Using Satellite Data for Improved Urban Planning: EO4SD Urban

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The project “Earth Observation for Sustainable Development-Urban” (EO4SD-Urban) was initiated in May 2016 and is supported by the European Space Agency (ESA).

The main objectives are:

• To improve understanding of EO applications for urban development with the Multi-Lateral Development Banks and developing countries.

• To mainstream EO applications in an operational manner into development programmes.

The project is being implemented by a Consortium of European EO-Service Providers led by GAF AG.
About 40 cities have been identified and stakeholder engagement initiated.

- Distributed globally.
- Include mega-cities and small to medium sized cities.
- Cover a multitude of urban planning/development issues.
EO Products for Urban Development

Baseline Products
Urban and Peri-Urban LU/LC

- Green Areas/Networks
- Urban Extent and Change

Detailed Change

- Building Footprint
- Population Density
- Waste Sites
- Transport Infrastructure
- Informal Settlements
- Flood Risk
- Landslide Risk
- Terrain Motion
Examples: Informal Settlement Mapping

• “Urban poverty is still a major challenge, with the number of people living in informal settlements projected to rise globally from 1 billion to 2 billion by 2030, primarily in Sub-Saharan Africa, South Asia and Latin America” (UN-Habitat 2003).

• In this context a main component of UN SDG Goal 11 is Target 11.1: “By 2030, ensure access for all to adequate, safe and affordable housing and basic services and upgrade slums.”

• The geo-spatial data on informal settlements can be used to provide overviews of the spatial extent, location related to high risk areas, access to transport lines and water etc.
Example of Geospatial Product for SDG Indicator 11.1.1

Initial detection and delineation

Example of Geospatial Product for SDG Indicator 11.1.1

Slum area characterization - slum areas typology

Name: Tambak 02
Location: Tanjungsari
City: Surabaya
Type: AlongRailway
Area: 2ha
Perimeter: 600m
Shape compactness: Medium
Built-up density: High
Built-up homogeneity: Medium
Open spaces density: Low
Greenness: Low
Avg dwelling size: 50m2
Roof heterogeneity: Low
Distance to paved road: 0.01km
Distance to railroad: 0.01km
Distance to centre: 6.3km
Distance to shoreline: 5.7km
Avg terrain slope: 5deg
Inundation risk: Low
Landslide risk: Medium

Slum Areas Typology

Residential Center
Suburban Industrial
Urban Fringes
Along Railway
Along Roads
Along Shore
Pocket Slums
Example of Geospatial Product for SDG Indicator 11.1.1

User verification (e.g. crowd source supported)
Example of Building Heights for Kigali

Building height datasets are needed for urban planning, assessment of property taxes, floor-area-ratios (part of the legal zoning framework for the building/construction sector), etc.

- Methodology relies on the use of a Digital Surface Models (DSMs) and Digital Terrain Models (DTMs)

- DSM can be accurately derived from 3 Pléiades Satellite Images of different acquisition angles (0.5m spatial resolution).
World Bank Development Economics Data Group (DECDG) is supporting the Rwandan Government to improve methods of land valuation.

A pilot study for Kigali has the objective:

• To assess methods for using land transaction data from the country with the land cadastral map and basic building height data (from the EO data) to simulate different property values and related tax rates.

• Such methodologies can support the country to develop a relevant land taxation system and improve the total revenues captured.
 EO4SD-Urban provided geo-spatial building height data to DECDG for Kigali.

- The DECDG team overlaid it with the spatial cadastral data and the results show high levels of concurrence between the building height data and the cadastral data.

- The next step is to undertake rigorous accuracy assessment and user validation of the product.
3D Digital Surface Model from VHR Data
Concluding Comments

• Positive stakeholder engagement from the Banks and developing countries confirm the high interest in EO applications for urban development/planning.

• User requirements for 40+ cities for geo-spatial products completed.

• Harmonisation of EO processing methods and rigorous Quality Control will be ensured via consolidated Guidelines (used by Consortium).

• Products have a value for multi-disciplinary applications.
Thank you for your attention

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