74th Meeting of the European Working Group "Multiple Criteria Decision Aiding"

Integrating Multicriteria Analysis and Geographic Information Systems for studying ecological corridors in the Piedmont Region

Valentina Ferretti [1], Silvia Pomarico [2]

[1] Politecnico di Torino, Land, Environment and Geo- Engineering Department (DITAG). valentina.ferretti@polito.it
[2] Politecnico di Torino, Department of Housing and City (DICAS). silvia.pomarico@polito.it

Territorial transformation project and, more generally, spatial plans are subject to evaluation and their consequences have to be considered and managed. In this context, different and conflicting objectives have to be taken into account, referring to social, environmental and symbolic interferences, that can be addressed through integrated quantitative and qualitative assessments. This leads to consider territorial transformations processes as "weak" or unstructured problems since they are characterized by multiple actors, many and often conflicting values and views, a wealth of possible outcomes and high uncertainty (Prigogine, 1997; Simon, 1969).
Speaking about spatial planning, a very important issue refers to nature conservation and biodiversity. The importance of the topic is stressed above all in the European Directive on the Strategic Environmental Assessment of plans and programmes (European Directive 42/2001) where ecological conservation is defined as one of the key topics to address.
Knowledge of the land suitability to become an ecological corridor thus provides a very useful input to land-use planning. Given the spatial nature of the problem, an efficient support is provided by a family of methods that are rapidly gaining traction for planning and policy-making, named Multicriteria-Spatial Decision Support Systems (MC-SDSS; Malczewski, 1999), which are based on Geographic Information Systems (GIS) and Multicriteria Analysis (MCA) coupling.
The present paper proposes the integration of the GIS with a specific Multicriteria Analysis technique, named Analytic Network Process (ANP) (Saaty, 2005) to assess the land ecological value of the region under consideration and to generate cartographic results to be used as decision variables in planning. The approach relies on ecological indicators and on the application of multicriteria analysis in a Geographic Information System (GIS) context, paying attention to issues such as transparency and applicability. The method is illustrated with reference to a case study in the Piedmont region (northern Italy).
The purpose of the research is to study the ecological value of the region under analysis in order to highlight potential ecological corridors by generating a suitability map.
The application allows the dependence relationships among the aspects and criteria to be assessed and the relative importance of all the elements that play an influence on the final choice to be elicitated. Mention should be made to the fact that the analysis takes into account the opinion of several experts in determining the importance of the different elements of the model.
The results are obtained in the form of maps and have been analyzed through both the IDRISI Andes software and the ILWIS 3.3 one in order to compare their respective solutions.
The study concludes with some lessons learned during the development of the MC-SDSS and highlights that the applied methodology is an effective tool in providing decision support for spatial planning.
The implementation of the spatial ANP technique gives an originality value to the present research since it represents one of the first applications at the national level.

Keywords: Multicriteria- Spatial Decision Support Systems, Geographic Information Systems, Ecological corridors planning, Analytic Network Process, Environmental analysis, Suitability map.