

**Non-Peer Reviewed*

Housing Affordability in Kenya: How Alternative Building Materials can be used to lower the Cost of Housing in Kenya

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Introduction

The demand for affordable units is more exacerbated in the urban areas, especially in Nairobi. According to the 2019 census, Nairobi's population grew from 3.1 million to 4.4 million, representing an annual growth of almost 3.4% per annum. This can be compared to the nationwide growth of 38.6 million to 47.6 million. The population of Nairobi is forecasted to grow to 5.6 million in 2025. This can be used as a sample of cities in the country and possibly other urban areas in third-world countries in Africa.

Despite growth in population in the country, the number of housing units delivered per year is unable to match the demand. In addition, the government is a relatively passive participant in the sector allowing the private sector to play a major role in supplying housing across all economic levels (Walley, 2011). The government plays the role of an enabler but as history has evidenced in the past, there is typically a housing deficit where government takes a backseat. Noppen argues that the country is experiencing a housing thrive impacting on the viability of potentially affordable homes. The misalignment between demand and supply puts buyers at the mercies of developers who being rational and business-oriented would be willing to secure the best rate of return (Noppen, 2013).

The Affordable Housing Plan (AHP) was launched as part of the four pillars of development by former president, H.E. President Uhuru Kenyatta. Promising to take the burden off Kenyans' shoulders, AHP was to produce 500,000 units by 2022 pricing them between Kes. 1 to 3 million. While these costs might be cited as 'affordable', they are bound to increase in the foreseeable future given the increase in demand for serviceable land and construction costs. This year, construction costs are estimated to have risen by 7% mainly attributable to an increase in the cost of cement, bitumen, fuel, and steel (Ambani, 2023). The Kenya National Bureau of Statistics reported through the Construction Cost Index that construction cost inputs rose in the fourth quarter of 2021 to 2022 from 106.21% to 113.65%. This was forecasted by Vuluku & Gachanja in 2014. The authors had commented on the overreliance of Kenya on imports (i.e. steel, tiles, furniture, ceramic, fixtures, etc.) to meet market demands. A weaker shilling would result in higher housing costs. Between January 2020 and January 2023, the Kenya shilling has lost 25% of its value compared to the US dollar (Business Daily, 2023).

With its vital position in the physical, social and physiological development of a society, housing is a necessary asset for every household. Rising construction costs could mean an increase in affordable housing prices even with the enabling environment provided by the government. A consideration of switching to alternative building materials could prove the solution that the country needs.

The Housing Market

Housing plays a critical role in the life of every household generating consumer services and also serves as a potential investment good. Its acquisition in the primary market, however, is hinged on a household's income, the prices of available parcels or housing units and the interest rates offered. Compared to other economic goods, the housing market operates within an imperfect market. Information is never completely available to either the buyer or seller and the players behave irrationally to the available information (Augustyniak, et al., 2015). Solutions offered towards housing revolve around creating more transparent relations in the property market. This role is often left to the state due to its influence and market-shaping policies (Danilova & Litvinova, 2021).

According to the World Bank, approximately 244,000 housing units are required annually to meet demand nationwide. The formal market has been unable to meet this demand over the years resulting in a bulging deficit that is estimated to be within the range of 2 million units. An increase in population and an increase in demand for serviced land only adds oil to the fire. Keynesian theory and the economic laws of demand and supply support an increase in the price of land and available housing units.

Being a developing nation, Kenya's population curve is still on the rise. This has an impact on the demand for housing and subsequently on the cost of serviced land. With a rise in the cost of land, a passive approach by the government, and Kenya's capitalistic economy, it would be difficult for developers to consider affordable housing for those on the end of the income scale. As a cautionary note, it is not uncommon to hear about the displacement of lower-income households as developers look for available land to set up units for the more affluent households in society (Sharma, et al., 2021).

The legal provision for affordable housing

Prior to 2010, the right to housing was not implicitly recognized in its statutory framework. But it was not blind to the need for housing units, affordable housing units for its citizens. History has it that several policies and legal frameworks were made over the decades that had an impact. The maiden national housing policy was made in 1966 via Sessional Paper No. 5 of 1966. The housing policy recommended the establishment of a national housing authority to facilitate the provisions of the document. The National Housing Corporation (NHC) under the Housing Act. After the amendment of the Constitution in 2010, Section 43 (1b) was introduced providing that every person has the right to "accessible and adequate housing and a reasonable standard of sanitation." (Wambugu, 2018)

It was after the introduction of this section in the Constitution did we see a surge in legal cases promoting and defending the right to accessible and adequate housing. One of the landmark rulings, Susan Waithera and others vs. the Town Clerk, Nairobi City Council and two others provided: "Most of the court decisions have mainly focused on the negative obligation of the state with regard to the right to adequate housing. So far there is very little that has been done to clarify the specific and concrete steps that the government should take to improve the livelihoods and living standards of the millions of people who continue to live in inhumane conditions in most of

the urban informal settlements and rural areas. This is the new battle zone for the right to adequate housing and indeed for all economic and social rights. We hope that this report, which is the second in our series of annual reports on the state of housing rights in Kenya, will contribute in some small way to making this possible.”

A key barrier to the development of housing units was the issue of land fraud and the unreliability of the land administration system. To iron out the kinds and improve the accuracy of the land system and create a robust local market, the National Land Policy (NLP) was adopted. The policy pushed for the overhaul of the current land policies to address chronic land issues that had tainted the picture of the Kenyan real estate market. It is from these recommendations that we saw the introduction of the Land Act, the Land Registration Act, and the National Land Commission Act in 2012. The NLP envisioned and propagated for equitable and sustainable use of land while providing for principles in the management of land and protection of fragile ecosystems.

The position of affordable housing in Kenya

It seems the government has taken a step back and relaxed into a role of formulation, appraisal, and execution of housing policies and legislation. Many in the Kenyan market believe that it is the private sector that plays a major role in the supply of affordable housing despite the potential of the government as a fundamental enabler (Matindi, 2008). Since its inception, NHC has been playing ‘catch-up’ to market needs and demands for housing. A case point is the 1974 to ’79 Development Plan. It was estimated that (under the development plan and taking into consideration market needs) 110,000 housing units would be required in urban areas to house the population. At that time, there was already a deficit of 50,000 housing units in the urban market. Within the same period, NHC only managed to construct 11,406 units. The current housing shortage in 1979 stood at 148,594 units, excluding the units constructed by the private sector (Ogutu, 1978). Thus began the deficiency in housing units that led to the current scenario with an undersupply of over 2 million units and a need for 250,000 housing units annually (CAHF, 2022).

With development left to the private sector, housing became a business. And a rational business person will seek to provide a solution to willing buyers with the financial capabilities to purchase the ‘available products’. Fueled by the desire for a profit, developers focused on housing for the upper middle class and high-net-worth individuals leaving the rest of the demographic to settle for below-par forms of housing. Financial institutions followed suit. To reduce risk, they opted for salaried individuals as opposed to those individuals in the informal sector (Ojijo, 2013). These and other factors influenced the type of properties and the asking price for the final development.

The Affordable Housing Programme in Kenya was one of the pillars of the Big Four Agenda implemented by President Uhuru. The four pillars, which were centred on the issues of food security, manufacturing, provision of universal health care, and affordable housing, were meant to promote long-term economic development for the country.

Some of the housing projects being developed in the AHP Programme are as described below:

Housing Program	Developer	Location	No. of Units
Pangani Affordable Housing Program	National Govt. & Tecnofin KE	Pangani	1,562
River Estate Affordable Housing Program	National Govt. & Edderman Property Ltd.	Ngara	2,720
Park Road Affordable Housing Program	National Housing Corporation	Ngara	1,370
Mukuru Affordable Housing Program	National Housing Corporation	Mukuru, Enterprise Road	15,000

Source: Boma Yangu Portal

Other projects that have been launched in the recent years and are under construction include Shauri Moyo A Affordable Housing Project (3,848 units), Ruiru Affordable Housing Project (1,050 units), Homa Bay Affordable Housing, NHC (2,000 units) and Starehe Affordable Project (6,074 units).

However, the chief question is “Are these affordable housing units actually affordable?”

According to the AHP Programme, there will be three main typologies offered; a one-bedroom unit of 30 metres squared at Kes. 1 million, a 2-bedroom unit of 40 metres squared priced at Kes. 2 million and a 3-bedroom unit of 60 metres squared priced at Kes. 3 million. Despite the ‘affordable prices’ quoted by the AHP Programme, most Kenyans are unable to meet the set regulations by financiers to apply for home financing. The government introduced the Kenya Mortgage Refinance Company (KMRC) which would work in tandem with banks and financial institutions to offer mortgages at fixed interest rates below 10% (State Dep. for Housing and Urban Development, 2023). We can contrast this to information obtained from the Kenya National Bureau of Statistics (KNBS) on income.

The KNBS reveals that the country’s annual gross national income grew to Kshs. 241,474 from Kshs. 216, 337; an increase of 11.6% between 2021 and 2020. Therefore, the average Kenyan earns Kes. 20,123 per month (Business Daily, 2022). Juxtaposed against the prices of the affordable housing units and assuming a 30% allocation of income to housing needs, it will take a Kenyan approximately 12 years, 25 years, and 37 years to afford the 1, 2, and 3 bedroom units respectively. This is working with the assumptions of a stable income, 0% mortgage rate, and a stable economy among other factors.

While the current formal property landscape has seen the introduction of ‘new’ affordable housing at or slightly below the Kes. 2 m market, this price point is still unaffordable to a significant segment of the low-income population. This fact is evidenced once you factor in the increased living cost.

With the mismatch in the growth in income and purchasing power compared to the appreciation of property and increase in average house prices, the brunt of the situation will be felt by the low-income earners as they will be abandoned in the search for profit and an above-average return.

Thus, we reiterate the question, can alternative building materials be introduced to lower the cost of 'affordable housing' to the low-income earners in Kenya?

What influences the selection of building materials?

Before we consider new/ alternative building materials, we must first assess the current selection criteria. It can be deduced that alternative building materials should also be able to meet the same criteria to be considered as 'true substitutes'.

Cost

As mentioned earlier, most of the housing units are developed by private entities whose main concern would be the return on investment. The most affordable option while taking into consideration the strength and other pertinent issues will be preferred. Sub-standard materials will only call for replacement in the near future reducing the profit margin in the long run.

Strength

Building and construction materials are often subjected to significant tension and compression forces. A developer will often choose a building material that can withstand these stresses over the years without distortion to its shape or its utility.

Sustainability

As the call for development increases, so does the push for green products, sustainability, and mitigations to climate change. An increasing emphasis is also being placed on the sustainability of materials specified. Construction processes on conventional sites often see a significant level of waste material either through profligacy or damage. Other environmental factors that have a significant impact on the local community but are often ignored include noise pollution, traffic movements, and air pollution (NHBC Foundation, 2016).

In assessing the sustainability and eco-friendliness of construction technology, the following criteria should be considered:

Local materials usage

Non-renewable resources in manufacturing or production usage

Waste products usage

Ability of the material to be recycled.

Waste generation and utilization of waste generated.

Pollution through emission of hazardous materials.

MHUPA (2015).

Social Issues and Perception

Due to the cost implications of construction, formal buildings are conceptualized, developed, and occupied by individuals and households with considerable means. Some of the ABMs are perceived to have a 'rural feel'. A good example is ISSBs which often use mud and wattle. This perception is common among medium to high income earners who deem the items to be of poor quality due to the affordable costs. Promoters and companies in the ISSB market can attest to the lack of acceptance due to the perception that "use of cement in soil blocks leads to the desired strength and durability of a house" (Margret, 2015).

Time

More often than not, the construction of a building is in response to certain conditions that are clear (somewhat) to key players. A key player would wish for their development to enter first into a market and thus enjoy the full benefits of 'being the first (Odongo, 2019). Savings in construction time are of significance to various stakeholders in the construction industry. A rational developer would assess the construction speed of an ABM in comparison with the conventional method.

Available Alternative Building Materials in Kenya

Below are some of the available alternative building materials that are currently being used or can be used in Kenya.

Expanded Polystyrene Sheets/ Panels (EPS)

EPS is made of polystyrene, an aromatic polymer that is transfigured into pre-expanded polystyrene beads to form either molded sheets or styroboard EPS. The panels have been used as building insulation or packing materials. Styroboard EPS, which is strong and lightweight is used as a construction material (Mwafongo, 2012).

Styroboard EPS is consistent with other orthodox construction materials in terms of characteristics. It has insulating properties that protect occupants from noise and unwanted temperatures. The panels also have low moisture absorbency rates and are weather-resistant. EPS panels can be manufactured to varying degrees of thickness depending on customer specifications and use. To significantly enhance its thermal conductivity often Styroboard EPS is incorporated in masonry walls. In the era of sustainability, Styroboard EPS complies with set standards somewhat. Its production can be deemed environmentally friendly since there are minimum emissions of ozone-depleting gases and its degradation doesn't create harmful or toxic substances (Mwafongo, 2012).

Having been used widely across the world, the panels have been tested. They are known to have high compressive resistance and high resiliency. The panels can be used for repetitive loading of roof insulation, road building, sub-pavement flooring and as a general load-bearing insulation. While they can be adjusted to fit various specifications, the panels can handle compressive resistance of approximately 60 PSI (EPS Industry Alliance, 2018).

EPS panels have enjoyed considerable uptake in the development of both residential and commercial units in Kenya. Some of the developments include Balozi estate along Thika Road, Nairobi (2010), Silver Springs Hotel extension in Nairobi (2007), partitioning and remodeling of

Chinese Restaurant at Adams Arcade, off Ngong Road, Nairobi (2011) and Ruai Police Housing Scheme (2013) just to mention a few (Ngigi, 2016).

Interlocking Stabilized Soil Blocks (ISSB)

As established earlier, a prudent developer will push the final costs of construction (plus his profit/return/ markup) onto the final consumer i.e. the property buyer and occupier. Finding an appropriate material that would be both economical and appeal to consumers' tastes and preferences will work well to significantly reduce the final costs. One such building material is interlocking stabilized soil blocks (ISSB). The blocks are not local to Kenya and have been used successfully in other countries in the world.

To produce these blocks, cement is mixed together with soil and water depending on the soil's characteristics. The composition is then fed into a simple machine that compacts it into blocks. They would then be covered with polythene paper or a substitute for a period of a week or so to cure; after which, they would be ready to be used in construction (Geoffrey, 2001).

Compared to its cousin the clay brick, ISSBs are considered more sustainable and environmentally friendly. Clay bricks are fired in brick kilns as the final process. ISSBs preserve timber (forests) and thus reduce the emission of carbon dioxide. The production process is also faster, easier, more affordable, and user-friendly. The main drawback to using ISSBs is the quality. One can expect a varying quality of ISSBs depending on the type of soil used, method of production, and the stabilizer used (Ngigi, 2016).

Fiber Reinforced Concrete (FRC)

As the name suggests, FRC contains fibers that are uniformly distributed to improve the tensile strength of concrete. Some of the commonly used fibers include synthetic fibres, natural fibers, steel fibers, or glass fibers which add different structural characteristics to the concrete. As a result, FRC quality, tensile strength, and other pertinent properties will rely on fiber material, distribution, geometrics, and densities. While these fibers may increase concrete's shatter resistance, permeability, or its impact abrasion, they are not a substitute for steel reinforcement. In the past, FRC has been used to create roofing tiles, serving as an alternative to asbestos sheets or galvanized iron sheets (Gallen, 1992). FRC roofing tiles are durable (with some being used for more than two decades, are relatively affordable, aesthetically pleasing, and offer considerable protection from the elements (Roland & Kiran, 1993). FRCs are also fire resistant and offer better thermal and acoustic characteristics especially when compared to GCI sheets. Considering the technology used in their production, the tiles are relatively lightweight. They would require less supporting structure (be it timber or steel). And in areas where cement is not readily available, it can be produced as a substitute (Gallen, 1992).

FRC is not without drawbacks and limitations. It is still reliant on the availability of cement in the locality. In addition, it requires clean water in the production and curing process; which might not be readily available everywhere. The production of FRC is technical and requires experts who can set standards with regards to quality control (Gallen, 1992).

Artificial Pozzolans

A pozzolan can be defined as a siliceous and aluminous material which is mixed with calcium hydroxide in the presence of water to react chemically forming compounds that possess cement-like properties (Mehta, 1987). By this definition, what can be identified as a pozzolan or pozzolanic can be a wide range of compounds; as long as it reacts with calcium hydroxide and water and possesses cement-like characteristics.

Pozzolans can have different composition, origins, and properties. They can also occur naturally or artificially, with a significant number of pozzolanic products being man-made. Some pozzolans are by-products of high-temperature processes. A good example is fly ash which is a by-product of coal-fired electricity production (Schneider, et al., 2011). As it stands, industrial by-products make the majority of the most used pozzolans such as fly ash, silica fume from silicon smelting, highly reactive metakaolin, and rice husk ash (Mweu, 2017).

Challenges in the adoption of ABM in construction

A significant dynamic that has hindered the adoption of ABM is the cost of raw materials. From the alternative options listed above, you can appreciate the use of cement. It is one of the commonly used ingredients in the production of ABM. The cost of cement is on the rise in most African countries including Kenya (U.S. Geological Survey, 2011). *Include data on rising costs of cement and clinker in Kenya.

Many of these alternative building materials require technical know-how and expertise, which many developers and building professionals still lack. While the use of ABM is recommended as a better alternative to conventional materials, the lack of technical knowledge limits its adoption by the main stakeholders. In Sub-Saharan African countries where the need for housing is high, small scale developers are not cognizant of ABM specifications leading to low adoption. And even if adopted, the final product performs poorly (UN-Habitat, 2010).

Adoption of ABM is not supported by policies and regulatory framework. Property is one of the most highly regulated sectors of any society due to the role it plays from a psychological, physiological, and economical perspective. These laws touch on every element of property including the construction of developments. Most countries will attest to having building laws and codes that guide and prescribe on this. These policies, regulations, and economic measures are used to determine environmental friendliness and sustainability of construction materials (Mpakati, et al., 2011). Without incorporation of ABM into construction laws and guidelines, we cannot expect developers (both large scale and individuals) to incorporate these materials.

In most scenarios, ABM technology needs to be customized to the local conditions within a country. A good example is the Interlocked Stabilized Soil Blocks, ISSBs. The ratio mix of soil, cement, and water depends on the type and quality of the soil. Locally based studies and research need to be conducted to establish the ideal ABM in a region that might be unsuitable for use in another (Acosta, 2000).

Impact of alternative building materials on cost

Let's have a look at the size of the housing provided for the AHP. According to information provided on the Boma Yangu platform, the size of a 1-bedroomed unit is 30 square metres, a 2-

bedroomed unit is 40 square metres, and a 3-bedroomed unit is approximately 60 square metres. We will use this information to analyse the cost of each unit. We acknowledge and understand the difference between price, cost and value however it is with the costings of the project that we would be able to a good comparison of the building materials.

Our method of analysis/ comparison will be the cost approach; an approach that provides an indication of value using the economic principle that a buyer will pay no more for an asset than the cost to obtain an asset of equal utility, whether by purchase or construction (RICS, 2022).

Below is an analysis of the various building materials' costings for the walling as per the IQSK construction handbook and specialists from the National Housing Corporation:

Solid concrete block walling: Kes. 2,400 per square metre

Brickwork: Kes. 1,600 per square metre

Stabilized Soil Blocks: Kes. 1,100 per square metre

For EPS Panels: Kes 2,300 per square metre

Given the rule of thumb that walling can cover from 15 to 25% of construction cost and a wall to floor ratio of 0.4, we can deduce the following:

Construction material	1 bedroom (30m ²)	2 bedroom (40m ²)	3 bedroom (60m ²)
Solid concrete block walling	18,000/-	24,000/-	36,000/-
Brickwork	12,000/-	16,000/-	24,000/-
Stabilized soil blocks	8,250/-	11,000/-	16,500/-
EPS Panels	17,250/-	23,000/-	34,500/-

Potential pricing of new units

	1 bedroom (30m ²)	2 bedroom (40m ²)	3 bedroom (60m ²)
Solid concrete block walling	1,000,000/-	2,000,000/-	3,000,000/-
Brickwork	660,000/-	1,320,000/-	1,980,000/-
Stabilized soil blocks	458,000/-	916,000/-	1,374,500/-
EPS Panels	958,300/-	1,916,000/-	2,874,000/-

Recommendations

The uptake of alternative building materials in the country has been rather slow and marked by a lack of a solid regulatory framework, slow adoption by key players, research gaps for a local context, and varying quality of workmanship. Proper addressing of these issues will change perception of both developers and consumers of housing units boosting awareness and acceptance of new housing units using alternative building technology.

As it stands, Kenya imports a considerable amount of its construction products from clinker to steel. Given the challenges in global logistics, increasing in local taxation rates, and the devaluation of the local currency, it would be impossible to expect a decrease in price in affordable housing units. There needs to be a long-term solution that can offer a reprieve for Kenyans given that housing is a basic right to all.

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