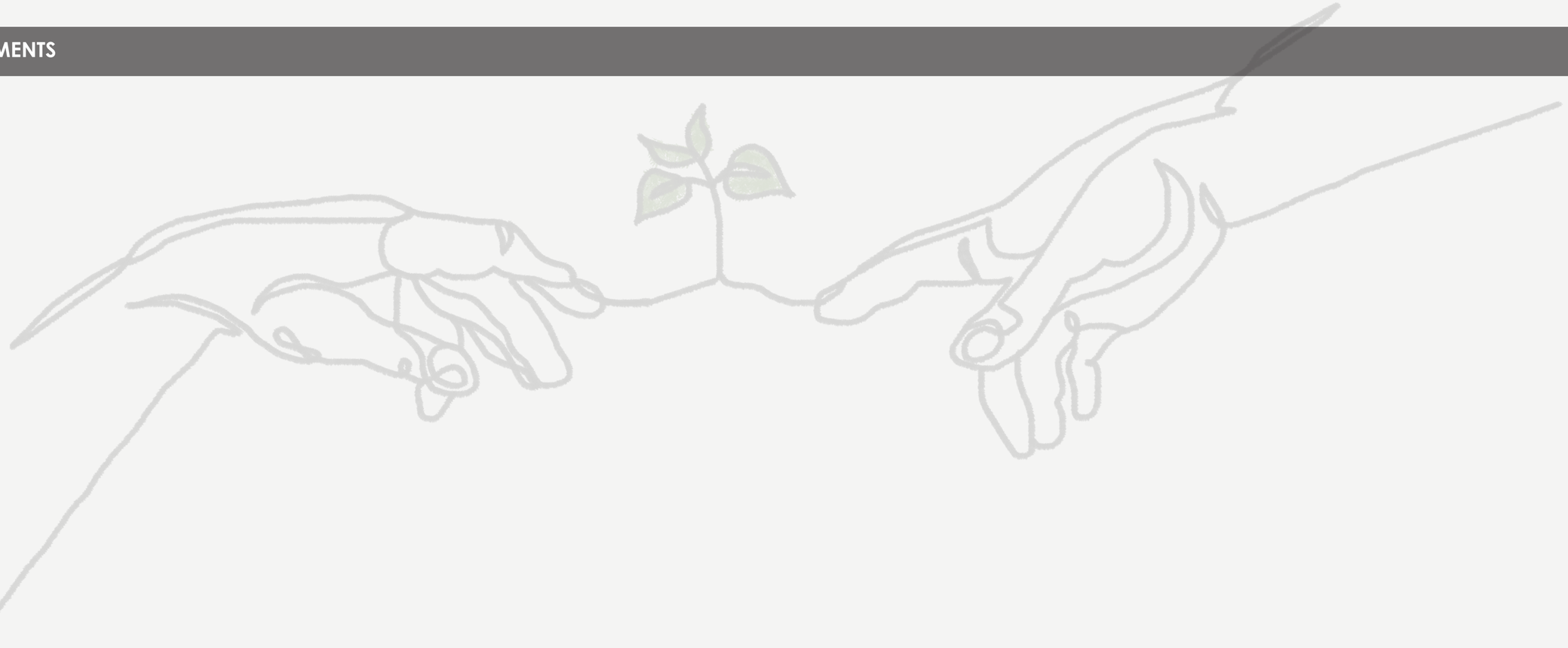


Oikos of Relational Encounters

An Eco-Tourist Visitor's Centre and Extension to Twinstreams Environmental and Education Centre in the Umlalazi Nature Reserve

Jeanne Nel 2016013506

EXAMINER'S COMMENTS



This dissertation is submitted in partial fulfilment of the neccessary requirements for the Masters of Architecture (Professional) degree, (M.Arch. Prof) at the University of the Free State. All the work in this document is my own - unless stated otherwise.

Department of Architecture | Faculty of Natural and Agricultural Sciences | University of the Free State.

Declaration of original authorship:

The work contained in this dissertation has not been previously submitted to meet requirements for an award at this or any other institution of higher education. To the best of my knowledge, this dissertation contains no material previously published or written by another person except where otherwise stated.

Signature



Supervisors: Dr. Hendrik Auret, Prof. Jan Smit, Petria Smit and Hein Raubenheimer.

Date of Submission: 15 October 2021

Acknowledgements:

Dr. Hendrik Auret for his dedication and expertise throughout the process of this dissertation and for not giving up on me.
My ever- supportive family.
The orange-door cubicle inhabitants of 2021.

This disseration would not have been possible without the abovementioned people. Thank you.

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ABSTRACT

In the time of the Anthropocene, we have reached a point as humans where we have removed ourselves from nature and, in turn, have idealized and romanticised views of our initial natural habitat. We have abandoned our initial biophilic relationship with nature.

In the context of the Umlalazi Nature Reserve, the varying levels of our anthropocentric interventions are highly prevalent and serves as a metaphor of our relationship with the environment in the Anthropocene. The landscape is comprised of two prominent manmade forests- a eucalyptus plantation, as well as an indigenous forest that was planted years ago. This relationship, however, exists alongside a myriad of other relations, including spaces of liminality between manmade vehicular roads, a natural stream, a forest, as well as pathways and openings within the forests. It is evident that for our relations with nature to oppose the dominating forces of the Anthropocene, an awareness of the fragility of these relations needs to be stimulated.

Professor and philosopher, Timothy Morton's notion of 'Dark Ecology' proposes that, in order for a new 'ecological awareness' to emerge, we must abandon the romantic ideals that we have of nature and our surrounding environment. Dark Ecology, alongside principles of biophilic design are investigated throughout this dissertation as a way to recast the romantic expectations we have evolved to possess and stimulate a new form of 'ecological' awareness through an 'oikos' of relational encounters.

This project and dissertation illustrates how the implementation of a biophilic architectural approached, shaped by Dark Ecology, may recast the romantic expectations of nature and stimulate richer relational encounters between the flaneur in the forest within the Anthropocene and eco-tourism industry.

Keywords*: Anthropocene; Biophilia, Dark Ecology, Relations*

STRUCTURE OF DOCUMENT

This dissertation is comprised of three parts according to the grounding, making and reflection of the project. ***PART 1: GROUNDING*** *aims to introduce the project themes and research question, alongside an understanding of the site and context of the new design proposal. Furthermore, the theoretical discourse of the project allows for an understanding of the design approach.*

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- Declaration of authorship + Acknowledgments
- Abstract
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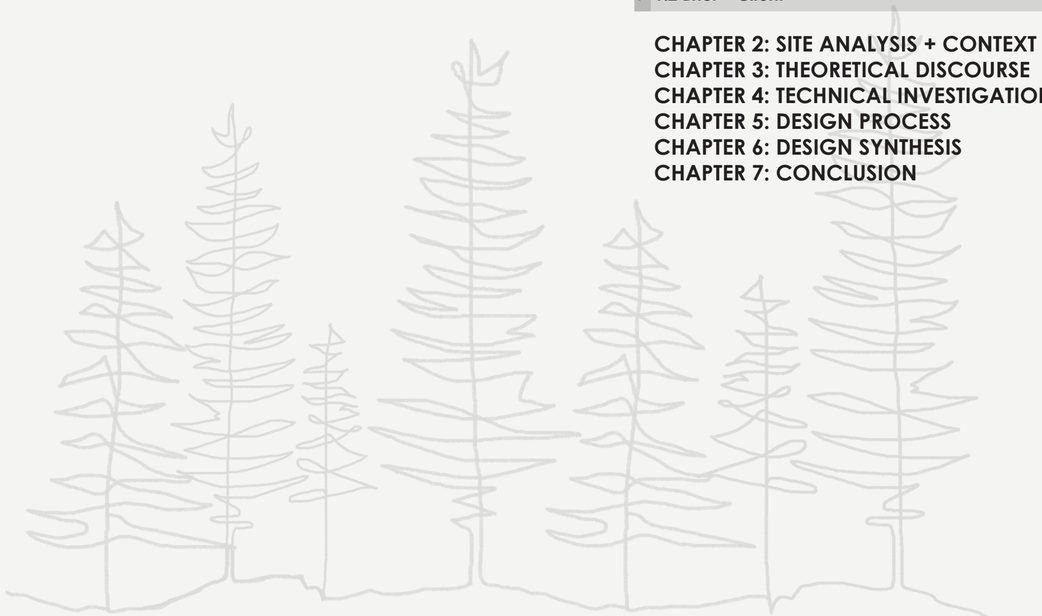


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1.0 INTRODUCTION

In the time of the Anthropocene, it is evident that a loss of awareness and initial biophilic relationship with nature has changed dramatically. Nature is seen as something outside of us and we designate spaces for it to co-exist with us - albeit elsewhere.

We are living in a time where 'eco-awareness' is integral to the understanding of our place within the environment. The term 'eco' derives from the Greek word 'oikos', which translates to 'house', as well as 'any dwelling place of the human body.' (Smith, 1998: online). It also possesses meaning pertaining to kin (family), home (place), house (belongings) and denotes the environment in which these happenings occur (Messer, 2019: online). In turn, the term, 'eco' automatically has relevance to the relationships between these entities- the living body, the relationships between living bodies, and the relationship between the living body and its environment. Relations play a key role within this investigation, and everything is observed through the lens of dark ecology.

Philosopher and professor, Timothy Morton, coined the term 'Dark Ecology' which is the paradoxical idea that where, for the human to save its environment, the romantic idea that we have about nature should first be abandoned and that we should confront the ecological devastation we have created without seeing it as perversion of nature, but rather as a syntax error and a problem of the system.

Through site analyses, a theoretical discourse, a technical investigation and design process- it becomes possible for a new design proposal within the natural landscape which allows for eco-awareness in the context of the Anthropocene.

1.1 RESEARCH QUESTION + THEMES

Research Question:

How may a biophilic architectural approach, shaped by the notion of dark ecology as a way to recast romantic expectations of nature, stimulate richer relational encounters between flaneur and forest in the Anthropocene and eco-tourism industry?

Leading Theme:

The leading theme for this dissertation is that of **relational encounters -** with emphasis on how awareness of the relationship between humans and nature can be stimulated, recast and nurtured.

Sub-themes:

Shifting from the Anthropocene towards biophilia
Transformation from the romantic ideals of nature towards dark ecology
Eco- Tourism
Relational encounters

1.2 BRIEF + CLIENT

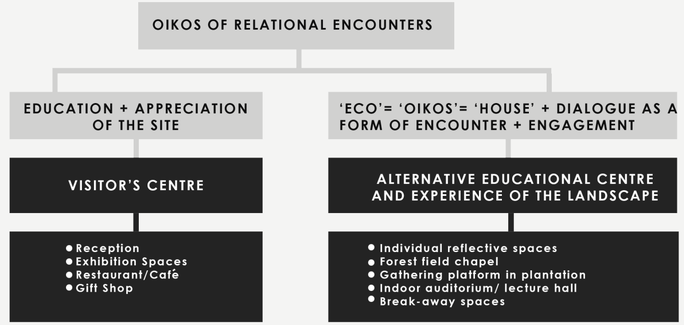


Figure 1: Diagram of proposed functions (author,2021)

The Brief:

With the idea of an 'Oikos of Relational Encounters' in mind, the program of the project will consist of two parts with interwoven elements. Firstly, a visitor's center with exhibition spaces and a restaurant is to be incorporated into the design in order enhance the relationship between flaneur and site through the appreciation and education thereof. Next, the eco-tourist as the reflective dweller on the site will be accommodated through gathering spaces for conferring with each other to enhance human relations, as well as individual reflective spaces. This also enables a relation to and expansion of the functions from the existing Twinstreams Environmental and Education Centre in the proximity.

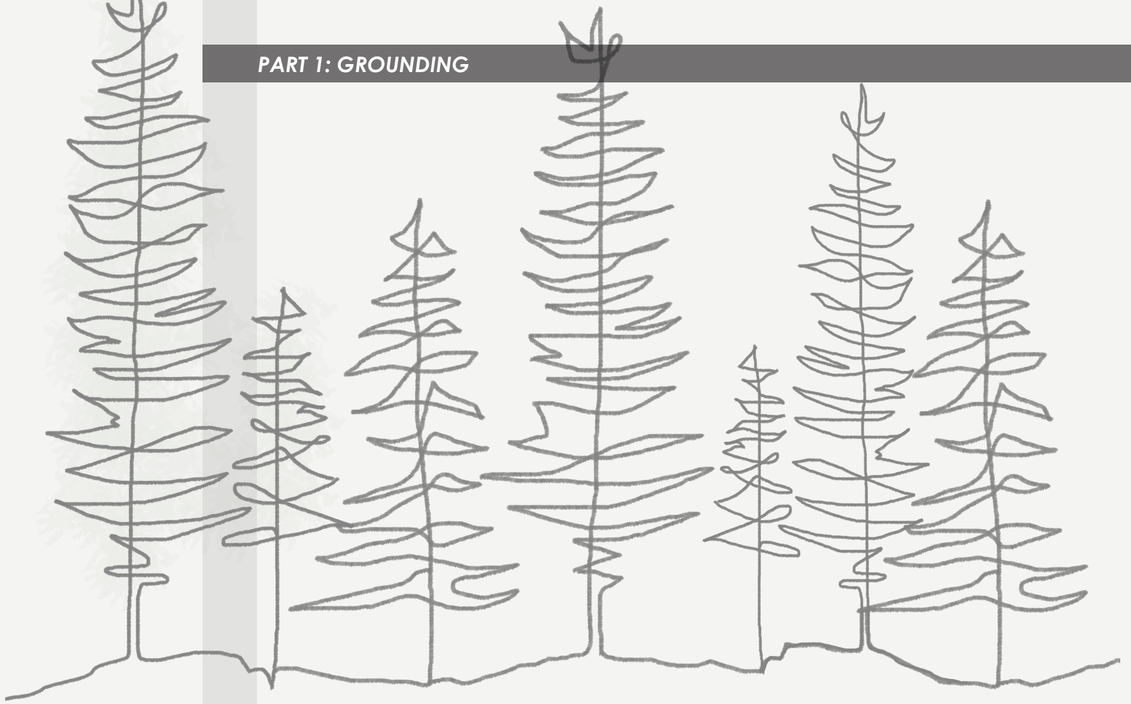
Lastly, in terms of relational encounters and the intention of creating a conversation and dialogue about eco-awareness may be achieved through a functional program consisting of educational spaces (see figure 1).

Proposed Client:

As the current inhabitants of the site, the Wildlife Environment Society of South Africa aims to support and initiate high-impact conservational and environmental projects to raise awareness and 'promote participation in caring for the earth' and its relations (WESSA, 2021: online) (see figure 2).

WESSA
PEOPLE CARING FOR THE EARTH

Figure 2: Wessa Logo. (WESSA, 2021: online)



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2.0 INTRODUCTION
Chapter 1: Site Analysis and Context

CHAPTER 1: VISUAL STUDY OF CONTEXT aims to investigate and analyses the site in a myriad of ways in order to orientate the reader as to where the site is located and gain an understanding of the rich context and history that lies within. It is evident that the site possesses many varying forms and relations in terms of its macro, meso and micro context.

On a macro scale, the context of the nearby village (Mtunzini), the prevalent industries in the vicinity, and the forest of the Umlalazi Nature Reserve are investigated in terms of the history of the varying levels and relations of anthropocentric intervention and development within the area. The climatic conditions of the uMlalazi Municipality in Kwa-Zulu Natal are also investigated. Photographs of Mtunzini are included with personal experiences and observations of the village.

On a meso scale, Twinstreams Environmental and Education Centre towards the east of the site is explored, which allows for the initial formation of a project brief and deeper understanding of the relations on the site after an interview with Raymond Ngubane (the current manager of Twinstreams Environmental and Education Centre). Photographs of Twinstreams and the surrounding forest are included with personal observations to allow the reader an understanding of the area.

On a micro scale, the site itself is explored in terms of the relations between the two 'manmade forests' (the plantation and the planted forest of the Umlalazi Nature Reserve) and the significance of this relationship. The stream, footpaths, openings in the forest and the different forms of vehicular roads are also explored. Photographs portraying the existing co-existence of opposites pertaining to industry and nature are also included.

2.1 MACRO ANALYSIS
Village, Industry and the Forest



Figure 3: Context in South Africa (author,2021)

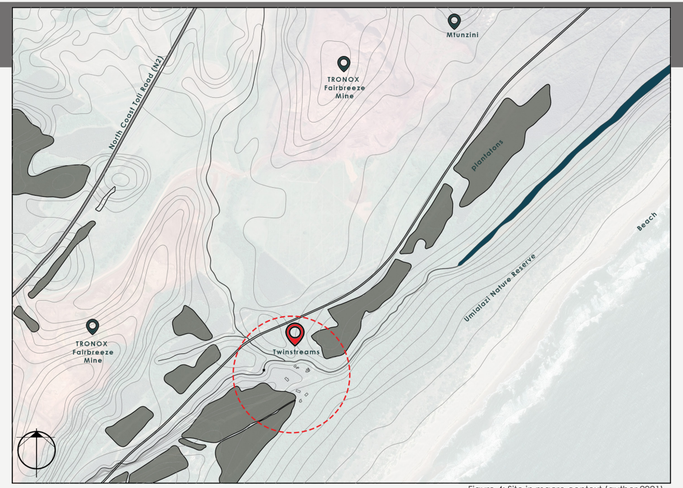


Figure 4: Site in macro context (author,2021)

Context within South Africa

The site is located on the east coast of South Africa within the province of KwaZulu-Natal (see figure 3). Sugarcane (as an integral agricultural crop for the country) is also farmed along the coast of KwaZulu-Natal. Eucalyptus and pine plantations (for the production of raw materials and paper) are also prominent due to the climate (Britannica, 2020: online). It is also noted that the mining industry operates within the vicinity and creates tense relationships between the mining industry and the local inhabitants of Mtunzini.

The site + context

Within its immediate macro context, the site is located to the south of the village of 'Mtunzini', which is approximately 140km north along the coast from Durban. Although the area is not equipped for commercial tourism, people flock there to experience the wild forests, beach, and the many outdoor activities it has to offer. To the west of the site is the Tronox Fairbreeze mine- where titanium dioxide is extrapolated. Also, to the north-east and south- west of the site are Eucalyptus plantations. Running alongside the coast and on the site itself is the Umlalazi Nature Reserve which consists of a dense forest (see figure 4). Although, it is later noted that the forest was planted by humans and that (from the perspective of dark ecology) the romantic ideal of planting a forest is not necessarily the only way to enhance the relationship between man and nature. However, the area still serves as prime example and precedent to many in search of rehabilitating nature effectively (Ngubane, 2021: personal interview). While the forest appears 'natural' and conforms to romantic notions of preservation, it is actually manmade.

2.1.1 RELATIONS ON A MACRO SCALE

There are many existing systems and relationships prevalent within the site context which are maintaining themselves and interacting with other systems and relationships (see figure 5). It is evident that commercial and industry driven corporations are present as one form of relationship within the context where harsh interventions and incisions are being implemented by humans in the pursuit of economic gain. For example, MONDI's Eucalyptus plantations, and the Tronox Fairbreeze mine (see figure 6). The natural relationships within the site context emerges mainly from the ocean - which pumps water into the stream, as well the prevalent ecologies existing harmoniously within the Umlalazi Nature Reserve (see figure 7). It is noted that the reserve also serves as a form of romantic idyllic relationship between human and nature where we have designated a certain boundary for nature to thrive. There are also constant and direct relationships present and occurring between humans and nature. The village of Mtunzini towards the north serves as a structured dwelling place for humans next to the coast, and all the industrial relationships (the mine and plantations) are influenced by the human's will and need for economic gain (see figure 8). These relationships are in constant flux and flow with one another and cannot be ignored within the context of the forests of KwaZulu- Natal.

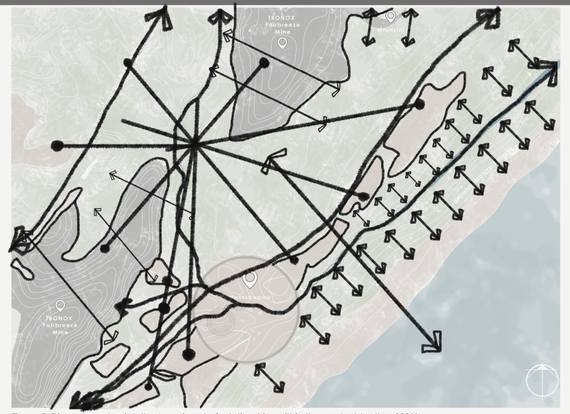


Figure 5: Diagram portraying the 'messiness' of relationships within the context (author,2021)

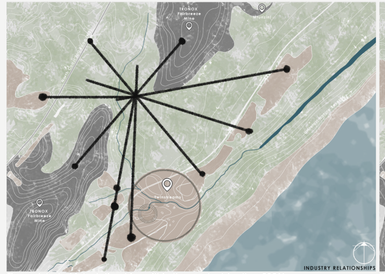


Figure 6: Industrial relationships within the context (author,2021)

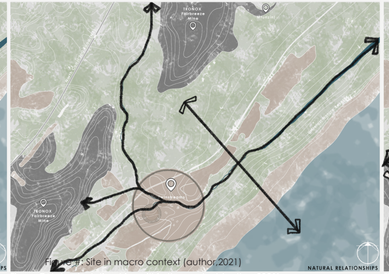


Figure 7:Natural relationships within the context (author,2021)

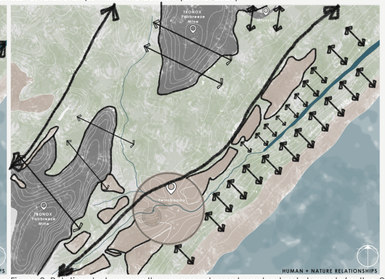


Figure 8: Relations between anthropocene elements and natural elements (author,2021)

2.1.2 MTUNZINI



Figure 9: Stone church (author, 2021)

No matter where one finds oneself in this beautifully diverse country, there will always be a stone-built church within the axis of the main street. It is evident that when these churches were built, the climate was not taken in to consideration and general methods and materials were used and applied all throughout South Africa (even on the coast of Natal) (see figure 9).

There are architectural elements within the village allowing for ventilation through openings within brick walls (see figure 10). The newest commercial structure in the village houses a new shopping center, where the roof of the structure allows for polycarbonate sheeting and timber structures to emphasize the entry of light within the courtyards (see figures 11).

The village of Mtunzini boasts extraordinary views through the trees and out on to the abandoned railway (see figure 12).



Figure 10: Brick structure (author, 2021)



Figure 11: Shopping centre (author, 2021)



Figure 12: View out on to the railroad (author, 2021)

2.1.3 CLIMATIC CONDITIONS
uMlalazi Municipality, KZN

GENERAL
The climate in this region varies from subtropical to temperate.

RAINFALL
Annual yearly precipitation of 1045mm, with the most rainfall in the month of January, and the least in winter months.

HUMIDITY
High humidity averaging 75% in the summer months and lower humidity in the winter months dropping to 67%.

SUMMERS and WINTERS
This coastal area is generally frost-free and remains warm throughout the year with hot summers, and warm, sunny and dry winters which allows this coastline to become a prominent destination for holidaymakers in the country. North-easterly winds are prevalent in the summer alongside high temperatures and humidity levels.

(See figure 13).

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Avg. Temp ℃	24.7	24.9	24.2	22.3	20.4	18.4	17.9	19	20	20.9	22.2	23.8
Rainfall (mm)	121	111	111	92	68	45	59	51	67	101	111	108
Humidity (%)	75%	76%	76%	74%	72%	68%	67%	67%	70%	73%	74%	75%
Rainy Days	11	10	10	8	7	5	6	7	8	11	11	11
Avg. Sun Hours	8.2	8.4	8.3	7.8	8.1	8.0	8.0	7.9	7.7	7.3	7.4	8.0

Figure 13: Climate Table (climate.org, adapted by author,2021)

2.2 MESO ANALYSIS
Twinstreams Environmental + Education Centre, the Stream and Plantations

Within the area, site possibilities are investigated which inhabit varying degrees of thresholds and levels of Anthropocentric intervention. The two site possibilities (see figure 14) both house elements including Eucalyptus plantations, the forest, and the stream running within the area from the Mlazi river. There are existing trails and footpaths used by cyclists, hikers and joggers within the area as well.

Also within the area is the Twinstreams Environmental and Education Centre (see figure 15- 16). This center was the first of its kind within Africa and was established by the Garland family in 1952 with the goal of educating the population about the human's relationship with nature. The MONDI corporation bought the land from the Garland family in 1987 to use for their Eucalyptus plantations, or 'working forests'.

Currently, they are functioning as an adventure-camp for school children in order to teach them about the environment, as well as housing professional functions and conferences on occasion. The centre lacks capital (when compared to the MONDI corporation) and accommodation, and facilities need to be added to aid their mission (Ngubane, 2021: personal interview).

Thus, educational facilities are to be added within the new design intervention which can be adapted and used by the Twinstreams Environmental Centre facility.



Figure 14: Mezzo analysis and site possibilites (author,2021)





Figure 15: Twinstreams Environmental Centre (author,2021)



Figure 16: Twinstreams Environmental Centre office/reception (author,2021)

2.2.1 INTERVIEW WITH MR. RAYMOND NGUBANE OF WESSA TWINSTREAMS



Figure 17: Mr Raymond Ngubane at Twinstreams Environmental and Education Centre on April 22nd at 16:30pm (author,2021)

On the 22nd of April 2021, I had the privilege of meeting with WESSA Twinstreams Environmental and Education Centre's manager, Mr Raymond Ngubane, at the Twinstreams Environmental and Education Centre (see figure 17). Mr. Ngubane's passion for the environment gleams through his charming personality and he is one of the few people I have met who puts his ideologies in to action and truly lives for his goal of educating people about the environment. He has been running the centre for the last 15 years and is very informed about the site's history and the conservation and educational efforts implemented in the area. Our conversation can be summarised as follows:

Firstly, Mr Ngubane explained that all of the land in the surrounding area was owned by Mr Garland (who was a sugar cane farmer) and that the forest was non-existent at this time. Mr Garland had a deep sense of biophilia towards nature and mainly wanted to study butterflies. He had the goal of attracting wildlife back in to the area, and arranged for 80 000 indigenous plants and trees to be planted in the area in an attempt to rehabilitate the land and invite wildlife to inhabit it. When he sold the land to the MONDI corporation (who specialises in plantation developments for industrial purposes), it was stated in the title deed that conservation efforts need to be implemented, and that the Twinstreams Education Centre may not be touched and should be allowed to keep running.

However, Mr Ngubane continues explaining that ever since the Eucalyptus plantations (derived from Australia) were introduced and the Faribreeze mine (for the extrapolation of titanium dioxide) was built in the area, the level of the streams have dropped by 3 meters and the fish have disappeared due to waste from the mine leaking in to the stream.

These two anthropocentric interventions throughout history (the rehabilitation of the forest, and the implementation of industrial exploitation of nature) are prime examples of two different ways in which we approach nature, with two very different results. The one poses a situation of awareness which in turn allows for a harmonius relationship motivated by biophilia, whereas the other poses a threatening relationship where we ignore the consequences and see nature as something 'other' than us.

It was a pleasure meeting Mr. Ngubane and learning about the history of the site and the various relationships inhabiting it. With the knowledge of the surroundings of the site, it becomes possible to investigate it on a micro- scale.

2.2.2 PHOTOGRAPHS OF TWINSTREAMS



Figure 18: Twinstreams Environemental + Education Centre gathering point (author, 2021)

The existing Twinstreams Environmental and Education Centre serves to educate the population about the environment and our relationship with it. Walking through the site, one notices light structures within the openings of the forest which creates an instinctual urge to gather in that space, away from what lies hidden within the forest (see figure 18).

The stream houses remnants of the past when activity was more prominent, and the stream use to be more filled-up before the perpetuary Eucalyptus plants have taken away from it (see figure 19). Memories of locals all contain stories of childhood play in the forest and the stream, and one can only imagine what it must have been like growing up in this area and having it as a personal playground.



Figure 19: Activity Remnants on the Stream (author, 2021)



Figure 20: Structures in TEC (author, 2021)



Figure 21: Structures in TEC (author, 2021)

2.2.3 PHOTOGRAPHS OF THE SURROUNDING FOREST AND RESERVE



Figure 22: Umlalazi Nature Reserve, 23 April, 06:34am (author, 2021)

The area invites one to rise early in the morning with the impending promise of experiencing the transformative beauty of the rehabilitated forest and views it has to offer. It is welcoming by nature with the fresh morning air breeze from the ocean calling out to you, and the sun in the distance slowly rising and beaming out its yellow hues and in turn nurturing and feeding the elements and systems within the landscape to allow for growth and prosperity (see figure 22). Eagerness sets in with mental preparation in anticipation for adventure and possible discoveries that awaits within the landscape on this day.

A mere half-hour after the first encounter, the blue hues of the sky and the river start to emerge, as the sun continues to rise (see figure 23). The rhythmic ripples in the river create a sense of peace, but also uneasiness paired with the knowledge that crocodiles reside within it.



Figure 23: Umlalazi Nature Reserve, 23 April, 07:04am (author, 2021)



Figure 24: Riverside mangroves (author, 2021)



Figure 25: Red-horned spider (author, 2021)

The light starts to shine through the mangrove trail (see figure 24), and one is forced to take off one's shoes and explore the terrain with one's feet which only leaves behind a footprint which will fade with the passage of time. Moving towards the forest, one is able to observe the various different plant-species, with subtle markers placed on them to educate the user about the different types. It is evident that some of these trees have been here longer than others and serve as 'mother trees' who nurture their offspring and keep the system alive and growing into prosperity. On some of the trees, various relations can be noted and the growth of different kinds of funghi can be observed living off both living and dead trees (see figure 26). One can't help but wonder which of these would be safe to ingest? Also, another prevalent experience on the site, is the presence of the red-horned spider's large-spanned webs obstructing the footpaths (see figure 25). One has to tread and observe carefully as to not walk face-first in to them. This also serves as a reminder (on a small scale) that nature will still take its course long after humans are gone. When the footpaths remain untrodden on for a while, the spiders flourish and the webs only increase.



Figure 26: Fungi growth (author, 2021)



Figure 27: Natal Fig tree in the forest (author, 2021)

2.3 MICRO ANALYSIS

Eucalyptus plantations, Raphia Palm Forests, Clearings and Roads

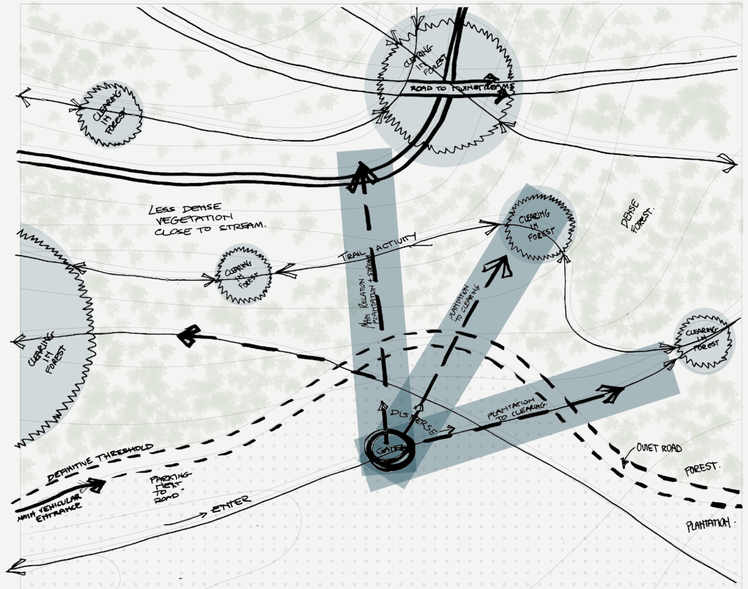


Figure 28: Initial Site Exploration + Impressions (author, 2021)

On a micro scale, the site which was eventually chosen mainly consists of the Eucalyptus plantation, the forest, and the stream- with existing roads and footpaths within and around the area (see figure 28). All of these elements are in relation with one another, although they may function separately. The prominence of the man-made elements on the site is evident.

The site can be seen as a form of organic syntheticism due to every element having been planted by humans (excluding the stream). All of these elements are natural, but are only there due the different forms of relationships between humans and the landscape. The plantations were planted for economic purposes, which, in turn, has an effect on the stream. Also, the forest was planted by humans which has allowed for a greater diversity of plant and animal species to thrive and live in relation with one another through their various eco-systems.

The vehicular roads present themselves as the way that humans have evolved to move within the landscape in cars. The openings in the forest and the footpaths are another form of relation existing between the human/ animals and the landscape where clearings within the forest emerge. These footpaths, clearings, and less-dense areas within the forest are integral to be noted so that the proposal of an architectural intervention may not super-impose on the landscape, but rather for it to be guided by these clearings and openings to cause as little damage to the landscape as possible.

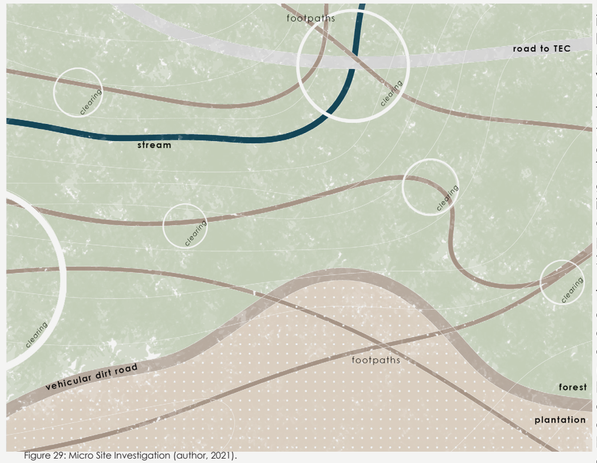


Figure 29: Micro Site Investigation (author, 2021).

The eucalyptus plantation trees are noted to have been planted in a 3m x 3m grid. These trees represent temporal rhythms within the landscape, for they will be cut down eventually and used for another purpose. Leaving behind the stumps of the cut down trees, a new seed will be planted right next to each stump in order for the next tree to be able to grow.

The vehicular dirt road presents itself as a definitive threshold separating the rigid plantation and the free-flowing forest which is ordered organically through sunlight, soil conditions and availability of water. The trees and vegetation within the forest represent the new life and growth that was stimulated when they were initially planted. However, it is noted that the plantation is also a form of 'living' forest but lacks in diversity and can be seen as bio-monotone. The pathways within the plantation for cyclists and hikers stretch out into the forest (see figure 29).

The main elements from which relations occur on the site are thus the openings on the site (portraying the relationships between the human and the animal within its landscape, and shows where the natural points of gathering occur within it). The vehicular roads are also prominent (which are seen as thresholds, but also symbolise the way in which the human moves within their landscape in the Anthropocene). There are also footpaths (which are seen as elements of path within the landscape and are in relation to the landscape, showing the relation between the human and their urge to move within the natural landscape in the time of the Anthropocene). Lastly, there is the stream (which is in relation to the larger context connecting to the ocean- but also serves as the main form of sustenance for the forest and plantation trees) (see figure 30).

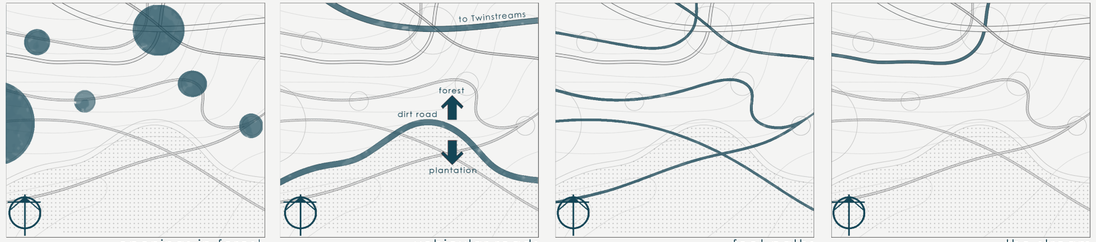


Figure 30: Relational Elements on the site (author, 2021).

2.3.1 SITE SECTIONS

Slope + Progression between plantation and stream



Figure 31: Section from plantation to stream (author, 2021).

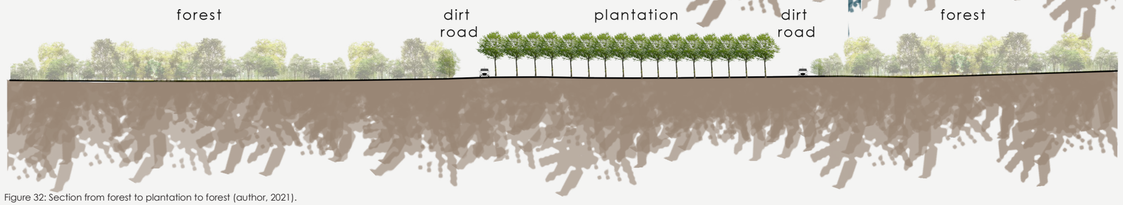


Figure 32: Section from forest to plantation to forest (author, 2021).

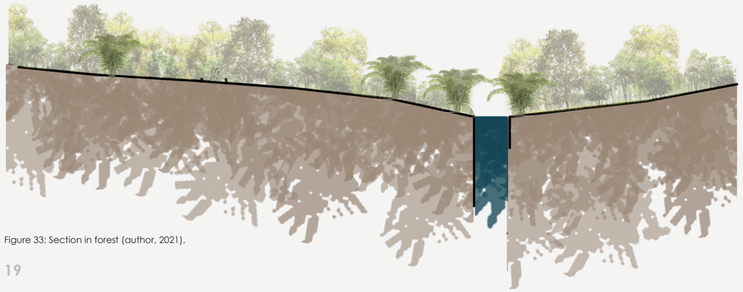


Figure 33: Section in forest (author, 2021).

When looking at the site on section, it is evident that the biodiversity within the plantation is non- existent when compared to the forest with various different plant and animal species. The site is monotonous yet rhythmic in the plantation, and then slopes gently towards the stream amidst forests (see figure 31). The plantation appears odd and stands in stark contrast to the forest (see figure 32), and the forest is very diverse (see figure 33).

Again, it is noted that both of these forests were created by humans with different intentions in mind and relationships driving their creation.

2.3.2 INDUSTRY VS NATURE

Plantation, forest and the mine



Figure 34: Threshold between plantation and forest (author, 2021)



Figure 36: Tronox Febreeze Mine (author, 2021)



Figure 35: Plantation (author, 2021)

One cannot escape the most distinct relationship between human and nature within this area. However, the added nuance of a dialogue on site between two kinds of 'man-made forest' is crucial to the position of this thesis, as informed by the tenets of dark ecology and biophilia. The threshold between the plantations and the forest forces one to confront the issue, where the diversity of the forest can be seen on one side (but poses a false and romantic sense of certainty and eternity), and the temporal rhythms of only one species on the other (see figure 34 + 35).

Whilst walking along the footpaths and dirt roads within the area, the titanium dioxide mine can be seen from afar, with the red-steel coloration mimicking the contents of the red pigmentation of the elements it exploits, as well as sitting in stark contrast with the green hues of the surrounding landscape (see figure 36).

2.4 INITIAL OBSERVATIONS AND RESPONSE

Towards a discourse

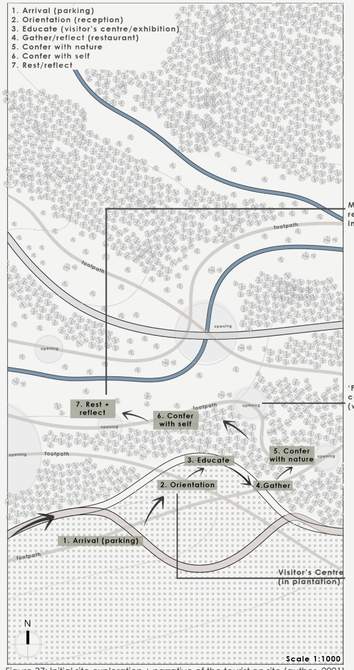


Figure 37: Initial site exploration + narrative of the tourist on site (author, 2021)

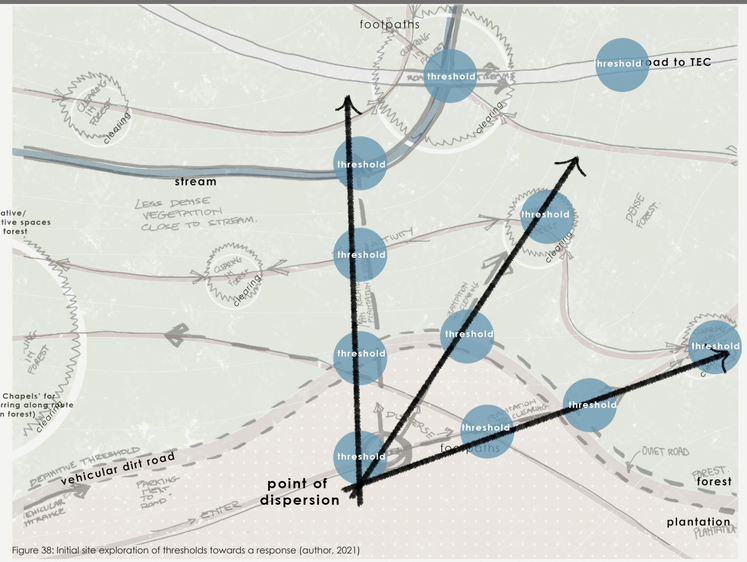


Figure 38: Initial site exploration of thresholds towards a response (author, 2021)

The initial response towards an intervention allows for the narrative of the tourist (arrival, orientation, educating, conferring, reflecting and gathering) to find specific places within the site (see figure 37). There was also a consideration to transfer the dirt road deeper in to the plantation, however, it becomes clear that the dirt road is a significant threshold between the forest and plantation and also serves as a relationship in itself and is to be kept. Various thresholds on the site are identified, for example, where crossovers of footpaths occur and in-between spaces present themselves as opportunities for relational encounters (see figure 38).

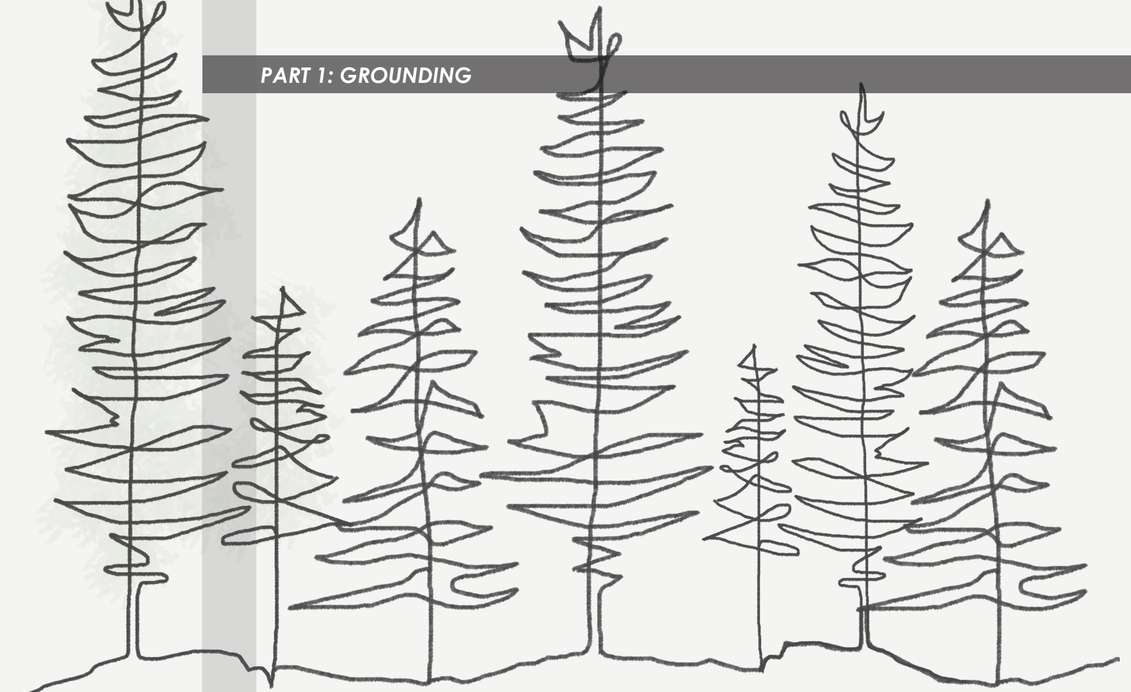
2.5 CONCLUSION

Chapter 1: Site Analysis and Context

In conclusion, **CHAPTER 2: VISUAL STUDY OF CONTEXT** aimed to investigate and analyse the site in order to orientate the reader of its context and history. It is evident that there is a rich history of relations and encounters between human and nature within the area which are integral to understanding the way forward towards a design intervention.

Through taking the relations in the macro, meso, and micro context of the site into account, alongside a personal interpretation and understanding of the context, it becomes possible to formulate a theoretical discourse moving forward.

The following chapter, **CHAPTER 3: THEORETICAL DISCOURSE**, explores the themes relating to the research question. Themes pertaining to the Anthropocene, biophilia, and dark ecology are explored and applications towards a design discourse emerge.



PART 1: GROUNDING

CHAPTER 1: INTRODUCTION
CHAPTER 2: SITE ANALYSIS + CONTEXT

CHAPTER 3: THEORETICAL DISCOURSE

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CHAPTER 4: TECHNICAL INVESTIGATION
CHAPTER 5: DESIGN PROCESS
CHAPTER 6: DESIGN SYNTHESIS
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3.0 INTRODUCTION: *Chapter 2: Theoretical Discourse*

How may a biophilic architectural approach, shaped by the notion of dark ecology as a way to recast romantic expectations of nature, stimulate richer relational encounters between flaneur and forest in the Anthropocene and eco-tourism industry?

Within the last century, it is evident that there has been a global and mental shift pertaining to the human's relationship with nature and the subsequent relations emerging from it. We have moved from a time of biophilia,- where we directly inhabited nature and formed a part of it, towards the time of the Anthropocene where we dominate nature for industrial evolution and monetary gain. We see nature as something other than ourselves and romantic ideals regarding nature has emerged where we reserve specific places for nature in our daily lives instead of living harmoniously with it.

For a new design proposal in an ironically anthropocentric site and to make the human aware of their relationship to nature again, Timothy Morton's views on 'dark ecology' as a form of biophilia is investigated in order to abandon the romantic ideals we have about our natural surroundings, and return to the idea that we, and everything we have created as a human force, is still a part of nature. Only when this harsh fact is recognized it becomes possible to accept the consequences of what we have done, live within the dualities that emerge, and realize that we need to take care of nature (because it is a part of us) for an improved relationship to occur. When applied to the project site, it is integral to investigate the relations within it and for one to notice the various levels of anthropocentric and natural elements and their relation to one another in order to intervene accordingly.

Next, the loops, ecognosis and 'weird coexistences' of dark ecology are investigated in terms of ironic inverses of experiences. When applied to the new project proposal, inverses occur between the beginnings and ends of axes, materiality and the spatial implications of the relations on the site and project axes.

Lastly, biophilic design principles, alongside the revelations dark ecology provide various applications in terms of designing for the relationship between the human and nature with regards to direct experiences, indirect experiences and the experience of place and space on the site. Through studying precedents by Kengo Kuma, ways of experiencing the relational encounters are investigated in terms of suspension and hovering between heaven and earth between the earth and sky in an ironic duality.

3.1 Background: From Biophilia towards the Anthropocene

3.1.1 Biophilia as an initial relation between human and nature

Within the natural world in which humans have been emplaced, we have had no choice but to reside alongside and within nature- implying that there has and always will be an existing relationship between humans and nature.

The term 'biophilia,' originates from the Greek word 'philia' and translates to 'love of life or living things' (Planteria, 2021: online). It is used to describe the affinity that humans have towards nature and means that humans have an inherent love for their natural surroundings. Biophilia is noted to be a quality and characteristic of the human mind and is evident throughout history. This inherent fondness of nature has been expressed by humans throughout most cultures and in most time-periods, for example, nature portrayed in early cave paintings (see figure 39), plant pots and vases throughout history (see figure 40). Even today, most people will claim that they feel less stressed and at peace when they are within the natural environment (Planteria, 2021: online).

Biophilia can be seen as the initial relation between human and nature always had the natural urge to mimic it, portray it, and make it a part of our lives. However, ironically, in post-industrial times, we have realized that not all conditions are ideal or appropriate within nature and have evolved to manipulate the natural environment and create synthetic ones within the limits that nature provides. This has led to various new environments that differ in terms of geography, climate, differing needs of intellectual infrastructure, and the human's different perspectives and definitions of what the relationship between nature and humans entail. In turn, our agricultural revolution and post- industrialized state has enforced an unbalanced relationship between the two, and we have adopted a parasitic, consumerist attitude towards nature where we exploit all it has to offer. There is thus a lack of understanding of the human's real needs within contemporary times, and it is evident that humans, through removing themselves as one from nature, have dominated their natural surroundings, albeit unintentional.

It is evident that a loss of awareness to our inherent biophilic relationship with nature has emerged over the last century, and the time of the Anthropocene has emerged.



Figure 39: Early cave painting of animals (Sardi, 2019: online



Figure 40: Vase from 1899 (Ellison, 2013: online).

3.1.2 The Anthropocene and The Human's Loss of Awareness to their inherent biophilic relationship with nature

The Anthropocene can be defined as the geological epoch in which we as humans have become capable of physically altering the planet's chemical, geological and biological composition (Kuittinen, 2020: 16). For example, moving double the amount of soil and earth than all seas, oceans, lakes and rivers combined (Torres-Campos, 2016: online). Furthermore, it holds more power than purely manmade destruction, but can also be interpreted as a moment in time of 'blinking self-awareness' in the sense that humans have become conscious of themselves as this dominating planetary force. We have become aware of our impact and ecological destruction (Blasdel, 2017: online).

We have transformed and evolved from the natural surroundings being our habitat towards industrialism and reserved/designated places for our original, natural environment. For example, the allocation of botanical gardens amidst bustling industrial cities such as the Durban Botanic Gardens (see figure 41). In turn, a romanticized view of nature and our surrounding ecology has emerged where we see ourselves and humanity as something separate from it in the time of the Anthropocene.

With regards to the project site, this becomes apparent in the history of the site and the commonalities and differences between the differing forests.

It can be argued that the level of awareness of ourselves as a planetary force and what we have done in the Anthropocene, along with the awareness of the environment and its significance, are equally important. The one implying a sense of responsibility and care that we are to approach the environment and landscape with, and the other pertaining to an appreciation that we are to have for the earth and its resources.

We need a more involved and immediate engagement/relationship with nature, where the romantic ideals about 'framing' nature are abandoned, and we rather recognize our 'true' place within it. Through research on biophilic design, it becomes evident that it is equally beneficial for the human and nature for us to give in to our inherent feelings of biophilia, and strategically implement its principles within our lives and built environment in order to achieve a synthesis with it once more. With added benefits for the human such as improved cognitive performance, well-being, psychological health and physical health (al-Rhodesly, 2019: 17), a biophilic design approach and application in the forests of KwaZulu Natal is appropriate in terms of design and reconciling the relationship between human and nature through the mediation of an architectural intervention.

However, to further understand the relationship between human and nature in the Anthropocene, professor and philosopher Timothy Morton's notion on 'dark ecology,' and it's 'weird coexistences' and ecognosis, are investigated.



Figure 41: Durban Botanical Gardens amidst the city (maps, 2021: online, adapted by author).

3.2 Dark Ecology

3.2.1 Questioning the Romantic Ideals of Nature

In the era of the Anthropocene, it is noted that we as humans feel alienated from nature and that there is a general feeling of having lost touch with it. We have been indoctrinated to think about nature in the way that the historical Romantics did, where they intended to bridge the relationship between man and the natural world (the subject + object division). This, in turn, implies that nature is something separate from us and nature is 'aesthetically framed' and there for our pleasure at our disposal. This creates a distancing psychological barrier which is inevitably counterintuitive towards any efforts of improving the planetary conditions we have created. There is the recurring theme of human activity being seen as a perversion of nature, where we forget that we are a part of that nature and that it IS us.

Philosopher and professor, Timothy Morton, coined the term 'Dark Ecology' which is the paradoxical idea that where, for the human to save its environment, the romantic idea that we have about nature should first be abandoned and that we should confront the ecological devastation we have created without seeing it as perversion of nature, but rather as a syntax error and a problem of the system. When organic matter is boiled down to its purest elements, the romantic idea that we have about it is oppressed and the mechanical structure of technology starts to be unveiled. This makes the distinction between the natural and unnatural blurry, and we struggle to frame it as something outside of us. Through an abstract materialism where the landfill is seen as just as natural as a tree, a subject synthesis begins to occur. Morton suggests that we must confront our guilt (which arises from the realization that we are both perpetrator and victim) and sit with our discomfort as a way to move forward and take action (Guppy, 2017: video).

Within the site of the newly proposed project, it is evident that a romantic ideal of nature is present. This is neither a positive nor a negative romantic ideal, but it is present in the duality between the two differing forests. The site, which used to be a sugar-cane farms, was planted by humans due to the initial biophilia they had for the nature. When taken over by the Mondi Corporation in later years, the industry took over and has started infiltrating the land. There is now a clear divide between the diversity of the naturally planted forest, and the monotonous plantation for monetary gain. These two 'manmade' forests are seen as two entirely differing entities, but in essence, they are the same in the eyes of dark ecology when the romantic ideals of the planted forest are abandoned (see figure 42).



Figure 42: Dark Ecology and the manmade forests (author, 2021).

3.2.2.1 'Extensions' by Jeanne Simmons

In 'Extensions,' a model's hair is made one with a grassy hillside. The hair is seen as an extension of one's own nervous system. The feeling is expressed that we are extensions of the natural world and, in turn, the natural world is an extension of us as a human species. This unbreakable bond between the natural world and humans is provocatively expressed in this land art (see figures 43-45).

The artist expresses that we as humans are incapable of escaping this relationship and that it is not possible for us to 'be' without this relationship. The model was physically bound to the earth through her hair illustrating this concept.

In terms of Dark Ecology where a synthesis between subject and object (man and nature) needs to be established in order to move forward in a positive manner, this piece of land art aims to emphasize this connection and the idea that nature is us, and we are nature. The connection between the grass and the model's hair is symbolic of the strange coexistence between the human and the landscape, and allows one to think of the two as one entity although they are entirely different.

Morton states that dark ecology is a form of ecological awareness. 'Dark-depressing', 'dark-uncanny' and 'dark-sweet'. Dark ecology notices the loops and cycles of opposing concepts and encourages that we make peace with the discomfort within these relations.



Figure 43: 'Extensions' (Simmons, 2020: online)

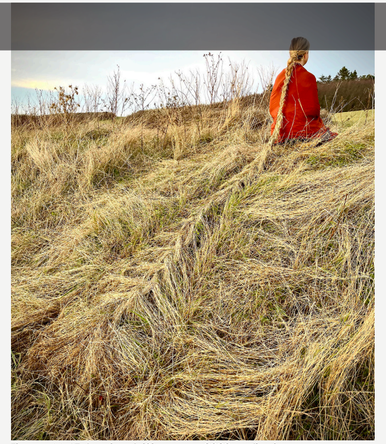


Figure 44: 'Extensions' (Simmons, 2020: online)



Figure 45: 'Extensions' (Simmons, 2020: online)

3.2.2 Loops, Ecognosis and 'Weird Coexistences'

Morton states that all things, including ecological awareness, are strange in the sense that everything inhabits a twisted and looping form because there is 'no limit to the scope of ecological beings (biosphere, Solar System)'. This means that we live in a world of finitude and fragility where objects exist in 'hermeneutical clouds of unknowing'. He also coins the term 'Ecognosis', translating to the idea of 'getting used to something strange' and 'slowly learning to know'. He argues that ecognosis is a weird loop:

> *'Ecognosis, a riddle. Ecognosis is like knowing, but more like letting-be-known. It is something like coexisting. It is like becoming accustomed to something strange, yet it is also becoming accustomed to strangeness that doesn't become less strange through acclimation. Ecognosis is like a knowing that knows itself. Knowing in a loop; a weird knowing. Weird from the Old Norse, urth, meaning twisted, in a loop.' (Morton, 2015: online),*

Morton suggests that the dark-ecological loop is one of ecognosis and that 'being and appearing, are deeply, inextricably intertwined, yet, different' (Morton, 2015: online). The site can be seen as a form of dark-ecological ecognosis, where the plantation and forest differ from eachother dramatically, but are yet 'inextricably intertwined' due to both being examples of manmade forests (see figures 46-47).

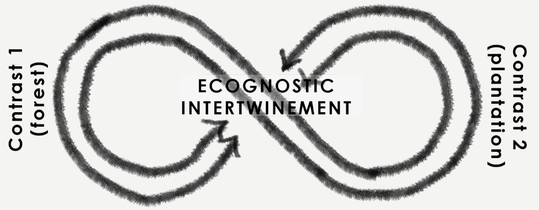


Figure 46: Ecognostic Intertwinement of the plantation and forest (author, 2021)



Figure 47: Collage of the forest and plantation appearing and being in a weird coexistence (author, 2021)

3.2.2.2 The Site, Relations, Loops and Weird Coexistences

There are many coexistences and relations present on the site emerging between the various levels of anthropocentric interventions and other relations on the site.

Moments of weird coexistences occur between commercial functions such as the plantations which are scattered all throughout the context in between the planted nature reserve, as well as the Tronox Fairbreeze mine located on the edge of the forest. Also, coexistences between the planted, rehabilitated forest and the thrivingly diverse ecologies and systems on the site emerge from the life and opportunity to 'be' they have been given due to biophilia and anthropocentric intervention. The coexistence and dark ecology lie within the liminality between these various aspects on the site. For example, the natural stream in the context merges with the planted forest (which comprises of varying other systems in relation to one another), the planted forest and the planted Eucalyptus plantation reside in coexistence with the emphasis on the dirt road between them (see figure 48) .

These elements are all in relation with one another and have relations functioning within them individually. The forest houses eco-systems and mother-trees which nurture their offspring. The natural openings on the site house memories of something moving through it- and over time- creating the opening/breathing space. The plantation is symbolic of the ritual and temporality of industry, and the stream houses eco-systems and feeds the plantations and other trees in the area as well.

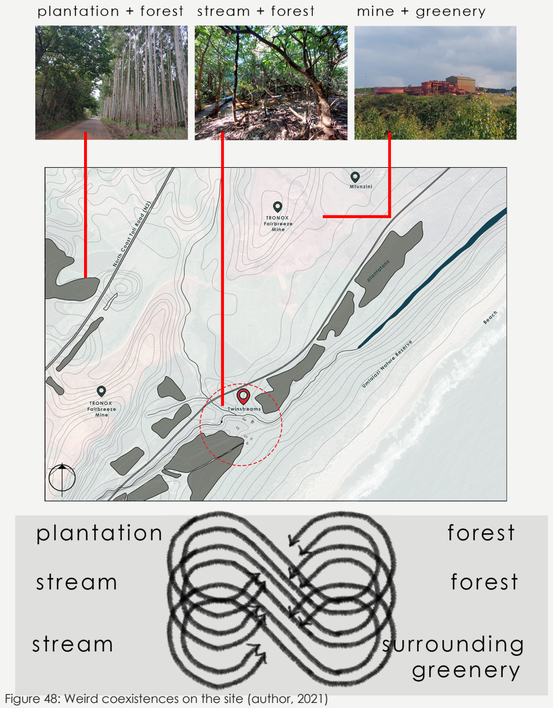


Figure 48: Weird coexistences on the site (author, 2021)

3.2.2.2 Linear Axes

The most prominent relation on the site is the distinction between the two manmade forests. Through the identification of the other relations on the site, it becomes possible for an axial, linear approach through the landscape in order to inhabit these moments of relational coexistences.

For the implementation of a north-south axis, there is a clear existing grid within the Eucalyptus, and the axis may start within it. The grid generates a path towards the stream and allows the newly proposed design to inhabit various different relations on the site. It becomes evident that the mediative architectural intervention will be implemented in differing ways within each of these relations to allow for the emphasis and experience of the differing spaces.

For the next axis, as the main entrance axis of the design mimics the flow of the river towards the north but urges the user to move in the opposite direction in an inverted way.

Lastly, a third axis stretches towards an opening in the forest at an angle and pays tribute to the existing Twinstreams Environmental Education Centre towards the east (see figure 49).

In terms of dark ecology and the project site, it is possible to identify these 'loops' in the landscape and moments of ecognosis and weird coexistences in the relations within it. Through investigating these elements and architecturally inhabiting a series of 'weirdly coexistent' moments in the landscape, new ways of thought may be stimulated and the romantic ideals we have about nature become challenged when face to face with these relations on the site.

The project site exists in the form of many differing elements where both of the manmade forests exist in a coexistence with one another. However, the planted natural forest appears to be something that it is not (one would not know that it was planted), whereas the plantation reveals the truth about what it is from the get-go. Dark ecology asks of us to see the two as the same, with both in a constant state of 'appearing' and 'being' in a weird coexistence with each other.

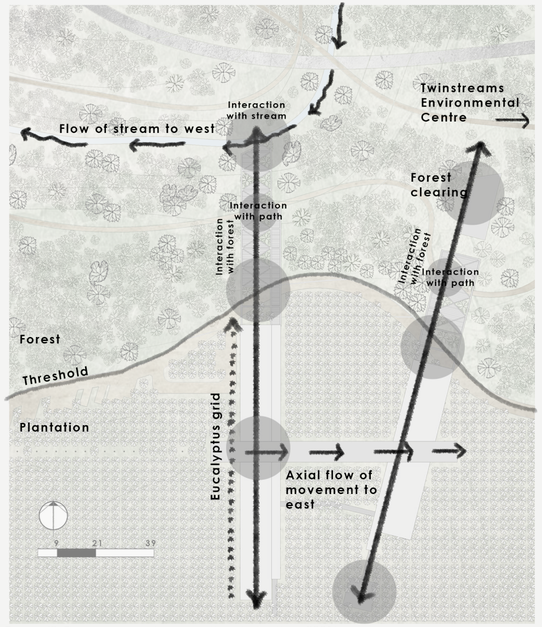


Figure 49: Three proposed axes on the site (author, 2021)

Beginning + Ends of Axes as Ecognosis

The beginning and ends of the newly created axes allow for opposite ends of relational encounters at each end. The axis is in relation to itself and allows for a user experience between the two. For the newly implemented north-south axis, the south side extends into the plantation in the form of a viewing platform for the immersive, individual and reflective experience of the plantation. The north extends as an exhibition space within the forest with gathering spaces, which allows for group spaces standing in contrast to the individualistic nature of the south (see figure 50).

The west to east axis serves as the entrance within the plantation and extends into the plantation ending with an indigenous tree planted within the plantation to emphasise the duality between the vegetation of the landscape. Also, a new, synthetic version of both the contradictory forests can be implemented within the main axis of the structure serving as an inverse of the forest (see figure 51).

The north-east to south-west axis aims to allow for the learning centre functions (focusing on groups). In the plantation, a simple platform is installed, allowing for the feeling of openness in the plantation, only concealed by the silhouette of the Eucalyptus trees. On the north east in the forest, an intimate field chapel stands in contrast with the elements of gathering from the plantation platform (see figure 52).

Each of these axial beginnings and ends allow for relational functions to occur at each end but differ in character depending on whether it is placed within the forest or plantation, whether it is a private or public function, as well as the irony of the new forest in the plantation within the main entrance axis.

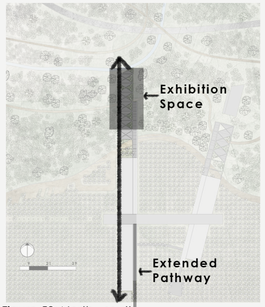


Figure 50: North - south (author, 2021)

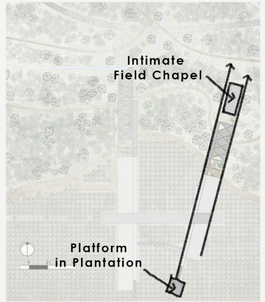


Figure 52: South-west - north east (author, 2021)



Figure 51: West - east (author, 2021)

Canopies + Materiality

With the two distinct parts of the site investigated (the Eucalyptus plantation and the planted indigenous forest), it becomes evident that a binding element is needed to allow for continuity in the linear design proposal. Traditionally, canopy structures are used in tropical locations to allow for optimal ventilation. The roof structure of the linear design is to function as a binding element in the form of canopy structures mimicking the surrounding canopies of vegetation (see figure 53).

For example, polycarbonate sheeting is an extreme form of a 'manmade' material comprising out of human engineered plastics. On the other hand, timber as a material is noted to emerge from the earth and is a more 'natural and alive' material than the plastic- but in the end they are both used as construction materials. There is thus an ecognosis between the two materials.

On the site, the canopies of the axes within the plantation are sheeted with translucent polycarbonate, and the canopies within the forest are comprised of timber. The functions underneath them allow for the application of inversed material cladding with lightweight steel as the constant between the two. An inverse ecognostic loop of materials is thus implemented on the site.

Furthermore, the materiality differences between the two canopies and suspended elements could allow inverse versions of one another between plantation and forest which further enhances the ecognostic relationship between the two parts of the site which are in strong relation with one another (see figure 54).

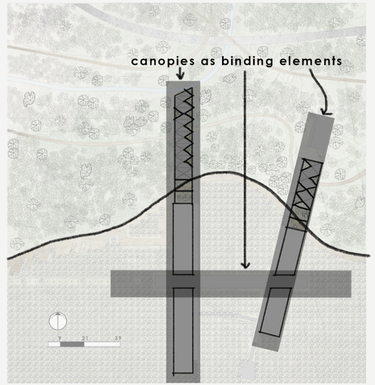


Figure 53: Canopies as binding element (author, 2021)

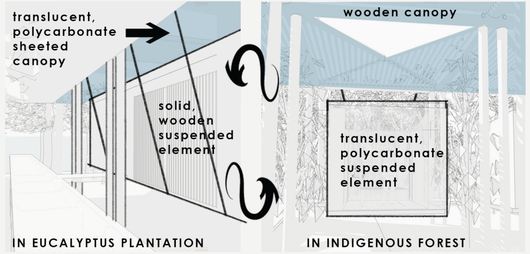


Figure 54: Materiality as inverses of each other (author, 2021)

3.2.3 Biophilic Design Priniciples and Dark Ecology

Through the application of biophilic design principles within the moments of weird coexistences on site, a coexistent and ecognostic cycle of biophilia, dark ecology and ecological awareness may emerge. The human's inherent 'love of life' can be translated and interpreted within the realm of the built environment. In essence, it could be argued that biophilic design pertains to the relationship between humans and nature but includes the mediation of the built environment between the two. In the context of the site, the relations may be experienced through these dark ecological moments of an architectural intervention.

It is noted that there are two ways in which biophilic design can be approached, namely,

1. an organic approach and
2. a place-based approach (al-Rhodesly, 2019: 14).

For a 'place- based' biophilic approach - in order to establish a relationship with the specific place and the celebrate the abovenamed coexistent relations- there are 3 main ways in which biophilia may be applied and experienced within an architectural intervention. All these ways in which the human interacts with their environment can be seen as a form of relationship and emphasizes a different kind of relationship within a moment of ecognosis on the site.

1. Direct Experience of Nature *(Light, air, water, plants, animals, weather, natural landscapes and ecosystems, fire (Calabrese, 2015: 10)) (see figure 55).*

2. Indirect Experience of Nature *(Images of nature, natural materials, natural colors, simulating natural light and air, naturalistic shapes and forms, evoking nature, information richness, age+ change, and the patina of time, natural geometries, biomimicry (Calabrese, 2015: 10)) (see figure 56).*

3. Experience of Place or Space *(Prospect and refuge, organized complexity, integration of parts to wholes, transitional spaces, mobility and wayfinding, cultural and ecological attachment to place (Calabrese, 2015: 10)) (see figure 57).*



Figure 55: Direct experience visually and physically with nature (author, 2021).

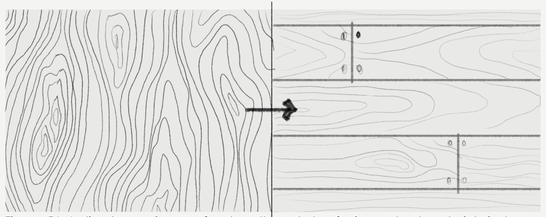


Figure 56: Indirect experience of nature through tranferring natural materials in to building materials (author, 2021).



Figure 57: Experience of place and space in the plantation, prospect and refuge + an organisational complexity (author, 2021).

3.2.3.1 Direct Experience + Dark Ecology

The physical contact between the environmental features of 'place' in the built environment and the human is a direct form of experiencing nature, usually in the visual sense. This direct relation can be investigated in terms of the user/ human entity as a tourist/eco-tourist experiencing an 'Oikos' of relational encounters within the landscape. However, through physical interventions with biophilic properties, it becomes possible for the design of further coexistences in the design proposal in order to create dark ecological moments of ecognosis.

For example, the main entrance axis of the design mimics the flow of the river towards the north, but urges the user to move in the opposite direction. The main axis also allows for the intervention of indigenous plants within the plantation to create a weirdly coexistent axis mimicking the stream, and a moment of dark ecology within the plantation. This allows for the direct experience of the indigenous plants within the plantation, and ends the axis with a large tree/indigenous forest which emerges in stark contrast to the surrounding Eucalyptus trees (see figures 58-59).

A direct experience of these elements thus occurs in a dark-ecological way within the plantation. In turn, the relationship between the forest and the plantation becomes enriched through the architectural intervention and the irony of the forest returning to the plantation makes itself present.

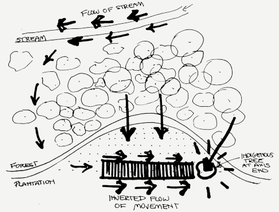


Figure 58: Exploration (author, 2021)

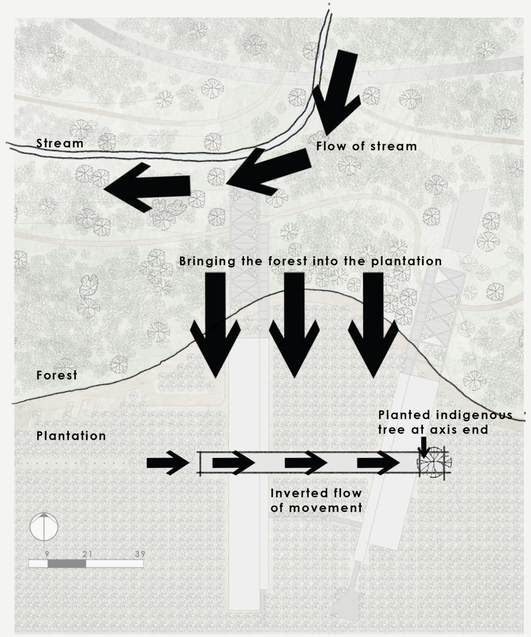


Figure 59: Axis as the inverse of the river flow, and indigenous trees in the plantation as dark ecological ecognosis (author, 2021)

3.2.3.2 Indirect Experience + Dark Ecology

The contact with a representation of nature through the human's many different senses, stimulating a mental reaction, can be seen as the indirect experience thereof. For example, scientific research has shown that the presence of nature alone has a positive effect on humans, but why is this so? These indirect experiences allow for evocative reactions within the human which is primarily based on their embodied experience of the natural world. The indirect relations we have with nature (through our senses) can be explored in terms of Juhani Pallasmaa's writings on embodiment of place within the thresholds that 'place' (the site) offers, and how we experience these varying relations with more than just 5 senses.

In his essay, 'Architecture and Biophilic Ethics', Finnish architect and philosopher Juhani Pallasmaa, states that it is fundamental for humans to re-evaluate their thinking with regard to education and daily practices. He says that firstly, the embodied essence and historical essence of human experience, memory and cognition needs to be accepted by the human because architecture is inherently based on our 'embodied way of being in the world' and thus articulates this mode of being. This means that architecture deeply and unconsciously represents our own bodies and how we as humans view the world. Secondly, Pallasmaa states that we are 'fundamentally sensory and sensual beings' and that the built environment that we have created engages with more than the five Aristotelian senses. For example, studies have shown that there are over 33 different sensory systems which operate and pertain to our relationship with our surroundings. Pallasmaa argues that in architecture, the sense of self we perceive, alongside the existential sense, becomes integral in the way we experience space. Thirdly, creative acts such as thinking, memorizing and perception are based on neural and mental images (rather than a direct language or use of words). We thus maintain the world through our mental and sensory acts. He argues that the 'language of architecture' emerges from the human's 'embodied and existential dialogue with our world' (Pallasmaa, 2017: 66). Sensory input thus plays a key role in spatially emplotting the various weird moments of co-existence within the proposed design.

For example, a new, synthetic version of both the contradictory forests can be implemented within the main axis of the structure. Thresholds are created with differing heights and spatial implications for the dweller underneath (see figure 60), and in turn allows for different sensory experiences and feelings of spatial proximity within the thresholds (like one may experience in the two different forests). Through emphasizing the heights of the various vegetation on the site, indirect experiences allow for the user to experience the weird coexistence through a mental state.

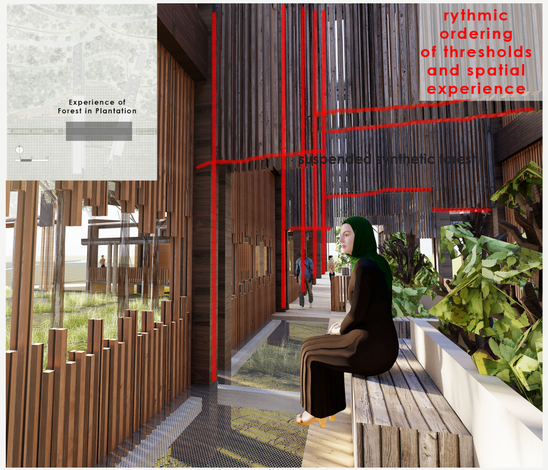


Figure 60: Experience of thresholds and synthetic hanging forest within the plantation (author, 2021)

3.2.3.3 Experience of Place/Space + Dark Ecology

Lastly, the spatial characteristics influencing the experience of place within the natural environment pertain to this form of relation between human and nature. In terms of the site and biophilia, it can be argued that the notion of a treehouse – as simple as it may seem, embodies a built form with the underlying characteristics one might feel and experience within the relations of the site and context of the project. A treehouse also consists of ecognostic relationships and inhabits iconic dualities, allowing for a moment of suspension between heaven and earth at the center of the egonostic loop. Kengo Kuma's suspended forest is analyzed as a precedent in terms of a contemporary interpretation of the simplicity, but complexity of the tree house structure, and how the rigidity of a tree-like structure may allow for moments of suspended relational encounters within it. Also, Kengo Kuma's Pacific Flora Main Gate is analyzed, with a different relation emerging from the structure and may pertain to the trees within the project site.

> *"A tree house is ironically a house without a foundation, that embraces a tree and is rooted to the ground only through that tree. The house literally sways in the sky representing freedom in modern life but is profoundly grounded as ironic duality. Designs may address this duality between sky and ground as well as other dualities such as adventure-security, entropy-stasis, domesticity and wild nature and the contradiction of inhabiting a living place that reshapes your world and in turn shapes your choices."- Treehouse Park Competition Page (competition, 2020: online).*

Firstly, the treehouse, which does not consist of a foundation and is notrooted in this way can be compared to the situation of the tourist and user of the project. The tourist and user of the project are also not grounded in the sense that the Oikos they are visiting is temporary. Next, the tree 'oikos' swaying in the sky as an entity of ironic dualities is symbolic of the state of the tourist as well. It is grounded through the tree stump (nature) and represents freedom of the movement the tourist (human) experiences. A tree house is a simple structure with a relation to the nature it 'clings' on to. The feelings of domesticity (provided by the Oikos and feeding the human's need for belonging) coincide contrastingly with the 'wild nature' surrounding it.

Through a newly generated awareness from 'inhabiting a living space that reshapes your world', the human's choices may be shaped, and an appreciation may arise of and from the relationship they have with nature. The suspended nature of a treehouse can thus be seen as a dark ecological moment of awareness which embodies various dualities and contrasting notions. One physically experiences the relation between the earth and sky and hovers within its duality without choosing a site- but rather existing within the dark ecological moment of ecognosis between them.

The notion of the treehouse and suspension leads to the investigation of suspended architectural structures by Kengo Kuma, which represent treehouses in the built form of the human and comprises of these dualistic qualities. In the site context, it is possible to implements moments where one experiences the path of relational encounters emerging from the ground, as well as the dark- ecological moment emerging from a suspended structure.

The newly proposed design may emerge from the ground in the form of paths, whilst the functions are suspended from above. A moment of transition and awareness is thus created in between the two (see figure 61).

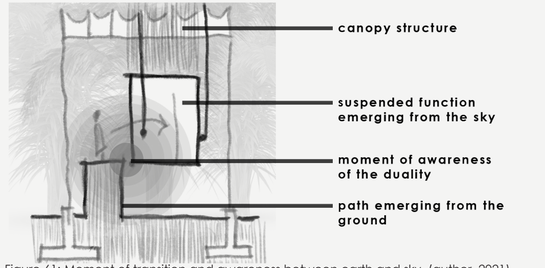


Figure 61: Moment of transition and awareness between earth and sky (author, 2021)



Figure 62: Kengo Kuma Design within Jan Michalsky Complex
(Kuma, 2019: adapted by author)

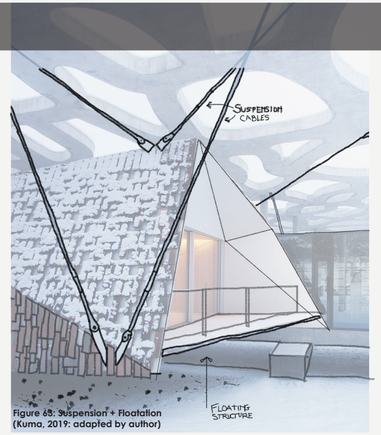


Figure 63: Suspension + Floatation
(Kuma, 2019: adapted by author)

Fondation Jan Michalski ('Suspended Forest') by Kengo Kuma

At the bottom of the Swiss Jura Mountains in Montricher, Switzerland, is a residency program open to writers who may stay within the complex for the duration of their various writing projects (Fondation, 2021: online). There are also functions which allow the public to attend exhibitions and cultural events. The complex barely touches the ground and allows for an architecture 'between heaven and earth,' with a large concrete canopy standing on pilotis (symbolic of the surrounding trees in the forest), and the majority of structures and functions hanging from the canopy. Each unit (designed by various architects) resembles a treehouse (Rogers, 2019: online).

Kengo Kuma and Associates designed another family house within the complex which was to be suspended from the existing concrete canopy (see figure 63). The house appears cocoon-like, with a continuous and gradual space which connects all the interior functions through a corridor. A floating balcony connects the surrounding environment with the interior. The house and entrance-staircase is suspended and fixed to pre-defined points along the existing canopy. A rough, contemporary interpretation of traditional materiality is used to create a façade system and wooden roof, as well as smooth white-coated plywood panels to finish the interior spaces as an inverse of the exterior (Associates, 2019: online).

Moments of suspended elements housing functions in the project allow for a series of floating structures within the Umlalazi Nature Reserve where one hovers between earth and sky in a dualistic moment of dark- ecology.

An overriding canopy structure in the plantation and the forest is to be utilized and change in form depending on which part of the relation it resides in.

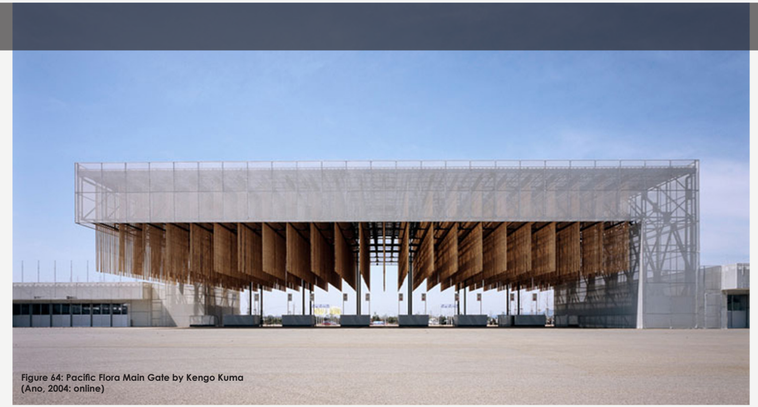


Figure 64: Pacific Flora Main Gate by Kengo Kuma
(Ano, 2004: online)



Figure 65: Pacific Flora Main Gate by Kengo Kuma
(Ano, 2004: online- adapted by author)

Pacific Flora Main Gate by Kengo Kuma

In 2004, the Shizuoka International Garden and Horticulture Exhibition celebrated a new temporary exhibition space to offer the public a walk-through of 6000 plant species from all over the world. The entrance gate (see figure 64) design resulted in a vague boundary between the exterior and interior of the exhibition which used elegant, simplistic patterns of traditional Japanese architecture and natural materials. 2328 pieces of suspended bamboo creates a veiled entrance in to the space and mimics the atmosphere of a forest (AV, 2021: online).

The rigid form of the canopy structure overhead allows for a strict form of suspended elements underneath the structure where one moves through on ground level.

There is a stark contrast of materiality between the overriding steel canopy structure and the tectonic wooden elements suspended from it and the two seem to coexist in a inverted duality.

A rigid structural system allows for repetition and continuity throughout the design (see figure 66).



Figure 66: Model of Structural System
(Steed, 2015: online- adapted by author)

Within the first example, the organic concrete canopy allows for the articulation of spaces underneath. Within the project, a canopy structure in the forest could allow for the articulation of vegetation and specific trees within the context through openings within it.

In the Pacific Flora example, a rigid canopy structure allows for the suspension of elements hanging from it underneath in order to establish a veiled threshold. In the plantation, a more rigid canopy structure could allow for the flexibility of spatial ordering underneath (see figure 67).

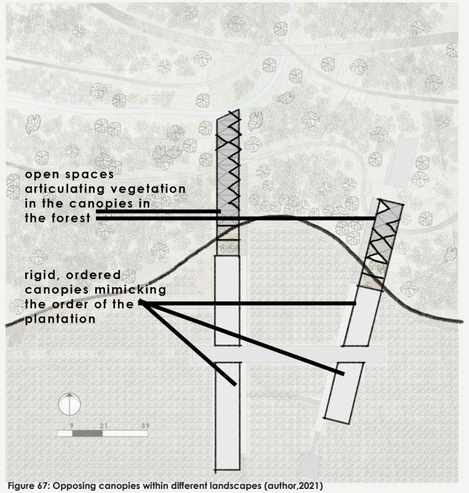


Figure 67: Opposing canopies within different landscapes (author,2021)

TOWERS + VERTICALITY

Another form of experiencing the place/space (the site), pertains to the feelings of proximity one experiences and how they may be translated in terms of the design intervention. Through analysing the height of the surrounding trees and vegetative canopies, it becomes possible for this to be an indirect experience of nature, as well as a physical experience in terms of embodiment.

Due to the dirt road on the site being the most prominent physical entity symbolising the relationship between the forest and plantation, the implementation of a towered exhibition space, as well as a look-out tower, may allow for a moment of verticality (mimicking the trees) as a transformative space between the two different materials and structures of the canopies (see figure 68).

In turn, the physical experience of the verticality is made prevalent when moving through the spaces, and the surrounding elements of the forest and Eucalyptus plantation are both celebrated at the threshold between the ecognostic relationship.

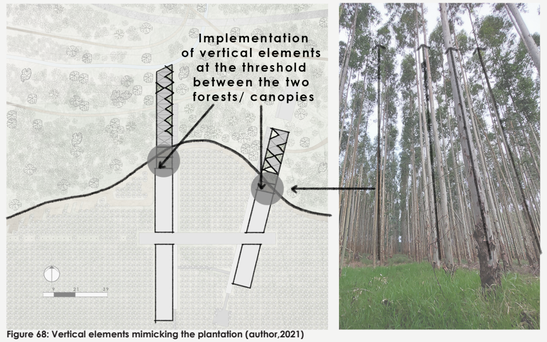


Figure 68: Vertical elements mimicking the plantation (author,2021)

3.3 CONCLUSION

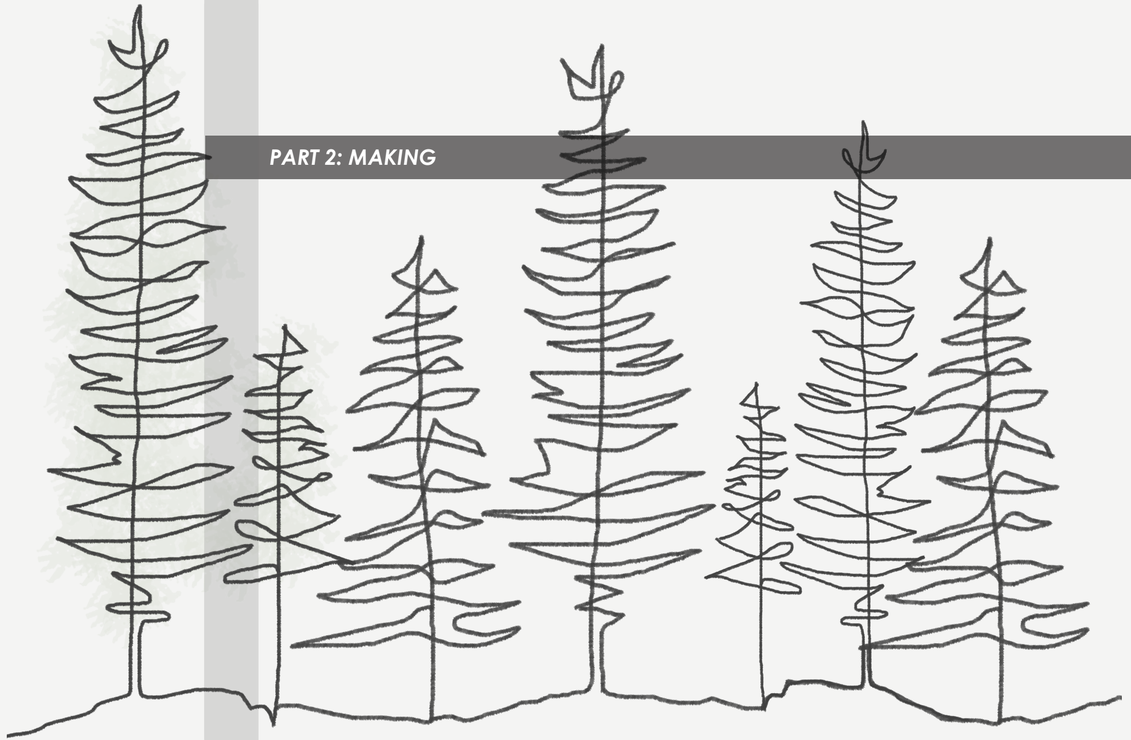
In conclusion to **CHAPTER 3: THEORETICAL DISCOURSE**, the design exploration is greatly supported by theoretical themes such as biophilia and the fact that we are living in the geological epoch of the Anthropocene. It is evident that a shift needs to occur from where we perceive nature as something outside of us in the Anthropocene, towards a mindset of dark ecology which allows for us to realize that we are nature as well.

Morton argues that we need to embrace ourselves in the form of one of many species, and that we are then able to transform from a depressive state into a 'dark sweetness' of ecological awareness. Although dark ecology does not map out the political and ethical strategies it promises, an ecstatic attitude and the hope emerges towards the inevitable dark future of the Anthropocene- a future where nature and humans are weirdly coexistent (Peterson, 2017: online).

The loops and cycles of ecognosis are investigated through the eyes of Dark Ecology and relations on the site are investigated. In turn, the inverses and contrasting elements of the site may be applied to the design proposal to enhance the awareness of the site's relations.

Dark Ecology is also investigated in terms of biophilic principles in order for relational and ecological awareness to occur on the site. Through biophilic approaches allowing for direct experiences, indirect experiences, and experiences of place/space, it becomes possible for these weird coexistences to emerge and stimulate ecological awareness within the context of the forests of Kwa-Zulu Natal.

The next chapter, **CHAPTER 4: TECHNICAL INVESTIGATION**, serves as an exploration of the technicalities pertaining to the project. The climatic needs of a subtropical climate are investigated, and an initial structural response is explored in terms of a CONSeption design. Structural investigations of suspension , canopies and louvre systems are investigated alongside an accommodation list or requirements. The materiality, sewage treatment, circulation and parking within the project are also explored.



PART 2: MAKING

CHAPTER 1: INTRODUCTION
CHAPTER 2: SITE ANALYSIS + CONTEXT
CHAPTER 3: THEORETICAL DISCOURSE

CHAPTER 4: TECHNICAL INVESTIGATION

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CHAPTER 5: DESIGN PROCESS
CHAPTER 6: DESIGN SYNTHESIS
CHAPTER 7: CONCLUSION

4.0 INTRODUCTION

CHAPTER 4: TECHNICAL INVESTIGATION, serves as an exploration of the technicalities pertaining to the project.

Firstly, the climatic needs of a subtropical climate are investigated in terms of the sun and heat gain, materiality, thermal massing and ventilation techniques for a passive design.

Next, initial structural response is explored in terms of a CONSeption design. This is achieved by observing the existing structures of Twinstreams Environmental and Education Centre, as well as drawing inspiration from the many natural structures within and around the site, including the spider web of the red-horned spider.

The structural notions and detailing of suspension, canopies and louvre systems are also investigated to allow for a secure structure within the landscape, as well as providing optimal ventilation in the subtropical climate.

Materials are investigated in terms of the ecognosistic relationships on the site and the newly implemented axes including cross-laminated timber (to be re-purposed from the Eucalyptus plantation), and polycarbonate sheeting.

Alternative sewage systems and treatments are explored to allow for sustainable and integrated waste removal, and the circulation and vehicular parking is explored.

4.1 THE SITE AND CLIMATIC NEEDS

Building climatology is the scientific study of climates pertaining to the built environment. Buildings exist in varying geographical contexts with differing seasonalities, rainfall patterns, sunlight, humidity and wind. In order for a symphonic relationship between the environment and structure within the context of the Umlalazi Nature Reserve, is important to investigate and understand the context and its requirements (Mour, 2019: online)

It is noted that the building industry is responsible for 40% of energy consumption in Australia alone (Ahmed: 2014: 1). It is thus integral for the reduction of energy consumption within the built environment. This can be achieved through simple techniques and methods, for example, passive systems which provide natural cooling and minimize heat gain. It is noted that passive cooling strategies are suitable for subtropical zones with warm winters and humid summers, as well as subtropical areas with mild winters and warm and humid summers (Ahmed: 2014: 1).

Firstly, the sun and heat gain from the sun may be designed for in terms of spatial layouts, orientation and forms of the structures.

Next, appropriate materials are investigated for a subtropical climate.

Furthermore, it is integral to understand thermal massing and the insulation of materials.

Lastly, natural ventilation techniques are explored and investigated in terms of the new building proposal in the Umlalazi Nature Reserve.

4.1.1 The Sun

Differing main spaces of a structure, namely internal spaces, external spaces, and light-sensitive spaces, have different needs in terms of the allowance of entry of sunlight. For example, museums with exhibitions should not allow direct sunlight onto exhibitions unless intended. Spaces need to be well planned in terms of the sunlight in the area as to not allow for harsh exposure to natural elements (Mour 2019: online).

In the site of the new design intervention, there is very little harsh sunlight due to the amount of vegetation on it. Factors such as depth, density and width of structures are explored in terms of spatial organisation (see figures 69). The design intervention proposes a new canopy structure with enclosed functions suspended from it. This will allow only filtered light onto the main functional structures. In the plantation, the canopy structure aims to allow light in through the use of polycarbonate sheeting (which is strongly UV resistant). In the forest, a wooden threaded canopy is utilised to provide the structures (with polycarbonate sheeting walls) maximum shade amongst the forest trees. It is noted that the forest also filters light and provides natural shading (see figure 70).

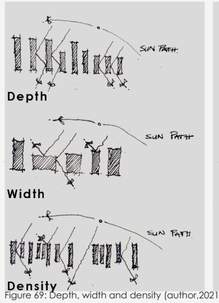


Figure 69: Depth, width and density (author,2021)

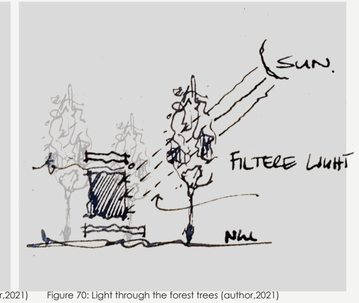


Figure 70: Light through the forest trees (author,2021)

4.1.2 Appropriate Materials and Construction Techniques

In humid, hot and tropical climates, lightweight construction/frames construction techniques utilising metal framing or timber are ideal. Mass walls are more suited to temperate climates, but due to the properties of lightweight constructed walls they are more efficient in maintaining cooler temperatures throughout the nighttime as well (architropics, 2021: online). Typically, light gauge steel members are used where the frame is the main structural element (see figure 71). Cladding serves as a skin which covers the frame, and exterior claddings may comprise out of metal, wood, cement board sidings and vinyl. For the interior, plasterboard or drywall may be used (where contact with moisture can be avoided) (architropics, 2021: online).

Within the new design proposal, it is possible to use lightweight steel construction frames which will allow for enclosed spaces, the design of openings, and sufficient thermal properties within the subtropical climate of the Umlalazi Nature Reserve. The lightweight steel frames allow for a mediative structure within the different parts of the site, which may be treated differently on the exteriors in the differing forests.

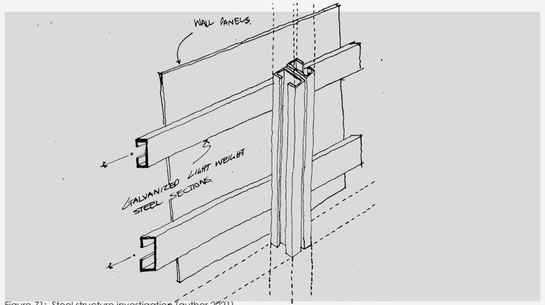


Figure 71: Steel structure investigation (author,2021)

4.1.3 Thermal Mass + Insulation

The response a material has to the application of heat on it is its thermal property. A wall's thermal properties is a primary determining factor of how well it will cool the interior of a structure. In a tropical climate, the difference between night-time and day-time temperature is not incredibly different, so using lightweight steel construction with a low thermal mass is ideal. Walls with wooden cladding do not store a lot heat (architropics, 2021: online).

However, insulation is crucial due to the high levels of humidity and moisture which may cause rotting a mold which could destroy the structure of the wall. Continuous insulation will prevent the thermal bridging as well as reduce heat transfer (McCutcheon, 2018: online).

Within the new design proposal, it is important to consider a thermal insulator within the lightweight steel frames. Cellulose is known for being an environmentally friendly insulator- comprised of boards made of crushed newspaper. For fire protection, aluminium sulphate or borates are added to the mixture (Allplan, 2017: online) (see figure 72).

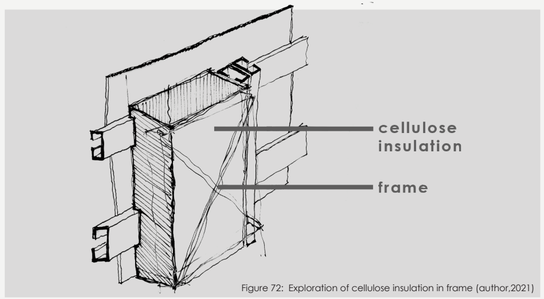


Figure 72: Exploration of cellulose insulation in frame (author,2021)

4.1.4 Openings + Ventilation

Openings within a building in a tropical climate are critical due to being the determining factor of the structure's breathability amidst the humidity. Although openings are integral within this climate, it is also important to make sure that wind does not enter the structure over hot surfaces. Openings may be placed along wind channels, and trees may be used as buffers (Mour, 2019: online). Sun and breeze corridors between enclosed structures are vital in preventing damage to structure due to a lack of proper ventilation (Council, 2020: online). The use of elevated structures are integral within this climate to allow for breezes and ventilation underneath the structure (see figure 73).

In the design, it is possible to allow ventilation space between structures by separating the spaces and functions and allowing for louvre systems to aid air flow (see figure 74). The structure should also be orientated for maximum exposure to cooling breezes and designed with cross-ventilation in mind. Within the new design proposal, the openings are to be designed in terms of cross ventilation with the axes of the design allowing the prevailing winds from the ocean from the south-east to enter and flow through the building (see figure 75).

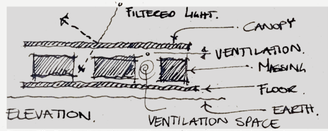


Figure 73: Exploration of ventilation on elevation and elevated structure (author,2021)

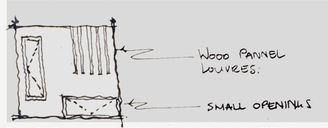


Figure 74: Exploration of ventilation on elevation (author,2021)

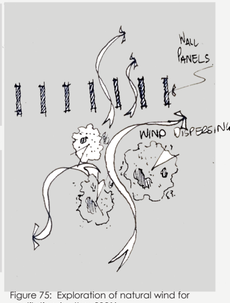


Figure 75: Exploration of natural wind for ventilation (author,2021)



Figure 76: Palmyra House (Binet, 2007: online)

4.1.5 Palmyra House by Studio Mumbai as a Climatic Precedent

Although this structure is presented on a smaller scale than the intended new project proposal, the climate in which it is built is like that of the forests in KwaZulu Natal and are both within a tropical, humid climate and suggests the need for an adaptable structure allowing for ventilation and climate control amidst the humidity. Palmyra House is situated just outside of Mumbai situated by the Arabian sea amidst a coconut plantation. It was built as a retreat within nature from the busy city life and is a 300 meter-squared house consisting of two louvered structures made of wooden frames and in-fill paneling (archdaily, 2010: online).

Although the structure is anchored atop stone platforms, it is still elevated from the ground to allow cross ventilation (see figure 77). The structural framing consists out of local 'ain' hardwood and is constructed using traditional joinery systems of interlocking. The pieces of wood are shaped almost like a 3D puzzle piece, where they fit in to one another through exact sizes (see figure 78). The structure thus mainly consists out a light wooden structure, with in-fill wooden paneling where needed, and adaptable louvre systems – where the house may 'breathe' within and in in reaction to the tropical climate (see figure 83). The louvres are handcrafted from the exterior of the palmyra trunk (another local palm tree in the area) (archdaily, 2010: online).

Also, emphasis is placed on the locally quarried black basalt in the area for the construction of aqueduct walls, pool plaza and stone plinths (see figure 79) (archdaily, 2010: online). (archdaily, 2010: online).



Figure 77: Elevated structure (Binet, 2007: adapted by author)

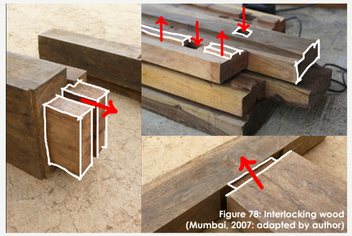


Figure 78: Interlocking wood (Mumbai, 2007: adapted by author)



Figure 79: Palmyra House Staircase and materiality (Binet, 2007: online)

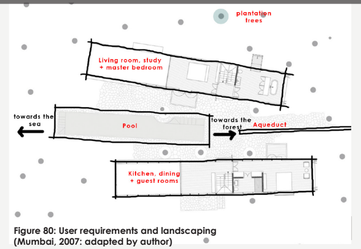


Figure 80: User requirements and landscaping (Mumbai, 2007: adapted by author)

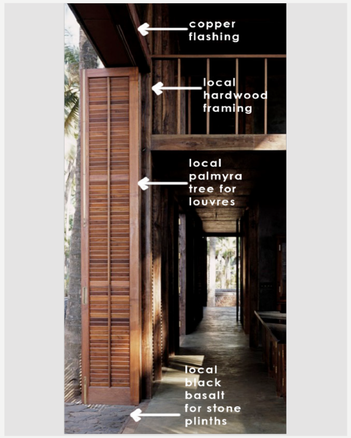


Figure 81: Materiality (Mumbai, 2007: adapted by author)

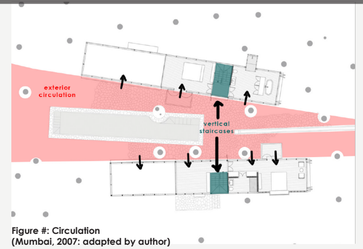


Figure #: Circulation (Mumbai, 2007: adapted by author)

Two volumes of structures are used to separate the varying functions with a linear pool running in between and offers views of the palms towards the east and the ocean towards the west (see figure 80). An aqueduct also sits within the site (archdaily, 2010: online).

The circulation of the structure consists of horizontal circulation between the two main volumes on the exterior around the pool plaza in the centre, as well as linear circulation within the interior volumes which allows for branching out in to the closed spaces within the interior. Vertical circulation consisting of stairs are present in each of the two volumes (see figure 82).

Lessons Learnt (see figure 84).

1. A light + adaptable structure with adaptable screens within a tropical climate (see figure 83).

2. Spatial organization within an industrial plantation.

3. The use of local materiality for structure and aesthetic purposes.

4. The elevation of structure to allow for cross-ventilation underneath the building.

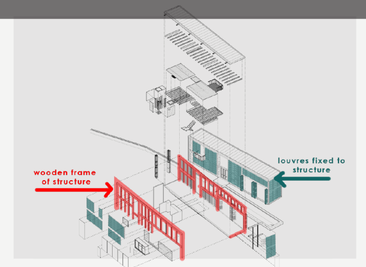


Figure 83: Timber structure with in-fill louvres (Mumbai, 2007: adapted by author)

Application in design:

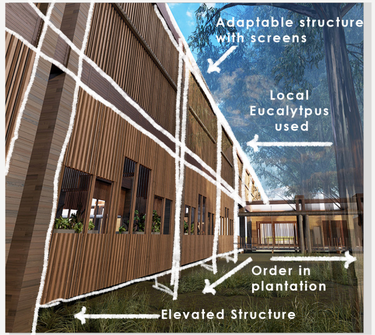


Figure 84: Application in design (author, 2021).

4.2 CONSeption

For the CONSeption/initial technical investigation, the existing structural elements within and around the site are analysed. Already- built structures are investigated, as well as the natural strucures on the site.

Existing structures at Twinstreams Environmental + Education Centre:

Floor: The existing structures on the site are all elevated to allow for proper ventilation in the humid climate, as well as elevate the structure from the cyclical decay and growth on the ground, as well as compensate for possible movement within the ground. The structures are most likely rooted within pile foundations deep within the ground, and the floors consist mostly out of wooden decking. One of the structures, however, has a solid concrete plinth as the floor (see figure 85).

Wall: In some of the structures in the proximity of the site, the more public spaces do not have walls, apart from brick structures enclosing the services in the structure (for example, the dining hall area of Twinstreams Environmental and Education Centre). However, the buildings that do have walls are either enclosed with wooden frameworks and filled- in with wood, or bricks are used on the more plinth-like floors (see figure 86).

Roofs: The curved zinc roofs used on the site are the most economic way of using materials, however, this is not necessarily practical for the sound reduction amidst sub-tropical thunderstorms and elevate the feeling of danger that man already experiences within the forest. The curve, however, mimics the enclosure- like canopy one receives on the trails of the trees which curve over them over time, as well as the curved network of mangrove roots alongside the stream. Also, looking at roof structures of precedent studies in the sub-tropical region of KZN along the coast, it becomes evident that large roof structures are used in order to enclose the spaces, where pods of networked spaces are formed underneath one roof (see figures 87).


Figure 85: Floors (author, 2021)


Figure 86: Walls (author, 2021)


Figure 87: Roofs (author, 2021)

Natural structures around the site:

Knots + twists of trees and vines


Figure 88: Twisted trunk (author, 2021)

Prevalent spider's webs (tensile strength + suspension)


Figure 89: Red-horned spider (author, 2021)

Centipede (adaptive with passive opening and enclosing methods)


Figure 90: Centipede (author, 2021)



Pierced mangrove leaves (nature's shading device)


Figure 91: Pierced leaves (author, 2021)

Ever- changing sand dunes (adaptability)


Figure 92: Sand dunes (author, 2021)

Through the investigation of existing and natural elements around the site (see figures 88-92), emphasis is placed on the tensile forces of the red-horned spider's web (see figure 94) as well as the adaptational centipede. An explorative structure is designed in terms of these different elements, with a main central structure (path), and suspended walkways and pods emerging from it (see figure 93). Also, a main structural frame is created and filled in to create adaptable panels which can open and close in response to the climate (see figure 96). The entire structure is elevated and aims to 'touch the earth lightly in hermeneutic relation with the natural landscape (see figures 94-97).

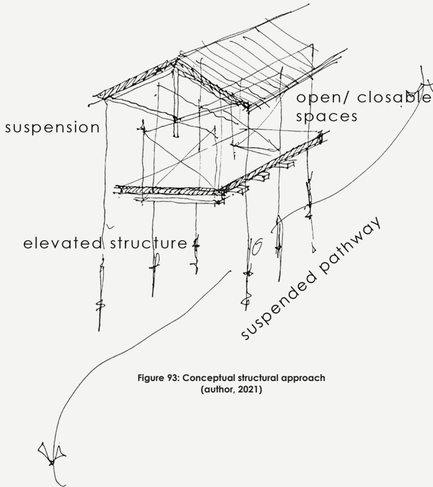


Figure 93: Conceptual structural approach (author, 2021)



Figure 94: Structure of the spider's web (author, 2021)

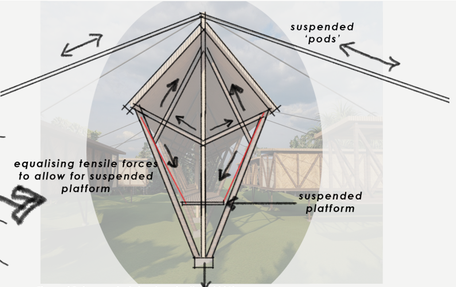


Figure 95: Suspended structure (author, 2021)

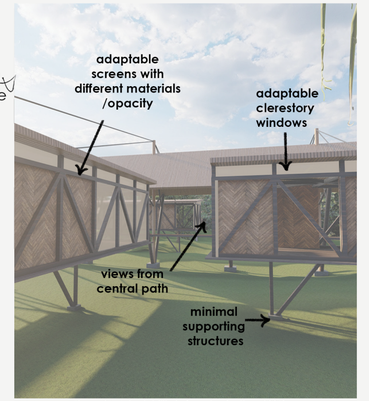


Figure 96: Adaptability in facades (author, 2021)

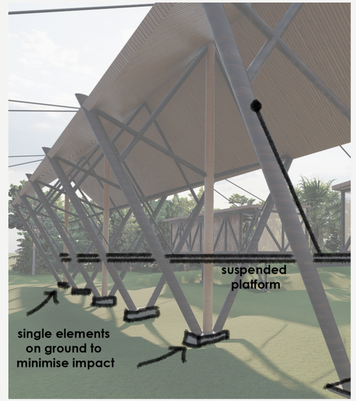


Figure 97: Minimal impact on ground + suspended platform (author, 2021)

4.3 STRUCTURAL INVESTIGATION OF CANOPY AND SUSPENSION

An overriding canopy structure is proposed to allow for an ordering of functions underneath within the subtropical climate of the Umlalazi Nature Reserve, where the sheeting of the canopy structure in the plantation is a polycarbonate material, and in the forest a wooden pergola sheeting is used.

The observation of the spider and its suspended web between the trees in the forest, alongside the theoretical approach of biophilia and dark ecology through the creation of moments of ecognosis, allows for the investigation of suspended functions underneath the proposed canopy structures.

Structures which are supported from higher points (for example, floors or a buildings which are hung from separate structures), are suspended structures (encyclopdia, 2019: online). Throughout history, suspended structures have mainly been concerned with bridges. However, recent applications and developments in technology have allowed for light, single storey structures to be suspended as well. A strong structure may allow for the weight of a suspended structure to be transmitted to its core, or by means of a beam-action between two cores. Beams enable large spans to be suspended. (Rose, 2015: online).

Within the new design proposal, a canopy (column and beam structure) is used to suspend the functions underneath it. The detailing of the suspension elements are to allow for steel rods, attached to the beam structures of the canopy, which are attached to the lightweight steel constructed function.

4.4 LOUVRE SYSTEMS

To allow for adaptation within openings (which aid in ventilation and may be incorporated in to lightweight steel construction), louvre systems are investigated as an appropriate construction element in a subtropical climate.

In tropical climates, louvres are one of the best types of openings for windows which allow for ventilation. Louvre systems have also been developed in terms of design, durability and performance over recent years (architropics, 2021: online) and there are many benefits to incorporating them in to a structure in this climate. For example:

- Large ventilation opening
- Flexible sizes
- Keeping rain out
- Material options
- Controlling natural light
- Privacy
- Easy to clean
- Motorised options
- Security
- Less air leakage
- Hurricane resistant

(architropics, 2021: online)

Within the new design proposal in the Umlalazi Nature Reserve, it is possible to incorporate a manually-operated louvre system in to the facades of the new lightweight steel constructed enclosed functions.

In terms of materiality, it is possible to repurpose the cut-down Eucalyptus trees within the plantation for the louvre panel system.

4.5 ACCOMMODATION LIST

The accommodation list for the new design proposal includes functions pertaining to a Visitor Centre, Restaurant, Administration, Services (Ablution), Academic, Social and Individual. The following table lists the requirements of each of these spaces, as well as the m^2 size of each in the new design proposal.

1. VISITOR CENTRE	**165 m^2**
Reception	**28.9**
Gift Shop	**66.5**
Storage	16.5
Shop space	50
Exhibiton Spaces	**69.6**
2. RESTAURANT	**109.73 m^2**
Kitchen	**50.93**
Cold Storage	5.23
Dry Storage	2.8
Washing space	3.6
Staff WC's	6.3
Food Preparation space	5.3
Service Yard	6
Delivery Entrance	2.5
Circulation	19.2
Coffee Bar	**5.3**
Seating	**53.5**
3. ADMINISTRATION	**98.73 m^2**
Meeting Room	**14.35**
Offices	**33.7**
Staff WC's	**6.6**
Staff Changing Rooms	**13.89**
Lounge Space	**30.19**

4. ABLUTION	**78.5 m^2**
Public WC's	**65.6**
Staff WC's	**12.9**
5. ACADEMIC	**163 m^2**
Break-away rooms	**87.6**
Seating	87.6
Projectors	
Lecture Hall	**75.4**
Seating space	75.4
Projector/Screen	
6. SOCIAL	**520.53 m^2**
Gathering Platform	**81**
Informal Gathering Spaces	**439.53**
7. INDIVIDUAL	**497.9m^2**
Field Chapel	**62.3**
Pathways	**435.6**

4.6 FUNCTIONALITY OF BUILDING + USERS

1. FUNCTIONING OF BUILDING

1. Visitor Centre

The structure is to be used an eco-tourism destination to learn about the surrounding area and conservation efforts. Visitors may buy food from the deli and eat at certain spots on the site to experience the landscape. Also, it is possible for the design of a cellular application which is to be downloaded at the reception upon entry for visitors to be guided around the structure and landscape paths into the rest of the forest with extra information as it changes throughout time.

2. Refuge for surrounding researchers/conservationists and academics

There are a lack of work facilities for researchers, conservationists and academics when they visit the area to do their work. In the administration part of the building, it becomes possible for a shared office space where students and professionals may work and do their research for the time they are in the area.

3. Learning Centre to be used for lectures and conversations as an extension to Twinstreams Environmental and Education Centre

Twinstreams Environmental and Education Centre (towards the east of the site) lacks the capacity to function to their full potential. It becomes possible for the new design intervention to allow for bigger groups of students where information may be be presented. The structure may also serve as a base for students to return to after completing activities.

4. Conservation lectures/small conferences

WESSA, who are the current owners and facilitators of Twinstreams Environmental and Education Centre, are known for hosting events and lectures pertaining to conservation efforts and hosting fundraising events. The structure may utilize lecture halls and break-away functions to aid with these functions.

2. USERS

1. Visitors

Visitors may come to the structure as an eco-tourism destination to learn about the Umlalazi Nature Reserve, the area, and the conservation efforts in place. A restaurant and gift shop allows for an income from the visitors.

2. Staff

Receptionist: To orientate visitors

Curator: For running the exhibitions

Conservationists/Researchers: From Twinstreams Environmental and Education Centre may utilise the space in the offices, as well as the lecturing and educational facilities where they may present information to children and/or visitors.

Retail: Management and running of the gift shop

Restaurant: Roughly two people to prepare food in the kitchen, and at least two food servers.

Maintenance: For maintenance and cleaning purposes.

3.Academic

Professionals seeking alternative conferencing space

Supervised children (School Adventure Camps) from the Twinstreams Environmental and Education Centre

4.7 MATERIALITY

1. LIGHTWEIGHT STEEL FRAMES + CLT EUCALYPTUS CLADDING

It has been established that lightweight steel construction is to be used to enclose the functions suspended from an overriding canopy structure. Within the plantation, and to mimic the surrounding forest, timber can be used to clad the lightweight steel constructed frames for aesthetic reasons, as well as to create louvre systems for ventilation in the subtropical climate.

Cross- laminated timber consists of layers of dimensions timber which are glued together to form structural panels. They have great strength, rigidity and stability whilst remaining lightweight. The seismic, thermal, acoustic and fire performance is also exceptional, and has a low environmental impact when compared to other building materials. Minimal waste is produced in the manufacturing process, and only little amounts of water are used. The used glues are also pass European health and environmental standards and are free of formaldehyde (XLAM, 2021: online).

XLAM is a company who specializes in the creation of CLT (cross-laminated timber) building materials. The benefits of CLT include:

- Speed
- Strength
- Cost-Saving
- Insulation
- Sustainability
- Precision

(XLAM, 2021: online).

The eucalyptus trees which are to be cut down for the design intervention can be repurposed for this function, allowing for the integration of the site once again (see figure 103).



Figure 103: From plantation to building material (author, 2021) and (Wood, 2020: online (adapted by author)

2. POLYCARBONATE SHEETING (CANOPY + WALL)

In contrast and as an inverse to the natural, wooden materials, plastic is seen as a more human-manufactured material. Polycarbonate is a resilient and strong thermoplastic which can withstand extreme temperatures and is also lightweight. For these reasons, it can be an effective material for roof sheeting and certain wall structures (Plastics, 2021: online).

Benefits of polycarbonate sheeting include:

- Resistance to Extreme Temperatures
- High-Quality
- Affordability
- Extreme Strength
- Lightweight
- UV Resistant
- Protects Against Discoloring
- Perfect for Greenhouses

(Plastics, 2021: online)

By applying polycarbonate sheeting to the top of the canopy structure in the plantation, the wooden structures underneath may be protected from the sun as well as water. In the forest, the lightweight steel frame structures may be filled with polycarbonate sheeting.

4.8 SEWAGE TREATMENT: BIOROCK

Alternative methods of sewage treatment are investigated in hopes of having a less harmful impact on the environment than a traditional sewage system or septic tank system.

BIOROCK is a company who uses innovated techniques in sewage treatment plants which have low carbon footprints, are non-electric, and require minimum maintenance. Their aim is that nature runs the process of sewage removal, and warranties are provided alongside the product in proof of their effectivity (Biorock, 2021: online).

Benefits of BIOROCK (especially in the natural landscape) include:

- **Silent operational system** (no compressors, pumps or loud motors)
- **Low carbon footprint** (no electricity is used to eliminate carbon emissions)
- **Long desludge intervals** (tanks only need to be desludged every 3-5 years).
- **Visually unobtrusive** (no above-ground station)
- **No concrete needed**
- **Minimal annual maintenance**
- **No moving parts**
- **No electricity required** (natural flow and gravitational system)
- **Low running costs**
- **The most sustainable sewage system to date**

(Biorock, 2021: online).

How Does it Work?
The ECOROCK units consist of a primary tank which divides oils, fats, organic solids and greases. Afterwards, the sewage passes an effluent filter and gets discharged in to the BIOROCK reactor. This further purifies the wastewater with biological processes and the unique BIOROCK Media. Lastly, effluent is discharged through gravity or a pump (depending on soil conditions) (Biorock, 2021: online). (See figure 104). The outgoing water quality may be directly discharged and used for irrigation.

ECOROCK UNITS

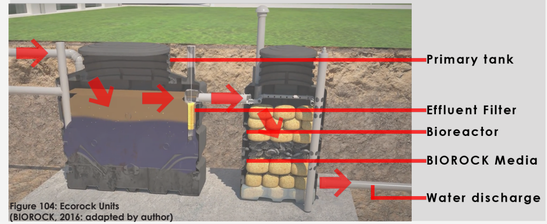


Figure 104: Ecorock Units
(BIOROCK, 2016: adapted by author)

BIOROCK MULTIROCK SYSTEM

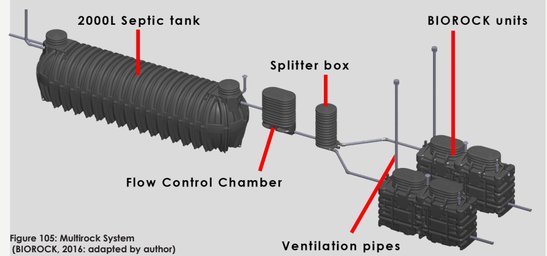


Figure 105: Multirock System
(BIOROCK, 2016: adapted by author)

The Biorock Multirock System allows for a large capacity from between 60 - 300 people. Professionals link and scale the various units to adapt the system according to the needs of the site and functions. Up to 9 BIOROCK units may be placed in parallel to increase the capacity (Biorock, 2021: online). A main 2000l septic tank connects to a flow control chamber, then connects to a splitter box which is attached to the ECOROCK units where sewage is processed (see figure 105).

4.9 CIRCULATION

The newly proposed axes within the design aim to allow for accessible and simple horizontal circulation to take place within the structure.

On the western north-south axis, the enclosed suspended structures are to be located on the west, with a subsequent path underneath a canopy structure running parallel with the structures. On the north-east to south-west axis, the enclosed suspended structures are located towards the eastern side of the canopy, with a parallel horizontal circulation path towards the west (see figure 106).

The central, binding axis of the structure serves as the main horizontal circulation between the two axes, as well as a space of experiencing thresholds. A narrow, subsequent pathway through the plantation connects the two axes again for the purposes of allowing the easiest routes to the public ablution facilities (see figure 107).

When ground levels change from the design towards the natural ground into the forest, ramps are installed to allow for accessibility. Paths and landscaping emerge from the ramps in to the forest to encourage the user into the landscape.

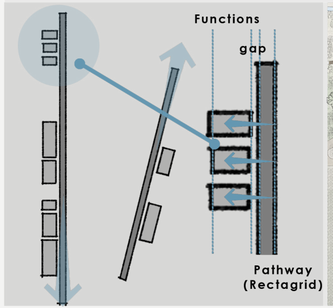


Figure 106: Horizontal axes circulation (author, 2021)

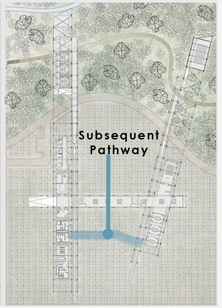


Figure 107: Subsequent pathway (author, 2021)

4.10 VEHICULAR PARKING

For visitors not approaching the building from the existing Twinstreams and Environmental Centre to the east by foot, the existing vehicular dirt roads are utilized to incorporate vehicular parking for the public, as well as service parking and routes for restaurant deliveries.

For an integrated approach, the vehicular parking is designed next to the existing roads within the plantation (where Eucalyptus trees are removed to accommodate the cars instead of removing the vegetation of the forest).

Next, in order to make the visitor aware of the structures in the plantation through the grid of trees, painted gum poles are erected in line with the central axis of the structure, and in turn, this draws the user in to the plantation by foot at the beginning of their journey. Linear paths lead to the axis of gum poles, where a meandering pathway leads the user into the entrance of the building (see figure 108).

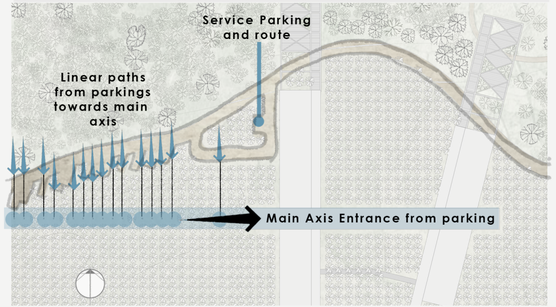


Figure 108: Parking (author, 2021)

4.11 CONCLUSION

In **CHAPTER 4: TECHNICAL INVESTIGATION**, it becomes evident that there are many different technical aspects that need to be taken into consideration for the new design proposal in the Umlalazi Nature Reserve. The sun patterns and heat gain, thermal massing, appropriate materiality, and ventilation within the design are paramount in a subtropical climate.

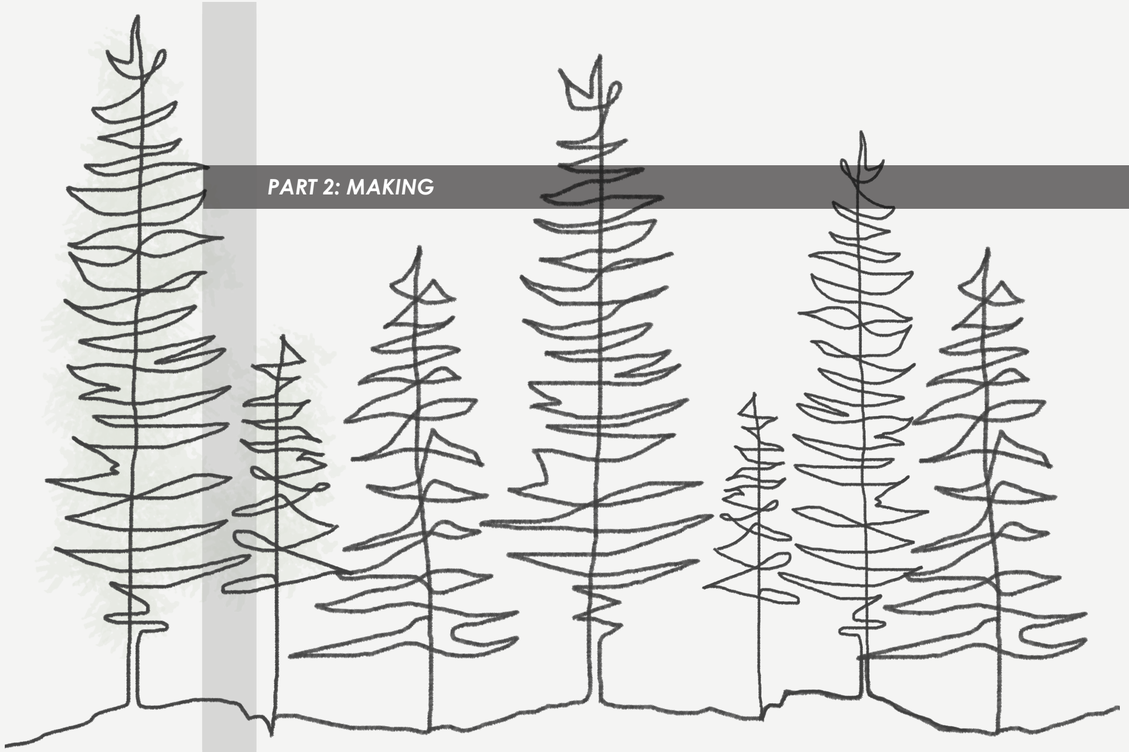
Through the developent of a CONSeption model which was derived from analysing the site and the varying natural influences on it, it becomes possible for the investigation of canopy structures, suspended structures, and the use of louvre and screen systems for a passive design.

Next, through compiling an accommodation list and the requirements for the different functions, it becomes possible to start understanding the functionality of the new design, as well as its intended users.

Cross-laminated timber and polycarbonate sheeting are investigated in terms of materiality and cladding materials, and alternative methods of sewage treatment (BIOROCK) are looked into.

Lastly, the circulation of the structure and integrated parking is determined.

The next chapter, **CHAPTER 5: DESIGN PROCESS**, will illustrate how the design process is developed and synthesized through a Touchstone and Concept investigations, as well as precedent studies and design developments through diagrams and sketch plans.



PART 2: MAKING

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CHAPTER 2: SITE ANALYSIS + CONTEXT
CHAPTER 3: THEORETICAL DISCOURSE
CHAPTER 4: TECHNICAL INVESTIGATION

CHAPTER 5: DESIGN PROCESS

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CHAPTER 5: DESIGN PROCESS
CHAPTER 6: DESIGN SYNTHESIS
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5.0 INTRODUCTION
Chapter 4: Design Investigations

CHAPTER 5: DESIGN PROCESS aims to portray the narrative of the design process and the varying influences regarding decision making in the design process and in turn, leading up to the final design synthesis.

Firstly, a design touchstone aims to capture the essence of awareness which is intended by the project. Through a metaphorical investigation into human nature and the overriding dominant relationship we have towards our environment, it becomes possible to understand how an architectural intervention may be used as a tool to stimulate awareness and allow a change in thought about our relationship towards nature.

Next, four concepts are investigated through aspects pertaining to the site and personal experience thereof, materiality and climatic influences, as well as the user experience of relational encounters.

Furthermore, design precedents are analyzed with regards to the design of a visitor centre, a field chapel and exhibition spaces.

Lastly, the design process is illustrated to show the development of the design and the driving thoughts behind the made decisions.

5.1 DESIGN TOUCHSTONE
The Essence of Awareness

With emphasis placed on the relationship between humans and nature, the initial design touchstone explores the initial idea of how eco-awareness should be enabled and encouraged through an architectural intervention to allow for a minimised impact and less invasive relationships towards it.

The process that takes place in the touchstone was the placement of two identical sheets of paper on the floor in a public space with prominent human activity where the papers symbolise nature.

Firstly, the one piece of paper is left untouched (and a video is taken of people walking over it) leaving it (nature) highly damaged and imprinted on.

Next, a simple structure symbolising a possible architectural intervention is placed on the second piece of paper. Automatically, the inevitable human activity occurring on the site is encouraged to step around and rather observe the structure, which in turn protects the piece of paper by making them aware of its very existence.

Lastly, the two pieces of paper are displayed and exhibited in separate but identical boxes with a singular interwoven string connecting the two pieces of paper. This symbolises the transition that needs to take place in human thought and relation towards nature. The touchstone is thus used to metaphorically portray the fact that an architectural intervention may contribute to the awareness a human may have about their surroundings and relation with it (see figure 109).

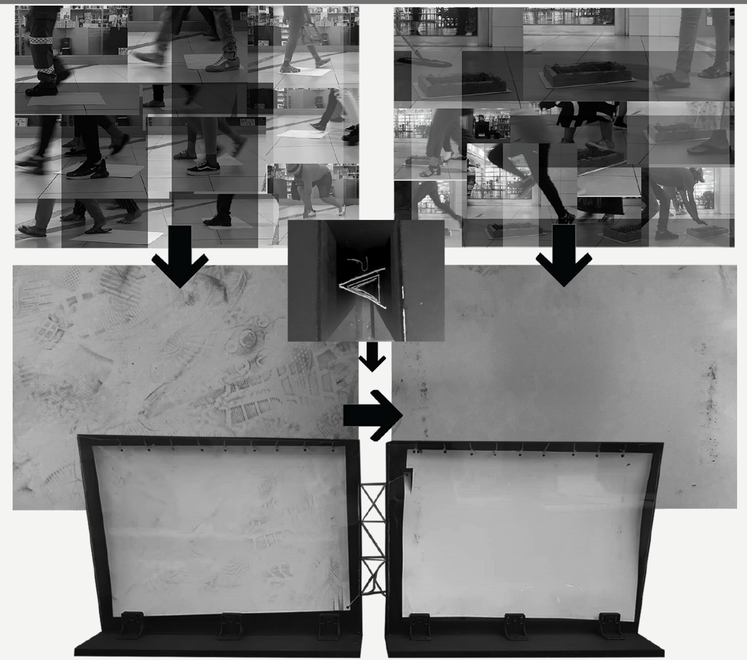


Figure 109: Touchstone process (author, 2021)

5.2 CONCEPT 1: FRAGMENTATION THROUGH TRANSFORMATION

Site + Experience

First, the idea of 'Fragmentation through Transformation' was explored in terms of the physical aspects of the site and context. Through observations of the topologies on site, alongside the context, it became clear that the elements resembling higher degrees of elemental human interference (such as the industrial plantations and the mine) were to be represented through rigid, linear and dense patterning in response to the threatening relationships they symbolize. Next, the transition of density towards fragmentation was observed where the site and its elements dematerialize towards the ocean, where there is 'more room' for relationships to flourish on an ecological level (see figure 110).

Also, from a climatic point of view, the wind is more intense closer to the ocean, and the dense forest moving inland starts to inhibit the wind. This conceptual investigation lead to an emphasis of fragmented elements by the natural stream on the site, where the dense elements have been broken apart but are still linked to one another. This is also representational of how the trees of the forest are more fragmented and 'natural looking' than the repetitive, homogenous plantation grid (see figure 111).

This is also symbolic of the transformation that we as humans need to go through to improve our relationship with the environment.

This concept may allow for site specific and climatic architectural responses towards the transforming wind intensity and allow for dematerialisation and transformation to take place within detailing and form giving.

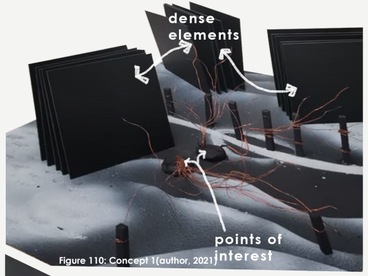


Figure 110: Concept 1(author, 2021)

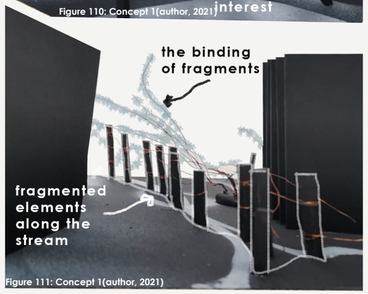


Figure 111: Concept 1(author, 2021)

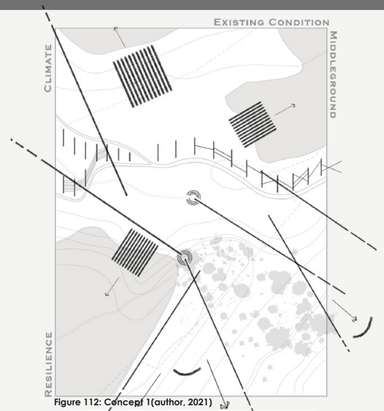
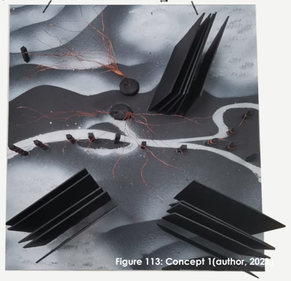


Figure 112: Concept 1(author, 2021)


Figure 113: Concept 1(author, 2021)

5.3 CONCEPT 2: BIO-DEGRADATION

Materiality + Un-invasive Relations

Next, the concept of 'biodegradation' on the site was explored in terms of appropriate materiality and can be seen as the implementation of a hermeneutic relationship (between architecture and nature) on the site.

When observing the site, datums were organized from the ocean towards the stream, as well as from the mines towards the ocean. The ocean 'disintegrates' through interaction with the land through the stream by dispersing into an even smaller stream through movement over the passage of time. The same is said about the mine and how the level of invasive human relations towards the environment decreases from the mine towards the forest and coast. Again, this process is one of dematerialization, but the idea of biodegradation allows for the integration of dematerialized parts, aiming for a sustainable resolution (see figure 114).

When interpreted in to a 3D model, it becomes evident that the structures of the datums are to be elevated from the site (see figure 115)- allowing the structure (as well as human impact) to 'touch the earth lightly' and separate the harsh impact of the human from the natural earth whilst allowing for an integrated experience and relation between the two. Architecturally, clues from this concept may be found within this separation of man and earth, as well as looking at materiality and how the timber from the plantations may be used as building material with the aim of bio-degradation as a non-invasive relation.



Figure 114: Concept 2 (author, 2021)

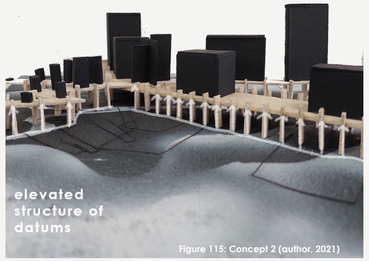


Figure 115: Concept 2 (author, 2021)

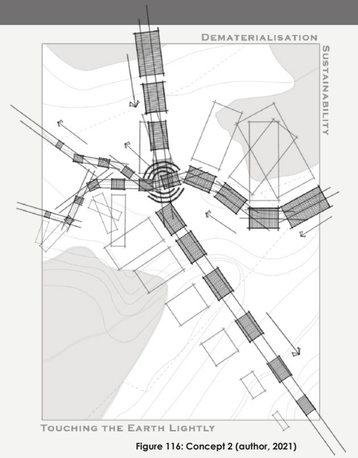
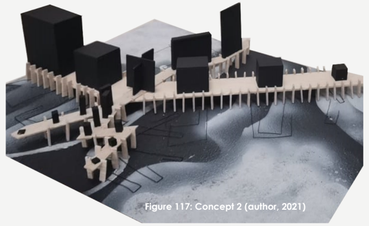


Figure 116: Concept 2 (author, 2021)


Figure 117: Concept 2 (author, 2021)

5.4 CONCEPT 3: FLANEUR IN THE FOREST

User experience

Thirdly, the intended user and their experience was taken in to account with the concept of the 'flaneur in the forest' or 'nature-walker'. A sense of wanderlust exists within the eco-tourist and anyone wanting to improve their relationship with nature, with a set of observatory skills and intentions which could be compared to that of the flaneur/flaneuse. Humans already flock to this specific area to experience this beautifully unique and tropical part of the country with scattered walking trails throughout the forest and the beauty of the coastline. There is a lot for the user to observe in the area when they are open and attuned to observing and respecting it. An idea emerges, claiming that the user is on a constant 'path to nowhere' with the sole intention of participating with and existing alongside nature.

Through investigating this idea on the site, a broken and scattered yet never-ending pathway connects to existing pathways within the rigid plantations. The question arises of how an architectural intervention on the site may amplify the experience of nature and thus the appreciation thereof through blurred thresholds. This automatically encourages an enhanced relationship between the user and the site. Architecturally, investigating thresholds and ritual pertaining to the 'nature walker' could allow for ways in which the architecture will be subsequent to the nature, but allow for the embodiment and movement between the varying levels of thresholds - as well as amplify the user experience of the site (see figures 118 -121).



Figure 118: Concept 3 (author, 2021)

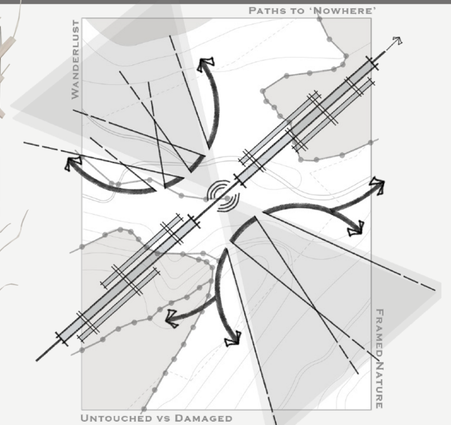


Figure 120: Concept 3 (author, 2021)

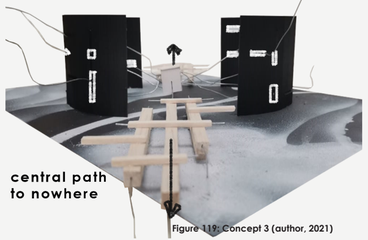
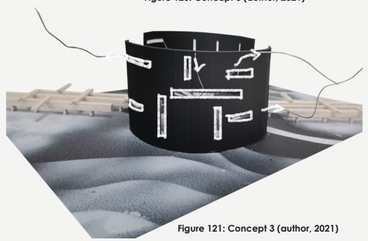


Figure 119: Concept 3 (author, 2021)


Figure 121: Concept 3 (author, 2021)

5.5 CONCEPT 4: SUSPENSION

Tension between heaven and earth

As a later-explored concept, the notion of suspension and the creation of a hovering point within the relation between the sky and the earth is investigated (see figures 122- 125).

The suspended structure is seen as a form of embodying various dualities between relations, such as the earth and sky. It is within this moment of tension - between heaven and earth - where the relation between the two is experienced and one is confronted with the fact that you are not fully in either of these realms, but in the ecognostic space between them.

The use of an overriding canopy structure with suspended structures emerging from it may be seen as a moment of dark ecological awareness which embodies a series of dualties which can be further explored by means of inversed materiality and functions.

Furthermore, the use of canopy structures in a linear form (generated by the existing plantation grid), may house the functions which are suspended from them, but in turn still allow for and protect pathways against the elements. This facilitates the horizontal circulation and 'path to nowhere' (concept 3) where revelations may occur.

Through the exploration of these four concepts, alongside a theoretical discourse pertaining to biophilia and dark ecology, it becomes possible to investigate precedent studies pertaining to the new design proposal in the Umlalazi Nature Reserve.

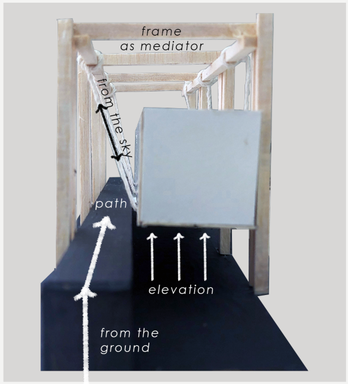


Figure 122: Concept 4 (author, 2021)

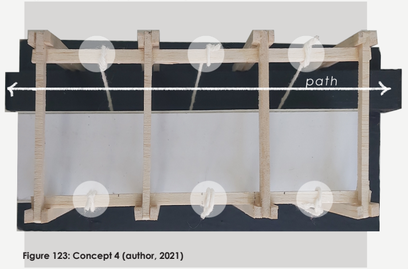


Figure 123: Concept 4 (author, 2021)

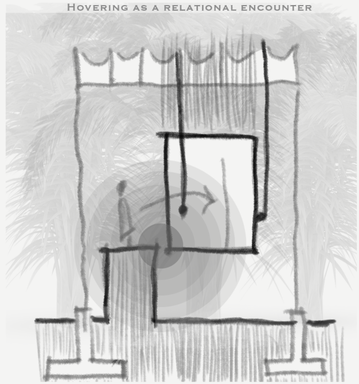
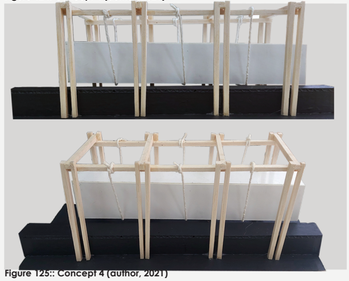


Figure 124: Concept 4 (author, 2021)


Figure 125:: Concept 4 (author, 2021)

5.6 DESIGN PRECEDENTS

5.6.1 Arjuzanx National Reserve by Inca Architectes + ALEP



Figure 126: Arjuzanx Entrance (Castests, 2015: online)

This project is also located on a site with various relations between humans and nature. It extends into a 'manmade' lake (which was originally a mine and then filled up with water) in the Landes region in France, and is also surrounded by plantations (see figure 127). The visitor centre functions as a 'discovery centre' and aims to encourage the user to go outside and explore the surroundings instead of capturing them inside.

The main structure is located on the north-west to south-east axis (see figure 128), being able to obtain optimal natural sunlight from the south (in the northern hemisphere). The building is situated to be placed on a 'major landscape axis' and connects the shores of the lake. This allows for a linear walk through the site in order to experience the various elements within it.

The linearity of the created landscape axes allows for a narrative progression of spaces along the axis, with larger structures at the starting point which then become dispersed and fragmented as one moves along the axis. One moves from the parking, through pathways, towards preparation for the journey, more pathways, pause spaces, and then proceeds to the docking station at the end of the journey where one will experience the site on a boat journey. The axis thus ends in a space of transformation (see figures 129-130).



Figure 127: Location + manmade elements (maps, 2021: adapted by author)



Figure 128: Axis (maps, 2021: adapted by author)

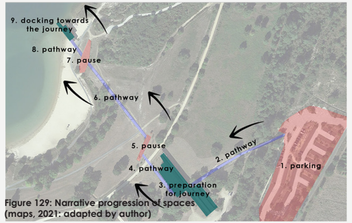


Figure 129: Narrative progression of spaces (maps, 2021: adapted by author)

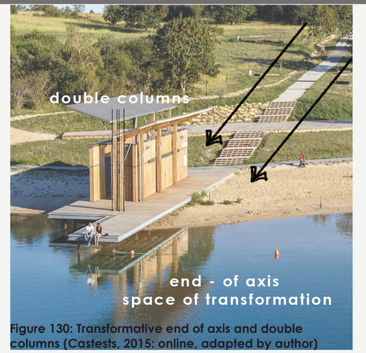


Figure 130: Transformative end of axis and double columns (Castests, 2015: online, adapted by author)

Double- timber columns are used to emphasise the use of natural materiality and guides the user through the walkway. Steel bracing is used to support the butterfly roof consisting of timber and steel cladding- and allows for a box-gutter combatting the prominent rainfall in the area.

Lastly, a suspended installation in the interior of the exhibition space emphasises the materiality further (see figure 140). In the context of the Umlalazi Nature Reserve, suspension is ever- present in the prominent spider's webs throughout the forest and plantation, and may be further explored in terms of an installation space expressing the context and liminality thereof.



Figure 140: Suspended timber elements (Castests, 2015: online, adapted by author)

Lessons learnt:

1. The use of landscape axes to create a walkthrough narrative progression of relational experiences (see figure 141).

2. Double columns to articulate materiality (see figure 142).

3. Suspended materiality to celebrate the context which allows for a synthetic, inverted forest installation (see figure 143).

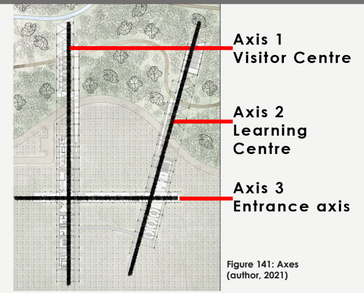


Figure 141: Axes (author, 2021)

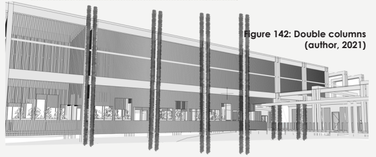


Figure 142: Double columns (author, 2021)

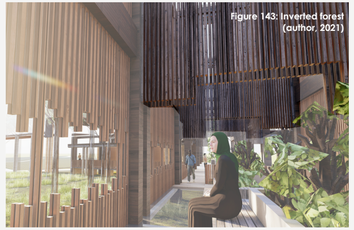


Figure 143: Inverted forest (author, 2021)

5.6.2 Wooden Chapel by John Pawson



Figure 144: Wooden Chapel by John Pawson (Friedmann, 2019: online)

Chapels have traditionally been erected as architectural and spiritual features in the landscape. The Wooden Chapel by John Pawson was designed as part of a larger series of structures in which cyclists may take shelter, reflect and pause (see figure #) (archdaily, 2019: online). The chapel aims to be encountered as a 'found' object within the landscape within the threshold between open ground and forest. From afar, the structure appears as a stacked pile of logs and pays triibute to the materiality of the surrounding forest, whereas a supporting concrete plinth aims to create a formal impression of the logs as a sculpture in the landscape (see figure 145) (archdaily, 2019: online).

Openings within the wooden walls articulate the thickness of the wooden logs, and the narrow entrance and circulation of the structure recreates the sense of physical proximity one encounters whilst moving through the forest (see figure 146) (archdaily, 2019: online).

Within the interior of the structure, the material of the timber is celebrated through its exposed treatment, where one can experience inherent tactile patterns and surfaces and warm hues. Clerestories allow for streaks of natural light to filter in to the interior (see figure 147)(archdaily , 2019: online).

It is clear that the chapel does not function as a space of traditional religious gathering, but is intended as space of reflection and pause for the flaneur moving through the forest, and there are lessons to be learnt in terms of a reflective/meditative space in the forest.



Figure 145: Plinth and stacked logs as a sculpture in the landscape (Friedmann, 2019: adapted by author)



Figure 146: Cut openings (Friedmann, 2019: adapted by author)



Figure 147: Clerestory slit (Friedmann, 2019: adapted by author)

Lessons learnt:

1. Intimate reflective space within the landscape
Within the new design proposal, it becomes possible to allow for an intimate, reflective space amidst the trees for the flaneur to encounter in order to reflect internally on their new revelations and experiences within the landscape.

2. The encounter of a 'found object' between thresholds in the landscape
Spiritual spaces usually present themselves at the end of prominent axes. In the case of the new design proposal, it becomes possible to place the new field chapel at the end of an axis which is secluded from the main structure in order to offer privacy for the flaneur and their experience within it (see figure 150).

3. Articulation of surrounding materials and appreciation through the articulation of prevalent elements
Given the prevalence of natural materials on the site (Eucalyptus, wood, earth etc), it can become possible to highlight the relations between the structure and the surroundings through the use of materiality. Through framed views on to specific elements (such as specific trees) and the use of natural materials, the surrounding site may be incorporated and articulated within the design of the field chapel (see figure 149).

Application:

As the definitive beginning and end of the south-west/ north east axis, of the design, the notion of two different types of reflective/ gathering spaces arises. The first in the plantation as a platform where the surrounding trees aim to enclose the structure in its bare and vulnerable form (see figure 148). Next, the second results in a more intimate field chapel as a non-denominational reflective and meditative space, where the flaneur may reflect upon their encounters at the end of the axis/experience they have inhabited.

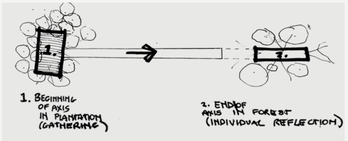


Figure 148: Axis beginning and end, platform and field chapel (author, 2021)



Figure 149: Openings (author, 2021)



Figure 150: Found object (author, 2021)

5.6.3 'Making a Forest' exhibition by Mjölk architekti



Figure 151: Making a Forest Exhibition (BoysPlayNice, 2017: online)

'Making a Forest' is an exhibition space in Prague where the exhibition spaces are exposed in order to separate each topic of exhibition into their own independent space (see figure 151). However, an outer cover is generated to allow for a double perception where one has to walk through the main space and each intimate room of exhibition is revealed to the user (archdaily, 2017: online) (see figure 152).

Furthermore, prefabricated wooden structures are used to enclose the exhibition rooms under an overriding roof. Due to the translucent nature of the woven fabric in-fill of the frames, it becomes possible to visibly see the outline of the exhibition pieces against the interior walls from the exterior- which encourages entry for discovery into them (see figure 153).

It becomes evident that the intervention within the forest and the intervention in the plantation needs to be approached differently. A singular element (overriding structural element) is used to bind the building together but is treated differently in each of these spaces.

Within the forest, and exhibition spaces aiming to attract the flaneur into it, it is possible for a powerful statement to be made with the use of a translucent material as the shell of the exhibition structures to allow for awareness of the surrounding environment and the flaneur's relationship towards it. In turn, an inverse exhibition of the human inside occurs, and invites more users inside to experience the information.



Figure 152: Main spaces vs exhibition boxes (BoysPlayNice, 2017: online, adapted by author)

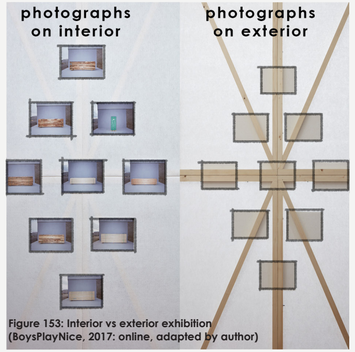


Figure 153: Interior vs exterior exhibition (BoysPlayNice, 2017: online, adapted by author)



Figure 154: Exhibition space (BoysPlayNice, 2017: online)

Lessons learnt:

1. Overriding canopy structure with ordered exhibition spaces underneath

An overriding canopy structure is proposed in the new design intervention which allows for flexibility in the order of spaces underneath it. For the exhibition space in the forest, 3 exhibition spaces are proposed aiming to exhibit elements pertaining to the conservation efforts, the flora, and the fauna of the area. The spaces are ordered along the axis undeneath the more-fragmented canopy structure as the end of the axis (see figure 155). The idea of suspension occurs, mimicking the suspended structures of the spiders web in the forest.

2. The use of transclucent material allowing for an inverse exhibition and celebration of liminality

With the exhibitions encapsulating a transclucent material, it allows the flaneur in the forest a visual cue that there is something to be seen inside and invite them in to experience the information. In a way, the flaneur is framed on the inside and may be seen as a shadow on the outside, resulting in an inverse exhibtiion for the surrounding forest of its maker (the human species who planted it in the first place) (see figure 156). This also celebrates the liminality of the threshold between interior, exterior, and physical proximity.

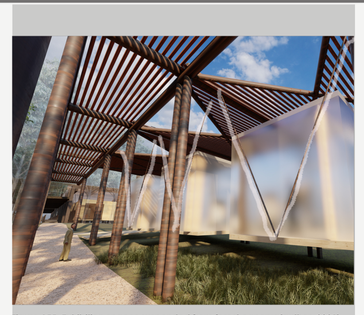


Figure 155: Exhibition spaces suspended from forest canopy (author, 2021)

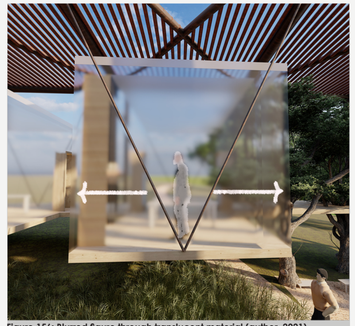


Figure 156: Blurred figure through translucent material (author, 2021)

5.7 DESIGN PROCESS

5.7.1 Development 1 + 2: Initial Investigations

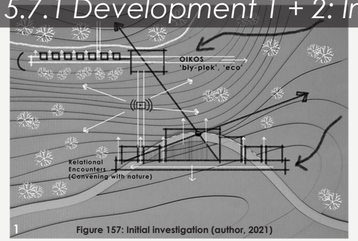


Figure 157: Initial investigation (author, 2021)

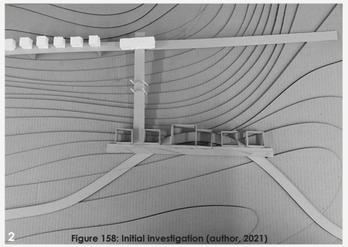


Figure 158: Initial investigation (author, 2021)

Before taking the thresholds and levels of anthropocentric intervention into consideration, the initial design response aimed towards a spatial ordering of functions. The most prominent relation is the one between the plantation and the forest. In an initial investigation (see figures 157-185), it became evident that the more private functions were to be within the forest and closer to the stream, whereas the majority of the building was to be in the plantation. Both of the forests hold potential for relational encounters.



Figure 159: Fragmentation, in-betweens and the spider (author, 2021)

Next, in preparation for External Review 1, key ideas were explored in terms of fragmentation (the sharding of elements towards the stream), the articulation of the in-betweens of nature, as well as the dark ecology of the spider and the way that it moves within and atop its web (as an obstruction of path, as well as in terms of user experience) (see figure 159).

Initially, the design investigation leads to a brief consisting of lecture halls, an auditorium as a point for conversation to take place (positioned in the most prominent threshold between the plantation and forest), a visitor's centre and restaurant, meditation spaces, and accommodation. All of these functions are scattered and dispersed but linked through the paths between them (see figure 160). Materiality is also explored through models (see figure 161).

However, it is noted that for relational encounters to be enriched, a deeper understanding of the site and where to intervene is needed.

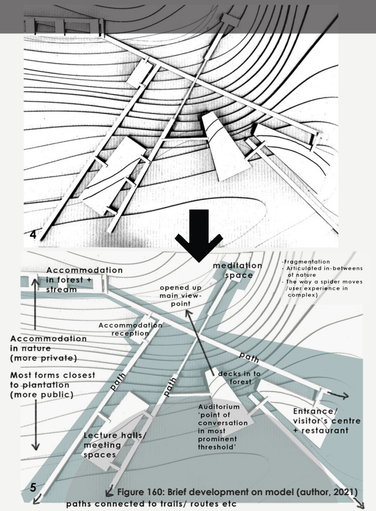


Figure 160: Brief development on model (author, 2021)

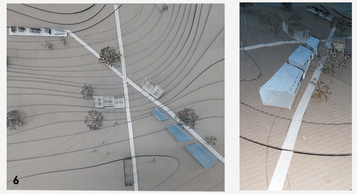


Figure 161: Investigative model (author, 2021)

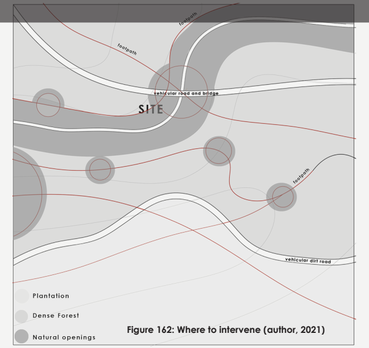


Figure 162: Where to intervene (author, 2021)

Furthermore, openings and elements on the site were investigated to decide where to intervene within the site (see figure 162). Also, through taking the natural openings on the site into consideration, the idea of rigid forms imitating the rigid plantations were explored (see figure 163).
The grid of the plantation is used as the grid of a new proposal, and the trees are used as a possible form of structure with platforms filled in between them and built upon (see figures 164-165). Openings as thresholds in the platforms allow for vertical circulation and articulation of existing vegetation.
A more curvilinear design is also considered and bends with the existing dirt road to articulate the threshold between plantation and forest (see figures 166- 167).

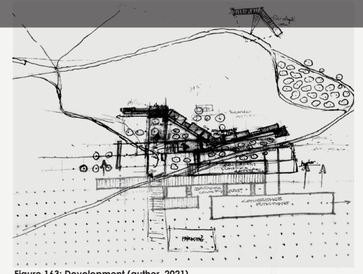


Figure 163: Development (author, 2021)

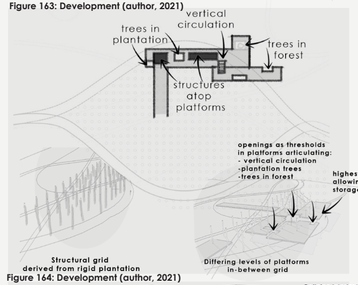


Figure 164: Development (author, 2021)

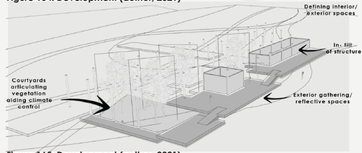


Figure 165: Development (author, 2021)

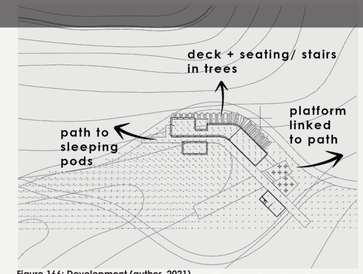


Figure 166: Development (author, 2021)

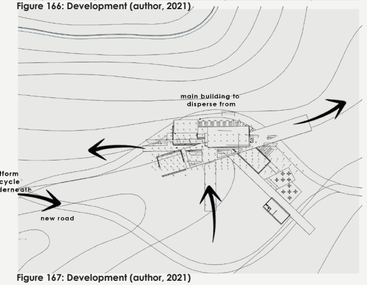


Figure 167: Development (author, 2021)

From this point on, it becomes clear that a deeper investigation in to the surrounding site needs to occur and the elements of relational activity need to be further explored in order for the 'Oikos of Relational Encounters' to inhabit all the relations.

5.7.2 Development 3: Emphasis on Relations

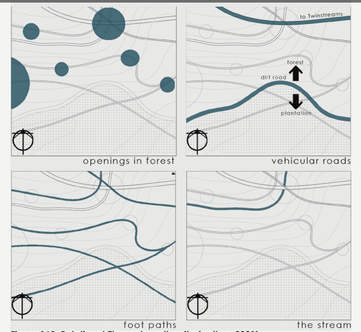


Figure 168: Relational Elements on the site (author, 2021)

In preparation for External Review 2, elements on the site are examined (such as the natural openings within the forest, the various vehicular roads, the footpaths within the forest and plantation, and the existing stream emerging from the ocean. It becomes evident that progressions of encounters need to occur for these various elements to be experienced and interacted with. These progressions of encounters aim to inhabit the different elements on the site and relational interaction between them needs to occur as well (see figure 168). It becomes clear that two 'legs' on plan allow for these interactional progressions of encounters through reaching out from certain points towards others, and these legs are in relation to each other as well. It is clear that the parts of the intervention within different parts of the site are to be designed according to the relation they occur in.

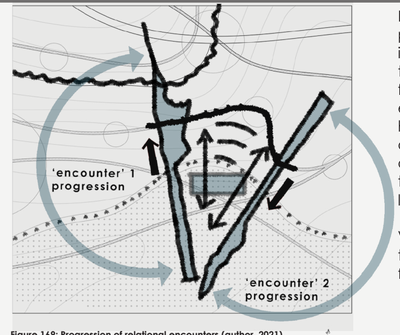


Figure 169: Progression of relational encounters (author, 2021)

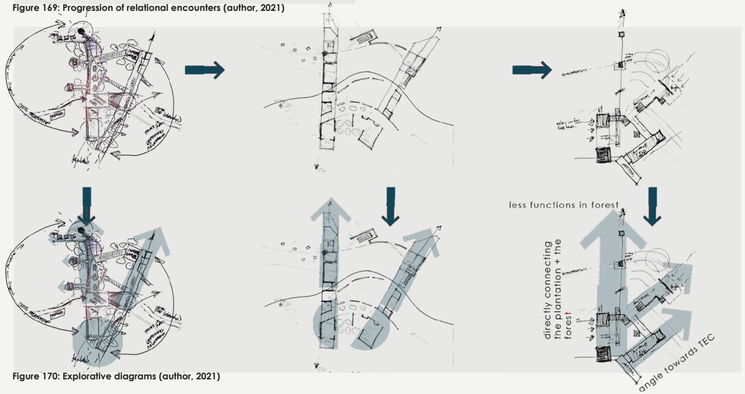


Figure 170: Explorative diagrams (author, 2021)

Explorative diagrams aim to show how progression may occur from the 'romantic ideals of the oikos' within the plantation towards the notion of dark ecology in the forest. A progression may also occur from the exploitative anthropocentric relationship we have with nature in the plantation (where we aim to exploit nature for monetary gain), to one of biophilia in the forest (in the same way that Ian Garland planted the forest due to his love for nature).

Various diagrams explore the possibilities that these implications could pose on the site (see figures 169 -170).

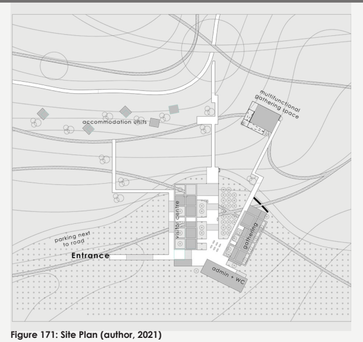


Figure 171: Site Plan (author, 2021)

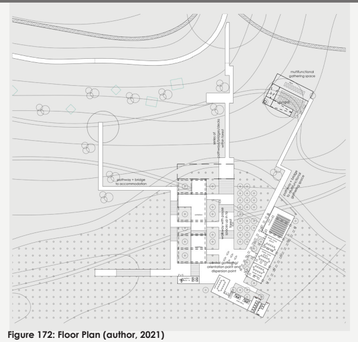


Figure 172: Floor Plan (author, 2021)

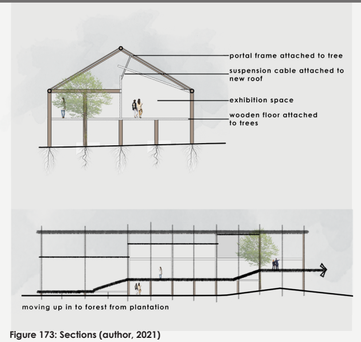


Figure 173: Sections (author, 2021)

A diagrammatic site and floor plan of these possibilities illustrate how a visitor's centre could form the first 'leg' of the relational encounter towards the west, and the conferencing and learning activities could take place towards the east to tie in with the existing functions of Twinstreams Environmental and Education Centre. The possibility of a permeable walkway extending in to the forest between these two legs is also explored in another creation of a 'human forest' (see figures 171- 172).

The structural possibility is explored of using the existing eucalyptus trees as the physical structure of the building, with portal frames attached and the functions being suspended from the portal frames. In this way, a structural canopy is formed (in the same way the trees form a canopy over the forest), and elements live in relation with one another underneath (see figures 173-174).

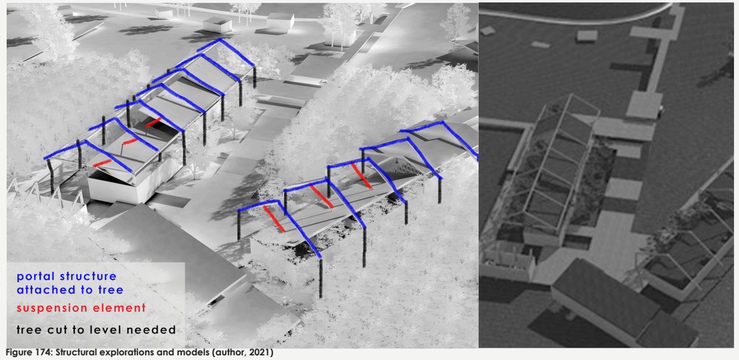


Figure 174: Structural explorations and models (author, 2021)

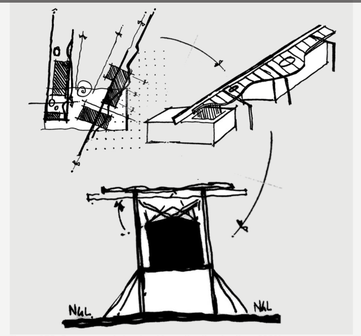


Figure 175: Canopy and structural investigation (author, 2021)

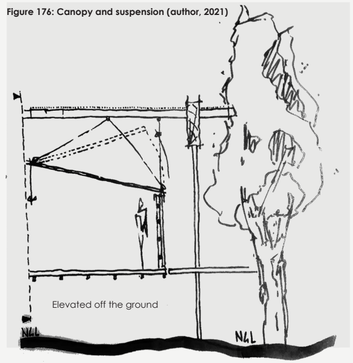


Figure 176: Canopy and suspension (author, 2021)

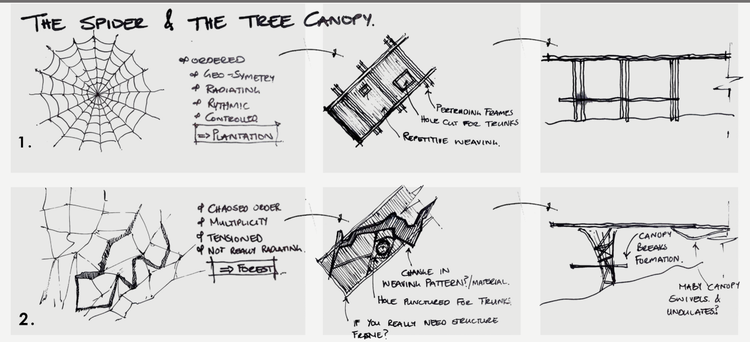


Figure 177: Spider webs and canopy investigations (author, 2021)

The possibility of an overriding canopy with structures suspended from it are further investigated in terms of plan, elevational and sectional relationships as a form of ecognosis. An organic canopy is investigated with more rigid forms underneath it- as well as the idea of the structures being highly elevated off the ground. (see figures 175- 176).

The canopy structure is investigated in terms of the different types of spiders and spider's web found in the Umlalazi Nature Reserve. For example, some spiders have ordered, radiating, rhythmic and controlled forms of webs. This can be compared with the rigid and ordered nature of the plantation. A rhythmic canopy is investigated for the possibility in the plantation. Furthermore, some spiders present an unordered web of chaosed order, multiplicity and tension. This can be compared with the chaotic order that the planted indigenous forest presents. Another canopy structure and form is investigated in terms of a lighter material, as well as it having the opportunity to swivel and undulate on elevation (see figure 177).

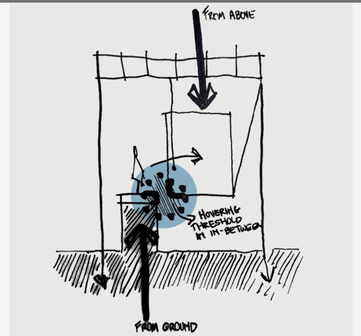


Figure 178: Threshold between earth and sky (author, 2021)

Further explorative sketches aim to understand the importance of a threshold between the earth and sky (see figure 178).

In terms of the structure throughout the site and the progression of the downwards slope on the site, the idea of a consistent habitable level within the hanging structures is explored, where at the bottom of the slope, movement may still occur underneath it. Conceptual elevations illustrate this (see figure 179).

Furthermore, the axes and landscaping are investigated in terms of the paths they generate on plan (see figure 180).

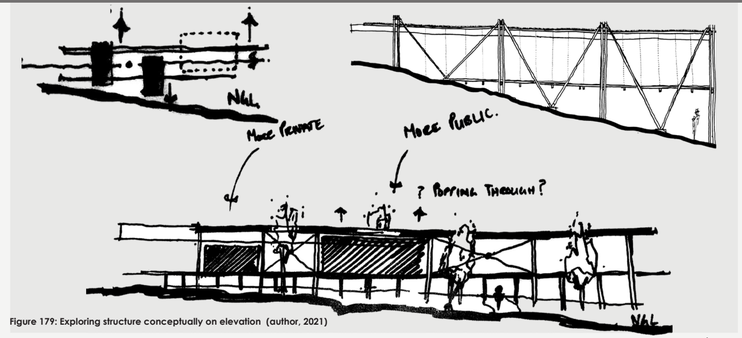


Figure 179: Exploring structure conceptually on elevation (author, 2021)

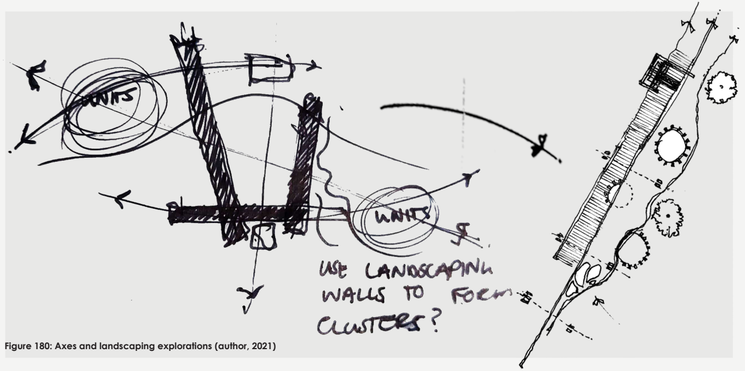


Figure 180: Axes and landscaping explorations (author, 2021)

5.7.4 Development 5 Spatial Organisation and Functions

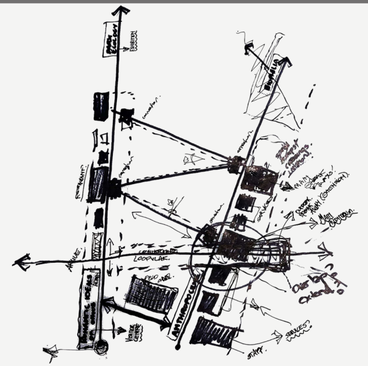


Figure 181: Explorative diagram (author, 2021)

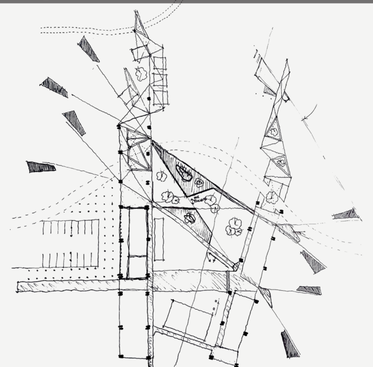


Figure 182: Explorative diagram (author, 2021)

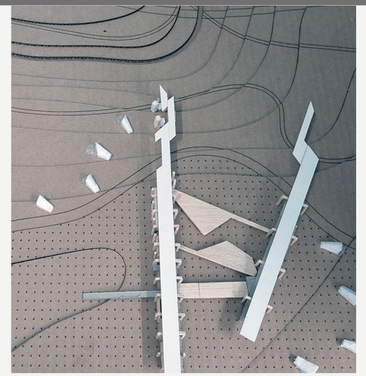


Figure 185: Explorative model (author, 2021)

The axes in terms of ecognosis with reverse functions and materiality are investigated through explorative diagrams (see figures 181-182) and models (see figures 185- 186). Binding elements emerge between the two main axes, and accommodation is scattered throughout the context.

Through a theoretical understanding of the ecognosis that dark ecology proposes, the spatial organisation of the different functions start to become clear in terms of where to place opposing functions. The ordering of exhibition spaces (see figure 183) and further canopy explorations are investigated (see figure 184).

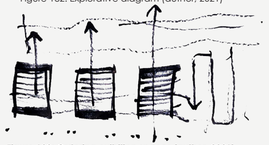


Figure 183: Ordering exibition spaces (author, 2021)



Figure 184: Forest canopy exploration (author, 2021)

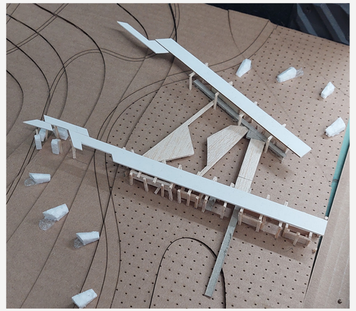


Figure 186: Explorative model (author, 2021)

A main entrance axis is attached in between the two legs of the intervention with rotated functions in line with the tilted leg to the east. This new axis serves as a binding element, but may also lead to something within the plantation at a later stage.

The positioning of the 'complex in the forest is determined through the more natural openings within the forest, and the accommodation is scattered throughout the site to allow for various relational encounters within them (see figure 186).

The idea of two field chapels is explored (one in the plantation and one within the forest) in order to inhabit these two different aspects of the site and to allow for a meditative experience or point of gathering within both of them (see figure 187).

The suspended strucures at this stage are placed on various different levels to allow for a physical experience of vertical movement within the design, as if one were moving up in to the trees (see figure 189).

Parking within the plantation towards the west by the entrance is also investigated. The accommodation is bundled together (one in the forest and one in the plantation) due to the implementation of possible services (see figure 187).

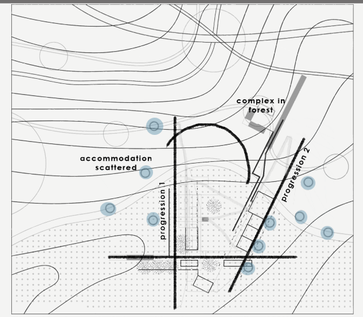


Figure 186: Conceptual plan and forest complex (author, 2021)

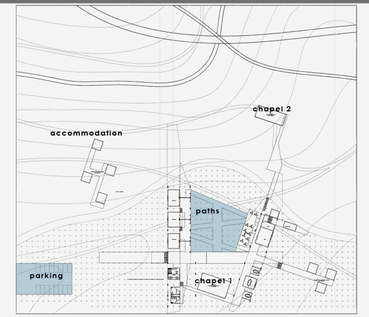


Figure 187: Conceptual plan and two field chapels (author, 2021)

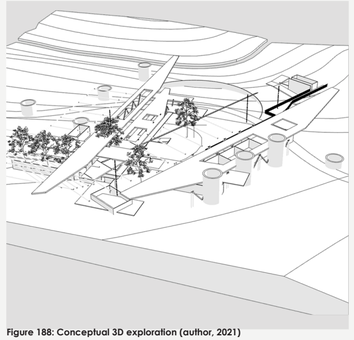


Figure 188: Conceptual 3D exploration (author, 2021)

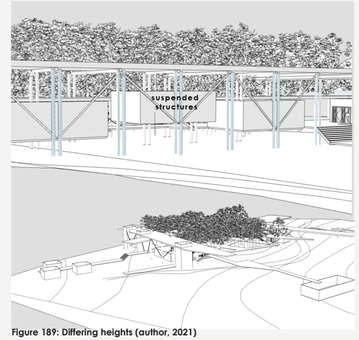


Figure 189: Differing heights (author, 2021)

5.7.5 Development 6: Towards EXR 3

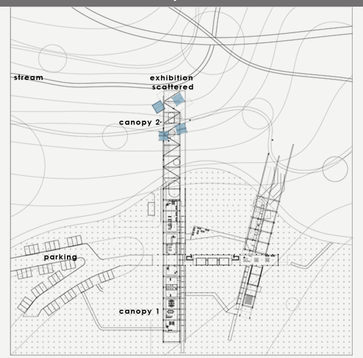


Figure 190: Conceptual plan to 3D (author, 2021)

New vehicular parking is explored towards the west, however, it becomes clear that vehicles may park next to the dirt road and a painted column (in line with the entrance axis) may lead the flaneur in to the plantation first, and then towards the structure within it (see figure 190-191). The structural canopy of the visitor's centre (towards the west) follows a strict order within the plantation and continues into the forest through triangulated connections articulating the vegetation underneath (see figures 194-195). The suspended structures are also more rigid in the plantation, and scatter in the forest exhibition space towards the north (with the intention of leading the flaneur into the forest). The binding axis between the two main structures allow for an installation to occur. The installation serves as a new 'synthetic forest' in the plantation and allows for views towards the forest to the north (see figure 193).

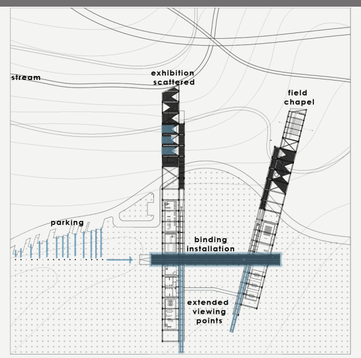


Figure 191: New parking, field chapels +extended views (author, 2021)

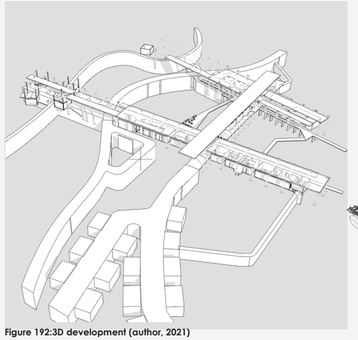


Figure 192:3D development (author, 2021)



Figure 193: Middle axis installation developemnt (author, 2021)



Figure 194: 3D development (author, 2021)

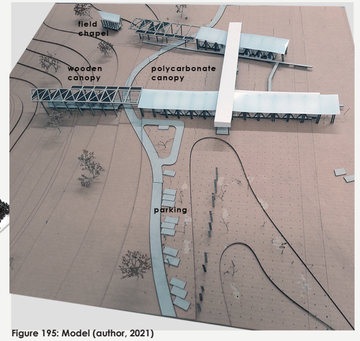


Figure 195: Model (author, 2021)

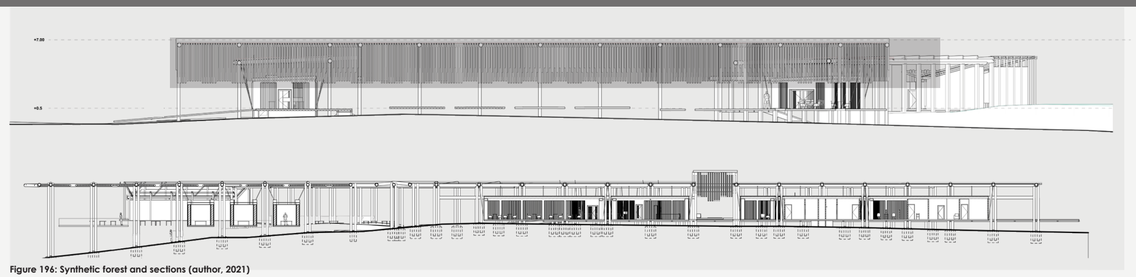


Figure 196: Synthetic forest and sections (author, 2021)

On section, the new synthetic, ecognostic and suspended forest allows for an experience of transforming light and views outwards whist walking on the platform of the main entrance axis (see figure 196).

The materiality of the main structure is explored also. Because the lightweight steel constructed frames of the enclosed functions and structures serve as a mediator between wood and polycarbonate in the forest and plantation, steel rectagrid may be used as the mediating element between heaven and earth as the top of the pathway level (see figure 197).

The field chapel in the forest is explored by allowing for two different parts of the structure which integrates and interacts with the canopy in the forest. However, it becomes clear that the field chapel needs to read as its intended purpose of mediation and reflecting (see figure 198).



Figure 197: Rectagrid pathway (author, 2021)

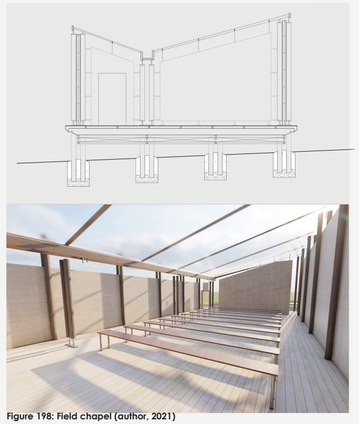


Figure 198: Field chapel (author, 2021)

5.7.6 Verticality + Forest vs Plantation

Lastly, the canopies' beginning and ends are re-evaluated in terms of how they start and end. As the liminal space between the plantation and the indigenous forest, the two different canopies become joined together by single elements of portal frames (mimicking the main entrance axis structure) to further articulate the thresholds between them. In turn, Eucalyptus trees are framed and subtly 'exhibited' to the passer-by (see figure 199).

Also, the idea of bringing more of the indigenous forest into the plantation as another form of ecognosis and 'weird coexistence' is explored as the end to the main entrance middle axis of the new design proposal (see figure 200).



Figure 200: Indigenous plants at the end of axis amidst eucalyptus plantation on exterior (author, 2021)

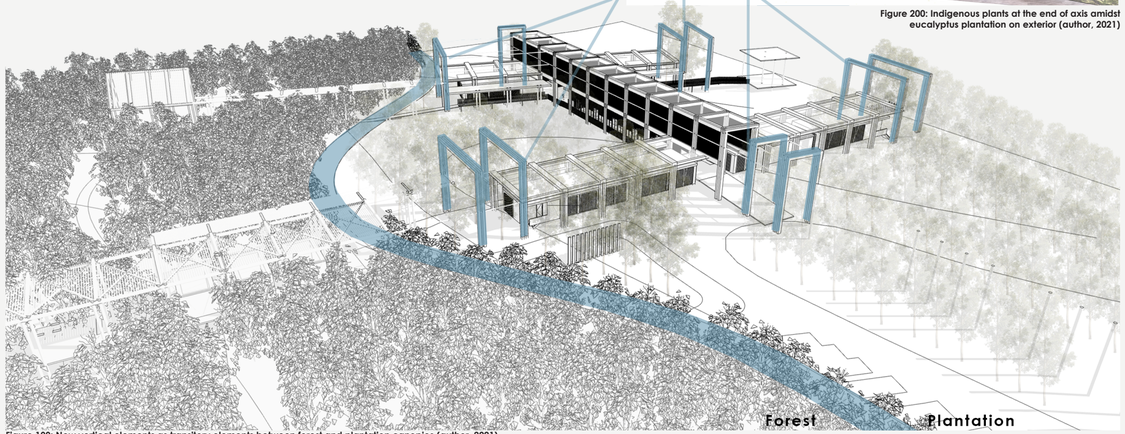


Figure 199: New vertical elements as transitory elements between forest and plantation canopies (author, 2021)

5.8 CONCLUSION

CHAPTER 5: DESIGN PROCESS aimed to illustrate the narrative of the design process and the varying influences regarding decision making.

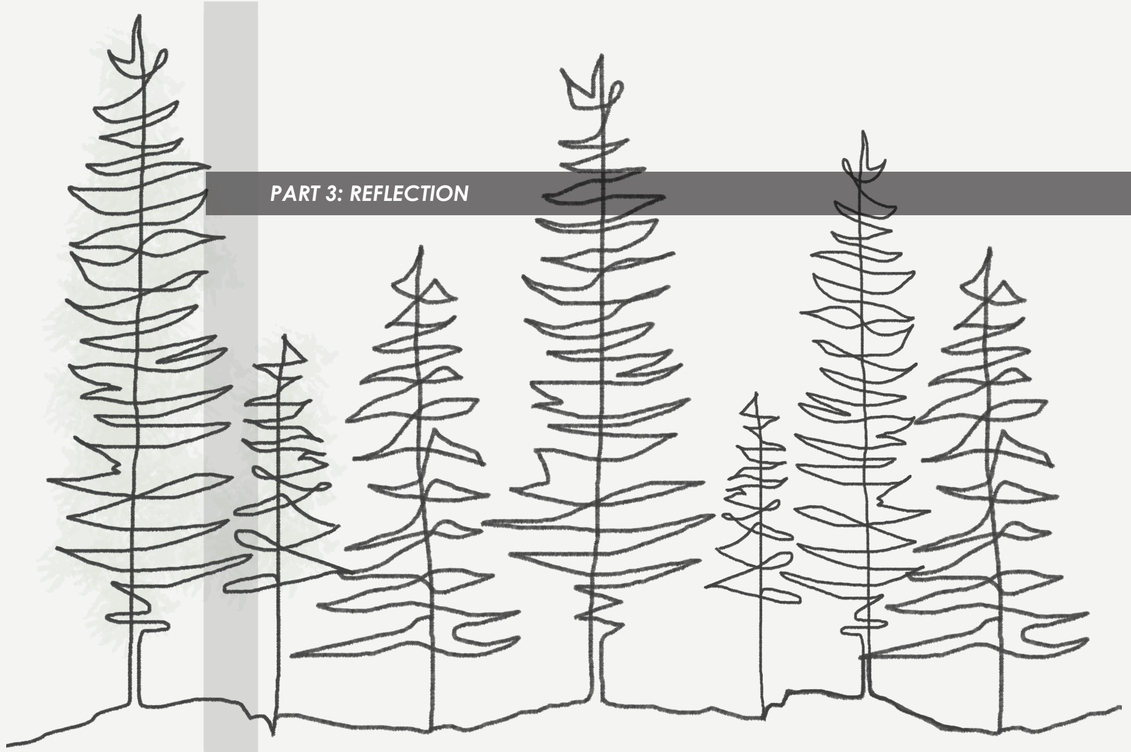
Through the investigation of a design touchstone, a metaphorical understanding of our relationship with nature is made clear- and portrays how an architectural intervention could aid with a return to ecological awareness for an improved relationship.

The exploration of four concepts aid with elements of the design including the experience of the site, materiality, climatic influences, and suspension as a form of a relational encounter.

Design precedents such as the Arjuzanx Reserve, Wooden Chapel and Making a Forest Exhibition allow for the development of linear design elements in terms of spatial narrative, field chapel development, and exhibition spaces within the new project proposal.

Lastly, a series of design developments portray the process of the design towards a final synthesis.

Next, **CHAPTER 6: DESIGN SYNTHESIS**, aims to illustrate the final design synthesis.



PART 3: REFLECTION

CHAPTER 1: SITE ANALYSIS AND CONTEXT
CHAPTER 2: THEORETICAL DISCOURSE
CHAPTER 3: DESIGN INFLUENCES
CHAPTER 4: TECHNICAL INVESTIGATION
CHAPTER 5: DESIGN DEVELOPMENTS

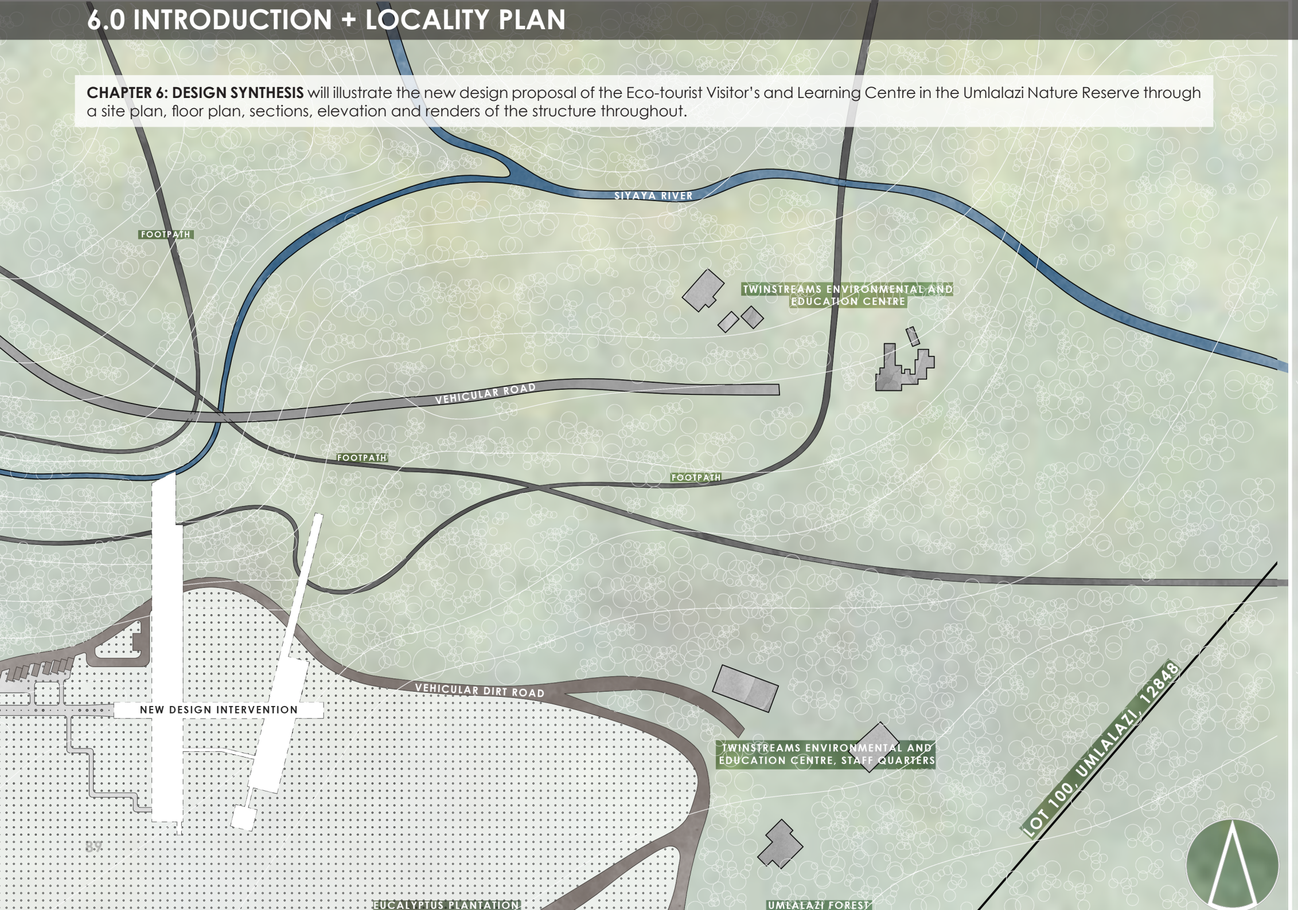
CHAPTER 6: DESIGN SYNTHESIS

89 6.0 Introduction + Locality Plan
90 6.1 Site plan
91 6.2 Ground floor Plans
93 6.3 Sections
99 6.4 Elevations
103 6.5 Renders
107 6.6 Model

CHAPTER 7: REFLECTION

6.0 INTRODUCTION + LOCALITY PLAN

CHAPTER 6: DESIGN SYNTHESIS will illustrate the new design proposal of the Eco-tourist Visitor's and Learning Centre in the Umlalazi Nature Reserve through a site plan, floor plan, sections, elevation and renders of the structure throughout.

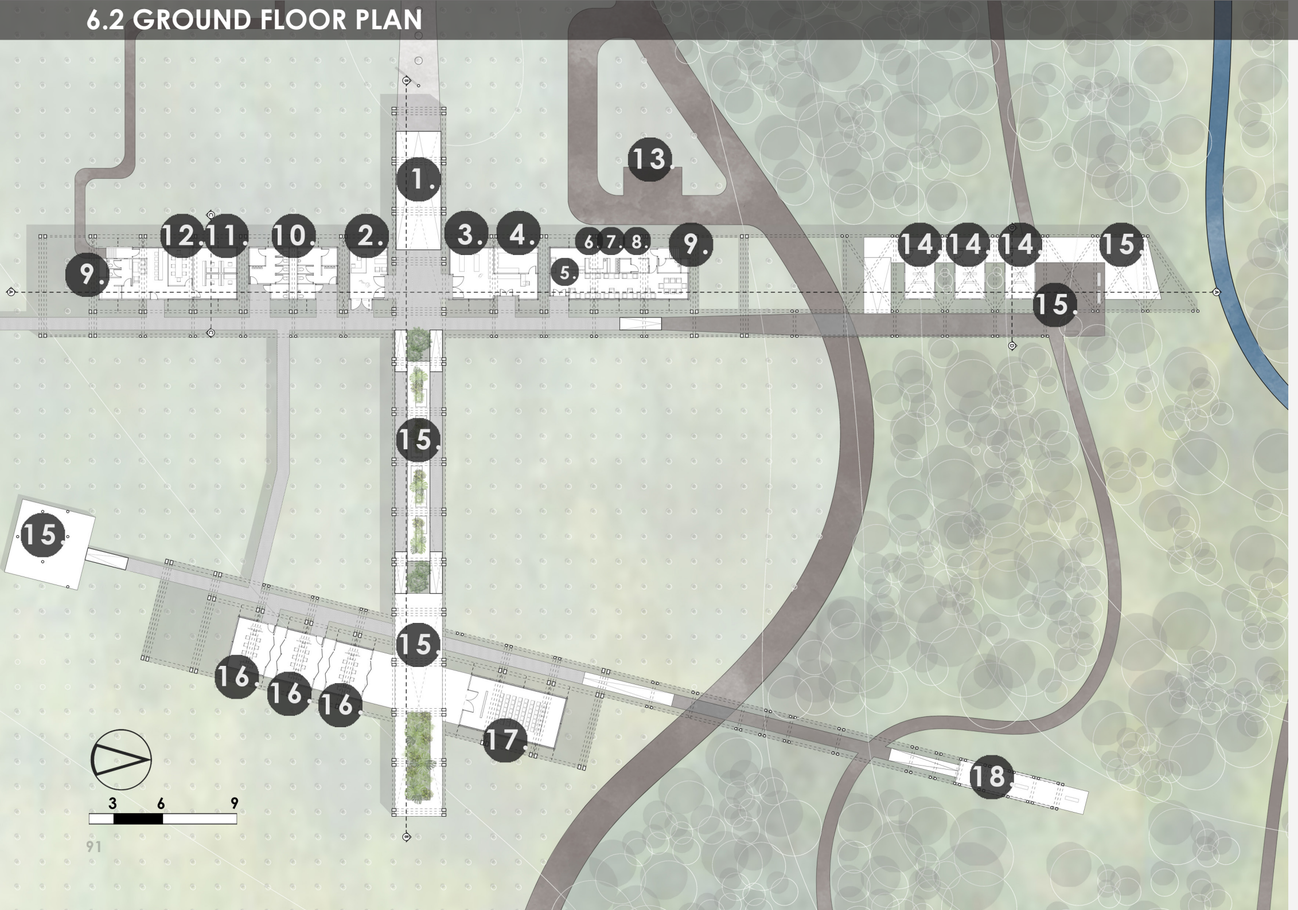


6.1 SITE PLAN



1. Stream
2. Vehicular Road to Twinstreams Environmental Centre
3. Footpath
4. Existing dirt road
5. Parking
6. Service Parking
7. Entrance
8. Field Chapel
9. Eucalyptus Plantation
10. Forest
11. Gathering platform
12. Pathway
13. Staff pathway

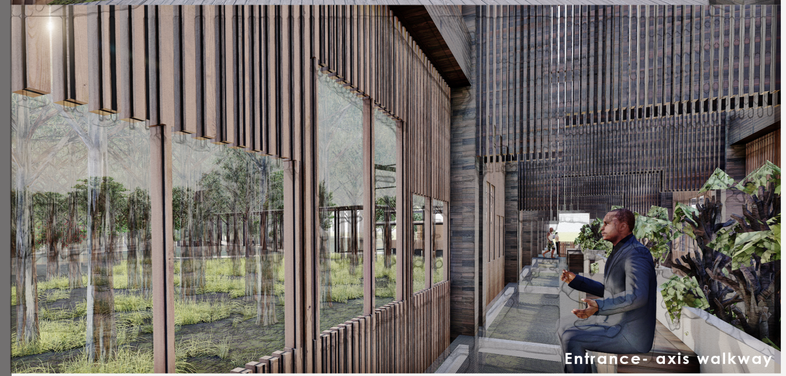
6.2 GROUND FLOOR PLAN



1. Entrance
2. Reception
3. Gift Shop
4. Gift Shop storage
5. Restaurant
6. Kitchen
7. Washing
8. Cold + Dry Storage
9. Staff WC
10. WC's
11. Shared Offices
12. Meeting Room
13. Service Parking
14. Exhibition
15. Gathering space
16. Break- away room
17. Lecture Hall
18. Field Chapel

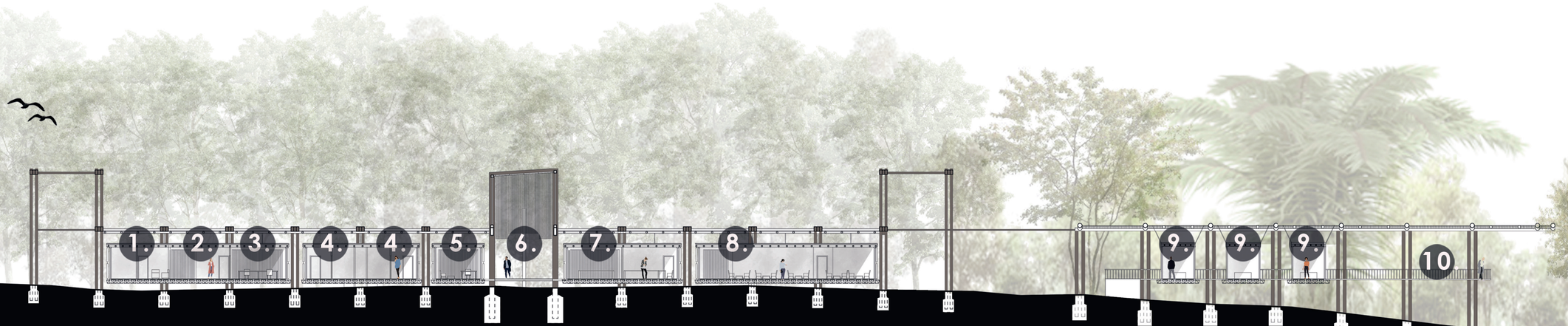


Entrance



Entrance- axis walkway

6.3 SECTION A- A



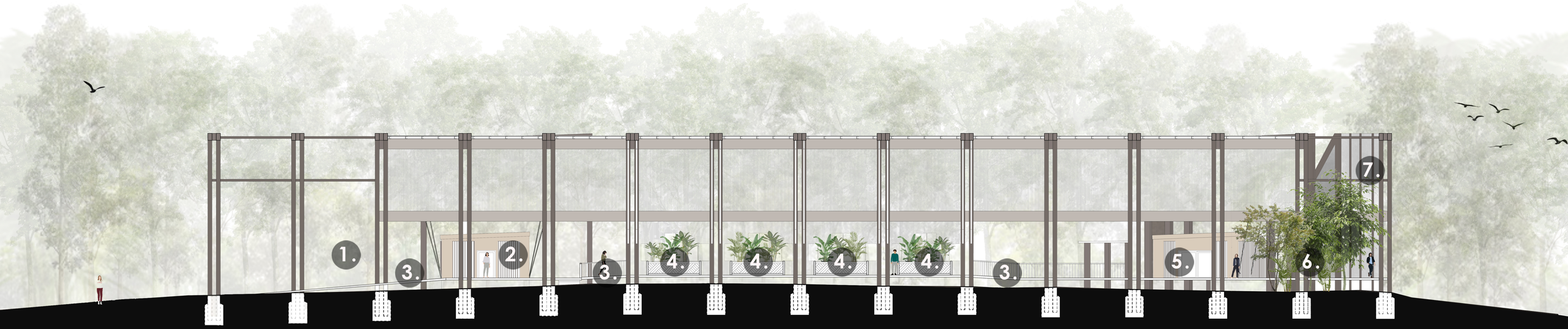
1 Staff change room
2 Admin coffee lounge
3 Offices
4 Entrance to WC
5 Reception

6 Entrance
7 Gift shop
8 Restaurant
9 Exhibition space
10 Gathering space

3 6 9

Section A - A

6.3 SECTION B-B

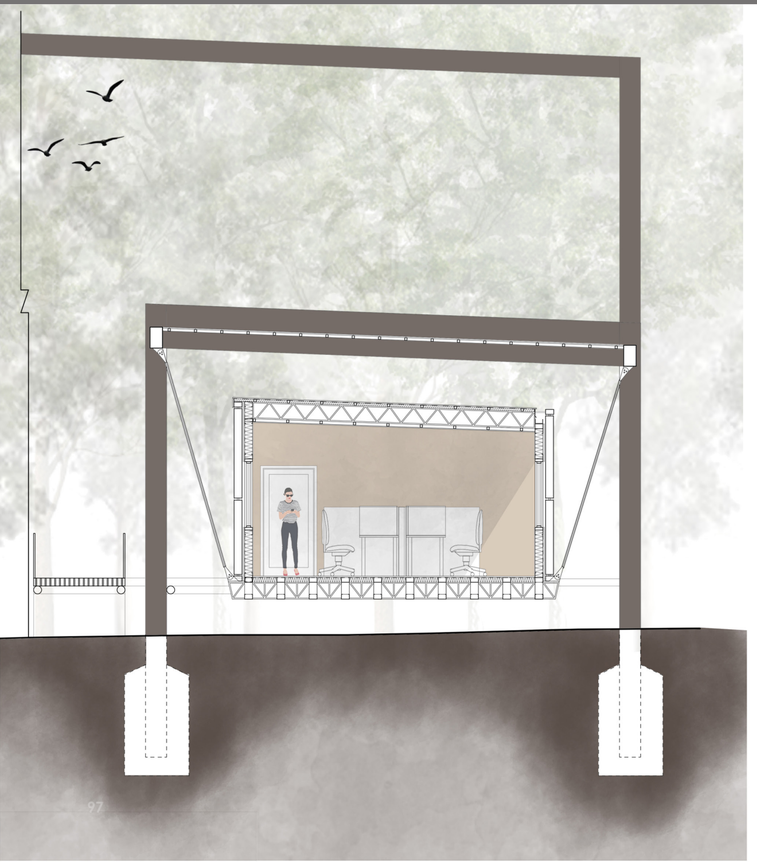


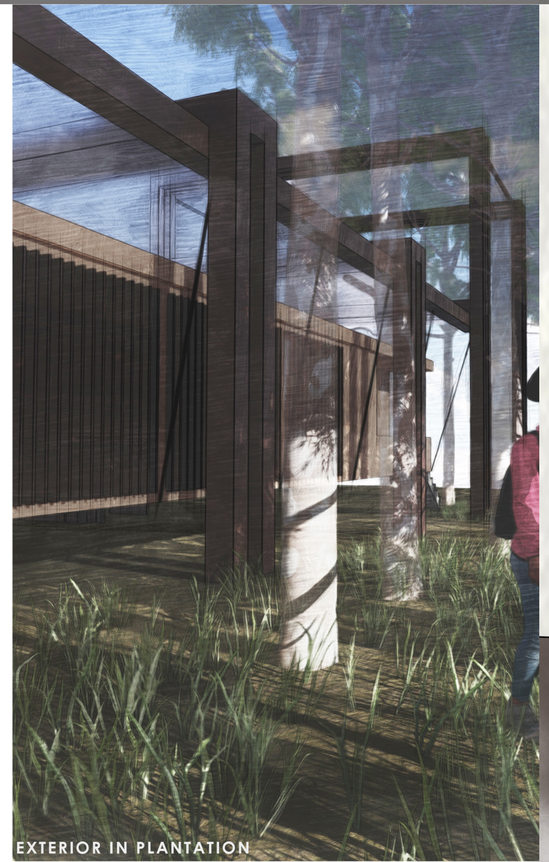
1 Entrance
2 Gift shop
3 Ramp
4 Indigenous planter
5 Break-away room
6 Indigenous plants
7 Field chapel

3 6 9

Section B - B

6.3 SECTION IN PLANTATION

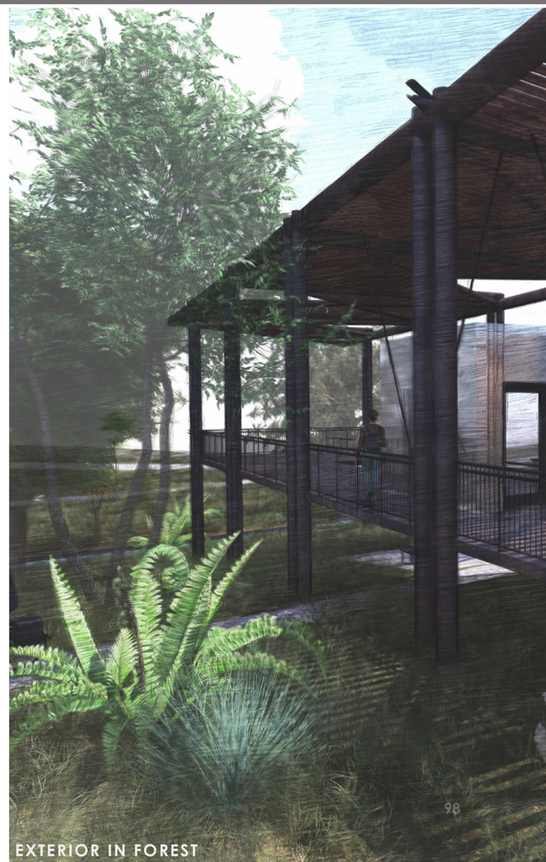




EXTERIOR IN PLANTATION

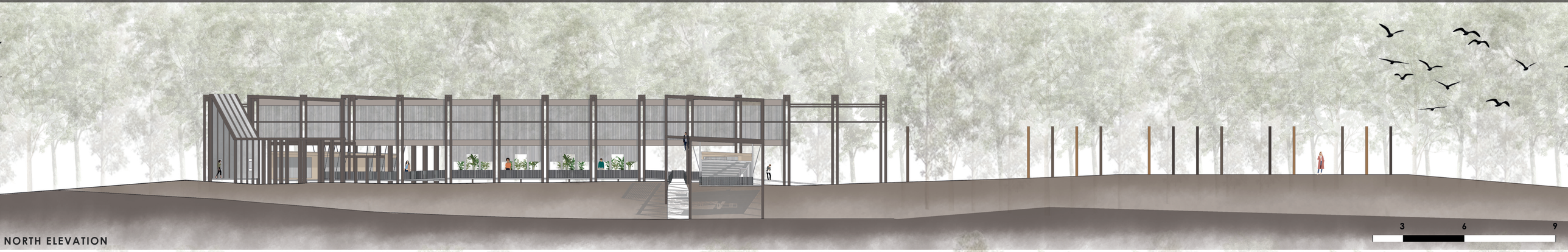
6.3 SECTION IN FOREST



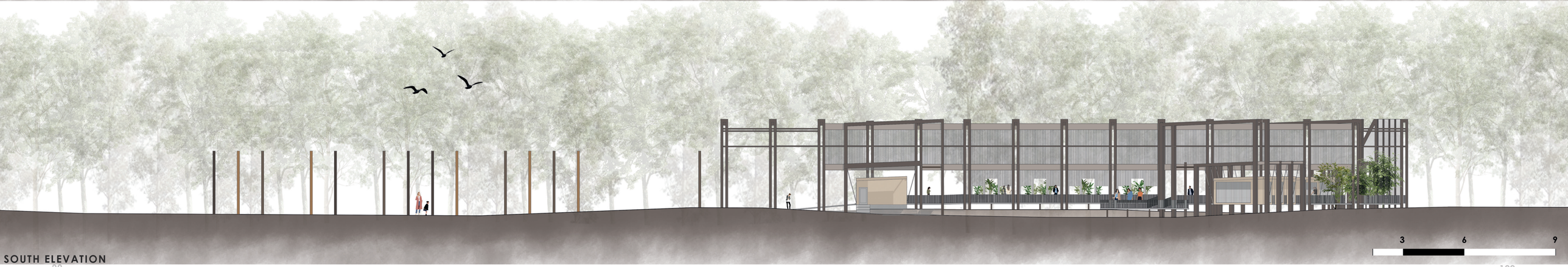


EXTERIOR IN FOREST

6.4 ELEVATIONS

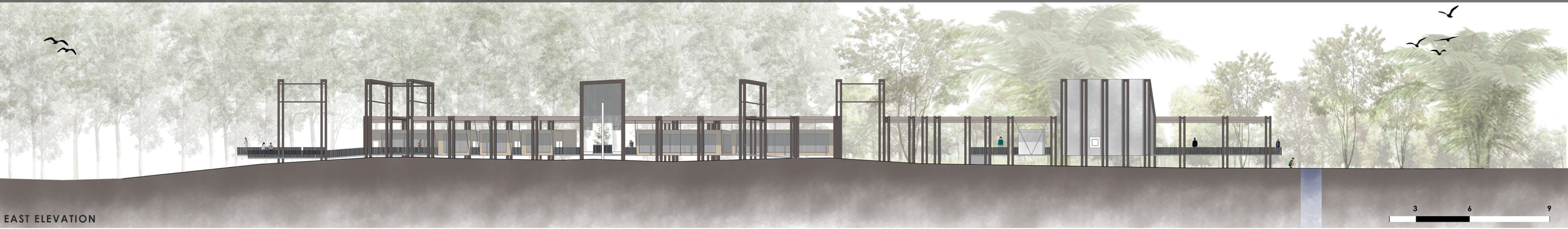


NORTH ELEVATION



SOUTH ELEVATION

6.4 ELEVATIONS

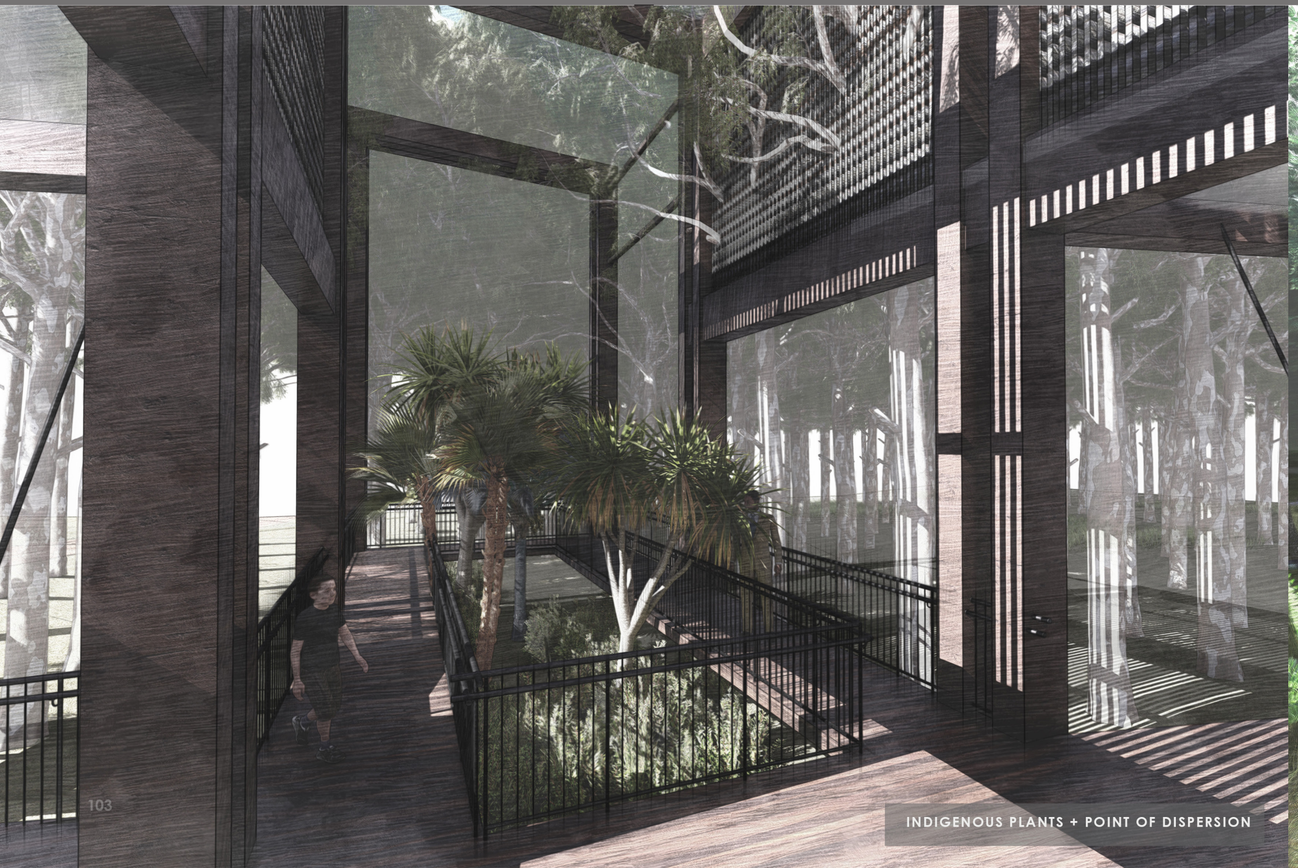


EAST ELEVATION

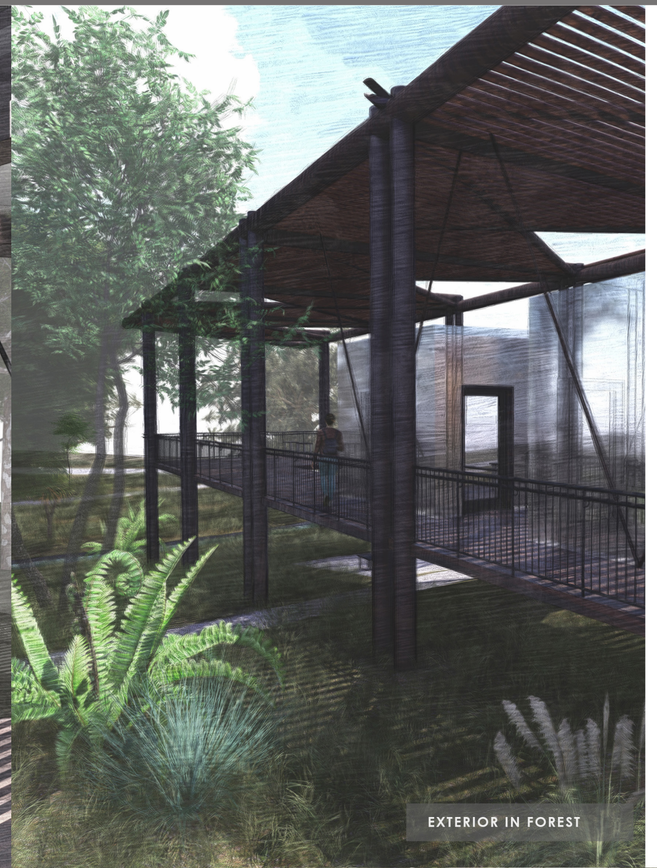


SOUTH ELEVATION

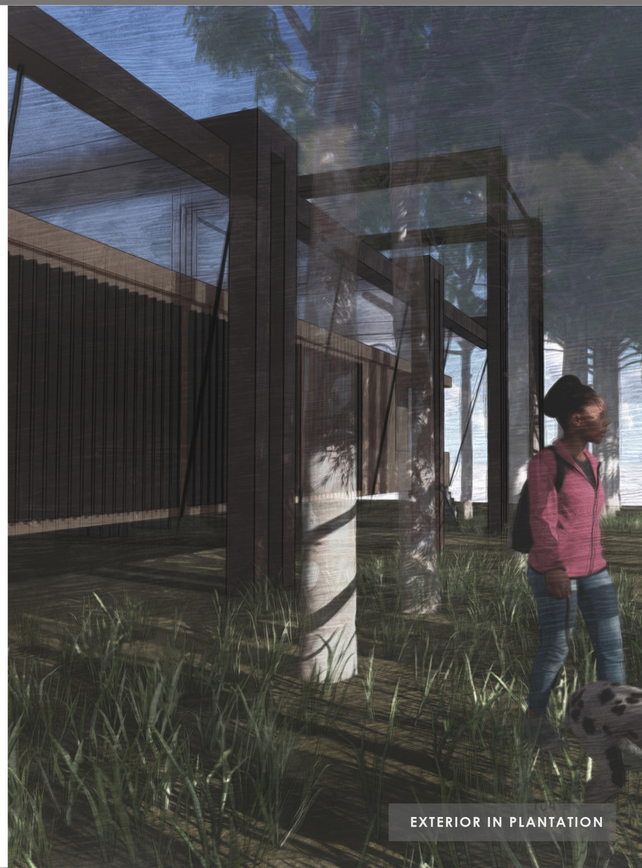
6.5 RENDERS



INDIGENOUS PLANTS + POINT OF DISPERSION



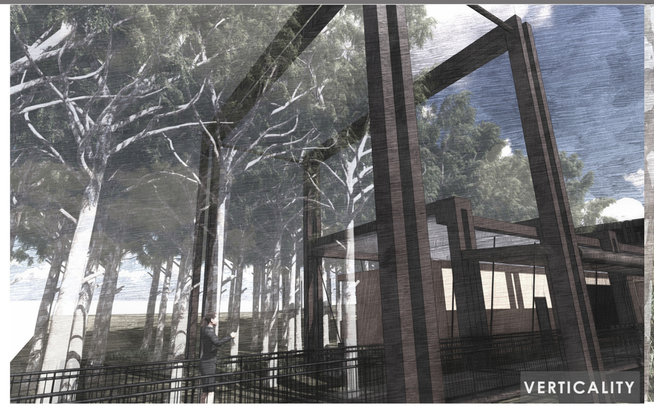
EXTERIOR IN FOREST

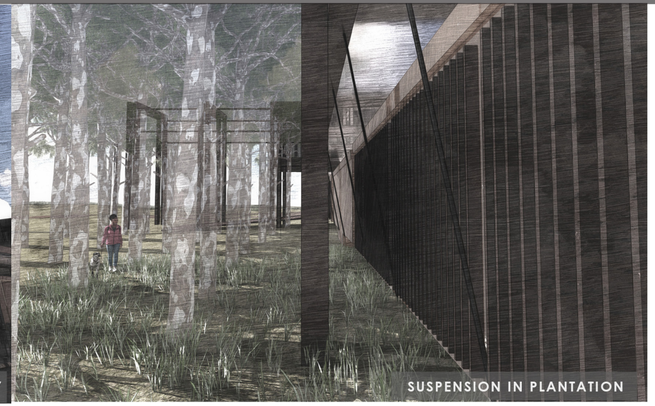


EXTERIOR IN PLANTATION

6.5 RENDERS


GATHERING PLATFORM IN PLANTATION

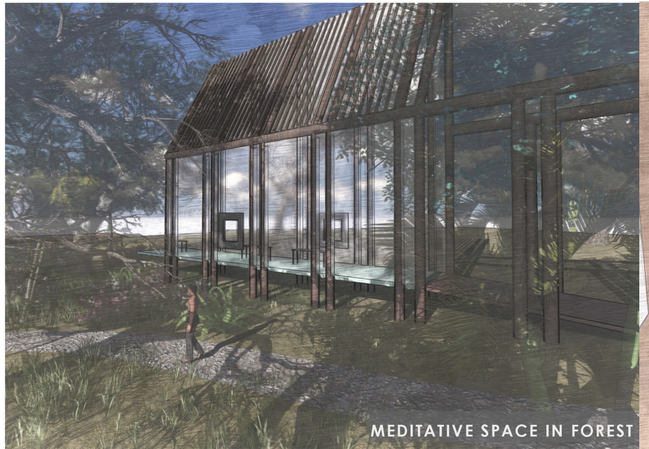

VERTICALITY

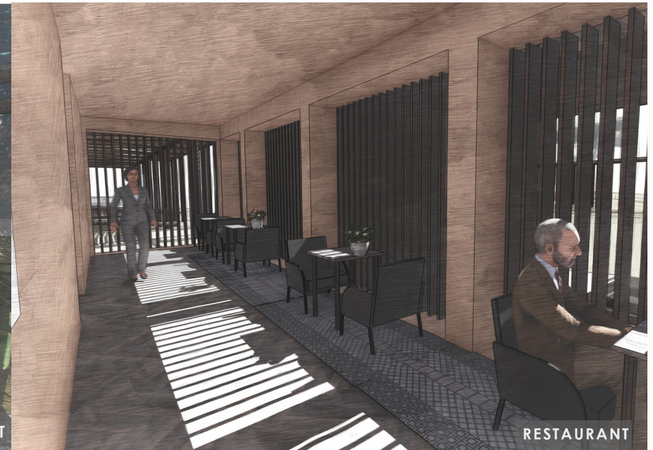

SUSPENSION IN PLANTATION


FOREST INSTALLATION IN PLANTATION



FROM PARKING TO FOREST

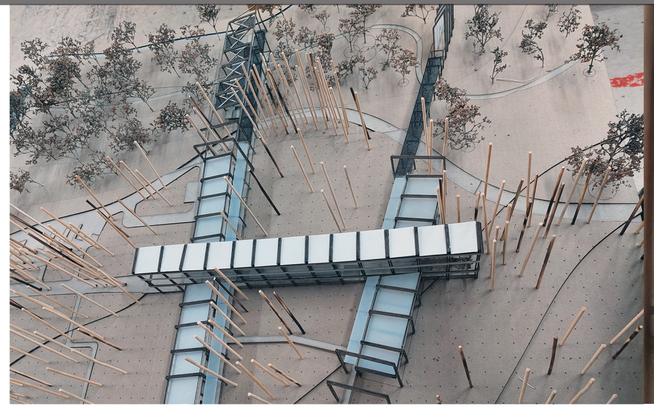

MEDITATIVE SPACE IN FOREST


RESTAURANT

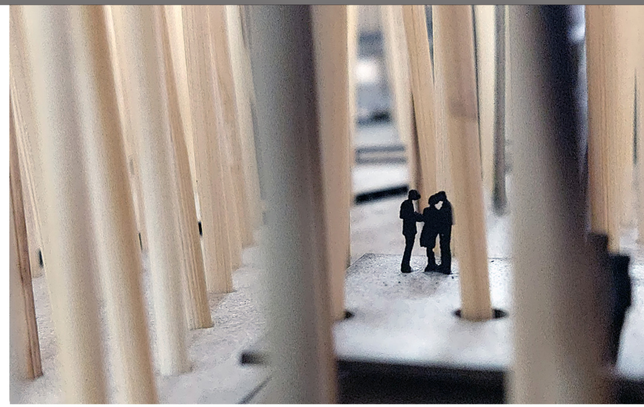


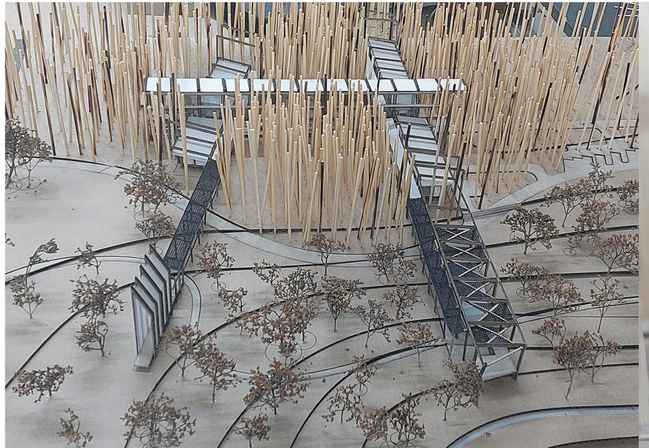
ENTRANCE IN TO BUILDING FROM AX



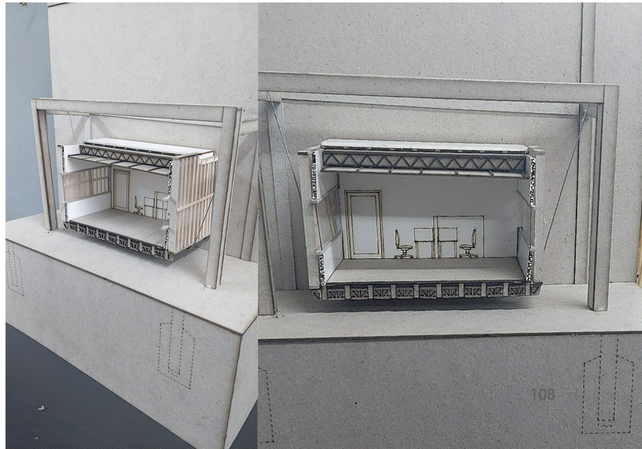


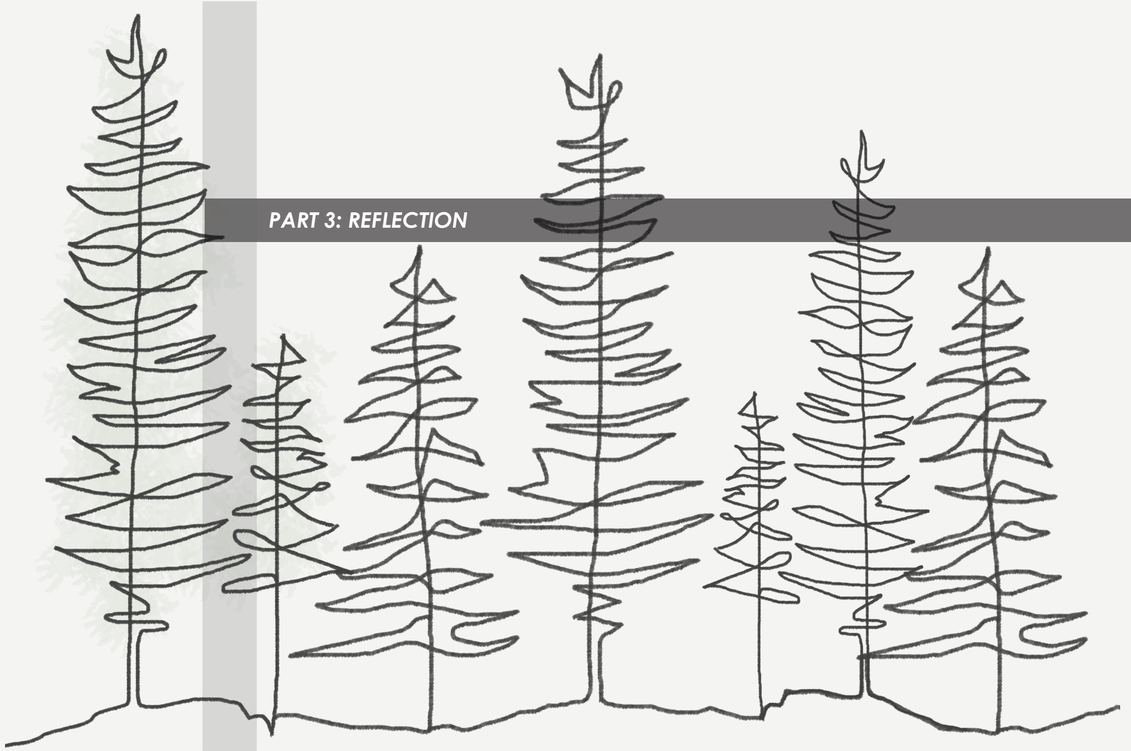












PART 3: REFLECTION

CHAPTER 1: SITE ANALYSIS AND CONTEXT
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CHAPTER 3: DESIGN INFLUENCES
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CHAPTER 5: DESIGN DEVELOPMENTS
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116 7.4 Appendix 1 - Turnitin Report
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7.1 CONCLUSION

In conclusion, it is evident that in the time of the Anthropocene we have lost touch with our inherent biophilic relationship with nature.

Through the investigation of Biophilia and concepts such as Dark Ecology, it becomes possible to reimagine and abandon the ways in which we think about nature and the surrounding environment.

A design intervention within the Umlalazi Nature Reserve is implemented to allow for a series of relational encounters and, in turn, stimulating a richer awareness and relationship between the various entities that exist within, pass and experience these relationships.

7.2 REFLECTION

The following is a reflection of the project and research process from a personal point of view:

When visiting the Umlalazi Nature Reserve by the 'wild coast' for the first time, it was evident that there was a chaotic harmony of noises, sights, and smells; and of earth, water, and sky. A landscape which I had never been exposed to before caught my attention and I longed to understand its complexity.

Throughout the process of this dissertation it was made clear to me that it is and was and will always be about the relationships between the various beings and things on the planet, and I am grateful for the experience.

Although the design process is never an effortless one- especially when an unfamiliar climate and landscape presents challenges, I enjoyed the learning opportunities and engaging with the project.

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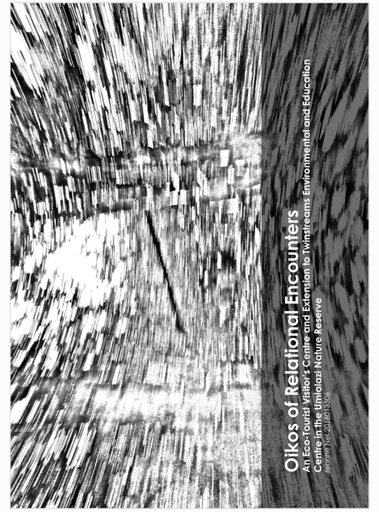
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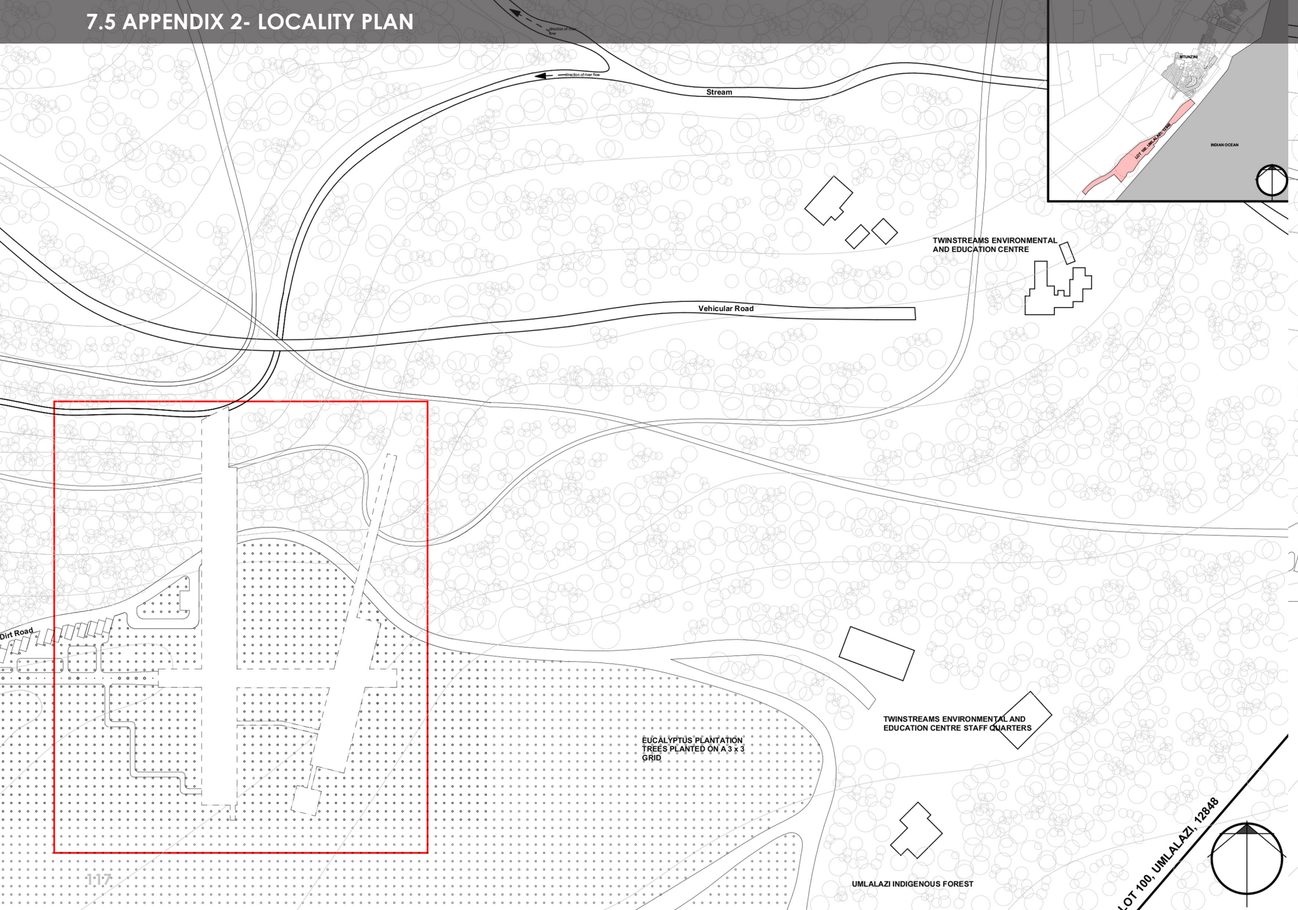


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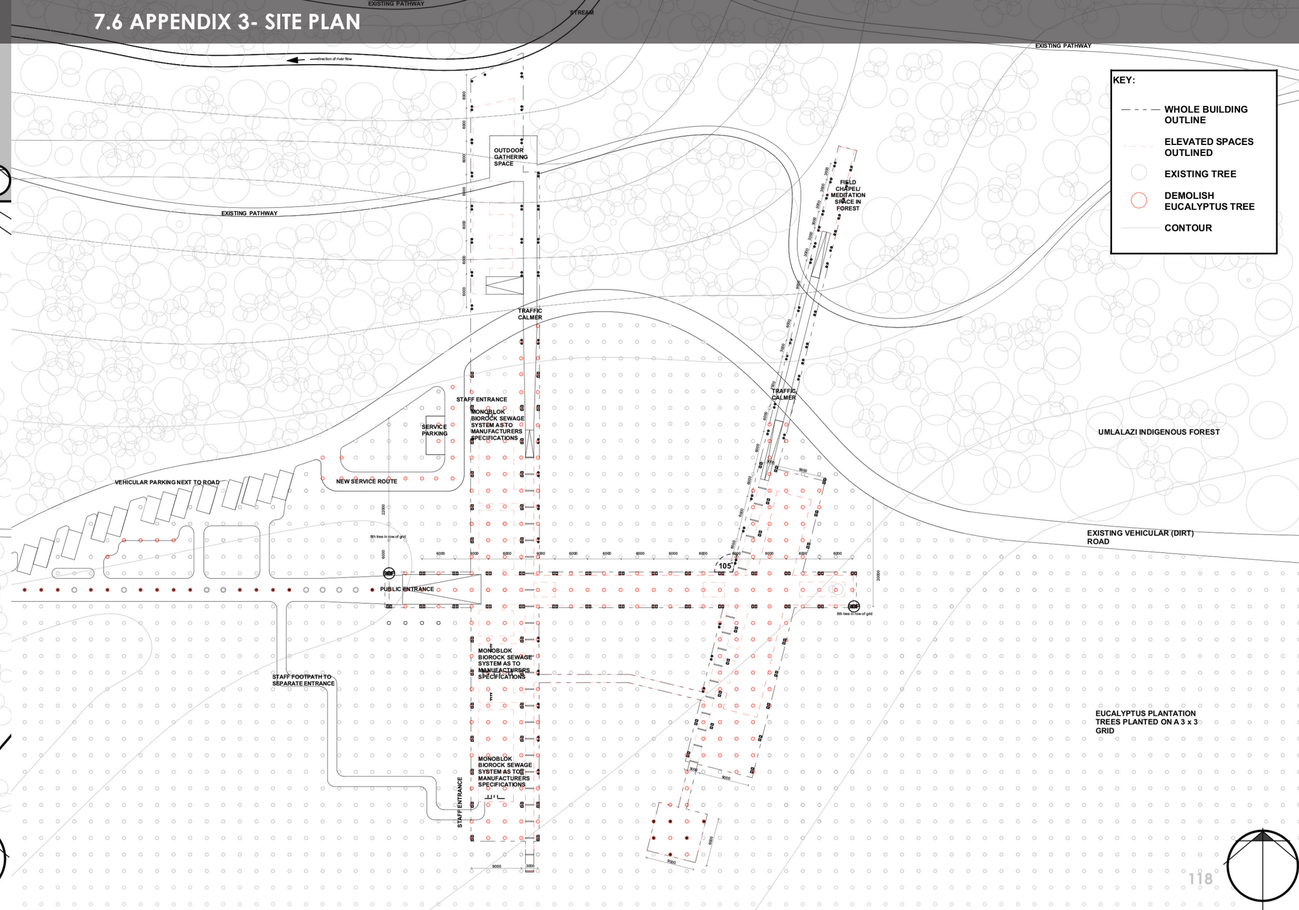
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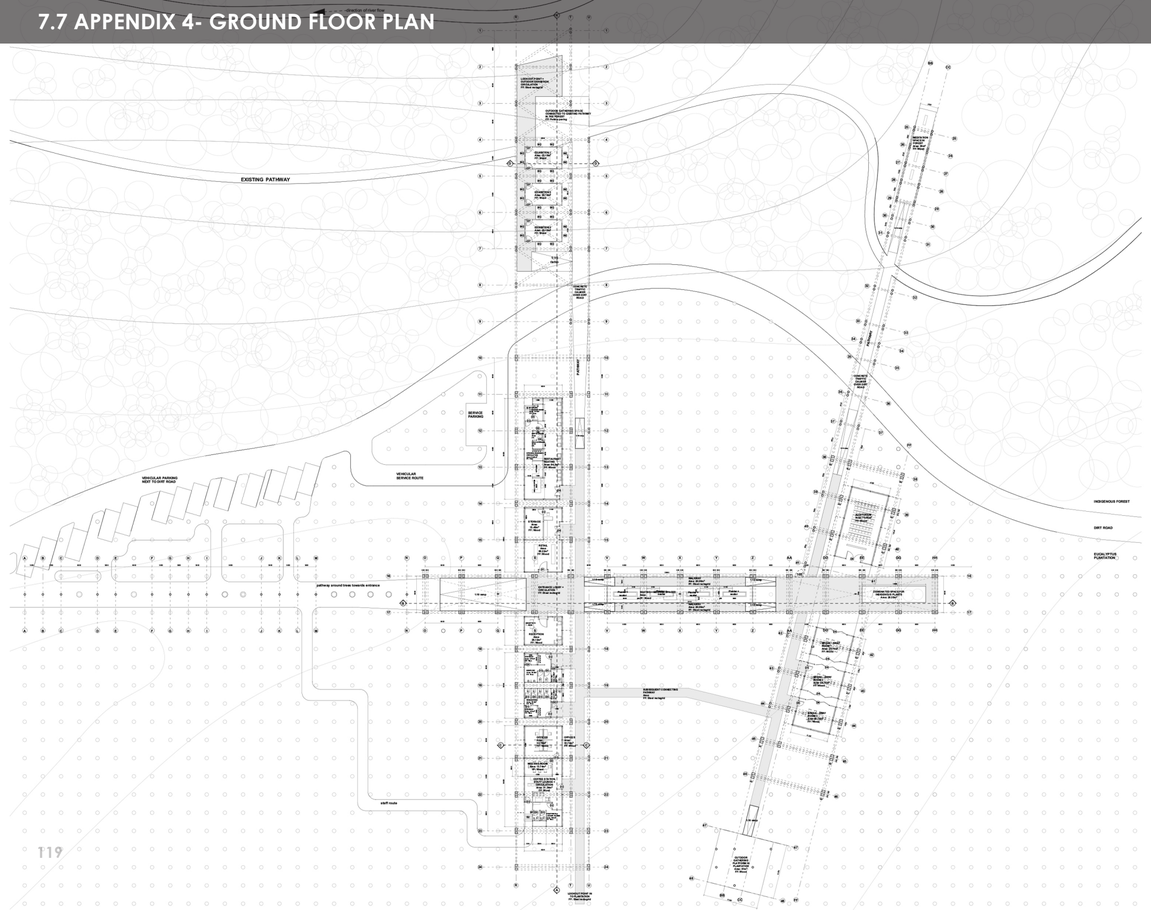
7.5 APPENDIX 2- LOCALITY PLAN



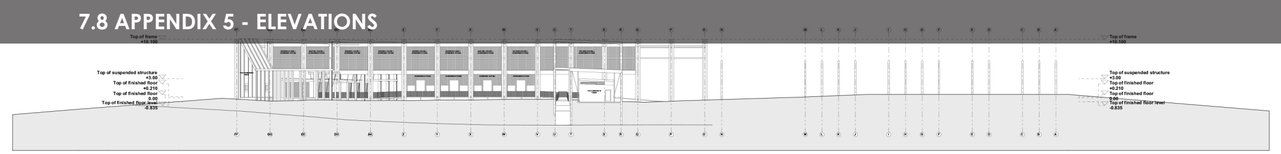
7.6 APPENDIX 3- SITE PLAN



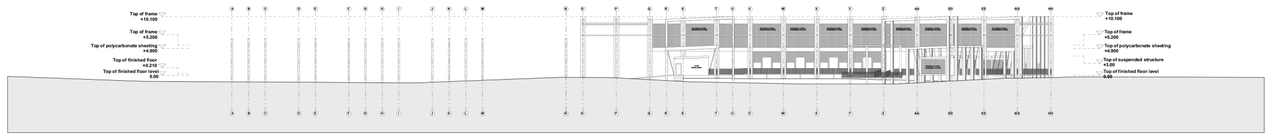
7.7 APPENDIX 4- GROUND FLOOR PLAN



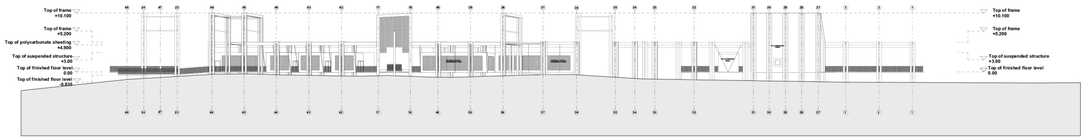
7.8 APPENDIX 5 - ELEVATIONS



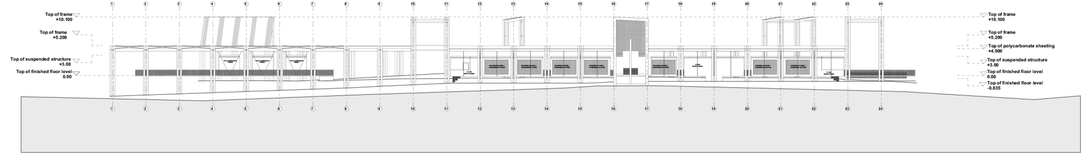
North Elevation
Scale 1:200



South Elevation
Scale 1:200

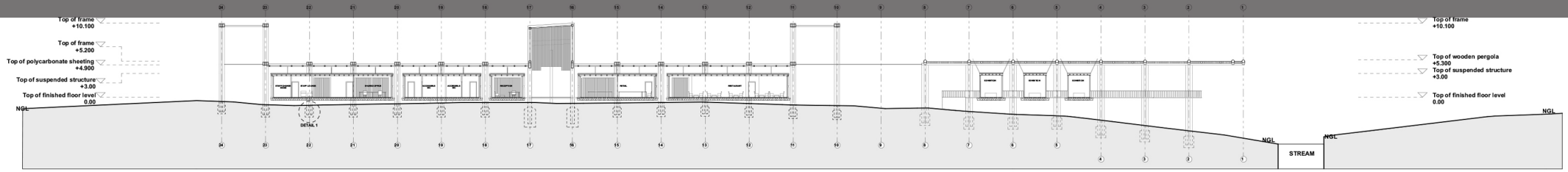


East Elevation
Scale 1:200

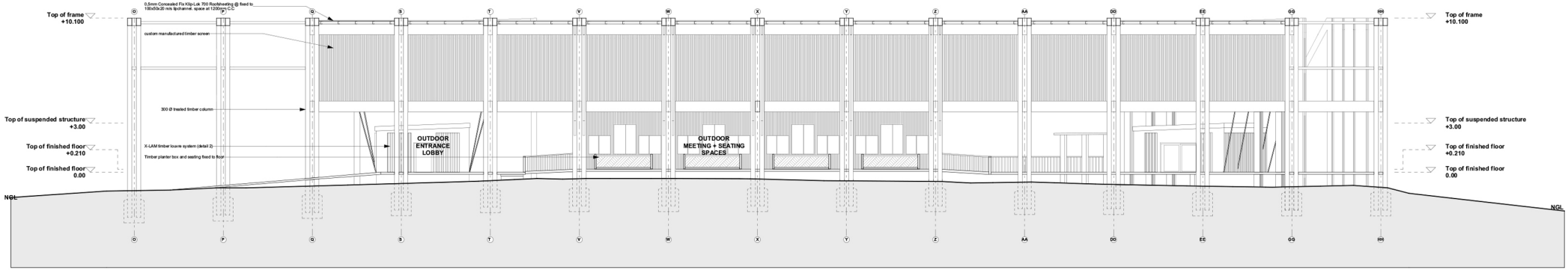


West Elevation
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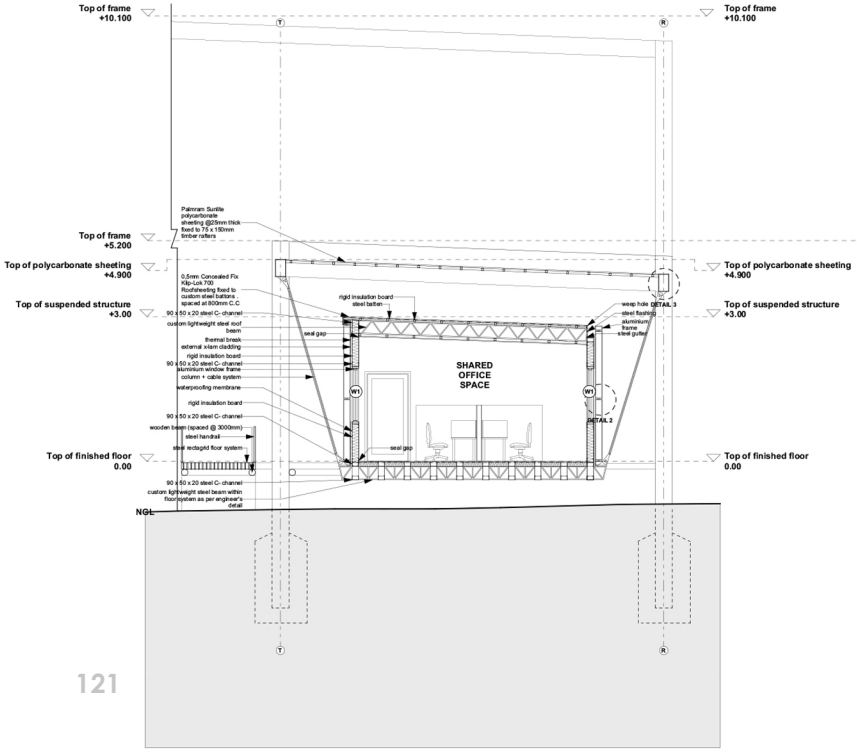
7.9 APPENDIX 6- SECTIONS + DETAILS



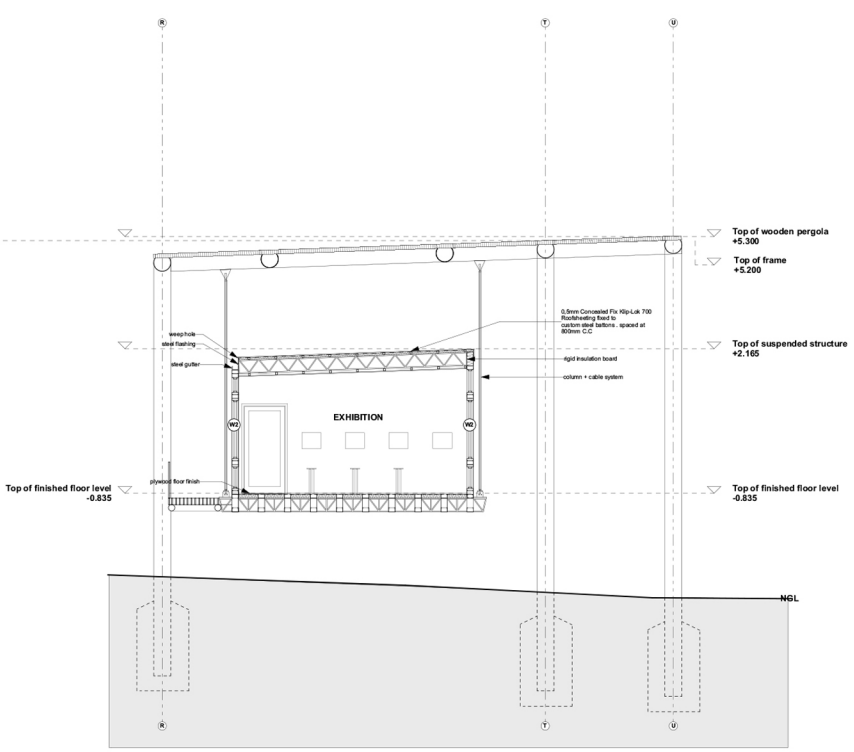
Section A-A: Longitudinal View



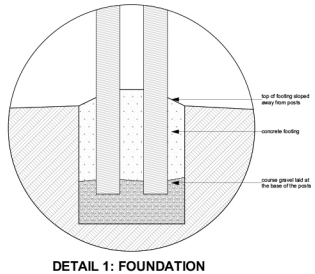
Section B-B



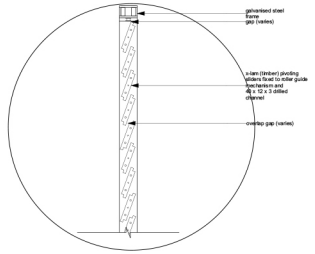
Section C-C: Office in Plantation



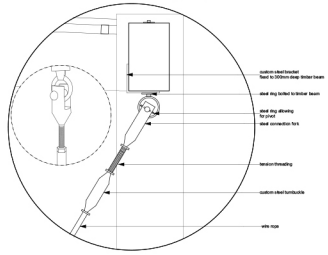
Section D-D: Exhibition Space in Forest



DETAIL 1: FOUNDATION



DETAIL 2: LOUVRE (plan)



DETAIL 3: SUSPENSION CONNECTION