Empowerment Through Architecture

Designing Refugee Habitats to Empower Rohingya Refugees in Kutupalong, Bangladesh.

A Design Thesis by Laura Salmela

EMPOWERMENT THROUGH ARCHITECTURE

DESIGNING REFUGEE HABITATS TO EMPOWER ROHINGYA REFUGEES IN KUTUPALONG, BANGLADESH.

A Design Thesis Submitted to the
Department of Architecture and Landscape
Architecture Of North Dakota State University

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ABSTRACT

According to the United Nations High Commissioner for Refugees, 602,400 Rohingya refugees reside in the Kutupalong-Balukhali Expansion Site. Located along the coast of south eastern Bangladesh, the camp has become a haven for the Rohingya, a Muslim ethnic minority who have fled their native country of Myanmar. When Myanmar broke out in violence on August 2017, 671,000 Rohingya were forcefully and violently driven out of their homes by the government. This influx of refugees fled into Bangladesh within a single year, most arriving to the Kutupalong camp within a two-month window. With rapid vigor, a camp of approximately 14,000 people sprung to an excessive 602,000 almost overnight. Camp standards regarding space and infrastructure were not kept. Proper sanitary methods, standards of living, roads, bridges, and structural stability from landslides were all compromised to care for the basic needs of 600,000 people. As a result, Kutupalong also claims the title of the world's most densely populated refugee camp. As humanity, we have a moral responsibility to respond to this global crisis and the Rohingya people affected by it. As architects, we especially have a unique opportunity to respond to this issue with our design skills, understanding of global sustainability, and compassion. This design thesis will use the existing Kutupalong refugee camp in Bangladesh to insert new infrastructure, community facilities, and central nodes into the refugee habitat, thus creating an operational and empowering city. Due to Kutupalong's pre-existing structure, an organic configuration of densely packed dwellings situated atop the hills of the camp, the decision was made to work with what is present, versus demolishing and starting fresh. This incision into the camp will be done in such a way as to create a habitat based on the principles of a city for the Rohingya community. It should empower refugees by providing access to transportation, communication, jobs, education, and autonomy. Through the analyses of precedent studies, this thesis design will use the research gleaned from existing camps to insert new design elements which empower Rohingya refugees.

Image taken from Google Maps of Kutupalong Refugee Camp

THE INTERNATIONAL REFUGEE CRISIS

This thesis project explores the insertion of architectural design into the refugee habitats of the Rohingya minority group. Empowering international refugees and mitigating the refugee crisis are the overarching goals of this project. Refugees are people who have forcibly fled their own country to seek protection in another country. (Refugee, 2010) Persecution based on ethnicity, religion, or political views, terrorism, political unrest, natural disaster, and climate change are a sampling of the causes people are forced to flee their home country. Currently, the amount of displaced people seeking haven in a country other than their own is the highest it has been since world War II. There are 68.5 million people forcibly displaced worldwide, 25.4 million of these being refugees. (UNHCR, 2018) Most of the world's refugees are in haven countries, or countries adjacent to refugee's home countries. They reside in large camps where they receive public aid, housing, and food from external aid organizations. Often, an influx of displaced people results in poor living conditions with small food rations and temporal housing units. (Betts, 2017) Originally created as a safe haven from violence and persecution, these camps have become a prison of immobile life and reliance on outside sources for aid and food. When we consider that the average amount of time spent in camps is 17 years (Refugee, 2010), it makes this fact even more bleak. As architects and designers, we have a unique opportunity to be an active part of global response and change.

DEVELOPMENT OF THE THEORETICAL STATEMENT

THEORETICAL DEVELOPMENT

In the preliminary stages of developing a thesis statement, the initial question regarding the design of refugee habitats revolved around the idea of assimilation into host societies. With more research, it transformed into the question of How can be better integrate refugees into their host societies? After reading the book Refuge, by Betts and Collier, a knowledge base was further expanded. The reoccurring issue with the design of refugee camps is that they are built for the temporal, not for permanence. Instead of investing in the people of these camps, only people's immediate needs are cared for. This entails giving rationed food and temporary shelters.

This thesis design will look at the long-term goal of investment. Investment in the built environment leads to investment in refugees. By proposing the idea to integrate design elements into the framework of the Kutupalong refugee camp, the result should be an empowering city model. the greatest impact. The city was chosen as a model because of their self-sustaining nature. Complete with unique cultures, entertainment, education systems, services, and economies with jobs and resources, cities are a complex interdependent example of autonomy. By designing a city where refugees have access to jobs, education, entertainment, and religious connections, they build a sense of dignity, purpose, and self-reliance. Ultimately, they become less dependent on global aid and become less of an economic burden on host countries.

RESEARCH METHODS

Because the theoretical premise is based on a subjective worldview in which the world changes through people's perspective, beliefs, and thoughts, it is believed that refugee habitats should be better designed to enable individual and community empowerment. Through a qualitative research method, I seek to gain knowledge concerning why refugee camps are failing to meet more than the bare minimum of people's needs. Analyzing case studies, scholarly books, and articles on the subject will be the main strategies I use to acquire and validate my knowledge. Using inductive reasoning, I will analyze the known realities of current refugee camps which are good examples of empowering refugees and examples which fail to do this. Based on this knowledge I will produce a better solution of what an empowering refugee habitat should be.

PERSONAL INVESTMENT

I am personally invested in this topic because of my passion to learn about and understand different cultures. My numerous international friends are a valuable part of my life. My goal was to pursue a thesis which has international impact and impacts people from backgrounds different than my own. The area of refugees was of specific interest to me because it lies in the realm of social impact architecture and the empowerment of human dignity in design.

PROJECT TYPOLOGY

URBAN DESIGN / URBAN INFILL

The project typology for this design thesis is a medium city. Utilizing the existing Kutupalong refugee camp, which is home to 602,400 Rohingya, the design will strategically infuse elements of a city into the camp. It essentially is the re-working of the infrastructure, transportation, and organization of the Kutupalong camp. Due to the high density of the buildings and structures of the site, the typology can be seen as urban infill. Working around and with the existing structures present in Kutupalong, the design will integrate the principles learned from precedent research into a city model.

MAJOR PROJECT ELEMENTS

- Central Nodes/Nuclei.
These will be various community facilities. Each will be based on the needs of the local community in a certain area. They will include mixed typologies including:
    - Community Based Education/Career Center
    - Religious Buildings
    - Playground/Interactive Space for Children
    - Gathering/Community Space
    - Innovation Center (engineering/mechanic/computer/teaching/learning)

- Health Care Centers

- Development of Master Road System. (connecting communities with the whole of the city)

- Marketplaces

- Allocated Farming/Agricultural Space

- Integration of Individual/Family Unit Gardens

- Official Offices for Volunteer/External Staff (UNHCR)

- Reception/Assessment Centers within each Camp District

- Plan for Sustainable Additional Growth of Camp

USER/CLIENT DESCRIPTION

The users of this project are the internationally displaced Rohingya population. They are an ethnic and religious minority of the Rakhine State of Myanmar. Due to the nature by which they are being displaced, they are an extremely sensitive population. They have unwillingly been driven out of their homes violently and horrifically. They have left almost all possessions behind and are in need of protection, health care, food, clothing, and shelter. In addition to material needs, many will need emotional counseling to recover after witnessing and experiencing traumatic events.

According to UNHCR, 42% of the population are between 18-59 years, 23% are between 12 and 17 years, 14% are between 5 and 11 years, 15% are between 1 and 4 years, and 3% are older than 60 years. Essentially the majority of the Rohingya population in Kutupalong are in the middle years of their lives.

In addition to refugees, another client will be the Non-governmental organization (NGO) which oversees these refugee habitats. It can be an external relief organization, a representative organization from the host country, or most commonly, UNHCR (United Nations High Commissioner for Refugees). UNHCR is the overseeing organization in Kutupalong. Ultimately, UNHCR will be the organization in charge of implementing, approving, as well as utilizing the final design.

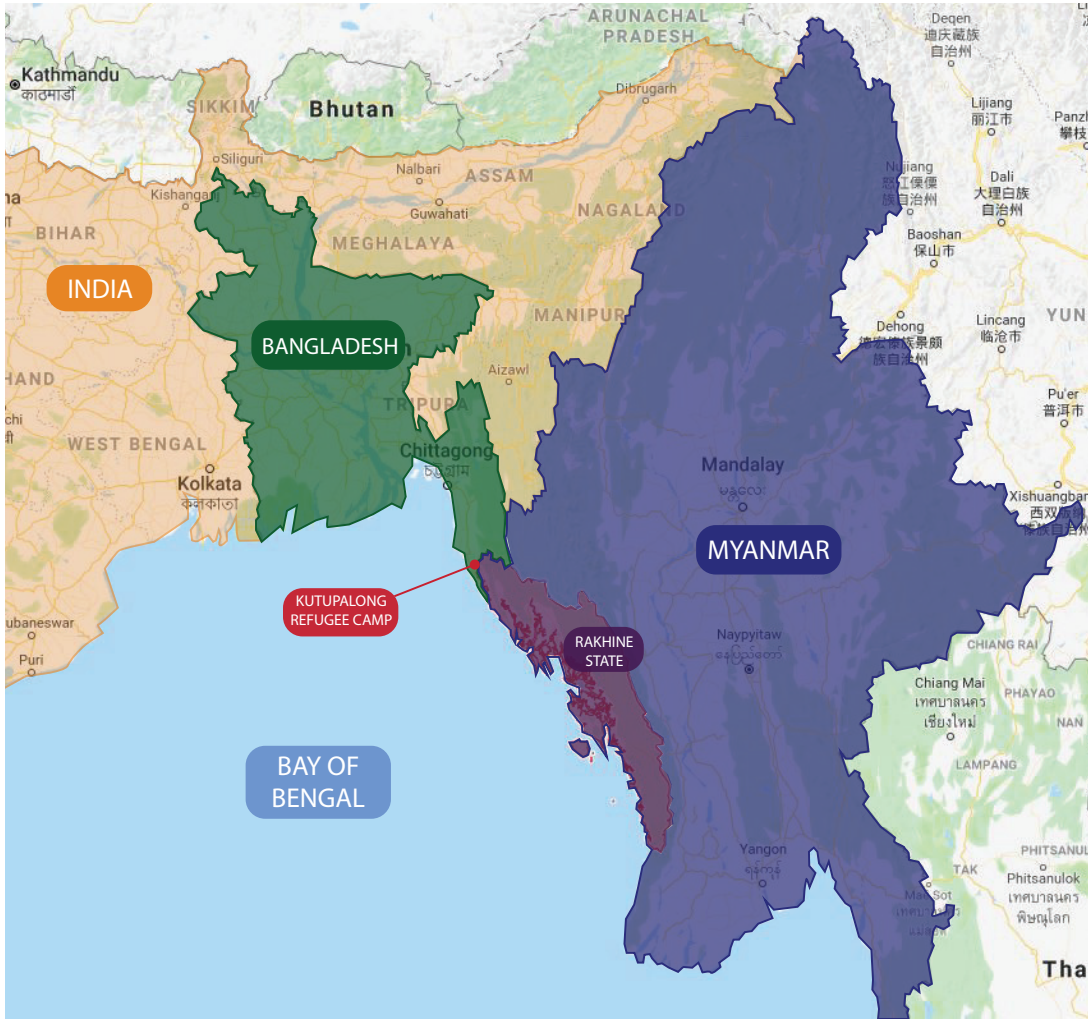
UNHCR
The UN Refugee Agency

Rohingya Women

KUTUPALONG REFUGEE CAMP, BANGLADESH

Bangladesh is a country in south Asia, which is bordered by India to the north and west, Myanmar (formerly Burma) to the east, and the Bay of Bengal to the south. It has a tropical climate, which consists of heavy seasonal rainfall and high temperatures and humidity. Bangladesh cycles through three distinct seasons; hot, humid summers, cool and rainy monsoon season, and a cool, dry winter. One of the greatest issues related to climate is its flat countryside flooding during the monsoon season. Due to its proximity to the Bay of Bengal, it receives large amounts of rain and is at risk for tropical cyclones during monsoon season.

Bangladesh's is the only land border with the Rakhine State of Myanmar This has led to a mass exodus of 640,000 Rohingya refugees fleeing their home Rakhine State to seek safety in Bangladesh's Kutupalong refugee camp. Kutupalong's location along the south-eastern coast of Bangladesh leaves it especially vulnerable to flooding and cyclones during the monsoon season.



Regional Map

Figure 1.

KUTUPALONG REFUGEE CAMP, BANGLADESH

Kutupalong Refugee Camp in Bangladesh was chosen as the site for this project for various reasons.

- Bangladesh is a haven country for the Rohingya fleeing Myanmar. This means it is a country which, because of its proximity to a politically unstable country, becomes the host for refugees fleeing their country. Haven countries typically have similar cultural values, religions, worldviews, climates, and economies to the country which people are fleeing from. Therefore, it is easier for refugees to adapt a way of life which is similar to the one they lived in their home country.

- The huge mass of refugees which reside in the Kutupalong Refugee camp provide a unique challenge and opportunity in achieving the design goal of empowering refugees and creating autonomy.

- The pre-existing urban fabric of Kutupalong makes it an opportune site to develop a method of city integration into a current refugee camp. The overall layout of the camp is predetermined by the refugee's organic development and placement of elements. This will provide a framework to work alongside in the design.

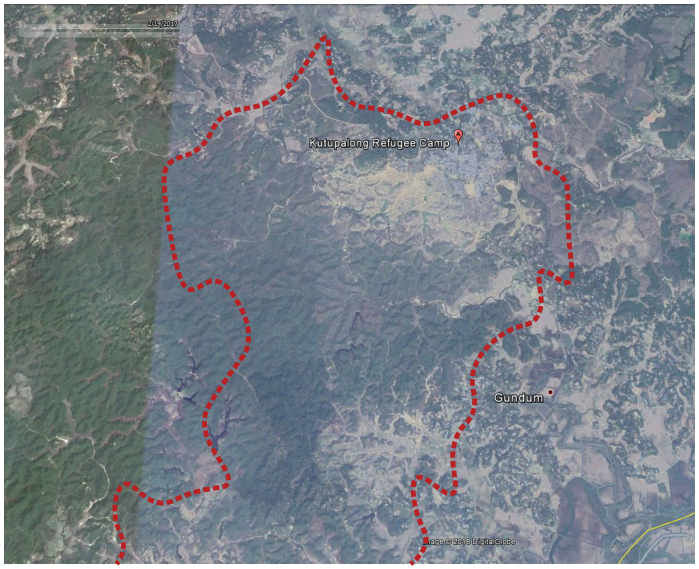


Figure 2. Kutupalong. May 2017

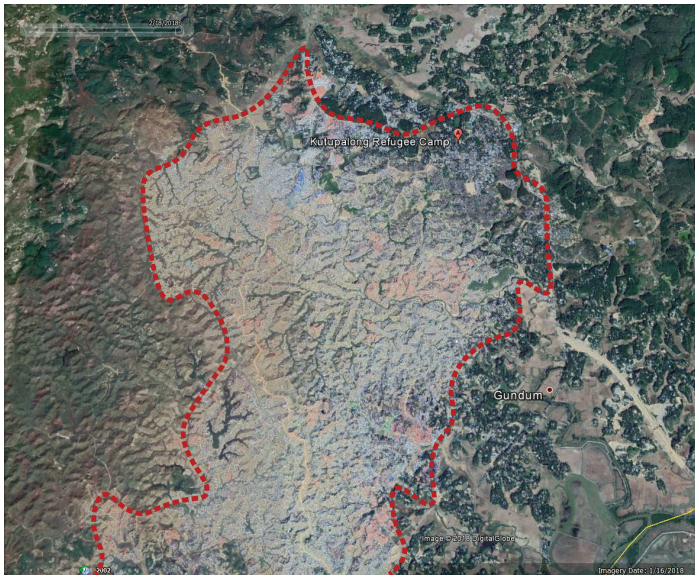


Figure 3. Kutupalong. February 2018

Comparison of the amount of land used by refugees after the influx from May 2017 to February 2018.

Figure 4. Context Map

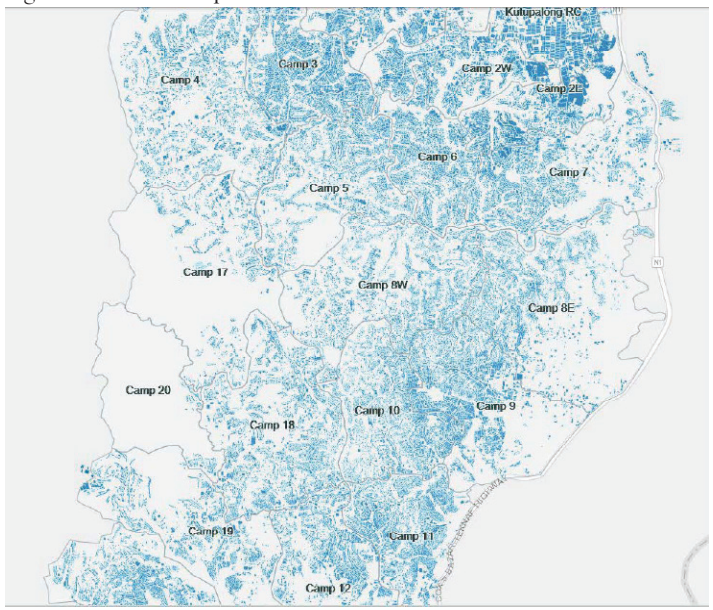
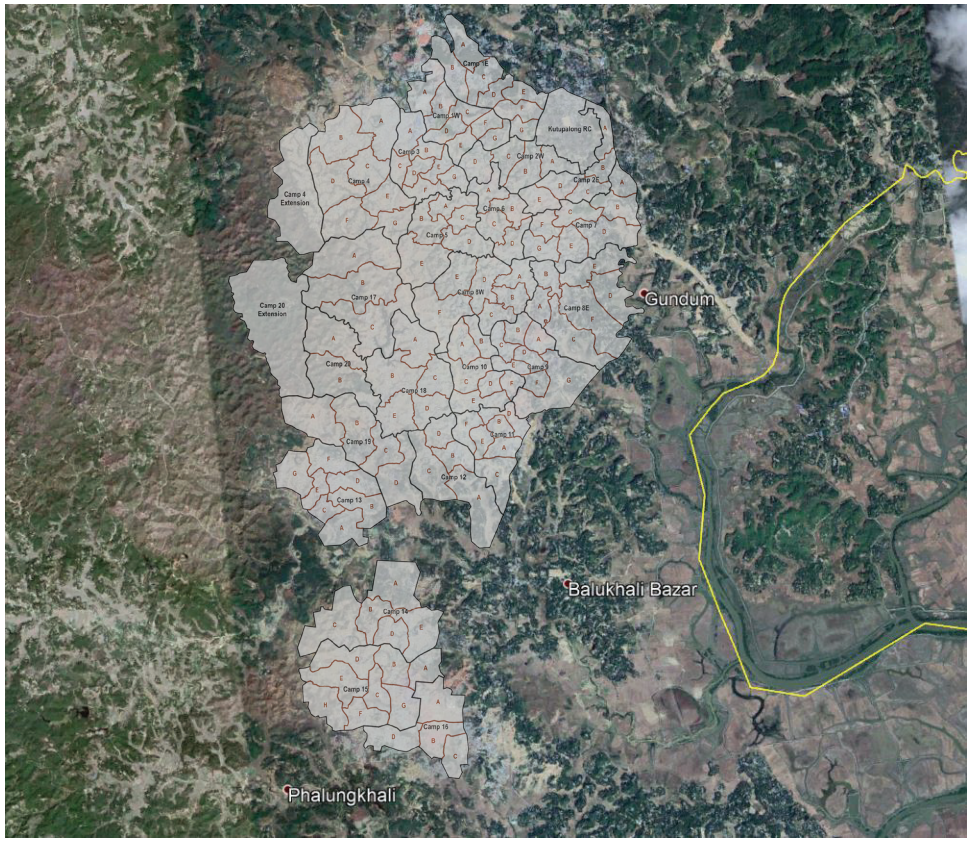


Figure 5. Existing Shelters of Kutupalong

Figure-Ground of
Existing Shelters and
Structures in Kutupalong.



Site map of the various districts within
the Kutupalong Refugee Camp

PROJECT EMPHASIS

1. Insertion of Community and Family Centers.

These centers should be within proximity to each set of communities, easily accessible, and within walking distance to every family unit. The design of these community centers, their location, and connections with residents will be of particular importance.

2. Development of Infrastructure.

Though there is existing infrastructure in the Kutupalong camps, it is minimal. It includes main roadway bridges, fresh water pumps, and bathroom facilities, which are often too close to water pumps. There will be an emphasis on developing the existing infrastructure to provide a proficient amount of roadways for all to safely navigate the camps, opportunities to build and reinforce existing shelters, provide adequate fresh water, connections to electricity and communication tools, as well as adequate and safe bathroom facilities.

3. Focus on Sustainability.

The Kutupalong camp's rapid and intense growth resulted in the loss of approximately 2,500 acres of Bangladeshi forest. This project seeks to combat this loss through the redevelopment of the forest's vegetation. It also seeks to reduce deforestation which often happens through land use for shelters and the gathering of firewood. This project also seeks to develop and implement sustainable energy resources within the camp. These sources are more renewable, better for the environment, and provide an easier way to bring electricity to the camp.

4. Cultural Relevance in Design.

The project seeks cultural relevancy in its designs. This includes understanding and referencing cultural values in both the project's organization tactics and individual units. Family and community life structure should have an immediate impact on the organization and placement of elements in the camp. Materials should reflect the values and customs of the Rohingya, as well as respect and pay homage to their homes. Resources and materials should be sourced locally and sustainably where possible.

5. Creation of a Master Plan.

A master plan will be completed which connects infrastructure, community centers, and individual family dwellings. The insertion of elements into the fabric of the existing camp should enable a functioning city in which all parts work together to enable autonomy.

GOALS

The main design goal is the empowerment of Rohingya refugees. As a design, it should prioritize dignity and autonomy among habitants. This should work directly alongside the priority of basic human rights and material needs.

Cause the audience to look at refugees in a new light. Instead of pity or dehumanization, I hope to promote a view of refugees as capable, resilient, and talented.

Promote global awareness and architecture's potential to make an impact worldwide.

Design refugee habitat elements which can be implemented in various circumstances and which have the opportunity to change and grow according to user's needs, cultural factors, and climate.

Design should benefit both refugees and host countries. These benefits should be measured economically, culturally, and psychologically (well-being).

The project should be culturally and environmentally responsive. It should specifically be centered around community and family.

Design should enable access to the global market (enable refugees to work).

Design should make the most efficient use of finances and materials

PLAN FOR PROCEEDING

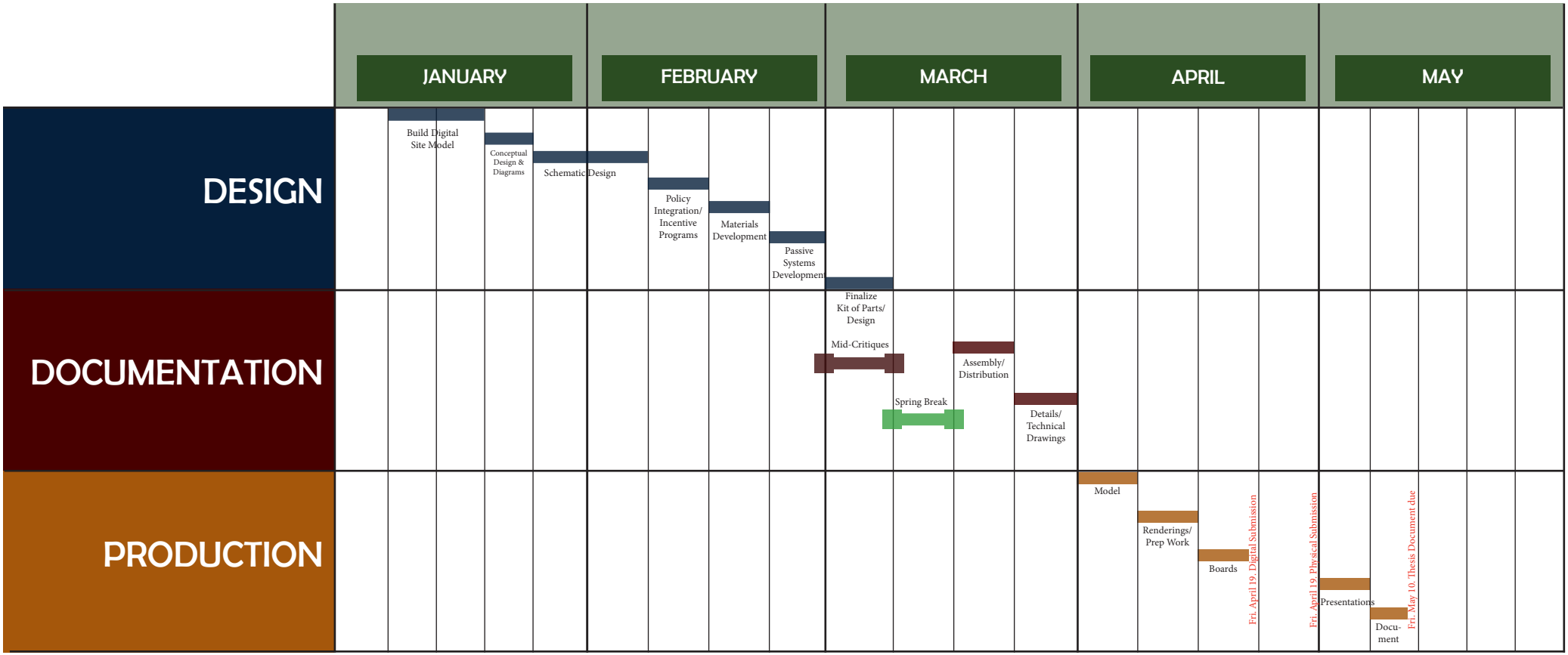


Figure 6. Plan for Proceeding

LITERATURE REVIEW

Manual of Tropical Housing and Building
Koenigsberger, O. H.; Ingersoll, T. G.; Mayhew, A.; Szokolay, S. V.

A handbook for environmental systems in tropical regions, this book gives great examples of passive design strategies for hot-dry and warm-humid climates. Fitting the warm-humid climate of Bangladesh, the book gives a synopsis of the climate, indigenous design responses, optimal configurations, passive strategies, and building materials.

Below are the strategies which will be implemented in the proposal for Kutupalong.
The dominant characteristics of a warm-humid climate are the presence of hot, sticky, humid conditions and the constant presence of dampness. Little seasonal variation is present throughout year. The primary change is the enhancement or decrease of rain and intense storms. Air temperatures remain moderately high, with little change at night. However, air temperatures rarely exceed normal skin temperature.

These conditions are prevalent in Kutupalong and have led to many of the paralyzing issues within the camp. For example, the rains which come with monsoon season are intense and strong for a couple months, causing the landslides and flooding which have the greatest sense of urgency within the camp. High air temperatures and heavy humidity promote an overall uncomfortable and trapping feeling in dense living conditions. This is only heightened by the presence of inadequate access to sanitary standards. Traveling long distances to facilities for basic necessities within these climatic conditions is also not ideal.

Humidity within warm-humid climates is quite high, with a consistent relative humidity of 75 percent.

Precipitation is high throughout the year as well. There are a few consecutive months of extreme rainfall and storms.

In a densely packed refugee camp, these conditions create disaster. Especially when adequate infrastructure and structural supports are not prevalent. Consistent rainfall can heavily damage and erode living spaces. Especially with the rapid rate of arrival and development within the camp, intense rains and flooding creates an extra set of problems when attempting to locate space and homes for people to dwell.

Sky Conditions remain relatively cloudy throughout the year. Cloud cover ranges from 60 to 90 percent. Solar radiation is partially reflected and partially scattered by clouds and high vapor content in the atmosphere. Radiation which reaches the ground is diffuse but strong, creating intense sky glare. Heat does not disperse well at night, due to the high humidity and vapor content.

Sky conditions which partially shade from the sun can be a positive factor. It mitigates the sun's intense rays and light, providing small measures of visual, psychological, and physical relief from the sun and elements.

Wind typically blows in low velocities. However, intense, strong winds occur during rain storms and squalls. Theses winds are a major factor to consider, especially when shelters are of basic design and structure, easily uprooted by intense gusts. Adding heavy rainfall to this wind intensifies the circumstances, namely flooding and landslides, creating greater risks for structures.

Due to the constant presence of rain, moisture, and high temperatures, vegetation flourishes and grows quickly. It can be difficult to control because of the ideal growing conditions. Soils are typically poor for agriculture. Concentrated plant cover reduces reflected radiation, decreasing the heating of the ground.

Due to the rampant rate of deforestation, the natural ecosystem of tropical rainforest has essentially vanished in the Kutupalong refugee camp. Reduction of ground temperature, soil stability, and air filtration have been lost. By re-introducing vegetation, the habitat can regain these benefits once again. Poor soil conditions make it difficult to grow crops and produce food from the ground. Agricultural is a promising possibility for development and autonomy. It is a way for refugees to produce a needed resource which goes directly to them and their families. It provides a sense of ownership to provide food for yourself, family, and community. The presence of steady rain, moisture, and atmospheric conditions make this the ideal climate to grow vegetation and agriculture. However, the poor soil conditions make it difficult to sustain and maintain agriculture. Therefore, the design will propose hydroponics systems. Hydroponics is a system which grows plants without soil. It utilizes nutrient filled water to produce vegetation. Plants are suspended in the water by an insert, providing support and oxygen to the plants. This would provide the means to grow agriculture without the need for soil, which isn't a viable option in the environment.

LITERATURE REVIEW

A New Beginning. Refugee Integration in Europe.
UNHCR

This article, published by UNHCR, looks at refugee integration in Europe. Though this research project does not revolve around integration, a few key findings which were relevant to my topic of study include:

1. "The individuality of each person's integration process is particularly important for refugees who arrive in EU Member States from very different individual backgrounds. Challenges can only be addressed if refugees are recognized as individuals, rather than as a homogenous group for whom the same interventions are envisaged as applicable".

Every refugee is different. They face different situations, challenges, and needs. They are from different backgrounds, cultures, worldviews, and climates. Therefore, there is not a "one size fits all" solution to the refugee crisis. Responses should constantly be changing and adapting to refugee's issues. Therefore, it is vital to have a comprehensive understanding of the refugee phenomenon, as well as a great understanding of the refugee population one is designing for, as well as the site.

2. "The transition from asylum-seeker to refugee is a particularly stressful time for refugees because many do ors open at this point, including full rights to work, access to structured language courses, and access to housing."

3. "Employment was the key concern for refugee respondents."

Most refugees are refused the right to work in host countries. The fact that employment is such a concern is not surprising. In order for people to live, they need to have a way to make money and bring in revenue. The fostering of employment and access to the financial market should be a top priority when integrating design into Kutupalong.

4. "Refugees frequently suffer under – employment. Downward professional mobility was particularly hard to cope with for those refugees with qualifications who may suffer downward social, as well as professional, status."

Even when given the chance to work in a host country, the policies surrounding employment for refugees are limiting. Is there a way to create employment centers based primarily on the refugee population, their needs, qualifications, and employment standards? Build these employment centers inside the refugee habitats? Create and encourage markets within the camps?

5. "Language was found to be a key influence on almost every policy area, and the level of language tuition was widely stated to be too low for practical use."

Is there a way to promote the learning of the language? Integrating the language into the existing culture of the refugees? Rohingyan refugees could benefit by learning the local Bengali language to communicate for commerce and political reasons.

6. "Compared to wider migrant groups and the receiving population, refugees struggle to access appropriate, secure, suitable and affordable housing."

The article points out that refugees differ from any other migrant population because of their specific needs. These include "loss of the protection of their country; their experiences of persecution or armed conflict; their particular difficulties obtaining documentation; and the separation and loss of family which often follows as a consequence of flight." …"Measuring the impact of integration policies on refugees without an understanding of their particular needs may lead to misguided policy development and to lack of crucial support needed to avoid long-term dependency, marginalization and isolation of refugees."

This shows yet again that before any sort of policy, design, or proposition is made, it is vital to understand the context and population of the specific refugee population. If this is not done, it runs the risk of hurting the population more than helping it. If the design makes them more dependent on external aid and sources, it has failed at accomplishing its goal of autonomy.

Rohingya Girls. Source: UNHCR

Through an inductive approach, I have analyzed specific refugee camps to glean knowledge and understanding of why they have failed to meet the needs of empowerment, or what has been an example of empowerment within camps. In addition to these case study analyses, numerous scholarly articles and books were reviewed.

Findings show that refugees thrive and have the greatest sense of autonomy when they are **given the chance to design their homes and communities**. They know what their specific needs are, therefore they have the best chance of designing **relevant architecture** for their community. **A sense of pride** is present when refugees invest in their homes or shops. However, it is important to implement a master plan or set of guidelines which ensure designs follow guidelines that are safe, efficient, and environmentally conscious.

Infrastructure is a key component in all refugee habitats. The lack of adequate infrastructure can be devastating. It creates a lack of the most basic material needs, such as water and personal hygiene, hinders the mobility of people, creates health issues, and leaves a sense of powerlessness. Providing adequate infrastructure will be of utmost importance in the final design.

Refugee camps can be **sprawling complexes which eat up land**. In some locations, this does not have a pressing effect on the land and host country. However, when refugee habitats develop on valuable land, this can become a pressing issue. For example, the intensely packed Kutupalong refugee camp in Bangladesh has demolished precious forest land to make room for shelters and occupants. Addressing this issue of sprawl will be another aspect that should inform my design.

In addition to these issues, I have found multiple notions which I **seek to avoid** in my project. This includes **rigid, gridded architecture that does not belong and is not relevant to the location and culture**. For example, Al Azraq is the first designed refugee camp. It implements great passive energy systems, but the individual shelters are all the same white, metal box. They are set up in rows similar to a military base or prison. My project will seek to avoid this kind of architecture. Instead, the project should utilize local materials, building construction, and cultural values.

MAJOR ISSUES REFUGEES FACE

Food

Distributed exclusively by external aid sources. When there is a shortage or rations by institution, refugees have no option other than to go hungry. If each refugee camp was provided with a source of agriculture than can be grown locally it would help alleviate this issue. It would also provide a source of income for individuals and a market within the camp. It also has the possibility of creating a market and supplying food for the host country.

Currency

If it is illegal for refugees to work, how do they have a source of currency, barter, and trade? Is there a way to create a source of currency within the camp?

Skills

There is either a lack of, or no way to utilize skills. Education can be a great way to teach people skills. These include construction, agriculture, teaching, entrepreneurship, health care, mechanical skills, communication, and politics.

Bias/Stereotypes

The rest of the world and host countries typically see refugees as someone they need to rescue, instead of giving them the chance to rule and determine their lives.

Settlement.

When refugees are not allowed to leave camps and are not given the options for development, the idea of "brain waste" takes place. This is essentially the loss of an entire generation because they have not means to contribute to society. Refugees have no way of controlling how long their stay will be in a refugee camp. What will stop them from living their whole lives in the camp? How can architecture promote advancement and development for refugees?

PASSIVE AND SUSTAINABLE APPROACH

Source: Dissolve

Passive design strategies are very efficient, as they utilize energy sources which already exist. We are surrounded by energy from nature; namely the sun, wind, and atmosphere. By utilizing these resources, many energy and comfort needs can be met. Exploiting these resources often takes the form of simple measures, such as deliberate choice of building orientation, shape, openings, and materials. If these strategies are implemented from the start, it is typically no or low-cost increase for great future benefits. With resources and finances short in refugee camps, utilizing as much as the earth can offer will have substantial benefits. These can be seen financially, environmentally, and psychologically. People typically prefer natural spaceswith access to the elements.

EMPOWERING CITY MODEL

Dhaka, Bangladesh

A city is the model for Kutupalong due to their self-sustaining nature. Cities provide their own facilities and systems to their residents. They also contribute back to the economy and culture of host countries. The vision is to create a general master plan for Kutupalong. From this, individuals can exercise their own creative and entrepreneurial freedom. There will be a set of guidelines which must be met to facilitate the greater good, character, and health of the city.

The following is a set of elements prevalent in cities, which should be implemented into Kutupalong. They are broken up into two categories; tangible and intangible.

HARD. Physical/Tangible:

- Infrastructure:
  - -Fresh/Potable/Drinking Water (Hydration & Sanitation)
  - - Sewer/Waste System
  - - Power Supplies/Electricity
  - - Transportation. Roads/Bridges
  - - Telecommunications (Internet, -Wifi, Telephone Service)
  - -Trash Removal (Recycling)
- Healthcare
- Law Enforcement
- Education
- Emergency Systems (Crisis Plans)
- Recreational Facilities & Entertainment
- Sustenance (Food & Water)

SOFT. Intangible:

- Culture
- Social Context/Freedom/Expression
- Political Systems. (Opportunity to participate in policy making)
- Economy (cash flow)
- Religion

TEMPORARY IMPACT

The aim this project is to implement an architecture which promotes the development of refugees. However, the seemingly conflicting goal of temporary impact on the land exists as well. The overarching idea of empowering refugees revolves around integrating architectural solutions into temporary camps to create permanent cities. Refugees are trapped in a location for an indefinite amount of time. In Kutupalong, current circumstances do not look promising for a fast repatriation. However, refugees should be allowed to either return home or be repatriated once conflict is either resolved or is deemed too long to return. When this does happen, all the structures which refugees have occupied will be left behind. The impact they have on the environment and country when abandoned will be significant. Therefore, if they can be designed in such a way that their materials can either be reused, recycled, or returned to the ground, this would be beneficial. These benefits would apply to the environment, economy and, host country. It could provide an incentive for the host country to invest in this city model. If a phasing system, from beginning to an easy, ethical, and environmental disposal can be proposed, it is a much more sustainable and attainable solution for host countries. Some possible temporary building materials are earth and bamboo.

KIT OF PARTS

Through an understanding of the refugee crisis, urban design, development and operations of slums, the conclusion has been reached that instead of providing completed buildings and structures, a general kit of parts will be the major component of the design. In order to empower refugees and provide dignity, it is vital for them to determine their lives and spaces. Therefore, they must have access and control over the building and design of their homes and community. This kit of parts should be general design principles to be emphasized and prioritized in Kutupalong. This includes optimal locations, orientation, and design strategies for individual shelters and buildings. Also, a description of passive systems and their implementations, pro-active design approaches, and general instructions on the placement, construction, and type of infrastructure will be introduced. This kit of parts will be in supplication to the design of an overall master plan for camp thirteen.

CASE STUDIES

The Jungle. Calais, France

Al Zaatari Refugee Camp. Jordan

Al Azraq Refugee Camp. Jordan

THE JUNGLE. CALAIS, FRANCE

The Jungle, a pop-up refugee camp outside Calaise, France has a controversial history. It has received high publicity due to its demolition by the government in 2016. In an attempt to relocate the refugees to an organized complex consisting of stark white shipping containers, the entirety of the camp's individual shelters was bulldozed.

Due to the economic opportunities in the U.K., refugees from various countries had hoped to cross the Strait of Dover, the shortest channel between France and the U.K. Once it became clear that the possibility of reaching the U.K. was bleak, refugees started to camp out in Calais. This is how the refugee designed city of The Jungle was born.

The Jungle is an excellent example of the autonomy and ownership that is possible within refugee habitats when refugees are given some control over their lives, homes, and community design. Calais, is an example of an unplanned camp without external aid from an NGO. Though the camp had poor living standards, no running water, and limited electricity, refugees in Calais had a sense of autonomy that is not present in other camps. The fabric of Calais is comprised of individual shelters which are organized by ethnicity and community structure, a market street lined with small businesses and vendors, places of worship, and places for entertainment. This entertainment included a makeshift soccer field, a night club, a charging and WIFI station, and even an art district. Though the Jungle has been disassembled entirely, including the places of worship which were preserved from the first round of bulldozing as well as the shipping container camp, it is an excellent example of refugee autonomy. By analyzing the fabric of The Jungle, one can discover the organic nature of a refugee city. It revolves entirely around user's needs and cultural orientation. Whatever the refugees needed, they created with the resources and skills they possessed.

The Jungle. Contrast between organic refugee shelters and government shipping containers.

THE JUNGLE. CALAIS, FRANCE. ANALYSES

According to Sophie Flinder, an architecture student at Oxford Brookes School of Architecture in England who studied the Jungle for her dissertation; "What is built in the Jungle is based on the refugees' desires, memories and shared symbols. Shelter, religion, education, trading and culture are five clear aspects of any community and they are present in the Jungle." (Faris, 2016)

Components which were present in the Jungle include:

- A marketplace with refugee run shops
- Convenience store
- Cafes
- Restaurants
- Churche
- Mosque
- Bookshop
- Radio station
- Wifi and charging station
- Night club
- Barbershop
- Educational center
- Hospital


Examples of living conditions and shelters in The Jungle


St Michael's Church


Mosque


Eritrean Night Club


Shipping container shelters


Shops along market street


Wifi and charging station


Makeshift soccer field

Language school

Bookstore

PHOTOGRAPH MAP OF THE JUNGLE

Figure 7

SPATIAL AND CONNECTIONS ANALYSES

Figure 8. Housing Clusters and Market Districts

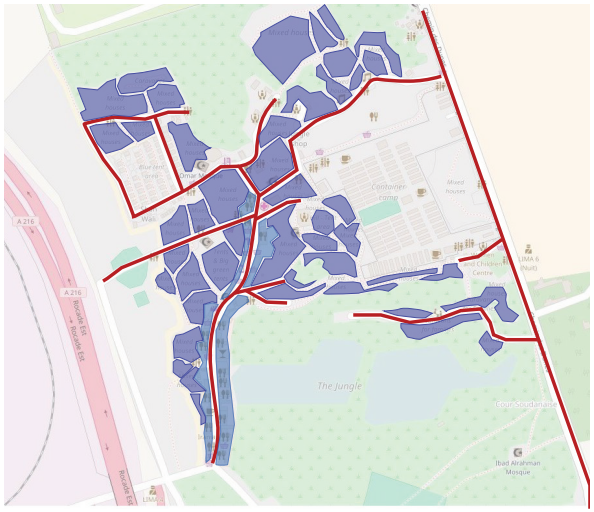


Figure 9. Housing Clusters, Market Districts, Main Pathways

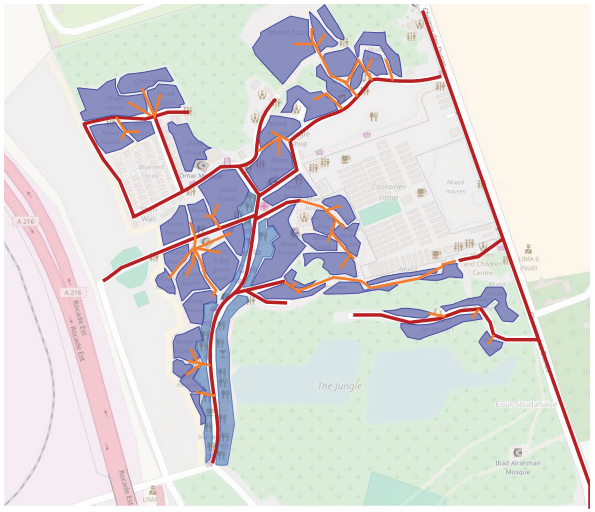


Figure 10. Housing Clusters, Market Districts, Main Pathways, Secondary Pathways & Connections

- Market Spaces
- Residential Shelters/Communities
- Main Transportation Pathways
- Secondary Transportation Pathways & Connection

CASE STUDY TAKEAWAYS:

- Customization and ownership of homes, businesses, and cities is the strongest design values present in the Jungle. Though living conditions are poor, a sense of autonomy is present in the Jungle, which is absent in NGO and aid providing camps. In the thesis design it vital to include and prioritize these qualities.

- The Jungle has an interesting design master plan. Due to its spontaneous development, it has an organic structure. It is full of visual interest, especially when looked at from an aerial view. The various cultures present within the camp have created a unique, interwoven fabric of organization. Each people group had a unique way of organizing their homes, community structure, and businesses. This is extremely relevant when looking at organizing future habitats. One large act of empowerment for refugees is allowing them to design their homes and communities as they see fit for their cultural values. This provides a sense of ownership, comfort, and home.

- The presence of clusters, pods, and pockets. These are created by families, communities, and ethnic groups. People with something in common tend to stick together in clustered communities. Integrating these clusters and central nuclei will be vital in the final design.

- It is extremely Important to integrate new structures into the existing fabric of a refugee camp. Don't slice up the existing framework with a stark, contrasting design style. It is important to understand existing design style and to mesh into it.

Figure 11. Aerial view of The Jungle

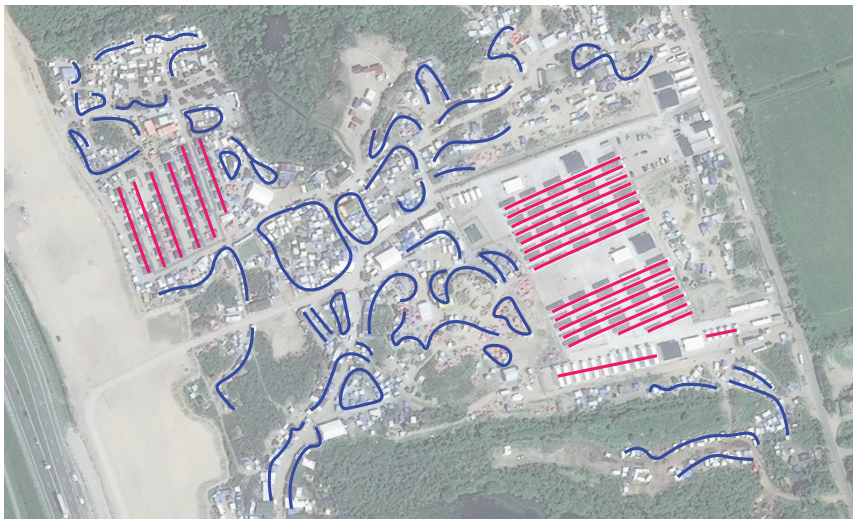


Figure 26. Aerial View of The Jungle Analyses

By visually analyzing the organization of structures and buildings of The Jungle, we see a start contrast between government provided structures and the refugee designed communities. The shipping containers are organized in strict gridded lines, similar to a military encampment or prison. The refugee's shelters seem to have developed organically, organized along paths or often in a circle around one another, creating small pockets of communities.

AL ZAATARI REFUGEE CAMP. JORDAN

Size: 5.3 k2

Population: 40,712

Location: Northern Jordan. 10 km east of the city of Mafraq. 12 km south of the Syrian border.

Design Strategy/Development:
UNHCR organic development. Relatively planned.

Climate: Subtropical Arid. (Hot Dry Climate)
- Long, Hot, Dry Summers
- Short, Cool Winters

Figure 13. Zaatari's Location in Relation to Jordan.


Aerial View of Zaatari.

AL ZAATARI REFUGEE CAMP. JORDAN

According to UNHCR, Al Zaatari Refugee camp, near Jordan's northern border with Syria, hosts approximately 80,000 refugees. The camp was opened in 2012, after violence erupted in Syria, forcing Syrian refugees to flee and seek haven in Jordan. Zaatari became the preeminent location for Syrians fleeing their country. It hosts the most Syrians of any established camp in Jordan. UNHCR was the leading organization to respond to the crisis. As a result, the camp was planned according to their design standards. Density and the allocation of an adequate amount of space were evident factors in the growth of the camp. When looking at an aerial view, strict gridded rows of white shelters cover a flat barren landscape. The 2.046 square mile camp sprawls across the dessert much like an American suburb. It is prone to dust storms as winds rip across the desert and pick up sand particles. This causes many respiratory issues.

Individual Shelters of Zaatari.

Al Zaatari has the population of the 4th largest city in Jordan. It hosts over 78,000 people but was initially designed to host 60,000 people. It is divided into 12 sperate districts with a refugee representative from each who oversees the wellbeing of the people in that district.

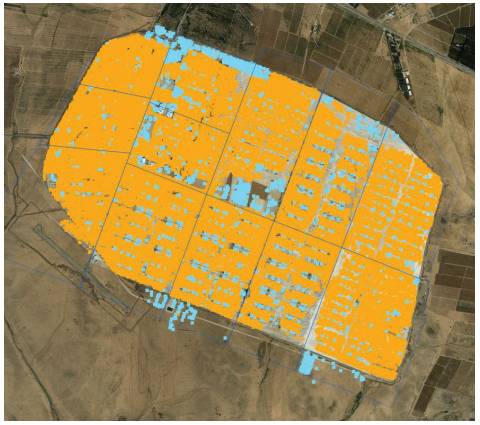
The oldest parts of the camp, consisting of districts 1 and 2 was developed in close proximity to facilities in the camp. However, UNHCR has raised concerns about the density of this area. On their agenda to address this is the relocation of current refugees to a less densely populated area. They want to prioritize the existing communities and preserve the relationships within them by keeping their homes together.

AL ZAATARI REFUGEE CAMP. JORDAN. ANALYSES

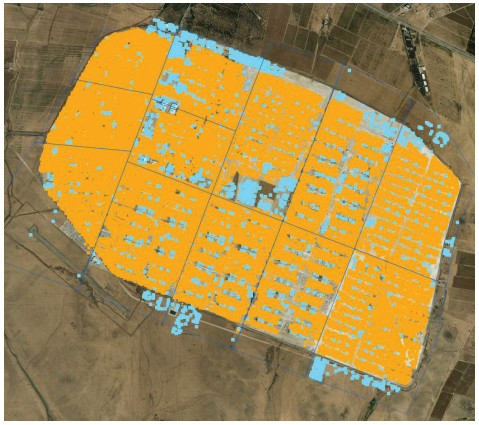
DENSITY AND GROWTH ANALYSES

Zaatari Shelters 2012

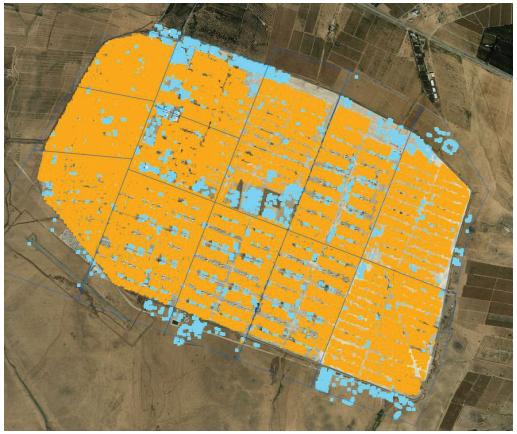
Zaatari Shelters 2013



Zaatari Shelters 2014



Zaatari Shelters 2015



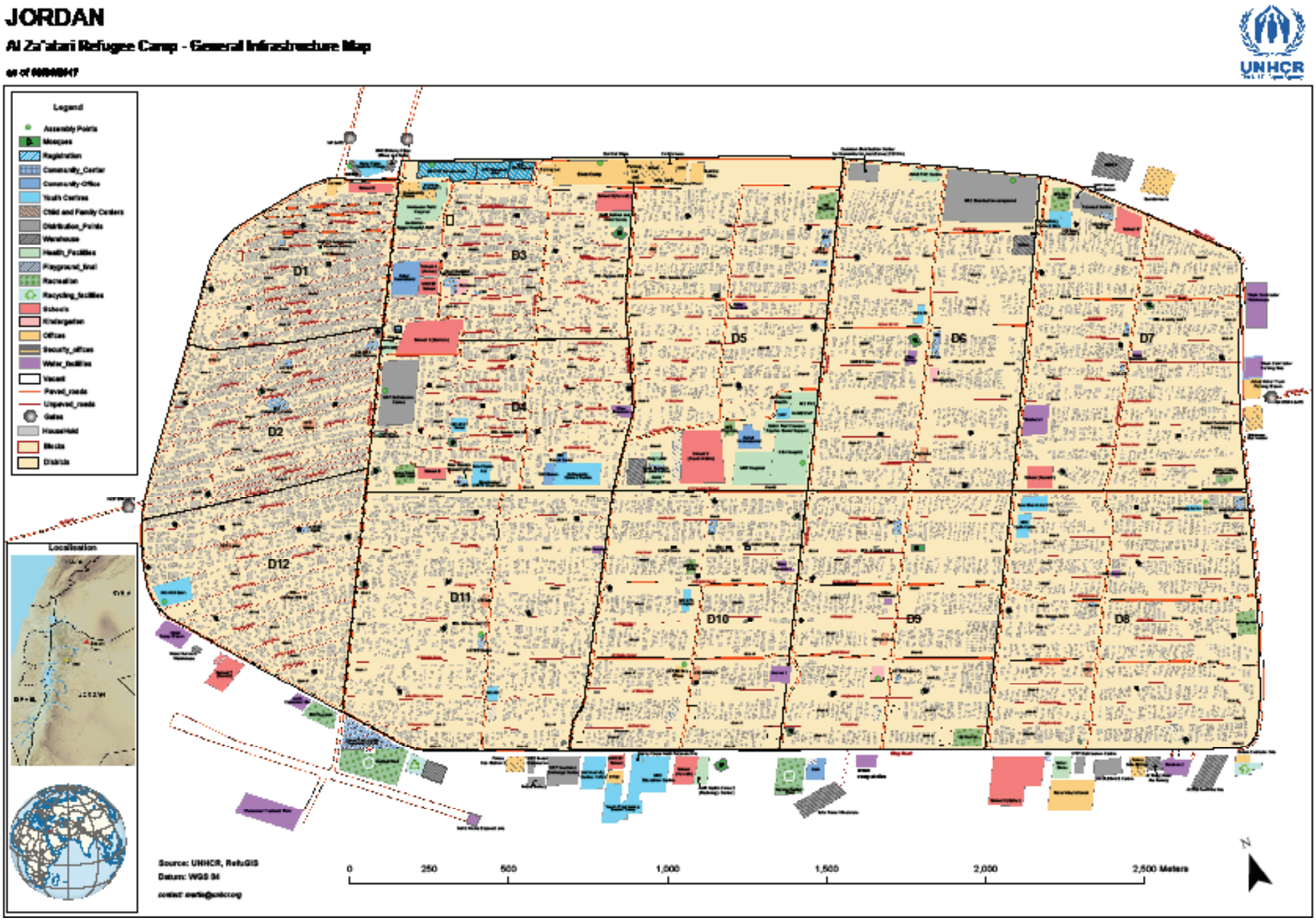
Zaatari Shelters 2016

Infrastructure Buildings

Individual Dwelling Shelters

The illustrations, taken from UNOSAT show the consecutive development of Al Zaatari Refugee camp. It developed in planned portions, begining with the western side, moving towards the eastern side, and filling the middle of the camp. In the beginning, infrastructure buildings were located next to shelters. However, as the camp developed, infrastructure buildings began to be placed on the edge of the settlement, further away from shelters.

AL ZAATARI REFUGEE CAMP. JORDAN. ANALYSES



AL ZAATARI REFUGEE CAMP. JORDAN. ANALYSES

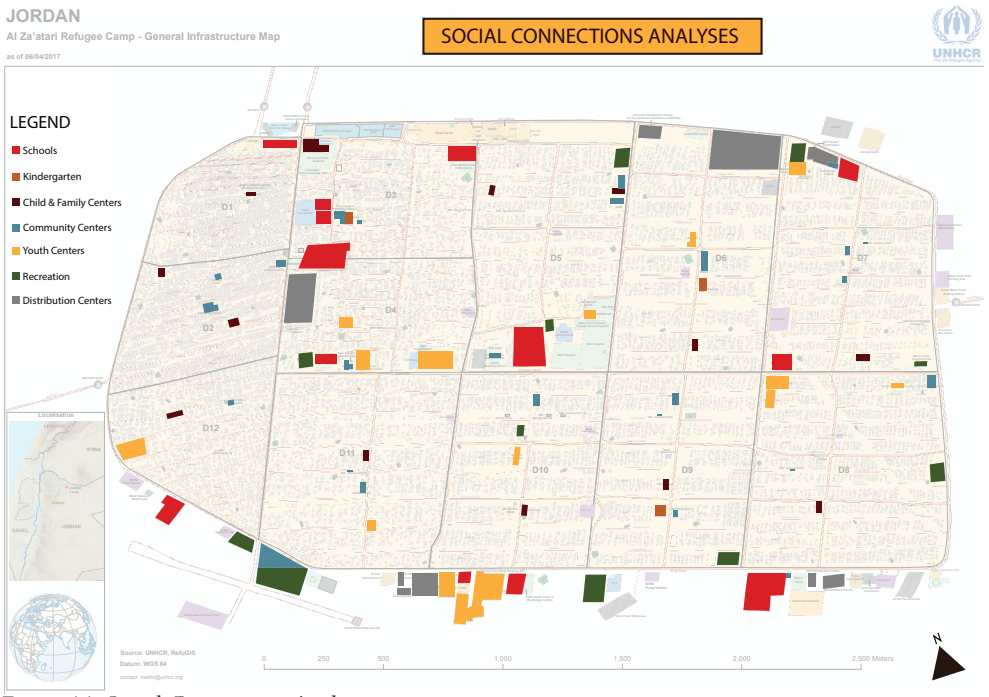


Figure 14. Social Connections Analyses

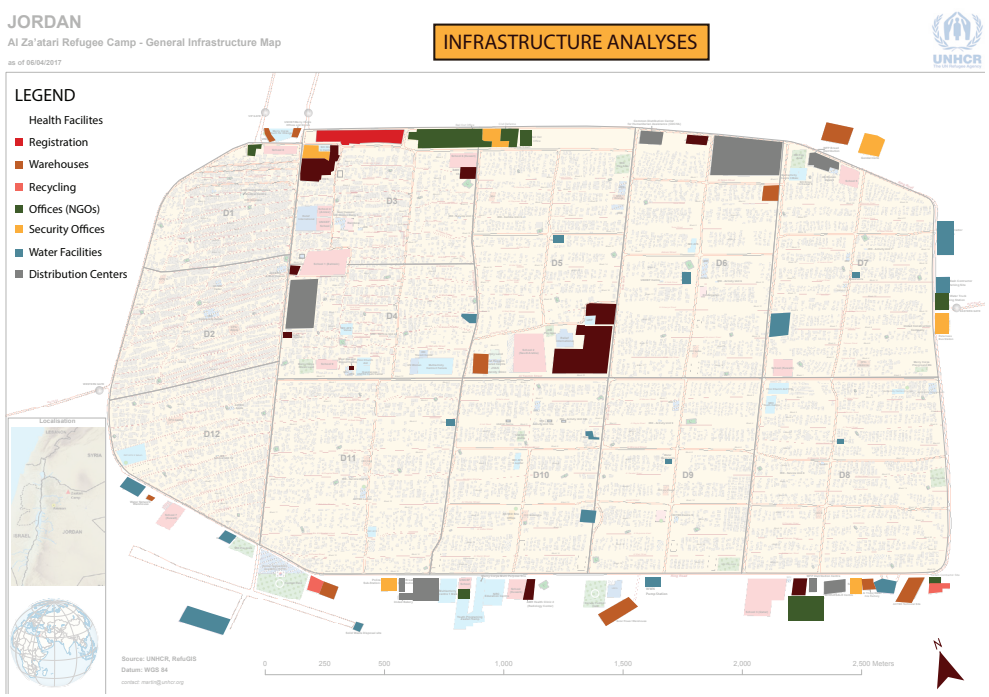


Figure 15. Infrastructure Analyses

The social centers of Zaatari are clustered in dense areas around the camp. As the camp developed from west to east, facilities were developed here. However, as the camp's population increased, facilities started to develop in the middle of the camp and towards the outer edge. This provides limited access to certain areas of the camp.

Infrastructure facilities are clustered mainly around the borders of the camp. This provides access for the transportation, pick up and drop off of items. However, it can also create issues when residents do not have easy access to facilities. It may prevent them from utilizing systems in the camp.

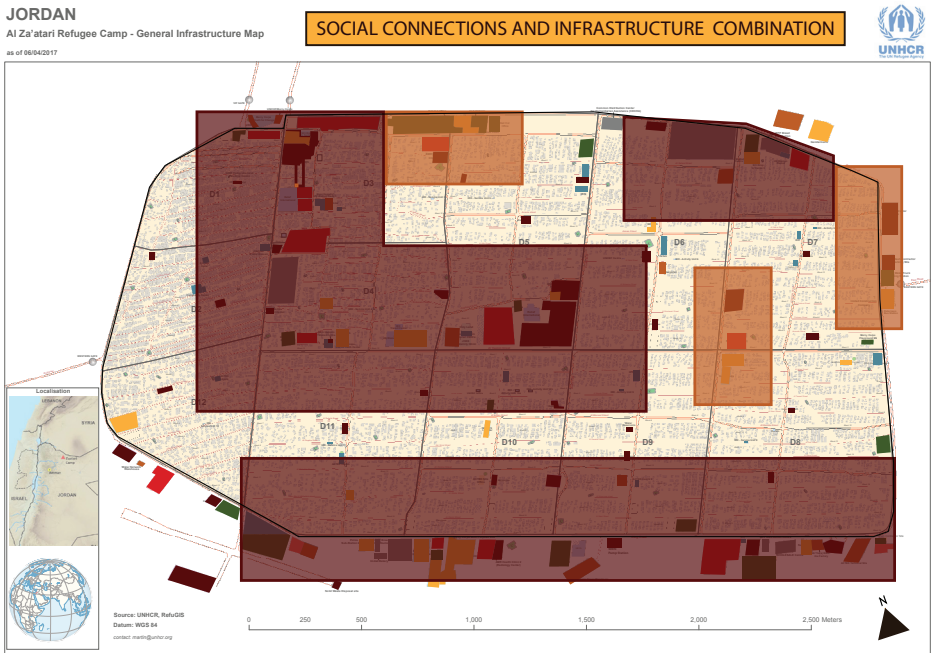


Figure 16. Areas of Impact

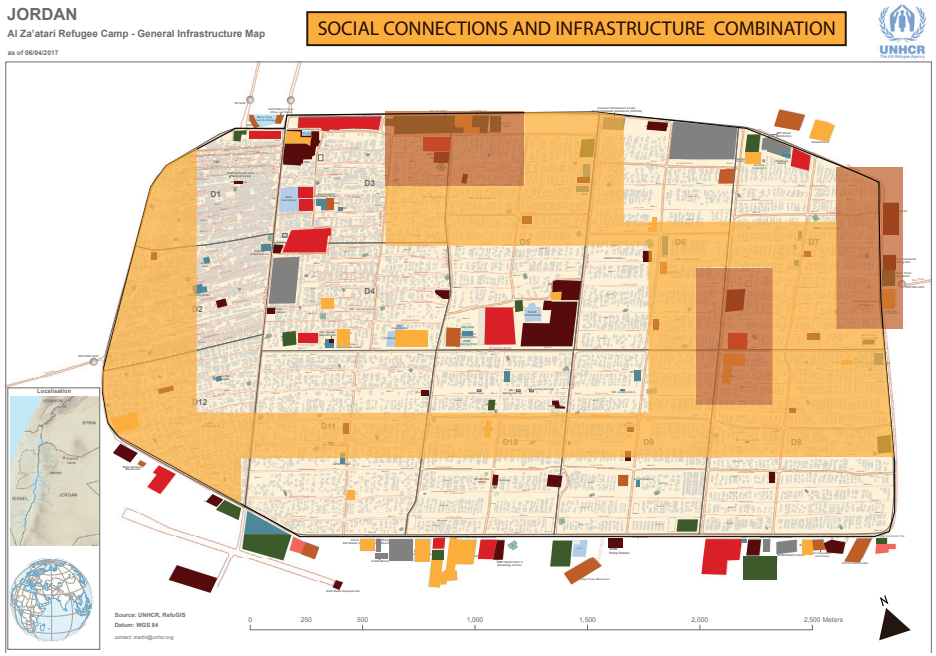


Figure 17. Areas of Opportunity

This map analyses the area of impact that clustered sections of social centers and infrastructure create. The general area which can be easily accessed next to each set of facilities is highlighted in maroon. Secondary sections are highlighted in orange.

This map looks at the negative space that is left behind from the areas of impact. They are resource deserts, which do not have easy access to facilities, or would take a long distance to travel to.

CASE STUDY TAKEAWAYS

Providing an adequate amount of space for everyone should be a major priority. This enables privacy and a sense of home. Its location in the middle of the desert is not ideal. Though camps are often formed without a choice on location, putting effort into improving the landscape could have a positive impact on refugee's wellbeing.

The Champs-Elysees market of Zaatari is an excellent example of autonomy. When refugees are able to create their own space with a chance to develop their skills and businesses, the result is often something that resembles the infrastructure of a city.

It is important to keep in mind the master plan of any refugee habitat. When analyzing the overall site plan of Zaatari, the first camps to develop are in close proximity to infrastructure buildings such as education centers, hospitals, and communication centers. However, the portions of camp which developed later are much further from these buildings. The infrastructure buildings tend to lie around the edge of these camps instead of at central points. Designing habitats with critical community buildings at the center of camps is a better design principle.

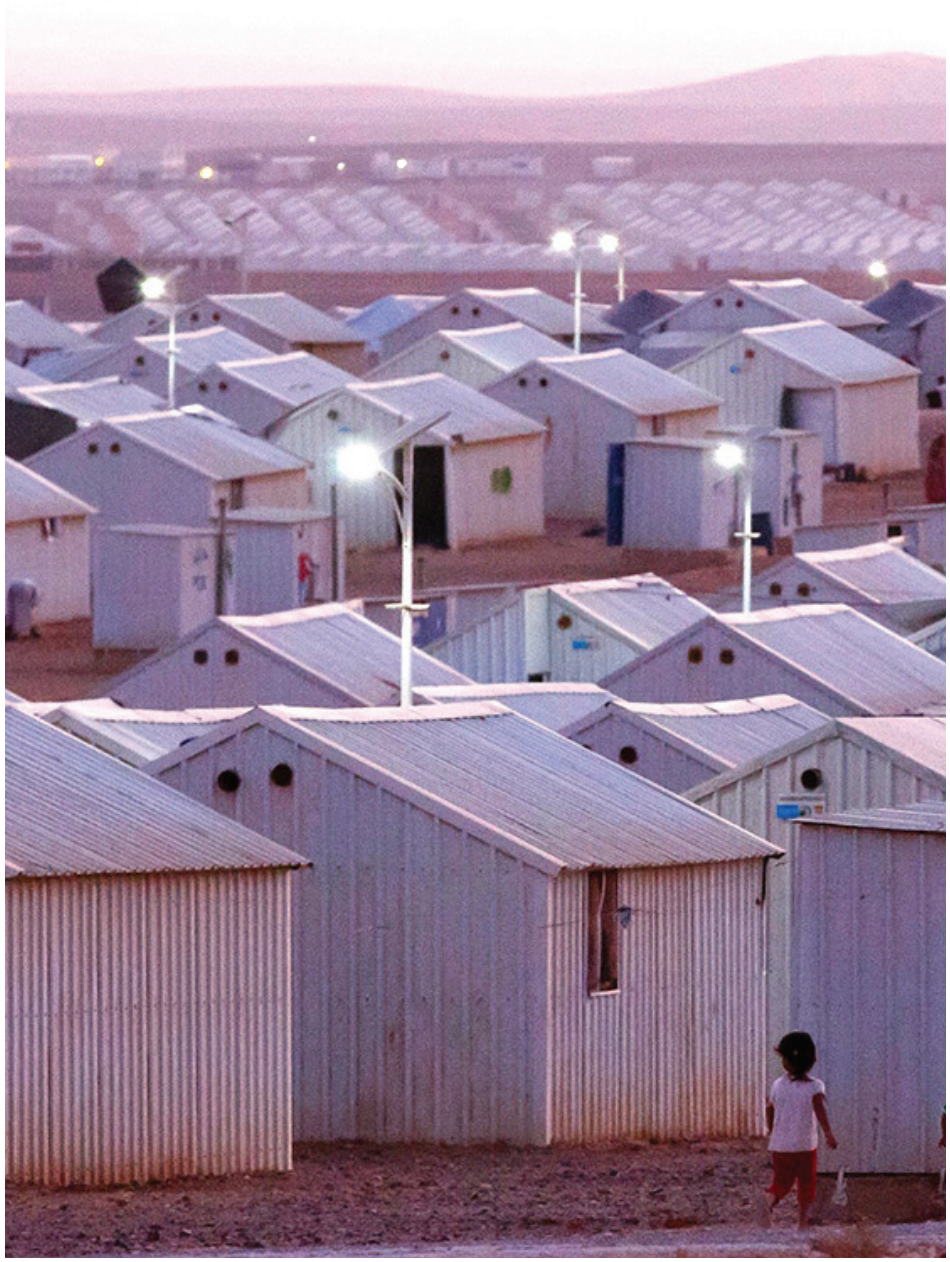
Champs-Elysees Market Street

AL AZRAQ REFUGEE CAMP. JORDAN

Al Azraq is the first refugee to be designed before refugees arrived at the camp. It's organization is based upon a strict grid with rows of white metal shelters. These grids are organized into large sections of camps. There is room between to allow for expansion if needed. It was opened in April 2014, as a response to the influx of Syrian refugees flocking to Al Zaatari. The first phase was designed to accommodate 50,000 refugees. A total of 36,605 refugees live in the camp, with 8,823 shelters currently being utilized by refugees. The camp has put extensive efforts into developing a photovoltaic system that runs the electricity for the shelters. As the first designed refugee camp, sustainable power was a great opportunity for the camp.

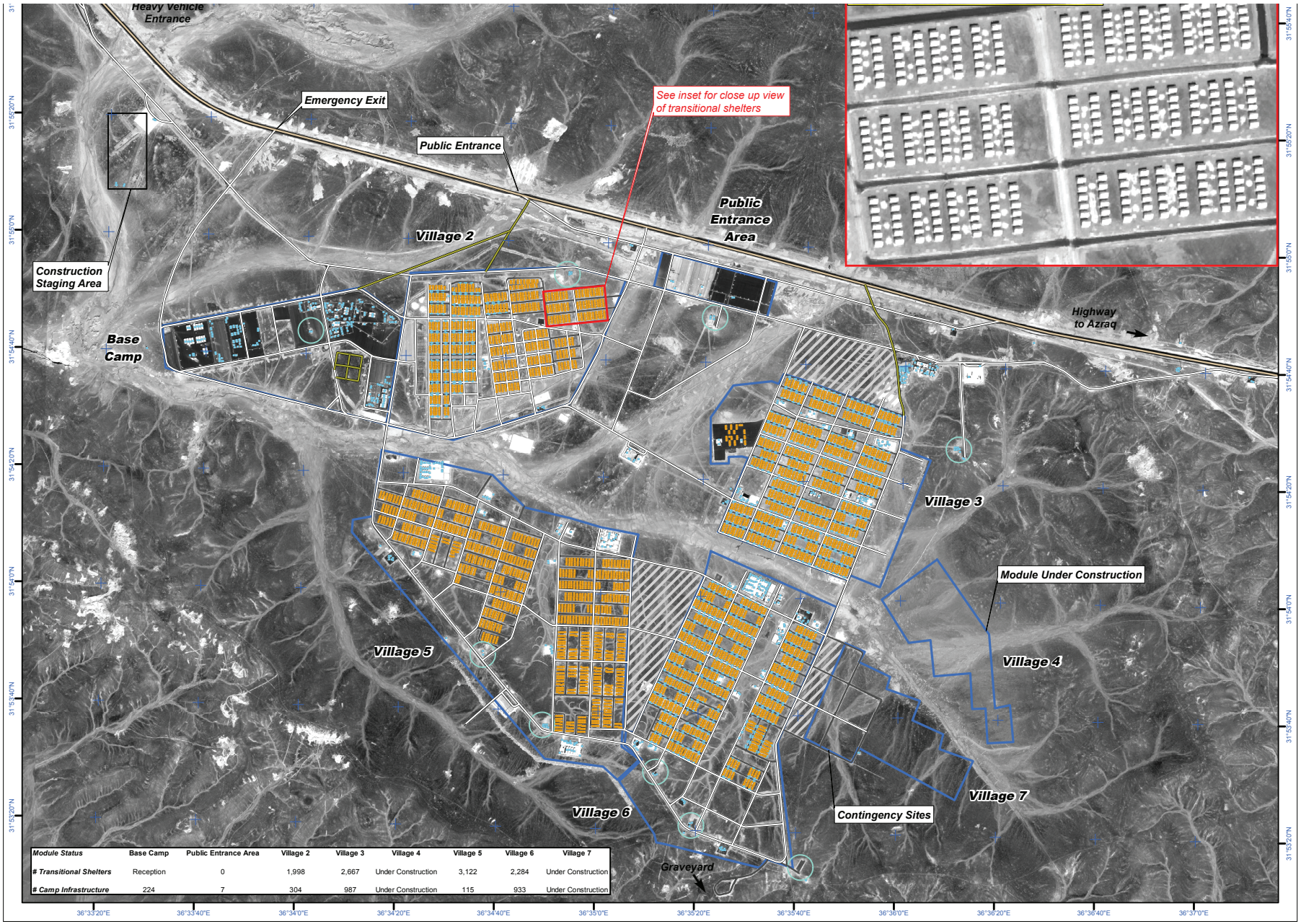
Located in an extremely hot region of dessert in Jordan, many refugees prefer to not be outside during the day due to the scorching heat. Azraq is not near to any towns or cities, therefore external sources of entertainment and communication are basically non-existent.

The strict layout of the camp does not leave much room for community organization and organic growth. All the parts are pre-determined and placed according to a master plan. There is not room for spontaneity and compromise.



Al Azraq City

AL AZRAQ REFUGEE CAMP. JORDAN. ANALYSES



Module Status	Base Camp	Public Entrance Area	Village 2	Village 3	Village 4	Village 5	Village 6	Village 7
# Transitional Shelters	Reception	0	1,998	2,667	Under Construction	3,122	2,284	Under Construction
# Camp Infrastructure	224	7	304	987	Under Construction	115	933	Under Construction

UNOSAT

AL AZRAQ REFUGEE CAMP. JORDAN. SHELTER ANALYSES

Transitional Shelter (T-Shelter) Design for Azraq Camp, Jordan

UNHCR
The UN Refugee Agency

This is the main diagram showing the T-Shelter design, with the possibility of adding a side entrance for enhanced privacy. The 3D section into the shelter reveals the steel structure, insulation, plastic sheeting and concrete flooring behind the external metal cladding.

The pre-fabricated T shelter is distributed to each family within Al Azraq is. It is clad with a white metal and flashings and is complete with aluminum foam insulation. The steel structure is interlock able and can be set up similar to a tent, with a kit of parts. The floors are made of a concrete slab. Every shelter is exactly the same, creating a language of white boxes placed along a gridded line.

AL AZRAQ REFUGEE CAMP. JORDAN. CRITICAL ANALYSES

One of biggest criticisms of Azraq is its failure in the realm of sustainability, particularly the design of the T-shelter. When looking at traditional and vernacular building in Jordan, the primary building materials tend to be of the earth. These include stone, marble, earth, and adobe. This is due to the large thermal capacity of these materials. In a hot, dry climate, the sun harshly and directly penetrates the ground, as there is no atmosphere to break up its rays. At night, this results in quick heat loss to the atmosphere. Therefore, a large mass which blocks heat and light from entering in during the day and radiates heat at night is optimal. However, the main building material of the T-shelter is metal. Not only is it metal, but it is white metal, which reflects and intensifies the suns direct and painful glare during the day. As a manufactured material, steel which constitutes the T-shelter is not sourced locally. The entire kit is transported into the camp.

A critical question to this design is; What is to be done with the shelters once refugees either return home to Syria, or are relocated elsewhere? It is possible that they could be re-used in other camps. However, they are worn and in need of an extensive and tedious repair process. The steel could be recycled but takes a lot of energy to do so. A natural and native building material would be much more sustainable, not to mention culturally relevant. Materials such as earth and bricks could be re-used or returned to the environment.

T-Shelter

Traditional homes in Amman, Jordan.

CASE STUDY TAKEAWAYS

The camp is designed very rigidly. Especially when looking at the newer portions of the camp, these are strictly militarily gridded. A look at the 2012 arrangement shows a bit more organic movement. The entire camp is based around gridded lines. It is clear that movement and efficiency were priorities in the planning of the camp. The strict lines leave no room for a central community node or any chance of clustering buildings around an area. Organic movement and organization is discouraged. The stark white of the shelters along with the gridded lines give a sense of being a number in an experiment. These aspects are design tactics that should be avoided in the final design.

All the camp facilities, such as help centers, distribution centers, and schools are located in the very middle of the camp or on the outside edges. They should be located in central nodes in each community. This would provide less distance to walk, especially in the heat of the dessert. It would also create a place to gather that becomes a central community space.

The site of Azraq is anything but ideal. The desert wasteland, far from neighboring towns does not lend many chances of going outside. All the tents and homes are covered in dust. The presence of vegetation could have a positive impact by reducing the amount of dust flying around.

Syrian children playing in the water distribution point.

PROJECT JUSTIFICATION

WHY REFUGEE CAMPS?

We are currently in the aftermath of one of the most publicized refugee phenomenon since the end of World War two. If architects and designers act in a positive and empowering way now, it could change the trajectory of living standards and design within camps. Showing how it can be done in an efficient, beautiful, and empowering way shows the impact architecture can have on humanity.

WHY A CITY?

Cities are structured around sustainability, development, and autonomy for their residents. Essentially, they are a self-sufficient entity. This type of model is desired for Kutupalong because it provides access to infrastructure, healthcare, law enforcement, education, emergency actions, recreational facilities, entertainment, and sustenance. Cities also have their own cultures, religions, political systems, and economies. They also contribute these things back to their broader country. If Kutupalong were given the opportunity to operate like a city, it would benefit both its residents and host country of Bangladesh.

WHY EMPOWERMENT?

The biggest issue refugees face is a world structured around the temporary (aid, shelters, home) when their biggest need is development and establishment. This includes a chance to develop a life, education, job, skills, family, and access to the market until they return home or are relocated. By giving refugees the opportunity to take ownership of their homes and communities, it gives them the chance to become self-sufficient instead of dependent on external aid.

WHY KUTUPALONG?

Kutupalong is the largest and most densely packed refugee camp in the world. In the span of one year, from August 2017 to August 2018, 580,000 Rohingya refugees arrived in Kutupalong seeking asylum. This influx took place mainly within a two-month period, creating extremely poor living conditions. By choosing this site, it has a huge chance for positive impact.

ECONOMICS

Millions of Rohingya people that have been forcibly removed from their homes under traumatizing circumstances. Their health, well-being, safety, and lives are on the line. As people, they deserve protection, care, and the chance to continue their lives through development. If architecture and spaces can enable them to do so, the funds to provide this are justified. Also, a goal of the project is to make it as affordable as possible. This will be done using local and natural building materials.

The vision is for the funding of this project to come from governments globally. If all countries were to contribute to the cause, it is less of a burden on individual countries. Developed countries have a special opportunity to contribute economically. If they are to do so, less developed hos countries would not have a struggle to provide for refugees and would be more hospitable and welcoming to this vulnerable population.

SOCIETAL IMPACTS

This project is important to society because as humanity, we have a responsibility to care for those around us, especially those whose undesirable circumstances are beyond their control. As Architects, we have a unique opportunity to do so. Our understanding of the design process, global sustainability, way of seeing the world and the connections between it, and compassion well equips us to respond to these challenges.

ENVIRONMENTAL IMPACTS

- Flood control
- Rebuilding/Reestablishment of natural forests and wildlife habitats.
- Use of natural resources to construct shelters and buildings.

PROJECT JUSTIFICATION

PERSONAL INVESTMENT

Designing refugee habitats is important to me because I believe architecture should have global impact. In an ever-connected world, we are becoming more aware of the afflictions, joys, differences, and similarities of people across the globe. My numerous international friends have helped me gain a much-cherished global perspective. This perspective has enabled me to look outside of my country and self to seek out people and cultures who are different from my own for inspiration, answers, questions, and solutions. Learning about other cultures, especially through their architecture is one of my greatest passions.

As I developed ideas for my thesis, I was certain the project should be within the realm of humanitarian architecture. This can be understood as architecture for the approximately 90 percent of the global population which cannot afford and often has no access to design. Designing for internationally displaced people, or refugees, became my focus due to the massive scale of displacement coupled with low living standards. Essentially, the challenge is great, but this leaves substantial room for the design benefits to be great. My intention in pursuing this thesis project is implementing a global, cross cultural impact through architecture and binging awareness to global design issues.

PERSONAL DEVELOPMENT

It is important for me to tackle this project at this point of my academic career because it is the culmination of my knowledge of architecture thus far. My first year of architecture school, I was struck by the privileged and high end spread of design which I saw in school. I was interested in the realm of architecture which provided for people who had less material and financial resources. Also, I was intrigued by vernacular architecture, which is design by local people in response to the needs of environments, climate, and culture. This project combined both of these elements simultaneously and will be a great achievement for my academic development.

When I went to Cambodia with a humanitarian architecture firm in the summer of 2017, I practiced much of the ideas I was interested in. I learned much about practicing design in third world country, the differences in materials, access, and cultural values and norms. I learned what it is like to design in a tropical climate, much different than my own. This thesis project will help me to further develop my skills and passion in humanitarian and vernacular architecture.

As a final project, this thesis design will challenge me in new ways I have not yet experienced in my education. Instead of focusing on materials, structure, transportation, and building codes as previous projects have, this thesis will challenge me culturally, socially, and spatially. Working in an intensely dense refugee settlement introduces me to challenges such as infrastructure and adequate space while also addressing basic needs such as sanitation, health, shelter, safety, and material needs. Inserting architectural elements into a densely packed space with existing cultural values, norms, and associations will be an immense challenge that will require the expansion of my knowledge base and the best of my skills.

HISTORY OF THE REFUGEE PHENOMENON

Motivated by the 2015 international refugee crisis, this thesis project will explore the design of habitats for international refugees which leads to empowerment and mitigation of the refugee crisis. Refugees are people who have forcibly fled their own country to seek protection in another country. Numerous causes lead to fleeing. These include persecution based on ethnicity, religion, or political views, terrorism, political unrest, natural disaster, and climate change. Currently, the amount of displaced people seeking haven in a country other than their own is the highest it has been since world War II. There are 68.5 million people forcibly displaced worldwide, 25.4 million of these being refugees. (UNHCR, 2018) While refugees and immigration are a heated debate topic in European politics, especially in terms of economic and moral responsibility, the majority of the world's refugees are located in countries adjacent to refugee's home countries. These typically are in Africa, Asia, and the Middle East. Many refugees live in large camps where they receive public aid, housing, and food. Often, these camps are anything but ideal. An influx of displaced people has led to poor living conditions with small food rations and temporal housing units, namely tents. Refugees are typically denied the right to work or leave the camps. Originally designed as a place of refuge, these camps become a prison of immobile life and reliance on outside sources for aid and food. When one considers that the average amount of time spent in camps is 17 years (Refugee, 2010), it makes this fact even more bleak. This calls for a moral response to the issue. As architects and designers, there is a unique opportunity to be an active part of global response and change.

HISTORY OF THE ROHINGYA AND KUTUPALONG

According to the United Nations High Commissioner for Refugees, 602,400 Rohingya refugees reside in the Kutupalong-Balukhali Expansion Site. Located along the coast of south eastern Bangladesh, the camp has become a haven for the Rohingya, a Muslim ethnic minority who have fled their native country of Myanmar. When Myanmar broke out in violence on August 2017, 671,000 Rohingya were forcefully and violently driven out of their homes by the government. This influx of refugees fled into Bangladesh within a single year, most arriving to the Kutupalong camp within a two-month window. With rapid vigor, a camp of approximately 14,000 people sprang to an excessive 602,000 almost overnight. Camp standards regarding space and infrastructure were not maintained. Proper sanitary methods, standards of living, roads, bridges, and structural stability from landslides were all compromised to care for the basic needs of 600,000 people. As a result, Kutupalong also claims the title of the world's most densely populated refugee camp. As humanity, we have a moral responsibility to respond to this global crisis and the Rohingya people affected by it.

In August 2017, mass violence and chaos erupted in the Rakhine state of Myanmar. Home to an estimated one million Rohingya, an ethnic Muslim group of Myanmar, the Rohingya comprised approximately one third of the Rakhine state's population before 2017. Conflict between the Rohingya and the Rakhine, the Buddhist majority of the state, has been prevalent since the late 1940's, when Myanmar (then Burma) gained its independence from Great Britain. The state refused to grant the Rohingya citizenship. What has followed are decades of strife and violence between the Rohingya and the Myanmar government. The Rohingya have continually fought for their citizenship, while the government has gone through various waves of persecution against the Rohingya. With cultural and religious practices similar to Bangladesh, the Myanmar government claims the Rohingya belong to Bangladesh. The Rohingya see Myanmar as their home, with ties to the area dating back centuries. (Hossain, 2011)

The violence of August 2017 was triggered by an attack on Myanmar police posts by an organized Rohingya military group. What ensued next was the largest catastrophic wave of persecution the Rohingya had faced yet. A mass ethnic cleansing of the state led to the death of an estimated 7,000 Rohingya, while approximately 671,000 forcibly fled their homes. (Albert, 2018) This number is almost two thirds of the entire Rohingya population in Myanmar. Hundreds of villages and homes were burned, numerous women were raped, thousands of Rohingya were brutally attacked, and thousands were murdered in the process.

This ethnic cleansing led to nearly two thirds of the Rohingya population fleeing to Bangladesh. In the two months following this violence, approximately 580,000 Rohingya arrived in the Kutupalong Refugee camp. Due to this massive influx in such a small window of time, any hope of maintaining camp spacing and living standards vanished. The United Nations High Commissioner for Refugees' standard planning recommendation of 45 square meters per person is not met in 95 percent of the camp. In some areas, as low as 8 square meters per person is common. (UNHCR, 2018) Overcrowding is just one issue in the camp. As refugees moved into the camp and built shelters, the heavily forested land was demolished in the attempt to set up shelters. This left the soils of the hilly area without the structural stability that was provided by the tree roots. Therefore, the land is prone to landslides, especially during the Monsoon season, when the region receives 35 inches of rainfall annually. Due to the excessive amounts of rain, lack of stable soil, and undeveloped infrastructure, the chances of waterborne diseases are high. Throughout the Monsoon season, people often must trudge through flooded roadways. Deforestation also raises environmental questions. Approximately 3,000 acres of Bangladesh forest was destroyed to make space for shelters. The gathering of firewood also poses threats to the forest, which is home to numerous animal and plant species. These are simply the basic, material needs of the Rohingya in Kutupalong. Questions of autonomy, empowerment, education, and chances for development are another aspect which must be addressed.

SOCIAL AND CULTURAL CONTEXT

As society, we are seeing unprecedented amounts of people becoming refugees. Numbers have not been this high since the end of World War II, when tens of millions of Europeans were displaced from their homes. However, the system which refugees are forced to operate in has changed very little change since then. This is astonishing, considering the world is vastly different now than it was then. A few of the major differences are; the nature by which people are internationally displaced, globalization, the evolution of technology, and the new role of business.

The refugee system, including its policies, finances, and aid structure, was developed in the late 1940s as a response to the cold war. As the Soviet Union began persecuting eastern Europeans, western democracies enacted a system which would allow people the right seek haven in a country which would provide the opportunity to escape persecution and receive aid. This led to the creation and signing of the 1951 Convention on the Status of Refugees. This agreement, which 145 countries signed, ensured that people fleeing persecution would receive open doors within these countries. According to this document, a refugee is "someone who is outside her or his country of nationality and faces a "well-founded fear of being persecuted for reasons of race, religion, nationality, membership of a particular social group or political opinion." (Refuge, Betts, pg. 4) Though this definition applied to refugees at the time, it does not consider all the factors by which people become displaced today. For example, global climate change and political instability are not taken into account. Current refugee policies should address this. However, they do not. What is our response to this as a society, and more specifically, as architects and designers? The actions we take in regard to this phenomenon will affect not only the world today, but future generations as well. The unprecedented numbers of refugees today provides an opportune time to act. Refugees have been given immense public attention and are the topic of many political debates. Attention, whether positive or negative is seen as a success for them, as their cries for safety, justice, and protection have been ignored for centuries. Providing a viable design option to these issues is a way to change the policies, spaces, and world which refugees live in.

Figure xxx. https://chagrinarts.org/?event=changing-perceptions-of-global-diversity-discrimination

In the design realm, the typology of refugee camps has not been explored until recently. The European refugee crisis of 2015 triggered a chain reaction of architectural responses to the refugee camp. In the past, camps had been organized either organically by refugees themselves, or loosely planned by external aid organization such as the UNHCR. The sporadic pop-up nature of refugee camps typically resulted in an organization absent of developmental and access needs.

One recent response to the refugee camp are an array of "one size fits all" shelters which can be deployed to and set up in various camps. This has good heart behind it but lacks the insight and understanding of the nature of refugee camps. Camps often stay open for decades, which is not accounted for in the shelter designs whose lifespan is a couple years.

Another approach was the design of Al Azraq. It was the first pre-designed refugee camp. It provided good sustainable approaches and adequate material provision. However, it does not take into account the climate of the area, the cultural preferences of the people, or the promotion of the development of refugees.

As a response to these recent design solutions, the idea of a self-sustaining refugee city is to be implemented. This provides, encourages, and promotes the development and empowerment of refugees.

BANGLADESH: MACRO CLIMATE

Bangladesh is a country in south Asia, bordered by India to the north and west, Myanmar (formerly Burma) to the east, and the Bay of Bengal to the south. It has a tropical climate, which consists of heavy seasonal rainfall and high temperatures and humidity. Bangladesh cycles through three distinct seasons; hot, humid summers, cool and rainy monsoon season, and a cool, dry winter. One of the greatest issues related to climate is its flat countryside flooding during the monsoon season. Due to its proximity to the Bay of Bengal, it receives large amounts of rain and is at risk for tropical cyclones during monsoon season.

KUTUPALONG: MICRO CLIMATE

Kutupalong's location along the coast makes it particularly susceptible to the wind, rain, and intense storms which come with the summer monsoon season. It is also located at a lower sea level than the rest of the country.

TEMPERATURE:

Temperatures range from 60 to 90 degrees Fahrenheit. They can reach as low as 60 degrees Fahrenheit during December and January, the region's coldest months.

HUMIDITY:

Average relative humidity fluctuates between 60 and 80%

SUNLIGHT:

Daylight hours range from 11 hours - 13.5 hours.

WIND DIRECTION:

Most winds come predominantly from the Nothern direction.

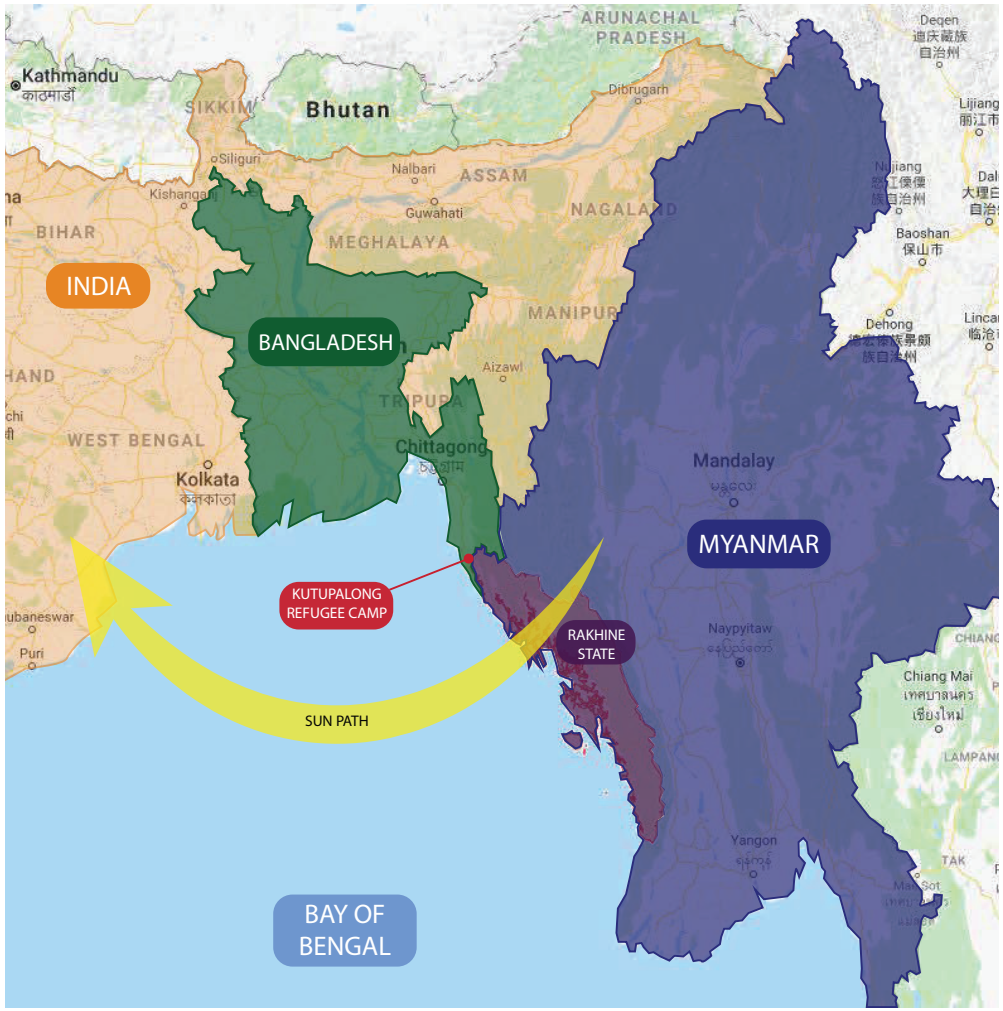


Figure 18. Site Analyses

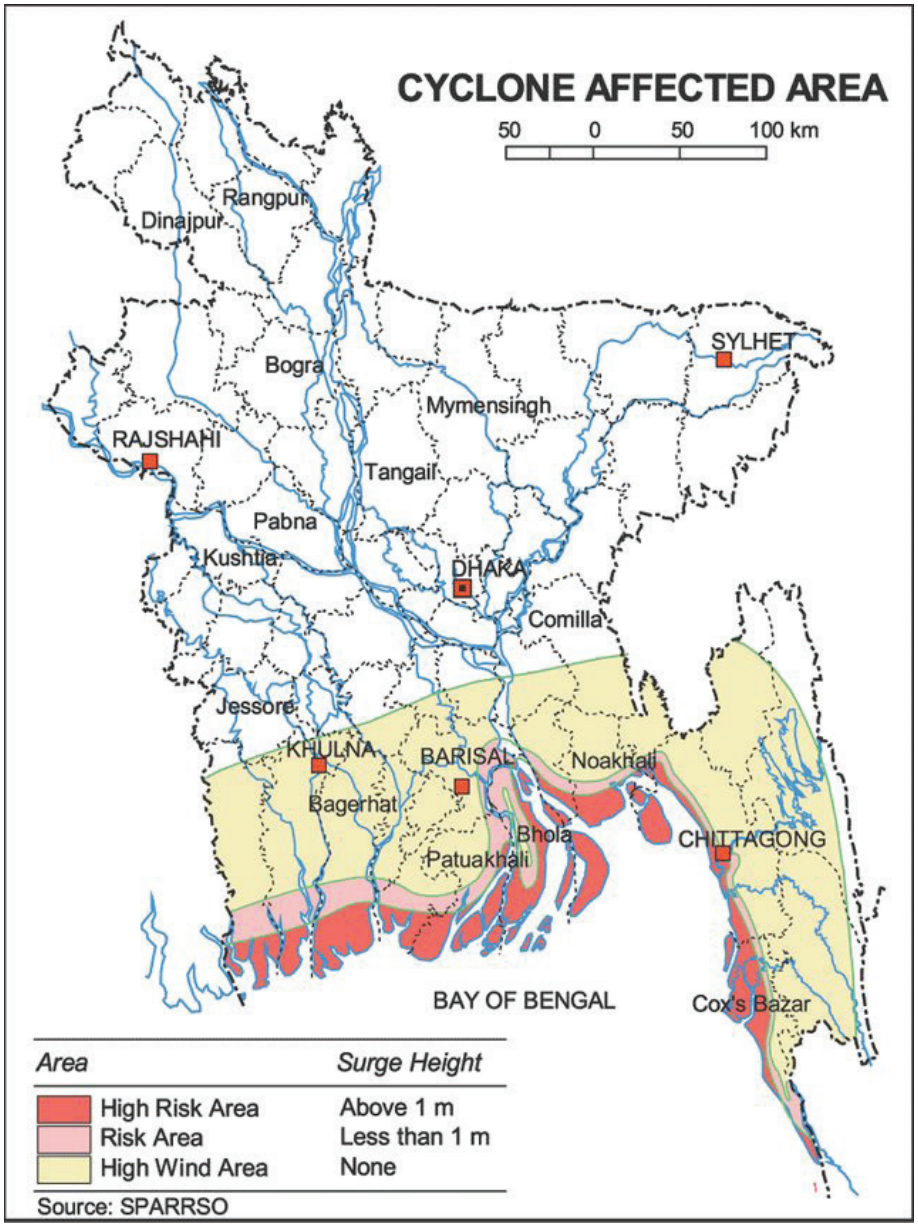
Source: Humanity & Inclusion

Source: Adriane Ohanesian

"STRESS ON THE SITE"

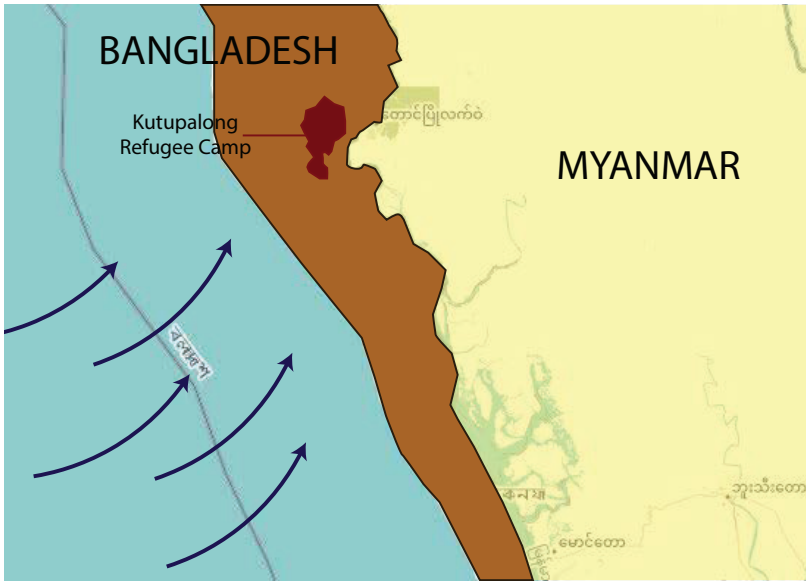
Kutupalong is located on national forestland in Bangladesh. This forestland used to consist of a dense tropical forest. It has been stripped of most vegetation to make room for the refugee's homes. The site is under extreme stress from this. Hills which used to gently roll with vegetation are packed with makeshift shelters of bamboo and tarpaulin. Many are at risk from landslides. Much of the hills have eroded due to the immense stress of thousands of people and the lack of tree roots which held it together in the past. Lower elevations of the camp fill with polluted waste water. A site which was once a beautiful tropical habitat is crying out in pain with the people that occupy it.

. Kutupalong Images



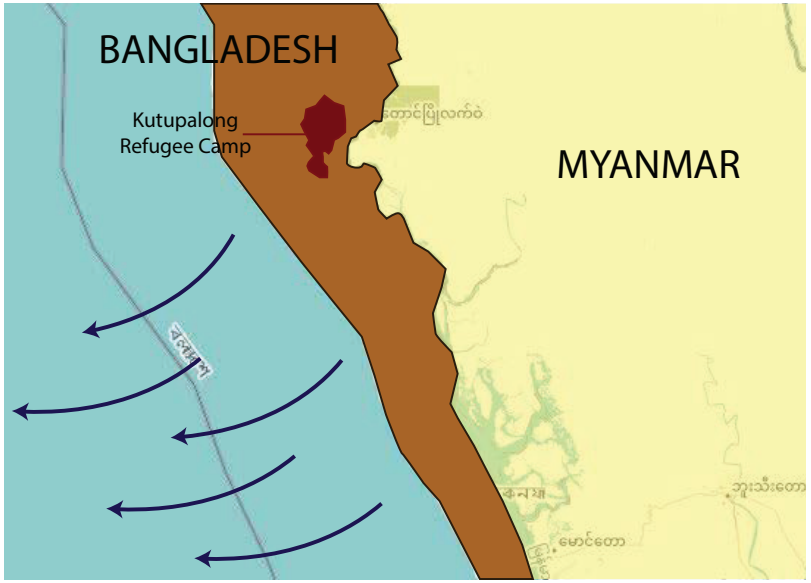
Source: SPARRSO

Kutupalong is located just on the edge of area classified as a risk area. However, it is located in a high wind area. These winds can be damaging to structures and homes in the camp



SUMMER MONSOON WIND DIRECTION

Figure 19. Summer Monsoons
Intense monsoon winds penetrate the shores of Bangladesh from the south-west direction durring summer storms.



WINTER MONSOON WIND DIRECTION

Figure 20. Winter Monsoons
Durring the winter months, winds are pulled from the shores in a north-east direction.

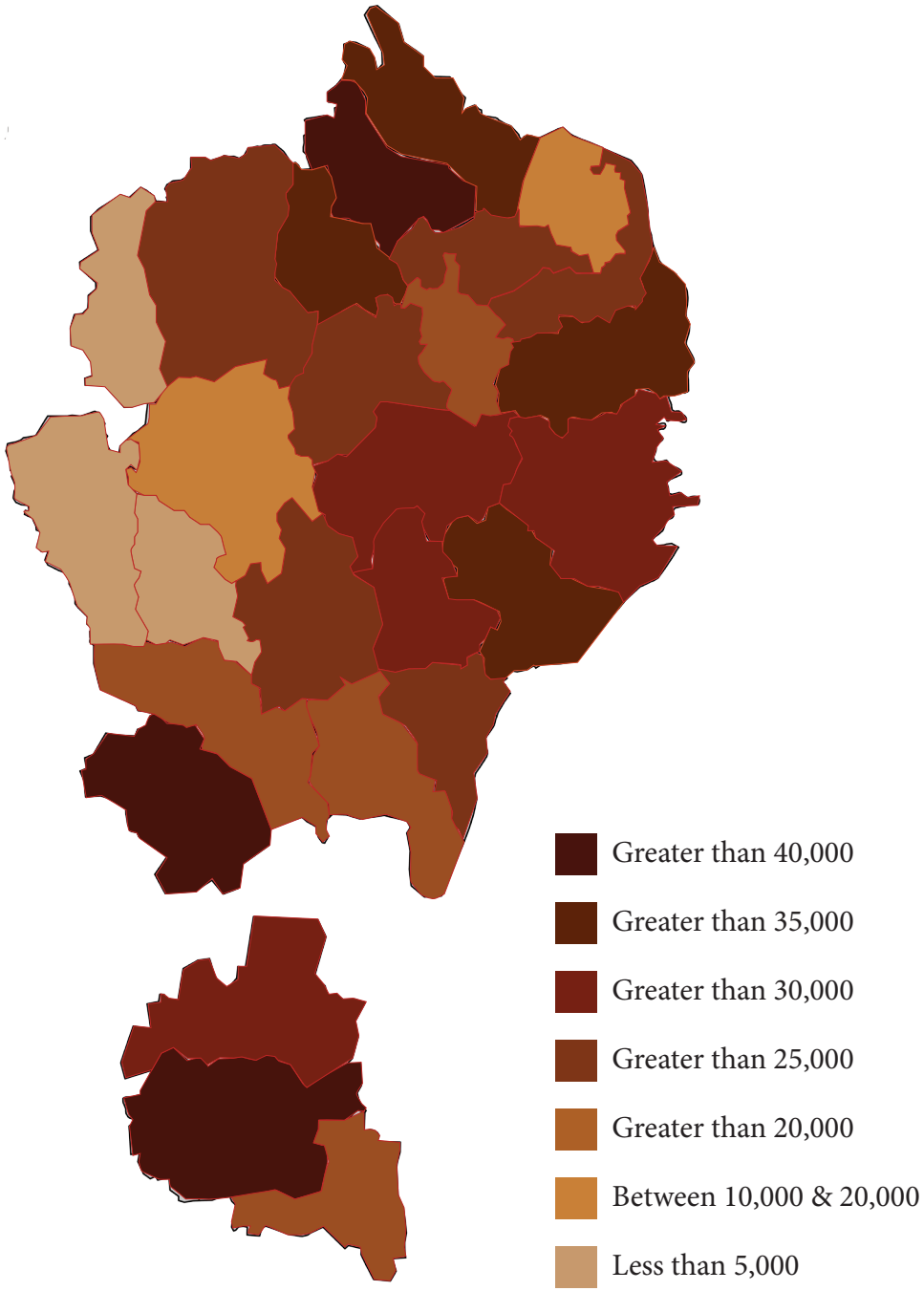
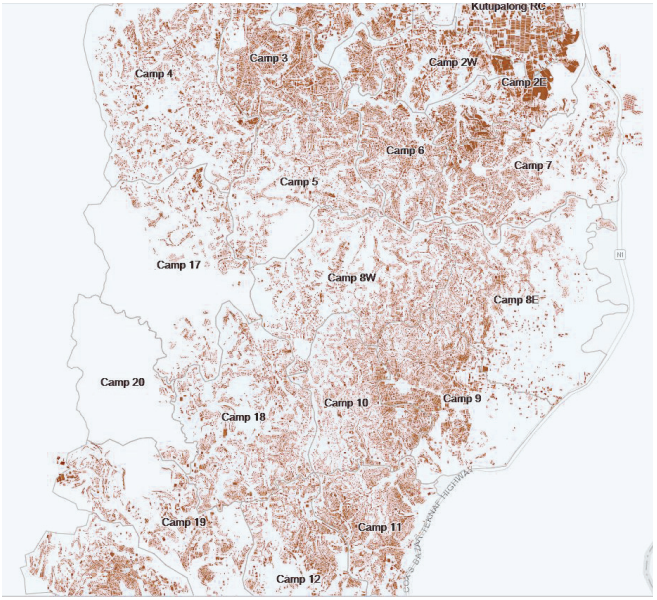


Figure 21. Kutupalong Density

THE WORLD'S MOST DENSELY PACKED REFUGEE CAMP

Bangladesh is one of the most densely populated countries in the world. Compared to other cities in Bangladesh, Kutupalong's population makes it the fourth most populated city in Bangladesh. However, these 602,400 people live within a densely packed area of 13 km2. In comparison, the city of Sylhet, Bangladesh has a population of 526,412 (2011). The city occupies 42km2 of land. Kutupalong occupies approximately 1/3 of this amount of land. This has resulted in it being the largest and most densely packed refugee camp in the world. This fast and rapid growth has led to a lack of material necessities. These include basic infrastructure, transportation, adequate clean water, easy access to food, appropriate sanitation methods, and adequate waste removal.

Figure 21 demonstrates the density of each individual camp. The densest camps are in the darkest red and move down the spectrum to the lightest color.The densest regions of the camp exist around the original Kutupalong camp. It concentrates around the eastern corner, as well as the lower unconnected portions.



Source: UNHCR

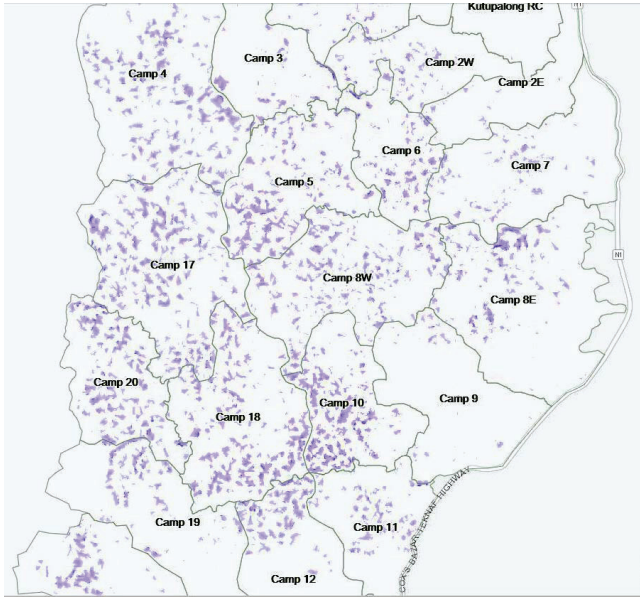
EXISTING SHELTERS

This figure-ground map analyzes the existing shelters to demonstrate the immense density of the camp. It is retrieved from UNHCR's report on Kutupalong. This map shows the evolution, development, and spread of the camp. The edges of the camp around camps 17, 20, and 8E are relatively empty. Density within the camp is not equally distributed, with shelters tending to concentrate at the center of the camp. Therefore, it is vital to account for these dense pockets and propose adequate amounts of facilities here.

Source: UNHCR

FLOOD RISKS

Kutupalong's location is one full of topography. It is built atop a series of undulating hills, whose base's flood during the monsoon season. The result are small ravines and branches of rivers which cover a large portion of the site. Many of the shelters of Kutupalong are built on areas which are prone to flooding. The eastern portion of camp 8E is particularly susceptible to flooding. The possibility of a small lake during monsoon season needs to be considered when planning Kutupalong.



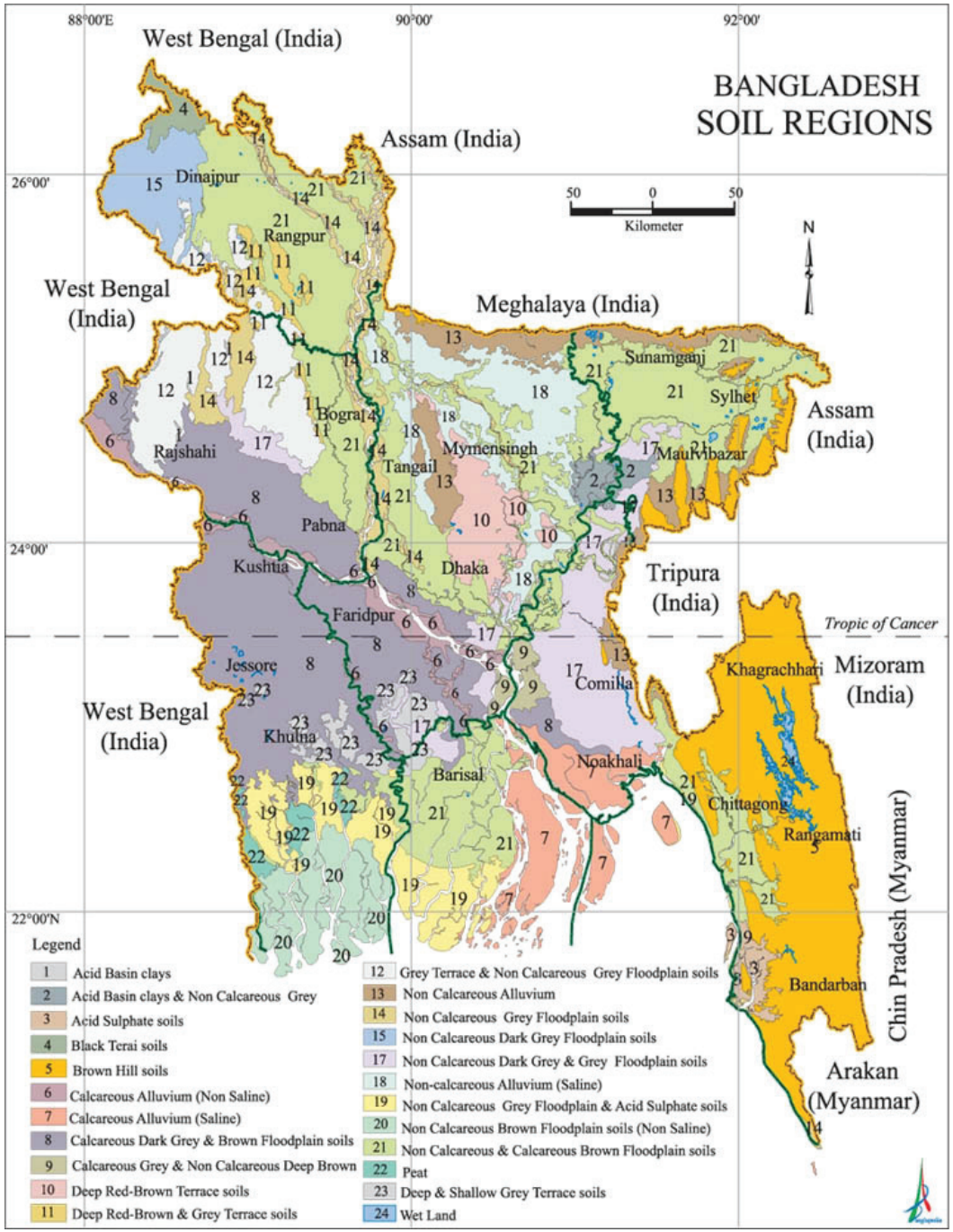
Source: UNHCR

LANDSLIDE RISKS

Numerous shelters and structures are at risk of damage or destruction due to landslides in Kutupalong. This is primarily because of poor soil conditions, heightened by intense rains during monsoon season. The deforestation of the area is a major reason for these poor soil conditions. Previously vast, dense forestland, Kutupalong's soil was stabilized by the many trees growing on the land. The loss of vegetation has resulted in unstable ground and soil conditions. Dense portions of landslide risk are evident in camps 10, 12, and 18.

SITE ANALYSES. SOIL CONDITIONS

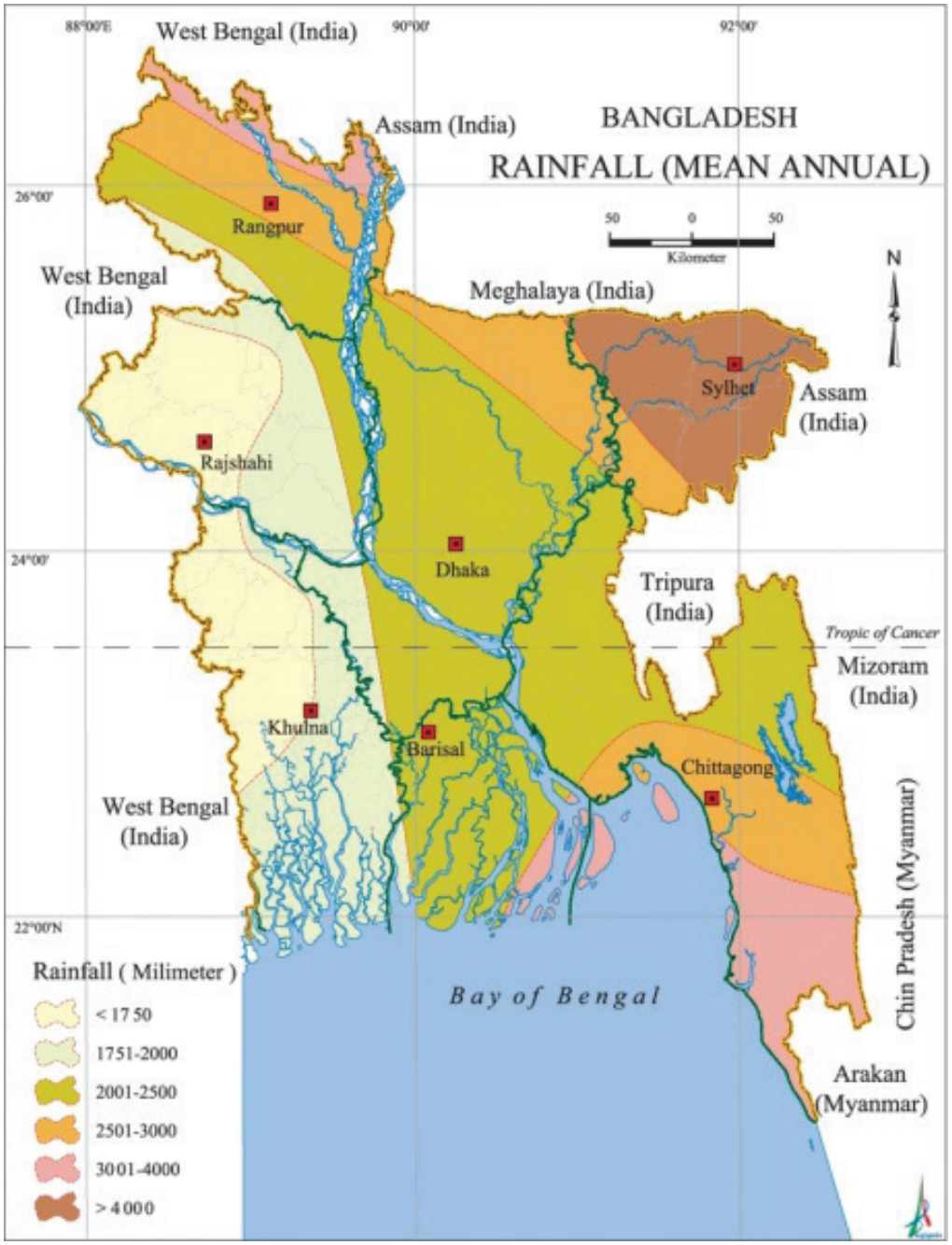
According to this map, the area in which Kutupalong is located is composed of brown hill soils. These soils are made up of loamy sand. Bangladesh is in an area of extremely low elevation. The entire country is prone to flooding during monsoon season. It is split in the middle by deltas which drain out of the Himalayas. Therefore, the country is subject to flooding and large amounts of water.



Bangladesh Soil Regions. Source: Banglapedia

RAINFALL

Average rainfall in Bangladesh ranges depending on region. Kutupalong lies in the area which receives some of the largest amount of rainfall in the country. This ranges from 118 to 158 inches of rainfall per year.



Bangladesh Rainfall. Source: Banglapedia

NARROWING DOWN THE SITE

It was determined that the final design should focus on one specific district. Camp thirteen was chosen due to its large population, density, and distance from the original Kutupalong camp. It was developed after the majority of the camps yet is extremely dense. Its population of 41,050 gives it the second largest population in this section of Kutupalong. It is home to 9,618 families.

Camp thirteen has significantly more open space and room for sustainable city planning other districts. The western portion of this district is very open. There are great opportunities to develop a social hub here. This section of camp is also highly prone to flooding. Mitigating the effects of this will be a challenge with great opportunity. District thirteen's location on the border of Kutupalong also has design implications on the deforestation of the area. It provides opportunities to provide sustainable alternatives to firewood for fuel and light. If this district can propose this, its effects will trickle inwards to the center of camp.

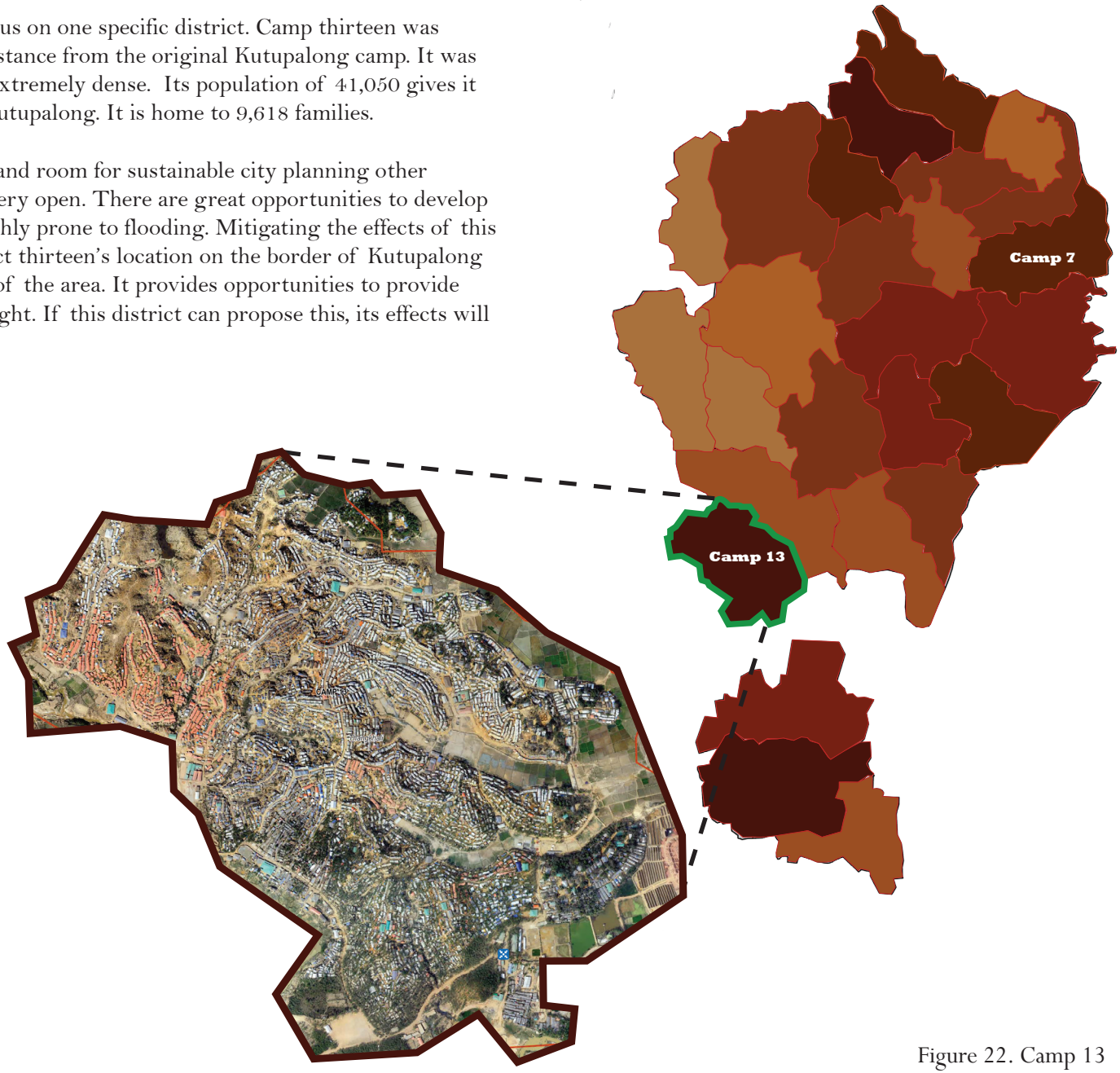


Figure 22. Camp 13

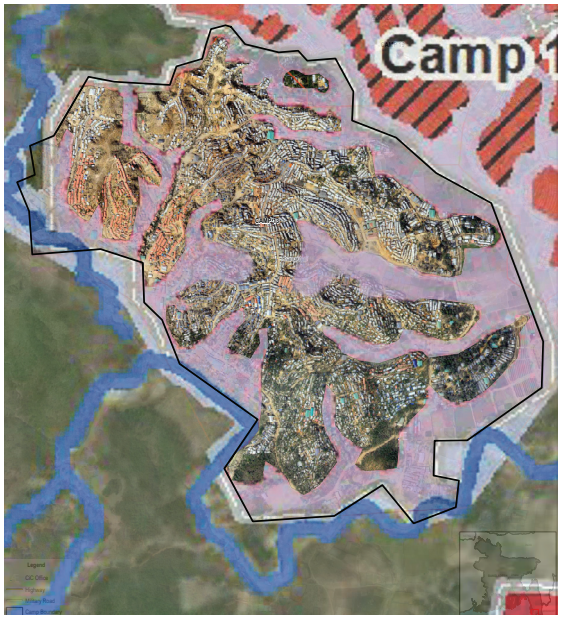


Figure 23. FLOOD RISKS

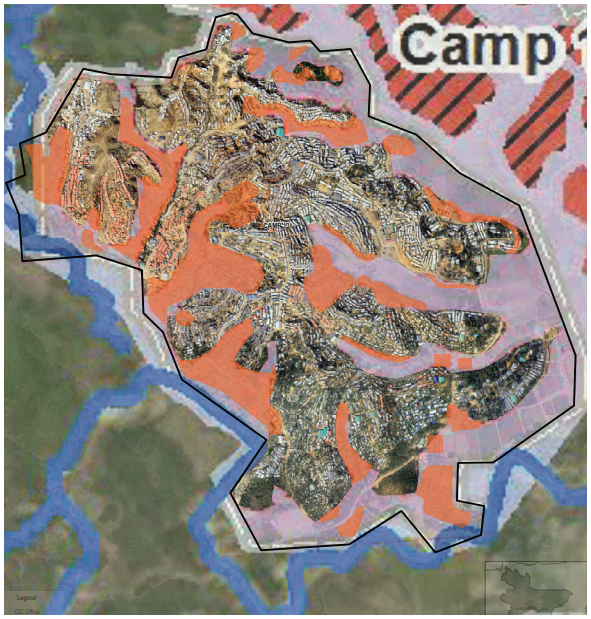


Figure 24. FLOODS AND SHELTERS AT RISK

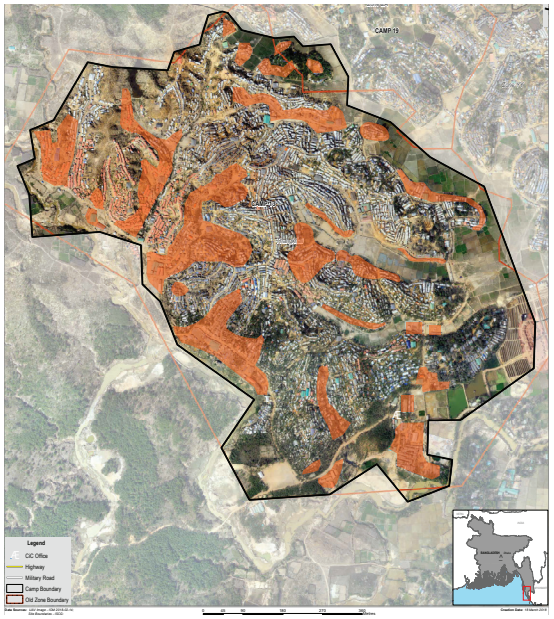


Figure 25. SHELTERS AT RISK

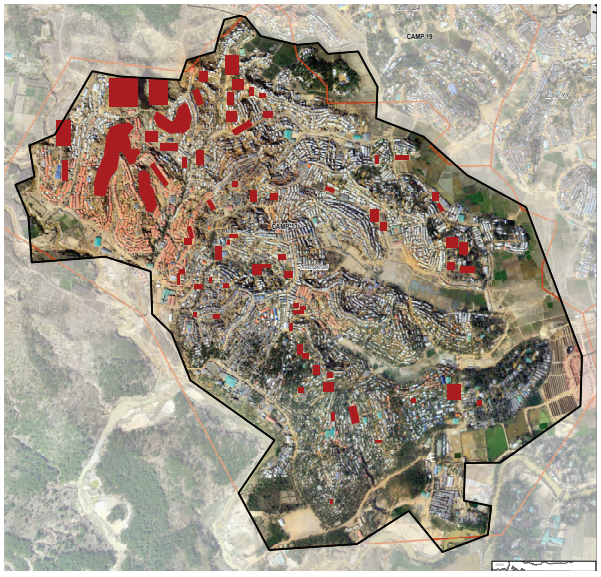


Figure 26. OPEN SPACES

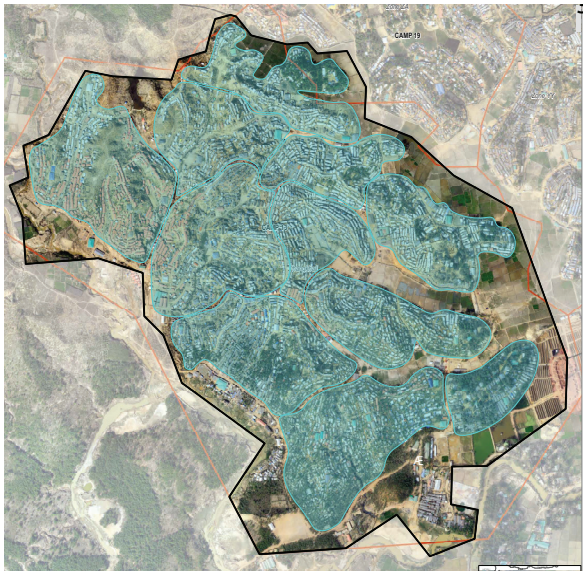


Figure 27. DISTRICTS

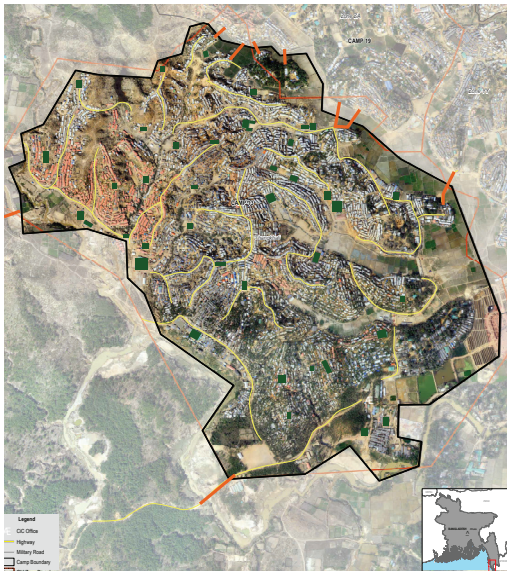


Figure 28. EXISTING FACILITIES.ROADS.

PERFORMANCE CRITERIA

SPACE ALLOCATION

1. *Public spaces should provide an adequate amount of space for people to occupy facilities comfortably. New additions to the camp should adhere to the space standards of Camp Planning Standards provided by UNHCR.*

These standards are as follows:
Average camp area per person (measured in Square Meters)

- Standard = **45 sq. m**
- Acceptable = **35 sq. m**
- Unacceptable = **34 - 30 sq. m**
- Critical = **29 sq. m**

At a minimum, additions to Kutupalong should adhere to "acceptable" standard of 35 sq m per person.

2. *Adequate amounts of infrastructure, health facilities, schools, and social connections should be provided in each camp. These facilities and infrastructure should be easily accessible and proximate to as many family's shelters as possible.*

This will be accomplished by measuring the distance between shelters and facilities, as well as finding the radius of impact of facilities.

ENVIRONMENTAL IMPACT

3. Design should prevent and stop the current deforestation in the area. In addition, it should rebuild and restore forestland that was lost.

4. Design should not further encroach onto Elephant pathways and migratory paths. Design should cater to elephant migratory paths and mitigate human / elephant conflict.

5. Any additional structures which are added to the camps should use natural materials which can be easily returned to the earth without high embodied energy.

6. Designs should utilize passive design principles to lessen the amount of fossil fuel energy, pollution, and greenhouse gases.

SPATIAL INTERACTIONS DIAGRAM

This diagram represents the spatial interactions and relations between facilities. It looks at two types of spaces. The first are existing spaces within Kutupalong that have been established by aid organizations. These facilities play a vital role in the access to resources for residents in Kutupalong. Therefore, it is important to include them in the spatial analyses. The second group are proposed spaces. As each district of the camp is unique, the location of each of these will vary depending on the existing locations of facilities and open spaces in each individual area. Another major element which is not included in this analysis are individual refugee shelters. As they are prevalent everywhere in the camp, it is hard to quantify them into this graph. However, each neighborhood and district of shelters should have good access to public facilities.

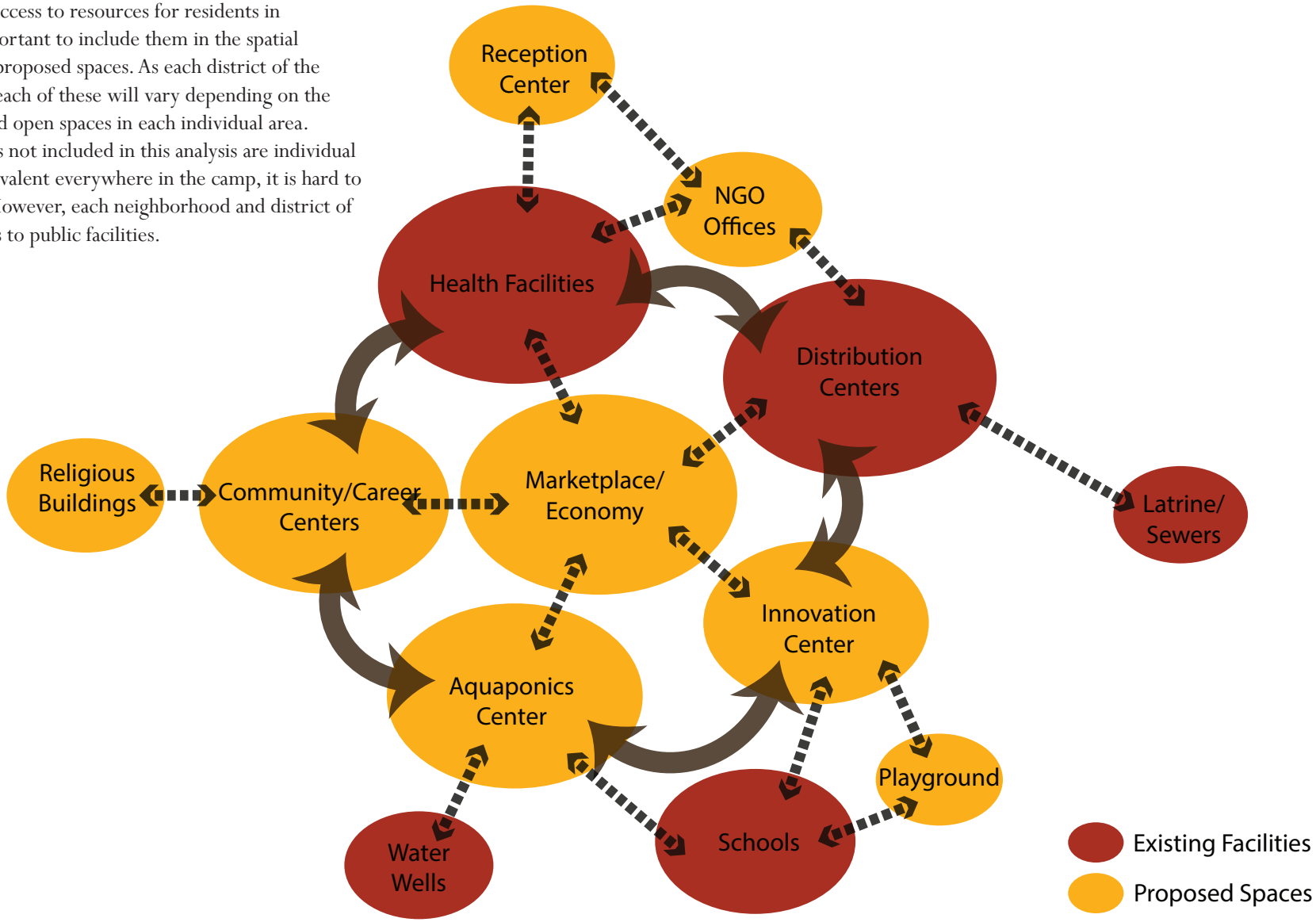


Figure 29. Spatial Interactions Diagram.

SPACE ALLOCATION MATRIX

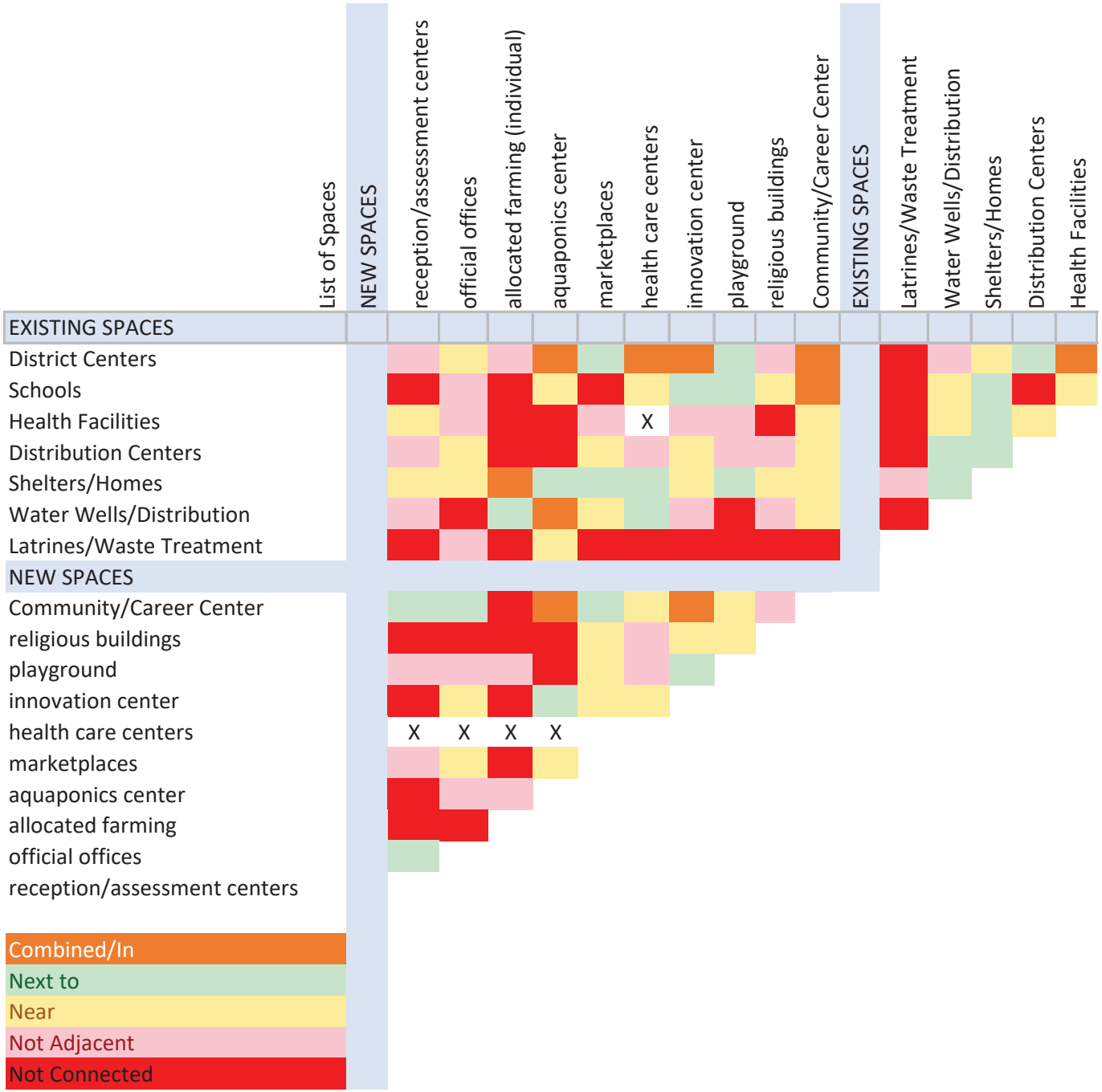


Figure 30. Space Allocation Matrix.

DESIGN APPROACH

It was determined early in the design process that instead of digitally modeling the buildings and structures of the project, that each would be designed and built in the form a physical model. To promote a sense of pride, ownership, and empowerment it was determined that the Rohingya refugees will be the ones building the structures. If this is the case, then it is vital to understand the tactile fashion of building with bamboo, as well as the structural systems of each building. This is done much better building physically than with a digital simulation.

BAMBOO

Bambusa Bambos
- Native to Bangladesh
- Height: 20-30 m (65-98 ft.)
- Diameter: 10-18 cm (4-7 in.)

Dendrocalamus Giganteus
- Introduced in Bangladesh
- Largest species in the world
- Height: 25-35 m (82-115 ft.)
- Diameter: 15-30 cm (6-12 in.)

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- Koenigsberger

Appendix 11

TABLE 1

Location	KUTUPALONG
Longitude	92.16 N
Latitude	21.21 E
Altitude	

Air temperature: °C

	J	F	M	A	M	J	J	A	S	O	N	D	High	AMT
Monthly mean max.	26	29	30.5	32	32	30	29.5	30	30.5	31	29	26.5	32	23
Monthly mean min.	14.5	16.5	20	24	25	25	24.5	24.5	24.5	24	20.5	16	14.5	17.5
Monthly mean range	11.5	11.5	10.5	8	7	5	5	5.5	6	7	8.5	10.5	Low	AMR

Relative humidity: %

Monthly mean max. a.m.												
Monthly mean min. p.m.												
Average	70	69	70	75	79	81	82	83	82	81	79	78
Humidity group	3	3	3	4	4	4	4	4	4	4	4	4

Humidity group:	1	If average RH: below 30%
	2	30–50%
	3	50–70%
	4	above 70%

Rain and wind (MM)

Rainfall, mm	4.1	17	35	122	287	802	925	667	330	214	109	13	3528 Total

Wind, prevailing												
Wind, secondary												
	J	F	M	A	M	J	J	A	S	O	N	D

Comfort limits		AMT over 20°C		AMT 15–20°C		AMT below 15°C	
		Day	Night	Day	Night	Day	Night
Humidity group:	1	26–34	17–25	23–32	14–23	21–30	12–21
	2	25–31	17–24	22–30	14–22	20–27	12–20
	3	23–29	17–23	21–28	14–21	19–26	12–19
	4	22–27	17–21	20–25	14–20	18–24	12–18

TABLE 2
Diagnosis: °C

	J	F	M	A	M	J	J	A	S	O	N	D	AMT
Monthly mean max.	26	29	30.5	32	32	30	29.5	30	30.5	31	29	26.5	
Day comfort: upper	29	29	29	27	27	27	27	27	27	27	27	27	
lower	23	23	23	22	22	22	22	22	22	22	22	22	
Monthly mean min.	14.5	16.5	20	24	25	25	24.5	24.5	24.5	24	20.5	16	
Night comfort: upper	23	23	23	21	21	21	21	21	21	21	21	21	
lower	17	17	17	17	17	17	17	17	17	17	17	17	
Thermal stress: day	O	O	H	H	H	H	H	H	H	H	H	O	
night	C	C	O	H	H	H	H	H	H	H	O	C	

Indicators

Humid:	H1				X	X	X			X	X	X		8 Totals
	H2	X	X										X	3
	H3				X	X	X	X	X	X				6
Arid:	A1													0
	A2			X										1
	A3													0

Applicable when: / Meaning:	Indicator	Thermal stress: Day	Thermal stress: Night	Rainfall	Humidity group	Monthly mean range
Air movement essential	H1	H			4	
		H			2, 3	Less than 10°
Air movement desirable	H2	O			4	
Rain protection necessary	H3			Over 200 mm		
Thermal capacity necessary	A1				1, 2, 3	More than 10°
Out-door sleeping desirable	A2		H		1, 2	
		H	O		1, 2	More than 10°
Protection from cold	A3	C				

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Indicator totals from table 2					
H1	H2	H3	A1	A2	A3
8	3	6	0	1	0

TABLE 3
Recommended specifications

Layout

			0–10			✓	1	Orientation north and south (long axis east–west)
			11, 12		5–12			
					0–4	✓	2	Compact courtyard planning

Spacing

11, 12							3	Open spacing for breeze penetration
2–10						✓	4	As 3, but protection from hot and cold wind
0, 1							5	Compact lay-out of estates

Air movement

3–12						✓	6	Rooms single banked, permanent provision for air movement
1, 2			0–5					
			6–12			✓	7	Double banked rooms, temporary provision for air movement
0	2–12							
	0, 1						8	No air movement requirement

Openings

			0, 1		0	✓	9	Large openings, 40–80%
			11, 12		0, 1		10	Very small openings, 10–20%
Any other conditions							11	Medium openings, 20–40%

Walls

			0–2			✓	12	Light walls, short time-lag
			3–12				13	Heavy external and internal walls

Roofs

			0–5			✓	14	Light, insulated roofs
			6–12				15	Heavy roofs, over 8 h time-lag

Out-door sleeping

				2–12			16	Space for out-door sleeping required

Rain protection

		3–12				✓	17	Protection from heavy rain necessary

Indicator totals from table 2					
H1	H2	H3	A1	A2	A3
8	3	6	0	1	0

TABLE 4

Detail recommendations

Size of opening

			0, 1		0	✓	1	Large: 40–80%
					1–12		2	Medium: 25–40%
			2–5					
			6–10				3	Small: 15–25%
			11, 12		0–3		4	Very small: 10–20%
					4–12		5	Medium: 25–40%

Position of openings

3–12						✓	6	In north and south walls at body height on windward side
1–2			0–5					
			6–12			✓	7	As above, openings also in internal walls
0	2–12							

Protection of openings

					0–2	✓	8	Exclude direct sunlight
		2–12				✓	9	Provide protection from rain

Walls and floors

			0–2			✓	10	Light, low thermal capacity
			3–12				11	Heavy, over 8 h time-lag

Roofs

10–12			0–2			✓	12	Light, reflective surface, cavity
			3–12				13	Light, well insulated
0·9			0–5					
			6–12				14	Heavy, over 8 h time-lag

External features

				1–12		✓	15	Space for out-door sleeping
		1–12				✓	16	Adequate rainwater drainage

VERNACULAR STUDIES

Malaysia

The study of vernacular architecture within a similar climate and context was extremely important to the project. Local building materials were a requirement of the project, so understanding how these locations build vernacularly was analyzed. An array of locations from south to south east Asia were studied.

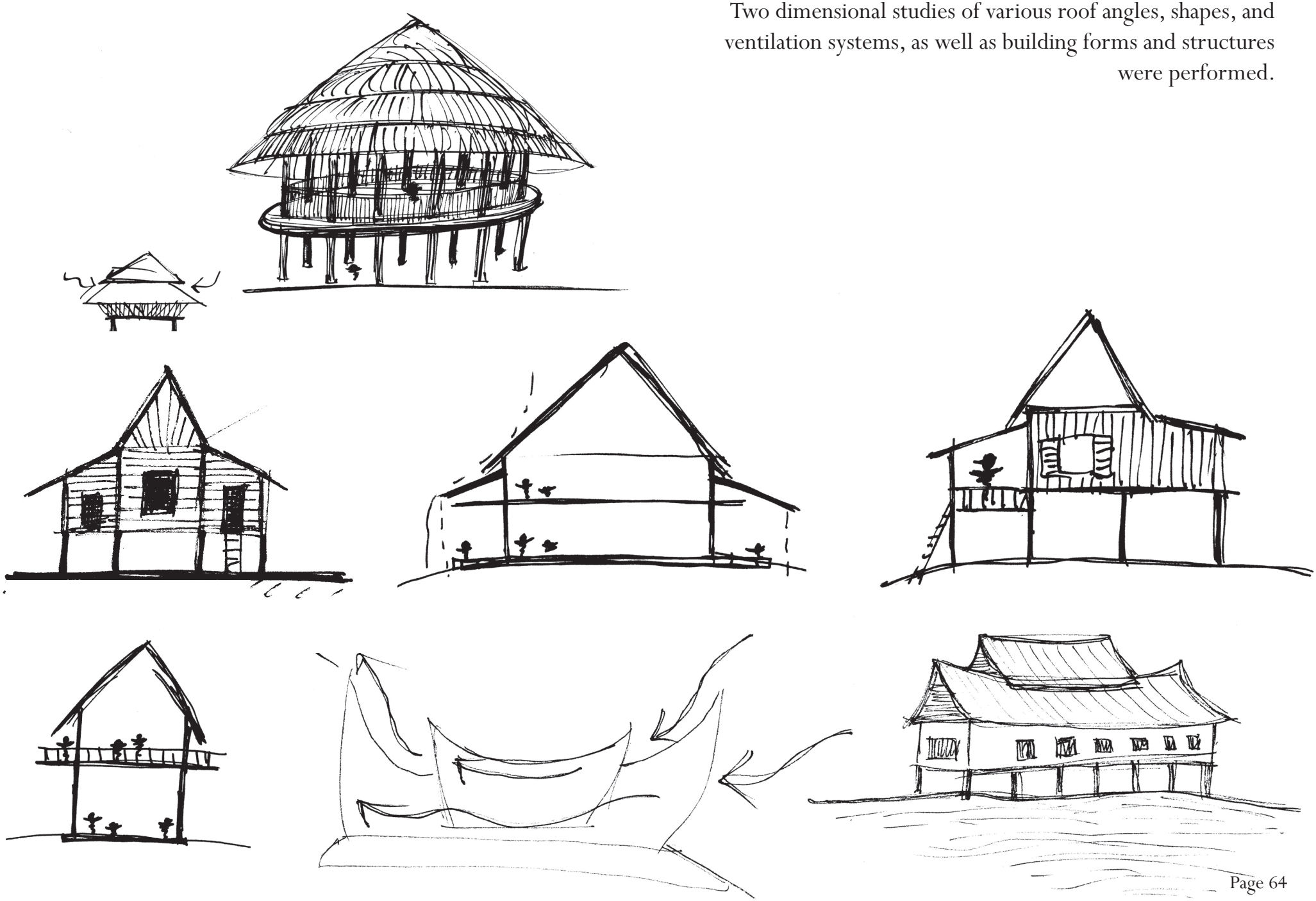
Kerala, India

Indonesia

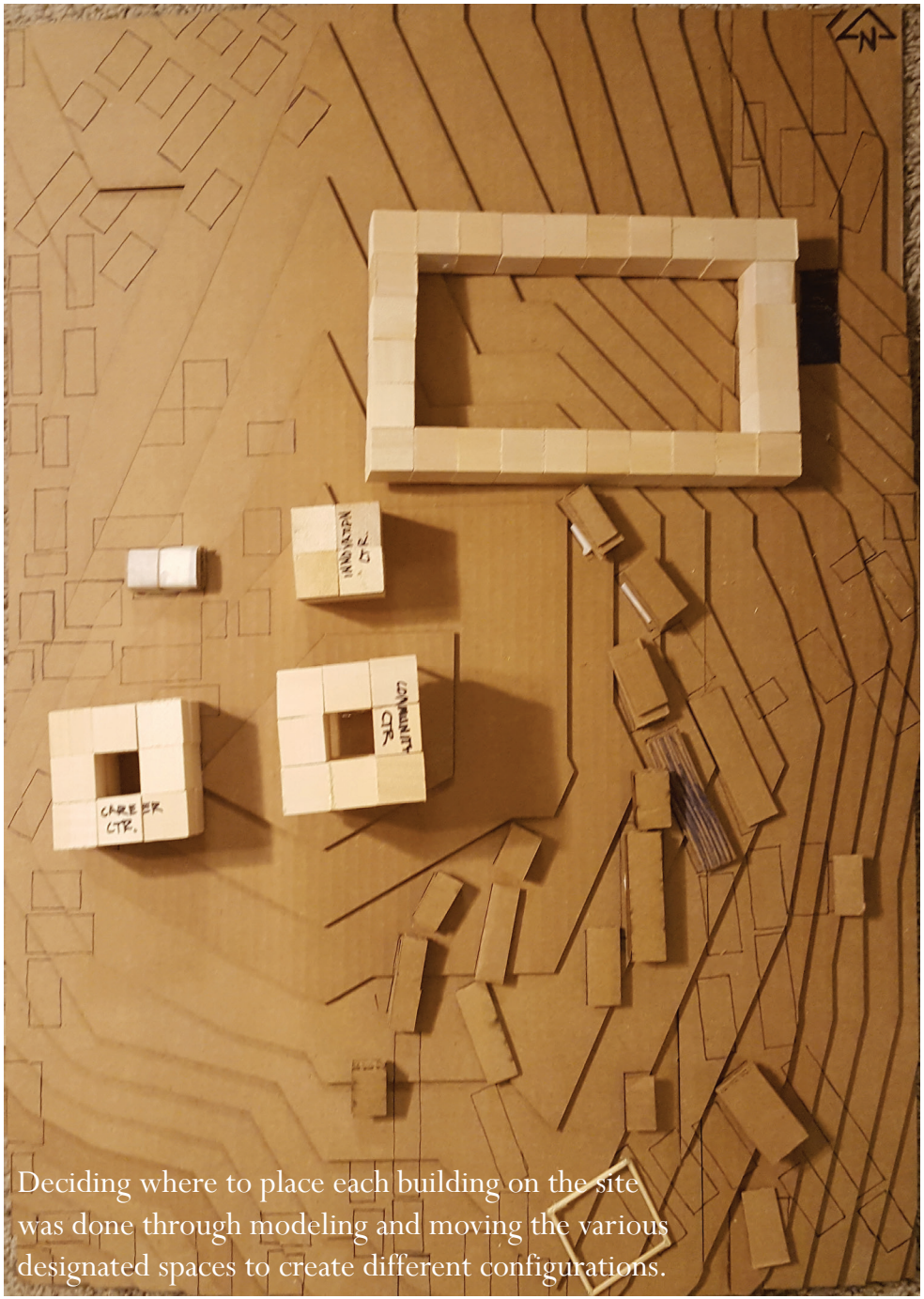
Inle Lake, Myanmar

VERNACULAR ANALYSES

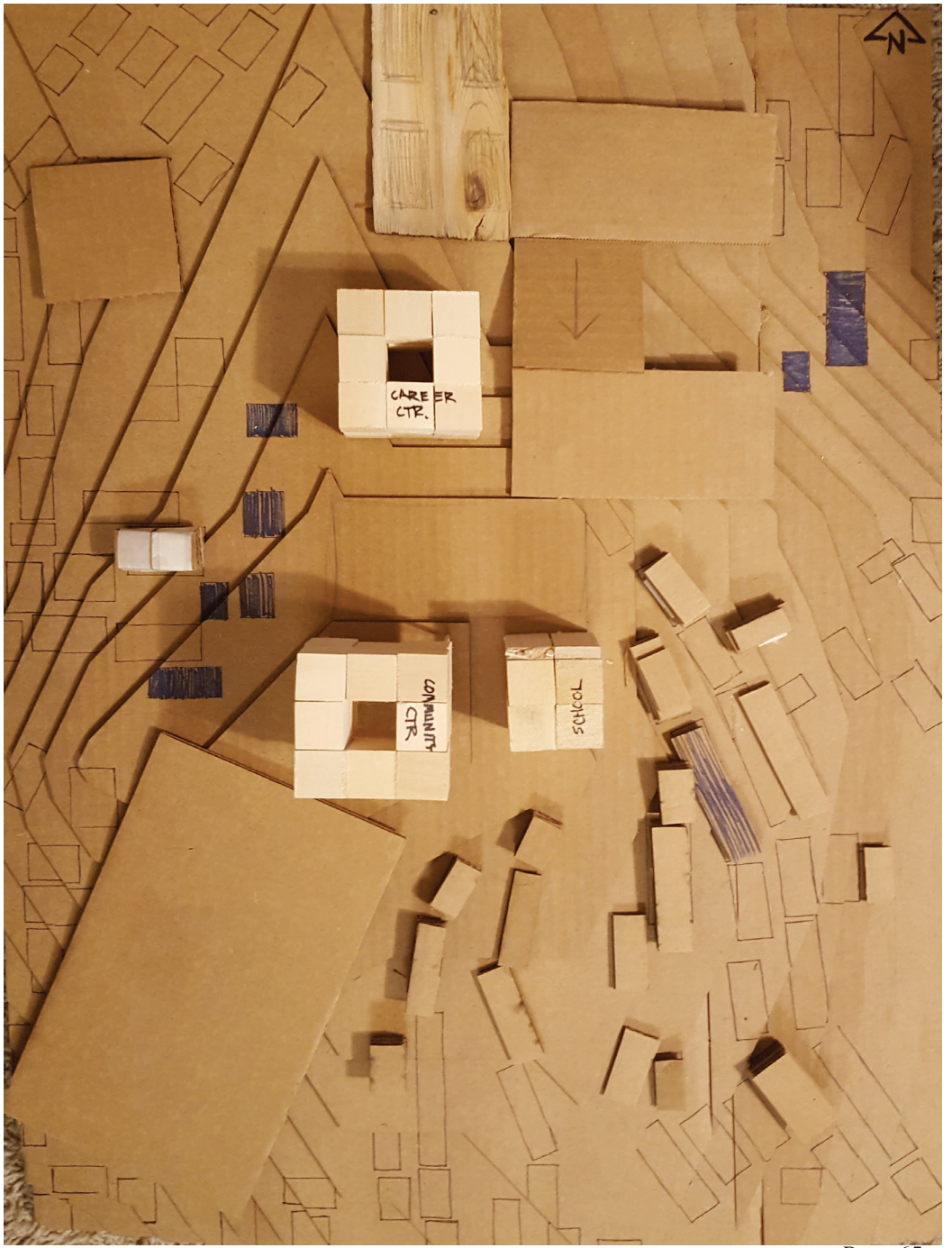
Two dimensional studies of various roof angles, shapes, and ventilation systems, as well as building forms and structures were performed.



SITE PLANNING PROCESS



Deciding where to place each building on the site was done through modeling and moving the various designated spaces to create different configurations.



COMMUNITY CENTER
- 2,000 Sq Ft

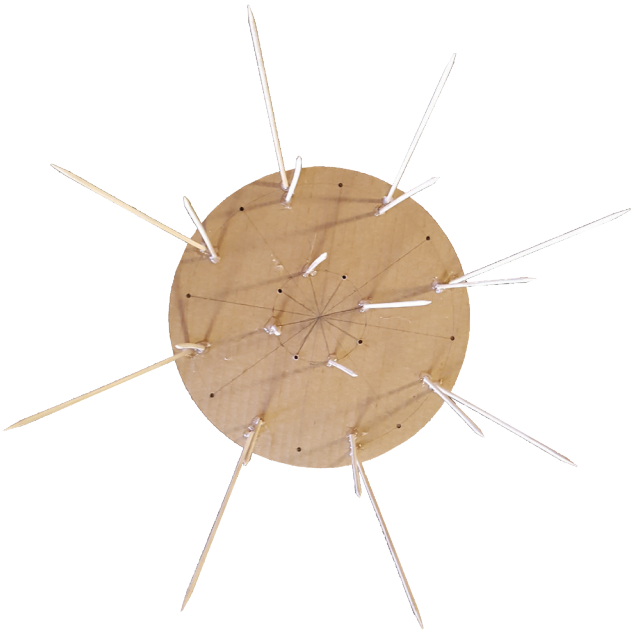
SCHOOL
- 2,500 Sq Ft

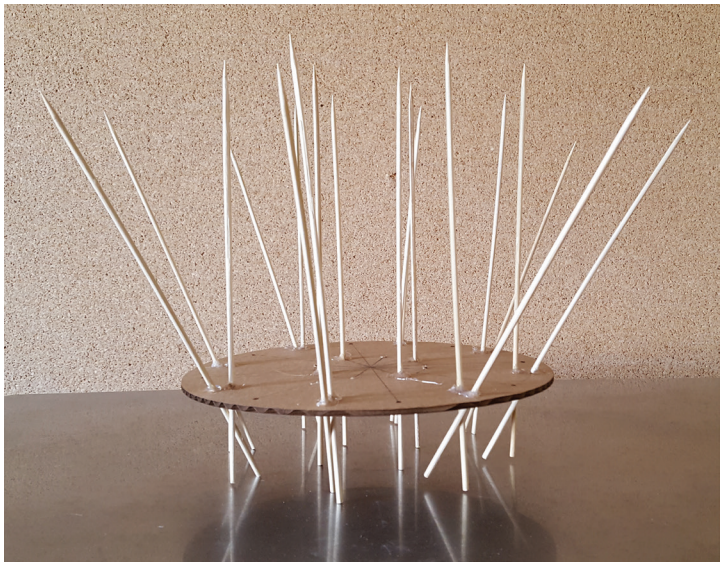
INNOVATION AND CAREER CENTER
- Innovation Center:1,800 Sq Ft
- Career Center: 2,000 Sq Ft

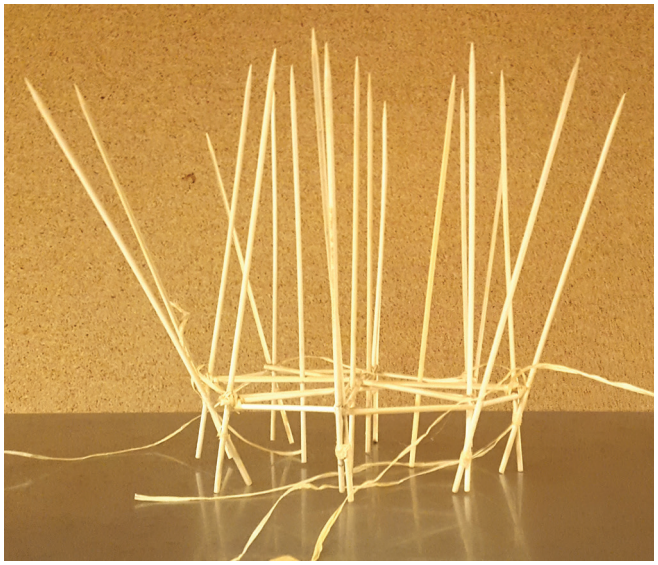
MARKETPLACE
- 6,250 Sq Ft

Iteration 1

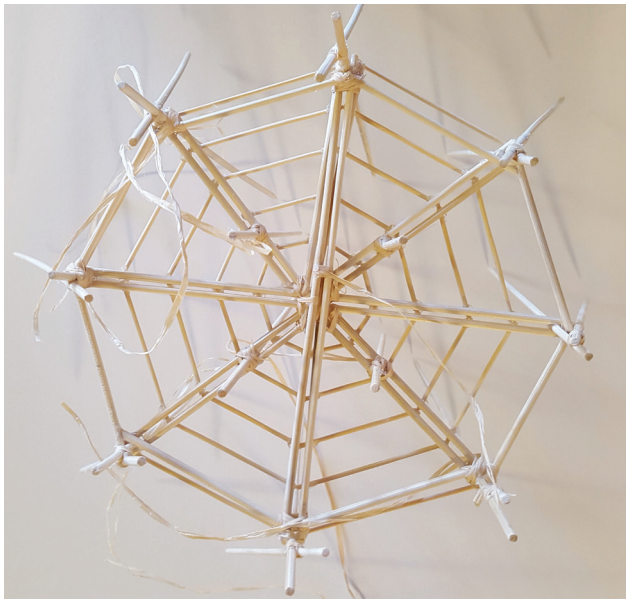
Iteration 2: Process Photographs of the Evolution of the Community Center

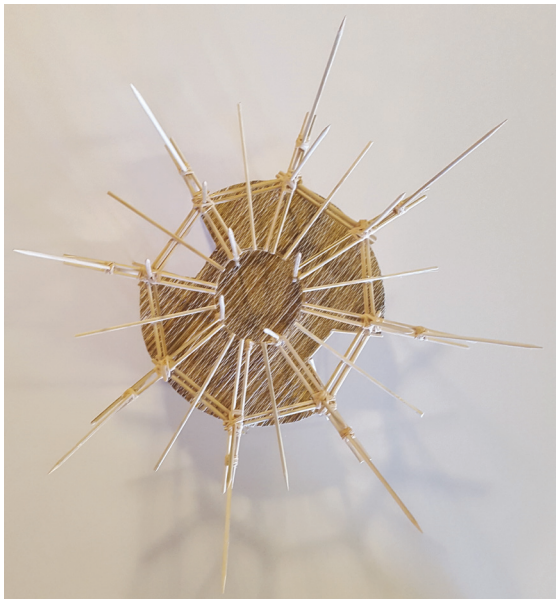


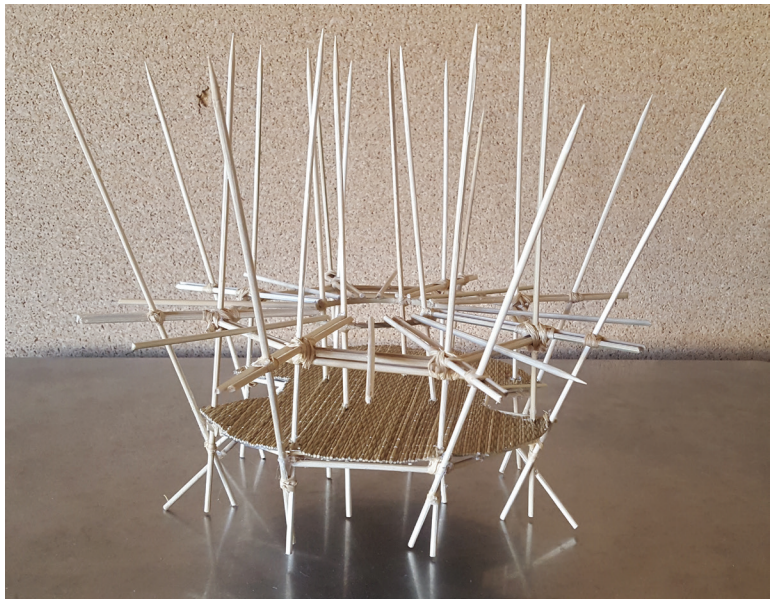




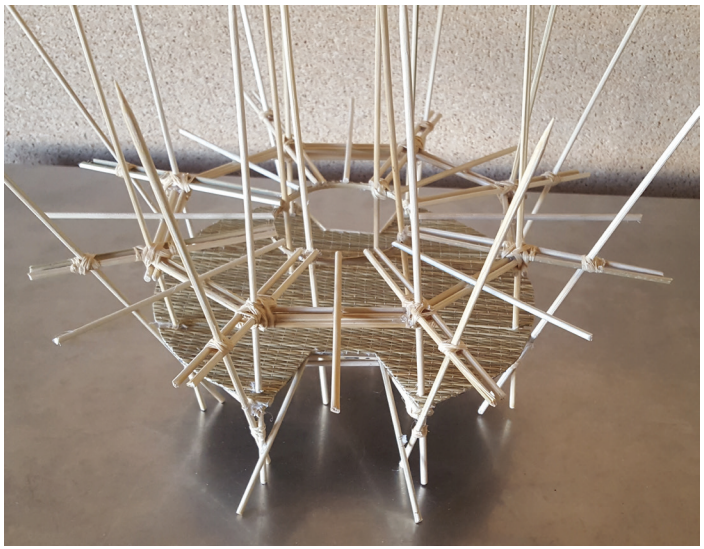
Building the Final Iteration; Evolution of the Base and Structure

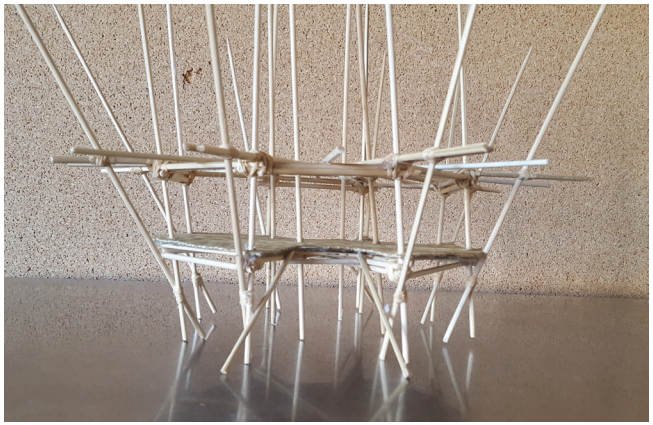


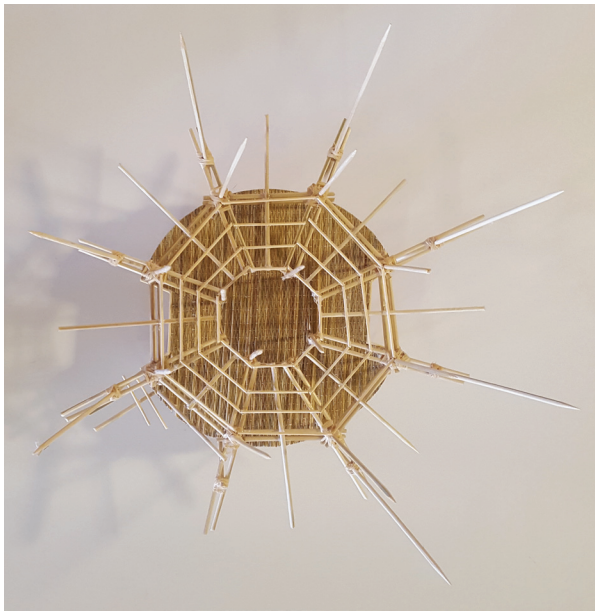


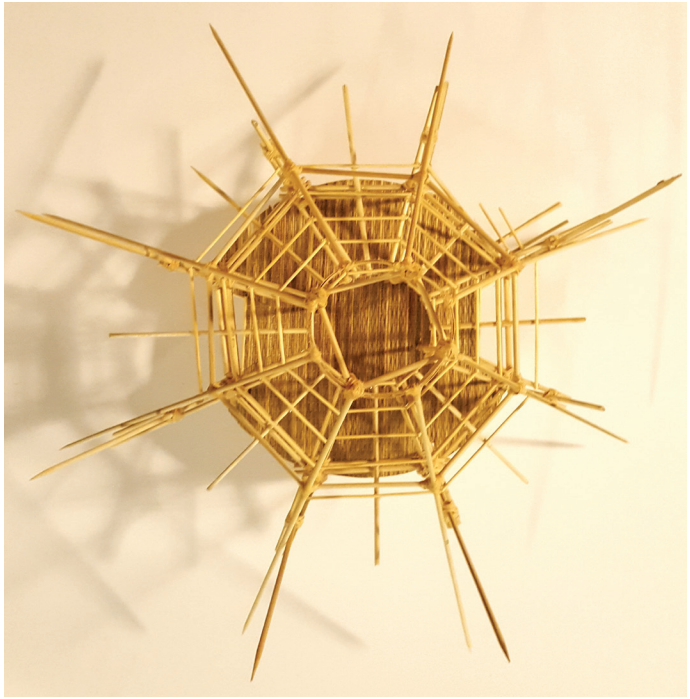


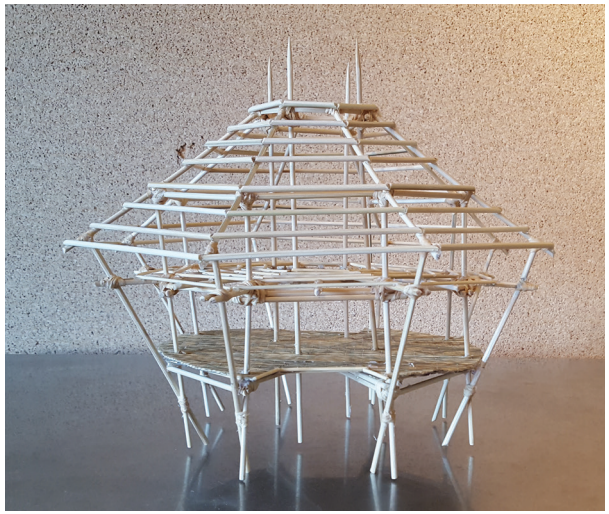
Building the Second and Third Levels

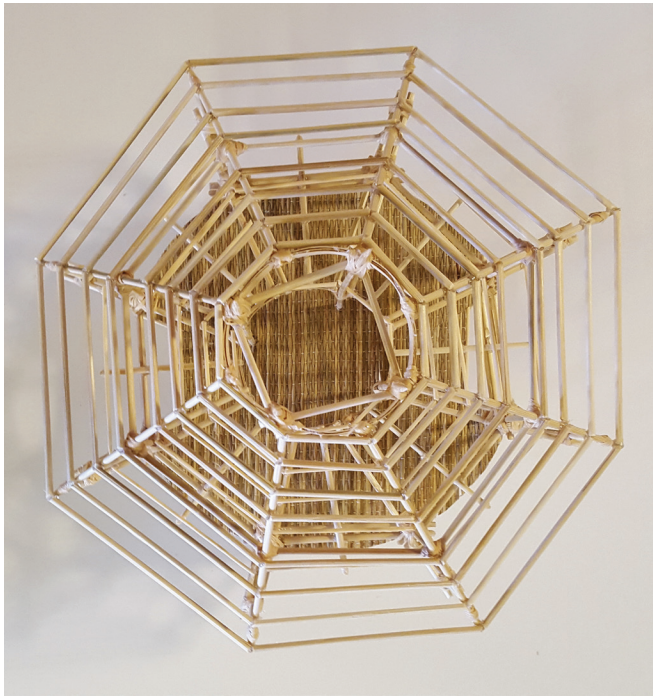












Building the Roof Structure

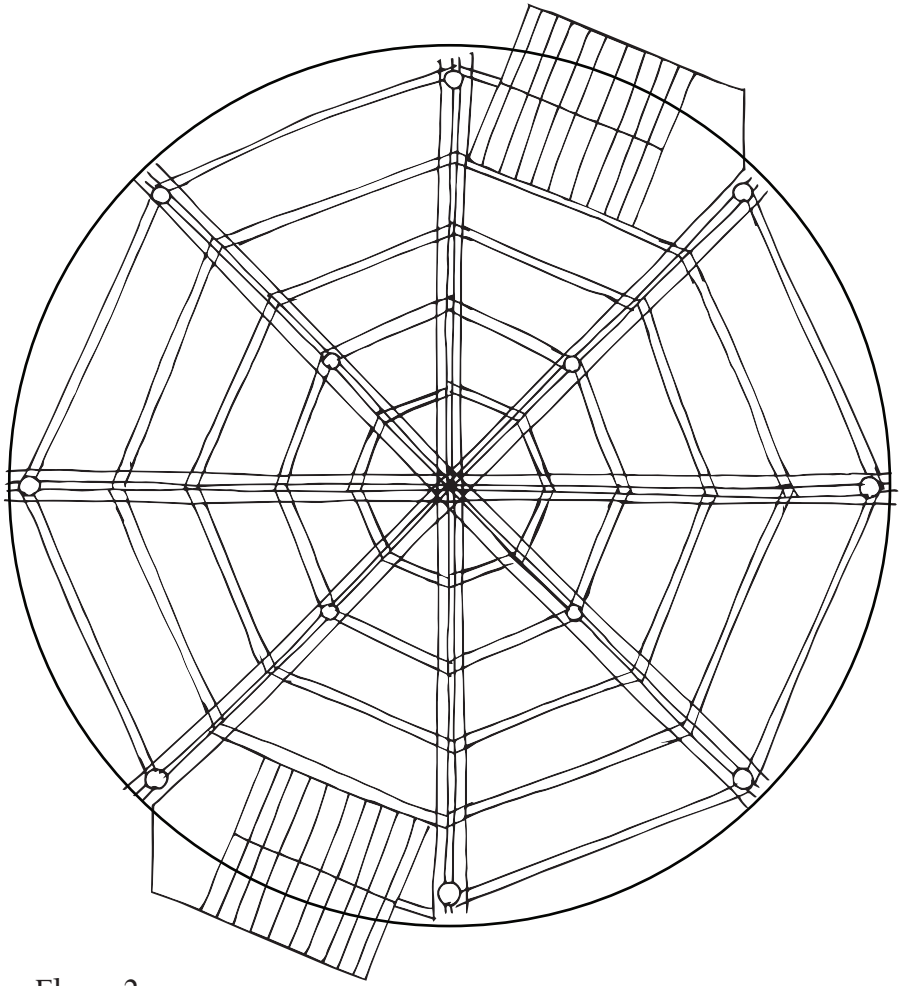
COMMUNITY CENTER FINAL MODEL

COMMUNITY CENTER

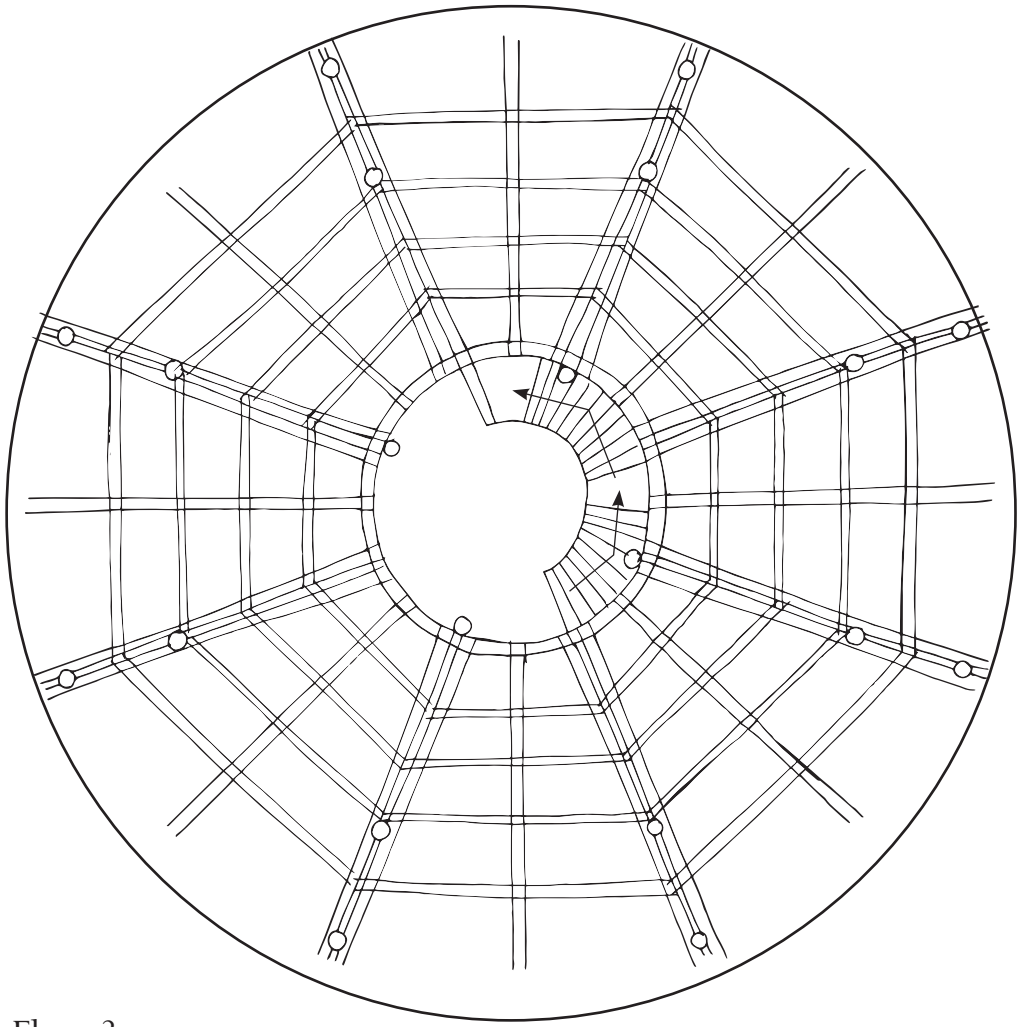
- 3 Story Central Meeting Space
- Political Meetings
- Community, Gathering, and Celebratory Events

COMMUNITY CENTER PLANS

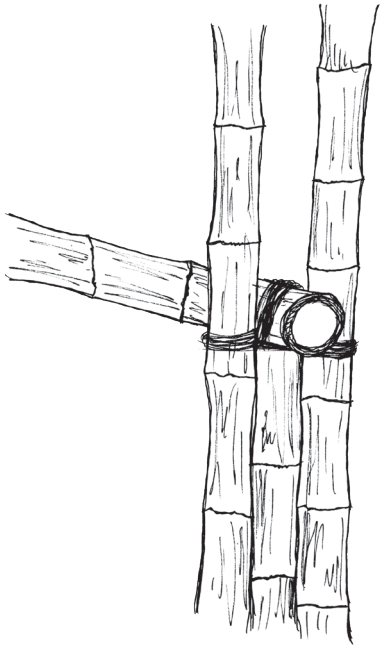
All floor plans are structural in nature and left open to accommodate for various uses as determined by the refugees. Circulation and stairways are shown through the plan instead of in model form.



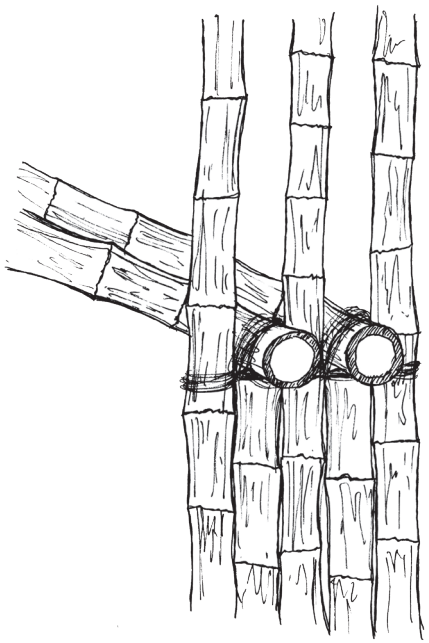
Floor 2



Floor 3



Wall & Floor Connection



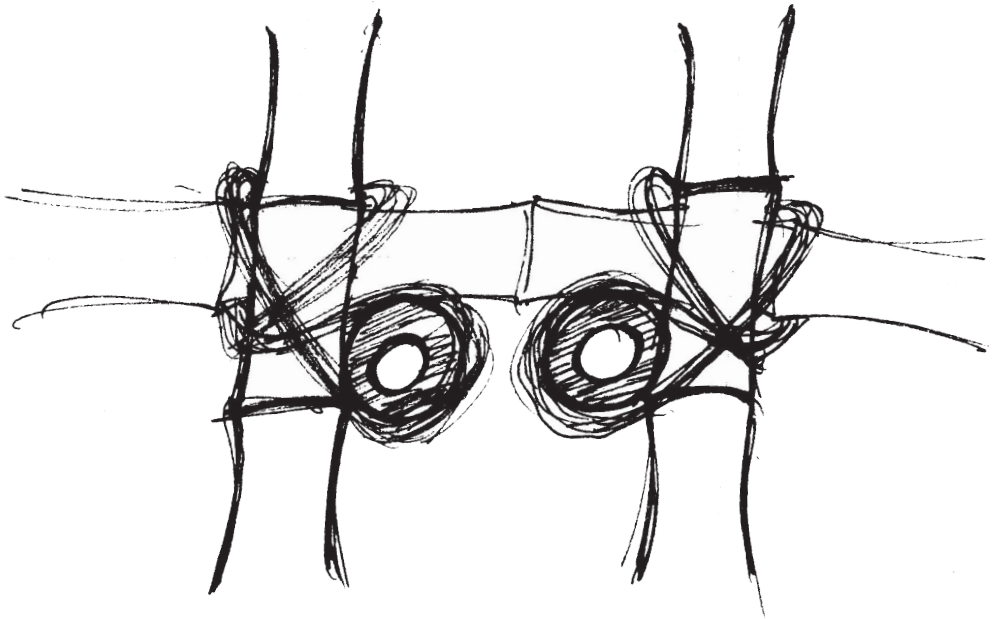
Life Size Bamboo Connection

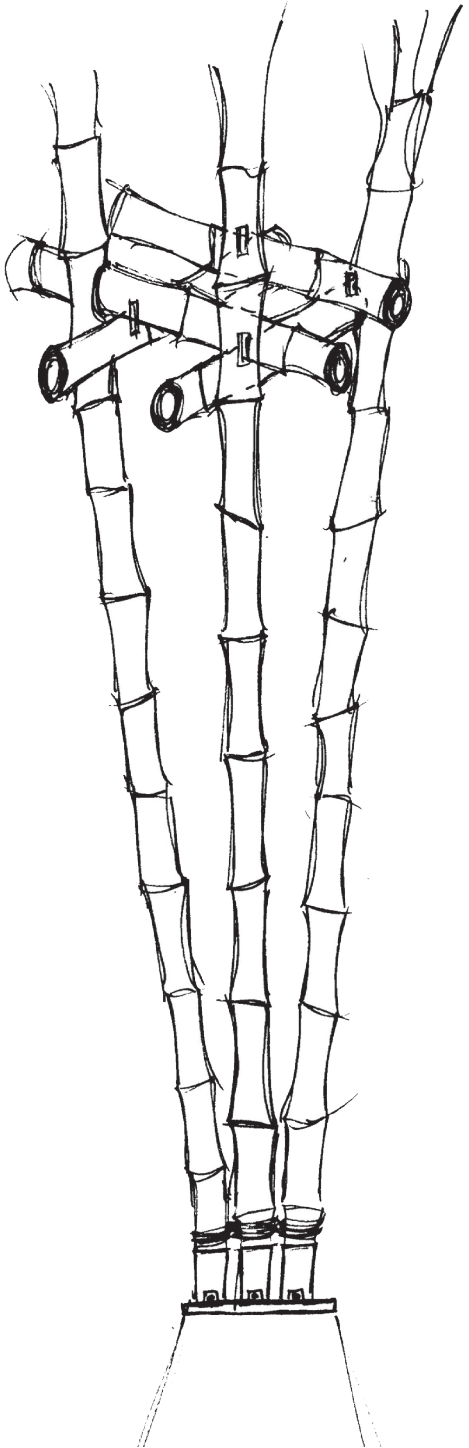
SCHOOL

-Adaptable 2 Story Space
-Operational for Primary, Secondary, or Adult Education

The school is customizable depending on location and need. Levels can be added or subtracted. It is intended that each district within the camp would have a local school. Multiple schools would be constructed within Camp 13.

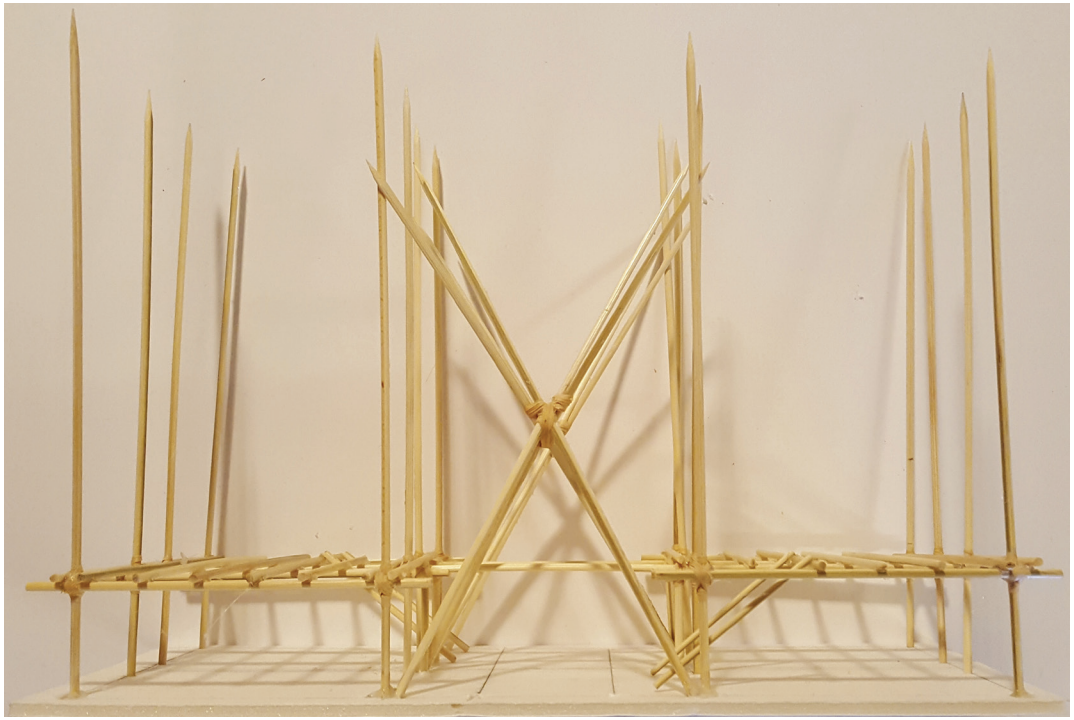
Column Details

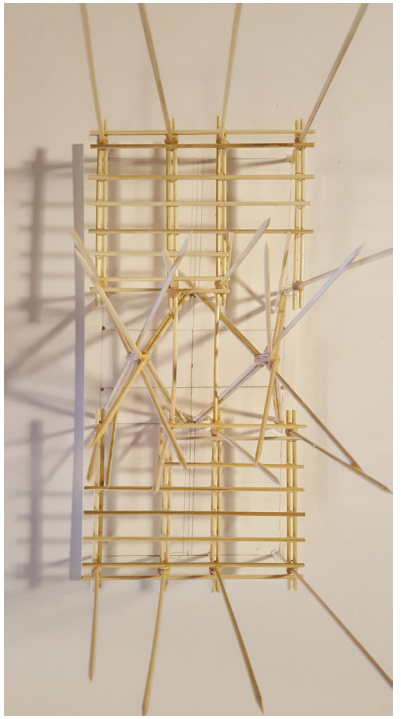




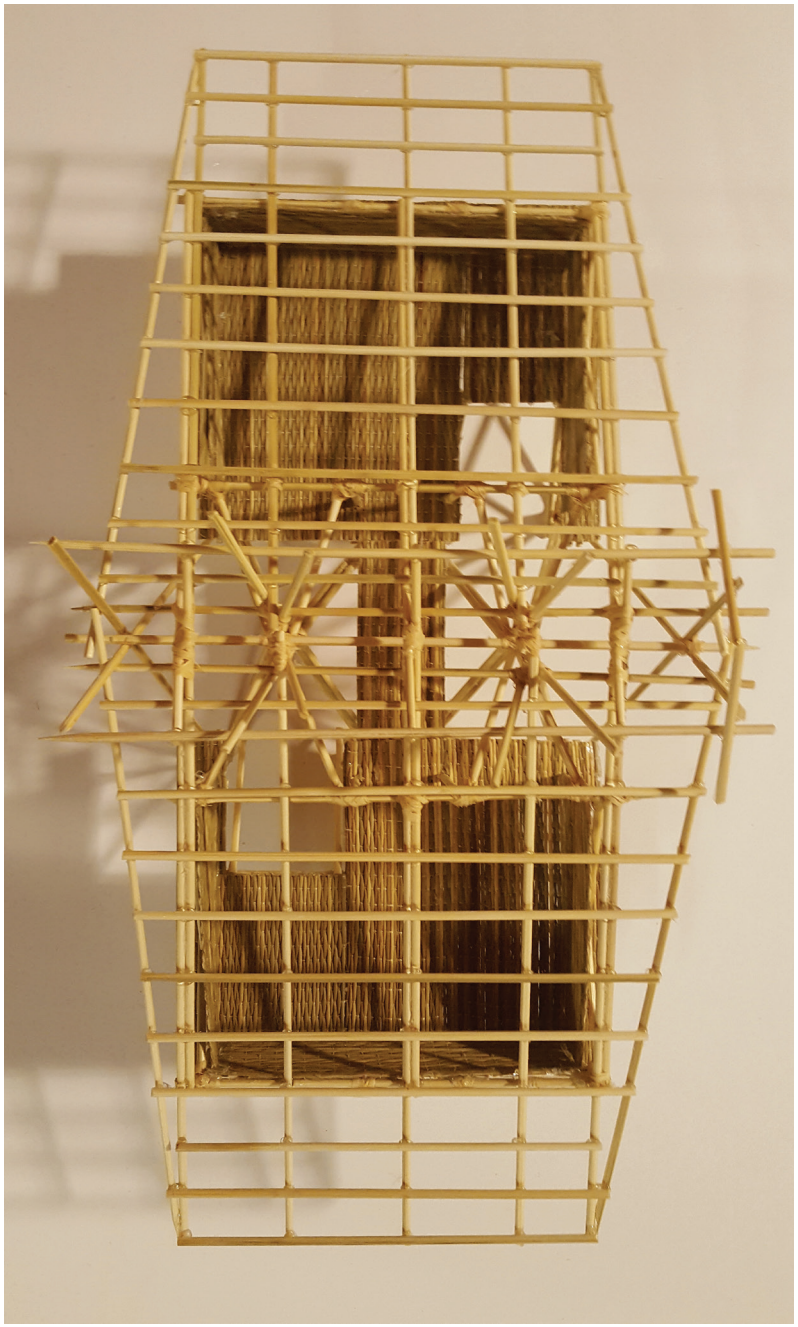
INNOVATION CENTER PROCESS

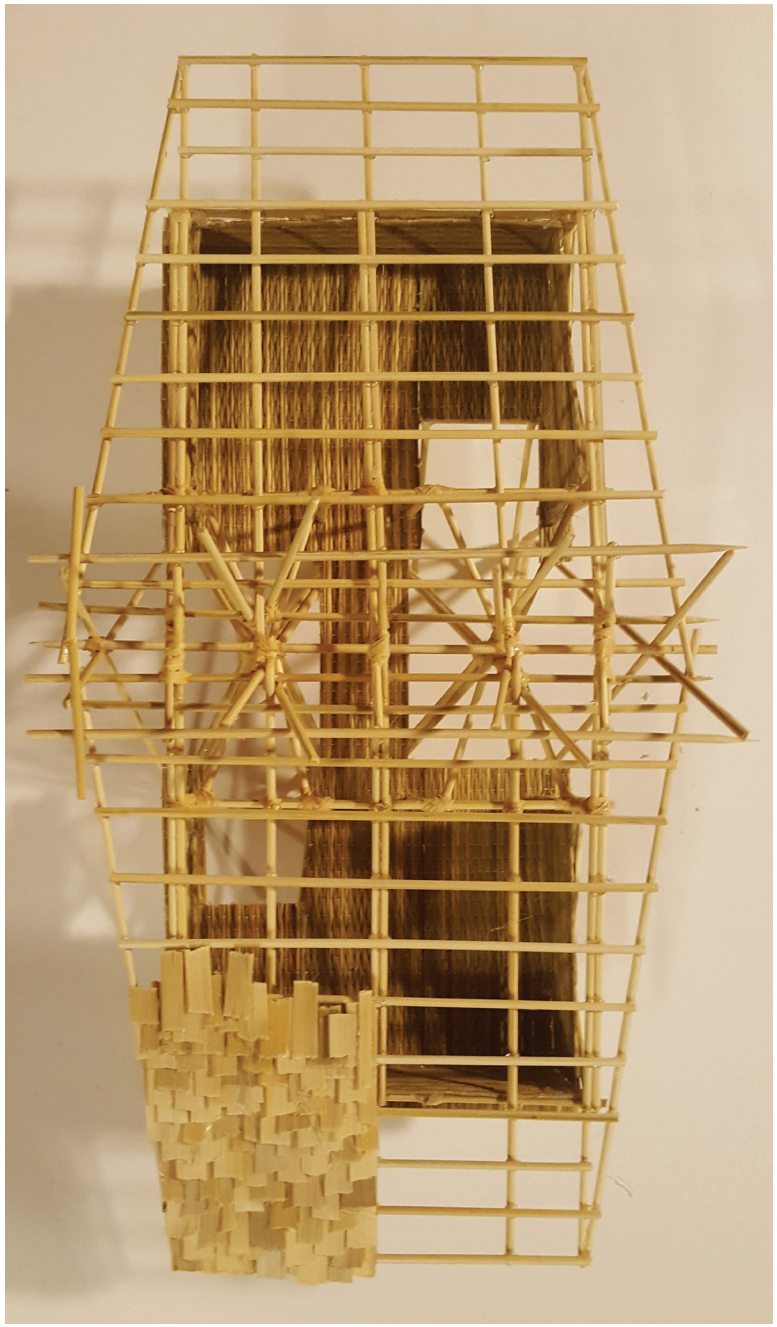
It was decided to combine the innovation and career center due to the lack of space on the site, as well as the similarities in the uses. Build up instead of creating an extra structure would be a better use of space. The bottom level would be the innovation center, as large machines can easily be brought onto the foundation and worked on here. The top level would be the career center.





Building the Final Iteration; Structure of the Second Level

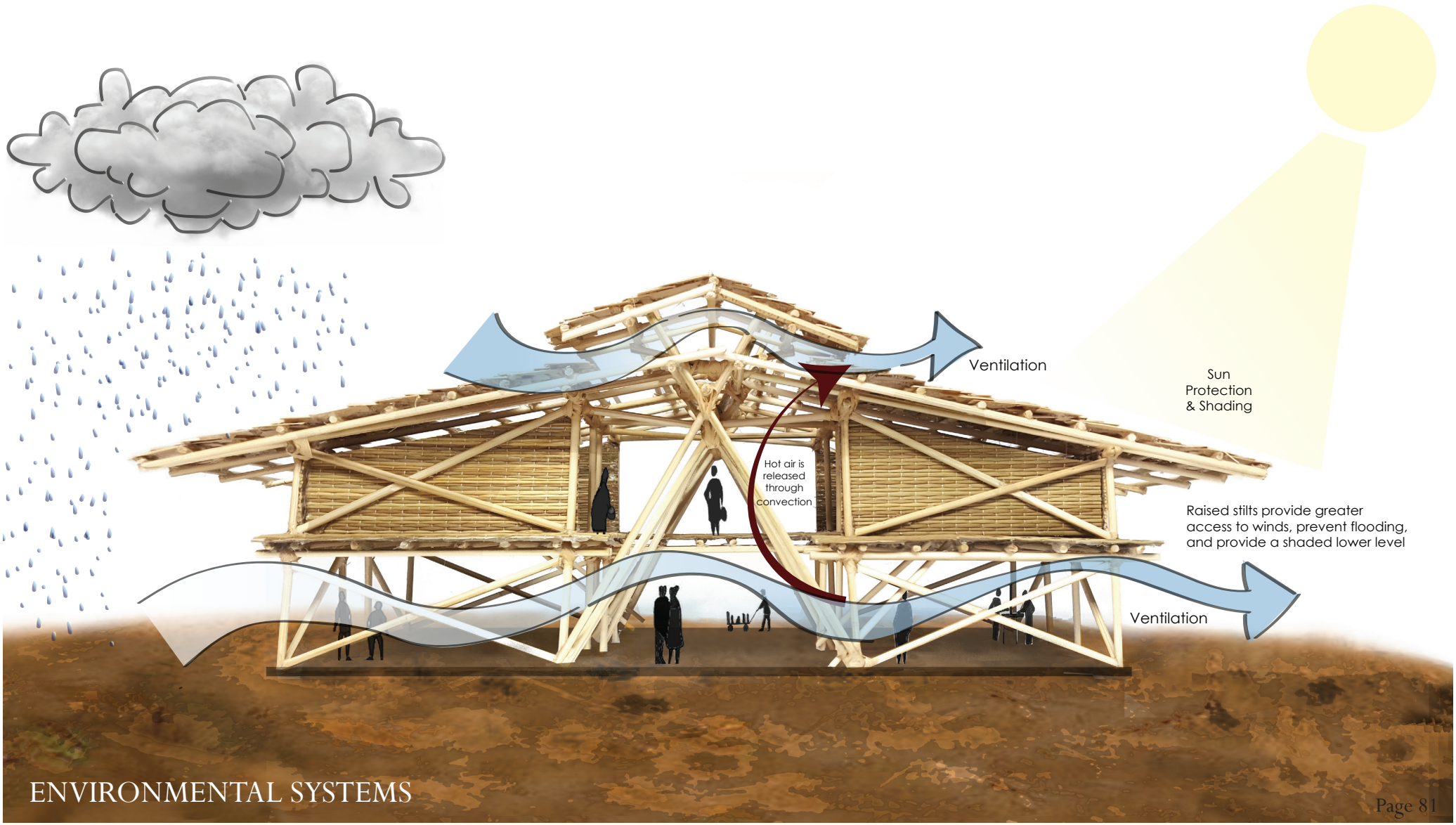




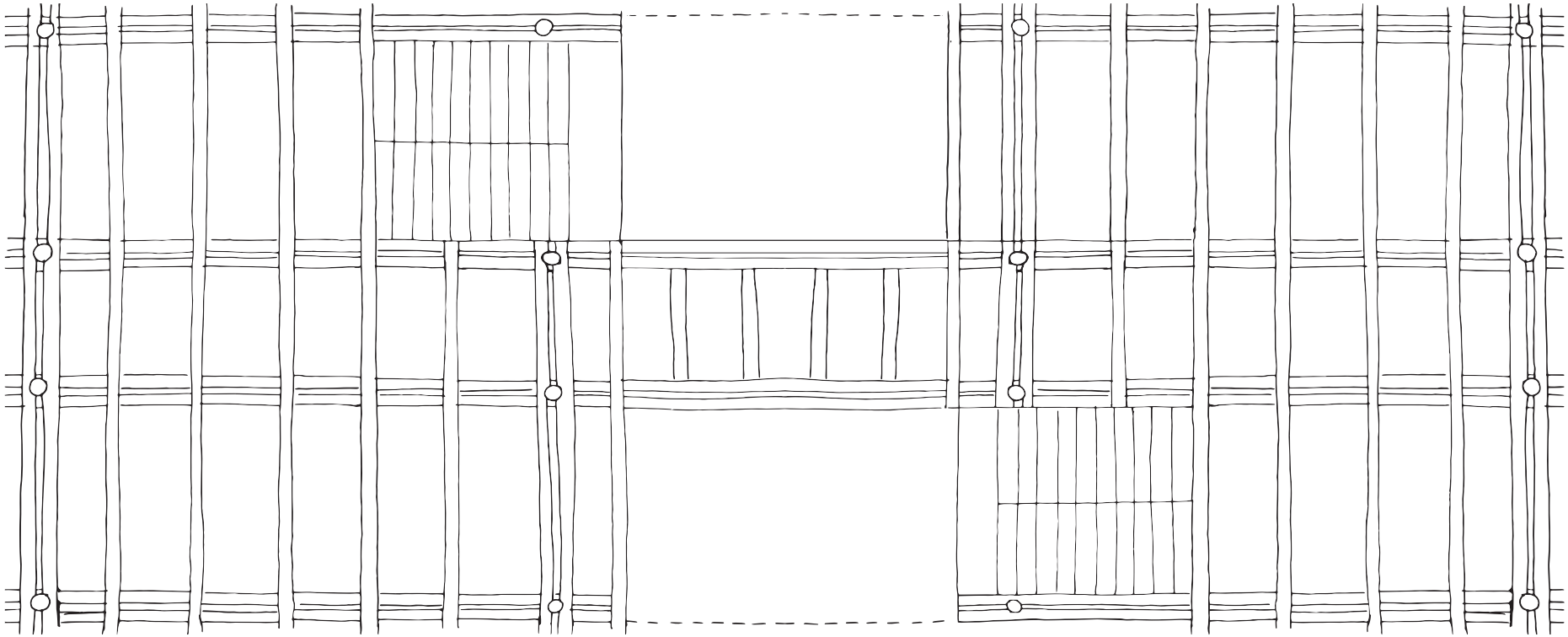
Evolution of the Roof

INNOVATION CENTER

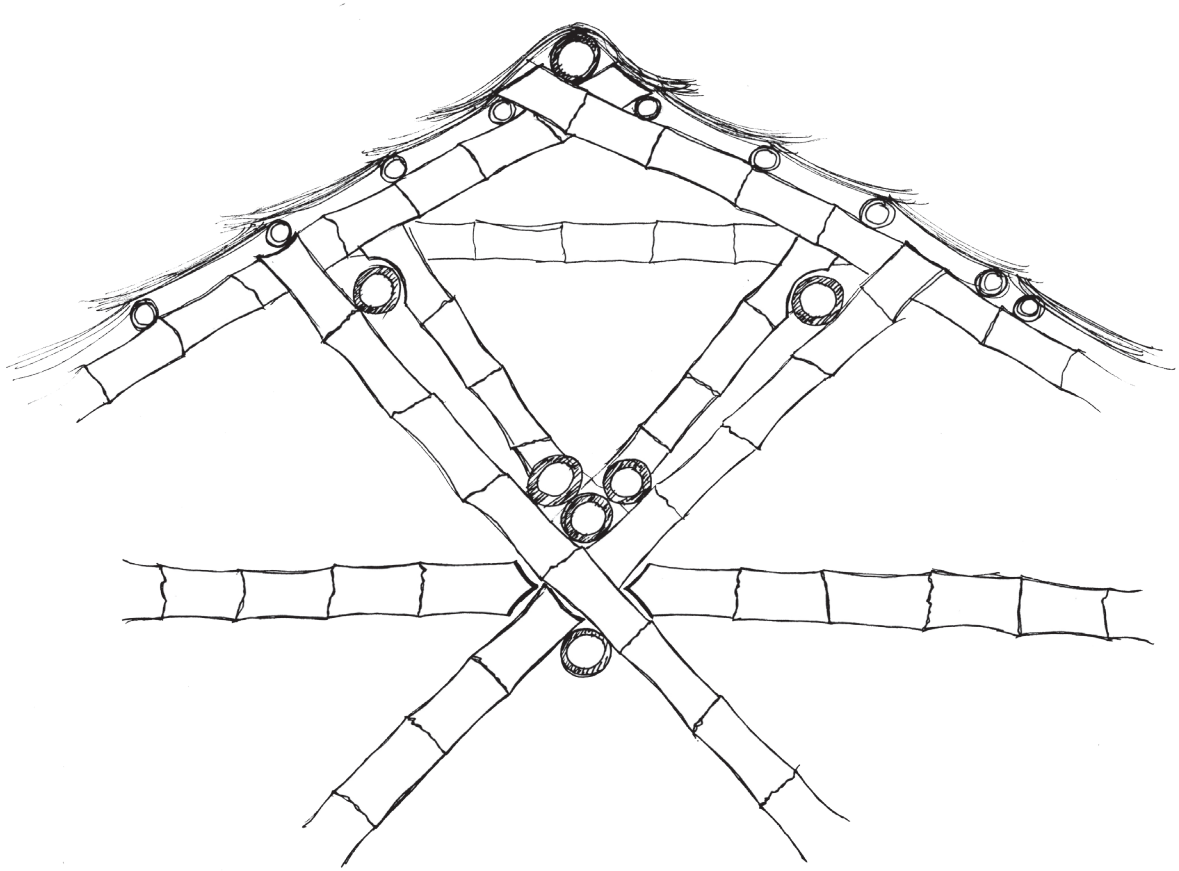
- Practice Skills in Local Craft, Engineering, Construction, Mechanics
- Prove Access to Resources for Skill Development and Job Seeking



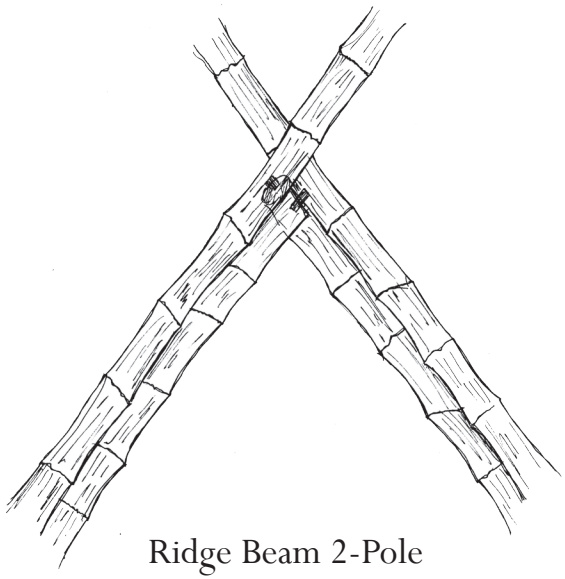
INNOVATION CENTER PLAN



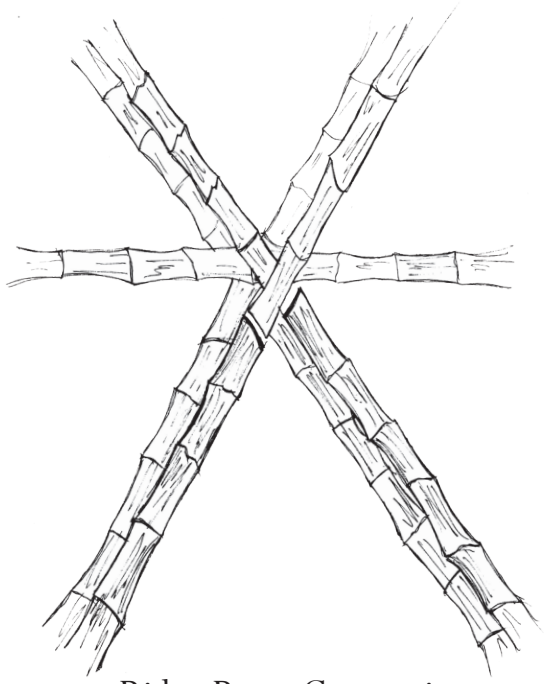
Level Two



Ridge Beam Section



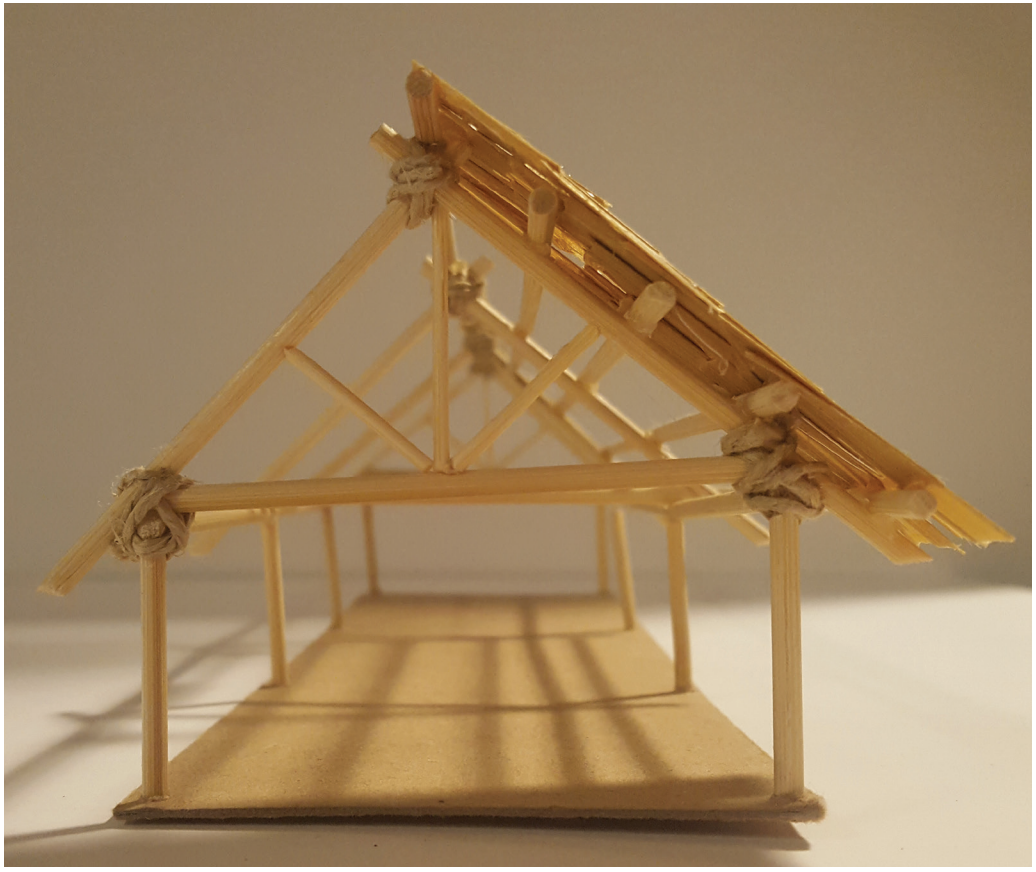
Ridge Beam 2-Pole
Connection Detail

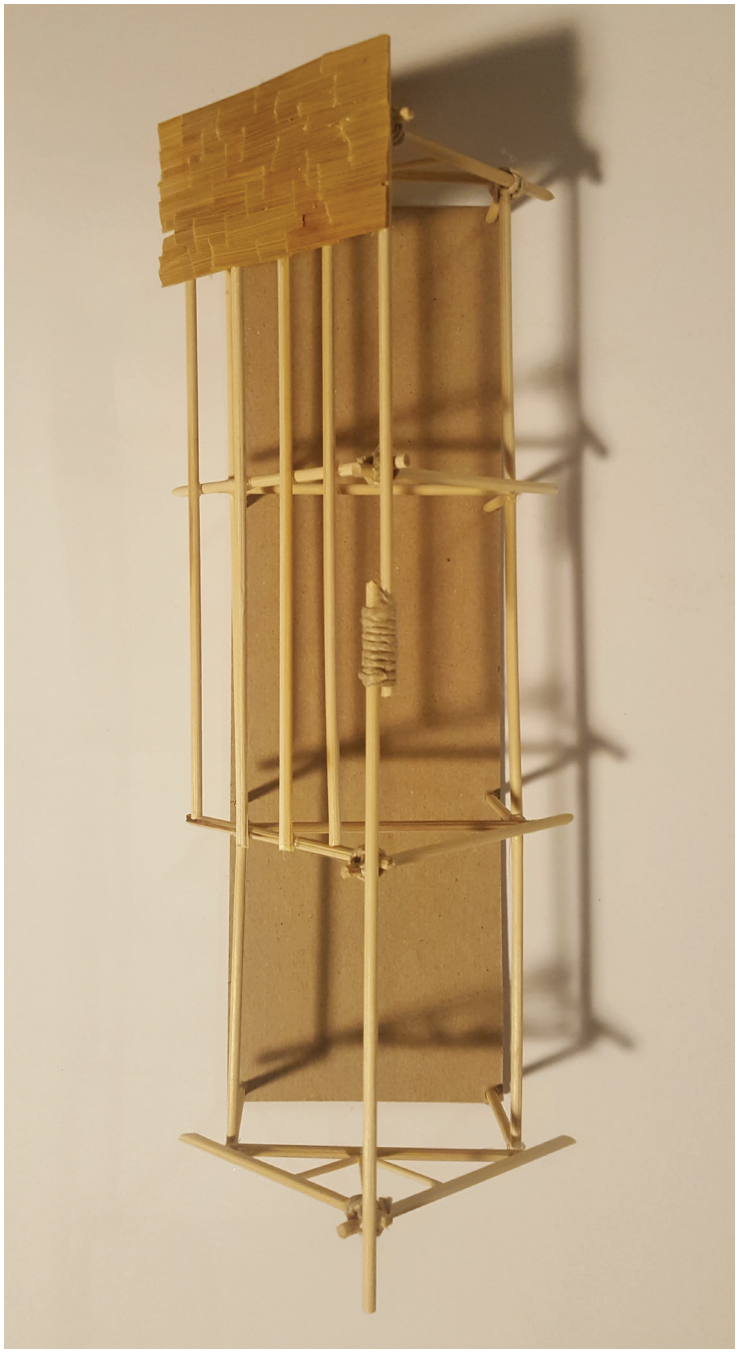


Ridge Beam Connection
Elevation Detail

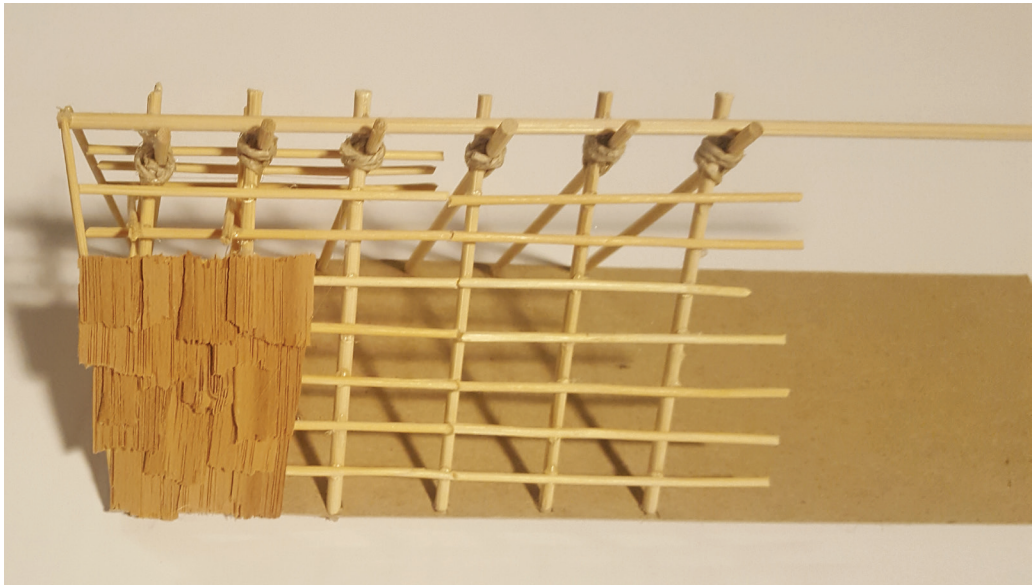
During the design process, various configurations were explored. It was determined that a long, linear plan that has vendors on either side would be culturally and site responsive. Various iterations were explored based on structural systems.

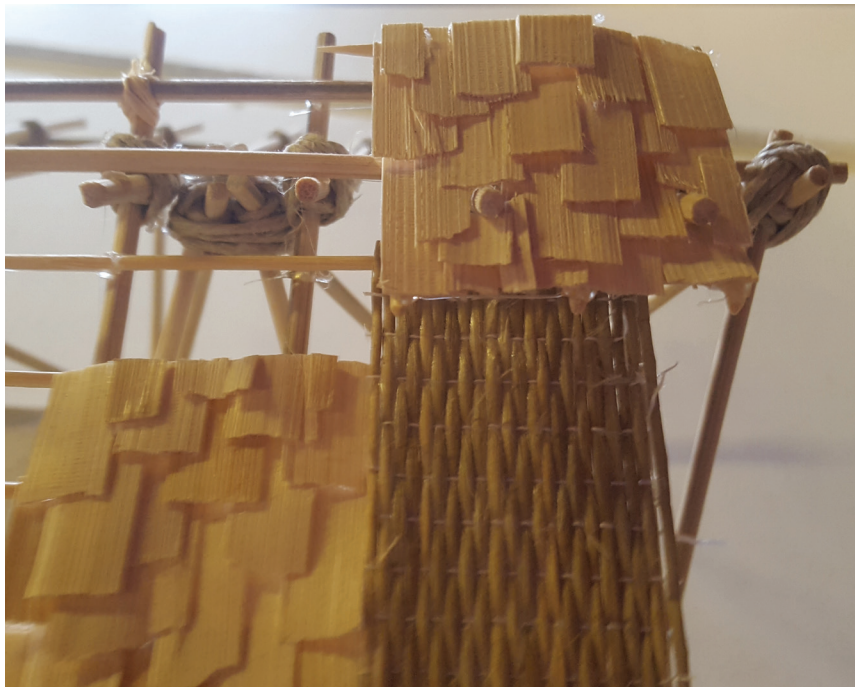
Iteration 1: Truss & Beam Construction



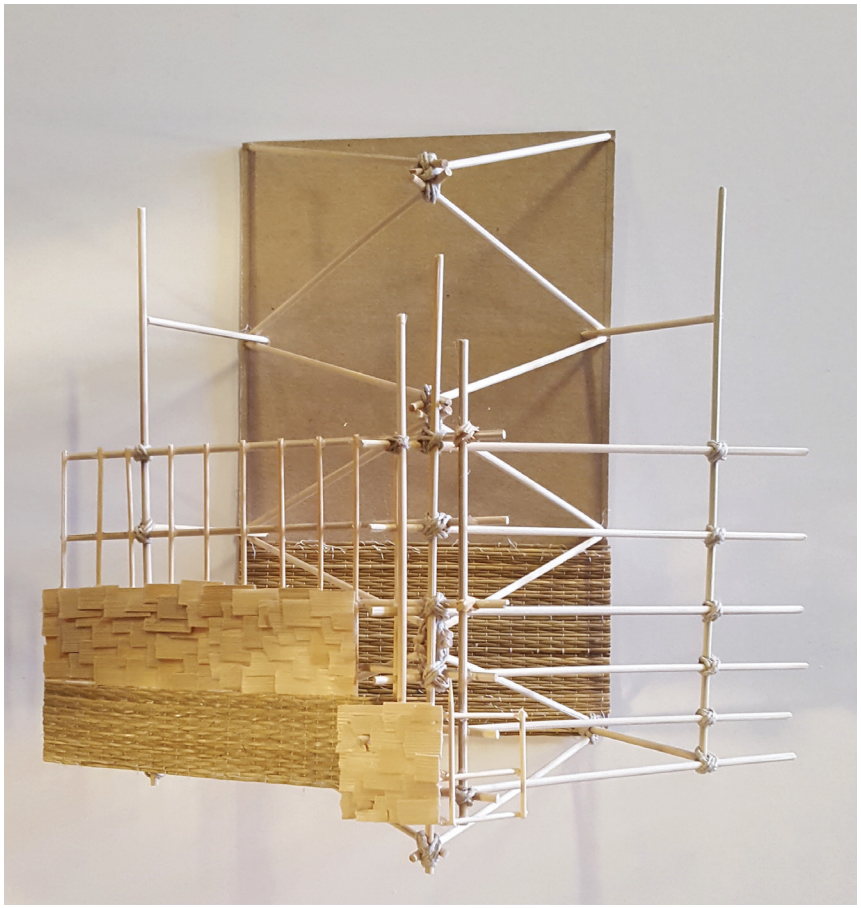


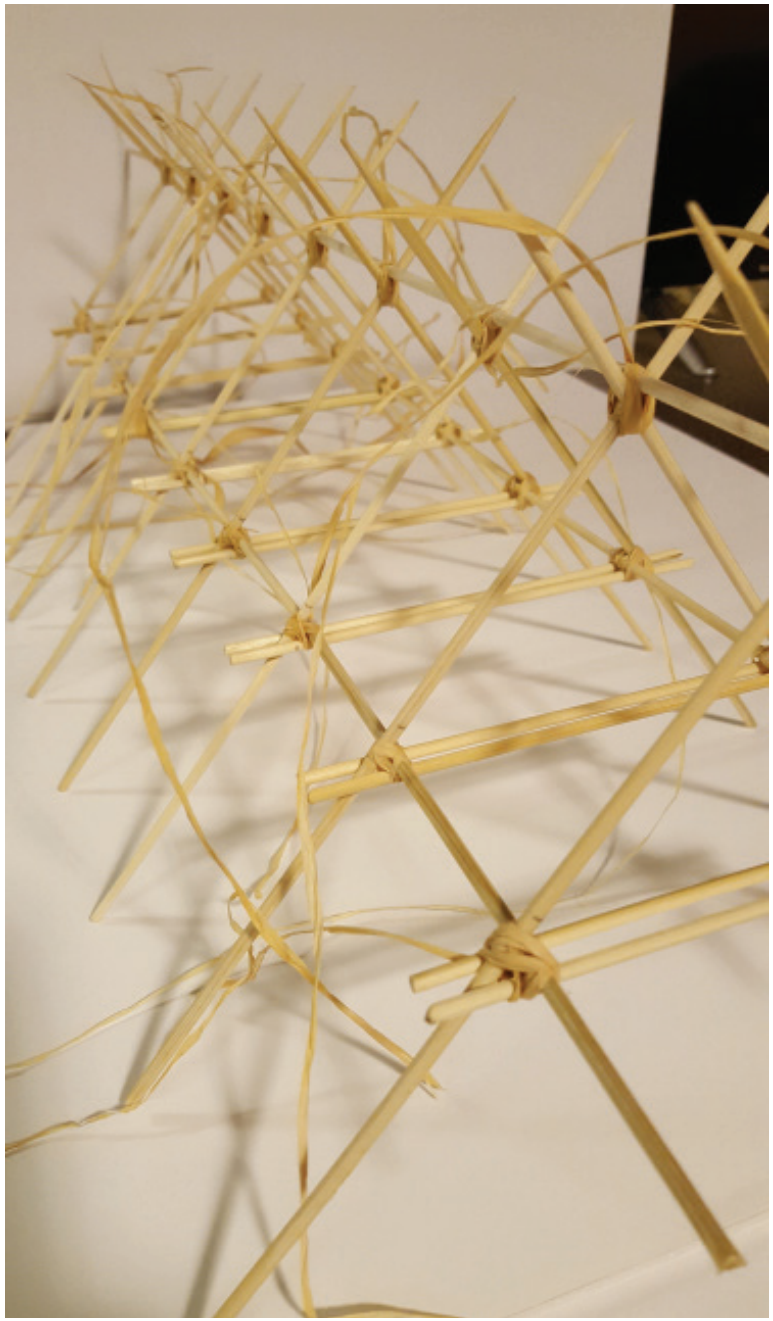
Iteration 2:
Triangle Structure



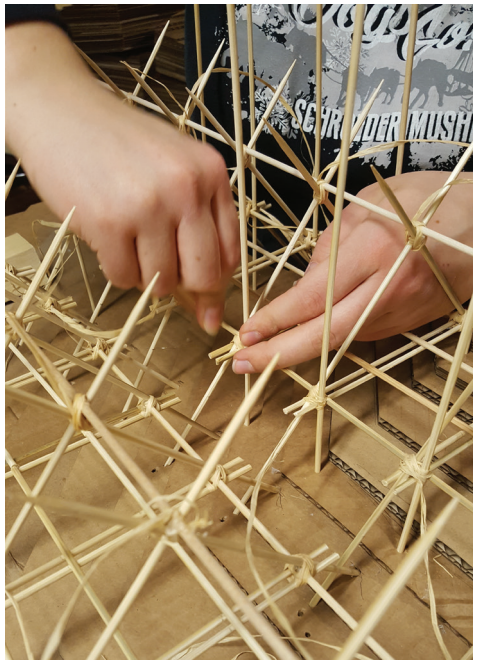


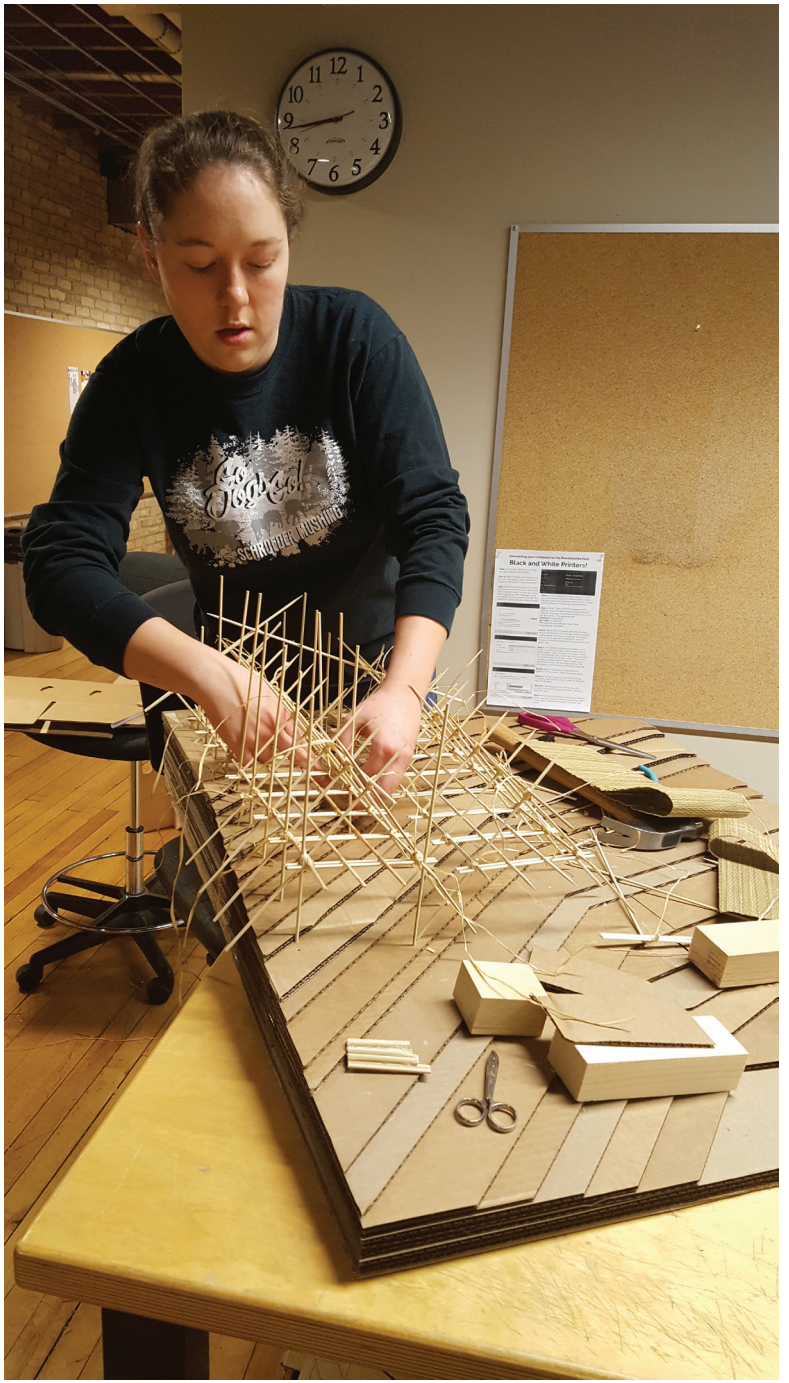
Iteration 3: Leaning Triangle Structure

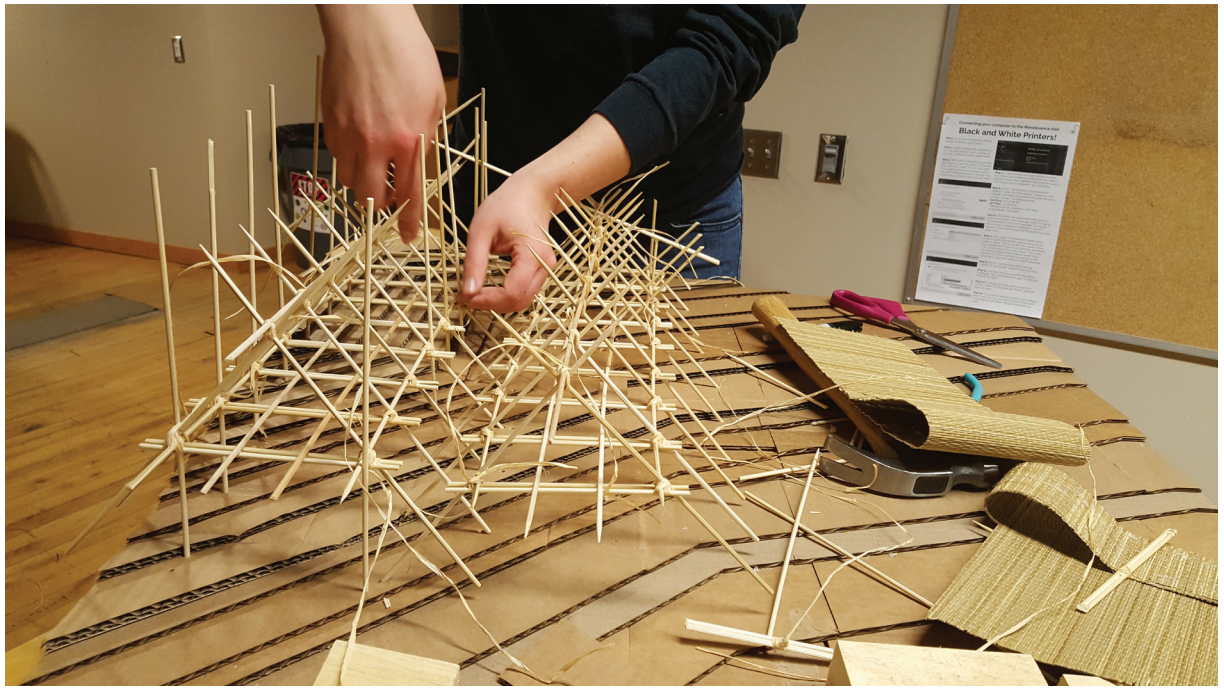


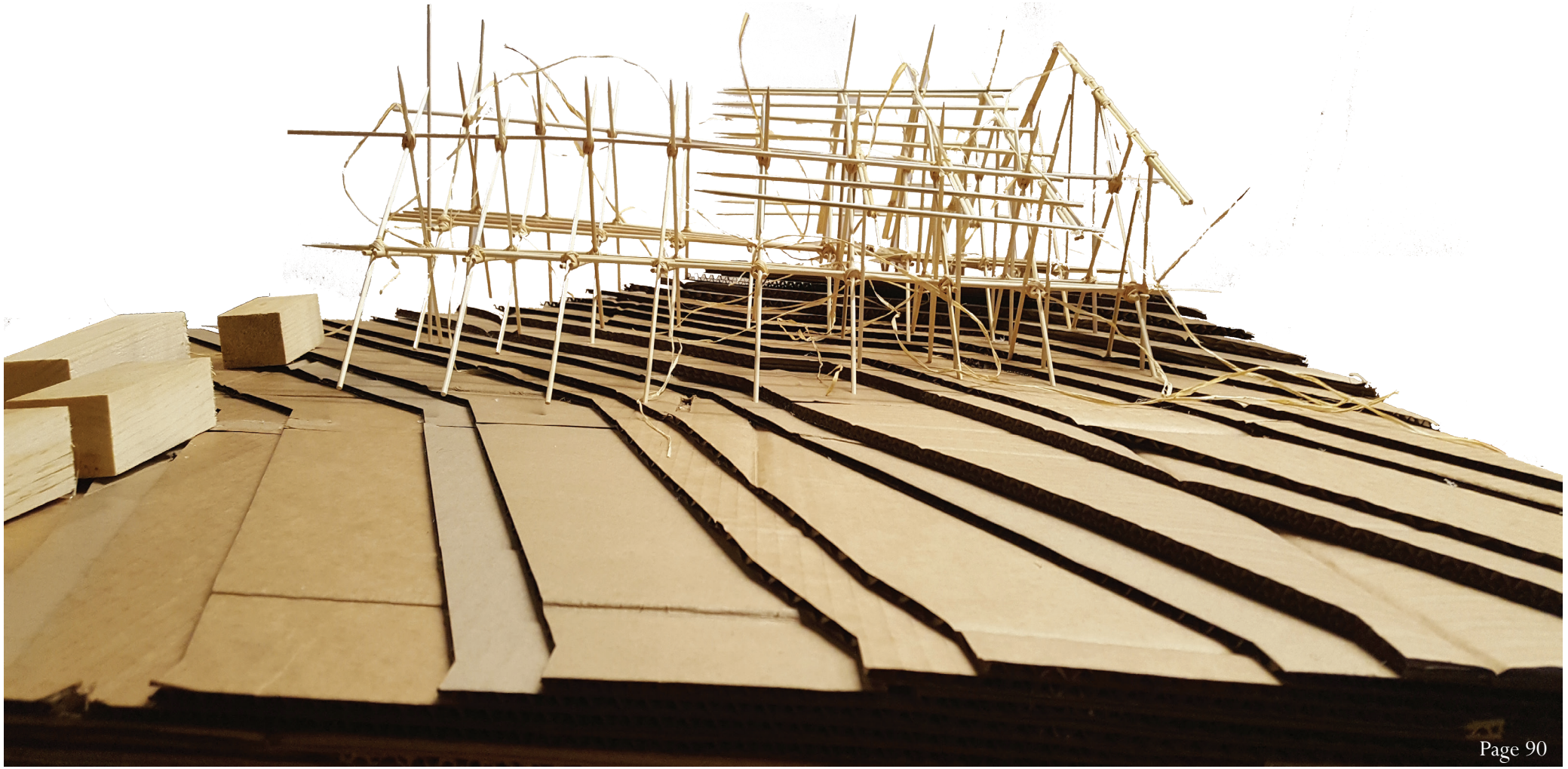


MARKETPLACE PROCESS

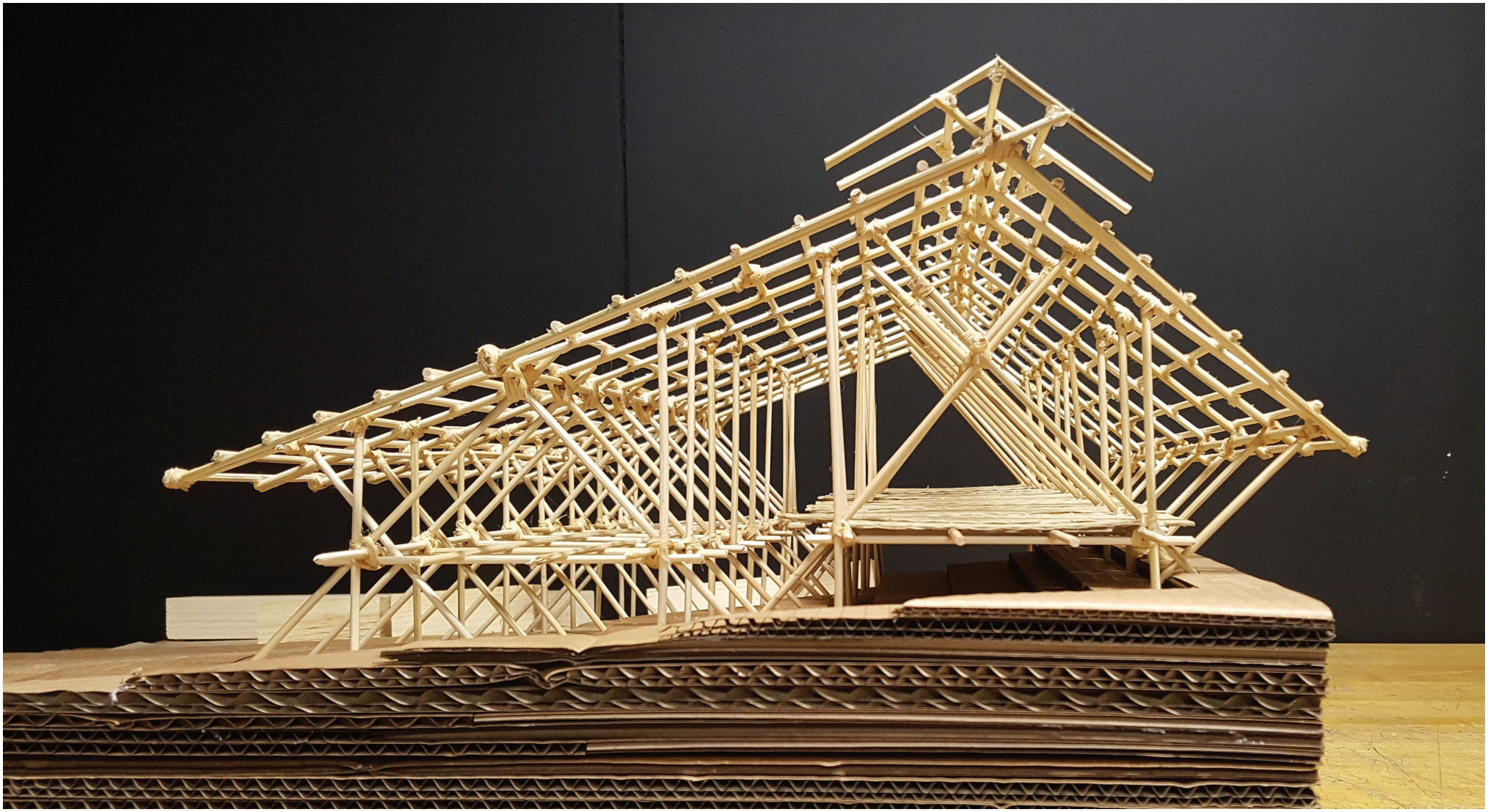








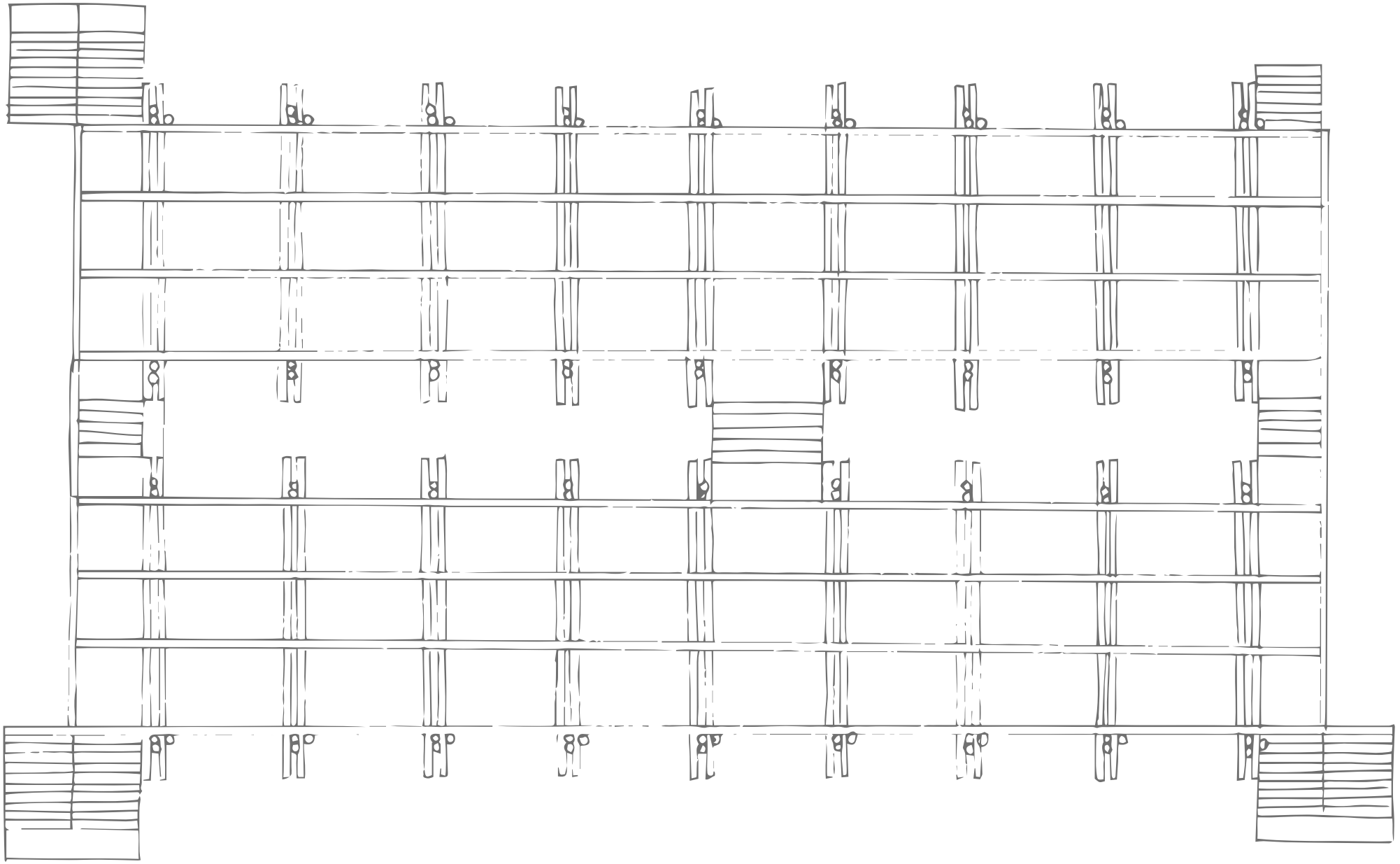
MARKETPLACE FINAL MODEL



MARKETPLACE

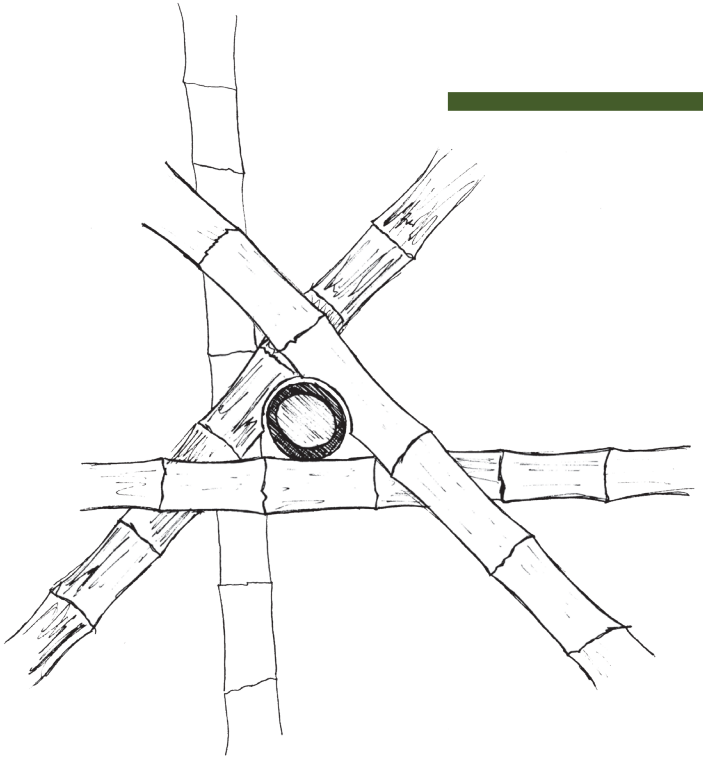
The market is an adaptable space which provides space to sell goods, agriculture, local crafts, and engineering projects. This enables the Rohingya to have a source of income. The open plan allows vendors to sell goods on the side as customers walk through. Each structure is intended to equip 24 stalls of 10 x 10 feet.

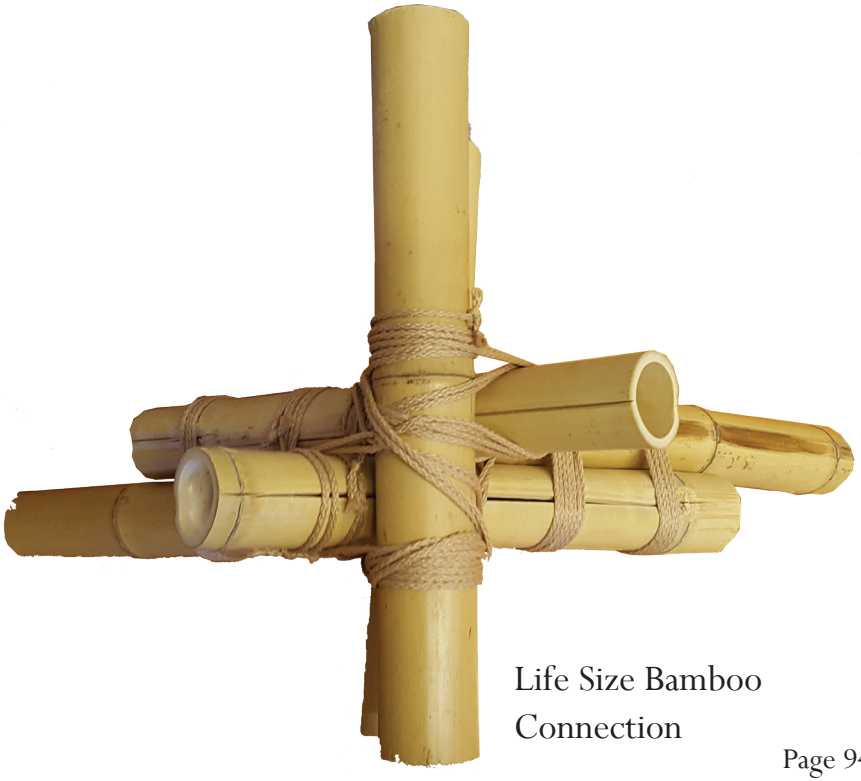
MARKETPLACE PLAN



Level One

MARKETPLACE DETAILS





Life Size Bamboo Connection

PERFORMANCE ANALYSES: RESPONSE TO PRECIDENT RESEARCH

After analyzing various refugee camps, various goals and recommendations were determined. From Al Azraq, it became evident that creating a "one size fits all" solution for individual shelters was not the right answer. Looking at the Jungle in Calaise, France showed that refugees thrive best when they can determine their own lives and spaces. Both were taken heavily into consideration throughout the design. Individual shelters were not designed because if the Rohingya can build their own community facilities, they will have the skills to build their own homes as they choose. The community facilities were the main design focus to create a place that the community can learn, grow, live, and thrive together.

PERFORMANCE ANALYSES: RESPONSE TO PROJECT GOALS

PROJECT GOALS:

-Empowerment of Rohingya Refugees

This was met through the giving of the design and building process to the refugees. The locations, uses, and building type will be determined by the Rohingya. In addition, the bamboo structures will be grown and built by the refugees. This provides a sense of accomplishment and ownership.

- Promote Global Awareness

The project's location in Kutupalong, Bangladesh provides an insight on the events happening globally, particularly the persecution of the Rohingya population.

- Provide Context Specific Design

By giving the Rohingya the opportunity to design the structures for specific locations, it gives freedom to change and adapt to the needs of each site, as well as the community which lives there.

-Benefit Refugees and Host Country

The community-oriented typologies provide a chance for the Rohingya to gather and unite as a community. In addition, the ownership provided through the building of their own homes is psychologically beneficial for the refugees. Hydroponics provides an opportunity to grow produce and crops which benefits both the refugees and the host countries. It provides food for the Rohingya and does not drain resources from Bangladesh.

-Culturally and Environmentally Responsive

Through the study of vernacular architecture, cultural relevancy is evident in the design. Inspiration was drawn from local structures, form, and materials. By nature, vernacular architecture responds to the environment, so by studying and implementing aspects of it in the final design does as well. Examples of this include buildings lifted on stilts to provide better ventilation, bamboo as a light building material, and large openings to allow breezes.

- Efficient Use of Materials

By using a local and sustainable material, the amount of material that needs to be shipped into the site is minimized. In addition, bamboo is a fast growing material that can be replenished fast.

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PAST STUDIO EXPERIENCE

2nd Year

Fall 2015. Joan Vorderbruggen.
- Tea House Project. Moorhead, Minnesota.

Spring 2016. Ronald Ramsey.
- Small Residential Dwelling Unit. Cripple Creek, Colorado.
- Bird House Design. Integration of the White Breasted Nut Hatch and the design process of Jorn Utzon.
- Montessori School. Fargo, North Dakota.

3rd Year

Fall 2016. Regin Schwaen.
- Oscar Zero Visitor Center. Cooperstown, North Dakota.
- Plains Art Palm Garden. Fargo, North Dakota. (in collaboration with classmate Paige Falk)

Spring 2017. Bakr M. Aly Ahmed.

- The Open Book: Public Library for St. Louis County, MN. Virginia, Minnesota.
- Learning for Life: A School for the Mentally Disabled. Fargo, North Dakota.

4th Year.

Fall 2017. David Crutchfield.
- Urban Design High Rise Studio.

Spring 2018. Paul Gleye.
- Urban Design Project. Semester Abroad in Brussels, Belgium.

5th Year.

Fall 2018. Ganapathy Mahalingam.
- Research Design Studio. Refugee Habitat Integration. International Design.

PERSONAL IDENTIFICATION

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