

[H]éstia

A shelter for a transitional world

Participation synopsis at the Red Cross conference “Innovation in Humanitarian Habitat”-Luxembourg

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Hind Al-Shoubaki and Matthias Drilling, University of Applied Sciences and the Art FHNW Switzerland
Dimitris Psychogyios, Yioryos Chatziefthymiou, Tatiani Fragkou, The University of Thessaly Greece
André Costa, University of Basel Switzerland

Contacts of authors

Hind Al-Shoubaki, PhD, research fellow, hind.alshoubaki@fhnw.ch (corresponding author)

Matthias Drilling, Prof. Dr., Head of ISOS, matthias.drilling@fhnw.ch

Institute Social Planning, Organizational Change and Urban Development ISOS
University of Applied Sciences and the Art FHNW
School of Social Work
Hofackerstrasse 30
CH - 4132 Muttenz

Prof. Dr. Dimitris Psychogyios, Assistant Professor, Architect, dps@uth.gr

Yioryos Chatziefthymiou, MSc(I) in Urban Planning and Regional Development, bachelor's student in Architectural Engineering, gchatz@uth.gr

Tatiani Fragkou, bachelor's student in Architectural Engineering, fragkou.tatiani@gmail.com

The University of Thessaly in Greece
Αργοναυτών, Filellinon και, Volos 382 21, Greece.

André Costa, Product designer and master student in critical urbanism, andre.marinhocosta@stud.uni-bas.ch

The University of Basel
Peterspl. 1, 4001 Basel

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The project has been supported by an international group of experts (alphabetic order):

Davidia Arsenopoulou, bachelor's student in Architecture, The University of Thessaly in Greece

Thomas Betschart, Doctoral researcher in urban studies, The University of Basel

Alaa Dia, Architect, doctoral researcher in urban studies, The University of Basel

Nilly R Harag, Architect and a senior lecturer, The Bezalel Academy in Jerusalem

Mohamed Mansy, Veteran civil and planning engineer, The American University in Cairo

James Merron, Dr., Radio Astronomy in Ghana and Remote Sensing in South Africa, University of Basel

Davide Nicolini, Architect, and Humanitarian affairs specialist, Swiss Humanitarian Aid Unit SHA

Tebogo Emmanuel Ramalto, Architect and Lecturer, Tshwane University of Technology-South Africa

Aris Tsangrassoulis, Dr., Building Physics, The University of Thessaly in Greece

Berihun Wagaw, Political Philosophy, University of Applied Science and Arts Northwestern Switzerland

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1. Introduction

In May 2023, the Institute of Social Planning, Organizational Change, and Urban Development ISOS was invited to participate in a colloquium titled "Innovation in Humanitarian Habitat." The colloquium was organized under the "Humanitarian Luxembourg Hub" project by the Shelter Research Unit (SRU) of the International Aid of the Luxembourg Red Cross (AICRL). This presented an opportunity for Prof. Dr. Matthias Drilling and Dr. Hind Al-Shoubaki to form a consortium comprising students, professors, professionals, and practitioners specializing in Architecture, Urban Planning, Civil Engineering, and HVAC Engineering from various locations worldwide to apply for the call. The establishment of this consortium is aligned with the vision of the FHNW School of Social Work, which seeks to tackle present-day global challenges and their impacts on various levels with a renewed emphasis on providing refugee housing and promoting social-spatial integration at the neighborhood level. The consortium aimed to improve the quality of humanitarian housing in the Al-Sahel region by providing additional engineering and architectural expertise, technical knowledge, and professional capacity. We aimed to build bridges between different actors to create a shared space for work and development. We put together an international and multidisciplinary team to design a shelter prototype that would sustainably meet the needs of refugees using local materials in the Al-Sahel area.

At the initial consortium meeting, a total of 12 members actively participated in an online session. The participants comprised distinguished representatives from renowned institutions, including the Swiss Humanitarian Aid (SHA), the World Health Organization (WHO), the American University in Cairo, the Bezalel Academy in Jerusalem, the University of Thessaly in Greece, the University of Basel, Tshwane University of Technology-South Africa, and the University of Applied Sciences and Arts of North-western Switzerland (FHNW). During the meeting, the main focus was laying out the key design parameters essential in constructing a shelter as a process, not a product.

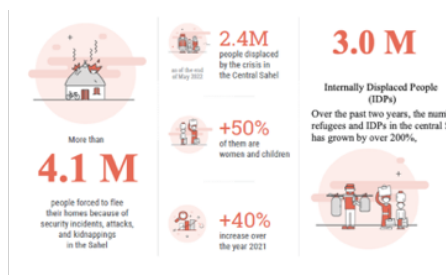
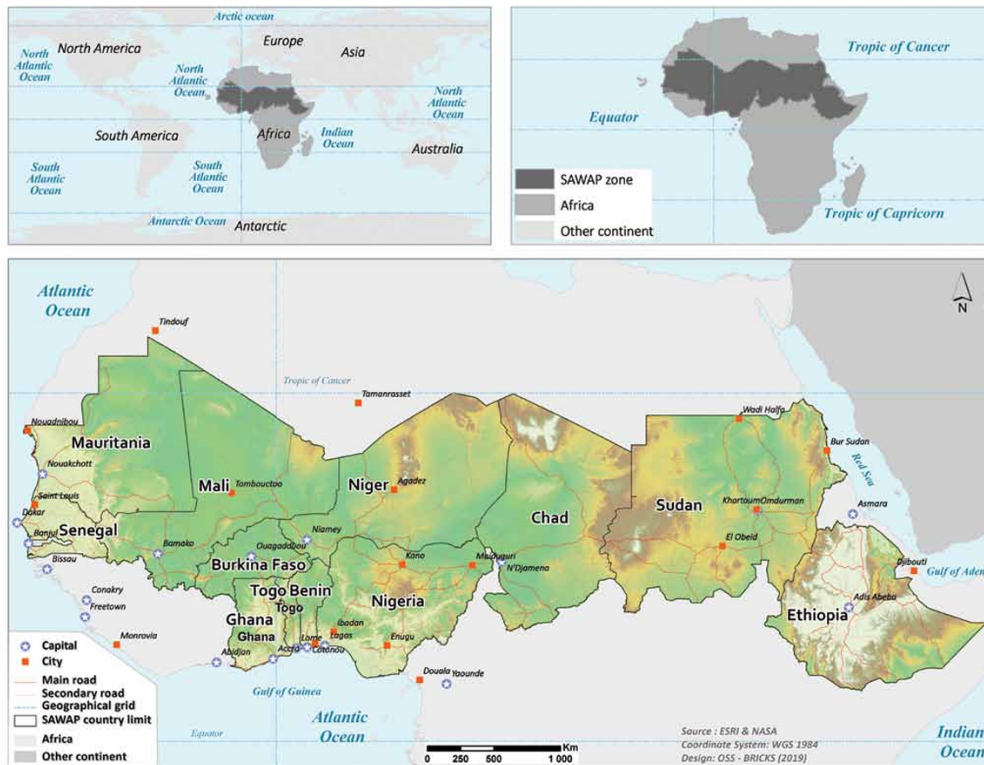
Additionally, the participants initiated the first step towards organizing a workshop in partnership with the University of Thessaly-Greece in Volos. The Volos workshop outcomes were a graphic document that describes a shelter prototype for refugees and internally displaced persons in the Al-Shale region. The proposal aims to provide a sustainable and dignified solution for emergency housing, which can eventually be converted into a durable house for a family of six members. The minimum space requirement for each person in emergency housing is 3.5 m². The shelter prototype should be suitable for the sub-Sahel region of Western Africa, considering their local culture, materials, and climatological and geographical conditions. It should also be designed to cater to the family structure of the region. Technical requirements should include plans, elevations, sections, structural details, 3D visualization, and a mock-up model.

Our project proposal, named "[H]éstia," was deemed one of the top three submissions out of a total of twelve by the Luxembourg Red Cross committee on October 27, 2023. Our submission included detailed architectural and structural drawings, 3D renderings, and mock-up model drawings. We also presented our research paper titled "A Place to Call Home? Materializing Shelters and Emergency Infrastructures as Neighborhoods," in which we discussed how a shelter unit for refugees could contribute to the spontaneous growth and organic development of a refugee camp that is self-governed by the refugees themselves and guided by the urban planner, and how does the spontaneous neighborhood approach ensure an equitable provision of design alternatives for individuals of all genders?

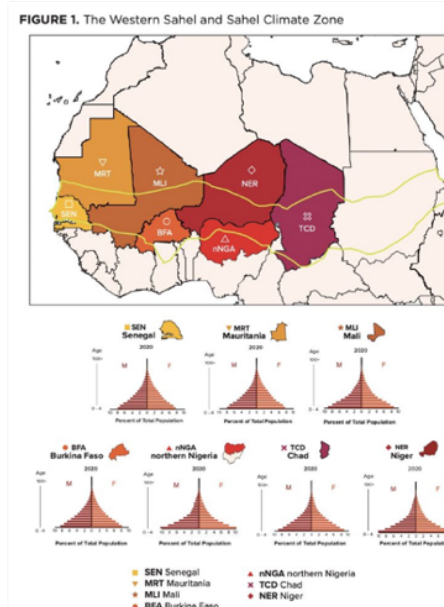
2. Challenges of the topic

The Sahel region of Africa is grappling with a multitude of challenges, ranging from armed conflicts, climate change, food insecurity, and a widespread lack of socioeconomic opportunities. As the population in the region continues to grow at a rapid pace, these issues are becoming increasingly intricate (Skretteberg, 2019). Due to the escalating conflict and deteriorating security situation, the number of forcibly displaced people in the Sahel has risen to 4.1 million, which includes 1.1 million refugees and asylum-seekers, as well as 3.0 million internally displaced people (IDPs). Over the past two years, the number of refugees and IDPs in the central Sahel has grown by over 200%, and this number is expected to increase in the coming years (UNHCR, 2021). These numbers are a cause for concern as they indicate that the situation in the Sahel is becoming increasingly dire (See Figure 1). An ongoing food crisis, resource scarcity, and the effects of climate change compounded the challenging living conditions of those in the region. As a result, rural populations sought refuge in urban areas, only to face new safety concerns. Women and youth who already lacked access to land, shelter, and employment were particularly vulnerable to exploitation, violence, recruitment, and trafficking (UNHCR, 2021).

To mitigate the humanitarian crisis in Al-Sahel, UNHCR follows a protection-oriented emergency response that includes essential components such as registration, gender-based violence prevention and response, risk reduction, child protection, education, civil documentation, and shelter provision (UNHCR, 2020). This includes temporary and semi-permanent shelters as well as the distribution of essential relief items. Despite their temporary nature, these structures, either camps, transitional shelters, asylum centers, or temporary housing, have the capacity to remain operational for a protracted period, often spanning years. The assumption of the camps as temporary structures and refugees as urban actors has been criticized by critical camp studies for their constitutive absence and subversive presence (Dalal et al., 2018). The camps have been figured as the exceptional (Agamben, 2000), the non-place, the extra-national (Auge, 1995; Diken, 2004), and the abnormal, the extra-legal (Hanafi, 2008; Ramadan, 2009), un-urban (Malkii, 2002), the ghetto and the gated community (Dalal et al., 2020), and a spatial container for those who have no right to have rights (Arendt, 1951). Kennedy (2004, 2005, 2008) provided practical criticism of the UNHCR model when constructing refugee camps as he demonstrated using calculations that the available planning standards are inadequate and become complicated once refugees start to expand beyond the space given to them at the beginning. Herscher (2017) proposed that “when the state imagines refugees as members of the labor force, architecture for refugees is oriented toward cities; when it imagines refugees as members of its citizenry, architecture is oriented towards housing; and when it cannot imagine refugees as either citizens or workers, architecture is oriented towards camps” (p. 8). According to UNHCR (2018), it is common for humanitarian settlements to lay the foundation for future towns. However, it is crucial to understand that these settlements do not exist in isolation. Instead, they are part of a larger development context at the national, sub-national, and local levels. The refugee camp as a spatial phenomenon represents one of the purest forms of “makeshift architecture, last-ditch living, and emergency urbanism” (Lewis, 2008, p. 1).



Source: UNDESA, Population Division, 2019



Source: UNDESA, Population Division, National Bureau of Statistics 2019

Figure 1 : Al-Sahel region: the big picture at glance

Agier (2002) claimed that the refugee camp can be understood as a “novel socio-spatial form, ... in which new identities crystallize and subjectivation takes root” (p. 318). Agier conceptualizes the camp as a city by drawing on three features, which he believes define urban life (p. 324): (1) the camp’s ability to produce and reproduce spatial symbolism, like the marketplace in Hagadera camp (Kenya); (2) its ability to generate social stratification: the elite (traders and livestock farmers), voluntary community workers, and finally, the recipients of basic minimum aid; (3) Its ability to allow for the construction and negotiation of both ethnic and nonethnic identity and the strengthening of particularisms, antiethnic behaviors, and interethnic exchanges.

The current humanitarian response to displacement is often driven by political factors: “Camps are established with the intention of being demolished. They are meant to have no history and no future (Petti, 2019, P.1), resulting in temporary solutions for hosting refugees. The Al-Sahel crisis is a complex and urgent situation that demands a sustainable approach. According to OCHA (2022), expanding emergency response efforts comprehensively and sustainably is crucial. This involves addressing the root causes of the crisis and not just the symptoms. By taking such an approach, we can ease the suffering of those affected by the crisis and help them rebuild their communities. Therefore, meticulous attention should be given to the planning and design of refugee camps, with a focus on creating sustainable and effective settlements that can support long-term development. A well-designed camp can provide a secure and safe environment for refugees while minimizing negative impacts on the surrounding ecosystem and broader socio-economic context.

In pursuit of our goal, we embarked on a comprehensive design process for the shelter unit. Our team made a conscious effort to conceptualize and visualize the technical nuances of the project, ensuring that our output would align with the socio-cultural and climate conditions of the Al-Sahel region while also adhering to the competition requirements, as will be further explained in the following sub-sections. The design process involved a thorough analysis of the region's unique cultural and environmental factors, as well as an in-depth consideration of the competition guidelines. This ensured that the final product met all the necessary criteria and was both functional and culturally appropriate.

3. Response to the proposed problem

As per our earlier discussions, the problem we are dealing with is that refugee camps have conventionally been perceived as provisional urban arrangements or disconnected areas that are controlled by fragmented planning protocols (Oesch, 2020). However, it has become evident that shelters and settlements are interrelated and cannot be viewed as distinct solutions or entities (Setchell et al., 2018). The neighbourhood, which encompasses physical, cultural, educational, economic, ethnic, religious, and political traits, is the urban equivalent of a settlement (Drilling et al., 2022). Our proposal aims to examine the potential of a well-designed shelter in promoting the organic growth and self-governance of refugee camps under the guidance of both the refugees themselves and urban planners. This approach places a strong emphasis on local participation and a do-it-yourself mindset, allowing the inhabitants to construct their own city. Our ultimate objective is to establish a more humane and comfortable living space for refugees, one that cultivates community, creativity, and resilience in the face of adversity.

Following that, the research team conducted extensive research on the Al-Sahel region as part of the workshop organized by the Department of Architecture at the University of Thessaly, Greece. The workshop was held in collaboration with the Institute of Social Planning and Urban Development at the School of Social Work FHNW.

The research conducted a comprehensive study of the Al-Sahel region to gain a better understanding of the area pertinent to the project, delving into various aspects such as its diverse landscape, the climate conditions, the existing natural resources, and their utilization by the locals. Furthermore, the research examined the migratory patterns of the people in Al-Sahel, including their reasons for migration, the places they moved to, and the impact of migration on the region's demographics and economy. The history of local architecture was also explored, including the different styles used and the materials employed in construction. The study delved into the traditional practices of the people living in the Al-Sahel region, such as their cultural beliefs, rituals, and customs, as well as their impact on the environment and the region's cultural heritage. Moreover, it analyzes the existing practices of production and siting of shelters and camps by international organizations. The findings of the investigation are expected to provide valuable insights to facilitate the successful execution of our proposal.

The aforementioned variables were leveraged as a foundational basis to reassess design solutions and interventions by adopting a narrower, more targeted approach. To facilitate this transition, the relevant data were meticulously grouped into distinct categories, allowing for enhanced organization and in-depth analysis.

4. Migration flows analysis

Migration trends in Al-Sahel recommend the most effective project site by analyzing the latest census data on refugees in the Al-Sahel area while considering migration patterns both within the region and beyond national borders. Utilizing precise census data ensures a well-informed decision-making process, resulting in the highest possible benefit for all parties involved. The migration flow analysis is an essential parameter in designing the shelter unit. The comprehensive analysis of migration flow is a crucial factor that must be taken into account when designing a shelter unit. It involves the evaluation of the movement of people within the urban area, and its assessment can provide valuable insights into the optimal layout and capacity of the settlement. By considering factors such as space utilization, accessibility, and safety, designers can create a shelter unit that is not only functional but also fosters a sense of community among its occupants.

In 2022, the central Sahel faced a troubling increase in forced displacement, resulting in over 2.9 million refugees and internally displaced persons scattered throughout Burkina Faso, Mali, and Niger. Additionally, a concerning pattern arose with Burkinabe citizens seeking asylum in both southern and northern regions, including North Africa and Europe. The violence and conflict even spread to coastal nations such as Benin, Cote d'Ivoire, Ghana, and Togo, bringing thousands of new individuals (UNHCR, 2023). The deteriorating security situation has resulted in reduced humanitarian access throughout the region. Local communities and national authorities, who already had limited resources, became further stretched, causing more Sahelians to join mixed movements towards coastal countries, North Africa, and Europe. Burkina Faso had two coups in 2022, and the number of internally displaced persons (IDPs) reached almost 1.9 million people, representing a 300,000 increase (UNHCR, 2022) (see Figure 2). In parallel, non-state armed groups (NSAGs) imposed a blockade on urban centers by severing roads and supply lines, resulting in the displacement of rural inhabitants across international borders. In 2022, the number of people who fled Burkina Faso reached 22,000, seeking refuge in neighboring countries such as Benin, Côte d'Ivoire, Ghana, and Togo (see Figures 2 and 3).

Additionally, 50,800 people sought asylum in Mali and Niger, with women and children comprising the majority of refugees. Over 700 officials and community members in Burkina Faso, Chad, Mali, and Niger were trained on referral mechanisms for mixed movements. More than 32,000 people on the move were identified, and over 2,500 were referred to protection services. Information on protection risks and alternatives to dangerous journeys was provided to 70,000+ people. Asylum seekers were informed of their rights. Within the contexts of Sudan and Mali, it has been observed that migration is a prominent method of coping and adapting to the ramifications of climate change. This strategy is often employed in conjunction with an array of other techniques for mitigating the effects of these catastrophes (The British Red Cross, 2022).

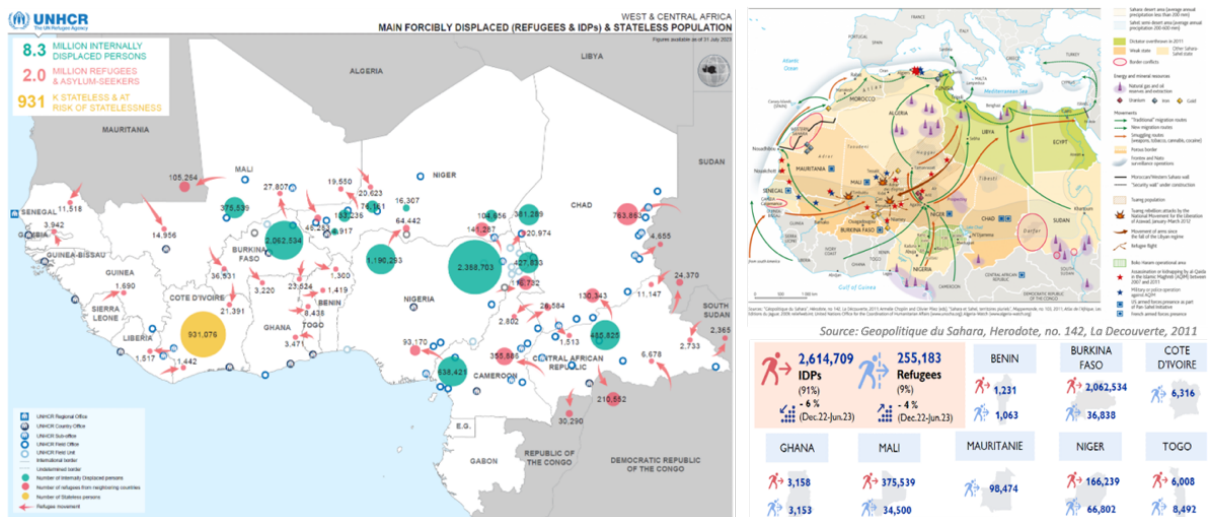


Figure 2: Migration flows in Al-Sahel region. UNHCR, 2022

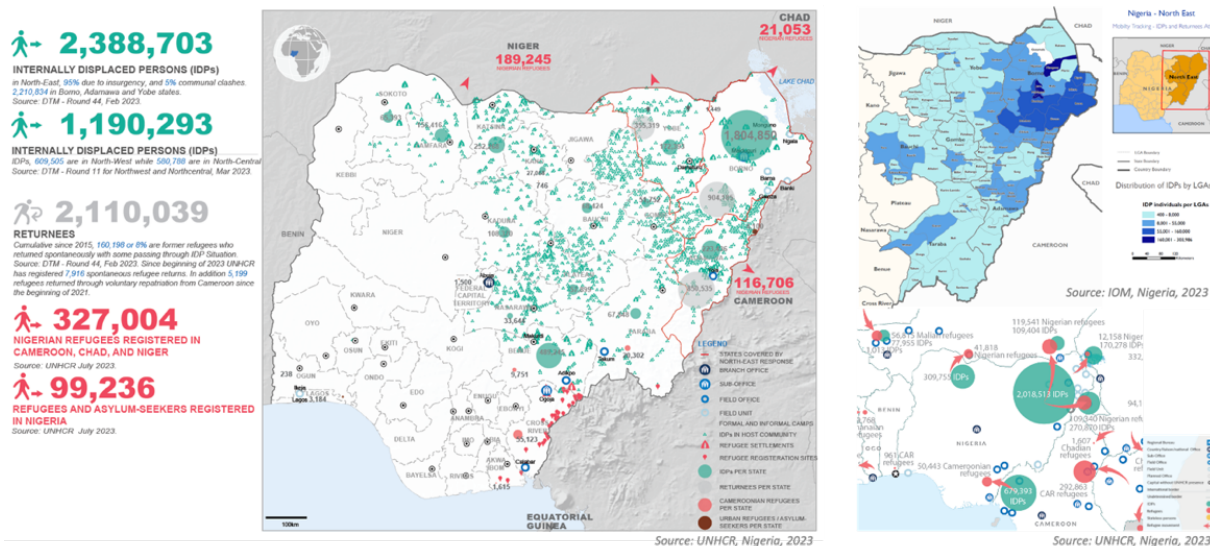


Figure 3: Nigeria migration flows, UNHCR, 2022

Migration patterns in the Al-Sahel region have primarily emerged as a consequence of conflicts and natural disasters that have compelled the Sahelians to relocate to safer regions. These movements have had a profound impact on the region's economic, social, and cultural fabric and have presented significant challenges for policymakers, researchers, and humanitarian actors. The causes of these migrations are complex and multifaceted and have often been exacerbated by a range of factors, including climate change, political instability, and economic stressors. The assessment of migration flow presents compelling evidence indicating the necessity for the provision of habitable spaces in the Al-Sahel region for those who are on the move. These populations are frequently compelled to move due to either the prevalence of conflicts or natural calamities. Therefore, the creation of habitable spaces to accommodate these populations can serve as a crucial measure in mitigating the effects of displacement, and in promoting sustainable living.

5. Local climatic considerations:

The Sahel, a transitional region between the Sahara Desert and the savannas of West Africa, is known for its tropical semi-arid climate that varies considerably across the region. The climate is characterized by high temperatures, ranging from 30 to 45°C, and low humidity levels, which, together with abundant sunshine, create a hot and dry environment for most of the year (see Figure 4). The annual precipitation is low and erratic, usually between 200 and 600 mm, and falls mainly during the wet season, which lasts from June to September. The Sahel's precipitation is often in the form of heavy, brief thunderstorms. The region also experiences moderate to strong Harmattan winds, which blow from the Sahara Desert and contribute to the dryness of the air. Overall, the Sahel's climate resembles that of the Sahara Desert but with less extreme conditions (Jaramillo et al., 2023).

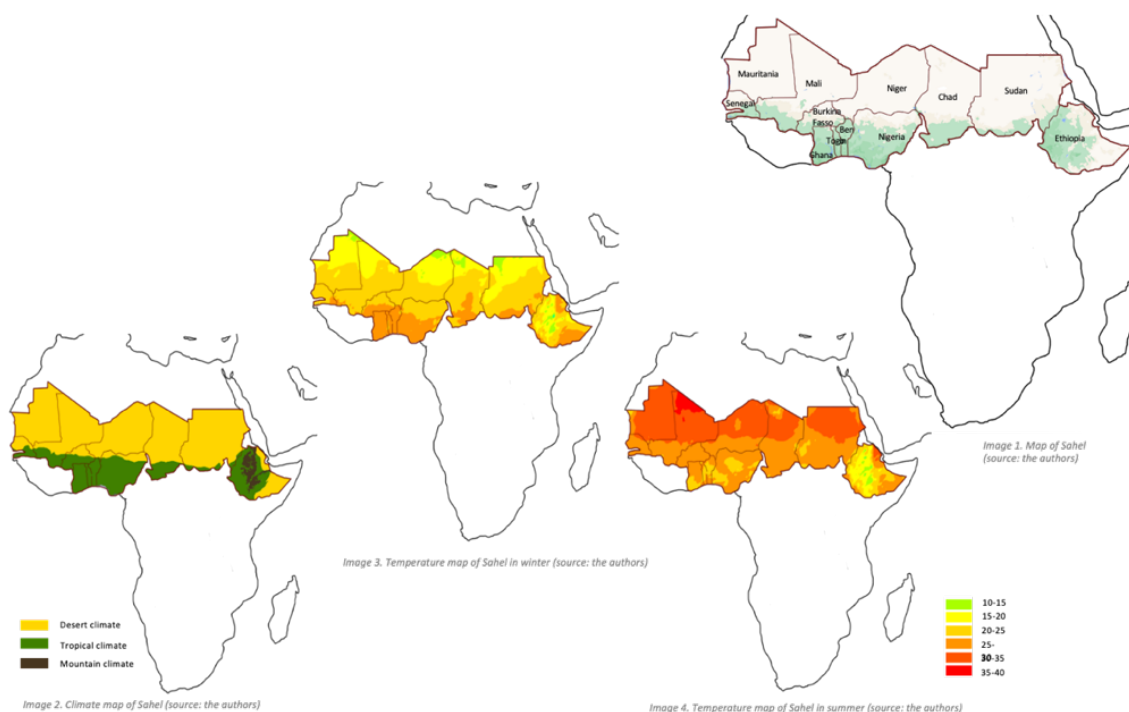


Figure 4: Temperature maps, and climate map of Al-Sahel. Source: The team, 2023

Adapting shelter materiality and design to conform to the tropical semi-arid climate of the Al-Sahel region is a critical consideration in addressing local climatic conditions. The Sahel region is characterized by high temperatures, low rainfall, and frequent dust storms, which pose significant challenges to the design and construction of shelters. In this regard, it is essential to employ appropriate materiality and design practices tailored to the region's specific climatic conditions. Such practices may include the use of locally sourced and sustainable materials, the incorporation of passive cooling and ventilation strategies, and the integration of appropriate shading and insulation systems. By adopting these measures, it is possible to create shelters that are not only resilient to the harsh climatic conditions of the Sahel region but also contribute to the sustainable development of local communities.

6. Analysis of local neighborhood typologies

We analyzed the traditional neighborhood typologies in two selected locations, namely Bomo and Maradi's traditional settlement patterns and residential compounds in Nigeria. The analysis focused on the structural and functional features of both neighborhoods, including their planning, layout, and design. The present study endeavors to uncover valuable insights into the traditional urban and residential planning typologies that have emerged in Sahelian communities, with a focus on their architectural and social aspects. The primary objective of this research is to develop a shelter unit that accurately reflects the Sahelian culture and way of life. Through a thorough analysis of the community's social structure, we aim to identify the factors that have contributed to the evolution of these planning typologies. By so doing, we hope to get essential information that can aid in the development of sustainable and context-appropriate shelter solutions.

The initial stage of the research comprised an in-depth analysis of the urban space of Bomo and Maradi, focusing on their technical aspects and intricate details.

6.1 Bomo (Zaria)

Bomo is situated in the Sudan Savanna (see figures 5 & 6), which experiences a mixed climate. From May to October, the region undergoes a hot and humid spell, followed by a hot and dry climate from November to April. The hottest month in Bomo is April, with a mean maximum temperature of 35°C, whereas the coolest month is December, with a mean minimum temperature of 13.7°C. The annual average rainfall in Bomo is 1066 mm, with most of it occurring during the wet season between May and October. During the dry season, which lasts from November to April, the relative humidity is low, often less than 20% in December and January. In this season, northeast trade winds carrying dust from the desert blow across the northern part of Nigeria, making the thermal conditions quite uncomfortable (Peel, 1958).

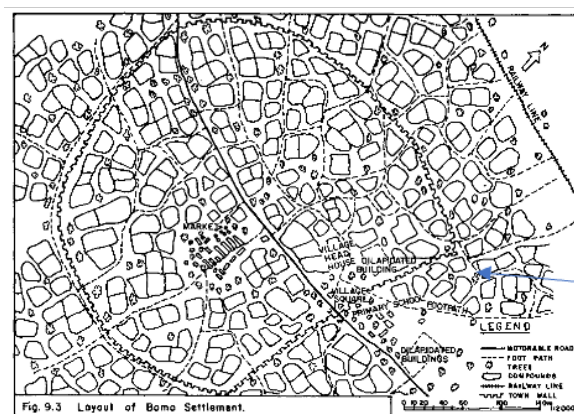


Figure 6: Layout of Bomo Settlement

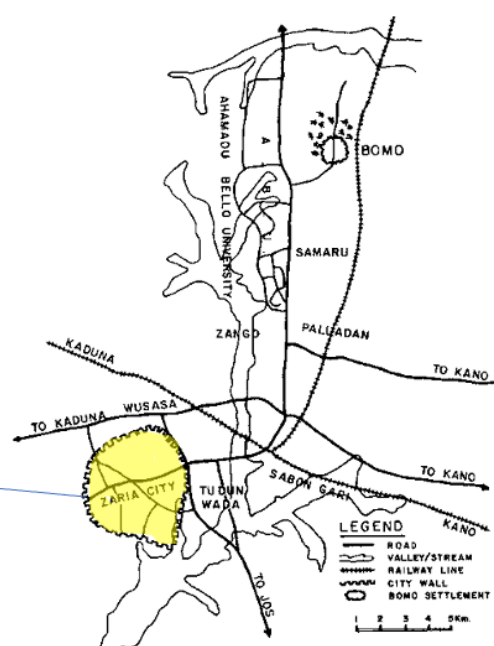


Figure 5: Location of Bomo within greater Zaria

Figure 5 and figure 6: Layout of Bomo Settlement (left) and Location of Bomo within greater Zaria (right)

The unique climate in Bomo presents a significant challenge for housing design, given its composite nature. The demands of the hot and humid Damina and the hot and dry Bazara are at odds with the requirements of the cold and dry Hunturu and those of Bazara (Sa'ad, 1991). Consequently, achieving year-round comfort in a building without relying on mechanical aids can be a daunting task. Housing design must take into account the climatic conditions of each location to ensure that the building is comfortable throughout the year.

Achieving this requires a careful balance of factors, including passive design techniques, insulation, and the use of materials that are suited to the local environment. Traditional compounds often don't utilize their varying thermal properties for comfort, leading to discomfort. For instance, mud rooms with domed roofs and small windows are occupied year-round despite being ideal for cold nights and hot afternoons. Similarly, sheds made of posts and thatch, which are comfortable during hot and humid periods, are often reserved for animals or used as cooking areas. Meanwhile, the corrugated iron roof with a hard-board ceiling and relatively large window is viewed as a symbol of status and used as the household head's dwelling throughout the year (Peel, 1961).

The analysis of Bomo reveals several areas of climate adaptation, along with a marked preference for anticlimactic solutions influenced by cultural and traditional practices. Following key observations:

- (a) Buildings are typically oriented North-South with south-facing windows to meet climatic requirements. However, windows are scarce.
- (b) The provision of shading is of paramount importance to the inhabitants of a given locality, as it contributes significantly to the enhancement of the thermal comfort of the occupants. In this regard, it is a common practice to plant leafy trees in the courtyards of most compounds,

as well as in open spaces designated for communal gatherings, such as the Dandali. It is widely acknowledged that the presence of such trees is instrumental in providing the required thermal comfort to the inhabitants of the locality.

- (c) The utilization of a courtyard serves a dual purpose in providing privacy to residents while also serving as an effective thermal comfort solution. The courtyard's effectiveness in regulating the temperature within the living space is attributed to its ability to protect the interior from external environmental factors. It provides a natural source of ventilation, which enables the circulation of air throughout the space, maintaining a comfortable living environment by keeping the interior cool in hot weather and warm in cooler weather. Thus, the use of a courtyard not only preserves privacy but also contributes to a sustainable and comfortable living environment (see Figure 7 & 8).
- (d) Traditional architecture often featured small, high-level window slits that measured approximately 25cm x 40cm. These apertures were primarily intended to provide illumination rather than ventilation. Conversely, modern vernacular architecture generally incorporates windows; however, they may remain closed as a symbolic gesture.
- (e) Historic structures frequently incorporate thick walls, which offer insulation and protection during the Kaka and Hunturu seasons; however, such walls can create negative consequences in hot and humid weather.
- (f) Ceilings are often installed for decorative purposes rather than thermal comfort. However, it is common knowledge among builders and homeowners that ceilings made of corrugated iron roofing materials can improve the indoor climate and provide better thermal insulation.

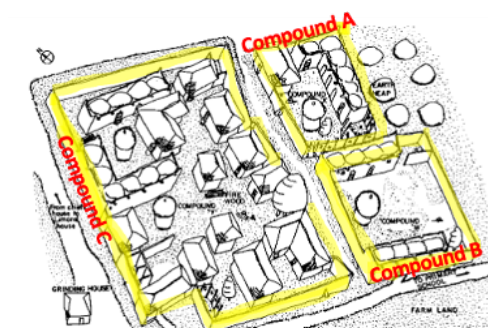


Figure 7: Bird's eye view of residential compound in Bomo. Edited by the authors, 2023.

Figures 7 (left) and 8 (right)

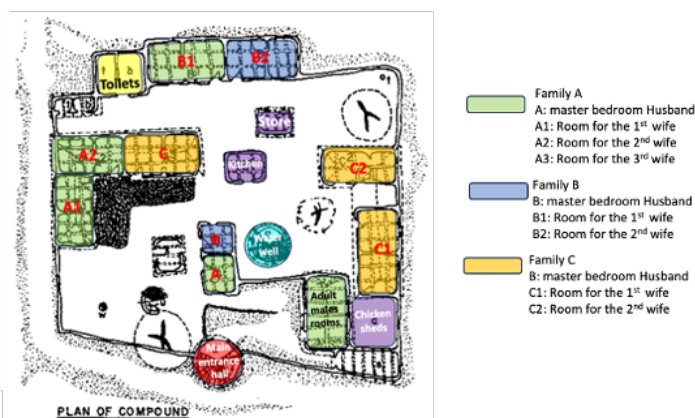


Figure 8: Compound details in Bomo. Edited by the authors, 2023.

6.2 Maradi City

The historic city was nestled in the valley alongside the Maradi River, a sporadic waterway that originates in Nigeria. The town was roughly circular in shape and safeguarded by a banco (mudbrick) wall with four entrances. In 1945, at the end of the rainy season, the Maradi River flooded the entire town except for the groundnut oil mill and a few multistory commercial buildings (see Figure 9). To prevent this from happening again, the authorities moved the entire town up onto the plateau in December 1945.

This caused a drastic change in Maradi's appearance, with a new checkerboard design bounded by orthogonal axes. The new design focused on a vast circular space where the palace of the provincial Sarki and the main mosque were built. The commercial district was relocated to the east side of the town, while the market was placed in the new town center. The administrative quarter remained at its initial location since it was already on the plateau and had not suffered from the flooding. This section, which is made up of various town offices, is unmistakably stamped by typical colonial architecture

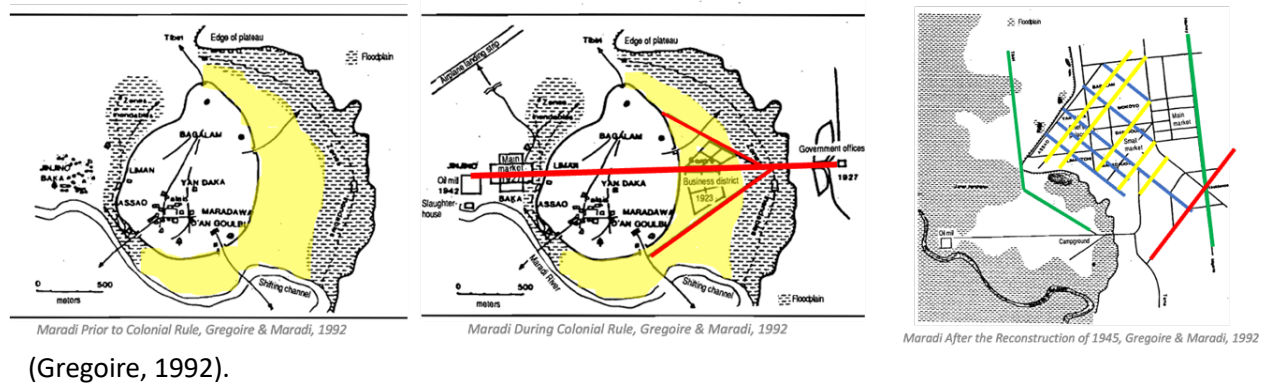


Figure 9: Maradi development prior to Colonial rule up to 1945. Gregoire & Maradi, 1992

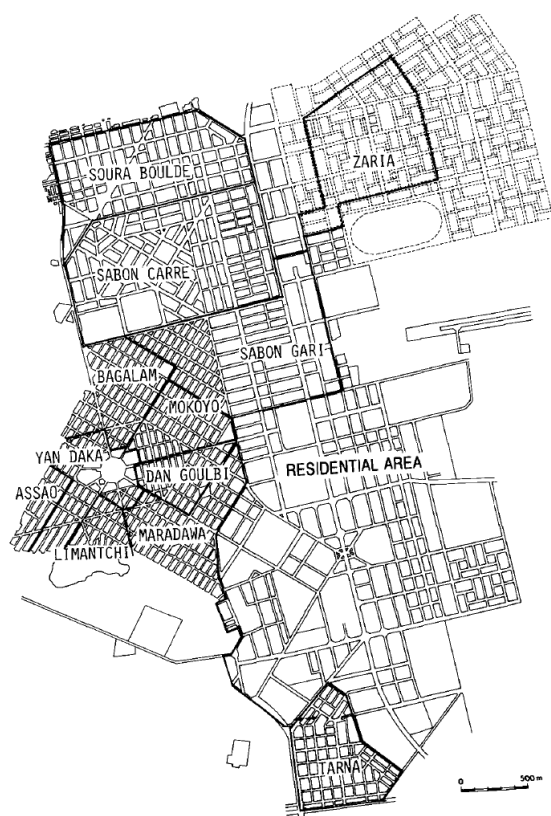


Figure 10: Modern Maradi, Gregoire & Maradi, 1992

During the 1970s, Maradi experienced a surge in urban growth, primarily due to a drought that caused a significant influx of rural migrants. This led to the expansion of the city's administrative functions, making it the hub of the national government's departmental services in the area. Furthermore, the establishment of multiple factories bolstered the city's industrial sector. To accommodate this growth, new neighborhoods such as Soura Boulde, Tarna, and Zaria were established between 1977 and 1981. A comprehensive city plan was created in 1973 and later revised, with coherent policies in place to prevent the formation of vast slums and manage demographic growth. Maradi's potential for development is promising due to its vast land reserves, strategically located along the road to Niamey. Additionally, the city could potentially connect with Tibiri, which is the traditional capital of

the Hausa territory of Gobir, situated approximately 7 kilometres away (Gregoire, 1992). With the advent of colonialism in Nigeria, the traditional lifestyle and culture of the Nigerian people underwent a significant transformation. The introduction of foreign ideas, beliefs, and practices had a profound impact on the socio-economic and cultural fabric of the society. As a result, the connection between traditional architecture and contemporary architecture in Nigeria became increasingly tenuous. Agboola and Zango (2014) have highlighted the implications of this change, noting that it has resulted in a loss of historical and cultural identity for the Nigerian people. The shift towards contemporary architecture has led to the erosion of traditional building techniques, materials, and designs, which were once an integral part of Nigerian heritage. Thus, the impact of colonialism on Nigeria's architectural landscape has been far-reaching and has had significant implications for the nation's cultural identity. (See figure 10).

Upon examining the city plan, it has become apparent that climatic factors were not given high priority, rendering it different from the approach taken in Maradi. At a city scale scale, the way land is used and designed can have significant implications for the quality of urban air. It is important to note that different land uses such as residential, commercial, and industrial areas have different air quality impacts, which can be further influenced by the design and layout of these areas. For instance, the design of buildings and streets can impact the concentration and dispersion of air pollutants. Given the potential impacts of land use and design on urban air quality, it is vital to take a comprehensive approach while planning and designing cities to ensure that the quality of urban air is not compromised.

Our in-depth analysis of neighborhood urban planning typologies that have emerged in Sahelian communities has yielded valuable insights into how these practices can be adapted and applied in the design of a humanitarian habitat that aligns with the local building culture and social features. It is evident that traditional Sahelian architecture is perfectly suited for the harsh climatic conditions of the region, but modern urban planning practices have failed to take this fact into consideration. Our study emphasizes the need for a more comprehensive approach that incorporates the cultural, social, and environmental features of the region. The analysis of Sahelian urban planning typologies revealed that the use of locally available building materials, such as mud bricks, and the incorporation of passive cooling principles, such as courtyards and wind towers, are central to the success of traditional Sahelian architecture. It is essential to incorporate these features into the design of a humanitarian habitat that meets the needs of the local population.

Moreover, the use of communal spaces, such as courtyards, and the integration of green spaces and facilities for social interaction can foster a sense of community and promote social cohesion. To design a sustainable and culturally appropriate living environment, it is crucial to consider the unique needs of Sahelian communities. Using traditional building materials, incorporating passive cooling principles, and creating communal spaces can lead to the development of sustainable and culturally appropriate habitats that reflect the needs and values of these communities.

7. Analysis of local housing typologies

In order to gain a thorough understanding of the local housing typologies, a comprehensive analysis was conducted on various vernacular architecture types while taking into account the rich legacy of building-making that characterizes the region. Through this process, we aimed to identify and evaluate the different architectural styles and techniques that have been employed in the construction of houses in the area. The results of this examination will provide valuable insights into the unique cultural and historical context of the region's housing and will be of significant interest to researchers, academics, and industry professionals alike.

Consideration of climate is a crucial aspect of traditional architecture worldwide. As per Rapoport (1969), traditional builders are unable to overlook climate in their designs due to the lack of technology. Traditional builders in Hausa in Northern Nigeria exhibit their expertise in materials by erecting structures capable of withstanding rain and winds. The direction of winds and rain may sometimes influence the orientation of these buildings, while window openings and sizes are appropriate for wind direction (Sa'ad, 1991). Therefore, a general observation suggests that traditional builders in Hausa land have created a unique cultural response to climate and micro-climatic conditions. Sa'ad (1986) categorizes the traditional Hausa household into three distinct areas: the private inner core, the semi-private central core, and the public outer core (see Figure 11). The inner core, also called the women's area, encompasses the ward, guest/servant quarters, and a backyard designated for animal husbandry and waste disposal. In Hausa culture, conventional architecture often includes a spacious dwelling that can house a man and his up to four wives, along with their offspring. Typically, this housing unit is situated within a grand walled city that boasts a towering multi-story building with a gate (Ebenezer, 2020).



Figure 11: Vernacular Architecture in Hausa. edited by the authors, 2023.

The courtyard, predominantly located in the central core, serves as a central space for household and social activities, as well as an indispensable source of ventilation and natural light. These architectural principles can be traced back to Egyptian domestic architecture from around 500 CE and have influenced the morphology and housing arrangements of Hausa villages and towns (Gali et al., 2019).

The Hausa architectural style is renowned for its distinct separation between exterior and interior spaces. The influence of Islamic culture is notable in the concept of "Purdah," which emphasizes the social and religious practice of female seclusion. As a result, the design of living spaces is divided into two areas: the Haremlik, which is accessible to women, and the Selemlik, which is not. The courtyard functions as the central hub for household and social activities, whereas the kitchen and dining areas are usually situated in separate spaces. The kitchens are typically located away from the main living areas, and dining areas may be found either individually or collectively in a Parlour or open area (Agboola & Zango, 2014). To maintain privacy, hygiene, and other fundamental aspects, the restrooms or toilets are placed at the end of the compound, away from the living quarters. Throughout Nigeria's diverse geographical zones, traditional buildings have evolved to respond comprehensively to the climate, local technology, and socio-economic environment in which they were created. The roots of these varied building styles can be traced back to the natural materials available to local builders, as well as religious beliefs, cultural practices, and taboos (Ibid, 2014). The majority of dwellings in Northern Nigeria today are what may be called "vernacular architecture" rather than "traditional architecture" since quite a number of modern elements have been incorporated into their design and construction (see Figure 12). These include corrugated iron roofs, asbestos or concrete ceilings, windows with glazed, wooden or metal sheet shutters, cement-screed floors, plastered and white-washed walls, and so on.

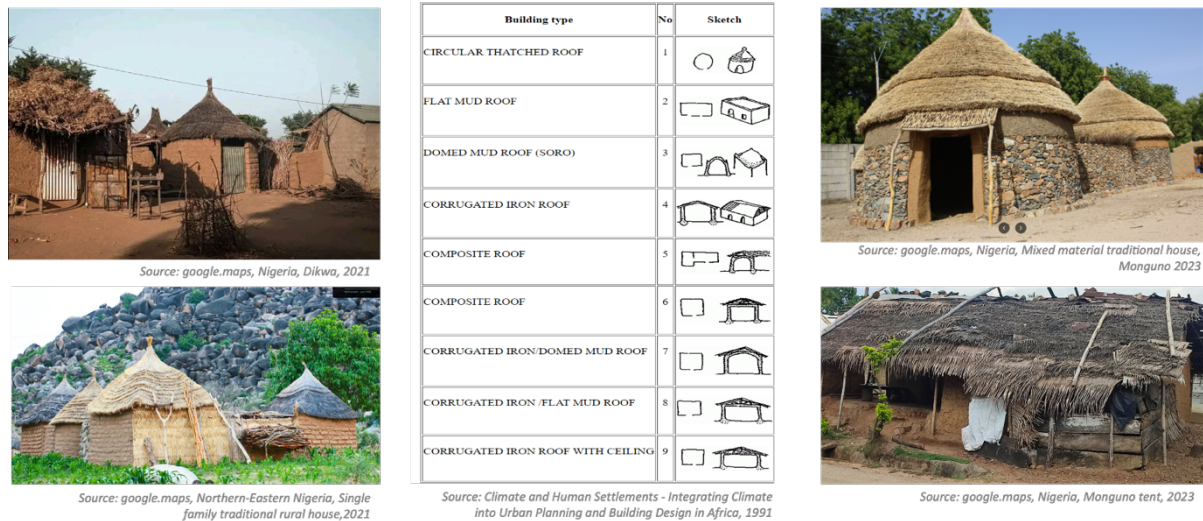




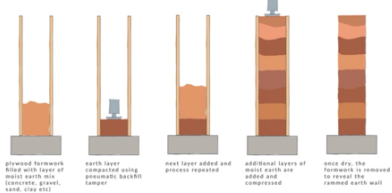
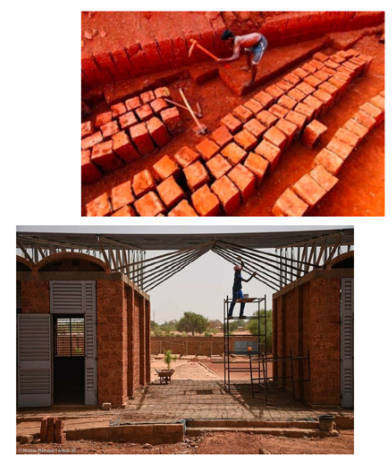
Figure 12: The vernacular architecture of Al-Sahel

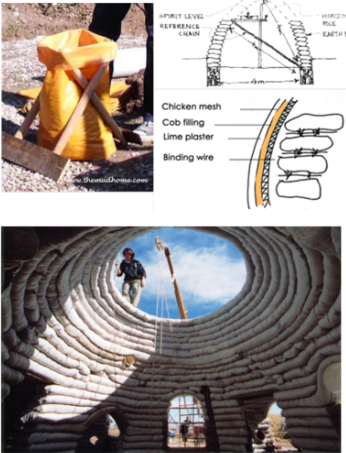
The analysis of housing typologies in different areas of the Al-Sahel region allowed us to gain valuable insights into the key architectural features and characteristics that are unique to that geographical location. We have discovered that the Sahelian homes in the region exhibit an apparent response to the climatic conditions, and this should be a critical consideration when designing the shelter for the area. Our research has also revealed that the use of local materials and techniques is an integral part of the architectural style in the region. This information can help inform our decisions regarding the materials and techniques to be used when designing the shelter. Furthermore, we have observed that the use of courtyards and open spaces is a common feature in Sahelian homes, and this has significant implications for the overall design of the shelter. By incorporating such features in the design, we can ensure that the shelter is not only functional but also aesthetically pleasing and in harmony with the environment.

8. Analysis of local construction methods and materials

We conducted an analysis of the primary building material utilized in the Al-Sahel area. The study aimed to provide a detailed understanding of the material's properties, advantages, and limitations. Our goal is to have an in-depth understanding of the available construction materials in the region. (See table next page)

Table 1: Construction Material Analysis. Source: the authors, 2023

Material Name	Description	Pros.	Cons.	Examples
Adobe (Sun-Dried Mud Bricks)	A traditional building material made by mixing earth, sand, straw or other organic materials, and water. The mixture is placed in molds and compressed; the bricks are then left to dry in the sun..	<ul style="list-style-type: none"> -Locally available soil. -Cost-effective. -Good thermal properties, provide insulation against the region's hot daytime. Temperatures and cool nights Durable when properly maintained. 	<ul style="list-style-type: none"> -Susceptible to erosion and water damage. -Regular maintenance and reapplication of mud plaster. -Not withstand strong earthquakes -The drying process can take time. 	
Compressed Earth Block (CEB)	<p>Manufactured with a mechanical press, these blocks are denser and more uniform than adobe bricks.</p> <p>Unlike traditional adobe, Compressed Earth Blocks (CEBs) have superior resistance to erosion and water damage.</p>	<ul style="list-style-type: none"> -Ensuring the longevity of naturally occurring materials that are available in the local area. -The thermal mass aids in regulating indoor temperatures, resulting in reduced heating and cooling expenses. -The material exhibits good thermal properties, thus providing insulation against the hot daytime temperatures and cool nights prevalent in the region. -Create durable buildings that have a prolonged lifespan and are capable of withstanding severe weather conditions. -Aesthetically appealing 	<ul style="list-style-type: none"> -Susceptible to moisture -Limited Structural Strength -To enhance the stability of Compressed Earth Blocks (CEBs), it might be necessary to include stabilizers, such as cement. b-uildings may need to be maintained more often as compared to structures made of other construction materials 	
Rammed Earth	The method consists of compacting earth (soil, clay, gravel along with small amounts of cement and water) into wooden molds . It requires specialized techniques and equipment,	<ul style="list-style-type: none"> -Excellent thermal mass properties, regulating indoor temperatures -Durable -Fire-resistant -Esthetically unique 	<ul style="list-style-type: none"> -Wood is needed for the molds. -Require specialized equipment. -The quality of the soil mix and proper stabilization are critical for durability. 	
Laterite Bricks	<p>It is made from a natural sedimentary rock called laterite. These bricks are commonly used in tropical and subtropical regions, including parts of Nigeria, due to their availability and suitability for construction.</p> <p>Laterite bricks have unique properties that make them suitable for specific applications.</p>	<ul style="list-style-type: none"> -Locally Sourced: This can reduce transportation costs and the environmental impact associated with the procurement of construction materials. -Natural insulation: Good thermal properties, this can help maintain comfortable indoor temperatures in hot climates. -Durability: They can withstand weathering, particularly in regions with a tropical climate. -Low Carbon Footprint: High-temperature furnaces are not required, such as for the manufacture of fired bricks -Fire Resistance: The dense earth-filled bags offer thermal 	<ul style="list-style-type: none"> -Low structural strength compared to concrete or fired clay bricks. -Inconsistent Quality: The quality of laterite bricks can vary significantly depending on the specific composition of the manufacturing process. -Maintenance requirements. -Construction might be limited during rainy seasons due to soil moisture. Aesthetics: walls may not suit everyone's aesthetic preferences 	

		mass, regulating indoor temperatures		
Earthbag Construction	They are special bags which are made of local soil and are placed horizontally on top of each other up to the desired height of the structure. It is a very easy and quick construction process.	<p>-Low Cost: inexpensive and use minimal additional materials. Soil is abundant and often free.</p> <p>-Sustainability: It minimizes the use of non-renewable resources and reduces waste.</p> <p>-Ease of Construction: It is simple to fill and stack, making them suitable for unskilled labor and community involvement.</p> <p>-Resilience: Earthbag walls can be resistant to weather, fire, and pests when properly finished and maintained</p> <p>Thermal Mass The dense earth-filled bags offer thermal mass, regulating indoor temperatures</p> <p>Adaptability Earthbag construction can be adapted to various shapes and sizes</p>	<p>-Stabilization: Depending on the soil type, stabilizers like cement may be needed to ensure durability.</p> <p>-Require engineering expertise to ensure stability for large structures.</p> <p>-Weather dependency. Construction might be limited during rainy seasons due to soil moisture.</p> <p>-Aesthetics: walls may not suit everyone's aesthetic preferences</p>	

After evaluating various construction methods and materials available in the local area, our team has determined that a combination of prefabricated materials and adobe bricks would be the most optimal solution. This approach offers several advantages, Prefabricated materials offer several advantages over other construction methods. They can be manufactured quickly, which allows for faster implementation and reduced labor costs. Additionally, they can be designed to meet specific requirements, which ensures a high level of quality and consistency in the final product. Combining prefabricated materials with adobe bricks offers further benefits. Adobe bricks are made of natural materials and are highly durable, which makes them an excellent choice for building structures that need to withstand harsh weather conditions. They are also energy-efficient, which can help to reduce the overall environmental impact of the project.

Moreover, this approach allows for a smooth transition from temporary to permanent structures. The prefabricated materials can be used to construct temporary structures, which can later be replaced with adobe bricks as the project progresses. This not only saves time and money but also ensures that the structures are built to last and conform to the Sahelians' local building culture.

9. Analysis of existing shelter types and projects by UNCHR

We have examined various shelter designs that fall into three categories: emergency shelters, designed for immediate response to natural disasters or other crises; transitional shelters, intended for use in intermediate stages of recovery and reconstruction; and durable shelters, built to withstand long-term use and provide sustainable housing solutions.

1. Emergency shelters

- Emergency shelters are designed for immediate and short-term use in the aftermath of a crisis or displacement. These shelters are rapidly deployable and are meant to provide a basic level of protection and comfort to refugees or internally displaced persons (IDPs) during the initial stages of a humanitarian emergency. (see Figure 13).

- Common types of emergency shelters include tents, tarpaulins, and makeshift structures. These shelters are relatively simple to set up and are intended to provide a temporary solution until more durable housing options can be established.
- Emergency shelters are crucial for providing immediate relief to those affected by natural disasters, conflicts, or other crises.

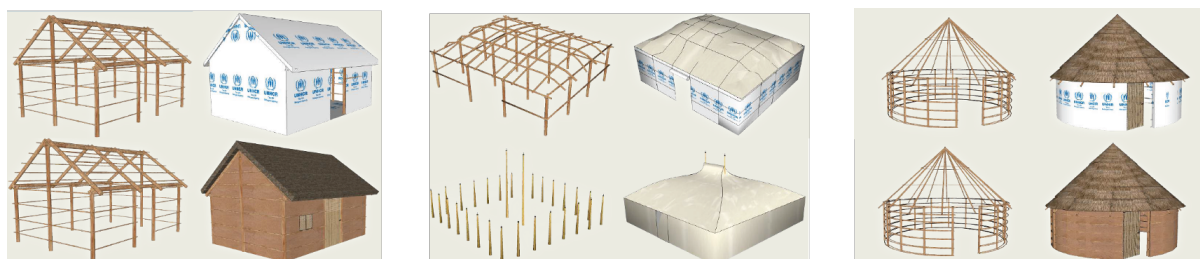


Figure 13: Types of emergency shelters. Source: UNHCR, 2021

2. Transitional shelters

- Transitional shelters offer better living conditions than emergency shelters, providing a more comfortable and stable environment for displaced individuals and families.
- These shelters give displaced populations a sense of stability and security.
- Are more durable and comfortable than emergency shelters, often made of sturdier materials and better insulation, providing better protection against extreme weather conditions.
- These shelters can facilitate the organization of displaced communities, helping them establish social structures and access essential services more effectively. (see Figure 14).



Figure 14: Types of transitional shelters. Source: UNHCR, 2021

3. Durable shelters

- **Long-Term Stability:** Durable shelters are intended for long-term habitation, offering a stable and secure housing solution for displaced populations.
- **Improved Quality of Life:** They provide better living conditions, including improved sanitation, access to clean water, and more space for families, which contributes to an enhanced quality of life.
- **Self-Reliance:** Durable shelters support self-reliance by creating a stable environment for refugees and IDPs to rebuild their lives, pursue education, and engage in income-generating activities.
- **Integration:** In some cases, durable shelters may be integrated into host communities, fostering social cohesion and reducing the burden on host countries' infrastructure. (see Figure 15).

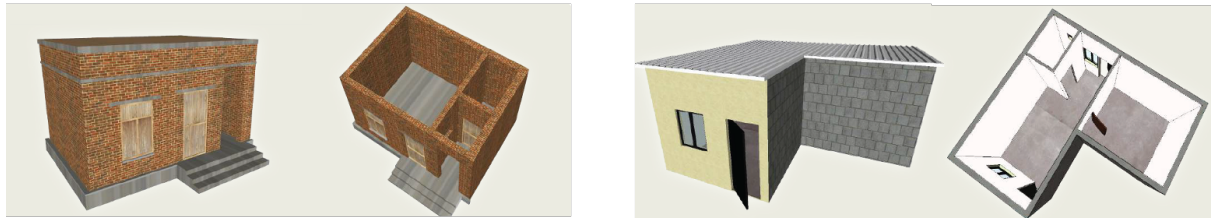


Figure 15: Types of emergency shelters. Source: UNHCR, 2021

Our challenge is to create a habitable unit that can accommodate the three distinct phases of an emergency, transitional, and durable situation. This requires careful consideration of the technical and logistical needs of each phase, as well as the unique challenges that may arise during each period. During the emergency phase, our unit must be able to provide immediate shelter and essential resources to those in need. This requires a focus on rapid deployment and a design that can accommodate a variety of unforeseen situations. The unit must be easy to assemble and disassemble, transportable, and able to withstand severe weather conditions. In the transitional phase, the focus shifts to creating a more permanent residence for the displaced individuals. At this stage, the unit must be able to adapt to the changing needs of the community and provide a comfortable living space that can accommodate the needs of households, neighborhoods, and settlements. This requires a design that can accommodate a variety of different living arrangements, such as individual homes, apartments, or communal living spaces. During the durable phase, the unit must be able to provide a sustainable and functional living space that can support the long-term needs of the community. This requires a focus on utilizing sustainable materials, energy-efficient technology, and the creation of necessary infrastructure such as schools, hospitals, and community centers. Overall, the creation of such a unit requires a deep understanding of the technical details involved in each phase, as well as the ability to adapt to changing circumstances and requirements. By carefully considering these factors, we can design a habitable unit that can effectively fulfil the needs of communities during times of crisis and beyond.

10. Designing the shelter

Based on the team's prior analysis, the shelter was developed in accordance with the previously established parameters. So, here comes our design proposal [H]éstia. In Greek mythology, Hestia was revered as the goddess of home and domesticity. While each Greek city had a patron god, Hestia was regarded as the goddess of the entire state. Her sphere of influence was linked to the role of the hearth in public life and the concept of a city as a vast family (Fatica, 2021). Our concept comes to help the war/climate victims to feel at home. "For a refugee, the only really human settlement is one in which he/she can cease to be a refugee, or better still, need not become one". (UNHCR,1976, p.15).

The preliminary designs commenced with the architectural form that is commonly found in the Sahelian region. Specifically, the traditional Igbo houses, characterized by circular mud walls (ulo aja oto) and thatched roofs (aju or atani), provided the initial inspiration for the sketches. (see Figure 16).

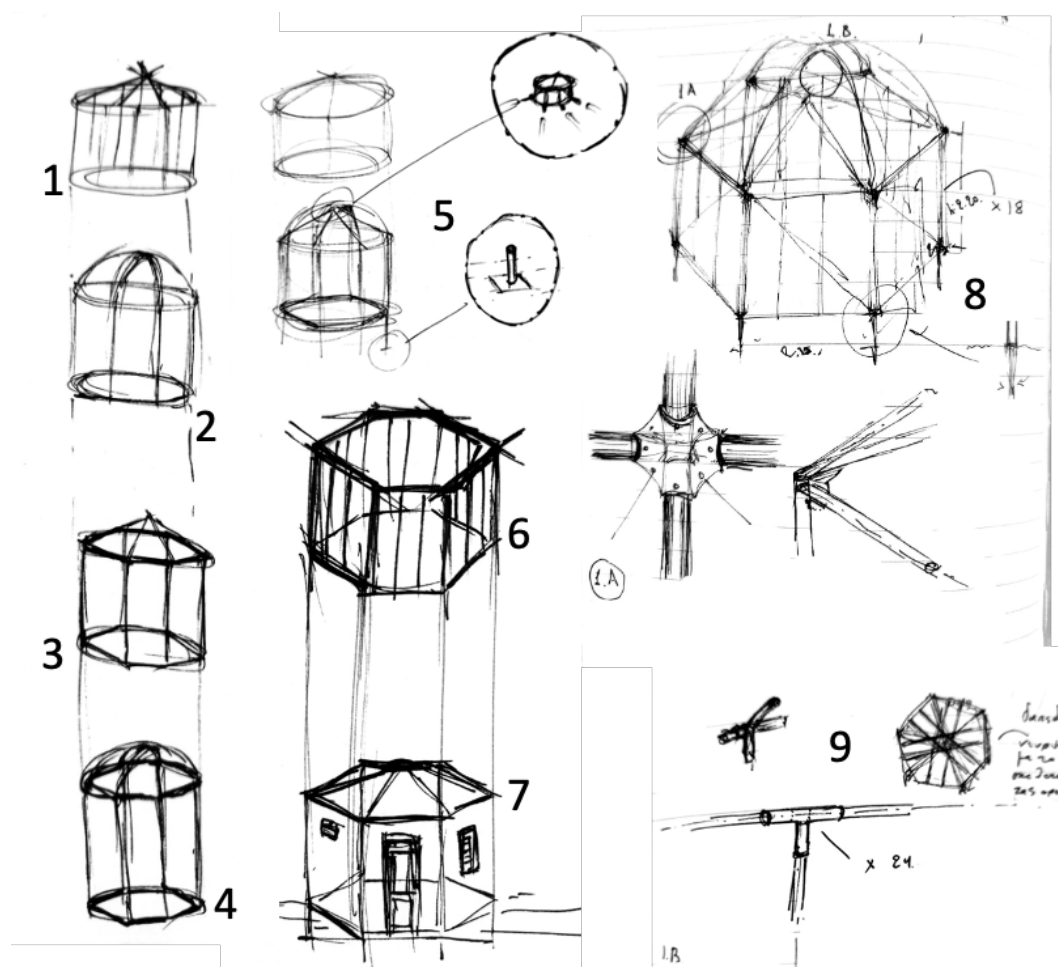


Figure 16: The preliminary sketches of the shelter design. the authors, 2023

The shelter units are designed with a hexagonal shape, which offers a high degree of adaptability for campsite arrangements, circumventing the need for a standardized approach. This design presents a unique opportunity for customization and flexibility in placement and orientation. Following the sketches phase, the work was directed toward the architectural drawings, including the top view, the plan, the main elevation (See Figure 17), and the 3d rendering (see Figure 18). The aim of these drawings was to provide a comprehensive visualization of the proposed design and layout.

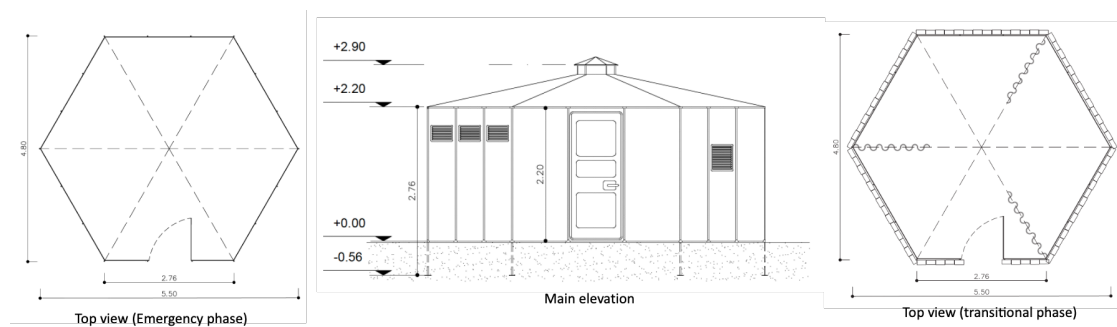


Figure 17: Hestia architectural drawings. Source: The authors, 2023



Figure 18: Hestia exterior and interior shots. the authors, 2023

The shelter design is extremely flexible, which means that it can be combined with multiple units to match the specific functional needs of the building. This implies that if the initial shelter is not enough, multiple units can be easily combined horizontally to create a larger living space. Moreover, the unit-scale design is highly adaptable and can adjust to environmental conditions. The design has divided the masonry into three parts, which makes it possible to change the openings and create them according to the specific conditions in the area. In other words, the panels of the infill walls snap together in three equal parts to create openings, avoiding the "one size fits all" approach. This design implicitly affects the larger scale, as there are numerous possibilities for configuring the space between shelters to form a communal patio. This patio provides a comfortable and relaxing outdoor area for residents to enjoy (See Figure 19). This approach to architecture reflects the Sahelian customs of constructing and safeguarding individual privacy while offering a leisure area within their residential compounds. Overall, the design is highly adaptable and can be tailored to meet the unique needs and preferences of each individual community.

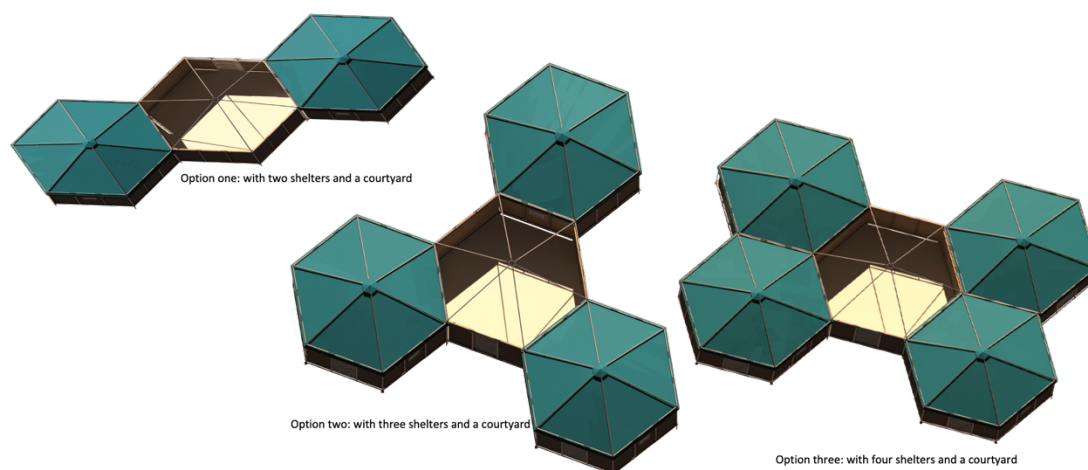


Figure 19: The potential of the shelter unit in creating different housing typologies. The authors, 2023

By collaborating with the appropriate organization, it becomes feasible to vertically expand the structure by incorporating locally sourced materials. This method permits the construction of two-story units in public buildings and provides a solution to the issue of camp sprawl's rapid expansion. Although it may pose some challenges, this approach is highly effective in achieving successful densification and ensuring sustainable growth.

The above-mentioned standpoint accentuates the importance of not just procuring diverse materials and local know-how but also emphasizing a philosophical participatory process that is grounded in cultural values. To indeed gather expertise and knowledge, it becomes imperative to delve deeper into the cultural ethos of the region. By fostering a participatory process, we are able to assimilate and benefit from the collective knowledge and experience of the community, which in turn leads to a more comprehensive and insightful understanding of the local environment. This approach fosters community development by facilitating job creation and economic growth while also nurturing small-scale enterprises. Its participatory nature acknowledges and respects the diversity and dignity of local residents. Additionally, it is designed to provide gender and age-friendly humanitarian habitats. This approach not only supports the local economy but also promotes inclusivity and social equity in the community.

The shelter would follow transitional construction phases that initially deliver an easy-assembly and deployable solution with pre-fabricated components and a toolbox considering the possible urgency of building a shelter but are also devised for the long-haul by cladding the pre-fabricated primary structure with the use of local materials and vernacular techniques so to reinforce the shelter into a more permanent one while offering the possibility for residents to partake in the process and engage with their own home customization.

The shelter was designed to withstand the climate conditions of the AI-Sahel region. For this reason, a bioclimatic design analysis was conducted to investigate the thermal comfort conditions of a shelter under local conditions. The analysis demonstrated the effectiveness of the used materials in the transitional phase.

To investigate environmental conditions and increase thermal comfort, construction materials and natural ventilation were considered. The latter plays a decisive role in reducing the temperature (See diagram 20). In this way, the design of the shelter is primarily based on the design under existing conditions, recognizing, on the one hand, the need to meet immediate needs (emergency shelter) and, on the other hand, the further mitigation of high temperatures (gradual transition to a durable shelter).

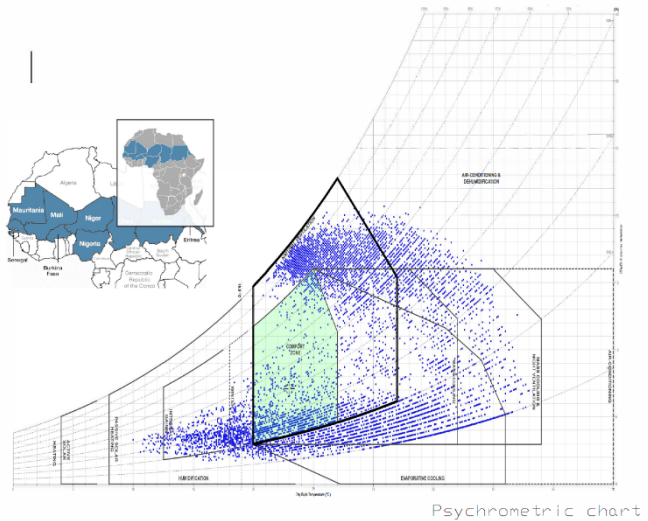


Figure 200: The bioclimatic analysis for the shelter unit. the authors, 2023

The use of brick was found to enhance the thermal performance of the shelter, while natural ventilation was identified as a dominant variable for dealing with heat in the absence of artificial means (see Figure 21). The design of the façade openings and roof were identified as integral solutions for improving thermal comfort. Overall, the analysis confirmed the shelter's sustainability and resiliency to adverse external environmental conditions.

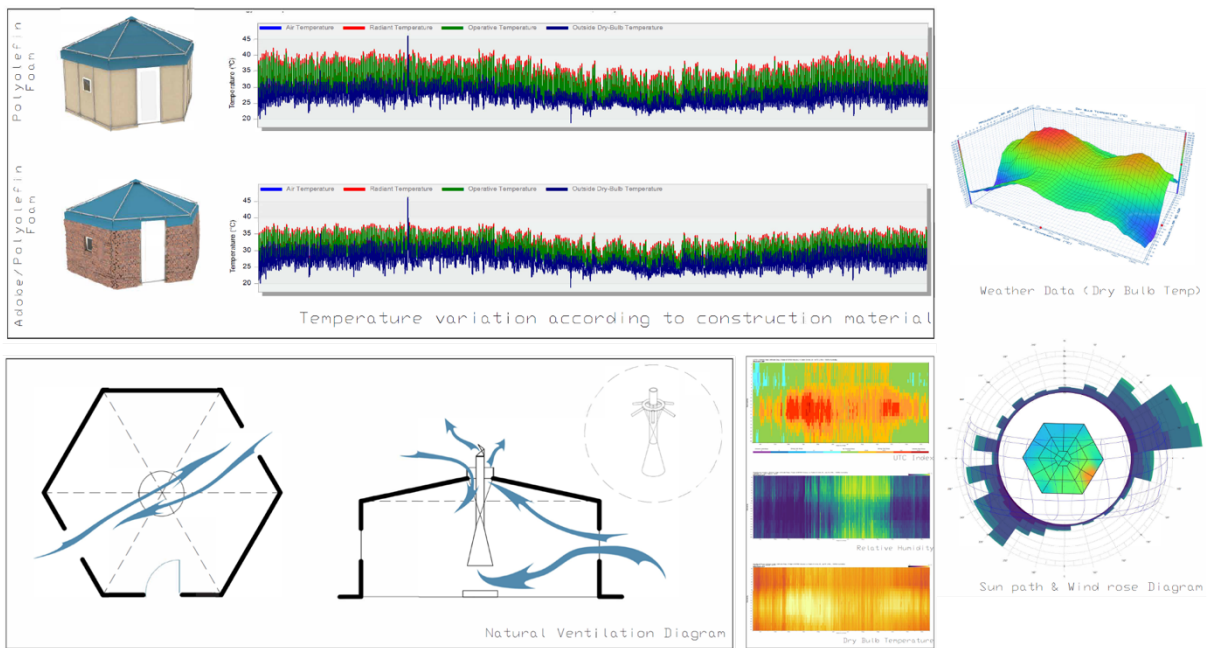


Figure 211: The bioclimatic analysis for the shelter unit. the authors, 2023

11. Assembly proposal overview

The primary step is to assemble the main body of the construction with the help of the different connectors using a groove-and-tongue method (see Materials: Bill of Quantities). The secondary bearing body is then placed where it helps to connect the infill masonry panels as well as the roof panels. At the same time, the static adequacy of the load-bearing structure and the masonry is reinforced through the cross wires that tie on the one hand to the primary load-bearing body and on the other hand to the links on each side in the upper part. Then, the roof panels are snapped in, and a skylight is attached to the load-bearing body, which acts as an interior air re-circulator. The last stage is the implementation of the construction with the elements of the door, windows, ventilation, and a solar panel to cover the basic electricity needs. As for the latter, these parts can be placed on any wall panel, making the overall construction flexible according to the needs of each user.

This proposal also offers the possibility of converting the temporary shelter into a permanent one. In other words, by maintaining and utilizing the main supporting body and selected panels (to avoid one-size-fits-all), the possibility of creating a permanent structure is provided. This permanent structure, built with local materials of the area (adobe bricks), offers the satisfaction of better living conditions both qualitatively and quantitatively. Qualitatively, the use of local materials provides, on the one hand, an ambiance with respect to each local characteristic and, on the other hand, better thermal comfort (optimization of insulation). Quantitatively, the possibility of conversion from a transitional shelter to a permanent one gives the possibility of enlarging both the family homes (small scale) and the respective camp in general (large scale).

12. Design coherence

Budget

72\$/ square meter

1 unit = 21 square meters

$72 \times 21 = 1510\$$ + extra cost of estimated 300\$ for the exterior wall

Total = 1810\$ per unit

Materials: Bill of Quantities

1. Galvanized Steel Frame
 - a. Column frame tube $\varnothing 20\text{mm} \times 2.76\text{m}$. [x 24 units]
 - b. Secondary frame tube $\varnothing 20\text{mm} \times 2.20\text{m}$. [x 12units]
2. Small connection standard components (steel)
 - a. Foundations [6 units] Base connectors [6 units]
 - b. Secondary connectors [24 units]
 - c. Top connection components [6 units]
 - d. Roof connection component [1 unit]

3. Steel Wires 5.47m. [13 units]
4. Covering Panels
 - a. Polyolefin foam roof panel [6 units] (treated with UV protection, waterproof)
 - b. Polyolefin foam wall panel [17 units] (treated with fire retardant and UV protection, waterproof)
5. Other
 - a. High-resistant door and hinges with lock, which can be padlocked from both sides for added safety for women and children. (polymer plastic) [1 unit]
 - b. Intrusion prevention window with mosquito net and shade made of UV and heat-resistant polymer plastic. [3 units]
 - c. Ventilation UV and heat resistant (polymer plastic) [3 units]
 - d. Solar panel 300 X 300mm [1 unit]
 - e. Small wall and roof steel components
6. About Durable/ Permanent Construction

The building material (adobe) depends on the molds. Therefore, their dimensions are not standardized. For the design, we assumed a thickness of 15 cm.

13. Shelter assembly step-by-step guide

Step 1: Main body and foundations

- 1.1. Place the 6 columns (1a) on base foundations (2a)
- 1.2. Then pass the base links (2b) through the columns.

Step 2 (Adapting connection components)

- 2.1. Pass the secondary links (2c) through the 12 horizontal columns (1a)
- 2.2. Attach the 6 horizontal columns (1a) to the base links (from step 1.2.)
- 2.3. Then, fit the 12 tubes (1b) to the secondary links.

Step 3: Ceiling structure

- 3.1. Attach the other 6 horizontal columns (1a) to the top links (2d).
- 3.2. Then, fit the other 6 columns (1a) to the third top link (2d).
- 3.3. And all the other sides of the pipes to the top connector (2e).

Step 4: Connect the ceiling to the base construction.

- 4.1. Mount the roof (from phase 3) on the columns from phase 2c.

Step 5: Covering

- 5.1. Cover the polyolefin panels (4b) from the inside of the shelter to the vertical columns.
- 5.2. Next, we place the roof panels on the roof pillars and screw them in place.
- 5.3. Finally, put the openings whenever you want/need them. Crop the foam panels opening and then place the window etc. and screw it.

+ Step 6 (Optional): Covering – second skin.

- 6.1. Adobe brick extraction
- 6.2. Waiting for physical preparation of the material (14 days in the sun)
- 6.3. Perimeter construction in an existing structure.

The Red Cross Luxembourg presented the top three selected projects. Hestia's representative model was showcased at the prestigious Neumünster Abbey in Luxembourg. We were asked to prepare the drawings also for the mock-up model and construction components. (See Figure 21 + 22)

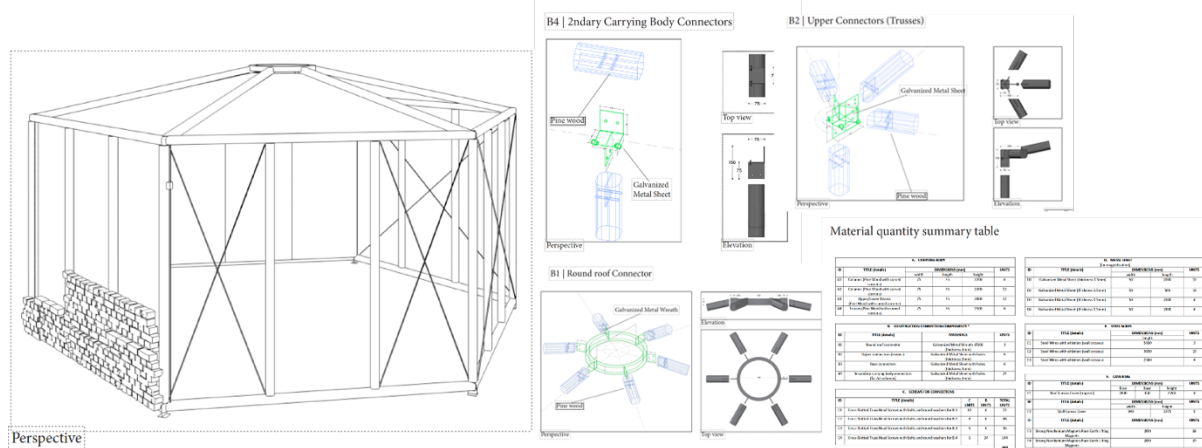


Figure 22: Mock-up model and structural components for the exhibition. By the authors, 2023



Figure 23: The exhibition day. the authors, 2023

14. Main results (expected or obtained)

Refugee camps are often viewed as bleak and uninspiring places that lack the basic amenities required for a decent standard of living. In the proposed shelter, [H]éstia, the shelter is viewed as a process rather than a product. [H]éstia's approach to refugee shelter is based on the principles of sustainability, community engagement, and empowerment. By involving refugees in the design and construction of their own shelter, [H]éstia promotes a sense of ownership and pride in the community. This, in turn, fosters a sense of empowerment and self-reliance, which can have a positive impact on the mental health and well-being of refugees. Its humanitarian approach to refugee shelter is a testament to the power of community-driven solutions in tackling complex humanitarian challenges. The hexagonal prototype for six family members was designed using locally sourced materials, which were carefully chosen to suit the cultural appropriateness and functional needs of the refugees. The hexagonal shape was chosen for its versatility, as it allows for easier assembly and transportation of the habitat. Moreover, the hexagonal design provides better ventilation, natural light, and privacy for each family unit.

The hexagonal structure underwent a comprehensive bioclimatic analysis to evaluate its thermal comfort and has been proven to be a robust and resilient architectural design. This analysis included the consideration of various environmental factors, such as wind patterns, solar radiation, and temperature fluctuations, to ensure the structure's ability to withstand harsh conditions. The result is a structure that is well-suited for the challenging weather conditions that are common in the Al-Sahel region, where refugees often face extreme temperatures and harsh weather. In addition to its ability to withstand challenging weather conditions, Hestia's hexagonal structure design facilitates natural ventilation, promoting optimal air circulation and reducing the transmission of airborne illnesses. The hexagonal shape of the structure allows for the creation of a central courtyard, which serves as an open space for air to circulate freely. The design also includes a series of openings that allow fresh air to enter the structure and stale air to exit, creating a natural flow of air.

By incorporating hexagonal shapes, the camp layout can be arranged in a more efficient manner, allowing for better use of the available space and resources. This arrangement not only improves the living conditions for refugees but also optimizes the use of available resources. The hexagonal shape of [H]éstia shelter structure presents diverse alternatives for the development of patios assigned to refugees. This innovative design provides a wide range of options that can accommodate varying preferences and needs. The hexagonal shape of the shelter provides a unique opportunity to create distinct and functional outdoor living spaces. This feature, along with the shelter's other design elements, facilitates the creation of patios that are both aesthetically pleasing and practical. Overall, the [H]éstia shelter offers a versatile solution for the development of outdoor spaces for the benefit of refugees. As a result, a locality is built by its inhabitants.

15. Limitations

The proposal has some limitations that need to be acknowledged. Firstly, the team did not have the opportunity to visit any country in the Al-Sahel region to gain a more comprehensive understanding of the situation and engage with the local community to identify their needs. Secondly, the impact of Hurricane Daniel on the University of Thessaly coincided with the scheduled workshop, which meant that the entire team had to resort to virtual communication. This hindered the possibility of direct contact in the design studios. Despite these limitations, the team members collaborated commendably, and their efforts resulted in a positive outcome.

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