Comparing Environmental Values and CO2 Values in Geographical Contexts

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Abstract. The earth's surface, as is known, performs a number of functions, which guarantee the existence of flora, water, fauna, and further factors for the survival of nature. Among such functions, those generated on "the ground" and born from the balance of ecosystems stand out. In the past few years, the analysis of these functions has led to the classification of soils on the basis of the identification of a various "geographies" of "environmental values".

The subject of the paper is the story of the evolution of a recently started research. In this research phase the attempt is the try to compare different classification of soils.

The classification refer to identify sub-areas, constructed by evaluating scales of "environment value" and their ecological functions, by evaluating the carbon dioxide (CO2) containment capacity of the same environments.

The research of this paper therefore attempts to build a link between the first qualitative, spatial, multidimensional evaluation (the geography of environmental values that reminds us of the overlay) and the second monetary one, based on the containment capacity of CO2 emission compared to the ground.

The research was conducted on the basis of this comparison/overlapping, and the paper illustrates the results obtained.

The geographic rankings produced by the overlay between the mapping of eco-nomic values (related to the cost of segregated CO2) and ecological-environmental values (in the multidimensional geographic evaluation) should lead to a geographic-economic reapproach, which can alternate with forms of cross-evaluations between the cost-benefit analysis, compared through the use of overlay mapping (which reminds us "Design by Nature" Mc Harg).

At the same time, the variety of the surface and its sub-stratum is analyzed and in the field of environmental economics studies.

The aim is to identify the differences between various natural and possibly artificial soil surfaces by attributing an economic value to the different classes.

The concept of "Geography of Environmental Values" is recalled. The geographical classification is formed by building a "mosaic" of the different surfaces, which differ on a physical, ecological level.

These differences, found between those terrestrial factors that influence the dynamics of global warming, have already been reported in research and publications that use "monetization". The main issue to be analyzed regarding the diversity of surfaces (man-made and natural, protected and to be conserved), is an important topic in the field of geographical research aimed at constructing soil classifications.

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The identification of territorial differences through the scales of environmental values of the soils themselves can lead to hierarchies which, on the one hand, refer to indicators such as the ecological footprint, or impermeability, or biomass productivity, to which necessarily added the cost of carbon segregation, for the containment of global warming. The paper highlights the intersections between the qualitative classification of soils and the environmental value of the soils themselves, expressed through monetization, in the logic of implementing methods that contribute to improving the development of cost-benefit analyses.

Keywords: CO2 · Carbon sink · Environmental values · Spatial multicriteria analyses · Environmental Economics

1 Introduction

Our planet surface is the basis of deep studies whenever new needs appear in a future urban development, or new policies are oriented towards nature preservation.

The Earth's surface (as well-known) performs a number of functions, which guarantee the existence of flora, water, fauna and, as well, further oriented factors, on one hand in favor of survival of nature, and of preservation of natural way of life.

The first capital stage of planning activity is based on several addicted approaches for managing spatial, social, economic and environmental information.

The knowledge has to be increasing, in order to understand, to interpretate and to refer the investigation about natural attributes of soil, such as flora and fauna, heritage and landscapes.

Among such functions, we can take care (or in account) of those that have been generated on the ground, and have been born as a consequence of the balance of stand out ecosystems.

The paper recounts the developments of a research started a few years ago, when a group of scholars began to deepen the methods of analysis of territorial dynamics connected to the transformation of the environment generated by urban development. The first step concerned the application of the method that we can define as "spatial multi-criteria evaluation".

This research then continued in successive phases that are still ongoing. In these where the researchers have developed and applied methods for evaluating the environmental and economic effects in the natural and urban territory. The effects of such research produced a widening of studies linking the dimension of nature and soil with transformation and planning actions.

Evaluative approaches extended the investigation from multidimensional assessment to the search for "universal indicators".

At the same time some aspects of the study were considered of greater interest and the research was extended. One of the main themes today is connected to the relationship between geographical-territorial analysis and economic-environmental analysis.

The research seems an experiment, that appears aimed at improving new models of economic and environmental characterization and typification of parts of the territory.

The paper shows a tale about the evolution of some investigations that started few years ago, and that are still developing. Just more in detail, several current research phases are related with the attempt to apply paths and studies, in order to identify and classify a set of well-defined typologies of soil.

In the past years, the studies of such functions led to apply a new detection of soils in order to identify a variousness of "geographies of values": such spatial investigation has been consequently considered as the basis of multiple environmental ranking of values by sub-areas.

The analyses stats on the identification and the comparison of two approaches:

- the first approach is based on the definition of a set of values-scaling for environmental and ecological functions of soils
- the second approach is estimating the containment of carbon dioxide (CO2) inside the same environments.

The "geography of environmental values" therefore has been considered not a simple ranking, but an useful approach of classification of soils. As regards such experiment.

2 Assessing CO2 as Cost-Opportunities for New Land-Uses

The paper explains the approach of an investigation that is described in the following pages and, therefore, to create a link between a qualitative, spatial, multidimensional evaluation approach and a second quantitative monetary one, that is related with the amount of containment capacity of CO2 emission connected to the ground.

The research has already been conducted on the basis of this comparison/overlapping. Such paper therefore illustrates the results obtained.

The paper talks about the development of several researches, few years ago, carried out by groups of scholars began to deepen new methods of spatial analysis and interpretations of territorial dynamics connected with the environment changes due to the evolution of urban developments.

The new investigation concerned with new steps for implementing (as method) the "spatial multiple - criteria assessments".

Such research will continue in further phases that are still ongoing. As a consequence, scholars and researchers tried to test and apply those methods for evaluating the environmental and economic effects in the natural and urban territory.

The effects of investigation, in the wile, generated the increase of studies about the evaluation (in terms of dimensions) of soil and nature changes, due to planning procedures. Evaluation as well has been extended from multidimensional evaluation to the search for "universal indicators".

At the same time some aspects of the study were considered of greater interest and the research was extended.

One of the main themes today is connected to the relationship between geographical-territorial analysis and economic-environmental analysis.

The figure describing the overlay mapping shows different levels of the territorial representation with the identification for each map of the land cover (for example woods, artificial soils, crops, etc.). The elements of the grid that shapes the land covers are

associated with a given level of value connected to a territorial element according to a criterion. Land covers can be natural or man-made.

The overlapping of multiple layers sustains the combination of features that guide towards the result of a multiple criteria assessment. The multiple evaluation has been managed according some approach that is based on a cost-opportunities. The value of CO2 segregation represents a good way to define a ranking.

A priority starts when being considered on the base of capability of carbon dioxide. The

– the scale of values of each type of cover,
– the value of each land cover (that's related with scaling)

The overlapping of all the grids entails a resizing of each element of the grill, and in this way the spatial classification takes on a certain multidimensional character.

The consequent multiple dimensioned reality implies the use of a multi-criteria evaluation. The main task of the multiple criteria evaluation of natural, artificial land covers is based on providing information on the environmental value of the various territories that has been subjected to studies and research.

The geographic rankings produced by the overlay between the mapping of economic values (related to the cost of segregated CO2) and ecological-environmental values (in the multidimensional geographic evaluation) should lead to a geographic-economic reapproach, which can alternate forms of cross-evaluations between the cost-benefit analysis, after the implementation of overlay mapping (proposed by Mc Harg approach).

At the same time, the variety of the surface and its sub-stratum is analyzed and in the field of environmental economics studies.

The aim is to identify the differences between various natural and possibly artifi-cial soil surfaces by attributing an economic value to the different classes.

The concept of "Geography of Environmental Values" (proposed by G.Maciocco) recalls the implementation of multidimensional assessments and procedures in order to identify, by decision support systems, the most relevant parts of surface, according with.

The geographical classification is formed by building a "mosaic" of the different surfaces, which differ on a physical, ecological level.

Such discrimination found itself among those terrestrial factors that affect the dynamics of global warming. In the same time spatial analyses have already been reported in research and publications that put on appraisal for "monetization". The main issue to be analyzed regarding the diversity of surfaces (man-made and natural, protected and to be conserved), is an important topic in the field of geographical research aimed at constructing soil classifications.

The identification of differences and variousness - by the scales of environmental values of soils themselves - can lead to hierarchies which, on the one hand, refer to indicators such as the ecological footprint, or impermeability, imperviousness, biomass productivity. All such issues are necessarily conjoint with the cost of carbon segregation, for the containment of global warming.

The paper highlights the intersections between the qualitative classification of soils and the environmental value of the soils themselves, expressed through monetization, in the logic of implementing methods that contribute to improve cost-benefit analyses.

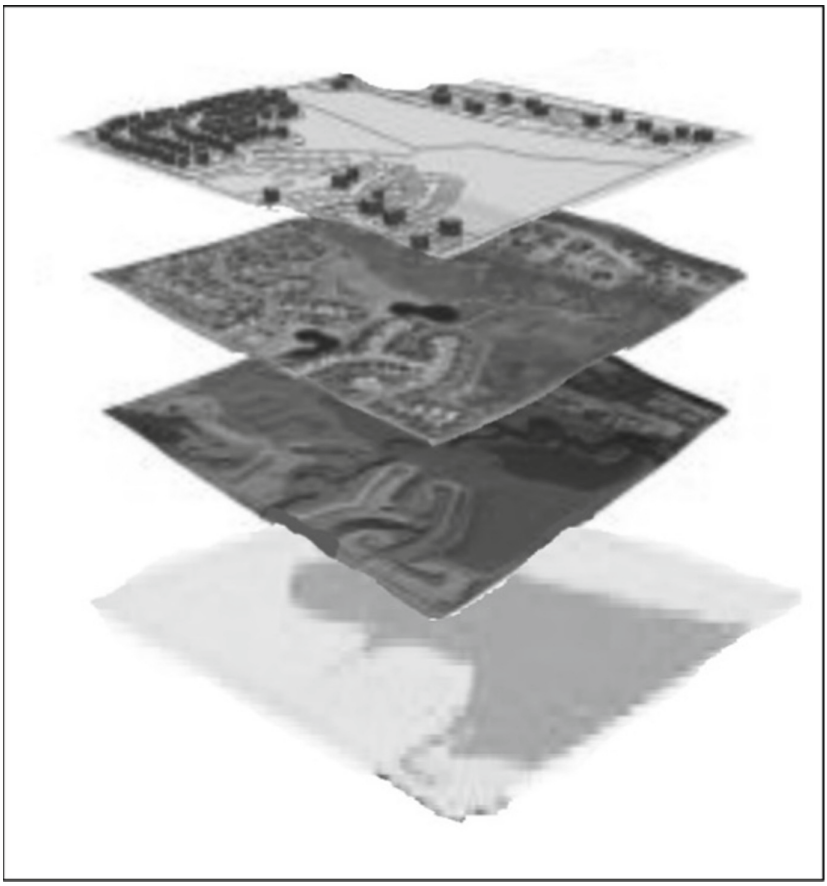


Fig. 1. The highest map is the result of an overlay of the three underponed maps

In Fig. 1 the procedure of "overlay mapping" is represented. The over-position of layers shows various representation and identification of each map of the land cover (for example woods, artificial soils, crops, etc.). Each maps represents a homogeneous component of "hearth surface". The highest map on the top is the result of three combination of layers. On the top the highest layer collects the various nature functions connected with each theme. Figure 2 represents by a grid the classification of multiple environmental values. Such values are the results of a multicriterial assessment. The result of the multi-criteria evaluation of land covers (natural, artificial) provides information on the deepest environmental features, linked with the various sub-environments that are subjected to studies and research.

The elements of the grid that shapes the land covers are associated with a given level of values, that are connected with a territorial element according to a criterion. Land covers can be considered as a mix among natural or man-made environments.

As regards the overlapping of multiple layers that recompose the ground, guides and forwards the combination of multiple criteria that identifies the scale of values of each type of cover.

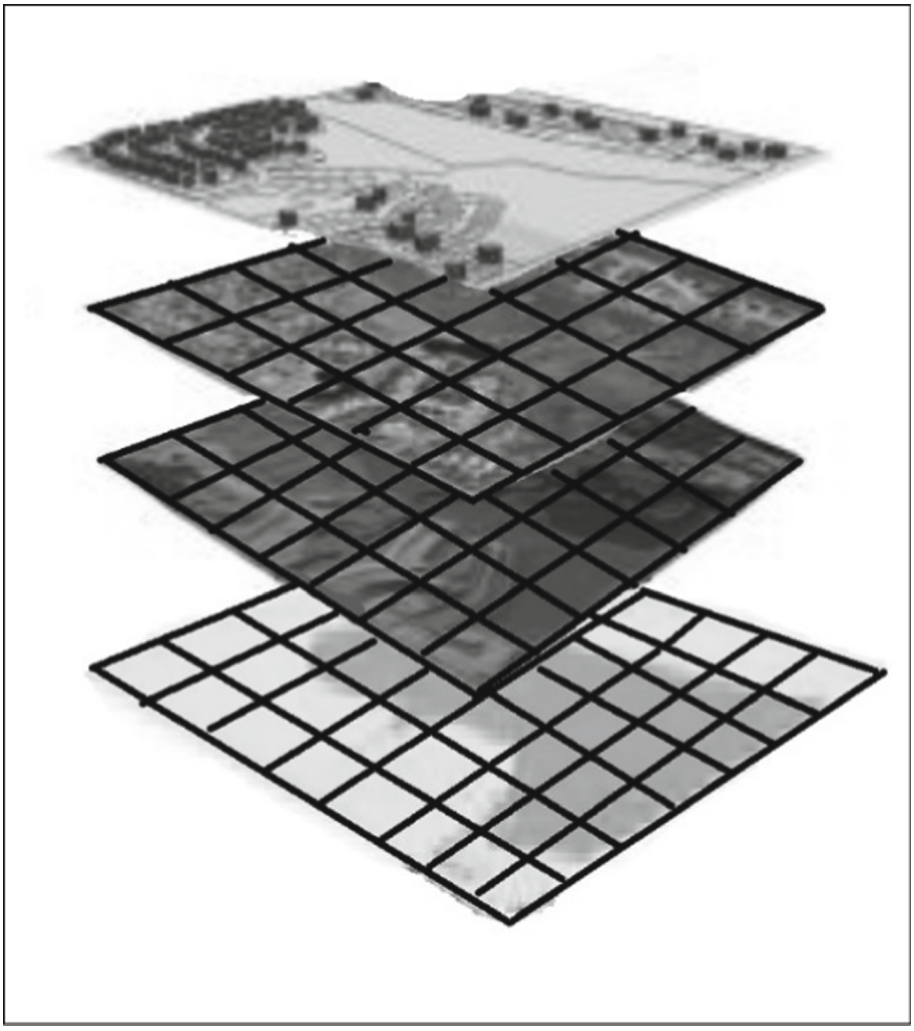


Fig. 2. The combination of grids favors the implementation of a spatial multiple criteria assessment. Each element of the grid represents an alternate piece. The table on the top is the basement of the multiple combination of layers

The value of each land cover becomes the overlapping of all the grids entails a resizing of each element of the grill. In this way the spatial classification takes on a certain multidimensional character. Multidimensionality implies the use of a multiple criteria evaluation. Each squared grid will represents the base for a criteria classification (connected by a layer) and each element of the grid represent a component of the layer.

3 Final Remarks

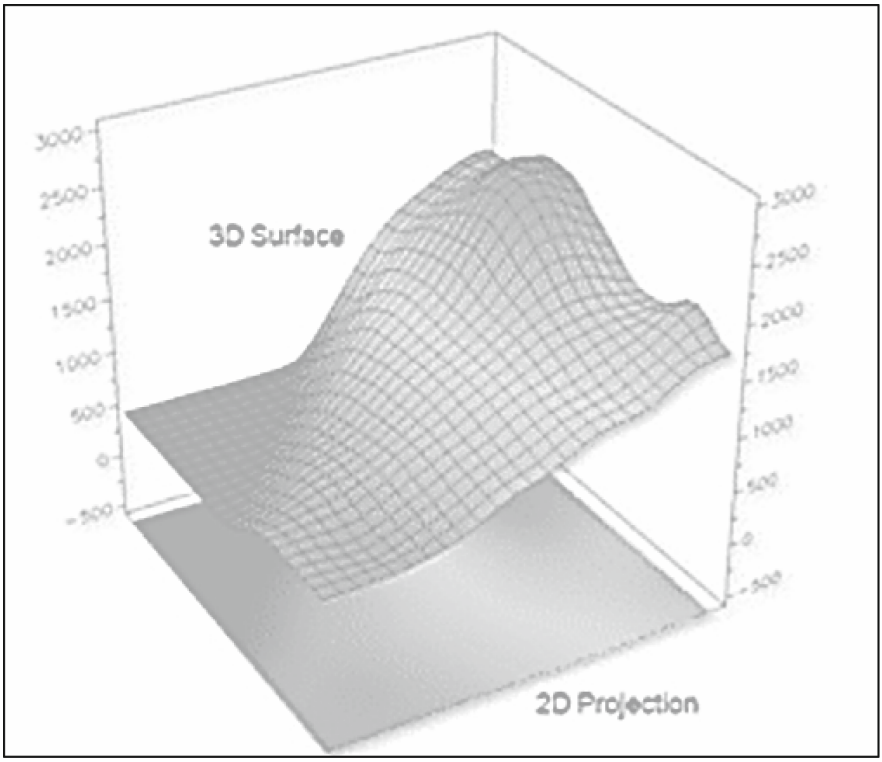


Fig. 3. Tre- dimension grids and assignment of values to each squared element.

4 Final Remarks

The triple dimension grids represent the assignment of values to each squared elements of soil. Such elements favor spatial multiple criteria assessment. First of all, the main element of the grid represents an alternate piece. The highest values represent a highest capability to CO2 retainment The table on the top is the basement of the multiple combination of layers. The height of the grid's surface represent the amount of money values proportioned with the capability to retain underground CO2.

The characteristics of layers represent the criterion for assessing the quality of grid element. First of all, it is important to not forget that the relevant attribution is the capability of retainment of CO2. Each element of the grid, can be considered an alternative solution. In the same time each layer represent a connected with the soil and the spatial units. Each square is represented as an element.

Figure 2, therefore, shows clearly that each square element of the grid can be characterized by a specifical money value, deriving from the capability of retain CO2. Figure 3 shows the variability of values, according to various circumstances.

As a consequence, a scaling of values is attributed to each element of the grid. In this case the assessment is not oriented to assign a score. The main attribute is the money value connected with the capability of retain CO2.

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