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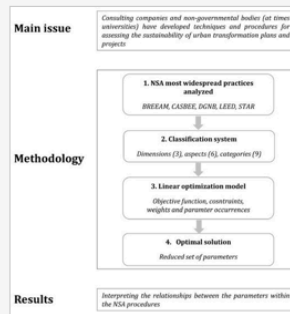
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An Optimization Model Fitting the Neighborhood Sustainability Assessment Tools

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Abstract

The phenomenon of rapid and unplanned urban growth, driven by the migration from rural to urban areas, has hindered healthy urbanization and undermined sustainable development. Sustainability assessment has become one of the popular terms in different fields, especially in architecture and urban planning, and world leading urban sustainability assessment tools have been proposed. Each tool is based on a set of weighted evaluation parameters, related to some main sustainability dimension (environment, economy, society …), and requires to reach a sustainability threshold. In this paper, after a brief review of the state of the art, a linear optimization model is presented, which aimed to find the minimum set of parameters needed to guarantee the sustainability threshold for each tool, taking into account all the sustainability dimensions. The model has been positively experienced with 144 input parameters belonging to five assessment tools. The tests prove that this procedure is able to summarize and overcome the choices made by the certifying bodies. Indeed the proposed optimization model selected 26 parameters of the five tools. The majority of the selected parameters are related to the environmental emergency that in recent decades has characterized—and still affects—urban systems. View Full-Text

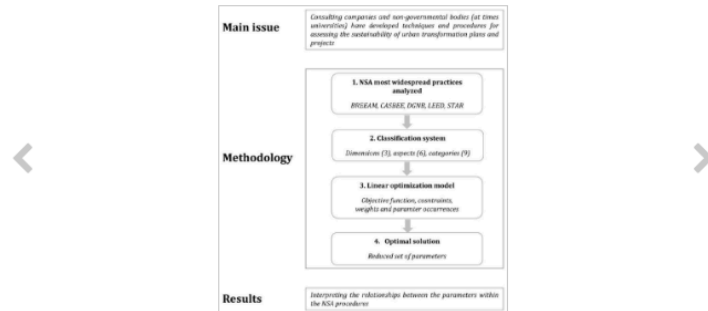Keywords: urban sustainability; neighborhood sustainability assessment; optimization model

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An Optimization Model Fitting the Neighborhood Sustainability Assessment Tools

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Abstract: The phenomenon of rapid and unplanned urban growth, driven by the migration from rural to urban areas, has hindered healthy urbanization and undermined sustainable development. Sustainability assessment has become one of the popular terms in different fields, especially in architecture and urban planning, and world leading urban sustainability assessment tools have been proposed. Each tool is based on a set of weighted evaluation parameters, related to some main sustainability dimension (environment, economy, society . . .), and requires to reach a sustainability threshold. In this paper, after a brief review of the state of the art, a linear optimization model is presented, which aimed to find the minimum set of parameters needed to guarantee the sustainability threshold for each tool, taking into account all the sustainability dimensions. The model has been positively experienced with 144 input parameters belonging to five assessment tools. The tests prove that this procedure is able to summarize and overcome the choices made by the certifying bodies. Indeed the proposed optimization model selected 26 parameters of the five tools. The majority of the selected parameters are related to the environmental emergency that in recent decades has characterized—and still affects—urban systems.

Keywords: urban sustainability; neighborhood sustainability assessment; optimization model

1. Introduction

The ecological dimension of the concept of sustainability [1] quickly encompassed the economic and social ones, according to the fact that "our struggle for sustainability will be won or lost in cities" [2] (p. 3). To guarantee that urban sustainability results in the simultaneous achievement of these three aspects, local administrators have begun to assess and certify the sustainability of the different proposals of urban transformation (plans and/or projects).

In recent years, consulting companies and non-governmental bodies (at times universities) have developed techniques and procedures for assessing the sustainability of urban transformation plans and projects. If an ex-ante evaluation by local administrations is now an instance of good practice widespread at the international level, to obtain a form of certification attesting the sustainability of the proposed transformation choices, the attention given by the scientific community to many of the techniques and tools seems to be lacking and certainly not exhaustive. Few studies have tried to investigate and compare these techniques with an analytical approach, and they failed to secure the expected results due to the lack of information about: (i) Criteria and selection procedures of parameters; (ii) the measurement and setting of weights and scores to parameters; (iii) the shared definition of sustainability certification thresholds.