Incremental Housing and the Material Blind Spot in Sub-Saharan Africa

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Abstract:

Urbanization in sub-Saharan Africa is largely through auto-construction, and incremental housing serves as the *de facto* city-making scheme. Urban resilience discourse leans heavily on the location and legality of incremental housing settlements, therefore missing a critical blind spot in materiality (the physical substance of the houses). This paper addresses this blind spot by arguing that the “Standard Trajectory” that favors industrial materials such as concrete is more than just a financial and technical decision. It is a profound bid to be a legitimate urbanite through material citizenship. Through the analysis of Environmental Imaginary (the social prestige of durability) and Structural Market Constraints (the "Cement-Concrete Complex"), we identify a dominant Maladaptation Trap. This trap explains why, in attaining social legibility, homeowners are often exposed to thermally hostile and financially rigid structures. We also demonstrate a dependency created by the cement industry, which marginalizes sustainable alternatives. The paper concludes that genuine urban resilience needs to dismantle this trap by giving sustainable materials more visibility, accessibility, and aspirational desirability, similar to concrete.

Keywords: *Incremental Housing, Urban Resilience, Sub-Saharan Africa, Materiality, Maladaptation, Concrete, Vernacular Architecture, Climate Change.*

1. Introduction

The Material Blind Spot in Urban Resilience

Africa is undergoing a prominent demographic shift. The continent's population is projected to increase by an estimated 90% by 2050, from an estimated 1.308 billion in 2019 to 2.5 billion (Awoussi et al., 2025). The growth is largely urban; city-dweller numbers have grown from just 4% at the beginning of the 20th century to over 40% today. The significant aspect of this growth is not simply the numbers, but the substance of what people live in. With 17 African countries having at least a deficit of 1 million units (Asibey et al., 2025), self-built homes have become a dominant part of city-making.

Incremental housing serves as the de facto solution to the housing deficit in sub-Saharan Africa (SSA) (Goethert, 2010), where housing capital is typically sourced from personal savings or government loans and not external investment markets. As a result, "build as you earn" accounts for almost 70% of the urban housing stock in the developing world (J & E, 2025; Van Noorloos et al., 2020a). It is mostly attributed to low-income households with limited access to mortgage schemes, resulting in the construction of their houses in stages (Asibey et al., 2025; Hasgül, 2016; J & E, 2025; Van Noorloos et al., 2020a).

Despite the predominance of this model, there is a critical blind spot in urban resilience research. Research creates a discernible fixation on the physical location (Wainer et al., 2016), regulatory issues that surround incremental housing (Hasgül, 2016), and the quantitative aspect of incremental housing (e.g, additional spaces and structural quality) (J & E, 2025). In doing so, only a partial picture of material selection and how these choices evolve is offered. Some studies do track material-related change in informal settlements over short time windows, often through proxies such as roof upgrades (Gevaert et al., 2020). However, data on the spatiotemporal development of slums in sub-Saharan Africa remain scarce (Büttner et al., 2025), and monitoring change in informal settlements is still widely described as a critical challenge in data-scarce contexts (Veeravalli et al., 2025). As our cities face intensifying heatwaves and other climate extremes, the physical materials used in constructing our homes should be given more attention, as they directly affect indoor thermal comfort and everyday safety (Correia & Delgado Henriques, 2025). However, homeowners persistently choose

maladaptive materials while sustainable alternatives are available, suggesting that material choice is more than just about finances.

This paper addresses the blind spot by analyzing material choice as a collision between environmental imaginaries and market constraints. Following this brief introduction, we examine the material trajectory that incremental housing projects undertake over time. The subsequent two sections focus on the driving factors that influence material selection, specifically the "Environmental Imaginary" and "Informality as a Constraint." These sections highlight the pervasive dominance of concrete within the construction industry. We argue that material choices are not merely made based on finances, but serve as a bid to be recognized as legitimate urbanites (Van Noorloos et al., 2020). Next, we synthesize our findings to connect them with "The Maladaptation Trap" that these drivers establish. We conclude by focusing on potential avenues for future research pertinent to this topic.

2. From Temporary to Permanent: Material Trajectories in Incremental Housing

Material upgrading is more than just the technical process of home improvement; it is also a trajectory of “hardening” by which houses attain permanence. Upgrading materials involves replacing temporary or low-durability components with more durable and permanent materials (Kamruzzaman & Ogura, 2009). It is a bottom-up process that fundamentally contrasts with top-down housing delivery, where the process is defined and linear: land is allocated, technical infrastructure is established, and then a permanent dwelling is constructed in a single phase. Incremental processes, by contrast, reverse this sequence, prioritising housing construction over infrastructure provision and tenure formalisation, which come later in incremental development (Bennett, 2016).

The housing trajectories of rural-urban migrants in Tanzania give a clear example of incremental material change, driven by cultural adaptation and a pursuit of higher social status. Initially, migrants construct their houses using traditional local materials (e.g., mud or thatch), reminiscent of the materials found in their villages. The later adoption of urban life then coincides with a systemic shift towards industrially produced materials, such as concrete and iron. However, these material selections often disregard their suitability for local climatic conditions or cultural building practices (Huba M. Ngulum, 2018)

Within a single informal settlement, the housing environment can be heterogeneous, consisting of dwellings built of temporary materials to consolidated brick-and-mortar houses. Structures built with lighter, less durable materials such as timber, reused clay roof tiles, and corrugated iron sheets face several risks. Their poor insulation and lower construction quality make them highly vulnerable to rain, heat, cold, and humidity (Ehebrecht, 2014). Upgrading materials doesn't just make a home more secure; it also reduces the frequency of needed maintenance. For example, houses made from raw, unstabilized earth require repairs after every rainy season (Huba M. Ngulum, 2018). This material spectrum underpins the aspiration among urban dwellers to eventually achieve a permanent brick house with a reinforced concrete roof (Kamruzzaman & Ogura, 2009).

This preference for industrial materials is reinforced by international development metrics. Materiality is captured in UN-Habitat's assessment of housing conditions, where construction-related factors are described in terms of structural quality and dwelling durability[1]. Within this framework, the permanence of the structure is considered a key indicator. Because cross-country data on housing construction quality and materials are uneven and often incomplete, floor material is frequently used as a proxy indicator when assessing dwelling durability in large-scale monitoring datasets (Thomson et al., 2021). Based on this indicator, approximately 20% of people in sub-Saharan Africa live in dwellings with non-durable floor materials. In Benin, 80% of dwellings were classified as durable when assessed solely on floor materials, but this share decreases to 60% once wall and roof materials are included. Similarly, for Chad, the durability percentage drops from 15% to only 5% (McBride et al., 2011).

This bias in statistics highlights a critical issue: durability is measured by the dominance of industrial materials, specifically cement and its derivatives. By codifying industrial materials as indicators, a "standard trajectory" is enforced, which pushes material choice toward climatically unsustainable choices.

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[1]Official UN-Habitat definition: " *A house is considered as 'durable' if it is built on a nonhazardous location and has a permanent and adequate structure able to protect its inhabitants from the extremes of climatic conditions such as rain, heat, cold, and humidity. The following criteria are used to determine the structural quality/durability of dwellings: permanency of structure (permanent building material for the walls, roof and floor; compliance with building codes; the dwelling is not in a dilapidated state; the dwelling is not in need of major repair); and location of house (hazardous location; the dwelling is not located on or near toxic waste; the dwelling is not located in a flood plain; the dwelling is not located on a steep slope; the dwelling is not located in a dangerous right of way: rail, highway, airport, power lines)*." (UN-Habitat, 2016)

3. Driver A: The "Environmental Imaginary"

Analyzing material choice in incremental housing through an economic lens fails to account for the environmental imaginary that dictates safety and modernity. This argument is valid in post-colonial sub-Saharan Africa, where concrete has successfully become a boundary marker of what is backward and what is progressive. The desire for concrete in African society is not entirely objectively based on its functionality and resilience as a material, but on its social standing. Concrete has developed an unequivocal agency for itself in social relations and politics. Choplin (2023) describes concrete as a global commodity that contributes to globalization. Validated by state institutions, building codes, and private practice, it is indeed the ‘golden child’ of globalization.

3.1 The Imaginary of Durability:

Low-income households prioritize industrial materials even when they are climatically hostile. The reason lies beyond economics. Material choice is driven by the ‘environmental imaginary’; the collective belief systems of groups and individuals in society to interpret and interact with the natural world (Directory, n.d.). This consists of the mental images, the popular narratives, and the conceptual frameworks that we use to position ourselves in our ecological reality. In this context, it represents the belief that only modern materials like concrete can protect against the forces of nature (e.g., rain and time).

Consider this composite narrative:

> A family of four lives in a provisional home made of adobe and timber in a peri-urban neighborhood of a quintessential sub-Saharan African city. Although it is somewhat cramped for an entire family, the walls made of earth keep their one-room home cool and comfortable, especially on hotter nights. Over the course of several years, they accumulate enough wealth to secure their land tenure and to commence building a more permanent structure. Without hesitation, they replace their home with a more spacious two-room house made of unplastered concrete blocks. This decision instantly grants them a shift in their

social standing among their friends and in their neighborhood. The permanent concrete structure showed that they were now financially buoyant. However, during the night, they experience significant discomfort in their newly constructed home, something they unanimously agreed was never a problem in their adobe abode. Although they acknowledged the thermal discomfort, they viewed it as a necessary price to pay to uphold a social standing.

3.2 The Stigma of the Vernacular, The Dominance of Concrete

The hypothetical family's rejection of earth illustrates the prevalent rejection of vernacular materials when selecting construction materials. Sustainability is not the first thing that comes to mind, but rather the social standing they are associated with. The potency is so prominent that income studies conducted in Nigeria for incremental housing reveal that low-income groups may even build with earth and then plaster the walls with cement to give them a modern appearance (Olagunju & Atamewan, 2017). This demonstrates that the issue is not merely structural, but deeply aesthetic: the appearance of concrete is as important as concrete itself. The central question arising from this observation is: When and how did concrete permeate African urbanism to attain such unprecedented prestige?

The current hegemony of concrete is a direct inheritance of the colonial project. Concrete's history in Africa began with the importation of cement from Europe to build early colonial urban centers (Choplin, 2023). Colonial administrations rejected African vernacular architecture. Their reason was clear: the materials lacked the durability of industrial materials such as concrete and steel, and were susceptible to rain and decay. This led to the legal enforcement of prescribed definitive construction materials (industrial materials) in urban centers (Lidón De Miguel et al., 2021).

The successive leadership of African states after colonialism continued to enforce this policy through modern architecture, albeit with a different rationale. Where colonial administrations promoted modern architecture as a symbolic reminder of their homes away from home, it became a representation of the newfound identity they sought in their independence (Ciarkowski, 2015). The consensus was that concrete represented a politically and socially progressive independent Africa (Ciarkowski, 2015; James-Chakraborty, 2014). African elites continued to revere imported industrial materials as they were a symbol of their prestigious status. Additionally, the absence of indigenous African architects at the beginning of the

post-independence era meant that European architects continued to design monumental buildings and infrastructure, disregarding vernacular materials as contenders to industrialized materials (James-Chakraborty, 2014). Ultimately, the importation of foreign ideologies and materials produced designs that were devoid of connection to local needs, climate, and culture.

The appeal of concrete has led to a diminished prestige of traditional materials, a situation that continues to be true today. They are associated with being poor and stuck in the past; a relic of little significance for a legitimate urbanite. Although a strong case can be made on how research has given earth the agency to compete with and outperform concrete, it continues to struggle in achieving a significant market breakthrough.

4. Driver B: Informality as a Structural Constraint in Material Markets

While the environmental imaginary explains how the desire for industrialized materials such as concrete in incremental housing came to be, it does not explain their contemporary ubiquity. Much research focuses on replacing unsustainable materials with sustainable alternatives (Van Noorloos et al., 2020). However, it is necessary to position building materials as part of a larger system and understand how the market is structured.

4.1 The Cement-Concrete Complex

Cement is an omnipresent, inevitable building material in today's construction industry (Choplin, 2023). Choplin's research followed the "cement trial" along the West African coastal corridor to affirm this statement. Globally, concrete is the world's most produced material with powerful actors in every part of the chain, from production to development, to government agencies that regulate the market, retailers, landowners, and bricklayers (Choplin, 2020). It is a key indicator of economic growth and development, and very profitable for the actors involved. We will first examine the cement industry by utilizing Choplin's research work to establish a foundation for understanding the concrete industry. Subsequently, we will examine how the sustainable material industry compares to the well-established concrete industry.

The demand for cement in urbanizing Africa was previously met through imports from various countries. Since 2010, Foreign companies like LafargeHolcim, HeidelbergCement have operated in the market to dominate the West African market (Choplin, 2023, p. 2). However, none of these has been more successful than Dangote. Dangote has established a pioneering

model in cement production in West Africa, one that is now largely owned by Africans (Choplin, 2023). Materials are now sourced and produced in the region, where prior sourcing was largely dependent on global importation.

Economically, the industry is an oligopoly in which only a powerful few compete in the market. The price of cement in Africa is comparable to the stock market, as it fluctuates daily. Even with the new plants operating and companies competing, the average price of cement in Africa is 183% higher than it is globally (Choplin, 2023). Allegedly, major producers are very careful not to overproduce, as it would drive the price of cement down. Despite the high cost of cement, it remains dominant. Why? It is dominant because an oligopoly guarantees availability. West African coastal cities are littered with cement depots, cement block companies, as well as materials for reinforced concrete such as gravel, sand, and iron (Choplin, 2023).

In other instances, the consolidation of logistics and production provides a competitive advantage in the market, exemplified by the case of Dangote (Choplin, 2023). Competition between manufacturers is intense, and most competitors complain about the unfair commercial activities of their rivals. None has faced this criticism more than Dangote. It is alleged that Aliko Dangote has leveraged his relationship with successive Nigerian governments to gain an upper hand in the market (Akinyoade & Chibuike, 2016). It is widely believed that numerous policies used during the bid to boost local cement production in Nigeria were put in place to benefit Dangote. However, he has defended allegations by emphasising the importance of building good relationships with the government when doing business. This illustrates how intertwined and protected the industry is with politics to leverage tax incentives and government subsidies.

The structure of the cement industry provides insight into why the sustainable construction materials industry has a difficult time penetrating the market. The ubiquity of cement creates a sachet economy that best serves the poor. A household can purchase cement and its derivatives incrementally, which aligns with their wages. In contrast, alternatives like the earth material market have not reached this stage. It is more common to have an upfront execution of a rammed earth project, for example. While in theory stabilized earth materials are cheaper, concrete is more accessible in practice and a far more organized industry.

There is a lack of knowledge by the construction material industry regarding the market demand in the practice of incremental housing (Jokar & Khakzand, 2025). Dethier (2020) cautions against the cement industry’s propensity to consolidate even the sustainable material sector.

This is exemplified by their provision of compressed stabilized earth blocks (CSEBs) stabilized with cement or lime. It effectively marginalizes smaller competitors who specialize solely in this service, takes away the self-build option for which earth architecture is known, and further diminishes its visibility.

4.2 Labour, Skills, and Material Choice in Incremental Housing

The construction sector employs several million people worldwide. In particular, in SSA, where the informal economy plays a crucial role, employment in this sector represents a significant opportunity for rural–urban migrants, as it is relatively easy to access and often serves as an entry point into urban life (Yaro et al., 2016). Incremental architecture is a process in which the owner acts as a self-builder, although this does not necessarily imply that the owner undertakes construction work personally. In practice, the owner more often assumes the role of a manager who coordinates the building process.

Material choice strongly influences the type and availability of skills required for construction. In incremental housing contexts, where informality is dominant, materials become part of a broader building strategy. The informal construction sector, therefore, plays a central role in incremental housing and is largely shaped by informally trained artisans. Choplin (2023) employs the metaphor of “children’s play” to describe this widespread perception of simplicity and accessibility. However, this view contrasts with the actual organisation of construction work, in which technical knowledge is unevenly distributed and reproduced through informal yet strongly hierarchical apprenticeship systems led by site foremen. Urban construction sites frequently rely on labour recruited through family and social networks, including workers from rural areas who gradually acquire masonry skills through on-site practice rather than formal training. Some of these workers later remain in the city and continue working in the construction sector, contributing to the circulation of concrete-based skills across urban contexts (Choplin, 2023).

Across several SSA contexts, the dominance of cement and concrete-based construction is accompanied by a decline in sustainable traditional building skills. As a result, fewer workers can construct or maintain buildings using non-concrete techniques (Appeaning Addo et al., 2025; Choplin, 2023). While several international organizations and NGOs working on incremental housing focus on skill acquisition for innovative materials (Van Noorloos et al., 2020b), it is still not widespread enough to challenge the hegemony of concrete. This shift can

reinforce concrete as a default option, because households' material choices are constrained not only by markets but also by the locally available labour and skills ecology.

5. Synthesis: The Maladaptation Trap

The convergence of the environmental imaginary and (Driver A) and the constraints (Driver B) caused by the concrete supply chain creates a standard trajectory in material upgrading that is difficult to escape. While the upgrade from makeshift housing to more solid structures is in itself an achievement, the standard trajectory creates a maladaptation trap. In the context of climate change, maladaptation refers to the unfavorable effects of adaptations to climate change (Magnan et al., 2016). It also includes the policies and practices that inadvertently make people more vulnerable to changes in their natural environment. In incremental housing in sub-Saharan Africa, we see this trap manifest through housing construction with concrete, which increases both climatic and financial vulnerability. This trap forces the aspiring homeowner to choose between social legibility, the need to gain social status, and climatic safety, the need to have a house that withstands harsh weather without posing a health risk.

5.1 The Thermal Trap

While the environmental imaginary associates concrete with modernity, thermal discomfort is the immediate symptom of maladaptation. The standard concrete block is thin and has high thermal conductivity, meaning it transfers heat more rapidly into a building during the day. The natural properties of earth make it a material that offers optimal thermal comfort. Earth can be used as a heavy material with a thermal mass greater than 1500kg/m³ (Jurriaan van Stigt, 2021). It works as a buffer, absorbing heat from the outside and gradually releasing it to the inside of a building, thereby moderating the temperature. The higher the compression of the earth material used, the better its thermal inertia value (Dethier, 2020; Jurriaan van Stigt, 2021). Generally, the wall thickness ranges between 30-60cm, especially for external walls that have direct contact with sunlight.

Residents achieve a permanent home either way; however, the difference is seen in the inhabitability without mechanical cooling of thermally improper materials. The commitment to concrete is difficult to reverse. Consider retrofitting for thermal performance; while it can be achieved through shading, or more commonly, mechanical cooling, it is a costly endeavor that is

not easily attainable for low-income homeowners. This leaves residents in inefficient structures in the midst of intensifying heatwaves due to climate change.

5.2 The Financial and Labour Trap

The second aspect of the maladaptation trap is the economic dimension. As discussed in Driver B, the cement industry has perfected the sachet economy, giving the advantage to buy building blocks or cement bags incrementally. However, while this makes concrete more accessible, it is still a market that can sometimes be unpredictable. Referring back to the fact that cement is 183% more expensive on the African continent than in other places is an alarming fact. Because it is an oligopoly, even a change in government can affect the price of cement (Choplin, 2023). For an incremental builder, interruptions due to market volatility lead to prolonged construction time and overshoots in construction costs.

Material innovation is an important part of incremental housing. Wainer et al. (2016) observe that restrictions and pressure on conventional building supplies prompt homeowners to seek viable alternatives. For example, Compressed Earth Blocks (CEBs) and earth bag construction have gradually replaced traditional fired bricks amidst the strict laws against tree felling and burning in Kigali, Rwanda.

The trap is further reinforced by the way the labor and skill ecology is designed. Concrete is the universal language of masonry; it is the only material that is always available. While a household might prefer to be climatically superior, the immobility of skill related to sustainable earth construction forces them back into the cement industry. Skill and labor acquisition must be prioritized for earth to become a more visible option in incremental housing. For example, in Jinja, Uganda, the local slum dwellers' association, together with Slum Dwellers International, has started the initiative of using compressed stabilized earth blocks (CSEBs) in upgrading incremental housing projects. It is currently a learning center for climate-responsible building materials from local sources (Van Noorloos et al., 2020).

5.3 Scope and Limitations

While the synthesis provides the framework of the Maladaptation Trap that stems from the Drivers, it is important to acknowledge the primary limitations in this research work.

1. Geographic and Climatic Specificity

The term sub-Saharan Africa employed in this research is in itself broad, and the empirical evidence provided to support our theses is largely drawn from East and West Africa (e.g., Nigeria, Tanzania, and Uganda). However, the climate conditions, particularly when approaching the Thermal Trap, are more nuanced; arid zones and tropical zones require different defense strategies. While the environmental imaginary in favor of concrete is a common phenomenon in SSA, the intensity of vulnerability to climate differs by region. Future investigations must position themselves within the various climatic contexts that exist in SSA.

2. Nuance Beyond the Material Binary

Secondly, this paper analyzes material choice through a rigid binary of 'industrial materials' (concrete) versus 'vernacular materials' (stabilized earth) to emphasize the dichotomy that exists in the construction market. In practice, however, hybrid materiality is gaining more ground in sustainable construction. For example, concrete is commonly used at the foundation level and as the structural frame of a project that uses CSEBs. It is also common to use a percentage of cement as the stabilizer in CSEBs. As researchers, we must acknowledge the blurred middle that exists in the spectrum of materiality and understand how this affects the maladaptation trap framework.

6. Conclusion

This article argued that material choice in incremental housing in sub-Saharan Africa is not only a technical or economic decision, but also a social one shaped by what people value and what is realistically available. Although incremental housing is widely recognised as a major form of urban housing production, debates about urban resilience often focus on land, infrastructure, and governance, while paying less attention to the everyday material realities of self-built housing.

However, by tracing material trajectories, we showed that upgrading is usually gradual: households start with minimal cores and lower-durability components and progressively "harden" dwellings as resources become available (Kamruzzaman & Ogura, 2009; Patrick

Wakely & Elizabeth Riley, 2011). These shifts are not only about performance; they also relate to recognition and belonging. In Tanzania, “modern” housing is associated with concrete blocks, cement-screed floors, and iron-sheet roofing, even when such choices may conflict with climatic comfort or vernacular building logics (Nguluma, 2003). This supports our first driver: an “environmental imaginary” in which concrete is widely read as safe, durable, and socially legitimate, while vernacular materials are often framed as temporary or backward (Choplin, 2023; Olagunju & Atamewan, 2017).

At the same time, preference alone does not explain concrete’s dominance. Our second driver highlights how informality works as a constraint through supply chains: cement and concrete remain prevalent because their markets are organised, visible, and accessible to incremental builders, including through purchasing formats that match “build-as-you-earn” practices (Choplin, 2023). In contrast, climate-appropriate alternatives (including earthen techniques) often rely on weaker supply ecosystems and do not fit incremental purchasing and staged execution in the same way, which limits their everyday viability (Van Noorloos et al., 2020).

Finally, labour and skills reinforce these patterns. Even where concrete is seen as simple, construction quality depends on specialised knowledge that is unevenly distributed and reproduced through informal and hierarchical apprenticeship systems (Choplin, 2023). As concrete-based construction becomes the default, traditional building skills tend to decline, further narrowing the set of “practical” options available to households (Appeaning Addo et al., 2025; Choplin, 2023). Together, these drivers point to a maladaptation trap: choices that feel safe and socially “right” at the household level are reinforced by markets and skills, making it harder to adopt alternatives that may perform better in local climates and over time.

Moving forward, a fundamental shift is required in the material imaginary, one that gives sustainable materials more visibility, accessibility, and aspirational desirability, similar to concrete. The goal of urban resilience in SSA should be to protect the everyday lives of the people, and housing should reflect this pursuit through thermal and financial comfort.

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