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Preserving cultural heritage by supporting landscape planning with quantitative predictions of soil consumption

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ABSTRACT

Landscape preservation in Italy is a major issue in national cultural heritage conservation policies. Urban settlements growth is among the most threatening factors for the correct landscape preservation. Such phenomenon may result in corrupting the correct landscape-system functioning, particularly when the development occurs without precise planning prescriptions. Land-use/cover evolution dynamic is a subject widely and thoroughly investigated, especially concerning consumption of natural and other lands due to anthropogenic activities. This paper focuses on a region in southern Italy, where soil consumption is known to represent a urging matter of concern. However, although the negative impacts of soil consumption are well known, to our knowledge there are no case studies presenting a precise quantitative assessment of the intensity of such phenomenon for the region of interest. Furthermore, this study aims at forecasting the development of urban settlements through the application of the cellular automata model SLEUTH; the case study concerns the Municipality of Altamura (Apulia region, Italy). Results highlight how current landscape preservation instruments alone cannot ensure a reduction in soil consumption phenomenon and how urban areas expansion is incompatible with a correct landscape conservation in the study area.

1. Introduction

Landscape values are among the main foci of the recently revitalised scientific and cultural debate on environmental sustainability. In fact, although for long time the scientific community investigated and tried to warn about the deleterious influence of anthropogenic activities on environmental and climate change, is only recently that this urging problem was echoed extensively. This was also due to the United Nations that brainstormed about the (partially unsuccessful) Millennium Development Goals (MDGs) [1,2] and improved them through the definition of the Sustainable Development Goals (SDGs) by the UN to be achieved by the year 2030 [3]. Furthermore, media attention on environmental issues was also due to the intervention of Pope Francis who with his Encyclical Letter "Laudato si" highlighted how the current development model based on the intensive use of fossil fuels is the major responsible for land use change process leading to soil sealing, progressive overconsumption of natural resources threatening Earth's resilience, and depauperation of the values of landscapes as a whole [4]. Nevertheless, also the intense weeks of negotiation that ended with the historic agreement at the Conference of Parties on climate change (COP21) in Paris in December 2015 helped echoing this topic even more.

Therefore, the identification of landscapes as part of the identity of a territory is of great interest. Cultural heritage preservation is a top priority for Italian legislation. Art. 9 of Italian Constitution reads: "Italian Republic promotes culture, scientific and technical research development; it preserves National landscape and historical and artistic heritage". The Ministry of Education with Bottai's laws started the first Italian historical goods preservation act. The current statement is DLgs 42/2004, "Codice dei beni culturali ed ambientali". Art. 1 of the previous DLgs states that "[...] preservation and valorisation of cultural heritage contribute to preserve the memory of the national community and its territory, and to promote culture development". There is a biphasic logic: a will of goods valorisation and use is coupled with a constraint preservation. Then the article continues: "[...] administrations promote cultural heritage fruition and valorisation". Finally, comma 5 imposes a very interesting constraint to property right, since "private owners of such goods must always provide to their conservation [...] private owners must guarantee goods fruition". Article 2 describes the composition of cultural heritage. This "is made up by cultural

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and landscape goods". The law defines landscape as "the territory expressing identities deriving from actions and interrelations of natural and human factors. Landscape is preserved by the State, Regions [. . .]; landscape preservation aims to recognise, preserve and safeguard cultural values which it expresses". Categories of landscape goods are defined according to art. 134. They are:

- goods defined by law;
- goods defined according to a concertation process;
- goods defined by landscape planning instruments.

Goods preserved by the law are coastal territories within 300 m from the shore line, lakes and their 300 m respect zone, rivers and creeks including a respect band of 150 m, glaciers, national and regional parks and reserves, wetlands, mountains for the part exceeding 1200 m a.s.l., volcanoes and archaeological areas. The latter undergo a double preservation, since they are also part of properly said cultural goods.

This paper considers soil resource as part of the landscape, and therefore of the cultural heritage. Soil is not directly protected by Italian legislation, even though the need to protect it is now a belief shared by the scientific community. The European soil Charter (1972) [5], in fact, states that "soil is one of the most precious human goods, because it allows plants, animals and human beings to live on the earth surface". Soil can be compared to a living organism, continuously changing, which is the necessary base for all biosphere biological activities. Agricultural and zoo-technical production – and therefore human food production – strongly depends on soils. The increasing and constant growth of world population was made possible only through the introduction of intensive cultivation technologies, which aimed at maximising the exploitation of soil potential. Monoculture, i.e. growing of a single plant species, on one hand ensures more food production, but on the other hand it implies high environmental costs, e.g. a large use of petroleum derivatives for machinery moving, fertilization and crop defence from parasites. However, still nowadays, the main threaten for the agri-food sector is urban areas expansion, which mainly occurs on agricultural areas. Thus agricultural areas are pushed further away often replacing soils of poorer quality; this is a major concern, since having less fertile land may means weakening the production potential.

Urban areas growth processes are a top threaten for the correct safeguard of landscape goods. Despite the presence of landscape preservation instruments, the more or less regulated growth of settlements tends to affect landscape and ecosystems configuration, even when it does not directly occur in areas under preservation. Soil preservation is therefore an important issue [6]. Soil is a non-renewable resource and, like water and air, it has to be considered a common good. Soil degradation can be caused by many factors (e.g. erosion, organic matter decline, compacting, landslides, floods, and desertification). Only in recent times, the attention has been focused on the main threat of soil: soil sealing. Consequently, the construction of new residential areas, industrial zones, trade and services centres, roads and other infrastructures, is a major problem because it causes soil sealing [7–11]. A sealed soil loses its biological value, becoming unable to absorb and filter rainwater [12]. Excessive urbanization, especially when it is due to ineffective urban planning, generates a strong fragmentation of natural and agricultural landscape [13–18]. These issues are typically included within the definition of soil consumption, a term which describes the land cover transition from natural to artificial. The European research LUCAS allows to compare general characteristics of land cover in 27 European countries (Fig. 1). In Italy, the portion of territory with artificial cover accounts about 7.8% of the total, while EU average reaches roughly 4.6%. Italy is ranked at the fifth place among the countries with the highest proportion of artificial cover, after Malta (32.9%), Belgium (13.4%), the Netherlands (12.2), Luxembourg (11.9%), and slightly before Germany, Denmark and the UK [19] although it is one of the biggest. Analysing in detail artificial cover, distinguishing between residential areas, services and other artificial areas such as infrastructures and annexed areas, it is clear that in the 27 EU countries the value of residential areas and services is about 1.5% of total area, approximately one third of the artificial surface, while other artificial areas represent the 3.0% of the territory. In Italy, there are 7.8% of artificial areas, with 2.7% residential areas and services and 5.1% other artificial areas.

The "Roadmap to a Resource Efficient Europe" delineated by the European Commission (2011) in Paragraph 4.6 defined the target for 2050 as stopping the use of new areas for location of new neighbourhoods. This phenomenon has been widely discussed in Italy without achieving considerable results. Italian national legislation in the field of soil consumption, and more generally in territory governance, is unfortunately obsolete and unable to tackle the problems of modern urban/rural landscapes. However, several legislative drafts, concerning territorial government, are currently deposited at the Chamber of Deputies, and they deal, in a more or less pronounced way, with soil consumption. Expressing a judgment about the quality of such legislative drafts is not the purpose

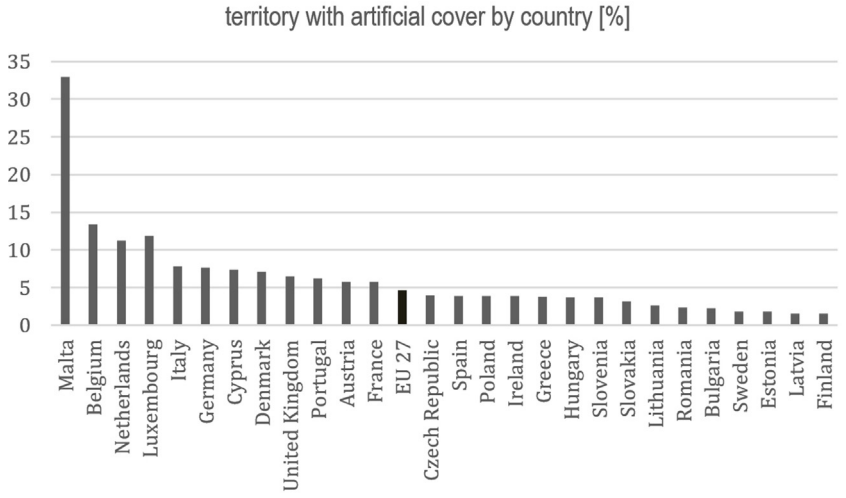

Fig. 1. Territory with artificial cover by country, LUCAS survey, 2012 (percentage incidence on total area).
ISTAT elaboration on Eurostat data.

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