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Curtin University
School of Design and The Built Environment
Discipline of Architecture

How can the quality of space in public primary schools in the informal urban settlements in Kenya be improved?

Roy Githaiga Maina

This thesis is presented for the Degree of
Master of Architecture
of
Curtin University

November 2019

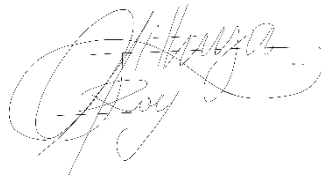
Declaration

This thesis contains material from my dissertation proposal submitted to Curtin University on the 9th of June 2019 Titled, Dissertation Proposal ARCH 6008 in the following parts of this thesis.

1. Abstract.
2. Formal education in Kenya.
3. Structure of Kibera.
4. Design considerations
5. Case studies informing the design.
6. Cultural Analysis.
7. Site analysis.
8. Design proposal.

To the best of my knowledge and belief this thesis contains no material previously published by any other person except where due acknowledgment has been made.

Signature:

A handwritten signature in black ink, appearing to read 'Roy Githaiga Maina', written over a set of horizontal dashed lines.

Date: 6th November 2019

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Abstract

“Architecture is the thoughtful making of space”

Louis Kahn (Maina 2019).

The analysis of the current state of classrooms in the informal urban settlements or slums as they are also known is examined by referring to the different environmental conditions (e.g. ventilation & air quality), physical conditions (e.g. site location and context) and socio-cultural conditions (e.g. health, sanitation and culture), found in these settlements. This analysis goes towards understanding how these different conditions directly or indirectly influence the learning experiences within schools in these settlements. The socio-cultural conditions response to the communities that largely live and work in the “slum” context sheds light on the different cultural backgrounds and shows how these cultures can be integrated within schools to create a strong cultural foundation that informs the quality of spaces. This thesis highlights the lack of proper educational institutions especially for the younger population in these settlements and aims to propose a design for an elementary school that ties culture back into the architecture to produce good quality school for young children (Maina 2019). By referencing the history of the education system in Kenya, this thesis project intends to shine a light to the genesis of the problem with relation to infrastructure or as Le Corbusier put it “We cannot escape the past or ignore the pit from where we were hewn.” (Le Corbusier 1937, x; Maina 2019, 1). This project responds to the need for good quality spaces that will in turn help the growing interest with social sustainability and architecture which has a social responsibility to design quality spaces that come with the need to equip the three main local communities (Kikuyu, Luo and Nubian) of Kibera slum in Nairobi, with the tools they need to afford them a better future.

Acknowledgement.

I would like to express my special thanks and gratitude to my supervisor **Dr. Tanja Glusac** for guiding me through this journey. I am mostly thankful for her understanding and time dedication to reviewing my work and being as cut throat as possible for my own good (I am not as rigid as I was at the beginning). Her valuable guidance has shaped the present work as shown.

I would also like to thank **Dr. Boon Ong** for his advice on using my skillset in hand drawn sketches to show and communicate my theory and research as a strength to help my work stand out as it should.

My **fellow thesis colleagues** who have been with me through this process, I thank you for always motivating me to do better and be better at my work.

Last, but not least, **my parents** whom I hold in high regard for inspiring me to work on completing my Master's degree and guiding me through the dark times of financial despair. My **father** has been a constant reminder of what success looks like and my **mother** has been my motivational speaker who has kept me going. I express my gratitude to them.

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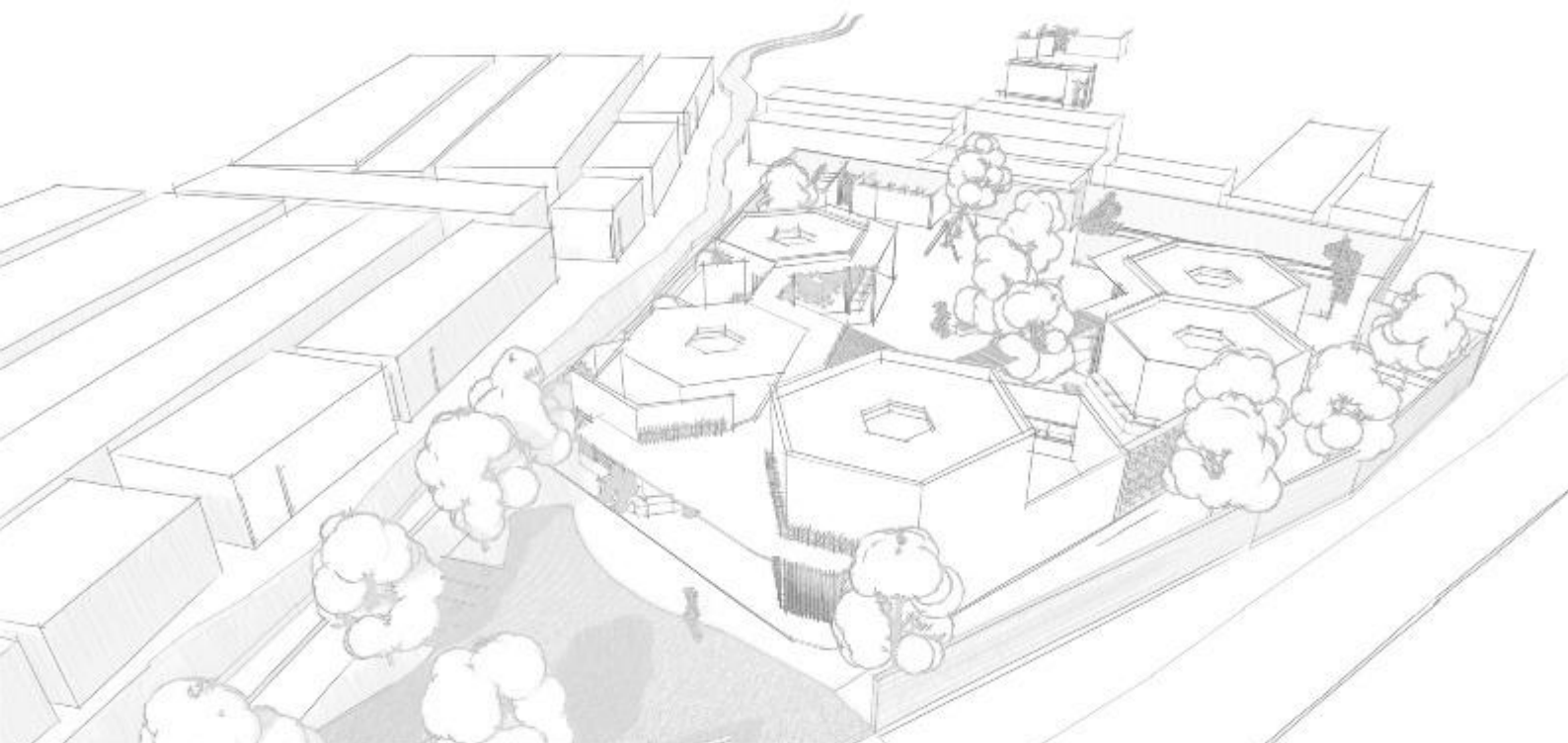
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Introduction.

As basic as it may seem, architecture is the art of creating space and whether it's internal or external, a space is almost always considered for a specific function. It is for this very reason that architects and designers constantly strive to improve how spaces relate to different biotic and abiotic conditions i.e. everything around us. The most sought-after conditions are environmental, contextual and cultural which relate the occupancy of the spaces to comfort and can be considered as the basis for understanding the quality of space. In schools, these environmental, contextual and cultural qualities are further analyzed to fit the demographic of young occupants and how these spaces are designed can help improve the opportunity for communication inspired spaces and student interaction where necessary. In Kenya's informal urban settlements, schools seem not to be given the proper priority needed to create spaces that improve the wellbeing of the students. Factors like funding, land ownership and insecurity are some of the main factors that play a role that is directly linked to the deplorable quality of spaces provided in the slums. Spatial quality relies on its function as well as its response to context and culture, and when dealing with the young demographic in an informal settlement, these environmental, contextual and cultural conditions need to be expounded upon to understand the requirements needed to develop a physical narrative of these spaces.



Formal education in Kenya

In the early 1500s, before Christian missionaries introduced formal education in Kenya, there were very few instances where defined spaces were used as education centers. These defined spaces were only used for special occasions, for example the rite of passage for young males and females which in some cultures was held in huts. Since some of these traditional rites of passage are no longer valid, education has since then become the new rite of passage, graduating from one level to the next.

Before Kenya's independence, education was merely the transfer of cultural values from one generation to another. These values were accompanied by the integration of social, artistic, religious and recreational life which provided the skills and knowledge that allowed Kenyans to work and progress their lives (Cradle 2019; Maina 2019, 3). For this, they did not need any formal space. With the arrival of the Portuguese nearly 300 years later, the first missionary school was set up at the coast of Kenya in Rabai, but this did not come without its challenges (Rebman 2019; Maina 2019, 3). The push for formal education was largely questioned and contested by local communities in Kenya who by the time of Portuguese arrival, were already skilled farmers and hunters, which at the time was all they needed to survive. Through the introduction of the formal education, the colonial government aimed to tap into a source of cheap labor by training the locals in carpentry, masonry and other related crafts. The chieftains influenced the local communities to question the validity of the education and because of this, the colonial government needed to bridge the gap between them and the communities. They in-turn educated the chieftains and the headmen to assist in administration at the local level providing them with a new level of knowledge, which helped change the locals mindset to adopting formal education. Since the gaining of independence, the Kenyan education system has transformed to a more formal system emulating the practices of the developed world (Maina 2019, 3). Parts of the city such as the informal urban

settlements, nevertheless, have not developed as graciously as Nairobi has, due to the dwindling space as a result of the increase in internal migration.

Informal Urban Settlements.



Figure 2 Kibera Slum Density.

Informal urban settlements are described as shameful features of poverty that have a limited authorization or an unauthorized occupation of the land they occupy. These settlements are a frowned upon part of the developed urban realm because they tend to give a negative view of the city scape. In her book *Informal urban settlements: A perpetual challenge?* Marie Huchzermeyer writes about illegalities of land occupation and informal dwelling arrangements. She suggests that the informal urban settlements stem from deep marginalization and exclusion from the formal access to land and development. She also suggests that there is a need for such forms of occupation, thus legitimizing the existence of informal urban settlements in the formal context (Huchzermeyer 2006, 4). These informal urban settlements create challenges and difficulties specific to young children due to the lack of proper education and recreation centers, for example, safety and security. Due to constant urbanization in search of better working opportunities and the need for accommodation, pressure is applied to the already limited space and resources available therefore increasing the scale

of these settlements. This increase in scale also has a direct effect to the development of children by having limited areas for interaction and play.

In Nairobi, Kenya's capital city, there are six major informal urban settlement of which *Kibera* is the largest. All these settlements are within a 10km radius around the central business district (CBD) which make them part of the urban context. Kibera, which translates to the "Land of the forest" in Nubian (tongue of the original settlers of Kibera), is populated with an approximate 1 million plus dwellers making it Africa's largest slum and one of the biggest in the world. Life in Kibera has some major challenges for the occupants and more so to young children. Crime caused by the ever-growing gangs and gang violence is one of the biggest challenges to Kibera's livelihood, followed by disease associated with the lack of basic amenities such as access to clean water and sanitation. The government and local authorities are faced with a challenge of guiding the physical growth of urban areas and providing adequate services for the growing urban population (UN-Habitat 2008, 5). Government development projects such as roads and government housing create a sense of instability whereby schools, homes, businesses and even children's homes have been bulldozed to create enough room through and around the slum. Life in Kibera may be considered impermanent and having supported families from different ethnic communities in Kenya (Maina 2019), Kibera is constantly growing but its architecture is temporary. Analyzing the ethnic living conditions of the three most common communities in Kibera, the Kikuyu, the Luo and the Nubians, will introduce their traditional housing qualities intended to inform the design component of this thesis.

Kibera's people.

Kibera is home to a combination of ethnic communities from all around Kenya. The three most common communities, Kikuyu, Luo and Nubians are by far the largest inhabitants in Kibera. With a population of about 1 million according to the 2009 census and a 4% projected increase will have set the

population of Kibera at around 1.4 million by the end of 2019, and this statistic is only growing.

Descended from the Nuba mountains of South Kordofan, Sudan, the Nubians were the first settlers in Kibera after being awarded 4000 acres of land by the British colonialists for their services in the various wars they participated in with the British empire¹. Since receiving the land, they have struggled to keep and maintain it as their own as other communities encroached on it. Over the period of 100 years, the Nubians have lost the rights to most of the land they were given. It was only until recently that they were awarded 288

TRADITIONAL NUBIAN HOME:

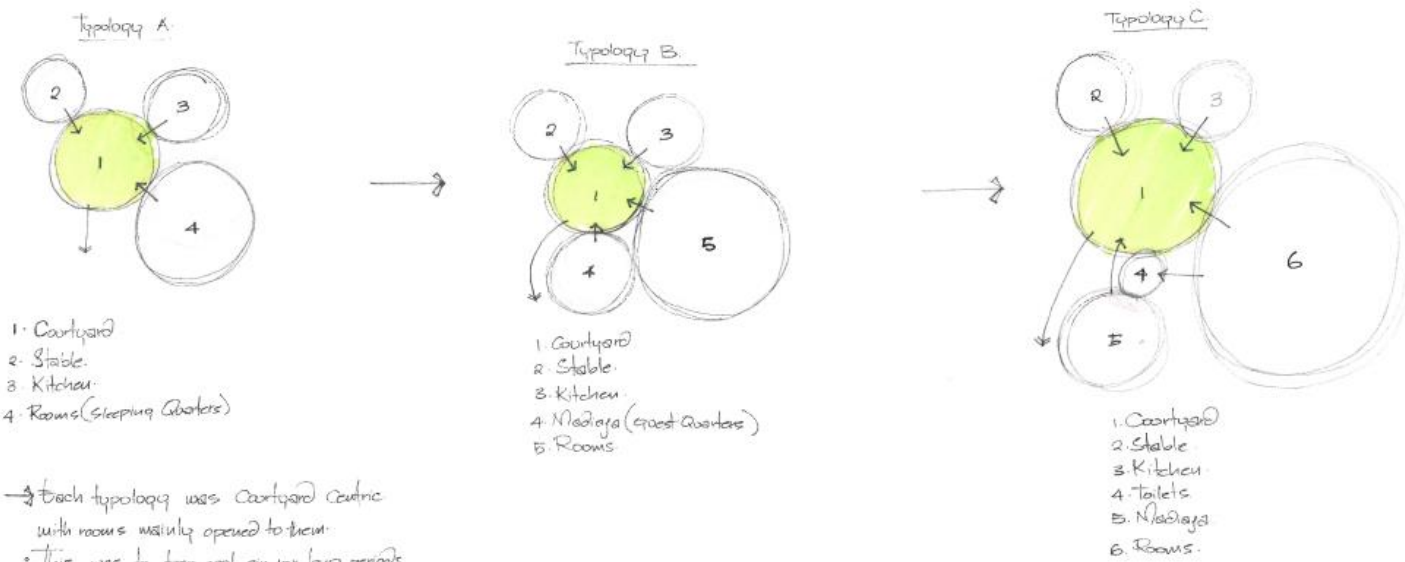


Figure 3 Traditional Nubian Typologies

acres by the Kenyan government in 2017 which only makes 7.2% of their original land. With the Kenyan government not openly accepting the property rights of Kibera as the Nubian ancestral homeland and by insisting they were squatters on government land, the Nubian community has iterated their fear of being considered stateless and scattered which has had a direct negative effect to their cultural development, way of life, values, language and even their architecture (Migiro 2016, 5; Maina 2019, 3).

¹ In the early 1900s, the British colonialists forcibly conscripted the Nubians into their army as part of their African rifles also known as "Askaris". They were deployed into the various parts of the British East Africa including the present-day Kenya (O. S. J. Initiative 2010; Maina 2019)

Traditional Nubian architecture was divided into three main typologies. The differences between the three ethnic Nubian architectural typologies is the spatial arrangement related to their sizes. The typical Nubian house is very spacious with several large rooms that accommodate extended family members and guests (Asmail, n.d.; Maina 2019). A relation to ancient roman architecture, the Nubian home has an open atrium which was used as a gathering space for meals and socialization. The front of the houses was

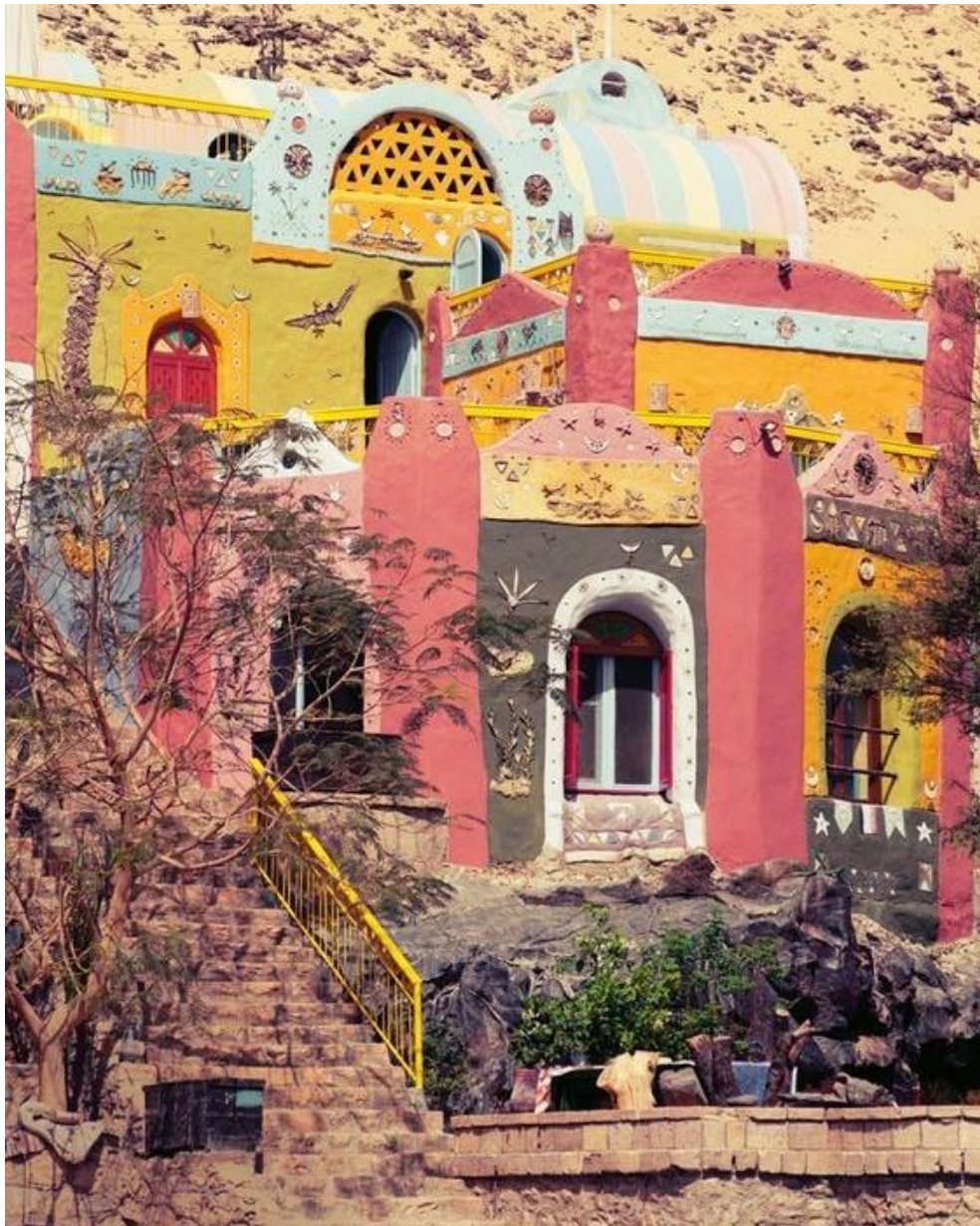


Figure 4 Traditional Nubian House Façade.

covered in colorfully painted geometric patterns with religious

connotations. These colors are an admired and distinctive feature of the Nubian culture. The Nubians did not rely on any engineers or architects however, their architecture was geometric in form and retained an ancient technique for roofing in mud brick.

The hierarchical order of how the spaces are arranged is culturally linked to their heritage and was set at irregular intervals in a staggered line somewhat parallel to the river Nile. Their principal entrance to the houses always faced the rivers whether they were on the east or west banks, it didn't matter but the direction towards the river was important. The main entrance led into an open courtyard with palm stems and branches that covered the entrance to the adjacent rooms that made up the exterior wall perimeter of the house and acted as a covered seating area along the courtyard. This covered seating space around the courtyard created the opportunity for people to

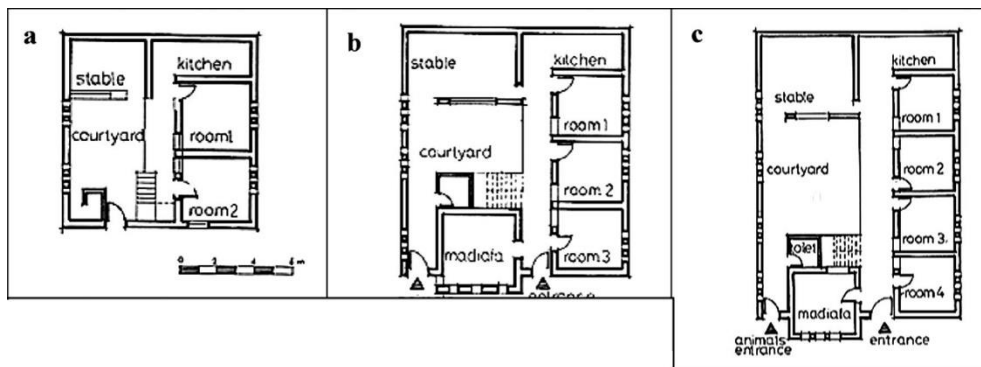


Figure 5 Typical Nubian plan typologies

interact with one another regularly and it

is for this reason the proposed design implements such culturally linked ideas.

Each typology had a guest room or *mandura* which had a separate entrance allowing the freedom of movement while maintaining family privacy in the inner quarters. The mandura was considered an important part of the house, since the Nubians believed in the significance of hospitality which continues to be an important obligation (Asmail, n.d.) to this day. The larger houses on had separate entrances for animals and people but both had to go through the courtyard which depending on the width of the yard enclosure (Mahmoud Bayoumi 2018), the courtyards trapped cool air for a long time.

Like the proposed design, the courtyard plays a key role in trapping the air and acting as a connecting space to the classrooms around it. The materials for construction were localized to minimize on cost and to maintain a sustainable way of building. The walls were made of mud, mud brick or stone and for their roofs they used split palm trunks and acacia wood beams. The interior and exterior decorations were plastered on by the women and children of the household. This was a family experience of building homes that created a sense of ownership and cultural significance. ² With relation to Kibera, the sense of ownership of the proposed design would tie back to the Nubian cultures way of life.

Structure of Kibera.



Figure 6 Structure and Materiality of Kibera 01

The structure of the slum is made primarily of temporary material, mainly mud and wattle with corrugated iron sheet roofs. Most of these spaces are characterized by spatial inadequacies and insufficient protection from the

² From hierarchy of the spaces around the courtyard to the use of the courtyard and the importance of the guest room, these typologies set a blue print for the school designed in this thesis. Since the information required to successfully complete it is based on a comparison between three cultures, the Nubians are analyzed alongside the Kikuyu and the Luo.

elements. Many of these spaces also host several functions such as cooking, socializing, leisure, sleeping, living, dining and in some cases, home based



Figure 7 Structure and Materiality of Kibera 02

businesses. Much like the cultural way of living, these spaces have a close relation to how their ancestors lived. In some cultures, a single hut was used as a multi-purpose room with little or no divisions. Due to the lack of spatial specialization or separation, these functions overlap and are carried out simultaneously within the same setup. Unfortunately for young children living in these conditions, their education centers are very similar to their home situations. Just like their homes, classroom spaces only have one window and one door limiting both light and ventilation (Mukeyu 2018, 24). Kibera's context presents difficulties in creating spaces that exemplify adventure and learning in schools and which possess qualities expressed through the combination of light and ventilation, adequate acoustics and ergonomics. Primary school rooms should provide a sense of security and comfort through "child-friendly measures but they should also stimulate activity and exchange and give students the opportunity to codesign the spaces" (Schenker Salvi Weber Architekten 2018; Maina 2019), something that is very much lacking in Kibera.

The increased need for adequate education facilities in Nairobi's informal urban settlements have led residents to take measures into their own hands to designing schools themselves. One of these community schools is *Anwa junior academy* designed by the *Kounkuey design initiative* (Grozdanic 2017; Maina 2019). A new green school in Kibera slum was built to replace the original 2-story ramshackle building. The school was started by a group of local women who were concerned for their children's educational future. Kounkuey design initiative used sustainably sourced and certified timber framing, "wattle and double mud walls on the ground floor and steel sheets on the first which referenced the traditional construction techniques while keeping with the local identity of the settlement." (Grozdanic 2017; Maina 2019). By using locally sourced materials and a local labor force (for cost efficiency), this allowed the community to get involved with the build, not only as potential parents of future pupils but also provided them the opportunity to experience a sense of ownership. The overall need for education in these settlements is to create opportunities for the young children. According to the *affordances theory*, perception drives action. This means that the world is perceived not only in terms of object shapes, in this case the physical aspects of schools, but also in terms of object possibilities for action i.e. affordances (Gibson 1950; Maina 2019).

J. J. Gibson narrates "the affordances of the environment are what it offers and provides, either for good or for ill" (Gibson 1950; Maina 2019). Exploring the way in which humans perceive and interact successfully in their environment is the basic need for introducing new school designs and how children relate to space. Our constant need to immerse ourselves through curiosity into different spaces is the foundation for these ideas explored in this project. The creation of spaces that evoke this basic curiosity is aimed to positively increase the perception of schools and therefore assist in creating opportunities that have been discussed by Gibson (Maina 2019).

Case studies informing the proposed design.



Figure 9 Ruhehe classroom interior.

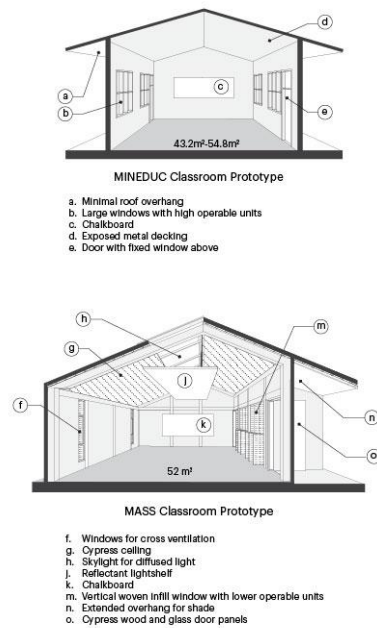


Figure 9 Comparison diagram between regular classroom and prototype.

The Ruhehe primary school was designed by a group of young designers from the African Design Center launched by MASS Design Group. The design of the school involved a lot of the local community in the construction and utilized locally sourced materials (Kililio 2018; Maina 2019). 75% of the schools budget was spent in Ruhehe Village with 80%

of the local materials sourced not more than 50Km from the schools location (Kililio 2018; Maina 2019). The goal for this school was to create active learning spaces for the kids. Through observations and workshops, the classrooms were designed to accommodate various learning activities with the ease of flexibility (Kililio 2018; Maina 2019). This included the use of skylights for more natural lighting with artistic light filters that assisted to diffuse the light adequately for comfortable reading and writing. This form of environmental Architecture resonates with the need for activity and opportunity in the education of the students (Maina 2019). Architect Francis



Figure 10 Kibera Hamlets exterior structure

Kere applies the same theories in the school he designed in Gando, Burkina Faso by responding not only to the environment but to the occupants' experience, tapping into humanities curiosity and creativity (Maina 2019).

As Kibera's building context is mostly corrugated metal sheets, the architects SelgasCano used similar materials to create a pavilion that could be relocated when needed. The pavilion was built as a showcase art gallery in Copenhagen, Denmark and was later shipped to Kenya and reassembled in



Figure 11 Dilapidated classroom interior

Kibera as a school. Kibera's context creates some difficulty in creating such spaces that are meant to be rather exciting adventure areas that encourage creative participation (Maina 2019). For example, Kibera Hamlets School was founded in 2004 by local youth starting out as a club to keep children off the streets which grew into a donor funded community-run school (Fairs 2016). However due to lack of consistent funding, the school fell into a dilapidated state due to some of the additional spaces being made of reclaimed run-down corrugated metal sheets. As much as there was privacy in the classrooms, there was a lack of comfort of the space influenced by inadequate light and ventilation Figure 11, improper proportions of scale and little to no views which resulted in a poor character of space (Fairs 2016). The pavilion was however built to replace the previously deplorable structure(Maina 2019). The quality of the new spaces was achieved by providing open spaces that allowed for better ventilation and natural light with adequate acoustics and ergonomics. Further analysis of the school suggests that SelgasCano understood the need for public space as part of Kibera Hamlets School to act as a gathering space. They introduced a central



Figure 11 New Kibera Hamlets School



Figure 12 View from the main entrance through the campus.

stair that has a double function; one as a stair from the ground floor to the



Figure 13 Analysis of Kibera Hamlets floor plan.

first floor and secondly as a learning stair. The new school is made up of cheap but durable materials like chipboard, polycarbonate and scaffolding components. Built as a temporary structure, Kibera Hamlets School was



Figure 14 Spatial analysis of Kibera Hamlets

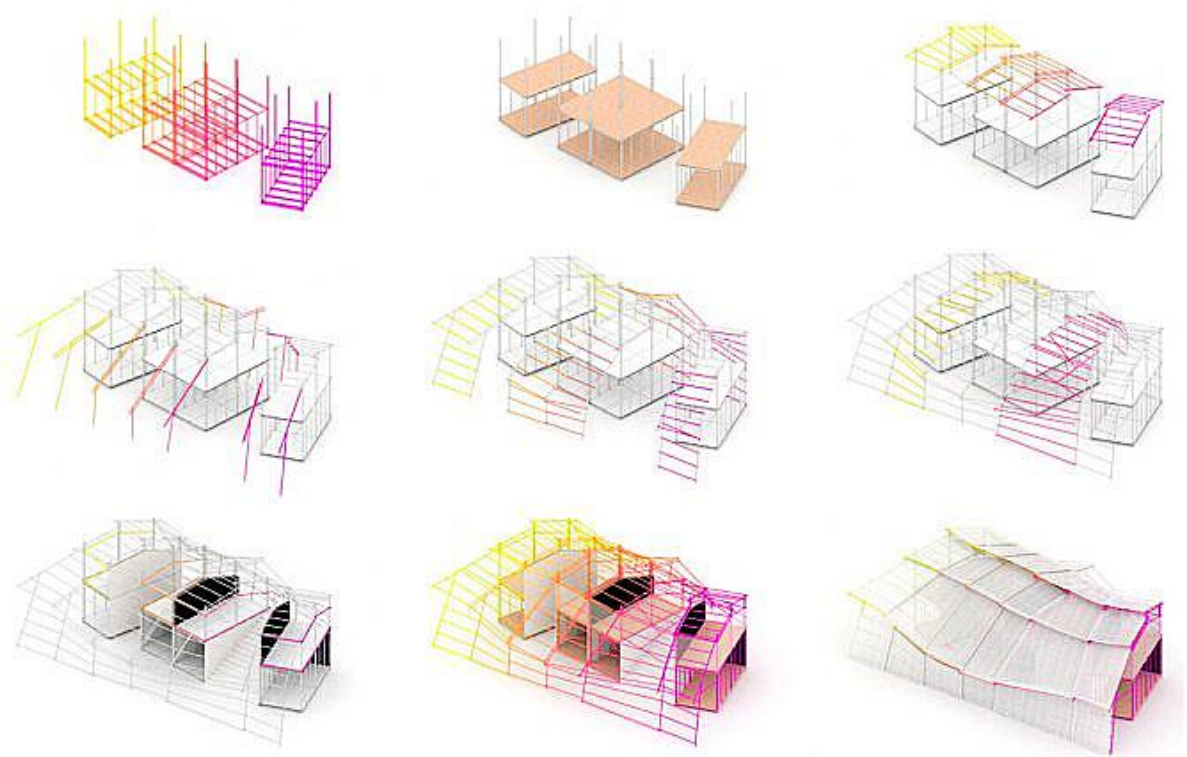


Figure 14 Dismount Schedule

designed intended to be dismantled and a dismount schedule was

developed for when that need arises in the future which also responds to the everchanging need for space within the slums.

*“In an age of constant change, temporary structures have a special significance, for they allow a quick, flexible and usually cost-effective response to shifting needs. Buildings with a limited life also **afford** architects and planners greater freedom than permanent structures to explore unconventional spatial solutions, new materials and forms of construction or to play with visual ideas.”* (Schittich 2013, 1058). Meaning that informal urban settlements need more fluid structures that are easily demountable Figure 14 when need be or at least use materials that can be quickly put together and create safe spaces for children.

Design considerations.

Designing learning spaces, day care centers, nursery or primary schools is a task that needs empathy over dramatization if one is to comply with the needs of young people (Schittich 2008, 130). In his book, *The Perception of the Visual World*, J. J. Gibson’s describes sensation as the raw material of human experiences that lead to perception by categorizing sensations as colors, sounds, touch, odors and tastes, therefore objects and spaces depend on perception (Arnheim and Gibson 1950, 11:12). The link between visual perception and early learning is closely related to the psychology of the child and school facilities have a profound impact on them. Children in various stages of development are stimulated by the sensations described by Gibson, the scale of their surroundings and the navigational aspects of their schools. Elementary schools should be visually, acoustically and thermally comfortable, they should have excellent indoor air quality and they should be safe and secure. The context of Kibera slum however is a difficult area to utilize all the perceived sensations due to problems like sanitation which causes an issue with air quality, safety and security, and the visual repetition of deplorable material.

The proposed design aspires to be a play and learning environment with a variety of spaces that influence the creativity of young minds³ in a self-sustaining and safe environment⁴. It is a combination of recreational spaces and formal learning spaces⁵ that interact with one another for the development of students minds. These classrooms are meant to inspire learning as well as communication between the students and the teachers. The school has recreational spaces between and around the classrooms that help reduce unwelcomed distractions from their studies and encourage play when necessary. Its architecture is a combination of the Luo, Kikuyu with visual patterns that closely resemble the Nubian culture. The building provides both privacy and openness within spaces and the courtyard as much as possible. Children need spaces in which they can feel secure and at the same time learn and be creative. They are curious by nature and want to discover the world on their own by perceiving their environment with all their senses and learn by experimenting (Rühm 2018, 17). Since the planning of the school must consider children first, every element must tie back to children’s ergonomics.

The proposed design strives to be exciting and encourage creative participation whilst responding to the context of Kibera. The school must be a clean environment that reflects good practices which differ from the gritty unsanitary context of Kibera.

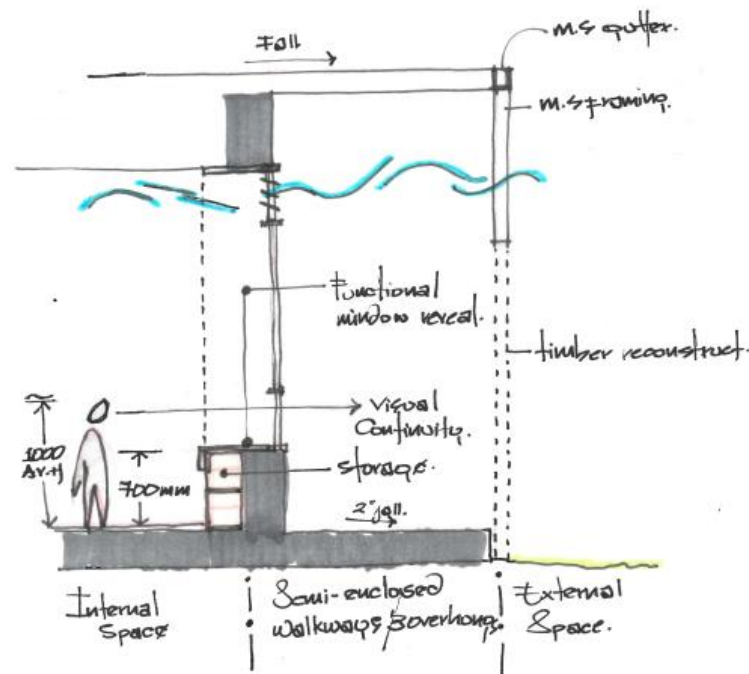


Figure 15 Children’s relation to internal and external space through a window opening.

³ Young minds – 6 to 13 years of age.

⁴ Safe environment – Home away from home.

⁵ Formal learning spaces – classrooms.

Cultural Analysis.

The Kikuyu and Luo communities.

Like the Nubians, the Kikuyu and the Luo communities, built their homes together as a way of transferring knowledge from generation to generation, thus maintaining the traditional way of living over time. These traditional practices have not changed as much in the era of modernization. Both

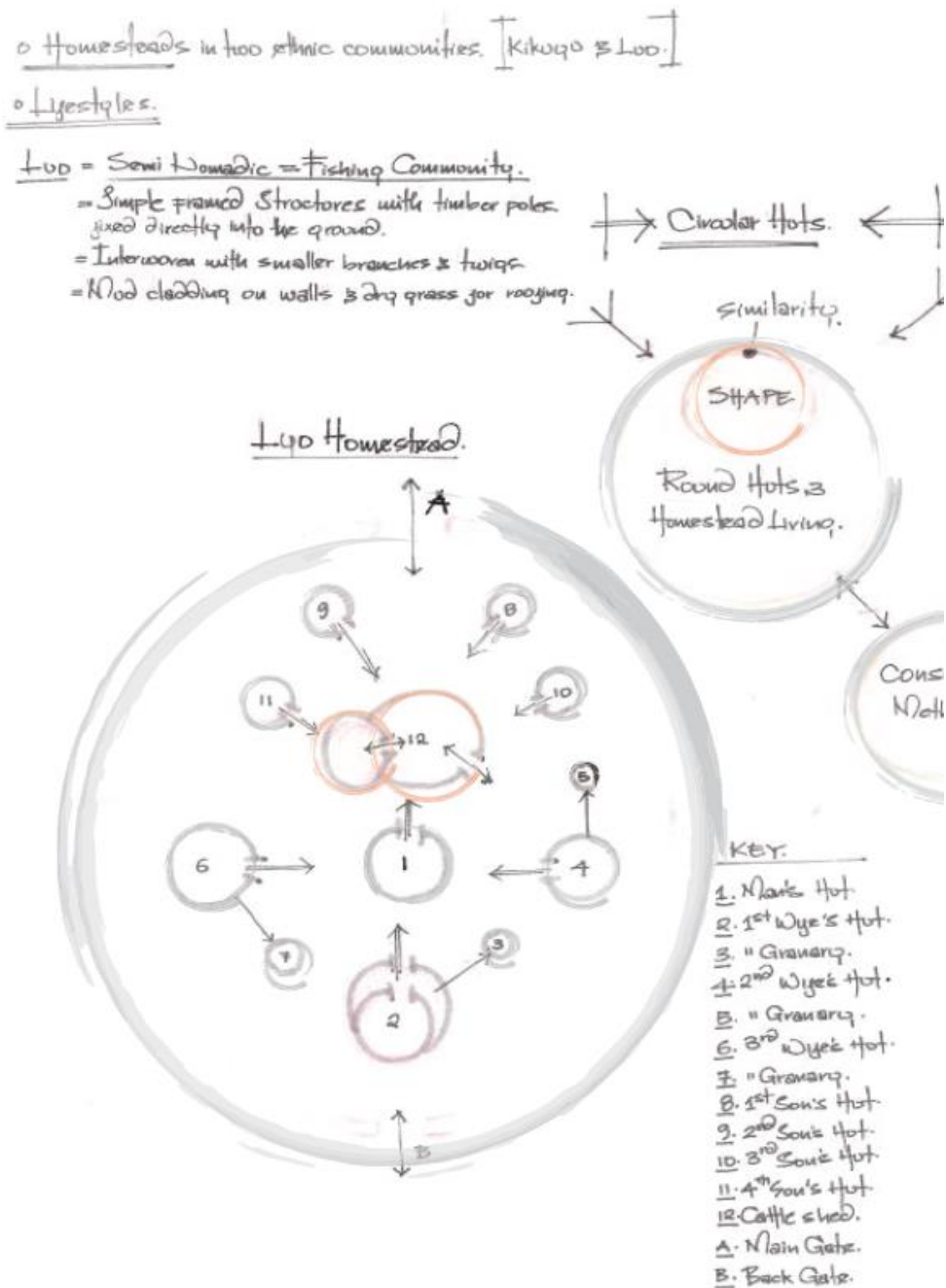


Figure 16 The Luo community's traditional homestead and spatial hierarchical relation.

cultures largely lived in homesteads of 10 to 14 units per stead depending on the number of extended family members. In the case of the Luo, the number of sons had an impact on the number of units for they each had their own hut whereas the Kikuyu had their sons share a hut or two. A hierarchical order in the placement of the huts was very important with the man's hut being a focus of most if not all spaces Figure 16. While the Nubians had their entrances facing the river Nile, the Luo and the Kikuyu had their huts entrances directed towards the man's hut as a reference point.

The Luo huts were made from simple framed structures with timber poles fixed into the ground interwoven with smaller branches and twigs. These huts were clad with mud and dry grass was used for roofing in layers to protect the house from rain. Their heritage was well linked to their trade as fishermen which still holds great relation to Lake Victoria⁶. Just like the Nubians, they had a high connection to rivers and water bodies where their livelihood came from. This allowed them to feed their families and trade and in the context of the current modern Kenya, the fisherman trade is still highly

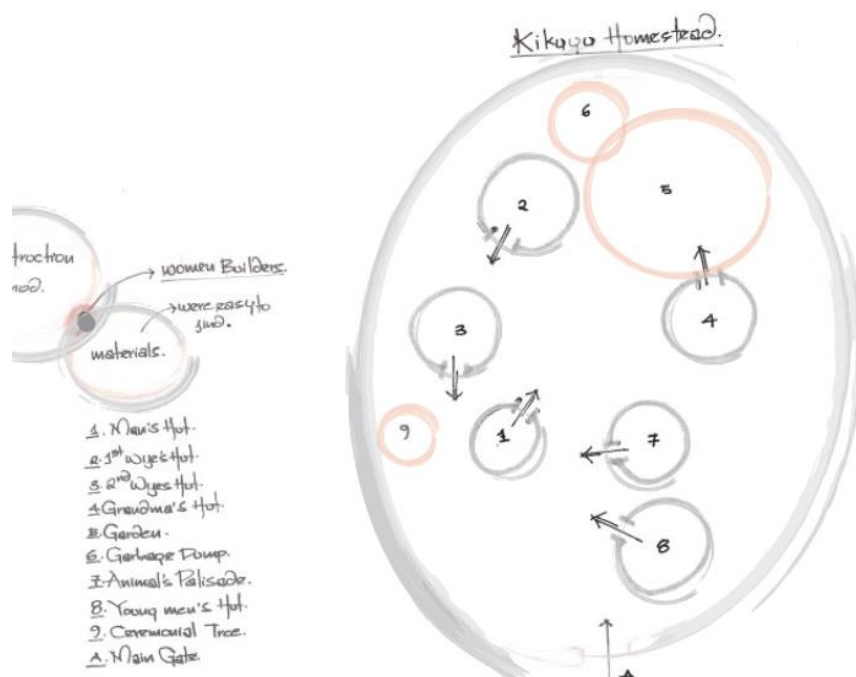


Figure 17 The Kikuyu community's traditional homestead and spatial hierarchical relation.

⁶ World's largest tropical lake and the second largest fresh water lake in the world which is also the source of the river Nile.

linked to the Luo community. The traditional round hut was a common feature of the Luo and similarly, the Kikuyu community.

As farmers, the Kikuyu's subsistence farming was mainly for survival and for feeding their families more than trading. Their ancestral home is central Kenya where the famous Mount Kenya⁷ sits. They lived along the slopes of the mountain feeding off its fertile volcanic soil. They believed in large communal gatherings for meals and special occasions either within a homestead or several homesteads together. Each homestead had its own garden that was tended to with care for it fed the entire stead. The responsibility for tending to this garden was left to the young women before they were married and the man's mother who was the elder of the stead and therefore her hut was the closest to the garden than the rest Figure 17. A hierarchical order was also placed on the position of the young men's hut which was situated by the main entrance as a form of security with their entrance directed at their father's hut. Like the Luo community, their huts were made of poles and lattice made from saplings and filled with stones and thatched grass roofing. The structure of their walls was very similar to the gabion wall, but they clad it with mud found around their sites to stop the free flow of water into their huts. They also used planked brushwood walls in layers which allowed for ventilation and in some instances a

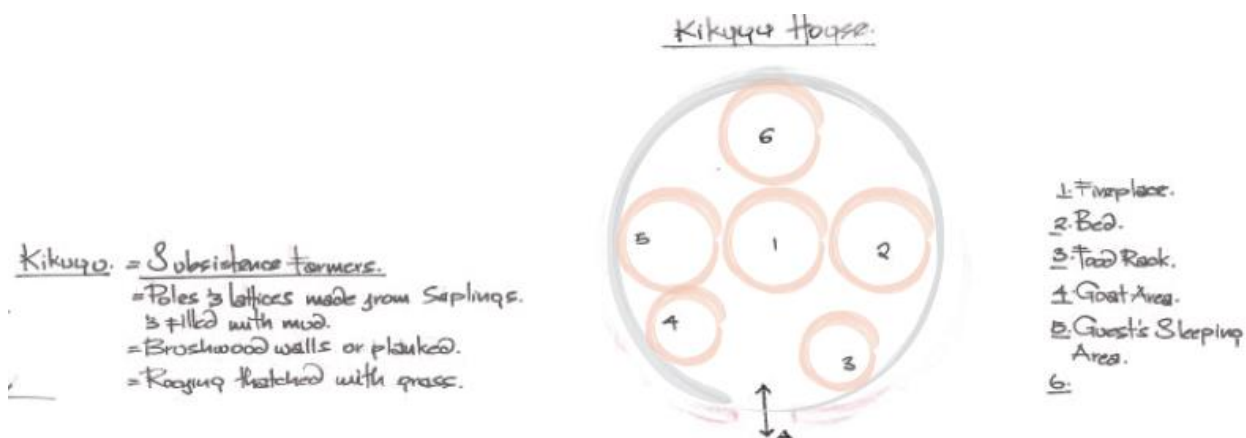


Figure 18 The kikuyu stand-alone hut

⁷ Second highest mountain in Africa.

combination of the two types depending on their needs. The kikuyu also had stand-alone huts Figure 18 when the men would leave the family stead that acted as a multipurpose space. In this space was the fire place, the sleeping quarters, a food rack, an animal pen and like the Nubian community, there was room for a guest as well. Traditional architecture holds blueprint knowledge necessary to design communal spaces where activity is a necessary factor.

The comparison of the traditional typologies goes to show the communities of their similarities over their differences as cultures. What links these communities to one another is their need to have a communal social life and a space for community gatherings. The main link Between the Luo and the Nubians was their connection to water where one community was at its source and the other was along the river, between the Luo and the Kikuyu was a similarity in living conditions and housing typology, and between the Nubians and the Kikuyu was subsistence farming. These similarities in architectural language can be utilized in building schools and homes in Kibera that have a strong cultural relevance and more so, the integration of more than one culture.

Table 1 Cultural analysis

<i>Cultures</i>	<i>Nubians</i>	<i>Kikuyu</i>	<i>Luo</i>
Ancestral homeland.	Sudan	Central Kenya	Western Kenya
Cultural Focus.	River Nile	Mount Kenya	Lake Victoria
Livelihood.	Traders	Farmers	Fishermen
Architecture typology.	Single standing houses	Homesteads	Homesteads
<i>Architectural similarity</i>	<i>Courtyards</i>	<i>Courtyards</i>	<i>Courtyards</i>

The goal is to try and change the visual perception of the slums where the ramshackle perspective portrayed as a negative context of the city. With this context comes insecurity and safety issues for the inhabitants and since primary schools are designed to cater for the young (5-14-year-old)(Maina 2019), their security in Informal settlements is a major concern that needs to be addressed (Maina 2019).

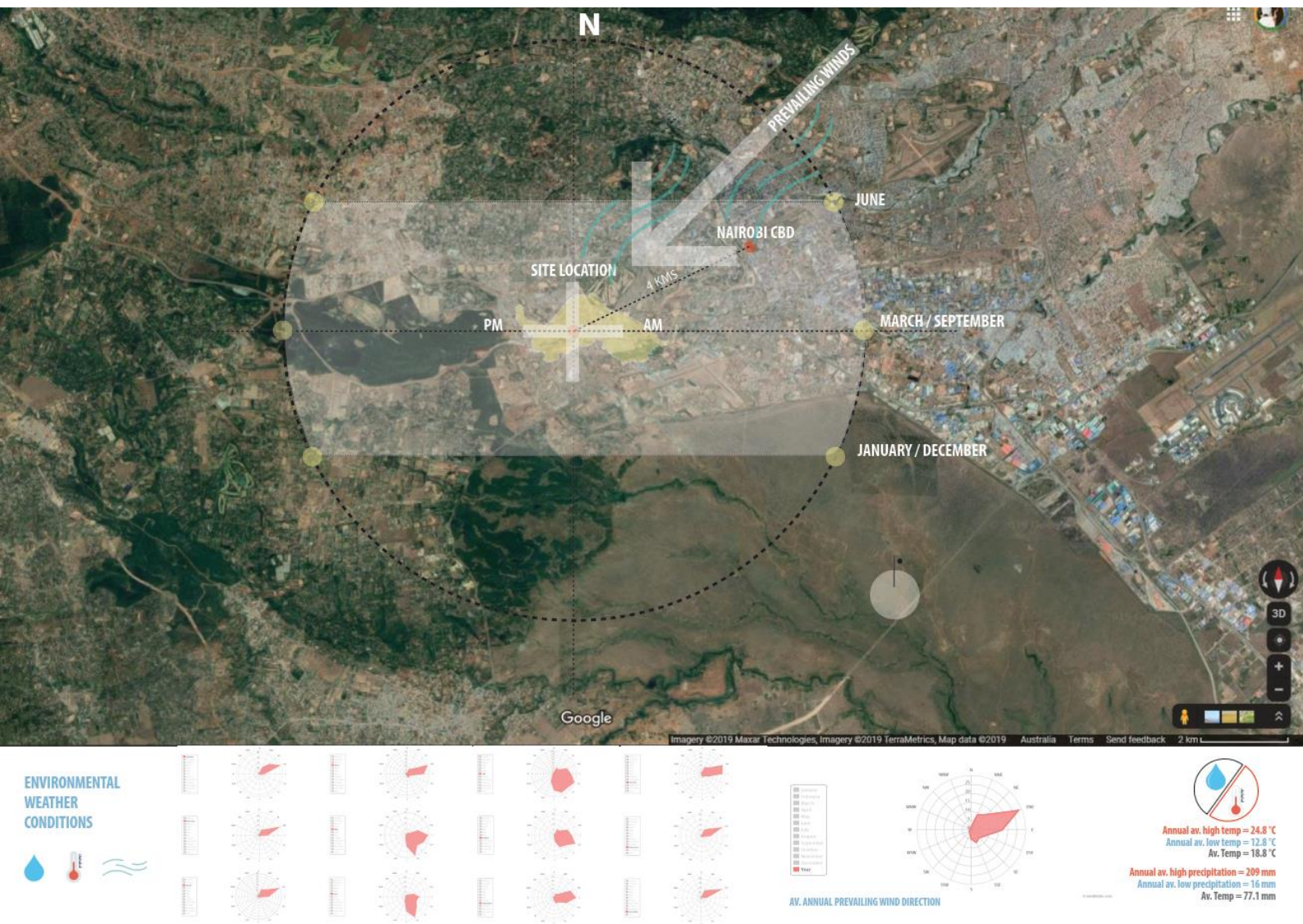


Figure 19 Site analysis with the prevailing wind direction, the sun levels in summer and winter seasons and the proximity to the CBD

Site Analysis.

The proposed school is located less than 5 km from Nairobi’s central business district between two villages in Kibera, Gatwekera⁸ and Kisumu Ndogo⁹. The two villages are densely populated and separated by a river that flows into a manmade water reservoir, the Nairobi dam. The villages are linked by a 3 to 4-meter-wide marram¹⁰ road providing access to the site and

⁸ Gatwekera – translates to “a place cut off” in Kikuyu.

⁹ Kisumu Ndogo – translates to “a small/miniature Kisumu” in Swahili. The Luo community come from Kisumu, Western Kenya.

¹⁰ Marram road – Dirt road.

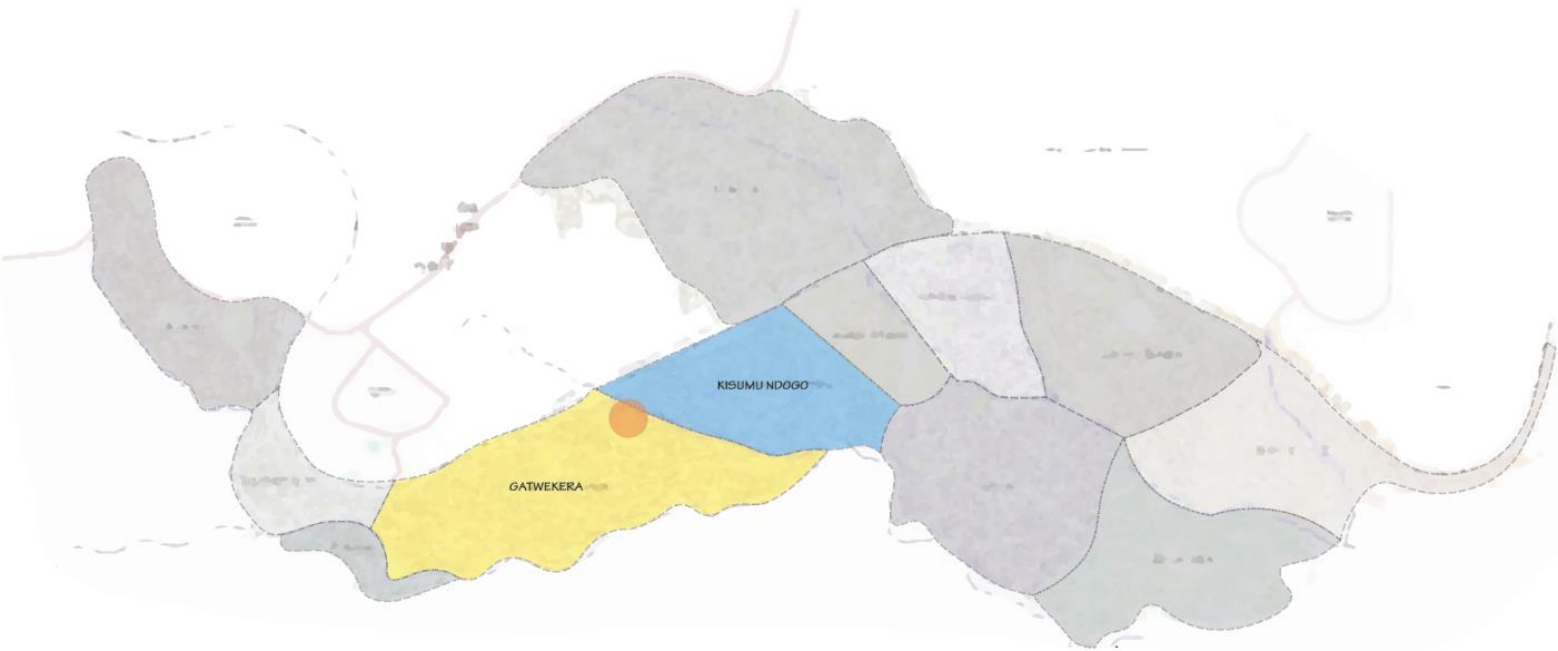


Figure 20 Site location between the two villages.

other support functions in the wider context¹¹. The site is home to the Gifted Hands Primary School¹² which aims to re-develop into a productive public learning space (K. D. Initiative 2016, 2). The redevelopment provides the opportunity to clear the site of any existing buildings and begin anew. Having a clear site also provides the opportunity to play with different planning typologies that fit with the space provided. The site is an approximate 1500 sqm¹³ lot that lies between a river and a road to its northern and southern perimeters respectively, riparian land and road reserve space is needed to comply with local planning permission, therefore must be considered. After setting out the riparian and road reserve constraints, the site available to work with is approximately 1400 sqm. As confirmed by the National Land Commission of Kenya, for a seasonal or perennial river, land on each side of the water course has a minimum 2 meters, or equal to the full width of the river as measured between the banks of the river course up to a maximum of 30 meters. (Commission 2017, 8) Mapping out the site constraints made

¹¹ Small shops,

¹² A run-down existing school that has been involved in trying to develop a new design for its students since 2014.

¹³ SQM - Square meter.

planning easier which gave way to the proposed options. Each design option systematically changed according to the research process.

Design Proposal.

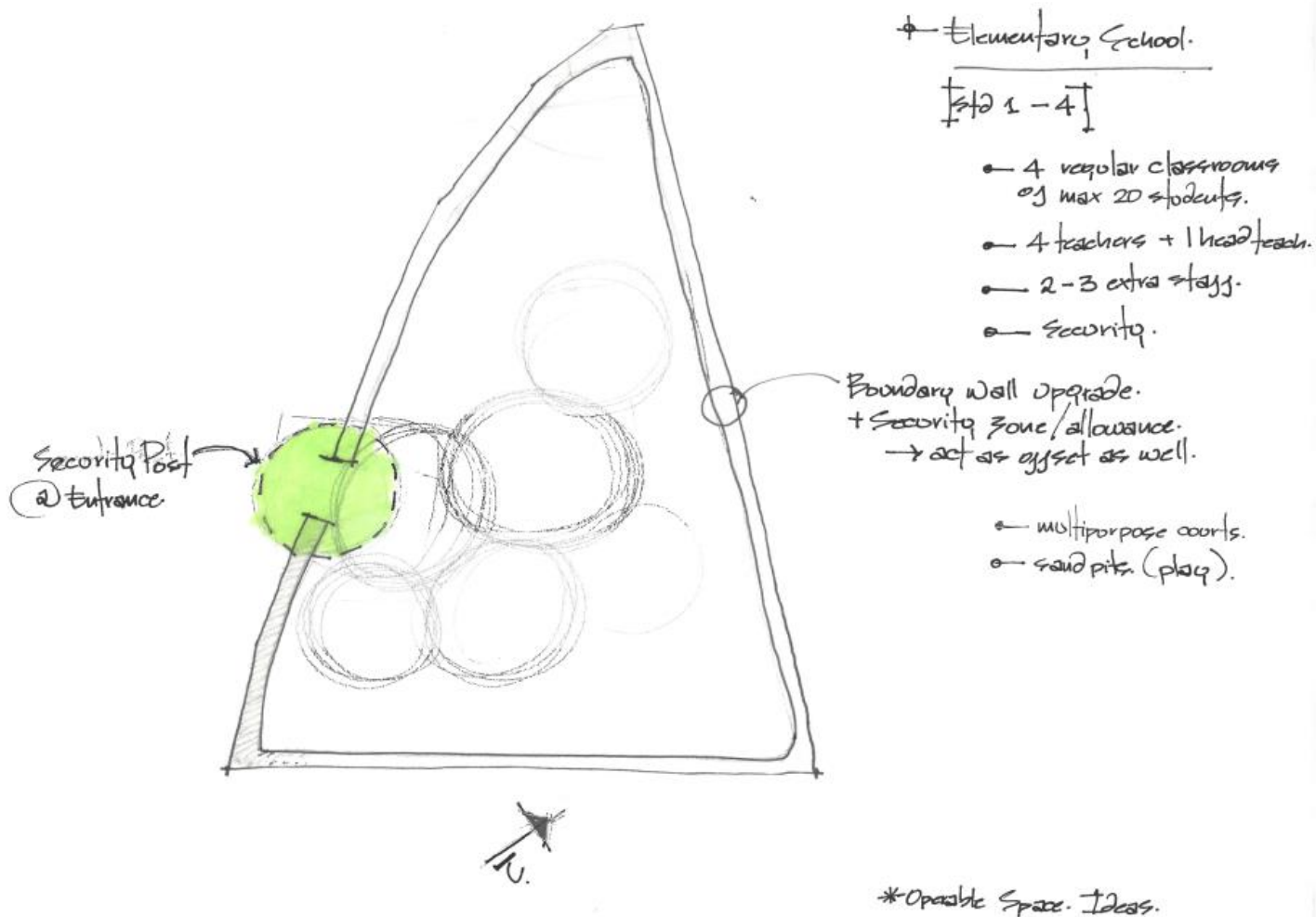


Figure 21 First sketch of the site.

The proposed design, limited to 1400 sqm, needed a set accommodation schedule as a guide before going too far in design. The accommodation schedule included, 4 classrooms, an administration block/unit, kitchen and servery, toilets, multi-purpose court and most importantly a courtyard.

Each classroom is designed to accommodate 12 to 15 students and are meant to surround the courtyard as a response to traditional cultural building. A series of design options testing the sites opportunities and weak points on an accommodation level was necessary. Initially sketching the site

in different scales helped map, levels, existing site ingress¹⁴, existing boundary wall extent, immediate context¹⁵ and the internal space to work with after mapping the road reserve and riparian land¹⁶.

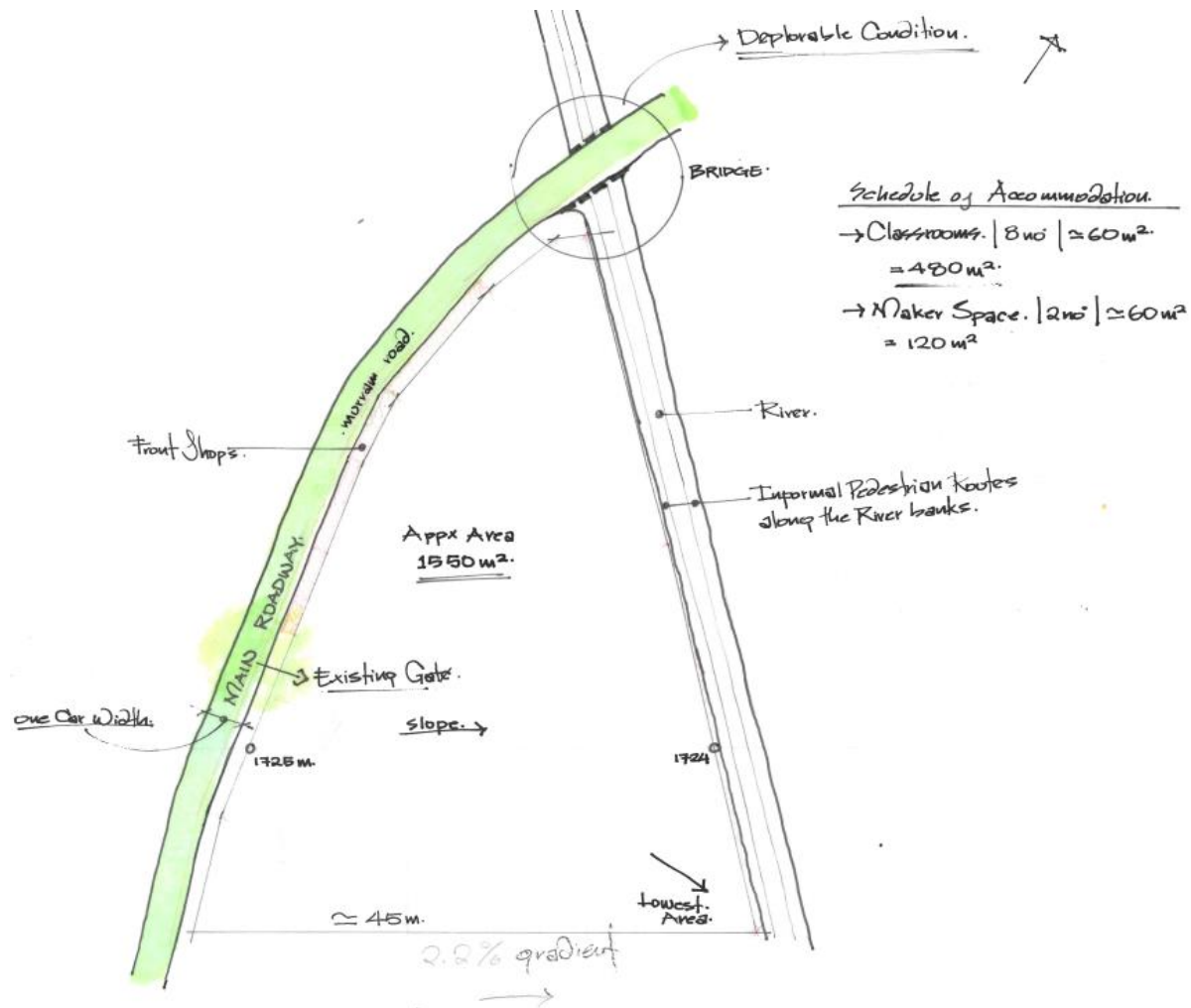


Figure 22 Site sketch with more detail, approximate measurements, gradients and immediate context.

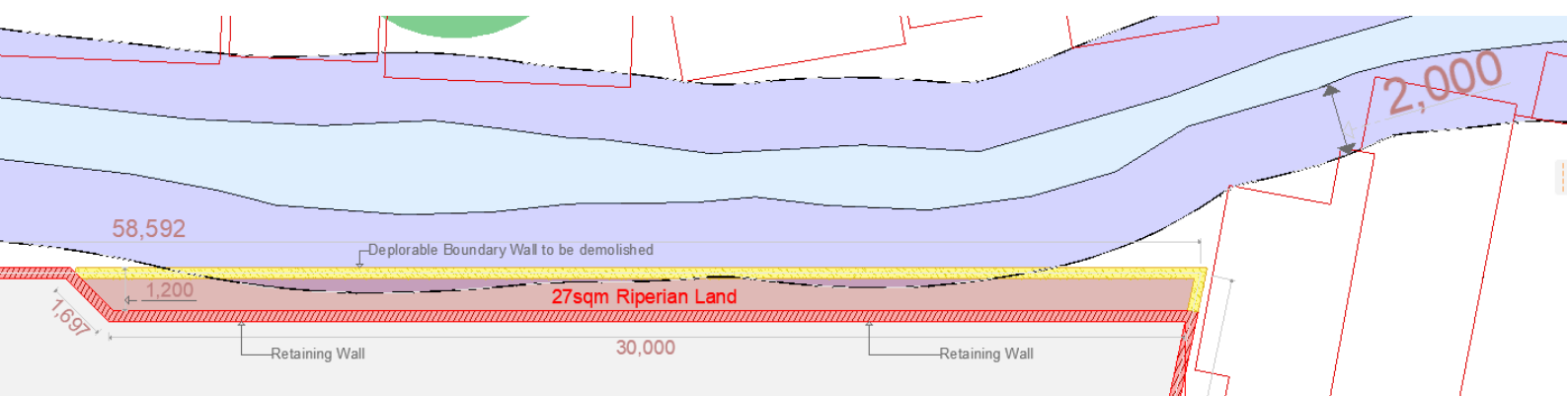


Figure 23 Riparian Constraint.

¹⁴ Figure 22.

¹⁵ Figure 23 - River next to the site and adjacent marram dirt road.

¹⁶ Figure 24.

Figure 24 analyses the effect of the riparian constraint where in this case a considerable 30 meters of existing wall must be demolished and replaced by a retaining wall recessed 1.2 meters in the site.

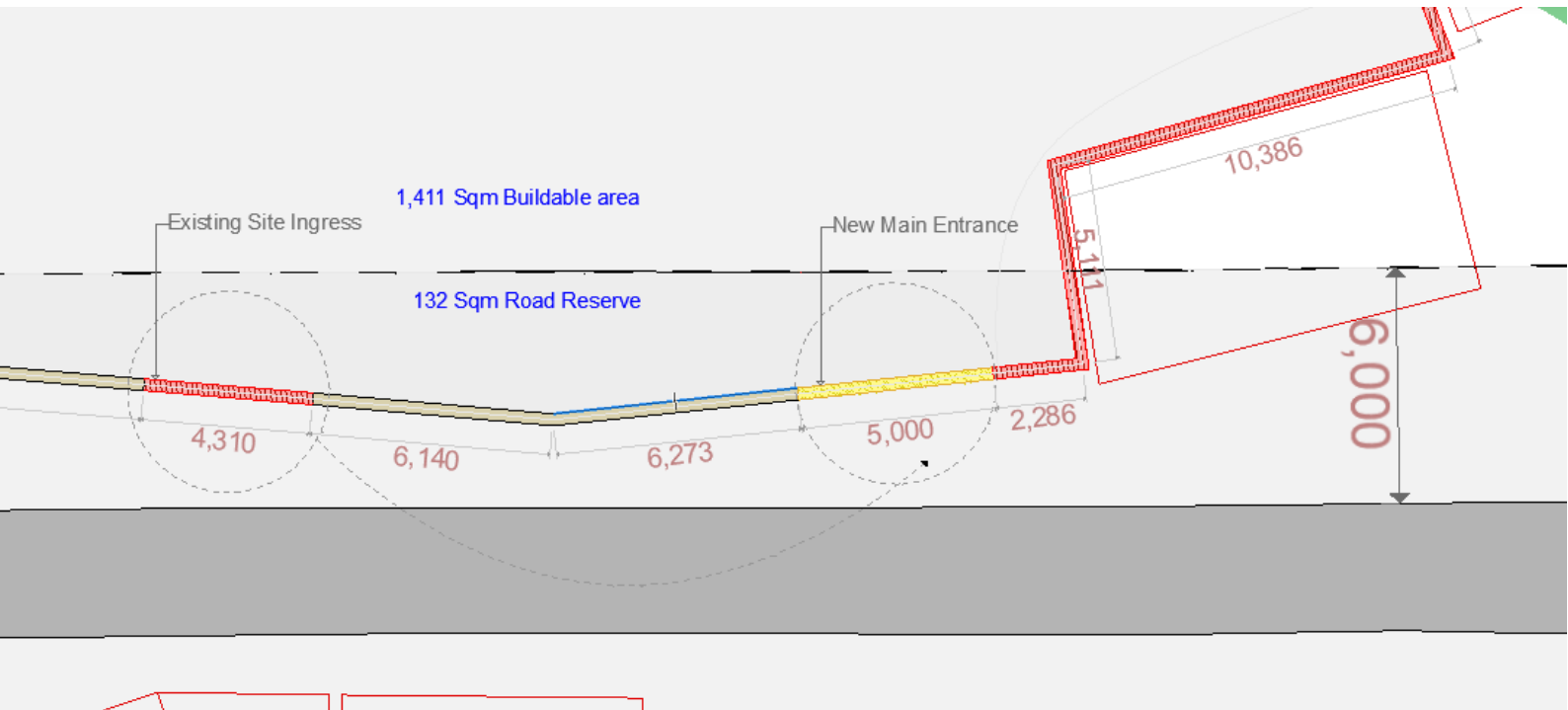


Figure 24 Road reserve

Figure 25 analyses the road reserve constraint. According to the planning department and building code Cap 525, the road reserve must be set to 6 meters on either end of the road. This implication creates a 132 sqm space that cannot be built on, however, the boundary wall can stay as is until time for road expansion. Each planning typology kept to these two constraints throughout and created different opportunities where necessary.

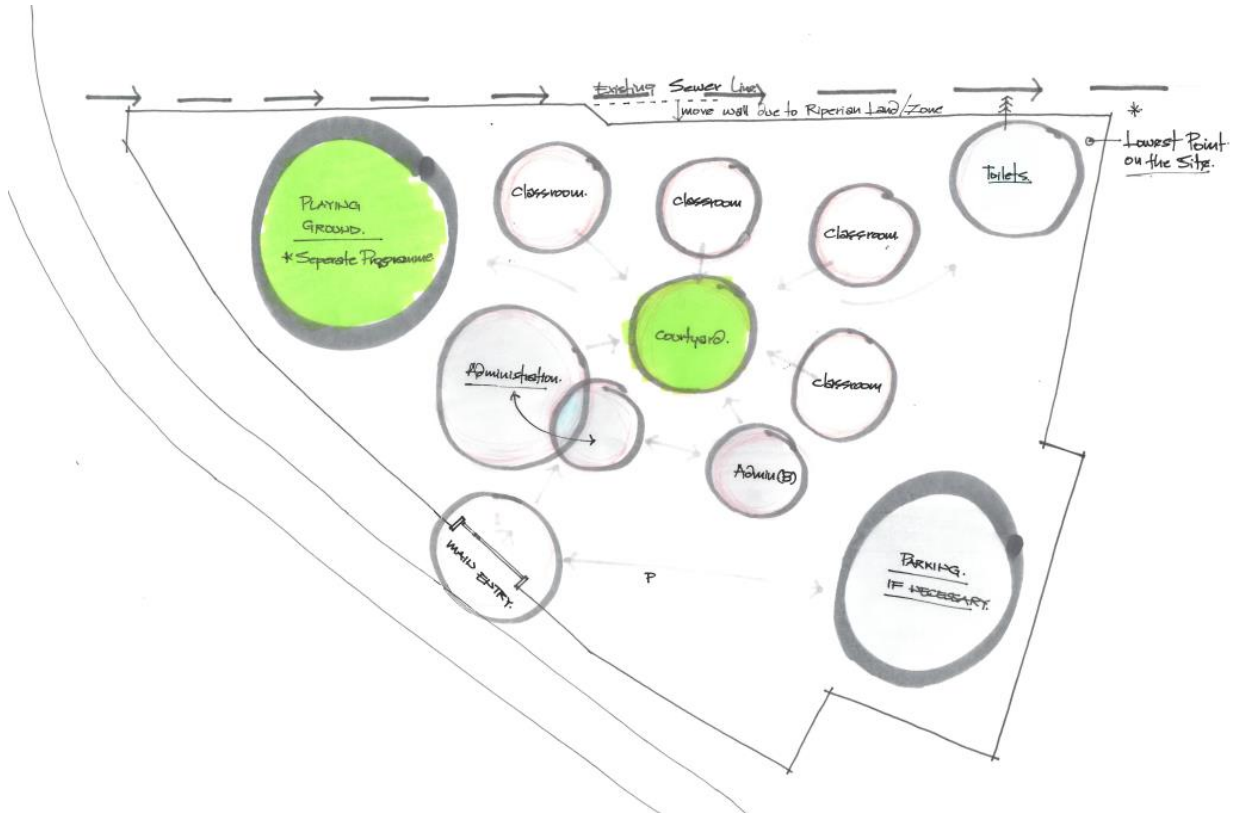


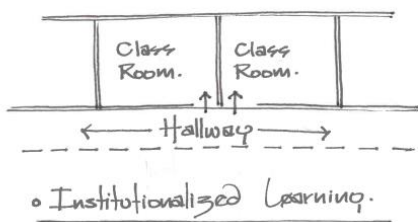
Figure 26 Bubble diagram 01



Figure 26 Design Option 01

Design option 01 sets the classrooms at 40 sqm as a standard that can accommodate a maximum 20¹⁷ students that allows 2 sqm comfort space per student. This scale allows the students to explore their surroundings without worrying about availability of space or feeling cramped affording them steps towards social education.

⑩ Classroom Analysis.



⊗ Quality of Space.

Outcomes....

→ Spaces that inspire learning & communication.

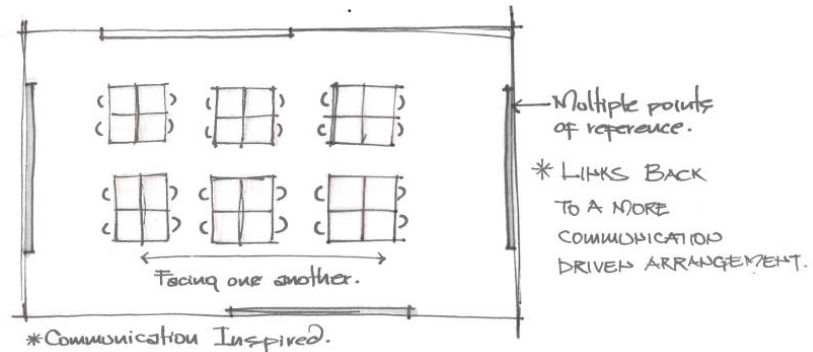
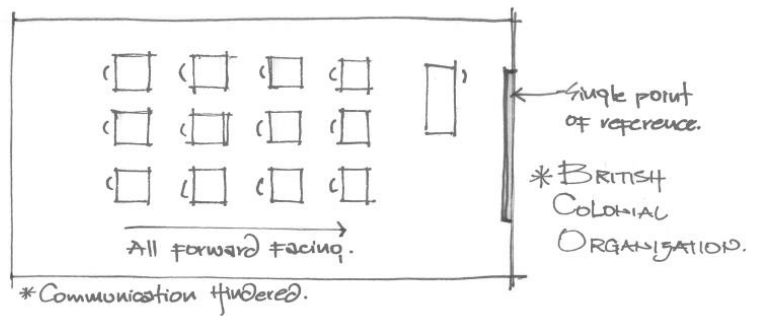


Figure 27 Classroom analysis

In institutionalized learning typology, the seating arrangement hinders communication and social learning and is more direct and instruction based with a single point of reference. A space that inspires learning and communication, however, needs to have more than one point of reference that encourages the students to interact with one another. It is possible to have more than one point of reference with a rectangular classroom, but it is still 4 walls. Increasing the dynamics of scale and form should provide a different experience of space-specific properties and an increase in spatial diversity.

¹⁷ 20 places for accommodation acts as the highest benchmark above the planned 15 students as per the brief.

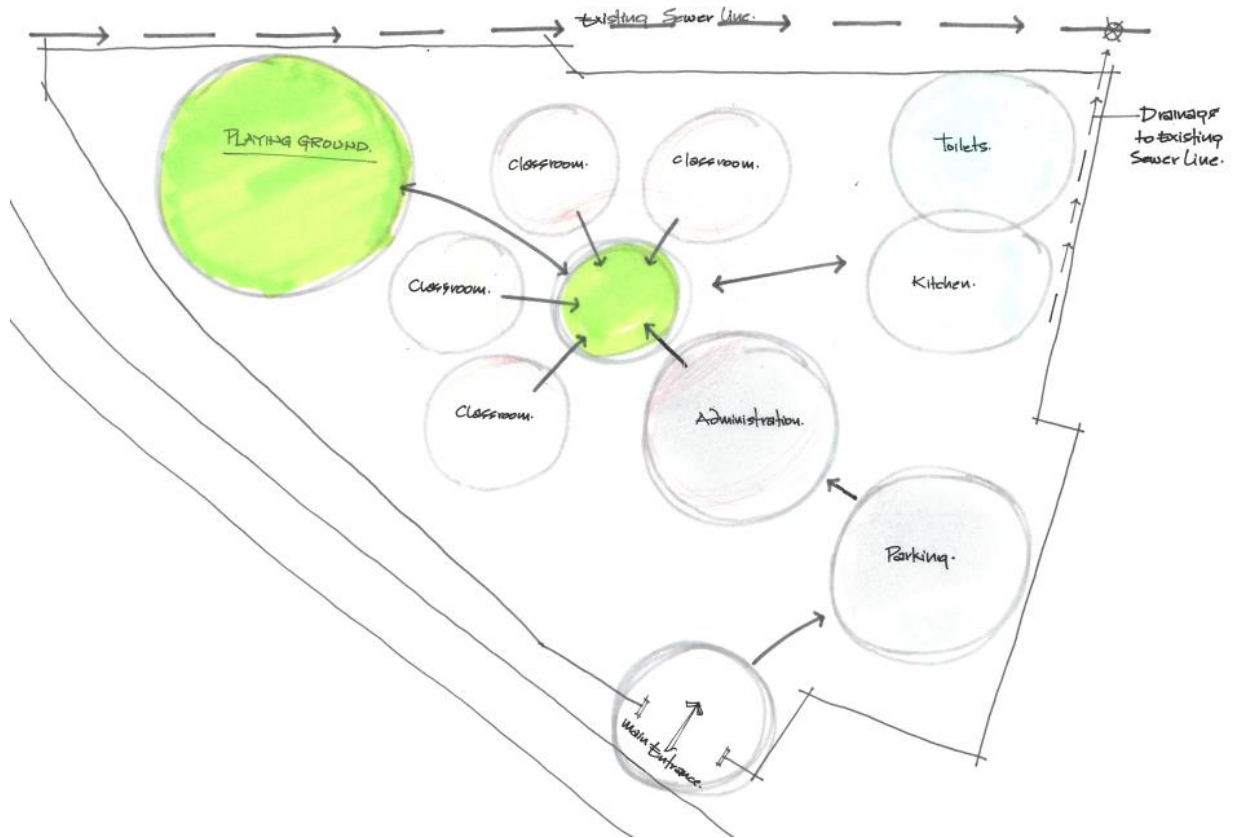


Figure 29 Bubble diagram 02.



Downs Theory
 → Ancient architecture
 Provides a wealth of information
 of the various potential configs
 of Downs architecture
 → Vitruvius → atrium = main
 room
 → Atrium = winter →
 house

Figure 29 Design option 02

A change in the main entrance creates the opportunity to focus the design on one side of the site rather than trying to divide it. This provides a

combined mass and the opportunity to have better spatial relationships.

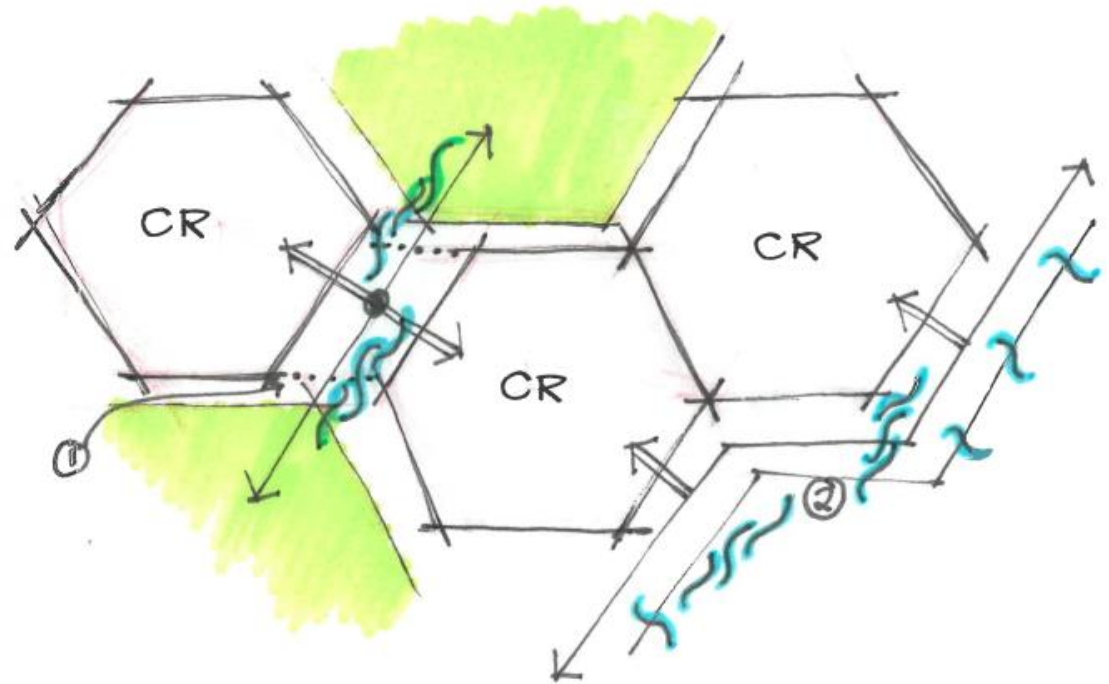


Figure 30 Relation between spaces.

These spatial relationships are beneficial for trapping and / or directing ventilation and creates a dynamic relationship between the internal and external spaces (see figure 16). Such dynamics create several architectural qualities that are children and spatial related. From having a functional window reveal¹⁸ that covers storage spaces underneath and allows for visual connectivity between internal and external spaces, all being scale sensitive to the students average height.

¹⁸ Set at a height of 700 mm.

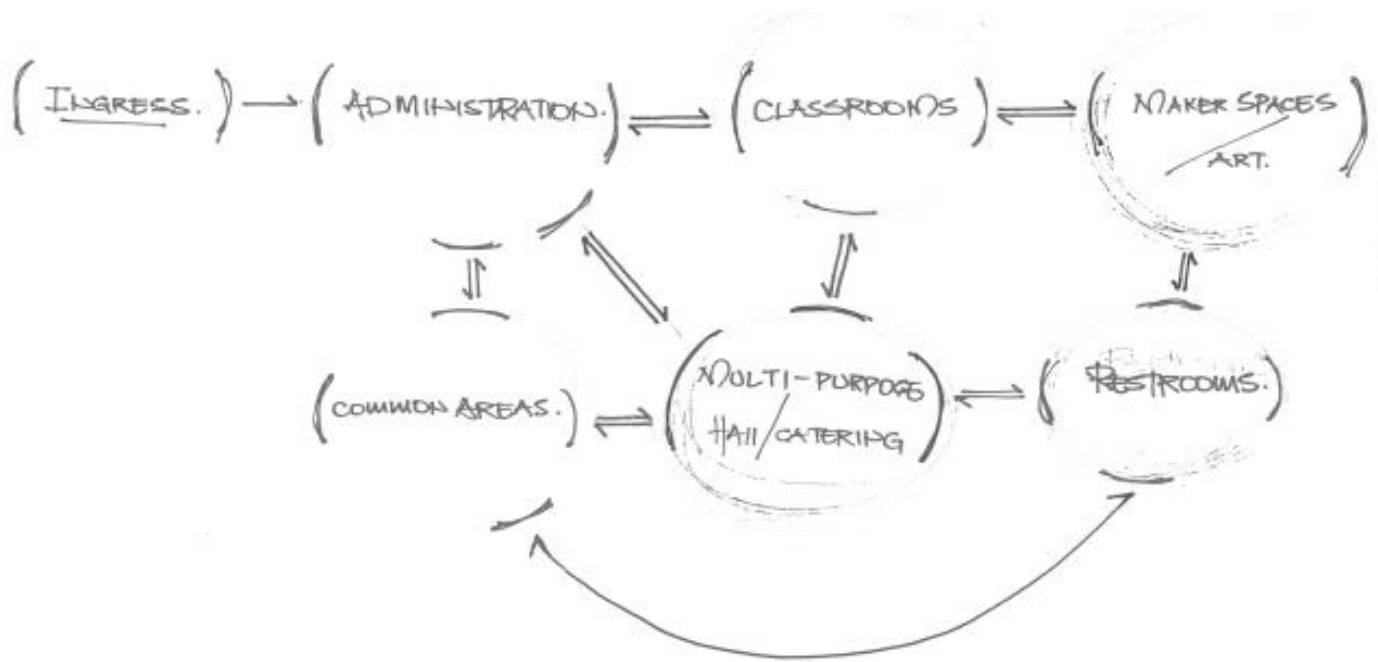


Figure 31 Spatial relationship design guide

Understanding how these spaces interact with one another is the key to planning. These relationships are informed by the design consideration of affording opportunity¹⁹ as discussed by Gibson.

Structure of the proposed School.

Just like Kibera hamlets and Ruhehe primary, the building materials of the proposed re-development of Gifted Hands School²⁰ must be localized which will help keep the cost of construction down. The easiest and most sustainable material found around Kenya is timber and more so, hardwood timber. Using timber frame construction for the build will create an opportunity to use a localized labor force for timber construction is one of the most commonly used materials in Nairobi. The buildings insulation is a cellulose insulation that offers over 75% recycled content. The cellulose insulation used is stabilized which can be controlled unlike loose cellulose that needs a blower on site. It is a non-hazardous natural plant-based material with low embodied energy. The timber frame is clad with 25mm extruded polystyrene thermal panels rendered in a neutral light grey cement

¹⁹ Theory of affordances.

²⁰ Gifted Hands School – abbreviated GHS

ash finish²¹ which later becomes the canvas for all the cultural print and pastel colors. Parts of the building will be clad in timber panels on the exterior to create a different texture that contrasts the ash render. Both the maker space and the external seating covered areas are secured by a brown brick perforated wall²². These two spaces are divided by a courtyard that is the focus of all the classrooms and it affords the children the opportunity to physically experience their environment as well as interact with others outside the classroom in a safe environment. The planning of the courtyard is intentional with focus on the different age groups and functions of the school.

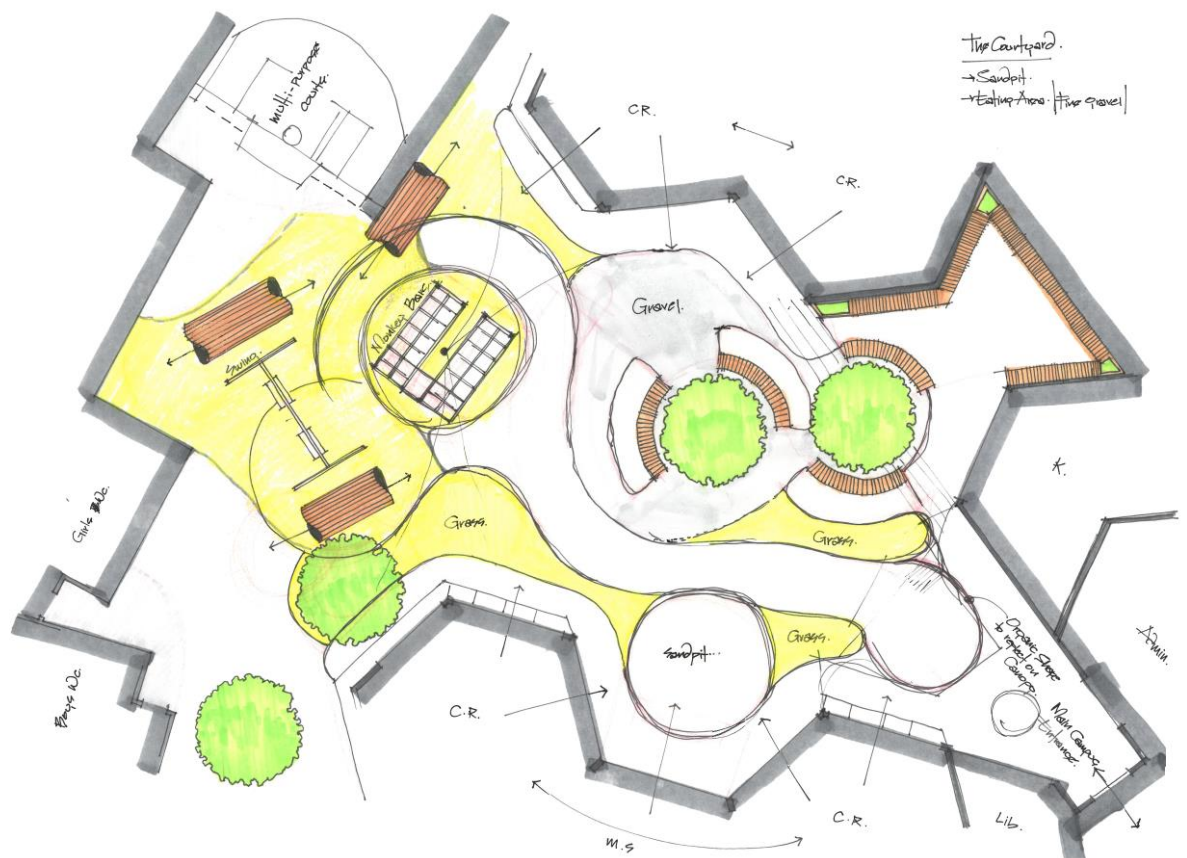


Figure 32 Courtyard Plan

From the main entry next to the administration offices, is a paved connecting space to both sides around the courtyard. There is a change in floor type throughout the courtyard and for children, this provides different surfaces they can explore, play

²¹ Wood float finish.

²² Known locally as a some yes, some no wall.



Figure 33 Interior view of a typical classroom

and learn through touch. A few playful elements²³ strategically placed in the courtyard provide the children with physical elements of leisure and play. A combination of timber and metal is used in the construction of most of these physical elements both for aesthetics and structural integrity as they will be used frequently.

Timber framed doors and windows will be clad with cultural prints that will be primarily painted on by the Nubian community to tie the architectural elements back to culture. While many of the walls will maintain the clean ash grey finish, some of the interior and exterior walls will be painted pastel blue and pastel pink on the ash concrete. The texture of the ash grey is visible through the paint since it is a wood float application and the subtle contrast will create a good balance between the cultures and since the proposed design is intended for young children, visual comfort is very important. The floor of the classrooms [Figure 33](#) is clad in reclaimed floor tiles that end up as waste and therefore dumped.

²³ Swings, crawl tubes, monkey bars and a sand pit.



Figure 34 Servery and covered seating area.

The exterior seating spaces are covered by wild wattle reeds which create beautiful patterns that double up as appropriately shaded spaces for children. With close relation to roman architecture, the courtyard is designed to be a space that combines different functions eliminating corridors and unwanted circulation spaces.

Good quality spaces are not only internal spaces but can be categorized as spaces that respond to a specific need of the occupants. These quality spaces can also be described by the opportunity to create visual senses of connectivity from both the outside looking in and the inside looking out.

Conclusion.

Creating these good quality spaces for children, an architect or designer needs to understand the needs for children where nothing can be taken for granted but must be considered. Even when presented with a limited site, it is important to see the world from the perspective of a child to understand how to design for one, leave alone a school that accommodates 60 plus. The benchmark for any spatial planning consideration is always children (Maina 2019; Rühm 2018).

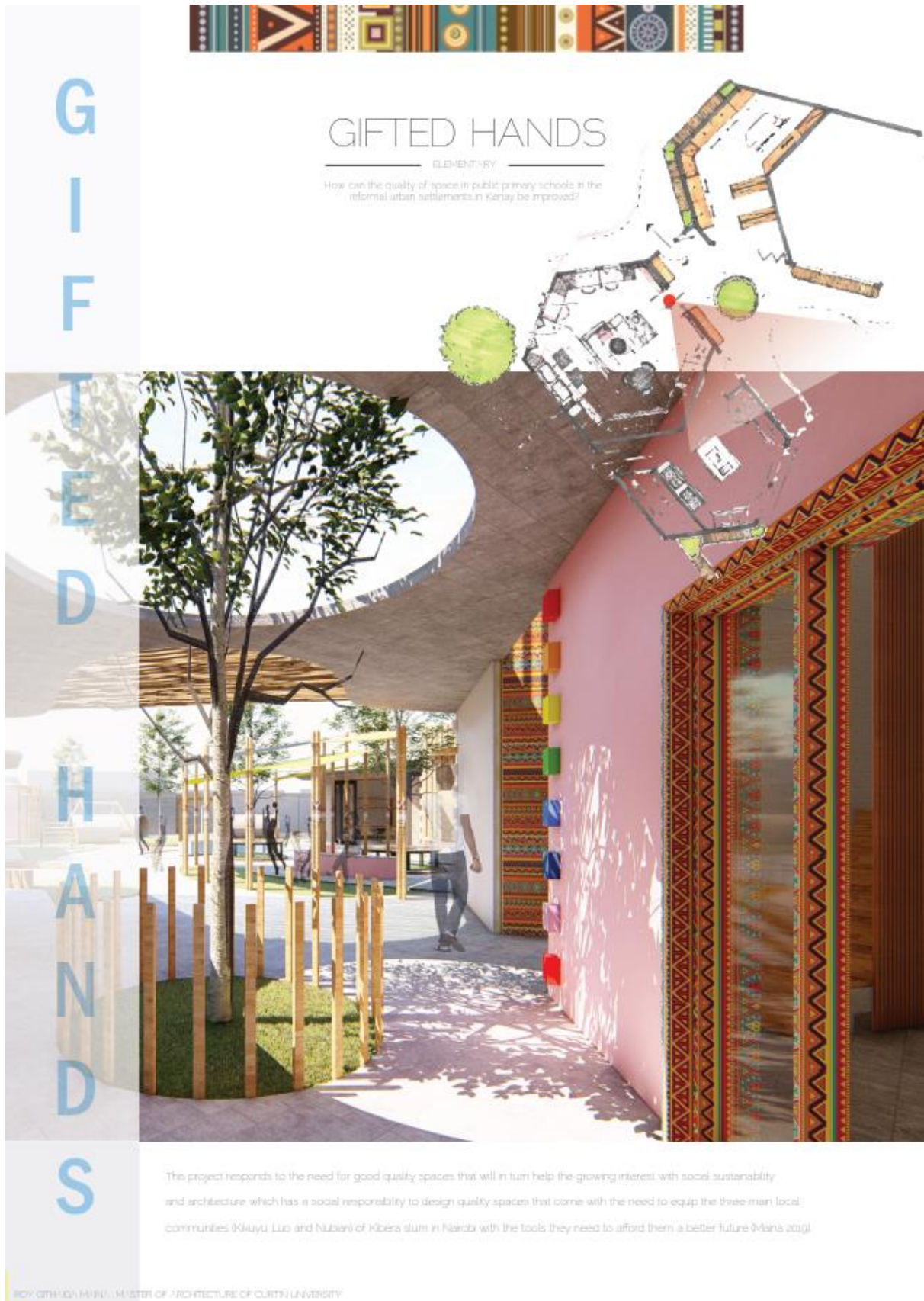
By far one of the most important aspects of good quality spaces in culturally strong locations is creating environments that are community strong creating a vibrant sense of place. Involving the local community of Kibera in the design and construction of the proposed school will, in the least, create a secure place for the children to call 'home away from home' (Maina 2019). As such, the local community will begin to create, following the example of the school, their own 'good quality' spaces for their homes and the surrounding context which will strengthen their bonds and create a safe heaven for their children and in turn afford them better futures.

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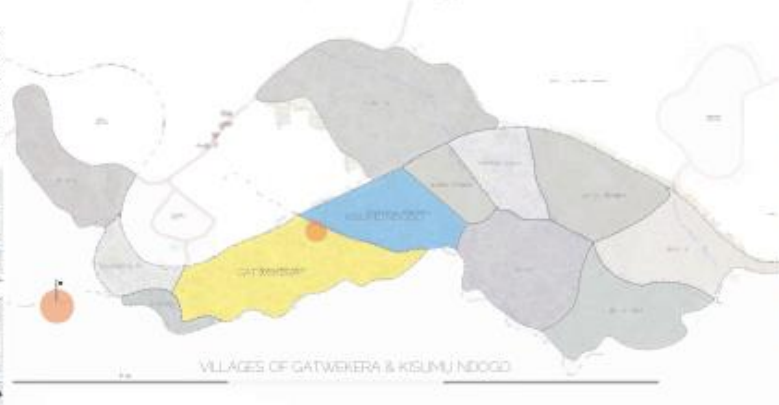
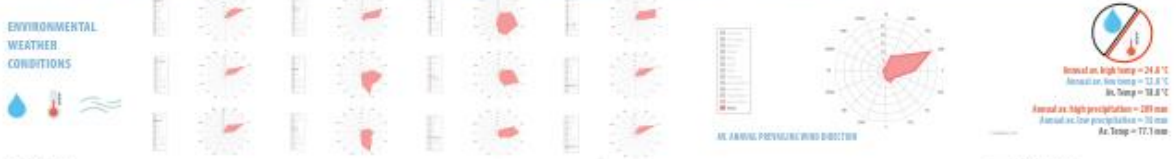
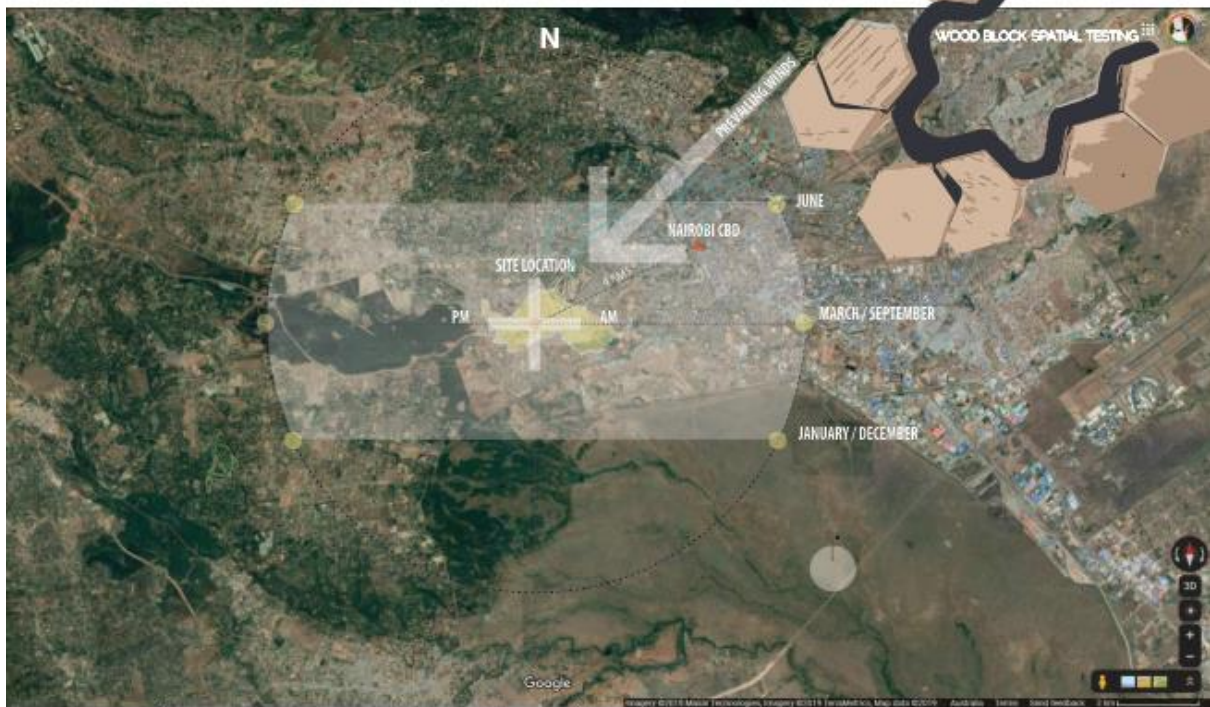
Appendix.





SITE LOCATION

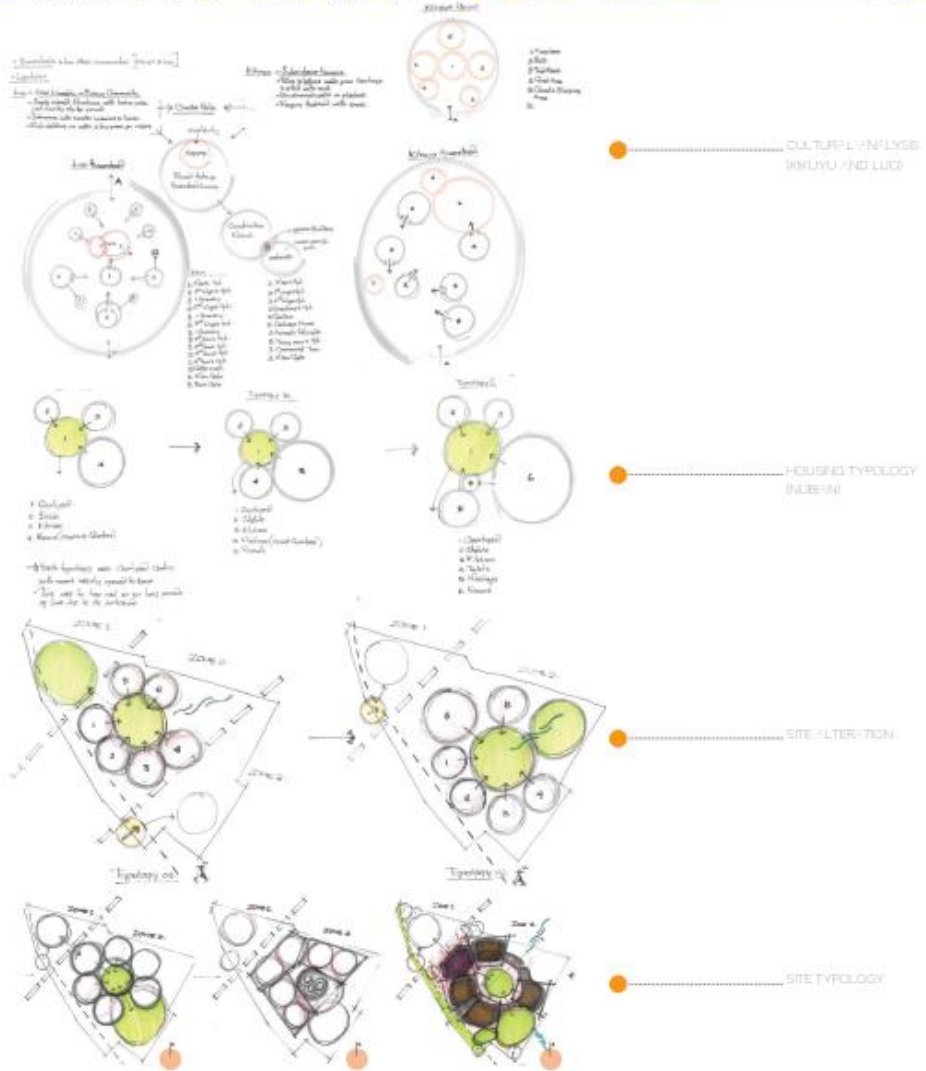
ANALYSE





METHODOLOGY

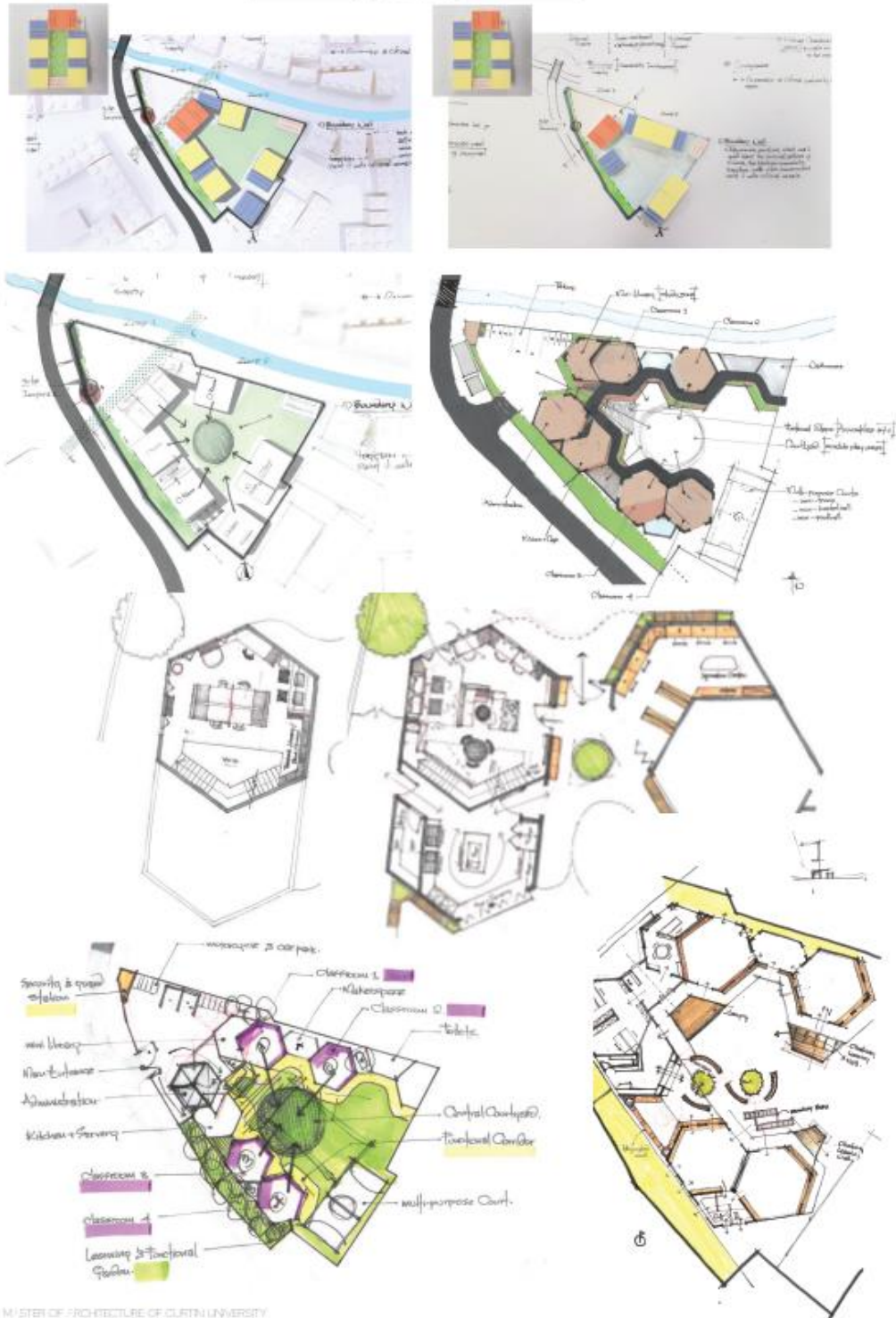
CULTURE





METHODOLOGY

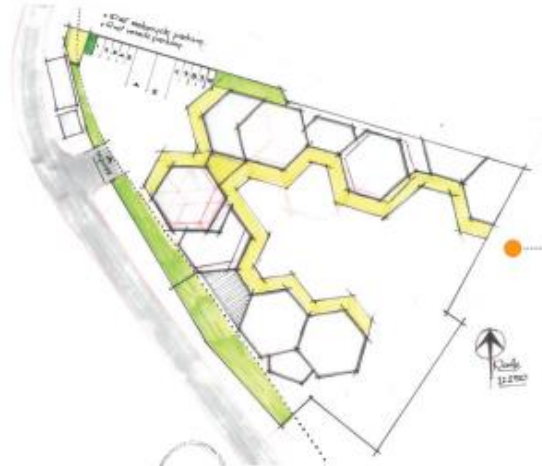
SCOLLER TESTING



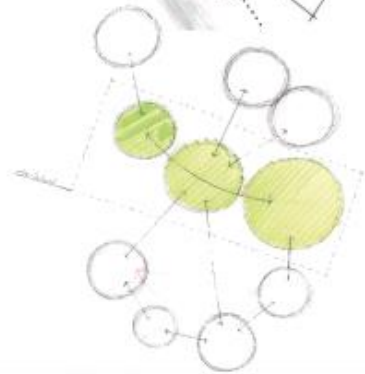


METHODOLOGY

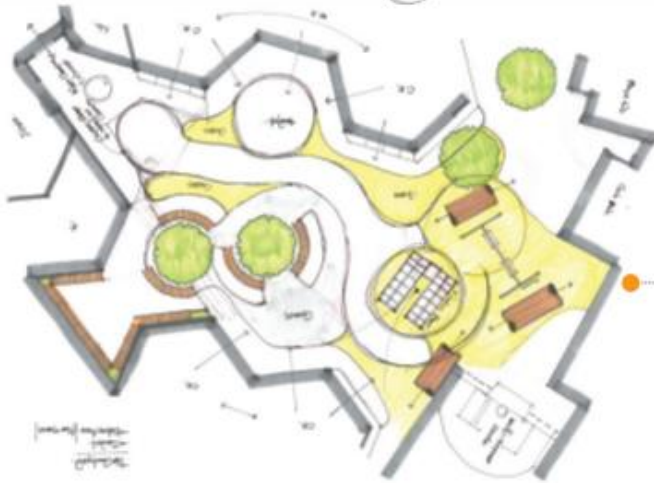
COURTY-RD



COVERED W/ WALKWAY
AROUND COURTY-RD



COURTY-RD BUBBLE DIAGRAM



COURTY-RD COMPONENT DESIGN



COURTYARD

ELEMENTS



● MAIN ENTRANCE



KIKIAY GRASS



GRAVEL FLOORING



PERFORATED BRICK WALL



LATTICE LANDSCAPING



RECLAIMED TIMBER



● COVERED SEATING NEXT TO SERVICE



M-HOGANY STRIP FACADE



● MAKER SPACE VIEWS & SAND PIT



WILD WATTLE CANOPY



● SAND PIT



COURTYARD DESIGN

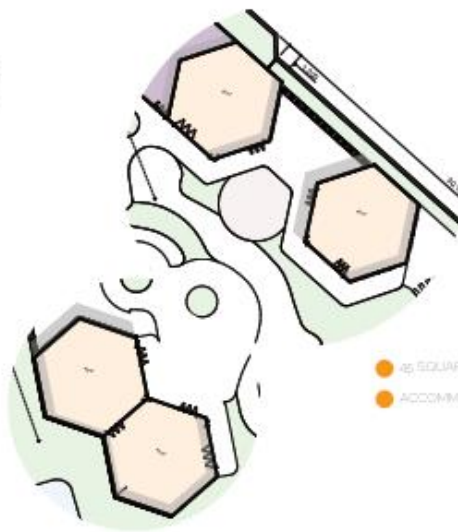
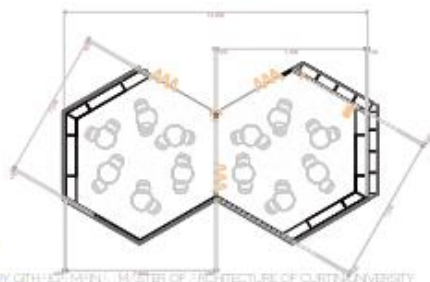
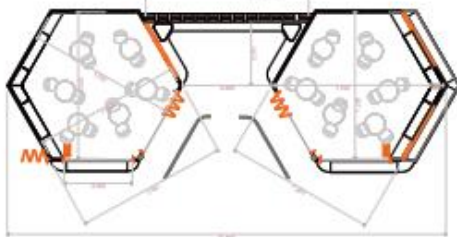


CLASS ROOMS

QUALITY



- 
 RECLAIMED
TIMBER
- 
 FLYWOOD
- 
 TRI-DIRECTIONAL
NUB-IN
PRINT
- 
 F-STEEL
RENDER PINK
- 
 F-STEEL
RENDER (NEUTRAL)
- 
 F-STEEL
RENDER BLUE
- 
 RANDOM
RECLINED
MOSAIC TILES
- 
 HARDWOOD
PLANKS
- 
 BESPOKE
FURNITURE



- 45 SQUARE METER CLASSROOMS
- ACCOMMODATES 12 - 15 STUDENTS

ROY GUY-HOY-MANN, MASTER OF ARCHITECTURE OF CLUTEK UNIVERSITY



GIFTED HANDS COMPLEX



