Chapter 6
Defining Energy Criteria in the Absence of Open Data: A Stakeholder-Oriented Approach Based on Multi-Criteria Analysis (MCA)

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ABSTRACT

The urban decision processes should be optimized according to the current "green" context. Despite the literature advocating for an open availability of data to facilitate higher quality science and a more effective science-policy boundary, one of the main challenges when dealing with energy processes is the absence of accurate data. This chapter aims at illustrating a stakeholder-oriented approach based on multi-criteria analyses (MCA) in defining the set of evaluation criteria and their relevance in supporting the development of "what if" urban energy retrofitting scenarios. In this regard, the SRF method has been used highlighting that the most important criteria for the problem in exam are related to economic and environmental aspects. In this context, big data visualization and geographical locations of the alternative scenarios, producing presentation features and performing spatial operations are fundamental. Hence, the authors supported the decision process through MC-SDSS to optimize the urban decision purposes. The results of this chapter are part of the national project EEB.

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INTRODUCTION

Nowadays, many cities are defining urban energy scenarios and plans in order to reduce energy consumption and Greenhouse Gas emissions (GHG) (Fokaides et al., 2017) according to the European Directive 2010/31/EU of 19 May 2010 (European Directive 31/2010), which obliges the member states to adapt the heating systems to the new energy standards. In Europe, the highest amount of energy usage belongs to cities (United Nations, 2015). In particular, the building sector is responsible for around the 40% of the total energy consumption and the 36% of the CO_2 emissions (IEA ETP, 2016; Hilty et al., 2013). This is partially due to the old age of the existing buildings stock having, consequently, low energy performances.

In this perspective, new dynamic urban energy scenarios are needed due to the long life and the low demolition rate of existing buildings stock, in order to make successful energy savings objectives (Torabi Moghadam et al., 2017; Lombardi et al., 2018).

However, developing urban energy scenarios choosing the most appropriate improvement is a very complex process which is configured as a political and environmental choice rather than a technical and economic issue (Head, 2008; Abastante et al. 2017) and involves a number of different stakeholders.

Hence, the aforementioned process is characterized by many levels of difficulty such as: 1) technical (technologies features, spatial boundaries); 2) economical (investment and management costs); 3) environmental (reduction of the CO_2 emissions, NO_x emissions, energy requirements); 4) regulatory (compliance with local standards, and national and international regulations); 5) social (directly related to the citizens' behaviors); 6) political (connected to the strategic vision for city development). It emerges that the development of urban energy scenarios is a delicate decision process that requires a huge number of data and information.

Despite the literature advocate for an open availability of data to facilitate higher quality science and a more effective science-policy boundary, one of the main challenges when dealing with decision processes related to the energy field is the absence of sensible and complete information about energy consumption and pollutant emissions (Pfenninger et al., 2017). This is mainly due to privacy constrictions, ethical and security concerns, unwanted exposure, additional workload, and institutional or personal inertia (Pfenninger et al., 2017).

As a result, qualitative and quantitative information still dominate the process of decision-making in energy, but they are often tricky or comprehensible only for people experts in the field.

In this panorama, in order to define and support urban energy scenarios, it is necessary to rely on innovative integrated approaches overcoming the traditional