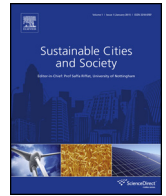




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Multicriteria analysis model for urban open space renovation: An application for Rome

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ABSTRACT

Urban public open space has continuously played a significant role in enhancing the quality of life of urban inhabitants and in supporting urban metabolism. However, open space has experienced a physical and social decline, while its heterogeneity and richness is often neglected and its contribution to the well-being of a community ignored within current planning instruments. Therefore, the aim of the research presented in this study is to develop a multicriteria analysis (MCA) method to support the decision process of open space renovation and the selection of a renovation scenario. The method is based on the Analytic Hierarchy Process (AHP) and adapts existing models and criteria to the investigation field. It is applied by means of a computer-based tool, which permits an ex-ante evaluation of alternative projects, rating them against several weighted objectives using a set of indicators, thus combining the common design practice of scenario planning with a multicriteria analysis. In order to clarify the tool operation, this article illustrates its application to a theoretical case, which represents a conceivable public open space renovation in a simplified way. The choice of a theoretical case, instead of an actual one, permits us to follow the process without referring to a specific situation, in order to have a general overview of the MCA method's implementation.

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1. Introduction

1.1. Urban open space renovation

Urban public open spaces comprise of all parts of the physical environment that the public can experience or have access to (Lofland, 1998). Open areas have continuously performed a fundamental social and cultural function, especially in the countries where benign climatic conditions favour an extended season for outdoor activities (Commission for Architecture and the Built Environment & Greater London Authority, 2008). Even within a wide variation of typology, morphology and use, the system of spaces “between” buildings still provides a framework for several activities, planned or spontaneous (Gehl, 1980), thus contributing to the quality of life of the urban inhabitants, as well as to the increased social cohesion and the feeling of

identity and security (Whyte, 1980). It also represents an essential part of the towns' aesthetic and plays a significant role in urban metabolism (Chrysoulakis, 2008). In fact, properly designed open spaces can promote vegetation integration within cities (GFA Consulting, 1996); can sustain the urban hydrological cycle by providing temporary storage for rainwater, enhancing water drainage and depuration for non-potable uses and supporting controlled infiltration (Makropoulos, Natsis, Liu, Mittas, & Butler, 2008; Niemczynowicz, 1999); can substantially affect the urban microclimate (Givoni, 1998); can help reduce energy and resource consumption (Futcher, Kershaw, & Mills, 2013).

Nevertheless, the value of open space, is experiencing a physical decline, while the heterogeneity and richness of public life is often neglected and its contribution to the well-being of a community ignored (Carmona, 2010). City planning based entirely on zoning techniques has generated the illusion of addressing the standard needs of a standard individual, regardless of local tradition or lifestyle, within an extremely simplified urban structure that can accommodate only strictly separated functions (Rykwert, 2000). Political and socioeconomic issues, such as public authority weakening, indoor displacement of numerous urban functions (Sennett, 1977) and emphasis on private transportation (Newman & Kenworthy, 1999) have downgraded urban open space to a

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leftover expanse with no defined purpose, mostly used as a car park, thus increasingly deteriorating over time. The phenomenon has been further intensified by urban sprawl, which dissolves and fragments open space (European Environment Agency (EEA), 2005b). Moreover, this lack of interest has led to underestimate open space function as a microclimate modifier, though it has been acknowledged (Givoni, 1998) that urban fabric affects climatic elements, such as solar radiation and heat distribution, air temperature, air humidity and wind conditions.

However, there is rising recognition of communal open space importance in assuring the social and environmental quality of towns (Carmona & Tiesdell, 2007). Urban renovation represents one of the European Union's main strategies towards sustainable cities and has stressed the necessity to tackle urban open space renewal, in order to intensify its use and thus indirectly influence the economic and ecological behaviour of the urban ecosystem as a whole (European Commission, 1991). To achieve these targets, public open space renovation and management must deal with two fundamental issues. On the one hand, they have to improve the rational use of resources in the whole life-cycle of an urban space and its components (such as equipment and outdoor furniture), from material production, to construction, maintenance and possible disposal. On the other hand, they have to ameliorate the multi-sensory comfort of the users, addressing use and aesthetic qualities, safety and air quality, and paying special attention towards bioclimatic comfort (Matzarakis, Mayer, & Iziomon, 1999).

This full range of interdisciplinary goals, which involve heterogeneous actors and stakeholders within a complex system, requires an integrated and flexible approach that can incorporate existing values and adjust to changing conditions (Böhner, 2006). This approach justifies micro-scale interventions in a delimited area, which allow the decision process to deal readily with diverse topics and to evolve over time according to feedback, within the framework of broader planning policy (European Ministers on Urban Development, 2010).

To achieve this result, however, the decision makers need to employ specific techniques that can support this process, alongside current planning instruments, to enhance quality outcomes. To address this shortcoming in planning policy, this study aims to develop a multicriteria analysis tool that applies to the decision process of public open space renovation. In fact, a multicriteria analysis appears particularly consistent with open space renovation issues, as it is capable of taking into account multiple subjects in a structured way, highlighting matters of judgement, coordinating development and responding to change.

1.2. Multicriteria analysis for urban design

Multicriteria analysis (MCA) is a mathematical tool designed to investigate a number of possible alternatives for a given question against several, often conflicting, priorities (Voogd, 1983), providing a structured method for comparative analysis. It thus helps the decision makers investigate complex problems with qualitative attributes, using open and explicit judgement criteria to obtain better informed and justifiable choices (Goodwin & Wright, 1991). When dealing with composite, unpredictable issues, MCA possesses various advantages over informal judgement unsupported by analysis. The process of analysing the decision adheres to established techniques and is well documented; therefore, it can be cross-referenced with other information sources, amended or improved and reproduced for similar decisions. This process also provides an important means of communication between the decision makers and the wider community, creating a shared understanding about the issues at hand.

One of the crucial points of MCA is the prominence given to the decision makers' judgement regarding the problem to address.

In fact, rather than being an "objective" method such as cost-effectiveness analysis (Great Britain & Treasury, 2003), MCA has the purpose of providing structure and openness to subjective opinion. The method is generally used to rank proposed alternatives against each of the priorities that are defined and weighted by decision makers, thus presenting them a broader understanding of the situation. It can also allow the identification of a single most fitting solution for a certain set of priorities. In any case, it usually has an advisory function rather than mandatory: the responsibility to provide a unique answer belongs to the decision makers and is necessarily a human function (Department for Communities & Local Government, 2009).

MCA has been widely employed in urban planning, especially within cities (Curwell, 2005a), in order to promote a common view of the strategic goals of urban development and to address environmental, social and economic aspects of sustainability. Conversely, at a neighbourhood and building level, environmental certifications represent a standardised version on MCA, with a fixed process and given objectives and criteria, with the purpose of establishing quality benchmarks for the building stock (Lee, 2012).

1.3. Multicriteria analysis for public urban open space renovation

Compared with existing MCA approaches on different spatial levels and different topics, public open space renovation demonstrates some singularity. Urban open space possesses a relevant hybrid character (Tibbalds, 1992), as it hosts heterogeneous and often informal functions, while it is difficult to track down its stakeholders and to accurately define their necessities. Besides, it is hard to isolate its metabolism from the entire urban ecosystem. At the same time, public intervention on a small-medium scale requires decision support methods that are economic, fast, easy to use and easy to monitor, yet still grant public authorities considerable control over their choices.

For these reasons, the study proposes a flexible, but partly set up MCA model, where assessment criteria are established in advance. This approach can appear incoherent with MCA's ability to represent a particular situation and the corresponding decision makers' preferences very specifically. However, such a model can be generally operable, providing the decision makers with a sound starting point for discussion, and yet adapt to specific urban context and encompass the stakeholders' viewpoints and objectives. Moreover, it stresses the relevance of sustainability targets for urban planning and it consents us to compare and analyse different renovation scenarios for open spaces, thus giving an overview of current practice.

To increase consistency for the proposed set up approach, the MCA model should apply to a selected typology of urban open spaces, with similar morphological, social and microclimatic features that solicit similar renovation strategies towards sustainability. In the present case, the interest focuses on public spaces with a distinct morphology and a legible shape, whom Christopher Alexander (Alexander, Ishikawa, & Silverstein, 1977) defined "positive spaces". Therefore, the selected criteria used to define this typology are the floor area ratio of the surroundings and the linear dimension and height/width ratio of the open space itself. Employing these criteria, small scale squares or streets (linear dimension of the shortest side less than 100 m, h/w ratio calculated on the shortest side more than 0.2), located in a medium-high compact urban fabric (floor area ratio in a radius of 250 m from the centre of the open space more than 40%), at least partly pedestrian, are considered. Moreover, these open spaces should be located within Mediterranean climatic zone (Kottek, Grieser, Beck, Rudolf, & Rubel, 2006) in the Mediterranean basin.

Nevertheless, decision makers or researchers can integrate the given list of criteria with additional records, or even significantly transform it. Besides, the focal point of the study resides in the

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