Thematic Session: IT Innovations

Geospatial Approaches to Damage Assessment: The Example of Haiti Earthquake

Date: 10/05/2011
Location: Geneva, Switzerland

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Organization: UNITAR-UNOSAT

World Reconstruction Conference

Recovering and Reducing Risks after Natural Disasters

GFDRR
Global Facility for Disaster Reduction and Recovery

ISDR

Global Platform
for Disaster Risk Reduction

- ***<u>United Nations Institute for Training and Research</u>***

- ***Mission***: To deliver innovative training and conduct research on knowledge systems to develop the capacity of beneficiaries in the fields of Environment; Peace-Security and Diplomacy, Governance and Research

UNOSAT

- **UNOSAT** is the Operational Satellite Applications Programme of the United Institute of Training and Research (UNITAR)

- **Goal**: to make satellite analysis/solutions and geographic information easily accessible to the UN, local governments, international organizations and NGOs

unitar
United Nations Institute for Training and Research

UNOSAT's three main operational areas

Humanitarian Aid and Relief Coordination

- Crisis & Situational Mapping
- Damage assessment

Human Security

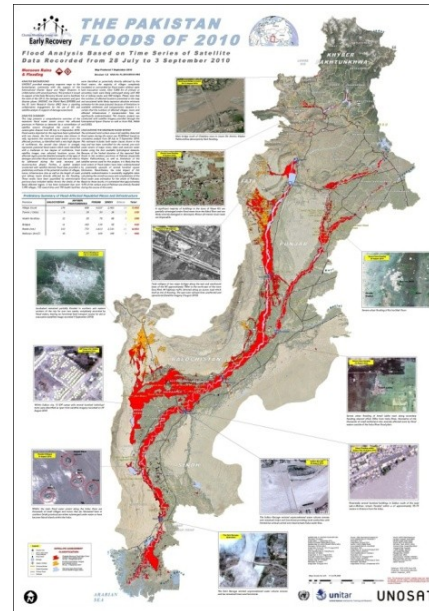- Conflict Monitoring
- Human Rights -
Damage Assessment

Territorial Planning and Environmental Monitoring
- Capacity Development & Technical Assistance
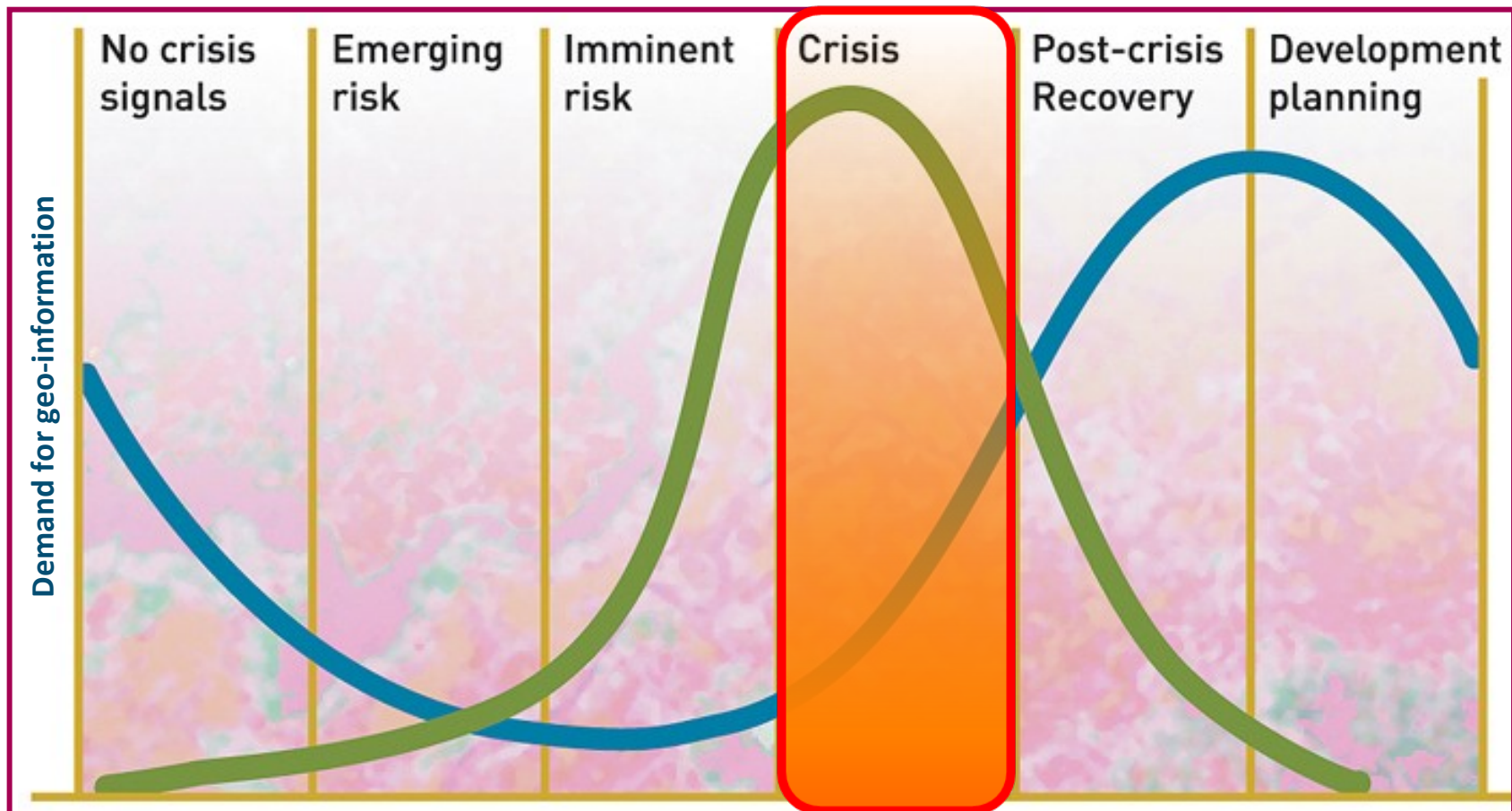- In-country project development

Satellite based Analysis and Mapping

- UNOSAT mapping Covers major conflicts and all types of disasters: **35 events per year**

- Tasked since Jan. 2003 in over **200 emergencies & conflicts**;

- UNOSAT means:

- Over **1000 maps/analyses**,

- **2 Million map downloads**,

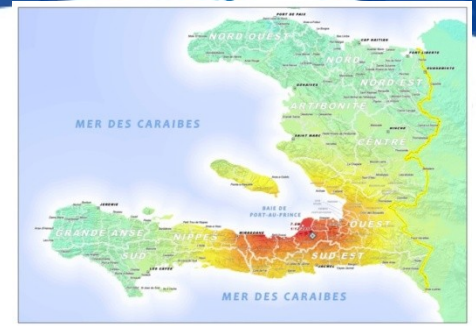- **Professional training & Capacity Building**

5
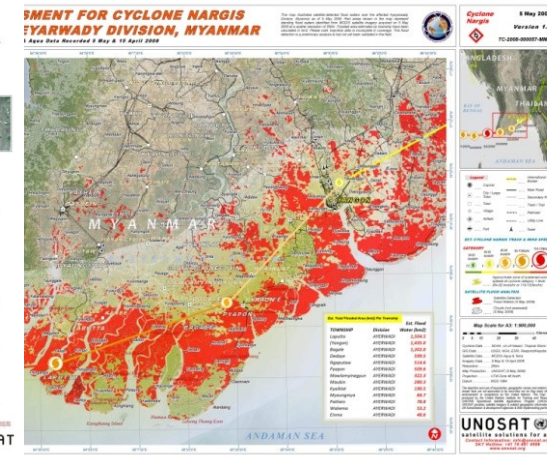
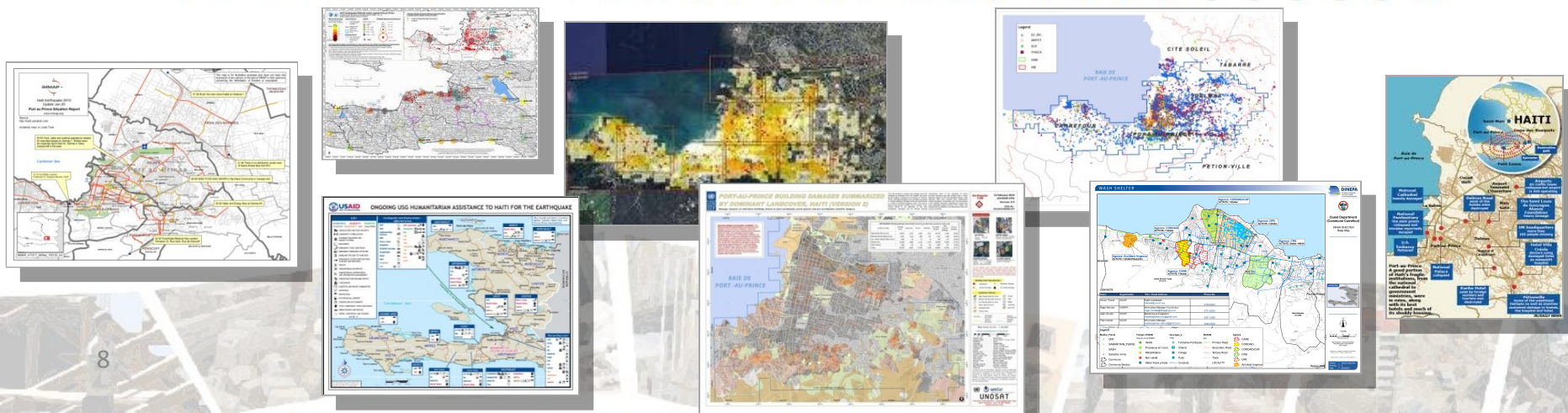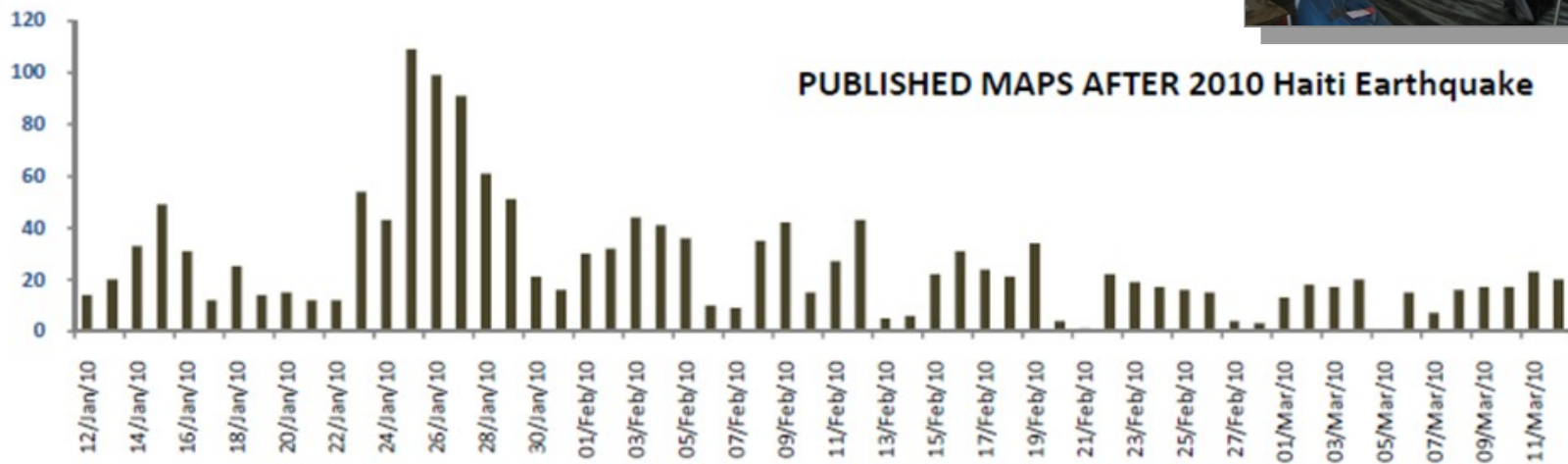# Crucial Role Of Geo-Information in Disaster Response

Demand for geo-information

| No crisis signals | Emerging risk | Imminent risk | Crisis | Post-crisis Recovery | Development planning |

Rush demand of basemap

Complex info with added value

The Haiti Earthquake (12/01/2010)

Thousands of GI related products produced by over 50 different organizations...

PUBLISHED MAPS AFTER 2010 Haiti Earthquake

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PUBLISHED MAPS AFTER 2010 Haiti Earthquake
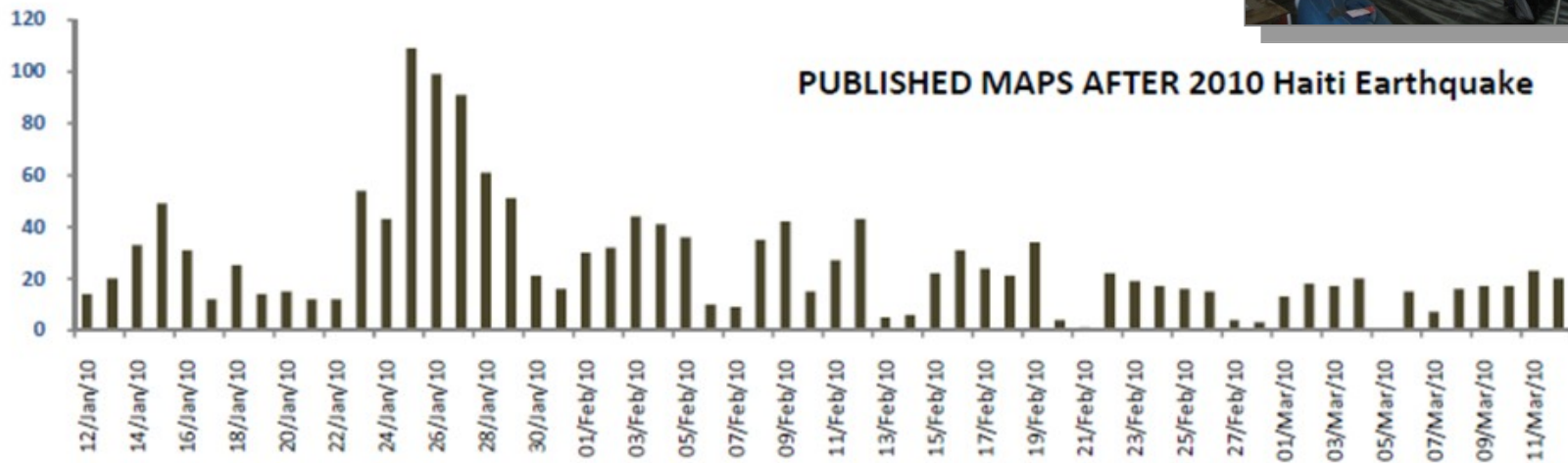
Haiti EQ: UNOSAT Geospatial Products (Timeframe)

Situation maps Preliminary DA

UN-EC-WB Comprehensive DA and Joint Blds DA Atlas

UNOSAT/JRC/WB combined GIS database

Field Validation (UNOSAT- CNIGS- JRC)

Flash Appeal

PDNA

S. Dom. Conf.

NY Conf.

Haiti EQ

12 Jan. 22 Jan. 18 Feb. 26 Feb 12 Mar. 17 Mar. 31 Mar. April

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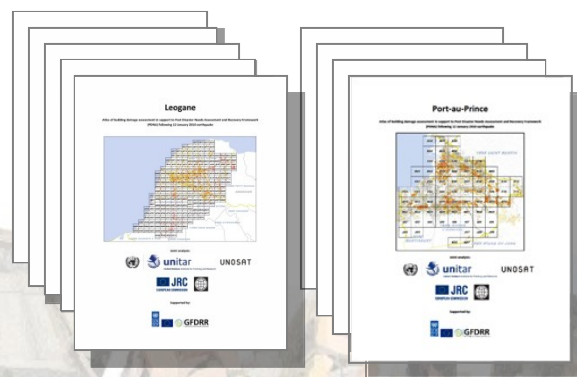
UNOSAT methodological approach for Remote Sensing based building damage analysis:

Pre-Disaster Sat. Image

Post-Disaster Aerial Photo
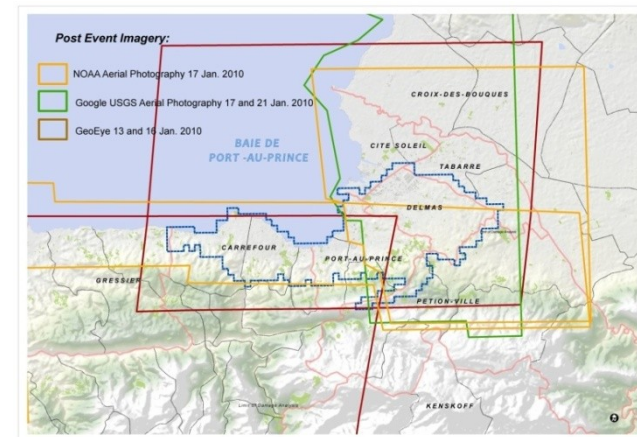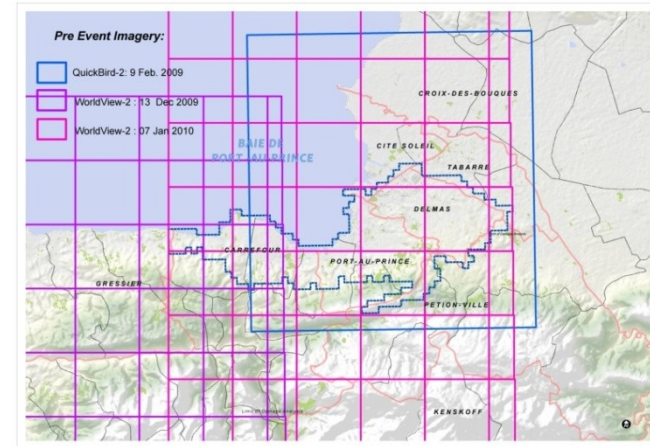
UNOSAT methodological approach for Remote Sensing based building damage analysis:

European Macro-seismic Scale-98 (EMS-98) definition:

GRADE 1: No visible damage

GRADE 4: Very heavy damage

GRADE 3: Substantial to heavy damage

.

GRADE 5: Destruction

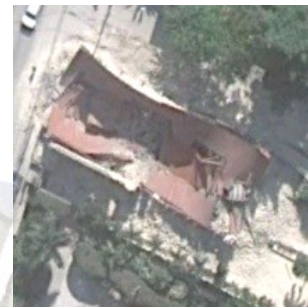| Classification of damage to masonry buildings	
	Grade 1: Negligible to slight damage (no structural damage, slight non-structural damage) Hair-line cracks in very few walls. Fall of small pieces of plaster only. Fall of loose stones from upper parts of buildings in very few cases.
	Grade 2: Moderate damage (slight structural damage, moderate non-structural damage) Cracks in many walls. Fall of fairly large pieces of plaster. Partial collapse of chimneys.
	Grade 3: Substantial to heavy damage (moderate structural damage, heavy non-structural damage) Large and extensive cracks in most walls. Roof tiles detach. Chimneys fracture at the roof line; failure of individual non-structural elements (partitions, gable walls).
	Grade 4: Very heavy damage (heavy structural damage, very heavy non-structural damage) Serious failure of walls; partial structural failure of roofs and floors.
	Grade 5: Destruction (very heavy structural damage) Total or near total collapse.

- *WB, EC-JRC and UNOSAT* worked jointly to provide for the ***Post Disaster Needs Assessment (PDNA) process*** a comprehensive atlas of blds damage assessment.

- *300,000* assessed buildings.

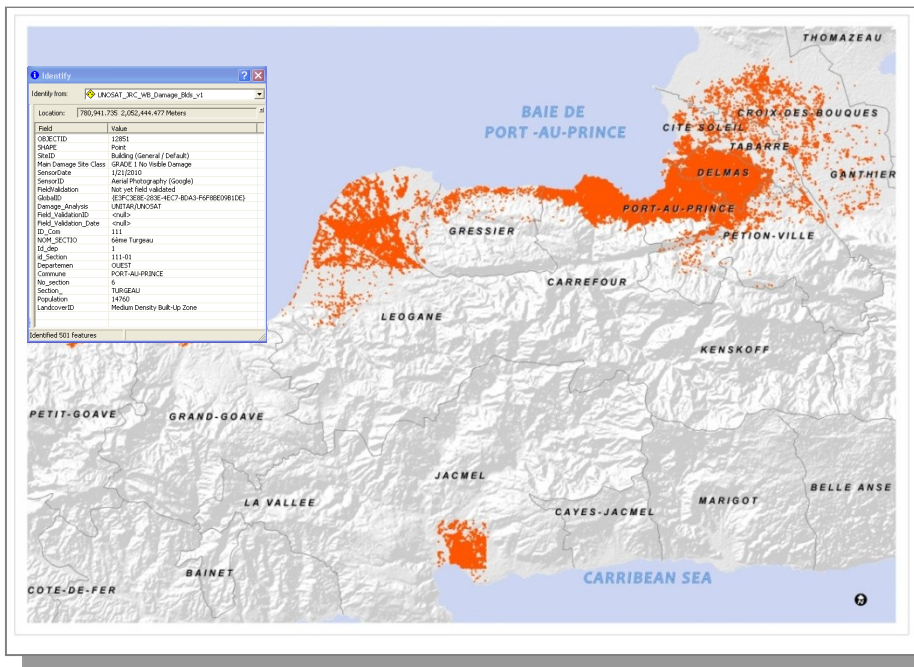- *67,000* identified as damaged (Grade 4 and5 on the EMS-98 scale).
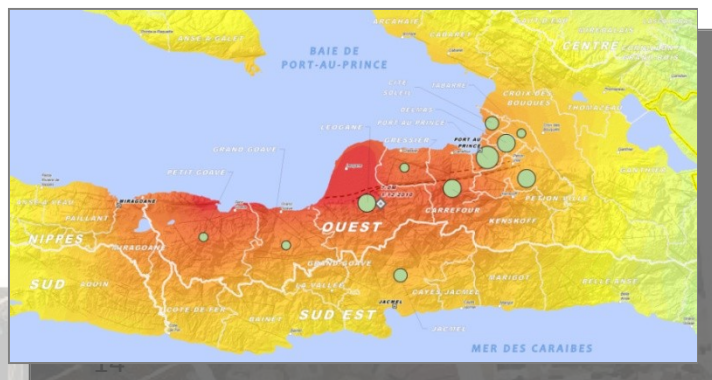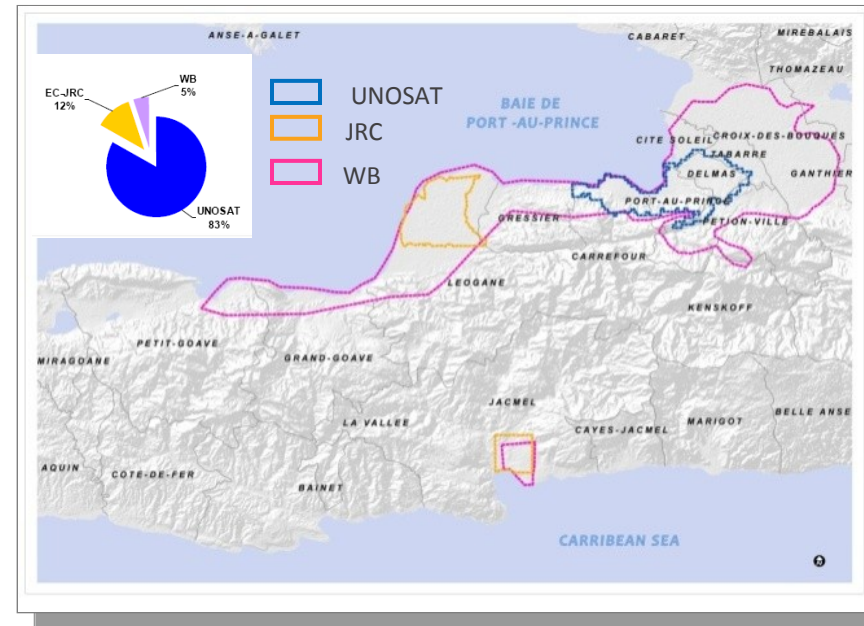
Assessed Commune	Damaged Buildings
PORT-AU-PRINCE	27,703
CARREFOUR	9,414
LEOGANE	8,891
DELMAS	8,599
PETION-VILLE	6,204
JACMEL	2,099
CITE SOLEIL	1,993
TABARRE	1,170
GRESSIER	913
PETIT-GOAVE	408
GRAND-GOAVE	270
Total	67,664

UNOSAT – JRC – WB combined DA-GIS database

http://www.unitar.org/unosat/haiti-earthquake-2010-remote-sensing-based-building-damage-assessment-data

•Field Validation Activities

~ 6,000 bld samples
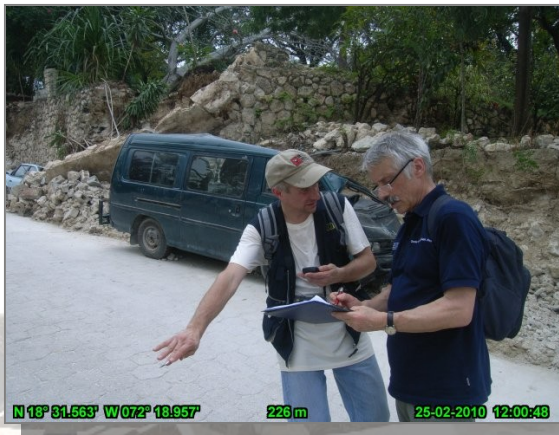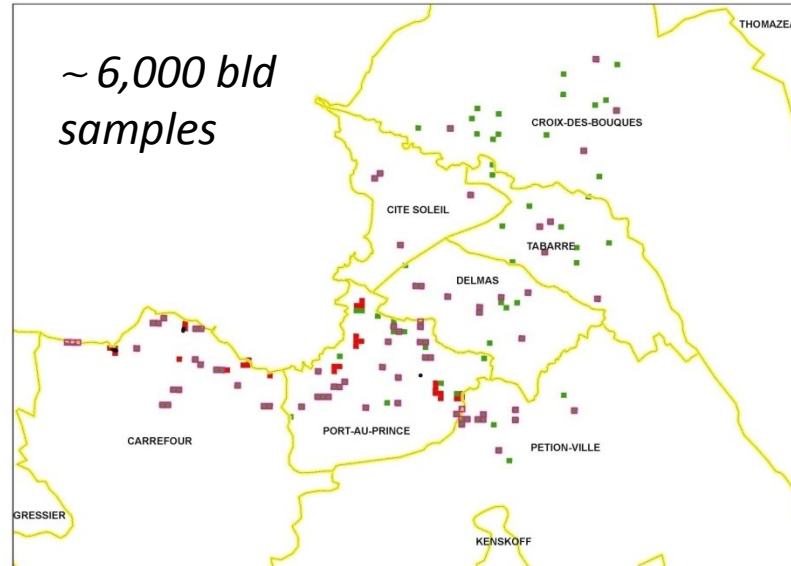
Accuracy Assessment Results: 4 and 2 damage classes Validation
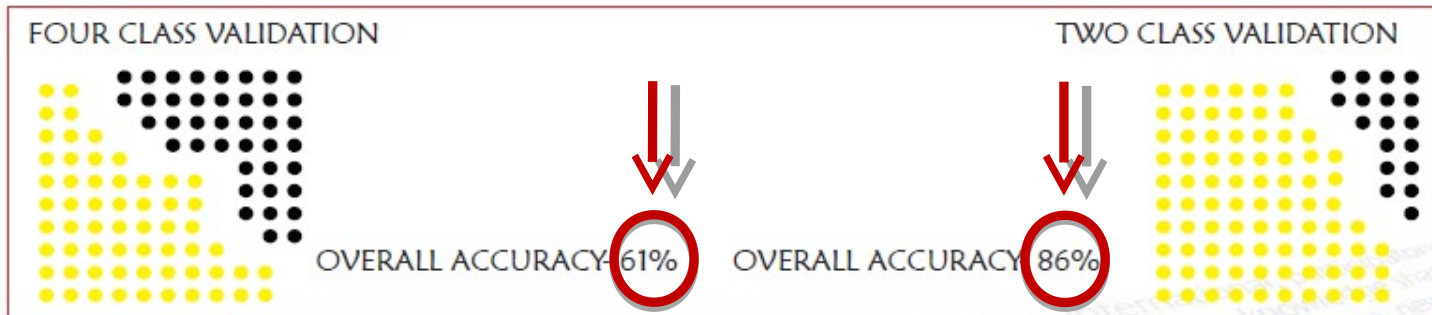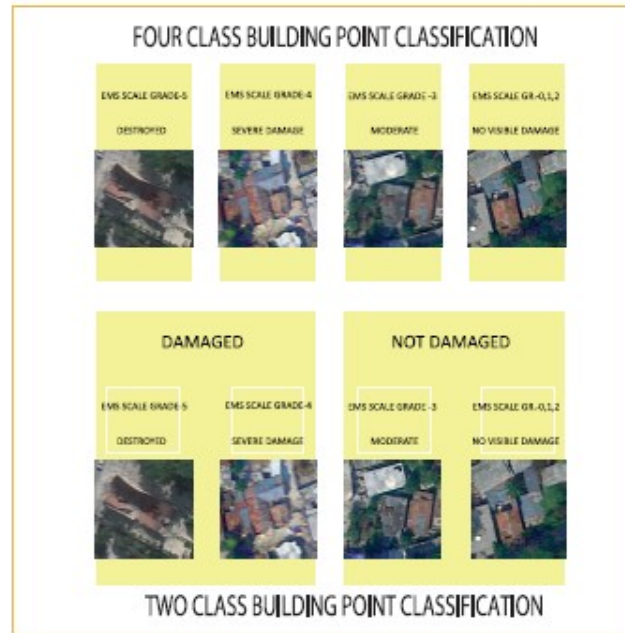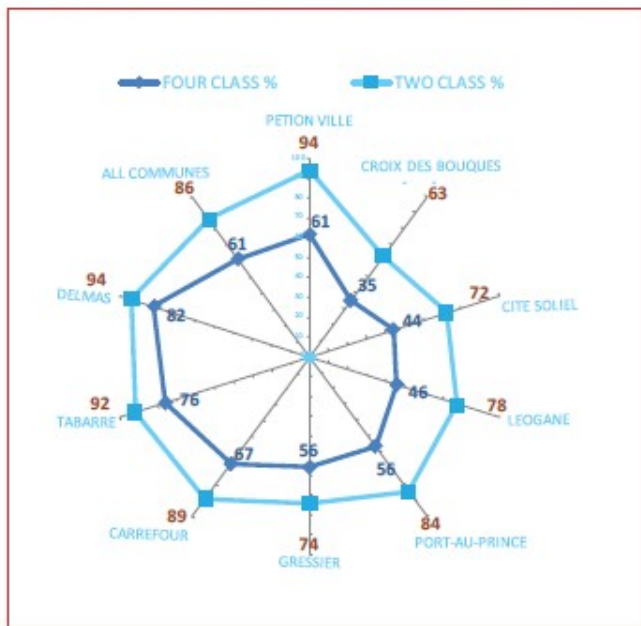
Lessons Learnt:

- *Availability of suitable imagery, pre-disaster baseline GIS datasets* (e.g. census, building footprints, roads, critical facilities, landcover/landuse, etc..) *is a key* **to improve** and to speed up **Remote Sensing based damage analysis**.

- *Remote Sensing imagery has still some limitations* for assessing different levels of building damages...(spatial resolution, angle of acquisition ,etc..) but with the fast improvements in RS technology they will be reduced..

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Lessons Learnt

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- *RS imagery has still some limitations* for assessing different levels of building damages...(spatial resolution, angle of acquisition ,etc..) but with fast improvements in RS technology they will be reduced..

- *Crow sourcing* **is very important** for primary and secondary data collection but **expertise in analysis is needed** to make good use of it.

- **UNOSAT-JRC-WB** are working together on the **definition of standards and validation methods (SOPs)** to conduct collaborative Remote Sensing based damage assessment.