# Sustainable Real Estate Development in Kenya: an Empirical Investigation

**Catherine KARIUKI, Nicky NZIOKI and Jennifer MURIGU, Kenya**

**Key words**: sustainable design, green building, sustainable development, building rating systems, real estate, LEED, renewable resources.

**SUMMARY**

The introductory section of the paper starts off by discussing the concept of sustainability and the current building ratings systems applicable in varied attempts to classify buildings and their various aspects of sustainable building operations to qualify to be labelled as green buildings. A sustainable building maximises operational efficiency while minimizing environmental impact.

It goes on to explain the various fundamental measures that are critical to incorporate in sustainable real estate development including the Leadership in Energy and Environmental Design (LEED) launched in March 2000. The critical features of a sustainable building are taken to include the following; low operational energy, low carbon emission, use of renewable resources, little or preferably no waste, low maintenance, high durability and the use of appropriate technology.

The paper further goes on to present observations and results gathered through a field survey of several commercial developments in Nairobi City within the Nairobi City County in Kenya. . The purpose of the field survey was to ascertain the extent and level of incorporation of the key LEED factors and the sustainable building features in the selected buildings.
The paper concludes with a brief description of the various degree courses in the Department of Real Estate and Construction Management (RECM) on the training to promote green building and sustainable buildings especially the incorporation of LEED for existing buildings: operations and maintenance at the University of Nairobi (UON).

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## 1. INTRODUCTION

Sustainable real property development discussions are growing in importance in the advent of global warming and climate change. The interest is from all sectors, from the developer, the regulators and the occupiers. From research done it is apparent that buildings have a profound effect on the environment and changes in all stages of development, however small will have an impact on global warming. The building sector contributes up to 30% of global annual green house gas emissions and consumes up to 40% of all energy. Given the massive growth in new construction in economies in transition, and the inefficiencies of existing building stock worldwide, if nothing is done, greenhouse gas emissions from buildings will more than double in the next 20 years. Therefore, if targets for greenhouse gas emissions reduction are to be met, it is clear that decision-makers must tackle emissions from the building sector. Mitigation of greenhouse gas emissions from buildings must be a cornerstone of every national climate change strategy. The world's governments can successfully tackle climate change by harnessing the capacity of the building sector to significantly reduce GHG.

Sustainability property development means integrating the decision making process across your organization, so that every decision is made with an eye to the greatest long term benefits. It means eliminating the concept of waste and building on natural processes and energy flows and circles recognizing the interrelationship of our actions with the natural world.

Every aspect of the property cycle is affected by sustainability and those involved at the different stages need to consider its implications. Their decisions will also have effects on other stages and especially the developers. Sustainability means asking questions from the acquisition of the site stage (in relation to location to the effects to the neighbourhood). In the design stage, will the development incorporate "green buildings".

At the construction stage sustainability will be ascertained when the effect of the construction activity on water courses and on neighbours to the scheme are considered. What happens to the waste generated by contractors?

At the occupation stage, are tenant's or occupier's needs captured? Could 'green lease' be relied on to reduce environmental damage? Are effective environmental and building management systems in place? For the investors the questions asked will include what is the obsolescence risk of the building? Are environmental issues considered as components of a prime property? What are the value implications of "green specifications?

Owillah (2013) established that stakeholders in Nairobi, Kenya, in the residential development, who include professionals and the occupiers of the units are informed of the concept of sustainable development. They all thought sustainable property development is the way to go. However one of the challenges noted was that sustainability is unaffordable, This is was from the information gathered from the professionals and the occupiers.

Green building refers to a structure that is environmentally responsible and resource efficient throughout a building's life-cycle; from siting to design, construction, operation, maintenance, renovation and demolition. The practice expands and compliments the classical building design concerns of economy, utility, durability and comfort. Green building is simply the practice of creating structures and using processes that are environmentally responsible and resource efficient throughout a building life cycle from sitting to design, construction, operation, maintenance, renovation and deconstruction. This practice expands and complements the classical building design concerns and economy, utility, durability and comfort.

Green buildings also known as sustainable building are supposed to emit fewer greenhouse gases; consume less energy, use less water and offer occupants healthier environment than the typical buildings. The green building uses salvaged, recycled or low carbon materials and

they support rain water harvesting, bicycle commuting, solar heating, natural ventilation and other environmentally friendly practices (UN-Habitat, 2010). Green buildings are said to be expensive to construct but there is now evidence that the benefits maybe more than the capital costs incurred. The Commonwealth of Pennsylvania Department of Environmental Protection has two buildings that remove the myth that Green Buildings always cost more.

## 2. FUNDAMENTALS MEASURES

There are fundamental measures that are critical to incorporate in sustainable real estate development. The critical features of a sustainable building include the following: low operational energy, low carbon emission, use of renewable resources, little or preferably no waste, low maintenance, high durability and the use of appropriate technology.

Five elements and principles of Green building have been identified by the Governors Green Government Council in the United States of America. These are sustainable site, water efficiency (quality and conservation), energy efficiency atmosphere, Indoor Environmental quality (IEQ, materials and resources). A sixth element was also identified by the United States Green Building Council (USGBC) through the Leadership in Energy Environmental Design (LEED) launched in March 2000. The following discussion is mainly from the Fundamental Principles of Green Building and Sustainable Site Design by the Governors Green Government Council.

### 2.1 Sustainable Site Design

Sustainable property development starts with site planning and selection. There are at least ten strategies and technologies that were recommended by Governor's Green Government Council. This will incorporate efforts to minimize urban sprawl and needless destruction of valuable land, habitat and green space. To this end that space already occupied by buildings should be used more efficiently, renovating and expanding the useful life of existing buildings rather than new construction. Where construction of new buildings is evitable, avoid sites that play a key role in the local and regional ecosystems. Go for higher density development to reduce urban sprawl. It also includes issues of landscaping, site orientation that take advantage of solar energy, natural day lighting, natural breezes and ventilation. The use of

mass transport methods and the construction of buildings that are pedestrian and bike friendly are also important in this strategy. There is also the need to reduce the urban heat island effect by using paved areas that are already available and use of light coloured roofs and provision of natural shading of buildings etc. Finally use of site storm water and water recharge and landscape design that restores the region's natural habitat and heritage and reduction of night time illumination to deal with pollution.

### 2.2 Energy Efficiency and Environment

The need to reduce energy load and increase efficiency is vital in sustainable property design. The inclusion of solar panels in the design and the effective window placement/day lighting can provide more natural light and reduce the use of electric lighting during the day. In this principle it is recommended that the design of the development should as much as possible minimize adverse impacts on the environment through optimized building siting, optimum building design, material selection and aggressive use of energy conservation measures. This should result in a building performance that does not exceed the international Energy Code (IEC) compliance level by 30% to 40% or more. To minimize the adverse effects of the environment, there is the need to use renewable sources of energy, like solar and wind power. The use of energy saving bulbs, efficient ventilation and air conditioning systems, plumbing and water heating equipment should also be considered.

### 2.3 Water Conservation and Quality

The demand for water is increasing at an alarming rate, especially in urban areas. A sustainable building should reduce, control and recycle water. To be able to do this, it was recommended that there is the need to preserve the existing natural water cycle and design site. The main interest is the retention of storm water and on-site infiltration and ground water recharge. The design of buildings should take into consideration more environmentally preferable design for the site and storm water. Indigenous and drought resistant and hardy trees can also be used to conserve and preserve site and water quality. Grey water can be used for site irrigation etc.

### 2.4 Indoor Environmental Quality (IEQ)

It has been stated, the quality of the indoor environment has a significant impact on the wellbeing and the health of the building occupier. The design in this case should provide the best conditions in indoor quality by using building materials, finishes etc that do not generate, contain or release gaseous contaminants.

Ventilation and natural lighting can be improved by the provision of operable windows. Indoor air conditions should also be monitored. The building should also provide thermal comfort. Meaning that the design must respond to seasonal changes. From a property manager's perspective, smoking should only be allowed in designated areas. It was also noted in this principle that contamination during construction should also be prevented. At the maintenance stage, routine cleaning should be done with biodegradable and environmentally friendly cleaning agents.

### 2.5 Conservation of Building Materials and Resources

The materials used in the building should be environmentally friendly. The need to maximize the use of reusable and renewable and sustainably managed, bio-based materials and reduce use of non-renewable materials would be a way of conserving building materials. Materials that are certified green include lumber from forests that are sustainably managed, renewable plant materials like bamboo, straw, recycled stone, and metal and other non-toxic materials.

Within this principle there was also recommended the need to have a construction waste reduction plan. This is to eliminate waste during the construction period. It was also noted that where possible, the construction team should use locally available materials to reduce on transportation, energy use and emissions.

### 2.6 Innovation and process design

In this particular case the design team and projects have the opportunity of being awarded points for exceptional performance above the requirements set by the LEED Green Building Rating System and/or innovative performance in Green Building categories not specifically

addressed by the LEED Green Building Rating System (USGBC, 2002). LEED has developed a checklist of activities or elements that contribute to a building being green and credit/points contribution

## 3. ENHANCING GREEN BUILDING IN KENYA

In Kenya, several new buildings owned by large corporations have embraced the idea of green development. Whether they meet all the requirements of a green development has been debated in the media and the academic circles. These buildings include The Coca Cola Building in Upper Hill, The Standard Chartered Building in Riverside and a building in the UNEP headquarters among others. The National government in Kenya took the initiative of environmental protection by enacting the Environmental Management and Coordination Act of 1999. Other legislation is not specific in environmental protection.

### 3.1 Findings

In this section the paper presents observations and results gathered through a field survey of some commercial developments within Nairobi City, Nairobi City County in Kenya. The empirical survey was conducted based on non Kenyan codes, that is the LEED Green Building Rating System (USGBC). The purpose of the field survey was to ascertain the extent and level of incorporation of the key LEED factors and the sustainable features in the selected buildings. Two buildings were chosen for this study, the Standard Chartered building and the Coca Cola Plaza in Nairobi. Observations were made to see how sustainable the two buildings are. The discussions on the findings is made in the following paragraphs.

The Standard Chartered of Kenya Headquarters building is one of the newest buildings in Kenya. It claims to be the first environmentally friendly building in Kenya. It is designed to achieve the Leadership in Energy and Environmental Design (LEED) certification. LEED is an internationally recognised green building certification system that ensures that buildings are designed, constructed and operated with high environmental standards. It has 14 floors which according to Ochieng (2011) cost US$36m (or Kshs. 3.3 billion). Ochieng (2011) also states that the Standard Chartered Bank Headquarters building is rated as environmentally sustainable under the policy of the Standard Chartered Plc Global Office Workplace

Standards, which are a clearly defined set of standards for all the group's new buildings worldwide. In March 2012, the Bank won a Green recognition from the Kenya Association of Manufacturers.

The Coca-Cola Plaza, the other building looked at was completed in August 2008. It serves as the regional head office for the giant firm, supervising activities in 27 countries in Africa. It was built at a cost of $10 million (Sh870 million), the building is said to be one of the greenest in the region. Looking at the different parameters the following observations were made of the Standard Chartered building in Kenya and the Coca Cola Plaza

### 3.1.1 Sustainable Site Design

The location of the development was another concept considered as important in sustainable property development. The idea that places of work should be near places of residence to reduce on travel time and therefore carbon emissions into the environment. The Standard Chartered Building is located along Chiromo road in an area not far from many up-market properties. It was not established where the employees reside, but more benefit will come to the customers, who are more than the employees. These customers drive and are likely to live within a few kilometres of this development.

The criticism against the site was that the location of the building is in what was once a residential zone. Though it has now changed to commercial zoning, the width of the roads have not been widened to take care of the increased traffic. The water and sewerage services are also under pressure and have each building drill a borehole depleting the already challenged water resources.

The Coca-Cola building is in upper Hill area of Nairobi. It has close proximity to commuter transport system. This means that employees and visitors can use public transport, reducing the number of cars used and eventually reducing pollution.

### 3.1.2 Energy Efficiency, Environment and Water Conservation and Quality

In terms of energy and water efficiency, the building developer of the Standard Building used solar panels, motion sensors and double glazing fixed on the building to minimizing energy consumption which is one of the characteristics of green buildings. The use of solar panels being main the source of energy, means it reduces the use of power energy and consequently the electricity bills.

It was also established that there is water conservation. The rain water is harvested and used in the building. Water is recycled and used in the rest rooms. As far as indoor environment is concerned there is natural lighting and ventilation for the building. The natural lighting and natural extraction of foul air is important for the wellbeing of employees and customers. It was however noted that circulation of air on the upper floors seems inadequate because the design did not provide for space between the roofing and atrium. The other aspect of the building that was criticized for was that the second glazing did not allow a good view of the outside. The second glazing also contributed to unwanted heating of the building especially during the hot months.

The solar panels, in the Coca-Cola Plaza have been installed to provide solar energy for heating water for use in bathrooms and kitchens. On the roof top is a lawn whose purpose was to reduce 'heat gain' into the office. This control of heat minimizes the use of mechanical cooling system, and fits in with the idea of green building. According to one of the managers, the company has been saving 30% on its power bill since it relocated to the Coca Cola Plaza.

The same reduction in bills is seen for water, as a result of rain water harvesting. Rainwater harvesting techniques with a capacity to hold 50,000 litres of water have been included. The water is used in the health club and in the lawns around the office. To control the consumption of water, the bathroom taps are fitted with hydro sensors that dispense water automatically when there is one wants to use the water.

The Coca Cola building, was however, criticized on the use of a generator as an alternative source of energy to the National Electricity Grid. It was expected that solar energy would have been used.

### 3.1.3 Indoor Environment Quality

The key principle here is the provision of a healthy, comfortable and productive indoor environment for occupants and visitors. It was established that the Standard Chartered building has a central atrium that allows a lot of light into the building and also assists in the general circulation of fresh air. It was however suggested that a gap should have been provided for between the roofing and the atrium to enhance air mixing and a better working environment. Indoor pollution is ranked (by the Environmental Protection Agency) among the top five environmental risks. The green wall also denies the occupants beautiful views of the University of Nairobi, thus reducing their IEQ.

The design of the Coca-Cola building is such that natural lighting is adequate throughout the day. It has wide, clear windows with a north/south orientation to allow natural lighting to filter in while keeping direct heat away from the building and eliminating the need for mechanical air conditioning system. The lighting systems near windows are fitted with photo sensors which enable them to switch off automatically once they detect enough external lighting during the day. The window panes are made to minimize heat gain and diffuse light inside the offices. There are photo sensors in the drive way that turn on when the sunsets.

There is also provision of the smoking zone. There was however evidence that roof top lawn is sometimes used as the smoking zone.

### 3.1.4 Conservation of Building Materials and Resources

The building materials used in sustainable property development should be environmentally friendly and minimize impacts of global warming, resource depletion and human toxicity. Materials considered green include lumber from forests that have been certified to a third

party forest standard, rapidly renewable plant materials like bamboo, stone, recycled stone and metal, baked earth, rammed earth etc. (USGBC-LEED, 2002)

For the Standard Chartered Building, the outside wall of the building is covered with glass. For management purposes keeping the walls clean is a challenge. From a maintenance point, the building proofed difficult to clean, especially the external facade. This may proof expensive in the long run.

The restrooms have sensing water faucets. The water comes out when one wants to use and closes immediately after use. Large tiles were fixed in rest rooms for easy cleaning. Most of the office floor was carpeted. The cleaning uses chemical which may not be friendly to the environment. Carpets also contain fumes that affect the quality of indoor air. Bamboo and cork, according to many researchers are cheaper than ordinarily wood which is a better floor finish and have no effects on the environment.

The roof top of the Coca Cola building is a lawn, whose main purpose is reduction of 'heat gain' into the offices. The Coca Cola building was constructed after the demolition of another building. If they were truly environmentally sustainable, they would have used some of the materials from the demolition, which they did not.

### 3.1.5 Design of the Building

The Standard Chartered building has an open plan design. The design can accommodate any changes because the walls can be adjusted. The rooms are spacious enough and every employee can have the required space as per the prescribed standards for each individual. Generally the building gives the employees a good working environment since it can stand extreme weather conditions.

Coca Cola Plaza is built in a circular form to maximize on the utilization of space and create an orientation that does not allow much sunlight into the building as well as boosting good

ventilation to the offices. The lawn on the rooftop allow for a recreation space for employees and reduced heat gain into the office.

## 4. SUMMARY OF THE SURVEY

It was concluded that the Standard Chartered and the Coca Cola buildings have incorporated some aspects of green and sustainability. There were however several aspects of a green buildings that were not captured. To achieve full benefits of green buildings technology there is need to work on the improvements. It is necessary to consider the needs of all the stakeholders. The building must be in the right location, it must incorporate all green building design consideration at all construction stages. It must provide a good working environment, ensure that the operating costs are reduced significantly, that there are reduced maintenance costs, lower waste disposal costs, lower environmental impacts, higher visibility and marketability, increased value of the building, better tenant and worker attraction, decrease in absenteeism and higher productivity.

### 4.1 Green Building Services and Comprehensive Building Sustainability Audit in degree programmes at the University of Nairobi

Teaching at the University of Nairobi to both undergraduate and postgraduate students in the Department of Real Estate and Construction Management is conducted on the Introduction of LEED, Green Building Services and Comprehensive Building Sustainability Audit. This involves an introduction to Green building services, Energy benchmarking and the Features of LEED. Purpose of LEED to evaluate environmental performance from a whole building perspective over a building's life cycle, providing a definitive standard for what constitutes a green building in design, construction, and operation. Introduction to the LEED rating systems designed for rating new and existing commercial, institutional, and residential buildings. Organization of each rating system into 5 environmental categories: Sustainable Sites, Water Efficiency, Energy and Atmosphere, Materials and Resources, and Indoor Environmental Quality. An additional category, Innovation in Design (or Operations), addresses sustainable building expertise as well as measures not covered under the 5 environmental categories. Introduction to LEED Curriculum, and the promotion of efforts to

develop LEED Kenya for Existing Buildings: Operations and Maintenance Green Building Rating System.

The Department of Real Estate and Construction Management offers teaching to registered postgraduate students in the course code BBE 533 on Maintenance Technology for the degree of Master of Arts in Construction Management and the course code BLE 508 on Environmental Impact Assessment for the Master of Arts degree in Valuation and Property Management. At the undergraduate level the teaching and conducting seminars in course code BBE 407 in Building Maintenance Technology for the Bachelor of Quantity Surveying including the course code BLE 407 on Building Maintenance Management and the BLE 406 Building Maintenance Management for the Bachelor of Real Estate. For the registered undergraduate students in the Bachelor of Construction Management the course code BCM 314 on Construction and Environment is taught to expose the students to achieve improved environmental performance in buildings and construction practices.

## 5. CONCLUSION

There is an urgent need to promote green building services and comprehensive building sustainability audits in all real estate developments undertaken in the urban centres in Kenya. The teaching of relevant courses to promote green building practices needs to be given more priority in all aspects of the built environment training programmes. There is indeed the need to enhance the efforts to promote the operation of the Kenya Green Building Council together with other partners willing to spear the development of an appropriate green rating system applicable to the local economy. The government can promote sustainable real property development by educating the public on sustainable development practices and through the introduction of various forms of incentives on the sale and the adoption of environmentally sensitive materials.

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## BIOGRAPHICAL NOTES


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