decu|manus

Catalog of Products

Version 2.0
Last update: 04th November 2015

Climatic Parameters

(Yearly Average data)

- *Precipitation*
- *Sensible Heat Flux*
- *Temperature*
- *Zonal Wind Component*
- *Meridional Wind Component*
- *Heat waves*
- *Humidex*
- *Maximum Temperature*
- *Minimum Temperature*
- *Precipitation Events*
- *Summer Days*
- *Tropical Nights*

Air Quality

(Yearly Average and annual data)

- *Carbon Monoxide*
- *Nitrogen Dioxide*
- *Ozone*
- *Particle Matter*
- *Sulphur Dioxide*

Health Indicators

(Yearly Average data)

- *Respiratory Hospital Admissions*
- *Changes in Cardiovascular Hospital Admissions*
- *Changes in Respiratory Hospital Admissions*
- *Mortality – All causes*
- *Mortality – Cardiovascular causes*
- *Mortality – Respiratory causes*
- *Mortality +65 years – All causes*
- *Mortality +65 years – Cardiovascular causes*
- *Mortality +65 years – Respiratory causes*
- *Changes in mortality – All causes*
- *Changes in mortality – All Cardiovascular causes*
- *Changes in mortality – All Respiratory causes*

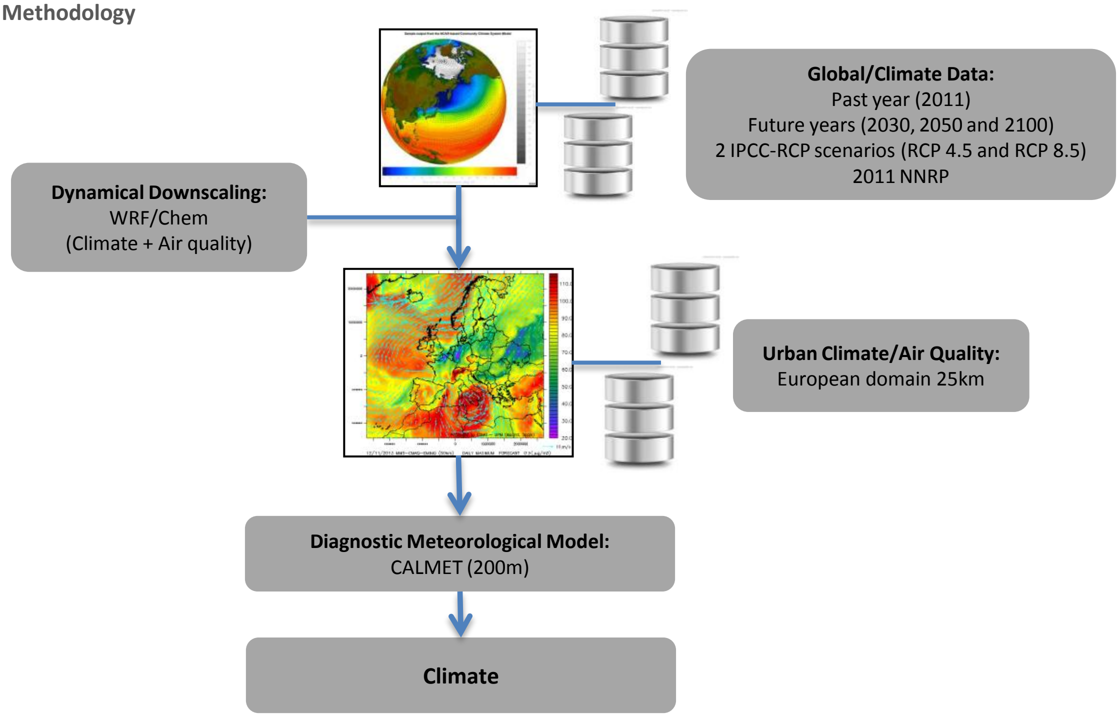
Climatic Parameters		
	▪ *Precipitation* ▪ *Sensible Heat Flux* ▪ *Temperature* ▪ *Zonal Wind Component* ▪ *Meridional Wind Component* ▪ *Heat waves*	▪ *Humidex* ▪ *Maximum Temperature* ▪ *Minimum Temperature* ▪ *Precipitation Events* ▪ *Summer Days* ▪ *Tropical Nights*

Description

These products show how urban meteorology responds to different future climatic scenarios identifying vulnerability hotspots over the cities. A regional climate model (WRF-Chem) has been used to downscale a global climate model (RCP 4.5 and 8.5 scenarios) to develop meteorological fields up to 25km of spatial resolution. Finally the system makes a diagnostic urban downscaling (CALMET) to cities (200m of spatial resolution)

Input data	Topography, Land Use, Soil Type, Vegetation Fraction, Population, Meteorological Observations
Reference scale	1:1,000,000
Geographic coverage	Cities (Antwerpen, Helsinki, London, Madrid, Milano) Europe
Temporal coverage	2011, 2030, 2050 and 2100 years

Methodology



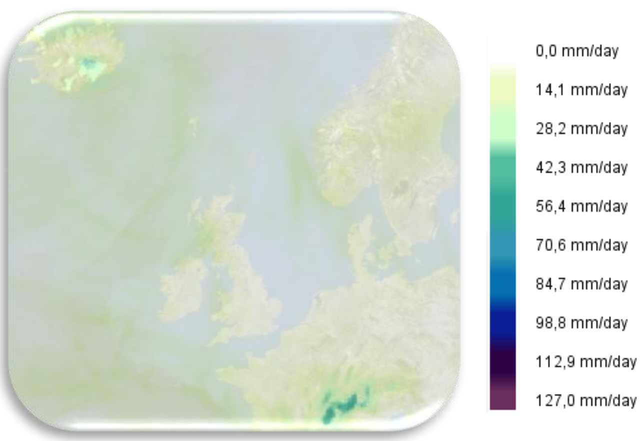
Applications

- Understand the impact of the global climate change on the local urban environment identifying vulnerabilities
- Identify key adaptation challenges in their areas of interest using reliable science-based information

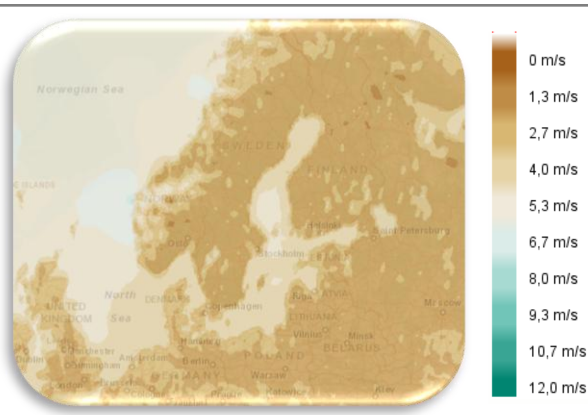
Climatic Parameters		
	Precipitation	*Humidex*
	Sensible Heat Flux	*Maximum Temperature*
	Temperature	*Minimum Temperature*
	Zonal Wind Component	*Precipitation Events*
	Meridional Wind Component	*Summer Days*
	Heat waves	*Tropical Nights*

Examples

Milano RCP 4.5 Yearly Average Maximum Temperature



Europe RCP 4.5 Monthly Average Precipitation, April 2011



Europe RCP 8.5 Yearly Average Meridional Wind Component, December 2050

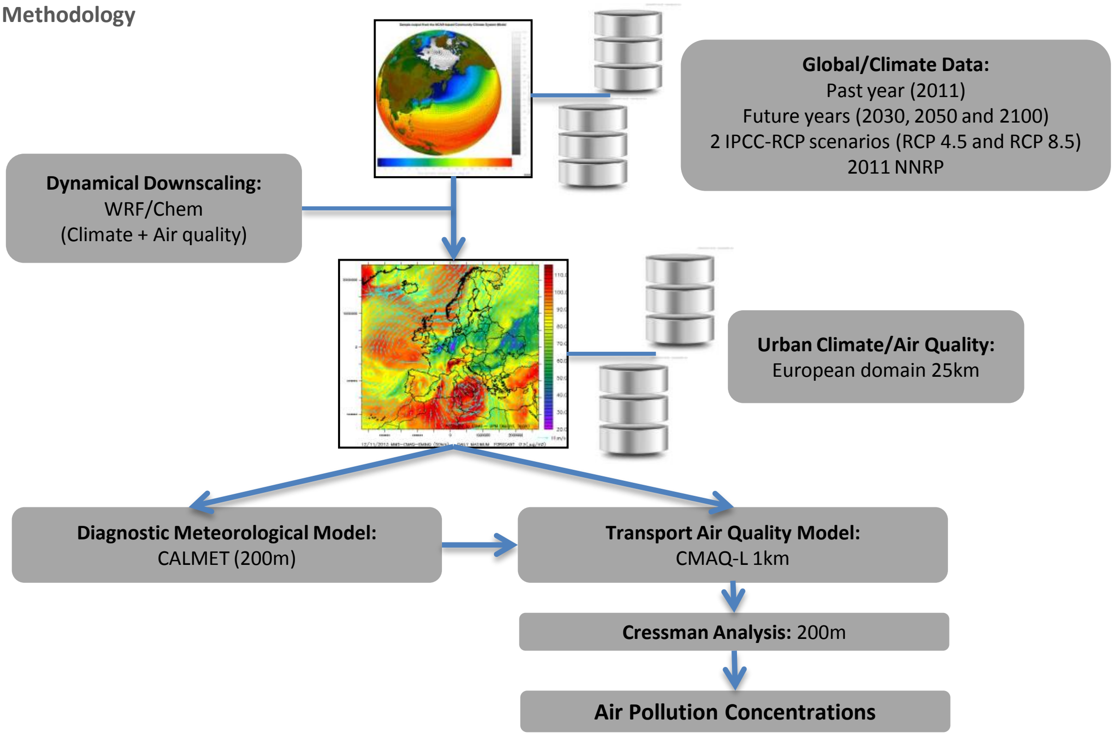
Air Quality	▪ *Carbon Monoxide* ▪ *Nitrogen Dioxide* ▪ *Ozone*	▪ *Particle Matter* ▪ *Sulphur Dioxide*

Description

These products quantify the effects of climate scenarios on air pollution concentrations

Input data	Air quality data, Population, Traffic lines (roads, streets), and Climate Outputs
Reference scale	1:1,000,000
Geographic coverage	Cities (Antwerpen, Helsinki, London, Madrid, Milano)
Temporal coverage	2011, 2030, 2050 and 2100 years

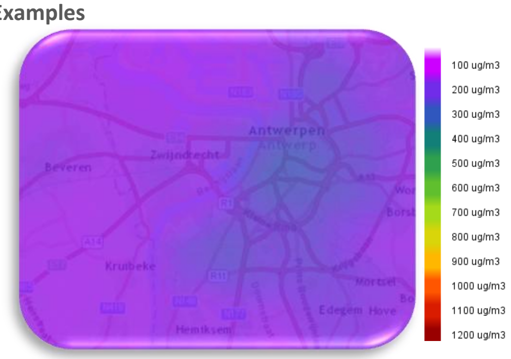
Methodology



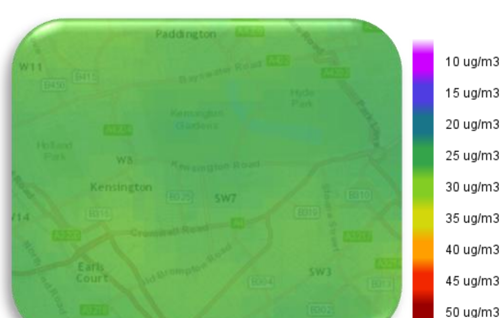
Applications

- Understand the impact of the global climate change on the local urban environment identifying vulnerabilities
- Identify key adaptation challenges in their areas of interest using reliable science-based information

Examples



Antwerpen RCP 8.5 Yearly Average CO



London RCP 4.5 Yearly average PM10

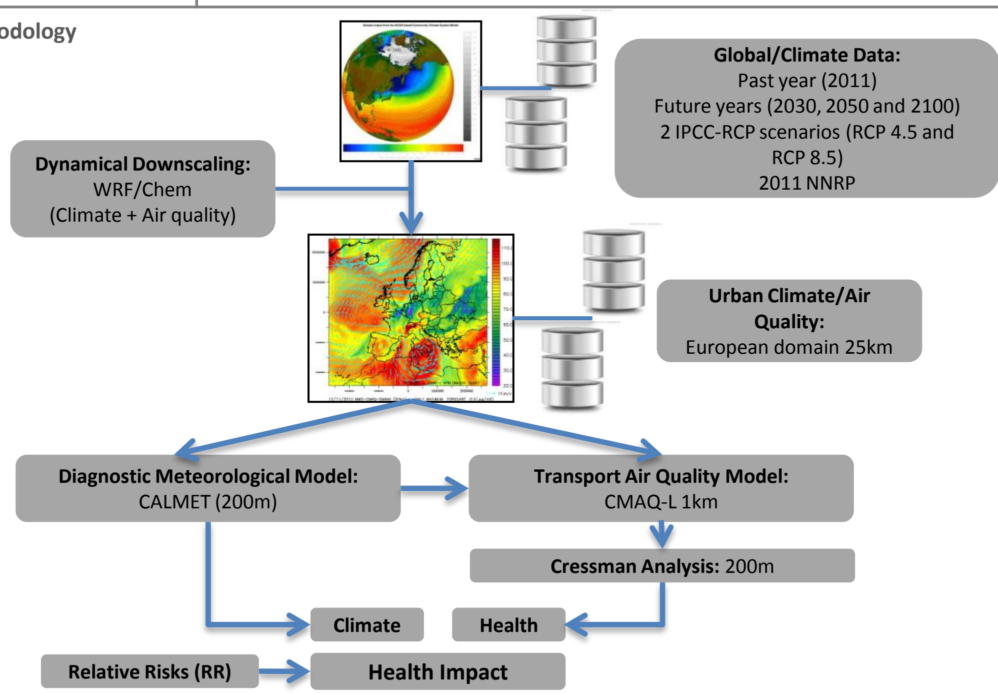
Health Indicators		
	▪ *Respiratory Hospital Admissions* ▪ *Changes in Cardiovascular Hospital Admissions* ▪ *Changes in Respiratory Hospital Admissions* ▪ *Mortality – All causes* ▪ *Mortality – Cardiovascular causes* ▪ *Mortality – Respiratory causes*	▪ *Mortality +65 years – All causes* ▪ *Mortality +65 years – Cardiovascular causes* ▪ *Mortality +65 years – Respiratory causes* ▪ *Changes in mortality – All causes* ▪ *Changes in mortality – Cardiovascular causes* ▪ *Changes in mortality – Respiratory causes*

Description

The objective is quantifying the future short-term health effects of the global climate. The products are focused on the direct health effect of global climate in relation to temperature and air quality. The exposure-response relationships estimated from the epidemiological studies have been applied to projections of climate

Input data	Climate and Air Pollution Outputs. Relative Risk (RR) values from epidemiological studies
Reference scale	1:1,000,000
Geographic coverage	Cities (Antwerpen, Helsinki, London, Madrid, Milano)
Temporal coverage	2011, 2030, 2050 and 2100 years

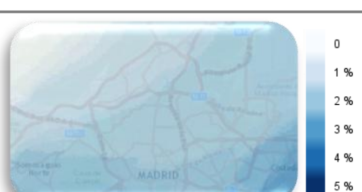
Methodology



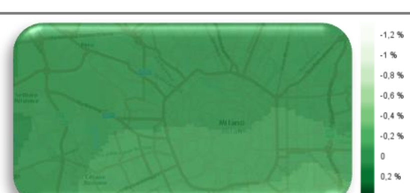
Applications

Understand the health impact of the global climate change on the local urban environment identifying relevant vulnerabilities

Examples



Madrid RCP NNRP - Yearly average of increase in daily mortality +65 years all causes due to heat wave days



RCP 4.5 - 2030 respect to 2011. Yearly average of change in daily respiratory mortality due to O_3 8 hours average. Upper confidence level 95%

Energy Efficiency

- ***Heat Loss***
- ***Building Relative Emission***

Description

These products are useful to detect energy waste due to anthropogenic heating. This requires night-time satellite acquisitions during cold, cloud-free and snow-free conditions

Input data	Landsat-8 and Suomi-NPP Water/roads (Urban Atlas) and Forest/grass/impervious fractions (GioLand)
Reference scale	1:1,500,000 to 1:2,000,00
Geographic coverage	Cities (Antwerpen, Helsinki, London, Madrid, Milano) Europe
Temporal coverage	

Methodology

Heat Loss

1. Browse meteorological archives for suitable weather conditions, and check which suitable windows overlap with a satellite acquisition (exclude acquisitions with too large angle of view)
2. Create land cover map based on existing data and derive from this an emissivity map
3. Combine emissivity with thermal radiance to obtain surface temperature, and visualize using user-friendly and intuitive atlas lay-out

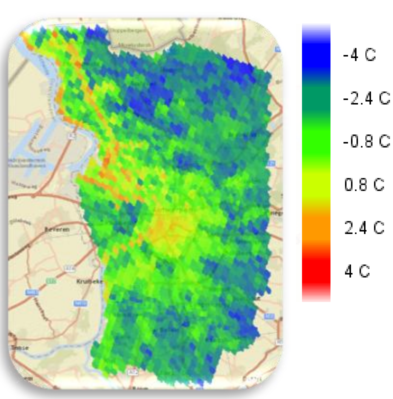
Building Relative Emission

1. Calculate land cover proportions per S-NPP pixel
2. Perform multivariate linear regression by considering in each pixel (1) the relative amount of each land cover type, and (2) the observed pixel-wide thermal radiance. From this, derive “typical thermal radiance” per land cover type
3. From the typical radiances, derive an “expected heat loss map”, and compare it with the observed map. Deviations between both are considered as the contribution of the anthropogenic heat emissions

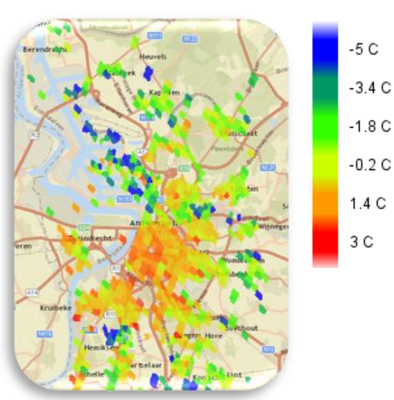
Applications

- Locate areas with anomalously high energy losses: hot spots (thermal losses)
- Quantify where energy is consumed in specific areas of a city using a monitoring instrument

Examples



Antwerpen Heat Loss



Antwerpen Building Relative Emission

Energy Efficiency	▪ *Light Emission*

Description

This product provides a quantitative estimate of integral light pollution, rather than the exact location and identification of light spots. It is, for instance, related to the number of stars visible for the human eye and can also be used for ecological purposes

Input data	Suomi-NPP
Reference scale	1:3,500,000 to 1:4,000,00
Geographic coverage	Cities (Antwerpen, Helsinki, London, Madrid, Milano) Europe
Temporal coverage	May of 2014

Methodology

<u>**Light emission map**</u>

1. Check most recent release of monthly composites published by NOAA-EOG
2. Verify meteorological conditions (snow cover and fog) and exclude unsuitable months
3. Define classes, categorize, create smoothed contours, add legend, etc. (visualisation)
4. Use different months to investigate recent trends in light emissions (optional)

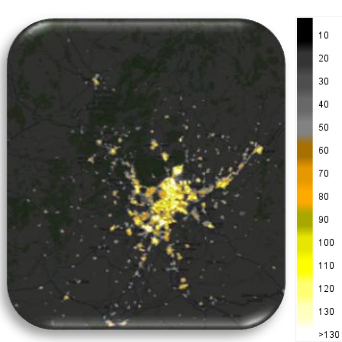
<u>**Light spot detection**</u>

1. Calculate land cover proportions per S-NPP pixel
2. Perform multivariate linear regression by considering in each pixel (1) the relative amount of each land cover type, and (2) the observed pixel-wide light emission. From this, derive "typical light emission" per land cover type
3. From the typical light emissions, derive an "expected light emission map", and compare it with the observed map. Deviations between both are classified, and pixels >99th percentile are assigned to the category "over-emitting", i.e. the so-called light spots

Applications

- Detect city light spots (light emissions) at neighbourhood scale (i.e. multiple building blocks) and at European level
- Monitor light emission in time, e.g. for as evidence-based policy support before, during, or after large-scale retrofitting/renewal campaigns across the city
- By comparing between cities, it can act as benchmarking tool to rank cities based on their per-capita light emission

Examples



Madrid Light Emission

Europe Light Emission

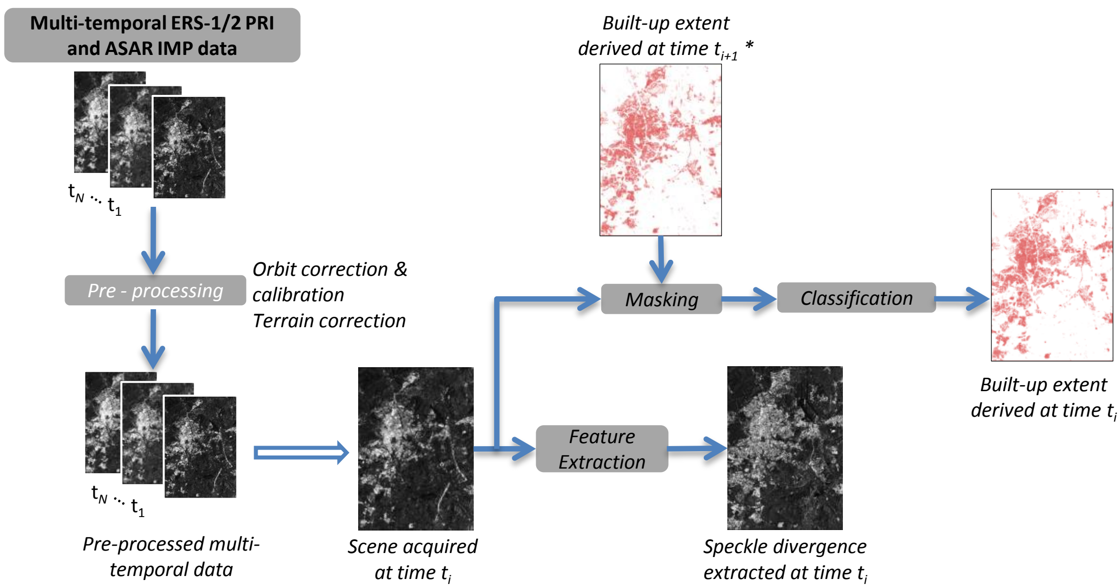
Land Monitoring ▪ *Urban Growth*

Description

This product provides delineation of urban settlements over time. Concretely, it shows urban expansion during the years 1992, 2000, 2006 and 2010.

Input data	Landsat-5, 7 and 8 ERS-1/2, Envisat ASAR
Reference scale	1:100,000
Geographic coverage	Cities (Antwerpen, Helsinki, London, Madrid, Milano)
Temporal coverage	1992, 2000, 2006, 2010

Methodology

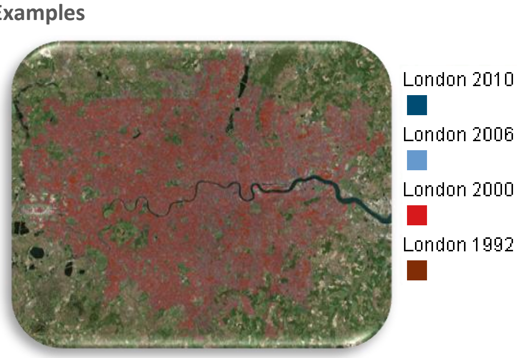


*Built-up extent at time t_{N+1} is any reference map available a priori for the study area generated later than t_N

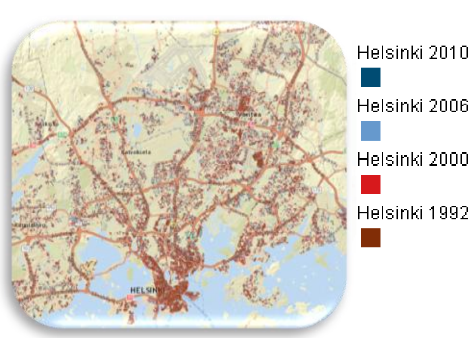
Applications

- Locate urban growth and observe how urban areas have expanded most rapidly in recent times
- Determine trends to be expected in coming years
- Identify the drivers behind urban sprawl and determine which can be controlled and at what level
- Identify how sustainable urbanization is and what are the consequences beyond city boundaries

Examples



London Urban Growth



Helsinki Urban Growth

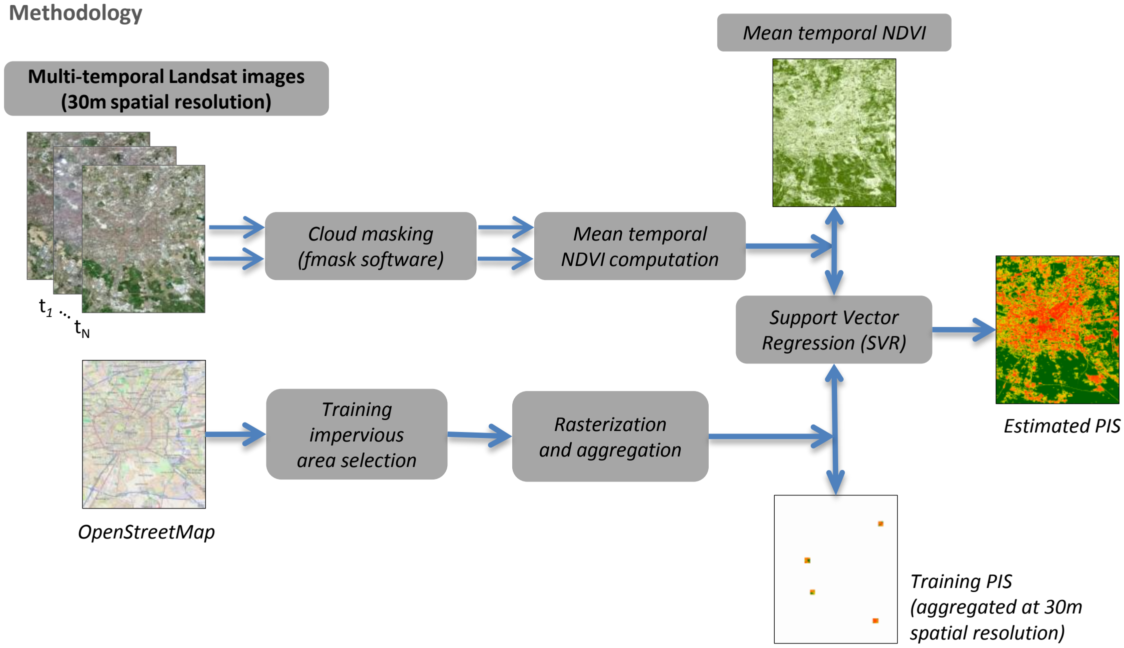
Land Monitoring ▪ *Impervious Surface*

Description

This product provides an estimation of the percentage of impervious surface: it includes areas such as roads, buildings, parking lots, railroads and/or other infrastructural elements of urban zones.

Input data	Landsat-5, 7 and 8 Roads and railway network
Reference scale	1:100,000
Geographic coverage	Cities (Antwerpen, Helsinki, London, Madrid, Milano)
Temporal coverage	2013-2014

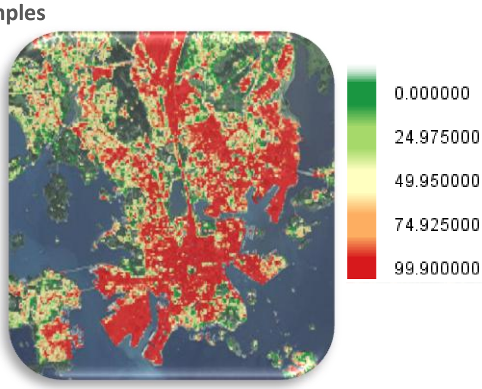
Methodology



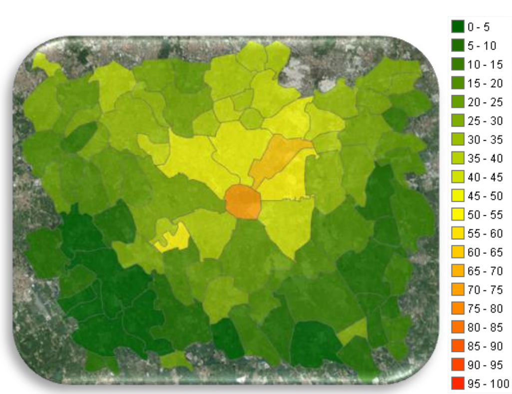
Applications

- The Percentage of Impervious Surface (PIS) is a very useful indicator to measure the impacts of land development associated with the expansion of urban agglomerations
- PIS is quantifiable and can be managed and controlled through each stage of the land development process

Examples



Helsinki Percentage Impervious Surface 2013-2014



Milano Percentage Impervious Surface 2013-2014. Mean districts

Population Impact

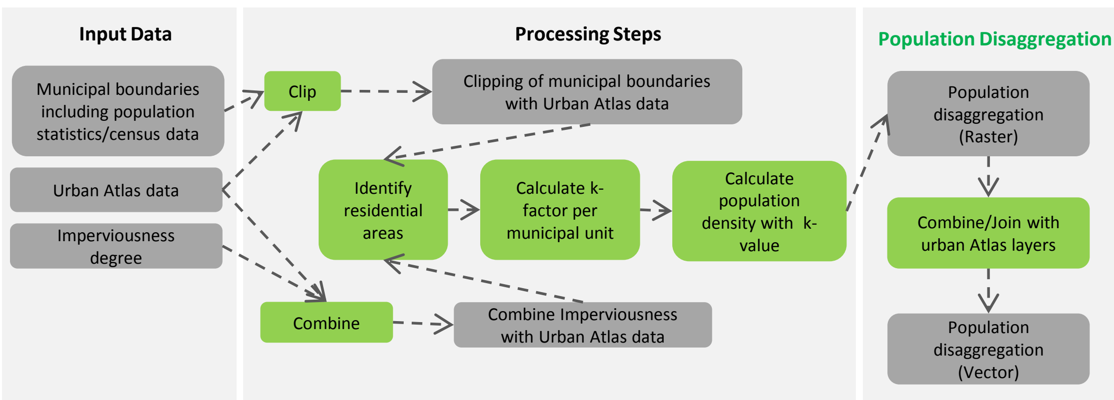
▪ *Population Disaggregation*

Description

The product consists of Population Disaggregation along the city area, according with a population distribution model based on official census population data combined with LULC data.

Input data	Detailed population statistics/census data (down to LAU-2) Regional LULC maps (Urban Atlas & HR Imperviousness Layer) Urban morphological data, city specific environmental & climate change data
Reference scale	1:100,000
Geographic coverage	Cities (Antwerpen, Helsinki, London, Madrid, Milano)
Temporal coverage	

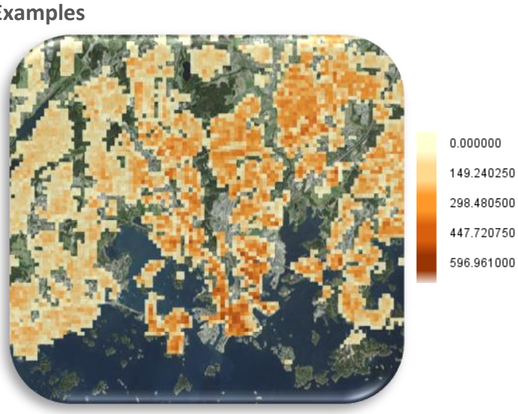
Methodology



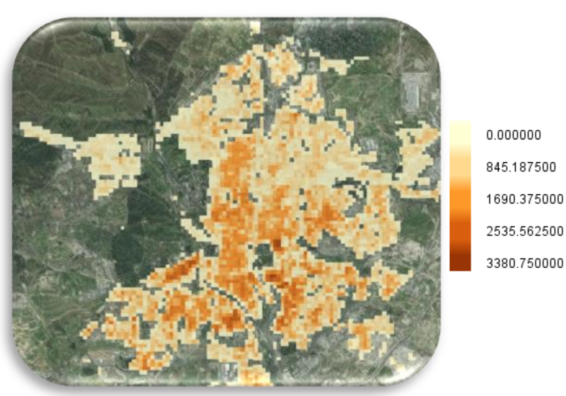
Applications

Derive how many people within the wider city/agglomeration are affected by selected environmental threats/climate change risks

Examples



Helsinki Population Disaggregation 200m



Madrid Population Disaggregation 200m

Common Technical Characteristics	
The following Technical Characteristics are common for all products present at the Decumanus Geoportal	
Product Format:	shp or tif
Projection:	Geographic WGS84 (degrees, minutes, seconds)
Metadata:	ISO 19115 compliance (xml format)
Raster (tif):	8 bits

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For further assistance, please contact

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