

THE INTEGRATION OF ARCHITECTURE AND EMPOWERMENT

Inserting Architectural Design into
Refugee Camps to Empower Refugees Worldwide

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ABSTRACT

How can the insertion of architecture and design into refugee habitats empower refugees individually and collectively in specific locations globally? The goal of this research project is to discover ways in which the design and infrastructure of current refugee camps might be improved by creative thinking and architectural design. First, the identification of major issues within camps were identified through a qualitative analysis of case studies and literature reviews. These problems include dependence on external aid and a lack of autonomy, empowerment, and development. Then, architectural solutions to these issues are identified and proposed through the analyses of two specific refugee camps. The result is a set of specific design interventions which can be inserted into each refugee camp. This includes schematic placement of architectural interventions, building typologies, construction methods, construction materials, as well as a plan of implementation, which includes refugee involvement. Also, general issues within most refugee camps were identified and presented, along with general architectural solutions and guidelines to improve autonomy.

INTRODUCTION

As humanity, there is an inherent responsibility to care for those around us. This is especially true of people who have gone through traumatizing experiences such as mass brutality, physical harm, political violence, persecution, and natural disasters. By their nature, refugees have undergone some or all of these hardships, being stripped of their home and national identity in the process. Architects have a unique opportunity to respond to these issues by restoring dignity, life, and hope to this population through the built environment. Shelter is one of the most basic human needs. By providing spaces which go beyond basic shelter and enable people to dwell and thrive, architecture can restore dignity and promote empowerment. Through a unique understanding of the design process, global sustainability, and ability to discover connections, architects and designers are well equipped to respond to these challenges.

The topic of design within refugee habitats is the focus of this research project due to its extreme relevance and opportunity for impact worldwide. Over 90 percent of the global population cannot afford and often has no access to design services. Frequently, these are the people who would most benefit from design. The refugee population is at the extreme disadvantaged end of this spectrum. They are often violently and abruptly forced from their homes, abandoning all sources of income, arriving in neighboring countries with only the clothes on their backs. In designing for this population, immense global impacts are possible. Millions of people in low living standards could be positively affected through design and architecture.

METHODOLOGY

Utilizing a qualitative research approach, this project employed multiple strategies to acquire knowledge. It revolved around information gathering and analyses of case studies, academic books, scholarly articles, and periodicals. It began with understanding the broader context of the refugee crisis to recognize refugee's greatest needs as well as the issues they face. Historical research on the refugee phenomenon as well as past and current policies relating to the displacement of people both domestically and internationally was undertaken. Knowledge was gathered through books and articles on the subject from credible authors and sources. Then, two separate refugee camps were analyzed as case studies. These two camps are; Zaatari, Jordan and Kutupalong, Bangladesh. To fully understand the refugee crisis, it was determined these two case studies should have significant relevancy within the current refugee phenomenon. They should also be comprised of a different cultural and ethnic population. In doing so, the research project had a wide breadth and scope. The planning principles and system insertions which are proposed in this research project can be better utilized for a wide range of people groups, climates, political systems, terrain, and economies if different samples are examined.

NARRATIVE

This research project seeks to create a set of design interventions for refugee habitats which empowers refugees and enables autonomy. Through an inductive approach, specific refugee camps were analyzed to determine issues within the camps. Then, a general assumption of empowering design insertions for each specific location was produced. Based on this approach, the research utilizes a subjective worldview in which multiple realities are possible. These realities are determined by people's personal experiences, feelings, and beliefs, coinciding with the domain of Constructivism. (Groat, 2013) In this perspective, the world changes and can be changed. A qualitative research strategy will be implemented throughout the project to acquire knowledge. This strategy was chosen because the notion of successful empowerment through design cannot easily be measured by the numbers of a quantitative approach. Empowerment is based on individual's experiences, values, and perception of freedom.

Due to the nature by which people become refugees, this research project implements the Design-Polemical theory, which is based on what we are morally required to do. (Groat, 2013, p. 116). Refugees are forcibly removed from their homes, livelihood, and culture by external forces without an immediate way to care for themselves. These forces often include violence, mistreatment, or trauma. This project pursues a "better" way of design within refugee habitats because people "ought to" have the necessities of a place to call home, access to the financial market, a place for education, and the exchange of cultures and ideas. Based on the Design-Polemical theory, humanity has a global responsibility to respond and care for the people who are affected by displacement beyond their control. By analyzing global issues and fighting for justice through the profession of architecture, this project seeks to impact the way architects and designers view their vocation.



CASE STUDY ANALYSES

Case studies of existing refugee camps were chosen as the main research procedure due to their analytic nature. The chosen case studies provide the opportunity to propose architectural design interventions. The two case studies have different climates, cultures, population ranges, topography, and density, providing contrasting evaluations. However, both are extremely relevant because of their recent development and their prevalence in the worldwide refugee crisis.

AL ZAATARI, JORDAN



Zaatari, located in northern Jordan, has received recent public attention and investment due to the refugee crisis of 2015. It is a haven for Syrians fleeing civil war in their country. Many of the refugees who crossed the sea to Europe in 2015 were Syrian. However, the vast majority of Syrian refugees reside in the developing countries surrounding Syria. Jordan claims third place in hosting Syrian refugees, coming after Turkey and Lebanon. According to UNHCR, there were 673,414 Syrian refugees residing in Jordan in November 2018, Zaatari being the primary reception camp in Jordan. Due to the large influx of refugees, the camp expanded to the first ever formally designed camp, Azraq, thirty miles from Zaatari.

KUTUPALONG, BANGLADESH



Kutupalong was recently and rapidly established in August 2017. It is currently one of the greatest refugee camps of our time. At the end of 2017, it became the largest refugee camp in the world, with 733,000 inhabitants. It is also the most densely populated refugee camp in the world. It is in desperate need of developed infrastructure systems, such as roadways and sanitation systems, as well as structural reinforcement of buildings and shelters. These insertions are the bare minimum of design needs within Kutupalong. Spaces which enable safe transportation within the camp, foster social connections, education, idea generation, and autonomy would greatly benefit the camp.

AL ZAATARI, JORDAN

According to UNHCR, Al Zaatari refugee camp hosts approximately 80,000 refugees. Al Zaatari has the population of the fourth largest city in Jordan. It was initially designed to host 60,000 people. 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, gridded rows of white shelters cover a flat barren landscape. The 2.046 square mile camp sprawls across the desert 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.

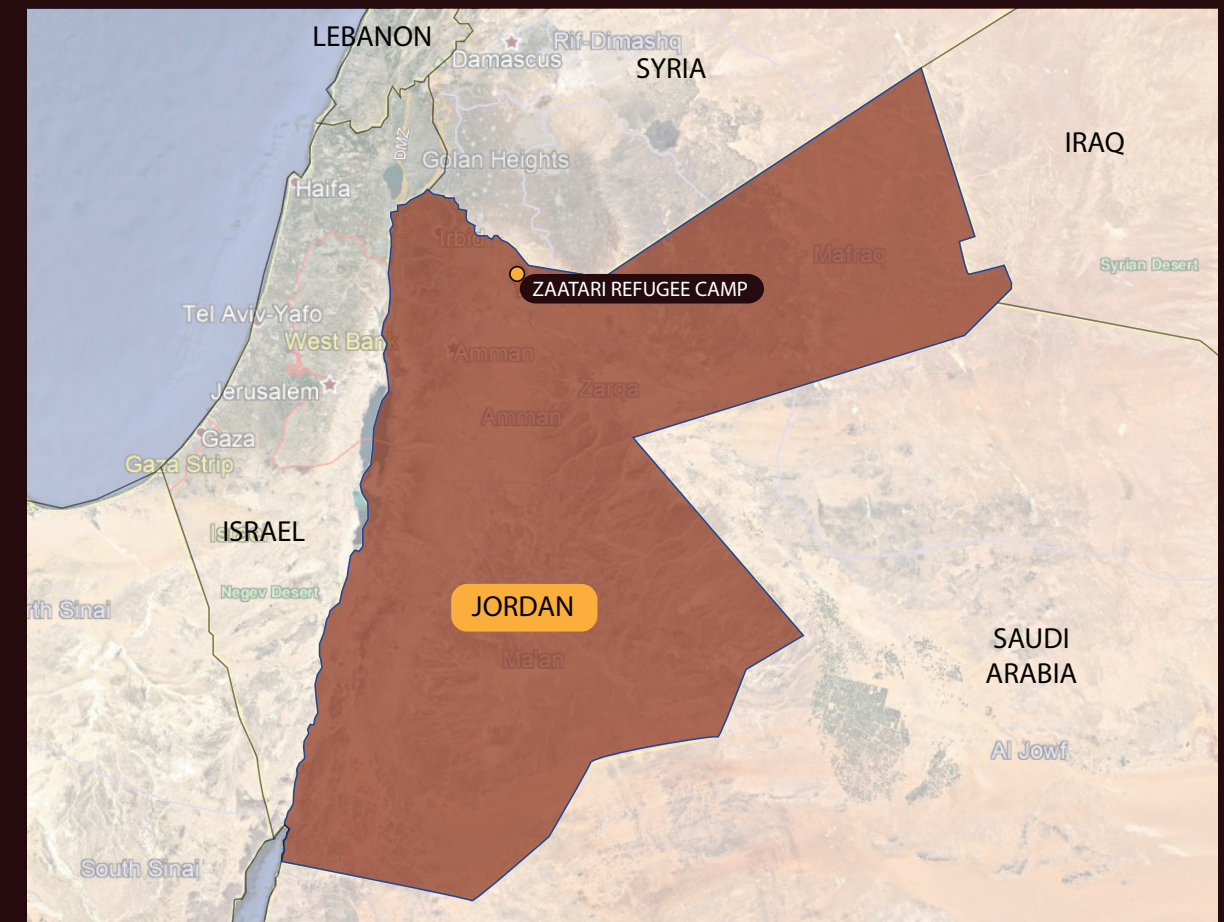


Figure 1. Zaatari Context Map

Zaatari is located near Jordan's northern border with Syria, making it the primary reception center for Jordan. It is jointly administered by the Jordanian government and UNHCR.

Population: **78,357** Syrian Refugees (as of October 2018. UNHCR)

- nearly **20%** are under five years old
- **20%** of households are female headed
- **19,500** children are enrolled in 32 schools, which equates to:
 - **68.5 %** of children between ages 5 and 17 are enrolled in school
- an average of **80** births per week



CLIMATE

According to Weather Online, Jordan's climate is hot and semi-arid, with long, hot, dry summers and short, cool winters. During January, Jordan's coldest month, temperatures reach as low as 40 degrees Fahrenheit. During the hottest and longest season, from April to August, temperatures range from 60 to 90 degrees Fahrenheit. In August, temperatures can reach up to 100 degrees Fahrenheit.

The hottest months, June through August, typically have little to no rainfall. Often, intense, hot, and dry winds blow during this season. This often results in sandstorms.

Most rainfall takes place between November and March. When rain falls, it is often in intense and concentrated storms, which can create flooding and erosion.

EXISTING FACTORS

Champs Elysees Market.

One of the most notable features of the camp is its central marketplace, Champs Elysees, which spans the oldest and most widely used street of Zaatari. It includes vendors selling vegetables, clothing, footwear, restaurants, butchers, and pet shops. This bustling market has close ties for residents to Syria and the tradition of markets prevalent there.

Environmental Concerns.

A majority of the fresh water supply in Zaatari is trucked in from adjacent sites. The amount of transported water is so great that local Jordanians have complained about the damaging road conditions trucks are creating. This has also led to concerns of over pumping ground water supplies, as well as pollution of aquifers under Zaatari, which are an extremely vital water source for Jordan.

Political Climate.

Zaatari currently runs on an informal political system made up of major tribal leaders. These leaders had prevalent social standing and leadership while in Syrian. They have maintained these roles in Zaatari, ruling major streets and regulating the distribution of resources and jobs. Many of these street leaders exploit fellow Syrians, stealing resources and using violence to maintain their positions. Minority groups are especially vulnerable to exploitation.



MAJOR CAMP ISSUES

Issue. (Material, Social, etc...)	Related Consequences	Architectural/Design Issue in Correlation
Healthcare	Cronic health issues; often untreated	Not enough/adequately designed facilities
Strong Wind (arid, hot, & dusty)	Respiratory Health Issues (related to dust)	Damage to structures from wind
Desert Heat	Heat Stroke. Dehydration. Dangerous to be outside/physically active	Shelters need to be protected from heat/desert/sun
Unequality of Districts (Politics)	Food & Resources distributed unequally (access issues)	Facilities in a hierarchial placement
Security (crime/violence)	Formal protection within the camp is not implemented (mafia system)	Insecure shelters. Are streets safe?
Hierarchial/Connection/Family Based Distribution	Refugees from "lower" families/reputations receive less aid/distribution	People of higher status recieve better shelters/protection
Densely Populated	Health Issues. Poor Quality of Life.	Poor Planning & Infrastructure.
Water (limited access)	Water Trucked in. Damage to roads. Depletion of resources in a desert country. Concerned citizens.	Boreholes spattered randomly around camp
Unequal Electricity Distribution	Portions of camp without electricity & Lighting (Security Issues)	Unsafe Places. Unlight Places
No Waste Disposal/Sewer System. (Trucked out)	Waste Material trucked out untreated. In home latrines create sanitation issues (flood season)	Contaminated Water. Land Pollution.
Misuse/"Corruption" of distribution of resources	Communal sources are depleted.	Communal Builidngs lack necessities and luxuries
Mental/psychological Issues. Trauma	Difficulties functioning in society. Prevailing psychological issues.	N/A
Insufficient Infrastructure	Not enough water, bathrooms, hygiene, electricity, etc...	Water loss. Dangerous electrical connections. Sewage leakage.
Poor Sanitation	Leaks into drinking water. Health Issues.	Unsatisfactory water quality.
Theft	Depletion of resources provided by NGOs & UNHCR	Loss of built environment, security, comfort. (fences stolen for other uses)

Issue. (Material, Social, etc...)	Possible Design Solutions
Healthcare	More well designed facilites, close to each set of shelters
Strong Wind (arid, hot, & dusty)	More Vegetation? Thicker building materials (earth/stone) Cluster buildings close together
Desert Heat	Insulation (earth?). Vegetation/Shade Structures. Buildings closer together/multiple stories?
Unequality of Districts (Politics)	Equal placement of facilities/centers/distribution. All locations should have equal access
Security (crime/violence)	Secure Shelters/Locks. Provide safety in streets (people). Provide adequate night lighting
Hierarchial/Connection/Family Based Distribution	Equal Distribution (regardless of economic/social status)
Densely Populated	Density relief by building up instead of out.
Water (limited access)	Water Collection & Storage
Unequal Electricity Distribution	Renewable power sources. Equally distributed.
No Waste Disposal/Sewer System. (Trucked out)	Sustainable sewage system?
Misuse/"Corruption" of distribution of resources	Provide each family with a kit of parts to customize. (incentive program?)
Mental/psychological Issues. Trauma	Provide spaces that "feel" safe.
Insufficient Infrastructure	Provide sufficient and efficient infrastructure.
Poor Sanitation	Prioritize Sanitation. Provide waste management for individual homes.
Theft	Provide raw materials. Can these be sourced sustainably?

ACCESS

POLITICAL CORRUPTION

STRONG DUST FILLED

WIND STORMS

SECURITY

RESPIRATORY ISSUES

HOT INTENSE DESERT HEAT & SUN

POOR SANITATION

CLEAN WATER SOURCES

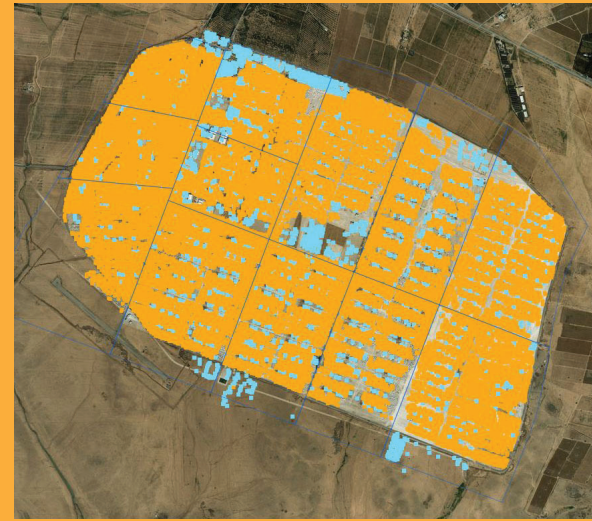
DEVELOPMENT & DENSITY



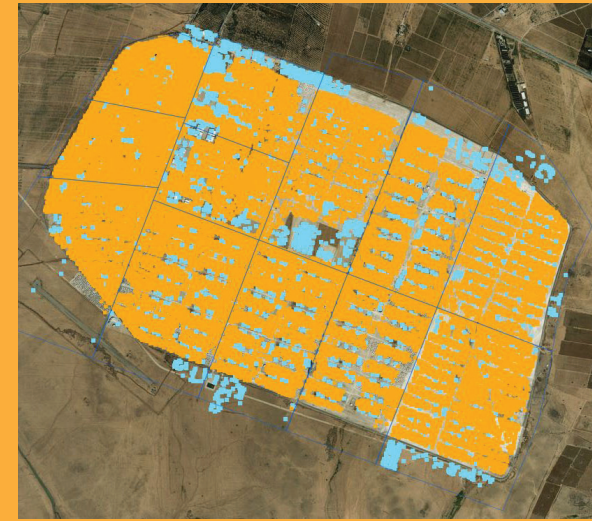
Zaatari 2012. Source: UNOSAT



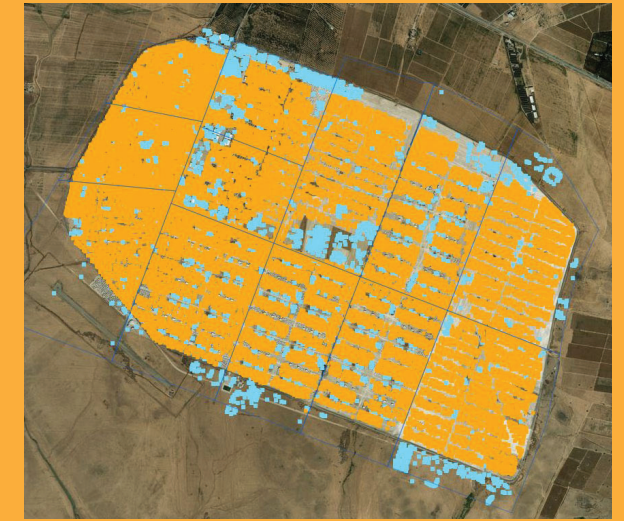
Zaatari 2013. Source: UNOSAT



Zaatari 2014. Source: UNOSAT



Zaatari 2015. Source: UNOSAT



Zaatari 2016. Source: UNOSAT

Photo Credit:

- Infrastructure Buildings
- Individual Dwelling Shelters

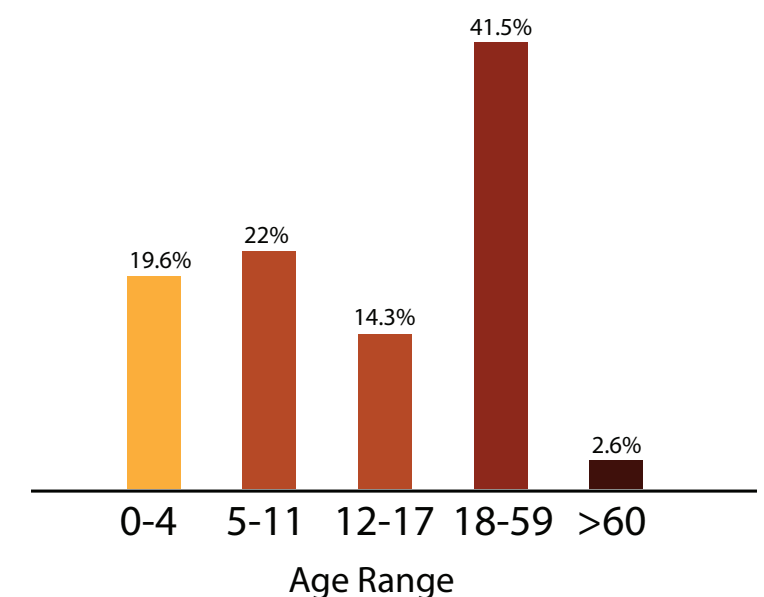
The illustrations, taken from UNOSAT show the consecutive development of Al Zaatari Refugee camp. It developed in planned portions. In the beginning, infrastructure buildings were located next to shelters. However, as the camp developed, they began to be placed on the edge of the settlement, further away from shelters.

Zaatari evolved in a general west to east configuration. The densest portion of the camp on the western side is also the oldest. Laid out in a grid pattern, the goal was to keep this organized configuration. However, the large influx of Syrians soon proved to overwhelm the capacity of officials to strictly regulate the placement of shelters. The introduction of caravans created even greater organizational freedom for citizens. Families moved next to extended family or community members, creating informal gathering spaces and shared courtyards.

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.

The majority of the population lies within the 18-59 year old category. However, when ages 5 through 17 are combined, they comprise approximately 36 percent of the population.

POPULATION RANGE OF ZAAATARI



SOCIAL CONNECTIONS ANALYSES

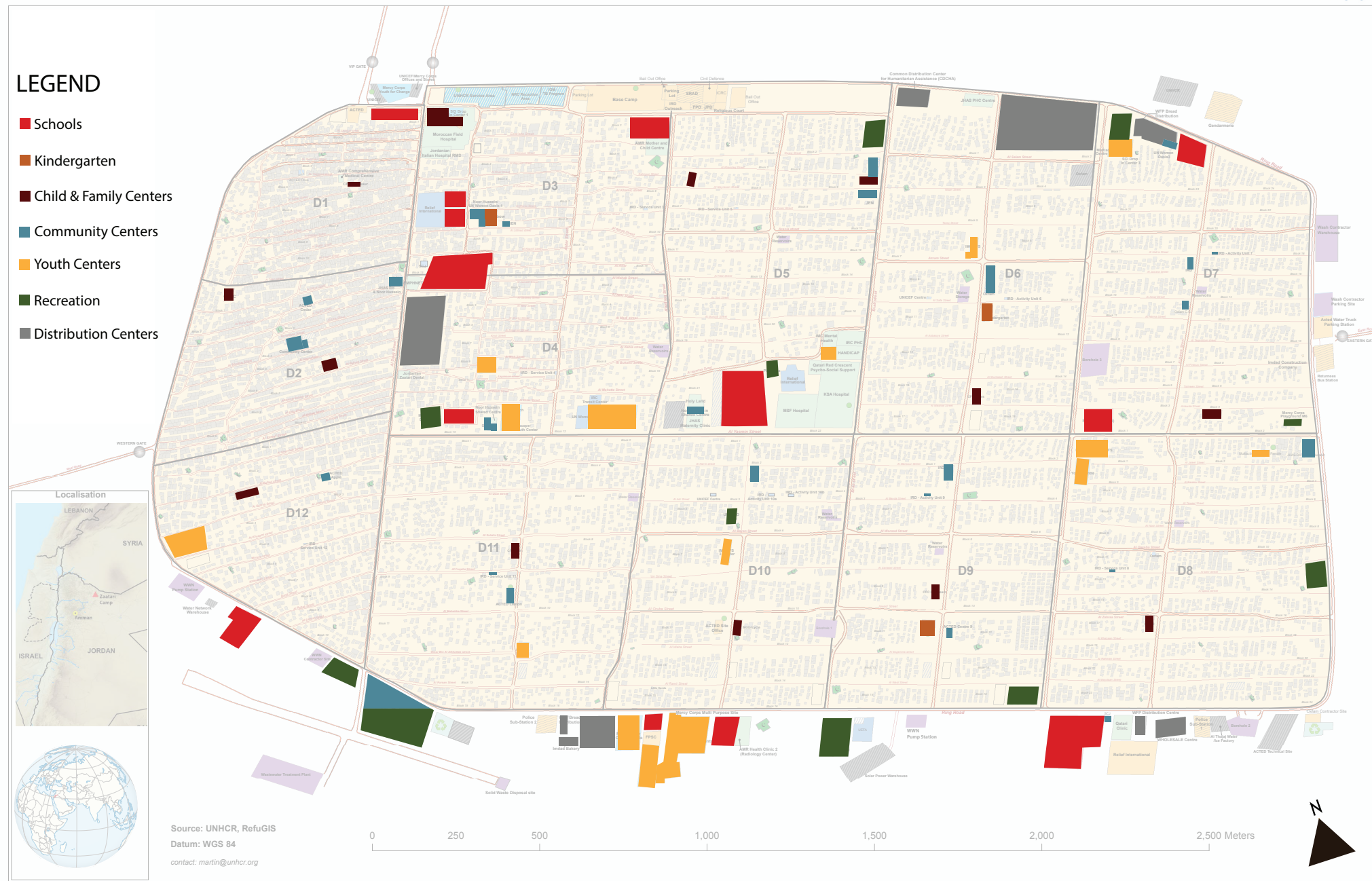


Figure 2. Zaatari; Social Connections Analyses

SOCIAL CONNECTION FACILITIES COUNTS

- Schools: 13
- Kindergartens: 3
- Child and Family Centers: 13
- Community Centers: 21
- Youth Centers: 15
- Recreation: 10
- Major Distribution Centers: 2

SOCIAL CENTERS

Schools:

Education is the most effective means of development. If children, adolescents, and adults can be taught valuable skills and languages, they have a much better chance to take control of their lives. There seem to be an adequate amount of schools in each district. However, districts 2, 6, 9, and 11 would benefit from a closer school, especially a major one.

Community Centers:

According to UNHCR, there are 58 community centers. These include youth, child, and family centers. The camp has done a good job of providing adequate numbers of community facilities. However, there are certain areas which could benefit from mixed use community facilities.

Recreation Spaces:

There are a surprising amount of green spaces in Zaatari compared to other refugee camps. Half of the districts have green spaces located in them. Most of these recreation areas are sports courts or fields. Given the camp's location in a dry dessert, green spaces such as parks would be extremely beneficial. They would provide shade from the hot and bright sun during the day. In addition to green parks, recreational spaces would benefit from shading by adjacent buildings.

Distribution Centers:

There are two major distribution centers in the camp. Though they are spaced decently apart from each other, many shelters and districts are located a long walking distance away from their main source of food and resources. The south east corner is a great distance from either distribution center. This location would benefit from a more proximate supply center.

INFRASTRUCTURE ANALYSES

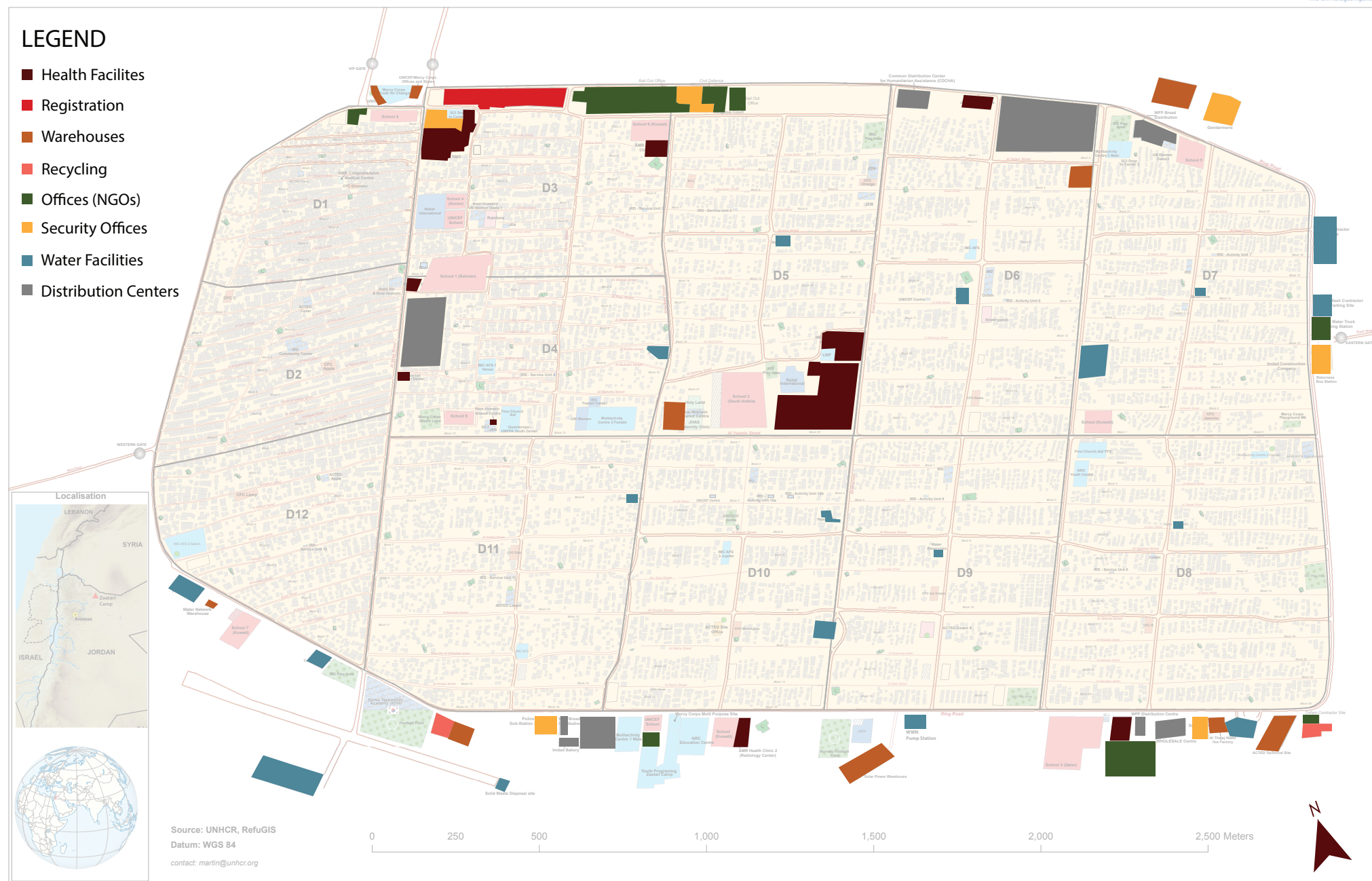


Figure 3. Zaatari; Infrastructure Analyses

INFRASTRUCTURE FACILITIES COUNTS

- Health Facilities: 9
- Registrations: 1
- Warehouses: 9
- Recycling: 2
- Offices: 8
- Security Offices: 6
- Water Facilities: 16
- Distribution Centers (Primary & Secondary): 9

INFRASTRUCTURE

Health Facilities:

There are three main hospitals run by separate aid organizations. Additional facilities would be beneficial in the south west corner of Zaatari.

Registration:

The major registration center is placed at the entrance of the camp.

Recycling:

There are currently only two recycling centers. They are located at the bottom edge of the camp. This is less than ideal, as long distances must be traveled to recycle items. Introduction of more recycling facilities would be beneficial to encourage recycling by residents.

Offices:

NGO offices are important as aid workers are stationed here. They provide a space for refugees to go for grievances and issues within the camp.

Security Offices:

All security offices exist on the borders of the camp. This creates issues if refugees need to appeal to offices or seek assistance.

Water Facilities:

There is a great deal of water facilities spattered throughout the camp. The drilling of more could cause depletion of water sources, therefore is discouraged. Rain water collection is a better approach.

Distribution Centers:

In addition to the major two distribution centers, some secondary ones exist on the edges of the camp.

Solar Plant:

There currently exists a large solar plant to the south of the camp. It sustainably supplies a majority of the power for residents.

EXISTING FACILITIES

SOCIAL CENTERS + NEEDS AND PROXIMITY

AREAS OF OPPORTUNITY

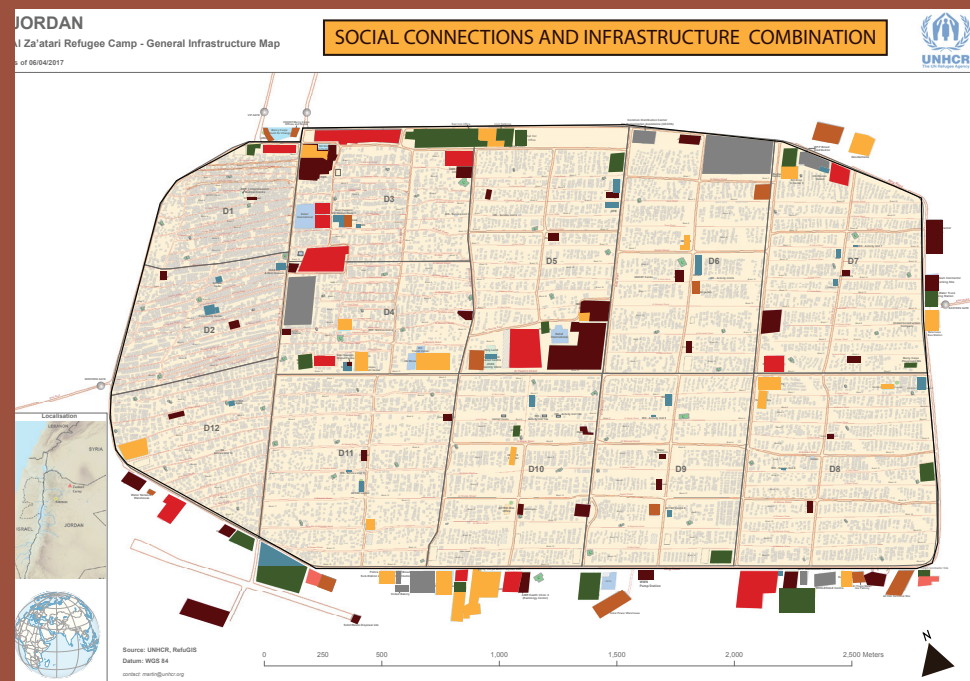


Figure 4. Zaatari; Existing Facilities

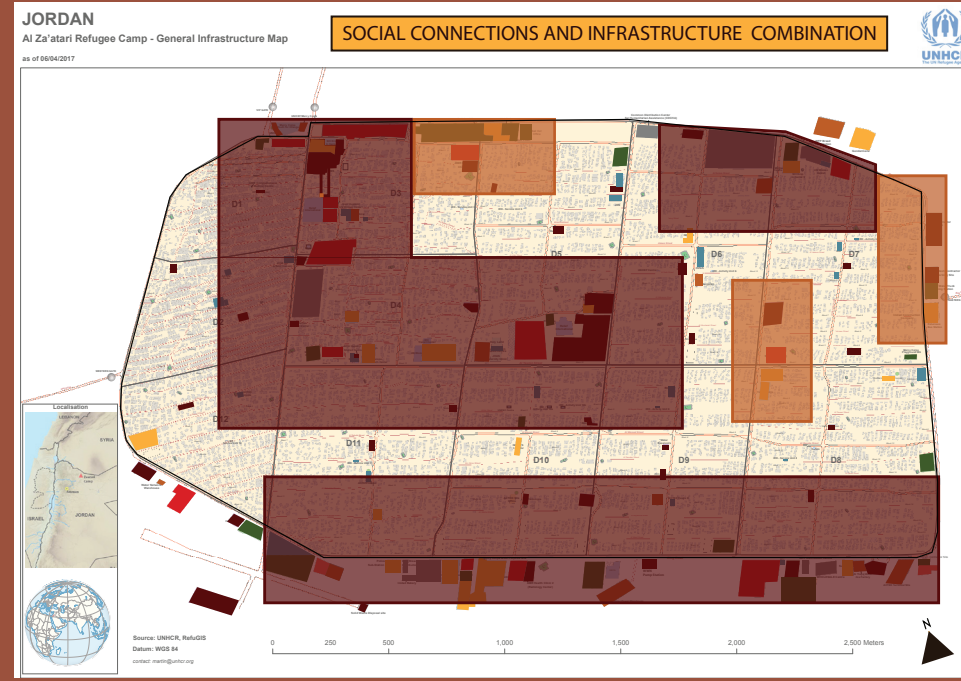


Figure 5. Zaatari; Social Needs and Proximity

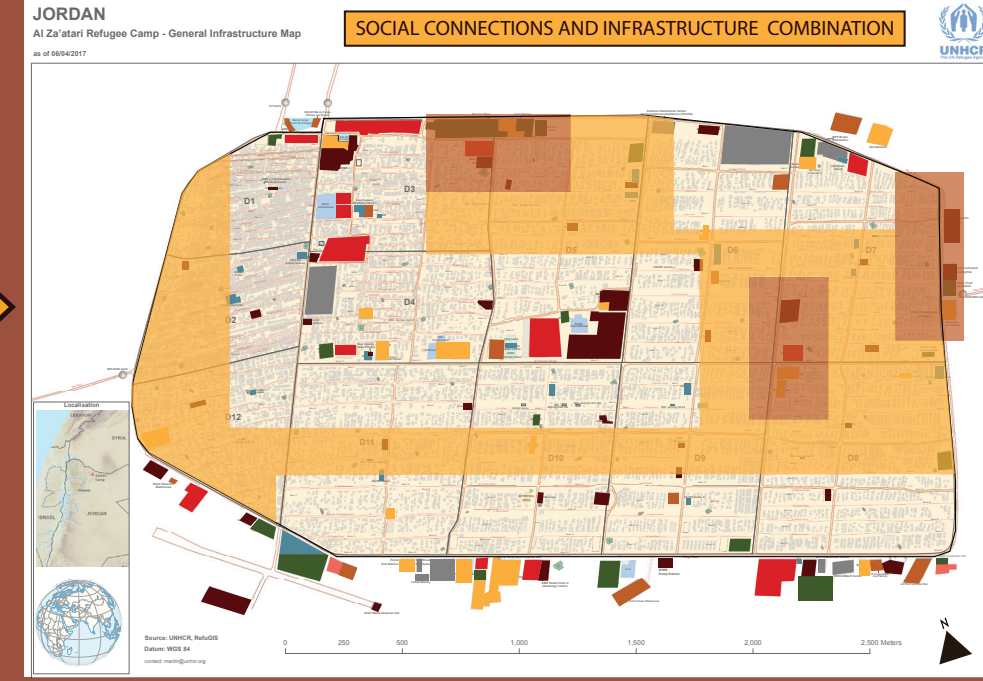


Figure 6. Zaatari; Areas of Opportunity

All the facilities that exist within Zaatari are highlighted in this map. This includes infrastructure and social connections such as schools, recreation spaces, and community, family, and youth centers. It also includes the major distribution centers. They are organized primarily around the edges of districts and the border of the camp. Not many exist within the center of districts.

- Primary Areas of Impact
- Secondary Areas of Impact

This analyses map takes the clustered sections which compromise the greatest amount of facilities and resources for Zaatari. It then draws a square around the area of impact in maroon. Essentially, this is the area that is easily accessible for nearby shelters. Secondary connections, comprised of much smaller hubs, are colored orange. The resulting empty spaces are considered “Areas of Opportunity”, which would benefit from a social connection and hub.

- Greatest Areas of Opportunity/Needs
- Secondary Areas of Opportunity/Needs

This map looks at the negative space left behind from the areas of impact. They are resource deserts, which do not have easy access to facilities and take a long distance to travel to. This is particularly undesirable in the hot arid climate of Jordan. The areas in yellow have the greatest areas of opportunity. Areas in orange are secondary connections that could benefit from additional facilities but are not in as great of need as the yellow areas.

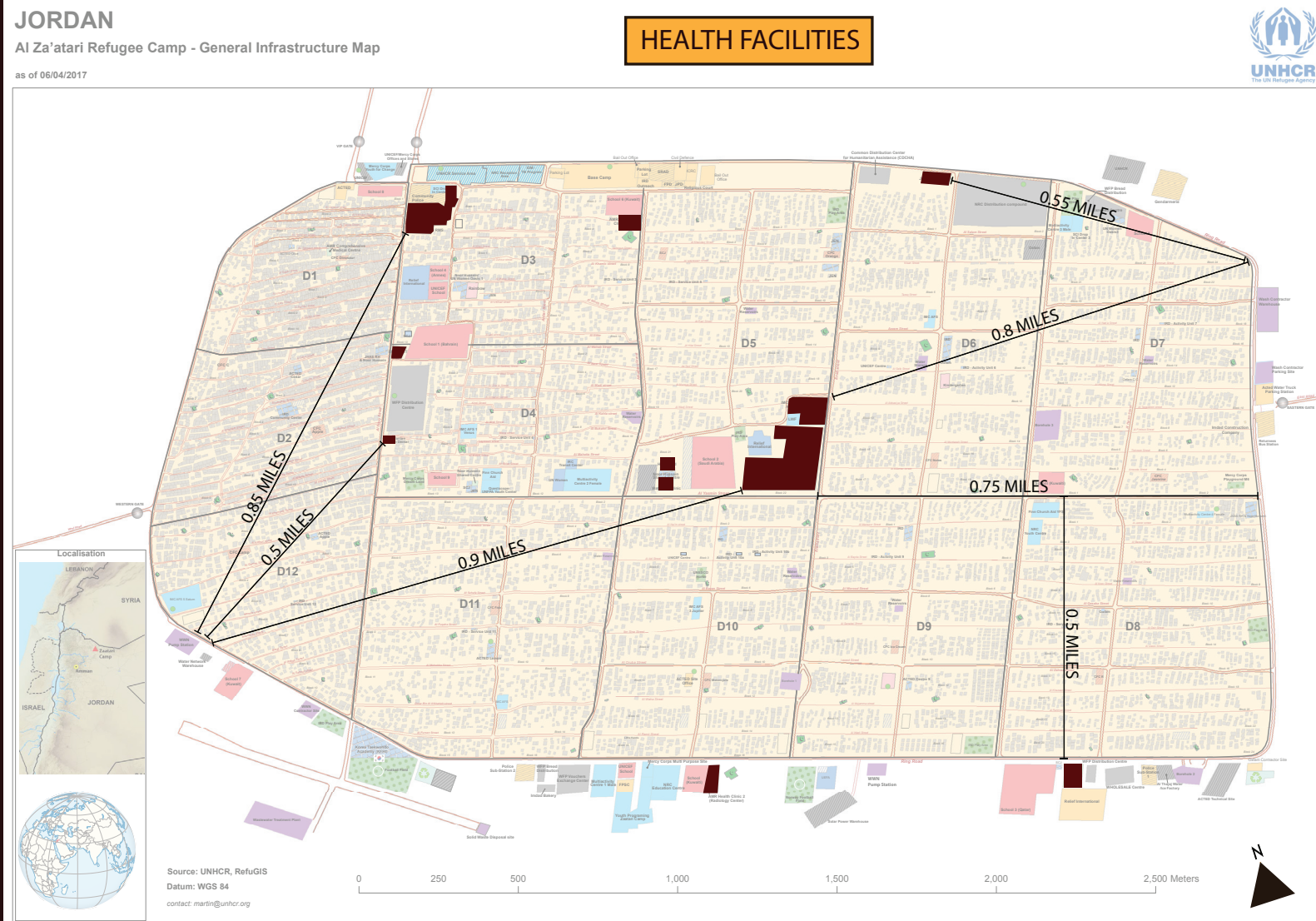


Figure 7. Zaatari Health Facilities and Proximity

The map highlights current health facilities within Zaatari. Currently, there are two major hospitals, the largest being in the middle of camp. This optimal location is next to the camp's major social center. However, at some points within Zaatari, the distance to a hospital is close to a mile away. Given the hot desert climate of Zaatari, this can be problematic when people need to seek health care. With such a far distance to reach a health facility, it can deter people from utilizing health care, causing symptoms and health issues to worsen. Also, many homes are close only to a smaller health facility which may provide less services than the main facility. More health facilities should be introduced into the habitat.

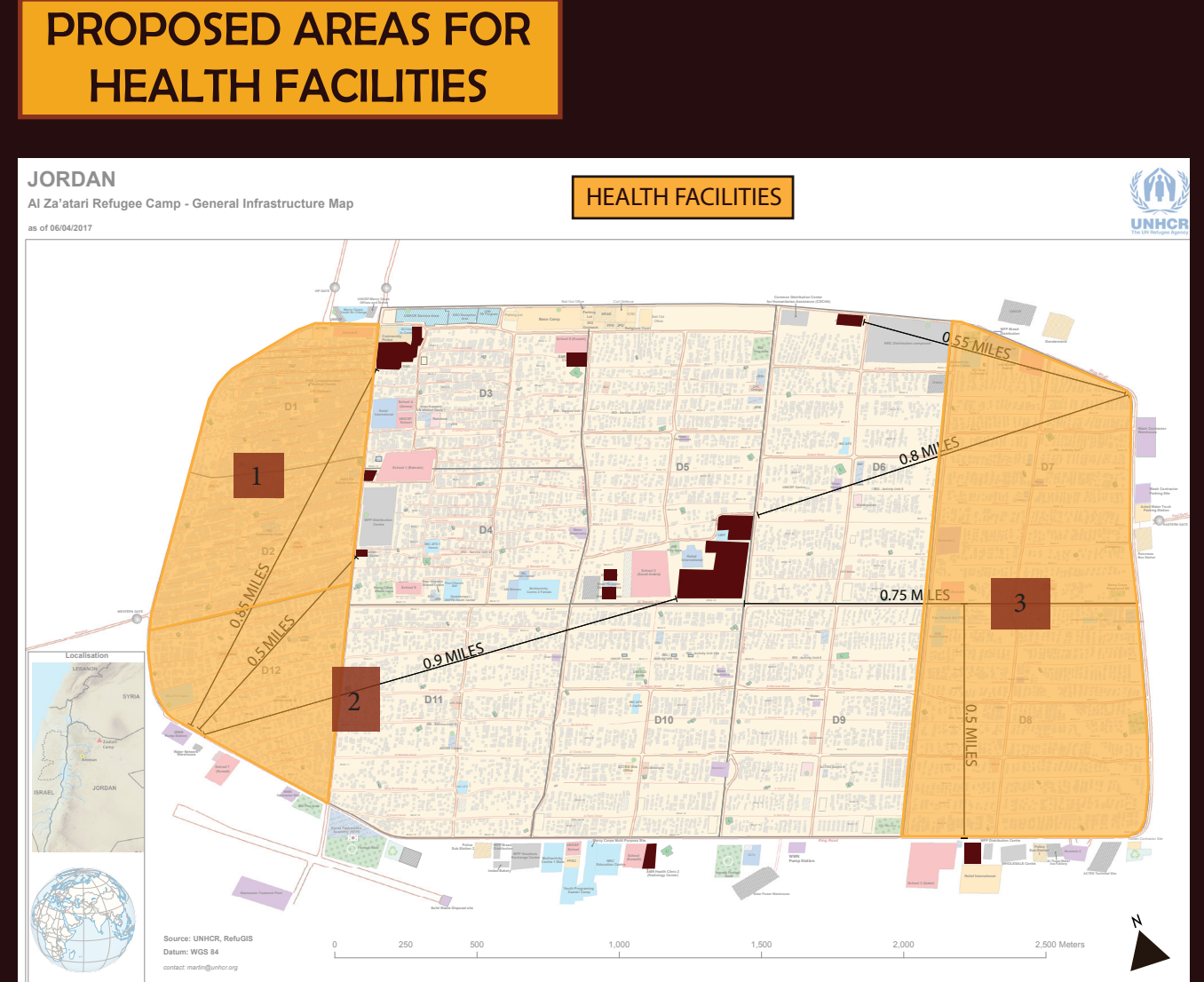


Figure 8. Zaatari Proposed Health Facilities

- Areas in greatest need for closer health facilities
- Proposed region for a health facility

The areas in yellow are the regions which would benefit from an additional health facility. This was based on proximity to existing facilities, as well as the density of the areas. The orange represents the general area where health facilities are being proposed.

1. These are the two most densely populated districts; therefore, this location is intended to serve a large population.
2. This was placed just outside the yellow area to reach homes in District 11.
3. Located in the middle of the two districts, this proposed location would serve both districts.

HEALTH FACILITIES

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 hot-dry desert climate of Jordan, 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 Al Zaatari.

OVERVIEW OF HOT-DRY CLIMATE:

- General Characteristics: **Extremely hot. Dry air. Dry Ground.**

- Humidity: Moderate to low. 10 to 55% (Relative Humidity). Rapid Evaporation, due to the dry climate.

- Precipitation: Slight and variable throughout year. Flash-storms may occur in certain areas, resulting in large amounts of rain in a few hours, while some regions don't receive rain for years.

- Sky Conditions: Typically clear, without cloud cover. Rain and dust storms can interfere with luminance, darkening the sky. At the end of hot periods, dust can suspend in the air, creating a white haze with diffuse light and a painful glare.

This glare is particularly significant in Zaatari, where the camp is open and is absent from vegetation, which could provide protection from the glare. The wide streets allow for immense amounts of direct light into spaces. Most shelters are white, which works well for not conducting heat, but also produces glare from the sun.

- Solar Radiation: Direct and strong during the day. Nights provide easy release of heat, due to reradiation into the night sky. The low humidity and absence of cloud cover accommodates this release of heat.

Radiation in Zaatari is very intense. Long distances between shelters and resources, especially water and food distribution, create discomfort and greater possibilities of heat stroke and dehydration.

- Winds: Local, hot, dust and sand carrying. Often result in dust-storms.

Protection from these winds is very minimal in the current design of Zaatari. By placing buildings closer together, it shelters from winds.

- Vegetation: Sparse and difficult to maintain due to the lack of rain and low humidity. Dry and Dusty soil dries quickly after rain and would typically be fertile if irrigated. This does not facilitate agriculture and growing in Zaatari. Alternative methods such as hydroponics would be an alternative.

- Physiological Objectives: Heat is the main factor of discomfort in this climate. Therefore, the main priority for physical comfort in this climate is the reduction of intense radiation from the sun, ground, and surrounding buildings. Natural breezes do not help with perceived comfort, as they are typically warmer than the body temperature and dust filled.

- Design Configurations: Radiation, temperature, and winds are so intense, it is vital to protect buildings and exterior living spaces from outdoor conditions. Enclosed, compactly planned and inward-looking configurations are most optimal. Easy access and short distances to resources reduces physical exertion and preserves user's energy. Locating as many uses as possible under one building, provides less thermal loading from the sun. and hot air. This effectively reduces the amount of surfaces exposed to the sun.

- Building Materials: Stone, Earth, Bricks.

“Extremely Hot. Dry Air. Dry Ground.”

SYSTEMS PROPOSALS

VEGETATION

Due to Zaatari's flat layout with the only presence of widely spaced single-story buildings, the sun has great opportunity to penetrate streets and reach residents. This causes excessive heat and glare for the refugees of Zaatari. Adding vegetation to the landscape would help mitigate these effects. Trees would break up light, create shade, bring temperatures down, filter air, and decrease glare. They would also have the option of growing produce for residents. The planting of trees is proposed on the major streets of Zaatari. In addition to this, an incentive program revolving around the introduction of more vegetation is proposed. Residents would be given trees to plant next to their homes as they see fit. They would be given additional vegetation if they are willing to move their homes to a design configuration which better shades and shelters homes.

AQUAPONICS

Hydroponics is a gardening system which grows plants in water without soil. The water is supplemented with a mineral nutrient to help plants grow. Multiple types of produce can be grown this way. This system is to be implemented in Zaatari because of its dry desert climate which is short on water. In hydroponics systems, water is continually circulating and being reused. Therefore, it is a much more efficient system in terms of water use. Growing produce through would help promote refugee empowerment by creating a self-sustaining system run by refugees.

CONFIGURATIONS

Current design configurations in Zaatari are less than ideal for the arid desert climate. The large distances between buildings and shelters allows heat, sunlight, and dust to easily penetrate the camp and its streets. If buildings were configured closer together, they would shade from the sun and protect from dusty winds. An incentive program will be proposed for residents who are willing to move their homes into closer configurations. This would also provide much more cultural relevancy to the camp's design, as it would be a similar design language as existed in Syria.

STREET EDGE

By moving buildings up to the street edge, it creates shaded streets which are much easier to traverse than the open, hot, and bright streets which currently exist in Zaatari. This would be implemented in the proposed hubs and connections, as well as any new construction in Zaatari.

RAIN WATER COLLECTION

Though it does not rain often in Zaatari, when it does, it is often in intense, strong squalls that produce large amount of water. It is not uncommon for floods to occur when it rains. If sustainable rain water collection was implemented, this water could be used for agricultural purposes and would be a viable option to reduce flooding.

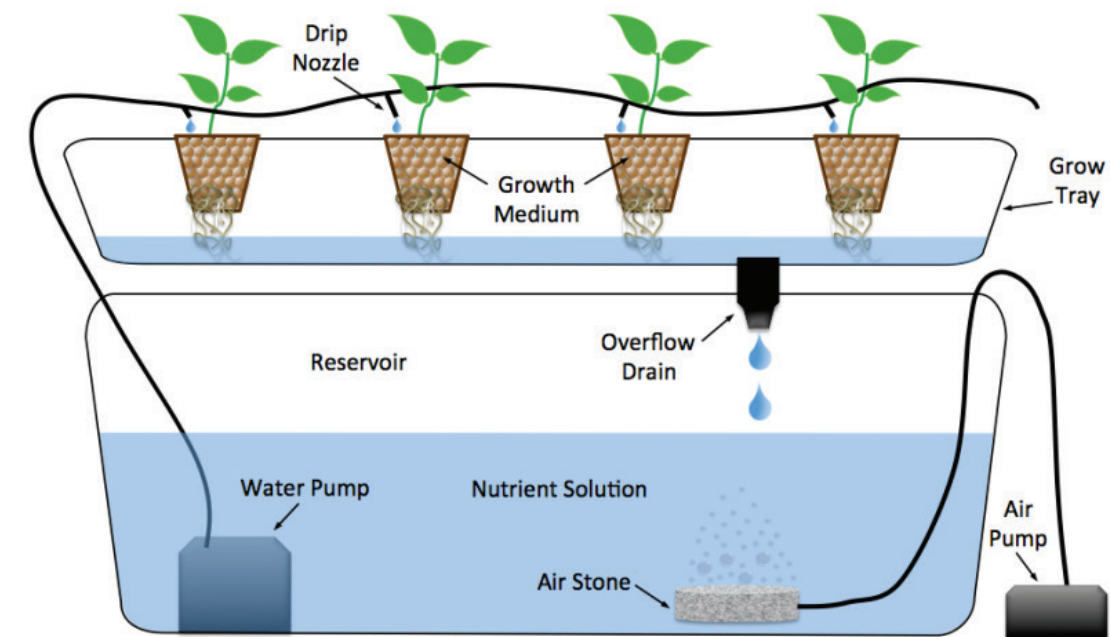


Figure 9. Hydroponics System. Source: Off Grid Gorilla

MATERIALS

The best materials to use in this climate are those with large thermal mass and conductive properties. These typically are earth materials. Rammed earth, cob, adobe, and stone are the proposed building materials.

PROPOSED GENERAL CONNECTIONS AND PATHWAYS

The map below illustrates the existing connects between roads, therefore people and social aspects. It also proposes four new connections based on their proximity within areas of opportunity and distance from social and infrastructure connections. These were determined by visual analysis of Zaatari, as well as prioritizing existing facilities to reduce intrusive design as much as possible. Schematic connecting pathways create faster, easier, and more organic movement between the districts of the camp.

1

Chosen for its location next to the oldest and densest districts of the camp, Districts one and two. Its location along the main dividing highway reaches both districts and is in close proximity to the main Champs Elysees market.

2

This location is a proposed hub for the small existing connections between districts. It was chosen based on its proximity to the few existing facilities connecting districts seven and eight. Also, it is a proposed connection for the areas of opportunity within these districts.

3

Districts ten and eleven are located between two large groups of social and infrastructure facilities. However, the middle of these districts is a desert without any connections. Location three was chosen for its pre-existing community and family centers, which provide opportunities for expansion. Also, its proximal location within the two districts provides options for a connecting path.

4

Location four serves as a secondary node and connection for the northern portion of Zaatari. It utilizes existing green space and community centers, which can be expanded upon.

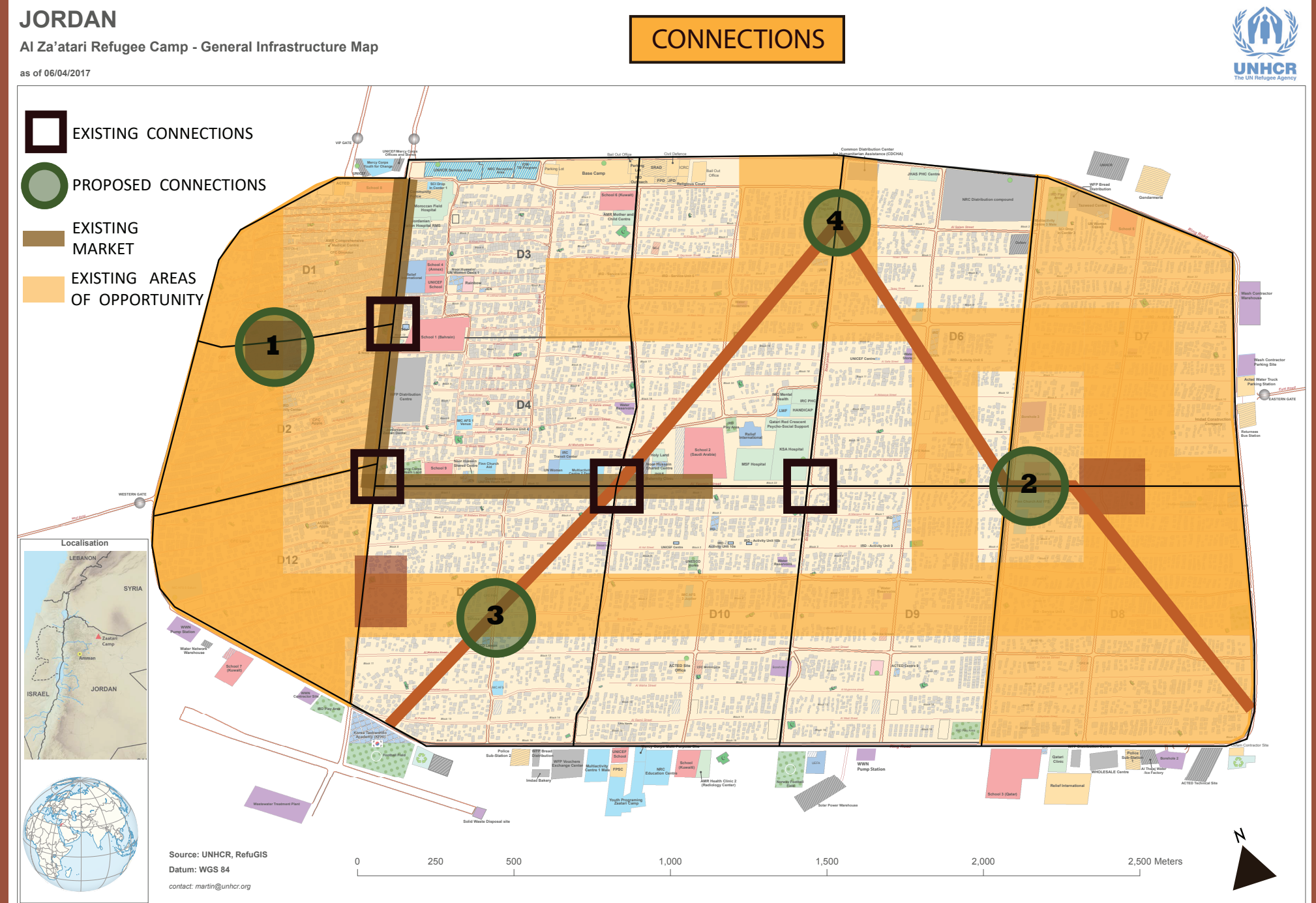


Figure 10. Zaatari Proposed Connections

DESIGN INCENTIVES

The following pages, ... contain two design vignettes which are general configurations of the plans for proposed hubs and connections. Of these two vignettes, two separate options are proposed for each connection.

The first option leaves every building and shelter as it is in its position. The attempt is made to be non-invasive. It utilizes only the open spaces in each location, proposing general building configurations and uses for each.

The second proposes the moving and shifting of shelters to create these hubs. This is done in order to give adequate space and prime location to the spaces and facilities needed in the district. As compensation for moving their homes, families and individuals would be given an incentive to move. This could include or be a combination of; a larger plot of land, individual courtyards, permanent building materials, as well as the space, resources, and plants for a small garden or orchard. Therefore, it gives people the option of choosing something in their life, versus constantly being forced and told what to do. Figures ... look at the possibilities of these configurations. Each rectangle is an individual shelter and is configured to optimize the reduction of the sun's intense rays through the utilization of existing buildings for shade, as well as creating shaded courtyards for these shelters. These configurations are general planning schemes. By their nature, they can and should be changeable and adaptable to user's needs.

INDIVIDUAL CONFIGURATIONS

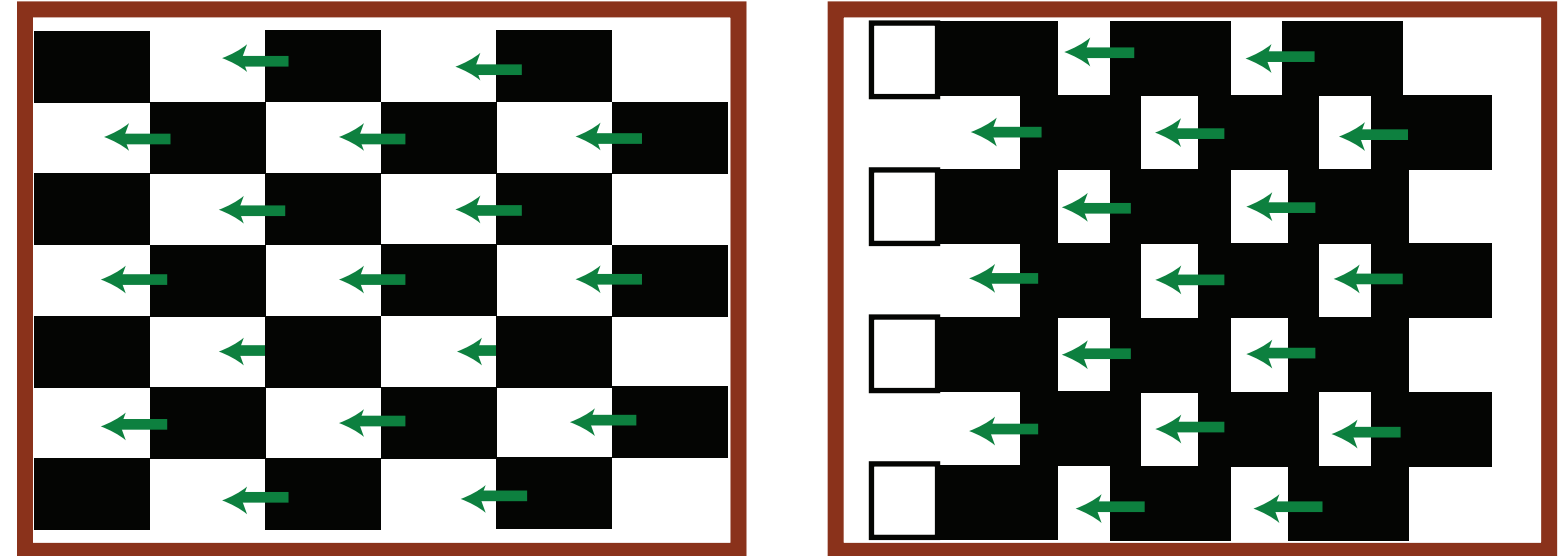


Figure 11. Zaatari Individual Configurations

COMMUNAL CONFIGURATIONS

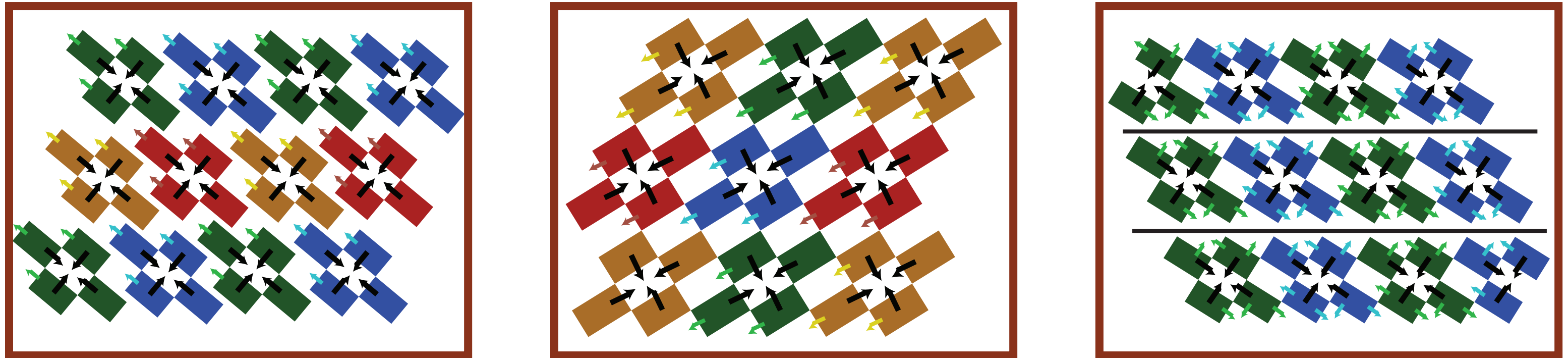


Figure 12. Zaatari Communal Configurations

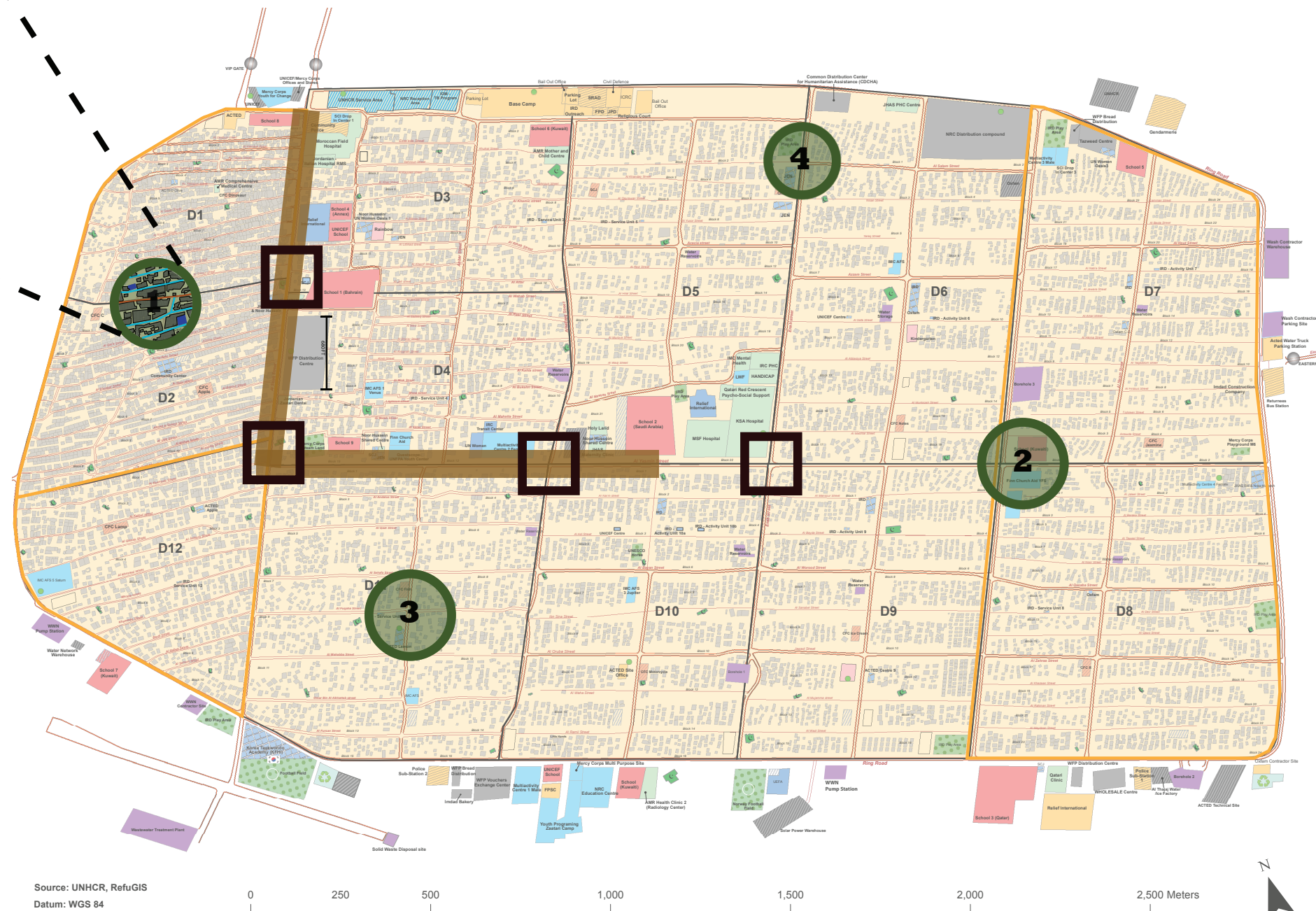
EXISTING CONDITIONS



PROPOSAL PLAN OPTION 1



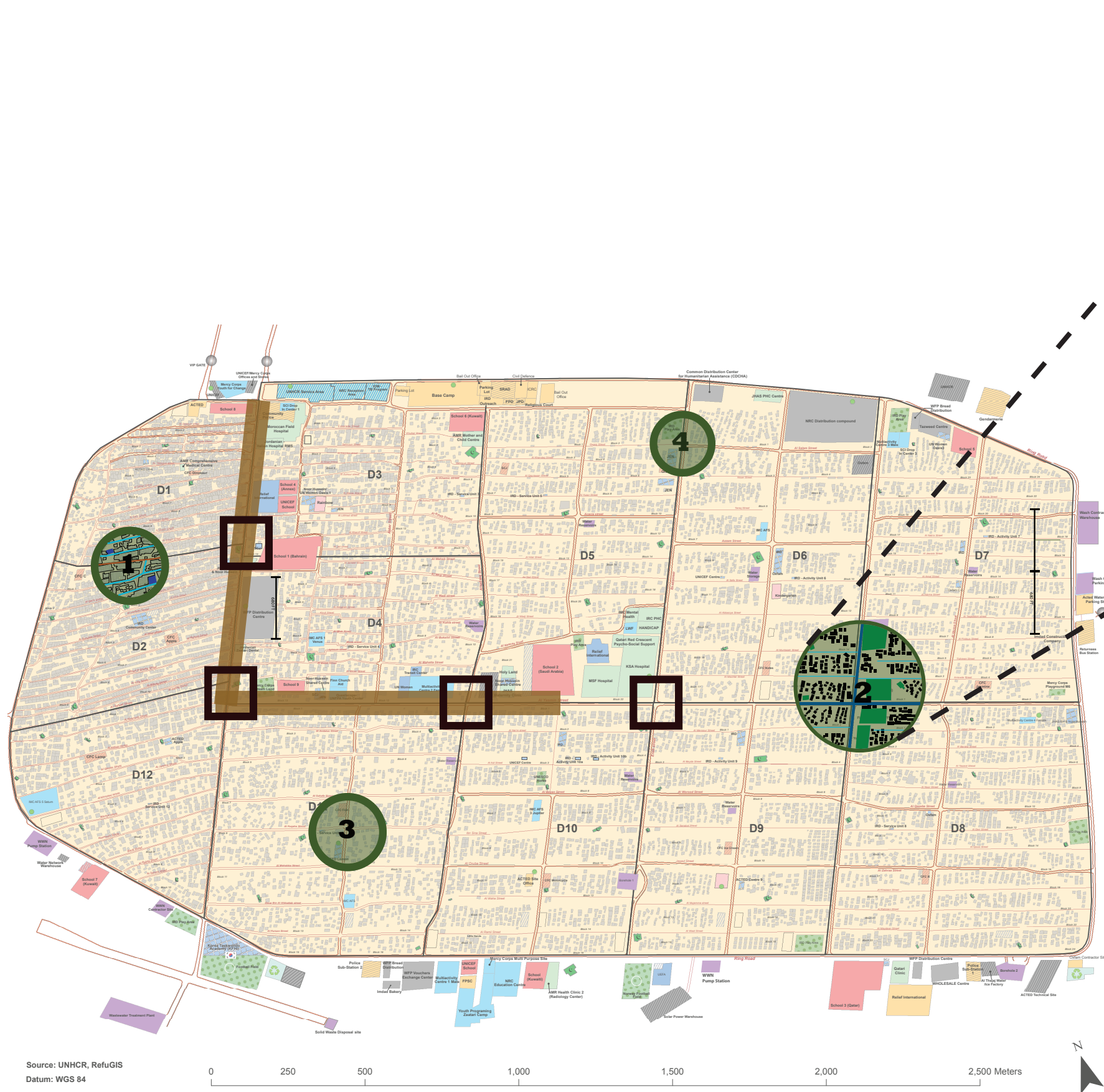
PROPOSAL PLAN OPTION 2



Source: UNHCR, RefuGIS
 Datum: WGS 84
 contact: martin@unhcr.org

Figure 13. Zaatari Connection 1 Proposals

CONNECTION 1



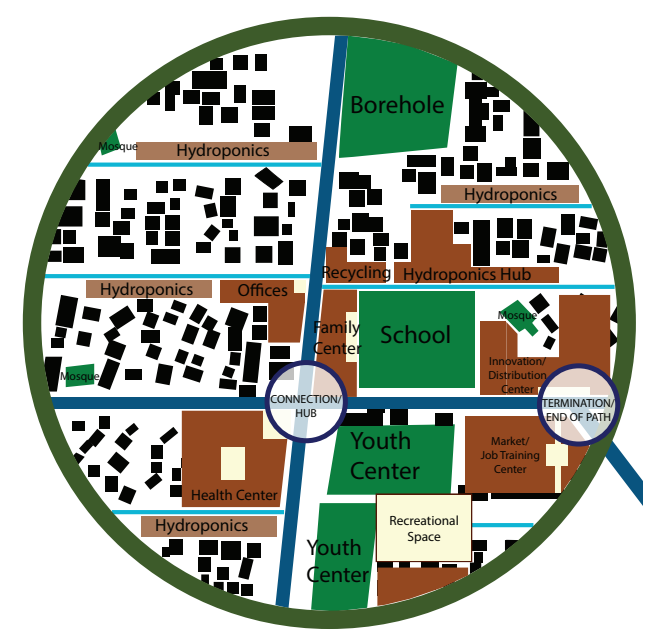
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 contact: martin@unhcr.org



EXISTING CONDITIONS



PROPOSAL PLAN. OPTION 1



PROPOSAL PLAN. OPTION 2

CONNECTION 2

Figure 14. Zaatari Connection 2 Proposals

KUTUPALONG, BANGLADESH

An aerial photograph of the Kutupalong refugee camp in Bangladesh. The camp is built on a steep, eroded hillside, with thousands of makeshift dwellings packed closely together. The roofs are made of various materials, including corrugated metal, plastic, and thatch. Some buildings have colorful walls, while others are more basic. The terrain is uneven, and the overall appearance is one of a densely populated, makeshift settlement. In the foreground, several people are visible walking along a dirt path. The background shows more of the camp extending towards the horizon under a clear sky.

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.

The Rohingya are an ethnic and religious minority of the Rakhine state in Myanmar. Conflict between the Rohingya and the Rakhine, the Buddhist majority in the region, has prevailed since the late 1940s. The Rohingya claim Myanmar as their home, as their ancestors have resided here for generations. Myanmar claims they belong to Bangladesh and will not grant them citizenship or rights. In August 2017, mass violence broke out between government officials and Rohingya citizens, resulting in mass ethnic cleansing and exodus from Myanmar into the Kutupalong refugee camp.

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 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.

BANGLADESH

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.

DENSITY

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. In conclusion, it is extremely densely packed. The camp lacks most of the major necessities of all major cities. These include basic infrastructure, political enforcement, transportation, adequate clean water, secondary education, access to food, goods, and the financial market.

POLITICS

In August 2017, mass violence and chaos erupted in the Rakhine state of Myanmar. After an uprising by Rohingya military group, the government retaliated with mass ethnic cleansing, burning entire villages, murdering thousands, and driving approximately 671,000 Rohingya from their homes.

This has forced the Rohingya to flee to Bangladesh. Here, they are met with reception, but the overwhelming influx has left government and citizens cynical about the continuing arrivals of the refugees. They claim they are depleting economic and environmental resources. They hope to repatriate the Rohingya back to Myanmar as soon as possible, prohibiting any sort of movement outside of refugee camps. This leaves the Rohingya a stateless people with only two options. The first is Myanmar, where they are under constant threat of life-threatening persecution. Second, is Kutupalong, where they await their fate in poor and densely packed living conditions, dependent on unreliable external aid.

LOCATION

Bangladesh's is the only land border with the Rakhine State of Myanmar. This has led to a mass exodus of 735,000 Rohingya refugees fleeing their home Rakhine State to Bangladesh. Of these, 640,000 have sought 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.

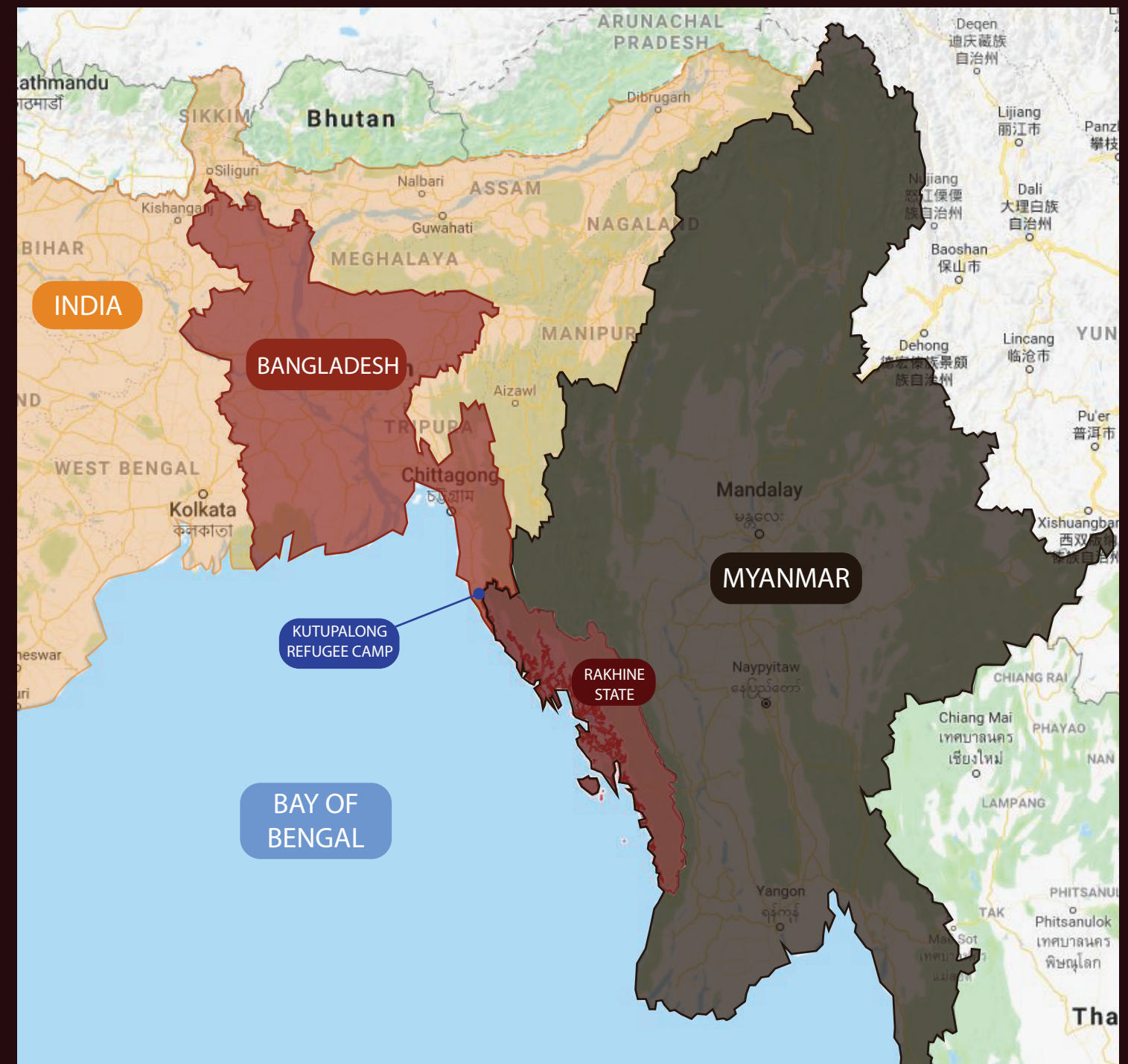


Figure 15. Kutupalong Context

GENERAL CAMP ISSUES & NEEDS

Issue. (Material, Social, Political)	Related Consequences	Architectural/Design Issue in Correlation
Densely populated	Health Issues. Poor Quality of Life.	Poor Planning & Infrastructure.
Massive population	Resources run thin. (food, shelter, healthcare, materials)	Inadequate amount of facilities/structures. Inadequate planning
Access; Resources (food, materials, necessities)	Uneven and poor distribution of necessities. People hungry/cold.	Not enough roads/pathways/connections to distribute and receive resources.
Access; Healthcare	Inadequate healthcare. People stay sick, which can lead to death.	Inadequate health facilities.
Access; Education	Lack of education. Lack of skills. Lack of development. Lack of way of life.	Inadequate amount of schools/quality of schools.
Poor Sanitation	Contaminated drinking water. Health Issues. Poor Quality of Life. Stinky.	Poor water quality. Contaminated Soil.
Flooding (especially during monsoon season)	Shelters covered with water/damaged/destroyed. Waste water leakage.	Loss of shelters/structures
Inadequate Infrastructure	Lack of transportation/movement/autonomy. Feelings of helplessness.	Lack of cohesive working plan. Only certain pieces work.
Deforestation (firewood & clearing for shelters)	Loss of natural habitats. Negative perception by host citizens	Negative environmental impacts. Loss of habitat and clean air.
Located along elephant migration path	Loss/injury/death to people and elephants. Destruction of shelters	Shelters/structures located along path
High risk of landslides	Loss of homes. Safety Concerns	Loss/damage to shelters.
Steep Terrain	Inhibits access to resources/facilities. Physically straining/unsafe to walk.	Hard to build & maintain shelters/roads. Landslide prone
Lack of signage/wayfinding for refugees	Refugees unable to find facilities, therefore don't go (school, market, etc)	No coherent general system/wayfinding. No monumental feature
Lack of opportunities to make a living	No currency. No way to obtain needed resources on their own. Dependent.	No spaces for job-related activities to take place.
Restrictions of movement beyond camps	No access to external resources needed for living	No escape from poor, densely populated living conditions.
Personal safety & security	Violence and crime	Not enough/adequate security
Mental Health Issues. (trauma, violence,)	Limits societal functioning and contribution.	Designs not addressing these issues.

Issue. (Material, Social, Political)	Possible Design Solutions
Densely populated	Relieve density by building up instead of out.
Massive population	Insert infrastructure/overall master plan for transportation, distribution, processes, etc..
Access; Resources (food, materials, necessities)	Provide access/infrastructure/paths for distribution.
Access; Healthcare	Provide roads/paths. Provide health care facilities proximal to each location/shelters/homes.
Access; Education	More education facilities. Specialized schools. Access to schools for all children/families.
Poor Sanitation	Provide adequate sanitation. Provide preventative solutions for flooding/monsoon season.
Flooding (especially during monsoon season)	Preventative design for flooding. Stilts? Control canals? Reinforcement for flooding.
Inadequate Infrastructure	Provide adequate infrastructure. (roads, bridges, sewer, water systems, electrical systems)
Deforestation (firewood & clearing for shelters)	Re-introduce trees. Provide alternative sources of energy in place of fire.
Located along elephant migration path	Prevent further structures from being built on paths. Work on reducing structures along path. Clear a path?
High risk of landslides	Re-introduce trees to stabilize soil. Design for landslides. Provide strong foundations/structures
Steep Terrain	provide alternatives/paths to terrain to make it easier to trek. Flat.
Lack of signage/wayfinding for refugees	Provide a refugee-led map system. Provide signage. Overall masterplan that is easy to navigate.
Lack of opportunities to make a living	Creation/Facilitating of market and commerce spaces. Creation of spaces to learn and perform skills/ jobs.
Restrictions of movement beyond camps	Promoting refugee's ability to work by a positive space which helps them contribute to their host country.
Personal safety & security	Provide security. (both for individual shelters & safe public spaces which encourage group interaction)
Mental Health Issues. (trauma, violence,)	Provide spaces and centers which promote a sense of safety, security, and community.

MAJOR CAMP ISSUES

DENSITY

SANITATION & WASTE REMOVAL

FLOODING & LANDSLIDE RISKS

ACCESS TO RESOURCES & FACILITIES

DEFORESTATION

DENSITY STUDIES

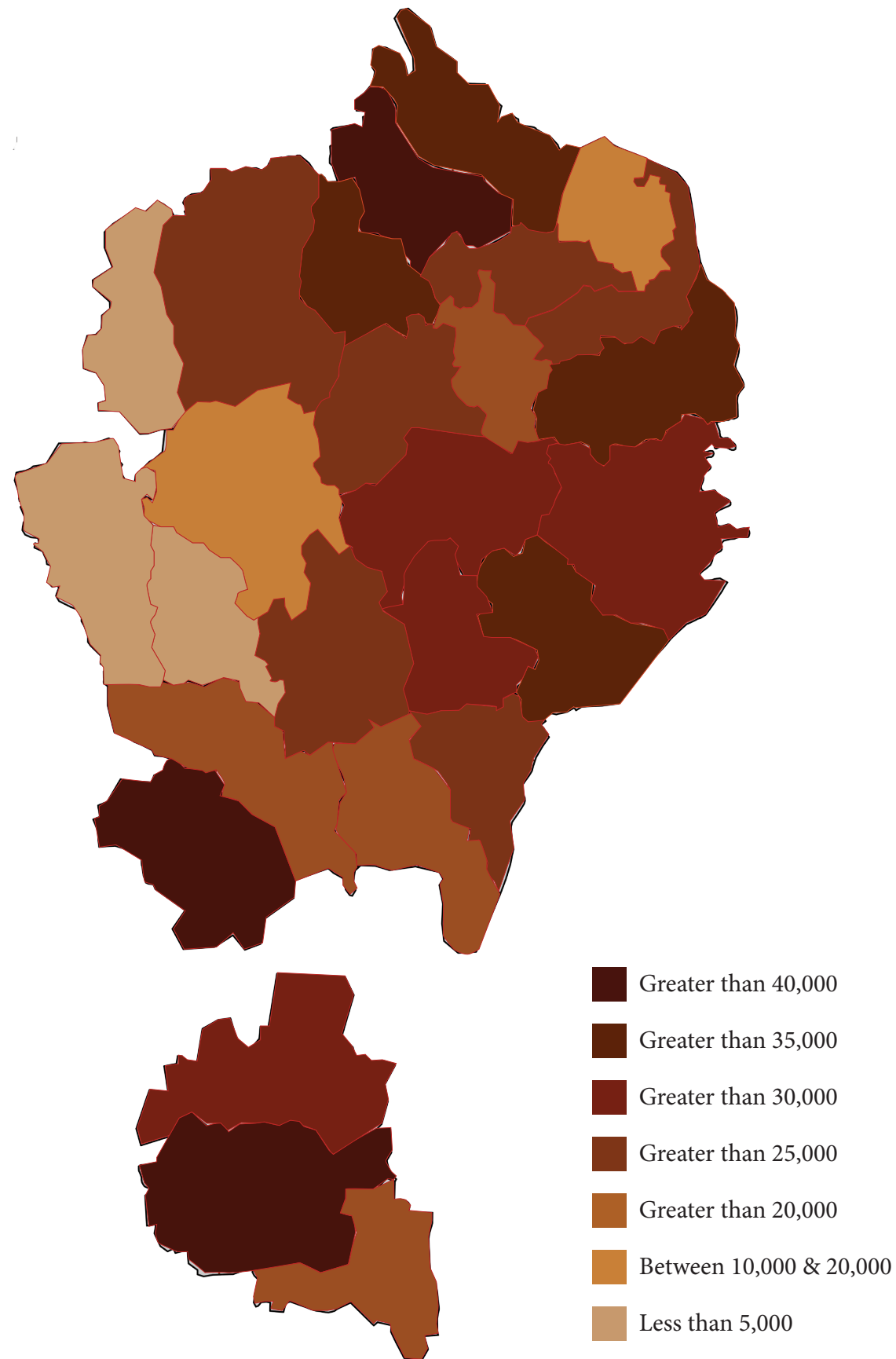


Figure 16. Kutupalong Density

Density

Figure 16 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.

EXPANSION & GROWTH

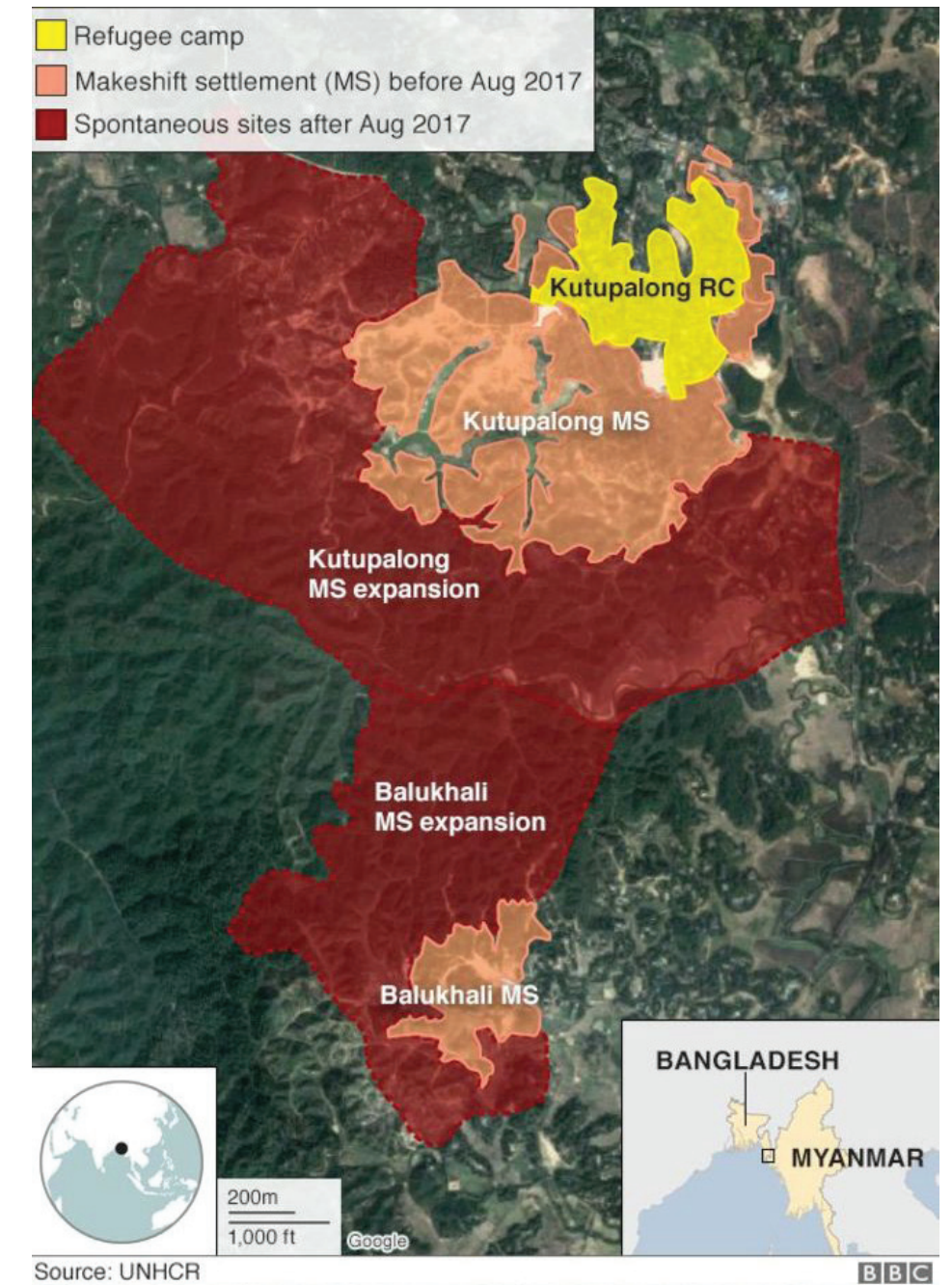


Figure 17. Kutupalong Expansion & Growth. Source: UNHCR

As Kutupalong developed, it expanded outwards in a general south west direction. The original camp is shown in yellow. Without any sort of sustainable way to control this expansion, shelters and homes continued to develop further and further away from the main camp and the resources it provides. Also, accessing these portions of camp is much more difficult due to the intense topography of the region and high flood risks.

EXISTING FEATURES OF KUTUPALONG

EXISTING SHELTERS

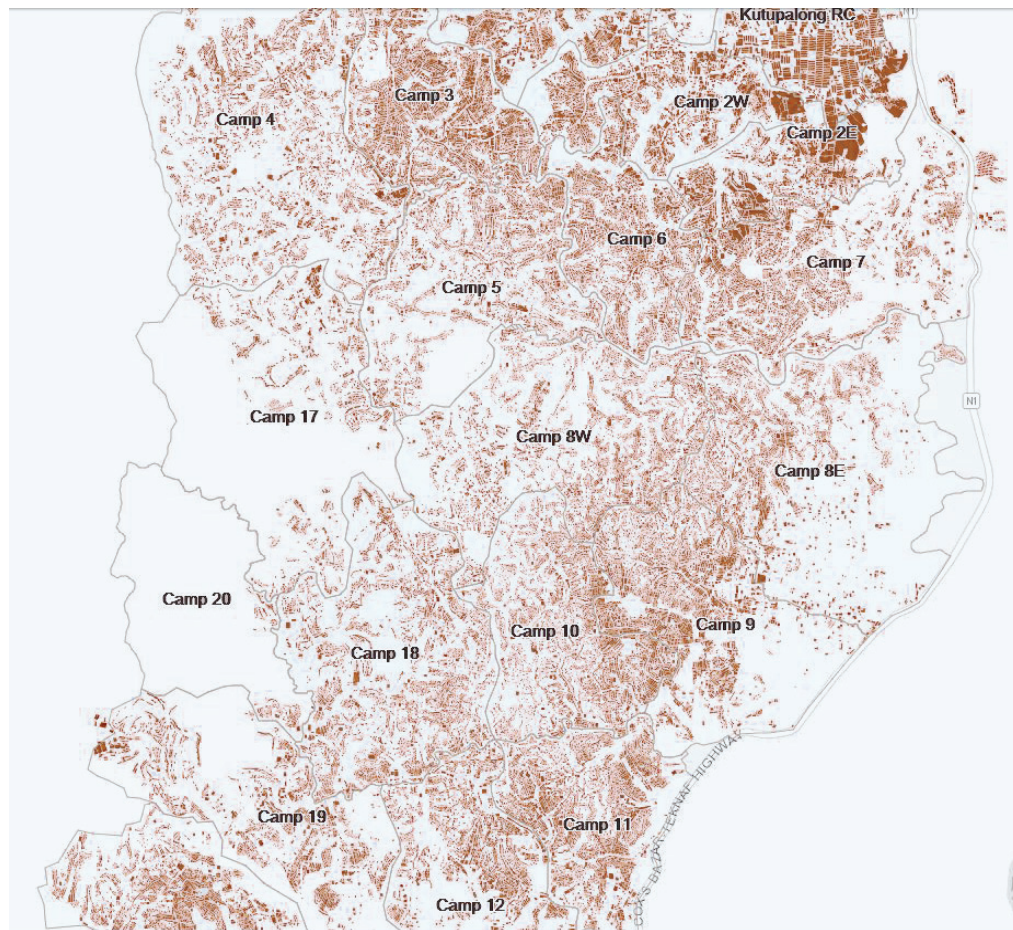


Figure 18. Existing Shelters. Source: UNHCR

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 can be used to analyze the evolution, development, and spread of the camp. The edges of the camp around camps 17, 20, and 8E are relatively empty. It shows that the density of the camp is not equally distributed, with the tendency for shelters 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.

FLOOD PRONE AREAS

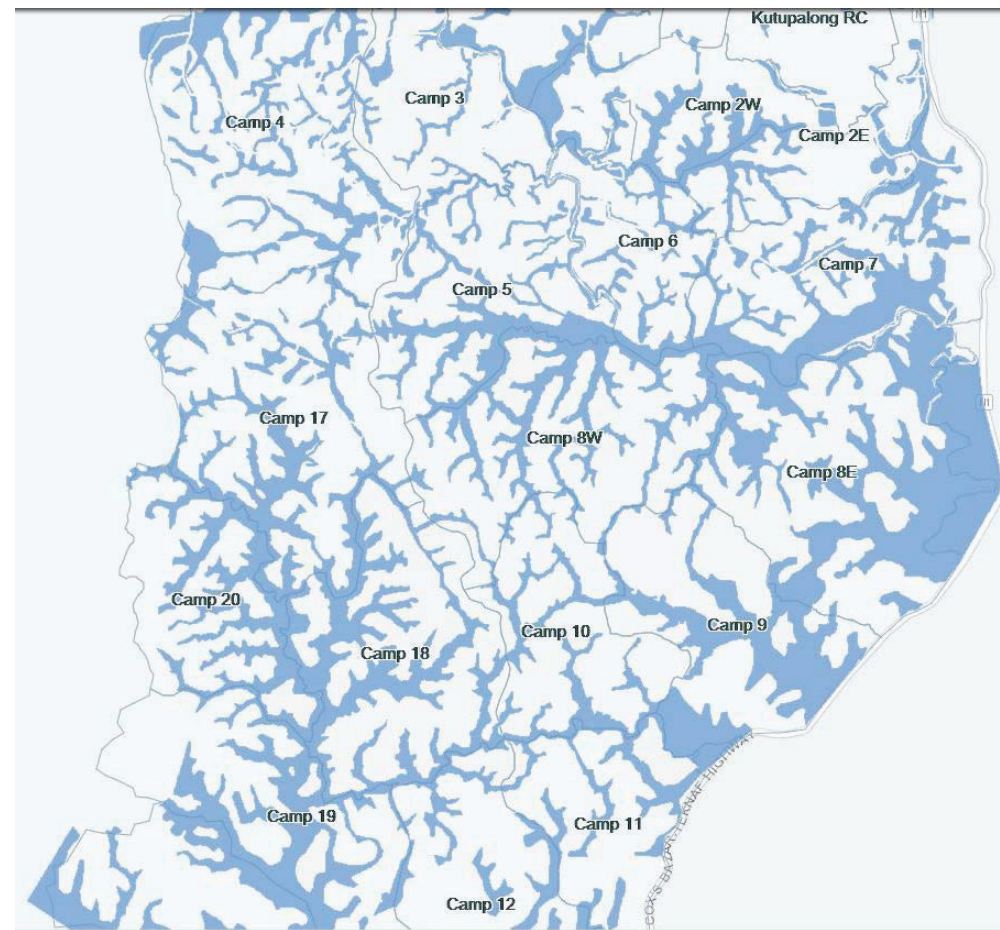


Figure 19. Flood Prone Areas. Source: UNHCR

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.

LANDSLIDE PRONE AREAS

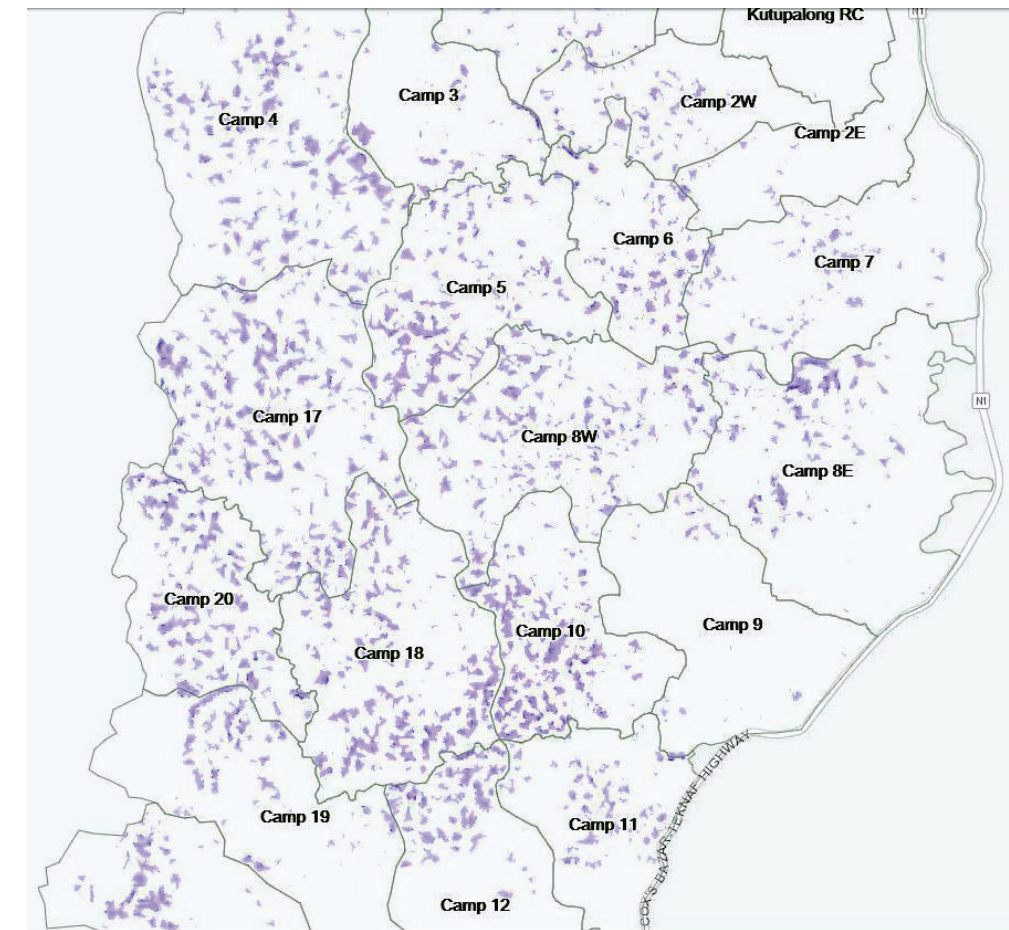


Figure 20. Landslide Prone Areas. Source: UNHCR

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.

PHYSICAL FEATURES ANALYSES

Some of the major issues Kutupalong faces are deforestation, flooding, landslides, access to resources, dense population, poor sanitation, and steep terrain.

Visual analyses of the camp provides insight on the intense density of the camp. Shelters are packed close together in organic shapes. Some of the densest portions of camp also have the least amount of access to them. Long distances over rolling hills do not provide easy access to these areas.

Many shelters are at risk of flooding and landslides, especially during summer monsoon season when intense rain and storms blow through the area. Though the UNHCR has distributed kits for securing shelters during monsoon season, a more viable option would be to implement a different design method, such as building on stilts, or moving these shelters.

The area which Kutupalong now occupies was previously a dense national forestland. However, this has almost entirely been cut down to make room for shelters and exploited by the gathering of firewood. The loss of this forest is felt ecologically, as groups of native elephants which find their home there have had conflicts with residents of Kutupalong, resulting in the death of both elephants and refugees. It can also be felt by local Bangladeshi residents, who mourn the loss of the beautiful valued forestland.

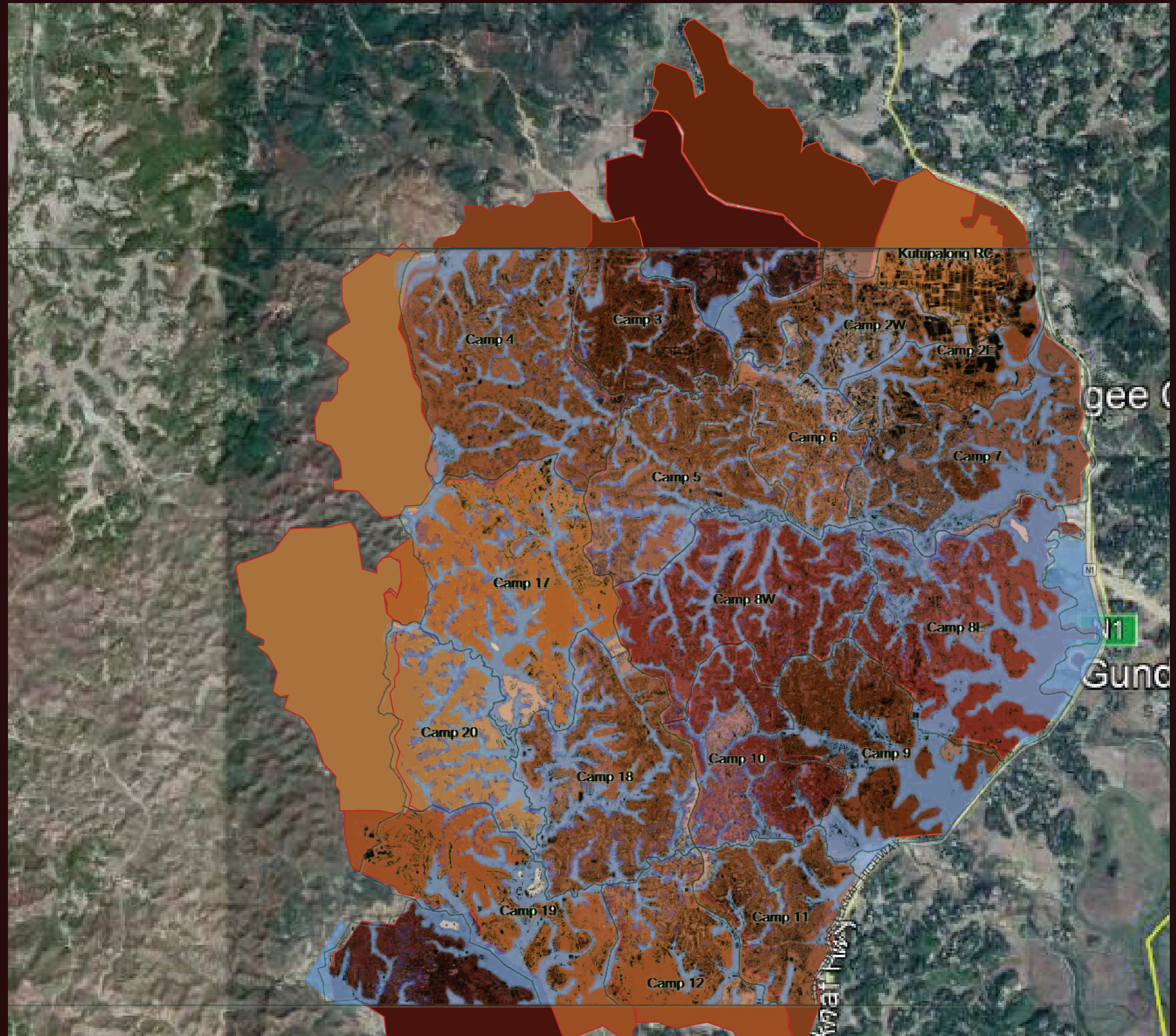


Figure 21. Kutupalong Existing Features

ANALYSES

FLOODS

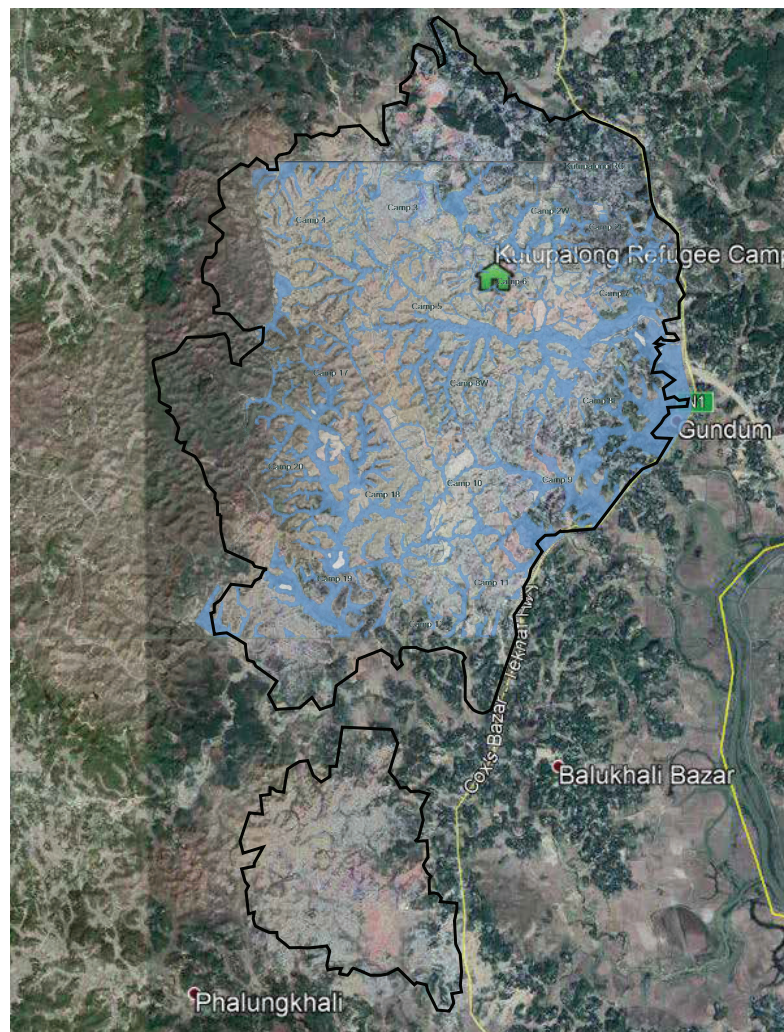


Figure 22. Kutupalong Flooding

Flooding is one of the greatest risks in Kutupalong. Monsoon season brings with it the fear of losing structures and homes. Large areas of the camp turn into small lakes as they flood.

FLOODS & LANDSLIDES

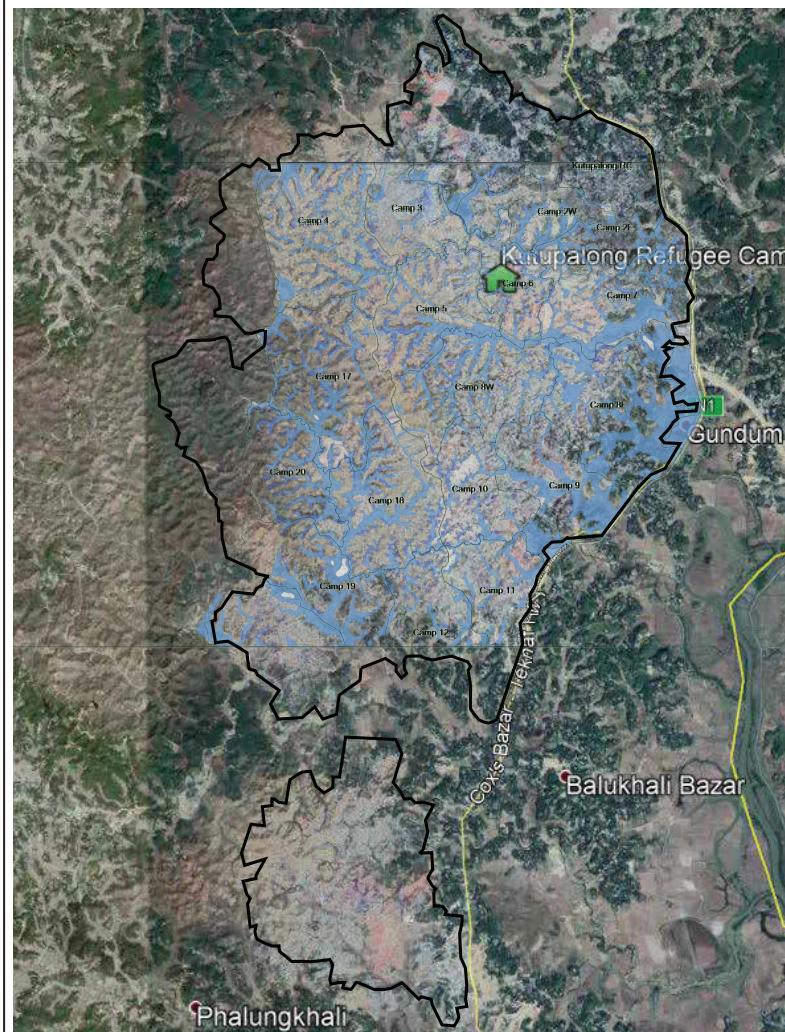


Figure 23. Kutupalong Flooding & Landslides

Along with flooding comes the risk of landslides. These can damage and destroy structures. Efforts have been made to provide landslide kits to refugees. However, if landslides were considered prior to the distribution of shelters, the result would require less maintenance.

ROADS

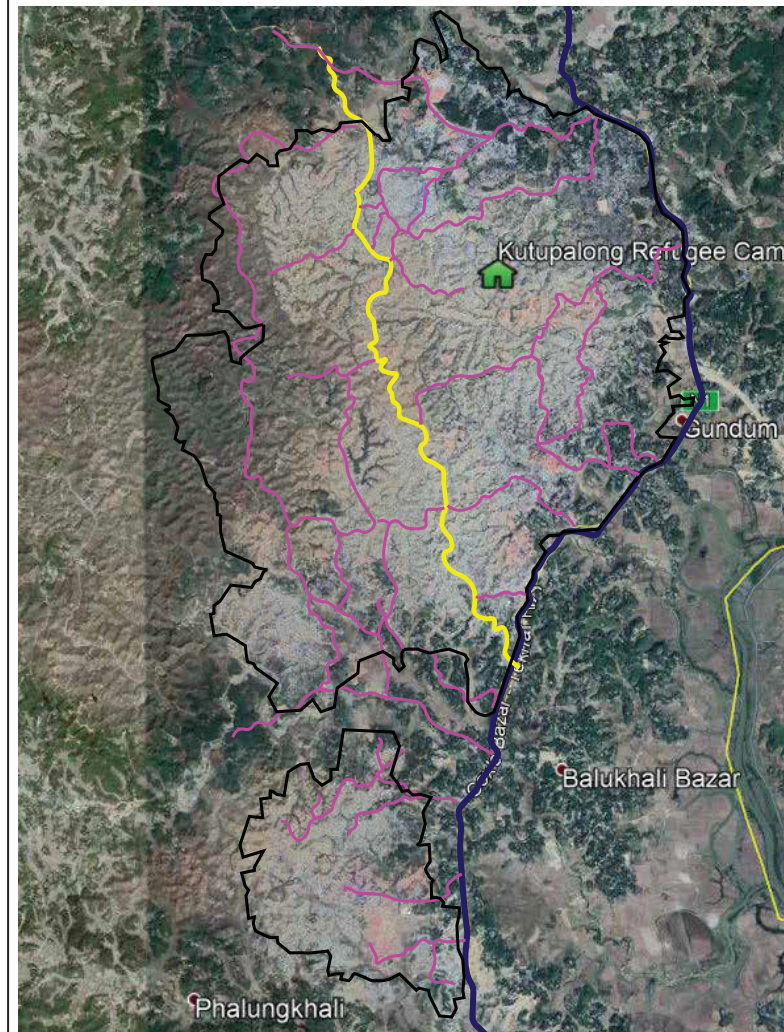


Figure 24. Kutupalong Roads

The yellow line shows the existing main road through Kutupalong. The pink lines represent secondary unpaved roads. Additional roads would greatly benefit the camp, especially another main road which gives access to every district.

DENSITY. FLOODS. ROADS.

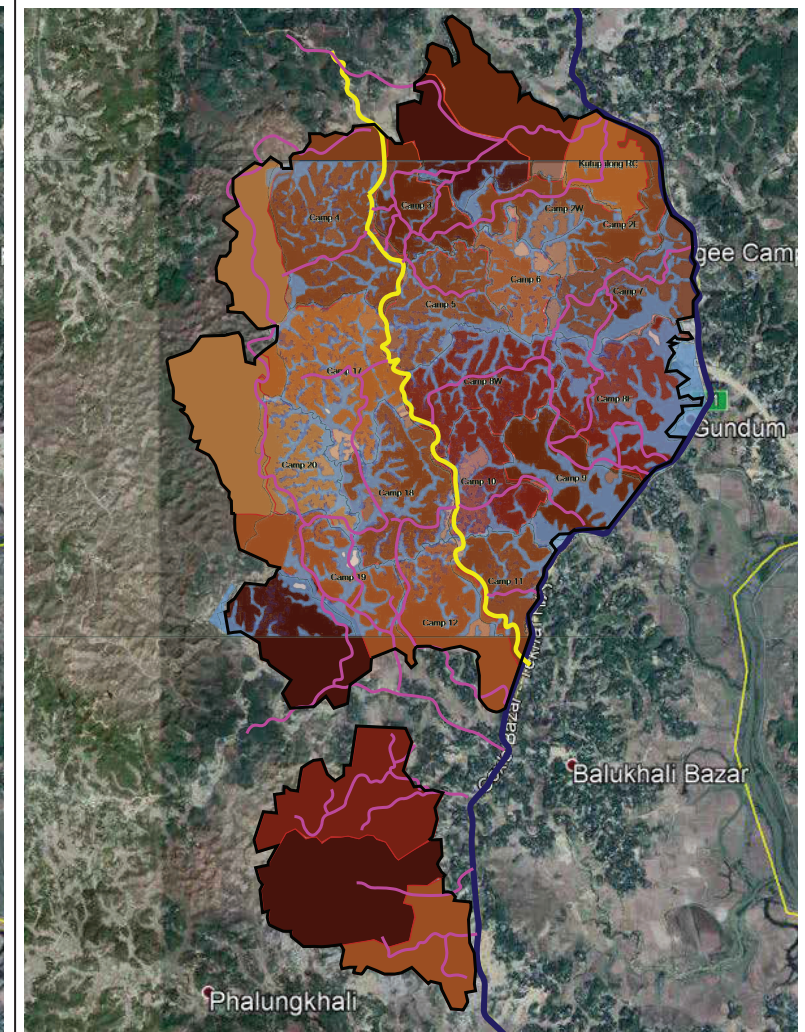


Figure 25. Kutupalong Density. Floods. Roads

The combination of density analyses, flood risks, and roads shows a comprehensive analysis of the entirety of the Kutupalong camp. The least dense districts also have fewer roads. Many of the secondary roads cross areas which are at risk of flooding. When monsoon season hits, these roads may be underwater.

LITERATURE REVIEW

MANUAL OF TROPICAL HOUSING AND BUILDING.

Koenigsberger, O. H.; Ingersoll, T. G.; Mayhew, A.; Szokolay, S. V.

OVERVIEW OF WARM-HUMID CLIMATE

Dominant Characteristics: Hot, sticky, and humid conditions. Constant presence of dampness. Little seasonal variation 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.

- Humidity: High. Consistent 75% (Relative Humidity)

- Precipitation: High throughout the year. 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. High humidity and rain can cause a constant physiological feeling of entrapment within the humidity, which is heightened by the dense living conditions.

- Sky Conditions: Relatively cloudy throughout the year. Cloud cover can range from 60 to 90 percent.

- Solar Radiation: Partly reflected and partly 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.

- Wind: Low velocities. Intense, strong winds occur during rain storms and squalls.

- Vegetation: Flourishes and grows quickly, due to the constant presence of rain and moisture, as well as high temperatures. It can be difficult to control because of the ideal growing conditions. The soils are typically poor for agriculture. Concentrated plant cover reduces reflected radiation, decreasing the heating of the ground.

The natural ecosystem of tropical rainforest which provide these favorable characteristics has essentially vanished in the Kutupalong refugee camp, where deforestation has run rampant. Reduction of ground temperature, soil stability, and air filtration have been lost. By re-introducing vegetation, the habitat can regain these benefits.

**“Hot, Sticky, and Humid Conditions.
Constant Presence of Dampness.”**

CAMP 7

Camp seven was chosen for its proximity to the original Kutupalong refugee camp. As refugees arrived in Kutupalong after August 2017, they first settled in this part of camp. However, as more and more massive numbers of people arrived, the camp had no place to expand but out. Due to the major highway bordering the eastern side of the camp, shelters have steadily crept outwards in a general south west direction. Camp seven borders the original camp, therefore is an older “new” expansion. (This contrasts with camp thirteen, which borders the Bengali forest and is one of the newer portions of the camp). It also has the sixth highest population of the 26 camps within the district. To the right of Kutupalong, just on the border of camp seven lies the largest basins in the camp. It essentially creates a small lake when it floods. Most of the right portion of this district is comprised of what looks like farmland, making it uninhabitable. Its eastern edge borders the major highway, Cox’s Bazar Teknaf Highway.

It has a total population of **38,500 people** and **9,150 families**.

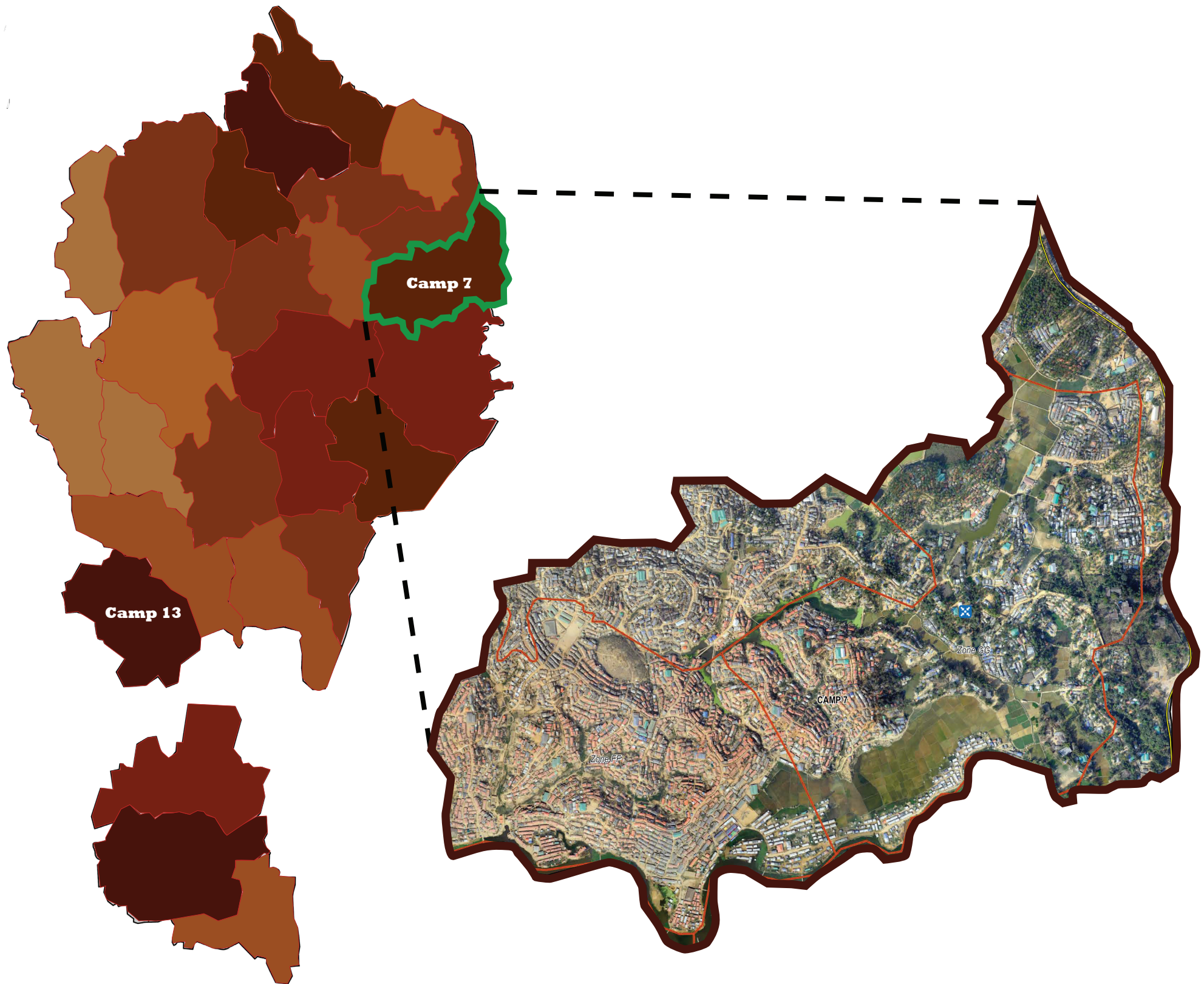


Figure 26. Camp 7

ANALYSES

BASE MAP

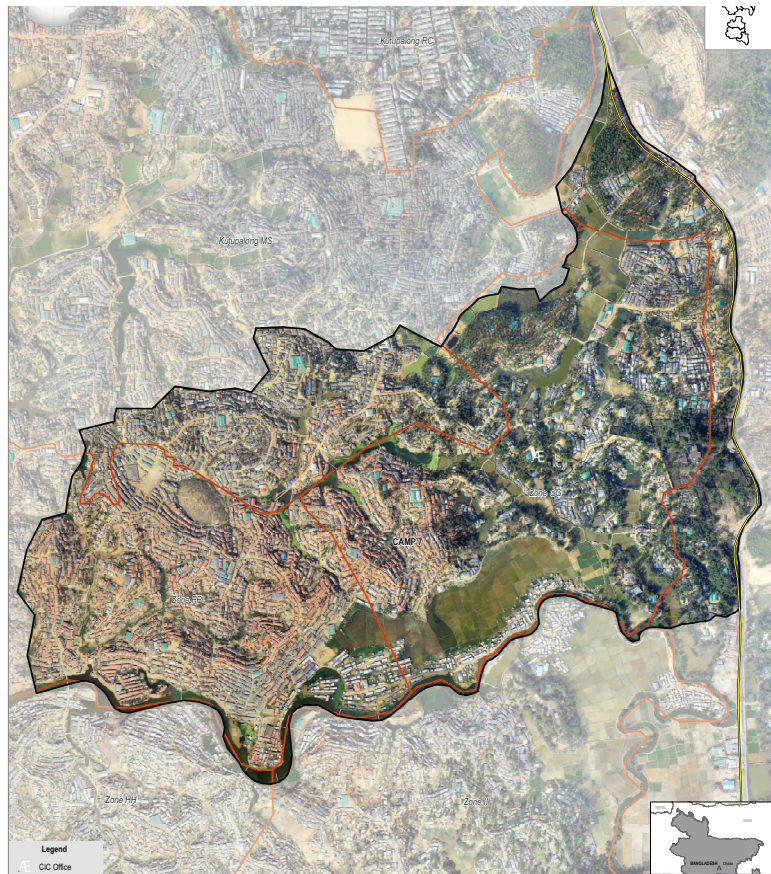


Figure 27. Camp 7 Base Map

The majority of shelters reside in the western portion of the camp. The eastern side is relatively empty in comparison. There are also large open agricultural areas that occupy low flood ground.

TOPOGRAPHY

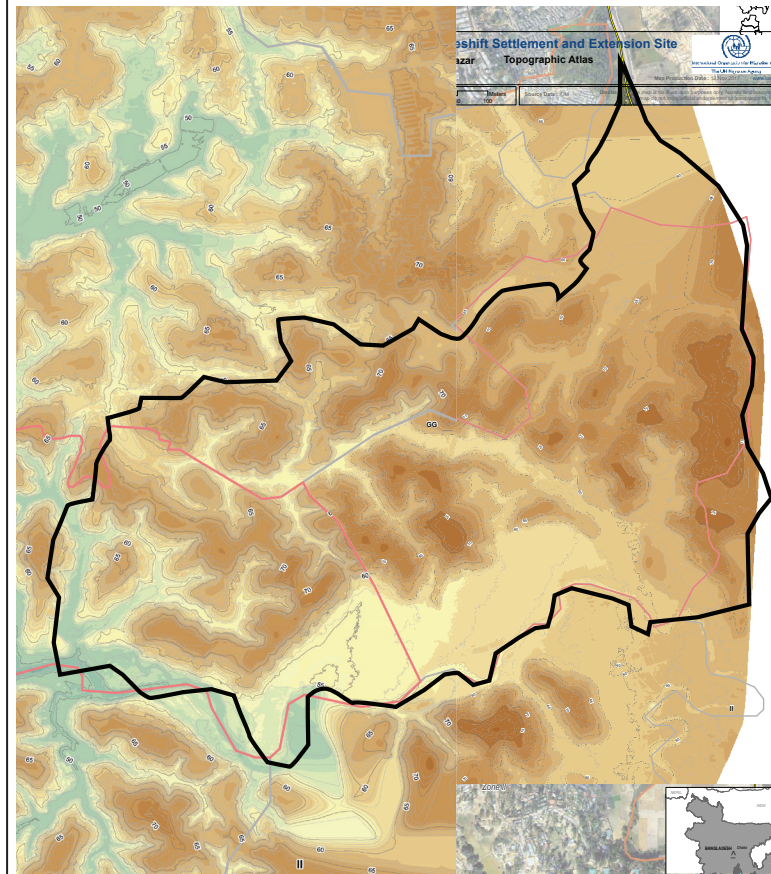


Figure 28. Camp 7 Topography

A topographical analysis of camp seven demonstrates the various rises in the landscape. A large portion of light yellow reveals the site's potential to flood. Rivers already exist on the map. The taller portions of topography look like they could become islands if it were to flood. These hills are long and skinny.

FLOOD RISKS

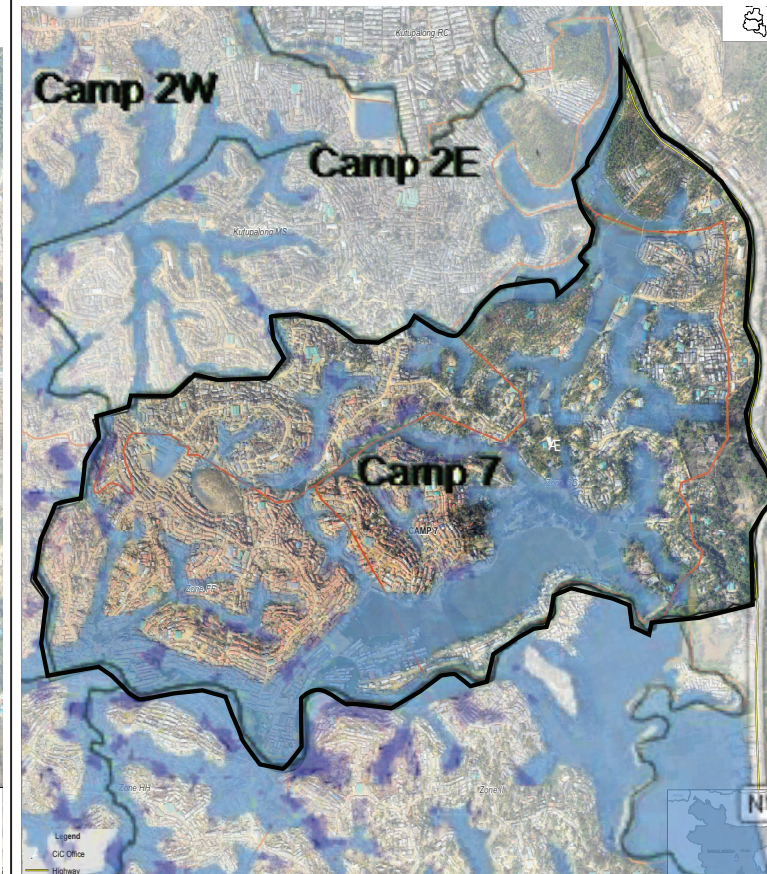


Figure 29. Camp 7 Flood Risks

Flooding has the potential to cover almost half of camp seven. Numerous existing shelters would be at risk of flooding. A large portion of the camp is subject to filling up a small pond.

The purple areas on the map signify areas which are prone to landslides. These are spread throughout camp seven and almost all of these areas currently have shelters on top of them.

OPEN SPACES

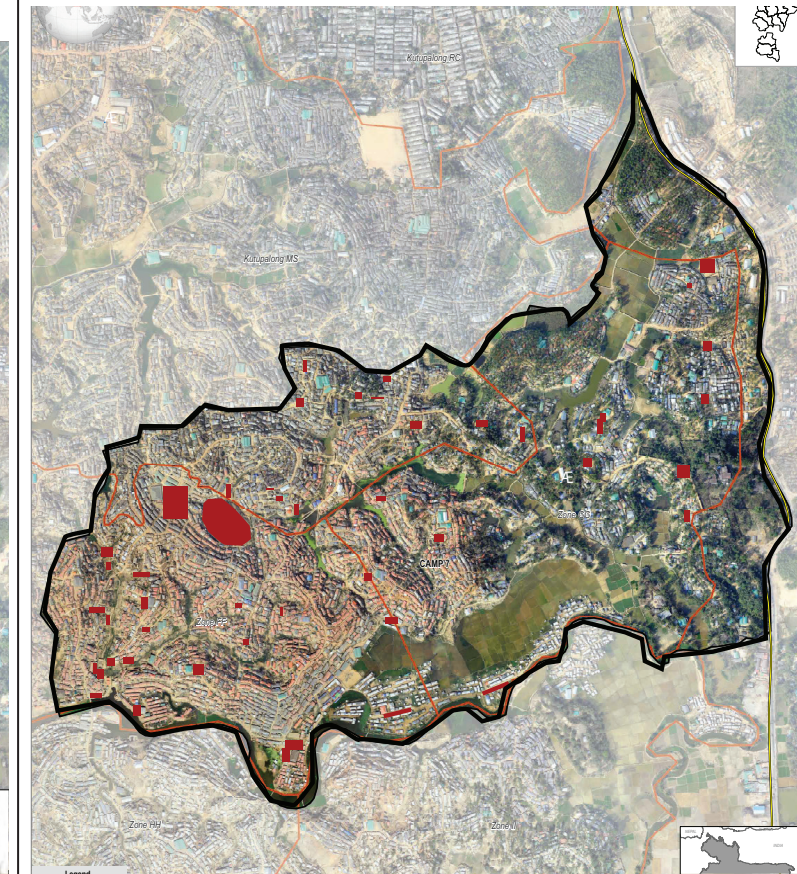


Figure 30. Camp 7 Open Spaces

Not many open spaces are available in this densely packed district. The western side is especially packed. This portion would benefit most from added facilities due to its dense nature. However, there is one large oval open space which would be a great design opportunity.

ANALYSES

TOPOGRAPHY, FLOODS, OPEN SPACES.

FLOODS & AREAS AT RISK

AREAS AT RISK

DISTRICTS

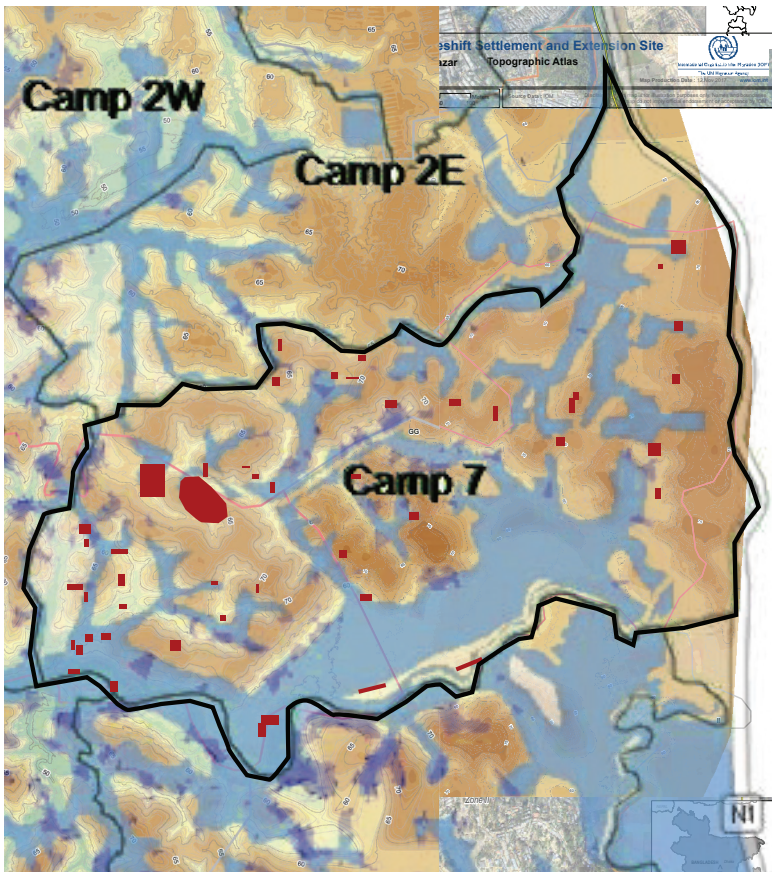


Figure 33. Camp 7 Topo. Floods. Open Spaces.

Higher portions of topography and hills stick out above the flood plain. A decent amount of open spaces are located in areas that are not at risk for flooding. The two large areas on the western portion of the camp are not at risk for flooding. These locations would be good design options.

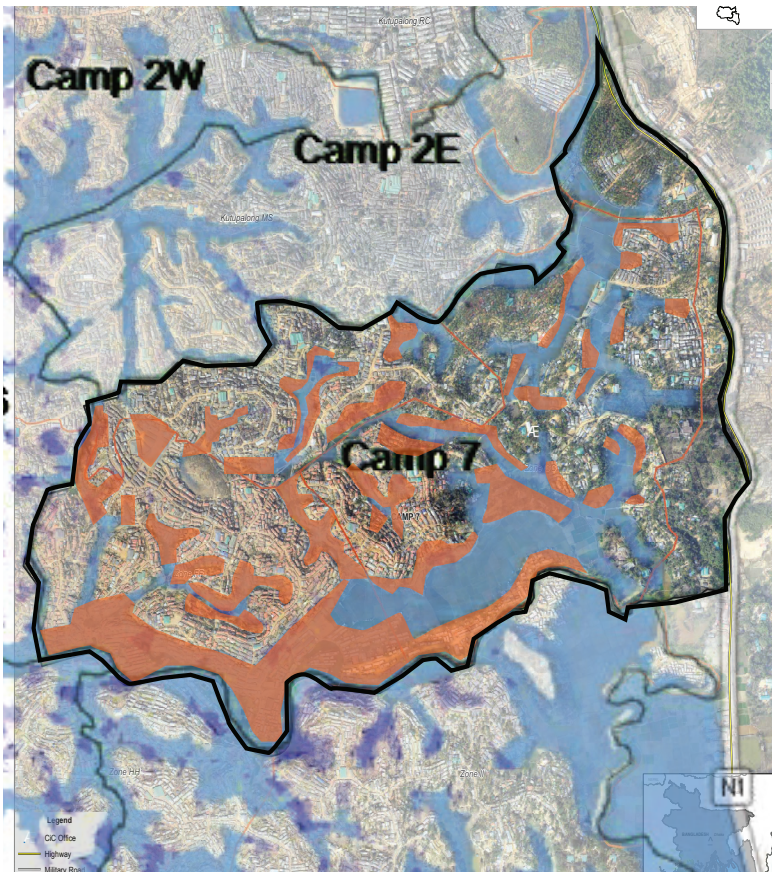


Figure 34. Camp 7 Floods & Areas at Risk

Areas at risk of flooding are highlighted in blue. Shelters which reside in the area at risk are highlighted in orange. The lower portion of the camp is almost entirely covered.

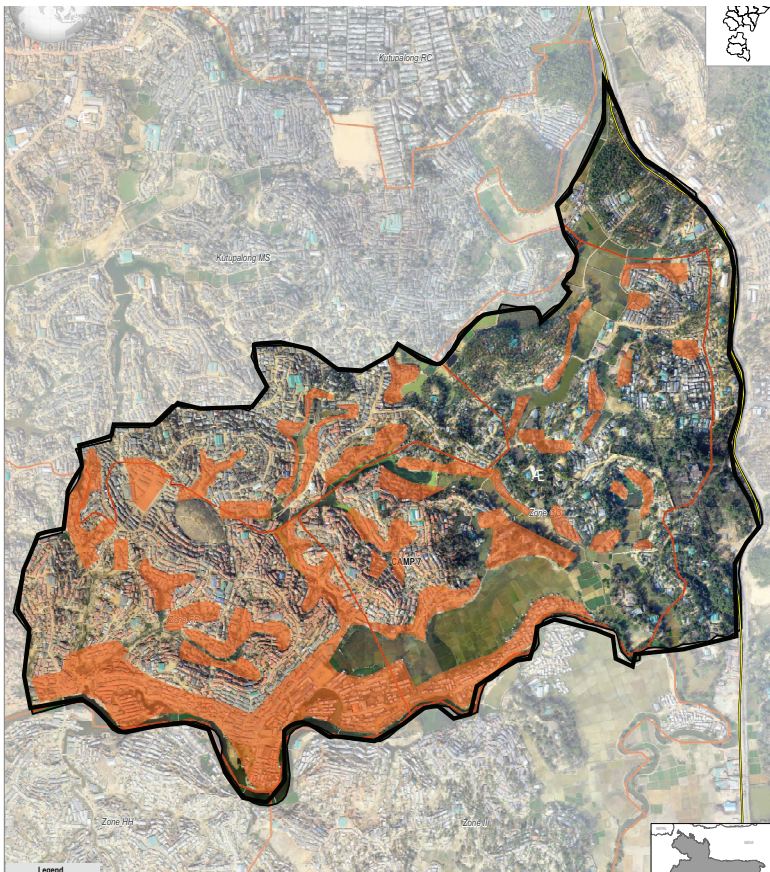


Figure 35. Camp 7 Areas at Risk

A great portion of shelters are at risk in camp 7. Relocation, reinforcement, or different building construction methods could be viable options.

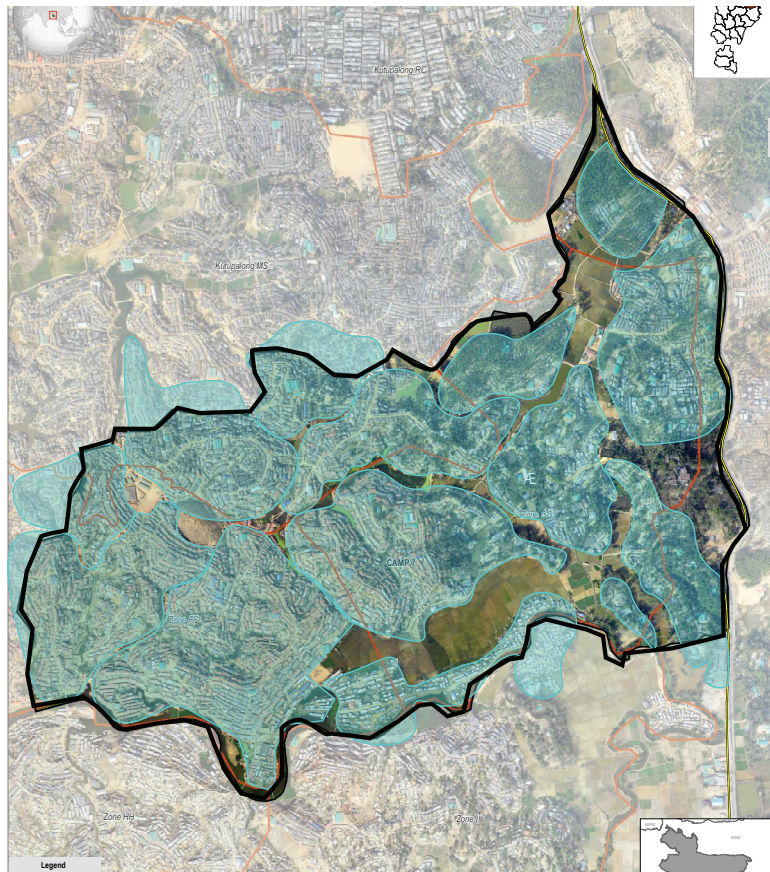


Figure 36. Camp 7 Districts

This map shows the conglomerations of different districts. They are grouped based on clusters and nodes. Each district would benefit from a central connection to facilities.

CAMP 7

ANALYSES

DISTRICTS. AREAS AT RISK. OPEN SPACES.

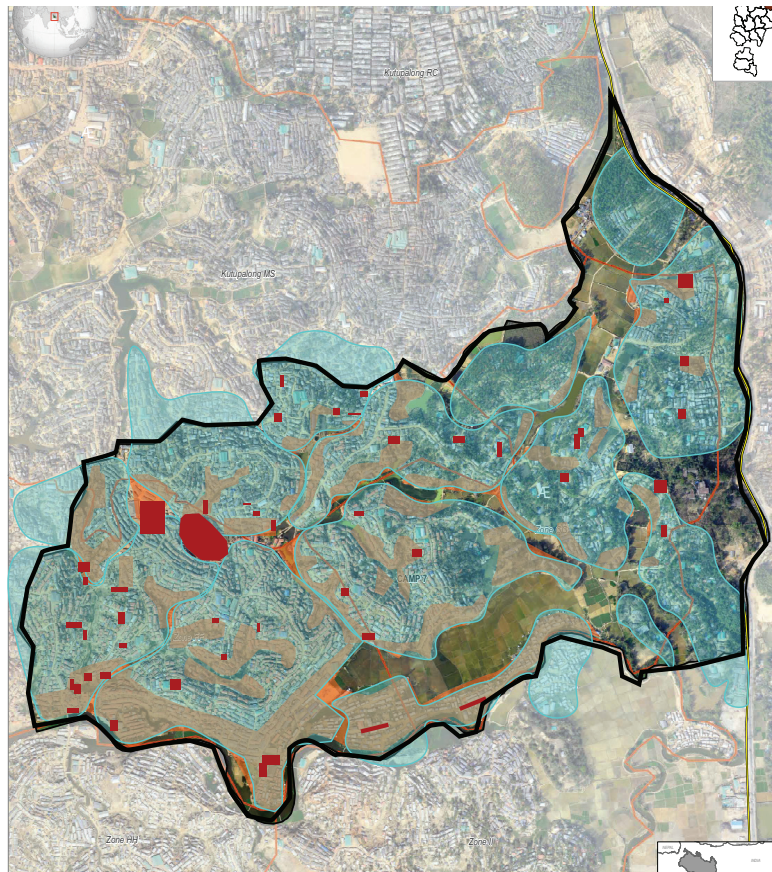


Figure 37. Camp 7 Districts. Areas at Risk. Open Spaces.

There are open spaces in almost all the districts. However, they are not evenly distributed. Unfortunately, a large majority of the open spaces reside in areas at risk of flooding.

ROADS & BRIDGES

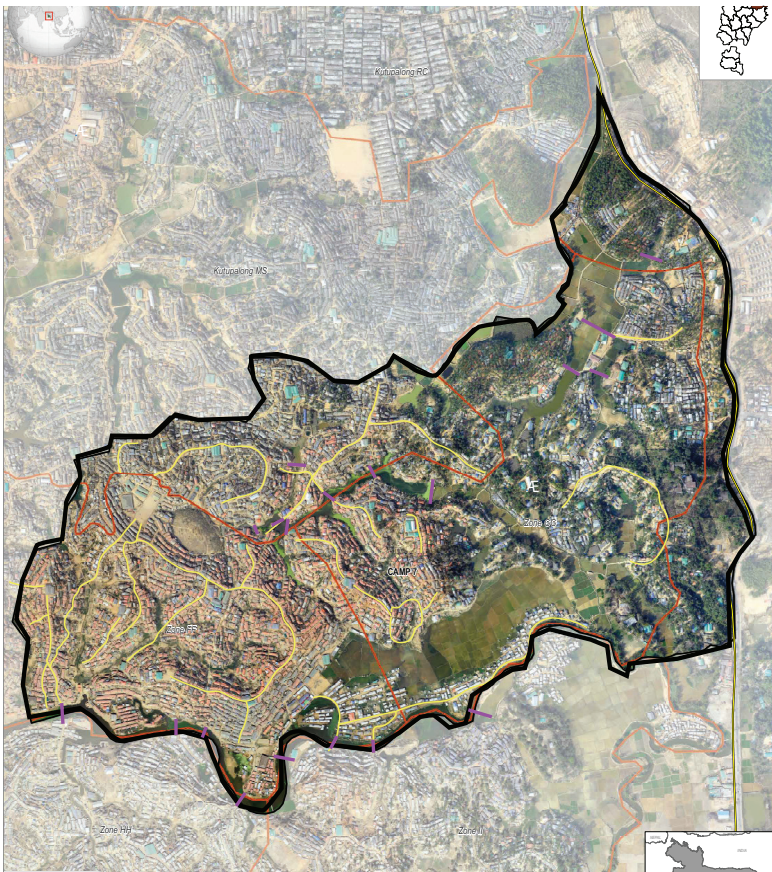


Figure 38. Camp 7 Roads & Bridges

Numerous roads and bridges are present. Many of the roads exist on the edges of districts and nodes. There is not one main access or roadway.

ROADS. BRIDGES. FACILITIES.

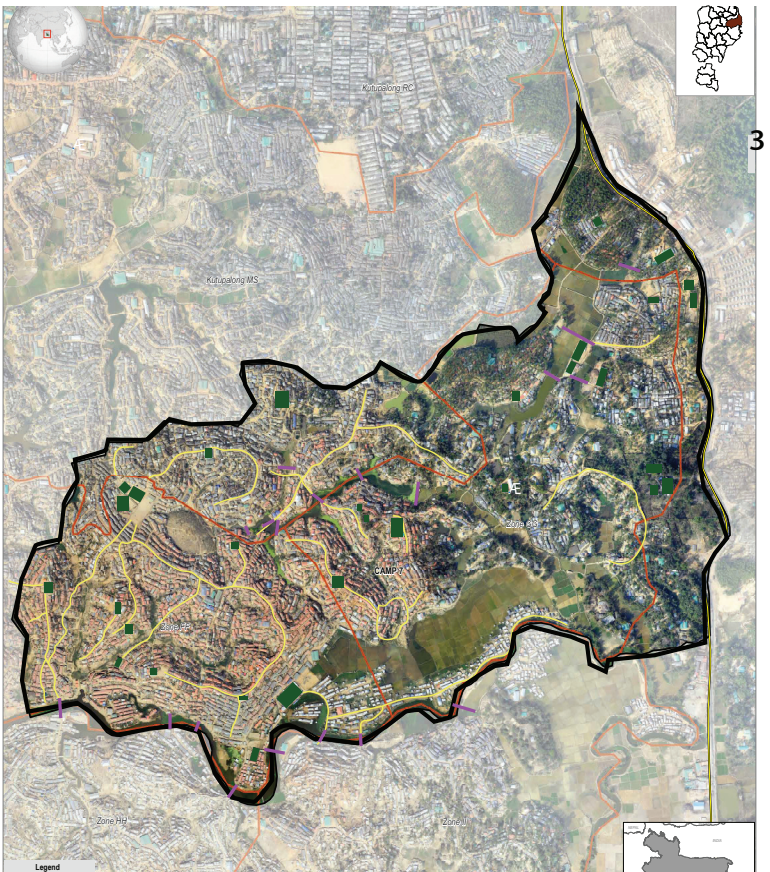


Figure 39. Camp 7 Roads. Bridges. Facilities.

Many of the facilities lie along roadways, or roadways lead to them.

INFRASTRUCTURE ANALYSES

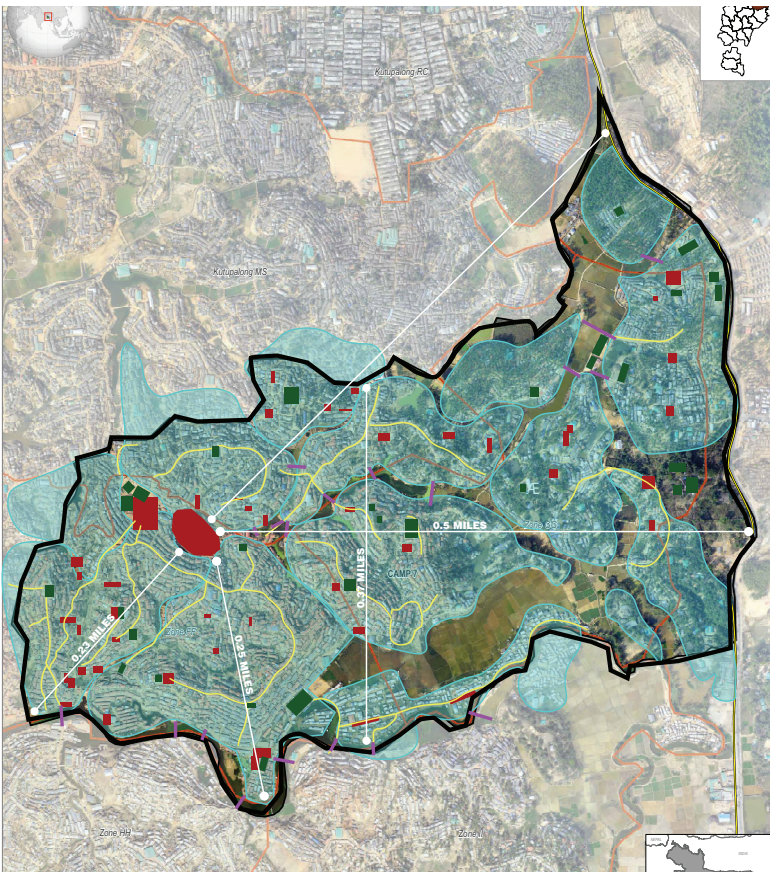


Figure 40. Camp 7 Infrastructure Analyses.

Distances between both ends of the district is long, especially considering that the measurement does not account for the winding of paths and topography of the site.

PROPOSALS

PROPOSALS

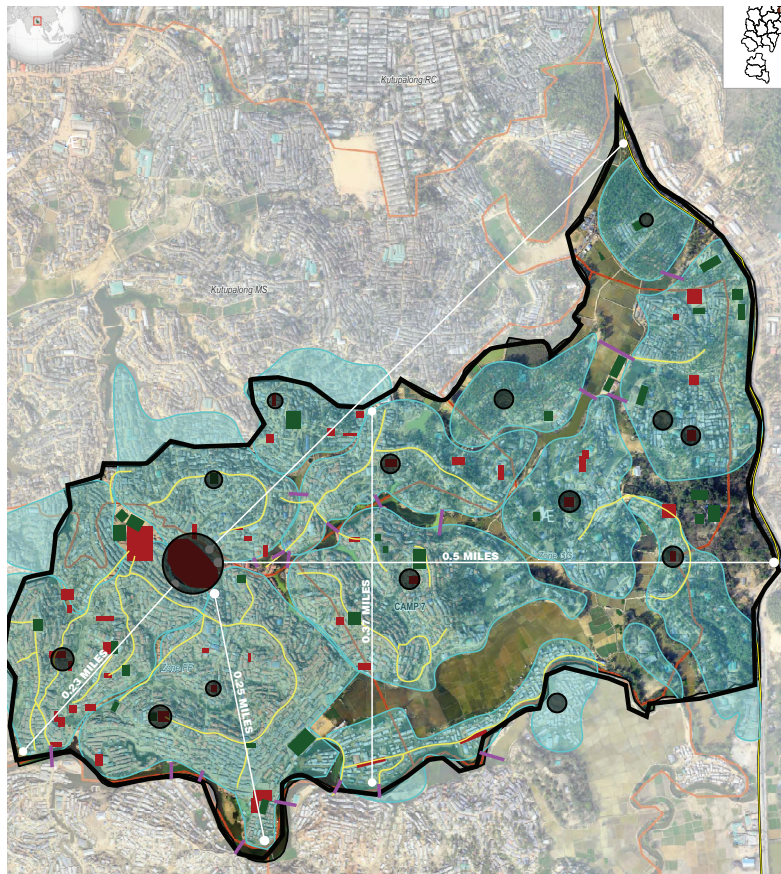


Figure 41. Camp 7 Proposals 1

This map illustrates the distances to the proposed connections. A connection is proposed in each district. At a minimum, these would be comprised of a community center and gathering space. Optimally, they would include spaces such as health facilities, education centers, aid offices, innovation and career centers, as well any addition resources needed.

PROPOSALS

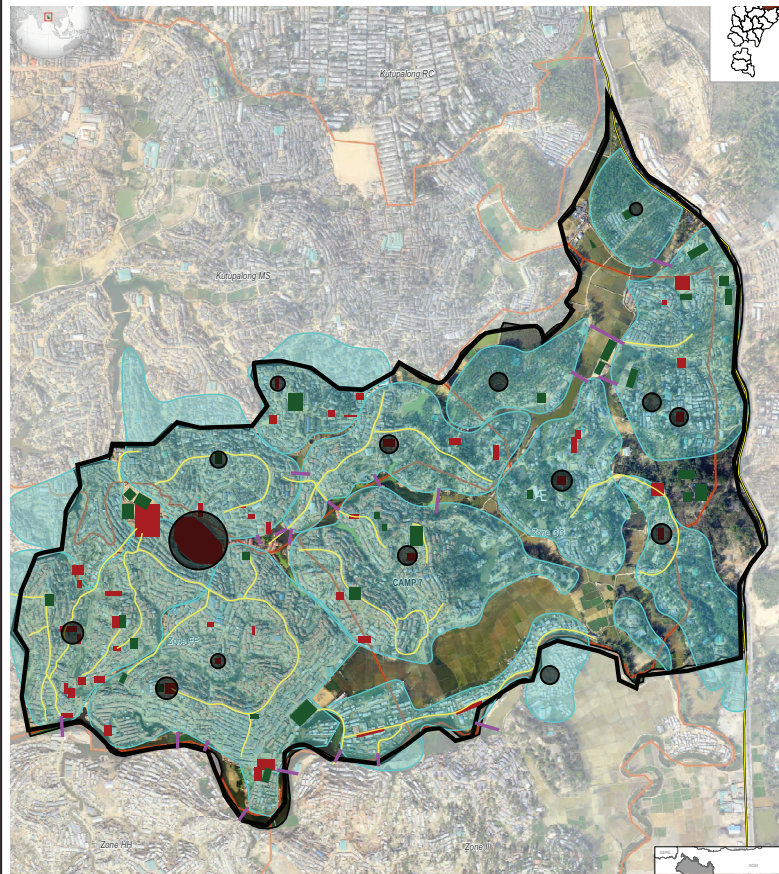


Figure 42. Camp 7 Proposals 2

This map shows the proximity of each center in relation to individual districts. In the western portion of the camp, a large uninhabited mound exists. This is a prime location for a community/innovation/education center. There is a decent amount of space on the mound, which does not appear often in Kutupalong. This mound also exists in the middle of the densest portion of the district on the western side. This has potential to be a main hub for this and surrounding districts. However, to take full advantage of the spot, facilities must build up, as there is not room to build outwards.

PROPOSALS

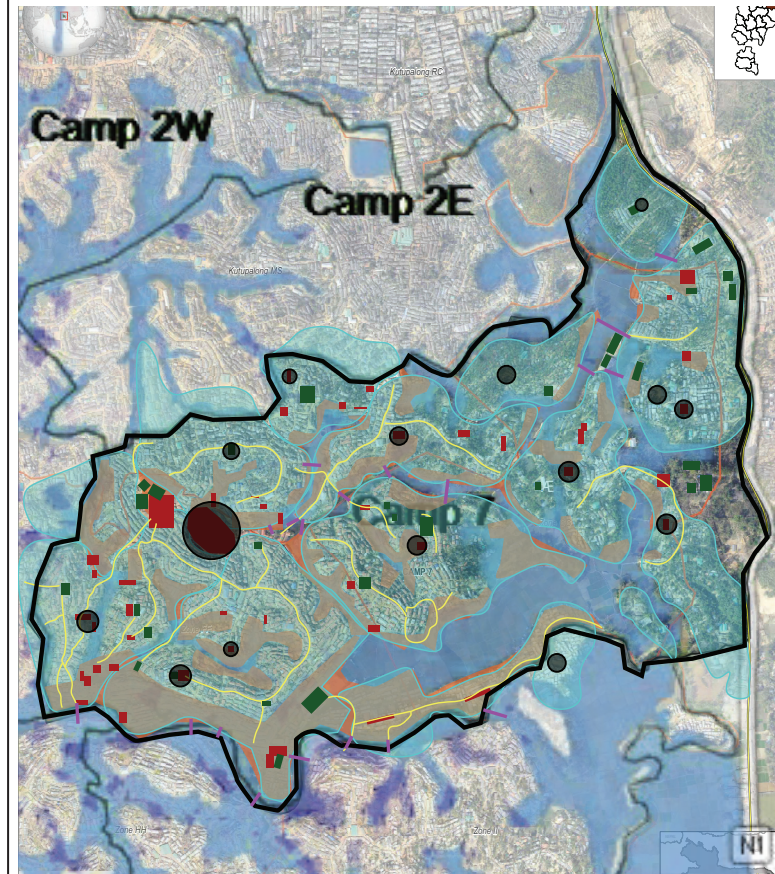


Figure 43. Camp 7 Proposals 3

The flooding that covers much of the bottom portion of the camp does not affect the main hub of the district. Connections were chosen so they would not be at risk of flooding.

The nature of camp seven lends difficult access to its different regions, particularly in the north eastern corner. The main connection was chosen because it is one of the few open spaces and because of the density of the region.

CAMP 7

CAMP 13

Camp thirteen was specifically chosen to analyze due to its large population, density, and distance from the original Kutupalong camp. Its population of 41,050 gives it the second largest population of all the camps in Kutupl. It is home to 9,618 families. Contrasting the reason camps 7 was chosen for its closeness and oldness as next to the original Kutupalong, camp thirteen was chosen because of its distance from the original camps. It was developed after the majority of the camp, but is extremely dense.

Thirteen has some great opportunities which are not present in seven. For example, there is much more open space and rooms for sustainable planning than in the established camp seven. The western portion of this district in particular is very open. There may be great chances for a social hub on this end of the camp.

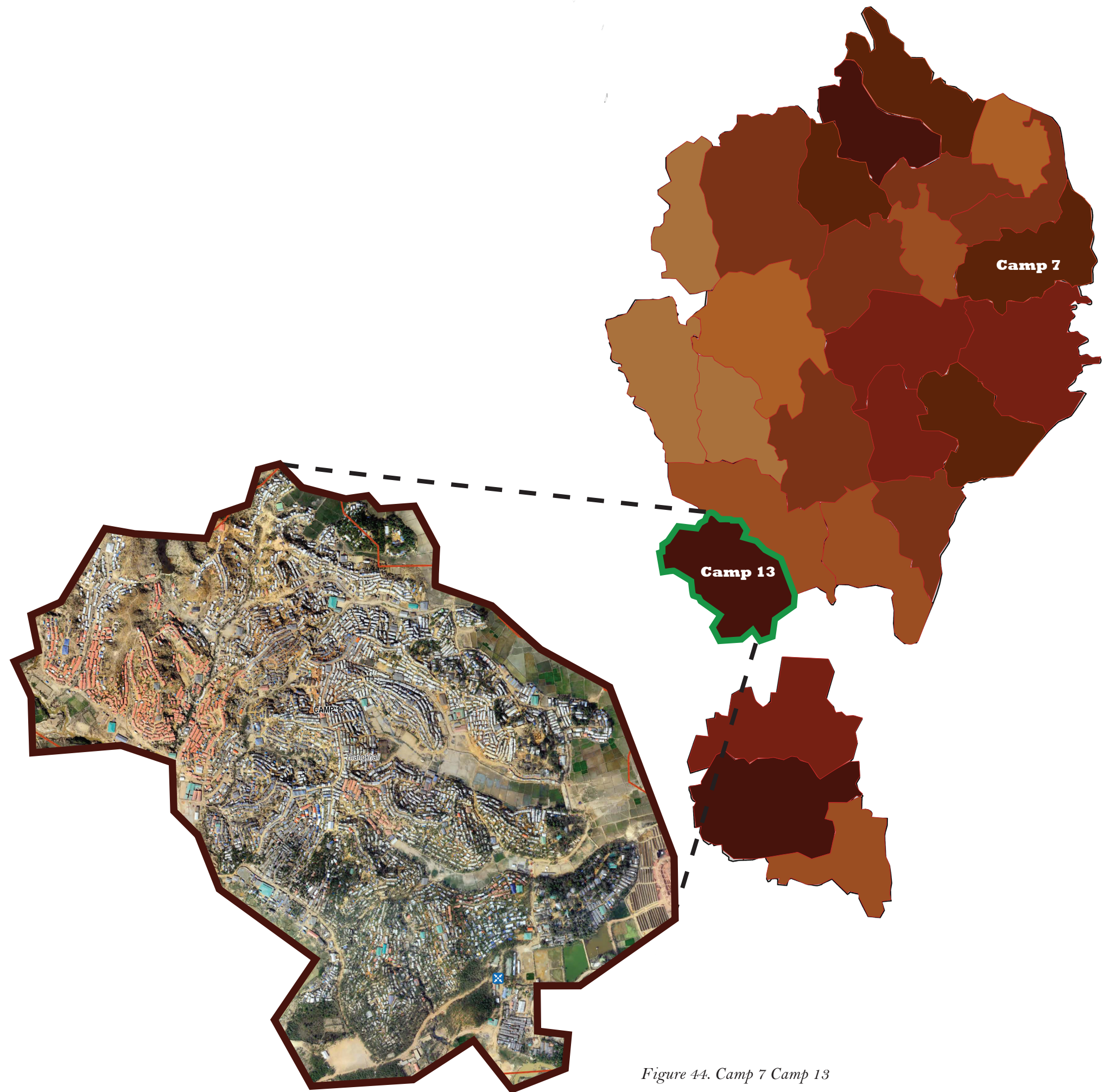


Figure 44. Camp 7 Camp 13

ANALYSES

BASE MAP



Figure 45. Camp 13 Base Map

Camp thirteen is one of the densest districts of Kutupalong. Looking at an aerial view, it is evident that the camp developed from an east to west configuration. The western side is not fully developed and has room open to develop a master plan and central hub.

FLOOD RISKS

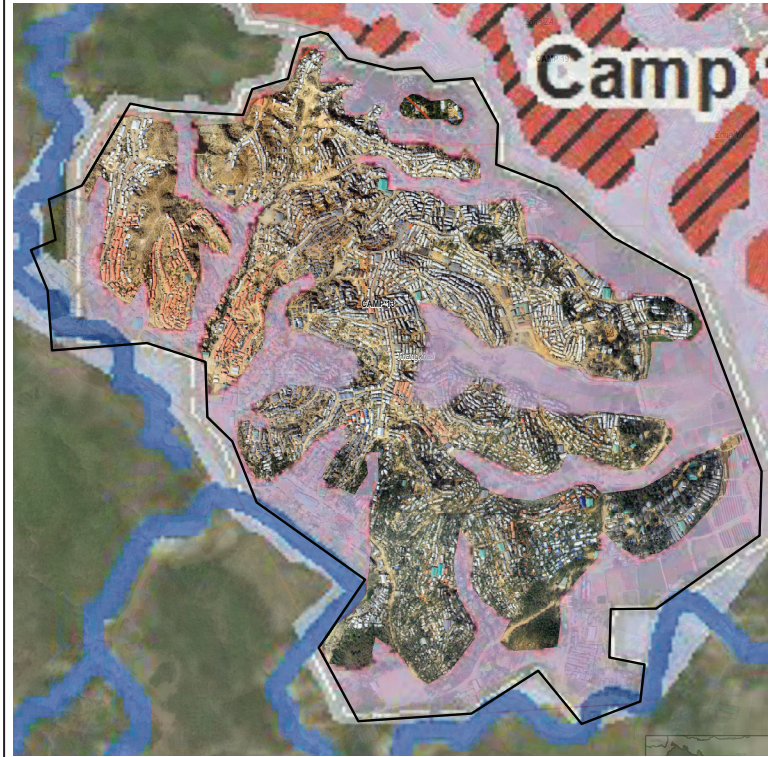


Figure 46. Camp 13 Flood Risks

Flooding in camp thirteen essentially creates one large island of the camp. The majority of the land masses are connected by land, but not all of them.

FLOODS & AREAS AT RISK

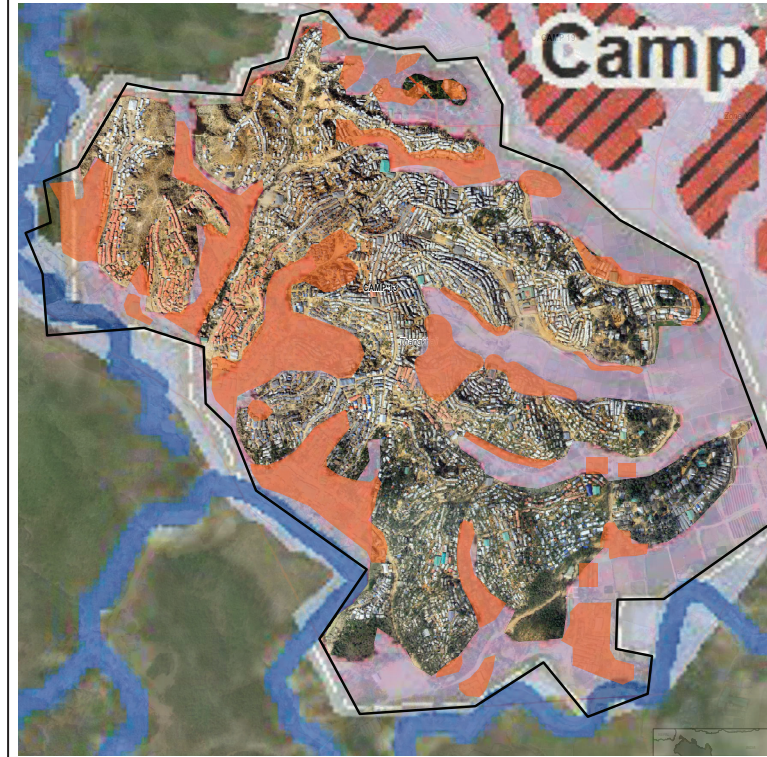


Figure 47. Camp 13 Floods & Areas at Risk

The orange portions represent the shelters and buildings which are at risk of flooding. These extend quite far into the center of the camp, creating a large island with many peninsulas.

AREAS AT RISK



Figure 48. Camp 13 Areas at Risk

There are significant numbers of shelters at risk. The camp has developed over the entirety of the site, including the lower portions which are prone to flooding and landslides.

CAMP 13

ANALYSES

DISTRICTS

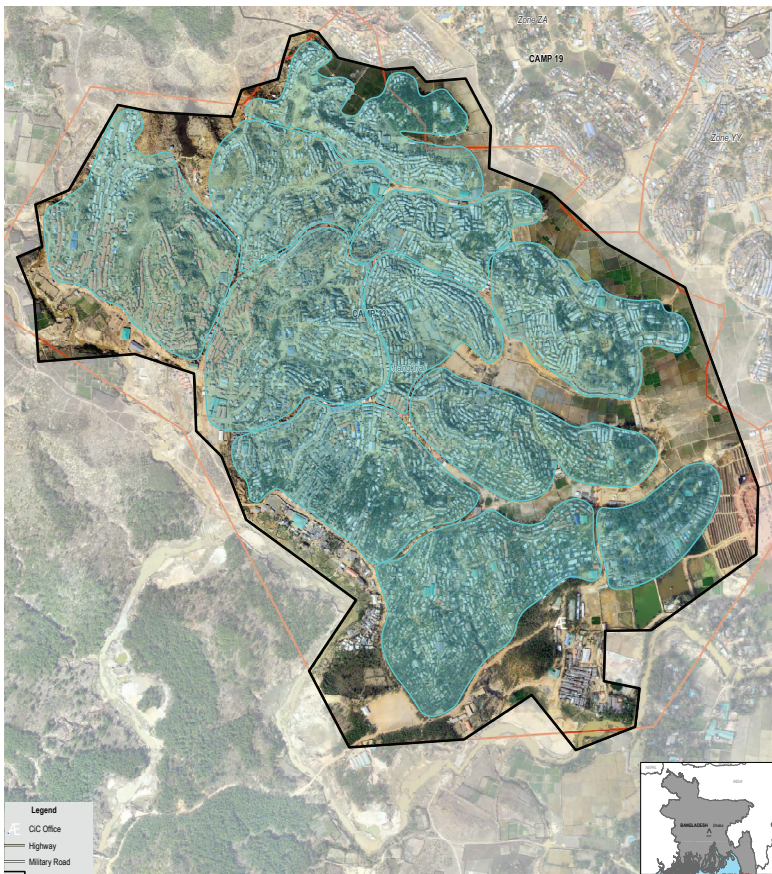


Figure 49. Camp 13 District

Districts in this camp are very irregular and tend to run in a long direction. This makes it more difficult to create a central location in the middle of the districts.

OPEN SPACES

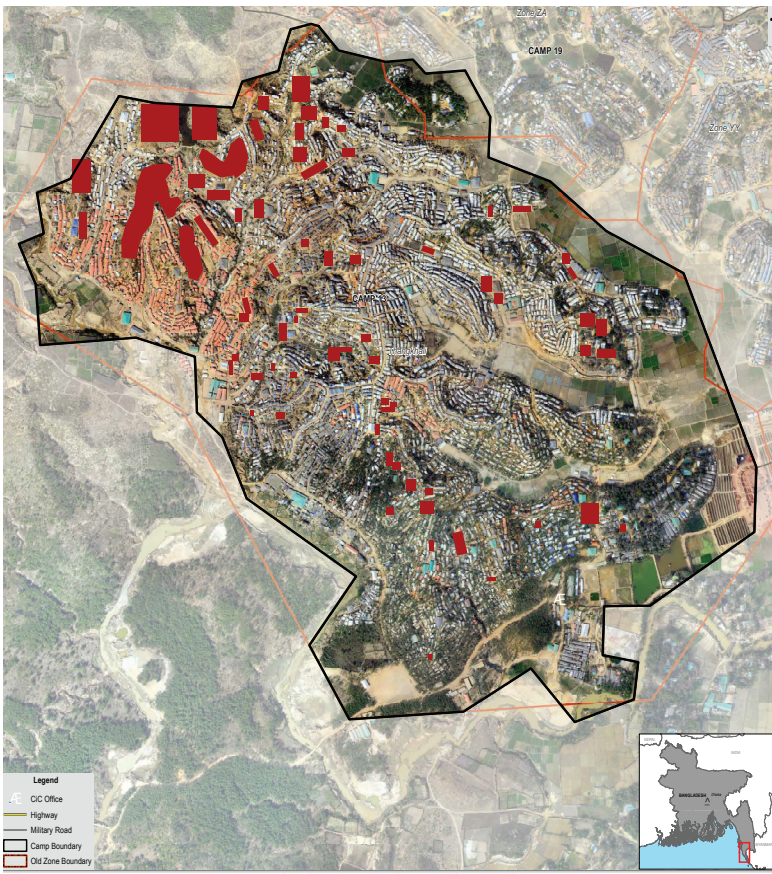


Figure 50. Camp 13 Open Spaces

There are many open spaces in comparison to camp seven. The western north west portion of the camp is particularly open, leaving adequate room to create a master plan.

ROADS. BRIDGES. FACILITIES.

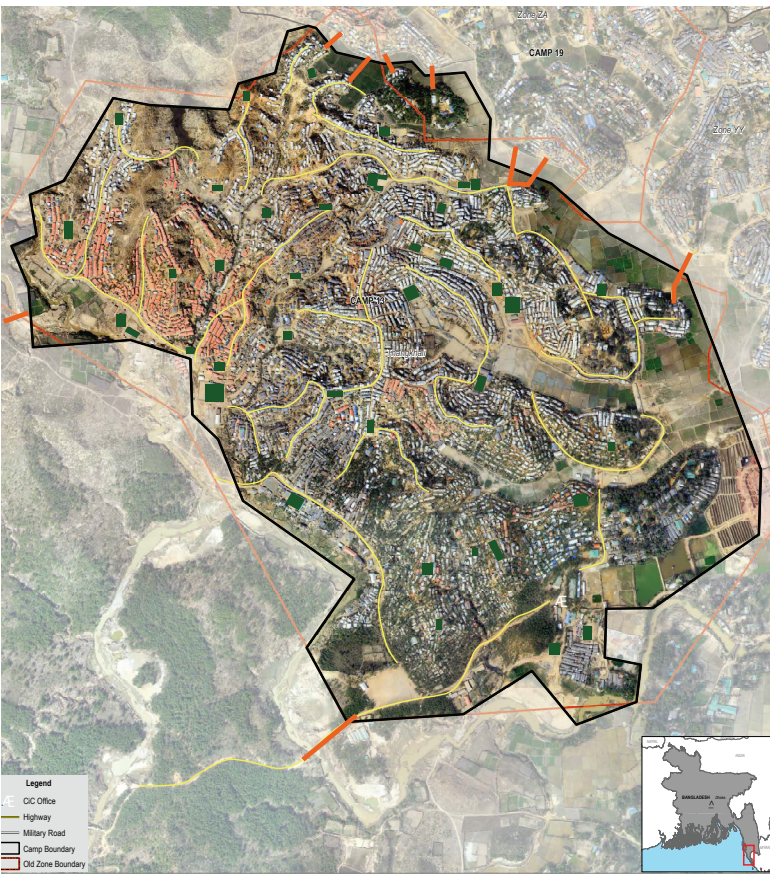


Figure 51. Camp 13 Roads. Bridges. Facilities

An adequate number of pedestrian pathways exist. Most of the existing facilities have paths that either lead to or terminate at them. Additional bridges and roads would be beneficial.

INFRASTRUCTURE & FLOODS



Figure 52. Camp 13 Infrastructure & Floods

Many of the existing facilities and roads reside in flood prone areas. For them to be effective year-round, they should either be moved, or reinforced.

PROPOSALS

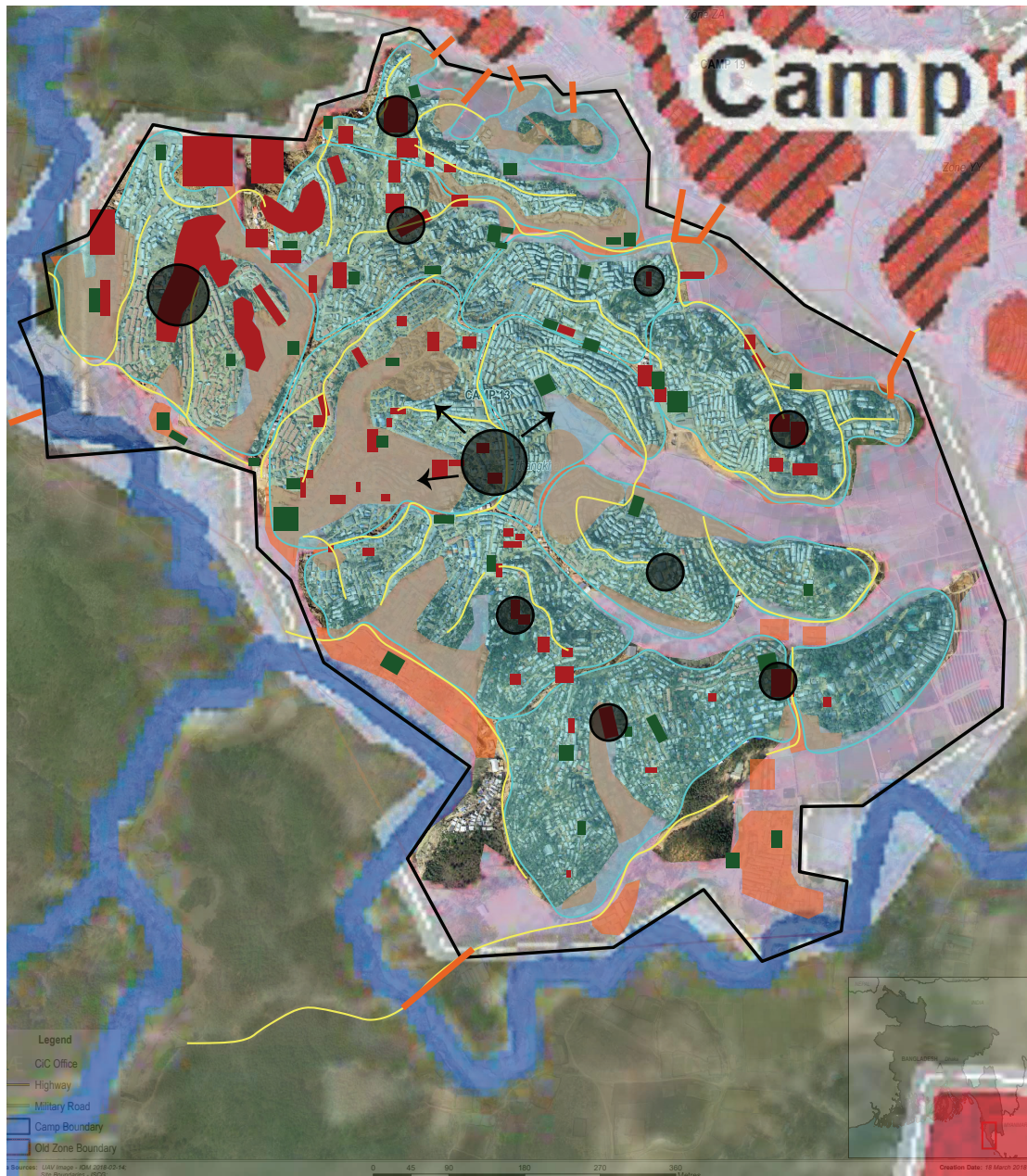


Figure 53. Camp 13 Proposal

Two major connections are proposed within the camp. The central one has the greatest reach to all regions of the camp. A central hum is to be proposed in the western portion of the camp where establishments have not yet fully developed.

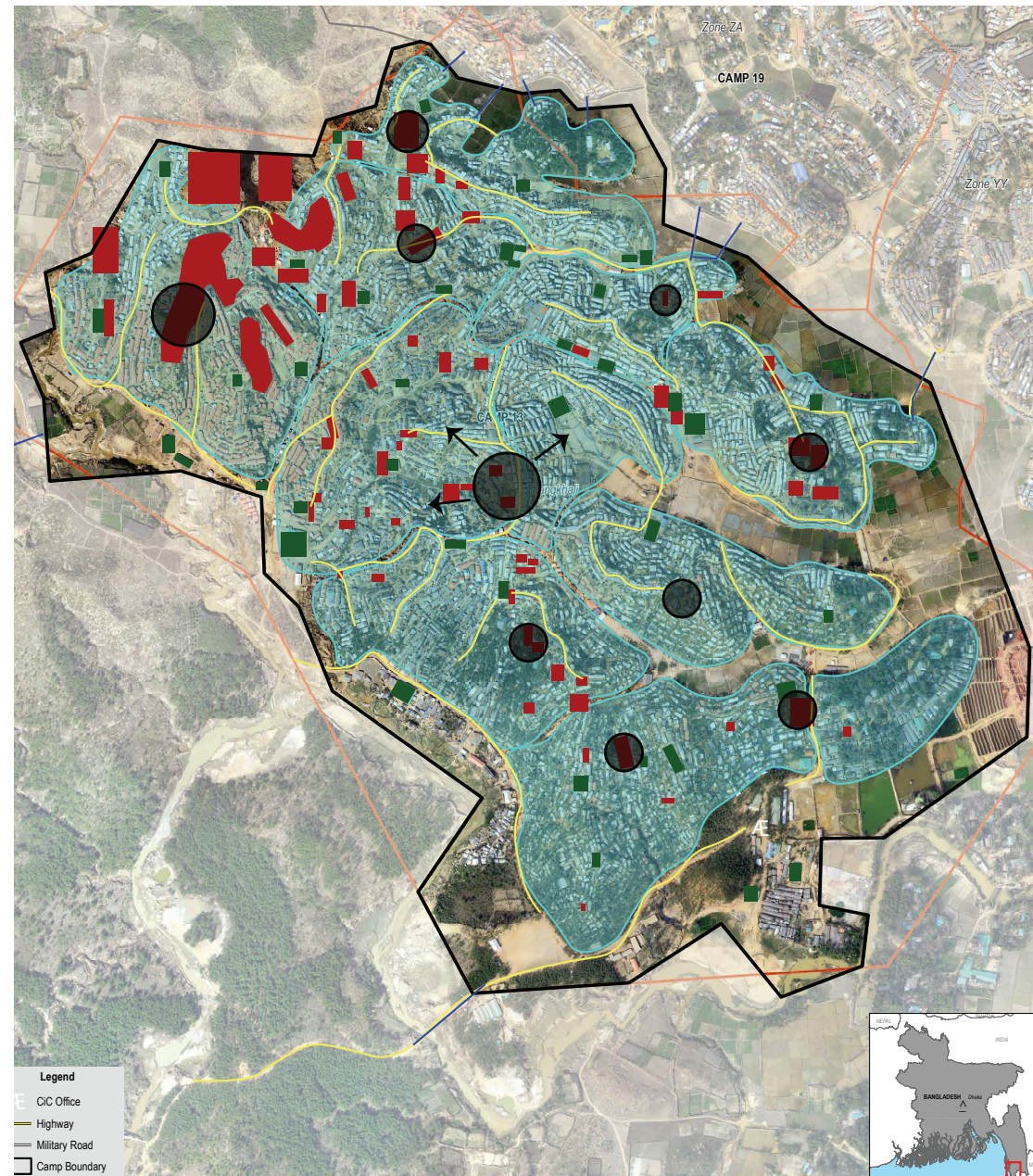


Figure 54. Camp 13 Proposal

Smaller connections are proposed in each of the districts to provide access for as many people as possible. Additional roadways would be beneficial.

CAMP 13

SYSTEMS PROPOSALS

RE-FORESTATION

The re-introduction of vegetation and local trees into the landscape of Kutupalong is of utmost priority. By providing trees to residents, they can plant them next to their homes. In turn, this will provide greater stability for the soils, thereby shelters as well. Trees have the opportunity of producing fruits and vegetables, which would be a beneficial by-product. Also, if residents can be educated on the propagation process of the trees they are given, they can produce more, especially considering Bangladesh's ideal climatic and growing conditions.

AQUAPONICS

The introduction of aquaponics will be utilized in Kutupalong as well. Given the heavy rain conditions of the area, it provides a great opportunity for water re-use. If rains can be collected and used for aquaponics, this makes use of natural resources and would require less land use of already precious property. Land could instead be dedicated to more shelters, roads, social centers, or recreational space.

CENTRAL HUBS/CONNECTIONS

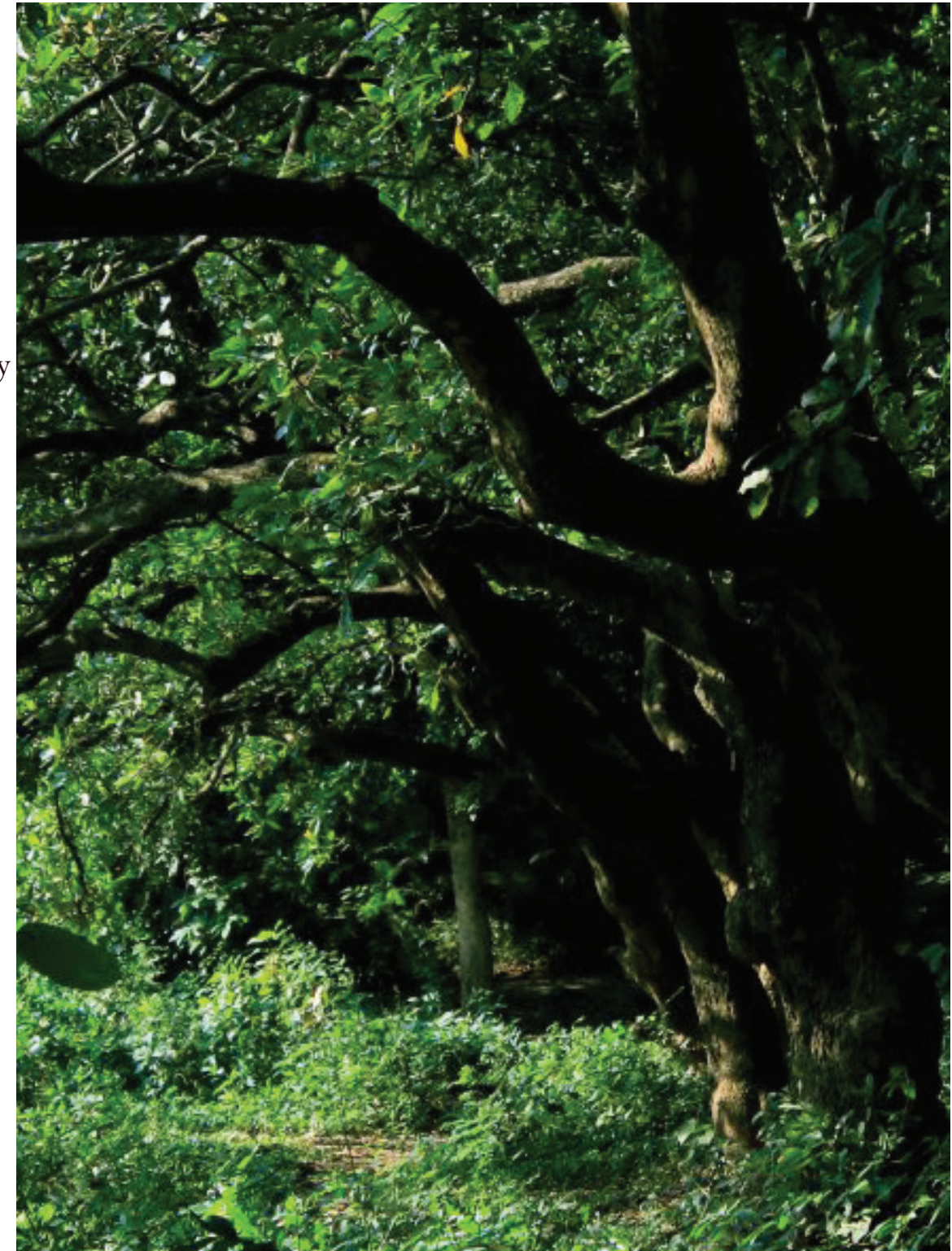
At least one central hub is proposed in each camp of Kutupalong. This way, there is a central point for each area which provides a community connection, marketplace, healthcare, and security center. This provides access for refugees, which is currently one of their greatest needs. Also, more roads, especially major military grade roads are presented.

BUILD UP INSTEAD OF OUT

The density of Kutupalong is one of its biggest and most pressing issues. Ways to alleviate this density other than a new location would be beneficial. One way is to condense structures by building up instead of out. This would include any future buildings being required to expand upwards. It could also provide incentive programs for consolidating current homes into multiple story shelters.

ALTERNATIVE RESOURCES

Alternative natural resources to firewood, such as solar powered lights would be very useful in Kutupalong. An alternative to cooking with wood would be beneficial as well. The goal is to deter refugees from the wood which has been exploited in the past year. Instead, implementing bamboo farms would be a viable option. Bamboo grows rapidly, so it can be cut and regrown continually. It will be used for shelters, community structures, and possibly a fuel source.



MATERIALS

Due to Bangladesh's hot humid climate, openness and ventilation are priorities for any building typology. Therefore, the use of wood, namely bamboo is proposed.

GENERAL CONCLUSIONS

After a thorough visual analyses of the previous two case studies some general principles which can and should be implemented in all refugee camps were concluded. They are as follows:

AUTONOMY

Refugees thrive and are given 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. 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, such as Zaatari refugee camp, which is in an unoccupied desert. However, when refugee habitats develop on valuable land, this can become a major issue. For example, the intensely packed Kutupalong refugee camp in Bangladesh has demolished precious forest land to make room for shelters and occupants.

EMPOWERING CITY MODEL

Refugee camps are currently centered around immediate humanitarian aid, therefore bypassing the vital need of development. Camps are based on the temporary, while cities are based on development and are established self-sustaining entities. 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.

PASSIVE AND ENVIRONMENTAL STRATEGIES

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.

ENVIRONMENTAL/TEMPORARY IMPACT

Implementing an architecture which promotes the development of refugees seemingly conflicts with the goal of leaving a temporary impact on the land. 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. However, they 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.

COLLECTIVE, PROACTIVE, AND INTEGRATED APPROACH

Many of the current flaws of the refugee phenomenon can be linked to the indifference, inexperience, and apathy of people, culture, and designers. A vast majority of the issues refugees face, from the denial of the ability to work to inadequate and poor housing conditions could have been easily addressed if they had been tackled and taken into account at the beginning of the crisis.

Therefore, it must be a collective approach, by a worldwide contribution of politicians, humanitarian workers, designers, and refugees themselves that will lead to the empowerment of refugees. The participation of only a select few countries has failed to provide adequate resources for refugees. Instead, every country must contribute what is possible and plausible of their resources. Also, the contribution of only one profession tackling the issue will not have an optimal result. Different viewpoints, opinions, and ideas must be shared. For example, to determine the best design configuration for a refugee habitat, an architect is needed to provide information on the best space utilization, materials choice, and passive design approaches. Humanitarian workers are needed to explain details on how spaces will be utilized. Politicians are needed to argue policies that may prevent the implementation of ideas. Refugees are needed to provide information on their greatest needs and how they will use spaces.

A proactive approach is almost always the best way to go about designing refugee habitats. If configurations were planned from the beginning, in such a way that utilizes refugee's greatest needs and cultural orientation, it would provide much easier maintenance of design, living, and space requirements. If refugees are included in this process, they provide invaluable information and insight for the design. Including them also provides a sense of purpose and empowerment. Having a general plan of implementation, space allocation, and access plans to design from creates an organized and orderly system of approach.

Since many refugee camps are already existing and cannot utilize this proactive approach, integrated incentive programs are vital. Divorcing architecture and design from the policies they operate under in refugee camps would be detrimental. Issues related to dignity and autonomy are hindered by the policies related to refugees. These include the lack of ability to legally work, lack of the ability to leave camps, lack of political power to make and take actions related to their lives, and a lack of resources. Therefore, if architecture within this context is to be effective, it must accommodate and challenge the policies that it operates within. For example, incentive programs can be introduced with architectural design ideas, or arguing for policy changes to come with a certain piece of architecture can be implemented.

CONCLUSION

Refugee camps are complex typologies with many factors to consider. These are physical, social, cultural, and political. Before empowerment through design can be implemented, a thorough analyses must be completed. General design ideas have been identified after an analysis of both the Zaatari and Kutupalong refugee camps. These include but are not limited to; giving refugees control over their lives and homes, using the city as a design model, utilizing passive strategies, and employing materials which will have temporary impacts.

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