The "Land Unit and Soil Capability Map of Sardinia (Italy)" (1:50,000 scale): the GIS oriented methodological approach

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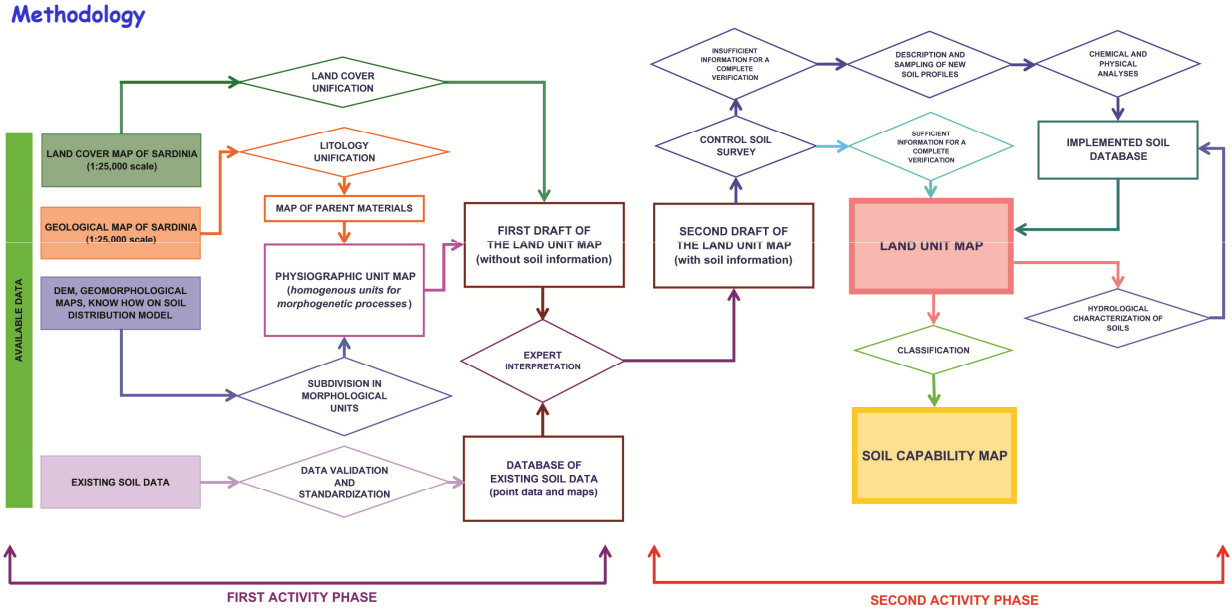
Introduction

The island of Sardinia (Italy), due to its particular geographical position and its extreme climatic events, such as droughts and floods, can be considered a representative area for the typical environmental problems of the Mediterranean Basin. In particular, the landscape morphology and the climate make the island's soils very fragile and sensitive to degradation under any land use change which does not properly take into account the soil properties. Due to this, the problem of soil degradation is of great concern to the island and the subject has been widely investigated over the last decades within the framework of national and international researches and projects. The findings have shown anthropogenic factors to be the leading cause of soil degradation. Therefore, land planning at different levels is viewed as the key issue in preventing and mitigating soil degradation in the island of Sardinia. To fulfil this purpose, the planning processes must be based on an accurate inventory of the natural resources, including soil, on their evaluation and on the definition of alternative, suitable use. Nowadays, the only available regional soil inventories are the Soil Map of Sardinia, at scale 1:250,000, and the Soil Map of the Irrigable Areas of Sardinia, at scale 1:100,000. The scale of these two soil maps is not adequate for local land planning strategies. Consequently, a new project, funded by the Sardinia Region (DGR n. 56/36, 29.12.2009), for the realisation of a "Land Unit and Soil Capability Map of Sardinia", at scale 1:50,000, has recently started.

The purpose of this paper is to present the methodology which will be used for the preparation of this new map.

Methodology



At present, numerous soil data are held by public and private institutions, but these data are not readily available or accessible to users. The project partners, which own most of the existing soil information in Sardinia, will share their archived soil data. This, in addition with a GIS-oriented approach, will reduce as much as possible the cost of the project.

The work will be divided in two main activity phases. During the first activity phase the existing data on the fundamental factors of soil formation will be acquired and used to produce a first draft of the Land Unit Map, lacking of soil information. The following three information layers will be used: land use and land cover (regional map, 1:25,000 scale), geology (regional map, 1:25,000 scale) and the regional Digital Elevation Model (10 m resolution). The original land use and land cover units, as well as the original geological units, will merge into new units relevant for soil formation. The regional digital elevation model will be used, driven by the know how on the regional soil distribution model, to produce a landform map, via a semi-automatic classification by means of an isocluster algorithm, whose units are relevant for soil formation. The three layers will merge into the first draft of the Land Unit Map. Simultaneously, all the existing soil data (both maps and punctual data) (Figs. 1 and 2) will be collected, evaluated, standardized and input in a database, that has been specifically designed for this project and will be accessible to all partners from a central server. By means of an expert interpretation, the soil database will be linked to the first draft of the Land Unit Map, to produce the second draft of the Land Unit Map, containing soil information. During the second activity phase the second draft of the Land Unit Map will be verified in the field, modified and implemented with new soil data if this is the case, which will be input in the soil database, and the final Land Unit Map will be produced. The Soil Capability Map will be produced classifying the Land Units by means of a reference matching table of Land Capability classes created on purpose for this project.

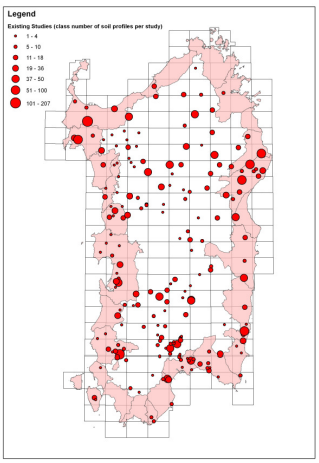


Figure 1. Existing soil data belonging to the partners of the project (in pink the Coastal Area of Sardinia).

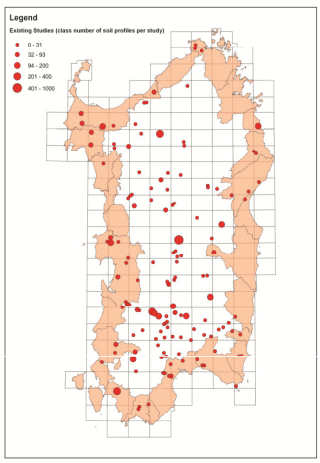


Figure 2. Other existing soil data (in salmon the Coastal Area of Sardinia).

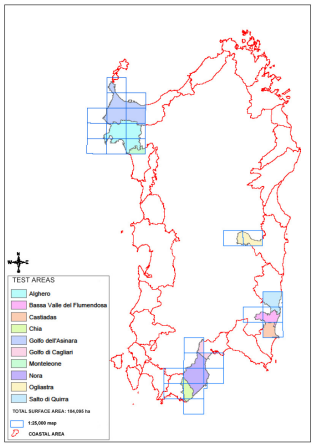


Figure 3. The representative sample areas where the methodological approach will initially be tested.

The chosen methodological approach will initially be tested in 4 representative sample areas (Fig. 3), covering roughly 185,000 hectares. The 4 test areas include a large spectrum of soilscapes with a great variability of parent materials, landforms and land use cover. In these areas, 613 described and sampled soil profiles already exist and further 3,750 observations are expected to be made according to the survey scale (1:50,000). These areas form part of the Coastal Area of Sardinia, to which the Sardinian Region has given priority for the realisation of the project, as related to the Landscape Regional Plan (the current and strategic instrument of regional planning).

Conclusions

The "Land Unit and Soil Capability Map of Sardinia" (1:50,000 scale) will be a valuable tool which may drive the decision making process and, consequently, favour the prevention and mitigation of soil degradation processes in the island.

Examples of areas where information on land properties and on soil capability will be essential for this goal are given in Figure 4b), c) and d).

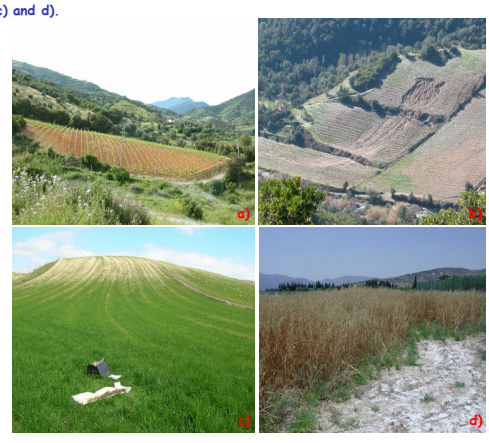


Figure 4.
Rolling landscape with soils formed from metamorphic rocks (a and b) in areas with a sound balance between agriculture (vineyard) and semi-natural environment (a) and in areas with landslides in vineyards (b); hilly landscape with soils formed from marls in areas with intensive agriculture and soil erosion (c); coastal plain with soils formed from alluvial sediments in areas with agriculture and strong salinisation due to wrong water management practices (d).