ISPRA
Istituto Superiore per la Protezione e la Ricerca Ambientale

LIFE+IMAGINE
Integrated coastal area Management Application implementing GMES, Inspire and sEis data policies

INSPIRE - Infrastructure for Spatial Information in Europe

SEIS
Shared environmental information system

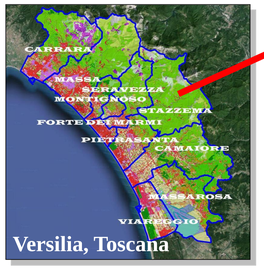
Copernicus
The European Earth Observation Programme

LIFE+ Project No.
LIFE12/ENV/IT/001054

SOIL CONSUMPTION IN COASTAL ZONES

The pilot application will be carried out to produce a pilot service and a dissemination system related to land consumption in the coastal area in order to make land monitoring data, indicators and services available to public and decision makers.
The urbanization process has characterized the Italian territory in the last 60 years so there was a relevant increasing consumption and exploitation of the coastal areas that increases the impacts on the coastal/marine ecosystem. Hence there is the need to measure and quantify the urbanization process through the study of the land consumption for an integrated coastal management. In order to assess and control urban sprawl, various indicators (each of them underpinning specific aspects of the phenomenon) are available to spatial planners and decision makers as well as the public. However, the reliability of such indicators is related to the quality of the exploited data. Being such data usually created by different entities, data interoperability is mandatory. With reference to the spatial data interoperability bases its legal obligation on the INSPIRE Directive and on the associated Implementing Rules.
Among the GMES Land monitoring services, the Pan-European High Resolution Land cover layers and Urban Atlas were identified as a possible test bed for the pilot. The main objective is providing additional information to the elaboration of environmental policies, deriving new indicators from GMES data and services with the integration of in situ and local data in the field of land take, soil sealing, urban sprawl and urbanization monitoring and strategic environmental assessment.
The integration of pan-European and local data, realised and shared in according to the data model and web services as defined by the INSPIRE Directive and integrated in the Regional and National Environmental and Spatial Data Infrastructures, provides an enhancement of assessment and environmental reporting activities at local level, with a possible extension at national level, especially to monitor the fringe of urbanised areas and urban sprawl in the coastal areas, characterised by a significant spatial variability of the soil imperviousness and cover and to improve data and indicator accessibility and dissemination.65

PILOTS

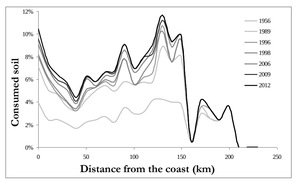


Input INSPIRE Reference Data

TYPE OF PARAMETER	SYSTEM PART	INSPIRE DATA MODEL
Road network and infrastructures	Soil Sealing	I.7 Transport networks
Rail network and infrastructures	Soil Sealing	I.7 Transport networks
Artificial surfaces	Soil Sealing/ Land Take	II.2 Land cover
Buildings	Soil Sealing	III.2 Buildings
Land use	Urban Sprawl	III.4 Land-use
Distribution of people	Urban Sprawl	III.10 Population distribution — demography

Soil consumption at national level

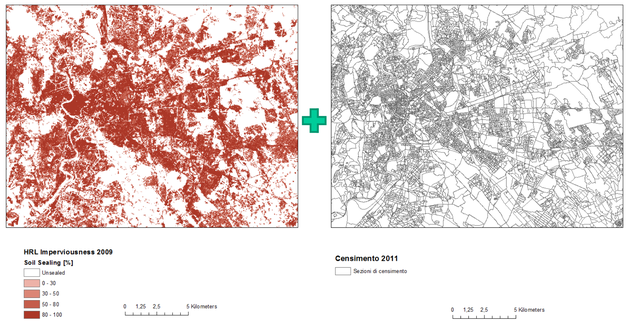
	'50	1989	1996	1998	2006	2009	2012
Consumed soil (%)	2,9%	5,4%	5,9%	6,1%	6,8%	7,0%	7,3%
Consumed soil (km²)	8.700	16.220	17.750	18.260	20.350	21.170	21.890



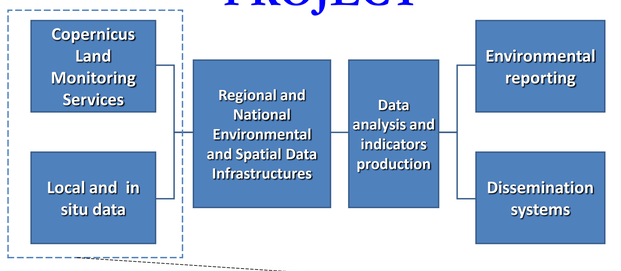
Soil consumption in coastal zones

Distance from the coast (km)	'50	1989	1996	1998	2006	2009	2012
< 10	4,0%	7,1%	8,0%	8,2%	9,1%	9,6%	10,5%
> 10	2,5%	4,7%	5,2%	5,4%	6,1%	6,3%	6,5%

✓HRL Soil Sealing (raster, 20mx20m, 2009, 0 -100%, EEA-ISPRA, *Copernicus*).
✓Census areas (shapefile, 2011, ISTAT).

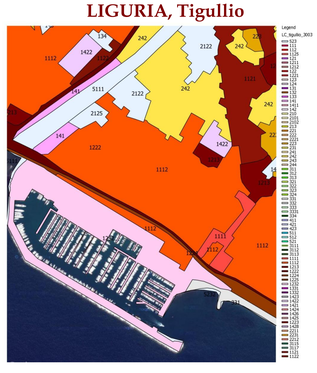


PROJECT

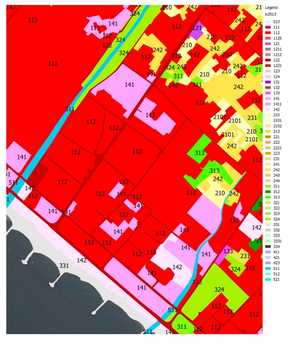


1) National data by ISPRA and European data by GMES/Copernicus (e.g. GIO -GMES Initial Operations- Land Monitoring Implementation Plan 2011–2013)
2) Local dataset already produced by Liguria and Tuscany Regions, harmonised in accordance with the European legislation and environmental initiatives (INSPIRE, SEIS, GMES)

LIGURIA, Tigullio



TOSCANA, Versilia



Urban sprawl indicators

1. The built-up area of the largest polygon over the total built-up area [%] LPI – *Largest Patch Index.*
2. The average size of the polygons excluding the largest polygon [ha] RMPS – *Remaining Patch Size.*
3. Edge Density of urban area [m/ha]
4. Mean urban patch area [ha]
5. The built-up area in the municipality [%].
6. The artificial area at the municipal level [ha].
7. The built area/artificial area at the municipal level.
8. Population density [Inhabitants/ha].

Use Cases

1 **Soil consumption calculation at the national level**
The soil consumption is caused in particular by the city expansion that converts the soil surface from natural or agricultural use to built-up. The land take is, in particular, referred to an increase of impervious surface, often caused by urban development. This first use case refers to soil consumption calculation expressed by 5 indicators. It is the measure of the soil sealing at the national level elaborated for the Italian municipalities. The indicators are showed by graphics/tables/maps/services.
It's also provided the integration of the indicators with the data at the local level for the pilot (Toscana and Liguria) area.

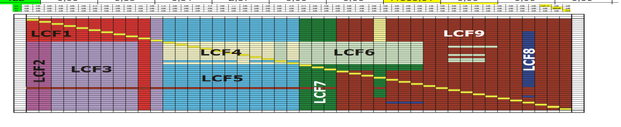
2 Analysis of the Degree of Imperviousness for the calculation of landscape metrics at the municipal level
Evaluation of soil consumption is an important piece of information to assess anthropic pressure and to support policies designing for more balanced development. This second use case refers to the analysis of the Degree of Imperviousness for the calculation of landscape metrics at the municipal level. In order to assess the urban sprawl at the municipal level, 4 indicators are calculated using the Degree of Imperviousness integrated with census tract layer. In order to assess the area of built-up in the municipalities other 4 indicators are calculated using the Degree of Imperviousness integrated with census tract layer, the regional land use maps and the local building maps. These indicators are influenced by the spatial resolution of the Degree of Imperviousness, which is 20m.

3 Land cover flow reporting
The Soil Consumption scenario is addressed to determine and show specific soil consumption indicators. This use case is based on the regard that the scenario application starts from different land cover year maps. A significant information in order to support the decision maker is related to the availability of reports, concerning phenomena guided by land cover changes, for instance available thanks to a matrix of changes (LCC Matrix). More in detail by the LCC Matrix is possible to know not only a class quantitative change but above all where each change is taken from each class to the detriment of what class (in growth or reduction), analysing the kind of change, and so having enough data for process analysis.

LC Change Matrix *Vs* LC Change Flows

2007 \ 2010

	111	112	1121	121	1211	1212	122	1221	123	124
111	12086,18	0,87	0,00	0,00	0,00	0,00	0,45	0,00	0,00	0,00
112	0,00	49452,71	0,00	3,82	0,00	0,00	3,40	0,00	0,00	0,00
1121	0,00	1,78	33296,21	3,04	0,00	0,00	0,74	0,00	0,00	0,00
121	0,00	3,22	0,00	23810,26	0,00	1,06	1,35	0,00	0,00	0,00
1211	0,00	0,00	0,00	0,00	106,44	0,00	0,00	0,00	0,00	0,00
1212	0,00	0,00	0,00	0,00	0,00	5,47	0,00	0,00	0,00	0,00
122	0,00	0,89	0,51	2,87	0,00	0,00	41385,01	0,00	0,00	0,00



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