

**URBAN GREEN SPACE REJUVENATION –
THE USE OF REGENERATIVE LANDSCAPE DESIGN THROUGH
BIOPHILIA TO CONNECT HUMANS BACK TO NATURE**

A Thesis

Submitted to the

Faculty of Miami University

In partial fulfillment of

The requirements for the degree of

Master of Architecture

Department of Architecture and Interior Design

By

WINFREY NYARKO

Miami University

Oxford, Ohio

2020

Advisor _____
(*Mary Rogero*)

Reader _____
(*Mary Ben Bonham*)

Reader _____
(*John Becker*)

Title: Urban Green Space Rejuvenation – The Use of Regenerative Landscape Design Through Biophilia to Connect Humans back to Nature.

Author Name: Winfrey Nyarko

I hereby grant to Miami University the royalty-free, non-exclusive right to archive, reproduce and distribute this work, in whole or in part, and/or my abstract, in whole or in part, in and from an electronic format.

I represent and warrant that this work and abstract: (1) are my original work, (2) do not infringe or violate any rights of others, and (3) are not subject to any contractual or legal restriction which would prohibit Miami University from archiving, reproducing or distributing this work.

To the extent that there is third-party copyrighted material within the work or the abstract, I have obtained written permissions from the owner(s) of such third party copyrighted matter and will supply copies of such upon request by Miami University.

I acknowledge that Miami University may opt not to publish or may withdraw from publication the work if, in its sole judgment, it believes the appropriate rights have not been obtained. In the event that Miami University, in its sole judgment, believes that any material contained in the work infringes any third-party intellectual property right(s) or otherwise violates the law or if the University receives a notice alleging such infringement or violation, Miami University reserves the right to immediately remove the material.

I acknowledge that I retain ownership rights to the copyright of my work. I also retain the right to use all or part of my work in future works (such as articles or books).

Signature

05/15/2020
Date

DEDICATION

I dedicate my thesis work to my family and many friends. A special feeling of gratitude to my loving parents, Dominic and Rosemary whose words of encouragement and push for tenacity ring in my ears. My siblings Audrey and Patrick have never left my side and are very special. I also dedicate this dissertation to my many friends who have supported me throughout the process. I will always appreciate all they have done.

Thanks for being my best cheerleaders.

ACKNOWLEDGEMENT

First of all, I give thanks to the Almighty God for this provision of life. I wish to thank my committee members who were more than generous with their expertise and precious time. A special thanks to Mary Rogero, my committee chair for her countless hours of reflecting, reading, encouraging, and most of all patience throughout the entire process. Thank you Mary Ben Bonham, John Becker, Jay Elliot, and John Blake for agreeing to serve on my committee.

I would like to acknowledge and thank my school division for allowing me to conduct my research and providing any assistance requested. Special thanks goes to the members of staff development and human resources department for their continued support.

Finally I would like to thank the studio professors and administrators in our school division that assisted me with this project. Their excitement and willingness to provide feedback made the completion of this research an enjoyable experience.

Urban Green Space Rejuvenation –

The Use of Regenerative Landscape Design through Biophilia to Connect Humans Back To Nature

WINFREY NYARKO

Miami University

ABSTRACT.

"Nature holds the key to our aesthetic, intellectual, cognitive and even spiritual satisfaction, stated American biologist and author" E. O. Wilson. The natural world has been altered over the past years, resulting in a disruption between the human - nature connection. This connection that was evident during the prehistoric eras when nature and humans were interdependent seems to have dwindled over the ages due to our own activities such as urbanization, deforestation, among others. Frank Lloyd Wright stated "Study nature, love nature, and stay close to nature. It will never fail you." Nature has and continuously offers us everything. Right from the way termites build their houses to how leaves use up water for photosynthesis-; natural orders happen around us every day.

What can we learn from nature in solving design problems that engage how we live and where we live?

The necessity to establish sustainability principles and practices has developed over the past years and measures are being made to make our designs more sustainable. Considering the principles of sustainability in design to connect natural processes to building technologies and habitability, this paper aims to use regenerative landscape design through biophilia to rekindle the connection humans had with nature. This is aimed at achieving environmental, social/cultural and economic sustainability.

Through Literature done on regenerative landscape design and biophilia, including The Regenes Group's works, Regenerative Development and Design a Framework for Evolving Sustainability as well as The Biophilia Hypothesis written by E.O Wilson and Professor Stephen Kellert, Case studies of The Ghana Permaculture Institute and The Paley Park, and lastly interviews of the general public conducted to understand how regenerative landscape design and biophilia are understood and what their preferences as far as nature experience goes, would be, a consensus was reached.

The analysis of the literature, responses from the general public and the information gathered from the case studies generated into an urban park that not only bridges the gap between humans and nature but also encourages bio diversity for an improved ecosystem, highlights some parts of the Ashanti culture and promotes communal interactions.

Keywords: Regenerative landscape, Biophilia, Sustainability, Nature, Green Spaces.

INTRODUCTION

BACKGROUND OF STUDY

Ever wonder how it would feel if we were to bring back “Eden”? What if a walk through our cities, workplaces or even our homes felt like we were walking through nature itself? What if we could rekindle our relationship with nature? An environment that has all natural creations together is what I see as the perfect surrounding – If one references “the Garden of Eden”, should one decide to take it from the religious point of view about the beginning of creation or the untouched amazon basin, should one take it from the geographical stance.

Looking back to the times when humans were hunters and gatherers, although not the ideal position to be in (not having a permanent shelter to live under) the connection between nature and humans was evident. We played with trees, lived under them, had an abundance of natural food, interacted with animals, and had access to sunlight and natural air. An example can be taken from the Amazon Basins, where most of the rainforests have been kept intact, (until recent times) thereby maintaining the ecosystem within the region.¹ What if we can redesign our cities and neighborhoods to incorporate more green spaces, as well as nature-inspired elements to make us not only feel nature but actually connected to nature?

“This paper seeks to find ways that regenerative landscape design through biophilia can be used to boost our relationship and experiences with nature to help improve bio diversity, community interactions, general wellbeing, foster social interaction and promote sustainability. This research was undertaken to discuss how our natural green landscapes have been destroyed by human means, which in effect has caused our detachment from nature. This paper examines how we rekindle our connection to nature by regenerating the destroyed and abandoned landscapes through the use of natural elements and processes.

I am from Ghana, and understand the condition of depleting natural resources from a personal and community perspective. The depletion and abandonment of green spaces in Kumasi, Ghana, is an example of the problem of urban decline of green areas. Through examining Kumasi, Ghana, and arriving at a set of parameters to mitigate the depletion of the urban landscape, similar global conditions could be addressed.

Kumasi, Ghana, as the prime study, can help understand how the depleted and abandoned green spaces can be regenerated, and understand how biophilia can support its feasibility in our current generation. Lastly, the paper discusses the connection between regenerative landscape design and biophilia and their benefits to humans and the environment.

METHODOLOGY

The paper analyzes existing literature concerning regenerative landscape, and biophilia, and their process of operation as well as how beneficial they are in our current generation. The books by The Regenesys Group and E.O Wilson and Stephen Kellert titled *Regenerative Development and Design a Framework for Evolving Sustainability* and *The Biophilia Hypothesis* respectively are amongst the literature studied and reviewed. Case studies include different types of urban and Ecological parks such as The Paley Park in New York, and the Cleveland Square by James Corner. The Ghana Permaculture Institute at Techiman, Ghana and The Buttercrunch Farm at Colorado will also be studied. These cases are studied to learn the strategies and design considerations the architects made to generate their designs, as well as understand the current state of their work. Interviews conducted with three main groups of people; - the heads of organizations responsible for planning and protection of the landscape in Kumasi (i.e. the Kumasi Metropolitan Assembly - KMA, The Parks and Gardens and the Forestry Department) to find out their strategies dedicating the percentage of land to

green spaces, and what they do protect these lands once they are established. Secondly, approximately 20 indigenes of Kumasi and architects are also interviewed to find out their conception of regenerative landscape and biophilia and how they perceive it benefiting them. Lastly, observing and analyzing how some natural processes occur with living organisms and how these processes could be adopted in proposed designs to solve the pressing problems of landscaping. Landscape architect Kate Orff offers insights as to how regenerative landscape projects offer economic opportunities for communities as well as healthy habitats.

DISCUSSION

To better understand the current need for more designed livable spaces where nature is key to our human experience, I choose to highlight Ghana as a prototype to the other parts of the world similarly affected by the erosion of natural spaces. As I am Ghanaian, my personal experience offers direct observation of spaces and places undergoing environmental changes affecting its natural landscape.

GHANA

Ghana is a Western African country with an area of approximately 238,533 sq km. It is administratively divided into ten regions. The two main cities of the country are Accra (the capital city of the Greater Accra Region) and Kumasi (the capital city of the Ashanti Region) of which I am a native.



Figure 1 Map of Africa showing the location of Ghana. Image Source: Google maps

The figures below show the changes undergone in Ghana’s land coverage from 1975 to 2013.

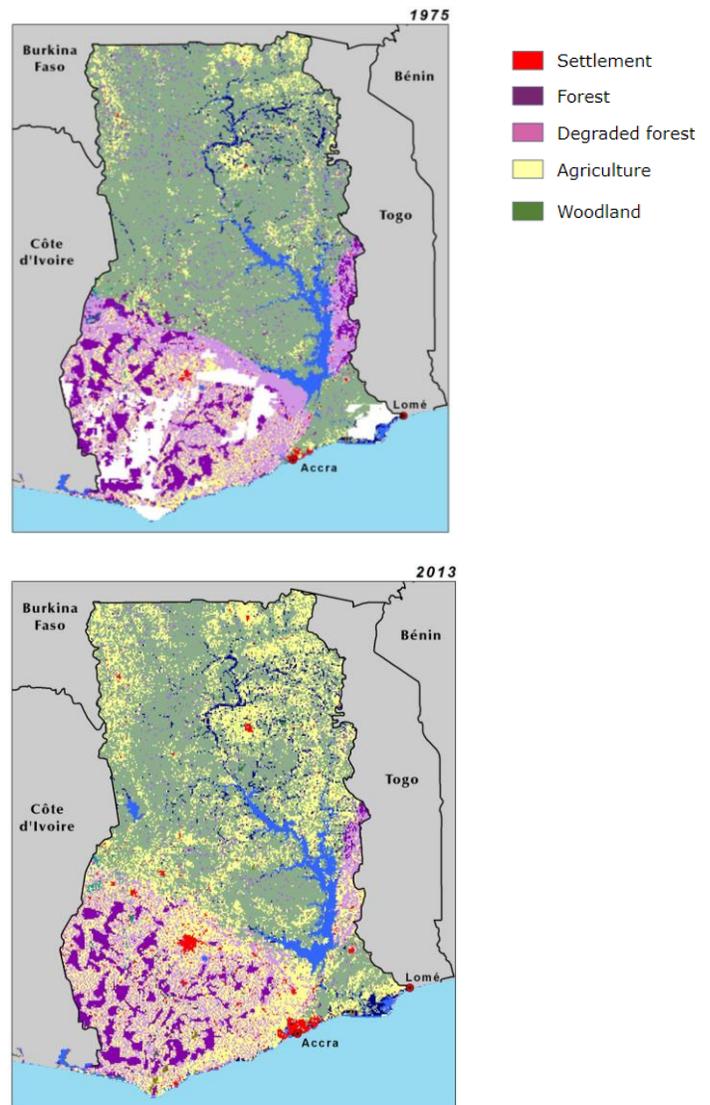
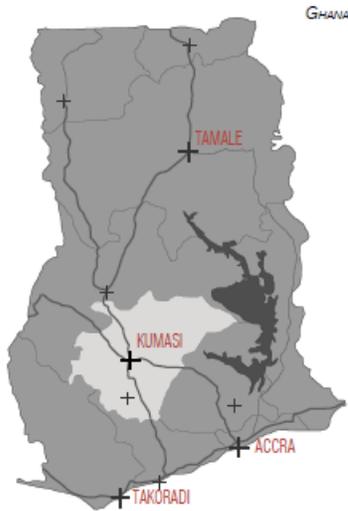


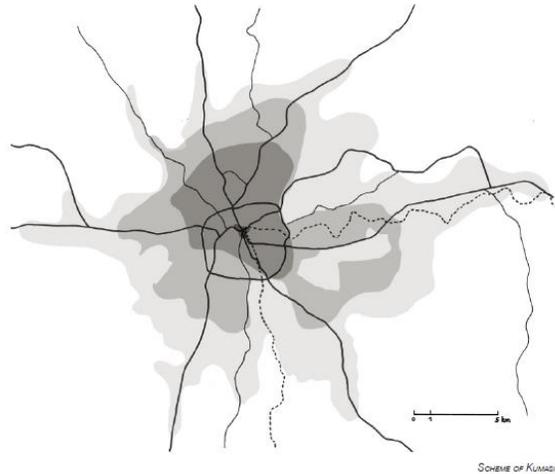
Figure 2 and 3. Maps of Ghana showing the land cover of Ghana in 1975 and 2013 respectively.

Over time, I realized that our culture which offers us the opportunity to engage with nature inclusive of playing games and sports gradually became lost. Parks and outdoor communal socializing spaces were built over, abandoned or destroyed. We have seen our green space replaced by hard concrete roads and structures that make us as humans displaced from our natural setting unconsciously hence, the lost that connection we had with nature and ourselves.

KUMASI



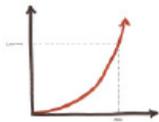
KUMASI AND THE ASHANTI REGION IN GHANA



SCHEME OF KUMASI

CONTEXT

EXPLOSIVE POPULATION GROWTH



Kumasi has known an enormous explosion in growth over the last decades. Today, Kumasi has a population of about 2 million people. It is therefore the second biggest city in Ghana. With a grow rate of over 3,5 percent per annum, it is today growing much faster than the capital Accra.

CLIMATE



The Ashanti region is located in a tropical forest zone. The city therefore knows heavy tropical rainfalls alternated with periods of drought. Deforestation, erosion and frequent floods are therefore important issues in Kumasi.

Kumasi is located above an increased soil water level. Many small rivers origin in the area around Kumasi. This makes water pollution, also of the subsoil water, a serious environmental problem.

INFORMAL CITY



Petty trading and informal sector businesses form the base of Kumasi's economy and they probably represent over 70 per cent of employment in Kumasi. Adaptation and the use of public space is therefore a very common feature in Kumasi. Hawking and street vending is present throughout the city. Small kiosks which house little shops, chop bars (places to eat), sewers, barbers and many more are an urban element of every street.

CONGESTION, DISCONNECTION AND POLLUTION



Traffic congestion is a major issue in Kumasi. Even outside rush hour, it can take a long time to reach a nearby destination. This congestion coincides with a large amount of smog and air pollution, worsened by the bad condition of the old vehicle stock. Congestion, however, is not the only problem for (public) transport in Kumasi. Many roads are not paved or well maintained; certainly during the rain season, this creates inaccessibility and disconnection for certain areas of the city.

ECONOMIC NETWORK



Kumasi is often regarded as the commercial capital of Ghana, with its Kejetia market rivalling Onitsha in Nigeria as West Africa's largest open-air market. Part of Kumasi's relative prosperity derives from the timber forest of the surrounding region and natural resources such as gold, rubber, cacao and bauxite but it is also renowned for its local enterprise and artisan skills, particularly in the areas of furniture-making and vehicle engineering, which serve clientele from surrounding countries.

GATEWAY



Kumasi is situated on the border between the dry and poor north and the richer, more developed, south of Ghana. The city is therefore some kind of gateway, a city function which is confirmed by the road and railway network in Ghana. All important roads from different places in the south merge in Kumasi, and from this point, they diverge again and continue to the north.

ASHANTI



Kumasi is the capital of an ancient West-African empire: Ashanti. At the peak of its power, This Empire occupied large parts of present day Ghana and Ivory Coast. Today, Kumasi still is the centre of the Ashanti culture. This culture still plays an important role in everyday life in Kumasi and also attracts many tourists. As the capital of the Ashanti region and with the Asantehene's palace in the centre of the city, Kumasi has been a powerful alternative locus of political power to Accra and often a focus of political opposition.

During the Kumasi was labelled as the Garden City in 1961 by Queen Elizabeth due to its abundant vegetation cover. High population growth and urbanization caused a reduction in our natural landscape covers. Figures 4 and 5 below show the land use map of Kumasi from 1985 to 2016.

LAND USE MAP FOR 1985 (LANDSAT TM)

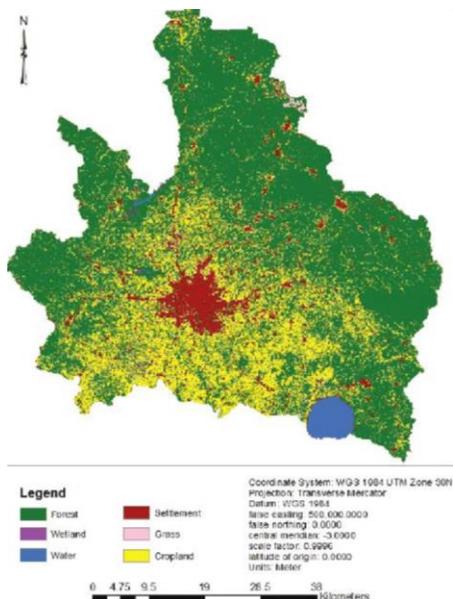


Figure 4. Land use map for 1985. Image Source: (Koranteng 2007).

LAND USE MAP FOR 2016 (LANDSAT TM)

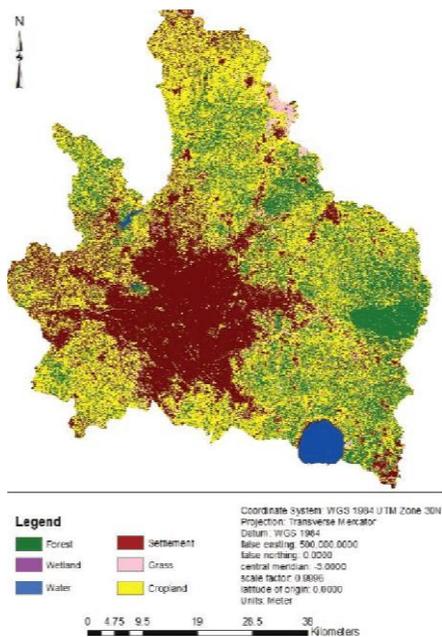


Figure 6. Land use map for 2016. Image Source: (Koranteng 2007).



Figure 7. State of Kumasi in 1961. Image Source: (Arku 2013)



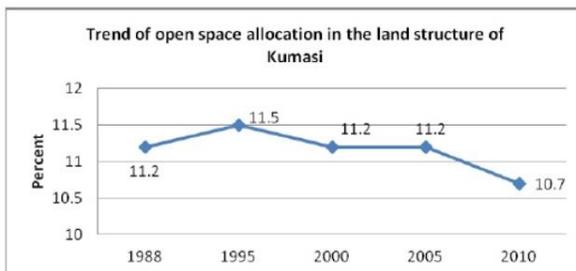
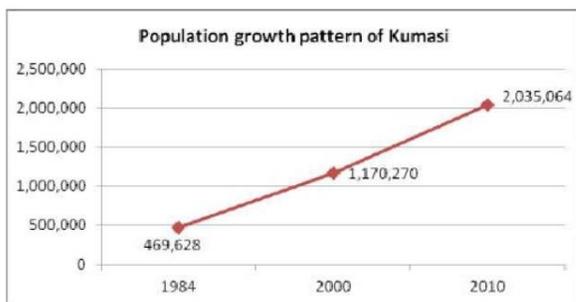
Figure 8. A Current image of Downtown Kumasi. Image Source: ("Kumasi - The Garden City" 2019)

During the colonial Communal Green spaces such as the Kumasi Children’s Park hosted family, communal and some national events aside being a space where people could interact with nature. I only hear stories of it now as it was abandoned before I was born. The history of how Kumasi came about is literally based on the growth of a tree. During the 17th century, “Okomfo” (meaning Chief Priest) Anokye planted three “Kum” trees in three different towns, Kwaaman, Apemso-Bankfofo, and Oboani. This was done to find out which city would be greater depending on the growth of the trees. The tree at Kwaaman flourished more than that of the other two and attracted The Chief and his subjects to settle under it. Thus, a change of name from Kwaaman to Kumasi (under the tree).² How

can a city born out of nature, now destroy and abandon its heritage? Although I was not in existence during the prime years of “The Garden City”, I recall from my childhood an abundance of green vegetation and natural elements. In recent times all those natural landscapes have been replaced, damaged or abandoned.

CAUSES OF NATURAL LANDSCAPE DEPLETION

With reference to Ghana (and probably most developing countries), the gradual depletion of our landscapes can be attributed to an increase in urbanization. Majority of the indigenes interviewed blurt out urbanization and increased commercial activities as causes of urban green space depletion. Most developing countries experience urban sprawls which require shelters to be provided for the migrated people. As population increases, spaces allocated for greenery reduces. This in effect causes us to erect more structures that replace our soft landscapes with the hard landscape. Figures 9 and 10 below show the pattern of the population to green spaces allocation in Kumasi respectively.



Images Source: (Mensah 2014)

Another factor contributing to landscape depletion is the socio-economic activities of the people of Kumasi. The daily struggles to make ends meet is due to limited jobs, and overpriced stalls at markets causes green spaces to be turned into commercial areas where petty traders set up their stalls and sell their goods. Politically, governments see the need for infrastructure such as schools, hospitals, roads, among others as priorities more than providing for and maintaining green spaces. ³

Figures 11 and 12 below show the encroachment of traders on a once important green park and the para gardens taken over by road construction respectively.



Images Source: (Mensah 2014)

Other causes of the green space depletion include ignorance and lack of maintenance of these spaces within the culture. Both the authorities in charge and the general public are guilty in this stance. Once a development is labelled public or not labelled, people tend to show little concern and attention to it. Green spaces are therefore left after conception with little concern and maintenance from authorities and total ignorance from the people it was intended for. An interview with Mr. Amponsah, the Head Director of The Parks and Gardens – An organization responsible for implementing green space allocations presented by the Town and Council Planning; revealed that their jobs are hindered due to unconcern from the government. Revenue generating projects are prioritized and green space development and maintenance are downplayed.

These factors mentioned above obviously happen not only in Ghana but in many other countries. How are we to tackle this problem, and make nature a part of us as needed?

Figure 13 below shows the Upper Guinean Forest change from 1975 to 2013.

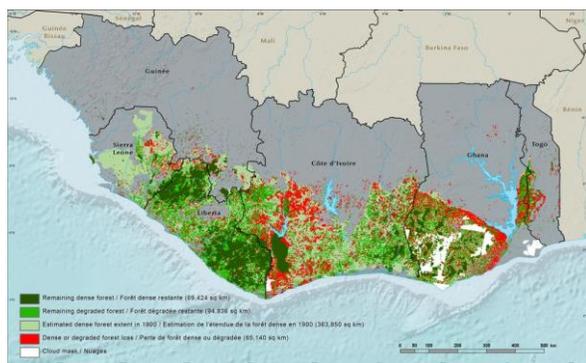


Image Source: ("The Deforestation of the Upper Guinean Forest | West Africa" 2019)

Professor Stephen Kellert, who co-authored with E. O. Wilson, *The Biophilia Hypothesis* notes "Although we may be biologically inclined to affiliate with nature, for this contact to be useful, it must be nurtured through repeated and reinforcing experience" ⁴ Research has shown that human to nature connections reflect positively on health and human performance raising it to a number one priority

in both design practice and research.⁵ Clare Cooper Marcus, Professor Emerita, University of California, Berkeley states "We grow as children through interactions with nature and learning about the world and ourselves, but we cut that off". Marcus' words support what E.O. Wilson tells us about biophilia – which it is an inborn desire to be with, around, and interact with nature. We have not only unconsciously been deteriorating our health but have been destroying our ecosystem as well. The good news, however, is that we are currently in an era where we are trying to make better choices and take sustainable approaches to both our building designs and general lifestyles and I believe nature is what we should look to. Organizations such as the green building organization and other design and construction companies have embraced biophilia over the last decade but I believe there is more to be done.

We can take this from an approach of regenerative landscape design. Regenerative design refers to the process of renewing, restoring or revitalizing resources, specifically, green landscapes.⁶ Regenerative landscape design allows landscape design to let ecosystems come back to life. I believe it is about time we renewed our built environment to include nature, natural landscapes and nature-inspired designs to foster the human-nature connection, maintain a balanced ecosystem and promote sustainability. The questions raised concerning this research are the following - Are there any connections between regenerative landscape design and biophilia? If there exist any connections, what are they, and how would they foster the human - nature relationship?

ECOLOGY AND LIFE PROCESSES

The Regeneration Group, a leading regenerative development group consisting of educators in the fields of permaculture and ecological design, describes ecology as the interdisciplinary scientific study of how living organisms interact with each other, with and within their surrounding in both the organic

and inorganic manner.⁷ Ecosystems as an interactive system of living things and their non-living habitat are found within ecology. The Regenes Group states that The Ecosystem concept is a coherent framework for redesigning our landscapes, buildings, cities, and systems of energy, water, food, manufacturing and waste" through "the effective adaptation to and integration with nature's processes." In simpler terms, the ecosystem has emerged to be simply as a concept that embodies the relationship between humanity and nature. Landscape architect and a member of Rossetti Architects, Kevin Stover, when interviewed, stated that embarking on a regenerative design requires the designer to study the existing ecosystem in order to achieve a successful design. Ghana has two main ecosystems namely, Rainforests and Savannahs which are sub divided into six agro ecological zones namely, Sudan Savannah, Guinea Savannah, Transitional Zone, Deciduous Forest, Coastal Savannah and Rain Forest.⁸

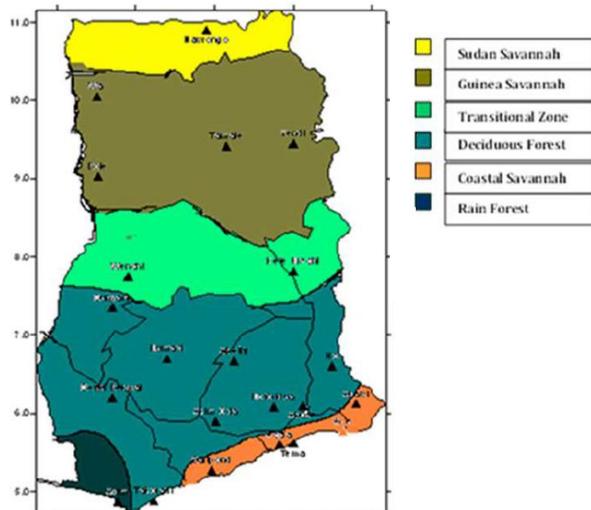


Figure 14. Agro ecological Zones in Ghana.

The Ecosystem reveals the interdependence (not overlooking "the hunt or be hunted situation" where organisms can be preys or predators) all living organism have with each other and the importance of understanding that cycle of natural processes that occur for this system to be balanced. Landscape

architect, Kate Orff gives us a great reference in her TedTalk titled "Reviving New York's rivers with Oysters (Oystertecture)". In this lecture, Orff gives an educative example of oysters and the Gowanus Canal in New York. The ability of Oysters to filter both dirty water and air, form eco reefs (bedrocks) for water bodies and not forgetting its tastiness as a meal (within favorable conditions) make them extremely important creatures (as all other creatures are). Rearing a group of oysters in the Gowanus Canal would not only help filter the water and provide food but would offer recreation to people (for example, scuba diving), employment opportunities (rearing and harvesting oysters) and a regenerating and sound ecosystem as the oysters will keep reproducing as and when they are ready to be eaten. A lesson could be learned from this regenerative life process and adopted within areas where appropriate.

REGENERATIVE/RESTORATIVE DESIGN

Regenerative Design is a system of technologies and strategies, based on an understanding of the inner working of ecosystems that generates designs to regenerate rather than deplete underlying life support systems and resources within socio-ecological wholes. Restorative Design, is a design system that combines returning "polluted, degraded or damaged sites back to a state of acceptable health through human intervention" with biophilic designs that reconnect people to nature.⁹

The fundamentals of regenerative landscape design include co-evolution of humans and nature, understanding place, what is unique about it and designing appropriately for the place. These require us to acknowledge our existence not as loners but within a bigger system which requires us to co-exist and co-evolve with the natural systems, by recognizing the unique attributes of a place in order to design appropriately.⁸

"Regeneration" looks to connect nature, people, and building. Undisturbed nature provides us the source of learning how natural

processes work, thus, we must refrain from (or at best replace them) destroying the untouched nature.

PERMACULTURE

When regeneration is mentioned, one thing that is associated with it is permaculture. Coined by Bill Mollison, an Australian biologist, author, scientist and researcher, Permaculture refers to the conscious design and maintenance of agriculturally productive ecosystems which have diversity, stability and resilience of natural ecosystems. It involves the harmonious integration of landscape and people providing their food, energy, shelter and other material and non-material needs in an all-round benefitting way for all life forms.

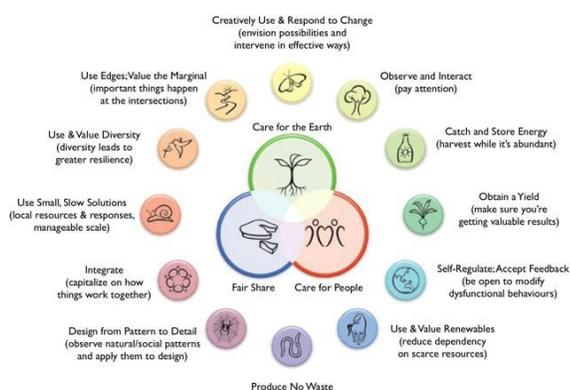


Figure 15. The 12 Principles of Permaculture.

As all these are aimed at achieving sustainable development, one distinction that can be made between, whereas the highest aim of sustainable development is to satisfy fundamental human needs today without compromising the possibility of future generations to satisfy theirs, the goal of regenerative design is to develop restorative systems that are dynamic and emergent, and are beneficial for humans and other species. This process revitalizes communities, human and natural resources, and for some, society as a whole. For example, Jay Womack, a Senior Landscape Architect and Ecological Designer at Huff and Huff Inc pointed out that, with the intention of attaining a sustainable design, a designer may opt to go for a traditional type of turf grass lawn which

although is a natural grass, requires a lot more maintenance, resources (water) and energy (the use of a mower to cut down grasses). Opting for a native grass type that strives within the location in question and may survive within the climate and soil type perfectly without extreme maintenance and resources works effectively. Here, the native landscape will be restored and resources (such as water and energy) can be conserved for other uses.



Figure 16. *Onoclea sensibilis* beneath *Itea virginiana* forms a rhizomous mat that reduces maintenance needs while providing coverage for nectar-loving insects. / image: Kelly Fleming

With reference to the plant species above, it would double as both a biodiversity enhancer to both humans and insects, and also serve as a regenerative plant considering it takes care of itself with little maintenance and less resources. This would be definitive if, of course, it is planted in its native setting. Conserving the biodiversity with the recognition that humans belong to the natural ecosystem is what a Regenerative design does.

BIOPHILIA.

The concept of biophilia can be traced to E.O Wilson a biologist who deduced that humans have an inborn desire to know nature and its processes. This concept, when introduced by Wilson, appeared to be a hypothesis which needed more clarification. Wilson explained further that our need to connect with nature is not only linked to material aspects but to our emotional, aesthetics and spiritual lives as well. So when we decide to embrace or take away parts of nature, it is because of that

established connection. Over the years, the concept of biophilia has been communicated by professionals such as Professor Stephen Kellert who had been with Wilson from the inception of the concept. Kellert helps us understand that biophilia in its simplest form focuses on the contributions of nature and its processes for the betterment of human wellbeing and survival. ⁴ According to Kellert, the conditions necessary for a biophilic design include the following.

Firstly, we need to place emphasis on the exposure and embracing of humans to nature. Any incorporation of natural settings which is not beneficial to the human wellbeing is not considered the biophilic design.

Secondly, we need to constantly engage with nature, as isolated connections prevent us from achieving the full benefits and hinder us from realizing the need for nature. There is also a need to integrate and enforce a holistic design of place and setting. Disconnected natural elements within spaces do not qualify as biophilic design.

Fostering an emotional connection to place attributes as biophilic design. When people are connected to their workplaces or homes encouraging their comfort and productivity, it pushes us to inhabit, maintain and protect the space. Lastly, we as humans need to rekindle the relationship with each other. When a design is able to do that, biophilic design is achieved. ⁴

About 90% of the subjects interviewed did not have any idea of the terms biophilia or regenerative landscape design. However, when asked how they felt within spaces with nature versus places void of nature, they expressed their comfort, relaxation, peace, enthusiasm and interesting outlook for places with nature and the feeling of stress and discomfort within places void of nature. Unconsciously, we all yearn to have natural elements around us, which confirms the biophilia concept of E.O Wilson. Even though our modern lifestyle has not fully encouraged biophilia, I believe we are recognizing the facts and are ready to embrace

biophilia as a way to satisfy that inborn desire we have to connect with nature.

Table 1. The connection between Regenerative Landscape design and Biophilia.

Regenerative Landscape Design	Biophilia
Co-evolution with natural systems	Constant interaction with nature and natural systems. Fostering the relationship between humans.
Knowledge and study of a place's unique attributes.	Integration and enforcement of holistic design of place and setting
Design harmoniously and appropriately to place.	Fostering an emotional connection to place

Source: Author's Construct.

Figure 17 below shows a constructed diagram map of the benefits of Biophilia and Regenerative Landscape Design by the author.

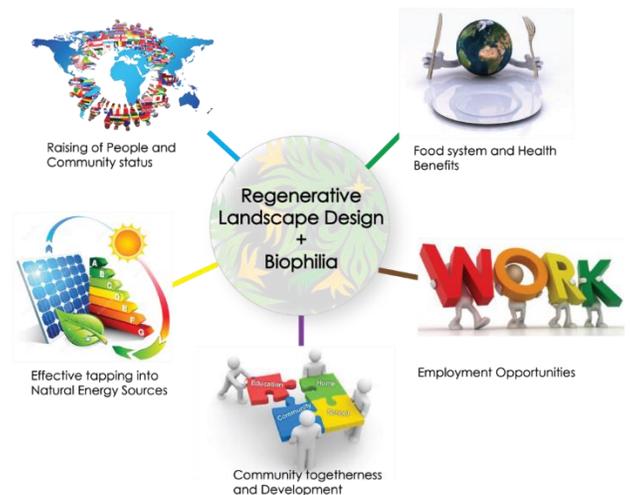


Image source: Author's Construct.

URBAN GREEN SPACES (UGS).

The World Health Organization (WHO) also considers UGS as a space within the urban setting that is covered by any kind of vegetation. This includes smaller green space features such as street trees and roadside vegetation, green spaces not accessible to the public such as green roofs and facades and lastly, larger green spaces that facilitate social and recreational functions such as parks, playgrounds and greenways. Some of these larger green space structures (such as green belts, green corridors or urban woodlands) can actually have regional scope and provide ecological, social and recreational services to various urban communities. Attributes of UGS that might stimulate and encourage use include walking/cycling paths, wooded areas, open spaces, water features, lighting, pleasant views, bike racks, parking lots, and playgrounds. ¹²

PLANNING STANDARDS FOR UGS (OPEN SPACES) FOR KUMASI (GHANA)

Although The WHO considers green spaces and open spaces as two different landscapes, The Ministry of Environment Science and Technology Town and Country Planning Department, Ghana, in their latest edition of the zoning guidelines and Planning Standards, considers green spaces as part of open spaces. Under Recreation, two categories are identified; Active and Passive Recreation. Active Recreational facilities include sports facilities for indoor games and field sports while Passive Recreation embodies public open spaces for parks, gardens; children's playground and durbar Ground. ¹³ Tables 2 and 3 below show details on active and passive recreation planning.

Table 2. Active Recreation – Local sports field

Population to be served	Up to 5,000 people
Site size	0.5 ha per 1000 persons with minimum total area 2.0 – 2.5 ha.
Minimum facilities	Football field, tennis, volleyball and netball courts and a parking space for at least 10 cars.
Location	Within good access to public transport
Minimum Services	Water

Table 3. A - Public Open Space

Population to be served	Minimum of 2,500 people at 0.5 ha per 1000 people or not less than 10% of development area.
Site facilities	0.5 ha per 1000 persons with minimum total area 2.0 – 2.5 ha.
Minimum facilities	Adequate number of public seats strategically placed.
Location	Equally distributed over settlement area.

B – Durbar Grounds

Population to be served	Up to 35,000
Site facilities	From 0.2 ha to 1.0 ha
Minimum facilities	Adequate number of public seats strategically placed.
Location	Within settlement center with good access to public transportation. It could be part of a public open space.

Tables' Source: The Ministry of Environment Science and Technology Town and Country Planning Department, Ghana.

CHALLENGES TO UGS'S

There is sure to be challenges with UGS designing where urban space is limited. There are three main challenges to UGS.

Firstly, where UGS has been overlooked, it may be at greater risk of being developed rather than refurbished. Environmental decay can negatively affect residents' sense of security and increase perceptions of crime. Secondly, resource constraints and reductions in public spending will affect the development of UGS as there are other public services which may require attention and resources. The cost of maintaining UGS raises concerns for the government, developers and the community. It is difficult to make the case for allocating scarce public resources on UGS especially in the situation where the community may not see its benefits. Lastly, UGS initiatives to make more deprived neighborhoods healthier and more attractive can drive up property values and displace local residents.¹²

BENEFITS OF UGS

Individuals such as Frederick Law Olmsted and Jen Jenson saw the need to bring back nature into the lives of people. Aside aesthetic values, there are various benefits that can be gained from UGS. These present themselves in three ways, Environmental benefits, Social benefits and Economic benefits.

Environmental Benefits: Urban green areas enhance urban communities with ecosystem services ranging from maintenance of biodiversity to the regulation of urban climate. Plants improve air circulation, provide shade and increase the rate of evaporation. This provides a cooling effect and help to lower air temperatures. A study in Chicago has shown that increasing tree cover in the urban community by 10% may reduce urban heat islands Research has also shown that averagely, green spaces help filter the air of all pollution by 85%. UGS serve as protection centers for reproduction of species and conservation of plants, soil and water quality. A working network of green areas is important

for the maintenance of ecological aspects of the urban landscape, especially when native plant species adapted to the local condition with low maintenance are used.

Social Benefits: The connection between people and green areas is important for everyday productivity and general mental health. A recent study shows that over 80% of UK's population lives in urban areas, and thus green areas within urban areas provide a sustainable proportion of the total outdoor leisure opportunities. In a psychological review, patients in a hospital whose rooms were facing green areas had a 10% faster recovery and needed 50% less strong pain relieving medication as compared to patients without views to nature or outdoors. Urban green areas may also influence social capital by providing a meeting place for users to develop and maintain neighborhood social ties. This interaction enhances the personal and social communication skills of users. The presence of green vegetation and the formation of neighborhood socialization significantly contribute to residents' sense of safety and belongingness. Understanding, therefore, the relationship between the residents' recreational needs and their community urban green areas helps to achieve successful and sustainable landscape designs. The status of the community and the country as a whole is significantly raised with the development of successful green spaces.

Economic Benefits: According to land developers, property values and financial returns are heightened by a percentage increase between 5% and 15% with the successful integration of green spaces within communities. References can be made to Singapore, Thailand and Malaysia, in that, their beautification through natural landscape (green space) development was a major factor that attracted and still attracts significant foreign investments that assisted in their rapid economic growth. UGS also offers employment opportunities to the people of the community right from construction through maintenance and sustenance.¹³

CASE STUDIES

In order to gain insight, and tangible information regarding projects that address regenerative landscape design the following case studies are analyzed. These include The Ghana Permaculture Institute, The Buttercrunch Farms in Colorado, The Paley Park in New York and The Mannheim Multihalle in Germany.

Restorative, Regenerative and Natural Process

The Ghana Permaculture Institute.



Figure 18. Aerial View of the Institute in 2004

Process of Restoring the Landscape



Rice Chaff, Moringa and Pigeon Peas respectively.



Figure 19. Aerial View of the Institute in 2010.

The Ghana Permaculture Institute located in Techiman, Ghana began in 2004 on a degraded and abandoned land. In order to restore the

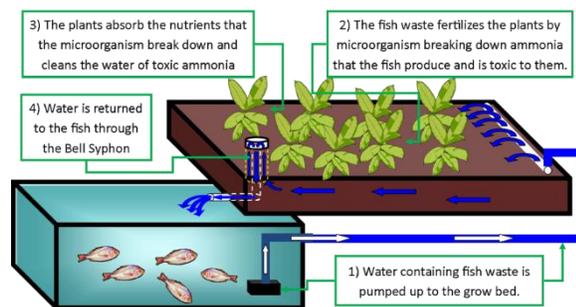
nutrients of the land, saw dust was spread over the land for a year to about a foot high. Within that period, pigeon peas and moringa were planted to help with the nutrient restoration process. The saw dust used here shows that there is nothing as waste and that everything can be reused for a beneficial outcome. As I am looking to restore the abandoned Children’s Park, it is a good study for me to go by.

Another plant that was grown is the Oyster Mushroom. Not only is it good for food but it also serves other benefits such as bioremediation (i.e. the use of lifeforms to break down pollution), saprotrophicism (i.e. the ability to grow and feed on dead material) as well as health benefits by having the ability to slow down cancer spread and reduce cholesterol. This is another species that will do well in the regenerative process.



Figure 20. The Oyster Mushroom

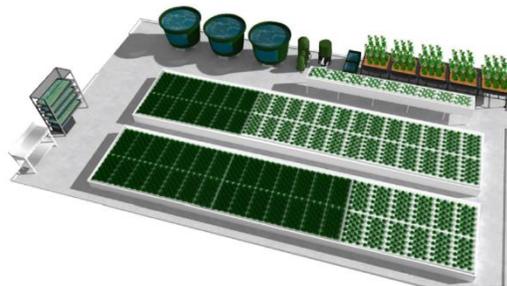
Aquaponics: Aquaponics is the integration of recirculating aquaculture and hydroponics in one production system.



The ButterCrunch Farms, Eagle – Colorado



ButterCrunch farms was built in the fall of 2016 and is located on private property in Eagle, CO. The farm serves restaurants and markets in the Vail Valley region with high quality greens, microgreens and herbs along with Tilapia.



Farm Features

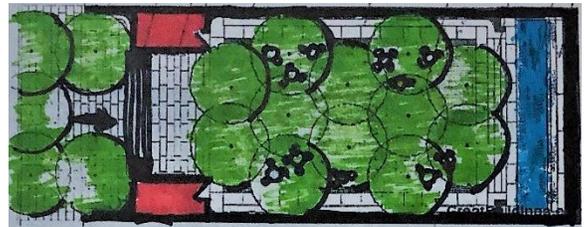
- Mid-sized farm system.
- The Flourish 30 x 52' Aquaponics Farm
- 40' x 80' greenhouse dedicated.
- A separate 30' x 30' barn which holds the fish tanks.
- There are three 8' x 62' deep water culture troughs.
- There are four 500 gallon tanks with a three stage filtration system.
- Crops grown include tomatoes, eggplants and peppers.

Paley Park – New York



- Location: Manhattan, New York.
- Size: 4,200 sq ft.
- Uses: Lunch, Meetings, Relaxing

There appears not to be a healthy amount of greenery around the park. It is surrounded by hard surfaces and structures. The Paley Park seems to break that pattern and provide some greenery for the workers and visitors around.



Plan View of Park.

Biophilic elements: Presence of Water, Thermal & Airflow Variability Dynamic and Diffuse Light



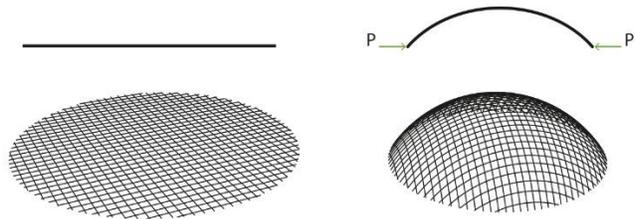
- Waterfall which generates cool breeze through the park. It promotes airflow and serene atmosphere in the park.
- Flexible seating for the comfort of individual users.
- Dynamic light penetration through honey locust trees.

Structure

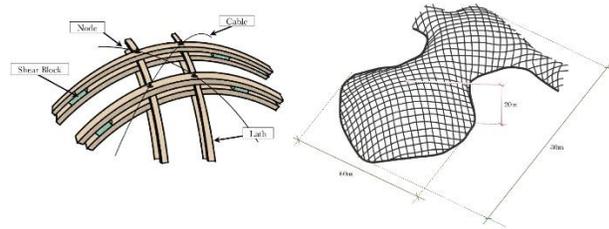
Mannheim Multihalle - Germany



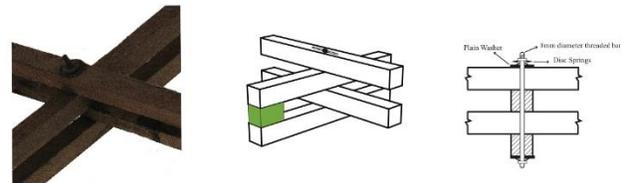
The form finding process of the Mannheim Pavilion involved a hanging chain model. This method allowed architects to develop architectural spaces that fit any plan giving a "sensible structure" Frei Otto had already used this technique to derive his first timber grid shell in Deubau by suspending threads loaded with nails, and he refined his technique by using a chain and its self-weight for the Mannheim design. The design of the Mannheim Pavilion involved a computer generated mathematical model as well as the physical one, which in the end yielded very similar results to what they had found in the hanging chain model. The computer model was an idealization, and to some extent a simplification, of the actual model due to its complex four-layer grid and unique construction process involving scaffolding to manually erect the shell from below. The idealized model represented the shell using fewer members and made assumptions about joint flexibility.



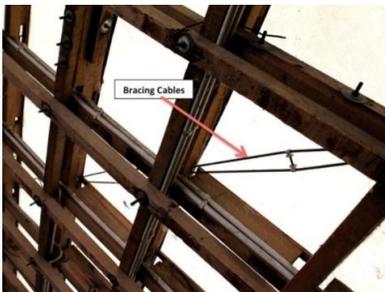
From flat to curved: the forces along the boundary cause the wooden laths to bend into a curved shape



Multihalle Dimensions



Joint System



Views of 4 layered grid shell with bracing and Grid shell supports with concrete and posts.

Conclusion: Whiles some initiatives such as the "Garden City Model" have been proposed by developers, no actions have been made towards improving the greeneries in Kumasi. Both the public and the government need to be educated and reminded of the importance of bringing back nature not only for its unarguable benefits, but also because we belong to a larger system and we need nature to function as designed. All the information

acquired and results gained from discussions of the cases, interviews, and literature, were analyzed and combined to come out with a befitting design that regenerates the natural green landscapes within the city of Kumasi thus helping to improve the connections humans have with nature., This research may also serve as a reference for upcoming green space designs in both the selected country and outside of it.

NOTES

- 1 "Amazon Rainforest", *Wwf.Panda.Org*. 2019
http://wwf.panda.org/knowledge_hub/where_we_work/amazon/about_the_amazon/ecosystems_amazon/rainforests/.
- 2 Jasmine Arku , "Kumasi: The Garden City without Gardens?", Graphic Online, 2013. <https://www.graphic.com.gh/features/features/kumasi-the-garden-city-without-gardens.html>.
- 3 The Story of Two British Campaigns in Africa - Naval & Military Press[publisher=|accessdate=28 October 2016}
- 4 Stephen Kellert, <https://www.metropolismaq.com/architecture/what-is-and-is-not-biophilic-design/>, 2015
- 5 "14 Patterns of Biophilic Design", *Terrapinbrightgreen.Com*, 2014, Accessed March 7, 2019. <https://www.terrapinbrightgreen.com/reports/14-patterns/>.
- 6 Edith Nkwocha, "What Is Regenerative Landscape Design- Steps To Take - Heal Estate". *Heal Estate*, 2017, Accessed March 30 2019, <https://healestate.com/regenerative-landscape-design-steps-take/>
- 7 Wikipedia contributors, "Regenerative design," Wikipedia, The Free Encyclopedia, https://en.wikipedia.org/w/index.php?title=Regenerative_design&oldid=892930804 (accessed April 23, 2019).
- 8 Haggard Ben.and Pamela Mang, *Regenerative Development and Design*, 2016.
- 9 Anne Baeyens, Kumasi, Ghana. *Critical Study of an African Urban Structure*. 2012, EBook. <https://lib.ugent.be/catalog/rug01:001887157>.
- 10 Helena, Farrell, "Understanding The Concept of Regenerative Landscape Design: An Interview With Helena Farrell And Sebastian Gutwein Of Regenerative Design Group LLC". *Massrealty.Com*. 2015. <http://www.massrealty.com/articles/understanding-the-concept-of-regenerative-landscape-design>.
- 11 "Urban Green Space Interventions and Health: A Review of Impacts and Effectiveness. Full Report (2017)", 2019, Euro.Who.Int. <http://www.euro.who.int/en/health-topics/environment-and-health/urban-health/publications/2017/urban-green-space-interventions-and-health-a-review-of-impacts-and-effectiveness.-full-report-2017>.
- 12 Ministry Of Environment Science and Technology Town and Country Planning Department, "Zoning Guidelines and Planning Standards", Accra, 2011.
- 13 Ebtesam Elgizawy, the Significance of Urban Green Areas for the Sustainable Community, 2014.

All interviews conducted by the author, Winfrey Nyarko, have been approved by Miami University IRB. Winfrey Nyarko, CITI Certificate number: 30904323

BIBLIOGRAPHY

1. "14 Patterns of Biophilic Design". 2014. *Terrapinbrightgreen.Com*. Accessed March 7, 2019. <https://www.terrapinbrightgreen.com/reports/14-patterns/>.
2. Arku, Jasmine. "Kumasi: The Garden City without Gardens?" *Graphic Online*. 2013. <https://www.graphic.com.gh/features/features/kumasi-the-garden-city-without-gardens.html>.
3. "Amazon Rainforest". 2019. *Wwf.Panda.Org*. http://wwf.panda.org/knowledge_hub/where_we_work/amazon/about_the_amazon/ecosystems_amazon/rainforest/s/.
4. Baeyens, Anne. *Kumasi, Ghana. Critical Study of An African Urban Structure*. 2012. Ebook. <https://lib.ugent.be/catalog/rug01:001887157>.
5. Ben Haggard and Mang Pamela. *Regenerative Development and Design*. 2016
6. Dias, Bruno. "Beyond sustainability-- biophilic and regenerative design in architecture". 2015. *European Scientific Journal*. 11: S147.
7. Elgizawy, Ebtessam. "The Significance of Urban Green Areas for the Sustainable Community". 2014
8. Farrell, Helena. "Understanding The Concept Of Regenerative Landscape Design: An Interview With Helena Farrell And Sebastian Gutwein Of Regenerative Design Group LLC". *Massrealty.Com*. 2015. <http://www.massrealty.com/articles/understanding-the-concept-of-regenerative-landscape-design>.
9. J. Mark Souther, "Public Square," *Cleveland Historical*, accessed May 16, 2019,
10. Kellert, Stephen. 2015. <https://www.metropolismag.com/architecture/what-is-and-is-not-biophilic-design/>.
11. Kellert, Stephen. *Nature by Design, The Practice Of Biophilic Design*. 2018. Yale University Press.
12. Kellert, Stephen R, and Edward O Wilson. 1993. *The Biophilia Hypothesis*. Washington, DC: Island Press.
13. Koranteng, A. *The study of the Land Use/covers of Kumasi and its environs using Landsat images*. 2007
14. "Land Use, Land Cover, and Trends in Ghana | West Africa". 2019. *Eros.Usgs.Gov*. <https://eros.usgs.gov/westafrika/land-cover/land-use-land-cover-and-trends-ghana>.
15. Mensah, Collins Adjei. "Urban Green Spaces in Africa: Nature and Challenges". *International Journal of Ecosystem*. 2014. doi:10.5923/j.ije.20140401.01.
16. Mensah, Collins Adjei. 2014. "Is Kumasi Still A Garden City? Land Use Analysis between 1980-2010". *Journal of Environment And Ecology* 5 (2): 89. doi:10.5296/jee.v5i2.5968.
17. Ministry Of Environment Science and Technology Town and Country Planning Department. 2011. "Zoning Guidelines and Planning Standards". Accra.
18. Nkwocha, Edith. "What Is Regenerative Landscape Design- Steps To Take - Heal Estate". *Heal Estate*. 2017. <https://healestate.com/regenerative-landscape-design-steps-take/>.
19. "The Deforestation of the Upper Guinean Forest | West Africa". 2019. *Eros.Usgs.Gov*. <https://eros.usgs.gov/westafrika/land-cover/deforestation-upper-guinean-forest>.
20. The Story of Two British Campaigns in Africa - Naval & Military Press|publisher=|accessdate=28 October 2016}

-
21. Trends in Ghana | West Africa "Land Use, Land Cover, And Trends In Ghana | West Africa". 2019. *Eros.Usgs.Gov*. Accessed March 31, 2019. <https://eros.usgs.gov/westafrica/land-cover/land-use-land-cover-and-trends-ghana>.
 22. "Urban Green Space Interventions and Health: A Review Of Impacts And Effectiveness. Full Report (2017)". 2019. Euro.Who.Int. <http://www.euro.who.int/en/health-topics/environment-and-health/urban-health/publications/2017/urban-green-space-interventions-and-health-a-review-of-impacts-and-effectiveness.-full-report-2017>.
 23. <https://vimeo.com/ondehumand/biophilicdesign>
 24. https://www.ted.com/talks/kate_orff_oysters_as_architecture?language=en Wikipedia contributors, "Regenerative design," Wikipedia, The Free Encyclopedia, https://en.wikipedia.org/w/index.php?title=Regenerative_design&oldid=892930804 (accessed April 23, 2019).

Thesis Addendum

WINFREY NYARKO

Miami University

Written Thesis to Design Approach.

It is pretty obvious the alarming rate that our natural landscape is being replaced by hard surfaces and structures. The effects although may not be apparent on first thought include global warming, rise in sea levels, among others. Kumasi, "the Garden City", has seen its share of nature loss affecting mostly urban parks and public green spaces. Looking to reconnect humans back to nature, I became keen on reviving one of the abandoned parks in Kumasi. The Kumasi Children's Park, one of the five recreational parks set up in the 19th century to serve the community of Amakom has been abandoned for over a decade now. Focusing on regenerative landscape design and biophilia, I hoped to be able to see the connections between these two concepts and how their principles could be employed into renewing and regenerating the Children's park. As regeneration looks to connect nature, people, and building by putting in place system of technologies and strategies, based on an understanding of the inner working of ecosystems causing resources to renew, and biophilia looks to solve the innate desires of humans to interact by adopting all things nature, with natural elements such as plants, water, natural materials and nature-inspired shapes the relationship between these two concepts is undeniably strong and similar.

Site Selection

Before settling on the Children's Park, there were two other parks considered for the restoration. The focus as stated earlier was on abandoned parks, thus, all the sites considered were abandoned parks. The summer of 2019 saw me do a lot of site analysis and comparison between these three sites and the

strengths and opportunities of the Children's Park outweighed the other two. Right from the numerous activities within the Amakom community, to its easy accessibility being bounded by two roads to its soil potential to host a lot of native plants, the uneven contoured topography that was both challenging and interesting as it offered more opportunities for different experiences, among many other cons, the Children's park seemed ideal.

Concept

The fall semester began the design concept period with the chosen site in mind. My main aim was to design an urban Park that not only bridges the gap between humans and nature but also broadcasts the Ashanti culture symbolically and gives Kumasi an identity. A series of ideas were explored and as we were into our second review, there was encouragement from the committee to come up with a definite organization principle as I had so many different ideas going on. With an intention to portray the Ashanti culture through this park, I decided to use the "Adinkra" Symbols as my organization principle. These symbols are aphorisms that have great meanings behind them. Majorly used on fabrics, buildings and handicrafts as decorations but also to show our identity as Ashantis. There are over fifty symbols but I settled on six of them which had meanings connected to restoration, harmonious living and regeneration. Going through a number of initial ideas, I thought of the symbols mostly in plan views and used them literally and in the same shape as they are. Feedback from my committee made me understand that there were different ways I could use these symbols without them being so literal. This pushed me to tie these symbols to the design I wanted to achieve.

Final Design and Presentation

The final semester of the design was truly a rollercoaster trying to define all pragmatic needs and settling on a befitting design that

answers the thesis questions and concept ideas already detailed above. The summer of 2019 also involved some interviews with the people to find out what they wanted in a park of which I took into consideration coming up with programming. The programs proposed included an Administration, consisting of an open floor office space with a receptionist desk, a waiting area, a lounge, a kitchenette and some washrooms for both the staff and the general public, an arts display space to showcase the art crafts of artists, an indoor and outdoor event space to host different activities organized by the community, an educational area to help teach students in the schools nearby the fundamentals of permaculture and aquaponics, an observatory tower with a café for bird viewing and relaxation, a parking space and drop off zones for private and public transport with the rest being a forest reserve and formal gardens for picnicking, relaxation and pure enjoyment of nature. In terms of design values, the park design needed to have connectivity to the community and within the park itself, promote harmonious interaction and co-existence between humans and nature, and humans and humans, weaving patterns to help with the interplay of light within spaces, fluidity and lastly, flexibility with spatial arrangements.

A grid shell structure was adopted for the administration and art display spaces to have a lightweight structure that would be light on the ground and use natural wooden materials from trees that would be cut down and ones from nearby; and also to bring in light at different angles at different times of the day for an all-out experience. The educational area was made informal with three pavilions, which may serve as seating areas for people when they are not being used for learning purposes, overlooking the aquaponics room and beyond. The indoor event space is a submerged space bounded by the art display space with its roof serving as a roof garden and a water collection fountain from rain water that drains off the roof of the grid shell structure. The observatory tower was inspired by the history of Kumasi having developed from the "Kum"

tree thus looks like a tree with a nest like object on its top to attract birds and give off light at night. Leaf like patterns were used on the floor to achieve the weaving affect as well. The outdoor event space was covered by hexagonal tree like solar infused panels with LED lights to also give off light at night. This will save some solar energy enough to power the park.

Ponds that serve as reservoirs and fountains were used to collect water upstream and bioswales were created downstream at appropriate places to help deal with drainage. Most of the vegetation on site were not cut down and newer, native plants ranging from those that provide shade, those that fix nitrogen, those that attract birds and butterflies to those that have vibrancy and are sweet scented were planted at eroded places. Vendors who sold their products at the boundaries of the park were provided spots within the park to help promote their business and also serve as revenue for the park.

As unprecedented these times have been, the final presentation was an unconventional one. Due to schools being closed down, all learning activities moved to homes, online. The final presentation was held online as well, a first at that, and although it was unconventional, it was a whole new experience for all of us. The slides of my process down to the final design drawings and renderings coupled with a video walk through of the proposed site received overwhelming feedback I honestly did not expect. The criticisms I had were how I could reduce the scale of the outdoor event space tree like coverage, and also how I could deal better with the residents that were right on the eastern boundary of the site. The security entrance developed raised mixed reviews as one half the jurors liked its organic shape and the other half felt it was going against the flexibility concept as it may be serving as a barrier for people to use the facility. All in all, the proposed park was well received.

Conclusion

"Study nature, love nature, stay close to nature. It will never fail you." Frank Lloyd Wright. I push for bringing back nature into our lives. Whether that is done through landscape, lifestyle, art or the combination of all the above. I push for the ecological value and quality of landscaping. I am all for landscape construction as far as the right plants and animals are put in place to allow natural processes to work their magic. Over manipulating and eliminating landscape and nature is what I speak against. That includes abandonment, deforestation and all other activities that be littles nature. Recognizing ourselves as part of nature is what will make us realize not to harm "her". This park is intended to remind the people of Kumasi that. T h Garden City needs to return to the Garden City for all our survival. The Akan Adinkra symbol, "obi nka bi" which means no fighting each other makes a solid statement. If we are nature, we would not harm nature. "Assase y3 Duru" Mother Earth (Nature) is divine.

DESIGN PROCESS

Urban Green Space Rejuvenation

The Use of Regenerative Landscape Design Through Biophilia to Connect Humans Back to Nature

The Garden City



The City without Gardens

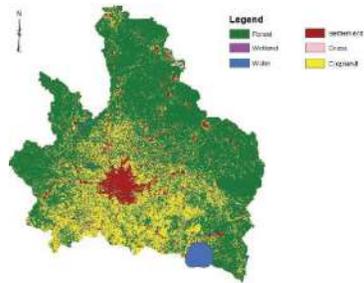
Introduction

Background

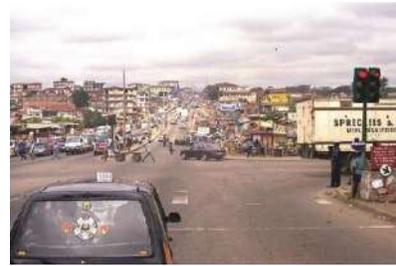
Kumasi, the capital city of the Ashanti Region in Ghana is the focus of this research. The Garden City as it is popularly known had an abundance of natural vegetation hence its name. During the colonial era, the colonial masters found the potential and necessity in establishing parks to bring people closer to nature while encouraging leisure and recreation. Over the years, these green areas have been taken over by hard structure and surfaces thereby taking a part of our intended nature away.



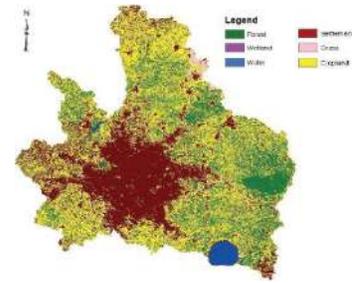
The Garden City (Kumasi) in the 1960's



Land use map of Kumasi for 1985



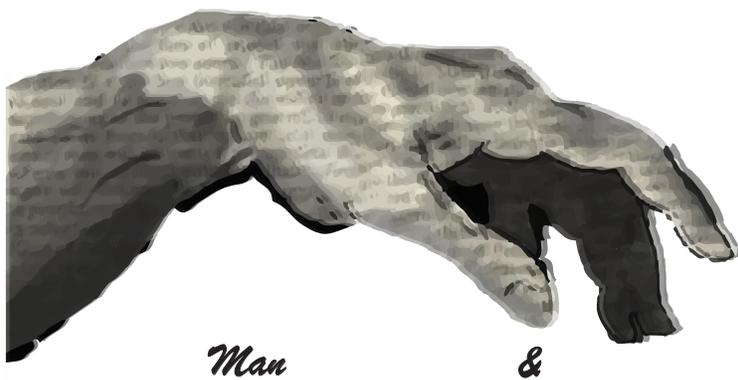
Current image of Downtown Kumasi.



Land use map of Kumasi for 2016

Thesis Statement

The massive loss of nature through the activities of man has caused a disconnect in the relationship between humans and nature. Restoring the lost landscapes and incorporating biophilia can help rekindle that connection.



&

Thesis Questions

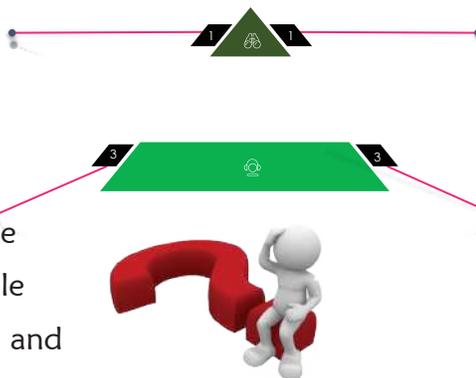
What is the connection between Regenerative Landscape Design and Biophilia?

How can Regenerative Landscape Design and Biophilia help rekindle the connection between humans and nature?

Research Objectives

To find out how Regenerative Landscape Design and Biophilia are connected.

To investigate the importance of regenerating our natural landscapes while incorporating biophilia to help reconnect humans and nature.



Introduction

Regenerative
Design

Biophilia

Culture



=

Urban Park that combines biophilia and aspects of culture as well as community interaction to help bring can help bring a community together and strengthen its identity.

Target Group



People from the community and beyond

Location



World Map



Map of Ghana locating Kumasi



Map of Kumasi

Region: Ashanti

Population: 1,468,609

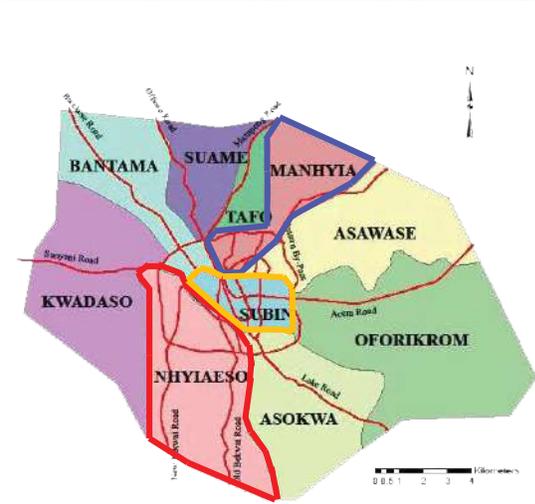
Elevation: 270 m over sea level

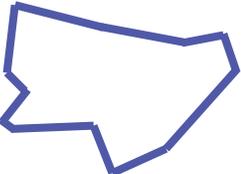
Time Zone: GHST

Longitude: -1.624430

Latitude: 6.688480

Proposed Sites



 Site 1	 Site 2	 Site 3
Rattray Park, Nhyiaeso Existing Park Not in good condition due to low maintenance culture Within the Nhyiaeso Sub Metro	Kumasi Children's Park, Amakom Abandoned Park Government Property. Found within the Subin Sub Metro	Manhyia Park, Manhyia Non existent park Cultural history Found in the Manhyia Sub Metro

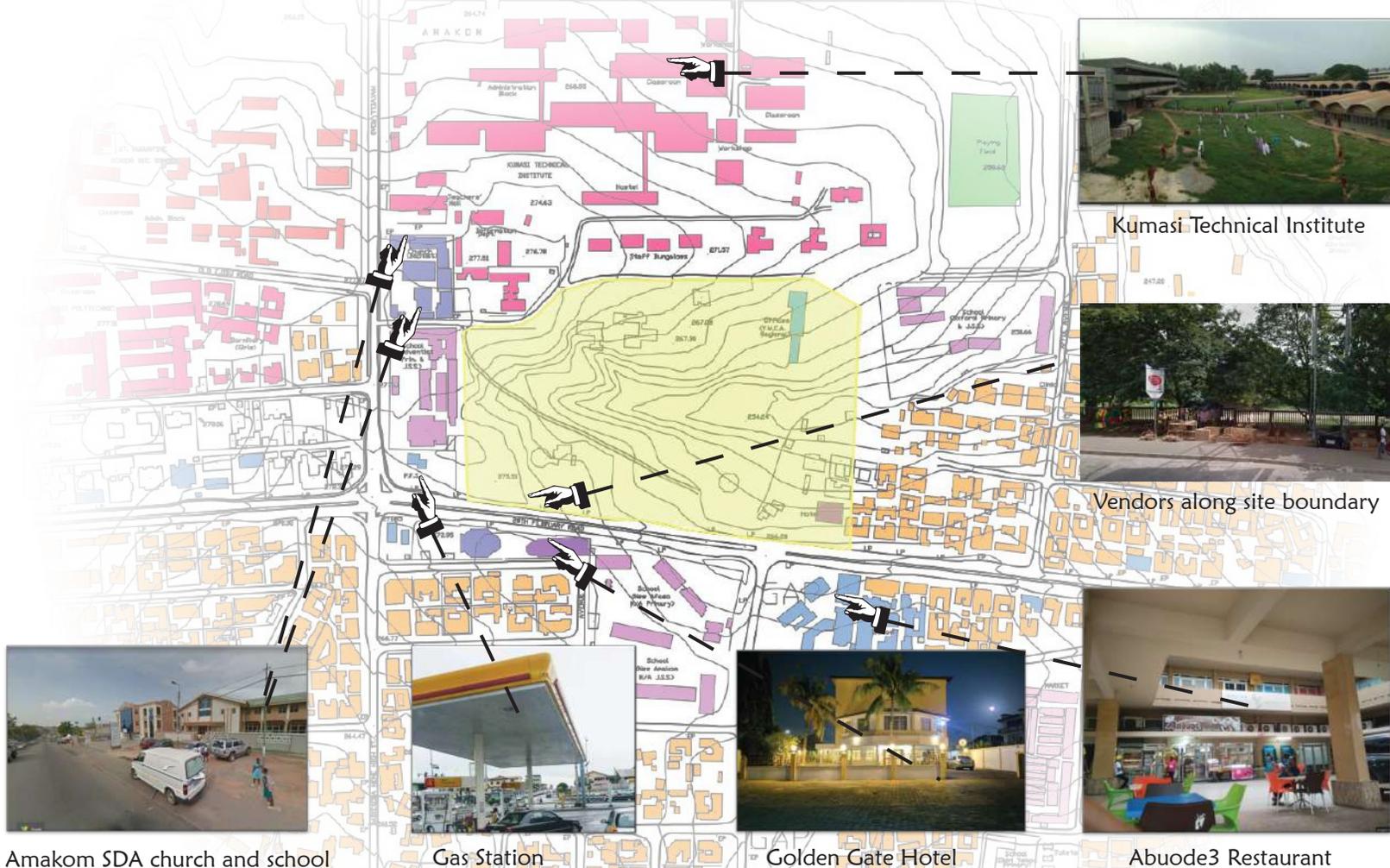
Site Selection

Selected Site - Kumasi Children's Park. Amakom-Kumasi

Owner: Otumfo) Foundation Status: Abandoned Park

Status: Abandoned Park Size: 16 Acres

Site Context



Land Use Map

Legend ■ Residential ■ Educational ■ Commercial ■ Religious ■ Market

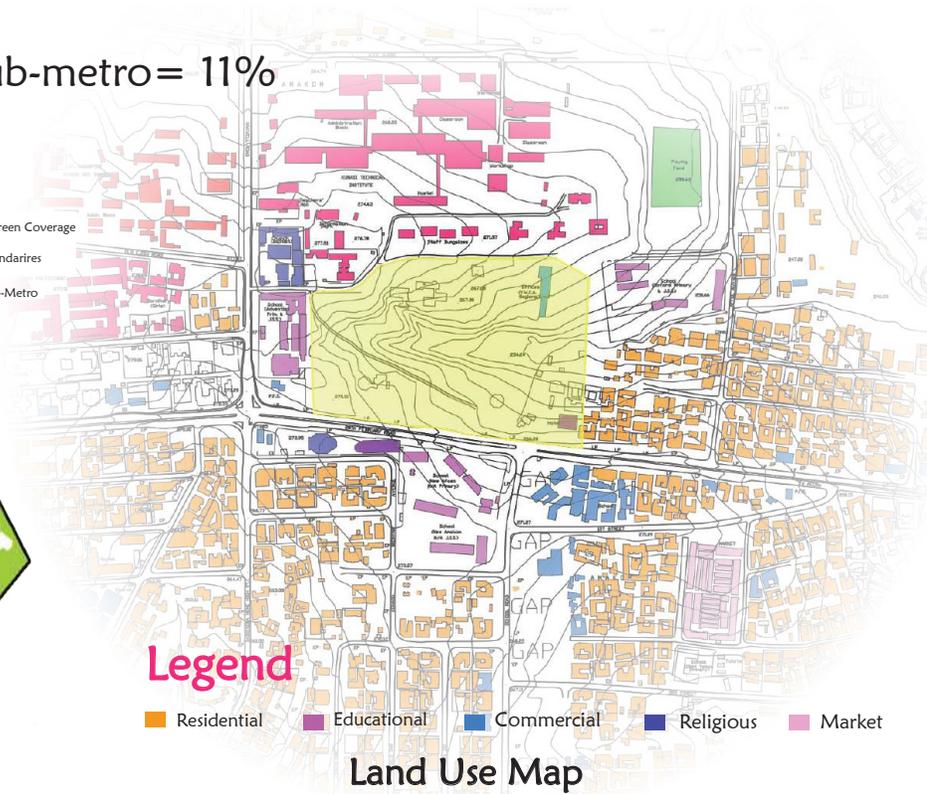
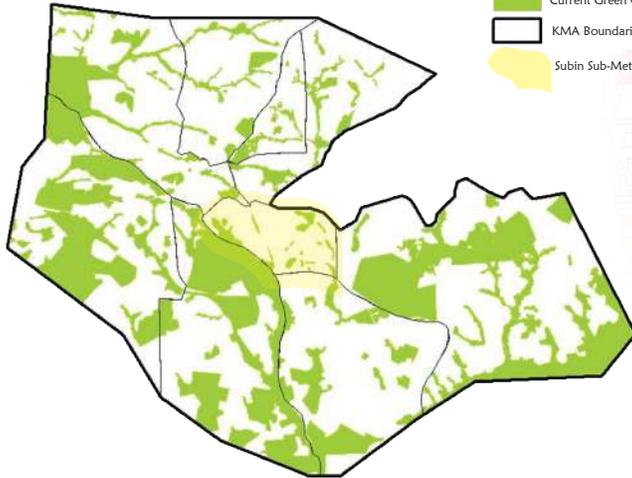
Neighbourhood Character

The Kumasi Children's Park located at Amakom is surrounded by different activities such as commercial, residential, educational, and religious. There are about three schools right at the boundaries of the site with some residents encroached on the site. The area could be categorized as a very busy one especially during the late afternoons when schools close and workers get off work. Night life is also prominent as there are quite a number of restaurants and pubs around for people to relax after work. The markets close to the site fall under the commercial. There are constant traditional ceremonies such as funerals and weddings that go on during weekends. There is a concern about safety as the main highway (Accra-Kumasi Road) bounds the Southern side of the site. That is also an advantage as it allows for easy recognition and access for both residents and visitors of the site. The town is truly a vibrant one.

Site Narrative

Current Vegetation cover of Subin Sub-metro = 11%

Current Green Coverage



Demographic Characteristics of Amakom



Activity Based Needs

Schools

1. High Schools
2. Elementary/Middle Schs.
3. Polytechnic
4. Technical Institute

Needs:

- Educational areas - Permaculture education and
- Seating areas for studying and relaxing

Workers

1. Teachers
2. Shop attenders
3. Fuel station Attendants
4. Bank Tellers

Needs:

- Shaded areas for eating lunch
- Seating and realxing areas for stress relief after work.
- Meditation areas

Markets

1. Upholstery sellers
2. Fugu Sellers
3. Basketry sellers
4. Produce sellers.

Needs:

- Sheds for sellers to operate under.
- Food crops for produce sellers.
- Plant species that may serve as raw materials.

Religion/Culture

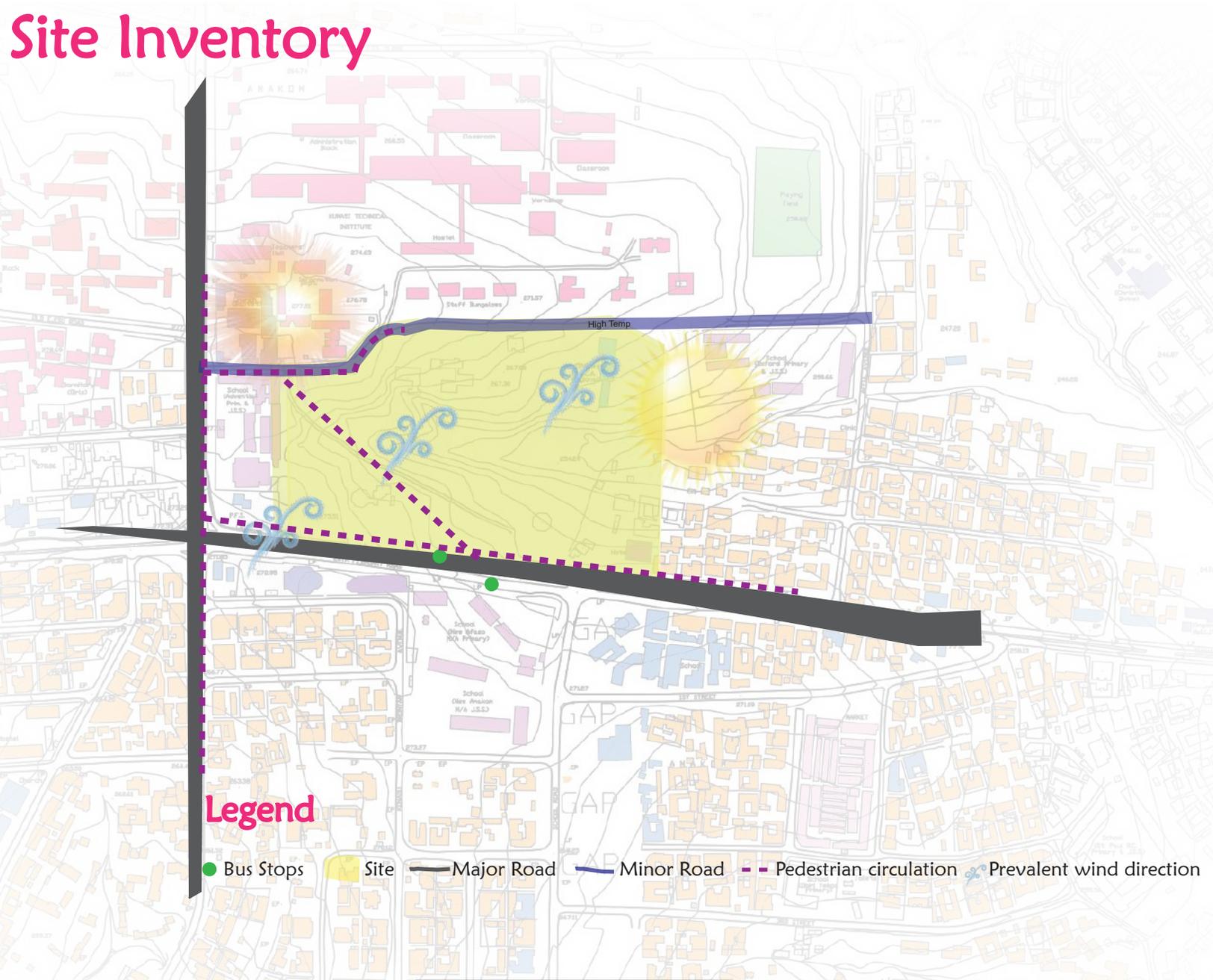
1. Churches
2. Funerals
3. Weddings

Needs:

- Multipurpose Open Spaces
- Pavilions to host such events.



Site Inventory



Legend

- Bus Stops
- Site
- Major Road
- Minor Road
- - - Pedestrian circulation
- ☼ Prevalent wind direction



Library



Eroded Green Areas



Existing Vegetation



Existing Pedestrian Entry

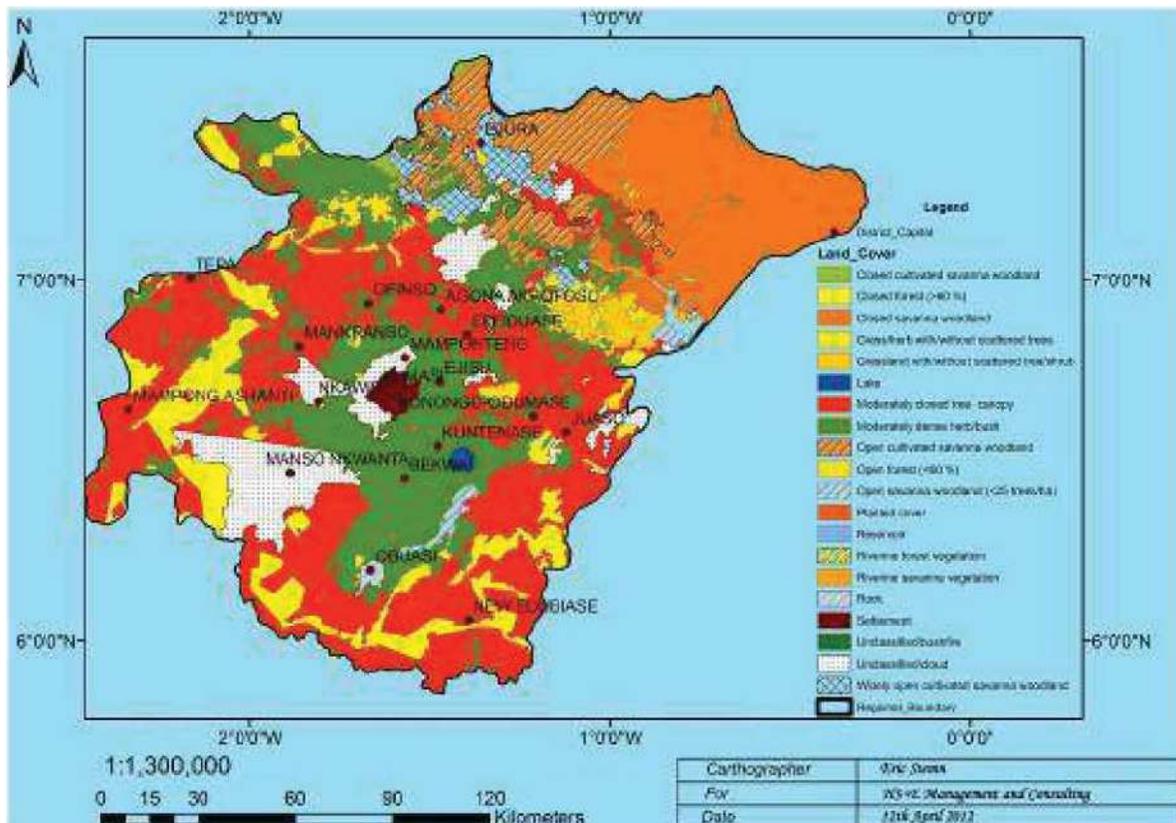


Washrooms



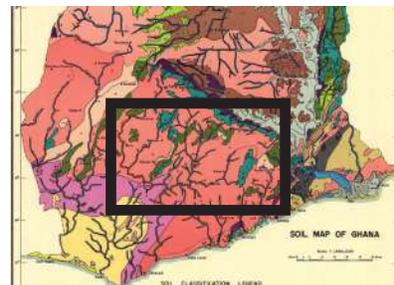
Pavilion

Site Analysis



Vegetation map of Kumasi

CHARTER'S (Brammer 1956, 1962)	USDA 7 Approx. (1960, 1967)	FRENCH SYSTEM (Aubert, 1965)	F.A.O. UNESCO LEGEND (1968, 1970)
1 Savannah Ochrosols	Oxisols, Eutrustox?	Sols ferrallitiques faiblement désaturés?	Eutric Nitisol
2 Savannah Ochrosols - Groundwater Laterites	Oxisols - Inceptisols	Sols ferrugineux tropicaux indurés sur cuirasse de nappes	Eutric Nitisol - plinthis Ferralisol
3 Groundwater Laterites (Petrosoils, Obeng 1970)	Inceptisols	Sols ferrugineux tropicaux lessivés indurés ou Sols hydromorphes à cuirasse de nappes	Plinthis Ferralisol?
4 Savannah Lithosols	Entisols (ustents, Lithic)	Lithosols et lithiques	Lithosols
5 Savannah Gleysols	Entisols (ustents)	Sols hydromorphes peu humifères à gley peu profond	Dystric Gleysols
6 Savannah Gleysols - Tropical Block Clays	Entisols - Vertisols	Sols à gley - Vertisols	Gleysols - Vertisols
7 Savannah Gleysols - Alluviosols	Entisols (ustents - fluvents)	Sols à gley - Sols peu évolués d'apport	Gleysols - Fluvisols
8 Tropical Black and Brown Clays	Vertisols	Vertisol à drainage externe nul ou réduit	Patic Vertisols
9 Tropical Grey Earths and Regosols GWL	Alfisols - Entisols	Sols à alcali lessivés et sols salinisés regosoliques (peu évolués d'érosion)	Gleyic Solonchaks - Rhegosols (Petric)
10 Sodium Viosols	Inceptisols (Hetaquepts)	Sols à alcali très salés	Gleyic Solonchaks
11 Forest Oxisols	Oxisols?	Sols ferrallitiques moyennement ou fortement désaturés - typiques, appauvris, lessivés	Ferric, Plinthis Acrisols?
12 Forest Ochrosols	Ultisols	Sols ferrallitiques moyennement ou faiblement désaturés	Acrisols - Ferralites?
13 Forest Ochrosols - Oxisol intergrades	Oxisols - Ultisols	Sols ferrallitiques moyennement désaturés - id	Acrisols - Ferralites?
14 Forest - Hydrosol - Ochrosol intergrades	Oxisols	Sols ferrallitiques faiblement désaturés lessivés	Rudic Ferralites
15 Forest Lithosols	Entisols (Aquepts, Lithic)	Lithosols	Lithosols
16 Forest Gleysols	Entisols (Aquepts)	Sols hydromorphes humifères à gley peu profond	Dystric Gleysols
17 Regosols	Entisols (Psamment)	Sols peu évolués d'érosion? regosoliques	Dystric Rhegosols
18 Forest Ochrosols - Lithosols	Ultisols - Entisols	Sols ferrallitiques - lithosols	Nitisols - Lithosols
19 Savannah Ochrosols - Lithosols	Oxisols - Entisols	Sols ferrugineux tropicaux lessivés - lithosols	Nitisols - Lithosols
20 Savannah Lithosols - Gleysols	Entisols (ustents - fluvents)	Lithosols - Sols à gley	Lithosols - Gleysols
21 Savannah Branosol - Ochrosol intergrades	Ultisols	Sols ferrugineux tropicaux lessivés madous	Chromic Luvisols
22 Forest Gleysols - Alluviosols	Entisols (ustents - fluvents)	Sols hydromorphes peu humifères à gley Sols peu évolués non climatiques	Gleysols - Fluvisols
23 Regosolic Groundwater Podzols	Entisols	Podzols de nappes (des régions tropicales)	Albic Arenosols?



The soil type of Kumasi is the Forest Ochrosol. These are deeply weathered soils found in the semi deciduous forest and parts of the forest savanna transition agro ecological zones of Ghana. These zones stretch from West to East along the middle portions of the country across the Volta Lake. The soil profiles are matured and often show clay accumulation in the subsoil.

Climate



Average Temperature
High = 27.9
Low = 24.4



Average rainfall
1484mm
58.4 in

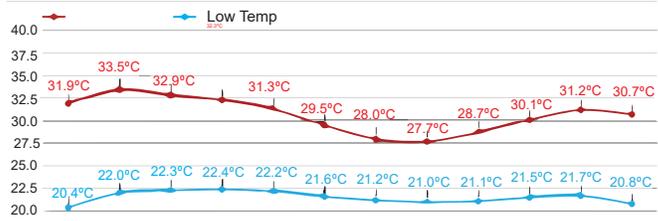


Average relative humidity
83.2%



Predominant Wind Direction
South West
(Moonsoon Winds)

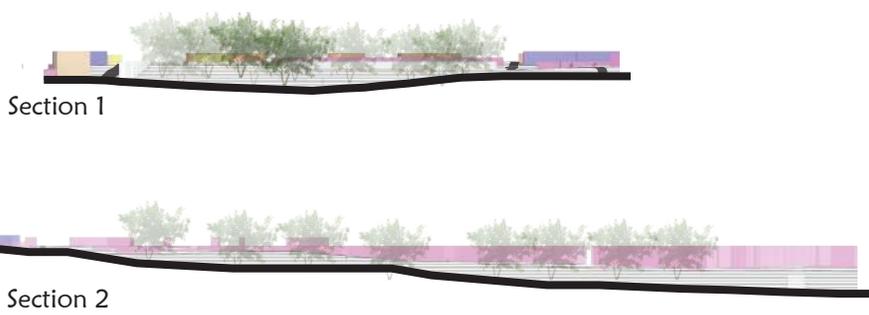
Average Temperature of Kumasi (°C)



Average Rainfall of Kumasi (mm)



Topography, & Vegetation



Cacia Siamea



Peacock flower



Banana Earleaf Acalpha

SWOT Analysis



S

1. Easy accessibility as site is bounded by roads and streets on three sides.
2. Site is located in an ideal location consisting of educational, residential and commercial activities.
3. Sloping site aids in effective drainage.
4. Dense vegetation cover as soil type (forest ochrosol) encourages vegetation growth.



W

1. Site slope offers great landscape design conforming to human experiences.
2. Availability of utilities such as power and water make for a suitable site.
3. Climate (high rainfall during rainy season will aid in vegetation growth)



O

1. Roads and streets bounding site produce noise from vehicles.
2. Poor maintenance of site will lead to disrupted development.
3. No access for vehicles to site.
4. Site has only two opportunities to good views.



T

1. Unmonitored and non meticulous crossing of roads and streets may pose as threats for pedestrians.
2. Hawkers and Resident on site may pose as problems when site needs to be developed.

Current Site Status



Existing Pedestrian Entry into Site



Parts of the site littered



Parts of the site eroded

Concept



Restoration

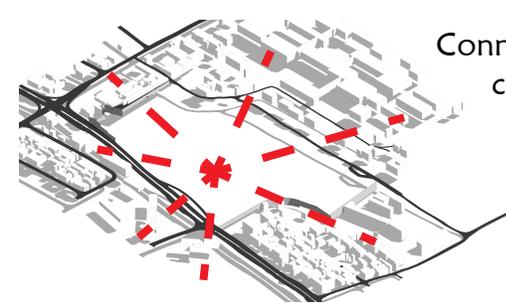


Regeneration

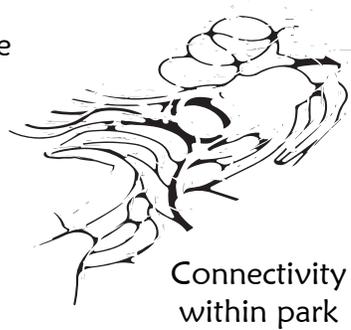


Conservation

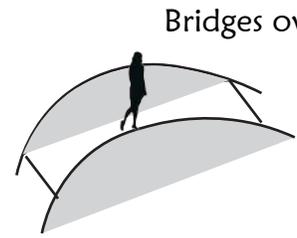
Fluidity (Connectivity) : The park design is intended to promote barrier free spaces that flow into each other fluidly.



Connectivity to the community

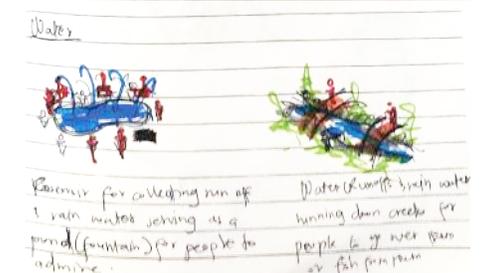
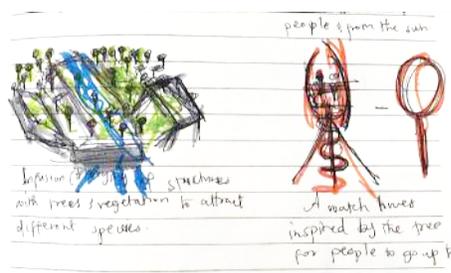
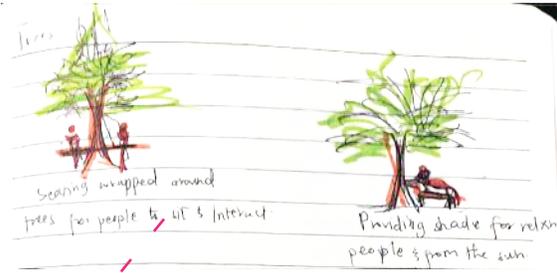


Connectivity within park

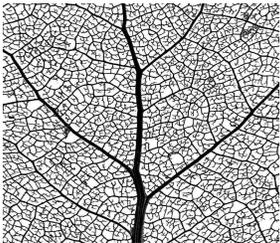


Bridges over water

Harmony : The park design is intended to connect humans and nature back together while promoting the harmonious interactions and coexistence between them eliminating all sorts of boundaries, being it physical, social or mental.



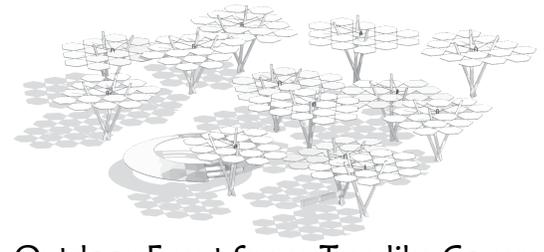
Weaving: Weaving is shown in patterns on floors and structure to give dynamic daylight penetration into spaces.



Observatory Floor Pattern

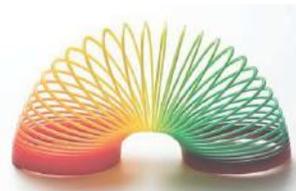


Grid shell Pattern



Outdoor Event Space Tree like Coverage

Flexibility: The ability of spaces to hold different activities as needed,



Building Form Development

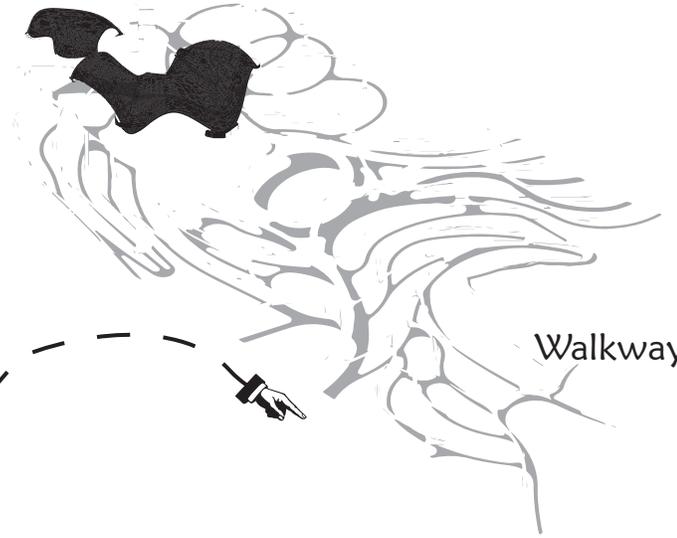


“Sank)fa Bird”

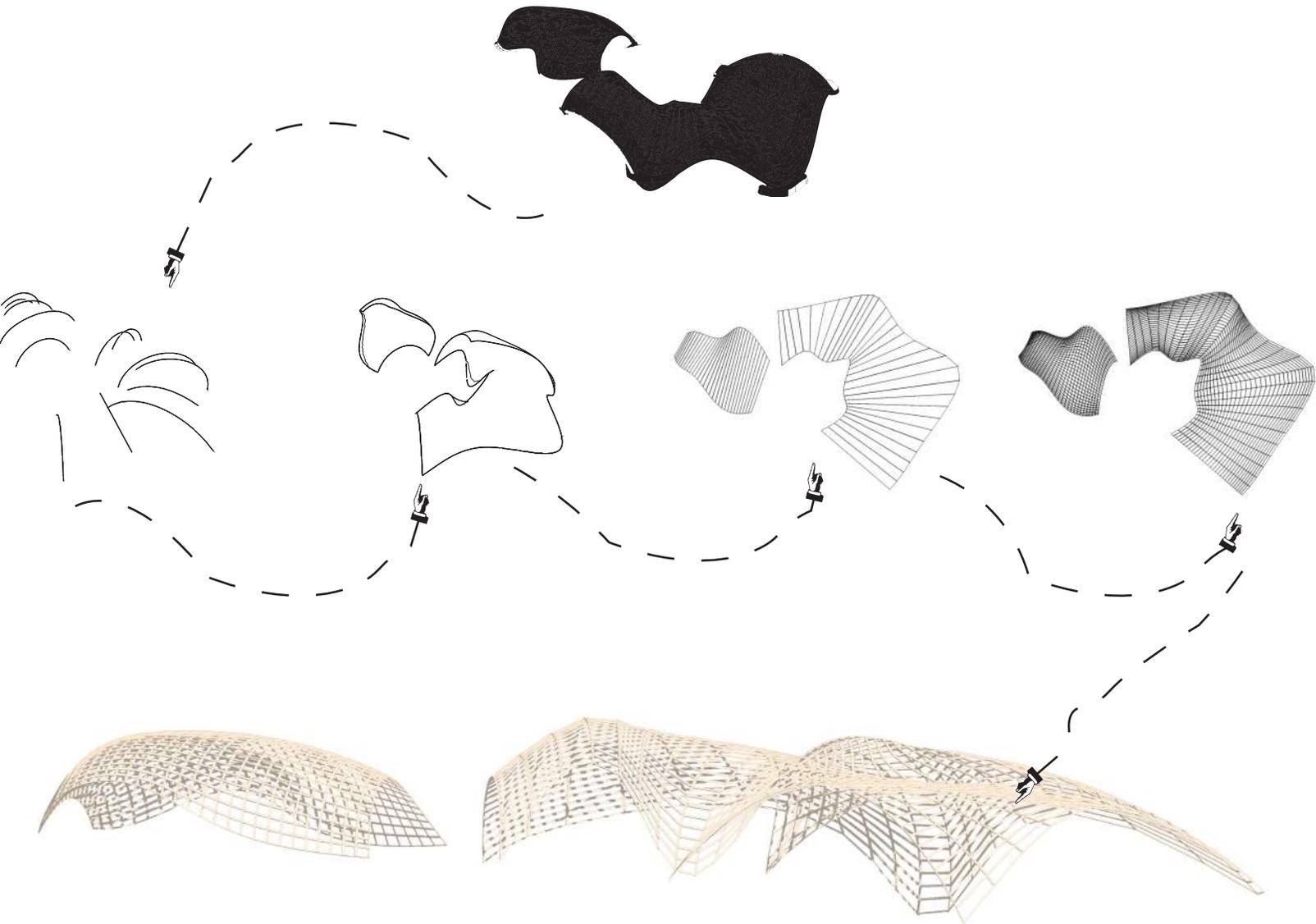
Symbolic Meaning - Renewal
This spread of newness is seen in
the walkways representing its
wings.



Main Building



Walkways



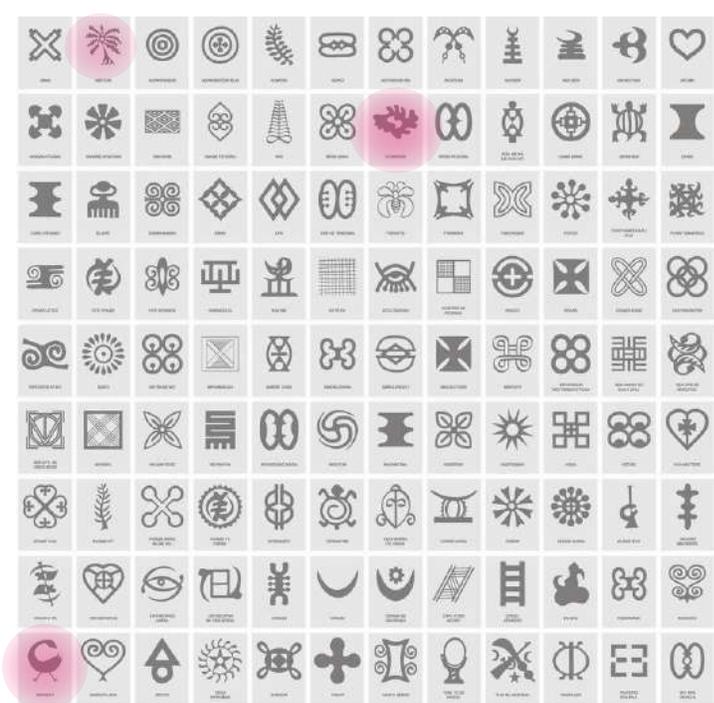
Sequence of form development

Concept

Symbols & Abstractions

Adinkra Symbols:

Adinkra symbols are visual representation of concepts and aphorism developed by the Akan people of Ghana. Adinkra symbols are extensively used in fabrics, pottery, logos, and advertising. They can also be found on architectural buildings, as well as on traditional Akan gold weights, and sculptures. The adinkra symbols are not just decorative objects, or drawings, but actual messages conveying ancient traditional wisdom relevant to aspects of life or the environment.



A linguist staff with sank)fa on it

The adinkra cloth

Symbols used on Buildings for

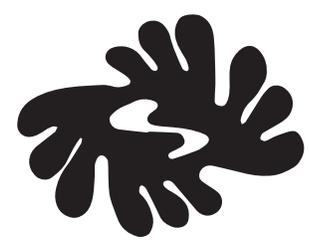
Symbols Used in Design

As These symbols depict harmonious, connectivity and co evolving and I believe it can be connected with the park design.



“Sank)fa” - Go back and retrieve.

It speaks of returning to the past and learning from it for the future.



“Bi Nka Bi” - No one should bite/fight the other

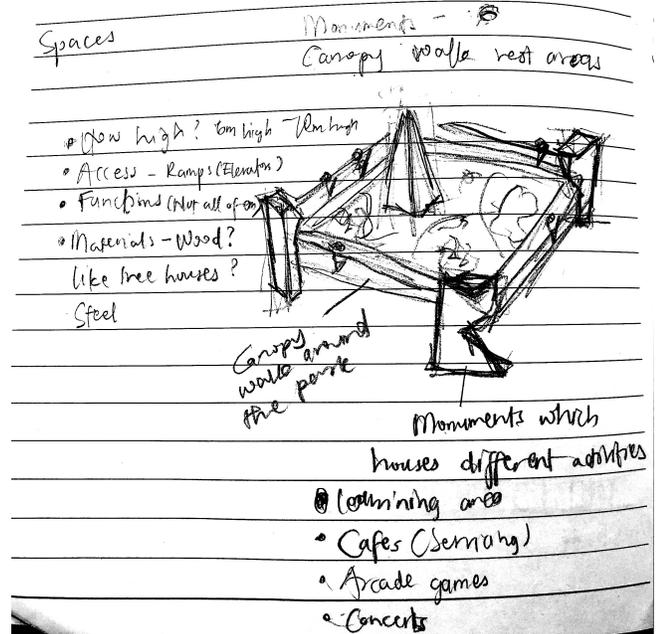
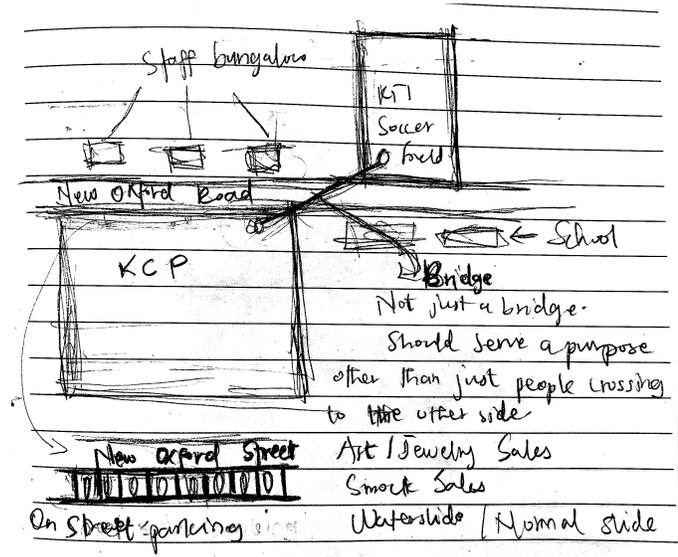
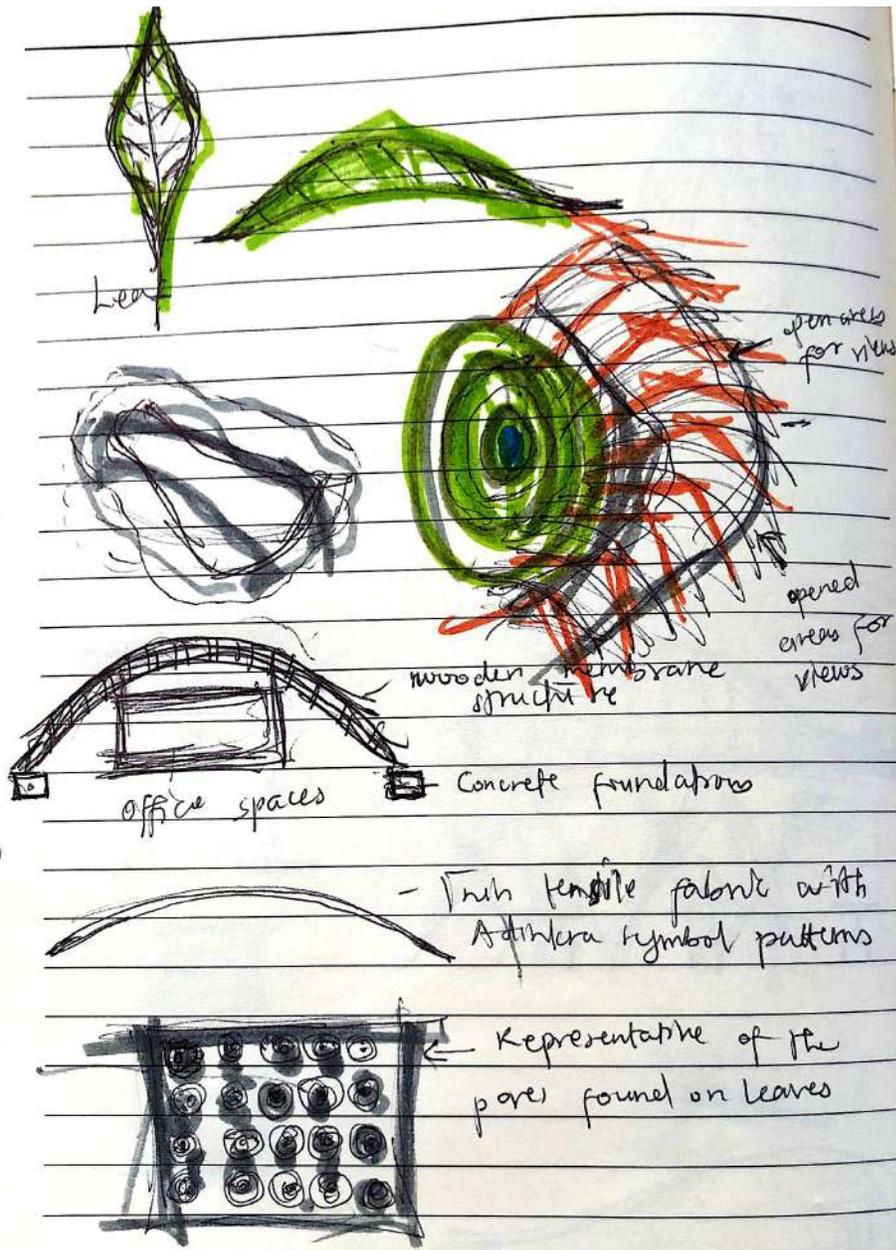
It speaks of staying harmonously and co-existing with others.



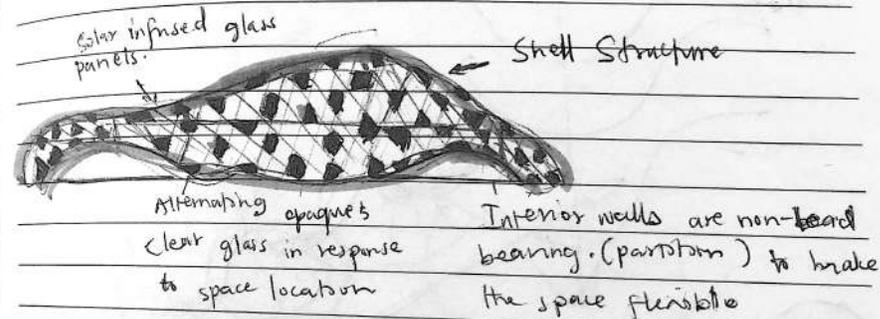
“Ab3 Dua” - Palm Tree

Symbolizes resourcefulness and wealth.

Concept

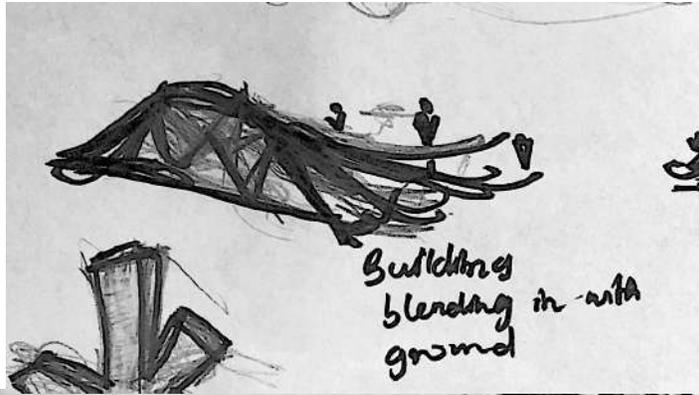


Grid Shell Membrane Str.

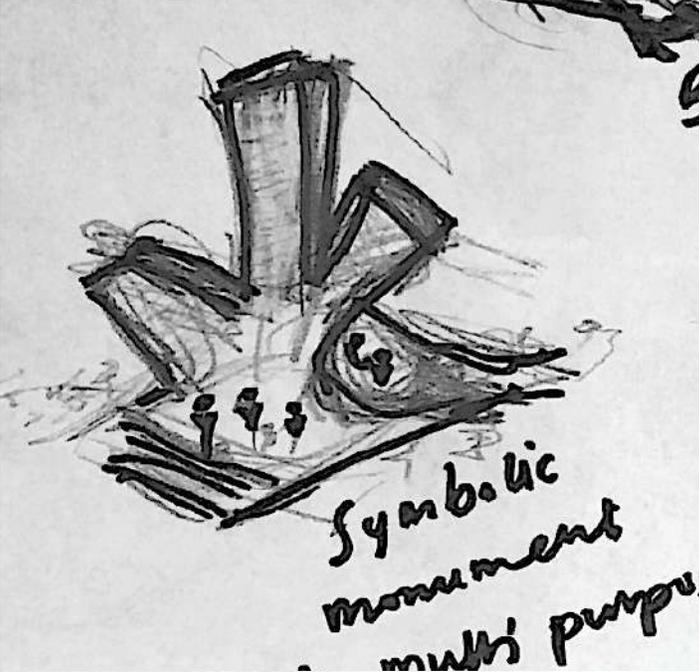


Initial building sketches

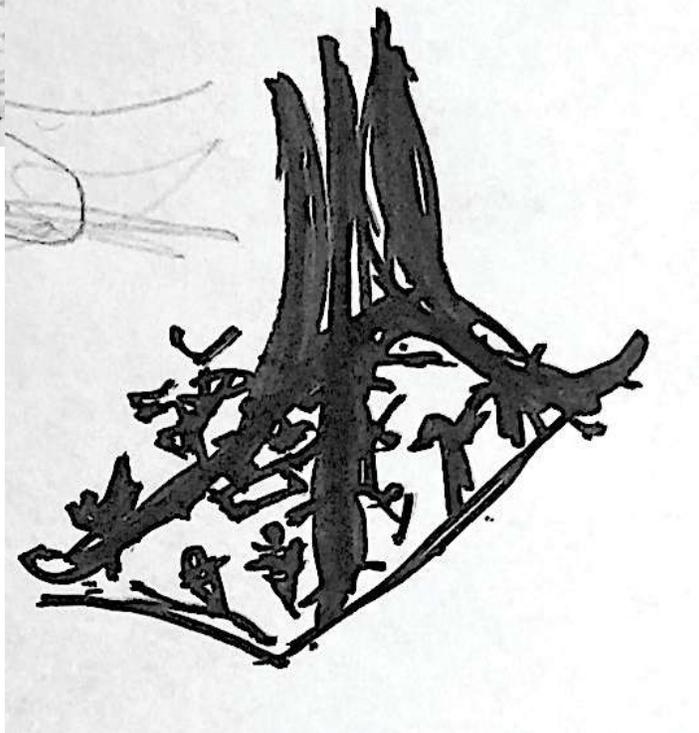
Initial Sketches and Ideas



Buildings
blending in with
ground



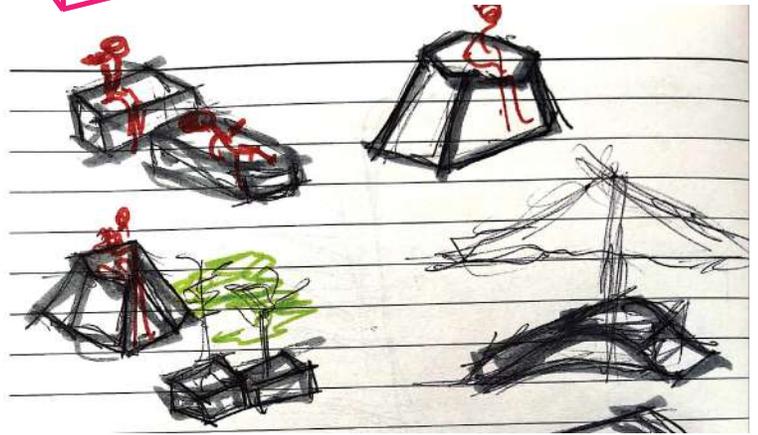
Symbolic
monument
multi purpose



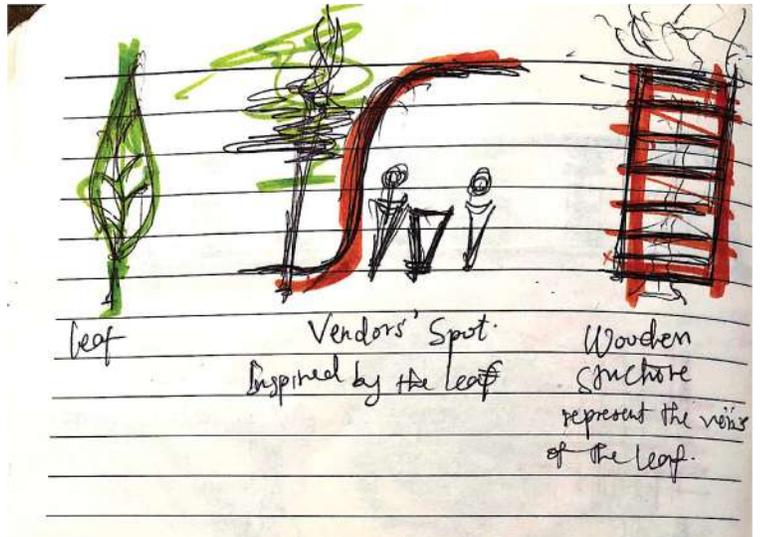
“Bama” - Plinth.



Most traditional houses have bama in front of their houses and it is where visitors are welcomed and entertained



Seating/Benches Ideas, Inspired by the “bama” - plinth where most of visitors are recived at homes.

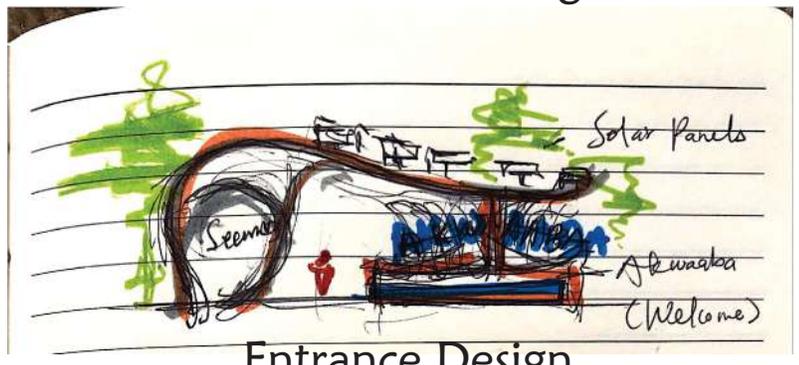


leaf

Vendors' Spot.
Inspired by the leaf

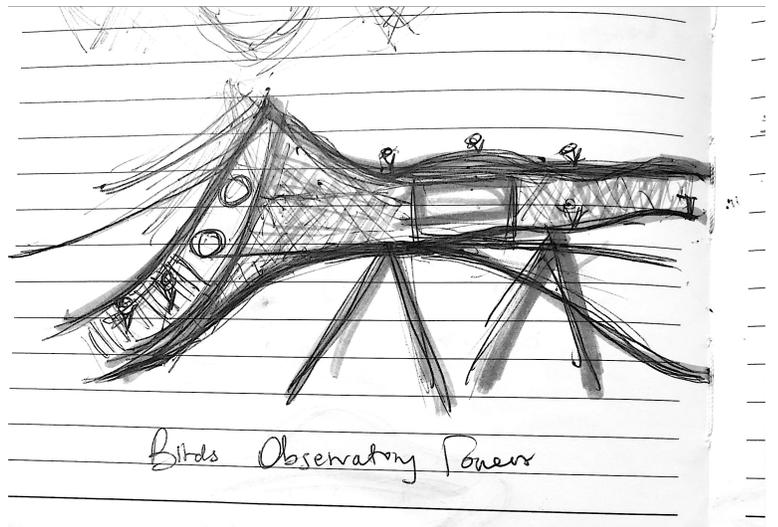
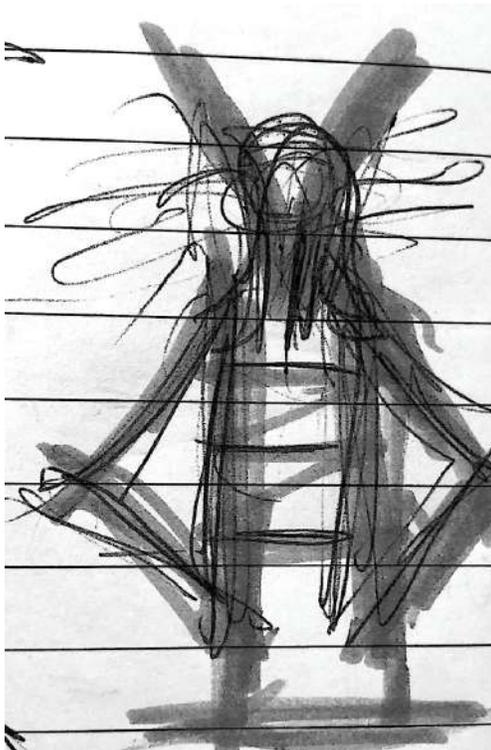
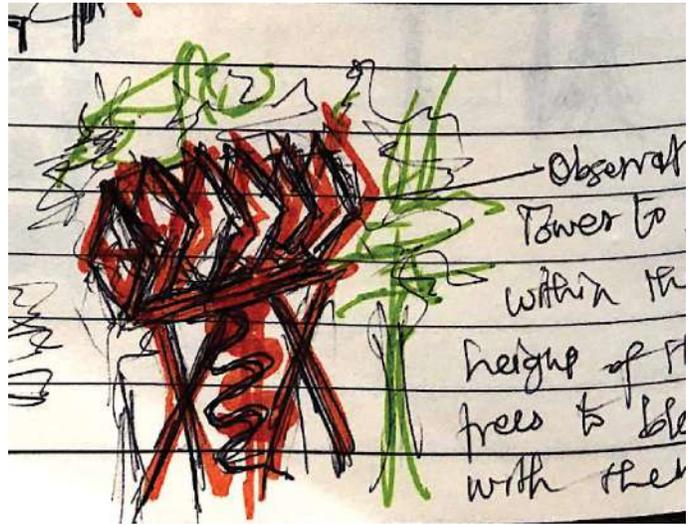
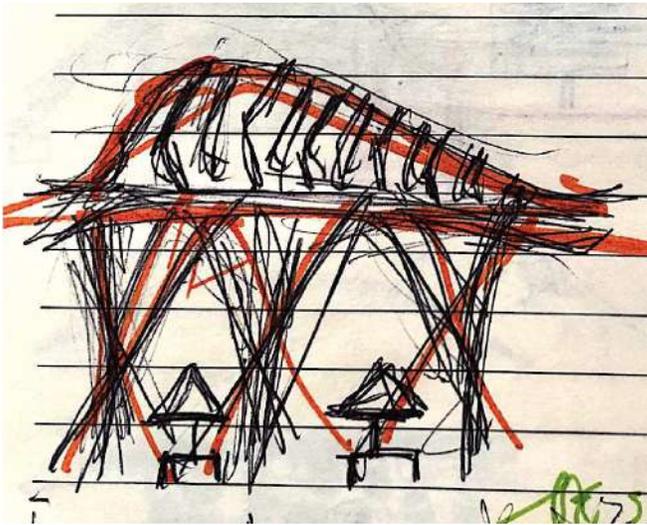
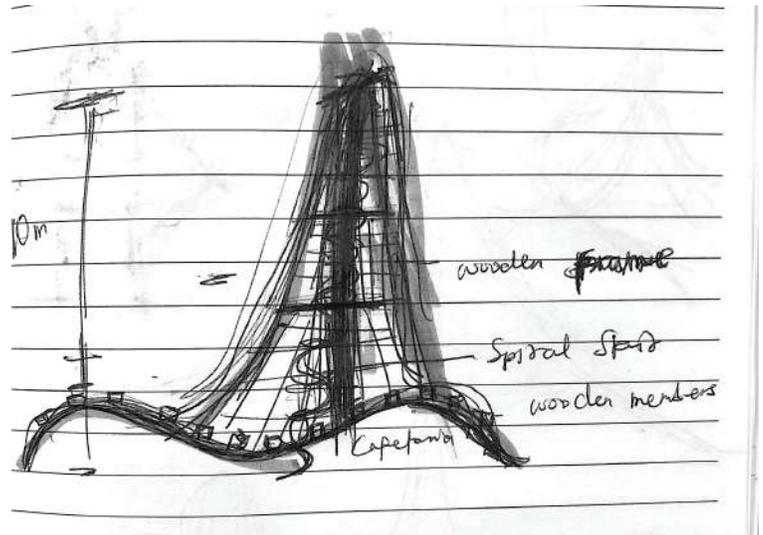
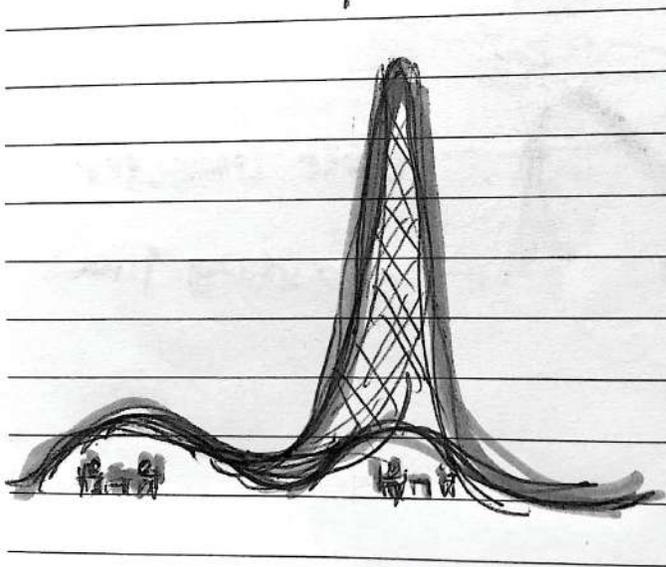
Wooden
structure
represent the veins
of the leaf.

Vendors Stall Design



Entrance Design

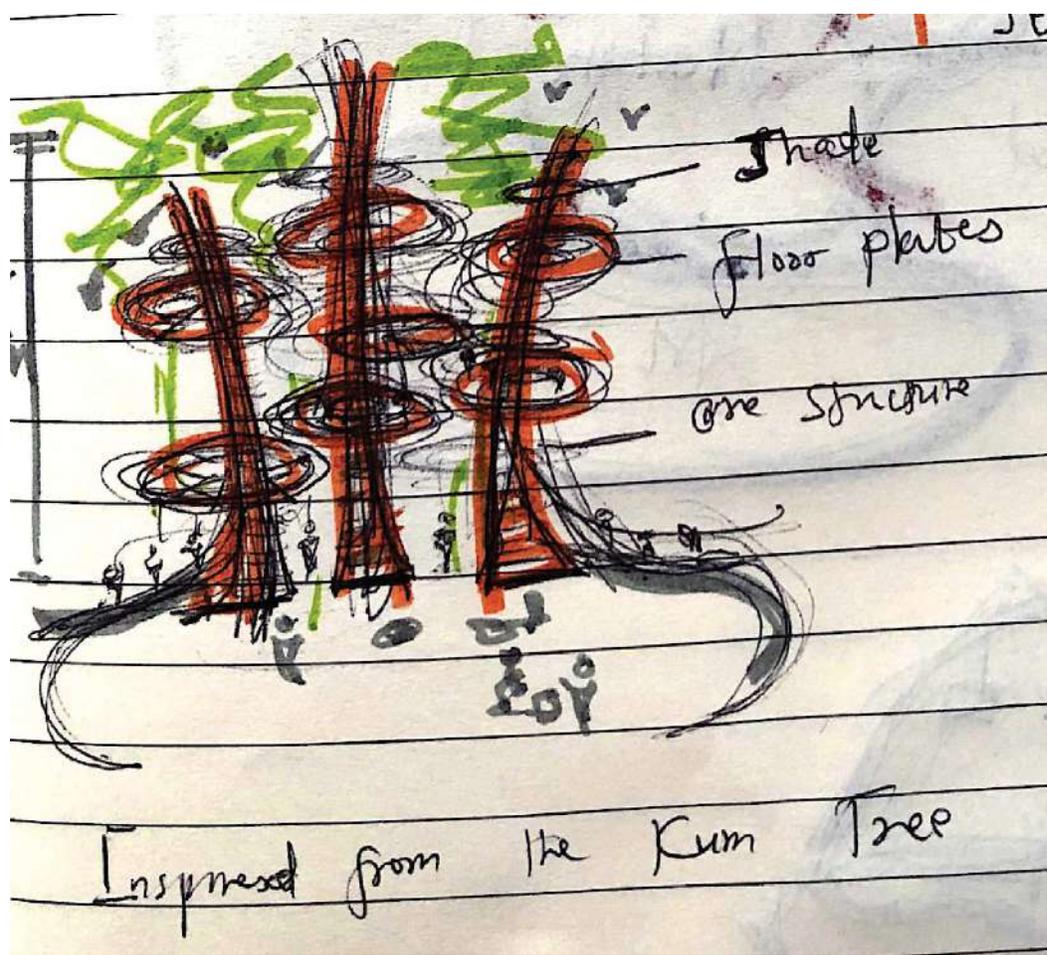
Initial Sketches and Ideas



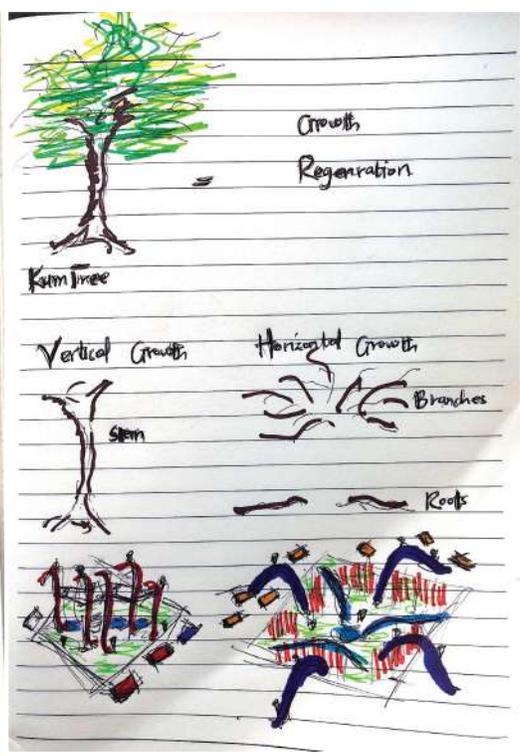
Initial Observatory tower sketches

Concept

Observatory Tower Development.

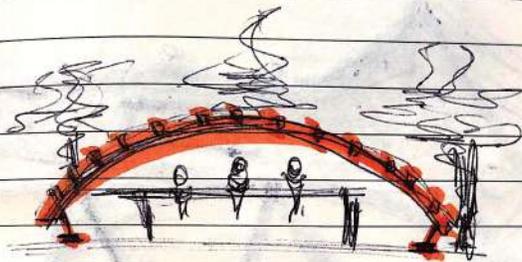
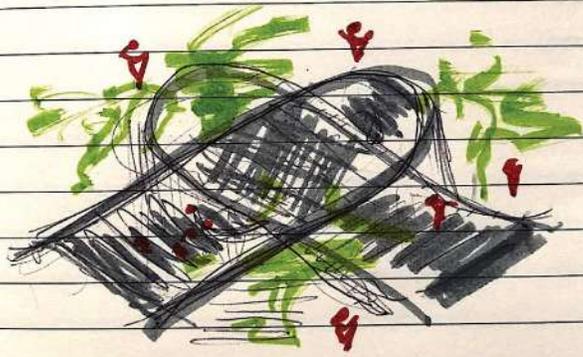


The observatory tower was inspired by the history of Kumasi. The “Kum” tree which was the initiator of this city served as a source of stability and communal living for the people and this tower is serve same only not for people but for other “nature” as well (birds, butterflies, etc).

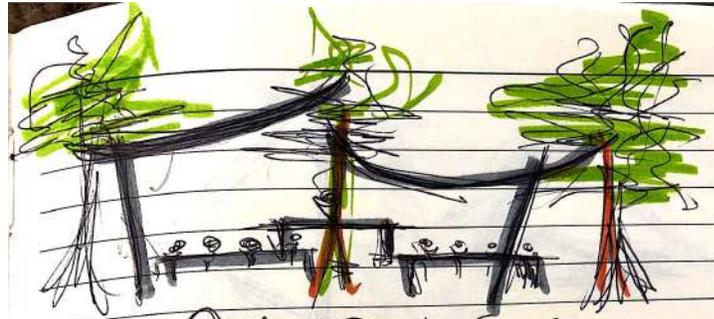
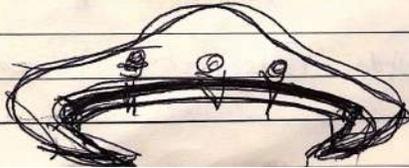


Made of wooden elements the outdoor terraces serve as standing and sitting platforms for people to stand and observe the rest of the park. The interior serves as a lace for information knowledge on birds, butterflies, other creatures, history of Kumasi, and any vital information.

Outdoor Event Space Ideas



Bus stop



Outdoor Event Space

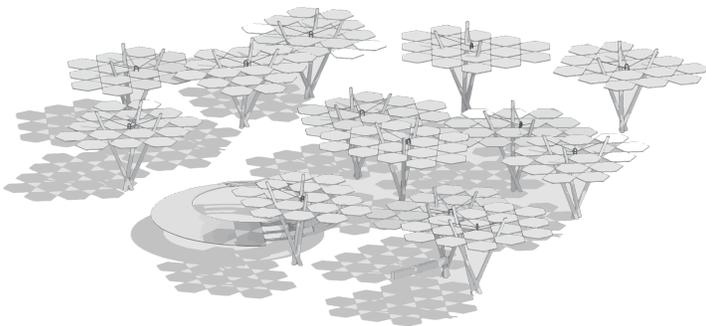


Tensile Covering in the spirit of flexibility & light permeance.



Cable Connector

Existing Trees



Use of hexagonal connected shading material that is able to store and give off light with a solar panel LED light infused. This will allow most trees to be maintained while still blending with them.

Initial Outdoor Event Space

Programming

Space	Total Square Footage	Space	Total Square Footage
Administration		Observatory Tower	
Office	9,000 ft ²	Observatory	10,500 ft ²
Reception and Waiting Area	2,840 m ²	Seating Area	975 m ²
Lounge	840 m ²	Servery/Food Area	
Kitchenette		Learning Centre	
Washrooms/Janitor's Store/ Store		Classroom Pavilions	21,500 ft ²
Plumbing Room		Aquaponics Room	2,000 m ²
Electrical/Pump Room		Storage	
Art Display Area		Outdoor Spaces	
Display Space 1	33,000 ft ²	Outdoor Event Space	520,000 ft ²
Display Space 2	3,060 m ²	Forest Zone	48,000 m ²
Display Space 3		Gardens	
Indoor Event Space		Outdoor Spaces	
Event Space		Parking/Drop offs	83,000 ft ²
Stage	10,700 ft ²	Service areas	7,740 m ²
Storage	1,000 m ²	Security	
Green Room		Total Area of Site	
Male & Female Changing Room		16 Acres	
Washrooms			

Site Plan & Layout



Site Plan

Legend

Main Building	Parking
Indoor Event Space	Walkways
Learning Area	Service Areas
Observatory	Dropoffs
Gardens/ Forest Zone	Vehicular Entry
Outdoor Event Space	Pedestrian Entry
Security Entry	



Block Plan



Legend

- | | | |
|------------------------------------|--------------------------------------|--------------------|
| A - Administration | E - Observatory Tower /
Food Area | J - Parking |
| B - Art Display Space | F - Vendor's Stalls | K - Service Area |
| C - Fountain/Indoor Event
Space | G - Reservoir /
Fountain | L - Drop Offs |
| D - Education Area | H - Outdoor Event Space | M - Security Entry |
| | I - Forest Reserve | |

Aerial View

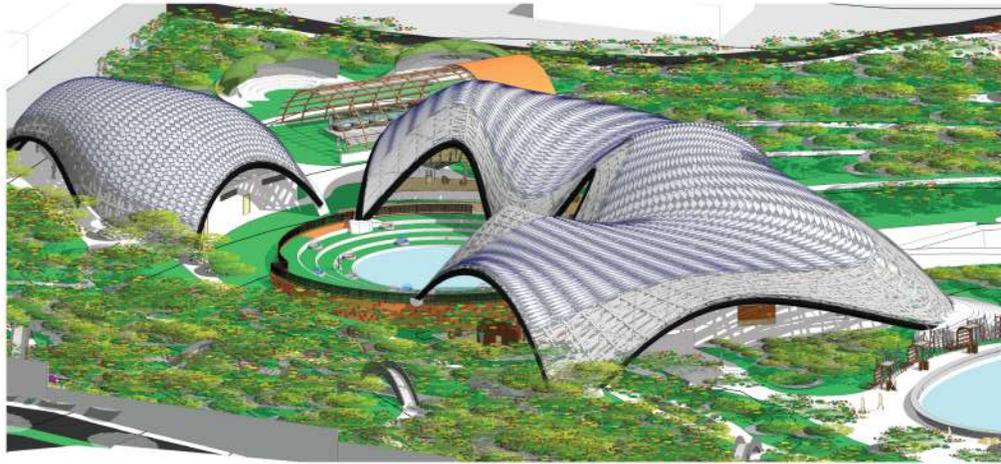


Daytime View



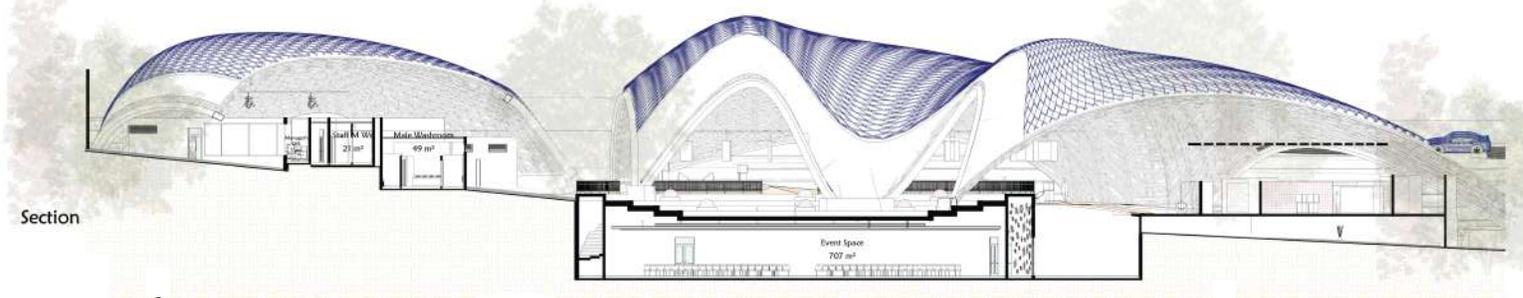
Night View

Main Building



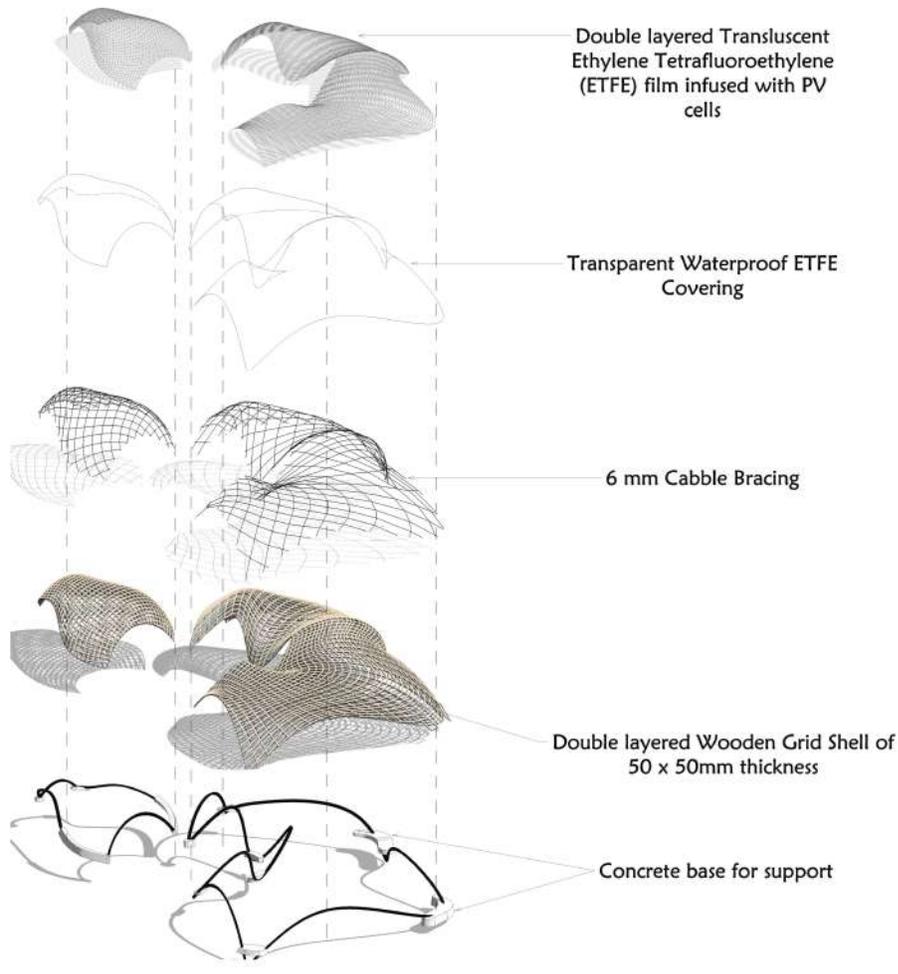
Top View of Main Building

3d View



Section

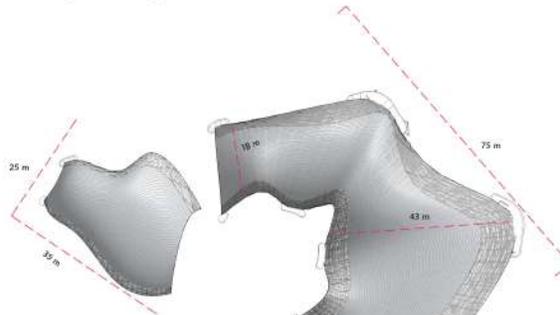
Structure



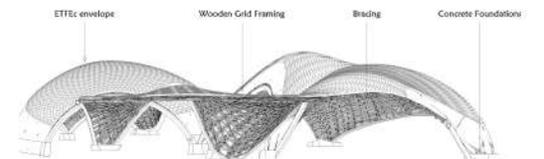
Explode Axonometric of Structure



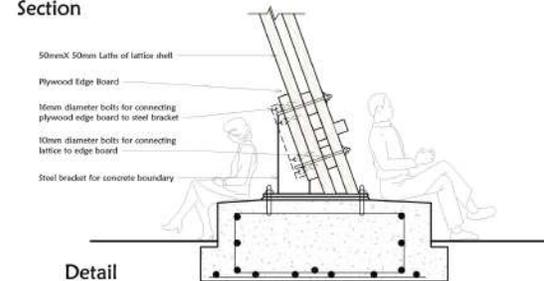
Height from ground



Width

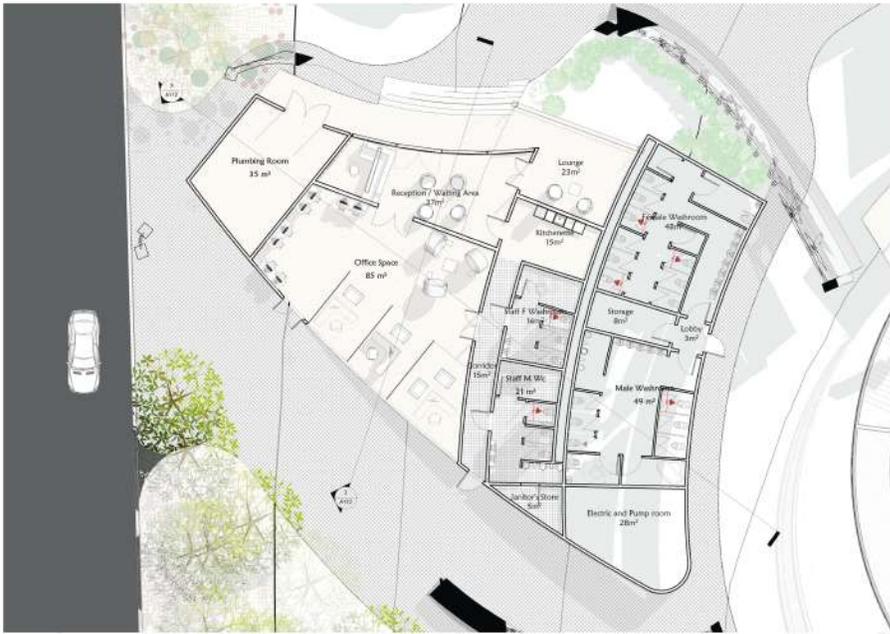


Section



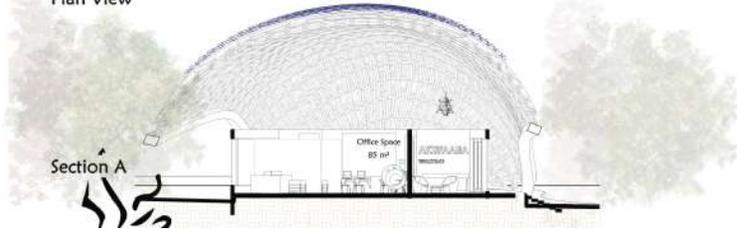
Detail

Administration

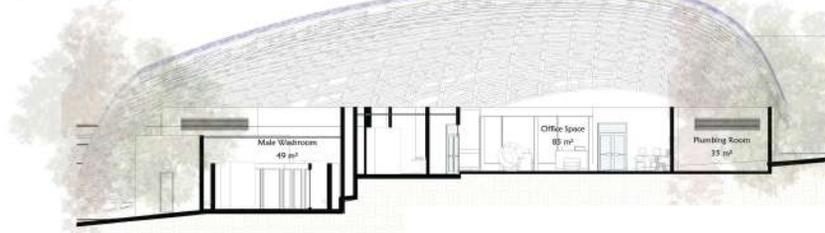


Axon of Interior

Plan View



Section A

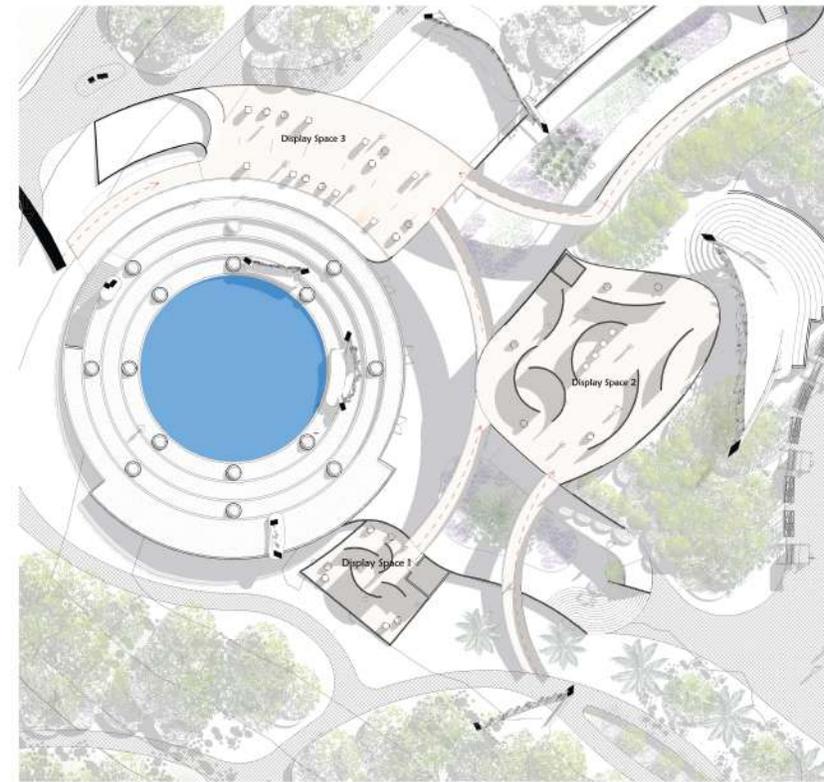


Section B

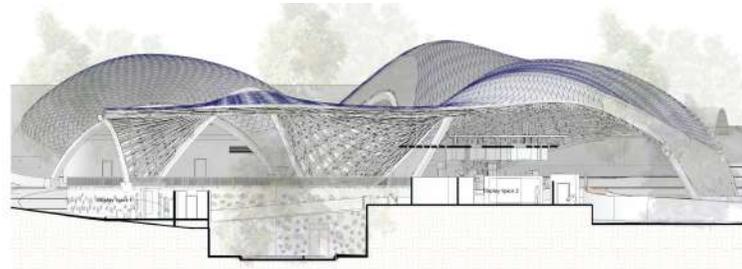
Interior View of Office



Art Display Space



Plan of Art Display Area



Section

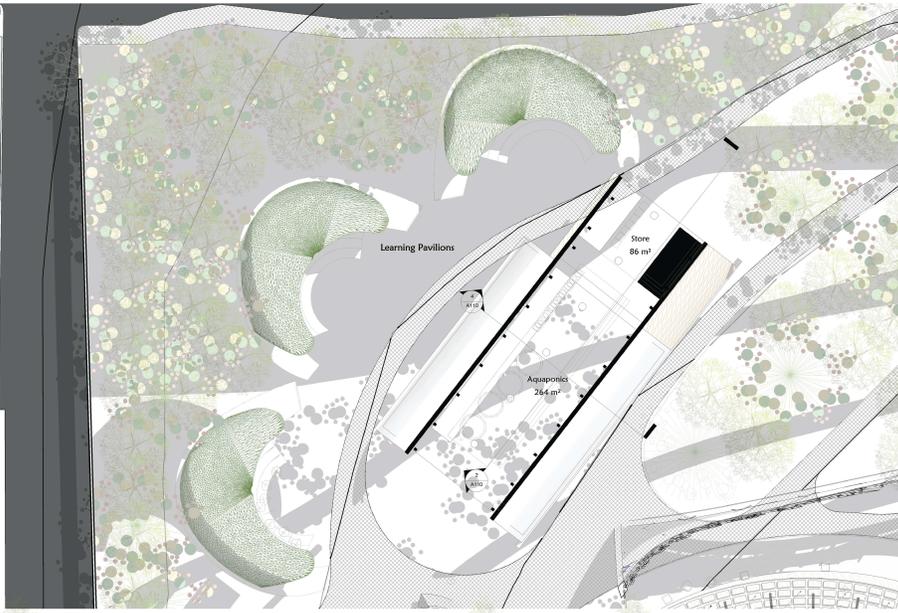


3d View

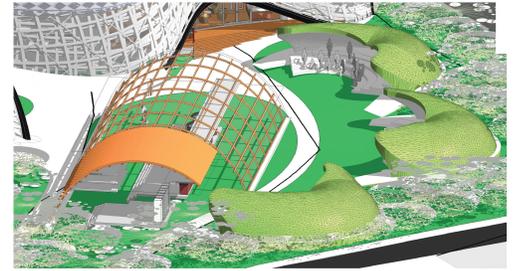
Interior View of Display Space 3



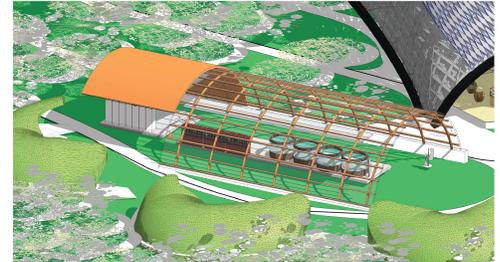
Educational Area



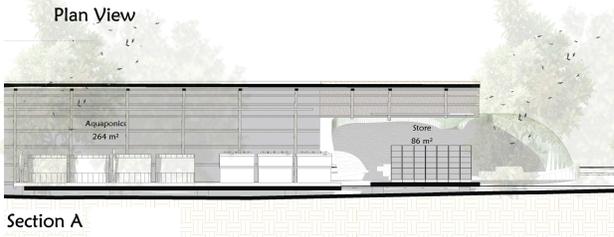
Plan View



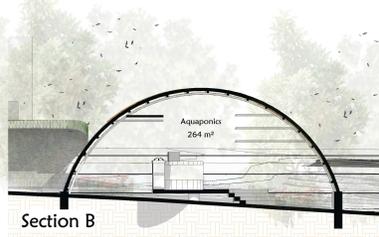
3d View



3d View



Section A



Section B



View of Learning Pavilion

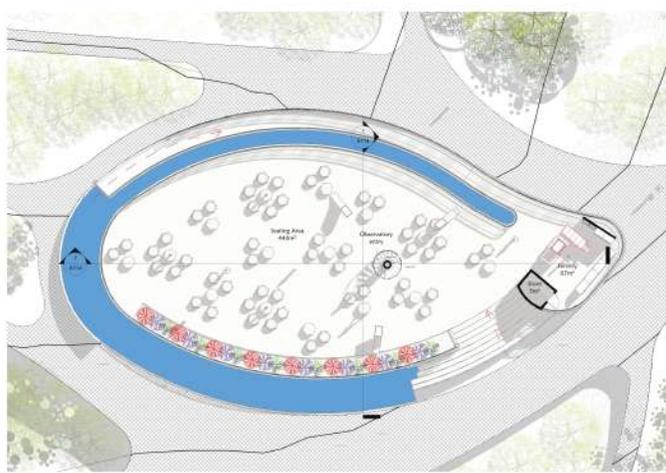
Interior View of Aquaponics Space



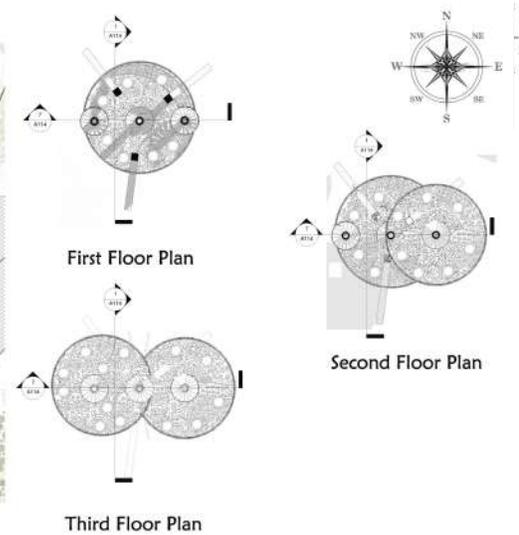
Observatory Tower



Block Plan of Observatory Towers



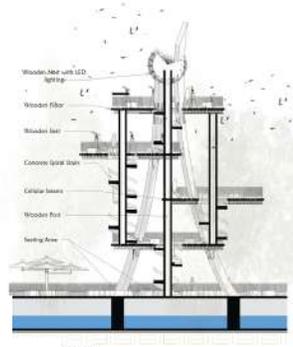
Ground Floor Plan



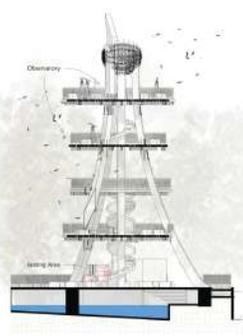
First Floor Plan

Second Floor Plan

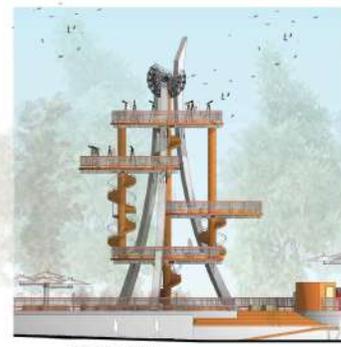
Third Floor Plan



on 1



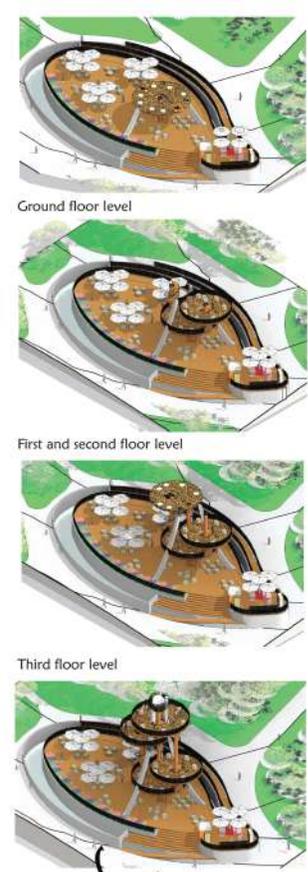
Section 2



Front View



Axonometric View and Aerial View of Tower



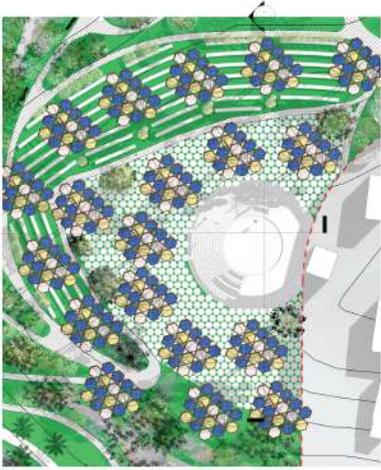
Ground floor level

First and second floor level

Third floor level



Outdoor Event Space

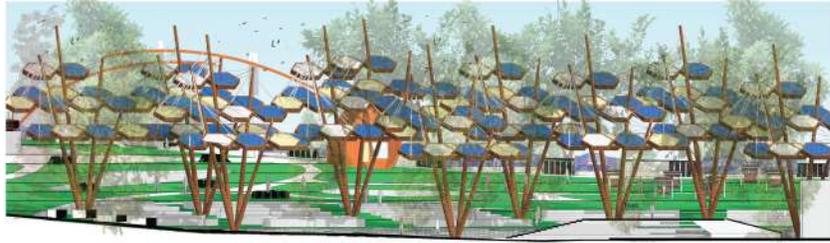


Plan View



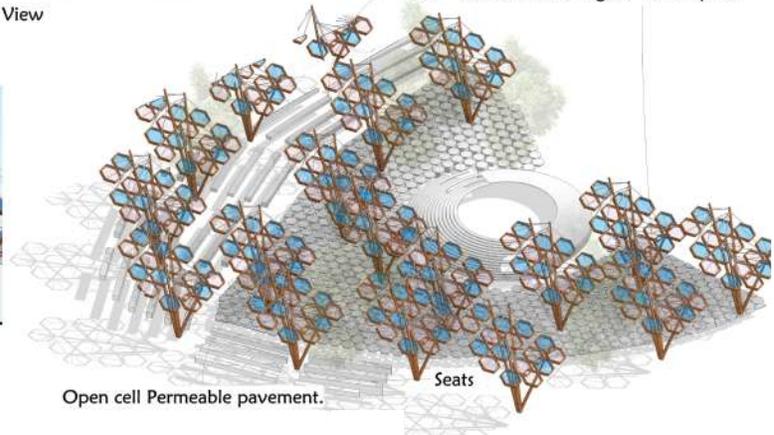
Axonometric View

Tree like Hexagonal Solar Infused LED Panels as covering for Event Space



Solar infused LED panels with wooden posts and cables support

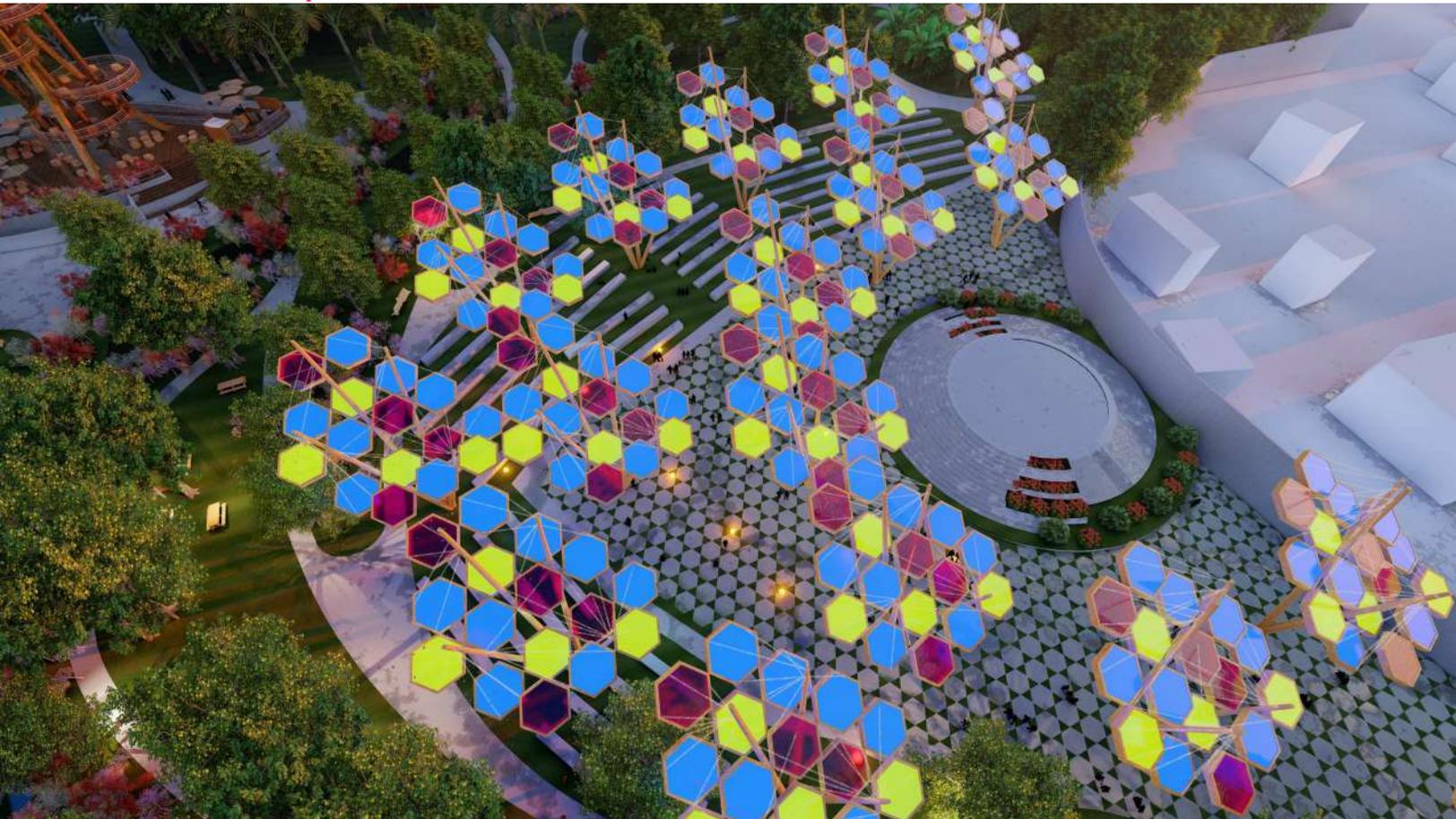
Section A



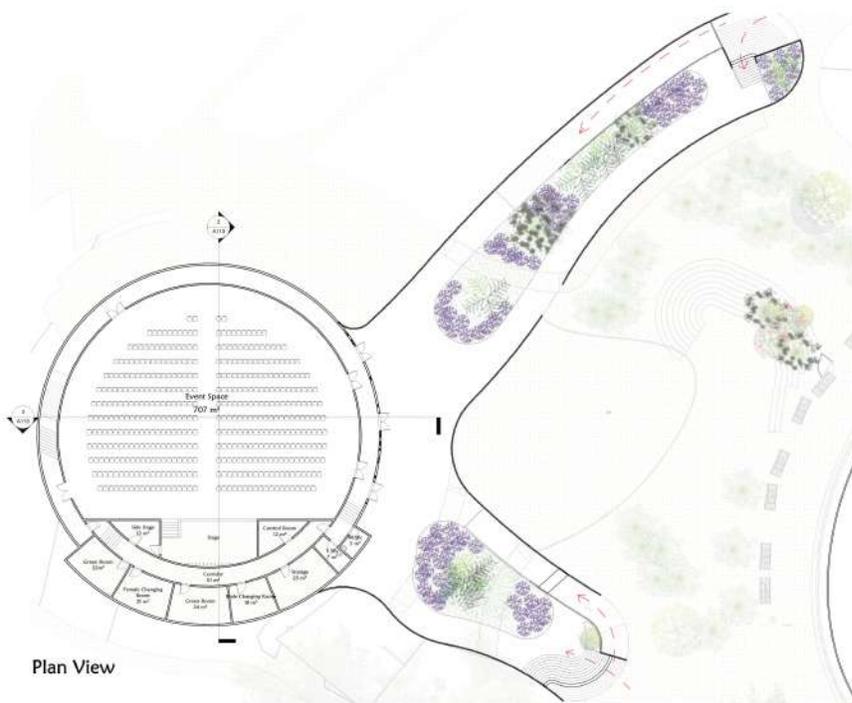
Open cell Permeable pavement.

Seats

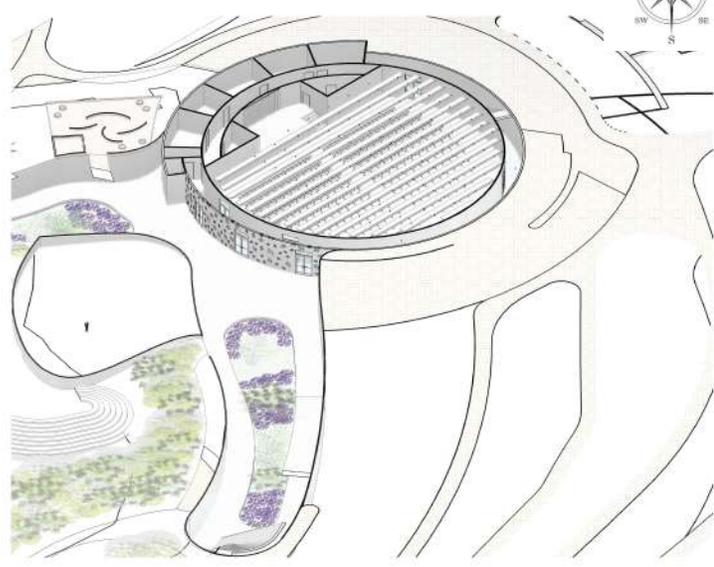
View of Event Space



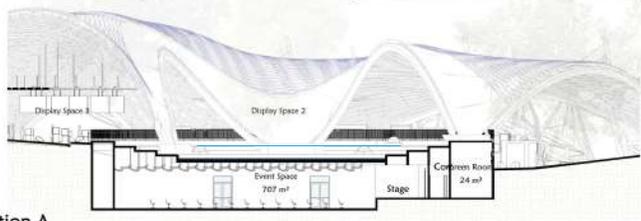
Indoor Event Space



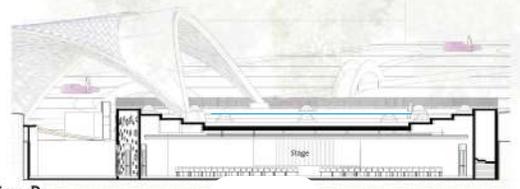
Plan View



Axonometric of Event Space

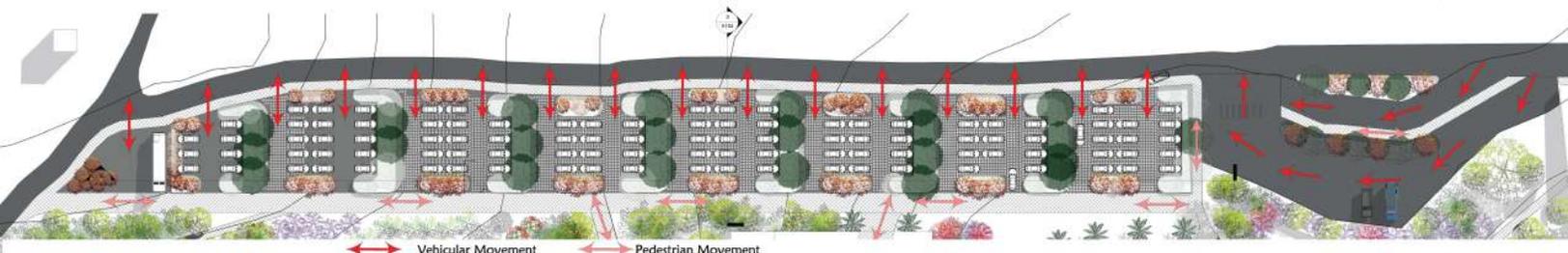


Section A



Section B

Parking



Plan Of Parking

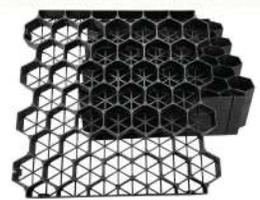


Section A

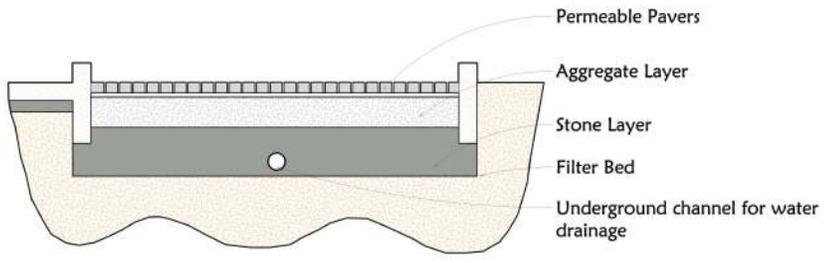
Shade Trees



Section B



Open cell concrete blocks/ permeable pavers

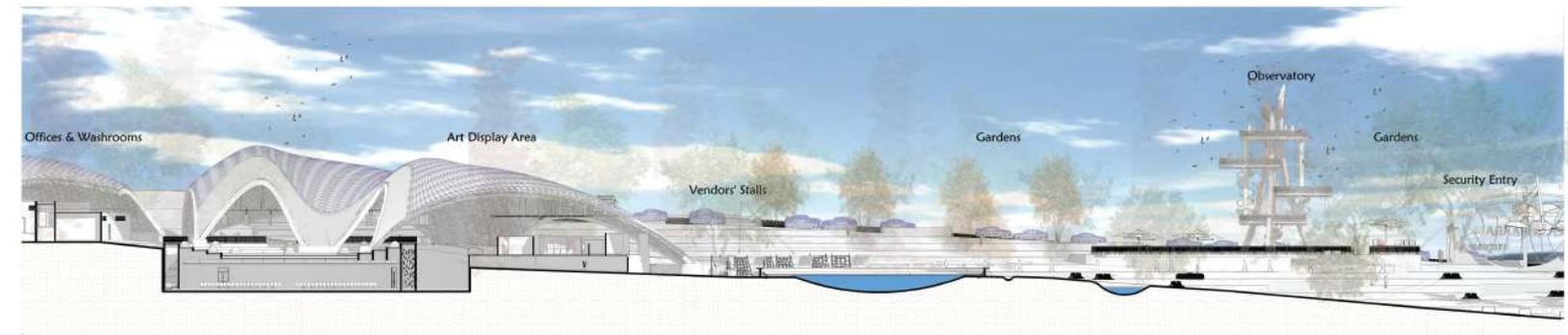


Detail Section of Open Cell Pavement

Site Sections



Site Section 1

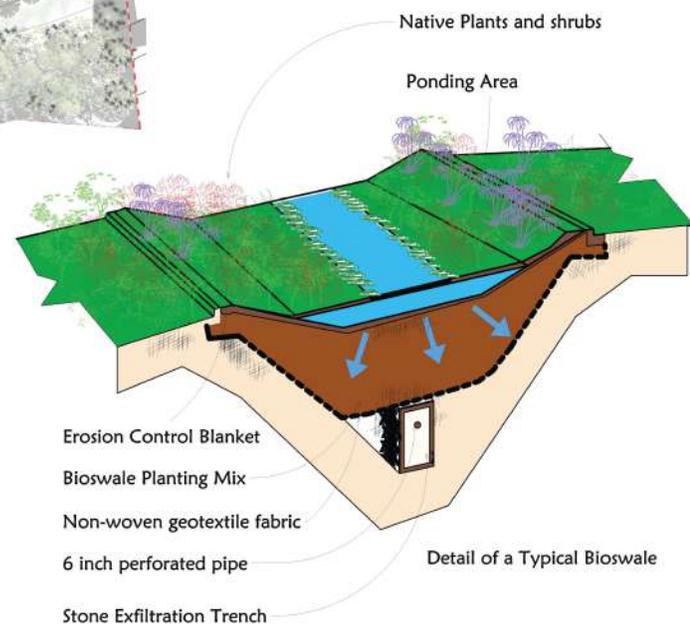


Site Section 2

Bioswales



Floor Plan showing positions of bioswales and direction of flow



Native Plants and shrubs
Ponding Area

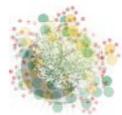
Erosion Control Blanket
Bioswale Planting Mix
Non-woven geotextile fabric
6 inch perforated pipe
Stone Exfiltration Trench

Detail of a Typical Bioswale



Site Section Showing Bioswales

Landscape Plan



Cacia Siamea



Description
Medium-sized
Dense rounded crown
Straight bole up to 30cm ø.
Habit: Evergreen Tree
Height: 15m - 18 m
Growth Rate: Fast

Benefits
Food
Medicinal purposes
Ornamental
Provide shade.
Serves as windbreak.
It effectively increases topsoil infiltration, reducing runoff and combating soil erosion.



Foxtail Palm



Description
Foxtails are fast growers, reaching an ultimate height of about 30 feet. Requires no trimming as old ones fall off on their own.

Benefits
After flowering, it bears a large, heavy cluster of fruit containing seeds. Lining a walkway or drive. Tropical accent near an uncaged pool In the Ashanti Culture, it means resourcefulness and wealth.



Acacia nilotica



Description
It is a medium sized tree, growing to about 7-13 m in height, with bark approximately 20-30 cm. Acacia nilotica is very drought resistant, and can be grown on almost all types of soils.

Benefits
Serves as food.
Valued as fodder and fuelwood for some regions of semi-arid Africa and India.
Used as a pioneer species in land rehabilitation and as a barrier to desertification.
Nitrogen fixing.
Sweet scented.



Banana Earleaf
Acalpha



Description
Large herb up to 7m tall. Pseudostems blotched with green, brown and/or black. Leaves up to 3m long. Can both reproduce sexually and asexually. Pollinated by wind, insects and bats.

Benefits
Bananas are eaten the world over. Provides shade, shelter, building materials, wrappings for food and other goods. Boosting energy of people/athletes



Ixora coccinea



Description
A tropical evergreen shrub that grows between 100 to 300 cm. leaf shape: lanceolate shape with all edges, radial symmetry. It scatters inflorescencely, and has other colours like orange, yellow and peach.

Benefits
Cut flowers.
Potted plants.
Gardening.
Sweet Scented



African Walnut



Description
An evergreen ornamental tree in the garden. medium to large tree which grows between 9 to 17 metres tall and has a canopy spread of between 5 to 12 metres. It is a fast-growing, hardy tree which thrives in the warm bushveld regions, in deep sandy soil and lots of water during the hot summer months.

Benefits
Ornamental plant.
Sweet Scented
Attracts sunbirds, bees and insects



Peacock flower



Description
It is a shrub growing to 3 m tall. In climates with few to no frosts, this plant will grow larger and is semi evergreen. C. pulcherrima tolerates hot, dry areas, and forms an effective thorny barrier. This species is more sensitive to cold than others. The leaves are bipinnate, 20-40 cm long.

Benefits
The C. Pulcherrima is used as/for Stimulants
Agroforestry purposes
Boundary, barrier or support
Ornamental purposes
Sport (hunting, shooting, fishing, racing)
Fruits and Seed
Source of medicine/pharmaceutical



Flamboyant



Description
Grows to a modest height (mostly 5 meters, but it can reach a maximum height of 12 meters) but spreads widely. The flowers of Delonix regia are large, with orange-red petals up to 8 cm long. The pods are green and flaccid when young and turn dark-brown and woody.

Benefits
Ornamental value
Useful as a shade tree. In areas with a marked dry season, it sheds its leaves during the drought, but in other areas it is virtually evergreen.



Purple Duranta



Description
A tropical shrub that grows up to 18 feet. Grows quickly into a large shrub or small tree over the course of a few seasons. Grows best in full sun exposure and comes in different colours including blue, violet, green and white.

Benefits
Ornamental plant.
Sweet Scented

