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Designing for Resilience: Housing Needs and Climate Perceptions in Rural Siaya County, Kenya

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Abstract

Architecture can play a pivotal role in addressing the climate crisis by embedding sustainable design principles that reduce environmental impact and enhance resilience. Beyond ecological considerations, architectural interventions are crucial in developing structures capable of withstanding extreme weather events—and thereby mitigating the displacement of vulnerable populations. This study emphasizes the importance of tailoring architectural responses to the specific environmental challenges and evolving needs of rural communities. Drawing on the Perceived Values and Climate Change Resilience Dataset collected in Siaya County, Kenya, the research explores local perceptions of climate change and how these shape housing priorities. Among 300 respondents, 83% express concern about climate change, identifying drought as the most pressing environmental threat. The evolving desire for housing solutions that respond to specific needs highlights the need for more secure housing. This specifically calls for improvements in watertightness, pest resistance (especially against termites), and overall structural durability, as well as reducing maintenance effort, enabling houses to be enlarged, and improving their aesthetics. These findings provide critical insights into how rural populations in western Kenya are experiencing and responding to climate-related stressors. By foregrounding community perspectives, the study informs the development of adaptive, resilient, and contextually appropriate architectural solutions. It contributes to broader discourses on climate adaptation, vernacular design, and inclusive development strategies in Sub-Saharan Africa, reinforcing the imperative to align architectural innovation with both environmental imperatives and cultural realities.

Keywords: climate resilience; rural housing design; sustainable development; socio-economic context; housing policy; Sub-Saharan Africa

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1. Introduction

The accelerating effects of climate change on rural communities in Sub-Saharan Africa underscore the critical imperative to develop climate-resilient housing in ecologically vulnerable areas. Repeated exposures to floods, cyclones, heat, and related climate risks frequently overwhelm weak construction methods and low-cost, self-built, or temporary housing [1]. Studies from India, Bangladesh, Vietnam, Pakistan, Zimbabwe, and Australia consistently describe non-engineered dwellings with inadequate foundations, poor technical design, and inflexible government modules as particularly susceptible [1–5].

Rural communities in Siaya County, Kenya, located along the shores of Lake Victoria (Figure 1), exemplify the local challenges posed by climate-related risks, including economic instability and threats to human well-being [6,7]. Given its geographical position and primarily agricultural economy, Siaya County serves as a compelling case study to examine the intersection of climate change, housing needs, and community resilience.



Figure 1. Map of Kenya, indicating Siaya County.

Siaya County (Figure 1) spans approximately 2530 square kilometers in western Kenya, characterized by a rich cultural heritage and a predominantly Luo population. This setting provides a unique context for exploring the interplay between traditional and contemporary lifestyles. Traditionally, Luo homestead structures consist of separate houses designated for different family members. However, modern influences are leading to a transition towards single, larger structures, reflecting a shift influenced by Western culture [8]. These transformations raise questions about the sustainability of architectural styles amid urban and climate pressures.

The region's economy is mainly reliant on agriculture, with subsistence farming and fishing as primary activities, complemented by remittances from family members living in urban areas. This reliance makes the region particularly sensitive to climate risks such as wildfires, river flooding, droughts, and potential earthquakes, which pose challenges to sustainable development and adaptation strategies [9–11]. Despite these challenges, local adaptation efforts in response to increasing droughts and rising temperatures primarily focus on agricultural practices, leaving housing-specific adaptations largely unexplored [12]. This gap is notable because suitable housing can mitigate climate extremes' effects on people, such as heat waves and heavy rainfall, thereby enhancing community resilience [13].

Siaya County experiences a tropical climate with two rainy seasons: the long rains from March to June and the short rains from October to December. The average annual rainfall ranges from 1500 to 2500 mm, supporting agricultural activities but also posing challenges like flooding and soil erosion. Temperatures in the county are generally warm, averaging between 19 °C and 35 °C [14]. Since 1979 and until 2024, temperatures in Siaya have risen on average about 1.2 °C. According to the rising temperature, precipitation sunk [14].

These data show the climate change that already exists in Siaya County. The Kenyan government has established County Climate Change Funds to support local adaptation efforts and mainstream resilience into County Integrated Development Plans [15]. The Siaya County Climate Change Action Plan (2023–2028) focuses on very important key factors like water and sanitation; agriculture and food security; fisheries; forestry and land use; social infrastructure; energy; health (mainly on promoting vaccination); and education [16]. However, this overlooks the fact that individual homesteads and homes can contribute differently to the overall total, meaning that each individual contributes to the greater good. For example, targeted architectural planning can facilitate the collection of clean rainwater, and a home that is clean, thermally suitable, and structurally sound can enhance the well-being and safety of its occupants [17]. The use of regional resources in architecture should also be considered alongside the sustainable planning of forests and land use.

Clearly, a holistic approach involving various disciplines is essential for climate-resilient building planning. Research shows that some of these strategies can be relearned and reinterpreted in vernacular architecture [18,19]. Many contemporary housing solutions, however, tend to overlook locally sourced materials and traditional knowledge systems, leading to designs that may not fully align with local needs or environmental realities—and thus fall short of achieving long-term adaptability and sustainability [20]. A critical assessment of local housing systems is therefore essential to identify opportunities for improvement and develop strategies that are both culturally and environmentally sound. These strategies should combine modern amenities with traditional practices to promote sustainable development in rural communities [20–22].

This study contributes to this discourse by analyzing survey responses from 300 residents of Siaya County, provided by the University of Oxford and CLASP Nairobi [23]. The study aims to clarify underlying housing needs, independent of existing building preferences, to inform future regional architectural strategies.

Prior analyses using the same dataset, such as that by Leonard et al., have emphasized the importance of energy in healthcare and education access, highlighting the critical need for infrastructure tailored to marginalized populations [24]. Other studies underscore persistent challenges, including energy poverty, financial constraints, and limited self-build capacity, all of which are intricately connected to broader systems of service delivery and opportunity [25–28]. While the aforementioned studies address important infrastructure improvement points, this study focuses specifically on individual buildings and their residents' needs. This is important because it reveals the functional and environmental requirements necessary for climate resilience, rather than simply repeating traditional designs that may no longer be suitable. This distinction allows architects to address emerging challenges such as thermal comfort, flood protection, and material sustainability more effectively. Prioritizing needs over preferences allows design to better support long-term adaptability and community well-being.

2. Materials and Methods

This study is based on the dataset "Perceived values and climate change resilience dataset in Siaya County, Kenya", provided by the University of Oxford and CLASP in Nairobi [23], which was published in March 2024. It gives the responses of 300 citizens of Siaya County in Kenya to 82 questions about perceived values, demographic constellations, household information, housing ownership and satisfaction, health, water supply, electricity supply, extreme weather, community services, and information communication. The data was generated with a user-perceived value (UPV) game—a perception-based surveying approach [23]. The participants ranged in age from 16 to 95 years, with the ma-

jority being between 26 and 65 years old. Among the 300 participants, 150 are crop farmers, 43 are animal farmers, 64 are self-employed, 55 are unemployed, and the remainder are engaged in various other occupations.

This study evaluates the following questions (Table 1) to set the focus on the constructed buildings and the influence of climate change.

Table 1. Evaluated questions in the analyzed dataset [23].

Questions regarding climate change influence	(1) "Are you worried about climate change?" (2) "What extreme climate event are you most worried about? " (3) "Have you experienced flooding in your home?"; "Do you have any means of preventing flooding in your home?" (4) "Have you experienced fire in your home?"; "Do you have any means of preventing fire in your home?" (5) "What other extreme climate event are you worried about?"
Questions regarding building needs and challenges	(6) "Are you happy with the quality of the construction in your house?" (7) "What are the main 3 building materials used to build your house?" (8) "What would you change about your house and why?"

Question 1 employed a binary response format (yes/no), whereas Questions 2 through 7 utilized a structured response format requiring participants to select from predefined categories (Drought, Earthquake, Wildfire, Flood, Hurricane, Extreme Heat, and Other). Questions regarding flooding (3) asked whether they had experienced flooding in their home and if they have any means of preventing it. These two questions were linked to determine whether, if they had already experienced flooding, they had already developed measures against it, and whether, if they had not experienced flooding, they were already protecting themselves. Similarly, for the questions relating to experienced fire (4), it was asked whether they had already had a fire in the house and how they protect themselves against it, or if they had not yet had a fire but nevertheless take precautions. Question 5, regarding other experienced hazards, used structured responses with predefined responses like "Outbreak of Diseases", "Drought", "Mud Slide", "Storms", "Stream Pollution", "Dumping", and "Others". Question 6 was answered by a binary response format (yes/no). The answers were then connected to the answers from Question 8, e.g., whether they are satisfied with their home but still have desires to improve it, or whether they are dissatisfied but cannot address any specific change requests. As a result, it also shows exactly how many are dissatisfied and have specific desires for change, and how many are satisfied and have no desires. In Question 7, three main building materials were to be selected from a given list, which included "Corrugated iron sheets", "Mud bricks", "Bricks", "Wood", "Cement", "Steel bar", "Grass thatch", and "Other".

Question 8 was open-ended, permitting unrestricted textual responses. All responses were systematically analyzed and classified into relevant thematic categories as part of the study. Four main desires emerged from the analysis: (A) permanent construction, (B) change of roof, (C) permanent plaster or tiles, and (D) increasing house size.

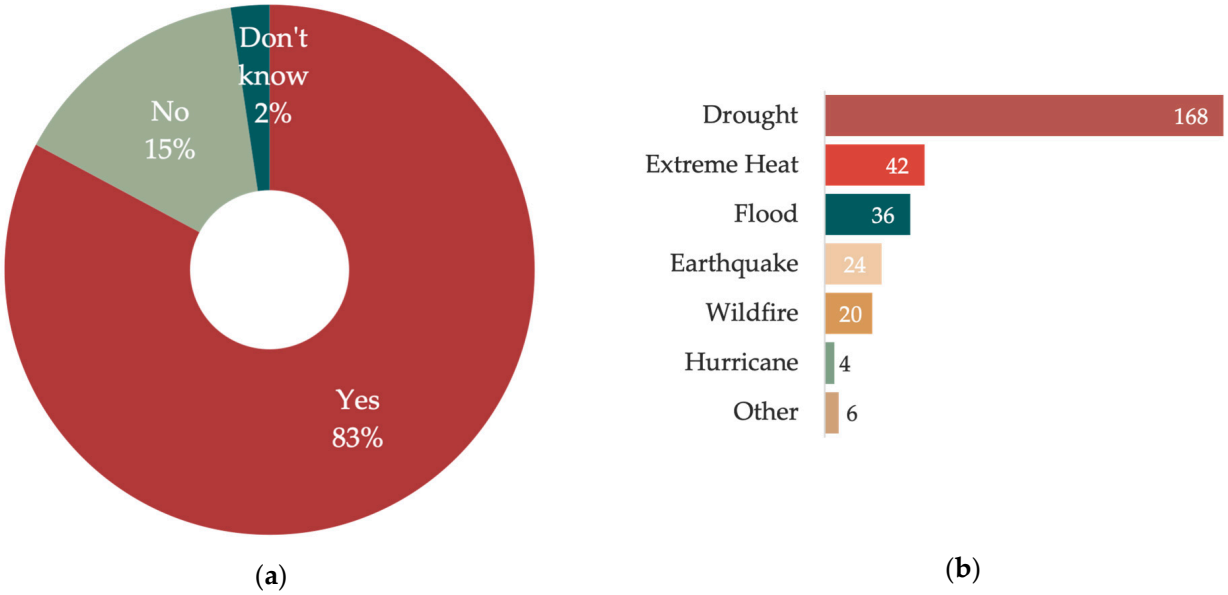
The accompanying explanatory statements for A, B, and C were summarized into four drivers behind the desires: (1) safety—meaning generating watertightness, structural safety, and preventing intrusion of wildlife (i.e., snakes) and insects (i.e., termites); (2) minimizing the effort of maintenance (including maintaining a clean healthy home); (3) aesthetic; and (4) increasing house size.

As several participants also stated several needs and/or reasons, the percentage analyses do not refer to the total number of respondents but serve for comparison purposes. Finally, further needs were identified that were also named by a small number of people. The study concludes with a discussion.

3. Results

3.1. Anticipated Climate-Change Worries and Feared Climate-Change Events

A significant majority of participants (83%) reported concerns about the impacts of climate change, while 15% indicated no such concerns, and 2% were unsure (Figure 2a). Among those expressing concern, the most frequently cited threat was drought (*n* = *168*), followed by extreme heat (*n* = *42*) and flooding (*n* = *36*). A smaller proportion of respondents mentioned earthquakes (*n* = *24*), wildfires (*n* = *20*), hurricanes (*n* = *4*), and other events (*n* = *6*), with the primary referring to heavy rainfall (Figure 2b).



(**a**) (**b**)

Figure 2. (**a**) Graph about climate-change worries, generated from dataset [23]. (**b**) Diagram about which climate-change event is most feared, generated from dataset [23].

3.2. Experienced Flooding and Means for Its Prevention

A total of 58 participants (19%) reported having experienced flooding in their homes. Among those affected, 26 indicated they had measures in place to prevent future flooding, 15 stated they did not have such means, and 17 reported being unsure about whether their homes are protected. Interestingly, while most participants (81%) had not experienced flooding, nonetheless, 13% reported having implemented preventive measures. The specific types of preventive measures were neither specified by participants nor explicitly addressed in the survey.

3.3. Other Experienced Hazards

Responses of the 300 participants returned 381 entries related to environmental hazards, indicating that each respondent identified an average of approximately 1.27 experienced hazards. The most frequently reported events included disease outbreaks (*n* = *120*), droughts (*n* = *73*), mudslides (*n* = *49*), and storms (*n* = *35*). Additionally, 22 participants reported stream pollution, 15 mentioned illegal dumping, and 67 cited various other hazards (mainly heavy rainfall), reflecting a diverse range of environmental stressors impacting the community (Figure 3).

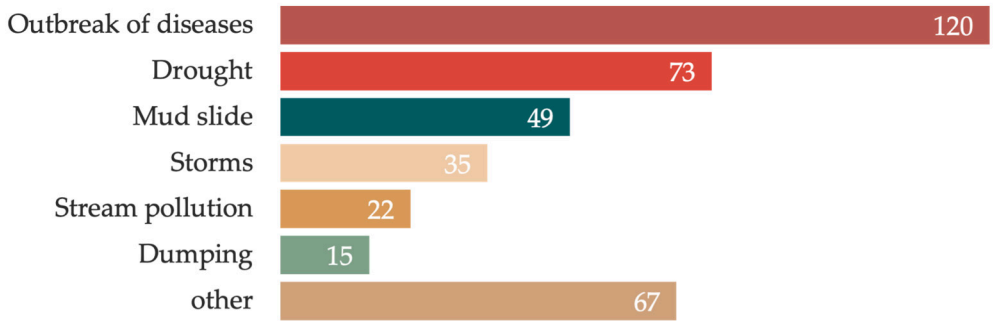


Figure 3. Other experienced hazards, generated from dataset [23].

3.4. Main Used Construction Material

An analysis of the construction materials used by participants reveals intriguing patterns of mixed building methods (Figure 4). Of the total respondents, all but 15 indicated the installation of corrugated iron sheets for roofing, signifying its widespread adoption. In contrast, only four participants reported using grass thatch as a roofing material, suggesting its limited popularity. A slight majority ($n = 154$) acknowledged the use of mud bricks in their construction activities, whereas 205 individuals reported employing standard bricks. Additionally, 193 participants indicated the utilization of wood, showcasing a preference for diverse structural materials. The data also indicates that a substantial number, 95 participants, incorporated cement in their construction processes, while 37 individuals opted for steel bars. These findings collectively suggest a prevalent trend of integrating various building materials and techniques, reflecting a composite approach to construction practices.

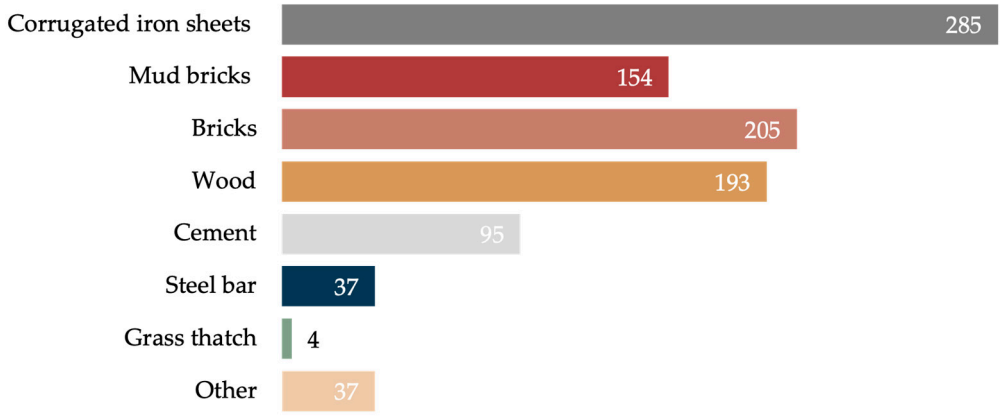


Figure 4. Main construction materials used, generated from dataset [23].

3.5. Expressed Satisfaction with the Housing Construction

After understanding which building materials are most used, the following section examines residents' satisfaction with their homes. The following graph (Figure 5) shows two circles. The outer circle demonstrates the answers to the question "Are you happy with the quality of the construction in your house?" Among the survey participants, 45% reported satisfaction with the quality of their house construction, but 36% of them still desire a change, which was identified within the question that asked, "What would you change about your house and why?" In contrast, 55% of participants expressed dissatisfaction with their current housing, and 48% of them provided specific reasons and articulated a desire for change. When combining the responses of those who were dissatisfied with those who reported general satisfaction yet still expressed wishes for change, it becomes evident that 92% of all participants desire some form of alteration to their living environment.

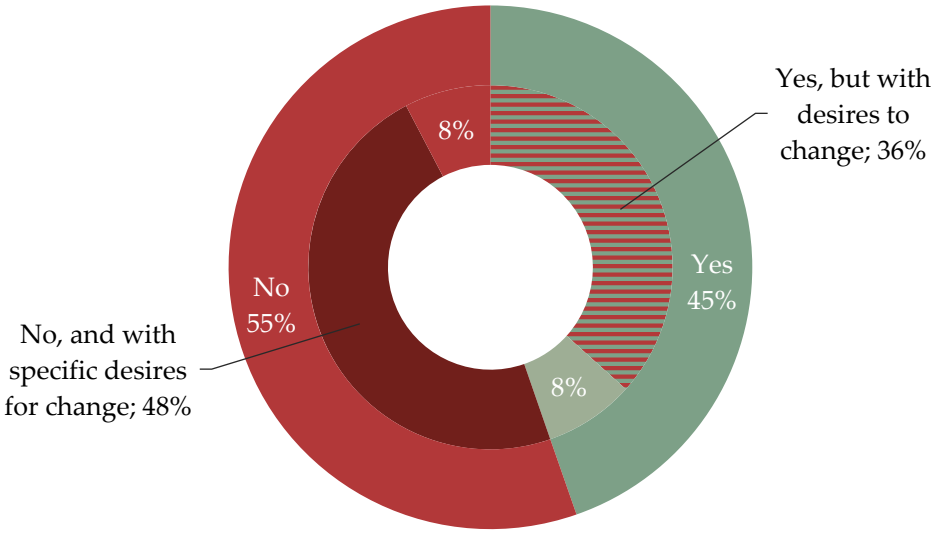


Figure 5. Visualization of participants' satisfaction regarding their housing conditions, generated from dataset [23].

3.6. Drivers Behind Specific Housing Solution Desires

Among the participants interviewed, 253 individuals, representing 84% of the total, articulated distinct aspirations regarding modifications they wished to make to their homes. On average, each participant conveyed 1.36 specific wishes, amounting to a cumulative total of 343 individual desires. These articulated preferences are classified into four main thematic categories (Figure 6): (A) transitioning to permanent construction, accounting for 37% of the wishes; (B) roof replacement or enhancement, comprising 19%; (C) installation of permanent plastering or tiling, also constituting 19%; and (D) expansion of house dimensions, representing 15%.

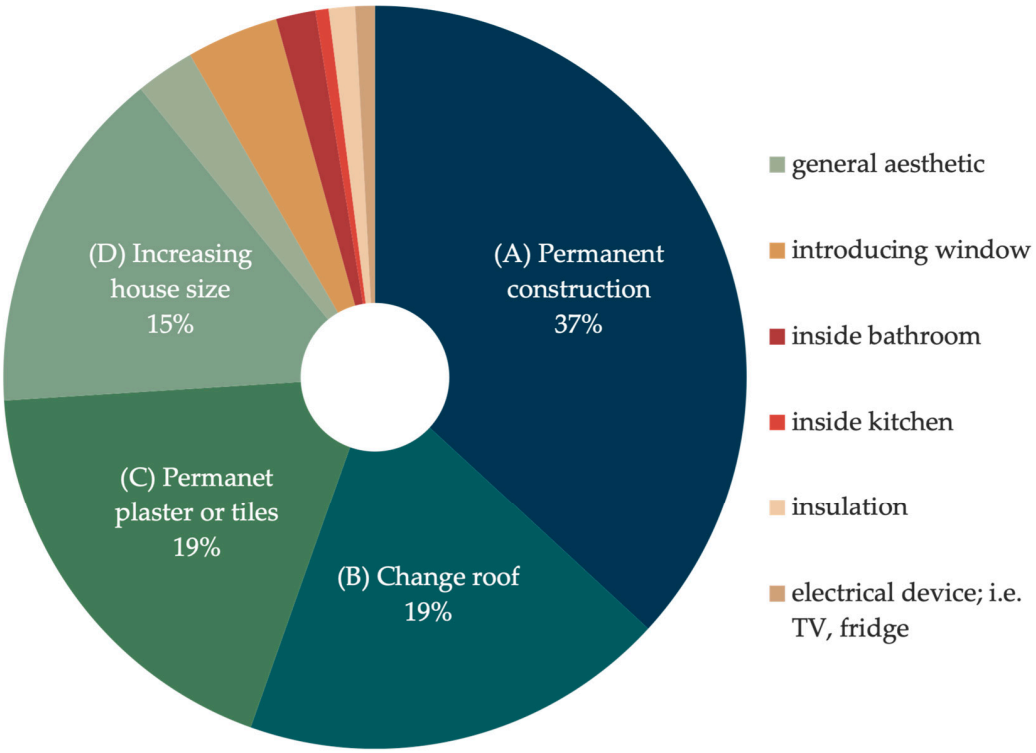


Figure 6. Showing respondents' aspirations for specific housing interventions, generated from dataset [23].

The remaining 10.5% of the desires encompass a variety of additional enhancements, including improvements to general aesthetics ($n = 9$), the inclusion of windows to augment ventilation and natural lighting ($n = 14$), and the installation of indoor bathrooms ($n = 6$). The latter was especially highlighted by older participants due to concerns about safety at night. Other desires included the addition of an indoor kitchen ($n = 2$), improved insulation to mitigate cold conditions ($n = 4$), and access to electrical devices ($n = 3$).

The subsequent section will delve into the underlying factors driving these specific housing modification preferences, providing a comprehensive understanding of the motivations behind these articulated desires.

3.6.1. Permanent Construction

Among the 300 participants, 129 individuals mentioned a desire for permanent construction and provided one or more reasons to support this preference. Twenty-nine participants cited multiple reasons, resulting in a total of 168 reason statements. These reasons were categorized into six thematic areas: (a) protection from floods or heavy rainfall, (b) termite infestation, (c) wildlife intrusion, (d) concerns about structural safety and intrusion by animals, (e) the intention to minimize maintenance efforts, (f) aesthetic considerations, and (g) unspecified reasons. The following graph (Figure 7) shows the distribution of the stated reasons for a permanent construction.

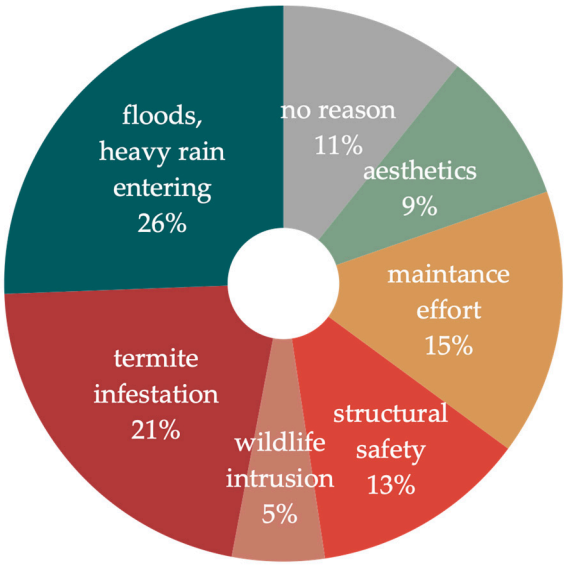


Figure 7. Stated reasons for a permanent construction, generated from dataset [23].

3.6.2. Change of Roof

Focusing on the underlying motivations for the desire to modify the roof, 85% of respondents cited the need to address leakages as the primary reason. A further 13% were driven by aesthetic considerations, while only 2% mentioned heat-related issues. Additionally, four individuals reported experiencing cold during the winter months; however, they did not explicitly associate this discomfort with a need to change the roof.

3.6.3. Permanent Plaster or Tiles

Among respondents who expressed a desire for a cleaner home environment, 68% identified the application of permanent plaster or tiles as their primary approach to achieving this goal. An additional 12% indicated that their preference was driven by aesthetic considerations, and 20% did not provide a specific reason for their preference.

3.6.4. Increasing House Size

In terms of motivations for increasing the size of their homes, 43% of respondents expressed a desire for additional space specifically to accommodate visitors. A total of 25% cited the need for more room for their children, while the remaining 32% did not specify any reason for wanting a larger living area.

3.7. Evolving Needs by Stated Solutions

When the expressed design wishes are examined from a functional perspective, it becomes particularly insightful to explore the underlying needs driving these preferences. This lens allows for the identification of whether alternative design approaches could satisfy the same needs more effectively or sustainably. The needs have been categorized into four overarching themes: (1) reduction of maintenance efforts, including promoting hygiene; (2) improvement of structural safety by ensuring the watertightness of the building envelope, and preventing insect infestations (particularly termites); (3) aesthetic enhancement; and (4) increasing house size. The subsequent analysis focuses exclusively on categories A, B, and C, as defined in the previous section.

From the 343 stated reasons, 309 aligned clearly with one of the four categories of need. As illustrated in the following graph (Figure 8), nearly half of these needs (49%) relate to improving the safety and integrity of the structure, 25% aim at reducing maintenance demands, 16% to increase the house size, and 10% are motivated by aesthetic considerations. Notably, the desire for aesthetic enhancement appears to be influenced by subjective perceptions, often associated with the use of industrially manufactured materials. This inclination may reflect broader societal values related to modernity and socioeconomic aspiration.

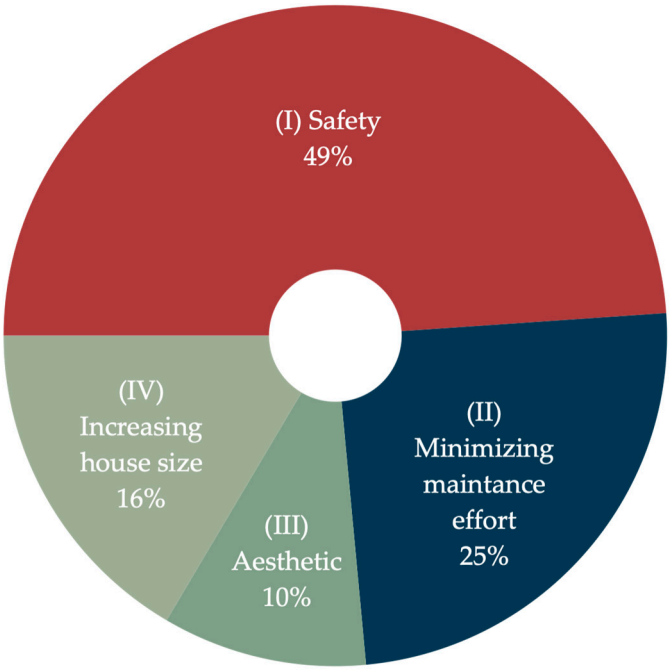


Figure 8. Graph about evolving needs by stated solutions, generated from dataset [23].

Regarding the need for minimizing maintenance efforts, 44% of respondents identified the transition to permanent construction as a solution, while 56% referred specifically to the application of permanent plaster or tiles, including promoting hygiene through easy-to-clean surfaces. In relation to structural safety concerns, 36% expressed a desire for a watertight roof, 28% viewed permanent construction to achieve watertightness, 13% associated permanent construction with enhanced structural integrity, and 23% cited

permanent construction as a response to termite infestations. Concerning aesthetic needs, 37% considered permanent construction to contribute to improved appearance, 22% saw aesthetic value in changing the roof, and 19% viewed the application of permanent plaster or tiles as a means of enhancing visual quality.

4. Discussion

4.1. Regarding Climate Change

"African countries are suffering the most from the impacts of global climate change" [29]. Climate change in Kenya is manifesting through unpredictable rainfall patterns, prolonged droughts, and flash floods [30,31].

The findings of the survey reveal a strong awareness and concern among rural residents in Siaya County regarding climate-related risks and their impact on everyday life. A significant 83% of participants expressed concern about climate change, with drought identified as the primary threat. Seventy-three individuals noted that they have previously experienced drought conditions. This aligns with regional climate-risk assessments, such as "ThinkHazards", which categorize drought in the area as a medium-level risk. The concern over drought is particularly relevant given the community's high dependence on subsistence farming and self-supplied food sources, which are directly affected by irregular rainfall and water scarcity [7,30]. Also, climate change has led to increased pest and disease occurrences, affecting crop and livestock production [7].

Beyond drought, residents also highlighted extreme heat and flooding as major concerns. Interestingly, while extreme heat is categorized as a lower risk in the region, floods, particularly in areas close to rivers, pose a high hazard. This disparity between perceived and officially categorized risks underlines the importance of incorporating local perceptions into regional housing planning processes. Although only 19% of participants reported direct experience with flooding, nearly half of them indicated the implementation of some form of flood prevention. However, the survey lacks detail regarding the nature, scale, or effectiveness of these measures. Moreover, 13% of those who had not experienced flooding still reported having flood prevention measures in place, suggesting a proactive or learned behavior based on regional knowledge or shared community experience.

In response to the question of which hazard had already been experienced, 120 marked "outbreaks of diseases". Sanitation is a crucial aspect for social and economic development [32]. This also includes the integration of proper sanitary facilities in building planning. "Community-led total sanitation (CLTS) has emerged as a popular approach in rural areas of low-income countries", with boosting measures showing increased latrine ownership, with adjusted odds ratios ranging from 3.01 to 7.92 [32]. The goal of CLTS is to foster changes in hygienic behavior by actively engaging the community, rather than merely focusing on the construction of toilets. Another case study reported that CLTS, paired with local government and UNICEF partnerships, reduced open defecation from 20% to 6% and achieved Open Defecation Free status [33]. In one survey, 59.3% of households accessed improved sanitation, while 13.9% still practiced open defecation [34].

Furthermore, future architecture must not only be climate-resilient; it must also not further exacerbate the global emissions and resource problems. To this end, future architecture must comply with the principles of the circular economy [29].

4.2. Regarding Building Materials

The survey clearly indicates that most participants utilize corrugated iron sheets in their building construction practices, also known as "mabati" in Kenya. It remains a common construction material all over Kenya [35]. However, the survey fails to specify whether these sheets are employed primarily for roofing or also for wall paneling. Corrugated iron

sheets were first patented in Great Britain in 1830 and were subsequently introduced to Kenya in the mid-20th century during the colonial era [36]. The reduced susceptibility of corrugated iron sheets to maintenance appears to outweigh concerns regarding thermal comfort, as evidenced previously in Figure 6. This is further validated by the finding that 25% of participants express a preference for reduced maintenance work. However, scientific thermal simulations show that corrugated iron sheets provide a worse indoor climate than clay walls or thatched roof systems [37]. During a case study investigation in Siaya County, Hage et al. found that corrugated iron sheets are also used for rainwater harvesting. However, a "literature review found that Aluzinc, Aluminium, and Galvanized roofing materials make harvested rainwater unsafe to drink because they cause water quality to exceed WHO limits, posing health risks" [22]. Therefore, water harvesting with corrugated iron sheets needs some kind of water treatment for drinking water [38].

Though traditional thatch was only marked by four participants, it has better insulation effects. In this context, it can be inferred that elevated maintenance costs significantly influenced decision-making [22]. Nevertheless, in the survey for house change wishes, the replacement of the roof was also mentioned by 19% of the participants, who cited instability and leakage of the roof during rainfall. This leads to the assumption that there was a lack of expertise in the execution of the roof construction and/or that the building material was inadequate. A lack of craftsmanship also related to the construction of traditional thatch roofs was reported in the study by Hage et al. As a result of colonial influence, traditional craftsmanship was neither acknowledged nor advanced. However, in addition to the impact of colonial influence, the preservation of traditional vernacular architectural knowledge encounters global challenges due to industrialization [19].

Other building materials selected by participants include mud bricks, wood, and bricks. Regrettably, the survey did not clarify whether the traditional wattle-and-daub technique, as identified in the study by Hage et al., was considered [22]. It can only be speculated that the category "wood" might refer to this method or alternatively to its use in roof construction. This highlights a distinct gap in identifying and understanding the specific applications of these materials and applied building construction techniques. Also, the survey does not provide clarity on whether the term "mud bricks" refers specifically to sun-dried or fired mud bricks. Additionally, it is unclear if the option labeled "bricks" pertains to fired mud bricks, compressed earth blocks (CEB), or some other type of material. Compressed earth blocks are commonly known as "Makiga" bricks in Kenya, whereby the name "Makiga" refers to the machine brand used to compress the earth [39]. CEB were "introduced from the 1950s onwards, under affordable housing programs" [40]. Also, the option of using natural stones was left out. Depending on the geological formation diversity, different types of stones have been used as structural masonry elements [40]. Nevertheless, it shows that around 2/3 of those surveyed use wood, around half use mud, and 2/3 use bricks. This shows the mixed use of natural resources.

Furthermore, only one-third of participants indicated the use of cement, but the context remains ambiguous; it is unclear if it is intended to mean foundations, wall structures, or flooring. The question of whether stabilized earth blocks are possibly used also remains open after the survey. In 2012/13, Muinde investigated the use of interlocking stabilized earth blocks in Siaya and found that they had not been used up to that date, mainly due to the local citizens' resistance to change [41].

4.3. Regarding Housing Desires

The most frequently reported hazard, however, was the outbreak of diseases. This can be attributed to limited access to clean water, proper sanitation facilities, and the fact that Siaya County lies in a high-risk malaria zone. These conditions increase the

urgency for clean, safe, and hygienic living environments. The link between health and housing becomes particularly apparent in this context, emphasizing the need for integrated approaches that consider sanitation, ventilation, and thermal comfort in housing design. Several studies indicate that ensuring natural ventilation, which lowers respiratory illness and enhances thermal comfort, is critical [17,42]. Similarly, designs that maximize access to daylight through proper room orientation and courtyard configurations have been linked to improved mental well-being and social support [17,43,44]. Also, using locally available, thermally appropriate materials tailors a home to its climate while enhancing overall comfort [45]. In addition, the use of regional resources strengthens cultural ties to the surrounding area. Finally, accessible, single-story or barrier-free layouts help maintain mobility and reduce injury risk, especially for older adults [46].

An overwhelming 96% of respondents indicated a desire for changes to their current housing, despite 45% stating that they are generally satisfied with their homes. This points to a nuanced understanding of satisfaction, where basic acceptance coexists with an aspiration for improved living conditions. The desire for permanent construction was the most frequently expressed need (37%), and the desire for changing the roof (19%) seems driven largely by concerns around structural safety, implying watertightness. Also, the desire for permanent tiles or plaster (19%) seems driven by the desire to maintain a clean home. This suggests a shift away from semi-permanent surface typologies toward more easy-to-clean structures.

When examining the desire for increased house size among participants, specific motivations were illuminated. A total of 15% of respondents expressed a wish to enlarge their current living spaces. Within this group, 43% identified the need to accommodate visitors as their primary reason, underscoring the cultural importance placed on hospitality and the ability to host family and friends in comfort. The desire for additional space for such social interactions highlights a communal aspect deeply rooted in their lifestyle. Additionally, 11 of those wanting larger homes mentioned the need for more room to accommodate their children. Traditionally, in Luo culture, it has been customary for children to have their own huts within the family homestead [22]. The inclination towards integrating additional space within a single house, rather than separate structures, suggests a cultural shift towards more Western-style living arrangements. This transition reflects changing dynamics, where families prefer to maintain a more cohesive family unit under one roof, possibly aiming for convenience, safety, or modern living standards. Although this request was "only" made by 11 out of 300 participants, this should not be generalized. Some areas in Sub-Saharan Africa maintain strong connections to vernacular architecture, which embodies cultural identity and local knowledge [47]. Efforts to integrate indigenous architectural practices with modern technologies are emerging, aiming to address housing challenges while preserving cultural heritage [48]. These approaches seek to balance sustainable development with cultural values, as seen in projects implementing culturally appropriate welfare architectures in rural Mozambique [49].

Interestingly, 32% of respondents did not specify a reason for wanting a larger house, which could indicate a general perception of larger spaces as beneficial for addressing a variety of potential needs. The lack of explicit reasoning underscores an inherent appreciation for increased living areas, which may offer flexibility to accommodate evolving family or social demands. Collectively, these findings highlight a nuanced interplay between traditional values and modern living aspirations among the communities surveyed.

A few other (n = *14*) comments, among others, expressed the desire for windows to provide fresh air. A bathroom inside the house was noted by six, particularly older participants, as going to the toilet outside at night can be dangerous.

4.4. Regarding Housing Need

The specific motivations behind housing improvements provide further insights into evolving resident priorities: 49% seek enhanced structural safety; 25% want to reduce maintenance efforts, particularly for maintaining hygiene and cleanliness; 16% aim to increase living space; and 10% are motivated by aesthetic considerations. These priorities illustrate a holistic view of housing, where functionality, safety, health, and identity are intertwined. By pinpointing the specific motivations underlying these diverse preferences, it becomes feasible to ascertain the necessary architectural developments required to address them effectively. Such insights also facilitate the examination of whether alternative solutions to the expressed desires may be viable or beneficial.

Aligning architectural innovation with both environmental imperatives and cultural realities requires a careful balance between technical performance and socio-cultural acceptance. In this context, environmental imperatives include the need for climate resilience, the use of low-impact and locally available materials and improved sanitary conditions. Cultural realities encompass the importance of permanent materials as symbols of status and security, familiar spatial configurations, and local knowledge embedded in construction practices. Innovation, therefore, should not aim to replace traditional approaches, but rather to enhance or adapt them—such as improving wattle-and-daub techniques through better constructive weather protection, or reinterpreting traditional compound layouts to accommodate improved drainage and ventilation. These considerations are crucial for developing housing strategies that are not only sustainable and resilient but also socially meaningful and accepted. This alignment forms the conceptual foundation for a context-sensitive construction manual that builds on residents lived experiences, aspirations, and environmental conditions.

For instance, developing a comprehensive construction manual could equip individuals with the essential knowledge needed to construct a safe dwelling, thereby overcoming the initial obstacle posed by scarce local craftsmanship. Eight studies carried out in various rural regions within developing countries suggest that construction manuals, when customized for local contexts, can improve construction practices [50–56]. In rural Guatemala, a randomized controlled trial with 60 adults of low literacy demonstrated that visual, step-by-step instructions improved construction accuracy and boosted self-efficacy. However, these instructions did not impact efficiency or satisfaction [50]. In remote regions of South Africa, a written design catalogue enabled successful road construction and improvements in the quality of life [51]. In regions susceptible to seismic activity, including areas of Pakistan and India, written manuals incorporating seismic guidelines have been linked to improved public safety, enhanced capacity building, and heightened public awareness. These benefits are particularly notable when the manuals are supplemented with community-based training programs and public education initiatives [52]. Further research from Africa, Asia, and the Pacific indicates that manuals that concentrate on leveraging local resources, providing detailed procedural guidance, and using case-based principles have promoted improved resource accessibility, fostered skill development, and strengthened community mobilization [54]. The evidence gathered from a mix of high-quality trials, case studies, and surveys shows that construction manuals can significantly improve construction practices in rural areas of developing countries. By aligning with the specific needs and conditions of these rural communities, the manuals can help boost skills and support better building outcomes, making them valuable tools in enhancing construction efforts.

A further study on the existence of locally naturally available materials would be useful for this purpose. In addition to ecological sustainability, natural materials would also have an economic advantage, as they could be cultivated or harvested on the respective property. Furthermore, a study of the possibility of using natural materials and the degree

of self-processing of these materials into building materials would be necessary. This can also provide an indication of the potential for new local industry that could develop for such local responsive architecture. Therefore, it also guides local economic planning, which can influence job markets, particularly in construction and materials supply.

However, the survey does not reveal to what extent the participants are prepared to use new architecture solutions and how open they are to alternatives. Factors like "cost, brief preparation, service quality, result demonstrability, project time, environmental considerations, training considerations, and user-friendliness" were identified by Algassim et al. as meaningful for the implementation of technology adaption in the architecture industry [57].

Besides structural safety, keeping a healthy house is an important need. Maintaining a clean and healthy house in Siaya County, Kenya, is crucial for family health, particularly for children's respiratory well-being [58]. The county has made progress in sanitation and hygiene prioritization through collaboration between local government and development partners like UNICEF [33].

Together, these findings highlight the importance of user-centred, climate-responsive housing strategies in Siaya County. Any future architectural intervention must not only address technical performance and environmental risk but also reflect the aspirations, lived experiences, and cultural preferences of the community. In this way, resilience can be redefined not as a fixed outcome, but as a co-evolving process grounded in local realities.

5. Conclusions

This study reveals an urgent need for homes that are both structurally sound and healthy, as housing-related health risks have emerged as the most pressing concern among rural residents in Siaya County. Although droughts and floods are consistent with regional climate-hazard data, it is the frequent outbreak of diseases that has the most acute effect on daily life. This highlights the critical link between housing conditions, health, and infrastructure, particularly in Siaya County, where poor ventilation and inadequate sanitation significantly contribute to the spread of preventable illnesses. These findings emphasize the inadequacy of current rural housing in safeguarding inhabitants against environmental and health vulnerabilities. The widespread and consistently echoed aspiration across the survey for permanent, safe, and hygienic homes reflects a growing awareness of housing's role in community resilience, shifting the focus from coping with adversity to envisioning a dignified and sustainable rural future.

As climate risks intensify, designing for resilience must prioritize the voices and needs of rural populations. It is essential to translate their lived experiences into adaptive, context-specific housing strategies that acknowledge their unique realities and aspirations. This research provides a foundational step towards these goals by highlighting the need for deeper integration between climate science, design innovation, and the daily realities of affected communities. Collaborative approaches that unite diverse fields of knowledge are necessary to develop solutions that are technically sound as well as culturally and socially relevant.

Future research can build on these findings by addressing issues that were beyond the scope of the present survey but emerged in the discussion—for instance, clarifying how traditional techniques such as wattle and daub are currently perceived, whether "mud bricks" refers to sun-dried or fired variants, and how materials like cement or stabilized earth blocks are used or viewed. Further studies could also explore the extent to which residents are open to new architectural solutions and how these might be meaningfully integrated into evolving housing practices. Such investigations would offer valuable insights for developing more nuanced and locally adapted housing strategies.

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Abbreviations

The following abbreviations are used in this manuscript:

CEB	Compressed Earth Blocks
UPV	User-Perceived Value
CLTS	Community-Led Total Sanitation

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