EDGE & AFFORDABLE HOUSING

UPDATE REVIEW OF THE EDGE CERTIFICATION PROCESS - POST AUDIT AFFORDABLE HOUSING FOCUS – A CASE STUDY OF KWANGU KWAKO HOMES

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***Note**: This publication reflects EDGE definitions and KKL audit outcomes as of June 2025*

A. EXECUTIVE SUMMARY

KKL is a design, manufacture and build company that is based in Kenya whose vision is to provide safer, secure, dignified and affordable housing. KKL received support from Reall to undertake EDGE training and from FSD Kenya to undergo EDGE evaluation for one of its projects and share the experiences. The EDGE Audit was completed in early 2025 with KKL's project receiving EDGE Advanced certification, and KKL herewith shares experiences from its journey as an affordable housing developer and green certification evaluation.

The EDGE platform is designed to ensure resource efficiency in buildings (by reducing consumption of water, energy, and environmentally unfriendly materials) and promote green building culture through certification of these buildings.

- To achieve EDGE Certification a building must demonstrate a 20% reduction in energy consumption, water use and embodied energy in construction materials in comparison to a local **base case**. Savings are achieved using efficiency measures such as water saving taps.
- To achieve EDGE Advanced Certification a project must meet the EDGE basic criteria (above) **and** reach 40% or more energy savings.

KKL project is one of only a few affordable housing projects in Kenya to achieve this level of certification and delivers housing at affordable construction costs per square meter.

The study update acknowledges improvements made to the EDGE process and shares KKL's experience in the final part of the process to deliver the EDGE Advanced Certification.

The KKL study revealed that low-income housing conforms with EDGE standards to a notable extent, with potential to achieve more savings. The study of the actual consumption of electricity and water was found to be lower than the base case provided for the region pointing to lifestyle differences for low income households vs the average. The study also indicated that actual electricity and water consumption in the KKL case study units was notably lower, approximating a third to half of what the system estimates as the base case for these unit types.

Other key points noted:

- Low-income housing construction utilises less material (embodied energy) per capita than any other form of housing and whether a saving should be granted for this optimum use of space is an important next step for EDGE, or any green building certification.
- Most affordable housing units' occupants rely on public transport rather than using a private car, which is very good for the environment both in terms of lower building of hard car parking spaces and vehicle omissions. However, green building certifications often do not take this into account.
- This report also recognises a major challenge to the democratisation of EDGE also being the high fee attached to certification being unfavourable to small scale developers.
- Finally, EDGE is a global standard and is based on savings compared to the **base case** of a country. However, this means that countries like Kenya, who have heavily invested in renewal energy to run most of its national electricity grid, do not get credit for this as a nation.

Therefore, green financing may flow more easily to countries that are less environmentally conscious.

Since 2022, KKL and EDGE have forged a strong partnership, with KKL and FSD contributing recommendations to enhance EDGE for affordable housing in Kenya's localised context. Many of these have already been implemented by EDGE, reflecting the impact and strength of the collaboration. These changes include:

- the use of actual consumption to measure the resource efficiency of operational low-income homes. This has now been incorporated in the EDGE system.
- To increase resource efficiency using greener locally produced fixtures e.g. taps and construction materials, open-source green building directories e.g. Jenga Green library, should be promoted. This is now allowable through the applicant demonstrating to the Auditor the performance of the relevant fitting etc.
- Different fee options have been proposed such as the stepped minimum for smaller scale developers and a type approval for developers who use standard house designs.
- Facilitation of green building education by stakeholders as evidenced by Reall who facilitated the KKL team training is also encouraged to increase uptake. EDGE and other stakeholders are continuing to promote and raise awareness of the EDGE Certification.
- Democratisation must also involve public education on the benefits of EDGE at a tenancy level, landlord level and developer level.

B. ACRONYMS AND ABBREVIATIONS

AC - Air Conditioning
CFL - Compact Fluorescent Light
CO2 - Carbon Dioxide
EDGE - "Excellence in Design for Greater Efficiencies"
GHG - Greenhouse Gases
IEA - International Energy Agency
IFC - International Finance Corporation
KKL - Kwangu Kwako Limited
kWh - Kilowatt Hour
LED - Light Emitting Diode
SR - Solar Reflectance
tCO_2 - one metric tonne of carbon dioxide
T5 - Tubular, 5mm diameter light
UNEP - United Nations Environment Programme

C. DEFINITIONS OF TERMS

Affordable Housing - Refers to housing units that are cost effective to that section of society whose income is below the median household income. (In Nairobi, this section of society comprises 74.4 percent of the population in formal employment) (Cytonn report, 2022). For KKL we target the bottom 40% income bracket of the population - There is conflicting information on this and acquiring detailed statistics on what income encompasses the bottom 40% has been a challenge. The Government of Kenya , Habitat for Humanity, etc use KShs. 50,000 per month as household income as the median. This means any rental level of under KShs. 16,666 per month would be "affordable".

Base Case - In the context of this report and EDGE, a base case is the measure of expected expenditure of water, electricity and embodied energy in building materials contextualised for the building functions and location. Ie, the expected usage of water, electricity and materials derived from typical units in a local area.

Efficiency Measure - An efficiency measure is an action, (installation, design, component) that has been put in place, to lower consumption of energy and water, or to reduce the embodied energy in a building.

Embodied Carbon - This consists of all the Greenhouse Gas (GHG) emissions that are associated with the process of building construction, in this case, the extraction, transportation, manufacturing and installation of building materials.

Embodied Energy - Is the primary energy demand for the production of materials used in the building, measured in Megajoule (MJ) per square metre.

Energy Use - In this case, energy use is defined as the delivered energy, ie, what is paid for by the consumer. Energy use is measured in kilowatt hour(kWh). It is what is typically referred to as units or tokens in prepaid systems.

Green Building - (also known as green construction or sustainable building) refers to both a structure and the application of processes that are environmentally responsible and resource-efficient throughout a building's life-cycle: from planning to design, construction, operation, maintenance, renovation, and demolition. *Ref - Wikipedia*

Green Measures - Similar to efficiency measures, these are actions that are put in place to reduce the resource utilisation of buildings in terms of water, energy and embodied energy in materials.

Improved Case - It is the expected measure of usage of water, electricity and embodied energy in materials consumed in construction after the efficiency measures have been introduced. It is indicated by the percentage in savings for each of the elements.

Suggested improved case - This is what the system considers an automatic improvement in specification of the base case parameter.

U-Value - The rate of flow of heat across a material. The higher the U value, the faster the heat loss. The lower the U value, the better the insulator properties of a material.

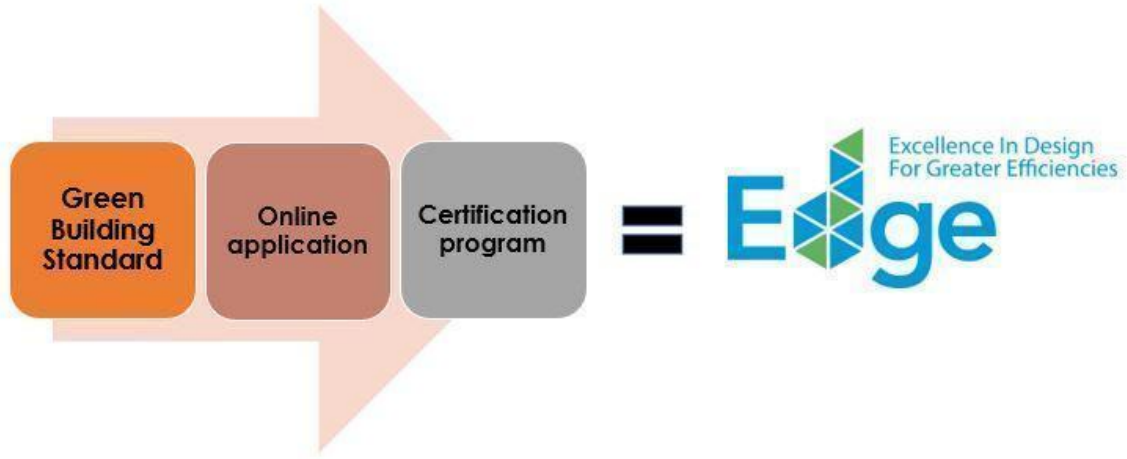
Virtual Energy - is the energy that will be used to ensure comfort for the user. For example, if an Air Conditioning (AC) system is not installed, where the area may require thermal regulation, it is the energy that would have been used to ensure thermal comfort.

Water Use - In this case, water use is defined as the delivered water, i.e., what is paid for by the consumer. It is measured in kL. I.e., 1,000 Litres. Harvesting water for example reduces the amount of water that is paid for which therefore increases the water efficiency percentage of a building.

1. WHAT IS EDGE?

1.1 Introduction

EDGE is a green building platform that allows users to calculate and evaluate a building's carbon emissions and operational expenses. EDGE aims to allow its users to integrate technical solutions especially at the design stage, with the aim of reducing both emissions and operational expenses. The platform is aimed at all building stakeholders who include building owners, engineers, architects and developers. EDGE is a platform that is composed of the EDGE green building standard, the online application and a certification programme . It is an innovation of the IFC (International Finance Corporation), a sister organisation of the World Bank and a member of the World Bank Group.



To achieve the Global EDGE Green Building standard:

- For EDGE Certification: a building must be able to **demonstrate a 20% as compared to a local base case in the following aspects:**
  - Energy consumption
  - Water use
  - Embodied energy in construction materials
- For EDGE Advanced Certification: a building must be able to **demonstrate a 40% reduction** in the above three aspects.

1.2 The EDGE perspective

"The intent of EDGE is to democratise the green buildings market, which was previously reserved for higher-end buildings standing in relative isolation in primarily industrialised nations. Government regulations in emerging economies rarely require resource-efficient building practices. EDGE is creating a new path for green growth by proving the financial case in a practical, action-oriented way that emphasises a quantitative approach. This approach closes the gap between non-existent or weakly-enforced green building regulations and expensive international standards. It realises the potential to lower utility costs while reducing GHG emissions" (EDGE User Guide)

1.3 Housing and Climate Change

The construction and housing sector attributes approximately 38% (IEA,2019) of the global CO_2 emissions and therefore the need to build green has never been higher. Of the 38% the

construction process accounts for 10% of the global emissions, while building occupation and operations account for 28% of the emissions. Getting ahead of this problem especially in the developing world will help reduce future emissions and will create a culture of green building that is core to the future of housing.

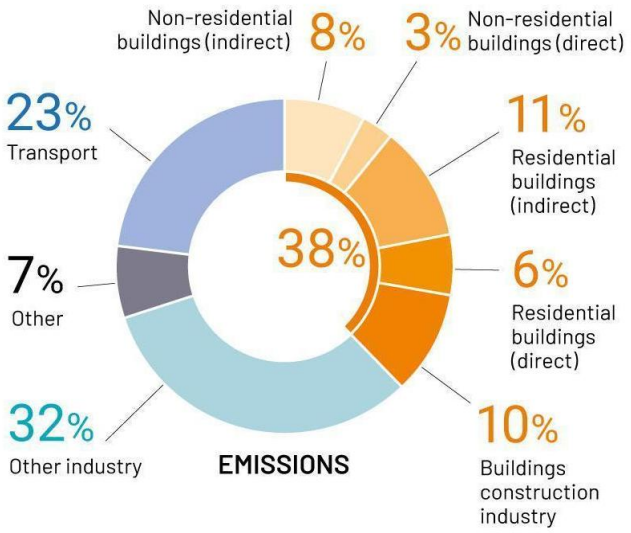


Figure 1.3.1: 2020 Global Status Report for Buildings and Construction, United Nations Environment Programme; adapted from "IEA World Energy Statistics and Balances" and "Energy Technology Perspectives" (IEA 2020d; IEA 2020b).

Note: The buildings construction industry is the portion (estimated) of the overall industry devoted to manufacturing building construction materials such as steel, cement and glass.

According to UNEP, to get on track to net-zero carbon building stock by 2050, the International Energy Agency (IEA) estimates that direct building CO2 emissions need, by 2030, to fall by 50 % and indirect building sector CO_2 emissions by 60 %. This equates to building sector emissions falling by around 6 % per year until 2030.

1.4 The Certification Process

Certification of projects can be undertaken at different stages of the build process:

- **Completion of the design stage** - this is preliminary and comprises a design review of the project on the EDGE app.
- **Completion of the construction stage/post construction EDGE certification** - a project is audited by an EDGE accredited auditor to verify the specifications which had previously been entered into the EDGE App (design drawings, data sheets from manufacturers, calculations and pictures)), and if compliant, certification is granted.

- **Operational stage** - EDGE certification is awarded at design and post-construction (as-built). Operational performance audits may be undertaken under specific programs or client initiatives.

The certification process is supported on the EDGE App which is an easy-to-use platform for trained experts that allows users to enter the project details and get immediate feedback on the performance of their building with regards to energy, water and material savings. In an effort to increase the sustainability of affordable housing in Kenya, Reall supported the training of the KKL team therefore making the certification more accessible to KKL and their clients.

Figure 1.4.1: Certification process, Source www.gbcsa-learn.co.za EDGE Expert Training

In summary, the process is as follows:

- The client appoints an EDGE Expert who works with and advises an architect, contractor and/or client on design options that promote less energy use, materials and methods/techniques to be used during construction. These will have less embodied energy and equipment to be installed in the building that result in low operational energy use.

- The EDGE Expert also reports on project details as constructed or proposed design details (if applying for preliminary design certification) on the EDGE app before submitting the project for auditing. The required documentation for proof is uploaded at this stage.

- An EDGE Auditor (cannot be the same as the EDGE Expert) reviews the project (once the design and documentation is to the required level, confirmed by the EDGE Expert) by verifying the standards against the EDGE guideline through assessment of available documentation and site visits.

- EDGE Auditor declines or approves a building to be certified as green. Should she/he find non-compliance with the guideline, she/he can ask for a re-installation (construction phase), or a redesign (design phase), to make the project compliant after which the assessment is redone.

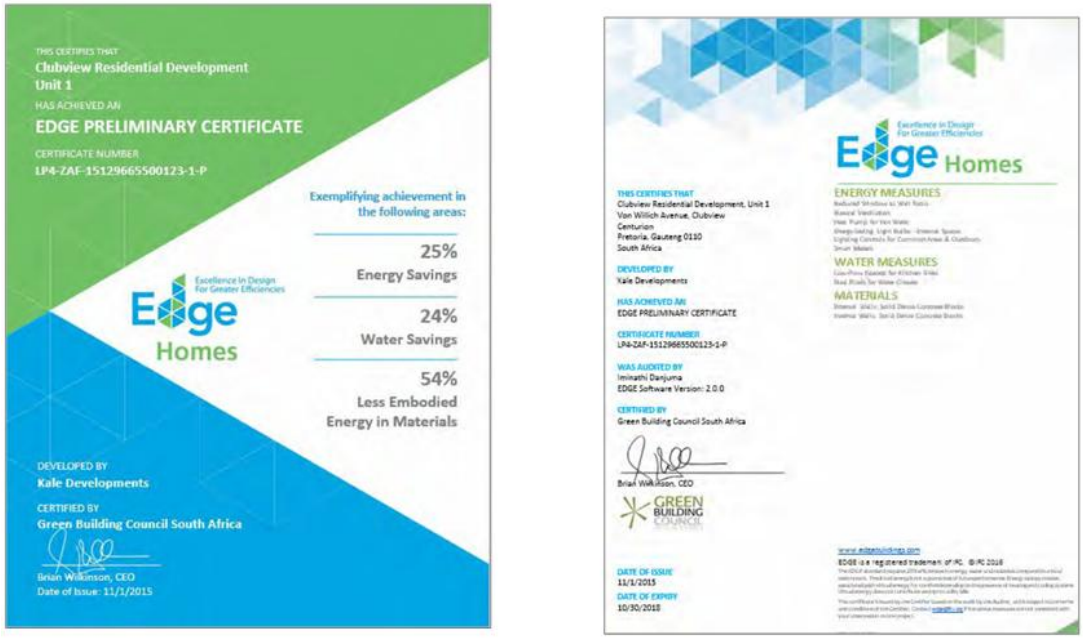


Figure 1.4.2: EDGE Preliminary Certificate source : www.esmap.org

Upon completion of this process satisfactorily, the buildings in consideration are then awarded with the green building certificate by a **licensed EDGE certification provider**, which should be renewed every three years to ascertain that the measures put in place are still active. It is worth noting that benefits from the EDGE app use are mostly felt when it is used from the design phase as it is at this point where most decisions that will later affect the resource uses are made.

Here is a simple video from the EDGE buildings YouTube Page on how to design resource efficient buildings: How to design resource efficient buildings by EDGE. For more information on EDGE, here are some EDGE Green Building tutorials and documentation.

1. How to Meet the EDGE Standard
2. How to Calculate the Window to Wall Ratio in EDGE
3. EDGE User Guide - EDGE User Documents Archive

2. THE EDGE KENYA BASE CASE FOR HOMES (NAIROBI)

2.1.1 Introduction

The data input into the EDGE app is used to determine the resource use for buildings and eventually the efficiency of the building. Efficiency is calculated in comparison to a **base case** which is determined by the context of the building use (housing, retail etc) and the location of the building (city and country).

For example, the resource usage of a one-bedroom apartment input in the EDGE app is compared to what is considered the typical usage for a similar sized apartment in the same area which is considered the base case.

The **improved case** is determined by inputting the actual specification of fixture, appliance or any other green measure used or expected to be used in the actual housing project in the EDGE app, leading to a saving in water usage, energy usage or embodied energy in material consumption that is expressed in percentages.

The system may have a **suggested improved case** for some parameters**,** which is what the EDGE App interprets as the expected efficiency for the specific element, but it also allows the user to input the actual specification for the design parameters. Therefore, this number is not intended to confine the user to a set standard but rather act as an efficiency goal, thus guiding the design process. Savings will be achieved if the actual specification input is lower than the base case.

The suggested improved base case is especially useful during the design stage, before construction where the specification for various elements is still being decided upon, forming a guideline upon which the design can follow.

2.1.2 Examples explaining the base case, the improved case and the suggested improved case.

Example 1: When considering cisterns as we will do later in the document for water saving, a 8L per flush cistern is considered the base case and any other value below that is considered an improved case. The suggested improved case for cisterns is 6L per flush.

Example 2: For the use of refrigerators and washing machines, the base case considers that homes have refrigerators and washing machines, but they are not efficient. Therefore, the use of energy and water saving refrigerators and washing machines is considered the improved case for which credit is received.

Example 3: In Material usage the base case for walling is considered to be 200mm thick masonry wall, and therefore once the user inputs a different value, eg, KKL wall at 50mm, the system auto calculates the embodied energy associated with the new material and grants the resultant embodied energy savings.

2.2 Energy saving measures

In this section, the user inputs the actual specifications for the fixtures and systems in use which are measured against the base case to achieve savings in energy consumption. Homes that require less energy whether to keep them cool or warm them up are more energy efficient.

Energy saving measures for low income housing. Base case location: Nairobi, Kenya.

Element	**Base Case for Low-income housing in Nairobi, Kenya from EDGE**	**Suggested improved Case** Any measure more efficient than the base case allows one to get a saving
1. Window to Wall ratio Affects heat gain or heat loss for homes through windows. The lower the better.	30% Window to Wall ratio Calculated based on area of window to area of external walls	20% Window to Wall ratio
2.Solar reflectivity of Roof (Affects the ability of a roof to reflect heat away. The higher the better)	Solar reflectance (SR) 0.3 This is darker roofing	Solar reflectance (SR) 0.7 This is brighter roofing
3.Solar reflectivity of Wall (This affects the ability of a wall to reflect heat away. The higher the better)	Solar reflectance (SR) 0.4 These are darker walls	Solar reflectance (SR) 0.7 These are brighter walls
4.External shading devices *protect homes from direct sunlight/solar radiation	Assumes no shading devices	Shading factor of 0.7 i.e. reduces heat gain from window by 30%
5.Roof insulation Reduces heat loss or heat gain to the environment	Roof U value - 2.12 W/m2k.	U value of 0.45 W/m2k. the lower the better but choice of material may affect material savings

Table 2.2.1 - Base cases for Energy saving measures and their improved cases for the Nairobi Region. Source: Retabulated from the EDGE App.

More items are available in Appendix A

2.3 Water efficiency measures

In this section, the user inputs the actual specifications for the fixtures and systems in use which are measured against the base case already in the system based on the choice of location, which in this case is Nairobi, Kenya.

Water efficiency measures for low-income housing. Base case location: Nairobi, Kenya.

Element	**Base Case for low-income housing in Nairobi, Kenya from EDGE**	**Suggested improved case** Any measure more efficient than the base case allows one to get a saving
1.Shower Heads	Water flow rate - 12 Litres (L)/min	Water flow rate - 6 Litres (L)/min
2. Wash Basin Faucet	Water flow rate - 8 Litres (L)/min	Water flow rate - 6 Litres (L)/min
3.Water closet single flush	8 Litres (L) per flush	6 Litres (L) per flush
4.Water closet dual flush	8 Litres high volume (L) and 6 Litres(L), low volume	6 Litres high volume (L) and 3 Litres(L), low volume
5.Kitchen sink faucets	Water flow rate - 12 Litres (L)/min	Water flow - rate 8 Litres (L)/min
6.Water efficient dishwashers	30 Litres per cycle	10 Litres per cycle
7.Pre rinse spray valves for kitchen	Water flow rate - 8 Litres (L)/min	Water flow rate - 3.75 Litres (L)/min

Table 2.3.1 - Base cases for water saving measures and their suggested improved cases for the Nairobi Region. Source: Tabulated from the EDGE App

More items are available in Appendix B

2.4 Material saving measures

This section is quite straightforward, allowing the user to input data on the type of material used for various elements in the buildings and the quantities consumed. The materials section does not have a suggested improved case but has a drop-down list where you can choose the type of material and size. Embodied energy of materials is largely determined by various production factors and may vary from country to country. A sustainable material in one country may be unsustainable in another.

Material saving measures for low-income housing. Base case location: Nairobi, Kenya.

Element	**Base Case for Low-income housing in Nairobi, Kenya from EDGE**	**Notes on expected input** Note that any material greener than the base case allows one to get a saving. Material use is subject to structural design recommendation.
1.Ground Slab	100mm thick in situ concrete slab and 35 Kg of steel per square metre	Thinner concrete slab and reduced weight of steel grants a saving. Using greener materials than the concrete slab such as timber also grants a saving
2. Intermediate Slab	200mm thick in situ concrete slab and 35 Kg of steel per square metre	Thinner concrete slab and reduced weight of steel grants a saving. Using greener materials than the concrete slab such as timber also grants a saving. Note that this is subject to structural design.
3. Roof (Without finishes)	200mm thick in situ concrete slab roof and 35 Kg of steel per square metre.	Thinner roofing material and reduced weight of steel grants a saving. Using greener materials such as timber also grants a saving

Table 2.4.1: A sample of material options for various building elements for the Nairobi region. Source: Tabulated from the EDGE app

More items are available in Appendix C

3. THE KWANGU KWAKO CASE STUDY

3.1 Case Study Introduction

Kwangu Kwako Limited (KKL) delivers affordable housing to underserved communities. Affordability is primarily achieved through use of design for functionality, off-site manufacture, and use of modular precast walls, prefabricated metal/recycled plastic components combined with planned resources which reduce waste in terms of materials, time and human resources.

The original case study in 2023 involved reviewing bedsitter KKL units, the most common KKL units, using the EDGE App in order to check the performance of the project. During that process KKL worked closely with IFC EDGE to continue to improve and refine the process and system to improve the effectiveness for truly affordable housing.

Figure 3.1.1 - Abstract from KKL Quotation Template

This update report covers the final Audited KKL project efficiencies, and our experience with the Audit process. The Audit resulted in the KKL case study project achieving EDGE Advanced Certification:

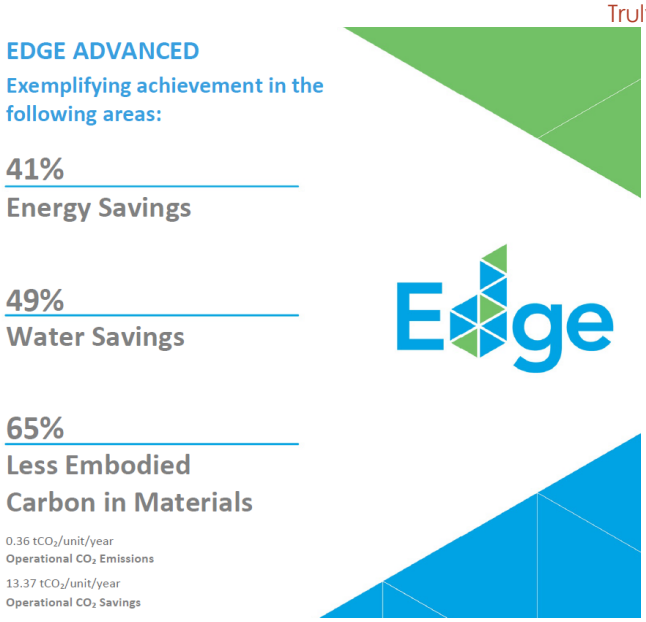


Figure 3.1.3 - All efficiency measures from the KKL EDGE Advanced Certificate.

Audit results: Case study project achieved 41% in energy savings, 49% in water savings and 65% in materials savings which resulted in the project achieving the conditions required for an EDGE Advanced green design certification.

For details of the full assessment refer to Appendix E

3.2 Survey based energy and water consumption analysis

For the final Audit assessments KKL used the actual reading for the occupants and also tested the appliances and fittings on the ground to prove the usage levels for Audit purposes. This enabled locally produced and procured fittings etc to achieve the full credit needed (overcoming a challenge previously noted in the earlier report).

3.3 Energy Savings

Energy savings are much more straightforward to attain since power ratings are easy to find on most appliances and fixtures.

3.3.1 Solar reflectivity of paints on roofing and walls

When surfaces are reflective, they reduce the amount of heat gain the house is subjected to and this translates to lower costs for temperature control within the house and ultimately less energy consumed. In Kenya, colour choices are usually determined by the client and the project Architect. KKL buildings are predesigned. KKL assists the customer with colour choices to ensure maximum solar reflectivity is achieved.

3.3.2 Reward based efficiency vs actual expenditure for homes with appliances

A key challenge identified is that the EDGE system, through its reward-based efficiency model, grants savings for energy-efficient appliances being present, but does not extend this credit for the complete absence of such appliances, even if this leads to inherently lower energy consumption. This is particularly critical for low-income housing, where tenants often do not own appliances like refrigerators or washing machines, leading to significantly lower actual energy use and embodied energy from appliances that goes unrecognized by the system. KKL recommends that EDGE allow users to opt out of systems that do not describe the units they seek to certify, such as washing machines and dishwashers, to provide a more accurate baseline for low-income buildings.

3.3.3 Virtual energy for comfort

This is the amount of energy that the system calculates the home will be required to provide in order to provide liveable conditions within the home. For example, in places where the weather is too hot or cold, the system assumes that if one hasn't selected a thermal regulation system, one may still require some energy to attain thermal comfort and provides for this thus increasing the energy use per month/unit. In a sample project which had attained a 25% savings on energy use, the system allowed for 39kWh which accounted for around 32% of the energy consumption for the improved case for heating and cooling.

3.3.4 Renewable energy savings

Figures sourced from the KPLC Annual Financial report 2019, shows that approximately 88% of Kenya's energy grid is derived from renewable sources (44% Hydro, 33% Geothermal, 10% Wind, and 1% Solar). While the low grid emission factor due to this clean energy mix inherently benefits overall carbon calculations, the current EDGE system primarily grants direct energy savings for onsite renewable energy procurement, which some perceive as a missed opportunity for explicit recognition of offsite clean energy contributions. We welcome ongoing dialogue with IFC/EDGE on how national clean grids are reflected in benchmarking.

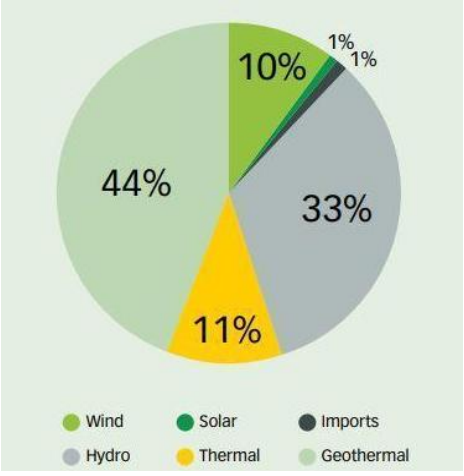


Figure 3.3.4.1: Distribution of sources of energy in Kenya, Source: Kenya National Energy Efficiency

3.4 Water Savings

As previously mentioned, the EDGE app assesses the water savings using the consumption by the consumer i.e., what the end user pays for. It is defined as the delivered water by the EDGE guideline and is measured in kL, which is equivalent to 1,000L and what is commonly referred to as water units in Kenya. For the audit KKL used the actual usage levels achieved by utilising in use meter readings.

3.4.1 Taps

Most affordable housing construction uses locally available taps and cheap imports that may not necessarily have the data sheets that show manufacturers specifications. Pricing for affordable taps seen on the market range from KShs. 60 to Kshs. 1500. Other taps available in the market are imported, have datasheets and are green rated but are more expensive than the generic taps. Kwangu Kwako conducted a study using physical measurements on available taps in the market (generic local and imported), with flow rate results ranging from 4.2L/minute - 6L/minute. The locally available water-reducing kitchen taps used by KKL have flow rates of 4.2L/Minute which is lower than the suggested improved base case scenario of 8L/minute for the same. The KKL taps passed the auditing process; they were accepted as a water saving measure through audit verification assessment. This process is very useful in allowing the use of local fitting and materials.

3.4.2 Cisterns

KKL uses specific water saving cisterns in its construction. It was clear from the original study that there were several products that meet the threshold requirements of the improved base case of 6L for the first flush and 3 litres for the second flush. KKL also learnt that landlords are increasingly adopting these top flush systems due to their water saving capability which in turn reduces water usage and reduces the volume of waste for their waste management systems.

3.4.3 Rainwater collection

EDGE credits rainwater collection for use in the home as a water saving measure. However, EDGE requires the collected rainwater to be treated and purified to be considered as having fulfilled this requirement. Further deliberations on this topic with the aid of the EDGE certification team explained that the water generally must be in suitably good condition allowing it to be used in the home. Following a review by the EDGE auditor, this standard was attainable for the KKL audited project.

3.4.4 Grey and Black water recycling

Key in the understanding of the base case for recycling and water harvesting measures, is that according to EDGE, the collected and recycled water must be used within the building, hence reducing the water consumption bill. Therefore, at the moment, most low-income homes do not meet this standard and the cost of adopting this is prohibitive. Given that sewer systems are directed to municipal waste recycling and treatment plants and then released to the environment, there is an opportunity for EDGE to consider recognizing savings where it can be demonstrated that waste is directed to and processed by such facilities. Biodigesters and septic tanks are more commonly used in these environments which play a key role in groundwater recharge.

This section prompts a deeper consideration within the EDGE framework regarding the comprehensive definition of green waste management, particularly concerning off-site municipal systems. Does the fact that affordable homes do not possess the systems that allow for the utilisation of recycled water mean that they are not as green as the homes that do? Do the systems need to be onsite, or can they be shared facilities that are more common? What if the water is recycled at a central plant and released to the environment? This highlights an area where resource efficiency assessments at a purely household level could be expanded to more fully recognize the potential of green measures implemented at a broader community or systemic level.

3.5 Materials Savings

For the Kwangu Kwako product case study, the reduced embodied energy use in materials was straightforward due to the reduced thickness of the walls. The KKL walls are 50mm thick, precast concrete, reinforced with a steel mesh. The finishing method is also considerably simple as painting is done straight onto the panels without plaster, hence reducing the materials usage, compared to the 200mm thick masonry wall baseline. The Kwangu Kwako unit achieved a saving of 64.93% in embodied energy of materials. It was noted that the system now allows for a choice in the reuse of existing walling material and offers a saving which is an important attribute for KKL walling system.

3.5.1 Embodied energy of materials per capita

3.5.1.1 A sample of an affordable housing size scenario in low-income areas

As defined earlier in the report (Section C Definitions), 'Affordable Housing' is defined as units that rent for less than KShs. 16,666 per month. The following housing units from surveying low-income areas like Kawangware where KKL works can be considered affordable.

Type of unit	Rental cost/ unit KShs.	Size (Living space)	Expected inhabitants
Singles (room only with access to shared toilets/ showers outside)	3,000 - 5,000	12.96 SQM (144 sq. Ft)	1-2
Bedsitters/Studio (includes a toilet / shower facility inside)	5,000 - 9,000	16.38 SQM (180 sq. Ft)	1-3
One bedroom	9,000 - 12,000	25.92 SQM (288 sq. Ft)	1-4
Two bedroom	12,000 - 16,000	45.36 SQM (504 sq. Ft)	3-6

Table 3.5.1.1: A sample of an affordable housing scenario in low-income areas, Source: Author.

3.5.1.2 Area occupied per capita

Currently, the EDGE app rewards 'greener consumption' but does not reward lower consumption per capita. Using the comfortable accommodation numbers, i.e., 1 person in a single unit, one person in a studio, 2 people in a one bedroom and 4 people in a two-bedroom unit, **the area occupied per person in this scenario is 12.54 SQM**.

House Sizes (M2)	Studio	1 Bed	2 Bed
Kwangu Kwako	16.72	26.7	46.8
Zima Homes	20	30.6	41.8
Tsavo	18.5-23.2	27.9	46.5

Table 3.5.1.2: Typical unit sizes for studios (Bedsits), One Beds and Two Beds

The size of the unit and number of inhabitants contribute highly to the materials and services used in a building. Low-income housing is characterised by more people living in a smaller living space as compared to other types of housing. The question raised here is whether **there is an optimum use of space per person**. For example, the materials consumption per person for a 3-bedroom unit housing one person is higher per person than one which houses a family of five. If one considers the other operational expenses such as cleaning and keeping the space comfortable using thermal regulation methods, the difference in consumption per person increases drastically in this scenario.

3.5.1.3 How then can low-income structures be granted savings on the use of space?

A question can be posed on whether low-income housing gets savings for housing more people per unit and how such savings can be realised. Comparison for net built up **area per occupant** can be analysed as both the gross area/capita and net area/capita for comparison between high income, middle income and low-income housing. This is a key area for EDGE to consider allowing affordable units with a smaller carbon footprint to be realised, along the lines of Table 3.5.1. The intention is not to promote overcrowding, but to reward lower consumption that is the basis of low-income households and define optimum unit sizes and occupancy. Note that the table above does not consider the communal space such as parkings and gardens (Gross area), but only considers the actual size of home (net area).

3.5.1.4 Parking Space allocation in structures and mode of transportation to work

Another area identified for improvement is the lack of credit within the EDGE system for affordable housing units that have less parking provision, which aligns with their occupants' typical reliance on public transport or walking, thus contributing to significant energy usage and embodied carbon savings from private cars and parking spaces.

4. THE COST OF EDGE CERTIFICATION

4.1 EDGE Certification Fees – EDGE fees, as shown in the EDGE Certification pricing,.

A major challenge to the widespread adoption and 'democratisation' of EDGE certification for affordable housing, particularly for small-scale developers and private micro-landlords in Nairobi, is the high fee attached to certification. For the KKL project, consultant fees alone amounted to $6,450, representing 4.8% of the project cost, which often presents no direct perceived benefit to landlords without compensating financial incentives. To address this, KKL proposes implementing more accessible fee structures, such as a 'stepped minimum' for smaller projects, 'EDGE Lite' for a lighter touch service, and 'EDGE Typology Approval' for developers using standard house designs.

4.2 Opportunities

It is an advantage that the app is free so the trained public i.e. EDGE experts can access the information to aid decision making, without proceeding to the certification process.

4.2.1 Opportunity 1 - Increase usage EDGE App for data collection and decision making

There currently exists free access to the App and the design information, guides and decision-making support data. However, self-builders, landlords and small-scale developers are unaware of this. KKL feels there are many people who would make use of this data and the app as they search for better and more cost-effective solutions. Marketing this opportunity and free service to the masses, especially the self-builder/small developer/landlords will raise awareness of the wider EDGE service and advantages together with delivering the desired results of EDGE - reduced environmental impact of buildings in construction and operation, increase dialogue and social media sharing of the advantages etc will spread the excitement and message rapidly.

4.2.2 Opportunity 2 - "EDGE Lite" for smaller projects

There is an opportunity for a lighter touch service to be offered to the wider market delivering affordable housing especially to landlords and small-scale developers. Homeowners could use the free EDGE app to ensure their projects are in principle EDGE certifiable without necessarily applying for certification. If they felt that they were certifiable they could then apply for an inspection grant/or pay a nominal fee. IFC could subsidise this "random audit" service to provide vital research data and ensure the lowest cost projects have access to the EDGE advantages too.

4.2.3 Opportunity 3 - "EDGE Typology Approval"

Many developers (contractors like KKL) have standard layouts/typologies of buildings to promote cost efficiencies. They then repeat these typologies across the development plot and on multiple development plots. If EDGE were able to provide an option for a typology approval, the developer could then use that approval and just adjust for site specific EDGE data for a final project certification. The EDGE Expert and Auditor input for such a development would be significantly lower as the main buildings are already certified. A reduced fee structure would then be possible for these projects. There would need to be an "annual update/review" fee for periodic updates to the design etc. Such a methodology would significantly improve the time cost involved. For KKL this would definitely encourage them to gain EDGE Certification.

4.2.4 Opportunity 4 - "A stepped minimum"

Consider another lower tier or two for project sizes e.g., a stepped minimum. We understand that, from the financial perspective, there may be a minimum economic value for the certification service. This raises the question on the need for subsidies in order to encourage a shift of the developing affordable housing markets in order to encourage a climate sensitive driven approach to construction.

5. RECOMMENDATIONS

5.1 Recommendations for the EDGE Platform

The EDGE platform can become an integral part of the design and construction process due to its ability to anticipate resource expenditure during the design process, construction and even later during the operational phase. The EDGE App which forms the interface through which users interact with the building standard has been designed in a way that it is simple, easy to use (especially the earlier versions) and free for trained experts. It makes it easy for experts to input the relevant data and assess for themselves the impact of having green measures and the cost benefit analysis associated with these green building costs. The ability of the app to be contextualised to match the local region is also key in ensuring that it is adaptable and reliable.

Key in the use of the EDGE app is the requisite training to understand the EDGE platform and how to use it. Kwangu Kwako benefitted from Reall who in their aim to provide clean green homes for human potential, invested in the KKL team training, to ensure that KKL is equipped with the skills necessary to deliver green homes and pursue certification for these homes.

5.1.1 User experience

While the EDGE app is evolving to incorporate more comprehensive assessment parameters, maintaining ease of use and clarity, particularly for newer versions, remains vital for the goal of democratizing green building. Ensuring intuitive navigation will help prevent potential misinterpretations and support users in making informed design decisions.

5.1.2 The base case

The study revealed that the established baselines for specific regions, income levels, and unit sizes sometimes demonstrated a notable divergence from the actual observed consumption patterns, particularly in low-income settings. This highlights an opportunity to further refine the granularity of baselines to better reflect diverse living conditions.

5.1.3 Alternative efficiency measuring method

The EDGE app can track operational water and energy consumption for an existing, occupied building. As an alternative efficiency measurement method for existing buildings in low-income areas, a method of analysis can be adopted where one inputs the operational energy use and water use which can be measured against the base case. These would serve as the actual operations cost and a savings can be granted especially if the consumption is lower than the base case in accordance with the EDGE standard. This would provide an opportunity to those without the specific efficiency measures available in the EDGE app to get accredited based on their actual consumption data. However, this may require the use of smart meters to ensure credibility.

5.2 Recommendations for energy savings

The recommendations for energy savings are to integrate:

1. Consumption based metrics for the computation of the used energy can be introduced as an additional check if buildings are operational. This would allow the EDGE expert to

gauge the actual usage and its deviation from the expected base case and therefore derive the energy savings percentage from there.

2. Incorporation of the affordable and sustainable lighting fixtures and appliances such as power saving bulbs, solar heating and green rated appliances into the green building materials and technologies libraries such as the Jenga Green Library in order to make information on the products more accessible.
3. The EDGE base case house for Kenya takes into account that 90% of the national power is provided from renewable sources (mostly geothermal). Therefore, Kenyan homes are being measured against a much higher bar to start with than many other countries. It would be interesting to see a comparison between a Kenya base case house and, for example, a USA/UK/German house. We suspect the Kenya base case house would already have significantly reduced energy etc levels than the comparison countries listed. It would be good if this information could be provided by EDGE or an Auditor.

5.3 Recommendations for water savings

1. Consumption based metric for the computation of the delivered water can be introduced as an additional check if buildings are operational. This would allow the EDGE expert to gauge the actual usage and its deviation from the expected base case and therefore derive the water savings percentage from there.
2. Incorporation of the affordable fixtures such as taps and showers into the green building materials and technologies profile such as the Jenga Green Library This would give Green housing developers a range of products to choose from depending on their price point.
3. Considerations should be made to have a Kenyan approved testing location where developers can bring samples to be tested then these are published on a web portal so other developers can see a wider range of products that are approved or rated through this testing method.

5.4 Recommendations for embodied energy in material reduction

1. There needs to be a more detailed look into the embodied energy in materials especially in the local context in order to allocate the right amount of savings from the use of these locally produced materials.
2. Information on the embodied energy for commonly used materials should be made more accessible using the already existing platforms.
3. Creation of a standard middle income base case that elaborates on housing sizes and inhabitants in order to understand material usage/capita, which can then be used as a base case. This will allow smaller units to get a saving for reduced embodied energy per capita.
4. The current EDGE app rewards 'greener consumption' but does not explicitly recognize or reward the lower consumption per capita inherent in low-income housing, where more people typically live in smaller spaces. This 'optimum use of space per person' results in less material usage and lower operational expenses per capita, which should be acknowledged. KKL recommends the creation of a standard middle-income base case that incorporates housing sizes and inhabitants to better understand and grant savings for reduced embodied energy per capita in smaller units.

5.5 Recommendations for EDGE certification fees

An increased range of access/service for varying levels of interest and affordability would increase awareness and interaction with the EDGE app. KKL showcases opportunities that could be explored individually or as a full range of service levels. (Refer to section 4.4 above for more detail).

- **EDGE Lite** - To encourage single homeowners and small developers to submit data/get certified, without needing the full service and costs.
- **EDGE Typology Approval** - For developers with standard designs, getting preapproval for the standard typologies once and then using that for a quicker/cheaper process on future development using that layout and specification.
- **Additional Fee Range Levels** for the minimum fee (A stepped minimum fee or sliding scale % of project cost).

6. CONCLUSION

Kwangu Kwako Limited shares in EDGE'S general vision(Source: Edge User Guide) 'to democratise green building construction' and in this way ensure that green, efficient and sustainable housing is not only a preserve of the rich but the only way in which structures are built whether they are meant for the affordable housing or not. With the climate crisis, the developers investing in structures that are both environmentally and financially sustainable is key.

Through dialogue and increased understanding the refinements made to the EDGE app and process and increased awareness by the KKL team, the benefits of the KKL specifications and tenant lifestyles became increasingly acknowledged and this greatly assisted in the delivery of EDGE Advanced certification at Audit stage. This demonstrates that Kenyan affordable housing sector may be more green than perceived by many. The KKL EDGE Advanced Certification will hopefully help to ensure greater awareness of this

For EDGE to become more widely used, there is a need to **educate the key stakeholders** in the advantages of an EDGE certified building. To the **end user/resident** in a low-income household, the key decision point is not on environmental friendliness but rather on the *affordability and cost effectiveness* of the greener home. To the **local landlord**, the decision point may be increased access to *finance* to build green homes, *reduced project registration* rates for green buildings, i*mproved tenancy* and *reduced operational* costs over time. This is how we will achieve greener buildings while solving affordable housing challenges.

***Note**: This publication reflects EDGE definitions and KKL audit outcomes as of June 2025*

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APPENDICES

APPENDIX A: ***Continued Table 2.2.1 Base cases for energy saving measures***

Element	Base Case for Low income housing in Nairobi, Kenya from EDGE	Suggested improved Case Any measure more efficient than the base case allows one to get a saving
6.Insulation of external walls	Wall U value - 2.12 W/m2k.	Wall U value - 0.44 W/m2k. (the lower the better but choice of material may affect material savings)
7. Low emission coated glass	Glass U value - 5.75 W/m2k.	Glass U value - 3 W/m2k.
8. Natural ventilation	Assumes that the home does not meet specification	The home meets the design specification
9. Ceiling fans	Assumes no ceiling fans	Assumes rooms have efficient ceiling fans installed (Ceiling fans reduce cooling requirements. Note: this is only positive in areas where there is a high requirement for cooling. Otherwise more energy to run the ceiling fan reduces savings.)
10.Air conditioning system	Air conditioning system efficiency C.O.P - 2.9 (C.O.P - Coefficient of Performance. The higher the better.)	Air conditioning system efficiency C.O.P - 3.5
11. Efficient lighting for internal areas	Value of bulbs at 65L/W (L/W - Lumens/Watt)	CFL/LED/T5 light bulbs (Energy saving light bulbs)
12. Efficient lighting for external areas	Value of bulbs at 65L/W	CFL/LED/T5 light bulbs Energy saving light bulbs
13. Lighting controls Eg. Automatic motion sensors	No lighting controls	Features lighting controls eg movement and timer sensors
14. Efficient refrigerators and washing machines	Conventional appliances	Energy saving appliances
15. Smart meters for energy (meters that can record consumption)	No smart meters	Smart meters installed resulting in a reduction of 3% of energy use.
16. Onsite renewable energy	Assumes no onsite renewable energy	Onsite renewable energy contributes to at least 25% of annual energy use

Appendix A: - Table 2.2 - 1 Base cases for energy saving measures and their improved cases for the Nairobi Region.
Source: Retabulated from the EDGE app

APPENDIX B: ***Continued Table 2.3.1 - Base cases for water saving measures***

Element	**Base Case for Low income housing in Nairobi, Kenya from EDGE**	**Suggested improved Case** Any measure more efficient than the base case allows one to get a saving
8. Bidet	Water flow rate - 12 Litres (L)/min	-
9.Washing machines	55 Litres per cycle No rinse water reclaimed	35 Litres per cycle
10. Swimming pool covers	No swimming pool cover	30% of swimming pool covered
11.Landscape Irrigation system	6 L of water /Square metre/day	4 L of water/Square metre/day
12.Rainwater Harvesting system	No rainwater harvesting	30 Square metres of catchment area. 50% of roof area used for rainwater collection
13.Wastewater treatment and recycling	No water recycling system	Wastewater treatment and recycling system (100%) treated
14. Condensate water recovery	No condensate water recovery	100% condensate water recovery Reuse of water lost as steam
15.Smart meters for water	Assumes no smart meters for water	Uses smart meters for water

Appendix B: Table 2.3.1 - Base cases for water saving measures and their suggested improved cases for the Nairobi Region.
Source: Tabulated from the EDGE App

APPENDIX C: ***Continued table 2.4.1 Material selections***

Element	**Base Case for Low income housing in Nairobi, Kenya from EDGE**	**Notes on expected input** Note that any material greener than the basecase allows one to get a saving. Material use is subject to structural design recommendation.
4.Floor finish	10mm of ceramic tiling	Using greener materials such as stone tiling or wooden parquets grants a saving
5. External wall Thickness	200mm Stone block, Machine cut - Polished.	Using greener materials grants a saving Greener materials include rammed earth, wooden walls, stabilised earth, hollow concrete blocks etc.
6. Internal wall Thickness	200mm of concrete block/solid blocks of dense concrete	Using greener materials grants a saving. For example KKL panels and stabilised earth blocks
7.Window frames	Steel is used to fabricate windows	Using greener materials grants a saving For example - wooden frames
8. Window glazing	Single glazing 8mm	Adding double and triple glazing increases material use but may improve energy savings.
9. Roof and wall insulation	Assumes no insulation	Addition of insulation increases embodied energy in

Element	Base Case for Low income housing in Nairobi, Kenya from EDGE	Notes on expected input Note that any material greener than the basecase allows one to get a saving. Material use is subject to structural design recommendation.
		material used and will reduce material savings Note: This measure increases energy savings
10. Floor insulation	Polystyrene board spray or foam insulation	Reduced insulation, no insulation or greener insulation is preferred

Continued table 2.4.1 - Some material options for various building elements for the Nairobi region. Source: Tabulated from the EDGE App

Appendix D - EDGE Advanced Certificate

Edge

THIS CERTIFIES THAT
FIRST CLOSE
Kawangware
NAIROBI,
Kenya

DEVELOPED OR OWNED BY
Kwangu Kwako Ltd

HAS ACHIEVED AN
EDGE ADVANCED CERTIFICATE

CERTIFICATE NUMBER
GP1-KEN-22110910149261-42

WAS AUDITED BY
Gladys Assan
EDGE Software Version: v3.0.0

CERTIFIED BY
Sintali

Thomas Saunders, Managing Director

Sintali
path to a sustainable future

DATE OF ISSUE
21-MAR-2025

ENERGY MEASURES

Reduced Window-to-Wall Ratio
Reflective Roof
Insulated Roof
Natural Ventilation
Efficient Exterior Lighting

WATER MEASURES

Water-efficient Showerheads
Water-efficient Faucets in Bathrooms
Efficient Water Closets
Water-efficient Faucets in Kitchen

MATERIALS

Material-efficient Bottom Floor Slab - Concrete Slab | In-situ Reinforced Conventional Slab
Material-efficient Floor Finish - Tiled | Ceramic Tiles
Material-efficient Exterior Walls - Concrete Panels | Precast Panels (single layer)
Material-efficient Interior Walls - Concrete Panels | Precast Panels (single layer)
Material-efficient Window Frames - Steel
Material-efficient Window Glazing - Single Glazing

www.edgebuildings.com

The EDGE standard requires 20% efficiencies in energy, water and materials compared to a local benchmark. Predicted efficiencies are not a guarantee of future operational performance. Energy savings may be associated with virtual energy for comfort depending on the presence of heating and cooling systems. Virtual energy does not contribute savings to utility bills.

This certificate is issued by the Certifier based on information provided by the client and the audit by the Auditor, and is subject to the terms and conditions of the Certifier. Contact edge@ifc.org if the above measures are not consistent with your observation on the project.

APPENDIX E: EDGE Advanced Submission

Homes
EDGE Assessment: v3.0.0
Downloaded date & time: 2025-03-21 11:43
40.98% | 48.60% | 65.00%

Project Name: 221109 - First Close Studios
Subproject Name: FIRST CLOSE

Project Details

Project Name
221109 - First Close Studios

Number of Distinct Buildings
10

Number of EDGE Subproject(s) associated
1

Total Project Floor Area (m²)
697.2

Project Owner Name
Kwangu Kwako Ltd

Project Owner Email
info@kwangukwako.com

Project Owner Phone
Mobile -

Share project name and basic information to potential investors or banks?
Yes

Is this Project created for Training Purpose?
No

Address Line1

Address Line2

City

State/ Province

Postal Code

Country
Kenya

Project Number
1001125416

Do you intend to certify?
Yes

Associated Subproject(s)
Total associated subprojects: 1
The complete list of Associated Subprojects is available in the last section of this document.

Subproject Details

Subproject Name
FIRST CLOSE

Building Name
Dyonis and Kariuki Studios

Subproject Multiplier for the Project
1

Certification Stage
Post-Construction

Status
Certificate Issued

Auditor
Gladys Assan

Certifier
Sintali

File Number
22110910149261

Address Line1
Kawangware

Address Line2

City
NAIROBI

State/ Province

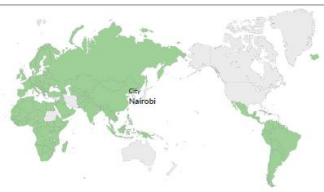
Postal Code

Country
Kenya

Subproject Type
New Building

Homes
EDGE Assessment: v3.0.0
Downloaded date & time: 2025-03-21 11:43
40.98% | 48.60% | 65.00%
Project Name: 221109 - First Close Studios
Subproject Name: FIRST CLOSE

Location



Building Type

Primary Building Type
Homes

Subtype
Low Income

Created By: Betty Maeda
Downloaded By: Symon Maara
File Number: 22110910149261
Project Number: 1001125416

Homes
EDGE Assessment: v3.0.0
Downloaded date & time: 2025-03-21 11:43
40.98% | 48.60% | 65.00%
Project Name: 221109 - First Close Studios
Subproject Name: FIRST CLOSE

Building Data

Single Typology

Default	User Entry
No. of Bedrooms: ~~4~~	1
Total No. of Homes: ~~10~~	42
Average House Area (m²): ~~10~~	16.6
No. of Floors Above Grade: ~~4~~	1
No. of Floors Below Grade: -	0
Floor-to-Floor Height (m): ~~0.0~~	2.825
Aggregate Roof Area (m²): ~~17~~	19.02

Operational Details

Default	User Entry
Occupancy (People/House): ~~0~~	2

Building Costs

Cost of Construction (KES/m2): ~~40,000.0~~	25,000
Estimated Sale Value (KES/m2): ~~88,480.0~~	35,000

Created By: Betty Maeda
File Number: 22110910149261

Homes
EDGE Assessment: v3.0.0
Downloaded date & time: 2025-03-21 11:43
40.98% | 48.60% | 65.00%
Project Name: 221109 - First Close Studios
Subproject Name: FIRST CLOSE

Area and Loads Breakdown

Gross Internal Area/House (m²)
16.6

Default (m²/House)	User Entry (m²/House)
Bedroom: ~~5.0~~	8.4
Kitchen: ~~0.0~~	1.5
Dining: 0.8	0
Living: ~~2.0~~	5
Toilet: ~~0.0~~	1.7
Utility: 0.3	0
Balcony: 0.5	0
Staircase: ~~0.0~~	0
Enclosed Garage: ~~5.0~~	0

Default	User Entry
Area with Exterior Lighting (m²): ~~728~~	728
External Carparking Area (m²): -	350

Water End Uses

Default	User Entry
Irrigated Area (m²): 252	0
Swimming Pool Type (m²): ~~Indoor Heated Pool and Outdoor Unheated Pool~~	None
Swimming Pool (m³): 20	0
Car Washing: ~~Yes~~	No
Washing Clothes: Yes	Yes
Process Water: No	No
Dishwasher: ~~Yes~~	No
Pre Rinse Spray Valve: ~~Yes~~	No

Created By: Betty Maeda
Downloaded By: Symon Maara
File Number: 22110910149261
Project Number: 1001125416

Detailed Loads Input

Activities	Space Conditioning Type	EDGE Default Space Conditioning	Default Heating and Cooling Set-point Temperature	Plug Loads (W/m²)	Equipment Load (W/m²)	People Sensible Heat (W/Person)	People Latent Heat (W/Person)
Bedroom	No Conditioning Provided	AC & HTG					
Kitchen	No Conditioning Provided	NON AC & NO HTG					
Dining	No Conditioning Provided	AC & HTG					
Living	No Conditioning Provided	AC & HTG					
Toilet	No Conditioning Provided	NON AC & NO HTG					
Utility	No Conditioning Provided	NON AC & NO HTG					
Balcony	No Conditioning Provided	NON AC & NO HTG					
Staircase	No Conditioning Provided	NON AC & NO HTG					
Enclosed Garage	No Conditioning Provided	NON AC & NO HTG					

Building Dimensions

Default Building Length (m/House)	User Entry (m/House)	Façade Area Exposed to Outside Air (%)
North 4.5	4.525	100
North East 2.1	0	0
East 3.6	3.625	100
South East 2.1	0	0
South 2.1	4.525	100
South West 2.1	0	0
West 3.6	3.625	100
North West 2.1	0	0

Building HVAC System

Select Input Type
Simplified Inputs

Does the Building Design Include an AC system?
No

Does the Building Design Include a Space Heating System?
No

Does the Building Design Include Purchased Chilled Water and Heating Supply (District Cooling or Heating)?
None

Applicable Baseline
EDGE

Fuel Usage

Default	User Entry
Hot Water: Electricity	Electricity
Space Heating: Electricity	Electricity
Generator: Diesel	Natural Gas
% of Electricity Generation Using Natural Gas: 1.00%	0
Fuel Used for Cooking: Electricity	LPG

CO_2 Emissions Factor

Default	User Entry
Electricity (kg of CO_2/kWh): 0.27	0.27
Diesel (kg of CO_2/kWh): 0.25	0.25
Natural Gas (kg of CO_2/kWh): 0.18	0.18
LPG (kg of CO_2/kWh): 0.24	0.24
Coal (kg of CO_2/kWh): 0.32	0.32
Fuel Oil (kg of CO_2/kWh): 0.25	0.25

Cost Input

Default	User Entry
Electricity (KES/kWh): 16.48	23.14
Diesel (KES/Lt): 189.80	190
Natural Gas (KES/kg): 83.57	83.57
LPG (KES/kg): 83.57	193
Coal (KES/kg): 8.2	8.2
Fuel Oil (KES/Lt): 30.7	30.7
Water (KES/KL): 79.56	200
Conversion from USD (KES/USD): 130.69	130

Homes
EDGE Assessment: v3.0.0
Project Name: 221109 - First Close Studios
Subproject Name: FIRST CLOSE
Downloaded date & time: 2025-03-21 11:43
40.98% | 48.60% | 65.00%

Climate Data

Default	User Entry	Default	User Entry
Elevation (m) 1,819		Latitude (degrees) 1	
Rainfall (mm/year) 761		ASHRAE Climate Zone 3C	3C

Temperature (°C)

Default (Monthly Max.)	User Entry (Monthly Max.)	Default (Monthly Max.)	User Entry (Monthly Max.)
Jan 28.8	Jan	Jul 26.4	Jul
Feb 31.0	Feb	Aug 26.8	Aug
Mar 29.9	Mar	Sep 27.4	Sep
Apr 27.8	Apr	Oct 28.9	Oct
27.0		Nov 25.8	Nov
Jun 25.9	Jun	Dec 27.4	Dec

Default (Monthly Min.)	User Entry (Monthly Min.)	Default (Monthly Min.)	User Entry (Monthly Min.)
Jan 11.3	Jan	Jul 7.3	Jul
Feb 11.3	Feb	Aug 7.9	Aug
Mar 12.2	Mar	Sep 9.1	Sep
Apr 12.5	Apr	Oct 11.0	Oct
10.8		Nov 12.4	Nov
Jun 9.4	Jun	Dec 11.0	Dec

Homes
EDGE Assessment: v3.0.0
Project Name: 221109 - First Close Studios
Subproject Name: FIRST CLOSE
Downloaded date & time: 2025-03-21 11:43
40.98% | 48.60% | 65.00%

Climate Data

Relative Humidity (%)

Default (Monthly Avg.)	User Entry (Monthly Avg.)	Default (Monthly Avg.)	User Entry (Monthly Avg.)
Jan 72.3%	Jan	Jul 79.8%	Jul
Feb 73.3%	Feb	Aug 81.8%	Aug
Mar 76.7%	Mar	Sep 83.3%	Sep
Apr 80.2%	Apr	Oct 78.7%	Oct
78.2%		Nov 78.0%	Nov
Jun 82.5%	Jun	Dec 76.4%	Dec

Wind Speed (m/sec)

Default (Monthly Avg.)	User Entry (Monthly Avg.)	Default (Monthly Avg.)	User Entry (Monthly Avg.)
Jan 3.7	Jan	Jul 2.5	Jul
Feb 3.8	Feb	Aug 2.6	Aug
Mar 3.7	Mar	Sep 3.1	Sep
Apr 3.0	Apr	Oct 3.6	Oct
2.6		Nov 3.8	Nov
Jun 2.5	Jun	Dec 4.0	Dec

Homes
EDGE Assessment: v3.0.0
Project Name: 221109 - First Close Studios
Subproject Name: FIRST CLOSE
Downloaded date & time: 2025-03-21 11:43
40.98% | 48.60% | 65.00%

Results

Final Energy Use (kWh/Month/House) 114	Improved Case EPI (kWh/m²/year) 83.0
Final Water Use (m³/Month/House) 4	Total Building Construction Cost (Million KES/House) 0.4
Final Operational CO_2 Emissions (tCO_2/Month/House) 0.03	Incremental Cost (Million KES/House) 0.00
Final Embodied Carbon (Kg CO_2e/m^2) 143	% Increase in cost 0.37%
Final Utility Cost (KES/Month/House) 3,502	Payback in Years (Yrs.) 0.0
Subproject Floor Area (m²) 697.2	Number of People Impacted (No.) 84
Energy Savings (MWh/Year) 49.50	Base Case - Refrigerant Global Warming Potential (tCO_2e/Year/House) 0.8
Water Savings (m³/Year) 2,075.03	Improved Case - Refrigerant Global Warming Potential (tCO_2e/Year/House) 0.8
Operational CO_2 Savings (tCO_2/Year) 13.37	
Embodied Carbon Savings (tCO_2e) 178.73	
Utility Cost Savings in USD (USD/Year/House) 285.80	
Utility Cost Savings in Local Currency (Million KES/Year/House) 0.037	
Base Case EPI (kWh/m²/year) 154.0	

ENERGY SAVINGS — EDGE ADVANCED
Energy Efficiency Measures 40.98% — Meets EDGE Energy Standard

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Net Carbon Emissions: 1.1 tCO_2e/Year/House

Energy Efficiency Measures 40.98%

- ✓ EEM01* Window-to-Wall Ratio: 8.97%
  Base Case Value: 15%
  WWR (%): 8.97
- ✓ EEM02 Reflective Roof: Solar Reflectance Index 57
  Base Case Value: 43
  SRI: 57.00
- EEM03 Reflective Exterior Walls: Solar Reflectance Index 85
- EEM04 External Shading Devices: Annual Average Shading Factor (AASF) 0.17
- ✓ EEM05* Insulation of Roof: U-value 6.98 W/m²·K
  Base Case Value: 1.93 W/m²·K
  U-Value (W/m²·K): 6.98
- ✓ EEM06* Insulation of Ground/Raised Floor Slab: U-Value 6.9 W/m²·K
  Base Case Value: 0.49 W/m²·K
  U-Value (W/m²·K): 6.90
  Edge Insulation Type: None
- EEM07 Green Roof
- ✓ EEM08* Insulation of Exterior Walls: U-Value 5.22 W/m²·K
  Base Case Value: 1.86 W/m²·K
  U-Value (W/m²·K): 5.22
- ✓ EEM09* Efficiency of Glass: U-Value 7.01 W/m²·K, SHGC 0.76 and VT 0.79
  Base Case Value: 5.7 W/m²·K & SHGC 0.8 & VT 0.7
  W/m²·K: 7.01 VT (Factor): 0.79
  SHGC: 0.76
- EEM10 Air Infiltration of Envelope: 50% Reduction
- ✓ EEM11 Natural Ventilation
  Base Case Facade Opening: 0%
- EEM12 Energy Efficient Ceiling Fans

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Energy Efficiency Measures 40.98%

EEM15 Fresh Air Pre-conditioning System: Efficiency 65%

✓ EEM18 Domestic Hot Water (DHW) System : Solar 0%, Heat Pump 0%, Boiler 0%
Base Case Solar HW Usage : 0%
Base Case Hot Water Heater Usage: 0%
Base Case Hot Water Heater Efficiency: 100%

	Default Hot Water Usage (%)	User Entry Hot Water Usage (%)	Default	User Entry
Solar	50%	0		
Heat Pump	50%	0	3.00	COP
Boiler	0%	0	100%	% Efficiency

EEM19 Domestic Hot Water Preheating System

EEM22 Efficient Lighting for Internal Areas

✓ EEM23 Efficient Lighting for External Areas
Base Case Value: 65 L/W
Efficiency Type:Luminous Efficacy
Luminous Efficacy (L/W): 94.44

EEM24 Lighting Controls

EEM26 Demand Control Ventilation for Parking Using CO Sensors

EEM29 Efficient Refrigerators and Clothes Washing Machines

EEM30 Submeters for Heating and/or Cooling Systems

EEM31 Smart Meters for Energy

EEM32 Power Factor Corrections

EEM33 Onsite Renewable Energy: 25% of Annual Energy Use

EEM34 Other Energy Saving Measures

EEM35 Offsite Renewable Energy Procurement: 100% of Annual Operational CO_2

EEM36 Carbon Offsets: 100% Annual Operational CO_2

EEM37 Low-Impact Refrigerants

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WATER SAVINGS

Water Efficiency Measures 48.60% — Meets EDGE Water Standard

Water Efficiency Measures 48.60%

✓ WEM01* Water-efficient Showerheads: 4.35 L/min
Base Case Value: 12 L/min
Bath Type:Showerheads | Flow Rate (L/min): 4.35 | Hot Water Provision: Yes | Bath Tub: No

✓ WEM02* Water-efficient Faucets for all Bathrooms: 4.37 L/min
Base Case Value: 8 L/min
Faucet Type:Faucets with Aerators | Flow Rate (L/min):4.37 | Hot Water Provision:No

✓ WEM04* Efficient Water Closets for All Bathrooms: 7 L/High volume flush and 3 L/Low volume flush
Base Case Value: Single Flush,8 L/flush
Type Of Water Closet:Dual Flush | High Volume Flush (L/min):7 | Low Volume Flush (L/min):3

WEM06 Water-efficient Bidet: 2 L/min

✓ WEM08* Water-efficient Faucets for Kitchen Sinks: 5.51 L/min
Base Case Value: 12 L/min
Hot Water Provision:No | Flow Rate (L/min): 5.51

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Water Efficiency Measures 48.60%

WEM11 Water-efficient Washing Machines: 35 L/Cycle

WEM12 Swimming Pool Covers: 30% Area Covered

WEM13 Water-efficient Landscape Irrigation System: 4 L/m^2/day

WEM14 Rainwater Harvesting System: 10 m^2 of Catchment Area

WEM15 Waste Water Treatment and Recycling System: 100% Treated

WEM16 Condensate Water Recovery: 100% Recovery

WEM17 Smart Meters for Water

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EMBODIED CARBON SAVINGS

Materials Efficiency Measures 65.00% — Meets EDGE Material Standard

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Materials Efficiency Measures 65.00%

Improved Case Selection		Building Material	Proportion %	Thickness (mm)	U-Value (W/m^2K)	Embodied Carbon(kg/m^2)
MEM01*	Bottom Floor Construction Base Case Material: Concrete Slab | In-situ Reinforced Conventional Slab Thickness : 100mm & Steel : 35kg/m^2	Type 1 Concrete Slab | In-situ Reinforced Conventional Slab	100 %	100	6.90	
MEM02*	Intermediate Floor Construction Base Case Material: Concrete Slab | In-situ Reinforced Conventional Slab Thickness : 200mm & Steel : 35kg/m^2	Type 1 Default Base Case Material	100 %			
MEM03*	Floor Finish Base Case Material : Tiled | Ceramic Tiles Thickness : 10mm	Type 1 Tiled | Ceramic Tiles	100 %	7		
MEM04*	Roof Construction Base Case Material : Metal Roof | Steel Sheets on Steel Rafters Thickness : 200mm & Steel : 35kg/m^2	Type 1 Metal Roof | Steel Sheets on Steel Rafters	100 %	50.305	0.00	
MEM05*	Exterior Walls Base Case Material: Stone Blocks | Machine-cut Polished Thickness : 200mm	Type 1 Concrete Panels | Precast Panels (single layer)	100 %	50	5.22	
MEM06*	Interior Walls Base Case Material: Concrete Blocks | Solid Blocks of Dense Concrete	Type 1 Concrete Panels | Precast Panels (single layer)	100 %	50		

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Materials Efficiency Measures 65.00%

Improved Case Selection		Building Material	Proportion %	Thickness (mm)	U-Value (W/m^2K)	Embodied Carbon(kg/m^2)
MEM07*	Window Frames Base Case Material : Steel	Type 1 Steel	100 %			
MEM08*	Window Glazing Base Case Material: Single Glazing Thickness : 8mm	Type 1 Single Glazing	100 %	3	1.71	
MEM09*	Roof Insulation Base Case Material: X - No insulation Thickness : 0mm	Type 1 Customized Material Customized Material Used: Polyethylene	100 %	3		0.2487
MEM10*	Wall Insulation Base Case Material : X - No insulation Thickness : 0mm	Type 1 X - No Insulation	100 %			
MEM11*	Floor Insulation Base Case Material: Polystyrene Foam Spray or Board Insulation Thickness : 54.9mm	Type 1 X - No Insulation	100 %			

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EDGE Certification Checklist

Building Type	Certification Stage	Subproject Name
Homes	Post-Construction	FIRST CLOSE

Water Measures		Construction Audit Requirements
WEM01	Low Flow Showerheads	✓ Documents from the design stage if not already submitted. Include any updates made to the design stage documents to clearly reflect as-built conditions; and ✓ On site test results using actual water pressure on site, which will supersede the standard design flow rate values; with average flow rate sampled from multiple locations, floors, or units, as applicable, measured at the highest flow per minute, using a timer and a measurement container; and ✓ Date-stamped photographs of the showerhead(s) taken during or after installation showing the make and model; or ✓ Purchase receipts for the showerheads showing the make and model. ✓ Existing building projects If some of the documents required above are not available, other evidence of construction details, such as existing building drawings or photographs can be submitted.
WEM02	Low-Flow Faucets for Private Bathrooms	✓ Documents from the design stage if not already submitted. Include any updates made to the design stage documents to clearly reflect as-built conditions; and ✓ On site test results using actual water pressure on site, which will supersede the standard design flow rate values; with average flow rate sampled from multiple locations, floors, or units, as applicable, measured at the highest flow per minute, using a timer and a measurement container; and ✓ Date-stamped photographs of the faucet(s) taken during or after installation showing the make and model; or ✓ Purchase receipts for the faucet(s) showing the make and model. ✓ Existing building projects If some of the documents required above are not available, other evidence of construction details, such as existing building drawings or photographs can be submitted.
WEM04	Low-Flow Water Closets for Private Bathrooms	✓ Documents from the design stage if not already submitted. Include any updates made to the design stage documents to clearly reflect as-built conditions; and ✓ Date-stamped photographs of the water closet(s) taken during or after installation showing the make and model; or ✓ Purchase receipts for the water closet(s) showing the make and model. ✓ Existing building projects If some of the documents required above are not available, other evidence of construction details, such as existing building drawings or photographs can be submitted.
WEM08	Low-Flow Faucets for Kitchen Sink	✓ Documents from the design stage if not already submitted. Include any updates made to the design stage documents to clearly reflect as-built conditions; and ✓ On site test results by the auditor of the flow rate at the highest flow per minute, using a timer and a measurement container; and

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WEM08	Low-Flow Faucets for Kitchen Sink	✓ Date-stamped photographs of the faucet(s) or flow restrictor(s) taken during or after installation showing the make and model; or ✓ Purchase receipts for the faucet(s) or flow restrictor(s) showing the make and model. ✓ Existing building projects If some of the documents required above are not available, other evidence of construction details, such as existing building drawings or photographs can be submitted.

Energy Measures		Construction Audit Requirements
EEM01	Window to Wall Ratio	✓ Documents from the design stage if not already submitted. Include any updates made to the design stage documents to clearly reflect as-built conditions; and ✓ As-built façade drawings; or ✓ External and internal photographs of the building showing all the elevations Date-stamped photographs of the building interior and exterior showing all the elevations. ✓ Existing building projects If the documents required above are not available, other evidence of construction details, such as existing building drawings or photos taken during renovation can be submitted.
EEM02	Reflective Paint/Tiles for Roof	✓ Documents from the design stage if not already submitted. Include any updates made to the design stage documents to clearly reflect as-built conditions; and ✓ Date-stamped photographs of the roof(s) showing the claimed products on site; or ✓ Purchase receipts showing the installed products. ✓ Existing building projects If the documents required above are not available, other evidence of construction details, such as existing building drawings or photos taken during renovation can be submitted.
EEM05	Insulation of Roof	✓ Documents from the design stage if not already submitted. Include any updates made to the design stage documents to clearly reflect as-built conditions; and ✓ Date-stamped photographs of the roof(s) taken during construction at a point when any insulation materials claimed were visible on site; or ✓ Purchase receipts showing the installed products. ✓ Existing building projects If the documents required above are not available, other evidence of construction details, such as existing building drawings or photographs can be submitted.
EEM06	Insulation of Ground/Exposed Slab	✓ Documents from the design stage if not already submitted. Include any updates made to the design stage documents to clearly reflect as-built conditions; and ✓ Date-stamped photographs of the floor(s) taken during construction at a point when any insulation materials claimed were visible on site; or ✓ Purchase receipts showing the installed products. ✓ Existing building projects If the documents required above are not available, other evidence of construction details, such as existing building drawings or photographs can be submitted.
EEM08	Insulation of External Wall	✓ Documents from the design stage if not already submitted. Include any updates made to the design stage documents to clearly reflect as-built conditions; and

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EEM08	Insulation of External Wall	✓ Date-stamped photographs of the exterior wall(s) taken during construction at a point when any insulation materials claimed were visible on site; or ✓ Purchase receipts showing the installed products. ✓ Existing building projects If the documents required above are not available, other evidence of construction details, such as existing building drawings or photographs can be submitted.
EEM09	Efficient Glass	✓ Documents from the design stage if not already submitted. Include any updates made to the design stage documents to clearly reflect as-built conditions; and ✓ Date-stamped photographs of the glazing units installed; or ✓ Purchase receipts showing the brand and product installed. ✓ Existing building projects If the documents required above are not available, other evidence of construction details, such as existing building drawings or photographs can be submitted.
EEM11	Natural Ventilation	✓ Documents from the design stage if not already submitted. Include any updates made to the design stage documents to clearly reflect as-built conditions; and ✓ Date-stamped photographs showing that the plan layouts and location of openings as specified at the design stage have been constructed. ✓ Existing building projects If some of the documents required above are not available, other evidence of construction details, such as existing building drawings or photographs can be submitted.
EEM18	Hot Water Generation System	✓ Documents from the design stage if not already submitted. Include any updates made to the documents to clearly reflect As-Built conditions; and ✓ Date-stamped photographs of the water heating equipment taken during or after installation showing the make and model; or ✓ Purchase receipts for the water heating equipment showing the make and model; or ✓ Contract with the management company showing the efficiency of the water heating system, if the system is under separate management or off-site.
EEM23	Energy-Efficient Lighting for External Areas	✓ Documents from the design stage if not already submitted. Include any updates made to the documents to clearly reflect As-Built conditions; and ✓ Date-stamped photographs of the installed lighting; it is not necessary to take photos of every single installed lamp, but the auditor is responsible for checking and verifying a reasonable proportion; or ✓ Purchase receipts for the lighting. ✓ Existing building projects If some of the documents required above are not available, other evidence of construction details, such as existing building drawings or photographs can be submitted.

Material Measures		Construction Audit Requirements
MEM01	Bottom Floor Construction	✓ Documents from the design stage if not already submitted. Include any updates made to the design stage documents to clearly reflect as-built conditions; and ✓ Date-stamped photographs of the floor slabs taken during construction showing the claimed products on site; or

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MEM01	Bottom Floor Construction	✓ Purchase receipts showing the installed products. ✓ If the documents required above are not available, other evidence of construction details, such as existing building drawings or photos taken during renovation can be submitted.
MEM03	Floor Finish	✓ Documents from the design stage if not already submitted. Include any updates made to the design stage documents to clearly reflect as-built conditions; and ✓ Date-stamped photographs of the flooring during or after installation showing the claimed products on site; or ✓ Purchase receipts showing the installed products. ✓ Existing building projects If the documents required above are not available, other evidence of construction details, such as existing building drawings or photos taken during renovation can be submitted.
MEM04	Roof Construction	✓ Documents from the design stage if not already submitted. Include any updates made to the design stage documents to clearly reflect as-built conditions; and ✓ Date-stamped photographs of the roof(s) taken during construction showing the claimed products on site; or ✓ Purchase receipts showing the installed products. ✓ Existing building projects If the documents required above are not available, other evidence of construction details, such as existing building drawings or photos taken during renovation can be submitted.
MEM05	Exterior Walls	✓ Documents from the design stage if not already submitted. Include any updates made to the design stage documents to clearly reflect as-built conditions; and ✓ Date-stamped photographs of the floor slabs taken during construction showing the claimed products on site; or ✓ Purchase receipts showing the installed products. ✓ Existing building projects If the documents required above are not available, other evidence of construction details, such as existing building drawings or photos taken during renovation can be submitted.
MEM06	Interior Walls	✓ Documents from the design stage if not already submitted. Include any updates made to the design stage documents to clearly reflect as-built conditions; and ✓ Date-stamped photographs of the floor slabs taken during construction showing the claimed products on site; or ✓ Purchase receipts showing the installed products. ✓ Existing building projects If the documents required above are not available, other evidence of construction details, such as existing building drawings or photos taken during renovation can be submitted.
MEM07	Window Frames	✓ Documents from the design stage if not already submitted. Include any updates made to the design stage documents to clearly reflect as-built conditions; and ✓ Manufacturer's data sheets showing the make and model, material and U-value of the installed window frames; and

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MEM07	Window Frames	✓ Date-stamped photographs of the window frames during or after installation showing the make and model; or ✓ Purchase receipts showing the make and model of the installed window frames. ✓ This measure includes exterior glass doors. ✓ Existing building projects If the documents required above are not available, other evidence of construction details, such as existing building drawings or photos taken during renovation can be submitted.
MEM08	Window Glazing	✓ Documents from the design stage if not already submitted. Include any updates made to the design stage documents to clearly reflect as-built conditions; and ✓ Manufacturer's data sheets showing the make and model, U-value and SHGC of the installed glass; and ✓ Date-stamped photographs of the glazing during or after installation showing the make and model; or ✓ Purchase receipts showing the make and model of the installed windows/glass. ✓ ? This measure includes exterior glass doors. ✓ Existing building projects If the documents required above are not available, other evidence of construction details, such as existing building drawings or photos taken during renovation can be submitted.
MEM09	Roof Insulation	✓ Documents from the design stage if not already submitted. Include any updates made to the design stage documents to clearly reflect as-built conditions; and ✓ Manufacturer's data sheets showing the brand and product name and insulating properties of the installed insulation; and ✓ Date-stamped photographs of the insulation during construction showing the product; or ✓ Purchase receipts showing the brand and product installed. ✓ Existing building projects If the documents required above are not available, other evidence of construction details, such as existing building drawings or photos taken during renovation can be submitted.
MEM10	Wall Insulation	✓ Documents from the design stage if not already submitted. Include any updates made to the design stage documents to clearly reflect as-built conditions; and ✓ Manufacturer's data sheets showing the brand and product name and insulating properties of the installed insulation; and ✓ Date-stamped photographs of the insulation during construction showing the product; or ✓ Purchase receipts showing the brand and product installed. ✓ Existing building projects If the documents required above are not available, other evidence of construction details, such as existing building drawings or photos taken during renovation can be submitted.
MEM11	Floor Insulation	✓ Documents from the design stage if not already submitted. Include any updates made to the design stage documents to clearly reflect as-built conditions; and

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MEM11	Floor Insulation	✓ Manufacturer's data sheets showing the brand and product name and insulating properties of the installed insulation; and ✓ Date-stamped photographs of the insulation during construction showing the product; or ✓ Purchase receipts showing the brand and product installed. ✓ Existing building projects If the documents required above are not available, other evidence of construction details, such as existing building drawings or photos taken during renovation can be submitted.

Associated Subproject(s)

Sr No.	Associated Subproject Name	Country	City
1	FIRST CLOSE	Kenya	Nairobi