

# Agenda for Sustainable Construction in Africa

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## Abstract

To discuss sustainable construction in the African context requires the definition of construction in at least four levels: site/assembly activities, project cycle, sector level and settlement production and habitation. This facilitates the review of major socio-economic and bio-physical challenges facing construction in the different countries.

Although the diversity of current initiatives in South Africa gives the impression that issues at all four levels are being addressed, further analysis reveals that it is only the socio-economic considerations which have benefited in terms of articulated policies and implementation programmes. The bio-physical considerations have tended to remain as research questions to be addressed by research and academic institutions. Absence of appropriate legislation or incentives, as well as the incapacity of local authorities and central governments to implement existing ones, has meant that the middle/high income residential and commercial sub-sectors have neglected to address the bio-physical issues.

The challenge of sustainable construction has therefore remained the same. In spite of the tremendous efforts in tackling the socio-economic considerations, there are no signs yet that the demand is being met. In view of this, it is evident that the resources of most stakeholders in construction will continue to be directed to this component of sustainability. The market-driven sector is likely to continue ignoring socio-economic and bio-physical considerations unless there is a significant change in legislation/incentives and the capacity of governments to implement them. The emergence of a green financing mechanism (locally based and internationally linked) might constitute a long-awaited signal for both public and private sector stakeholders.

## 1. Introduction

### 1.1 The Commissioning Brief

This paper constitutes a contribution towards the Agenda for Sustainable Construction in the Developing World which is a sub-theme of CIB's Agenda 21 on Sustainable Construction. Contributions to the sub-theme are supposed to offer comments on:

- The different regional understandings of sustainable construction
- The issues and challenges facing the regions
- The impact of the construction industry on the economy, the environment and society in the regions
- The barriers to sustainable construction
- The strengths and opportunities presented by the cultures and traditional practices of the regions; and
- Suggested actions for the research community, governments and the construction industry

As one of the contributions from Africa to the above sub-theme, this paper first reviews the subject matter based on the structure outlined in a later part of this introduction. This provides the pool of information and motivation for the conclusion section which is structured according to the six requirements above.

### 1.2 Delimitation Of Scope

As a matter of scope-delimitation, it is important to note here that the paper restricts itself to issues which can be addressed through sustainability initiatives in the built environment. However, one must recognise that this is a highly simplistic view based on the assumption that several other macro-scale factors are appropriately addressed. Four such factors not directly covered in this paper are:



- **Political stability and transparent governance.** The political instability which has become characteristic of African states during colonial and post-colonial period greatly undermines sustainable construction among other facets of socio-economic life. Besides people, buildings and settlements are often the first targets of political violence which in turn:
  - **Renders people homeless** (refugees) thus creating a need/demand for emergency shelter and settlements
  - **Reduces lifespan of buildings** either through actual destruction or lack of care and maintenance
  - **Reduces incentives to invest** in property development and maintenance
  - **Reduces incentives for research and training** in sustainable construction while contributing to brain drain of already existing capacity

Absence of transparent governance also translates to a situation where the construction industry becomes tainted with unfair practices especially corruption through bidding, tendering and contract awards as well as through the construction process. This applies both to public and private sector procurement. Without political stability and transparency, potential for sustainable construction in Africa would remain unrealised.

- **Economic growth and redistribution of wealth.** The improvement of quality of life especially in urban areas of Africa strongly depends on sustainable economic growth coupled with meaningful job creation and wealth redistribution. In the absence of such growth, poverty will persist and scope for sustainable construction and human settlements will remain under constraint as most resources and capacity will continue being absorbed in poverty reduction initiatives.
- **Meaningful integration and participation in the global economy.** The realisation of outcomes (1) and (2) above can only be meaningful if Africa takes an effective positioning within the global economy rather than the marginalised status the continent finds itself in at present. The key requirement in this respect is enhanced competitiveness and strategic integration into the global IT/communications networks. Equally, there is a requirement for awareness and practice of future scenario building and strategising for meaningful participation and directing the unfolding of such scenarios to Africa's best interests. The ongoing debate on debt relief and flexible conditions of funding development and opening up of markets of the developed world for goods and services from the developing world are crucial steps in this requirement.
- **Meaningful political and economic co-operation among African states.** This will facilitate sharing of expertise and resources thus avoiding duplication of efforts or stagnation due to inadequate capacity within some states. This takes cognisance of the fact that some states have undertaken some sustainability initiatives several steps ahead of others in terms of research, policies, curriculum development, tendering/procurement procedures, legislation/bylaws etc. It would be unnecessary for each country to start from scratch on issues around which another African country has undergone relevant experiences that could be adapted. The African Renaissance could be one avenue towards such co-operation.

While it is clear that all the above factors directly influence sustainability in construction in Africa, sustainable construction itself has no meaningful leverage to facilitate the realisation of the above macro-scale pre-conditions. It is in this respect that the four factors above (and similar others like control of the HIV/AIDS epidemic, man-made or natural-disaster management capabilities etc.) have been delimited as out of scope of this paper. However, as the Agenda process unfolds (especially in view of other developing-world contributions) it is not unlikely that a meaningful leverage between sustainable construction and the macro-scale factors will emerge thus bringing such factors into the scope of the Agenda.

The rest of this section provides an outline of the structure of the rest of the paper. Besides this introduction, the paper is in four sections, namely:

- 1 Unsustainable construction in Africa: Where is the evidence?



- 2 Sustainability initiatives in construction in Africa: Who needs them, who provides them?
- 3 Sustainable construction in Africa: What future, with what contribution and from whom?
- 4 Bibliography and Appendices

The first part provides the theoretical and empirical basis of the rest of the paper. It attempts to contextualise sustainable construction in Africa in a global and local socio-economic framework in order to identify the dynamics behind this phenomenon and how it is being interpreted in Africa. The second part provides a critical review of the 'demand' and 'supply' sides of sustainable construction in the context of stakeholders in the built environment as well as the interfacing/negotiation mechanisms involved. The key approach here is the application of the market paradigm in assessing the opportunities and constraints for sustainable construction in Africa (Is there a need, who 'demands' it, who is paying, who is 'supplying' etc). This yields an insight as to why sustainable construction has been so slow to emerge so far.

The third part picks up the thread of the second part and provides an assessment of future opportunities and constraints in the context of the dynamics discussed in part one, the stakeholder roles/interests discussed in part two and the review of a sample of ongoing sustainability initiatives mainly from South Africa. The conclusions consolidate the key insights of the paper within the format of the six areas listed for comments in the commissioning brief. The final part provides a bibliography of relevant readings as well as an appendix of visual illustrations on various aspects of the topic.

### 1.3 Definition Of Terms

- **Construction:** Defined in this study at four levels as site operations/activities of assembly stage, project cycle, sector level and production of human settlements.
- **Sustainable construction:** Bio-physical and socio-economic responsiveness in the production and habitation of the built environment at all four levels defined under construction above.
- **Socio-economic considerations:** Construction's contribution to socio-economic needs such as housing and services, job creation and employment, gender equity and children's rights, entrepreneurship capacity building.
- **Bio-physical considerations:** Construction's contribution to mitigation of deterioration of bio-physical environment whether through over-exploitation of resources or pollution of resources such as water, air and land
- **Low-cost informal sub-sector:** Part of the built environment viewed to be in need of public sector intervention as a result of inability of the formal property-market mechanism to address the need.
- **Middle/high income residential and commercial sub-sector:** Part of the built environment primarily produced and operated through formal property-market mechanisms.
- **Urban sprawl:** A pattern of urban land use characterised by low densities of buildings and inhabitants such that each property comprises a building surrounded by a large open space within a single stand. This is evident in both sub-sectors as defined above.
- **Energy efficiency and conservation:** Meeting the same or higher level of energy services/needs with less energy supply. This is often termed as demand-side management as opposed to expanding supply to meet new demand. Use of renewable energy is often viewed as part of energy conservation.
- **Water efficiency and conservation:** Similar to energy efficiency and conservation. Water recycle and rainwater harvesting are key components of water conservation.
- **Re-use and recycling of materials and components:** Re-use is the application of construction/demolition waste in construction without reprocessing in a factory process. Recycling involves reprocessing of waste from any source to produce building materials and components.
- **Cradle-to-grave cycle:** Comprehensive view of the materials cycle in an economy (from extraction to disposal after use), which allows consideration of opportunities for re-use and recycling rather than disposal in landfills, junkyards or incineration. This contributes to resource conservation.
- **Life-cycle analysis/costing:** Similar to cradle-to-grave analysis except that in its conventional application in building professions, it tends to be restricted to the project cycle of a building (feasibility, design, construction and operation).

- **Stakeholders:** Parties who have any interest in the impacts (negative or positive) of construction as defined at any of the levels discussed under the term construction.

#### 1.4 Abbreviations and Acronyms

- **WCED:** World Commission on Environment and Development
- **Rio Summit:** Earth Summit held in Rio de Janeiro in June 1992 and where the global sustainability framework (*Agenda 21*) was launched
- **NGOs:** Non-governmental organisations
- **CBOs:** Community-based organisations
- **CIB:** International Council for Research and Innovation in Building and Construction
- **DPSIR:** Driving forces, Pressures, State, Impacts and Responses (format for state of environment reports under the CEROI programme)
- **UNEP:** United Nations Environmental Programme
- **GRID-Arendal:** Global Resources Information Database in Arendal, Norway.
- **ICLEI:** International Council for Local Environmental Initiatives: Cities 21 Campaign
- **IT:** Information Technology
- **CEROI:** Cities state of the Environment Reports on the Internet
- **IIEC:** International Institute for Energy Conservation
- **SMMEs:** Small, Micro- and Medium Enterprises
- **GEF:** Global Environmental Fund

## 2. Unsustainable Construction in Africa: Where is the Evidence?

### 2.1 The Shack Paradox

There is possibly no better starting point for a sustainable construction agenda in Africa than the shack. This building type, which is predominant in all cities of the developing world and Africa in particular, is a highly paradoxical phenomenon. On the one hand, it epitomises the pinnacle of sustainability, which even developed countries are still struggling to achieve – re-use and recycling of building materials and components. A conventional shack constitutes close to 100% re-used components or materials sourced close to the site. Since they are self-built, shacks exploit the most abundant skills and technology available within the household and community (see Plates 1 and 2). This enhances resource conservation and affordability while providing a channel for household employment and investment.



**PLATE 1:**  
Re-use of materials and components in shacks:  
Photo by Lindsay Bremner: Slide Library, School of  
Architecture and Planning University of Witwatersrand.



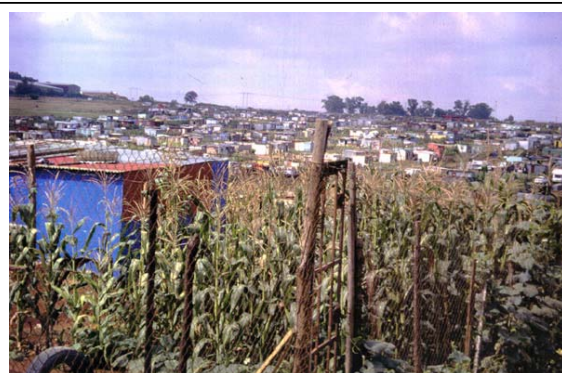
**PLATE 2:**  
Re-use of materials and components in shacks:  
Photo by Lindsay Bremner: Slide Library, School of  
Architecture and Planning University of Witwatersrand.

The shack is thus quite low in embodied energy and very easy to deconstruct and reassemble as required (de Klerk 1999). Its production, operation processes and layout also provide opportunities for the development of

cohesive communities and settlement structures which have proved difficult to replicate through formal upgrading and new formal settlement development (see Plates 3, 4, and 5 versus Plates 6 and 7). The intense debates surrounding current approaches in settlement upgrading have been critically reviewed in Huchzermeyer (1999).



**PLATE 3:**  
Urban agriculture in informal settlements  
Photo by Lindsay Bremner: Slide Library, School of Architecture and Planning University of Witwatersrand.



**PLATE 4:**  
Urban agriculture in informal settlements  
Photo by Lindsay Bremner: Slide Library, School of Architecture and Planning University of Witwatersrand.



**PLATE 5:**  
Spatial diversity and densities in informal settlement  
Source: Housing in Southern Africa: February 2000, p. 16



**PLATE 6:**  
Spatial anonymity in new low-cost housing  
Source: Housing in Southern Africa: February 2000, cover page



**PLATE 7:**  
The new low-cost housing settlements (Durban)  
Source: Housing in Southern Africa, March 200, p. 9

On the other hand, the shack epitomises much of what is unsustainable about construction and the built environment in Africa. This is characterised by the following:

- Lack of tenure: most of the shack dwellers are squatters who occupy land illegally often at very high densities
- Inadequate shelter (poor construction and inadequate size for the number of occupants often results in congestion)
- Poor indoor air quality especially due to inadequate ventilation and use of combustible fuels like charcoal, coal or paraffin
- Inadequate services (water, waste disposal, electricity, sewage etc.)
- Major contribution to water and outdoor air pollution as well as to one of the man-made

disasters - fire- which renders thousands of households homeless every year. Other natural and man-made disasters contribute to forced migration and the need for emergency shelter and coping strategies as a sustainability need in Africa.

Due to the above shortcomings, the shacks and the informal settlements where they occur have become clear indicators of severe socio-economic deprivation (Huchzermeyer 1999: 40).

While the formal built environment sector (residential, commercial and industrial) reflects higher standards of socio-economic integration and sustainability, they suffer tremendously from bio-physical unsustainability as well as unresponsiveness to opportunities or strategies for addressing the socio-economic deprivations manifested in informal settlements. The bio-physical unsustainability is characterised by:

- Inefficient use of energy in the operation stage of the life-cycle of a building
- High embodied energy through the cradle-to-grave cycle of components and materials
- Inefficient use of water
- Inefficient land use (urban sprawl especially with residential suburbs, office parks and shopping malls)
- Short economic lifespan
- Minimal opportunities for re-use and recycling of components and materials
- High levels of solid waste generation

The key contribution to socio-economic sustainability is manifested through:

- Sustained employment opportunities through formal construction
- Sustained employment opportunities through material production and distribution
- Sustained employment through related services like transport, financial, marketing and rental/sale of property
- Sustained employment through operation and maintenance during the economic life span of the buildings
- Sustained investment and capital formation opportunities for the economy

The case of the formal construction and allied industries as key sectors of developing countries' economies has been articulated in Ngoasheng (1995) with a focus on South Africa's cement and clay brick industries. According to the study, construction's contribution to gross domestic product (GDP) averages 3 to 4% per annum in South Africa and most developing countries (p.10).

With respect to gross fixed capital formation (GFCF), Tassios (1993: 2) observes that construction's contribution ranged between 35 and 81% for developing countries in the 1970s. A study on labour market trends in South Africa (Whiteford et al 1999: 22 - 23) indicates that the construction sector is among the very few with a positive employment growth rate (about 2% per annum). Most of the other sectors are experiencing negative growth rates.

The above scenario where the two building types, their related settlement patterns and production processes display strong tendencies of sustainability and unsustainability constitutes the background on which this paper is based. Since the contextualisation of sustainable construction within the greater sustainable development framework has been realised in several other publications (see for example Hill and Bowen 1997), the following section is only intended to provide an overview on the role of sustainable construction in sustainable development.

## **2.2 Sustainable Construction in Sustainable Development**

The sustainable development paradigm as consolidated in the World Commission on Environment and Development (WCED) report (often referred to as the Brundtland Report) constituted a key step in environmental conservation as it created a rationale for mainstreaming the environmental agenda into all aspects of development. This call for a paradigm shift also recognised socio-economic and cultural considerations as equally critical factors in sustainable development besides the bio-physical factors which had been the main focus of attention before then. In this regard, issues like poverty alleviation, gender equality and cultural conservation became legitimate issues to be addressed hand in hand with environmental conservation in all development initiatives.



The real meaning of the new paradigm was consolidated through several global and regional fora which culminated into the Earth Summit in 1992 (Rio Summit) and *Agenda 21* which was the key output of the summit. The document provides a guide for global and local mainstreaming of sustainability in all socio-economic activities as well as the institutional and networking requirements among different stakeholders and role players. It is out of the Rio Summit and especially *Agenda 21* that most of the sustainable development initiatives today trace their roots and rationale.

Sustainable construction is one such initiative which emerged and developed rapidly especially due to the critical role which buildings and the construction sector play in modern economies. Although various components of sustainable construction were being pursued (in research and practice) well before the WCED report and the Rio Summit, there had been no previous efforts to consolidate them into one theme or agenda. Such initiatives cover issues like energy and water conservation, building conservation (mainly those of monumental/heritage value), affordable housing, job creation in construction, environmental impacts of materials and waste management. The new and broader initiatives which emerged after the WCED and *Agenda 21* reports, include sustainable architecture, sustainable planning/design and sustainable cities (urban sustainability). These initiatives have now been consolidated into the over-arching paradigm of sustainable construction and sustainability in the built environment. In this regard therefore, the sustainable construction paradigm provides a broad structure under which a wide range of issues on sustainability in the built environment can be pursued both academically (teaching and research), as well as in policy and practice.

Since this paper is based on this broad view of sustainable construction, it is important to provide an overview of what construction means in such a context. Four such meanings are implied in the context of this paper:

- 1 Construction as site activities, which lead to the realisation of a specific building. In this regard construction is viewed as a specific stage in the project cycle as described below
- 2 Construction as the comprehensive cycle of a building project covering key stages such as feasibility, design, building, operation, decommissioning, demolition, disposal
- 3 Construction as a sector of the economy, which is in turn linked to allied sectors and industries in material production and distribution, as well as service sectors such as transport and finance
- 4 Construction as the broad process/mechanism for the realisation of human settlements especially the provision of affordable housing, related infrastructure and services. This entails land identification, planning, design and implementation processes of sustainable built environment or human settlements. The concept of production of buildings and the built environment has been used occasionally to reflect this broader scope (see for example the series of reports of proceedings on the Production of the built environment conferences which took place in the 1980s under the co-ordination of the Bartlett School of Architecture, UK)

Each of the four variations in meaning has different implications on the relevant sustainability issues to be addressed. This is highlighted in the subsequent subsections.

### **2.2.1 Construction as a Site Process and its Sustainability Implications**

This entails all the operations (building works) within a site and the related assembly of materials/components of a building. Sustainable construction in this context is of extremely limited scope as it only aims at minimising the environmental and worker-related impacts such as:

- Minimising soil erosion
- Minimising disturbance/destruction of fauna and flora of site and adjoining properties
- Minimising water and energy use in construction (water and energy efficiency)
- Implementation of labour intensive construction methods
- Minimising waste of materials especially those with high resource impacts or embodied energy (e.g. cement, bricks, steel, timber etc.)
- Minimising pollution (dust, noise, gaseous emissions) as well as avoidance of toxic inputs like pest control chemicals
- Safeguarding worker safety and health



Such impacts are now being addressed in South Africa through environmental impact assessments and mitigation plans for major construction projects as required by legislation. Any broader concerns with sustainability in the built environment require to be addressed at earlier and later stages of the project cycle other than at the construction stage. This leads to the second level of meaning of construction.

### **2.2.2 Construction As The Comprehensive Project Cycle**

This entails the pre-construction stages such as feasibility, site identification, design/technical documentation and contract awards as well the actual building works and post-construction stages such as occupation/operation and demolition. This definition opens up a wider range of sustainability issues and opportunities such as:

- Energy and water conservation during the operation stage based on appropriate design and site implementation
- Environmental considerations during site identification, feasibility studies and operational stages of a building (life cycle analysis and costing)
- Environmental impact assessment and management plan before construction and operation (mitigation of building-works impacts as well as those of the operation phase)
- Enhancement of job creation through design and construction methods

Although this definition provides a more comprehensive framework for integrating sustainability issues in the built environment, it is still limited. This is mainly because the lifecycle (and related impacts) of most construction materials/components begins well before the conventional project cycle begins and ends well after the project cycle is over. This necessitates the third level of definition.

Most of these opportunities are rarely exploited in projects mainly due to lack of awareness and the perception of abundant and cheap resources like clean water, energy, land and air.

### **2.2.3 Construction As A Sector Of Modern Economies**

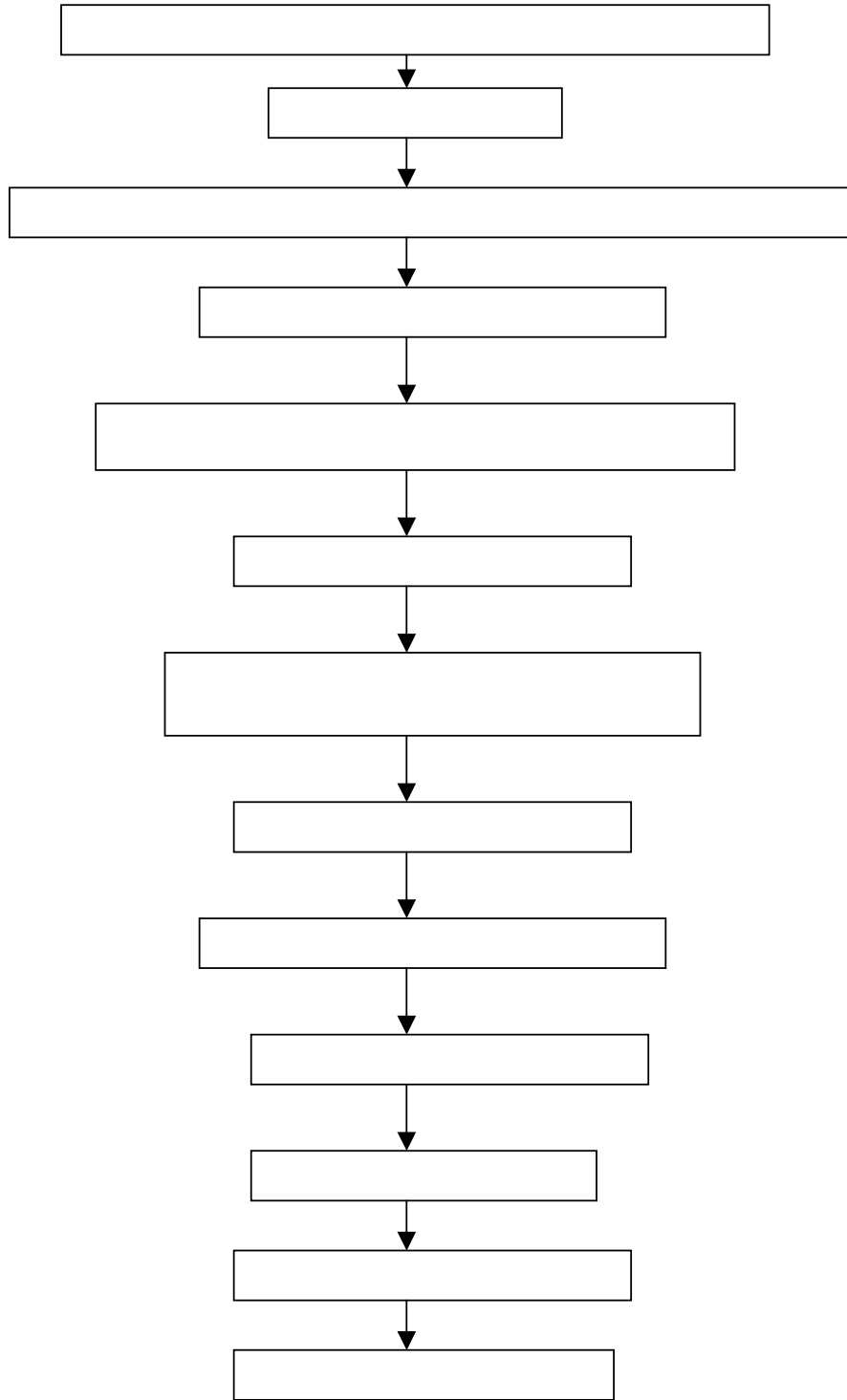
In this respect, the sector is viewed as a critical link in a chain of events originating with the extraction of raw materials (mining and harvesting) through processing and distribution of components, assembly of components on site and building occupation followed by decommissioning of buildings demolition and disposal of resultant waste. This is often referred to as the cradle-to-grave cycle of materials and components (see Figure 1 for illustration). Illustrations on various stages of key materials in South Africa are shown in plates 8 to 11 while demolition impacts and strategies are shown in Plates 12 to 15).



**PLATE 8:**  
Sand harvesting and stockpiling in South Africa.  
Source: Irurah (1999).



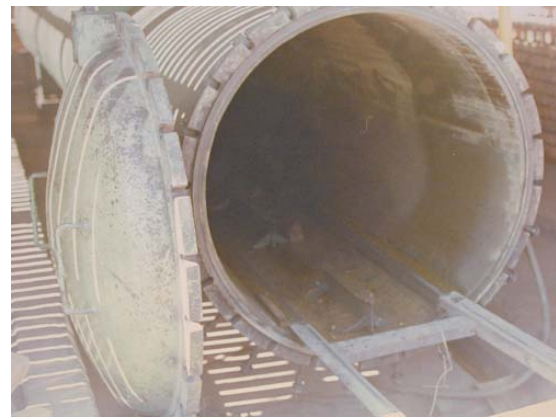
**PLATE 9:** Limestone quarrying for cement production, South Africa  
Source: Irurah (1999).



**Figure 1:** Cradle-to-grave cycle of materials and components. Source: Holm, Irurah and Stroh (2000: 162).



**PLATE 10:**  
Timber processing, South Africa.  
Source: Irurah (1999).



**PLATE 11:**  
Timber treatment, South Africa.  
Source: Irurah (1999).



**PLATE 12:**  
Ad hoc demolition of concrete works, South Africa.  
Source: Irurah (1999)



**PLATE 13:**  
Ad hoc demolition of concrete and related works.  
Source: Irurah (1999)



**PLATE 14:**  
Demolished timber sorted for re-use, South Africa.  
Source: Irurah (1999)



**PLATE 15:**  
Demolished steel sorted for re-cycle, South Africa.  
Source: Irurah (1999)

With this approach, the range of sustainability issues and opportunities broadens out significantly. In terms of opportunities, issues like job creation and enhancement of entrepreneurship opportunities could be meaningfully addressed at this scale especially where this is reinforced through the project cycle. The environmental impacts to be addressed are spread out in multiple production centres and distribution routes beyond the construction site itself. From the point of view of a conventional project cycle, cradle-to-grave cycle impacts become very difficult to address. The concept of minimisation of embodied energy, enhanced re-use and recycle of materials and components, enhanced durability/re-use of buildings have been identified as project cycle measures which could be used to address material/component cycle impacts.

#### **2.2.4 Construction As Process Of Production Of Human Settlements**

The key limitation of the above three definitions is that they tend to focus on the bio-physical and economic considerations of sustainability in the built environment while ignoring the human dimension (inadequate provision for basic needs such as shelter, poverty, threat to cultural values and inequalities - gender, generational or regional). This has led to the broader view of construction as the process/mechanism for the realisation of human settlements and especially as it relates to basic needs such as shelter, infrastructure and related services. Sustainable construction in this context focuses on providing human settlements that reaffirm human dignity rather than undermining it. Du Plessis (2000) has expressed doubt as to whether the prevailing sustainability paradigm is capable of meeting these needs in view of the major socio-cultural and spiritual differences between the people affected by unsustainability in Africa versus those who espouse the paradigm.

Enhancement of income generation for poverty alleviation (job creation and entrepreneurial opportunities), adequate level of services (water, energy, sanitation, waste disposal), minimising inequalities (gender, regional, generational) and threats to cultural values become the key considerations in planning and development of human settlements. The role of human settlements in abating crime and enhancement of psychological/spiritual well-being of the inhabitants become critical issues. Several bio-physical issues still remain to be addressed at this level. This includes minimisation of pollution (water and air) and proper land use to avoid sprawl and inefficient usage.

The scope of the four alternative definitions has been applied as a guide in the delimitation in the scope of this paper. Consequently, in the coverage of sustainability in construction, the paper assumes a wide array of opportunities and challenges at human settlement scale through cradle-to-grave and project cycles to site-specific activities and operations. However the overall structure of the rest of the paper constitutes a substantiation of three broad statements.

The first hypothesis is that although sustainability at human settlement scale has received the greatest attention so far in Africa, it still remains the most glaring challenge in terms of its demand on resources and expertise. Substantiation of this statement constitutes the content of the second section.

The second hypothesis is that the demand at human settlement level (especially affordable housing) has become so demanding that there is hardly any spare capacity to be directed to the other levels of sustainability especially with respect to the impacts and opportunities of the formal construction sector. On the other hand, it is at settlement level where Africa's contribution in sustainable construction becomes most effectively demonstrated. This is substantiated in the third section of the paper.

The last hypothesis is that the diversity of sustainability initiatives currently under way in South Africa constitutes a good indicator of future opportunities of shifting from research and pilot-testing to mainstreaming sustainable construction for better quality of the built environment for Africa's future. This is substantiated in the final section of the paper.

### **2.3 Unsustainable Construction In Africa: The Contradicting Evidence**

As pointed out in the introduction, the prevalence of shacks and informal settlements in Africa's cities is a clear manifestation of the socio-economic deprivation facing most of inhabitants of these cities. Such settlements are characterised by inadequate shelter (inadequate space and poor construction) as well as poor services in terms

of water, sanitation and waste disposal. Lack of tenure of land, congested inhabitation and high densities are some further characteristics of these building and settlement types.

This phenomenon is often attributed to rapid urbanisation due to rural-urban migration and formation of new households out of the high urban population growth. Such growth and household formations often happen in a context of high unemployment, low literacy levels and inadequate training (Badenhorst, 1999)

Although it is clear why this has been identified as one of the most pressing sustainability issues in African cities, it is rarely recognised that the shack and its related informal settlement types has extremely unique sustainability qualities which need to be enhanced. Key among these are: the re-use and recycling of construction components and materials, labour-intensive construction methods, locally sourced materials, highly structured and internally networked communities. The communities also contribute to general recycle of resources from the waste stream not only for their own use, but also for supply to the conventional recycling stream.

Failure to recognise these sustainability qualities, often leads to them being disregarded during housing interventions aimed at improving socio-economic sustainability. This point is clearly articulated in Marais (2000). In the rush to provide better housing and improved services, communities are relocated to remote sites which often inhibit the social processes that facilitate cohesive communities and settlements. Single purpose land use, low densities, long distances from work centres and inadequate public transport are some of the urban level unsustainability issues related to such interventions. For example, in a detailed comparison of informal settlement upgrading in South Africa and Brazil, Huchzermeyer (1999) finds the South African approach to be highly insensitive to existing community structures and resource base when compared to that of Brazil.

At the house-design and construction level, most of the low-income housing shows minimal improvements to the shack. Inadequate size, poor thermal and structural performance, use of costly and highly processed materials and technologies, short economic life span with high maintenance requirements as well as inadequate community/owner participation in the intervention are some of the inadequacies of the housing delivered. As the term often implies, low cost housing interventions aim at low initial cost per unit delivered (construction stage) with minimal considerations for the life cycle cost of the housing provided both to the owners, the communities and the society in general.

The properties also hardly get integrated into the conventional property market, as they are perceived to be of inferior quality and constituting high financial risk. Bond (1999) has argued the case for higher standards in infrastructure and services in low-cost housing even if it means higher initial costs and basic-level services at no cost because the long-term benefits (socio-economic and environmental conservation/health) far outweigh the cost-savings through current practice.

Although affordable housing has been pursued as the most critical agenda for sustainable construction in Africa, one can conclude that most of the interventions have not been carried out in a sustainable way from both socio-economic and bio-physical considerations. It is therefore clear that the delivery of sustainable and affordable housing/settlements (in both socio-economic and bio-physical considerations) still remains one of the most critical agenda for sustainable construction in Africa.

In this regard, four key challenges must be faced. These are:

- A perception of abundance of cheap land which is often used as the compensatory resource for scarce capital and managerial resources required for higher quality of housing, social infrastructure and services. Uncontrolled land invasions, location of low cost housing in the cheapest sites available, suburban approach to housing (the detached house) and single purpose residential land use are some of the manifestations of this perception. The hidden cost of this perception is often borne by the low income households in the form of costly infrastructure (sometimes unaffordable not only with respect to initial cost but also in terms of maintenance and operation costs) per serviced plot or house, long distances from work centres or markets (translates to high transport costs) in face of poor public transport. The ultimate outcome is that minimal finance is available for implementation of the actual house. Hence the inadequate size, poor construction and short life spans of most low cost houses in Africa.

- Low acceptability of the resultant low cost housing properties in the conventional property market (often referred to as redlining) leads to a situation where a household's major investment gets locked up in a non-tradable asset with no further economic value except the shelter function.
- Perception of social housing provision as a welfare responsibility of the government with minimal tangible returns. Opportunities to link housing delivery to other socio-economic and environmental policies of the country (economic growth, job creation, entrepreneurship promotion, environmental conservation etc) are therefore ignored and the potential synergies are lost.
- Inability of the relevant local and central authorities to regulate or control land invasions or to tap into the growing body of knowledge and expertise in sustainable affordable housing. This can be attributed to a lack of internal capacity to articulate the need and the perception that sustainable housing is more costly (hence unaffordable) and more time consuming to deliver. Opportunities for partnerships with other stakeholders such as NGOs, CBOs, consultants, property developers and financiers are hardly explored.

## 2.4 Formal Residential And Commercial Sub-Sector

The intense focus of sustainability efforts in affordable housing in Africa leaves the impression that the formal residential and commercial sub-sector has no serious sustainability problems to be addressed. Whereas the buildings and related settlements of this sector may be characterised as passively satisfactory (in terms of size, quality of construction, level of services, durability as well as contribution to sustained employment and growth in the allied industries) they often fail to actively pursue a sustainability agenda in several ways.

At the urban scale such developments still thrive on the perception of abundance of cheap land as is evident from the single purpose land usage. Urban sprawl supported by motorised transport especially with the private car, costly infrastructure networks (transport, water, electricity, sewage etc.) are some of the issues. At the building unit level, failure to address energy and water conservation, re-use and recycling of components and materials, targeted job creation and use of local resources as well as gender equality are some of the unsustainability outcomes of the sub-sector.

The significant contribution of this formal sub-sector to economic performance in growth, employment and capital formation must be weighed against the heavy environmental impacts through the project cycle and cradle-to-grave cycle of materials and components. In the project cycle level, most of the impacts include:

- Heavy land take arising from urban sprawl as most such properties are developed at very low densities (the sub-urban approach for residential and corporate/office park or malls for the commercial properties). This poses a major threat to other land uses such as agriculture, forestry, quarrying, mining or natural conservation. Urban sprawl also contributes significantly to loss of bio-diversity and impairment of water catchment areas and wetlands. Dependence on motorised transport to link up the different zones of land use further contribute to energy and time inefficiency which could be minimised through mixed use, higher densities and enhanced public transport.
- Increased water pollution due to greater runoff from hard paved surfaces and waste/pollutants generated through urban use such as motorised transport, soil erosion from excavation sites and uncollected solid waste.
- Heavy consumption of resources for inputs to production of virgin components. Most of the materials used (cement, glass, burnt clay bricks, steel etc.) involve high levels of embodied energy through their production and distribution. Absence of re-use and recycling of construction waste means that most such precious resources end up in dumps and landfill after demolition of buildings especially in face of the declining lifespan of properties in the formal sub-sector. Irurah and Holm (1999) and Irurah (1999) provide detailed analysis of embodied energy and environmental impacts respectively of construction materials in South Africa.
- The operational phase of such buildings mean consumption of energy and water due to absence of conservation strategies or initiatives to exploit renewable resources such as solar energy through passive

thermal control, solar water heating or photovoltaics as well as rainwater harvesting. Absence of strategies for recycle of water and solid waste further translates to excessive levels of consumption and pollution.

- High dependence on mechanised construction and factory-based production of components increases embodied energy intensities while minimising job and entrepreneurial opportunities in the cradle-to-grave and project cycles of the sub-sector.

This sub-sector therefore poses different sustainability challenges compared to the informal and low cost housing sub-sector. However, these are often the 'invisible' challenges that hardly attract attention from either local or central authorities, NGOs, developers, built environment professionals or manufacturers of materials and components.

### 3. Sustainable Construction in Africa: Who Demands it, Who Supplies it?

In view of the need for sustainable construction at different levels and sub-sectors as discussed in the previous section, this section attempts to establish the level of demand and supply of sustainability in construction and human settlements. The key observation here is that demand for socio-economic sustainability is quite high while demand for bio-physical sustainability is still extremely limited.

Awareness of human rights with respect to basic needs such as shelter and related services (water, energy, sanitation) has translated into communities' and households' increasing demand for housing and infrastructure interventions. This demand side pressure is characterised by:

- Highly conscientious communities with respect to human rights, due to advocacy work of NGOs, CBOs and leaders representing communities in larger fora such as local authorities, national government and international organisations such as UN agencies.
- High levels of gender related conscientiousness. This relates to the fact that women and children are more negatively impacted by poor shelter and services in human settlements.

Besides the affected households and communities, other stakeholders have taken up the challenge of socio-economic sustainability with respect to poverty alleviation, housing and human settlements, women and children's rights as well as the role of construction in these initiatives. Research and academic institutions see this as a growth niche and are thus generating new information and training opportunities. NGOs and CBOs have also identified improved housing and human settlements as an attractive field for fund raising. Some governments and consultancies are also becoming aware of the funding opportunities now opening up in this sub-sector. Most of the NGOs focus their fund raising initiatives/programmes on poverty alleviation, addressing gender imbalances, community empowerment for meeting basic needs such as shelter, income generation and healthy settlements. This also constitutes the key focus of local leaders and politicians. A review of sample cases of such initiatives is provided in Section 4.0.

What is conspicuously missing in this demand side of the sub-sector is NGOs' and leaders' initiatives/facilitation in bio-physical sustainability beyond environmental health at household and settlement level. For example, the search for sustainable energy services is often driven by the need for improved household health through improved indoor air quality and gender issues such as minimising time spent by households (especially women and children) in search of fuels like charcoal, paraffin, fuel-wood or coal. This is in major contrast to energy efficiency and renewable energy initiatives in developed countries where mitigation against global warming, risk of resource depletion and insecurity in producer-countries constitutes the key driving factors.

This neglect of the bio-physical component of sustainability is further characterised by low commitment by various stakeholders such as:

- **Politicians:** Hardly do mainstream bio-physical sustainability issues constitute agenda-differentiation of parties or political leadership except where they can be directly linked to gender and poverty



- **Manufacturers:** Hardly do manufacturers/suppliers of materials promote environmental responsiveness as a criteria in their marketing or specifications
- **Local authorities:** Hardly do bio-physical sustainability issues constitute criteria or requirements for plan approvals, land use or land sub-division
- **Built environment professionals:** Hardly do sustainability considerations make it to the brief, design criteria or specifications. Related training institutions have negligible capacity for training in these issues.
- **Developers/financiers and contractors** hardly recognise sustainability as a means to competitiveness in local or foreign markets.

Given the persistent need/demand and supply side initiatives for socio-economic sustainability with respect to housing and human settlements, it is critical that bio-physical sustainability be regularly integrated into such initiatives. The Kutlwanong housing development in Kimberley (South Africa) constitutes a pioneering example where energy conservation was integrated as one of the key criteria in the housing delivery process (see Kutlwanong Community and PEER Africa 1997). However, issues like water conservation, resource conservation (for example minimisation of embodied energy, enhancing re-use and recycle of construction materials) were not considered. Innovative interventions at settlement level (for example higher densities, mixed use, better location in relation to work centres) were not considered either.

Within the middle/high income residential and commercial sub-sector, an absence for a need in socio-economic intervention and lack of comprehensive programmes addressing bio-physical considerations in construction and human settlements has created high levels of complacency among the stakeholders involved. This is in spite of the fact that not only is this sub-sector the one with the highest levels of impacts but also the one with adequate resources (financial resources for research and development as well as for meeting the higher initial costs) to start addressing this need. Absence of appropriate legislation or market-based incentives encourages the various stakeholders to continue along the unsustainable path in construction.

The complacency is possibly sustained by the fact that the critical impacts of the sub-sector often take place in far off locations and only cumulatively over time. Consequently, the key stakeholders (owners, developers, contractors, manufacturers, professionals, local authorities) rarely get meaningful feedback of the consequences of their decisions and actions. It is mainly for this sub-sector that the impacts need to be systematically audited and brought to the attention of the respective stakeholders. There is also a need for evolving and implementing appropriate strategies for mitigation of the impacts. However, given the existing inertia in the sub-sector, there are chances that the basic-needs approach in the low income housing sub-sector will drive the demand for bio-physical considerations sooner than the high income market-driven sub-sector. For example, as discussed in section 4, Johannesburg is undertaking the formulation and implementation of a sustainability policy/guidelines to guide implementation of its low-cost housing delivery programme.

## 4. Sustainable Construction In Africa: What Future

### 4.1 The Two Competing Futures

The previous sections reviewed the current status of construction in Africa in an effort to understand what is sustainable or unsustainable about it. This section attempts to explore the likely future scenario for sustainable construction based on ongoing initiatives, thus bringing out the perspective of two competing futures. There is the possibility that unsustainability as discussed in the previous sections will prevail for an extended period versus the possibility that current initiatives would coalesce to a major paradigm shift which boosts the momentum of sustainable construction.

The review of ongoing initiatives is based on the following three points:

- Focus on South Africa



- Categorisation into nine major categories
- The information on cases reviewed is collected from a diverse range of sources most of which provide no assessment of the impact of the initiative on sustainable construction. The intention here is to demonstrate the diversity of initiatives rather than to evaluate their impact or level of contribution to sustainable construction in Africa. The latter need constitutes a basis for a more extensive empirical research.

#### 4.1.1 Focus On South Africa

The sample initiatives presented in this paper are mainly from South Africa for three major reasons. Firstly, in view of the time constraint, it was not possible to collect information that would allow for a more representative review for Africa as a whole. Secondly, due to the dual nature of South Africa's economy (with a highly industrialised sector co-existing with an informal sector) the resultant impacts of unsustainable construction are much higher compared to other African countries.

Finally, the transition to democracy within a period of globalisation and movement towards political transparency worldwide has yielded opportunities for sustainability debates and initiatives to take root and grow faster in South Africa than in any other African country. The resource base/flow in terms of expertise and funding (both local and foreign) is much more favourable in South Africa thus creating room for both research and piloting/implementation of both sustainability policies/legislation and projects.

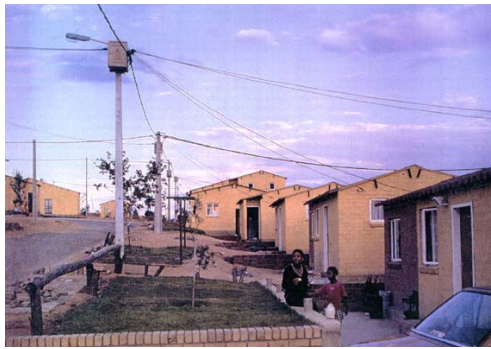
In this respect, South Africa is in a trend setting role for Africa thus demonstrating possible opportunities and constraints that hold valuable lessons for other African countries as they get to stabilise both politically and socio-economically. However, there are great expectations that this bias towards South African initiatives will be rectified through contributions from other parts of the continent as the Agenda process evolves.

#### 4.1.2 The Key Categories Of Initiatives

The following nine categories have been used to structure the range of sustainable construction initiatives into an accessible format. These are:

- a) Housing and poverty alleviation programmes.** This category includes all public and civil society initiatives targeted at social housing delivery and income generation. With respect to housing, the public sector initiatives include policy formulation, setting up of appropriate structures and funding mechanisms as well as offering general support and guidance to other stakeholders in this sub-sector. The policy aspects of the housing component at the national level have now been consolidated into a single document: the National Housing Code. Job creation programmes range from small -scale community initiatives focused on construction and housing or other SMMEs to the nationally co-ordinated ones such as the Presidential Job Summit and the *Community-Based Public Works Programme (CBPWP)* under the national Department of Public Works.
- b) CBOs' and NGOs' initiatives:** This category covers a wide range of initiatives driven by CBOs and NGOs especially in housing, job creation, materials supply and intermediate technologies. Some examples include:
  - Kutlwanong Community Integrated Housing
  - Tiholego Development Project
  - Green Professionals Programme of the International Institute of Energy Conservation (IEEC)
  - The Greenhouse Project of Johannesburg
  - Midrand Eco-city Project
  - Mvula Trust (focusing on water supply to communities and management for water efficiency)
- c) Practice:** This includes initiatives implemented through a conventional project cycle within the practice culture of the built environment professionals. Energy and water efficiency are the key focus of such projects. Examples include Eastgate Building in Harare, Zimbabwe, Technology Centre in Gaborone,

Botswana (first two are not South African initiatives) and Soweto Energy Efficient House in Johannesburg.



**PLATE 16:**  
Architect-designed low-cost housing, Alexandra, Johannesburg: Architect: P. Rich. Photo by Lindsay Bremner: Slide Library, School of Architecture and Planning University of Witwatersrand



**PLATE 17:**  
Architect-designed low-cost housing, Alexandra, Johannesburg: Architect: P. Rich. Photo by Lindsay Bremner: Slide Library, School of Architecture and Planning University of Witwatersrand.

- d) **Policy and legislation (national and local).** This includes spatial planning and environmental policies/legislation at national or provincial level as well as by local authorities. Examples include the National Environmental Management Act (which requires environmental impact assessment for certain categories of projects even in the built environment), Integrated Development Frameworks, *Sustainable Housing Policy for Johannesburg* and the National Strategy for Sustainable Development (NSSD).
- e) **Procurement strategies:** Through this initiative, procurement of public sector projects in construction (buildings and engineering works) is used as a tool for the realisation of sustainability outcomes such as wealth redistribution through job creation and entrepreneurial capacity development among previously disadvantaged groups. The *Targeted Procurement Strategy* of the Department of Public works is a good example here.
- f) **Green/Alternative Financing:** Since inadequate finance is considered to be the major constraint in implementation of sustainable construction, innovative strategies of channelling finance to such initiatives are emerging worldwide. It is evident that South Africa has started tapping into such flows both locally and internationally. Besides the conventional flow through CBO and NGO funding as well as government grants aimed at housing and poverty alleviation, there are now innovative market-driven financing opportunities such as those linked to climate change funds under the Global Environmental Fund (GEF). Examples of initiatives under this category include the Energy Efficient Lighting (BONESA) by ESKOM (financed by GEF/World Bank and International Finance Corporation - IFC), Dutch AIJ (Activities Implemented Jointly) energy efficient housing project (supported by private and public sector funding from Netherlands) and *PEER Africa's Green Financing Programme also supported by GEF/World Bank and IFC*.
- g) **Research, Dissemination and Training:** This category includes initiatives related to actual research of general principles and policy/implementation strategies as well as creating awareness and capacity through communication, training, workshops and conferences. It would cover sustainability courses in degree programmes of built environment professions such as the *sustainability in housing* course at the University of Witwatersrand, Sustainability in the Built Environment Conferences (1998 and 2000) and the African Solutions Network (2000), assessment and simulation tools/software such the *Green Buildings for Africa Programme* (by the Building Technology Division of the CSIR) and Building Toolbox for thermal simulation developed by the University of Pretoria, demonstration cases such as the Soweto Energy Efficient House by the University of Witwatersrand and other partners (see Plates 18 and 19), and a wide range of research programmes/projects, theses and papers. Electronic dissemination of information through websites and electronic publication is becoming common practice among stakeholders in the built environment.



**PLATE 18:**  
Soweto energy efficient house, Johannesburg  
Photo by Lindsay Bremner: Slide Library, School of  
Architecture and Planning, University of Witwatersrand.



**PLATE 19:**  
Soweto energy efficient house, Johannesburg  
Photo by Lindsay Bremner: Slide Library, School of  
Architecture and Planning, University of Witwatersrand.

- h) Manufacturers/market-driven initiatives:** In this category, initiatives by private sector stakeholders would include built environment companies' membership in the Industrial Environmental Forum (IEF), implementation of the international environmental management standards (ISO 14001), establishment of a *sub-sector environmental initiative such as the one by ASPASA (Aggregate and Stone Producers Association of South Africa)*, and social/community programmes of built-environment companies as part of their marketing and public relations initiatives.
- i) International networks, linkages and collaboration:** This category would include initiatives which involve interaction between two or more countries in Africa or abroad. Examples include the Africa Solutions Network which was launched in March 2000, *CEROI (Cities Environmental Reports on the Internet of which Johannesburg, Cape Town, Durban and Pretoria are among the pioneering 23 cities world wide)*, staff/student exchange programmes such as through the Danish Consortium of Universities for Environment and Development – Industrial and Urban Areas (DUCED-I&UA) which links with the Southern African Consortium of Universities on Development and Environment - Industrial and Urban Areas (SACUDE-I&UA), the Sustainable Construction Agenda 21 initiative of which this paper constitutes one of the inputs.

The following subsections provide broad overviews on selected initiatives (as indicated in bold and italics above) from each category.

#### **4.2 Community-Based Public Works Programme (CBPWP)**

The CBPWP was launched in 1994 as a Presidential Lead Project under the Department of Public Works (DPW). The strategic objectives of the programme are:

- Upliftment of living standards of communities through delivery of community-level infrastructure, job creation and support of local enterprises
- Stabilise and improve community livelihoods where faced with threats of drought, flooding and other disasters
- Capacity-building in local development organisation and promotion of partnerships between public and private sectors as well as civil society with a view to management of community development ventures

According to DPW (1997: 14 - 17) by 1997, a total of about 950 projects were under implementation and close to 5 million worker-days had been generated. The programme specifically targets women, youth and disabled in job opportunities.

### 4.3 CBO And NGO Initiatives: Kutlwanong Community Housing In Kimberley

This project falls within the category of 'people's housing process' as defined under the National Housing Code of South Africa. Under this category, beneficiaries (households) organise themselves into a legal entity (usually a CBO like a community trust) which in turn contracts with the individual households to facilitate access to subsidies and subsequent utilisation of the subsidy to acquire land and develop the house. This eliminates the need for large-scale developers or contractors while providing opportunities for job creation, skills development and entrepreneurial capacity development within the community. However, this project has the unique quality that the community took a decision to pilot-test energy efficient low-cost housing models with the support of PEER Africa which is an environmental and investment consultancy company originating from US. So far over 200 houses have been completed and occupied and over 300 more are at different stages of the delivery process.

Monitoring and evaluation of thermal performance, air quality and electrical consumption as well as the socio-cultural and economic dimensions of domestic energy use in low-income households has been launched. The findings will contribute to a better understanding of the energy saving potential (viability) of energy efficient low cost housing from techno-economic and socio-cultural perspectives. Improved indoor air quality (and hence health improvement of households) and reduction of green house gas emission from this sub-sector will also be assessed from the data collected. The unfolding of the project is clearly documented in Community of Kutlwanong and PEER Africa (1997).

### 4.4 Practice: Eastgate Building, Harare Zimbabwe (Plates 20 to 23)

The category of practice is one which would be better served by a world-acclaimed success story in Zimbabwe. This is the Eastgate Building in Harare (see Slessor 1996). Besides the energy efficiency focus for which the project is well known, it also has a strong component of cultural considerations, job creation and enhancement of utilisation of local resources while minimising the use of imported components.

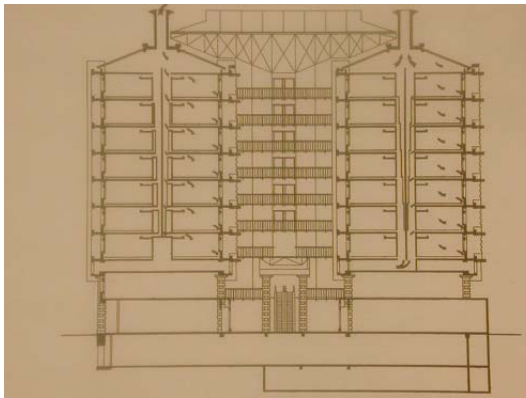


**PLATE 20:**  
Eastgate Building, Harare.  
Source: Slessor 91996

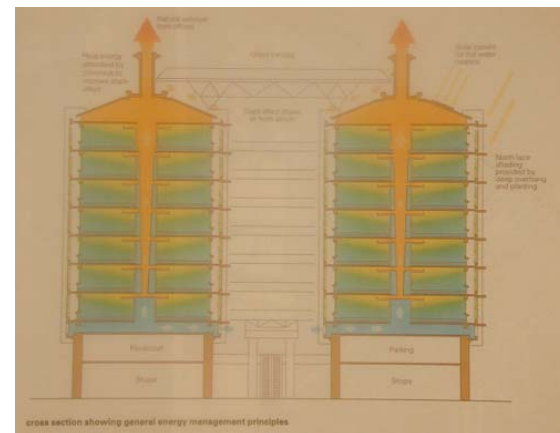


**PLATE 21:**  
Eastgate Building, Harare.  
Source: Slessor 91996

In terms of energy efficiency, the building relies on its glass-covered atrium, series of solar chimneys within the north and south blocks adjoining the atrium, double-layered floors providing space for air circulation/cooling within the slab and columns of planting (climbers) on the facades which moderate temperature and humidity of the body of air next to the facades. The facades and ceiling are highly articulated with thermal mass structures of pre-cast concrete which facilitate heat exchange between the building and the surrounding air bodies. In a review of the building immediately after occupation, Slessor (1996: 40/9) notes that peak electrical demand for the building when operating in its designed mode is about 20 times lower than conventional air conditioning for a building of the same type. The monitoring and assessment of performance in terms of energy/cost savings and reduction in green house gas emissions is ongoing. The engineering consultants of the project have now developed a sustainability assessment tool for buildings and other sectors of the economy. The tool is called Sustainability Project Appraisal Routine (SpeAr) (Urban Green Files, July/August 2000: 6).



**PLATE 23:**  
Eastgate Building, Harare. Passive cooling and heating strategies.  
Source: Slessor 91996.



**PLATE 23:**  
Eastgate Building, Harare. Passive cooling and heating strategies.  
Source: Slessor 91996.

#### 4.5 Policy And Legislation: Sustainable Housing Policy For Johannesburg

In the process of low- cost housing delivery in South Africa after transition to democracy in 1994, emphasis on numbers and speed to clear the backlog of close to 3 million units in 10 years has resulted to unsustainable built environments and communities. Energy and water inefficiencies, high life-cycle costs, disregard of cultural values and socio-community dynamics have been cited as the most glaring deficiencies of the approach taken so far (Bond 1999, Huchzermeyer 1999 and Marais 2000 for example).

In order to avoid such deficiencies in delivery of housing in future, the Johannesburg Council has commissioned a policy formulation and pilot-testing project with the following expected outputs:

- Guidance documents for planning, delivery and management of sustainable housing
- Revised tender documents to include point/rating system for environmental considerations
- Guideline document for procedures and conditions for decisions
- Guideline document for procedures and documentation for monitoring actual construction and corrective action
- Training manuals and training of council staff
- Communication strategy to disseminate information to stakeholders
- Marketing strategy for community empowerment and participation
- Database/websites of best practice.

The policy is expected to cover key components such as energy efficiency and green financing, water efficiency and sanitation, materials selection and waste management, land use and urban integration, culture, rights of vulnerable population groups, (gender, children, the aged and the disabled) as well as considerations for impacts of HIV/AIDS in settlement planning and housing delivery. The policy formulation and pilot testing is expected to take eight months to one year. It is also expected to fall in line with the National Strategy for Sustainable Development (NSSD), which is also at the formulation stage.

#### **4.6 Procurement Strategies: Targeted Procurement Under The Department Of Public Works**

This is a programme of the national government of South Africa which has been implemented through the Department of Public Works since 1999. The primary objective of the programme is to exploit the potential of public procurement (especially for building and construction projects and services) as a tool for socio-economic policy with a special focus on:

- Affirmative action on empowerment of previously disadvantaged groups (blacks, women and disabled). This involves an entrepreneurial component (joint ventures and sub-contracting) and management/ownership criteria. This is covered under Resource Specifications 1, 2, 3, (Baird et al 1999, Gounden et al 1998a, 1998b and).
- Job creation and support for local economies through a local resources component. This is covered under Resource Specification 4 and 5 (Gounden et al 1999c and 1999d)

Under this programme, tenders are assessed in terms of cost competitiveness (with 90% weighting) and contribution to socio-economic objectives (with 10% weighting). The effect of the weighting is that a contractor could quote a higher price and still win the tender on the basis of the socio-economic response. Besides the resource specifications mentioned above, the implementation process is guided by accredited built environment professionals who oversee the tendering and contract administration requirements of the programme. The programme includes a monitoring, reporting and evaluation mechanism to assess overall impact/performance with respect to the stated objectives. Watermeyer et al (2000a and 2000b) provide the theoretical and logistical background of targeted procurement which was the foundation of the specifications currently in use.

#### **4.7 Green/Alternative Financing: Peer Africa's Green Financing Programme**

A 'green-financing' programme linked to the Global Environmental Fund- (GEF) -(for the mitigation of global warming and conservation of bio-diversity) was launched in South Africa by PEER Africa (Pty) Ltd in 2000. The aim of the fund (which is supported by World Bank and the International Finance Corporation –IFC) is to target energy efficient housing especially for the lower end of the market. The financing would cover bridge financing loans, wholesale mortgage and bond finance. The financing would be targeted at builders, contractors, municipalities, finance institutions, equipment manufacturers and building material suppliers. The funding hopes to enhance access to finance which has been cited as one of the most critical barriers to energy efficient housing in the developing world especially in view of the fact that such housing tends to entail higher initial costs compared to conventional housing (Housing in Southern Africa: 2000: 18). A comprehensive review of alternative and green financing for low cost housing in South Africa has been undertaken by the Department of Housing (see Environmental Evaluation Unit 2000).

The energy efficient lighting (ELI) programme under Eskom (South Africa's power utility parastatal) and a Dutch-linked energy efficient housing project (within the AIJ - Activities Implemented Jointly - under the International Institute of Energy Conservation - IIEC) are two other climate-change-fund linked projects in South Africa. The World Bank is currently undertaking the formulation of a business proposal for a nation-wide renewable energy programme and projects under the Departments of Minerals and Energy (DME), and Housing (DoH) for grant-funding from GEF.

#### **4.8 Research, Dissemination And Training: The Green Buildings For Africa Programme**

The Green Buildings for Africa programme (GBfA) is an assessment tool for voluntary rating of sustainability of urban properties in South Africa with a possibility for implementation in other parts of Africa. The programme was



developed by the Building Technology Division (BOUTEK) of the Council for Scientific and Industrial Research (CSIR) in South Africa. It is currently in pilot-testing phase with applications in commercial buildings in Johannesburg and Pretoria. Website coverage of the programme indicate the following activities:

- Encouraging property owners to commit themselves through voluntary signature of a memorandum of understanding
- Facilitating property owners' participation in the programme
- Green partner recognition
- Environmental performance evaluation using the CSIR's unique Building Environmental Assessment and Rating System (BEARS)
- Energy auditing of buildings
- Evaluation of upgrade options and monitoring performance improvements
- Collaboration with international communities towards development of an international framework for environmental performance evaluation of buildings.

Further details on GBAP can be found on URL <http://www.greenbuildings.co.za/>

#### **4.9 Manufacturers And Market-Driven Initiatives: Environmental Rating Programme Of The Aggregate And Sand Producers Association Of South Africa (ASPASA)**

ASPASA's environmental initiative is an adaptation of a US equivalent under the name of About Face Programme of the National Stone Association - NSA. The ASPASA programme aims at conferring recognition to companies in aggregate extraction and processing. Awards are conferred in four categories:

- Interim Award in recognition of initial efforts in environmental management
- Fish Eagle Grading Award (in a 1 to 5 scale with 5 as the highest award).
- Quarry of the Year Award in recognition of a quarry which achieves the highest operational improvements in a given year
- The Show Place Award in recognition of an all round outstanding operation

In a study of sustainability initiatives for the construction materials-sub-sector in South Africa, Irurah (1999: 3) observes:

'So far the *About Face* scheme is the most comprehensive and systematic sector-wide programme encountered'.

Besides bio-physical issues, the study notes that the scheme does not effectively integrate socio-economic considerations in the criteria for awards.

#### **4.10 International Networks, Linkages And Collaboration: Cities Environmental Reports On The Internet (CEROI)**

This is an international collaboration between cities of both the developing and developed world aimed at facilitating compilation of state of environment reports within a standardised format which facilitates comparability and electronic access through the Internet. The initiative is funded by UNEP/GRID-Arendal within the Agenda 21 context. Twenty-three cities worldwide are involved in the initial/pilot phase of the programme. In South Africa four cities are participating under the co-ordination of the national Department of Environmental Affairs and Tourism (DEAT). The cities are Johannesburg, Durban, Pretoria and Cape Town. The key components of the programme are:

- Development of a reporting framework. This has now been consolidated into the DPSIR (Driving forces, Pressures, State, Impact, Response) format of reporting which has to be applied by participating cities. The format is also used for national and provincial state of the environment reports.
- Actual research (data collection and analysis)
- Reporting. The indicators format (DPSIR for different categories of bio-physical and socio-economic components) is the most significant contribution of CEROI towards standardised reporting. Facilitating Internet reporting greatly enhances access to such reports by different interested parties (usually faster and cheaper). At present, Durban, Johannesburg and Cape Town have launched their reports on the Internet while the one for Pretoria is expected to be launched soon. The respective URLs are

Johannesburg: [www.johannesburg.csoe.co.za](http://www.johannesburg.csoe.co.za), Durban: [www.durban.gov.za/environment](http://www.durban.gov.za/environment) and Cape Town: [www.cmc.gov.za/peh/soe/](http://www.cmc.gov.za/peh/soe/). The URL for CEROI is [www.ceroi.net/](http://www.ceroi.net/).

The initial reports from the piloting cities will serve two main purposes, which are:

- Test and provide feedback for refinement of reporting tools and format
- Provide the baseline case of a city on which future changes in state of the environment (improvements or deterioration) can be assessed.

## 5. Conclusions And Recommendations

Section 4 is possibly a good point to start on conclusions and recommendations of the study. This is mainly because it clearly demonstrates the priorities that have been identified by the key stakeholders in sustainable construction. Judging by the intensity of initiatives and the resource levels being channelled to a given initiative, it is clear that the socio-economic component of sustainability is viewed to be the most challenging in Africa. Provision of affordable housing and related services has been clearly articulated in terms of policy and implementation. Job creation, entrepreneurship capacity building and gender equality as well as children's rights have also been clearly articulated even if not always implemented. There is no doubt that most of the resources available to different stakeholders will continue to be directed at this challenge.

On the other hand, bio-physical considerations in the built environment have not been clearly articulated beyond the impact on environmental health. Implementation is even scantier. Lack of appropriate legislation/incentives and capacity for implementation has led to situation where a large part of the middle/high income residential and commercial sub-sector has almost totally disregarded such considerations. There is now a major possibility that the low-income/informal sub-sector might begin addressing this component before the market-driven sub-sector wakes up to the issue.

In terms of research and technologies, it is clear that there are a lot of gaps, especially in the cradle-to-grave cycle of materials and appropriate selection criteria. However, there are enough know-how and cost-savings opportunities on which to mainstream sustainable construction with the view of deriving lessons as the process unfolds. It is also clear that green financing mechanisms are starting to emerge and this might constitute the signal that the market-driven sub-sector is waiting for. South Africa's involvement in international networks in sustainable construction and urban sustainability is gaining momentum especially with the developed world. Efforts to initiate and strengthen such networks with other African countries should be made. The African Solutions Network, which was launched in March 2000, is a good example in this field.

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