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Urban sustainability mobility assessment: indicators proposal

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Abstract

The main goal of this paper is to analyse the flexibility and applicability of urban sustainability assessment methodologies, and propose an approach for the sustainable assessment of urban areas, also focused on mobility. Current high importance of urban sustainability, considering its constantly evolving, associated with a growing environmental awareness of the population, results on the need to reevaluate the current management systems for sustainability of urban centers, trying to give them a larger organization and efficiency, associated with a low socio-economic impact. Different sustainability assessment methodologies were analysed and it was concluded that have to be complemented to have a more balanced distribution of its indicators among the different sustainability dimensions. Based on literature review, four sustainable dimensions were considered in this study: environmental, social, economic and cultural that includes specific indicators for urban mobility. A new proposal of an indicators system for urban sustainability assessment was proposed. A balanced distribution of the indicators within the four dimensions and a more flexible and suitable indicators were obtained.

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1. Introduction

The environmental dimension is one of the main concerns of sustainability studies since its beginning [1, 2, 3]. However, the vision on the study of sustainability has widened to consider other dimensions like the economic and social issues [2, 3] that were considered since the 1992 Earth Summit [3]. These dimensions contribute to the knowledge of the sustainability impact at urban level, for example, within the study of the density of buildings, land use or even the organization of urban layouts [4].

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Thus, three important dimensions (also known as vectors or pillars) support urban sustainability: environmental, economic and social, characterized by more than 700 indicators [5]. The number of sustainability dimensions has generated some controversy having some authors that refer the existence of one more: the cultural. The Abu Dhabi Urban Planning Council [6] and Ameen *et al.* [2] suggests this dimension, to justify the need to understand the cultural differences that exist relatively to the Middle East population. Tweed and Sutherland [7] refers the increase recognition that the built cultural heritage has a significant impact on the social wellbeing of different population groups, living increasingly in cosmopolitan towns and cities. Geniaux *et al.* [8] and Singh *et al.* [9], sustains that there is a need to create a fourth vector, the institutional one, since there are indicators evaluated in the other three dimensions that could easily be exchanged for this one and be certainly identified by the institutional side, mainly due to interdependencies between dimensions. Shen *et al.* [10] advocate governance as the fourth dimension, arguing that there is a need for development, by creating opportunities for public participation in decision-making.

According to Ameen *et al.* [2], the greatest challenge is not to fill economic, social or environmental deficits, but also to promote the preservation of local cultural values in order to conserve the different identities of communities. Documents and organizations such as Agenda 21, UNESCO, World Summit on Sustainable Development, among others, have been struggling for the inclusion of the cultural dimension as one of sustainable development, since is directly associated with the development and behaviour of the different globe's populations [11]. So, considering the above and similarly to Abu Dhabi Urban Planning Council [6] and Ameen *et al.* [2] the sustainability analysis indicators proposed in this work consider four dimensions, including the cultural one. In spite of this institutional and governance indicators are included in social and economic dimensions. Sustainability assessment methodologies in urban areas have been developed in order to meet requirements from the point of view of land use and territory planning. The increasing urbanization has been responsible for the loss of some ecosystems and land areas in order to meet the intensification demand for urban resources. Besides that, sustainability assessment methodologies also promote sustainable urbanization leading to achieve some goals proposed by the management/governmental entities and international institutions [10]. According to Pacheco [12], the accessibility and mobility conditions are fundamental in the decision-making on the location and access of interest urban locations, being the large urban centers the most dependent of those conditions. At urban level the land use and land demand, are also dependent on mobility, supported on a more efficient modal split, reducing the distances between points of interest and using, mainly, more sustainable modes of transport, namely public transports, bike and walk. Aiming to achieve these goals, in the 1990s, Portugal adopted the Common Transport Policy of the European Union (EU). This policy was based on the sustainable mobility, which would discourage unnecessary transport demand by developing appropriate spatial planning policies and promoting alternative transport modes in order to reduce the use of the most polluting, private car [12].

2. Methodology

2.1. Urban sustainable assessment methodologies: analysis

According to Bragança *et al.* [13], the development of sustainability assessment methodologies, a process that has been going on for more than two decades, has been more focused on the evaluation of buildings and their components. However, as stated by Ameen *et al.* [2] and Gargiulo and Daniotti [14], it is so important to assess the sustainability of the building as of the urban environment in which are inserted.

The lack of efficiency in the sustainability assessment of urban environments is because many of the indicators used have interdependencies between them, being the application of these indicators a challenge, since the performance of one indicator is linked with others [2]. In response to this implementation barrier, there is a need to develop methodologies based on networks grouping indicators with interdependencies into categories, depending on the different areas of intervention, for example, environment and green spaces, health and wellbeing, land use, transport and circulation, public space and social cohesion, culture and education, among others [2, 5, 15, 16, 17]. Although, the development of sustainability assessment methodologies of urban environments is a relatively recent process, several projects, indices, evaluation frameworks or even tools dedicated to specific characteristics of each region have already been developed [2]. The evolution of these processes demonstrates once again the importance of sustainability in urban planning and decision-making [18].

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