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Journal of Environmental Management 88 (2008) 752–769

Journal of Environmental Management

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Application of spatial multi-criteria analysis to site selection for a local park: A case study in the Bergamo Province, Italy

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Received 1 September 2005; received in revised form 14 January 2007; accepted 9 April 2007
Available online 20 September 2007

Abstract

This contribution discusses a site selection process for establishing a local park. It was supported by a value-focused approach and spatial multi-criteria evaluation techniques. A first set of spatial criteria was used to design a number of potential sites. Next, a new set of spatial and non-spatial criteria was employed, including the social functions and the financial costs, together with the degree of suitability for the park to evaluate the potential sites and to recommend the most acceptable one. The whole process was facilitated by a new software tool that supports spatial multiple criteria evaluation, or SMCE. The application of this tool, combined with a continual feedback by the public administration, has provided an effective methodology to solve complex decisional problem in land-use and urban planning.
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Keywords: Decision making; GIS; Site selection; Spatial multi-criteria analysis

1. Introduction

This contribution discusses an application of spatial multiple criteria decision analysis (SMCDA). An introduction to this field can be found in Malczewski (1999), who contributed to bridging the gap between geographical information systems, GIS, and multi-criteria decision analysis, MCDA. SMCDA was applied here in support of a real management problem of the Provincial Administration of the City of Bergamo in northern Italy's Lombardy Region. Within a part of its administrative territory, The Park Office of the Province of Bergamo needed to select the most suitable sites to build a local park of extra-municipal character (Parco Locale di Interesse Sovracomunale, or PLIS). This particular type of park, introduced in the Lombardy Region by a regional law (L.R. 30 novembre 1983, n. 86),[1] often does not have the same naturalistic value as do other types of protected areas. It has a strategic role, however, in protecting and improving the environmental quality of a territory.

Usually the establishment of a PLIS is promoted by the local community and put into practice by the Provincial Authority (L.R. 5 gennaio 2000, n. 1). In this particular case, however, the Provincial Authority (represented by the Provincial Park Office) wished to promote the establishment of a new park and therefore needed to select the most suitable location and design so that the decision would be justified by the municipalities involved.

Formalized methodologies to select suitable areas to be included in a park did not exist in that Province. The selection was mainly based on *expert's knowledge* and strongly influenced by the existing City Master Plans. Owing to the fact that there was no formal method for this type of site selection process, the Park Office would have liked to benefit from a more analytical and transparent approach. This situation made it feasible to develop the application discussed here.

The process considered was a complex decision problem, which involved multiple criteria and dealt with a large

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[1]Legge Regionale (Regional law).

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doi:10.1016/j.jenvman.2007.04.026

number of environmental factors and socio-economical constraints. Such factors and constraints were mainly site specific; therefore the geographic attribute of various locations was to play a major role in site selection. Moreover, the process that led to the final decision had to be as clear and transparent as possible to the municipal Councils and to the relevant stakeholders.

This contribution briefly presents the procedure developed and applied in support of the design and the evaluation phases of this type of park. The methodology used benefited from multi criteria decision analysis and spatial multi-criteria evaluation (or SMCE) and made the process more rational and transparent. The process was intended to be used by the Park Authorities for design and evaluation of proper sites in supporting decision making and dialog with the Municipal Councils.

In the following section the study area and its related problems are introduced first. Then the applied methodology is illustrated, followed by development and implementation of a conceptual framework for the design and evaluation of alternative locations for a new park. Next, the potential sites are evaluated and the most suitable one is selected. Finally a short discussion is made on the methodology and tools applied.

1.1. Study area

The Serio-Oglio study area, shown in Fig. 1, is located in the Province of Bergamo in a plane between two rivers, the Serio River to the west and the Oglio River to the east. The size of the area is approximately 153 km^2 and includes 13 municipalities, with a total of 49,650 inhabitants. The main land use is agricultural and the area falls between two parks of regional relevance, the Serio River Regional Park and the Oglio River Regional Park. A great variety of cultural, historic and architectural assets are disseminated over the entire area. In the southern part it is still possible to find many active fountainheads. These are water resurgences springing in the transitional area between the higher part and the lower part of the Po River Plain, where the terrain porosity decreases and the groundwater gets spontaneously to the surface creating wet zones with flora and fauna typical of marshlands. This natural phenomenon has been largely utilized in the past to supply irrigation canals and to grow fodder plants even in winter, because the temperature of the water is persistently between 10° and 15°. The fountainheads are an important cultural heritage to be preserved and even if they are not completely natural, they represent a unique ecological environment.

Human activities, such as the construction of a new motorway (the Bre.Be.Mi project of the Società di Progetto Brebemi SpA, 2004) and an increasing urban growth, are threatening this area. Therefore, it has become necessary to preserve the environmental quality of the region in general, and specifically to avoid inappropriate development of human activities as a consequence of the construction of new infrastructures. The establishment of a PLIS should represent an important step towards this general objective.

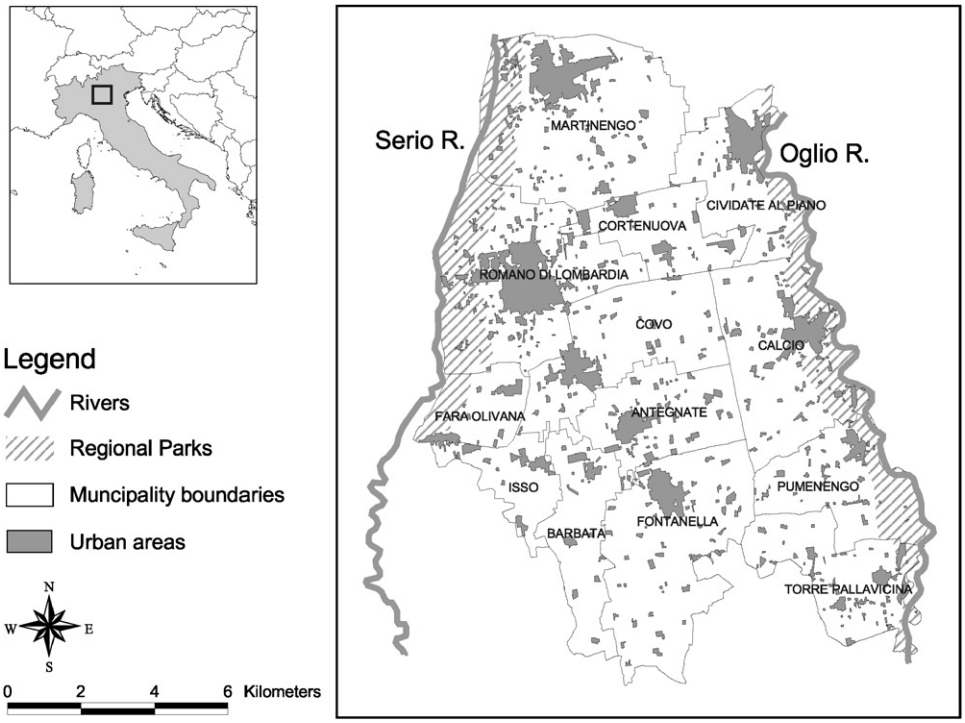

Fig. 1. The Serio-Oglio study area in the Province of Bergamo, northern Italy.

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