→ EARTH OBSERVATION FOR SUSTAINABLE DEVELOPMENT

Disaster Risk Reduction

disaster risk reduction
eo4sd

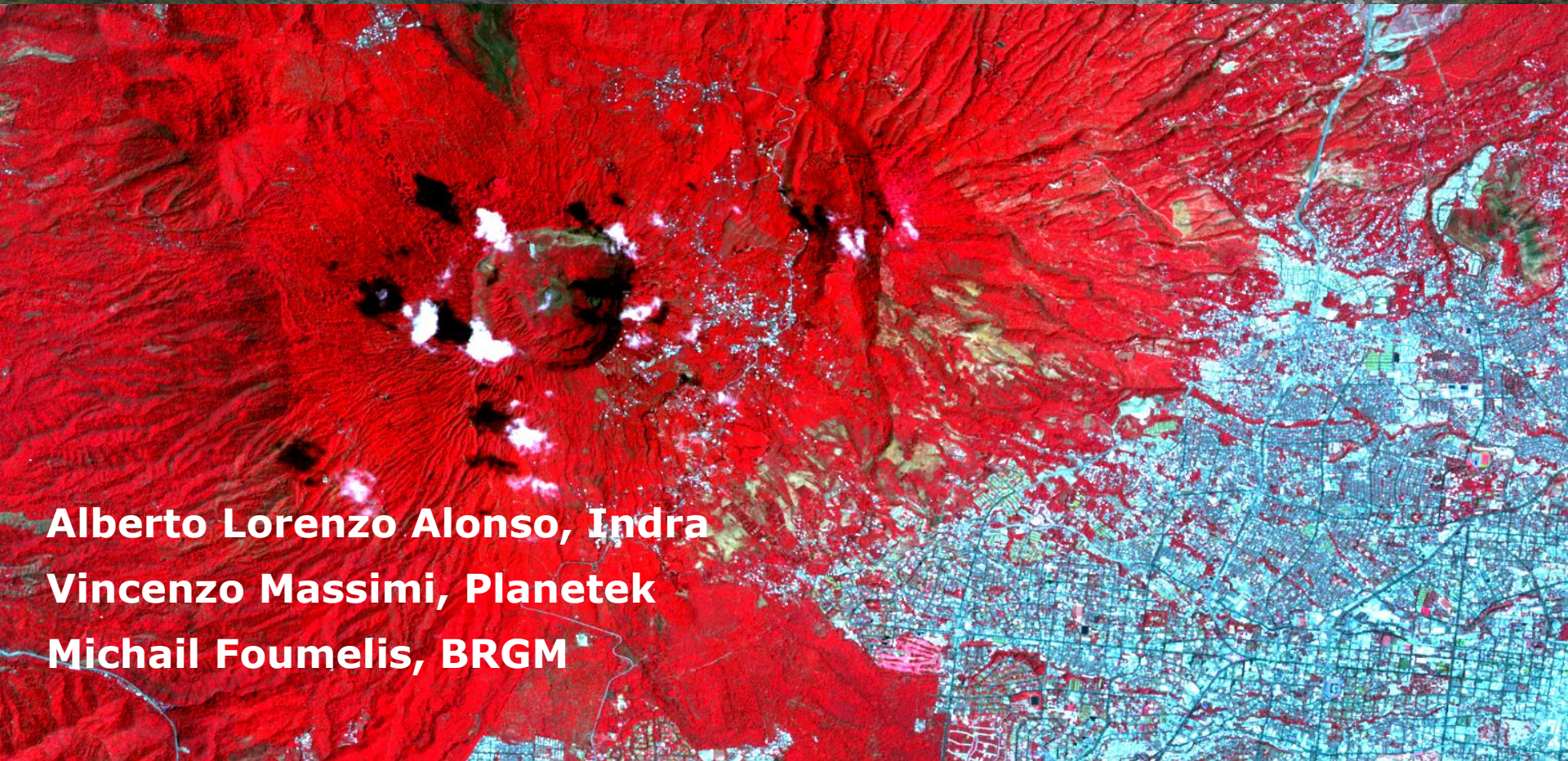
EO4SD DRR in support to risk and recovery in Central Sulawesi

Jakarta, 19 June 2019

Alberto Lorenzo (ESA EO4SD DRR project)

ESA UNCLASSIFIED - For Official Use

EO4SD in support to Disaster Risk Reduction



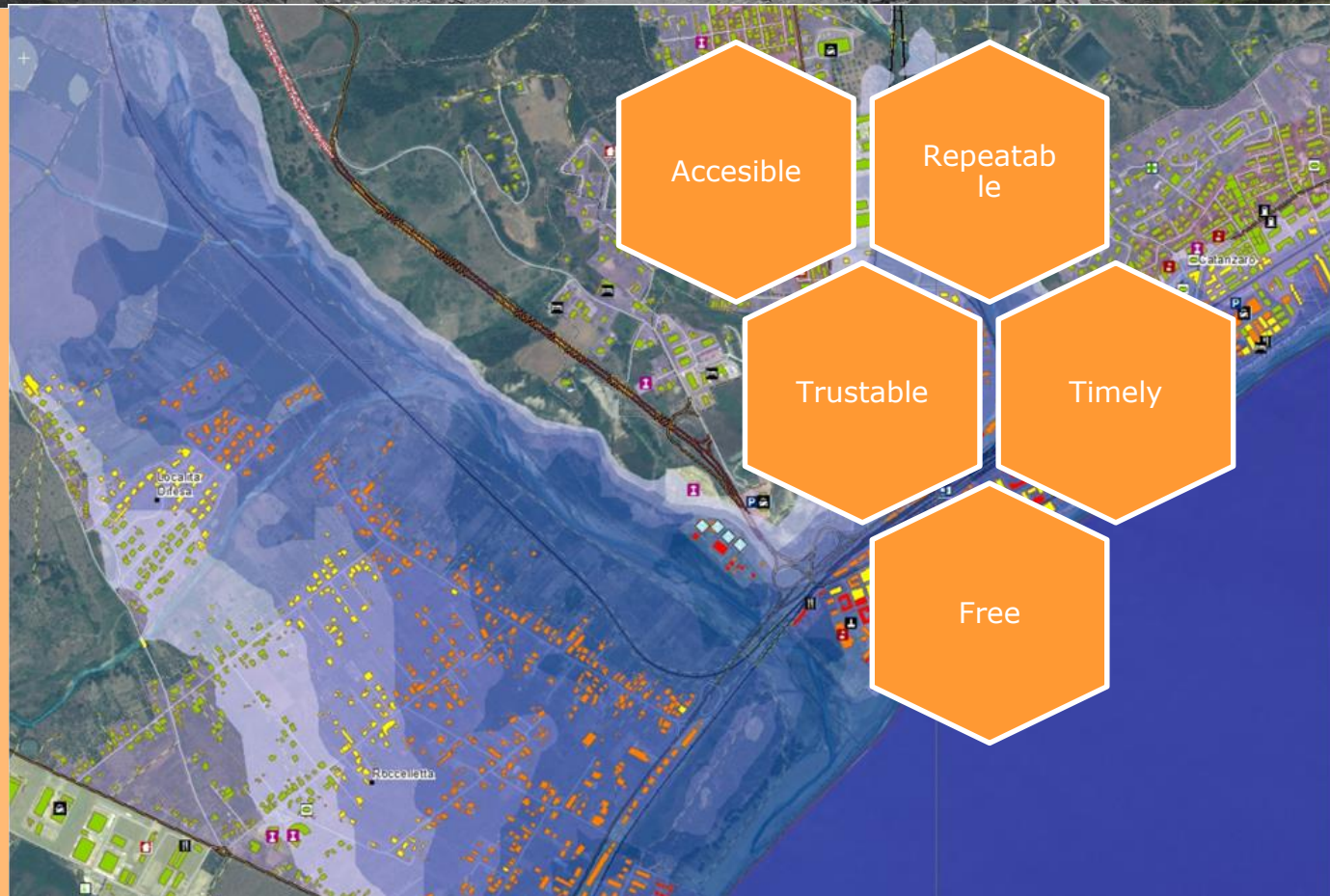
Alberto Lorenzo Alonso, Indra

Vincenzo Massimi, Planetek

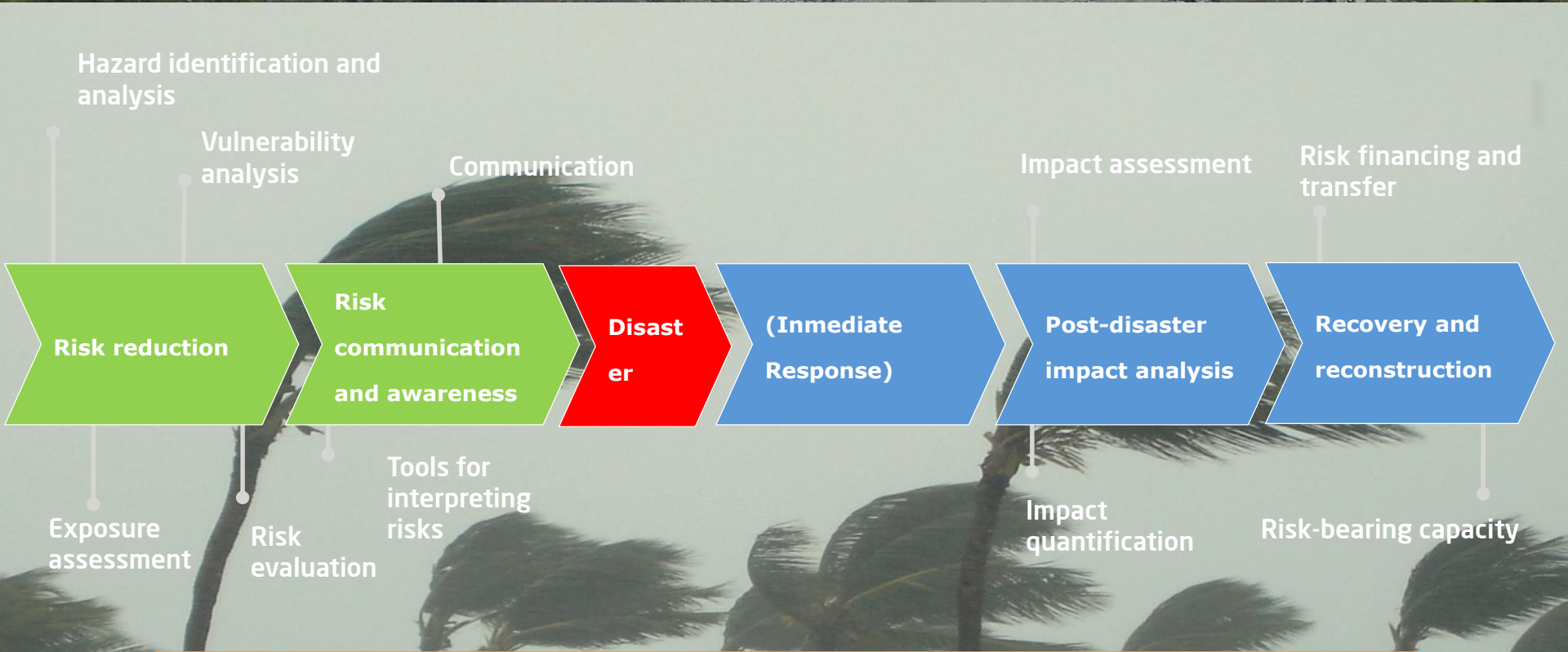
Michail Foumelis, BRGM

How Earth Observation can help?

Satellite-based data provides actionable information for development assistance in all phases of the DRM cycle



The cycle of service provision in EO4SD DRR supporting Sulawesi

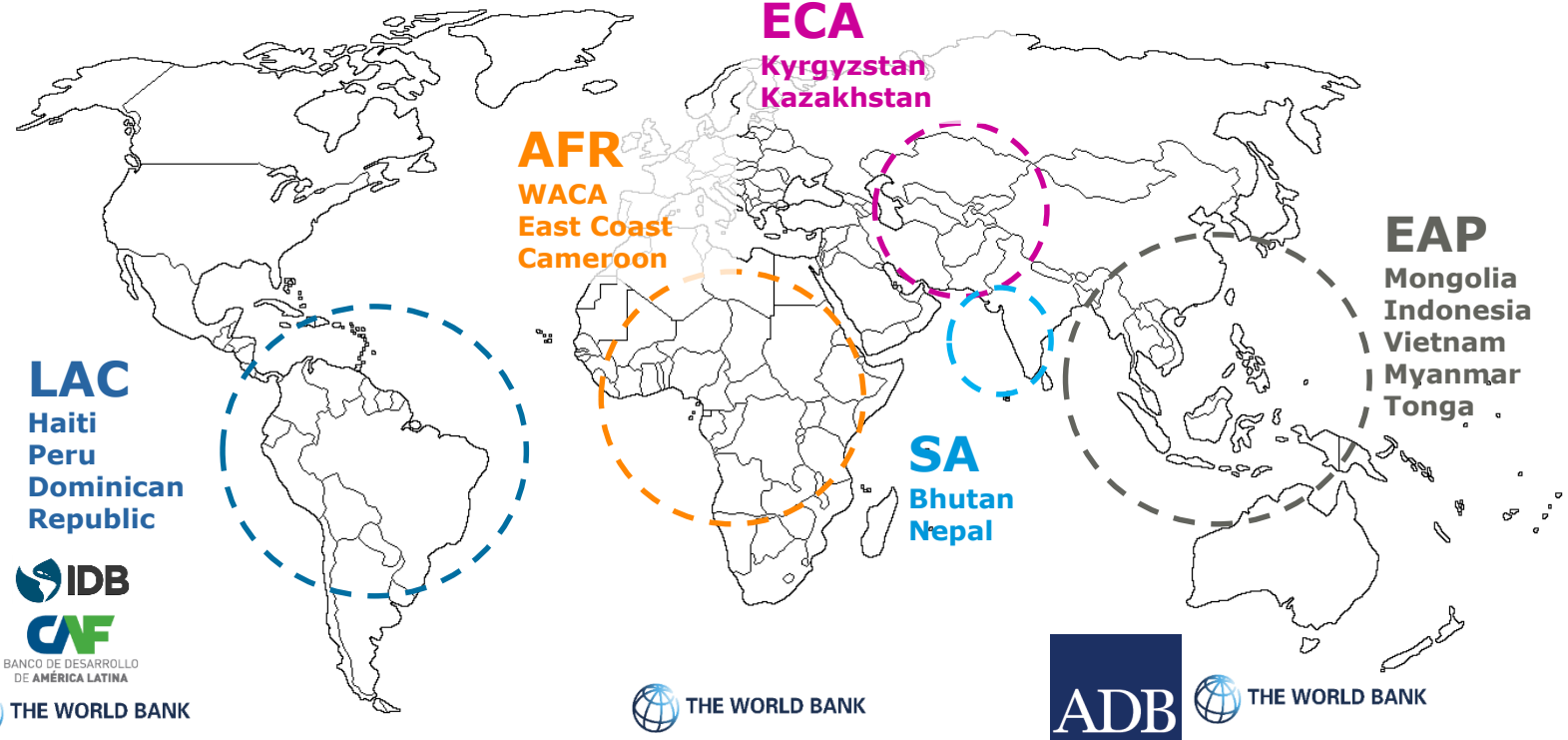


Satellite-based data provides actionable information in all phases of the DRM cycle

- Aims
  - Focused on Disaster Risk Reduction, not response
  - To promote the use of space technology
  - To strengthen cooperation wit IFIS AND Local users
  - To establish long term relation, and not just provide some products and go

ESA UNCLASSIFIED - For Official Use

Earth Observation for Disaster Risk Reduction



indra
gisat
planetek italia
ARGANS
ZAMG
nazka

The cooperation among EO4SD DRR (ESA), ADB and Government of Indonesia

- Purpose: to **contribute** to the efforts of **reconstruction** of Palu **from our expertise in Space Technology**
- The consortium was activated at **short notice**
- **Challenging and comforting experice**
- There was a **first request** of products that were provided with the **resources of ESA**
- Then due to the interest, there was the possibility of providing **additional products** with the **resources of ADB**

The Teluk Palu bridge **after** the 28th September 2018 earthquake and tsunami

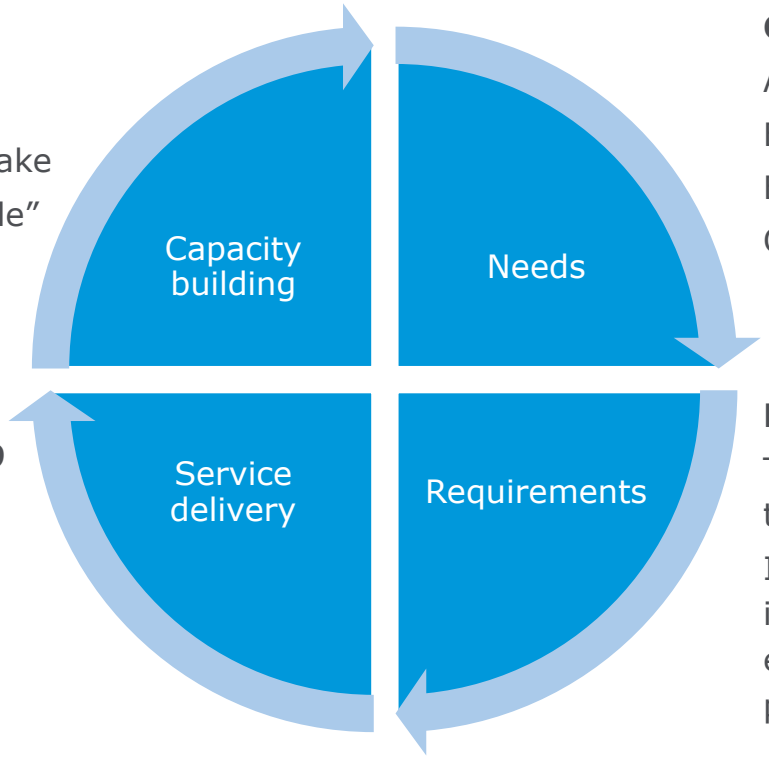
The cycle of service provision in EO4SD DRR supporting Sulawesi

June 2019

Capacity Building Workshop

The key stone for the user uptake

The first step for the next "cycle" of cooperation



October 2018

ADB and ESA contact

EO4SD DRR project is activated

Expression of needs

Official request

November 2018

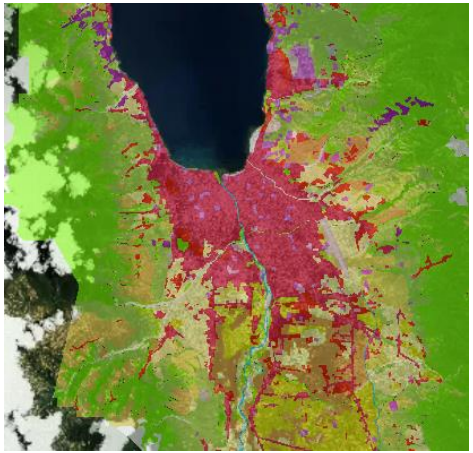
Translation of needs into technical requirements

In urgent cases, this activity is squeezed between the expression of needs and the production

December 2018 / May 2019

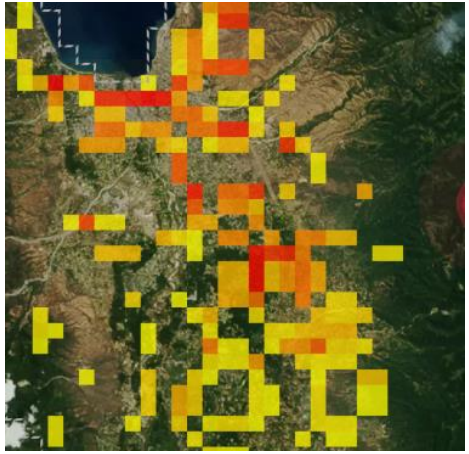
Delivery of Land Use / Land Cover product, Flood susceptibility, Night light change and Terrain deformation (pre and post-event)

Full picture of the cooperation: products

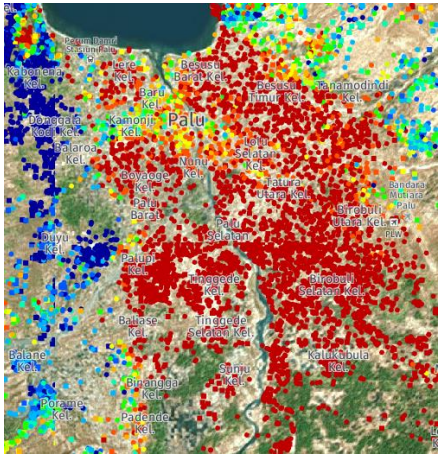


Land Use / Land Cover

Flood hazard mapping



Night light change



Terrain deformation and building stability

Full picture of the cooperation: discovery platforms

- **Web GIS**
  - **Intermediate user web GIS (all products)**
    - EO4SD DRR web mapping application for discovering, overlaying etc. of a intermediate level user high level understanding

      http://eo4sd.dev.nazkamapps.com/
  - **Professional user web GIS (centered in displacement)**
    - Due to the complexity, terrain deformations, is provided in Rheticus platform for advanced users

      https://displacement.rheticus.eu/#/

Product: Land cover

Information content

- Land use / land cover polygons (27 classes present out of 44 possible)

Method

- Manual extraction using Sentinel-2 images before the event (10m resolution)

Benefits for the users

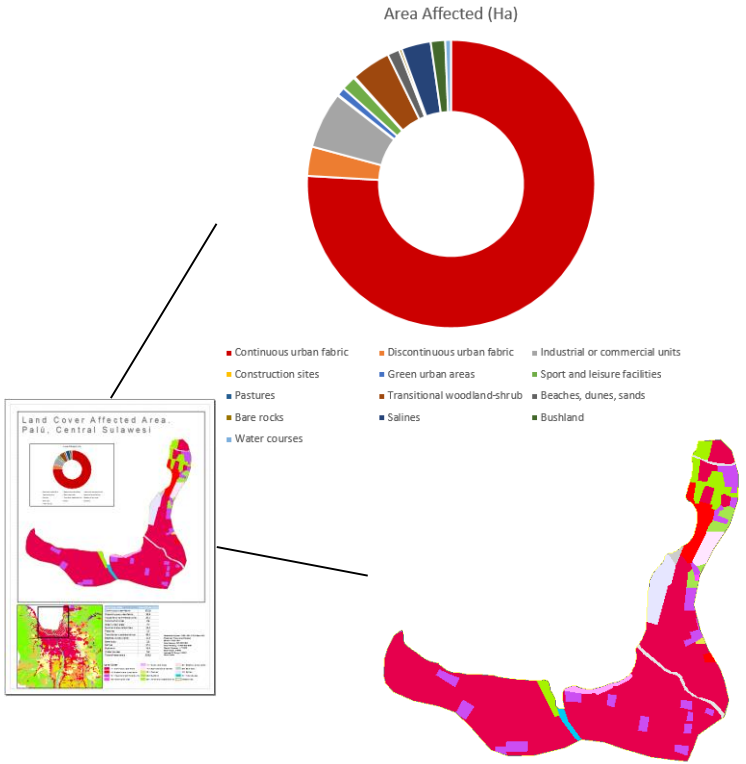
- Complete overview of landscapes distribution
- Provides statistics of affected land cover
- Support for land planning decision taking at medium scales

Constraints

- Representation scale (ideal) 1:25.000
- Limited to level 3 detail land cover classes
- Not applicable decision taking at detailed scales

Next steps

- Detailed Land Cover maps (1:5000)
- Hot spots detection for further cartography production



Product: Flood hazard map

Information content

- Multi-resolution raster map providing susceptibility to flood at pixel level

Method

- Historical analysis of Sentinel-1 and ERS 1-2 radar imagery + geomorphometric measures from Digital Elevation Model + visual extraction of main water courses and riverbeds

Benefits for the users

- Indication of zones prone to flood
- Decision taking for land planning at small scale

Constraints

- Resolution of DEM and limited Product quality depends on the historical imagery available
- It is not an hydrological model

Next steps

- Detailed flood susceptibility with better Digital Elevation Model
- Fully fledged hydrological model

Night Light Change

Information content

- Change in the intensity of lights between pre-disaster and post disaster situation indicating zones of power outage

Benefits for the users

- Quick overview of areas affected by blackout
- Support to planning for power infrastructure reparations

Method

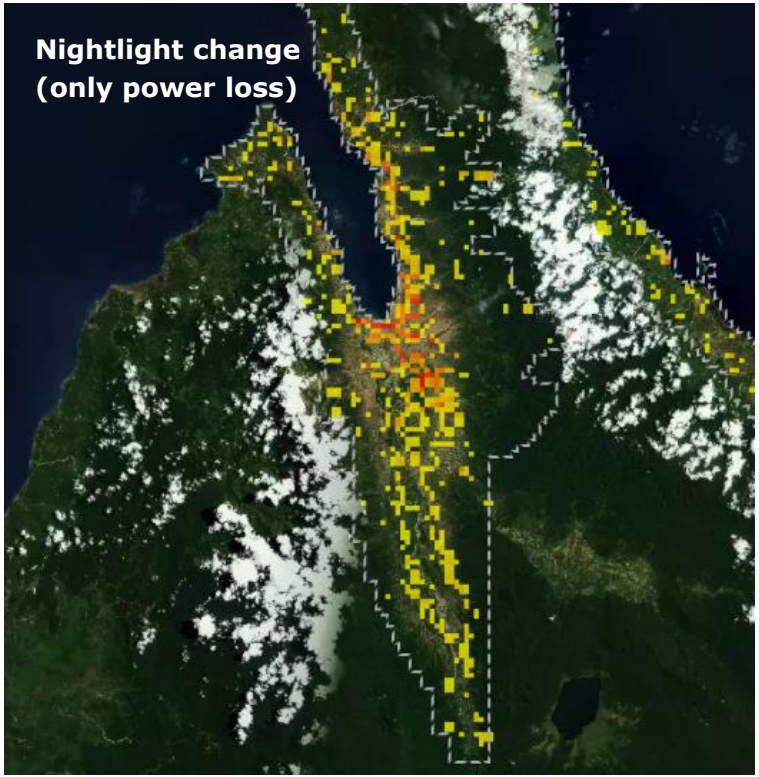
- Raster night light change map between Suomi-NPP VIIRS pre and post event (740 m resolution)

Constraints

- Product conditioned by cloud cover
- Suitable only for larges scales

Opportunities

- Continuous monitoring of power supply



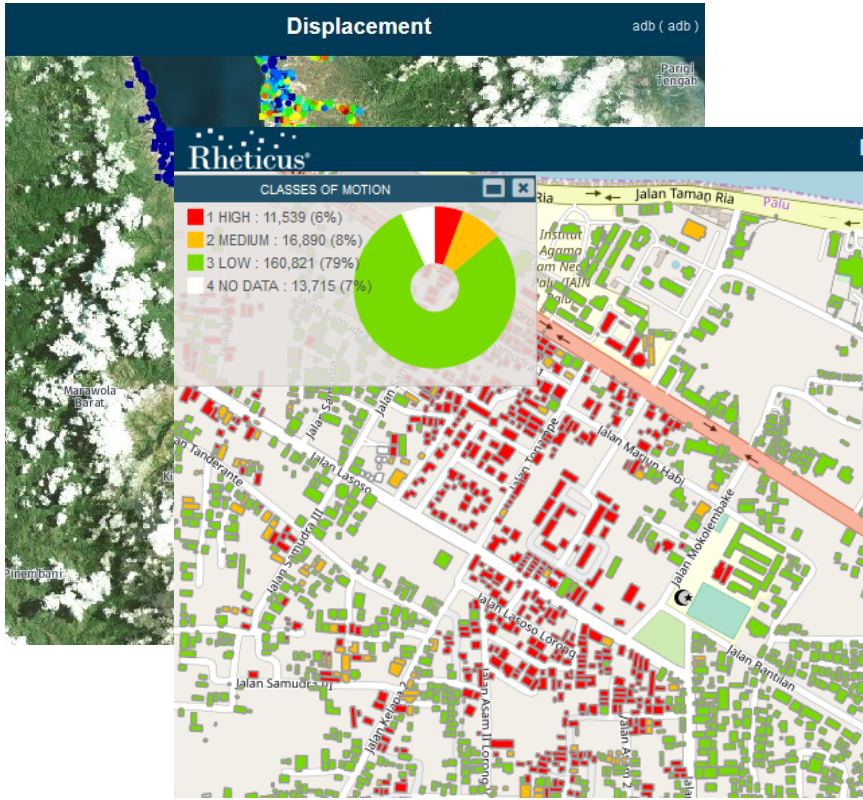
Product: terrain displacement & building stability

Information content

- Terrain displacement: Point database with observed pre-event and post-event terrain displacement
- Building stability: terrain displacement assigned to buildings to indicate their stability over time (pre-event and post-event)

Method

- Multi-Temporal Interferometry based on SPINUA algorithm, delivered by Rheticus® Displacement service.

Constraints

- A large stack of images is used in the generation of this product. However, the technique implies that there are some objects or areas in the image hat are not measured due to the lack of Permanent Scatterers. Those objects or areas are not measured, not meaning that there is not terrain motion.
- Vegetated areas affect negatively the identification of Persistent Scatterers