



ISPRA - The Italian Institute for Environmental Protection and Research

URBAN GROWTH SOLUTIONS



VHRL for Urban Change Detection

The goal is to identify new built-up areas with a pixel resolution of 5m.

Input data: free HR images such as Google Maps, Planet, Pleiades; land consumption map (2017, 2018).

Current status: implementation initiated. A first intermediate product available.

3rd level classification: distinction between permanent soil consumption (buildings; paved roads; railway station; airport runways, docks, squares and other waterproofed or paved areas; permanent paved greenhouses; landfills) and reversible soil consumption (unpaved areas with vegetation removal and soil removal or compaction due to the presence of infrastructures, construction sites; ground photovoltaic systems; other artificial cover not related to agricultural activities where the removal of the cover restores the natural conditions of the soil);

No potential obstacles

Stakeholder's involvement: SNPA, network of contacts of land consumption monitoring, network of contacts of Soil4life project (Regions,...), local administrators (5 pilot cities) for implementing urban policies

Future plans: developing a homogeneous classification system of Urban Change Detection at very high resolution. Specific indicators such as *SDG 11.3.1* and *Per capita soil consumption*.

Replicability: it depends on the input data. Necessary VHR images referring time series and/or a land consumption map of the previous year (Copernicus HRL Imperviousness if present).



VHRL for Urban Change Detection

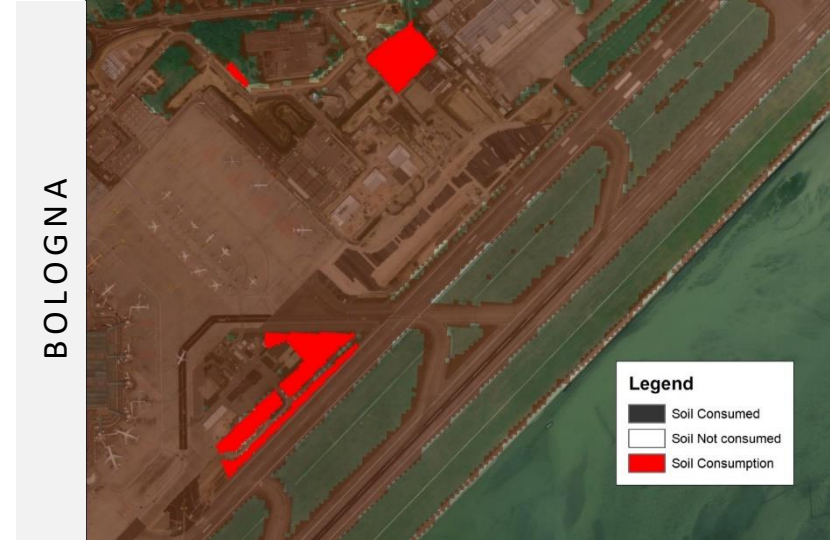
- Accuracy of the estimation of changes in Land Consumption
- Ability to detect new punctual and linear elements

Limitation:

Need for a high resolution imagery availability
 Frequency of Update strongly depending on satellite imagery
 Fotointerpretation and Validation is time expensive

Potentiality:

Mapping new buildings can improve urban planning efficiency



Urban Growth Metrics

City-scale metrics and indicators referring to urban growth processes:

- LCPI (Largest Class Patch Index),
- RMPS (Residual Mean Patch Size),
- ED (Edge Density)
- ID (Dispersion index)
- Soil consumption (% , ha)
- Annual percentage increase in soil consumption
- Loss of agricultural, natural and semi-natural areas

Input data: Sentinel2, ISPRA/SNPA National built-up map (10 m, binary classification)

Current status: implementation initiated. A first intermediate product available.

No potential obstacles

Stakeholder's involvement: SNPA, network of contacts of land consumption monitoring, network of contacts of Soil4life project (Regions,...), local administrators (5 pilot cities) for implementing urban policies.

Future plans: developing a homogeneous classification system of Urban Growth indicators at european and global level. Specific indicators e.g. quantification and distribution of green urban areas (fragmentation, distribution and size).

Replicability: it depends on the input data, based on national built-up maps. The Copernicus HRL Imperviousness could be used.



URBAN LAND COVER CLASSIFICATION BASED ON EIONET EAGLE

It's a land cover classification based on satellite images at 10m resolution.

Input data: Sentinel 1, 2. ISPRA/SNPA National built-up map for *abiotic artificial* land cover class (EAGLE Matrix LCC). Vegetation indices.

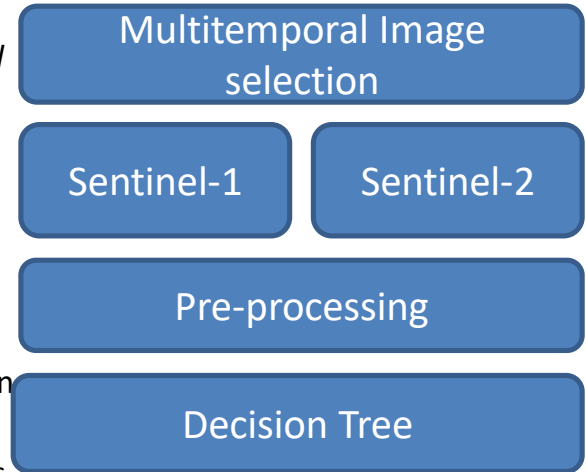
Current status: Medium solution maturity.

Potential obstacles: cloudy satellite images (north of Italy)

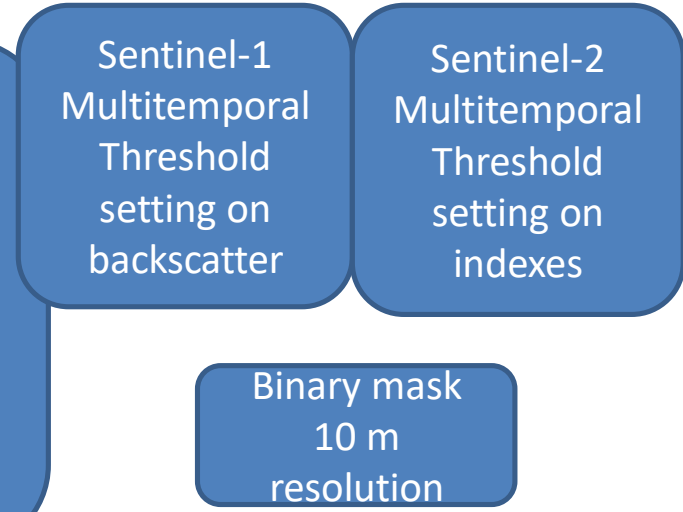
Stakeholder's involvement: SNPA, network of contacts of land consumption monitoring, network of contacts of Soil4life project (Regions,...), local administrators (5 pilot cities) for implementing urban policies.

Future plans: developing a homogeneous classification system of LCC at European and global level. Specific indicators e.g. fragmentation.

Replicability: it depends on the input data. Necessary no cloudy satellite images.



- Water and Ice
- Grassland/Arable land (permanent and periodically herbaceous: *work in progress*)
- Woody - coniferous
- Woody - broadleaves
- Bare soil (abiotic natural)
- Urban (abiotic artificial)



URBAN GROWTH SOLUTIONS REPLICABILITY

Methodology implemented by ISPRA is replicable

SMURBS Partners should verify the presence of input data:

- VHR satellite images referring time series.
- Land consumption map or HRL Imperviousness (2006, 2009, 2012, 2015, next 2018) or Urban Atlas (2006, 2012) or European Settlement map or....., referring time series.
- Frequency of updates.

Concerning the elaboration of metrics SMURBS Partners should use GIS tool Focal Statistics and FRAGSTAT software.

