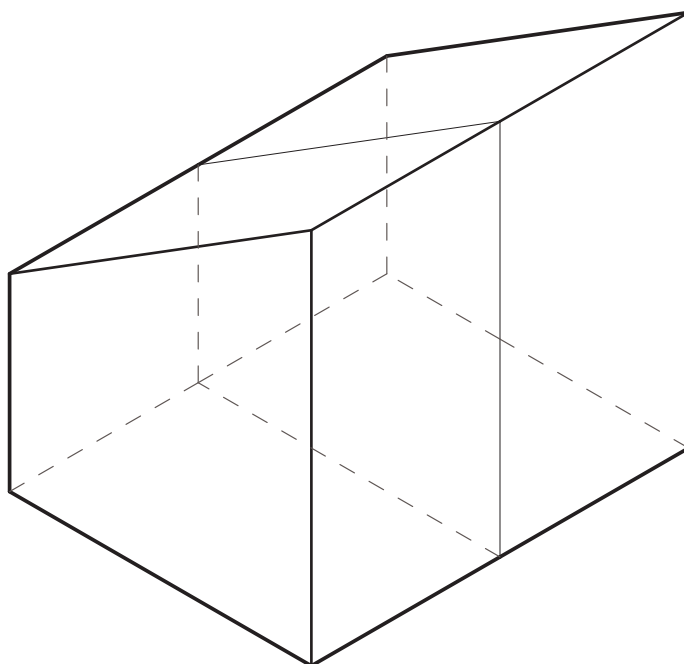


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# OurHome

The Geneva Challenge 2022



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## I. Abstract

More than 100 million people experience forced displacement globally, a number predicted to grow significantly. By 2050, researchers anticipate over one billion people to be displaced from their homes—with climate change serving as a “threat multiplier” to existing causes for displacement. Such forced migration is intricately linked to poverty since it can deprive people of financial and material resources. Furthermore, migrants may be subject to unhealthy, unsafe, and uncomfortable living conditions, making wealth accumulation difficult and furthering the cycle of poverty. Safe, healthy, and culturally inclusive housing can alleviate material poverty, while cost-effective sustainable shelters built from local materials can ease financial poverty. Providing adequate thermal comfort also has the added benefit of preventing illnesses that might otherwise hinder one’s ability to earn a living.

Studies identify thermal comfort, socio-cultural appropriateness, and lack of privacy as weaknesses in current refugee shelters that result in low levels of occupant satisfaction. Our analysis of existing efforts with a focus on the Middle East revealed that the failure to achieve refugee housing satisfaction exacerbates poverty. Dissatisfaction is furthered by the lack of participatory process in the designing of shelters, which is primarily due to aid agencies’ lack of time and resources to conduct extensive social surveys and develop participatory design methodologies.

Our proposed solution, called **OurHome**, is a digital platform consisting of dual mobile and web applications that serve to collect and exchange information between identified stakeholders, including displaced persons, aid agencies, and local authorities. The mobile application, to be available in Arabic and English, will allow refugee camp residents to provide critical feedback regarding living conditions and housing satisfaction, which camp administrators will be able to see. The website, intended for use by aid agencies and housing designers alike, will provide administrators feedback on shelter performance while also acting as a repository for the best-in-class shelter designs suited to the region. Although our case study focuses on the Middle East, **OurHome** is designed to be replicable and scalable to other regions. With climate change, war, social unrest, and food insecurity threatening to displace billions globally, **OurHome** can help establish cost-effective and high-quality housing while minimizing the effect of displacement on future poverty.

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## II. Defining the Problem Displacement and Poverty

### A. Global Displacement: Status and Trends

This year the United Nations reported a somber record: over 100 million people—one in 78 globally—are currently experiencing forcible displacement from their homes. Unfortunately, the number of displaced people is growing. In the last year, those experiencing displacement grew over 10%. Over the last decade, the number has more than doubled (United Nations, 2022).

In the short term, experts project the increase in displacement to persist due to continuing fallout from current conflicts and the COVID-19 pandemic (Danish Refugee Council, 2021). Looking to the longer term, climate change has the potential to significantly accelerate forced displacement by introducing new issues and serving as a “threat multiplier” to existing drivers of displacement. Projected sea level rise from polar ice melt threatens hundreds of millions of residents of shoreline communities (Ayeb et al., 2020). Today, extreme weather leads to displacement of over ten million people per year. As climate change increases the frequency of extreme weather events, this number could grow to the hundreds of millions (Cohen, 2022). Increased heat waves, desertification, drought, and other factors threaten agriculture and food security, leading to hundreds of thousands of expected additional annual premature deaths by 2050 (Refugees International, 2016). Each of these challenges will contribute to societal destabilization, growing the risk of conflict and further displacement (Hendrix & Brinkman, 2013). While the ultimate impacts of these combined effects are highly uncertain, some researchers believe they could amount to the displacement of over one billion people by 2050, on the order of one in ten people across the world (Henley, 2020).

### B. Connecting Displacement to Poverty

Forced migration directly leads to immediate material and financial poverty. During displacement, migrants are often forced to endure unhealthy (Bempong et al., 2019), unsafe (United Nations, 1993), and uncomfortable (Moran et al., 2021) conditions. These experiences are, in and of themselves, forms of material deprivation. Furthermore, individuals experiencing displacement can lose generations worth of assets and struggle to regain incomes in their new locations, leading to financial poverty (McCarthy, 2020).

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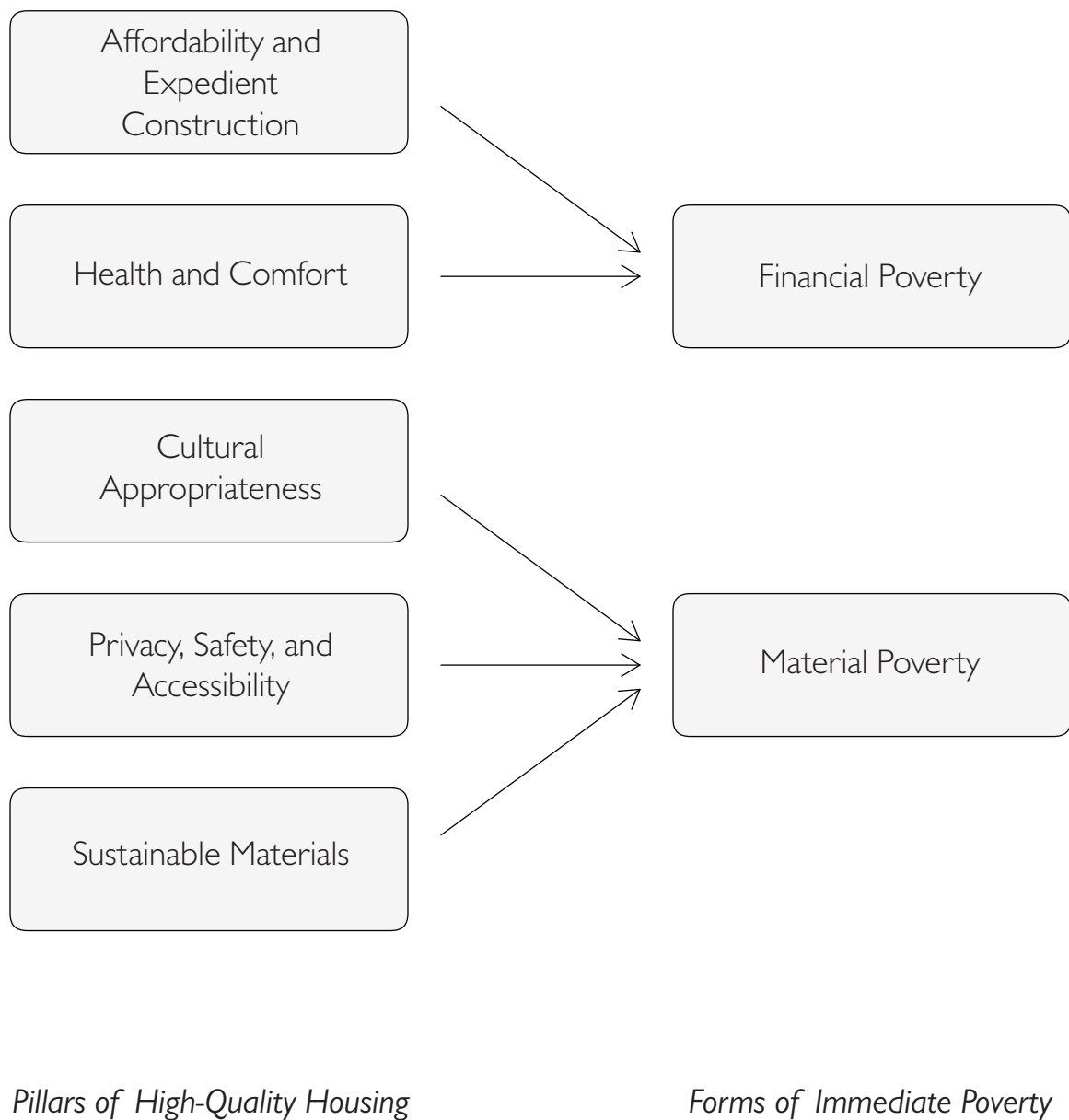
At the macro level, displacement also results in significant barriers to economic development. The World Bank estimates that about 80% of displaced people live in developing countries (The World Bank, 2022). Especially in developing economies, large influxes of migrants can rattle labor markets. New migrants often struggle to find work and the additional influx of large numbers of people can shock already underfunded social services and public infrastructure. One study on the impact of refugees entering Lebanon between 2012-2014 estimated that merely maintaining the country's pre-existing levels of social services would have cost Lebanon an additional 5.5% of its GDP (Dadush & Niebuhr, 2016). The strains that mass migration introduces on the governments of developing economies threaten economic development and social cohesion, potentially leading to a vicious feedback loop of underdevelopment and further displacement (Gamlen, 2014).

### **C. Improved Immediate Housing as a Poverty Intervention**

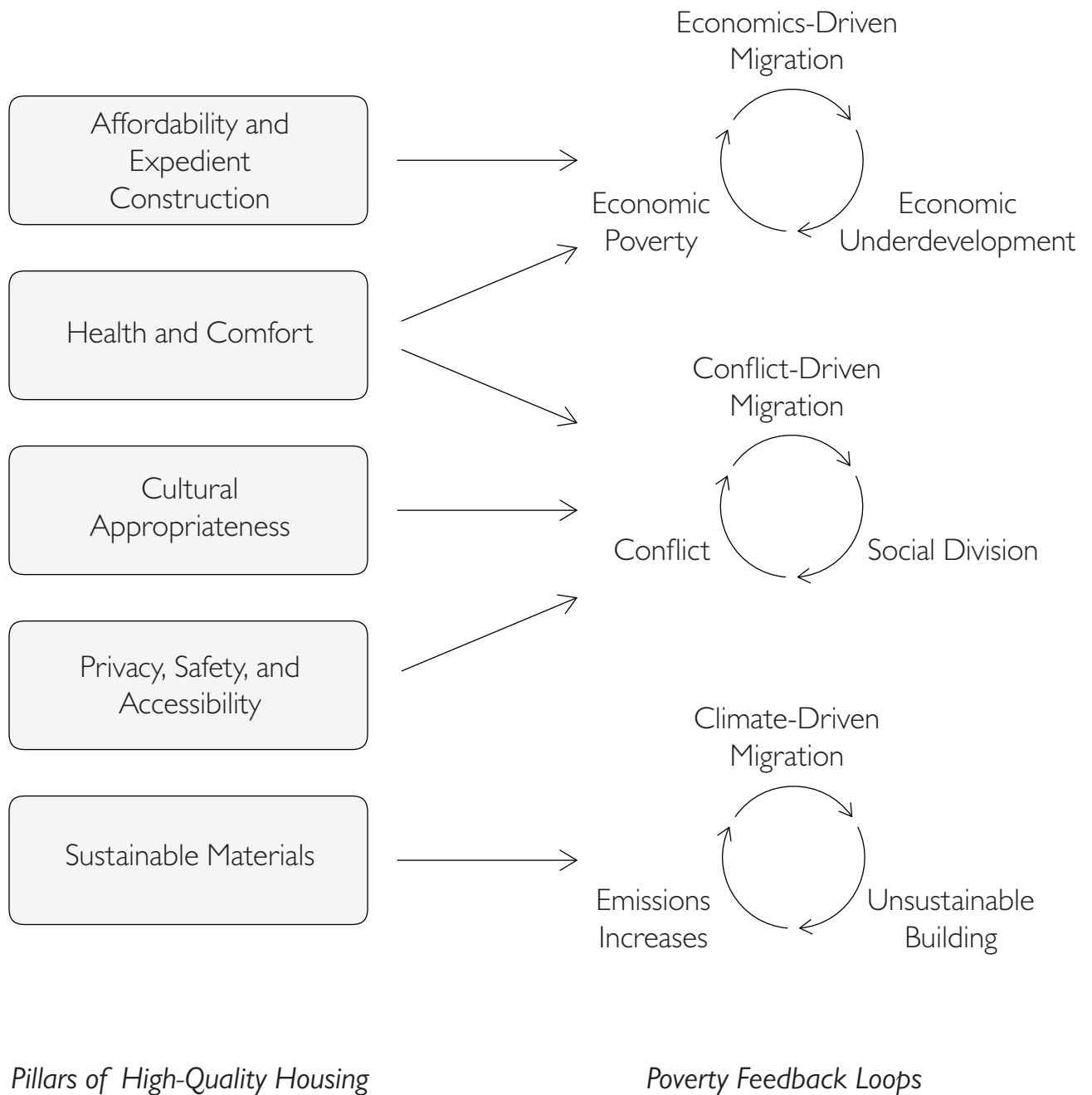
Improved refugee and migrant housing, measured across multiple dimensions, could be a high-leverage solution for addressing problems at the complex intersection of displacement and poverty. In the near term, high-quality housing has the potential to provide immediate poverty relief. Healthier, safer, more comfortable housing alleviates material poverty. Expediently constructed, affordable housing ameliorates financial poverty (Financial Security Program & EPIC, 2020). In Figure 1 below, we map five pillars of high-quality housing to the two forms of immediate poverty relief.

High-quality housing has the potential to disrupt vicious cycles of displacement, limiting future displacement-driven poverty. For instance, safe and culturally appropriate housing can help prevent social disorder and further conflict-driven displacement. Sustainable construction can mitigate greenhouse gas emissions, limiting the extent of further climate-driven migration. Increasingly, development economists recognize the importance of affordable housing for encouraging economic development, reducing the risks of poverty and further economics-driven displacement (Harris & Arku, 2006). In Figure 2 below, we show how the five pillars of high-quality housing can disrupt cycles of further displacement and compounding poverty.

**Figure I** High-Quality Housing Provides Immediate Poverty Relief



**Figure 2** High-Quality Housing Mitigates Vicious Cycles of Poverty





### III. Case Study Housing for Displaced People in the Middle East



Source: Shutterstock (open-use)

**Total Population** 411.8 million

**Main Languages Spoken** Arabic, Turkish, Persian, Kurdish, Hebrew

**Ongoing Major Crises** Syrian Civil War, Yemen Civil War, ISIS insurgency in Iraq

Syria 5.6 million external refugees, 6.6 million internally displaced people

Yemen 4 million internally displaced people

Iraq 2 million internally displaced people

**Registered Refugees from Syria by Country** (as of end of year 2021)

Lebanon 844,056

Jordan 672,084

Turkey 3,769,240

Iraq 252,591

Egypt 136,061

**Number of Repatriated Syrian Refugees in 2021** 32,581 (down from 38,235 in 2020)

**Largest Refugee Camps by Population**

Zaatari Jordan - 80,434 in 26,000 shelters

Azraq Jordan - 39,060 in 8,797 shelters

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Migration and conflict have been a mainstay of human history. Over the past century, as the concept of human rights developed and strengthened, the international community has converged on a set of agreed-upon methods to respond to mass displacement events (Robertson & Hoffman, 2014). Since then, communities in regions across the world have experienced forced displacement due to conflict. For the purposes of this report, the Middle East will be used as a case study, with a specific focus on refugees of the Syrian civil war that have fled to neighboring countries. By narrowing in on the challenges displaced peoples in the Middle East have faced in securing adequate shelter, this paper will highlight the opportunity that exists to directly engage with residents of formal refugee camps as a means of improving housing design.

The modern history of the Middle East has been shaped by forced migration (Lynch, 2017). The Israel-Palestine war of 1947-48 displaced 700,000 Palestinians, who fled to refugee camps across the Levant. Major displacement events continued in the second half of the 20th century, with the June 1967 Israeli invasion of the West Bank, and the fifteen-year long Lebanese Civil war, the Iran-Iraq war, and the Gulf Wars in Iraq. More recently, the civil war in Syria resulted in one of the most severe refugee crises in history, with over 12 million people displaced from their homes (United Nations, 2021). Those who fled the country have largely migrated to Lebanon, Turkey, and Jordan. Recipient countries have struggled greatly to provide basic services to meet the needs of Syrian refugees. An equally catastrophic war in Yemen has resulted in millions of internally displaced, as the Saudi blockade has stopped citizens from leaving the country.

Responding to the humanitarian crisis caused by extensive forced migration in the Middle East has been a complex, resource-intensive, multi-stakeholder task. A prime example of such an effort is the Regional Refugee and Resilience plan (3RP) – a combined project between the United Nations High Commissioner for Refugees (UNHCR), the United Nations Development Programme (UNDP), a number of independent NGOs, and the governments of Egypt, Turkey, Jordan, Lebanon, and Iraq. 3RP defines itself as “a strategic, coordination, planning, advocacy, fundraising, and programming platform for humanitarian and development partners to respond to the Syria crisis (3RP Syria, 2022).” The 3RP partnership has been vital in protecting displaced persons through legal status and civil documentation, improving day-to-day living conditions, promoting the socio-economic inclusion of refugees in host countries, and aiding with repatriation when appropriate.

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With regard to housing, it is estimated that 10% of external Syrian refugees have been settled in formal refugee camps; the vast majority of refugees have sought to find their own settlements in urban and rural areas. The total number of refugees in formal camps is approximately 500,000 in Turkey, Jordan, and Iraq. The lack of official refugee camps for Syrians in Lebanon is a deliberate result of official government policy barring the establishment of formal camps, a policy that can be traced to Lebanon's experience hosting UN Palestinian refugees who have largely remained in the country 60 years after the establishment of the camps. This policy has sparked a debate in the humanitarian response community over the benefits that formal camps bring to displaced peoples.

A recent study by Oxford University found that the right of economic participation in the host country can play a large role in poverty reduction amongst displaced peoples (Betts et al., 2014). The report found that refugees living outside of formal camps tended to be more economically integrated with the general population of the country compared to those living in camps. However, a lack of formal camps, as in the case of Lebanon, can result in highly inadequate housing for winter conditions, as well as extensive difficulties in distributing and receiving international aid (Rainey & Kelley, 2015). Ultimately, the current reality of hundreds of thousands of displaced Syrian nationals living in formal camps calls for additional efforts and attention to their conditions.

How are displaced Syrians living in formal camps faring? Recent studies by researchers associated with the Healthy Housing for the Displaced (HHFTD) project have identified major gaps in thermal comfort, socio-cultural appropriateness, and privacy that have resulted in low levels of occupant satisfaction (Hart et al., 2018). In the Zaatari and Azraq camps in Jordan, surveying efforts by HHFTD have found that direct engagement with residents was limited in the initial build and settlement phases of the camps. This is a common problem worldwide as agencies responsible for the logistics and construction of camps are more focused on speed of build as opposed to other factors.

While the intensity of the Syrian Civil war has declined, there is still fighting ongoing in the Idlib region, complicating the return of refugees back to Syria – along with numerous other considerations that prevent a safe return home, namely lack of financial resources to make the return trip and lack of security/safety in places of origin. The importance of improving the quality of housing in formal refugee camps for refugees of the Syrian civil war, and across the

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world, remains of the utmost priority. Refugees should not be thought of as simply passive victims of conflict, but as active agents, with their own capabilities and vulnerabilities, who should be engaged with as much as possible by external forces seeking to aid them.

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## IV. Needs Assessment Providing Adequate Housing

### A. Failures to Provide Adequate Housing to Refugees

Refugee camps, according to the UNHCR, are “temporary facilities built to provide immediate protection and assistance to people who have been forced to flee their homes due to war, persecution or violence (United Nations, n.d.).” Because they are intended as a short-term solution for housing displaced persons, camp shelters are generally lightweight, makeshift structures provided by humanitarian or government agencies (Albadra et al., 2017). Studies show, however, that the average amount of time spent as a refugee is 17 years (though not all of this time may be spent in a camp) (Lahn & Grafham, 2015). The UNHCR points out that “it is common to have entire generations growing up in the camps.” As a result, refugees end up living in temporary camp shelters for many more years than originally intended by the designers and providers of such shelters, significantly compromising living standards and reinforcing conditions of poverty (Aburamadan, 2022).

Surveys of occupants living in temporary displacement shelters have demonstrated notable dissatisfaction with the privacy, security, thermal comfort, and socio-cultural appropriateness of camps (Aburamadan, 2022). The sustainability of materials used in constructing the shelters has also arisen as a significant issue (Alshawawreh et al., 2020) (McConnell & Bertolin, 2019). These issues are exacerbated by a lack of feedback mechanisms as well as undemocratic design practices. This section details the physical and socio-cultural inadequacies of refugee shelter design, evidencing the ways in which current practices lead to unhealthy living conditions that impede poverty alleviation.

#### AI. Physical Inadequacies of Current Shelter Design

##### *Sustainable Housing Materials*

According to the World Bank, climate change alone could displace 200 million people by 2050 (Brito, 2021). This expected influx of climate refugees has led researchers to consider the possibility of designing shelters with minimal environmental impact. A meta-analysis on refugee camps found that consideration of sustainability as a pressing issue has increased over the last decade. However, because refugee camps are regarded as temporary settlements, long-term solutions that center sustainability are difficult to establish (Wardeh & Cunha Marques, 2021).

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Another study found that materials sustainability is rarely considered when designing “post-disaster post-conflict” shelters. A comparative life-cycle assessment (LCA) of prefabricated and container shelters in Turkey found containers to have higher carbon emissions and energy requirements, with the majority of emissions associated with the operational phase as opposed to materials and construction. Conversely, an LCA of temporary housing in China found that the construction phase contributed to more than 60% of the life-cycle energy use and recommended the use of recycled materials to reduce this (Pomponi et al., 2019).

### *Thermal Comfort*

Temporary shelters are typically lightweight and uninsulated, making them ineffective at regulating internal temperatures and humidity levels (Albadra et al., 2017). Because many camps are located in environments with extreme climate conditions (e.g., Zaatari or Azraq in the Middle Eastern desert), high summer and low winter temperatures can heavily impact the thermal comfort of a shelter. Lack of forethought into thermal comfort can also be dangerous, leading to increased morbidity and/or mortality in camps (Albadra et al., 2018).

Surveys demonstrate that acceptable thermal comfort conditions are not being met at many camps (Moran et al., 2021). One study surveyed refugees in Azraq and found that over 90% of occupants were unsatisfied or highly unsatisfied with the temperature of their shelters in the summer, and that 87% had modified their shelters to adapt to the heat. Similarly, 85% of Zaatari residents were unsatisfied with thermal conditions in the summer. The study also demonstrated the inequitable ways in which thermal comfort impacts women compared to men, as women are often unable to modify clothing due to cultural preferences and thus have fewer adaptation tools at their disposal, making them more sensitive to changes in thermal conditions. Through interviews and surveys, displaced refugees prioritized thermal comfort as one of the top design considerations (Asfour, 2019) (Albadra et al., 2018). To ensure physical and socio-cultural comfort in extreme climatic conditions, shelter insulation must be better prioritized (Asfour, 2019).

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## A2. Socio-Cultural Inadequacies of Current Shelter Design

### *Privacy and Cultural Comfort*

Apart from satisfying the physical comfort needs, researchers also emphasize the adverse impact that a lack of emotional and psychological comfort can have. Aburamadan highlights the fact that, despite the impressive design evolution of refugee shelters over the last few decades, camp designs do not include socio-cultural considerations (Aburamadan, 2022). Yu and Bai add that a lack of comfortable living situations and privacy “will inevitably lead to peoples’ psychological exclusion” (Yu & Bai, 2018).

Particular attention needs to be given to balancing peoples’ socio-cultural needs with other basic needs. One study reviewed the practices of the Zaatari and Azraq camps and found that a lack of flexibility in adapting shelters to personal and cultural norms in Azraq led to psychological (and physical) issues. For example, residents reported blocking low-level windows that “allow passing males to see into female areas,” which resulted in inadequate ventilation. In Zaatari, where residents were able to modify their settlements, they reported feeling more comfortable, were able to maintain cultural conventions, and experienced less household tension. However, the researchers found that this led agencies to face problems in expanding other essential infrastructure (Hart et al., 2018). As a result, open dialogue between residents and the aid agencies is recommended in addition to better support agencies in making thoughtful, culturally appropriate design choices.

## B. Best Practices in Providing Adequate Housing

There are a number of “best practices” that should be taken into consideration when designing appropriate, comfortable, and immediate refugee housing. Many of these considerations also present design challenges. For example, material use is crucial to a high quality design for environmental impact, comfort, and cultural appropriateness. Building shelters well and with high quality materials increases occupant comfort and sense of safety. However, high quality materials can signify to local inhabitants that emergency housing could be more permanent than aid agencies have indicated, leading to local strife (Healthy Housing for the Displaced, n.d.). This section outlines the main criteria to be considered when designing high-quality refugee housing, and highlights the challenges associated with specific design criteria.

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## **BI. Best Practices: Physical Shelter Design Considerations**

### *Affordability and Expedient Construction*

Design for refugee housing must adhere to a strict budget. There is a significant gap between the funds that are available for these structures and the funds that are needed (United Nations, 2018). Investments made to build long-lasting displacement shelters positively affect the environment impact, cost, reusability, and comfort of the structures. Expediency of manufacturing, delivery, and distribution on site are also crucial, decreasing the time it takes for new residents to move into the space (Healthy Housing for the Displaced, n.d.). A practical modular design can benefit timing in manufacturing, delivery, and assembly.

### *Environmental Impact and Local Materials*

The use of local materials can have both a positive and negative impact on refugee camp shelters. Supplies of locally-sourced materials can be limited, delaying construction. If the infrastructure of the local area is not robust enough to handle the supply, demand of local materials can lead to depletion of natural resources, and deforestation. However, the use of readily available local materials can also help the local economy. Shelters with a short lifespan have a greater environmental impact because they enter the waste cycle more quickly (Healthy Housing for the Displaced, n.d.). Designs must assess the pros and cons of the local materials regarding durability, use, and environmental impact.

From a climate change perspective, sustainable housing should minimize energy usage in production. Mass transport using sea-going bulk carriers and heavy goods on vehicles is highly energy efficient, despite common conceptions. The last leg of the journey can oftentimes have the largest carbon footprint. The weight and compactness of building materials is critical for the energy efficiency of shelter transit (Healthy Housing for the Displaced, n.d.).

Additionally, designers should consider the embodied energy and carbon in materials. When selecting materials and assessing embodied energy and carbon, it is important to consider the full lifespan of the material. For example, wood sequesters carbon as it grows, which means when it is used as timber in construction, it stores the carbon in such a way that can offset energy use from milling and manufacturing processes (Abed et al., 2022).



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Another consideration related to material selection is local perception. If the housing is perceived as permanent, this could lead to social unrest. Therefore, the materials used in construction should be carefully selected. For instance, concrete can have a negative impact because it has high embodied energy and carbon, but also because it can be perceived as permanent (Healthy Housing for the Displaced, n.d.).

### *Light, Air, and Thermal Comfort*

It is likely infeasible to incorporate sophisticated mechanical heating, ventilation, and air conditioning systems into many emergency housing solutions. Therefore, the building itself must be designed to moderate the thermal environment. It is important to gain knowledge of the local climate prior to design, set a numeric temperature target, and then design to hit that target. Interior summer temperatures are comfortable between 25 degrees C (77 F) and 30 degrees C (86 F). Interior winter temperatures are comfortable between 20 degrees C (68 F) and 25 degrees C (77 F) (Healthy Housing for the Displaced, n.d.).

In architecture, it is crucial to balance solar temperature gains from sunlight entering the space with natural light. Too much sunlight entering the space can cause overheating, while natural light allows occupants to complete everyday tasks without electricity. Overhangs to cover openings during the summer months that retract during the winter months can have great benefit to displacement housing.

A well-insulated building can keep the heat out during the summer and can reduce heat loss during the winter. Insulation only works to mitigate a change of temperature from the outside environment if the building is built airtight. While it is important to allow for ventilation and fresh air to enter the interior space, open windows and doors can lead to increased temperatures during hot days and heat loss during cold days. Insulation in the roof and walls does prevent heat gain indoors, when the sunlight hits the exterior of the building, which conducts into the space.

Air quality within buildings is crucial for the wellbeing of its occupants. For buildings to have good air quality, they must be made from materials that avoid volatile organic compounds

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(VOCs), they must be well ventilated by natural or mechanical methods, and they must be sited in areas with limited existing pollutants.

Many of these considerations can be addressed in the design process. For example, in order for a space to have proper cross ventilation, a minimum of two openings in a space is important. The location of bathrooms and the kitchen are crucial for internal air quality. The location of vents need to be considered alongside solar gains from natural light, temperature control, external environment (sand and dust), cooking fumes, privacy, security, and the internal layout of furniture (Healthy Housing for the Displaced, n.d.).

## **B2. Best Practices: Socio-Cultural Shelter Design Considerations**

### *Cultural Appropriateness*

Emergency housing for displaced people must be able to fit within the local, cultural area appropriately. It is necessary to the comfort and safety of inhabitants that there is not significant strife between incoming refugees and local residents. The refugee housing must also meet the critical cultural needs of the occupants. Collaborative build and design processes between the incoming residents and local authorities has shown to improve relationships between refugees and the local population. A sense of belonging for future occupants could be reinforced by promoting and sharing knowledge of local trades and skills (Healthy Housing for the Displaced, n.d.).

Structures should also be adaptable to meet the desires of the occupants. Important design components to consider in the design include whether items can be hung from walls or ceilings, whether adaptation of interior walls would cause structural issues, and whether the space can be subdivided (Healthy Housing for the Displaced, n.d.). The ability to control the internal and external spatial environment is important to feeling at peace in the home.

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## *Privacy, Safety, and Accessibility*

The Shelter Assessment Matrix defines the humanitarian character of refugee shelters to be “the right to life with dignity,” “the right to receive humanitarian assistance,” and “the right to protection and security” (Healthy Housing for the Displaced, n.d.). In order to create a safe living environment, the space must be secure from intruders. If the structural envelope is secure, the most vulnerable areas of forced entry of the shelter will be the openings. The layout and relationship of unit to unit is an important design consideration for the shelters. Entry points that may be more hidden from public view may be more prone to forced entry. The location, height, material, and protection of openings should be carefully considered to ensure the safety and security of the occupant.

When considering the design of the openings, light, air, ventilation, and sound should be balanced with elements in windows and doors that increase privacy such as curtains, or latticed surfaces. The use of translucent but not transparent openings could provide a benefit for privacy. Privacy could be further increased through adding decorative and edible plants outside windows.

Accounting for accessibility is crucial for the comfort of people with disabilities and their families. Openings should be clear enough for a person in a wheelchair and all areas of the home should be accessible. Ramps should be available at the entrances of the shelters. Poorly designed structures can lead to significant psychological and physical stress on those with disabilities who have been forcibly displaced (Healthy Housing for the Displaced, n.d.).

### A. Analysis of Existing Efforts

Failure to achieve adequate levels of occupant satisfaction in formal refugee housing amongst displaced refugees has contributed to worsening of poverty via unmet essential needs. The main problem identified by our analysis is twofold: (1) physical aspects of housing structures do not meet essential needs (thermal comfort, safety, lighting, etc.) and (2) socio-cultural fit is not achieved due to lack of inclusion of displaced peoples in the process of designing and upgrading their homes. Extensive evidence has been identified in the literature supporting these claims, as has been shown in the Needs Assessment section. Further, these problems are intertwined and compounding—failure to address either one will only serve to exacerbate final outcomes with regards to needs satisfaction and poverty alleviation.

In recent years, several projects have sprung up to address this problem, which is highly encouraging. The Healthy Housing for the Displaced (HHFTD) project is a prime example. A joint effort between researchers and practitioners in the UK, Jordan, and Turkey, HHFTD has undertaken extensive resident surveying to gain a better understanding of the problems facing displaced people living in refugee camps, with an explicit focus on desert environments in the Middle East. Their stated vision is to “transform the lives of displaced people encamped in extreme conditions through an engineered solution to housing that promotes a new science of shelter design.” HHFTD sought to investigate both the physical and social conditions in refugee camps through a three-year project engaging occupants and administrative agencies, particularly the UNHCR.

### B. Findings from Prior Fieldwork in Jordan

One of the major conclusions of the HHFTD project was that there is significant room for improvement in the field of shelter design in refugee camps, especially with regard to improving participatory design and climate-appropriate best practices for architecture:

Shelter design can create specific problems for inhabitants increasing, in turn, the demands upon humanitarian organisations. For example, health can be undermined when poorly-insulated shelters fail to mediate extremes of temperature and design that

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doesn't meet the need for privacy and security can harm psychosocial wellbeing (Healthy Housing for the Displaced, n.d.).

These survey findings were supplemented by physical measurements conducted in Jordanian refugee camps in the summer and winter. The study found that “The refugees were very unsatisfied with the thermal conditions in their shelters, particularly in summer. Internal surface temperatures of 46°C were recorded in September and indoor CO<sub>2</sub> concentration levels of 2700ppm were measured in winter” (Albadra et al., 2018).

Additional fieldwork was conducted on the meaning of ‘home-making’ for displaced Syrians, focusing on gauging “the actions and aspirations of camp residents to imbue their dwellings with a sense of home.” This segment of the project produced strong findings to counter the claim assumption of a “rigid dichotomy between temporariness and permanency” in refugee housing, as well as illustrate the well-being benefits that can be achieved by “supporting camp dwellers in their efforts to imbue their surroundings with a sense of home” through flexible, adaptable, and relational shelter designs (Hart et al., 2018).

Finally, new forms of participatory design, i.e., inclusion of refugees in the design process, were explored. In one HHFTD study on cycling shelter design, the authors note that ongoing monitoring of occupant satisfaction is not a major driver of shelter maintenance planning, resulting “in shelters with thermal environments far from ideal and a risk of increased morbidity.” Using the Azraq camp in Jordan as a case study, the team successfully implemented a series of architectural interventions that resulted in decreased overheating, suggesting that “cyclical approach can lead to significant improvement in conditions currently experienced in refugee camp shelters (Fosas et al., 2018).”

## C. Gaps Identified

We identified major gaps amongst existing efforts to improve occupant satisfaction in formal refugee camps. The first is the time and resources required to undertake extensive social surveying and participatory design efforts. The efforts from organizations such as HHFTD show the massive value in engaging with camp residents on issues like social and thermal comfort. However, these engagement efforts require extensive time and resources to execute, and are not easily scalable. The practical challenges of setting up and undertaking such efforts also

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mean that sample sizes in surveys were relatively low, usually between 50-200 residents, which could risk not capturing heterogeneity that exists amongst resident needs.

Another main concern is an inability to collect time series data without longitudinal studies, which are difficult due as the entire study would need to be undertaken again (for social studies that is—physical measurement devices can collect time series data easily). Under the current approach, multiple ‘on-the-ground’ social surveys would be needed to successfully implement a cyclical design approach, as new resident feedback and direction would be required whenever upgrades or or major maintenance to shelter or infrastructure occurs.

The final gap identified is the lack of a medium to share the most up-to-date, sustainable, socio-culturally appropriate shelter designs to a variety of stakeholders in a clear and comprehensive way. The HHFTD project produced a ‘Shelter Assessment Matrix’ (also referenced in the Needs Analysis section) which aims to provide guidance for builders, administrators, and architects of refugee camps. However, this tool does not allow users to proactively view how certain designs and best practices have fared in the past with regard to occupant feedback. While HHFTD has made their data from Zaatari and Azraq camps open-source, it is only accessible in Excel format, making it difficult for users to easily view and make sense of the information.

#### **D. Solution Overview and Core Principles**

Based on the gaps identified in the sector above, our proposed solution is a digital platform to facilitate the exchange of information between displaced people living in refugee camps, administrative staff at camps and aid agencies, and designers. The platform, which will be called **OurHome**, will consist of two major components: a smartphone app for occupancy feedback on shelter design and experience, and a web portal for camp administrators to view the feedback and identify best practices for design principles for refugee housing. The structure of the **OurHome** platform will be elaborated on in the Functionality section below.

In order to ensure that our solution will deliver improved housing conditions for displaced persons, we sought to center our design process around the following four core principles:

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## **D1. Democratic Engagement and Active Agency**

Formal refugee camps are one part of a multi-pronged approach from international aid organizations to help secure decent living standards for displaced persons. However, this does not mean that displaced people are entirely dependent on humanitarian assistance (Betts et al., 2014). As such, it is essential for displaced people to be included, to the highest degree possible, in the decision-making process regarding their living situations. We believe that no third party is more qualified than residents themselves to direct how their living spaces are constructed and organized, while considering the constraints at hand in the refugee camp environment.

## **D2. Accommodating for Transitionality**

The conflict-displaced refugee does not return to their home for 17 years on average (Lahn & Grafham, 2015). The concept of transitionality, i.e., the necessity for continuous adaptation in long-term housing, is therefore an essential consideration for housing conflict-displaced refugees. Transitionality is necessary in order to secure decent living standards and occupant satisfaction—both physical and socio-cultural. For example, researchers have argued that over the past decade, the Zaatari refugee camp has been in the process of “urbanising and trying to become a city,” as part of an effort to integrate into the Jordanian economy and give better financial prospects to residents (Dalal, 2014). Our solution will be centered around the desire of residents to create a prosperous life in their new homes, regardless of their timeline for repatriation to their country of origin. We will also seek to ensure that best design practices include durable materials as much as possible to accommodate for transitionality.

## **D3. Dignity-first approach**

While achieving physical and thermal comfort in homes is largely a product of material choice and following best design principles, social satisfaction in both homes and communities rely on more intangible factors, such as community vitality, social interaction, and cultural appropriateness. In the literature we reviewed, one common complaint amongst refugee camp residents was that they did not feel that they had a space they felt comfortable receiving guests in. Similarly, in the context of the Middle East, additional attention must be paid to gender norms, so ventilation must not compromise concerns about modesty. Ultimately,

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residents can provide the best source of information on what will lead to living a dignified life as a displaced person.

#### **D4. Sustainable and Livable Design and Architecture**

The major accompanying piece to the resident feedback tool in our solution is the best design practices repository. Our team seeks to use the following 7-Point Approach, which has adapted from our Needs Analysis section and the HHFTD Shelter Assessment Matrix, to guide the development of this best practices repository tool:

- 1) Buildability - cost, ease of delivery and construction, adaptability, scalability, and local acceptability of material
- 2) Comfort - air quality, daylighting, thermal performance
- 3) Sustainability - reusability, recyclability, environmental impact, durability
- 4) Safety and Access - security, disability access, fire resistance
- 5) Protection from Environment - weather tightness
- 6) Privacy - visibility, noise
- 7) Socio-Cultural and Psycho-Emotional fit - natural environment integration, social spaces, practical considerations.

#### **E. Key Stakeholders**

Along with the integration of our four core design principles, we sought to define our key stakeholders, i.e., the beneficiaries and users of our platform in our initial design and deployment stage. This stage will be focused on the two major Syrian refugee camps in Jordan: Azraq and Zaatari. Inclusion of all key stakeholders in the development of our solution will seek to facilitate a virtuous, cyclical design process, to the benefit of residents.

##### **EI. Camp Residents**

As of June 2022, there are 132,819 displaced Syrians currently living in the Azraq and Zaatari refugee camps in Jordan (United Nations, 2022). The main language in use is Arabic, and over half of the population is children. The residents come from a variety of regions throughout Syria. Most arrived in 2013 and have remained in Jordan since. Our solution will seek to



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improve the lives of these residents by connecting their housing needs directly to camp administrators.

## **E2. Aid Agencies/Camp Administrators**

The UN Refugee Agency operates in Jordan under the name UNHCR-Jordan. They maintain 500 staff located across 4 offices in Jordan and are responsible for the operations of the Azraq and Zaatari refugee camps, which currently contain nearly 35,000 shelters. Every month, several thousand shelters are repaired or upgraded (United Nations, 2022). As such, Our**Home** will allow this maintenance work to be connected to actual resident needs, as well as allow expansions of camps and new builds to be constructed according to best local practices.

## **E3. Host Governments/Local Authorities**

Host governments and local authorities work closely with aid agencies on issues such as security, economic integration, and material sourcing for construction. Information pertaining to resident satisfaction with regards to housing and security will therefore be highly pertinent to them. Our solution will allow officials and civil servants to access the feedback facilitation and best design practice tools, without compromising the ability of residents to freely share their feedback in an open and democratic manner.

## **F. Functionality**

Our main method to facilitate democratic engagement of displaced persons living in formal refugee camps is by collecting information from the residents themselves. Aforementioned issues like climate-related and socio-cultural dissatisfaction can be best addressed by giving a voice to displaced persons. Ultimately, we seek to shift away from the paradigm of refugee camp designers imposing their view of what people want/need and move toward an approach that acknowledges the agency of refugees. The following two sections will detail how Our**Home** will be used by residents, international aid organizations, and host governments.

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## Mobile App - Feedback Facilitation Tool

The purpose of the mobile app segment of OurHome is for feedback on housing satisfaction and general suggestions to be communicated by residents to camp administrators and, ultimately, to designers. The app, which will be available in English and Arabic, will be free to download in all the major smartphone app stores. Over 90% of Jordanian households use smartphones (Jordan Times, 2018). We expect smartphone usage amongst Syrians in Jordan to be similar. Therefore, the app should be accessible to most households in Zaatari and Azraq. Residents without smartphones will be able to provide input through centrally located tablets in camps.

When a user opens the app, they will be asked to provide some basic demographic information, as well as which area of the camp their residence is located. Once they have filled in this section, they will gain access to the survey portion of the app, which is the primary means of sharing information about their level of housing satisfaction. The survey format will be split into seven sections, corresponding to the 7-Point Approach described in the Core Principles section above. Each section will have a combination of quantitative, qualitative, and open-ended feedback sections.

For example, for the comfort section of the survey, OurHome will facilitate the exchange of thermal comfort information using the “Arabic thermal comfort survey based on the numerical ASHRAE” developed by HHFTD. Similarly, a numerical scale will be used to gauge the level of privacy residents feel in their homes. These numeric questions will be supplemented with qualitative questions, such as “What features, if any, do you feel would improve the privacy of your residence?”

Finally, open-ended feedback boxes will be available to allow residents to share any general comments they may have that were not captured in the quantitative or qualitative survey questions. Upon submission of the form, residents will be redirected to a homepage that will inform them about the timing/planning of future upgrades and retrofits for residences. Form submission will be limited to once per month per household by default.

*“We currently live in a sardine tin. We suffer from rain and wind noise. Electrical safety is a concern. A timber shelter would be better.” Resident of Azraq camp, Jordan (Hart et al., 2022).*

## Mobile App Thermal Comfort

The image shows a mobile application interface for assessing thermal comfort. The app is displayed on a smartphone screen with a status bar at the top showing the time 9:41, signal strength, and battery level. The main title is "Thermal Comfort". Below the title, there are four questions, each followed by a horizontal slider:

- Question 1: "Are you comfortable in your current home?"  
Slider range: "Not Comfortable" to "Comfortable". The slider is positioned slightly past the midpoint towards "Comfortable".
- Question 2: "Are you too hot or too cold?"  
Slider range: "Hot" to "Cold". The slider is positioned slightly past the midpoint towards "Cold".
- Question 3: "Is there enough natural light?"  
Slider range: "No" to "Yes". The slider is positioned slightly past the midpoint towards "Yes".
- Question 4: "Is there good air quality?"  
Slider range: "No" to "Yes". The slider is positioned slightly past the midpoint towards "Yes".

At the bottom of the screen, there is a navigation bar with three icons: a back arrow, a bookmark icon, and a share icon.

## Mobile App Safety

The image shows a mobile app interface with a light gray background. At the top, the status bar displays the time 9:41, signal strength, Wi-Fi, and battery icons. The app title 'Safety' is centered at the top. Below it, there are four questions, each followed by a horizontal slider:

- Do you feel safe in your home?**  
The slider ranges from 'Not Safe' on the left to 'Safe' on the right. The marker is positioned approximately 75% of the way towards 'Safe'.
- Do you have privacy in your home?**  
The slider ranges from 'No Privacy' on the left to 'Privacy' on the right. The marker is positioned approximately 50% of the way towards 'Privacy'.
- Is your home sanitary?**  
The slider ranges from 'Unsanitary' on the left to 'Sanitary' on the right. The marker is positioned approximately 60% of the way towards 'Sanitary'.
- Is your home accessible to the disabled?**  
The slider ranges from 'Not Accessible' on the left to 'Accessible' on the right. The marker is positioned approximately 40% of the way towards 'Accessible'.

At the bottom of the app, there is a navigation bar with a back arrow on the left and two icons (a bookmark and a share icon) on the right.

## Mobile App Structure



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## *Web Platform - Best Design Practices and Information*

The web platform component of Our**Home**, which will be called Beituna in the Arabic version, will be accessible to aid agencies, camp administrators, designers, and local government (if desired). The main functionalities of this tool are:

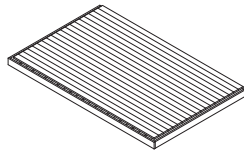
- Customization of the survey that is sent out to residents, as well as adjust the frequency by which it can be submitted, and what information will be shared with users on the homepage. If no customization is required, the default survey design and frequency of submission will be utilized.
- Ability to view the responses of residents. This is the crucial component of the tool that will allow camp administrators to see how shelters are performing from the perspective of occupants. After multiple iterations of feedback collection and shelter upgrades, longitudinal data of occupant scoring will be able to be viewed graphically.
- Access to the Our**Home** design repository. As discussed in the Core Principles section above, our team utilized the HHFTD Shelter Assessment Matrix tool to gather a set of modular, sustainable designs that can be viewed by key stakeholders like UNHCR workers and camp maintenance staff.

The ultimate goal of the Our**Home** web platform is to provide camp administrators with an easy way to access best-in-class shelter designs that are specific to their climatic-conditions, while simultaneously being able to accurately gauge lived experiences of camp occupants. Meanwhile, the survey feature of the mobile application will allow residents to be more involved in the official planning process for their neighborhoods. The ability for camp administrators to create a 'Home Page' showing previous and planned shelter upgrades, as well as any other pertinent information, will be another useful mechanism to facilitate cyclic design processes.

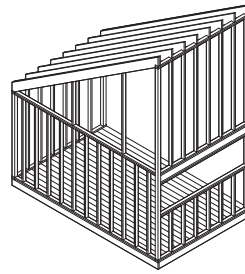
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## Web Platform Design Repository

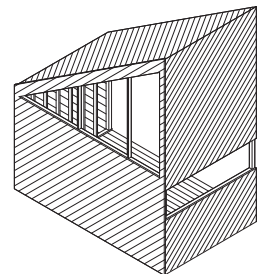
### Details



Foundation

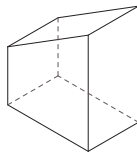


Framing

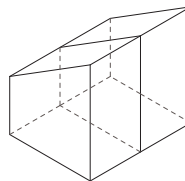


Cladding

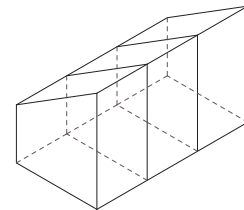
### Massing



Single



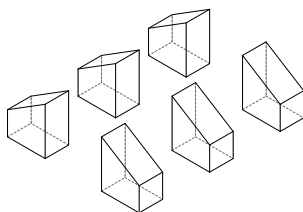
Double



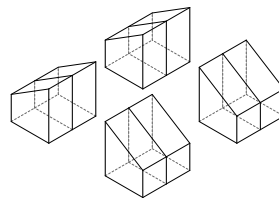
Triple



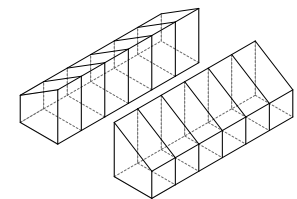
### Siting



Individual



Family



Row

The Design Repository is a file structure on OurHome where designers can share digital **Detail**, **Massing**, and **Siting** drawings and models on an open source platform. This platform will allow a faster flow of information so that digital drawings and models of successful immediate housing interventions can be made available to anyone around the world.

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## G. Financing and Grants

Seeing as our solution is not a for-profit enterprise, we will seek to rely on external funding to develop and operate our digital applications. As such, we have identified several grants that our team would seek to apply for as we get started. Firstly, we would apply for the UNHCR Refugee-led Innovation Fund, which aims to provide support for solutions that “will enable [NGOs] to design new interventions which will have a lasting positive impact on their communities.” We would seek to apply for the maximum funding amount of \$50,000 USD, which, if successful, would fund our initial app development phase.

Other than this grant, we will look for philanthropic funding opportunities in the US, Canada, and EU, where available.

## H. Initial Deployment Plan

Our**Home**, which will be branded as Beituna in Jordan, will be planned as a multi-stage development and deployment process. The first step of this process, prior to applying for the grants mentioned above, is to partner with a local, refugee-led non-profit in Jordan. The purpose of this collaboration will be to discuss and verify our theory of change with people who have experienced forced displacement and refugee camp housing themselves.

The second step in our development process will be to conduct a set of interviews for each of the key stakeholders we have identified. At this stage, we will seek to learn from major concerns shared and present our solution in the form of design mock-ups. We expect some insights learned in this step to lead to some degree of pivoting from our initial conception of the solution.

The third step and final step of our initial deployment plan will be to secure an official partnership with the UNHCR in one of the Syrian refugee camps in Jordan. Once this occurs, we will prepare for a trial roll-out in one specific neighborhood of the refugee camp, whereby one entire cycle of survey responses, data analysis on the web-portal, and upgrades are completed. We expect this to take 3-6 months, after which we will analyze how the trial fared and consider what improvements could be made to the solution.



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## I. Possible Limitations

Our goal is to improve occupant satisfaction in refugee housing by connecting displaced people with the parties that are largely responsible for how their shelters are planned and maintained. We believe that our mobile application and web portal will be useful tools to achieve this goal. However, there are several major tradeoffs and limitations to our solution that we have identified.

First and foremost, our team acknowledges that there is a very real benefit of conducting the participatory design and feedback sessions in-person rather than remotely. The main trade-off at hand here is potentially lower quality of communication received from the mobile app survey tool, in return for a much larger sample size and quicker turn-around. To deal with this limitation, we suggest that **OurHome** serve as an additional resource to camp administrators, in addition to the in-person fieldwork conducted by researchers and practitioners like the HHFTD team.

Another limitation of our solution is that it does not challenge the underlying power dynamic that exists within formal refugee camps run by international humanitarian organizations. As alluded to in the Case Study section of this report, recent scholarship has questioned the extent to which formal refugee camps hamper the economic potential of displaced people. Our team considered whether restricting camp residents from accessing the web portal tool was appropriate given our commitment to democratic engagement and active agency. However, we decided that given the inherent constraints of the environment that we were seeking to operate in, we would go forward with our proposed approach and wait to receive feedback on our solution prior to shifting direction.

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## VI. Conclusion and Future Vision

Displacement and forced migration have compounding, multidimensional impacts on poverty. As rising conflict and more frequent climate change-induced extreme weather events increase the likelihood of displacement over the coming decades, it is necessary that government and NGO decision makers work proactively to create sustainable poverty mitigation solutions for displaced people.

Through our research and interviews, we identified improved housing as an opportunity to break cycles of poverty related to displacement. Experts agree that current top-down design practices fail to deliver immediate, low-cost housing that also provides across the diverse spectrum of human needs—including health, comfort, privacy, and security. To address this issue, we propose a democratic platform, **OurHome**, based in our case study of refugee housing in the Middle East. **OurHome** would give refugees an opportunity to provide feedback on their housing conditions, either through a smartphone app or a centralized physical interface within the camp. The feedback would be utilized both by aid program administrators to provide immediate relief, as well as by designers to improve future housing design.

Initially, **OurHome** would launch in Syrian refugee camps in Jordan. However, we believe that its greatest potential benefit over the status quo survey-based research efforts is its scaling potential. With programmatic support from the UNHCR, occupant feedback could be synthesized and shared between designers, architects, and engineers worldwide. Eventually, our vision would be for designers, architects, and engineers to also contribute to the platform, sharing open source blueprints and models with one another. Through information-sharing and two-way communication, we hope **OurHome** can enable the quicker development of cost-effective, high quality immediate housing, helping to improve living conditions for displaced people and mitigating the impacts of displacement on global poverty.

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