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Incorporating biodiversity assets in spatial planning: Methodological proposal and development of a planning support system

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Abstract

The information on biodiversity issues that planners have at disposal often offers a very limited support, due to the lack of informative data and suitable planning support systems (PSS). This paper aims at improving the treatment of biodiversity assets in spatial planning by proposing an approach to map and assess biodiversity assets, and by implementing it into a PSS, characterised by ease of use and usefulness. Biodiversity assets were divided into six themes, two of which refer to species (animal and plant species), and the remaining four to ecosystems (forest, agriculture, aquatic and alpine ecosystems). For each theme, the relevant baseline data were collected and processed, a multicriteria evaluation scheme was set up, and value judgments provided by experts of research institutes and public administration technical offices were sought. The themes were then integrated into a composite map. Factual and value-based information generated during the analysis was organised into a PSS, represented by a Geographic Information System (GIS) platform with a customised querying interface, which allows users to access to thematic layers in a hierarchical fashion, as well as to retrieve relevant background information and reports. The PSS was tested for a specific planning task: the screening stage of Environmental Impact Assessment (EIA). The study area is located in Trentino, an alpine region in northern Italy.

Keywords: Expert panel; GIS; Delphi survey; Multicriteria analysis; Project screening

1. Introduction

The critical role played by spatial planning in the conservation of nature and biodiversity has been increasingly acknowledged in the last decade (Theobald et al., 2000; Forman and Collinge, 1997). As an example, the European Union (EU) Directive on the strategic environmental assessment of plans and programmes explicitly refers to biodiversity as one of the key topics to address (EC, 2001a). Nevertheless, the information on biodiversity aspects that planners have at disposal often offers a very limited support, because of three main limitations.

Firstly, biodiversity data and studies tend to be available only for areas already designated for nature conservation. Although several researches can be found that focus on biodiversity issues in urban and human-dominated landscapes (Löfvenhaft et al., 2002; Langevelde et al., 2002; Savard et al., 2000), the ecological importance of those areas is not systematically investigated. This encourages planners, as well as developers, to perceive land in a sort of binary fashion, according to which everything that lies outside protected areas is devoid of nature conservation interest. Despite the scientific community efforts to foster more holistic approaches (Treweek et al., 1998; Seiler and Eriksson, 1995), focusing on the impacts that affect protected areas only is still very common in planning practice (Byron et al., 2000).

Secondly, data available to planners typically consist of a mere description of features (e.g., vegetation maps, species inventories), rather than an assessment of their value. Consequently, they provide little support to land use decisions, regardless their completeness and accuracy. Ecological evaluation is a well-established discipline, and several evaluation schemes and criteria have been proposed (see reviews in Geneletti, 2006; Fandiño, 1996). However, most studies target specific problems, such as the identification of ecological corridors or conservation priorities (Larson and Sengupta, 2004; Vuilleumier and Prélaz-Droux, 2002; Lee et al., 2002; Sierra et al., 2002; Pirnat, 2000), rather than assessing the overall biodiversity assets of a region. Therefore, they cannot be straightforwardly applied by planning offices of public admin-

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istrations, which still largely rely on descriptive data layers only.

Thirdly, even when suitable data are available, they are hard to retrieve, understand, and utilise due to the lack of dedicated planning support systems (PSS). PSS are geo-information instruments that are used specifically by planners to undertake their professional responsibilities (Brail and Klostermann, 2001). They can provide support to different aspects of the planning process, such as problem diagnosis, data collection and organisation, stakeholder consultation, scenario generation and visualisation (Hopkins, 1999). Despite the number of PSS proposed in the scientific literature (see review in Geertman and Stillwell, 2003), real world experiences are still very limited (Geertman and Stillwell, 2004; Uran and Janssen, 2003), especially in the context of biodiversity and nature conservation where only few examples can be found (USGS, 2004; Larson and Sengupta, 2004).

According to Klosterman and Pettit (2005), one of the reasons that undermines the widespread application of PSS is their limited capability to provide needed output for a substantial user community. PSS should be context related, and should assist end users in performing specific tasks required by planning practice. This view is confirmed by a recent survey of experts aimed at identifying the bottlenecks blocking widespread usage of PSS (Vonk et al., 2005). The survey showed that these tools "need improving to be able to offer better support for planning tasks so that planners feel that PSS offer advantages for their work" (Vonk et al., 2005, p. 920). In particular, improvements should relate to both ease of use (e.g., transparency, accessibility, quality of data) and usefulness (e.g., applicability, relative advantage).

This paper aims at overcoming the above-discussed limitations and contributing to the incorporation of biodiversity issues in spatial planning, by proposing an approach to map and assess biodiversity assets, and by implementing it into a PSS. More specifically, the research objectives are to map biodiversity assets within the whole area under consideration, to propose suitable evaluation schemes, and to integrate the results into a planning support tool that ensures ease of use, by paying attention to issues such as transparency, quality of data and applicability. The PSS was tailored for the Avisio River Basin in Trentino, Italy, to support one specific planning task: the screening stage of Environmental Impact Assessment (EIA), which aims at determining whether an EIA is required for a particular project, i.e., whether the project is likely to have a significant impact on the environment (EC, 2001b). The PSS was tested for the screening of 65 different projects.

2. Study area

Trentino is an alpine region located in north-eastern Italy, as shown in Fig. 1. The region is characterised by pristine environmental assets, and more than half of the land area is covered by forest. The local government claimed significant achievements in environmental management, such as the first environmentally oriented spatial plan drawn up at regional level in Italy (1987), and the first Italian regional law on EIA. However, the consideration of biodiversity and ecological assets in spatial planning still largely relies upon descriptive data, such as land cover information and maps drawn according to generic law provisions on the protection of mountains, water bodies, and forests.

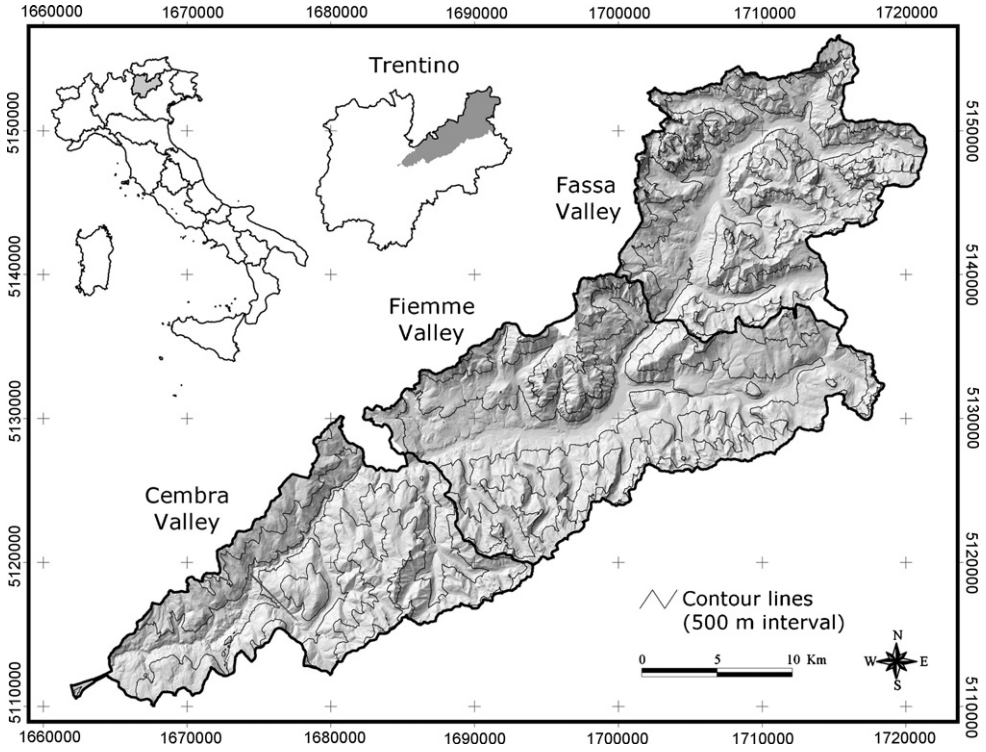

Fig. 1. Location of Trentino in Italy and digital elevation model of the Avisio River Basin (Map projection: Gauss-Boaga, West Zone; Ellipsoid: International 1924; Datum: Monte Mario, Rome 40).