

Designing Sustainable Transitional Shelters for Displaced Populations: The Case of Syrian Refugees in Lebanon

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Abstract

Climate change and political conflicts stress resources and people, causing many to leave their homes. During these times, rapid help and the ability to adapt are significant. However, United Nations agencies and Non-Governmental Organizations often focus on building shelters quickly. They usually ignore sustainability, climate resilience, and the well-being of the people affected. They also neglect the culture of the displaced population. Because of this, displaced people end up living in poor conditions for long periods.

This PhD thesis aims to address these issues by designing adaptive transitional shelters that are sustainable, climate-resilient, low-cost, and built from locally sourced materials. The goal is to provide displaced populations safety, protection, and belonging. These shelters are designed to be easily assembled by the displaced individuals, fostering a sense of ownership and enabling rapid response to crises.

The case study for this research focuses on Syrian refugees in Lebanon. Since 2014, Syria has been the primary source of millions of refugees, with Lebanon hosting the highest number of Syrian refugees per capita. This study integrates environmental, economic, sociocultural, and technical considerations into the design of transitional shelters while reviewing existing literature on previously developed shelters.

A significant aspect of this study is the emphasis on the culture of the displaced population taking as a case study Syrian refugees. Field visits and observations of the shelters built by Syrian refugees informed the design prototype, ensuring it respects and incorporates their cultural practices and preferences.

The research explores the policy landscape, types of settlements, and alternatives to informal tented settlements in Lebanon to enhance shelter design. A qualitative research approach ensures the development of user-

centered shelter designs. The final shelter prototype, refined through feedback from refugees, aims to improve rapid response capabilities in mass displacement and climate change while addressing local conditions and the needs of refugees.

Disclaimer: Artificial Intelligence (AI) was strictly used to proofread for typos and grammatical errors within this PhD.

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List of Abbreviations

CGT	Constructivist Grounded Theory
IAQ	Indoor Air Quality
IFRC	International Federation of Red Cross and Red Crescent Societies
IOM	International Organization for Migration
SDG	Sustainable Development Goals
UNDP	United Nations Development Programme
UNHCR	United Nations High Commissioner for Refugees
USAID	United States Agency for International Development

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Chapter 1: Introduction

1.1 Research Overview

The field of architecture has traditionally focused on addressing fundamental human needs, including the provision of shelter, the promotion of communication among diverse populations, and the fostering of a sense of community. In the context of humanitarian crises, architecture has evolved from prioritizing aesthetic and functional aspects to responding to societal needs through resilient and community-focused designs (Ajith Kumar et al., 2021). The ongoing Syrian refugee crisis remains one of the largest displacement crises globally, with over 5.6 million Syrians registered as refugees in host countries such as Lebanon, Turkey, and Jordan and an additional 6.8 million internally displaced within Syria (UNHCR, n.d.). Many Syrian refugees remain unregistered, further complicating efforts to quantify the full scale of displacement. Lebanon, hosting the highest per capita concentration of refugees worldwide, faces immense pressure on its infrastructure, shelter availability, and resources.

Between September and October 2024, the expansion of the Israeli-Palestinian conflict into Lebanon generated mass internal displacement, forcing more than one million individuals to flee to safer regions across the country. These Internally Displaced Persons (IDPs) took shelter in already overcrowded and resource-scare areas, limiting the availability of healthcare services and clean water and sanitation provided to them (Médecins Sans Frontières [MSF], 2024). This displacement phenomenon, coupled with pre-existing and overlapping crises already facing Lebanon, has further intensified the country's displacement challenges. Indeed, Lebanon continues to struggle to accommodate the needs of large numbers of Syrian and Palestinian migrants it currently hosts, along with catering to IDPs (Norwegian Refugee Council [NRC], 2024). The stresses on the precarious healthcare sector and the

humanitarian assistance system urge for collaboration between actors in both fields to develop support strategies and implement relief efforts.

Given the ongoing regional instability and the growing demand for temporary accommodation in Lebanon, this research focuses on developing sustainable and culturally appropriate transitional shelter designs tailored to meet the complex and evolving displacement needs. While the primary case study is Syrian refugees in Lebanon, this research holds broader regional relevance due to shared cultural and climatic conditions across the Middle East. Furthermore, the suggested transitional shelters can also be deployed and used in cases of internal displacement as a rapid and dignified disaster relief response mechanism. This is particularly valuable in the current context of the Israeli-Palestinian conflict in Palestine and Lebanon. Refocusing on the Lebanese context, many internally displaced Lebanese citizens who were unable to secure spots in schools or to afford renting apartments have found themselves on the streets for an undiscernible amount of time. As such, these transitional shelters have the ability to be game changers for them.

1.2 Motivation

Lebanon's experience as a host country for displaced populations, including Palestinian refugees since 1948, has shaped its current approach to the Syrian refugee crisis. The country's "no-policy-policy" reflects its reluctance to establish formal settlements for Syrian refugees due to socio-political concerns. This policy has left refugees vulnerable, with limited legal recognition and inadequate shelter options (Nassar and Stel, 2019).

The recent displacement caused by the conflict in Gaza and violence in Lebanon underscores the urgency of developing shelter solutions that balance immediate relief with cultural sensitivity and sustainability

concerns. Transitional shelters, which provide both short-term stability and pathways toward long-term resilience, offer a critical opportunity to address these complementary needs. This research seeks to bridge existing gaps in transitional shelter design by integrating insights from global best practices with localized data and user-centered design principles.

1.3 Aim and Objectives

The aim of this research is to propose transitional shelter design criteria and guidelines that address sustainability, cultural appropriateness, and shelter adaptability. While the focus is on Syrian refugees in Lebanon, the findings and designs are intended to be suited for broader regional applications. The objectives of this research include:

1. Investigating the challenges faced by displaced Syrian refugees in informal settlements in Lebanon.
2. Analysing global shelter solutions and evaluating their adaptability to Lebanon's socio-cultural and climatic context.
3. Identifying the impact of cultural and contextual factors on shelter design.
4. Proposing comprehensive guidelines and a shelter prototype that balances cost, sustainability, and functionality.

1.3.1 Research Question(s)

The main research question guiding this study is as follows:

How can the design of transitional shelters for Syrian refugees in Lebanon be improved to ensure adaptability, cultural sensitivity, and sustainability while balancing humanitarian standards?
To respond to this question, this study also examines the following sub-questions:

1. Which transitional shelter design criteria and building standards best combine between affordability, functionality, and sustainability in Lebanon?
2. How can architects and engineers integrate recycled, eco-friendly, and locally abundant materials into transitional shelter design while being mindful of refugees' sociocultural needs?
3. How can a context-sensitive and participatory transitional shelter design approach benefit the creation of transitional shelters in Lebanon?

These sub-questions align with the main research question and more broadly with the study's objectives. They help align theoretical and practical considerations to foster cultural sensitivity and sustainability in transitional shelter development.

1.4 Research Methodology

This study adopts a qualitative research methodology, combining field visits, interviews, focus groups, and analysis of shelter materials and spatial configurations. Data is synthesized to inform an iterative design process that emphasizes user-centered and context-sensitive approaches. The final prototype integrates sustainability considerations, such as the use of abundantly available and locally sourced recyclable materials, with cultural and environmental appropriateness.

1.5 Contribution to Knowledge

The following thesis significantly contributes to preexisting knowledge and literature on shelter design, sustainability, and displacement by addressing critical gaps found in the field of humanitarian architecture. It mainly focuses on assessing the shelter standards set within The Sphere Handbook (2018), including their limitations in catering to displaced populations' economic, social, and

cultural needs as well as broader environmental sustainability concerns. However, this thesis goes beyond the Sphere Handbook (2018) to include interdisciplinary and intersectional perspectives from the fields of architecture, environmentalism, sociology, and sustainability to further contextualize shelter responses.

Additional contributions made by this thesis to the literature are outlined and elaborated upon as follows:

1- **Bridging the Gap Between Policy and Practice:**

This research explores preexisting shelter guidelines, standards, policies, and practices. It seeks to enhance and adapt preexisting shelter responses based on humanitarian principles and refugees' needs. It builds on previous research conducted by the Global Shelter Cluster, IFRC, and UNHCR and integrates locally sourced, easily available, and recyclable building materials while adopting a user-centered design approach.

2- **Innovating in Transitional Shelter Design:**

While previous research (e.g., Batchelor, 2011; Opdyke et al., 2018) explored shelter typologies, this thesis advances the field by proposing a modular and scalable shelter prototype that adapts to environmental constraints, temperature fluctuations, and community preferences. Furthermore, integrating participatory design methodologies aligns with user-driven approaches and user-centric design principles advocated for by Albadra et al. (2020).

3- **Advancing Environmental Sustainability in Humanitarian Architecture:**

Unlike previous studies that mainly focus on shelters' structural resilience, this research also emphasizes the ecological footprint of shelter construction. To do so, it aligns itself with sustainability

frameworks, advocating for the use of recycled plastics as well as locally available and easily sourced building materials, therefore contributing to circular economy initiatives in post-disaster and displacement contexts.

4- Emphasizing Cultural Sensitivity in Shelter Design:

Unlike generic shelter models, this study integrates socioeconomic and cultural considerations into shelter design principles. Drawing from fieldwork in Lebanon, it aligns with previous studies on cultural appropriation in displacement architecture (Dabaieh, 2017; Alshawawreh et al., 2020), providing empirical evidence to inform future policy development.

By linking the above-mentioned additional contributions to the broader academic discourse on shelter design, sustainability, and displacement, this research strengthens the interdisciplinary foundation of humanitarian architecture while offering actionable insights for policymakers and practitioners.

1.6 Structure of the Thesis

This thesis is structured as follows:

1. Introduction - Outlines the research background, motivation, aim, objectives, methodology, and contributions to knowledge.

2. Literature Review - Discusses shelter categories, environmental, economic, technical, and socio-cultural aspects of shelter design, as well as global standards and guidelines.

3. Methodology - Details the research philosophy, qualitative methods, data collection techniques, and ethical considerations.

4. Shelter’s Spatial Organization - Analyzes spatial distribution and critical issues related to shelter use, such as thermal comfort, ventilation, maintenance, and fire safety.

5. Shelter Design Guidelines and Proposal - Presents design guidelines and a detailed shelter prototype, focusing on cultural, technical, and social aspects.

6. Conclusion - Summarizes findings, discusses implications, and provides recommendations for future research.

Chapter 2: Literature Review

This chapter reviews the literature surrounding three critical themes central to developing effective, sustainable, user-centered, and culturally sensitive shelter solutions. These themes, shelter and settlement, standards and guidelines, and global plastic waste pollution are critical as they form the backbone of this study's aim to innovate shelter design, particularly for displaced populations.

The first theme, shelter and settlement, comprehensively explores various strategies and methodologies for designing and building shelters across diverse contexts. This review draws on a broad spectrum of case studies, academic discourse, and practical implementations. It is a crucial tool for understanding the complex dynamics of shelter provision. It identifies effective and ineffective shelter solutions, how shelters adapt to environmental challenges, meet cultural and social needs, and provide sustainable solutions beyond temporary housing. This analysis is instrumental in identifying ways in which new designs can better respond to the nuanced needs of displaced communities and keep them informed and engaged in the process.

The second theme, standards and guidelines, provides a comprehensive analysis of the regulatory framework governing the shelter and settlement field, examining key principles, benchmarks, and their implementation in humanitarian contexts. This review is a formality and a vital step in aligning the proposed shelter designs with established international norms and humanitarian ethics. By examining the guidelines set forth by reputable entities such as the Sphere Project, this section aims to reassure readers about the ethical considerations in the proposed designs. Furthermore, it contextualizes the proposed designs within a framework emphasizing human dignity, safety, and well-being. It also scrutinizes how these standards are applied in practice

and explores their efficacy and relevance in various humanitarian settings. This examination ensures compliance with humanitarian principles and enriches the design process by embedding a rights-based approach to shelter provision.

The third theme focuses on global plastic waste pollution and introduces an environmental lens to the study, emphasizing the importance of sustainability in shelter design. This section investigates the dual challenge of addressing shelter needs while concurrently confronting the global plastic waste crisis. By exploring innovative uses of recycled plastic materials in construction work, this theme examines the potential for shelters to contribute to environmental sustainability positively. It specifically assesses the ecological impacts of plastic waste, the feasibility of using recycled plastics in building durable and eco-friendly shelters, and the potential integration of such practices into humanitarian responses without compromising the quality or safety of the shelters.

Despite the historical use of natural materials such as timber and natural fabrics in emergency shelter designs, this study deliberately excludes them due to critical considerations, including cost, availability, and durability:

Cost and Availability: In post-disaster contexts like Haiti, the high demand for locally sourced timber led to cost inflation and supply shortages, delaying the provision of emergency shelters (Corrêa, 2017). Similarly, deforestation and reliance on imports in Lebanon make timber an expensive and logistically challenging choice for large-scale shelter construction (Trovato, Al-Akl, and Ali, 2021). Instead, materials like recycled plastic offer a more cost-effective and readily available alternative.

Durability in Harsh Climates: Natural materials, such as untreated timber, are prone to rot, warping, and pest infestations in humid or extreme climates. In Lebanon's varied climate—from the humid coast to the arid Bekaa Valley—engineered materials, such as sandwich panels or modular plastic components, perform better in terms of durability and thermal insulation (Ajith Kumar, Priyadharshini, Narayanan, and Kumari, 2021).

Sustainability and Environmental Impact: The use of recycled plastics aligns with global efforts to repurpose waste and reduce the environmental impact of post-disaster reconstruction. Innovative approaches, such as Shigeru Ban's paper log houses and the use of plastic in modular housing systems, demonstrate the potential to minimize resource exploitation and promote eco-friendly construction (Kumar et al., 2021; Corrêa, 2017).

This research adopts alternative materials to address immediate shelter needs, support a circular economy, contribute to local livelihoods, and enhance resilience against future crises.

These themes provide a holistic view of the current landscape of shelter design and set a solid foundation for the proposed research. By synthesizing insights from these diverse yet interconnected areas, the following literature review aims to carve out a niche for this study, highlighting the research gap the proposed shelter design intends to fill. The goal is to forge a path toward innovative shelter solutions that are practical and responsive to the immediate needs of displaced populations and visionary in their approach to cultural sensitivity, sustainability, and adherence to humanitarian standards. This comprehensive review thus serves as a critical steppingstone for the subsequent development of a shelter design model that aspires to be at the forefront of humanitarian innovation.

1- Shelter and Settlement

This section reviews various documents and research studies on shelter and settlement for people who have been forced to leave their homes. The focus is on understanding different types of temporary housing, especially transitional shelters, and on the environmental, economic, technical, and cultural factors that influence shelter design. It also examines how shelters are organized in refugee camps in different countries.

The need for better shelters is critical, as reported by the United Nations High Commissioner for Refugees (UNHCR), which notes that 100 million people were displaced worldwide in 2022. This represents an increase of 10.7 million displaced individuals from the previous year due to wars, conflicts, and natural disasters (UNHCR, n.d.b). The World Forum for Democracy (2021) additionally predicts that there could be up to 200 million climate refugees by 2050, which makes it even more urgent to develop shelters that can adapt to changes in migration fluxes caused by climate change.

Shelters provide displaced people with a private and secure place to live, which is essential for their recovery and rebuilding their lives. The Global Shelter Cluster (2018) defines adequate shelter as providing protection, space for living and storage, privacy, comfort, and a sense of identity, all of which are important for building toward a hopeful future. This definition is widely accepted and helps guide the development and assessment of shelter solutions worldwide.

However, a review of existing policies and guidelines shows that the actual performance of shelters often does not meet expectations. Relatedly, Basharwi et al. (2014) point out several issues with shelter design, such as insufficient consideration of cultural and social needs, not using local materials and readily available skills, difficulties

adapting to fluctuating climates, delays in shelter provision, and cost overruns. These problems show a gap in how shelter designs are planned and implemented, raising questions about how these insights are included in global shelter guidelines and their relevance in specific places like Lebanon.

UNHCR's shelter guidelines emphasize the need for a flexible and context-specific approach, recognizing that the needs of displaced populations can vary greatly depending on their location and circumstances (UNHCR, n.d.c). Urban areas present different challenges and opportunities compared to rural settings, which influence the choice of materials, design requirements, and the sustainability of shelters. The guidelines offer a range of options, from cash-based assistance that allows displaced individuals to build their own shelters to the direct provision of materials for constructing transitional shelters. This reflects the understanding that no single solution can address the diverse needs across different humanitarian contexts.

This review aims to support the ideas found in the UNHCR guidelines by offering evidence from research and looking at how these ideas work in different settings and how well they meet the needs of displaced people. By examining case studies and reports, this review identifies best practices, gaps, and areas for improvement in shelter strategies, mainly focusing on their use and relevance in Lebanon. This thorough analysis helps deepen the understanding of shelter and settlement issues and guides the development of more effective, suitable, and sustainable shelter solutions.

The shift toward more comprehensive approaches in shelter design strategies, emphasizing cultural sensitivity, community involvement, and sustainability, has been gaining momentum over recent years. This evolution reflects a deeper understanding of the multifaceted challenges

that displaced individuals and communities face and the critical role that effective shelter strategies can play in their recovery and in helping them build future resilience. Traditionally, humanitarian aid focused predominantly on meeting the immediate needs of those who were displaced by providing essential protection and safety quickly and with little regard for the long-term recovery of affected populations. This resulted in temporary and often inadequate shelter solutions that failed to consider displaced communities' broader social, economic, and cultural contexts (Davis, 1978).

In recent decades, however, there has been a growing recognition of the importance of adopting more holistic and sustainable approaches. This paradigm shift can be attributed to several factors:

1- Understanding of Long-Term Needs**:** This is reflected in increased awareness that shelters are not just temporary refuges but crucial structures for the overall recovery and future resilience of communities. This has led to the creation of adaptable shelter designs that could potentially be turned into permanent housing options (Corsellis and Vitale, 2005).
2- Community Involvement: The involvement of affected communities in the shelter design and the corresponding implementation process is now considered essential. This ensures that the solutions meet the actual needs of displaced populations and support the community's social fabric (Kennedy et al., 2008).
3- Cultural Sensitivity**:** There is a greater acknowledgment of the need for shelter solutions that respect local customs and social structures, leading to more successful and sustainable outcomes (Sanderson and Burnell, 2013).

4- Resource Efficiency and Environmental Concerns**:** The environmental impact of shelter construction has become a significant consideration when designing and building shelters, driving the use of sustainable building materials and methods (UNHCR).
5- Evidence-Based Approaches**:** A more analytical approach to shelter solutions, supported by research and data, has led to better shelter outcomes and informed the development of adaptable and scalable shelter policies and practices (IFRC, 2013).

These changes are evident in the guidelines and policies of major humanitarian organizations, such as the United Nations High Commissioner for Refugees (UNHCR) and the International Federation of Red Cross and Red Crescent Societies (IFRC). These organizations are important in the context of displacement as they advocate for inclusive and sustainable shelter strategies to be integrated into broader humanitarian responses and development plans (IFRC, 2013).

These paradigm shifts highlight modern shelter strategies that address the immediate needs of displaced individuals and that are crucial for the long-term recovery and dignity of refugees and internally displaced persons, aligning with broader humanitarian goals.

The paradigm shift emphasized in the emergency handbook "Strategic Considerations in Shelter Responses" (UNHCR, 2024) towards tailored, context-sensitive shelter solutions in humanitarian crises likely stems from a combination of lessons learned from past interventions, emerging research in the field, and a growing recognition of the complex dynamics affecting displaced populations. Several factors may have initiated this change:

1- Evaluation of Past Interventions: Over time, the humanitarian sector has critically assessed the outcomes of past shelter responses. Studies and post-crisis evaluations often revealed that generic solutions can lead to inefficiencies, resource waste, and poor satisfaction among shelter inhabitants. These evaluations highlighted the need for strategies that more accurately reflect the nuanced realities of affected communities (UNHCR, 2024).
2- Advancements in Research: New research in environmental sustainability, social anthropology, and disaster resilience has provided more profound insights into how shelter strategies can be optimized to meet the specific needs of diverse populations better. Academic and field studies have contributed to a better understanding of the intricate balance between immediate shelter needs and long-term recovery and sustainability (UNHCR, 2024).
3- Increased Collaboration with Local Communities: There has been a notable shift towards adopting more participatory approaches in humanitarian aid, through the active involvement of local communities in planning and implementing shelter projects. This community-based engagement has underscored the importance of understanding and integrating local customs, knowledge, and resources into designing and building shelter solutions (UNHCR, 2024).
4- Broader Socio-Political Dynamics: The "Strategic Considerations in Shelter Responses" emergency handbook may also respond to broader socio-political dynamics, such as migration patterns, urbanization, and the increasing frequency of climate-induced displacements. These factors

require shelter strategies adaptable to changing environments and varying population dynamics (UNHCR, 2024).

5- Policy and Advocacy**:** Influential global frameworks and policies, such as the Sustainable Development Goals (SDGs) and the Sendai Framework for Disaster Risk Reduction, emphasize the need for building resilience and sustainable development. These frameworks advocate for approaches that provide immediate relief to affected individuals and communities and contribute to long-term recovery and risk reduction (UNHCR, 2024).

The research basis for such a strategic shift in shelter responses typically includes interdisciplinary studies encompassing environmental science, urban planning, sociology, and emergency management. Additionally, collaborations with academic institutions, international organizations, and local NGOs provide empirical data and theoretical backing that support the evolution of these strategies.

By recognizing the limitations of a one-size-fits-all approach and advocating for context-driven responses, the "Strategic Considerations in Shelter Responses" document aims to catalyze a more effective and respectful approach to shelter provision in humanitarian crises, enhancing both the immediate impact and long-term sustainability of shelter interventions (UNHCR, 2024).

In humanitarian response, the transition towards context-driven shelter strategies marks a significant evolution from the traditional one-size-fits-all approaches that often fall short in addressing the diverse needs of displaced populations. The UNHCR's "Strategic Considerations in Shelter Responses" emergency handbook (2024)

advocates for such tailored approaches, emphasizing the importance of adapting shelter solutions to affected communities' unique environmental, cultural, and socio-economic contexts. This shift is underpinned by extensive research and field studies, including those by Patel and Burkle (2012), highlighting how rapid urbanization can exacerbate vulnerabilities and complicate the provision of adequate shelter to displaced individuals. Similarly, Shaw (2006) underscores the necessity of integrating environmental sustainability into disaster recovery efforts to enhance the long-term viability of reconstruction projects. Indeed, adopting context-driven strategies allows for designing and implementing more sustainable, effective, and culturally respectful interventions that meet immediate displaced individuals' shelter needs and contribute to communal resilience and recovery. As such, this approach aligns with global frameworks like the Sendai Framework for Disaster Risk Reduction and ensures that shelter provision contributes to a more durable and equitable recovery process.

Batchelor's thesis, titled "Tarpaulins, Transitional Shelters, or Permanent Houses" (2011), profoundly explores how different shelter assistance modalities affect the recovery trajectories of communities devastated by disasters. Through a meticulous analysis of two Indonesian case studies following significant earthquakes, Batchelor's research sheds light on the distinct impacts of various shelter strategies on the long-term recovery and resilience of affected communities. The thesis meticulously contrasts the effectiveness, sustainability, and community acceptance of temporary solutions like tarpaulins, intermediate options such as transitional shelters, and more permanent housing solutions. By demonstrating the diverse outcomes of each sheltering approach, Batchelor's (2011) work underscores the importance of strategic, contextually informed decision-making, particularly in the initial stages of disaster response. His findings serve

as a critical resource for policymakers, practitioners, and researchers, highlighting the consequential nature of early shelter interventions on the broader process of community recovery and resilience building.

The "Humanitarian Shelter Cluster Review" (2011) is an invaluable document that thoroughly assesses shelter interventions in various emergency situations, offering critical insights into multifaceted challenges and effective practices within the humanitarian shelter domain. This review delves into the operational complexities and strategic considerations that are essential for delivering shelter assistance in diverse, and often adverse, environments. It critically examines various elements including coordination mechanisms, stakeholder engagement approaches, and resource allocation processes that underpin successful shelter responses, highlighting the importance of shelters' climatic and cultural adaptability, community involvement, and inter-agency collaboration. By dissecting case studies and drawing on empirical data, the review articulates lessons learned from a wide variety of contexts and recommends strategies to enhance the efficacy and efficiency of shelter provision. For practitioners, policymakers, and researchers, the "Humanitarian Shelter Cluster Review" (2011) serves as a crucial guide, offering a nuanced understanding of the dynamic landscape of humanitarian shelter interventions and the key factors that drive their success or failure.

In the broader context of academic research on shelter responses during humanitarian crises, the integration of various studies reveals a complex landscape where different methodologies and focuses shed light on the nuanced needs of disaster-affected populations. Batchelor's thesis, "Tarpaulins, Transitional Shelters, or Permanent Houses" (2011), is particularly notable for its detailed examination of how different shelter types affect communities' recovery trajectories and their

resilience post-disaster. The thesis provides a valuable empirical perspective that complements broader operational studies, such as those encapsulated in the "Humanitarian Shelter Cluster Review" (2011).

Batchelor's (2011) work is additionally significant because it directly analyzes the immediate impacts and long-term benefits of various shelter options. It provides critical insights that help refine shelter strategies from an effectiveness and sustainability standpoint. His findings suggest that transitional shelters bridge the gap between emergency and permanent housing while offering a balance that supports immediate relief needs and longer-term recovery concerns. This is crucial for informing shelter selection, design, and implementation guidelines in diverse emergency contexts.

The "Humanitarian Shelter Cluster Review" also highlights the operational challenges and best practices observed in shelter design and building. It delves into the logistical and strategic aspects of deploying shelters in emergencies, offering a comprehensive overview that helps stakeholders understand and navigate the complexities of shelter provision.

These sources enrich the academic discourse on shelter design and provision by offering complementary perspectives: Batchelor's (2011) focused empirical analysis and the broader operational insights from the Humanitarian Shelter Cluster Review. Evaluating these studies side by side underscores the diversity of research in this field and highlights the critical interplay between theoretical research and practical implementation. Such a synthesis is instrumental in advancing the development of more nuanced and effective shelter policies and practices responsive to the varying conditions and needs encountered in humanitarian crises.

In this thesis, the literature review's advocacy for continuous learning, shelter adaptation, and adopting evidence-based practices in the humanitarian shelter sector emerges as a crucial outcome. The review methodically examines existing research, highlights successful strategies, and identifies gaps in current shelter responses. For instance, by analyzing studies such as Batchelor's (2011), which provide empirical evidence on the effectiveness of different shelter types, the thesis identifies best practices that help refine future shelter provision. It also underscores operational challenges, like those revealed in the "Humanitarian Shelter Cluster Review," that can impede effective shelter deployment. This comprehensive synthesis points to the need for adaptable shelter strategies that respond to evolving circumstances. It further emphasizes the improvement of shelter policies and practices to better support displaced populations' recovery, well-being, and resilience. Thus, the literature review enriches academic discourse and aims to influence practical improvements in the shelter design and provision sector by advocating for policies more aligned with the complex realities of humanitarian crises and the needs of affected communities.

Table 1: Various settlement options with their most frequently associated shelter solutions (UNHCR, n.d.b).

Settlement	**Most frequently used Shelter Solutions**
Planned and managed camps	Tents, shelter kits, plastic sheeting, transitional/temporary shelters, local construction materials
Hosting villages	Shared accommodation or shared property: Plastic sheeting, shelter kits, local construction (one room), cash assistance
Dispersed self-settlement without legal status	Tents, plastic sheeting, shelter kits, cash assistance
Short-term land, house, apartment, or one-room tenant	Individual or shared accommodation: Cash assistance, plastic sheeting, shelter kits, local construction

Collective centres, non-functional public buildings, and transit centres	One-room accommodation: Plastic sheeting, shelter kits, local construction (adaptation)

Table 1 categorizes various settlement options and associates them with the most frequently used shelter solutions according to UNHCR guidance. This classification is vital for understanding the diversity of shelter approaches based on settlement types.

Planned and Managed Camps: These camps are systematically organized and offer structured services. Tents, shelter kits, plastic sheeting, and local construction materials are standard solutions in these camps, providing flexibility and adaptability to varying concerns, needs, and conditions.

Hosting Villages: Displaced individuals integrate into existing communities in these settings, often sharing accommodation. Shelter solutions used in hosting villages include plastic sheeting and shelter kits to create additional private spaces. Cash assistance also helps alleviate the cost of local housing.

Dispersed Self-Settlement without Legal Status: Individuals in these settlements find housing solutions without formal support, often using tents, plastic sheeting, or shelter kits to create their own shelters. Cash assistance is crucial here for securing basic shelter needs autonomously.

Short-term Land, House, Apartment, or One-room Tenant: This shelter solution refers to the rental or temporary occupation of existing structures. Cash assistance can facilitate access to housing, and shelter kits or plastic sheeting can be used for minor adaptations.

Collective Centers, Non-Functional Public Buildings, or Transit Centers: These are often makeshift solutions using available buildings.

Shelter kits and plastic sheeting are used in these settings to help create individual living spaces within larger structures.

This study focuses on "planned and managed camps" and "dispersed self-settlements without legal status," as they represent critical contexts where establishing new shelters is crucial in the broader narrative of humanitarian response strategies. These two settings offer a contrasting view of shelter solutions, each having its unique challenges and opportunities for enhancing the effectiveness of shelter interventions. The emphasis on individual family shelters is a testament to these structures' importance in providing safety, security, privacy, and maintaining family cohesion, which are fundamental aspects of human dignity and psychological well-being, particularly in times of crises. The design and construction of these shelters should resonate with the cultural norms and practices of their occupants, advocating for the use of locally sourced and abundantly available materials and traditional building techniques whenever feasible. This approach fosters a sense of belonging, normalcy, and acceptance among displaced populations and encourages community participation and ownership, which are crucial for the sustainability and success of shelter interventions. This study leverages these considerations to propose shelter solutions that are practical, secure, and culturally sensitive. Moreover, the suggested shelter solutions emphasize environmental sustainability, therefore contributing to a more holistic understanding of shelter provision in humanitarian crises.

The comparative analysis table of shelter solutions below combines information from the UNHCR's "Emergency Handbook" and the "Global Shelter Cluster 2023 Achievements Report." It provides an overview of each shelter type's pros and cons, along with insights on how GSC's strategies might help mitigate some of the cons.

Table 2: Comparative analysis of shelter solutions in humanitarian crises (Global Shelter Cluster, 2023 and UNHCR, n.d).

Shelter Solution	**Pros (UNHCR)**	**Cons (UNHCR)**	**Insights on Mitigation Con (GSC)**
Family Tents	Lightweight, proven design, good headroom, winterizable, large production capacities.		
Plastic Sheeting	UV-resistant, heavy-duty, lightweight, flexible, large production capacities.	Environmentally harmful due to collecting wood for frames.	Advocates for greener practices and sustainable materials for support frames.
Materials and Tools for Construction (Shelter Kits)	Local materials are best, culturally sensitive, and socially appropriate.	Requires time and training.	Focuses on disability inclusion and local adaptation to enhance training and material suitability.
Prefabricated Shelters and Containers	Permanent or semi-permanent, easy to maintain, long-lasting, reusable materials.	High costs, long shipping and production times, transport and assembly challenges, and cultural inappropriateness.	Aims to integrate environmental considerations and adapt designs to be culturally appropriate.
Rental Subsides	Greater independence, community integration, and	Difficult to monitor standards, potential market exploitation.	Implements cash programming strategies to ensure standards

	income influx to host communities.		and reduce exploitation.

The table above highlights the unique advantages and challenges of different shelter options. It explores how strategic initiatives by the Global Shelter Cluster aim to address and mitigate some of the cons associated with each shelter type. This integrated perspective allows humanitarian agencies to consider practical and strategic dimensions when planning for shelter responses.

Overall, Table 2 outlines the pros and cons of different shelter solutions, each with significant implications for the quality of life of displaced populations.

Family Tents are portable and quick to deploy, ideal for immediate needs. However, they may suffer from durability issues and provide limited insulation, which can be problematic in harsh weather conditions.

Plastic Sheeting is versatile and crucial in many operations, especially as it offers rapid coverage; however, it relies on additional materials for structural support, potentially leading to environmental harm due to the degradation of building materials if not managed sustainably.

Materials and Tools for Construction (Shelter Kits) enable tailored solutions that utilize locally sourced and abundantly available materials, allowing shelters to be adapted to specific environmental and cultural conditions. Nevertheless, assembling these kits requires considerable time and expertise, which can delay shelter provision.

Prefabricated Shelters and Containers offer a durable and reusable solution, yet their high cost, transportation challenges, and potential

misalignment with local cultural norms can limit their applicability in specific contexts.

Rental Subsidies funnel resources into host communities, providing a pathway to greater integration and independence. Nonetheless, they pose significant challenges in monitoring standard compliance and can inadvertently disrupt local markets and economies.

In Lebanon, where the diverse needs of Syrian refugees necessitate a carefully considered approach, understanding the nuances of these sheltering options is critical. Selecting the right strategy can be tedious as it requires balancing immediate relief needs with sustainable, long-term housing solutions, ensuring that shelter interventions effectively address displaced populations' urgent and ongoing needs.

The "Shelter Sector Strategy for 2014" by the Inter-Agency Shelter Sector Working Group-Lebanon and the "Evaluation of Lebanon Host Communities Support Project (2019-2022)" focus specifically on addressing the shelter needs of Syrian refugees within Lebanon's unique context, reflecting a targeted approach that incorporates local, legal, and social constraints, urban challenges, and the need to cater to dense refugee populations. In contrast, general literature on shelter solutions found in documents such as the UNHCR Emergency Handbook and reports from the Global Shelter Cluster provide broader guidelines that can be replicated and applied across diverse global settings. These sources typically discuss shelter options, the sustainability of these diverse options, and community involvement, thus promoting shelter adaptability to various environments. Lebanese documents specifically delve into strategies particularly viable in Lebanon, like rental subsidies and urban shelter upgrades, which are closely integrated with national policies and local economic impacts. They also feature country-specific timelines and frameworks for implementation, which are essential for

monitoring progress and adapting strategies to the evolving needs of refugees in Lebanon, thereby aligning international best practices with local realities to support the displaced Syrian population effectively.

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These documents offer a detailed recount of the strategies that can be employed and the myriad challenges encountered by the refugees and the host communities within Lebanon. They elucidate the multifaceted approach that Lebanon has adopted, encompassing emergency shelters, transitional housing, and longer-term settlement solutions to accommodate the diverse needs of the displaced Syrian population. The analysis provided in these documents sheds light on the operational complexities, resource constraints, and socio-political dynamics that shape the shelter responses in Lebanon. By integrating these insights, this study aims to enrich the discourse on shelter provision, highlighting the necessity of context-sensitive, collaborative, and adaptive strategies to meet the pressing needs of refugees while also considering the capacities and concerns of host communities. The Lebanese experience, as detailed in these sources, offers valuable lessons for the broader field of humanitarian shelter provision, emphasizing the importance of strategic planning, stakeholder engagement, and resilience in the face of protracted displacement crises.

The "Shelter Sector Strategy" document from 2014 focuses on Lebanon’s response to the Syrian refugee crisis. It offers a detailed plan to shelter Syrian refugees, tailored to Lebanon's unique socio-political and environmental context. This strategic document differs from broader shelter guidelines, such as those in the UNHCR Emergency Handbook or the Global Shelter Cluster reports, emphasizing a collaborative approach between the UNHCR and Lebanon’s Ministry of Social Affairs

(MoSA). This collaboration is critical due to Lebanon's complex governance structure and the number of refugees it hosts.

The strategy document emphasizes safe and dignified shelters as a basic human need and a cornerstone of personal security, safety, and dignity. It recognizes the crucial role of shelters in protecting displaced individuals from environmental hardships, promoting their health and well-being, and restoring a sense of normalcy. This aligns with the broader humanitarian principles discussed in the global shelter literature. Nevertheless, the Lebanese strategy is context-specific, with a clear focus on integrating cultural sensitivity, sustainability, and community engagement in a manner directly relevant to the local setting. This includes considerations of Lebanon's urban settings and dense population centers, which may not be as prominently addressed in more generic global documents.

The underpinning research includes analyses of past responses to refugee crises in Lebanon and the region, evaluations of shelter needs among Syrian refugees, and reviews of collaborative efforts between local governmental and non-governmental entities to ensure that the implemented strategies are grounded in current realities and capacities. This type of localized research supports the development of tailored interventions more likely to succeed than one-size-fits-all solutions.

Compared to the UNHCR and Global Shelter Cluster literature, which often proposes broad strategies applicable in diverse geographical and cultural settings, the "Shelter Sector Strategy" document dating back to 2014 provides a nuanced blueprint specific to Lebanon’s context. It incorporates the lessons from broader humanitarian shelter practices while adapting them to meet Lebanon's specific demands and challenges. Doing so guides the provision of immediate and effective shelters and contributes to the broader discourse on adapting global best

practices to fit specific local contexts. This approach ensures that the interventions are practical, applicable, and respectful of the host community's cultural norms and social fabric, thereby enhancing shelter efforts' overall efficacy and sustainability.

The Lebanon Host Communities Support Project outlines strategies to support Syrian refugees and Lebanese host communities. It was authored by the United Nations Development Programme (UNDP) and listed as the implementing partner. This Project was developed collaboratively by the UNDP, which acts as the implementing agency, along with input from various stakeholders, including government partners, local authorities, and other NGOs and international organizations that are part of the response and support mechanism. This document is a comprehensive plan to address various issues, ranging from shelter provision to social stability and improving living conditions for affected populations. It aims to detail and implement a balanced approach that meets refugees' immediate needs and fosters long-term resilience and self-reliance between refugees and host communities.

The focus on inclusivity and sustainability in the program design is crucial for ensuring that the proposed interventions have a lasting impact that benefits a broad spectrum of stakeholders and supports Lebanon's overall stability and prosperity in the face of ongoing refugee challenges. This strategic document is critical in coordinating the efforts of all parties involved, aligning their activities with the broader goals of enhancing the welfare of vulnerable populations and reinforcing community ties.

Integrating the insights from these documents with Table 1's data, it becomes evident that Lebanon's shelter response strategies are designed to address the diverse needs of refugees based on their settlement context. The documents underscore the importance of providing various

shelter solutions, ranging from emergency tents and shelter kits to more durable housing options like the rehabilitation of existing structures, which aligns with the needs of refugees living in planned and managed camps, hosting villages, dispersed self-settlements, and other types of settlements. These strategies reflect a commitment to ensuring that all refugees can access adequate shelters that meet their security, privacy, and dignity needs while also considering the socio-cultural and environmental implications of shelter interventions in Lebanon.Top of Form

2- Categories of Shelter

The research on shelters in humanitarian settings provides an in-depth examination of how shelters are thoughtfully planned, designed, and put into action to assist individuals who have been displaced from their homes. This body of work discusses various types of shelters, delving into the details of their design, the process of acquiring building materials, and shelters' effects on the people living in them. Much of this research is dedicated to transitional shelters, which are crucial for helping individuals transition from immediate emergency conditions to more stable and longer-term living situations. The studies highlight how the design of these shelters is evolving to better meet the needs of displaced individuals by focusing on shelters' adaptability to local environments, the use of locally sourced and accessible materials, and the importance of involving the community in the building process. This comprehensive research underscores the vital role that well-designed shelters can play in providing a sense of safety and security, ensuring refugees' privacy, and supporting the psychological and social well-being of displaced populations, ultimately contributing to their recovery and resilience.

Comprehensive Shelter Typologies: Shelters are categorized into various types, such as emergency shelters, temporary housing, transitional shelters, progressive shelters, and core shelters, each serving a unique purpose during different phases of the post-disaster recovery process. Emergency shelters provide immediate, short-term, and essential protection following a disaster. Temporary shelters, which are more durable than emergency shelters, can be quickly assembled and are cost-effective, making them suitable for short to medium-term use. For a longer duration, temporary housing, which includes rented accommodation or prefabricated units, offers displaced individuals a more standard living environment. A significant focus is placed on transitional shelters, which are versatile structures designed to aid refugees' transition from residing in temporary structures to living in more permanent housing solutions. These transitional shelters are adaptable and allow for modifications over time, with the active participation of future occupants in their construction and alteration, ensuring that these shelters meet their evolving needs (Basharwi et al., 2014).

Procurement and Construction Paradigms: Shelters are sorted into categories like emergency shelters, temporary shelters, temporary housing, transitional shelters, progressive shelters, and core shelters to understand the type of housing needed after a disaster. Emergency shelters are immediately used after a disaster, offering basic cover and protection. Temporary shelters are more stable and can be quickly and affordably set up, which is suitable for short-to-medium-term needs. Temporary housing is for a more extended period of time and might include rented or prefabricated units, giving people a more standard living situation. Transitional shelters, the main focus of this study, are designed to be flexible and help people transition from temporary to more permanent living situations. They can be modified as their

inhabitants' needs change, and their future residents are part of the building and modification processes. This user-centered design and involvement ensures that the shelters meet displaced populations' needs and preferences, making their transition smoother and more comfortable (Basharwi et al., 2014).

Transitional Shelter Design: Transitional shelters are a critical element in the range of shelter solutions, uniquely designed to adapt to the changing requirements of displaced populations. These shelters are pivotal for transitioning from temporary to more stable living conditions and are engineered for ease of assembly, disassembly, transport, and modification. This adaptability is crucial, as it facilitates a seamless shift towards more permanent housing solutions when suitable. The architecture of transitional shelters often features modularity and flexibility, allowing for easy expansion or alteration to meet the evolving needs of their inhabitants. This design approach reflects a broader trend in humanitarian shelter provision towards customization and adaptability, acknowledging that the circumstances of displaced individuals are dynamic and varied. Central to the modern discourse on transitional shelters, as highlighted in the literature and emphasized by the International Federation of Red Cross and Red Crescent Societies (2013), is the active participation of beneficiaries in the shelter's design and construction processes. This user-centered approach ensures that the shelters provide physical protection and align with the personal preferences, cultural norms, and practical needs of those who inhabit these shelters. By involving future shelter residents in the process of creating their living spaces, transitional shelters foster a sense of ownership, dignity, and community, thereby supporting displaced individuals' psychological well-being and autonomy as they navigate their path toward a more stable and permanent living situation.

Evolution in Shelter Design: The trend in shelter design within the humanitarian sector is progressively leaning towards solutions that are sustainable, adaptable, and culturally sensitive, marking a significant evolution in how shelters are conceptualized and implemented. This shift underscores a growing recognition that effective shelter solutions must be deeply attached to the environmental, social, and economic contexts of the regions where they are deployed. The emphasis on sustainability is evident in the increasing use of renewable, locally sourced, and abundantly available resources and the integration of energy-efficient designs, which reduce shelters' environmental footprint and ensure shelter interventions' long-term viability and cost-effectiveness.

Moreover, incorporating cultural and social considerations into shelter design is gaining traction, as shelters must do more than provide physical protection to their inhabitants; they must also act as socially and psychologically nurturing spaces for the displaced populations. By designing shelters that respect and reflect the cultural identities and social norms of the communities they serve, humanitarian efforts can foster a sense of dignity, comfort, and normality for individuals and families who have experienced displacement. This holistic approach to shelter design, which balances environmental sustainability with cultural and social sensitivity, is crucial for creating living spaces that genuinely support the well-being and recovery of displaced populations.

The research conducted by Conzatti et al. (2022) and published in the Journal of International Humanitarian Action provides a comprehensive analysis of how shelter design impacts the health of displaced populations, a crucial aspect often overlooked in humanitarian responses. This study emphasizes the critical factors of indoor air quality (IAQ) and internal temperatures, identifying them as critical

determinants of health within displaced communities' shelters. The systematic and bibliometric review methodologies allow for a deep dive into existing literature on this matter, highlighting the strengths of current research and the significant gaps that remain, particularly in linking shelter conditions directly to health outcomes (Conzatti et al., 2022).

Comparatively, while the Lebanon Host Communities Support Project (2019-2022) focuses on practical implementation strategies within a specific geopolitical and cultural context—Lebanon hosting Syrian refugees, in this case—it might lack the detailed empirical health-related research found in Conzatti et al.'s work. Indeed, the Lebanese project document outlines comprehensive shelter strategies addressing social stability; however, it does not appear to delve into the health impacts of shelter designs with the depth or research rigor found in Conzatti et al.'s reviewed academic article.

Moreover, Conzatti et al. (2022) highlight a crucial research opportunity: the need to delve deeper into transdisciplinary approaches to establish more explicit guidance and evidence on the relationship between shelter quality and health outcomes. This suggests that while the Lebanese strategy is robust in its community-oriented and culturally focused approach, it could benefit from integrating more detailed health impact assessments similar to those discussed by Conzatti et al. to enhance its shelter solutions' effectiveness and health outcomes.

This comparative analysis underscores the importance of grounding humanitarian shelter strategies in context-specific logistical and cultural considerations, as seen in the Lebanese approach and in robust empirical research that closely examines the health implications of shelter conditions. This combination would likely yield the most effective outcomes for displaced populations.

The "Mass Shelter Capability: Literature Review" report dating back to September 2015 and written by Thomas Abeling and Hugh Deeming extensively examines mass shelter strategies within the context of EU disaster preparedness, distinguishing itself from other research by considering planned camps as a strategic component of disaster management. The report utilizes a mixed-method approach that includes systematic and non-systematic reviews, allowing for a comprehensive assessment of the current landscape and identifying gaps in mass shelter capabilities (Abeling and Deeming, 2015). Its detailed analysis of case studies related to significant disasters, such as the 2002 European floods and Hurricane Katrina in 2005, offers practical insights and lessons learned that are crucial for refining shelter strategies. This practical orientation is complemented by the evaluation of existing guidelines and the formulation of tailored recommendations for the European context, which are vital for enhancing policy and operational frameworks. The proactive stance of the report in proposing new strategies and policies provides a valuable resource for policymakers, contrasting with the more theoretical focus that is typical of academic literature, which often prioritizes conceptual concerns over operational applications. Additionally, integrating findings from studies like Conzatti et al. (2022), which explore the health impacts of shelter design on displaced populations, could further enrich the strategic recommendations of the MaSC project report by ensuring that shelter interventions also address health and well-being needs effectively (Conzatti et al., 2022).

Anne Marie Loiselle's "Empathetic Design: Transitional Shelter" thesis offers a deep dive into architectural empathy. It focuses on how design can profoundly affect the lives of displaced and homeless populations by creating environments that meet these populations' immediate needs and foster a sense of dignity and hope. The thesis stresses that architecture should be responsive and sensitive to its users'

emotional, psychological, and spiritual needs, promoting an environment that shelters and supports recovery and personal growth (Loiselle, 2008).

Loiselle (2008) advocates empathetic architecture, which goes beyond physical structures to address the deeper needs of shelter inhabitants. By analyzing various case studies, like those of the Contra Costa County Transitional Shelter and the Plaza Apartments in San Francisco, Loiselle demonstrates how design elements can contribute to creating functional, healing, and empowering spaces for their residents. This approach significantly differs from conventional architectural designs, which often prioritize aesthetics and functionality over shelters' emotional and psychological impacts on users.

Furthermore, Loiselle's work (2008) ties into broader discussions about the role of architecture in social change, particularly in how the environment can shape the experiences of vulnerable populations. This thesis aligns with current research suggesting that well-designed spaces can significantly impact displaced individuals' health outcomes, social interactions, and overall quality of life.

Loiselle's in-depth examination (2008) presents a comprehensive review of empathetic design principles, providing a critical framework that could enhance and inform current strategies in humanitarian shelter design, as seen in various projects and research studies on the global stage.

Research Gaps and Future Directions

The existing body of literature on shelter solutions in humanitarian contexts offers a wealth of knowledge; however, some areas still warrant deeper exploration to enhance our understanding of humanitarian shelter solutions and improve practices. One such area is the long-term impact

of shelter solutions on the well-being and recovery of displaced populations. Investigating how different shelter types influence individuals' and communities' psychological, social, and economic recovery can provide critical insights for future shelter strategies.

Moreover, the potential for integrating new technologies and innovative building materials into shelter design represents a significant avenue for advancement. Exploring how cutting-edge construction techniques, sustainable materials, and intelligent design can improve shelters' efficiency, durability, and comfort could lead to groundbreaking solutions that better meet the needs of displaced populations.

Understanding the broader implications of shelter strategies on the social fabric of displaced communities and host populations is also vital. This includes examining how shelters affect community dynamics, integration processes, and social cohesion and how they can inform the development of more holistic and sustainable shelter interventions. Humanitarian efforts can enhance physical structures and facilitate community resilience building and harmony by considering the interplay between shelter solutions and social structures. This comprehensive approach to shelter provision, which considers long-term impacts, technological innovation, and social implications, is essential for crafting truly supportive and sustainable strategies for displaced individuals and communities.

In summary, the research surrounding shelters in humanitarian contexts is comprehensive and diverse. It addresses various aspects, from the categorization of shelters and procurement strategies to the principles of shelter design and the importance of involving beneficiaries. Among the various shelter types, transitional shelters stand out as a focal point, encapsulating the essential principles of adaptability, sustainability, and participatory involvement. These

principles are increasingly acknowledged as crucial for developing effective and compassionate shelter solutions.

As the domain of humanitarian shelter continues to progress, the imperative for continuous research and innovation becomes increasingly apparent. Such endeavors are essential to navigating the intricate challenges of providing shelter amidst humanitarian crises. Future research and advancements are crucial to enhance our understanding and execution of shelter strategies, ensuring that they are physically robust and conducive to the broader objectives of recovery and resilience for displaced communities.

The ongoing evolution in this field points towards a more nuanced understanding of adequate shelter provision. This approach emphasizes that shelters should go beyond physical structures to support the overall well-being, dignity, and recovery of individuals and communities affected by crises. This comprehensive approach aims to create shelters that are not just places of temporary refuge but that act as stepping stones towards rebuilding stability, recovery, and a restored sense of normalcy for displaced populations.

The document "Transitional Shelter in Post-Disaster Contexts" comprehensively reviews the strategies and outcomes associated with transitional shelters in response to natural disasters in developing countries. It elucidates the importance of shelters in ensuring survival, security, and resistance to ill health, especially in post-disaster contexts where victims face extreme vulnerabilities (Rohwerder, 2016).

Three primary methodologies of transitional shelters are discussed in the document, each with its distinct operational practices. The Shelter Centre and IOM guidelines emphasize an incremental process where shelters evolve into permanent structures that can be relocated or reused for other purposes. The IFRC approach describes a sequenced approach

from emergency shelters to permanent housing, noting that transitional shelters should be upgradable. USAID focuses on addressing immediate to medium-term needs with options for integrating salvaged materials and ensuring compliance with international standards (Rohwerder, 2016).

Critically, the document highlights that transitional shelters are more than temporary solutions; they play a pivotal role in the longer-term recovery and resilience of affected communities. This involves ensuring that shelters are culturally appropriate, utilizing local materials and labor, and are planned to reduce future disaster risks. Several lessons are also highlighted in the document, such as the cost-effectiveness of transitional shelters when implemented correctly, the importance of community involvement in planning, designing, and building shelters, and the challenges of managing expectations and legal frameworks that impede adequate shelter provision (Rohwerder, 2016).

Furthermore, case studies from various countries like Bangladesh, Pakistan, and Haiti illustrate diverse applications of transitional shelter strategies and underscore the complexity of responding effectively to varied disaster contexts. These cases reveal the need for flexibility in shelter programs to adapt to each disaster-affected area's specific cultural, economic, and environmental conditions (Rohwerder, 2016).

This document, therefore, serves as a critical resource for understanding the multifaceted nature of transitional shelters and provides valuable insights into how these structures can be integrated into broader disaster response and recovery frameworks.Top of Form

Transitional Shelter

As outlined by the International Organization for Migration (IOM) in 2012 and enriched by the IFRC's comprehensive examination of

shelter designs in 2013, the transitional shelter approach represents a significant paradigm in humanitarian response to displacement caused by conflicts and natural disasters. This approach, grounded in a blend of field experiences and multi-agency consensus, underscores the importance of shelters that provide immediate relief and support refugees' transition toward permanent housing solutions.

Defining Transitional Shelters: The IFRC's definition of transitional shelters emphasizes their role as a bridge between emergency shelters and permanent housing. These shelters are designed to be adaptable, upgradable, and relocatable, meeting the immediate needs of displaced populations while offering a pathway to more stable, long-term housing solutions (IFRC, 2013). This definition aligns with the broader humanitarian goal of supporting displaced individuals through various recovery phases while ensuring that shelter strategies are integrated into the continuum of care and support.

The documents "Transitional Shelter in Post-Disaster Contexts" and "Tarpaulins, Transitional Shelters or Permanent Houses" effectively illustrate the implementation of the foundational guidelines established by the International Organization for Migration (IOM) and the International Federation of Red Cross and Red Crescent Societies (IFRC) within the realm of transitional shelters. For example, "Transitional Shelter in Post-Disaster Contexts" discusses the importance of adaptable and sustainable shelter solutions, mirroring the IOM's strategy for shelters that evolve alongside the changing needs of affected populations (Rohwerder, 2016). Similarly, the IFRC's focus on flexible shelters, which can be upgraded, relocated, or reused, resonates throughout the strategies detailed in these studies, ensuring that shelters meet the transitional needs of displaced communities (IFRC, 2013). Furthermore, Batchelor's research in "Tarpaulins, Transitional Shelters

or Permanent Houses" presents empirical evidence from Indonesian case studies, aligning with the IOM and IFRC's advocacy for the use of local materials and community participation in designing and building shelters, underscoring their critical role in effective disaster recovery (Batchelor, 2011). These documents stress the relevance of the IOM and IFRC guidelines, showcasing their practical applications in real-world settings and their contribution to the discourse on effective disaster response strategies.

Shelter design plays a crucial role in enhancing the resilience and well-being of displaced populations. Research indicates that well-thought-out shelter designs provide immediate relief and facilitate longer-term recovery and community integration (Batchelor, 2011). Effective shelter solutions must consider factors such as cultural appropriateness, environmental sustainability, and scalability to adapt to the evolving needs of affected populations (Rohwerder, 2016). For instance, transitional shelters, which bridge the gap between emergency response and permanent housing, emphasize adaptability and upgradability, reflecting an understanding that shelter needs may change over time (IFRC, 2013). Furthermore, incorporating locally sourced and abundantly available materials and involving the community in the shelter design process is crucial for ensuring that shelters are physically durable and socially sustainable (Batchelor, 2011). By focusing on these aspects, shelter design can significantly contribute to creating a sense of normalcy and security for displaced individuals, ultimately supporting their dignity and recovery.

Considerations in Transitional Shelter Design: The design of transitional shelters is informed by many factors that reflect the complex interplay of environmental, cultural, and economic considerations. Life span, shelter size, privacy, security, cultural appropriateness, ventilation,

thermal comfort, environmental impact, and cost are pivotal variables in shaping shelter solutions that are functional and respectful of beneficiaries' dignity and cultural identity (IFRC, 2013). For instance, the design must account for local climatic conditions, ensure adequate ventilation and thermal comfort, and be sensitive to cultural space utilization and privacy norms.

The Evolution of Transitional Shelter Guidance: The IOM's detailed guidelines on transitional shelters, developed in collaboration with numerous agencies and specialists, represent a consolidated effort to capture and formalize the collective wisdom and best practices in the field (IOM, 2012). This document provides a framework for designing and implementing transitional shelters. It emphasizes the process' incremental nature, encouraging a participatory approach where beneficiaries are actively involved in the shelter's design and construction.

The design of shelters is pivotal in disaster relief operations and emergencies, playing a key role in ensuring the safety, dignity, and recovery of affected populations. Effective shelter design must be multifaceted, incorporating environmental, economic, technical, and sociocultural considerations to optimize its functionality and adaptability (Bashawri et al., 2014). This encompasses designing for fluctuations in local climatic conditions, utilizing locally available materials and skills, and aligning shelter designs with displaced populations' cultural and social norms. Additionally, considerations for the future reuse and storage of materials can enhance the sustainability and cost-effectiveness of shelters.

Shelter design goes beyond physical protection; it also supports displaced individuals' social and psychological needs, helping them recover from trauma and regain a sense of normalcy. Therefore, shelters

should facilitate social interactions and foster community building among residents. This holistic approach to shelter design provides refuge. It supports individuals' overall well-being and long-term recovery, aiding their transition from emergency conditions to more stable, long-term living arrangements.Top of Form

Transitional Shelter Characteristics: The IOM identifies five stable characteristics of transitional shelters: upgradability, reusability, transportability, income generation potential, and recyclability. These characteristics ensure that shelters can adapt to changing circumstances and needs, offer a sustainable solution, and contribute to displaced communities' broader recovery and rebuilding efforts (IOM, 2012).

Principles of Transitional Shelter: The ten principles outlined by the IOM serve as a comprehensive guide for assessing and implementing transitional shelter strategies. These principles include community involvement, vulnerability reduction, standard agreement, choice maximization, and planning for site and reconstruction. They highlight the multifaceted nature of shelter provision, where logistical, technical, and social elements converge to create practical and empowering solutions for the affected populations (IOM, 2012).

Challenges and Misconceptions Related to Transitional Shelters: While transitional shelters are widely known in the humanitarian sector, misconceptions persist, particularly regarding prefabricated shelters. Often considered synonymous with transitional shelters, prefabricated solutions may not align with the incremental and participatory ethos of the transitional approach. The lack of beneficiary involvement and the import of ready-made products can limit the adaptability and cultural appropriateness of the shelters, underscoring the need for a clear distinction in shelter categorization and implementation strategies.

Application and Contextualization: In this study, the focus on the transitional shelter approach and the IOM's ten principles is intentional, recognizing the approach's ability to balance immediate needs with long-term recovery objectives. The transitional shelter offers a flexible, sustainable, and culturally sensitive solution, aligning with the broader goals of humanitarian shelter provision. By adopting this approach, the proposed shelter prototype aims to address the nuanced requirements of displaced populations, ensuring that the shelter strategy responds to an immediate need and is a step towards durable, dignified living conditions.

In conclusion, the research on transitional shelters represents a critical area of humanitarian scholarship, offering insights and guidance on how to best support displaced populations through a nuanced, context-sensitive, culturally aware, and participatory approach to shelter provision. The evolution of this research reflects a broader shift in the humanitarian sector towards more sustainable, adaptive, and inclusive strategies, ensuring that shelter solutions are not merely functional but also integral to the recovery and resilience of affected communities.

The paper "Designing a Transitional Shelter for Disaster Affected Communities" (Jayathilake et al., 2019) comprehensively analyzes the process and considerations involved in designing transitional shelters for communities affected by disasters. The research emphasizes the importance of creating quick-to-assemble shelters suitable for families for 1-2 years. These shelters must be stable against natural disasters, have minimal environmental impact, and be built at the lowest possible cost. The paper mainly discusses the necessity of such shelters due to the increasing frequency of disasters and the prolonged time required to construct permanent housing, which can lead to social and mental issues for affected communities living in temporary accommodations. The

study also highlights the different types of post-disaster shelters and the role of transitional shelters in affected populations' recovery process, noting the importance of considering various factors related to shelter design, including lifespan, size, shape, privacy, security, cultural appropriateness, ventilation, thermal comfort, environment, and cost (Jayathilake et al., 2019).

The article titled "A Comparative Analysis of Coordination Participation and Training in Post-Disaster Shelter Projects" by Opdyke et al. (2018) examines the factors that influence the success of post-disaster shelter projects. It focuses on coordination, participation of beneficiaries, and training. The study analyzes nineteen shelter projects in the Philippines following Typhoon Haiyan, utilizing a fuzzy-set qualitative comparative analysis to determine how these factors, individually and in combination, affect the resilience and sustainability of community infrastructure systems. The research highlights the significance of early household involvement in shelter planning and design, subsequent training, and its role in improving recovery outcomes. The authors underscore the need to support household sheltering processes, link project processes strategically across phases, and align humanitarian actions with long-term development (Opdyke et al., 2018).

3- Environmental, Economic, Technical, and Sociocultural Aspects in Shelter Design

The literature on shelter design in humanitarian contexts emphasizes a multidimensional approach that transcends the mere construction of a physical structure. It encompasses environmental, economic, technical, and sociocultural factors, pivotal in ensuring that shelters provide refuge and foster a sense of belonging and well-being for displaced individuals. This expanded review delves deeper into how these factors are

integrated into the shelter design process, drawing on various academic sources and case studies.

Environmental Considerations: The environmental impact of shelters is a significant concern to international organizations, architects, and researchers, with studies advocating for climate-responsive designs having minimal ecological footprints. Dabaieh's (2017) concept of an "eco-cycle refugee emergency shelter" epitomizes this approach, aiming for zero emissions, zero waste, and minimal environmental impact post-demolition. The use of bio-natural materials, as explored by Kuittinen and Winter (2015), further exemplifies a shift towards more sustainable shelter solutions that reduce shelters' carbon footprint and promote ecological balance.

Economic Aspects: The cost of shelter construction is a critical factor influencing design decisions. Alshawawreh's (2019) analysis of global shelters highlights the variation in shelter costs, which include considerations like material transportation, labor costs, and the scale of construction. The economic feasibility of shelters is crucial for ensuring that limited humanitarian resources are utilized efficiently, providing the maximum benefit to the maximum number of displaced persons.

Technical Factors: Technical considerations encompass the design, size, and layout of shelters, which need to be adapted to the specific conditions and needs of the displaced population. Albadra et al. (2020) discuss the participatory design approach, which shows how involving beneficiaries in the design process can lead to shelters better suited to their occupants' needs, enhancing these shelters' functionality and livability.

Sociocultural Aspects: Cultural sensitivity in shelter design is paramount to ensure that displaced individuals feel connected to their temporary homes. Alshawawreh et al. (2020) and Dabaieh and Alwall

(2018) emphasize the importance of designing shelters that respect the cultural norms and practices of the displaced population. This includes considerations related to communal spaces, privacy concerns, and the inclusion of cultural design elements that resonate with the occupants' heritage.

Case Studies and Practical Applications: Various case studies provide insights into the practical application of these principles. Ravina and Shih (2017) discuss the design and construction of transitional shelters in the Philippines post-Typhoon Haiyan, highlighting the benefits of using locally sourced materials and involving beneficiaries in the design process. Similarly, the modifications made by refugees in the Azraq and Zaatari camps in Jordan, as noted by Albadra et al. (2020), illustrate the dynamic nature of shelter usage and the need for adaptable designs.

Participatory Design: The merits of participatory design (PD) in shelter provision cannot be overstated. By engaging displaced individuals in the design process, humanitarian agencies can create shelters that are not only culturally appropriate but also enhance the occupants' mental health and sense of ownership. However, as Albadra et al. (2020) point out, the PD approach can be challenging due to logistical, time, and communication barriers. Nonetheless, its increased satisfaction rates and sociocultural appropriateness are significant benefits.

Future Directions: Looking forward, shelter design in humanitarian contexts is moving towards more integrated, sustainable, and occupant-centered approaches. Innovations in the use of building materials, construction techniques, and participatory design methodologies offer promising avenues for developing shelters that meet the complex needs of displaced populations. Continued research and collaboration among

humanitarian agencies, academic institutions, and affected communities are essential for advancing this field and ensuring that shelter solutions are practical, efficient, humane, and dignified.

The literature on shelter design highlights a comprehensive approach that balances environmental sustainability, economic viability, technical functionality, and sociocultural sensitivity. By considering these factors, humanitarian agencies and designers can create shelters that provide more than just physical protection—they can offer a space that supports the psychological and social well-being of displaced individuals, facilitating their recovery and transition to more stable living conditions.

Review of Current Prefabricated Shelters

In her study, Lara Alshawawreh (2019) comparatively analyzes global shelter designs between 2007 and 2016. Her research highlights the wide range of adaptability considerations, shelter costs and sizes, and building material performance in prefabricated shelters. While these shelters can be deployed faster and are more durable than tents, they incur high costs related to procurement and transportation and lack climate adaptability and cultural appropriateness. Many designs are difficult to modify by refugees, or their alterations lead to sub-optimal performance. These shelters also compromise on thermal comfort, privacy, and ventilation.

The IKEA Better Shelter, often discussed in humanitarian shelter provision, highlights the strengths and weaknesses of prefabricated shelter models. In his research, Tom Scott-Smith (2019) points to its limiting and inadequate one-size-fits-all contribution. For instance, in Switzerland, the IKEA Better Shelter failed fire tests. In Lebanon, it is perceived as a luxurious and permanent shelter solution, raising political sensitivities. This shelter design raises additional concerns related to assembly time, fire safety, wheelchair inaccessibility, and restricted

modularity. Withal, this demonstrates the limits of prefabricated shelter designs in meeting climatic and cultural needs as well as political demands in various country contexts.

In relation to this thesis, the existing gaps in current prefabricated shelter designs usher in the need for adaptable, cost-efficient, climate-sensitivie, modular, and safe transitional shelter design. This alternative design goes beyond the one-size-fits-all solution. It addresses challenges related to user-driven alterations, sustainability, climate suitability, and complies with accessibility, safety, and ventilation standards.

4- Camps

While vital for immediate protection and humanitarian aid, refugee camps encompass complex challenges beyond basic shelter and safety. These settlements are not just clusters of tents and makeshift shelters; they are dynamic communities where displaced individuals and families strive to maintain a sense of normalcy amidst turmoil. Managing these camps involves a delicate balance of humanitarian aid, environmental stewardship, and accounting for the socio-economic dynamics of the refugee population and the host community.

Refugee camps in the Middle East and North Africa (MENA) region have evolved significantly yet still face numerous challenges. The growing number of forcibly displaced people due to conflicts and natural disasters in countries like Syria, Sudan, and Libya has intensified the demand for sustainable and long-term shelter solutions. As Sarkar (2024) highlights, the demographic pressures in camps like Zaatari in Jordan, where children make up half of the population, underscore the need for enhanced support systems and infrastructures to cope with long-term displacement.

Over time, refugee camp development has transitioned from temporary emergency encampments to complex settlements that often

last decades, necessitating a shift from short-term relief operations to sustainable community development (Dantas and Amado, 2023). This includes integrating better planning strategies and management of camps, recognizing the semi-permanent nature of many of these settlements, and adopting new strategies to improve living conditions within the camps. The chronic challenges faced by camps, such as those housing Palestinian refugees, show a dire need for policies that go beyond immediate relief and address the socioeconomic and environmental impacts of long-term encampments. Thus, aligning contemporary humanitarian responses with long-term urban planning and community integration strategies becomes crucial (Sarkar, 2024; Dantas and Amado, 2023).

Environmental Stewardship in Camp Management: The environmental impact of refugee camps is a critical concern, often characterized by deforestation, water pollution, and waste management challenges. Kibreab (1997) argues that the environmental consequences of refugee movements reflect broader geopolitical and economic factors. This insight urges a reevaluation of environmental strategies adopted in camps, emphasizing the importance of sustainable practices. For instance, implementing waste recycling programs, establishing green zones, and utilizing solar energy can significantly reduce the ecological footprint of these settlements.

Socio-Economic Impacts on Host Communities: Refugee camps can have profound socio-economic impacts on host communities. These effects can be positive, such as increased demand for local goods and services, or negative, such as competition for resources and employment. Bridging the gap between refugees and host communities through joint economic ventures and community projects can foster mutual understanding and cooperation. Additionally, vocational training

programs within camps can equip refugees with skills that are beneficial for the camp economy and the host community, therefore promoting economic integration and self-reliance.

Psychological and Social Well-Being of Refugees: The psychological and social well-being of refugees in camps is a significant concern, often overshadowed by immediate physical needs. Prolonged stays in camps can lead to feelings of uncertainty, dependency, and loss of agency, thus impacting mental health. Providing access to education, recreation initiatives, and community-building activities can enhance displaced populations' sense of normalcy and dignity. Moreover, involving refugees in the shelter planning process and management of the camp fosters a sense of ownership and empowerment, contributing to their overall well-being.

Sustainable Environmental Practices: Sustainable environmental practices are crucial for the long-term viability of refugee camps. Beyond the use of renewable energy sources and creation of waste management systems, there is a need for comprehensive environmental education programs within the camps. These programs can raise awareness among refugees about the importance of environmental conservation, encouraging them to participate actively in sustainable practices.

Integration and Future Planning: Looking toward the future, integrating refugees into host communities presents a viable alternative to traditional camps. This approach alleviates the burden on a single location and promotes cultural exchange and mutual enrichment. Planning for the eventual integration of refugees into host societies from the outset can lead to more sustainable and dignified living conditions for displaced populations, reducing reliance on temporary camps.

In conclusion, refugee camps are complex ecosystems where challenges vary, therefore requiring nuanced and integrated approaches to overcome them. A holistic perspective is essential, integrating environmental sustainability, socio-economic impacts, and the psychological well-being of refugees. By adopting sustainable practices, fostering community integration, and prioritizing the dignity and autonomy of refugees, the international community can improve the effectiveness and humanity of its response to displacement crises. As we continue to navigate the challenges of global displacement, we must strive for solutions that honor the resilience and rights of refugees while promoting environmental sustainability and social cohesion.

5- Standards and Guidelines

While there are no universally accepted standards for designing shelters in contexts of forced displacement, various humanitarian organizations and agencies have developed guidelines to inform and improve shelter design. Notable among these are the International Federation of Red Cross and Red Crescent Societies (IFRC, 2013) guidelines and the Transitional Shelter Guidelines produced by the Shelter Centre and the International Organization for Migration (IOM, 2012). These resources offer crucial insights and recommendations to aid in the creation of effective and responsive shelter solutions for displaced populations.

The Sphere Handbook, widely recognized in the humanitarian sector, serves as a primary reference for many of these guidelines, underpinning the principles and practices outlined in them. It provides a comprehensive framework integrating considerations for the dignity, safety, and well-being of affected populations into shelter design. As such, the Sphere Handbook is frequently cited and utilized by various

organizations and aid agencies as a benchmark for quality and accountability in humanitarian response, including shelter provision.

Organizations and practitioners in humanitarian aid consistently seek to align their shelter design strategies with the Sphere Handbook and above-mentioned guidelines, aiming to ensure that their interventions are both practical and respectful of the rights and needs of displaced individuals. By doing so, the humanitarian community strives to enhance the living conditions and overall resilience of displaced populations in times of crisis.

The Sphere Handbook: The Sphere Project, now known as the Sphere, was initiated in 1997 by a group of Humanitarian NGOs and the Red Cross and Red Crescent Movement to develop universal standards in core areas of humanitarian response (Sphere Association, 2018). The handbook gathers the insights of thousands of individuals from nearly 450 organizations across 65 countries worldwide. Sphere focal points dispersed across the globe hold face-to-face consultations to revise the handbook. These consultations include individuals, civil society organizations, UN agencies, and governments.

The Sphere Handbook (2018) is pivotal in guiding humanitarian responses in disaster and conflict scenarios, emphasizing the improvement of response quality and reinforcing the accountability of humanitarian actors towards affected individuals (Sphere Association, 2018). This handbook is grounded in a philosophy that rests on two foundational beliefs that are central to the humanitarian sector's approach to crisis management. These beliefs focus on the dignity of individuals and the necessity of a response that is both effective and empathetic, ensuring that aid is delivered in a manner that respects and upholds the human rights of the affected populations.

To support these core beliefs, academic research in humanitarian assistance often references the Sphere Handbook's (2018) principles. For instance, disaster response and conflict management studies frequently cite the Sphere standards as benchmarks for best practices in humanitarian interventions. This academic engagement with the Sphere Handbook (2018) underscores its significance in both practical and scholarly contexts, highlighting its role in shaping an ethically grounded and rights-based approach to humanitarian aid. According to the Sphere Association (2018), the Sphere philosophy is based on two core beliefs:

1- People affected by disaster or conflict have the right to live in dignity and, therefore, the right to assistance, and
2- All possible steps should be taken to alleviate human suffering from disaster or conflict.

With this goal in mind, the Sphere Association developed the Humanitarian Charter which defines a set of humanitarian standards to apply during humanitarian responses. The Sphere Association (2018) emphasizes four technical areas within its humanitarian standards:

1- Water supply, sanitation, and hygiene promotion (WASH)
2- Food security and nutrition
3- Shelter and settlement
4- Health

This thesis analyzed the “shelter and settlement” area to extract the guidelines that were used for designing the T-shelter prototype for Syrian refugees in Lebanon. The ‘shelter and settlement’ section consist of seven standards: planning, location, settlement planning, living space, household items, technical assistance, security of tenure, and environmental sustainability (Sphere Association, 2018).

Crises affect people in many ways, and each affected individual has different needs related to shelter and settlement. Working with groups facing specific barriers to shelter access is important in the planning phase. These include people with disabilities, the elderly, and female heads of households. Working with local and national authorities is equally prominent in assessing shelter and settlement needs and capacities. Another essential element is considering the crisis' direct and indirect effects on people's living conditions, including its economic, political, and social impacts. Cost efficiency, timing, speed, and technical quality should be optimized in shelter design (Sphere Association, 2018).

Location and settlement planning standards emphasize the provision of accessible living spaces to the affected population, securing access to essential services and livelihoods. The minimum surface area of a planned or self-settled settlement should be 45m² per person and 30m² per person where services are provided outside the settlement. For fire safety, the distance between every two shelters must be at least 2 meters (Sphere Association, 2018).

Living space is critical for people's well-being. It is a basic human need and right to have a safe place to live with family and perform various essential activities. According to the Sphere Association (2018), affected people must have access to living spaces that are safe and adequate for daily activities, respecting their local culture and way of life. To accommodate their residents' daily activities (food preparation and eating, dressing, washing, and storing food), shelters need an enclosed space with an adequate floor area of 3.5m² per person or 4.5m² per person in cold climates. The minimum height of the shelter should be 2 meters or 2.6 meters in hot climates (Sphere Association, 2018). Additionally, shelters must provide physical safety, dignity, privacy, and

protection from weather elements, as well as appropriate lighting, ventilation, and thermal comfort. The standard also recommends using cultural and environmentally sustainable building solutions, building materials, and techniques (Sphere Association, 2018).

Household items should be provided and included in the plan. This standard relates to sleeping, eating, drinking, thermal comfort, food preparation and storage, lighting, and personal clothing. For example, artificial lighting should be provided to ensure personal safety in and around settlements where general lighting is unavailable (Sphere Association, 2018).

Technical assistance is an integral part of the shelters and settlements response. It revolves around assisting affected people in improving the quality and safety of their shelter and settlement as well as supporting and enhancing the self-recovery of affected people. Affected households or communities must be actively involved in selecting the shelter design, site layout and materials, and in supervising or executing the building of the shelter (Sphere Association, 2018). This standard encourages using locally sourced and sustainable materials to maintain and improve the shelter. Building materials and construction methods should allow affected people to adjust, maintain, and improve their shelter by properly using safe, available, affordable, and familiar tools. Having building materials readily available will speed up the construction process and allow affected people to build their own shelters. Additionally, the engagement of affected people is critical in the design and construction phase. Nevertheless, while the Sphere standards offer an essential framework for humanitarian responses, studies have highlighted significant gaps in their practical application, particularly in protracted crises and transitional shelter design.

6- Critical Gaps in Sphere Standards

Several studies reveal that the Sphere guidelines often fail to address the long-term needs of displaced populations effectively. Köseoğlu and Demiray (2014) examined the implementation of the Sphere standards in Turkish refugee camps and identified significant shortcomings in shelter design. Despite compliance with hygiene and food distribution standards, shelters frequently lacked durability and adaptability, exposing refugees to harsh weather conditions and failing to accommodate their prolonged stays. These findings underscore the need for shelters that have extended lifespans and greater resilience, particularly in times of protracted crises.

Similarly, Patel and Chadhuri (2019) criticized the Sphere standards for their aspirational nature, highlighting their inadequacy in addressing the realities of urban informal settlements. In their study of settlements in Nairobi, Kenya, key metrics such as living space and shelter quality fell far below the Sphere benchmarks, revealing a critical gap in the adaptation of these guidelines to urban contexts.

Babister and Kelman (2002) further emphasized that emergency shelters are often conceptualized as static objects rather than dynamic systems that can transition into sustainable housing. Case studies from Macedonia and Afghanistan showed that emergency shelters failed to meet displaced populations' long-term needs due to shelters' insufficient integration with cultural practices and inadequate durability. This highlights the importance of designing shelters that can evolve into permanent housing solutions while respecting local customs.

These studies collectively highlight the limitations of the Sphere standards in addressing the contextual, cultural, and environmental challenges associated with shelter design in displacement settings.

The identified gaps in the Sphere standards directly inform the development of this study's transitional shelter prototype. For instance:

- Köseoğlu and Demiray's (2014) findings on the inadequacy of tents in harsh weather conditions have guided the inclusion of durable, insulated materials and structural reinforcements in the prototype design.
- Patek and Chadhuri's (2019) emphasis on the importance of localized adaptations has shaped the cultural sensitivity and flexibility of the proposed design.
- Babister and Kelman's (2002) critique of static shelter designs informed the transitional nature of the prototype, which is designed to evolve into semi-permanent housing with minor modifications.

By addressing these shortcomings, this research contributes to bridging the gap between emergency response and long-term shelter solutions. The proposed prototype integrates resilience concerns, cultural appropriateness, and environmental sustainability, ensuring it is not only compliant with Sphere standards but also adaptable to the specific needs of displaced populations in the Lebanese context.

While the Sphere Handbook (2018) serves as a foundational guide for humanitarian response, its limitations in addressing long-term shelter needs underscore the necessity for innovative approaches. This study builds on the existing literature to propose a transitional shelter prototype that not only meets the Sphere standards but extends beyond them, offering a practical and culturally sensitive solution for displaced populations in Lebanon and in similar contexts.

In summary, the diverse guidelines emphasize the need to respect displaced individuals' human rights and their refugee rights. These include the right to live a life in dignity and to receive assistance, which translates into providing urgent relief for displaced individuals. Regarding shelter and settlement, the most important components include planning, the choice of location, safety, security, and sustainability. As such, adequate surface areas should be observed for many purposes, including fire safety, thermal comfort, and accessibility considerations. Nevertheless, in Lebanon, as field research will demonstrate in subsequent chapters, many of these conditions are unmet, increasing migrants' vulnerabilities and reducing their sense of belonging and their shelters' efficacy, sustainability, flexibility, and safety. My suggested shelter design prototype considers these guidelines while adapting them to the Lebanese context. It provides a transitional shelter that is culturally sensitive and built from readily available, low-cost, environmentally friendly, and sustainable materials.

The Sphere Handbook's (2018) standards and principles have been applied in various humanitarian interventions in Lebanon, especially considering the country's history of hosting many refugees, mainly from Syria, and dealing with internal and external conflicts. The Sphere standards provide a framework for delivering humanitarian aid that meets the basic needs of affected populations while ensuring that their dignity and rights are respected. For example, in the context of the Syrian refugee crisis, humanitarian organizations in Lebanon have utilized the Sphere Handbook (2018) to guide their responses, particularly in terms of shelter provision and securing access to clean water, food security, and healthcare services. Agencies have applied Sphere standards to ensure that shelters are not only a place of refuge but also offer adequate living space, privacy, and safety, contributing to the well-being of displaced individuals.

Additionally, Sphere standards have been employed in the health sector to ensure that refugees and affected communities have access to essential medical services, including preventive and curative care, which is crucial in settings with high population density and limited resources.

Moreover, in response to the Beirut port explosion in August 2020, humanitarian actors referenced Sphere guidelines to address emergency shelter needs, medical care necessities, and psychological support requirements for the affected populations, ensuring that immediate and longer-term responses adhered to recognized humanitarian standards.

While specific references to reports or articles directly citing the application of Sphere standards in Lebanon are not accessible in this environment, numerous humanitarian agencies operating in Lebanon, including UNHCR, UNICEF, and various NGOs, frequently reference the Sphere Handbook (2018) in their operational reports and strategic documents.

7- Global Plastic Waste Pollution

Plastic Pollution Around the World: The exponential increase in global plastic production, which has doubled from 2000 to 2019, reaching a staggering 460 million tons, reflects a growing dependency on plastic materials in various sectors of the economy (OECD, 2022). This surge in plastic use has led to a proportional rise in plastic waste generation, posing significant challenges for waste management systems worldwide. Despite efforts to mitigate plastic waste, a substantial portion ends up in landfills, incinerated, or dispersed in natural environments, including oceans and rivers, where it adversely affects ecosystems, human health, and economic activities.

Alarmingly, only 9% of plastic waste is recycled. This statistic underscores the inefficiency of current recycling processes and the urgent need for more effective waste management strategies (OECD,

2022). Most plastic waste that is not recycled contributes to environmental degradation and poses risks to public health and biodiversity. When discarded inappropriately, plastics break down into microplastics, tiny fragments that can permeate ecosystems and accumulate in the food chain. Edmond (2022) highlights the pervasive nature of microplastics and their toxicological risks, emphasizing the threat they pose to both terrestrial and marine life and to human populations who depend on these ecosystems for sustenance and livelihood.

Moreover, plastic pollution exacerbates climate change. During its decomposition, plastic releases greenhouse gases, contributing to global warming and impacting climate patterns. This interaction creates a vicious cycle that undermines environmental sustainability and hampers efforts to achieve the sustainable development goals.

The repercussions of plastic pollution extend beyond environmental concerns, affecting social welfare and economic stability, especially in communities reliant on natural resources compromised by plastic contamination. Addressing the plastic waste crisis requires a multifaceted approach that includes enhancing recycling technologies, reducing plastic production and consumption, and implementing robust policies to manage and mitigate plastic waste effectively.

8- Lifecycle of Plastic and Plastic's Impact on the Planet and People

Lifecycle of Plastic: The lifecycle of plastic, from production to disposal, harbors various indirect harmful effects that are not immediately observable but that have long-term consequences on the environment and human health. These impacts are cross-sectoral, permeating various facets of the planet and affecting people in multifarious ways. The Geneva Environment Network, through a comprehensive review of secondary sources, highlights the extensive

reach of plastic's lifecycle impacts. This review incorporates insights from a broad spectrum of stakeholders, including UN agencies, governments, civil society organizations, media, and academic institutions, underscoring the global consensus on the issue. Throughout its lifecycle, plastic contributes to resource depletion, greenhouse gas emissions, and the release of toxic substances in the environment. These processes threaten biodiversity, disrupt ecosystems, and pose health risks to communities, especially those near plastic production sites or waste dumps. The collected evidence from diverse sectors illustrates plastic pollution's pervasive and insidious nature, urging a concerted global effort to address its lifecycle impacts comprehensively.

Impact on the Planet: The lifecycle of plastic is intrinsically linked to climate change, presenting multifaceted challenges that extend from plastic production to its disposal. The plastics industry is a significant consumer of global oil, accounting for about 6% of worldwide oil consumption, a figure projected to surge to 20% by 2050 (Tsydenova and Patil, 2021). This consumption depletes finite fossil fuel resources and contributes to plastic’s carbon footprint through the energy-intensive processes required to extract, transport, and distill oil into plastic.

Plastic manufacturing is a significant source of greenhouse gas (GHG) emissions. From the extraction of raw materials to the production processes, the plastic industry exacerbates GHG emissions, thereby impeding global efforts to limit temperature rise below the critical threshold of 1.5°C (Geneva et al., 2022). The pervasive use of plastics and inadequate plastic waste management practices currently in place lead to a substantial amount of plastic waste ending up in landfills or the natural environment, including our oceans.

The environmental impact of plastic extends into the marine ecosystem, where vast quantities of plastic waste accumulate, breaking down into microplastics. These microplastics directly threaten marine life and contribute to climate change by releasing greenhouse gases as they degrade (Tsydenova and Patil, 2021). The interaction of microplastics with marine species can lead to bioaccumulation, affecting the food chain and indirectly impacting human health and livelihoods, particularly in communities that rely on marine resources.

Moreover, the open burning of plastic waste, a common practice in many regions due to the lack of proper waste management infrastructures, releases many toxic pollutants, including black carbon. Black carbon is a significant component of delicate particulate matter (PM2.5). It has a global warming potential far exceeding that of carbon dioxide, contributing to the greenhouse effect and climate change (Edmond, 2022). The health implications of inhaling toxic emissions from burning plastics are severe, affecting respiratory systems and increasing the risk of cardiovascular diseases and cancer among exposed populations.

The link between plastic and climate change underscores the need for comprehensive strategies that address the entire lifecycle of plastic products. Reducing reliance on single-use plastics, enhancing recycling rates, and developing alternative materials can mitigate the environmental and health impacts of plastic. Moreover, transitioning to a circular economy, where materials are reused and recycled, can significantly decrease the demand for new plastic production, thereby reducing greenhouse gas emissions.

International cooperation and strong policy measures are essential to effectively tackle the plastic-induced climate challenge. Initiatives to reduce plastic production, promote recycling, and curb plastic pollution

can contribute to global climate mitigation efforts. By understanding and addressing the interconnectedness of plastic pollution and climate change, societies can work towards building a sustainable future that ensures the planet's health and its inhabitants' well-being.

Impact on People: The lifecycle of plastic, from its production to its disposal, has profound and multifaceted impacts on human health and the environment. Humans are exposed to hazardous plastic-related substances at each stage, whether through direct contact with plastic, its ingestion, or its inhalation. The Center for International Environmental Law's comprehensive report, as analyzed by Bienkowski (2019), underscores the myriad ways in which the chemicals and pollutants in plastics pose significant health risks, including carcinogenic potential and detrimental effects on vital organs and systems, such as the eyes and the endocrine system.

The production phase of plastics releases toxic particles. It poses significant risks due to industrial hazards, including fires, explosions, and exposure to high noise levels, compromising the safety and well-being of workers and nearby communities. Furthermore, the extraction processes for fossil fuels, the primary raw materials used in plastic production, result in environmental degradation, contributing to air and water pollution and affecting ecosystems that communities rely on for sustenance and livelihood.

Once in the environment, plastics continue to pose risks to marine health and human health. Microplastics, the tiny fragments resulting from the breakdown of more oversized plastic items, permeate ecosystems, entering the food chain and, ultimately, human bodies. These particles' pervasive nature and their potential to carry toxic substances raise concerns about their long-term impacts on human health.

Moreover, the widespread misinformation regarding plastic pollution exacerbates the problem, hindering effective responses. This misinformation undermines efforts to address the environmental and health implications of plastic pollution, delaying the implementation of strategies that could mitigate these impacts.

The interconnectedness of plastic production, use, and disposal with human health highlights the urgent need for comprehensive approaches to manage plastic waste and reduce reliance on plastic products. Addressing these challenges requires concerted efforts across sectors, informed by accurate information and supported by policies prioritizing human and environmental well-being. Such efforts will contribute to safeguarding the right to a safe and healthy environment, which is essential for current and future generations to thrive.

Plastic Pollution in Lebanon: Lebanon's waste management crisis, notably highlighted in 2015 due to the accumulation of uncollected garbage in Beirut, underscores a long-standing issue of inadequate waste governance. This situation escalated when the primary landfill used for waste disposal reached capacity, particularly in the absence of a contingency plan. This led to visible environmental and health hazards (Galer, 2018). The crisis, however, is not limited to Beirut; it reflects a broader national issue where the central government's approach to waste management has historically been inconsistent, often leaving municipalities without the necessary support for effective waste management (Plastic et al., 2017).

The ramifications of this systemic neglect are profound. Unregulated waste disposal practices, notably the burning of waste, have become prevalent across various regions, posing severe health risks to the population. Human Rights Watch and other organizations have documented the adverse health outcomes associated with exposure to

toxins released from burning waste, including a range of respiratory and cardiovascular diseases, as well as increased risks of cancer (Khawaja, 2017). Furthermore, the Plastic Pollution Coalition's report illustrates the scale of the problem, with a significant portion of Lebanon's waste not being adequately managed, therefore exacerbating environmental degradation and public health risks (Plastic et al., 2017).

In addition to these challenges, Lebanon's reliance on bottled water due to the lack of access to clean drinking water has further contributed to the proliferation of plastic waste. The inadequate waste management infrastructure has struggled to cope with the increased plastic debris accumulated in urban areas and natural habitats, further straining the country's environmental resources.

The tragic Beirut port explosion in 2020 intensified the existing waste management crisis. The destruction caused by the explosion resulted in massive amounts of debris, including glass and plastics, which overwhelmed the city's already overstretched waste management system. The damage to waste processing facilities in Karantina and Bourj Hammoud hampered efforts to address the mounting waste problem, illustrating the fragility of Lebanon's waste infrastructure (Philipp, 2020).

Considering these challenges, there is a critical need to re-envision waste as a resource, particularly in Lebanon's ongoing crisis. The potential for recycling plastics, a predominant component of the country's waste, presents an opportunity to mitigate plastic’s environmental impacts while supporting local communities, especially vulnerable populations such as Syrian migrants in Lebanon. By developing and implementing innovative recycling initiatives, Lebanon can transform its approach to waste, turning a persistent challenge into a sustainable resource that benefits both the environment and its people.

This thesis explores the feasibility and benefits of using locally sourced recyclable plastics to create transitional shelter components for Syrian migrants in Lebanon. By focusing on practical and sustainable applications of recycled materials, the study will contribute to a broader understanding of how circular economy principles can be applied in crisis settings to address environmental challenges and support community resilience efforts.

In conclusion, Lebanon's waste crisis is a multifaceted issue that requires a comprehensive and sustainable approach. Transforming plastic waste into valuable resources addresses environmental concerns and offers economic opportunities for marginalized communities. By leveraging innovative recycling technologies and fostering partnerships among stakeholders, Lebanon can pave the way toward a more sustainable and inclusive future, demonstrating the potential of waste to act as a catalyst for positive change in times of crisis.

In summary, the literature reviewed highlights the multifaceted nature of shelter provision in humanitarian contexts, emphasizing the interplay between environmental, economic, technical, and sociocultural considerations. The synthesis of research on shelter and settlement, global guidelines, and sustainability through the lens of plastic waste management underscores the evolving discourse in humanitarian architecture. The review reveals critical insights into the importance of community engagement, adaptability, and cultural sensitivity in designing effective shelter solutions. Furthermore, it exposes gaps in existing practices, such as the challenges posed by traditional natural materials like timber, which may be limited by cost, availability, and climate-related durability concerns.

The findings reinforce the need for innovative approaches that balance rapid deployment with long-term sustainability and resilience.

By addressing these challenges, this study contributes to bridging the gap between emergency response and permanent housing, proposing a transitional shelter model that aligns with humanitarian principles while adapting to the specific needs and constraints of displacement in Lebanon. The proposed design framework, informed by lessons from global best practices and contextualized research, aspires to provide displaced populations with dignified, culturally appropriate, and sustainable living spaces that foster recovery and resilience.

Overall, the literature review conducted throughout this chapter highlights several remaining challenges related to pre-fabricated and transitional shelter design. Common strengths characterizing these designs include the ability to rapidly deploy them when a crisis occurs, their enhanced durability, and the possibility of modular construction. Enduring weaknesses are linked to accessibility barriers, a lack of cultural adaptability, poor thermal performance, and inadequate ventilation. Political sensitivities, particularly due to perceptions of permanent migration, impact shelter acceptability. These were reflected in the IKEA Better Shelter design (Scott-Smith, 2019).

Shelter performance studies point to a need for more field-based and longitudinal research that accounts for occupant comfort and health variables. Currently, the majority of implemented studies are founded on short-term research or laboratory research. This creates knowledge gaps in relation to shelter maintenance, modification, and usability on the longer term. Few shelter designs incorporate environmental sustainability and cultural sensitivity. Standardized criteria also lacks in the humanitarian sector to merge between shelters' cost-efficiency and refugees' dignity and safety.

This thesis attempts to reduce these challenges through a context-sensitive modular transitional shelter. This suggested design accounts

for Lebanese climate fluctuations and incorporates culturally sensitive elements. It also leverages recycled and locally sourced plastic while balancing accessibility concerns, fire safety measures, and ventilation needs. It adopts a participatory design approach and contributes to shelter design knowledge by bridging the gap between prefabricated models and user-centric solutions.

Chapter 3: Methodology

1- Introduction

This chapter thoroughly defines the research methodology and paradigm that constitute the foundation of this thesis, offering a comprehensive guide to the processes and philosophies guiding the study. Initially, the chapter interprets the specific research methods that have been employed, providing a detailed account of the procedures for data collection, analysis, and interpretation. It elaborates on the various techniques and tools that were utilized, detailing their functionality and the reasons for their selection, thereby ensuring transparency and reproducibility of the research.

The narrative outlines the analytical strategies implemented to decipher the collected data, shedding light on the methodological choices that drive the investigation. This includes an in-depth discussion of the research's quantitative or qualitative nature, employing statistical tools or thematic analysis, and integrating various data sources to foster a robust understanding of the subject matter.

Subsequently, the chapter examines the research paradigm that supports the thesis, providing insight into the philosophical underpinnings that guide the inquiry. This discussion encompasses the paradigm's ontological and epistemological premises, explaining how these beliefs influence the research approach, from formulating research questions to interpreting results.

The exploration of the research paradigm extends to articulate its alignment with the thesis's objectives, underscoring how this correspondence ensures a coherent and focused research journey. The paradigm's role in shaping the researcher's perspective and approach

towards data is highlighted, illustrating its impact on the overall research process.

The methodology and paradigm chapters are vital to the thesis, establishing a structured and principled framework for the research. This detailing ensures that the study is not only systematic and rigorous but also aligned with the academic standards and the specific aims of the thesis, contributing to the body of knowledge with a meaningful and methodologically robust approach.

2- Research Philosophy and Paradigm

2.1 Scientific Research Philosophy

This section begins by explaining "research philosophy," a concept involving the development of research assumptions and the understanding of knowledge acquisition. Two prevalent research philosophies are highlighted: positivism and interpretivism.

Positivism asserts that reality is objective and measurable. In this framework, the researcher is seen as an independent entity whose findings are free from personal biases. This philosophy emphasizes quantifiable data and typically employs deductive methods to discern objective truths. Applying positivism to a study on the shelters of Syrian refugees in Lebanon would entail focusing on measurable factors such as shelter size, materials used, occupancy, and durability. Researchers might use structured surveys or statistical analysis to uncover patterns or correlations. For example, they could explore how the size of the shelter affects the health outcomes of its occupants. However, positivism may fall short of capturing the refugees' subjective experiences, like their feelings of safety, comfort, or the cultural appropriateness of the shelters (Desai and Potter, 2006).

In contrast, interpretivism, often linked to subjectivism, diverges from positivism by employing inductive methods and focusing on

understanding social experiences. This philosophy is particularly relevant in social sciences and social justice research (Bryman, 2016).

Exploring how Syrian refugees interact with and perceive their shelters in informal settlements in Lebanon is crucial. Interpretivism delves into refugees' experiences beyond measurable factors, aiming to understand how their cultural beliefs influence their attitudes and behaviors toward their shelters. It captures the nuances of human interactions and experiences, offering a deeper insight into the refugees' perspectives. Jacobsen (2001) highlights the limitations of positivist approaches in comprehensively addressing the complexities of refugee situations, such as building sustainable shelters in Lebanon, by emphasizing how these approaches often overlook refugees' nuanced realities and local integration needs. The study's choice not to use positivism is due to its tendency to oversimplify complex phenomena, thus failing to address the nuanced realities of building sustainable shelters for Syrian refugees in Lebanon.

This study uses a simple approach called interpretivism to understand how Syrian refugees think about their shelters and how their cultural beliefs shape how they live. We want to know the refugees' stories, their beliefs, and how they use their shelters. To do this, researchers might talk to refugees in detail, listening to their personal stories and feelings about their homes. They will explore how the refugees' cultural traditions and habits influence their living spaces. For example, they might find out why certain parts of the shelter are essential to the refugees or how they change their shelters to show their identity and culture.

By using interpretivism, the refugees' feelings and cultural backgrounds can be examined more deeply. Their experiences are complex and filled with emotions that cannot be counted or measured

easily. Understanding these emotions and cultural aspects is essential in designing shelters that meet the refugees' needs (Easton-Calabria and Omata, 2018).

This chapter explains why interpretivism is the preferred way to study this topic. This approach provides a comprehensive view, connecting different parts of the refugees' experience and beliefs. This is crucial for creating physically strong shelters and ensuring that the refugees feel at home and respected in their cultural beliefs.

2.2 Scientific Research Paradigm

Discussions about research philosophy are critical because they help researchers establish their beliefs about knowledge and understanding. A research paradigm is a comprehensive framework encompassing and integrating these beliefs with the study's methodologies (Guba and Lincoln, 1994). This paradigm guides researchers in conducting their studies systematically.

This study employs a clear framework that integrates the three main components of a research paradigm: ontology (what is real), epistemology (how knowledge is acquired), and methodology (how to investigate). Combining these elements provides a comprehensive understanding.

Ontology concerns beliefs about what is real. The study examines what is essential and fundamental for Syrian refugees, particularly their shelters.

Epistemology concerns the nature of knowledge and how it is acquired. Engaging in conversations and listening to the refugees' stories can help us understand their needs and feelings.

Methodology pertains to the methods used to determine what is to be known. Detailed conversations with the refugees are conducted

because this approach helps understand their experiences and cultural beliefs.

By combining these three components, the study establishes a solid foundation. This foundation facilitates a profound and accurate understanding of the refugees' needs and beliefs. It guides the research, ensuring the refugees' views and experiences are respected and accurately represented. Consequently, the research can more effectively contribute to creating shelters that are both physically sound and culturally respectful and supportive of the refugees.

The research paradigm facilitates a multi-perspective approach (Zakauskas et al., 2018). In this study, three essential components—ontology, epistemology, and methodology—establish the shelter prototype's design guidelines. These components also aid in understanding how Syrian refugees in Lebanon utilize and perceive their shelters, particularly about their culture, displacement experiences, and shelter design. Employing interpretivism as the primary research method emphasizes the personal experiences of the refugees, adding greater depth to the study.

Ontology: Ontology, a key concept in research, addresses the nature of reality. This study investigates the real-life situations of refugees (Rehman and Alharthi, 2016), aiming to understand their living conditions and worldview. By examining their daily challenges and how they adapt to their shelters, the study gains insights into the refugees' resilience and creativity in overcoming adversity. This ontological perspective comprehensively explains the refugees' lived experiences and adaptive strategies.

Epistemology: This aspect concerns the nature and validation of knowledge, focusing on the accuracy of tools and methods used for

information gathering. It ensures that interactions with refugees lead to a genuine understanding of their views and experiences.

Methodology: This concerns the steps taken to gather information. Direct conversations with refugees were chosen because they clarified their feelings and thoughts about their shelters.

Combining all these components, this study aims to understand how Syrian refugees in Lebanon design and live in their shelters. The focus is on the physical aspects of their shelters and how their culture and experiences shape their living spaces. This approach offers better suggestions for designing shelters that are more than places to stay; they can be places where refugees feel safe, respected, and at home.

Linking ontology with interpretivism in this research involves combining two significant concepts. Ontology pertains to what is considered natural or genuine, often viewed as objective truth or universally accepted facts. In contrast, interpretivism emphasizes individuals' varied perspectives based on their feelings, beliefs, and social backgrounds. This combination allows for examining the refugees' shelters as physical spaces while also understanding the personal and cultural meanings they hold for the refugees (Schwandt, 2000).

However, the use of ontology can be challenging. It can sometimes suggest that there is only one correct way to perceive things, resembling a positivist approach that relies heavily on complex data and measurable facts to uncover the truth (Bryman, 2016). In the study of people and societies, particularly in contexts such as those faced by Syrian refugees, multiple realities exist. Each individual has their version of truth, shaped by their unique experiences and emotions.

The study uses ontology to comprehend the fundamental facts concerning refugee' shelters. Acknowledging that each refugee has a unique story and viewpoint is crucial. Incorporating these individual narratives into the analysis provides a more comprehensive understanding, encompassing not just the physical attributes of the shelters but also the emotional and cultural influences shaping how refugees construct and inhabit them.

In summary, the research aims to recognize and comprehend the diverse realities of refugees' lives. It seeks to explore the physical aspects of their shelters and how these spaces influence and mirror the refugees' individual experiences, emotions, and cultural contexts. This method enables a deeper understanding of the complexity of refugees' coping mechanisms and the importance of these strategies in designing meaningful and effective shelters.

Epistemology serves as a tool to comprehend the nature of knowledge, its acquisition, and dissemination. It addresses the question of how to ascertain what is accurate or true. This aspect is particularly crucial in research as it prompts a profound reflection on selecting appropriate learning methodologies and their validity (Kivunja and Kuyini, 2017; Rehman and Alharthi, 2016).

In the study on improving shelters for Syrian refugees, epistemology guides the exploration of how to comprehend the needs and sentiments of refugees regarding their shelters. It extends beyond factual considerations, such as available resources or environmental conditions, to encompass the narratives and experiences of the refugees. Employing an interpretive approach allows for a more comprehensive understanding, valuing individuals' perspectives and emotions.

The research methodology involved integrating complex data, including weather information and material specifications, with

personal accounts gathered through refugee interviews. These interviews facilitated an understanding of their cultural values, resilience in displacement, and aspirations for new shelter solutions. This combination of empirical data and personal insights informed the development of environmentally sustainable shelter designs that resonate with the refugees' cultural identities and address their emotional needs.

In the research on shelters for Syrian refugees, epistemology functions as a guiding principle, facilitating the integration of factual data and personal narratives to develop culturally sensitive and emotionally supportive shelter solutions. This approach ensures that the shelters serve as safe and respectful living spaces.

Conversely, methodology refers to the structured approach used to collect, analyze, and interpret data in the research. It acts as a set of guidelines, ensuring the reliability and validity of the findings (Rehman and Alharthi, 2016). The methodology addresses the fundamental question of ascertaining what is accurate or true.

The research is underpinned by an interpretive perspective, which emphasizes understanding individual experiences and subjective perceptions. The focus is on the personal and cultural dimensions of the refugees' lives, such as their emotions, beliefs, and cultural backgrounds.

To achieve this understanding, participatory mixed qualitative methods are employed, akin to using a toolbox with various tools for different purposes. For instance, interviews are conducted to gather firsthand accounts of the refugees' experiences and preferences regarding shelter. Additionally, observations and surveys supplement these narratives with additional data.

These methods enable a comprehensive understanding of the refugees' physical and emotional needs, as well as their cultural values. Consequently, the research informs the development of shelter solutions that are practical, respectful, and tailored to the refugees' unique experiences and cultural contexts, ensuring that the shelters are welcoming and supportive environments.

This study applies an interpretivist approach to examine how Syrian refugees in an informal settlement interact with their self-built shelters. This approach allows for consideration of the broader context, including the refugees' experiences and cultural backgrounds.

- **Nature of Reality (Ontology):** The study examines the natural behavior of Syrian refugees in their interaction with shelters, recognizing that each refugee's reality is shaped by their unique experiences. The focus is on understanding how individuals view and utilize their shelters, which provides insights into their needs and values.
- **Theory of Knowledge (Epistemology):** A deeper understanding of their beliefs and cultures is sought to comprehend the rationale behind the design and use of the refugees' shelters. This requires asking questions about the influence of cultural beliefs on shelter construction and decoration, aiming to grasp the underlying motivations of the refugees' actions and decisions.
- **How Knowledge is Acquired (Methodology):** Data collection involves direct observation and engagement with the refugees through focus groups or one-on-one interactions. This hands-on approach allows researchers to observe and listen to the refugees directly, gaining insights into their lives and shelters beyond mere notetaking.

This holistic approach provides a detailed understanding of the refugees' lives, encompassing their shelters' physical structures and emotional and cultural significance. Such understanding can guide improvements in living conditions that respect the refugees' needs and values.

Ontology is the foundational concept, with epistemology building upon it to frame the understanding of a given ontological reality. Methodology is the bridge between ontology and epistemology, defining the processes and steps required to develop a new understanding of the world (McBride et al., 2022).

Table 3 likely illustrates the comparison between different research philosophies and the research paradigm under discussion. Research philosophies represent fundamental beliefs about conducting research, guiding researchers in what to study, how to study it, and the knowledge to gain. In studying Syrian refugees and their shelters, the research paradigm represents a specific application of these beliefs.

Research Philosophies: Research paradigms are akin to overarching principles guiding research. They determine the focus of the study, the methods employed, and the desired knowledge outcomes. Different philosophies can lead researchers to emphasize different aspects of a topic and select different research methods.

Research Paradigm: In this study, the paradigm operationalizes the chosen interpretivism philosophy. It directs researchers to closely examine the personal experiences and cultural contexts of Syrian refugees, guiding the use of methods such as interviews and observations to gain profound insights into their shelter interactions.

In summary, research philosophies establish the foundational beliefs about research conduct, while the research paradigm outlines how those beliefs are implemented in a specific study.

Table 3: Comparison of positivism and interpretivism (McBride et al., 2022).

Aspect	Positivism	Interpretivism
Ontology	Objective reality: Shelters are measurable physical entities (size, materials).	Subjective reality: Shelters are understood through refugees' personal and cultural perspectives.
Epistemology	Knowledge is accurate and objective, obtainable via measurement and statistics.	Knowledge depends on individual beliefs, values, and lived experiences.
Methodology	Uses surveys, experiments, and statistical analysis.	Uses field studies, case studies, hermeneutics (cultural influences), and phenomenology (emotional aspects).

This table outlines the core differences in how Positivism and Interpretivism approach the reality of shelters, the nature of knowledge about them, and the methods used to gain this knowledge, especially in the context of Syrian refugees' experiences.

3- Qualitative Research Methods

This paper adopts an interpretive approach and utilizes various qualitative research methods to comprehensively understand Syrian refugees' perspectives and shelter-design processes in Lebanon. It aims to elucidate the significant distinctions between interpretivism and positivism in research paradigms. Interpretivism is characterized by its qualitative methods, which offer a detailed exploration of individuals' experiences and thoughts. In contrast, positivism aligns with quantitative methods, focusing on measurement and deriving generalizable findings (Hennink et al., 2020).

Quantitative research can be likened to using a wide-angle lens, capturing broad data sets to identify patterns or trends applicable to a larger population. It emphasizes numbers and statistical analysis. However, this study employs qualitative research, akin to a zoom lens, allowing for a detailed examination of individual refugees' lives. This approach facilitates an understanding of their personal narratives, beliefs, and interactions with their living environments.

The research utilizes methods such as interviews, enabling direct engagement with refugees to elicit their stories and insights. Focus groups are also employed, facilitating group discussions among refugees to gather diverse perspectives. Observational tours allow researchers to visit refugee shelters, observe living conditions, and note any modifications made by residents. These methods enable the collection of detailed information regarding the refugees' experiences in the Droube 019 informal settlement.

By focusing on qualitative methods, the study aims to develop shelter designs that are tailored to the refugees' needs and preferences. This approach ensures that the designs not only provide physical shelter but also integrate and respect the refugees' cultural values and personal aspirations, thereby enhancing the effectiveness and meaningfulness of the shelters for their inhabitants (Creswell, 2013; Bhandari, 2020).

Qualitative research plays a crucial role in understanding the nuanced perspectives of individuals, particularly refugees, in the context of shelter design. Clarke and Oswald (2019) underscored the significance of such research in aiding individuals in need of shelter. Their approach involved the active participation of shelter occupants in the design process, ensuring that the shelters were robust and aligned with the cultural and emotional needs of the refugees.

Understanding refugees' personal and cultural perspectives entails a holistic approach, delving into their values, lifestyles, and requirements to foster a sense of home, even in challenging circumstances. This involves more than just soliciting preferences; it necessitates observation, attentive listening, and an in-depth comprehension of their daily lives and the underlying meanings of their choices and inclinations.

For instance, shelters co-designed with refugees may incorporate features like communal spaces for family gatherings, kitchen areas tailored to traditional cooking practices, or architectural elements reflecting their cultural heritage. These seemingly minor details can significantly enhance refugees' comfort and dignity.

Qualitative research methods, such as interviews and observations, are instrumental in uncovering these nuanced preferences and needs. They enable the design of shelters that transcend mere structural elements, offering spaces that uphold refugees' dignity, preserve cultural practices, and restore a semblance of normalcy amidst upheaval.

This approach transforms shelters from physical structures into environments that support refugees' cultural identity and psychological well-being, effectively becoming a true home away from home. The human-centered approach inherent in qualitative research ensures that shelters are designed for survival and dignified living.

While qualitative research offers profound insights into refugees' shelter needs, it has challenges and limitations. Due to the specific nature of the studied group, findings may not be universally applicable. Additionally, the reliance on personal narratives and perspectives raises concerns about researcher bias.

Furthermore, ethical considerations are paramount in qualitative research, particularly concerning the privacy and well-being of participants. In the study conducted in Droube 019, researchers diligently adhered to ethical guidelines to ensure the safety and respect of the refugees involved (Creswell, 2013; Bhandari, 2020).

Despite the emphasis on qualitative methods, the study acknowledges the value of quantitative research in providing a broader perspective and corroborating qualitative findings. Quantitative methods, which entail more conventional scientific approaches involving measurement and quantification, can complement qualitative insights, enriching the understanding of refugee shelter needs.

The study predominantly employs qualitative research to gain in-depth insights into Syrian refugees' personal experiences and cultural contexts. However, it also acknowledges the value of quantitative methods, recognizing that combining both approaches yields a more comprehensive understanding. This integrated approach is essential for designing structurally robust, safe, culturally and personally meaningful shelters for the refugees, ensuring their long-term sustainability.

In conclusion, the study underscores the importance of a balanced use of qualitative and quantitative research methods in comprehensively addressing the multifaceted shelter needs of Syrian refugees. This balanced approach contributes to developing better, more sustainable living environments for this population.

Table 4 provides a comparative overview of the key differences between qualitative and quantitative research methods, specifically regarding Syrian refugees' shelter needs.

Table 4: Key differences between qualitative and quantitative research (Hennink et al., 2020).

Aspect	Qualitative Research	Quantitative Research
Objective	Gain a deep, contextual understanding of Syrian refugees' behaviors, beliefs, and motivations.	Quantify data on Syrian refugees' shelter needs and apply findings to a larger population.
Purpose	Explore why and how Syrian refugees adapt to shelters, their cultural influences, and living processes.	Measure the adequacy of shelters, count the number of people per shelter, and study shelter durability.
Data	Textual data from interviews detailing personal stories and experiences with shelters.	Statistical data on shelter sizes, materials, and occupancy rates.
Study Population	A small group of refugees was selected for detailed interviews and observations.	Large-scale survey across multiple refugee settlements to get representative data.
Data Collection Methods	In-depth interviews, focus groups on community living, and observations of daily life in shelters.	Surveys on shelter conditions, structured interviews about basic needs, and preference opinion polls.
Analysis	Interpretive analysis of how cultural and social factors influence refugees' shelter perceptions.	Statistical analysis to identify shelter needs and preferences trends across the refugee population.
Outcome	Develop an understanding of Syrian refugees' specific shelter needs and cultural considerations, informing sustainable shelter design.	Identify common shelter requirements and design standards that can be applied to broader refugee housing solutions.

This table summarizes how qualitative research offers a detailed, nuanced view of individual refugees' experiences and needs. In contrast, quantitative research provides broader, generalizable data on shelter requirements, contributing to the overall goal of building sustainable shelters.

Building on the work of Mouris-Hanna (2021), who investigated refugee settlements in Jordan, this study examines the design of shelters for Syrian refugees in Lebanon. While Mouris-Hanna (2021) conducted extensive fieldwork, surveys, and sketches in Jordan, this research adds depth by focusing on the experiences of Syrian refugees in Lebanon.

The research involved visiting an informal settlement in Lebanon to observe how refugees organize their living spaces, living conditions, and shelter modifications to meet their needs. This approach mirrors Mouris-Hanna's methodology but focuses on Syrian refugees' unique challenges in Lebanon.

The study paid particular attention to the materials used for shelters, the available space, and how this space is arranged to create a sense of home. Adaptations to changing seasons and family needs were also examined. This approach goes beyond quantitative measures, aiming to understand the refugees' daily lives and how they maximize their limited resources.

Combining detailed observations with interviews and focus group discussions with the refugees provides a comprehensive picture of their needs and desires for their shelters. The goal is to construct durable shelters and create spaces where refugees can feel safe, maintain their dignity, and experience a sense of normalcy. This information is intended to inform the development of shelter designs that are practical and respectful of the refugees' culture and personal preferences, contributing meaningfully to their well-being.

An essential contribution of this research is the inclusion of in-depth interviews and focus group discussions with Syrian refugees. These offer valuable insights into their subjective experiences, perceptions, and challenges in informal settlements. This enriched understanding grounds the study in human-centered design principles, emphasizing social justice and human rights, particularly the right to live in dignity.

This research builds on Mouris-Hanna's work by focusing on the refugees' perspectives on their shelters. While Mouris-Hanna conducted significant surveys and fieldwork in Jordan, this study deepens the inquiry by engaging with Syrian refugees in Lebanon, listening to their stories, and understanding their needs.

This study's approach was participatory, actively involving refugees in the research process. Refugees were asked about their preferences and needs for shelter, living habits, and what made them feel comfortable and safe. This ensures that the shelters are structurally sound and practical and that they are places where refugees can feel at home, reflecting their culture and respecting their dignity.

Through close collaboration with the refugees, the research uncovered insights that are not apparent from data or drawings alone. The study revealed how refugees use space to maintain family traditions and adjust their shelters to cope with weather conditions. The focus is not merely on constructing shelters but creating spaces where refugees can rebuild their lives with normalcy and respect.

This work underscores the importance of including the voices of those being designed for in the design process. It demonstrates that listening to refugees and understanding their experiences can lead to better solutions that meet their needs. This human-centered approach distinguishes this research, offering valuable insights into how architecture and design can positively impact the lives of displaced

individuals. It serves as a reminder that in humanitarian aid and shelter design, the voices of the affected people are crucial in developing functional, compassionate, and respectful solutions.

Qualitative Research Approach

This study employs the Constructivist Grounded Theory (CGT) methodology to explore the design of shelters for Syrian refugees in Lebanon, building on the foundational work of Mouris-Hanna (2021) on refugee settlements in Jordan. CGT, as articulated by Charmaz (2008), aligns with an interpretive approach, beginning with data collection and allowing theories to emerge from the collected information rather than starting with a predefined theory.

Using CGT involves data collection and active engagement with Syrian refugees to understand their perceptions and adaptations of their shelters. This approach is both hands-on and personal, delving deeply into the refugees' experiences, cultural backgrounds, and adaptive strategies in their living situations. It recognizes the uniqueness of each individual's experience and seeks to understand the world from their perspective, thus creating a more detailed and accurate depiction of their reality.

The primary objective of this research is to develop a framework that explains why refugees design and adapt their shelters in specific ways, encompassing both the physical and emotional aspects of these spaces. The study aims to uncover the logic and emotions driving refugees' choices, rooted in their lived experiences.

In researching shelters for refugees, CGT offers a profound understanding of how displaced individuals perceive and utilize their shelter spaces, considering their cultural backgrounds and real-life experiences. This approach provides insights beyond numerical data and

surveys, offering a more detailed and personal view of individual experiences (AlShawi et al., 2021).

The methodology includes in-depth interviews that allow refugees to share their personal stories, beliefs, and unique adaptations to their living spaces. These interviews go beyond structured questions, fostering open conversations that enable refugees to express themselves freely, thereby providing rich, detailed insights into their lives.

The methodology includes in-depth interviews that allow refugees to share their personal stories, beliefs, and unique adaptations to their living spaces. These interviews go beyond structured questions, fostering open conversations that enable refugees to express themselves freely, thereby providing rich, detailed insights into their lives.

The role of the researcher in CGT is crucial, not just in posing questions but in creating an environment where refugees feel comfortable sharing their thoughts and experiences. The theories or findings of the study emerge gradually from these personal stories and observations of the refugee settings (Yin, 2016). For instance, Alshawawreh et al. (2021) demonstrated how qualitative methods like focus groups and observations can illuminate the needs and perspectives of residents in Jordan's Zaatari refugee camp, emphasizing the importance of giving refugees a voice in the design of their shelters.

This research examines the Syrian refugees living in Lebanon's Droube 019 informal settlement, focusing on how they create and personalize their shelters. Open-ended interviews encouraged refugees to share their stories in their own words, facilitating an understanding of their cultural practices, perceptions of quality of life, and the subtle yet significant modifications they make to their living spaces.

Observational tours of the settlement provided additional insights into how refugees live, revealing the materials they use and their adaptations. For instance, using salvaged blankets for warmth and spatial division highlights how refugees create a sense of home and privacy, reflecting their identities and needs beyond physical shelter (Brun and Fábos, 2015).

These observations underscore that refugees are active agents in shaping their environments, even under harsh conditions. They creatively use available resources to make their shelters more comfortable and suitable for their lifestyles. Understanding these personal and cultural adaptations is crucial for designing shelters that meet refugees' diverse needs and resourcefulness, emphasizing the importance of considering individual preferences and ingenuity.

Applying CGT principles, this study meticulously analysed the narratives and data shared by Syrian refugees to identify common themes and patterns (Charmaz, 2017). Questions focused on the significance of materials used in shelter construction and modification and how daily activities influence spatial preferences, ensuring that the findings genuinely reflect the refugees' needs and values.

By centering on the refugees' words and experiences, CGT created a framework deeply connected to their real-life situations, filling gaps in existing research regarding the cultural factors and individual stories that shape refugees' interactions with their shelters. This approach highlights the socio-cultural dimensions of displaced people's lives, providing valuable insights for creating better support structures.

In conclusion, this study emphasizes the necessity of incorporating the unique socio-cultural contexts of displaced individuals when designing effective and meaningful shelters. Recognizing the refugees' resourcefulness, preferences, and cultural expressions, even in

challenging circumstances, offers a more humane and relevant approach to humanitarian aid and shelter design.

4- Data Collection Methods

This research utilized various qualitative methods to understand the experiences of Syrian refugees in Lebanon, particularly concerning their shelters. By integrating different research techniques, an interpretivist approach was embraced, and Constructivist Grounded Theory (CGT) was applied. This approach involved the refugees as active participants in the research process rather than merely subjects of study.

This inclusive method is crucial given the complex and unique socio-cultural backgrounds of Syrian refugees. Their experiences and needs cannot be fully captured with a one-size-fits-all approach. Using CGT allowed the refugees' experiences and perspectives to shape the research. Rather than starting with a fixed hypothesis, the refugees' stories and observed patterns guided the understanding.

For instance, the study examined how refugees utilized different materials in their shelters and what these choices reveal about their cultural values and needs. Additionally, the influence of daily activities on the organization of their living spaces was explored. These insights emerged directly from the refugees through in-depth interviews and observational tours, providing firsthand observation of how they lived and adapted to their environment.

Actively involving the refugees in the research ensured their voices were heard and their experiences were central to the findings. This approach offers a more accurate and nuanced understanding of their shelter needs and preferences, contributing to developing more effective and meaningful shelter solutions. The aim was to develop frameworks sensitive to the specific socio-cultural contexts of displaced individuals,

thereby filling gaps in existing literature and offering practical insights for improving their living conditions.

Ravina and Shih's (2017) approach to creating shelters for Typhoon Haiyan victims in the Philippines is an essential reference for this study on Syrian refugees in Lebanon. Ravina and Shih emphasized gathering data from site visits, utilizing reusable and local materials, and ensuring that shelters could be easily upgraded or moved. They also stressed the importance of community involvement in the shelter design process.

Inspired by their methods, this research involved visiting informal settlements in Lebanon to engage with Syrian refugees, understand their needs and observe their living conditions. However, this study further delves into the specific socio-cultural aspects of the Syrian refugee community and the traditional Syrian architectural styles. This ensures that the shelter designs are functional, environmentally friendly, and culturally resonant with the refugees.

While Ravina and Shih concentrated on the practicality of using local and reusable materials, this study also considers the environmental impact of shelter construction, aiming to align with sustainable development targets. It is essential to design shelters that provide immediate relief and are sustainable in the long term, benefiting both the inhabitants and the environment.

By combining Ravina and Shih’s practical approach with a deeper understanding of the Syrian refugees' cultural background and environmental sustainability, this research seeks to develop a more holistic and culturally sensitive approach to designing transitional shelters. The goal is to create shelters that are not merely places to live but spaces that respect the refugees' heritage, meet their current needs, and are environmentally sustainable.

During the field visits to the informal settlements where Syrian refugees live in Lebanon, several methods were used to understand their shelter needs and preferences. These included semi-structured interviews, focus group discussions, and observatory tours.

These field visits at Droube 019, in Zahle, occurred over a period of four days. The first day was August 30th, 2021. It consisted of a focus group discussion held with six participating Syrian refugee families and a tour of the settlement. The majority of the focus group participants were female, with two of them being elderly. Each of the families was composed of two women and two children. The men of the families were away for work. Children were not included in the focus groups. During the tour, I walked around Droube 019 and the six families whom I had spoken with allowed me to enter their shelters to observe the dimensions, layout, and materials used in constructing them.

On August 31st and September 1st, I interviewed 20 and 15 Syrian refugees, respectively. The majority of interviewees were women. These interviews included refugees living in different parts of Droube 019, allowing me to get a better overview of their living situations and needs. On September 2nd, I had finalized the selection of five shelters and came back to note down their detailed measurements. Figure 3 in Chapter 4 relays these shelters' dimensions and layouts. The Appendices A and B include the semi-structured interview questions and answers as well as the focus group discussion guides.

During the shelter design phase for my prototype, I visited Dalal Steel and Plastic Lab. Consulting with these two Lebanese manufacturing companies enabled me to observe the manufacturing process of their construction materials. The conversations that I had with their engineers and technicians gave me insights into adapting materials for local conditions and how to realistically balance cost, durability, and

ease of assembly. Ultimately, the outcome of these discussions was reflected in the prototype design, ensuring local manufacturing of the proposed shelters.

Detailed descriptions of these methods are provided in Chapter 4. However, a brief overview of each method and its utility is presented below:

5.1 Semi-Structured Interviews

Objective: To collect detailed personal stories and insights about the refugees' experiences with their shelters.

Advantages: It allows for an in-depth understanding of individual experiences and provides flexibility to explore new topics that emerge during the conversation.

Disadvantages: Time-consuming and resource-intensive. A limited sample size may not provide a broad perspective. The lack of objective statistical data makes it challenging to represent findings through charts and statistics.

5.2 Focus Group Discussions

Objective: To gather diverse opinions and ideas from a group of refugees, encouraging interaction and discussion among participants.

Advantages: Generates a wide range of views, stimulates dynamic conversations, and can reveal community norms and shared experiences.

Disadvantages: Dominant voices might overshadow quieter participants, and consensus may suppress individual views.

5.3 Observatory Tours

Objective: To observe how refugees live and adapt their shelters, noting the use of space and materials.

Advantages: Provides contextual insights and real-life examples of shelter adaptation and usage.

Disadvantages: Observers' presence might influence behavior, and interpretations may be subjective.

These combined methods comprehensively understand the refugees' shelter preferences and the cultural, social, and practical considerations that influence their design choices. By engaging directly with the refugees through interviews, encouraging them to share their views in focus groups, and observing their living conditions firsthand, the study aims to gather nuanced information that can inform the development of shelters that are not only practical and sustainable but also culturally appropriate and aligned with the refugees' desires and needs.

Interviews: During the field visit to Droube 019, an informal settlement in Lebanon, discussions with Syrian refugees were conducted to understand their experiences with their shelters. The refugees highlighted their struggles with the shelters, particularly their discomfort during different seasons—being too cold in winter and excessively hot in summer. Additionally, they mentioned issues with privacy and the difficulty of separating private spaces from public ones within their living areas.

To address these issues, the refugees demonstrated considerable creativity. They modified their shelters by adding partitions to create private spaces and extra rooms, when possible, despite having limited materials. These adaptations illustrate the refugees' efforts to make their shelters more comfortable and suitable for their families' needs.

These insights were primarily gathered through semi-structured interviews, where the interviewer had some planned questions and allowed interviewees to share their thoughts freely. This approach

efficiently understands profound, personal experiences, enabling individuals to express what is important to them. It provided the research team with a deeper understanding of the fundamental challenges faced by the refugees and their autonomous efforts to improve their living conditions. Without these interviews, the team might have missed the full extent of the refugees' creativity and resilience in making their shelters more liveable.

Structured interviews involve prepared questions, with the interviewer adhering strictly to these questions during the conversation. This method can include close-ended questions, which usually require yes or no answers, and open-ended questions, which allow for more detailed responses. The main advantage of structured interviews is their ability to provide consistent data, facilitate comparison of responses, and draw conclusions. They are straightforward to conduct and analyze, offering reliability in the findings. However, their structured nature can restrict the flow of conversation, potentially missing deeper insights as they do not allow for spontaneity or exploration beyond the prepared questions (Bhat, 2020; Alsaawi, 2014; Dornyei, 2007; Carey, 1994).

Unstructured interviews, conversely, resemble open conversations without a strict set of pre-planned questions. This flexibility allows the conversation to flow naturally, enabling interviewees to express their thoughts and experiences more freely. Such interviews can uncover rich, detailed information that might not emerge in a more controlled interview setting. The interviewer can adapt and probe deeper based on responses, gaining a more nuanced understanding of the topic. However, the lack of structure can make these interviews more challenging to analyze since each conversation can be unique and lacks consistent data points across different interviews.

In studying Syrian refugees' shelter experiences, **semi-structured interviews—**which blend the structured and unstructured formats—proved particularly useful. They provided a framework for the conversation, ensuring that key topics were covered while allowing for in-depth exploration based on the refugees' responses. This approach facilitated the collection of valuable insights into how refugees perceive and adapt to their living conditions, offering a comprehensive understanding of their needs and challenges.

Interviews are vital in qualitative research because they allow researchers to explore people's thoughts and experiences deeply. As noted by Bhat (2020), Alsaawi (2014), Dornyei (2007), and Carey (1994), different types of interviews, each with their strengths and weaknesses, contribute significantly to the richness and depth of qualitative data.

1- **Structured Interviews:** These interviews use a set list of questions asked the same way to each participant. This consistent approach makes it easier to compare answers from different people. However, a downside is that it does not allow follow-up questions based on the participant's responses, which can sometimes limit how deeply a topic can be explored.
2- **Unstructured Interviews:** These are more like open conversations without a fixed set of questions. They allow for flexibility and can lead to unexpected insights because the interview can go in any direction based on what the participant says. The challenge is that these interviews can take longer and be more complex to analyse since each conversation might differ.

3- **Semi-Structured Interviews:** These are a combination of both structured and unstructured approaches. They commence with prepared questions, but the interviewer can explore new topics as they arise during the conversation. This method, with its adaptability to the natural flow of the conversation, allows for an in-depth understanding. It is a favoured choice among researchers, as it provides the flexibility to delve into unexpected areas, potentially unearthing new and valuable insights. However, like unstructured interviews, they can be time-consuming to conduct and analyse.

Semi-structured interviews were instrumental in the study of Syrian refugee shelters. They allowed for detailed and personal insights into the refugees' experiences while allowing for the flexibility to explore new topics that emerged during the conversations. This method helped uncover the specific challenges and adaptations the refugees faced in their shelters, providing valuable data that could inform better shelter design and support.

This study employed semi-structured interviews to understand the experiences of 40 Syrian refugees living in the informal settlement "Droube 019." This approach allowed for asking specific questions while enabling the refugees to share their stories and details that might not have been anticipated.

During the interviews, the refugees were asked about their daily lives, shelters, and the cultural backgrounds that influence their living conditions. This direct feedback proved invaluable, offering a clearer picture of their needs, preferences, and challenges within their shelters.

For instance, insights were gained into how refugees make their shelters more comfortable during varying weather conditions and how they arrange their living spaces to maintain privacy and respect cultural

practices. These findings are crucial for improving living conditions in the settlement, demonstrating that practical support must meet basic needs and respect the refugees' cultural identities and personal preferences.

Engaging directly with the refugees through semi-structured interviews not only provided valuable data but also helped build a connection, essential for establishing trust. This trust made the interviews more productive, as the refugees were more likely to share their true thoughts and feelings. The information gathered from these interviews will inform the design of better shelters that protect the refugees from the elements and provide a space where they feel safe, respected, and connected to their cultural roots. This human element of the research is crucial for the audience to understand the depth and significance of the findings.

Focus Group Discussions: Focus groups differ significantly from one-on-one interviews in qualitative research methodologies. They involve a group discussion where the researcher adopts a more facilitative role, encouraging participants to interact with each other. This interaction often leads to a richer and more diverse data set, as participants can build on each other's comments, offer different viewpoints, and express common concerns or satisfaction. Focus groups can reveal much about how refugees feel and think about their shelters, providing valuable insights into the group's collective experiences and opinions.

While focus groups can gather a broad range of information quickly, they require careful planning to coordinate participants simultaneously. This method has inherent drawbacks, including the inability to delve deeply into each individual's perspective and the potential reluctance of participants to share personal or sensitive information in a group setting.

Despite these challenges, the focus group conducted at Droube 019, an informal settlement in Lebanon, was a significant part of the study on Syrian refugees' shelter experiences. This communal discussion provided a platform for refugees to voice their concerns and preferences, contributing to a comprehensive understanding of their shelter experiences.

In the focus group discussion at Droube 019, 20 Syrian families participated, offering a platform to share and discuss their views openly. The discussion centered on two main themes: their shelters' current conditions and materials and the improvements they wished to see in their living spaces. This setting allowed refugees to share their experiences and hear from others, creating a collective voice highlighting common issues and desires.

The focus group discussion revealed critical insights into the refugees' daily challenges and needs. Participants discussed what they liked and disliked about their shelters, the materials from which they were made, and the changes they believed would improve their lives. This group conversation was vital because it highlighted shared problems and common aspirations among the families, which might not have been as apparent in one-on-one interviews.

One of the significant benefits of the focus group method is its ability to foster interaction among participants. This interaction often leads to a richer data set because participants can build on each other's comments, offer different viewpoints, and express common concerns or satisfaction. For example, during the focus group at Droube 019, participants discussed how they coped with extreme weather conditions. Some families shared their strategies for insulation during winter, while others discussed ventilation methods to combat the summer heat. This

exchange of ideas not only provided diverse solutions but also highlighted common challenges faced by the community.

Furthermore, the focus group setting created a sense of community and solidarity among the refugees, as they realized that their neighbours shared many of their struggles and hopes. This communal perspective is crucial for those planning and providing shelter solutions, as it points to broader trends and needs that can inform more effective and responsive shelter designs. The collective voice that emerged from the focus group discussion underscored the importance of designing shelters that are not only practical but also culturally and socially appropriate.

However, the focus group method is not without its limitations. Coordinating multiple participants at the same time requires careful logistical planning. Additionally, the group setting may inhibit some participants from sharing personal or sensitive information, which could limit the depth of the data collected. Despite these challenges, the focus group at Droube 019 was an essential part of the study, offering rich, nuanced insights into the refugees' perceptions of their shelters.

To complement the data collected, focus groups and individual interviews were conducted. These interviews provided a more personal and in-depth understanding of the refugees' experiences. By combining both methods, the study created a well-rounded view of the living conditions and aspirations of the Syrian refugees in the settlement. The individual interviews allowed for a deeper exploration of personal stories and experiences, while the focus group provided a broader perspective on common issues and collective needs.

The research highlighted the importance of understanding the refugees' perspectives in developing shelter solutions through this multifaceted approach. The focus group at Droube 019 showcased the collective experience of the Syrian families, offering a valuable

perspective that complements the individual stories collected through interviews. Understanding these shared views is essential for developing shelter solutions that genuinely address the needs and preferences of the refugee community, aiming to improve their quality of life in meaningful ways.

Observatory Tours: The research design for the observatory tours at Droube 019 was structured to complement the semi-structured interviews and focus group discussions. The primary aim was to observe the living conditions and shelter materials firsthand, verifying and enriching the subjective information gathered from the Syrian refugees.

Observatory tours are a form of qualitative research that leans on observation and ethnography. They allow researchers to immerse themselves in the environment they are studying. This participatory and constructivist approach helps construct or reconstruct the refugees' lived realities, offering a tangible context to their narratives (Dornyei, 2007).

In this case, the observation was overt, meaning the refugees knew they were being observed, which fosters trust and transparency. Although observation comes with challenges like potential access issues, time constraints, and the possibility of observer bias, it provides invaluable direct insights and a level of detail that can be missed in interviews or discussions.

During the observatory tours at Droube 019, the research team walked through the settlement, visiting shelters with the refugees' permission. The aim was to see and document the conditions discussed in the interviews and focus group, adding a layer of visual and physical context to the collected data. The team took notes, captured photographs, and recorded visual data to capture the essence of the shelters and the settlement layout. Measurements of the shelters were taken to understand the spatial dimensions and compare them with international

shelter guidelines. Rough sketches made on-site were later refined for further analysis.

These tours provided a direct view of how the refugees live, the materials they use for their shelters, and how they adapt their spaces to meet their needs. Observing the actual living conditions offered a deeper understanding of the refugees' challenges, such as privacy concerns, space limitations, and the impact of material choices on comfort and functionality.

By integrating these observational insights with the information from interviews and focus group discussions, the study comprehensively understood the refugees' shelter experiences. This multi-faceted approach ensures that the final recommendations for shelter improvements are grounded in a detailed, well-rounded understanding of the refugees' living conditions, preferences, and needs. It underscores the importance of considering shelter design's physical, cultural, and personal dimensions to create spaces that genuinely support the well-being and dignity of displaced populations.

Table 5: Comparison of three qualitative methods (Hennink et al., 2020).

Method	Objective	Research Instrument	Advantages	Disadvantages
In-Depth Interviews	To identify individual perceptions, beliefs, feelings, and experiences	Interview guide	**Gain in-depth information:** In-depth interviews delve deeply into topics, providing detailed insights that broader methods cannot. **Identify personal experiences:** These	**No interaction or feedback from others:** Participants' views are isolated without influence from other responses. **Multiple interviews needed:**

			interviews allow individuals to share their unique stories, highlighting diverse perspectives. **Beneficial for sensitive issues:** They offer a confidential space for participants to discuss delicate matters openly. **Identify participants' context:** Interviews help understand the broader context of participants' lives, enriching the data's relevance.	Numerous individual interviews are required to gather a range of perspectives.
Focus Group Discussion	To identify a range of opinions on a specific issue or understand community norms	Discussion guide	**Group interaction:** Offers diverse viewpoints and broadens the range of topics discussed. **Detailed discussions:** Provide in-depth explanations and clarifications. **Quick data collection:** Gathers a lot of information in a short time.	**Less depth of information:** Focus groups may not delve as deeply into individual perspectives. **Less suitable for personal experiences:** They might not be ideal for sharing sensitive, personal stories.

			Critical issue identification: Helps pinpoint the main concerns within a group. **High emancipatory effect:** Empowers participants by giving them a voice.	**Group dynamics can be challenging:** Managing and navigating interactions and discussions within the group can be complex.
Observation	To observe how people act and interact in certain social situations	Observation guide	**Unobtrusive:** Observations do not interfere with natural behaviors. **Contextual information:** Provides a rich understanding of the setting and context. **Identifies behavior:** Reveals how people behave and interact.	

This table summarizes the essence of each method, highlighting its purposes, tools, advantages, and potential disadvantages in the context of qualitative research.

5- Qualitative Data Analysis: Grounded Theory Analysis

Grounded Theory was selected as the inductive analytical approach due to its alignment with the study's interpretivist paradigm, seeking to develop theoretical frameworks rooted in qualitative evidence versus imposing external assumptions (Charmaz, 2008). This iterative methodology allows concepts to emerge from the subjective interview, focus group, and observational data to design the prototype shelter for the displaced population, which is Syrian refugees.

In GT data analysis, coding is essential to develop a theory. First, it separates and conceptualizes the collected data for analysis and then defines the relationship between the data (Santos et al., 2018). There are three stages of coding: open coding, axial coding, and selective coding. Open coding is when the extracted data is classified. Axial coding identifies the relation and connections between the categories. Lastly, selective coding is when the "core category" is developed; it is the central phenomenon where the categories are built and the theory is generated (Noble and Mitchell, 2016). There are two methods of coding qualitative data: automated and manual. This study used NVivo, a thematic analysis software program for qualitative research. NVivo facilitates the process of coding, managing, and analysing data (Dhakal, 2022).

All interviews and discussions were recorded and transcribed; they were inserted into the NVivo software along with notes and photos taken in the informal settlement during the observatory tours, where a thematic coding structure was used. The interview data and notes from the observatory tours were classified into codes and combined to form the theoretical framework (Table 6). Each code and category was used to provide the themes in the shelter design guideline: design elements and principles, access to services, and livelihood and materials. The

final shelter design guideline is discussed in detail in Chapter 5. The surveyed shelters were digitally redrawn to analyze the distribution of the space inside the shelter along with the dimensions and area.

Table 6: Thematic framework.

Codes	**Categories**
Distribution of the Space	Outdoor courtyard Family sitting/reception room Storage room Facilities
Critical Issues Related to the Use of Shelter	Weather elements/thermal comfort Maintenance Natural ventilation and lighting Fire and flammability
Future Consideration	Covered living area Materials and setup techniques Privacy and security Shelter affordability

6- Quality and Rigour

Ensuring quality and rigor in research revolves around four key elements: credibility, originality, resonance, and usefulness (Charmaz, 2016). Charmaz's framework is directly applied to this research, guiding the production of an impactful and robust study on designing transitional shelters for Syrian refugees residing in informal settlements in Lebanon using locally sourced materials. This study is particularly relevant given

that only 60 academic papers in the past 38 years have been published on “emergency or temporary shelters,” only nine addressed the shelters’ environmental impacts and life cycle sustainability (Alshawawreh et al., 2020, p.2).

The *“credibility”* is about the research being believable and reliable. To ensure credibility, Chamaz (2016) suggests strategies such as understanding and observing the situation being studied by using different methods to cross-check and validate the findings. To ensure credibility in the context of this research, several field studies were conducted on the informal settlement, including interviews, focus group discussions, and observatory tours. This involved engaging with the refugees, observing their living conditions, and understanding their shelter needs and challenges. In addition, using locally sourced materials such as insulated panels and recyclable plastic ensures that the shelters can be built without the need to import materials, thus making the construction process more efficient and sustainable. In addition, involving local manufacturers and suppliers supports local businesses, contributes to the local economy, and ensures that the study’s findings are realistic.

The *“originality”* refers to the significance and novelty of the research. According to Charmaz (2016), original research should offer fresh insights and contribute something new to the existing body of knowledge. The originality of this study is demonstrated in the innovative approach of using locally recyclable materials and the unique context of Syrian refugees in Lebanon. Using insulated panels and recyclable plastics is an innovative solution that provides new insights into environmentally and low-cost shelter construction. Given the scarcity of academic literature on this subject, this approach can

potentially contribute novel insights into emergency housing and sustainable architecture.

"Resonance" ensures that the perspectives and voices of the participants are represented authentically in the research. In this research, the perspectives, lived experiences, specific needs, and feedback of the Syrian refugees form the core of the design process. The proposed shelter design prototype also aligns with their cultural practices and values to ensure cultural appropriateness and acceptance.

Lastly, the engagement of refugees in the study ensures that the shelter prototype meets their cultural preferences and specific needs and fosters a sense of ownership and empowerment among the refugee community. The emphasis on using locally sourced materials implies that the shelter prototype offers cost-effective and practical solutions for housing displaced individuals. This research could contribute to policymaking and practices related to sustainable architecture and refugee housing by improving the living conditions of displaced populations and minimizing environmental impact, thereby enhancing the usefulness of the research.

7- Ethical Guidelines and Principles

Due to the participants' vulnerable status, rigorous ethical precautions were taken. Informed consent forms were verbally translated to ensure understanding, clearly outlining protections for anonymity and potential risks, such as psychological distress from discussing difficult experiences. Participant comfort levels were continuously monitored during interviews and focus group discussions to ensure their well-being throughout the research process.

At the beginning of each interview, focus group, and tour, the refugees were briefed about the study and its intended outcome and were asked to provide informed consent. It was communicated to them that their privacy and confidentiality would be respected. They were informed that no remuneration would be provided for their participation and were told they could withdraw their consent or refrain from answering a question at any time. Refugees' consent was again requested before recording the information in the form of notes and audio for future transcription and analysis, as well as before entering their shelters during the observatory tours and before taking photographs of these shelters.

In their seminal work, Jacobsen and Landau (2003), "The Dual Imperative in Refugee Research: Some Methodological and Ethical Considerations in Social Science Research on Forced Migration," highlights the critical need for ethical sensitivity in refugee research. They argue that researchers must be vigilant about the potential risks their studies might pose to participants. This includes ensuring that the questions asked do not retraumatize participants and that the methods used do not expose them to further harm or exploitation.

In their research, Jacobsen and Landau (2003) stress the importance of informed consent, confidentiality, and the right to withdraw from the study at any point without repercussions. These ethical considerations are essential to protect the participants' physical, psychological, and social well-being. They also discuss the balance between the researcher's need for information and the participant's right to privacy and dignity. The "Do No Harm" principles necessitate that researchers prioritize the participants' safety and well-being over the academic or practical benefits of the research.

Applying these principles in the context of this study, the focus group at Droube 019 was conducted with careful attention to the lack of confidentiality inherent in group settings. The potential risks posed by this lack of confidentiality were weighed against the benefits of developing a user-centered prototype for shelters that promote social justice, inclusion, and human rights. Participants were reminded of their right to avoid answering questions, and the researcher facilitated the discussion to ensure a respectful and supportive environment.

By adhering to the "Do No Harm" principles, the research aimed to minimize potential risks and empower the participants by valuing their input and experiences, thereby contributing to developing more effective and humane shelter solutions.

This study's data analysis and storage methods align with the University of Nottingham's data management and security regulations. Data was coded within NVivo to maintain confidentiality, avoiding using names or personal identifiers, which adhere to the university's ethical standards. The University of Nottingham recommends using Microsoft 365 OneDrive and Microsoft Teams for secure and encrypted data storage, ensuring compliance with their data protection protocols. These platforms provide secure, backed-up storage solutions, making the data accessible and safeguarded against unauthorized access. Furthermore, including photographs and notes analyzed for structural elements of the shelters while maintaining participant anonymity is consistent with the university's ethical framework for handling sensitive research data. This approach responsibly and ethically manages the data, minimizing participant risks while adhering to the institution's guidelines (University of Nottingham, 2024).

8- Conclusion

The techniques and methodologies adopted in this study—interpretivism research philosophy, Constructivist Grounded Theory, and mixed qualitative research methods—are practical for capturing Syrian refugees' shelter perceptions and preferences in Droube 019, Lebanon, and hold significant potential for broader applications. These approaches can be effectively utilized in designing sustainable shelters for various displaced populations, whether due to political conflicts or climate change.

The adaptability of these methods lies in their core emphasis on understanding the unique experiences, cultural backgrounds, and personal needs of displaced individuals. By focusing on interpretivist philosophy, researchers can delve into any displaced group's subjective realities and lived experiences, acknowledging that each situation and population has its complexities and nuances. This approach ensures that displacement's emotional, cultural, and psychological aspects are considered, leading to more compassionate and responsive shelter designs (Charmaz, 2014).

Constructivist Grounded Theory, emphasizing theory emerging from the data, is particularly valuable in diverse contexts. It allows for developing theories and solutions grounded in the actual experiences and needs of the displaced rather than imposing preconceived notions or one-size-fits-all solutions. This is crucial in settings impacted by political conflicts or environmental changes, where each situation may present unique challenges and require tailored approaches (Charmaz, 2014). This method has been successfully used by Abramowitz and Kleinman (2008) in their study on post-conflict health interventions in Liberia, demonstrating its adaptability and effectiveness in different contexts.

Moreover, the use of mixed qualitative research methods facilitates a comprehensive understanding of the needs and aspirations of displaced populations. These methods can be adapted to different cultural and environmental contexts, providing a versatile toolkit for engaging with and learning from various displaced communities. For example, Betts, Bloom, and Weaver (2015), in their work with urban refugees in Nairobi, provide insights into the potential of humanitarian innovation that starts with the communities themselves, overcoming the limitations of traditional quantitative methods and allowing for deeper insights into the lived experiences of displaced individuals.

In practice, these methodologies have been proven effective in various contexts. For instance, the work of Abramowitz and Kleinman (2008) highlights the importance of cultural translation in humanitarian interventions, ensuring that the mental health and psychosocial support provided are culturally appropriate and effective. This approach can be crucial in designing shelters that meet physical needs and support the psychological and emotional well-being of refugees.

In designing shelters for Syrian refugees in Lebanon, the combination of interpretive research philosophy, Constructivist Grounded Theory, and mixed qualitative research methods proves highly pertinent. This approach places the affected individuals at the heart of the research, enabling them to actively participate in shaping solutions that are culturally sensitive, contextually relevant, and responsive to the complexities of displacement due to political conflicts or climate change.

Betts, Bloom, and Weaver (2015) further illustrate the importance of innovation that originates within the refugee communities themselves. Empowering refugees to contribute to the design and implementation of their shelters makes the solutions developed more likely to be

sustainable and effective. This aligns with the principles of Constructivist Grounded Theory, which emphasizes the emergence of theory from the data itself, ensuring that the solutions are grounded in the actual needs and experiences of the displaced.

In conclusion, the methodologies and best practices demonstrated by researchers such as Abramowitz and Kleinman (2008) and Betts, Bloom, and Weaver (2015) affirm the value and applicability of these approaches in creating meaningful and effective shelter solutions for displaced populations. By integrating interpretive research philosophy, Constructivist Grounded Theory, and mixed qualitative research methods, this study contributes to a robust framework for designing sustainable shelters that respect the cultural and psychological dimensions of displacement, ultimately improving the quality of life for refugees.

Chapter 4: Spatial Organisation of the Shelter

This chapter explores the spatial organisation of shelters within the informal settlement of Droube 019 in Lebanon. It focuses on adapting shelter design to accommodate Syrian refugees' cultural, social, and environmental challenges. The findings presented here are based on field observations and semi-structured interviews conducted with residents, providing insights into their lived experiences and the key issues that they perceive regarding shelter design, use, and satisfaction.

1- Context of Informal Settlements in Lebanon

Lebanon's longstanding policy against establishing formal refugee camps for Syrian refugees has resulted in over 2,000 informal settlements being created across the country, mainly in the North and Bekaa regions (Trovato, 2019). These settlements lack official recognition and basic infrastructure, leading refugees to construct and adapt their shelters with limited external support. This situation reflects broader challenges in host countries where formal camps are absent, exacerbating issues related to sanitation, safety, and access to essential services (Kikano et al., 2021).

The interaction between the Lebanese government, international organizations, and refugees significantly shapes the nature and development of these settlements. The government's policy discouraging the use of permanent construction materials aims to prevent informal settlements from becoming established fixtures. This policy reflects a complex mix of politics, hospitality, and concerns about the future. The refugees' living conditions, therefore, result from navigating this environment while trying to meet their needs for shelter, safety, and dignity.

Field Visit and Observations: This study employs qualitative research methodologies to examine the connections between Syrian refugees and their shelters in the informal settlement of "Droube 019" in Lebanon's Beqaa region. Lebanon hosts nearly 1.5 million Syrian refugees, the highest number of refugees per capita worldwide (UNHCR, 2023).

A map (figure 1) illustrates the locations of informal tented communities across Lebanon, highlighting areas such as the Bekaa, West Bekaa, and Akkar, which accommodate a large number of refugees. This geographical representation helps contextualize the

spatial distribution of Syrian refugees and emphasizes the need for customized shelter solutions that respond to specific living conditions and cultural backgrounds.

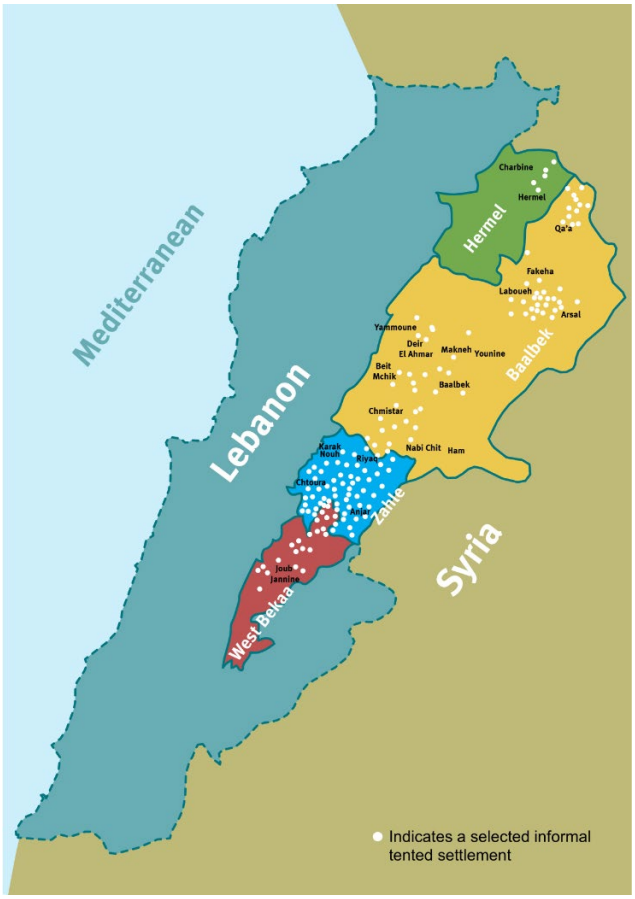


Figure 1: This map displays the presence and distribution of informal tented communities in the Beqaa region of Lebanon in 2017, as documented by Habib et al. in 2019.

The informal settlement, Droube 019, is the primary site where the fieldwork was conducted. It was selected based on different methodological and practical considerations. It is located in Zahle, in the Beqaa region, and includes the highest number of informal settlements across the country. This makes it a good location to examine shelter conditions for refugee individuals and families. Shelters in Droube 019 are densely clustered and share similarities across material

and spatial elements. Droube 019 is accessible and houses a substantial Syrian refugee population. It is also considered safe for conducting multiple field visits and engaging with the refugee community. All these characteristics facilitate the implementation of qualitative research approaches embedded in this study.

In September 2021, the study team conducted field visits targeting the informal community "Droube 019," created in 2012. This settlement consists of 70 shelters, each providing housing for a family with an average of nine members, including four or five children. "Droube 019" is an example of a typical situation in informal settlements, where housing units are constructed on land without legal ownership or property rights. This results in a need for more security and stability for the tenants. The entire area of "Droube 019" is 2400 square metres.

The "Droube 019" shelters illustrate the difficulties commonly linked to informal settlements, such as inadequate urban planning. The absence of proper planning leads to disorganized construction, insufficient access to vital amenities, and failure to comply with zoning restrictions, all of which contribute to the unstable living circumstances endured by the population living in such settlements. The informal character of the community results in inadequate infrastructure and lack of access to vital services, including sanitation, electricity, and safe drinking water, which negatively affect the everyday lives and well-being of the families residing there.

The study undertaken at "Droube 019" offers unique insights into the living conditions and difficulties encountered by families residing in informal settlements. It emphasizes the pressing necessity for interventions that not only focus on the physical building of shelters but also consider the broader aspects of legality, service provision, and

community planning to enhance the quality of life for these vulnerable groups.



Figure 2: This picture depicts a tent cluster in the informal settlement known as Droube 019.

Figure 2 provides a comprehensive overview of 'Droube 019', an unstructured community where Syrian refugees live. This panoramic photograph displays the condensed layout of shelters strategically organized in rows to optimize the utilization of the limited available area. The proximity of the shelters suggests a dense population, which is likely to affect the refugees' living conditions, particularly in terms of limited space and privacy.

The graphic showcases five shelters, easily discernible due to their distinct red color. This helps better comprehend the shelters' arrangement and dimensions. The close-knit arrangement of these shelters demonstrates the improvised and limited character of the colony. This hints at the daily difficulties encountered by their residents, such as potential problems with airflow, sunlight, and the existence or non-existence of individual living areas.

After a thorough on-site evaluation, comprehensive blueprints were created for the five distinct shelters. This required precise measurement and detailed sketching of the existing structures at the location, correctly

documenting their dimensions and layouts. Subsequently, the sketches were transformed into a digital format using AutoCAD software. This approach guarantees that the shelter layouts are accurate and meticulously represent the living conditions of the refugee residents and shelter requirements. The AutoCAD drawings offer a methodical and organized depiction of the shelters to enhance structural comprehension and potentially help improve shelter residents' living circumstances in 'Droube 019'.



Figure 3: This digital drawing displays the measurements of five Syrian shelters located in Droube 019.

Figure 3 exhibits an architectural floor plan that precisely illustrates the arrangement of the five separate shelters within the 'Droube 019' informal community, including their unique measurements. These floor plans play a crucial role in guiding architectural and humanitarian work,

particularly when it comes to documenting and analysing the housing situation in informal settlements where more standard planning and data collection may be needed.

The inclusion of accurate dimensions in the floor plan reflects the comprehensive observational survey that was carried out, during which these measurements were carefully recorded. This practical technique guarantees that the data accurately represents the living spaces, providing valuable information about each shelter's physical limitations and architectural design. This is important because precise measurements enable academics, architects, and planners to evaluate the effectiveness of space usage, comprehend the possible difficulties that may exist in the living environment, and recognize possibilities for enhancing these living spaces.

The architectural floor plans have various functions. Firstly, they serve as a foundation for assessing the sufficiency of a shelter, measured against specific standards or guidelines. Secondly, they provide a structure for discussing enhancements or expansions. Thirdly, they can be a valuable instrument for involving multileveled stakeholders, including the settlement's residents, in conversations about living conditions and shelter requirements.

Additionally, the architectural floor plan might emphasize discrepancies in shelter provision by indicating disparities in family size, building preferences, or available resources. It can also unveil prevalent design components or makeshift adjustments that the inhabitants make to deal with their surroundings, therefore providing insight into their ability to withstand structural challenges and display cleverness in the face of adversity.

Figure 3 further enhances our comprehension of the strategies employed by Syrian refugees in Lebanon to adjust to shelter constraints

and allows us to oversee their living situations by meticulously documenting the state of affairs in the shelters within the 'Droube 019' informal settlement. This highlights the significance of obtaining precise and detailed information about a particular location when formulating plans to enhance the well-being of individuals living in informal settlements.



Figure 4: This picture depicts a slender passageway situated between two protective structures.

Figure 4 provides a glimpse into the daily life of a Syrian refugee living in an informal settlement. It shows a tiny corridor situated between two shelters, which is most likely used by the residents as a communal pathway. The shelters, made from textile materials, display unique styles—one embellished with decorative patterns and the other showing a simpler texture—pointing to the tenants' endeavour to customize their living environments despite existing constraints.

The pathway is constructed using concrete, a pragmatic decision in these surroundings. Concrete provides superior durability and requires less care than dirt or gravel, which tend to become muddy under rainy conditions. The inclusion of concrete suggests an effort to bring a sense of durability and tidiness to the settlement's otherwise impermanent and crowded circumstances.

This narrow tunnel has enough space for only one person to pass through. This reflects the overcrowded nature of numerous refugee communities where available space is scarce. The proximity of the shelters in these communities is a typical characteristic resulting from the need to accommodate many inhabitants in a limited space.

The scene depicted in Figure 4 is a powerful representation of the refugee community's ability to adapt and endure, effectively utilizing scarce resources and space. Additionally, it highlights the difficulties of guaranteeing privacy, convenience, and security in densely inhabited towns, where every available space is carefully utilized to build walkways, dwelling spaces, and communal places. These photos play a vital role in illustrating the actual conditions of living in informal settlements. They provide a visual representation that enhances statistical data and narrative descriptions while emphasizing the immediate necessity for more sustainable, dignified, and compassionate housing alternatives for displaced populations.



Figure 5: This picture shows pigeons occupying the outdoor areas of the shelters.

Figure 5 provides a close-up view of the everyday activities and routines taking place at an informal Syrian refugee settlement in Lebanon. This scene depicts a moment in which a gathering of pigeons assembles in a compacted space adorned with small stones, situated amidst temporary structures. The shelters, constructed from tarpaulins, wood, and other easily accessible materials, demonstrate the cleverness and inventiveness of their inhabitants, who endeavour to establish liveable environments and upgrade them according to their needs, despite their limited circumstances and restricted access to building materials.

In this context, pigeons can evoke emotions, symbolizing a sense of normalcy and establishing a link to familiar cultural customs amid the turmoil caused by displacement. Indeed, pigeon-keeping is a cherished

pastime in many Middle Eastern countries, including Syria. It provides a feeling of connection to one's homeland and a temporary escape from the daily difficulties of residing in a refugee camp which might be located hundreds or thousands of miles away from home.

This snapshot also showcases nuanced indications of attempts at individualization and adjustment as well as embellishment within the residences: a diminutive window encased in timber, cables stretched across to demarcate boundaries or to suspend possessions, etc. Every minutiae conveys a narrative of adaptation and fortitude. The pieces highlight the migrants' efforts to recreate a sense of solitude, solidarity, and home in an environment characterized by transience and poverty.

This image, located in an informal settlement, meshes the intricate relationships between survival, culture, and community in the lives of displaced migrants. It additionally demonstrates how individuals strive to preserve their cultural heritage and customs, even in the most arduous situations, cultivating a feeling of belonging and optimism amidst uncertainty.



Figure 6: This picture depicts garments suspended between the shelters.

Figure 6 provides a dramatic insight into the daily life of Syrian refugees residing in an informal settlement in Lebanon. The image depicts the sight of laundry being hung out to dry, which serves as a simple yet impactful reminder of the daily routines that endure even in displacement situations. A satellite dish indicates the residents' intention to maintain a connection with the outside world, enabling them to access news and entertainment that provide them with a sense of normalcy and a connection to the broader global community.

The setting of this everyday scene is starkly contrasted with Lebanon's exquisite and unforgiving terrain. Snow-capped mountains in the distance highlight the environmental challenges that small settlements may face, especially in colder months of the year. This contrast also highlights the migrants' ability to bounce back and adjust to the diverse challenges of living in an informal settlement, particularly those that are climatic in nature.

The presence and distribution of these settlements in Lebanon are intricately intertwined with the interactions between the refugees, the Lebanese government, and the international organizations found in Lebanon. The government's policy, which promotes the avoidance of using permanent construction materials, seeks to prevent the settlements from becoming permanent fixtures in the landscape. This policy reflects an intricate combination of hospitality, politics, and concerns about the future.

Against this landscape, the international community continues to offer crucial aid to Syrian refugees, sometimes even without the official government’s acknowledgment and backing. Shelter kits are an example of such aid. These kits consist of basic materials such as plastic sheets and timber, which migrants utilize to build, upgrade, or personalize their living areas. The small spaces occupied by Syrian refugees emphasize

the limited restrictions they have to manoeuvre through while striving to adapt to challenging circumstances.

Moreover, the economic exchanges happening inside these communities exemplify a miniature representation of a community structure and methods for ensuring survival. Syrian refugees frequently lease land from Lebanese landowners to establish their shelters, which introduces an additional level of intricacy to their already perilous existence. The "Shawish," a prominent individual in the refugee community, serves as a crucial middleman, overseeing the interaction between the refugees and the landowners, which involves the gathering and remittance of rent.

When considered in the broader framework of the refugees' encounters in Lebanon, this image captures a moment of everyday existence that is commonplace and remarkable. This phenomenon highlights the ability of humans to establish and sustain links to cultural traditions and global networks, even in challenging situations. The image captures the tenacity and sense of solidarity among displaced individuals as they strive for dignity and stability among the challenges of displacement. The juxtaposition of laundry drying and a satellite dish against primitive shelters and breathtaking mountains visually conveys this narrative.

Semi-Structured Interviews: In addition to field observations, semi-structured interviews provided deeper insights into the refugees' personal experiences and living conditions within the Droube 019 informal settlement. The interviews explored the different spatial, cultural, and functional aspects of shelter use alongside perceptions of safety, privacy, and overall living conditions. The semi-structured format allowed participants to share their experiences while ensuring the discussions covered critical areas related to shelter design. This enabled

us to capture the direct lived realities of Syrian refugees, and their personal struggles reflected in their efforts to survive, build resilience, lead a life in dignity, and adapt to a new context while preserving cultural elements from home.

2- Key Themes from the Interviews

Shelter Specifications: Participants were asked about the number of individuals and families residing in each shelter and the geographical space allocated to each person within that shelter. The aim was to understand how space limitations influenced their quality of life, crowding, and overall comfort.

- *How many individuals live in this shelter? What is the approximate living space or floor area per person allocated to each occupant?*

Many participants reported that overcrowding in the shelters impacted their ability to maintain personal space and privacy. On average, each shelter housed seven to nine individuals, making the limited space challenging for carrying out daily life activities and individuality. The interviews further revealed how families adapted their living arrangements, including by using shared spaces for multiple purposes, such as converting reception rooms into bedrooms at night.

Social and Cultural Norms: This section explores how cultural expectations, such as privacy, social interactions, and shared spaces, influenced the daily lives of Syrian refugees in the Droube 019 settlement. Many participants expressed a strong desire to maintain cultural practices, such as separating private and public spaces, even within the constraints of the informal settlement. These cultural norms impacted how they adapted to their living environment and interacted with their neighbours. For many refugees, privacy within the crowded settlement was challenging to achieve. In their homes in Syria, they

could easily maintain boundaries between private and public spaces. However, here, the lack of physical barriers and the proximity of shelters made it challenging to preserve these distinctions. As a result, outdoor courtyard spaces were frequently repurposed as semi-private areas where families could experience a sense of ownership and personal space. These courtyards served multiple functions, acting as private family gathering areas and spaces where they could receive guests, allowing the continuity of some cultural practices.

- *Have you resided in other camps in this country or in another country? Where did you feel safer, and why?*

Interestingly, most participants had not resided in other camps upon initially arriving in Lebanon. Seeking safety from the conflict in Syria, they moved directly into informal settlements, often with the help of friends, neighbours, or extended family members who had arrived earlier. This network of community support played a crucial role in their transition. Many Syrian refugees found comfort in settling close to people they knew, such as cousins or neighbours, which helped create a familiar social environment despite the challenging circumstances.

The participants highlighted that Syrian refugees who had already established themselves in Lebanon were instrumental in assisting newly arriving refugees. These early settlers shared information about informal settlements like Droube 019, helping newcomers find housing and guiding them through the process of settling into the community. This mutual support fostered a sense of camaraderie and solidarity, which was especially valuable for refugees adjusting to life in a new country.

Design Elements and Materials: The interviews explored how Syrian refugees had adapted or modified their shelters to suit their needs. Participants were also asked about the materials they used for constructing or upgrading their shelters, whether they received any

assistance in upgrading their shelters, and what further improvements they wished to make.

- *Did you make any adjustments to your current shelter? What adjustments or additions would you like to make, if possible?*

The majority of interviewed residents responded that they had modified their shelters. Examples of modifications included adding plastic sheeting or creating partitions to foster an increased sense of privacy. However, they unanimously expressed frustration with the poor quality of the available materials and the lack of sufficient external support from international organizations for shelter improvements. Participants additionally highlighted the need for the provision of more durable materials, especially for weatherproofing, and mentioned that insulation was a priority for comfort during extreme temperatures.

Safety and Security: Lastly, participants were asked how safe they felt within their shelters, both from environmental threats and potential man-made violence. Privacy and disease concerns were also explored to understand the health and security risks they perceived and faced within informal settlements.

- *Do you feel protected by your shelter from weather or threats of violence? Does the shelter provide you with the privacy you need?*

Many residents reported feeling insecure, especially during the winter season when the shelters were prone to leaks and provided insufficient insulation. Women and girls, in particular, voiced concerns about their safety and the lack of secure locking mechanisms in their shelters. There was also a significant concern about disease transmission due to the proximity of the shelters and the limited sanitation facilities available.

The semi-structured interviews provided crucial insights into the experiences of the Syrian refugees in the Droube 019 informal settlement, highlighting the challenges they continue to face due to inadequate shelter design and building materials. These findings are essential for understanding how refugees adapt to life in informal settlements and what improvements can be made to enhance their quality of life. The interviews emphasize the importance of designing shelters that consider the social, cultural, and environmental needs of displaced populations, aligning with broader research advocating for user-centered design approaches in humanitarian architecture (Albadra et al., 2020).

3- Materials and Construction Techniques

Within the informal settlements of Lebanon, Syrian refugees have cleverly constructed shelters out of sheer necessity by employing a combination of ingenuity, communal assistance, and whatever resources seem to be accessible to them. Their shelters, predominantly made of plastic sheeting, lumber, and corrugated metal, demonstrate a profound resilience and capacity to adapt to their limited and constrained surroundings.

Plastic sheeting is commonly used for roofs and walls because of its widespread availability, simple installation process, and cost efficiency. Although it offers essential protection against wind and rain, it cannot effectively insulate and protect refugees from temperature fluctuations. This poses a significant disadvantage in areas with diverse topographies and climates. Timber is the primary support system for these constructions, creating the necessary framework and canvas upon which other elements of the shelter are constructed and personalized. Wood, being readily accessible and adaptable, offers the opportunity for individualization and customization in the field of construction.

Certain refugees choose corrugated metal sheets as a roofing solution, providing more robust protection against the elements compared to plastic sheeting. Obtaining this material might be complex, though, due to the Lebanese government's limitations on long-lasting construction supplies. These restrictions are intended to discourage refugees from seeking permanent settlement in their shelters and within Lebanon.

Notwithstanding these limitations, migrants frequently install concrete flooring within their shelters. Although thin, the flooring is considerably more resilient and comfortable than dirt or improvised materials. Concrete offers a firm and sanitary surface that facilitates everyday activities and hygienic practices. This is especially crucial in densely populated living environments.

The daily existence of refugees within these informal settlements is a remarkable demonstration of the tenacity and flexibility of the human spirit. The shelters, albeit improvised, are more than simple constructed structures; they function as residences where families reside, engage with one another, and uphold a sense of normalcy. Women, who are frequently responsible for caring for these household areas, play a vital role in upholding their cleanliness. Concrete flooring facilitates this duty when mopping or sweeping the floor.

Cultural norms and the necessity for privacy influence the design and organisation of these shelters. Spaces are frequently partitioned and organized to suit the requirements of family life, societal norms, and personal preferences. This exemplifies an exceptional ability to establish a sense of belonging and camaraderie, even under challenging circumstances.

This account of building Syrian refugee settlements captures well the broader process of being forced to leave one's home and adjusting to

new circumstances. This statement highlights the complex relationship between human actions, physical limitations, and the need for respect and worthiness in times of great uncertainty and turmoil. As these groups persist in braving their difficult conditions, their resourcefulness and ability to bounce back are evidence of the enduring human determination to achieve stability and a feeling of fitting in, even in a world vastly different from their homeland.

4- Distribution of Space

The spatial organisation and construction of shelters in Lebanon's informal settlements, where Syrian refugees seek safety, are significantly impacted by various factors, such as cultural and social norms, the size and features of the informal settlement, the topography of the land, and the resources available to refugees. The choice of settlement location typically depends on the availability of arable land or closeness to urban areas. This affects the amount of space used for building shelters.

Refugees typically go to places where they can find or create a sense of cultural affinity and community, generally selecting communities with established ties to their family or friends. The significance of community relationships and shared heritage in selecting a settlement location highlights a social aspect, as refugees strive to offer emotional support to one another and to recreate a sense of normalcy in the face of displacement.

Syrian refugees exhibit exceptional resourcefulness when constructing their shelters by using plastic sheeting, lumber, and corrugated metal sheets. Plastic sheeting is frequently selected for roofing and wall applications due to its widespread availability, simple installation process, and cost-effectiveness despite its low insulating ability. Timber is the primary support system, providing flexibility and

convenience, particularly regarding local availability. Corrugated metal is the preferred choice for roofing when it is available because it offers better protection against the weather elements compared to plastic. Nevertheless, obtaining it can be difficult because of governmental limitations on construction supplies.

Refugees frequently install thin concrete flooring in their shelters, which goes against the rule of not using permanent materials. Usually, these floors are 1-2 cm thick and offer a more solid and sanitary surface than dirt or temporary alternatives. This is in keeping with cultural traditions of cleanliness, particularly among women who are used to cleaning floors daily.

The configuration and aesthetics of the shelters are also influenced by the refugees' need for seclusion and their cultural inclinations, which impact the arrangement and utilization of spaces within the shelter’s limitations. The careful arrangement demonstrates a collaborative attempt to create a sense of personal living space, even in temporary conditions.

Viewed from this perspective, the informal settlements in Lebanon are not merely groups of temporary shelters but rather vibrant communities where Syrian refugees navigate the intricate challenges of being displaced. These refugees utilize their ingenuity and connections within the society to establish living arrangements that, although imperfect, serve as a foundation for preserving self-respect, dignity, cultural heritage, and a sense of belonging in an otherwise unpredictable existence.



Figure 7: This digital rendering shows the different layouts of the shelters used by Syrian refugees in the Droube 019 informal settlement. These configurations were sketched based on field data.

Figure 7 comprehensively depicts the architectural arrangement of five distinct shelters in the 'Droube 019' informal community. It highlights the careful design considerations that aim to address Syrian refugees' specific requirements and differing situations in Lebanon. Each shelter's arrangement is marked with its own square-meter area, demonstrating designs that may be adjusted to fit different land shapes and sizes in the settlement. The plans are carefully designed to guarantee that each shelter can adequately accommodate the anticipated number of people, striking a delicate balance between maximizing space and preserving personal privacy.

The shelter designs incorporate shared public spaces, such as outside courtyards and reception areas, to emphasize the traditional significance of social interaction and community cohesiveness. These spaces are

crucial for residents to participate in social activities. They also promote a feeling of community and stress mutual solidarity and assistance – elements that are important for adaptability and resilience during periods of displacement.

Furthermore, every shelter layout incorporates designated storage sections, showcasing a practical and pragmatic strategy for maximizing space utilization. Efficient space utilization is essential in transitional shelters, which are often small and confined. This helps ensure organization and cleanliness, enhancing the shelters' overall habitability.

The Droube 019 shelters are strategically arranged in a clustered form, effectively using the restricted space and facilitating communal paths between them. This arrangement promotes optimal land utilization and fosters social engagement among inhabitants, stimulating social activities and cultivating community. The paths function as vital conduits for the settlement, encouraging social interaction, culinary activities, hygienic practices, and participation in communal routines. These activities are additionally critical in maintaining mental health and fostering social cohesion.

Figure 7 depicts the practical elements of shelter design used in the Droube 019 shelters and emphasizes the focus on human needs in these informal settlements. It shows how architecture and urban planning are closely intertwined with the refugee population's needs, social structure, and cultural traditions. The comprehensive blueprints further demonstrate the tenacity and flexibility of Syrian refugees, who, despite the difficulties of being uprooted, endeavour to establish residences and rebuild societies that preserve their self-respect and dignity, embody their cultural principles, and aid their ongoing pursuits of stability and rehabilitation.

The graphic exemplifies five distinct shelter configurations, labeled I through V. Each plan illustrates the arrangement of rooms, including bedrooms, kitchens, living areas, restrooms (WC), reception areas, and storage spaces, together with their various proportions. Each room has amenities that help comprehend the available living space. Figure 7 can be used as a planning tool to construct or improve shelters in informal settlements. It offers a top-down view that illustrates the connections between rooms, spaces, and physical elements. Below is a detailed analysis of the usual content displayed in the plans.

Dimensions and Capacity: Beneath the shelter designs, there is a chart displaying the dimensions of each shelter and the maximum number of individuals it can house. This demonstrates a prioritization of guaranteeing the availability of sufficient living areas for each individual. Understanding the magnitude and capability of the informal settlement requires knowledge about its total area, the year of initial arrivals, and the population density per shelter.

The assortment of layouts indicates a capacity to adjust to the various dimensions and configurations of the town's available land. This adaptability is essential in informal settlements where space is frequently constrained and irregularly shaped.

Essential Facilities and Seclusion: Every unit is equipped with fundamental facilities such as a kitchen and toilet (WC). The inclusion of separate bedrooms indicates a deliberate effort to ensure seclusion and individuality within the living areas.

Public Areas that Multiple Individuals Use: Within the temporary communities of informal settlements, communal facilities such as open courtyards and reception spaces play a crucial role, acting as extensions of individual dwellings and essential centers for community engagement and social activities. The common areas are cleverly built to provide

extra living space that is suitable for various activities, such as social gatherings and daily tasks. This further demonstrates the community's ability to adjust and endure.

Outdoor courtyards, typically located between the shelters, offer a flexible and spacious environment for children to play, adults to interact socially, and families to participate in community activities like cooking and dining. These venues serve as a vital connection for community cohesiveness, providing a feeling of normality and inclusion in the face of the uncertainty of being displaced. Residents are permitted to uphold cultural practices and rituals in these spaces, which helps to cultivate solidarity through a shared identity and the formation of a network of mutual support.

The reception areas, usually near the shelter's entrance, function as transitional zones that integrate the public and private domains. These places serve as spaces where residents can receive guests, participate in communal debates, or simply unwind after a long day. These areas play a vital role in preserving the social structure of the settlement, allowing people to establish and develop relationships, exchange resources, and provide mutual assistance in their everyday activities.

These shared spaces are essential for cultivating a sense of community and enhancing the overall quality of life in the settlement by allowing for social interaction and additional living space. They exemplify the community's ingenuity and cohesiveness, showcasing how, even in the face of limited conditions, the human essence forges significant social bonds and creates environments of shared happiness and assistance.

Efficient use of space is crucial for having a storage room in a shelter, especially given the usually limited living space that exists in such settlements. This designated area functions as an essential storage

facility for personal possessions, contributing substantially to the orderliness and comfort of the living environment. Extensive storage space ensures that necessary items are organized and easily reachable, improving overall orderliness, comfort, and functionality. Furthermore, the storage room offers a protected area for guaranteeing the safety of crucial documents and precious items, reducing the possibility of them being lost or damaged. In settings characterized by limited resources and constrained living areas, a dedicated storage area can significantly create a feeling of organization, safety, and self-respect for individuals and families living in the shelter. Therefore, its incorporation fosters normality and stability in challenging conditions.

Within the complex network of informal communities such as "Droube 019," the shelters are not just buildings, but carefully crafted dwellings tailored to their residents' specific needs and requirements. Syrian refugees utilize their resourcefulness, available construction materials, and understanding of their culture to construct shelters that effectively combine privacy, security, comfort, and community elements. Figure 7 provides a comprehensive depiction of this intricate equilibrium, with shelters that are designed to adjust to the diverse dimensions and configurations of the accessible land while also guaranteeing sufficient personal space for every inhabitant.

The inside architecture of the shelter points to meticulous planning, effectively utilizing the limited space to establish separate sections for sleeping, cooking, and socializing, among other activities. Specific shelters may also have allocated chambers for males and females or distinct sleeping or play areas for adults and children, which align with cultural conventions and the necessity for confidentiality. Specific spaces may be designated for religious activities, prioritizing the spiritual requirements of the inhabitants. In addition, it is essential to

provide functional areas for showering, washing, and storage. It is also necessary to consider the refugees' daily routines and hygienic practices.

Utilizing suspended sheets or drapes to delineate distinct shelter zones provides privacy while preserving a feeling of spaciousness and interconnectedness within the familial unit. This design method demonstrates a profound comprehension of the significance of family relations and communal life within Syrian culture.

The digital configurations in Figure 7 vividly depict the proximity of the shelters, the interconnected paths between them, and the shared outdoor areas that are common to them and which serve to promote a strong sense of community. They further depict the resourceful use of every available space by the settlement's residents. They likewise demonstrate various activities, such as animal husbandry and the creation of communal courtyards, highlighting the resilient and flexible nature of community life under challenging settings.

The "Droube 019" shelters symbolize physical edifices and Syrian refugees' endurance, heritage, and communal solidarity. Each shelter in the informal settlement represents a small-scale version of Syrian cultural norms and traditions, adjusted to fit the limitations and circumstances of living in such a community. These shelters have specific sections for living, cooking, and socializing. Figure 7 and its accompanying digital renderings provide a comprehensive analysis of diverse shelter layouts and community dynamics within one informal settlement. These effectively demonstrate how Syrian refugees in Lebanon endeavor to establish a sense of home and community amid the uncertainty caused by displacement.

5- The Courtyard

The courtyard, heavily influenced by Islamic and Syrian architectural traditions, is deeply rooted in cultural, social, and religious contexts, as Alabidin (2010) thoroughly addresses. Serving as a central element in residential buildings, it reinforces traditional norms, such as gender roles and the need for seclusion. The design of the courtyard features shaded areas, water features, and decorative plants. This creates a comfortable microclimate while also aligning with cultural practices that prioritize family gatherings and social events. The courtyard promotes a sense of community and facilitates social engagement by providing a dedicated space for gatherings and interactions.

The open architecture allows for natural airflow and light, enhancing the quality of the living environment and contributing to its sustainability. Additionally, the courtyard offers a peaceful retreat from the noise and bustle of city life, functioning as a sanctuary for relaxation and contemplation. Thus, integrating a courtyard into architectural designs not only honors cultural heritage but also enhances the overall quality of life for residents, particularly when it comes to their physical and mental well-being.

The Social and Cultural Dimension of Courtyards: Courtyards have traditionally served as crucial, private spaces within homes, enabling the protection of social interactions and domestic activities from public observation. This architectural element strongly reflects cultural beliefs, especially in societies where privacy is paramount. Due to their seclusion, courtyards allow residents to partake in communal meetings, family bonding time, and daily activities without external interference, promoting a sense of safety, security, and intimacy. The fact that courtyards accord with cultural norms highlights their lasting

significance and usefulness in various architectural styles and configurations.

Environmental Benefits: Courtyards significantly impact a home's microclimate, leveraging natural factors to control temperature and ventilation. Offering shade and promoting airflow reduces the necessity for artificial cooling systems, especially in dry, hot areas and climates. The inherent cooling mechanism improves comfort and supports energy efficiency, which aligns with sustainable design principles. Courtyards are environmentally friendly solutions that help maintain a comfortable temperature in residential areas by seamlessly blending architecture with the surrounding environment.

Psychological Impact: The availability of a secluded outdoor space, such as a courtyard, can encourage physical activity, reduce stress, and improve mental health. Observing abundant vegetation and vast open skies from the comfort of one's residence further cultivates a deep feeling of serenity and calmness. This affiliation with the natural world provides a temporary break from the pressures of everyday existence, fostering a state of calmness and restoration. By incorporating natural components, such as courtyards, into residential spaces, individuals can feel the positive effects on their mental well-being. This highlights the inherent connection between architecture, nature, and human welfare.

Physical Health: Courtyards can accommodate plants and water features, providing more than simple visual attractiveness. They enhance air quality and serve as spaces for physical activities, promoting residents' physical and mental well-being. Greenery promotes air purification, while adding water elements improves tranquillity and humidity. Furthermore, these adaptable areas offer chances for physical activity and leisure, fostering a dynamic way of life inside the boundaries of one's residence. Courtyards, as such, play a crucial role in

residential architecture by promoting a mutually beneficial link between nature and human activities. They prioritize both environmental sustainability and personal well-being.

Aesthetic Appeal: Courtyards enhance the aesthetic appeal of a home by incorporating attractive landscaping options and offering picturesque views from internal spaces, making them fascinating focal points of interaction and conversation. The meticulous placement of plants and foliage enhances the aesthetic appeal, resulting in a visually attractive setting that harmonizes with the architectural landscape. Residents can enjoy the serene and calming atmosphere of the courtyard from the comfort of their homes, offering a soothing escape from daily life. The inclusion of both indoor and outdoor spaces enhances the dwelling's aesthetic appeal and fosters a deeper connection with the natural environment, ultimately improving the quality of life for its inhabitants. This promotes a stronger bond with the natural environment, which in turn improves the quality of life for those living there.

Thermal Comfort: Courtyards, when carefully planned, can effectively utilize solar radiation during the winter season and offer shaded areas during summer months, guaranteeing year-round climate-controlled comfort for residents. Courtyards optimize sun exposure during colder months by strategically orienting it and including architectural elements like overhangs and pergolas, which promote natural warmth and illumination. In contrast, these features protect shelters from excessive heat in warmer seasons, forming shaded areas that preserve a comfortable temperature. This deliberate design approach not only improves the habitability of the area but also encourages energy efficiency and environmental sustainability by decreasing dependence on artificial heating and cooling systems.

Courtyards are dynamic features that adjust to seasonal changes, maximizing residents' comfort all year round.

To summarise, in Syrian architecture, the courtyard is more than just a physical area. It represents a complex and elaborate idea closely connected to cultural norms, social rituals, and environmental factors. In his research, Zein Alabidin (2010) emphasizes the importance of traditional values, specifically regarding the separation of genders within living spaces and the importance of individuality and privacy. In the specific situation of Syrian refugees living in "Droube 019," these cultural values and architectural concepts have been cleverly adjusted to meet their needs, requirements, and conditions.

Refugees have ingeniously integrated parts from their traditional architectural style into their shelters, most prominently by including outdoor courtyards (Figure 8). These courtyards are deliberately located next to the houses and serve several functions that align with cultural values. They enhance mobility inside the community while guaranteeing a sense of seclusion for the residents. By engaging in meticulous planning, individuals and families can carry out their everyday activities without feeling vulnerable to the scrutiny of neighbours, thus upholding the cultural importance of privacy and seclusion.

Incorporating courtyards into refugee shelters showcases user-centered design that is culturally sensitive and reflects the tenacity and ingenuity of displaced people in preserving their cultural heritage and fostering social unity in the face of hardship. Refugees have successfully modified traditional architectural concepts to accommodate their living arrangements, even under challenging circumstances. This modification offers apparent advantages in enhancing freedom of movement and privacy while also serving as a concrete connection to their cultural history and fostering a sense of belonging.

Furthermore, including courtyards in refugee shelters highlights the broader importance of design in meeting the intricate and culturally specific requirements of displaced communities. By incorporating traditional design aspects into humanitarian operations, organizations can construct environments that meet practical needs and align with the occupants' cultural and social identities. This method promotes a feeling of self-respect and strength among migrants, acknowledging their ability to influence their living conditions. It also eases their process of adaptation to their new surroundings and living environment.

Overall, the courtyard in Syrian architecture symbolizes a physical area and encompasses diverse reflections of cultural beliefs, social customs, and environmental approaches. The Syrian refugees in "Droube 019" have exhibited endurance, resourcefulness, and a dedication to safeguarding their cultural legacy by incorporating traditional building concepts into the designs of their respective shelters. Including courtyards in their shelters demonstrates their adeptness in managing, preserving, and reconciling their cultural identity throughout migration. Therefore, these courtyards represent optimism, perseverance, and uninterrupted human existence, resistance, and resilience in the face of unpredictability.

Despite the spatial limitations imposed by informal settlement layouts, the refugees have adapted by creating compact courtyards—typically measuring 1 meter by 2 meters—that serve as essential extensions of their living spaces. Strategically positioned in front of or behind the shelters, these courtyards often feature openings from the kitchen and reception areas to facilitate both airflow and social engagement while maintaining privacy. By thoughtfully organizing these spaces, the residents have maintained cultural practices such as

communal gatherings and outdoor domestic activities, even under challenging conditions.

These courtyards not only enhance thermal comfort through natural ventilation and shading but also foster a sense of normalcy and community cohesion by providing dedicated spaces for social interactions. The inclusion of plants, makeshift seating, and shaded areas reflects their resilience and creativity, turning functional spaces into symbols of familiarity and stability. Therefore, these courtyards represent optimism, perseverance, and uninterrupted human existence, resistance, and resilience in the face of unpredictability, illustrating how architectural adaptation can preserve cultural identity while promoting well-being in displacement contexts.



Figure 8: This picture depicts one of the outdoor courtyards found at "Droube 019".

The image (figure 8) displays a humble courtyard space featured in a casual Syrian settlement in Lebanon. The image depicts a confined passageway bordered by improvised partitions, which leads to a larger space featuring a sheltered portion, presumably designed to provide shade. The presence of organized arrangements and domestic elements, such as clothing being hung to dry and plants being potted in reused containers, adds to the overall aesthetic and feel of a comfortable and environmentally friendly living space. Large metallic containers

indicate the presence of water storage, which is an essential and sustainable resource in these villages.

This arrangement demonstrates the residents' endeavors to establish a practical and efficient living environment under challenging circumstances. Despite the limitations, this architectural plan and configuration aim to preserve cultural traditions. The makeshift dwellings seen in the refugee settlement exemplify the typical characteristics of such communities, emphasizing the harshness of being displaced balanced with the resourcefulness and creativity of the inhabitants in adjusting to unfamiliar surroundings.

6- Family Sitting/Reception Room

The family sitting room, often known as the reception room, is designed for relaxation and socializing inside a household. The family sitting room or reception room is an integral component of the architectural design of traditional Syrian houses.

The area, which can be accessed directly from the house's entrance, is designed to serve multiple purposes. It predominantly serves as a venue for family members to convene, partake in social endeavors, unwind, and host visitors. The space is usually embellished with customary ornamental features, such as rugs, fabrics, cozy seating arrangements, and occasionally wall art or calligraphy. The rooms frequently have delicate geometric patterns on the floors, imitating the aesthetic of oriental carpets and enhancing the overall appeal and coziness of the area. During the winter months, a fireplace can serve as a central element, providing a focal point and a means of generating heat.

During field visits, it was observed that Syrian refugees in informal settlements integrated aspects of the traditional reception room, a prominent feature of their homes in Syria, into their living spaces as they

strive to recreate a sense of familiarity. This adaptive measure demonstrates their commitment to preserving cultural practices and social norms, even while displaced.

Dimensions and Architectural Elements: The typical dimensions of the family sitting room in informal settlements like "Droube 019" range between 10 m² and 12 m². Key architectural elements include:

- **Doors:** The doors are generally around **0.8 to 0.9 meters wide**, facilitating movement while maintaining a compact layout.
- **Windows:** Windows, where present, are typically **0.5 meters in width**, allowing minimal natural light and ventilation. However, some rooms lack windows altogether, reflecting spatial limitations and the need to prioritize structural insulation over openness.

These dimensions and features illustrate the resourcefulness of the refugees in maximizing the limited space available for multiple functions.



Figure 9: This picture depicts a family sitting room or reception room within an informal settlement.

The photograph (figure 9) depicts a room with a cooker presumably used for both heating and cooking. This type of stove, typically called a “Sobia” or wood stove, is frequently seen in remote and rural village areas with limited access to or lack of affordability of central heating. This is a pragmatic solution for heating a living area and can occasionally serve as a cooking surface. Stoves are essential in informal settlements, where Syrian refugees may live, as they are vital for both comfort and survival in cold weather. They provide a crucial way to heat the indoor environment and keep it warm. The remainder of the interior design is minimalist, including fabric wall coverings offering insulation and a modest level of comfort. The room is a versatile space where various activities, such as family gatherings and welcoming guests, can occur throughout the day. The minimalistic decor reflects the transient nature of these settlements and suggests a pragmatic attitude to living arrangements, commonly found in temporary or small dwellings where occupants must make the most of limited resources and space. The prevailing impression is efficiency and flexibility, endeavouring to establish familiarity and comfort in a potentially temporary settlement scenario.



Figures 10a and 10b: Figure 10a depicts a sitting area for the family, while Figure 10b represents a bedroom.

The Syrian refugees in the informal settlement "Droube 019" integrated the family sitting room/reception room space (figure 10) into the interior design of their shelters. The photographs (figure 10) depict two areas within an informal Syrian community in Lebanon, commonly recognized for their primary and utilitarian design. To the left is a chamber with a door connecting to another area, suggesting it is a section of the shelter, potentially serving as a central living space. The room is sparsely furnished, with walls covered in fabric and a ceiling made of wood and other materials. These modifications suggest that its inhabitants have used their limited resources to create habitable living quarters. To the right, another room is depicted, where illumination streams from a window, enhancing the area's brightness. An unrolled mat is positioned on the floor, indicating that this space potentially

serves as a designated location for sleeping or sitting. Both photographs show walls and ceilings designed to insulate the space to maintain thermal comfort and ensure privacy. This is a typical requirement and need expressed by the Syrian refugees, given the confined living conditions of informal settlements. These photographs depict the circumstances of Syrian refugees who have found asylum in Lebanon, demonstrating their ability to adjust to new surroundings with resourcefulness and determination. The minimalistic nature of the spaces accentuates the difficulties encountered by refugees and the unwavering resolve to uphold a semblance of normality and comfort amidst trying conditions.

The Syrian refugees in "Droube 019" replicated the same technique within their shelters. The family sitting room or reception room is situated near the shelter's entrance and serves several purposes. It is a communal area where families convene and spend time together, as well as being a designated area for hosting guests. The area is typically furnished with couches, carpets, and pillows. Syrian refugees adorn the space with personal belongings like photos and traditional motifs to establish a feeling of home and a sense of belonging. This chamber also serves diverse practical purposes: in certain instances, it can be divided into smaller sections to function as a sleeping area or to establish distinct living spaces, given the restricted space in the shelters.

7- Functional and Spatial Adaptation

The shelter's family sitting room or reception room has both utilitarian and social purposes and acts as a transitional location between "public" and "private" spaces. In conventional Syrian residences, the "public" space includes the living room, kitchen, and bathroom, which are accessible to both family members and visitors. Simultaneously, family members can enter the bedroom, which is considered a "private"

area. Syrian refugees are deeply concerned about the movement between "public" and "private" spaces within their shelters. They prioritize the protection, comfort, and respect of their family members' privacy, which is a reflection of their cultural values.

The family sitting room or reception room is a crucial area in traditional Syrian architecture, having been modified to become integrated into the informal settlement. It serves as a venue for social interactions and entertaining guests, connecting public areas to private chambers. The family sitting room or reception room is adorned with personalized and customary features, fostering a feeling of domicile and cultural affiliation or heritage for Syrian refugees.



Figure 11: This picture depicts a multipurpose room located in an informal settlement in Lebanon.

The picture (Figure 11) depicts an interior space that fulfills two functions: a living room during the day and a sleeping area at night. This multifunctional room is frequently found in informal settlements inhabited by Syrian refugees in Lebanon. A "Sobia," a traditional wood-burning stove, acts as a necessary heating source, particularly during winter months. The central location of the sobia indicates that it functions as the main heating source for the room.

The furniture reflects a minimalist aesthetic, featuring cushions and materials that presumably double as seating and beds. The colorful cloth on the walls enhances the aesthetic appeal and offers insulation. The spatial configuration of the room and the items found within the room exemplify the residents' ability to withstand obstacles and adjust to challenges, effectively utilizing the constrained area and available resources to transform the living space. This illustrates the difficulties faced by Syrian refugees when seeking to establish a practical living environment that can efficiently support their daily activities within a limited space.

The depicted lifestyle, characterized by communal living and sleeping areas, is commonly observed in informal communities that face spatial constraints and have little to no access to resources. These settlements are frequently distinguished by their transient buildings and the absence of basic facilities, posing difficulties for the daily existence of their residents. Refugees, although facing several challenges, make a conscious effort to preserve a sense of normality and domesticity within their shelters. This is evident in the neat and organized arrangement of the room and in their attempt to create a comfortable living place with few resources at hand.



Figure 12: This picture depicts a social gathering, capturing a moment of solidarity and camaraderie within a place of safety or protection.

The photograph, labeled Figure 12, was taken during a visit to the site and depicts a scene within what seems to be a central living area or family sitting room/ reception room within an informal settlement. In numerous Middle Eastern countries and civilizations, it is customary for women and children to sit on the floor when socializing, dining, and occasionally resting.

The room is sparsely furnished, with pillows placed directly on the floor. The walls are adorned with patterned cloth, which adds to its aesthetic and helps with insulation.

This picture depicts Syrian refugees living in informal settlements in Lebanon, where living quarters are typically cramped and used for various functions. Although the living conditions are complex, the photograph portrays a feeling of oneness, solidarity, togetherness, and collective understanding. The illumination from the doorway accentuates the disparity between the subdued inside and the luminosity of the external surroundings, emphasizing the distinct difference between the two environments. The image exemplifies the power of

individuals to adjust and persevere, establishing a sense of normality despite temporary and limited conditions.

In summary, the family sitting room or reception room remains a vital part of informal refugee shelters, serving as a social space that upholds cultural traditions while addressing practical living needs. Despite the challenges posed by displacement, these rooms embody a sense of resilience and adaptability, reflecting the refugees' determination to preserve ther cultural identity and create a familiar and comfortable living environment within limited means.

The storage room is called "Mouneh."

The term "Mouneh" is derived from the Arabic word "mana," which translates to "to store." It refers to preserving meals for the winter season (Fanack, n.d.). Zaman al-Wasl (2015) highlights that the difficulties posed by the war and economic adversity have rendered food preservation a crucial means of survival for numerous Syrian families. Despite their increasing expenses and the reduced availability of ingredients, the longstanding practice of Mouneh remains an important cultural element and support system, allowing Syrians to preserve their cultural heritage and guarantee food stability during unpredictable periods. Preparing food for a month is a collective endeavor that enhances social connections and fosters a sense of solidarity among those involved, emphasizing its significance beyond simple food storage (Zaman al-Wasl, 2015). Zaman al-Wasl (2015) further states that the Mouneh custom serves to guarantee food security and doubles as a means of demonstrating the innate kindness and hospitality that is deeply ingrained in Syrian culture.



Figure 13: This picture depicts the storage room or Mouneh room in an informal settlement.

In the Droube 019 informal settlement, women gather and prepare their "Mouneh." Preparing and distributing Mouneh goes beyond mere sustenance and represents a more profound cultural belief and practice anchored in generosity, where society's welfare precedes individual desires.



Figure 14: This picture depicts the process of preparing preserved food, also known as Mouneh.

The visual representation (Figure 14) effectively communicates a sense of collective identity, cultural heritage, and long-established customs. It demonstrates the often-communal nature of preserved food preparation duties or Mouneh preparation and emphasizes the significance and importance of social connections and cultural customs in everyday living. Additionally, it provides insight into the ingenuity, resilience, and collaborative endeavors of individuals residing under challenging circumstances, such as refugees who depend on conventional techniques of cooking and preserving food for the winter months ahead.



Figure 15: This picture depicts a shelter's roof designed to protect from climatic fluctuations and to expose various types of food to the sun.

The photograph (figure 15) depicts a series of red peppers arranged in a line, being exposed to sunlight to dry. This is a customary and traditional technique used for food preservation. This scenario describes an informal settlement in Lebanon with little access to resources, where people often rely on traditional ways to preserve food. The peppers are strategically distributed on the rooftop, demonstrating a clever utilization of space in a densely populated area where available ground space is scarce. Air-drying the peppers helps maintain their quality and intensify their taste. This is an essential step in Levantine cuisine to reach a specifically sought-out flavour profile that is characteristic of numerous regional recipes. The photograph showcases the ingenuity, adaptability, and flexibility of the locals, emphasizing their capacity to innovatively use limited spaces to help preserve traditional cuisine traditions despite living in challenging environments.

Facilities (Including the Kitchen Area, Toilets, and Showers)

The kitchen area in the "Droube 019" informal settlement is situated within each shelter and serves the multiple purposes of preparing meals, showering, and doing laundry, owing to space constraints and limited available resources (see Figure 16). Due to concerns over privacy, safety, and security, particularly among women and girls who may feel uneasy showering in public, residents utilize the kitchen for showering purposes. Furthermore, it is crucial for inhabitants, especially women

and children, to have quick and reliable access to a safe and secure showering area. In addition, the kitchen functions as a space for social interaction, where family members and friends come together to cook and enjoy meals, fostering a sense of social togetherness, solidarity, and community in their new surroundings. Generosity and hospitality are also integral aspects of Syrian culture, as stated by Tahhan (2011).

Residents construct and arrange their kitchen shelves using limited resources such as wooden planks. These shelves store household items, food, and cooking tools based on Syrian refugees' specific needs. The refugees' construction and upgrading of their kitchen area or space offer seclusion, a sense of normalcy, and the opportunity to uphold their cultural customs and traditions.



Figure 16: This picture illustrates the kitchen area, which sometimes doubles as a laundry room or showering space.

Refugees living in these shelters construct and arrange their kitchen shelves using scarce resources such as timber planks. These shelves can store various home objects, food, and culinary utensils according to refugees' needs and requirements. The kitchen, constructed by the residents themselves, offers seclusion and enables them to uphold their cultural customs and traditions. It also reflects an important part of daily life and culture, echoing Syrian heritage.

Figure 17 below captures the interior of a temporary construction within an informal settlement for Syrian refugees, shot during a site visit to the Droube 019 informal settlement. The scene exemplifies the improvised and makeshift living circumstances frequently encountered in these settlements, where refugees ingeniously attempt to utilize available resources to construct their individual and shared living spaces. The observed area appears to be arranged and prepared to wash dishes or prepare meals, as evidenced by the presence of cooking pots and a basin on the floor. Utilizing plastic sheeting as wall partitions indicates a pragmatic and economic solution to create distinct and delineated secluded and individualized areas within the shelter. The shelter's design overall prioritizes fundamental shelter design requirements and practicality over maximizing comfort or visual aesthetic or appeal. The living conditions exemplify the resourcefulness, resilience, and tenacity of Syrian refugees who manage their shelters and daily lives and maintain household routines and tasks despite the absence of institutional infrastructure. This arrangement demonstrates an endeavour to uphold orderliness and sanitary norms, which can be difficult to sustain in highly crowded communities such as informal settlements with restricted access to basic amenities.



Figure 17: This picture shows the interior of a kitchen area located within an informal settlement.



Figure 18: This picture depicts the interior of a kitchen storage area within an informal settlement.

The photograph (figure 18) depicts a designated area utilized for food preparation and storage within a Syrian refugee shelter. Although regulations prohibit the construction of permanent buildings and structures, which includes a ban on the use of certain building materials that are deemed more permanent in nature, such as concrete flooring, the image clearly shows a concrete floor. The refugees may prefer this type of flooring due to its longevity and the ease of cleaning it. The wall is decorated with shelves covered in attractive fabric and filled with various kitchenware and consumables. This suggests an effort to create

a well-organized and practical kitchen and Mouneh space despite the limitations imposed by refugees' status and government laws.

The bathroom facilities in the informal settlement "Droube 019" are located outside the shelters and are communally used by multiple households (figure 19). Each of the three interviewed families living in Droube 019 shelters shares a single toilet situated outside their shelters. Non-governmental organizations and humanitarian organizations typically provide portable chemical toilets to serve as toilet facilities.

The absence of adequate and sufficient sanitation facilities, including toilets and showers, poses a significant obstacle for Syrian refugees living in "Droube 019." This issue is particularly concerning for women and girls, as they feel vulnerable and unsafe when using shared facilities, especially at night. Furthermore, it can result in health hazards and raise issues about hygienic concerns. Even when accounting for these difficulties, Syrian refugees persist in taking the required measures to safeguard and uphold their cultural customs and personal confidentiality.



Figures 19a, 19b, and 19c: Figure 19a depicts an outdoor bathroom facility located adjacent to a shelter. Figure 19b shows the bathroom facility's door, while Figure 19c provides an interior view of the bathroom facility.

8- Key Issues Related to the Use of the Shelter

During focus group discussions with 20 Syrian refugees, several key issues regarding the use of their shelters were identified, shedding light on the everyday challenges they face in these spaces. These discussions provided a deeper understanding of their concerns and helped outline potential improvements that could better meet their needs. The topics raised included critical issues related to weather resilience, thermal comfort, ventilation, drainage, and overall shelter quality.

9.1 Vulnerability to Weather Conditions and Thermal Discomfort

Winter Conditions and Exposure to Cold: Refugees expressed that during the winter months, their shelters offer little protection against the cold, which leads to severe discomfort and recurring health issues. Without proper insulation, the interior temperatures of the shelters can drop to dangerously low levels, making them cold, damp, and uninhabitable. Many refugees shared experiences of frequent colds, respiratory infections, and joint pain exacerbated by the cold

environment, which lacks any form of heating or insulation. Families are forced to use makeshift heating methods, such as burning wood or other materials, which not only provide inadequate warmth but also introduce health risks, including respiratory issues from indoor smoke exposure. Additionally, they noted that the lack of insulation compromises privacy, as the thin walls do little to block sound or provide a secure, enclosed space.

Summer Conditions and Overheating: During the summer months, refugees struggle with extreme heat, particularly between April and October when temperatures in Lebanon often rise above 35ºC, with records as high as 41ºC. This excessive heat makes it nearly impossible to carry out daily tasks within the shelter, with many describing their living spaces as “stifling” and “unbearable.” The lack of proper ventilation and cooling mechanisms creates a buildup of heat inside, turning the shelters into hot zones where even basic tasks and restful sleep become difficult. This contributes to fatigue, dehydration, and other heat-related health issues, particularly affecting the elderly and young children, who are more vulnerable to heat stress. Refugees have expressed a strong need for structural improvements that can allow for better air circulation, shading, and heat protection to mitigate the impact of the intense summer temperatures. This extreme heat makes it difficult for people to carry out their daily tasks and get restful sleep (Climates to Travel, n.d.).

9.2 Flooding, Water Seepage, and Inadequate Drainage Systems:

Water Infiltration During Heavy Rainfall: During periods of intense rainfall, which are common in Lebanon’s rainy seasons, refugees frequently experience water seepage and even flooding within their shelters. The absence of a reliable drainage infrastructure in the settlement means that rainwater accumulates around and often within

the shelters, soaking floors and damaging personal belongings. In figure 20, the photograph highlights rainwater that has penetrated the shelter's interior, affecting the quality of living conditions and creating a damp, mold-prone environment that jeopardizes the health of its residents. Many refugees noted that they must elevate or cover their belongings to protect them from water damage, which is particularly challenging when water infiltrates suddenly during a heavy downpour.

Impact on Hygiene and Food Storage: The state of the shelter seen in the photograph below (figure 20) substantially affects its residents' welfare and sense of human and physical security. Due to its lack of elevation, the shelter is vulnerable to water infiltration resulting from heavy rainfall or melting snow. This can be damaging to personal goods, and food supplies and creates a damp and uncomfortable living environment. In such circumstances, ensuring food preservation and the continued implementation of hygienic practices poses a difficulty, putting at risk both the nutritional quality of food within the shelter and the overall well-being of the refugees. This highlights the necessity for more durable and resilient housing structures, characteristics, and options in informal settlements.



Figure 20: This picture depicts the presence of rainwater within the shelter. This seepage can be damaging to items located in the shelter and negatively impacts refugees' sense of well-being.

9- Perceptions of Safety and Community Support

Although many refugees in "Droube 019" have developed informal support networks within the settlement, the lack of reliable shelter infrastructure makes them feel exposed and isolated during environmental stress. Despite the community support and solidarity among residents, the inadequate shelter conditions remain a constant reminder of their displacement and the temporary, precarious nature of

their current homes. The limited resources, combined with the lack of proper protection from the elements, reinforce a perception of insecurity that hinders a sense of belonging and stability.

10.1 Maintenance

The Syrian refugees at the "Droube 019" informal settlement encounter difficulties when preserving, fixing, and seeking to upgrade their shelters due to the restricted availability of needed material resources and supplies. Consequently, over time, shelters rapidly deteriorate, generating safety and security risks, discomfort, and an inability to offer sufficient protection from severe weather fluctuations and conditions. Additionally, the absence of regular upkeep of the shelters can result in further structural deterioration, water leaks or seepage, and health issues or outbreaks, especially for more susceptible individuals.

An interview with a Ministry of Social Affairs (MoSA) employee revealed that shelters in Lebanon's informal settlements undergo annual evaluations, typically in late spring or early summer. These assessments are collaboratively conducted by various United Nations (UN) organizations, including UNHCR and UNICEF, alongside MoSA. The evaluations aim to assess the wear and damage each shelter sustains over the preceding year, examining factors such as weather exposure, seasonal wear, and damage from high winds or rain, as well as the general stability and safety of the structures.

Following the assessments, the findings inform decisions regarding the type and number of materials required to improve shelter conditions. Households with minor damage may receive plastic sheeting or lumber to reinforce existing structures. In contrast, those with extensive damage or complete structural failure are provided with a full tent kit to enable the construction of a new shelter.

The distribution of materials and kits is organized to ensure readiness before winter, with the goal of completion by the end of November. This proactive approach is especially critical for vulnerable families, as Lebanese winters can be harsh, with freezing temperatures, heavy rainfall, and snow in mountainous areas. By preparing shelters in advance, MoSA and UN agencies work to mitigate health risks, providing refugees with a safer living environment throughout the colder months.

During the field visit to the Droube 019 informal settlement, locals expressed the need for supplementary plastic sheets to safeguard their roofs from rainfall, which often results in damaging water seepage within their shelters. Moreover, the refugees shared that they encountered issues with sewage pipes, resulting in the inundation of water within their shelters (Figure 21). According to the information they shared, the maintenance personnel exhibited a sluggish response to meeting these needs and requirements, resulting in pain, frustration, degradation, and irritation.

Figure 21 below depicts an open-air space situated amidst the temporary dwellings. The presence of water puddles on the ground indicates recent precipitation, as the uneven and low-lying terrain hinders proper water drainage, causing water to pool instead. These circumstances might result in the formation of muddy terrain, which can impair navigation and freedom of movement and perhaps worsen health, safety, and security concerns and issues.



Figure 21: This picture depicts the occurrence of water leakage in sewage pipes.

The refugees residing in the informal settlements in Lebanon are adversely affected by the delayed maintenance response times and the restricted availability of resources and materials, which ultimately compromises their safety and well-being.

10.2 Natural Ventilation and Lighting

During the observatory tour around the Droube 019 informal settlement, the shelters were equipped with limited small windows protected by a steel net. This was done to create a sense of privacy for the people living in the shelters (see Figure 22). The refugees stated that

they blocked the openings of their shelters to prevent outsiders from peering into them. Privacy holds significant importance in Syrian religion and culture, especially for women and girls who may encounter social interactions with men who are not part of their immediate family.



Figure 22: This picture depicts a shelter opening or makeshift small window protected by a steel net.

The insufficient number of openings in the shelters within the "Droube 019" informal settlement poses substantial difficulties for Syrian refugees residing in it, adversely affecting their well-being and convenience. For example, one room had a floor area of 5.9m² with an opening measuring 0.4m², which exceeds the Sphere standard requirement of 0.295m² (5% of the floor area). Despite meeting the minimum surface requirement, the opening's placement and the absence of additional ventilation points fail to provide adequate airflow and cross-ventilation. In some rooms, there are no openings, further compounding the issue. Inadequate or lacking ventilation systems in shelters can lead to various health hazards and cause illnesses such as respiratory issues, which can worsen when using indoor heaters and cooking stoves that emit pollutants. In the sweltering summer, the absence of natural ventilation exacerbates these problems, resulting in discomfort and deteriorating indoor air quality.

Figure 23 illustrates a Sobia inside a shelter, a wooden stove used for cooking and heating. This emphasizes the settlement's dependence

on these heating techniques. Although the little window above the stove provides a certain degree of ventilation, more is needed to guarantee appropriate air circulation, mainly when using the furnace. Adequate ventilation is crucial when burning wood indoors to avoid smoke and carbon monoxide buildup, which can present substantial health hazards, respiratory problems, and risks of asphyxiation by carbon monoxide poisoning. The small size of the aperture could hinder the circulation of fresh air and the release of smoke, which could worsen the indoor air quality problems in the shelter.

A comprehensive strategy is needed to tackle these difficulties, focused on enhancing the architectural design and construction of shelters and upgrading ventilation systems. To improve airflow and reduce interior air pollution, one can enlarge apertures or add more diversified ventilation systems, such as vents or fans. In addition, advocating for alternative heating technologies that emit fewer pollutants, such as clean-burning stoves or solar-powered heaters, can help mitigate the health hazards linked to indoor air pollution and improve the longevity and sustainability of these heating, cooking, and ventilation options.

Moreover, implementing community-driven efforts to educate people on effective ventilation techniques and encourage sustainable heating solutions can empower individuals to support the creation of healthier living environments actively. Effective implementation of pragmatic solutions and resolution of intricate issues related to indoor air quality in refugee settlements such as in the "Droube 019" informal settlement necessitate the cooperation of humanitarian organizations, local authorities, and community members.

Ultimately, it is essential to tackle the insufficient air circulation in the shelters of "Droube 019" to protect the refugees' health and well-

being. By applying strategies to enhance air circulation and minimize indoor air contamination, we will have established more secure and healthier living conditions for displaced populations, bolstering their ability to withstand obstacles and recover from challenging circumstances.



Figure 23: This picture depicts the interior of a shelter, including heating and ventilation.

The influence of natural light on mental well-being, especially among susceptible groups such as refugees, is of great significance. There is a strong correlation between exposure to natural light and

enhanced mood and happiness. This connection also significantly impacts factors such as productivity and quality of sleep. This perspective highlights the importance of including natural light in the architectural planning of displaced persons' living spaces to protect their general welfare.

The design of shelters in refugee settlements has significant implications for the refugees' health and well-being. Cultural norms often prioritize privacy, resulting in shelters not having enough ventilation, poor indoor air quality, and an increased risk of disease transmission. In addition, the dependence on conventional wood-burning stoves (Sobia) for heating due to inadequate insulation worsens the difficulties in controlling indoor air quality and temperature fluctuations.

Furthermore, the limited availability of natural light in shelters presents substantial hazards to mental well-being. Inadequate exposure to natural sunlight can contribute to the development of mood disorders and worsen pre-existing trauma among refugees who have undergone displacement and adversity. This emphasizes the significance of considering physical and psychological factors when designing shelters for displaced populations, notably as mental well-being directly impacts physical health and vice versa.

To tackle these challenges, a comprehensive approach that considers the complex relationships between cultural, environmental, and psychological factors is necessary. Sufficient ventilation is essential to maintaining good indoor air quality when designing shelters. At the same time, insulation measures should be incorporated to reduce temperature fluctuations. Furthermore, it is advisable to include tactics to optimize the amount of natural light in shelters, such as strategically positioning windows and skylights to enhance mental well-being.

Moreover, efforts to increase knowledge about the significance of natural light and ventilation and educate refugees about sustainable heating options can actively empower refugee communities to support the creation of healthier living conditions. Effective implementation of practical solutions and resolution of the intricate challenges of shelter design in refugee settlements require the cooperation and coordination of humanitarian organizations, local authorities, and community members.

Ultimately, incorporating natural light, ventilation, and sustainable heating and cooking solutions is essential to foster the physical and mental well-being of displaced populations. By giving priority to these elements in the design of shelters and implementing comprehensive strategies, we can create living environments for refugees that are safe, healthy, and dignified. This will enhance their resilience and ability to recover from challenging situations.

Multiple factors expose Syrian refugees living in the informal settlement "Droube 019" to a heightened risk of fire hazards. The main reason is the shelters' proximity, which enables Syrian refugees to remain together as nuclear and extended families, preserve solid social relationships, cultural values, and heritage, and efficiently use the available space.

In the "Droube 019" informal settlement, a stark disparity exists between the minimum standards outlined in the Sphere Handbook (2018) and the realities of shelter construction. Per the Sphere standards, the recommended minimum distance of 2 meters between shelters is often disregarded, with shelters built adjacent. This proximity poses a significant fire hazard, impeding quick evacuation during a fire outbreak.

Compounding this risk is the prevalent use of flammable construction materials like plastic and tarpaulin in shelter construction by Syrian refugees. While these materials are readily available and affordable, they exacerbate the rapid spread of flames in the event of a fire. Additionally, the lack of proper infrastructure and restricted access to electricity compels refugees to resort to candles and heating appliances for warmth and cooking, further increasing the likelihood of fire incidents.

Furthermore, inadequate fire protection services and resources compound the risk. Syrian refugees frequently do not have access to essential fire safety equipment, including smoke detectors and alarms. Their limited awareness of basic fire safety practices exacerbates their vulnerability to fire hazards.

In conclusion, inadequate shelter spacing, the use of non-fire-resistant materials, and the absence of proper fire safety measures expose Syrian refugees in the "Droube 019" informal settlement to significant fire risks, perpetuating unsafe and vulnerable living conditions. Immediate action is required to tackle these challenges and reduce the risk of fire incidents in the settlement.

10- Summary of Findings

This study delves into the informal settlement "Droube 019" in Lebanon, where residing Syrian refugees have taken the initiative to construct, upgrade, and customize their shelters rather than relying on prefabricated options. It underscores the critical importance of involving forcibly displaced individuals in the shelter design stage and the construction process, empowering them, and recognizing the value of their voices in shaping their living environments. However, the absence of proper guidance and planning in constructing self-built shelters has resulted in various challenges and shortcomings.

This research highlights the significant gap between the existing self-built shelters in the "Droube 019" informal settlement and the minimum standards outlined in the Sphere Handbook (2018). The Sphere Handbook (2018) serves as a comprehensive resource used during humanitarian crises, offering guidelines for shelter design aimed at ensuring safe, dignified, and appropriate living conditions for affected populations. These guidelines include providing habitable living spaces, ensuring natural ventilation and lighting, and safeguarding refugees from weather elements.

Despite the well-intentioned efforts of residents to construct their shelters, the lack of professional guidance and planning has led to shelters that often fall short of meeting these essential standards. For instance, inadequate ventilation and lighting, insufficient protection from weather elements, and overcrowded living spaces are common challenges faced by residents in the "Droube 019" Informal settlement. These shortcomings not only compromise the physical safety and well-being of refugees but also undermine their sense of dignity, safety, and security.

Addressing these issues requires a holistic approach that prioritizes the active involvement of displaced communities in the shelter design and construction processes. Humanitarian organizations can better understand refugees' needs, preferences, and cultural norms by engaging them as active participants rather than passive aid recipients. This participatory approach ensures shelter interventions are more responsive and contextually relevant while fostering a sense of ownership and empowerment among residents.

Furthermore, bridging the gap between self-built shelters and Sphere standards necessitates capacity-building initiatives and technical assistance to enhance refugees' skills and knowledge of shelter

construction and design. By providing training and support, humanitarian organizations can empower residents to improve the quality and resilience of their shelters, thereby enhancing their overall well-being and resilience to future crises.

In conclusion, while the self-built shelters in the "Droube 019" informal settlement demonstrate the resilience and agency of displaced communities, they also underscore the importance of integrating the Sphere standards and guidelines into shelter interventions. By prioritizing the involvement of affected populations and providing the necessary support and material resources, humanitarian organizations can ensure that shelter interventions are practical but also dignified, safe, and sustainable in the long term.

11- Comparative Analysis of the Droube 019 Informal Settlement and the Za'atari Refugee Camp

The challenges faced in Droube 019, an informal settlement in Lebanon, are distinct from those experienced in formal refugee camps, such as the Za'atari Refugee Camp in Jordan. Unlike the Za'atari Refugee Camp, a government-sanctioned camp with formal infrastructure, Droube 019 exists as an informal settlement due to the Lebanese government's policy banning the establishment of official Syrian refugee camps. As a result, refugees in the Droube 019 informal settlement are forced to rely on self-built shelters with minimal external assistance.

In contrast, the Za'atari Refugee Camp, which houses over 70,000 Syrian refugees, benefits from prefabricated shelters provided by international non-governmental organizations and access to essential services such as electricity, water, and sanitation (Albadra et al., 2020). While this format supports essential services, the shelters in the Za'atari Refugee Camp often lack the cultural adaptability and the personal

modifications seen in the Droube 019 informal settlement. In contrast, refugees in the Droube 019 informal settlement play a crucial role in shaping and adapting their shelters to suit their needs despite lacking material resources and institutional support.

This contrast underscores how government policies directly shape the refugee experience. While formal camps like the Za'atari Refugee Camp provide structured support, they often limit refugees' agency in shelter adaptations. Meanwhile, in Lebanon, the ban on formal camps has led to the creation of numerous informal settlements like Droube 019, where refugees have more control over their living conditions but face more significant challenges in accessing essential services. This comparison highlights the importance of considering local government policies when designing and implementing refugee shelter solutions (Kikano et al., 2021).

Habitable Living Space: The Sphere Handbook (2018) provides clear guidelines regarding the minimum living space required per person to ensure a healthy, secure, and private living environment. It recommends a range of 3.4 to 4.5 square meters of covered living space per individual (The Sphere Project, 2018). However, in settlements like "Droube 019," the dimensions of existing self-built shelters often fall short of meeting these minimum requirements. This shortfall arises from various factors, including the refugees' specific needs and cultural norms.

In the "Droube 019" informal settlement, residents construct their shelters without professional guidance, resulting in shelters that do not adhere to the Sphere standards. The dimensions of these self-built shelters vary widely, influenced by family size, individual preferences, and cultural practices. For instance, larger families may require

additional living space, while others may prioritize privacy or adhere to specific cultural norms, leading to variations in shelter design and size.

This variation highlights the importance of considering displaced populations' unique needs and circumstances when designing shelter interventions. While the Sphere Handbook (2018) provides valuable guidance, it must be adapted to accommodate affected communities' diverse needs and preferences. By engaging with residents and incorporating their input into shelter design processes, humanitarian organizations can ensure that interventions are effective, culturally sensitive, and respectful of individual dignity.

Natural Ventilation and Lighting: Ensuring adequate shelter conditions is paramount to addressing displaced populations' needs, particularly in informal settlements like "Droube 019." However, challenges persist in meeting essential weather protection and thermal comfort requirements. For example, many shelters rely on plastic sheeting for roofing and openings, which must be revised to safeguard against rainfall and temperature fluctuations. This inadequacy leads to discomfort and health risks, especially during harsh weather conditions in the winter months when water leakages and temperature variations are prevalent.

Moreover, the disparity between the Sphere Handbook's (2018) guidelines and the current shelter conditions in the "Droube 019" informal settlement is evident. The Sphere Handbook (2018) emphasizes the construction of appropriate sanitation facilities, site planning, and the creation of needed infrastructure such as drainage systems and guaranteeing clean water access; the settlement must include these essential requirements. Lack of technical expertise and scarce resources impede the implementation of these provisions,

resulting in poor sanitation, increased flood risks, and environmental pollution.

Addressing these disparities necessitates collaborative efforts from humanitarian organizations, local authorities, and the affected community. By prioritizing the integration of the Sphere Standards into shelter design and infrastructure development, stakeholders can work towards ensuring the safety, dignity, and well-being of displaced populations in informal settlements.

Protection from Weather Elements: Shelters within informal settlements must ensure essential protection from weather elements and prioritize thermal comfort and adequate sanitation facilities to safeguard the well-being of displaced populations. Unfortunately, in settlements like "Droube 019," many shelters do not adequately meet these requirements. Refugees often construct shelters using plastic sheets for roofs and openings, which are prone to inadequate installation and offer limited protection against rainfall and temperature fluctuations. Consequently, residents endure discomfort and health hazards, especially during harsh weather conditions in the winter months, when water leakages and temperature variations are common.

Furthermore, the mismatch between the Sphere Handbook's (2018) guidelines and the existing realities in the "Droube 019" informal settlement is striking. While the Sphere Handbook (2018) advocates for suitable sanitation facilities, site design, and infrastructure, including drainage systems and access to clean water, the reality in the settlement paints a different image. Limited technical skills and the scarcity of resources have delayed the implementation of these critical provisions, resulting in poor sanitation, heightened flood risks, and environmental degradation.

Addressing these gaps requires joint efforts from humanitarian groups, local authorities, and the impacted population. By prioritizing the inclusion of the Sphere Standards into shelter design and infrastructure development, stakeholders can strive to guarantee the safety, dignity, and well-being of displaced populations in informal settlements like "Droube 019."

Table 7: Comparison between the Sphere Standards and current shelters in ITSs.

	Sphere Standards	**"Droube 019" Reality**
Fire and Flammability	○ 30-meter fire breaks every 300 meters between built-up areas. ○ A minimum distance of 2 meters between structures.	Shelters in the settlement are constructed near one another, and there is a lack of the minimum distance required by the Sphere Standards.
Natural Ventilation	○ Surface of all the windows openings > 5% of the surface of the floor area.	Some rooms have no openings, making the ventilation conditions worse.
Thermal Comfort	○ Indoor temperature between 20-25°C, should not be less than 13°C.	The shelter is not fit for extreme temperatures (wall and roof materials do not have a high insulation factor made using plastic sheets).
Personal Security	○ Inner and outdoor locks. ○ Artificial lighting source. ○ Strong, non-transparent shelter cladding materials. ○ Window opening not more significant than 60x60cm.	There is no door lock, artificial lighting for the corridors, and outdoor lighting.
Covered Living area	○ Minimum covered living area of 3.5m2/person (hot climate). ○ 4.5m2 per person (cold climate).	Shelter does not comply with the Sphere Standards; for example, for a shelter of 32m², the minimum covered living area is 3.5m².

Privacy	○ Need for internal subdivisions. ○ Made from non-transparent materials.	The shelter provides minimum privacy (has more than one room).
Natural Lighting	○ Surface of all the window and ventilation openings > 10% of the surface of the floor area.	The shelter does not meet minimum natural lighting requirements.
Facilities (kitchen area, toilets, showers)	○ Provide designated spaces to cook. ○ Ensure adequate and appropriate toilets and showers. ○ Solid waste management should be safely contained.	The shelter is not equipped with showers; however, there are communal toilets on site.

The Sphere Handbook (2018) is a crucial framework that sets forth minimum standards for designing shelters that fulfill the basic needs of forcibly displaced individuals. However, its effectiveness hinges upon the ability to integrate these standards with the cultural context of the affected population. In the case of Syrian refugees, cultural norms surrounding privacy present a significant consideration in shelter design.

Privacy holds paramount importance in Syrian culture, particularly concerning gender segregation. Therefore, any shelter design must incorporate provisions to address these concerns effectively. This might entail including separate areas or partitions within communal spaces, allowing individuals to maintain their privacy while sharing common areas. Additionally, careful attention must be paid to the size and placement of openings, ensuring that they neither compromise privacy nor security.

Engaging with the affected population is crucial in understanding their priorities and preferences. By involving them in the design process, humanitarian agencies can gain valuable insights into the cultural

nuances that must be considered in shelter design. This participatory approach ensures that the resulting shelters are culturally appropriate and foster a sense of ownership and empowerment among the displaced community.

Adapting the Sphere Standards to the unique context of each situation is imperative for achieving effective and sustainable shelter solutions. This may involve modifying existing standards or developing supplementary guidelines tailored to specific cultural contexts. By balancing universality and cultural sensitivity, humanitarian organizations can better meet the diverse needs of displaced populations worldwide.

Furthermore, it is crucial to recognize that shelter design is not a one-size-fits-all endeavour. Each displacement crisis presents challenges and considerations, necessitating a flexible and adaptive approach to shelter provision. By continuously improving and refining shelter standards in response to feedback and evolving circumstances, humanitarian agencies can better meet the growing needs of displaced populations.

While the Sphere Handbook (2018) provides essential guidelines for shelter design, it is imperative to contextualize these standards within the cultural realities of the affected population. Particularly in cultures like Syria, where privacy is highly valued, shelter designs must incorporate provisions to address these concerns effectively. The findings from the Droube 019 informal settlement in Lebanon and the comparative analysis with the Za'atari Refugee Camp in Jordan demonstrate the significance of tailoring shelter designs to local contexts and government policies.

In informal settlements like Droube 019, where refugees construct and adapt their shelters with limited external assistance, engaging with the affected population becomes even more critical. This participation

not only ensures cultural relevance but also fosters a sense of ownership and agency among the refugees. By contrast, formal camps like the Za'atari Refugee Camp offer structured services but often at the cost of cultural flexibility and adaptability.

Ultimately, engaging with the affected population and adapting standards accordingly are essential steps in ensuring that shelter designs are not only functional but also culturally appropriate and sustainable in the long term. By prioritizing these elements, future shelter interventions can better address the needs and challenges faced by displaced populations, leading to more resilient and dignified living conditions.

Chapter 5: A Comprehensive Shelter Design Guideline for Transitional Shelters

Chapter 5 focuses on developing a comprehensive shelter design guideline for transitional shelters, drawing upon insights from the literature review (Chapter 2), the methodological framework (Chapter 3), and the observations made during the field visits as well as the conducted interviews with Syrian refugees in informal settlements (Chapter 4). This chapter integrates these perspectives to propose a culturally sensitive, adaptable, and sustainable shelter design specifically tailored to the needs of displaced populations, particularly those who migrated to Lebanon.

The chapter begins by critiquing existing shelter design frameworks, such as the Sphere Handbook (2018) and its guidelines, highlighting their limitations in addressing specific climatic, cultural, and socio-economic contexts. While global standards like the Sphere Handbook (2018) provide valuable guidance, they often lack the flexibility required to meet the unique needs of displaced populations such as Syrian refugees. Privacy concerns, gender segregation, and cultural norms around private and communal spaces are essential considerations often overlooked in global standards.

This chapter argues that the proposed shelter design improves upon the limitations of existing frameworks by integrating global best practices with local adaptations derived from the lived experiences of displaced individuals. By utilizing interpretivism, Constructivist Grounded Theory, and mixed qualitative methods, the proposed shelter design responds directly to Syrian refugees' real needs and preferences. This approach ensures that the shelters are not only functional but also supportive of the cultural, psychological, and physical well-being of their inhabitants.

In addition to addressing cultural appropriateness, the chapter further tackles the environmental challenges identified in Chapter 3. During the field visits to Droube 019, an informal tented settlement in Lebanon, interviewed Syrian refugees highlighted issues such as water leakage during cold, snowy winters, and overheating concerns in the summer. The proposed shelter design in this chapter incorporates locally recyclable materials, such as plastic, and uses sustainable techniques to remedy these challenges and enhance climate adaptability and resilience in the face of extreme temperatures. These innovations directly respond to the feedback gathered during the fieldwork, ensuring that the shelters are practical for Lebanon's challenging climate while remaining affordable and sustainable.

Building on the findings of previous chapters, this chapter contributes new knowledge by offering a regionally-adapted, culturally-sensitive, and sustainable shelter design that balances global humanitarian principles with local realities. It expands on existing research by providing a more context-specific critique of global frameworks like the Sphere Handbook (2018) and its guidelines, arguing that shelter designs must be adapted to local conditions to be effective. The chapter's approach to incorporating cultural, environmental, and socio-economic factors provides a flexible, sustainable solution that can be applied to various displaced populations facing similar challenges.

Chapter 5 offers a comprehensive framework for transitional shelter design, grounded in the theoretical and practical insights gained from the earlier chapters. By critiquing global standards and offering a locally adapted alternative, this chapter significantly contributes to the field of humanitarian shelter design, putting refugees at the center of design practices. It proposes a sustainable and culturally sensitive model with the potential for broader application in other countries and regions.

The previous chapter explored the impact of cultural considerations on shelter design for displaced populations, focusing on the importance of privacy and gender segregation within Syrian culture. These findings emphasized the need to incorporate separate areas or partitions within communal spaces and carefully design and place openings to ensure both privacy and security for shelter residents. However, other key findings also emerged from the field research. Syrian refugees expressed their concerns about inadequate thermal comfort, with extreme cold being felt during the winter months due to poor insulation and overheating during the summer months caused by a lack of proper ventilation. Water leakage and poor drainage during heavy rains posed further challenges, damaging personal belongings and creating unhealthy living conditions. Additionally, the proximity of shelters to one another increased fire hazards, particularly given the use of flammable building materials such as plastic and tarpaulin. Limited access to resources for repairs and maintenance further worsened these challenges, making it difficult for residents to maintain safe and comfortable living environments. These considerations—thermal comfort, ventilation, water management, fire safety, and resource limitations—are critical to understanding the complexities of designing culturally sensitive and practically effective shelter solutions for displaced populations.

This chapter starts by examining the relevance of the Sphere Handbook (2018), which sets essential minimum standards for humanitarian responses, particularly regarding shelter design. While crucial in providing general guidelines, this chapter argues that the Sphere Handbook (2018) requires more adaptation to account for the specific cultural and environmental contexts of displaced populations, such as those in Lebanon. This is where the limitations of the Sphere Handbook become evident. The one-size-fits-all approach of the Sphere

standards, though comprehensive in theory, lacks the flexibility necessary to address the unique challenges faced by Syrian refugees in informal settlements, particularly concerning privacy, gender segregation, climate variability, and available building resources.

In contrast, my research constitutes a stepping stone towards establishing a more context-specific approach which addresses the real needs of displaced individuals. By applying interpretivism and Constructivist Grounded Theory, my research places the affected population—Syrian refugees—at the center of the design process. This ensures that the designed shelter solutions are theoretically sound and emerge directly from field data, reflecting the lived experiences, preferences, and cultural needs of the refugees. This approach differs from the Sphere Handbook (2018) by emphasizing the local engagement of architects and designers and the active participation of refugees in designing solutions tailored to their specific environment and cultural practices.

While the Sphere Handbook (2018) provides universal humanitarian principles, my research contributes to shelter design knowledge by offering a regionally adapted framework which further specifies the Sphere Handbook (2018) principles and expands on them. This framework not only aligns with global standards but also incorporates local realities, such as climate adaptability (addressing cold winters and hot summers), using locally abundant recyclable materials like plastic, and designing solutions to enhance privacy and cultural sensitivity. By combining global best practices with localized adaptations, my research fills the gaps found in the Sphere Handbook (2018), ensuring that the designed shelters are both sustainable and suited to the specific context and needs of the displaced populations in Lebanon.

Moreover, this chapter will delve into a unique approach which investigates the feasibility and benefits of using locally sourced and abundantly-found recyclable plastics to create valuable products for Syrian migrants in Lebanon. The study demonstrates how sustainability and circular economy principles can be applied in crisis settings by focusing on environmental sustainability through the practical and sustainable reusing of recycled materials. This approach balances economic, planetary, and social concerns by addressing environmental challenges while offering economic opportunities for marginalized communities, therefore highlighting the potential for waste reduction and its catalysis into positive change.

Creating adequate shelters goes beyond simple architectural design practices anchored in disaster response and humanitarian assistance. As discussed in the previous chapters, integrating cultural, technical, environmental, economic and social aspects is essential to developing sustainable shelter solutions that promote well-being and protect displaced populations. The context of shelter design must consider the unique challenges presented by the specific environment in which the displaced population resides. For instance, shelters in Lebanon must account for the region's fluctuating climate, which includes hot summers and cold, wet winters. These environmental factors require shelter designs to incorporate elements and principles of climate adaptability, such as the use of enhanced insulation building materials for winter and proper ventilation mechanisms to prevent overheating in the summer. Shelters in Lebanon must also account for the volatile context of instability plaguing the country and the region by emphasizing transportability, for example.

Moreover, economic realities and high costs associated with humanitarian aid require that shelter solutions remain cost-effective and

accessible, particularly in resource-constrained settings. Building materials need to be locally sourced and affordable to ensure widespread adoption of shelter design solutions. From a technical perspective, the designs must also be adaptable to the local topography and infrastructure, ensuring accessibility and durability.

Sociocultural factors, such as privacy and gender segregation—particularly crucial in the Syrian refugee context—must also be embedded in the shelter design. Shelters that fail to respect these cultural norms risk separating, isolating, or further traumatizing displaced populations. Thus, involving the displaced communities in the shelter design process through participatory approaches ensures that shelters meet residents' cultural, psychological, physical, and practical needs.

By continuously refining shelter standards based on received feedback from those directly affected by crises and by adapting to changing regional and country-specific circumstances, humanitarian agencies can better address the growing needs of displaced populations. This comprehensive approach ensures that shelters are functional, protective, and responsive to individuals' broader socio-environmental, psychological, and physical needs, therefore promoting resilience and recovery in times of crisis.

In conclusion, this chapter builds on the insights gathered from previous research and discussions. It demonstrates the importance of contextualizing and expanding the Sphere Handbook (2018) standards to account for the cultural and environmental realities of displaced populations, particularly Syrian refugees in Lebanon in this case. Rather than simply applying the Sphere standards, this research adapts them by actively engaging with the refugee community through semi-structured interviews and an observatory tour. This direct engagement provides crucial insights into the lived experiences, challenges, preferences, and

unmet needs of the refugees, ensuring that adopted shelter designs are functional and culturally appropriate, with a specific focus on privacy and gender segregation—key concerns expressed and relayed from the Syrian culture.

This research's contribution lies in its innovative use of interpretive research philosophy and Constructivist Grounded Theory, ensuring that the design solutions emerge directly from the refugees' needs and lived experiences. It gathers quantitative data as well as detailed qualitative insights that serve to inform practical and culturally relevant shelter designs, gathered through in-depth interviews and on-site observations. This approach goes beyond global frameworks like the Sphere Handbook (2018) by emphasizing a flexible and adaptable model that addresses local conditions, such as extreme weather fluctuations, resource scarcity and constraints, and cultural considerations.

Unlike existing global standards, this research introduces a shelter design framework adaptable to the specific cultural and environmental context of the displaced populations in Lebanon. The proposed solutions incorporate locally available, sustainable materials while addressing critical issues such as thermal comfort, ventilation, and privacy concerns. This reimagined framework offers a more holistic and effective approach to shelter design, contributing to the broader field of humanitarian architecture by demonstrating that context-specific adaptations can significantly improve the displaced individuals' quality of life. By grounding the research in the realities of the population it seeks to serve, this work sets a new standard for sustainable, dignified, and secure shelter design and deployment in humanitarian contexts.

1- Shelter Design Guideline and Shelter Outline Proposal

Shelter Design Guideline and Shelter Outline Proposal aim to build on the accumulated insights deduced from the literature review. They

integrate new layers of understanding and knowledge of practical applications derived from field visits and interviews with Syrian refugees in informal tented settlements like "Droube 019." While the literature review in Chapter 2 provided a thorough analysis of global shelter case studies, this section extends those findings by addressing real-world challenges observed in informal settlements. The guideline critiques global frameworks like the Sphere Handbook (2018), examining how its standards align—or fail to align—with the practical realities faced by displaced populations.

Creating adequate shelters goes beyond implementing simple architectural design during times of crisis, disaster response, and humanitarian assistance. As Jha et al. (2010) emphasized, integrating cultural, technical, and social aspects is crucial to developing sustainable shelter solutions that promote refugees' well-being and protect the displaced population. This comprehensive approach ensures that shelters not only provide physical safety concerns, but also cater to the broader needs of individuals affected by crises. This section aspires to expand and critique the insights gained from the literature review, integrating additional empirical findings and practical observations. This comprehensive approach is essential for ensuring that designed shelters provide physical safety to their inhabitants and address the broader needs of individuals affected by crises.

Corsellis et al. (2005) and Rapoport (1969) highlight that cultural appropriateness is critical to shelter design. This involves gaining a deep understanding of displaced populations' lived experiences and realities and integrating their customs, beliefs, and related cultural elements into shelter design practices to create physically comfortable and culturally resonant spaces. This attention to cultural details can significantly enhance the adaptability and acceptability of shelters among displaced

individuals, offering them a sense of familiarity and comfort in their temporary homes away from home. While the literature review covered these aforementioned aspects, this section further examines how these principles have been practically implemented and adapted in the field.

Technical considerations in shelter design, as discussed by Kennedy et al. (2008), the Sphere Association (2018), and the International Federation of Red Cross and Red Crescent Societies (IFRC, 2013), include building material selection, structural integrity, environmental sustainability, cost-effectiveness, and accessibility. Selecting appropriate building materials and implementing adequate construction techniques ensures that shelters are durable, environmentally friendly, and suitable for the specific conditions and challenges posed by the disaster-stricken area. Moreover, designing for accessibility ensures that all individuals, regardless of their physical abilities, can safely and comfortably use the shelters. This section critically and constructively evaluates these technical standards by comparing them to the empirical data gathered from field observations and interviews with Syrian refugees in Lebanon.

Davidson et al. (2007) outline that social aspects play a crucial role in shelter design processes by fostering community cohesion and individual well-being. Communal spaces within shelters can facilitate social interaction and support social networks, which are vital for the psychological and physical health and recovery of displaced populations. Additionally, involving affected communities in the shelter design process can empower individuals, giving them a voice in making decisions related to their living spaces and promoting a sense of ownership and belonging. This section will extend these insights by presenting findings from field visits and interviews, showing how these

social aspects have been integrated-self-integrated in many cases-into Syrian refugees' design and use of shelters.

In conclusion, the design of transitional shelters requires a nuanced and integrated approach that considers cultural, technical, economic, environmental, and social dimensions. By doing so, shelters can become more than just physical structures; they can provide a foundation for recovery, resilience, and dignity for those displaced by natural disasters and crises. This holistic approach to shelter design is essential for creating environments that truly support the needs and well-being of affected populations, as rightly noted by Jha (2010) and as further elaborated by subsequent scholars and practitioners in the field.

In addition to the literature review, the Shelter Design Guideline incorporates key principles and standards from the Sphere Handbook's "shelter and settlement" section. Specifically, the guideline draws from the Sphere Handbook's (2018) emphasis on cultural appropriateness, material selection, environmental sustainability, and accessibility. These critical elements serve as the foundation for creating shelters that are not only functional and durable but also sensitive to the diverse needs of displaced populations. The Sphere Handbook (2018) establishes minimum standards that ensure shelters provide essential protection, safety, and human dignity, including specifications for adequate space, ventilation, privacy, and basic amenities like WCs and cooking facilities.

While the minimum standards derived from the Sphere Handbook (2018) form the base for the guideline, this research expands upon them by adapting the standards to address the specific cultural, environmental, and logistical challenges observed in the field. For example, the guideline builds on the Sphere Handbook’s (2018) standards for cultural appropriateness by addressing the unique privacy needs and family dynamics of Syrian refugees, as emphasized during field interviews. The

inclusion of private WCs and showers within the kitchen area, as well as the central role played by courtyards notably to stimulate family gatherings, are examples of how the guideline makes the case for going beyond the generic recommendations found in the Sphere Handbook (2018) to offer culturally specific solutions.

Additionally, the guideline expands on building material selection and environmental sustainability by stressing the merits of incorporating locally available, low-cost materials, such as plastic sheeting, observed during field visits. Although these materials do not always meet the Sphere standards for durability, they reflect the practical adaptations made by refugees to balance limited resources with increased yearning and need for privacy. The guideline proposes further improvements, such as integrating more durable yet accessible materials while retaining the flexibility demonstrated by Syrian refugees in their shelter modifications.

In summary, while the Sphere Handbook (2018) provides foundational standards for shelter design, the proposed guideline expands on these by offering more context-specific adaptations that address the particular needs of Syrian refugees in Lebanon. It builds upon the handbook's core elements—cultural appropriateness, building material selection, environmental sustainability, and accessibility—while tailoring context-specific solutions to meet the real-world challenges faced by displaced populations in informal settlements.

Field visits to informal settlements, such as "Droube 019" in Lebanon, provided critical insights into the shelter construction practices of Syrian refugees. These visits revealed several key findings:

1- Refugees often use readily available materials, such as plastic sheeting, for both roofs and walls despite these materials offering poor insulation and minimal durability.

2- The shelters lack proper ventilation, with either too small or non-existent windows, leading to health and comfort issues, especially during the hot summers and cold winters.
3- The layout of the shelters often includes private WCs and showers integrated into the kitchen areas—an adaptation reflecting the cultural need for privacy, particularly for women and children.
4- The courtyard plays a central social role, serving as a communal space for family gatherings, daily tasks, and to improve airflow between rooms.

These practical adaptations, while accounting for resource constraints, demonstrate refugees' ingenuity and ability to innovate based on their immediate needs and cultural values.

Interactions with community members further highlighted the importance of these modifications. Refugees expressed that privacy concerns, protection from the elements, and having a space for family interaction were key priorities in shelter design. The knowledge gained from these field observations has been instrumental in shaping the shelter design guideline presented in this research. The guideline emphasizes the importance of creating culturally appropriate and adaptable shelters that respond to the specific environmental, economic, and social conditions experienced by displaced populations.

Building upon three foundational sources—**field observations, community interviews, and existing literature on culturally sensitive shelter design**—a transitional shelter prototype is developed as a case study to practically test and refine the design guideline. These sources provided the basis for identifying the key challenges and priorities in shelter construction, while also highlighting best practices and lessons from previous shelter projects.

By integrating theoretical knowledge, technical standards, and empirical observations, this chapter provides a robust framework for designing culturally-sensitive and context-specific transitional shelters. The comprehensive guideline emerging from this synthesis is a valuable resource for governments, humanitarian agencies, architects, engineers, and researchers involved in shelter design and provision. It offers a blueprint for creating structurally sound, sustainable shelters that align with displaced populations' cultural and social dynamics. Through this holistic approach, the guideline aims to foster the development of shelters that offer physical protection and support the psychological and physical well-being and dignity of their inhabitants, ultimately contributing to more effective and humane responses to displacement crises.

1.1 Shelter Design Guidelines

Table 8 presents a comprehensive set of design guidelines for transitional shelters tailored to meet the needs of displaced populations. These guidelines address critical cultural, technical, and social aspects of shelter design, providing a holistic framework for creating effective and sustainable housing solutions. By offering a clear and organized overview, this table serves as a valuable reference for architects, designers, and planners aiming to develop shelters that are adaptable, resilient, and responsive to the unique challenges faced by displaced communities.

Table 8: Comprehensive guidelines for transitional shelter design for displaced populations.

Themes	Guidelines
Cultural Aspects	**Covered Living Space:** - Hot climates: 3.5m²/person (excluding WC, bathing area and cooking) - Cold climates: 4.5m² - 5.5m²/person (including cooking and bathing areas) - Field visit findings: 7.2 m²/person for overall comfort **Interior Spaces:** - Rectangular structure: 30 m² - Living room: 10m² - Bedroom: 10m² - W.C + shower: 3m² - Reception room: 2m² - Kitchen: 3m² - Storage room: 2m² **Outdoor courtyard:** 6m² **Privacy, Security and Cultural Appropriateness:** - Separate sleeping areas for men and women - Private sanitation facilities - Designated prayer spaces
Technical Aspects	**Ventilation, Lighting, and Thermal Comfort:** - Openings >10 % of floor area - Shelter height: 2.5m in warm climate, 2.2m in cold climate - Indoor temperature: 20-25ºC in warm climate, not below 13ºC in cold climate

	<u>Building Materials:</u> - Durable, environmentally friendly, safe, and culturally accepted - Recyclable, locally sourced insulation building materials, reflective coatings - Weather and fire-resistant building materials
	<u>Lifespan:</u> - Consider long-term stability and differentiate between emergency and temporary shelters - Integrate urban resilience and local customs
	<u>Cost:</u> - Balance between quality and cost, ranging from $1250 to $5500 per shelter
	<u>Access to Secure Facilities and Livelihood:</u> - Locate latrines and showers within secure, well-lit areas. - Ensure proximity to shelters to minimize travel distance. - Provide gender-separated facilities with lockable doors for privacy.
Social Aspects	**<u>Inclusive and Participatory Design:</u>** - Engage refugees in the planning, design, and construction phases - Address refugee preferences and needs

The guidelines outlined above are derived from established standards, empirical research, and specific field observations conducted in informal settlements, such as "Droube 019" with Syrian refugees. By categorizing the guidelines into **Cultural, Technical, and Social Aspects**, this table provides a holistic approach to transitional shelter design, ensuring that considerations of sustainability, community engagement, and cultural appropriateness are interlinked. Each guideline is specifically designed to respond to the unique challenges faced by displaced populations.

1.1.1 Cultural Aspects

i. Covered Living Space

- The Sphere Handbook (2018) suggests a covered living space of 3.5m²/person in hot climates and 4.5m² to 5.5m²/person in cold climates, including facilities for cooking and bathing. These standards were used as a baseline for comparison.
- Field visits to the "Droube 019" informal settlement revealed that these minimum space requirements were insufficient for overall comfort. Through conducted interviews and direct observations, it was found that refugees often required at least 7.2m²/person to accommodate daily activities and maintain a sense of normalcy. This additional space allows for better accommodation of family structures and cultural practices.

ii. Interior Spaces

- Specific dimensions for interior spaces (e.g., reception room, living room, bedroom, kitchen, W.C. + shower areas) were derived from field research where refugees expressed their spatial needs and preferences. These dimensions ensure functional and culturally appropriate living arrangements,

reflecting the importance of spaces such as reception areas for guests, which are vital in Syrian culture.

iii. Privacy, Security, and Cultural Appropriateness

- Observations and interviews consistently highlighted the need for separate sleeping areas for men, women, and children, private sanitation facilities, and designated prayer spaces. The interviewed refugees emphasized these elements, underscoring their importance for maintaining cultural norms and ensuring psychological and physical comfort.

1.1.2 Technical Aspects

i. Ventilation, Lighting, and Thermal Comfort

- Standards for ventilation, lighting, and thermal comfort are based on both the Sphere Handbook (2018) and empirical findings. Openings(windows) greater than 10% of the floor area and specific shelter heights were validated during field visits, where proper ventilation and lighting were noted as critical for habitability.
- Thermal comfort guidelines (e.g., indoor temperature ranges) were corroborated by direct feedback from Syrian refugees, who reported suffering from extreme hot and cold temperatures due to inadequate insulation.

ii. Building Materials

- Studies like those carried out by Tan and Tan (2021) informed the selection of building materials such as recyclable, locally sourced, and abundantly available insulation materials and reflective coatings. Field evidence showed that using plastic sheets, for example, led to poor thermal performance, prompting a need for better materials.

iii. Lifespan and Cost

- Considerations for long-term sustainability and cost were derived from analyzing various case studies (e.g., Alshawareh, 2019) and field observations. The cost range reflects cost-effectiveness or the balance between affordability and quality, which is essential to consider when designing sustainable shelter solutions.

1.1.3 Social Aspects

Inclusive and Participatory Design: The importance of engaging refugees in the planning, design, and construction phases was highlighted through participatory field observations, interviews, and focus group discussions. Refugees expressed a desire to be involved in ensuring that the designed shelters met their specific needs and preferences, reinforcing the necessity of a participatory approach.

Overall, these guidelines were shaped by a combination of theoretical knowledge, existing standards, and direct empirical evidence gathered from the field, ensuring that they are context-specific, culturally-sensitive, refugee-centered, and practically applicable.

2- Shelter Outline Proposal

The ongoing Syrian refugee crisis has significantly impacted Lebanon, leading to the emergence of several informal settlements throughout the country. This study has developed an innovative shelter prototype to address Syrian refugees' needs and the unique challenges that they face in these settlements. This research introduces a shelter design that integrates context specificity, cultural sensitivity, gender considerations, and sustainable materials, differentiating it from shelter designs found in the existing literature. Furthermore, it incorporates architectural patterns and spatial arrangements reflecting Syrian culture, such as courtyards and designated areas for family gatherings, cooking, and socializing. It also respects Syrian norms, such as gender segregation, needs for privacy and security, and fosters a sense of ownership and belonging. Recyclable, locally sourced, and abundantly available insulation materials, reflective coatings, and natural ventilation techniques combine in this shelter design to improve thermal comfort and reduce environmental impact and costs. By balancing functionality with cultural appropriateness, this shelter prototype offers a comprehensive solution that enhances the living conditions of displaced Syrian refugees while adhering to and expanding upon current shelter design guidelines, as outlined above in Table 8. This innovative approach addresses the physical needs of Syrian refugees and supports their psychological and social well-being, contributing new insights to the field of transitional shelter design.

The functionality section will thoroughly detail the shelter’s layout and design, highlighting its effective and well-organized spatial distribution as well as its separation of private and public spaces. The climatic design aspects will also be examined, focusing on the design strategies adapted to adjust to local environmental conditions, ensuring the shelter's resilience. Additionally, the ventilation and thermal aspects

of the shelter will be discussed, showcasing how the design effectively ensures a comfortable living environment for residents in various weather conditions.

The building materials section will focus on the innovative use of locally sourced and abundantly available recycled plastics and insulated panels as primary construction materials for the shelter. The selection of these materials addresses environmental considerations and increases the sense of cultural familiarity for the refugees. By incorporating materials and design elements that align with the refugees' cultural background, the shelter fosters a more comforting and supportive living space for its residents. Moreover, the life span and performance of the shelter will be assessed by considering the evolving needs of Syrian refugees and the dynamic nature of informal settlements. Finally, the cost of the proposed shelter will be evaluated, considering its cost effectiveness, defined in this case as the balance between affordability, the provision of essential facilities, and ensuring the physical, psychological, and social well-being and safety of the displaced individuals.

Integrating cultural, technical, social, environmental, and economic components in transitional shelter design builds towards a comprehensive framework for developing effective and responsive shelter solutions. As synthesized previously in Table 8**,** this study's guideline draws upon a rich tapestry of sources, including academic research, humanitarian standards epitomized by the Sphere Handbook (2018), and pragmatic insights compiled from field observations, interviews, and focus group discussions. These elements are not standalone; instead, they interweave to offer a holistic approach to shelter design, addressing the multifaceted needs of displaced populations.

The cultural aspect of shelter design emphasizes understanding and integrating the affected community's customs, values, and traditions into the design. Based on field research, including interviews and focus group discussions with displaced populations, it became clear that cultural nuances significantly shape how refugees use and adapt their living spaces. For example, due to a lack of private shower facilities in the provided shelters, many Syrian refugees showered inside the kitchen area, an adaptation driven by the need for privacy, especially for women. However, WCs were not located within the kitchen, maintaining a separation of spaces in line with cultural norms. Additionally, courtyards played a vital role in family life, serving as communal areas where families gather, perform daily tasks, and circulate between private rooms and living spaces. These elements offer functional solutions and reflect the inhabitants' cultural identity, helping them maintain a sense of normalcy and comfort amid displacement. This approach draws on the work of Corsellis et al. (2005) and Rapoport (1969), who stress the importance of culturally appropriate shelter design. The findings from the conducted field research further reinforce the idea and argument that culturally resonant designs enhance the adaptability and acceptance of shelters, offering displaced individuals a space where they feel understood, cared for, dignified, and respected.

Technical considerations encompass selecting building materials, construction methods, and design principles to ensure that shelters are safe, durable, as well as environmentally and economically sustainable. This includes considering local climatic conditions, available resources, and potential environmental impacts, ensuring that shelters are practical, robust, and that they harmonize with their surroundings. The technical aspect further ensures that shelters meet established international humanitarian standards, providing a benchmark for quality, safety, and security. For instance, the guidelines integrate standards from the Sphere

Handbook (2018) and insights from Kennedy et al. (2008), emphasizing the importance of building material selection and structural integrity. Field observations have shown that using locally sources and abundantly available materials reduces costs and aligns with environmental and economic sustainability goals.

The social components of shelter design focus on fostering community cohesion and supporting the psychosocial and physical well-being of the shelter's occupants. Through field visits and interviews, it was observed that communal areas, such as courtyards, played a crucial role in facilitating social interactions and daily family activities. These spaces allowed families to gather, perform daily tasks, and interact with their neighbors, reinforcing a sense of community and connection. Although the shelter design process did not include formal participatory workshops to integrate refugee voices, community engagement was achieved through interviews and interactions with the Syrian refugees, where they shared their experiences and preferences for improving their living conditions. For example, they highlighted the importance of maintaining private spaces while also valuing the creation of areas for socializing, such as outdoor courtyards.

Engaging the Syrian refugee population in these discussions gave them a voice in the shelter design process, helping architects and designers to shape effective solutions that were both functional and culturally appropriate. This empowering step fostered a sense of ownership and agency for the refugees, allowing them to contribute actively to their recovery. The findings align with Davidson et al. (2007), who emphasize the importance of social aspects in shelter design. The conducted field interviews confirmed that integrating community input led to more functional and widely accepted shelter solutions, ultimately

supporting the displaced population's psychological and physical health and their social well-being.

By integrating these cultural, technical, environmental, economic, and social aspects, the guideline provides a dynamic framework that engineers and architects can adapt to varying contexts. This adaptability is crucial, as each displacement scenario presents unique challenges and needs. While the core components of the guideline offer a solid foundation, the flexibility to tailor shelter designs to suit specific contexts ensures that shelters are functional and nurturing environments that support the recovery and dignity of displaced populations. This holistic approach addresses immediate shelter needs and contributes to longer-term resilience and psychological as well as physical well-being, aligning with the comprehensive shelter design principles advocated by Jha (2010) and further elaborated by subsequent scholars and practitioners in the field.

In conclusion, integrating cultural, technical, environmental, economic, and social components into shelter design leads to the creation of a comprehensive and adaptable framework for designing effective and responsive shelter solutions. The cultural aspects include respecting refugees' privacy needs, such as ensuring that there are private WCs and maintaining communal spaces like courtyards, which reflect the importance of family gatherings and cultural norms. Technically, the guideline emphasizes using locally sourced, abundantly available, and sustainable materials, integrating proper ventilation into designed and built shelters, and committing to durable construction methods to address environmental challenges and material constraints observed in the field. Socially, including communal areas and engaging displaced populations in discussions about shelter needs, even informally, helps foster community cohesion and a sense of ownership

over their living environment. These findings, informed by academic research, humanitarian standards like the Sphere Handbook (2018), and empirical insights from interviews, focus group discussions, and field observations, offer a robust blueprint for designing structurally sound, culturally appropriate, and socially supportive shelters. This multifaceted approach ensures that shelters provide physical protection and promote community well-being, dignity, and resilience, ultimately leading to more effective and humane responses to displacement crises.

3- Cultural Aspects

The cultural aspects of transitional shelter design cover three critical dimensions: covered living space, privacy, security, and cultural appropriateness, as well as ventilation, lighting, and thermal comfort. These elements were identified through various methods, including interviews with displaced populations, focus group discussions, and field observations, which provided firsthand insights into Syrian refugees' priorities, preferences, and needs. Academic studies and humanitarian standards, such as the Sphere Handbook (2018), further supported this research. These methods confirmed that shelters must act as spaces offering physical refuge and align with cultural norms to ensure a sense of safety, security, dignity, respect, and comfort. The findings emphasize that addressing these dimensions is essential for fostering physical, psychological and emotional well-being, helping displaced populations feel a sense of normalcy and stability during times of crisis and upheaval.

4- Importance of Cultural Aspects in Shelter Design

Covered Living Space: The significance of adequate covered living space is underscored by Corsellis et al. (2005), who emphasize its role in safeguarding physical and mental health, well-being, and dignity. Adequate living space is essential for daily activities and social interactions, maintaining the fabric of family and community life even in temporary settings. The Sphere Handbook (2018) provides baseline guidelines, suggesting a minimum of 3.5m² per person in hot climates and 4.5m² to 5.5m² in colder climates. However, field research, including engagement with Syrian refugees in the "Droube 019" informal settlement, suggests that these minimum space requirements might be underestimated. Refugee experiences indicate a need for at least 7.2m² per person to accommodate daily activities and provide a sense of comfort and normalcy. This insight highlights the importance of understanding the specific needs of displaced populations, which can vary on the ground based on cultural and social practices.

Privacy, Security, and Cultural Appropriateness: Privacy, security, and cultural appropriateness are central to providing psychological comfort and maintaining social cohesion within transitional shelters. Rapoport (1969) emphasizes embedding cultural dimensions into shelter design to ensure that spaces reflect their inhabitants' identity and accommodate their lifestyle. This includes recognizing gender-specific needs, family dynamics, and social practices. During the conducted fieldwork, semi-structured interviews with Syrian refugees revealed a strong emphasis on privacy, particularly regarding gender segregation. Families preferred designated areas within shelters to separate male and female spaces, ensuring privacy for women and preserving the cultural norms of family interaction. Security was also a key concern, with refugees highlighting the importance of having secure doors and windows to protect their families from external

threats and to simultaneously maintain control over their living environment. These findings were derived from direct conversations with refugees, in which they voiced the need for spaces that align with their cultural practices and which offer them physical and emotional safety. Though the study did not include formal participatory design workshops, the in-depth interviews, focus group discussions, and observations were critical engagement tools, allowing refugees to share their preferences, needs, and expectations for culturally appropriate shelter designs.

Ventilation, Lighting, and Thermal Comfort: These elements directly impact shelters' livability and environmental quality, affecting both physical and psychological health as well as overall well-being. The Sphere Handbook (2018) and research led by Jha (2010) highlight the importance of designing for the provision of adequate natural light, appropriate thermal conditions, and sufficient air circulation. Field observations confirm that poor ventilation and lighting can lead to health issues and discomfort, emphasizing the need for shelters to be designed with these factors in mind. Ensuring proper ventilation, lighting, and thermal comfort is vital for creating a comfortable and healthy living environment, which is crucial for the well-being of displaced populations.

Fieldwork conducted with Syrian refugees in the "Droube 019" informal settlement provided valuable insights into how cultural aspects influence shelter design preferences. Refugees consistently expressed that the minimum space requirements outlined in the Sphere Handbook (2018) were inadequate for preserving their cultural and social practices, particularly concerning family gatherings and gender segregation. They preferred more spacious living areas to accommodate their multigenerational family structures, which are central to their sense of

social cohesion and to the cultural practice of hospitality in Syrian society.

The interior layout of the shelters, shaped by refugee feedback, includes designated areas vital for ensuring privacy, security, and cultural appropriateness. One key feature that emerged from the interviews and focus groups was the inclusion of a Family Sitting Room/Reception Room. This was defined by the refugees as a multifunctional space that reflects the profound cultural importance of hospitality and gathering with others. This space serves as a room for receiving guests and as a central area for family gatherings, reinforcing the value placed on family unity. The room's layout allows for a smooth transition from public spaces to private areas within the shelter, upholding the cultural norm of maintaining privacy in family life while allowing for social interaction. This spatial arrangement is crucial for maintaining gender segregation, ensuring that women in particular have the privacy they need within the home.

These design elements, grounded in field observations and interviews, demonstrate the critical importance of aligning shelter design with displaced populations' cultural and social realities. By integrating cultural values into the design, shelters become more than just temporary housing structures; they offer spaces where families can continue to practice their traditions and maintain a sense of normalcy and dignity. This alignment ensures that the shelters are functional, context specific, culturally resonant, and supportive of the physical and psychological well-being of their occupants.

The cultural aspects of transitional shelter design—covered living space, privacy, security, cultural appropriateness, ventilation, lighting, and thermal comfort—are identified as critical through a rigorous combination of literature review and empirical field research. These

elements are essential for creating shelters that are structurally sound, context specific, culturally resonant, and supportive of displaced individuals' psychological and emotional well-being. By embedding these considerations into the shelter design process, practitioners can create environments that protect refugees against the elements and promote the dignity, security, and cultural well-being of those they are intended to serve. This comprehensive approach differentiates this research from existing studies and contributes valuable insights to humanitarian shelter design.

The interior layout and design of the shelters, informed by Syrian refugees' preferences and needs, includes designated areas that are essential for ensuring privacy, security, and cultural appropriateness. This understanding stems from the comprehensive field research that was carried out and which included interviews, focus group discussions, and observational tours conducted with Syrian refugees in the "Droube 019" informal settlement. These interactions identified key spaces within the shelter, highlighting Syrian refugees' cultural and social priorities.

Family Sitting Room/Reception Room: This multifunctional space is central to the shelter's layout and serves various roles—from a family gathering area to a reception space for guests. It represents an embodiment and reflection of Syrian cultural emphasis on hospitality and family cohesion. During field visits, interviews, and focus group discussions, refugees consistently highlighted the importance of having a communal space to accommodate family interactions and social gatherings. This area is strategically located to facilitate a smooth transition from public spaces to private areas within the shelter,

underscoring the importance of balance between engaging in social interaction and maintaining a private family life.

For example, in interviews with families, many expressed a strong desire to maintain traditional hospitality practices, even in times of displacement. One family noted, "Having a sitting room where we can receive guests and gather is essential for us. It helps us feel more at home and connected to our culture." This sentiment was echoed by multiple households, emphasizing the need for a designated family sitting area within the shelter.

Additionally, observations of the modifications made by Syrian refugees to their shelters revealed the importance of these communal areas. Families often reconfigured their living spaces to create a central sitting room, which was used for various activities, from meal preparations to evening gatherings, highlighting its multifunctional nature and its crucial importance in Syrian refugees' minds and culture.

Field research indicated that these family sitting rooms/reception rooms were typically placed at the shelters' entrances, facilitating easy access for guests while maintaining the privacy of more intimate family areas. This layout carefully considers cultural norms, ensuring that the shelter's design aligns with Syrian refugees' social and cultural practices and values.

These findings underscore the necessity of incorporating culturally appropriate spaces within transitional shelter designs. By understanding and integrating refugees' preferences and needs, designed shelters can provide a more supportive and familiar environment, promoting physical and psychological well-being and social cohesion. The family sitting room/reception room is just one example of how culturally informed design can enhance the livability and acceptance of transitional shelters among displaced populations.

Storage Room: The storage room was defined by Syrian refugees as a designated space for storing food, particularly “Mouneh” which was mentioned in the previous chapter, and which is comprised of dried or preserved seasonal items. The creation of a makeshift storage room reflects Syrian refugees' adaptation to their living conditions and the importance that food security holds for them. This room is crucial for maintaining a supply of essential food items, allowing residents to manage their resources efficiently and sustain their culinary traditions.

Kitchen (figure 24): Beyond its primary cooking function, the kitchen in Syrian refugee shelters serves multiple purposes, including that of a makeshift washing and showering space. This multipurpose use of space highlights the design's adaptability to accommodate essential daily activities within limited confines, ensuring functionality, and responding to hygienic concerns.

Outdoor Courtyard (figure 25): A model element of Syrian architectural typology, the outdoor courtyard is a versatile space for various activities, ranging from social gatherings to private family time. It allows for indoor-outdoor living, providing residents with a sense of openness, togetherness, and freedom while maintaining privacy from the public eye.

These spaces, integral to shelter design, demonstrate a deep understanding of Syrian refugees' cultural and practical needs, ensuring that the shelters are not only places of refuge but also homes that support their way of life and cultural identity away from home.



Figure 24: Kitchen doubling as a makeshift washing and showering space.



Figure 25: Outdoor courtyard.

The difference between the Sphere Handbook's (2018) generic space standards and the specific findings from field visits to the “Droube 019” informal settlement, as seen in the case of Syrian refugees, underscores the necessity of context-specific shelter design. Kellett and Moore (2003) emphasize the importance of adapting shelter standards to displaced populations' unique circumstances, preferences, and needs. Similarly, Rapoport (1969) and Jha (2010) highlight how cultural factors significantly influence spatial perception and organization within a community. Field research conducted in the "Droube 019" informal settlement confirmed these insights, revealing that Syrian refugees required more space than the Sphere Handbook’s (2018) minimum

standards to maintain daily activities and cultural practices. As Sanderson and Ramalingam (2015) advocate, engaging with affected communities is crucial in understanding these unique needs. Such engagement ensures that shelters not only meet basic living space requirements but also respect and uphold the dignity and well-being of individuals residing in them, providing a foundation for more effective and humane responses to displacement.

5- Privacy, Security, and Cultural Appropriateness

Adapting the layout and design of shelters to fit refugees' cultural nuances is pivotal in fostering an environment that offers privacy, security, and a sense of physical and psychological well-being. Corsellis and Vitale (2005) emphasize the importance of incorporating cultural elements into shelter design to create spaces that provide physical protection and resonate with shelter inhabitants' cultural identity and values. This approach acknowledges that a shelter is more than a physical structure; it is a space that should support displaced individuals' social and psychological needs.

The UNHCR guidelines (2016) emphasize the prominence of incorporating social norms, family structures, gender roles, and religious practices into shelter design to ensure that shelter spaces are functional and culturally appropriate for displaced populations living in them. These considerations are critical for Syrian refugees due to the central role that family dynamics, social interactions, and religious observances play in their daily life. Syrian families often live in multigenerational households, necessitating larger living areas to accommodate family gatherings and support social cohesion. Gender roles, especially concerning privacy for women, require designated spaces that respect gender segregation, such as private areas for women and children, as well as gender-specific amenities like separate WCs. Religious

practices, such as daily prayers and observances, also influence shelter design. Providing quiet and private spaces where individuals can pray is crucial for maintaining spiritual well-being. Additionally, the design of communal areas must allow for carrying out cultural norms surrounding hospitality and social interactions, as these are fundamental to the social fabric of Syrian communities and Syrian society. These considerations, informed by the UNHCR guidelines and confirmed through conducted field research, ensure that shelters support the physical and psychological needs of displaced populations and their cultural and social ways of life. Incorporating these cultural considerations into the design process involves actively engaging the refugee community to gather insights into their specific priorities, needs, and preferences. This participatory approach ensures that shelters are designed with a deep understanding of the cultural context, leading to solutions that are not only practical but also culturally sensitive. These solutions enhance the overall physical and psychological well-being and dignity of the displaced population. By doing so, the shelter design transcends mere functionality, offering a foundation for a stable and respectful temporary life during times of displacement.

Field research carried out in informal settlements, like in the case of the “Droube 019” informal settlement in Lebanon where Syrian refugees upgraded their shelters, revealed how cultural, social, and religious factors influence shelter design. Interviews, focus group discussions, and observations showed that many families live in communal arrangements with extended family members, requiring shelters to have enough space to accommodate large families while still maintaining individual privacy. This balance between shared spaces and private spaces is essential for family life and religious practices, as many families need quiet areas for daily prayers. Gender segregation is another key consideration, with separate spaces for men and women

being necessary during gatherings. These insights highlight the need for shelter designs that respect cultural, social, and religious needs, providing flexible spaces that work for both family usage and personal use.

Gender roles, distinct and deeply embedded in Syrian culture, require careful consideration when designing shelters. Creating separate sleeping and changing areas for men and women is not merely a design choice but a cultural imperative that respects the privacy and dignity of displaced individuals. Similarly, sanitation facilities must be designed to guarantee privacy and security, addressing the needs of all family members while respecting cultural norms. This was evident during the conducted fieldwork and observational tour, as many families had reconfigured their living spaces to ensure women had private areas for changing clothes and sleeping.

Religious practices are also integral to the daily lives of many Syrian refugees, and shelters need to incorporate dedicated prayer spaces. These areas provide a sanctuary for spiritual practices, contributing to the psychological well-being and comfort of the residents. During the field visit, it became apparent that families often designated specific areas within their shelters for prayer, underscoring the importance of religious observance in maintaining a sense of normalcy and spiritual well-being.

While there might be a temptation to design shelters based on generalized cultural and religious affiliations, it is crucial to recognize the diversity of refugees' identities, even within the Syrian refugee community. Each family or individual may have unique priorities, preferences, and needs, underscoring the importance of flexible shelter design. Allowing for customization or adaptation of spaces ensures that shelters can better respond to the diverse ways residents may use and

interact with their living environment. For example, one family preferred an open layout to facilitate communal activities, while another family valued closed spaces for privacy.

In summary, the study highlights the need for a culturally informed and adaptable shelter design approach. This approach would allow for creating spaces that respect and accommodate the complex and varied needs of Syrian refugees. Such an approach not only ensures the functionality and usability of the shelters but also fosters a sense of dignity, security, and normalcy for the displaced individuals, contributing to their overall physical, psychological, and spiritual well-being during times of uncertainty and transition.

6- Ventilation, Lighting, and Thermal Comfort

Natural ventilation and lighting are essential in maintaining a healthy internal environment within the shelter and in contributing to the physical and psychological well-being of displaced individuals by preventing health risks associated with cooking and heating emissions. To optimize these factors, the shape, size, and placement of openings in refugee shelters should be carefully considered, not only to meet guideline and standard requirements, but also to account for the varying needs of the shelter's inhabitants, including privacy and security concerns, among others (Corsellis and Vitale, 2005).

Dabaieh's study on designing an adaptive refugee camp model for the Middle East region highlights the importance of considering cultural preferences, climatic variations, and local context in the placement and sizing of the openings in a shelter to achieve optimal natural lighting, thermal comfort, and cross-ventilation without compromising the well-being, security, and privacy of the shelter's inhabitants. The Sphere Handbook (2018) recommends that the combined surface area of all openings should be > 10% of the surface of the floor area. According to

the Sphere Handbook (2018), the shelter's height should be 2.6 meters in warm climates and 2 meters in cold climates (Sphere Project, 2018).

In a study conducted by Cornaro et al. (2015) regarding the thermal performance of an emergency shelter using a dynamic building simulation, it was found that the shelter's internal temperature during the summer could be reduced by up to 2.2º by increasing the window-to-wall ratio (WWR) from 10% to 20%. A study done by Al-Nammari and Alasir (2015) on evaluating the thermal performance of refugee shelters in the Talbiyeh Camp in Jordan suggested that the size of the windows should be at least 15-20% of the shelter's floor area and the height of each window should be at least 1.2 meters above the floor level. However, the windows' size and placement must be adapted to the context and specific needs of the shelters and their occupants.

Studies have shown that adequate thermal comfort inside the shelter allows its occupants to be comfortably warm, with an ideal indoor temperature ranging between 20-25ºC in warm climates and not below 13ºC in cold climates (Moran et al., 2021; Thapa et al., 2018). By investigating the thermal comfort and performance in refugee camps in Palestine using computer simulation, Saleh (2016) found that natural ventilation significantly reduces the energy consumption required for cooling and heating to acclimate the shelter and improves indoor air quality. Moreover, Ahmed et al. (2021) emphasized the importance of natural ventilation in warm climates as it significantly maintains thermal comfort in shelters by providing a cooling effect. Combining natural ventilation with passive solar design and insulation techniques can create a comfortable and energy-efficient shelter. Examples of this include using low-emissivity window glazing, reducing air infiltration, and increasing the insulation thickness of roofs and walls (Nocera et al.,2020; Cornaro et al., 2015).

7- Technical Aspects

7.1 Building Materials

In selecting building materials, it is essential to consider factors such as cost, availability, durability, environmental impact, safety, familiarity, and cultural acceptance. Using recyclable materials supports sustainable development and can reduce the environmental impact of construction methods. Additionally, using locally sourced and abundantly available materials can optimize the speed of construction and be cost-effective. It can also empower the displaced individuals by involving them in the design and construction processes related to their shelters (Kiwane et al., 2018).

General building material considerations include ensuring that appropriate building materials are used in designing temporary shelters to protect against severe weather conditions and provide thermal comfort. For instance, the study by Tan and Tan (2021) highlights that using insulation materials and reflective coatings can significantly improve shelters' thermal comfort. Additionally, natural ventilation techniques and lightweight and portable materials, as seen in nomadic housing, can be adapted for use in temporary shelters to enhance their overall livability and comfort.

According to a study by Alshawareh (2019) on material analysis of 38 case studies, some commonly used building materials in designing transitional refugee shelters include:

Walls and frames: bamboo/ wood (the most used building material), tarpaulin, mud, and corrugated sheets. These materials are used because of their widespread availability, affordability, ease of installation, and ease of transportation, but they have varying environmental impacts and thermal performance. Steel is sometimes used for its durability and strength.

1- **Roof:** corrugated metal sheets, plastic sheeting, thatch, steel, and wood/bamboo.
2- **Floor:** wood (the most used building material); the second most used building material is concrete. However, Lebanese authorities limit the use of permanent materials such as concrete.
3- **Foundation:** stone, concrete, wood, and steel reinforcements were used in some cases.

Safety considerations are paramount, including resistance to extreme weather conditions and climatic fluctuations, as well as non-flammability. Specific findings from the "Droube 019" informal settlement with Syrian refugees revealed critical insights into the practical challenges of building material selection and use. The use of plastic sheets, for example, presents significant issues. While plastic sheets are common due to their widespread availability and low cost, they have a low insulation factor, high environmental impact, and short lifespan, leading to inadequate protection from severe weather conditions. During discussions with Syrian refugees, many reported sufferings from cold temperatures in winter months and overheating during summer months, which were directly attributed to the low insulation properties of the building materials used in designing and upgrading their shelters.

These findings underscore the need to improve building material selection to meet general shelter standards and address the geographical location's unique environmental and climatic challenges. By incorporating feedback from the affected community, shelter designs can be tailored to better meet their needs, therefore simultaneously enhancing comfort and safety.

7.2 Life Span

Specifying the life span of refugee shelters during the design phase is vital as this influences the selection of building materials. It also helps estimate the period before the shelter's components begin to deteriorate, preventing negative impacts on refugees' well-being. A comprehensive field study conducted by Alshawawreh (2019) highlights the need to consider the life span of the shelter during the design phase to minimize adverse impacts on refugees' quality of life. In their study, Marji and Kohout (2022) further argue that the life span of shelters should be considered during the design phase, and long-term solutions must be developed to provide more stability and a sense of home away from home.

In the context of natural disasters and conflicts, it is essential to differentiate between emergency and temporary shelters, as each exhibits unique characteristics and serves a distinct purpose. An emergency shelter takes different forms, ranging from tents and material kits to collective centers with a short-term life span (Davis, 1978). Their purpose is to offer immediate security and protection to the affected individuals following a disaster. However, a temporary shelter that is neither a tent nor a permanent structure has a life span of 3- 5 years (Burnell and Sanderson, 2011). Temporary shelters aim to provide a more stable living environment for the affected population during a disaster's reconstruction and recovery phase.

Various studies explored the factors that influence the life span of shelters. Chamma and Zaiter (2017) emphasize that the life span of shelters is affected by the surrounding environments. This includes inadequate infrastructure and overcrowding. It is essential to integrate urban resilience strategies that address these complex issues to enhance the life span of refugee shelters. Hart et al. (2018) highlight the

importance of incorporating local cultural customs and practices into shelter designs to create spaces that can evolve into long-term homes. Atmaca's (2017) research emphasizes the need for humanitarian agencies and architects to consider building material selection, construction techniques, and maintenance practices when determining the appropriate life span of shelters and to improve the living conditions of the affected population.

7.3 Cost

The source of the building materials the shelter's design, its size, its geographical location, community participation, the quality of the building materials and their durability, and construction methods are all crucial factors that contribute to the overall cost of a shelter. Finding the right balance between quality and cost is critical to maximizing the number of displaced individuals that a shelter can host while accounting for durability and safety.

The International Federation of Red Cross and Red Crescent Societies (IFRC, 2013) provides valuable insight into the risks associated with refugee shelters that are too high or too low in terms of standards and cost. Below are the details for the aforementioned points, listed in Table 9.

Table 9: Risks of a shelter being at a too-high or too-low standard and cost (IFRC, 2013).

Too high	Too low
Risk of the design and assembly being too slow, and shelters delivered too late.	Shelters risk collapse, and inhabitants risk injury.
The number of shelters built is small, limiting the number of people that the project can support.	Shelters risk being refused by affected people.

Shelters risk being held to a higher standard may create societal divides, as beneficiaries have better living conditions than non-recipients, leading to dependency on aid.	The building materials are low quality and not sufficiently durable for use/reuse in a permanent house.
	The design life of the shelters will be too short.

Too high:

1- **Risk of being too slow:** High-cost shelters can take longer to build, resulting in delayed immediate shelter provision for affected individuals following a natural disaster or crisis. This is due to the expensive cost of materials (such as the use of advanced insulation and fire-resistant materials), specialized construction methods, and more complex designs.

2- **Limited number of shelters:** Higher costs may limit the number of shelters that can be built because of budget constraints, thus limiting the number of affected populations who can be accommodated in these shelters.

3- **Societal divisions:** If high-standard shelters are provided, this may lead to division and inequality among communities, as the shelters may be considered superior to housing provided to host communities and to those unable to receive shelter.

4- **Increased dependence on external aid during future crises or disasters:** Shelters that are too high in standards can lead to increased dependence on external aid, as there will be an expectation for similar standards to be met in the event of future crises or disasters.

Too low:

1- **Risk of collapse:** Shelters constructed using low-cost materials and inadequate construction techniques may lead to structural failure. They pose a risk to their inhabitants due to their lack of proper resistance to environmental factors (heavy rain, snow, or strong winds) and load-bearing capacity.
2- **Rejection by affected people:** Shelters that fail to provide adequate living conditions, protection from the elements, privacy, and security can lead to refugees' dissatisfaction and unwillingness to utilize them, ultimately leading to unsuccessfully providing effective shelters to the affected individuals.
3- **Low-quality materials and short design life:** The use of low-cost materials can result in shelters that do not provide adequate insulation or protection from the elements, have low fire ratings, and are not durable for long-term use, thus requiring frequent maintenance due to the damage caused by fire hazards or environmental factors. This poses a significant risk to the safety and well-being of their inhabitants.

Analyzing 12 existing refugee shelters funded by the IFRC or UNHCR, Alshawareh et al. (2020) found that the average material cost of a shelter amounted to $1300, with the highest cost reaching $5,500 for a project in Iraq. Using this data, a cost classification was established, categorizing building materials costs as shown in Table 10. The suggested cost range is between $1,250 and $5,500, aiming to offer effective and affordable shelter solutions for the displaced population.

Table 10: Cost classification of 12 shelters (Alshawawreh et al., 2020).

Building Materials Costs	<$1300	$1300 - $3400	$3400 - $ 5500	>$5500
Description	Below average	Above average	Within existing range	Unaffordable

7.4 Access to Services and Livelihood

Providing adequate services and infrastructure in refugee camps and other temporary settlements is essential for providing a healthy, safe, and comfortable living environment for the displaced population. The site planning standards for services and infrastructure, as outlined by the Sphere Association (2018) and UNHCR (2007), are provided as follows:

- Latrines: One communal latrine per 20 persons should be provided with separate facilities for women and men to ensure the inhabitants' safety and privacy (emergency phase). In the case of long-term accommodation, one household latrine per family offers more privacy and a sense of ownership. Latrines should be located not more than 50m from the shelter and not closer than 6m (Sphere Association, 2018; UNHCR, 2007). In the case of an informal settlement, each family should have one latrine close enough to their shelter to encourage their use and ensure privacy and security, especially among women and children.
- Showers: Shower areas should be well-drained and adequately maintained, with one shower per 50 persons. Shower facilities should be gender seggregated for women and men to ensure privacy and security (Sphere Association, 2018; UNHCR, 2007). However, in the “Droube 019” informal settlement, refugees

were unsatisfied with the location of the showers outside of their tent, which led them to shower inside their shelter, such as in the kitchen area.

- 100-litre rubbish containers: One rubbish container per 50 people or one rubbish container per 10 families to maintain a hygienic and clean environment.
- Refuse pit (2m x 5m x 2m): One refuse pit per 500 persons or one refuse pit per 100 families facilitates the proper disposal of solid waste.
- Water supply: It is recommended that at least 20 liters of water be provided daily for one person to meet basic needs such as cooking, drinking, and personal hygiene.
- Water distance: Shelters should be located at a maximum of 200 meters away from a water distribution point to facilitate easy access to water supply for daily activities.
- Lighting: Proper lighting should be observed in communal areas, pathways, and shared facilities such as latrines and shower areas to ensure that essential activities and services can be carried out efficiently and safely (Sphere Association, 2018; UNHCR, 2007). However, Syrian refugees residing in the Droube 019 informal settlement experience challenges related to electricity access, with only one hour of electricity per day.

During the field visit to the informal settlement “Droube 019” in Lebanon, it was observed that the settlement lacked adequate drainage and sewage systems, exacerbating flooding. Upon engaging with the Syrian refugees, they expressed their concern about the flooding caused by sewage pipe issues, which can have severe consequences on their health, in particular related to the elderly and children. In addition to health risks, the absence of appropriate infrastructure can significantly

deteriorate Syrian refugees' living conditions and damage their belongings.

8- Social Aspects

Inclusive and Participatory Design: Engaging refugees in the design and construction processes contributes to the settlements' overall success and long-term sustainability. While this study did not involve formal participatory design workshops, interviews, focus group discussions, and direct interactions with the refugees provided valuable feedback that shaped the shelter prototype designs. Through these conversations, refugees expressed their priorities, needs, and preferences, which were incorporated into the design process. This form of engagement fostered a sense of ownership, as refugees felt more connected to the shelters they helped shape, reinforcing their commitment to maintaining and caring for their living spaces (Scott-Smith, 2019).

Kelltet and Moore (2003) emphasize that understanding the preferences and needs of refugees is essential for developing culturally appropriate and context-specific shelter solutions. In their study on Syrian refugees in Palestinian refugee camps and informal settlements in Lebanon, Chamma and Zaiter (2017) highlight that by involving the refugees in the design and construction processes, architects can address challenges, leading to more effective and context-sensitive shelter solutions that meet the needs of the affected population.

9- Functionality of the Shelter

This section will provide a brief overview of the intermediate steps and development process that led to of the design the shelter prototype's layout. This prototype is explicitly designed for Syrian refugees as their displacement realities in Lebanon constituted the case study adopted in this research. The designed prototype is based on field studies,

interviews, focus group discussions, assessments of Syrian refugees' current living spaces, and shelter design guidelines outlined in Table 3. The shelter prototype offers a comprehensive solution incorporating Syrian refugees' specific priorities, needs, preferences, and cultural backgrounds.

9.1 Spatial Organization and Cultural Sensitivity

The shelter prototype introduces innovative features by incorporating architectural patterns, design elements, and spatial arrangements that reflect Syrian refugees' culture and traditions. This includes the integration of courtyards and designated areas for family gatherings, cooking, and socializing, which are central to Syrian communal living and Syrian society. Additionally, the shelter layout respects and adheres to Syrian cultural norms and sensitivities, such as gender segregation, privacy, dignity, and security. By embedding these cultural aspects into the design, the prototype aims to foster a sense of ownership and belonging among the refugees and enhance their comfort and physical and psychological well-being. This culturally sensitive approach represents a significant innovation in transitional shelter design, ensuring that the shelters are functional and sustainable and that they resonate with the displaced population's cultural identity.

Layout and Dimensions:

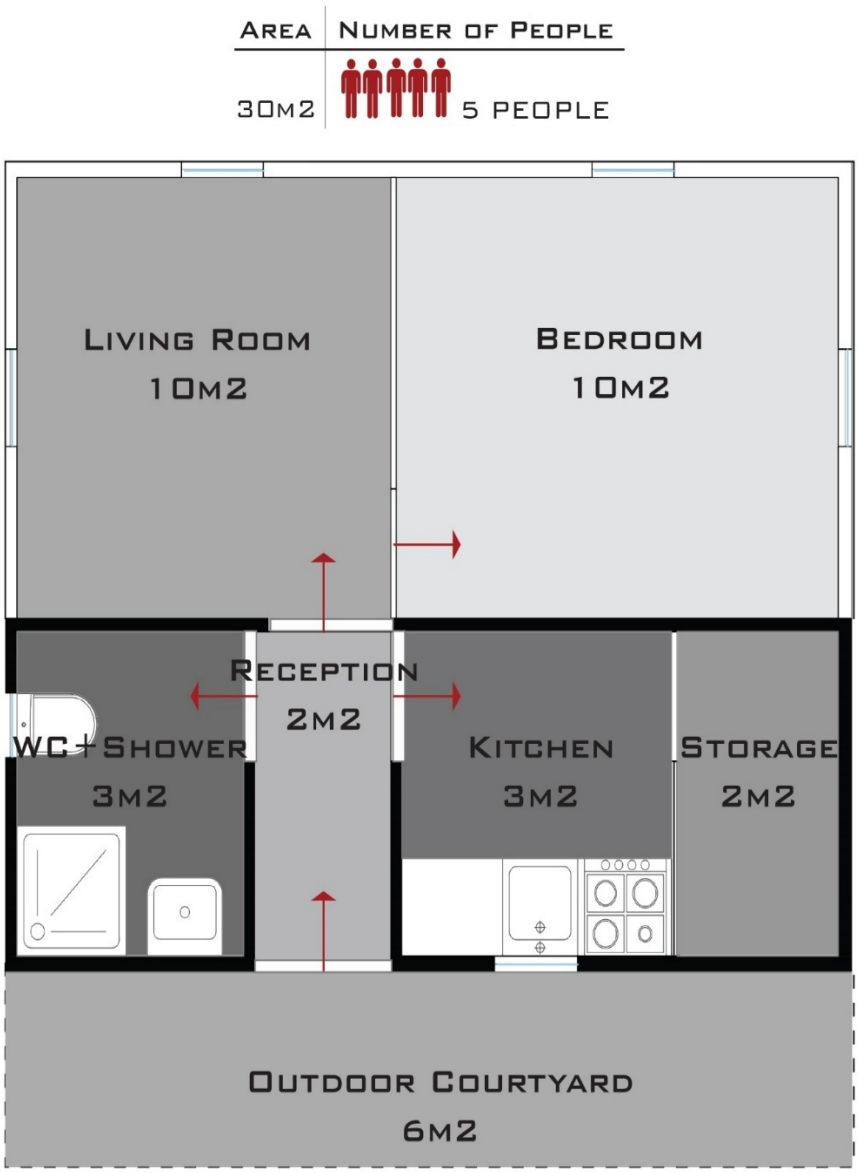


Figure 26: Floor plan for a family-oriented transitional shelter.

Figure 26 presents a detailed layout of a transitional shelter specifically designed to accommodate a family or group of five people (two adults and three children). This is based on field visit observations conducted in the informal settlement “Droube 019”, where it was found that most Syrian refugee families, typically consisting of five to seven members, lived in a shared tent with an average of 36m² area. The shelter

prototype is a simplistic rectangular structure with a total area of 30 square meters, which is segmented into specific living areas:

- The living room occupies 10 square meters, serving as the communal space for the family to gather and engage in daily activities.
- The bedroom spans 10 square meters, offering private sleeping quarters.
- The reception area is a 2 square meter space serving as the transition zone between the public spaces and private areas of the shelter.
- The kitchen measures 3 square meters and is equipped with essential appliances as well as a space for meal preparation.
- The storage room consists ofa 2 square meter area, used for storing belongings and non-perishable “Mouneh” food items.
- The sanitation facilities include a water closet and shower within a 3 square meter space, ensuring hygiene and privacy.

Additionally, an outdoor courtyard with an additional 6 square meters of space provides an area for outdoor activities, further enhancing the living environment, and providing a semblance of normalcy for the shelter’s residents. The extra outdoor area is vital for relaxation and socialization and could also be used for small-scale gardening.

As outlined in the shelter design guideline, it is essential to engage refugees in the construction of their shelters, as this active involvement enhances their physical, psychological, and spiritual well-being and empowers them. As such, the prototype shelter should be designed to make it easy for the refugees to construct it themselves. The rectangular

shape was chosen as it offers a simple and efficient design, making it easy for refugees to construct, upgrade, and maintain. The shelter's height varies between 2.2 meters at the lowest point and 2.5 meters at the highest point, considering the field study findings and the Sphere standards. The prototype facilitates expansions and upgrades by adopting a simple design, enabling families to modify their space according to their changing needs and ensuring that the shelter remains functional and relevant. Moreover, a simple design allows for rapid relocation and reduces time and cost. The shelter plan layout is illustrated in Figure 26. The overall design of the shelter strikes a balance between communal living and individual privacy, encapsulating the basic needs of Syrian refugees within a compact yet efficient layout.

Public and Private Spaces:

The shelter's design embraces Syrian refugees' cultural sensitivity and religious values, notably by separating public spaces and private areas. Field visits have provided valuable insights into Syrian refugees' living space conditions and concerns. It was observed that most of the interiors of the shelters included a reception room, kitchen, and bedroom. Refugees expressed their need for a toilet and a proper shower inside the shelter to ensure security and privacy. As gleaned from the field visits and to actively address their concern, the shelter's interior is divided into two sections, public and private. This helps ensure privacy and accommodates various activities. The public areas consist of a kitchen ($3m^2$), a storage room ($2m^2$), and a reception room ($2m^2$) that allow for circulation between spaces, while the private area includes a family room ($10m^2$) and a main bedroom ($10m^2$). The living room can be transformed into a second bedroom at night by adding a partition which would provide enhanced privacy during social gatherings. Partitions can be used to separate and create public and private spaces

as needed, including for dedicated and gender-specific prayer areas. In response to the concerns of Syrian refugees, the shelter incorporates an indoor toilet with a shower (3m²), demonstrating a commitment to create an environment that is both comfortable and respectful of Syrian refugees' unique practices, customs, and beliefs.

9.2 Climatic Design

Transitional shelter designs should account for local climate conditions and the relevant specific needs of Syrian refugees as climate fluctuations affect shelters' thermal comfort and habitability. Several factors should be considered when creating an effective climatic design, including the local climate context, passive solar design, and natural ventilation. Additionally relevant are the heat generated by internal activities and the occupants' clothing which also impact the occupants' comfort.

Local Climate Context: This shelter prototype is designed to accommodate Syrian refugees residing in the Bekaa region located in Lebanon. Lebanon has a Mediterranean climate, with hot, dry summers (June to September) and mild, wet winters (December to mid-March) with an average annual temperature of 15ºC (World Bank, n.d). The Bekaa Valley, where the "Droube 019" informal settlement is located, experiences extreme temperature variations due to its inland location and elevation. The Bekaa Valley, situated in eastern Lebanon, has an elevation of around 960 meters (3,150 feet) above sea level (Encyclopedia et al.). The "Droube 019" informal settlement is exposed to harsh winters and snowstorms, forcing refugees to cope with tough living conditions.

Understanding the local climate context of the Bekaa is crucial for designing a shelter that can withstand variouse weather conditions.

Bearing this in mind, the prototyped shelter should incorporate passive solar design and natural ventilation to address these challenges.

Passive Solar Design: Passive solar design adaptations focus on providing natural cooling, preventing heat accumulation and overheating by promoting natural ventilation, considering building orientation, and accounting for solar protection (Santons et al., 2022). In addition, implementing simple strategies such as thermal mass enhances living conditions by reducing overheating (Moran et al., 2021). Tiwari et al. (1994) highlightthed the importance of building orientation for cooling, ventilation, thermal mass, shading, insulation, and passive water cooling of roofs. All of these elements also promote passive solar design and thermal comfort. Additionally to shading, window sizing, and insulation, vegetation elements along facades provide thermal protection (Santons et al., 2022).

Building on existing design principles, the Sphere Handbook (2018) recommendations, field visits, and shelter design guidelines, the shelter prototype is designed with a strong emphasis on openings, roof design, and orientation as follows:

The openings' size should be 10% to 20% of the surface floor area (Cornaro et al., 2015; Al-Nammari and Alasir, 2015; Sphere Handbook, 2018). In the proposed shelter, the four sizes of the living room and bedroom windows are 80cm x 70cm, accounting for 10% of the total surface area (17m²). The windows are positioned on opposite walls to enhance cross ventilation, thus allowing airflow to enter the room, circulate throughout the space, and exit the opposite opening. The size of the kitchen's window is 0.7m x 0.6cm, which covers approximately 10% of the kitchen's surface area (4 m²), providing natural ventilation for cooking and dispersing fumes. In the WC, a window measuring 0.4m x 0.4cm (>10% of the area, 3 m²) is integrated for ventilation. Shading

is also provided to alleviate privacy concerns, doubling as a protective measure from the sun. As concluded from field visits, privacy and security are significant concerns of Syrian refugees; therefore, all the windows are placed 1.2 meters above ground level.

The informal settlement's location in the Bekaa region in Lebanon, which experiences rainfall and heavy snow, has raised concerns among refugees regarding water penetration potentially damaging their possessions and clothing. The shelter floor is elevated 0.3m above the ground, and the roof features a pitched deign.. Elevating the floor above the ground provides a buffer against water pooling on the ground's surface, thus minimizing the risk of water penetration. In addition, an elevated foundation reduces heat transfer between the ground and the shelter's floor, thereby contributing to improved thermal performance and promoting better airflow beneath the shelter. The pitched roof ensures that water runs off the surface rather than pooling and causing leakages or potential structural damage.

Lastly, the shelter's orientation is significant in achieving optimal energy efficiency and thermal comfort. During winter, there is a south-facing orientation (in the northern hemisphere) or a north-facing orientation (in the southern hemisphere) (Garatt, 2022). To minimize overheating in the summer and maximize the warmth in winter, the shelter in Lebanon (located in the Northern Hemisphere) is oriented with the living room and bedroom façades facing south. Positioning the shelter with the room's opening south-facing means that the living room and bedroom areas will always have direct sunlight in winter, keeping the inside of the shelter well-lit and warm. In the kitchen and storage room (south), very little sunlight enters, which protects food goods and other supplies from sun damage. As mentioned before, all the openings are shaded to protect from the sun and due to privacy concerns.

9.3 Materiality of the Shelter

The choice of building materials and construction techniques used in designing the shelter prototype depends on several factors, including environmental concerns and transportation impacts, social and cultural acceptability, and promoting sustainability and local markets. It should also consider the engagement of the Syrian refugees in building their shelters, thus guiding the design process towards more acceptable and eco-efficient solutions.

Addressing the limited research on the environmental impact of temporary refugee housing, Dabaieh et al. (2020) presented a comprehensive LCA calculation for a physical house prototype. It was found that using low-impact raw building materials for construction with passive solutions for cooling and heating achieves a minus-carbon outcome in temporary housing. Insulation materials for walls, roofs, and foundations, such as double-glazed windows and sandwich panels, reduce operational energy consumption in temporary housing (Atmaca, 2017).

This section presents a detailed discussion of the selection of the building materials to be used in the shelter prototype, based on several criteria: cultural and social acceptability, sustainability, local sourcing, and environmental impacts throughout the materials' life cycle.

Insulated Panels: Sandwich panels, also known as structural insulated panels (SIPs), consist of multiple layers, usually two structural boards made out of a high-density and robust material and a core in between made out of a low-density insulation material. The layers are available in various sizes, thicknesses, and colors. Usually, in most cases, the outer layer consists of galvanized steel sheets, oriented strand boards (OSB), wood-cement, or plywood boards. These panels are known for their thermal and acoustic performance, high strength, and

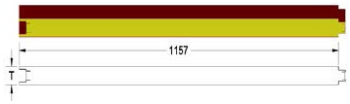
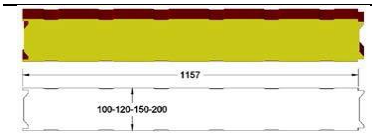
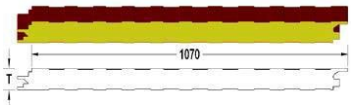
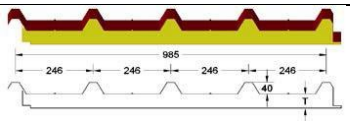
lightweight (Thongcharoen et al., 2021). The core is usually composed of an insulating material: polyurethane (PUR), polyisocyanurate (PIR), or mineral wool (rock wool). Insulated panels with a mineral wool core layer meet high fire safety standards, providing more than 2 hours of fire resistance (Cooke, 2004; Studziński and Pozorski, 2016). A recent study by Dhaif and Stephan (2021) compares the performance of structural insulated panels (SIPs) and concrete hollow blocks in the hot climate of Bahrain. The study showed that the SIPs led to 21.4% and 25.9% lower cooling energy demand than concrete blocks. Insulated panels also positively contribute to the environment by reducing greenhouse gas emissions.

Dalal Steel Industries, a leading Lebanese company specializing in Sandwich panels, offers an ideal local source for SIPs. Incorporating locally sourced SIPs into the design of the prototype shelter promotes regional economic development and environmental sustainability while meeting the unique needs of refugees. For the purpose of this study, Dalal Steel Industries provided data on wall and roof panel types (effective widths, available insulation materials, base materials, and fire resistance classifications). The data aided in selecting the suitable SIP options for the prototype.

Wall and Roof Panels:

Depending on their use, there are two types of insulated panels: wall and roof panels.

Table 11: Sandwich panels (Source: Dala Steel Industries).

	**Type** **Effective width (mm)** **PU Thickness T(mm)**	**WSPF-1157** 1157 50, 80, 100	**Wall Panels** Visible fastening tongue-groove, flat on two sides, maximum length 3000mm.
	**Type** **Effective width (mm)** **PU Thickness T(mm)**	**WSC-1157** 1157 100, 120, 150, 200	**Wall Panels** Cold store sandwich panels, double tongue-groove, micorib on both sides.
	**Type** **Effective width (mm)** **PU Thickness T(mm)**	**WSPH-1070** 1070 50, 80, 100	**Wall Panels** Hidden screw connection, micorib on both sides.
	**Type** **Effective width (mm)** **PU Thickness T(mm)**	**RSP- 985** 985 50, 80, 100, 120	**Roof Panels**

Core Type:

The three commonly used core materials are mineral wool (rockwool), PUR (polyurethane), and PIR (polyisocyanurate) (table 11).

1. **Rockwool core made of mineral wool:**

   Mineral wool cores are classified as A2-s1, d0 and have a hard core of high-density mineral wool fiber, providing excellent fire resistance. A mineral wool panel typically produces less heat and smoke than panels with a polymer core.

2. **PUR core made of stiff Polyurethane B3 Foam:**

   PUR foam cores are usually classified as C or D-s3, d0. Compared to PIR and Rockwool insulation, PUR foam produces more heat and emits more smoke during a fire.

3. **PIR core made of Stiff Polyisocyanurate Foam:**

   PIR core, a type of modified polyurethane, is classified as B-s2, d0. It is more fire-resistant than a PUR B3 and emits less smoke and heat.

Characteristics:

Table 12: Core types of characteristics (Source: Dalal Steel Industries).

	Rockwool	**PUR**	**PIR**
Core Density (±3kg/m³)	100	40	40
Thermal Conductivity (W/m*K)	0.035	0.022	0.023
Compressive Strength (kPa)	15	180	180
Closed Cell Content	0	≥96%	≥96%
Typical Fire Resistance Class	E120	EI 15	EI 15/EI30
Acoustic Resistance Coefficient Rw	31	27	27

For the shelter prototype, the chosen SIP material for the exterior walls will be the WSP-1157, which has a thickness of 100mm, and a Rockwool core made of mineral wool. The WSP-1157 panel type is chosen due to its micro-ribbed surface on both sides of the panels, enhancing the shelter's structural durability, rigidity, and resilience in challenging conditions. A 100mm thickness has been selected to optimize thermal performance and insulation, considering the weather conditions in the Beqaa. Additionally, this choice enhances the energy efficiency of the shelter by reducing energy consumption for cooling and heating purposes. A thicker exterior wall not only contributes to a more stable indoor temperature but also enhances the comfort of the shelter's inhabitants. The Rockwool core is selected for its fire resistance characteristics (A2-s1, d0). During a fire, it produces less smoke and heat than PIR and PUR cores, ensuring the safety of the Syrian refugees.

For the interior walls, the WSPF-1157 panel type with a thickness of 50mm is a suitable and sufficient choice for interior partitions, allowing for cost and space savings in the shelter's layout. The flat surface on both sides creates a visually smooth, pleasing appearance for interior walls, contributing to a more appealing and comfortable living environment for the shelter's inhabitants.

The WSP-1157 and WSPF-1157 wall-type sandwich panels offer aesthetically pleasing and practical solutions for exterior and interior walls. They provide ease of installation, efficient use of materials and space, and flexibility. These wall-type sandwich panels can be installed horizontally or vertically, offering flexibility in the layout and design of the shelter. In addition, the visible fastening tongue-groove system allows for straightforward and quick installation.

Recycled Plastics:

Moreno-Sierra et al. (2020) highlight the potential benefits of using recycled plastics instead of traditional ceramic bricks as a construction material for emergency shelters in post-disaster contexts. The results showed that construction elements composed of 100% recycled plastics exhibit durability, low density, excellent thermal insulation, and water resistance. In another study by Kognole et al. (2019), plastic sand bricks were a variable alternative to traditional masonry units due to their durability, compressive strength, and cost-effectiveness. In addition, plastic bricks help address the environmental concerns associated with plastic waste.

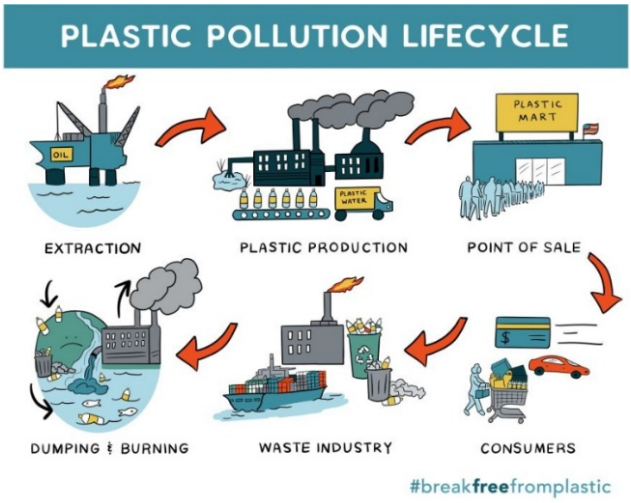


Figure 27: Plastic pollution lifecycle (Tsydenova and Patil, 2021).

Figure 27 illustrates the lifecycle of plastic pollution, starting from the extraction of raw materials like oil, followed by plastic production, distribution, and consumer use, culminating in waste management processes such as dumping, burning, or recycling. Each phase contributes to environmental degradation, with significant greenhouse gas emissions generated during the plastic production and disposal phases, therefore exacerbating climate change.

In relation to this study, the figure highlights the urgent need to manage plastic waste to prevent it from becoming an environmental burden. This research proposes an innovative approach using recyclable plastic waste to construct sustainable shelter prototypes for Syrian refugees in Lebanon. By incorporating recyclable plastic into building materials, the study provides durable housing solutions and actively interrupts the traditional plastic pollution lifecycle. This approach aligns with the principles of a circular economy and Sustainable Development Goal 11, which focuses on sustainable cities and communities by repurposing plastic waste into a resource for social and environmental benefit. Through this model, the study addresses the shelter needs of displaced populations and the broader ecological challenge of plastic waste.

Plastic Lab Lebanon, founded by Rami Ralph Sbeih, is a pioneering initiative that focuses on creating eco-friendly construction materials from recycled plastic. Incorporating locally sourced plastic bricks, beams, and panels from Plastic Lab Lebanon aligns transitional shelters designs with environmental and practical concerns. Plastic Lab Lebanon (table 13) sourced all the data below. Plastic Lab Lebanon uses innovative production to transform plastic waste into recyclable materials. The process involves several stages:

Stage 1: Plastic waste is collected and sorted to separate different types of plastic to ensure that only compatible materials, such as high-density polyethylene (HDPE) and low-density polyethylene (LDPE), are combined.

Stage 2: The sorted plastic waste is then washed and cleaned to remove debris and dirt, guaranteeing the quality and purity of the final product.

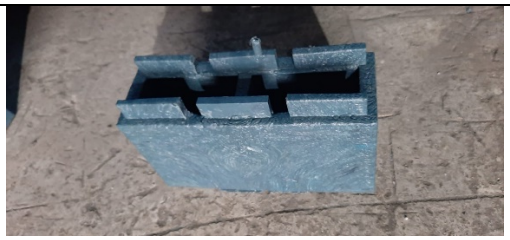
Stage 3: The plastic waste is shredded into small pieces, melted, and mixed with other materials, such as cement, sand, and fire retardants, to enhance the bricks' strength, durability, and fire-resistant properties.

Stage 4: The shredded plastic and additional mixture are heated, causing the plastic to melt.

Stage 5: Once melted, the mixture is poured into molds of various shapes and sizes (brick shape and size, beam size, and panel) to create versatile construction materials.

The shelter's structure is made of plastic beams, offering an environmentally friendly alternative to traditional construction materials. The exterior walls are constructed using a combination of insulated sandwich panels, plastic bricks, and plastic panels. This combination accounts for environmental impact, cost, and aesthetic considerations and helps differentiate between public spaces and private areas within the shelter. The insulated wall panels are used explicitly for the living room and bedroom to provide insulation and thermal comfort. Plastic bricks and panels are used for public areas, creating visually colorful and appealing alternatives, and a positive living environment compared to the usual grey, monotonous appearance. Plastic panels are more cost-effective options. Bricks have been used in Syria as a traditional construction material. Therefore, incorporating bricks into the shelter's design creates a sense of familiarity and helps refugees feel more connected to their traditions and cultural roots. In addition, the familiarity of brick construction techniques allows for rapid construction. By incorporating insulated panels and recyclable plastics, the shelters aim to promote sustainability in the design.

Table 13: Recyclable plastic types (Source: Plastic Lab Lebanon).

Recyclable Plastic	Dimensions (mm)	
Beam	60 x 40 60 x 60 100 x 100 Maximum length: 2500	
Brick	290 x 160 x 100 190 x 160 x 100 90 x 160 x 100	
Panel	1000 x 1000	

10- Shelter Performance

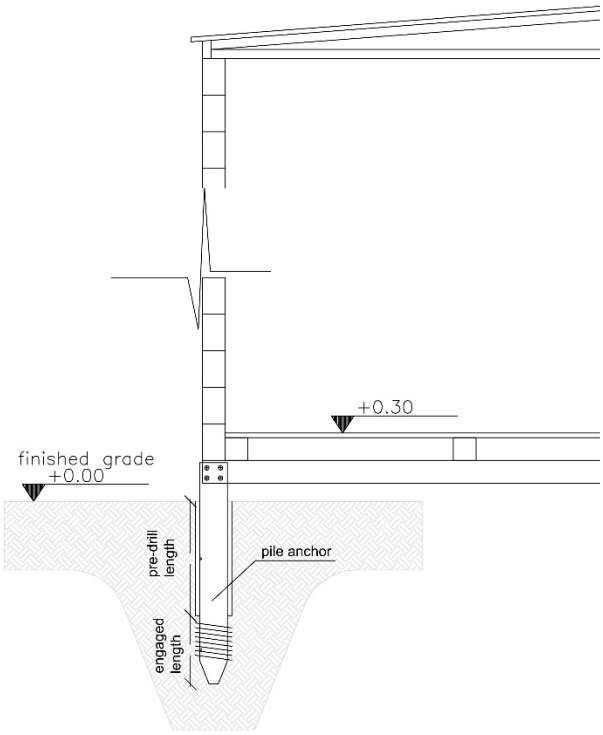


Figure 28: Ground screw detail.

The shelter is elevated above the ground using ground screws instead of traditional concrete foundations, as detailed in Figure 28. Ground screws provide several benefits, such as faster installation time, minimal environmental impact, and the potential for easy disassembly and reuse. This approach also allows rainwater to filter into the ground, therefore preserving the soil's ecosystem naturally. Additionally, this is a good alternative, seeing as the Lebanese government banned the use of concrete due to concrete being considered a pathway to permanent structures.

The elevated shelter’s floor is constructed from plastic panels (1000 x 1000 mm) that are supported by a grid of plastic beams spaced 500 mm apart to ensure the floor’s durability and strength. Each plastic panel requires four beams (100 x 100 mm) along its perimeter and one in the center (60 x 40 mm), as illustrated in Figure 28.

The shelter's roof is designed to provide structural support and insulation while utilizing environmental materials. It is constructed using ten insulated roof panels measuring 3200mm in length and 985mm in width. These roof panels are supported by a plastic beam truss grid with a 1500mm span between each truss to ensure adequate support for the insulated roof panels.

In summary, the transitional shelter prototype for Syrian refugees in Lebanon exemplifies innovative construction techniques and sustainability elements by combining plastic beams, panels, bricks, and insulated panels.



Figure 29: Plastic panel and plastic beam structure.

Figure 29 showcases the prototype of a wall panel constructed from recycled plastic, supported by plastic beams that form its structural framework. The plastic beams are designed to provide stability and durability, enabling the panel to withstand harsh environmental conditions, including strong winds and storms. This setup demonstrates how the beams act as a reinforcement, holding the panel securely in place to form a robust, reliable wall structure suitable for use in temporary shelters. The use of plastic materials not only leverages recycled waste but also enhances the shelter's resilience in challenging weather conditions.

The design of this prototype leverages the insulating properties of recycled plastic panels to maintain thermal comfort within shelters,

which is essential in mitigating the extreme temperature fluctuations of Middle Eastern climates. Given Lebanon's seasonal temperature variations—from cold, wet winters with heavy rainfall to hot, arid summers with intense sunlight—thermal resilience becomes crucial in maintaining a safe and comfortable indoor environment. The plastic panels act as a thermal barrier, reducing the need for additional heating or cooling equipment, thereby creating a shelter suitable for diverse climatic zones across the Middle East.

Structurally, the use of reinforced plastic beams provides a sturdy framework capable of withstanding harsh weather conditions, including strong winds and heavy rain, which are common in Lebanon's mountainous regions and coastal areas. These plastic beams offer flexibility and durability, essential qualities that enable them to absorb environmental shocks without compromising the shelter's integrity. During severe rainfall, which can lead to flooding in low-lying areas, elevated and sealed construction minimizes water infiltration. Similarly, in desert regions with extreme heat and direct sunlight, the prototype's plastic structure resists warping or deterioration, making it an adaptable shelter option across the Middle East.

Together, the thermal insulation and structural resilience features of this shelter design aim not only to address Syrian refugees' immediate needs for safer, more adaptable housing but also to provide a sustainable, durable solution for displacement contexts. By incorporating recycled plastic, the shelter balances environmental sustainability with practical adaptability, making it a viable long-term option for improving living conditions in refugee camps and other temporary settlements.

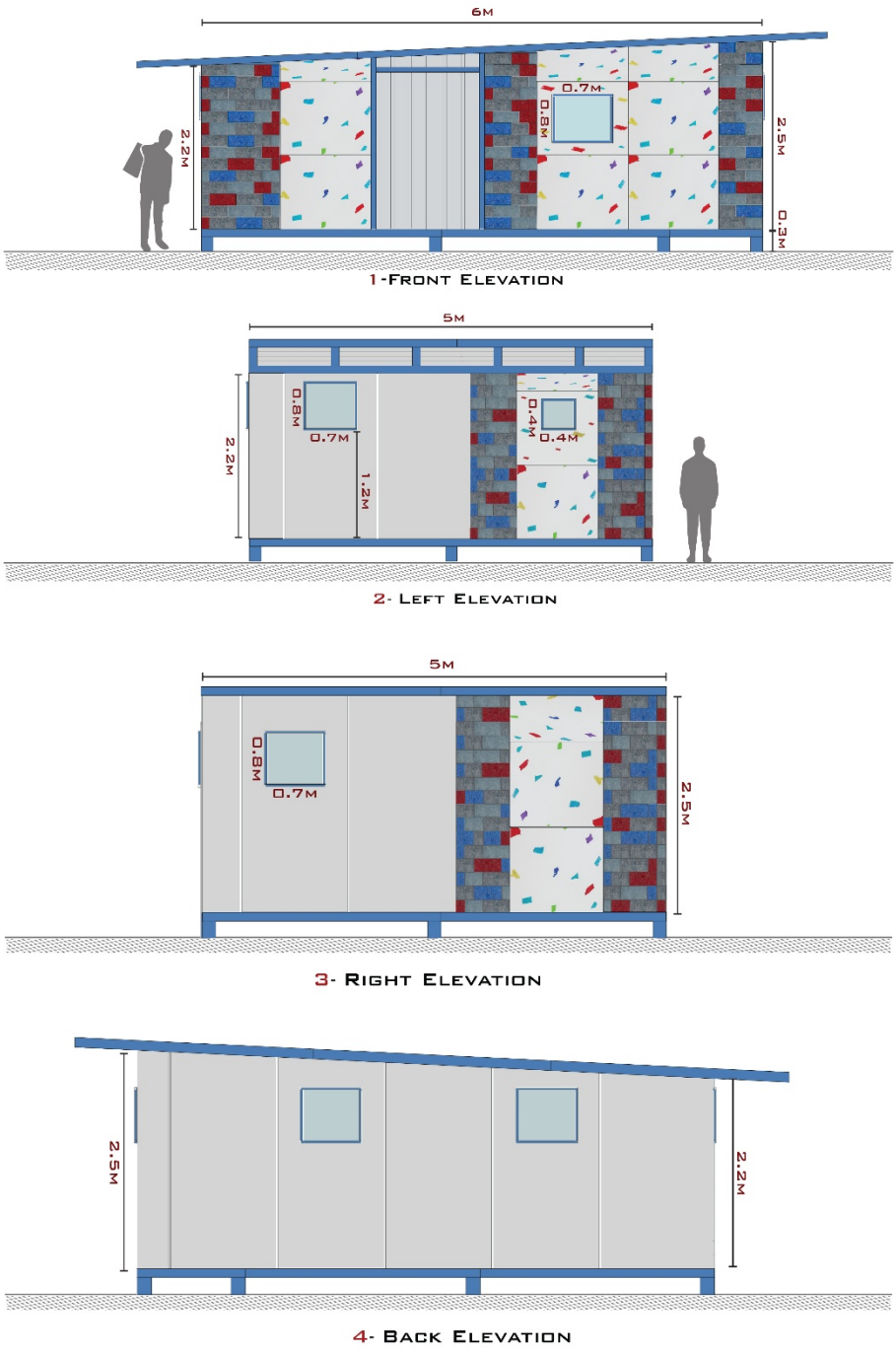


Figure 30: Elevation views of transitional shelter for displaced populations.

Figure 30 illustrates the detailed elevation views of a prototype for a transitional shelter tailored to the needs of displaced populations. This design combines practicality with cultural sensitivity, balancing

structural resilience with aesthetic appeal. Each elevation view is labeled to highlight different aspects of the shelter's functionality and user-centered design.

1. **Front elevation:** The entrance, positioned centrally, is surrounded by a vibrant array of recycled plastic "mosaic bricks." These colorful bricks mimic the look and feel of traditional Syrian brick construction, resonating with familiar cultural aesthetics. By using recyclable plastic in place of traditional materials, the design maintains a sense of cultural continuity while addressing environmental considerations. The extended roof adds practical shading and weather protection, making the shelter resilient across the diverse climates found in the Middle East.
2. **Left Elevation:** The left side includes two well-placed windows that serve the living area and WC, respectively. Their dimensions are chosen to meet the Sphere standards, ensuring that the total window area exceeds 5% of the floor area, thus facilitating adequate ventilation while preserving privacy. The use of plastic "brick" panels in colorful patterns aligns with traditional Middle Eastern construction styles, offering refugees a sense of familiarity and dignity within their living environment.
3. **Right Elevation:** Similar to the left, the right elevation mirrors window placement to create balanced cross-ventilation, which is essential in hot climates. This design encourages airflow through the living spaces, helping to regulate indoor temperatures naturally, without compromising on structural durability or aesthetic appeal.
4. **Back Elevation:** Designed with fewer openings, the back elevation emphasizes privacy and protection from external elements. This orientation ensures a sheltered, more secure

environment for inhabitants, while still contributing to overall ventilation and thermal comfort.

The proposed shelter’s elevations, presented in Figure 30, demonstrate how façade design accounts for climatic fluctuations, cultural considerations, and rapid deployment and assembly needs. The proportions of the window openings allow for adequate sunlight penetration and proper ventilation while balancing privacy concerns. The design of the plinth and roof enables rainwater drainage and protects against dampness. The public-facing nature of the façade encourages social interaction, while private elevations continue to guarantee safety and privacy. These elevations are possible because of the lightweight wall insulation, which blends durability with thermal comfort considering Lebanon’s fluctuating climate.

The recycled plastic bricks and panels are not only eco-friendly but also provide thermal insulation and structural integrity. These durable materials are resistant to weather fluctuations, making the shelter suitable for regions experiencing both harsh summers and cold winters. By embracing culturally familiar "brick-like" construction methods combined with recyclable materials, this shelter prototype serves as a sustainable, adaptable, and dignified solution for displaced communities in Lebanon and across the Middle East. The colorful design further enhances the shelter's appeal, while the practical structure promotes resilience, reinforcing the shelter's role as a long-term transitional home.

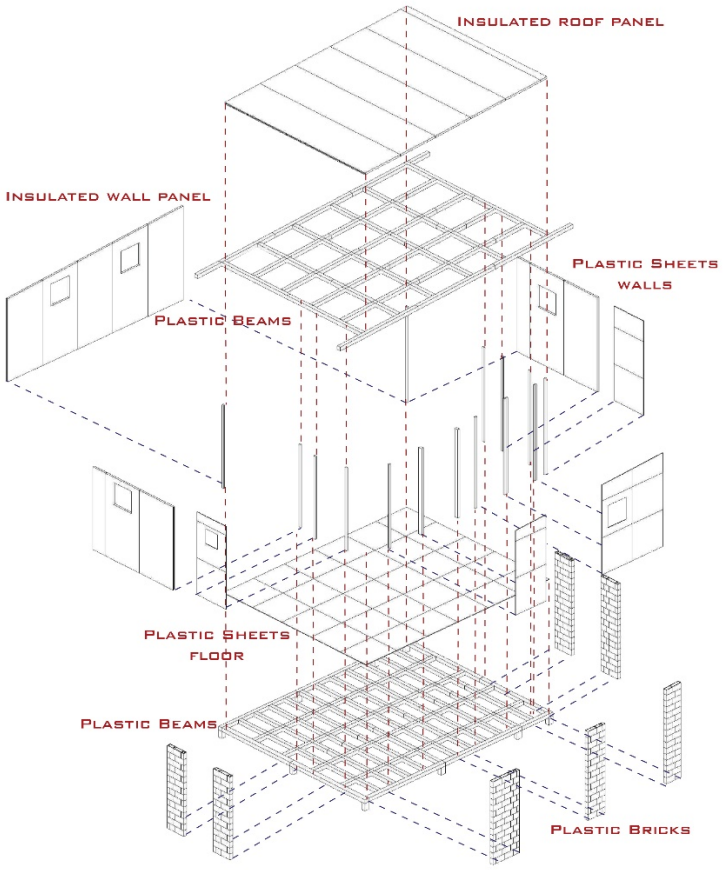


Figure 31: Exploded view diagram of a modular transitional shelter.

Figure 31 illustrates an exploded view diagram of a modular transitional shelter, highlighting its construction components. This projection gives insights into the assembly process following a step-by-step approach. Simultaneously, it showcases the interlocked nature of the construction materials that were used. Additionally, this diagram reveals how the floor, roof, and walls connect, enabling proper load distribution, modularity, and thermal adaptation. The design features an insulated roof and insulated wall panels for thermal comfort, with the walls being made of plastic sheets for durability and ease of assembly. The structure is supported by a framework of plastic beams, ensuring lightweight construction and flexibility. The floor also comprises plastic

sheets on a foundation of plastic beams and bricks, emphasizing the use of recyclable, sustainable materials. This shelter is likely designed for quick assembly and disassembly, allowing for efficient transport and adaptation to various terrains and conditions typically faced by displaced populations.

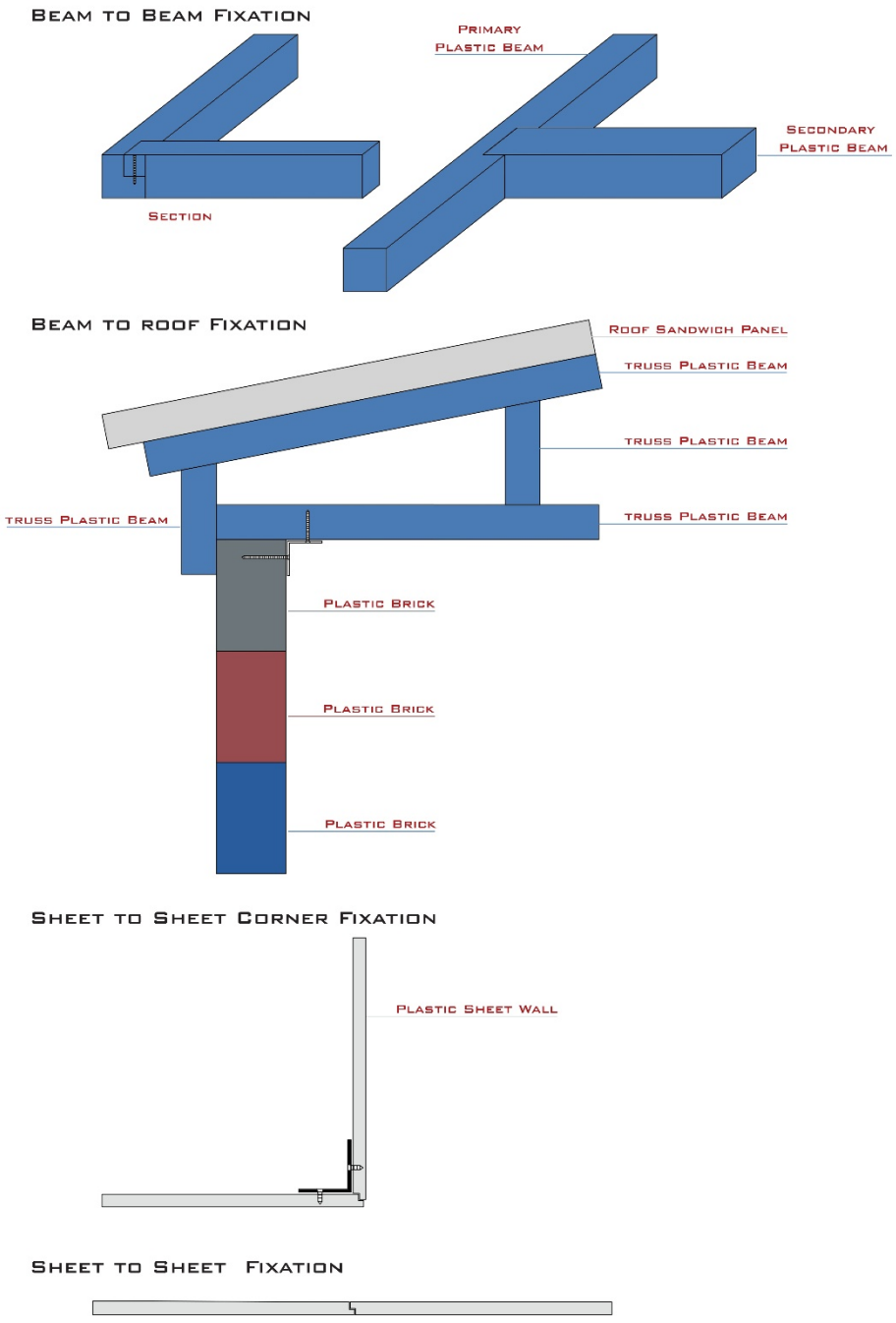


Figure 32 Structural connection details of the modular transitional shelter

Figure 32 explains the three fixation mechanisms within the proposed transitional shelter design. These include: (i) beam-to-beam fixation, (ii) beam-to-roof fixation, and (iii) sheet-to-sheet fixation. Taken together, these three mechanisms enhance the shelter's

modularity and stability and allow for rapid shelter deployment. Beam-to-beam fixation enables continuity throughout the structure. Beam-to-roof fixation secures the roof sandwich panels to the truss plastic beams, ensuring load transfer and thermal adaptation. Sheet-to-sheet fixation is used to lock plastic sheet walls together, enhancing the shelter's durability and thermal comfort. The recycled nature of the used plastic materials further contributes to sustainability.

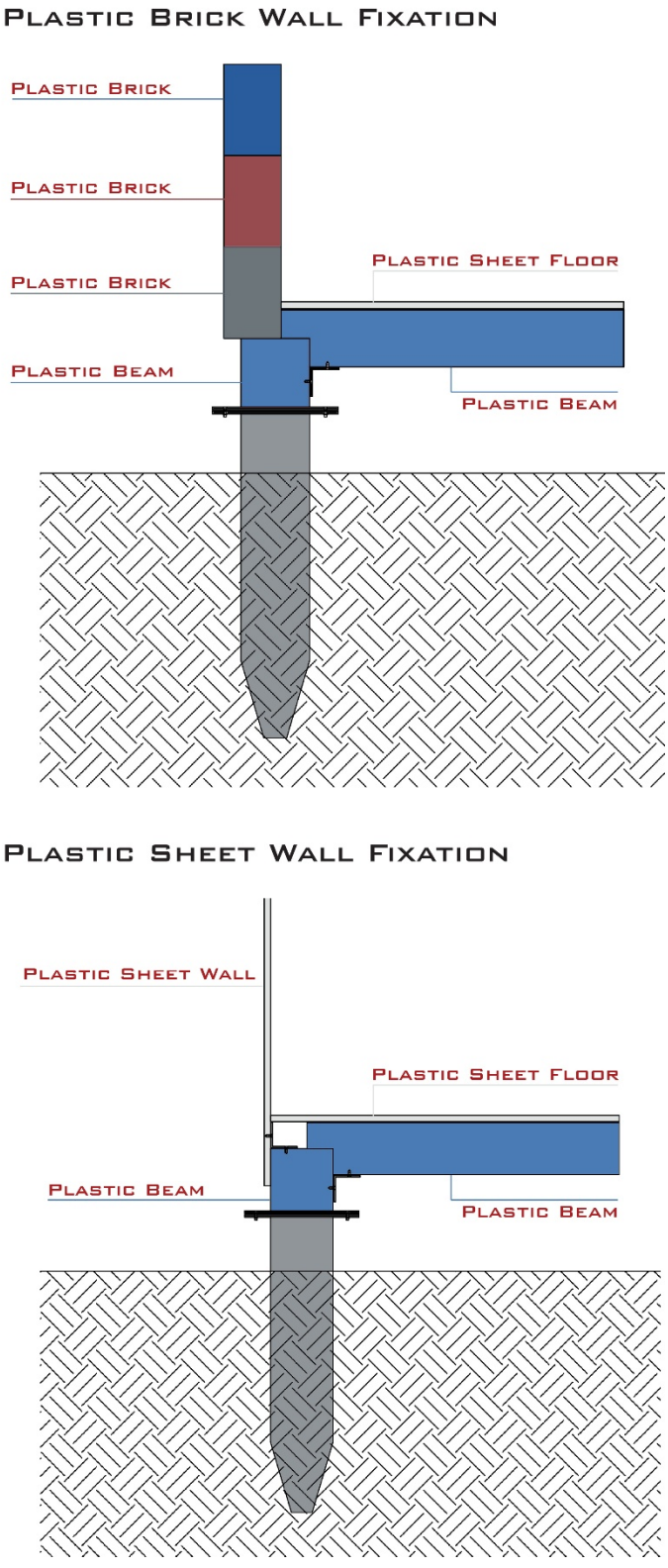


Figure 33 Detail connections between wall systems and floor beams

Figure 33 illustrates two fixation mechanisms that can be used in modular transitional shelter design. The first, plastic brick wall fixation, showcases the fixation between plastic brick walls, plastic sheet floors, and plastic beams. This emphasizes durability, resistance, and stability. The second, plastic sheet wall fixation, illustrates the fixation between plastic sheet walls, plastic sheet floors, and plastic beams, acting as an anchoring system that guarantees vertical alignment and thermal continuity. Both fixation mechanisms contribute to modular transitional shelters' adaptability, notably by balancing construction material efficiency, ease of assembly, and robustness.

Structural and Environmental Considerations

The shelter prototype explains the feasibility of constructing lightweight and modular shelters with roof sandwich panels and truss plastic beams. Nonetheless, supporting infrastructure is needed for the long-term success of this system, particularly adequate water drainage mechanisms. This is important to avoid water accumulation which would compromise the plastic's durability and impact on thermal comfort. This pitched roof design allows for rainwater collection, therefore preserving the structural integrity of the shelter and contributing to increased water security. Shelters' habitability is also contingent on energy provision, the availability of sanitation facilitates, and proper waste management. As such, the shelter should be understood as part of a wider structural and environmental ecosystem enabling dignified, sustainable, and safe living conditions for its inhabitants.

Shelter Adaptability and Redeployment

The proposed transitional shelter can be easily assembled, disassembled, and redeployed. The beam-to-panel fixations and the lightweight nature of the plastic materials allow for quick assembly or

dismantlement without requiring specialized equipment or expertise. This adaptability is beneficial in displacement contexts, which may require shelter relocation or redeployment to new areas. It also enables shelters to be repurposed after emergencies. The use of recycled materials means that they can be reused or further recycled, therefore reducing decay and waste. As such, the proposed shelter is a good solution for both short-term emergencies and long-term displacement.

This study initially focused on developing a sustainable shelter prototype specifically for Syrian refugees residing in Lebanon's informal settlements, as detailed in Chapter 4. The data and findings were primarily centered around the challenges,needs, priorities, and preferences of Syrian refugees. However, given the shared cultural norms and environmental conditions across Syrian, Lebanese, and Palestinian communities, this prototype's design holds broader applicability across the Middle East.

Countries in the Middle East often experience extreme seasonal temperatures, with sweltering summers and cold, wet winters, underscoring the need for climate-resilient shelter solutions. For instance, Lebanon's summer temperatures can exceed 40°C, while winters bring heavy rainfall and even snow in elevated regions. This prototype addresses these climatic challenges with its insulated plastic panels and durable plastic beam framework, providing effective thermal regulation and protection from weather extremes. Additionally, the design respects cultural needs for privacy and spatial separation, which is crucial across Syrian, Lebanese, and Palestinian cultures (Albadra, Coley, and Hart, 2020).

The recent escalation in displacement in Lebanon highlights the urgent need for adaptable, scalable shelter options. The ongoing conflict in Gaza has had direct repercussions on Lebanon, where Israeli attacks

have displaced nearly 500,000 Lebanese residents from areas like Dahiye, Jnoub, and Baalbek, with many relocating to safer regions such as Ehden, Zgharta, Dhour Chweir, Khenchara, and Byblos (UN News, 2024; Al Jazeera, 2024). Due to ongoing bombing and destruction or critical damage to their original homes, many displaced individuals have been forced to seek refuge in public schools or rent apartments to secure safer accommodations. The strain on Lebanon's infrastructure and local resources has intensified, with public spaces and private housing options now doubling as emergency shelters, creating further challenges for families trying to maintain stability during displacement (NRC, 2024).

Lebanon already hosts over 1.5 million Syrian refugees and nearly 479,000 registered Palestinian refugees, creating an urgent need for resilient, culturally sensitive shelter solutions (UN News, 2024). This prototype's modular structure and adaptable design make it well-suited not only for Lebanon's displaced communities but also for the broader Middle Eastern region facing similar displacement challenges, such as Gaza, Jordan, and Syria. By supporting culturally relevant, climate-adaptive shelter solutions, this prototype addresses both humanitarian needs and the principles of sustainable shelter development in the Middle East.

11- Material Specifications and Quantities for Transitional Shelter Construction

Table 14: Comprehensive materials and components specification for transitional shelter construction.

Material Component	Material Type	Dimensions/ Specifications (mm)	Application	Description	Quantity Needed	Estimated Cost (USD
Exterior Wall Panel	WSP-1157	1157 Thickness 100	Exterior Wall Panel	Visible fastening tongue groove, microrib on both sides	11	23
Interior Wall Panel	WSPF-1157	1157 Thickness 50	Interior Wall Panel	Visible fastening tongue groove, flat on two sides, for interior walls	7	23
Roof Panel	Insulated Roof Panel	320x985	Roof Insulation	Insulated panels for roof covering	10	24.5
Plastic Beam	Recyclable Plastic Beam	40x40x2500 *(roof structure)* 60x40x2500 *(wall structure)*	Structural Support	Plastic beams for structural support of walls and roof, max	25 20 54 24	5 6 2 8

		60x40x900 *(floor structure)* 100x100x2500		length 2500mm		
Plastic Brick	Recyclable Plastic Brick	290x160x100 190x160x100 90x160x100	Foundation/ wall Support	Plastic bricks for foundational support and wall stability	105 90 90	6 4 2
Plastic Panel	Recyclable Plastic Panel	1000x1000	Wall Construction	Plastic sheets for wall construction and additional structural support	30	22
Building services	Electrical Systems	Appropriate to Electrical Source	Utility Installation	Wiring and related infrastructure for electricity, including third fix	10 points	20
Building services	Water System	Appropriate to Water Source	Utility Installation	Piping and related infrastructure for water,	8 points	35

				including third fix		
Storage Cabinets	Kitchen Storage	Custom or Standard Size	Kitchen	Cabinets or shelving units for storing kitchen supplies	LS	450
Kitchen Appliances	Refrigerator and cooktop	Custom or Standard Size	Kitchen	A small fridge stores perishable food items, and a sink with a tap is used for washing and preparing.	LS	150
Ground screw					12	10
Electric water heater					1	200
Solar panel	Solar Note: Every four shelters share the same inverter				2	500

	and batteries					
Windows and Door					6	600
					Total Cost ($) 5234	

The construction of a sustainable transitional shelter, as outlined in the provided material specifications and quantities, represents a comprehensive approach to environmentally friendly and energy-efficient housing. This analysis delves into the cost implications of the specified materials and components, aiming to provide a clear understanding of the financial requirements for such a construction project. The exterior and interior wall panels, designated as WSP-1157 and WSPF-1157, respectively, serve as critical components of the shelter's structure. The exterior wall panels, with a thickness of 100mm, are designed for durability and insulation, featuring a microrib design on both sides for enhanced structural integrity. The interior wall panels, at half the thickness of the exterior ones, ensure a comfortable indoor environment while facilitating easy installation. The cost for these panels is $23 per unit, reflecting the quality and functionality they bring to the shelter's construction.

The roof, a pivotal element in ensuring the shelter's sustainability, utilizes insulated panels specified as 320x985 mm. These panels are crucial for maintaining an optimal internal temperature, reducing the need for additional heating or cooling. This supports the shelter's commitment to sustainability, highlighting the focus on energy efficiency and long-lasting durability. Plastic beams and bricks form the shelter's structural backbone, catering to various structural roles, from

roof support to foundational stability. These components, made from recyclable plastic, highlight the shelter's commitment to sustainability by reducing waste and promoting the use of eco-friendly building materials. The shelter incorporates essential utilities like electrical and water systems for building services, ensuring a livable and functional space. Including storage cabinets and kitchen appliances further enhances the shelter's habitability, providing necessary amenities for daily living. Notably, the reliance on a solar panel system for electricity underscores sustainable design, minimizing reliance on non-renewable energy sources and reducing operational costs.

The estimated cost of $5,234 for the shelter's construction reflects a reasonable balance between sustainability and affordability. This cost encompasses all necessary materials and components, from structural elements to building services and essential appliances. It illustrates a commitment to creating an environmentally friendly and economically viable shelter, making it a feasible option for transitional housing needs.

This study contributes significantly to sustainable shelter design by demonstrating how sustainability principles can be effectively integrated into construction methods, offering a detailed cost-benefit analysis of eco-friendly materials, and emphasizing the importance of cultural and contextual adaptability. By incorporating feedback from field research with Syrian refugees, the analysis ensures that the shelters are not only environmentally sustainable but also culturally appropriate and responsive to the specific needs of their inhabitants. The findings provide valuable insights for policymakers, architects, and humanitarian organizations, guiding them in implementing sustainable shelter solutions that are environmentally responsible, economically viable, and culturally sensitive. By adopting these principles, stakeholders can create shelters that support displaced communities' long-term well-being

and resilience, offering a scalable model that balances ecological responsibility with economic practicality. This research provides a blueprint for sustainable living, making a compelling case for integrating sustainability in transitional housing solutions and contributing to more effective and humane responses to displacement crises.

In conclusion, this chapter has presented a comprehensive analysis of the construction of a sustainable transitional shelter, detailing the material specifications and quantities required for its development. This shelter design exemplifies a commitment to sustainability and practicality by integrating environmentally friendly and energy-efficient materials. The use of exterior and interior wall panels, insulated roof panels, and recyclable plastic beams and bricks forms the backbone of the shelter, ensuring its durability, insulation, and structural integrity. Including essential utilities like electrical and water systems, as well as storage cabinets and kitchen appliances, enhances the livability of the shelter, making it a functional and comfortable space for its occupants.

The estimated cost of $5,234 for the shelter's construction represents a judicious balance between sustainability and affordability, encompassing all necessary materials and components. This cost analysis highlights the project's financial feasibility, making it a viable option for transitional housing needs. Furthermore, the reliance on a solar panel system for electricity underscores the shelter's sustainable design, reducing reliance on non-renewable energy sources and operational costs.

The chapter also underscores the importance of cultural considerations in shelter design. Engaging with the displaced population and understanding their cultural norms and practices ensures that the shelters are functional and culturally appropriate. This approach respects

the social dynamics and preferences of the Syrian refugee community, enhancing their overall well-being and dignity.

This study significantly contributes to sustainable shelter design by demonstrating how sustainability principles can be effectively integrated into shelter design and construction. The detailed cost-benefit analysis of eco-friendly materials and the emphasis on cultural and contextual adaptability provide valuable insights for policymakers, architects, and humanitarian organizations. By adopting these principles, stakeholders can create shelters that support displaced communities' long-term well-being and resilience, offering a scalable model that balances ecological responsibility with economic practicality. This research provides a blueprint for sustainable living, making a compelling case for integrating sustainability in transitional housing solutions and contributing to more effective and humane responses to displacement crises.

Shelter Placement in Settlements

A shelter's placement in a settlement directly impacts its inhabitants' living conditions, sense of safety, and overall social cohesion. The Sphere Standards recommend allocating a minimum of 45 m^2 of land area per person. They also stress the need to ensure that there is sufficient space between shelters to enhance ventilation and reduce fire risks. The proposed shelter's modularity allows for flexible clustering of family and community shelters, while preserving privacy and enabling proper airflow. Adequate spacing of shelters also facilitates the creation of shared infrastructure, including sanitation facilities, drainage systems, and rainwater collection mechanisms, contributing to increased functionality and resilience.

In summary, with a construction cost of $5,234, the proposed shelter offers a sustainable and culturally sensitive solution compared to

the more affordable Sphere Handbook (2018)-compliant shelters, which typically cost between $1,500 and $3,500. While Sphere shelters meet the minimum requirements for safety and functionality, focusing on cost-efficiency and basic amenities, they often lack features like renewable energy systems, enhanced insulation, and consideration of cultural practices. In contrast, the proposed shelter includes eco-friendly materials, solar panels, and culturally relevant spaces, such as private WCs and courtyards, designed to accommodate Syrian refugees' social and family dynamics in settlements like "Droube 019." Although more expensive, the proposed shelter's focus on long-term sustainability, energy efficiency, and cultural appropriateness makes it a more comprehensive solution that better supports the dignity and well-being of displaced populations.

Scaling Up Shelter Production

The proposed shelter design’s cost makes it feasible to scale up shelter production and rapid deployment. The use of recycled plastic materials, such as beams and panels, enables mass production, therefore reducing costs per unit while remaining environmentally friendly. This allows for more rapid shelter deployment in humanitarian assistance contexts, to address displacement. Additionally, localizing production diminishes transportation costs and fosters job creation.

Considering the ongoing regional conflicts and rising displacement, this research holds increased relevance for Middle Eastern countries grappling with humanitarian crises. The recent escalation in hostilities between Israel and Lebanon has led to an unprecedented wave of internal displacement, particularly impacting vulnerable communities in border areas. The Lebanese Ministry of Social Affairs reports that nearly half a million residents have evacuated conflict zones, many of whom have taken temporary refuge in schools and rented apartments to escape

bombings and security risks (Anadolu Agency, 2024; Al Jazeera, 2024). These developments underscore the urgent need for adaptable, sustainable shelter solutions that can accommodate rapidly shifting populations and provide safety amid deteriorating conditions.

The implications of this research reach beyond Lebanese borders, as countries like Jordan, Syria, and Gaza face similar cultural, climatic, and political contexts. Each shares the challenge of accommodating large populations of displaced individuals within limited infrastructure. This prototype, which prioritizes culturally sensitive and climate-resilient design, aligns with the increasing demand for practical and regionally adaptable shelter models. By offering a modular, durable, and sustainable shelter solution, this research addresses not only the immediate shelter needs of displaced populations but also highlights the potential for application across a broader Middle Eastern context, especially as regional stability remains volatile (UN News, 2024; NRC, 2024).

Chapter 6: Conclusion

This thesis explored the design of transitional shelters taking as a study case Syrian refugees in Lebanon, aiming to address the urgent need for sustainable, culturally sensitive, and adaptable housing solutions in displacement contexts. By integrating innovative architectural practices, environmental sustainability principles, and participatory design approaches, this research contributes to the broader discourse on shelter design in humanitarian contexts.

The study critically analysed the limitations of existing global shelter guidelines, including the Sphere Handbook (2018), and proposed solutions to bridge these gaps. The findings emphasized the importance of designing shelters that extend beyond immediate emergency relief to provide durable, culturally appropriate, and environmentally sustainable solutions. Specifically, the research addressed the inadequacies of temporary shelters in harsh climates, the need for cultural sensitivity in urban and informal settings, and the importance of building shelters that can be modified, if desired, to transition into more permanent housing structures.

6.1 Key contributions:

1. **Addressing Gaps in Shelter Standards:** This study highlighted critical shortcomings in the Sphere Handbook (2018), particularly regarding the durability, adaptability, and cultural relevance of shelters. These insights guided the development of shelter prototypes prioritizing extended lifespans, resilience to harsh weather, and alignment with cultural practices.
2. **User-Centered Feedback:** This research engaged directly with Syrian refugees through field visits, interviews, and focus group discussions to gather feedback on their shelter experiences. This feedback informed the shelter design process by identifying the

features that refugees found helpful in their shelters, the adaptations they had made to improve their shelters, and the structural elements that they still wished to change. This approach ensured that the proposed shelters were practical, functional, and aligned with their inhabitants' lived realities.

3. **Culturally Sensitive Design:** This study emphasized the significance of cultural norms in shelter design to ensure privacy, security, and community integration. This approach helps foster a sense of belonging to the community and a life in dignity among displaced populations.
4. **Sustainability and Local Adaptation:** This study underscored using abundantly available, locally sourced, low-cost materials found in Lebanon, such as recyclable plastics, to reduce environmental impact, stimulate the local economy, and expedite material and shelter delivery. This assists in alleviating environmental challenges, such as Lebanon’s plastic waste crisis, while responding to the immediate housing needs of displaced populations.
5. **Transitional Shelter Prototype:** The proposed shelter prototype integrates flexible, modular designs that allow for evolution from temporary shelters to semi-permanent housing. This potential for adaptability ensures long-term utility while respecting cultural and environmental contexts.
6. **Global Applicability:** While focused on Lebanon, the research offers a replicable framework for designing shelters in diverse contexts of displacement caused by conflicts or natural disasters. The prototype's adaptability to different climates and material availability highlights its global relevance.

All in all, integrating environmental considerations, such as utilizing recyclable materials, addresses pressing ecological challenges while benefiting affected communities. This innovative approach demonstrates how shelter design can transform crises into windows of opportunity for sustainable development.

By directly engaging with refugees to understand their experiences and preferences, this study further ensures that the proposed transitional shelters are functional and tailored to the specific needs of displaced individuals. This user-centered design helps foster a sense of empowerment and ownership among the refugees, enhancing the shelters' long-term usability and adaptability.

In conclusion, this thesis provides a comprehensive framework for transitional shelter design that balances sustainability concerns, cultural appropriateness, and adaptability. By addressing the immediate needs of displaced individuals while considering the long-term implications of their displacement, it advances the discourse on humanitarian architecture and its potential to support refugees and internally displaced populations to live a life in dignity and remain resilient in the face of challenges.

The findings and recommendations from this study serve as a valuable resource for architects, policymakers, and humanitarian organizations aiming to create innovative shelter solutions that are both contextually relevant and globally adaptable. This research underscores the transformative potential of architecture in addressing global displacement crises and contributing to the well-being and empowerment of vulnerable populations while promoting sustainable practices.

The research finds that:

- Current shelter standards and practices often disregard cultural considerations, rendering shelters unsustainable in the longer term, particularly when it comes to building social cohesion and creating a sense of belonging.
- Recycled plastic can be considered a sustainable, locally sourced, eco-friendly, and cost-efficient alternative to current construction materials used in building shelters.
- Participatory shelter design, which integrates refugee communities' perspectives and needs, fosters improved functional layouts and enhanced privacy and comfort.
- Shelter prototypes that are flexible and modular can provide emergency relief while acting as more durable housing options.

These findings directly impact shelter designs and prototypes, and combine climatic, cultural, and environmental considerations. They are also linked to this study's objective of developing adaptable, culturally sensitive, and sustainable transitional shelters for Syrian refugees in Lebanon. Simultaneously, they address the main research question, particularly by showcasing how participatory and context-sensitive design, sustainable selection of locally sourced and eco-friendly building materials, and shelter construction principles can bridge the gap between adhering to humanitarian standards while meeting refugees' needs. The development of design criteria, the use of recycled and locally sourced materials, and the inclusion of displaced communities in the design process further contribute to meeting the broader objective of this study.

6.2 Research Limitations:

While this study makes significant contributions to sustainable shelter design for displaced populations, particularly in Lebanon and the wider MENA region, it is essential to acknowledge certain limitations:

1- **Scope of the Fieldwork:** This study primarily focuses on the case of Syrian refugees in Lebanon. While the findings are applicable to other displacement contexts, additional comparative studies in different geographic, environmental, socioeconomic, cultural, and political settings would enhance its generalizability. It is advised to learn and take inspiration from the Lebanese experience to adapt shelter designs and approaches based on context-specific and migration-specific needs.

2- **Material Constraints:** This research promotes sustainable construction methods using environmentally friendly building materials, including recycled plastics; however, practical implementation may vary depending on the local availability, cost, and logistical constraints tied to these materials. Future studies should assess the feasibility of using and scaling up the use of such materials as well as adequate ways of substituting them across different contexts.

3- **Performance Testing of Materials:** This study proposes recycled plastic as a locally sourced, cost-friendly, sustainable, and eco-friendly construction material. Nonetheless, it did not test the performance of recycled plastic in a laboratory environment. Key laboratory tests should focus on examining recycled plastic's fire safety, structural strength, and thermal insulation. The prioritization of such tests is critical in future research to ensure compliance with building codes and safety standards.

4- **Limited Longitudinal Data:** This study evaluates shelter performance based on qualitative data from field observations and interviews conducted in Lebanon. A long-term study with a bigger sample, which would measure the durability and impact of already existing and proposed shelter prototypes over several years, would provide deeper insights into shelters' effectiveness and adaptability.

5- **Regulatory and Institutional Challenges:** While this research proposes innovative shelter solutions, their adoption depends on the evolution of governmental policies and humanitarian agencies' willingness to implement alternative designs. Bureaucratic barriers and funding limitations may impact the large-scale deployment of modified and enhanced prototypes.

Acknowledging the limitations outlined above highlights areas for further research and guarantees transparency regarding this study's scope and applicability.

6.3 Future Research Directions

Building on this thesis, several avenues for future research emerge:

1- **Comparative Studies in Different Displacement Contexts:** Future research should examine the applicability of the proposed shelter guidelines and prototype in diverse contexts, including conflict zones, disaster-affected areas, and urban displacement settings. This could include neighboring countries, countries within the broader MENA region, and countries within regions beyond the MENA.

2- **Longitudinal Evaluation of Shelter Performance:** Conducting long-term monitoring of shelter durability, adaptability, user satisfaction, and environmental impact

would provide valuable data to refine shelter design principles and inform policy recommendations.

3- **Technological Innovations in Humanitarian Architecture:** Further exploration of the use of advanced materials and technologies (e.g., biodegradable composites and 3D-printed structures), as well as digital modeling tools, could enhance efficiency and sustainability in shelter construction.
4- **Policy he Integration and Institutional Adoption:** Researching strategies and opportunities to bridge the gap between academic findings and practical implementation of shelter prototypes by engaging with humanitarian agencies, policymakers, and local governments would facilitate the broader adoption of improved shelter designs.
5- **Intersection of Shelter and Livelihood Strategies:** Investigating how transitional shelters can be designed to support income-generating activities (e.g., small-scale workshops and communal agricultural spaces) could enhance refugees' and internally displaced persons' self-reliance and economic resilience.

By pursuing these research directions, future studies can build upon this thesis to further enhance the effectiveness, sustainability, and cultural relevance of transitional shelter solutions for displaced communities worldwide.

While this research takes Droube 019 in Lebanon as a case study, its methodology is replicable and adaptable to other country contexts. This is particularly true for the study design, the participatory shelter design approach with refugees, and the embedded sustainability principles and practices. Interregional research would supplement the findings,

therefore allowing for a broader examination of varying cultural, environmental, and material considerations and adding to the existing literature on displacement and shelter design.

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Appendices

Appendix A

Semi-Structured Interviews (SSI) – Syrian Refugees

A. Shelter's specifications:

1. How many individuals live in this shelter?

We are about eight people living together in this shelter: my husband and I, my sister, and five children. Each shelter houses, on average, eight or nine individuals. Syrian families typically include the parents and around five children. Other shelters have 2 families sharing the same space.

2. How many families live together in this shelter?

Usually, one family lives together in a shelter. It is common for extended family members to live in nearby shelters and to visit each other.

B. Social and culture norms:

3. How many years have you been in this camp?

I arrived at Droube 019 five years ago, while others have been there for close to 10 years. What started as temporary displacement for many of us quickly turned into a longer stay.

4. Have you resided in other camps, either in this country or in another country? If yes, what are the differences or commonalities between these camps? Where did you feel safer? And why?

Yes, I used to live in a camp in the Bekaa Valley. I have also lived in different informal settlements throughout the years; however, I feel safer here. There's a sense of community, familiarity, and closeness with other Syrian refugees living in Droube 019.

5. **Could you tell us a bit about your house in your country of origin; particularly about the material used and the size of the house?**

Syrian homes are built with stones or concrete and include decorative elements that reflect Syrian culture. Compared to our shelters in Droube 019, houses in Syria are "larger" and have more rooms; this allows for increased privacy. Houses back in Syria also provide better protection from natural elements and climatic fluctuations.

6. **Do you share the outside area of the shelter with the neighbour?**

Yes, outside shelter areas are communal spaces used to reinforce or facilitate a sense of community through joint daily activities, such as social interactions, visits, and cooking.

C. **<u>Design elements and materials of shelters:</u>**

7. **Did you make any adjustments to your current shelter? If yes, why did you make these adaptations?**

Yes, I have made some adjustments to my shelter over the years. These adjustments were not just cosmetic changes; they served practical purposes. For example, I divided the existing room to create additional spaces that increase privacy. I also used available materials to reduce the impact of weather fluctuations on my shelter. This helped improve insulation and made my shelter structurally stronger and less prone to water leaks and damage.

8. **What other adaptations would you like to make to your shelter, if you could?**

If I could, I would make my shelter stronger and more comfortable. I would improve insulation and privacy features

and would include bathroom facilities, kitchen, and storage spaces. I would also build a sturdier roof and walls.

9. Did you receive any materials to upgrade/construct your shelter?

Basic construction kits and materials were given to us, including plastic sheeting and timber frames. However, these were insufficient on their own to upgrade the shelters. We had to buy other materials to use in addition to what was already being provided by UNHCR and other non-governmental organizations.

10. Did you receive technical assistance/training on how to use construction materials to upgrade your shelter?

No technical assistance or training was provided on how to use these materials. I relied on my previous informal knowledge. I learned over the years through trial and error. I am thankful to my neighbours for helping me upgrade my shelter over the years. I have also tried to return the favour when I could.

D. <u>Safety and Security:</u>

11. Do you feel protected by your shelter (from the weather, threats of violence)? If not, why?

No, I don't feel protected by my shelter, mainly due to weather fluctuations and the unsuitability of building materials to withstand rain, snow, and wind. I also worry about fire risks because of the flammable nature of some of the materials used.

12. Does the shelter give you the privacy you need?

No, privacy in the shelter was lacking or insufficient, especially before I made some additions and upgrades. There was mainly a shortage of individual living spaces. For example, I had to share

sleeping space with other family members. Girls and women particularly felt at a disadvantage.

13. Do you feel safe inside your shelter during the day? At night?

During the day, I feel safer than at night; daytime provides a bigger sense of safety. At night, I get scared due to the lack of safety and security features, random noises that are easily heard, and weather fluctuations.

14. Have you suffered from diseases after moving to the camp?

Yes, I suffered from respiratory problems, such as asthma and other illnesses, as well as flu and skin irritation. I think it's linked to weather fluctuations, improper insulation, poor ventilation, and mold.

15. What are the issues you have faced or are facing with your current shelter?

The main issues I face are related to the lack of insulation and inadaptability to weather fluctuations (cold winters, hot summers), water leaks and related damage, low durability of building materials, and a reduced sense of privacy.

Appendix B

Focus Group Discussions – Syrian Refugees:

A. **Shelter's evaluation:**

1. **What is the distance (firebreaks) between the shelters? Are you satisfied with the layout of the settlement?**

There is very little distance between shelters, and there aren't safety measures, such as firebreaks. Droube 019 feels overcrowded and generally unsafe. We're not satisfied with the layout; we wish for wider spacing between shelters, increased privacy and safety features, better ventilation, and increased weather adaptability.

2. **Where are the bathroom and kitchen located? Are they communal?**

While the kitchens are located inside the shelter, the bathroom facilities are communal and shared by several shelters.

3. **Do you feel safe in your shelter and when using communal facilities?**

During the daytime, we feel safe in our shelters and when using communal facilities. However, we feel discomfort and less safe at night, particularly when we need to use communal bathroom facilities. Poor lighting is also a key factor in the lack of safety that we feel.

4. **Do you have access to water? Is it available all the time?**

While there is access to water, it is interrupted or discontinuous. To overcome this, we store water during the few hours per day that it is available.

5. **Is electricity available all the time?**

Availability of electricity is discontinuous, with a heavy reliance on generators. The limited access that we get, for a few hours per day, negatively impacts our ability to heat our shelters, turn on the lights, and engage in other activities requiring the use of electricity.

6. **Have you experienced any ventilation issues?**

Yes, ventilation is insufficient inside the shelters. This leads to cold winters and very hot summers, particularly because the building materials have a low insulation factor. During winter, we try to keep our shelters as sealed as possible, mainly by limiting our mobility outside of the shelters.

7. **What are the most pressing seasonal issues that you have faced or that you continue to face?**

The most pressing seasonal issues that we have faced-and that we continue to face-have occurred during the winter and summer months. In the winter months, we have been experiencing heavy rain, water leaks, and related damage, and muddiness outside of our shelters. In the summer months, we tend to overheat and suffer from limited access to water.

8. **Are shelters accessible for people with reduced mobility**?

Shelters lack accessibility for people with reduced mobility. This can be seen in the overcrowding, the lack of sufficient space between shelters, the unevenness of the ground, the narrowness of the paths, and the communal nature of bathroom facilities.

B. <u>Social and Culture norms:</u>

9. **Are the shelters adapted to your cultural and religious background?**

No, we feel that the shelters lack privacy features that would allow us to freely practice our religious beliefs. These missing features also contradict our cultural expectations and practices, particularly when it comes to girls and women.

10. **What are the common spaces you share with you neighbours?**

Many outdoor spaces are communal or shared among several neighbouring shelters. These include communal bathroom facilities, pathways, seating areas, gathering spaces, and laundry spaces. Some of these common spaces have practical uses, such as bathrooms and laundry areas, while others are used for social gatherings and interactions.

C. <u>Hypothetical scenarios:</u>

11. If you could change anything about your current shelter, what would it be?

If we could make additional changes to our shelters, we would strengthen their structure by using better building materials that have a higher insulation factor, a lower flammability risk, and that are better made to withstand weather fluctuations. We would also incorporate privacy features and build an individual bathroom within our shelter.

12. Would a portable, reconstruct able shelter encourage return to Syria?

Yes, a portable, reconstructable shelter would motivate and encourage us to go back to Syria. If it were possible, we would dismantle our shelter, transport it, rebuild it in Syria, and live in it temporarily while working on reconstructing our homes.

13. If given instructions, could you build your own shelter?

Yes, we would like to be involved in building our own shelters if given proper instructions and guidance. We're already adapting and upgrading our shelters due to necessity by using materials at our disposal and limited informal knowledge.