

## 5. SPECIFICATION FOR A BUILDING ASSESSMENT SYSTEM

### 5.1. Sub Problem Four and Hypothesis Four

Sub problem: Can a specification for an assessment tool which aims to ensure that sustainable development is addressed and incorporated in the briefing and design of buildings in developing countries, be developed by drawing on the sustainable development context (problem one), key sustainability concepts (sub problem 2) and key features of sustainable development, sustainability and development assessment systems and frameworks (sub problem 3)?

Hypothesis: A specification for an assessment tool, which aims to ensure that sustainable development, is addressed and incorporated in the briefing and design of buildings in developing countries can be developed.

#### 5.1.1. Introduction

In this chapter a specification for an assessment framework that enables sustainable development to be addressed in the building design process will be developed. This specification will be compared with the Sustainable Building Assessment Tool that will be introduced in the next chapter, Chapter six.

The specification for this tool will have the following structure. The **Purpose of the Tool** will provide a description of the aims of the tool. This is followed by the **Scope of the Tool**, which describes the area that the tool will address and define the limits of this. **Components of the Tool** will describe components of the tool that are envisaged to be necessary. These components consist of an **Assessment Framework** and a **Structured Process**. The Assessment Framework describes the envisaged structure and content of the tool and the Structured Process describes how the tool should be used and integrated into design and construction processes. Finally, there will be a description of a number of principles in **Principles for Design and Use**. These are drawn from earlier sections of the study in which sustainable development and assessment systems are reviewed.

#### 5.1.2. Purpose of the Tool

The purpose of the tool is to guide the development of buildings that support sustainable development in developing countries. The tool will achieve this through the use of an assessment framework and a structured process during the briefing and design stages of buildings. The tool will aim to achieve the following:

- Develop awareness about sustainable development in those involved in the building development process
- Develop an understanding of the implications of sustainable development for buildings in those involved in the building development process
- Involve those involved in the building development in discussing, and agreeing, approaches and targets for supporting sustainable development in the building
- Support decision-making in the design team by providing a framework with targets against which different design options can be evaluated.
- Monitor and report on progress towards targets set

The tool aims to support the development of buildings that support sustainable development by ensuring that sustainable development, the local context, and best practice in building and construction are explicitly addressed in a highly structured way in the design process and synthesized into high performance, appropriate, and sustainable, design solutions.

### 5.1.3. Scope of the Tool

The scope of the tool is as follows:

- **Buildings:** The scope of the tool will be limited to buildings. In particular, it will aim to impact on medium size buildings such as schools, clinics and small offices.
- **Design Stages:** The tool will be designed to influence the briefing and design stages of a building. It should however take into account all other stages in the building lifecycle.
- **Architects:** The main users of the tool will be design teams and in particular architects. However the tool should be designed to be easily understandable by lay people. It should enable all building stakeholders, who may be lay people, to participate in the process of using the tool.
- **Context:** The tool aims to address the context of a developing country.

### 5.1.4. The Components of the Tool

In order to support the design of buildings that support sustainability, a number of components are required. These consist of an assessment framework and a structured process.

**The assessment framework:** The assessment framework provides a structure in which high level sustainability goals can be developed into specific design objectives. Indicators can then be developed for these objectives, which enable an assessment of the extent to which these objectives have been achieved, to be assessed. The assessment framework thus enables sustainability to be interpreted into explicit objectives, which can be worked towards.

**The structured process:** The use of the assessment framework however requires a structured process. This is because addressing sustainable development effectively in buildings requires understanding and agreement from a number of stakeholders including the different members of a design team, the client or building owner, and building users. In addition, a structured process helps to ensure that sustainable development is an ongoing concern in all of a building's lifecycle stages.

These components are described in more detail below.

#### **5.1.5. The Assessment Framework**

The study reviewed a range of assessment frameworks in Chapter four. The specification will therefore aim to learn from these reviews in order to distil, and describe, important aspects, that the assessment framework must incorporate. These aspects can be described under three headings:

- Basis for the development of the assessment framework,
- Structure of the assessment framework, and
- The selection and development of indicators

#### **Basis for the Development of the Assessment Framework**

The review of assessment systems showed that assessment frameworks are developed, or underpinned, by theoretical and value systems. The World Bank describes this in the following way:

*Behind the formulation of any system of indicators lies some implicit or explicit model of (1) what matters, and (2) the way the world works<sup>195</sup>*

This specification should therefore aim to make explicit the main aspects of a theoretical frame of reference that should be drawn on, in developing the assessment framework. This is particularly important because of the complexity of the area being addressed and the range of definitions and models that currently exist for sustainability and sustainable development.

In addition, it is suggested, that common, existing, definitions of these areas are not necessarily useful for the development of an assessment framework. What is required, and what the specification should provide, is a description of the relationships between buildings and sustainable development. This, it is argued, will provide the elements necessary to develop an assessment framework.

---

<sup>195</sup> World Bank. 1996

The study will therefore describe the following aspects: 'Sustainability and Sustainable Development', 'A Developing Country Context' and 'Elements of a Building'.

### **Sustainability and Sustainable Development**

*Sustainability* can be described as a state in which man is living within the carrying capacity of the earth. This means that the earth has the capacity to accommodate the needs of existing populations in a sustainable way and is therefore also able to provide for future generations. However as we are currently in an unsustainable state as a result of man exceeding the carrying capacity of the earth, man must make a strong and concerted shift in direction in order to return to within the carrying capacity of the earth.

*Sustainable development* is the concerted and integrated action and change of direction required to enable man to return within the carrying capacity of the earth. This is designed to enable a return to a state of sustainability in which the earth is able to accommodate the needs of existing populations as well as future generations.

The review of sustainability in Chapter three suggested that sustainability could be described in terms of social, economic and environmental states that are required in order for overall sustainability to be achieved. These states are summarised below:

**Social state:** Safe, happy, healthy, cohesive, fulfilled, societies that have organisational structures and are able to develop innovative solutions, which enable them to share limited resources equitably and in ways that enable all existing and future populations needs to be met.

**Economic state:** Responsive systems and technology that are able to accommodate change and ensure that limited resources are used and maintained as efficiently and effectively as possible to provide for the needs of existing and future populations without damaging the biophysical environment.

**Environmental state:** Strong, robust, vibrant, biophysical systems that are able to provide resources and conditions necessary for existing and future populations on an ongoing and steady basis.

The review of sustainable development in Chapter two suggested that sustainable development objectives that support the return to a sustainable state can be defined. These are listed below:

### **Social Sustainable Development Objectives<sup>196</sup>**

---

<sup>196</sup> A table showing the development of these objectives from the WSSD Plan of Implementation is provided in Appendix three.

- **Access:** Ensure that development supports increased access to land, adequate shelter, finance, information, public services, technology and communications, where this is needed.
- **Education:** Ensure that development improves levels of education and awareness, including awareness of sustainable development.
- **Inclusive:** Ensure that development processes and benefits are inclusive.
- **Health, safety and security:** Ensure that development considers human rights and supports improved health, safety and security.
- **Participation:** Ensure that development supports partnerships, social interaction and involves, and is influenced by, the people that it affects.

### **Economic Sustainable Development Objectives**

- **Employment and self employment:** Ensure that development supports increased access to employment and supports self employment and the development of small enterprises.
- **Efficiency and effectiveness:** Ensure that development (including technology specified) is designed and managed to be highly efficient and effective, achieving high productivity levels with few resources and limited waste and pollution.
- **Indigenous knowledge and technology:** Ensure that development takes into account and draws on, where appropriate, indigenous knowledge and technology.
- **Sustainable development accounting:** Ensure that development is based on a scientific approach which measures and monitors social, environmental and economic impacts and this is used to guide development.
- **An enabling environment:** Develop an enabling environment for sustainable development through the development of transparent, equitable and supportive policies, processes, and forward planning.
- **Small-scale, local and diverse economies:** Ensure that development supports the development of small scale, local and diverse economies.

### **Environmental Sustainable Development Objectives**

- **Size, productivity and biodiversity:** Ensure that development conserves or increases the size, biodiversity, and productivity of the biophysical environment.
- **Resource management:** Ensure that development supports the management of the biophysical environment to ensure that this is not adversely affected.
- **Resource extraction and processing:** Ensure that development minimises the use/support of environmentally damaging resource extraction and processing practices.

- **Waste & pollution:** Ensure that development manages the production of waste to ensure that this does not adversely affect the biophysical environment.
- **Water:** Ensure that development manages the extraction, consumption and disposal of water in order not to adversely affect the bio-physical environment
- **Energy:** Ensure that development manages the production and consumption of energy in order not to adversely affect the biophysical environment.

This description provides simple definitions for sustainability and sustainable development. It is useful as it describes both an ultimate state that must be strived for as well as a set of actions or objectives, which if implemented, will lead towards this state. It also allows the broad concepts of sustainability and sustainable development to be defined and broken down into more concise elements. These elements enable an assessment framework to be developed as these elements can be compared in a matrix in order to develop an understanding of the relationships that exist. The charting of these relationships will be done later in the chapter.

Having described sustainability and sustainable development it is important to understand how this relates to developing and developed countries. Developed countries may have achieved certain aspects of 'a state of social sustainability', such as reasonable health and safety within their populations. It therefore could be argued that social sustainable development objectives could have a lower priority to economic and environmental sustainable development objectives in these developed countries.

Developing countries on the other hand are unlikely to have achieved many aspects described for a state of social sustainability. Therefore, addressing social sustainable development objectives is likely to be a priority in developing countries.

These differences in states mean that there are often differing priorities in developing and developed countries. In sustainable development it is therefore important to understand the local context and priorities. The assessment framework therefore must acknowledge and respond to the context in which it is used. The key aspects of a developing country context relevant for the assessment framework are listed below.

### **A Developing Country Context**

- **Infrastructure:** In developing countries there are generally lower levels of infrastructure development than in developed countries. This means that infrastructure development is required in order for key sustainable development objectives such as Access, Education and Health (for fuller descriptions see above) to

be achieved. There is an opportunity, in the development of this new infrastructure to design and manage this to support sustainable development.

- **Capacity:** There are generally low levels of capacity and education within developing countries. Sustainable development interventions are therefore likely to require the inclusion of education and capacity building programmes to ensure that development has the appropriate impact and is sustained.
- **Participation:** in developing countries populations may have had little say in how development has occurred. In order to ensure that development reflects the needs and priorities of the people it will affect, and will be supported by them, it is important to ensure that they are appropriately involved.
- **Social exclusion:** In developing countries there may be groups such as old people, poor people, disabled people, uneducated people or people from a particular tribe whose needs have not been adequately addressed by existing development approaches. It is therefore important to understand, and make sure that these needs, are addressed.
- **Social priorities:** In many developing countries there are urgent social priorities such as health and education that need addressing.
- **Economic priorities:** Developing countries often have urgent economic priorities that need to be addressed such as unemployment and inequity.
- **Development limitations:** Developing countries may have particular limitations and parameters that must be acknowledged. These may be physical, for instance developing countries may experience serious water shortages. They may also be financial with development options limited by lack of financial resources or access to foreign exchange.
- **Indigenous systems:** Developing countries may have highly evolved indigenous systems that are sustainable. These include technological, organisational, cultural and knowledge systems. These can provide highly valuable models for sustainable development as they provide working models that can be drawn on.

The description of a developing country context above suggests that interventions to support sustainable development in developing countries should address social and economic issues as a priority. It is not suggested that environmental issues should be forgotten, as this would not enable a state of sustainability to be achieved. Rather, It is suggested, that environmental

sustainable development objectives are acknowledged and addressed in interventions designed to address urgent social and economic priorities.

The description of the developing country context indicates that there may be a valuable opportunity to develop infrastructure that is aligned with sustainable development objectives. It suggests that new infrastructure, if developed correctly, may be able to avoid many of the problems associated with existing infrastructure in developed countries, which now has to be managed and adapted to try and make this more sustainable. In terms of an assessment system this context description suggests that two important questions should be asked in the assessment process. These are:

- Does the development directly address urgent national social and economic priorities?
- In the development intervention, has the unique opportunity for developing infrastructure that supports sustainability been recognised and adequately seized?

### **Elements of Buildings**

The description and classification of buildings is complex and it is not the intention of the study to review or describe these. It is important however for the study to be able to define buildings in a simple way that enables them to be broken down into a series of finite elements that can be used to assist in the development of an assessment framework.

It is suggested that a description of buildings must acknowledge the fact that buildings are both a physical entity (a building) as well as being a dynamic process (the building life cycle). Both of these can be described in terms of distinct *elements* or *stages*:

### **Building Elements**

A building may be described in terms of the following elements:

- **Location:** This describes the location of the building
- **Site:** This describes the site and landscaping in which the building is located
- **Size and shape:** This describes the size and shape of the building
- **Building envelope:** This describes the physical envelope enclosing the building
- **Internal space:** This describes the space enclosed by the building envelope



- **Furniture and fittings:** This describes equipment, furniture and fittings located within the internal space
- **Services:** This describes services in the building such as water, electricity and telephone
- **Materials and components:** This describes the materials and components used in the building

There are clearly overlaps between these elements, however, for the purposes of the study it is suggested that this breakdown provides the appropriate number of elements required to support the development of the assessment framework.

### **Building Life Cycle Stages**

The life of buildings can be broken down into a number of discrete stages. These are as follows:

- **Briefing:** This stage starts with the decision to develop a building and includes initial conceptualisation of the requirements of the building
- **Design:** This stage include the development of the design of the building through to tender documentation
- **Construction:** This stage refers to the construction of the building and ends at handover to owner or users on completion
- **Operation:** This describes the stage where the building is in normal use and ends when a decision is made to refurbish or demolish the building
- **Refurbishment/demolition:** This describes the stage when the building is deconstructed, or refurbished for further use.

This is also a relatively simplistic description of the life of buildings; however it provides 5 discrete stages which can be used to inform the development of the assessment framework.

### **The Implications of Sustainable Development for Buildings and Construction**

In order to explore the relationship between sustainable development and building and construction elements identified in each area can be entered into a matrix. This is shown in Table five.

### **Table Five: Sustainable Development and Building and Construction Element Matrix**

		Brief	Design	Design elements								Construction	Operation	Demolition /refurbishment
				Location	Site	Size and form	Envelope	Internal space	Furniture and fittings	Services	Materials & component			
		A	B	C	D	E	F	G	H	I	J	K	L	M
Size, productivity & biodiversity	1			●	●	●	●	●	●	●	●	●	●	●
Resource Management	2			●	●				●	●	●	●	●	●
Resource extraction & processing	3								●	●	●	●	●	●
Waste and pollution	4			●	●			●	●	●	●	●	●	●
Water	5			●	●	●	●		●	●	●	●	●	●
Energy	6			●	●	●	●	●	●	●	●	●	●	●
Employment and self employment	7	●	●	●	●	●	●	●	●	●	●	●	●	●
Efficiency and effectiveness	8	●	●	●	●	●	●	●	●	●	●	●	●	●
Indigenous knowledge & technology	9	●	●						●	●	●	●	●	●
Sustainable development accounting	10	●	●									●	●	●

An enabling environment	11	●	●									●	●	●
Small-scale, local and diverse economies	12	●	●	●	●	●	●	●	●	●	●	●	●	●
Access	13	●	●	●	●	●		●		●			●	
Education	14	●	●	●	●			●	●	●		●	●	●
Inclusive	15	●	●	●	●		●	●	●	●	●	●	●	●
Health, safety and security	16	●	●	●	●	●	●	●	●	●	●	●	●	●
Participation	17	●	●	●	●	●	●	●	●	●		●	●	●

### **Buildings and Construction Sustainable Development Objectives**

The matrix is helpful in that it begins to enable the implications of sustainable development for buildings and construction to be elucidated. In order to chart this relationship sustainable development objectives (vertical column, numbers 1-17) were compared with building and construction elements (horizontal rows letters A-M). Dots indicate where there appears to be implications for a building element of a sustainable development objective. The implications for building elements of sustainable development objectives have been used to generate building and construction sustainable development objectives. These detail specific objectives that should be aimed for in buildings and construction in order to support sustainable development. These are listed in Appendix eleven. This list is not intended to be exhaustive as it is designed primarily as a prompt, and checklist, for the development of an assessment tool. The list of objectives forms a 'comprehensiveness check' within the specification, ensuring that important building and construction sustainable development objectives are not missed out in the assessment tool.

#### **5.1.6. Structure of the Assessment Framework**

The review of assessment frameworks carried out in Chapter four provide a number of recommendations for the structure of assessment frameworks. These recommendations suggest that there should be a hierarchical structure consisting of goals, objectives and

indicators. This structure, it was suggested, enables complex high-level goals to be broken down into manageable and understandable actions and objectives. In order to assess progress towards achieving actions of objectives, indicators linked to these objectives should be used. The assumption being that by achieving all the objectives one is able to achieve a higher-level goal. In many of the assessment systems reviewed this hierarchy was reflected in a tabular form similar to that show in Table six.

**Table Six: Assessment Framework Structure**

Goal	Objective 1	Sub objective 1a	Indicator 1a
		Sub objective 1b	Indicator 1b
	Objective 2	Sub objective 2a	Indicator 2a
		Sub objective 2b	Indicator 2b

Having defined a broad structure it is useful to consider how the content should be developed. What are, for instance, the criteria that should be used in developing or selecting goals, objectives and indicators for the assessment framework? To a certain extent this has already been answered in the previous sections of the chapter, however it is useful to review this.

**Goal:** The goal in the assessment framework describes a high level goal that should be achieved. Examples of this high level goal can be found in national policy frameworks for instance the UK Strategy for Sustainable Development has as goal ‘to improve quality of life’ while South Africa’s Reconstruction and Development Plan (RDP) had the major goal of ‘achieving better equity’.

In the assessment framework, ideally, the goal should be a simple, easily understandable statement. For instance the goal that the assessment tool may aim to achieve could be:

*The development of buildings and construction processes that support sustainable development.*

**Objective:** In the assessment framework this high level goal should be broken down in to objectives that can be achieved in the building. This area has already been explored in an earlier in this chapter and building and construction sustainable development objectives generated and listed in Appendix ten. This section provides a large number of suggested objectives that should be achieved in a building in order to make sure that the goal of achieving buildings and construction processes that support sustainable development is achieved. There is however little overall order in the way the objectives are currently organised, and it is apparent that there are overlaps between these. In addition, the list has no prioritisation.

In order to be able to address objectives it is valuable to be able to develop a clear structure and prioritisation for these. The structure chosen is likely to be guided by how the tool will be used. For instance, if mainly architects use the tool, a structure related to how architects work, and describe buildings, would be appropriate. This will be explored in more depth in the next section titled 'The Use of the Tool'. The selection and prioritisation of objectives is also important. It is suggested that explicit criteria are used for this. The criteria suggested for the selection and ranking of objectives are as follows:

- **Context:** This criterion ascertains whether the objective addresses important social and economic priorities that exist in many developing country contexts. The social and economic priorities used are those defined in the Millennium Goals.<sup>197</sup> It is suggested that this is important because there are priorities in developing countries that need to be addressed first, and it is important that the assessment framework prioritises these. This is not to say that other objectives are not important, just that they may not be the first priority to address.
- **Ease of implementation:** This criterion ascertains whether the objective can be achieved reasonably easily with the resources and capacity that exist in a developing country.
- **Cross support:** This criterion investigates the extent to which the objective supports sustainable development in other areas. For instance an objective such as provision of space for education may not only support increased social sustainability but also increased economic sustainability (through increased ability to innovate) and environmental sustainability (through greater awareness and understanding).

These criteria enable objectives to be ranked. It is argued that objectives that are prioritised in this way should be the ones that are addressed first as these are relatively easy to implement and will have the greatest impact on a developing country context.

It is important however to note that objectives that do not emerge as a top priority through this ranking processes should not be ignored. Instead there should be a system of primary and secondary objectives. The highest ranked objectives should be primary objectives, which once achieved, should be replaced with secondary objectives, which are lower ranked. In this way there is a dynamic development process that progresses through a series of sustainable development objectives in order to move towards a state of sustainability. The ranking of objectives can be carried out using a simple table as indicated below.

---

<sup>197</sup> <http://www.un.org/millennium/sg/report> 19/12/02 09:00

**Table Seven: Objective Rating Criteria**

Objective	Context: Addresses social and economic priorities (as defined in the Millennium Goals)	Ease of implementation: Can be achieved with limited resources & technical capacity	Cross support: Addresses other social/ economic/ environmental objectives	Rating
Objective one	Y			1
Objective two		Y	Y	2

Having developed a list and structure for the objectives in the assessment framework it is useful to check this by asking the following questions.

- What is the balance between objectives that are designed to address social, economic and environmental aspects? Is this balance correct?
- Can the objectives be used or changed in a dynamic way to respond to different contexts and priorities? Is there a logical progression of objectives that can be followed to support a continuous sustainable development process, as objectives are achieved over time?

#### 5.1.7. The Selection and Development of Indicators

Once a system of objectives have been designed it is important to develop or select indicators linked to these objectives that can be used to measure progress towards achievement of these objectives. Care should be taken however in selecting or developing indicators, as they are unlikely to be used if they are not reliable, or too complex. In order to assist in the design and selection of indicators it is suggested that a number of criteria are used. These are as shown below.

**Table Eight: Indicator Rating Criteria**

Indicator	The indicator is easy to understand by all stakeholders	The information required for the indicator is readily available	The indicator requires minimal additional modelling, calculation	The method of measuring the indicators is objective	Has a target against which it can be compared	Rating

		and easy to capture	n or investigati on			
Indicator one		Y			Y	2
Indicator two	Y	Y	Y	Y	Y	5

These criteria, it is suggested, will assist in the selection or development of suitable indicators for the assessment framework. It is important however that these are treated as guidelines and not hard and fast rules. For instance a building objective may be the development of adaptable and flexible space. While this may be a very important building and construction sustainable development objective there may be very few indicators that are suitable or meet the above criteria. In cases like this it may be important to relax the criteria applied and note the area, as one to be addressed, in further research.

It is also important that the right mix of information is collected. This is because sustainable development is about qualities, such as quality of life, as well as about quantity. Many aspects of sustainable development also centre on people, and it is often difficult to develop reliable quantifiable indicators for aspects of human life, like social cohesion or motivation.

Another aspect that is important to acknowledge in the selection and development of indicators is the importance of relationships and links within sustainable development. Indicators that enable information about these links are useful because they are more reliable ways of measuring whether the overall intention behind objectives is being achieved. For instance, a broad objective might be to support education and small businesses by ensuring that buildings provide facilities for a local community to access the Internet. In this case, as well as measuring access to the Internet by the local community, it is important to assess whether this access is affordable for them. The inclusion of affordability ensures that the indicator is more reliable as it takes in to account income levels, which may be an obstacle, as well as levels of access to the Internet.

Thus in reviewing indicators, it is suggested that the following questions should be asked.

- Has the right mix of indicators been developed to reflect fully sustainable development progress in qualitative as well quantitative terms?
- Do the indicator mix reflect the right balance between sustainable development (short term objectives) and sustainability objectives (long term objectives)
- Do the indicators capture important relational information that 'cross check' the achievement of objectives and help ensure that these are reliable?

In order to indicate how these elements form a whole, a simple example is provided in the table below.

**Table Nine: Building and Construction Sustainable Development Assessment Framework**

Goal	Objective	Building Objectives	Indicators
Social Sustainability	Provide access to appropriate education	Design space in buildings to support education	% area of floor area provided for education as a proportion of total floor area
		Provide services such as access to the Internet to support education	Number of workstations with access to the Internet available for use, relative to number of building occupants

#### 5.1.8. The Structured Process

In order to make the assessment framework an effective tool for addressing sustainable development in the design of buildings it must be used as part of a structured process. This process is required because it enables the assessment framework to be effective by:

- Ensuring that the assessment framework is used at the right time where it will make the most impact and can be fully integrated into the building development process
- Helping to make sure that there is an awareness about sustainable development amongst building stakeholders and that there is an understanding of how, through early briefing and design decisions, this issue can be addressed effectively in the building development process.
- Making sure that the decisions required by the assessment framework to support sustainable development are taken by the right people, and that these decisions are documented appropriately.



- Making sure that this has an ongoing influence on the building and on construction processes throughout the building life cycle.

### **The Building Lifecycle and the Use of an Assessment Framework**

The structured process should integrate the use of the assessment framework into conventional processes that take place in the development of buildings. This requires key decision and monitoring points to be identified when the tool can be used to set the direction and monitor progress. These points and the use of the assessment tool in the various building life cycle stages are described below.

- **Briefing:** This stage is the most important for the assessment framework. This is when the use of the assessment framework should be agreed to by all involved in the building development. It should also include an initial discussion, which uses the assessment framework to develop and agree, an outline performance targets for the building. Ideally these outline performance targets should support decision making on areas such as whether a new building is really required, and where this should be sited. A valuable aspect of this stage is achievement of an 'in principle' agreement by all involved in the building development, that sustainable development is an important aspect to address, and integrate into the briefing and design of the building.
- **Site analysis:** The site analysis stage provides an opportunity to evaluate opportunities offered, and needs that could be addressed, at the selected site in terms of sustainable development. This analysis should be used to inform and prioritise targets set, in the next stage, the target setting stage.
- **Target setting:** During this stage the design team should develop detailed and challenging performance targets for the building. These should draw on the outline target sets during the briefing stage, the findings of the site analysis, and best practice performance and benchmarks from buildings of similar function and locations. These detailed targets are used by the design to inform the decision making during the design process. They are also used by all involved in the building development to monitor and evaluate progress in supporting and integrating sustainable development in the building.
- **Concept design:** During this stage the first conceptual designs for a building are developed. Having an assessment framework with detailed performance targets should ensure that designers generate solutions that support sustainable development. These solutions can be evolved through iterative processes where design options are evaluated against targets set in the assessment framework.

- **Detailed design:** This iterative process continues as the detail of the design develops. Ideally this should inform all aspects of the design including decisions such as the location of light switches and the specification of finishes. It is suggested that at key stages in the design process, design reports accompanied by an assessment should be developed and presented to all of those involved in the development of the building. Where performance targets set in the assessment framework are not being met the reports should hi-light these, enabling these to be discussed and addressed at project design meetings.
- **Tender documentation:** In conventional practice building designs are developed into production information and tender documentation. This is used by contractors to prepare tenders and for constructing the building. In the structured process it is important that this documentation make the sustainable development objectives of the building explicit to the contractor. In addition, where there are particular targets that must be addressed through the construction process, these should be included in a way that ensures that a contractor is contractually bound to address them. Examples of these types of targets may be the minimisation of construction waste and the training of local personnel during construction.
- **Construction:** During construction, the contractor should address sustainable development targets identified for this stage. Progress towards the achievement, of these targets should also be reported on. Care should be taken to make sure reporting is accurate, and it may be useful to ensure that this is done by an independent party such as a Clerk of Works. Reporting on targets should be integrated into conventional construction and contract administration. It therefore should be included in monthly construction reports provided to a design team and client. It should also be an agenda item at project progress meetings. Where it becomes apparent that progress is not being made towards the achievement of targets this needs to be hi-lighted and addressed at progress meetings and, if necessary, through administration of the construction contract.
- **Handover:** On completion of the construction stage the building becomes ready for occupation. In terms of the assessment framework this is an important moment because this marks a change in emphasis from design and construction objectives to management objectives. In order that management objectives are achieved it is important that building users and managers understand and support the sustainable development objectives that are being aimed for. They also need to understand how the building and its systems may have been designed to support sustainable development and are able to use and manage the building in a way that achieves this. As buildings may be complex it is important that the design team, and possibly

contractors and suppliers, provide adequate support. This can be done through an induction process for new occupants of the building, training for building managers and a building user manual. In each of these elements ideally sustainable development objectives should be hi-lighted and inform the content.

- **Operation:** During the life of the building it is important that the sustainable development objectives developed for the design also informs the use, and the management and maintenance of the building. Making these explicit during training, induction and in building user manuals can support this. However to fully integrate these objectives into the use of the building requires that progress towards achieving these objectives, be reported on regularly. The assessment framework developed for the design process may therefore be used to inform the development and setting of targets set in a 'management' assessment framework designed to ensure that sustainable development objectives are achieved in the operation of the building. This framework can be developed in a similar way as the design assessment framework. It should also be supported and understood by the key stakeholders such as the building owner and building users and indicators used to monitor progress towards the achievement of objectives. Examples of objectives set could be energy and water consumption targets.
- **Demolition or refurbishment:** At the end of the useful life, a building may be demolished or refurbished for further use. If it is demolished, hopefully the use of the assessment framework will have contributed to ensuring that this can take place in a way that supports sustainable development. For instance, the building may have been designed to be readily disassembled enabling components and materials to be recycled. The building user manual may also contain disassembly instruction to enable this to occur with a minimum of waste. If the building is to be refurbished it should be upgraded for better performance in terms of sustainable development. In order to do this an assessment framework similar to the one used for a new building could be used.

#### **5.1.9. Principles for Design and Use of the Assessment Framework**

In addition, as the assessment tool will be used to ensure that sustainable development is thoroughly addressed in buildings, it is important to ensure that it learns from the related fields of sustainable development and assessment systems.

#### **Sustainable Development Principles**

A number of principles were proposed for sustainable development from the literature reviewed in Chapters two, three and four. For the specification, the key principles are presented below:

- **Participatory:** The process of development should involve local people and reflect their priorities and needs
- **Social exclusion:** Development should take care not to exclude any groups such as women and disabled people from being fully involved.
- **Transparent:** The process for reaching decisions and carrying out actions should be as transparent as possible.
- **Local resources:** where possible development should draw on existing local skills, knowledge and resources.
- **Precautionary principle:** Development action and intervention should be guided by the precautionary principle and should not wait until there is comprehensive knowledge and understanding within an area.
- **Top-down and bottom-up:** The approach should enable development to be understood and monitored at a detailed level and at a holistic level.

#### **Sustainability Assessment System Principles**

A range of sustainability and environmental impact systems were reviewed earlier in Chapters two and four. The key best practice principles applied in these systems are listed below:

- **Hierarchical structure:** Assessment frameworks should have a hierarchical structure consisting of the following elements:
  - Overarching goal
  - Objectives
  - Sub objective
  - Indicators
- **Involve key stakeholders:** The process of assessment should actively involve those affected or concerned by the development.
- **Awareness:** The assessment process should increase awareness about sustainable development amongst those affected or concerned by the development. This encourages a shared understanding to be developed, which in turn, enables sustainable development to be addressed more effectively.

- **Agreement:** The assessment process should ensure that all those affected or concerned by the development are not only involved, but also actively participate in designing and agreeing objectives and indicators.
- **Monitor progress towards achievement of objectives:** Indicators should be used as part of the assessment framework to monitor and evaluate progress towards the achievement of sustainable development objectives.
- **Support decision-making:** The assessment frameworks should be used to inform decision-making. In order to check that appropriate decisions are being made, limited modelling may be necessary to check the performance of different options in order to ensure the most appropriate one is selected. The tool should support an iterative process where options can be tried and tested in order to develop, and evolve, the most appropriate solutions.
- **Responsive:** The tool should be able to respond to the local context, the users and the function of the building. It is therefore important that the tool is flexible enough to be used in different situations and care should be taken that the tool is not too prescriptive. In many situations, solutions and approaches may have to 'emerge' from an iterative design process.
- **Tool development:** A description of how and why the tool was developed should be provided.
- **Logical:** The tool must be structured in way that enables users to easily understand how the tool works and how this relates to buildings and sustainable development.
- **Linkages:** The assessment process should encourage investigation into understanding of linkages and interdependencies in systems.
- **Justifiable:** As far as possible, the content and emphasis in the tool should be justifiable through reference to research and other information.
- **Strong and weak science:** The tool should distinguish between areas where there is strong knowledge and areas where this is weak. In order to address differences in knowledge it may be appropriate to have a system of primary indicators and secondary indicators. Primary indicators should be used to monitor progress in well-established knowledge areas and secondary indicators used for areas where knowledge is not as strong, or where information may be unreliable.

- **Assumptions:** where important assumptions are made these assumptions should be described.
- **Reference materials:** Where reference information has been material to the development of the tool, full references for this material should be included.
- **Definitions:** Key definitions should be included in the tool. In particular it is important to include definitions for terms alluded to in the overarching goal of the assessment framework, such as sustainable development.

## 5.2. Addressing Hypothesis Four

The development of a specification raises a number of considerations that can be discussed. These are:

**Sustainable development:** The specification is helpful in that it provides a clear definition for sustainability and sustainable development. It also provides a clear set of sustainable development objectives. These objectives however have been developed from the UN's WSSD Plan. This means that the assessment tool will be aligned to UN policy. However, as discussed in Chapter two, there are concerns about whether the UN plan reflects sustainable development best practice and is comprehensive and rigorous enough to be used to implement sustainable development on the ground. A useful area of research would therefore be to analyse the UN WSSD and other sustainable development frameworks in order to develop sets of succinct sustainable development objectives for specific sectors such as education, health and building and construction. It is suggested that the implementation of sustainable development could be greatly supported if sector specific, practical objectives, and measures, were readily available. These would vary depending on context, and developing countries would have different objectives to those of developed countries.

**Building and construction sustainable development objectives:** The methodology used to generate building and construction objectives in the specification could be developed more rigorously and would be an interesting area to research further. However as the purpose in the specification was to develop a 'comprehensiveness checklist' it is suggested that the methodology is adequate.

**Criteria:** The specification provides a useful set of checklists and criteria for guiding the development of an assessment system.

**Structured process:** The structured process described in the specification is useful as it provides a guide as to how the assessment framework should be used and integrated into the building and construction processes. This process is not explored earlier in the study and

could be researched further. It is suggested that the level of detail developed in the specification is reasonable as the structured process is a supporting aspect of the assessment framework, which is the primary focus.

### **5.3. Concluding Hypothesis Four**

The hypothesis that “a specification for an assessment tool, which aims to ensure that sustainable development, is addressed and incorporated in the briefing and design of buildings in developing countries can be developed” is demonstrated. The study shows that it is possible to develop a specification for an assessment tool that reflects the sustainable development context, sustainability theory and sustainable development assessment methodology.