

Learning from Land: Interweaving Traditions of Making along the Blue Nile

by

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Dalhousie University is located in Mi'kmaq'i,
the ancestral and unceded territory of the Mi'kmaq.
We are all Treaty people.

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To the people of my motherland, reminiscing a peaceful, just, and beautiful Sudan as they now shelter in place while war rages through their neighbourhoods.

And to children of the diaspora – old and new - hoping to bring that memory back to life.

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Abstract

In Sudan, practices of agroforestry once created closed-loop cycles of production that harmoniously linked landscape, agriculture, craft, and architecture. However, these practices have largely been wiped out by past colonial powers. The country's once bountiful natural landscapes plastered over with abrasive industrialised agricultural systems which continue to be expanded; their grim long-term effects disregarded for the momentary relief they provide.

This thesis aims to recover traditions of making to help preserve ecologies threatened by the need for farm expansion – as is the case with a unique stream condition located in the rural town of Wad Hajja. Using the site as a stage for practices of agroforestry, adobe architecture and handcrafts, the project explores how to encourage the community's economy, education, and ecology through the design of a school of agroforestry and craft. The proposed scheme interweaves the place-based and the industrial to investigate their economic, ecologic, and functional synergetic potential.

Acknowledgements

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To my friends near and far - the Girlies, if you will – Habiba Awaad, Masa Al Baroudi, Abrar Bazara, Erin Haliburton, Courtney McCracken, Rin Miloš, Mehreen Mohammed, Emily Pyatt, and Zainab Rehman for constantly being the ultimate support team. Thesis was a daunting premise to me, but I am so lucky to have had such an incredible, kind and talented group by my side. I cannot wait to see what amazing things the future undoubtedly holds for you all.

And to the rest of my family, my mom and dad, brother and sisters, and grandparents, who for some reason – like my friends – believed in me enough to have supported me throughout my entire architectural career so far. I would not be here without you.

I cannot thank you all enough.

Chapter 1: Introduction

Intent

Going into thesis, the overarching goal was to study an area with traditional knowledge relatively unspoken about, overlooked and/or omitted - with a particular interest in the Middle East and Africa. The neglect of these topics is often exasperated by the decline of traditional practices in favour of more mainstream, globalised ones. Sudan, my motherland, and where this thesis places itself, is no foreigner to such attitudes towards its own place-based techniques. As a country once occupied by various colonial powers, from the Ottomans to the Egyptians and the British, before gaining its independence in 1956; many of its place-based techniques and unique cultural practices had been lost or labelled as inferior. Their importance, as methods and ways of life specific to the country's context tried and tested through time, overlooked.

Given the current issues faced in the country to do with unaffordable food, environmental degradation caused by harmful agrarian practices, and the increased stress put on the capital and surrounding rural areas as these issues accumulate, this thesis would aim to recover and encourage some of the valuable place-based methods that have been left behind. It seeks to add to the currently limited and depleting recorded knowledge on traditional practices, and how to develop them to meet modern needs. The direction taken for this thesis includes an exploration of the concepts of landscape, craft, and architecture. Focusing on how many place-based techniques and practices often synergistically weave these ideas together in ways that optimise social, economic and environmental conditions. What will also be

considered is how these ideas may be supplemented to support modern needs of communities.

However, as of April 15th of this year, 2023, the situation in Sudan has taken a drastic turn. Without any warning, any sign of the violent unravelling to come, fighting between the country's paramilitary and military broke out in its capital, Khartoum. Amidst civilian neighbourhoods, school zones, and offices, the sounds of heavy gunfire and air strikes rang out, leaving many stranded in place, having to maneuver the onslaught of bullets and destruction to make it to the safety of their own homes, where they would unknowingly remain on lockdown for the next couple of months. As I write this, many are still trapped in their homes – many without electricity, water, and low supplies of food – and a number of others have been senselessly kicked out by the paramilitary who then decide whether to loot them or turn them into barracks. The fighting has spread beyond the capital. Banks have been robbed, hospitals shut down, airports destroyed, and roads and bridges out closed off; rendering many innocent people helpless - unable to access basic resources, and unable to get to safety. Resultingly, there are a number of more important questions that need to be answered. Questions to do with the accommodation of the influx of refugees and the provision of accessible medical care, food and water, in such volatile environments (amongst many others) have to be given full attention. Perhaps an optimistic thesis like this can be revisited at a later time, when the people of Sudan are safe and healthy, and when the violence and corruption have become a part of the past. But for now, as you read this thesis, please understand the context from which it sprouted: a hopeful one.

Approach

The understanding of nature as the ultimate, self-sustaining system has been proven time and time again. With scientists and theorists such as John Lovelock, Eugene Storer and Paul Crutzen, and theories such as the Gaia Hypothesis and the Anthropocene, continuously exploring and adding to this understanding (Agrest 2021, 11). Our own day to day experience, as people of the 21st century witnessing the consequences of our own intrusions upon these age-old systems, proof of its own. It cannot be disputed. Nature – the Earth - is an entire system of both complex and simple relationships, each one impacting the next. A sympleiotic constellation of interrelated networks, of which we are a part. However, it is our place in this constellation that has often been debated. The understanding of how man relates to nature, particularly through the lens of architecture, has been one discussed throughout history. Often, the approach has been quite humancentric, suggestive of the notion that nature is something to be controlled and whose very existence is to serve us. Even in modern movements of green design, nature is still designated as a delicate thing that can only be saved by us. It is absolutely true that we have contributed to the loss of much biodiversity, our actions and attitudes towards the natural world have often been destructive. But another thing to consider is nature will prevail, with or without us. It will mesh and mold and warp as much as it needs to in order to continue to exist, as it has for the past millennia. We, on the other hand, will have a much harder time doing so. So, what would happen if we let the natural landscapes which we inhabit teach us? What if we let them guide our ways of life, and the ways we design?

These concepts may sound familiar to many – they aren't new. Examples of humans living in harmony with nature once prevailed. Vernacular, indigenous, and place-based techniques utilised local materials, and valuable expertise gained from centuries of experience to live together with nature. But these practices have increasingly been put aside – or in the case of many stolen or colonised lands - been deliberately stifled, and all in the name of development. From East Asia to the Middle East and Africa, from, Ghana, to the Gambia, and my motherland, Sudan, where this thesis will focus in on. Mud, wood, straw thatch, and their long-established applications, have given way to concrete, glass and steel conveying more globalised styles. The collateral damage of this process of neglect even extending beyond architecture and into areas such as those of traditional agriculture and craft. With traditional agricultural practices and handmade crafts being set aside in favour of their heavy machinery, mass produced and foreign imported equivalents. Replacements that support industries and habits that harm the environment and, in turn, the people in more ways than they may be beneficial.

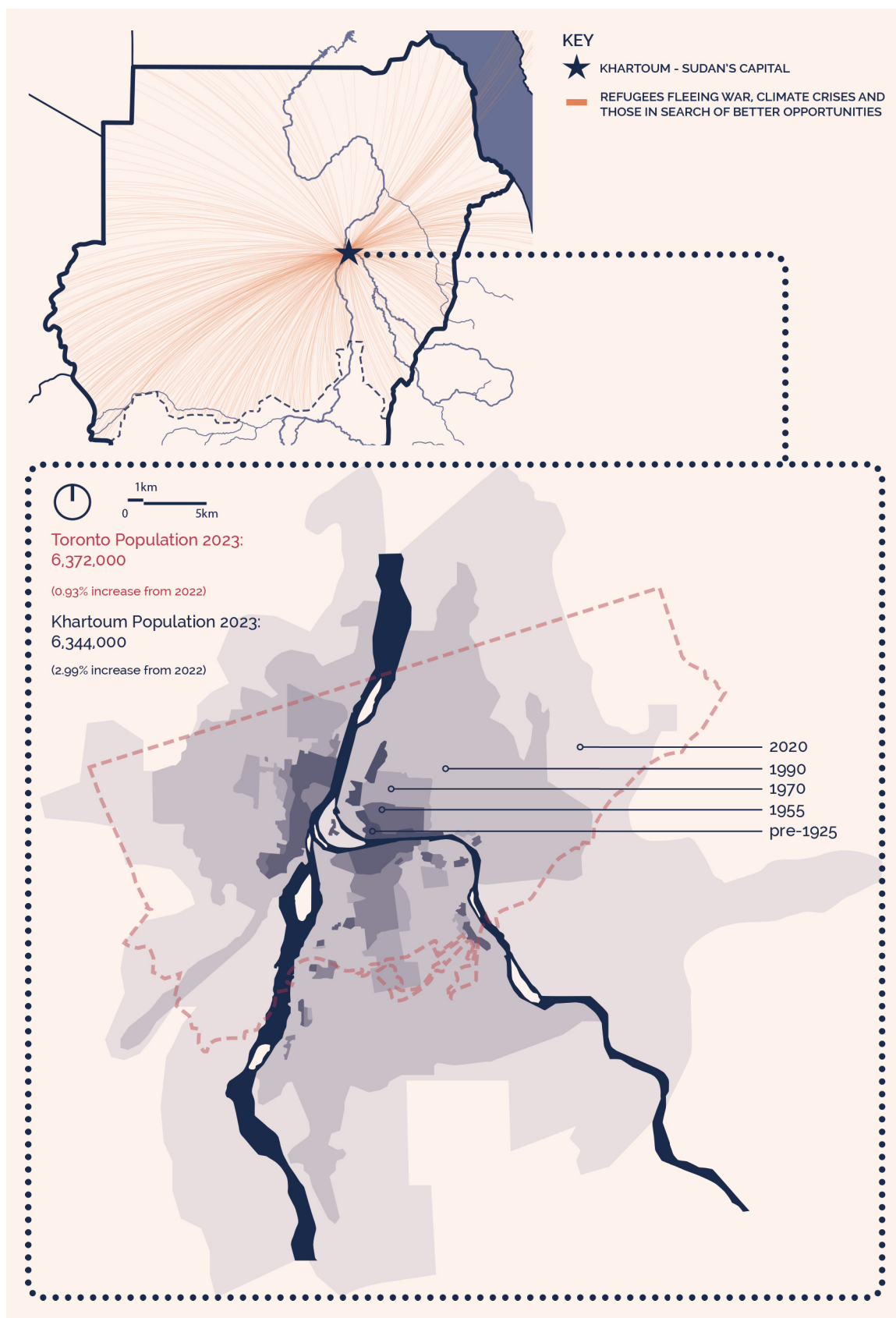
Through this process, what has been and continues to be disregarded is the value of place-based building techniques, despite the fact that they carry with them unique, unparalleled advantages. (Ease of use, locality, affordability, and thermal performance being some of them.) In fact, their long-established applications are increasingly deemed socially primitive or obsolete. Of course, these building methods and materials are not free of limitations. Some of the current issues faced in Sudan, for example, cannot be addressed with these practices alone. Given the changing climate - resulting in increased instances of



Here is an example of a particularly harmful global trend experienced at a magnified scale within the country. Woven baskets were once the go-to means of transporting items, however, they've become dominated by plastic and polyester bags since their global proliferation (Abdel-Rahman, et al. 2013, 383). Now factories continue to pump out their production, but the country's waste-management has not kept up, resulting in landscapes absolutely littered with them. Contaminating land and water, declining soil fertility, biodiversity, and overall ecology health – both within the country and beyond (Chol 2019).

flooding, unpredictable rains, and droughts - the methods once perfectly adapted to the environment are now facing new challenges. Not to mention the structural restrictions of such building techniques that limit certain applications necessary to support the rapidly growing population.

Perceived to be the best solutions to the modern-day issues faced around Sudan, globalised/industrial materials such as steel, glass and concrete are hastily applied. However, these mediums are not only more expensive to import, use and construct – but are also expensive to maintain. For instance, in the hot, the dry sub-Saharan climate, these constructions become living ovens, requiring an abundance of air conditioning – and thus energy - to allow them to be comfortably inhabitable. Not to mention the fact that the country has regular electrical outages due to its faulty electrical grid system currently reaping the consequences



Sudan population (The World Bank n.d.; base diagram by Ismail 2017)

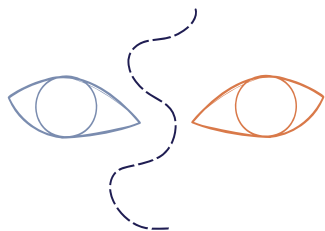
of decades of neglect. So, either inhabitants of these structures purchase an additional generator as a back-up during these instances, or they simply must muscle through the stifling heat.

For this reason: in this context, prevailing globalised and industrial styles could be utilised more strategically as tools to supplement the traditional, place-based knowledges of the people. Moreover, it may also be beneficial to first look to how indigenous communities from countries of similar conditions utilise their resources and inhabit their landscapes – before turning to the often less economically attainable and inefficient options such as steel and concrete. This could be achieved in a way that these realms of knowledge not only support each other, but enhance one another, uncovering more effective solutions to current issues of rising populations and climate change faced around the globe. An outlook that can extend beyond architecture and into other realms of making currently being put to the test: agriculture and craft.



Some place-based crafts/techniques and their industrialised substitutions

Luckily, theories that seek to interweave realms of knowledge in this way exist and will be looked to as inspiration for the development of this thesis. These theories are: Two-Eyed Seeing, a concept coined by Albert Marshall of the M'ikmaq community, and Lo-TEK, a theory written about extensively by author and designer Julia Watson.



Two-Eyed Seeing

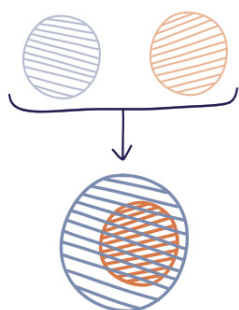
Two-Eyed Seeing

Two-Eyed Seeing is a theory that seeks to create a symbiotic relationship between indigenous knowledge and ways of knowing, and Western ones. It aims to relate them in this way so as to benefit from the strengths of each, facilitating opportunities for technological and educational advancement. It is a principle that seeks to understand indigenous and Western ways of knowing, for all their similarities and differences, to allow for a more productive transfer of information between the two.

This principle's emphasis on understanding the differences between the two is quite interesting as often divergencies in knowledge sharing methods have been glossed over. Or one particular method is given priority, whilst the other is forced into submission - no matter how ineffective this may render it. Much like swimming upstream rather than working with the current. The recognition of these differences and the understanding of them as real benefits to collaboration is key and distinguishes the Two-Eyed Seeing concept from others attempting to deal with knowledge sharing.

Another important note is the philosophies endorsement of the engagement of indigenous and non-indigenous educators, stakeholders, communities and government for the achievement of a real, meaningful transcultural exchange and understanding (Hogue and Bartlett 2014, 3). How

architecture could potentially support such collaboration is an intriguing concept, and one delved into extensively by architects such as Vivian Manasc and Richard Isaac (Manasc 2020). For this thesis, it could be beneficial to interpret some of these principles in the context of interweaving globalised and mainstream modern practices with more traditional and place-based ones. With the architecture itself speaking to this goal through the marriage of both local and globalised methods, techniques and materials; and where the exercise of each is determined through an assessment of the benefits they would bring on various scales, and in relation to one another. The projects program seeks to serve the community in various dimensions, namely: economically, culturally, and ecologically. Looking to achieve harmony between these various realms once more.



Lo-TEK

Lo-TEK

Lo-TEK, is a design movement combining ideas of Lo-Tech and Traditional Ecological Knowledge (TEK). The former being a concept of primitive or simple technology, and the latter being a collection of traditional knowledge passed down through generations of practice. Lo-TEK aims to reintroduce traditional knowledge as not only the core of all modern innovation, but as intrinsically innovative. It seeks to reintroduce these traditional methods often deemed primitive, as sources of inspiration vital for the development of a true sustainability.

Indigenous innovation in Lo-TEK is understood to be a key factor of what Watson refers to as “species symbioses”. Meaning that these traditional technologies, and ideologies are so intertwined with the natural world that they can satisfy not only our own various cultural and ecological needs, but

they enhance the lives of all the ecological systems involved. So much so that the increasing displacement of various indigenous groups around the globe have had a negative impact on the ecological systems which these communities were once a part of.

It is clear that these methods, techniques and understandings (which in many indigenous communities also come in the form of mythology or story-telling) carry much value. Passed down through the generations, and practiced for centuries, but now threatened by neglect and the displacement of native communities, it is important to return to these practices and truly understand their value and potential. In many instances, it is the indigenous, traditional practices of societies that are the most suited to place. Not only that, but they also encompass some of the most accessible techniques for each unique region.

This last point being an important advantage to these methods - one that can be especially useful in cases like that of Wad Hajja, Sudan, where certain materials, especially those considered to be most "current", are not available in abundance or at all. These materials are often expensive and must be produced in factories that only add to the ever-growing environmental issues experienced in the region and elsewhere. The way forward may very well be a return to the traditional knowledges of the region. Encouraging their understanding in full, down to their very principles, even those embedded in stories or in the tasks of the everyday lives of the locals. Extracting their core concepts, reviving them, and/or inspiring innovation with them in ways similar to those proposed by Lo-TEK could prove quite fruitful. In Wad Hajja, the type of ecological, cultural and economic symbiosis this could promote could radically change the lives of the locals

for the better. Successful practices reinvigorated and put to use may then be transferred throughout the region where appropriate.

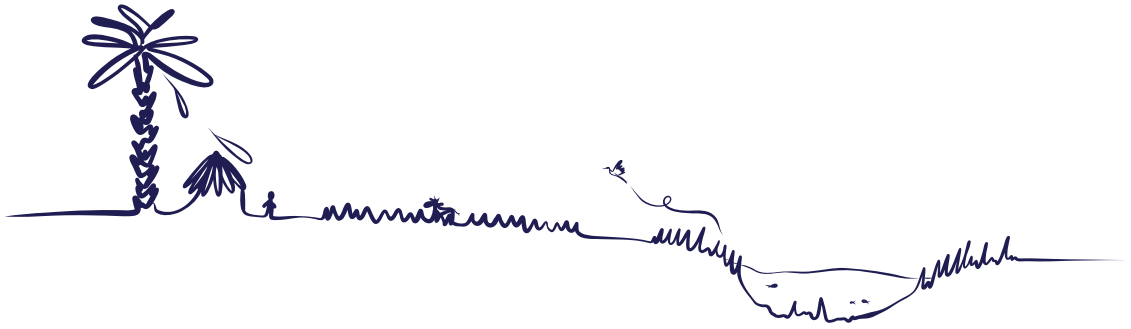
Of the many intriguing examples that exist around the world, and those that have been included in Julia Watson's extensive writing on the topic, there are a handful that speak to the idea of craft and architecture – such as the Mudhif of Iraq. It is clear that throughout time, there are many instances in which craft has played an integral role in architecture; in Sudan, in the aforementioned example, and elsewhere.

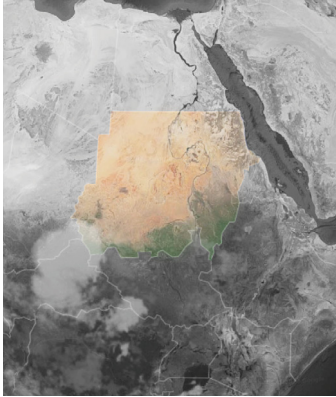
Taking these topics into account, the strategy proposed is the design of a space for traditional agriculture and craft to be taught and experimented with to resolve problems encountered by rural communities. The traditional agricultural practices to be utilised are agroforestry techniques – particularly advantageous methods of cultivation once commonly used throughout the region, now lost due to their replacement with massive, industrial cash crops. The crafts to be taught are used in the everyday lives of locals and utilise the materials available on site as well as the by-products of the agricultural production: mud, dried palm leaves, dried millet stalks and papyrus to name a few.

Through allowing room for the teaching and practice of such traditions, the design may become an attraction, a source of revenue for the community, as well as a breeding ground for the advancement of place-based practices. In doing so, this approach can support the self-reliance and resiliency of the community of Wad Hajja - a rural village in Sudan that, like its neighbours, has learned to look inward for progression in the current conditions of mass rural to urban migration, and governmental and economic instability.

Structure

The thesis begins by introducing Sudan and its major agricultural state, Gezira, in a general sense - highlighting the history of land use, economy and some of the modern-day issues faced within. This will set the stage for a more detailed investigation of the site and its context. The role and relations of place-based architecture, agriculture, and craft in this area will take shape in the successive chapter, followed by a section discussing theoretical case-studies. With this base knowledge on the site, context, and theory, a vocabulary and methodology for design thinking will be developed to finally be put to the test by the resulting proposal.





Sudan (Google Earth 2015)

Chapter 2: Methodising Productive Landscapes

Spanning the distance between the Libyan Desert and the Red Sea, encompassing arid zones, tropical zones, and many in-between, Sudan's landscapes are almost as diverse as its people. Historically, the Sudanese people lived lifestyles that flowed with the seasons; guided by the natural landscapes that surrounded them. There were mainly nomadic and semi-nomadic pastoralist tribes, and sedentary tribes. The nomads would move to and from lakes and swamplands whose water content would fluctuate with the seasons. Setting up temporal structures of fabrics, sticks and bamboo (such as the baggara tent and the rakubah to be delved into further in chapter 3), nomadic communities would settle by these bodies of water and riverbanks in the dry season, and then move further inland during the wet season. A system of life that allowed their herds of cattle and sheep to graze rotationally and more sustainably - reworking and naturally fertilising soils whilst avoiding overworking any one specific plot of land all year round (Kebbede 1997, 128).

Sedentary communities would inhabit homes of mudbrick and thatch by the riverbeds or in areas of fertile grounds - typically along the Nile or where ground water reserves were plentiful - cultivating various crops for sustenance. Agricultural land was often shared communally and managed by the community chief. (Kebbede 1997, 6) Like the nomadic tribes, they would also grow crops of sorghum and millet, and their direct access to the mineral rich soil of the area all year-round granted them the ability to cultivate larger varieties of fruits and vegetables depending on the

season (Impiglia 2017, 5). Tomatoes, cucumbers, onions, pumpkins, okra, lime, bananas and mangoes being of these.

All methods of traditional farming utilised traditional technologies which were typically easy to use and cheap to construct. For irrigating various crops, the two main tools used were al sagia and the shadouf (Impiglia 2017, 5). Al sagia is a type of traditional waterwheel stationed by the river, constructed of wood and rope, and driven by oxen (Hurreiz 2006, 3). Essentially, they consist of two large gear wheels: one horizontal with its teeth in contact with those of the second, which is vertically oriented and placed just above the surface of the water with pots (qawadis) attached along it. Oxen turn the first wheel around, resulting in the second spinning and gathering water in its pots as it rotates. The filled pots are emptied into a basin as the wheel continues to revolve, and water in the basin is dispersed through the fields via connected ditches and dikes (Hurreiz 2006, 3).

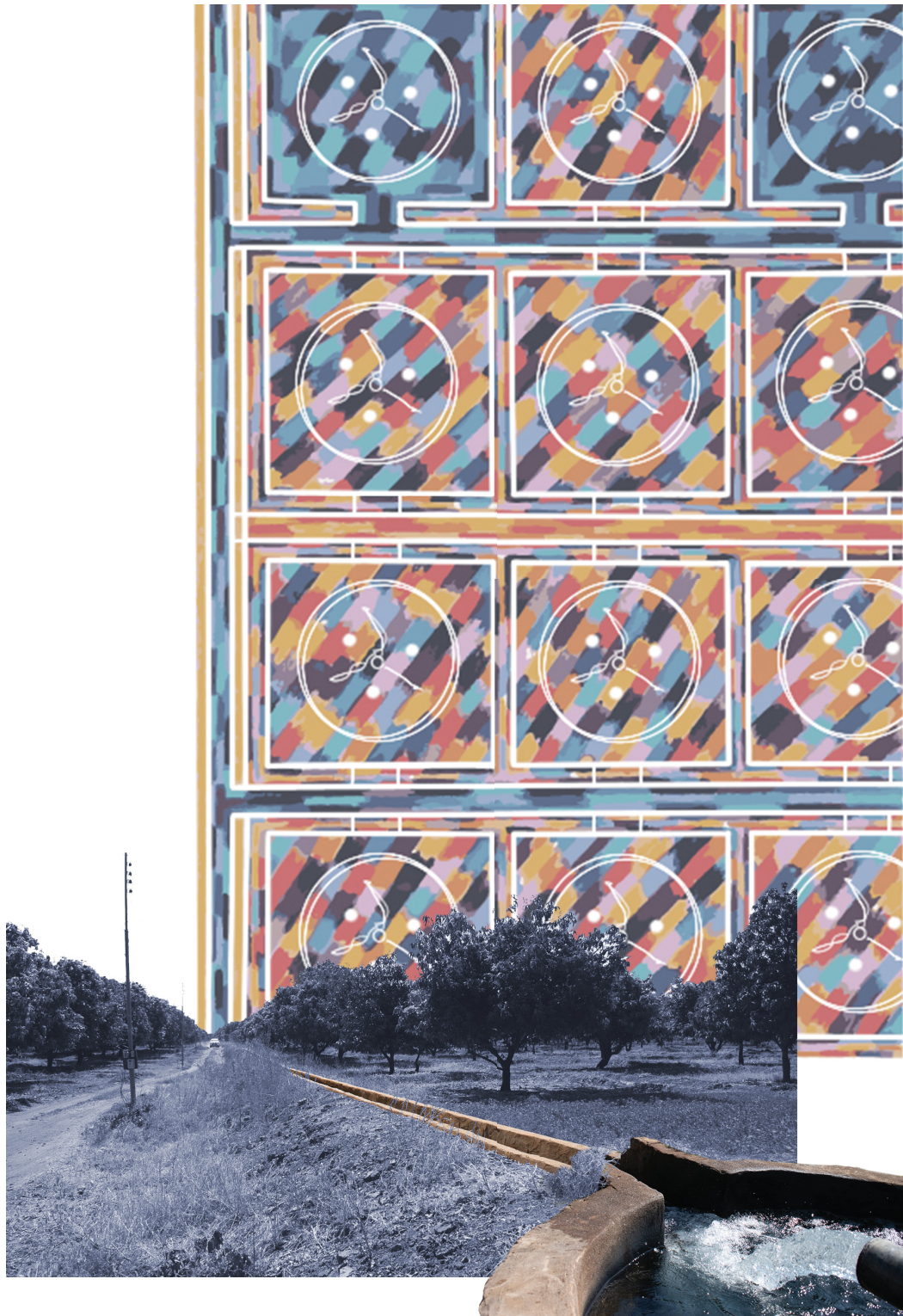


A modern saqiya undergoing final stages of construction (National Council for Culture Heritage and the Promotion of National Language n.d.)

The shadouf was yet another irrigation tool that also involved the utilisation of waterways such as ditches and dikes. The mechanism itself is crane-like, and the portion of it that extracts water functions like a seesaw. Usually constructed right by the Nile and/or wells, the structure is comprised of large branches tied together with rope, and it features an arm that protrudes out over the water. One end of the arm (the one inland) has a weight of a rock or clay mass attached to it, and the other (the one over the water) has a string tied to it, to the bottom of which a bucket is attached. To collect water, a user would pull the string down, submerging the bucket in the river. To bring the filled bucket back up, the user would gently release the string, and the counterweight on the other end of the arm would lift it. This bucket of water would then be emptied multiple times into a ditch, dike or channel that connects to others around the plot, allowing the water to flow throughout the small fields of crops.



The shadouf (Harris 1950-1955)



Above is a collage of an irrigation channel system in use- the images for which were taken at a farm in Arbaji that was using them to water tree groves (mango trees in these particular photos). A planar graphic is shown in the background, depicting the movement of water through the tree groves and placement of three fertiliser pockets (indicated as white dots) at the base of each tree. A grid of mud borders separates each tree, and, from this grid, openings may easily be dug out to allow for the flow of water to reach any specific tree or row of trees.

Some of the more common traditional agricultural techniques used around the country often incorporated existing ecologies on site, planting alongside native trees and shrubs, diversifying crops, and maintaining fallow periods. All practices that aid in preserving and replenishing soil fertility, whilst even allowing the land to be productive almost all-year round. (Kebbede 1997, 128) These systems include:

1. Shift cultivation
2. Mixed cropping
3. Intercropping
4. Agroforestry



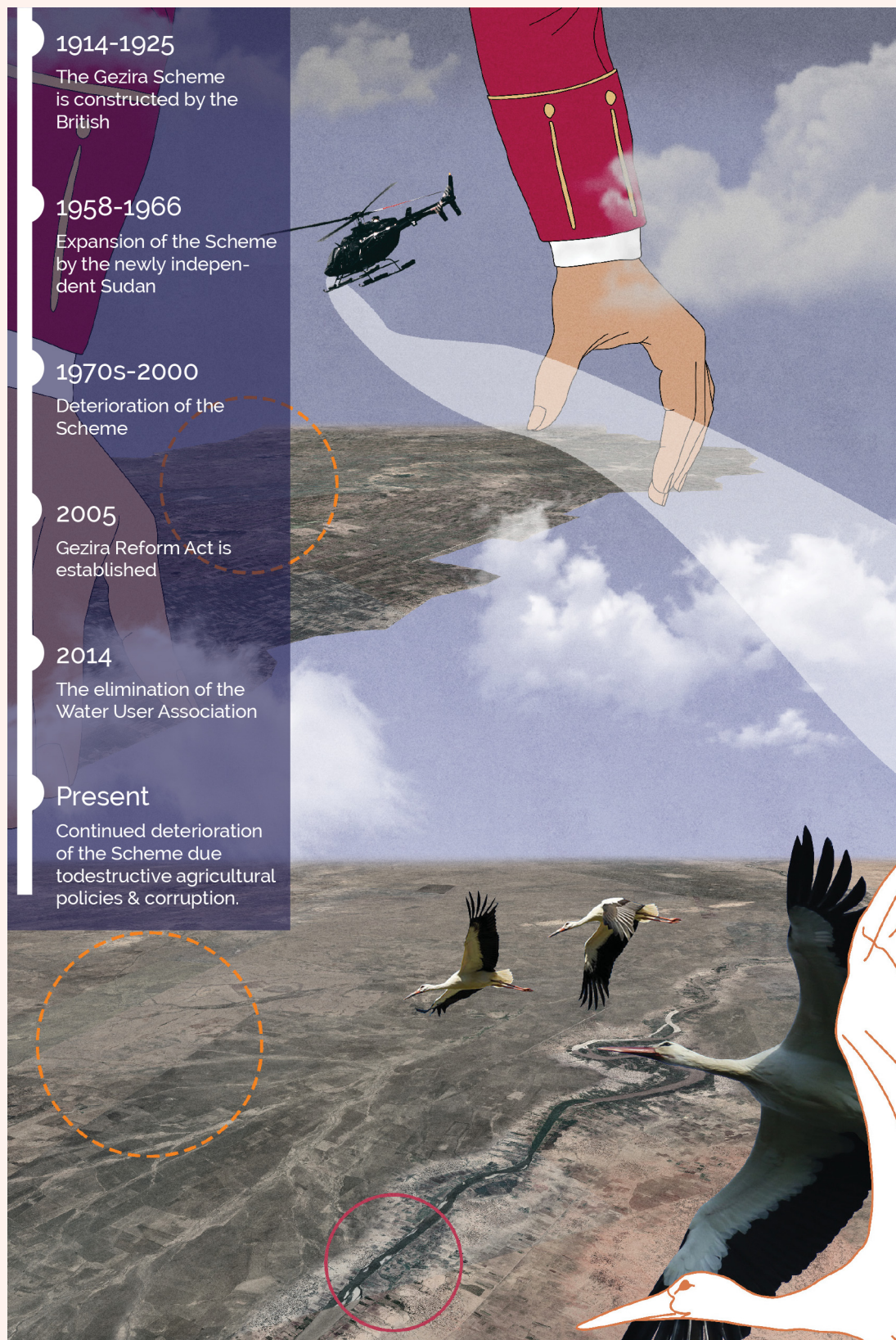
A motorised pump extracting water from a well and into traditional irrigation channels which disperse the water throughout the fields (in this case, the system is irrigating a mango tree grove)

For centuries, entire labour, social, and economical structures were dictated by these lifestyles and methods of cultivation. Agriculture and animal raising has always been, and continues to be, a major source of income and organiser of life to the Sudanese people. Many of the aforementioned tools and agricultural systems are still used around Sudan today. Irrigation channels, for instance, are still widely used to water crops, but with electric motors in place of sagia's and shadouf's. However, most traditional cultivation methods are used to a much lesser extent at larger scales due to their replacement with standardised practices first enforced by the British colonisers.

Large-scale industrial crops, catered mainly to satisfy export needs rather than those of the people, were introduced to the region when it came under British rule in the 1890's (Searcy 2019). Large spans of land, especially along the most fertile areas of the country; between and along the Nile rivers, were dedicated to cash crops cultivated to serve the

needs of the colonisers - cotton being the main one. Soon wide areas of natural landscapes, home to a diverse range of plant and animal life, were senselessly painted over by massive grid arrangements of monocrops. The natural scenery, sprinkled with age old acacia, baobab trees, and wildlife that the locals had lived alongside harmoniously throughout history, gave way to a new method of agriculture that betrayed and displaced them. Treating them as nothing but weeds and obstacles to be eliminated. (Kebbede 1997, 126) Victoria Bernal, associate professor of anthropology at the University of California, writes: "The British did not try to transform local practices so much as obliterate them, starting literally from the ground up, with new systems of production and productive relations of their own design. The schemes were enclaves where colonial control permeates the very conditions of people's daily lives to an extent the colonisers were unable to achieve elsewhere." (Bernal 1997, 453)

The Gezira Scheme was the largest colonial intrusion on agriculture in the region. Established in 1925, the project entailed the allocation of numerous crops, dams, and mechanised irrigation systems across the state of Gezira: one of Sudan's eighteen states and located just outside of the capital Khartoum, between the White and Blue Niles (Eldaw 2004, 1). It became one of the most intensive, centrally managed irrigation systems in Africa (Bernal 1997, 447). Not only were the Western ideas of agricultural development inflicted onto the Sudanese people, but economic ones too – also leading to a drastic shift in cultural and social norms. Focus and resources were concentrated on the newly established capital, strategically placed at the confluence of the White and Blue Niles: Khartoum.



Gezira Scheme timeline (Goelnitz and Al-Saidi 2020)

Agricultural exports became the countries main source of income, and it remains this way today, the influence of these impositions also still prevalent in the government's management and administration of agricultural production across the country. Despite the scheme being somewhat of a scar from the country's colonised past, representing both the physical and symbolic manifestations of colonialism on a major scale, it is still quite a productive system – the locals having incorporated their own means of economic diversity and social bonds within it, even while they were colonised. The area has even become a source of pride for some Sudanese people, a perceived symbol of the prosperity and development of the country. The major crops in the area being cotton, millet and sorghum.

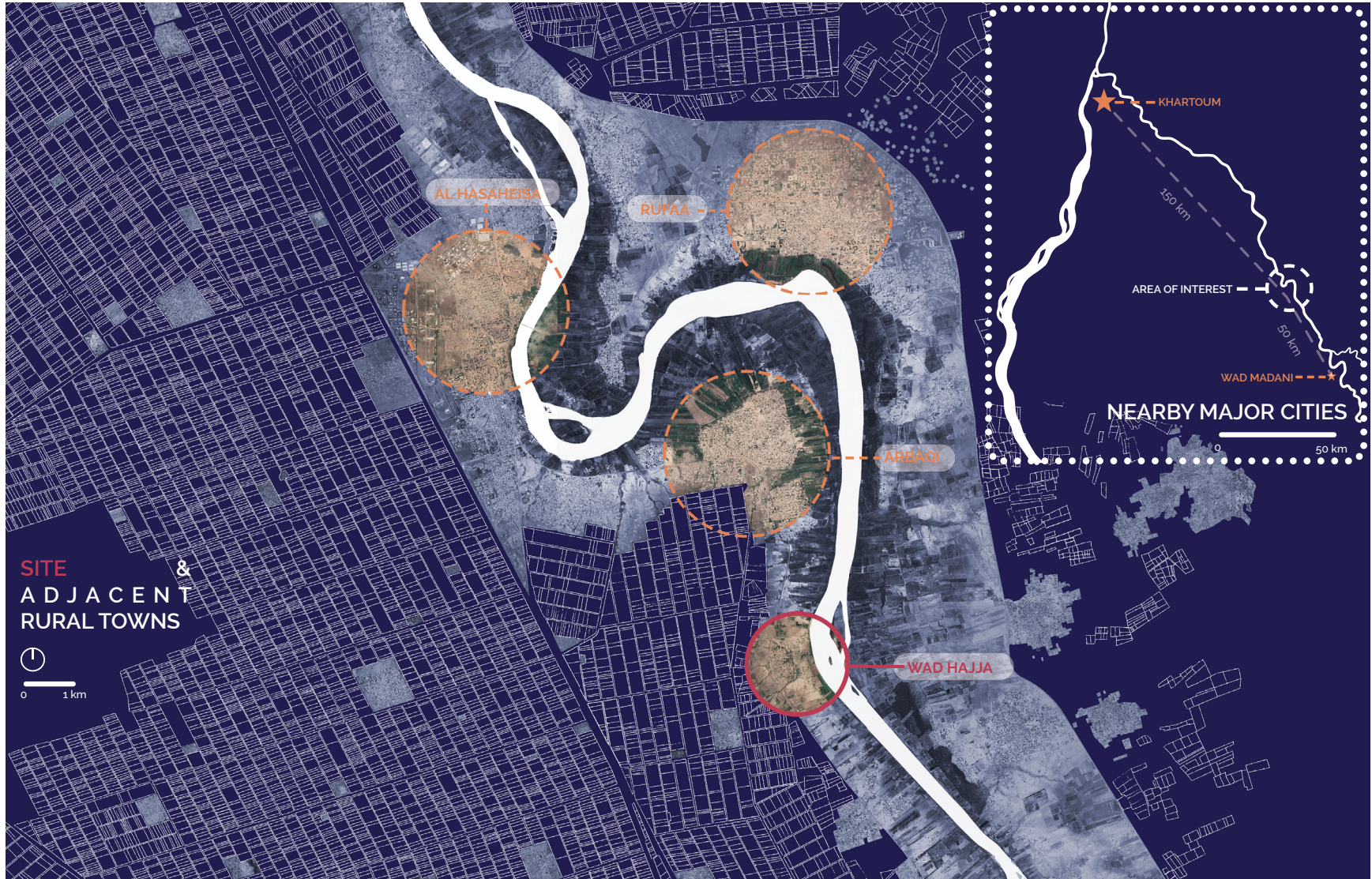
Yet, whilst the capital grew into the urban metropolis it is now, rural areas became increasingly neglected and overworked. And while agricultural exports are plentiful, locals are finding it harder and harder to afford sustenance themselves. Luckily, many of the rural areas maintained their communal attitudes, and learned to provide for themselves. In recent years, however, with the population of Khartoum increasing to a level which its own infrastructure cannot support, extra pressure has been put on these productive rural areas – especially those just outside the capital, like those within the state of Gezira. The influx of new city dwellers being caused by increasing numbers of war and climate refugees seeking safety and better opportunity, the need for more crops and means of income is being felt strongly in these areas.

It is clear that the roles of landscape and agriculture are deeply intertwined into the history, culture, and economy of Sudan. These relationships should be better maintained for the benefit of the people and ecology of the country, as – if

managed correctly - they may bring with them many potential solutions to the issues currently experienced in the area. Unemployment, land degradation, and deforestation being among them. Looking to the strained rural areas dealing with an influx of the aforementioned issues, compounded with governmental neglect, will also be beneficial. This is one of the reasons that the thesis will focus on Wad Hajja, a small rural city in the state of Gezira, located just along the outside bend of an oxbow of the Blue Nile, nearby the relatively larger rural cities/market centers of Al Hasahisa and Arbagi.

Introduction to Wad Hajja

With the aforementioned neighbouring communities reaching their capacity in terms of agricultural development and housing, Wad Hajja, is now next in line for its own developmental boom. With a handful of new housing and agricultural projects already underway in the small city of about 1 square kilometer in area, the changes are revving up to accommodate the increasing economic and sustenance needs of the community, the capital, and the influx of newcomers refugees. The city is at a pivotal state, and what's especially unique about this particular moment is the existence of a small stream and riparian zone springing off the Blue Nile and cutting through Wad Hajja's southern region. Now increasingly under threat, with its adjacent area of untouched land becoming smaller and smaller, this ecosystem and its surroundings may be an ideal location for showcasing an alternative approach to agricultural production. One that entails somewhat of a return to the traditional systems developed ancestrally and hybridising them with modern technology and techniques where appropriate for efficiency.



Al Hasaheisa, Arbagi and Wad Hajja

Of course, waterways, riparian zones, and forested areas such as this are better left untouched where possible. However, with the current demands of the community and the country at large, these lands and ecosystems have been and may very well continue to be at the bottom of the list of immediate priorities - however unfortunate that may sound. The people's needs have now eclipsed those of the ecosystems they inhabit, even blinding them from the recognition of their importance to the productivity of the land they so heavily depend on. Government greed does nothing to cure this, instead it happily endorses and takes part in these harmful patterns of land use. Ecosystems like this one will end up being used destructively and with current unemployment rates, rising populations, and peoples need for food, this may happen sooner than later – in many cases it already has. Beyond architecture there is much to be done. A massive shift in land management, laws, and regulations must take place. The realms of building, planning and agricultural education, research, and codes, must also be developed to address these issues. Of the 13 universities in Sudan offering agriculture programs, none of them teach methods of traditional cultivation that have qualities of efficiency, job opportunity, and sustainability and can also productively take place alongside ecosystems such as the one in Wad Hajja.

Hence, encouraging the motivation behind this thesis project being a space for said methods to be exhibited on this unique site. The needs of the people are pressing, but they can be met without neglecting the needs of the ecosystems of which they are a part. At the end of the day, destroying these natural orders will only drastically worsen the current issues faced in the region.

The remainder of this chapter will be dedicated to exploring the agricultural system of agroforestry; a technique briefly mentioned earlier as an example of a traditional practice once widely practiced in the region. One that's renaissance may be perfect for this specific context.

Agroforestry - A Potential Way Forward

Many researchers such as Mercedes Rois of the Bioeconomy Unit of the European Forestry Institute admit the fact that “in society, agroforestry is a new word for something extremely old and large” (Pantera, et al. 2021, 767). It is an agricultural practice that has existed in Sudan and around the globe throughout history, and in various forms. It mainly entails the practice of growing crops alongside existing trees and shrubs, deliberately planting trees and shrubs amongst crops, and/or integrating animal systems to make the most of these interactions ecologically and economically. This method of cultivation can aid in maintaining soil fertility, encouraging nitrogen fixation (a chemical process vital to the fertility and productivity of soil and aquatic systems) and reducing erosion (Kebbede 1997, 128). Agroforestry, acting as an “organic farming system”, also aids in the preservation of biodiversity (Pantera, et al. 2021, 768). Encouraging the conservation of existing native flora and fauna, in addition to supporting cycles of life necessary to the betterment of the system itself. In fact, in a recent study conducted by the University of Ghana, agroforestry management systems of cocoa farms were found to be less susceptible to insect pests than conventional ones. This is because the former system also supported the life of beneficial predatory insects, which naturally purged many of the pests (Akesse-Ransford, et al. 2021). Precedents of regenerative techniques practiced by native communities internationally include: the Aztec



Using agroforestry as a means to healthily reintroduce ourselves to the ecologies of which we are a part.

chinampas of Mexico and the Three-Sister crop models of indigenous communities of North America.

Chinampas of Mexico

The chinampas – or “floating gardens” – of Xochimilco were part of a land expansion project driven by the Aztecs living within the Valley of Mexico since 1325 (Gayatri 2022). Having established the area as their capital, they quickly realised there wasn’t enough land to grow their city as they were surrounded by five lakes; Xochimilco being one of them. This is when they developed the idea to construct artificial islands to use as farming area – but in doing so, they relied on natural materials, and understandings of the vital ecologies necessary to make the project not only function

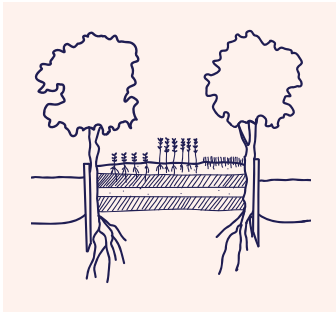


Drone shot of the chinampas agricultural system (Prevention Web 2021)

but thrive. The construction of these floating farmlands was as follows:

1. Perimeters of willow stakes were anchored to the lakebed.
2. Reeds were woven around the stakes to create an enclosed rectangular area.
3. The enclosed area was then filled with various organic matter (like brush and aquatic plants)
4. Mud retrieved the lakebed was then placed atop the layer.
5. Another layer of organic material, followed by mud would then be added ovetop, to allow the chinampa to reach the appropriate height (Millison 2022).

As time went on, the organic material within the layers broke down, releasing their nutrients into the soil, and allowing the willow trees to flourish – stabilising the whole system. More trees would be planted along its perimeters where necessary, and various crops could be planted within. Soon, many of these rectangular islands were built, creating networks of primary, secondary, and tertiary canals between them for servicing and transportation, and to allow for the islands to be easily irrigable (Millison 2022). What's more is the systems performance as an agroforestry system. With the varying plants and ecosystems supporting each other, making one another stronger. For instance, as the willow trees along the perimeters of the chinampas drop organic matter onto the chinampas, it feeds into the soil, releasing nutrients and increasing the soils water retention capabilities – reducing the overall need for irrigation (Millison 2022).



Chinampas section

These systems thrived for many years. Producing up to six crops annually, the chinampas continued to be home to the area's native species – even grounds for them to thrive. But the Spanish conquest of 1519, which oversaw the drainage of many of the lakes and rivers, and diverted the canals severely damaged the network (Booth 2012). The current pollution of connected water bodies, poor modern water management strategies, and introduction of foreign species of fish only compounded the issue, leading to the death of many. Today, there are initiatives attempting to save what remains of the floating gardens. Arca Tiera, led by philosopher Lucio Usobianga, seeks to reinvigorate regenerative practices of agriculture such as those of the chinampas (Arca Tierra n.d.). The project has already begun reviving some of these floating islands and has even incorporated natural bioreserves into some of the canals of the system to reintroduce endangered native species like the axolotl. Said species not only carry cultural value, but ecological value as well and are described as being bioindicators for the health of the network. Even some locals are putting in their own efforts to restore the project, like Roberto Altamirano a fisher working to remove harmful exotic species from the canal (Booth 2012). Most recently, a renewed interest in these practices was sparked by their high performance during COVID-19, when the city no-longer had access to imported goods – greatly catalysing recovery efforts (Gayatri 2022).

The Three-Sister Crop Model

This model of crop cultivation is used by a number of indigenous communities across the Americas and is an intercropping - or companion planting - technique. Usually, the crops planted together are corn, squash, and bean



Three-Sisters illustration
(Antal 2022)

crops – only varying in variety depending on climate and availability. When sown together, the harvests are especially successful, having particularly abundant yields. This is due to the fact that as each plant grows, they provide each other with nutrients, support and protection from pests. The system may be summarised as follows:

1. Corn is planted first, as its stalk acts as a vertical support for the beans to grow upon and keep the ground clear for the squash to grow comfortably. Even the root systems of the corn stabilise the earth, also supporting the other sisters crops growth.
2. Once the corn plant grows 4-6 inches high, the beans are planted and, as they grow, they further strengthen the corn stalks. The beans taproot systems also don't disturb the roots of the corn and squash and enriches the soil with ammonia from which the other crops can benefit (both immediately and in the future).
3. After the beans have emerged from the soil, the squash is planted. As it grows, and its prickly leaves and vines extend horizontally, protect the other two crops from pests, maintain soil moisture, and reduce the growth of weeds (GRIN-U Education 2021).

The way that the three crops support each other in a symbiotic system improves yields, and reduces the need for artificial fertiliser, and pesticides - thus aiding in the preservation of soil health overall.

These types of regenerative practices are slowly gaining traction in Western agricultural and forestry discourse, and there is still relatively little research and literature on agroforestry available. Around Africa there have been

a handful of other successful projects promoting its utilisation such as SINA in Uganda, ICRAF in Rwanda and Green Ethiopia. Even so, the movement has yet to reach Sudanese agricultural spheres of education, policy and research. Having been largely replaced with industrialised farming systems and large spans of monocrops, the agricultural technique is still unknown to many. Often, it has been misunderstood as out-of-date or insufficient in its productivity – a narrative which in the case of Sudan was first spun by the British colonisers and continues to be fed by the government.

As mentioned previously the term agroforestry is a new one used to identify it amongst other existing traditional systems of agriculture, as well as to begin to broaden understandings of the types of systems/techniques that fall under its umbrella. As it stands, the most common agroforestry systems used include::

1. Silvopasture: the intentional integration of certain crops with specific trees, shrubs and livestock to increase the productivity of the land as a system.
2. Alley cropping: the planting of rows of trees or shrubs to create alleys within which crops may be cultivated.
3. Integrated riparian management: involves working with existing conditions of riparian zones for their effective utilisation ensuring their protection, productivity and enhancement.
4. Windbreaks: the planting of rows of trees and shrubs to protect topsoil, crops, animals, and people from prevailing winds.

5. Forest management/farming: purposefully working with and/or implementing forest conditions to provide other resources whilst maintaining the integrity of the ecosystem.

What's interesting is the fact that many practitioners of agroforestry don't typically recognise it as a specific type of land use, nor do they recognise these systems as distinctive. It's traditionally viewed in a much more organic sense, free of any excessive scientific labels and classifications. However, for the sake of this thesis, these terms and classifications will be used in an attempt to thoroughly understand the networks at play and effectively integrate them on the site.



Agroforestry systems illustrated



*"Think with me, Malwal,
what a glory we can build together
on the Nile bank,
if we both in good faith came together!"
-Fakir Maie Malwal
(Think with me, Malwal)*

An early wish image of what the project may entail in terms of character and feeling)

Chapter 3: Making, Building, Growing

As introduced in the previous chapter, the site chosen for this project is within the city of Wad Hajja. Rooted in community, a majority of this city's locals have long family histories in the area. Throughout time, a number of them have been and continue to be reliant on agricultural production and trade as their main source/sources of income. Situated within the savannah belt of Sudan, Wad Hajja experiences a semi-arid climate. Its location along an oxbow of the Blue Nile is particularly advantageous and diversifies the types of ecologies supported in and around the area. It allows for the soils of the region to be especially fertile, which is why much of the surrounding area's land use is agricultural. The fruits and by-products of this agricultural production are also used to support another source of income for locals: handcrafts and homemade goods. These include baked goods, as well as self-care, home, and beauty products.

These economic activities once also encompassed a wider variety of crafts, with the women of the communities – typically being stay-at-home parents – weaving and sewing various home goods out of dried palm leaves, cotton, papyrus, straw and various other locally sourced dried grasses. However, the production of these types of crafts has been steadily declining due to the introduction of various mass-produced and imported substitutes. Notwithstanding, the making and selling of homemade products remains somewhat common due to the fact that: a percentage of the local population are unemployed, some do not have post-secondary educations, and many are unable to support the needs of their families

with their income from farming alone - making homespun wares especially viable ways to make-do.

This chapter delves into glimpses of life in and around Wad Hajja, along this particular oxbow of the Nile. Expressing elements of the day-to-day experiences of its population, the character of the city and surrounding areas, and delving into the aforementioned main skills and sources of income existing. Stories and conversations from site visits will be followed by research into the specific types of craft and creation practiced locally to further understand the types of skills, and materials available in the area - especially those that have ties with agricultural production. This way, they can be benefited from and enhanced where possible through their strategic incorporation into the projects program and design. Considering the fact that traditional crafts can have unique, age-old, affinities with the environment and cultures that they are part of, there is much to be gleaned from the ways these crafts innovate. Making the most of locally available materials, shedding light on new pathways to communal advancement, and reinvigorating old ones.



Typical Sudanese household items

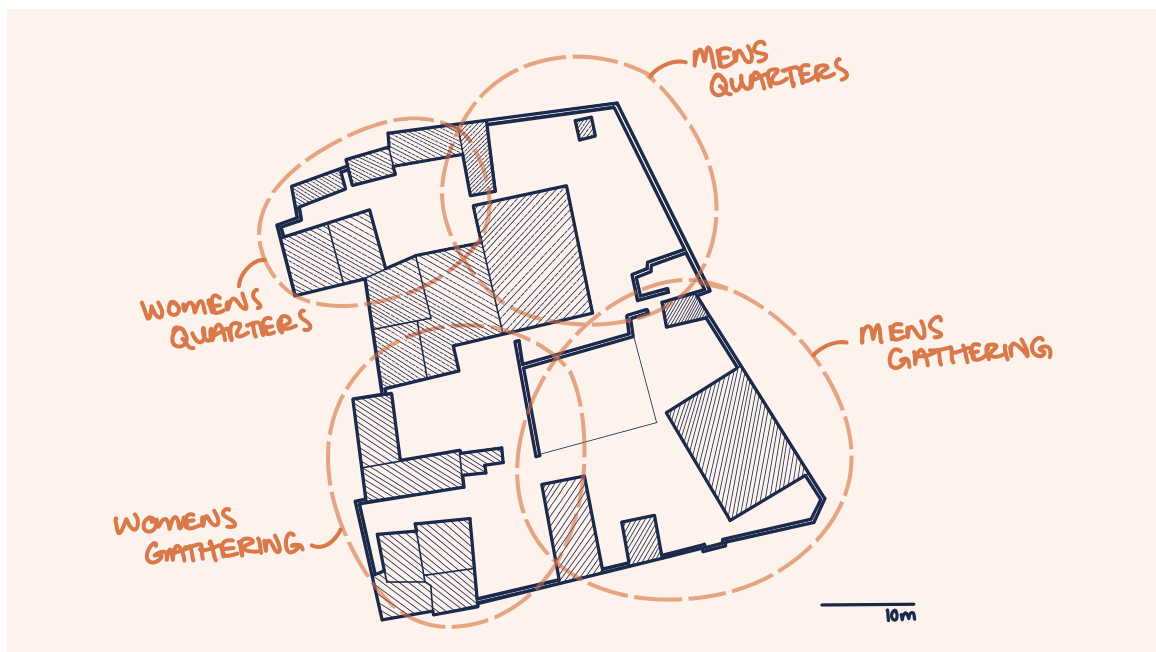
Life Along the Blue Nile

Story: A Typical Morning

To the sound of morning prayer being called, he awakes

dreary and sleepy eyed. Sliding into his slippers, making his way to the ablution sink, groggily (but gently) passing by his sleeping family – still deep in their slumbers. He finally slips into the threshold. Overlooking the courtyard where, at this hour, his regular clumsiness couldn't risk him the chance of waking the children inside. Here, he pauses for a moment, taking a deep breath as he leans against the doorframe. Softly rustling leaves, crickets, quiet. After he got back from morning prayer, he decided, he'd sleep the last hours of the night on the angaraib directly under the stars.

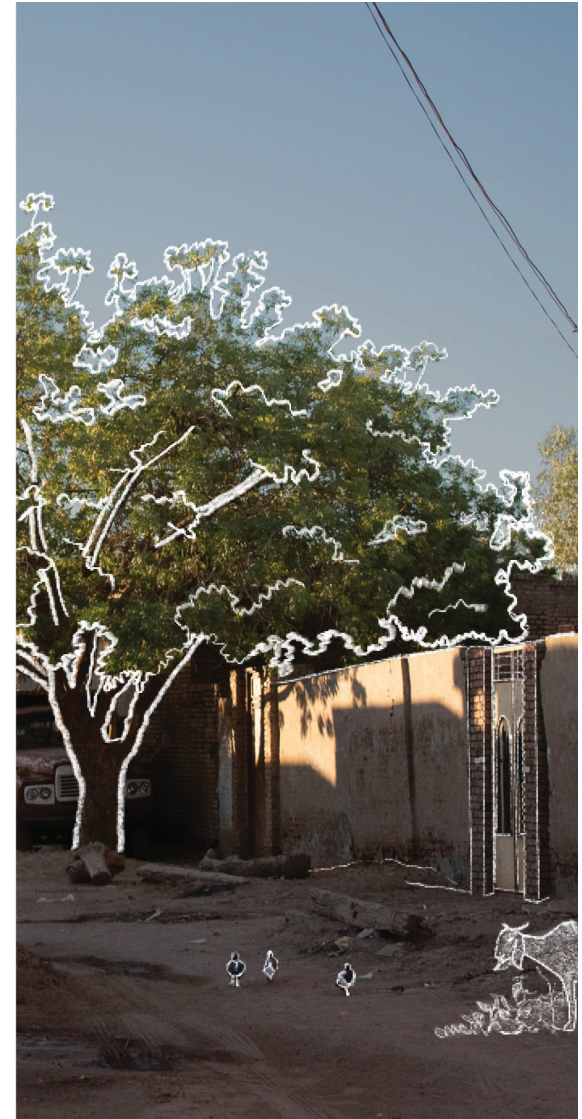
Beyond that he notices: someone left the kitchen lights on. Reluctantly, he pushes himself off the threshold and crosses the courtyard. Switching off the kitchen light, he turns back to the living quarters, against which the tiled ablution sink was stationed. He takes a seat, carefully washing himself in preparation for prayer. Once finished, he gets up and makes his way to the main door. Heavy, wrought iron tendrils spiraling up and around its surface, a slight creak could be



Example of existing residential building plan depicting organisation and distribution of courtyards throughout



Close up image depicting common local material palette



Images depicting some of the regions character

heard as he carefully pushed himself through – he would have to oil the hinges after he got back from work later on. Out in the street he catches up with Abdallah and his father Omar, slivering out from behind their own creaky iron doors. Exchanging quick and quiet salaams, they continued their way to the mosque a couple blocks down, their other neighbours - Mahyuldeen, Anas, Mohammed, Yahya – all joining in tow as they hurried along.

Conversation: The Weaving Circle

“Don’t people still weave baskets and dish covers here?”
“Actually, not really – they sell plastic and aluminum containers at the markets now of course, decent quality ones from outside the country too. It used to be a big part of our lives when we were younger though...” and she continued to describe mornings filled with weaving exercises. The women – their mothers – would often sit around in circles and weave together, chatting about the latest news. After breakfast they’d gather, sipping tea and weaving their pieces. Every sitting another loop, round or craft would be started. While the boys would run around outside - “often stirring up some kind of trouble” she added, laughing to herself - the girls would sit and watch. With their eyes, they’d trace the movements of their mothers and aunties hands as the bunches of dried materials turned into various forms of kitchenware. Sometimes they’d even take part, learning the weaving techniques just as their mothers and grandmothers had before them. An Arbagi native described his own recollection of the role of craft in his childhood. Now 54 years old, he described memories of a family friend who would swing by the house and weave as she would converse with his mother about the latest goings-on. Once, she noticed the young boys - him and his cousins – watching intently

as she would wrap the lengths of dried palm leaves around coils of dried grasses, fashioning them into a dish cover. “Come, let me show you how it’s done...” and she took them through the process. Step by step, bunching up the dried grasses, neatly wrapping them with a long flat strip of dried palm leaf, and then weaving the neatly wrapped bunch into the preceding loop that was beginning to take shape “...See, it’s not that hard!”

Conversation: “Itfdal”: Welcome

Waves of hands raised, and “salaams” passed us by as we weaved in and out of the city’s streets. Some narrow, some wide, some opening up into what appeared to be public courtyard spaces, others opening up into areas of untouched land. The trip was adorned with the chorus of my great-uncle returning the friendly hello’s, the sound of the truck’s wheels rolling over rocky patches, and branches of trees tapping against the windows as if to say hello too. Every so often, he would roll down the truck window to shout out a joke, a “how are you doing”, or a “say hello to...” before turning to us to explain how he knew each passerby. He’d tell stories and go over a web of social or familial relations that linked them – but even when we’d pass by a complete stranger, the hello’s were just the same. They’d laugh and they’d talk as if they’d known each other their whole lives.

We got lost a couple times, so we’d stop to ask around for directions. People out and about, people outside their shops hard at work, farmers on their way to their farms; all of them ready to shake our hands. Without knowing us, or us even speaking a word, they’d say “iftadal” - “come in, you are welcome”. Many offering us a seat, a drink of freshly squeezed juice or tea and if they were set up to dig into a

freshly prepared meal, they'd invite us to join. Surprised at the warmth, we'd comment on how kind everyone seemed, and my great uncle would say "of course, this is how we were taught. It's basic manners here, it's not like in the big city with people barely knowing their neighbours. We are a community."

As we'd continue on our drive, he would point out various projects that were funded and built by the community for the community. "There's the water tank funded by so-and-so who lives in Abu-Dhabi", "there's the school repaired and funded by this group of locals who now live around the globe", "there's the public park built by this person who lives in Khartoum". "The government is dysfunctional; the situation is grim; this country is doomed - just look at state of the capital. They won't help us out here, we can only depend on each other." He'd explain. "There used to be a lot more of us here too, but most people have left to work in Khartoum or abroad where there's more opportunity and better schooling for their children. They still send money back and organise certain projects to help the community though, they help maintain and improve what we have."

Passing by small solar farms, soccer fields, and water gathering projects funded and built by members of the community both residing in and outside of the region, it was incredible to witness the level of independence they'd achieved. The way the people of the community, even living abroad with foreign educations and employments, lent their own newfound expertise and resources back to the community, determined to improve the lives of its members with or without the help of the government was powerful. The importance of this kind of communal knowledge, skill and resource sharing between townspeople once again

proving itself vital to the betterment of the society. Those with the resources to gain formal educations and stable employment opportunities, and those without said assets but more in-tune with the community and their needs, all working in tandem to support the town.

Craft

Sudan's diverse cultural, and ethnographic landscapes are a major reason for the diversity in the types of handcrafts typically synonymous with the different regions of the country. In Eastern Sudan, like in the states of Kassala and Al Gadaref, blacksmiths practice the respected craft of sword and knife making. In Southern states you'll find a number of skilled practitioners of wood and ebony carving, and in central Sudan – in Omdurman and Bahri - you'll find seasoned wooden boat builders. Although popularly practised in these regions, the crafts don't limit themselves within their borders. Variations can be found across the country, each with their own unique design traits and constructions that distinguish their place of origin, and even the cultural/tribal background of the maker. This is most clearly illustrated in the crafts that are used in the daily lives of the Sudanese people; ceramics and woven goods.

Dried palm leaves, grasses and dyed cottons woven into mats, baskets, dish covers (tabags) and bed/bench frames (angariebs) among some of the most common household items. Lining the streets and public squares you'll find clay water pots on stands, ready to offer a thirsty passerby a sip of the water within, kept cool under the shade of a tree and the thickness of the pot's walls. These pots mirror the same types of clay creations found in the private homes of many; cooking pots and incense burners being among typical

finds. United in their inherent affinity to the land, these crafts can easily be found across the country. Their production was once a common practice from household to household, with the women of each producing their own unique wares, and particularly gifted individuals selling them. The practice of craft making is less popular today, as there's more of preference to purchase ready made counterparts, but these items still play consistent roles in the everyday lives of the Sudanese people. From rural contexts such as that of Wad Hajja, to urban ones such as that of Khartoum, it would be unusual to come across a home without a traditional craft used within it - be it for decoration, functionality, or both.

All these crafts utilise natural materials in their makeup: Nile silt, sand, manure, dried palm leaves and fibers often by-products of agricultural production. These items were molded from centuries of living with the land and are crafted from the very soils they're used on. For a long time, these crafts were common source of income for many people who hadn't had the means or desire to obtain formal educations, a large percentage of whom being women (in fact, as of the country's independence in 1956, it was estimated that only 4% of Sudanese women were literate (Sharkey 2016, 3). Passed down through apprenticeships and observation, handicrafts allowed households to be self-sufficient. Especially in rural areas already driven into poverty by governmental exploitation, locals would make the most of all they had, learning how to effectively utilise agricultural by-products – turning waste to functional pieces, and sometimes even profit.

Today unemployment rates in Sudan are only continuing to escalate. At an estimated 19.3% in 2020 (1.7% more than the year prior) the country's economic struggle has drained

the job market, leaving many unable to support themselves and their families – even those with formal educations (The World Bank 2023). This issue compounds itself with the faltering education system now reaching a point where only the wealthy can afford to obtain a quality formal schooling. Many cannot afford to go to school, and many don't, narrowing down their already minimal options tenfold (Sanyal and Yacoub 1975, 11,12). The solution to such an issue would require a lot more than what this thesis can even begin to cover, but what is posed here is the potential of handcrafts in such a condition. There are examples of communities that have utilised handcraft to catalyse some form of economic growth/support. The Obakki Foundation, a charity founded by Treana Peake, is an organisation that has multiple community projects around the world, a number of which seek to empower communities through utilising their traditional crafts and skills as tools to elevate their lives (Obakki Foundation 2018). Their projects vary with each unique context. Some of their work in the rural village of Akiliba, Uganda, for instance, maximises on the traditional craft of pottery practiced there, aiding the community through providing the tools and facilities necessary to allow their craft to reach larger markets and establish a sustainable and reliable source of income (Obakki Foundation 2018). Their work in Kitui, Kenya homes in on the traditional craft of sisal basket weaving, and in Queretaro, Mexico on woven textiles to name another few (Obakki 2018).

Projects such as these also create space for innovation. Irthi Contemporary Crafts Council, an organisation based in Sharjah, United Arab Emirates, conducts projects that revolve around the empowerment, preservation and growth of the traditional crafts and craft makers within the UAE and

beyond (Irthi Contemporary Crafts Council n.d.). Founded by Sheikha Jawaher bint Mohammed Al Qasimi, not only do they create platforms for artisans to teach their skills, but they also have initiatives which seek to inspire new ways of making, bringing new forms and realms of exploration to the forefront (Irthi Contemporary Crafts Council n.d.). Similarly, some projects – such as that of Dipdii Textiles, established by architect Anna Heringer – build upon sustainable traditions of recycling and upcycling already practiced in certain regions, encouraging their continuation and expansion (Dipdii Textiles n.d.). In a place like Wad Hajja, where natural resources, agricultural by-products, and synthetic waste in the form of plastic bags littered across its vista, material-based innovation may be an especially fruitful avenue for rural communities already striving for self sufficiency.

Once taught, these skills of making can give individuals the freedom to create goods they may sell to support themselves. Additionally, the skills required for some of these crafts are transferable to other realms, such as furniture making and even architecture, with them new avenues of income and local production may be brought about. Alone they will not provide complete salvation but could potentially provide some form of relief. And together with regenerative agricultural practices – which utilise traditional techniques that are more labour intensive - they can create jobs whilst reinvigorating local craft, culture economy and ecology. For this reason, the remainder of the chapter will be an exploration of the production process of some of these wares, to gain a better understanding and paint a clearer picture on the types of accommodations required to support such activities.

Weaving

The processes of weaving are quite diverse. From baskets, to tabags, to bambars and birish, the techniques of knotting and lacing morph to satisfy the functions of each. But the processes all begin with the same thing: the prepping of material. To illustrate these essential steps, the exercise of prepping one of the main native materials of particular interest – palm leaf – will be explained in detail. The prepping of palm leaves is as follows:

1. Palm tree leaves are cut off the palm tree. Leaves are usually obtained from younger palm trees are kept at bush height, which is about 1.8m high. (These trees are kept at said height by not cutting off leaves entirely from their sheaths/bases, but rather removing the needed amount of leaf directly from the leaflet. Only when the leaves are periodically removed from the actual sheath does the tree begin to increase in height – and it is the trees grown to full height that bear fruit.)
2. Cut leaves are separated into individual strips.
3. The edges of the strips are sliced off, and the remaining pieces are left to dry in the sun. This drying process turns the palm leaf strips green colour into a light beige.
4. Once dried, the strips can be cut into even thinner strips with a needle. (Note that sometimes, the edges from the previous step can actually be cut off the strips after they have dried. Those dried edges – which are more rigid than the inner strips of the

palm leaf - are gathered and used to make broom brushes.)

5. Then to soften dried inner strips of the palm leaf, and make them more flexible for weaving, the strips are placed in boiling water. After being soaked in said hot water for a short while, they are removed from and stored in a round container so that they dry in a bent/coiled form.
6. Once dried, the strips are ready to be woven, and the processes of which differ from item to item.



A pottery center's finished pottery yard - this one is located in Wad Madani

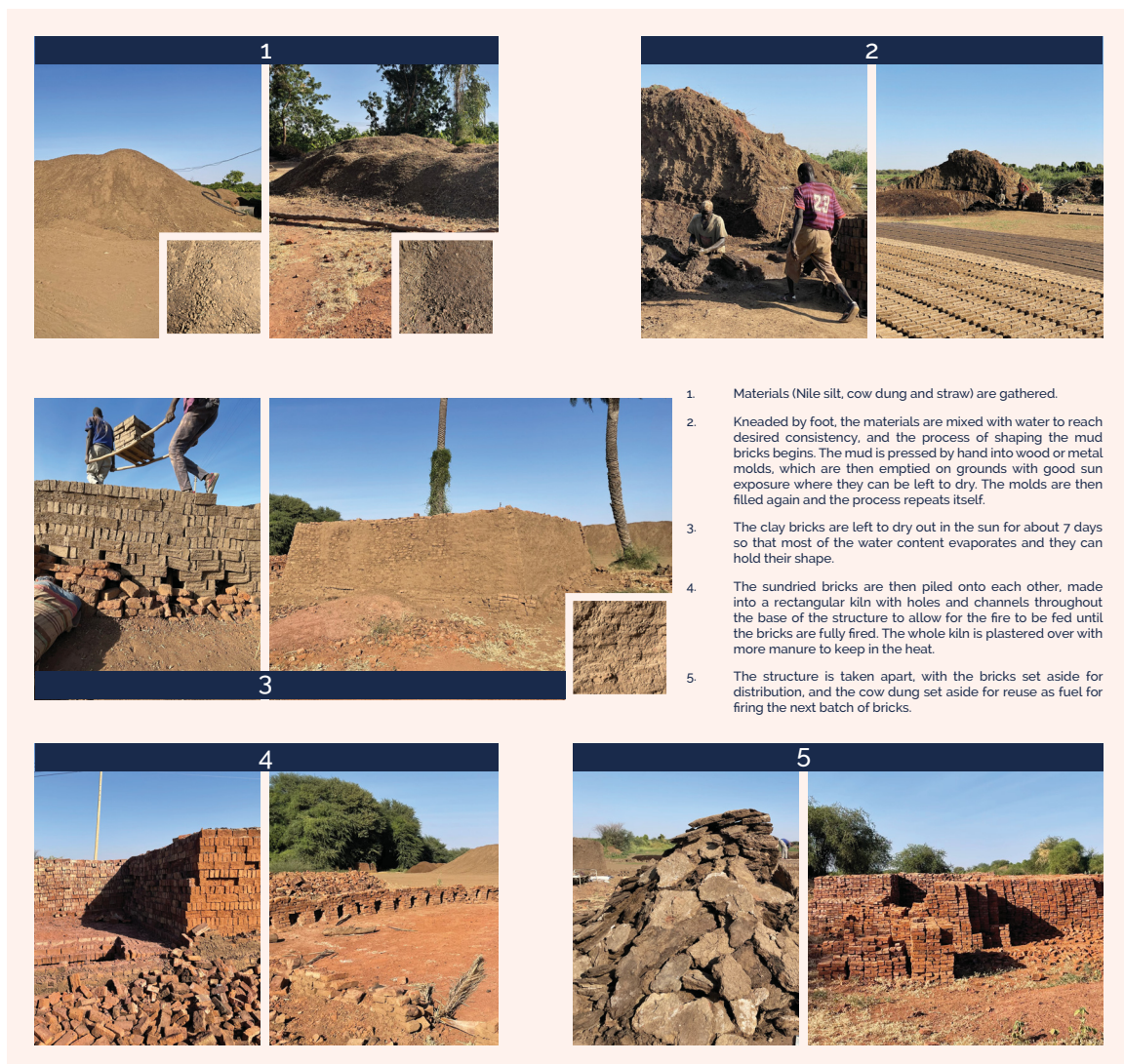
Pottery

The variety of ceramic goods made within the region each constitute slightly – and sometimes vastly – differing pottery processes. From wheel thrown pieces, to hand built, coil built, and paddled ones, there are many different ways in which the craft is exercised – but it all starts with prepping the materials. This procedure, like that of weaving expressed previously, was also discerned from conversations with local craftsmen during a visit to a pottery village (located in Wad Madani another large city about an hour away from this thesis's site in Wad Hajja). It is:

1. Nile silt is collected from fields directly along the Nile is gathered and brought to site. (Usually, the sites for pottery production aren't too far from these collection grounds, and are located right on their outskirts, right by agricultural fields.)
2. Temper – usually cow dung, but for food/drink vessels that is replaced with sand or crushed stone for their silica content – is collected. This is what makes the clay harden without cracking as it is fired.

3. The temper, Nile silt, and water is mixed to make the clay which is then placed in a pit and covered (to retain the water content) for a day.
4. More water and temper is kneaded and pugged into the clay until it reaches a satisfactory consistency and is ready for use.

Processes of clay brick making begin with the same steps of clay preparation. Albeit, the consistency of the clay used for brick making is slightly more fluid, ideal for its molding into various types of formwork and brick molds.



1. Materials (Nile silt, cow dung and straw) are gathered.
2. Kneaded by foot, the materials are mixed with water to reach desired consistency, and the process of shaping the mud bricks begins. The mud is pressed by hand into wood or metal molds, which are then emptied on grounds with good sun exposure where they can be left to dry. The molds are then filled again and the process repeats itself.
3. The clay bricks are left to dry out in the sun for about 7 days so that most of the water content evaporates and they can hold their shape.
4. The sundried bricks are then piled onto each other, made into a rectangular kiln with holes and channels throughout the base of the structure to allow for the fire to be fed until the bricks are fully fired. The whole kiln is plastered over with more manure to keep in the heat.
5. The structure is taken apart, with the bricks set aside for distribution, and the cow dung set aside for reuse as fuel for firing the next batch of bricks.

Photos of the mud brick making process

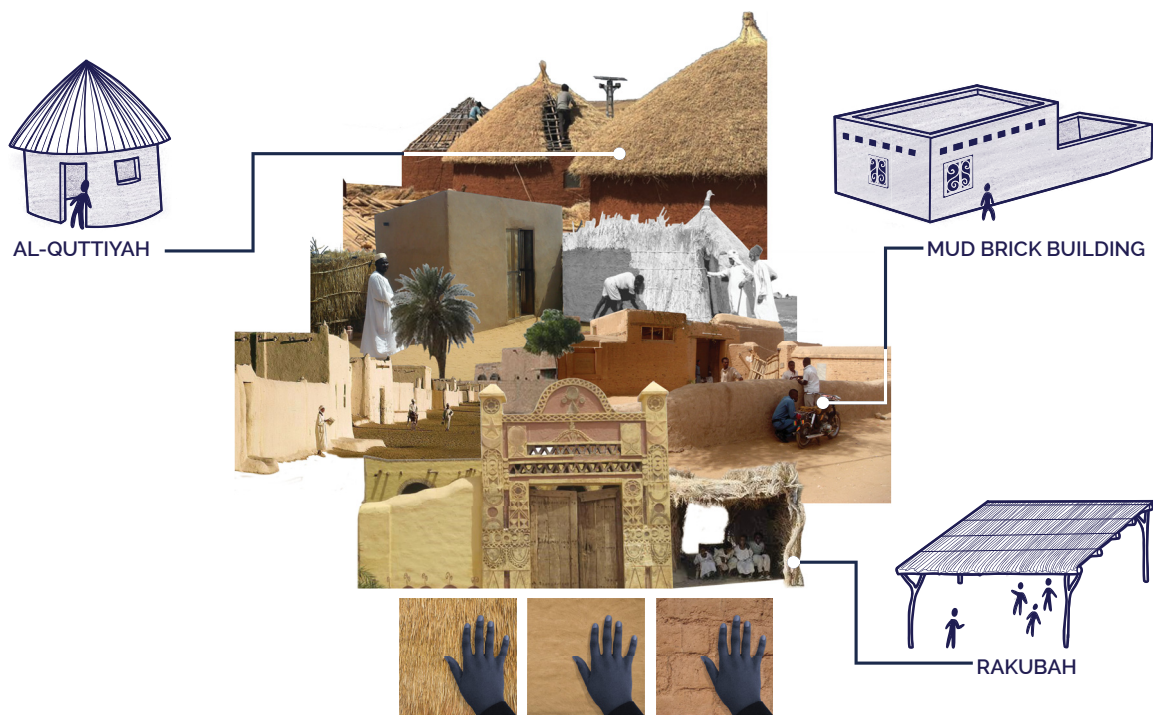
Architecture

As previously indicated through processes of mud brick making, there are many parallels between methods of construction and the traditional crafts common in the region. The same types of skills associated with crafts of weaving and molding manifest themselves architecturally in the regions indigenous building techniques. Tents of woven fabric walls make up the homes of many nomadic tribes. Mud brick and mud structures sculpted from the earth make up the homes of sedentary people. And frameworks of layered and knotted fibers create in-between spaces, or places of refuge, ready for all to take shelter underneath their dappled shade.

Like their craft equivalents, they utilise local natural materials, and the techniques of their construction have been tried and tested through time. However, the wealth of knowledge behind these methods is often overlooked. In the capital – Khartoum – you'll find structures of imported styles and materials appearing more and more, with surrounding rural areas also beginning to follow the trend. The industrialised materials are often viewed as progressive, and, in some ways, they are. Materials such as steel and concrete can support the design and construction of larger, more complex projects. But these new builds completely overlook place-based methods, resulting in issues of their own – as mentioned earlier in this paper.

In order to take effective steps forward, it's important to build on the foundations already laid by centuries of practice in these very conditions, rather than knock them all out and start anew. We must acknowledge and continue to expand upon the potential of raw materials such as mud, and dried fibers

and their associated processes of sculpting, compressing, thatching and weaving, to develop projects that speak directly to the wants and needs of the people and place. To illustrate some of these place-based techniques and the insight behind their processes, the traditional constructions of the quttiyah, mud brick building, rakubah and baggara tent will be explained in more detail.



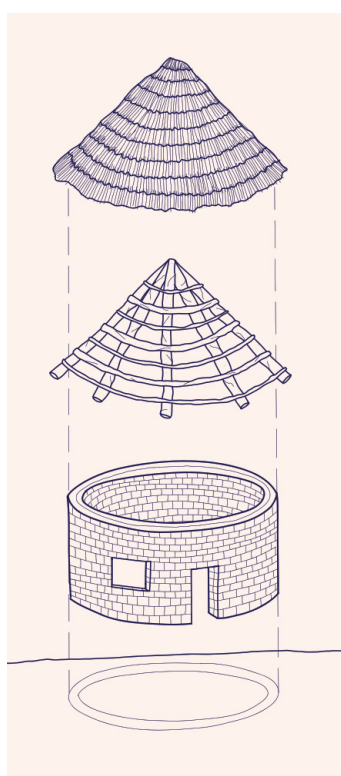
Traditional forms of architecture



Traditional quttiyah or tukkul construction in Eastern Sudan. (Norwegian Refugee Council 2022)

The Quttiyah

The quttiyah is a building typology that has existed in Sudan for centuries and is now most commonly used in the eastern, western, and southern regions of the country, with strong presences throughout the states of the Blue Nile, South Kordofan, and Darfur (Awad Allah 2022). The structure, customary to agrarian communities, with walls of mud and a thatched roof, is similar to wide array of traditional building types that exist elsewhere across Africa. Typically residential



Quttiyah illustration depicting construction

in program, the quttiyah's construction resembles those of the homesteads of the Karamojong, Pokot and Acholi people of Uganda, the Gaan people of Burkina Faso, the Batammariba of Benin, and the mud huts of Botswana – to name a few (Meuser and Dalbai 2021).

The construction of the quttiyah can be broken down into two stages: construction of the walls, and the construction of the roof. The assembly of these two elements varies from place to place across Sudan, all depending on the climate and locally available materials. For instance, the pitch of the conical roof can be contingent on the amount of rain experienced in the area. The rainier the climate, the steeper the roof's pitch. Additionally, examples of quttiyah's with rounded walls constructed of large stones, branches, straw and etcetera exist around the country.

In Wad Hajja, the use of the quttiyah is less common, however (in accordance with the available materials) there are two methods of wall construction that could be most appropriately applicable at the site. The first being completely of mudbrick - the composition of which either be of Nile silt, manure, and straw or of sand, Nile silt, gravel and straw (Adam and Agib 2001). Once the mudbricks are prepared and transported to site, the usta (the person in charge of the construction of the quttiyah) digs a circular trench 60 cm into the ground, marking the shape of the space to be enclosed by the walls. Into this trench the bricks are laid, mortar composed of mud, lime and sand binding them together (Adam and Agib 2001) and openings are left for doors and windows. The walls are raised up to a height of about 1.5 to 2 meters, and once complete are left to dry for 3 days (Awad Allah 2022).

The second method for making the walls is as follows. Columns of large sticks/branches found locally are arranged in a circular formation, planted firmly into the ground before bunches of dried grasses and palm fibers are tied together and laid around them. These stacks are added vertically, making up the walls of the structure so that the circle begins to take on a more cylindrical form. A thick layer of mud is then plastered along the interior and exterior faces of the bunches.

The roof structure is constructed away from the main body of the home. Made up of twigs and branches bent and tied together with palm leaf fibers into a conical formation, its base diameter is made larger than that of the walls it is to top. This is so that there is a sufficient overhang to protect the mud below from rain. The roof frame is then taken and raised up onto the walls of the quttiyah. In some cultures



Illustration depicting the communal transportation of the quttiyah roof.

around Sudan (namely those of the state of the Blue Nile), this process is ritualistic, with all the community men – especially family and friends of the owner of the quttiyah – helping to carry and raise the roof onto the base as an expression of community support. Depending on the culture, this process is concluded with celebratory song and dance, which the women of community can join in on. Finally – and sometimes this step occurs before its transportation onto the rest of the structure - the roof skeleton is clad in straw thatch, the process beginning from the bottom of roof upwards. Bundles of straw being attached to the bent twigs acting as the substructure of the roof, and then compacted through hammering with a wooden tool called almunfaala (Awad Allah 2022).

The sizes of the quttiyah aren't designated arbitrarily. They are determined in accordance with the culture of the community - or rather, the tribe - and social status of the family to which it belongs. To the average family of five, they are 2.5 to 3 meters in diameter, any increase in size usually indicating a higher social status (Al-Tayeb 2018).



The Khalifa 's House in Khartoum, Sudan. This building is an example of traditional mud brick building construction/design. (Maitland 2012)

Mudbrick Building

A widespread method of construction, variations of which witnessed from South America to the Middle East and Africa, mudbrick building is the prevalent typology in Wad Hajja. Its use in the rural city another way for locals to make use of one of the most readily available materials in the region: mud. Thanks to its commonality, there are a number of mudbrick quarries scattered around the region, nearby the Blue Nile riverbanks – with one right at the base of this thesis's site. There are several different types of mudbrick make-ups. Conventional mudbrick (both fired and air dried)

comprised of sand, Nile silt, gravel and manure being the most conventional type in Wad Hajja (Adam and Agib 2001).

Traditionally, mudbrick construction consists of cubical forms. From residential buildings, to public ones, rooms are split up into separate blocks, arranged around a common courtyard space, and the whole composition enclosed by a wall distinguishing the outside public realm from the private realm. Mudbrick construction can also support multistoried buildings, although there is a limit to the scale of which that can be sustained by the material alone. Compressed stabilised earth blocks provide a modern improvement to the traditional mudbrick, as they are stronger and more durable. The bricks themselves have the same/similar make-ups, however, they are stabilised (i.e. strengthened) in one of two ways. They are either compressed manually or mechanically, or cement is added to the brick mixture, which not only strengthens the mudbrick, but also increases its water-resistance (Adam and Agib 2001). So, there is potential here to introduce/encourage the use of these improved varieties of mudbrick. As well as to incentivise the employment of compressive forms that lend themselves well to the compressive strengths of mudbrick and CSEB, reducing the need for reinforcement; steel or otherwise.



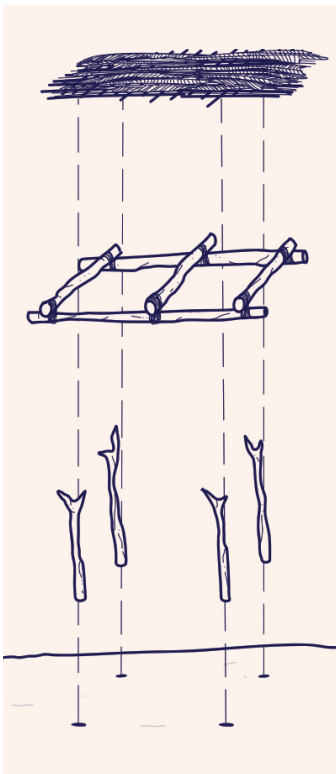
Owner of a traditional sesame press poses under his rakubah. Traditionally, even the posts of the rakubah would be of large branches, but in this instance steel posts are used.

The Rakubah

The rakubah is unique to Sudan. Used mostly as constructions for outdoor gathering and/or lounging, rakubahs are light structures of date palm fibers, straw thatch and branches that provide shade and refuge for their users. Scattered around Sudan, nearby corner stores, restaurants, and attached to residences, rakubahs are well established, traditional constructions.



This close-up of the sesame-press rakubah roof shows recycled rice bags and cloth being incorporated into the structure. These recycled materials are used alongside dried palm leaf fibers, bamboo, and twigs.



Rakubah illustration depicting construction

The process of making a rakubah is relatively simple. The framing of it is set up first. With four to six columns of large branches fixed firmly into the ground in a rectangular formation, and the framing of the roof structure (also of large branches) set atop. The first stage of the roof structure's construction begins with the set up of primary beams to connect the columns. The columns selected typically have forks in them, so the beams are placed resting in their joints, and are secured through rope ties (usually of palm tree leaf or bark fibers). Joists are then placed atop the primary beams, in a grid-formation, and tied to their subsequent structure with rope. Lastly, the roof structure is capped with bunches of thatch, which consist of common locally obtained grasses/agricultural by-products. In the case of Arbagi, these would typically be bunches of dried millet, wheat, or sorghum stalks that are tied to the grid structure of joists and primary beams.

Sometimes these structures are left "wall-less", with the pillars holding up the thatched roof fully exposed. On other occasions, horizontal furring strips (also of twigs) are attached to the walls, and these are covered in thatch. Most commonly, two to three sides of the structure are "walled" in this way, and the remainder is left open for cooling purposes.

Modern renditions of the rakubah have been popping up more and more around the country. These replace the branch columns, thatched walls and roofs with iron pipes, and corrugated metal sheets respectively. These new techniques are considered to be easier and quicker to construct. The traditional, hand-crafted items that used to furnish their interiors (such as the zir, and the anagireeb described earlier in the chapter) replaced with their mass-produced equivalents or removed all together,

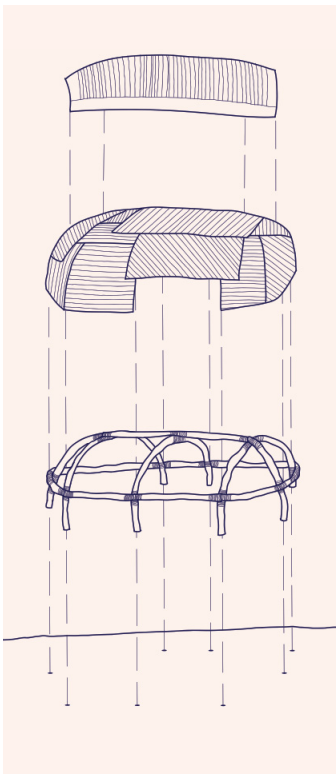


Image of bait al-birish (The National Council for Cultural Heritage and Preservation of National Languages n.d.)

and televisions and radios being introduced to the typical rakubah accoutrements.

Bait Al-Birish

This type of architecture is most commonly practiced by the nomadic Baggara and Abbala tribes of primarily western Sudan (Baggara n.d.). These pastoralist tribes of cattle, sheep and camel breeders seasonally migrate around the Lake Chad and White Nile regions, to and from their wet and dry season pastures. In order to support a life in constant flux, the homes of these tribes are often tent structures of branches fixed into the ground, bent, and tied into shape around a bed for women and children. In the wet season, a quilt of woven mats fabricated from dried doum palm leaf fibers would be draped over and fastened to the structure of the tent with more rope. In the dry seasons, when less protection from rain was necessary, a layer of thatch would often replace the use of woven mats and tarps. These structures provided shade and protection from mosquitoes and, in comparison to mudbrick constructions, were more breathable (Baggara n.d.). Once packed up for transportation, they would cushion the backs of cattle and camels, protecting them from back sores along their typically month-long journeys between pastures.



Bait al-birish illustration depicting construction

Take-aways

As suggested in this chapter, there are many parallels between practices of craft and architecture. Both realms traditionally utilise materials of the land, be it the Nile silt gathered for mud, or by-products of agricultural production such as the straw, dried grass and palm fibers often used for thatch and weaving. This optimisation of readily available materials and techniques that don't require heavy machinery,

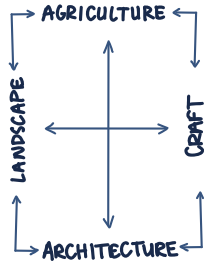
or industrial supplements, aids in the ability of locals to be independent. Repairing and expanding their wares whenever need-be, be it on their own private property, or in public spaces. This type of self-reliance is echoed in the newer community projects carried out in the region as well. Methods of knowledge sharing and do-it-ourselves attitudes carried on with new materials, techniques and technologies. A practice that this particular thesis project aims to promote through the provision of an educational space that provides community members with the knowledge necessary to continue to carry sustainable practices through all realms of life.

These goals may manifest themselves in the design of the project in a number of different ways. First, the incorporation of various scales of gathering spaces as buffer zones between programs to ensure that there's always room for casual knowledge sharing, communication and congregation. Second, the integration of traditional construction methods to involve local building culture and expertise – as well as to encourage the development of these traditions. And thirdly finding means of showcasing inherit relationships between place-based craft and architecture to demonstrate their potential to enhance one another, in addition to celebrating local craftsmanship.



A collage assembling the techniques of making, growing, and building mobilised in the thesis. Thinking of nature, the Nile, as a source of life, community and togetherness as a key source of strength and promoter of life, and craft and tradition as a centralizing element linking the two.

Chapter 4: Methodology - Traditions of Making as Assets for Advancement



The natural landscape, craft, architecture and agriculture as a traditionally interconnected loop, with each realm informed by the other.

Both architecturally and programmatically, the aim of this project will be to utilise place-based techniques as much as possible. In Sudan, many of these techniques are linked to practices in craft, as expressed in chapter 3 - and such is the case in many indigenous and vernacular styles globally.



Illustration depicting local place-based, global-placed based and globalised trends and practices

In Sudan, many plights experienced stem from the countries over-dependence on imported, standardised, and mass-produced globalised products and techniques. A dependence sparked by its former colonisers, who fed the flame to a point that now - almost seven decades after its independence in 1956 - the country remains engulfed. The acritical, extensive application of these globalised practices, products and techniques continuing to ravage its economy, ecology, and society. Considering the benefits of these practices, such as their intertwinement with ecological, cultural and social needs, and their encouragement of age-old local skills, trades and industries; there is much to be ascertained. However, it's important to recognise their weaknesses given modern issues such as those presented by the changing climate and rising populations. Understanding these shortcomings is key to knowing how to effectively combat them – which is where more globalised techniques, materials and practices may come into play and be used as tools to strengthen overall performance. Saving the project from falling into the same traps of unrealistic romanticisation and inaccessibility as past movements of Critical Regionalism and Arts and Crafts have before (Eggner 2002, 235; Naylor 1971).

The theories of Two-Eyed Seeing and Lo-TEK are a starting point for this project's own methodology, in addition to two architectural case studies showcasing examples of how other communities have combatted issues similar to those experienced at the site using techniques rooted in place.



Salaam Centre for Cardiac Surgery in Khartoum, Sudan. (Bonfanti n.d.)

Case Study: Salaam Centre for Cardiac Surgery

Located in Khartoum, Sudan, along a bank of the Blue Nile, this hospital project was designed with the local context in mind. According to the architects of Studio TAMassociati, there were three guiding rules that grounded the design of the project: “the idea of a “hollow” space and a pavilion-based system; the choice of the best possible technology given the context; the search for an ethical language for this type of architecture.” (Studio TAMassociati 2009) Throughout the centre, these three principals ring true on multiple levels.

The center incorporates high functioning mechanical systems that maximise efficiency in the given context. Cooling and air filtration systems that mixed active and passive strategies were developed to satisfy requirements for user comfort and hospital function. A highly insulative wall system comprising of a double layer of brick sandwiching an air cavity was designed to minimise the use of air-conditioning systems and solar panels were introduced as an alternative energy source to be used.

The use of traditional building methods and handcrafts can also be seen in the design. The traditional rakubah (explored in chapter 2) was looked to for means of overhead shading in various outdoor spaces throughout the design. Crafts of bed-making - or banbar weaving - were utilised as vertical shading elements providing protection from the harsh sub-Saharan sun to exterior walkways that run along many of the building’s spaces. Not only encouraging the use of these traditional skills, but also offering a sense of familiarity and warmth to what could’ve been an exceedingly sterile environment. Another element of familiarity presents itself in the form of the building’s organisation. Radiating off existing

mango trees, the hospital consists of intertwined indoor and outdoor spaces. The building functions are broken up into various “pavilion”-like arrangements, with each program leading into the next via a series of shaded outdoor walkways and courtyards – reminiscent of the arrangement of traditional Sudanese homes.



HIKMA Religious and Secular Complex in Niger (Wang n.d.)

Case Study: HIKMA

Designed by Atelier Masomi and Studio Chahar for the town of Dandaji, Niger, the HIKMA Religious-Secular Complex was both a restoration project and a new build. Initially, the project had stemmed from the community’s need for a new mosque, as their old one’s earthen structure had fallen into disrepair due to poor maintenance. Locals wanted to completely replace it with a new, concrete build that would require less maintenance than the traditional adobe construction and allow for a design that would accommodate the town’s growing population. However, when architects Mariam Kamara of Atelier Masomi and Yasaman Esmaili of Studio Chahar were brought onto the project, they advocated against the original mosque’s destruction. Instead, suggesting it be repurposed for use as a library, with a new mosque to be built across from it, with a public courtyard between them. Together, the programs and their proximity to one-another meet communal needs, encourage literacy, and reference the religions encouragement of peaceful co-habitation and education (Matispa 2020).

The construction of the projects themselves varied. The old mosque-turned-library incorporated steel substructures within the earthen walls for structural supports, as well as to act as partitions. To restore the buildings exteriors – namely its walls and roof - they enlisted the expertise of

the original architect's (Falké Barmou's) former assistant. Coating the final product in a newer concoction of plaster consisting of clay, shea butter and laterite, which requires less maintenance than the traditional mixtures which don't use the latter ingredient.

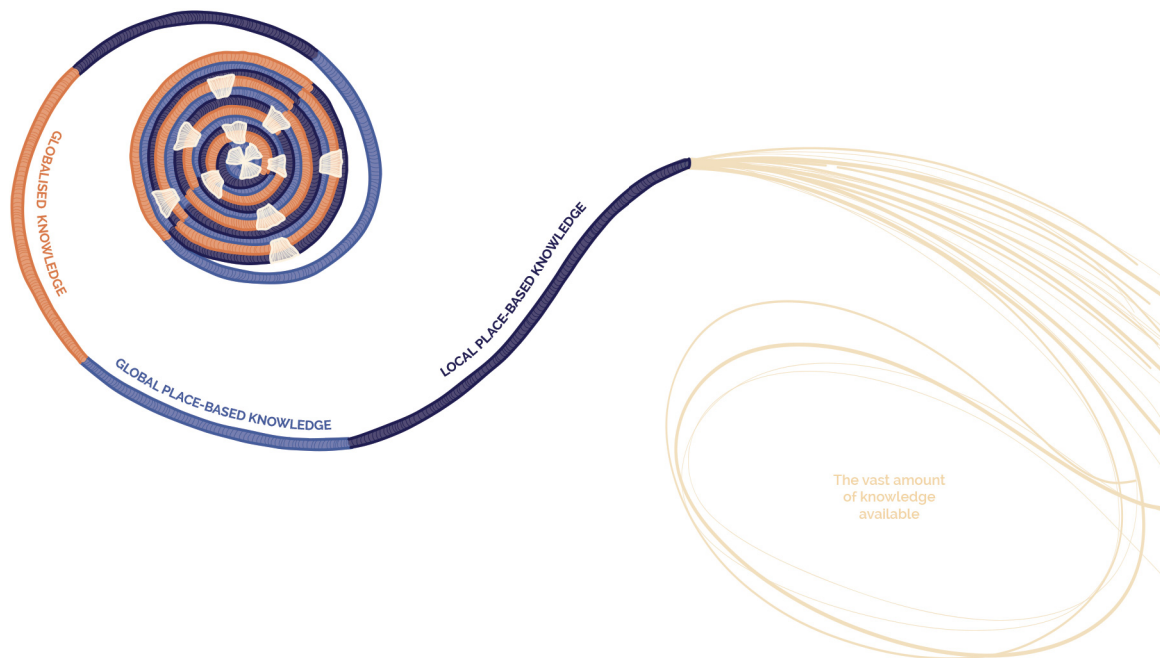
The new mosque incorporated the use of compressed earth blocks, or CEB's; a type of masonry more durable than clay. Typically made up of soil, an aggregate (like sand or dried fibers), and a stabiliser (like lime or cement), they are stronger and require less maintenance than traditional mudbrick. The construction also incorporated the use of concrete floors and structural lintels and columns, allowing for more flexibility in the design's scale and features. Local craftsmen were enlisted to incorporate vernacular domes, as well as traditional latticework into the steel doors throughout the project. Utilising their skill, with new materials due to the shortage of the more traditionally used timber for the latter example and for the increased durability of CEB in one prior. It is this method of interweaving the old and the new, the place-based and the modern that allowed for the design of a rich and highly collaborative project that met the community's modern needs whilst still being appropriate to the local economic, functional and aesthetic context. As Esmaili puts it: "There was a lot of exchange. We are architects, but we are not there just to prescribe from our Western Educations." (Beamon 2019) Emphasising the importance of open collaboration and incorporation of local resources and skill.

Take-aways

This thesis will take the form of a school of traditional agriculture and craft. It seeks to intervene in three principal

areas: economy, education, and connection. Generally, the aims highlight the interconnectedness of landscape, agriculture, craft, and architecture and can be summed up by the following:

- Synergetic technique: being intentional with the incorporation of traditional, place-based techniques as well as globalised, industrial ones.



Interwoven: A concept of knowledge sharing to inspire the creation of more fruitful outcomes. Inspired by those of Lo-TEK and Two-Eyed Seeing. Utilising place-based design, knowledge & craft as tools for economic, environmental and communal advancement.

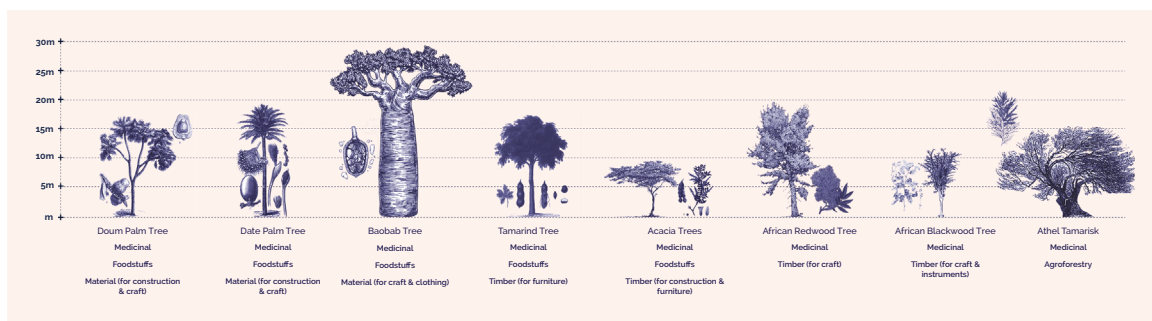
- Incorporation of craft and technology: using design to ephemerally depict the underlying relationships between place-based crafts and technology. Creating spaces that speak to the very principles and materiality they share and setting the stage for an ongoing collaboration between the collaboration between craft, art, and architecture.
- The concert with landscape and community: creating a space that not only maintains but emboldens

existing communal connections and relationships with the natural landscape - both being factors around which much of the community's lives and culture revolve.

Place-based technique and architecture will be used as the foundation for this project, both programmatically and architecturally.

For the support of place-based techniques of agriculture, specifically intercropping and agroforestry, programs must be allocated in a way that can best serve these processes. Space for the animals that are a part of these methods and the daily lives of the community (i.e., chickens, donkeys, sheep and cattle), must be included. And room for the livestock to roam somewhat freely as they would in nature, to support a type of pastoral system, should be considered.

Native, and existing trees on site such as the acacia and the jujube are to be nurtured, with more to be added alongside groves of date and doum palms, as well as crops of wheat – these are chosen for their multiplicity of uses in various parts of Sudanese daily life. The by-products of these crops (the fruit of the jujube, wood of the acacia, dried wheat stems, palm tree leaves, and etcetera) are also utilised in the traditional crafts to be taught on site.



Native trees and their traditional uses

Crops of fruits and vegetables for the supply of the community will be included. Namely: tomatoes, onions, cucumbers, okra, eggplant, hot peppers, bananas, mangos, lemons, and oranges, all allocated in accordance with common use in Sudanese cuisine and suitability to site.

Storage space for tools, machinery, and produce must also be designated, along with indoor and outdoor classrooms/ learning spaces for agricultural principles to be taught and crafts to be created. As spaces are to be used by several students at any given time (possibly 15-20 per class), said training environments should be spacious and varied enough to facilitate experimentation in methods of craft and agricultural production - innovation rooted in place-based principles and methods being one of the objectives of the program. The design and layout of said spaces should consider the unique processes and apparatus of each (outlined in chapter 3). For instance, ceramics classes will need access to indoor and outdoor kilns for the firing of the smaller and larger pieces made. Weaving classes will need to have spaces for the drying, softening and dyeing of palm leaves, Nile grass and wheat stalks – further encouraging the amalgamation of both indoor and outdoor learning spaces.

Additionally, as the project intends to attract people from other cities as well as the locals, it'll be practical to have dorm spaces, or on-site residences, for staff and visiting artists and students to support their stay. Outdoor seating areas and garden spaces that can be open to the public may be integrated throughout to further encourage public engagement. The garden spaces will also feature mainly naturally occurring and native vegetation so that minimal maintenance will be required, and species known to produce

essential oils that can repel insects such as mosquitos will be sprinkled throughout. (These species include Sudanese basil, neem trees and eucalyptus.) Exhibition spaces that can double as room for a Friday market will be allocated to sell goods produced on site; from the woven products, to pottery, to the produce cultivated. This will likely be located closer to the main road for ease of access, but should be designed in a way that's inviting, to encourage new visitors to explore the space further and learn of its program.

Architecturally, building organisation, to be allocated to areas to cause minimal ecological disruption, will draw from the traditional courtyard organisation exemplified in neighbouring homes and schools. This will be done to make use of the ventilative properties that such courtyard organisations may provide, to create more dynamic spaces and experiences that link indoor and outdoor realms, and to foster a sense of familiarity in users. Mudbrick construction, and its relatively newly improved compressed stabilised earth block, and rammed earth adaptations will be used as the main construction material for similar reasons. Also encouraging the project to make the most of the local availability of the material and skill. Seeking to support local economies, whilst elevating local practices to facilitate programmatic spatial needs. The forms will be determined by the functional and structural optimisation of mudbrick/ CSEB and rammed earth - which typically entail designs of simple, geometric forms.

Globalised techniques and materials will be utilised where the locally available, natural materials cannot suffice functionally or structurally. In particular, where the adobe meets the earth, and where it is exposed to the sky. Ferrock foundations and plinths raised about a foot above ground

level may be required to ensure the protection of the adobe from moisture. This use of the waste steel dust, silica from ground up recycled glass, composite material a prospective route to recycle waste – especially that of the several steel mills in Khartoum. Steel may also be used if the project is to be elevated above the ground for any reason, dependant on typology and proximity to the Blue Nile. Additionally, it can serve as structural reinforcement if and where necessary.

Methods of roof construction that echo that of the qattiyah and rakubah may be used for its protective qualities, as employing the same principles of deep overhangs, and passive ventilation and cooling will be essential to the comfortability and sustainability of the spaces to be designed. Noting the particular site's sun exposure, northeastern bound wet season winds, and the southwestern bound dry season winds to designate aperture and passive cooling system placement that also capture key views to the surrounding natural landscapes. In addition to devising and putting in place means of rainwater management and/or collection for reuse - especially throughout the projects various, water-dependant programs.

In the end, the goal would not be to replicate any one style or building technique, but rather to incorporate each where most appropriate. To replicate without intention may do more harm than good, in either respect, whether it be cloning traditional techniques entirely or swinging the opposite direction and bringing in a completely foreign design (Pereira and Gillett 2021, 240). As discerned from the site visits taken and conversations had with locals and architects in the region, the community may be more excited to see new and modern takes, as to them these would more effectively act as inspiring symbols of progression. But



these interventions must be easy and economical to build and maintain, otherwise they risk falling into unsalvageable disrepair. However – as a side note - such an approach may lead to notions that are anti-ornament like those expressed by modern architects such as Le Corbusier and Adolf Loos (the latter often voicing their views quite problematically) (Massey 2013, 509). The stance taken here does not discourage the incorporation of common motifs and decoration if it is done with the intention of celebrating the unique aesthetics and stories they carry along with them, engaging users, and/or creating spaces with a sense of familiarity. In Sudan, as in several non-Western contexts, there are many examples of traditional ornament that is multifunctional, serving roles beyond aesthetics. An example of this being the screens, ironwork and woodwork seen in the doors and windows of the homes of Wad Hajja. So long as it is applied strategically to enhance user experience, whilst meeting the programmatic, economic, ecological and cultural needs of the project – its function is valid.

Examples of ironwork doors seen around the town

Chapter 5: Proposal

Program

An educational space for traditions of making, specifically:

- Agriculture
- Craft

This will be done to support economy, education and a sense of community within the city of Wad Hajja.

Approach

Masterplan

The process of design began with a look into site organisation strategies that minimised the amount of interference with particularly sensitive ecological zones. Considering existing seasonal flows and traditional means of cultivation and land management throughout all of this as well.



Design goals



Typical seasonal flow chart, depicted by a woven dishcover

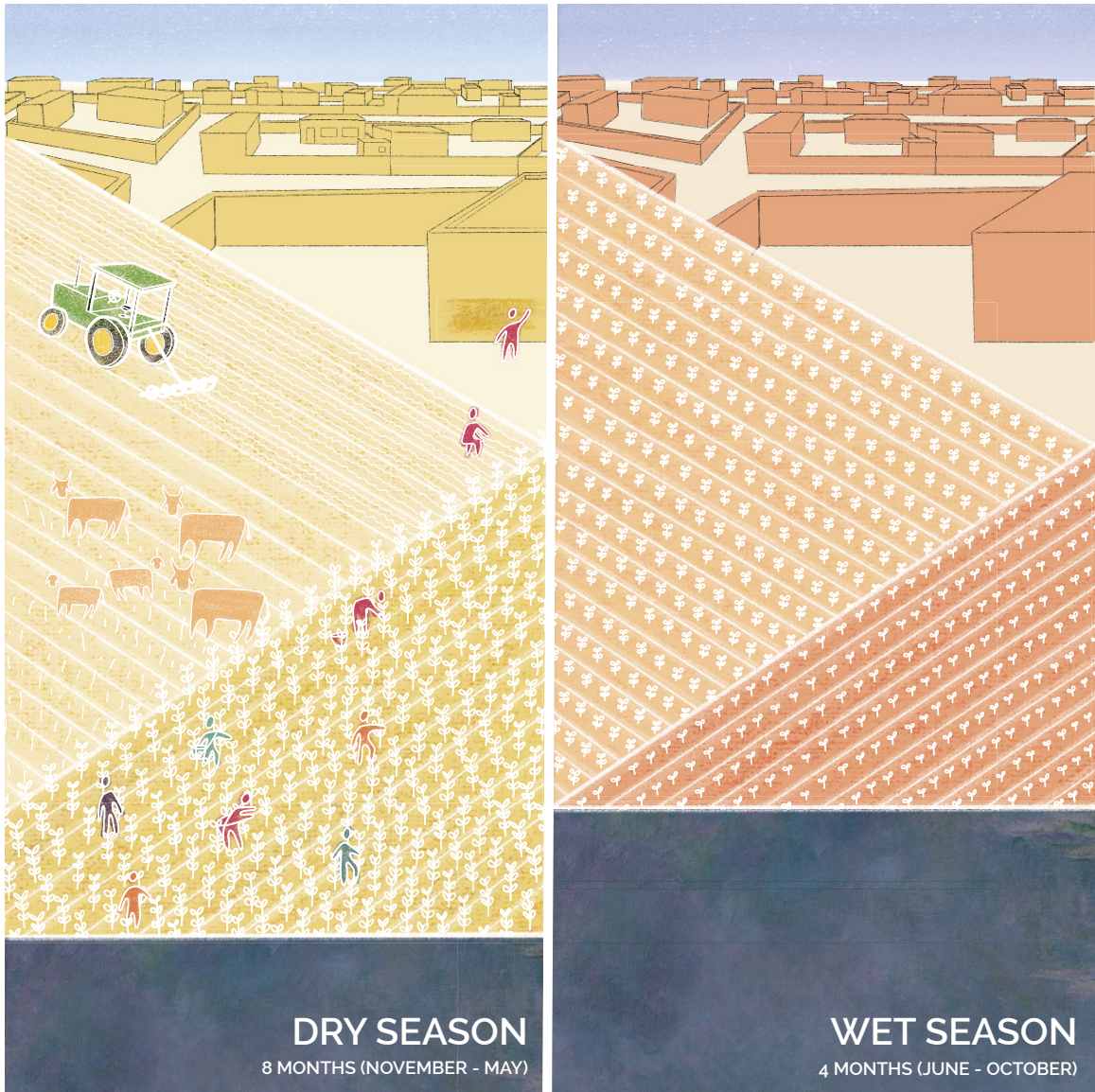
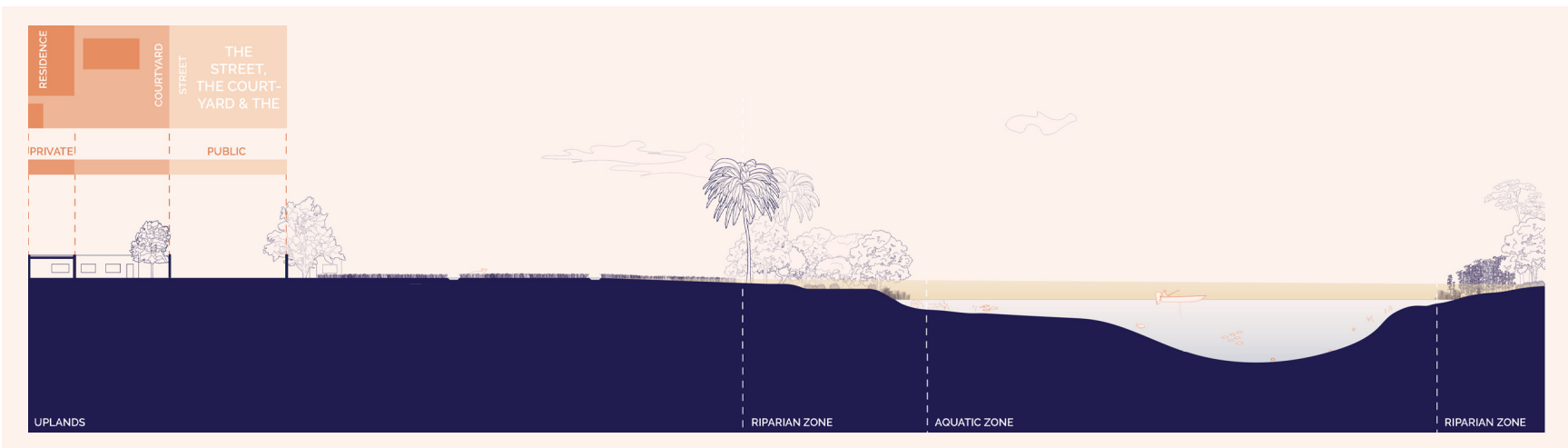


Illustration of seasonal activities



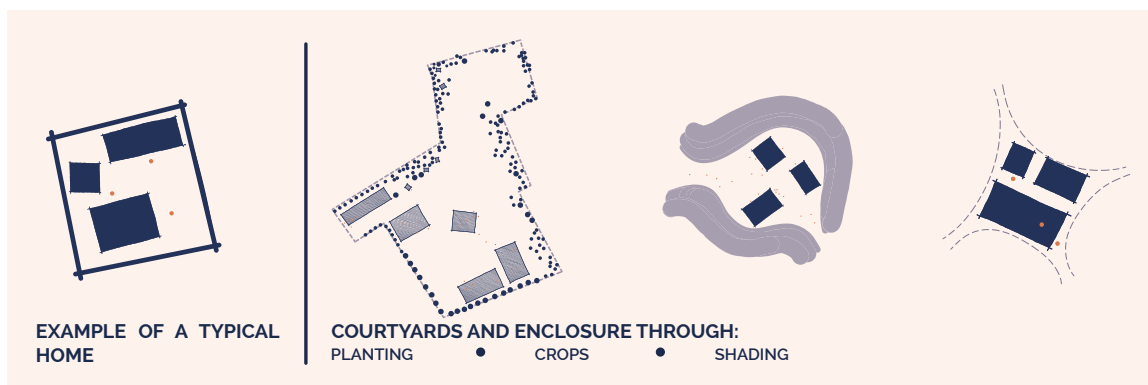
The typical relationship between the traditional courtyard home, the farm and the Nile (with the light orange colour indicating the Nile's wet season flood water levels)

The first step was examining the original layout of the site, and identifying which areas should be left untouched, to which areas would be ideal for systems of agroforestry, and which could be utilised as buildable space.



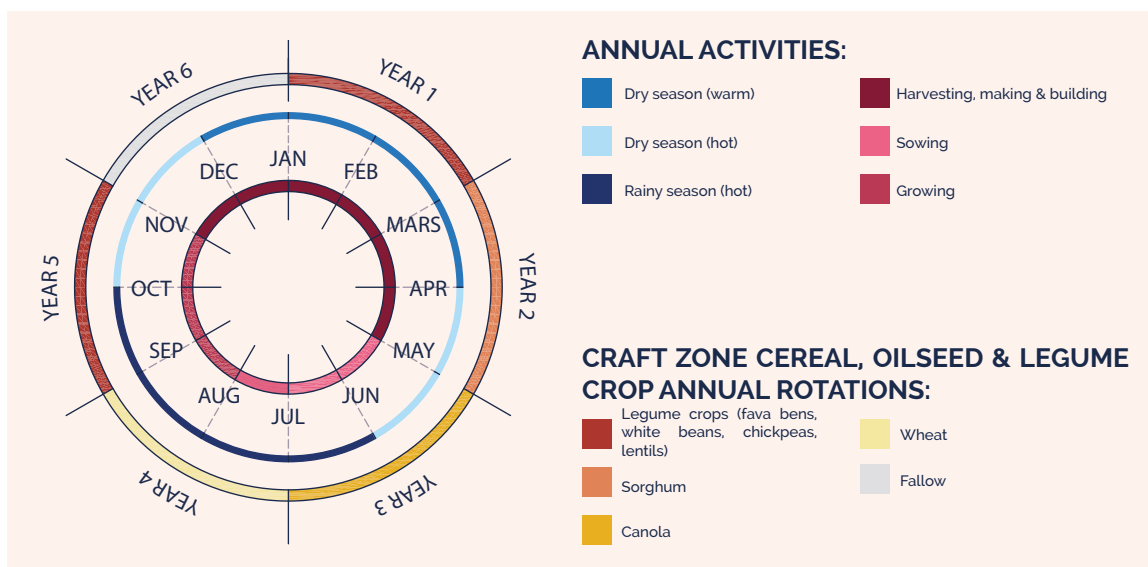
Preliminary site organising sketch

For all the vegetation cut down for use, it was important to replant various flora – especially in the zones requiring more ecological protection like the riparian zones alongside the sites stream, and by the Nile River. A set of more specific organising guidelines was derived from the layout of the surrounding traditional courtyard homes, and is indicated by the following diagram.

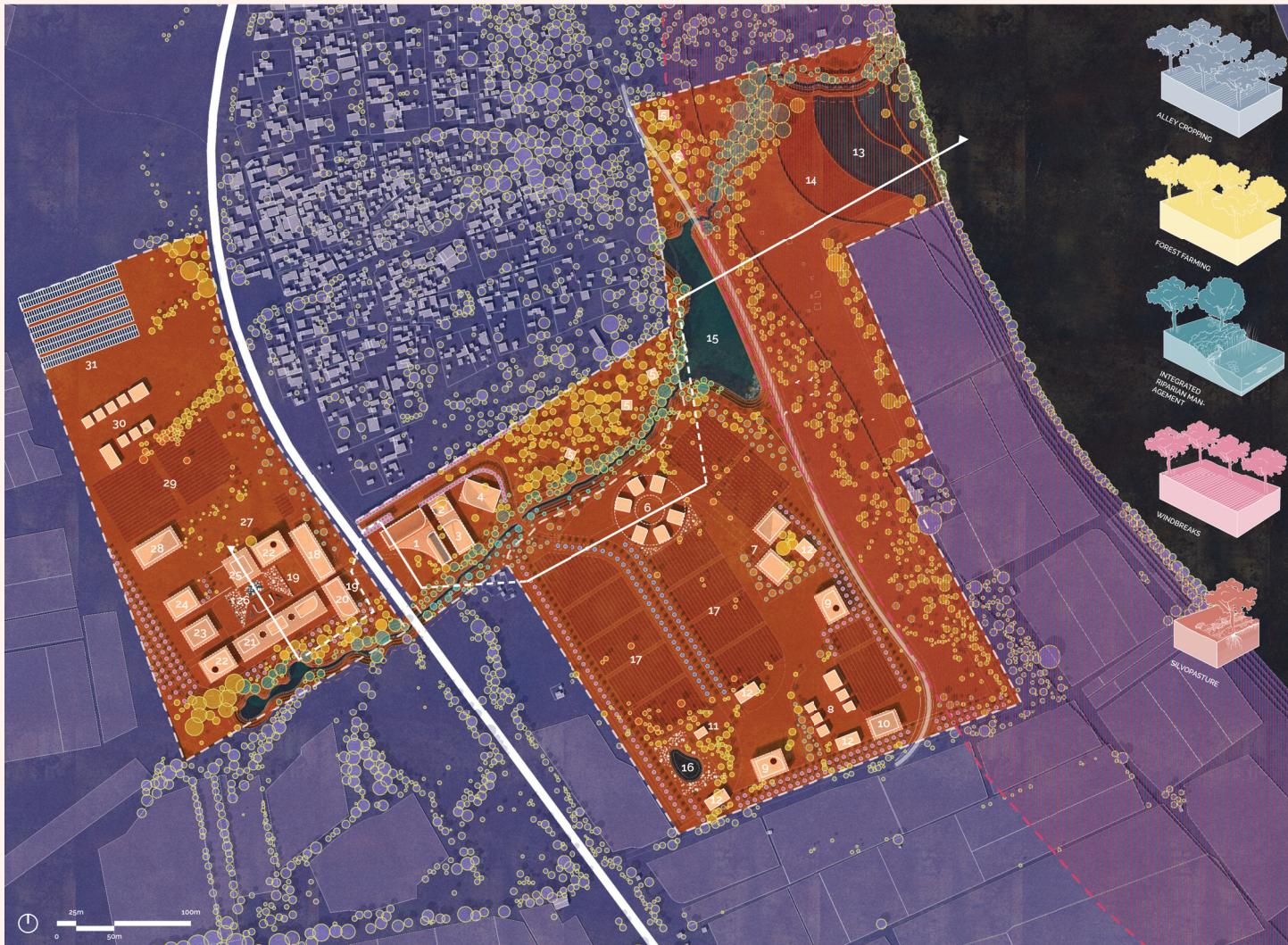


Site organisation diagram

After establishing said guidelines, and allocating crops, the resulting masterplan may be broken up into three zones: the welcome zone, the agricultural zone, and the craft zone.



Proposed seasonal activities and crop rotations, built off of existing annual traditional practices



LEGEND

WELCOME ZONE:

- 1. Student Welcome Center
- 2. Clinic
- 3. Library
- 4. Mosque
- 5. Artist residences

AGRICULTURAL ZONE:

- 6. Classrooms and labs
- 7. Auditoriums and offices
- 8. Employee residences
- 9. Dorms
- 10. Barns
- 11. Chicken coop
- 12. Storage
- 13. Rice paddies
- 14. Nile silt collection and mudbrick making grounds
- 15. Dam/irrigation and aquaculture pond
- 16. Water retention pond
- 17. Main fruit and vegetable crops

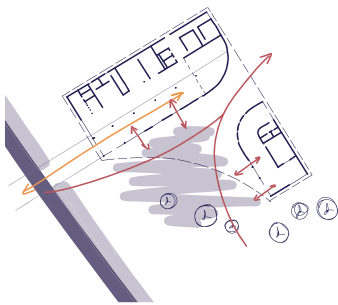
CRAFT ZONE:

- 18. Resource center and offices
- 19. Outdoor exhibition space
- 20. Gallery
- 21. Weaving classrooms
- 22. Dorms
- 23. Assembly hall
- 24. Barn
- 25. Pottery studio
- 26. Central courtyard & rain garden
- 27. Outdoor firing pits
- 28. Masters studio
- 29. Main grain crops
- 30. Employee residences
- 31. Solar farm

Site plan

Welcome Zone

The welcome zone consists of a student welcome center, artist residences and a clinic, library and mosque open to the public. This zone is intended to showcase traditional craft, architecture, and links to landscape through its designs. Being mostly areas accessible by the public, spaces are generous to support various needs, such as weekend markets, public meetings, and events.



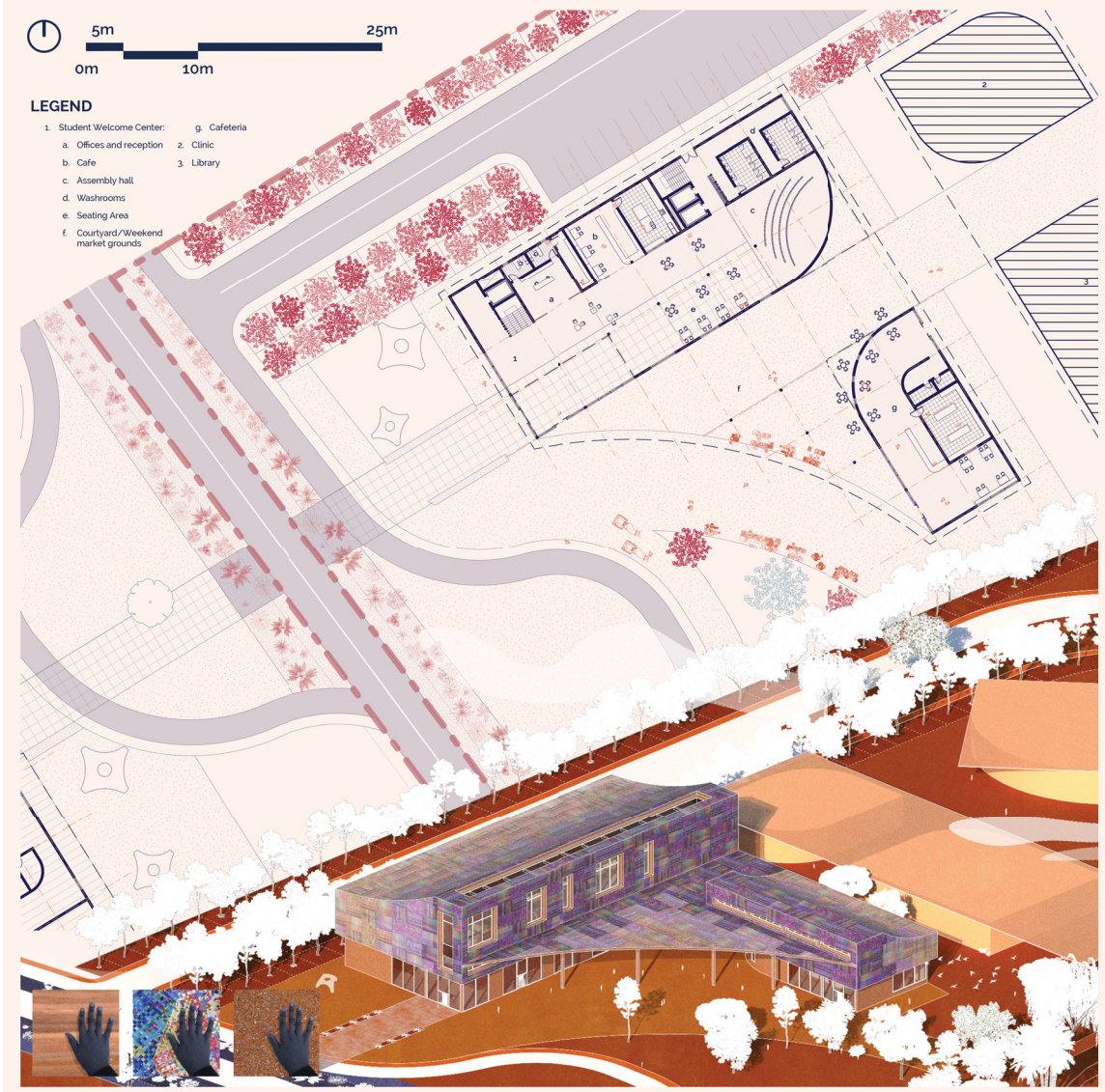
Student Welcome Center

The student welcome center is the most front facing of the programs. Stationed right by the area's main road, it seeks to create a sense of welcome, ushering the community and passersby in through its large outdoor courtyard, and directing them into the restaurant area or student center. Following its curved walls along will lead users out to the library, clinic, and mosque beyond.

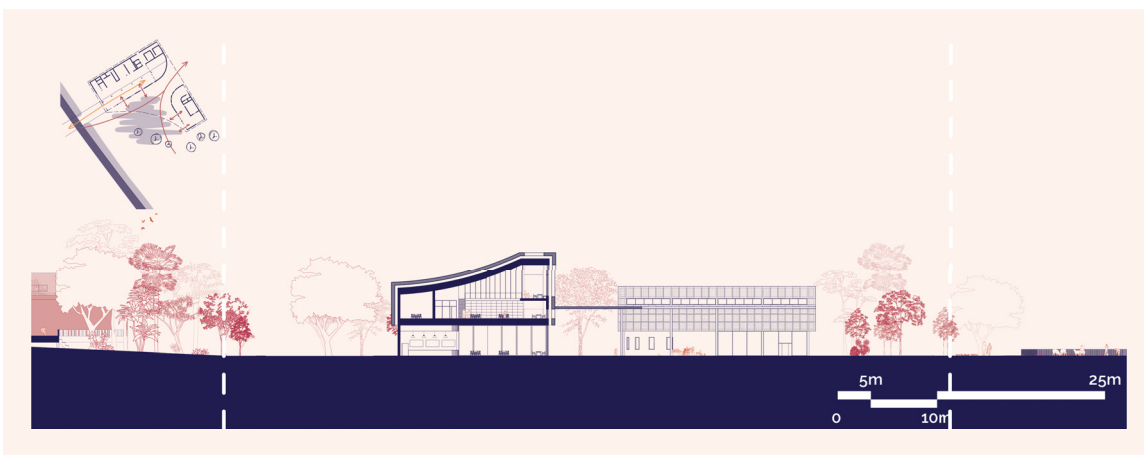


Form process model photos

With a construction consisting of mainly rammed earth, steel, and ferrock, the design of the student center also exhibits a building geometry devised to aid in the space's passive ventilation. A malqaf (a wind catch) is featured along its northeastern and southwestern façades to capture prevailing dry season and wet season winds respectively. The façade of the building incorporates a series of woven panels of recycled rice bags to make use of common waste often discarded in the region. The screen is elevated and offset from the building walls to provide shading and protection from rain along its exteriors. The main courtyard space in this instance also shaded by a composition of woven matts and native trees, its shaded areas animated by weekend markets, and Ramadan feasts open for all to take part in.



Student welcome center plan and axo



Student welcome center cross-section

Agricultural Zone

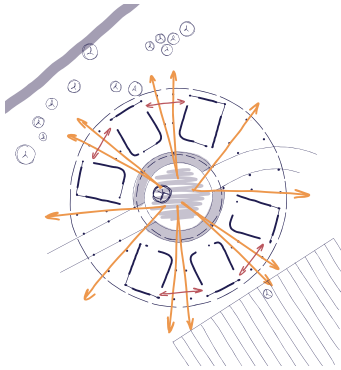
Activities of the agricultural zone vary from cultivation in the wet season, to mud brick making in the dry season. Classrooms, labs and assembly halls seek to frame views to the natural conditions, as well as views to the crops, suggesting their interconnectedness in the context of agroforestry and regenerative agricultural techniques. Barns, chicken coops and dorms are dispersed throughout, around fields of intercropped produce to encourage productive intermingling. The crops to be farmed include bamboo, acacia, baobab, tamarind and doum trees, sources of various materials and fruit used in the everyday lives of the Sudanese people. For the same reason, millet will also be farmed for consumption and to serve as fodder for animals living on site. However, this cereal crop will be allocated to the craft zone as the drier conditions there are more appropriate for its cultivation. The remainder of arable land available in the agricultural zone will be for various fruit and vegetable crops such as: tomatoes, cucumbers, onion, mangoes, and bananas – all of which are to be strategically intercropped and planted in periodical crop rotations.

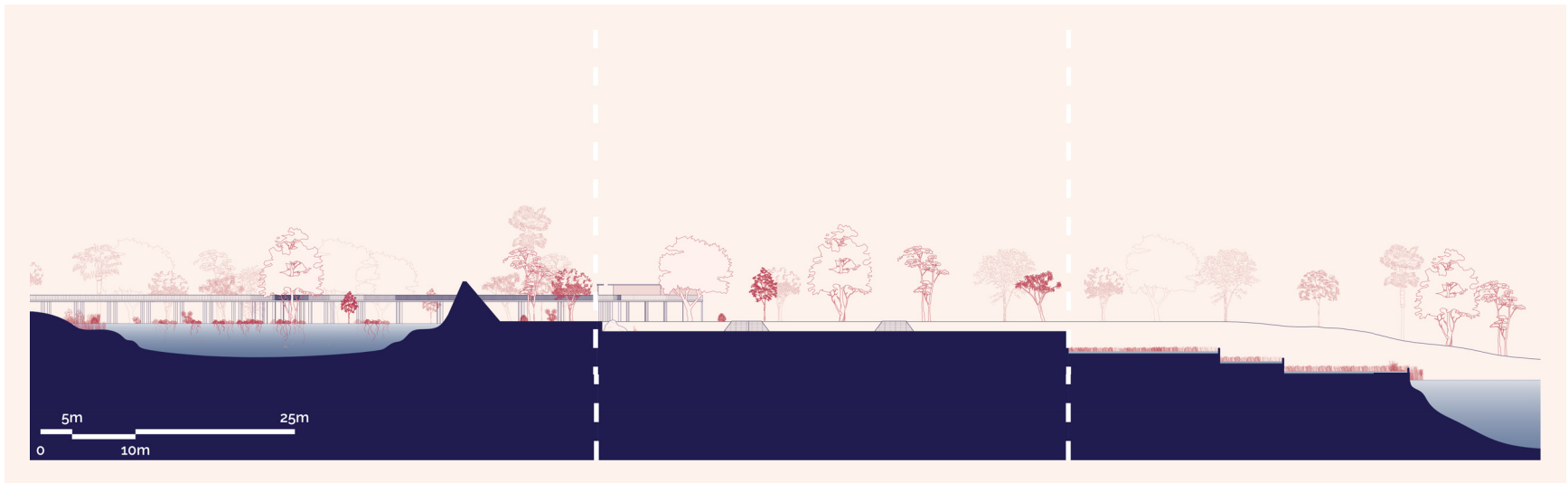
The site also utilises a number of functional landscape features. A clay cored and lightly planted dam aids in the resilience of the site to the increasingly unpredictable flooding. Its connected aquaculture pond an ideal site for aquatic life (such as water lilies and water lettuce) which can help maintain water levels, enrich it with valuable vitamins and minerals beneficial to crop growth, and be harvested periodically and used as natural fertiliser to aid in the departure from imported chemical substances. The topography of the site right by the Nile was also peeled back in layers, to allow for a terracing perfect for the cultivation of

rice crops – a major part of the Sudanese diet, yet rice crops in the region are relatively rare.

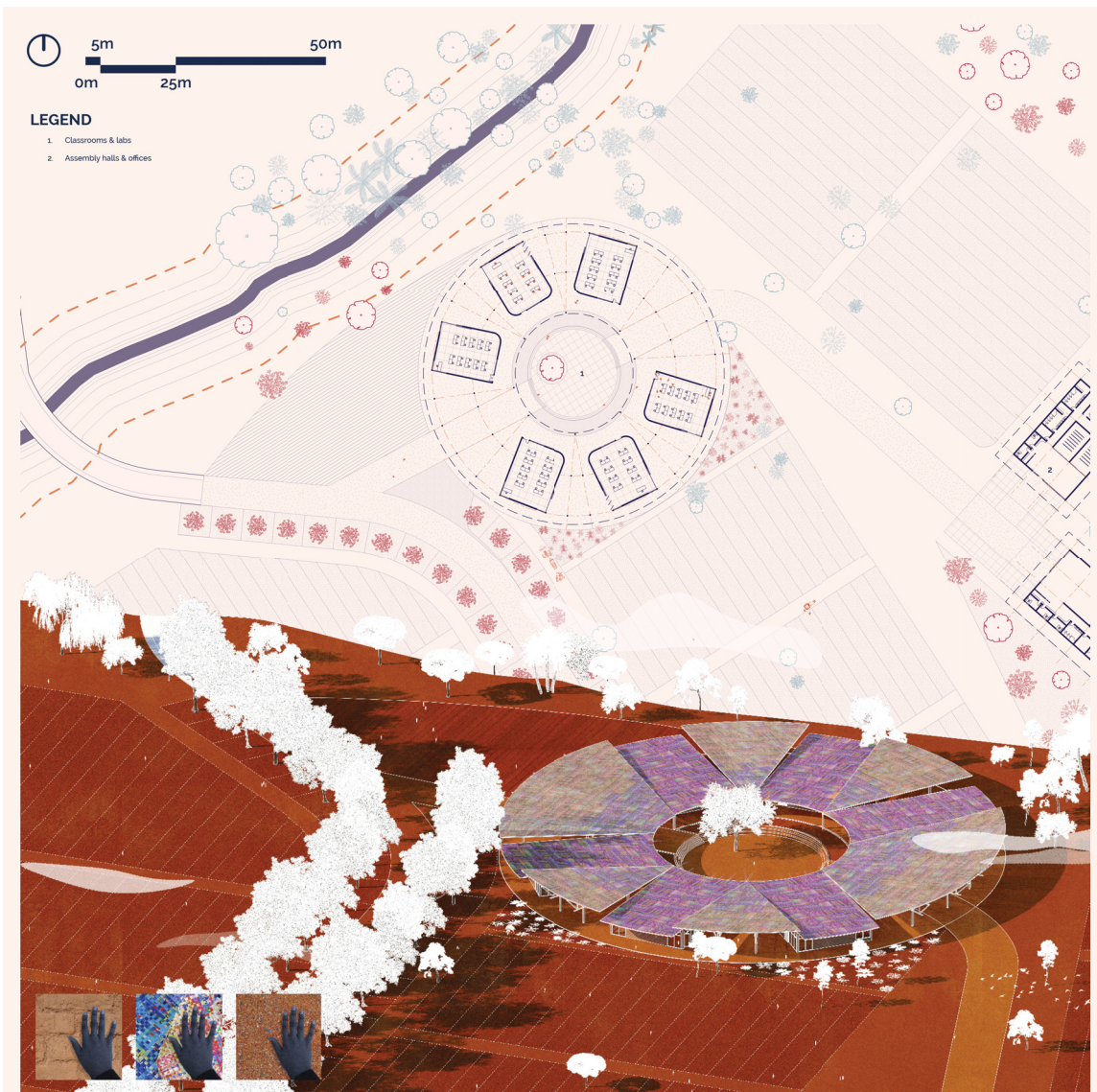
Agricultural Classrooms and Labs

Arranged around a courtyard, classroom roof overhangs not only frame views, but they direct rainwater away from the building's walls, and towards swales that guide it to storage tanks, saved for use in the nearby artificial aquaculture ponds and for irrigation. Moveable screens and windows allow the spaces to be opened up for ventilation and expansion for demonstrations requiring outdoor access.

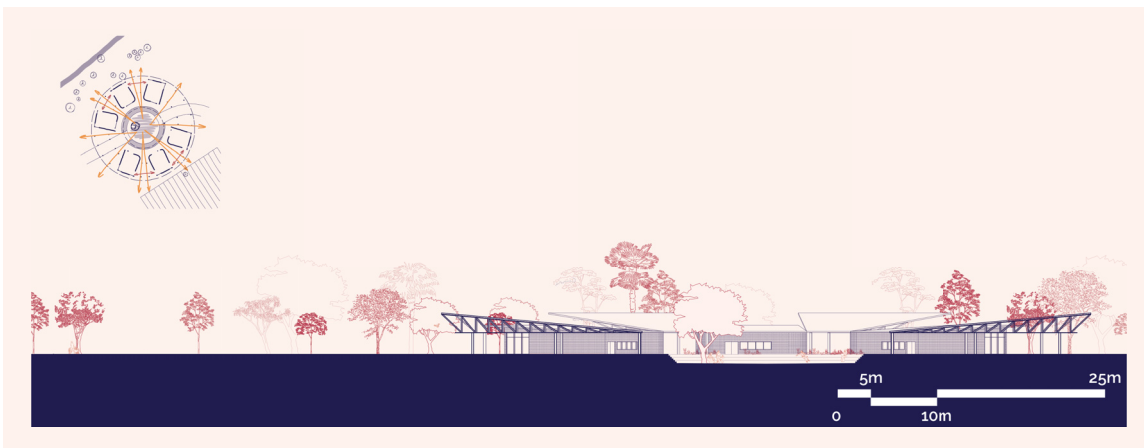




Section through aquaculture pond, dune, mud brick making area, rice paddies and the Nile



Agricultural classrooms and labs plan and axo



Agricultural classrooms and labs section



Interior view of classroom



Elevation detail of brick wall becoming increasingly porous as it meets with key windows



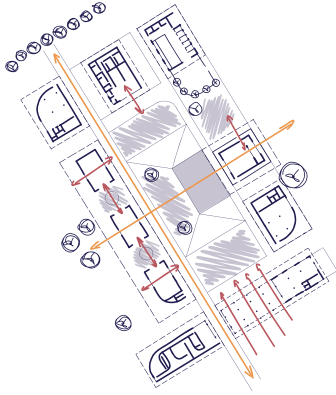
The agricultural zone crops in different seasons

Craft Zone

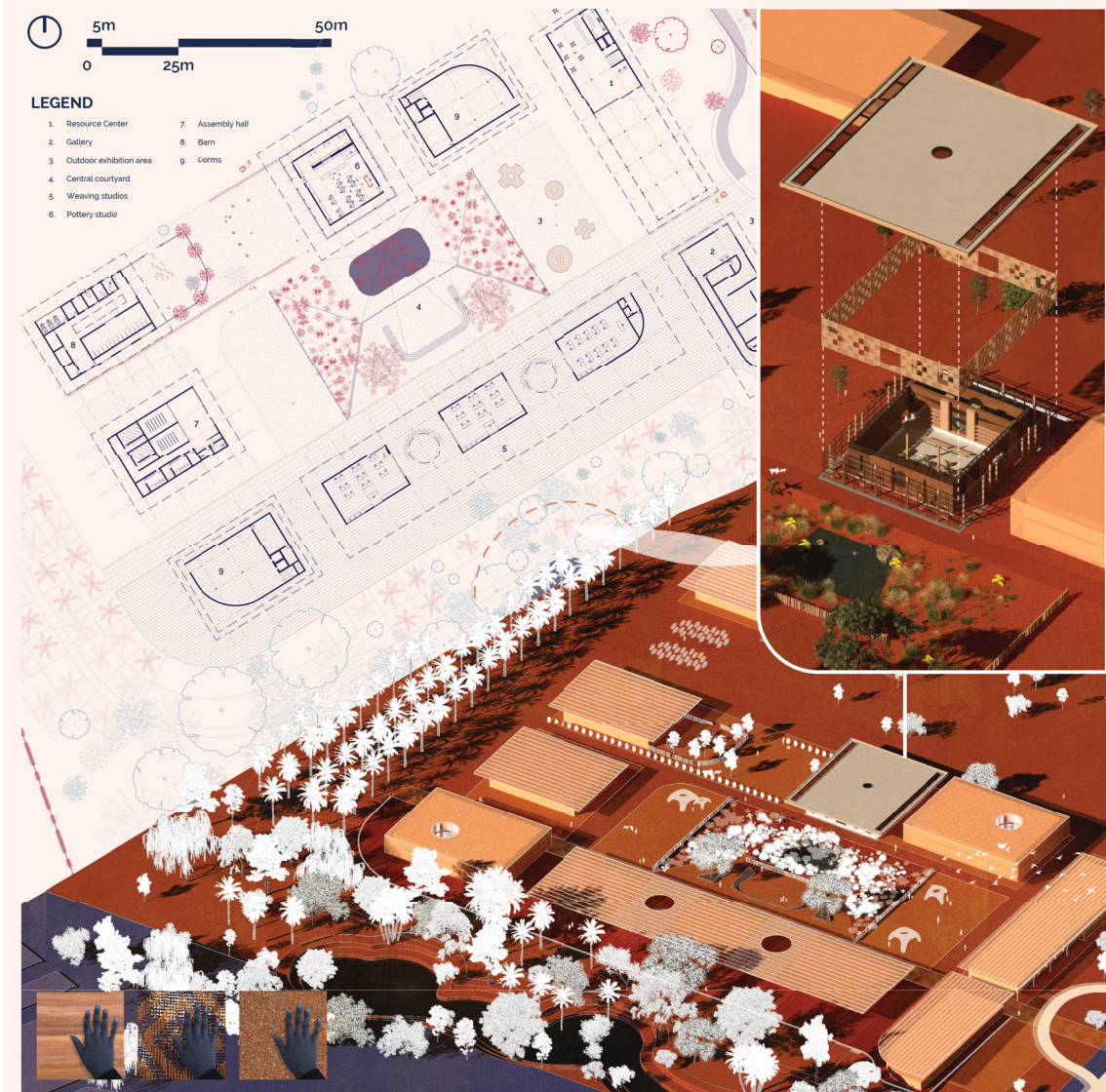
The craft zone is where a lot of the agricultural by-products and mud derived from the Nile riverbank would be utilised for the teaching of traditional crafts still used in the everyday lives of the people. The main ones to be taught are tabag (traditional dish covers), basket, matt, bed and bench frame weaving, and pottery. Adjacent to the welcome and agricultural zones, the craft zone seeks to further emphasise connections between the natural landscape, architecture, and making. Its resource center and gallery are placed at the forefront, right along the area's main road. The resource center - partially lifted on a colonnade - allows passersby by a peak into the site beyond, whilst the gallery's outdoor display areas offer room to exhibit the work of local craftsmen and students, drawing onlookers in to explore.

A ferrock tile pathway draws a connection between the student welcome center across the road, to a date palm grove at the craft zones western border, stitching the two sites together. Along with a visual throughline between agricultural plots, the pottery studio, central courtyard and textile classrooms, it acts as the site's axis mundi. The sites central courtyard, reminiscent of traditional typologies, is situated right at their meeting point. Here, under the shade of mango trees, people can gather and enjoy the view to a water harvesting rain garden just beyond. The craft zone also seeks to rejuvenate what remnants of the stream there may be, allocating the remainder of the site, where land is more barren and dry, to primarily cereal and legume crops and a small solar farm.

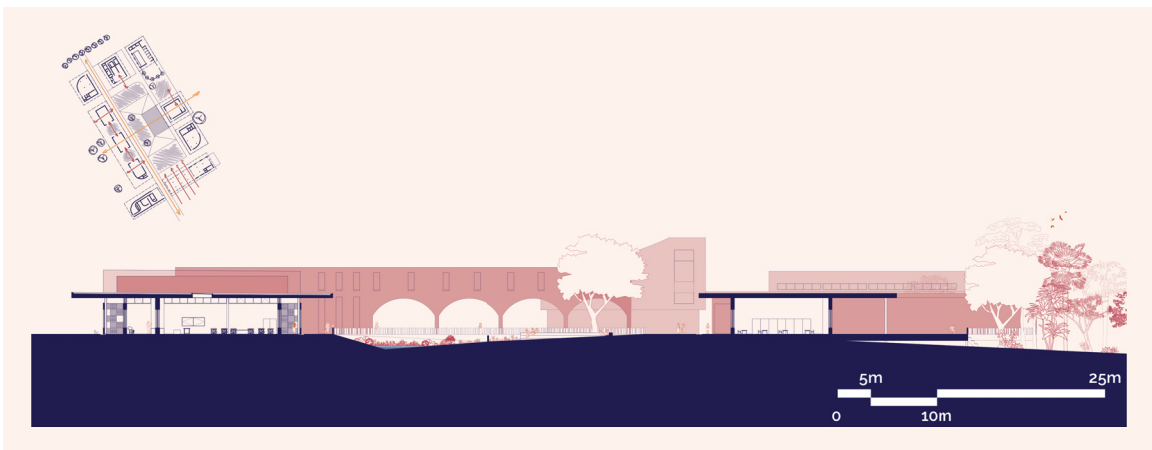
Craft Zone Classrooms



Classrooms of the craft zone would require some flexibility, as both weaving and pottery require the outdoors and sunlight during some their drying, dying and firing stages. For this reason, the classrooms are each connected to their own outdoor gathering spaces. Additionally, the design of the pottery studio exhibits a double envelope façade, utilising customisable screens and shelves as a flexible second skin that incorporates the display of pottery made on site into its design.



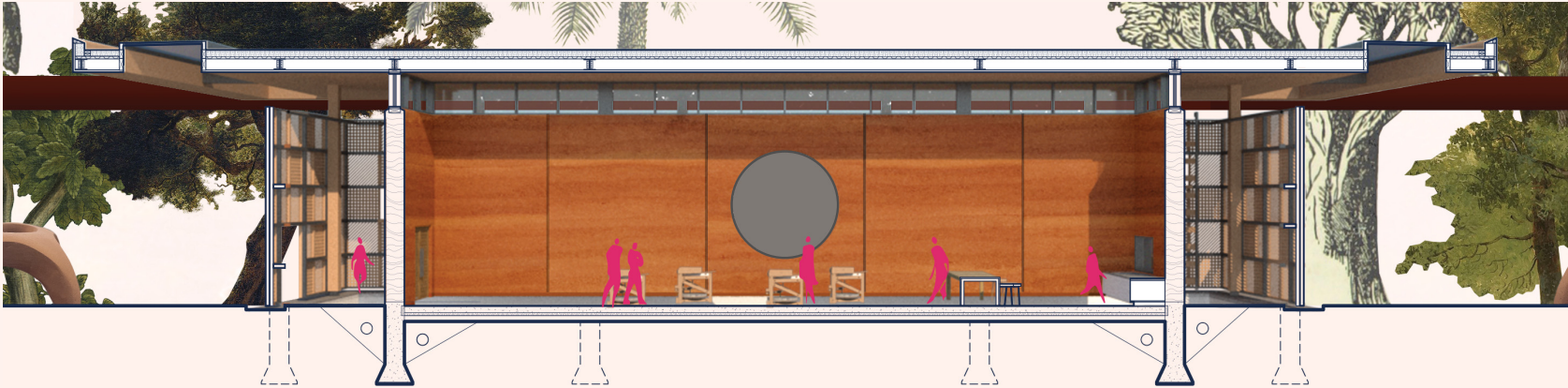
Craft zone classrooms plan and axo



Craft zone cross section



Elevations of pottery studio screen detail



Pottery studio section



View of pottery studio worktables



View from pottery studio porthole, overlooking courtyard and textile classes beyond

Chapter 6: Conclusion

As a project in an African context, exploring methods of reconciling the natural landscape, the artificial landscape (in the form of agriculture), and architecture, somewhat of a different approach needed to be taken – especially when it came to research. Understanding where certain tensions in architectural discourse on the topics lie, what voices should be amplified, and when architecture needed to take “a back seat”.

Quantitative data, something typically heavily relied upon in the context of architectural research projects, and particularly in the realm of Western formal education systems, was largely unobtainable in this instance. So, the exercise of listening to the experiences shared by other professionals, locals, family, and acquaintances met on site, became uniquely emphasised. The importance of listening, observing, and learning from the experience of the people we design for, is not yet given enough value – at least not in most formal architectural education systems. Where we may be introduced to ideas of data analysis and mapping (as important as they may be), we greatly lack introductions on how to work directly with communities. How to conduct site visits that don't just consist of gathering dimensions, arbitrary photographs, and firsthand observations usually as outsiders, but how to also conduct productive conversations with community members about what they themselves feel they need.

It is true that our more removed viewpoints tend to offer unique understandings of contexts we work with, which may be advantageous in some instances. However, leaning too far into these more alienated angles comes with the risk of

problematically assigning functions and projects that are of no use and benefit to their users – much like the colonisers once did. These are the same methods they used after all. That's why learning how to effectively instrumentalize qualitative data to still be able to design meaningful projects even when numbers are unobtainable is so important. At the end of the day, whether or not a community has the means to have extensive data readily available shouldn't make them any less deserving of projects that aim to celebrate and/or improve their lives in some way.

Having the opportunity to visit the site and surrounding areas, meeting local community members, farmers, brick-makers, potters, artists, and architects along the way was pivotal. Getting to see, firsthand, a lot of the processes explained in this paper, shifted the project from being superficial to being more thorough. Understanding my own position as someone who is from the region, but has never lived there for prolonged periods, and as someone with a Western education, more acquainted with Western ways of living, it would be interesting to see how much a longer stay in the area would allow certain details to reveal themselves. To see how long it would take for other qualities of the area to become apparent – things that my Great Uncle Mohammed mentioned only briefly, worried he'd "ruin my innocent view" of the towns we explored. Of course, problems revealed themselves in conversations with other locals, less worried about tainting my views. Lack of jobs, affordable education, the rising prices of imported chemical fertilisers, the diminishing productivity of the land, and waste management being among the repeated themes that this thesis attempts to respond to.

Additionally, consultations with other professionals in realms of landscape and agriculture was vital for the development of this project. A number of attempts at organising the site were made before I had the opportunity to set up meetings with an expert in agriculture: Lord Abbey, Associate Professor of Amenity Horticulture here at Dalhousie. These conversations allowed for the masterplan to be improved upon to a level otherwise unachievable with my limited knowledge on agriculture. What was achieved was a much more succinct organisation of site that prioritised ideal crop placement and ecological respect before then allocating architectural interventions accordingly.

In a way I hadn't entirely imagined, listening became the main research method for this project, and collaboration became the tool for its fruition.

Given the current political and humanitarian crisis that the country is facing, projects like this must be set aside for ones that seek to resolve the issues formed by conflict. How to accommodate refugees and those in need of medical care, and what to do in the aftermath are important questions that need to be answered in the context of such a complex situation. Perhaps optimistic projects like this can be revisited at a later time, when the people of Sudan are safe and healthy, and when the violence and corruption has become a part of the past. In the meantime, we can listen again to the needs of the people, and work together with them to provide any kind of help we can.

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