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A Holistic Methodological Approach in the Urban Context Towards Characterizing the Environmental Performance of Buildings and Promoting Strategic Governance and Sustainability

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Abstract

Nowadays, over half of the world's population is living in urban areas. Urbanization has not led only to economic and social transformation, but also to high resource consumption and considerable environmental damage. This study aims to promote a holistic methodological approach in the urban context in order to foster policy modeling, efficient governance and sustainability. The paper has a twofold purpose: (i) to provide an approach for tractably characterizing the environmental performance of the building sector, and (ii) to promote sustainable practices towards greener buildings in urban areas. Towards this aim a composite indicator is analytically defined. The index combines the main environmental pressures that can be attributed to the building sector and is mathematically formulated to be finally implemented generically. Apart from energy, water consumption and waste generation, the presented scheme establishes links with LCA in order to include estimations of carbon footprint (CO_2-eq). The formulated index is combined with the structure dialogue approach that has been developed within Urban Empathy, a MED Programme funded capitalization project focused on the efficiency of sustainable urban policies in the Mediterranean Basin. The structured dialogue process identifies key barriers to the implementation of the selected available practices into sustainable urban policies for the building sector. The paper highlights insights for common priorities, real pilot project results and their relation to implemented policies in order to foster strategic governance and policy modeling for specific areas under consideration.

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Keywords: building sector; sustainability; index, structured dialogue approach; decision-making.

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1. Introduction

Environmental quality contributes significantly to social welfare, public health and sustainability (e.g. Mozer, 2009; Pugh, 1996). Considering that over half of the world's population is living in urban built-up areas, the anthropogenic pressures on the environment have reached nowadays critical levels in numerous conurbations and urban areas worldwide, resulting in the continued deterioration of local environments (e.g., Atash, 2007; Moussiopoulos et al., 2010). The problems are more intense for conurbations, which are crucial engines of local socio-economic development and, where human activities are inevitably concentrated in relatively small areas (Vlachokostas et al., 2009). In this light, urban areas concentrate environmental decay, and air, waste and noise pollution, congestion, fresh water shortages and energy demands seriously threaten social welfare and development (Van Dijk & Mingshun, 2005). Urbanization, which is a continuous process, has led not only to economic and social transformation but also to high resource consumption and considerable environmental damage that can be attributed to many economic sectors; among others the building sector. On this basis, the efficient use of resources is regarded as a key challenge for the building sector and decision-makers in the continuous effort to encounter environmental deterioration, face climate change risks and eventually promote sustainability.

Towards this aim, the material to follow promotes a holistic methodological approach in the urban context in order to foster policy modeling, efficient governance and sustainability. The paper has a twofold purpose: (i) to provide an approach for tractably characterizing the environmental performance of buildings, (ii) to promote sustainable practices towards greener buildings in urban areas. In order to characterize the environmental performance of buildings a composite index is analytically defined which combines the main environmental pressures that can be attributed to the building sector. Apart from energy, water consumption and waste generation, the presented scheme establishes links with LCA in order to include estimations of carbon footprint (CO_2-eq). The approach is similar to the one followed by the Michailidou and colleagues approach (Michailidou et al, 2015).

The formulated index is combined with the Urban Empathy structure dialogue approach, which is adopted in order to put forward sustainable building practices. Urban Empathy is a capitalization project funded by MED Programme focused on the efficiency of sustainable urban policies in the Mediterranean Basin. The structured dialogue process identifies key barriers to the implementation of the selected available practices into sustainable urban policies for the building sector. The paper highlights insights for common priorities, real pilot project results and their relation to implemented policies in order to foster strategic governance and policy modeling for the area under consideration.

2. Materials and Methods

The main methodological element of the presented approach is the combination of the main environmental pressures that can be attributed to the building sector realized for an Urban Building Complex (UBC). The strategic aim is to provide a characterization for environmental sustainability based on the definition and implementation of the Building Complex Index for assessing environmental performance (BCI_{env}). BCI_{env} is developed by the authors to provide a comparative analysis for typical all-sized building categories in terms of their combined environmental pressure. Establishing links with carbon footprint is also crucial. Towards this aim, Life Cycle Assessment (LCA) gives the ability to indicate processes and/or flows that have the highest resource consumption and the highest carbon footprint in an effort to highlight interrelations with climate change and provide relevant normalized sub-indices for the developed index. LCA is crucial amongst other environmental performance tools for the building sector since it evaluates environmental impacts from different perspectives and assumptions.

2.1. Selection of the UBC

An area with considerable building density needs to be characterized not only by its local environmental quality, but also regarding the environmental pressures that can be attributed to the corresponding activity of the units of buildings in the area. The embedded complexity of this activity, pressures and impacts, both of short - to long-term nature, constitutes a great environmental challenge for the scientific community, e.g. space heating includes