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A framework model for assessing sustainability impacts of urban development

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Abstract

Urban man-made assets have impacts not just on those who develop, build and operate them, but on people who may be quite remote from them. For example, the impact of a building on greenhouse gas emissions arising from fossil fuel use, pollution caused by travel to work patterns and employment opportunities provided by urban developments may be far removed from their immediate locality. There is a growing recognition of the need to internalize these external costs and benefits in accountancy frameworks, drawing on experiences in accounting for sustainable development. This desire, however, presents major challenges in identifying, evaluating and allocating the external environmental, social and economic costs and benefits of an urban environment. This paper reports on the development of an Urban Development Sustainability Assessment Model (UD-SAM) which allows decision makers to identify sustainability indicators (economic, environmental and social) and which may lead to more holistic evaluation of the sustainability impact of elements of the urban environment. The UD-SAM builds on a sustainability assessment model (SAM) developed originally in the oil industry. This paper describes how SAM has been tailored for the construction industry and urban sustainability assessment, and how a set of generic sustainable development indicators have been identified and validated by stakeholders.

Keywords: Sustainability assessment; Full cost accounting; Built environment; Urban environment; Sustainable development indicators

1. Introduction

Urban development has special importance within the broader context of sustainability. In 2005, the world's urban population was 3.17 billion out of a world total of 6.45 billion (UN-HABITAT, 2007). Current trends predict that the number of urban dwellers will keep rising, reaching almost 5 billion by 2030 out of a world total of 8.1 billion (UN-HABITAT, 2007). Due to the density of populations and the intensity of economic and social activities, urban areas are also major consumers of resources, producers of waste and pollution, degraders of the environment, and foci for social problems. Building and construction activities worldwide consume 3 billion tons of raw materials each year, or 40% of total global use (Roodman & Lenssen, 1995). Construction, mainly for urban man-made assets, accounts for around 10% of national GDP globally (Howard, 2000). At the same time, there is a growing requirement for the

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construction sector in the UK and in other countries to adopt the principles of sustainability in their activities and polices (Augenbroe & Pearce, 1998; Brandon, 2005; Curwell, Yates, Howard, Bordass, & Doggart, 1999; Department for Trade & Industry, 2006; Organisation for Economic Co-operation and Development, 2002, 2003; United States Green Building Council, 2003; Walton et al., 2005). As a result, environmental and societal issues are increasingly being considered alongside functional and economic aspects of built environment by architects, surveyors, engineers, project managers and others responsible for making key decisions throughout the different stages in delivering an urban development project. Consequently, there is a demand for tools to support those decision makers in finding more sustainable solutions. For example, in the United Kingdom, some 25% of new office buildings have an environmental assessment (Hasegawa, 2002). Although sustainability assessment criteria are available, there is no single, robust methodology that can simultaneously quantify and assess all three dimensions (economic, social and environmental) of urban development.

Full cost accounting (FCA) has been identified as one way forward to analyse the environmental, social and economic costs and benefits at different spatial scales and at different stages in the life cycle (SUE-MoT, 2004b). The aim of this paper is to present the development of an integrated framework—an Urban Development Sustainable Assessment Model (UD-SAM) for assessment of economic, environmental and social impacts of buildings in the context of urban developments. This paper includes the following sections: background of this research, structure of UD-SAM, impact categories in the UD-SAM and a conclusion.

2. Background

There are currently several methods available and in use for the evaluation of environmental impacts of buildings and urban developments (SUE-MoT, 2004a). Much attention has focused on environmental impacts assessment, for example BREEAM (UK, Building Research Establishment, Environmental Assessment Method), ENVEST (UK, an offshoot of BRE's assessment method), LEED (USA, Leadership in Energy and Environmental Design), BEES (USA, Building for Environment and Economic Sustainability), and ATHENA (Canada, this is the name of an institute similar to those listed above). The issues covered by these assessment tools are mainly related to the use of fossil fuels, materials and land along with the pollution impact of buildings/urban developments. Integration of social and economic impacts into assessment has received less attention. As a result, existing tools cannot be described as integrated sustainability assessment tools. In order to develop an integrated assessment tool, one of the principal challenges facing developers and users is the difficulty of comparing apples and pears: that is, of measuring costs and values which are expressed in different units. Difficulties also arise in comparing alternatives and options across different projects and communicating assessment results across difference disciplines and to different groups of stakeholders.

FCA (for recent published reviews see Bebbington, 2007; Bebbington, Gray, & Kirk, 2001; Lamberton, 2005) is an accounting tool that seeks to identify external costs associated with a particular activity and to incorporate this information in decision-making processes (Bebbington et al., 2001). The assumption underlying the desire for FCA is that if one were to account for externalities then society could be better informed as to which options would be more likely to make sustainable development achievable. There has been some work in the field of entity level FCA (Atkinson, 2000; Bebbington et al., 2001; Bebbington & Gray, 2001; Casella Stanger, Forum for the Future, & Carillion, 2002), but so far none has focused specifically on urban sustainability assessment. This has arisen for two reasons. First, most accounting work is directed at the corporate level rather than the urban development level. Second, the complexity of urban sustainability assessment (both in terms of scientific uncertainty and ideological diversity) requires a multi-dimensional approach to assess the potential impacts of urban development, thereby increasing the complexity of the task (Bebbington, 2007).

In order to develop a robust model for assessing urban sustainability impacts and identify a most appropriate FCA model to be tailored for the urban sustainability assessment, existing sustainability accounting models were reviewed (Xing, Bebbington, Horner, & El-Haram, 2006). Applications, tools, findings and problems identified in each model have been analysed and it is evident that sustainability accounting models are currently fragmentary in nature and targeted on different issues and business domains. The existing models and frameworks can be broadly categorised into the following four groups:

(1) Project evaluation models (Antheaume, 2004; Baxter, Bebbington, & Cutteridge, 2004; Bebbington, 2007; Construction Industry Research and Information Association, 2001; Lamberton, 2000).