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A SUSTAINABLE INDEX FOR URBAN EXPANSION MANAGEMENT

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EXTENDED ABSTRACT

The main purpose of this abstract is to briefly describe the work developed until now under the PhD thesis entitled "A Sustainable Index for Urban Expansion Management". The main goal of this research project is to define an index that evaluates several criteria of the urban expansion in a sustainable point of view. The model will include multiple criteria related to the concept of sustainable development of cities. So, the sustainable index under development must evaluate the condition of the urban sprawl. Hence, it will be developed a theoretical model structured by a multicriteria analysis in order to be applied and validated in a case study carry out in a Portuguese medium city. The relevant criteria identified in the research will be incorporated in the model according to a specific hierarchical structure (Ananda and Herath 2008; Saaty 1980). Also, the spatial analysis model will simulate the urban space dynamics and their spatial-temporal variations with in a Geographic Information Systems environment (Bhatta et al. 2010; Dur et al. 2009).

To design the model it will be necessary to identify all the criteria related to the configuration of urban space and their occupation, level of coverage of urban infrastructures and public transport. These criteria may also be referred to as sustainability indicators, since the objective is to design a model according to patterns of integrated and sustainable urban planning and development. Several terminologies can be found in the bibliography for index and indicators. As referred by Marcelino et al. 2007 sustainable development indicator is obtained from a given variable or set of variables and one variable is a physical property that can be measured or observed. Still in according with that reference, an index results from the arithmetic aggregation or heuristic aggregation of the variables or indicators. Likewise, a composite indicator is formed when individual indicators are compiled into a single index on the basis of an underlying model (OECD 2008). Thus, is necessary firstly to identify all the variables for each sustainable development indicator and then to structure the model for to aggregate all the variables and indicators it in order to obtain the composite indicator or index.

Following the above, the model to develop will aggregate several urban sustainability indicators related to six main dimensions of the urban structure, i.e., urban sprawl, level of territorial cohesion, sustainable urban mobility, level of coverage of basic infrastructures in urban space, occupation of environmentally sensitive areas and occupation of risk areas. All the indicators will be integrated into a multicriteria analysis model in a hierarchical structure. Figure 1 presents schematically that structure of the dimensions to obtain a Sustainable Index of Urban Expansion (SIUE).

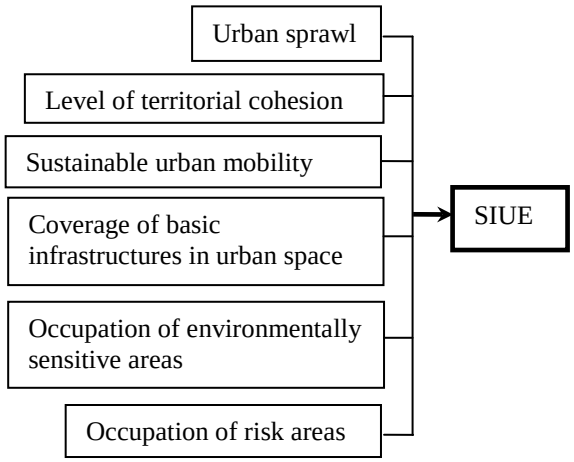

Figure 1: Dimensions of the Sustainable Index of Urban Expansion - SIUE

For the construction of composite indicators (OECD 2008) is necessary to take into account the following steps: 1) theoretical framework, to provide the basis for selection and combination of single indicators; 2) data selection; 3) imputation of missing data; 4) multivariate analysis, to investigate overall structure of the indicators; 5) normalization; 6) weighting and aggregation; 7) robustness and sensitivity; 8) back to the real data; 9) links to the others variables; 10) presentation and visualization.

The model will be validated by its application to a case study. The collection of geographic information for the analysis of urban space occupied will be based on remote sensing techniques and also on the city maps of study. These results reveal the territory under study and occupation of urban land. Also worth mentioning that the study will fall only on areas of urban expansion, for it will be these areas that record the urban sprawl.

MAIN EXPECTED RESULTS AND CONCLUSIONS

The multicriteria analysis model should allow know the level of territorial cohesion of the study area, typology of urban expansion and their relationship to urban development and also quantifying the rates of urban expansion in the sustainability dimensions defined. Will also verify the kind of urban mobility practiced and confront these data with the concepts associated with sustainable urban mobility. Will be possible to analyze the level of integration and adequacy of the urban infrastructures networks in urban land use. Among the dimensions of sustainability identified, the assessment of negative aspects applied, such as the occupation of environmentally constrained areas and risk areas, will be a support to avoid any future errors in territorial management and urban planning.

As a conclusion, it is expected that the critical analysis of the results obtained for the case study allows concluding the potentialities of the model as a useful tool for support urban planning.

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