

Reducing the Impacts of the Built Environment on the Environment through the Integration of Socio-economic Indicators in Certification Standards

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ABSTRACT

Some cities are recognized for their successful application of forms of revitalization of their habitat, while other cities are clogged and choked with traffic and pollution. The inclusion of "sustainable development" in the field of construction is behind new methodologies for achieving a more sustainably built environment. The use of tools to measure the degree of sustainability of cities is the method that receives the most attention in developed countries. However, none of the tools used to date covers all three pillars of sustainability (environmental, social and economic). Previous studies show that the participation of citizens and experts is not taken into consideration. This study (paper) will aim to explain the process of our research for integrating socio-economic aspects in the CASBEE-UD standard (neighbourhood level). First, the study will seek to analyse the existing built environment through a geographic system (GIS) for the identification of spatial indicators. In addition, from the use of social and economic data through the use of statistical analysis, we will select the data that present a true picture of our territory (either an existing district or a new district). The criteria selected in these analyses will be used in a (in an advanced analytic tool) multi-criteria tool to establish the most efficient indicators in order to integrate them into the CASBEE-UD standard.

Keywords: *neighbourhood sustainability assessment, sustainability coverage, applicability*

1. INTRODUCTION

In recent decades, much has been written about the concept of the need for sustainability in cities. The reason for this is that during the last century, the world has witnessed many social, economic and urban. Everyone knows that the construction sector has a huge impact on the consumption of resources. According to data disclosed by the leading research institutes (World Commission on Environment and Development (WCED), European Commission, 2009), construction industry uses globally about 40% of energy and 40% of natural resources (raw materials and other materials) and produces 25% of waste. Several communities and institutions have developed new methodologies for monitoring the sustainability status of their cities. Some communities (United States, European Community, United Kingdom, Japan, etc.) have launched tools to ensure that the hardware requirements of their cities strive towards sustainability. Three sets of certification have been developed recently: LEED-ND (1998) developed by the Green Building Council in the US, BREEAM Communities (1992) developed by the British organization BRE Global, and CASBEE-UD (2004) developed by IBEC Institute for strengthening the environment and energy conservation in Japan. All these standards are developed at the neighbourhood level. Certification standards mentioned above are the most known and used, but several weaknesses especially the socio-economic aspects. To measure progress towards this desirable state of sustainability, measurable indicators are required to assess urban efforts in the economic, social, environmental. Therefore, the importance of the issue of sustainability in general and in particular on sustainable urban planning in communities, has emerged as one of the key issues that must be taken into account by the authorities and experts. In the same context, at present, there are many areas that have experienced a marked change in their own style and their quality of use. To achieve these objectives, it is necessary to develop clear objectives and effective sustainability criteria. Also, it is necessary to understand and analyse existing certifications, specifically the criteria, which structure and guide the entire evaluation process. The goal is that the knowledge of the certification standards should help in the future development, for a more complete and efficient certification in order to have a tool based on strong sustainability criteria "triple bottom line". The aim of this study is to develop additional indicators to those existing in the certifications of tools to assist planners and citizens to improve the assessment of the built environment (neighbourhoods). Our research is guided by the development of an appropriate methodological approach based on the integration of socio-economic aspects to the CASBEE-UD standard. The article is structured in the following

manner: Chapter 1- context; the second chapter is dedicated to the review of the literature; and, the third chapter describes the methodology of our approach; the fourth chapter describes the application of our methodology framework for CASBEE-UD standard; the results and discussion will finish this study.

1.1. Context

In the second half of the twentieth century, the world's urban population has quadrupled from 732 million in 1950 to 2.8 billion in 2000 to over 3.2 billion in 2006 (Redman, 2010; United Nations, 2006). The year 2007 marked a turning point in history when half the world's human population lived in cities (Cities Alliance, 2007). This growth has caused a lot of pressure on a lot of resources and contributed to the depletion of natural and environmental resources. Urban society recognizes that activities that are developed for the production and processing of urban space influence and determine the survival of natural systems. There is now a consensus on the importance and the need for strategies to mitigate these problems and gradually increase the benefits of cities. In addition, the need for corrective actions reinforces the idea of developing new models to replace the current models, to reorient activities and human technology towards sustainability, and to ensure the survival of contemporary urban society. In recent years, there have been various collaborations in the field of construction to environmental objectives and sustainable development. Certification standards are an example of the principle tools that encourage market competitiveness "green." In addition, standards are working to improve the quality of products and services while introducing new criteria and values of productive activities. In the field of construction, the certifications are used in several countries (e.g. USA, European Community, Japan). They are used mainly to guide architects to techniques for the construction of buildings based on rigorous energy efficiency. The standards in the field of urban planning are a recent phenomenon. They have recently developed initiatives which aim to introduce sustainability criteria in the planning process (e.g. the construction of new neighbourhoods or rehabilitation of urban areas). In addition to these tools, which are used for products and value-added services, communities use them as an instrument of local politics. They are also used as means of verification of compliance with regulatory guidelines, or for granting financial credits and investment or to the development of private projects.

1.2. Justification of context

The scale of the neighbourhood is the area where we find all the dimensions to determine the design of a more sustainably built environment. This scale between the scale of the city and the building is very interesting in this context, in operational terms, as it is well suited to the testing of specific practices to increasing urban sustainability. It makes it possible to grasp tangibly urban issues that clearly exceed the size of a single building. The need for coordinated control of urbanization and mobility, the creation of joint dense clusters and the search for a better quality of urban life can be addressed through concrete solutions. It is in this perspective that emerges the concept of "sustainable neighbourhood", namely the realization of urban centres, dense and mixed, whose overall quality meets a thorough vision of sustainability. A number of parameters are however needed to apply the concept of sustainable neighbourhood.

2. THE NORMATIVE EVOLUTION

In the context of urban planning, there is now a broad consensus that sustainability has four main dimensions: environmental, social, economic and institutional. All these dimensions should be taken into account for sustainable development (Valentin and Spangenberg, 2000; Conte and Monno 2012). The evaluation of sustainability is considered the latest generation of impact assessment tools, and can be defined as "a process that directs decision making towards sustainability". Many methodological approaches were used to assess sustainability. All of these approaches use indicators as tools to generate relevant information. From the data, they acquire a wide range of sources. To a large extent, the effectiveness of the sustainability assessment depends on the robustness and rigor of the evaluation methodology. A research framework consisting of indicators and relevant criteria and poorly defined can misinform and mislead policymakers. Despite the relatively short history of the tools, evaluation of neighborhood sustainability (NSA = neighborhood sustainability assessment) has received considerable attention from the scientific community. Most studies have focused on the theoretical and unrealistic aspects. In one of the few studies on this issue, Saynajoki et al. (2012) found that some of the indicators used in the NSA's tools are not relevant. Similar results were obtained in studies that conducted respectively to examine the relevance of LEED-ND for use in England and Germany. This raises concerns that the results of these evaluations can mislead and misinform policymakers. Although there is still some controversy surrounding this issue, different tools have been used to assess the evolution of the neighbourhood in several countries. For example, LEED-ND has been used

outside the United States and some countries of the European Community. BREEAM Communities has been used in several countries in the European Community. On the other hand, the CASBEE standard was used, from the beginning, within the country and only by some Japanese cities. After underutilization, this standard has found greater consideration in his country, through its development and its methodology. Now the Japanese government imposed the standard for all major projects. The non-use of CASBEE in other countries is due to its young age and also because the standard to be used needs qualified experts.

2.1 Weaknesses in standards

The information available in the literature demonstrates that the tools need refinement. The most significant weaknesses found in standards and literature are: 1) The extent of sustainability (or sustainability); 2) The inclusion of prerequisites; 3) Adaptation to the locality; 4) The participation of stakeholders and citizens; 5) Placement of the actors in the project phases; 6) The presentation of results; 7) The application of the standard to different contexts.

The purpose of the sustainability assessment is to provide decision makers with a comprehensive and integrated local assessment system in the short and long-term prospects (LEED-ND, 2011 BREEAM Communities, 2009, CASBEE for Urban Development, 2007). Such a system would help them judge what actions should or should not be used in an attempt to create a more sustainable society. For coverage of sustainability, developers can use a better sustainability approach while improving the resilience of neighbourhoods through the provision of communities with strong local economy that are autonomous and have good infrastructure. These criteria are highlighted in a study on the relationship between urbanization and sustainable urbanization led by Oswald & McNeil, 2010; Waheed Khan, and. Veitch, 2009. These criteria are important when addressing affordable housing to inclusive communities, social networks, mixed use, and the local economy. They improve the ability of an area to resist the various social and economic status regardless of their inhabitants. Therefore, the context-specific criteria should be included as well as the weights to be assigned to the values of the relevant specific communities. This could impose an additional economic burden on the developer, but it's the only way we can ensure the viability and reliability of the assessment results. In terms of adaptation to the location, it was stressed that evaluation systems should vary depending on the type of development and also specific questions to the site. Other criticisms are the lack of citizen participation at the time of writing of the project, only because they are written by experts. The importance of the participation of different political and academic actors and the community during the various stages of planning is widely recognized by Khakee (1998). By focusing on the inseparability of planning and evaluation, it suggests that the evaluation should be a discourse between all the actors who are somehow affected by the assessment, and should take the form of negotiations rather than pursuing a solution to a problem. Finally, citizens can participate by providing feedback that planners use for system update. As for the use of such assessments, planners and developers can decide which changes are needed to bring the economic development activities in alignment with the ecological limits and social needs. The evaluation results can be potentially used by different stakeholders, including planners, designers, local authorities, the real estate market and residents. The central objective of most assessment tools is to act as a decision support tool. The final results must provide an adequate and reliable picture of the situation on the ground. They have the potential to guide decisions for planning, guide the evaluation of actions and the degree of progress towards sustainable development and to educate residents. The results should be simple and transparent to avoid greenwashing and unfounded decisions. The results are analysed to assess their ability to meet specified characteristics. BREEAM and LEED-ND Communities have a similar way of presenting the final results. The only difference between the two is that in BREEAM Communities, the projects that fail to acquire threshold points are also labelled. In most cases, certified projects receive a label based on the rankings they have achieved. CASBEE-UD, addressed, to some extent, deficiencies identified by presenting the results of each theme. In addition, there are scales (weak, good, very good, excellent) that can be used to highlight some performances. Although the tools are tailored to the priorities and conditions of their countries, the differences in climate parameters, social, and economic and type of developments are essential to make a customization of standards. However, this may not be possible due to various constraints. In such situations, the adopted standard should be adapted and customized using benchmarks and appropriate weightings to be used as part of the assessment. Due to significant changes in scope, planners should be aware that one size does not fit all. A personalized and customized tool with additional information is required for each development.

3. THE METHODOLOGICAL APPROACH

In this first stage, the opportunity to engage citizens in an urbanization project and the use of certain methods to help communities develop a list of indicators will be discussed. This approach to decision making is primarily a political responsibility. It enables decision makers to explain and justify their choices and objectives to citizens. The methodology is planned in three steps (Figure 1). In the first step, an area will be selected in order to perform a statistical analysis of data.

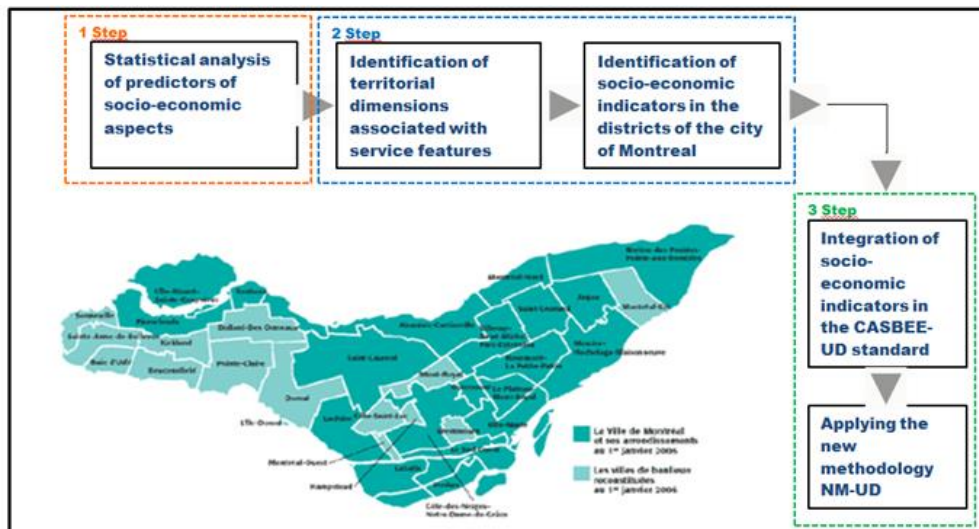


Figure 1: The methodological approach

With the statistical analysis, the independent variables of socio-economic aspects will be selected. In the second step, an analysis of the territory of each district to identify territorial dimensions (average distance of clinics, hospitals, public transportation, etc.) associated with the service functionality will be completed. In the same step, socio-economic and territorial indicators of each selected neighbourhood will be identified. In the third step, socio-economic and territorial indicators will be integrated into the CASBEE-UD standard and the new standard will be applied to the selected territory.

3.1. First step: Search for independent variables

In this stage, the criteria that have been selected are analyzed in four districts of the city of Montreal to measure their degree of sustainability. We initially chose to take the data that were used by the boroughs of Ahuntsic-Cartierville, Plateau Mont Royal, Sud-Ouest and Lachine to test the methodology through a statistical evaluation (see Table 1). The choice of these districts was made to combine the of each district (e.g. economics) in order to create a better sample. For this assessment, a statistical analysis is used for research of independent variables. After testing the results of these four districts, the analysis will be extended to all districts of Montreal for the assessment to be statistically representative. In this first stage, it was found that there are differences between the criteria selected by the standards and those used by the boroughs. To normalize the data, the equation was used to find the value for which our indices are to be divided. This statistical analysis gives the possibility of finding the weighting for each criterion. These statistical analyses will meet the first objective of our research. In this first stage, it was noted that there is an absence of territorial criteria in the characterization of citizen satisfaction. So the next step in an analysis of the territory will be carried out to identify the missing criteria.

Equitable social value and social responsibility	Strengthening cohesion and social equity	Accessibility
		Public spaces
		Density
		Distribution of services
		Inclusion
		Security
	Enhancement of architectural heritage (buildings and materials) and historical (preservation of historical memory)	Structure
		Materials
		Technology
		Protection
Economic strategy	Cost reduction	Care and maintenance
		Form
		Architectural fragmentation
		Architectural quality
	Increased cohesion (accessibility and transport) and economic dynamic (jobs and enterprises)	Waste management
		Distribution of functions
		Use - activity
		Contiguity
		Streets frame
		Public transport
		Ease of movement
		Traffic flow
		Parking
		Link, connection
	Economic diversification	
Multi-functionality of the territory, territorial competitiveness	Location	
	Connection	
	Partition areas	
	Urban frame	
	Public areas	
	Historical activities	

Table 1: Independents variables

3.2. Second step: The location of the essential functions

To meet the second objective, considering the territorial dimension, the proposed approach will be based on the use of geographic information systems (GIS) to study urban form. GIS is composed of different layers of geographic reference information. This will allow the user to combine the desired information and view it on a map. A multi-criteria analysis model will be used to synthesize geographic information to select indicators satisfying citizens' preferences. So the territorial dimensions will be identified to associate with the service capabilities across the GIS software for urban information and geographical shape. This information will include the criteria that are based on territorial characteristics and the location of critical functions for the quality of life of citizens. This approach was made to represent the diversity and distribution of the functions in the territory. Following this approach, the socio-economic and territorial indicators will be identified through a tool for decision support through a multi-criteria analysis method of hierarchical (Analytic Hierarchy Process (AHP)). With this method (AHP) it will be possible to determine the benefit / cost ratio of a project as for the advantages and disadvantages of its implementation that cannot be measured with money. All information is available both quantitatively and qualitatively. With this method, it is possible to treat problems with qualitative data type. This step will meet the second objective.

3.3. Step Three: Integration of indicators and application of the new standard

The third step is structured in two parts. First, the socio-economic indicators identified will be included in the CASBEE-UD standard and this standard will be applied to the selected territory. The application of the new standard (CASBEE-UD new version) validate its power through the comparison between the selected standard and the new standard. The validation will be given either by the presence of socio-economic indicators, either through using hierarchical approach to the decision that will compare the two methods of assessment and see the improvements. For a confrontation with targeted problems, this type of approach leads to innovative solutions, both through the application of certain technological developments by redefining the governance process. This creative dimension is integral to the philosophy of this type of project and often also a success factor for the implementation on the ground of an increased number of sustainability criteria.

4. DISCUSSION

A sustainable neighbourhood should also be considered a closed system and turned in on itself. By its size and quality, it will add value to an urban area far beyond its physical boundaries. In the literature, we realize that certification standards are, however, looking for a common measure. It is important to ensure that all certification steps are measured in the same manner to give a consistent message to the industry. This does not mean adopting a universal certification system. Overall, the various systems have many differences. A rough comparison, carried

out by researchers BREEAM, buildings with a score of "Platinum" (the highest) for LEED, reach a score lower in the ranking of BREEAM. In Europe, where the certification standards are more stringent than in the USA. Europe has also adopted the analysis of life cycle assessment (LCA) to a greater degree than in North America. In recent years, Japan, on the other hand, has developed innovative policies with respect to the state of its cities (Tokyo, Osaka). This is one reason why, in this study, the use of CASBEE-UD was chosen as a comparison standard. In its structure CASBEE-UD uses not only concepts linked to the building but also concepts related to the entire site's external environment. However, in this standard, the mainstreaming of social acceptability and identification of relevant indicators are not present. It is believed that the integration of these brings an improvement and a more concrete assistance in the design of a more sustainably built environment. We are of the opinion that this study is not comprehensive, but its structure is possible to highlight the fixed points that could help others seek to improve the structure of existing standards and make them independent of the interests of the furniture market which is oriented more towards labelling rather than take to heart the expectations of citizens.

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