THE SUSTAINABLE BUILDING ASSESSMENT TOOL: INTEGRATING SUSTAINABILITY INTO CURRENT DESIGN AND BUILDING PROCESSES

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Summary

The Sustainable Building Assessment Tool (SBAT) was developed to ascertain the performance of buildings in terms of their contribution to sustainable development. In particular, the tool focuses on a developing country context and includes social and economic criteria as well as environmental indicators. The paper reviews definitions of sustainable development and current measures of global and national sustainability performance and compares this to criteria used in the SBAT. It shows that the SBAT is reasonably well aligned with these definitions and measures and identifies a number of areas where alignment could be improved.

The paper suggests that the tool is reflects progress within the wider field of sustainability performance measurement. Here, environmental sustainability performance measurement is now well defined and can be ascertained in objective and detailed ways through ecological footprints and carbon emissions measurement and calculations. Social and economic sustainability measurement however is still difficult to measure and there are a range of competing systems such as the Human Development Index (HDI) and the Genuine Progress Indicator (GPI).

While there is no general consensus and appropriate measurement system for social and economic sustainability at global or national scale it will be difficult to finalize these aspects in assessment tools that aim to measure sustainability in buildings. The paper argues however that this should not be an excuse to leave out social and economic indicators in building sustainability assessment tools. It suggests instead that these criteria are important and should be developed, particularly in developing countries, as buildings and construction can make substantial contributions to local economic and social sustainable development.

1. Sustainable Development

What is sustainable development? There are many definitions of sustainable development. These generally describe a 'state' to be aspired to, and a recommended route to this. This state is defined in terms of its ability 'to maintain services and quality of natural resources', 'to live within carrying capacities of supporting ecosystems', 'to meet future generations needs and aspirations'. The recommended route to this state in these definitions expresses a concern about current populations and aims to ensure that 'current needs' are met, and the 'net benefits of economic benefit are maximised' and the 'quality of human life is improved'. Examples of definitions that reflect this are outlined below.

…development that meets the needs of current generations without compromising the ability of future generations to meet their needs and aspirations. (World Commission on the Environment and Development 1987)

…maximising the net benefits of economic development, subject to maintaining the services and quality of natural resources over time. (Pearce and Turner 1990)

…. development that improves the quality of human life while living within the carrying capacity of supporting ecosystems. (International Union for Conservation of Nature 1991)

These definitions focus on what Wackernagel and Yount call the "socio-economic" and "ecological imperatives" of sustainability (Wackernagel et al, 2000). Measuring progress towards sustainability therefore requires accounting tools that measure progress in terms of the socio-economic and ecological imperatives. Two well known tools for measuring progress in these areas are the Human Development Index (socio-economic) and Ecological Footprints (ecological)

1.1 The Human Development Index

The Human Development Index was developed as an alternative to economic progress indicators and aimed to provide a broader measure that defined human development as a process of enlarging people's choices and enhancing human capabilities. The measure is based on

- A long healthy life, measured by life expectancy at birth

- Knowledge, measured by the adult literacy rate and combined primary, secondary, and tertiary gross enrolment ratio
- A decent standard of living, as measure by the GDP per capital in purchasing power parity (PPP) in terms of US dollars

1.2 Ecological Footprint

An Ecological Footprint is an estimate of the amount of biologically productive land and sea required to provide the resources a human population consumes and absorb the corresponding waste. These estimates are based on consumption and production of waste in the following areas:

- Food, measured in type and amount of food consumed
- Shelter, measured in size, utilization and energy consumption
- Mobility, measured in type of transport used and distances traveled
- Goods, measured in type and quantity consumed
- Services, measured in type and quantity consumed

Figures from these measures have been combined in graph developed by the World Wildlife Fund (WWF), shown below. This shows that countries in Europe and North America tend to have very high ecological footprints and acceptable human development indexes (above 0.8), while countries in Asia and Africa tend to have unacceptably low human development indexes (below 0.8) but have ecological footprints within the biosphere's average capacity per person.

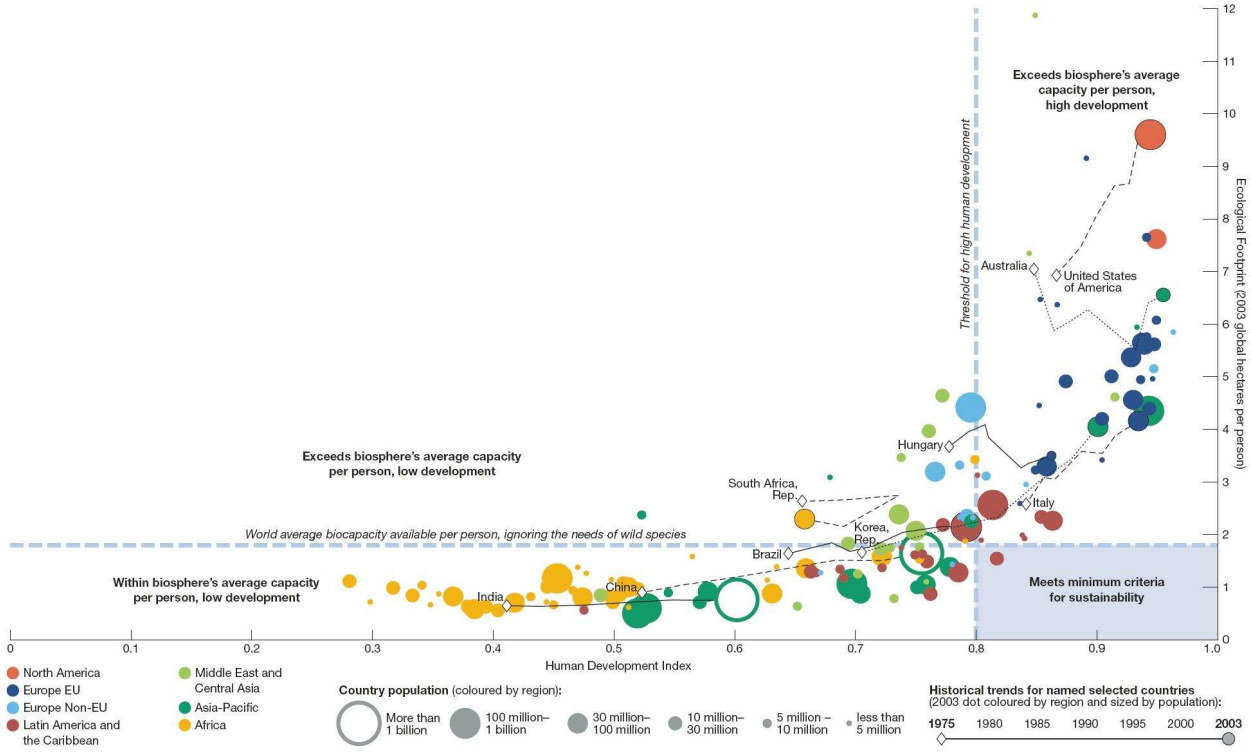


Figure 1 Human development and ecological footprints 2003 (from the Living Planet Report)

The figure is interesting in that it suggest that only one country (in Latin America and the Caribbean) meets the minimum criteria for sustainability. The clustering of countries from Latin America and the Caribbean (brown dots) around the minimum sustainability criteria for sustainability box suggests that these countries have development models that should be emulated.

2. Implications for buildings

The definitions of sustainable development described above have implications for the planning, design and management of the built environment. In particular, they suggest that the built environment should contribute to the socio-economic and ecological imperatives of sustainability. Assessment systems designed to measure a building's performance in terms of sustainability therefore must measure performance in terms of the extent to which a building contributes to these socio-economic and ecological imperatives.

Most building environmental impact assessments have focused on the shelter and, to a less extent, the mobility aspects described above. The Sustainable Building Assessment Tool has had a broader focus and aims to capture social and economic impacts of the built environment

3. The Sustainable Building Assessment Tool

The Sustainable Building Assessment Tool (SBAT) measures sustainability performance in the built environment against 15 social, economic and environmental criteria, as outlined below.

3. 1 Social

- SO1: Occupant comfort
- SO2: Inclusive environments
- SO3: Access to facilities
- S04: Participation and control
- S05: Education, health and safety

Economic

- EC1: Local economy
- EC2: Efficiency
- EC3: Adaptability
- EC4: Ongoing costs
- EC5: Capital costs

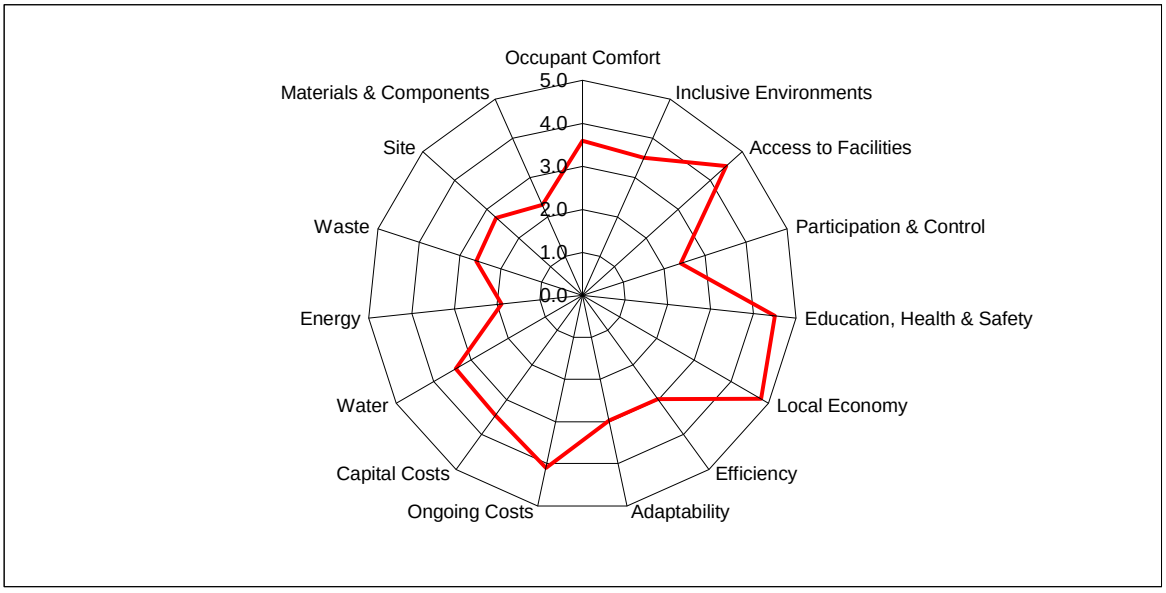
Environmental

- EN1: Water
- EN2: Energy
- EN3: Waste
- EN4: Site
- EN5: Materials and components

Performance in each of these areas is measured out of 5 and presented on a radar diagram, see below. This enables performance in the different areas to be 'read' quickly and the 'balance' of the approach between social, economic and environmental performance to be ascertained.

SUSTAINABLE BUILDING ASSESSMENT TOOL (SBAT- P) V1

PROJECT	ASSESSMENT	
Project title:	Date:	
Location:	Undertaken by:	
Building type:	Company / organisation:	
Internal area (m2):	Telephone:	Fax:
Number of users:	Email:	



Social	3.7	Economic	3.7	Environmental	2.6
Overall	3.3	Classification	GOOD		

Figure 2 SBAT report

SBAT criteria were developed through a process of describing, and understanding, buildings in terms of their relationship to social, economic and environmental systems Gibberd (2001). Different environmental and economic and social systems have different levels of sustainability and the approach used to develop the

SBAT aimed to assess not only the performance of buildings in terms of sustainability but also assess the extent of the building's contribution to supporting and developing more sustainable systems around it.

This aspect can be illustrated through the example of the **Local Economy** set of criteria in the Tool. This suggests that a strong and diversified local economy is important for sustainability. A local emphasis supports sustainability in a very simple way by reducing the need for transportation and therefore limits the consumption of non-renewable resources and pollution. A more subtle aspect of this concept is the way it draws on the connections between people and their environments. The local emphasis encourages people to adopt more sustainable practices by ensuring that people experience, and suffer the negative consequences of their actions (Ekins 1992). Buildings can also have a positive impact on the economy of an area by being designed, constructed and managed to stimulate, and support, a local, diversified economy and create local employment. In order to establish the extent and type of impact a building makes on the local economy the SBAT uses the following measures.

- **Local Contractors:** The extent to which local contractors and labour is used to construct the building
- **Local Building Material Supply**: the extent to which local materials is used in the building
- **Local Components, Fittings and Furniture:** The extent to which local components, fittings and furniture are used for the building
- **Small Business Support:** The extent to which small business such as contractors, manufacturers or retailers are supported through the construction process (i.e. through construction and business administration training) or in the completed building (i.e. through outsourcing, low or no cost access to space and facilities).
- **Maintenance:** The extent to which the building and its system is maintained locally.

4. Discussion

A review of sustainable development definitions and measures raise a number of questions for the development of tools that aim to measure sustainability performance in the built environment. These questions include:

A. Does the sustainable building assessment tool measure aspects related to human development or quality of life (as measured for instance by the Human Development Index)?
B. Does the tool measure the key factors related carrying capacity and ecological footprint?
C. What should be the balance of weighting **between** 'human development' measures and 'ecological foot print' criteria?
D. What should be the balance of weighting **within** the 'human development' and 'ecological footprint criteria'?

Applying the first two questions to the SBAT reveals a number of interesting findings. It shows that for each of the Human Development Index (HDI) criteria there, there are at least two relevant SBAT criteria. The SBAT criteria however are not directly related to the HDI criteria. Where the built environment was being used as mechanism to support human development, it could be argued that these measures should be more closely aligned. For instance, SBAT criteria could measure the labour intensity of building operation as well as labour intensity in construction (measured as person years of employment created per R million construction costs) and check that remuneration provided enabled a reasonable quality of life in terms of Purchasing Power Parity (PPP). The HDI measures with relevant SBAT criteria are shown.

Table 1 Alignment between HDI measures and SBAT criteria

HDI sustainability measure	**SBAT criteria**
A long and healthy life	SO1, SO5
Knowledge	SO3, SO4
A decent standard of living	EC1, SO3

Checking alignment of SBAT criteria with Ecological Footprint measures reveals an expected strong alignment for the Shelter measure. It also reveals weak alignment with the Services measure and no alignment with the Food measure, as indicated below.

Table 2 Alignment between Ecological Footprint measures and SBAT critiera

Ecological foot print Sustainability measure	**SBAT criteria**
Food	
Shelter	EN1, EN2, EN5 EN4, EN5, EC3, EC4, EC5
Mobility	EN2, SO3, EC3
Goods	EC1, EC2, EN5
Services	EC

The weak alignment for the Food and Services criteria is a result of the SBAT's focus on design rather than operational issues. To strengthen alignment there should be a stronger emphasis on operational issues. Specifically, criteria on the availability of 'low ecological footprint food' such as vegetarian meals in buildings as well as criteria that aim to minimize the ecological footprint of goods consumed and services used in buildings should be included.

The SBAT addresses the problem of weighting (Question C) by encouraging a responsive approach in which environmental, social and economic performance targets of the building relate to the building type, the owner of the building and the local context in terms local needs and opportunities. The Sustainable Building Lifecycle (SBL), the process by which the SBAT is used to integrate sustainability into buildings therefore recommends that background research is carried out of the local area at an early stage of the development of the building in order to ensure that this informs the development of the building. Thus, if this research revealed that there was high unemployment and an unreliable water supply in the area, targets within the Local economy and Water SBAT criteria should be challenging. This process can work well, for instance in the Thuba Makote project, however in many cases owners and professional teams are not willing to make the required investment in time to carry out these early studies and do not see local economic and social impact as part of their remit (Gibberd 2005).

The weighting of indicators within the social, economic and environment relate to the 'internal' performance and impact of buildings. The review (Question D) suggests that perhaps the weighting should reflect the balance found in the human development index and ecological footprint measures. Thus the weighting distributed to 'health', 'knowledge' and 'standard of living' in the Human Development Index should be reflected in the weighting of indicators supporting these measures in the SBAT.

5. Recommendations

Assessment tools that measure sustainability performance of buildings need to be aligned more closely to internationally accepted sustainability performance measures such as the Human Development Index and Ecological footprint. In order to do this the design and development of assessment tools should aim to incorporate the following issues:

- **Context responsive:** The design of tools and procedures used to apply assessment should take into account the local context. Where the ecological footprint of the country is well above 2 global hectares per person, the tool should have a strong weighting on criteria that measure environment impact. If however, the human development index of the country is well below 0.8 there should be a strong weighting on social and economic criteria in buildings that support human development.
- **Building-human interface**: An understanding of how the built environment can influence and structure human behavior should inform the design of assessment tools. For instance, easy access to 'low ecological' footprint food such as vegetarian meals and to facilities that support education and health could play a significant role in supporting sustainable development and should be included as measured criteria.
- **Operational issues:** Design of assessment tools should have a strong focus on operational issues. In particular, criteria measuring the ongoing contribution of buildings to human development and to reducing ecological footprints should be set and measured.

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