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**URBAN GROWTH SOLUTION PRECURSOR:
URBAN GROWTH MONITORING, METRICS, URBAN
GROWTH, URBAN DENSITY AND SPRAWL, GREEN AREAS,
SOIL SEALING RATIOS**



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General solution description:

- 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:

- ISPRA/SNPA National built-up map (10 m, binary classification)

Satellite data:

- Sentinel 1 and Sentinel 2

In-situ and auxiliary data:

- Available local data (provided also by municipalities) on built-up, roads, (OSM), orthophotos, etc.....



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Methodology:

- LPI** (Largest Patch Index) equals the area (sqm) of the largest patch of the corresponding patch type divided by total landscape area (sqm), multiplied by 100 (to convert to a percentage); in other words, LPI quantifies the percentage of the largest patch of a single class (built-up class) with respect to the total area of the patches of the same class (total built-up area). It provides a measure by which the dominant patch occupies the landscape, and is therefore an indicator of the compactness of an urban area or vice versa of its fragmentation: to very high values of LPI refer to the classes of urbanized areas are compact cities.
- RMPS** (Residual Mean Patch Size) represents the average size of the polygons excluding the largest polygon and refers to the residual obtained by subtracting to the total built area, the area of the polygon greater. It is expressed in hectares.
- ED** (Edge Density) equals the sum of the lengths (m) of all edge segments involving the corresponding patch type, divided by the total landscape area (sqm), multiplied by 10.000 (to convert to hectares). In other words it is the ratio between the total sum of the perimeters of the areas of the polygons constructed and municipal surface investigated. The indicator facilitates comparisons among landscapes of varying size and lends itself to be an effective measure of the shape and complexity of the different urban areas. In particular, the ED assumes increasing values, with the same surface area, in passing from urban areas with compact form in situations with limits more jagged.
- ID** (Dispersion Index) is ratio between the discontinuous urbanized surface (medium / low density areas) and the total urbanized area (high and medium / low density areas)
- The elaboration of metrics is based on the GIS tool *focal statistics* and in some cases on FRAGSTAT software, that is a software useful to compute several statistics for each patch and class in a landscape.



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Expected results:

- Thematic maps and tables of indicators (10m)
- (Potential application) elaboration of specific indicators such as green areas
- Interaction with local stakeholders
 - Development of indicators and maps for monitoring the expansion of infrastructures and the construction of new buildings, to control phenomena such as greenfield/brownfield projects, urban spread, fragmentation of ecosystems.
 - Development of indicators for evaluating fragmentation, distribution and size (quality) of green urban areas.

Timeframe and scalability:

- A first intermediate product will be available on June 2019, scalability from local to national level

