Project Soilconsweb

Multifunctional Soil Conservation and Land Management through the Development of a Web Based Spatial Decision Supporting System

soil degradation | desertification | soil pollution | loss of organic matter

PROJECT DESCRIPTION

Degradation, characterizing today much of our territory and in particular soils and landscape, is unfortunately advancing. Due to lack of adequate information, suitable databases and expert support, the institutions called upon to make decisions in terms of planning and management are often unprepared, or in great difficulty to face these problems. At the same time also farmers, foresters and local operators need practical information or useful tools for a sustainable land and landscape management.

OBJECTIVES

The **SOILCONSWEB** project was born from these considerations and its main objective was to produce, test and apply an **innovative tool**, developed through the web, **to support decision-making** concerning issues of agricultural and forest landscape in order to improve soil conservation and land management. The **WB-SDSS** (Web-based Spatial Decision Supporting System) is a tool compatible with the INSPIRE legislation (aimed at making geo-referenced environmental information homogeneous and shareable in the EU), also designed to facilitate the implementation, on a landscape scale, of the thematic strategy for soil protection and some important European environmental directives, including the *Nitrates Directive (91/676/EEC)* and the *Directive on the protection of the environment, and in particular of the soil, when sewage sludge is used in agriculture (86/278/EEC).*

PROJECT PHASES

The WB-SDSS was developed and applied in a pilot area of approximately 20 thousand hectares, in the Telesina Valley located in the Province of Benevento. It is a territory that presents a considerable complexity and environmental variability and a land use that varies from agricultural to forestry.

The realization took place substantially in four phases:

- **identification**, in collaboration with local administrators and operators, of the environmental factors and problems relevant to the sustainable management of soil and agro-forest landscape (for example erosion and soil sealing, potential nitrate pollution, decline in organic matter, etc.);
- **collection** of various spatial and non-spatial environmental information layers (for example thematic maps, satellite images, climate databases, etc.), which constitute the information base of the WB-SDSS;
- **definition** of the operation and elaboration criteria of the system, that is management modalities of the georeferenced data, visualization and management of maps, functioning and implementation of the dynamic simulation models;
- **development of the WB-SDSS** and its interface to allow interaction with end users (querying the system).

The WB-SDSS was subsequently made operational, only for some basic functions, in 4 other pilot areas: Region of Campania (the countryside of Aversano), Region of Lombardy (Piana di Lodi), Sicily (the slopes of Etna) and Austria (area of Wachau). This demonstrates the flexibility, adaptability and reproducibility that characterize the SOILCONSWEB system.

PROJECT RESULTS

The WB-SDSS SOILCONSWEB is freely usable, through a very intuitive interface, by concerned individuals (farmers, forestry experts), public bodies (in particular political decision makers, land planners and managers) and other interested parties, including single citizens. As part of the last WS-DSS development phase a specific document, *Implementation of the WS-DSS software and hardware systems* was also developed, which describes the system's architecture and provides useful information to the potential users on its use. **4 training courses** for specific target groups were also carried out, aimed at promoting awareness of the methodology and use of the system in relation to specific issues.

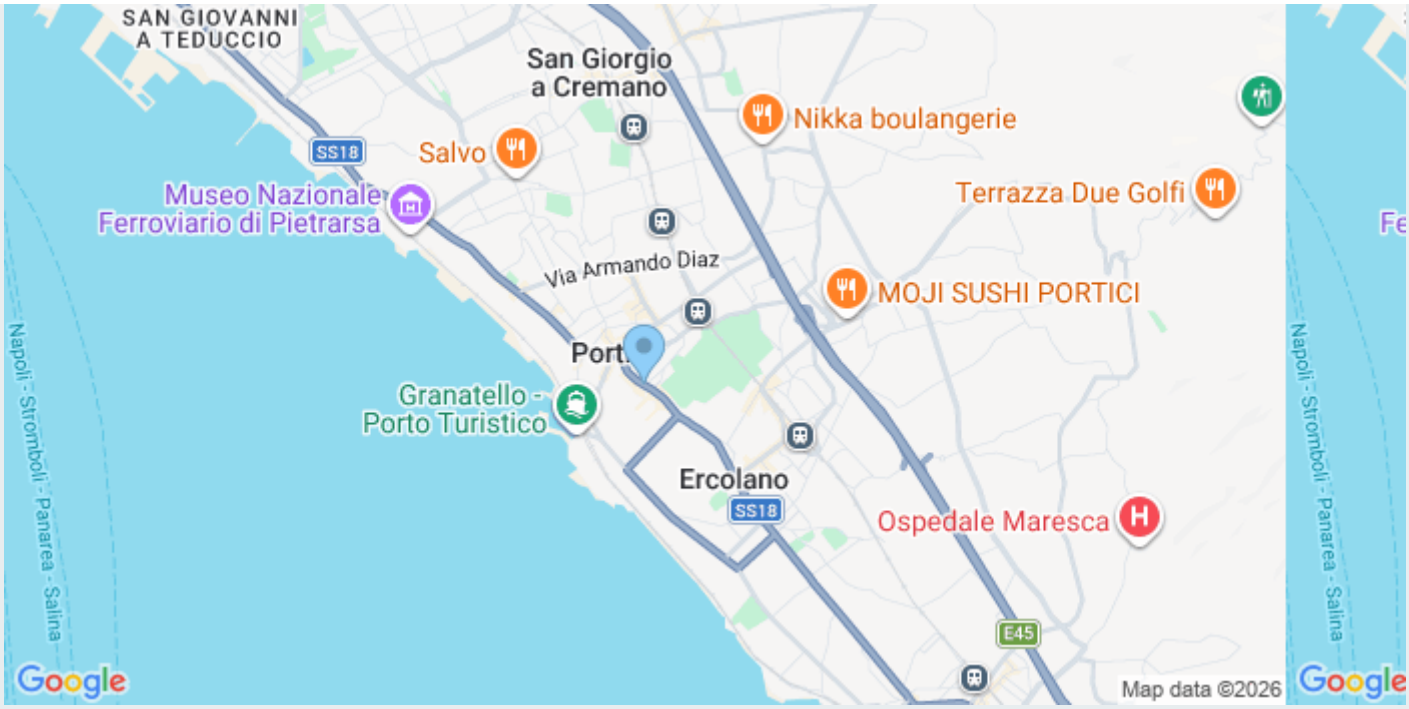
The structure of the WS-DSS is divided into 4 modules: ***Agriculture and Forests, Environmental Protection, Territorial Themes*** and ***User Themes***. The first two modules allow access to instruments designed to deal with problems related to **viticulture, olive growing, forests, soil degradation (erosion, decline in organic matter, soil sealing, slope stability, soil protection capacity, disadvantaged areas, nitrate pollution, wastewater spreading, etc.), land management**, etc. **The *Territorial Themes* module is a container for explorable data and maps relating to the territory, which presents the characteristics of a Web GIS (Geographic Information System) whose cartographic base is *Google Maps*. The last module, instead, contains the data selected and saved by the user.** This latter can query the database on environmental and agro-forestry problems, then **explore, evaluate and compare possible solutions**. The WS-DSS also allows interaction through the use of dynamic simulation models, considering **other parameters too, such as soil texture, type of cultivation, and period of interest for the simulation**. In this way, interested parties can produce detailed documents, reports, maps, maps with legend, tables and spreadsheets (containing the results of model simulations) in response to specific queries relating to agro-forestry and environmental issues.

Main **functions of the WB-SDSS developed through the SOILCONWEB** project are:

- **provides data on the potential erosion rate of soils and allows the user to simulate actual erosion;**
- **provides information on the evolution over time of soil sealing by urban development (the user receives data on surfaces lost in a given time period in a given area of interest);**
- **provides urban planners and municipalities free access to important aggregated data, such as land use classes (number of hectares of arable land, forest and urban areas), water resources, precipitation, data on soil geology and main types of land. This data can be compared with the 1954 orthophotos to generate reports showing how the use of land and land itself have changed;**
- allows to evaluate the surface (m^2) of **soil consumed per inhabitant between 1954 and 2011**, providing data also on the quality and fertility of the lost soils;
- allows, for a user-defined area, to **simulate the impact** that soil consumption has had or will have **on essential ecosystem services, such as food production, water absorption and carbon storage** (related to the CO_2 production);
- serves to **calculate** the loss of **hydrological functions** of the soil if sealed (the calculation is the result of hydrological modeling simulations and is based on the analysis of different types of soil in the area of interest, considering their different physical characteristics). This allows a local urban planner to **know the decline in the water absorption capacity of a soil** (in quantitative terms) caused by a new dwelling built on an area previously used for cultivation, enabling the planner to decide whether to proceed or not;
- allows political decision-makers to **identify**, on their territory, the **areas most exposed to nitrate pollution** of agricultural origin, or to delimit the best soils to be preserved, thus better addressing interventions in the territory;
- allows farmers to **monitor the real water content of farm soils, or to detect the soils' protective capacity against aquifer pollution** and then to define which could be the best agricultural practice to be adopted in their own farm;

- allows forestry experts to identify areas with the highest productivity of biomass and to identify the characteristics of the soils present therein, providing **useful information for forest management, even on a land lot scale**;
- finally, it allows ordinary people to learn more about the territory in which they live, identifying its potential and criticalities, and being able to **contribute, *in an informed manner*** through and through a bottom-up approach, **to decision-making processes concerning land management and land use planning**.

The SOILCONSWEB project represented an investment in innovation, anticipating by a few years an approach characterized by the combination of a decision support system with a Web GIS that has then soon spread to many European and non-European countries (although the SOILCONSWEB WB-SDSS remains a unique tool in its functionality and adaptability). The **adopted methodology has allowed to overcome the limitations of a normal Web GIS** that cannot process the available data, but simply display the information it contains, **creating a system that can combine GIS technologies via web with the application of complex simulation models.**



-

Acronym
Soilconsweb

Number of reference
LIFE08 ENV/IT/000408

Reference Programme
LIFE

Beneficiary Coordinator
Università di Napoli Federico II, Dipartimento di Scienza del Suolo, della Pianta, dell'Ambiente e delle Produzioni Animali (DISSPAPA)

Contacts
Luciana Minieri

EU contribution
1.591.567

Call Year
2008

Start Year
2010

End Year
2014

Beneficiary headquarters

Via Università, 100
80055 Portici NA
Italy

Region
Campania