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# Spatial decision support for strategic environmental assessment of land use plans. A case study in southern Italy

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## Abstract

This paper presents and discusses the construction of a spatial decision-support tool for the Strategic Environmental Assessment (SEA) of a land use plan: the spatial coordination plan of the Province of Naples, in southern Italy. The decision-support tool organises the relevant information, spatially resolves the actions of the plan, predicts their environmental impacts, and generates overall performance maps. Its final goal is to provide a suitable technical support to a formal SEA procedure. The expected implications of the plan, such as changes in land use and traffic flows and urban expansion, were modelled and assessed against a set of environmental criteria using SWOT (Strengths, Weaknesses, Opportunities and Threats) analysis and mapping. It was found that the SWOT analysis provided a good basis for assessment and strategy formulation. The paper also intends to contribute to the topic of data and scale issues in SEA, by exemplifying the role played by spatial data and spatial analyses to support informative SEA.

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<sup>1</sup> Paola Napolitano is expressing her personal views, which do not necessarily reflect that of the Province of Naples.

## 1. Introduction

The procedure of Strategic Environmental Assessment (SEA) is inextricably linked to decision-making (Sadler and Verheem, 1996). The SEA report is a decision-support instrument aimed at providing as detailed a picture as possible of the environmental impacts related to the implementation of a plan, policy or programme. In the case of plans, the SEA report must contain sufficient information to assess the acceptability of the impacts, and consequently to propose suitable modifications and mitigations. It can be argued that most of this information has a spatial component because geographical distribution of impacts plays a relevant role in determining how they are perceived by decision-makers, as well as by the affected stakeholders and the general public. Although this applies to all kinds of plans, it is particularly evident for land use plans, whose implications have an explicit spatial nature.

The SEA Directive has not yet been implemented in Italy, even though provisions to perform SEA have been introduced by several regional governments, and integrated into their existing Environmental Impact Assessment (EIA) or territorial planning legislation. Consequently, interest is rising and pioneer studies have been blooming (Daini, 2002; Bagnati, 2003; Bollini et al., 2003; Bagnati, 2004; Baldizzone, 2004; Giordano, 2005). However, there is not a consolidated approach widely accepted at a national level, and technical support (e.g., guidelines, best-practice handbooks) is lacking.

Most of the pioneer experiences referred to the European Commission guidelines for the SEA of structural funds (EC, 1998). Although methodologically sound, the guidelines present limitations that hamper their application to land use plans. In particular, they do not specifically provide for the use of spatial data, relying entirely on matrix-based assessments. In other words, the performances of a plan are generalised over the whole territory, and assessed by aggregated indicator values, rather than by their geographical distributions. Even though there are examples of Italian SEAs in which spatial analyses and maps were extensively used (Provincia di Milano, 2003; Bollini et al., 2003), the lack of technical guidance caused most studies not to account for the spatial representation of impact predictions. Consequently, key issues were disregarded (e.g., cumulative effects), reducing the effectiveness of SEA reports (Diamantini and Geneletti, 2004).

The purpose of this study is to improve current SEA practice by constructing a spatial decision-support tool for the SEA of a land use plan. The paper intends to contribute to the topic of data and scale issues by discussing, through a real-life case, the role played by spatial data and spatial analyses in SEA. The decision-support tool aims at organising the relevant information, spatially resolving the actions of the plan, predicting their environmental impacts, and generating overall performance maps. Its final goal is to provide a suitable technical support to a formal SEA procedure. The latter obviously requires also other types of inputs, such as public consultation and setting of environmental targets, which are not addressed by this paper. The case study is represented by the spatial coordination plan of the Province of Naples, in southern Italy.

The paper is structured as follows. Section 2 provides a description of the study region and of the spatial plan selected for the analysis. The methodology and its application to the case study are presented in Section 3, whereas Section 4 briefly discusses the results. Finally, Section 5 provides some conclusions and ideas for future applications and improvements.

## 2. The spatial coordination plan of the Province of Naples

The Province of Naples covers an area of 1171 km<sup>2</sup> and has a population of 3.1 million distributed over 92 municipalities (Fig. 1). It is a very complex region in terms of both

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