Sustainable building assessment methods in South Africa: an agenda for research

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1. INTRODUCTION

A vast amount has been written about the concept of sustainable development. The widely accepted definition of sustainable development is "*development that meets the needs of the present without compromising the ability of future generations to meet their own needs*" (WCED, 1987:43). According to *World Watch*, one-tenth of the global economy is dedicated to constructing, operating and equipping homes and offices. This activity accounts for roughly 40% of the materials flow entering the world economy, with much of the rest destined for roads, bridges and vehicles to connect the buildings (Roodman and Lenssen, 1994).

Since the early 1990s, building environmental assessment methods have been perceived as useful tools for promoting environmental awareness amongst built environment professionals. Cole *et al.* (2000) define building environmental assessment methods as tools for evaluating building performance with respect to a broad range of environmental considerations, organised into assessment criteria. These assessment methods vary in scope, structure, format and complexity.

The Green Building Challenge '98 (GBC '98) is an example of a recent, largely northern hemisphere, attempt to develop a universal method for measuring building performance across a range of environmental issues. Flowing from the GBC '98 was the international building environmental assessment method, namely, "The Green Building Tool (GBTool)" assessment framework. This framework is applicable to different types of buildings and focuses on environmental factors. Cooper (1999) contends that such current international attempts at developing a universal, standardised method for assessing the environmental performance of buildings are inherently flawed. He argues that such methods are found wanting in that they are culturally implicit, and that such methods or tools "*treat the sustainability [of the] wider built environment as simply a matter of energy and mass flows without due regard to the socio-economic and political dimensions of sustainability*" (Cooper, 1999: 329).

Such an approach ignores the other dimensions of sustainable development – economic, social, technical and process-orientated considerations. This shortcoming is particularly

significant in the South African context, where the explicit goal of the National Environmental Management Act (107 of 1998) is the attainment of sustainable development. This, and other contemporary legislation and policies of the South African government, explicitly incorporate the philosophy of sustainability. Other such examples of this goal are found in the Housing Act (Act No. 107 of 1997) and the National Housing Code (1999) which both clearly state that the delivery of housing should implement and uphold the principles of sustainable development.

Dominating development and the construction industry is the world imported from the West, with its order, its advanced technology, and its emphasis on economic growth and material wealth. In contrast there are the developing countries struggling with the dichotomies of air-conditioned skyscraper cities and manicured suburban lawns surrounded by vast tracts of low cost housing and informal settlements (du Plessis, 2001). du Plessis (1999) states that real sustainable development in the construction industry requires a completely new way of looking at the built environment. She asserts that the construction industry should not consider only its environmental impact, but also the social impact of its activities and how it can address the challenges of developing nations in a sustainable way. This assertion is supported by the framework for sustainable construction that incorporates principles for the biophysical, economic, social, technical and process-orientated dimensions of sustainability (Hill and Bowen, 1997a).

Developing countries often adopt strategies and methods of the developed world. There is cause for concern that South Africa may be tempted to overlook important areas of sustainability if theories and methods are adopted from developed countries without adaptation to suit local requirements. Sustainable development will not be achieved in the construction sector in South Africa, or on a global scale, if this sector adopts a fragmented approach to development that ignores crucial dimensions of sustainability, or a 'one-fits-all' approach whereby an international assessment method is applied to different buildings in different localities.

If construction happens in a sustainable manner, the positive impacts flowing out of this will be felt in the biophysical, economic, social and technical dimensions of life in South Africa. Given that these dimensions are interrelated and that they cover just about every aspect of life, South Africans would be better off as individuals and as a nation if this were to take place.

A comprehensive building assessment scheme therefore requires consideration of all the environmental, economic, social, technical, cultural and political impacts of a building development throughout the planning, design, construction, operation and deconstruction stages of the procurement process. The emphasis of assessment methods hitherto has been on the operations phase of the building life cycle (Hill and Bowen, 1997b).

The Council for Scientific and Industrial Research (CSIR) responded to the shortcomings of the GBTool through the development of their preliminary Sustainable Building Assessment Tool (SBAT). However, this tool operates as a problem-identification method, and does not provide for the detailed assessment of the full range of sustainability dimensions inherent in buildings (Kaatz *et al.*, 2002).

2. AN AGENDA FOR RESEARCH

Having identified the shortcomings associated with the utilization of sustainability assessment methods in the northern hemisphere for use in developed countries, a research project was initiated at the University of Cape Town in 2001 with the aim of developing a method for the sustainable assessment of buildings in South Africa. Funding was secured from the National Research Foundation (NRF) for a 5-year period.

The research project has the potential to have a positive impact on sustainable development, and sustainable construction, in South Africa. Construction activity is occurring at a rapid rate with houses, schools, industrial parks, office blocks and hospitals being built to meet the needs of the South African population. Alongside this is the goal of sustainable development which government states explicitly in its new policies and legislation. If this construction is not sustainable, the ability of future generations to meet their needs will be compromised.

The main goal of this project is to develop assessment methods which will be straightforward and user-friendly. Social and community development disciplines would benefit as they would assess the social sustainability of buildings during the design phase. Input from professionals in the social sciences would have a positive impact on the quality of life of the users and inhabitants of buildings. Likewise, specialists from the economic and environmental fields would have input into the planning of developments and design of buildings, using the assessment methods as checklists for sustainability criteria. In this way, factors which may be overlooked by engineers or builders can be taken into consideration early on in the construction phase.

The main research questions to be addressed in this project may be listed as:

- How applicable are the environmental considerations inherent in the GBTool/Sustainable Building Assessment Tool to building developments in South Africa?
- How contingent are environmental assessment methods on the type of building structure and its geographical location?
- How best can the social, economic, technical and process-orientated dimensions of sustainability be incorporated into an assessment of building performance?
- How contingent are multi-dimensional methods of sustainability assessment on factors such as the type of building structure, its geographical location, and cultural issues?
- How appropriate is an integrated sustainability assessment method to the evaluation of building performance?
- What purposes should such methods serve, and how are the results best utilised?

Flowing from the above, the objectives of the project are to:

- Examine the appropriateness of the GBTool on a variety of South African buildings, both in terms of its focus, approach, and in terms of the relevance of factors such as the type of building, geographical location and the cultural context of built environment groups.
- Define the dimensions of sustainability in the planning, design, procurement, construction, operation and deconstruction of buildings in South Africa i.e. establish a conceptual framework for sustainability in the built environment.
- Refine the environmental considerations inherent in the GBTool, and review and refine the Sustainable Building Assessment Tool developed by the CSIR, in the development of South African building environmental assessment methods, drawing on the South African procedure and approaches for Environmental Impact Assessment (EIA).

- As an extension of the environmental dimension above, explore and develop assessment methods for enhancing building performance with regard to the social, economic, technical and process-orientated dimensions of sustainability.
- Determine the pertinence of factors such as the type of building structure, its geographical location and cultural issues on methods for the assessment of the sustainability of buildings.
- Test the sustainability assessment methods on a variety of South African buildings.

The CSIR have agreed to collaborate with the NRF team in the review of their preliminary Tool, and the conceptualization and development of more specialized, dimension-specific assessment methods.

A valuable result of the research undertaken to date has been the establishment of new collaboration links with various international organisations and/or people, the first being the link created with Dr Ray Cole, one of the initiators of the Green Building Challenge. Research links have also been established with the School of the Built and Natural Environment at Glasgow Caledonian University, as well as with the Department of Building and Construction Economics at RMIT University, Australia. A joint RMIT/UCT project examining the sustainability of indigenous housing for Aboriginals in the Northern Territories has been initiated in parallel with the NRF project. ARUP have undertaken to make their case studies available to the research team and to provide critical comment on publications compiled by team members. The CSIR have invited project members to utilise SBAT for the assessment of buildings in 2002. In addition, they have undertaken to provide information relating to two case studies where SBAT was applied. The Department of Construction Management and Quantity Surveying at Peninsula Technikon in Cape Town is also participating in the project.

3. PROGRESS TO DATE (APRIL 2002)

The GBTool has been examined with respect to its appropriateness within the South African construction context. Advantages and disadvantages of evaluating South African buildings using the GBTool were documented in detail in the report "Environmental Sustainability Assessment Methods for Buildings in South Africa" prepared by the research team. The next phase of the project is to test the GBTool on actual buildings. For further information on this report, please refer to the paper presented by Kaatz *et al.* in this conference proceeding.

Definitions of sustainability dimensions within a construction development life-cycle were compiled in a paper entitled "The transition to sustainability in the planning, design, construction and management of the built environment in South Africa". The paper, prepared by the research team, discusses South African trends in the transition to sustainability for each of five stages in the life cycle of the built environment: urban planning, project design, manufacturing of building materials and products, construction, as well as maintenance and management. The paper has been accepted for publication in the International Journal of Environmental Technology and Management, in a special issue on "Sustainability in the Built Environment".

The Sustainable Building Assessment Tool (SBAT) developed by the CSIR was evaluated along with other building assessment methods (e.g. BREEAM, LEED, GBTool) with regard to their appropriateness to address the environmental sustainability of South African buildings. The report compiled by the project team ("Environmental Sustainability

Assessment Methods for Buildings in South Africa") was sent to the CSIR for critical comment.

In the above analysis it was noted that none of the examined building assessment methods comprised social, economic and technical criteria, except for SBAT, and then to only a limited extent. As the research in 2001 focused mainly on the biophysical dimension of sustainability, social, economic, technical and process-orientated dimensions were not analysed in detail. These dimensions of sustainability will receive greater attention in the near future.

4. FUTURE RESEARCH

4.1 Phase One

In order to examine and refine the appropriateness of the GBTool for South African buildings, a through examination, by means of case studies, of the appropriateness of the GBTool, the CSIR's Sustainable Building Assessment Tool, and related environmental assessment methods for the selected buildings will be conducted. Once the results have been obtained and analysed, the assessment methods will be refined for the development of South African building environmental assessment methods. Reports will be circulated amongst relevant professionals and feedback sessions, in the form of workshops, will be conducted.

4.2 Phase Two

Prior to defining a conceptual framework for sustainable building assessment methods in South Africa, it is essential that members elicit information from as wide a source as possible. To facilitate the propagation of this information, a website will be developed. The team has undertaken to participate in the CIB TG48 Task Group on Social and Economic Aspects of Sustainable Construction.

4.3 Phase Three

The various definitions of sustainability will be examined in an attempt to find common ground between the ideals of 'sustainability' in general, and those of 'sustainable construction' in particular. Hill and Bowen (1997b) state that four attributes of sustainability – biophysical, economic, social and technical – have been singled out to advance the understanding of the concept of sustainable construction. In order to critically examine the applicability of, and importance allocated to, each of the four 'pillars' of sustainability, the team will develop a framework for sustainable construction.

The thrust therefore will be to, *inter alia*, develop the assessment methods with regard to the economic, social, technical and process-orientated dimensions of sustainability, and determine the pertinence of type of building, geographical location and cultural issues on assessment methods. Various area-specific specialists, e.g. social anthropologists, public participation experts, community development specialists will be consulted. Their input will assist with devising factors and assessment criteria for each dimension of sustainability.

4.4 Phase Four

Thereafter, sustainability factors and means of measurement will be formulated into assessment methods. In order to examine the appropriateness of the devised assessment methods, case studies will be conducted. An analysis of the results will facilitate in further refinement of the assessment methods. The results will once again be circulated amongst relevant professionals and workshops held.

5. CONCLUSION

In order to be globally competitive with other markets, sectors of the South African economy need to keep up with international trends. It is foreseen that the research would enhance economic growth in South Africa by improving international competitiveness of the construction industry. If the South African construction industry was to adopt methods of sustainability, the industry would positively affect the quality of life of people, since sustainable construction aims to build quality human settlements and buildings that are healthy, habitable and affordable. The findings emanating from this research project would further contribute to improving the efficiency of resource utilization in buildings and reduce the impact of building activities on the biophysical environment. The authors would welcome any comments and ideas on the research questions and objectives outlined in this paper.

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