Spotted

Supports Public Administrations in the field of green areas management

www.cef-spotted.eu

SPOTTED Hackathon

Processing Blocks

Co-financed by the Connecting Europe Facility of the European Union

Table of Contents

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1 Introduction

SPOTTED project aims at facilitating the Public Administration in the management of **Green Areas,** supporting the policy makers in the analysis of data, exploiting the **High Value Datasets** such as geospatial, earth observation and environment, meteorological, statistics, etc.

SPOTTED has three main objectives:

1. Provide an **innovative solution** based on the integration and customized analysis of massive **open data collections**, including Earth Observation data to monitor and support decision takers in the field of Green Areas management
2. **Combine** different **disruptive technologies** (i.e. artificial intelligence processes, cloud storage and cloud computing), providing **customizable dashboards** to monitor and predict emerging land changes
3. Use of integrated Open Data collections though **Open Data infrastructures** such as EU Portal, CEF Context Broker and Copernicus Hub.

The main outcome of the project will be the ***SPOTTED Digital Service*** that is what SPOTTED Solution offers to the cities. In few words, starting from what a City wants to

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measure (e.g. one of indicators from Milan is the comparison of the Natural Capital and the Health), SPOTTED Platform will provide a digital service that collects satellite and open data, analyses them and delivers the information to be used by the City Portal to be visualised, according to its own way of visualisation. The result of the SPOTTED Digital Service will be published to the **European Data Portal**, as open dataset.

1.1 Aim of the SPOTTED Hackathon

The Hackathon aims at supporting the SPOTTED project to find new innovative solutions for the green area management of the cities.

In particular, the Applicant should address one of the following topics.

1. Starting from SPOTTED Digital Services, already identified by Pilots, look for data needed to run the **same service in different cities**.
2. Starting from the already existing data or new data found by Applicants, propose a **new Digital Service** and draw **its related Processing Block,** for the cities already involved in the SPOTTED Project.
3. Propose a new Digital Service and draw its related Processing Block, for the cities already involved in the SPOTTED Project, in **different thematic areas** (e.g. tourism for Naples), suggested by Pilots
4. Revise the already existing **Processing Blocks** and in case re-engineering them, providing better solutions

The Open Data made available by the cities involved in the project are already available at https://idra-sandbox.eng.it/IdraPortal/

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2 Processing Blocks

2.1 Milan Municipality

2.1.1 Natural Capital and Health Indicator

2.1.1.1 Description of indicator

Natural Capital and Health Indicator is based on the idea of how green areas can have an impact in mitigating the health risk that can be focused on vulnerable categories of the population such as the elderly or the young, contributing to the reduction or not of overheating of the body or heat-related diseases. Climate change is a source of health problems, especially for some age groups, especially the elderly and children. The aim is to identify the most critical areas (NIL) from this point of view, considering the heat islands, the age of the population that resides there, and the amount of existing greenery.

2.1.1.2 Description of processing block

The indicator provides for the use of satellite images for the calculation of heat islands and for the extraction of green areas in the city, data that will represent the input along with NIL areas and AGE CLASSES by NIL. In practice, the heat islands resulting from the processing of the Sentinel-2 images over a certain period will integrate with the NIL areas, creating a new layer that contains the temperature information at the NIL level. The data about the coverage of green areas will be derived from Sentinel-2 images with the help of vegetation indices and together with

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the previous resulting layer through a spatial join process, we will be able to distribute the temperatures of each NIL with the surface of green areas in that area. Later, the introduction of the last layer, that of age classes on each NIL separately and together with the NIL data containing the temperatures of the heat islands and the surface of green areas, through the same spatial join technique we will obtain the final layer that will help us to identify the correlation or not, between the high level of heat, the lack of green spaces and to identify the areas where vulnerable people (elderly and children) are prone to high temperatures, following the analysis to take decisions to mitigate the effect.

2.1.3 Example of figure

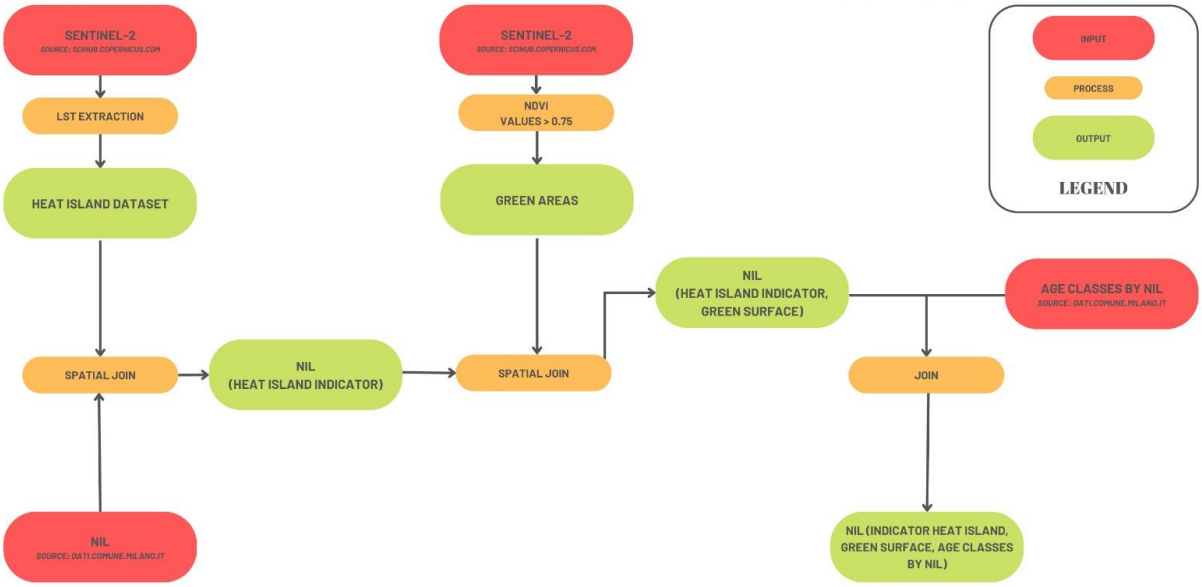

Figure 1 - Milan municipality - Natural Capital and Health Processing Block

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2.1.2 Natural Capital and Soft Mobility Indicator

2.1.2.1 Description of indicator

Natural Capital and Soft Mobility Indicators try to validate the idea of how green areas have an impact on enhancing or inhibiting the effective usability of soft mobility and slow-traveling network by guaranteeing or not adequate thermo-hygrometric comfort.

Green data (areas, existing and potential green roofs) and everything related to cycling and walking in urban areas. Satellite data on heat maps will be used as a starting point

2.1.2.2 Description of processing block

The processing block proposes the use of Sentinel-2 satellite images for the calculation of vegetation indices that will lead to the extraction of green areas by reference to a Normalized Difference Vegetation Index greater than 0.75 points, as well as the use of the same images for the extraction of heat islands for a period of determining time.

The data about the heat islands will be integrated and intersected with the vector data about the transport routes such as bicycle sharing stations, cycle paths, bus stations, and pedestrian areas that will be reported as a buffer, resulting in a new layer in which we can identify the areas of mobility that are affected by heat islands. The next step is the intersection of this area with each of the previously proposed mobility elements, from which the areas of the mobility elements that are affected by the heat island will be categorized. The green areas resulting from the processing of the Sentinel-2 images will also be intersected with the areas affected by the heat island and the correlation between the green areas and the heat island mitigation will be validated or not, so areas that need green spaces or areas will be highlighted greens that are not efficient.

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2.1.2.3 Example of figure

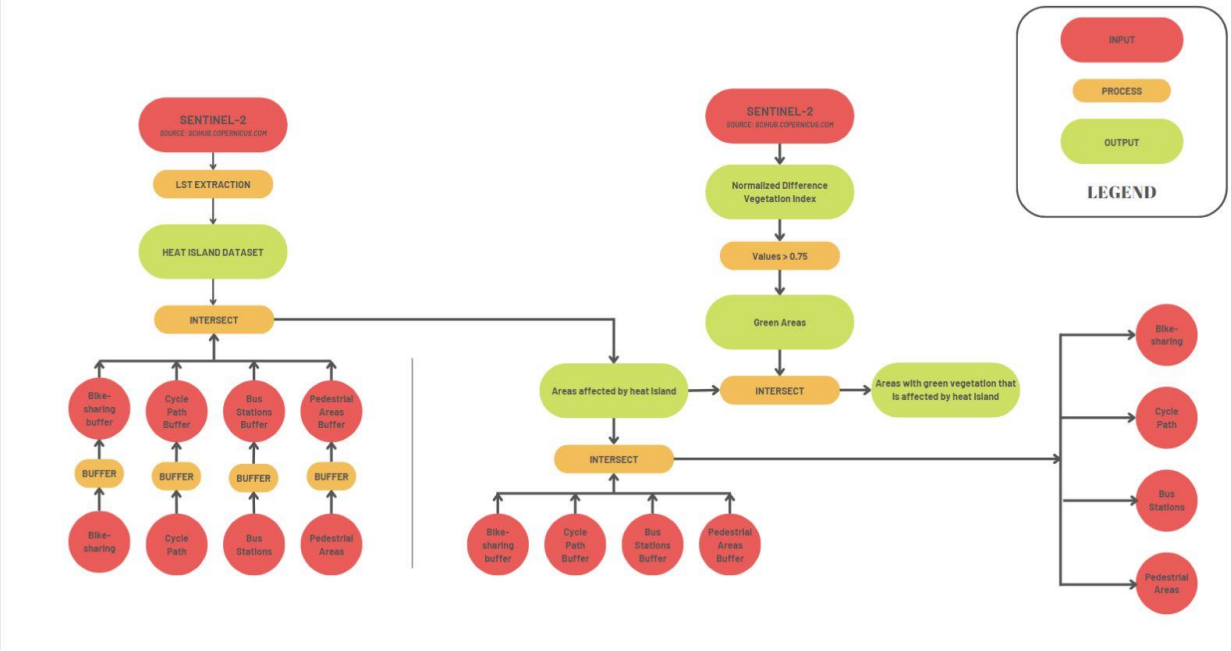

Figure 2 - Milan municipality - Natural Capital and Mobility Processing Block

2.1.3 Natural Capital and Social Cohesion

2.1.3.1 Description of indicator

Natural Capital and Social Cohesion Indicator try to validate the idea of how green areas have an impact on enhancing or inhibiting people's sociality, in terms of sociocultural events and/or activities organization, such as shared urban gardens; in addition, how this may have an impact on faster land degradation.

Green areas with particular regard to urban orchards and shared garden; demographic data and data relating to degraded areas in the urban context

In green areas, it is possible to create spaces of social cohesion. Shared gardens and urban orchards are examples of this paradigm; starting from this experience, others can be designed by reusing the degraded areas and the demographic characteristics of the population

2.1.3.2 Description of processing block

The processing block proposes the use of Sentinel-2 images as input data from which green areas will be extracted through the same procedures for extracting NDVI values, but also layers with zoning from the urban plan or damaged buildings.

The first step of the block is to integrate spatial join data about the degraded buildings and the urban plan for their location on each type of zoning in part of the plan. Furthermore, this result will be integrated with the green areas, with the help of which it will be possible to locate the green areas and their intersection with urban areas and degraded buildings in the city. Urban Orchards is a new input layer that will integrate with the previous layer in the processing block, resulting in a new layer that also locates urban orchards in the analysis, and then it will be integrated through spatial join with shared gardens.

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The NIL areas represent an important factor along with the demographic data, so they will be integrated and used spatially with the urban areas that contain all the information presented previously (damaged buildings, green surfaces, urban orchards, shared gardens). In this case, the final result will integrate the demographic data on NIL areas, resulting in an output layer that will be used for decision-making and the transformation of the targeted areas into areas for social cohesion.

2.1.3.3 Example of figure

Figure 3 - Milan municipality - Natural Capital and Mobility Processing Block

2.2 Helsinki Municipality

2.2.1 Climate Change Risk and Adaptation

2.2.1.1 Description of indicator

The Climate Change Risks and Adaptation indicator has as its main purpose the provision of pre-analyzed data for planners to help them mitigate the effects of floods and heat stress.

The processing block will use satellite data, maps of the municipality of Helsinki, buildings, air polar data, and weather and land use data.

2.2.1.2 Description of processing block

The processing block of the presented indicator provides for the use of Sentinel 2 satellite images from 2015 to the present, which will be preprocessed from the point of view of cloud cover/image clarity, increasing the accuracy in the subsequent analysis. From the selected satellite images, information will be extracted regarding the urban heat island, permeability, and air quality, data that will be transformed from raster to vector and that will be part of the output.

The LiDAR data will be used to extract tree canopy and tree height, while the other input data such as air quality, land use, and the topographic model will be the input data in the analysis of permeability and air quality, correlated with the sensitive population (elderly over 70 years old and children up to 10 years old.

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2.2.1.3 Example of figure

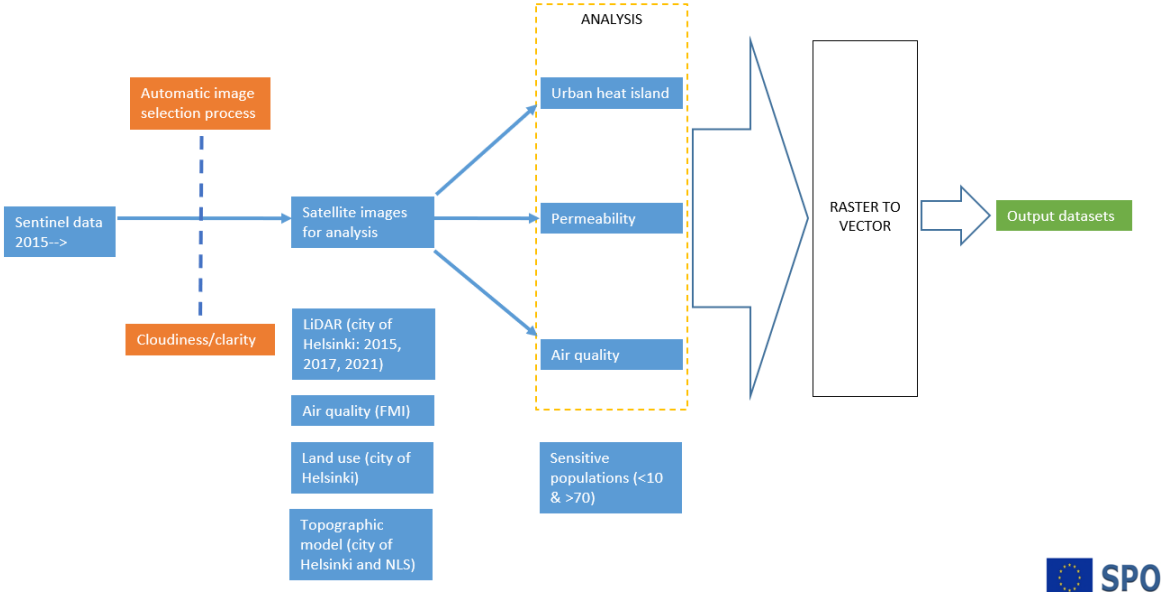

Figure 4 - Helsinki municipality – Climate Change Risks and Adaptation

2.2.2 Urban Green Index

2.2.2.1 Description of indicator

The Urban Green Index is an indicator that has as its main goal the generation of data on quantitative (absolute and relative) and quality of green areas. The calculations can be based on different index methodologies, depending on data availability and appropriate resolution. (Tree height and canopy cover, distribution of green spaces, access to green areas, etc.). A combination of open data on green areas/space (utilizing open satellite data for monitoring temporal changes), population grid, administrative boundaries, and register of the public. The main outputs of this pilot case might not be the actual map layers but rather the values of conducted calculations. These values could then potentially be linked to existing datasets that are used for monitoring, managing, and maintaining green areas of the city of Helsinki. The main benefits of using this indicator will be having a quick and easy assessment of greenery status in the city and particular neighborhoods/districts. On the other hand, this data will help the municipality of Helsinki to ensure that everyone has access to green areas.

2.2.2.2 Description of processing block

The current processing block uses as main input data the Sentinel 2 satellite images from which the green areas will be identified, through the process of calculating the vegetation indices, as well as the land use and the register of public areas of the municipality of Helsinki. Using the mentioned data, the layer of green areas will be validated and integrated with the help of land-cover layers, while the information from the public register will enter the same layer of green areas.

With the help of administrative borders, it will be possible to calculate statistics based on the number of green areas in each administrative unit, both at the city level and at the neighborhood and district levels.

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Integrating the population data, the data on the green areas will be correlated with the population distribution, thus the accessibility to green spaces will be obtained about the types and categories of the population.

The final process is that of extracting canopy cover and tree height with the help of LiDAR data available at the level of the municipality of Helsinki, which will result in a classification of the types of green areas from the point of view of tree height and the point of view of canopy cover. The result will be represented by a classified layer of green areas in classes such as a park, forest, meadow, etc.

2.2.2.3 Example of figure

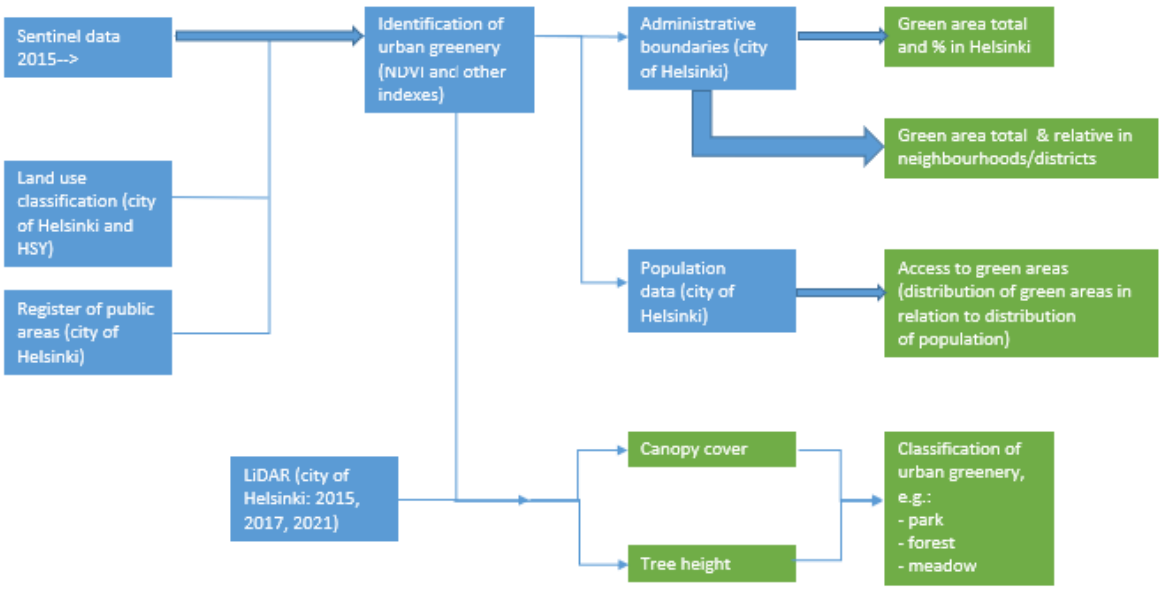

Figure 5 - Helsinki municipality – Urban Green Index