

1st CoP Meeting

Basel, April 25, 2012



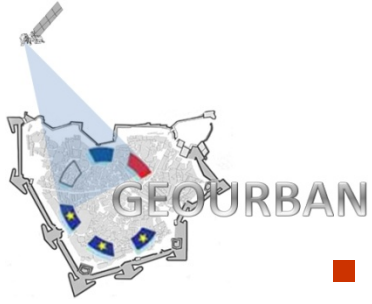
GEOURBAN

Introduction to GEOURBAN



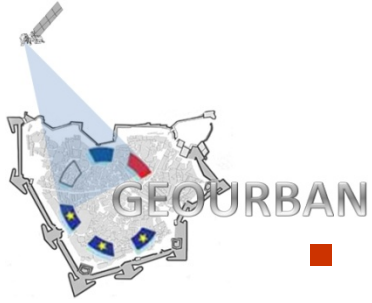
Nektarios Chrysoulakis
FORTH

The problem

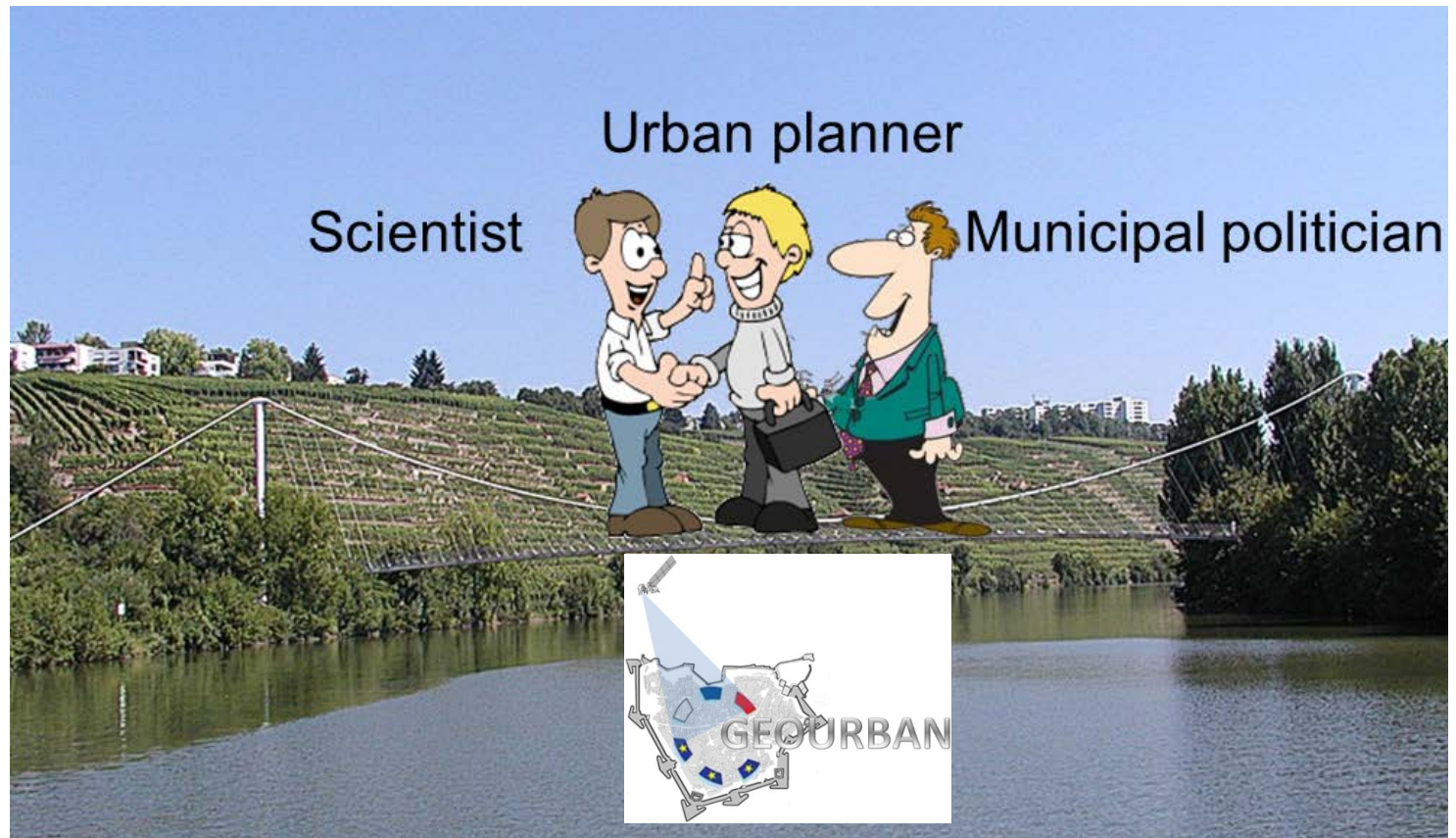


- Urban development has to meet the main requirements for **sustainability**, by optimising the use of **space**, **energy** and **materials** and by decoupling resource use from economic development.
- The planning policies reflect the logic of the market. They would better reflect a vision of urban development, in which **environmental considerations** play more important role in urban planning.
- The problems of cities cannot be solved at the local level alone. Better policy integration and new governance, involving closer partnership and coordination at **micro-scale** (building block) and **local scale** (neighbourhood, city), as well as at **regional scale** (region, country) are needed.

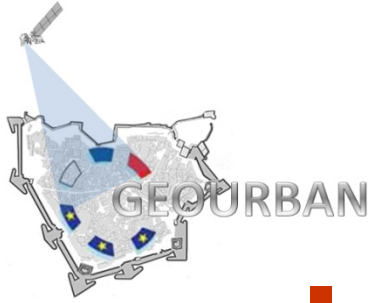
The problem



- All the available EO data on many case studies are useless, if the link between the EO scientists and the urban planning community is missing.

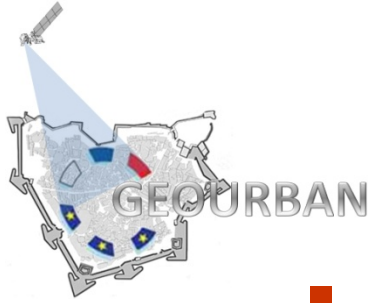


Why GEOURBAN?



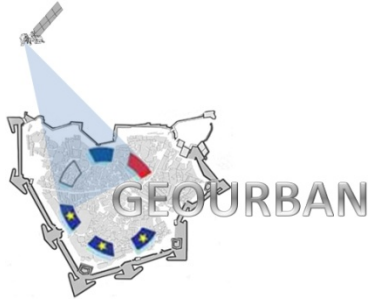
- Recent advances in EO have led to **new methods** to estimate urban surface and environmental parameters.
- There is **poor communication** of this new knowledge to end-users, such as planners, architects, engineers and policy makers.
- GEOURBAN responds to this challenge by providing the means to **close the gap** between EO scientists and urban planners, and to illustrate the advantages of **accounting** for EO in urban planning.

The GEOURBAN idea



- To demonstrate the ability of current and future **EO** systems to depict parameters of **urban structure** and **urban environmental quality**.
- To develop a set of **products and indicators**, easily understood by a non-scientific public, to **link** the satellite derived information with multidimensional issues of **urban planning and management**.
- To develop a **web-based information system** capable of evaluating these indicators.

The GEOURBAN idea



NASA GODDARD SPACE FLIGHT CENTER [+ Visit NASA.gov](#)

LAADS Web

Level 1 and Atmosphere Archive and Distribution System

+ HOME - DATA + IMAGES + TOOLS + HELP

Search for Data Products

If you know the file names of the products for which you are searching, you may also [search for file names](#).

Product Selection [+ View Help](#)

Please select one or more products:

Satellite/Instrument:
Terra MODIS Aqua MODIS Combined Terra & Aqua MODIS Ancillary Data NPOESS Preparatory Project VIIRS


Group:
Terra Atmosphere Level 2 Products

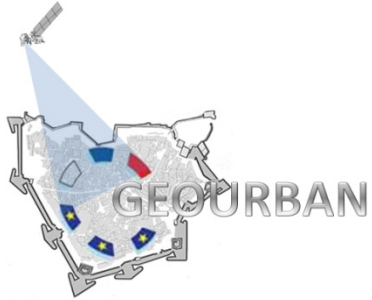
Products:

- MOD04_L2 - Level 2 Aerosol
- MOD05_L2 - Level 2 Total Precipitable Water Vapor Test Results
- MOD06_L2 - Level 2 Cloud Product
- MOD07_L2 - Level 2 Joint Atmosphere Product of Profiles, Total Column Ozone, Water Vapor, and Stability Indices
- MOD07_QC - MOD07 Level 2 diagnostic file
- MOD35_L2 - MODIS Level 2 Cloud Mask and Spectral Test Results
- MOD35_QC - MOD35 Interim ASCII QC Output Log File
- MODARNSS - Atmosphere Aeronet subsetting Product
- MODATML2 - Level 2 Joint Atmosphere Product
- MODCSR_G - MODIS/Terra Clear Radiance Statistics Indexed to Global Grid 5-Min L2 Swath 10km

Please read the [disclaimer](#) about the Collection 5 MOD04_L2 and MYD04_L2 products.

Note: All NPOESS Preparatory Project (NPP) VIIRS data are currently BETA QUALITY and are not intended for scientific use. VIIRS calibration is based on prelaunch data and on-orbit calibration and characterization has begun. For more information, see the [NPP VIIRS QA - Product Quality Documentation](#).

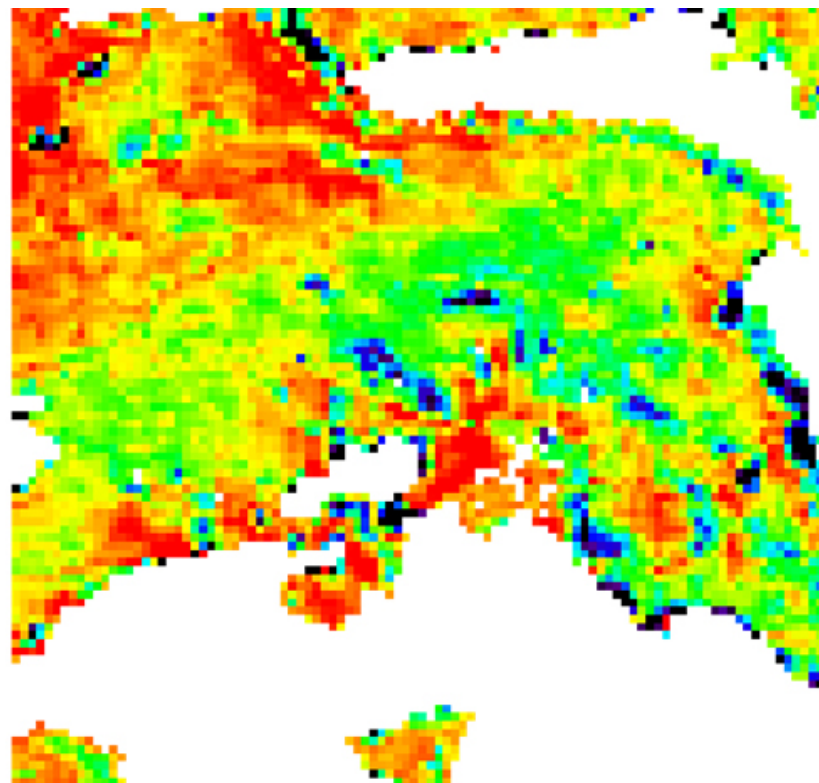
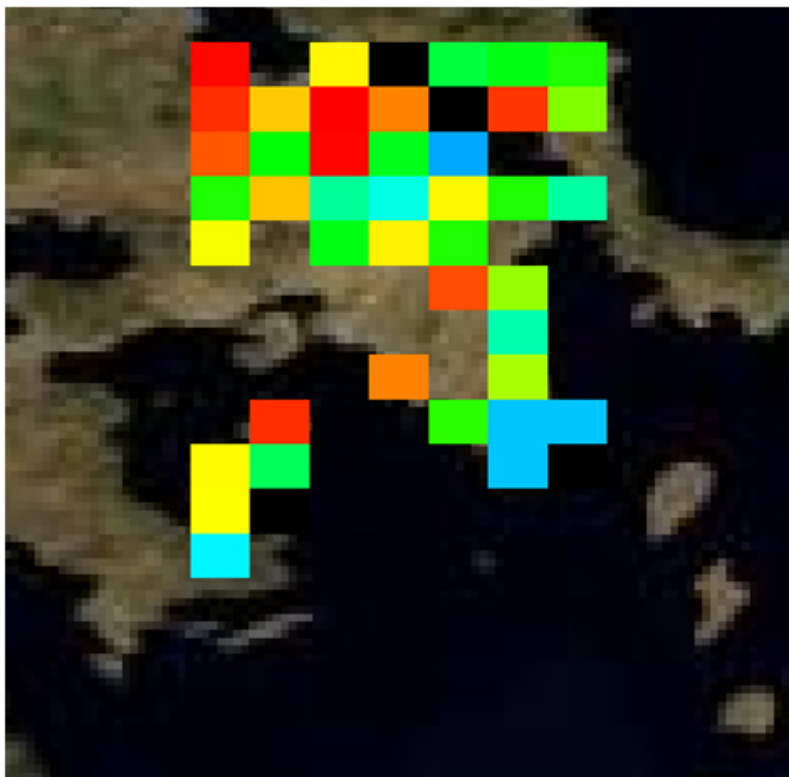
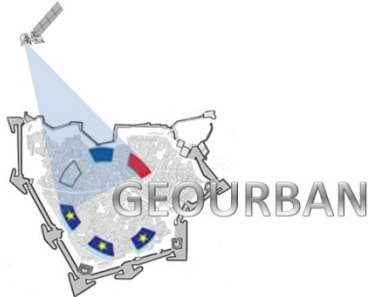
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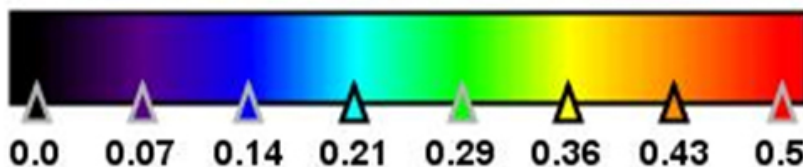
The GEOURBAN idea

A screenshot of a GIS software interface, likely ArcGIS, displaying a list of data fields on the left and a satellite image on the right. The interface includes a menu bar (File, Edit, View, Analysis, Tools, Window, Help), a toolbar with various icons, and a status bar at the bottom. The data field list on the left is organized into two main sections: [1] MOD04_L2_A2011230.0900.051_2011230192220_AOT550 and [2] MOD04_L2_A2011230.0900.051_2011230192220. The second section is expanded to show a long list of fields, with "mod04/Data Fields/Optical_Depth_Land_And_Ocean" highlighted. The satellite image on the right shows a grayscale view of a coastal area, with a compass rose in the top left corner. The status bar at the bottom indicates the current data field, coordinates, and other system information.

The GEOURBAN idea

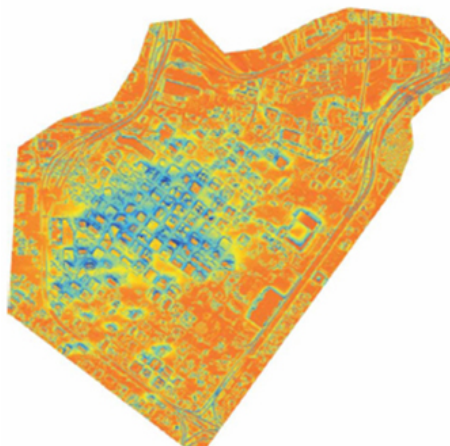
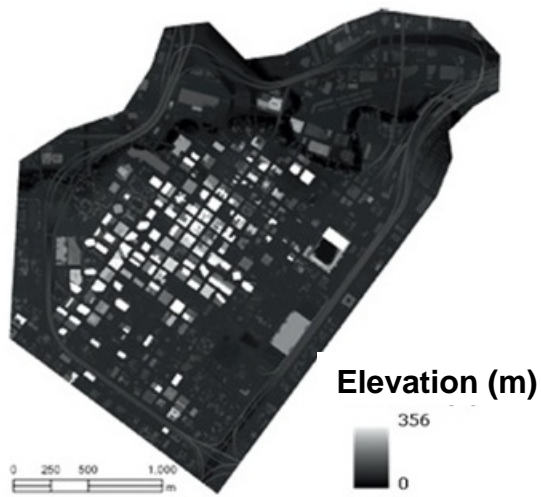
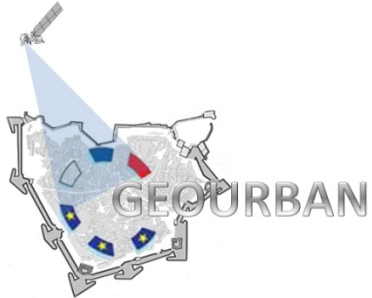


aot [-]

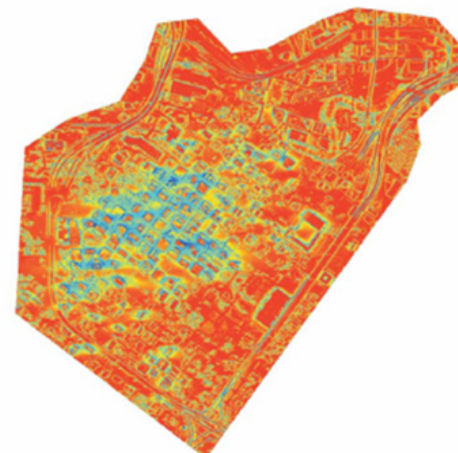


(Benas and Chrysoulakis 2012)

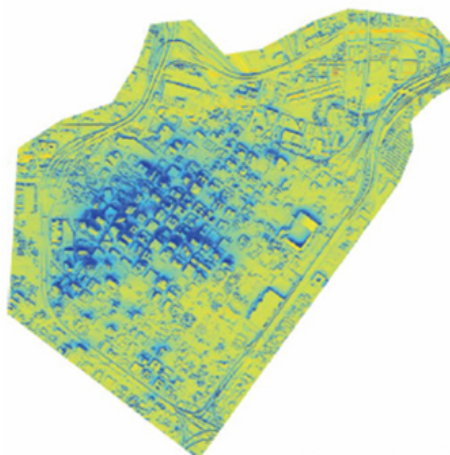
The GEOURBAN idea



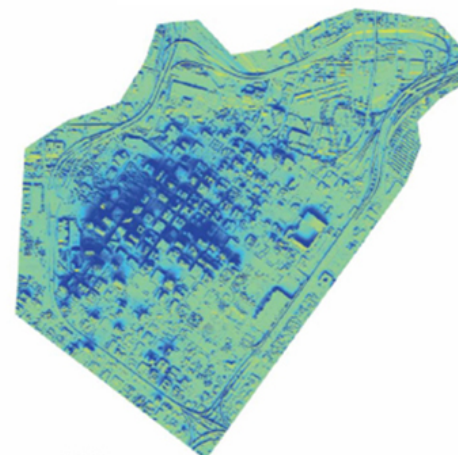
Spring



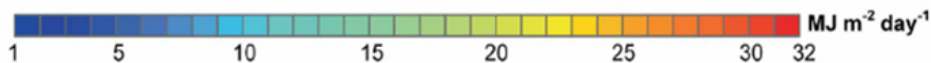
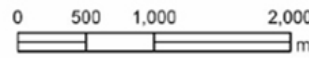
Summer



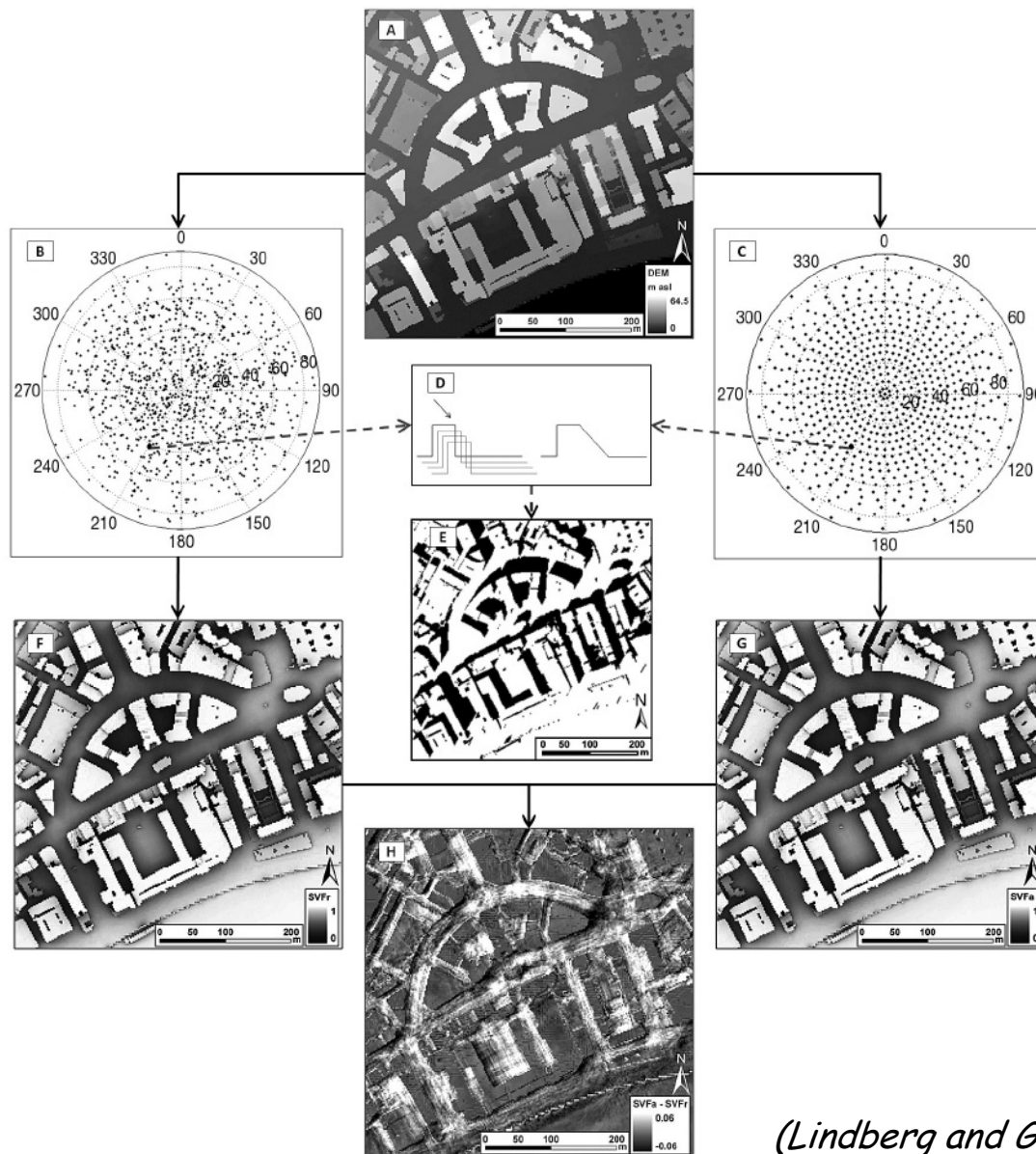
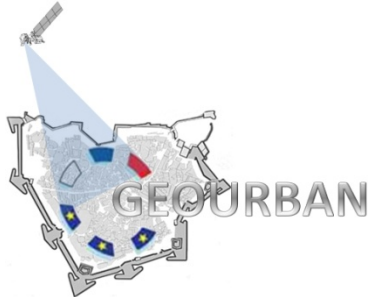
Autumn



Winter

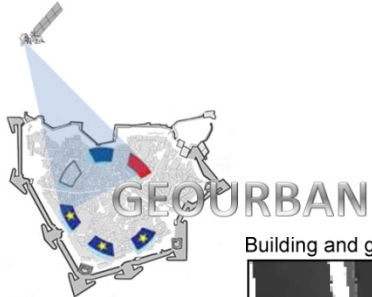


The GEOURBAN idea

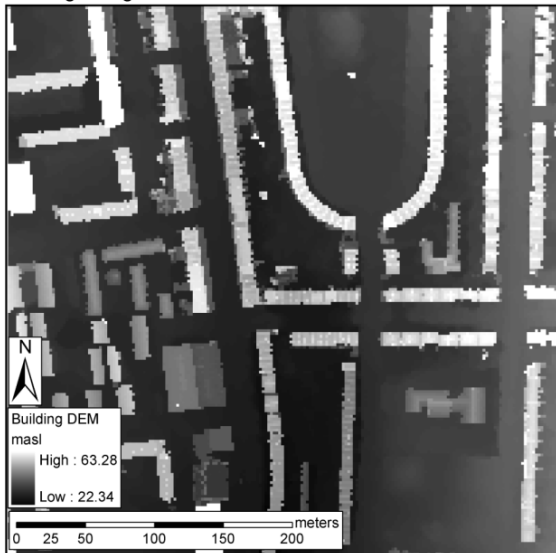


(Lindberg and Grimmond 2010)

The GEOURBAN idea



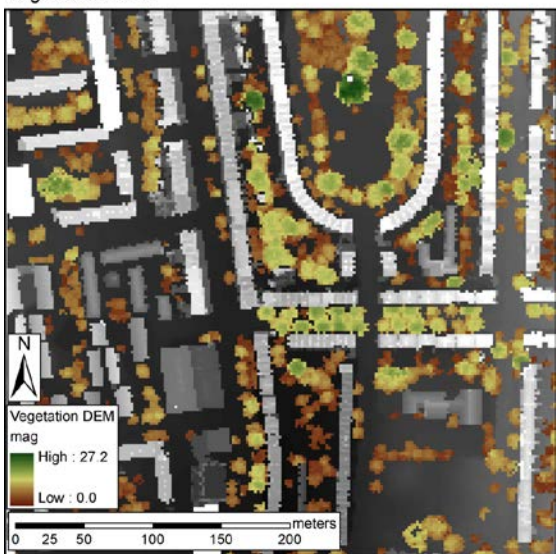
Building and ground DEM



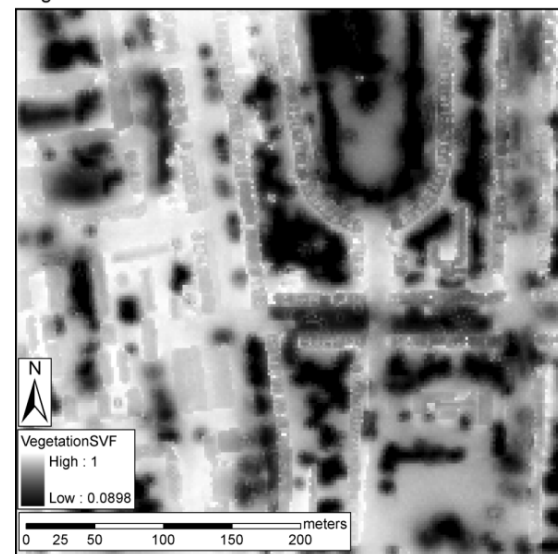
Building and Ground SVF



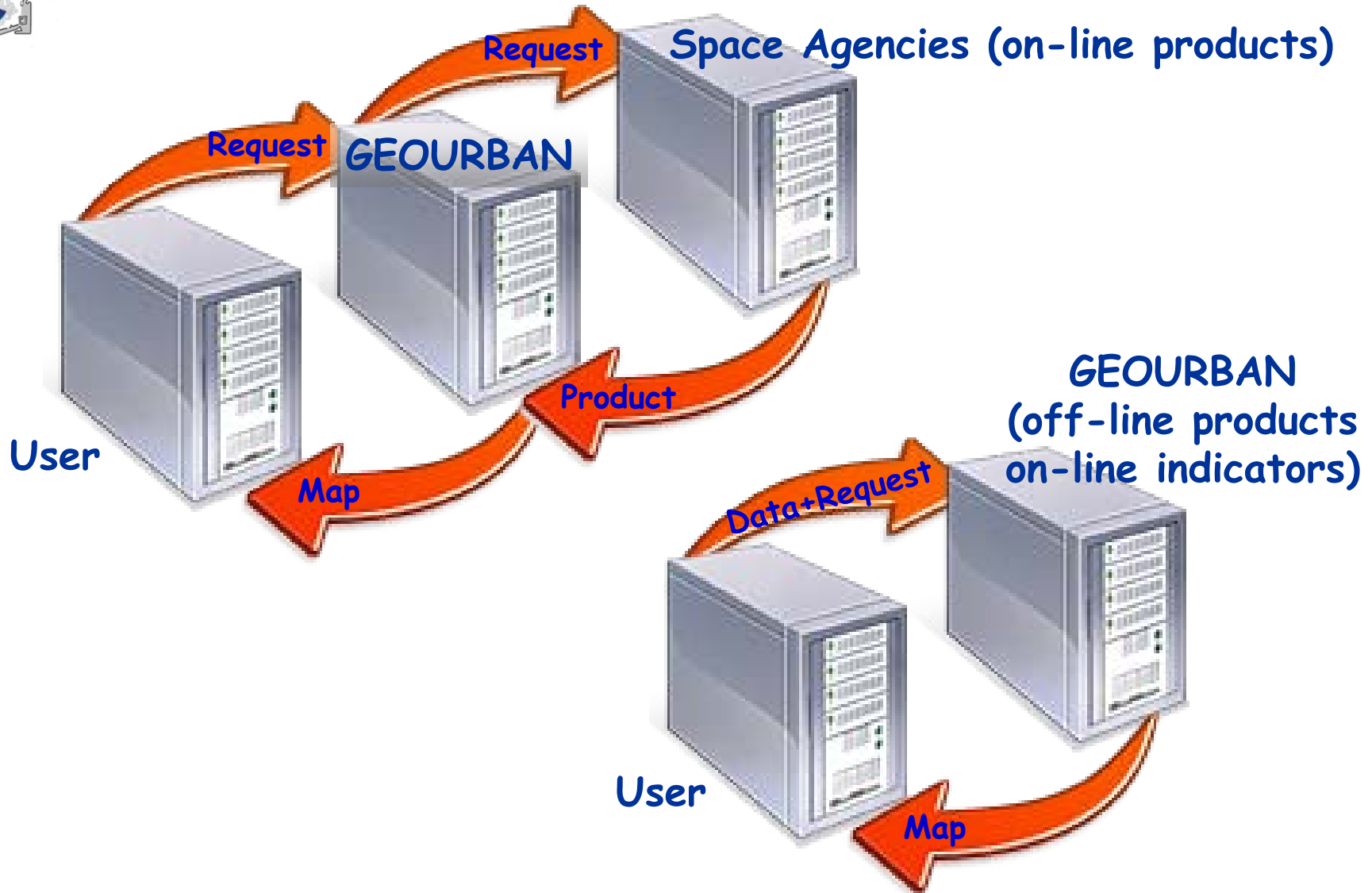
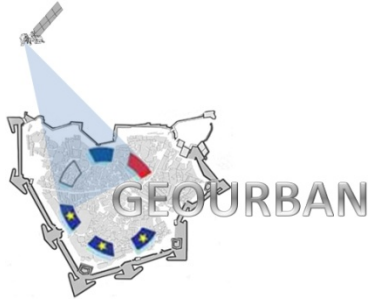
Vegetation DEM



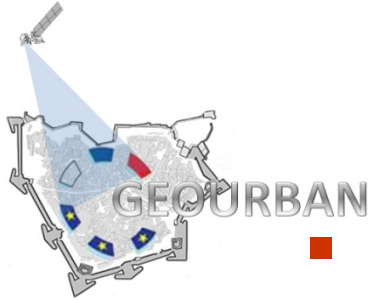
Vegetation SVF



The GEOURBAN idea

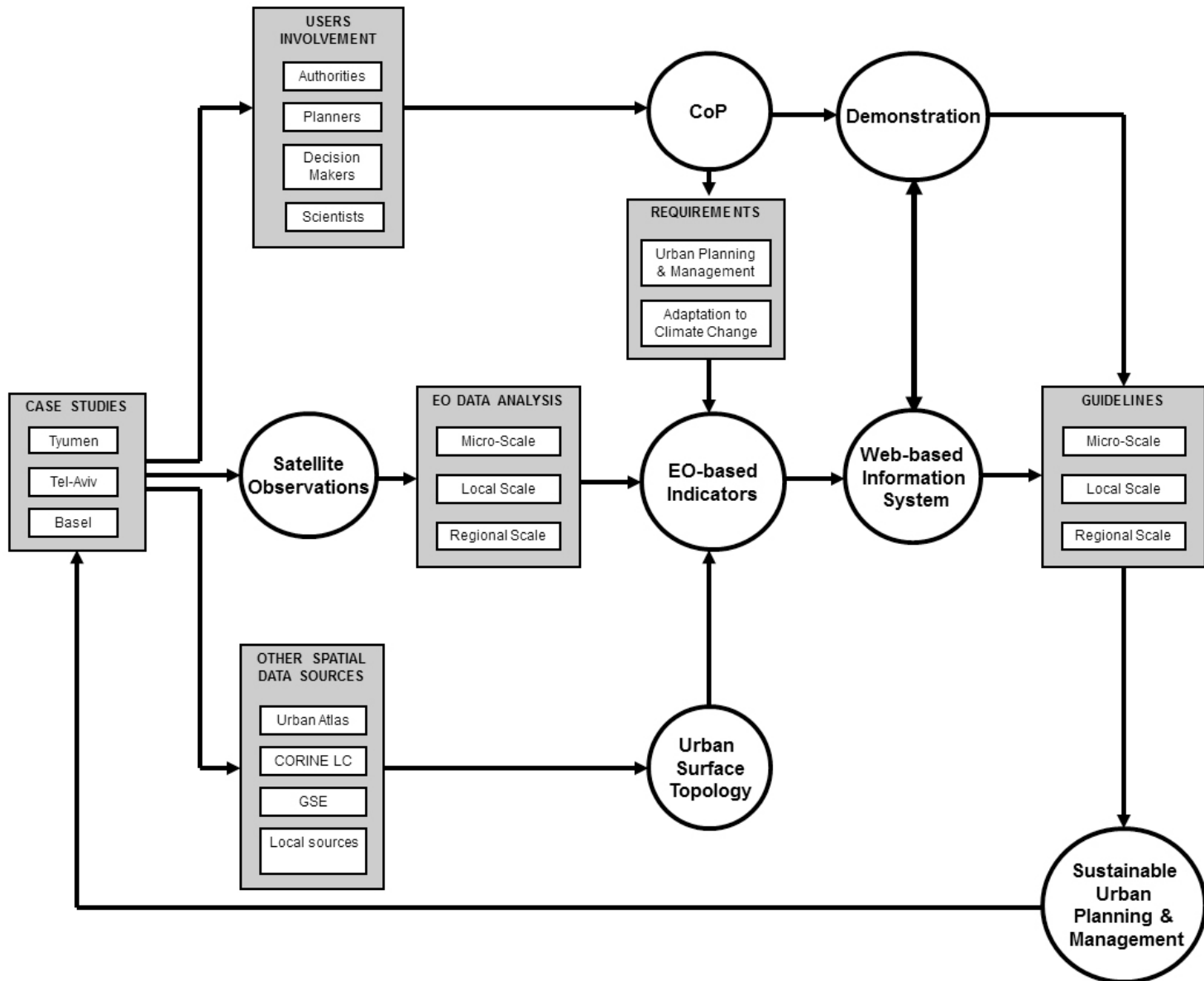
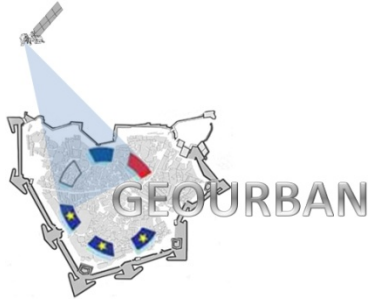


The objectives

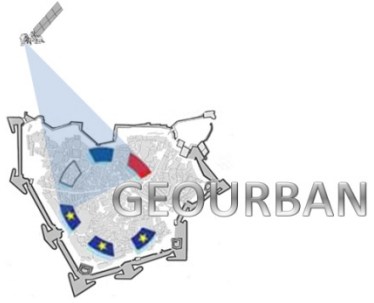


- **Bridge the gap** between EO scientists and urban planners by addressing issues of needs and the potential of EO methods and data.
- Analyse the urban planning and management **requirements** relative to EO.
- **Review** the EO data sources and the respective analysis techniques and implement the most promising ones at selected case studies.
- Analyze the **potential** of future EO missions to support urban planning and management.
- Develop a set of **EO-based products and indicators** to support sustainable urban planning and management.
- Develop a **web-based information system**.
- **Demonstrate** the developed system in specific case studies.

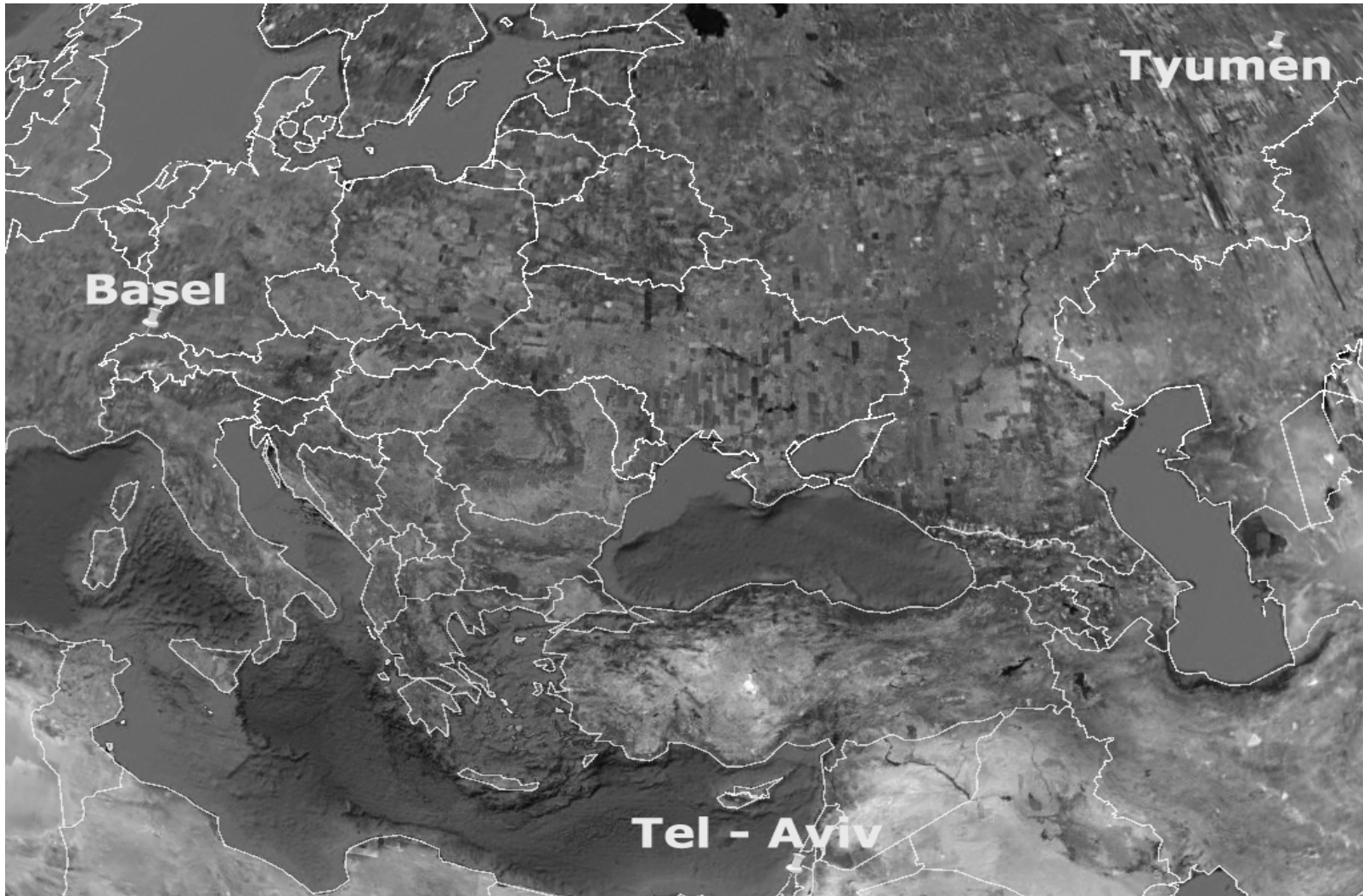
The approach



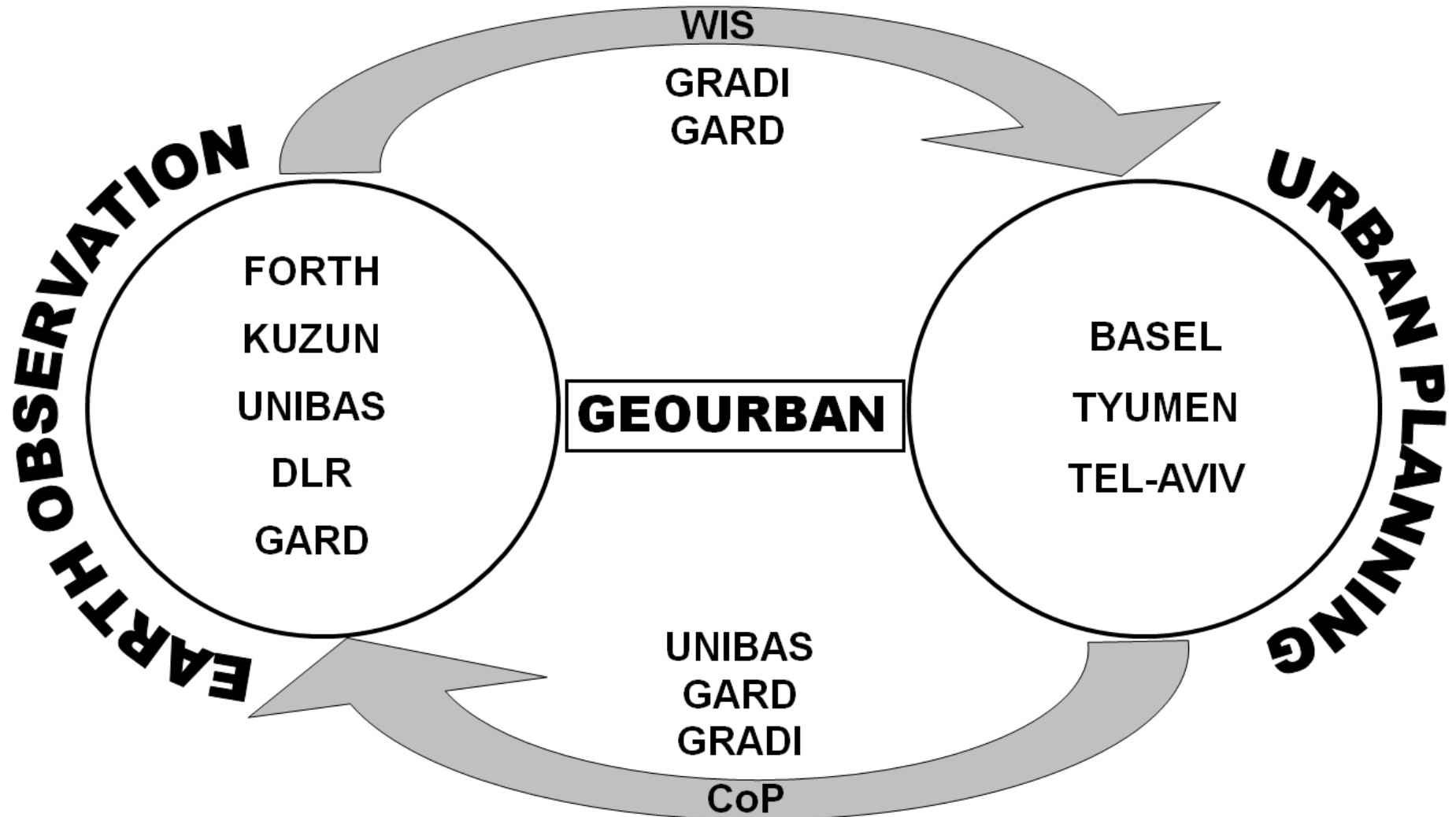
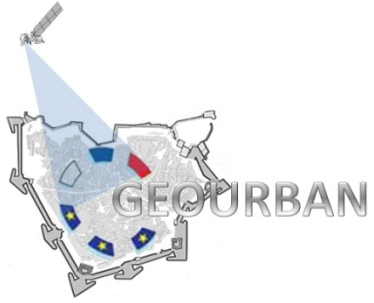
The main components



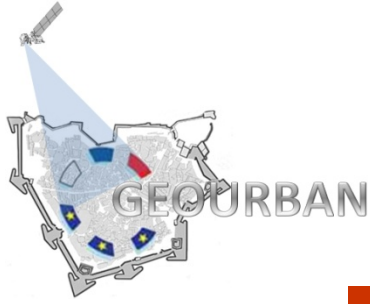
- CoPs in GEOURBAN Case studies.



The main components

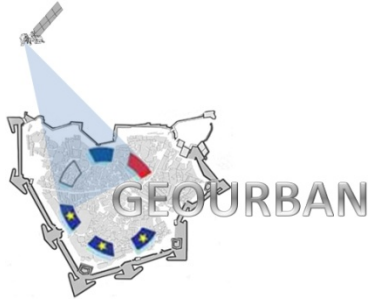


The main components



- The GEOURBAN indicators will be the means to exploit EO potential in addressing the following issues :
 - ✓ Urban surface structure.
 - ✓ Urban surface type.
 - ✓ Urban sprawl.
 - ✓ Urban environmental quality.
 - ✓ Vulnerability to hazards.
 - ✓ Socioeconomics.

Indicators examples



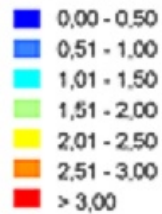
Degree of building density [%]



500 m



Floor-space index



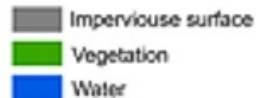
500 m



Urban structure

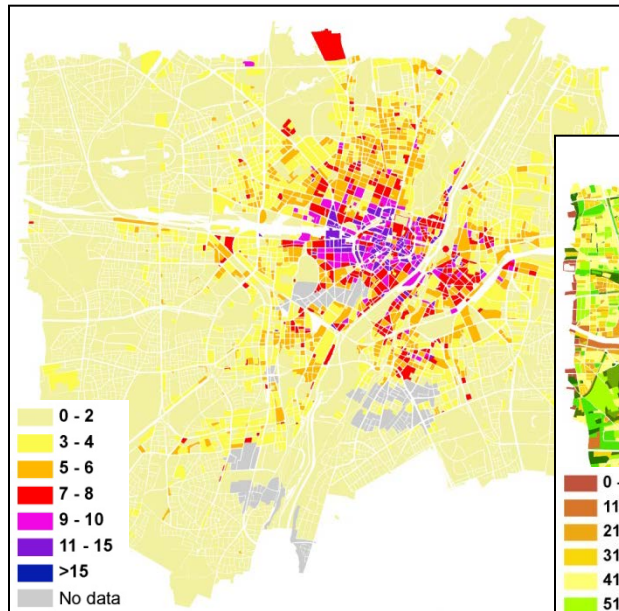
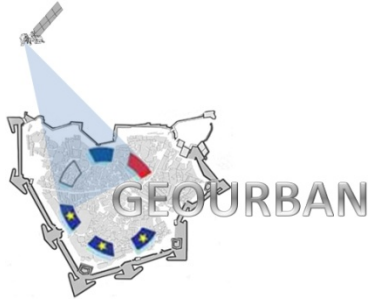


Land-cover

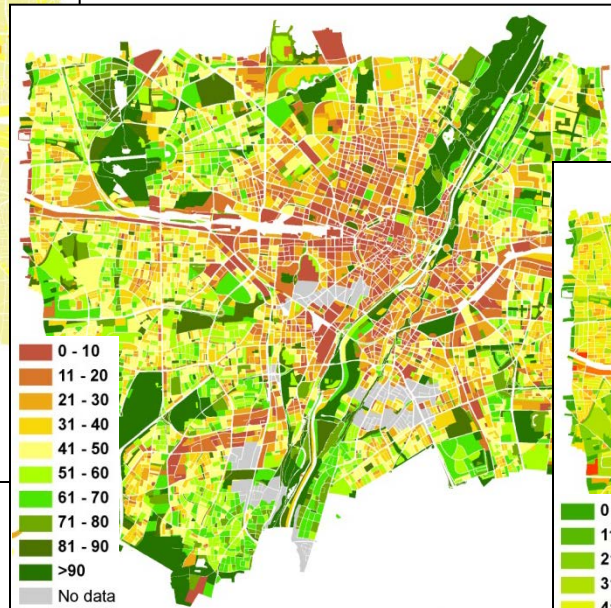


(Taubenböck and Dech 2010)

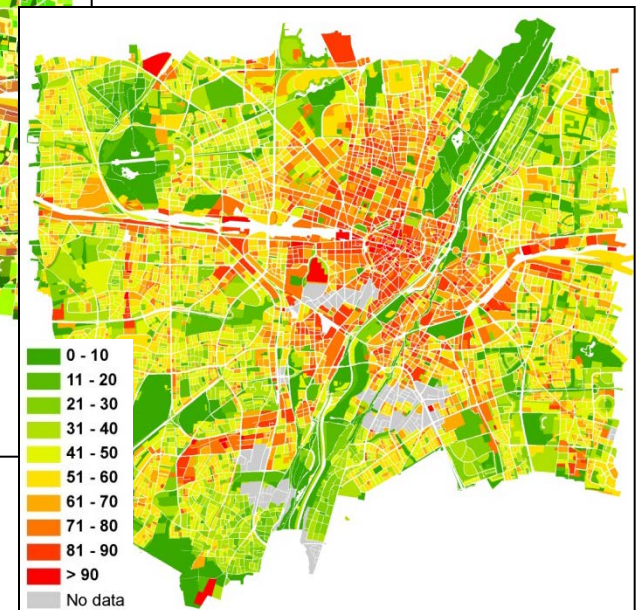
Indicators examples



Building volume [m^3]

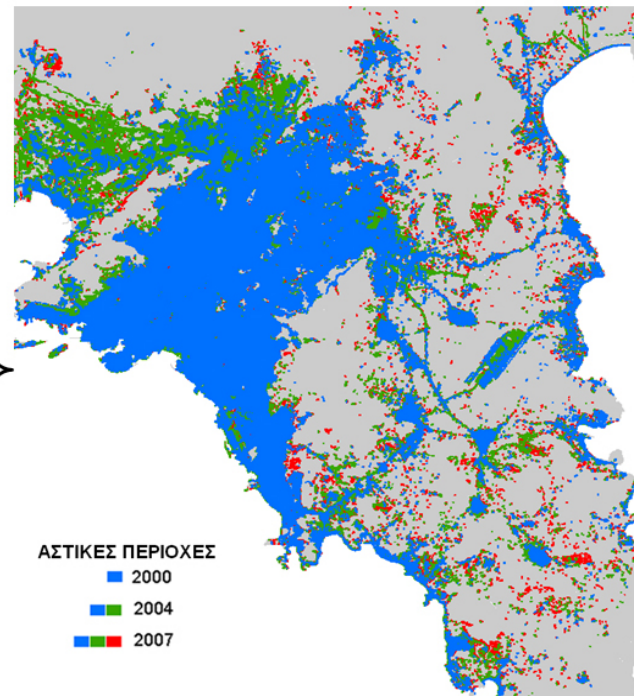
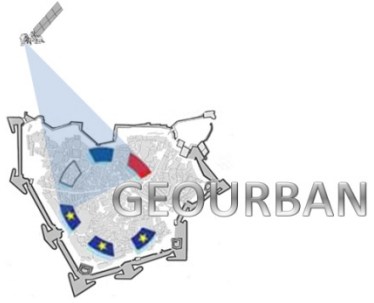


Vegetation density [%]

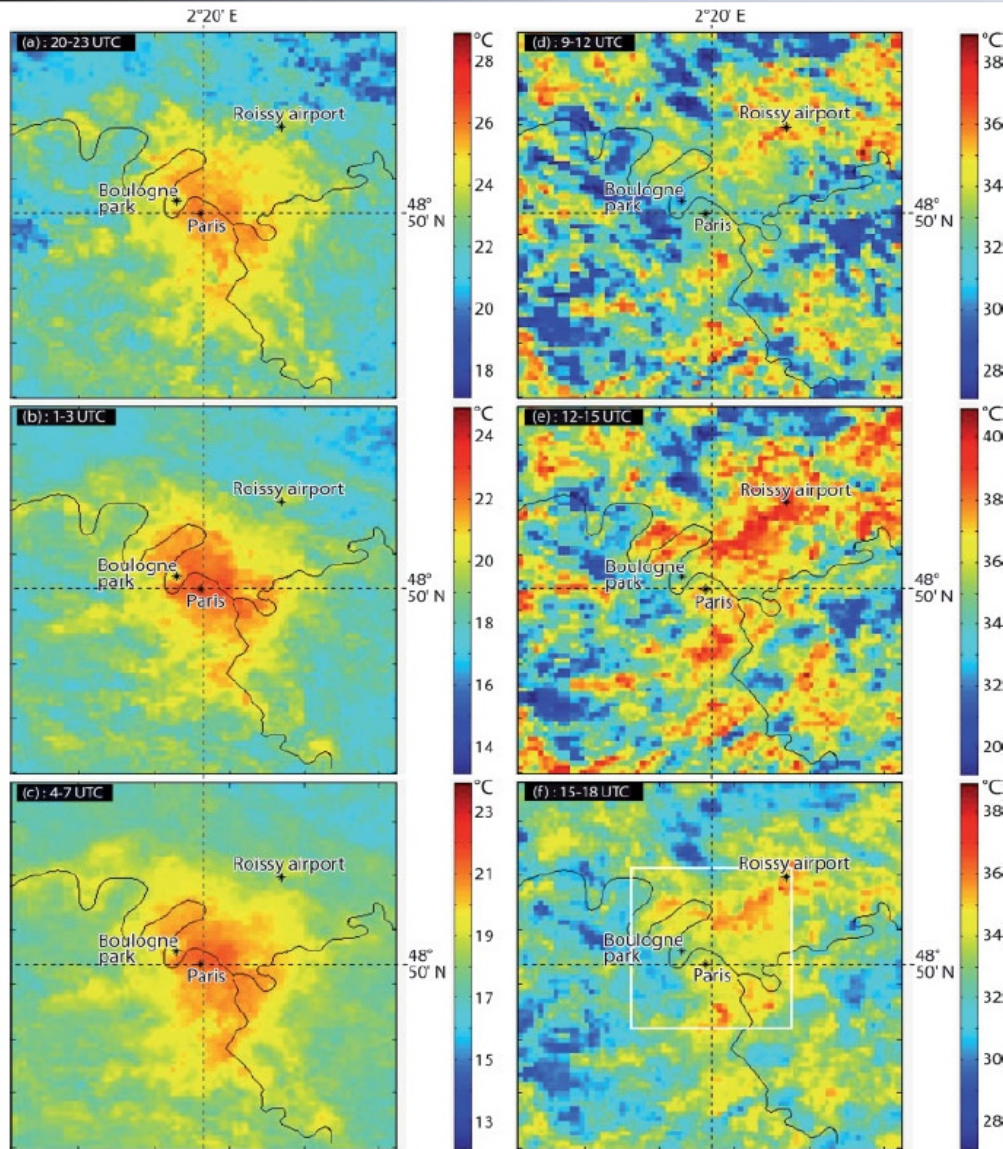
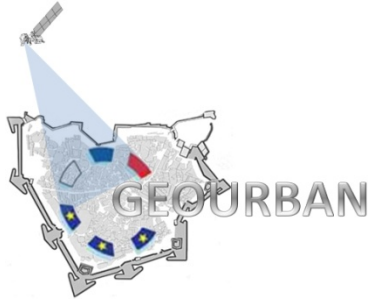


Impervious surface [%]

Indicators examples

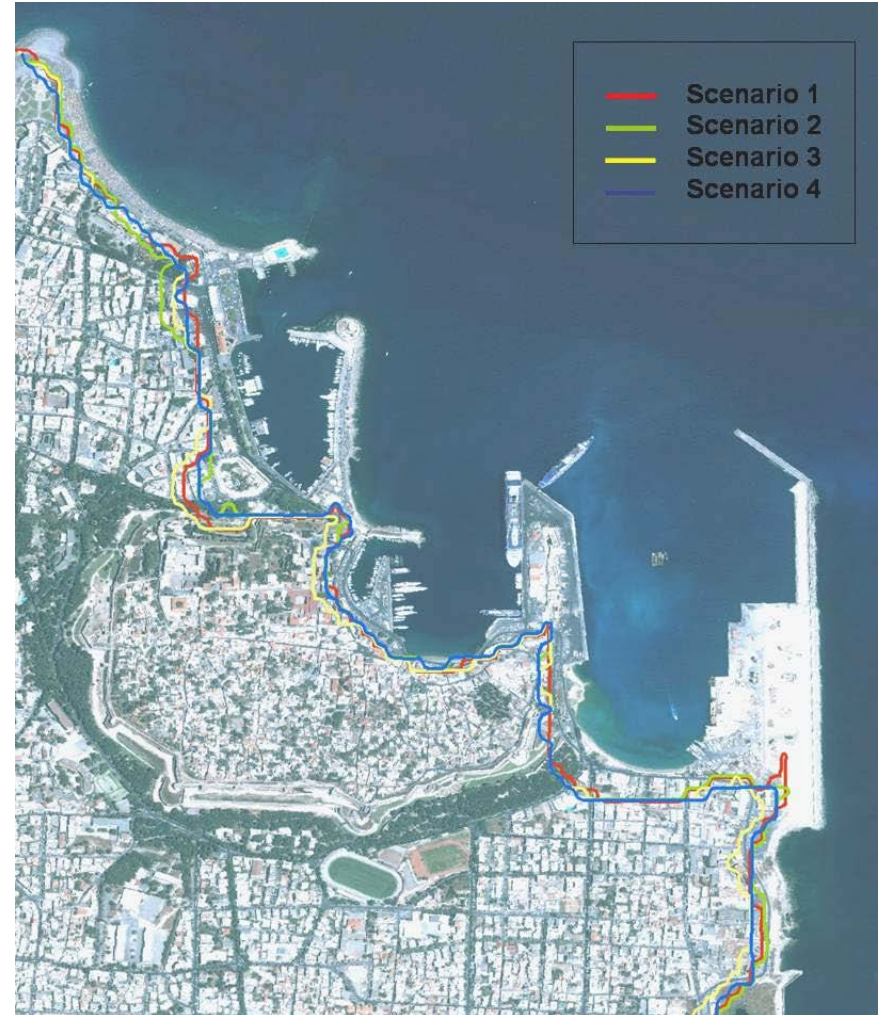
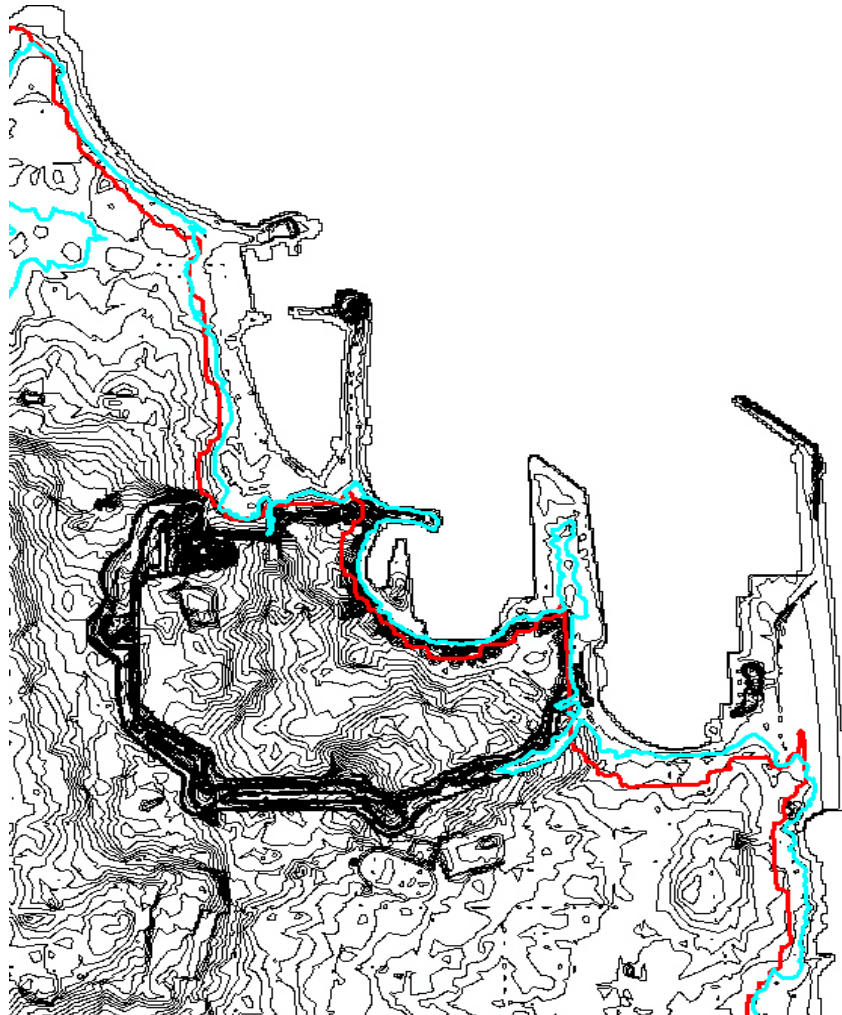
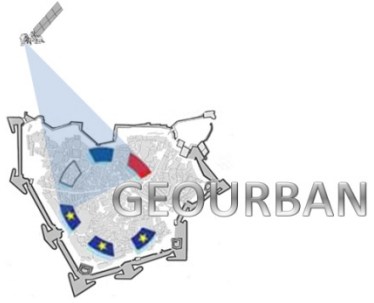


Indicators examples



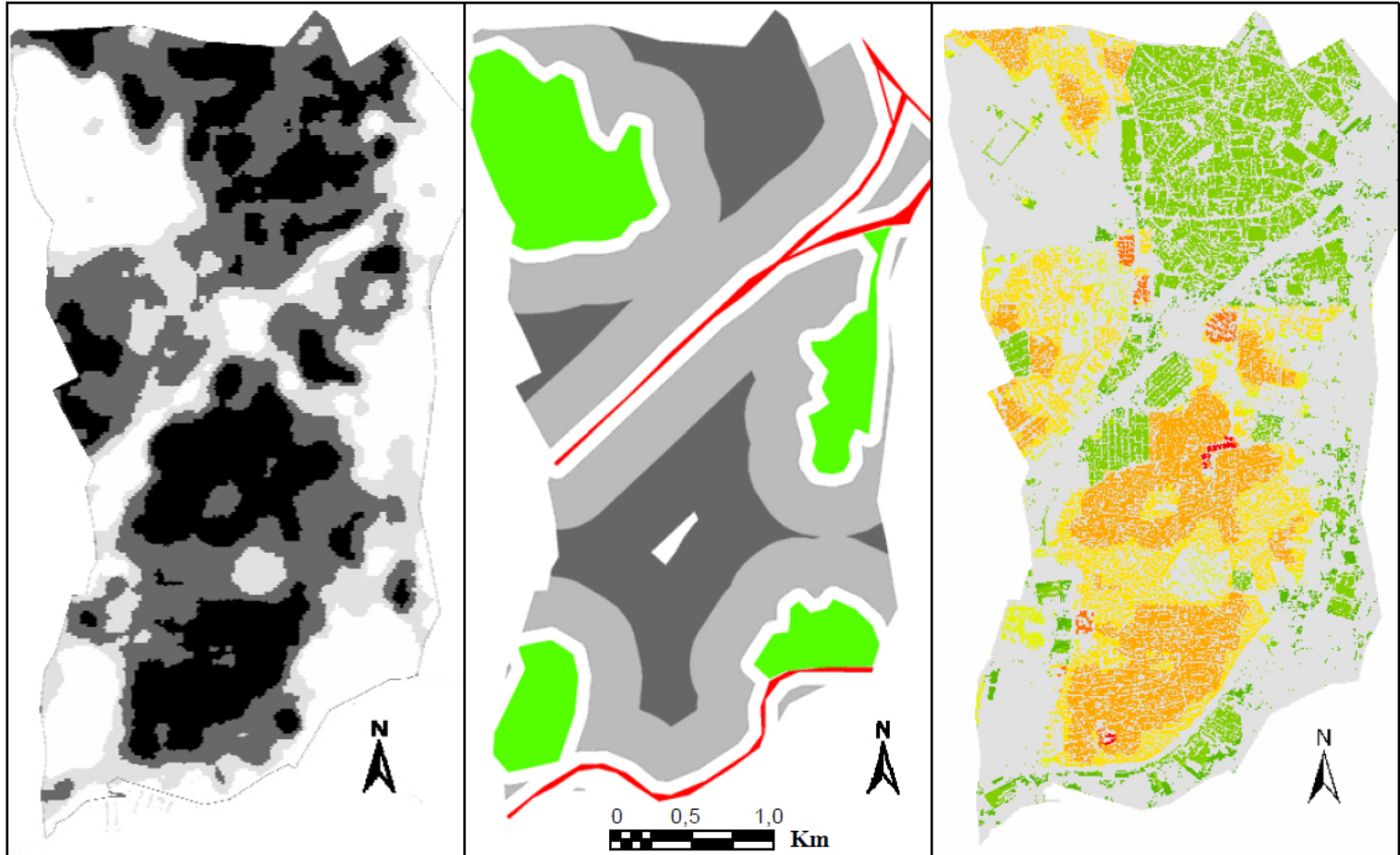
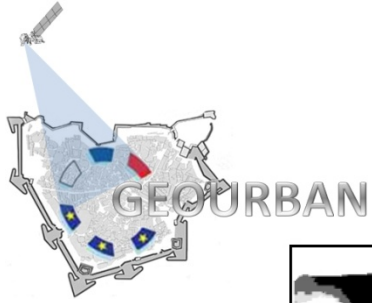
(Dousset et al. 2011)

Indicators examples



(Mitsoudis et al. 2012)

Indicators examples



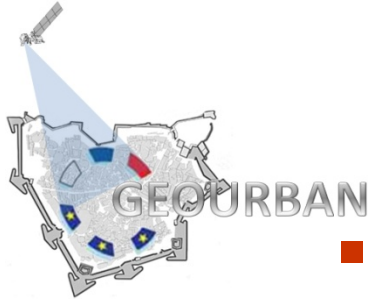
Built-up density
■ High density
■ Medium density
■ Low density
□ Open space

Thematic class
■ Inner-city highway
■ Open spaces

Distances
□ 0-100 m
■ 100-500 m
■ > 500 m

Population in 1000 / km²
■ 0-1 ■ 1-5 ■ 5-10
■ 10-20 ■ 20-30 ■ 30-40
■ 40-50 ■ 50-60 ■ 60-100

(Taubenböck et al. 2008)

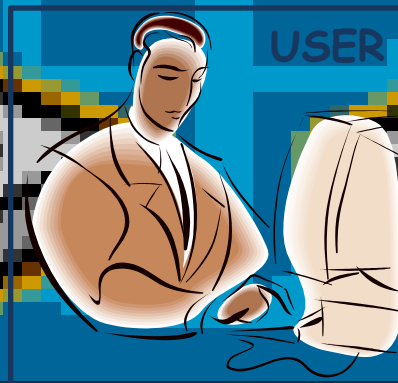
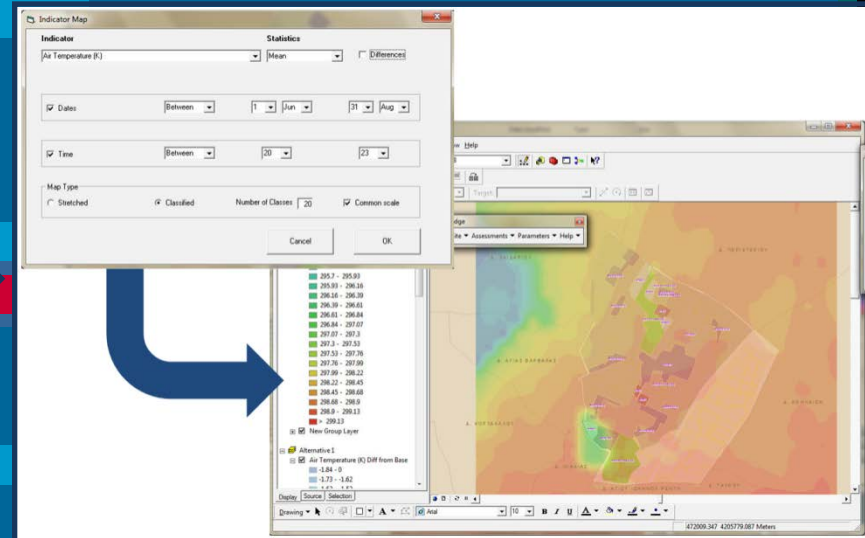
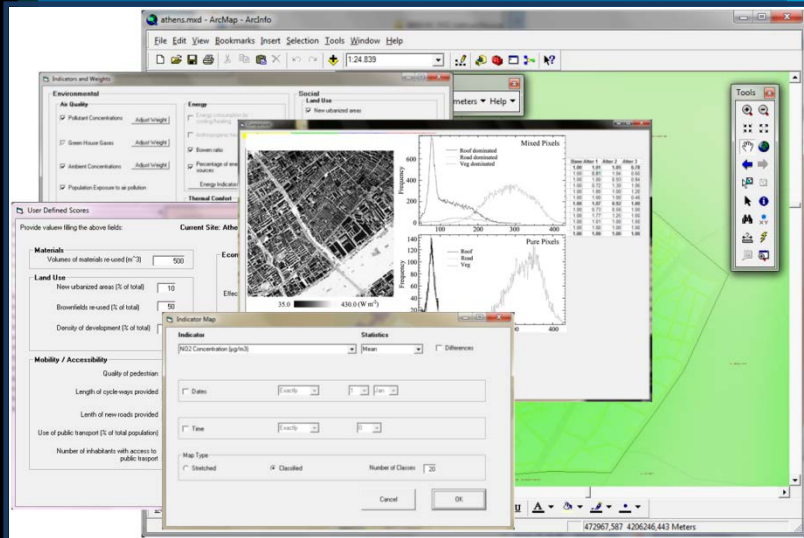


The main components

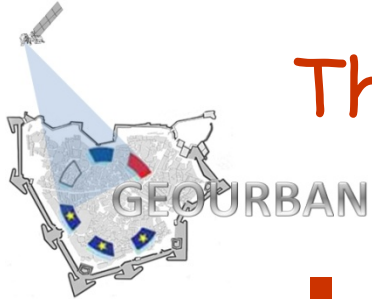
- The information system.

ANALYTICAL COMPONENT

VISUALIZATION COMPONENT



The vision: towards to an operational tool



- The web-based tool will have both **automatic** and **semi-automatic** functionality, depending on the application and scale, since it will cover **micro-**, **local** and **regional scales**.
- GEOURBAN will develop a **prototype** with the potential to lead to **new services** since it will be easily transferable to any city.
- Beyond GEOURBAN the consortium may further **exploit** the prototype by **updating** it with new processing modules and by **adapting** it to future missions (i.e. Sentinels, EnMAP, HypSI, etc.).
- A **fully operational tool** can be therefore developed, provided that EO data at the requested **spatial** and **temporal scales** are available.