Water as Agent:

Restoring Displaced Communities in Gulu, Uganda

by

Erica Jane Bright

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I hereby declare that I am the sole author of this thesis. This is a true copy of the thesis, including any required final revisions, as accepted by my examiners.

I understand that my thesis may be made electronically available to the public.

Abstract

Disasters due to war and conflict or natural forces are responsible for the 26 million people displaced across the world today. The crisis extends into the temporary, yet indefinite, displacement camps where people live in congested living arrangements, vulnerable to an increased risk of disease, death, and social violence (spousal abuse, rape). Even when chaos subsides, social and physical networks have frayed rendering the temporary displacement camp a permanent home for some. Often, despite this "permanence", access to adequate services and infrastructure and hence social and economic growth remains in a state of emergency.

This thesis proposes that water infrastructure is the key social catalyst for developing these displacement camps into permanent sustainable communities. An urban displacement camp in the town of Gulu, Northern Uganda, is the case study location for a speculative design intervention. During rebel activities from 1996 to 2004, the town of Gulu more than tripled in size, absorbing almost 100,000 displaced people forced to flee their land. These people settled in displacement camps next to, and within the wetlands that border the town on all sides. The urban metabolism of the town has become polluted as the displaced people use, alter and degrade the wetlands because they have no other alternatives. Following the instigation of a peace process in 2006, some people have begun the journey home. However, it is estimated that just over half of these people will continue to live in the squalid camps, without an opportunity to prosper.

A strategy is proposed for addressing and subsequently re-defining this urban metabolism. By synthesizing the existing urban fabric with strategies for harnessing the natural landscape, varying scales of water infrastructure are proposed. New opportunities for agricultural production is supported, while the spatial relationships created by the physical structuring of the water infrastructure renews the influence that water collection and distribution has in creating the social locus of a community.

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I would like to thank my supervisor, Lola Sheppard, for working alongside me on this project. Her dedication and input were invaluable. Thank you also to my committee members, Anne Bordeleau and Kathy Velikov, for their insight and for sharing my interest in humanitarian development. Thank you to my external reader, John van Nostrand, for his valuable critique and for encouraging me to continue improving upon this work. Thank you to my editor, Robert Moore, for patiently working through my iterations. Thank you to Byron Bright for listening and allowing me to share my ideas. And thank you to Agata Mancini for sharing this thesis experience with me!

Dedication

I would like to dedicate this thesis to Richard Otim and Janet Aipo for opening my eyes to the struggles they and their families have endured in Northern Uganda, and inspiring me to act in response; to the Hoyt family for being an amazing example to me while I was in Uganda; to Byron for first introducing me to East Africa; and to my family for supporting and encouraging me to travel and experience these places for myself.

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Introduction

Restoring Displaced Communities

Everyday, people are forced to flee their homes because of war, violence, or natural disasters. Sometimes without warning, and often without a sense of the destination, families take what they can carry and leave their homes behind. Consequently, relationships that people have established with their surroundings; relationships entrenched in their identity such as connections to the land, to vital networks such as water and to social networks, are completely severed.

Governments and international and local aid organizations respond to disaster emergencies as quickly as possible with relief aid: medical help, temporary housing, and food rations. Help is administered in congested camps that are formed for and often by the displaced. In the situation of displacement because of war, some displaced people must flee their country to refugee camps in a neighbouring state, while others find shelter in Internally Displaced Persons (IDP) camps within their own national boundary. Displacement due to conflict is an ongoing struggle with no clear end in sight. Depending on the size, congestion, and aid available, conditions in the camps degrade over time as stress is placed on what little physical and institutional structures exist. Already vulnerable, the displaced people's disconnection from their surroundings is further exaggerated under these circumstances.

When peace and stability are confirmed, relief aid terminates and development aid begins by addressing reconstruction and rehabilitation.[1] This can be a long process as capacities at all levels are assessed and major actors, funding and development ideas are gathered. The reality of displacement is that not everyone returns to the homes they left behind, once the conflict has ended. Conflict changes the circumstances surrounding people's lives, altering support systems and destroying assets. Some may start a new life

Figure 0.1 Congolese refugees

with relatives in a different area but for others, the displacement camp may become a permanent home.

Many displaced people are willing to accept the poor conditions of displacement camps as a "temporary" solution, but to live permanently under such circumstances is unacceptable and a threat to the quality of life. To address this crisis, a solution for permanent settlement must be addressed.

This thesis uses an urban displacement camp in the Northern Ugandan town of Gulu as a case study. To begin, analysis of current urban networks and landscape patterns at the national scale as well as the city scale, will identify water as an untapped resource in Gulu. Currently, water forms an integral part of an unregulated urban metabolism that is being exploited as IDPs lack sufficient resources and infrastructure. A complete analysis of the town of Gulu reveals the disparity of IDPs but also the potentials that lie in water infrastructure, housing, landscape, agriculture, and social and economic realms.

Bearing in mind the conditions of displacement and the looming permanency of the urban camp, an incremental design strategy is proposed to restore the Gulu IDP's connections to their surroundings: to the land, water systems and social networks. This design strategy will redefine the connections through the employment of water infrastructure. Water infrastructure, for both the delivery and harvesting of water, has the potential to alleviate the pressure on nearby natural water sources while acting as a social catalyst to generate a diversity of opportunity on the site of the camp. Equally as important, infrastructure has spatial qualities and dimensions that will serve to inform the new spatial relationships on the site. Essentially, in reference to Stan Allen's description of the agenda of infrastructure, the water infrastructure will work to "construct the site itself."[2]

A study of the design implementation will be carried out to assess the way in which the displacement camp should transition from its current state into this new community. In order to carry out this design intervention, a number of different actors from the "top-down" and the "bottom-up" will need to coordinate their efforts. Implementation begins with a survey of existing social units and their long-term goals in order to develop coher-

ent future block formations. Sensitivity is a priority of the implementation process, therefore an incremental approach is employed that will not displace families beyond the area they currently live in.

By harnessing the potentials of water as a resource on the site and a generator of a new social realm, the relationship of displaced people to their new permanent surroundings can drastically change and improve. This design intervention will act as a pilot project for informing the government and aid organizations on an alternative and integrated way of developing a displacement camp into a permanent prospering community. The hope is that the benefits will go beyond the visible physical re-ordering of the site, to positively engage the healing process as people rebuild their lives after conflict.

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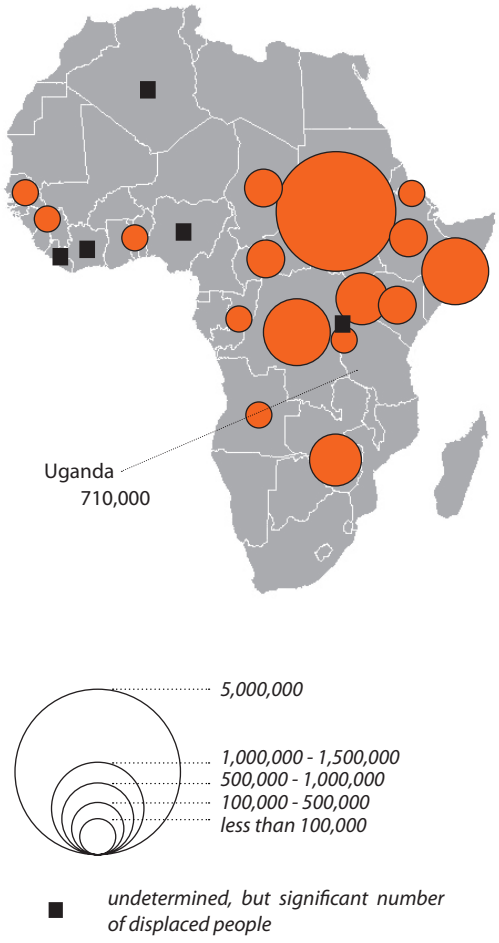

Figure 1.1 Number of Internally Displaced Persons in Africa at the end of 2008

Displacement

At the end of 2008, the global estimate of internally displaced people totalled 26 million.[1] Almost half - 11.6 million - of IDPs are in Africa, with nearly half of these people displaced in the Sudan.[2] While some world populations are subject to displacement due to natural disaster, most current displacement in Africa is due to ongoing conflict or failed peace negotiations.[3] In East Africa, the region directly south of the Sudan, rebel warfare and tribal struggles are common. Just over a decade ago, generational ethnic hatred incited genocide that ripped apart both Rwanda and Burundi. Last year in Kenya, the international community watched in surprise as tribal fighting erupted over election disputes, displacing and endangering people across the country. Currently, rebel groups terrorize the people of the Democratic Republic of Congo, forcing them to flee their homes.

Uganda, a landlocked country in East Africa, was considered by the Internal Displacement Monitoring Centre (IDMC) in 2005, to be "one of the world's worst internal displacement crises."[4] That year was the height of a crisis that began in 1988, when several rebel groups from Northern Uganda banded together as the Lord's Resistance Army (LRA) to fight against the newly elected government.[5] Led by President Yoweri Museveni, the new government put an end to two decades of dark political regimes, a period in Uganda's history that brought waves of violence and punishment to any hint of opposition.

When the British government granted Uganda its independence in 1962, it had hoped that its governing efforts would create a united nation. However, when they drew the lines of national boundary earlier in the century, they tied together many different tribes originating from two distinct language groups, under one Colonial rule. The Nile River, snaking its way through Uganda, divided the people from these two language groups into the North and South. Traditionally, people from the North and people from the South operated under very different and distinct so-

cial and political organizations. When the British arrived in the late 1880's, they formed a relationship with the people in the South who shared a similar monarchic structure of government. The Northern people were more dispersed and decentralized under small chiefdoms.[6] While people from the South took jobs in administration in the new Colonial Government, people in the North worked as unskilled labourers or joined the military.[7] Independence was viewed as an opportunity to even out the inequalities between the North and South. Consequently, instead of representing particular stances on governmental issues that affected the nation as a whole, future political leaders chose to represent the concerns of specific people groups, namely their own. As a result, each leader that followed Independence was ousted by the next and violence played out against the followers of the ousted leader.

Because of the Northern people's participation in the military during the previous regime, many feared and expected repercussions from Museveni's government. The Lord's Resistance Army (LRA), which is made up predominantly of members from the Northern Acholi tribe, formed in retaliation.[8] In 1996, after almost a decade of unsuccessfully fighting the government, the LRA's tactics took a surprising turn. Using the excuse that the people were acting against the LRA by supporting and informing the government, they began to torture, kill and maim their own people. To increase their numbers they abducted people of all ages, including children and youth, to act as soldiers, to carry supplies, or serve the commanders as 'wives.'[9]

In response to this crisis, the government began forcing people into Internally Displaced Persons (IDP) camps.[10] Others fled to the camps after their villages were attacked by the rebels. Attiak village, a community in Amuru District just west of Gulu District, was attacked by the LRA in 1995. The rebels massacred more than 250 students and parents at Attiak Technical School, causing them to seek refuge in an IDP camp. A man from the village by the name of Just Alengo recalls that "at first people were suspicious about the location of the camp proposed by the government... Then, we had no choice. Our people are hard workers - land was cleared, huts built - before long, 35,000 of us lived here".[11]

As they reached the camps, each family had a different story to tell of hiding in the bush from rebels, abducted children, homes burnt to the ground and loved ones killed. Traumatized and uncertain of their safety, the displaced Acholi people struggled to adjust to life in the camps.

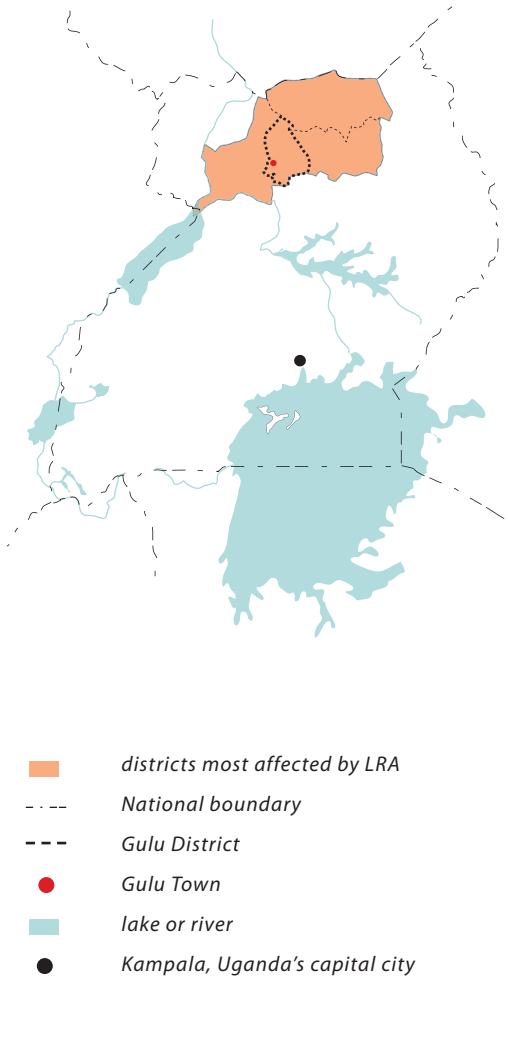

Figure 1.2 Ugandan districts most affected by the war

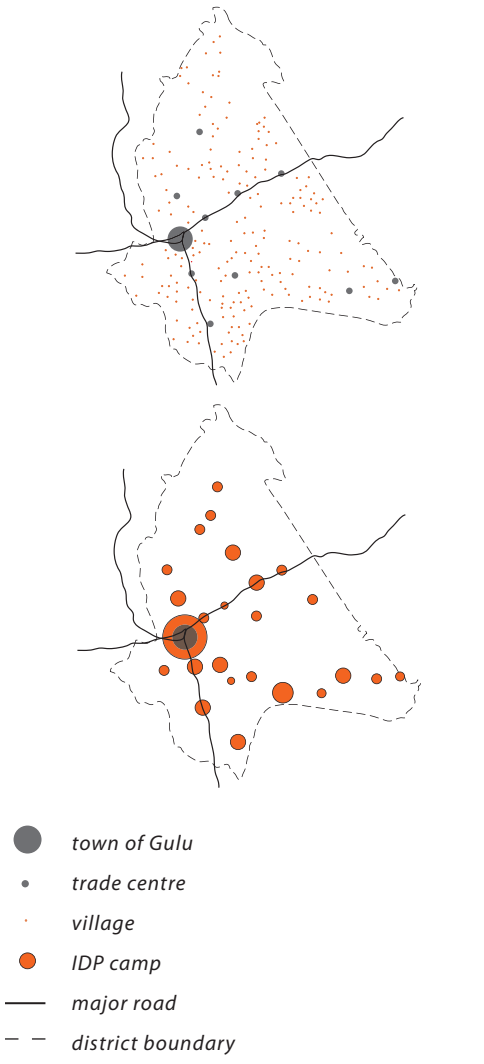

Figure 1.3 (top) Gulu District pattern of settlement in 1991: villages and small trade centres
Figure 1.4 (bottom) Gulu District pattern of settlement in 2002: trade centres become camps, villages destroyed

Gulu District: Displacement Camps

A study of Gulu District reveals the patterns of settlement from villages to displacement camps. Around 1991, while the war was still contained between the LRA and the government, Gulu District was characterized by small trade centres along primary and secondary highways, and villages scattered throughout the rural area. The town of Gulu, located in Gulu Municipality at the intersection of the country's major highways, supported the second largest urban centre in Uganda with a population of 38,297.[12] When civilians became targets in the mid 1990's, many of the small trade centres expanded to become IDP camps. By 2004, approximately 90 percent of the population in all of the Acholiland Districts were living in IDP camps.[13] The peak of displacement came the following year with a total of 1.8 million IDPs displaced across Northern Uganda.[14]

In this single decade, Gulu Town grew more than three times its size as camps formed in the urban centre and throughout Gulu Municipality. Almost overnight, the camps became larger than any of the existing towns (as the camps were typically located around these trade centres). One mega-camp, Pabbo IDP camp in the neighbouring Amuru District, grew to be even larger than Gulu in its pre-camp days, to a stifling population of 53,612.[15]

Displacement is a destructive force for the Acholi, as they are a people who define themselves by their connection to the land, both physically and spiritually, and by their community relationships. The camps not only physically removed them from their land, they challenged and ultimately changed a way of life that was ingrained in the identity of these people.

Stripped from the Land

> *In the Acholi imagination land is the fundamental asset, without which neither the individual nor the family can survive. This means that all one's social obligations and claims are connected to claims and rights about land. Land must be protected because it is material life, but also spiritual well-being. It is the essence of identity. ...Land is survival (i.e. the living), land is the future (i.e. the generations to follow) and land is the past (i.e. the dead). These elements must stay connected to each other if harmony and tranquility are to be preserved.*[16]

Ironically, it is often those people most intimate with the land, that are uprooted from it. The displacement camp has represented the end of a farming lifestyle for many displaced people in Northern Uganda. During displacement, only half of the displaced people in Gulu District were close enough in the camps to access their land for cultivation. However, traveling on the roads to their farms puts them at risk of being caught and abducted by the LRA, or being accused by government soldiers of collaborating with the rebels. In 2003, the World Food Programme indicated that 65% of the displaced people in Gulu District were depending on them to meet their minimum daily food needs.[17]

Before displacement, the Acholi tribe in Northern Uganda led an agrarian lifestyle. They used to raise livestock, as animals have both material and symbolic value. In the camps, "the fact that people have so little of them left, therefore contributes significantly both to their economic marginalization and their loss of identity."[18] As farmers, their relationship to the landscape played out over space and time. Working the land was the role of both men and women, and many extended families shared plots, farming duties, and the bounty of the harvest. Knowledge of the two seasons, the dry season and the rainy season, was passed down from generation to generation. The seasons played an important role in rural life over the course of the year. The rainy season, extending from April to November, occupied people with tilling, planting, harvesting, sorting, drying and preparing food for storage. In the dry season, people relied on carefully planned reserves to get through until the first harvest of the next rainy season. Displacement camps put an end to this social organization closely linked to land and water.

The relationship that people now have to the land in the camps is fragmented and unhealthy. Congestion is a key problem as environmental issues take a backseat to the more pressing issues of safety and security. Unfortunately however, the environmental context of the camp is intricately tied to the health and well-being of the displaced people.

Sanitation is provided in the form of communal pit latrines, an outhouse style toilet that is commonly used in both rural and urban areas. Health and cleanliness issues increase with the number of people using each latrine. The recommended number of displaced persons per latrine in an IDP camp is 20, but in Northern Uganda's camps there are often 100 or more people sharing one latrine.[19] The World Health Organization conducted a water quality study from 2007 to 2008 in

Figure 1.5 (top) Aerial view of congested IDP camp
Figure 1.6 (bottom) Danger of fire spreading from hut to hut is high because of congestion

Figure 1.7 (top) Flooding in an IDP camp during the rainy season
Figure 1.8 (bottom) Dilapidated latrine building in IDP camp

Gulu District, and found that just over half of the shallow wells and protected springs tested in and around the camps, contained fecal coliform bacteria. This contamination is "caused by latrines dug close to water sources, poor drainage, and ditches carved by animals, such as pigs, with dirty still water."[20] However, many families don't have any choice but to collect water from these sources.

Social Erosion in the Camps

Life in displacement camps is devastating for families. For the family unit, this is a time where "confusion and vulnerability prevail, with familiar spaces, structures, systems and relationships being undermined or even completely destroyed."[21] Traditional roles played by family members change and weaken, especially the male role. Women have always played the largest part in the domestic life, taking care of needs that still exist in the camps. Men, however, used to take on more demanding physical roles and as financial providers for their families. Without land to farm, adequate space or opportunities for economic activities within the camps, men have been unsuccessful "in redefining their masculinity in the context of camp life."[22]

A destructive cycle emerges where women have resorted to brewing beer in order to make money to support their families because the husbands are missing or without work. Men who can't find means of making an income resort to idleness and may be found intoxicated or spending time at the bar drinking the beer that the women are brewing. Unfortunately, intoxication is responsible for raising the levels of thefts, fights, rape and domestic violence in the camps.[23] The bars in the camps also encourage a lifestyle of prostitution that entices women and young teenage girls looking to make any money that they can. Young women and girls are also at risk of early marriages. In Uganda, the bride's family collects a dowry - payment of money, items, or livestock - from the groom's family. In desperation, girls are being married off at increasingly younger ages, preventing them from continuing their schooling.

The moral degradation of society is a result of the destruction of traditional Acholi social organization. Pre-displacement, people organized themselves in villages; groupings of extended families. They were often people of the same clan and recognized the same ritual chief and local leaders who made decisions for the clan and acted as a symbolic judge. The camps have a zoning struc-

ture of governance that is different from the previous village and parish (a collection of villages) structure. Because of this structure, people from the same village and parish may not be living nearby to each other, but in different zones across the camp. This means that a confusing mix of two camp governance structures exist. This makes it "more difficult to maintain the moral order of the clan. Peer pressure is reduced as members of the same clan and chiefdom no longer necessarily live together.[24]

Displacement has resulted in the destruction of the social fabric of Acholi society. The displacement camps have fostered poor living conditions resulting in disease, the breakdown of family structure and the breakdown of social organization. While intended as a measure of protection, the camps have effectively stripped the Acholi people of their identity, by removing them from their land and severing community relationships.

Figure 1.9 (top) Fire in the camp: fire rips through the thatch roofs, traveling easily from hut to hut because of the close proximity
Figure 1.10 (bottom) Rural village: In comparison, a rural village has living space defined by each family

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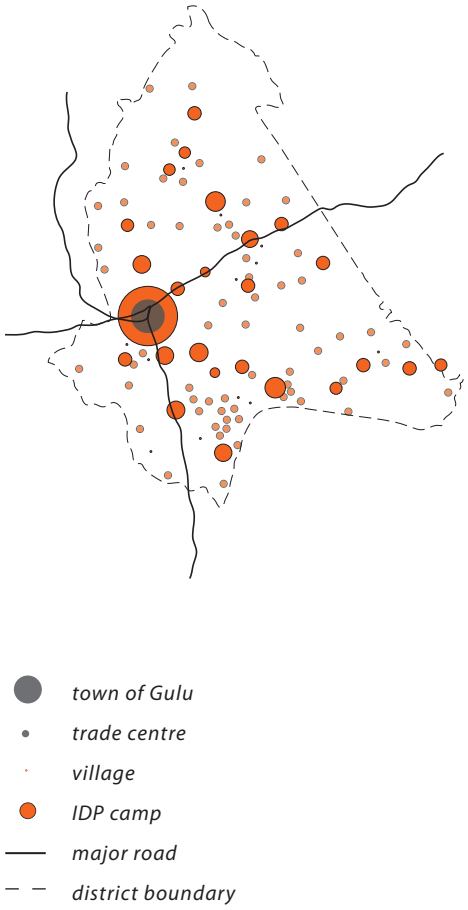


Figure 2.1 Gulu District pattern of settlement in 2006: displaced people are returning to villages of origin

Gulu Town: Permanent Displacement

As of mid-2006, Northern Uganda has reached a relatively peaceful state. Enough progress has been made in the peace agreements between the government and the LRA, that around half of the 1.8 million displaced people have begun the journey home.[1] To facilitate this transition, re-settlement sites, or 'transit' sites, have been constructed. A transit site is a less congested IDP camp that is located closer to a displaced family's old village so that they can access their farmland.

For those displaced to the town of Gulu, however, the displacement camps may cease to be a temporary measure and will become a permanent home. It is estimated that 60% of the people in Gulu's urban camps will remain.[2] Some people have found decent jobs and better schools for their children, prompting them to stay. Others are forced to stay because their severed connections to land and community in the village are impossible to repair. Essentially, the town of Gulu "could become the principal refuge for those Acholi unable or unwilling for various reasons to return home, a kind of free city for an anomic, frustrated, and economically and socially desperate population."[3]

To begin, there are several groups of women who may continue to make Gulu their home. Town life has given women an opportunity to form groups and discover economic opportunities that they didn't have in the village. These new social interactions have challenged the male authority, and empowered women as individuals. However, the traditional village mentality is that men have ownership of women. Women who have the resources may choose to stay in the town, instead of giving up their rights and power to men in the village. Other woman, such as widows and single women with children born out of wedlock, may try to return home, but find they can not regain ownership of their family's land.[4] Also, women whose husbands were abducted to fight with the rebels, and may or may not have returned, could face stigmatization in the village and be forced to stay settled in the town.

As well, ex-LRA rebels will also find it very difficult to assert ownership of their land, and merge back into their old village communities. In fact, "some ex-LRA reported already having been dispossessed of their land by other members of the community, sometimes with the collusion of clan authorities."[5] Those who do return to the villages expect poor treatment and revenge attacks. Unfortunately, people who served time with the LRA, were forced to commit acts of violence, sometimes targeting their own communities. This complicates the reconciliation process and many ex-rebels are excluded and marginalized by their communities. The town provides a level of anonymity to these people and the protection and refuge they need.

The town life also appeals to the Acholi youth, who are often adverse to returning to the rural village. The hard labour involved in working the land has been absent from their upbringing, as many have spent years growing up in the confinement of the camps. They may also feel isolated in their rural location from the friends they spent time with in the camps. For these reasons, the youth tend to lean towards a new life in the towns. This puts a strain on parents and grandparents who need the help of the youth to get shelter built and land cleared back in their home village. It also puts youth at risk for banding together with other vulnerable youth, such as youth previously abducted by the rebels.[6]

A concentration of these vulnerable groups - marginalized women, ex-LRA rebels, and youth - within post-conflict Gulu could de-stabilize the town. The factors that have stabilized the town during the conflict are now changing. For example, during the conflict, if people couldn't make economic ends meet in the town, they could return to one of the rural camps. Now these rural camps are closing, and if people are rejected in the villages but also unable to make a living in the city, they will become desperate. The economic health of the town has largely depended on the NGO economy. Now, the humanitarian economy is shifting from relief aid to development aid, and as a result, some NGOs are leaving. Even though a significant number will stay, other economic opportunities need to be explored in order to create a sustainable economy for the displaced people. In addition, as the urban displacement camps become permanent homes, people will cease to accept the squalid 'temporary' conditions as adequate permanent arrangements. Where they haven't before, the permanently displaced will begin to demand fair treatment in the workplace and decent living conditions. In addition, due to the end of the conflict, a reduced military presence will not be available to suppress outbursts of crime and violence perpetrated by a frustrated

Figure 2.2 (top) Child-headed households are more at risk and struggle to regain ownership of family land in the village
Figure 2.3 (bottom) Marginalised women: These women were abducted by the rebels who fathered their children, they face the struggles of integrating back into society

Figure 2.4 (top) Ex- LRA rebels who find it hard to integrate back into society may join the Ugandan army, or even try and return to the rebels
Figure 2.5 (bottom) Gulu's NGO economy is not a sustainable long-term option for supporting the number of displaced people who will stay permanently in the city

population.[7]

A result of permanent disconnection from land and community, these people represent a vulnerable population within the town of Gulu, living in tension under current conditions. In fact, there is a significant risk that "these tensions could explode into open urban conflict or could lead the displaced population to provoke significant instability in Acholiland."[8] Even as conditions in Northern Uganda stabilize because of peace, this potentially volatile situation in Gulu town can not be overlooked. It is imperative that solutions are addressed in order to prevent future conflict in the town itself, alleviate the poverty of the displaced people, and provide sustainable social and economic opportunities. The government and aid organizations must work together to establish an approach for permanently settling and integrating the displaced people within the town.

Humanitarian Design: Approaches to Development

Humanitarian Design is a term that covers a broad range of scales and conditions. From housing that is either emergency, transitional or permanent, to improved infrastructures, sanitation, or services, the term refers to a provision for those in need. There are several relevant examples that give insight into the permanent settlement of communities, like the urban camps in Gulu. The examples are broken down into three categories: new settlements for displaced people, development of or within informal settlements, and reconstructing post-disaster settlements.

Building a new settlement for people displaced requires a degree of sensitivity as an already existing community, with existing socio-economic patterns, is being shifted to an entirely new site. Hassan Fathy, an Egyptian architect, was hired to resettle a village in the 1940's. Charged with this task, he gave an eloquent summary of the predicament of resettling displaced people:

> *All these people, related in a complex web of blood and marriage ties, with their habits and prejudices, their friendships and their feuds—a delicately balanced social organism intimately integrated with the topography, with the very bricks and timber of the village—this whole society had, as it were, to be dismantled and put together again in another setting.*[9]

In order to address this complexity, Fathy attempted to incorporate as much traditional construc-

tion as he could. He tried to restore the community's building traditions through the incorporation of local forms such as the pigeon towers. He took other components, such as the place where the water jar is kept and modified them to incorporate passive cooling strategies.[10] Throughout the process of re-locating the community, Fathy thoroughly considered the role of the architect in the process and prioritized his sensitivity towards the community and desire for their involvement in creating the new village.

Charles Correa is a renowned architect and planner from India who has done extensive work on low-income housing and development projects in developing countries. In 1985, Correa developed a plan for a new town of 100,000 people. The town would be the new settlement for part of an existing town just 10 kilometres away. The people to be displaced were living in an area that would be submerged by the river, after dams were constructed to raise the water level. Correa's team conducted studies of the street patterns and social networks, housing typologies and construction materials of the old town before arriving at a flexible and organic street pattern. This spatial organization was a plan that replicated traditional Indian towns that had grown naturally over time.[11]

In the past, development in informal settlements has also been dealt with by displacing the entire community to a new site. This tactic is called the "clean-slate" approach. Also referred to as slum-clearance, this approach involves destroying a camp or slum area by removing all existing housing in one go, and re-locating residents to a new housing initiative.[12] This traumatic experience destroys all existing social fabric and networks. Unless planned with the care and sensitivity like Correa's and Fathy's designs, the resulting settlement could resemble an unsuccessful low-income housing initiative: poorly integrated buildings, lacking a relationship to communal spaces as well as the rest of the city. Often developing countries who have employed slum clearance have not been able to keep up with the demand for new housing, and informal settlements appear elsewhere.[13]

Contrary to slum-clearance, the current approach for developing informal settlements is slum "upgrading". Instead of shifting an existing community to a new site where everything from housing to infrastructure is needed, slum upgrading makes changes to the current conditions without displacing the people. Slum upgrading acknowledges the intimate role that the residents have

Figure 2.6 (top) The existing town of Bagalkot in Karnataka, India. The street patterns and social networks informed the design of the new town
Figure 2.7 (bottom) A Bazaar street pattern in New Bagalkot, designed by Charles Correa

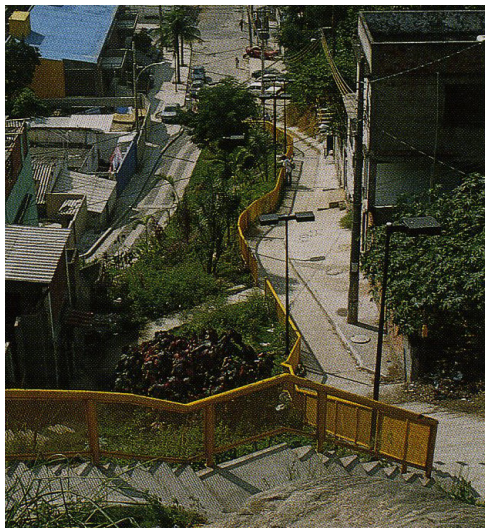


Figure 2.8 (top) The Favela-Bairro Project in Rio de Janiero improved public infrastructure such as this pathway that connects the informal settlement to surrounding city
Figure 2.9 (bottom) Preventing destruction: instructed by Shelter for Life, this man installs wooden beams in his home to make it more earthquake resistant

played in creating the home in which they live. Each resident is "a developer, designer, builder and occupant," therefore "the houses are idiosyncratic, reflecting a unique combination of factors: the typically irregular shape of the plot, the stage of growth of the structure, the building materials, and the decorations."[14] With this incredible involvement and understanding of their own context in mind, upgrading can involve the participation of community residents and create solutions that can be replicated by residents themselves, such as Urban Think Tanks implementation of dry toilets. After identifying the infrastructural grid to be a problem in the barrios of Caracas, the dry toilet was developed as a solution that would reduce barrio residents' need for failing municipal water and sewage systems.[15]

The well-known Favela-Bairro Project is another example of designers working directly with shantytown residents in Rio de Janiero, to develop a plan for meeting the needs of specific communities. Led by architect Jorge Mario Jauregui, the Favela-Bairro Project , or slum-to-neighbourhood project, improves slum communities through the construction of community buildings such as communal laundry, places of recreation, improved road infrastructure and improved connections to the surrounding existing city. Although the approach and strategies are similar in each favela, the resulting interventions vary, as "the solutions developed by Jauregui and his team are specific to each community's needs, the demands of its geography, and the wishes of its residents."[16] As well, integrating new infrastructure with improved systems and services is a priority, for example garbage disposal is addressed through improved access roads, drop-off points and visible signs to inform and encourage use.[17] If families are displaced through the phase of an intervention, they are given compensation or offered new housing that is integrated into the existing community and linked to the new infrastructure and facilities.[18]

The third category, reconstructing settlements destroyed by war or natural disaster, involves an existing community of people (albeit altered by the realities of disaster) rebuilding on the same site. The site has varying degrees of infrastructures and physical structures destroyed or still in place. The priority in this type of situation is often the provision of permanent housing that transitions people from temporary emergency shelters. Depending on the nature of the site and disaster, people have the potential to clean debris from their properties and rebuild their own homes. This is an opportunity for designers to improve upon the design of the structures that were destroyed in the disaster. Especially in the case of an earthquake or hurricane, designers can evaluate

the structures and instruct communities in better ways of building that will prevent destruction resulting from a future disaster.

Development Workshop, a non-profit organization improving community capacities in developing countries since 1973, has been working on post-conflict reconstruction in Angola. Development Workshop identifies in its research that a major opportunity is often overlooked when reconstructing communities destroyed by war:

> *Reconstruction programmes rarely address the social dimensions of reconstruction: they usually focus on rebuilding physical infrastructure, often putting back what existed previously whether or not this is still relevant or desirable. Reconstruction programmes rarely look for new solutions, rarely experiment, and rarely evaluate. They rarely tackle institutional strengthening.*[19]

The important task, Development Workshop explains, is to resist "quick fix solutions", the tangible results that donors are looking for, and examine the roots of the crisis so that new solutions can be integrated into the reconstruction program.[20]

Perhaps the failure of the reconstruction programmes that Development Workshop is talking of, is a result of a disconnect between those at the "top", the government and potential donors, administering funds that will affect those at the "bottom", the displaced community. An open dialogue needs to be initiated among all levels, so that the project can reach its full potential. Successfully understanding the needs of the communities involved in the Favela-Bairro Project in Rio was achieved by establishing project managers. These project managers were experts at the grassroots level of infrastructure upgrading so that they could work with community members but also communicate with the government.[22]

Water as Agent

Each category and example discussed above develops or improves a settlement for an existing community either on a new site, or on the site it currently occupies. In the town of Gulu, Uganda, one of the displacement camps will serve as a case study for an incremental design strategy that permanently settles the displaced people. These people are displaced from many different rural

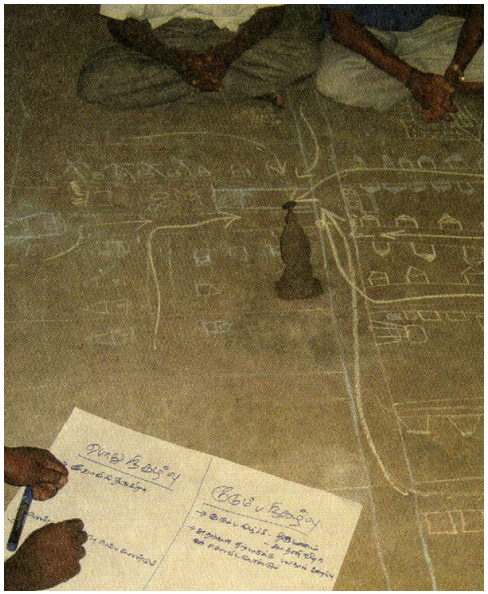


Figure 2.10 (top) A community design workshop for a community centre in India, is led by architect Purnima McCutcheon (seated at middle)
Figure 2.11 (bottom) McCutcheon helped the villagers create a diagram of their village so they could discuss the location of the future community centre

Figure 2.12 (top) A spring emerging from the hillside is a place of gathering for women charged with the daily task of water collection
Figure 2.13 (bottom) Especially during the rainy season, car washing is an important part of the transportation business. Here the wetland water is used for washing

communities, and they have established new social networks and relationships in the urban camp and the town. This thesis will develop an incremental strategy for permanent settlement on the site of this camp, without displacing the people yet again. With the fragility of the current social condition in mind, and the risk of conflict within the town, the design strategy needs to give these displaced people a way of re-connecting to the land and the community.

Most approaches and strategies for humanitarian design tend to revolve around housing design, issues of ownership and adequate infrastructure. While permanent housing and communal services are needed, infrastructure must come first to re-connect land and community and effectively integrate the settlement into different urban realms: social, economic, built, and landscape. Water infrastructure and water as a natural resource play a significant role in each of these realms. In the social realm, water plays an important role in the health of communities. Communities that have access to clean and secure water sources can lower their risk of spreading water-related diseases such as cholera. As well, water access locations are points of social interaction within a community; places of impromptu gathering and the sharing of information.

In the economic realm, water is linked to small-scale economies. For example, water irrigates small scale farming initiatives. Also, small catering businesses operating from rented stalls in the main market use water for cooking and cleaning. These businesses would supply lunch to people working in businesses around the market and in the downtown area. Small restaurants would have similar water requirements, while laundry businesses rely entirely on water. The water seller, or water vendor makes his/her living from selling water for domestic and commercial use. The price of water at a vendor is influenced by demand, as well as availability (e.g. costs may rise in a water shortage).

In the built realm, water infrastructure links each neighbourhood community to a larger network. This larger network of water supply involves not only the laying of water lines, but is related to a rational road network that needs to be adequately maintained in order to ensure proper maintenance access. Water infrastructure also involves networks of governance as management and input comes from a range of levels: from the central government, down to the local consumer.
In the landscape realm, water is present in the form of springs and wetlands, as well as surface runoff from rainstorms. The wetlands are part of a larger water network that connects and impacts

many who use it. People rely on wetland resources as a source of income, for example, papyrus reeds are collected and used to make mats and fences.

Water plays a role in all urban realms, and is an integral part of the urban metabolism. Water is the key to creating social networks and small scale economy, and it ties very local social structures to larger urban networks and landscape patterns. However, as the next chapter will confirm, water is an abundant, yet untapped resource in Uganda. Water infrastructure can harness this untapped water resource in order to make water the agent for creating new socio-economic opportunities for the displaced population in Gulu. The subsequent design strategy will offer a way of structuring relationships between water infrastructures and social and economic networks that will form the framework for a new Acholi society; a society that re-connects, integrates and improves the lives of those marginalized by displacement.

Figure 2.14 (top) Water plays an important role in small scale economies such as catering and small restaurant businesses
Figure 2.15 (bottom) Wetlands supply resources for income such as papyrus to make mats and fences for sale

03

Water's Irony

Having water is one thing, but having sufficient safe water for consumption is another thing.

Abia Papa, Tororo, Uganda[1]

Are we crazy to celebrate world water day when in Adjumani our wives always queue up overnight at the water points and we can't then even procreate?

Irama, Adjumani, Uganda[2]

Uganda has an abundance of natural water sources, but accessing the water as a potable source remains a challenge. This chapter reveals the greater context of the availability of water in the country.

The study of Uganda's geography reveals a national boundary beyond an arbitrary dotted line; mountain ranges, lakes and rivers provide its definition. Uganda is blessed with natural water sources. Lake Victoria is the second largest freshwater lake in the world, in surface area, and Uganda lays claim to half. Its highly indented edge creates inlets, bays and wetlands that extend into cities. The indentations are telling of the landscape above the surface of the water; a land of unique ridges and hills.

Uganda's Watersheds

There are five major country-wide watersheds in Uganda. As shown in the diagrams on the facing page, each watershed feeds a body of water that in turn supplies the Nile River as it flows from Uganda into the Sudan.

Maps of the watersheds reveal that cities that are built on the intersections of multiple watersheds, are the highest points in their surrounding landscapes.

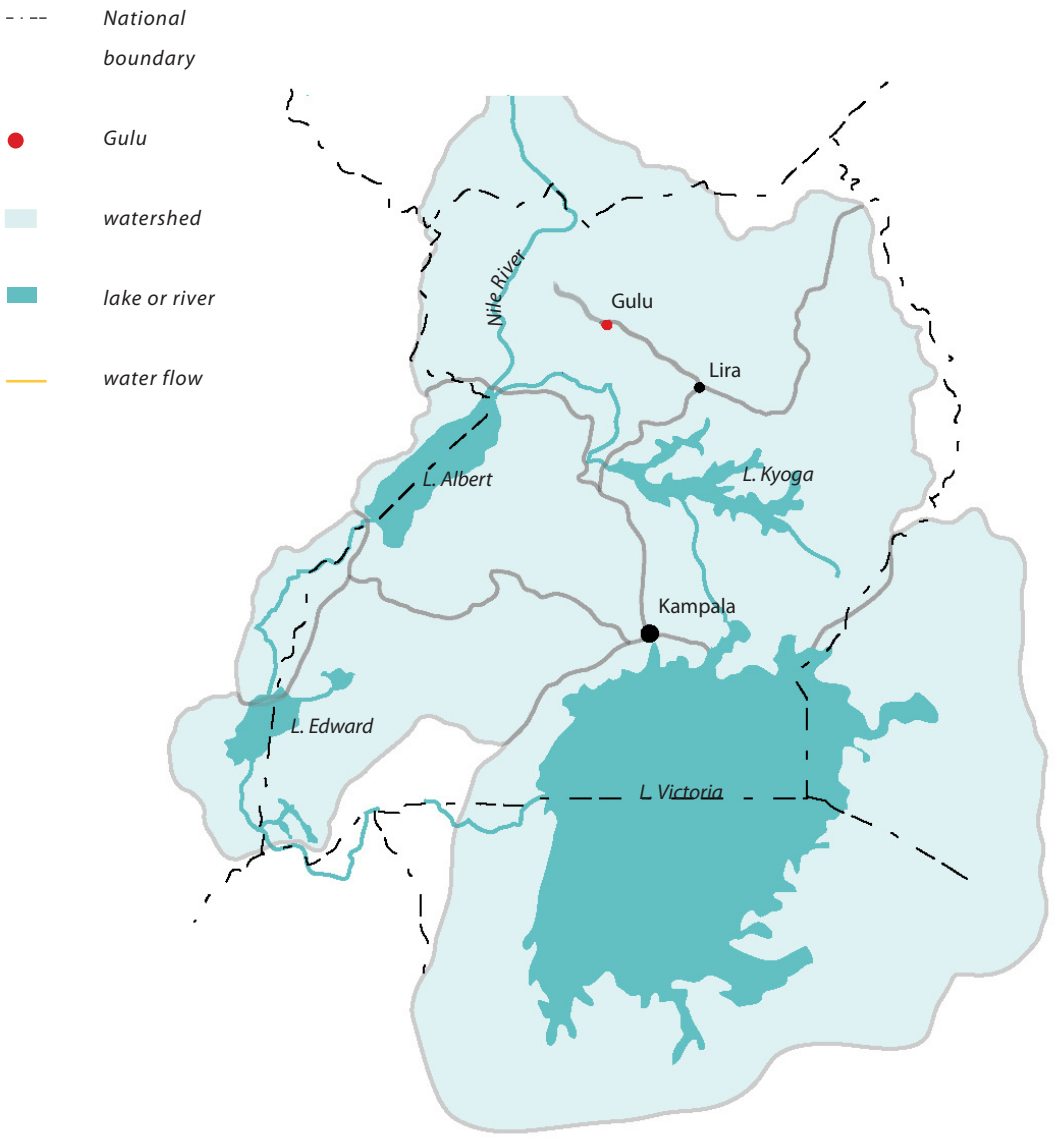


Figure 3.1 Uganda's watersheds

Figure 3.2 Watersheds for Lake Victoria and Lake Edward. Lake Victoria feeds the Victoria Nile River as it exits the north side of the lake

Figure 3.3 Watersheds for Lake Kyoga and Lake Albert. Lake Kyoga continues to feed the Victoria Nile River

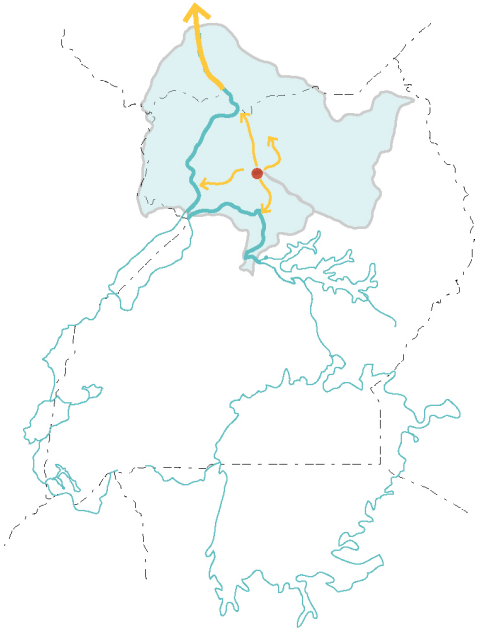


Figure 3.4 Watershed for the Nile River. The town of Gulu is in the catchment area for the River

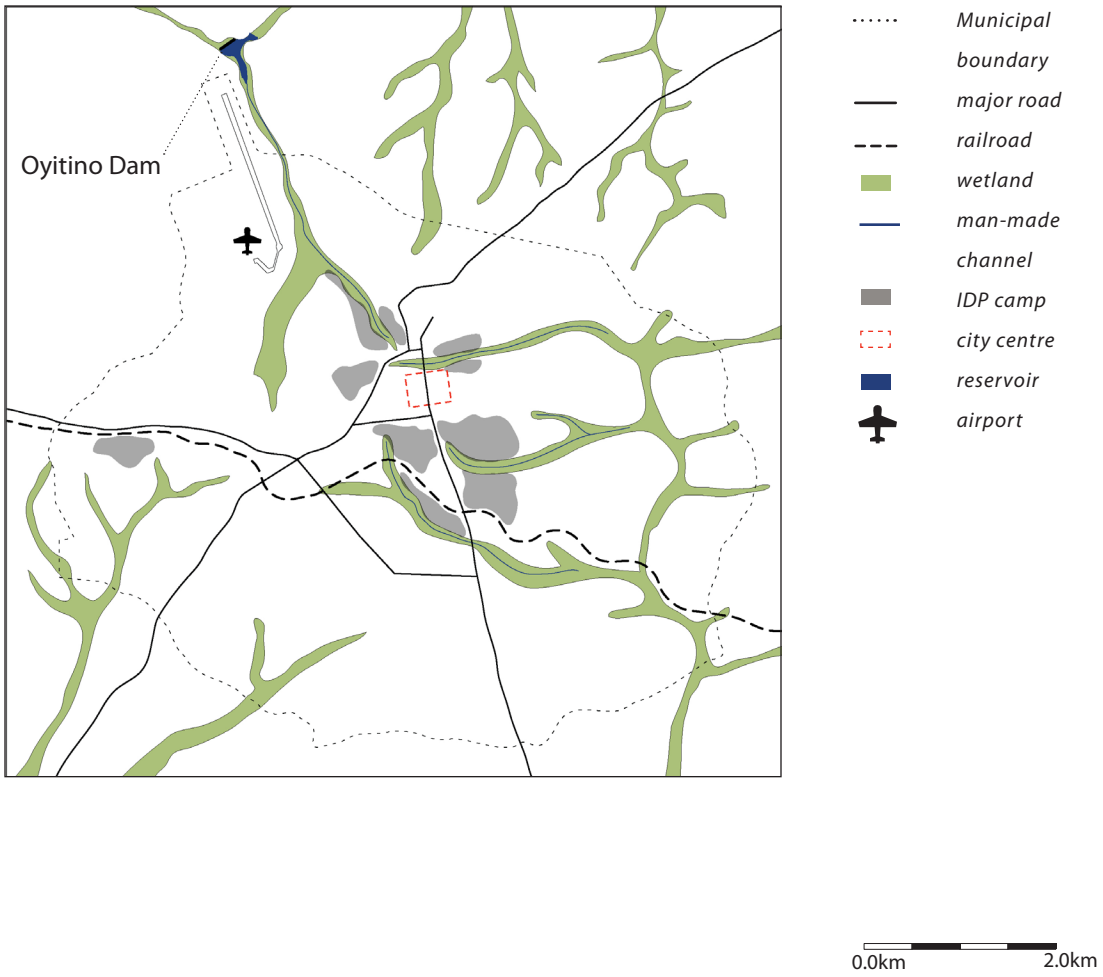


Figure 3.5 Gulu Municipality showing how the wetlands border the city on all sides. The camps are located next to the wetlands.

Gulu Municipality

Gulu Town is one such city sitting at the confluence of two watersheds. All of the surrounding landscape is a catchment area for the Nile River and the water makes its way from Gulu Town through a network of wetlands and smaller tributaries.

The adjacent map depicts how these wetlands limit the city in all directions and force roads and rail networks to negotiate their positions in relation to them.

To the north of the Municipality is Oyitino dam, built in one of the wetlands in order to supply the city with water.[3]

The IDP camps depicted in a grey tone stretch out and follow either the wetlands or rail tracks, in areas typically deemed undesirable. Building in or near wetlands is an issue for both the structural capacity of the building and the sustainability of the wetland. The design strategy proposed in this thesis seeks to reposition the relationship of the settlement to the land and water, into a more productive relationship.


LAROO DIVISION
Headquarters
GULU MUNICIPAL COUNCIL

04

Water and Disparity in Gulu Town

Taking landscape architect Ian McHarg's strategies of site and landscape analysis, this chapter is an analysis of relationships of urban fabric and landscape patterns in the town of Gulu. In order to develop the approach for permanently settling the displaced communities, it is important to understand both the existing urban fabric and the landscape patterns within the urban centre where the camps exist, and how these networks and patterns currently prevent the displaced people from prospering socially and economically.

The analysis of the city is followed by a brief analysis of the displacement camp in the town of Gulu which will serve as the site for an incremental design strategy. This camp is located in the industrial area of the town, hence it is called Industrial Camp.

Figure 4.1 Looking towards the downtown core of Gulu. This street is part of the main market area located on the town's main urban artery

Gulu Town Analysis

This chapter seeks to reveal the complexity of networks and patterns that form the physical, social, and economic realms of Gulu.

The adjacent map is a detailed composite of all of the networks and patterns.

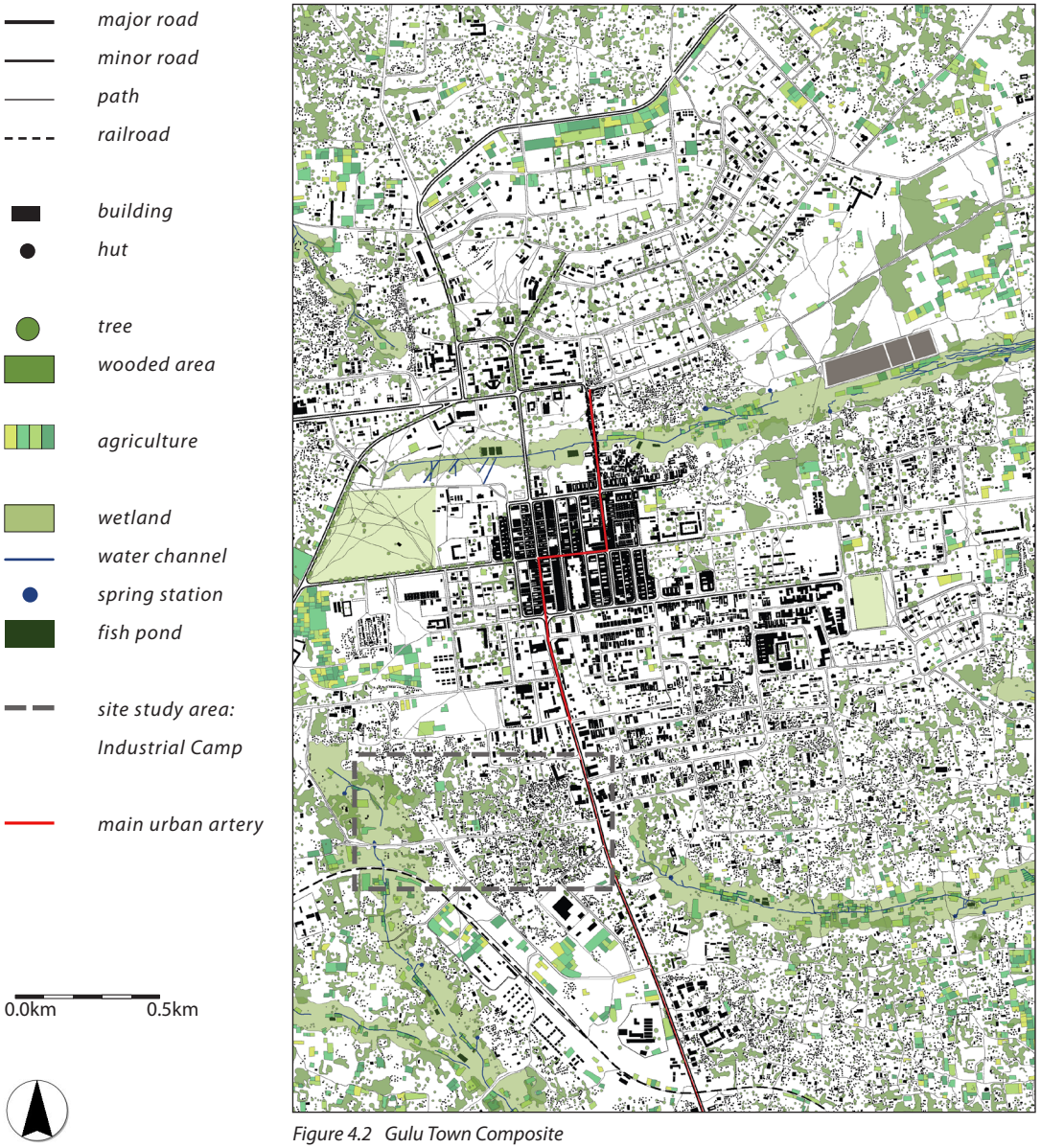
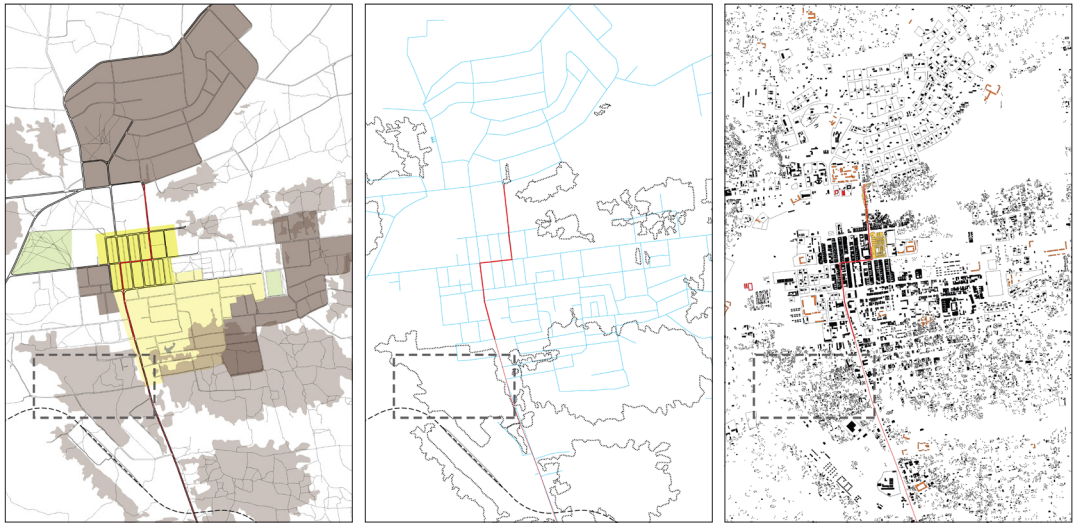
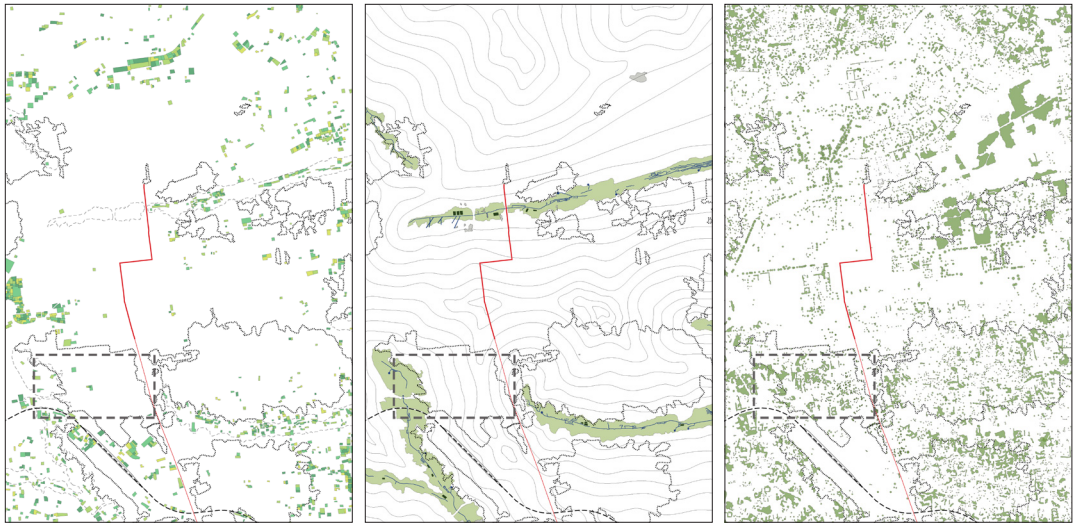


Figure 4.2 Gulu Town Composite



Road Network/ Social Realm *Water Infrastructure* *Built Landscape*



Agriculture *Wetlands and Topography* *Trees and Green Space*

Figure 4.3 Gulu Town Networks and Patterns

Urban Fabric

Studying the layers of urban fabric, one can visually recognize the social disparity between income groups. A further look reveals a vibrant social realm with an underlying lack of service provision for people in the displacement camps.

Landscape Patterns

The landscape patterns reveal the subsequent consequences of a failed service infrastructure. These patterns show the displaced population vying for space and natural resources.

Urban Fabric: Road Networks/ Social Realm

The ingredients of Gulu's social realm are similar to other towns and smaller cities across Uganda. The plan of the city has a rigid core where the streets are corridors of program. A product of Colonial settlement, the city centre contains the main shopping, hotel and business programs lining major arteries with compacted residential courtyards lining the back alleyways. As the grid of streets slowly loosens in rigidity, the programs begin to intertwine, a transition from the downtown area to primarily residential areas. Notice how the streets hardly penetrate the IDP camps. This is evident by the extensive, seemingly random pattern of path networks.

While the streets of the downtown grid are lined with shop arcades, there are several programs that act as anchors along a main urban artery. The market, for produce, food staples, and everyday and personal items, is a major driving force in social and economic interactions. The taxi/bus park acts as a gateway and important social hub, as most Gulu residents rely on the extensive mass transportation to get around.

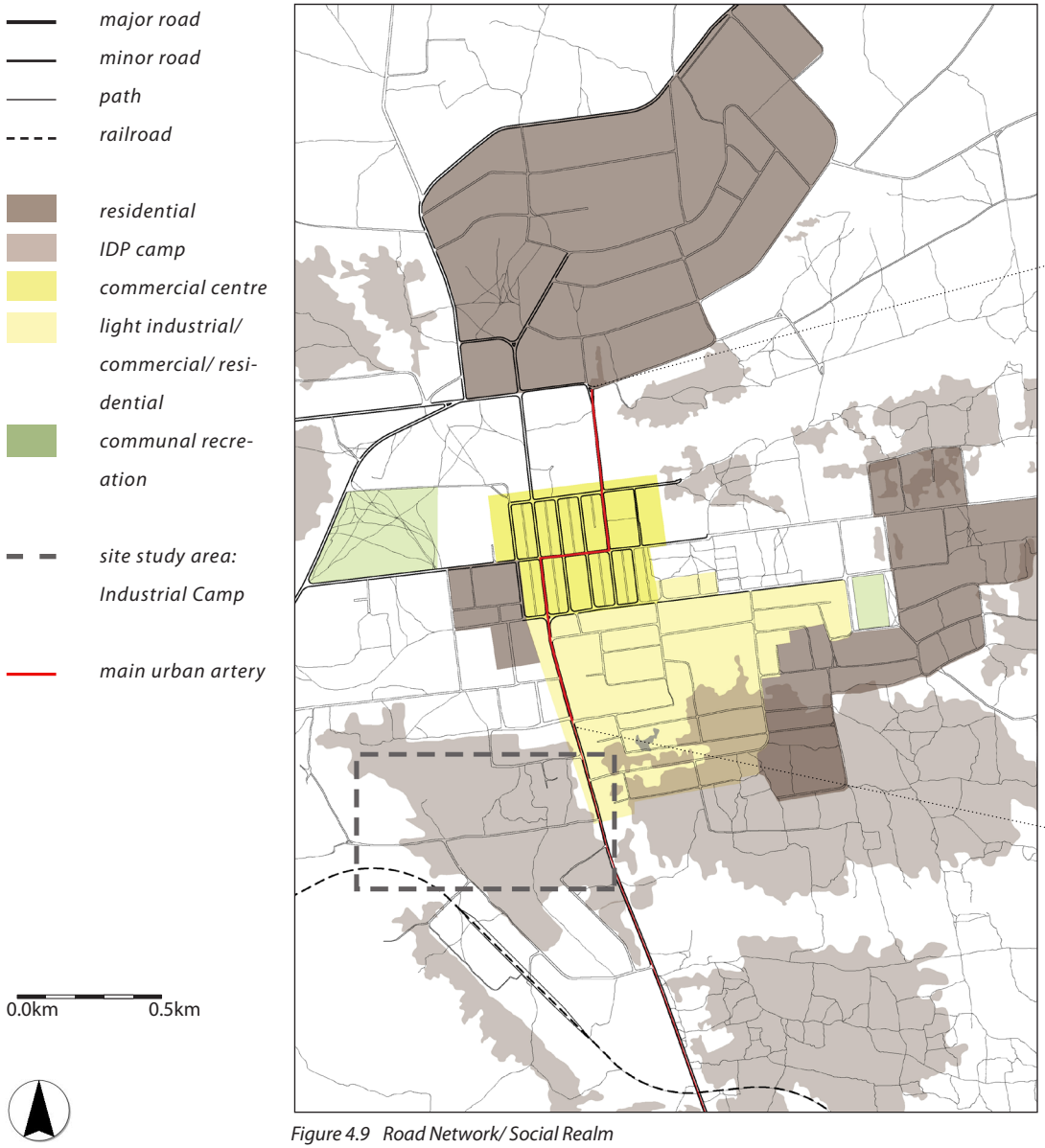


Figure 4.9 Road Network/ Social Realm

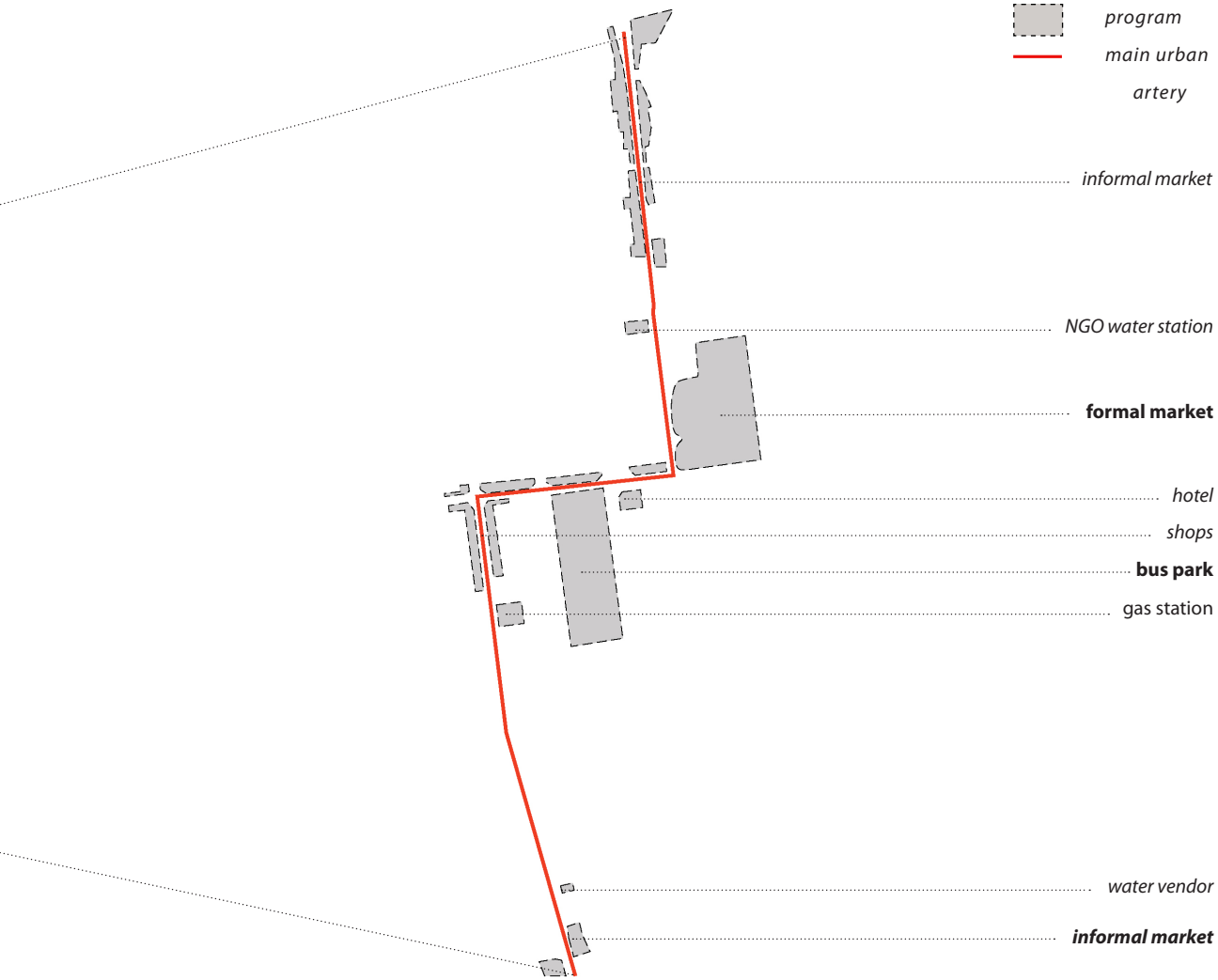


Figure 4.10 Together, these main urban arteries act as a corridor that connects all of the prominent social programs of the town

Figure 4.11 (top) Gulu formal marketplace
Figure 4.12 (middle) Gulu bus/taxi park
Figure 4.13 (bottom) Gulu clothing stands

Urban Fabric: Water Infrastructure

Water collected from the Oyitino Dam is distributed to the city through approximately 100 kilometres of pipe to 3,300 connections.[1] These connections are service accounts for homes, businesses, and also for water vendors who "re-sell" the water at a marked-up price. (Vendors are depicted diagrammatically on adjacent map).

Water from a vendor costs as much as ten times the price of water from a piped connection.[2] The yellow jerry cans represent a daily water purchase by an average family. Although a household with a piped connection consumes more, the comparable amount reveals a striking inequality.

Water collection is typically a woman's role. Collecting enough daily water from a water vendor can take several trips. The day before the World Health Organization conducted a water study in Gulu Municipality, displaced people spent a mean time of 1.3 hours collecting water.[3] This is time that could be spent doing other household tasks, or income-generating activities.

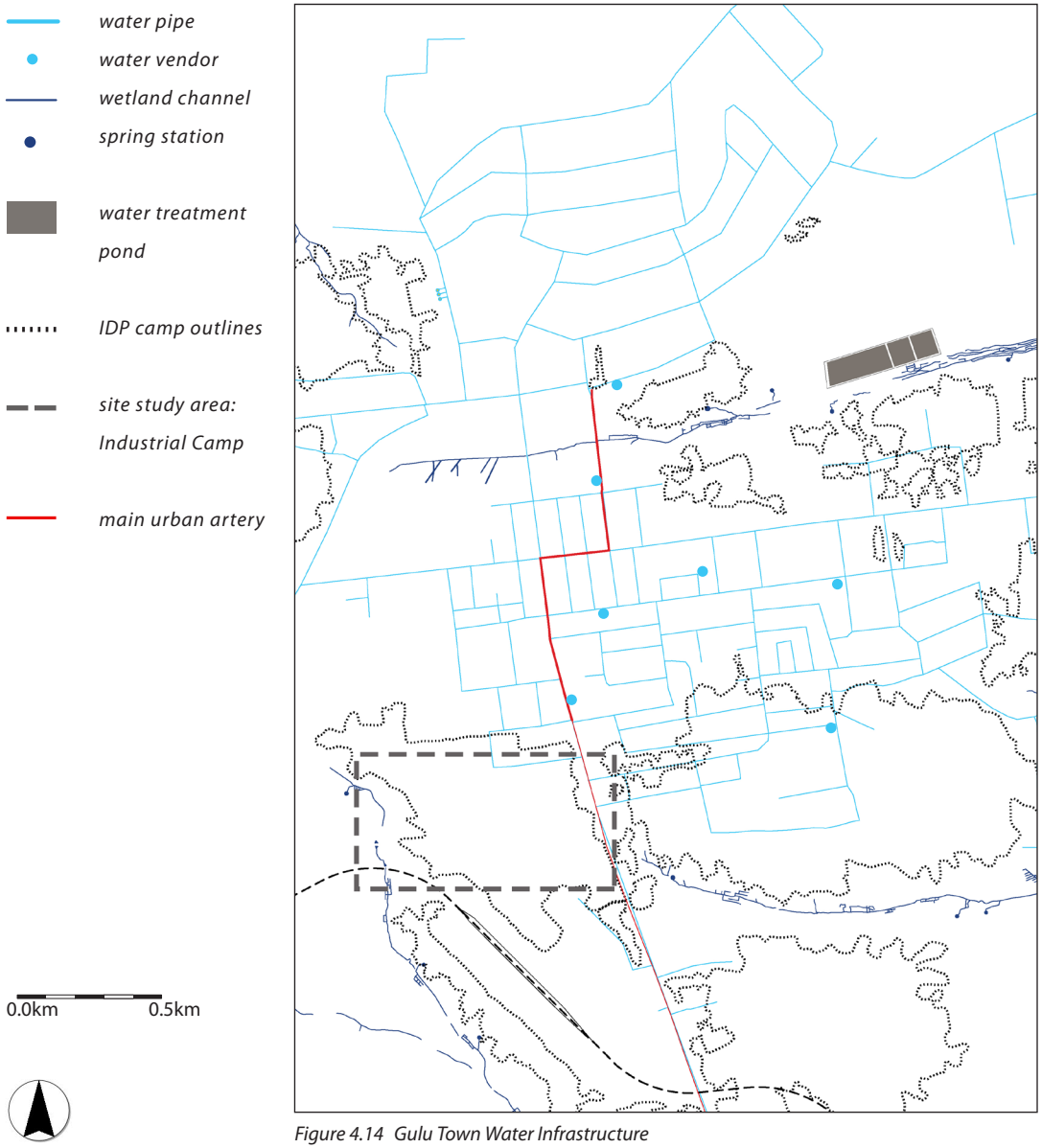


Figure 4.14 Gulu Town Water Infrastructure

Water Vendor

Piped Connection

1 jerry can = 20 L

50 Ugandan Shillings (USH)
(1 USD = 2000 USH)

Figure 4.15 Water Cost Comparison: Water purchased from a water vendor vs. a piped water connection

Figure 4.16 Line-up of jerry cans at an NGO water station
Figure 4.17 Displaced people access an unprotected spring in Patongo IDP camp

Urban Fabric: Buildings

The figure ground map to the right is helpful in understanding the density relationships in the different areas of Gulu Town.

The diagram on the facing page is showing the population density of a downtown block compared to similarly sized portions in the north neighbourhood and the IDP camp. It indicates a severe spatial inequality across the city.

The "gated" neighbourhood north of the downtown is called Senior Quarters. Senior Quarters was established by the British Colonialists for their families. They effectively separated themselves from the emerging town by the Pece wetland. This wetland is evident by the swath of empty white space on this figure ground map. The neighbourhood still remains as walled compounds for NGOs and the wealthy.

The IDP camps look like constellations radiated around the city centre. When displaced people moved to the city they often settled with others from their same village area, creating new neighbourhoods within the camps and the greater city.

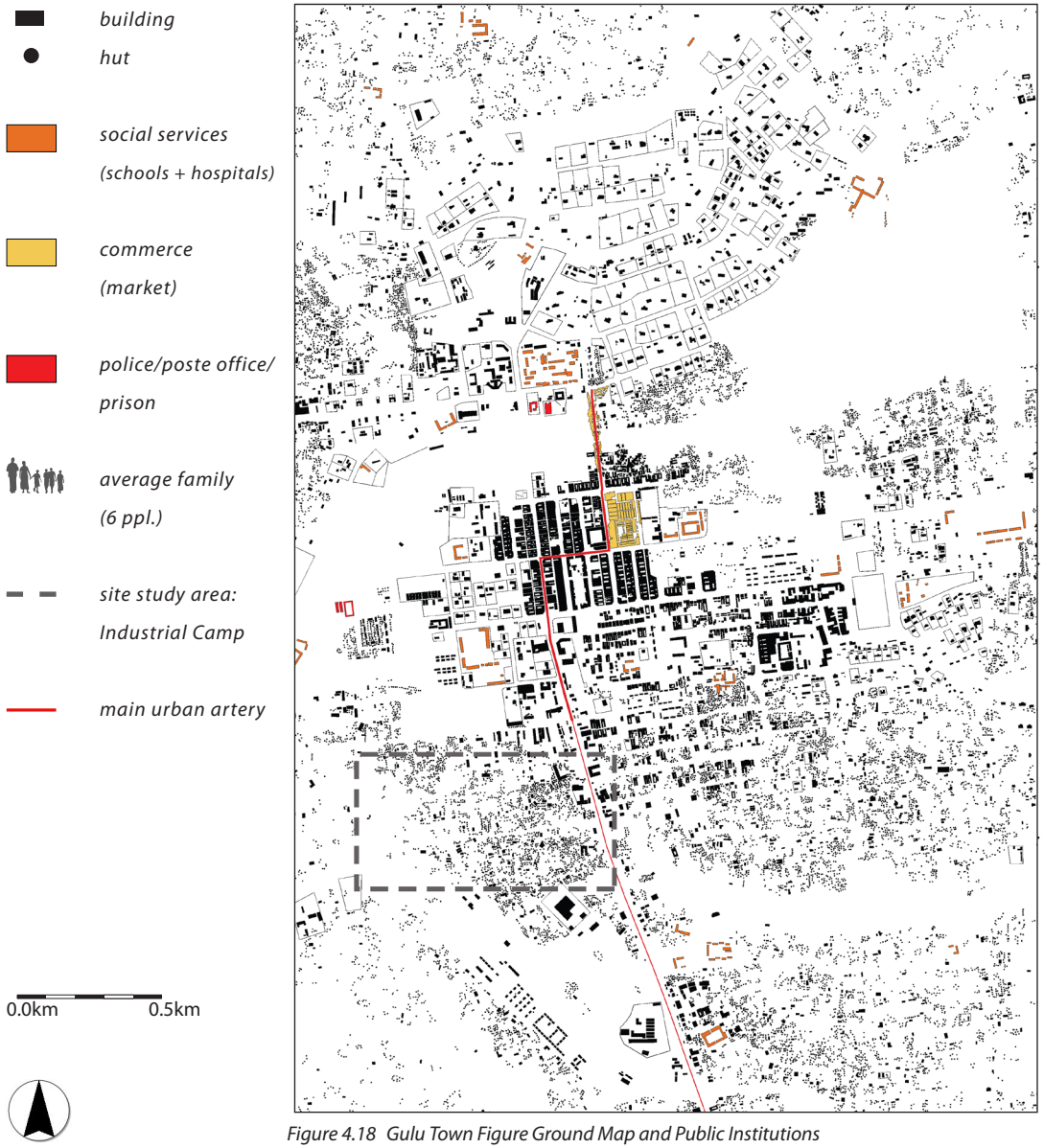


Figure 4.18 Gulu Town Figure Ground Map and Public Institutions

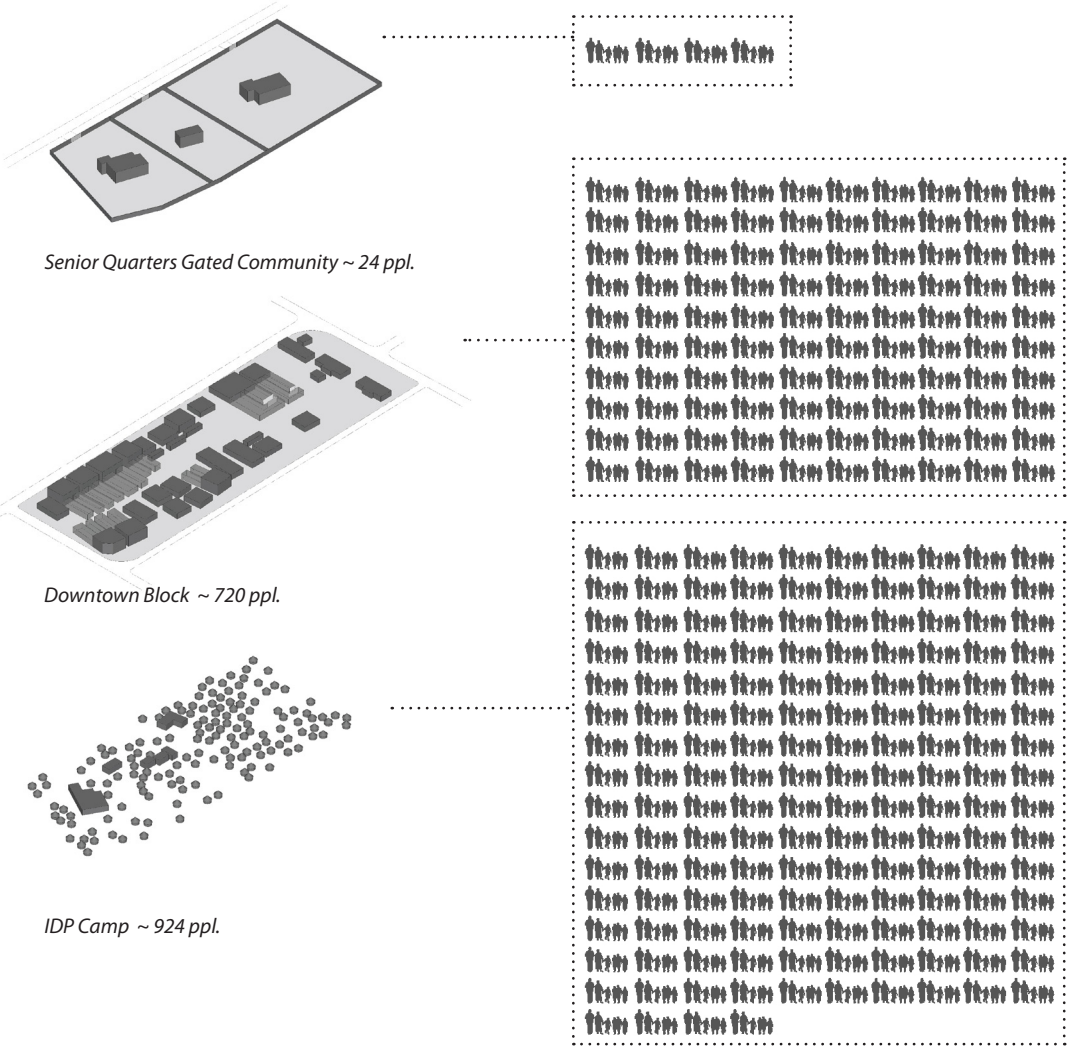


Figure 4.19 Neighbourhood Population Density Comparison

Figure 4.20 NGO walled compound
Figure 4.21 Downtown street in Gulu
Figure 4.22 Mud huts in a Gulu urban IDP camp

Urban Fabric: Neighbourhood Comparison

By comparing the neighbourhoods, an understanding of existing conditions and relationships is revealed.

The circulation diagram at right further indicates the isolation of Senior Quarters. There is only one level of spatial hierarchy in relation to the surrounding community, and this is clearly controlled by the front gate in the wall. This typical Downtown Block reveals a richer hierarchy of space. The circulation for the public and private areas of the block are separated (front and back of building), but not disjointed from one another. The spatial hierarchies of the IDP camp are harder to understand because the lines of public vs. private space are blurred.

It is interesting to note in the building occupancy diagram (facing page) that both the Senior Quarters neighbourhood and the IDP camp are predominantly residential. While this is desired in Senior Quarters, the IDP camp could benefit from the economic opportunities of the mixed use occupancies found in the Downtown Block.

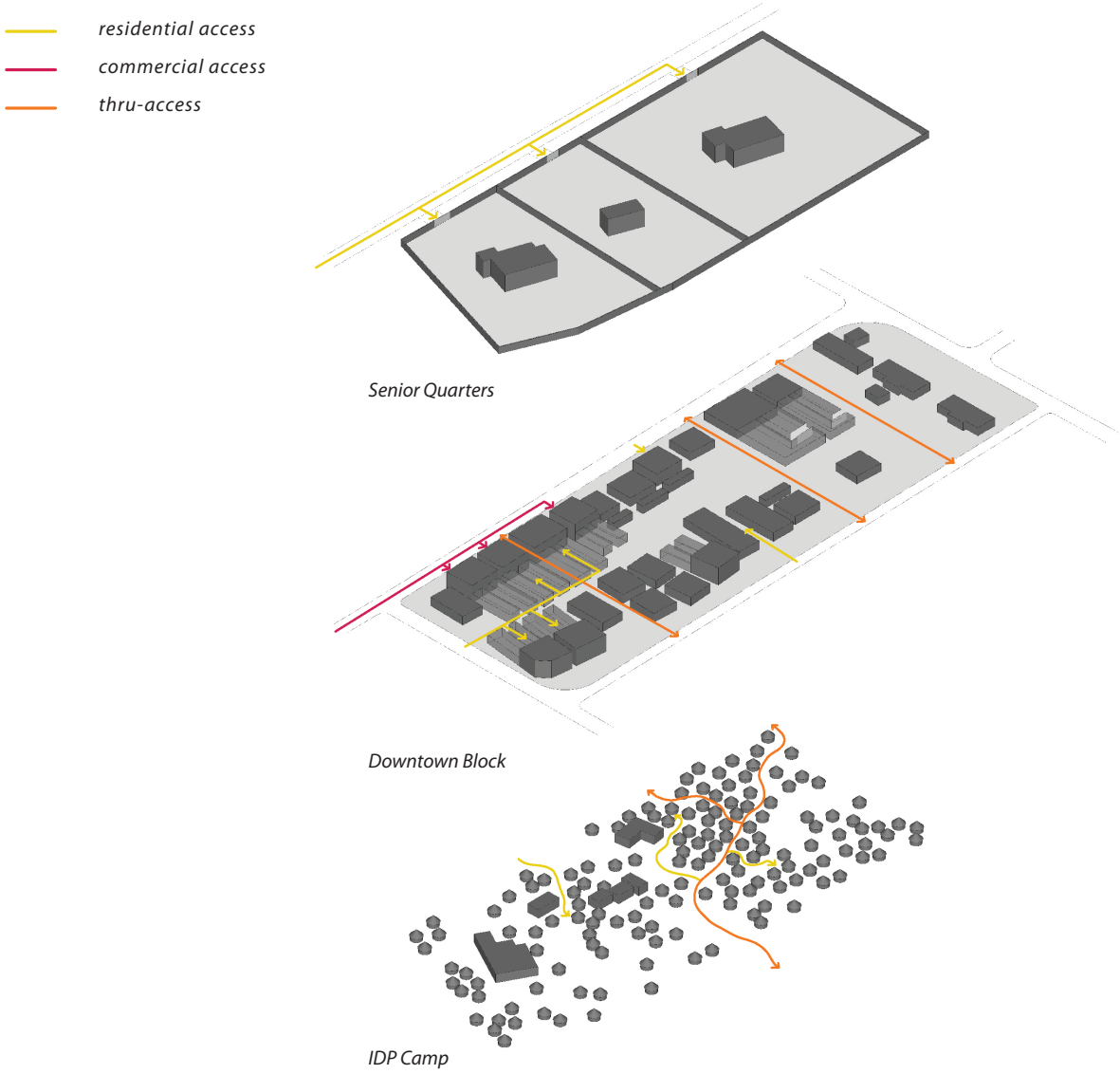


Figure 4.23 Neighbourhood Comparison: Access and Circulation

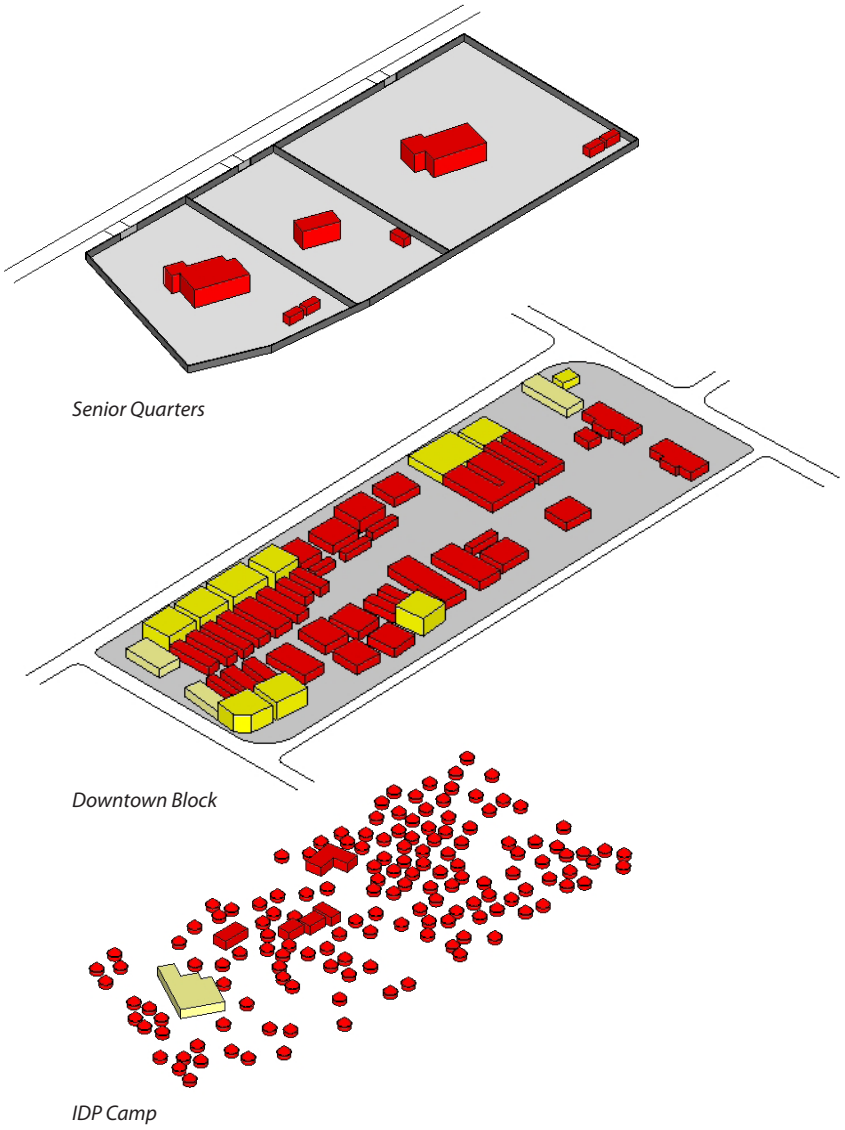


Figure 4.24 Neighbourhood Comparison: Building Occupancy

Figure 4.25 Paved street in the rich, gated neighbourhood of Senior Quarters

Figure 4.26 Back alley residential access in downtown block

Figure 4.27 Pathway/drainageway in IDP camp

Urban Fabric: Ownership

These diagrams provide a closer look at ownership at the scale of a plot.

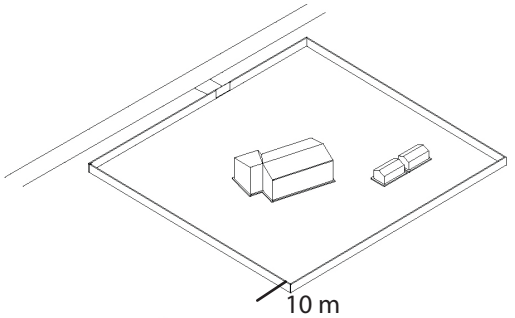
Many of the wealthy people in Senior Quarters may own their compound, however, NGOs typically rent their space. This is common in most cities unless the NGO has long term commitments to a catastrophe. The NGOs may rent other compounds as volunteer or guest housing needs arise.

The Downtown Block has an interesting building typology: a U-shaped building. One owner (or a group) owns and rents the different units from the retail in the front, to the residential rooms in the back. Renting is the typical way of life for the lower income population. Most of the time, one family crowds into one room. Unfortunately this typology and the renting aspect does not permit a family to expand their living areas and grow incrementally.

People in the IDP camp rent the land they have built their huts on.[3] This land may be owned by someone living in the camp, a wealthy land owner living elsewhere, or the government.

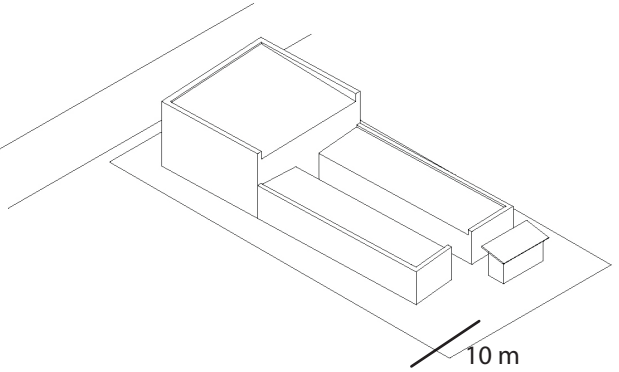
Senior Quarters Ownership Scenarios:

- *Single family owns and lives in plot and house.*
- *Single family rents house.*
- *NGO rents house as office.*
- *NGO rents house for volunteer living quarters.*



Downtown Block Ownership Scenarios:

- *One person/family owns entire building and plot.*
- *Owner rents out commercial space in front.*
- *Owner rents out residential rooms in behind.*
- *Owner builds latrine behind building.*



IDP Camp Ownership Scenarios:

- *One owner/family owns plot.*
- *Owner lives elsewhere or possible that owner lives on the plot as well.*
- *Owner rents space on plot to tenants.*
- *Tenants build own mud hut and latrine.*

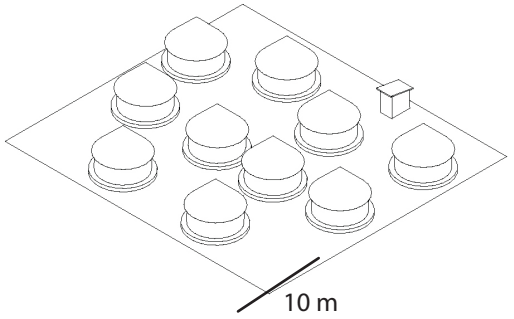


Figure 4.28 Neighbourhood Comparison: Ownership

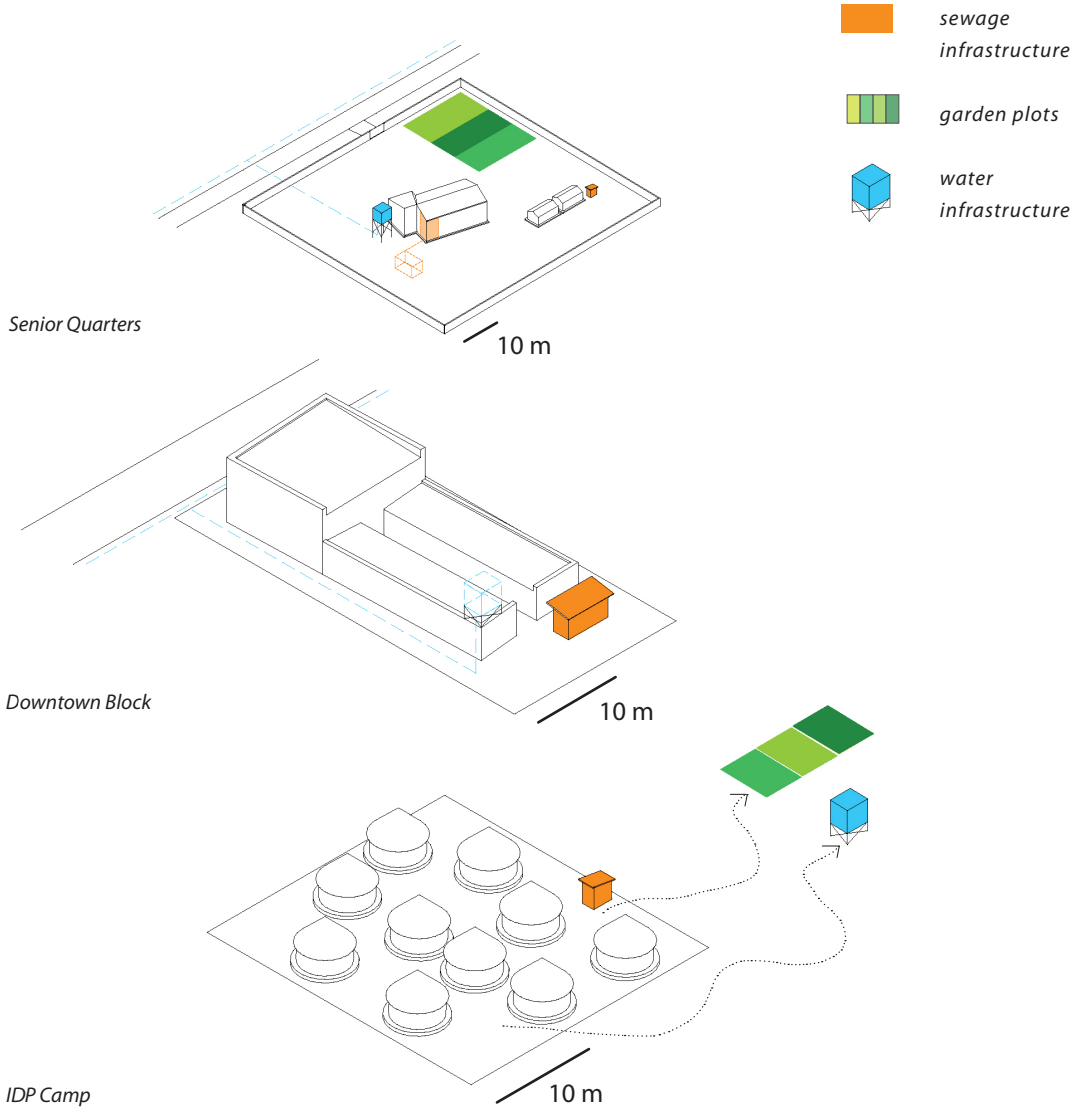


Figure 4.29 Neighbourhood Comparison: Infrastructure + Resources

Infrastructure + Resources

Almost every compound in Senior Quarters connects to the municipal water infrastructure. The Downtown Block has the same opportunity, although not all buildings need the connection. As further described on page 42, the IDP camps lack any kind of water delivery infrastructure. These people must walk to a water vendor to purchase their water.

These diagrams also indicate each plot's relationship to sewage infrastructure. A Senior Quarters compound primarily works on septic while the U-building has a connection to sewage service. There is likely a pit latrine behind the building for the residents to use. The displaced people have dug for themselves, on average, one pit latrine for each extended family (8 - 10 families).

In terms of access to gardens and places for agriculture, the Senior Quarters compound has ample space. If people who rent land or rooms in the other areas desire a garden, they must also rent land in an adjacent or available plot.

Landscape Patterns: Wetland

The IDP camps, as outlined in the map at right, exist adjacent to and within Gulu Town's wetlands. Wetlands International, a restoration organization, identifies that "a major cause of wetland degradation, loss of biodiversity and associated health problems is lack of sanitation and the disposal of waste."[5] This scenario is detrimental to both the people and the wetlands because of the camps' limited access to proper water and waste infrastructure.

To facilitate the flow of water in the wetlands, the city has created stone-lined channels down the centre.[6] These channels alter the ecology of the wetland by limiting the biodiversity . It is intended to prevent stagnant water, a breeding ground for mosquitoes that could carry malaria.

The Urban Metabolism diagram (facing page) is an overview of the many programs that use the wetland as a resource and link into the constructed water channel. These programs often have harmful by-product that contaminate the wetland ecology. In addition, because the wetland is a continuous system, the by-products of one program may become part of the wetland output (or program intake) of another.

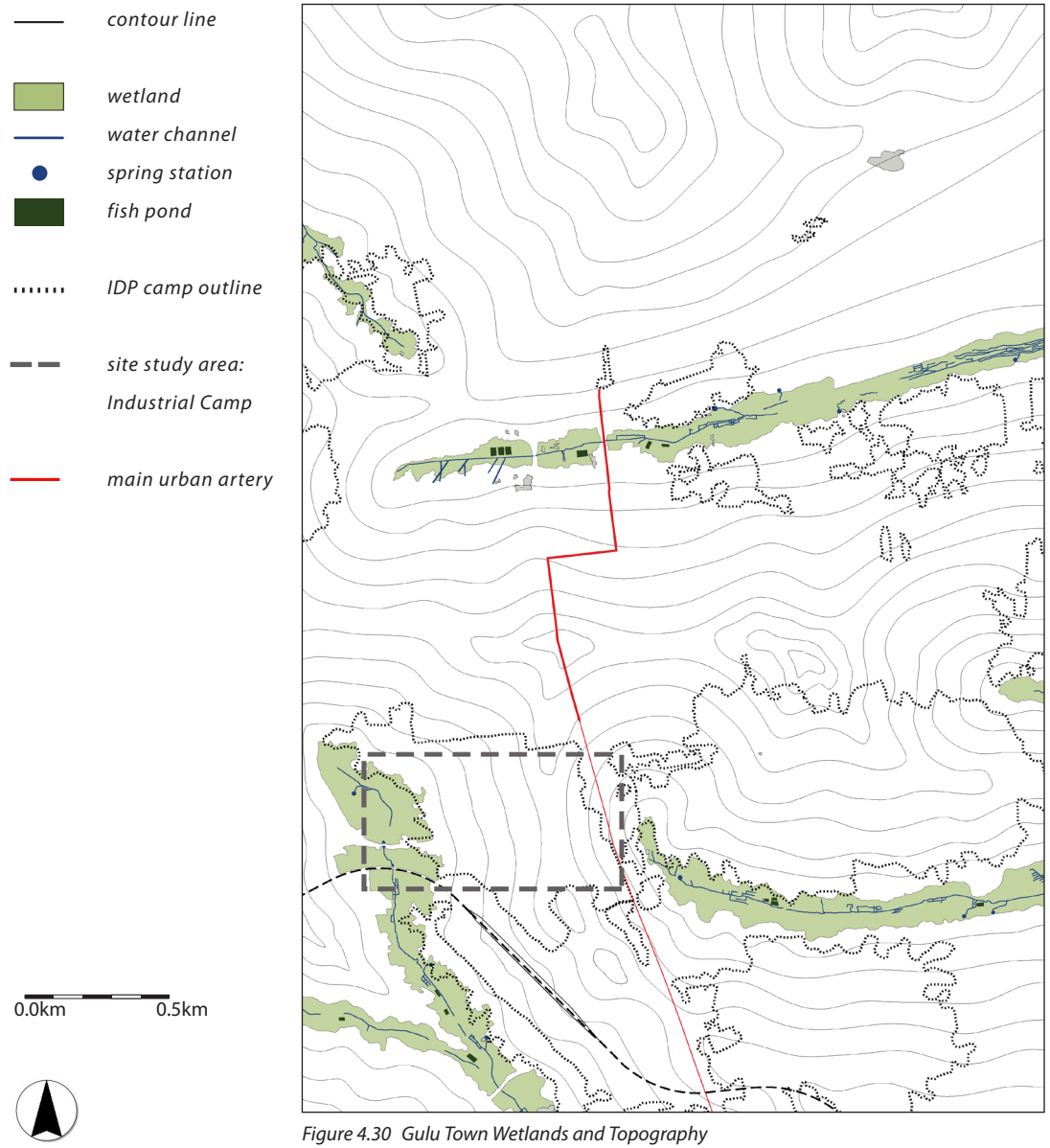


Figure 4.30 Gulu Town Wetlands and Topography

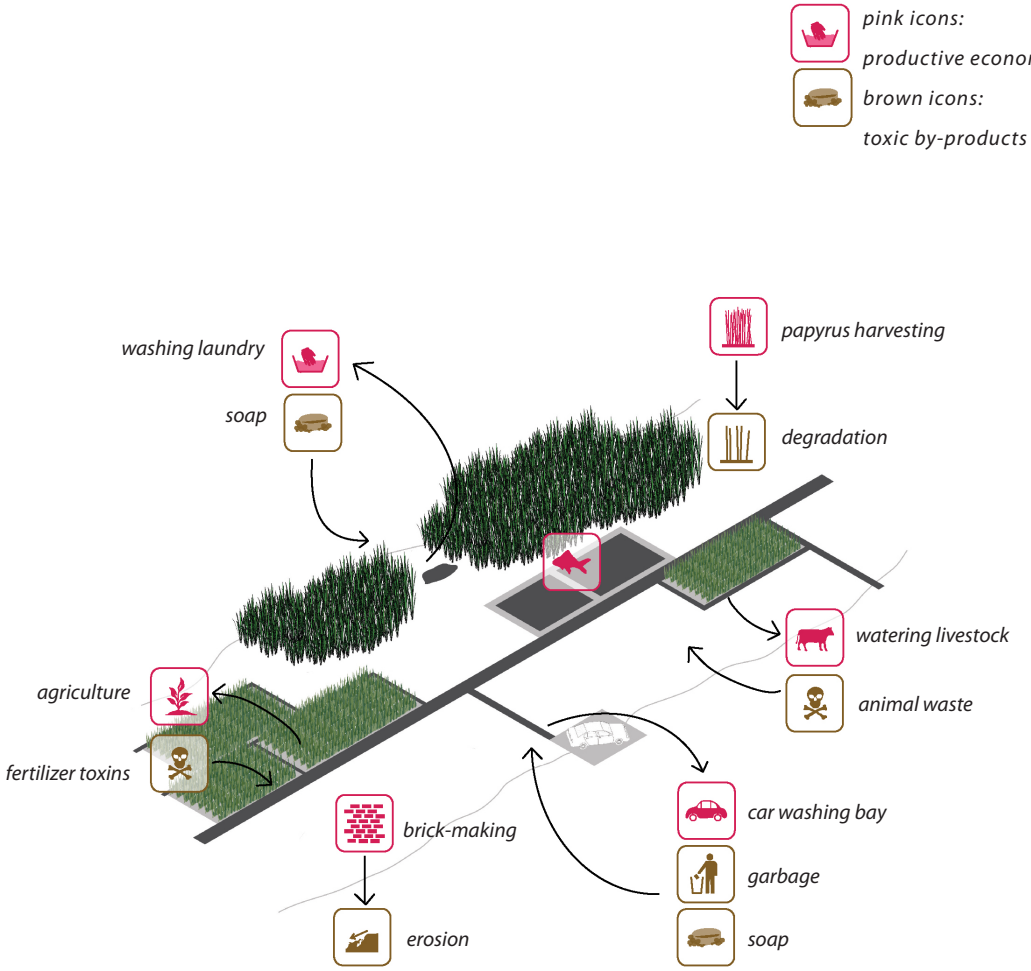


Figure 4.31 Urban Metabolism: Cycle of Outputs and Inputs

Figure 4.32 Illegal car washing bay polluting a diverted wetland channel

Figure 4.33 Garbage piling up against bridge over Gulu's main road

Figure 4.34 Children wash dishes in the wetland water

Landscape Patterns: Agriculture

Displaced people often don't have the money to rent an additional piece of land on which they can plant a garden. This map shows all of the areas in Gulu Town in which agriculture takes place. Note a concentration of agriculture in open areas, but also in the wetlands.

According to the Uganda's National Policy for the Conservation and Management of Wetland Resources, created in 1995, wetlands can not be owned and any activities within the wetlands must apply for permission before commencement.[7] However, city officials are turning a blind eye to wetland activities, as they aren't able to provide any alternate solutions in response to the displaced people's need.[8] Unfortunately, other Gulu Town residents who don't have the same needs as the displaced people, are taking advantage of the relaxed governing.

The landscape patterns (facing page) that emerge in the wetlands describe the alterations involved in agriculture and other programs. Because the wetland soil is saturated, farming in the wetlands requires a certain level of drainage. The drainage troughs link to the central water channels that facilitates flow away from the city.

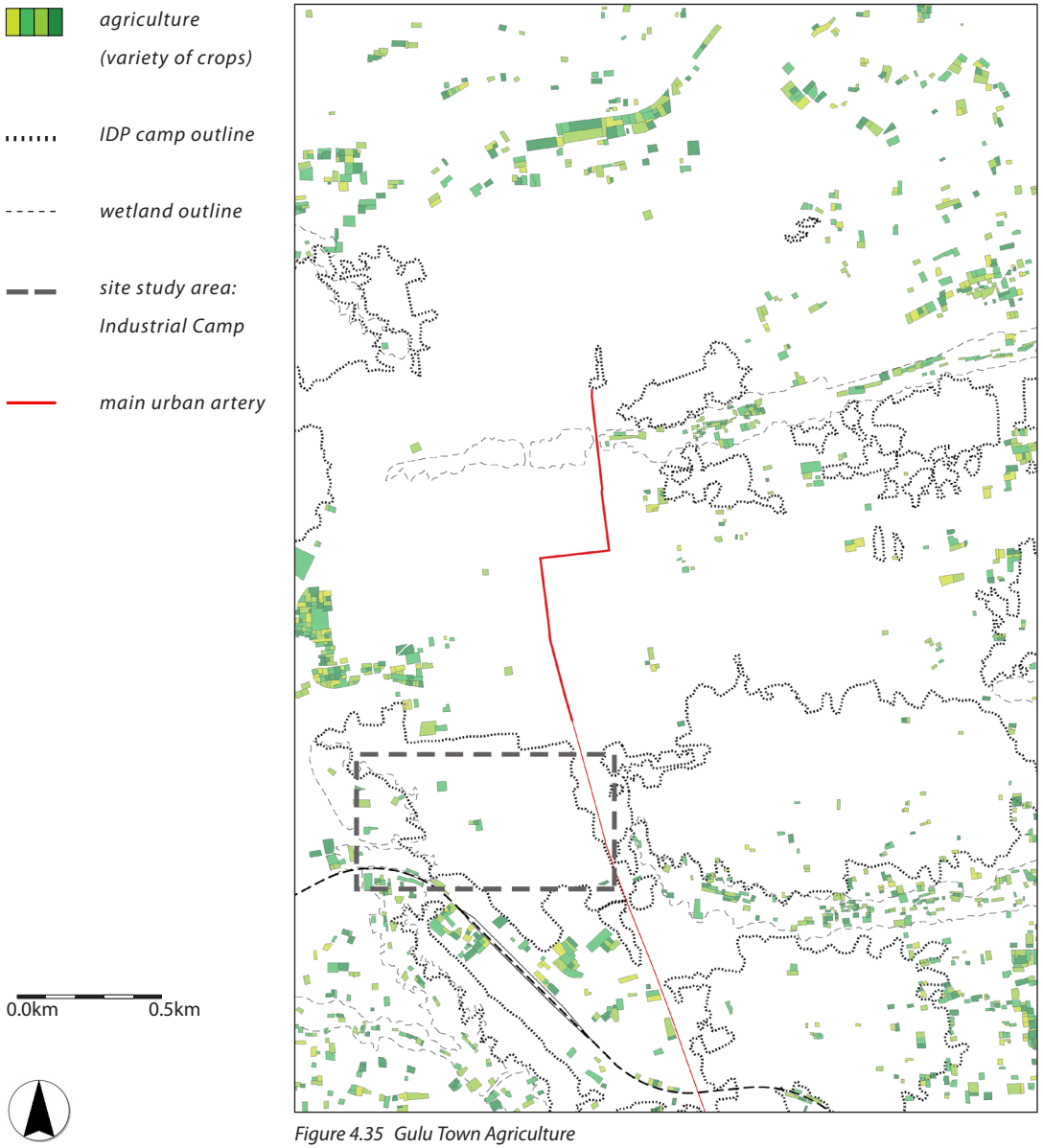
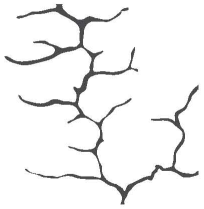
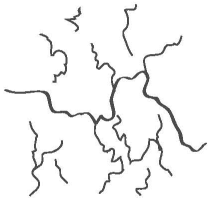


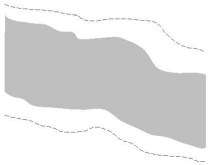
Figure 4.35 Gulu Town Agriculture



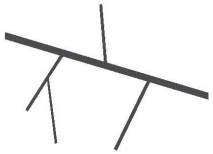
natural riparian corridor



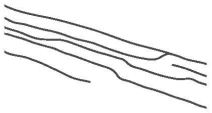
natural tributaries



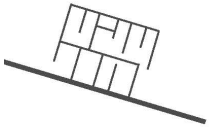
soil saturation - rainy and dry season



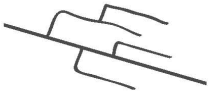
artificial riparian corridor



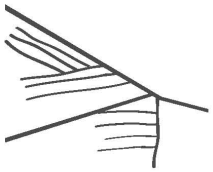
increased water flow



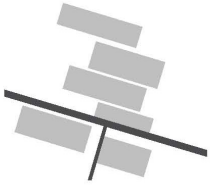
grid drainage for agriculture



drainage troughs for agriculture



corridor intersection



agricultural patches + water corridor

Figure 4.36 Water Patterns describing the pattern of ditches and troughs that emerge as people continue to use and pollute the wetlands

Figure 4.37 (top) Digging a trough that will drain an agricultural plot in the wetland
Figure 4.38 (bottom) Agriculture in the saturated soil of the wetland

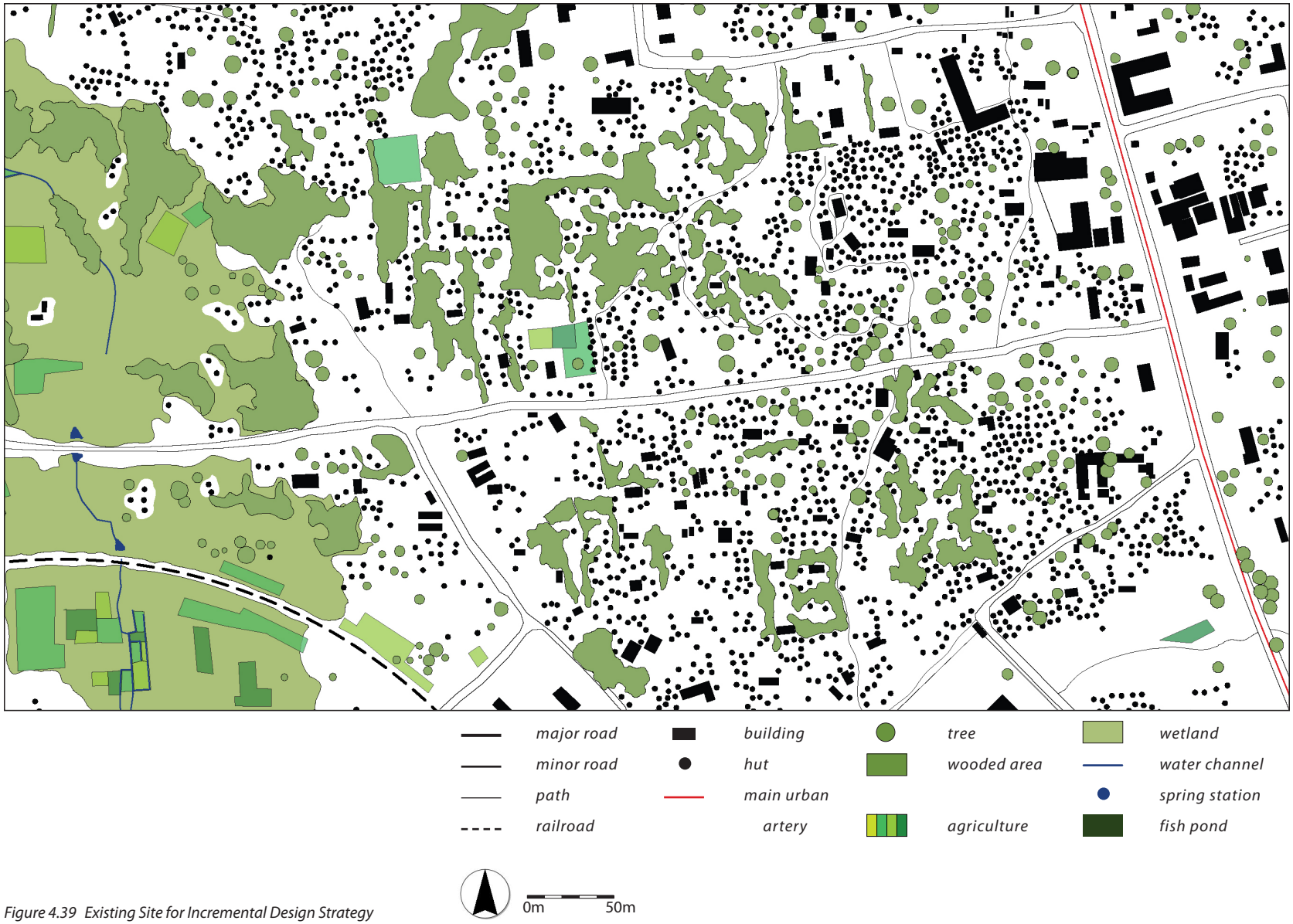


Figure 4.39 Existing Site for Incremental Design Strategy

Figure 4.40 Existing Site: Road Networks

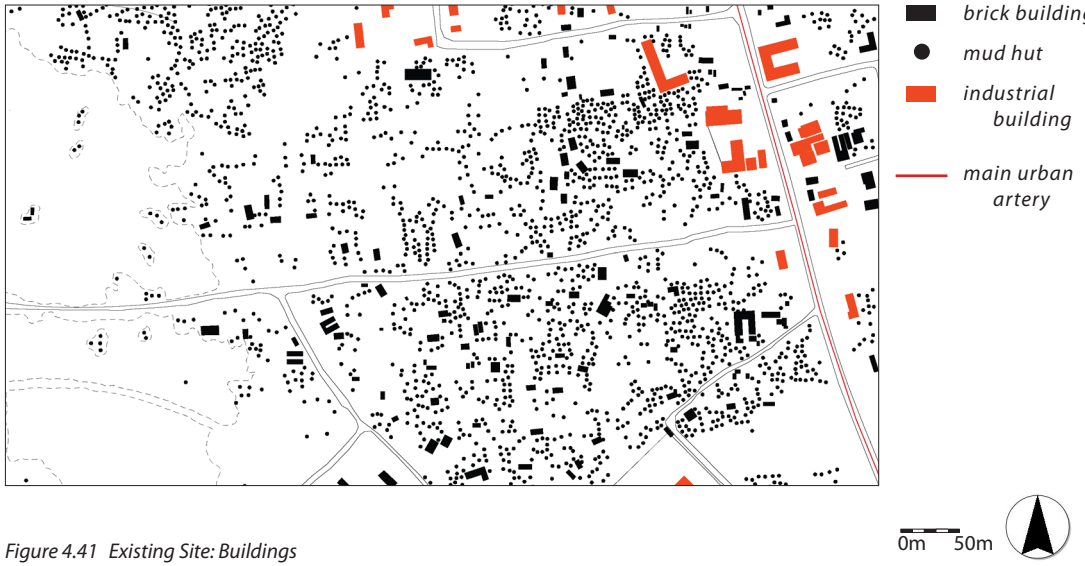


Figure 4.41 Existing Site: Buildings

Site: Layers of Analysis

The specific site for an incremental design strategy is 'Industrial Camp', southwest of the downtown core.[9] At a current population of approximately 13,000, this camp was chosen for its lack of integration with the city, and lack of formal networks.[10]

Road Networks:
The camp is sandwiched between the railroad, and the main road into Gulu Town. Few roads exist on the site to link the camp to the city or facilitate access or circulation based on levels of hierarchy.

Buildings:
The camp is located in an industrial zone, behind industrial buildings that line Gulu Town's main road. There are a few existing brick buildings on site, but the majority are mud huts built by the displaced people. At the site scale, the huts seem to have an arbitrary pattern. At a closer scale, however, there are established social networks in clusters of extended families and larger communities that must be taken into consideration in the design proposal.

Water Infrastructure:
This map reveals that although water infrastructure passes by the site in conjunction with the main road, it does not become available within the camp.[11]

Figure 4.42 Existing Site: Water Infrastructure

Wetlands:
The camp is sandwiched between Layibi Wetland and the main road into Gulu. East of the main road is another wetland. The camp sits within the catchment areas of these two wetlands, on both slopes of the low-rising hill. Surface run-off in these catchment areas are subject to contamination by activities within the camp.

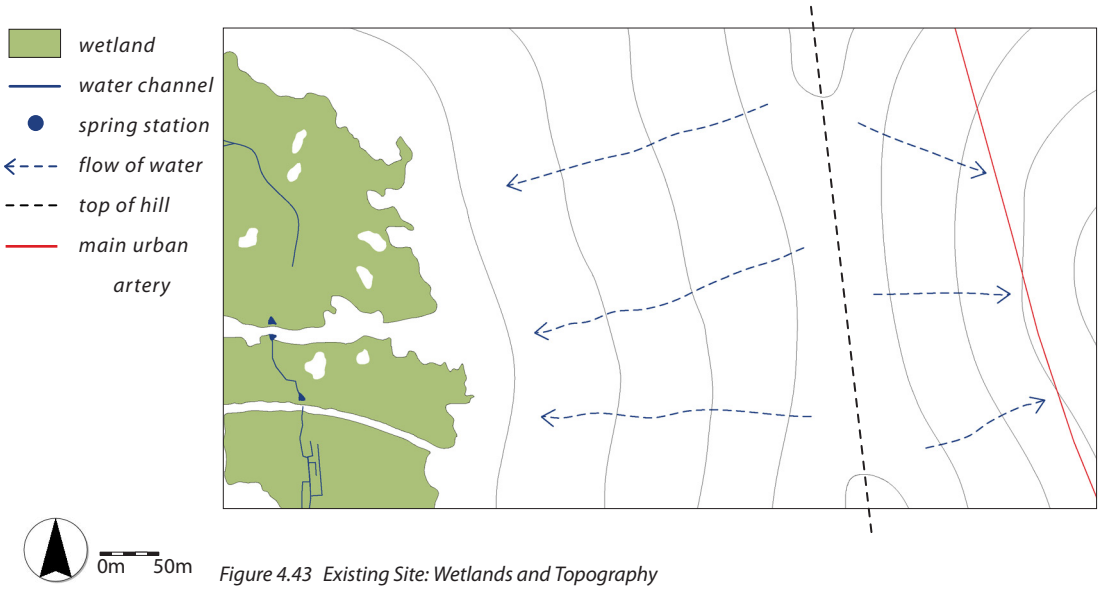


Figure 4.43 Existing Site: Wetlands and Topography

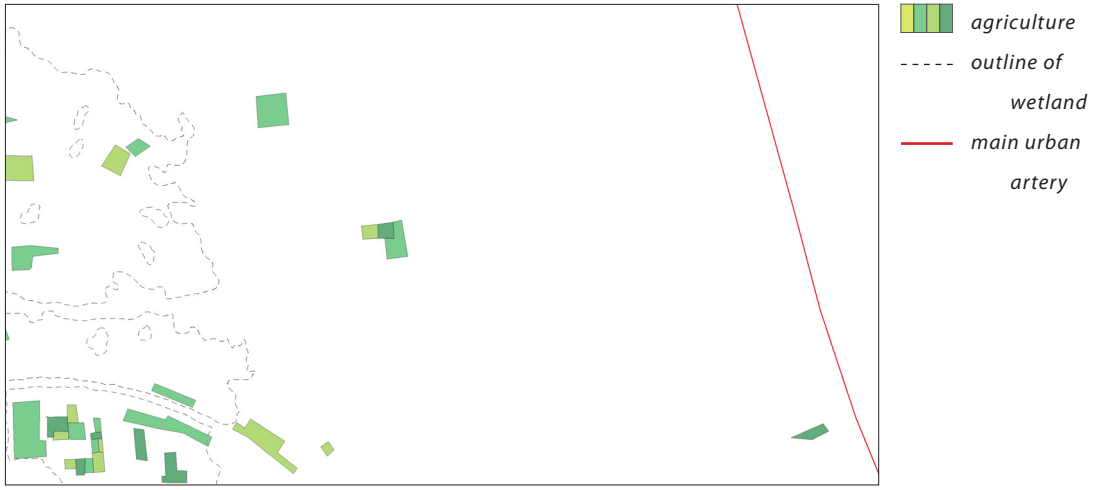


Figure 4.44 Existing Site: Agriculture

Agriculture:
The existing agriculture takes place mostly in the wetland and along the rail track. The area where the camp exists was probably previously used for agriculture. There are a few patches of agriculture that may be remaining from that time, as the landowners chose not to rent the land to the displaced people. The people use the wetland illegally because they don't have any other options.

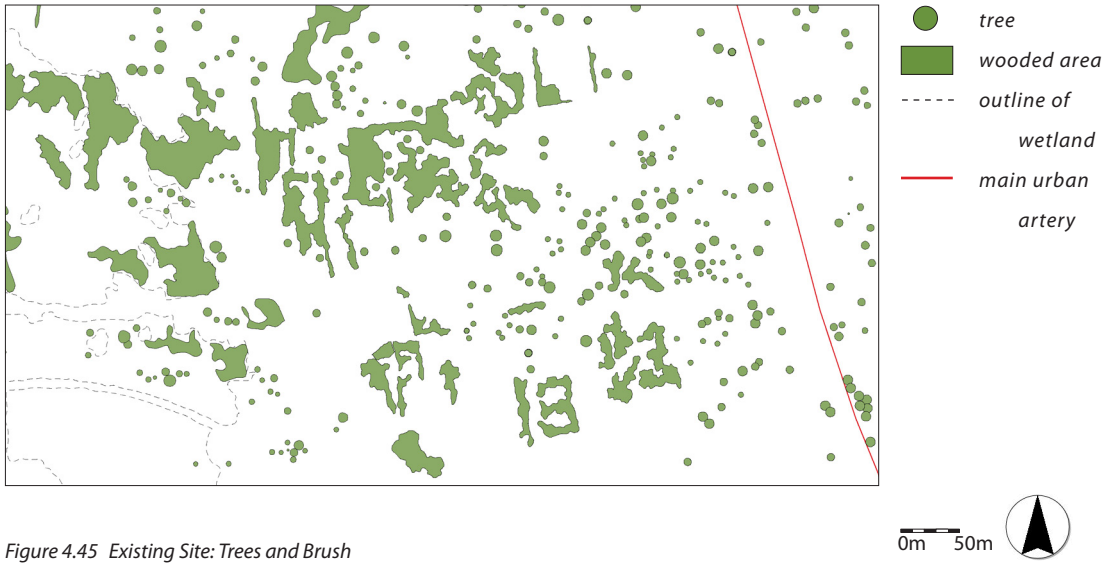


Figure 4.45 Existing Site: Trees and Brush

Trees and Wooded Areas (Landscape):
Portions of this area were also probably wooded before the displaced people arrived. The patterns of inhabitation have created enclaves in the wooded areas. Plot boundaries can be made out, as trees form rectilinear and parallel formations.

05

Precedent Case Studies

This chapter discusses the work of designers who have developed projects in line with the key strategies of this thesis. These projects can be examined in conjunction with the humanitarian design ideas discusssed in Chapter 2. The goal of the thesis proposal is to develop a permanent settlement, however the catalyst for the settlement will not be driven by the provision of housing, rather it will be led by the implementation of water infrastructures. Therefore, the case studies cover a range of categories from site-scale infrastructure, local infrastructures, and examples of building incrementally, to catalysts for urban equity and social change.

Case Study: Water Infrastructure

Quinta de Malagueira - Evora, Portugal
Designer: Alvaro Siza

Quinta de Malagueira is a new subsidized housing quarter integrated into an existing town fabric. Siza designed 1200 housing units including institutional and commercial programs. An aqueduct supplied the walled town with water during the Renaissance period, and still remains as an artifact in the landscape. This housing project references the aqueduct by supplying its services in a new 'aqueduct' infrastructure that links the rows of housing blocks together. The housing typology Siza uses is the courtyard type. Just like courtyard housing in ancient European towns like Pompeii, courtyard housing allows for different classes to exist in a formally coherent neighbourhood. From the exterior, the income levels are hardly distinguishable, while on the interior some are more dense and enclosed.[1]

This project is an example of infrastructure that plays a functional role of supplying services, but also serves to visually tie the community together and define public and private space.

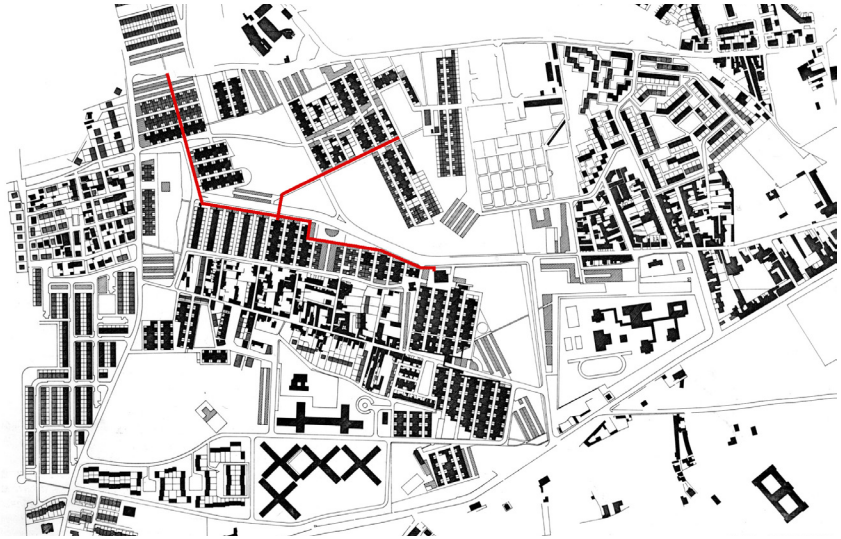


Figure 5.1 (top) Residents inhabit the service 'aqueduct'
Figure 5.2 (bottom) Plan of development showing the service 'aqueduct' as a spine tying the site together

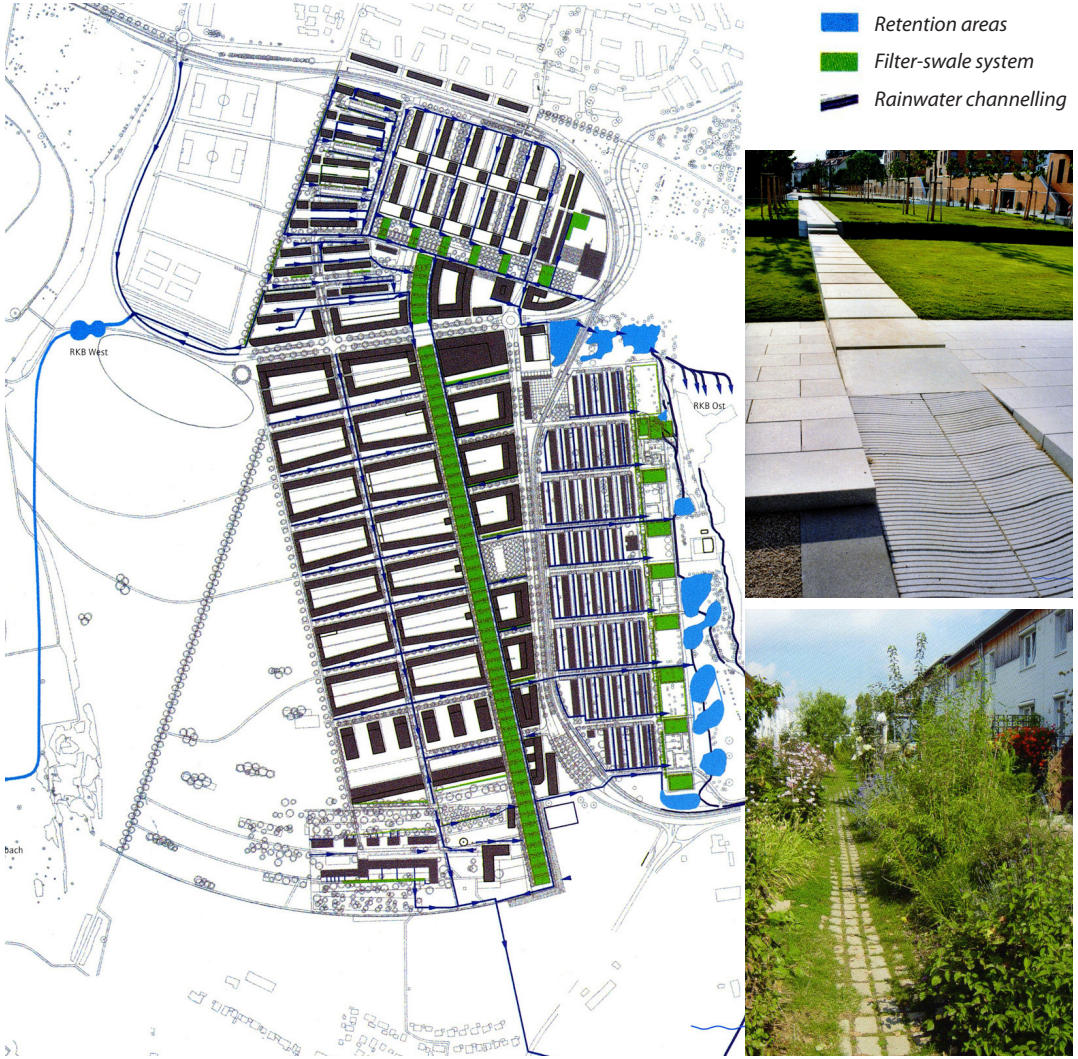


Figure 5.3 (above) Plan of the development showing the movement of rainwater and the landscaped 'backbone'
Figure 5.4 (top right) Water infrastructure doubles as pathway
Figure 5.5 (bottom right) Path in garden is also a pervious channel for rainwater

Case Study: Rainwater Management Systems

Scharnhauser Park - Ostfildern, Germany
Designers: Janson + Wolfrum

Scharnhauser Park is a project that integrates new housing, public recreation and rainwater management on a 150 hectare park was the site previously used as US military barracks. Located on a slope, a landscaped 'spine' of stepped gardens and pathway infrastructure serves as a backbone for the housing development. Instead of diverting stormwater to the sewer system, the site employs water infrastructure that channels it through the housing development to retaining pools for purifying the water before releasing it into the surrounding landscape. Also throughout the development, swales and permeable surfaces infiltrate water locally.[2]

The water infrastructure on this site is not a hidden feature, but serves to visually tie the site together. The infrastructure of each system serves not only the purpose of water collection and infiltration, but defines important public spaces.

Case Study: Harvesting Rainwater

Zvishavane Water Resources Project -
Zimbabwe
Founder: Zephaniah Phiri

Like many of the farmers in his region, Zephaniah Phiri relies on rainwater to irrigate his farmland. The government, in order to manage water during monsoon rains, had dug large drainage swales across their land. By studying the way water moved, Phiri "realized he could mimic and enhance" the areas where water pooled and collected, to keep the water from draining away or causing erosion.[3]

Using a system of reservoirs, berms and basins, fruition pits and smaller swales, Phiri designed his land's entire watershed to act as a net for infiltrating water before it evaporated. His site system directs water, collects it in cisterns for use in the dry season, and infiltrates water in his fields. These water harvesting infrastructures create microclimates where vegetation and wildlife flourish. Plantings provide a variety of building materials and a diversity of food crops that provide food security if other crops fail.[4]

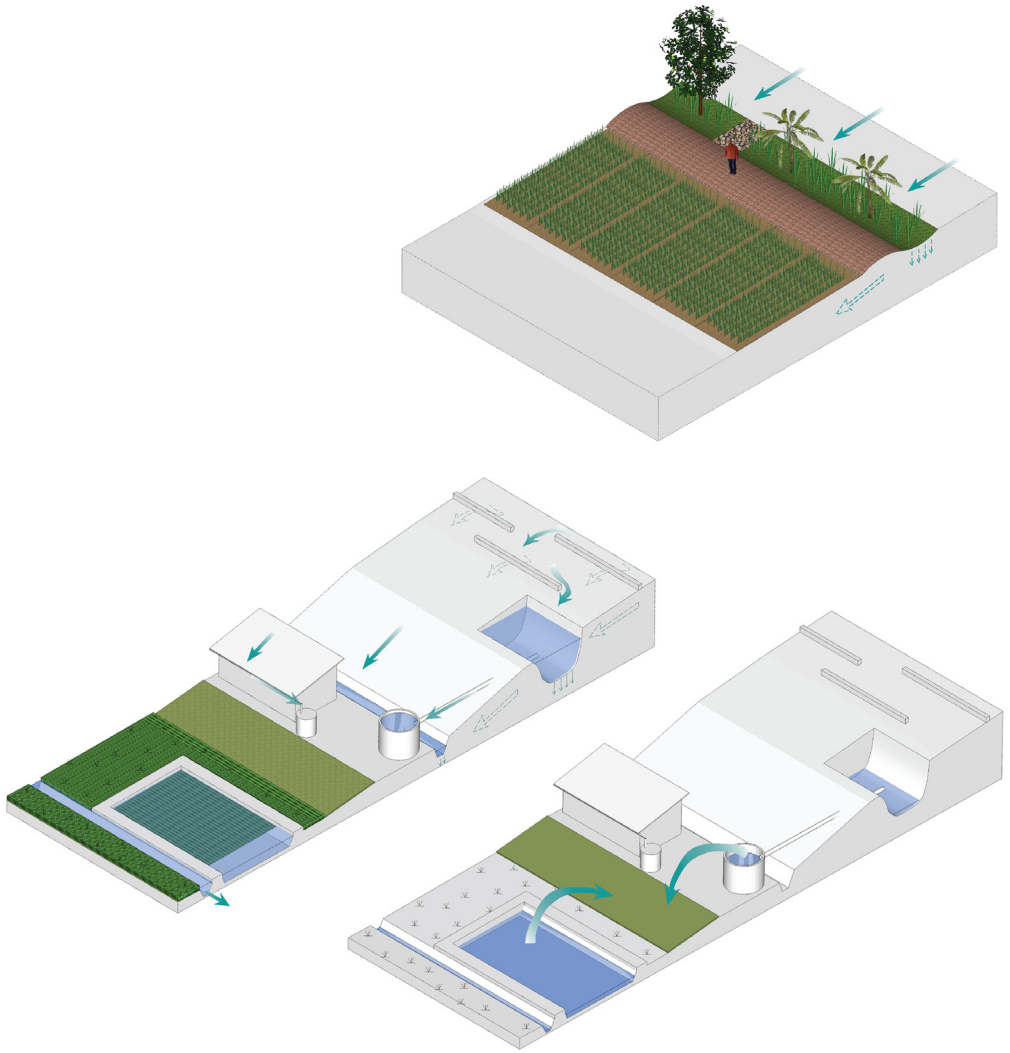
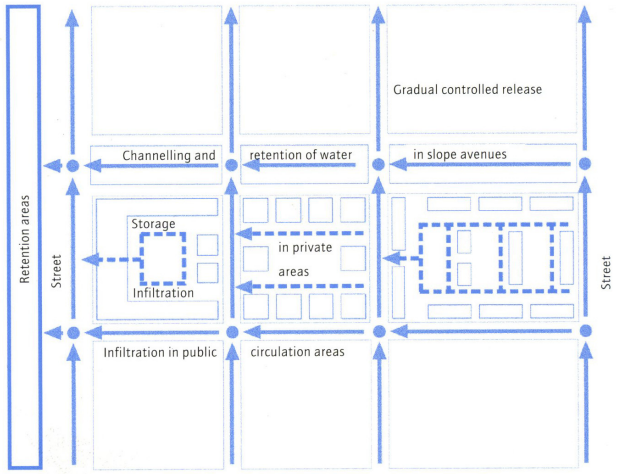


Figure 5.6 (top) Berm and basin infiltrates surface run-off and doubles as a pathway
Figure 5.7 (bottom) Rainwater harvesting site strategies of storing water for use on gardens in dry season



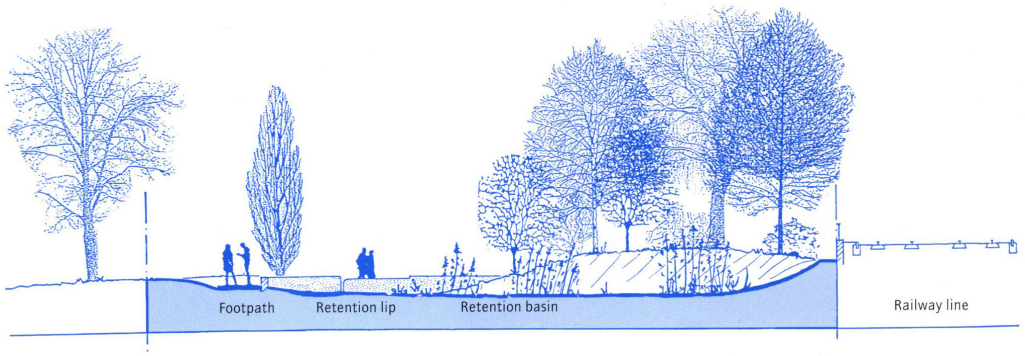


Figure 5.8 (above left) Plan of blocks reveal rainwater strategy of capture, storage, overflow, infiltrate
Figures 5.9 and 5.10 (top right and middle right) Retention terraces in main urban green area.
Figure 5.11 (bottom) Retention lip and basin engage rainwater overflow.

Case Study: Rainwater Retention

Kronsberg - Hanover, Germany - 1997

Kronsberg is a housing development, designed by 30 developers for the World Exposition exhibit in 2000. Housing 15,000 people, the development was to showcase the themes of "humankind, nature and technology."[5]

The project covers 130 hectares, and all rainwater is managed on-site at each scale of private, semi-private and public space. The management strategies are integrated with gardens that promote biodiversity across the entire site. The systems within each scale of space are linked to two urban green areas as well as terraced retention basins that infiltrate overflow. Overflow becomes part of the urban design as "surplus water flows over the concrete retention lips, drawn on the site as civilization lines, and down into the next basin."[6] Like Scharnhauser Park, the rainwater management strategies unify the housing development and form the basis for the settlement's communal public spaces.

Case Study: Urban Patterns + Incremental Housing

Belapur Housing - 1983-86 - New Bombay
Designer: Charles Correa

In all of his third world projects, Correa uses a set of principles: incrementality, pluralism, malleability, participation, income generation, equity, open-to-sky space, and disaggregation.[7] Dealing with urban equity, Belapur Housing is a high density, low-rise new settlement close to the city centre of New Bombay. The problem, Correa identifies in India is that the land one controls is relative to income, never to family size.

In this new settlement, despite the income-level, the plot sizes vary only slightly, from 45m^2 to 70m^2. Variation occurs when the families independently extend their homes outwards and upwards, as their needs change, or their income allows. Setbacks and rules pertaining to openings allow for this incremental growth. Larger open spaces provide room for communal activity and arrange groupings of housing in a hierarchy of spaces.[8]

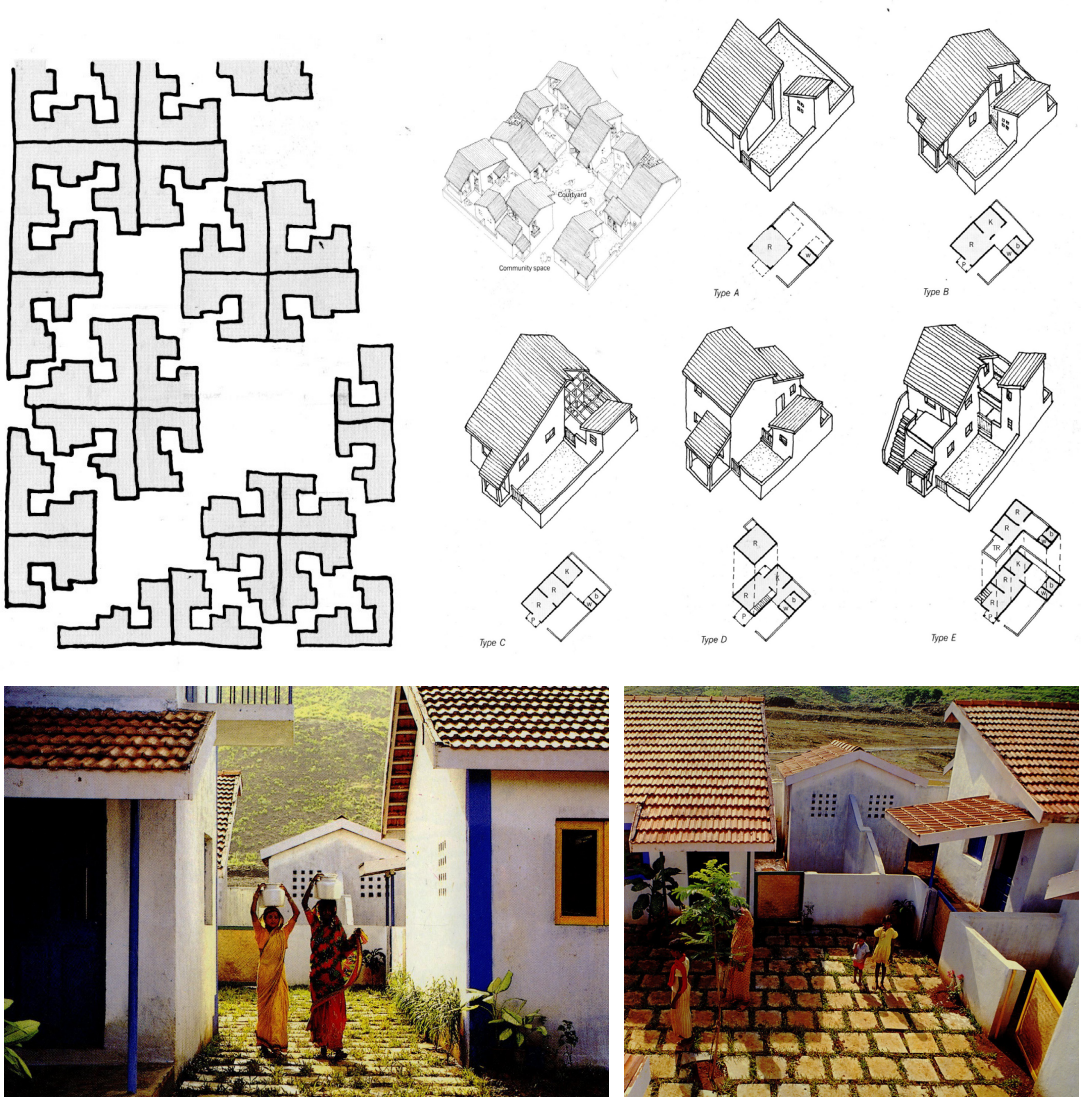
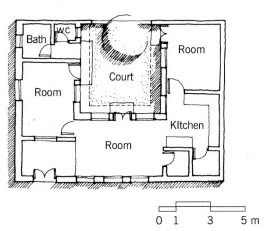
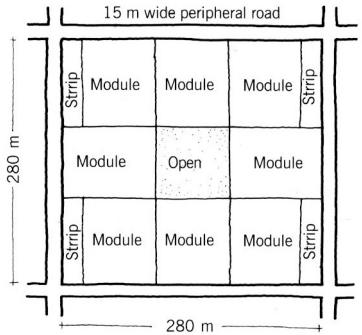
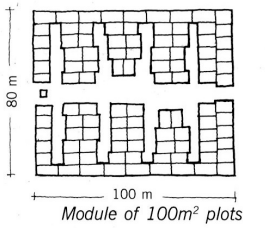
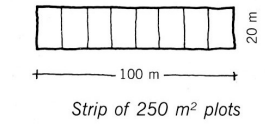


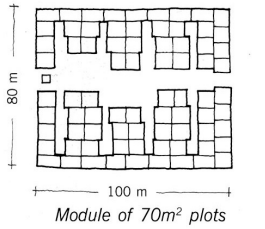
Figure 5.12 (top left) Individual plots combine to create clusters that group around hierarchies of open space
Figure 5.13 (top right) Housing typology allows for incremental building based on income and need
Figure 5.14 and Figure 5.15 (bottom right and left) Semi-private courtyards support communal life











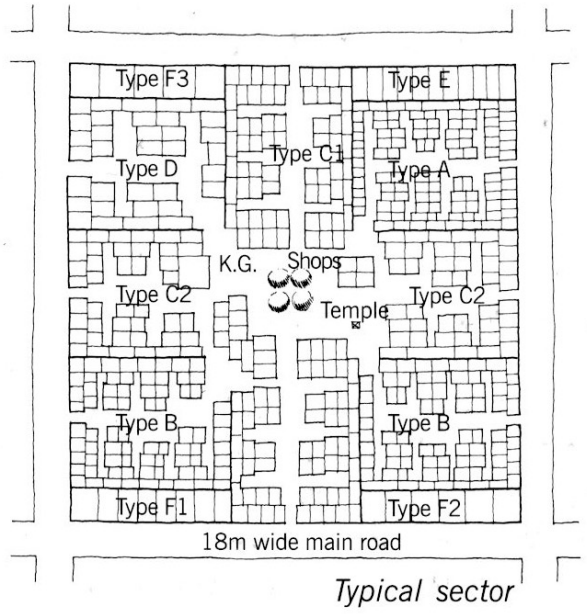


Figure 5.16 (top left) Single basic courtyard housing 'unit'
Figure 5.17 (bottom left) Each courtyard house combines to create 'modules'
Figure 5.18 (top right) Basic 'module' prototype
Figure 5.19 (bottom right) Typical 'sector' includes commercial and social programs

Case Study: Urban Patterns

New Bagalkot[9] - 1985 to present - India
Designer: Charles Correa

New Bagalkot is a new settlement for a population of 100,000 displaced by a dam reservoir project. New block typologies were designed starting at the scale of the plot. Four plot sizes were determined based on income levels, and modules and strips were designed to group each type of plot size/income level. The modules were then arranged into sectors that mixed the different modules to allow for a mixing of income groups and avoid "the cruel segregation of income groups and classes found in most 'planned' Indian towns."[10]

This system of arrangement is useful for the thesis design intervention. However, it assumes that families who want to live as neighbours, are in the same income group. Instead, this thesis design intervention will first assess the clusters of families as the module, and then poll the income levels and determine the plot sizes that will be included in each module/plot configuration.

Case Study: Incremental Housing

Quinta Monroy Housing Project - 2002 - 2005
Iquique, Chile
Design Team: Taller de Chile

This housing project was part of a pilot program designed to address new housing policies. The new policies, put in place by the Chile-Barrio national upgrading program, reduced housing subsidies. The challenge of the pilot program was to work with the reduced subsidy and still be able to purchase land and design a structurally safe home. The design team worked with 93 families in an illegal settlement, to develop this housing project on the same site.

The new housing "had to enable occupants to easily build additions as they could afford them."[11] A "parallel housing typology" was developed that enabled residents to build vertically while taking advantage of the dividing walls of neighbouring units. Housing was designed in U-shaped clusters that defined a hierarchy of common spaces, parking, roads and walkways.[12]

Figure 5.20 (top) Rendering of perceived community life within the new settlement
Figure 5.21 (bottom) Families have begun to fill in the area between units to create additional rooms

Figure 5.22 (top) Existing housing in Tijuana is innovative
Figure 5.23 (bottom) Scheme developed by Cruz that employs prefabricated steel frames on which to build houses with recycled materials

Case Study: Incremental Housing

Manufactured Sits Project - ongoing
Tijuana, Mexico
Designer: Teddy Cruz

Teddy Cruz, a San Diego based architect, has developed a new approach to housing strategies for Tijuana's informal settlements. Extensive local studies of flows of manufactured goods, people, and recycled materials across the US/Mexico border are the starting points for looking at the existing complex housing arrangements.[13]

Contrary to the mini-American suburbia that some developers build for low-income residents, Cruz has developed a stable prefabricated frame to support the recycled materials. It "could be the first step in the construction of a larger scaffolding that would help strengthen the otherwise precarious terrain, without compromising the temporal dynamics of these self-made environments."[14] The frame is just one part of a larger dialogue that challenges current planning and zoning practices that exclude marginalized people in Tijuana.

06

Incremental design strategy: Water as Agent

Like other urban IDP camps across Northern Uganda, Industrial Camp in the town of Gulu will become a permanent settlement within the urban core. At least 60% of these displaced will continue to live here and work in the city, putting the long term population of the camp at 8,000 people. To continue forward with the existing relationships described in the analysis would be detrimental to the natural environment and prevent the displaced people from prospering.

This thesis argues for a rethinking of these relationships by proposing an incremental design strategy that generates a new social and economic realm through the harnessing of water resources. This is achieved by synthesizing the urban fabric and landscape patterns, following the same layers that were analyzed.

A synthesis is proposed between social program and water delivery infrastructure, water resource management and water harvesting infrastructure, and agricultural production and water harvesting infrastructure. Further developed at the scale of the block, the design shows how water collection (harvesting infrastructure) can form the networks and open spaces around which housing clusters.

In conjunction with spatial organization and social and economic programming the design argues for a new system of ownership that recognizes both the communal nature of housing, as well as an individual family's need for growth as resources allow.

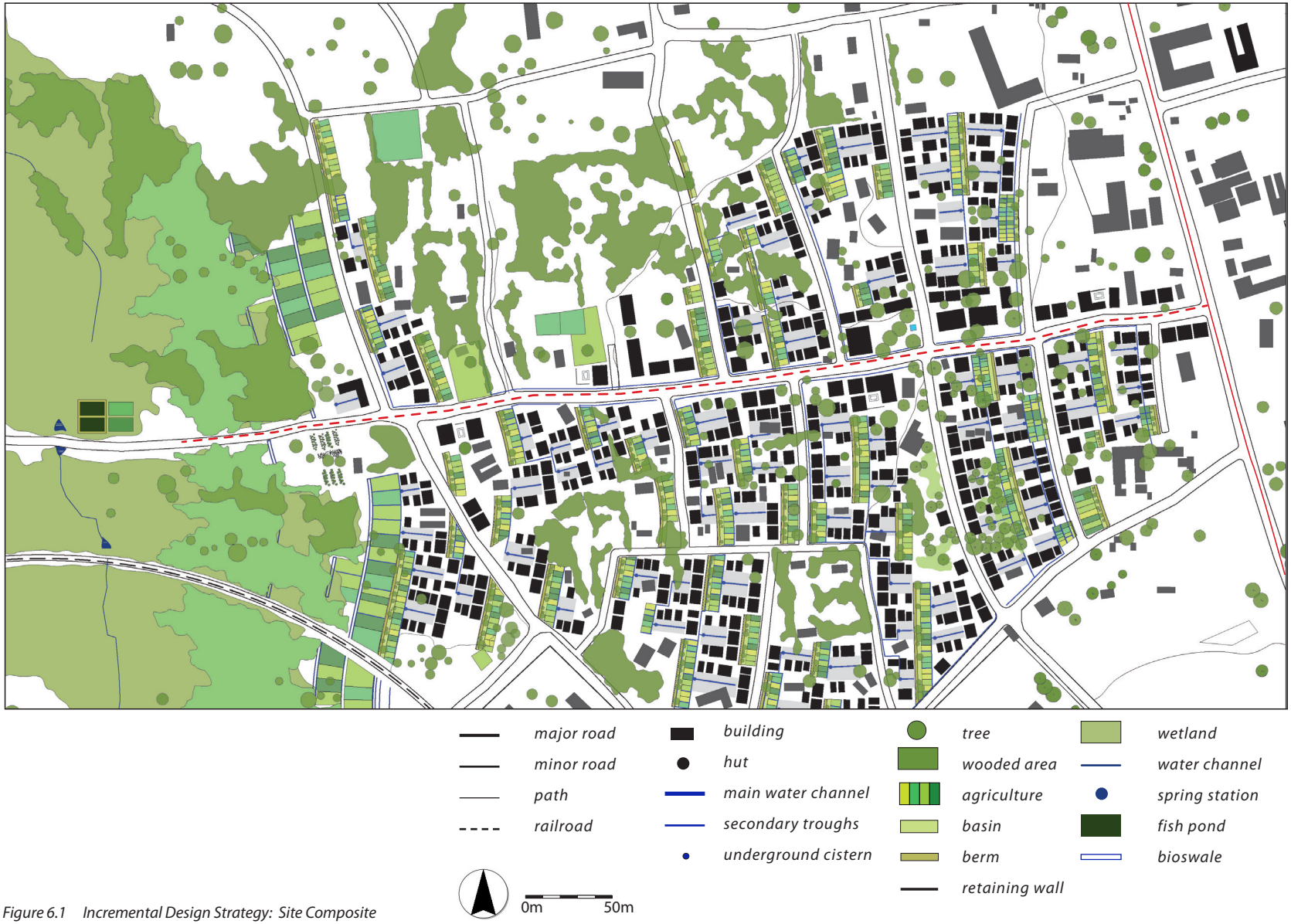
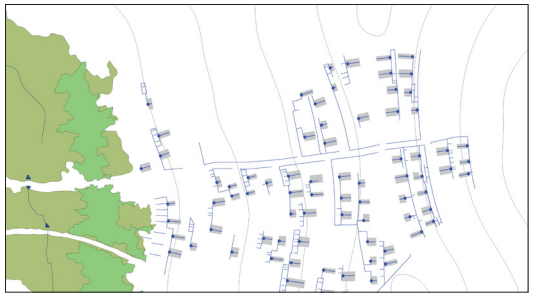
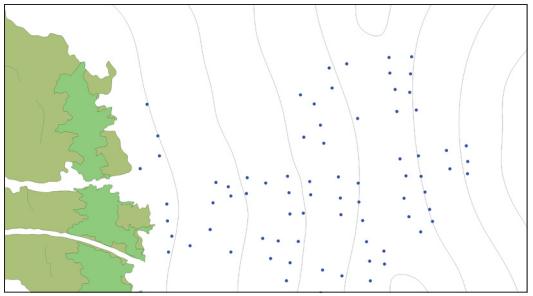


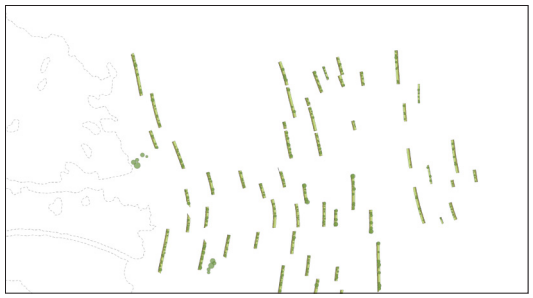
Figure 6.1 Incremental Design Strategy: Site Composite



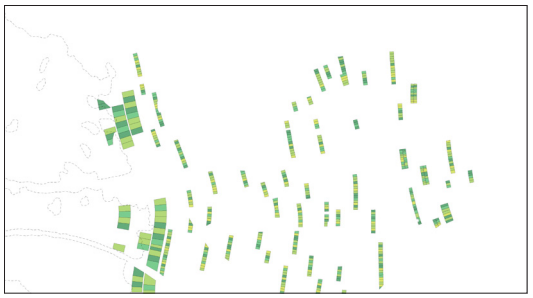
Water Harvesting: Rainy Season



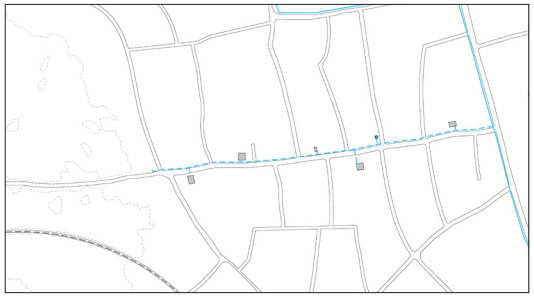
Water Harvesting: Dry Season



Landscape



Agriculture



Road Networks

Buildings

Figure 6.2 Incremental Design Strategy: Networks and Site Systems

Design Overview

Water Harvesting Infrastructure: A system of catchment areas, cisterns and troughs are employed to harvest surface run-off in the rainy season. This water is stored for irrigation use in the dry season.

Landscape: Berms and basins placed on contour will harvest and infiltrate water while providing microclimates within the greater system.

Agriculture: Plots will align in conjunction with the berms and basin to provide an alternative to farming in the wetland.

Road Networks: Instead of following the Colonial grid, new roads will follow the contours to aid in the water harvesting strategies. The main existing road on site will become a social spine for delivery of potable water and an intensification of program.

Buildings: New housing will attempt to maintain the existing communal cluster structuring.

Site Scale: Social Program + Water Delivery Infrastructure

The main axis road existing on the site will become the spine for both the main social programs on the site and the axis along which potable water will be delivered.

Water delivery infrastructure extends from the existing water line along Gulu Town's main road. A water tower at the top of the hill will store the water and continue to distribute it along the Water Delivery/ Social Spine.

This Spine contains not only programs related to the delivery and distribution of water, it also generates a commercial and social corridor of program. (See diagram on facing page). It plays a similar role as the main artery that runs through Gulu, connecting all of the social infrastructure in the city.

Secondary roads link this main axis Spine to the city. These new roads do not follow the Colonial grid, but are laid out on contour to facilitate water infiltration at specific local points, instead of draining surface water off of the site.

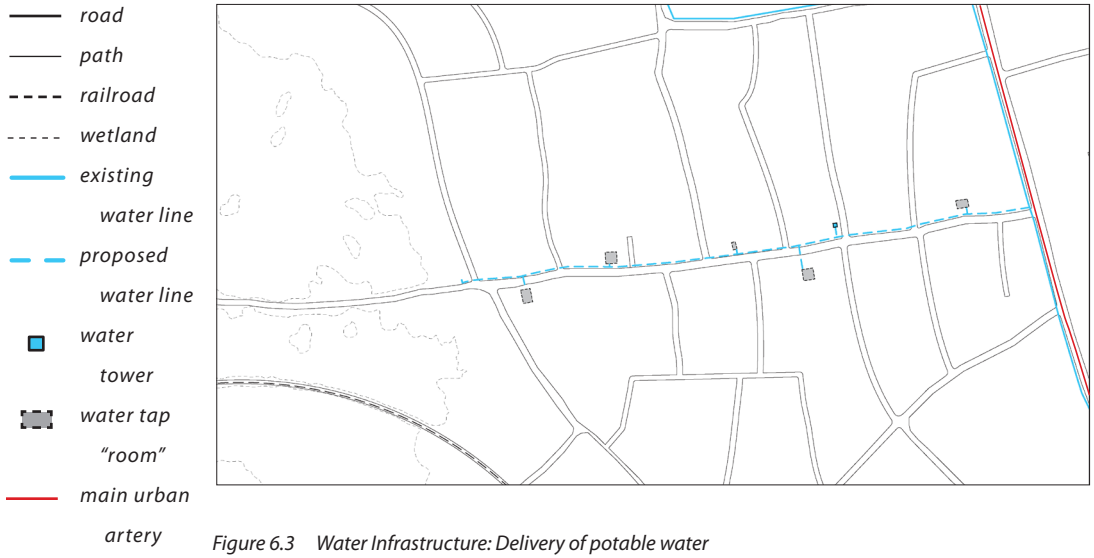


Figure 6.3 Water Infrastructure: Delivery of potable water

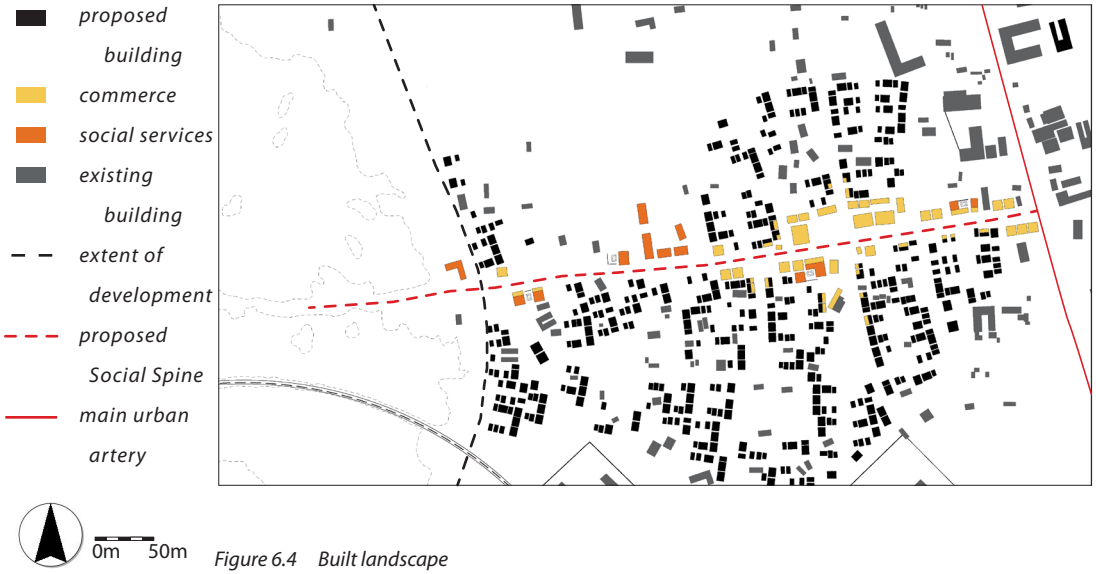


Figure 6.4 Built landscape

Figure 6.5 Water Delivery/ Social Spine: social programs are linked along the water delivery axis

Water Tower "Hub"

The water tower, taller than the buildings and trees, is a source for orientation on the site. It also indicates the presence of a market area below. The space around the water tower generates a "hub" of both commerce and communications. The market is a place where produce from the gardens on the site can be sold. This "hub" brings other residents of Gulu Town to this neighbourhood, to purchase and exchange, and a dialogue is created that didn't exist before.

Water Tap "Room"

The tap rooms are where the water from the water tower surfaces for distribution. These rooms are different than the open market area; they have a more private atmosphere and support a social program targeted towards women. Women are the primary water collectors in this society. The tap room has spaces for informal gathering, as well as rooms for women co-ops to meet and organize themselves.

Water is purchased at the price of the piped connection. Maintenance costs are paid through the advertising space on the billboards of the water tower.

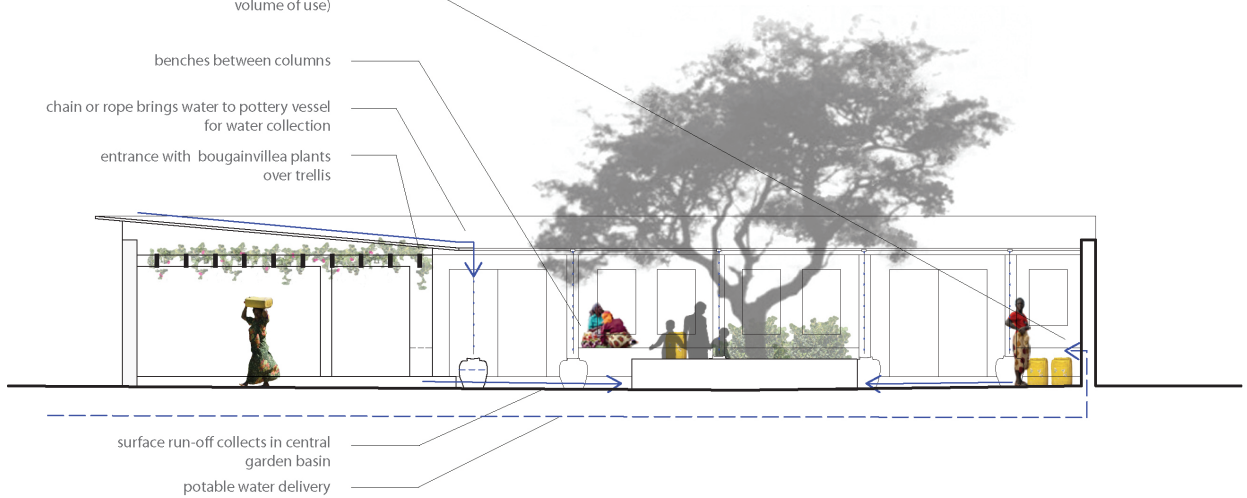


Figure 6.6 The tap "room" is an oasis away from the main road where women can gather together and share with each other

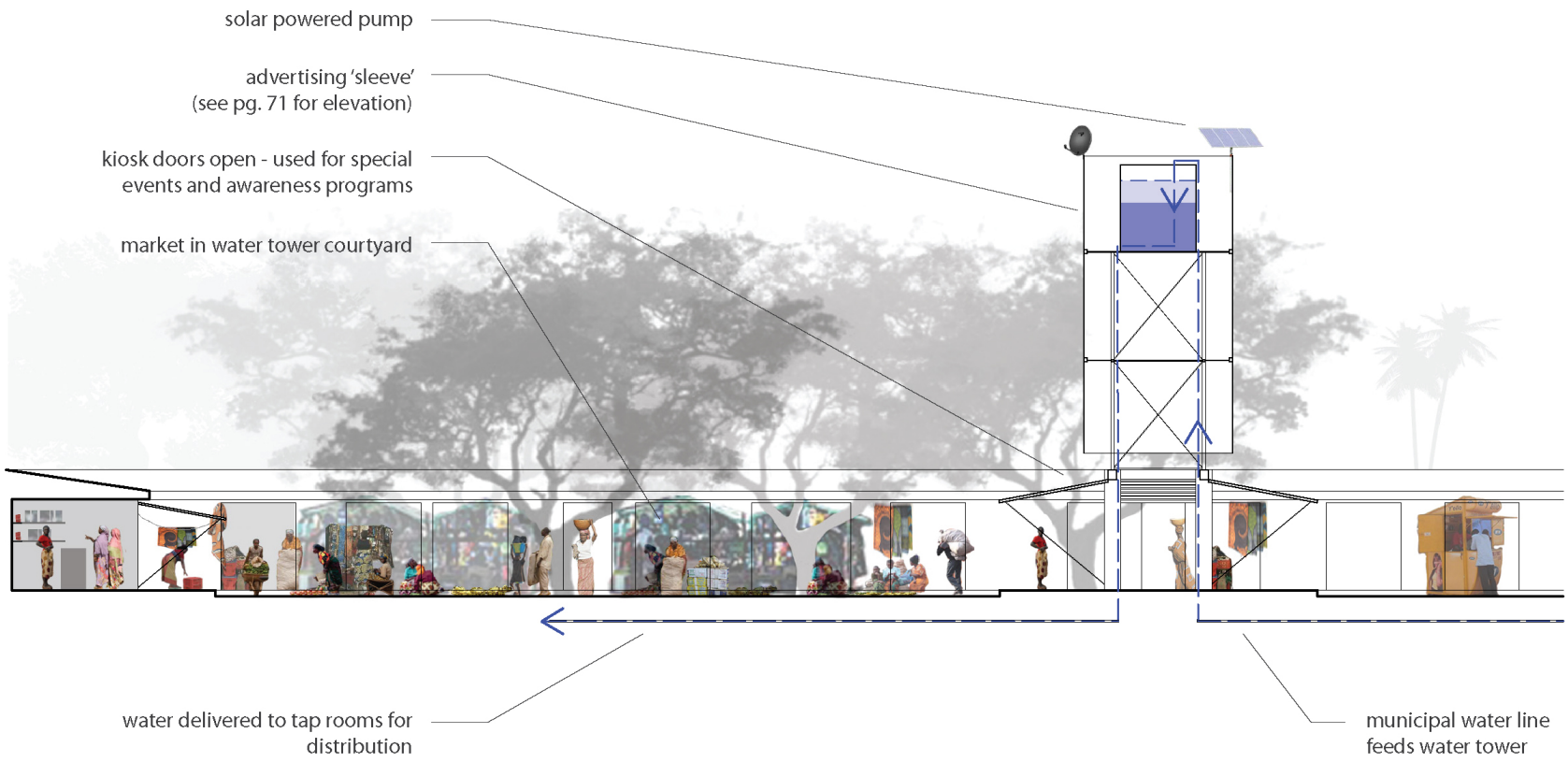


Figure 6.7 Water tower acts as a kiosk in the market square of the "hub"

Site Scale: Resource Management + Water Harvesting Infrastructure

Wetland Zones

The wetland area is divided into three zones: Nature Reserve Zone, Buffer Zone, and Community Zone.[1] One of the goals of harvesting water uphill on the site, is to limit the number of people accessing water from the wetland.

Rainy Season

A network of corridors carry water across the site during the rainy season. The corridors are troughs that connect patches of catchment areas to underground storage cisterns. The troughs and cisterns are diagrammatically depicted as full of water.

Dry Season

In the dry season the water is stored as a resource in the cistern. The stored water is used to sustain the garden plots throughout the year.

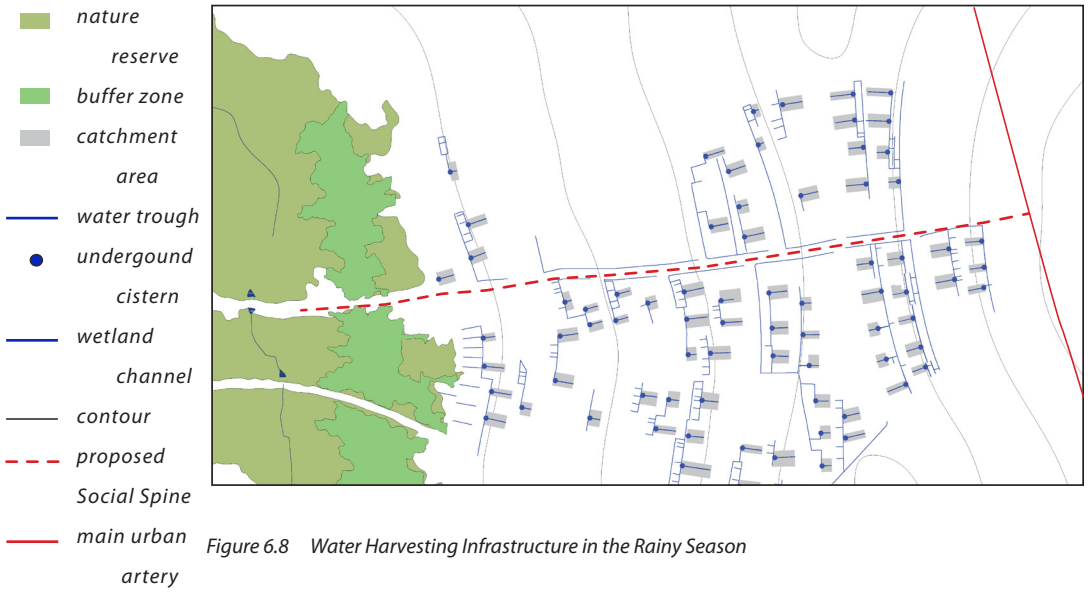


Figure 6.8 Water Harvesting Infrastructure in the Rainy Season

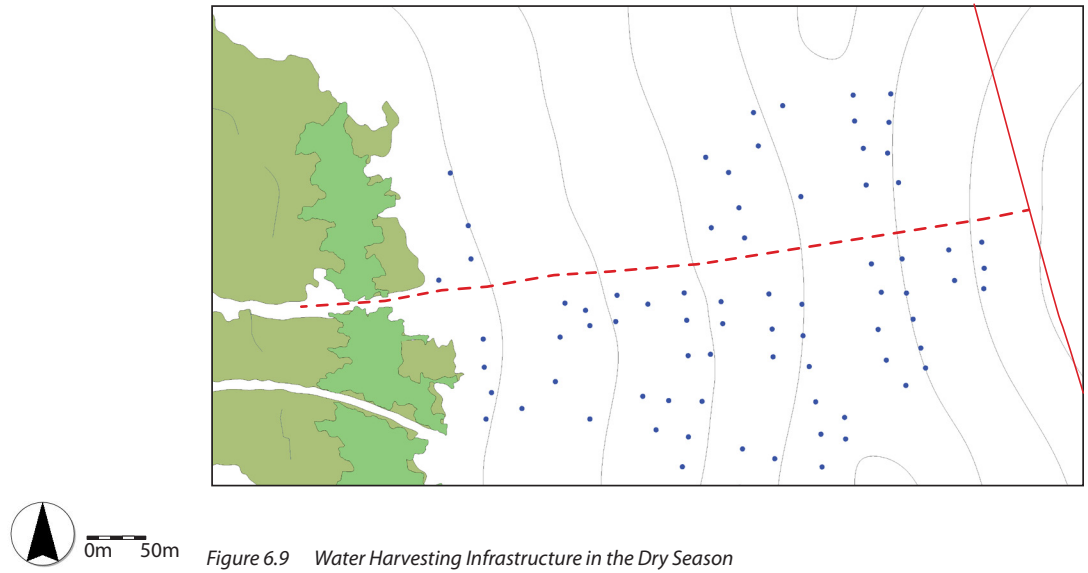


Figure 6.9 Water Harvesting Infrastructure in the Dry Season

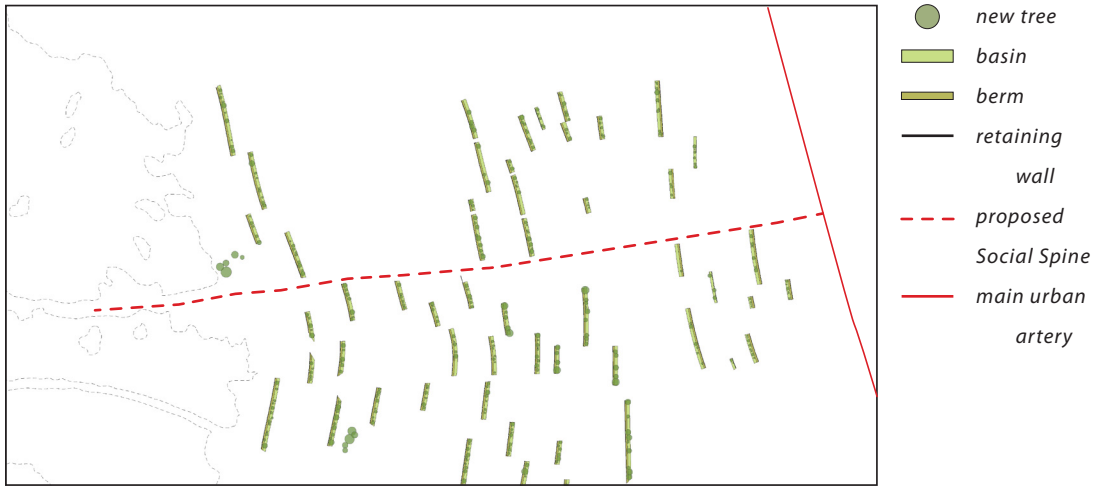


Figure 6.10 Landscape: Retaining walls, berms and basins stop and infiltrate surface run-off

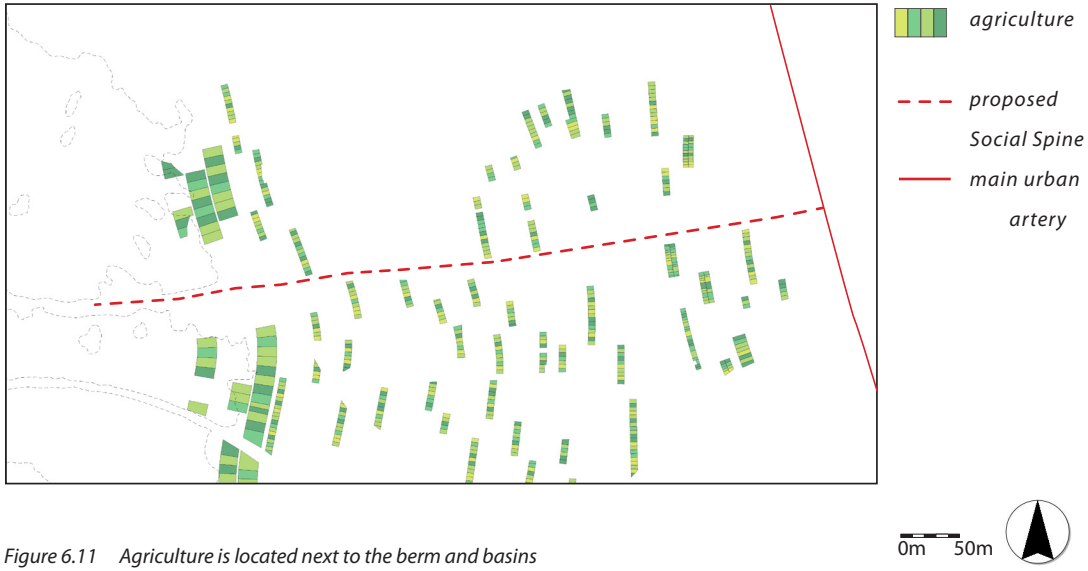


Figure 6.11 Agriculture is located next to the berm and basins

Site Scale: Agricultural Production + Water Harvesting Infrastructure

As mentioned above, capturing rainwater on the contour enables the water to infiltrate into the soil locally instead of directing it to drain into the wetland.[2] The infrastructure used for infiltration is a 'berm + basin'. The soil removed to create a basin is piled on the down-slope side to form a berm that stops rainwater as it flows on the surface. A stone retaining wall prevents the berm from washing away. The presence of the 'berm + basin' enhances the performance of agriculture on the site, prevents erosion in strong storms and helps to keep valuable top soil from washing away. The basins become important areas where fruit trees, grasses for thatch and other useful plants can grow.

Instead of draining the wetlands for unregulated agriculture, garden plots are integrated into the design of the site. Communal plots in the Community Zone at the edge of the wetland signal the edge of the site development and the beginning of the wetland.

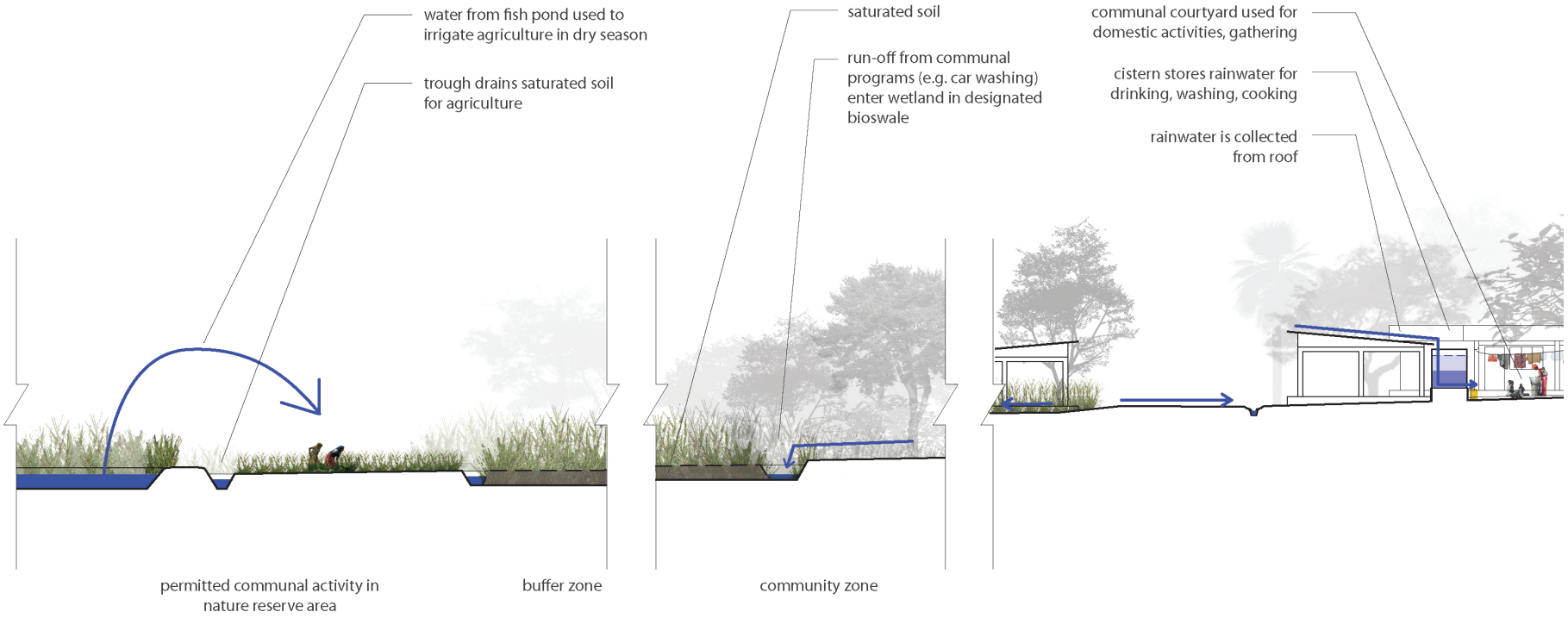
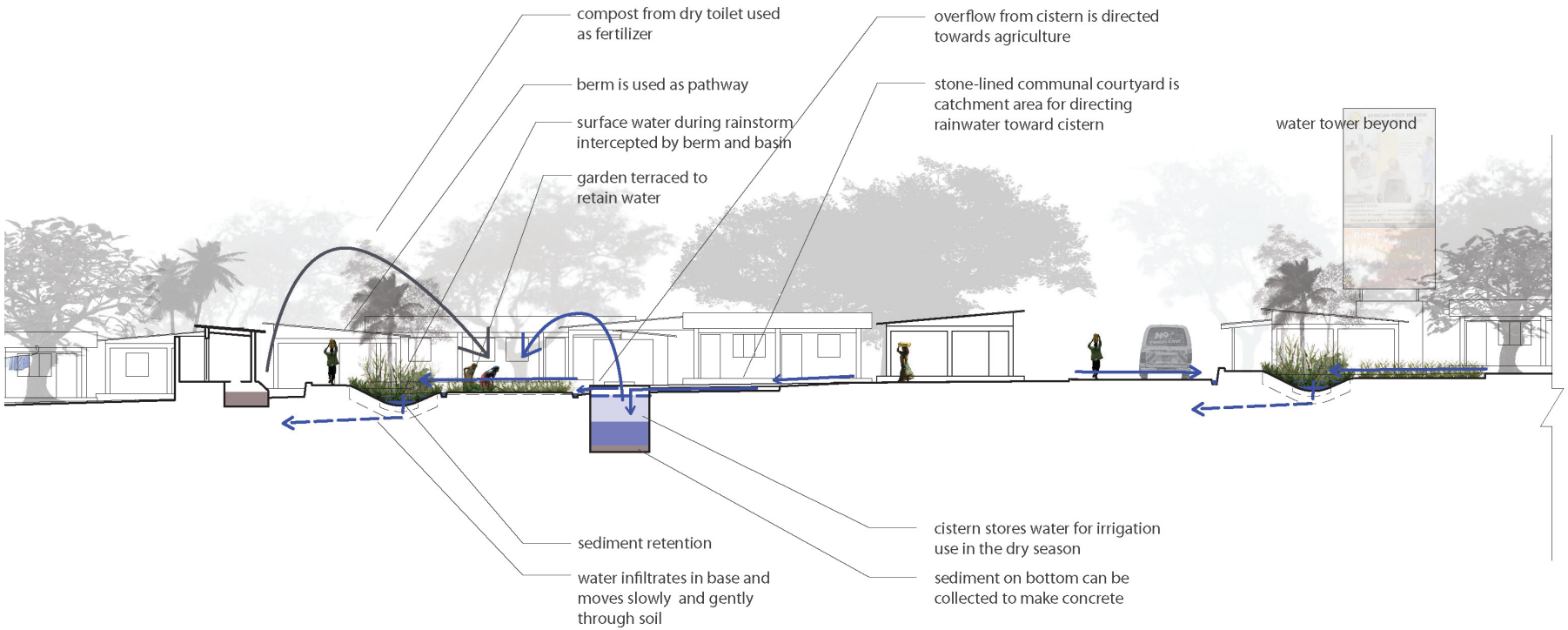


Figure 6.12 Incremental Design Strategy: Implemented together, these systems and networks support co-dependent programs. This segmented site section depicts conditions in the rainy season when water harvesting infrastructure is at work


compost from dry toilet used as fertilizer
berm is used as pathway
surface water during rainstorm intercepted by berm and basin
garden terraced to retain water
overflow from cistern is directed towards agriculture
stone-lined communal courtyard is catchment area for directing rainwater toward cistern
water tower beyond
sediment retention
water infiltrates in base and moves slowly and gently through soil
cistern stores water for irrigation use in the dry season
sediment on bottom can be collected to make concrete

Block Scale: Basic Block

The scale of one block enables a closer look at how the new networks and patterns affect the housing formations and everyday lives of the residents.

The block scale will be discussed first as a basic block, then as a specific block that evolves from this basic block formation.

Figure 6.13 Key Plan: location of study block

Figure 6.14 Detail of the Basic Block tuned to specific existing site conditions

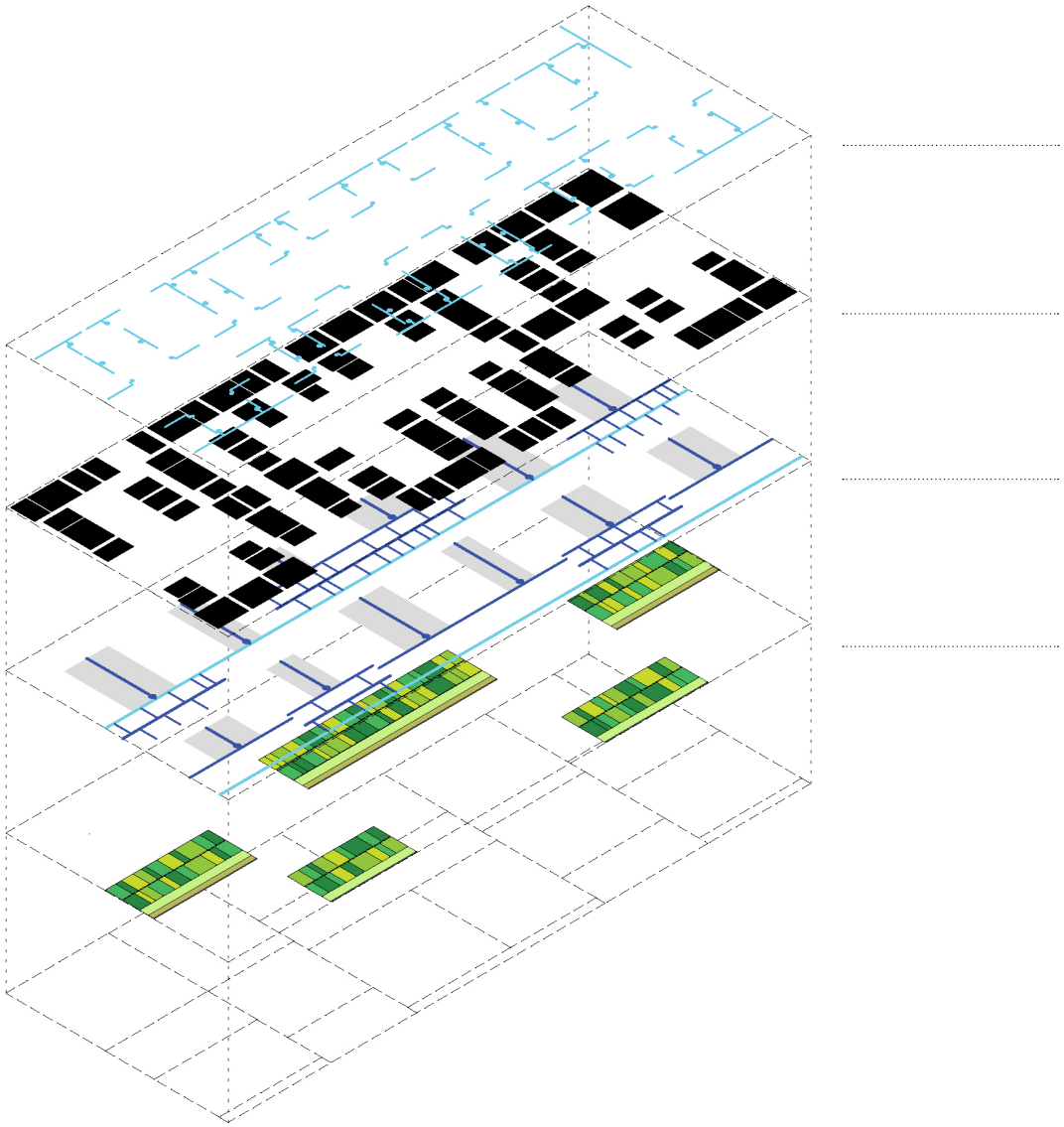


Figure 6.15 The Basic Block is 'unloaded' to reveal the specific strategies in each layer

Basic Block Unloaded

Water Collection - Roof: All roofs slant towards the inner courtyard where above ground cisterns collect rainwater from eaves-troughs.

Housing: New homes cluster in an U-formation around an inner courtyard. Housing types and plot types allow for different sizes and incomes within each cluster of families.

Water Collection - Ground: The surface of the courtyard is paved with stone slabs to act as a catchment area that delivers water to an underground cistern for storage. Housing clusters around these catchment areas.

Agriculture and Berm + Basin: Communal garden plots are arranged uphill from a berm and basin. The berm + basin catch the agricultural run-off and infiltrate it into the soil. The gardens receive the overflow from the housing catchment area.

Block Scale: Water + Waste Infrastructure

Rainwater Circulation: Ground

The water infrastructure for collecting surface rainwater really is the component that ties the entire block together. Each system at the communal plot scale feeds into the larger system at the block scale. The communal courtyards are catchment areas that store water in an underground cistern at the lowest point. Overflow from the cisterns is always directed towards agriculture or the basin. The water channels and troughs range in scale from the large channels across the entire site, to the fine grain troughs that people extend into their gardens.

Rainwater Circulation: Berm + Basin

The berm works with the basin to capture all run-off from the agriculture. This prevents any site contamination if fertilizers are used.

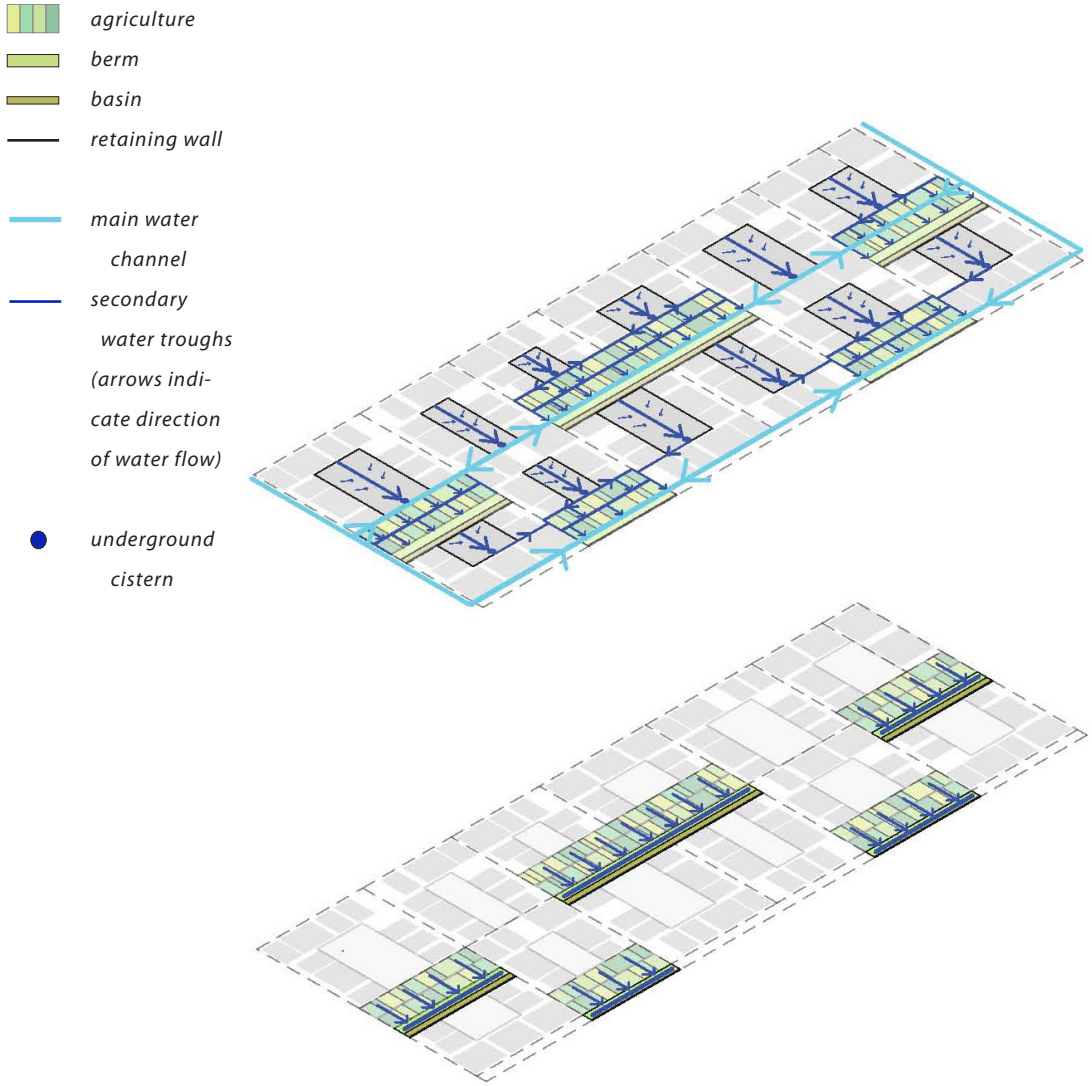


Figure 6.16 (top) Troughs direct water to underground cisterns for storage. All overflow is directed to agriculture
Figure 6.17 (bottom) The berm and basin collect, purify and infiltrate all water run-off from agriculture

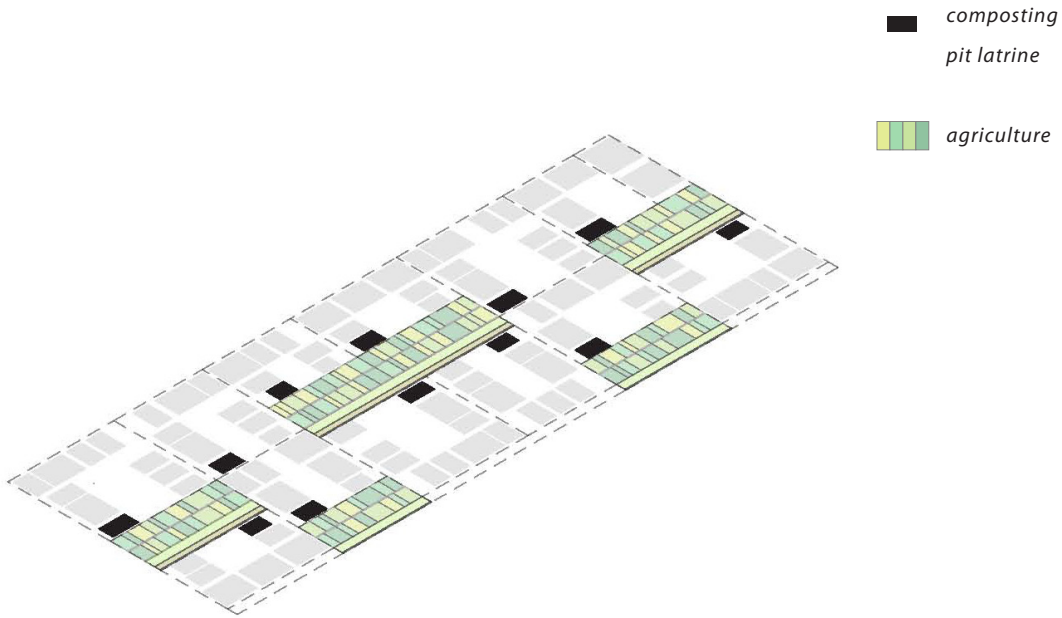


Figure 6.18 All latrines are located next to agriculture as the waste is composted and used as fertilizer

Composting Pit Latrines

Instead of digging deep holes for pit latrines on the site, composting pit latrines will be used. This latrine sits above the ground, reducing the risk of groundwater contamination. Ash is thrown on top of human waste, increasing alkalinity until it kills pathogens. After several months, the composted material is safe to use on the garden plots.[3]

Figure 6.19 A composting pit latrine is vented, and raised above the ground to provide access to the vaults below. The metal sheet heats up and aids decompostion

Block Scale: Built Realm

Ownership

Each family privately owns the sub-plot that their house sits on. This ownership is slowly worked towards through a rent-to-own program established with partnering NGOs. The sanitation facilities and catchment areas/courtyards are communally owned by the families on the communal plot. The agriculture plots are allocated to each family as a block strategy.

Pedestrian Circulation

Pedestrian movement on the block still maintains a sense of being able to infiltrate and move freely across the site. The berms become well-used pathways that traverse the site like an interior laneway. The berms are low enough that pedestrians can conveniently get on and off of the berm-path.

In the diagram, movement is intensified on the right side of the block, indicating a higher concentration of pedestrian movement and activity along the Social 'Spine'.

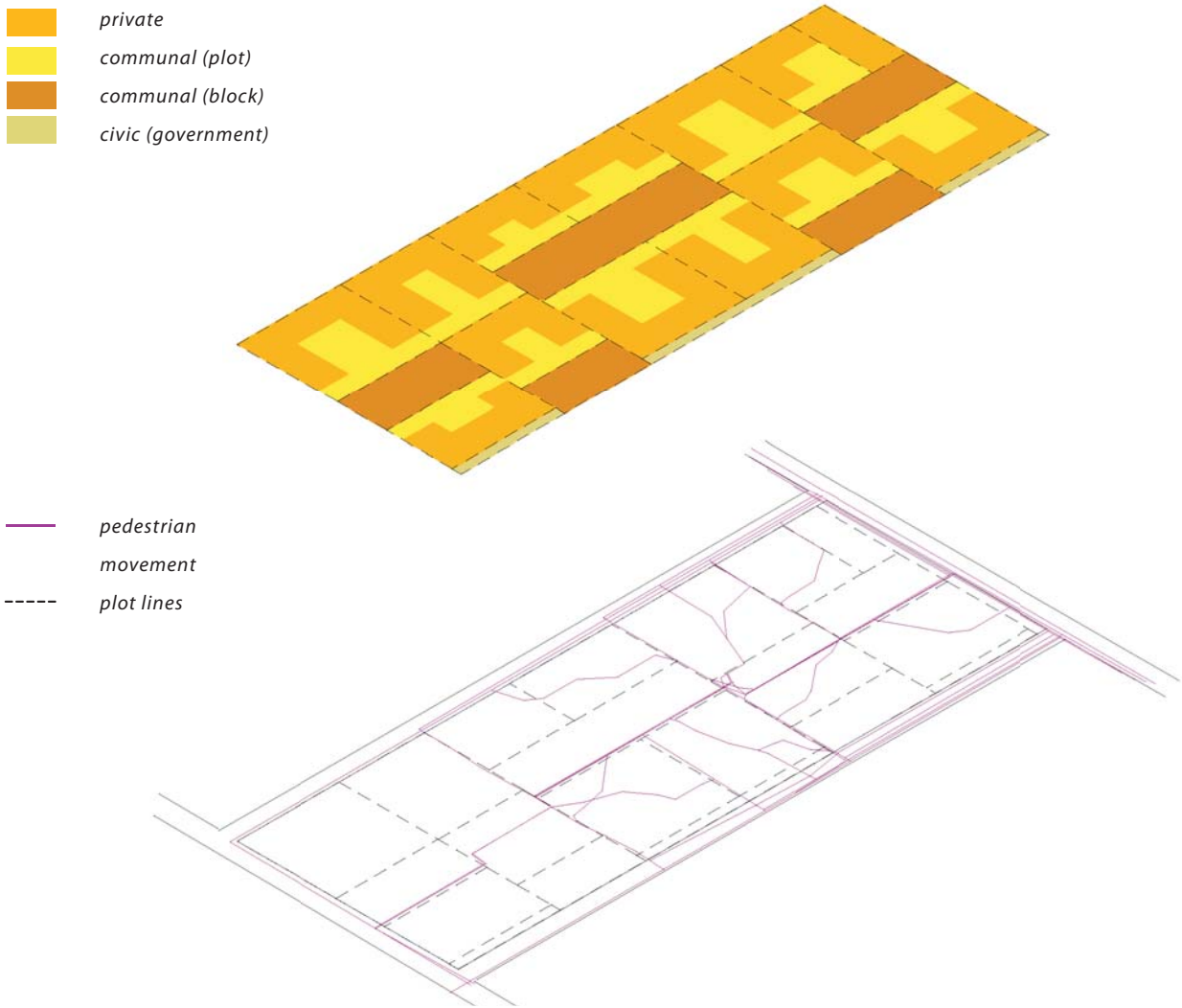


Figure 6.20 A range of ownership are proposed, from communal/public to private
Figure 6.21 Pedestrian movement is more condensed on the Social 'Spine' side of the block

Figure 6.22 The berm infrastructure is a corridor - a pathway that connects clusters across the site. Agriculture aligns along this berm, and rainwater and run-off from agriculture infiltrate in the basin next to the berm. The basin is also a resource with fruit trees and construction materials such as thatch grasses, and supports wildlife.

Typologies + Private Plots

The housing types developed for this project are a variation of an existing type in Gulu. Each house has a threshold - an outdoor space for cooking, washing, or gathering. The future expansion shows how this outdoor space can be enclosed as needs or resources arise, or transformed into a shop on the streetfront. There are three different variations corresponding to different income group. This approach acknowledges that within a cluster of families there would be different income levels and spatial needs/desires.

Communal Plot Configurations

In order to increase the flexibility of the basic block, different communal plot configurations are developed for the communal clusters. For example, these two communal plots have the same number of families, in a differing formation which creates a different shape of communal space. The private plots are arranged around a central communal courtyard/ catchment area. One latrine and one bathing room are built for every two families.

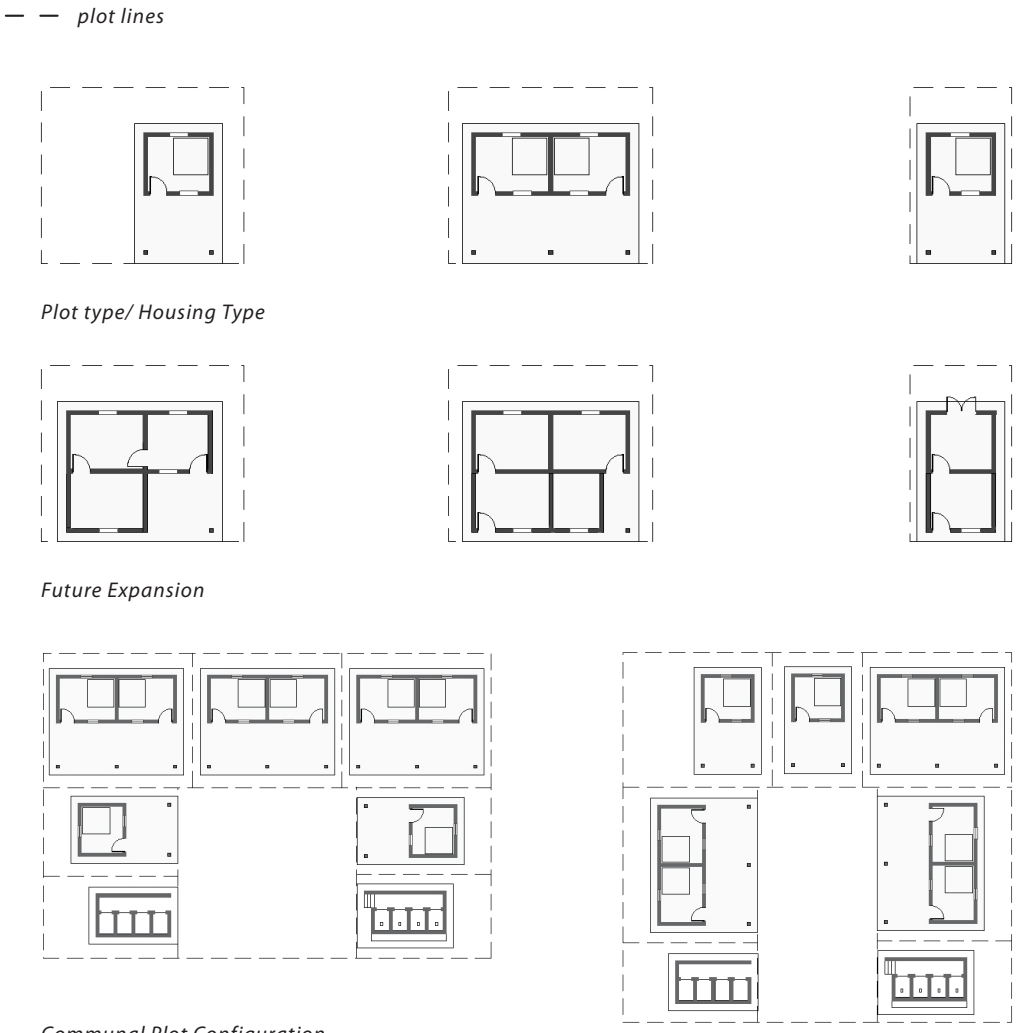


Figure 6.23 Housing typologies and private plot types, showing potential future expansion below
Figure 6.24 These housing types cluster on communal plots around common courtyards which serve as catchment areas

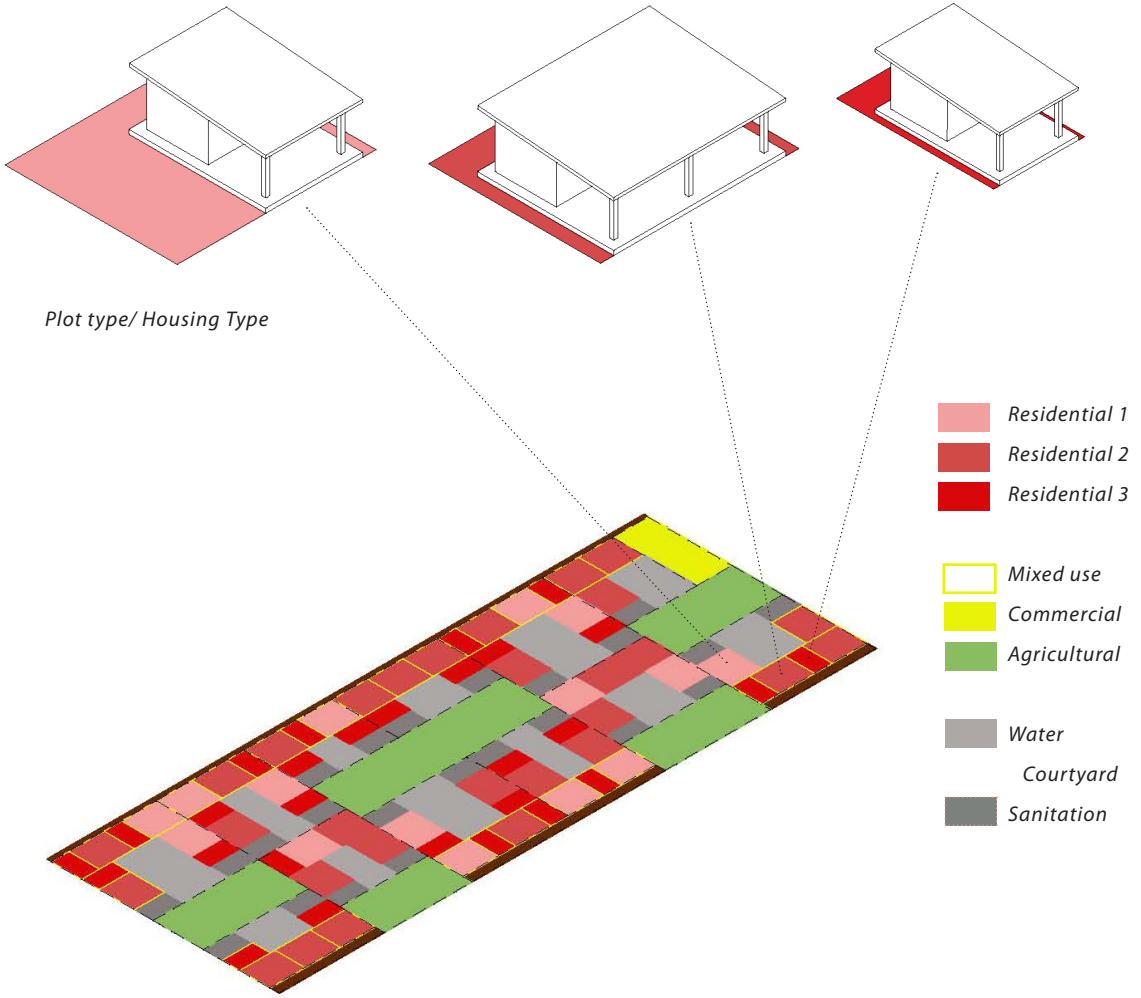


Figure 6.25 (top) Housing typologies on corresponding plot types
Figure 6.26 (bottom) Site zoning depicts a range of housing and plot typologies within each cluster.

Zoning

This diagram shows a range of zones on each communal plot, contributing to a diversity of zones across the site. The mixed use zone corresponds to residential zones that border each edge of the site. The houses on these private plots are able to independently develop shops and businesses on the street front and residential rooms on the courtyard side.

The commercial zone is sold to private investors to build shops while the rest of the site is still undergoing the incremental development. This is to encourage commercial activity on the site while the design phasing is still underway.

Figure 7.1 Implementation Scenario: Displacement Camp (Pre-Phase, see Figure 7.12 for diagram)
The following pages give an example of one cluster's transition from displacement camp to permanent settlement. This image shows the congestion of the camp, and the site drainage running past the doors of homes.

07

Design Implementation

The key to designing in such socially charged situations is to consider design implementation. The design should not be one master plan laid out on every block, but a block plan developed with the people who will be permanently living on that block in the future phases of settlement. The relationships of water infrastructure to corresponding components have been established, now it is time to use that framework to structure the future living arrangements of specific clusters of families. Therefore, the design that gets implemented is a pre-planned design, formulated to meet the requirements of each block, and will be entirely different from block to block.

To begin, this is an ambitious project that requires commitments from a broad ranges of actors. As indicated above, the approach to block design and implementation of that design is a bottom-up approach, meaning the clusters of families influence the design decisions. At the same time, the design is also a top-down approach, as the local government is involved in implementing the design at the site scale. In general, the actors are the local government (including the local council) and the non-governmental organizations (international, local, and church-based organizations). Other actors, such as donors, are linked specifically to either the government or NGOs (or both in some circumstances).

The first step in implementation is to establish a Program under which all of the proceedings will take place. The Program will be created under the umbrella of the local government and managed by a committee with representatives from the government, all NGOs involved, and leaders in the local community, both from the camp and from other communities in the town. There will be two co-chairpersons, one from the government and one from a prominent NGO in Gulu (e.g. Oxfam).[1]

Figure 7.2 Implementation Scenario: Water Channels & Troughs (Phase 2, see Figures 7.16, 7.17 for diagrams)
Water channels collect rainwater for storage in an underground cistern (see how the woman in the background is drawing water from the cistern). Other channels direct overflow from the cistern, to agriculture. The hut in the foreground of Figure 7.1, was removed to make way for a channel. The family living in that hut would have shifted to a vacant hut, or returned permanently to the village. In other areas, the channels easily slide between the huts. Topsoil is brought in and the area where the hut used to be becomes a garden that is irrigated by the stored rainwater. The garden supplements nutrition or becomes a source of income.

Role of the Local Government

The local government will oversee certain components of the design that affect the community/camp as a whole. These are components that would be looked after by the government's existing ministries. The local government can solicit the central government for funding to complete these projects. For example, the government will administer the contracts for surveying the site, constructing the roads, extending the water lines, building the water tower, constructing the market buildings, administering permits to vendors, constructing the tap "rooms" complete with water connections and tap stands, and selling commercially zoned land to private investors along the Social Spine.

Initially, the government's most important role will be to negotiate the land on which the camp is situated. This design assumes that all of the land will be purchased by the Program before any action is taken. This is because of the desire to prioritize land ownership for the displaced people. Considering the state of land disputes in Uganda, this will prove to be a long and tedious task. Even contacting the landowners to inform them of the government's intentions will take some time. However, Uganda's government system is decentralized, meaning the local government has more control, for example over the buying and selling of government land which will help to speed up the process. Landowners would be compensated for their land, or a trade for land elsewhere in the town, or even a trade for commercially zoned land on the site of the camp could be made. In some cases, it is possible the landowner lives on the site and is not willing to negotiate. Depending on the block and the needs for housing displaced people on that block, the landowner's wish to stay or keep part or the whole of his/her land, may be accommodated into the plan of the block.

Compensation to the landowner must be made in partnership with the individual NGOs who in turn are partnering with the family clusters. This is because the repayment system, which will slowly replace the money spent on buying the land, will be managed by the NGOs. This management strategy is a long-term responsibility of the NGOs.

Figure 7.3 Implementation Scenario: Housing Build (Phase 3, see Figures 7.18 - 7.22 for diagrams)
Several houses are able to be built as some families leave to return to the village. Their vacant huts are disassembled and housing is built with the help of volunteers. These houses are built specifically for family's that will be living in this new housing cluster in the future. Space is opening up in the courtyard for small-scale business such as bicycle repair.

Role of NGOs (Non-Governmental Organizations)

Each NGO involved in the Program forms a partnership with a cluster, or several clusters of families. As mentioned in the previous paragraph, the NGOs are involved in purchasing the land from the landowners. In fact, these NGOs are responsible for providing the funding for each new communal plot that "their" families will own. Once the land is purchased, the families will continue to pay the same amount of rent they currently pay for the land they occupy, but to their representing NGO instead of to the landowner. The people will understand the rent as going towards the future ownership of their own plots of land that the new housing units are built on, while the NGOs will reinvest the money into other programs.

Once the Program management structure, and initial and anticipated funding is in place, the design of each block can begin. In addition to administering the funds for the construction of each block, NGOs representing clusters of families within the same block must collaborate to develop the design of the block. Each NGO communicates with "their" cluster of families to discover what housing typology and sub-plot configuration each family desires. They would then come together and work on the full block plan to make sure every family is accommodated. These NGOs would receive their information for designing "their" block from the Program guidelines. Iterations of the block design would then be presented to cluster leaders who could relay the information to the families.

Other NGOs could be involved in the Program, without partnering with specific family clusters. The Phasing relies on some families returning to the village in order to accommodate families that are shifted by the construction of each Phase. In order to help facilitate this move, one or more NGOs could take on a 'return aid package' in Pre-Phase B, that includes tools, seeds, and household items to help families resettlement in their home villages. One of the deterrents to returning is the lack of resources in the village area. The Program could also communicate with other NGOs who may be instrumental in re-establishing social structures and institutions in the rural villages, to encourage people to return.

Figure 7.4 Implementation Scenario: Housing Build (Phase 3, see Figures 7.18 - 7.22 for diagrams)
The huts of families who moved during Phase 3A (Figure 7.3), either into new homes or permanently back to the village, are disassembled to make room for more housing. The central courtyard of the new housing cluster is slowly taking shape. The ground is graded towards the central water trough, and the surface is paved with local stone. The stone surface will prevent muddy conditions in the rainy season, and facilitate the collection and storage of the rainwater.

Developing the Phasing Schedule

The phasing schedule can be found on pages 94 - 97. The implementation phasing is purposely designed in increments in order to slowly transition the transformation of the site. Each phase logically follows the previous stage. For example, with the retaining wall in place in Phase 1a (page 84), soil dug to create the basin for infiltration in Phase 1b (page 95), can be piled against the retaining wall to form the berm on the down-slope side of the basin. The narrow linear components slide between huts and begin to define zones on the site. Each phase causes a small number of families to shift as their huts may need to be removed to complete the phase. It is a low-impact approach to implementation.

Implementing Each Phase

Phasing does not necessarily correspond with specific years, but it does however correspond with the time of year. This is because the phases are dependent on people moving back to the village in order to free up accommodation for the families who are being shifted by the construction of the phase. Any number of circumstances, for example land disputes back in the village, could slow this process down.

Instead of specific years, the Phasing therefore corresponds with the two seasons, rainy and dry, as well as the harvest. The reason for this is explained by the pattern of movement back to the village. In order for an entire family to return and resettle in the village, there needs to be a secure source of food available. To provide this, men often head back to the village earlier to work on clearing the land, build shelter while it is still the dry season and then plant crops at the beginning of the rainy season. The women, children and elderly will then join them after the first harvest. Phasing 1a, 1b, 2a and 2b therefore correspond with these families leaving after each harvest. Other families would leave at different times for different reasons, but the suggestion is that more families would leave at this time. All Sub-Phases in Phase 3 are for building the new housing units. This building would happen at any time in the dry season, as building in dry conditions is obviously more desirable than rainy ones. Each Sub-Phase could possibly occur in the same dry season, as it is dependent on the speed at which each phase of housing is built. When the families move into

Figure 7.5 Implementation Scenario: Completed Housing Cluster (see Figure 7.23 for diagram)
Each home in this cluster has been completed, as well as a latrine building and bathing building. At this point, all vacant huts and old latrines have been disassembled. Notice that one family has enclosed their verandah to create a second room (the woman in the blue shawl is standing in the new doorway). Rainwater is collected from roofs in above-ground cisterns, and surface water is directed towards the underground cistern. The courtyard becomes a communal space for cooking, washing, gathering and celebrating!

their new homes, their huts are disassembled leaving space for the next housing phase to begin construction.

Notes on the Phasing Schedule Diagrams (pages 94 - 97)

1. These phasing diagrams are meant to act as an example of how one block may transition from its current state, into its future designed block. The number of people who "leave" to go back to the village has randomly been chosen. In Phases 1a, 1b, 2a, 2b there have always been enough empty huts for people to shift into to make way for the infrastructure. However, if this was not the case, alternatives, such as the construction of new mud huts would have to be a revision to the implementation process as the process was carried out. Building structures that were not part of the block design, including future housing blocks, was avoided where possible. In other words, all decisions were made with the future block design in mind.

2. Although it is true that some families have already left the camp to return, for the sake of clarity, the phasing diagrams for this particular block begin with the assumption that no families have left yet.

3. When the caption refers to a number of families that "leave", this means they have left the camp to return to their villages.

4. The implementation phasing may seem too calculated (numbering every movement), however, this is meant to be interpreted as accounting for the transition of each and every family from their mud hut to their new housing unit.

5. In most Phases, a loop is shown linking the huts of each cluster so that the development of that cluster can be seen throughout the entire transition.

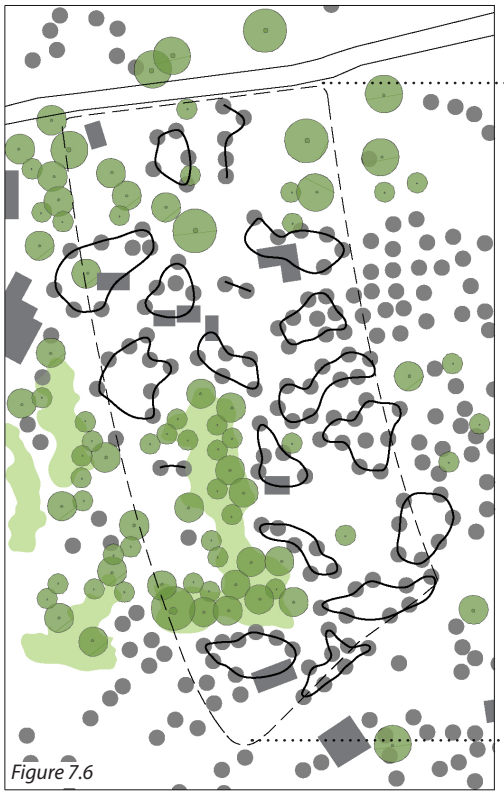


Figure 7.6

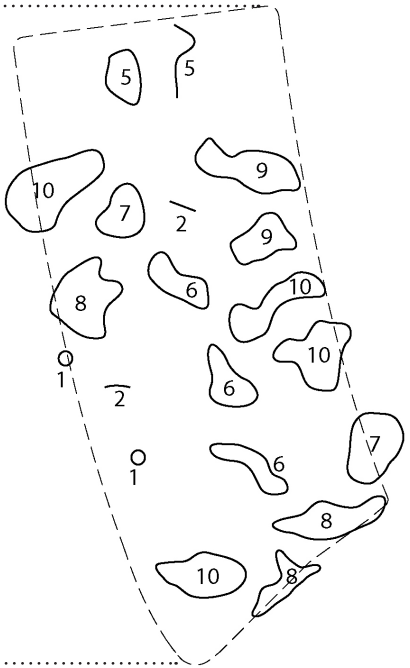


Figure 7.7

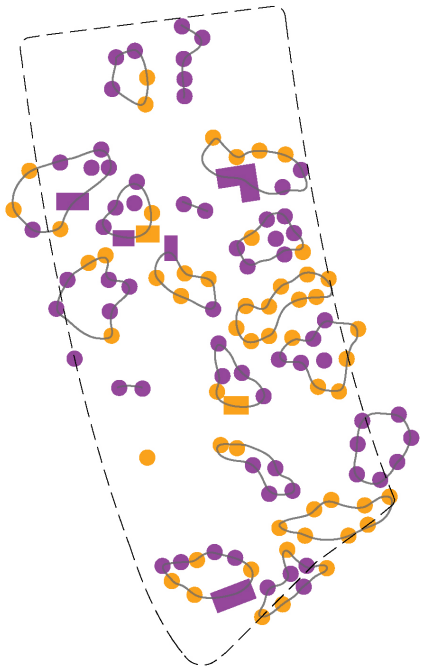


Figure 7.8

Designing a Specific Block

The block location is surveyed and "traced" onto the existing site. The clusters of extended families and families who form a support system are identified and symbolically grouped together.

1. Identify Existing Clusters

Working with the people, 20 clusters of extended families or people who associate themselves with one another, are identified.

--- block outline
—— cluster outline
'10' number of huts/families in each cluster

2. Long-term Goals: Staying or Leaving?

Meetings with each cluster to determine:

- those staying permanently
  = 74 families or 57%
  = approx. 438 people (6 ppl./family)

- those who will be returning to the village over the next 2 years
  = 56 families

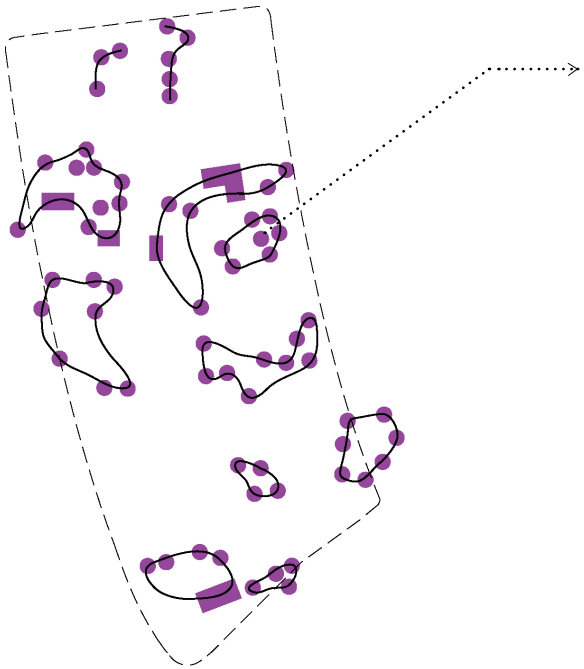


Figure 7.9

Figure 7.10

3. Identify Future New Clusters

New clusters are identified. Made up of people planning on staying to live in the new community, these clusters will be arrived at through phasing.

11 new clusters are identified (1 cluster will be phased onto adjacent block)

4. Configure Communal Plots

Establish private plot arrangements with individual families of each new cluster.

Develop communal plot configuration with each new cluster (arrangement of private plots, number of latrines etc..)

5. Configure Block Layout

Test and modify configurations on site with other plot configurations and water infrastructure.

Final block: 10 communal plots
= 67 families (one family per house)
= approx. 402 people (avg. 6 ppl./family)

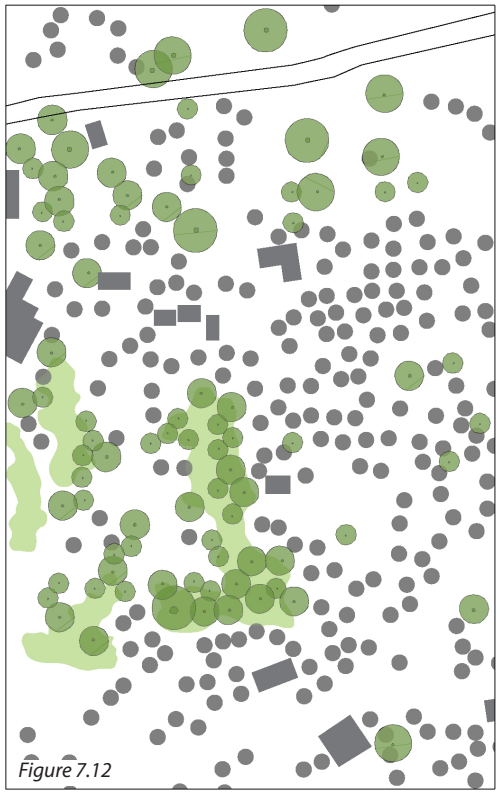


Figure 7.12

Pre-Phase A: **Developing the Program**

meetings with all actors:
- NGOs
- primary donors
- local government members
- LCs (local council members)

confirm funding sources
identify plots and landowners
buy land through the Program
hire local labour
begin site scale construction e.g. water lines

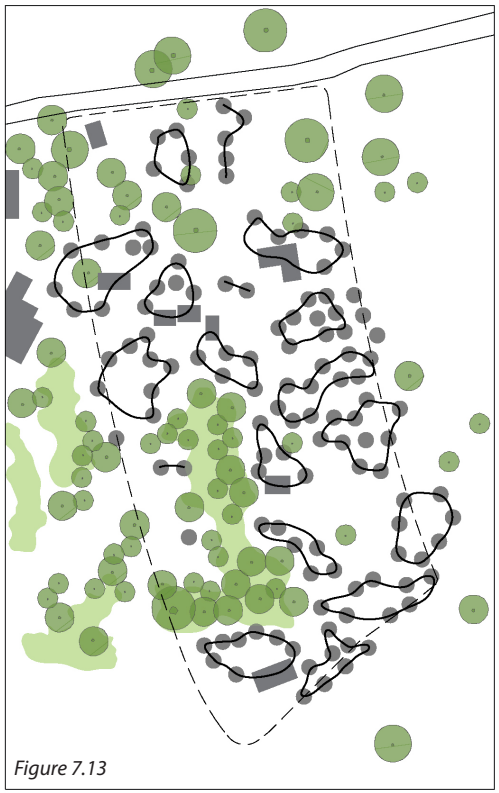


Figure 7.13

Pre-Phase B: **Community Planning**

At this phase, all representing NGOS work together with the clusters of families to design this specific block. The design process is described on the previous pages, 92 and 93.

Begin implementing the 'return aid packages' to assist those returning to the village.

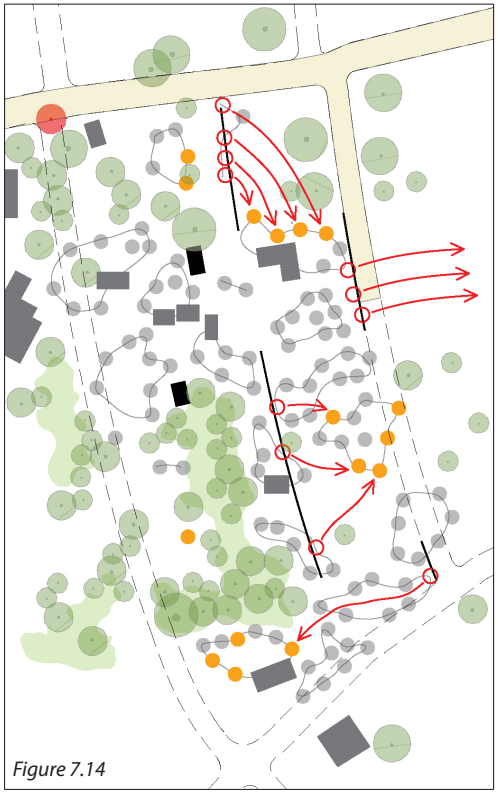


Figure 7.14

Phase 1a: **Retaining Walls**

retaining walls
existing buildings
trees removed for widening the road
main road is widened
begin constructing secondary roads
16 families leave/ 16 empty huts available
11 families shifted to empty huts
- 3 belong to cluster on adjacent block

8 homes available for next phase

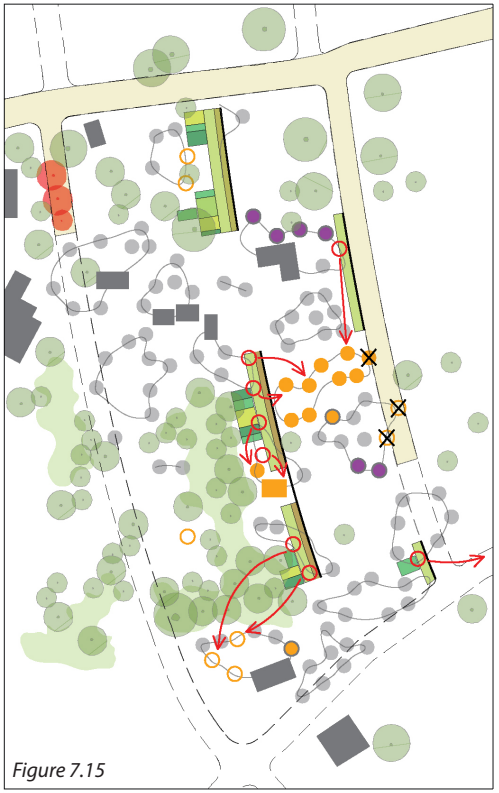


Figure 7.15

Phase 1b: **Berms + Basins**

berm + basin and agriculture
families shifted in 1A - will be staying
families shifted in 1A - will still be leaving
11 families leave/ 11 empty huts available
8 huts empty from last phase
8 families shifted to empty huts
1 family moves to adjacent block
3 empty huts removed for road expansion

9 homes available for next phase

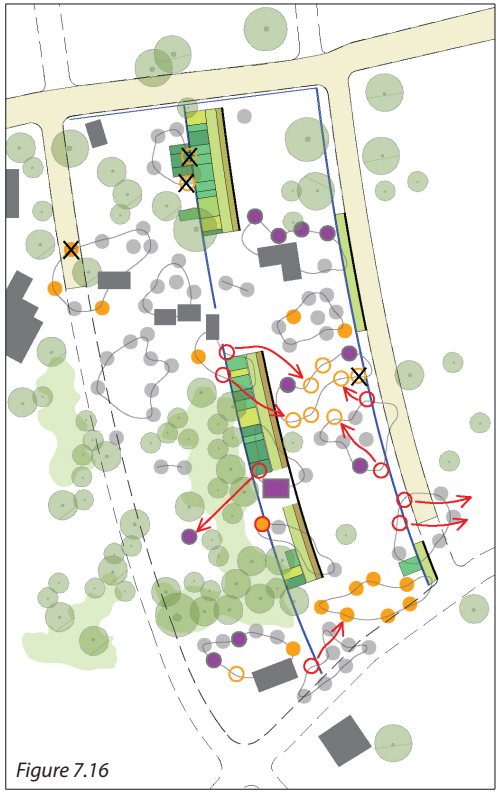


Figure 7.16

Phase 2a: **Main Water Channels**

main water channels
13 families leave/ 13 huts available
9 huts empty from last phase
8 families shifted to empty huts
2 families move to adjacent block
1 of the shifted families leaves
3 empty huts removed by water channels
1 empty hut removed for road expansion

13 homes available for next phase

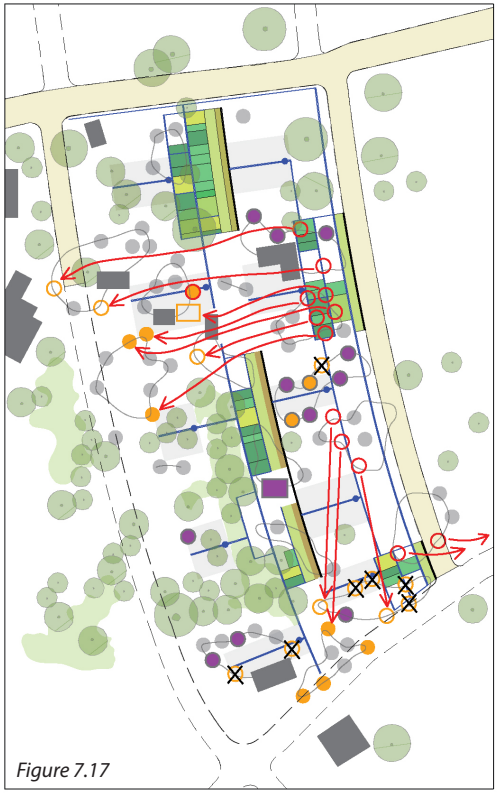


Figure 7.17

Phase 2b: **Secondary Water Troughs**

secondary water troughs
underground cisterns
8 families leave/ 8 huts available
13 huts empty from last phase
11 families shifted to empty huts
1 family moves to adjacent block
1 of the shifted families leaves
7 empty huts removed by water channels

4 homes needed for next phase

Figure 7.18

Phase 3a: **Housing Build**

Minimal shifting from now on - build new houses in space made avail. with each build.

14 new brick housing units built

14 families move into homes - huts removed

2 huts saved for shifted families

3 huts empty from last phase

5 families leave/ 5 empty huts available

4 families shifted by road expansion

---

space freed up for 12 new housing units

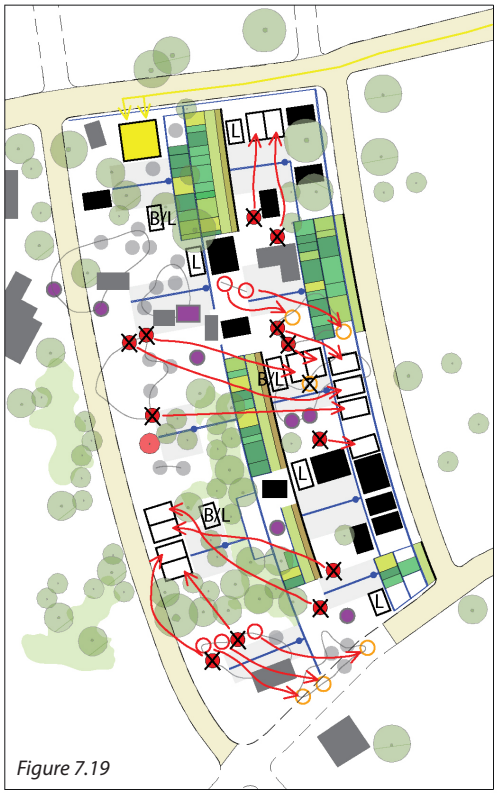


Figure 7.19

Phase 3b: **Housing Build**

12 new brick housing units built

12 families move into homes - huts removed

B/L 7 sanitation bldgs. built (L - latrine, B - bath)

1 commercial building built - 3 units

6 huts empty from last phase

5 families shifted to make space for houses

new brick housing units from last phase

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space freed up for 14 new housing units

Figure 7.20

Phase 3c: **Housing Build**

All families that planned to leave, have left.

14 new brick housing units built

14 families move into homes - huts removed

B/L 2 sanitation bldgs. built (L - latrine, B - bath)

new brick housing units from last phase

---

space freed up for 10 new housing units

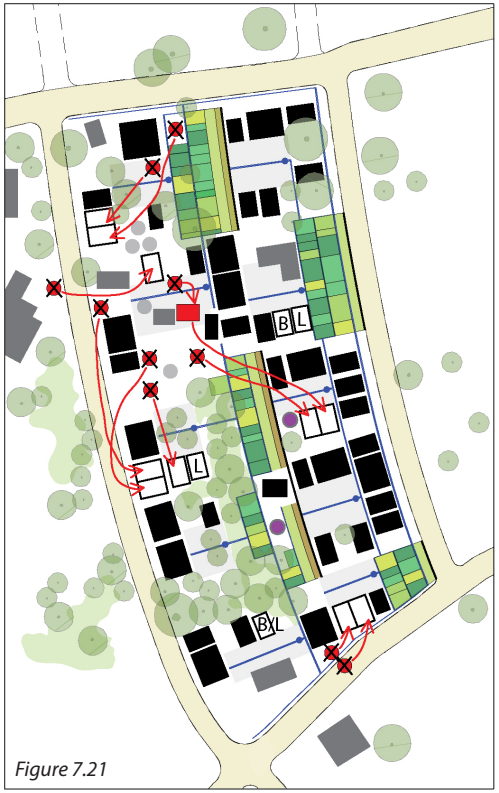

Figure 7.21

Phase 3d: **Housing Build**

10 new brick housing units built
10 families move into homes - huts removed
B/L 4 sanitation bldgs. built (L - latrine, B - bath)

new brick housing units from last phase

space freed up for 6 new housing units

Figure 7.22

Phase 3e: **Housing Build**

7 remaining new brick housing units built
7 remaining families move into homes - huts removed
B/L 4 sanitation bldgs. built (L - latrine, B - bath)

new brick housing units from last phase

all housing units are completed

Figure 7.23

Block Phasing is Complete

Housing continues to evolve as homeowners expand and personalize their homes.

Conclusions

War-induced displacement is such a difficult crisis to be providing solutions for. Despite extensive research in all stages of conflict and conflict-resolution, the world still struggles to act. This is possibly because conflict strains or even breaks down the physical and social frameworks at all levels of society. The primary victim is always the vulnerable citizen, the person who has little say in the conflict itself, the one who must uproot and adjust to a life forever changed.

Last year, over 11 million people in Africa lived in a place that was not their home because of conflict or violence. Living in temporary displacement camps, these people struggled under the collapse of familiar support systems, to provide for their families and to keep their culture and traditions alive. The critical nature of the crisis in these displacement camps is evident in statistics of disease and death, health concerns due to poor sanitation, the destruction of the surrounding natural environment, and the emergence of serious social problems.

In the case of displacement camps in the town of Gulu, Northern Uganda, even though the more general crisis of the conflict is in stages of resolution, the local crisis still remains critical. Rebuilding one's life when much has been lost, including key family members, is a formidable task and requires the intervention of different development aid organizations. For some people, this transition becomes impossible due to land disputes or rejection by their home community. Others make a choice not to return to their home villages because of the connections they have made in their host community (the community where the camp is located, either a trade centre or urban centre). It is imperative that a solution for permanent settlement be provided for these people: they can not continue to live permanently in the squalid conditions of a 'temporary' camp.

Current approaches to permanent settlement seem to deal only with housing, or only with infrastructures, without addressing new patterns that have emerged because of the crisis. Other approaches displace people to yet another location, severing social networks that were established in the camp or with the host community. This thesis responds to the crisis in the urban camps of

Gulu, with a different approach. The proposal begins with the most readily available resource to the displaced people in Gulu – a resource that is also primarily linked to their disparity – water. Water sources are intricately linked to the urban metabolism and as described in the analysis of the town of Gulu, the ecological processes of this metabolism are being altered and strained by the displaced population. In the urban realm, distances to access water and the exorbitant costs play a role in social and economic disparity. If the relationships continue on this path, the displaced people will never be able to rise out of their poverty. In fact, they will sink lower into poverty as natural resources dry up due to excessive and unsustainable use.

Instead of ignoring water's role in the displaced people's future demise, the design proposal argued water to be the starting point for developing a sustainable, prosperous, permanent settlement. By rethinking the current social and environmental conditions and identifying the untapped potentials, a strategy was formed that went beyond simply physically structuring the community; water infrastructure became the agent of change.

Priorities were established:

- to create a public social realm within the settlement
- to address the water cost inequalities in the urban centre
- to encourage economic opportunities and bring commerce to the site
- to organize housing that provides a hierarchy of private to public space
- to address the relationship of land ownership to prosperity
- to provide access to sustainable food sources
- to sustain on-site natural resources

Water infrastructure alone did not meet all of these priorities, however it was the primary instrument in setting up the physical framework within which the resolution of each priority took its place. It formed the spatial structuring of the site in such a way as to address and subsequently re-define the urban metabolism.

Designing how the project would be implemented was just as important as the design itself. At the scale of the block, the design was presented as a set of relationships and conditions influencing a developed prototype. This prototype became available as a design standard for NGOs. The

real designing came into play with community involvement as the NGOs used the standards to work with the clusters of families in designing their new blocks. Not only was there a site specificity to contend with, but a social specificity as well. With this in mind, the design process began with an inherent flexibility that could accommodate a range of cluster sizes and income levels. Once the design process was completed, a phasing system responded to the issues of transition with a necessary level of sensitivity. This phasing system allowed people to adjust to the new structures of each phase and to experience the new definitions of space as the components appeared in increments.

Challenges to Overcome

A challenge for the local community may be in picturing the final product. If they can't 'see' the full development of the community, they may not understand the importance of each component or phase. The goal was to create a community that they would literally own, but also take symbolic ownership of its new structures and infrastructure. In relevant projects, this seems to occur only if the community has involvement in the planning and constructing of the settlement.

Another challenge that comes to mind is defining the role of the architect. The case has been made before that the input of a designer, especially a 'Western' designer could undermine the significance of vernacular design, and the ability of the community to create what they know they need. But the role of the architect is not to enforce a solution that is foreign to the community. Instead, in this situation, the architect can act as an advocate for change: physical changes, political changes, and social changes. In the event of a crisis due to conflict, the government, aid workers, environmental advocates, social agents and other interested groups form opinions and agendas that don't always mesh. For example, protecting natural resources by preventing locals from accessing them is detrimental to the economic well-being of the people. But, prioritizing the needs of the people without a sustainable plan for the natural resources will surely speed the degradation and disappearance of the resource altogether. The architect can coordinate a design that responds to and is informed by, the needs and desires of all parties involved.

Measuring Success

The success of this incremental design strategy can be measured at a few different stages. The design implementation section has its own milestones that indicate how well the people are taking to the design process. The first sign of success would be the completion of a unique block design by the community members and their representing NGO. With many opinions and stories to be told, designing with community members is a challenge. However, the outcome of this process will be most fitted to the unique needs of the inhabitants.

Another sign of success will be the rehabilitation of the wetland. Now that agriculture production has been localized with the housing, and communal plots in the wetland are regulated within a specified community recreation zone, the biodiversity of the wetland has an opportunity to bounce back. As well, infiltrating the water intermittently in the basins on the slope of the site, instead of allowing it to shed on the surface, will help to improve the wetland water quality. The strategy will also work to prevent erosion on the site thereby reducing the amount of sediment entering the basin.

In addition, a further evolution of the site beyond that of the final Phase would indicate the community's successful integration into the new settlement. Each home has the ability to expand and grow. As people become comfortable with their surroundings and new systems, they can begin to invest in building as the need arises. The economic success of the site could also be measured in this way. The plots around the perimeter of each block are zoned as mixed use: commercial and residential. If the Social Spine is successful as a place of commerce on the site, individual residents will begin to convert one room of their homes into shops that front onto the main street or secondary streets. Seeing these changes implemented by the community themselves will indicate a positive social and economic response to the new settlement.

In summary, the challenge of transforming displacement camps into permanent settlements is one that must be met with innovation. It is not enough to prescribe a solution that simply houses the displaced community in permanent shelters. The solution needs to address the local ecology and 'metabolism' of the site, the problems that have arisen as a result of the survival strategies in the community, and the social and economic patterns that lock them in a cycle of poverty. A new

dialogue can be created by re-defining the role that water plays in the urban metabolism on the site of the camp and in the host community. The definition of this role actually informs the spatial organization, structuring a new permanent settlement. This new spatial organization re-writes both the significance of natural processes and the importance of the social realm in a community's strive for prosperity. The fruits of this design will restore a future for the inhabitants of the community, raise them above the cycle of poverty, enable them to regain their own sense of dignity, and create a healthy environment for future generations.

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