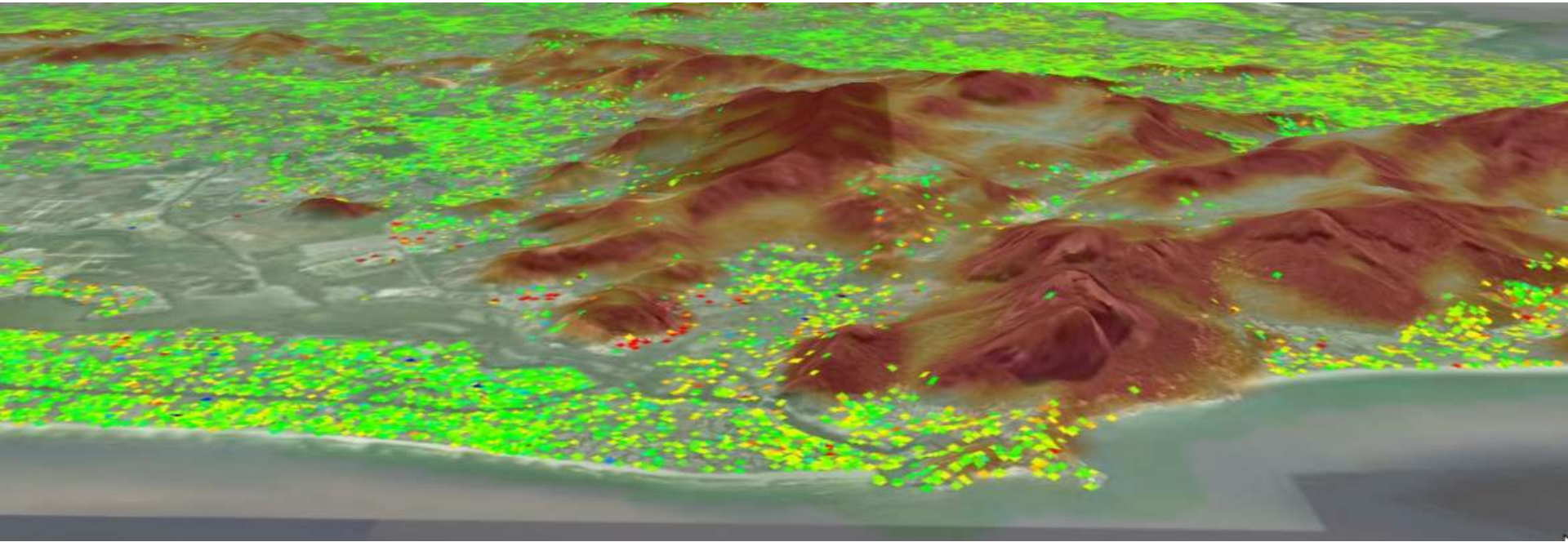


World Bank - European Space Agency Collaboration in using EO for Disaster Risk Assessment

Anna Burzykowska – World Bank



(1) Post- Disaster Needs Assessment

- large-scale emergency recovery programs

(2) Disaster risk mitigation and related climate investment programs

- risk mitigation programs, including those focusing on climate related hazards and urban resilience

(3) Innovation and application of new technologies

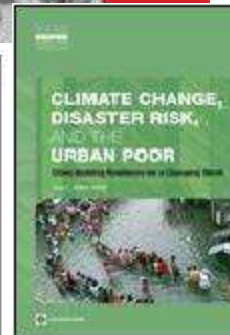
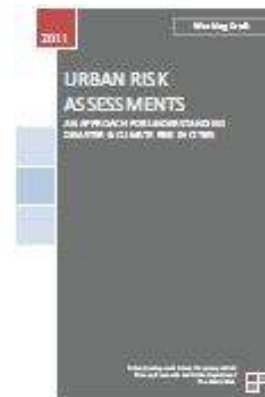
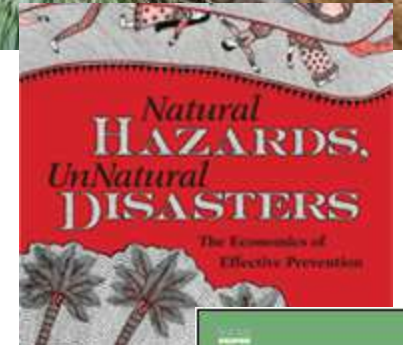
- remote sensing and geospatial analysis for mapping risks

(4) Global knowledge solutions and building access to data

- cutting-edge knowledge products, global knowledge sharing

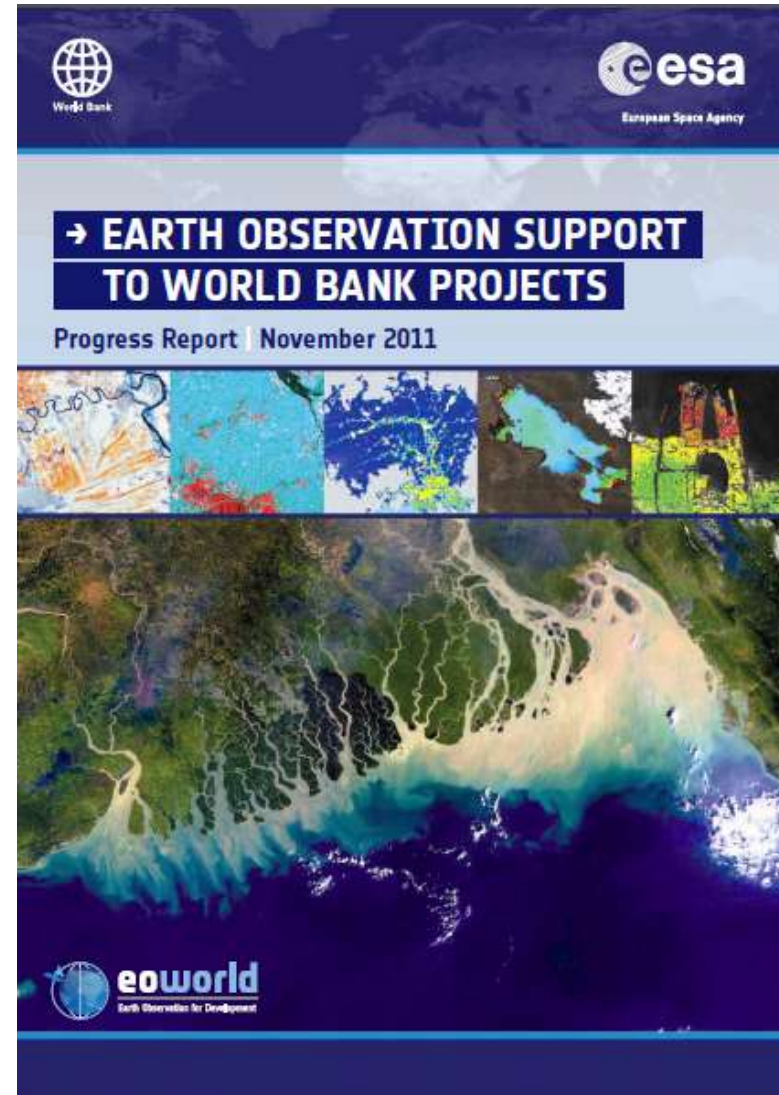
(5) Partnership development and donor coordination

- Strategic and operational alliances with technical and political leaders in the DRM field



- 15 pilot projects implemented across the **Sustainable Development Network**:
 - Disaster Risk Management
 - Urban Development
 - Agriculture and Forest Management
 - Water Resources Management
 - Coastal Zones Management
 - Marine Environment Management
 - Climate Change Adaptation

www.worldbank.org/earthobservation



Demonstration of the added value of using satellite EO to:

- (1) Hazard mapping
- (2) Exposure/Asset mapping and modeling

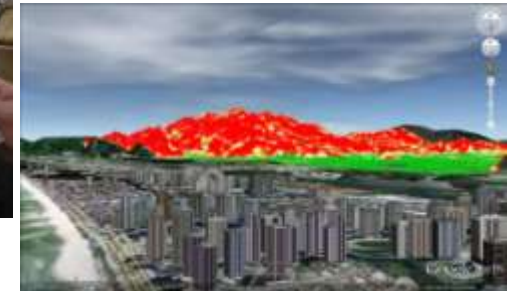
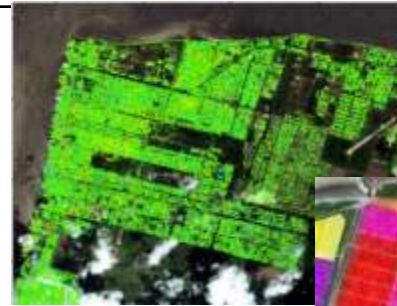
Urban risk management	Latin America Caribbean	Assessing Vulnerability in the Metropolitan Area of Rio de Janeiro	DEM-derived slope maps, Urban mapping of infrastructure & buildings, Flood risk analysis, Land motion mapping and analysis
Urban risk management	Latin America Caribbean	Building Flood Defence Systems in Guyana	Land motion mapping, Urban mapping of infrastructure & buildings
Urban risk management	East Asia Pacific	Multi-Hazard Vulnerability Assessment in Ho Chi Minh City and Yogyakarta	Land motion mapping and urban mapping of infrastructure & buildings, geo-hazard risk analysis
Disaster risk management	East Asia Pacific	Building Exposure Maps of Urban Infrastructure and Crop Fields in the Mekong River Basin	Urban mapping of infrastructure & buildings enhanced by in-situ data collected in the field, Crop mapping (crop type and acreage)
Urban risk management	East Asia Pacific	Analysis of Land Subsidence in of Jakarta	Land motion mapping and analysis
Climate Change Adaptation	Middle East and North Africa	Climate Change Adaptation and Natural Disasters Preparedness in the Coastal Cities of North Africa	Land motion mapping and analysis

Main Results:

- A variety of Disaster Risk Management products developed :
 - DEMs and DEM-derived slope maps
 - Maps of urban infrastructure & buildings
 - Precise terrain motion mapping
 - Landslide inventories
 - Historical Flood mapping
 - Flood simulations

- Strong involvement of local partners but the need for EO capacity building highlighted

- Adequate spatial data infrastructure and other IT tools



Case Study: Analysis of Land Subsidence in Jakarta

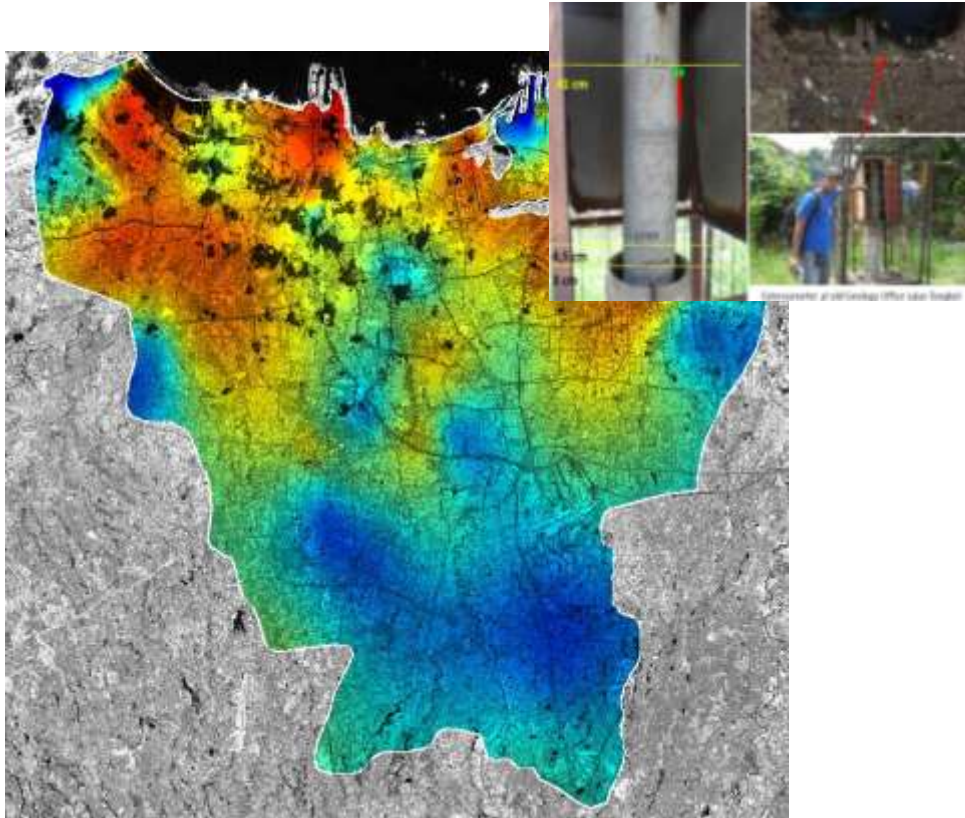


Figure (left): The map of Land subsidence in Jakarta during the period 1974-2010 based on levelling, GPS, extensometers and groundwater level measurements and PSI (ERS-2 1996-1998, Envisat 2007-2009 and ALOS PALSAR 2007-2010). Credit: Deltares 2011.

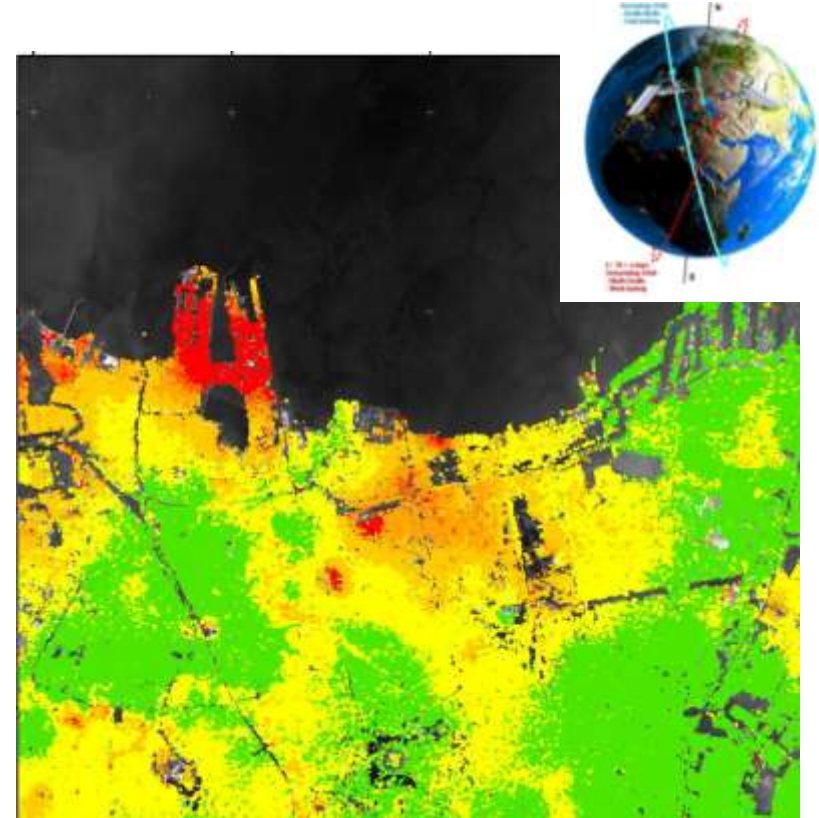


Figure (right): The map of subsidence derived from 3 millions of measurements points using PlnSAR technique and generated in the framework of the EOWorld project and derived from the analysis of ALOS PALSAR data (2007-2011). Credit: EOWorld project/Altamira Information, 2011 for ESA, World Bank.

Case Study: Analysis of Land Subsidence in Jakarta

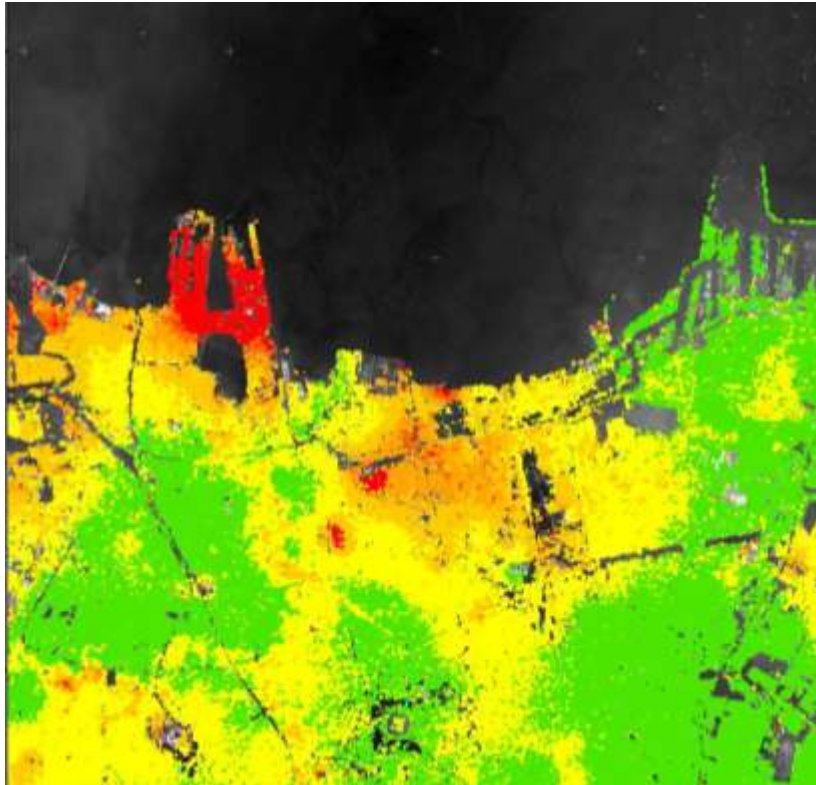


Figure (left): The map of subsidence derived from the analysis of ALOS PALSAR data (2007-2011). Credit: EOWorld project/Altamira Information, 2011 for ESA, World Bank.

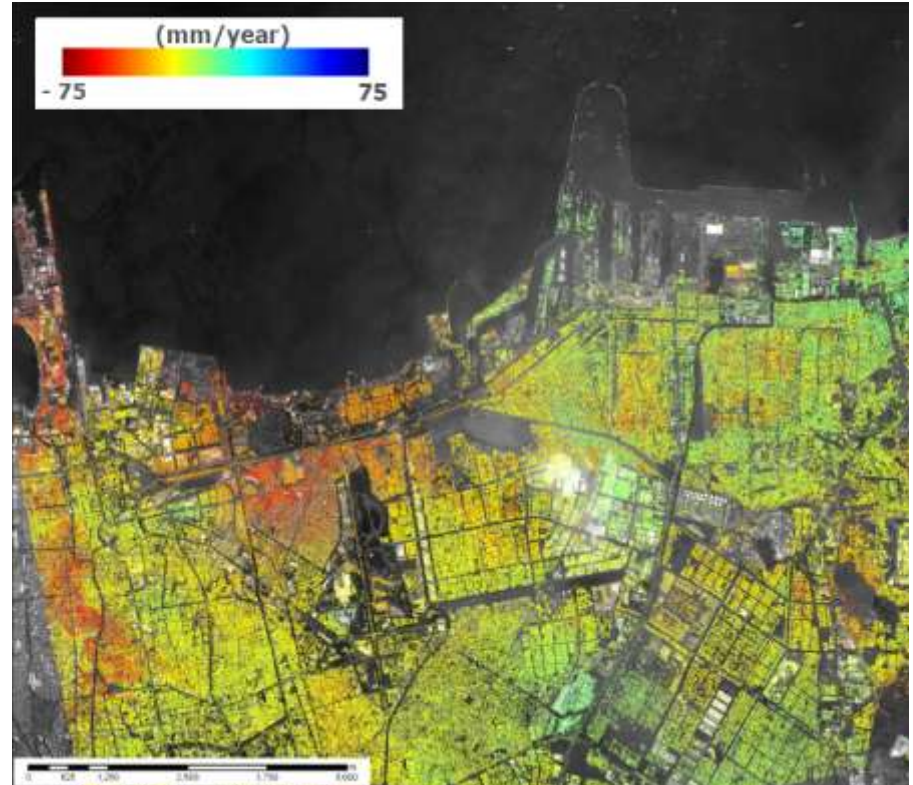
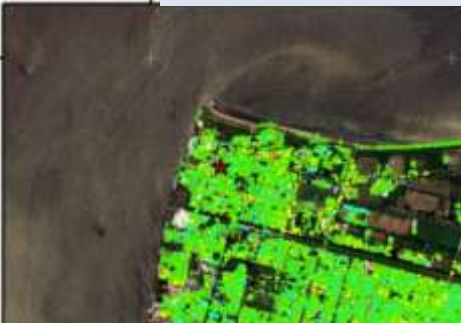
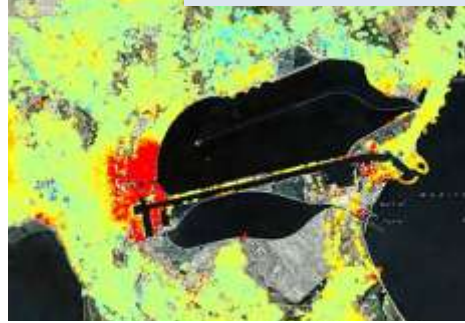


Figure (right). Deformation map in Jakarta Bay and harbor derived from the PSI analysis of VHR COSMO-SkyMed data (Oct. 2010 – Apr. 2011). Color scale between -75 (red) and 75 (blue) mm/year. Credit: EOWorld project/Altamira Information for ESA, World Bank.

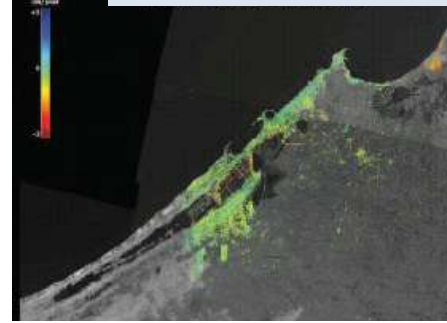
Georgetown, 2011



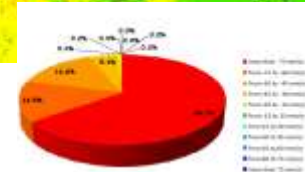
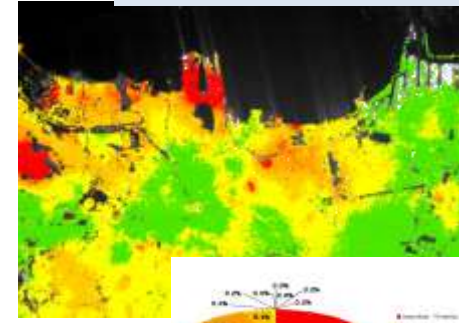
Tunis, 1992-2009



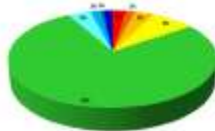
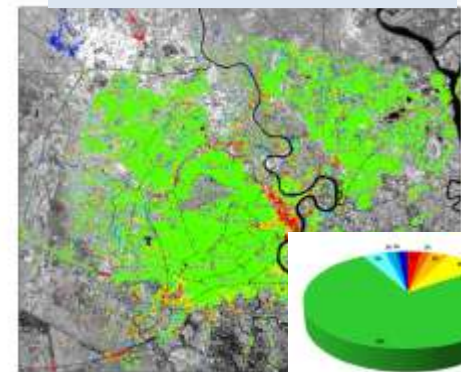
Alexandria, 1992-2009



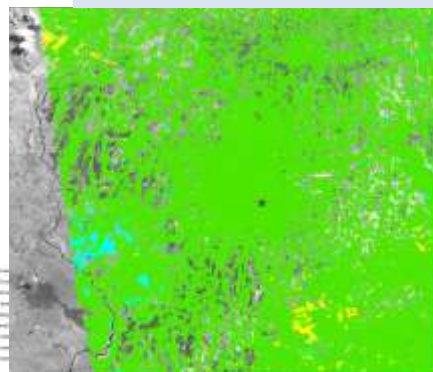
Jakarta, 2004-2007/2011



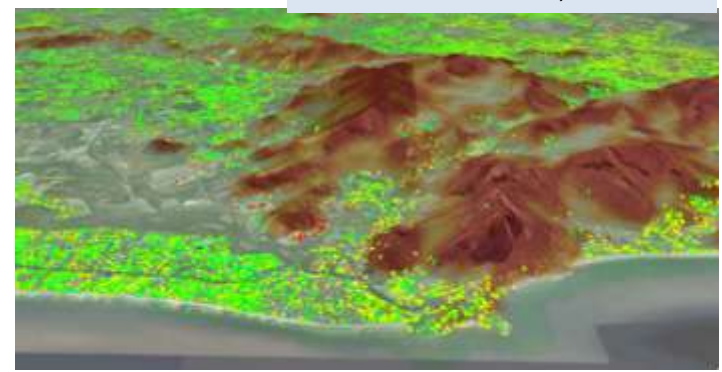
Ho Chi Minh City, 2007-2011



Yogyakarta, 2003-2011

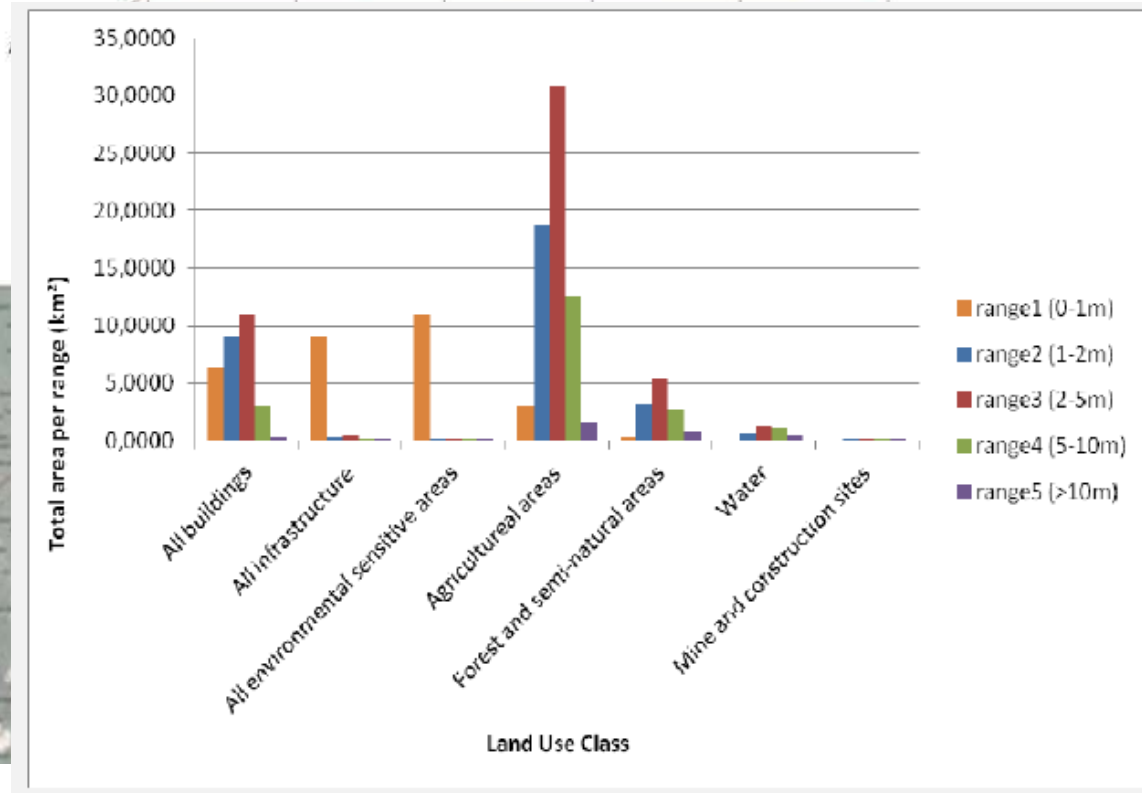
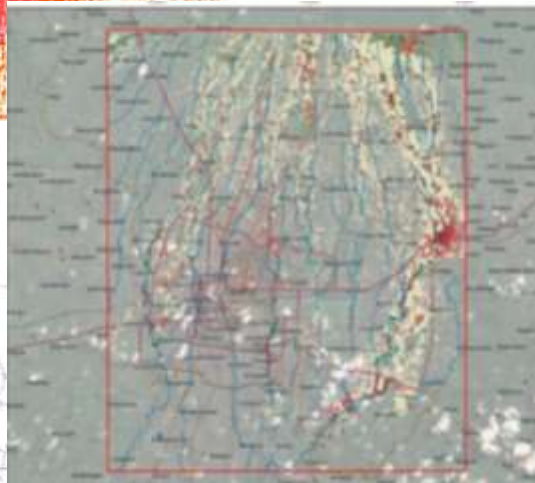
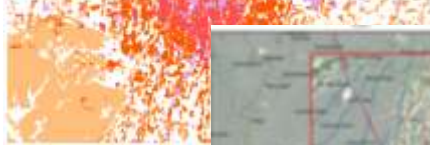


Rio de Janeiro, 2007-2011



Figures: Example of different precise motion products delivered in the framework of EOWorld projects. Credit: Altamira Information (Georgetown, Alexandria, Jakarta, Ho Chi Minh City, Yogyakarta), TRE (Tunis), Hansje Brinker (Rio de Janeiro) for ESA, World Bank. Data used: ERS, ENVISAT, ALOS, COSMO SkyMed, TerraSAR-X.

Case Study: **Developing Multi hazard City Risk Index Yogyakarta**

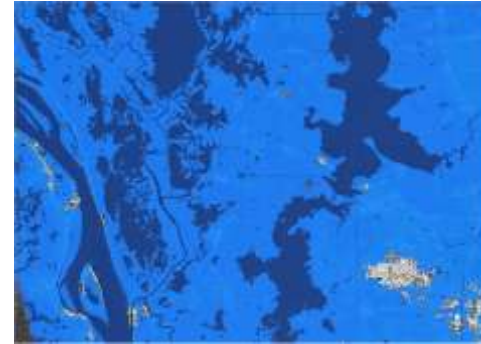
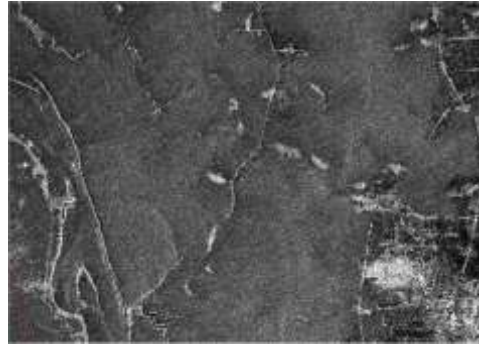


Figures: Example of different land use classes of the urban map of Yogyakarta derived from VHR SPOT5 data. Based on European Urban Atlas Methodology. Credit: EOWorld project/Eurosense for ESA, World Bank.

Case Study: **Building Exposure Maps of Households, Infrastructure and Rice Crops in the Mekong River Basin**

- Flood extent map for 2001 flood event

31 August 2001 (close to flood peak)



■ Permanent water
■ Flood extent

09 November 2001 (end of flood period)

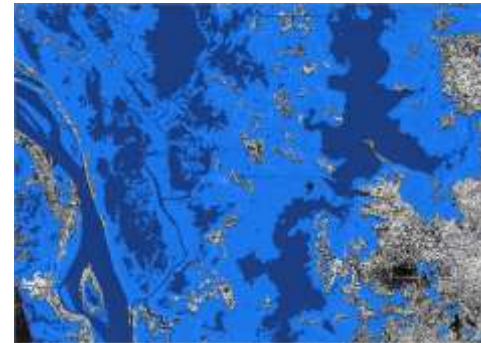
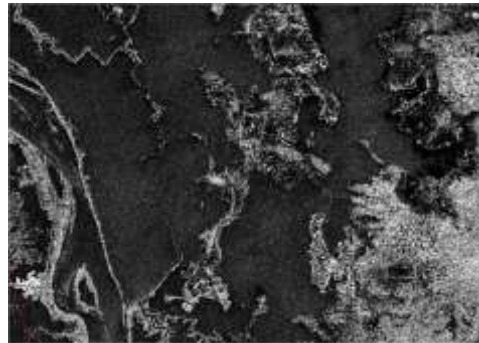
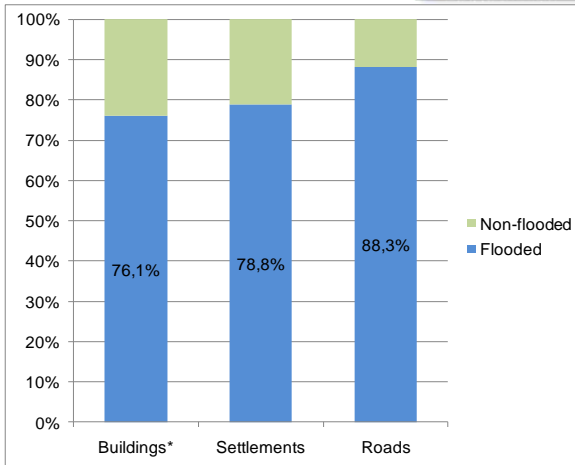
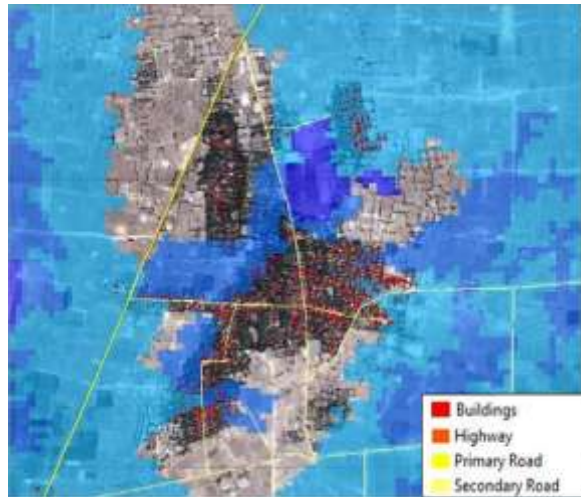


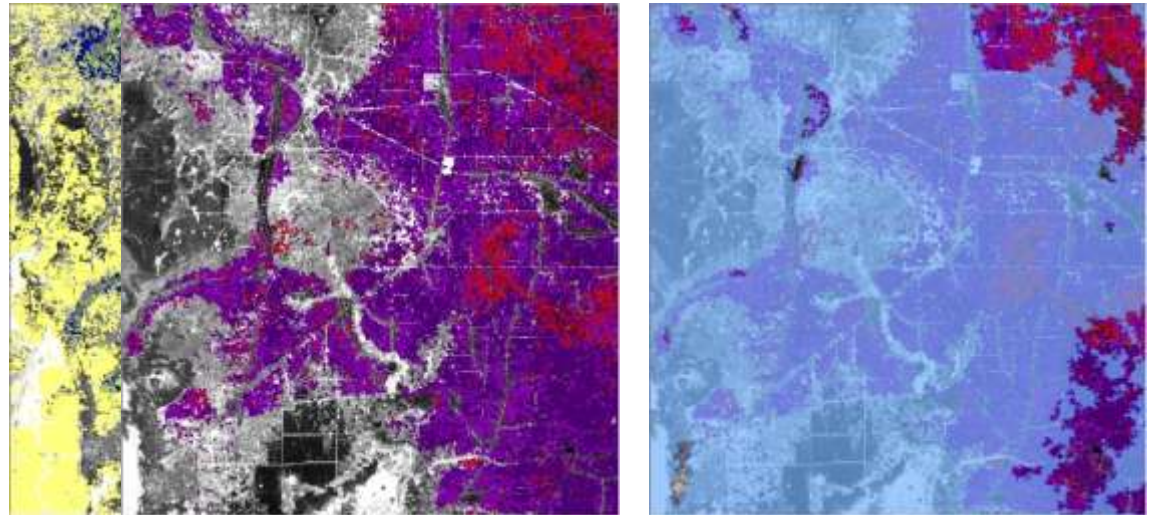
Figure: The map of flood extent in Mekong River Basin. Credit: EOWorld project/Geoville for ESA, World Bank.

Exposure of urban infrastructure & rice paddies to floods

Settlement areas under 2001 flood conditions



Rice cultivation areas under dry & flood conditions (2001)

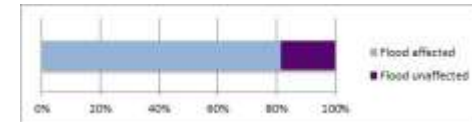


■ Dry season rice
■ Dry/wet season rice
■ Wet season rice

Credit: EOWorld project/Geoville for ESA, World Bank.

Facts:

- Under 2001 flood conditions,
- 79% of the settlement area,
- 88% of the road network, and
- more than 90% of the cropland would be affected by high water levels



Case Study: **Vulnerability Assessment in Rio de Janeiro (Flood Scenarios)**

- Mapping of buildings and infrastructure, including slope maps
- Flood scenarios based on the past floods occurring in Rio Grande watershed

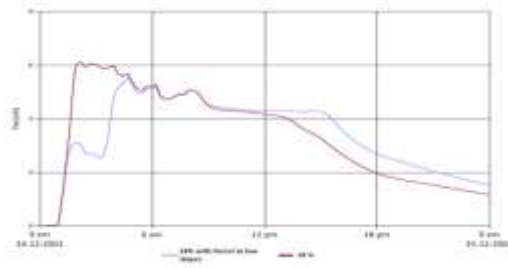
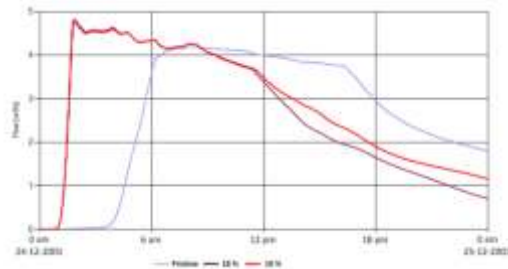
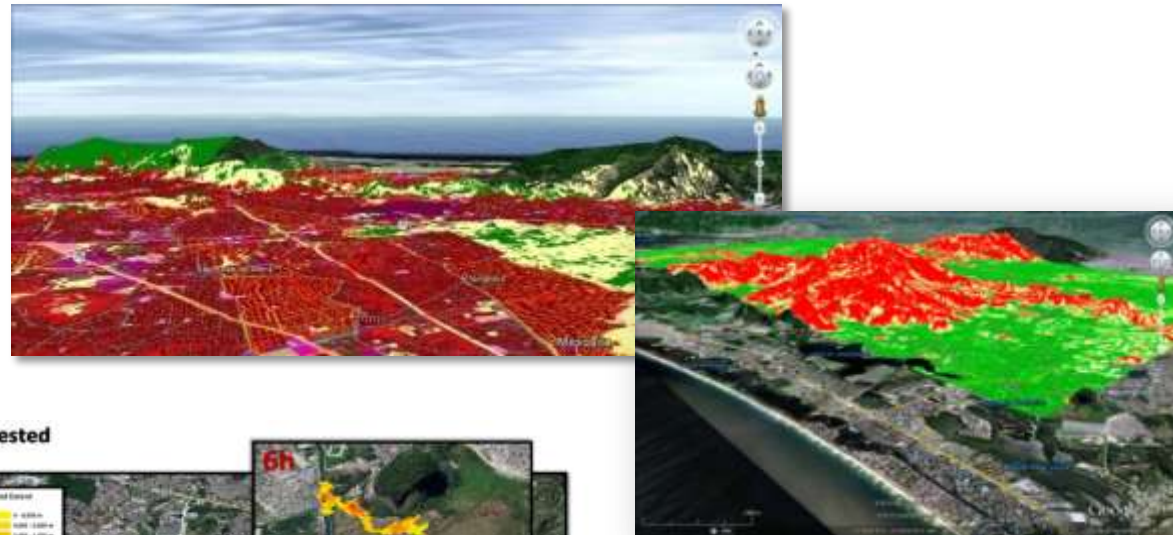


Figure (up): Rio de Janeiro urban land use map. Credit: EOWorld project/Critical Software for ESA, World. SPOT5DEM © SpotImage.

Figures (left): Rio Grande/Rio Anil flood simulation scenarios. Credit: EOWorld project/Hidromod for ESA, World Bank.

Case Study: **Vulnerability Assessment in Rio de Janeiro (Landslide Risk)**

- Mapping of buildings and infrastructure, including slope maps
- Landslide susceptibility analysis based on combination of satellite PInSAR, information about slope steepness, flow accumulation and urban land use

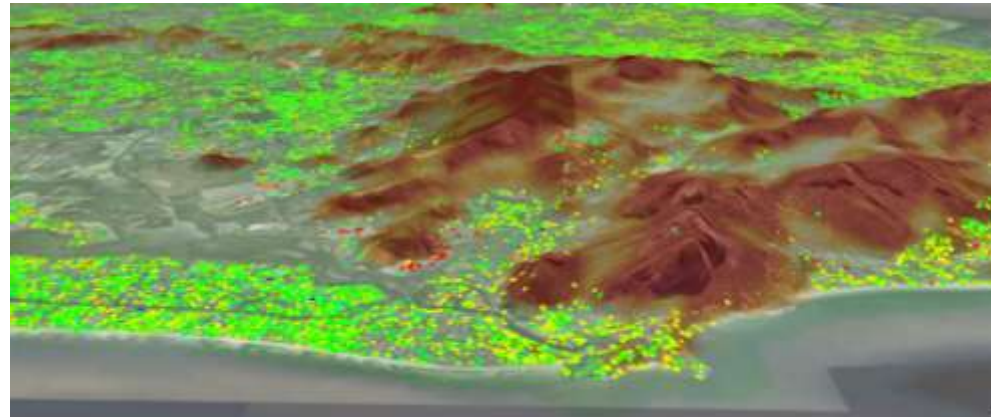
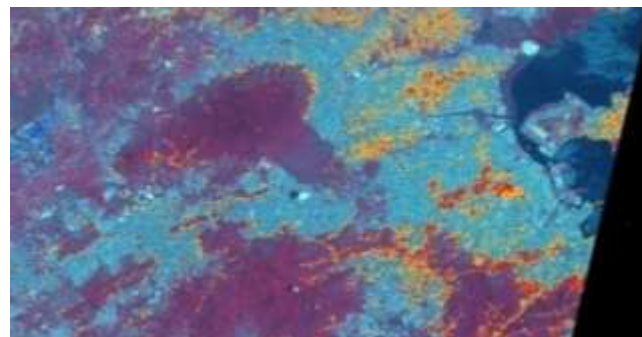
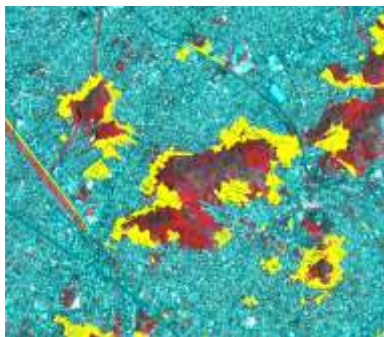


Figure (left): Linear deformation map of Rio de Janeiro based on ALOS data (2007-2011). Credit: EOWorld project/Hansje Brinker for ESA, World Bank.



Figures (left): Map of favelas in Rio de Janeiro based on 2010 SPOT5 data; (middle): land slide susceptibility map (I) based on slopes steepness, flow accumulation, and urban land use; (right): the land slide susceptibility that combines the information land slide susceptibility map (I) with information on land deformations based on satellite technology. Credit: EOWorld project/NEO and Hansje Brinker for ESA, World Bank.

- **ESA-WB collaboration (Phase1):**

- *Collecting precise, tailored information requirements to assist the World Bank projects*
- *Primarily based on European satellite missions (ENVISAT, ERS, RapidEye, SPOT5, TerraSAR-X, Cosmo-Skymed, etc.)*
- *Specialist EO providers delivering mature, validated and operational information services*
- *Concentrating on EO component which combined with other data sources can be a very powerful tool (end-to-end product)*
- *Utility assessment to measure the impact*
- *Financing & technical oversight by ESA*



Oil spill monitoring utility assessment, Washington DC



Training in small reservoirs mapping, Lusaka, Zambia

- **ESA-WB collaboration (Phase2): larger scale activities in priority areas**

- *Urban Development, Disaster Risk Management, Oceans, Forestry, Fragile States, +...*



Meeting with users, Port Moresby, Papua New Guinea



We look at this collaboration from the perspective of how efficiently we could use this new technology to better inform the dialogue with our clients. ||
Zoubida Allaoua, Director, FEU Department

- Access to information and sharing data is an important step to reducing risk
- The need to work with countries to enable them to manage and share their data



Earth Observation: **A necessity**



2012 UR Forum Mapping Global Risk