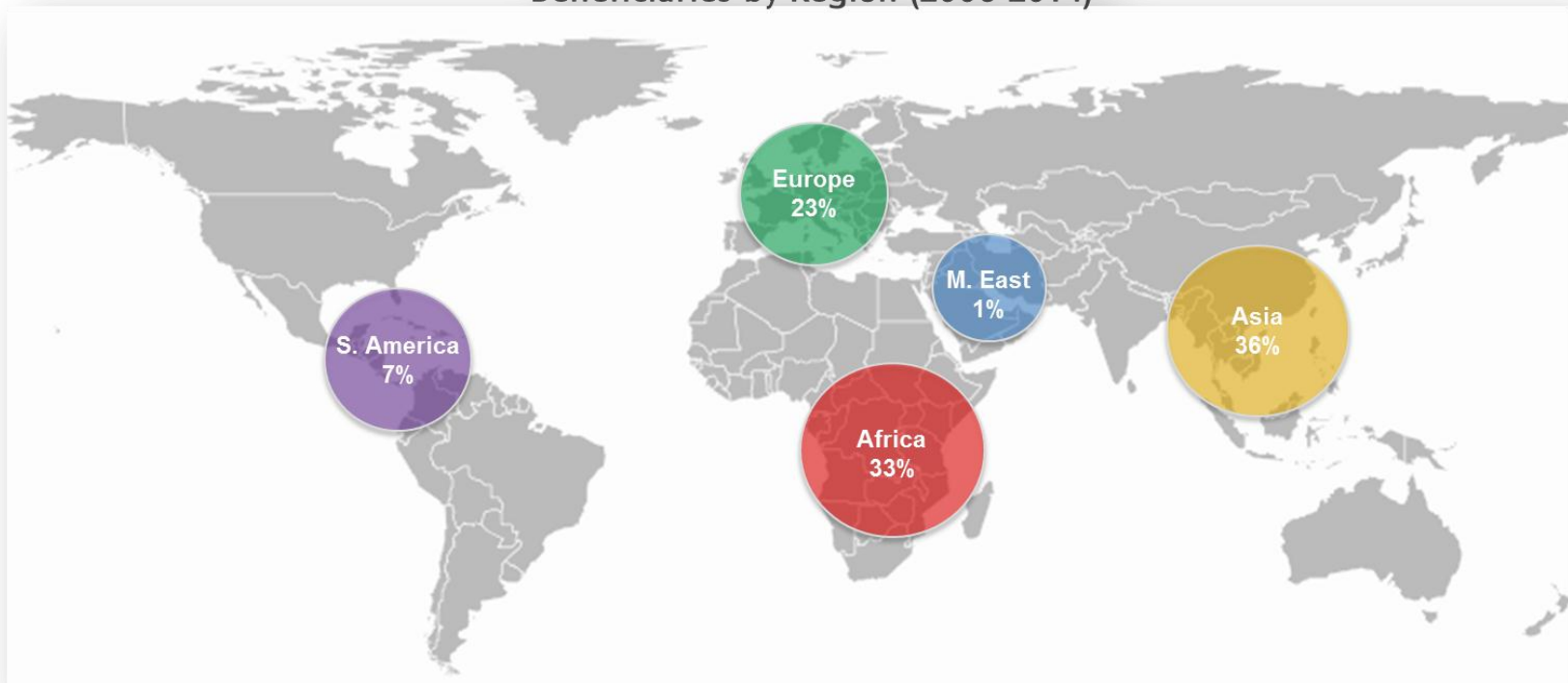


# From satellite analysis and mapping to training and capacity development



# Training and Capacity Building – Beneficiary Outreach

Beneficiaries by Region (2006-2014)



# Video: Training and capacity development by UNOSAT

<https://www.youtube.com/watch?v=27ZkqnhNUBI>



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