

## **AN INTEGRATED APPROACH TO PLANNING AND DEVELOPMENT OF SUSTAINABLE AFFORDABLE HOUSING IN DEVELOPING COUNTRIES**

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### **Abstract**

Every human being deserves a decent and healthy living condition regardless of their socio-economic status. While there is no single panacea that will eradicate poverty worldwide, there are innovative ways, however, to improve the living conditions of low-income people by making their built environment sustainable. Sustainability, in form of green construction practices has gained wide popularity in United States and a host of other developed countries. These practices have been implemented in the construction of affordable housing where results have translated into healthy living environment. Despite the documented evidence of benefits of sustainable construction practices across the globe, many developing countries still lag behind in adopting the concept. In fact, several scholars and proponents of sustainability studies have argued for and against the adoption of foreign-based sustainable construction practices in developing countries. One issue is whether sustainable construction practices can be successfully adopted in developing countries without adequate consideration of their economic, environmental, social, and political imperatives. In spite of these concerns, development of decent and healthy housing for the low-income masses must remain a top priority. Housing development for the low-income should not be undertaken without proper consideration for the environment and well-being of the occupants. This can be realized using integrated approach during the planning and development stages. Thus, this paper focuses on how to plan, design, and develop sustainable “green” affordable housing using integrated and holistic approach.

### **Introduction**

There is no ending in sight to the rate at which the world population is growing. In 1999, it was reported that world population reached an overwhelming 6 billion people. At this growth rate, it was further predicted that world population could reach 7 billion by year 2010 (Paudel & Lobovikov, 2003). In 2003, the UN-Habitat estimated that 928 million people live in slums (Cited in Okwo & Soboyejo, 2006). At the same time, studies show that intervention programs designed to address poverty alleviation has not kept pace with population growth in developing countries. The number of available housing still falls behind the population who needs shelter. Paudel

and Lobovikov (2003) linked the implications of increased poverty in developing countries to “lack of shelter” (p. 1).

There is no doubt to the fact that inadequate housing has been an on-going global challenge for many years. This acknowledgement has been documented by many academic housing researchers and affordable housing advocates. No part of the world is this problem more pronounced than in the developing countries (Okwo & Soboyejo (2006). The majority of world’s poor and disadvantaged population lives in developing countries where lack of adequate resources and modern

technology to address the situation is a familiar norm. In most cases, these problems are compounded by the political, economic and social policies of the government. For example, Nigeria did not recognize the need or social obligation to provide adequate housing for its citizens until during the 3rd (1975-1980) and 4th (1981-1985) National Development Plans. It was during these periods that Nigeria finally “accepted housing as part of its social responsibility” (Oruwari, 2006, p.33). Even with that, housing construction budgetary allocation was abysmally low. Some state government policies were also found to be counter-productive to the housing innovation processes (Lasisi & Adedipe, (2006).

UN-Habitat describes adequate shelter as one that provides “adequate privacy, adequate space, physical accessibility, adequate security, security of infrastructure, suitable environmental quality, health-related factors, and adequate and accessible location with regard to work and basic facilities.” (cited in Okwo & Soboyejo, 2006, p.2). A careful analysis of this definition indicates that “adequate shelter” must be sustainable. In addition to being sustainable, adequate shelter must also be affordable. A non-sustainable shelter will not fall within the scope of the definition.

The UN-Habitat broad definition of adequate shelter has been validated by many scholars. Winston and Eastaway (2007) indicate that “housing is an essential component of both quality of life and sustainable development” (p. 1).

### **Concepts of Sustainability and Sustainable Construction**

Sustainability has become a global phenomenon that has attracted so much attention not only in the developed countries, but also among developing countries as well. It is so popular that its movement is considered to be one of the most successful movements of our time.

Nowhere has it become so pronounced than in the construction industry. When sustainability concept is applied within the built environment, it can be viewed in

The authors link quality of life to various aspects of one’s home. They argue that the conditions of one’s home is “essential for quality of life, including structural and design elements, such as damp-proofing, sound-proofing, and energy efficiency” (p. 2). Koebel (1999) also links “adequate shelter” to sustainable housing construction practices. He argues that for sustainable residential development to be environmentally sensitive, houses must be built to quality standard with efficient use of material resources, while at the same time providing energy efficiency and comfort to inhabitants. He also maintains that sustainable buildings “must be designed to be adaptable to change in use”(p. 76).

Achuenu and Achuenu (2006) also contend that housing should be more than mere shelter. They argue that housing should provide necessary “ancillary services and community facilities” necessary for human well-being. Likewise, Aroni (1977) as cited in Achuenu and Achuenu (2006) stated that “housing should be a home, a resting place with the fundamental purpose of a secured, rewarding, happy or at least a livable life” (p.427).

It is clearly understood from the above arguments that the primary objective of any sustainable housing development is to improve human conditions and the well-being of the ecosystem. To achieve this objective, attention should be focused on effective integrated planning and development techniques that will lead to successful project.

the context of high performance, green or environmentally-sensitive construction practices (Montoyer, 2010). Based on the magnitude of global interest, one can consider sustainable construction a trend or revolution, depending on individual’s perspective. Before any further discussion on this topic, it would suffice to differentiate between sustainability and sustainable

construction and the context within which each is applied..

Gilman (1990) defines sustainability as “ability of a society, ecosystem, or any such ongoing system to continue functioning into the indefinite future without being forced into decline through exhaustion .... of key resources.”

Ruckelshaus (1989) explains it as “the [emerging] doctrine that economic growth and development must take place, and be maintained over time, within the limits set by ecology in the broadest sense – by the interrelations of human beings and their works, the biosphere and the physical and chemical laws that govern it ... It follows that environmental protection and economic development are complementary rather than antagonistic processes.” Another definition looks at sustainability as the “ability of a society, ecosystem, or any

The following terms describe specific techniques used in the assessment and application of sustainability within the context of built environment (Kibert, 2008):

- § Green Building
- § Building Assessment
- § Ecological Design
- § Life cycle Assessment
- § Life Cycle costing
- § High-Performance Building
- § Charrette

Sustainable construction has been defined in so many ways by different professional group. An analysis of these definitions points to the same objective of reducing construction impacts on the environment. The terms, “high performance”, “green”, and “sustainable construction” are often used interchangeably. A high-performance building is synonymous with green building. The U.S Office of Energy Efficiency and Renewable Energy (EERE) describes a high-performance building as one that ...”uses whole-building design to achieve energy, economic, and environmental performance that is substantially better than standard practice.” Green building has been

such ongoing system to continue functioning into the indefinite future without being forced into decline through exhaustion ... of key resources.”

(Gilman,1990). While any of the aforementioned definitions is acceptable, the most common and often cited definition is that offered by the World Commission on Environment and Development (WCED), otherwise known as Brundtland Commission. However, WCED (1987) goes further by adding “development” in its definition. It defines sustainable development as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (WCED, 1987, p8). Both sustainability and sustainability development address environmental, economic, and social factors.

defined in various, but related ways.

Examples include:

- A structure designed, built, renovated, operated, or reused in an ecological and resource-efficient manner (CalRecycle.ca.gov)
- A process of creating buildings and supportive infrastructure that reduce the use of resources, create healthier living environments for people, and minimize negative impacts on local, regional, and global ecosystems (Global Green USA)
- Quality and characteristics of the actual structure created using the principles and methodologies of sustainable construction ( Kibert, 2008).

Sustainable construction is a subset or component of sustainable development.

It focuses on the role of built environments in addressing the issue of sustainability. Within the context of built environment, sustainable construction focuses on the ecological, social and economic issues of a building.

According to Montoyer (2010), when the concept of sustainability is applied to the built environment, the entire process can be “viewed in the context of “green” or

environmental sensitive and conscious design and construction practices” (p.1). A healthy built environment based

The health and well-being of people are affected by the buildings in which we live and work. From the beginning of the era of construction technology, the construction industry has given little attention to the impacts of construction activities on the environment. As environmental issue becomes a global concern, it becomes apparent that construction and other building industries are major contributors to the problem. The extraction and manufacture of building materials cause pollution and degrade the land on which we live and play. Design and construction has tremendous impact on the environment and the natural resources. The construction and maintenance of affordable housing is no exception in terms of its resource consumption. Resource-conscious design is critical to sustainable construction, whose aim is to minimize consumption of natural resources and its impacts on ecosystem. In order to achieve the goal of environmental sustainability, any construction project must approach sustainability holistically. The primary

### **Sustainable Construction Practices in Developing Countries**

Sustainable construction practices in developing countries have not gained much expected momentum. Although many academic scholars have written on the need for more focused attention on sustainable construction practices, this campaign has yielded little or no result. This lack of attention or interest comes as no surprise since no single developing country has an established organization dedicated to the promotion of green building. However, recent developments point to a hopeful future of sustainable construction practices in Africa. A conference on “Promoting Green Building Rating in Africa” organized by the UN-Habitat at its Nairobi, Kenya headquarters was attended by building professionals from 20 countries across

on resource efficiency and smart ecological design is the major goal of sustainable construction.

objectives of sustainable construction are outlined by Kibert (2008, p. 6) as follows:

- Reduce resource consumption (reduce)
- Reuse resources (reuse)
- Use recyclable resources (recycle)
- Protect nature (nature)
- Eliminate toxics (toxics)
- Apply life-cycle costing (economics)
- Focus on quality (quality)

Additionally, any construction sustainability effort should focus on the following factors (Kibert, 2008, p, 58):

- Sustainable site development
- Water conservation and savings
- Energy efficiency
- Materials selection
- Indoor environmental quality
- Innovation and design process

Failure to meet any of the above objectives and factors will make any sustainable construction efforts inconclusive. A comprehensive coverage of the above subject matters is beyond the scope of this paper.

Africa. At the conclusion of the three-day conference, a declaration of commitment was made to “promote and foster green building practices in Africa, and a call to form an African Network of Green Building Council” (UN-Habitat, 2010).

Few scholars have voiced their opinions on the reasons why sustainable construction in Africa may be difficult to implement if certain factors are not considered. Adebayo (1999) took a critical look at sustainable construction in Africa. He agrees that sustainable construction has not received adequate attention in Africa. He argues that construction systems and techniques in Africa have been modeled on the experience of the developed nations. He further cited the argument of Taylor (1994) who questions the legitimacy of

any sustainable construction initiatives in Africa without understanding the broader issue of development. Adebayo (1999) further argues that “sustainable construction has to take place by understanding of the political, economic, social and developmental issues of a place, and that sustainable construction then becomes an integral part of sustainable development” (p. 1). Adebayo (1999) also revisited the WCED’s Brundtland definition of sustainable development. He argues that the application of the definition “may have worked in developed world but in the developing world and especially Africa, economic development has been paralyzed by poverty, war and an exhausting debt burden which leaves the future generation with a mammoth debt repayment problem, and disempowers it to respond to its present and future needs” (p. 1). He also alludes to other areas of environmental, economic, political, social, and policy issues that need attention before any meaningful

#### **Making a Case for Sustainable “Green” Affordable Housing**

There is no question about the need for adequate shelter in developing countries. The key issue is how to convince the stakeholders to buy-in into the concept. Knowing the mindset of most people, including the government about the introduction of new technologies or practices, one could argue that implementing green affordable housing in developing countries would require education and discipline among citizens, government and other stakeholders. For example, to truly implement sustainable buildings in Nigeria, Ogunlana (2006) stresses the need to provide “education and training to the [construction] industry, general public and the politicians” (p. 26). He recommends that a clear statement of project vision, goals, design criteria, and priority be developed.

sustainable construction practices can truly take place in Africa.

Miranda and Marulanda (1999) also state that sustainable construction practices have not received priority in developing countries. They argue that some government and other stakeholders have begun to rethink their views due to international pressure. They believe that responsibility for sustainability should not be relegated to the government and the construction industry only. It should be the responsibility of every citizen. Thus, everyone should be cognizant of his or her use of natural resources and the impact of such use on the environment. Majdalani, Ajam, and Mezher (2005) also argue that inadequate construction standards and lack of sound urban planning regulations or the enforcement of existing regulations further exacerbate environmental degradation. They call for more involvement in sustainable construction initiatives.

In addition to educating the masses and presenting the benefits of green housing (to be discussed later), it may be necessary to physically show what a green affordable housing looks like.

This means that one has to be constructed either by the government or by an independent developer. However, since there is no recognized green construction rating standard in Africa (except in South Africa), it may be impossible to determine if the project actually meets the necessary requisites to be considered green. Nevertheless, the idea right now is not to get the project “green” rated, but rather to ensure that the known objectives of sustainability are achieved.. Once the inhabitants begin to feel the difference in their living conditions, the viability of green housing will spread around.

The following are known benefits of green buildings (Shofoluwe, 2010)

- **Environmental Benefits**
  - Protect ecosystems & biodiversity
  - Improve air and water quality
  - Reduce solid waste

- Conserve natural resources
- Reduce harmful emissions
- **Economic Benefits**
  - Energy and water savings
  - Increased property values
  - Improved employee productivity and job satisfaction.
  - Reduced building operating cost

- **Social Benefits**
  - Improve quality of life of inhabitants
  - Enhance occupant comfort and health
  - Minimize strain on local infrastructure
  - Improve air, thermal, and acoustic environments

### **Planning and Development Considerations**

So much has been written about the quest for sustainable affordable or low-cost housing in developing countries. Literature review shows that most of the writing efforts in this area have been directed towards appropriate local construction material usage, policy issues, and the role of government. Few authors have focused on effective planning and development issues that must be addressed in order to make affordable housing construction project truly green. This is not surprising, however, since sustainable construction education has not been implemented in most universities. Even in developed

countries like United State of America, only few undergraduate construction management programs have included sustainable construction as part of the curricula. Research on sustainable construction practices are beginning to gain grounds in graduate education. In order to have a successful green construction project, we need to look at the similarities and differences between traditional and green construction delivery systems. Understanding the nature of each system will then enable us to concentrate on effective planning and development processes for green affordable construction.

### **Traditional Versus Green Building Delivery Systems**

Traditionally, construction project delivery systems fall into three major categories (in United States), including: Design – Bid – Build, CM – At – Risk (CMAR), and Design-Build. The characteristics of each are briefly discussed.

**Design – Bid – Build (DBB):** This is often referred to as a traditional contract system. This system involves three steps. The project owner selects a Designer (Architect) to design the project according to contract specifications. Invitation is then solicited from qualified general contractors to submit bid on the project. The lowest responsive bidder receives the award. To be considered responsive, the contractor must meet all the bid requirements of the project. The general contractor may award various phases of to project to the qualified subcontractors. The major advantage of the system is the relative low cost of the project to the owner due to the competitive bid process involved.

Disadvantages include the owner’s minimal involvement during the construction period, and miscommunications between project team members can often lead to uncontrollable amounts of change orders that can escalate project cost.

**CM – At – Risk (CMAR):** Under the CMAR contracting system, the owner contracts with the designer and construction management (CM) organization separately. The CM acts as a general contractor performing the work under a guaranteed maximum price (GMP). While the CM does not perform any work with its own workforce, it must carefully negotiate all subcontracts to ensure that the construction cost doesn’t run above budget. This risk of project cost overruns shifts back to the CM; hence the term “at-risk”.

**Design – Build (DB):** Sometimes referred to as design-construct, DB is a type of construction delivery system whereby a single firm enters into a single contract with the owner to perform both the

design and construction on the project. A major advantage of this delivery system is the application of the “fast-track” method of completing the project faster than the traditional design-bid-build method. Another advantage is the likelihood of reducing the typical design-construction conflicts often involved in DBB. DB also has proven to lead to improved quality since design and

construction activities are controlled by a single firm. The DB delivery system is very similar to the high-performance green building concept because of its collaboration between the design team and the construction team. For the high-performance green building to achieve its intended results, the design and construction phases must be closely collaborated.

### **High-Performance Green Building Delivery System**

In order to achieve its intended goals, green building delivery system must be approached differently from the traditional systems. Kibert (2008) states that “due to its adversarial nature, the hard bid delivery system is exceptionally difficult to employ for a green building project” (p. 81). For that reason, design-build has been the dominant contracting system for green building construction in United States. Several successful green building projects have been executed using design-build. However, Adebayo (1999) argues that any procurement systems used [in Africa] “should not focus on macroeconomic issues but should also embrace policies geared towards developmental needs” (p. 1). Masterman (1992) favors adoption of more logical approach to selection of the most appropriate methods of procurement system from various available options (Cited in Adebayo (1999). Adebayo (1999) further argues

that any selected procurement system must be specific to the location, project and community. He suggests incorporating cultural traditional methods into “conventional and non-conventional methods” (p.1). While the intentions of these arguments are well understood, their broad applicability in real sense is debatable. For public housing development, however, the involvement of the community is crucial, especially in green building development. To achieve its intended result, affordable green housing team must work closely together. This team must consist of a representative from the community. Every team member must understand its role and ensure clear communications about project requirements. Team members must possess unique qualifications in order to undertake true sustainable “green” projects.

### **Integrated Design Process for Affordable Green Projects**

As discussed earlier, the delivery system for green project is different from traditional delivery systems. In order to achieve the goal of environmental sustainability, a green project must use integrated approach. Instead of treating individual system separately, the entire operation must be treated holistically. As Montoya (2010) wrote, “A holistic, integrated approach – rather than the improvement of individual systems – allows project managers to evaluate the interrelatedness of impacts” (p.. 2). Leffers (2010) argues that using conventional process to execute green project will only inflate the cost of the project because unnecessary green

items will be included. Global Green USA (2007) also argues that for buildings to provide safe, comfortable, and affordable shelter, they must rely on a number of “systems” that address the building structure, ventilation, plumbing, temperature control, safety and durability.. It was further argued that these individual systems must be “seen as contributing to the overall building “ecosystem”, rather than as disconnected pieces and parts” (p. 14). For optimum success, affordable green housing project must begin with an Integrated Design Charrette. A Charrette is “an intensive, facilitated workshop that involves all team members ---- and aims

to create a clear vision for how the project will be developed, including how the green building elements will be incorporated" (Global Green USA, p. 17). Everyone involved in affordable green project should understand and apply the fundamental principles of sustainable design and green building. Kibert (2008) states that "integrated design process is characterized by early significant collaboration in design process --- [which] starts at the very beginning of the project and all team members have input on design decisions during the entire cycle of design" (p. 85). **Key Elements of Integrated Design and Construction Process**

The following are the key elements of integrated design and construction processes:

- **Make early decision - Decision should be made early whether to incorporate green building strategies. This should take place during conceptual phase of the project**
- **Set clear goals – Owner must set priorities and provide specific direction for the project and establish performance standards among project**

### **The Role of the Affordable Housing Developer**

Any discussion on planning and development of affordable green housing will be incomplete without discussing the role of the developer. This discussion is timely, considering the fact that most affordable housing scheme in developing countries, such as Nigeria, are undertaken by the government as the sole financier. With the expectation that change is inevitable and that individual developers will soon consider undertaking affordable housing construction programs in major parts of Africa, it would be justified in this paper to briefly discuss their role and expectations towards successful green projects.

Becoming a developer of affordable housing requires proper planning. There are certain factors that must be considered before making decision to engage in any form of affordable housing

team members

- **Select project team – Select qualified design team and the construction manager or design-build firm**
- **Form an Integrated Design Charrette to create a clear vision for the project**
- **Encourage collaboration – involve all stakeholders involved early in the project. This will give all participants in the Charrette a sense of belonging and ownership in the outcomes**
- **Make commitment – Emphasize the importance of following green construction principles**
- **Encourage feedback from project team members.. Use the feedback to review and refine project goals**
- **Analyze cost – Review cost periodically to justify green integration**
- **Execute the design process – This should include the schematic design, construction documents, and all necessary documentation of green building measures.**
- **Construct the building – The project should be constructed following the principles of sustainable "green" construction practices.**
- **Commission the building – The building should be commissioned and handed over to the owner.**

business. The following questions must be answered first to assess the developer's state of readiness:

- **Is single family affordable housing development part of the organization's mission?**
- **Does the organization have the necessary capacity to engage in affordable housing projects?**
- **Does the organization have knowledge of issues involved in sustainable affordable housing development?**

Once the above questions have answered affirmatively, the developer must examine the Strategic Planning, Project Design, and Project Planning issues. Developing a strategic plan is critical to success in any business. It is recommended that an experienced consultant be engaged to assist in

developing a strategic plan, especially for local developers with no experience in the area. During strategic plan brainstorming session, it is essential for the developer to revisit its mission statement. Is the organization experienced in affordable green projects? If not, does its leadership want to broaden role and revise mission? What are the strengths and weaknesses of the organization? To complete an effective strategic plan, the developer must complete A SWOT (STRENGTHS-WEAKNESSES-OPPORTUNITIES-

### **Conclusion**

Housing plays an important role in improving the health and quality of lives of people. The health and well-being of people are affected by the buildings in which we live and work. Government should do more to provide decent and sustainable affordable housing to the low-income masses. In order to embrace the concept of sustainability, sustainable affordable housing should be planned, designed, and developed using Integrated Design Process where the entire building systems are considered holistically, rather than individually.

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THREATS) analysis. Building sustainable affordable housing project poses key challenges. As an affordable housing developer, one must have knowledgeable staff to assist in carrying out various responsibilities. For a developer to accurately assess its ability, it must candidly examine its business management skill to coordinate complex tasks. It must also be financially disciplined. Where partnership is involved, the organization must be able to handle conflicts and manage risk effectively.

Developing countries must also begin to evaluate the possibility of establishing a Green Building Commission whose initial purpose will be to develop green building rating system for the country.

It takes special skills and knowledge to undertake any kind of green projects. Thus, green affordable housing developers must be knowledgeable in different construction delivery systems, and must possess strong management skill to undertake complex housing projects.

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