UNIVERSITY OF KWAZULU-NATAL ™

INYUVESI YAKWAZULU-NATALI

ENVIRONMENTAL REHABILITATION THROUGH ARCHITECTURE – AN ECO-SOCIAL SUSTAINABLE HUB FOR DURBAN CBD

By

ALEXANDRA VAN VUUREN

214548776

Supervisor: Juan Solis-Arias

The School of Built Environment and Development Studies

University of KwaZulu-Natal

Durban, South Africa

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Signed: ……... **ALEXANDRA VAN VUUREN** 214548776

Date: ……... AT THE UNIVERSITY OF KWAZULU-NATAL

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DEDICATION

Mom, Dad, Jarred and Josh. You have given me the world and there is nothing you wouldn't do for me; I am so grateful and I cannot thank you enough.

I hope I have made you proud.

ABSTRACT

"We do not inherit the earth from our ancestors. We borrow it from our children"

- Native American Proverb

Natural environments and eco-systems flourish on their own but man needs these environments in order to survive, yet nature is being destroyed faster than ever. Unprecedented changes need to take place in all parts of society in order to counteract the damage to the environment. The built environment plays an important role in every individual's life. It becomes an environment of its own, providing at a basic level, our need for shelter and forms the basic building block from which cities emerge. Built form takes precedent over natural environments as it creates economic income while nature happens on the outskirts of the cities. Man moulds natural environments to suit the built environment in order to maximise profit and create a world to serve mankind, yet natural ecosystems and commodities are becoming exhausted, overused, depleted or extinct.

Man, nature and architecture form three separate entities but by exploring the single connections between each: Man and nature; nature and architecture; and man and architecture, connections can be made throughout and co-existence can form between the three providing a platform that eradicates hierarchy and views each entity as an equal and important aspect towards fighting climate change.

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ONE | INTRODUCTION

Chapter one provides the framework for the research by discussing the background and justification of the study, stating the problem, aims and objectives, setting the scope of the study, introducing the theories and concepts and explaining the research methods and materials.

1.1 Background

"We are living in the beginning of a mass extinction. Our climate is breaking down…Lots of solutions are talked about, but what about a solution that is right in front of us…"

– Greta Thunberg (Mustill, 2019)

Greta Thunberg, a 16-year-old Swedish Environmental Activist, along with British Environmental Activist George Monbiot, released a short film titled: *"This Is Not A Drill"* in order to raise awareness of the risks posed by climate change. George Monbiot adds to the quote above by stating,

"there is a magic machine that sucks carbon out of the air, costs very little and builds itself. It is called a tree. A tree is an example of a natural climate solution. Mangroves, peat bogs, jungles, marshes, sea beds, kelp forests, swamps, coral reefs. They take carbon out of the air and lock it away. Nature is a tool we can use to repair our broken climate."

– George Monbiot (Mustill, 2019)

The mass extinction that Greta Thunberg refers to is the sixth mass extinction in earth's history and is underway due to a 'biological annihilation' of wildlife and the natural environment. In recent decades which has seen up to 200 species going extinct every day. According to Damian Carrington, an environmental journalist for The Guardian, scientists put the blame for the sixth mass extinction on human overpopulation and overconsumption and that it is a huge threat to the survival of human civilisation (Carrington, 2017).

The human population is growing at such a rapid pace that the planet is running out of resources to sustain it. Every day, on average, 400 000 people are born and only 160 000 die, leaving an additional 240 000 people (Nations, UN Climate Action Summit 2019, 2019). The increase of people means more space is needed for construction, more modes of transport, more

consumption of fossil fuels and more pollution which are aiding in the destruction of earth. The current population of 7.7 billion people is expected to reach 8.6 billion in 12 years, according to The United Nations (Nations, 2017). Population growth will lead to an increase in demand for basic necessities such as food, water and shelter which will then see an increase in poverty and pollution. This all negatively effects the environment and will further add to the current threat of global warming. More people will bring about more city development, more densification as well as more urban sprawl as people seek solitude from the densely packed cities, but there is only so much land. As the cities expand, they seek land that hosts natural vegetation, cities get preference over the space and the greenery soon becomes brick and concrete.

One of the biggest contributing factors to global warming is the agricultural industry which is constantly expanding to provide food for the increasing population. According to Kip Andersen, a writer who promotes a sustainable lifestyle, one third of the earth's surface is devoted to agriculture. Cities and agricultural land are expanding causing the destruction and depletion of forests and natural environments and habitats (Andersen & Kuhn, 2014). Cities and agricultural land are growing without consideration of the natural environment and with the intention to keep nature and the built form as separate, disjointed entities that overlap with man's desire to connect the two (Day, 2002). A world to serve man-kind has been created (Arthus-Bertrand & Pitiot, 2015).

Before the influence of man, the sandy Durban bay was populated with flamingos, crocodiles and hippos that were surrounded by swampy edges dense with mangroves. Beyond that were lush green hills home to elephants, hyenas and lions that roamed freely around areas that are today densely populated with people. Once the Durban population started growing the city took preference over the mangroves, the uMgeni river mouth was moved and built form replaced natural vegetation (Municipality, 2018). Urban growth comes about as cities represent centres of culture, religion and learning, but most importantly, economics with increased job

opportunities, a centralised market, better pay and higher individual wealth. Durban's inner city formed densely around the harbour surrounded by the developing suburbs and farming was pushed to the outskirts of the city (Beatley, Biophilic Cities, 2011).

South African cities suffer from disruptive apartheid planning from the past which has led to segregation and exclusion. The cities are divided with the division happening with people as well as typologies and building functions. Farming happens on the outskirts of cities because they take up horizontal space that the city can use for vertical development which increases the potential of making more money. People live in city centres but the natural environment happens elsewhere. The connection between man and nature has become near non-existent within the city environment.

1.2 Structure of the Dissertation

Chapter one:

Chapter one provides the framework for the research and serves to introduce the research problem and outline the approach in which the author is taking.

Chapter two:

The literature review unpacks the three main focuses of the research and explores them in greater depth. The connection between man and the natural environment defined as the Architecture of Hedonism and investigates man's connection to nature and social sustainability. Ecological Architecture is used to define the connection between the built environment and the natural environment by researching the restoration of natural elements, natural environments in the city and sustainable architecture. The connection between man and the built environment is defined as social infrastructure which seeks to understand man's connection to nature and inclusive architecture.

Chapter three:

This chapter seeks to explore and understand precedent studies that include: One Central Park in Sydney, Australia; ACROS Prefectural International Hall in Japan; and Superkilen Park in Copenhagen, Denmark. The precedents will allow for the further exploration of the connections between nature, man and architecture through the analysis of existing built form. The analysis will make use of concepts developed from the theoretical framework and literature review to further investigate their specific impacts and their added value to this research.

Chapter four:

The case study that will be analysed is Battery Park located in Cape Town, South Africa. The analysis will be a thorough depiction of the case study and include the positive and negative impacts and challenges it proposes within the surrounding area. Similarly, to the precedent studies, the analysis of the case study will make use of concepts developed from the theoretical framework and literature review and how that applies to a South African context.

Chapter five:

Chapter five will layout the data analysis and findings while introducing the exploration, discoveries and proposals that report on information gathered in previous chapters.

Chapter six:

The conclusion will summarise the findings and begin to introduce the design intervention that responds to the information that has been outlined in this dissertation.

Chapter seven:

Chapter seven will exhibit the design proposal of an Eco-Social Sustainable Hub within the Durban CBD. This section outlines the design proposal process through the implementation and incorporation of the design drivers, research focus, theoretical framework and analyses that were researched and investigated above.

1.3 Motivation/justification of the study

There is an extensive array of literature that has demonstrated how critical it is to form connections between man, nature and built form and how this effects a city socially, economically and physically, as well as how the impact of the increasing global population effects our city growth and natural world. (Giddings, Hopwood, & O'Brien, 2002) There is a need for man to connect to nature and a need for sustainable cities that will be able to provide for the large population it houses. In researching and investigating the relationship between nature and the built environment one is able to explore an architecture that can coexist with an existing natural environment while refining the city on a social and sustainable level.

This research is motivated by the ever-growing city and its constant exclusion of the natural environment. The influence of an architecture that coexists with a natural environment that provides for the people in the city will be investigated and relating theories and concepts will be explored and unpacked.

Definition of the Problem, Aims and Objectives

1.4 Definition of the problem

Before Durban was populated it was once a sandy bay that was home to flamingos, crocodiles and hippos, followed by a swampy edge that was thick with mangroves and beyond that lay lush green hills where elephants, hyenas and lions wandered freely. Once the city started growing the mangroves disappeared, the uMgeni river mouth was moved and built form took over natural vegetation. Farming remained on the outskirts of the city and as the city expanded and surrounding suburbs developed, the farms moved further and further out. (Municipality, 2018)

Today, the Durban CBD is developing without the consideration of what came before the built form and developers continue to build with the intention of keeping nature out by over waterproofing and keeping plants and buildings as separate entities only creating visual connections for people. Architecture and nature become two disjointed entities, overlapping with man's desire to connect the two, yet failing to coexist in this particular setting. According to Christopher Day,

"Environment affects us. It affects both social and personal health; body soul and spirit. For 90% of our lives, environment means built environment. Buildings, space between them, journeys amongst and through them" (Day, 2002, pg. 6)

He goes on to add that the built environment is responsible for roughly half the air pollution, generation of waste and soil destruction that is seen today, yet the connection to the environment should always be beneficial to human lives (Day, 2002).

The definition of this research problem can be viewed through three different lenses; socially, economically and physically. Socially being the lack of identity within the city as there is a

huge influx of people from vastly different backgrounds that convey the constant threat of historical racial segregation, current homelessness and poverty which brings about a community that do not interact. Economically, the world has become commercialised and profit driven with the influence of globalisation. An example will be the importing and exporting of food in South Africa. Locally farmed food is exported for a higher profit and cheaper food is imported and sold for our consumption with little consideration for the environmental impact that it generates. There has been a decline in social farming and a rise in commercialised farming. In addition, the physical aspect is that buildings continue rising in the city with no consideration of the environment or the people and natural ecosystems and habitats get destroyed in the process.

1.5 Aims

The primary aim of this research is to explore the principles and application of environmental rehabilitation and how it can influence sustainable development in the Durban CBD.

1.6 Objectives

This research project aims to:

1. Investigate sustainable approaches that can be implemented to counter act the impact that the built environment has on the natural environment.
2. Explore the relationship between man and nature and how the implementation of environmental rehabilitation can impact an area.
3. Research urban densification and how the inner city can define an identity and recreate a natural connection within the confinements of a city.

Setting the Scope

1.7 Delimitation of research problem

This dissertation primarily investigates the negative impact of rapid population growth and how the cycle leads to pollution, poverty, homelessness and the sustainability crisis and sets to investigate and propose a built form that can coexist with the natural environment in order to sustain and rehabilitate the state of the land. The research will present an analysis of how environmental rehabilitation can be implemented through architecture to facilitate urban regeneration and improve the social aspect of the city through an eco-social sustainable hub.

The researcher acknowledges that homelessness, poverty and pollution are a much greater issue within South Africa and that researching it in its full capacity sits within a greater field of investigation that extends beyond the field of architecture and urban design. The researcher also acknowledges that all farming cannot take place within the city as well as the fact that an urban farming scheme will not provide food for everyone.

Through research, thorough analysis, and by approaching the objectives with an unbiased, open mind the researcher will provide a solution to a growing worldwide problem that could well be a template for the design of a future city.

1.8 Definition of terms

The terms below have been defined within the context of this dissertation in order to provide a clearer understanding of the research:

Apartheid: A policy that enforced segregation and discrimination on the grounds of race.

Central Business District (CBD): The city centre and financial district.

Eco-Social: Derived from Social Ecology. A framework that investigates the many levels of a social system as well as the interactions between individuals and environments within this system.

Ecology: Studies the interactions and relationships of organisms to one another as well as their physical environment.

Environmental Rehabilitation: The process of returning land in a specific area to some degree of its former state, after some form of development or process has resulted in its damage.

Fossil Fuels: A fuel that is formed by natural processes such as coal or gas that forms from the remains of living organisms.

Gentrification: Renovating and improving an area so that it adheres to middle class taste, forcing current residents to leave the area.

Global Warming: A slow increase in the overall temperature of the earth's atmosphere that causes corresponding changes within the environment.

Globalisation: The progression of interaction or integration among people, governments and businesses worldwide.

Sixth Mass Extinction: Also known as the Holocene or Anthropocene Extinction. Species are currently becoming extinct or evolving into a new species entirely due to human activity.

Social Hub: Spaces that function as vibrant, shared public realms. A building block for producing a cultural heart.

Sustainable Crisis: The joint effect of environmental changes that are destroying the environment in which humanity can exist in the long term. The environmental changes include ozone depletion, the loss of biodiversity and mass extinction, the degradation of land and ecosystems, drought, pollution and climate change.

Sustainable Hub: A sustainable centre or network of activity that provides a platform for sustainable input and education.

Urban Ecology: The study of ecosystems that include humans living in cities and urbanising landscapes.

Urban Fabric: The physical aspect of urbanism, emphasizing building types, thoroughfares, open space, frontages and streetscapes.

Urban Farming: The growth and production of food within an urban setting or a heavily populated town or municipality.

Urban Regeneration: An attempt to avoid a decline within an urban setting both physically and economically.

Urban Sprawl: The migration of residents from populated cities to suburbs and low-density residential developments on undeveloped land.

Urbanisation: An increase of a city or town's population due to rural to urban migration or population growth within the existing framework.

Urbanism: The study of the interaction of inhabitants of towns and cities with the built environment.

1.9 Stating the assumptions

This dissertation assumes that there is insufficient natural resources and basic necessities to entertain rapid population growth worldwide which, in turn, results in increased poverty, pollution and homelessness. It is also assumes that environments influence people, and that the implementation of a natural environment within the built environment will bring about positive changes.

1.10 Key Questions

1.10.1 Primary Question

How can the implementation of environmentally responsible architecture within the Durban CBD enhance the social aspects within a city?

1.10.2 Secondary Questions

1. What are the benefits of the relationship between man and the natural environment and why is there a disconnect?
2. How can architecture and the natural environment sustainably co-exist?
3. How can the built environment promote a sustainable social space for Durban?

Theories and Concepts

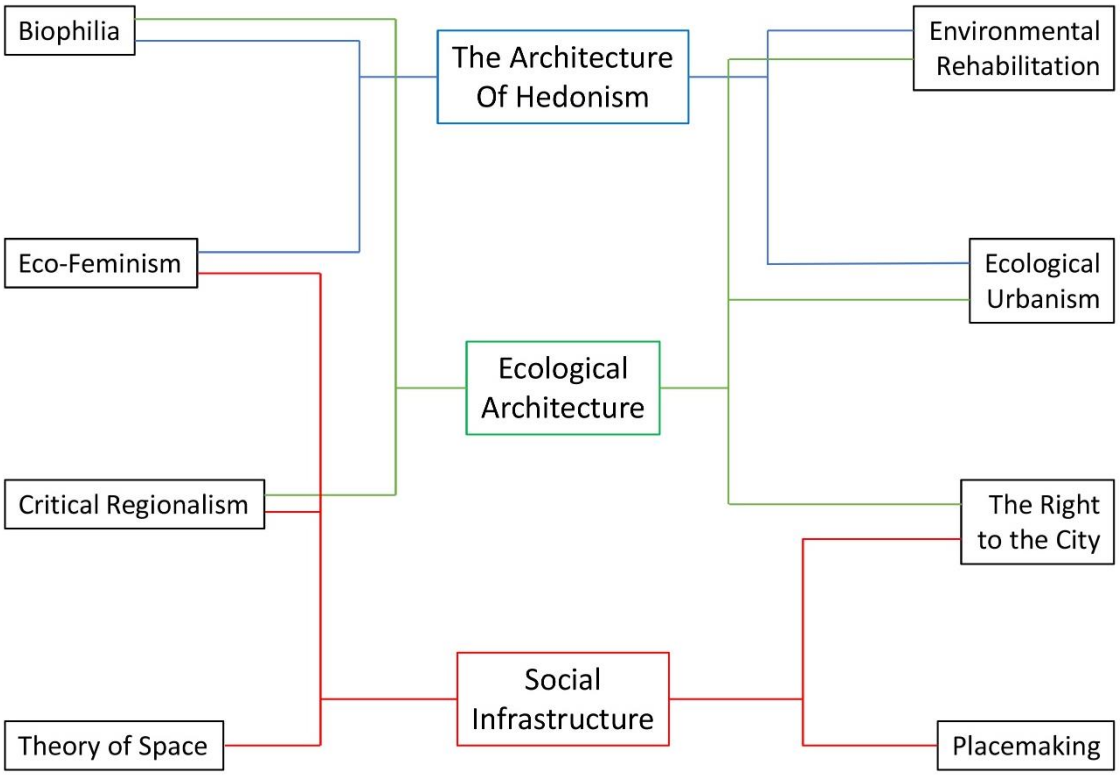


Figure 1: Diagram explaining connections between theories and concepts. By Author, 2018

1.11 Theories

The theoretical framework that is used in this dissertation is outlined below and viewed through the lenses of various theorists and architects. The theories used include Biophilia, Eco-Feminism, Critical Regionalism and The Theory of Space. The theories that have been chosen have similar or relatable attributes to at least one other theory as well as a correlation to the conceptual framework used.

1.11.1 Biophilia

"The innate tendency to focus on life and lifelike processes to the degree that we come to understand other organisms"

- Edward O. Wilson (Kellert & Wilson, 1993)

The theory of Biophilia suggests that human beings have an essential inclination to seek connections with nature and other forms of life due to the co-evolution between nature and man (Beatley & Newman, Biophilic Cities are Sustainable, Resiliant Cities, 2013). Stephen R. Kellert, a pioneer of the Biophilia theory, believes that a paradox has moulded the normality of life as it is known today due to cities and suburbs being designed and built in ways that both degrade the environment as well as alienate man and nature, even though studies suggest that man needs nature in a deep and fundamental manner (Kellert & Wilson, 1993)

1.11.2 Eco-Feminism

"Ecofeminism is a movement that sees a connection between the exploitation and degradation of the natural world and the subordination and oppression of woman."

- Mary Mellor (Mellor, 1999)

Referencing Mary Mellor's definition of Eco-Feminism above, Eco-Feminism relates woman and nature who are both seen to be exploited, degraded and oppressed. In the narrative, woman symbolise subordinate groups such as woman, people of colour, children or the poor and nature symbolises animals, land, water or air.

The term 'Eco-Feminism' emerged in the 1970's and was established by a French feminist Francois d'Eaubonne which was intended to relate environmental damage to the exploitation and lack of empowerment of woman (Thorpe, 2016). The theory around ecofeminism becomes a social movement and was brought about due to capitalistic society that has led to a destructive

divide between nature and culture and aims to abolish all forms of social inequality while recognising and embracing the connection that human beings have with nature (Sturgeon, 1997).

1.11.3 Critical Regionalism

"The paradox: how to become modern and to return to sources; how to revive an old, dormant civilisation and take part in the universal civilisation."

- Kenneth Frampton (Frampton, 1983)

The above paradox that Kenneth Frampton points out is not entirely rejected, instead Frampton proposes an architecture that encompasses both positions. Critical regionalism came about due to an increase in the international style with the aim of contradicting the Placelessness and lack of identity as well as dismissing the eccentric individualism and embellishment of the postmodern era. (Frampton, 1983) Douglas R. Powell, a Critical Regionalist author, argues that critical regionalism is a theory that teaches the process of drawing from a regional map which then connects to personal experiences as well as that of others, otherwise described as the prediction and critique of relationships among people and places through the deliberate use of a region in order to envision better alternatives (Powell, 2007).

1.11.4 Theory of Space

"Space in itself cannot be an explanatory factor because societies transform in a considerable way without significant changes to the environment…the geographical

environment is a necessary condition of social development, but it influences this development rather than accelerating it or slowing it down."

- Henri Lefebvre (Stanek, 2011)

Stanek outlines the transition of urbanisation from the neighbourhood to a global level and how that translates into the urban setting today. Theory of Space offers various strategies to intervene usefully in contemporary questions concerning space, time, difference, urbanisation, state, colonisation and radical politics. (Stanek, 2011) Lefebvre defines space as a social product and states that as social circumstances change, so do social experiences. (Gieseking & Mangold, 2014)

1.12 Concepts

The conceptual framework that is used in this dissertation is outlined below and viewed through the lenses of various theorists and architects. The concepts used include environmental rehabilitation, ecological urbanism, the right to the city and placemaking. The chosen concepts assist the theoretical framework and complement the focus of the research.

1.12.1 Environmental Rehabilitation

The concept of Environmental Rehabilitation is a management strategy that aims to slow down or reserve the negative consequences of land damage and the overuse of land. Land is damaged in order to serve human needs through agriculture, the built environment, mining and other activities that result in unusable land and damage to the natural ecosystems (Brown & Lugo, 1994). Environmental rehabilitation looks at rehabilitating the land which in turn rehabilitates the natural ecosystems allowing them to flourish. An understanding of environmental rehabilitation in conjunction with this research topic will see land rehabilitation and a built

environment that aids the maintenance of that rehabilitated land which creates an environment for natural ecosystems to prosper.

1.12.2 Ecological Urbanism

"Urban Ecology integrates both basic (fundamental) and applied (problem orientated), natural and social science research to explore and elucidate the multiple dimensions of urban ecosystems."

- Mark J. McDonnell (McDonnell, 2011)

The concept of Ecological Urbanism highlights factors such as climate change, urbanisation and ecology and how they influence the theory and practice of urban design. (Hagan, 2014) Ecological Urbanism forms a framework that addresses challenges that threat the natural environment and humanity, becoming critical to the future of cities as it fulfils humans need for health, safety, meaning and welfare. The emergence of ecological urbanism in the 1970's was partly due to the negative impacts that humans have on the planet becoming well documented as well as the increase of human settlements which was linked to aiding serious environmental problems that threaten the health of the human population in cities as well as rural areas globally (McDonnell, 2011).

1.12.3 The Right to the City

"The right to the city is, therefore, far more than a right of individual access to the resources that the city embodies: it is a right the change ourselves by changing the city more after our heart's desire."

- David Harvey (Harvey, 2012)

David Harvey states that changing the city depends upon the exercise of a cumulative power over the process of urbanisation which means that the Right to the City is a collective right rather than an individual right. The concept enables the residents to participate in the use and production of urban space as well as enabling them to two central rights: the right to participation and the right to appropriation (Harvey, Rebel Cities: From the Rigth to the City to the City Revolution, 2012).

1.12.4 Placemaking

Placemaking is a process in which a community works together to shape public spaces, which in turn brings together diverse people that improves a communities cultural, social, economic and ecological aspects. This concept exploits a community's assets, inspiration and potential with the aim of creating public spaces that promote health, happiness and well-being. The approach is centred around people and communities is not primarily about building or fixing up a space, but a process that fosters the creation of vital public destinations (Flemming, 2007).

Research Methods and Materials

The research approach and methodology applied to this study is outlined within this section. The procedures for all data collection (primary and secondary), techniques and methods used are defined here.

This research primarily made use of qualitative research methods and both primary and secondary data collection as it best suited the research topic allowing for smaller sample groups to be taken. Quantitative methods require an intense and time-consuming analysis which has deemed itself impractical for this study apart from the implementation of a basic questionnaire within the research methodology.

The primary data collection made use of interviews, questionnaires and site survey and analysis. The interviews were semi-structured and were conducted with applicable people in small samples. The interview allowed for a greater understanding of the challenges or opportunities within the context of this study. The interviews were targeted towards community and NGO leaders that knew the area best and others that made use of specific spaces within Durban CBD. Questionnaires were helpful as they aided the quantitative information and were conducted through random sampling which revealed a breadth of insights. Random sampling is a sampling technique that gives each sample an equal probability and represents a greater population with an unbiased outcome. This sampling technique is a simple form of collecting data that represents a diverse population. The site survey and analysis was an observation process and mapping exercise in order to understand the area and its surrounding context in a greater sense.

The research aimed to investigate, in some depth, the theories and concepts appropriate to the research question and greatly assisted in formulating the discussion on the concepts appropriate to the research question. The exploration of these various sources aided the theory and literature by formulating the discussion on the concepts behind environmental rehabilitation, social hubs and urban farming techniques which, in turn, helped to propose a framework that could be used to generate responsive architecture.

The data generated from the research was reliable as every effort was made to ensure its integrity throughout the collection and analysis process. The data that was collected was regulated in an open and unbiased manner and all the research was conducted in an ethical manner, all sources were referenced and anonymity of participants was enforced where necessary.

1.13 Primary Data Collection

1.13.1 Interviews

The interviews of NGO's and Urban Environmentalists were semi-structured and compiled with the assistance of NGO leaders, where necessary, within Durban. Homogenous and purposeful sampling was used to accumulate an adequate sample size of research participants who fit the criteria from diverse backgrounds, race, age and gender. The data collected from the interviews aided the topic by supplying a more in depth understanding of issues and possible outcomes for the Durban CBD that were important as it allows the topic to answer what the people need and expect.

1.13.2 Questionnaires

The attached questionnaires will enable the researcher to cover a larger base of interviews in a shorter time frame and provide a platform to start the research process.

1.13.3 Site Survey and Analysis

The site chosen to conduct the research is located 300m North-East of the Durban Harbour and 600m West of the South Beach Beachfront. The site was chosen for its proximity to the harbour, its location in between two residential zones and its connection to surrounding nodes within the Durban CBD. The chosen site currently sits in a semi-industrial strip that is occupied by panel beaters and vehicular repair services that is bordered by South Beach residents to the East and Victoria Embankment residents to the West. The Durban International Convention Centre is located 300m North-West of the site providing a wide variety of strong influences in which the research takes place. The location of the chosen site suits the research topic as it lies on the Eastern Vlei that channels storm water through the city and into the harbour thus allowing the topic to incorporate this into the conclusion.

Durban's climate can be classified as a humid subtropical climate that experiences hot and humid summers and warm and dry winters while lying 16m above sea level. Rainfall is higher in the summer months but has a significant amount of rainfall throughout the year with an average of 975mm per year. The social status of the specific site falls under the medium to low income bracket with a fair amount of homelessness and poverty throughout.

The site was critically analysed through observational studies and the researcher made use of photographic compositions in order to fully represent and understand the layers of analytical research and challenges evident in the chosen area.

1.13.4 Case Studies

A case study allows for a greater understanding of the relationship between architecture and people as well as allowing for the exploration of the theoretical framework in a tangible situation. The case study served as a means to gaining an understanding of the current setting for experiential qualities and processes that exist in Durban, South Africa. The specific case study that was chosen enforced the idea of opening up waterways and creating social spaces through the implementation of the natural environment. The idea was to analyse the success of these social spaces and the relationship between man and nature within these spaces in order to fully understand how it all co-exists.

1.14 Secondary Data Collection

Secondary data collection will help the researcher obtain important knowledge on the topic and will be outlined in the published literature review and bibliography which will include relevant information on the topic and theories that relate to the literature. The secondary research will form the bulk of this research document. The case studies will include homeless shelters, social living experiments as well as urban farming attempts.

TWO | LITERATURE REVIEW

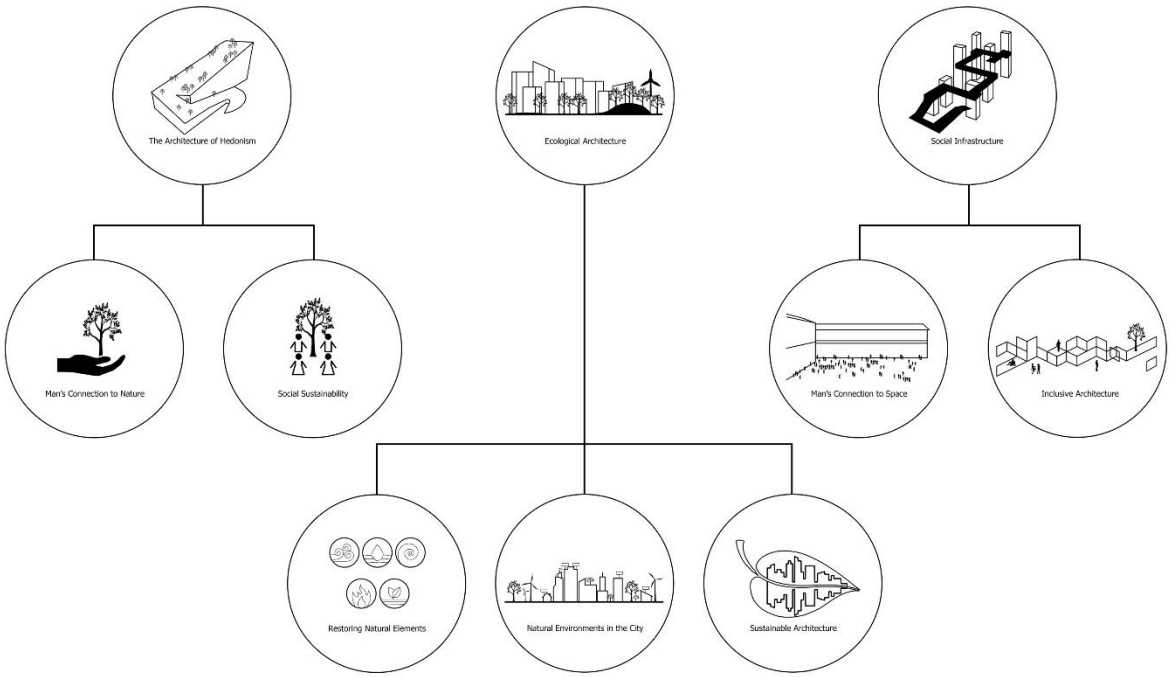


Figure 2: Research Focus. By Author, 2019

2.1 Introduction

This chapter will deal with the review of literature and is set out to provide a framework in which environmental rehabilitation and its impact on the built environment can be fully understood. The literature review will provide necessary background information in order to form an individual understanding of the topic of this research document, which will be the framework towards developing the architectural typology. The literature review looks at three important connections that form a vital role in the understanding of this research topic namely being: man and the natural environment (the architecture of hedonism), the built environment and the natural environment (ecological architecture) and man and the built environment (social architecture) in order to fully research the impact that man, the built environment and the natural environment have on each other and to lay a solid foundation of exploring a way forward where all three aspects can efficiently and effectively co-exist.

2.2 The Theory of Eco-Feminism

Feminism, a movement born from the inequalities that woman faced and the platform that cultivated ecofeminism. Feminism is seen to have four waves, as stipulated by Professor Martha Rampton, its first wave starting in the late 19th and early 20th centuries with the aim to create opportunities for woman and fight for woman's right to vote. The second wave started in the 1960's which aimed to broaden the fight for woman and include woman's role in society, cultural inequalities, reproductive rights and gender normalities. The third wave began in the 1990's due to feminism losing momentum because of varying feminist outlooks. This wave led to a true understanding of the term and acceptance of what feminism is about. Rampton goes on to add that the fourth wave of feminism is emerging at present through movements such as the #metoo Movement and the Times Up Movement which are fighting for equality between men and woman in society as well as outing the wrong doings of men towards woman's oppression (Rampton, 2015). The ideology of feminism can also be seen from different perspectives such as the radical feminist, the cultural/spiritual feminist, the socialist feminist,

the liberal feminist and the poststructural feminist from which ecofeminism draws inspiration. The different ideologies and interpretations of feminism still represent the same and/or similar goals when approaching woman's equality and rights and demand an equal place for woman in society. Whereas, the emergence of ecological feminism in the 1970's, introduced by French feminist Francois d'Eaubonne, aims to break down the structures and institutions that limits the philosophy of the feminist movement (Salleh, 2014). Francois d'Eaubonne coined the term ecological feminism in order to highlight the parallels that exist between a male dominated system that suppresses woman as well as the suppression of nature which d'Eaubonne believes that it results in the destruction of the environment (Gates, 1996).

Further interpretations of the term 'ecological feminism' grew into two different beliefs, one being an ecological stance on the feminist movement and the idea that woman have a stronger connection to nature and are oppressed in the same manner and the other being a movement aimed at the collapse of patriarchal dualism and that it consists of the oppressed and the oppressor. Catherine Larrére, a French philosopher, believes that ecofeminism embodies only two forms of domination, the first being men over women and the second being human over nature (Larrere, 2012), Virginie Maris adds to this belief by stating that ecofeminism does in fact embody domination but this domination is expressed through representation. Woman represent inferior groups such as woman, people of colour, children or the poor and nature represents animals, land, water or air (Maris, 2009).

An ecofeminist approach to architecture and the built environment is the adaptation of inclusive architecture, sustainable development and social infrastructure in order to achieve an all-inclusive approach to design that combats the hierarchy of the city-over-ecology dualism. The adaptation of ecofeminism promotes spaces that practically address equity, be it social, gender, racial or environmental, within a public urban space that in turn forms the reflection of a cities

well-being socially, economically, culturally and environmentally (Newalker & Wheeler, 2017). JR Thorpe, a feminist journalist, states that ecofeminism aims to enlighten and transform the way that the world relates to woman and the environment by transforming from domination and hierarchies to equality and communal interaction. An approach in an urban design setting implements communal decision-making, the natural environment within the city and sustainable design techniques (Thorpe, 2016).

2.3 The Architecture of Hedonism: Man and the Natural Environment

The architecture of hedonism is a hedonistic approach within the built environment which is a term that stems from the sustainability movement. The discussion around sustainability is often perceived as a concept that will be negatively life altering and one in which human beings will have to make sacrifices in order to achieve a more environmentally friendly lifestyle (Ingels, 2011). Sustainability, as defined by Brundtland in 1987, is an attempt to maintain the diversity of life on earth that supports the current population as well as maintaining the quality of resources for future generations (Meyer & Helfman, 1993). The sustainable definition, although very broad, stays fairly consistent throughout different departments but in order to fully achieve a comfortable definition within the built environment three pillars have to be met; economic, social and environmental. According to Bjarke Ingels, a Danish Architect who popularised the term, hedonistic sustainability focuses economic and environmental methods towards sustainability while introducing a youthful and dynamic approach in the built environment that proves that architecture can be both economically profitable and environmentally sustainable with an aim to improve the quality of life and human enjoyment through sustainable measures (Ingels, 2011)

The architecture of hedonism takes the connection between man and the natural environment and creates an architectural concept that can be applied to the built form. The term emerged due to the increasing need to transform the way man lives and the impact that they have on the environment (Ingels, 2011). Dominic Basulto adds to Bjarke Ingels' definition stating that the architecture of hedonism transforms the idea that buildings are structures by describing buildings as an ecosystem that can aid in creating a closed loop that recycles energy, minimises the environmental impact and improves the quality of life. Basulto believes that the starting point for sustainable cities are sustainable systems and with a hedonistic design, the built environment is transformed into an interwoven system (Basulto, 2011). Stephen M. Fiore states that many green and sustainable buildings today stand in contrast to the hedonistic approach as they fall short in contributing to human satisfaction throughout the design because they lack practical and pleasurable ergonomics (Fiore, Phillips, & Sellers, 2014).

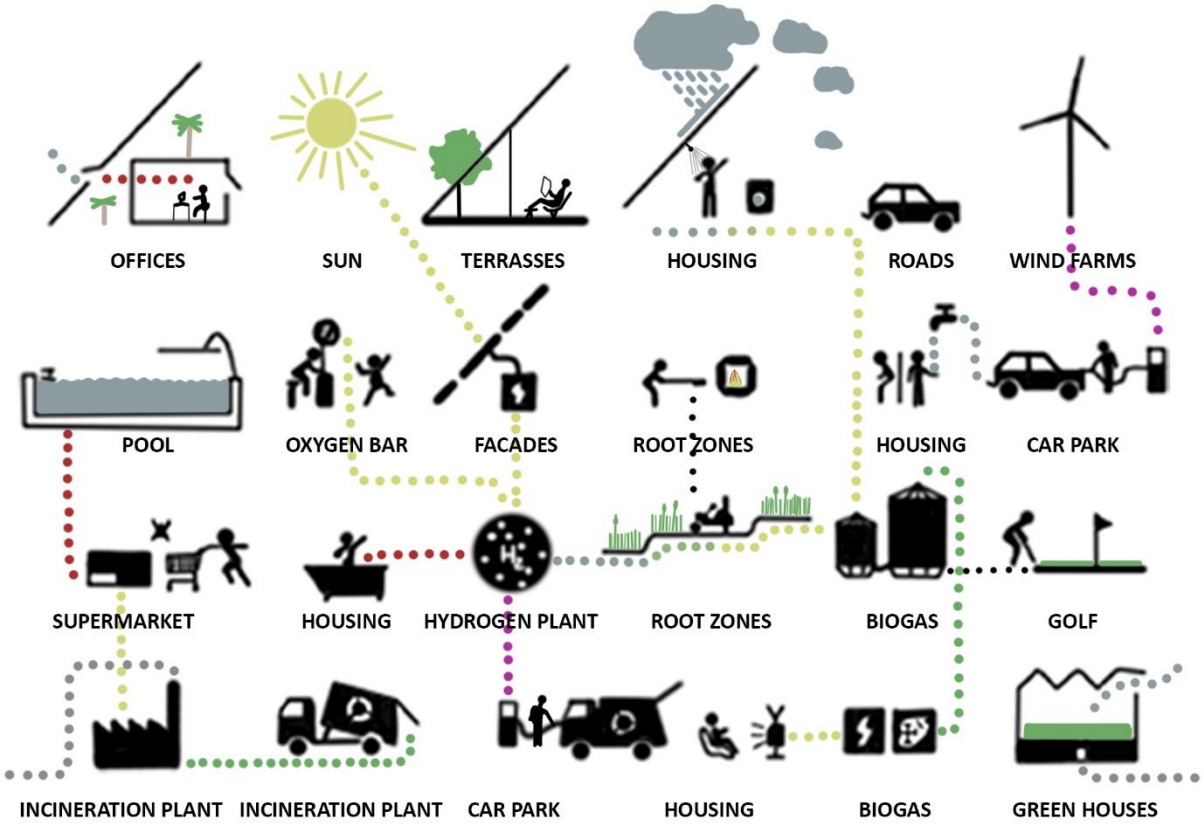


Figure 3: Diagram referencing Hedonistic Sustainability. By Author, 2019

The Ski Slope Power Plant in Copenhagen, called Amager Bakke, designed by Bjarke Ingels becomes a product of hedonistic sustainability. The building is located in an industrial setting within an urban environment that is known for its heavily negative impact on the environment. The design of the power plant becomes a hybrid project as it transforms a simple monolithic industrial fabric into a project that puts the needs of the environment and the inhabitants of the city first (Covatta, 2018). The building creates a platform for the community to ski, hike, climb and socialise but most importantly it starts a dialogue about waste and educates its users about their impact on the environment. Instead of burning fossil fuels, Amager Bakke burns household waste that cannot be recycled in order to produce electricity and heat to homes in Copenhagen with the use of state-of-the-art technology. Hedonistic sustainability can be seen throughout the design, construction and use of the building as it provides a better quality of life for the people of Copenhagen as well as having a positive impact on the natural environment especially for a building that should be producing dirty fuel and noxious gases (Rathi, 2019).

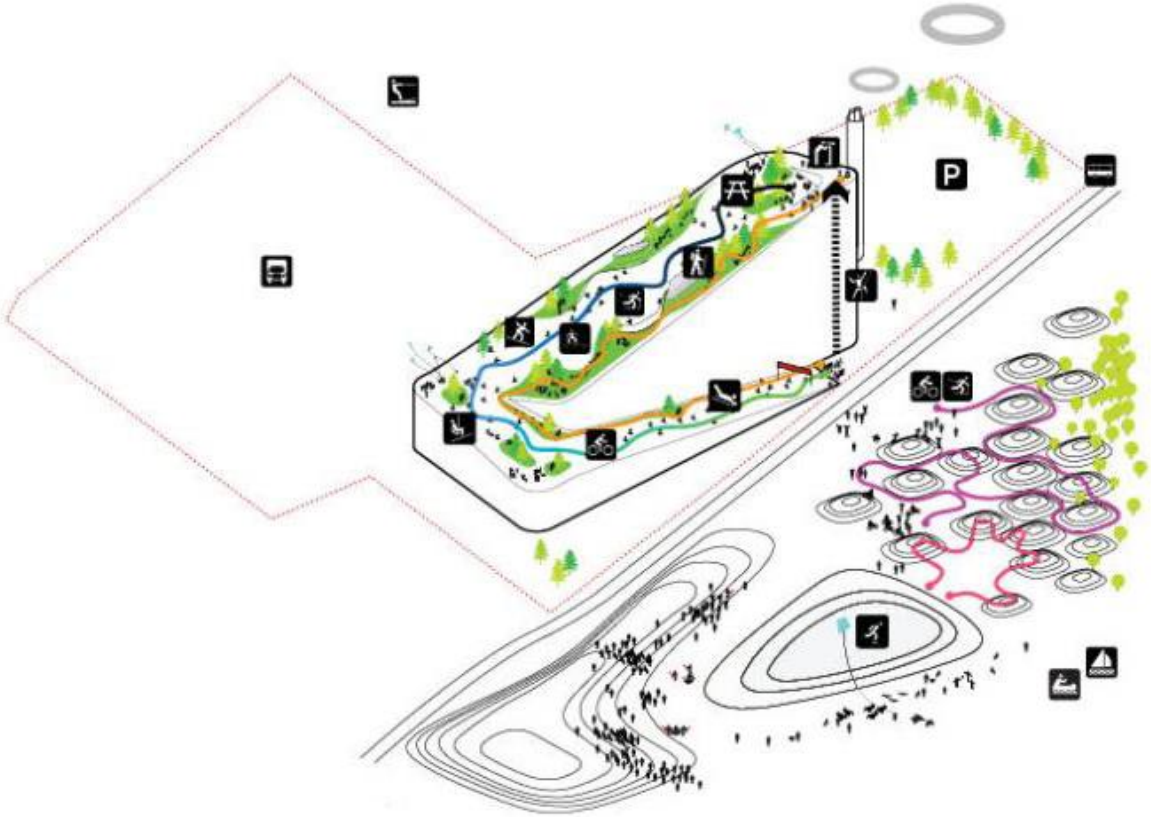


Figure 4: Image of the functions that take place on Amager Bakke. (BIG, 2019)

2.3.1 Man's Connection to Nature

Man's first connection with the natural world is at birth when we take our first breath of air and from there the natural world continues to keep the human population alive by providing clean water, food to eat, land to live on as well as clean air. Without the natural environment, living organisms would fail to exist. Although man needs nature in order to survive, man has constructed an attraction to nature which can be dated back to the origins of humanity. Humanity formed in savannas and open fields of nature with a landscape scattered with trees that formed canopies over water bodies and roaming hills in the distant view which possibly indicated food, shelter and places to explore. The appeal to the natural environment could represent mans need for survival (Frumkin, 2001).

Mankind's story begins in an all-natural environment that created the fascination with the natural world through the consciousness of humankind which was portrayed in the creation of imagery in cave paintings. In that same environment man evolved into a thinker with many natural events which were then filled with art, self-expression and culture. Then domestication, agriculture and animal husbandry came about which aided the development of civilisation. Man was in constant and direct contact with nature when shameanism was born, this gave the natural environment a spirit creating a level in which human life could further connect with nature. Sophisticated societies increased their level of disconnect with nature. As society became more sophisticated, tendency to control nature became apparent thus the connections to nature have decreased. Human beings have domesticated and dehumanised the natural world to a point where profit is more important than life (Arthus-Bertrand & Pitiot, 2015). Human evolution evolved from nature being home, to completely dominating and changing ecosystems to suit man. Humanity is destroying natural ecosystems and withdrawing its connection from what is left (Beatley, Biophilic Cities, 2011). With a faint connection between man and nature, evolving

towards a sustainable lifestyle in order to protect and improve the environment will prove to be difficult as humans cannot see the whole extend to which the environment is currently suffering (Arthus-Bertrand & Pitiot, 2015).

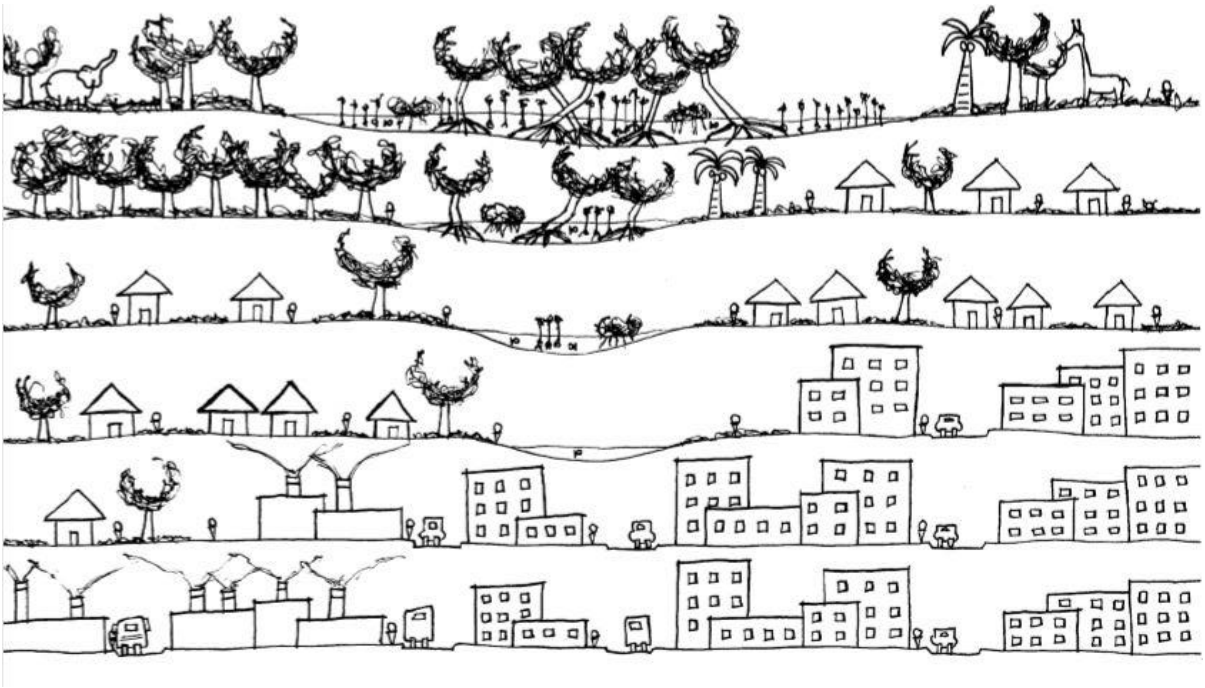


Figure 5: Sketch of the development of Durban. Natural environment became built environment. By Author, 2019

Biophilia is a theory that studies the benefits of human and nature interactions by infusing nature within the built environment with the aim to connect human beings with the natural realm to improve wellness and overall quality of life. According to Timothy Beatley and Peter Newman, biophilic design is a humble and stylish approach to counteract the distance that is being created between man and nature and that nature within cities can promote a connection with nature as well as a healthier and more sustainable lifestyle (Beatley & Newman, Biophilic Cities are Sustainable, Resiliant Cities, 2013).

2.3.2 Social Sustainability

Although sustainability focuses solely on the improvement of a natural world which aims to achieve the minimal social requirements, it can be argued that a new definition would be

suitable as defined by Sebastian Brandl, sustainability forms a relationship between ecological systems and social aspects that need to be maintained and shaped in order to improve the system as a whole. He adds that a sustainable approach includes the preservation and improvement of both human beings and ecosystems equally, not one at the expense of the other, in order to promote coexistence (Littig & Grieβler, 2005). Iman Ibrahim states that social sustainability is vital in achieving the overall sustainable approach as it forms one of the three important pillars within the sustainable realm (Ibrahim, 2015). Sustainability within a social setting becomes a lifestyle of its own, without sacrifice, instead increased improvements (McKenzie, 2004). Cities are influenced by capitalism and the constant emphasis for economic growth which has become a major factor in the imbalance of sustainable cities but the success of these cities are largely influenced by the well-being of its society which human health aspects contribute immensely, Beate Littig and Erich Grieβler believe that human health can be directly influenced by the natural environment, which means human health can be influenced by sustainability (Littig & Grieβler, 2005).

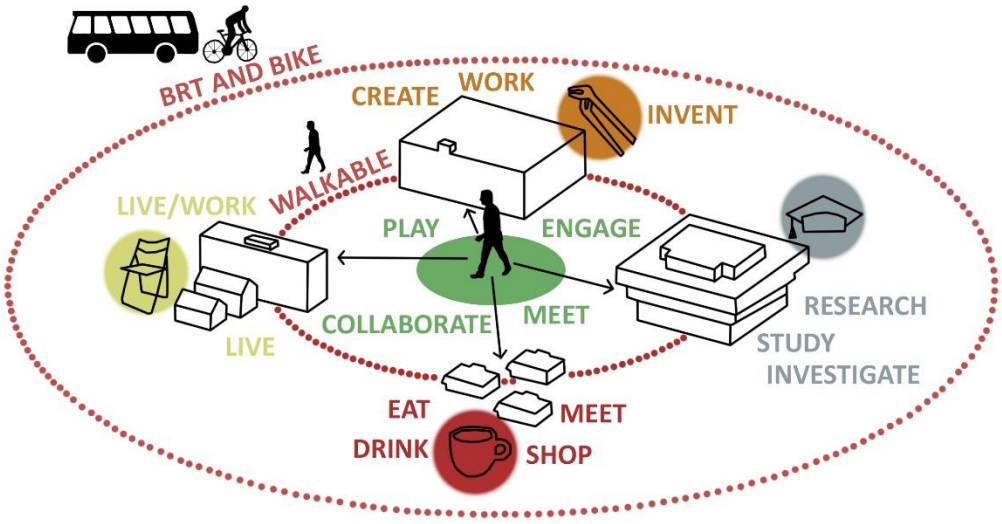


Figure 6: A lifestyle as a result of social sustainability. By Author, 2019

Social sustainability becomes a platform that focuses solely on the connection and interaction between society and nature which determines the quality of a society and meets the needs of

the current population as well as allowing future generations to comfortably meet their own needs. Sustainable societies can promote sustainable lifestyles which will contribute to the overall sustainable goal (Littig & Grieβler, 2005). An example of this can be seen in the design and use of the Swecohuset Office building located in Stockholm. The building was constructed in the late 1960's and can be described as a 14-storey brick and concrete block. In 2016 the building was transformed from a conventional office building to an indoor environmental with the use of sustainable and social aspects at the forefront of the design. Sweco Architects, the architects who redesigned and occupy the building, made use of a centralised space in order to create an internal "living room" that resembles a courtyard and functions as a social gathering space with open plan work spaces strategically placed with visual connections to one another as well as the "living room". The "living room" allows for social interaction between co-workers and visitors, a safe space for social cohesion and inclusivity as well as a platform for participation. The building promotes a sustainable lifestyle through its environmentally friendly construction and use as well as providing healthy social spaces throughout the design which allows it to successfully portray social sustainability within built form (Johansson, 2014).

It can be argued that social sustainability can be viewed through an ecofeminist perspective because it promotes sustainable social spaces that correlate with the inclusive idea that the theory of ecofeminism aims to portray. This relation can be envisioned successfully through the work of Damayanti Banerjee and Michael Mayerfeld Bell who state that ecofeminism and the study of social interactions are closely linked because ecofeminism is essentially a social theory (Banerjee & Bell, 2007). The movement of ecofeminism is the result of people looking for social change within societies, Judith Plant argues that society has rendered woman and the environment as second class citizens and that the ecofeminism movement is searching for justice and change by understanding the interconnected origins of all domination fighting the fact that everyone and everything are equal and apart of one another. Plant adds that the ecology protects the environment in the relationship between human and nature which is the inferior,

and feminism protects the female in a man and woman relationship, therefore ecofeminism protects the inferior (Plant, 1991).

Figure 7: Social change within a society, bringing environmental factors to the forefront. By Author, 2019

2.4 Ecological Architecture: The Built Environment and the Natural Environment

The natural environment provides the world with ecosystems that positively improve it by maintaining healthy earth quality, regulate temperatures and precipitation, prevent flooding, provide clean drinking water, maintain healthy and productive soil, preserve biological and genetic diversity and provide renewable and natural resources. The built environment provides shelter and includes patterns of development, transportation infrastructure and building location and design which effects the natural environment directly by taking the place of natural ecosystems and fragmenting habitats that impact people's health and the natural environment through air and water pollution and the global climate (EPA, 2013). Ecology is the study of the intertwined relationship between animals, plants, climate and their respective environments as well as the spatial connectivity between the natural environment and the built environment (Ibrahim, 2015). The study of ecology does not limit itself to investigating one individual

species but instead looks at the relationship between all living things and how different segments of the ecosystem interconnect and form an intersecting web that ultimately sustains life. The concept of ecological urbanism simply studies the multiple connections between the built environment and the natural environment as a coexisting ecosystem, suggesting that the city becomes part of the environment (Anker, 2006). Mark J. McDonnell, an urban ecologist from Melbourne University, defines urban ecology as the integration of both basic and applied, natural and social sciences in order to investigate and explain the various and intertwining dimensions of urban ecosystems which emerged from the sub discipline of ecology after human settlements started booming which threatened natural environments (McDonnell, 2011).

Figure 8: The urban fabric becoming an ecological urban fabric that forms part of an eco-system. By Author, 2019

Ecology in architecture becomes a segment of an ecosystem that seeks to combine the interests of environmental consciousness, sustainability, natural and organic approaches in order to achieve a design that is relative to its site, urban context, its inhabitants and local micro-climate and topography (Ibrahim, 2015). Ecological architecture proposes that architecture and the built environment become an integral part of natural ecosystems as it forms spaces that houses and maintains living organisms which promotes their survival. With that being said, the built environment and the natural environment would need to transform from two separate entities into a web of entities that functionally and successfully co-exist (Collins, et al., 2000).

The city of Lagos in Nigeria has seen a population growth of 9 million people in the past 17 years and is expected to double its 17.5 million people by 2050. The cities infrastructure and planning has not been able to adapt and cope with the population growth and the city is drastically changing the environment in a negative manner. Lagos does not have sufficient land or buildings to house the economy and people which is resulting in buildings being constructed in water, marshes and other natural, inhabitable spaces which is resulting in dense and compact city spaces that are further depleting the natural environment and creating a further disconnect between people and nature. Lagos has manipulated the natural land and transformed it in order to accommodate built form and an increasing population (Leithead, 2017).

Figure 9: An image of housing in Lagos, Nigeria. (Leithead, 2017)

2.4.1 Restoring Natural Elements

The earth took 4 billion years to get to where it is today, 4 billion years without the destruction that humans have caused. Mankind has managed to destroy it in 200 thousand years. Human

beings have completely transformed and moulded the earth and natural systems by adding new layers on the surface such as roads, bridges and buildings as well as leaving scars below the surface from activities such as mining. The planet has been transformed to a point that it might not be able to sustain humankind any longer without positively changing the way the earth is treated. If man-kind died out, the man-made world would fall apart and the earth and natural environments would flourish (Aronofsky, 2018). An example of this can been seen on the Hashima Island in Japan which used to be home to 5000 undersea coal miners and their families. The island was abandoned in the mid 1970's due to the depletion of the coal reserves and the popularity of petroleum being used for fuel which resulted in many people leaving because they were out of work. The buildings and man-made structures on the island have started to crumple and nature is flourishing and dominating (Goldfarb, 2018).

The rapid population growth worldwide is challenging nations in terms of food production, the availability of land for human use as well as the ecological integrity of the land left undeveloped. As the population grows and seeks a better quality of life, the need for rehabilitation within the environment has become increasingly important in order to increase the availability of resources and attempt to counteract the negative impact that people have on the environment (Roseland, 2012). According to Kip Andersen the rate at which land is being used and destroyed is severe with an acre of rainforest cleared every second to accommodate for building and agriculture, we are running out of world (Andersen & Kuhn, 2014).

The concept of environmental rehabilitation emerged as communities needed to restore damaged lands due to overuse, modification of topography, compaction of soils, unchecked erosion, continuous cropping without fallow periods or crop rotations and complete removal of vegetation cover for human activities. Damaged lands are unable to positively contribute to a sustainable economic development and the process of land rehabilitation is a fundamental step

for increasing the chances of sustainability. The rehabilitation process of the environment is a proposal as a management strategy that aims to reserve or slow down the negative consequences of land damage or degradation that will result in renewed or alternative natural ecosystems that can be reused to serve human needs (Brown & Lugo, 1994).

Environmental rehabilitation projects are becoming the solution to over-mined land in order to transform the land into fields for agriculture and natural fauna to sustain livestock as well as rehabilitating marshes, rivers and soil that has been damaged by human industries (Kenton, 2018). The harbour in Copenhagen went through a rehabilitation process where the harbour water has been cleaned and there has been an attempt to reintroduce the natural ecosystems that came before. It is one of the only harbours in Europe that is clean enough to fish and swim in. Beforehand, the harbour was located in a 'dead zone' where it was void of social spaces and very industrial, the rehabilitation of the harbour has allowed for social projects such as harbour beaches and harbour baths to be constructed which see many city inhabitants and tourists throughout the year (Kirk, 2016).

2.4.2 Natural Environments in the City

Just as man has drifted further away from nature, so have cities and urban environments as food production and forestry's are relocated outside cities leaving open canvases in the cities for built form to take over and adhere to human demands. The built environment effects ecosystems and replaces natural environments within city settings in order to accommodate development and food production. Just as man benefits from nature, so do cities and urban environments (Bakker, Dubbeling, Gundel, Sabel-Roschella, & de Zeeuw, 2000).

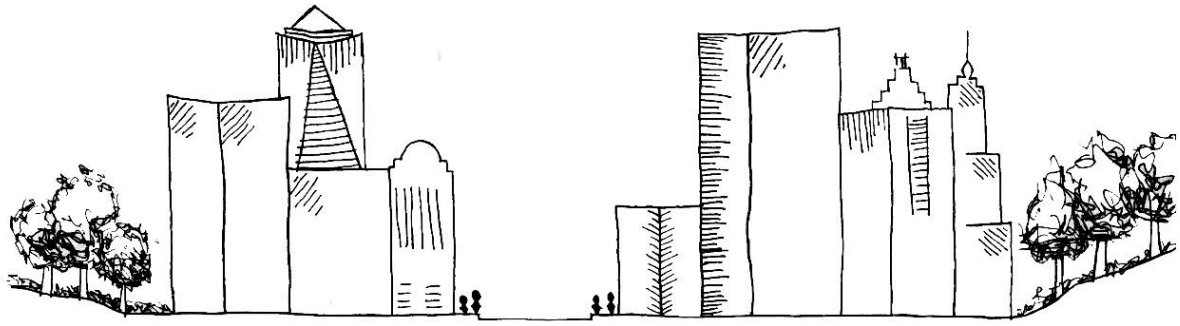


Figure 10: A sketch representing natural environments on the outskirts of cities. By Author, 2019

Sustainable cities and regeneration proposals tend to lean towards man-made and built interventions in the urban environment, which also includes artificial natural elements, and little consideration is given to the reintroduction of nature within our cities. The presence of the natural environments within a city can be in the form of urban parks and open green spaces which have proven to be invaluable to cities through improving the quality of life as well as improving the urban environment and society. The natural environment offers important environmental services such as air and water purification, wind and noise buffers and microclimate stabilisation but having a natural environment within a city adds social and psychological benefits that make modern cities livable and improve the dwellers quality of life (Chiesura, 2004). The addition of greenery in cities has proven to provide not only aesthetically pleasing views but also places of interest and the reduction of heat to make urban living more bearable for its inhabitants, especially with the current threat of global warming causing most summers around the world to be uncharacteristically hotter than usual. The reduction of heat and places of interest provide spaces for interaction and places to gather (Beatley, Biophilic Cities, 2011). The introduction of biophilia in the built environment considers the implementation of nature vital to human needs and studies have suggested that greener cities function in a more productive manner by creating a happier environment for its inhabitants thus proving that nature within cities can only improve a city (Sussman & Hollander, 2014). Edward O. Wilson introduced the term Biophilia in 1984 and defined it as *"the innate tendency to focus*

on life and lifelike processes" as well as *"the urge to affiliate with other forms of life"* (Kellert & Wilson, 1993).

Natural environments within the city have been proven to provide health and psychological benefits to the people that live there by creating and reinforcing humans innate desire to connect to the natural world, yet so many artificial natural elements have been created in cities with non-native species which has led to ecosystems that are unfriendly to local fauna. Studies show that the presence of nature in someone's life reduces stress, enhances positive moods and improves cognitive skills as well as academic performance and that level of health is directly correlated to the level of greenness (Beatley, Biophilic Cities, 2011). David Harvey states that in order to fully claim the right to the city, individuals need to have the power to shape the fundamentals of urbanisation so that as a collective, people have a say in the making and remaking of the city they inhabit. In saying this, since nature within a city benefits the inhabitants, it can be argued that nature should play a role in the making and remaking of a city and thus have its own right to the city (Harvey, Rebel Cities: From the Rigth to the City to the City Revolution, 2012).

2.4.3 Sustainable Architecture

Sustainable architecture is a global framework and phenomenon that aims to adapt the built environment in order to meet or adhere to a similar definition of the term *sustainability* (Williamson, Radford, & Bennetts, 2003). Sustainability within the built environment is crucial as urbanisation is drastically increasing with an average of 60% of the world's total population living in cities that consume two-thirds of the overall energy use and almost half of all pollution is caused by the built environment and construction industries (Day, 2002). Buildings consume a large amount of raw materials, energy and capital as well as emitting pollutants into the

environment and with the increase and demand for built form and urban space as well as the desire for a higher standard of living, this is getting increasingly worse and forming a risk situation in which human beings have no traditional experience in dealing with (Williamson, Radford, & Bennetts, 2003). Sustainable architecture is the suitable response to the negative effect that buildings, their construction and their use and disposal have had on the natural environment and our society and its practice can even promote a sustainable way of life, yet there is no legislation to implement sustainability in the built environment and leaving it to the market forces will prove to be unsuccessful (Sassi, 2006). Sustainability is a term that is becoming very popular throughout the world and throughout many different sectors, which is good because the environment needs it, but looking into some of the green initiatives a lot of people and companies make the change because it is "the right thing to do" without fully understanding what they are actually doing for the environment and why the environment needs sustainability to succeed. With a legislation in place, sustainability will transform from being popular to a legal compliance (Margolis, 2019).

Sustainability in the built environment needs to successfully create a balance between three pillars namely being the economy, the environment and society that then become the three pillars of the sustainable concept (Ibrahim, 2015).

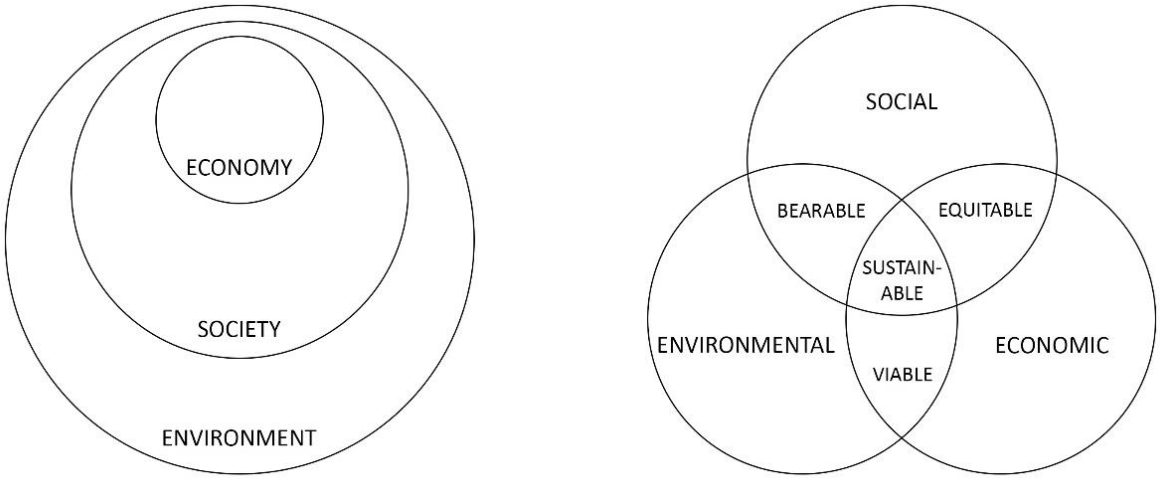


Figure 11: The representation of the three pillars of sustainability. By Author, 2019

These three pillars of sustainability came to fruition at a UN conference in 1992 as a result of a discussion about sustainable development and form guidelines for future developments (Moberg & Widen, 2016). Buildings need to positively contribute in aiding the design of socially inclusive and economically durable communities that consciously minimise the impact on the natural environment. The aim of sustainable architecture can be split into two mutually impacting aims that function as a whole. Firstly, buildings need to have a small ecological footprint and drastically reduce their impact on the environment during construction, their life span and towards the end of their life. Secondly, buildings need to address the practical needs of the people that occupy it while enhancing the surrounding environment to improve the psychological and physical well-being of the society in order to make a positive and constructive contribution to the social environment within their urban framework (Sassi, 2006).

With the popularisation of sustainability, green star buildings are being constructed world-wide. Green buildings are designed and constructed to promote the most efficient use of resources (water, energy and materials, etc.) and sustainability in built form as well as attempting to reduce the negative impact that the built form has on the environment. The US Environmental Protection Agency describes Green Buildings as environmentally responsible throughout the entire lifecycle of the building as well as resource efficient. Countries around the world have their own green buildings certification programs and they award certificates to buildings that meet their specific requirements (Steinemenn, Wargocki, & Rismanchi, 2017).

2.5 Social Infrastructure: Man and the Built Environment

Infrastructure has transformed from the idea that it provides basic amenities to the public as well as acting as a connection between people across great distances to the idea that built form

can cross the boundaries of diverse races, economic class and evolving social boundaries in order to create social cohesion (Lind, 2019). This transformation shifts the design approach to act as an enabler of social interactions that can be formed and moulded to accommodate and meet the needs of diverse inhabitants in order to generate various social and economic relationships. Infrastructure should meet the needs of the people who occupy the spaces and accommodate for the fluctuating relationships of social interaction that occur daily (Anderson, 2011). Social infrastructure attempts to reconnect the division among socioeconomic groups in order to maintain a greater sense of community (Lind, 2019). Cities are about the human connection and provide a space for people to meet, gather and form relationships, the built environment needs to be mindful of this and serve as a platform for social interactions to transpire (Gang, 2017).

Henri Lefebvre's concept, The Right to the City, promotes the inclusion of urban inhabitants when designing and shaping the environment in order to create spaces that they can identify as their own so that spaces can facilitate interaction, creativity and exchange on a social level. The implementation of social infrastructure provides a platform for individual and urban growth within the city by providing spaces that can be manipulated by its users for them to capitalise on forming connections and relationships (Anderson, 2011). Henri Lefebvre states that The Right to the City goes beyond individuals' access to urban resources and can be simplified as a right to change ourselves by changing the city (Lefebvre, 1996). David Harvey expands on Lefebvre's concept with a statement made by Robert Park who explains that the city is moulded after man's heart's desire yet the city sets the boundaries in which man lives, therefore, in man's attempt to make the city, man remakes himself. Harvey goes on to state that questioning the kind of city that is desired and the kind of people that man wants to be cannot be separated and that the right to the city is not an individual right, but a collective right as changing the city becomes a collective process of urbanisation (Harvey, The Rigth to the City, 2008). Lefebvre writes about historical cities that have not yet adapted to modern ways and describes them as

cities that are no longer lived and no longer understood because they become objects of consumption for tourism and avid spectacles. Cities need to adapt and become an expression of the individuals who live in them (Lefebvre, 1996).

The theory of critical regionalism can aid the implementation of social infrastructure because a critical regionalism approach invests in a community in order to improve and maintain a better quality of life for a society through social inventions. Douglas Reichert Powell suggests that critical regionalism within a place can be the way one would decide what the relationship of a place will be. Powell goes on to define a critical regionalist approach within a society as individuals having a collective ability to create place that connects the experiences of others (Powell, 2007). According to Nuit Banai and Alisa Beck, critical regionalism highlights the connection between local and global in order to shape a societies identity and create place that is rooted in modern tradition and cultural experience (Banai & Beck, 2017).

2.5.1 Man's Connection to Space

The connection between man and space forms the connection that man has with the built environment. This connection can be seen in many different forms and scenarios. The connection between man and space can be narrowed down to subconscious tendencies and behaviours that rule their responses within the built environment, certain spaces create different connections and feelings (Sussman & Hollander, 2014). The essence of a space is a product of its designer, the people who use and maintain it, the surrounding community and the people that came before it. This shapes and moulds the space into what it is capable of. The relationship that man has with space has many different views and definitions as space has different meanings to different people. Personal connections with space begin at various stages and a space that intends to leave a certain feeling might not affect everyone the same (Day, 2002).

Space can be directly correlated to human experience as space provides the platform for human experience to happen. Susan Bickford states that spaces can comprise of inside and outside environments within an urban context to which humans generally have different reactions to. Inside spaces resemble the inside as a dimension of the human experience which psychologically evokes privacy, intimacy, warmth and authentic self, whereas outside as a dimension of the human experience exposes an overwhelming vulnerability because of threats and danger from the outside world (Bickford, 2000). In saying that, outside spaces also provide a platform for man to experience natural environments to which has proven to be beneficial to human survival. Greener spaces in peoples living environments have proven to promote more active lifestyles and positive effects on people's moods (de Vries, Verheij, Groenewegen, & Spreeuwenberg, 2003).

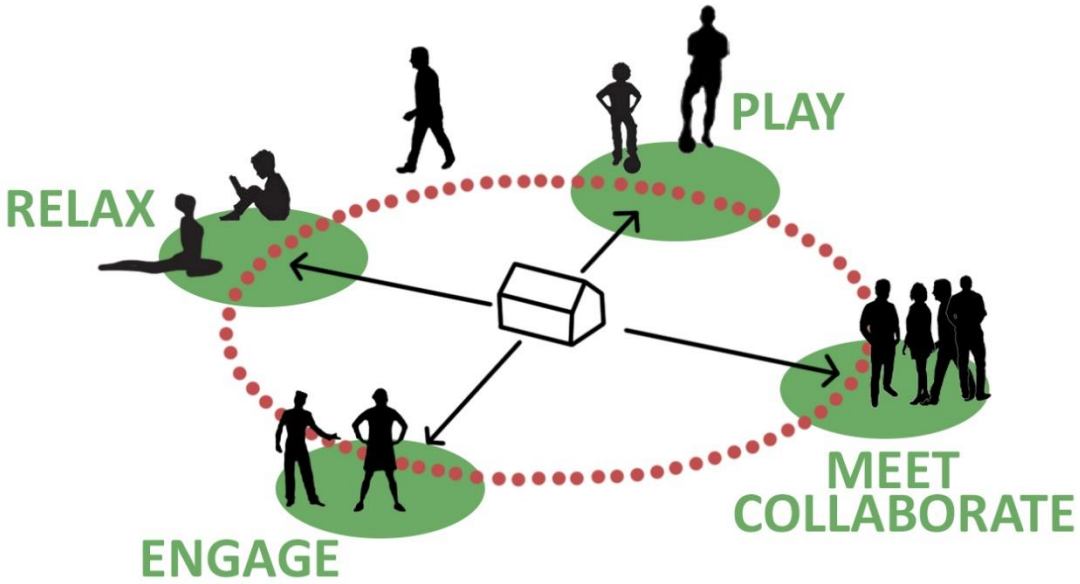


Figure 12: Green space promoting social interaction. By Author, 2019

Space and how it is perceived is subject to many different perceptions from different researchers. Tim Cresswell states,

"my place is not your place – you and I have different places"

adding that space is everywhere (Cresswell, 2004). According to John Archer's writings on the Social Theory of Space, built space are buildings, cities and landscapes, but whether space impacts man or vice versa is up to interpretation. Émile Durkheim analysed space within specific cultures and came to the belief that the function of spaces is closely related to the articulation of social interactions; these findings popularised the idea that space is formed by the person. Michel Foucalt had an opposing view on space and claimed that space became a platform where people in societies ranks and roles were fashioned, this became known as the Foucaldian perspective, where he went on to add that space merely governs the relationships that are formed within the space and not suggest personal consciousness or identity. Archer argues that neither space nor man have absolute control over the other and that they equally sustain one another (Archer, 2005).

The concept of placemaking also offers one the opportunity to further understand man's connection to space. In order to grasp the idea of placemaking, the term 'place' has to be defined. Stephan Feuchtwang separates place into two understandings, one being territorial place and the other being confined place. Feuchtwang describes territorial place as outside or open space which revolves around a centre that can take many forms and become highly complex by stating that, *"centring is the making of territory into a place."* Confined place is the polar opposite as it is described as a place that is enclosed by physical boundaries such as rooms or halls. Feuchtwang adds that open places such as markets, streets, parks or squares offer a greater variety of places that allow for interaction, unlike enclosed place. Territorial place allows for different inputs in order to achieve a variety of outputs that add to the interest of a space where individuals can perceive place as they please (Feuchtwang, 2004). Ronald Lee Fleming believes that placemaking provides a platform for connections to materialise and is able to strengthen those connection which in turn, strengthens the sustainability of a given place. Placemaking essentially offers a community a space in order to connect to place to give

it meaning and collectively improve the city by strengthening the connection between man and space to promote a better urban design (Flemming, 2007).

2.5.2 Inclusive Architecture; Inclusive Cities

Cities are home to diverse people that come from different backgrounds, cultures, races, disabilities, wealth and genders and with the huge increase in the global population and rural to urban migration, cities are expanding at a rapid rate. Tom Vavik believes that due to globalisation and an increase in people within urban settings, there is more diversity in cities than ever before. Vavik states that universal design is better design and the main aim of universal design is to consider and incorporate the needs of people within societies who have been previously excluded or marginalised by normal design methods and practices (Vavik & Gheerawo, 2009). Inclusivity in architecture is an extension from the idea of universal design, popularised by architect Ronald Mace, which transpired due to social ideals in Europe and, according to Wolfgang Saxon, describes a concept that is aesthetically pleasing and usable to the greatest extent possible using terms such as accessibility, movement, adaptive and assistive. Saxon adds that inclusive design takes universal design a step further and considers the needs, desires and abilities of each user (Saxon, 1998). Simon Poulsgaard defines inclusivity as the incorporation of aspects that allow any person to be included regardless of age, gender and disability by breaking down physical and social barriers in order to empower, benefit, create independence and full participation with equal opportunities and increase the level of usability and accessibility within a building. Poulsgaard states that an inclusive design has hidden benefits that can improve spaces within the built form for its users by creating connections and allowing for social activities to take place throughout a diverse setting. Accessibility plays a vital role in inclusive architecture as spaces and places should be accessible to all its users throughout the design without discrimination (Poulsgaard, 2016).

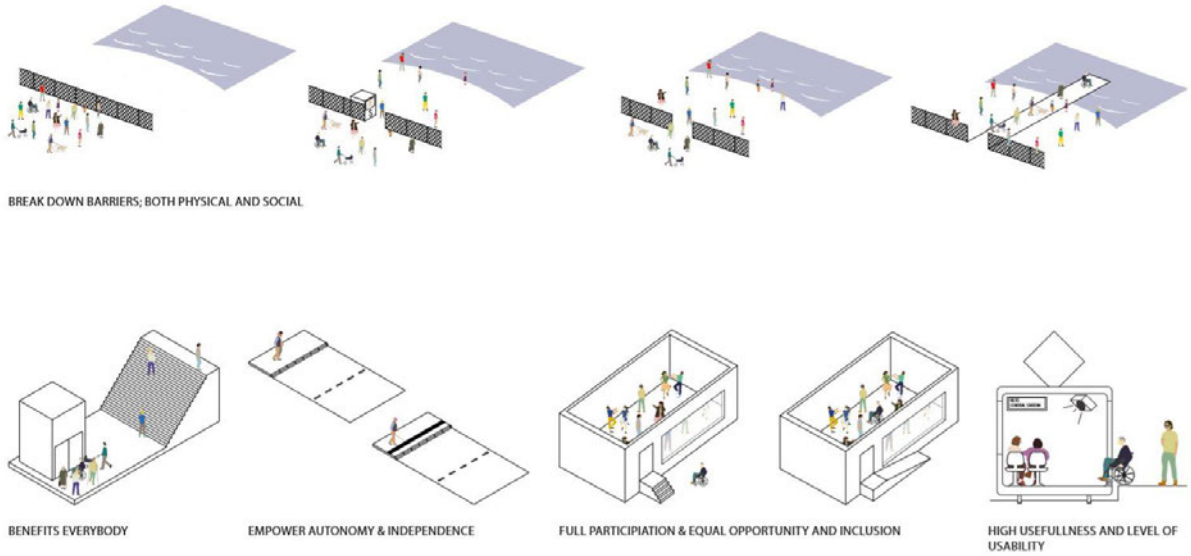


Figure 13: Inclusive architecture, breaking down barriers that prohibit certain people. (Poulsgaard, 2016)

The theory of ecofeminism aids the implementation of inclusive architecture within an urban setting as the broad aim is to bring the previously disadvantaged together in order to improve society as well as the environment. The ecofeminism movement was born from the feminist movement as well as the negative impact that society has on the environment, because of this, the movement revolved around male and female which has transpired into the belief that male represents the dominant and privileged figures whereas female represents the disadvantaged and inferior figures which includes nature, females, the disabled, the elderly, people of colour, etc (Shiva & Mies, 2014). Judith Plant suggests that the ecofeminist movement grants male and female figures common ground which forms the social system that allows humans to recognise and understand the profound structure of relationships with one another as well as the environment. She adds that as much as human beings need to support environmental issues, there also needs to be encouragement, support and development within communities (Plant, 1991).

The built environment directly impacts movement of people and the ability to ease them into social settings. It can be argued that with an inclusive design a platform is created in order to allow an individual to participate in society in order to achieve social equality and social sustainability. Architecture creates platforms for interactions to take place, Kerry Mulligan believes that if those platforms are fully inclusive and accessible, the space fulfils its function and is therefore an important asset to its city (Mulligan, Calder, & Mulligan, 2018). Inclusive architecture takes Lefebvre's concept, The Right to the City, one step further in saying that the city is for all of its inhabitants, design needs to take cognisance of who uses the spaces and allow for complete accessibility as everyone has an equal right to the city and use of its spaces (Whitzman, et al., 2013). With the understanding that inclusive architecture is built form designed with the consideration of all the needs of the individuals that will use the space, it can then be argued that inclusive cities are therefore the same concept at a larger scale. Cities should accommodate its inhabitants without discrimination or exclusion and should provide spaces that are accessible to all users without difficulty (Broadhead, 2017). According to Rhonda Douglas, inclusive cities can be defined through the lens of the Inclusive Cities Project which defines it as the inclusion of all residents, especially the urban working poor, having full access to protected and dignified livelihoods, affordable housing as well as basic services such as clean water, sanitation and electricity. Inclusive cities include the previously disadvantage city inhabitants and aims to improve the lives of all urban dwellers (Douglas, 2017).

2.6 Conclusion

This review has outlined the definition of environmental rehabilitation and how the natural environment plays a crucial role in the existence of living beings. It is clear that future building designs and techniques will have to make a concerted effort to incorporate sustainable principles in order to make a positive impact in the degrading state that the natural environment is currently in. From the literature above it is evident that environmental rehabilitation is an important and necessary towards a more sustainable future for human beings and other living

organisms. The following chapters will analyse precedent and case studies that relate to the three main headings in the literature review. The first precedent study will relate to the Architecture of Hedonism and the beneficial impact that the natural environment has on man in a residential environment. The second precedent study relates to Ecological Architecture and how the natural environment and built environment can successfully coexist. The third precedent study analyses the impact that Social Infrastructure has on spaces within a city.

THREE | PRECEDENT STUDIES

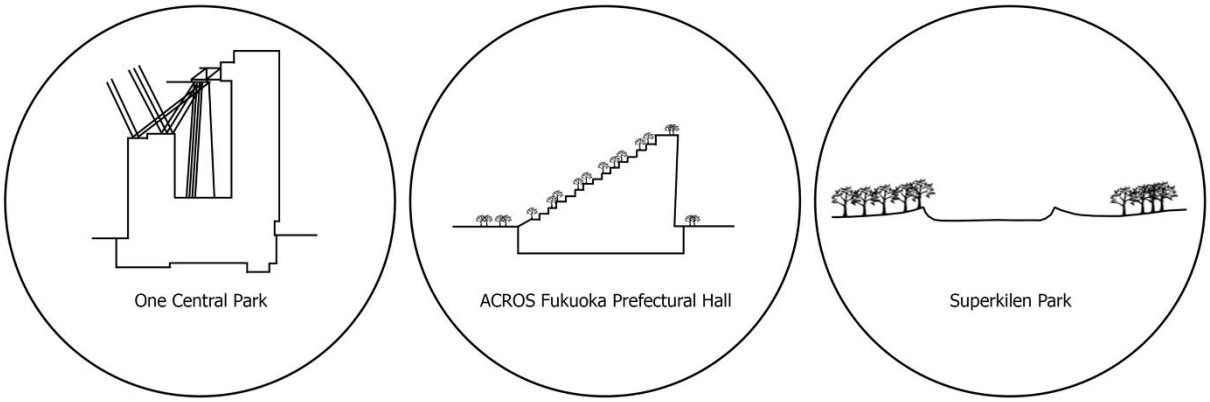


Figure 14: Representing precedent studies. By Author, 2019

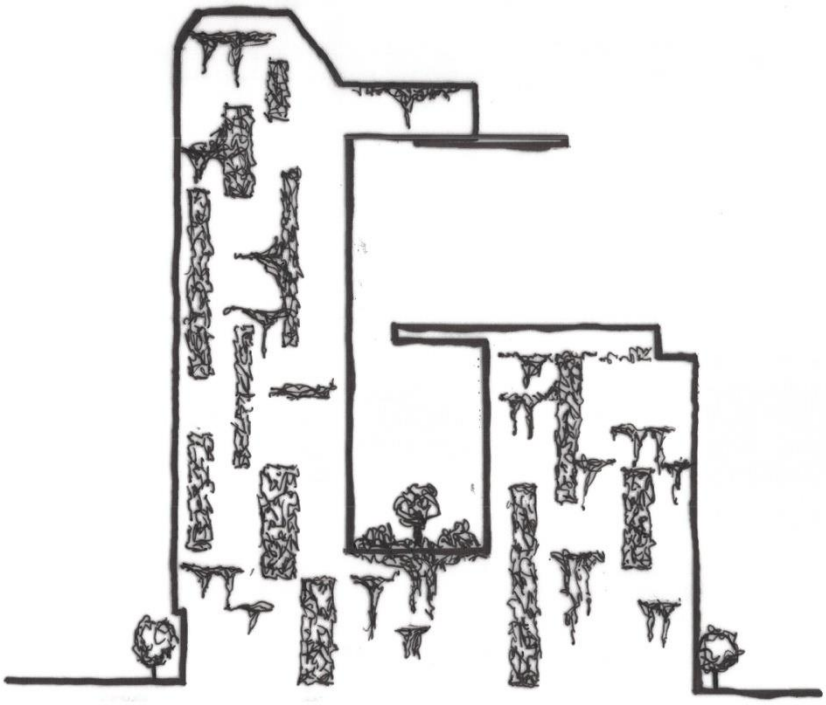


Figure 15: A sketch of One Central Park. By Author, 2019

3.1 One Central Park, Sydney, Australia

Architects: Ateliers Jean Nouvel

Architects of Record: PTW Architects

Clients: Frasers Property Australia and Sekisui House Australia

Project Date: 2008 – 2014

Category: Mixed Use

Green Walls design: Patrick Blanc

Size: 64 000 sqm

Introduction

Sustainable principles are emerging throughout the built environment worldwide due to the increasingly negative impact that manmade existence is having on the environment. Architects are attempting to produce designs that lessen the impact on the environment through sustainable principles but also improve the quality of life for its users and its city. One Central Park promotes the importance of green infrastructure and sustainable living in the context of a city by providing a strong and invaluable platform for the connection of people and nature as well as city and nature to take place. The brief for the project was to introduce green infrastructure through the implementation of sustainable initiatives such as green roofs, living facades, the recycling of demolished materials, adaptive reuse of existing buildings, sewer mining and water harvesting as well as allowing the adjacent park to "invade" the site (Urbannext, 2019). The building highlights the amalgamation of the natural environment and vertical living providing the city with a stronger connection to nature and the seasonal changes that are evident with the changing of the plants throughout the year. Completed in 2014, One Central Park is the tallest vertical garden in the world that is influenced by Central Park in New York and provides Sydney with a refreshing contrast to the usual city view by offering a healthy, environmentally responsive alternative for the future.

Figure 17: Iconic view of building. (Nouvel, 2019)

Figure 16: View approaching building. (Nouvel, 2019)

Location

One Central Park is located around a green urban park, Chippendale Green, within the heart of the new precinct in Chippendale, Sydney, Australia. The site was previously home to a derelict brewery building located in downtown Sydney, but since then there has been a rejuvenation project within the area in order to revitalise and activate the spaces in order to form an "urban village" in downtown Sydney. During the construction of this building, the surrounding areas where already home to an established living community that was growing due to the University of Technology which is located in close proximity to One Central Park. The location of the building borders a 6-lane arterial road that provides access through the city. The building offers a residential tower, shops and common space for the community to enjoy on the Southern edge of the CBD.

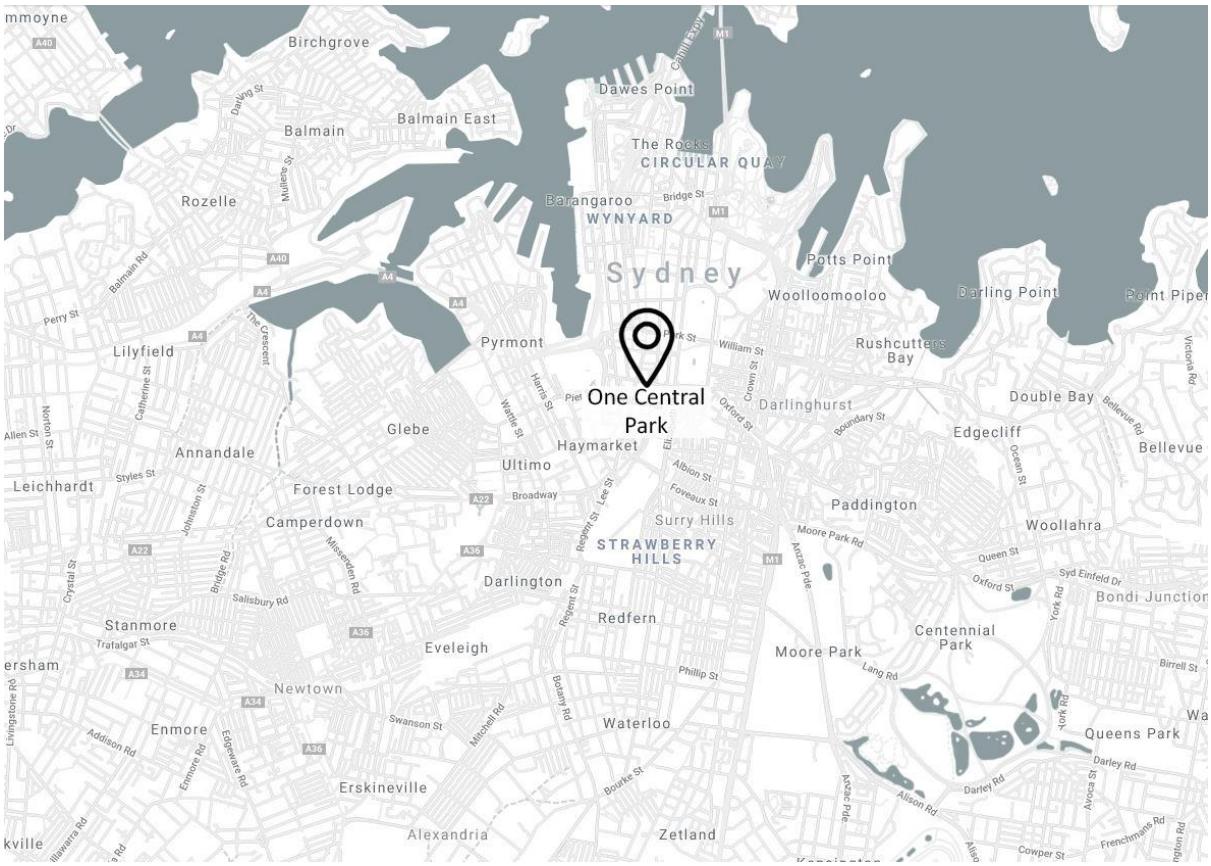


Figure 18: Location of building. By Author, 2019

Context and Scale

The design of One Central park offers the city of Sydney an iconic addition to its already impressive skyline with the combination of two residential towers that sit on top of a 5-storey retail podium linked to the surrounding parks with vertical landscapes. The towers are a 34-storey residential block (Eastern Tower) and a 12-storey serviced apartment block (Western Tower) that maintains a constant visual dialogue between one another and the podium that then extend from a vertical connection into a horizontal connection connecting the building to the surrounding park. The building reaches 117m high with the tallest residential tower slightly taller than the buildings in its immediate context but the park forms a green square in comparison to the buildings surrounding it. The building is distinguishable amongst its surrounding towers and warehouses as it resembles a green column within its context creating an impressive aesthetic for the area and forming a link between the southern end of the CBD and the adjacent residential areas.

Figure 19: Image of building within its context. (Nouvel, 2019)

Layout and Accessibility

As one approaches the building the space opens up to reveal a green square within the city. Upon arrival the space evolves into a park for recreational use that then merges into the building. The podium of the building revolves around an open atrium of lush green vegetation with off-set voids which creates a public open space and pedestrian access to the building.

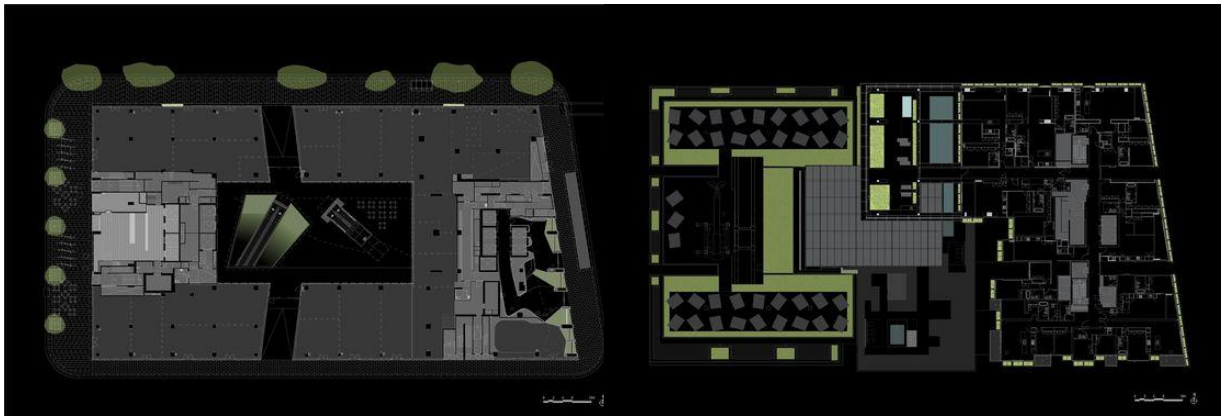


Figure 20: Floor plans. (Nouvel, 2019)

Tectonics

The structural system of the podium and two towers is comprised of a structural steel frame with reinforced concrete infill where necessary. The construction method is therefore simple to erect and allows additional support in order to hold the natural elements throughout the design as well as providing a strong support for the impressive cantilevering heliostat connected to the building by a structural steel frame that hovers over the gardens. The steel frame can be visually seen throughout the building's interior and exterior which allows for a clean and simple design that focuses on its sustainability impact.

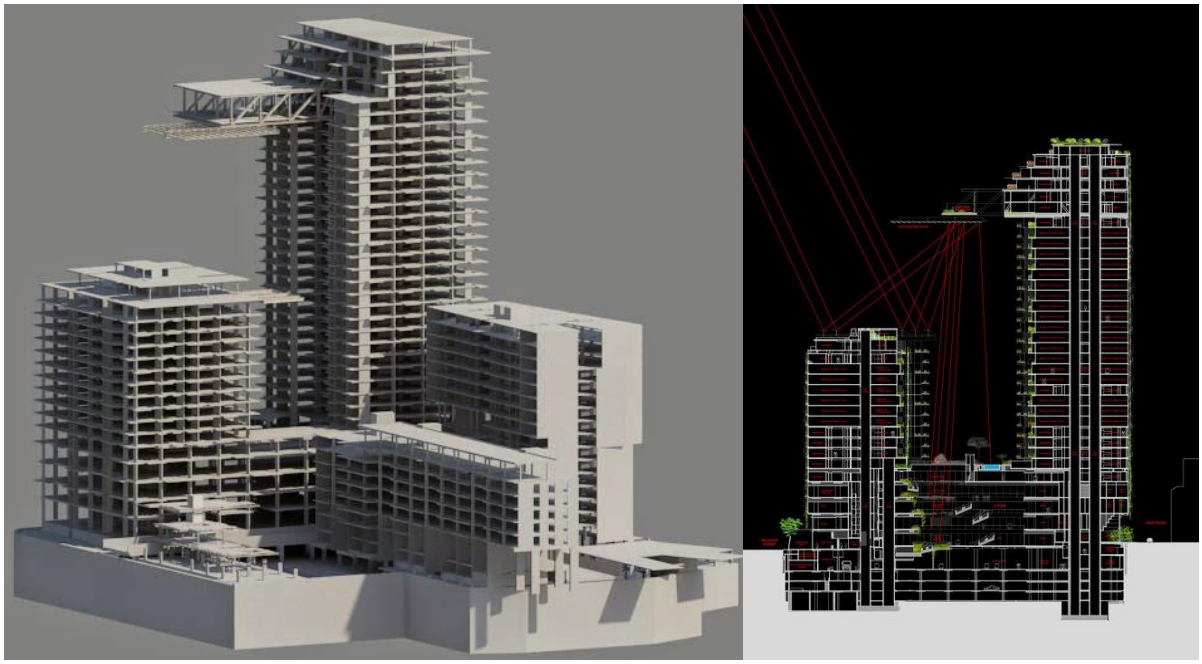


Figure 21: Structural 3D. (Nouvel, 2019)

Materiality

50% of the building's façade surface area is made up of a living green wall of 250 species of Australian flowers and plants, which forms a vertical garden system designed by French Botanist Patrick Blanc consisting of hydroponic walls and planting panels that are integrated within the building's façade structure. The construction of the building made use of recycling 93% of the previous building on the site. The cantilevering heliostat that hovers 40m from the edge of the building over the gardens and 100m above the ground consists of 520sqm of motorised mirrors that captures sunlight and directs it into the gardens. The heliostat displays a light show after dark designed by light artist Yann Kersalé. The light shows mimic the ocean from the Sydney harbour and represent the four different seasons. The podium that houses the retail spaces makes use of a permanently submerged glazed roof in order to allow sunlight into the 5-level space and light up the sunken courtyard allowing the internal planting to prosper through photosynthesis. The materials used in this project include reinforced concrete, stainless steel wire cables, glass, structural steel and plants. The gardens are anchored to the scaffolds

with the use of a mesh-covered felt and make use of a dripper irrigation system that is controlled remotely.

Figure 22: Plants on the façade of the building. (Nouvel, 2019)

Topographic Analysis

The building is a part of the Sydney CBD which is characterised by hot and humid summer weather patterns and fairly warm winters that sees most of its rainfall. The climatic zone of Sydney is classified as humid subtropical that does not see much change between the seasons. The extension of the adjacent park vertically onto the building allows for the plants to shield the apartments in the building from direct sun during the summer and admitting a comfortable amount of sun into the building during winter, acting as a natural sun controlling device. The building makes use of indoor/outdoor living through the extension of terraces in order to take maximum advantage of Sydney's hot climate. The South and West terraces extend further than the North and East terraces as the South and West take advantage of views of the adjacent park

whereas the North and East terraces are extended inwards from the façade to protect the spaces from noise, wind and excessive sun exposure.

Theories and Concepts

The concept of sustainability was a huge factor for the architects in designing One Central Park. Sustainable principles are seen throughout the building and have been achieved successfully as per their 6-Star Greenstar rating. The building makes use of reflecting natural light with a heliostat into spaces that fall in the shadow of the building in order to maximise plant growth as well as human comfort. Other sustainable principles in the building are the reuse of the previous buildings materials, the use of green walls and green roofs which naturally cool down spaces and clean the environment, the use of a central tri-generation plant that provides low carbon electricity powered by natural gas, an onsite water recycling plant, smart metering systems in the apartments to better monitor peoples consumption and a recycled water network for the plants. The building aims to promote sustainability as a way of life. The sustainability approach can also be seen in a social aspect as the design evolves around creating spaces and environments for people to embrace and enjoy with a focus on public space.

Another theory that can be seen in the design is biophilia. The architects working on the project wanted to form an amalgamation of artistic vision, the natural environment and public benefit in the built form realising that the connection between man and nature is crucial in tomorrow's world and that public space needs to create a platform for the two to connect.

The Right to the City can be seen in the design process as community engagement is crucial to the success of the building. The designers had open and constant communication with the public

through the use of a project hotline, newsletters, information seminars, a complaints department and building personal connections with the public.

The use and implementation of social infrastructure and ecological urbanism can be observed in the built form as the vertical park becomes a social platform for integration allowing social activities throughout the space both horizontally and vertically and ecological urbanism is the amalgamation of the natural environment and the built environment.

Spaces for Social Interaction

Social interaction is evident throughout the design as community engagement formed one of the most important key factors in the design of the building. The podium forms the base of the building where the horizontal parks meets the vertical park that forms a plaza lined with cafes and shops drawing people into the spaces and vertically up the building. The retail aspect of the building creates a platform for social spaces to transpire especially through the implementation of the sunken courtyard found within the podium and the connections of parks form meeting places for people to relax and gather as well as spaces for activity to take place such as running, walking and cycling. The implementation of social interaction throughout the building forms an inspired conversation about sustainability.

Centre to Edge

The centre of the building houses a natural sunken garden that receives natural light through the permanently submerged glazed roof bringing the idea of the park from the inside out. This public space creates an impression that the façade is permeable and people can move throughout enforcing the awareness of the public park located on the exterior of the building and immediate surrounding context. The centre spaces of the building form a strong connection with the edges of the site in order to form one centralised theme throughout the building which is the importance of the amalgamation of building and nature.

Figure 24: Section. (Nouvel, 2019)

Figure 23: Natural sunken garden at the centre of the building. (Nouvel, 2019)

Ability to Remain

The ability to remain is influenced by the architects hopes to provide a precedent for the future of Sydney as well as other cities around the world. The use of sustainable principles in the design of the building create a strong influence for other buildings to adhere to the sustainability movement and the importance of creating a connection between human and the natural environment. This building received a 6-star Greenstar rating for its use of sustainable

techniques throughout the construction and practice providing a better quality of life for its residents and an added benefit to the environment in Sydney.

Topography

The site was originally a derelict brewery building within an area that was in the process of rejuvenation due to an increased public interest in the area and the need for more residential spaces within the CBD.

Purposefulness

The vertical park shows its purposefulness through its commitment in creating a city that celebrates and incorporates the natural environment within its built form. The building forms a strong connection to nature and provides a platform for man to do the same. The residential component of the building creates an environment in which people can cohabitate with nature. The successful use of sustainability and nature within the city creates a purposeful building that serves as a precedent for future cities and man's desire to bring nature back into the built environment.

Intensity

The intensity of the building can be seen in its use of the natural environment and its ability to relate its vertical form to the horizontal immediate context. The building forms an intense contrast with a grey, dull city bringing life and greenery into the skyline providing a connection to nature in all aspects.

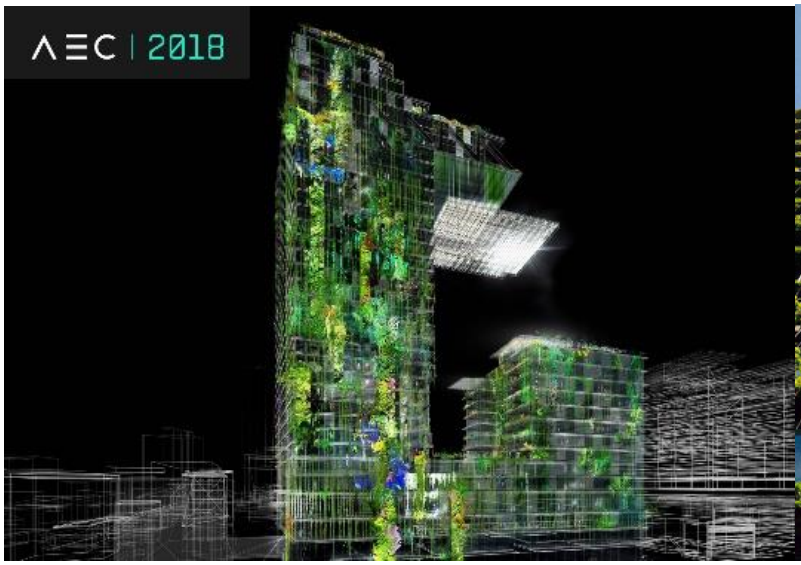


Figure 25: Image highlighting planting and heliostat. (Nouvel, 2019)

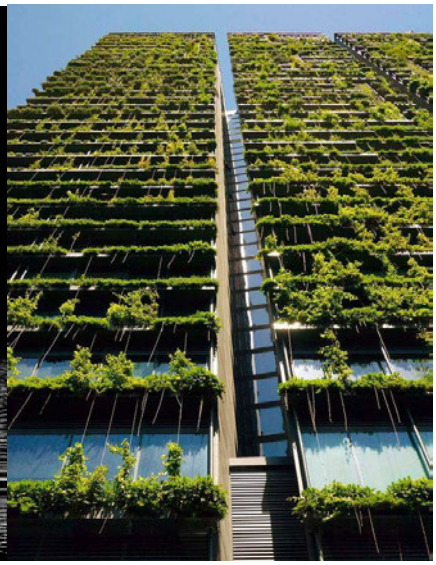


Figure 26: Building façade. (Nouvel, 2019)

Conclusion

One Central Park is a suitable precedent for this research topic as it shows a successful approach to the amalgamation of the natural environment and human existence. The analysis of this building displays a suitable approach to accommodate and create an environment where man and nature coexist. The successful implementation of biophilia and sustainability throughout the design grants the research validity in its quest to seek a more environmentally aware lifestyle through architecture as well as the social benefits of a more natural city. One Central Park stands as a precedent for a more inclusive city that includes diverse cultures and the natural environment.

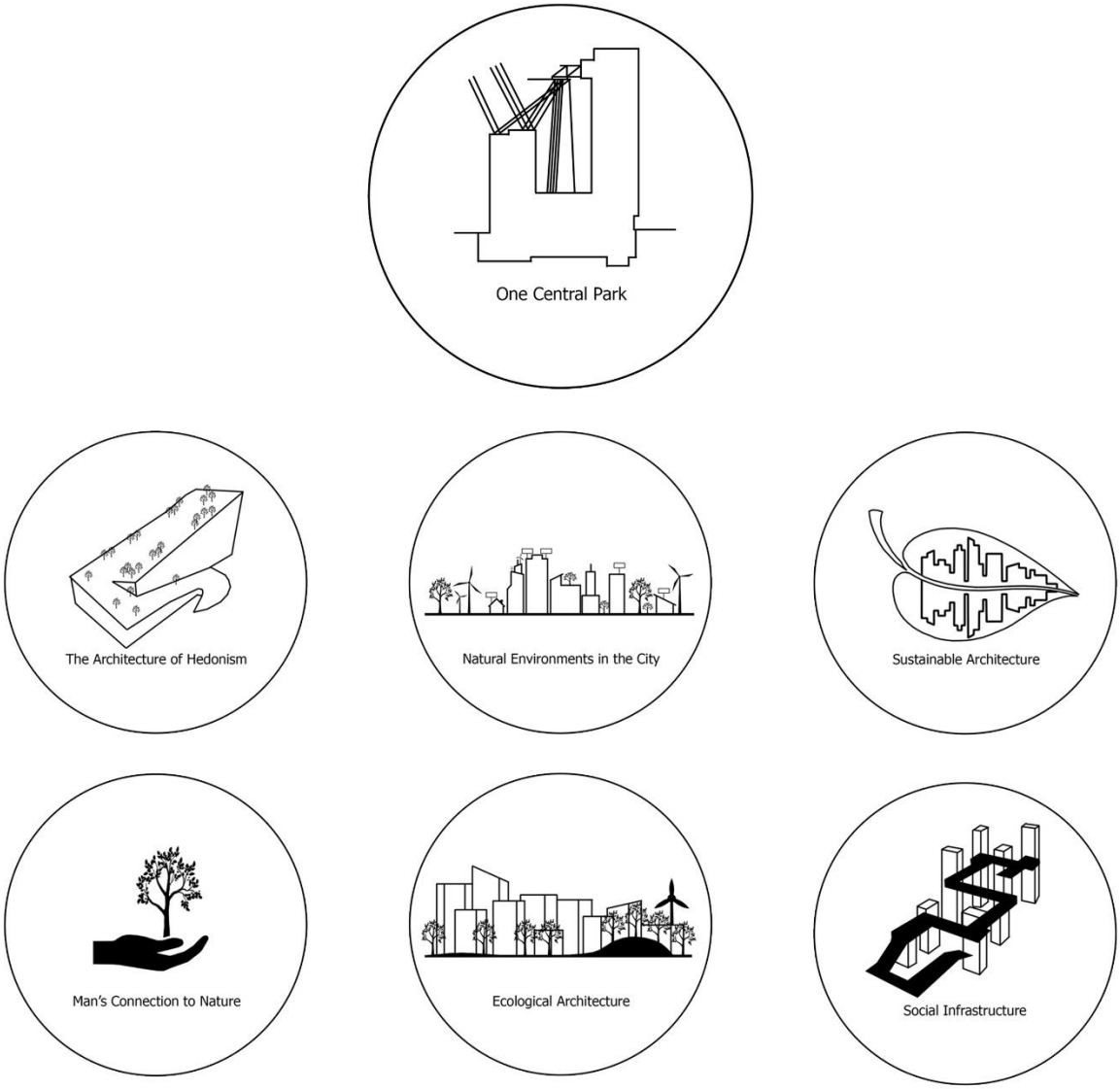


Figure 27: A bubble diagram representing the precedent studies connection to the research. By Author, 2019

Figure 28: A sketch of ACROS Fukuoka Prefectural International Hall. By Author, 2019

3.2 ACROS Fukuoka Prefectural International Hall, Japan

Architects: Emilio Ambasz

Clients: Dai-Ichi Mutual Life Mitsui Real Estate

Project Date: 1994

Category: Multipurpose; parks and recreation; concert hall

Size: 13 000 sqm

Introduction

The sustainability movement worldwide started gaining popularity and major recognition in the 1990's due many acts and conferences on the state of the earth (Hosey, 2017). Emilio Ambasz became an ambassador for sustainability within the built environment and strived to implement and achieve ecological architecture within his designs. Fukuoka city was in desperate need for a new government office building and had one site free to do so, when the city publicised their intention to build on one of the last and largest open green spaces within the city centre, the people of Fukuoka protested as the proposed site was a popular lush urban park. Ambasz strived to design a building for the park that would be profitable for the developers and adhere to the publics need for greenery and open space within the city. The building became Emilio Ambasz's most powerful amalgamation of urban and park forms that became a symbolic structure within the city of Fukuoka and a significant example of green infrastructure in the 90's (Mun-Delsalle, 2017).

Figure 30: The building within its context. (Ambasz, 2019) *Figure 29: The building from the water. (Ambasz, 2019)*

Location

The ACROS Fukuoka Prefectural International Hall is located within the city of Fukuoka, in Japan. The site was an urban park called Tenjin Central Park that is surrounded by a city in the heart of Fukuoka. The street that the building sits on is classified as one of the most prestigious streets in Fukuoka and is located within the financial district.

Figure 31: Location of building. By Author, 2019

Context and Scale

The building is made up of multipurpose space that contains a museum, an exhibition hall, a 2000-seat proscenium theatre, conference facilities and offices that sit on top of retail and underground parking that are covered with 15 one-storey terraces that houses a belvedere at its pinnacle that offers views of the city's harbour. The terracing of the building allows for the park

and building to combine as one element seamlessly where the park acts as a sanctuary within the city and the built form resembles an urban green mountain that relates to the surrounding buildings in Fukuoka and becomes an oasis among a concrete jungle.

Figure 33: The scale of the building. (Ambasz, 2019)

Figure 32: The scale of the building from the park. (Ambasz, 2019)

Layout and Accessibility

Entering the building from the street one will be met with a conventional office appearance of a glass façade that allows access to the multipurpose space. Entering from the park the public can wander the exterior of the building with the use of staircases that zig-zag up the terraces to reach the pinnacle. Each terrace allows for social interaction and public recreation. If one wants to enter the building from the park there is a semi-circular ‘wedge’ atrium that gives the public access to a triangular lobby.

Figure 34: Floor plans. (Ambasz, 2019)

Tectonics

The structural system of the building consists of reinforced concrete throughout with a lightweight steel space frame that supports the terraces that hold up the planting and supporting the 14 above ground floors and 4 below ground.

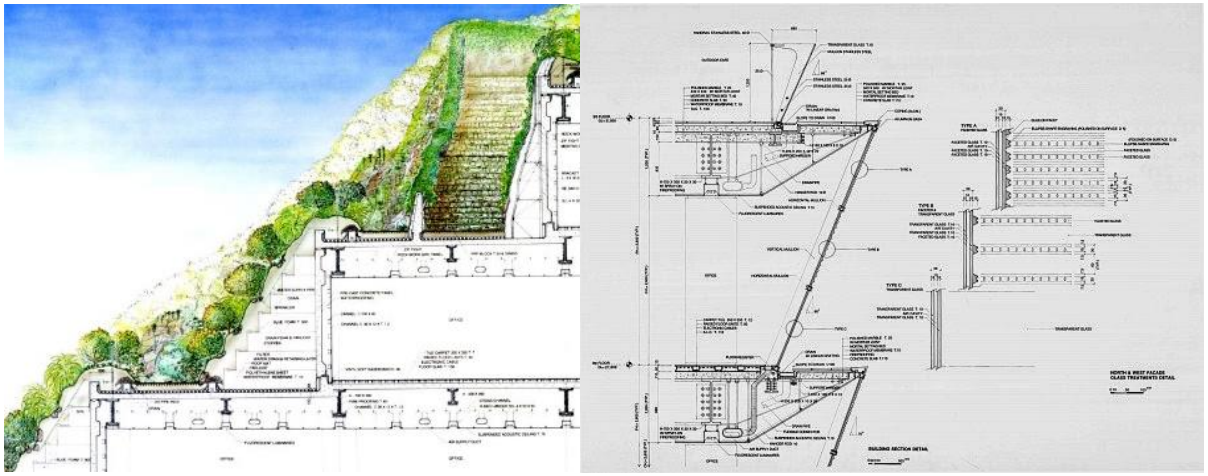


Figure 35: Detailed sections. (Ambasz, 2019)

Materiality

The materials used in the building consist of plastered and painted finishes, glass facades and windows and the green terraces. The green terraces act as green roofs for the building that reduce the energy consumption, capture rainwater runoff and support insects and bird life. The street facing façade of the building is identified with striped glass that reflects the public walking past and the park facing façade of the building is an extension of the greenery found in the park. From the park two glass atriums can be seen, one is the central glass atrium that allows natural light into the internal spaces of the building and allow for panoramic views from inside. The second glass atrium is an entrance into the building and also doubles as a ventilation funnel for the floors below and a raised stage for public performances.

Figure 36: Materiality of the building. (Ambasz, 2019)

Topographic Analysis

Fukuoka sees rainfall year-round with short and humid summers and long, cold and windy winters. The building accommodates the summer weather with the use of the greenery and terraced balconies creating a coolness in the building. In the winter, warmth is brought in through the glass atriums with natural light filtering through year-round. The North façade of the building appropriately suits the financial district that it is located in with a formal entrance

and a glass façade that allows for additional natural light and the South façade is terraced with natural plants and shelter that form an extension of the existing park meaning that the park doubles in size. The terraced balconies offer protection from bad weather like rain or wind that allow the public to use the space regardless.

Theories and Concepts

The architect's main concept throughout the project was ecological architecture as Ambasz strongly believed in the importance of nature within the city. This can be seen with the extension of the already existing park that the building now exists under. The green terraces sustain wildlife and ecosystems that would not usually be found in cities.

Theories that are evident in the design is the theory of space and biophilia. The theory of space can be seen in the importance of social space and the use of public spaces through the extension of the park up the building. Space has been designed and articulated throughout in order to provide social interaction and human connection to built form.

The theory of biophilia is shown through the importance of creating a human connection with the natural environment through the importance of the building becoming natural infrastructure and a terraced park.

Spaces for Social Interaction

Social interaction became one of the design factors for the architect as he wanted the building to form an extension of the park, therefore creating spaces for interaction as a park would. The

overlapping of landscape and architecture within a city setting allowed for spaces that increase public enjoyment and wellbeing that formed spaces that provoked human interaction with nature as well as each other and a space that provided a balanced environment to evoke emotion. The landscaped terraces house an array of gardens for meditation and relaxation and an escape from the city with the use of reflecting pools that are connected with upwardly spraying water that resembles a climbing waterfall and masks the noise of the city.

Centre to Edge

The centre of the building forms an atrium that has natural light filtered into it through the central glass atrium which forms a connection between the interior and exterior of the building. The street side of the building forms an overhang over the pedestrian side walk which defines the buildings entrance and invites people inside and through the building into the public park space on the other side. The terraces on the park side of the building have a zigzag of staircases allowing people to experience the buildings entirety.

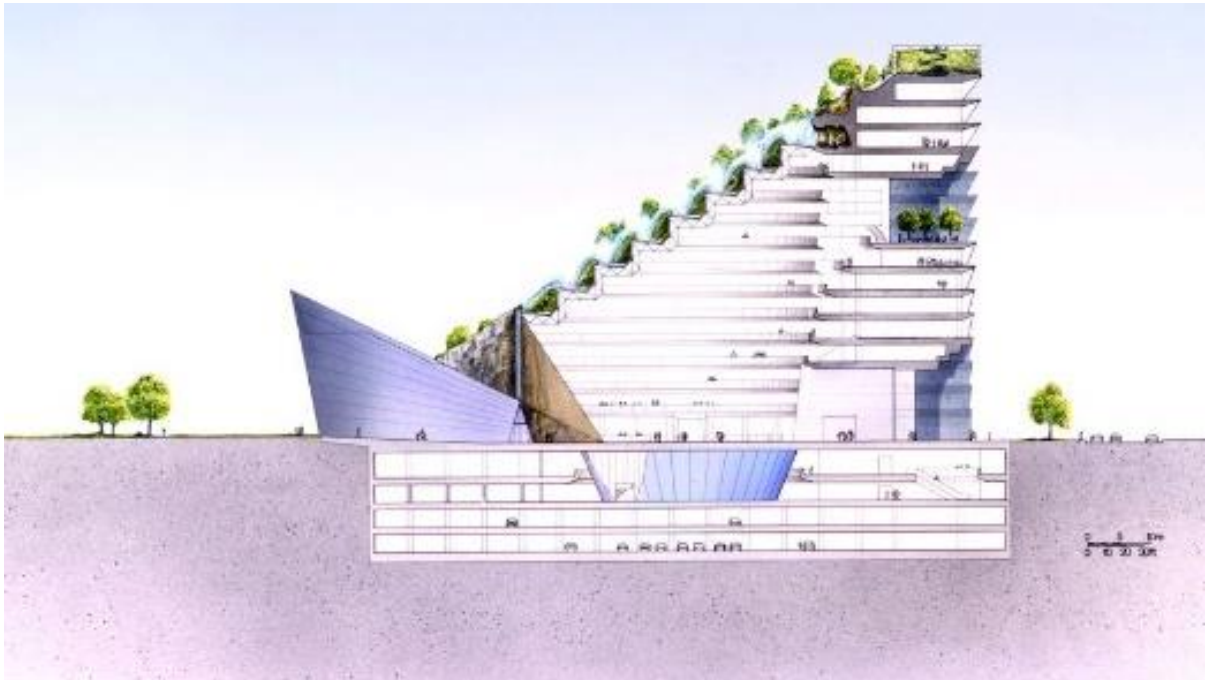


Figure 37: Section. (Ambasz, 2019)

Ability to Remain

The ACROS building has already been running for 25 years and still holds a symbolic stand in Japanese architecture, as well as globally, as a building that successfully incorporates human activity into the natural environment within an urban setting. The building becomes an environmentally friendly building envelope that offers the city green space as well as ensuring the profitability of the site.

Topography

Before the development of the building, the site was the last largest undeveloped plot within central Fukuoka. The building sits in a relatively flat setting and forms an urban mountain of greenery within a city that is flat with dense built form.

Purposefulness

This building is purposeful as it represents a precedent and desire for human and nature interaction in a city. Japan has a high population and is relatively land-scarce which allows the ACROS building purposefulness as it gives back to the city dwellers the nature that built form has taken away and reiterates that parks are not for the outskirts of the city, but in fact are beneficial in city centres.

Intensity

The intensity of the building can be seen in its ability to extend an existing park in build form. The overlapping of building and landscape offer an unusual but effect way to create green

spaces for public enjoyment and wellbeing. The building is so closely linked to its surrounding context that it forms a continuous silhouette with the park so that the public cannot differentiate where one ends and the other begins. According to Y-Jean Mun-Delsalle, a journalist for Forbes magazine, *"the building becomes the park and the park becomes the building in a seamless whole"* (Mun-Delsalle, 2017).

Conclusion

The ACROS Fukuoka Prefectural International Hall aids in the research by providing a precedent that incorporates the natural environment within the built environment. The building allows one to access the benefits that the natural environment adds to an urban setting. The design and layout of the ACROS Fukuoka Prefectural International Hall incorporates two separate functions in order to sustain a social platform that promotes greenery in city centres and the ability to incorporate built form within a park.

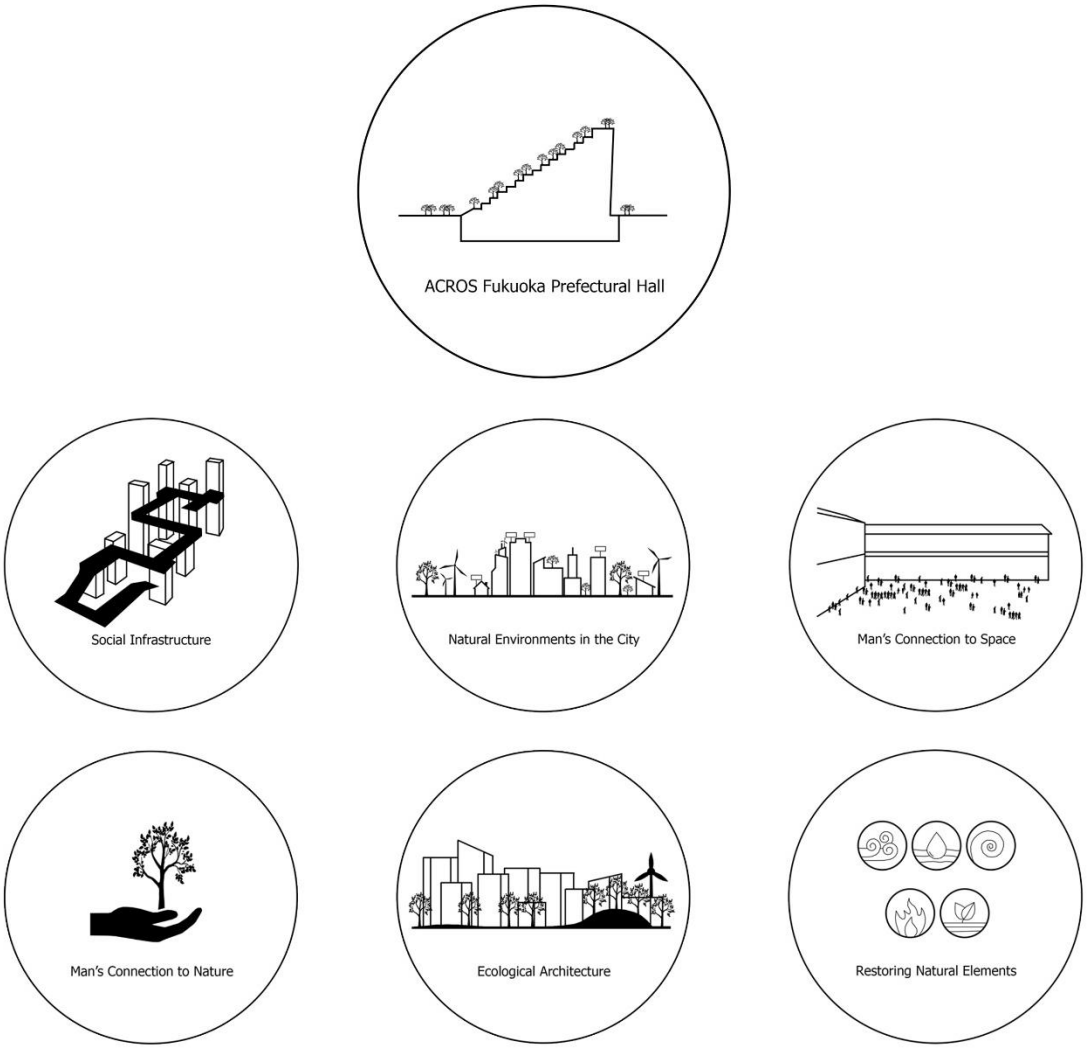


Figure 38: A bubble diagram representing the precedent studies connection to the research. By Author, 2019

Figure 39: A sketch of Superkilen Park. By Author, 2019

3.3 Superkilen Park, Copenhagen, Denmark

Architects: Bjarke Ingels Group, Topotek 1 Architects and Superflex

Clients: Copenhagen Municipality and the Realdania Foundation

Project Date: 2012

Category: Parks and recreation; public space

Size: 30 000 sqm

Introduction

Danish architects and architecture have seen the introduction of sustainability in theory and practice since the 1990's which has evolved into smart, sustainable and aesthetically pleasing buildings and urban spaces within cities that are designed to accommodate the cities inhabitants. In more recent years, the introduction of "hedonistic sustainability" has influenced and benefitted many designs within Denmark and become an integral part of Danish architecture. The implementation of "hedonistic sustainability" has introduced an architecture that is centred around sustainable principles that are both functional and economically profitable but also focuses on the individuals who will occupy the space, ensuring human comfort, interaction and coexistence. The brief for Superkilen (Super Wedge) Park was to create an urban park that provided a platform for social integration within Denmark's most multicultural and diverse district by bringing in urban narratives from all over the world. The overall goal was to create spaces for innovation of urban areas that are of an international standard that could set precedent for other cities worldwide not only through beautiful spaces but also the promotion and exhibition of the city's cultural diversity. The idea of representing diverse cultures meant that the park had to be for the people, by the people.

"The park becomes an urban safari into the diversity of the manmade forms of urban furniture"

– Bjarke Ingels (BIG, 2019).

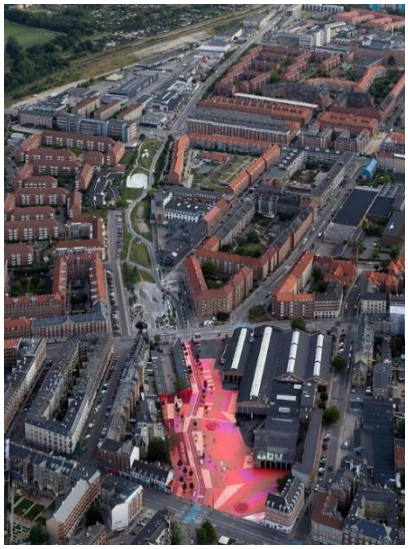


Figure 40: The length of the park. (BIG, 2019)

Location

The Superkilen park is located in NØrrebro, Copenhagen stretching a kilometre long between Norrobrogade (Norrebro's main street) and Tagensvej. Norrebro is known to be the most ethnically diverse and socially challenged neighbourhoods in Denmark as it is home to people from over 60 different nationalities. This specific area, that occasionally saw sporadic street violence, was in need of a transformation that increased social and cultural inclusion between the diverse nationalities and form spaces that these people could relate to and form a platform for social interaction.

"Superkilen is a half-mile long urban space wedged into one of the most ethnically diverse and socially challenged neighbourhoods in Denmark"

– Bjarke Ingels (BIG, 2019).

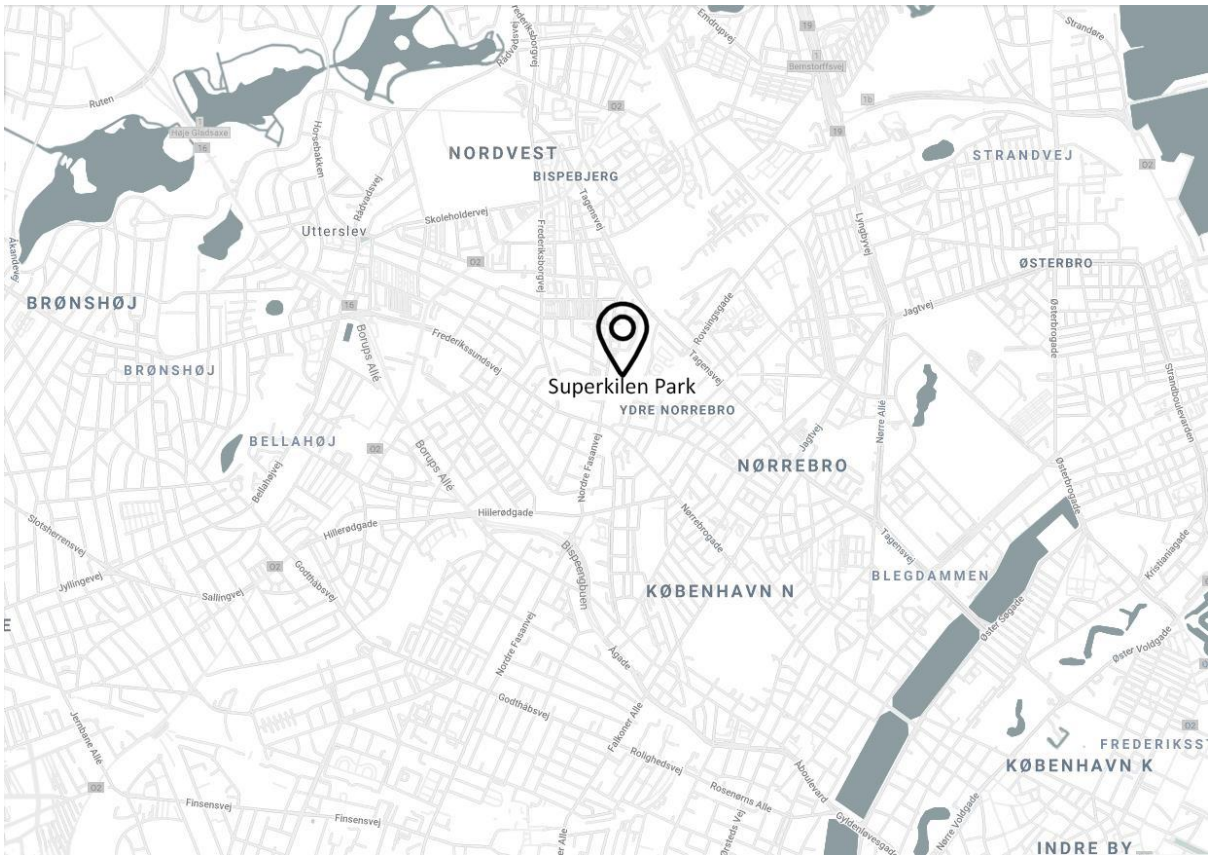


Figure 41: Location of the park. By Author, 2019

Context and Scale

The surrounding and immediate context of the park is relatively low lying with the park filling in between space from existing built form. From plan view the park stretches from one road to another merging into its context and resembling unification with its setting. The stretch of park becomes a connection within the city and a place for interaction of different activities.

Figure 42: Image of the Black market. (BIG, 2019)

Layout and Accessibility

The three areas of the park are split into different colour zones, the Red Square, the Black Market and the Green Park. When one approaches the park from Norrobrogade they are first met with the Red Square that is made up of everything red, orange and pink with neon signs located in the middle and swings from Iraq. This section is the sports section of the park and welcomes the public into the cultural space. The following section is the Black Market that is decorated with palm trees found in China, a Moroccan water fountain and benches from Turkey.

The Black Market hosts weekend markets, barbeque facilities and spaces for social interaction through backgammon, chess and an octopus playground. Lastly the public will experience the Green Park which is the softest section of the park. Spanish ping pong tables and a skate park are found in this section as well as the parks addition to greenery within the city. Pedestrian pathways and bike lanes connect the full length of the park and beyond reading as an integral part of the city. The park offers activities such as playgrounds, basketball courts, football fields, cultural activities, picnic spots and socialisation areas. The park is linked to Norrebro's busiest street becoming Superkilen's link to the city and an extension of an existing sports centre.

Figure 43: Plan of the park. (BIG, 2019)

Materiality

The architects involved in the design chose the choice of material for each section by defining that specific areas function. The park is divided into three different colours that represent three different zones namely; red, black and green. The Red Square makes use of pink, red and orange coloured asphalt with a rubbery floor surface that forms a safe environment for people to play and interact. The rubbery floor surface comprises of rubber granules and a polymeric binder

which is suitable for sporting activities for absorption and to prevent injuries. The Black Market is a combination of black aggregate and asphalt with decorative white paint stripes throughout that promote movement and a sense of direction. The Green Park makes use of grey asphalt paths for bicycles and pedestrians and the rest is mostly landscaped with exception to a skate park that is steel fibre reinforced concrete.

Figure 44: Images of all three zones. (BIG, 2019)

Topographic Analysis

Copenhagen is situated within the Oceanic climate zone which means that it has cool summers as well as cool winters and sees most of its rainfall in the summer months. There is a clear contrast between the seasons and the site experiences snowfall within the winter months and a dry spring. Because the weather in Copenhagen is relatively cool, people go outside year-round to get warmth from the sunlight.

Theories and Concepts

The concept The Right to the City is seen in the attempt to design space to include different nationalities within a single city in order to form socially inclusive spaces that accommodate diverse people. The spaces are designed to relate to the people that live in the area giving them a right to claim the space as part of their culture. People that reside within the area where encouraged to participate in the furnishing of the park by recommending objects in which they

would like to see displayed or replicated that they felt represented their nationality, this was referred to as peer-to-peer design.

The creation of space within the parks can be seen through the lens of the theory of space. The designers formed space through the use of multicultural furnishings in order to create the representation of an 'outdoor living room' for people to experience space as if it was a part of their own. The implementation of this park was to create social integration through the use and manipulation of space in-between buildings so that diverse people can relate to one area.

Spaces for Social Interaction

The park was designed with the intention to support diverse cultures and people and to provide a platform for the interaction of these people to take place. Social interaction is created in the spaces through the implementation of diverse cultural aspects that allow for interaction to take place. The designers viewed the idea of social interaction as an activity that desperately required bits from everyone's culture so that they could combat the fight against standardisation and provide a place that was relatable.

Centre to Edge

The centre of the space is open to the elements and in-between existing built form where people can gather and connect.

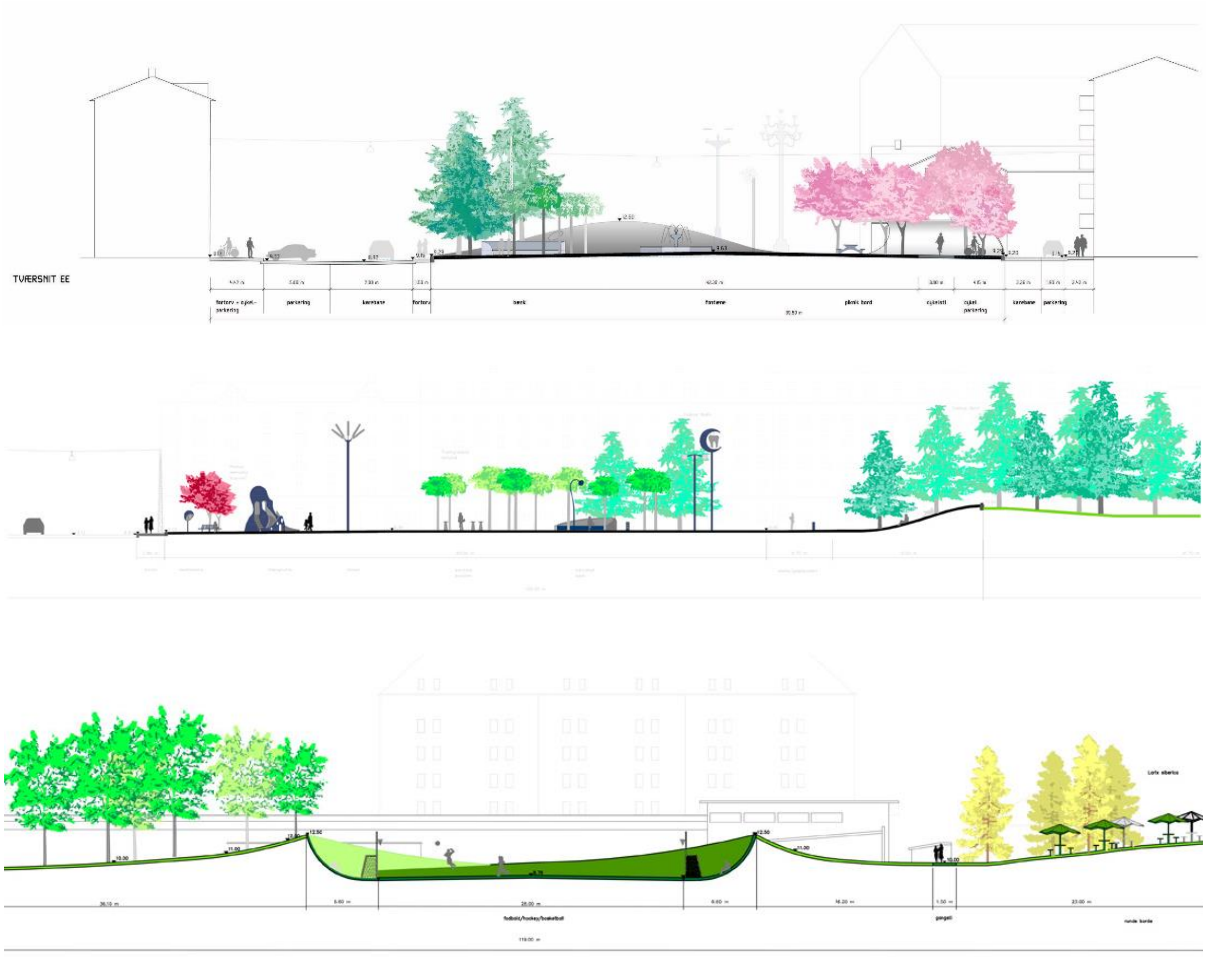


Figure 45: Sections. (BIG, 2019)

Ability to Remain

The Superkilen Park's ability to remain relies on its relevance to the people using the space and the people that live in the area. The park relates to a diverse community and with the increasing influence of globalisation and people living in different countries the park will continue to remain as a connecting factor for these people in a foreign city.

Topography

Before the construction of the park, the area was prone to sporadic street violence and home to many different nationalities that were not functionally coexisting.

Purposefulness

The park has a purpose within the city of Copenhagen as it resembles the diverse cultures that live there and creates a connection between people from different parts of the world. The aim of the Park was to help revitalise the area through the implementation of a global identity in order to unify the population.

Figure 46: The nationalities represented in the park. (BIG, 2019)

Intensity

The intensity of the park can be seen in its eccentric collection of furnishings from around the globe that coexist in one unifying park that is meant to represent the idea that the diverse nationalities can too coexist and live in harmony together.

Conclusion

Superkilen Park applies multiple cultures within a specific area that promote social interaction and inclusive space. This precedent study shows how design and furnishes can impact and form space that successfully relate to people from diverse nationalities. The important aspect to note is the ability to promote social spaces within previously ‘dead’ zones that successfully lay a platform for diverse cultural interaction and community engagement.

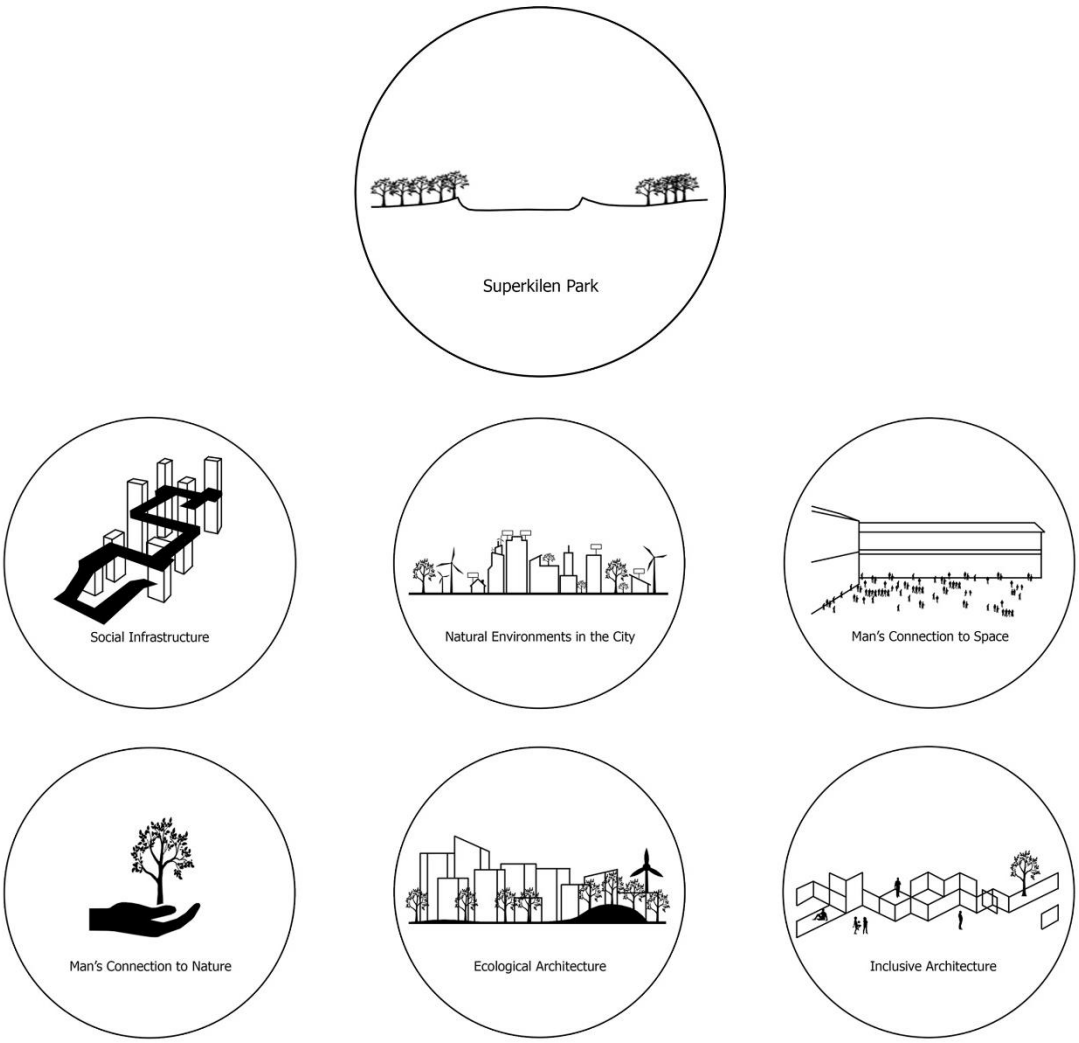


Figure 47: A bubble diagram representing the precedent studies connection to the research. By Author, 2019

FOUR | CASE STUDY

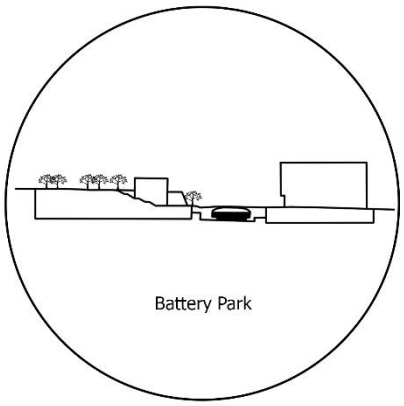


Figure 48: Representing case studies. By Author, 2019

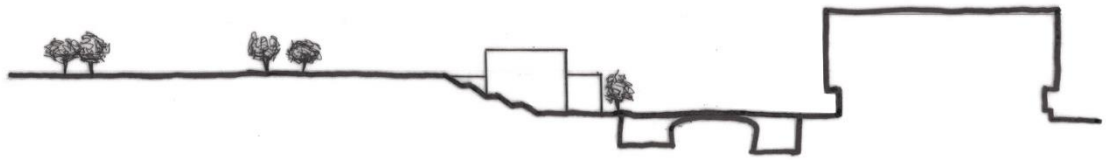


Figure 49: A sketch of Battery Park. By Author, 2019

4.1 Battery Park, Cape Town, South Africa

Architect: DHK Architects

Client: V&A Waterfront

Completion Date: 10th November 2018

Category: Park and recreation; historical

Size: 12 000 sqm

Introduction

The Amsterdam Battery was built by the Dutch settlers in Cape Town in 1784 which formed part of the coastal fortification systems that were constructed along the coast to defend them against attacks from the ocean. This specific Amsterdam Battery was one of the major coastal fortifications constructed and remains one of Cape Town's oldest structures today. The actual battery is buried near the entrance of the V&A Waterfront. DHK Architects transformed the historical aspects of the site into an urban park with the aim to activate an underused Canal District by implementing a new hub of activities in order to attract visitors to the site. Battery Park pays respect to the heritage of the Amsterdam Battery by retaining and enhancing the important line of sight between the battery and the noon day gun which is located on Signal Hill. The architects intentions for the previously fortified area was to re-establish and maintain an important connection between the city and the sea through the use of many pedestrian paths that create a link between the V&A Waterfront and the Cape Town CBD as well as providing a space that is functional, appropriate, safe and inclusive for all residents and visitors in Cape Town. The park offers a contradiction to the sites previous use as it was once a place of exclusion and incarceration whereas now it forms a public space full of life, greenery and activity. The park will activate the area and create a space for the public to have a break in the middle of the city.

Figure 51: Ariel view of park. (DHK, 2019)

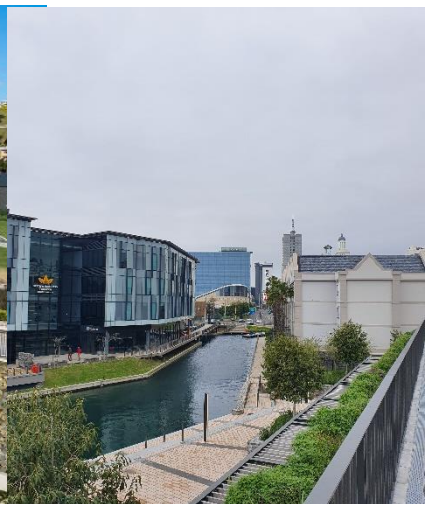


Figure 50: Canal. By Author, 2019

Location

The location of Battery Park is within the Canal District of the V&A Waterfront which acts as a connection between the Waterfront and the city. The site is located off Coen Steytler Avenue in close proximity to the Zeitz MOCAA Art Museum. The Amsterdam Battery was partially demolished in 1905 so that a railway could be constructed in order to connect the port to the growing city and since then the site and bordering canals have been largely unused and derelict. The remnants of the railway run through the site 8m above the level of the canal.

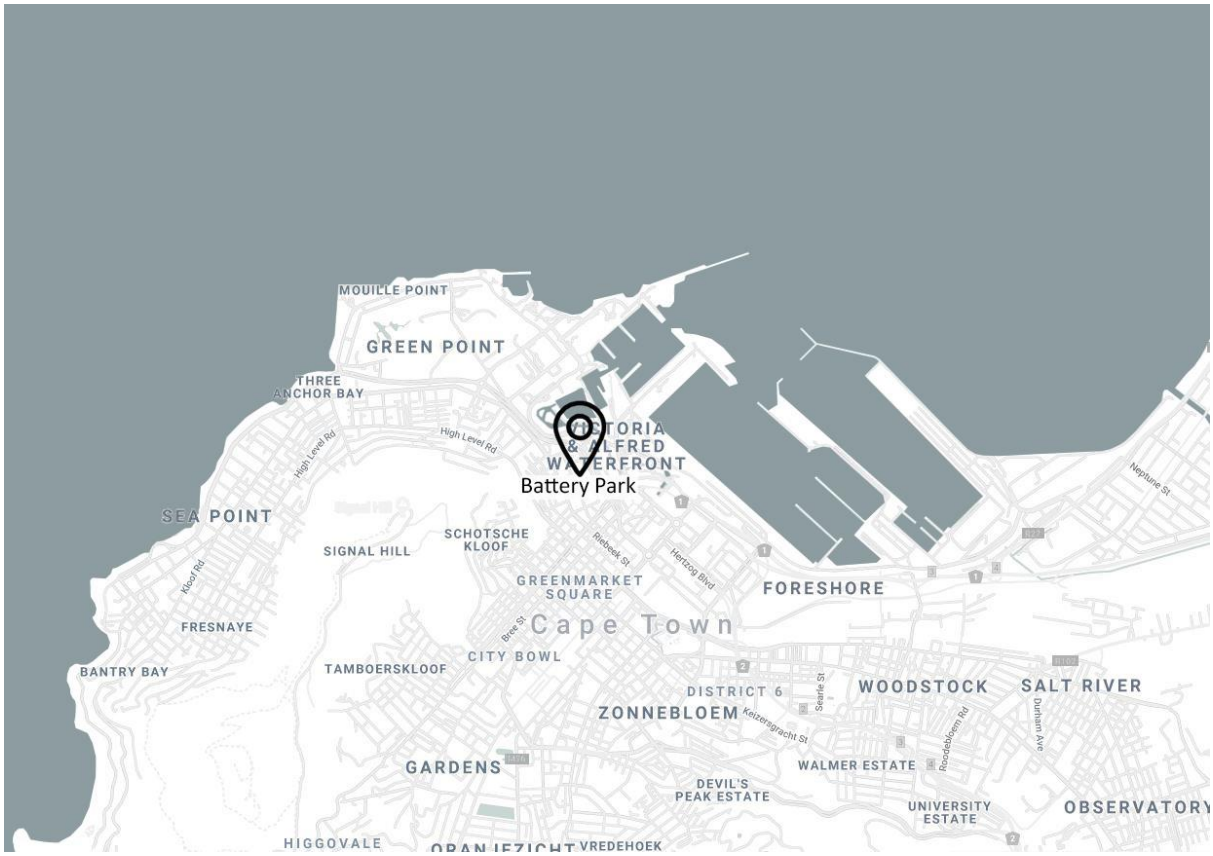


Figure 52: Location of Park. By Author, 2019

Context and Scale

The park acts as a green belt or corridor that binds two sectors of the city of Cape Town. The park is proportioned within its context as it sits on a sloped site that relates to the immediate surrounding buildings and offers integration between Cape Town's CBD and the V&A Waterfront through pedestrian movement. The park brings activity and movement to the area through recreational activities that attract the public and create social integration. Battery Park implements a green space within a busy city.

Figure 53: Ariel view of park within its context. (DHK, 2019)

Layout and Accessibility

The site is accessible with the use of the city's buses, water taxis and train networks with the incorporation of many pedestrian access points via Dock Road, Fort Road, Ebenezer Road and Alfred Street. Entrance into the park is free of charge and fully accessible to disabled visitors

creating an all-inclusive environment regardless of economic class, disability or demographics. Upon arrival, visitors can experience elevated levels of landscaped gardens, a public piazza, water activities in the canals, a skate park, retail space, a children's playground, a pavilion, a basketball court and recreational spaces that are all connected through a network of pedestrian paths that have built-in benches throughout. The layout of the park provides a safe public space for interaction and activity. Below the levelled park is a 4-storey parking garage that can be accessed via Alfred Street or Dock Road. Boutique shops can be found lining the canal facing walls on the eastern edge of the park forming the lower piazza that would have fronted the original battery. Retailers in the park include skate board and surf shops, water activity rental shops, bicycle rental shops, a restaurant and retail.

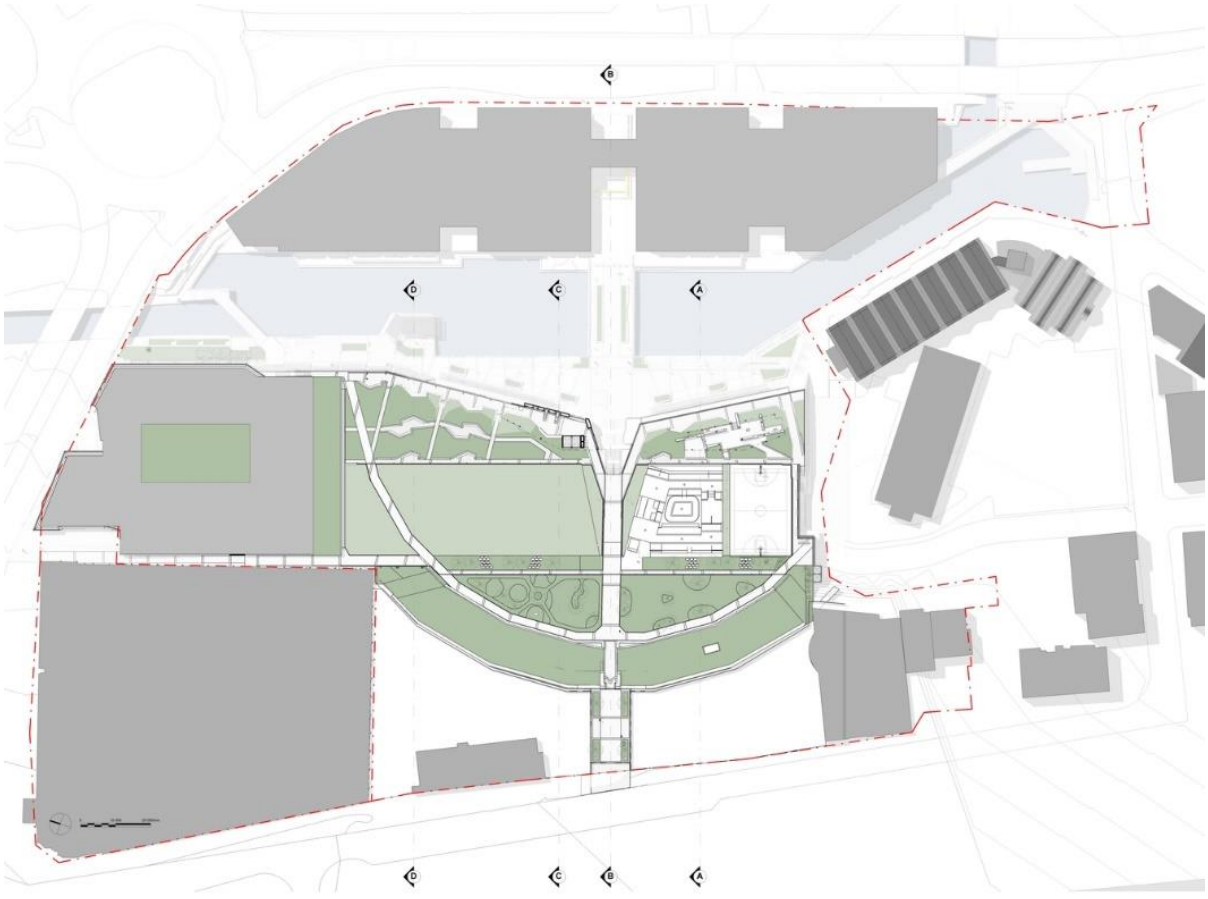


Figure 54: Plans. (DHK, 2019)

Tectonics

The park makes use of a simple grid layout for the underground parking structure and historical structures that are constructed using reinforced concrete as well as the original stonework from the Amsterdam Battery. The use of concrete was due to the fact that the South African built environment makes use of this material for construction yet it also creates a clear distinction between old and new structures.

Materiality

The materials that are used in the park either represent the historical importance or resemble the natural environment. The materials for the park form a contrast between old and new as it makes use of excavated stone throughout its construction and allows the public to distinguish between the materials from the old Amsterdam Battery and the new additions. Another contrast can be seen with the use of hard and soft materials. The hard landscaping and concrete benches contrast with softer materials used like timber pergolas and cladding as well as planting that has been designed to creep up the buildings in an attempt to connect nature and built form through an integrated façade.

Figure 56: Materiality. By Author, 2019 *Figure 55: materiality. By Author, 2019*

Topographic Analysis

The city of Cape Town experiences a hot and humid summer and a cool winter with winter rainfall patterns. The site accommodates the seasons all year round as it offers recreational and water activities during the summer as well as a sunny park to keep warm in the winter. Timber pergolas are located throughout the space in order to provide shelter from the sun or rain.

Theories and Concepts

The theory of critical regionalism can be seen in the design of Battery Park as the design and use of materials have an historical importance to the city of Cape Town as well as the notion to combat placelessness within a space that previously had no purpose.

Further investigating the attempt to combat placelessness, the theory of space can be evident in the use of the park as the park becomes a place for social infrastructure and inclusive architecture that forms spaces for different activities and emotions.

Biophilia can be used to describe the need to incorporate natural elements into a public space in order to form a connection between the city and man. Planting and natural elements have been used throughout the project in order to promote an outdoor and nature centred lifestyle within the area that allows people to form connections within a natural setting.

Spaces for Social Interaction

Spaces are created with the intention to create a platform for diverse people to integrate. Cape Town is home to many different cultures and ethnicities as well as diverse people from different backgrounds, racial groups and economic sectors, parks create a space for a diverse public to have an equal social setting that is stimulated by activities that promote inclusion.

Figure 57: Social integration through activities. By Author, 2019

Centre to Edge

The centre of the space becomes an amalgamation of the spaces around it allowing the functions of the surrounding buildings to pour out and integrate in the middle. The park acts as an oasis in-between two districts that become the centre of exchange and connectivity.

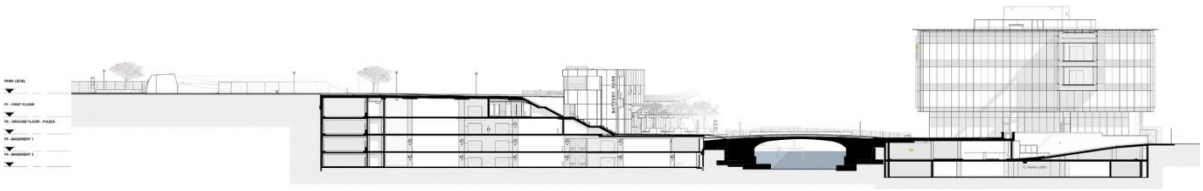


Figure 58: Section. (DHK, 2019)

Ability to Remain

The parks ability to remain relies on the sustainable principles used as well as the historical importance of the site. Green spaces within cities have proven benefits and are largely valuable to the people that stay or work in the area. The park offers a variety of activities for these people as well as visitors within the V&A District that promote an adventurous and healthy lifestyle.

Topography

The site started out as an Amsterdam Battery for the Dutch Colony but the space was then needed for the expansion of the harbour and the construction of a railway line. The park consists of open fields and indigenous natural environments that sit on top of an historical site. Before the park was constructed, archaeological digs uncovered two circular walls from the previous structure that have been retained and used in the present-day structure.

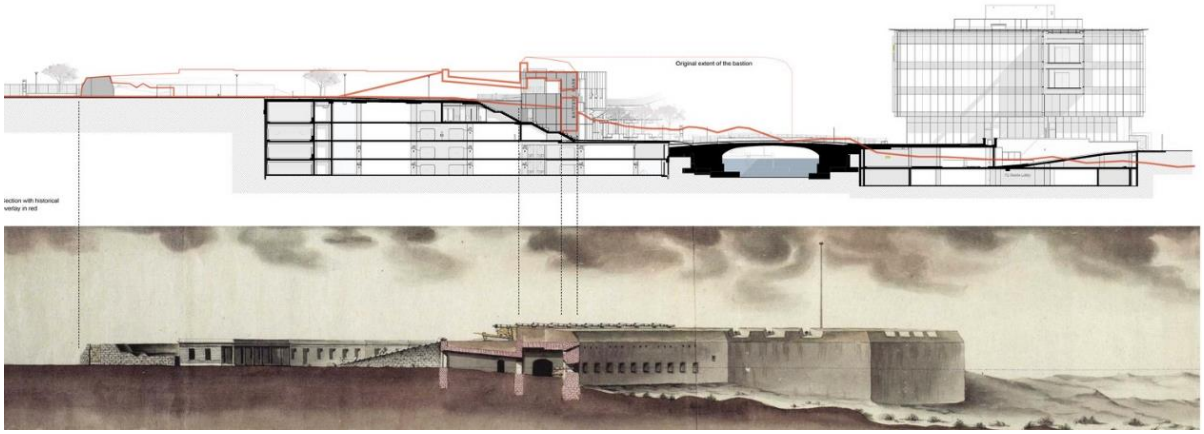


Figure 59: Section showing old Battery and new park. (DHK, 2019)

Purposefulness

The park creates its purposefulness as it forms a green and recreational space as the border between two busy districts. The contradiction of the space provides purpose for the city as it becomes a free and open space within a bustling area. The incorporation of the natural environment provides its inhabitants with nature that contrast from the surrounding built form as well as a fun place that allows for social interaction and integration.

Intensity

The intensity of the park can be seen in the contrast between its context and the park with the use greenery and canals. The canals and recreational spaces create activity in a safe space within the city and becomes a point of interest and relaxation. The piazza compliments the canal which then activates the space that then forms the connection between the districts which then encourages a pedestrian environment in the city of Cape Town.

Figure 60: Nature and built form. By Author, 2019

Conclusion

Battery Park forms connections within a city and introduces greenery and activity into a space that was previously lacking. The park forms a safe space for social integration and connectivity that allows its users to move freely and interpret space as they please. The introduction of social activities into a space that was once classified as a barrier has brought life and a destination to

this specific area which promotes a better lifestyle and a better connection to nature within cities.

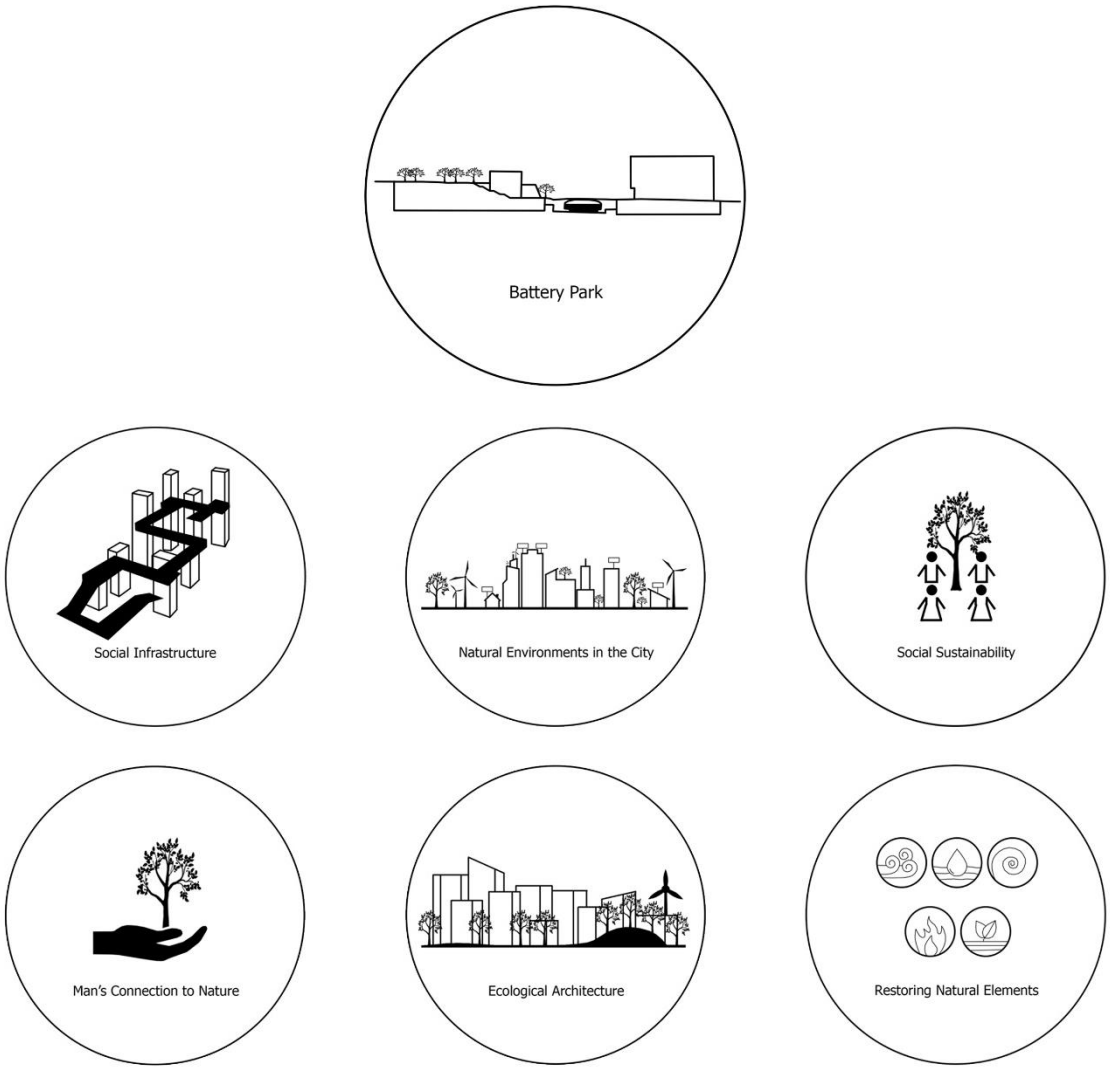


Figure 61: A bubble diagram representing the case studies connection to the research. By Author, 2019

FIVE | DATA ANALYSIS AND FINDINGS

5.1 Introduction

Provided, within this chapter, is the data and findings collected and analysed through the methods defined in Chapter One of this research paper. The intention of this chapter is to continue the conversation aligned with the themes that emerged in the chapters above. These themes also relate to the theoretical framework and were expanded on in the literature review as well as reiterated in the analysis of the precedent and case studies in order to address the key research question. The analysis of the data and findings aims to provide knowledge and insight around the research topic and in turn, these will be used to generate the conceptual framework and recommendations for the researcher's design project.

The research that emerged through the analysis of literature, precedent studies and the case study as well as interviews and informal questionnaires will be summarised in this chapter which will then form the basis of the recommendations in the chapter to follow.

5.2 Data Analysis and Findings

The review of literature focused on the connections between: Man and Natural Environments; Built Environments and Natural Environments; and Man and Built Environments in order to fully grasp the extent in which those connections are relevant to the research topic. The research further analysed theories and concepts that would further aid the interconnectivity of the three elements above (Man, Natural Environments and Built Environments) and subsequently suggest the coexistence of these three elements. The theories that have been applied to the literature include Biophilia, Eco-Feminism, Critical Regionalism and Theory of Space which make reference to the concepts that have been applied that include Environmental Rehabilitation, Ecological Urbanism, the Right to the City and Placemaking. The precedent studies above were analysed through the lens of the specific theoretical framework as well as the focus of the literature review in order to fully comprehend their relevance to the topic and

the architect's response to a similar problem statement. The case study presented in this document allows for a parallel application within a South African context that applied comparable design intentions and formed overlapping connections between the three elements that are focused on in the literature review.

5.2.1 The Connection between Man and the Natural Environment

The connection between man and the natural environment sets out to answer the question about the benefits of the relationship between man and nature and why the disconnect exists. When focusing on the connection between man and nature the research looked at the evolution of the relationship, how it formed and where it subsequently de-formed over millions of years. Concentrating on where the connection started and how the evolution of man has detached itself from the natural environment. Literature on the theory of Biophilia reiterates man's desire to connect to nature as well as the beneficial factors that are affiliated with it. Beyond man's connection to nature, research shows that healthy natural environments provide a natural climate solution for the climate crisis that the world is currently facing. The research investigated the relationship and interconnectivity of ecological systems and social aspects in order to achieve a sustainable outcome within the sub heading of social sustainability. Social sustainability gives the research greater insight as to the benefits of natural environments within society which in turn improves man's quality of life presently as well as for future generations. The theory of Eco-Feminism further reiterates the importance of the natural environment and the promotion of an all-inclusive society that is void of hierarchy and allows for all living organisms to be treated equally and a part of a common whole. One Central Park, ACROS Fukuoka Prefectural Hall and Battery Park, analysed above, show that the inclusion of social spaces and nature create a near seamless connection between man and the natural environment. These elements are the basic building blocks underpinning ideologies of social sustainability and biophilia. GO! Durban, a local NGO who focus mainly on repurposing and adding value to open spaces, want to make Durban a walkable city by the year 2030 by introducing man to

the natural environment in the Durban CBD. The NGO believes that the addition of nature will create spaces for safe human interaction and a natural journey through the city. It is of belief that the relationship between man and nature is growing but is an ongoing process as interventions need to be created to educate and create awareness for the public.

5.2.2 The Connection between the Built Environment and the Natural Environment

The connection between the built environment and the natural environment sets out to answer the question investigating ways in which architecture and the natural environment can sustainably co-exist. Ecology in architecture promotes a greater understanding of the importance of natural environments and built environments and how they may co-exist. The concept of Ecological Urbanism sets about to show that the built environment and natural environment are synergistic, co-existing ecosystems. Natural environments worldwide have been destroyed and overused by man and it highlights the critical importance, and urgency, of environmental rehabilitation in order to claim back what is fast becoming a scarce commodity as the population grows. Studies have shown that nature happens outside of cities yet it has proven to have multiple benefits to improving the quality of human life resulting in the need for ecological architecture. The implementation of the concept The Right to the City gives natural environments a right to cities but they are often disregarded when it comes to city development. The inclusion of greenery in the Durban CBD will result in reducing the temperature of the hot climate and providing shade and green roofs will provide additional green spaces and allow for planting initiatives to take place which will all add to a better quality of life. There is a demonstrable role for sustainable architecture and the precedent and case studies featured above clearly illustrate the benefits of ecological architecture and why this should be the direction in which built environments are progressed. Urban Ecology played a vital role in the design of ACROS Fukuoka Prefectural Hall, analysed above, which aimed at combining architecture with a natural environment in order to give land back to the park. This precedent uses sustainable design principles to make this happen, thus creating spaces that

enhance nature within an over developed city. Currently, there are reforestation and rehabilitation projects happening within the city of Durban but there are huge amounts of open spaces that have potential but are staying vacant.

5.2.3 The Connection between Man and the Built Environment

The connection between man and the built environment sets out to answer the question investigating how the built environment can promote sustainable spaces within cities, specifically Durban CBD. Understanding the connection between man and the built environment begins with understanding the importance of social infrastructure which aims to create a sense of community through the use of well-designed spaces. The right to the city praises social infrastructure with the inclusion of urban inhabitants as an important aspect to a socially inclusive city. Man's connection to space focuses on the human experience within the built environment and how that influences one's perspectives. Space becomes a spectrum of interpretation defined by the user. Inclusive architecture directly relates to the success of individual participation within society which results in social equality and social sustainability. The importance of inclusivity in architecture is vital as it correlates to a space's ability to fulfil its function within cities which adds to the space's success. Equality of spaces and inclusive architecture can be further studied through the implementation of the theory of Eco-Feminism as it promotes equality regardless of gender, race, environmental factors or social aspects. The analysis of the social spaces within the precedent and case studies above show that the inclusion of nature improves a space and is beneficial for the success of cities. Inclusivity among those spaces provide a platform for community which in turn creates a city for all, a space for inhabitants to relate and for interactions to take place. It is a space that provides a better quality of life for all.

5.4 Conclusion

To conclude, the research that took place through the use of the literature review, interviews, questionnaires, site observations and the analysis of precedent and case studies responds to the questions, aims and objectives stipulated in chapter one in order to address the problem statement of this research document. The design of an Eco-Social Sustainable Hub will use design principles that reflect the research within this document in order to create a solution and a response to chapter one. The researcher's architectural interventions aim to promote environmental rehabilitation while adhering to the co-existence of man, nature and architecture.

SIX | CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion Incomplete.

Chapter one set the scope for the research to follow by providing background information, stating the assumption and setting the questions and aims for the project. The primary question stipulated in chapter one set out to investigate environmentally responsible architecture and how it influences society and space within cities, the intention of the design is to incorporate the findings into a South African context, specifically Durban to act as a catalyst for further development. The aim of the research was met through the exploration of the principles and application of environmental rehabilitation and how that can influence sustainable development.

Chapter two looked at literature that focused on connections between man, nature and architecture in order to find a happy medium between the three and promote the ways in which all three can successfully co-exist. The literature review incorporated the theoretical and conceptual framework that was introduced in chapter one in order to further analyse the research and create a more defined understanding. The literature focused on the importance of environmental rehabilitation and how vital it is to incorporate sustainable principles in the built environment. An attempt has been made towards sustainable architecture and recreating the connection between man and nature but the disconnect is still clearly visible.

Chapter three analysed the literature through the use of precedent studies and how they further the understanding of the research. The precedents used relate to the literature review and show the success of the research in built form.

Chapter four illustrates a case study with the aim of providing information as to how this research attempts to adapt to a South African context. The case study is analysed through the same lenses used to analyse the precedent studies which in turn relates back to the research gathered in the literature review.

The answers to the questions asked in chapter one begin to conclude the research and provide insight for the design that follows.

Primary Question:

How can the implementation of environmentally responsible architecture within the Durban CBD enhance the social aspects within a city?

The literature focused itself around the inclusion of natural environments within cities and the additional benefits that this brings, one of those benefits include the increase of social spaces and activities as seen through examples and precedent and case studies above. Environmentally responsible architecture fits into the momentous and popular sustainable movement as a step in the right direction with regards to looking after our planet and the natural environment which is the direction in which many industries are heading but that doesn't necessarily mean that it goes hand in hand with social status. Through the analysis of precedent studies, it is not essentially the environmentally responsible architecture that improves or creates social space but it is, in fact, the implementation of activity within this setting that allows for the space to populate. The sustainable architecture merely provides a canvas for space to develop into social sustainable space.

Secondary Questions:

1. **What are the benefits of the relationship between man and the natural environment and why is there a disconnect?**

   The connection and disconnection between man and the natural environment was analysed in the literature review and focused on the primary and initial connection that man had with the natural environment and how civilisation grew and ultimately grew away from nature. Essentially, man created a man-made world and nature did not seem necessary. The sustainable movement has highlighted the importance of incorporating nature into mans daily life which has popularised and started to increase man's attraction to nature.

2. **How can architecture and the natural environment sustainably co-exist?**

   The precedent and case studies above represent architecture and natural environment that have managed to find a happy medium between the two. One Central Park in Australia co-exists with nature through the implementation of sustainable principles so much so that it is difficult to tell where one ends and the other begins. Sustainable principles become a link between architecture and the natural realm and allow architecture to be gentle to nature instead of reckless.

3. **How can the built environment promote a sustainable social space for Durban?**

   In isolation, the built environment is just that, the built environment, but once other factors are considered and included social spaces can form which can then become sustainable social space. Sustainable social space forms a necessary part of achieving a holistic sustainable outcome which transpires from the relationship between man and nature and, in turn, represented within space. The implementation of sustainable design principles within the built form as well as the inclusion of the natural environment aids the promotion of sustainable social spaces within a city.

The research aimed to explore the principles of environmental rehabilitation and how its application within the built environment can influence sustainable development through the assumption that natural resources are on the verge of depletion and cannot sustain the growing population. Environmental rehabilitation within cities promotes the inclusion of natural environments in urban space which, in turn, promotes positive change. These positive changes should include flourishing natural eco-systems that thrive on the grounds of architecture. Based on the review of literature, site observations, the analysis of precedents and case studies and a qualitative analysis of man, nature and built environments, it can be concluded that the implementation of environmentally responsible architecture within cities can encourage social environments and promote sustainable lifestyles and developments. The results indicate that man has a deep and fundamental desire to connect with nature so the inclusion of these environments in cities will be beneficial on many levels. These levels include a better quality of life and a more sustainable lifestyle which helps to protect nature. Environmental rehabilitation becomes a platform that restores land in order to sustain natural eco-systems, while the integration of environmental rehabilitation through architecture proposes a built environment that promotes the coexistence of natural eco-systems and social spaces for human interaction. Thus, recreating the connections between man, nature and architecture.

6.2 Recommendations

Based on these conclusions, recommendations are formed that will be used to define the design principles for environmental rehabilitation within cities that promote an environmentally friendly lifestyle. The focus of this research fixated on three separate entities and how they connect singularly to one another. furthering their connections into design principles allows those three entities to form co-existing bonds that subsequently form environmental rehabilitation within the Durban CBD that promotes social interaction.

Hedonistic Sustainability

Hedonistic sustainability focuses on man's connection to nature and social sustainability that is represented in built form. As research suggests above, the architecture of hedonism sets out to portray the sustainable movement that increases quality of life. Man's connection to nature becomes a beneficial relationship and increases man's quality of life and social sustainability promotes the preservation and improvement of man and ecosystems. Social activities in and around nature that uses sustainability as a way to enhance the natural environment as well as man's quality of life forms the principles in which hedonism transpires. Therefore, the design will focus on the inclusion of social spaces that interact with natural environments and promote sustainable principles.

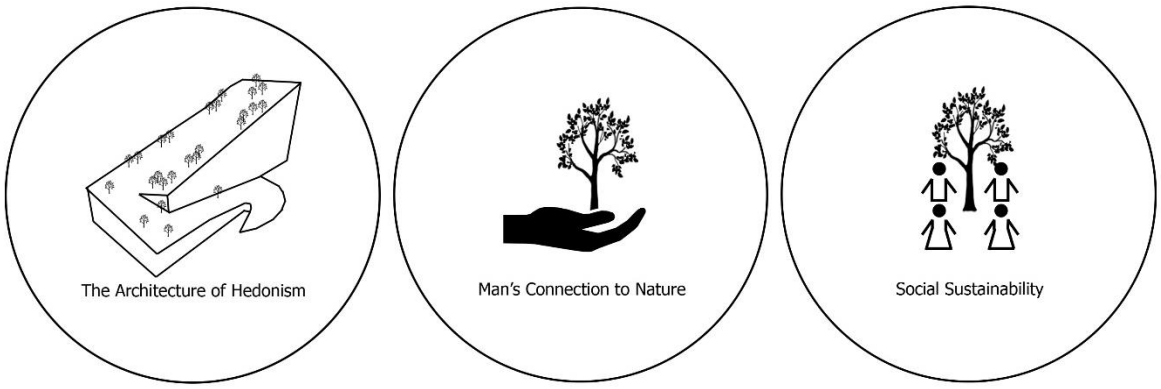


Figure 62: Design principles reflecting man's connection to the natural environment. By Author, 2019

Ecological Architecture

Ecological architecture looks at restoring natural elements, natural environments in the city and sustainable architecture. Ecological architecture forms an amalgamation between building and nature in order to create urban ecosystems that become the coexistence of architecture and the natural realm. Restoring natural elements becomes an important theme as it encourages environmental rehabilitation and the renewal of natural ecosystems that came before man's

destruction. Sustainable architecture will be represented through sustainable principles and techniques that allow built form to compliment and sustain nature. The design will also focus on including rehabilitation nature ecosystems.

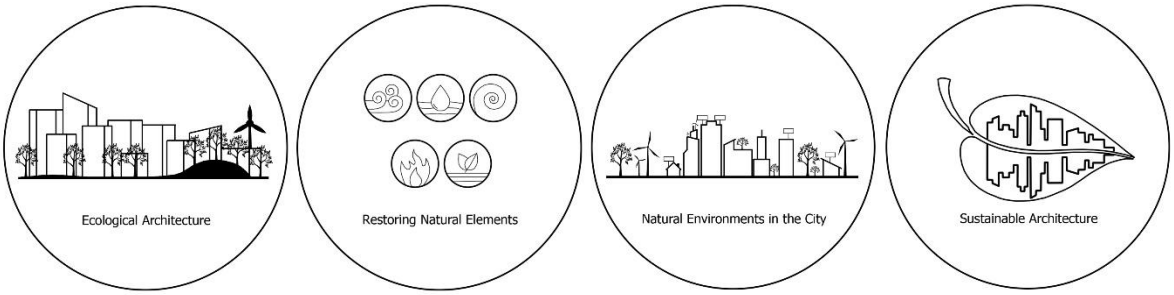


Figure 63: Design principles reflecting the connection between the built environment and the natural environment. By Author, 2019

Social Infrastructure

Social infrastructure focuses on built form that creates social spaces for human interaction. Man's connection to space and inclusive architecture represent social infrastructure and the connection between man and the built environment by creating socially inclusive space. Cities provide a platform for social interactions within the spaces inside and between buildings and the quality and design of these spaces form the social success. The design will focus on creating social spaces throughout the infrastructure that are inclusive and focus on interaction and connectivity.

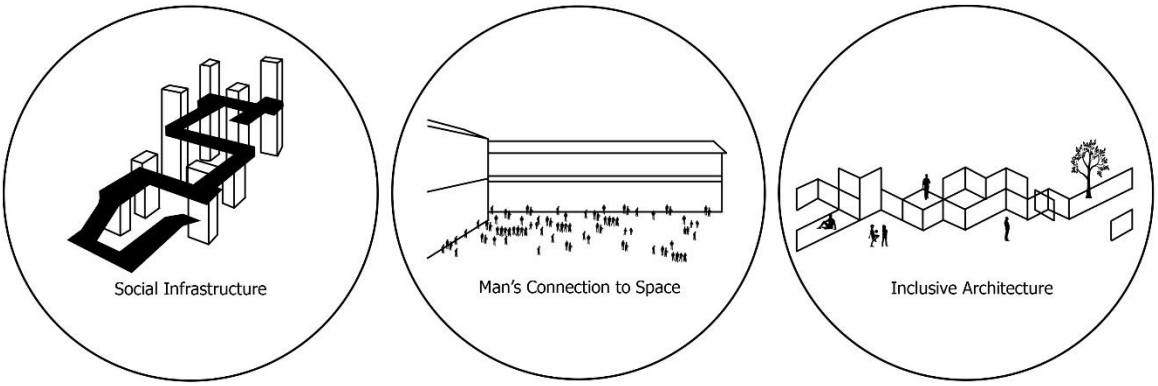
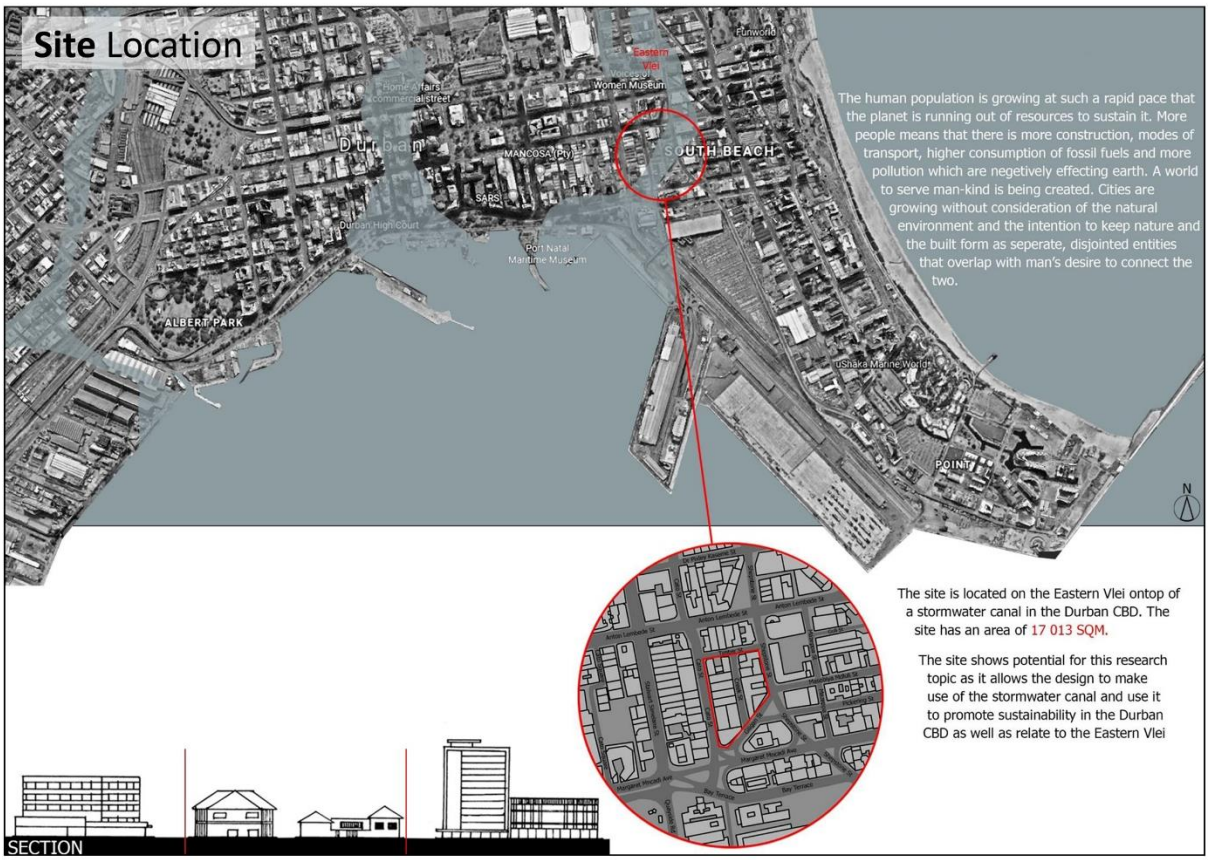


Figure 64: Design principles reflecting man's connection to the built environment. By Author, 2019

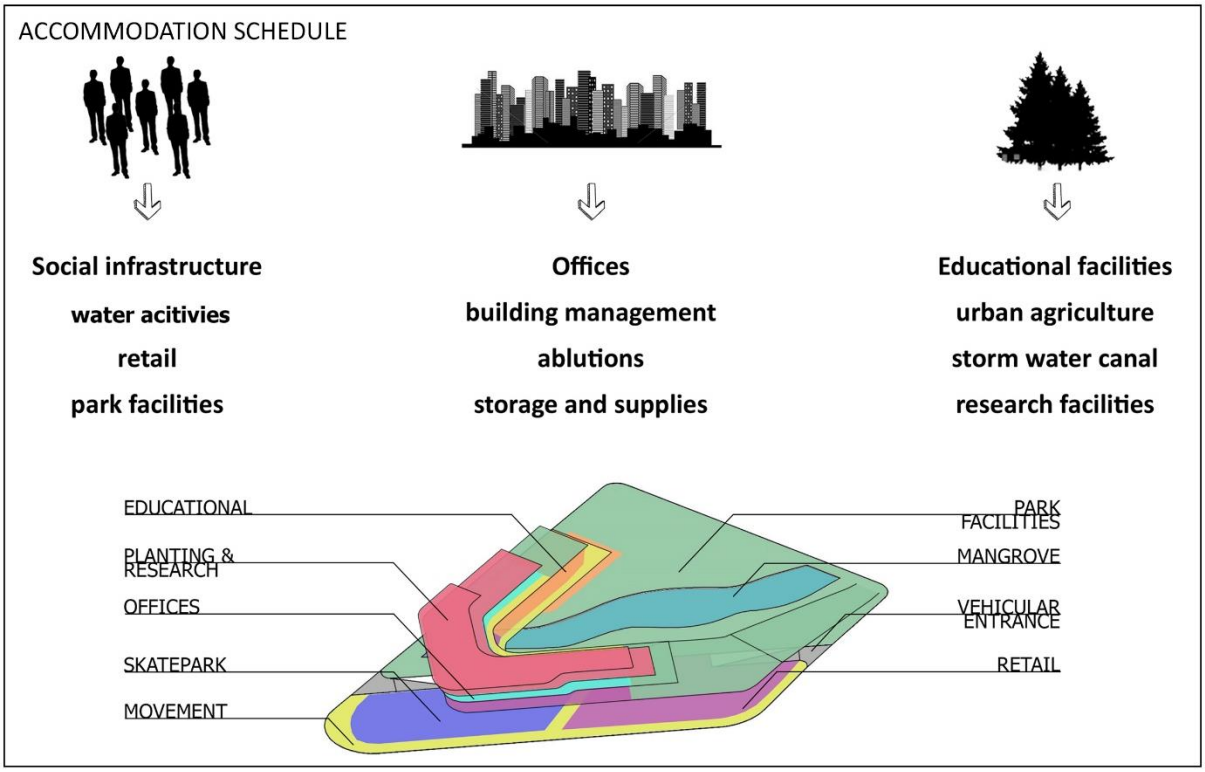
SEVEN | DESIGN REPORT

Chapter seven presents the site selection, accommodation schedule and design interventions presented at mock jury. The design principles are applied to the design as well as the representation of the theories, concepts, literature, precedent studies and case studies in order to respond holistically to the research question and problem statement.

7.1 Site Selection



7.2 Accommodation Schedule



FINAL PRESENTATION
19.11.2019

ENVIRONMENTAL REHABILITATION THROUGH ARCHITECTURE

- AN ECO-SOCIAL SUSTAINABLE HUB FOR DURBAN CBD

ALEXANDRA VAN VUUREN
214548776

WHO

OVER-POPULATION

CONSTRUCTION

DEPLETING NATURE

On average 400 000 humans are born and only 160 000 die every day. The population is growing at such a rapid pace that the planet is running out of space. More people mean more space is needed for construction, cities need to expand and there is a higher consumption of fossil fuels. The expantion of cities are resulting in the depletion of nature as construction takes precedent over the natural world

WHY

To reconnect man to nature and provide a catalyst for built form to connect to the natural environment, as well as promoting the benefits of sustainability and natural environments in the city

WHAT

An Eco-Social Sustainable Hub

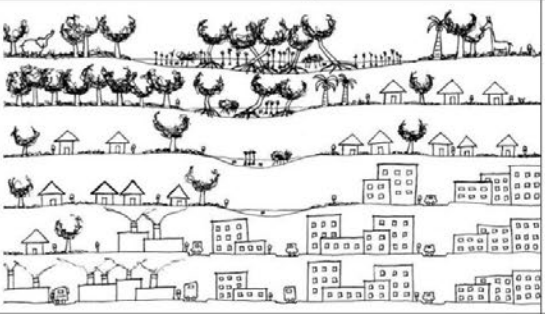
An eco-social sustainable hub focuses on the connections between man, nature and the built environment that provides a platform to educate humanity about the negetive impacts our way of living has on the environment and promoting a step in the right direction

PROBLEM STATEMENT

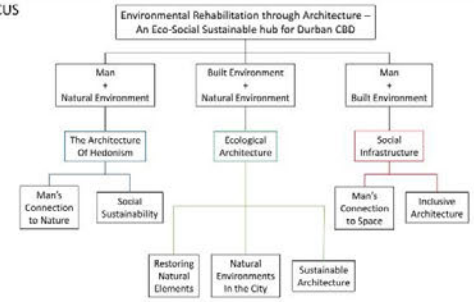
SOCIAL

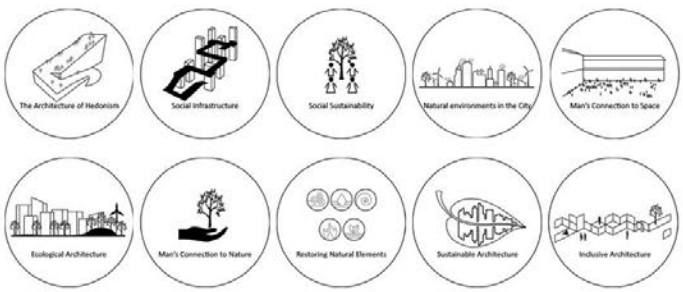
ECONOMIC

PHYSICAL



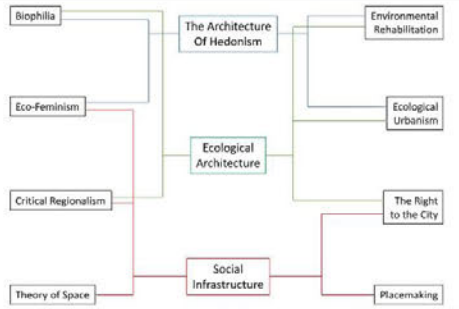
RESEARCH FOCUS

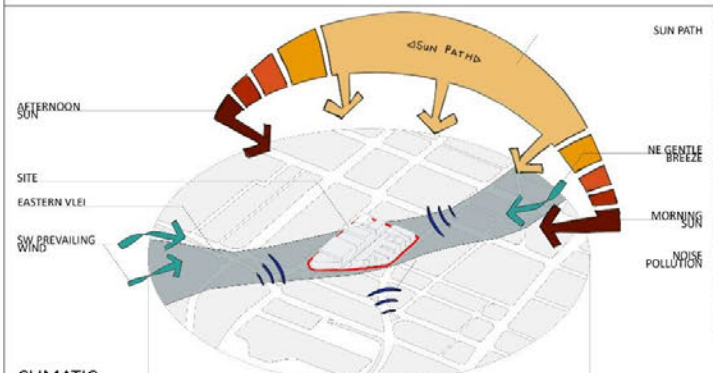




THEORIES

CONCEPTS

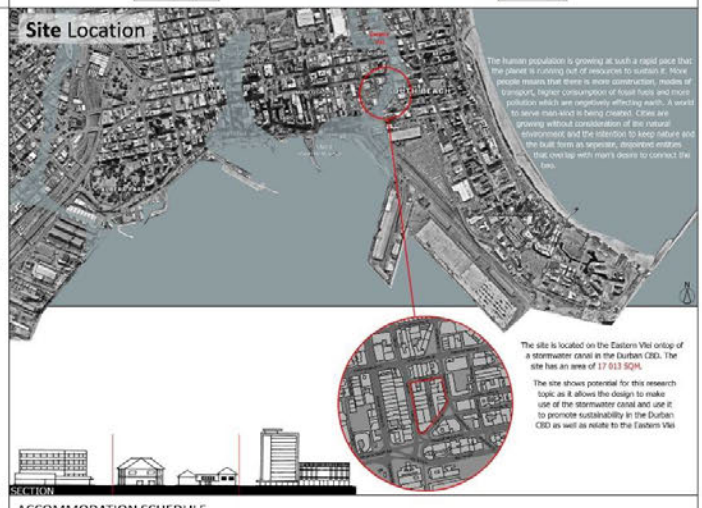




CLIMATIC

VEHICULAR + PEDESTRIAN

ZONING

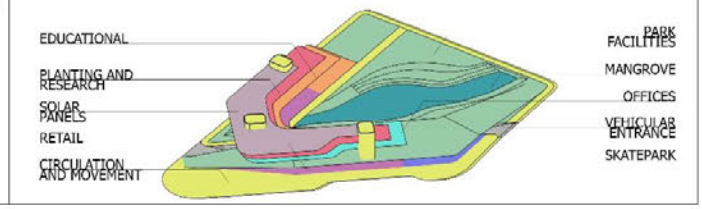


ACCOMMODATION SCHEDULE

SOCIAL INFRASTRUCTURE
WATER ACTIVITIES
RETAIL
PARK FACILITIES

BUILDING MANAGEMENT
STORAGE AND SUPPLIES
OFFICES AND RETAIL
ABLUTIONS

EDUCATION FACILITIES
RESEARCH FACILITIES
MANGROVE
PLANTING



FINAL PRESENTATION
19.11.2019

ENVIRONMENTAL REHABILITATION THROUGH ARCHITECTURE

- AN ECO-SOCIAL SUSTAINABLE HUB FOR DURBAN CBD

ALEXANDRA VAN VUUREN
214548776

PRECEDENT STUDY 1

One Central Park, Australia

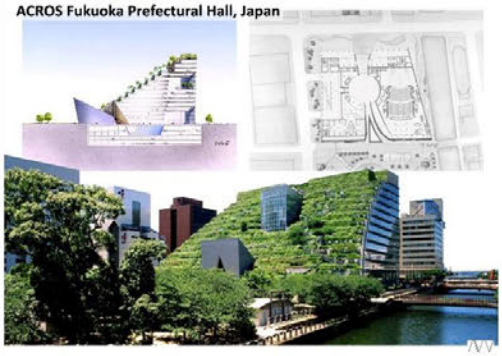
ARCHITECT: ATELIERS JEAN NOUVEL

LOCATION: SYDNEY, AUSTRALIA

Social spcaes through out the building as well as the introduction of the natural environment reconnecting man, architecture and nature within the city. The use of sustainable principles and sustainable technologies in order to promote a more eco-friendly lifestyle for the future of city living.

PRECEDENT STUDY 2

ACROS Fukuoka Prefectural Hall, Japan



ARCHITECT: EMILIO AMBASZ

LOCATION: FUKUOKA, JAPAN

Ecological urbanism within the city with the aim of promoting and celebrating natural environments and letting them thrive within an urban setting. The amalgamation of built form and the natural environment in order to achieve a better quality of life for man.

PRECEDENT STUDY 3

Superkilen Park, Denmark

ARCHITECT: BIG GROUP, TOPOTEK 1 AND SUPERFLEX

LOCATION: COPENHAGEN, DENMARK

An urban scale intervention introducing social spaces in a city promoting urban rejuvenation and a social corridor through residential zones. The social corridor becomes a platform for social gathering and interaction by offering a variety of activities and relating to a diverse group of people.

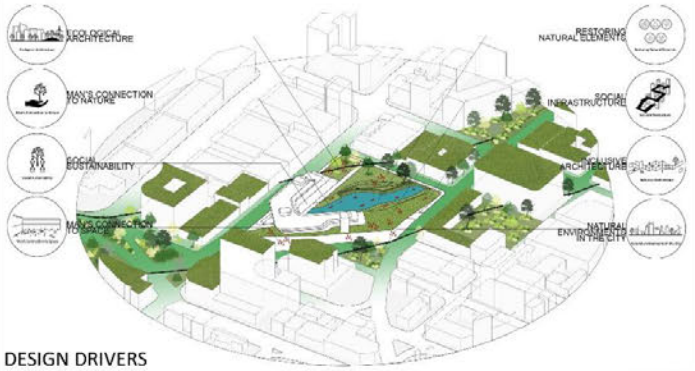
CASE STUDY

Battery Park, Cape Town

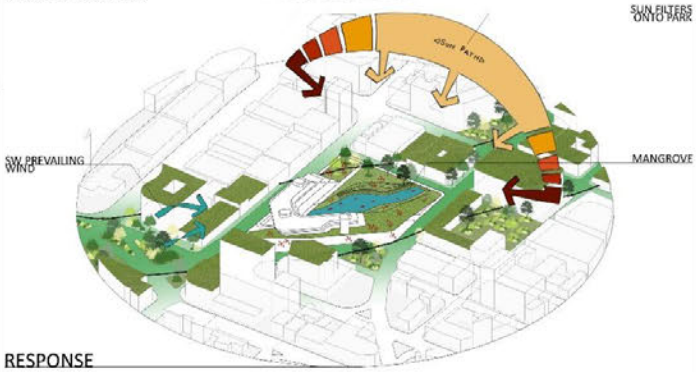
ARCHITECT: DHK ARCHITECTS

LOCATION: CAPE TOWN, SOUTH AFRICA

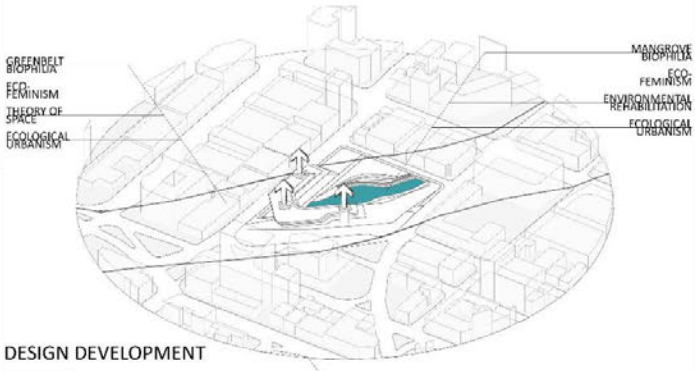
A park intervention with the intention of connecting the city to the V&A Waterfront in Cape Town. The park provides activites that are involved with natural elements which provide greenery to the city of Cape Town and a connection where social interaction takes place.



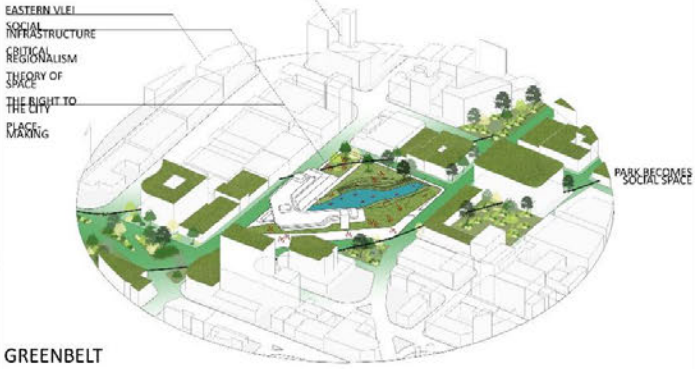
DESIGN DRIVERS



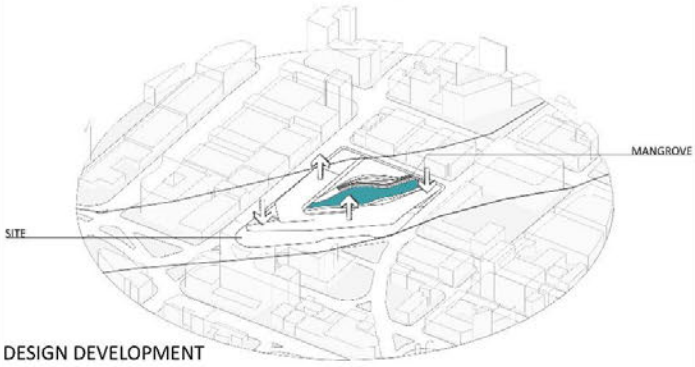
RESPONSE



DESIGN DEVELOPMENT



GREENBELT



DESIGN DEVELOPMENT

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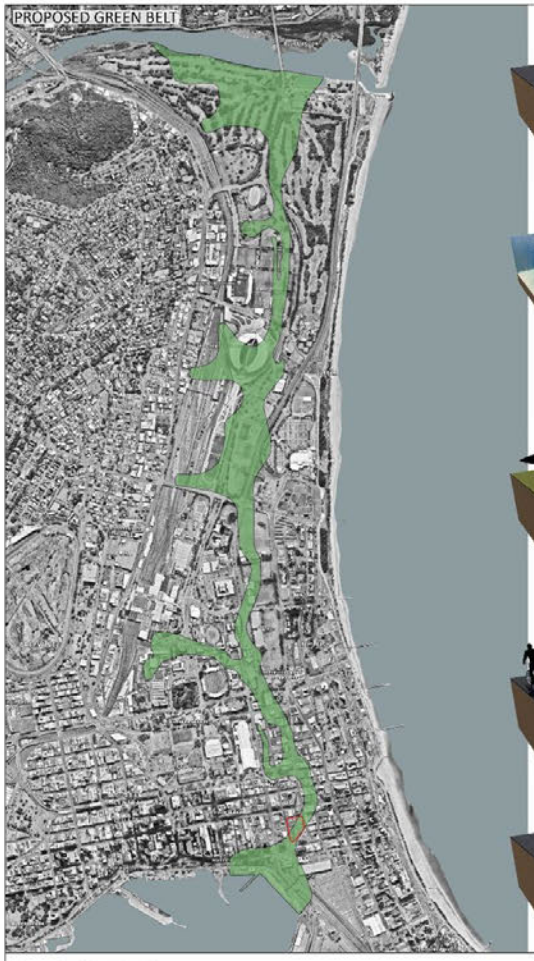
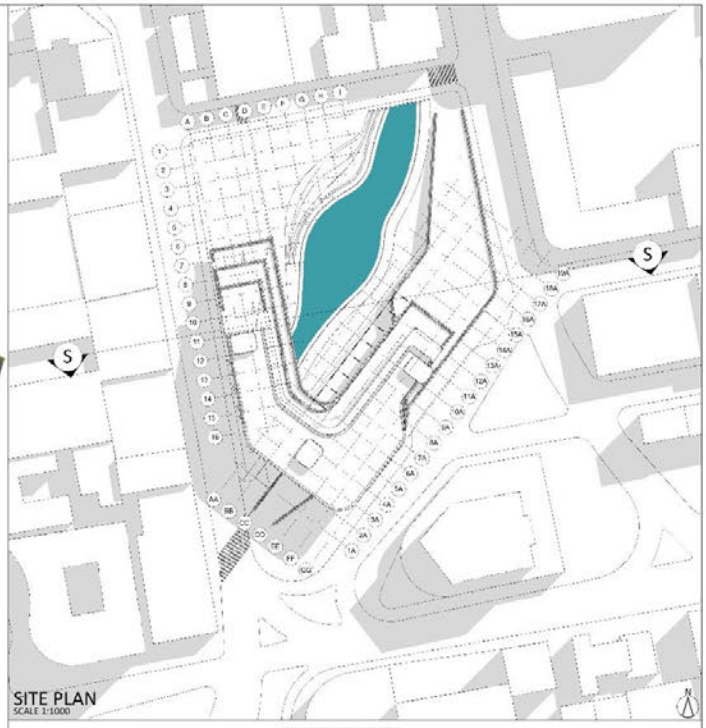
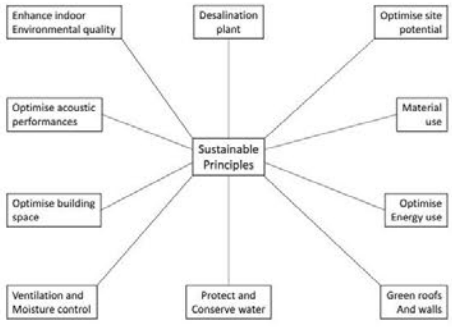
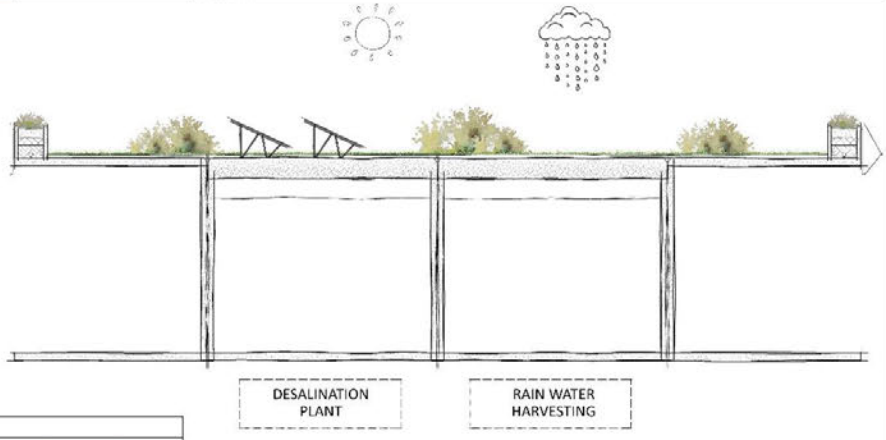
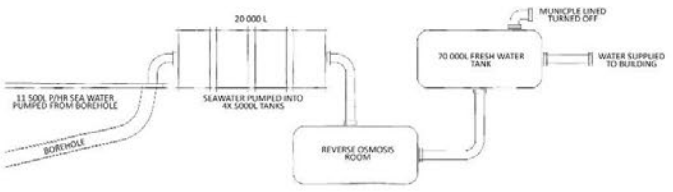




Sustainable Principles

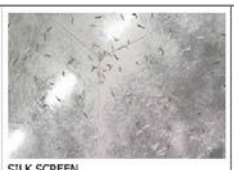






MATERIALITY

CHITOSAN
GROUND ARTHROPOD SHELLS ARE TRANSFORMED INTO CHITOSAN TO FORM A VARIABLE PROPERTY AQUEOUS SOLUTION. CYANOBACTERIA COATED CHITOSAN IS WATERPROOF AND AS STRONG AS CONCRETE.

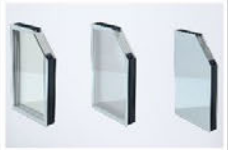


SILK SCREEN
A PRIMARY STRUCTURE IS CREATED MADE UP OF POLYGONAL PANELS OF SILK THREADS. SILKWORMS ARE THEN PLACED ON THE PANELS AND GENERATE FLAT, NON-WOVEN SILK PATCHES.

TIMBER
RECYCLED TIMBER USED FOR FINISHES AND THE SCREEN ON THE GROUND FLOOR TO REPRESENT THE NATURAL ELEMENT THAT IS EXPERIENCED WHEN WALKING THROUGH A FOREST.

NATURAL VEGETATION
PLANTING AND GRASS USED THROUGHOUT THE PROJECT TO INTRODUCE ARCHITECTURE AND MAN TO THE NATURAL ENVIRONMENT. ALL PLANTING TO BE INDIGENOUS TO THE AREA.

BRICK
BRICK IS USED AS INFILL WHERE NECESSARY AND FOR THE VIEWPORTS IN THE MAIN CHITOSAN SCREEN LOCATED ON THE SW SIDE OF THE BUILDING. UPCYCLED BRICK TO BE USED IF POSSIBLE.



GLASS
GLASS THROUGHOUT THE BUILDING IS DOUBLE GLAZED AND LOW-E.

UPCYCLED PLASTIC
UPCYCLED PLASTIC USED FOR THE BALUSTRADES THAT ARE ATTACHED TO THE CHITOSAN PLANTERS.

LOCAL ROCK AND RUBBLE
LOCAL ROCK AND RUBBLE FROM THE SURROUNDING AREA AND THE BUILDINGS THAT EXISTED PREVIOUSLY TO BE USED IN THE CONSTRUCTION OF THE BUILDING.

UPSCALED METAL
UPSCALED METAL WILL BE USED FOR FINISHES WHERE NECESSARY AND THROUGHOUT THE BUILDINGS TO PROMOTE A UNIFYING THEME.

ENVIRONMENTAL REHABILITATION THROUGH ARCHITECTURE

- AN ECO-SOCIAL SUSTAINABLE HUB FOR DURBAN CBD

ALEXANDRA VAN VUUREN
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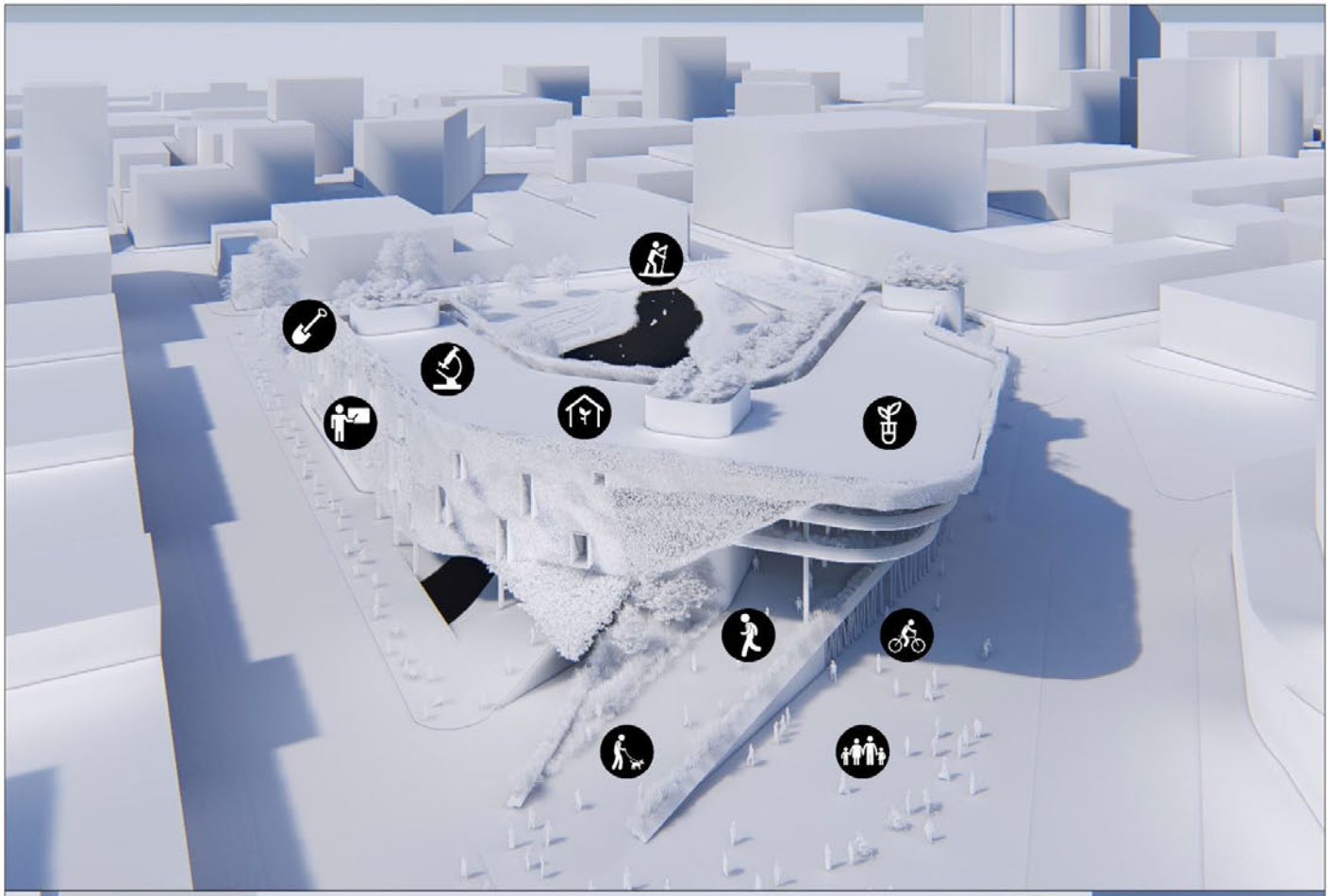

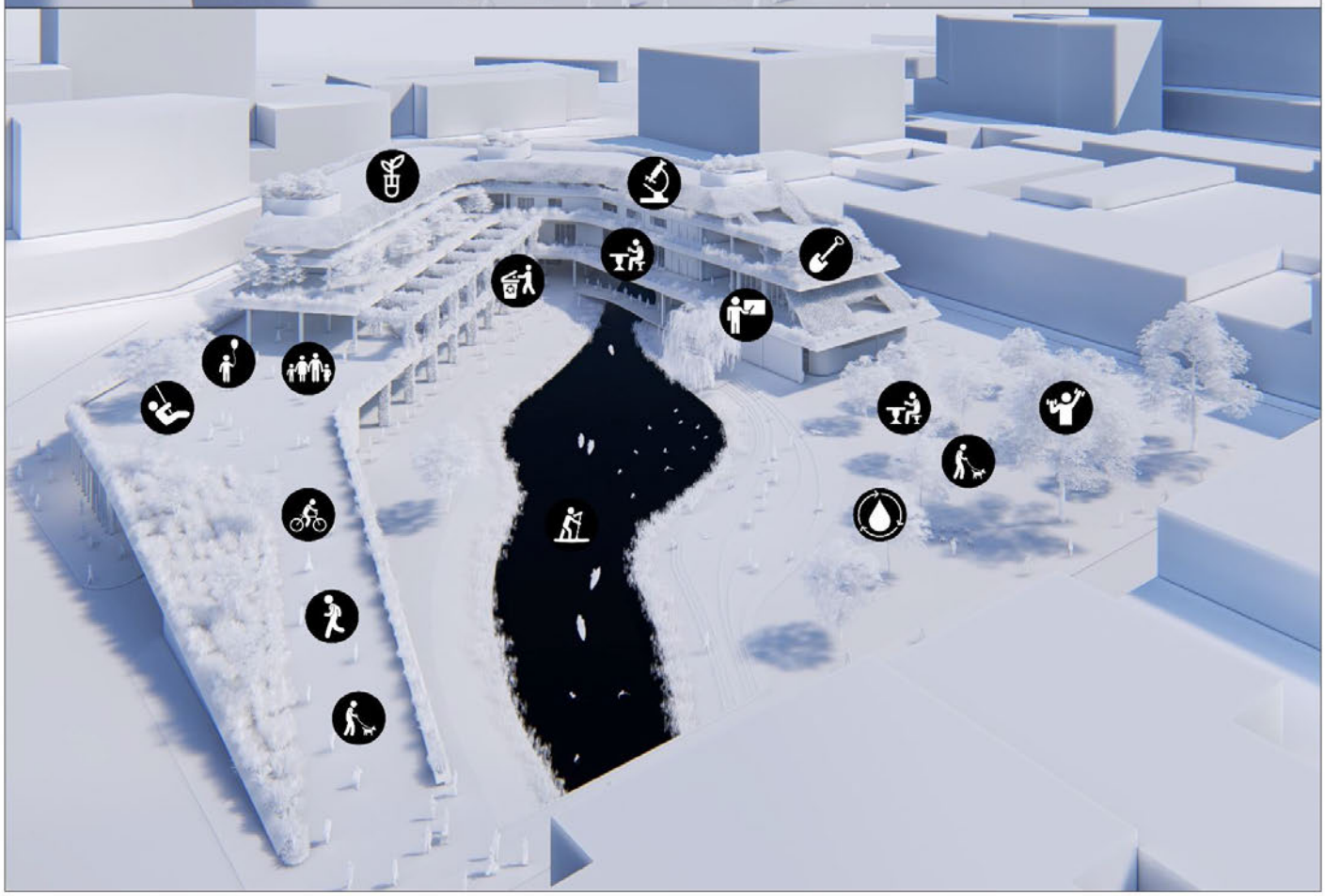

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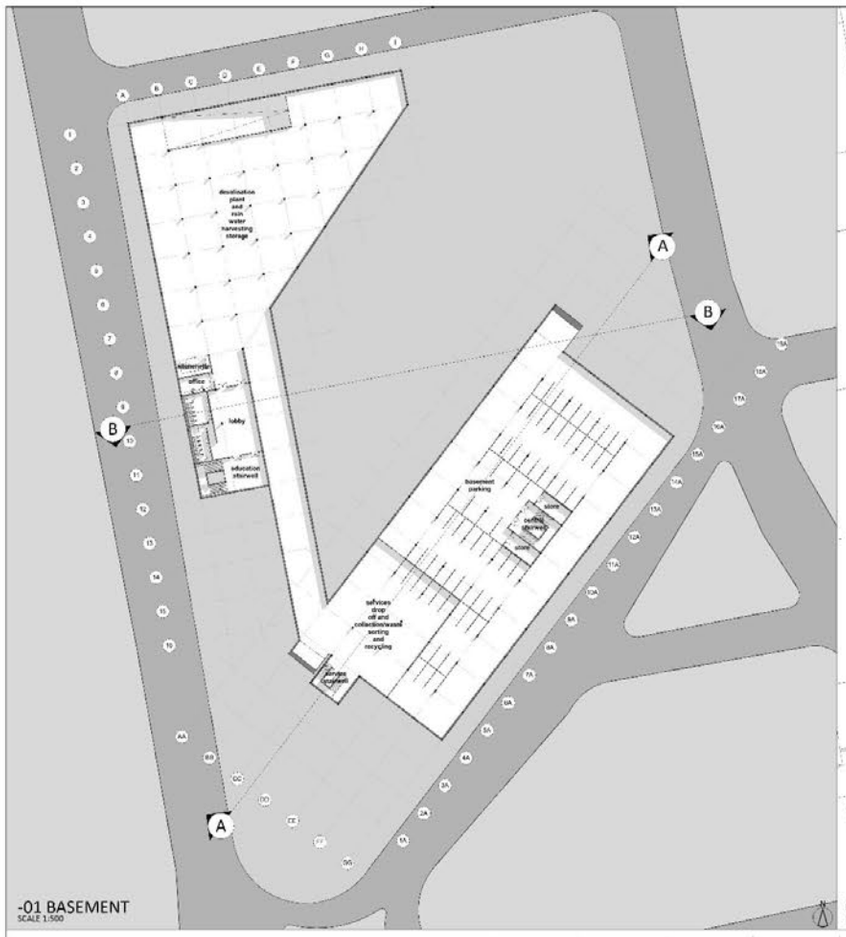

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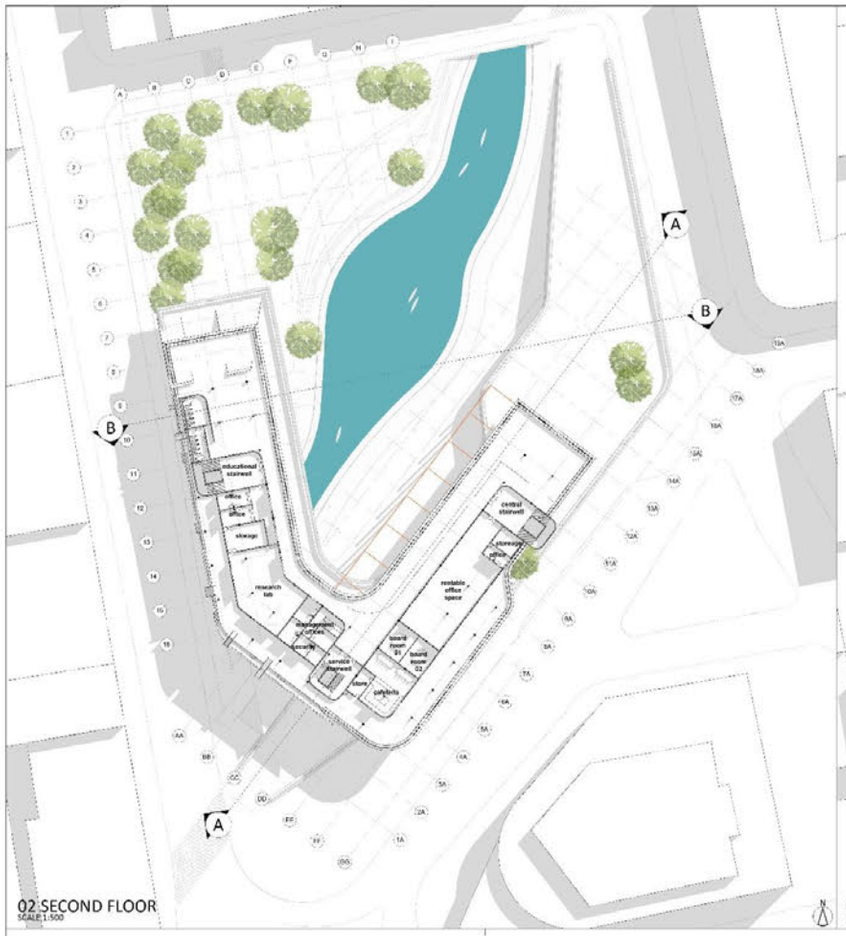
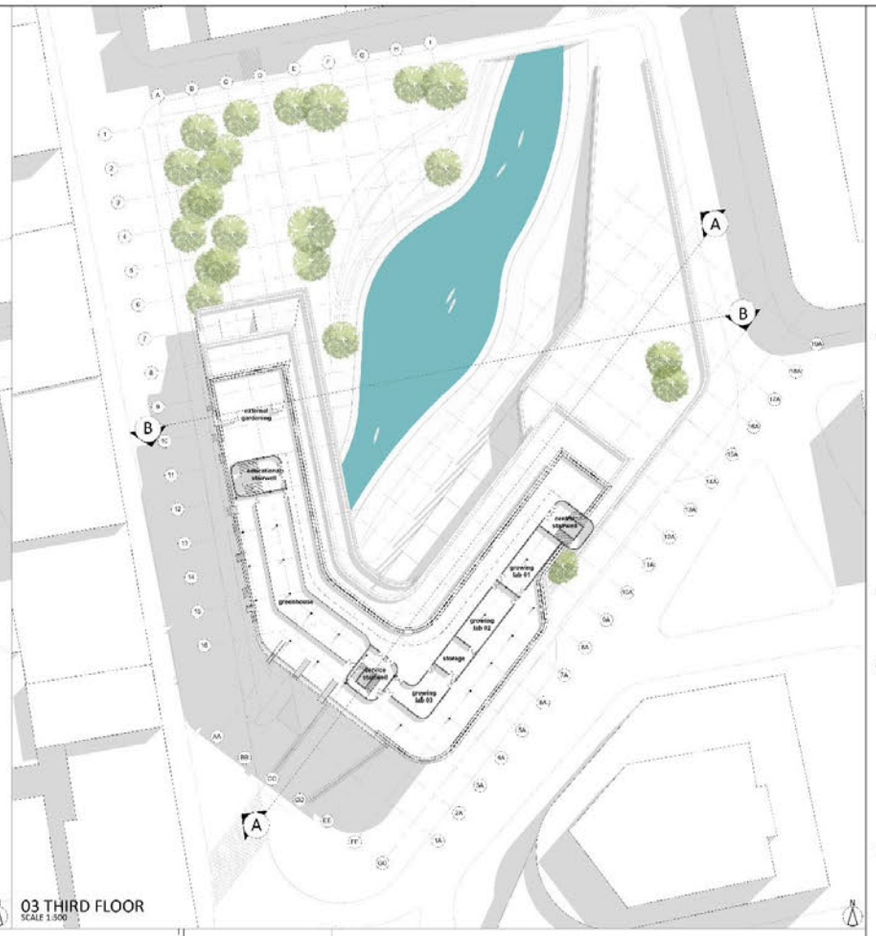
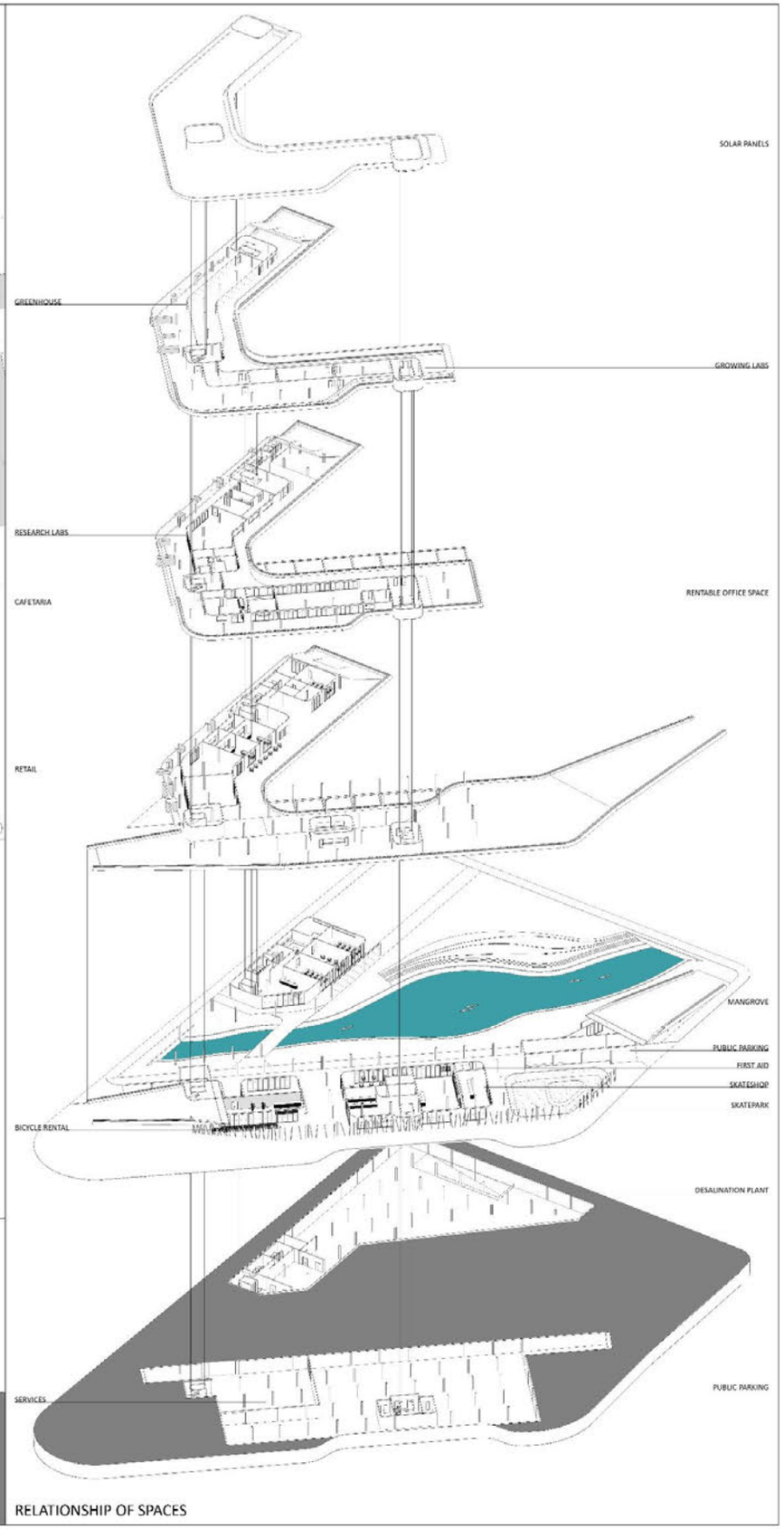


02 SECOND FLOOR
SCALE 1:500



03 THIRD FLOOR
SCALE 1:500

SECTION B-B
SCALE 1:200



RELATIONSHIP OF SPACES

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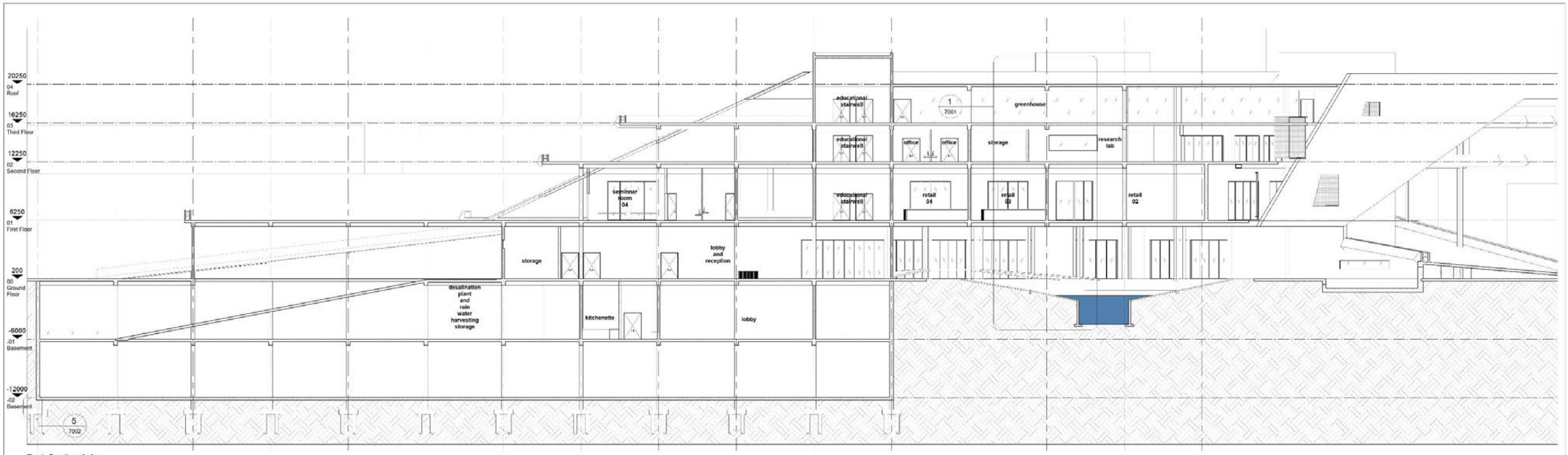
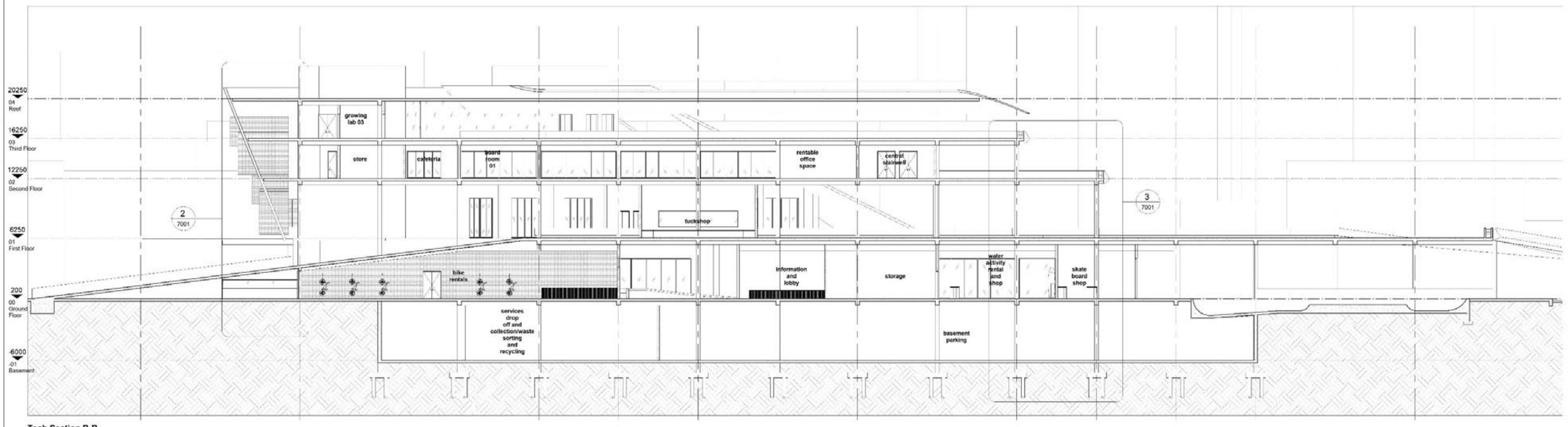


Tech Section A-A
SCALE 1 : 200



Tech Section B-B
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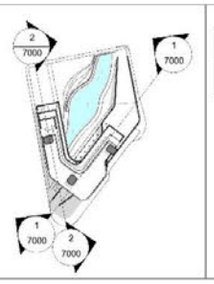
Architect: Alexandra van Vuuren

DRAWING TITLE:
TECH_Sections
PROJECT:
MArch_Tree Vista
FOR:
ERF NUMBER:
STREET ADDRESS:
17 Shepstone Street

No.	Description

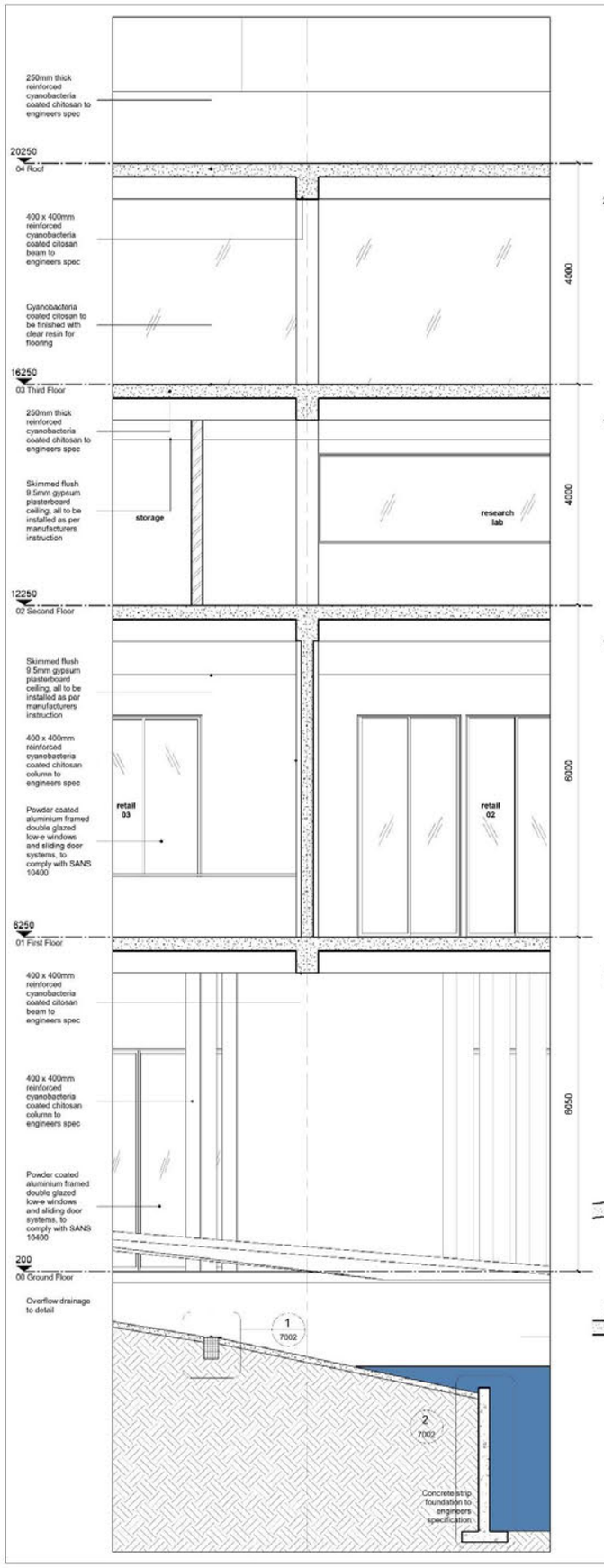
FOR CONSTRUCTION



JOB NO.	OCCUPANCY	DRAWING NO.
		- 7000
DATE	SCALE	DRAWN BY
19 Nov 2019	As indicated	AvV

EMAIL: alex.vanvuuren@hotmail.com
TEL: 0836272754

2019/11/19 08:46:15



FOR CONSTRUCTION

No.	Description

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Architect: Alexandra van Vuuren

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TECH

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MArch_Tree Vista

FOR:

ERF NUMBER:

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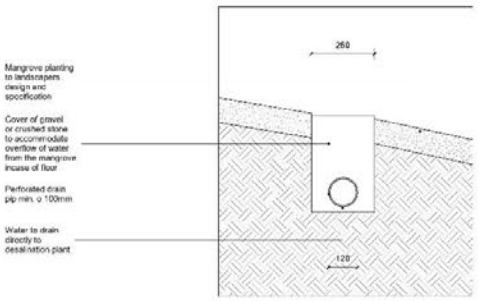
		- 7001
DATE	SCALE	DRAWN BY
19 Nov 2019	1 : 50	Author

EMAIL: alex.vanvuuren@hotmail.com
TEL: 0836272754

2019/11/19 08:46:50



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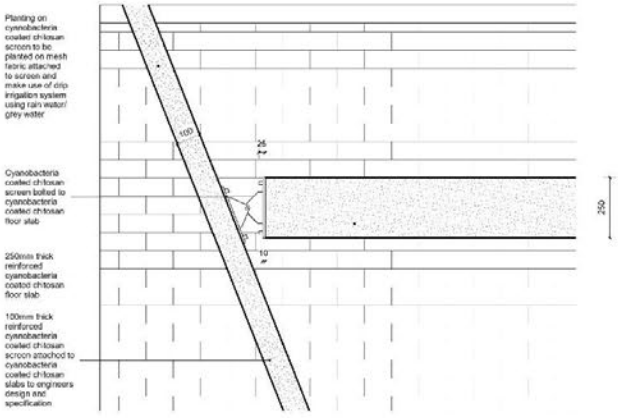

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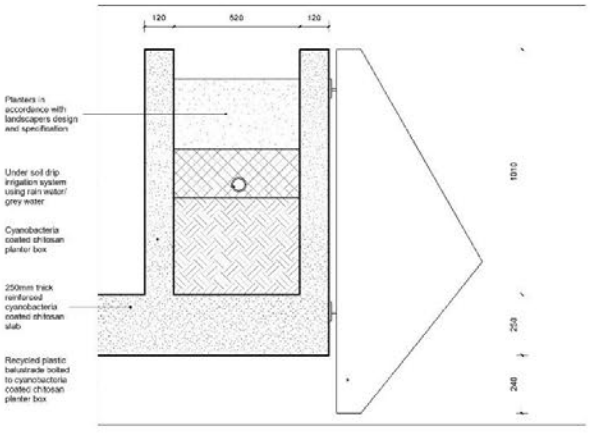

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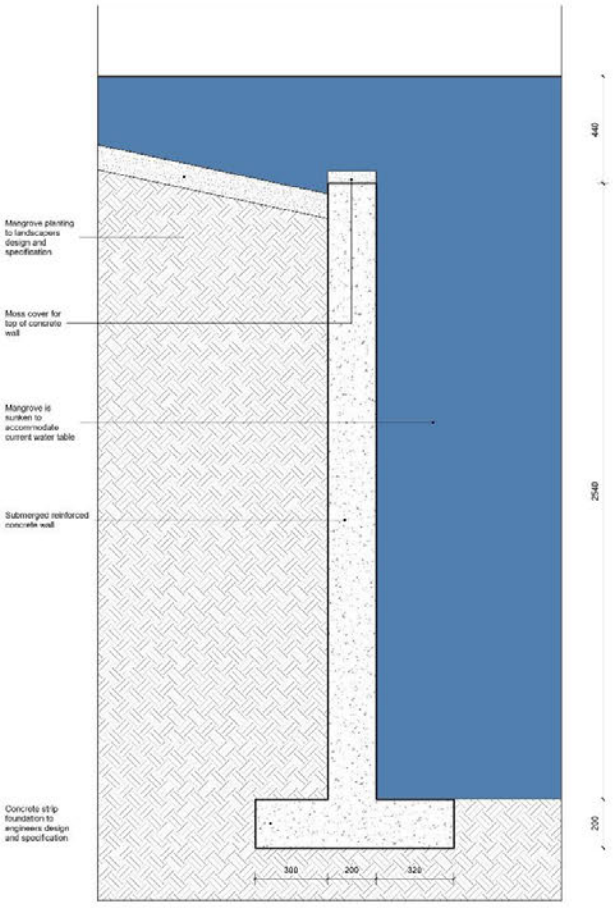

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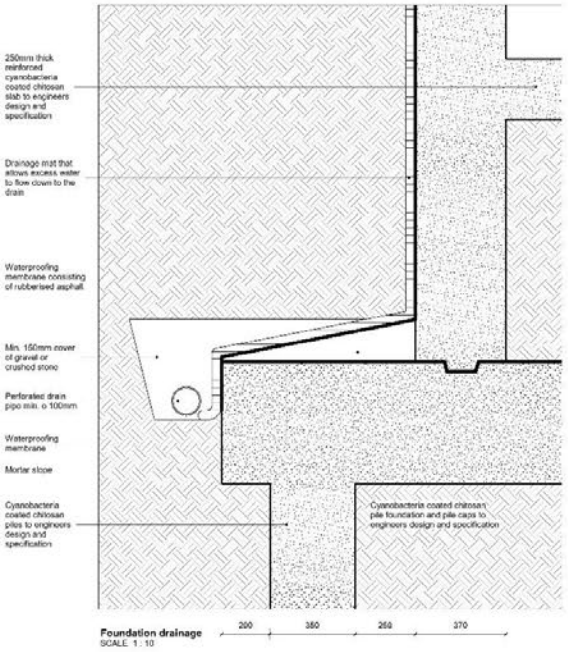

Foundation drainage
SCALE 1 : 10

No.	Description

DRAWING TITLE:
TECH

PROJECT:
MArch_Tree Vista

FOR:

ERF NUMBER:

STREET ADDRESS:
17 Shepstone Street

Architect: Alexandra van Vuuren

JOB NO.	OCCUPANCY	DRAWING NO.
		- 7002
DATE	SCALE	DRAWN BY
19 Nov 2012	1 : 10	Author

EMAIL: alex.vanvuuren@hotmail.com
TEL: 0836272754

LIST OF FIGURES

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APPENDIX A

Interview Schedule

Questionnaire:

1. Where do you live?
    a) City Centre?
    b) Suburb?
    c) Other?

2. Where do you work/study?
    a) City Centre?
    b) Suburb?
    c) Other?

3. How do you get to work/school?

4. How much nature do you interact wit on a daily basis? (e.g. plants, outdoor environments, etc.)

5. Would more nature in a city make you feel safer?

6. How does the natural environment make you feel?

7. Have you changed your lifestyle in any way to be friendlier to the environment? (e.g. recycling)

   If yes, please state what it is.

8. Suggest more ways in which you believe would make a positive impact on the environment?

9. Do you believe that natural environments could positively impact architecture?

Interview with Green Corridor:

1. What does Green Corridor do exactly?

2. What do you think are some of the social, economic and environmental issues that exist in Durban currently?

3. Are there any additional services that Durban Municipality could offer your line of work?

4. How do you address the safety issues within your sites?

5. What is your understanding of environmental rehabilitation and do you think Durban is in need of it?

6. Do you think the implementation of more urban farming schemes would be a success in the city of Durban?

7. Do you think Durban can benefit from a more natural city?

8. How do you perceive the relationship between man and nature?

9. What sustainable principles do you think are important for the future success of cities?

10. Could you please elaborate on your pocket park and community garden purpose projects?

11. What is your involvement with the mangroves?

ETHICS APPROVAL

UNIVERSITY OF
KWAZULU-NATAL
INYUVESI
YAKWAZULU-NATALI

04 September 2019

Miss Alexandra Van Vuuren (214548776)
School of Built Env & Dev Stud
Howard College

Dear Miss Van Vuuren,

Protocol reference number: HSSREC/00000079/2019
Project title: Environmental Rehabilitation through Architecture - An Eco-Social Sustainable Hub for Durban CBD

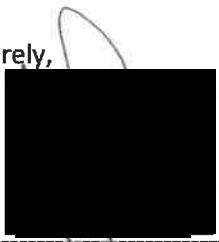
Full Approval – Expedited Application

This letter serves to notify you that your application received on 18 August 2019 in connection with the above, was reviewed by the Humanities and Social Sciences Research Ethics Committee (HSSREC) and the protocol has been granted **FULL APPROVAL**

Any alteration/s to the approved research protocol i.e. Questionnaire/Interview Schedule, Informed Consent Form, Title of the Project, Location of the Study, Research Approach and Methods must be reviewed and approved through the amendment/modification prior to its implementation. In case you have further queries, please quote the above reference number. PLEASE NOTE: Research data should be securely stored in the discipline/department for a period of 5 years.

This approval is valid for one year from 04 September 2019.
To ensure uninterrupted approval of this study beyond the approval expiry date, a progress report must be submitted to the Research Office on the appropriate form 2 - 3 months before the expiry date. A close-out report to be submitted when study is finished.

Yours sincerely,



Dr Rosemary Sibanda (Chair)

/spm