

THE GREENMARK STANDARD FOR GREEN BUILDINGS



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Final Draft



GREENMARK - A TOOL FOR RATING AND CERTIFYING GREEN BUILDINGS

FINAL DRAFT

Report compiled by Nickson Otieno (Consultant)



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The development of GreenMark Standard for Green Buildings (in short "GreenMark") was originally initiated by Green Africa Foundation (in short "GAF"). A Technical Committee (TC) developed the Standard with oversight by the GreenMark Standards and Certification Board (GSCB). We extend our deepest gratitude to individual GreenMark Board and technical committee members who participated in the development of this rating tool for their tireless volunteer spirit, efforts and constant support. Special thanks to the following institutions for allowing their staff to participate in the development of this tool: Kenya Bureau of Standards; Kenya Building Research Centre (KBRC) of the State Department of Housing and Urban Development; Climate Change Directorate of the State Department of Environment; National Construction Authority (NCA); National Environment Management Authority (NEMA); Energy Regulatory Commission (ERC); Kenya Institute of Curriculum Development (KICD); Kenya Medical Research Institute (KEMRI); Ministry of Health; Kenya National Accreditation Service (KENAS); Architectural Association of Kenya (AAK); Institution of Engineers of Kenya (IEK); County Governments of Nairobi, Makueni and Kiambu; University of Nairobi, Jomo Kenyatta University of Agriculture and Technology (JKUAT); Jaramogi Oginga University of Science and Technology (JOOUST); Mutizo Menezes International; Gopal Engineering International; Trine Architects; Archispace Architects; Technarch Consultants and the Slum Dwellers International Kenya.

We greatly appreciate the tireless active participation of Mr. Nickson Otieno (NIKO GREEN LTD) whose secretarial responsibility and technical expertise as a Consultant went a long way in enabling the realization of this Standard.

GreenMark is informed by the following existing rating tools: Australian Green Star and EnviroDevelopment systems; South African Green Star; US Leadership in Energy and Environmental Design (LEED), Building for Environmental and Economic Sustainability (BEES), Living Building Challenge and WELL Building Standard; Malaysian Green Building Index; UK British Research Establishment's Environmental Assessment Methodology (BREEAM); India's Green Rating for Integrated Habitat Assessment (GRIHIA); Singapore's Green Mark; Chinese Evaluation Standard for Green Buildings and the Israeli Sustainable Building Standard; which have been extensively modified for the Kenyan application. Grateful acknowledgment is made to the owners of copyright for these systems for use of their documents, information and materials in the development of the GreenMark.

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Thank you all.

Arch. Alan Simu, Chairman, GreenMark Standards and Certification Board

Foreword:

Photo of CS MoTIHUDPW

The Kenyan constitution guarantees the rights to *“a healthy and clean environment, accessible and adequate housing and reasonable standard of sanitation to every citizen.”* These rights are enshrined in the country’s development blueprint – the Vision 2030 which identifies building and infrastructure development as key pillars. This vision has been captured in the Country’s Green Economy Strategy and Implementation Plan 2016-2030 (GESIP) and the National Climate Change Action Plan which guide the country’s transformation to an inclusive green economy anchored on a low-carbon climate, resilient development pathway.

Photo of CS Environment and Forestry

The Government recognizes the critical role of the built environment in addressing climate change and environmental degradation. To this end, it has identified and empowered the Kenya Building Research Centre to champion and coordinate the government’s green building agenda in relation to climate change mitigation and adaptation as stipulated in the Centre’s Strategic Plan (2017/2018 – 2021/2022). Some of the Center’s key action areas include: development of green building policy, regulations and guidelines; mainstreaming green building principles in building design and construction; and, conducting research on climate resilient and sustainable building construction materials and technologies. These will contribute to the realization of **the government’s target of having 75% of new and renovated public and private large scale buildings as green by 2030.**

The realization of these targets requires structured and sustained partnerships between the government, private sector, the academia and multilateral organizations as demonstrated in the development of this Standard. We commend the Green Africa Foundation for taking the initiative of mobilizing key stakeholders to develop a homegrown’ Kenyan Standard for rating and certifying green buildings in Kenya.

We look forward to a stronger collaboration with the Foundation and all stakeholders involved in the ‘GreenMark Standard development in developing a National Green Building Policy as well as mainstreaming green building requirements in the ongoing review of the built environment policies and the Big Four Agenda for Development,

TO BE FINALISED

Cabinet Secretary,
Ministry of Transport, Infrastructure, Housing, Urban Development and Public Works

Cabinet Secretary,
Ministry of Environment and Forestry

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Executive Summary

The building and construction sector is a key sector for sustainable development. From a global perspective, this sector typically provides 5% to 10% employment nationally and generates between 5% and 15% of a country's GDP. Moreover it provides housing, mobility, water and sanitary infrastructures, and it represents the physical context for social interactions as well as economic development at the micro-level. (1) At the same time, the built environment is responsible for significant environmental damage. The sector accounts for the largest share in the use of natural resources, by land use and material extraction. The industry consumes some 40% of the world's fossil energy, 25% of forest timber and 16% of the world's fresh water (2). In 2010, the world's buildings accounted for 19% of all greenhouse gas (GHG) emissions (3) and 24% of the total GHG emissions deriving from fossil fuel combustion, second only to the industrial sector. In East African countries, the share of final energy consumption of the building sector is well above 60% (4). The building sector must therefore do its part in achieving the goal of reducing GHG emissions and resource depletion. This requires a radical transformation of the methods of designing, constructing, operating and decommissioning buildings. There is a growing global consensus that 'green building' or 'sustainable architecture' is a useful approach to achieving this transformation. The establishment of rating systems and tools which set a common language and best practice standard of measurement for green buildings is key in promoting green buildings.

The GreenMark Standard for Green Buildings provides a localized benchmark and guideline for assessing extent to which the development of new and existing buildings address climate change and environmental degradation. It highlights best practices in building design and construction, operation and maintenance so as to reduce or eliminate the adverse weather and environmental impacts on both the building and occupants. The Standard will provide a basis for assessing the sustainability performance of existing and new buildings holistically over the entire life cycle, thereby providing a definitive standard for 'greening buildings'. It also considers the fact that greening of buildings has a role in achieving sustainable development in Kenya and the Africa region given that shelter is a basic human need.

The Standard was initially conceived and developed by Green Africa Foundation in 2011 as the 'Green Africa Building Standard' which has been modified to the 'GreenMark' Rating Tool after a broad stakeholder consultation and incorporating various modifications by technical experts convened under the standing Technical Committee and independent GreenMark Standards Board. It takes into account the provisions of the Building Code, National Building Regulations 2014, the Physical Planning Act 2012, the Energy Management Regulations, the Environmental Management and Co-Ordination Regulations, the Environmental (Impact Assessment and Audit) Regulations 2003 and other local standards and laws and international codes. The system, by its qualitative and quantitative assessment criteria, would be able to 'rate' a building on the degree of its 'greenness'. The rating will be applied to new and existing building stock of varied functions – commercial, institutional, and residential.

On a broader scale, this Standard, along with the activities and processes that lead up to it, will benefit the Country at large with the improvement in the environment by abating GHG (greenhouse gas) emissions, improving related resilience of buildings, systems and occupants to effects climate change & variability, improving water and energy security, reducing the stress on natural resources, improving health by among others reducing exposure to environmental health risks associated with air and water pollution and supporting sustainable household, institutional and local livelihoods and economic development.

Internationally, voluntary green building rating systems have been instrumental in promoting sustainable design. However, most of the internationally devised rating systems have been tailored to suit the building industry of the country where they were developed. In Kenya the US based LEED rating system has been applied in rating a number of buildings, guided by individual accredited LEED professionals. The South African rating system, the Green Star SA, is being promoted by Kenya Green Building Society (KGBS) since 2015. Keeping in view of the Kenyan unique climatic and socio-economic conditions, a Kenyan Standard for Green Buildings is critical if the country is to transition to a truly low-carbon, climate-resilient and sustainable development pathway. In this regard, the initiatives of Green Africa Foundation and the Architectural Association of Kenya (AAK) are pioneering. AAK has convened a team of experts drawn from its Environmental Design Consultants (EDC) Chapter since 2014 to develop the association's local green building rating tool known as the 'Safari Green Building Index'.

The GreenMark Rating System has been developed with consideration for all kinds of building in varying climatic zones of the country. The Standard is organized into two major sections. The first section, provides an introduction covering the purpose, history, ownership and benefits of the standard as well as a synopsis of the GreenMark rating system, A second and the main section of the Standard prescribes the categories, characteristics and rating system used to award a certificate to all types and sizes of buildings which incorporate building materials, technologies and practices that are environmentally sustainable. Each category includes a background description on the Kenya context and the relevant statutory requirements that are considered mandatory prerequisites to qualify for a GreenMark rating and certification.

The category on Sustainable Site Planning and Development (SS) includes strategies and provisions for preserving the building's surrounding ecosystem. Sustainable Materials and Appropriate Technology (MT) category recommends environmentally responsible/friendly materials and products and resource efficient building technologies that minimize natural resource use and thus limit negative environmental impacts from material extraction, processing for use in building construction. Renewable Energy and Energy Efficiency (EE) category recommends use of cost-effective, energy from clean energy sources and energy-efficient appliances, fittings and systems in buildings to reduce the total energy consumption which reduces greenhouse gas emissions as well as the burden on energy supply systems. Water Efficiency and Safety category (WE) seeks to manage water sustainability by reducing the amount of potable water used in the building and reducing the burden on the municipal wastewater system. Healthy Indoor Environment category (HE) recognizes and encourages a healthy internal environment through the specification and installation of appropriate ventilation, equipment and finishing. Building Operation and Decommissioning category (OM) aims at optimizing the intended use of the building within its lifecycle. Finally, the Innovation category (IN) encourages the use of other exceptional green features above the requirements set by GreenMark rating system.

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The GreenMark is not intended to abridge safety, health, environmental or related requirements contained in other applicable laws, codes or policies administered by relevant public authorities. Where there is a conflict between a requirement of this Standard and such other laws affecting the design and construction of the building, precedence shall be determined by the relevant responsible authorities.

List of Acronyms and Abbreviations

Acronym	Full Name
AAK	Architectural Association of Kenya
ACE	Air Change Effectiveness
ACH	Air Change Hour
AMCEN	African Ministerial Conference on the Environment
APHRC	African Population and Health Research Center
ARI	Acute Respiratory Infections
AUA	Africa Urban Agenda
BEI	Building Energy Index
BEES	Building for Environmental and Economic Sustainability
BMS	Building Management Systems
BREEAM	British Research Establishment's Environmental Assessment Methodology
CEEC	Centre for Energy Efficiency and Conservation
EI	Energy Efficiency Index
EHIA	Environmental Health Impact Analysis
EIA/EA	Environmental Impact Assessment and Audit / Environmental Audits
EIK	Environment Institute of Kenya
EMCA	Environmental Management and Coordination Act 2009 revised
EMS	Environmental Management Systems
ERC	Energy Regulatory Commission
ETS	Environmental Tobacco Smoke
GAF	Green Africa Foundation
GESIP	Green Economy Strategy and Implementation Plan 2016-3030
GRIHIA	Green Rating for Integrated Habitat Assessment
GSCB	GreenMark Standards and Certification Board
HEI	Healthy Indoor Environment
IAQ	Indoor Air Quality
IEK	Institution of Engineers of Kenya
IN	Innovation
JKUAT	Jomo Kenyatta University of Agriculture and Technology
JOUST	Jaramogi Oginga University of Science and Technology
KAM	Kenya Association of Manufacturers
KBRC	Kenya Building Research Centre
KDHS	Kenya Demographic and Health Survey (2014)

KEBS	Kenya Bureau of Standards
KEFRI	Kenya Forestry Research Institute
KEMRI	Kenya Medical Research Institute
KICD	Kenya Institute for Curriculum Development
KIRDI	Kenya Industrial Research and Development Organization
KENAS	Kenya National Accreditation Service
KFMB	Kenya Federation of Master Builders
KGBS	Kenya Green Building Society
LCCA	Life Cycle Cost Analysis
LECRD	Low Emission and Climate Resilient Development project
LEED	Leadership in Energy and Environmental Design
MEA	Multilateral Environmental Agreements
MEF	Ministry of Environment and Forestry
MTIHUD	Ministry of Transport, Infrastructure, Housing, Urban Development and Public Works
NUHDSS	Nairobi Urban Health and Demographic Surveillance System
NEMA	National Environment Management Authority
NEPAD	New Partnership for African Development
NCA	National Construction Authority
NCCRC	National Climate Change Resource Centre
NLA	Non-living Areas
NRW	Non-Revenue Water
PV	Photovoltaic
POE	Post Occupancy Evaluation
QMS	Quality Management Systems
SDHUD	State Department for Housing and Urban Development
SS	Sustainable Site Planning and Development
TC	Technical Committee
UoN	University of Nairobi
UNDP	United Nations Development Programme
USAID	United States Agency for International Development
VOC	Volatile Organic Compounds
WHO	World Health Organisation
WSCSD	World Student Community for Sustainable Development

Definition of Terms

A **green building**, synonymous with sustainable building, is a structure that is designed, built, renovated, operated, or reused in a resource-efficient manner. Green buildings are designed to meet certain objectives such as protecting occupant health; improving employee productivity; using energy, water, and other resources more efficiently; and reducing the overall impact of the environment.

Green building (development) is the practice of creating structures that significantly reduce or eliminate the negative impact of buildings on the environment and occupants.

Buildings mean the physical building systems and the people who design, build, and occupy them.

Building Energy Index (BEI) or sometimes known as **Energy Efficiency Index (EEI)** is the ratio of total energy usage (kWh) in the building per year to the area of the building (m²)

Cogeneration means the production of electricity and heat in one single process for dual output streams

Contaminant – is defined as a solid, liquid or gaseous substance in, or on the ground to be covered by the building, which is classed as a hazard and therefore presents an unacceptable risk to human health and the environment

Decommissioning: the cessation of operations and the controlled process of safely retiring a facility from service.

Energy audit - means an inspection, survey and analysis of energy flows for the purpose of energy conservation in a building, process, or system to reduce the amount of energy input into the system without negatively affecting the output;

Energy Efficiency of a building is the extent to which the energy consumption per square metre of floor area of the building measures up to established energy consumption benchmarks for that particular type of building under defined climatic conditions.

Energy conservation - refers to the efforts leading to a decrease/optimize in energy consumption;

Energy Management – refers to the systematic use of practices and technology to improve an organisation's energy performance.

Energy savings - means the reduction of energy units consumed per unit of production or per square foot.

Greywater recycling – refers to the appropriate collection, treatment and storage of domestic wastewater (which is defined as that discharged from kitchens, baths/showers, laundry rooms and similar) to meet a non potable water demand in the building, e.g. WC flushing, or other permissible non potable use on the site of the assessed building.

GreenMark Score refers to the score for environmental performance of buildings computed in accordance with the criteria and the scoring methodology set out in this Standard

Heat Island Index: It is the difference between the temperature of an area in a city and the temperature of a meteorological observation point in a suburb, and a characterizing parameter.

Illuminance: The amount of light falling on a surface per unit area, measured in lux.

Indoor Environmental Quality (IEQ) refers to the overall comfort of a building's interior and the comfort and health of its occupants. The primary layers (each comprised of sub-layers) of concern to indoor environmental quality are the thermal environment, the luminous environment, the acoustic environment, and the air-quality environment.

Indoor Air Quality (IAQ) refers to the condition of the air inside a building, which can be tainted by pollutants such as smoke, combustion fuel sources, and building materials and furnishings that off-gas Volatile Organic Compounds (VOCs).

Innovation refers to the process by which an idea or invention is translated/rolled out into a good or service for which people will pay, or something that results from this process. Innovation often results from the application of a scientific or technical idea in decreasing the gap between the needs or expectations of the users and the performance of a building.

Legionnaires' disease: A type of pneumonia caused by the bacterium *Legionella pneumophila*. People catch Legionnaires' disease by inhaling small droplets of water suspended in the air, which contain the bacteria.

Life Cycle Cost Analysis - sometimes known as "whole cost accounting" or "total cost of ownership" is a process of evaluating the economic performance of a building over its entire life, from the design, through construction and operations to decommissioning.

Low grade aggregate uses - Crushed masonry used as fill material for general landscaping is not considered to be high grade. This practice is now common place on construction sites due to landfill costs.

Materials optimization - means adopting a resource efficient approach to design, which results in less material being used in the design (i.e. lean design), and/or less waste produced in the construction process, without compromising the design concept. Whilst this assessment issue is focused on specifying suitable durability measures, the design team should consider solutions that optimize the use of materials and therefore minimize construction waste

Natural ventilation - is the use of natural forces of wind and buoyancy to deliver sufficient fresh air and air change to ventilate enclosed spaces without active temperature controls or mechanical means.

Non potable water – refers to any water other than potable water, also referred to as unwholesome water

Non-revenue water - is the water produced by a water utility that is lost and does not earn any revenue for the utility.

Passive design: refers to a building whose architectural features are such that they take advantage of local climatic resources to provide an indoor environment which is as comfortable as possible, thus reducing energy consumption due to the need for mechanical heating or cooling.

Pre-consumer waste stream: Waste material generated during manufacturing processes. Excluded is reutilization of materials such as rework, regrind or scrap generated in a process and capable of being reclaimed within the same process that generated it.

Pollution: introduction of contaminants into the natural environment that cause adverse change that is harmful to living things

Pollution prevention is the use of materials, processes or practices that reduce or eliminate the creation of pollutants or wastes at the source. It includes practices that reduce the use of hazardous and nonhazardous materials as well as those that protect natural resources.

Post-consumer waste stream: Waste material generated by households or by commercial, industrial and institutional facilities in their role as end-users of the product, which can no longer be used for its intended purpose. This includes returns of material from the distribution chain.

Potable Water: Water of a quality suitable for human consumption (drinking, cooking and personal bathing) that does not contain any micro-organism, parasite or substance at a concentration or value which would constitute a potential danger to human health.

Project means the development which is the subject of the application for GreenMark.

Recycled aggregates: Those derived from reprocessing materials previously used in construction, e.g. crushed concrete or masonry from construction and demolition waste material.

Recyclable Material: It is a material that has been converted into another material by changing the form of a material which is not reusable, and that is recycled.

Remediation: Activity undertaken to prevent, minimize, remedy or mitigate the risk caused by contaminated land to human health or the environment

Renewable Energy: It is a kind of non-fossil energy that is gained from nature and renewable, such as wind energy, solar energy, hydro-energy, biological energy, geothermal energy and ocean energy.

Resilient and low-carbon infrastructure refers to the integration of climate change risks and opportunities in the design, operation and management of infrastructure.

Reusable Material: It is a material that is re-used directly with the premise of not changing the form of a recovered material or one that is re-used after being re-assembled or re-repaired.

Secondary aggregates - By-products of industrial processes that can be processed to produce secondary aggregates. Secondary aggregates are sub-divided into manufactured and natural, depending on their source.

Sustainable Site: This implies a building's exteriors which is sensitively developed to the natural ecosystem.

Sub-metering - is the installation of meters downstream from the main supply of electricity, water or gas, measuring the consumption of individual units and allowing for fair allocation of costs based on actual consumption.

Solar photovoltaic system or solar PV system" means a system consisting of photovoltaic modules, electrical, mechanical connections and mountings and regulating or modifying electrical output components that generate and provide electricity;

Waste recycling strategy and plan identifies types of recyclable materials diverted from landfills as well as recycling facilities that have been signed up to handle the recyclable waste. The waste management plan should include the following: waste generation; waste systems; minimization strategy; performance/reduction targets; bin quantity and size; collection frequency; waste contractors; waste management facilities shown on plans; signage; and monitoring and reporting including frequency and method.

Water efficiency can be defined as the accomplishment of a function, task, process, or result with the minimal amount of water feasible

Water resource management - is the conservation, including soil and water conservation, protection, development and utilization of water resources

For instances where terms are not expressly stated in this Standards and are defined in other referenced documents, such terms shall have the meanings as determined in those documents.

Introduction

What is GreenMark Rating System?

GreenMark is a Standard for use in rating and certifying green buildings in Kenya and the Africa region. It provides guidelines for independent assessment of the degree of 'greenness' of an existing or proposed building. It has been developed through a rigorous multi-stakeholder process based on professional practice, nationally accepted environmental considerations, and it seeks to elaborate on synergies between established practices and emerging concepts, both national and international.

The GreenMark Standard will be reviewed and updated regularly to ensure it responds to need while maintaining compliance requirement by Government and keeping in pace with dynamics in technology and industry. The Standard is designed to be flexible, pragmatic and innovative

Rationale and Justification of the GreenMark Standard

Green Building fulfils national commitments to International Agreements

Kenya has ratified several multilateral environmental agreements (MEAs) and international treaties, committing actions on environment, climate change and sustainable development. Some notable MEAs include; the Paris Agreement and the Sustainable Development Goals (SDGs) adopted in 2015, the New Urban Agenda (2016). At the regional level, legal instruments and initiatives include: the Africa Union's Agenda 2063, the Africa Urban Agenda Programme (AUA), the African Ministerial Conference on Housing and Urban Development, the New Partnership for Africa's Development (NEPAD) and the African Ministerial Conference on the Environment (AMCEN). This calls for relevant targeted actions in the building and other sectors.

Green building is linked to National Development Priorities

The GreenMark Rating System takes into consideration Kenya's National Priorities. Its application in promoting green building agenda would result in environmental, health, fiscal and social benefits including creating jobs, saving money – and most importantly, shaping a built environment that is a net positive environmental influence. These benefits are highlighted in more details in the table below:

	Impact	Outcome
Economic Impact	1. Reduced capital investment in new energy and water supply infrastructure	<ul style="list-style-type: none">• This will improve availability and reliability of electricity supply• Reliable electricity supply will result in minimizing economic losses and safety related risks and hazards associated with frequent blackouts and load shedding• Reduction in water demand through leakage prevention, use of efficient equipment and water re-use. This reduces strain on the water infrastructure thereby deferring expensive capacity investments and improving reliability
	2. Reduced production costs	<ul style="list-style-type: none">• Resource (Energy, water and material) savings realized from use of efficient equipment and processes;• Creation of employment

		<ul style="list-style-type: none"> Higher production rates
	3. Improved energy and water security	<ul style="list-style-type: none"> Energy saved from use of energy efficient equipment and on-site renewable energy generation can be used to expand investment and to distribute energy to any other part of the country Water saved from use of water efficient equipment and harnessing on-site groundwater and rainwater harvesting reduces operation & maintenance costs & can be used to supply other consumers and meet other water demands such as expansion of water demanding investments, agriculture, livestock and large-scale irrigation
	4. Premium cost of green buildings	<ul style="list-style-type: none"> The monetary savings from usage of the resource efficient materials and technologies are much higher than the initial cost Reduced investment (lifecycle cost) Increased user productivity Enhanced image and marketability (Increase in aesthetics hence value of the space)
Environmental Impact	1. Response to Climate change	<ul style="list-style-type: none"> Explore abatement of greenhouse gas through use of low-embodied materials, efficient energy and water use, and increased greenery in the development. Climate proofing increasing resilience of building systems and people to climate change
	2. Reduced destruction of natural areas, habitats, biodiversity,	<ul style="list-style-type: none"> Limited waste generation due to recycling and reuse Reduced soil loss from erosion Reduced air and water pollution
	3. Support enforcement of environmental regulations	<ul style="list-style-type: none"> Incentivize compliance with environmental management regulations and standards
Social Impact	1. Reduced respiratory diseases	<ul style="list-style-type: none"> Reduction of inefficient equipment; translates to lower carbon emissions & low indoor air pollution and hence less production of obnoxious gases that will eventually reduce extent of respiratory diseases due to pollution
	2. Enhanced consumer protection	<ul style="list-style-type: none"> Surveillance on compliance with prescribed performance Standards will protect consumers from substandard appliances and prevent dumping of obsolete technologies in the Country Enhanced consumer confidence in credible products hence influencing the markets of quality local products
	3. Create opportunities for new skills and jobs	<ul style="list-style-type: none"> accelerate opportunities for decent jobs promote green innovation and technology development

Green Building contributes to the Government's Big Four Agenda for Development

The Government of Kenya has launched an ambitious plan to deliver transformation across four development areas including food security, manufacturing, affordable healthcare, and affordable housing. Building is a key priority in the government's Big Four Agenda for development. The green building concept is recognized as one of the innovative approaches for the delivery of the affordable housing target of creating 500,000 new home owners by 2022. The government seeks to create 500,000 new home owners by 2022 delivered through low-cost and social housing approaches. The green building concept is foreseen to leverage delivery of the Big Four agenda. Possible benefits of mainstreaming green building into the Big Four agenda has been presented below:

Affordable Housing	<ol style="list-style-type: none"> 1. Reduction in the production costs through resource efficiency savings, integrated design process and biophilic designs. 2. Promoting ethical sourcing of materials, products and labour for construction, thus ensuring value for money by reducing money lost through corruption and ensuring quality (by avoided counterfeits and shortcuts) 3. Ensuring social inclusion in the delivery of the projects. Empowering youth and women with green construction skills and engaging them in the construction and maintenance of buildings. 4. Unlocking Climate Finance for the delivery of some of the units (developing a cluster of pilot green homes to be designed and constructed green. The units are expected to contribute to greenhouse reduction and adaptation in the building sector as part of climate change mainstreaming as per the KBRC's Strategic Plan and the Country's GESIP which aims at achieving 75% of new and refurbished green buildings by 2030.
Manufacturing	<ol style="list-style-type: none"> 1. Sourcing of local construction materials to provide incentive for investments in green innovation and development of efficient technologies. This will enhance the market for quality products thereby strengthening local capacity and catalyzing a the growth of green industries 2. Efficient use of energy and resources in manufacturing to lower cost of production and increase variety & competitiveness in quality and cost.
Affordable Healthcare	<ol style="list-style-type: none"> 1. Reduce exposure to environmental health risks associated with air pollution, water pollution, water supply and sanitation, waste management, radiation, noise, chemical and food safety by providing safe working and living environment 2. Reduce burden and budget related to treatment; increase investment out of savings and initiatives motivated by a healthy human resource <p>The economic cost of the loss of productivity from pollution-related diseases are estimated to be between 1.4% to 2.0% of gross domestic product (GDP)</p>
Food Security	<ol style="list-style-type: none"> 1. Promoting urban farming through use of innovative green building features such as green roofs, green walls, and increasing surface area of greenery 2. Sustainable management of organic wastes generated from the building through innovative practices such as vermicomposting could help in availing more organic fertilizers for food production 3. Efficient water use and conservation reducing the demand for artificial watering of the lawn, trees and garden, and reducing soil erosion through storm water

Legal, policy and institutional frameworks guiding Green Building

Although there is no stand-alone green building policy in Kenya, there are several national policies, laws, strategies and development plans that have bearing on green building. The Standard requires that compliance with the provisions of these statutory legal instruments be a pre-requisite for green building assessment and award.

The GreenMark Rating System complies with and presents an opportunity for the practical application and realization of the provisions of the following policy and legal instruments:

Regulations	Provisions	Applicable Categories
The Constitution of Kenya 2010	<ul style="list-style-type: none"> • Article 42 confers the right to a healthy and clean environment to every Kenyan citizen • Section 43 (1) (b)) grants that every person has the right to "accessible and adequate housing and reasonable standard of sanitation. 	ALL
Vision 2030	<p>The national development targets on the green building sector in the Vision 2030 are as follows:</p> <ul style="list-style-type: none"> • <i>Housing</i> - to produce 200,000 housing units a year for all levels of income earners 	ALL

	<ul style="list-style-type: none"> • <i>Environment</i> - to be a nation that has a clean, secure and sustainable environment by 2030, • <i>Energy</i> - to generate more energy and increase efficiency in energy sector. • <i>Water and sanitation</i> - to ensure that improved water and sanitation are available and accessible to all by 2030, 	
National Environment Policy, 2014. Sessional Paper No. 10 of 2014 on the National Environment Policy.	<p>Provides the framework for an integrated approach to planning and sustainable management of natural resources in Kenya. Key policy commitments directly relevant to green buildings are:</p> <ul style="list-style-type: none"> • Develop and implement an Integrated Housing Policy and Housing Master Plan that takes into account environmental considerations. • Develop and enforce integrated land use planning at all levels • Develop and promote a policy on eco-settlement centres including informal settlements. • Promote Environmental Health Impact Analysis (EHIA) as a component of EIA for all development projects. • Enhance the provision of occupational health and safety services. <p>Promote technologies for efficient and safe water use, especially in respect to wastewater use and recycling.</p>	ALL
Green Economy Strategy and Implementation Plan - Kenya 2016-2030 (GESISP)	<p>Provides a pathway for Kenya's low carbon, resource efficient, equitable and inclusive socio-economic transformation.</p> <ul style="list-style-type: none"> • Objective 1.4. Promote Sustainable Design, Construction and Maintenance of Buildings: <ul style="list-style-type: none"> ○ Ensure 75% of new and renovated public (national and county) and private large scale buildings are green by 2030; ○ Capacity-build architects, engineers and contractors and other stakeholders on integrated green technologies in design and construction ○ Develop and implement certification standards for green buildings • Objective 4.1 Increase National Energy Efficiency <ul style="list-style-type: none"> ○ Adopt minimum energy efficiency performance standards for lighting and industrial products ○ Roll out demand-side energy efficiency programmes in urban residential, commercial and industrial establishments • Objective 4.2 Enhance Water Use Efficiency in Urban Areas: <ul style="list-style-type: none"> ○ Has provision for promoting water footprint sustainability assessments, reduction of non-revenue water loss reduction; and demand-side water efficiency programs in urban residential, commercial and industrial establishments <p>Objective 4.3 Manage Waste as a resource</p>	ALL
<ul style="list-style-type: none"> • The Climate Change Act, 2016; • National Climate Change Framework Policy 2016; Kenya's National Climate Change Action Plan 2018-2022 	<ul style="list-style-type: none"> • Guides the development, management, implementation and regulation of mechanisms to enhance climate change resilience and low carbon development for the sustainable development of Kenya. • Resilient and low-carbon infrastructure recognized as key to addressing climate change, 	ALL
The Housing Act	<ul style="list-style-type: none"> • Regulates provision for loans and grants of public moneys for the construction of dwellings; establishment of a housing fund and a housing board for these purposes; and for connected purposes 	ALL

The National Housing Policy for Kenya, Sessional Paper No. 3 of 2004	<ul style="list-style-type: none"> Comprehensively addresses the shelter problem - intended to arrest the deteriorating housing conditions countrywide and to bridge the shortfall in housing stock arising from demand that far surpasses supply, particularly in urban areas. 	<ul style="list-style-type: none"> ALL
The Kenya Electricity Grid Code:	<ul style="list-style-type: none"> Is the primary technical document of the electricity supply industry (ESI), collating the majority of the technical regulations covering the generation, transmission, distribution and supply of electrical energy. 	<ul style="list-style-type: none"> EE
The Draft Energy (Appliances' Energy Performance and Labelling) Regulations, 2014	<ul style="list-style-type: none"> To facilitate efficient use of energy by enforcing Kenya Standards known as Minimum Energy Performance Standards (MEPS), which specifies the minimum efficiency of selected electrical appliances used in Kenya. The regulations govern the manufacture, importation, distribution and testing of the designated electrical appliances under MEPS. 	<ul style="list-style-type: none"> EE
The Draft Energy (Electrical Installation Work) Rules 2011	<ul style="list-style-type: none"> Is intended to replace, "The Electric Power (Electrical Installation work) Rules, 2006"; sets out the requirements for the licensing of electricians and electrical contractors, and regulation of Electrical installation works in Kenya. 	<ul style="list-style-type: none"> EE
Draft Energy and Petroleum Policy 2015; The Energy Act 2006	<ul style="list-style-type: none"> Has a robust strategy to increase the renewable energy share in the national energy mix and reduce overreliance on unclean woodfuel and kerosene for domestic and commercial energy needs Large new and existing buildings will be subject to energy audit and energy efficiency certification 	<ul style="list-style-type: none"> EE
The Energy Management Regulations 2012	<ul style="list-style-type: none"> Require energy efficiency and conservation measures to be put in place across facilities in all sectors. Stipulate that companies consuming more than 180,000 units of energy per year should carry out an energy audit every 3 years and implement at least 50% of the recommendations. 	<ul style="list-style-type: none"> EE
ERC's Energy Performance Baselines and Benchmarks and the Designation of Industrial, Commercial and Institutional Energy Users in Kenya'	<ul style="list-style-type: none"> Provides the baseline energy requirements for different building types and energy uses. 	<ul style="list-style-type: none"> EE
The Energy (Solar Photovoltaic Systems) Regulations, 2012	<ul style="list-style-type: none"> Requires all premises with hot water requirements of a capacity exceeding 100 liters per day to install and use solar heating systems 	<ul style="list-style-type: none"> EE
Standards	<ul style="list-style-type: none"> Kenya Standard - Off-Grid Solar Photovoltaic Lighting Kits, Requirements (KS 2542:2014); Kenya Standard - Domestic Biogas Lamps – Specification (KS 2521:2014) 	<ul style="list-style-type: none"> EE
Sustainable Energy for All (SE4All) Action Agenda	<ul style="list-style-type: none"> Sets a goal of universal access (100%) access to electricity and modern cooking fuels by 2030 	<ul style="list-style-type: none"> EE
Environmental Management and Coordination, (Water Quality) Regulations 2006	<ul style="list-style-type: none"> Protection of sources of water from pollution (prevention of water pollution); First schedule outlines water quality standards for domestic uses (Art. 10 – 18) Third schedule regulates sourcing of water for Industrial Use, Quality Standards for Industrial Water Use and discharge of Industrial Effluent Eighth schedule prescribes the quality guidelines for the use of wastewater for irrigation (Art. 20 - 23) Art. 24 prohibits water pollution through toxic. Poisonous, noxious chemical pollutants and radioactive wastes. The quality of such discharge is regulated by the Third Schedule of these regulations. 	<ul style="list-style-type: none"> WE
The Environmental Management and Co-Ordination (Wetlands, River Banks, Lake Shores and Sea Shore Management) Regulations, 2009	<ul style="list-style-type: none"> Regulates management of wetlands and wetland resources. Art. 7 outlines the permitted use for wetland resources (subsistence harvesting of papyrus, medicinal plants, trees and reed; collection of water for domestic use) Art. 14 & 17 provides for the protection of river banks, lake shores and the seashore from soil erosion, siltation and water pollution 	<ul style="list-style-type: none"> WE SS

	<ul style="list-style-type: none"> • Art. 5 & 21 requires a developer intending to undertake a project which may have a significant impact on a wetland, river bank, lake shore or the sea shore to carry out an environmental impact assessment and audits 	
The Water Act No.43 of 2016	<ul style="list-style-type: none"> • Prescribes ownership, use and management of water resources • Second Schedule sets the conditions relating to construction of works; Third Schedule regulates easements; Fourth Schedule regulates extraction or abstraction of ground water (construction of a borehole or well) 	<ul style="list-style-type: none"> • WE • SS
The Water (Services Regulatory) Rules, 2012	<ul style="list-style-type: none"> • Regulating provision of consumptive water services including licensing of water service providers, water supply infrastructure and facilities (water supply, Sewage Treatment and Disposal) and regulation of water tariffs 	<ul style="list-style-type: none"> • WE
National Water Strategy 2007-2015 Water Service Strategic Plan 2009	<ul style="list-style-type: none"> • Aim at ensuring that water resources are conserved and maintained and Non-Revenue Water (NRW) at water supply and sanitation systems is reduced to acceptable levels. 	<ul style="list-style-type: none"> • WE
WASREB's Guidelines on Drinking Water Quality and Effluent Monitoring 2008;	<ul style="list-style-type: none"> • Provides guidelines for monitoring compliance with established standards for the design, construction operation and maintenance of facilities for water services 	<ul style="list-style-type: none"> • WE
National Water Master Plan 2030	<p>Has the following targets for sanitation development::</p> <ul style="list-style-type: none"> • Increase coverage rate of improved sanitation to 100% (Improve sanitation by sewerage system and on-site treatment facilities), • Increase coverage rate of sewerage system to 80% for urban population, • Install improved on-site treatment facilities for remaining population not covered by sewerage systems. <p>The targets for water supply development by 2030 were set as follows:</p> <ul style="list-style-type: none"> • Increase coverage of improved water supply to 100% for both urban and rural areas, • Increase coverage of piped water supply by registered water service providers (WSPs) to 100% for urban population, • Increase unit water supply amount to suitable national standard level, and • Decrease NRW rate to 20% for efficient water use 	<ul style="list-style-type: none"> • WE
Standards for Non-Revenue Water Management in Kenya, 2014	<p>The Non-Revenue Water (NRW) reduction management standards consisting of a manual, guidelines and handbook is meant to provide a practical approach to reduction of NRW in Kenya.</p>	<ul style="list-style-type: none"> • WE
The Environmental (Impact Assessment and Audit) (Amendment) Regulations, 2009	<ul style="list-style-type: none"> • Requires Environmental Impact and Environmental Audit studies to be undertaken on the development activities which are likely to have adverse environmental impacts 	<ul style="list-style-type: none"> • ALL
The Public Health Act, Chapter 242	<ul style="list-style-type: none"> • Makes provision for securing and maintaining health (prevent danger to health from unsuitable dwellings). • Some of the provisions related to Sanitation and Housing include: maintaining cleanliness and prevent nuisances; controlling overcrowding; regulating the lighting and ventilation of buildings and the dimensions of rooms; height of buildings; fire safety, materials to be used in the construction of buildings, 	<ul style="list-style-type: none"> • HE • MT • SS • OM
The Physical Planning Act (Rev. 2012)	<ul style="list-style-type: none"> • Guides the preparation and implementation of physical development plans and for connected purposes • Regulates the preparation of Physical Development Plans as well as Control of Development (mandates local authorities to control the use and development of land and buildings) • Regulates zoning in respect of use and density of development 	<ul style="list-style-type: none"> • SS
The Occupational Safety and Health, 2007, (Rev. 2012)	<ul style="list-style-type: none"> • Provides for the safety, health and welfare of workers and all persons lawfully present at workplaces and for connected purposes 	<ul style="list-style-type: none"> • HE • MT

	<ul style="list-style-type: none"> Some of the relevant provisions include the ones relating to: Cleanliness. Overcrowding, Ventilation, Lighting, Drainage of floors, Sanitary conveniences, Safe use of plant, machinery and equipment; Ergonomics at the workplace; Safe means of access and safe place of employment; Fire prevention; Evacuation procedures; the handling, transportation and disposal of chemicals and other hazardous substances; Control of air pollution, noise and vibration. 	<ul style="list-style-type: none"> SS OM
Environmental Management and Coordination (Noise and Excessive Vibration Pollution) (Control) Regulations, 2009	<ul style="list-style-type: none"> Prohibit a production of any loud, unreasonable, unnecessary or unusual noise which annoys, disturbs, injures or endangers the comfort, repose, health or safety of others and the environment. The First Schedule prescribes the Maximum Permissible Intrusive Noise Levels. The Second Schedule prescribes maximum permissible Noise Levels for Construction Sites. 	<ul style="list-style-type: none"> HE
The Land Control Act, Cap. 302 (Rev. 2012); The National Land Policy of 2009	<ul style="list-style-type: none"> The Act provides for regulations controlling transactions in agricultural land The policy created a road map for institutional reform and rationalized laws on land tenure, titling, and registration. 	<ul style="list-style-type: none"> SS
The Forests Conservation and Management Act , 2016 (Section 37(2)); Forest Policy, 2014; The National Forest Programme (NFP) 2016-2030	<ul style="list-style-type: none"> Regulates the establishment, development and sustainable management of forests NFP is a strategic framework for forest policy, planning and implementation to coordinate the sector's development. 	<ul style="list-style-type: none"> SS MT EE
The Environmental Management and Co-Ordination (Conservation of Biological Diversity Resources, Access to Genetic Resources and Benefit Sharing) Regulations, 2006	<ul style="list-style-type: none"> Environmental Impact Assessment License is required to engage in activities with an adverse impact on any ecosystem; lead to the introduction of any exotic species; lead to unsustainable use of natural resources. 	<ul style="list-style-type: none"> SS
Pests Control Products Act Cap. 346	<ul style="list-style-type: none"> Regulates the classification, registration, labeling, packaging, advertising, import, export, distribution, storage, transportation, handling and disposal of pesticides 	<ul style="list-style-type: none"> HE SS & OM
Environmental Management and Co-Ordination (Waste Management) Regulations 2006	<ul style="list-style-type: none"> Outlines requirements for handling, storing, transporting, and treatment/ disposal of all waste categories (Solid Wastes, Industrial Wastes, Hazardous Wastes, Pesticides and Toxic Substances, Biomedical Wastes and Radioactive Substances) Third Schedule (Reg. 26 & 47) prescribes Standard for treatment and disposal of wastes 	<ul style="list-style-type: none"> OM HE
The Environmental Management and Coordination (E-Waste Management) Regulations of 2013	<ul style="list-style-type: none"> Provides guidelines and requirements for environmentally sound management of e-waste in Kenya. Applicable to building's electrical and electronic equipment waste transportation, recycling, re-use and recovery 	<ul style="list-style-type: none"> OM
Guidelines for E-waste Management in Kenya, 2010		
National Waste Management Strategy of 2014	<ul style="list-style-type: none"> Has a guiding principle of zero waste 	<ul style="list-style-type: none"> OM
The Environmental Management and Coordination (Toxic and Hazardous Industrial Chemicals and Materials Management) Regulations, 2013	<ul style="list-style-type: none"> Regulate the manufacture, exportation, importation, transportation, handling, usage and disposal of toxic and hazardous industrial chemicals or materials 	<ul style="list-style-type: none"> HE OM SS
Environmental Management and Co-ordination (Air Quality) Regulations, 2009	<ul style="list-style-type: none"> Outlines Occupational Air Quality Tolerance Limits; Guidelines and methods of measurement and monitoring of Air pollutants and Ambient air quality 	<ul style="list-style-type: none"> HE

The Building Code - Local Government (Adoptive By-Laws) (Building) Order 1968	<ul style="list-style-type: none"> Regulates all aspects of building including siting and space about buildings, building materials, technology and services 	<ul style="list-style-type: none"> ALL
Kenya Strategic Investment Framework (KSIF) for Sustainable Land Management (SLM)	<ul style="list-style-type: none"> To guide in addressing land management issues through effective multi-sectoral, multistakeholder partnerships and collaboration. 	<ul style="list-style-type: none"> SS WE
Urban Areas and Cites Act of 2011	<ul style="list-style-type: none"> Provides for the definition of and principles of governance and management for urban areas and cites in each county 	<ul style="list-style-type: none"> ALL
The Rent Restriction Act (Cap. 296); Landlord and Tenant Act, 2007	<ul style="list-style-type: none"> Regulate renting of business and residential premises 	<ul style="list-style-type: none"> OM
Sectional Properties Act 1987 and Sectional Property Regulations	<ul style="list-style-type: none"> 	<ul style="list-style-type: none"> OM
Kenya Building Research Centre's Strategic Plan 2017/2018 – 2021/2022	<p>The strategic plan has the following key result areas that directly address the green building agenda:</p> <ul style="list-style-type: none"> Coordinate mainstreaming of green building principles in building construction projects in Kenya Carry out research on and gazette sustainable building construction materials in Kenya Development of Green Building Policy, Regulations and Guidelines 	<ul style="list-style-type: none"> ALL

Who was involved in developing the GreenMark Standard for Green Buildings?

The GreenMark Rating System has been developed by a team of experts and stakeholders hosted by the Green Africa Foundation through a rigorous multi-stakeholder engagement involving several experts (drawn from the government, academia, private sector and the civil society) and guided by a Consultant (Mr. Nickson Otieno – NIKO GREEN LTD). The Ministry of Transport, Infrastructure, Housing, Urban Development and Public Works (MoTIHUD) as well as the Ministry of Environment and Forestry participated in this process. Green Africa Foundation provided secretariat services to both the Technical Committee and the activities of the Standard's Board. Additional support was provided by the LECRD project of the Ministry of Environment and Forestry – Climate Change Directorate.

The 'GreenMark' is managed by an independent, multi-stakeholder '**GreenMark Standards and Certification Board**'. The board formulates policies and makes strategic decisions that appertain to the development and use of the 'GreenMark' Standard. The Board is the Certifying body of GreenMark.

The technical advisory committee (TC) comprises of eminent architects and experts well versed with design and construction of green buildings. Members of the Technical Committee have been carefully selected based on expertise, experience and subject matter specialty.

The following table lists the institutions and experts who participated in the development of GreenMark Standard:

	Institution	Name of experts	Area of representation	
			Board	Technical Committee
National Government				
1.	State Department of Housing and Urban Development (SDHUD), Ministry of Transport, Infrastructure, Housing, Urban Development and Public Works (MTIHUD)	Arch. Wanjau M. Mwenja, Former Director, Kenya Building Research Centre (KBRC)	√	
		Director, Slum Upgrading - QS. Charles Sikuku (Board's Vice-Chairman)	√	
		Mr. Robert Sangori, KBRC		√
2.	State Department of Environment, Ministry of Environment and Forestry	Eng. Moses Omedi Jura, Former Deputy Director, Climate Change Directorate	√	
		LECRD Project: Philip Dinga, Mercy Kamau, Phanice Mokeira, Lillian Omondi		√
3. 4.	Kenya Bureau of Standards (KEBS)	Mr. Joel Kioko (rtd),	√	
		Mr. David Kirui (Lead Expert)	√	√
		Paul Munene, Jane Wachuka Maina		√
5. 6.	National Environment Management Authority (NEMA)	QS. David Ruto,	√	√
		Plnr. Isaiah Kyengo		√
7. 8.	National Construction Authority (NCA)	Arch. Steve Oundo, alternated by Arch. Winnie Kyala	√	
		Ruth Onkangi		√
9.	Energy Regulatory Commission (ERC)	Eng. Eustace Murithi Njeru		√
10.	Kenya Industrial Research and Development Institute (KIRDI)	Eng. Willis Makokha, Dr. Kelvin Khisia and Betsy Bowen		√
11.	Kenya National Accreditation Service (KENAS)	Eng. Carey Ochogo		√
12.	Kenya Institute of Curriculum Development (KICD)	David Ogogo		√
13.	Kenya Medical Research Institute (KEMRI)	Dr. Charles Mbakaya		√
14.	Waste Management & Climate Change Unit, Ministry of Health	Lolem Lokolile Bosco		√
County Governments				
15.	Council of Governors			
16.	Nairobi City County	Plnr. Raphael Kazungu, Plnr. Tom Odongo	√	
17.	Makueni County	Linet Mutheu		√
18.	Kiambu County	Plnr. David Gatimu		√
Professional Associations				
19. 20.	Architectural Association of Kenya (AAK)	Arch. Gad Opiyo, Vice-President of the Governing Council		√
		Arch. Gideon Olawo, Secretary of the EDC Chapter	√	
21.	Institution of Engineers of Kenya (IEK)	Eng. Julius M. Riungu, C.E.O. Tsavo Power	√	
22.	Kenya Association of Manufacturers (KAM)	Victor Gathogo, John Kamau		√

Academic Institutions				
23.	University of Nairobi	Eng. Simon Dulo and Edith Nasimbwa		√
24.	Jomo Kenyatta University of Agriculture and Technology (JKUAT)	Eng. Sylvia Njeri Kahiu	√	
25.		Liz Wangui Maina		√
26.	Jaramogi Oginga University of Science and Technology (JOOUST)	Prof. Washington H. Olima		√
Consulting Firms				
27.	Mutizo Menezes International	Arch. Allan Simu (Board's Chairman)		
28.	NIKO GREEN LTD	Nickson O. Otieno (Lead Expert / Consultant)	√	√
29.		Samuel Doe and Kenneth O. Obat		√
30.	Gobal Engineering International	Eng. Johnson Mulaimu	√	
31.	Kilonzo and Company Advocates	Diana Kethi Kilonzo	√	
32.	Trine Architects	Arch. Geoffrey Wasonga		√
33.	Archispace Architects	Arch. Simon Mulang'a		√
34.	Shelter Varieties Ltd.	Arch. Francis Mugo		√
35.	KEM Associates	Eng. Kennedy Otieno		√
36.	D-Sheq Managements System Consultants	David Musundi		√
37.	Enprohnet Agency	Elisha Shem Odondi		√
Civil Society				
38.	Slum Dwellers International (SDI) Kenya	Grace Githiri Watetu		√
39.	Green Africa Foundation	John Kioli (Executive Director); Isaac Kalua, Founder	√	
40.		Milton Ogada, Monika Masinzi, Nicholas Okeya		√
41.	Individual Consultants	Arch. Wanjau M. Mwenja (former Director KBRC, SDHUD)	√	
42.		Eng. Moses Omedi Jura (former Deputy Director, National Climate Change Directorate)		
		Eng. Amyn Anwar Khan, Eng. Rehema Atieno Simba,		√

Historical background of the GreenMark Standard's Development

The process of developing a Kenyan green building Standard commenced in 2010 with consultations between environment, building and standards development experts convened by the Green Africa Foundation and the Kenya Bureau of Standards. This led to the formation of a technical committee with representation of various stakeholders in the building and environment sectors tasked with establishing a roadmap for developing green building standards for use in Kenya and Africa. The following table summarizes the key milestones in the development of the GreenMark Rating Tool.

Date	Activity	Venue	Outcome
October 2011	Inauguration of the Technical Committee (TC) and First TC workshop	Kenyatta International Conference Center	First Working Draft 'GreenMark' Standard for Green Buildings
January - February 2012	Inauguration of the GreenMark Standards and Certification Board and Second Technical Committee meeting held	Kenyatta International Conference Center (KICC)	Second Working Draft GreenMark Standard approved
September 2016	Partnership between Green Africa Foundation and the Ministry of Environment and Forestry through the Low Emission and Climate Resilient Development Project (LECRD)	Partnership	Financial and technical support to finalize the development of the GreenMark
	Partnership Inception and 3 rd Technical Committee Workshop	Merica Hotel, Nakuru	Third Working Draft of the 'GreenMark' Standard
February 2017	2 nd GreenMark Standard and Certification Board Workshop	Geliam Hotel, Machakos	Comments on the 3 rd Draft GreenMark Standard; Roadmap for Finalization of GreenMark Standard
February 2018	4 th Technical Committee Workshop	KEFRI Training Centre, Muguga	Fourth Working Draft GreenMark Standard
May 2018	3 rd GreenMark Standard and Certification Board Workshop	KEFRI Training Centre, Muguga	Fifth Working Draft GreenMark Standard
June 2018	4 th GreenMark Standard and Certification Board Meeting	National Climate Change Resource Centre	<ul style="list-style-type: none"> Sixth Working Draft GreenMark Standard Institutional Framework for the GreenMark Rating and Certification Scheme
	Board's Working Group meetings	Online	
July 2018	5 th GreenMark Standard and Certification Board meeting	KICC	Zero Draft GreenMark Standard approved for broader Stakeholder Consultation and Validation
July - 12 th September 2018	Public consultation and Stakeholder Forum on the Validation of the GreenMark Standard	Online and at the National Climate Change Resource Centre	Broader public participation and Validation of the Standard

GreenMark Certification Process

The GreenMark Rating system has established criteria and methodology by which new and existing buildings are assessed for compliance. The system requires registration and assessment of buildings by qualified assessors against the set of indicators through a process as presented below:

1. Expression of Interest:	2. Registration for Project Evaluation
<ul style="list-style-type: none"> Interaction with the Secretariat to discuss GreenMark and its applicability to the project. Access to GreenMark Rating Tool Overview of resources available to assist in preparation of submission. Copy of Application Spreadsheet and Fee Schedule 	<ul style="list-style-type: none"> <i>Registration fee payable.</i> Site meeting with developer and/or project team on the application of GreenMark and how the standards apply to the project. Anticipate scheduling for review by GreenMark Board. Access to GreenMark knowledge bank of sustainability initiatives
3. Application Submission	4. On-site assessment / audit
<ul style="list-style-type: none"> Respond to any requests for further information following submission. Draft comments provided to applicant, with opportunity to respond / clarify prior to Board review. Commence early discussions on media release and public announcement event if desired <i>Certification fee payable.</i> Site visit arranged. 	<ul style="list-style-type: none"> A team of accredited GreenMark Assessors* (min. of three experts) undertake on-site audit of the building to assess compliance with the requirements set in this Standard and verify the data submitted by the applicants.
	5. Technical Committee and Board Review
	<ul style="list-style-type: none"> Respond to any requests for further clarification (if required) The Certification's Technical Committee reviews Assessors' audit report and submit its recommendation to the Board
6. Certification Decision	7. Ongoing Certification (Annual)
<ul style="list-style-type: none"> Licensing document, logos and statutory declaration provided for signing Announcement event / media announcement coordinated. Framed GreenMark certificate provided. Project added to the list of GreenMark certified projects on the website. Supplied with GreenMark marketing material. 	<ul style="list-style-type: none"> Project specific support to build the project's GreenMark branding strategy and ongoing media coordination. Annual recertification process undertaken. <i>Recertification fee payable.</i>

Because of the assessment period, Green Africa stipulates a maximum of 6 months from the date of registration for validating information and completing the certification process. The Certification granted shall be valid for three years, after which the proponent building will be due for recertification to encourage continuous improvement that achieves sustainability performance above government requirements and in light of new technologies and industry standards.

The GreenMark Secretariat (Green Africa Foundation) will organize and coordinate periodic training and certification of 'GreenMark Experts' accredited to offer technical advice for application as well as undertake assessment for compliance with the requirements of the GreenMark Standard.

Scope

This standard provides requirements for assessing the sustainability performance of buildings over their entire life cycle – from preconstruction, building design and construction, and building operation and maintenance stages. It has been developed to help ‘design and evaluate/assess’ ALL types of existing and new buildings. The rating tool is applicable for all types of premises – existing, new or alterations and extensions to existing residential or commercial buildings or structures, including:-

- a. small domestic houses as defined in the Building Code made under the Local Government Act;
- b. all domestic dwellings or residential houses and buildings as well as masterplans of neighbourhoods;
- c. commercial buildings including hotels, lodges, clubs, restaurants, cafeterias, laundries, eating places and similar premises;
- d. health institutions including hospitals, health centres, and clinics and similar medical facilities;
- e. educational institutions including universities, colleges, schools, and similar institutions

The Standard has been developed for Kenya but it will be applicable to other African countries with minor contextual amendments.

Synopsis of the Criteria for Rating

The standard consists of a definition of the scope, and a series of characteristics with compliance requirements, grouped into the following categories:

1. Sustainable Site Planning and Development (SS), 2. Sustainable Materials and Appropriate Technology (MT), 3. Renewable Energy and Energy Efficiency (EE), 4. Water Efficiency and Quality (WE),	5. Healthy Indoor Environment (HE), 6. Operation Maintenance and Decommissioning (OM); and 7. Innovation (IN).
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Each characteristic is structured as follows:

- i) **Characteristic Information**– characteristic number, title, number of points available and a minimum standard where applicable
- ii) **Intent**– the aim of the characteristic
- iii) **Assessment Criteria**– sets out the target/benchmark to be achieved
- iv) **Evidence Required** – outlines examples of the evidence required from the client by the assessor(s) to check compliance.

The standard prescribes categories, characteristics and rating system which can be used by the certification body to award “GreenMark” certificate to all types and sizes of buildings. The rating system shall have a classification of bronze, silver, gold, platinum, and diamond. All buildings that adhere to the requirements and incorporate practices and technologies implied in this standard shall be eligible for green building certification.

Assessment Framework

In a GreenMark's assessment process, a qualified assessor awards points for the building according to performance in a broad range of environmental impacts including: Sustainable Site Development and Management; Indoor Environmental Quality; Energy Efficiency; Water Efficiency and Conservation; Materials and resources; Operations Management and Maintenance and Innovation.

The characteristics of the above set of weightings shall enable the points to be added together to produce a single overall score. The building is then rated as bronze, silver, gold diamond or platinum.

Table 1: Rating System

Code	Category	Maximum Points	Score
SS	Sustainable Site Planning and Development	15	
MT	Sustainable Materials and Appropriate Technology	10	
EE	Renewable Energy and Energy Efficiency	20	
WE	Water Efficiency and Quality	20	
HE	Healthy Indoor Environment	20	
OM	Operation Maintenance and Decommissioning	10	
IN	Innovation	5	

Table 2: Green building Classification

Score	Rating	Remarks
91-100	Diamond	
85 -90	Platinum	
75- 84	Gold	
65-74	Silver	
50-64	Bronze	

Table 3: Green building baseline: requirements

Sl. no	Item	Baselines
1.	Green meetings	
2.	Water Management Plan	
3.	Integrated Design	
4.	Waste Management Plan	
5.	Energy Management Plan	
6.	Material Durability And Environmental Safety	
7.	Acoustics And Noise	
8.	Construction Management Plan	
9.	Environmental Management Plan	
10.	Green Building Work Plan	
11.	Green Building Action Plan	
12.	Construction Best Practices	

1 Sustainable Site Planning and Development (SS)

(15 marks)

The goal of this category is to have a safe building exterior that preserve surrounding ecosystem.

Kenya is prone to all seven types of land degradation, namely: soil degradation, biological degradation, water degradation, chemical degradation, physical degradation, climate deterioration, and land conversion. (5) Green Buildings will play a big role in Sustainable Planning and Management of Kenya's Land Resource.

The following thus are characteristics of the Sustainable Site category with their individual intent:

Code	Characteristics	Intent	Requirements / Criteria	Evidence	Weighting
Pre-requisites					
SS1	Building and Development Density Control	To encourage design that makes the best use of available land for development, with provision for open land.	Ensure that the density of the development meets or exceeds the requirements set out in the National Planning Regulations and Zoning ordinances	A copy of the site plan, design, valid permit and calculations showing the number of units per net acreage within the plot area	1 mark
SS2	Building Resilience and Safety	To ensure occupant's safety in emergencies and building's resilience against disaster risks such as fire, extreme climate events, terrorism attacks and earthquakes.	<ul style="list-style-type: none"> Provide emergency response strategies to meet or exceed the requirements of the national fire, occupational health and safety regulations (i.e. the Kenya Standards KS 2390:2012, Legal Notice No. 59 2007; Occupational Safety and Health Act 2007) Incorporate disaster and climate resilient design features which make the building resilient to climate variability, such that they maintain an acceptable level of functioning and structure in extreme climatic events. Use of defensive design strategies to improve building's safety against terrorist attacks 	<ul style="list-style-type: none"> Properly sited and labelled functional fire alarm systems, Fire assembly points, Emergency escape routes Proof of periodic safety trainings and drills Climate vulnerability assessments and evidence of climate-proof design strategies applied 	Pre-requisite: Exemplary strategies to be credited as innovation
SS3	Site Selection	To reduce pressure on undeveloped land for building, development and infrastructure and conserve green fields	<ul style="list-style-type: none"> Rehabilitate damaged or environmentally contaminated sites Construct or renovate a building on a previously developed site 	<ul style="list-style-type: none"> Specialist's land contamination report, remediation strategy and plan Site Plan showing location and footprint of proposed development and temporary works 	Pre-requisite
Participatory and Inclusive Design To design, plan and deliver accessible functional and inclusive buildings in consultation with current and future building users and other stakeholders.					2 marks

SS4	Integrated Design Process	To recognize and encourage an integrated development approach that ensures early engagement and effective collaboration among ALL consultants, proprietor and contractor from project's inception to completion.	<ul style="list-style-type: none"> • Involvement of at least one Certified GreenMark Facilitator as a principal participant of the project team who is engaged from the onset of the design process through completion of construction and until GreenMark Certification is obtained. • From design brief stage the client, building occupier, design team and contractor are involved in contributing to the decision making process for the project. 	Evidence of incorporation of the requirements for an integrated building design process into the project documents (brief, consultancy contracts, integrated design strategies)	1 mark
SS5	Community Engagement	To engage community stakeholders to consider how building design options can positively impact the adjacent buildings and surrounding community	<ul style="list-style-type: none"> • During the preparation of the brief, all relevant parties and relevant bodies are identified and consulted by the design team. The findings of the consultation influence the design and therefore the consultation should be held before key and final design decisions are made. 	A 'constructive' consultation plan which includes a timescale and methods of consultation for all relevant parties/bodies and how the relevant parties will be kept informed about progress on the project.	1 mark
SS6	Inclusive and Accessible Design	To ensure that the building is designed to be fit for purpose, appropriate and accessible by all potential users.	<ul style="list-style-type: none"> • Provide for access to and throughout the development for all users, with particular emphasis on the disabled users; people of varying age groups, genders, ethnicity and fitness levels; parents with children (where appropriate to building use/type). • Provide facilities for future building occupants and users including, where relevant, facilities that can be shared and are accessible to members of the public/community without gaining uncontrolled access to other parts of the building (unless hindered by security concerns) 	Evidence of provision of appropriate accessibility for all building users	Pre-requisite
Site and Development Planning <i>Reduce environmental impact from the location of a building on a site by designing buildings with a minimal footprint, maintaining natural storm water flows by promoting infiltration and providing vegetated surfaces.</i>					7 marks

SS7	Planning for the building's entire life	To recognize and encourage life cycle costing and service life planning in order to inform decisions relating to design, specification and through-life maintenance, operation and demolition	<p>A Life Cycle Cost Analysis (LCCA) is carried out based on the proposals developed during concept design/design development stage and is conducted in accordance with ISO15686-5:2008 for the following stages and uses a study period of at least 40 years, shown in real and discounted cash flow terms:</p> <ul style="list-style-type: none"> • Construction - includes capital costs • Operation - includes as a minimum, utilities, cleaning, management costs • Maintenance - includes as a minimum, planned maintenance, replacements and repairs costs 	<ul style="list-style-type: none"> • Relevant sections of the concept/design stage life cycle cost analysis report/documentation. • Relevant sections of the feasibility stage appraisal documentation. • Drawings or relevant section/clauses of the building specification or contract demonstrating implementation of LCC analysis options • Assessor's site inspection report and photographic evidence • EIA/EA report 	1 mark
SS8	Building Orientation and Form	To reduce environmental impact from the location of a building on a site and optimize the location of spaces within the building	<ul style="list-style-type: none"> • Placement of the building on the site takes into consideration environmental factors such as water source, wind direction, sun paths, and neighborhood structures. • The building envelope is designed with minimum direct West and East-facing window openings and/or having effective sun-shading of the West and East facing facades by use of egg-crate or vertical and horizontal sun-shading elements, deep roof overhangs, balconies and perforated timber screens etc. • Locate building services (e.g. toilets, staircases, lifts, lobbies, stores, ducts, service rooms etc) on the East and West facing facades. <ul style="list-style-type: none"> ○ The building envelope is designed for maximum natural lighting penetration and good cross-ventilation; e.g. buildings that are narrow in plan or with atrium lighting, courtyards, high ceiling heights 	<ul style="list-style-type: none"> • Site analysis including detailed climate analysis • Plans and elevations showing orientation of facades and window openings • Sections showing ceiling heights and details of sun-shading devices • Calculation of percentages of East- and West-facing window openings • Due consideration of environmental factors where the development is limited by pre-planned plot configurations, peculiar aesthetical and functional user needs. • EIA/EA report 	3 marks
SS9	Maximizing Usage of Built and Green Spaces	To include the maximum built usages within the borders of the buildings' footprint and maximize the usages of open spaces to promote sustainability	Maximize the amount of open space for landscaping and amenity areas by:	<ul style="list-style-type: none"> • A copy of the site plan/design showing the location of associated services and calculations 	1 mark

		(vegetation, shade trees, runoff retention and infiltration, amenities for common use etc.)	<ul style="list-style-type: none"> Locating associated services such as car parking, waste storage and building services either underground or within the building, developing roof areas as amenity areas 	<p>demonstrating the ratio of building footprint to open space.</p> <ul style="list-style-type: none"> Copy of the landscape plan demonstrating the location of vegetation, shade trees, runoff retention and infiltration, amenities for common use 	
SS10	Light Pollution Reduction	To minimize or eliminate light trespass from building and site thus reducing the development's impact on nocturnal environments.	<ul style="list-style-type: none"> Reduce sky glow Improve night-time visibility through glare reduction 	<ul style="list-style-type: none"> Window schedule and specifications, Assessor's site inspection report and photographic evidence 	1 mark
SS11	Storm Water Design and Management	To limit disruption of natural water systems by reducing impervious cover, increasing on-site infiltration, reducing or eliminating pollution from storm water runoff and eliminating contaminants.	<ul style="list-style-type: none"> Encourage treatment of storm water run-off before discharge to the public drains. Provide infiltration features or ABC water design features such as Bioretention swales, Rain gardens, Constructed wetlands, Cleansing biotopes, Retention ponds 	<ul style="list-style-type: none"> Storm water management plan which must include stream channel protection and quantity control strategies integrated water cycle management plan 	1 mark
<p>Sustainable Construction Practices <i>To recognize and encourage construction sites managed in an environmentally sound manner in terms of habitat conservation, efficient resource use, energy consumption and pollution control</i></p>					4 marks
SS12	Protect / Restore / Rehabilitate Habitat	To conserve existing natural areas and restore damaged areas to provide habitat and promote biodiversity.	<ul style="list-style-type: none"> Restoration of trees on site, conserving or relocating of existing trees on site as per Forest Conservation and Management Act 2016 Section 37 subsection 2. Fertile top soil is either conserved on site or returned to site post construction to a depth of at least 40 cm on the site's vegetated areas Protection of existing ecological features of the site and its vicinity from damage during clearance, site preparation and construction activities 	<ul style="list-style-type: none"> Biodiversity Management Plan Site layouts showing existing and final locations (where applicable) and number of the trees conserved or relocated Photographs of the existing inventory and improved development Erosion & Sedimentation Control Plan 	1 mark
SS13	Resource Efficient Construction	To implement sustainable construction practices to minimize resource consumption and pollution from construction activities	<ul style="list-style-type: none"> Monitoring, recording and reporting energy, water and transport consumption data resulting from all construction processes Ensure proper screening, covering stockpiles, covering brick and loads of dusty materials, 	<ul style="list-style-type: none"> Proof of an individual(s) responsible for monitoring, recording and reporting energy, water and transport consumption data 	1 mark

			wheel-washing facility, water spraying to reduce air pollution during construction.	<ul style="list-style-type: none"> • Proof that main contractor operates an Environmental Management System (EMS) covering their main operations. 	
SS14	Integrated pest management	To minimize use of harmful chemical and preserve the site's natural components.	<ul style="list-style-type: none"> • Application of biological methods of pest control • Use of least toxic chemical pesticides • Minimum use of chemicals ONLY in targeted locations and only for targeted species. • Conduct routine inspection and monitoring 	<ul style="list-style-type: none"> • Pest Management Plan • Landscape Management Plan 	1 mark
SS15	Construction Waste Management	To divert construction and demolition debris from disposal in landfills and incineration facilities.	<ul style="list-style-type: none"> • Recycle and/or salvage nonhazardous construction and demolition debris. • The contractor implements a comprehensive, project specific, waste management plan for the works that, at a minimum, identifies the materials to be diverted from disposal and whether the materials will be sorted on-site or comingled. 	<ul style="list-style-type: none"> • Construction waste management plan endorsed by the developer, with further statements from the consultants • Proof of engagement of waste disposal services of a licensed waste handler (contract) 	1 mark
Sustainable Transport <i>To reduce pollution from auto use and reduce land development for auto use</i>					1 Point
SS16	Non-motorized transport	To reduce emissions associated with automobile use by supporting effective non-motorized transport infrastructure	<ul style="list-style-type: none"> • Subject to the availability of safe, convenient cycling routes between the building and the adjacent street network, confirm provision of secure bicycle parking lots and changing facilities 	<ul style="list-style-type: none"> • Specifications, Plans showing the quantity and location of sheltered bicycle lots, shower and changing facilities and pedestrian paths 	
SS17	Mass, clean vehicular transport	To reduce pollution and land development impacts from single occupancy vehicle use and encourage use of low-emitting and fuel efficient vehicles	<ul style="list-style-type: none"> • Size parking capacity to meet but not exceed minimum local zoning requirements • Dedicated, clearly labeled car parking spaces provided for use by car-pool vehicles, car-share vehicles, hybrid and other alternative fuel vehicles 	<ul style="list-style-type: none"> • Site Layout showing the quantity, location and categorization of car parking lots 	

2 Sustainable Materials and Appropriate Technology (MT)

(10 marks)

The goal of this category is to minimize natural resource use and limit negative environmental impacts from material extraction, processing and use in building construction by encouraging the use of affordable, resource efficient (conserving energy, water and raw material use), low greenhouse gas- and VOC- emitting and climate responsive building materials, components, and systems.

Background:

The construction industry consumes over 3 billion tons of raw materials each year (which accounts for 40% of total global material use) (6). With growing concern over global warming and climate change, global responsibility in the consumption and production of renewable energy becomes not only a vital necessity, but a moral imperative.

The Standard therefore recommends the use of locally available, locally produced and responsibly sourced materials and products; materials with high recycled content; low greenhouse gas and VOC emitting materials as well as durable and rapidly renewable materials. Application of construction technologies that minimize waste, hasten the speed of construction and encourage re-use of materials at the end of the building's life cycle will also be promoted.

Statutory Requirements: Compliance with the building code, relevant KEBS standards, safety regulations and labour laws is pre-requisite for GreenMark assessment and certification.

The following are characteristics of Sustainable Materials and Appropriate Technology category with their individual intent:

Code	Characteristics	Intent	Requirements / Criteria	Evidence	Weighting
MT1	Climate Responsive Materials	Encourage the selection and use of construction materials that are appropriate to the project's climate zone to enhance the overall performance of the building enveloped in order to regulate heat gain.	<ul style="list-style-type: none">• Use high thermal mass on walls i.e. thick walls.• Specify external walls with appropriate thermal resistance, that is U-Value of wall $\leq 2 \text{ W/m}^2\text{K}$• Specify materials that have absorption coefficient of $\alpha \leq 0.35$ (bright colour) for roofs and absorption coefficient of $0.35 \leq \alpha \leq 0.55$ (moderate colour) for vertical surfaces.	Material schedule and specifications stating U-values and absorption coefficients of materials used for wall and roof construction	2 marks

MT2	Materials with Low VOC Content	To encourage the use of finishes and products with minimal volatile organic compounds (VOC) and formaldehyde content in order to minimize detrimental impact on occupant health	<p>Use the following low emitting materials:</p> <ul style="list-style-type: none"> • Adhesives and Sealants, Paints & Coatings and Floor coverings • All engineered wood and agrifiber products such as: particleboard, medium density fiberboard (MDF), plywood, wheatboard, strawboard, panel substrates and door cores • Laminating adhesives used to fabricate on-site and shop-applied composite wood and agrifiber assemblies 	<ul style="list-style-type: none"> • Drawings showing where low VOC materials or products are used • List of products installed that meet the credit requirements, and their specifications • Manufacturer's information including data sheets, certificates, test reports • Photographic evidence of each typical low VOC installation 	2 marks
MT3	Locally sourced Materials, Products and Labour	To encourage use of local materials and labour to stimulate local innovation, support local economy and minimize environmental impact caused from shipment and transport of imported construction materials.	<ul style="list-style-type: none"> • High content of good quality and affordable building materials or products (based on volume/mass) used in the project are manufactured or sourced locally • Engaging higher number of local competent workforce in the project • Promote an engendered construction workforce 	<ul style="list-style-type: none"> • Percentage of local materials specified to the total volume/mass of all building materials. • Details of the location and distance of the source of local materials. • Drawings and specifications • Details of the qualifications and source of the workforce 	1 mark
MT4	Responsibly sourced materials and labour	To discourage use of counterfeit, substandard and unethically sourced materials and labour in the project.	<ul style="list-style-type: none"> • Evidence that all specified materials and products used are 'legally' and ethically harvested and legally traded' • Use of materials and products manufactured with resource-efficient processes • Evidence that there is no use of child labour and gender discrimination in building construction 	<ul style="list-style-type: none"> • Detailed drawings and specifications • Relevant responsible sourcing scheme certificate(s) for the relevant specifications/ products 	1 mark

MT5	Materials with low carbon footprint	To recognize and encourage the use of robust and appropriate life cycle assessment tools and consequently the specification of construction materials with a low environmental impact (including embodied carbon) over the full life cycle of the building.	<ul style="list-style-type: none"> • Specification and application of reused or recycled materials (sourced from project construction site and demolition sites or waste processing plants within Kenya) to reduce demand for and extraction of virgin construction materials • Specification and use of rapidly renewable materials to reduce the use and depletion of finite raw materials and long-cycle renewable materials. 	<ul style="list-style-type: none"> • Percentage constitution, in weight or volume, of recycled materials to the total amount of construction materials • Specification and BQ listing the products specified with full and part recycled content • Source of recycled / secondary aggregates 	2 marks
MT6	Appropriate Building Technology	To encourage the application of construction technologies that minimize wastages and allows for future changes without compromising the building's structural integrity and functional performance.	<ul style="list-style-type: none"> • The design incorporates suitable durability and protection measures or design features/solutions to prevent damage to the vulnerable parts of the building. • Apply construction techniques that ensure speed and ease of construction, stability, flexibility and ease of recovery during demolition • Reduce volume, weight, and time of construction by adopting an efficient technology (e.g. pre-cast systems, ready-mix concrete, etc.). 	<ul style="list-style-type: none"> • Design drawings and/or specification or photographic evidence illustrating vulnerable areas/parts of the building and confirming the durability measures specified • Technical specifications and construction details demonstrating resource efficiency and ease of disassembly. 	2 marks

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3 Renewable Energy and Energy Efficiency (EE)

(20 Marks)

The goal of this category is to encourage the use of renewable energy sources and reduction of the total energy consumption of buildings.

Background:

According to UNHABITAT the building sector is responsible for 40% of fossil fuel consumption for energy in developed countries. In East African countries, the share of final energy consumption of the building sector is well above 60% (4). While 80-90% of the energy used by the building is consumed during the use (or operational) stage of a building's life-cycle (for heating, cooling, ventilation, lighting, appliances, etc.), the other 10-20% is consumed during extraction and processing of raw materials, manufacturing of products, construction and demolition (7). The Green Economy Strategy and Implementation Plan for 2016-2030 recognizes the huge potential that energy efficiency in buildings offers for abating greenhouse gases that are responsible for climate change and achieving environmental sustainability. Energy efficiency and conservation measures yield direct savings in total energy consumption and reduce greenhouse gas emissions. It can also significantly reduce the foreign exchange on oil imports and investments on additional power generation capacity.

Access to competitively priced, reliable, quality, safe, and sustainable energy is essential for achievement of the Country's national development blueprint – the Vision 2030. Kenya has achieved impressive progress in electrification, from 23 percent in 2009 to about 50 percent in 2016, underpinned by grid densification. The target for 2022 is 100% connection to be achieved through both grid and off-grid solutions (8). While about 5.5 million consumers are connected to the grid (as at 2017), about 4 million households currently lack access to electricity (9). Wood fuel (69%) and kerosene still provide the basic energy needs of most rural communities, urban poor and the informal sector. The current power generation system can hardly provide sufficient primary reserve power and often needs load shedding for frequency stabilization. (8)

Kenya has made tremendous progress in transitioning to clean universal energy access. Kenya's electricity generation is largely from renewable sources. The renewable energy share in the mix (power and heat) target is 80% by 2030, which will be projected from 65% and 43% for power and heat respectively (10). A vibrant solar energy market has developed in Kenya over the years to supplement the demand for electricity to homes and institutions which are remote from the national grid and for medium temperature water heaters for domestic and commercial usage. The World Bank estimates that 30% of off-grid households in Kenya had a solar product in 2017. About 2.75 million Qualified Verified solar products have been sold in Kenya since 2012 (700,000 through PAYG), representing 23% of all sales in entire Africa. (11)

To encourage private sector investments in renewable energy, the government has zero-rated the import duty and removed Value Added Tax (VAT) on renewable energy equipment and accessories. It has also issued Feed-in-tariffs that allows power producers to sell renewable energy generated electricity to the off taker. The Draft Energy Bill sets a target of eliminating kerosene use in households by 2022. The Energy Management, Solar Photovoltaic and Solar Water Heating Regulations of 2012 provide the necessary policy framework for renewable energy use and adoption of efficiency measures in buildings. The Building Code under review has incorporated provisions for mandatory resource and energy efficiency requirements. KAM in conjunction with the Ministry of Energy established the Centre for Energy Efficiency and

Conservation (CEEC) that runs energy efficiency and conservation programs designed to help companies identify energy wastage, determine saving potential and recommend measures to be implemented. The GreenMark rating System builds on these efforts offering a holistic benchmark for envisioning and measuring Kenyan pathway to Energy Efficient buildings.

Implementing energy efficient and cost-effective technologies in Kenya faces challenges that include: low level of awareness, inadequate fiscal incentives, inappropriate and limited credit and financing mechanisms. (12)

Statutory Requirements include: Minimum Energy performance Standards, the Energy Management Regulations as well as the Energy Performance Baselines and Benchmark

The following are characteristics of energy and atmosphere category with their individual intent:

Code	Characteristics	Intent	Requirements / Criteria	Evidence	Weighting
EE1	Optimize Energy Performance	Establish minimum level of energy efficiency performance requirements for building systems to reduce/optimize energy consumption in buildings	Undertake a whole building energy simulation exercise to ensure that energy consumption in building under a specified category is 10%–40% less than that benchmarked in the ERC’s 2013 Energy Performance Baselines and Benchmarks & the Designation of Industrial, Commercial and Institutional Energy Users in Kenya or any other relevant benchmarks.	<ul style="list-style-type: none"> • Report of Building Energy Intensity (BEI) calculations. • EMS printouts demonstrating that Energy Efficiency performance exceeds the baseline minimum to reduce energy consumption in the building 	2 Marks
EE2	Commissioning and re-commissioning of building energy systems	To ensure that fundamental energy elements and systems for buildings are designed, installed and calibrated to operate as intended	<ul style="list-style-type: none"> • To begin commissioning process early during design process • Execute additional activities after completing verification of system • Ongoing post occupancy commissioning done in 3 years in accordance with the Energy (Energy) Management Regulations, 2012 	<ul style="list-style-type: none"> • Documentary evidence that the full scope of Commissioning Specialist works have been carried out during the contract administration phase • Commissioning report, systems manual and evidence of training of building management staff 	2 Marks

EE3	Energy efficient Equipment, appliances, fittings	To encourage the use of energy efficient equipment and energy management systems, thereby reducing energy consumption and operational greenhouse gas emissions from the system's energy use.	<p>Specification and installation of the following energy efficient appliance (meeting or exceeding the Minimum Energy performance Standards):</p> <ul style="list-style-type: none"> lighting systems (≥ 60 lumen/watt, $\geq 50\%$ reflectance) transportation/mobility systems (lifts, elevators, car parks, refrigeration systems, laboratory systems, heating systems, kitchen and catering equipment, laundry facilities, office equipment, data centers, swimming pools 	<ul style="list-style-type: none"> Specification showing the provision of energy efficient features and the extent of implementation Calculation of energy savings reaped from the use of these features Calculation of Energy Efficiency Index (EEI) using pre-determined daily usage patterns 	6 Marks
EE4	Light Zoning	To provide flexible lighting controls so as to optimize energy use/savings	<ul style="list-style-type: none"> Provide clearly labeled and easily accessible individual switches to individual or enclosed spaces. The size of individually switched lighting zones shall not exceed 100m^2 for 90% of the naturally lit area Provide auto-sensor controlled lighting in conjunction with daylighting strategy for all perimeter zones and daylit areas, if any. Provide motion sensors or equivalent to complement lighting zoning for at least 25% naturally lit area. 	<ul style="list-style-type: none"> Drawings of floor plans clearly showing every proposed individually switched lighting zone and its coverage area. Electrical schematic drawings showing the locations and extent of switching, the area controlled by the switch and automated control sensing system detailed. 	2 Marks
EE5	Renewable Energy	To encourage use of on-site generated renewable energy sources in supplying a significant proportion of building's energy demand	<ul style="list-style-type: none"> Meet energy requirements for a minimum of 5% of the internal lighting load (for general lighting) or its equivalent from renewable energy sources Meet <u>80%</u> or more of the annual energy required for heating water through renewable energy based water-heating systems. Meet cooking needs from clean fuels and appliances Proof of compliance with the requirements of the Energy (Solar Photovoltaic Systems) Regulations, 2012 	<ul style="list-style-type: none"> plans and elevations marking out installation and location of renewable energy equipment technical specification of the renewable energy equipment and the quantity of energy generated 	5 Marks

EE6	Energy monitoring	To ensure each occupant has the opportunity to monitor and manage energy use	<ul style="list-style-type: none"> • Use of Energy Management System to monitor and trend log building system performance for system efficiency including parameters for plant sequencing, e.t.c. • Monitor sub-metering of building systems to track energy consumption of major building uses and other end use applications e.g. by categorizing into building systems or floors. • Each individual residential unit or commercial tenancy is sub-metered • Use of energy display devices to improve knowledge on energy consumption patterns and their consequences • 	<ul style="list-style-type: none"> • Clearly marked Electrical schematic drawings showing the exact locations of meters and the building usage served by those meters. • BEI achieved, Renewable Energy generated and Water consumption for completed building • Where EMS is installed, comprehensive printouts of EMS results including Maximum Demand Limiting program setting. 	3 Marks
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4 Water Efficiency and Quality (WE)

(20 marks)

The goal of this criterion is to manage water sustainably by reducing the amount of potable water used in the building and reducing the burden on the municipal wastewater system. The guiding principle is to ensure availability of quality water, optimal utilization of water and sustainable management of waste water.

Background

Kenya Vision 2030 recognizes the fact that Kenya is a water scarce country and therefore emphasizes water conservation and prudent use for the limited available potable water. In this regard, the Government of Kenya has instituted specific strategies to raise the standards of the Country's overall water availability/supply and resource management. The National Water Resources Strategy and the National Water Services Strategy aim at ensuring that water resources are conserved and maintained and Non-Revenue Water (NRW) at water supply and sanitation systems is reduced to acceptable levels. Accordingly the Ministry of Environment has developed standards for NRW management.

Access to clean water and sanitation services in Kenya is 52 percent and 69 percent respectively (12). In the country's two major cities—Nairobi and Mombasa— water demand exceeds supply by more than 150,000 and 100,000 cubic meters per day, respectively. The estimated renewable water resources in Kenya amount to 76,610 million m³/year of which 20,638 million m³/year is surface water and 55,973 million m³/year is groundwater. (13) But the greatest water resource in Kenya, the rainfall, remains largely untapped and thus, underexploited (14). The country has adequate rainwater to meet all her water requirements. The total volume of rainfall in Kenya is estimated as 365.6 billion m³/year, (15) which is really a substantive amount of water. The major disconnect is failure to harness the rainfall potential and store it strategically and in substantial amounts. The water storage developed in Kenya so far is very low with a recorded per capita storage of 102 m³/person/year. (14)

Kenya's water supply is marked by huge water losses. At 45% Non-Revenue Water, urban service providers are losing approximately KSh. 9.9 billion annually, slightly less than one third of the sector budget (16). The other challenges facing the management of water resources in Kenya include slow progress in coverage, financing gaps, enforcing compliance to water use regulations, destructive flooding, water pollution and encroachment of vulnerable catchment area, low demand-side water efficiency and effectiveness of investments as well as . (12; 17)

Out of some 175 urban centers in the country, only 47 operate conventional sewerage systems and treatment plants. Only about 18 percent of the total urban population has access to a sewer system, 70 percent rely on septic tanks and pit latrines, and the rest have access to no sanitation services at all. In addition, existing wastewater treatment systems operate at very low efficiencies leading to discharge of untreated effluents. (13)

The domestic water consumption accounts for about 39% of the total water use in Kenya (13). Buildings therefore have a huge role to play in ensuring water availability, efficient use of water and the sustainable management of water ecosystems. Building plans and policies, as well as construction itself, should anticipate and provide for

proper water harvesting and storage, purification and re-use on site. It is also important that building systems are designed to use water efficiently and avoid wastage of water through leakages.

Statutory Requirements: Compliance with Water Quality Regulations and Standards, wetland regulations and the water act is pre-requisite.

The following are characteristics of water efficiency and safety category with their individual intent:

Code	Characteristics	Intent	Assessment Criteria	Evidence	Weighting
WE1	Water Use Monitoring	To ensure water consumption and leakages can be monitored and managed	<ul style="list-style-type: none"> Provision of private meters to monitor the major water usage such as irrigation and tenants' usage. Linking all private meters to the Building Management System (BMS) for leak detection. Promote leak detection system for better control and monitoring of unwanted water loss. 	<ul style="list-style-type: none"> total net water consumption in litres/person/year for the building compared to a baseline performance inventory, plans and photographs of as-installed meters actual EMS report recording consumption and simulated leakage 	3 marks
WE2	Water Harvesting	To reduce the burden on municipal water supply through rain water harvesting and underground water abstraction e.g. using boreholes	Maximize rainwater collection from rooftop or runoff rainwater systems for non-potable building consumption such as irrigation	<ul style="list-style-type: none"> A technical report describing the concept and details of rainwater collection, conveyance system, filtration system (if any), storage facility and distribution system. A report on the proportion of water harvested to the overall water supplied to the building 	3 marks
WE3	Water efficient Fixtures and Fittings	To enhance water use efficiency in conveyance, storage and system operation.	<ul style="list-style-type: none"> Use of water efficient water closets, wash hand basins or shower heads or systems which have the potential to reduce potable water consumption in the building use of modified waterless urinals 	<ul style="list-style-type: none"> Water fitting schedules showing the numbers, types and approved rating Calculations to verify percentage of water saved 	5 marks
WE4	Waste Water Management	To encourage water recycling that will reduce generation of wastewater and potable water demand.	Provision of on-site sustainable wastewater treatment plant/systems that recycle greywater and/or blackwater for building (e.g. for toilet flushing) and irrigation/lawn and garden watering to reduce discharge to external sewer.	<ul style="list-style-type: none"> Metering or calculation of the volume of treated and recycled wastewater Drawings for wastewater recycling and treatment system, and storage tank location (to scale) 	4 marks

WE5	Water Efficient Landscaping or Efficient water use in gardening	Limit or eliminate the use of potable water supply from the local water authority for landscape irrigation	<ul style="list-style-type: none"> • Use of non-potable water including rainwater and on-site recycled water for landscape irrigation • Use of automatic water efficient irrigation system with climate based controller (e.g. rain sensor) • Use of ecologically suitable plant species (e.g. native plants) that require minimal irrigation 	<ul style="list-style-type: none"> • plans showing the detail location of the planted native adaptive vegetation and installed water efficient irrigation system (to scale) • Calculation of the reduction of potable water for landscape irrigation • photographs of the vegetation installed 	3 marks
WE6	Water Quality	To minimize the risk of water contamination in building services and ensure the provision of clean, fresh sources of water for building users	<ul style="list-style-type: none"> • All water systems in the building are designed in compliance with the measures outlined in the relevant national health and safety best practice guides/regulations to minimize the risk of microbial contamination, e.g. legionellosis. • Where humidification is required, a failsafe humidification system is provided • Prevent water mixing, secure storage tanks and ensure temperatures are well regulated 	<ul style="list-style-type: none"> • Proof of compliance with water quality standards prescribed in the National Water Quality Regulations (WASREB's Guidelines on Drinking Water Quality and Effluent Monitoring 2008; Water Quality) Regulations 2006) • Record of the water quality analysis 	2 marks

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5 Healthy Indoor Environment (HE)

20 Marks

The goal of this criterion is to provide indoor (interior) environments that enhance well-being, health and are conducive for occupant comfort and productivity.

Country Context

People spend about 90% of their time in buildings living, working and studying. Building occupants are exposed to other environmental health risks associated with air pollution, water pollution, water supply and sanitation, waste management, noise, chemical and food safety which require special attention. Pollution in the air, water and soil was responsible for 19.3% of all deaths in Kenya in 2015. Fifty eight thousand (58,000) Kenyans died from pollution-related diseases. That is more deaths than from HIV, TB and Malaria combined. The economic cost of the loss of productivity from pollution-related diseases are estimated to be between 1.4% to 2.0% of gross domestic product (GDP) (18).

Air pollution is a leading cause of respiratory diseases such as chronic obstructive pulmonary disease, lung cancer, pulmonary heart disease and bronchitis. The effects of outdoor air pollution are compounded by those of indoor air pollution. Most households use charcoal and firewood for domestic cooking. Indoor air pollution affects both urban and rural populations (19). Ambient air pollution levels in Nairobi are estimated to be $45\mu\text{g}/\text{m}^3$, or three times higher than the World Health Organization (WHO) recommended level of $15\mu\text{g}/\text{m}^3$. The high particulate matter in the air emanates from industrial and commercial activities, which are concentrated in urban areas and from emissions by vehicles and other forms of transport. In rural areas, the quality of air is affected mostly by over-reliance on wood fuel, agricultural activities and poor housing. (14)

According to World Health Organization (WHO) estimates, household air pollution (HAP) causes 14,300 deaths each year in Kenya and directly impacts the health of 14.9 million Kenyans. 67 percent of this dangerous exposure is due to household cooking on traditional cook stoves. Acute respiratory infections (ARI), often caused by HAP, are the second leading cause of death in the country and account for 26 percent of all deaths reported in Kenyan hospitals. The main groups affected include women and children in households using open fires in built-in kitchens, institutional cooks, kitchen helpers, and school students who study with kerosene lamps (20). According to the 2014 Kenya Demographic and Health Survey (21), more than half (53%) of households use one room for sleeping; 50% of households cook inside the residential house/dwelling unit, while 42% cook in a separate building and 7% cook outdoors. The percentage of households that cook within the dwelling unit is much higher in urban areas (77%) than in rural areas (30%). More than 90% of households in Nairobi's Korogocho and Viwandani slums cook in the same room used as a living and sleeping room (22).

Many green building related interventions can contribute to a healthy indoor environment, including use of day-lighting, passive design and natural ventilation, preventing moisture intrusion, specification and installation of appropriate equipment and building materials (finishes) with low or zero volatile organic compounds (VOCs) or other contaminants and pollutants.

Statutory Requirements

Compliance with the following requirements is prerequisite: Noise and Excessive Vibration Pollution Control Regulations; Toxic and Hazardous Industrial Chemicals and Materials Management Regulations; Air Quality Regulations; Health Acts; Public Health and Occupational Safety Act and incorporation of Environmental Health Impact Analysis (EHIA) as a component of EIA for all development projects.

The following are characteristics of Healthy Indoor Environment category with their individual intent:

Code	Characteristics	Intent	Assessment Criteria	Evidence	Weighting
	Ventilation and Thermal Comfort To encourage the use of passive design strategies relevant to the project's climate zone to enhance the overall performance of the building envelope in order to regulate heat gain and encourage natural ventilation thus maintaining a comfortable environment for occupants within the building.				7 Marks
HE1	Natural Ventilation, Heating and Cooling	To encourage use of natural ventilation to provide cooling by use of passive design strategies appropriate to the bioclimatic conditions and building types.	<ul style="list-style-type: none"> Building design that utilizes prevailing wind conditions to achieve adequate cross ventilation. Examples of strategies include: operable windows, thermal /wind chimneys, louvered fenestrations and perforated screens on openings. Use of wind simulation modelling and analysis to identify the most effective building design and layout in achieving good natural ventilation Use of appropriate window-to-wall ratio and window glazing types. 	<ul style="list-style-type: none"> Plan layouts and calculations of number and percentage of rooms with window openings facing prevailing wind directions Evidence of cross ventilation 	5 Marks
HE2	User-friendly ventilating, heating and cooling systems	Provide high level of thermal comfort system control for individuals and multi-occupant spaces to promote productivity, comfort and well-being of building occupants.	<ul style="list-style-type: none"> Provide individual comfort control for $\geq 50\%$ of the building occupants to enable adjustments to suit individual task needs and preferences, <i>AND</i> Provide comfort system control for all shared multi-occupant spaces to enable adjustments to suit group needs and preferences 	<ul style="list-style-type: none"> report on the individual types of control and the controls for multi-occupant spaces provided Photographic evidence of each typical type of sensor and control installed 	1 Mark

HE3	Air change effectiveness	To ensure effective delivery of clean air through reduced mixing with indoor pollutants in order to promote a healthy indoor environment.(NB: applicable to mechanical ventilation systems)	The ventilation system is designed to achieve an Air Change Effectiveness (ACE) ≥ 0.95 when measured in accordance with ASHRAE 129 -1997. Measure air change effectiveness, where ACE is to be measured within the breathing zone (nominally 1.0 m from finished floor level).	<ul style="list-style-type: none"> drawings to show the ventilation system report of measurement detailing the ventilation design criteria Where there is no mechanical system, transfer the mark to HE1 	1 Mark
Light and Visual Comfort To ensure daylighting, artificial lighting and occupant controls are considered in the design hence ascertain best practice visual performance and comfort for building occupants.					7 Marks
HE4	Natural lighting	To ensure provision of good levels of daylighting for building occupants to reduce the need for artificial lighting.	Optimize opportunities for daylight penetration into dwellings and tenancies through measures such as, but not limited to: <ul style="list-style-type: none"> light shelves; use of light colours; and/or dual aspect design. 	<ul style="list-style-type: none"> Floor plans with Daylight Factor measurement results Site plan incorporating height of existing buildings or planned buildings surrounding the building together with solar diagrams & sun path photographs of each type of typical device installed 	3 Marks
HE5	User-friendly Lighting Systems	Provide high level monitoring of lighting system and easy control by individual occupants or multi-occupant spaces for various tasks	<ul style="list-style-type: none"> Provide independent lighting controls for 90% (minimum) of the building occupants to enable adjustments to suit individual task needs and preferences Provide lighting system controls (light sensors, switches), for all shared multi-occupant spaces to enable adjustments that meet group needs and preferences for comfort, well-being and productivity. 	<ul style="list-style-type: none"> Number of occupants able to control lighting to suit their task needs and preference 	1 Mark
HE6	Glare control and view out	To provide building occupants with a visual connection to the outdoors through the introduction of daylight and views into the regularly occupied areas of the building while reducing	<ul style="list-style-type: none"> Luminaires in all main usages of the building areas to meet prescribed luminance limits (keep horizontal workspace luminance level below 2000 lux) Illuminance levels for lighting in all external areas within the open areas are specified in accordance with prescribed limits 	<ul style="list-style-type: none"> Lighting specification and lighting designer's calculations or site inspection report confirming unified glare ratings and conformity with luminance limits. photographs of each type of typical glared control system installed 	1 Mark

		discomfort of glare from natural light.			
HE7	Efficient Artificial Lighting Fittings	To ensure electric lighting level is not over-designed and encourage use of efficient electric lighting to minimize energy consumption from lighting usage while maintaining a comfortable visual working environment for occupants.	<ul style="list-style-type: none"> Design ambient lighting level in accordance with the recommended illuminance level Provide task lighting for occupants who require a higher lighting level either for their own preference or for various task needs. Specify and install high frequency ballasts ($\geq 20\text{kHz}$) in fluorescent light fittings to avoid flickers 	<ul style="list-style-type: none"> Drawings showing the lighting layout plans Photometric measurements Photographs of typical floor lighting installation Specifications of high frequency ballasts installed 	3 Marks
Indoor Air Pollutants To reduce the quantity of indoor air contaminants that are odorous, irritating, and or harmful to the comfort and well-being of occupants					5 Marks
HE8	Tobacco Smoke Control	Minimize exposure of building occupants, indoor surfaces, and ventilation systems to Environmental Tobacco Smoke (ETS).	<ul style="list-style-type: none"> Prohibit smoking in the building and locate any exterior designated smoking areas at least 10m away from entries, outdoor air intakes and operable windows, <i>OR</i> Prohibit smoking in the building except in designated smoking rooms and establish negative pressure in the smoking rooms together with provision of effective air filtration system. 	<ul style="list-style-type: none"> Detailed drawings showing location of exterior designated smoking zones and details of building envelope and systems to minimize ETS transfer 	Pre-requisite
HE9	Indoor air quality testing and monitoring	To evacuate air-borne contaminants in the building resulting from the construction process and confirm that the major contaminants are below recognized acceptable levels in order to help sustain the comfort and well-being of occupants	<ul style="list-style-type: none"> Develop and implement an Indoor Air Quality Management Plan for the Pre-Occupancy Phase Perform a building flush-out by supplying outdoor air to provide not less than 10 airchanges/hour (ACH) for at least 30 minutes operation before occupancy and continuous minimum 1 ACH during the initial 14 days occupancy of the completed building Within 12 months of occupancy, conduct IAQ testing to demonstrate maximum concentrations for pollutants are not exceeded 	Report on building flush-out and IAQ testing procedure including the actual dates of the flush-out and the results of the testing	2 Marks
HE10	Damp and Mould prevention	To prevent dampness and microbial contamination in the building to ensure the health and well-being of building occupants,	Ensure that excessive moisture in building is taken into consideration during design, and be controlled and monitored during construction and operation stages by control of the following: Rainwater leakage through roof and walls; Infiltration	<ul style="list-style-type: none"> Report outlining the strategies adopted to prevent the risk of mould growth 	1 Mark

		reduce cost of maintenance and extend the lifespan of the building	of moist air; Diffusion of moisture through walls, roof and floor; Groundwater intrusion into basements and crawl spaces through walls and floors; Leaking or burst pipes; Indoor moisture sources; Construction moisture	<ul style="list-style-type: none"> Manufacturer's information on all relevant materials specified for damp-proofing and mould prevention and/or resistance 	
		Acoustic comfort To ensure the building is adequately sound-proofed and meets the appropriate standards for its purpose.			
HE11	Internal Noise Level	To maintain internal noise level at an acceptable and tolerable level	Maintain internal noise levels at an acceptable and tolerable level. Demonstrate that 90% of the NLA do not exceed the following ambient internal noise level: <ul style="list-style-type: none"> Within the entire building general office, space noise does not exceed 40dBAeq OR Within the baseline building office space, the sound level does not exceed 45dBAeq for open plan and does not exceed 40dBAeq for closed offices. 	<ul style="list-style-type: none"> Report describing the measured internal and external noise sources and features installed to achieve required noise level Details of noise control features Manufacturer's data sheets of the acoustic materials used in building Evidence of sound measurements (sound meters) 	1 Mark

The design and construction of a building is only the beginning of the building's environmental impact. Implementing green building operations and maintenance (O&M) practices ensures that building systems achieve maximum efficiency over the life of a building. The succeeding category therefore sets out the criteria for assuring building performance in use.

6 Operation Maintenance and Decommissioning (OM)

10 Marks

The goal of this category is to maximize the intended use of the building within its lifecycle.

Background.

Despite efforts to encourage reuse, recycling and recovery, the amount of solid waste generated remains high and appears to be on the increase (19). Currently, only 8% of recyclable waste and 5% of compostable waste are recovered. The Green Economy Strategy sets a long-term target of 50% waste recovery (17% recycling and 32% composting) by 2030 and a short-term target to achieve 30% waste recovery (15% recycling and 15% composting). (12)

No urban area in Kenya has a properly engineered sanitary landfill, and most solid waste is dumped in open dump sites or other undesignated areas, or burned. In Kenya, less than 40% of solid waste is collected and disposed of at designated dumpsites. (23) Nairobi alone produces around 2,400 tons of solid waste per day, (24) but only 33% of the waste is collected and disposed at Nairobi's only dumpsite in Dandora. (14)

The current contractual relationship between consultants and developers does not include post-construction engagement of consultants, save for responsibilities during the defects liability period. Thus, rarely are post-occupancy evaluations done to assess the performance of buildings in use.

Statutory Requirements for Compliance:

E-Waste Management Regulations; Toxic and Hazardous Industrial Chemicals and Materials Management Regulations; Waste Management Regulations; Guidelines for E-waste Management in Kenya and the National Solid Waste Management Strategy of 2014 which has a guiding principle of "zero waste".

GreenMark Rating System:

The following are characteristics of operations maintenance and management category with their individual intent:

Code	Characteristics	Intent	Assessment Criteria	Evidence	Weighting
	Pre-requisites				
OM1	Environmental Management and Monitoring Systems	To recognize compliance with statutory and voluntary best-practice environmental and management systems.	<ul style="list-style-type: none"> Environmental Audits covering both the building's interior, exterior and the hosting landscape Energy audit and validation - Energy audit report prepared by ERC licensed auditors 	<ul style="list-style-type: none"> Environmental Management Plan Quality Management Systems (QMS) Environmental and Energy Audit reports 	1 Mark

		Operation and maintenance policies, documents guidelines			
OM2	Building User Manual	To document green building design features and strategies for user information and guide to sustain performance during occupancy	Building's User Guide(s) are provided and are appropriate to all users of the building (general users including staff and if applicable residents, as well as the non-technical facilities management team / building manager).	<ul style="list-style-type: none"> Operational and guidance manuals from specialists involved in construction Display of operation and maintenance policy and guidelines at appropriate places easily accessible by key building users 	1 Mark
OM3	Post Occupancy Evaluation (POE)	To encourage and recognize building owners for undertaking a Post Occupancy Evaluation (POE) one year after building occupation, to gain building performance feedback	<ul style="list-style-type: none"> Conduct an independent third party POE that covers: <ul style="list-style-type: none"> A review of the design and construction process (review of design, procurement, construction and handover processes), Feedback from a wide range of building users including facilities management on the design and environmental conditions of the building, Sustainability performance (energy/water consumption, performance of any sustainable features or technologies e.g. materials, renewable energy, rainwater harvesting, etc.) Dissemination of information on the building's post occupancy performance in order to share any good practice and lessons learned 	<ul style="list-style-type: none"> Signed and dated commitment by the client/developer or future building occupier to carry out a POE or Post Occupancy Evaluation (POE) report Evidence of implementation of reports 	2 Marks
OM4	Sustainable Procurement Policy	To promote the use of sustainable consumer products in building maintenance and operational needs, through the adoption of a sustainable purchasing policy.	<ul style="list-style-type: none"> Develop a Sustainable Purchasing policy to ensure responsible sourcing of product purchases within the building and management's control. Use of a tenancy lease agreement between the developer and tenant/s outlining fit-out guidelines to maximize material optimization and resource efficiency 	<ul style="list-style-type: none"> A Sustainable Purchasing Policy with its objective, scope and responsibilities, best practices and procurement strategies Service contracts with service providers A signed lease or tenancy agreement 	1 Mark

		Sustainable Waste Management To ensure there is a clear strategy which facilitates the recycling of resources and reduces waste going to landfill.			
OM5	Operations' Solid Waste Management	To encourage minimizing, sorting, collecting, quantifying, monitoring and recycling of a large range of solid waste generated during occupancy to reduce waste going to landfill	<ul style="list-style-type: none"> • Provide adequate, easily-accessible and clearly labelled dedicated areas and storage bins for non-hazardous materials for recycling during building occupancy. • Comply with the requirements of the Environmental Management and Co-Ordination (Waste Management) Regulations 2006 	<ul style="list-style-type: none"> • Floor plans and photos showing the proposed locations of the storage areas for recyclables and their proximity to the building entrance and vehicular access point/s. • A waste management strategy and plan aimed at achieving 'zero waste' living • Quarterly reports and waste records 	3 Marks
OM6	Building exterior management	To mitigate pollution to the environment when carrying out maintenance of building exterior, including landscapes.	<ul style="list-style-type: none"> • Use environmentally non-polluting methods and chemicals for cleaning of building exterior including maintenance equipment, chemicals, paint and sealants. • Erosion and sedimentation control for ongoing landscape operations including measures that prevent erosion and sedimentation, prevent air pollution from dust or particulate matter and restore eroded areas 	<ul style="list-style-type: none"> • Building exterior management plan and intended list of non-polluting cleaning agents / products • Photographic and documentation evidence of actual applications at site. • Erosion and Sedimentation Control Plan as well as Landscape Management Plan 	2 Marks

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7 Innovation (IN)

5 Marks

This category aims to support innovation within the construction industry through the recognition of sustainability related benefits which are not rewarded by standard GreenMark issues.

It provides opportunity for a submitted project to be awarded points for exceptional green features and performance above the requirements set by GreenMark rating system.

Assessment criteria

One innovation credit shall be awarded for each individual GreenMark category's exemplary performance level complied with. Any additionality that is or is not categorized but fits the description of innovativeness may be awarded due credit. Such may present bases for future review.

Examples of possible green features to be considered for innovation credit award include:

- SS - Life Cycle cost and service life planning; Wind break features; precautionary measures against earthquake hazard
- MT - Self-cleaning façade system, Cool Paints, Technology transfer
- EE: Alternative energy
- WE - Siphonic rainwater discharge system; cost-effective separate drainage system for reticulation of brown and gray water
- HE: Water bodies and features, Green roofs and vertical greeneries
- OM - Carbon footprint calculation, Compost bins to recycle organic waste, pneumatic waste collection system, dual chute system; Security system such as sensor controlled lighting, alarm, automation for safety and security

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Appendices

Appendix 1: Submission Data

Item	
1) Name of building :	
2) Postal Address :	
3) Physical address :	
4) Contact person :	
5) Architect :	
6) Project Manager:	
7) Civil engineer :	
8) Structural engineer :	
9) Mechanical engineer :	
10) Electrical engineer :	
11) Quantity surveyor :	
12) Landscape specialist consultant :	
13) Local authority :	
14) Total gross floor area :	
15) Land area :	
16) Building type/ description :	
Original construction date :	
Renovation dates :	
Number of floors above grade	
Number of floors below grade:	
Number of occupants:	
Number of occupants building was designed for:	
Original construction documents available	

Appendix 2: List of Stakeholders who participated in GreenMark Validation:

	Institution	Representative
1)	Mutiso Menezes International (MMI)	Arch. Alan Simu
2)	Kenya Forestry Research Institute (KEFRI)	George Migom
3)	Kenya Bureau of Standards (KEBS)	David Kirui
4)	Kenya Law Reform Commission	Odiek Daisy
5)	Climate Change Directorate	Michael Okumu
6)	Kenya Electricity Transmission Company (KETRACO)	Constantine Ngeno
7)	Kenya National Accreditation Service (KENAS)	Eng. Carrey Ochogo
8)	Architectural Association of Kenya	Arch. Gad Opiyo
9)	Town and County Planners Association of Kenya (TCPAK)	Pln. Mairura Omwenga
10)	University of Nairobi, Wangari Maathai Institute	Prof. Nzioka John Muthama,
11)	Kenya Institute of Curriculum Development (KICD)	David Ogogo
12)	Ministry of Health	Lolem Lokolile Bosco
13)	Kenya Industrial Research and Development Institute (KIRDI)	Dan Mbingo
14)		Willis Makhoha
15)	Kenya Federation of Master Builders	Edward Gichina
16)	Kenya Forest Service (KFS)	Joseph Njigoya
17)		Jacinta Mugo
18)	Materials Testing and Research Division (MTRD) of the State Department of Infrastructure	Eng. Albert Ndege
19)	Energy Regulatory Commission (ERC)	Eng. Eustace Njeru
20)	Environment Institute of Kenya (IEK)	Susane Manyasi
21)		Ronald Kimtai
22)	Nairobi City County (Physical Planning Department)	Plnr. Raphael Kazungu
23)	National Environment Management Authority (NEMA)	QS. David Ruto
24)	National Construction Authority (NCA)	Ruth Onkangi
25)	Jomo Kenyatta University of Agriculture and Technology	Ubanus Mutwiwa
26)	(JKUAT)	Liz Wangui
27)	Kenya Climate Change Working Group (KCCWG)	Vincent Ondieki
28)	World Student Community for Sustainable Development (WSCSD)	Azarius Karanja
29)	C40 CITIES	Philip Dinga
30)	Trine Architects	Arch. Geoffrey Wasonga
31)	Archi-Space Architects	Arch. Simon Mulang'a
32)	NIKO GREEN	Kenneth Obat

33)		Nickson Otieno
34)	VDS	Evelyn Nyatichi
35)		Silantoi Lapukenya
36)	Demassin Technologies	Esther Wendy
37)	African Youth Initiative on Climate Change (AYICC – Kenya)	Dolphine Magero
38)	Shelter Varieties	Arch. Francis Mugo
39)	Global Engineering International	Eng. Johnstone Mulaimu
40)	Tsavo Power	Eng. Julius Riungu
41)	Director, Slum Upgrading	QS. Charles Sikuku
42)	Private Consultants	Rehema Simba
43)		Arch. Wanjau Mwenja
44)		Eng. Omedi Jura
45)		Edith Nasibwa
46)	LECRD, Ministry of Environment and Forestry	Phanice Mokeira
47)		Lilian Ndunge
48)		Dr. Harun Warui
49)	Green Africa Foundation	Dr. Isaac Kalua
50)		Michael Malonza
51)		John Kioli

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