

Abstract

This research aims to find architectural and urban design related solutions to enhance the living conditions of refugees who are trapped in a protracted refugee situation. Such a situation results when 25,000 or more refugees from the same nationality have been in exile in a given asylum country for five or more years (US Department of State, n.d.). As an example of that refugee situation, focus within this research is upon the two refugee camp models found in Jordan; the Zaatari camp and the Azraq camp. Both were established as a consequence of the recent civil war in Syria, started in 2011. A comparison between the two refugee camps resulted in identifying the strong points and the shortcomings of the current models. In addition, an assessment of the refugees' needs is made based on the refugee camp's design guidelines and the official reports published by the different humanitarian organizations. The above mentioned researched information is utilized to develop a set of goals and strategies which is used within this research to redesign one village in the Azraq refugee camp. The new design applies sustainable urbanism principles and practices in the planning process of that village, aiming to enhance the living conditions of refugees staying there. This hypothetical exercise facilitated the study of the anticipated consequences that would stem from implementing the newly developed model in future designs. In conclusion, a summary of recommendations for future designs of refugee camps of similar social and ecological conditions are suggested based on the study of the anticipated consequences of the developed model. However, the recommendations would be more accurate if the suggested model is put into real life application and become subjected to a multi-disciplinary assessment, which consequently confirms the success or failure of the suggested model or parts of it.

Methodology

The main research method to accomplish this paper is the case study approach, with the case studies of the Azraq and the Zaatari refugee camps in Jordan. In addition, as a secondary method, interdisciplinary method is used to cover the important aspects that directly affect the design decisions of refugee camps. Such disciplines include: settlement patterns, environmental studies, humanitarian principles, and sustainable urbanism.

The goals and strategies that are used in redesigning a section of the Azraq camp are based on the following set of research elements:

1. A comparison between the two camps' conditions to evaluate how the designed models affected the livelihood of refugees living there. This comparison is based on feedback found on the internet from refugees living in these camps, pictures of the two camps and on the official published reports by the different humanitarian organizations, such as: UNHCR, CARE, and UNICEF.
2. Review of the written guidelines found in the United Nations High Commissioner for Refugees (UNHCR) handbook for emergencies.
3. Literature review of similar scope.
4. Case study of low-income housing neighborhood in developing countries of similar climate conditions focusing on architecture that utilizes passive design techniques for heating and cooling, such as Hassan Fathy's New Gurna village in Egypt.
5. Study of traditional cities layout and planning (Islamic rules in building, cultural preferences, community based urban fabric with courtyards)
6. Study of sustainable urbanism principles and practices in addition to self-sustaining measures and applications in the urban planning field.

Introduction

Limiting the humanitarian suffering of refugees remains an unmet need in the world today. An increasing number of people fleeing their homes, due to a well-founded fear of being persecuted for a variety of reasons, are registered at the United Nations High Commissioner for Refugees (UNHCR) every day. The UNHCR reports show that the number of people displaced by conflict including refugees, asylum seekers or those displaced internally, was at an estimated 65.3 million by the end of 2015. Eighty percent of the world's refugees are hosted by developing countries that suffer from unstable economies and limited resources (UNHCR, 2016). For example, Dadaab, the largest refugee camp in the world, located in Kenya, is hosting 263,063 refugees mostly from neighboring Somalia (UNHCR, Refugees in the horn of Africa: Somali displacement crisis, 2016). Similarly, the Zaatari refugee camp in eastern Jordan is the largest refugee camp in the Middle East with more than 80,000 Syrian refugees (UNHCR, Syria regional refugee response: Zaatari refugee camp, 2016). Consequently, the already limited resources of these hosting countries are going to be further strained.

The refugee's problem becomes more complicated when the camps, initially intended as temporary accommodations, become somehow the permanent residences for refugees. This protracted refugee situation results when 25 thousand people or more, originated from the same country, seek refuge in another country for at least five consecutive years (U.S. Department of States, n.d.). Consequently, those refugees find themselves in a long lasting and intractable state of limbo due to the unsettled political situation in their home countries. The situation of protracted refugees has received considerable interest from UNHCR due to the major consequences associated with this situation. Yet, the current UNHCR guidelines for designing refugee camps seem to be insufficient in solving the different aspects of the problem and accordingly, the camps

are becoming overcrowded and fail within a few years (Kennedy, Challenging camp design guidelines, 2005). This necessitates further research for creative solutions for the problem and the adoption of novel approaches towards housing refugees in the receiving countries.

Obviously, refugees are in dire need for all kinds of humanitarian assistance and funding to help them survive and overcome the intensive losses and instabilities that they face. However, in the case of a protracted refugee situation, the refugees' needs extend beyond their basic survival requirements to comprise more specified services such as: education, health care, more decent shelters, and more reliable infrastructure system, because despite the fact that refugees' lives may not be directly at risk while in refugee camps, their basic rights and essential economic and psychosocial needs remain unfulfilled for years while in exile. Freedom of movement and the right to seek wage-earning employment are other essential rights that need to be ensured in such cases of prolonged stay in refugee camps.

The responsibility of refugee camp planners and/or designers is to pay attention to the psychological aspect of the refugee camp design in addition to the physical aspect. For example, bringing architectural elements or features that are familiar to refugees helps them find a small part of home away from home, and consequently, raises their spirits and ensures a certain level of comfort during their stay in refugee camps. Therefore, in situations where a protracted refugee situation is expected, it is essential for planners to take a long-term perspective in planning the refugee camp so as to ensure the refugees well-being and to provide them with decent life options and opportunities (Kennedy, Towards a rationalization of the construction of refugee camps, 2004). This should not necessarily require overwhelming funding. In contrast, by using the existing resources and including the experiences and the work force available within the refugees themselves, the resources get multiplied and the chance to transform these potentials into a

productive community becomes more possible. One idea to make that happen is to shift towards applying sustainable urbanism principles and practices in the design of refugee camps (Kennedy, Towards a rationalization of the construction of refugee camps, 2004).

Sustainability is the ability to continue a defined behavior indefinitely. That requires all three pillars of sustainability to be sustainable themselves: social sustainability, environmental sustainability, and economic sustainability (Environmental sustainability, n.d.). Applying sustainability principles to refugee camp design doesn't sound so accurate since sustainability principles are usually applied to keep things lasting for a long time or indefinitely, while refugee camps are known to be planned and found for a limited yet unspecified period of time. But when this limited duration extends to a decade in some cases, such as the ones found in Tanzania, Cyprus, and Pakistan, or to half a century as in the case of the Palestinian refugees (Kasioumi, 2011), then the incorporation of sustainability-driven planning into the design of refugee camps might be the key to enhancing the living conditions within protracted refugee camps situations.

Through the examination of the two models of refugee camps in Jordan, the Zaatari and the Azraq refugee camps, this paper discusses the situation of protracted refugee camps and the problems associated with this situation, in addition, it suggests planning consideration and solutions that might be applied to enhancing the living conditions there. The proposed model within this paper for the redesign of one of the villages in the Azraq camp in Jordan relies on the UNHCR handbook for emergencies and the Sphere project humanitarian charter and minimum standards in disaster response as the main references for refugee camp design guidelines. However, another layer of designing requirements and standards is established within this research based on the specific ecological, social, and economical aspects of the refugee camp context. For example, different design consideration and decisions are expected based on the different climate zones and

the geophysical location of the designed refugee camp. By taking into consideration that the Azraq camp in Jordan is located in a hot arid climate and that refugees who are staying in the camp are from Arabic origins and are used to the Islamic customs and regulations, the design becomes more context-sensitive and suggests a more comfortable living conditions for refugees.

In the following sections there is a more detailed explanation regarding what additional guidelines are going to be applied to this design study of the Azraq camp and an analysis of how these decisions would change the physical arrangement of the camp and the psychological conditions of the refugees.

Scope of the problem

As a result of the recent civil war in Syria, which started in 2011 and deflagrated within months, many families found themselves in war zones and were forced to flee their homes and seek safety elsewhere. As of to date, among the 11.6 million people that were forced to leave their homes, there are 7.6 million who moved to different cities in Syria, and around 4 million people who are now refugees in other countries. According to the United Nations high commissioner for refugees' records, the Syrian refugees' situation is the worst refugee crisis of our generation. The distribution of the Syrian refugees is mainly in neighboring countries. 95% live in just 5 countries: Turkey, Lebanon, Jordan, Iraq, and Egypt, while only 5% are in the rest of the world seeking asylum (UNHCR, Worldwide displacement hits all-time high as war and persecution increase, 2015). When the above listed countries agreed on receiving the Syrian refugees, they allowed refugees to live within the fabric of its towns and cities, integrating with its communities, but when the refugees' numbers rose dramatically within a short period of time, and with the need to simplify the distribution process of resources and humanitarian services for refugees by the non-governmental organizations, in addition to ensuring the receiving countries' safety and control

over the sudden rise in its population, the need to establish refugee camps became more crucial.

Figure 1 shows the distribution of the Syrian refugees in neighboring countries.

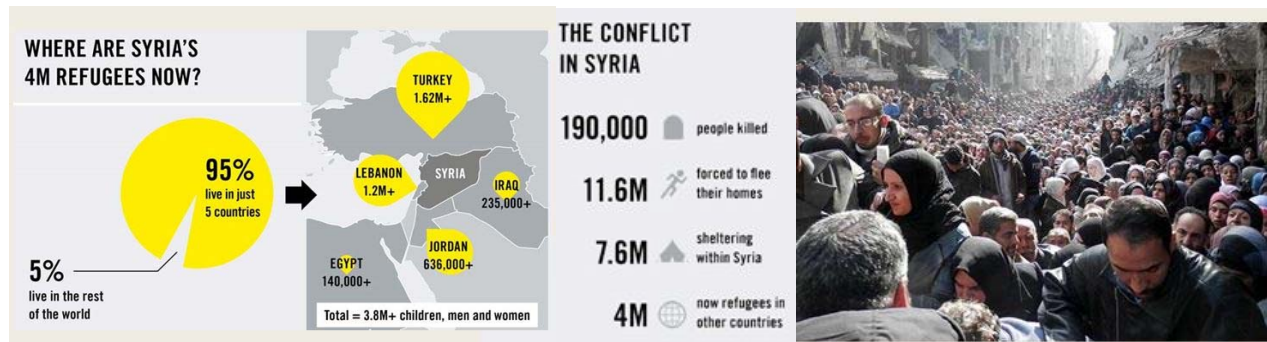


Figure 1: The distribution of the Syrian refugees in the neighboring countries (UNHCR, 2015)

Taking the Jordanian situation as an example, 82% of the Syrian refugees who live in Jordan are living within the urban areas of the Jordanian cities; only 18% of the Syrian refugees there are living in either one of the two main Syrian refugee camps in Jordan: The Zaatari camp which was founded in 2012, and the Azraq camp which was opened one year after the Zaatari camp has reached its full capacity and has become overcrowded (UNHCR, Syria regional refugee response: Zaatari refugee camp, 2016).

The Azraq refugee camp, was designed and built in 10 months. However, in cases of humanitarian responses, planners don't usually get the luxury of having that long of a period for planning refugee camps. That provided the chance for better understanding the situation and studying the context of the project, unlike the first camp which was developed spontaneously in just 9 days as an instant humanitarian response for sheltering the Syrian refugees. Nevertheless, the Azraq camp is still not fulfilling many of the refugees' needs and services, and is missing essential infrastructural elements such as roads and walkways, electricity, and reliable water connections. In addition, the senses of community and ownership, privacy and safety aren't incorporated well in the design of the Azraq refugee camp.

The Azraq camp requires a more climate and context sensitive design, to efficiently lessen

the effect of the harsh, hot, and dry weather conditions of Jordan's desert on the refugees living there. The new design should take into consideration making changes on the following three levels: the refugee camp's masterplan level, the refugees' communities level, and the single refugee's accommodation level.

This research aims to incorporate the knowledge of the passive architecture and urban planning strategies to design the new plan for a section of the Azraq camp. Those strategies have been used long before the introduction of electricity, and before the dependence on the different mechanical systems for heating and cooling the living spaces. In Luxor, Egypt, designed and built by the Egyptian architect Hassan Fathy, is a good example that incorporates the use of natural energies and the different passive design strategies in order to create a comfortable micro climate for its residents (Fathy, 1986). New Gurna village's location shares similar climate conditions as the Jordan desert, which makes that case study more valuable to this particular research.

Overview of the refugee camps in Jordan

The Zaatari and the Azraq refugee camps are the main two refugee camps located within the territory of the Hashemite kingdom of Jordan. They run under the joint administration of the Jordanian government and UNHCR. Although the Zaatari and the Azraq camps were built just one year apart as a response to the same humanitarian crisis, and although their locations share the same desert climate conditions, they have gradually produced two different models for refugee camp plans, and consequently ended up acting somehow differently on the community level. One feels more like a town, while the other feels more like a military base. Following is an overview of each camp's conditions and an evaluation of the livelihood consequences of each of them.

The Zaatari refugee camp

The Zaatari Camp is located in the desert of Jordan about 15km from the Jordan-Syria border, closer to the Jordanian city Al Mafraq. It was first opened in July to shelter Syrian refugees fleeing the civil war in Syria. At the beginning it was planned to host just 100 Syrian families and was constructed in nine days. Shortly after, and with no further planning, the camp became the home for 80,000 persons, all who live in a 5-mile circumference (UNHCR, Syria regional refugee response: Zaatari refugee camp, 2016). With this density the camp became Jordan's 4th biggest city. Refugees staying in the Zaatari camp were able to create a sense of community that is similar to regular villages, the reason could be the less restricted camp operation regulations, and the more flexible and organic growth of the camp's urban plan. Figure 2 shows an aerial view of the Zaatari refugee camp.



Figure 2: Aerial view of the Zaatari refugee camp in the desert of Jordan (UNHCR, 2016)

In order to get a better understanding of the Zaatari refugee camp in regards to its population, demographics, and essential services, figure 4 includes information as it is published by the UNHCR.

One of the strong points of the Zaatari refugee camp is the economy that refugees have established themselves in the camp. The Zaatari's informal market comprises an estimated 3,000 refugee-operated shops and businesses. In addition, approximately 3,000 labor opportunities are

provided via short term cash-for-work activities provided by community based non-governmental organizations (NGOs), that helps 60% of the working age refugee population earn some form of income (UNHCR, Syria regional refugee response: Zaatari refugee camp, 2016).

Another aspect that makes the Zaatari camp more favorable for refugees, is that shelters are connected to the Zaatari's electricity grid and have access to electricity 11 hours per day. However, in regards to water distribution, the Zataari camp depends on a network of trucks delivering water to communal public tanks instead of a water connection system. An average of 3300 m³ of water is delivered to the Zaatari camp by water delivering trucks every day.

Regarding waste management in the Zaatari camp, 80% of the waste generated in the Zaatari camp is being treated, 983 m³ of sludge is collected by desludging trucks every day, and around 750 m³ of solid waste is collected and transferred to an external waste facility.

The Azraq refugee camp

Due to reaching the maximum capacity of Zaatari camp which has been estimated to be 60,000 refugees in March 2013, the need to find alternatives for housing the continuously rising number of refugees travelling towards Jordan was necessary, thus the second camp, the Azraq camp, was built and opened in July 2014 to accommodate more refugees.



Figure 3: Aerial view of the Azraq refugee camp in Jordan (by Graeme Baker via pbs.twimg 4/21/2014)

Figure 3 shows an aerial view of the Azraq refugee camp, one can notice the linear rows of shelters that hosts refugees. The rigid and formal grid layout makes the camp look like a military base. Refugees living in the Azraq camp lack an active role in the functioning of the camp. Figure 4 includes general information about Azraq Camp. Even though there are two market areas operating in the Azraq camp, the 100 shops comprise 50 owned by the refugees and 50 owned by the host community. Those market areas provide the camp with food shops, restaurants, accessories, bikes, and many other items. In addition, UNHCR and its partners have set up an Incentive Based Volunteering (IBV) scheme, through which refugees can earn some extra income. However, those opportunities aren't enough to provide work opportunities for the refugees (UNHCR, Jordan Factsheet: Azraq Camp, 2014).

Azraq camp refugees are also complaining that the camp isn't connected to the electricity grid and that people don't have the means to operate lights, a refrigerator, a television, a fan or charge phones. The camp depends on solar energy to provide the minimal electricity requirements through providing individual solar lanterns and solar chargers for refugees once they arrive to the camp, and by installing 472 solar street lights for the night use within the camp.

In regards to water and wastewater management within the Azraq camp, the average water supply to the whole camp is 650 m³ per day, distributed through the water supply network to 37 tap stands located on different sections of the camp. On the other hand, a waste water treatment plant has been established within the camp's boundaries but away from the living areas to gradually receive the waste produced in the camp

Although the Azraq camp was built after the Zaatari camp, with a longer time for preparation, and presumably with opportunities to learn from the Zaatari camp experience, the living conditions of the Azraq camp is less favorable and the services are less developed. This observation raises

suspension that other design-related factors should have been considered in order to maximize the human experience for refugees and lessen the suffering during their presence in these camps.



HIGHLIGHTS

27,714

refugees are actually in the camp out of

42,848

persons of concern registered

56%

of children, including

394

Identified separated and unaccompanied minors

981

people with disabilities,

36%

of these are children

3 in 10

households are headed by women

1,991

women at risk

7,537

shelters currently allocated

10,023

shelters built since opening

General Information

Date of opening: April 30th, 2014

Capacity: 50,000 people (exp. to 100,000)

Size of camp area: 14.7 km²

Population increased since Jan'15: 284%

Place of origin in Syria	Total PoC
Aleppo	24.4%
Homs	18.6%
Dar'a	17.5%
Rural Damascus	9.4%
Other areas	30.1%
Total	100%

2016 Funding priorities

- Health Services
- Shelter Maintenance
- Protection

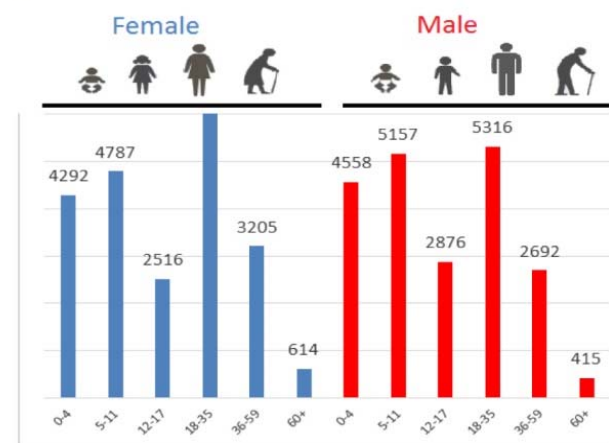


Figure 4: Zaatari refugee camp fact sheet (UNHCR, Syria regional refugee response: Zaatari refugee camp, 2016)



OVERVIEW

79,551
persons of
concern

461,701
refugees have
passed through
the camp

57% are youth,
19.9% are
under 5 years old

1 in 5
households are
headed by
women

Average of **80** births
per week, and **14,000**
weekly consultations

The Camp covers
some **5.3 km²**

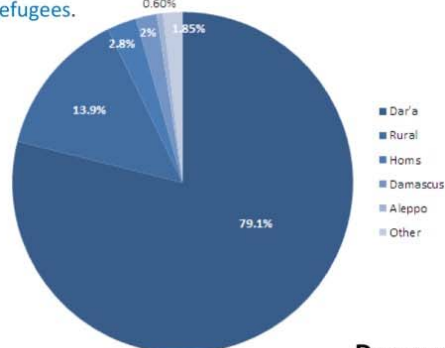
Location: Mafraq Governorate, Northern Jordan

Opening: 29 July 2012

HIGHLIGHTS

Population of concern

79,551 persons of concern, exclusively
Syrian refugees.



Essential services

Daily and **monthly** support in addition to
education and health care.

Service	Amount
Pre-fabricated caravans	24,000
Water per person	35+ litres
Food per person per day	2,100 k/calories
Cash for work per day for entire camp	36,000 JD

Demographic breakdown



Community based services

9 schools
where 20,771 school-aged
children enrolled.

27 community centres
provide psychosocial support &
recreational activities

2 hospitals with 55 beds and **9 health care**
centres, **1 delivery unit**
and 120 community health volunteers.

Figure 5: The Azraq refugee camp fact sheet (UNHCR, Syria regional refugee response: Azraq refugee camp, 2016)

Moving towards a protracted refugee camp design

When refugees either forcibly or willingly leave their homes, they often travel for miles on foot while carrying bundles of belongings on their backs and fear and insecurity in their hearts. Upon reaching a refugee camp or community, they require security, rest, food and water, medicine, and shelter. But once they regain their strength and begin to deal with the trauma they have undergone, refugees often start to look for ways to enhance their living conditions and earn a living in order to both feel productive and plan for the future of themselves and their families. Productive refugees have the additional benefit of shifting their community from one that solely consumes, to one that is productive and contributes. By providing job opportunities along with the raw materials and tools needed for production, refugees can potentially find new hope in their lives while easing the financial and resource burden on the hosting country and funding organizations.

One of the most difficult points when dealing with the design of refugee camps is the inability to estimate the period for which the design should be based upon, keeping in mind that the designed space and elements are going to stay there temporarily. That's why the difficult equation between stability and temporality is important to be solved. And this is where part of the title "Aiming for stability while planning for temporality" originated from.

Perhaps the ultimate solution for the refugees' crisis is to have them blend instantly into the fabric of the receiving communities, and to be given the opportunity to live, work, and learn in the urban cities of the hosting countries. This requires the support of the governments and the different humanitarian societies concerned with the refugees' condition, such as the UNHCR and UNRWA. However, this proposed solution becomes unreasonable and difficult-to-achieve right after the massive displacement of people within a short time, such as the one resulting from the recent civil war in Syria, where half the Syrian population were displaced either internally within

the borders of their country or externally to neighboring countries like Lebanon, Turkey, Jordan, Kurdistan (Iraq) or even further to European countries (5). That is when the importance of establishing refugee camps helps fulfil the requirement needed to ensure the well-being of refugees.

Moreover, refugee camps are usually built as a response to a sudden humanitarian problem. This leaves planners with a very limited time dedicated for planning the best solution for the refugee camp; instead, time is utilized in the execution of the plan to provide the humanitarian help which has to be on the ground as fast as possible. This is why it is important to conduct this type of research, to have enough hypothetical exercises and models that can be utilized right away once needed in humanitarian responses. Also, this type of research helps to explore ways to transform already built refugee camps from the instant less-context-sensitive design solution, to a more settled more-context-sensitive model when needed, that is in cases where the camp duration extends long enough to form a protracted refugee situation.

Transforming an already inhabited refugee camp is a difficult process because of the overwhelming density of people living there, and the limited space provided for living per person, in addition to the limited open spaces provided in between the sheltering units or blocks. Also, relocating the whole camp to a new location is not the best feasible solution because that requires the transportation of people, materials, shelter units, and aiding supplies. In addition, whatever infrastructure that was made to establish the instant camp will have to be repeated in another location to establish the long term camp, which requires a great amount of work and funds to get accomplished. To overcome this situation, from the beginning, the plan of the refugee camp should include ways to easily make the transformation from the instant solution to the long term or protracted solution when needed.

Overview of guidelines for refugee camp planning

This section discusses a summary of refugee camp planning guidelines as discussed in both the UNHCR handbook for emergencies, and Sphere project humanitarian charter and minimum standards in disaster response, as they considered the main references for refugee camp design guidelines.

Before getting to table 1, which lists the main guidelines for camp planning, it is important to define what UNHCR and Sphere guidelines consider to be a camp community, a camp block, a camp sector, and a camp module.

According to the guidelines, each family that consists of 6-10 persons is entitled to one tent. Every 16 tents comprise a camp community. There are 16 camp communities per camp block, and 4 camp blocks in a camp sector. 1 ideal camp consists of 4 camp sectors and host 20000 persons.

Table 1: UNHCR and Sphere guidelines for camp / shelter planning

Site Planning:		
Shelter		3.5 m2 per person
Land		30-45m2 per person
		Min 1-1.5m between ropes of tents on all sides.
Fire breaks		A clear area of 50m2 for every 300m2 of built up area.
Roads and walkways		20-25% of site
Infrastructure:		
1 Latrine	Per	1 family (6-10 persons)
1 Water tap	Per	1 community (80 – 100 persons)
1 Health center	Per	1 camp module (20,000 persons)

1 Hospital	Per	Up to 200,000 persons
1 School	Per	Sector (5000 persons)
4 Distribution points	Per	1 camp module (20,000 persons)
1 Market	Per	1 camp module (20,000 persons)
2 Refuse drum	Per	1 community (80 – 100 persons)

Table 1: UNHCR and Sphere guidelines for camp planning (Architects without frontiers)

Overview of sustainable urbanism principles

Table 2, lists the principles of sustainable urbanism. It is important after examining the list provided to decide on the applicable points that can be utilized to relate sustainability principles to refugee camp planning, in order to be realistic in the design and provide what is necessary for refugees in the case of a protracted refugee situation, without compromising their humanitarian needs, yet not overdesigning the refugee camp.

Many of the points listed in the table are helpful design goals and strategies that could be implemented during the design process of the section in concern in the Azraq refugee camp. Such strategies are: to provide a good micro-climate, to design safe and attractive public spaces, to incorporate mixed use, to implement efficient public transit, to provide reliable walkways and paths for biking, to use renewable energy resources, to reuse and the recycle available materials, to use passive architecture techniques, to create job opportunities and encourage commercial activities, to provide common facilities, and to encourage community relations (Kasioumi, 2011).

Having the chance to study and redesign a section of the Azraq camp village, this research is concerned with applying as many possible strategies among the above listed practices in order to define a more feasible, yet comfortable and sustainable design solution for the Azraq refugee camp.

SUSTAINABLE URBANISM	Contain urban expansion	<ul style="list-style-type: none"> > impose urban growth boundary > protect sensitive areas > reuse existing land and infrastructure 	land use and urban design
	Create healthy, green environments	<ul style="list-style-type: none"> > integrate natural systems in urban environments > eliminate pollution in the air, soil, and water > provide good micro-climate and protection from noise > design attractive and safe public spaces 	
	Develop compactly	<ul style="list-style-type: none"> > build densely > incorporate mixed uses 	
	Encourage green forms of mobility	<ul style="list-style-type: none"> > implement efficient public transit > discourage car use > provide infrastructure for walking, biking, car-sharing 	
	Support renewable systems and circular metabolism	<ul style="list-style-type: none"> > use renewable energy sources > reuse system outputs as inputs > conserve resources on-site > reuse and recycle materials 	technology
	Design buildings that consume minimal resources	<ul style="list-style-type: none"> > use energy and water conservation measures > employ low-impact materials > use passive architecture 	
	Establish economic activity	<ul style="list-style-type: none"> > create job opportunities > encourage commercial activity 	community & economic development
	Create equitable, livable places	<ul style="list-style-type: none"> > provide affordable housing > provide common facilities > encourage community relations 	

Table 2: lists sustainable urbanism practices (Kasioumi, 2011)

Overview of passive architecture design and strategies

This section discusses low-income housing neighborhoods in developing countries that share similar climate conditions as the Azraq refugee camp location. The study of this section aims to understand the techniques, methods, and materials that used to be implemented before the

introduction of the different mechanical systems, especially heating and cooling systems, into the design and construction field. The study helps to find traditional ways and techniques that can be applied to refugee camp design in order to passively create a cooler micro-climate within the refugee camp living units.

One very interesting case study that is located in a similar hot dry climate zone is New Gournia village in Luxor, Egypt, which has been designed and built by the Egyptian architect Hassan Fathy. That village gained attention and interest since Hassan Fathy has applied passive architecture principles and strategies to create a comfortable micro-climate in the design of a low cost multi-family housing for the villagers living there. The village rural context and hot arid climate are similar to the Azraq refugee camp context and climate. In addition, New Gournia village's main characteristics of repeating the traditional urban and architectural settings, and the effective use of the local materials and building techniques, as well as its extraordinary sensitivity to climate problems makes it a great case study in the field of sustainable human settlement, which greatly guided the decision making in the redesign of the Azraq camp village.

Through the review of Hassan Fathy's book (Fathy, 1986), lessons are provided regarding utilizing the natural energy to provide comfortable heating and cooling conditions within the built environment. By understanding how heat, radiation, pressure, humidity, and wind, among other factors interact to establish climate conditions near the Earth's surface, the designer can reinterpret this knowledge in the micro-climate scale of the design through the application of aerodynamic principles. In addition, the proper orientation and arrangement of the buildings' elements in the space, the characteristics of building materials, and the effect of surface, texture, and color onto the designed micro-climate, are other design decisions that greatly affects the comfort level of the living spaces.

The design process of village number 7 in the Azraq camp

This section deals with the redesign process of village seven, in the Azraq camp in Jordan. This village was particularly selected to be studied and redesigned since the official proposed design provided by UNHCR for that part of the camp hasn't yet been put on ground. Similar plans for the other villages are available, however, only two of the seven proposed villages' plans have been built and currently inhabited: village three, and village six.

Before starting the redesign process, it was important to study the current proposed design of village seven in the Azraq camp, in order to identify the design decisions that were thought to be working and reapply them.

The provided architectural program in the UNHCR plans, was referenced for sizing the different service buildings, and for deciding the appropriate number of shelters that should be provided within the new plan. However, a different arrangement for the new plan was carried out.

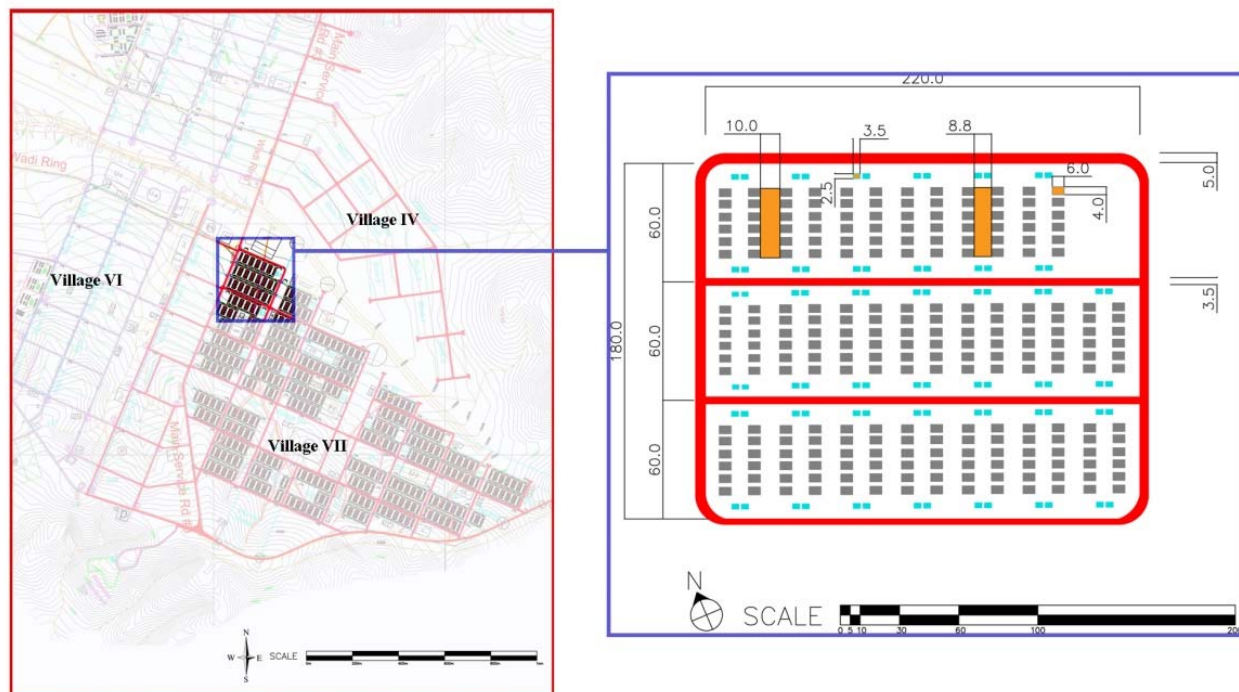
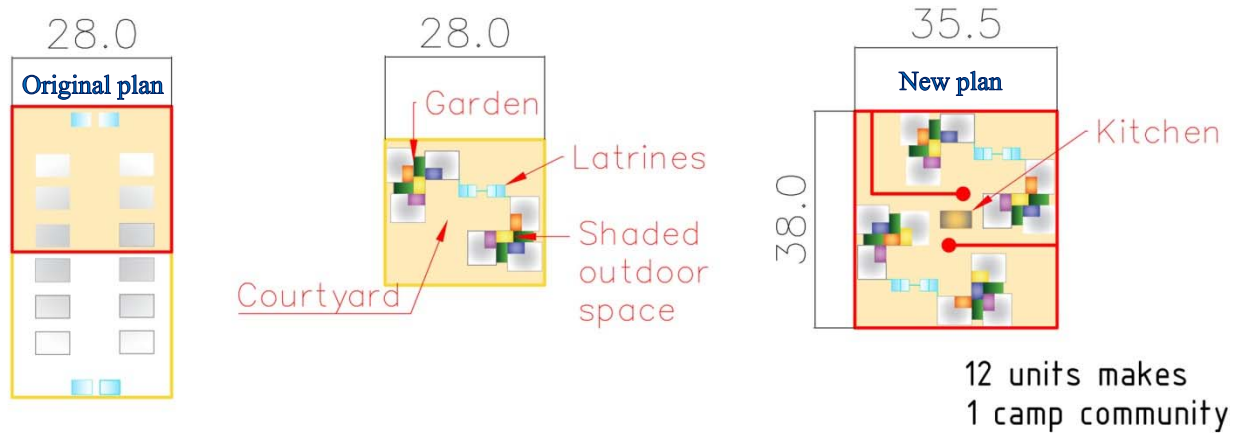


Figure 6: Analysis of the official proposed plan of one camp block of village 7 in Azraq camp (Self)

Figures 6 & 7 show the analysis of the original proposed plan for a camp block, and a camp community.



(Figure 7) Analysis of the official proposed plan vs. the newly designed plan (Self)

Compared to the old design with a row arrangement of the units, the new arrangement of the open space in between the shelters contributes in creating a better micro climate. The courtyards in the new arrangements act like reservoirs of cool air that prevents the cold air from being swept away by the desert's dry, hot wind.

The new plan takes into consideration creating a sense of community, safety, and ownership of the open space formed within the arrangement of the sheltering units.

Parts of the open space created within the arrangement of the six shelters are proposed to be shaded using recycled material. Tents that were used in the Zaatari camp before being replaced with caravans, are suggested to be reused to create a tent-like roof system that shades the shelter and part of the open space from the direct sun. The tent-like roof is proposed to be angled in different directions, allowing for vertical space between them. The intention of that decision is to mimic the wind catchments that redirect the wind into the space as necessary. Figure 8 shows the proposed idea of the proposed tent-like roof.



Figure 8: The simulation of the proposed idea of using a tent-like structure from recycled materials (Self)

The arrangement of the single shelters to create usable open space in the middle of each module is carried out to be applied on the masterplan level where 40 modules, are arranged together to create one camp block, the camp block will be centered with a larger courtyard, where people can gather and conduct different activities and businesses as shown in figure 9. This arrangement multiplies the available space and creates a more useful one.

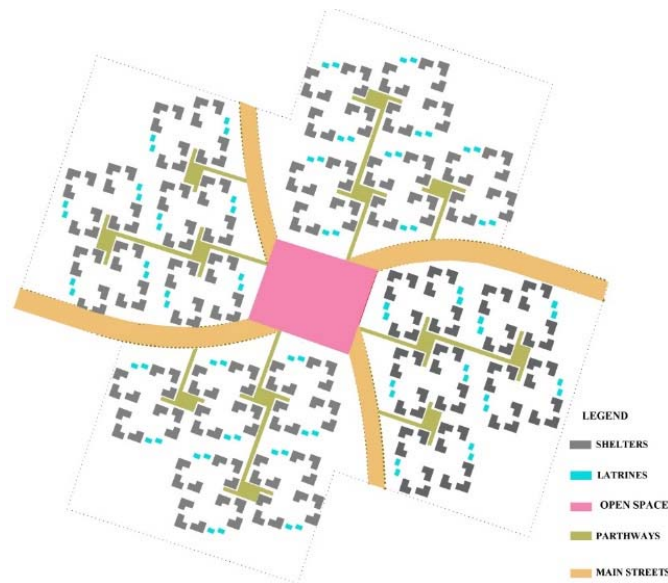


Figure 9: One camp block arrangement (self)

In addition, the new arrangement provides hierarchy of spaces as the design was applied from the single module to the block and consequently to the masterplan level. This bottom up

approach is favorable when dealing with urban plan design. The arrangement of the camp blocks within the masterplan involved the study of the best way to distribute the services within the camp, should it be centralized, decentralized, aligned with a certain axis or with the circumference of the camp. Each choice brings up some advantages and disadvantages. Assessment can be made based on the convenience, sense of safety, access, and other factors. Figure 10 shows how the services were distributed within the camp.

As shown in figure 10, the main road was planned to connect village 7 with the neighboring villages and the base camp. This road is the only road that permits the use of vehicles. It is considered the backbone of the village. Along this road, the different services are distributed to establish the business center of the village, where market places and workshops keep that road busy, and create a safe gathering space while people find their needed services.

Job opportunities are suggested in this plan through the inclusion of many workshops within the plan, and locating these workshops along the proposed commercial road where they become part of the business center of the village. These workshops will produce a wide range of items and provide different services to cover many needs of the refugees.

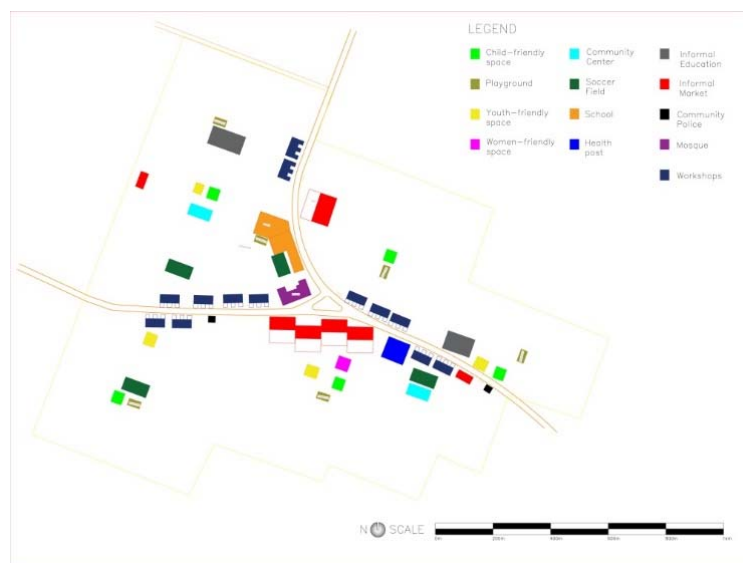


Figure 10: Distribution of services within the camp (self)

In addition, workshops provide places where skills can be obtained or developed by younger refugees in the camp who are looking for ways to make living, or who were forced to stop their education to support their families.

Other services, such as the child friendly spaces, playgrounds, and community centers, are distributed in a way to minimize the walking distance to the closest one, so that they serve the whole community in different locations and are away from the main business center and closer to the living areas.

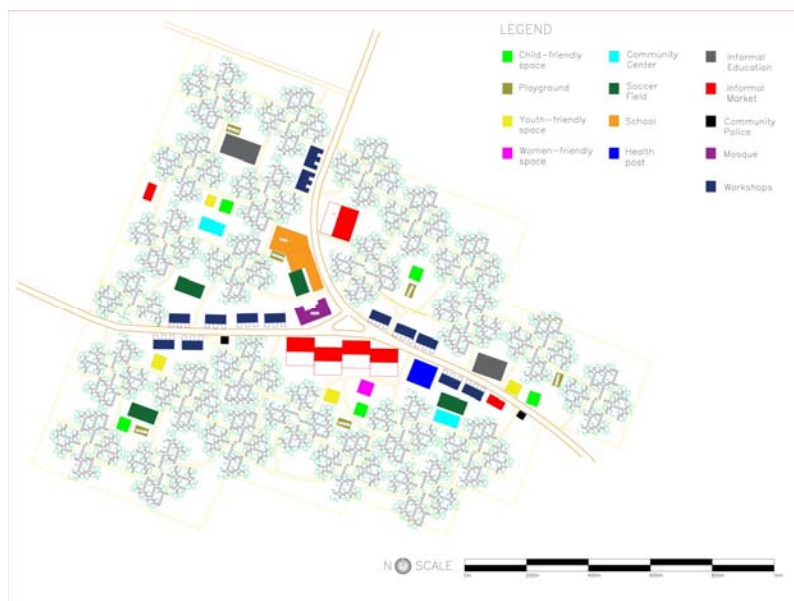


Figure 11: The new proposed masterplan for village 7 in Azraq refugee camp (self)

The final proposed masterplan of village number seven is shown in figure 11. The figure shows the distribution of services diagram (figure 10) superimposed on an arrangement of camp blocks modules (figure 9).

Conclusion

While most current refugee camp designs take the UNHCR recommendations and regulations into consideration, such designs are only minimally inspired by the context and the climate in which these camps will exist. Therefore, there is dire need for camp designs and models that takes into account the various contextual, cultural, and economic needs of a proposed refugee camp. Additionally, applying the latest affordable, yet innovative design solutions (such as taking advantage of the available natural energies or using newly developed and recycled materials) is strongly encouraged and will likely be beneficial when designing refugee camps.

Furthermore, taking a long –term perspective when designing refugee camps, prevents the camp from failing short after it has been established. In addition, providing adequate work opportunities for refugees likely will ensure a more productive community that is less dependent on support from humanitarian organizations’.

Needless to say, the above mentioned recommendations need to be evaluated in a systematic fashion by experts in this field in order to determine their utility. The only way to truly assess the efficacy of these recommendations would be testing the proposed design in a “real life” situation and applying a thorough multi-disciplinary assessment to the strengths and weaknesses of the suggested model and modifying it accordingly.

There is no doubt that preventing and solving the political conflicts leading to refugee crises is the most ideal solution for this epic problem that burden numerous areas across the globe nowadays, and cause misery to people who are forced to leave their homes. In this paper, however, we aimed to shed light on few potential urban design solutions that mainly target the humanitarian aspect of the problem and may help ensure the dignity and provide some quality of life to the refugees.

References

- Allen, K. (2013). Beyond the tent: Why refugee camps need architects now more than ever.
Retrieved from <http://www.archdaily.com/435492/beyond-the-tent-why-refugee-camps-need-architects-now-more-than-ever>
- Dalal, A. (2015). A socio-economic perspective on the urbanization of Zaatari camp in Jordan.
Migration letters journal, 12 (3)
- Fathy, H., Sultan, A. A. (1986). *Natural energy and vernacular architecture: Principles and examples with reference to hot, arid climates*. Chicago: University of Chicago press.
- Herz, M. (2012). *From camp to city: Refugee camps of the western Sahara*. Switzerland: Lars Muller Publishers.
- Kahera, A., Anz, C. (n.d.). The life and death of the post-war Islamic city: Critical environmentalism and the practice of reconstruction.
- Kasioumi, E. (2011). Sustainable urbanism: Vision and planning through an examination of two model neighborhood development. *Berkeley planning journal*, 24 (1), 91-114
- Kennedy, J. (2004). Towards a rationalization of the construction of refugee camps.
- Kennedy, J. (2005). Challenging camp design guidelines. *Forced migration review*, 23, 46-47.
- Masad, D. (2009). Moving Towards Self-Reliance: Living Conditions of Refugee Camps in Lebanon and Opportunities for Development (Doctoral dissertation, California Polytechnic State University San Luis Obispo)
- Reznick, A. (2015). Jordan's Azraq Syrian refugee camp stands largely empty. Retrieved from <http://www.aljazeera.com/indepth/inpictures/2015/05/jordan-azraq-syrian-refugee-camp-stands-largely-empty-150526084850543.html>

Slater, J. (2014). Urban systems of the refugee camp. *Architecture thesis prep*. Paper 272.

Retrieved from http://surface.syr.edu/architecture_tpreps/272/

Sphere project. (2004). *Humanitarian charter and minimum standards in disaster response*.

Geneva. Retrieved from <http://www.sphereproject.org/resources/download-publications/?search=1&keywords=&language=English&category=22>

U.S. Department of State. (n.d.). Protracted refugee situations. Retrieved from

<http://www.state.gov/j/prm/policyissues/issues/protracted/index.htm>

UNHCR. (2000). *Handbook for emergencies*. Geneva. Retrieved from

<http://helid.digicollection.org/en/d/Jh0216e/6.2.html>

UNHCR. (2015). Worldwide displacement hits all-time high as war and persecution increase.

Retrieved from <http://www.unhcr.org/news/latest/2015/6/558193896/worldwide-displacement-hits-all-time-high-war-persecution-increase.html>

UNHCR. (2016). Refugees in the horn of Africa: Somali displacement crisis. Retrieved from

<http://data.unhcr.org/horn-of-africa/region.php?id=3>

UNHCR. (2016). Syria Regional refugee response: Zaatari refugee camp. Retrieved from

<http://data.unhcr.org/syrianrefugees/settlement.php?id=176&country=107®ion=77>