CONNECTIVE TECTONICS

THE KUNYE CULTURAL COMMUNITY CENTRE

Weaving people, space, and time

M.Arch. (Prof.) Dissertation

Adeeshtra Govender

GVNADE003

SETI : Mike Louw

"WE ARE LIKE BUCKS, PART OF AN ENDLESS FOREST"
-ADAPTED XHOSA PROVERB

TITLE, DECLARATION & PLAGIARISM

Dissertation Title: Connective Tectonics: The Kunye Cultural Community Centre

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Student Number : GVNADE003

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Date: 12/09/2022

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"We face a stark choice: either we stop [the addiction] or it stops us. It's time to say: enough. Enough of brutalising biodiversity. Enough of killing ourselves with carbon."

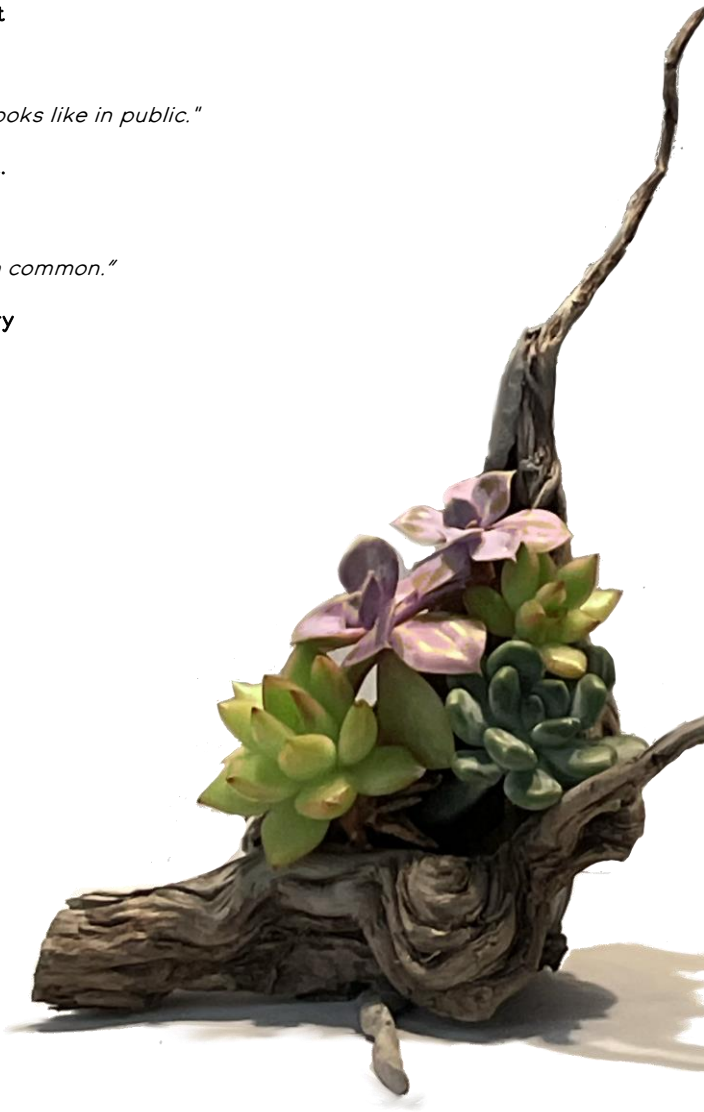
– Antonio Guterres criticizing our world leaders in the 2021 COP26 world summit

"Never forget that justice is what love looks like in public."

-Cornel West.

"The earth is what we all have in common."

-Wendell Berry



ABSTRACT

Fragments of apartheid spatial planning still linger in our South African cities. These modernist separationist elements take form as highways or green buffer zones. At neighbourhood scales, these elements create separation and spatial injustice from the lack of access to resources and amenities.

The open green space between Imizamo Yethu and the Helgrada-Kronenzicht Estate sub-districts are a clear indication of these elements in Hout Bay, South Africa. Strife and urban sprawl permeate Imizamo Yethu and there is a desire for nearby civic amenities. To soothe the spatial injustice, I propose to transform this green buffer zone into a public civic space with a cultural community centre that will benefit Hout Bay through gathering, better spatial connection, and cultural substance.

The current climate crisis acted as a primary design driver into the study of timber practice in South Africa for the architectural response. However, it is not common construction practice despite us having a timber practice heritage. An analysis of South African timber practice was undertaken in this dissertation to unpack architectural links to reconnect us to our timber heritage.

A reinterpretation of past timber practice acted as an informant for the design's construction logic. It evokes links of our memories of craft and shared cultural heritage. From this, I derived an architectural material attitude of permeation, honesty and connection and brought principles of the roof and tectonic as design drivers for my project.

Prototyping and digital modelling helped in reinterpreting the past through contemporary innovations of digital structural analysis, steam bending, and lamination. This informed the tectonic language of the architecture through the links of time, culture, technology, and space.

The project connects communities and cultural construction systems through time and space via the design of a cultural community centre in Hout Bay. It does this by reconnecting us to our past timber heritage by reinterpreting the ontological readings of historical timber systems for a better climate future. The design employs reinterpreted timber tectonic and tests the possibility of permeability and connection against the common practice of exclusionary, hard edged civic forms that causes spatial injustice. The result is an architectural design that gathers people under one roof to create art, learn, connect in a weave of space, time, and culture.

Keywords: Connection, Cultural substance, Timber tectonic

CONNECTIVE TECTONICS

THE KUNYE CULTURAL COMMUNITY CENTRE

Weaving people, space, and time.

Architecture Masters Dissertation

Adeeshtra Govender

GVNADE003

DEDICATION

I dedicate this dissertation to my mother, Anusha,

the most radiantly powerful and intelligent person I know.

Without her, I would not have become an architect.

I would not have been an artist. I would not have been blessed with this life.

It's all a little dance under the sun.

PREFACE

My interest in timber comes from my years of growing up in my big Nana's tree nursery. It was a blessing of privileged circumstance that he had built this nursery during the oppressive apartheid years as an Indian man. There he raised a close family inside brick homes with terracotta tiles in the lush forests of Durban. It was only after I started my education in architecture, that I began to question the lack of timber buildings in South Africa began to wonder and why brick and concrete houses are the standard.

My Big Nana was a descendent of migrant sugarcane slaves and his house was filled with colonial wooden ship maquettes to remind ourselves of our own liberation and successes since then. He was a big collector of such fine arts and models. He instilled the notion that art can be enjoyed regardless of class and race into my mother, which she then instilled into me.

As such, I grew up as an empathetic artist and social justice warrior. I can often get lost in the intricate bureaucracies of social issues. And as an architect, I've aligned myself in spatial justice, environmentally sustainable design and understanding the importance of architecture as cultural substance.

My thesis reflects myself as an architectural designer. The first and second section are a study and simulation of past timber practice. Although seemingly technical, it reflects my understanding of our ontological approaches and attitudes towards timber and unpacks how we perceive it to appreciate it. Here, we learn of our seemingly forgotten heritage to timber practice and that timber is a reasonable alternative to brick and concrete construction.

The third section uses the principles of timber tectonics' openness to address current architectural forms that perpetuate a sense of spatially unjust exclusion. Here, I went on guided informal settlement tours and did analysis mappings to provide an understanding into the spatial injustice of current architectural forms, programme, and urban planning in Hout Bay.

The last section ascribes the principles of timber as a reasonable design driver solution to a Cultural Community Centre in Hout Bay. It references past practice using contemporary innovations in timber. Thus, evoking a sense of cultural memory of craft and construction that is environmentally friendly and productive to the Hout Bay cultural public identity.

Timber is important to society not because it's a part of our South African heritage or can evoke imaginative designs. It is particularly important to society because we are in a climate crisis. One which is devasting our ability to sustain our lifestyle on Earth especially to the underprivileged. The construction industry accounts for almost half of global pollutants. It is time that we explore, embrace and champion alternative construction materials for the good of humankind and the natural world.

INTRODUCTION

Our world has been getting warmer. In July 2021, we exceeded the point of no return to reverse carbon-related damage on the planet (ISS Africa, 2021). Now, we are facing the consequences of our lack of action. Countries like Iraq and the UK are experiencing unprecedented heatwaves. Central African countries are experiencing droughts lasting three years. Wildfires are ravaging the countries of America and Australia causing massive wildlife loss. And for the fourth winter in a row, I returned to Durban in the mid-June winter and experienced lazy summer days rather than facing the biting colds of my youth.

This paper could focus on holistic net-positive building schemes as solutions to our climate crisis. However, the current South African construction culture has not reached the stage where alternative sustainable construction is the standard. Thus, it is almost unrealistic to promote net-positive or net-zero design until there is an ethical shift in our construction industry. Furthermore, South Africa has yet to meet our Paris 2030 goals of net carbon neutrality. Thus, for mass cultural change to happen, we need to be convinced that the construction industry, as it is, is not the future and can be changed. The dissertation then serves to start such thinking.

It is commonly believed that South Africans do not have a strong timber building culture. To address this, the dissertation becomes a motivation and study into the alternative construction material of timber in South Africa. It not only examines the benefits of timber in South Africa but also traces how we lost our heritage to different timber practices through time.

The project reveals how the cultural mindset of timber practice has shifted through time and aims to revive, remind, and reconnect timber construction culture to our contemporary society. It does so by reinterpreting past practice through new innovations. It reminds us that we do have a cultural heritage of timber and that the concrete and brick buildings of the colonial and apartheid eras are not our legacy and will not be our downfall.

South Africa can produce timber structures since the Manual Age. Today, our plantations are regenerative and capable of supplying timber that is strong and local timber innovations have made it even more durable than ever before.

The dissertation uses our architectural timber zeitgeist as paradigm to address spatial injustice within post-apartheid Cape Town. Sited in Hout Bay the architectural design aims to provide public space by gathering under tectonic roofs, connected through permeability and warmth that the material timber can award us.

CONNECTIVE TECTONICS

The Kunye Cultural Community Centre

TABLE OF CONTENTS

SECTION 1: THE STUDY

Tracing Timber Trajectories

THE STUDY

"Mankind's relationship to design is a multi-layered relationship between human life and its environment."

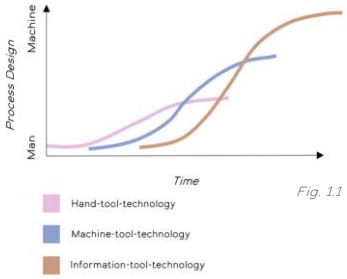
- **Naoto Fukasawa**

Section 1 of this paper is a summary of the Tracing Timber Trajectories paper produced by the Author earlier in 2022. The section revolves around the analysis of past timber practice precedents. It is informed through two frameworks. The research question of the study was: How have we lost our cultural heritage to timber architecture? The study unpacks this through an analysis of dominant building styles through the ages and their cultural contexts via architectural and technological frameworks.

The first theoretical framework is the categorization of human progress, organized by Schindler's periodization model. The second is Semper's Four Elements as a design analysis tool. This design analysis was constructed to investigate the ontological relationship South Africans have had with timber practice, across Indigenous people, colonizers, and contemporary designers

The study reveals how cultural shifts and advents of newer construction technology reduced timber to a roof tectonic and how contemporary innovations have redefined timber's role in South African Architecture as seen in the timber façade of the award-winning Deloitte's Ridge by Studio Mas.

This investigation reveals our complex relationship of reduction and celebration of timber through the years. It yields a set of principles, outlined in Section 2: The Simulation, that set-in motion the design attitude I have towards timber as a driving design factor for the design dissertation.



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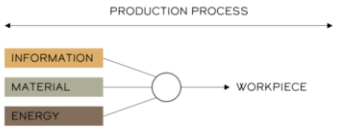

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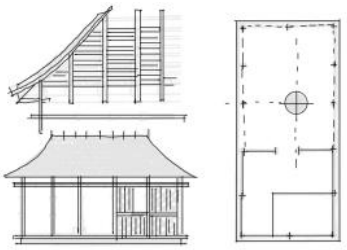


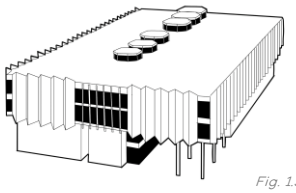


Fig. 1.3

Fig. 1.1: Diagrams explaining Schindler's Periodization Model (Source: Author).

Fig. 1.2: Semper's Hut on tectonic construction (Source: Author).

Fig. 1.3: Deloitte's Ridge designed by Studio Mas, 2020 (Source: Author).

Fig. 1.4

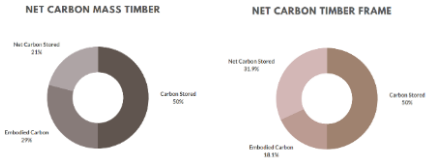


Fig. 1.5 MATERIAL STRENGTH/WEIGHT RATIO

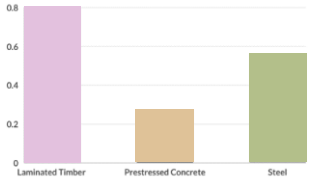


Fig. 1.6 MATERIAL STRENGTH COMPARISON

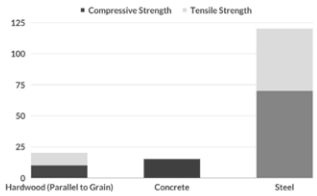


Fig. 1.7 EMBODIED ENERGY: MJ/KG

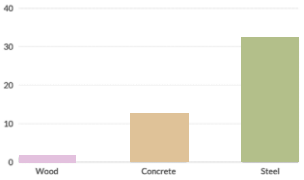


Fig. 1.8 EMBODIED WATER: KL/UNIT

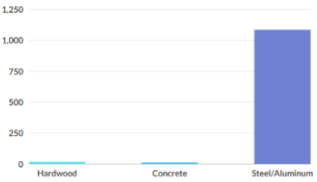
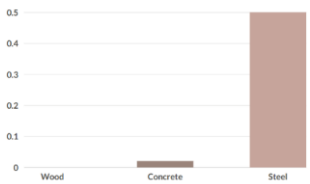


Fig. 1.9 CARBON EMISSION: KGCO2/KG



ANATOMICAL LEVEL | MOLECULAR LEVEL | GEOMETRIC LEVEL

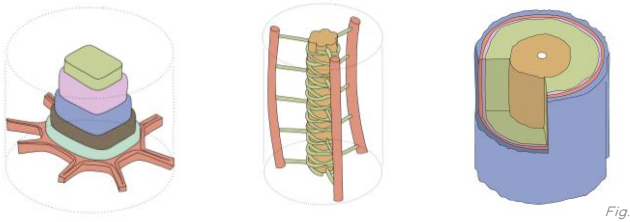
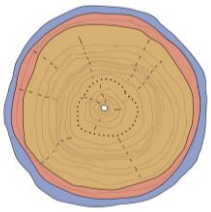


Fig. 1.10



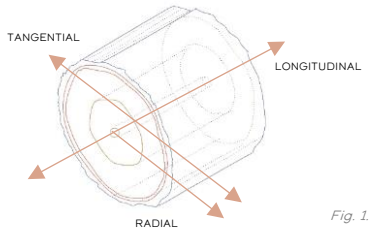


Fig. 1.11

Fig. 1.4: Pi chart on carbon positivity in timber frame and mass construction with relationship between carbon stored to embodied carbon as 163.7 t to 59.39 t and 323.47t to 187.53 respectively for a block of flats. (Source: Author after Dhanakoses).

Fig. 1.5: Material strength comparison showing that laminated timber outperforms concrete and steel in strength-weight tests. (Source: Author after Solidwoodhomes).

Fig. 1.6: mPa tests of strength comparison showing that timber competes equally with concrete (Source: Author after SolidWoodHomes).

Fig. 1.7: Comparison showing timber having the least embodied energy (Source: Author after Harte).

Fig. 1.8: Comparison showing timber using less water than steel and equally with concrete(Source Author after Fuller).

Fig. 1.9: Comparison of timber with least amounts of carbon emissions (Source: Author after ZH Architects).

Fig 1.10: Diagrams exploring timbers genetic makeup from Molecular, Anatomical and Geometric. (Source: Author).

Fig 1.11: Diagram showing the anisotropic forces that timber is strong along. (Source: Author).

WHAT NATURE TEACHES US

[The inherent anisotropic strengths of timber Fig. 1.10 makes it a viable competitive material compared to concrete and brick. Coupled with its low carbon footprint Fig. 1.3 makes timber an excellent alternative building material for our current climate crisis.]

Fig. 1.12

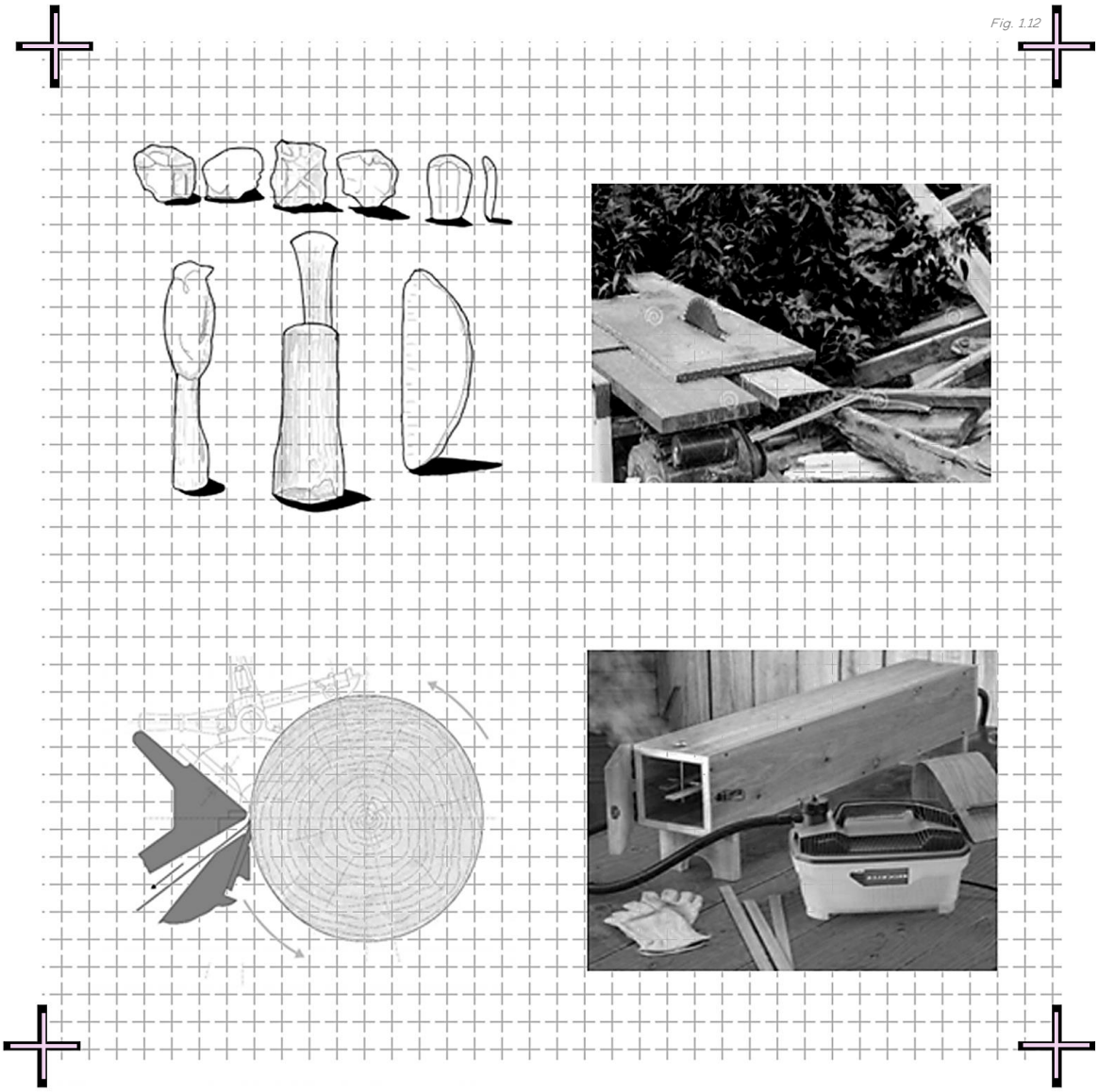


Fig. 1.12: Timber's processing tools from the Stone Tools of the Manual Age to the Industrial Age's sawing equipment to contemporary Innovations in lamination peeling and steam-bending has contributed to our understanding and manipulation of the natural material timber. (Source: Author with edited images from BrandskyLTD *et al*).

WHAT TECHNOLOGY TEACHES US

[Historic advances in processing technology ushered in different manufacturing ages. This affected our understanding of the material timber. Our current Information Age benefitted from the knowledge transfers from the Manual and Industrial Age (Schindler, 2007, p. 1-6).]. It is with these transfers that I wish to use contemporary, digital information tools to optimize my timber tectonics with.]

Fig. 1.13

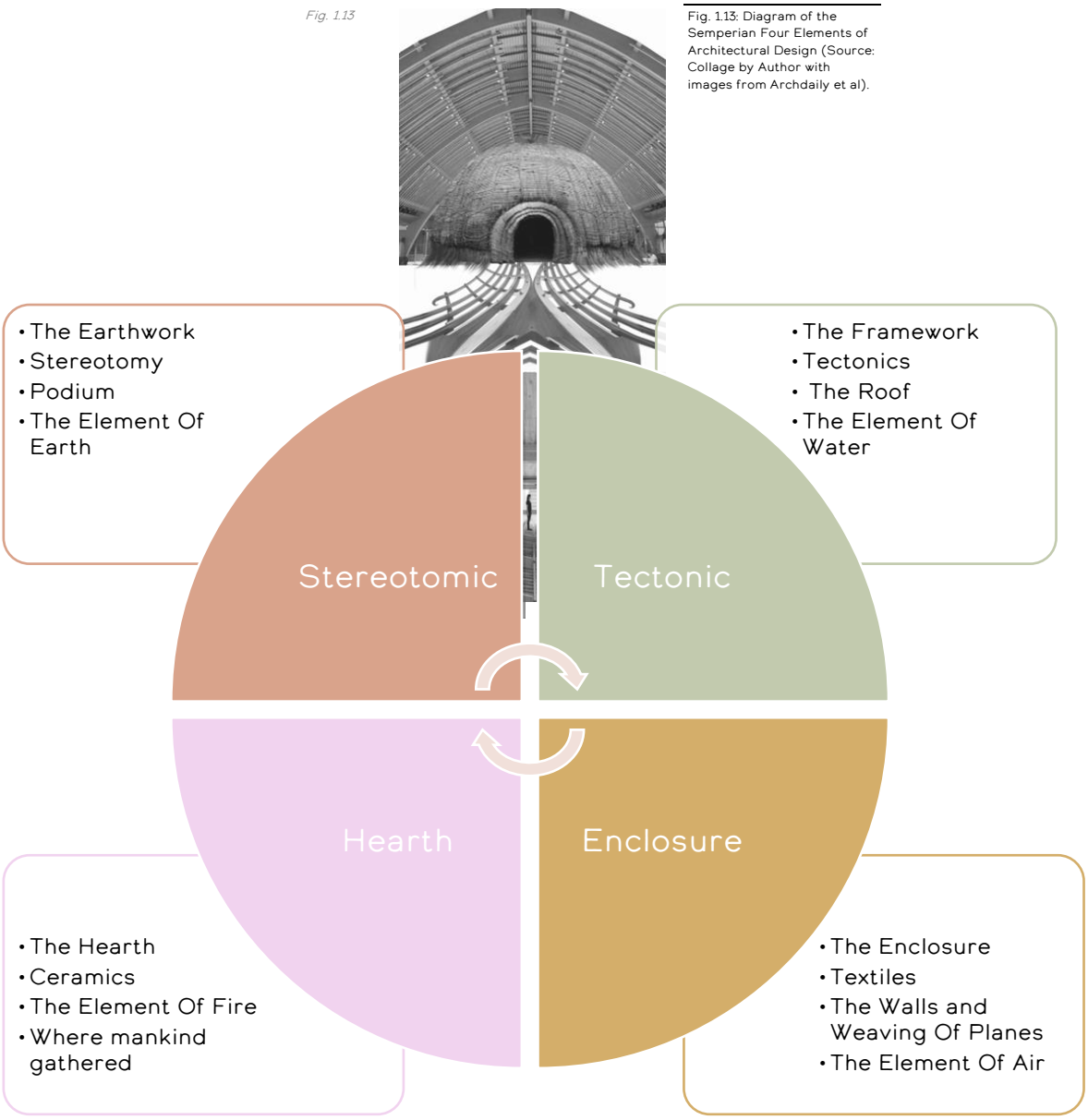
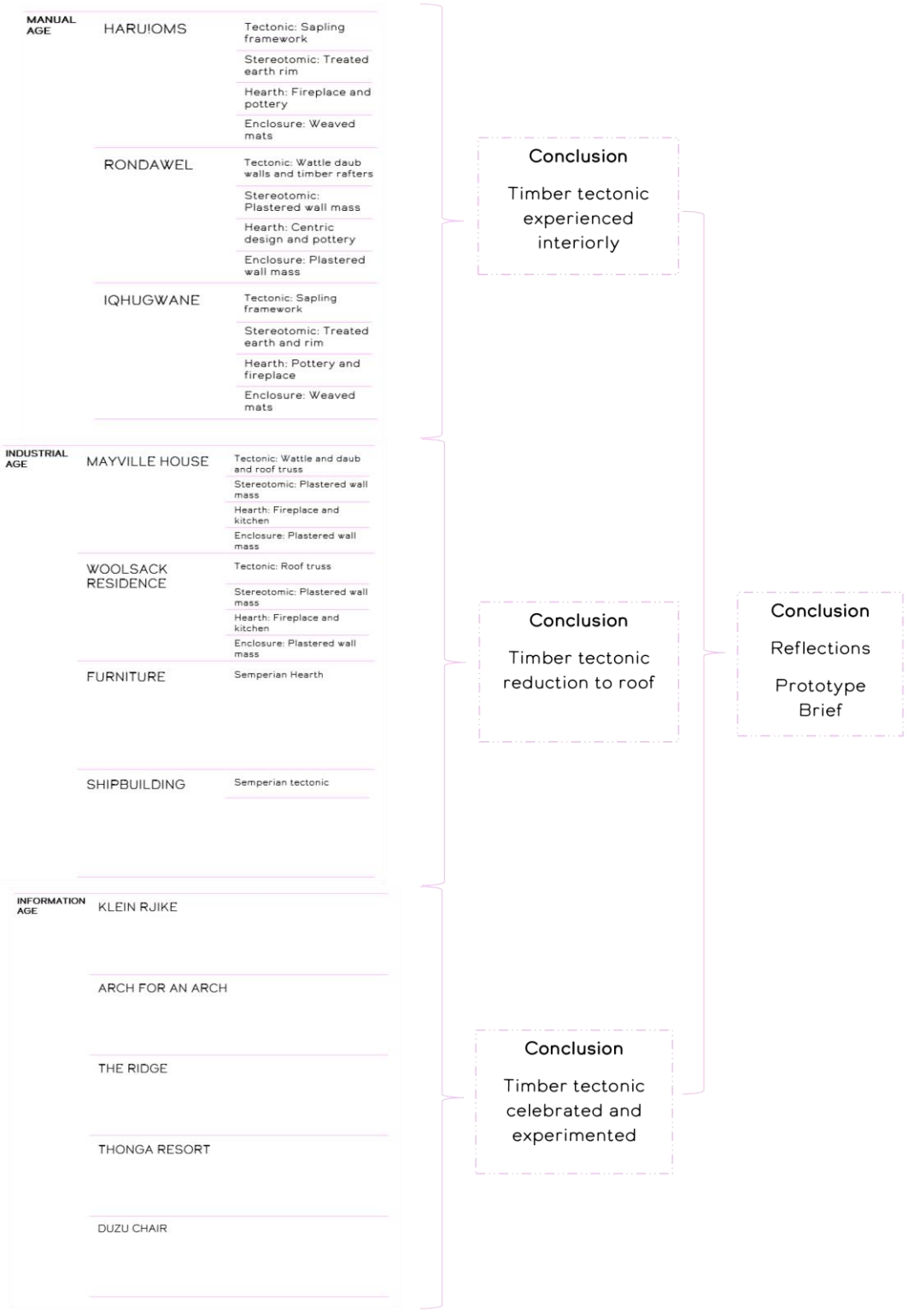


Fig. 1.13: Diagram of the Semperian Four Elements of Architectural Design (Source: Collage by Author with images from Archdaily et al).

WHAT DESIGN THEORY TEACHES US

[The Four Semperian Elements of Design (Frampton, 1995, p. 1-85) are deployed as an analysis tool to investigate the ontological relationship between timber construction logic and practice through Schindler's Periodization model, a General System Theory that investigates the relationship between technology & man & time (Schindler, 2007, p. 17-19). The tests reveal the cultural interrelationships we have had with timber design through time and how we lost our connection to the material.]



WHAT THE PAST TEACHES US

[Above is a summary of the study of past timber practice in South Africa. The summary is of 12 precedents ranging from homestead making to local shipbuilding to contemporary furniture design. They are organized within the ages of Manual, Industrial and Information and concluded by reflections on our ontological approaches towards the design practices and their principles]

Fig. 1.14

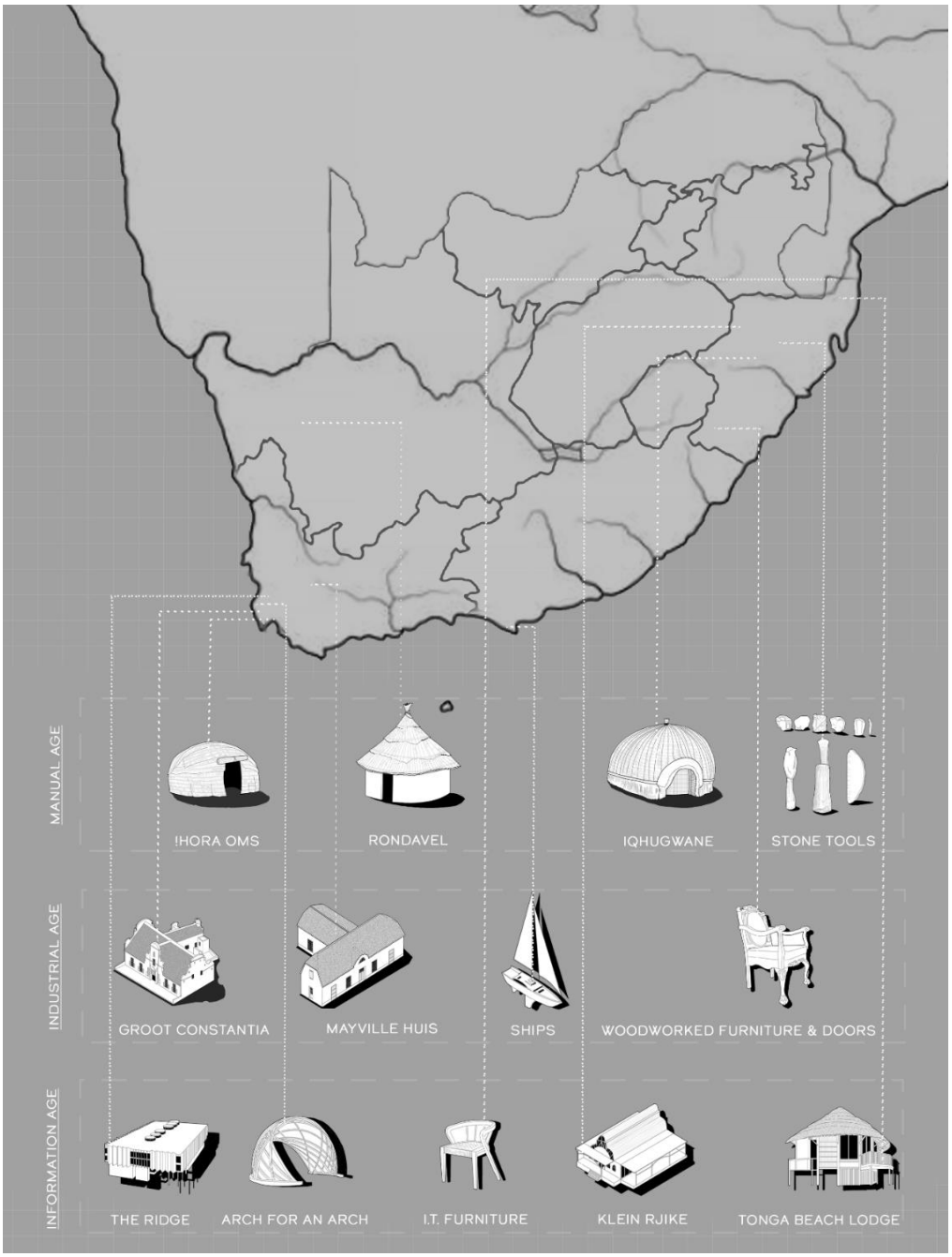


Fig. 1.14 Map showing location of past practice case study precedents (Source: Author).

WHAT THE PAST TEACHES US

[Fig. 1.14 is a mapping of the precedents and case studies organized into their respective periods, in lieu of Schindler's periodization model, across South Africa.]

Fig. 1.15

Fig. 1.15: Illustrations of studied precedents (Source: Author).

WHAT THE PAST TEACHES US

The following case studies are a summary from the theory written in the Tracing Timber Trajectories paper by the Author in 2022. They are written in the format of:

TITLE OF BUILDING | CONSTRUCTION AGENTS | PERIOD

Technology:
Ontological Keywords:
Construction Logic Principles:
[A concluding remark]

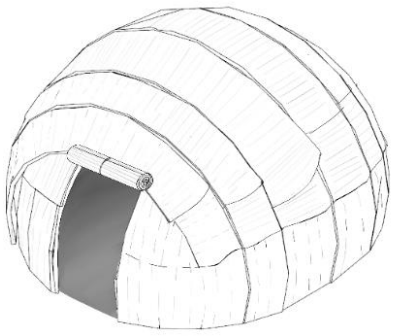
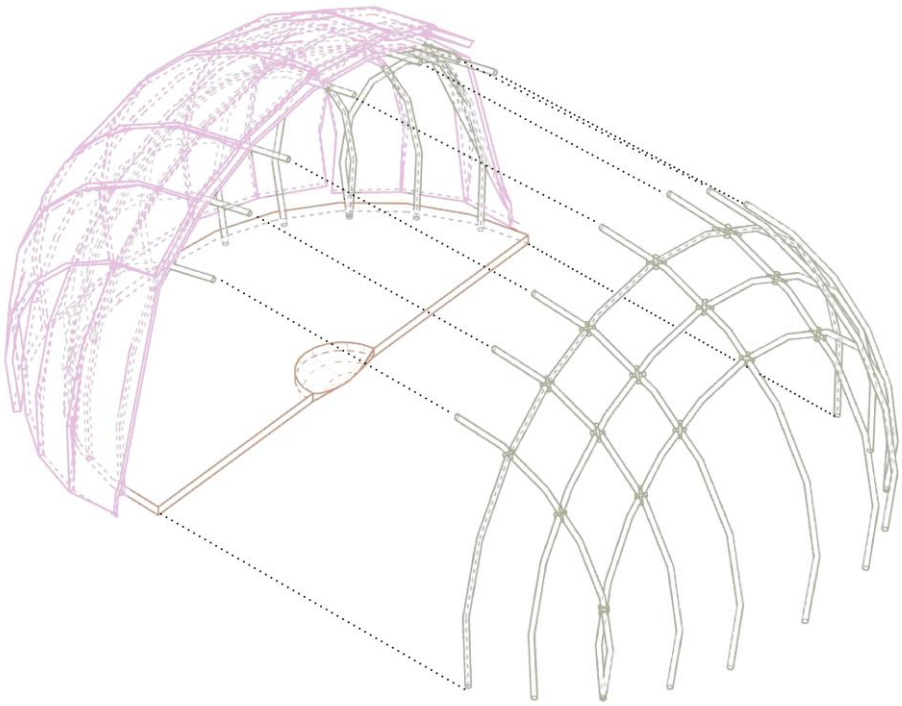


Fig. 1.16: Construction analysis of an !Haru Oms (Source: Tracing Timber Trajectories, University of Cape Town, by Adeeshtra Govender {Author}).

Fig. 1.16

!Haru Oms Construction Logic

- ENVELOPE : Grass rush mats tied by bark thread.
- HEARTH: Fireplace depression with clay pots.
- STEREOTOMIC: Cow dung and blood floors with depression.
- TECTONIC: tamarisk sapwood struts and withes.



!HARU OMS | KHOEKHOENS | MANUAL AGE

Technology: Flame-bent timber sapling framework.

Ontological Keywords: Gendered construction, Ritualistic tradition.

Construction Logic Principles: A grid-shell structure.

[Men bend saplings with fire and then cool them to stiffen in an arch. Women weave reed walls this is in lieu of the cultural rituals of "water stories" (Louw, 2017, p.98-99). This construction system marks the first inklings of contemporary steam-bending, grid-shells, and gendered roles in home-making in South Africa.]

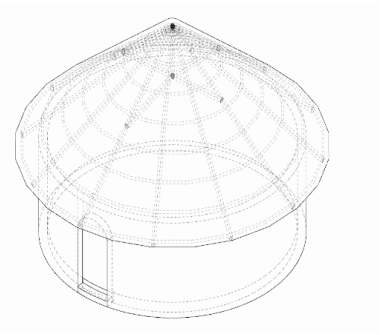
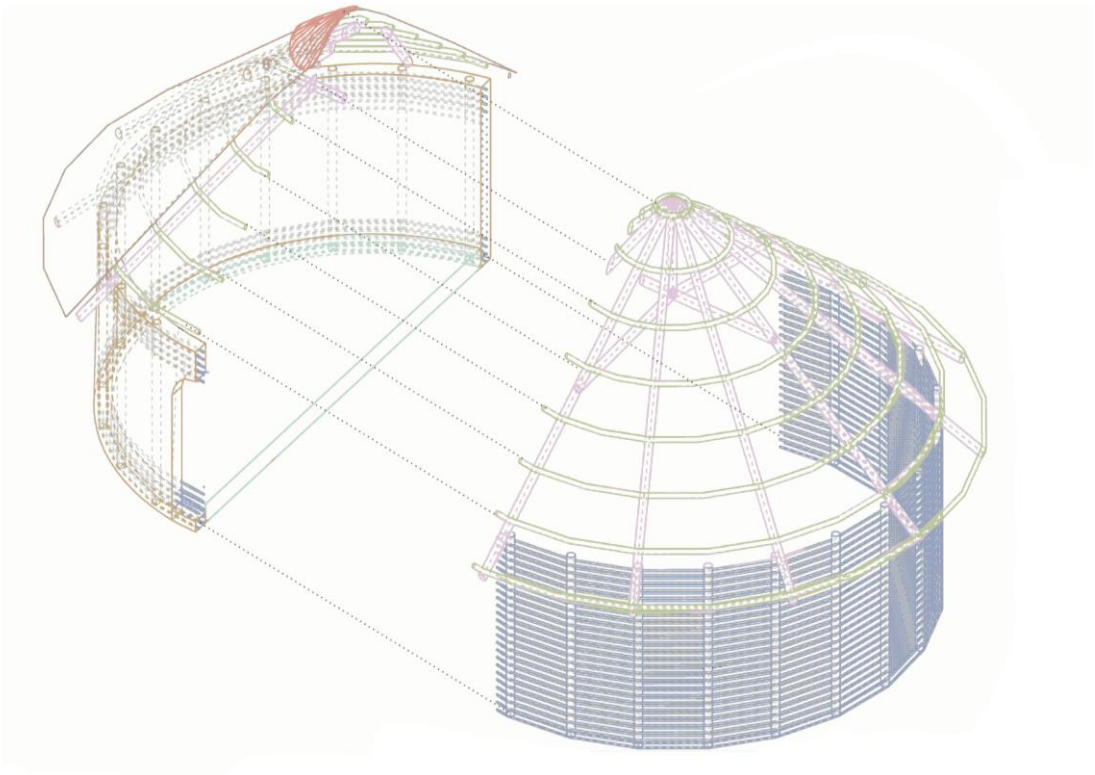


Fig. 1.17: Construction analysis of a Rondawel (Source: Tracing Timber Trajectories, University of Cape Town, by Adeeshtra Govender {Author}).

Fig. 1.17

Rondawel Construction Logic

- ENVELOPE : Daga filled walls of stone, mud, clay, and dung.
- HEARTH: Ntelezi clay crown, pottery, and concentricity.
- STEREOTOMIC: Daga walls and blood and dung smeared floors.
- TECTONIC: Timber gum pole rafters.
- TECTONIC: Struts and woven wattle withes .
- TECTONIC: Sapling hoop rings from Vundle construction logic .



RONDAWEL | INDIGENOUS PEOPLE | MANUAL AGE

Technology: Stiffening weaving of Wattle and Withe with trusses.

Ontological Keywords: Timber reduction, spiritual construction.

Construction Logic Principles: A timber frame structure.

[The Rondawel design shows the first reduction to timber tectonic, hidden within stereotomy and separating the roof from wall. Spiritual healers, Sangomas, often construct rondawels for their rituals and divination (Kuipers, 2022).]

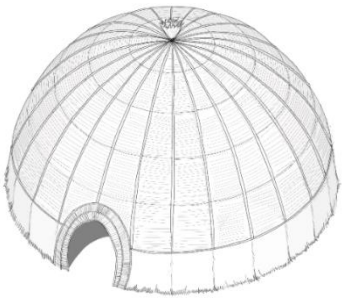
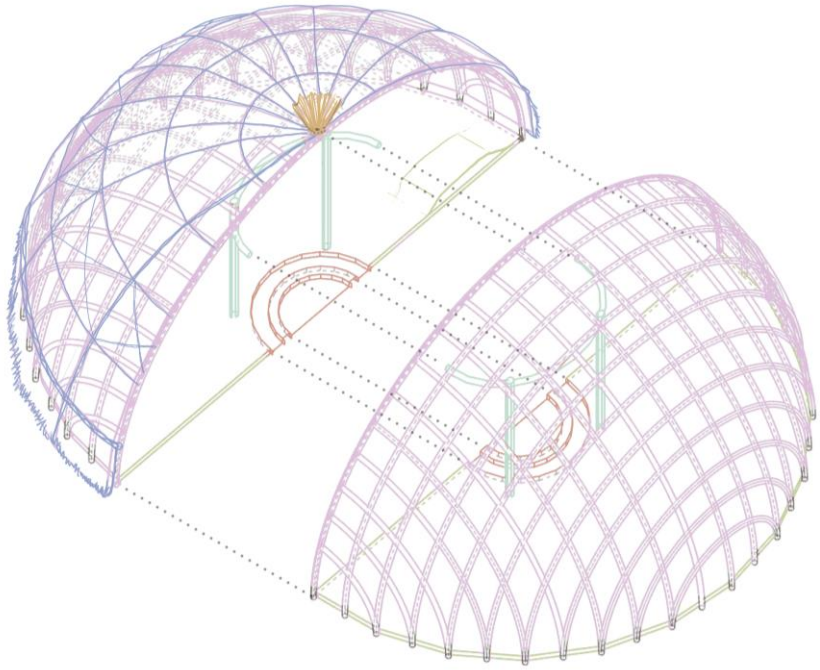


Fig. 1.18: Construction analysis of an amaqhugwane (Source: Tracing Timber Trajectories, University of Cape Town, by Adeeshtra Govender {Author}).

iQhugwane Construction

Fig. 1.18

- ENVELOPE : Woven thatch mats attached to izintungo and imishayo.
- ENVELOPE : iNgqonggwana finial.
- Hearth: Depression for fireplace and pottery.
- STEREOTOMIC: Cow dung and blood floors with raised rims for iziko (fireplace) and raised earth (unsamo) for pottery.
- TECTONIC: Framework of bent perpendicular saplings, known as izintungo and imishayo.
- TECTONIC: Ithala framework for mealies.
- TECTONIC: Izinsika wooden stakes attaching framework to ground near ukufululelu ground rope.



AMAQHUGWANE | ISIZULU | MANUAL AGE

Technology: Large spans of hand bent perpendicular saplings.

Ontological Keywords: Gendered construction, roof emphasis.

Construction Logic Principles: A grid-shell structure.

[The complex amaqhugwane structures were developed after the Rondawel intrusion and is like earlier beehive-like roof-wall tectonic structures (James, 1950, p. 31-39). The gender separationist culture of the isiZulu affected the construction logic, where men built the frames and women wove the walls.]

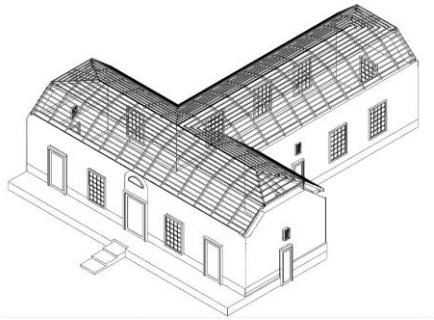
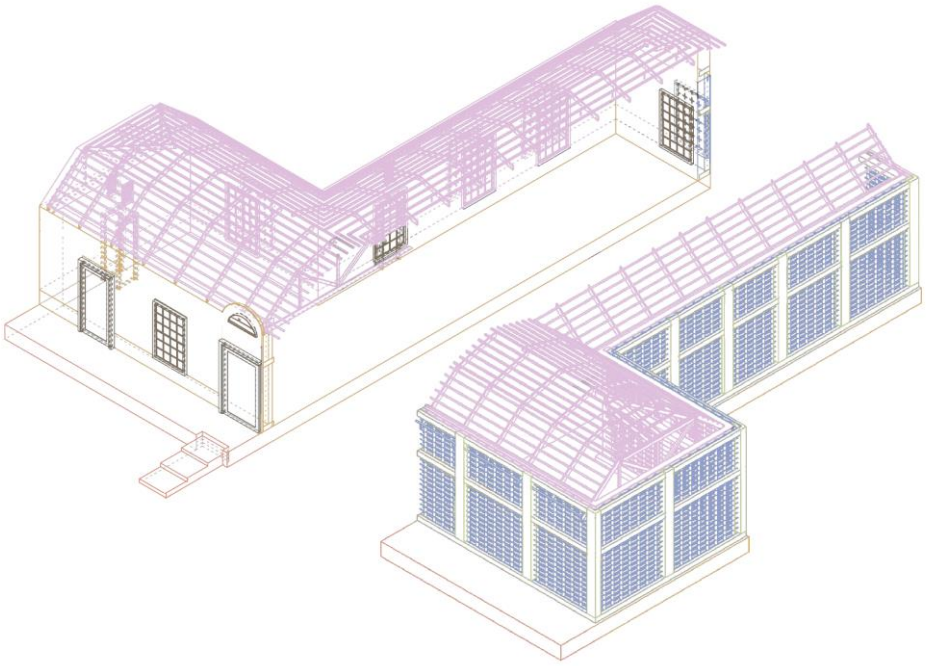


Fig. 1.19: Construction analysis of the Mayville House (Source: Tracing Timber Trajectories, University of Cape Town, by Adeeshtra Govender {Author}).

Mayville House Construction Logic

Fig. 1.19

- ENVELOPE : White plastered walls over wattle and daub.
- HEARTH: Stoep and kitchen.
- STEREOTOMIC: Plastered walls, gables and raised podium for stoep.
- TECTONIC: Mansard roof system with thatch on withes on purlins.
- TECTONIC: Timber frame struts and posts.
- TECTONIC: Timber frame beams.
- TECTONIC: Staves and weaved wattle system for wattle and daub.
- HEARTH: Timber elements, doors cape Dutch windows and gable, for identity.



MAYVILLE HUIS | DUTCH | PRE-INDUSTRIAL AGE

Technology: Narrow truss spans of local timber materials and wattle and withe walls of local materials.

Ontological Keywords: Roof reduction, settler-land relationship.

Construction Logic Principles: Wattle and withe, roof trusses.

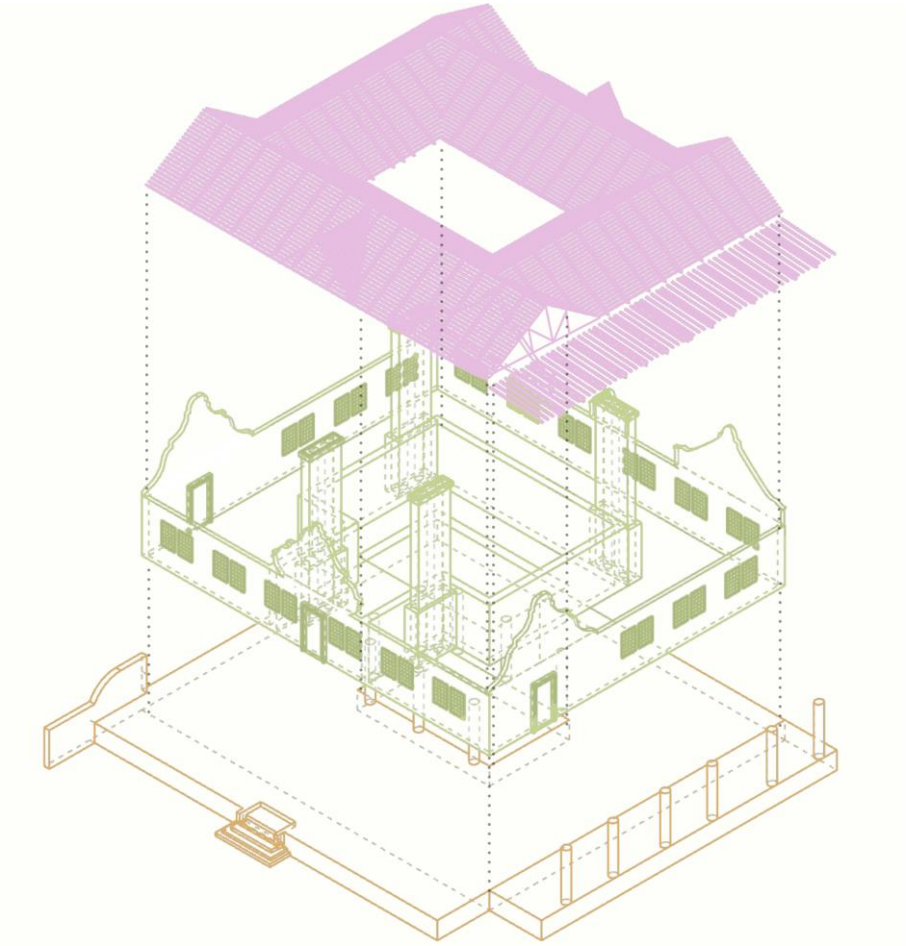
[Cladded in thatch roofs and stereotomic walls, the celebration of the timber tectonic sees a reduction with the arrival of early Cape Dutch architecture. The limitations of local materials and colonial identity impacted the spans of timber trusses and affected the design (Kruger, 1997, p. 13).]

Fig. 1.20: Construction analysis of the Woolsack Residence (Source: Tracing Timber Trajectories, University of Cape Town, by Adeeshtra Govender {Author}).

Woolsack House Construction Logic

Fig. 1.20

- TECTONIC : Dutch gable timber truss system with tiles on top.
- STEREOTOMIC: Podium of stoeps, steps, porches, and walls.
- ENVELOPE: White plastered brick wall mass.
- HEARTH: Fireplaces, kitchen, Cape Dutch architectural elements and stoep.
- STEREOTOMIC: Ceiling boards.



WOOLSACK RESIDENCE | DUTCH | INDUSTRIAL AGE

Technology: Standardized roof trusses and timber ceiling.

Ontological Keywords: Roof reduction, standardization technology.

Construction Logic Principles: Standardized roof trusses.

[With the advent of processing technologies capable of churning out standardized forms for the ease and timeous construction, the Cape Dutch Revival style saw a boom of cultural acceptance through its reinterpretation of the past with better technology capable of achieving greater spans (Kruger, 1997, p. 13-14).]

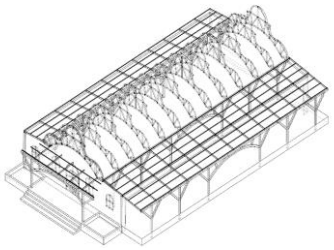
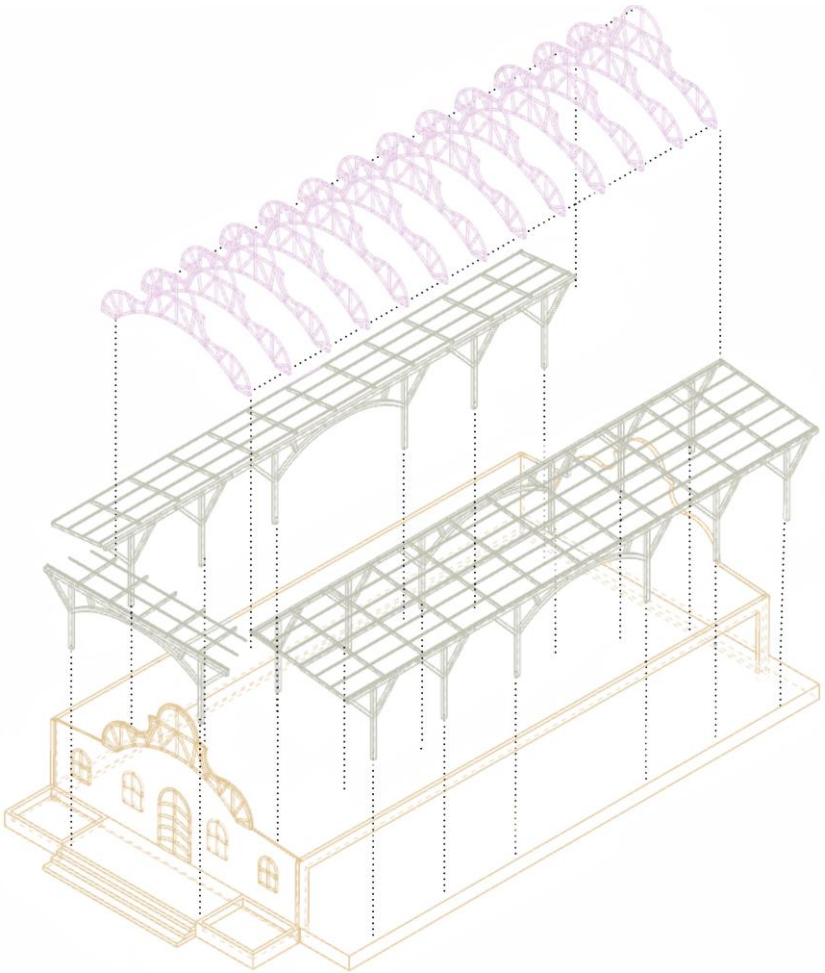


Fig. 1.21 Construction analysis of Kleine Rijke (Source: Tracing Timber Trajectories, University of Cape Town, by Adeeshtra Govender {Author}).

Kleine Rijke Construction Logic

Fig. 1.21

- TECTONIC : Timber steam bent trusses.
- TECTONIC: Timber rafter and frame systems for indoor/outdoor hybrid spaces.
- STEREOTOMIC/ENVELOPE: White plastered walls and raised podiums for stoeps and porches.



KLEINE RIJKE | DK&K ARCHITECTS | INFORMATION AGE

Technology: Steam-bent modular frames.

Ontological Keywords: Sculptural form, Steam-bent processing.

Construction Logic Principles: Frame construction.

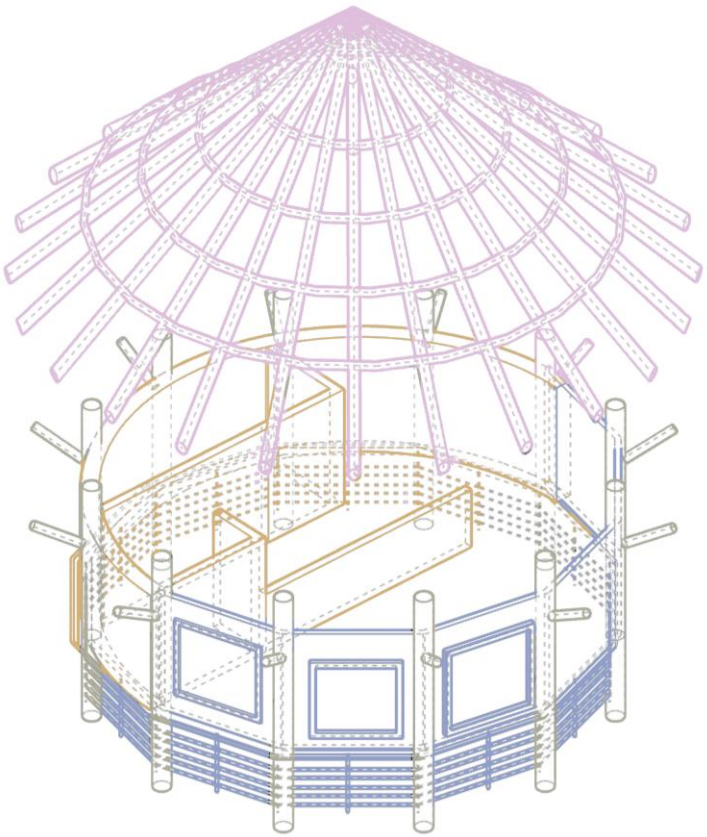
[The use of curved steam bent timber elements in Kleine Rijke (Schalkwyk, 2022) exhibits one of the ways the past construction of the frame has been contemporized by innovative steam-bending. This method preserves the anisotropic qualities of timbers in creating forms that are both structural and contiguous.]

Fig. 1.22 Construction analysis of a Thonga cabin (Source: Tracing Timber Trajectories, University of Cape Town, by Adeeshtra Govender {Author}).

Thonga House Unit Construction Logic

Fig. 1.22

- TECTONIC : Gum pole rafter roof system.
- STEREOTOMIC: Rammed earth walls for bathroom and as retaining wall.
- ENVELOPE: Weaved matts connected to wattle and stave systems.
- TECTONIC: Gum pole columns with arms attached to roof system.



THONGA CABINS | TJ ARCHITECTS | INFORMATION AGE

Technology: Gum pole, rammed earth

Ontological Keywords: Timber tectonic celebration

Construction Logic Principles: Gum pole frame construction

[The tactile timber tectonics of both weaved mats, wattle and withes shows that the structure is celebrated in Thonga's Cabins. Interestingly the stereotomic is now reduced to the inside of this cabin, reduced to bathrooms, which further supports the designer's choice to appreciate the timber tectonic throughout the architecture (isiBindi, 2022).]

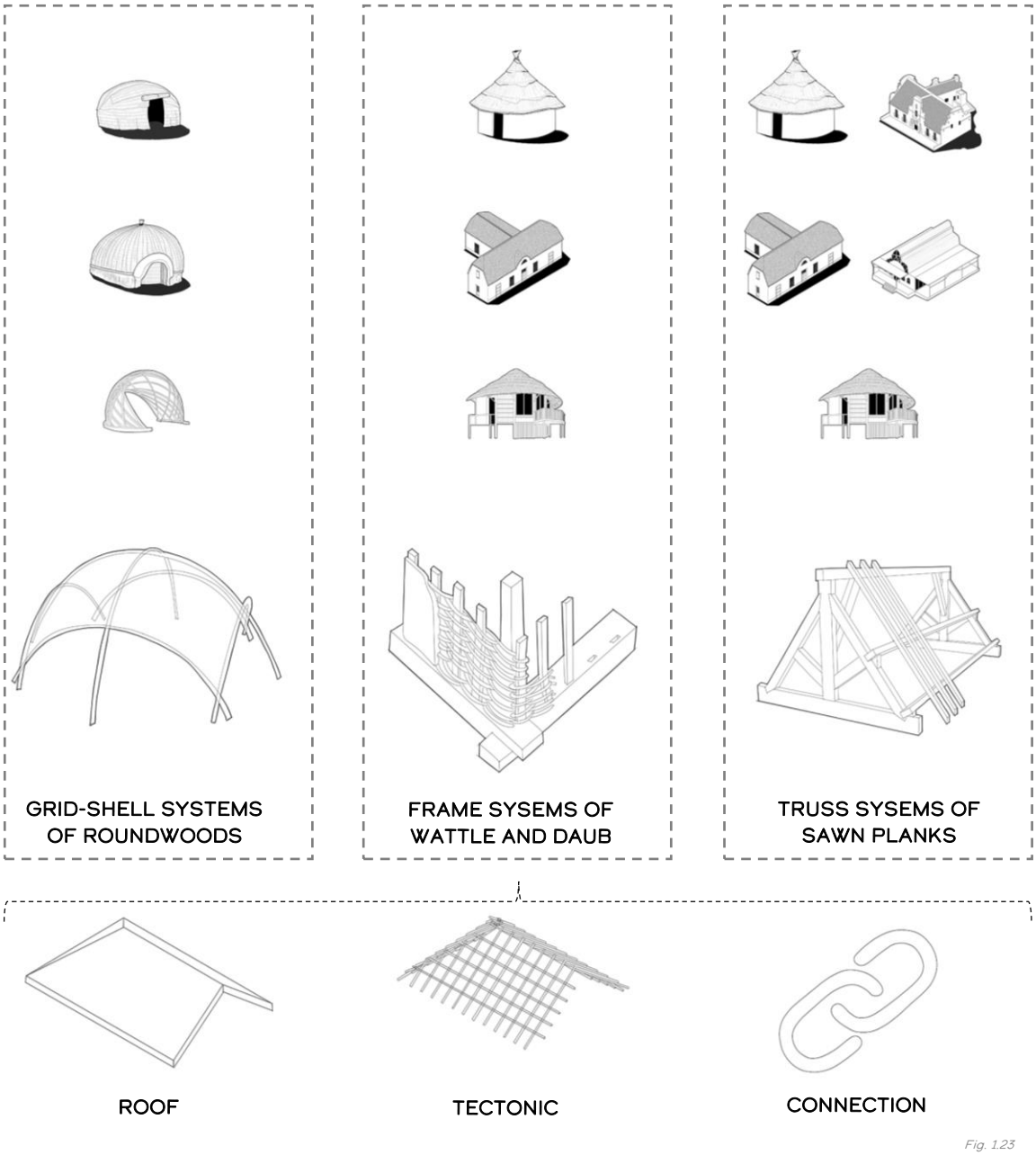


Fig. 1.23: Diagram on principles and construction systems (Source: Author).

WHAT THE PAST TEACHES US

[The case study of past precedents yielded an understanding of timber construction through time and how we lost our connection to it by the advents of the more durable and convenient brick and concrete of the colonial and apartheid eras. The takeaway from the study was a set of principles and construction systems derived from recognizing trends and attitudes in the timber architecture case studies [Fig. 1.23]. Those principles are Roof, Tectonic, and Connection and the construction systems are Grid-shells (indigenous homesteads), Frames (wattle and daub), and Trusses (Colonial period). These principles provide a playground for design experimentation that is linked to past practice. The project aims to reference these principles and systems in the final design solution.]

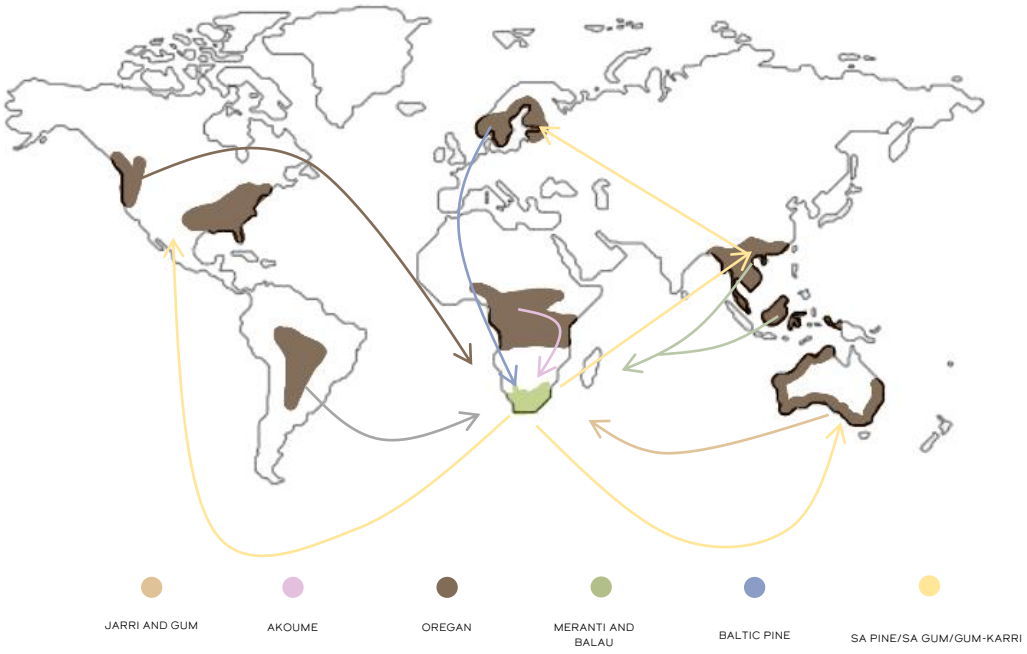


Fig. 1.24

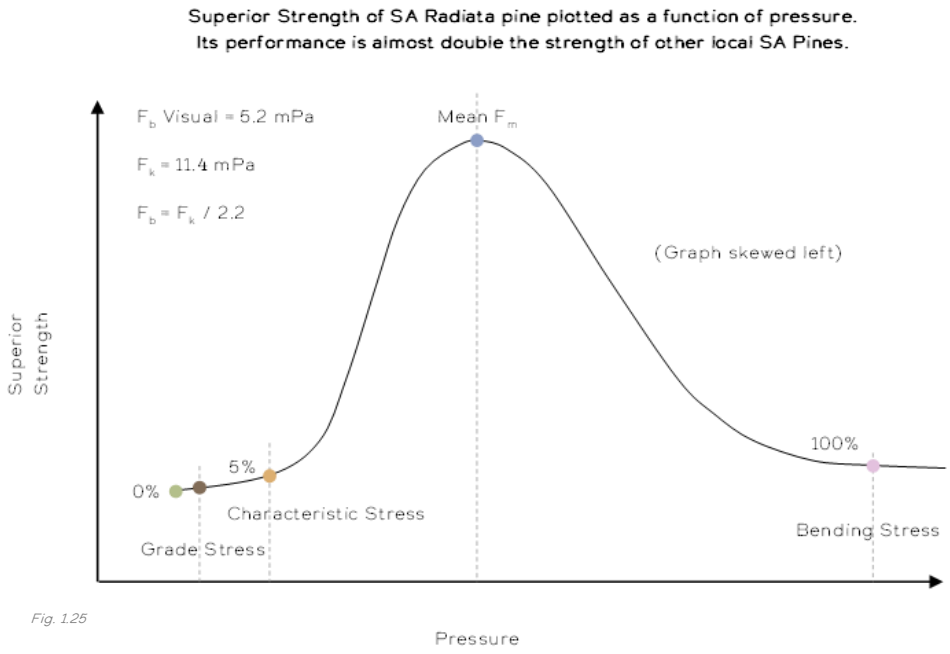


Fig. 1.25

Fig. 1.24: Mapping of the export/import timber culture in South Africa (Source: Author and Collis).

Fig 1.25: Superior Strength of 5 of Radiata plantation's SA Pine's shown on a graph against pressure revealing its robust performance (Source: Author and Collis).

WHAT THE PRESENT CAN TEACH US

[There is a stigma that South Africa's forestry industry is weak and thus timber construction is an unrealistic alternative to concrete and brick. However, South Africa has a thriving forestry industry that is sustainable and rooted in regenerative plantation techniques meaning that the industry focuses on continual regrowth of harvested plantations (FSA, 2017, p. 1-28)]

Fig. 1.26

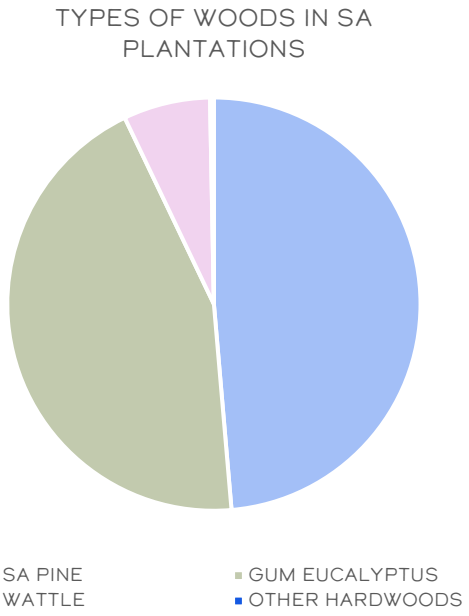
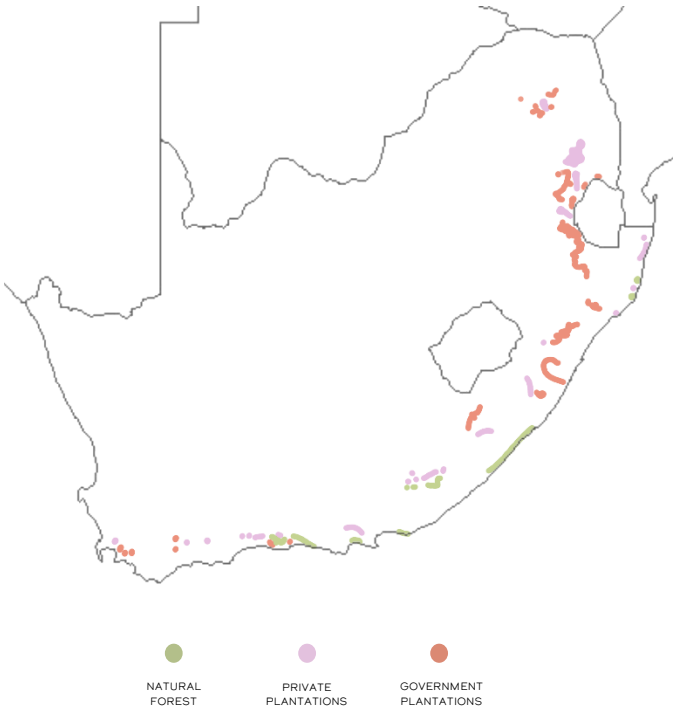


Fig. 1.26: Pi chart showing the relationship between different local timber plantations in South Africa (Source: Author).

Fig 1.27: Mapping of timber plantations and their privatizations (Source: Author and Collis).

Fig. 1.27



WHAT THE PRESENT CAN TEACH US

[Though scattered along our rich water coasts [Fig. 1.27], with more demand, the industry can grow to support a mass timber construction culture in South Africa (Collis, 2014) as our current plantation is area is about 1.1% of the total of south Africa (FPM&SETA, 2014, p. 3-4). Our largest plantations are of South African pine, which is exported globally and renowned for its innate strength, Eucalyptus and Black Wattle [Fig. 1.26]. These are commonly grown across over 26 000 South African plantations. Almost 80% of them are privately owned and 20% are publicly owned (FSA, 2017, p. 5).]

Fig. 1.28

Fig. 1.29

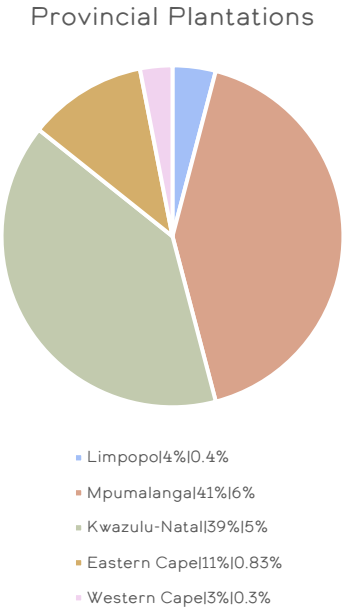


Fig. 1.30

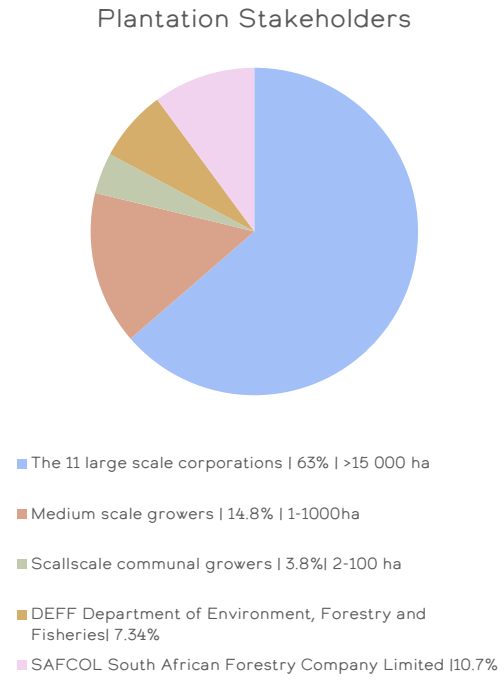


Fig. 1.28: Chart showing the socio-economical relation of timber plantations between government investment and employment (Source : Author after FSA).

Fig 1.29: Graph highlighting the relationship between provincial plantations in the format of province | industry national percentage | provincial land use (Source: Author after FSA).

Fig 1.30: Graph showing the stakeholders in the plantations of South Africa in the format of stakeholder | percentage owned | hectares of land (Source : Author after FSA).

WHAT THE PRESENT CAN TEACH US

[The largest percentage of our national plantations are in the water rich provinces of Kwa-Zulu Natal, 40%, and Mpumalanga, 41% followed by the Eastern Cape at 12% Fig. 1.29(FSA, 2017, p. 5). Plantation ownership varies, the largest sector is of 11 large scale cooperations, followed by government departments and then midscale and small-scale growers Fig. 1.30 (FSA, 2018, p.1). Of these, the top 3 biggest employment contributors, a social good, are SAFCOL's Komatiland Forests, KZN's Mondi South Africa and Sappi Forests (FP&M SETA, 2014, p. 3-4). Finally, since 2014, our government has invested in supporting these industries to stimulate employment Fig. 1.28 and begin combating climate change, as a green industry, since we currently have an insufficient land-use and forestry rating, as per the Paris 2030 commitment in lowering carbon emissions and maintaining a 1.5-degree warming (Climate Commission, 2022).]

WHAT THE FUTURE CAN TEACH US

"Life is divided into three terms- that which was, which is, and which will be. Let us learn from the past to profit by the present and from the present, to live better in the future."

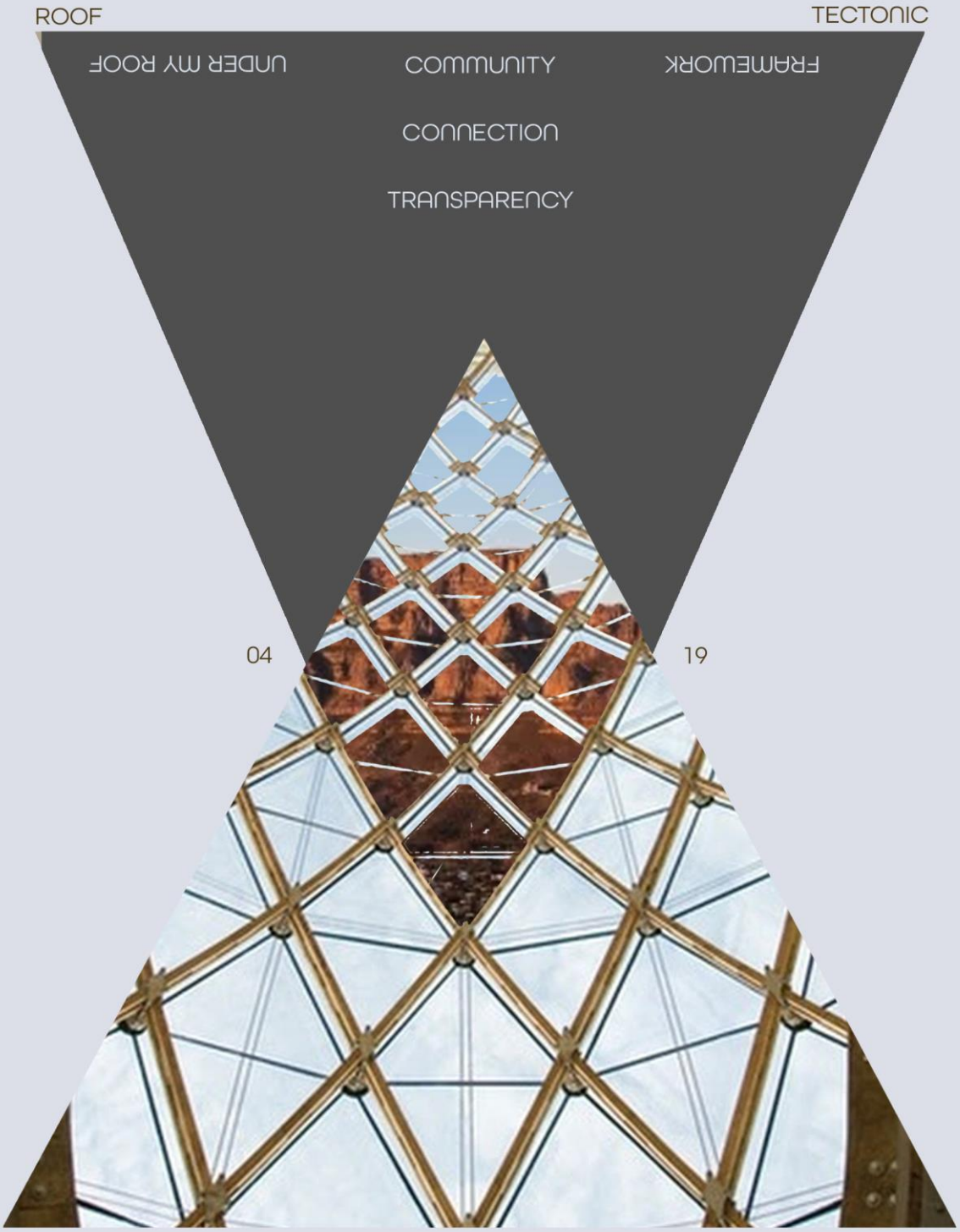
- William Woodsworth

I take the study forward by learning from the past practice and blending to with contemporary technology. This reminds us of our South African cultural heritage to the forgotten crafts of timber practice in a contemporary way.

The loss of this common construction logic was a result of apartheid modernist and colonial movements and their advent of brick and concrete. These materials were more convenient and economical in construction than timber during their periods and thus became widespread practice. Thus, the revival of timber not only aids the climate crisis through ecological benefits but also brings justice to the lost connection of our timber heritage.

This approach also confronts our current misconceptions of the use of timber as an outdated, unreliable material. By designing with new timber innovations, the potential of the material as a hi-tec alternative material is brought to public attention. Furthermore, designing with timber stimulates a sector in our country that the government has been investing money in, thus contributing to future employment of our already regenerative and vibrant forestry industry.

A development that champions timber, with links to past practice and innovation, proves our material heritage to South Africans and that it is possible to build and design with alternative building materials to combat climate change.



SECTION 2: THE SIMULATION

Translating Timber Trajectories

THE SIMULATION

"Prototyping is having a conversation with your ideas."

- **Tom Wujec**

The prior study of past timber practice yielded a productive design conclusion to our relationship towards timber in South Africa. Our current timber attitude, a zeitgeist, views it as a material that is appreciated regarding material honesty, tectonic and warmth.

This can be seen as a culture yearning for material honesty as a reaction against the previous modern design attitudes. Those prior design attitudes promoted contiguous, plastic modernity that is now perceived as something that is superficial, cold, and distant to humanity.

This zeitgeist, coupled with principles I have identified in the study, is used as a driving design factor for this project .

In this section, the three identified principles ; the Roof, the Tectonic and Connection are elaborated as important to us as, cultural substance through craft and heritage, and as a design aid.

These principles are then explored through a series of simulation tests. These tests simulate a reinterpretation of the past construction systems of the frame, truss and grid-shell new digital information-tool innovation, Rhino's Karamba. These tests range from material investigations of lamination and steam bending to digital-tool-informed design from parametric modelling and structure optimization within Rhino.

The prototyping tests these principles to simulate design reinterpretations of past practice with digital and material innovation.

THE PRINCIPLES

1. Roof

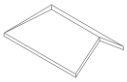


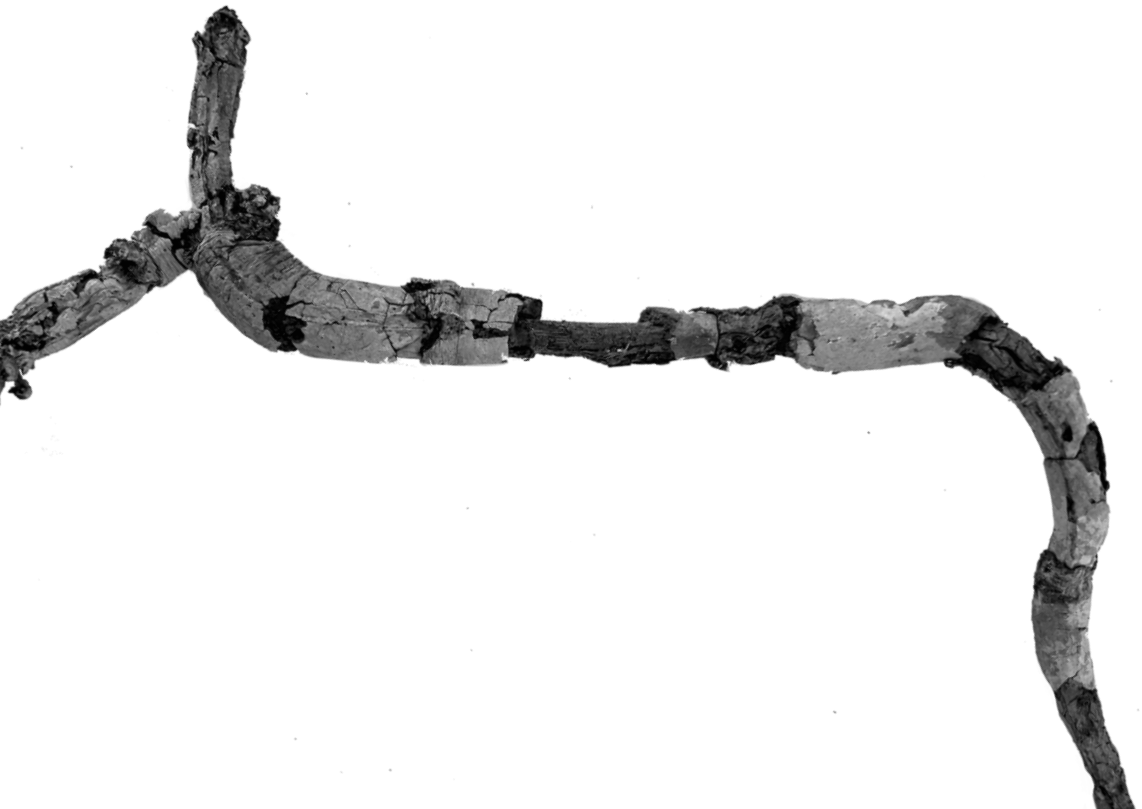
Fig. 2.1

If design is about reiteration and optimization, then reduction can be viewed as a part of it. Despite the reduction of timber in design, its optimization as a roof element is celebrated still today.

Roofs play a key role in our South African architecture. Dutch colonial architecture exerted its dominance over the land through its looming roof structures and the indigenous beehive structures can be seen as roof dominated architecture.

The roof connects us to the sky and gathers us at ground level as a protective umbrella from the elements to commune together. The phrase "We all live under one roof", echoes its use to communicate unity, togetherness, and connection.

Fig. 2.1: Symbol for roof (Source: Author)



THE PRINCIPLES

2. Tectonic

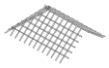


Fig. 2.2

In the Four Semperian Elements, the role of the roof was often the primary means of tectonic expression. It played the structural role in design, providing support and rhythm. Semper viewed the roof as a sort of boatbuilding in reverse (Frampton, 1995). This mirrors our reduction of timber to boatbuilding, as seen in Knysna and Hout Bay's nautical history (BeautifulKnysnaVillas, 2022).

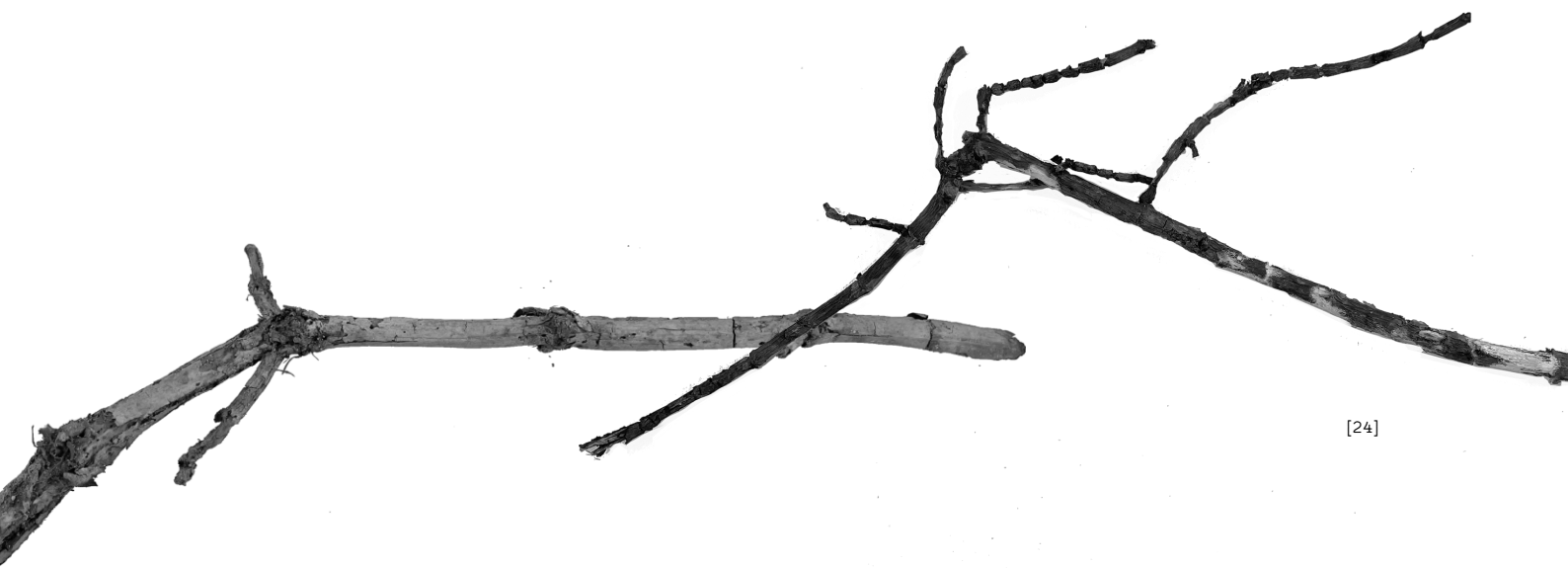
The tectonic plays a key role in form making and spatial arrangement. In the manual age, bent curved grid-shells and their interior spatiality were reliant on the structural capacity of the timber arches. The spans of local timber in pre-industrial Dutch trusses determined internal room sizes and layouts.

In most precedents, the timber tectonic was celebrated interiorly despite weaved mats or stereotomic walls hiding and protecting the timber structures exteriorly.

In Indigenous and pre-industrial Dutch homes they were used to keep personal goods safe and organized and had visual connection before the advent of ceilings in industrial Cape Dutch Revival and Rondawel construction.

Today, with contemporary innovations, the tectonic finds its rhythm exteriorly as seen in Tonga's cabins Fig. 1.22 and Kleine Rijke's structure Fig. 1.23; all of which express and celebrate structural tectonic rather than hiding it.

Fig. 2.2: Symbol for tectonics (Source: Author)



3. Connection

Fig. 2.3

The analytic framework of Semper's Four Elements reveals a relationship between the architectural design elements of the studies.

The studies reflect a dichotomous interdependent relationship between the juxtaposing elements of the tectonic and the stereotomic. The tectonic relies on the heavy stereotomic for its stability and durability against the elements. This is seen in wattle and daub walls of rondawels and the foundations of the Thonga cabins. And the hearth and enclosure, are elements that weave themselves between the spaces created by the stereotomic and tectonics.

The studies reveal that these design elements speak to connection of dichotomy; between the tectonic and stereotomic, built and natural world, the sky and ground, man and woman and the waking and spiritual worlds. Furthermore, the studies speak to the connections that timber practice has to time.

The timber tectonic is thought of as a framework, as a structural support system of connection. This when left uncovered creates an atmosphere of honesty, transparency through revealing. It encourages connection through sight and permeability via the inferred thresholds created by the spatial tectonic.

The method of material analysis in the study can be seen as a reconnection to forgotten past cultures. Thus, this principal of connection evokes a sense of a timber renaissance. One of which, when coupled with emergent technologies, can create an architecture that links the past to a better future for the world.

Fig. 2.3: Symbol for Connection (Source: Author)

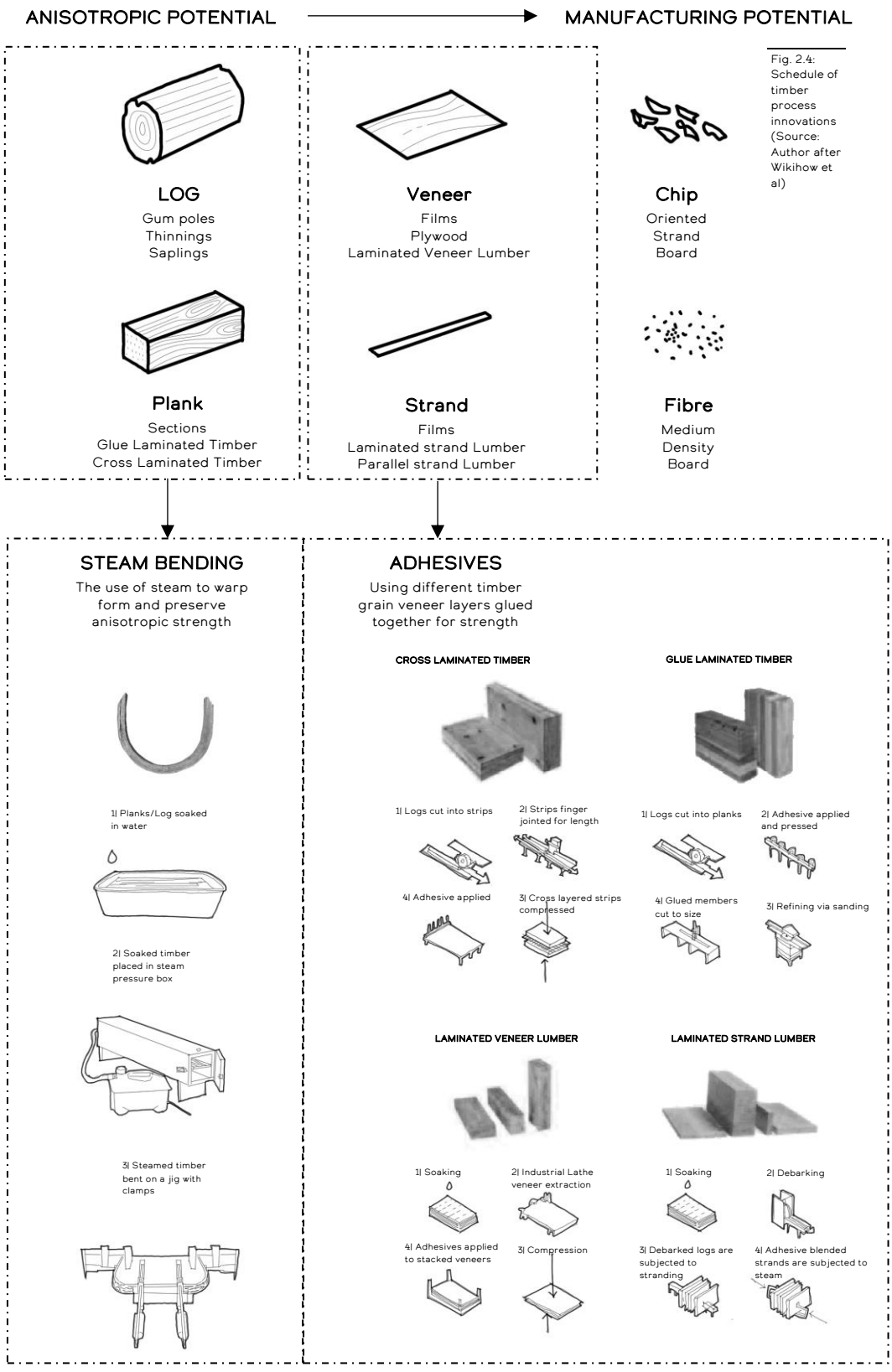


Fig. 2.4

Fig. 2.4: Schedule of timber process innovations (Source: Author after Wikihow et al)

THE NEW TECHNOLOGIES I

[New innovations in timber technology resulted in varying manufacturing properties and material syntheses. The project's innovation exploration lies within the veneer stranding and the log-planking material syntheses of steam-bending and adhesives as seen in the above diagram Fig. 2.4. This is because they both utilize timber's natural anisotropic properties, as used in past systems, making them an appropriate choice when compared to fibre or chip timber.]

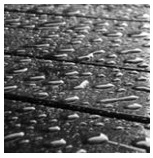
Fig. 2.5: Schedule of timber treatment innovations (Source: Author with images from Timbermaintenenc e.co.za et al)

TREATMENTS

Copper Chromium Arsenic

A toxic decay treatment best used for non-pedestrian use. Often traps moisture in and causes internal rot, best used against microbes. (Timber Maintenance, 2022)

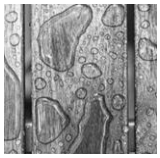
SA product: Steven Lumber Mills



Oil-based

An all-rounder durable, linseed oil water repellent treatment with UV and insect protection that penetrates the surface and forms a layer when dried. (Timber Maintenance, 2022)

SA Product: FurniOIL



Water-based

An acrylic/polyurethane solvent-based finish with a water functioning thinner that speeds drying with minimal fumes and discolouring but offers lower water and heat resistant and raises the grain of the wood. (Timber Maintenance, 2022)

SA Product: SatinWood

Wax-Based

A thick sticky compound spreads and penetrates the timber. It benefits in filling cracks to provide better water penetration prevention. It is quick to reapply layers. However, the Longer-drying liquid wax version is susceptible of trapping debris. (Timber Maintenance, 2022)

SA Product: FurniWAX

Glue/Epoxy-Based

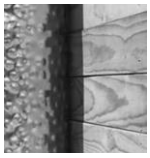
A 2-part Thermosetting polymer-based treatment of a waterproofing and hardening catalyst of UV, strengthening and durability properties. It is perfect for high traffic areas. (Timber Maintenance, 2022)

SA Product: AMTcomposities

Varnish

A film finish that is built up from layers of shellac/varnish/lacquer/ water or latex based stains. It leaves a hard impenetrable surface that can be coloured. However, it weakens via UV contact and thus is impractical for outdoor use. (Timber Maintenance, 2022)

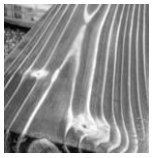
SA product: Timbertones



Rhino Modified Wood

A South African solution sourced from local sustainably grown timber plantations that use a two-step wood modification technique that presents a ready to use product at the same quality of forest hardwoods. Essentially, a heat treatment increases durability through dropping internal absorption rates, during this process the timber can be recoloured. Afterwards, the timber is placed in high pressure chamber where there is a 100% impregnation of a non-toxic wax that fills all voids and weaknesses. (Rhino Woods, 2022)

SA product: RMW



Shou Sugi Ban

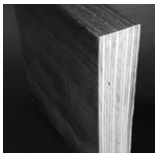
Through this method, the timber is UV protected, insect repellent, fire, and water resistant through the charring and coating with natural oils the. However, the timber required needs to be able retain their strength after charring like Japanese cedar or softwoods like spruce or local SA pine. (Eryn Whalen, 2020)

SA product: SA pine

Moon harvesting

The phases of the moon affect the flows of sap in trees like tides In the ocean. Sustainable South African plantations have taken advantage of this technique by harvesting the timber when the sap is at the lowest during autumn and winter moon phases. The lack of sap provides a natural protection that prevents microbial and insect infestation. After harvesting, the timber is cured thus providing superior, infestation proof, non-cracking durable timber. (Eco design architects, 2022)

SA product: SA pine



Multiculture Approach

The ability of lamination allows multiple local timber species to be used in a structure. The notion of a multi-culture promotes diversity in the timber plantation industry and prevents monocultural farming that can endanger already at risk species or introduce new alien species in the South African Plantation.

SA product: SA pine / Eucalyptus/ Black Wattle

MAINTANENCE

Cleaning

Apart from specific cleaning formulars, most chemical cleaners could harm the treatments on timbers and reduce their durability. Medium pressure water hosing or wiping is recommended for longevity. (Timber Maintenance, 2022)

Liquid Bleach

Such sodium hypochlorite includes a soapy surfactant that helps remove grime and dirt. However, any bleach should not be left on the timber for too long to prevent lignin degradation that can damage the timber. (eCleanMag, 2014)

Oxygenated Bleach

Such sodium percarbonate are a powerbases product that lifts and loosens dirt without causing damage even through scrubbing and has the best cleaning results compared to its competitors (eCleanMag, 2014)

SA product: UltraMean

Oxalic Acid

A more home-based solution to timber cleaning that achieves a non-scrubbing cleaning and brightening against dirt and debris. (eCleanMag, 2014)

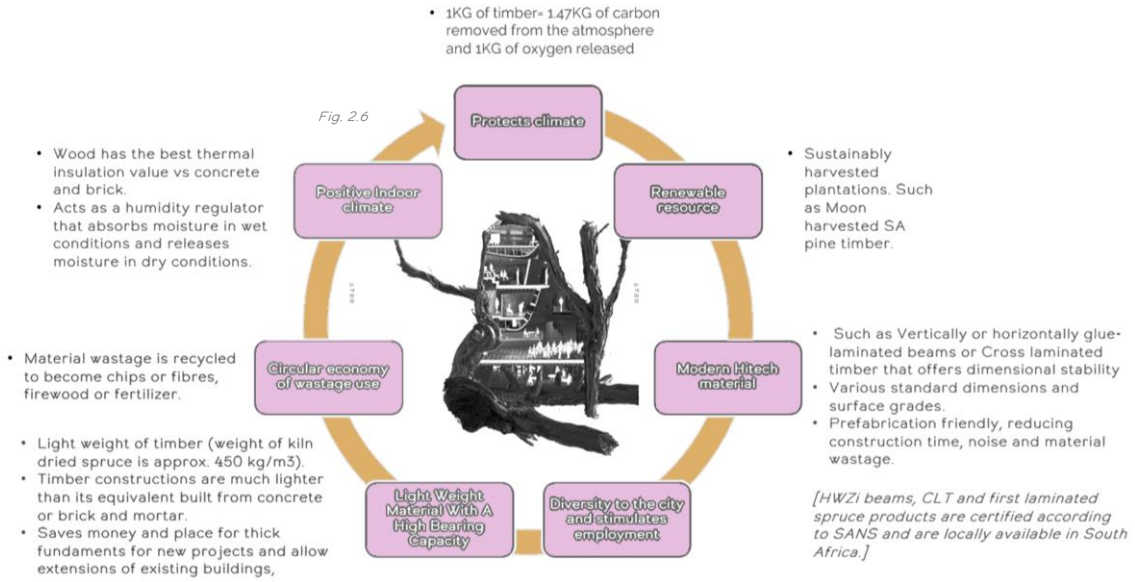
SA product: MilkPaint

Reapplication

Another key to maintenance of timber is the reapplication of finishes and treatments due to environmental damage on the surface finishes of those treatments from rain, wind, sun, and traffic. (eCleanMag, 2014)

THE NEW TECHNOLOGIES II

[A major stigma towards timber construction is its longevity and strength vs more readily available construction material. The above scheme Fig. 2.5 is of South African innovations in timber maintenance and treatment that have resulted in timber that is durable against weaknesses of microbial (fungal & insect threats), swelling, cracking, bending & twisting from moisture and strengthening against fires, seismic and wind activity (Timber Maintenance, 2022).]



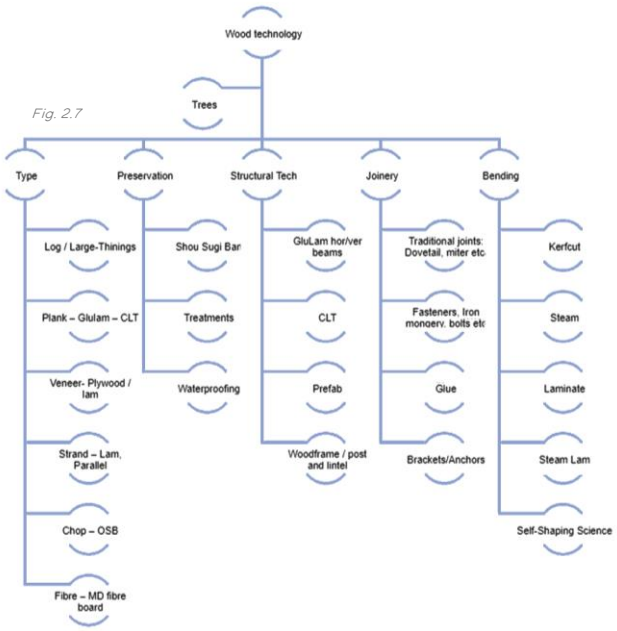


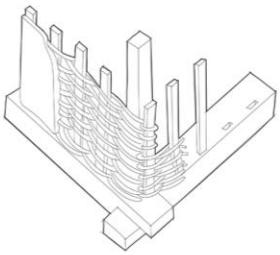
Fig. 2.6: Diagram illustrating the benefits of timber as an alternative construction material (Source: Author after Collis et al)

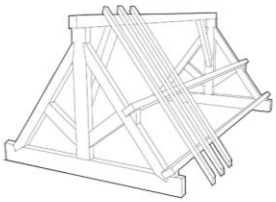
Fig. 2.7: Schedule of a technology tree of timber (Source: Author)

THE NEW TECHNOLOGIES III

[Advances in timber technology innovations have resulted in numerous advantages of using timber as a competitive common construction material especially for the climate crisis as seen in [Fig 2.6]. This project highlights the material innovations in logging and veneers with moon harvested RMW timber. It reinterprets the material's past practice links to steam/heat bending and adhesive lamination, with multicultural approaches with strong S.A. pine and eucalyptus, to explore their timber spatial tectonic.]

Fig. 2.8





Construction Logic

GRID-SHELLS

Materials:

GUM POLE/SAPLING

NEW TECHNOLOGY:

STEAMBENDING

Construction Logic

FRAMES

Materials:

WOVEN WATTLE WITHES AND DAUB

NEW TECHNOLOGY:

LAMINATION SPLITTING

Construction Logic

TRUSS

Materials:

PLANK

NEW TECHNOLOGY:

SPACEFRAME TRUSSES

Fig. 2.8: Diagram of past practice and modern reinterpretation (Source: Author)

REINTERPRETING PAST PRACTICE

[Reinterpreting past practice without copying is an important idea behind my project. Linking emergent timber innovations to past construction logic systems has yielded design potentials to explore along systems of grid shells, frames, and trusses [Fig. 2.8]. These systems are explored through a sets of simulation exercises. These systems are developed further through the Information Age with the use of CAD programmes like Rhino for parametric and digital structural optimization to blend past systems with the future.]

Fig. 2.9

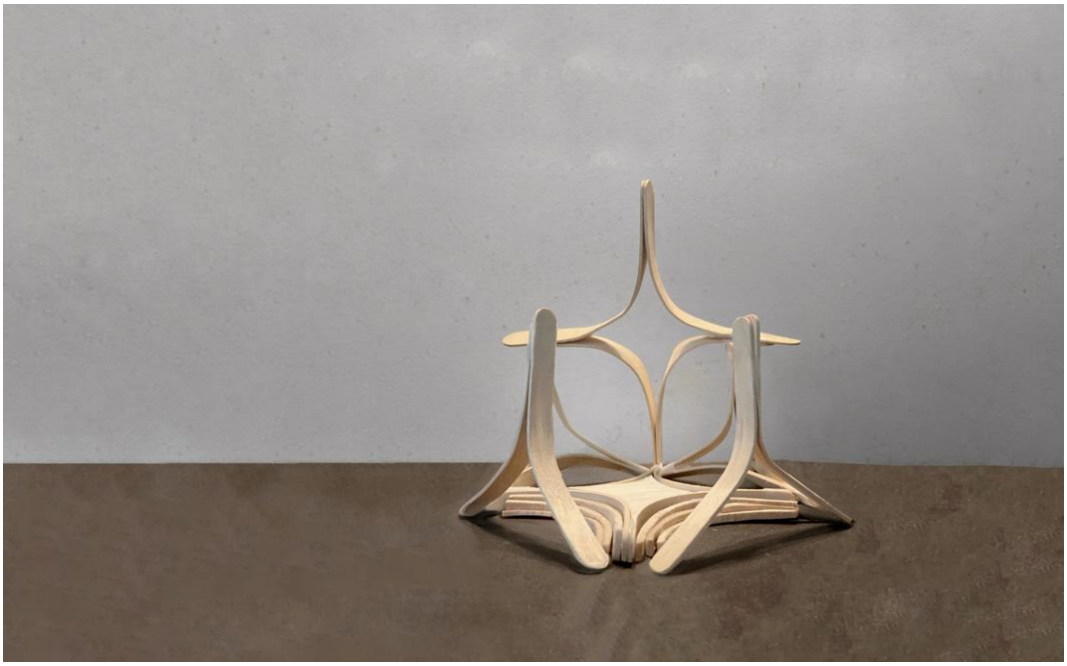
Fig. 2.9: Clay and sapling experiments (Source: Author)

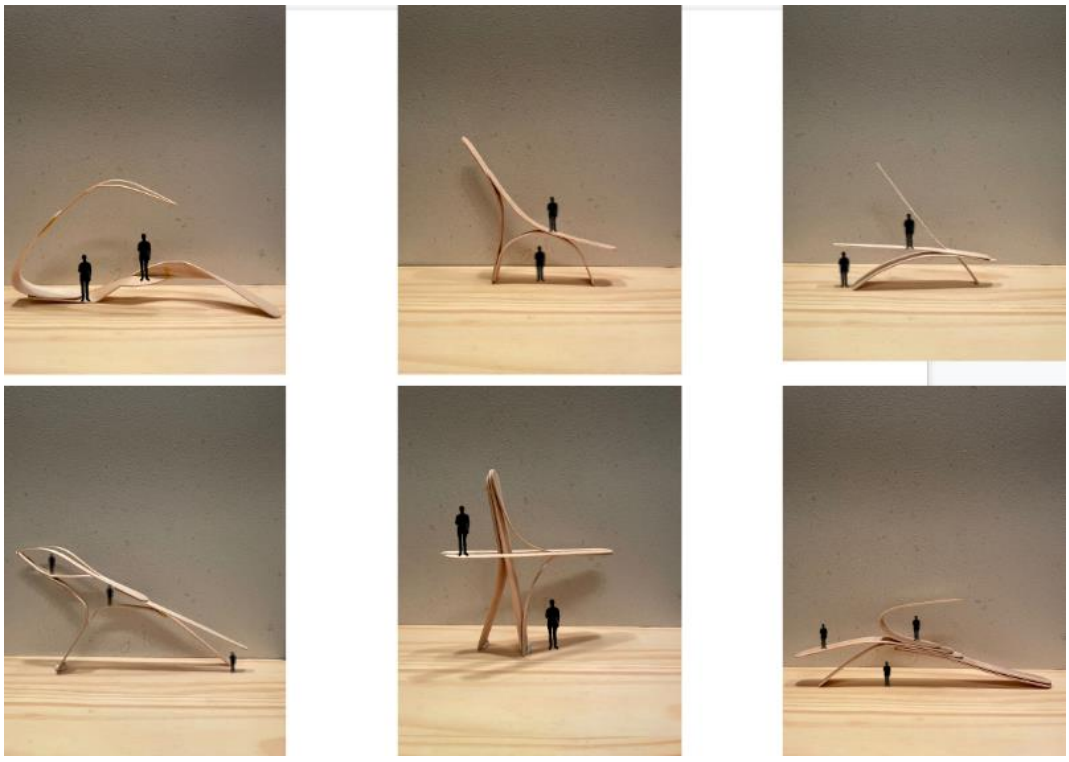
Fig 2.10: Steam-bending and laminate tests (Source: Author)

THE MAKING

[Fig. 2.9 was an artefact that explores the juxtaposing relation between timber structure and clay stereotomy. Fig. 2.10 is a series of timber laminate and steam-bending exercises that were conducted to understand the process of making. This making task was the first of a series of prototyping exercises that gave insight into the form-generation possibilities of timber with links to the past.]

Fig. 2.10





THE MAKING

[The following exploration exercises simulates reinterpretations of past practice with contemporary technology via the design of pavilions accompanied by structural prototypes that have helped me establish a deeper understanding of timber and evaluated the principles of the roof, connection and tectonic.]

Fig. 2.11

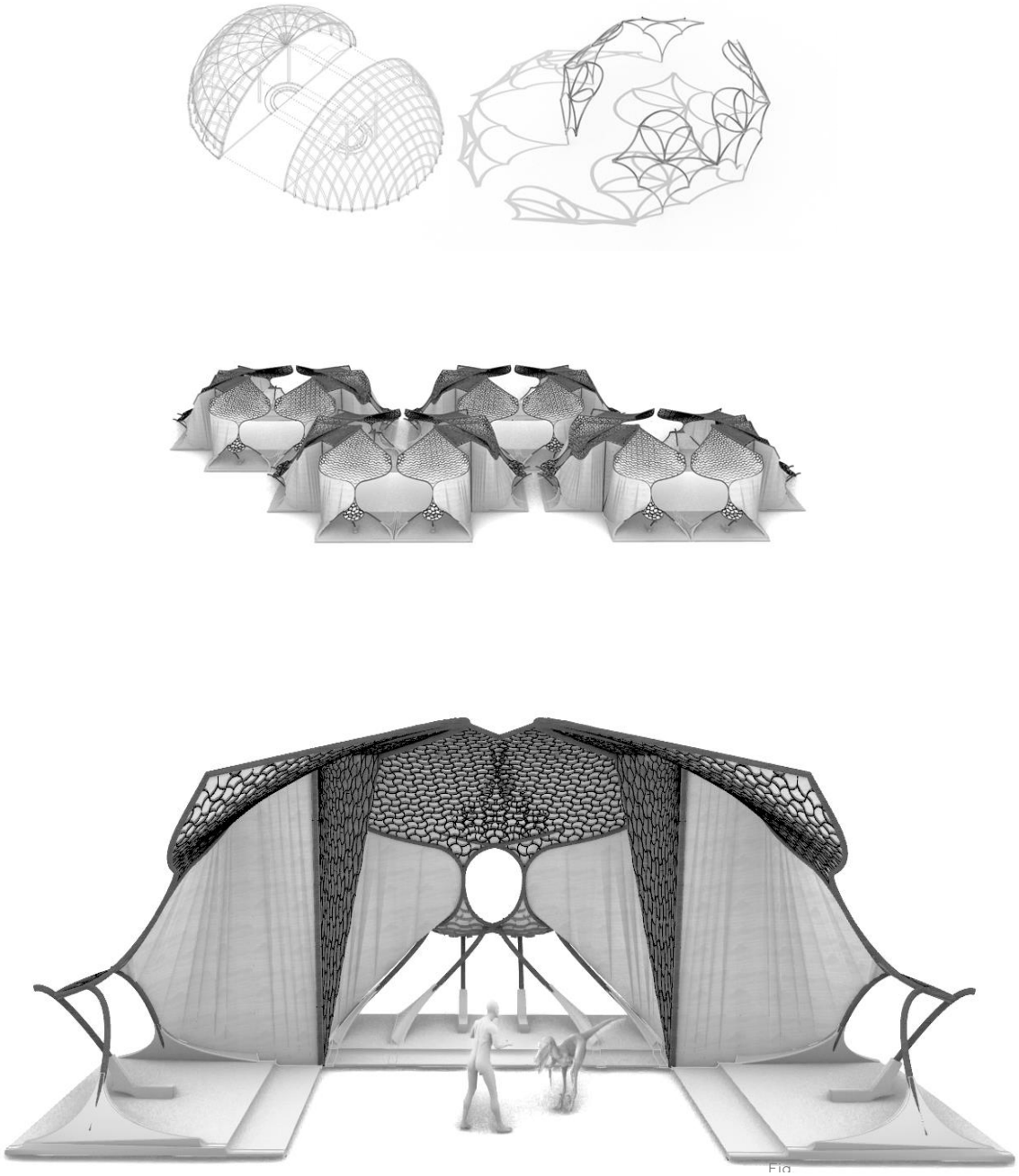
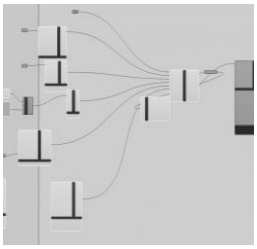


Fig. 2.11: Process of pavilion design using Rhino. (Source: Author)

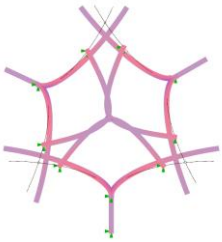
EXPLORING GRID-SHELLS

[Fig. 2.11 explores grid-shell systems through roof dominated pavilions. It reinterprets from heat bent saplings of the !Haru Oms and indigenous grid-shell structures through contemporary advances of steam-bent logs. In this structure, concrete plinths carry steam-bent tectonic load-bearing gum poles that carry an ornate grid-shell lattice roof. Kerf cut timber wall planes create tactile radiant lines. At points of axis changes, permeations allow visual connection through the structure.]

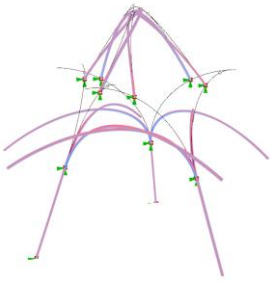
Fig. 2.12



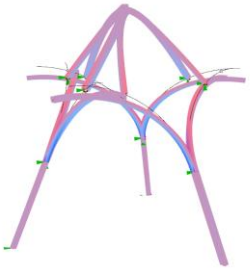
Karamba coding within Rhino



Plan of stresses, pink is tension, blue is compression.



Structural collapse, material too thin



Material thickness optimized

Prototyping: soaking and steaming of timber (pine laminates)

Prototyping: clamping timber around form

Prototyping: Assembly of bent timber components

Fig. 2.12: Process of prototype making of a bent sapling system (Source: Author)

BENDING SAPLING PROTOTYPE

[Fig 2.12 explores the poetic nature of steam-bending through the material having a memory. The process of steam-bending has timber remember a new form and forget its old stiffness. This links to the project's goals of evoking memory through reinterpretations via the relationship of new memories vs old form. This concept is explored above with a 1:100 steam-bent arch structure Fig. 2.11, like the !Haru Oms. The parametric engineering tool, Karamba in Rhino, was deployed to analyse structural tension and compression to aid in material thickness to optimize material usage/wastage in form generation.]

Fig. 2.13

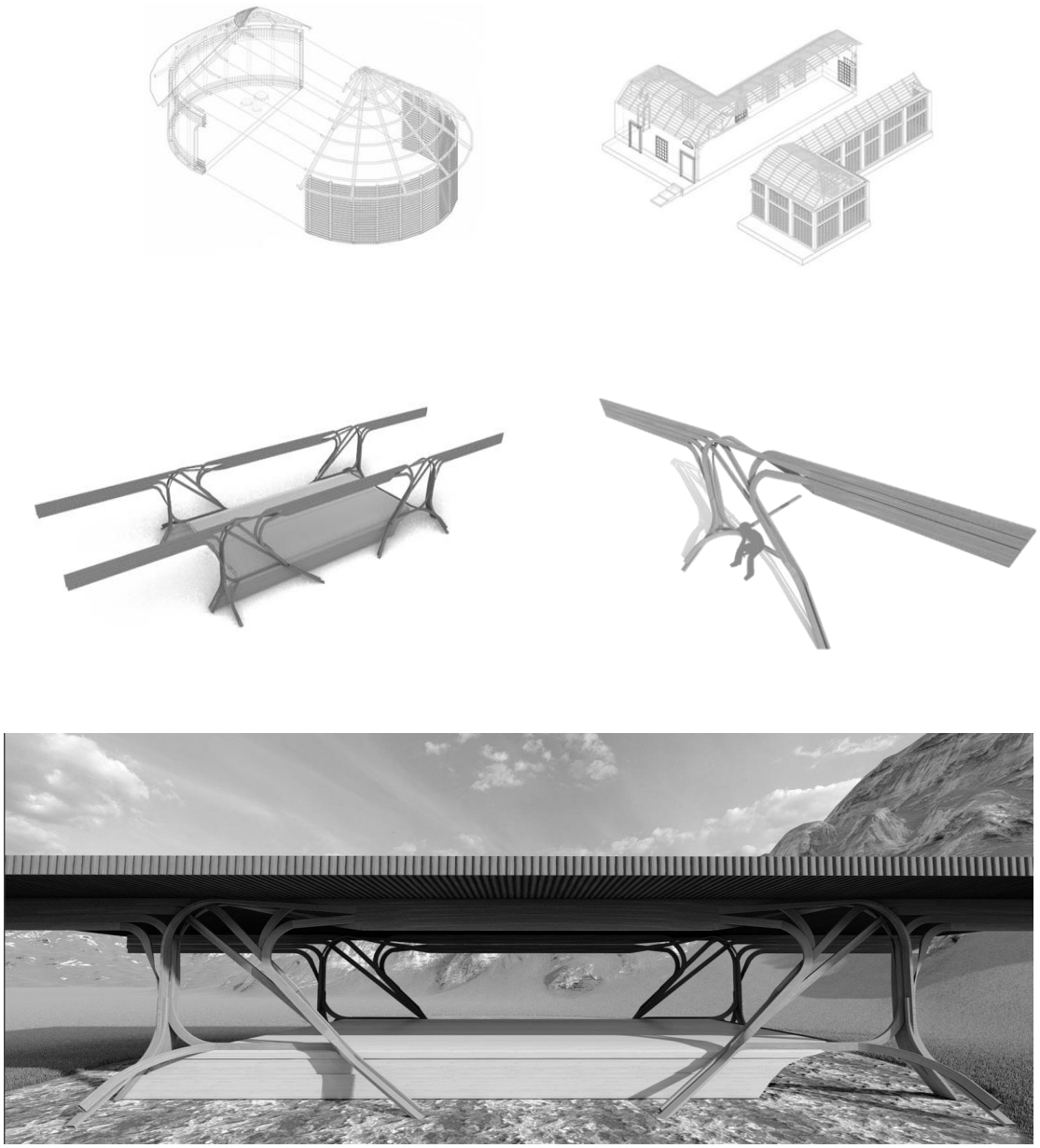


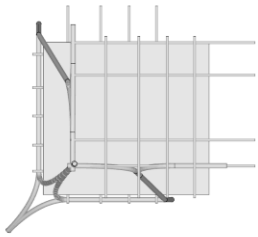
Fig. 2.13 Process of a wattle and daub frame reinterpretation (Source: Author).

EXPLORING FRAMES

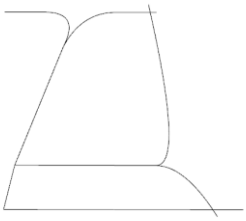
[In Fig. 2.13 frame systems were explored through laminate's ability to bend, twist and weave into different planes whilst providing structural support to the framework system. It provides a reinterpretation of woven wattle along staves in wattle and daub systems and evokes rondawel or early Cape Dutch architecture. Here, elements weave into one another and provide stiffening strength. In this pavilion, a corner frame module is designed, with the laminates connecting into each other across varying planes of columns and beams to carry to roof seamlessly.]

Fig. 2.14

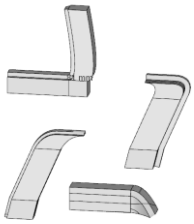
Conceived corner



Plan

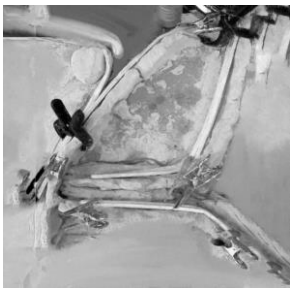


Bent elements



Digital subtractive Moulds for Jig Design

Clay Jig Modelled after Digital elements



Clamping along clay jig

Assembling elements

Fig. 2.14: Process of making a wattle and daub frame reinterpretation prototype (Source: Author).

SPLITTING LAMINATE PROTOTYPE

[The concept was then explored at a 1:20 model of a pavilion corner frame in [Fig. 2.14]. From this simulation I learnt the specific angles to which timber bends the best; between 15 to 60 degrees. I also learnt that the jig integrity is important, and the laminates need to be clamped to the interior of the jig to prevent cracking. This prototyping exercise helped me understand the subtractive nature of the jig; from digital mould to the physical clay structure.]

Fig. 2.15

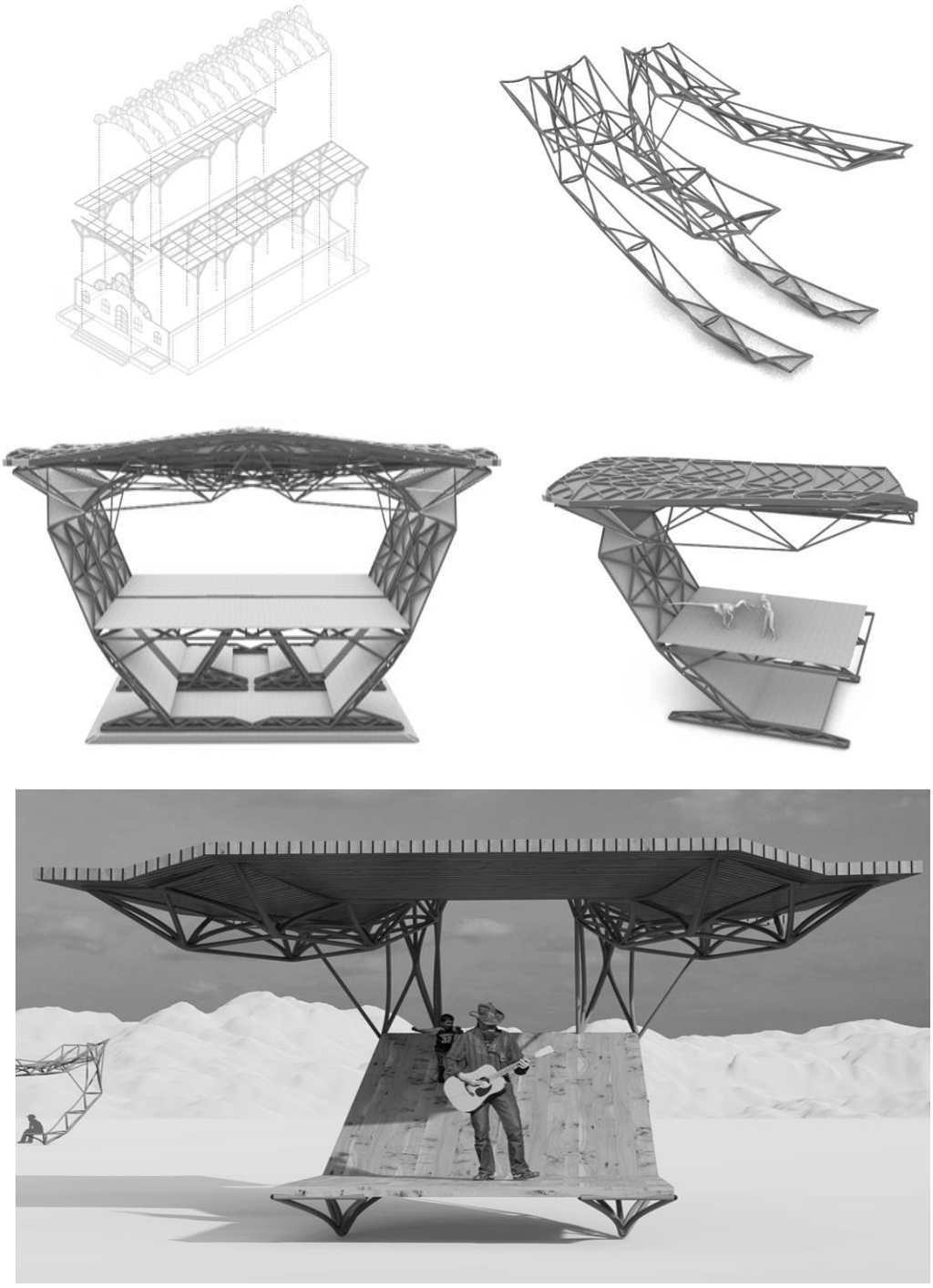
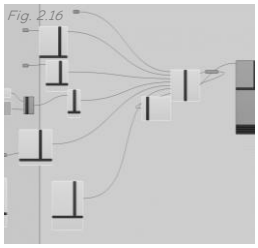


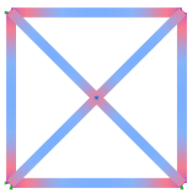
Fig. 2.15: Process of designing a pavilion whilst reinterpreting trusses (Source: Author)

EXPLORING TRUSSES

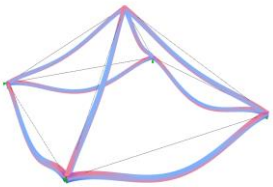
[Plank construction trusses were explored in [Fig. 2.15]. I wanted to explore traditional joinery with innovative space frame tectonic construction. This pavilion goes against trends of timber reduction to the roof as just truss, as seen in the past. It utilizes the loadbearing capacity of spaceframes along all axes to create a structure that is wall, floor, and roof. Thus, creating a system of connecting and folding across planes like origami.]



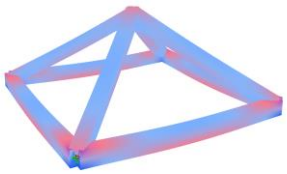
Karamba in Rhino



Plan of stresses, pink is compression, blue is tension



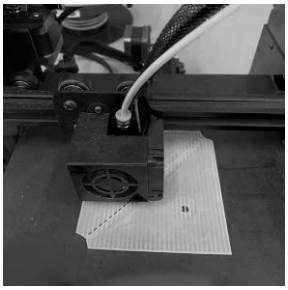
Deformation from material thinness



Optimal material thickness

Sawing the material by hand

Half Lap x Tongue and Groove Joint



3D printed angle

Fig. 2.16: Process of making a joinery detail of a spaceframe truss (Source: Author)

SPACEFRAME TRUSS JOINERY PROTOTYPE

[Traditional timber joinery was explored in a space frame prototype as a 1:5 detail in Fig. 2.16. Karamba was used to assess where the sliding forces are to secure against. 3D printed angles were designed to counter these forces. A hybrid half-lap x tongue and groove joinery system connects the bottom planks whilst an angled plank is joined via the 3D printed angles. The space frame trajectory was weaker for the project's goal, in comparison to the grid-shells or frames, since it does not allow for bending and dynamic form, an opportunity that contemporary innovations in timber have awarded us in new evocative form generation.]

LEARN, SIMULATE, EVOLVE

"If a picture is worth a thousand words, then a prototype is worth a thousand meetings"

- **Tom & David Kelly**

Prototyping and digital modelling provided a material understanding of timber, in lieu of Schindler's periodization model. It aided me in crafting timber by interrogating different past structural systems with contemporary innovation.

From the testing, I felt that a system that blends grid-shells and reinterpreted wattle and daub (frame) is aligned with the project's goals of pushing the envelope and form generation. Since they create more flexible design decision with the materials of gum poles and laminates in comparison to truss planks.

Research into local innovations yielded the best timber treatment for the design, a system of Rhino Modified Wood with a multicultural moon-harvested SA Pine and Eucalyptus laminates. This research gave a background for the design attitudes I have going into siting and massing within the design section of the thesis.

Fig. 2.17 Prototypes made in preparation for design investigation (Source: Author)

HOUTBAAI

Bay of Wood

-34.030814, 18.355008

SECTION 3: THE SITING

Transmuting Timber Trajectories

SITING AND PROGRAMME I

"Art is a ripening, an evolution, an uplifting which enables us to emerge from darkness into a blaze of light."

-Jerzy Grotowski

The ontological principles of the Roof, Connection and Tectonic present in past South African timber practice yields architecture values of unity, spatial tectonic, permeability and an honesty to materiality.

To explore timber's potential as a connective and permeable spatial tectonic would mean developing the project on an appropriate site and programme.

I have adopted the attitude of viewing this this zeitgeist as a potential and socially just alternative for problematic architectural forms that do not adopt the inviting openness of timber tectonic.

My personal connection to the fine arts placed me on a trajectory of being enthusiastic on addressing the institutional form of cultural fraternities. Such fraternities are art galleries and museums, an architectural form that the open timber tectonic could address due to its hard, excluding edges.

Fig. 3.1

Fig. 3.1: Artworks I've done over the years (Source: Author)

SITING AND PROGRAMME II

The project sits on an open field site between Imizamo Yethu and the Helgrada-Kronenzicht sub-districts in Hout Bay, Cape Town, South Africa.

The site was derived after a series of mapping exercises that examined the art route of the Cape coast, through the major towns. Cape Town was chosen for its site accessibility for me and its contested urban fabric.

The choice of Hout Bay was due to two reasons. The first is its heritage of ship building and its woody atmosphere. It is an appropriate trajectory, coming out of the study, as not only would it evoke national cultural memories of craft it also provides local cultural substance through links to the nautical context.

The second reason is the contested urban fabric. The informal settlement of Imizamo Yethu, exemplifies injustice when one compares its density, poverty levels and amenities to the neighbouring sub-districts. This provides a site to assess timber tectonics in extending themselves from technology and into the socio-spatial realm a design strategy that pushes outside of the building's envelope.

On a spatial justice level, informal settlements often experience an underservice in public cultural amenities and civic space due to the priority of other needs. This does a disservice to the cultural development of these settlements and their inhabitants. Thus, a programme of a community cultural centre with public spaces is formed.

The current Hout Bay art galleries displacement are far removed from Imizamo Yethu. And the lack of cultural educational facilities rehashes spatial injustice of inclusion and public participation.

The Lalela project is a cultural charity initiative that provides art education to combat youth gangsterism in Hout Bay. Its success highlights the communities' desire for formalized cultural facilities within Hout Bay and shows the current cultural spaces are insufficient.

Fig. 3.2: Site Location (Source: Author after Google Earth)

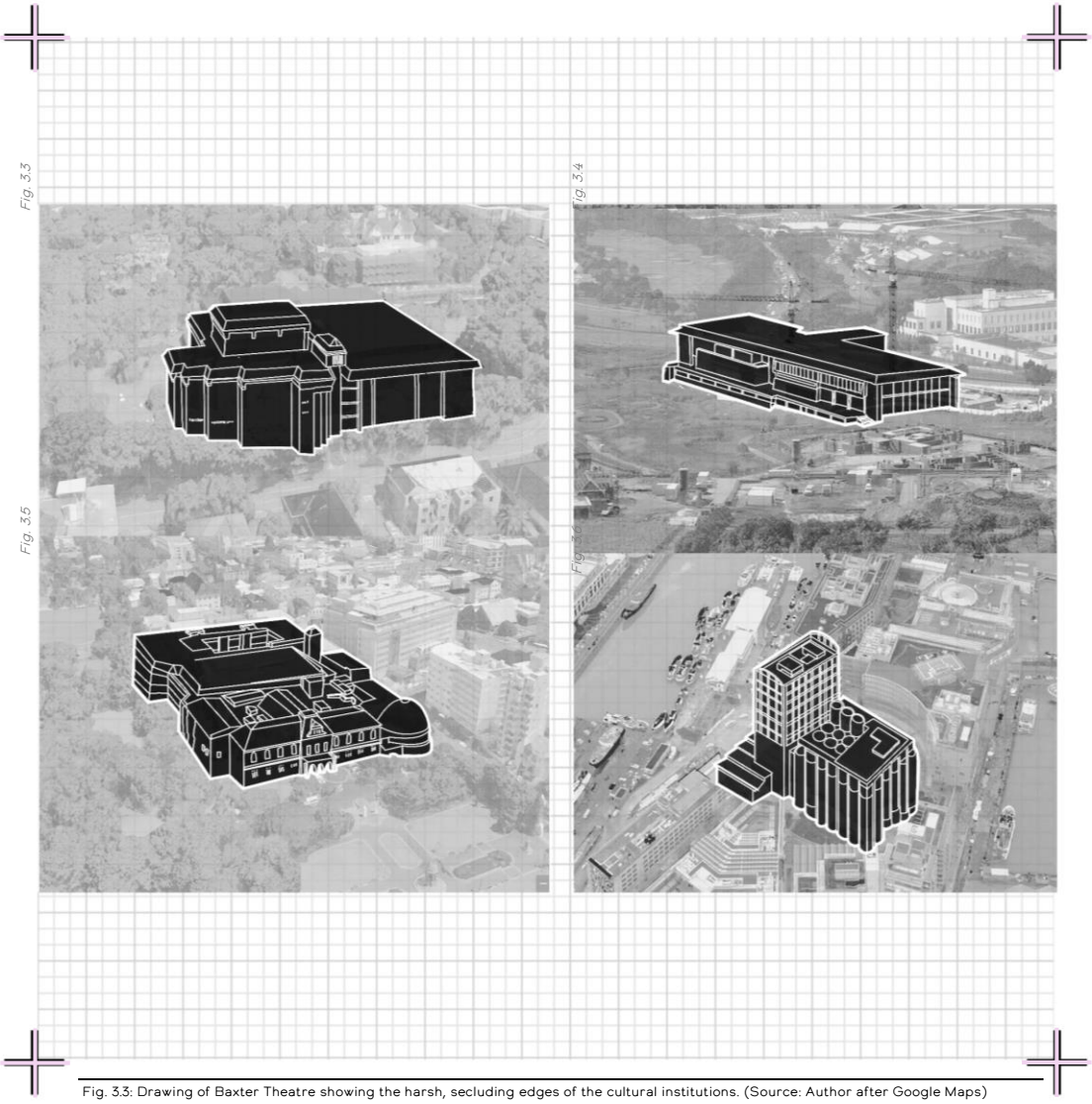


Fig. 3.3: Drawing of Baxter Theatre showing the harsh, secluding edges of the cultural institutions. (Source: Author after Google Maps)

Fig. 3.4: Drawing of Norval Foundation showing the harsh, secluding edges of the cultural institutions. (Source: Author after Google Maps)

Fig. 3.5: Drawing of Iziko Museum showing the harsh, secluding edges of the other institutions. (Source: Author after Google Maps)

Fig. 3.6: Drawing of Zeitz Mocaa showing the harsh, secluding edges of the cultural institutions. (Source: Author after Google Maps)

STEREOTOMIC EXCLUSION

[Like castles on a hill, our stereotomic dominated cultural institutes sit offset and secure against the public realm through fences, privatized property ad tight controlled accessways. Hard edges, lack of public/civic space and poor thresholds define these current architectural cultural institutional forms. This promotes exclusion through the feeling of being "guarded" from the public due to the provision of security it provides (Odendaal, 2019, p. 64-93).]

Fig. 3.7

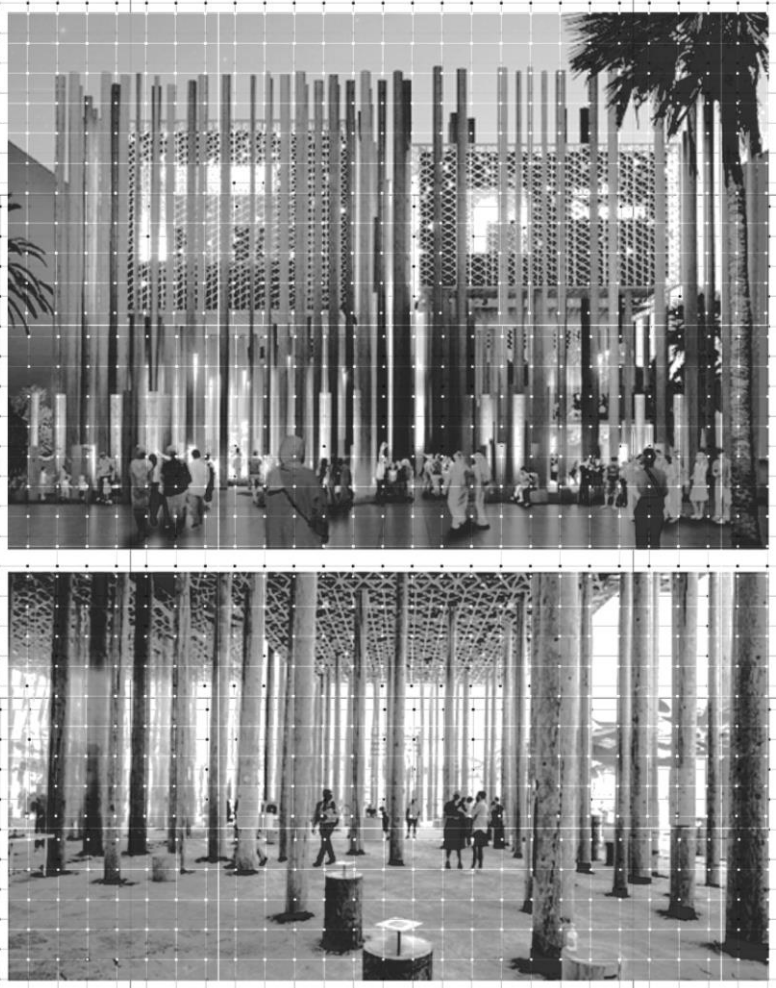


Fig. 3.7: The Swedish Pavilion, The forest, Dubai World Expo 2020 by Bellprat Partner. Timber tectonic expressed through tall gum poles that carry the roof. Under the buildings mass, intricate space is inferred through the position of the columns, tighter columns create better spatial articulation whilst sparser spaced columns encourage connection through sight permeation and circulation. (Source: Author after Archello)

TECTONIC INCLUSION

[Tectonic structures provide an architectural response and attitude against the prior stereotomic exclusion. They are lighter on the ground and allows for permeation. The permeation between structures creates a spatial tectonic. This infers layered spaces through the softening of edges that connect spaces and people together.]

Fig. 3.8

ART ROUTE OF THE CAPE

[Fig. 3.8 is a map of an art route through the Cape and reveals a lack of community-centric galleries. It also reveals a trend of monolithic, imposing architectural massing within those spaces, from the Zeitz Mocaa to Something Els. (Source: Author with images from Archdaily et al)]

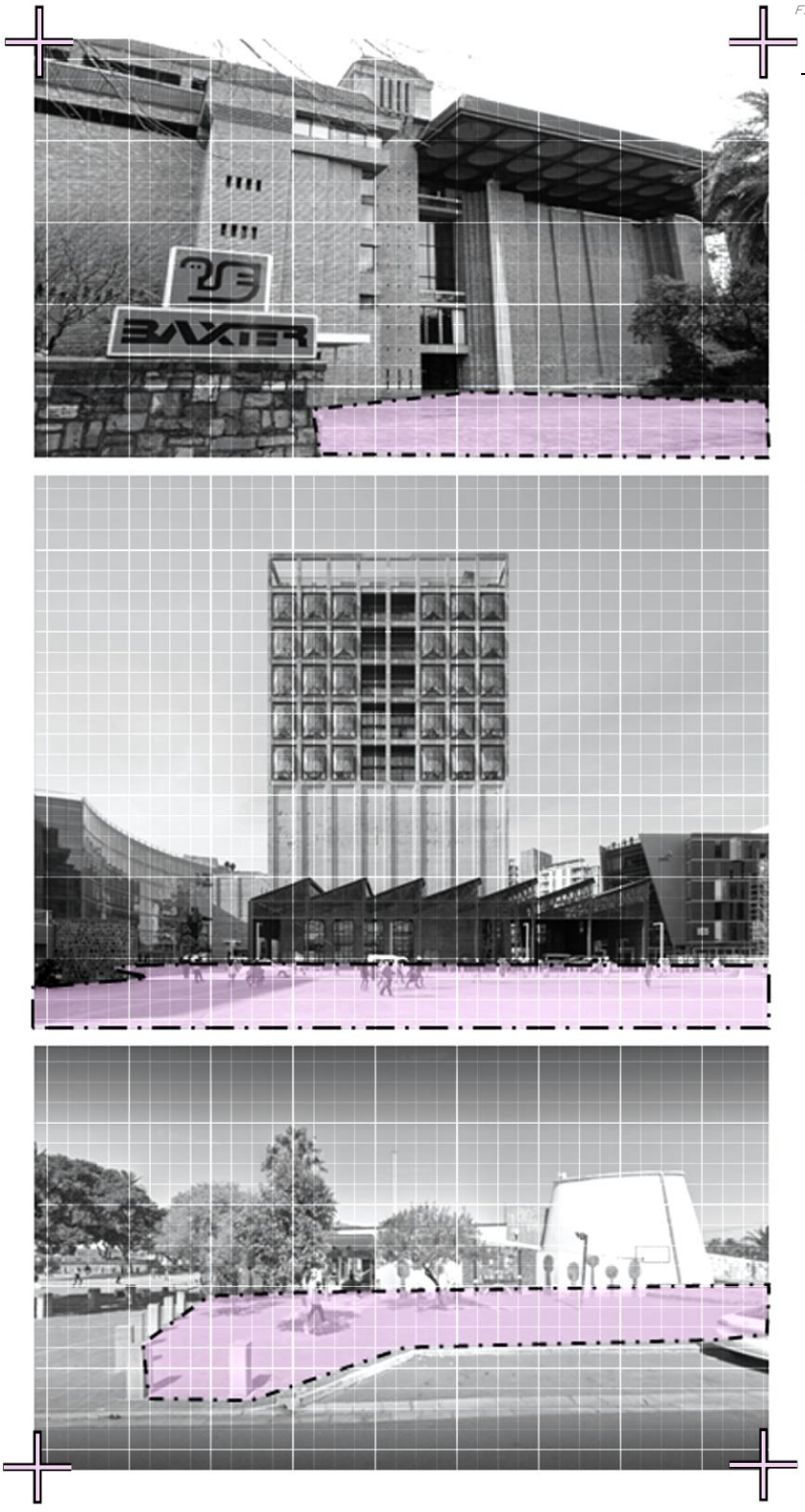


Fig. 3.9

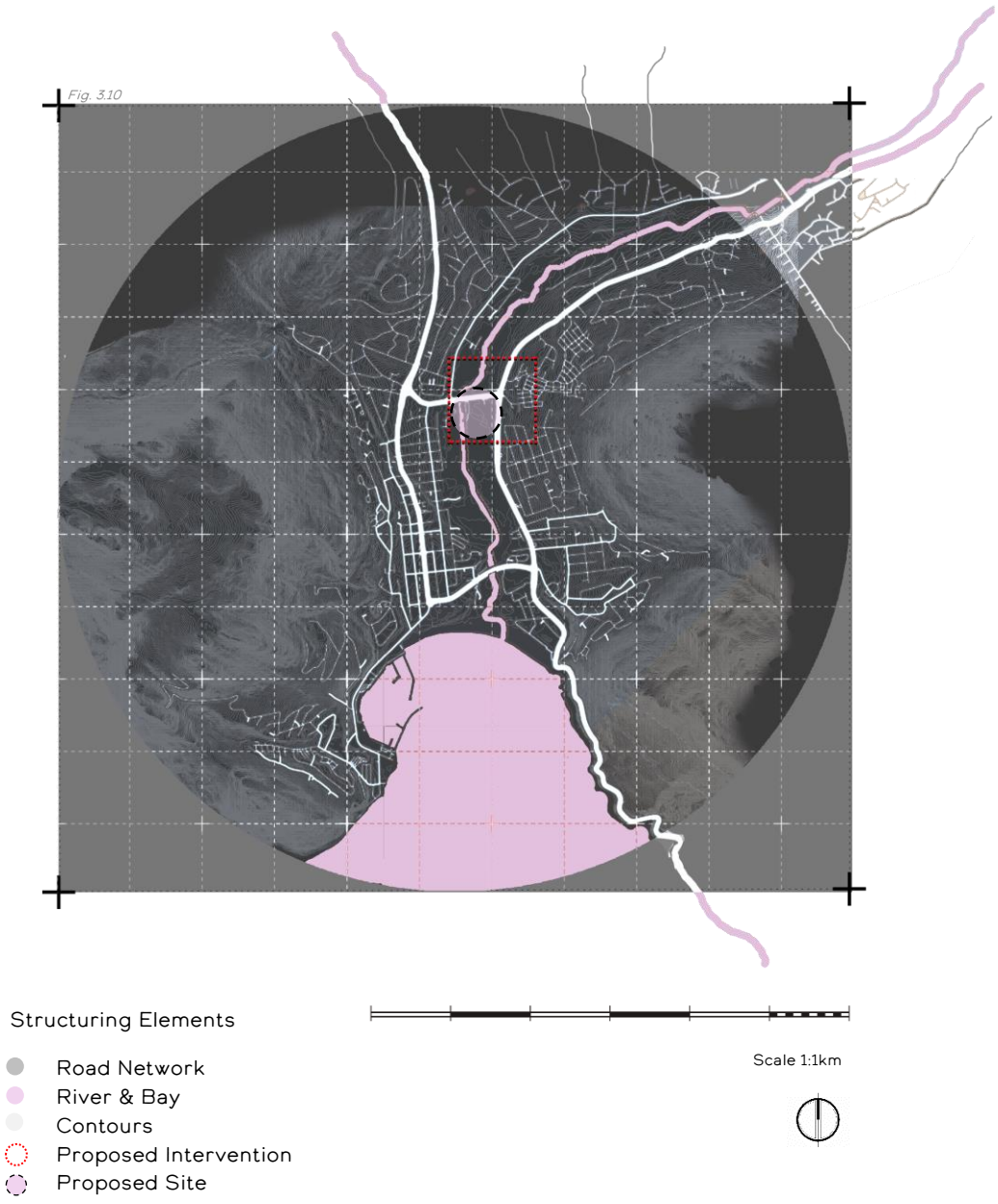
Fig. 3.9: Forecourt analysis of the Baxter Theatre, Zeitz Moccaa and Gugu S'thebe

The Baxter, Zeitz Moccaa and Gugu S'tbehe both use forecourts as a threshold to their building and public space. However, the public spaces in the Zeitz Moccaa and Baxter feel overwhelming due to the lack of human scaled thresholds.

This is perpetuated by the Baxter's forecourt being too small and privatized and the Zeitz's forecourt being too large and empty. Gugu S'thebe's forecourt meets a low mass entrance, it is a completely public space and not offset from the road or public circulation. This encourages a variety of activity from informal markets to children playing between the bollards and adjacent sports field. (Source: Author after Archdaily et al)

THE ROLE OF CULTURAL INSTITUTIONS FORMS

[Our current art spaces are heavy, self-important, authoritative forms that exert it's a cultural fraternity authority over society and other craft forms. This imposingness creates a sense of exclusion from edges to site location, which are often inaccessible to poorer communities. A thriving local example that goes against this trend is Gugu S'thebe in Langa, Cape Town [Fig. 3.9].]



HOUT BAY DISTRICT STRUCTURING ELEMENTS

[Fig. 3.10 is a map of the road arteries that displace and control access to opportunities and amenities of other sub-districts in Hout Bay. The density of road structuring elements and their layouts disconnect the sub-districts through reliance on the linear major roads. (Source: Author)]

Fig. 3.11

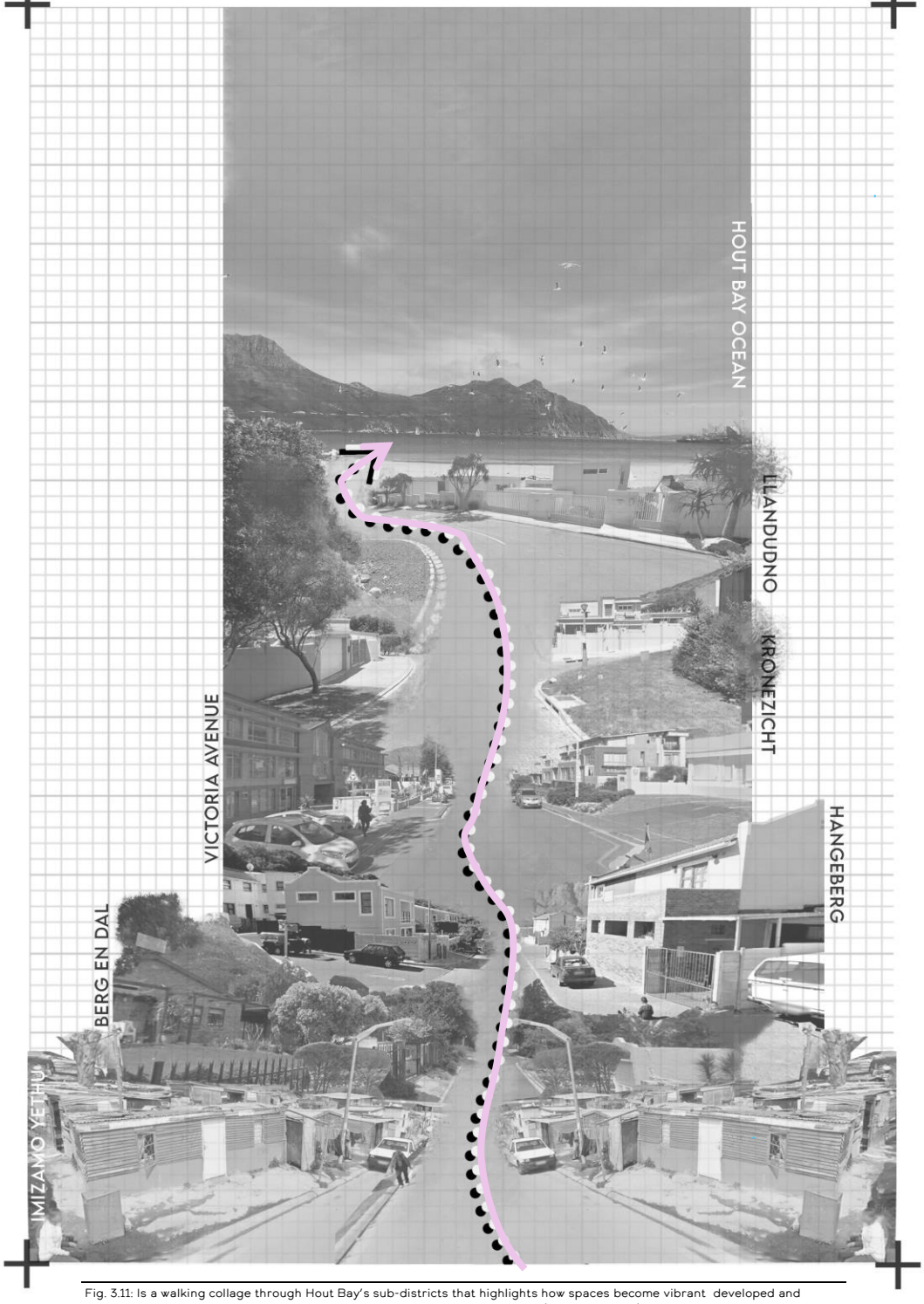
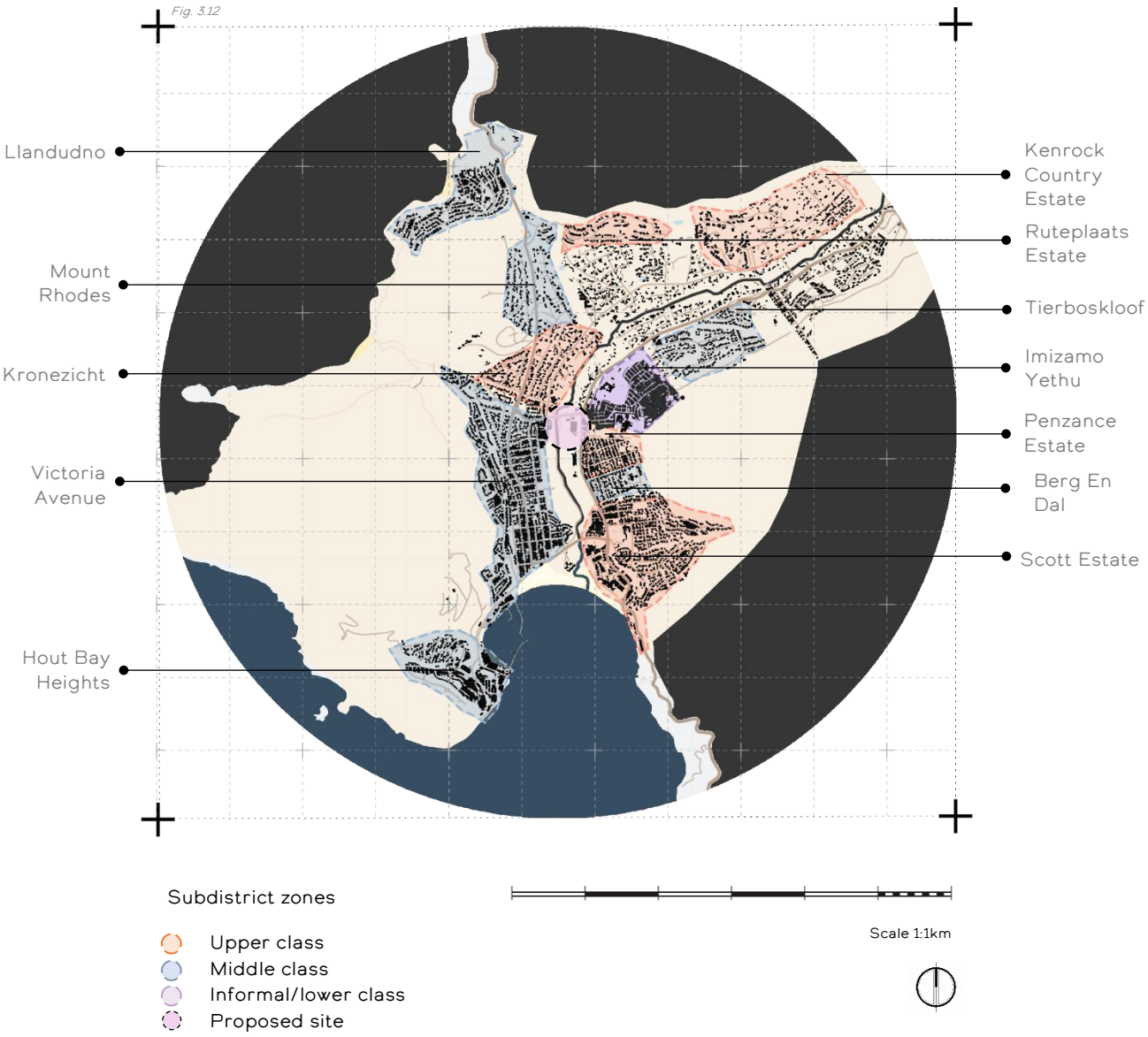


Fig. 3.11: Is a walking collage through Hout Bay's sub-districts that highlights how spaces become vibrant developed and deteriorate depending on sub-district class, with Imizamo being the poorest. (Source: Author)

SPATIAL INJUSTICE I

[Spatial injustice, as defined by Dewar, is a result of apartheid planning that caters for the few and not the public in the performative aspects of human habitation. It can be addressed through desirable urban performative qualities such of socio-economical sustainability, environmental justice, spatial integration, resilience, and a sense of place (Dewar, 2019, p.57-69). The classist sub-districts of Hout Bay are indicative of privilege; urban space fluctuates in quality and vibrance (Dewar and Uytenbogaardt, 1996, p1-33) depending on class. Fig 3.11]



SUB-DISTRICT CLASSES

[Fig. 3.12 is a map showing Hout Bay's division into classist sub-divisions ranging from informal settlements to upper-class estates (Source: Author)]

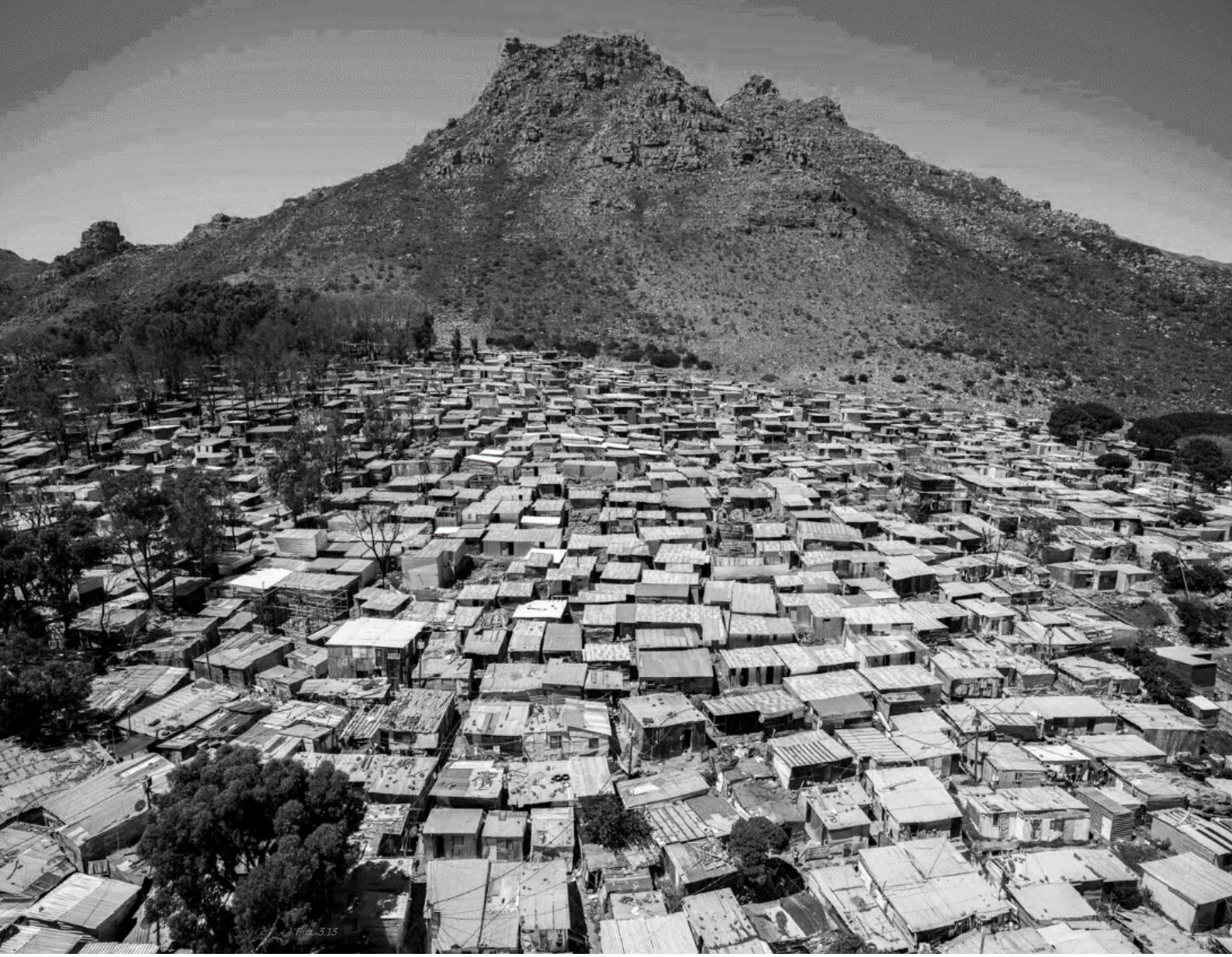
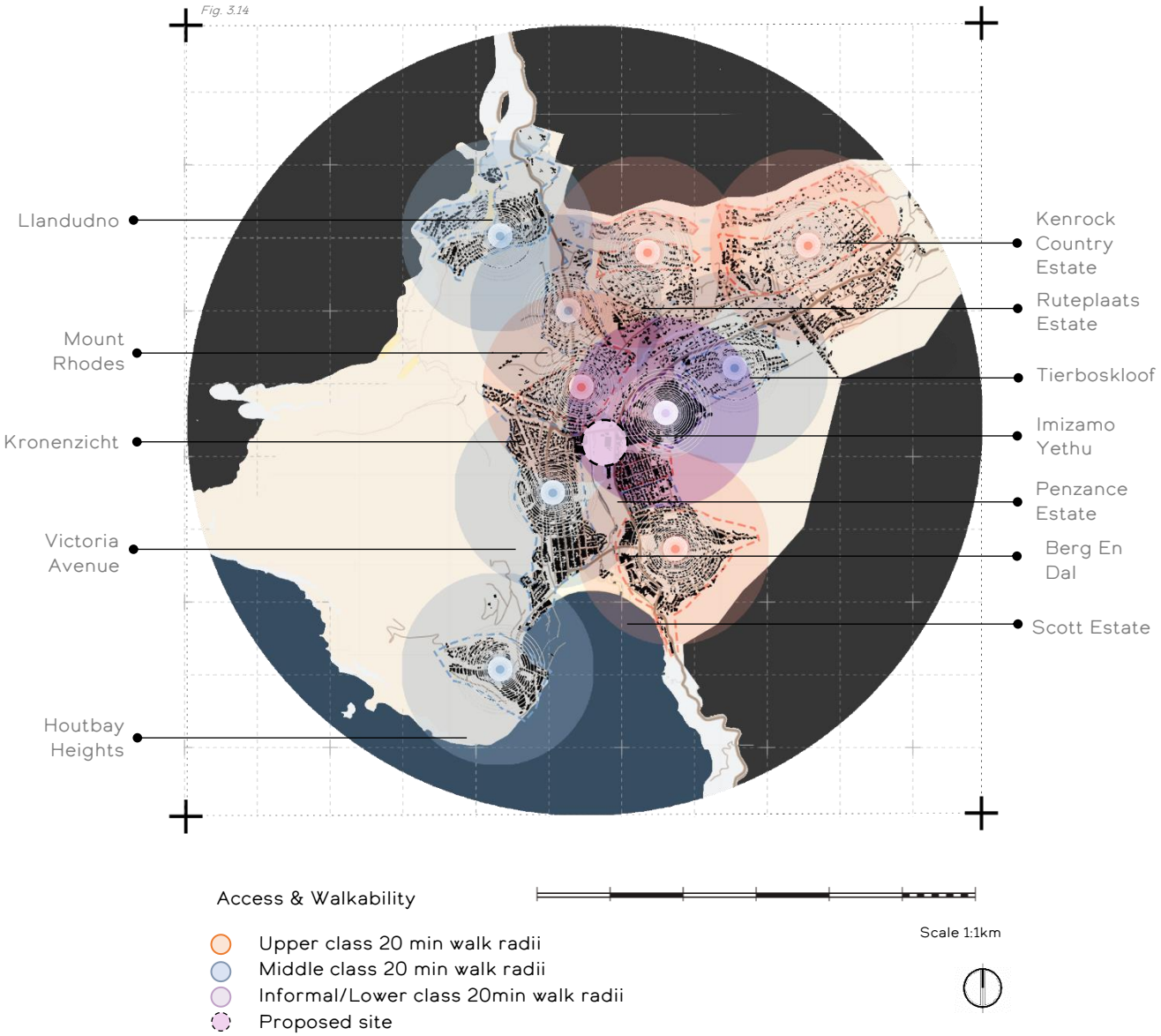


Fig 3.13: The sprawl of Imizamo Yethu is confined to the slopes of the Skoorsteenberg peak (Source: Millefoto.com)

SPATIAL INJUSTICE II

[Imizamo Yethu suffers from the spatial planning of Hout Bay. The informal settlement experiences uneven urban sprawl [Fig. 3.13]. The settlement is wedged between two wealthier districts causing it to grow precariously higher up the mountain.]

Fig. 3.14



TERRITORIES

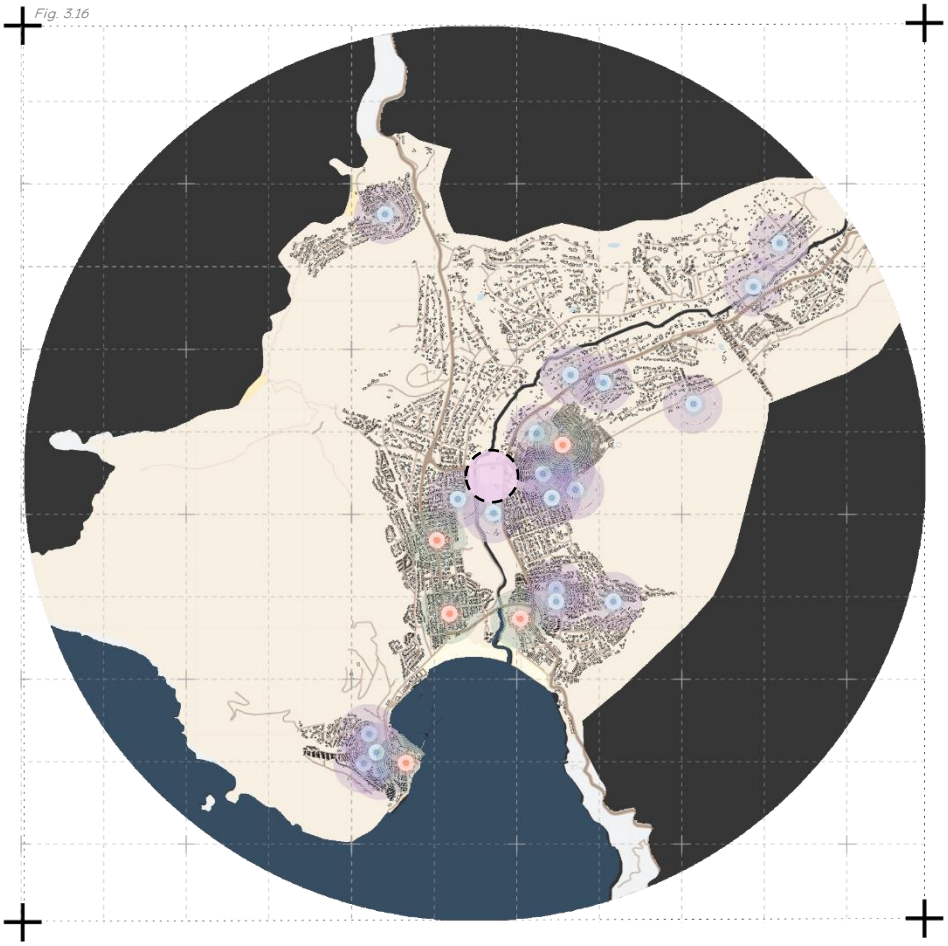
[Fig. 3.14 shows Hout Bay's division into classist sub-divisions ranging from informal settlements to upper-class estates. These territories contain walking distance amenities within themselves that are inaccessible that limit walkable access to amenities (Source: Author)]

Fig. 3.15

Fig 3.15: Apartheid white only beach area sign (Source: thoughtco.com)

SPATIAL INJUSTICE III

[Imizamo Yethu has been subjected to unequal access to amenities, resources, and opportunities in Hout Bay, which lie on the fringes of the town. It is like classist apartheid spatial planning and for this reason, makes Imizamo Yethu an appropriate choice for a site amenity that would benefit the community.]



SCHOOLS AND COMMUNITY CENTRES

[Fig. 3.16 High schools, educentres and primary schools are abundant around Hout Bay though classist divides result in some schools having better access to opportunities than others. (Source: Author)]

Fig. 3.17

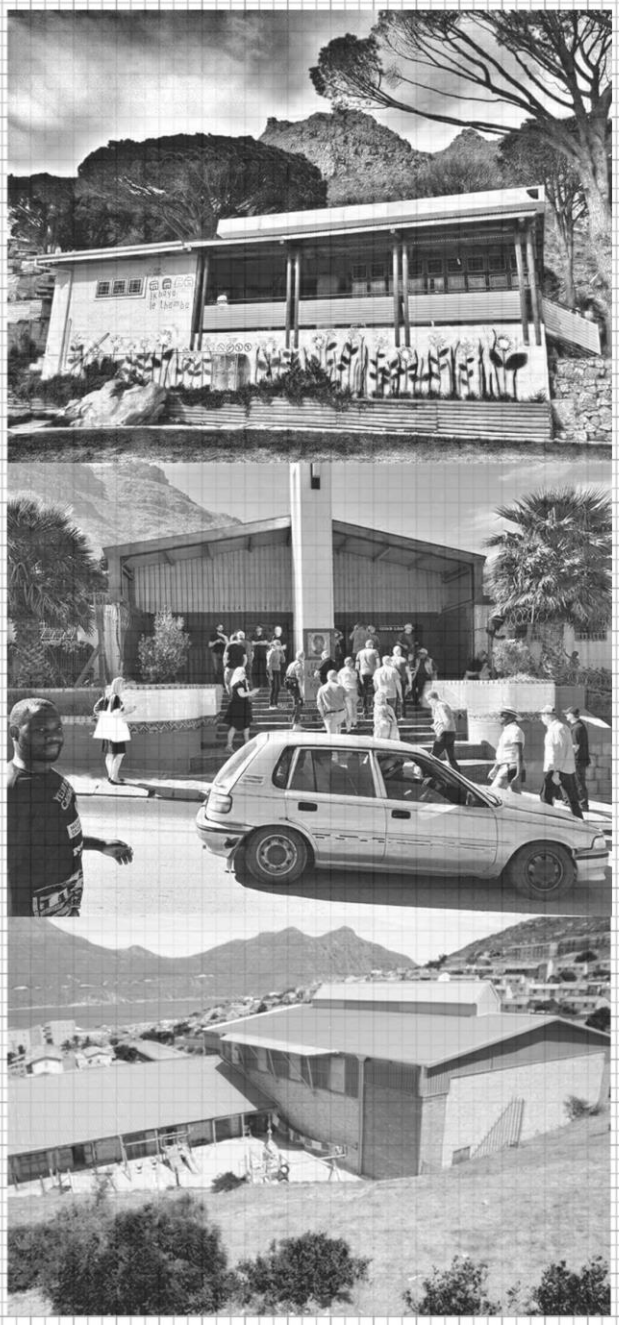
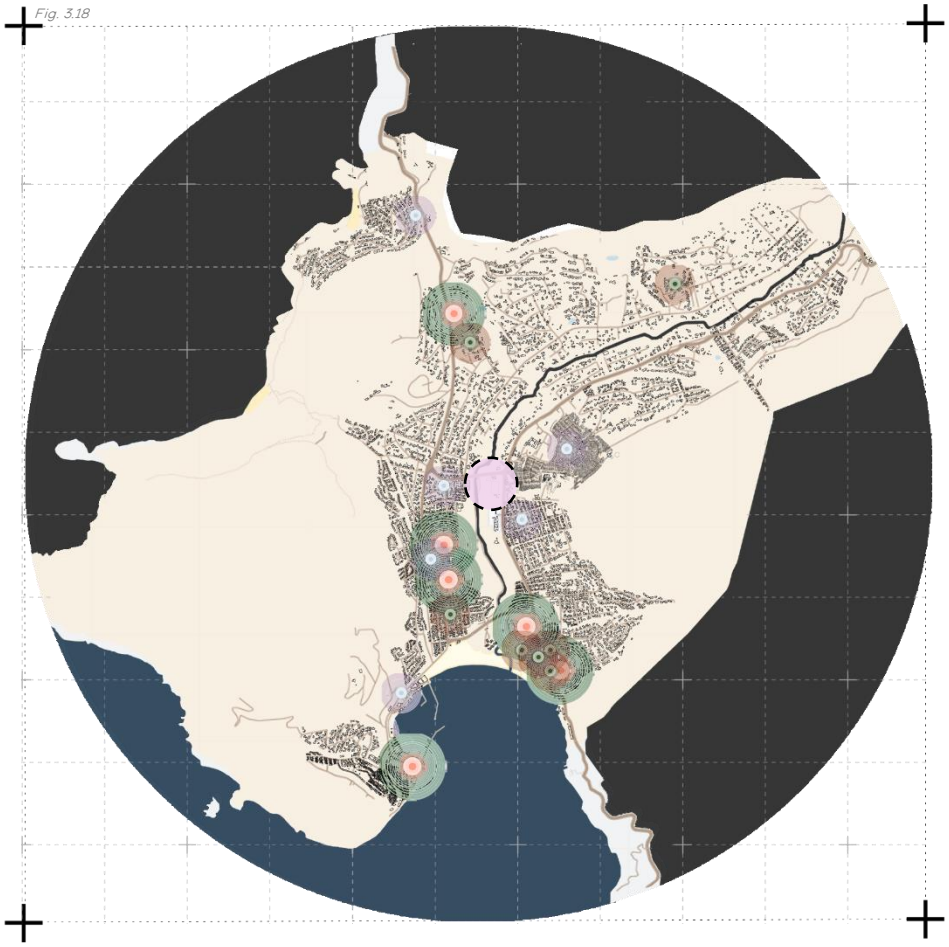


Fig. 3.17: Various centres of community gallery in Hout Bay. From top to bottom: Ikahaya Lethemba, Iziko Lombeni and the Hout Bay Civic Centre (Source: Author after Capetown.gov.za)

FORMS OF CENTRES

[Community centres around Hout Bay are often lacking in amenity and scale. As well as displaced from Imizamo Yethu. Community lead projects are often charity based as seen in Lalela project, Ikhaya Lethemba and Iziko Lombeni Fig. 3.17]

Fig. 3.18



Cultural Mapping

- Performance nodes
- Music nodes
- Fine Arts nodes
- Proposed site

Scale 1:1km

CULTURAL AMENITIES

[Fig. 3.18 is a mapping of Hout Bay's cultural amenities nodes. The present art galleries are aimed at exclusivity and do not provide cultural education apart from exhibition. Dance and theatre schools are abundant but there are no community theatres nearby.(Source: Author)]

Fig. 3.19

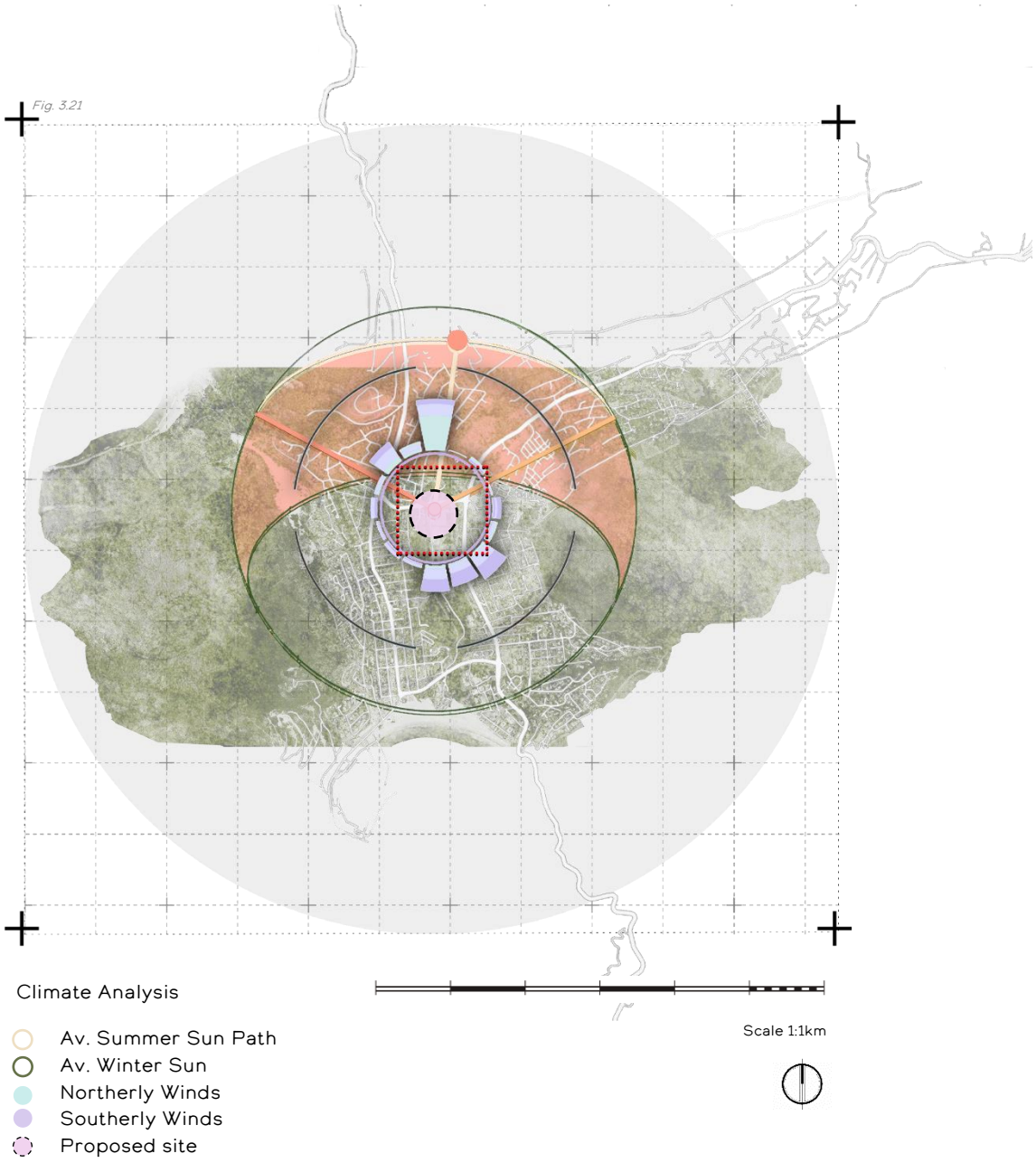
Fig. 3.20

Fig. 3.19: Helen Sebidi was originally a domestic worker and became an artist through encouragement from her employer (Lumvida, 2022). She has contributed to our national art culture with works like *The Child's Mother Holds the Sharp Side of The Knife,* on the left, and has been awarded the Order of iKhamanga making her a national treasure. (Source: Norvalfoundation.org)

Fig. 3.20: Willie Bester is a renowned artist from one of the poorer Cape Town suburbs of Montagu (Bester, 2022). He has contributed to our national art culture through his resistant art that was ignited from his experience of forced removals. On the left is an iconic piece of his, *Trojan Horse III.* (Source: Contemporary-african-art.com)

ART EDUCATION FOR CULTURAL SUBSTANCE

[Providing cultural amenities and knowledge to impoverished communities has yielded great cultural substance to us as South Africans (Fig. 3.19 and Fig. 3.20). Cultural education and engagement have the potential to uplift communities. "Urban and economic growth relies on the influx of and habitation by individuals engaged in 'creative ' fields of work" – Richard Florida, "The Creative Class." p.16/52 (Florida, 2002, p. 16-52)]

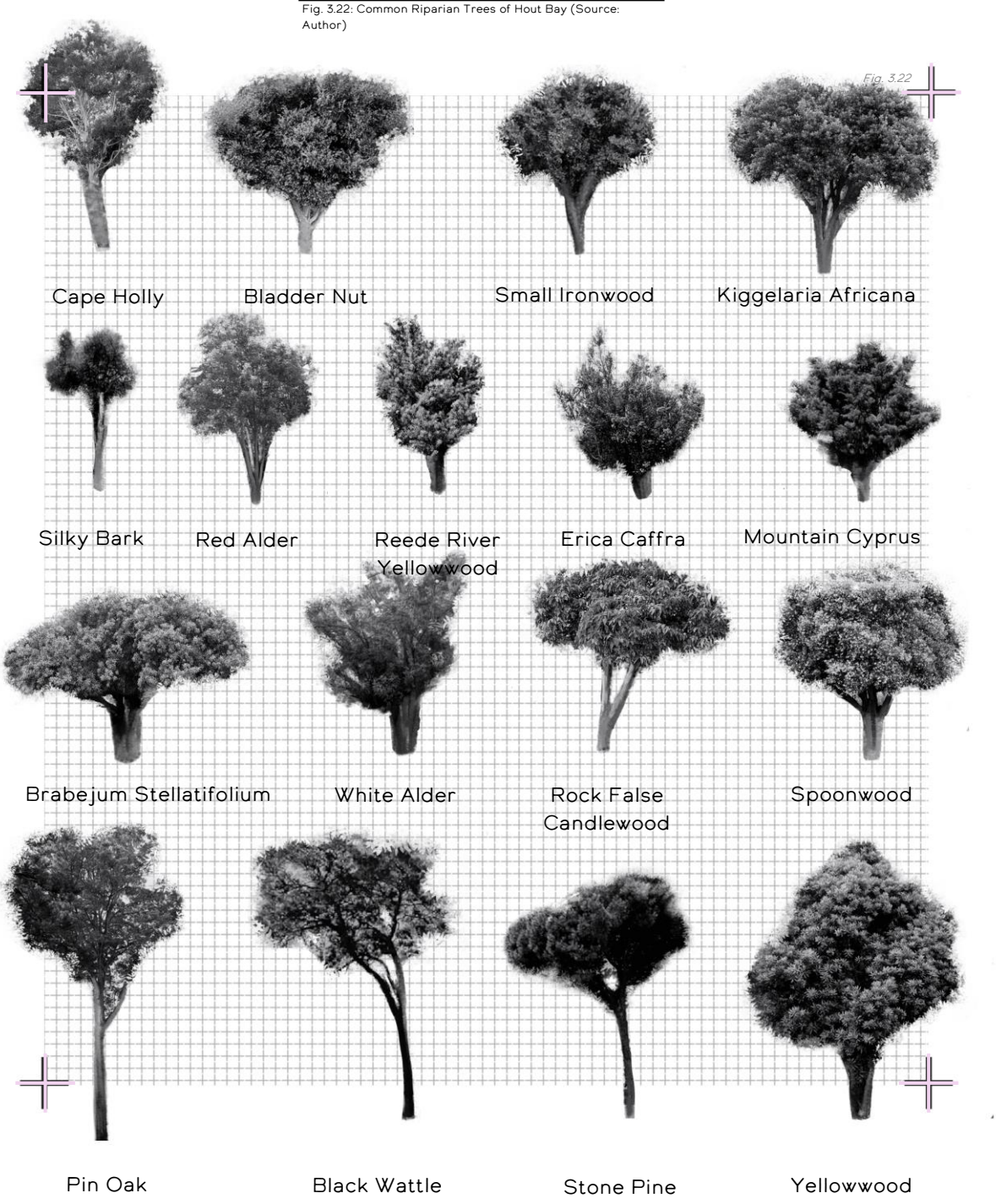


CLIMATE ANALYSIS

[Fig. 3.21 is a climate analysis of Hout Bay, Strong north and south easterly winds blow across the map between the mountain peaks. The Sun rises in the Skoorsteenberg peak and sets behind the Table Mountain Reserve. (Source: Author)]

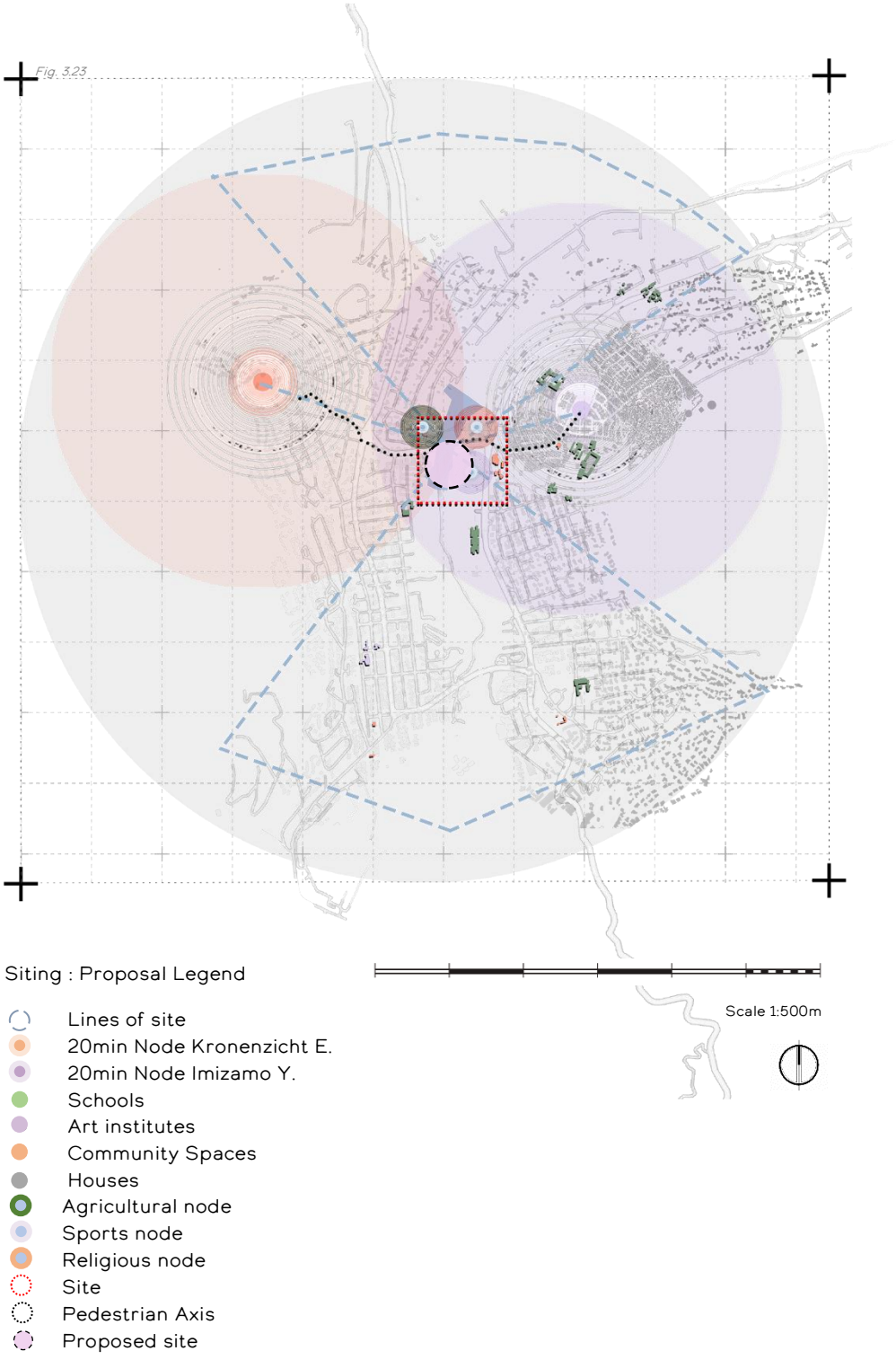
Riparian Trees of Hout Bay

Fig. 3.22: Common Riparian Trees of Hout Bay (Source: Author)



NATURE/ENVIRONMENT

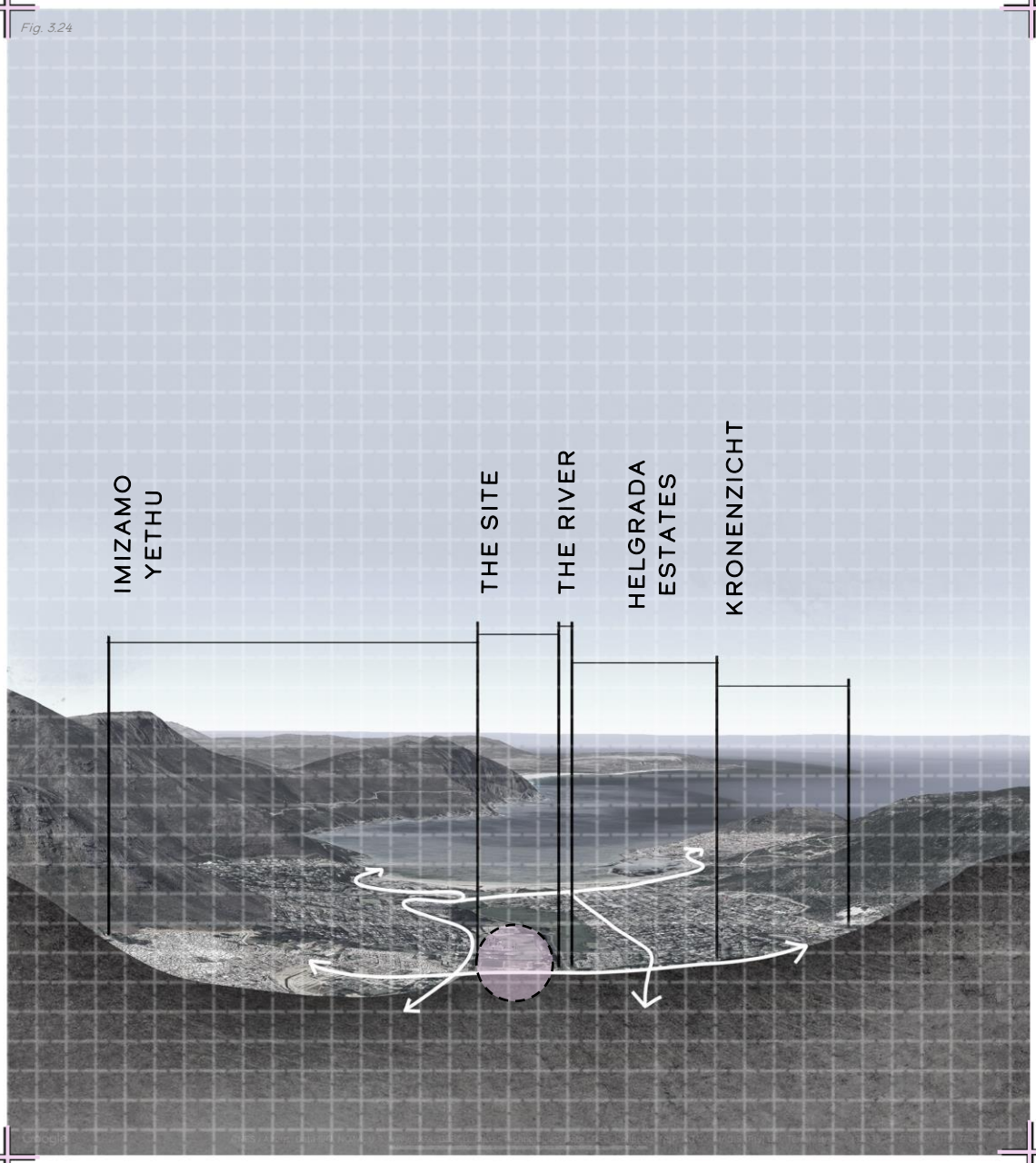
[The name Hout Bay dates to 1653 inspired by the plentiful Yellowwood trees which early Dutch settlers found to be growing in ravines and harvested them for local shipbuilding. Regenerative felling took place and eventually alien stone pine, and oak trees dominated the treeline of Hout Bay from as early as 1655 (De Villiers, 2016, p. 6-35). Today a mix of alien and indigenous Afromontane forests populate Hout Bay.]



PROPOSAL SITE

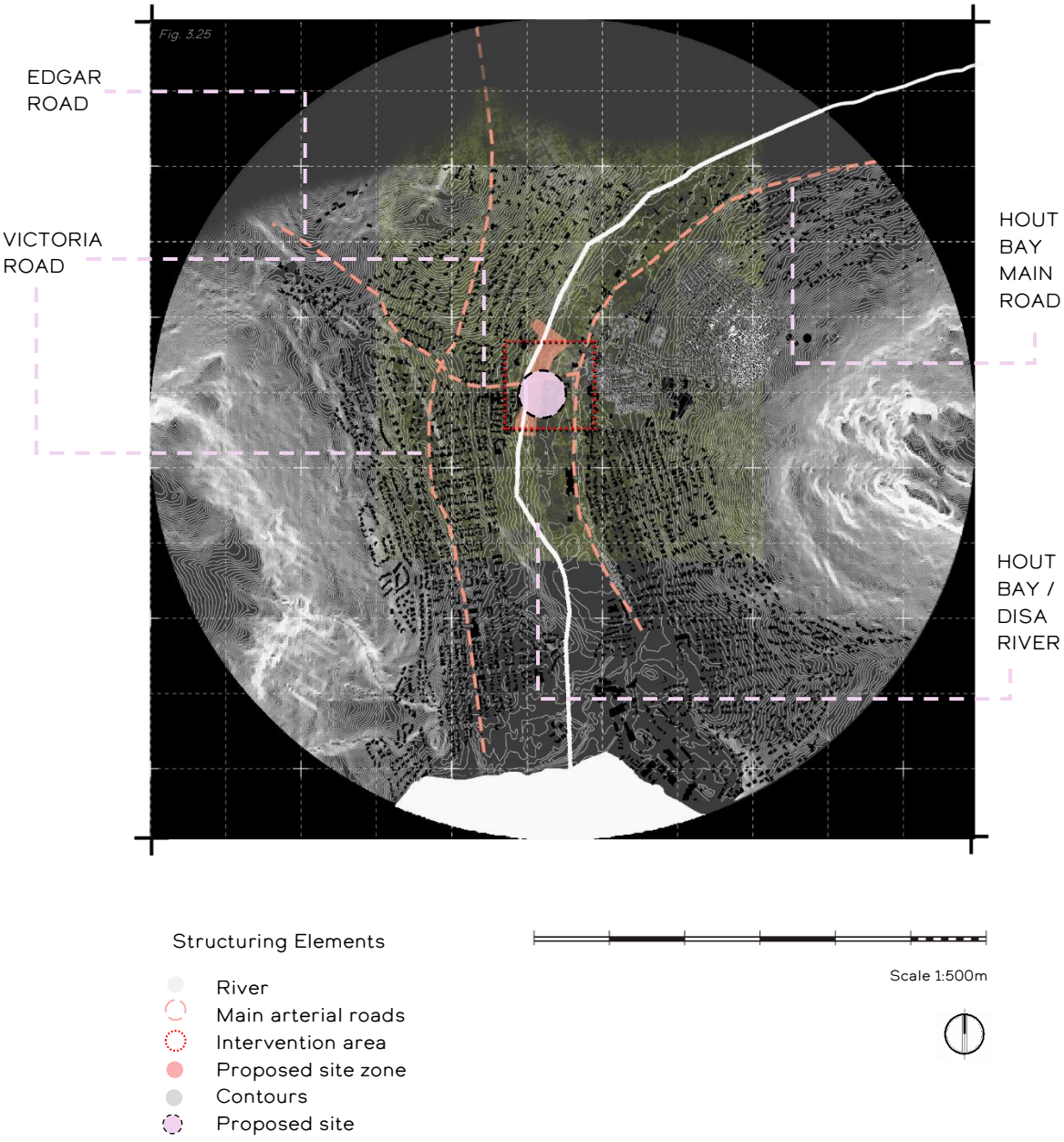
[Fig. 3.23 A mapping of subdistrict desire lines, amenities, schools , cultural and municipal lines determined the location of the site. The chosen location was in proximity to Imizamo Yethu and provides an architecture and programme to promote a good sense of place that is environmentally and socio-economically just (Dewar, 2019, p 57-69). The chosen site sits on an open field site in the valley between Imizamo Yethu and the wealthier Helgrada-Kronenzicht estates. (Source: Author)]

Fig. 3.24



CONNECTION

[Fig. 3.24 shows the site is in a prime location to become the hearth of Hout Bay. It is situated between the sleepy mountains, adjacent to the renowned river and has sights to the bay below. It serves as a convenient spot for gathering of the residents without excluding those at the periphery, the residents of Imizamo Yethu. (Source: Author)]



SITE STRUCTURING ELEMENTS

[Fig. 3.25 The site is nestled between two mountainous peaks, the Table Mountain Reserve, and the Skoorsteenberg Peak. A bridge lies between the two main roads articulating its orientation with the Hout Bay or Disa river cutting through the centre (Source: Author)]

Fig. 3.26

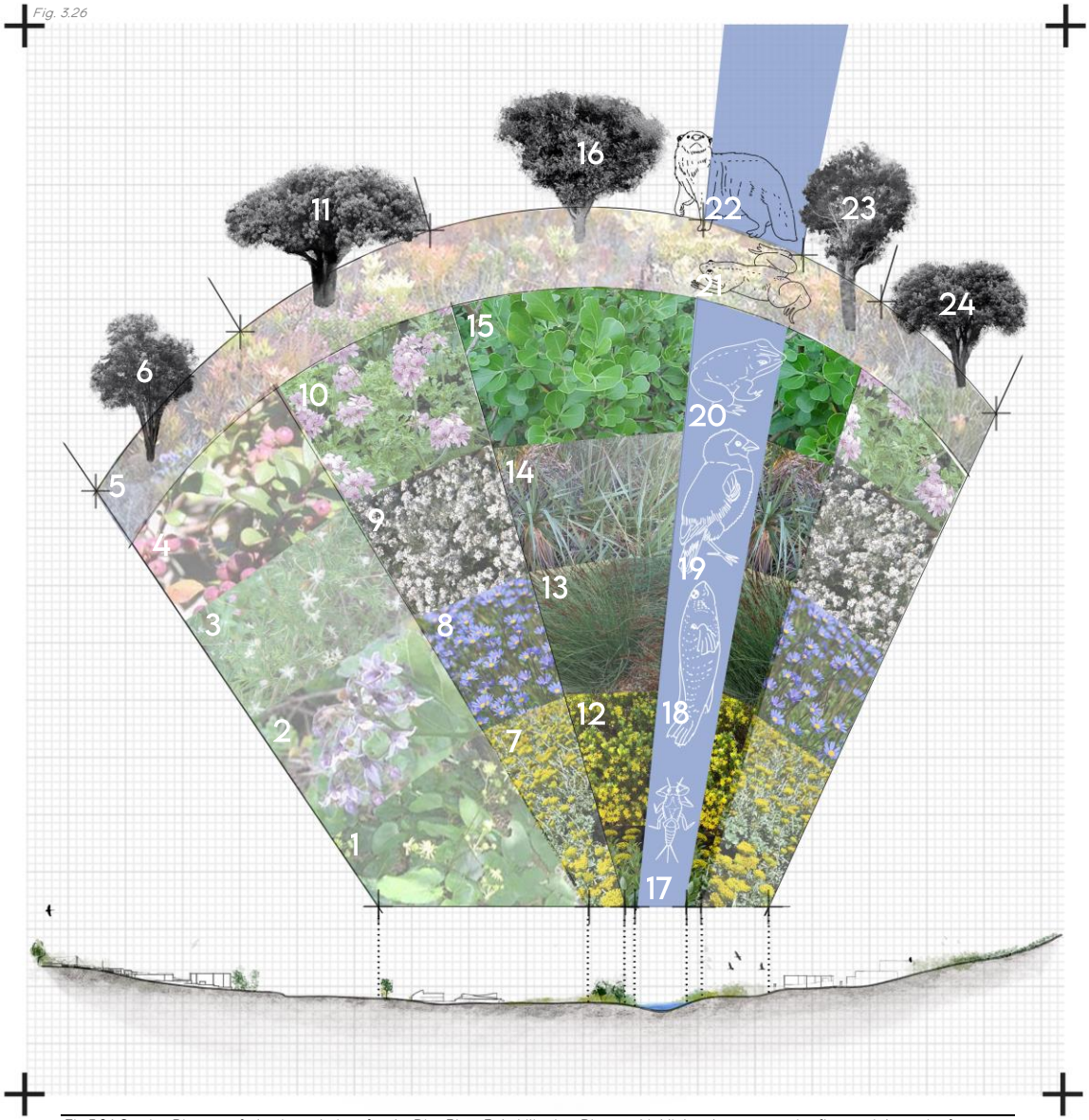


Fig 3.26 Section Diagram of planting solutions for the Disa River Rehabilitation. Diagram highlights the regenerative flora and the major fauna that is reliant on the existing ecosystem. (Source: Author after Friends of the River)

Shade Loving species: *Myrsine Africana, Asparagus Capensis, Solanium Africanum, Knowtonia Vessicatoria,*

Near Riverbank: (7) Golden Carpet, (8) Blue Felicia, (9) *Kapokbos*, (10) Rose scented *Pelagornium*,

Riverbank: (12) *Chrysanthemoides Monilifera*, (13) Palmiet, (14) Cape Rush, (15) Rhus Lucida

Fauna: (17) Spiny crawlers like *Petrothrincidae*, (18) Cape Kurper, (19) Red Bishop, (20) Cape River Frog, (21) Common Platanna, (22) Cape Clawless Otter

Anywhere: (5) Fynbos, (6) Small Ironwood, (11) Brabejum *Stellaforium*, (16) Bladdernut, (23) Cape Holly, (24) Kiggelaria Africana

THE RIVER

[The Hout Bay River ecosystem is under threat due to pollution, climate change and built development. The community has addressed this by producing a landscaping scheme for new developments to rehabilitate the ecosystem (Department of Water affairs and Forestry, 2003). The rich river alluvial soil is an excellent host for local river plants, trees, and fynbos. [Fig. 3.26] outlines suggested vegetation planting schemes near the river's edge [(Author after Friends of the rivers of Hout Bat, 2022).]

Fig. 3.27

TABLE MOUNTAIN RESERVE
Protected fynbos region

EYETHU SKATE PARK
Onsite ex.sports amenity that attracts all groups in Hout Bay

KRONEZICHT-HELGRADA ESTATE
Wealthy subdistricts with private estates

DISA/HOUTBAY RIVER
Protected for rehabilition from human development

RUNNING TRACK
Trail that hugs the river

ILLEGAL LUMBER YARD
Onsite informal socio-economic activity that deters peoples and relation to river

EARTHWORX
Aggricultural node

EXISTING

[Fig. 3.27 The site is home to many built elements. Hard drainage systems bisect the site. Recent land terracing provided a volleyball court for kids to play in. An onsite parking lot often sees recreational activities. (Source: Author)]

Fig 3.27

CAR PARK
Onsite ex.car park where people gather to hang out

GREENSPACE
Another field site that serves as spatial segregation

HOUT BAY OCEAN
Ocean inlet that the river feeds into

SPORTS CENTRE
Onsite ex.Sports Centre that facilitates the sports field and volley courts

SKOORSTEENBERG PEAK
Steep rocky cliffs where Imizamo sprawls upon

SCOTT ESTATE
Wealthy seaside subdistrict

PENZENCE ESTATE
Middle class subdistrict

VOLLEYCOURTS
Onsite ex.Volleycourts
Mainly used by women and girls

VEGETABLE STALLS
A formalized vegetable market

SPORTS FIELD
Onsite ex.Volleycourts
Mainly used by men and boys

BERG EN DAL
Middle class subdistrict

HOUT BAY INTERNATIONAL SCHOOL
An adjacent private school

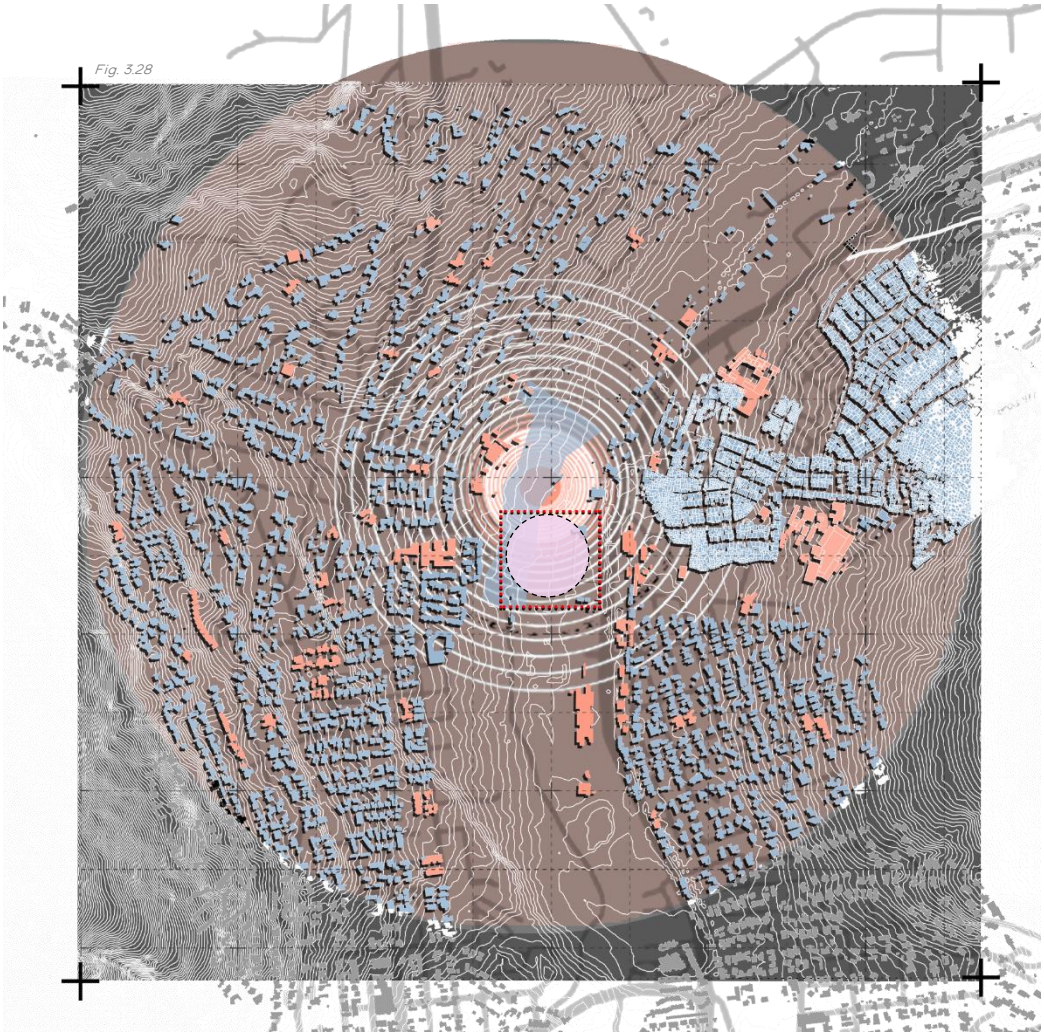
Imizamo Yethu
A vibrant yet hardship defined informal settlement

1. Ex Sports Centre use (Source: Author)
2. Ex. Sports field use (Source: Author)
3. Ex. Felling use (Source: Author)
3. Ex. Carpark use (Source: Author)
4. Ex. Skatepark use (Source: Lawden Holmes)

EXISTING

[Fig 3.27 A sports centre is seen adjacent to a skatepark and further west, an informal tree felling business operates that deters people from exploring the rest of the site. There are controlled entryways, with one vehicular entrance from the north and there are informal markets and vegetable stalls around the periphery. (Source: Author)]

Fig. 3.28



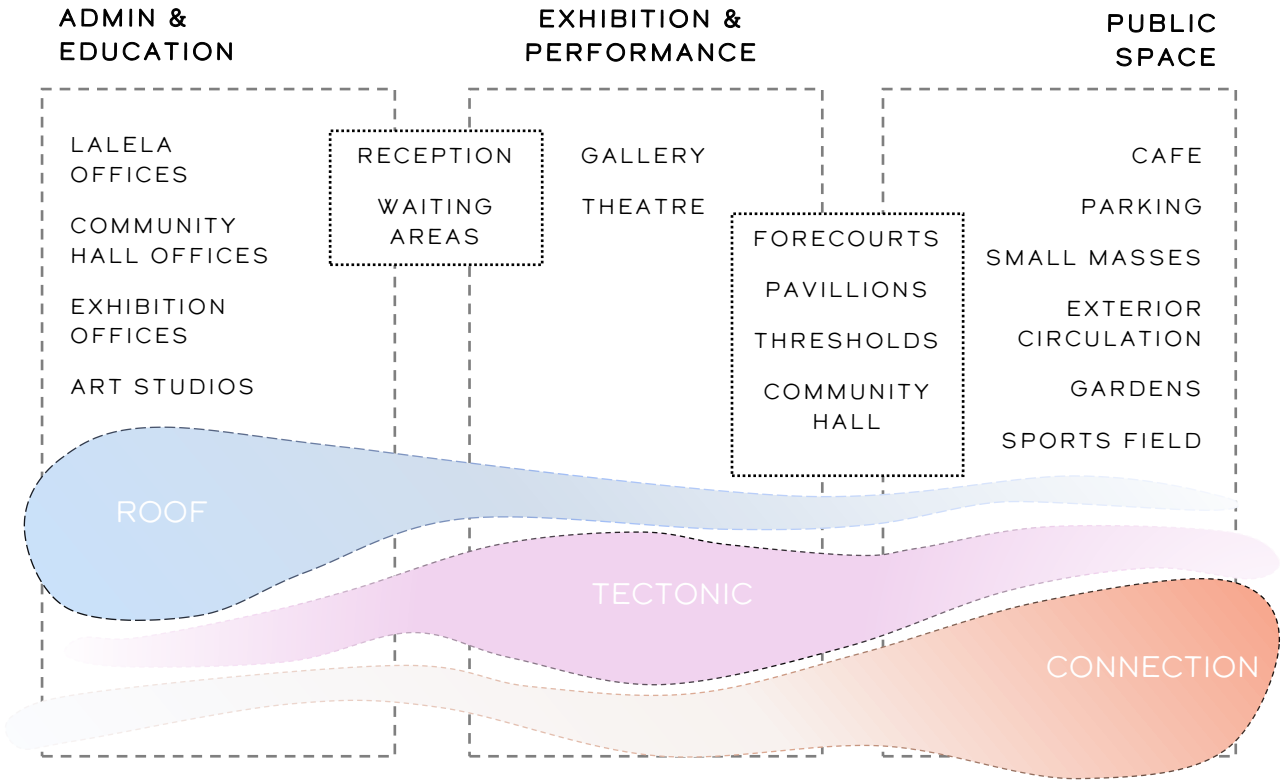
Massing Around Site Zone

- 20-minute walk radii
- Primarily single story
- Primarily two stories
- Proposed site

Scale 1:100

MASSING AROUND SITE

[Fig 3.28 is a mapping of the surrounding built mass within a 20minute walk. The massing of the built fabric is of primarily low single to double storey structures. Onsite, a single storey sports centre serves the existing sports amenities. (Source: Author)]



PROGRAMME III

"Where there is unity, there is always victory."

- **Pubilius Syrus**

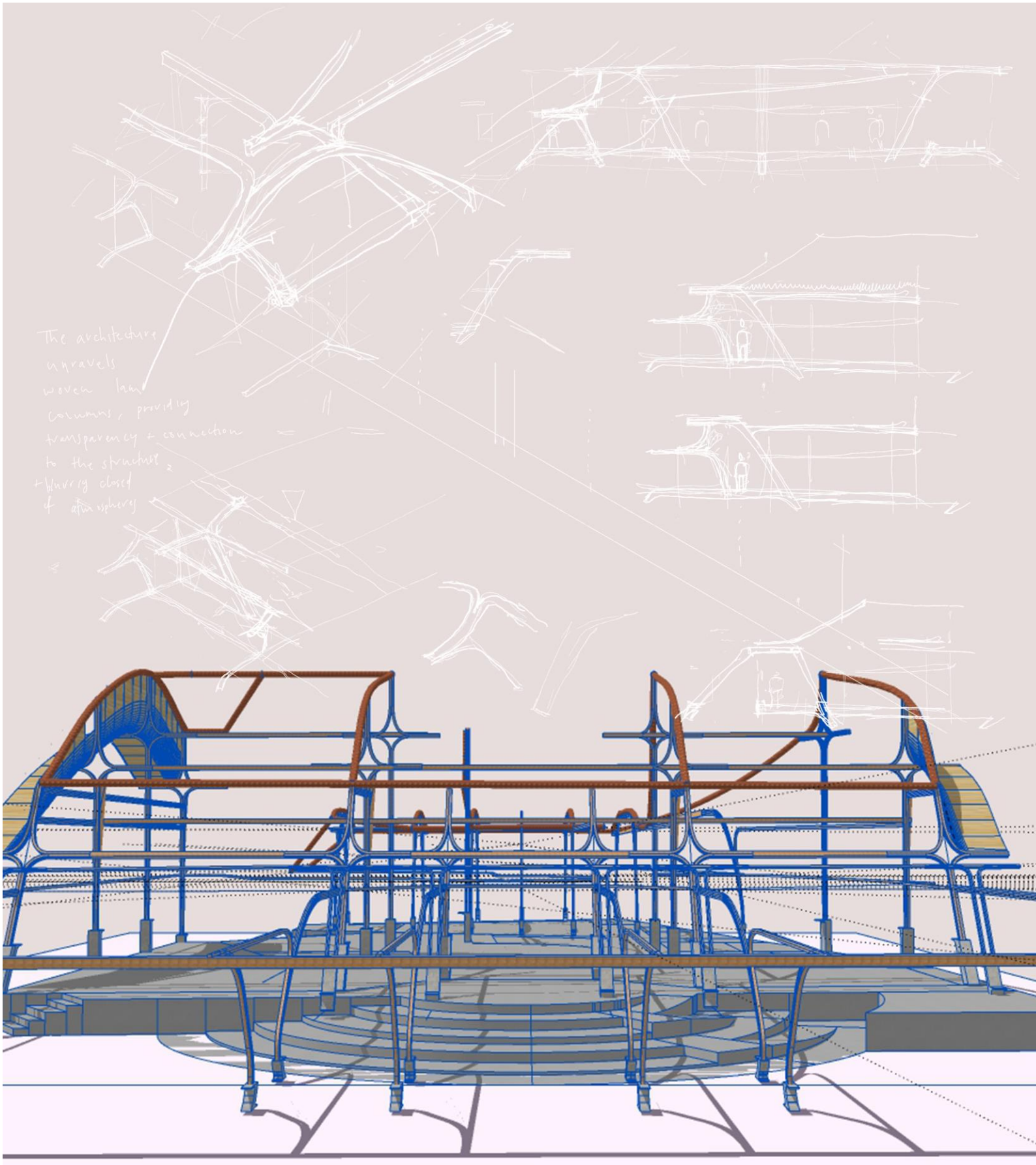
Apartheid spatial planning has affected the sub-districts of Hout Bay in terms of equal access of cultural amenities, and resources across their sub-districts, particularly for Imizamo Yethu.

The provision of a cultural centre and community hall would benefit the residents of Hout Bay as it connects the existing cultural dance, theatre, and music nodes into a public space in lieu of a public Semperian hearth.

Furthermore, the folding and formalization of existing NGO structures that benefit the residents, like the Lalela Project, forms part of the programme as a cultural facility that educates and exhibits for social good.

Community facilities will be public civic spaces and a community hall, which are amenities lacking in Imizamo Yethu. This promotes public gathering and articulates better and safer spaces for the children to gather after school.

The next section will detail a design synthesis that assesses the site analysis and possibility of timber tectonics reframing the art gallery typology to one that creates better public space and promotes inclusion through inferring connection.



SECTION 4: THE SYNTHESIS

Transporting Timber Trajectories

SYNTHESIS

"Sizoni landela maAfrika

Siyayibona Intlanzi. "

-Vicky Sampson

Sing in harmony; you, and me

I want us to live as one.

The title of the building is the Kunye Cultural Community Centre. Kunye is isiXhosa for one and together. This sentiment is aligned with the project's principles of connection.

The design development section is a merging synthesis of site, technology, and theory. This green belt site of Hout Bay meets timber tectonics in the production of a civic space that uses theories, ranging from addressing spatial injustice by Dewar, to cultural substance by Florida, to design elements by Semper.

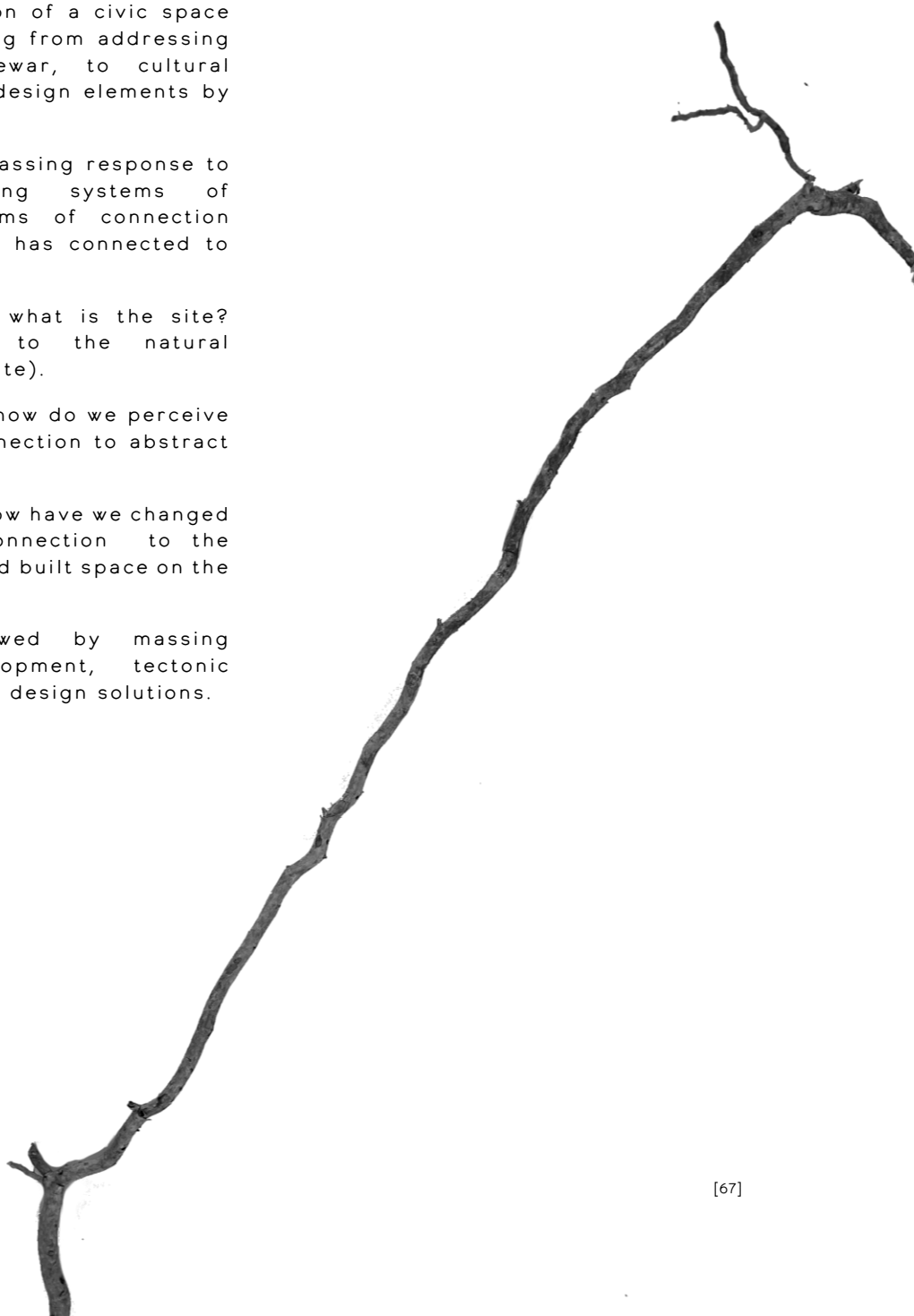
The design begins as a massing response to in-depth analyses along systems of connection. These systems of connection represent how humankind has connected to the site:

The Geographical; what is the site? (Our connection to the natural conditions on the site).

The Metaphysical; how do we perceive the site? (Our connection to abstract laws on the site).

The Built Fabric: How have we changed the site? (Our connection to the between activity and built space on the site).

This analysis is followed by massing responses, plan development, tectonic development, and the final design solutions.



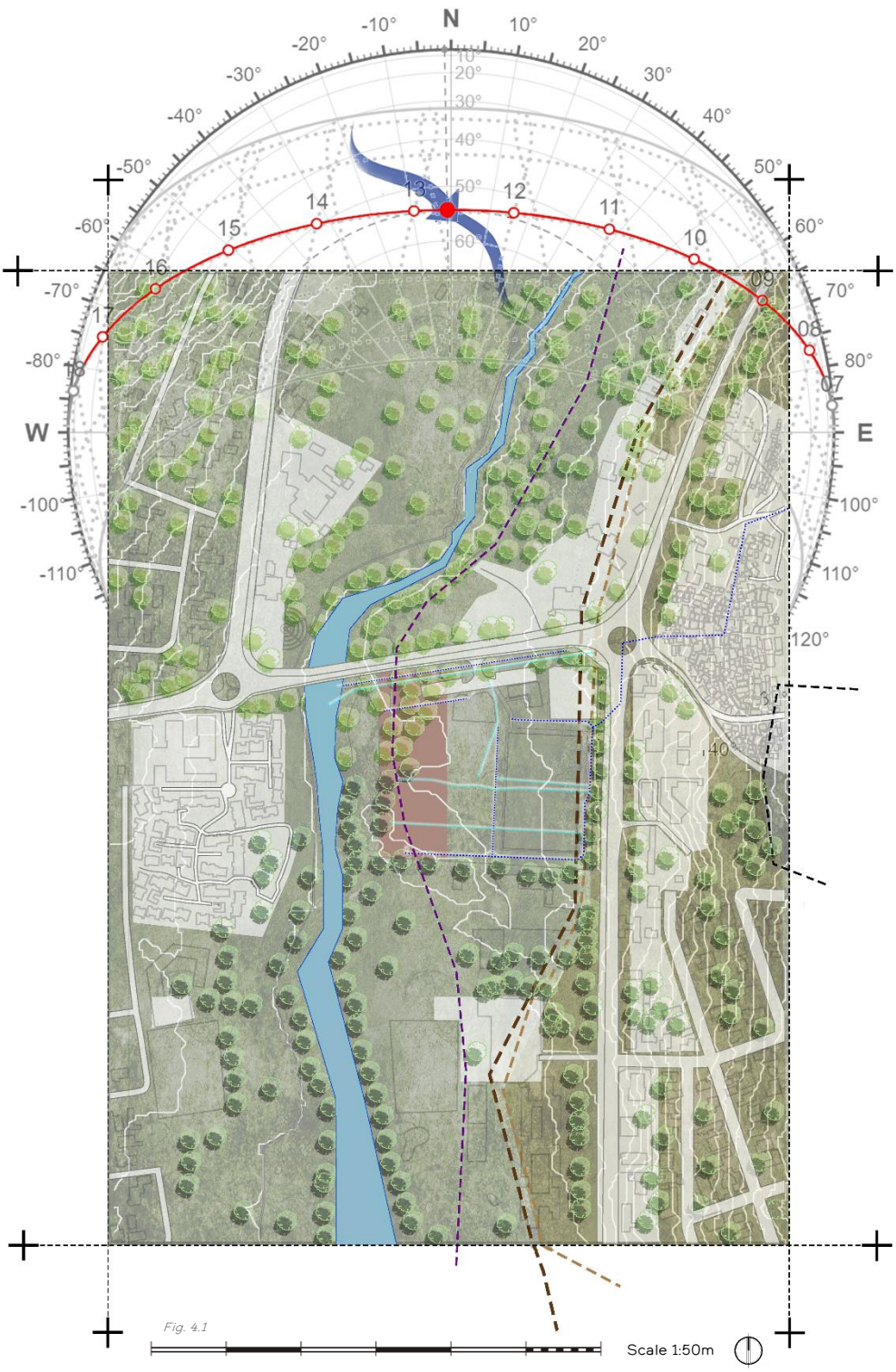


Fig. 4.1

Geographical Analysis

- Sun path
- Dominant wind paths
- River wetlands
- Flood line
- Contours
- Trees
- Alluvial Soil
- Non-hydromorphic Soil
- Quartzite Mountain Soil
- Surface Drainage
- Sub level Drainage
- Hard Surface spaces
- Soft Surface spaces

THE GEOGRAPHY

The site chosen is nestled between the steep cliffs of the Table Mountain National Reserve and the Skoorsteenberg Peak. The ever-changing name of the Disa river/Hout Bay River snakes in-between the valley, creating protected wetlands near its gentle banks. The site sits on these gentle banks on an open green space and slopes a mere 2-meter incline before reaching the river.

The conditions around the site champion a natural woody environment. Trees, steep rocky cliffs, river wetlands and views to the ocean further south, imply a need for an intervention that respects its environment.

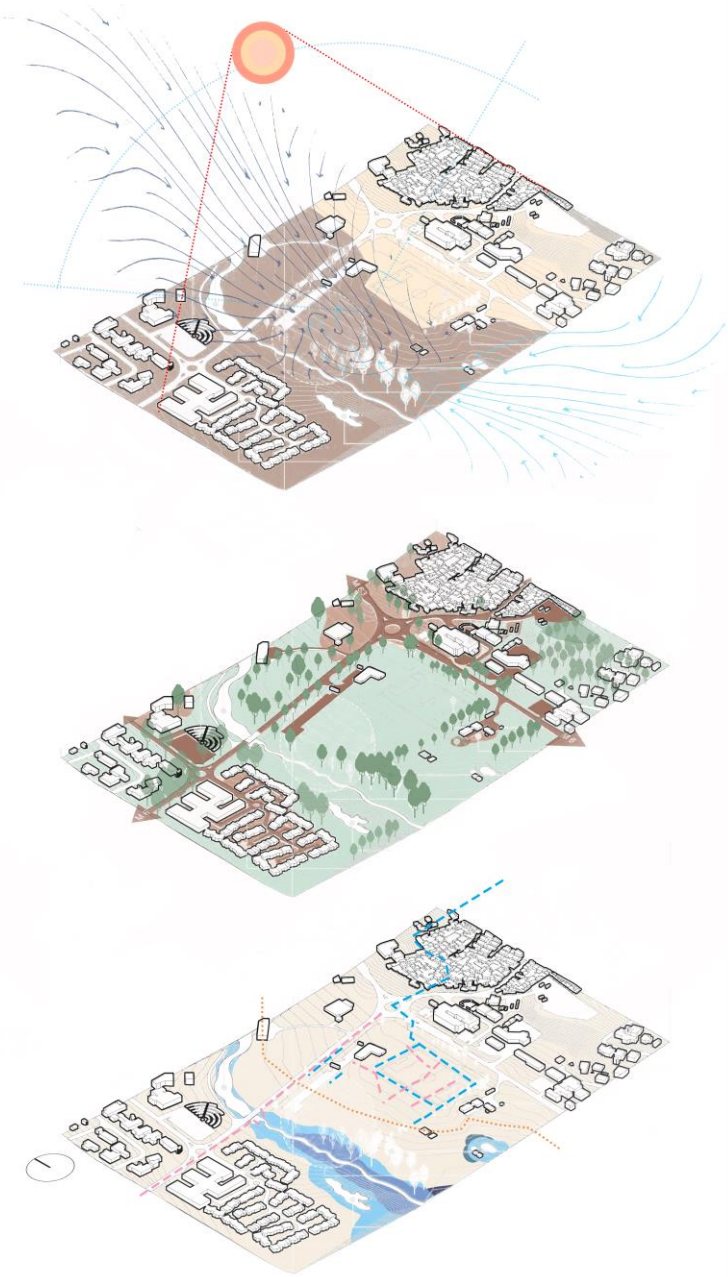
Northerly Summer winds blow down from the eastern cliffs and Strong Winter South Easterly winds blow down from the Skoorsteenberg Peak. Such winds have been known to cause structural damage to both informal and formal residential units in Hout Bay (Vos, 2021, p.86).

The site soil conditions sit in the ripe, clayish sediment of Alluvial soil. Such soil is perfect for vegetation to thrive and grow. As you approach the peaks of the valley, the soil condition changes to non-hydromorphic beach sand and then to mountainous soils of quartzite and other rocky stones.

The site is bisected by both surface and sub level drainage systems and water catchments. near the base of the river and towards the southern edge. These waterways flow from the eastern cliffs. down from the informal settlements and aid with the heavy winter storms. Rubbish tends block these waterways (Vos, 2021, p.86).

Hard surfacing engineers its way across dense narrow built forms, such as the western informal settlement of Imizamo Yethu and the wealthier eastern Kronezicht retirement home. that neighbour the site. In these hard surface spaces, such as narrow streets, children are seen playing on old mattresses and between the informal settlement units.

Fig. 4.2



Climate Analysis

- Sun path
- Strong Summer North westerly wind
- Mild Winter South Easterly wind
- Alluvial soil
- Non-hydromorphic soil
- Quartzsite mountain soil

Surface Analysis

- Hard surface road and parking
- Hard surface paving treatments
- Green spaces
- Trees

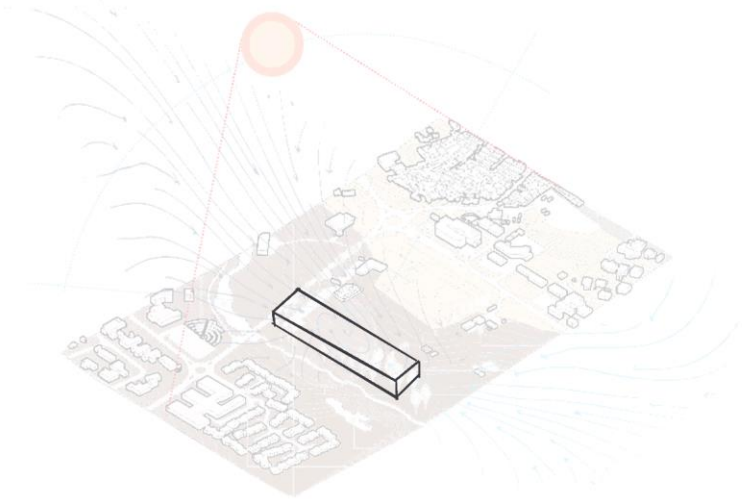
Waterflows Analysis

- Flood line
- Surface drainage
- Sub level drainage
- River
- River wetlands

GEOGRAPHICAL MASSING

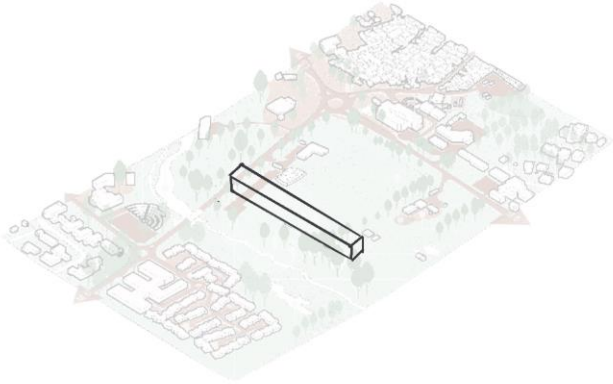
[Fig. 4.1 and Fig. 4.2 are of the site's geographical map and a summary of that map. It summarizes a variety of geographical relations on the site, such as its woody nature, slope, proximity to the river and more. (Source: Author)]

Fig. 4.3



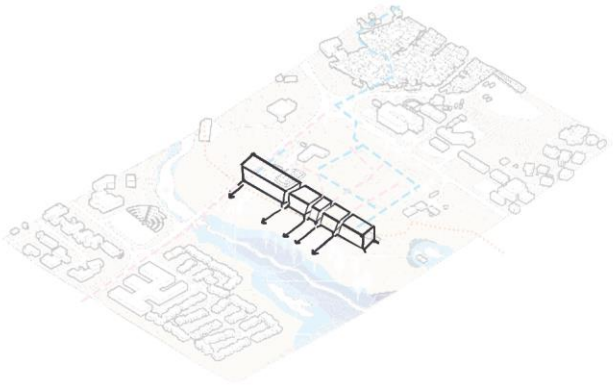
Climate Analysis

- Mass orientated for east west relationship
- Allows winds to flow



Surface Analysis

- Narrow mass for better open surfaces

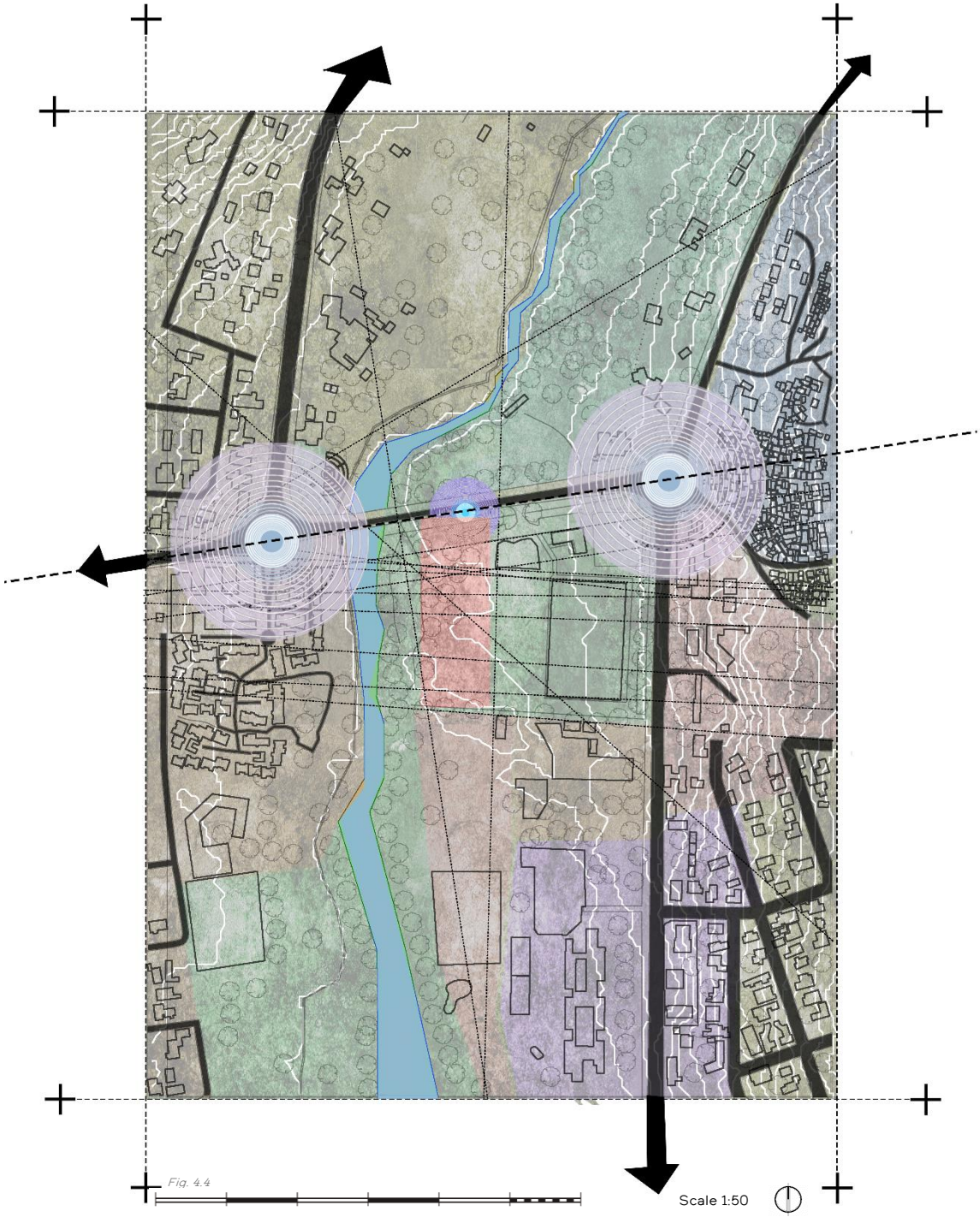


Waterflows Analysis

- Mass split to allow natural flows

GEOGRAPHICAL MASSING

[Fig. 4.3 is the design response to the geographical analysis (Source: Author) . The building orientates itself along the western side, to function as an edge that holds the site intimately and to brave the strong south winds. The width is made narrow to respect the natural environment. The mass is then split and plinthed by the existing drainage systems, allowing water and fauna to roam freely to the river below.]



Metaphysical Analysis

- Intersection nodes with Activity
- Inferred between activity node
- Proposed site area
- Roads
- Desire lines
- Open space 2
- General Business
- General Housing 1: Residential
- Single Residential 1
- Community 1: Local
- Community 2: Regional

THE METAPHYSICAL

On a metaphysical level political goals and planning, inferred desire lines and user observed activities exert an influence over how I perceive weaving an intervention into the site. The chosen Hout Bay region aligns with the City of Cape Town's goals of spatial development in the Southern District Plan.

The plan outlines a desire on securing the urban edges of Hout Bay and develop mixed-use developments from residential to community to playing fields and clinics. The residents of Hout Bay have contested this spatial plan (Vos, 2021, p.88)particularly by those of Imizamo Yethu due to the lack of public participation.

To gain a better understanding of what's needed as an intervention, I went on a tour around Imizamo Yethu with local tour guide, Kenny Tokwe. Through him I gained an insight into the urban fabric of Imizamo Yethu. After chatting to him I learnt about the lack of services, service ways and community facilities. The programme of my building needed to incorporate the community and provide better articulated public space.

The site issue is that it is zoned as an Open field site. Which calls for Land use change to better meet the needs of the Hout Bay residents.

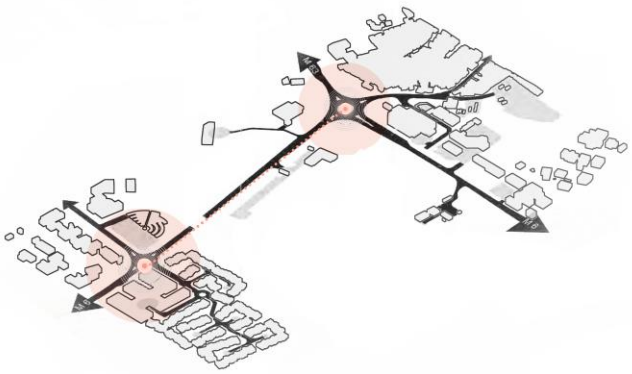
The proposed site area sits at an optimal location and is an accessible site to both the residents of Imizamo Yethu and the greater Hout Bay area. This is due to being at an intersection of main roads and as an entrance into the greater Hout Bay.

The proposed site sits between two active nodes of intersection and already hosts a myriad of formalized sport gathering and informal recreational 'hanging out' spaces and informal markets. Thus, the OS2 site can be contested to become a regional community site as already community infrastructure such a sports hall and skate complex, has already been developed on site. Furthermore, people already gather in the parking lot since it is the more articulated of the spaces.

The blurring of urban hierarchy by developing open green spaces promotes better connection between Hout Bay's sub districts especially between Kronezicht-Helgrada and Imizamo Yethu and goes against the contested politics around green spaces used in apartheid to segregate sub-district.

Thus, a cultural community hall with the city's goals of securing the edge of the green field and providing public space is developed. An attitude that the hall should embrace timber tectonics' open and public transparency, whilst articulating and holding spaces, answers the calls of the community for better infrastructure and provision of safe public space for both children and adults to gather under the same roof.

Fig. 4.5

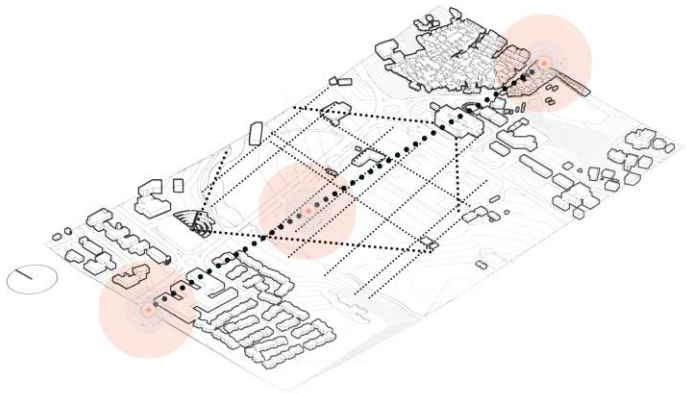


Nodes

- Activity Nodes
- Roads
- Parking

Future zoning

- Open space 2
- General Business
- General Housing 1: Residential
- Single Residential 1
- Municipal
- Community 1: Local
- Community 2: Regional



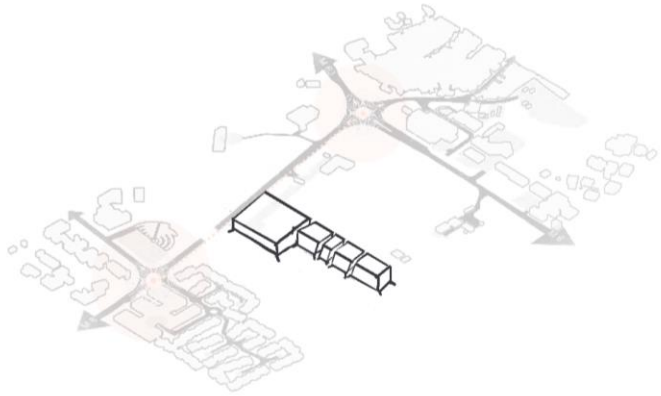
Desire lines

- Directional axis
- Axial nodes
- Inferred lines of site

METAPHYSICAL MASSING

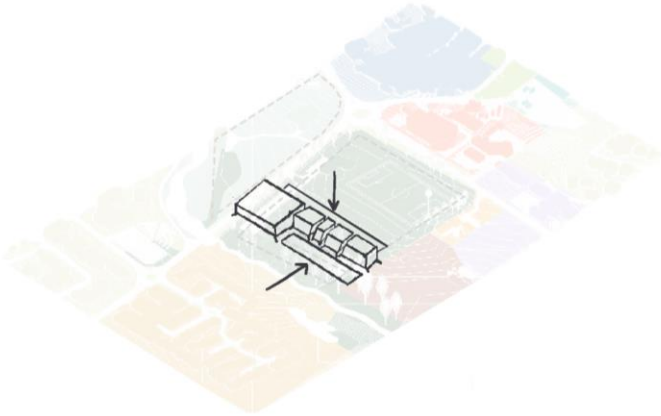
[Fig. 4.4 and Fig. 4.5 are of the site's metaphysical analysis map and a summary of that map. It summarizes a variety of metaphysical relations of the site, such as our projected laws and zoning, desire lines and observed nodes of activity. (Source: Author)]

Fig. 4.6



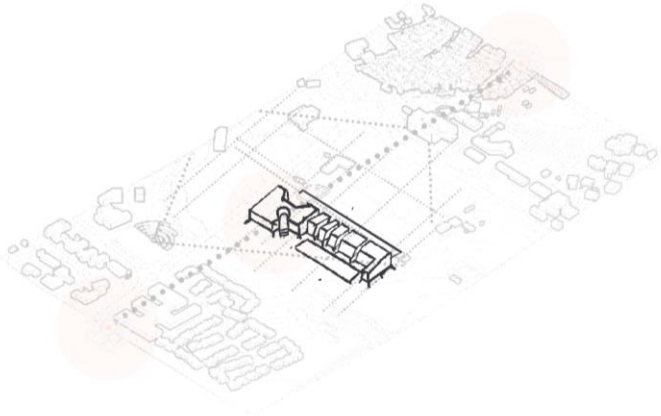
Nodes

- Victoria Rd edge bigger mass for public node



Future zoning

- Open green spaces such as forecourts and public gardens and parks



Desire lines

- Neighbouring and onsite site lines articulate form more

METAPHYSICAL MASSING

[Fig. 4.6 is the design response to the metaphysical analysis (Source: Author) .Nodes of activity demarcate the northern edge as the most public building, for the theatre, exhibition, and café. There are placed on the busy southern edge of the road. The lumber zone is reclaimed as a positive public garden, with previous users folded into the project for timber and gardening maintenance. Forecourts are designed to articulate public space as a response to the political zoning. Desire lines articulate the mass, with the public mass opening to face Imizamo Yethu and the forecourts.]

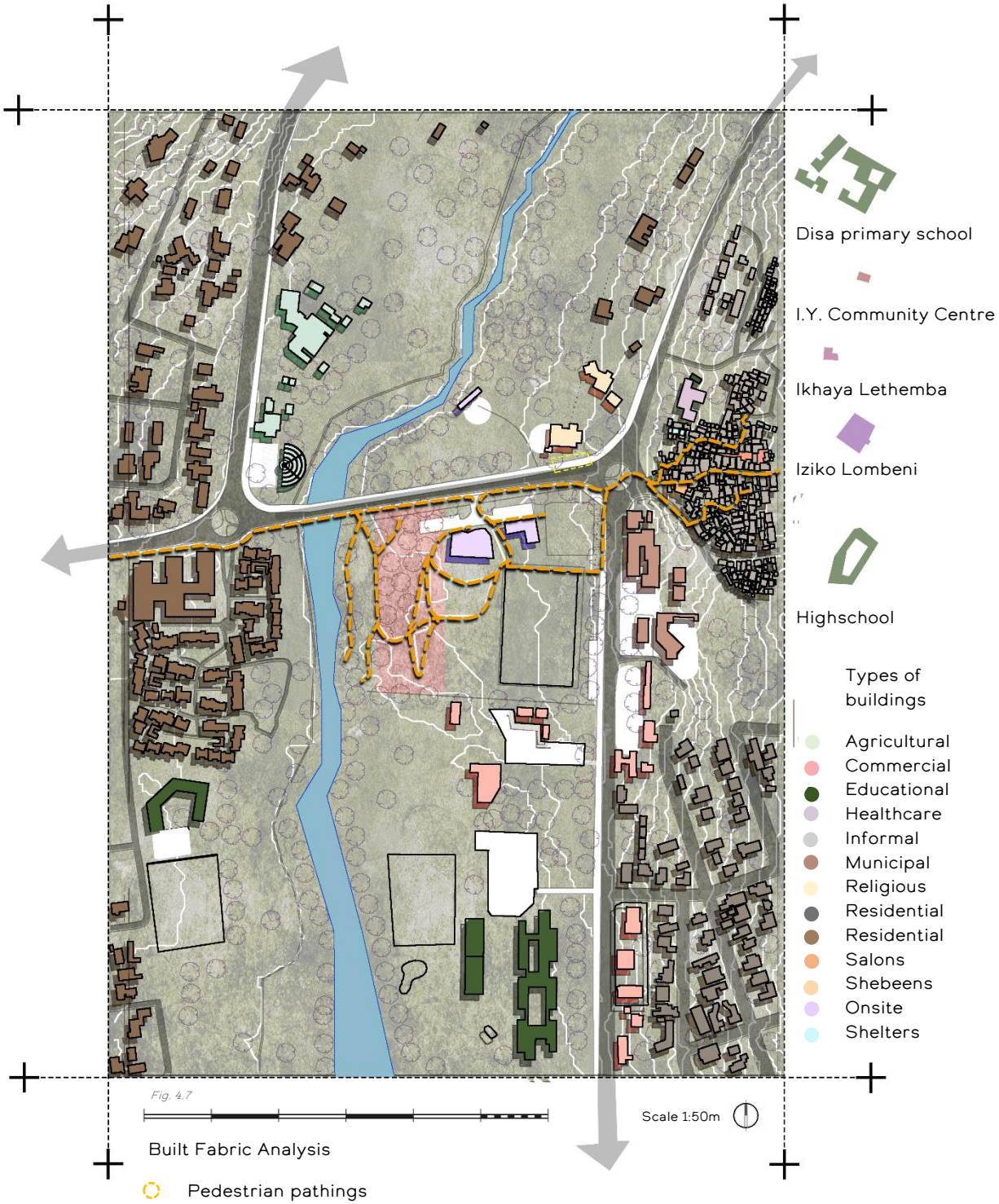

Disa primary school
I.Y. Community Centre
Ikhaya Lethemba
Iziko Lombeni
Highschool
Types of buildings
Agricultural
Commercial
Educational
Healthcare
Informal
Municipal
Religious
Residential
Residential
Salons
Shebeens
Onsite
Shelters
Scale 1:50m
Built Fabric Analysis
Pedestrian pathings
Roads
Parking & Servitudes
Proposed site Area
Trees

Fig. 4.7

THE BUILT FABRIC

The built fabric surrounding the site reflects different facilities across socio-economic realms. The neighbouring buildings are on a low scale, ranging from typical informal 1 storey shacks to 2 or 3 storey residential units

On the site developed spaces already exist. These include built a servitude on the eastern edge, drainage systems, terraced sports field, volleyball courts and a sports centre.

The proposed site sits between two very opposing class sub-districts- the Kronezicht and Helgrada estates and the Imizamo Yethu township.

Imizamo Yethu is composed of a diverse group of people from foreigners to locals to migrant workers from the Eastern Cape. Residents work through their hardships together and have created myriads of community initiatives despite the lack of infrastructure.

Throughout the years, the government has introduced social infrastructure to create a more resilient social system from sports fields to high schools close by to address issues of access (Vos, 2021, p.91).

The economy of Imizamo Yethu is made of a large amount of foreign owned informal businesses as a means of survival. On site, on the western edge, illegal lumber felling occurs. This relationship to the timber trajectory of this project provides an interesting opportunity to fold the practitioners into the project to provide a social impact. This benefits the site as the felling deters people from using the whole the site and has prevented a relationship with the river below.

The economic built structures range from informal markets set of street food sellers to at-home or curb salons. These street vendors benefit from the pedestrian-bustle flows on the narrow streets along the southern pavement edge.

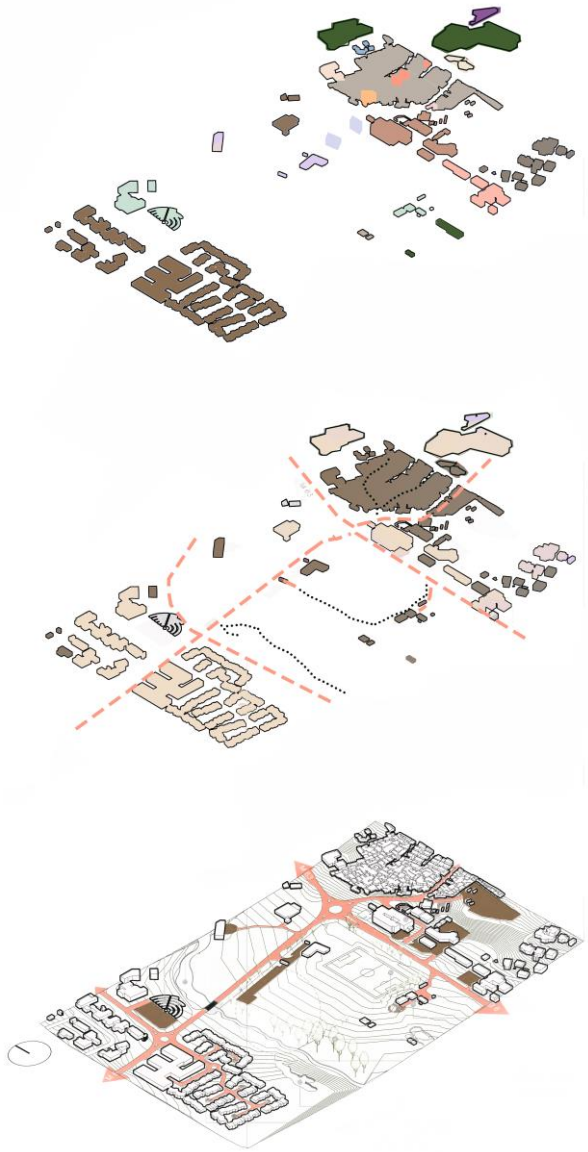
Formalized structures such as shebeens and spaza shops also are abundant and reflect a strong socio-recreational relationship which can be seen as an economic concern (Vos, 2021, p.92).

Along the main M4 road of Hout Bay just below Imizamo Yethu, are Municipal facilities such as a fire department, for handling common settlement fires, police stations and health clinics.

Past the bridge, on the western side are the Helgrada-Kronenzicht estates where the socio-economic environment differs. Here the demographic shifts to a primarily white-English speaking group from the migrant-working isiXhosa speaking group of Imizamo Yethu (Frith, 2011).

This wealthier neighbourhood, with an upper-household income class, has medium to large households with high fences. Privatized businesses operate along the main roads such as the agricultural Earthworx Garden World. And reflect a less communal reliance in comparison to its adjacent sub-district of Imizamo Yethu.

Fig. 4.8



Built form analysis

- Agricultural
- Commercial
- Educational
- Healthcare
- Informal
- Municipal
- Religious
- Residential
- Residential
- Salons
- Shebeens
- Onsite
- Shelters

Mass and Pedestrian analysis

- Pedestrian South edge walking pavement
- Pedestrian access routes on site and activity
- Single storey units
- Double storey units

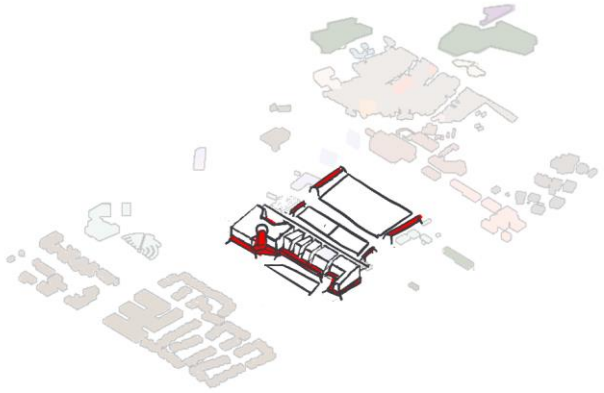
Roads and surface analysis

- Major arterial routes
- Parking

BUILT-FABRIC ANALYSIS

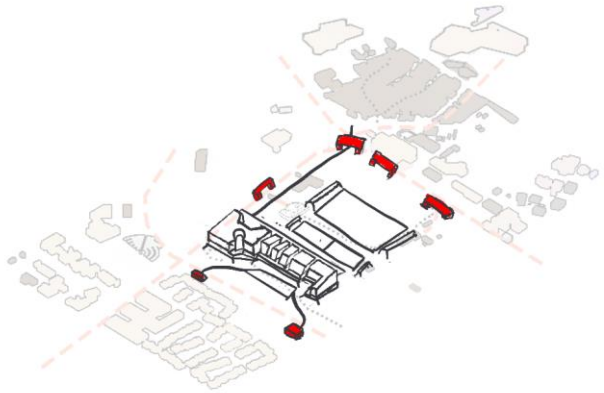
[Fig. 4.7 and Fig. 4.8 are of the site's built-fabric analysis map and the summary of that map. It summarizes a variety of built fabric relations of the site, such as socio-economic activity, engineered surfaces, massing and pedestrian or vehicular circulation. (Source: Author)]

Fig. 4.9



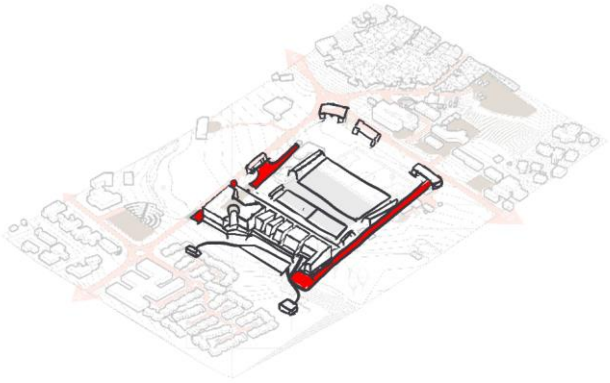
Built form analysis

- Pavilions and building podium and plinths are for public use and interaction



Mass and Pedestrian analysis

- Gateways and pavilions are set along pedestrian runways and routes



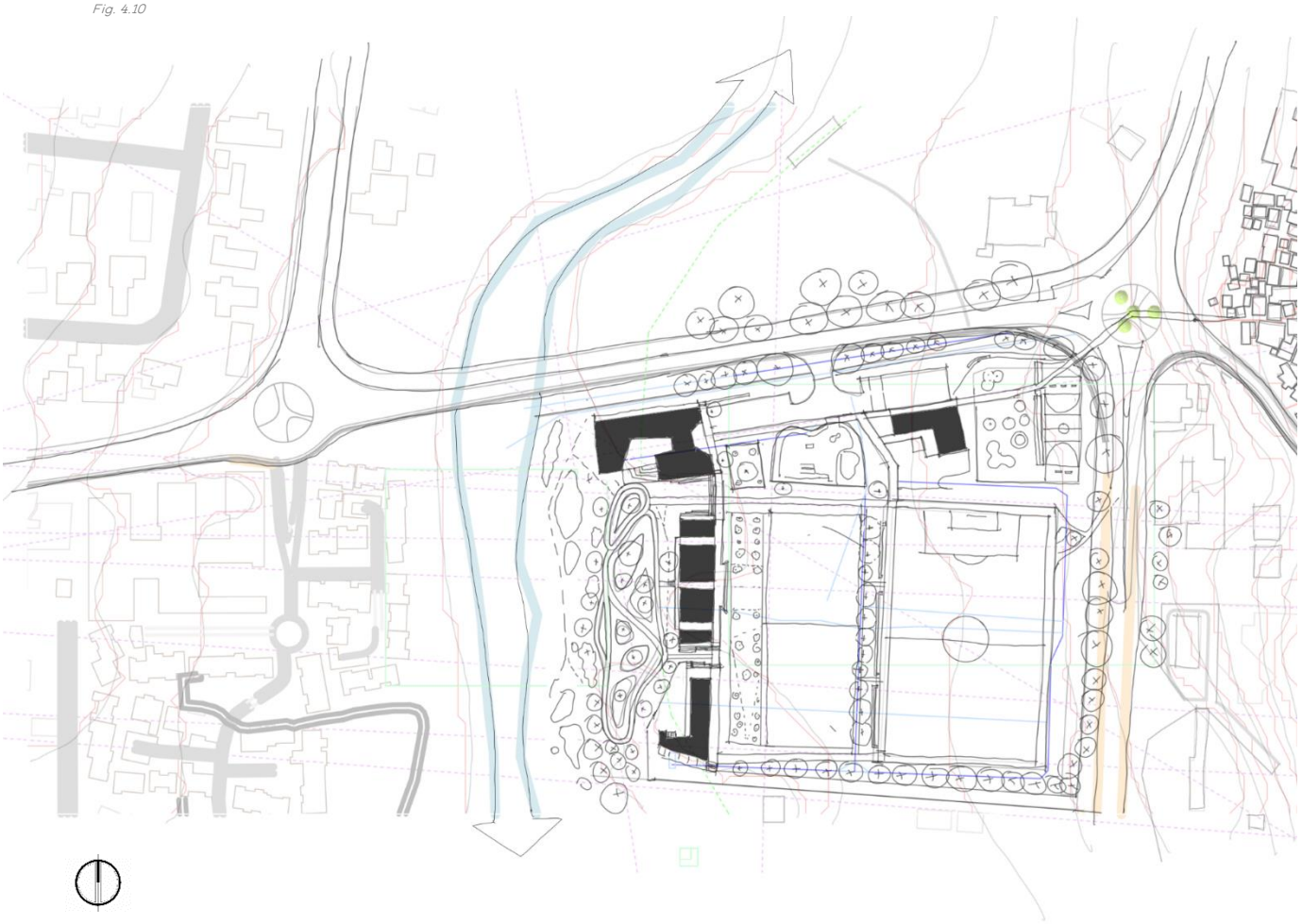
Roads and surface analysis

- 3 different parking hierarchies, common forecourt, admin/service, and community hall.

BUILT FABRIC MASS RESPONSE

[Fig. 4.9 is the design response to the built fabric analysis (Source: Author) . The site is developed through the introduction of public roofing as pavilions, gateways, shaded benches, and bridges. I propose an addition of 2 5v5 fields with shaded benches flanking both them and the larger sports field. A new pedestrian axis is defined through the public building and into Imizamo Yethu to connect it better. . These pavilions and gateways are placed along the pedestrian routes. Parking acts a service, with its own use-defined entrances. A service/staff parking is on the north-western edge, the existing active north easterly parking is extended, and a community hall parking is kept separate on the southwestern edge.]

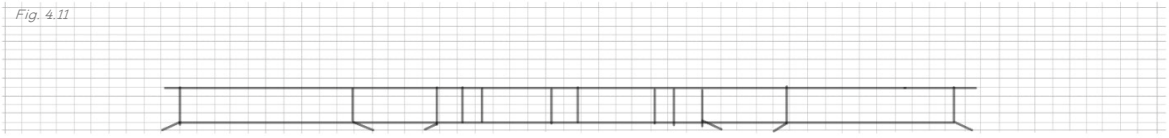
Fig. 4.10



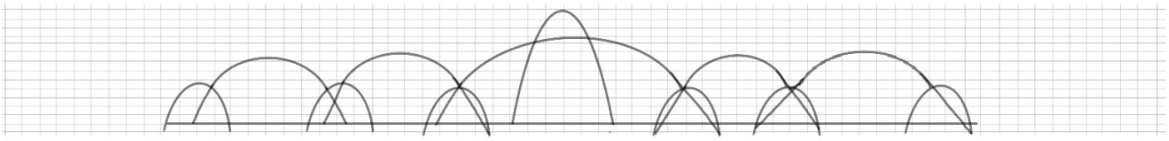
PROCESS WORK MASSING INFORMANTS

[The analysis provided a series of informants that plotted a massing response. Fig. 4.10 (Source :Author)]

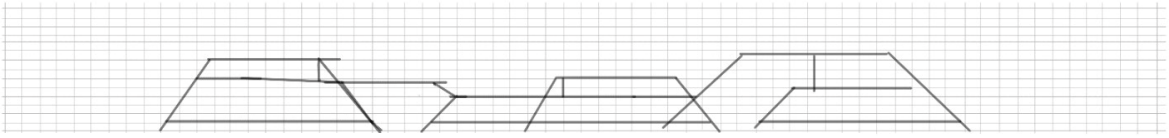
Fig. 4.11



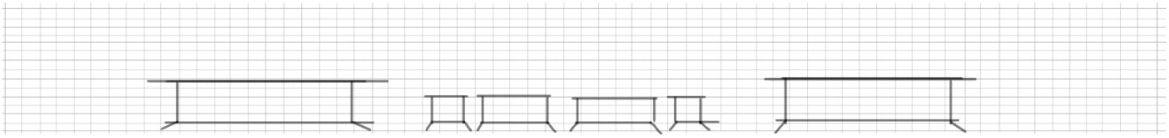
Masses all under one roof, united



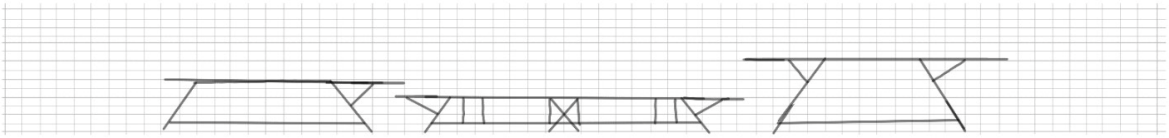
Intersecting arches of grid-shells



Staggered arches of truss planes



Disconnected masses of frame construction

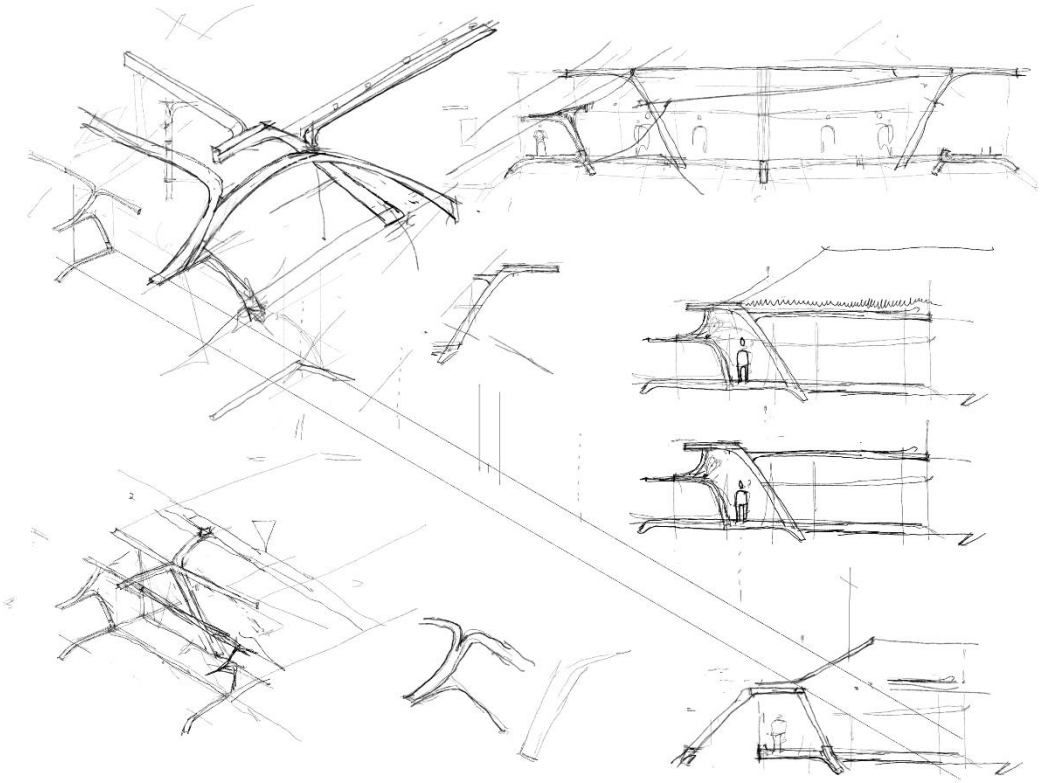


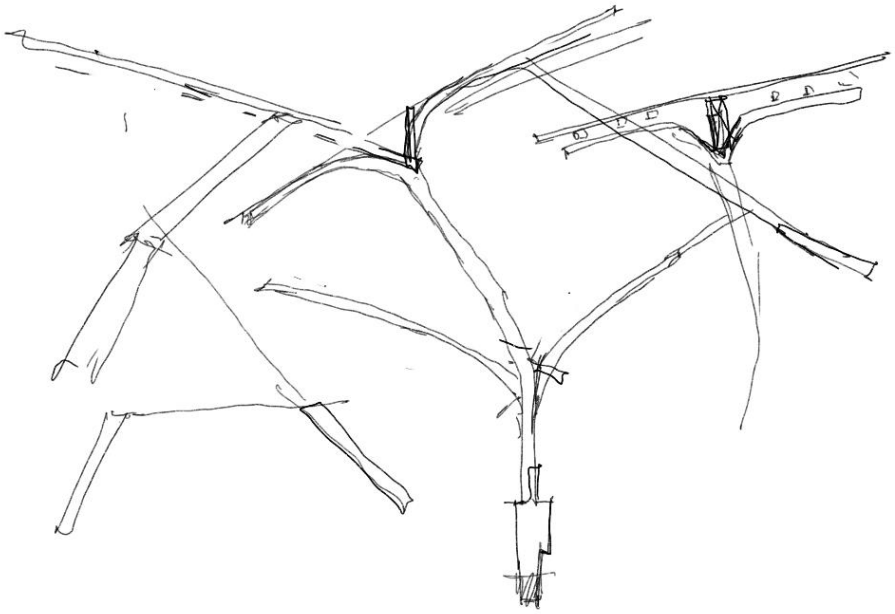
Frame construction extended to roof and plinth, roof infers continuity and interest through staggering and overlap

PROCESS WORK DEVELOPING DESIGN: FRAME

[Developing the frame network of the massing resulted in 3 masses connected through roof overhangs. Fig 4.11 (Source : Author)]

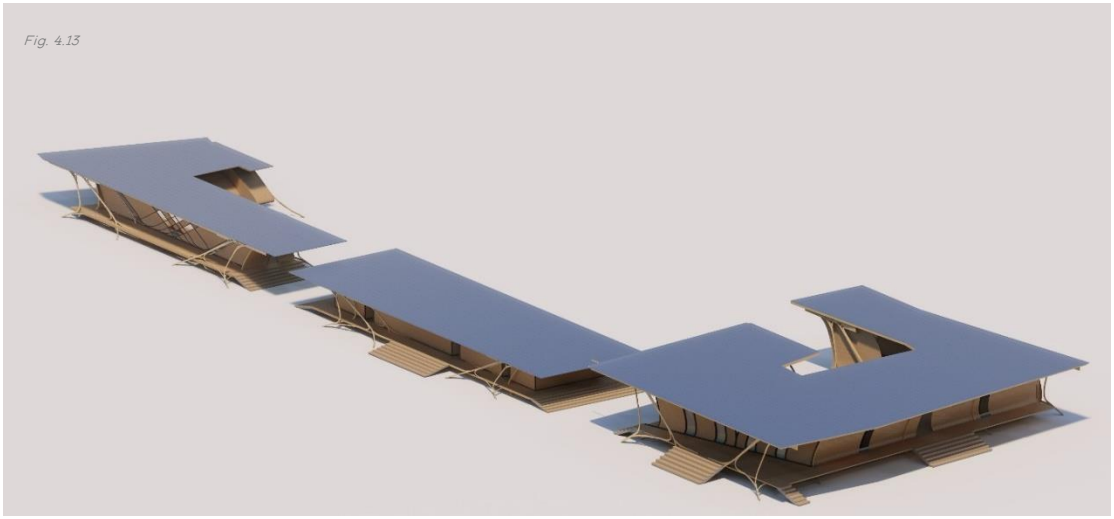
Fig. 4.12

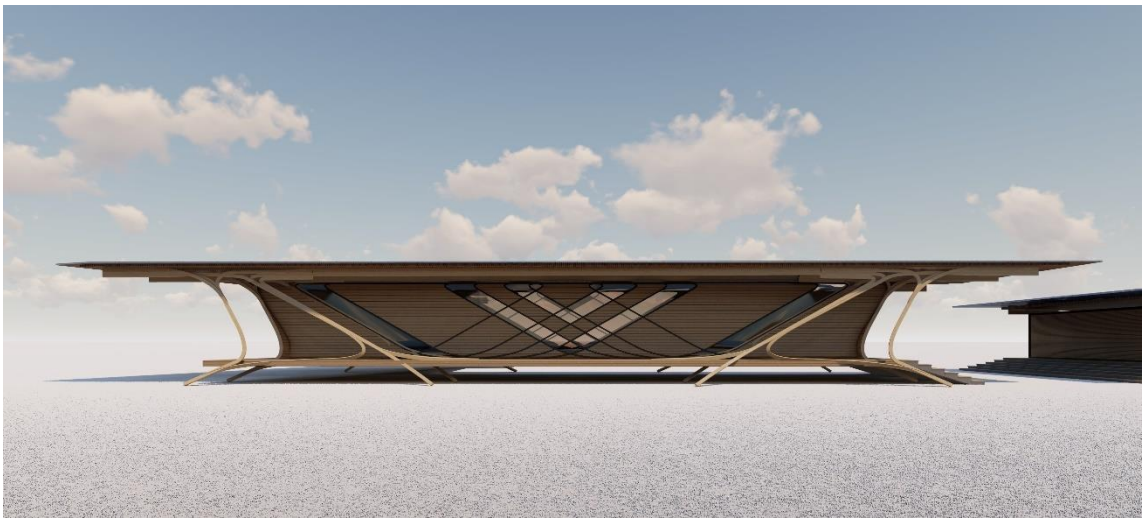




PROCESS WORK DEVELOPING DESIGN: FRAME

[Resolving and developing details of the frame happened with hand drawing. Fig. 4.12 (Source: Author)]

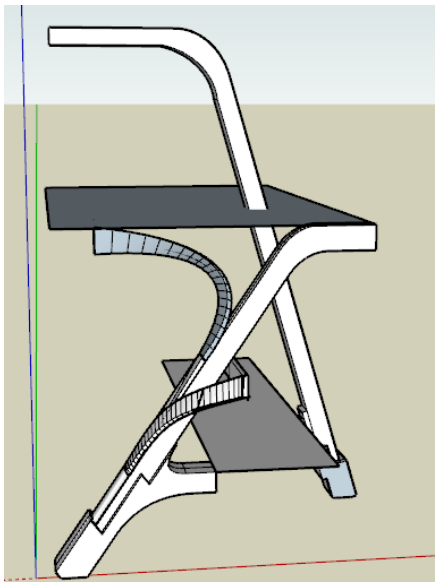


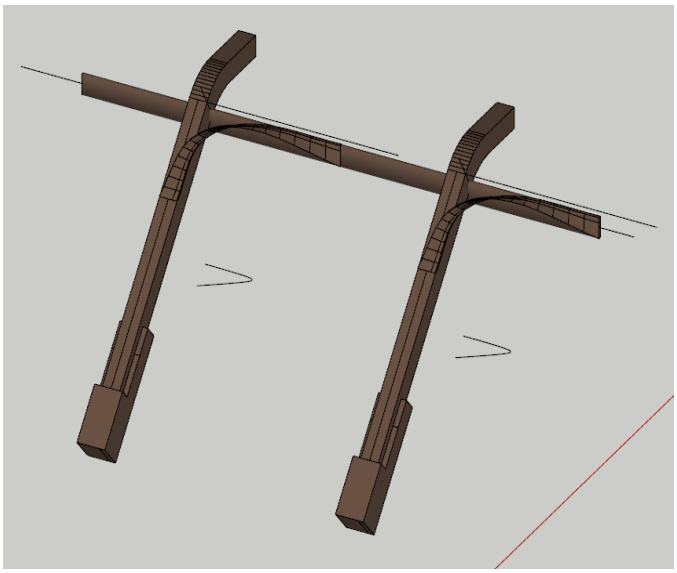


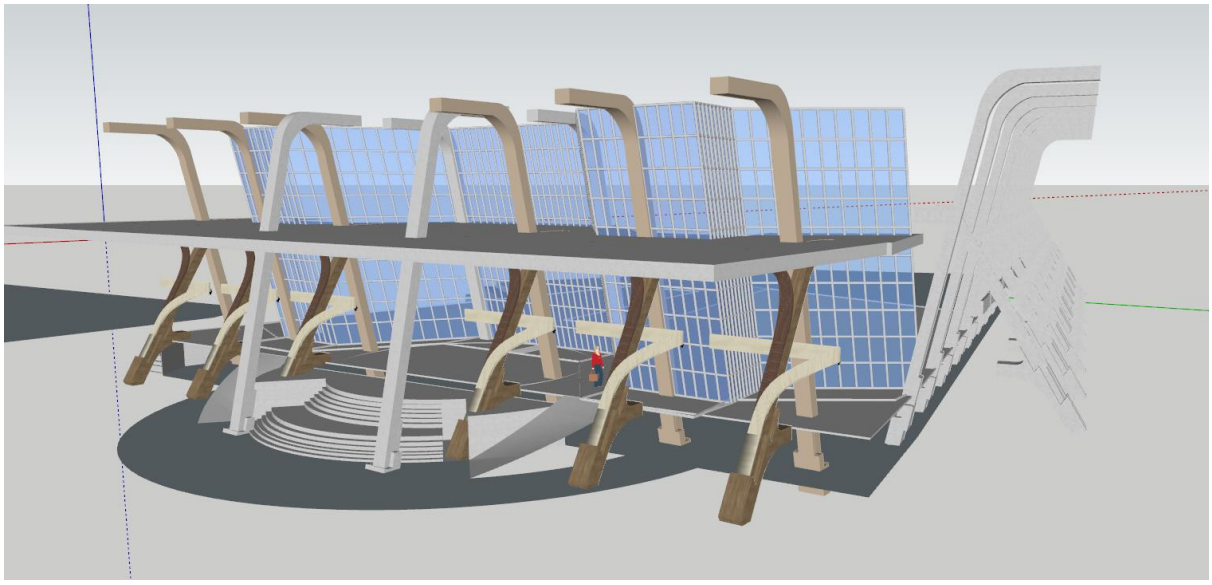
PROCESS WORK DEVELOPING DESIGN: FRAME

[The development of this laminate frame-grid-shell design was assessed through digital modelling. The current design of the assembly speaks to how different sculptural forms create different spatial qualities. Here, welcoming curved laminate frames peel off each other and connect to varying and dynamic and stable forms of columns through dado-dovetail joints. The materiality of all these is Rhino modified SA Pine Wood with eucalyptus inserts for the laminates to prevent monocultural structure as a strengthening treatment.[Fig 4.13 (Source: Author)]]

Fig. 4.14



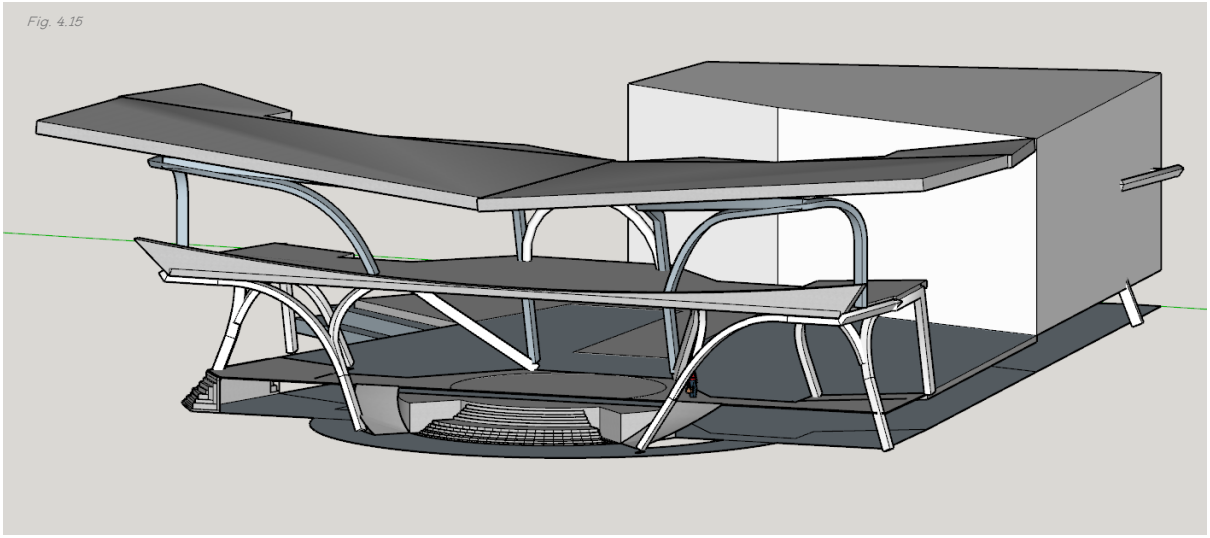


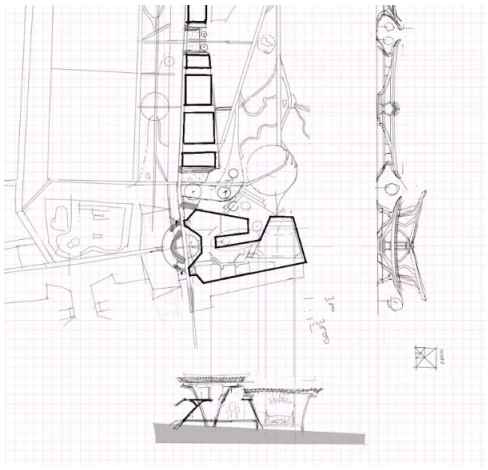


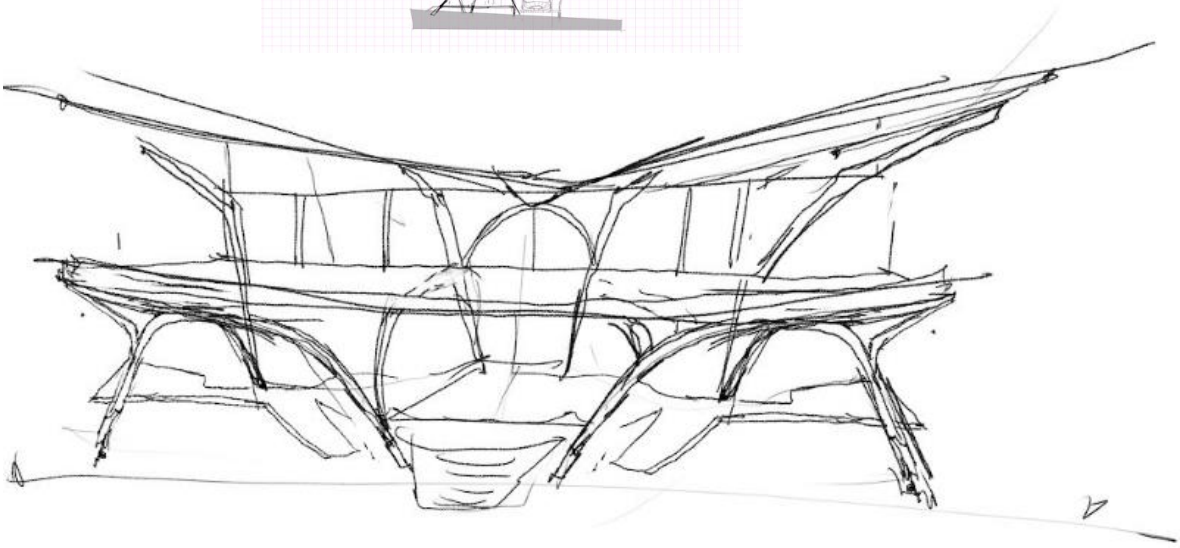
PROCESS WORK DEVELOPING DESIGN: PROTOTYPING

[Connections of the frame to the ground aims to promote social interaction in public space. Fig. 4.14 (Source: Author)]

Fig. 4.15



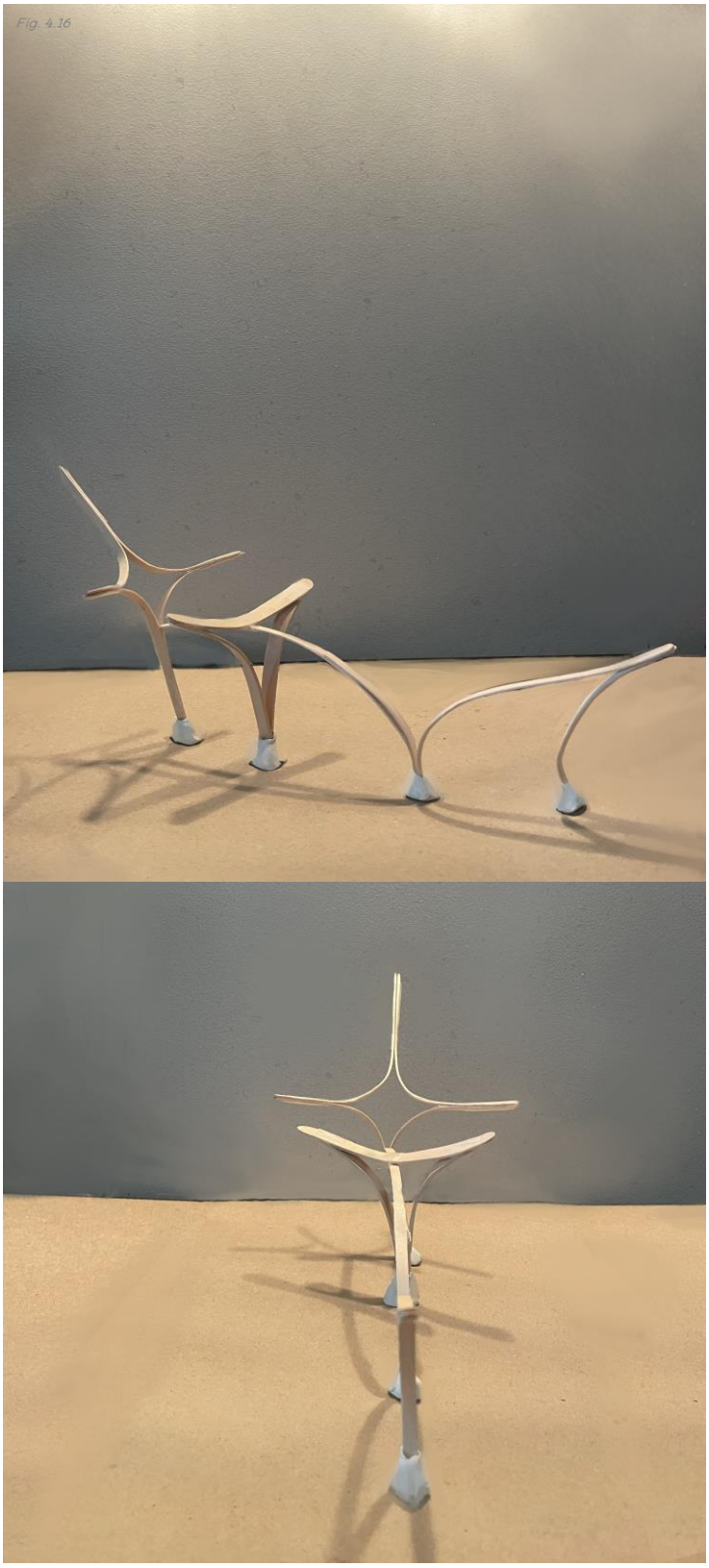




PROCESS WORK DEVELOPING DESIGN: PROTOTYPING

[Connections of the frame to the sky aims to promote social interaction through public gathering under roof overhands. Fig.4.15 (Source: Author)]

Fig. 4.16



FUTURE WORK DEVELOPING A PROTOTYPE

[Design informed by rhino parametric, form finding and structural analysis optimization] [Using Laminates to create structure via 3D printed moulds] [Laminate process making] [Prototype connection interrogation.
Fig. 4.16 (Source: Author)]

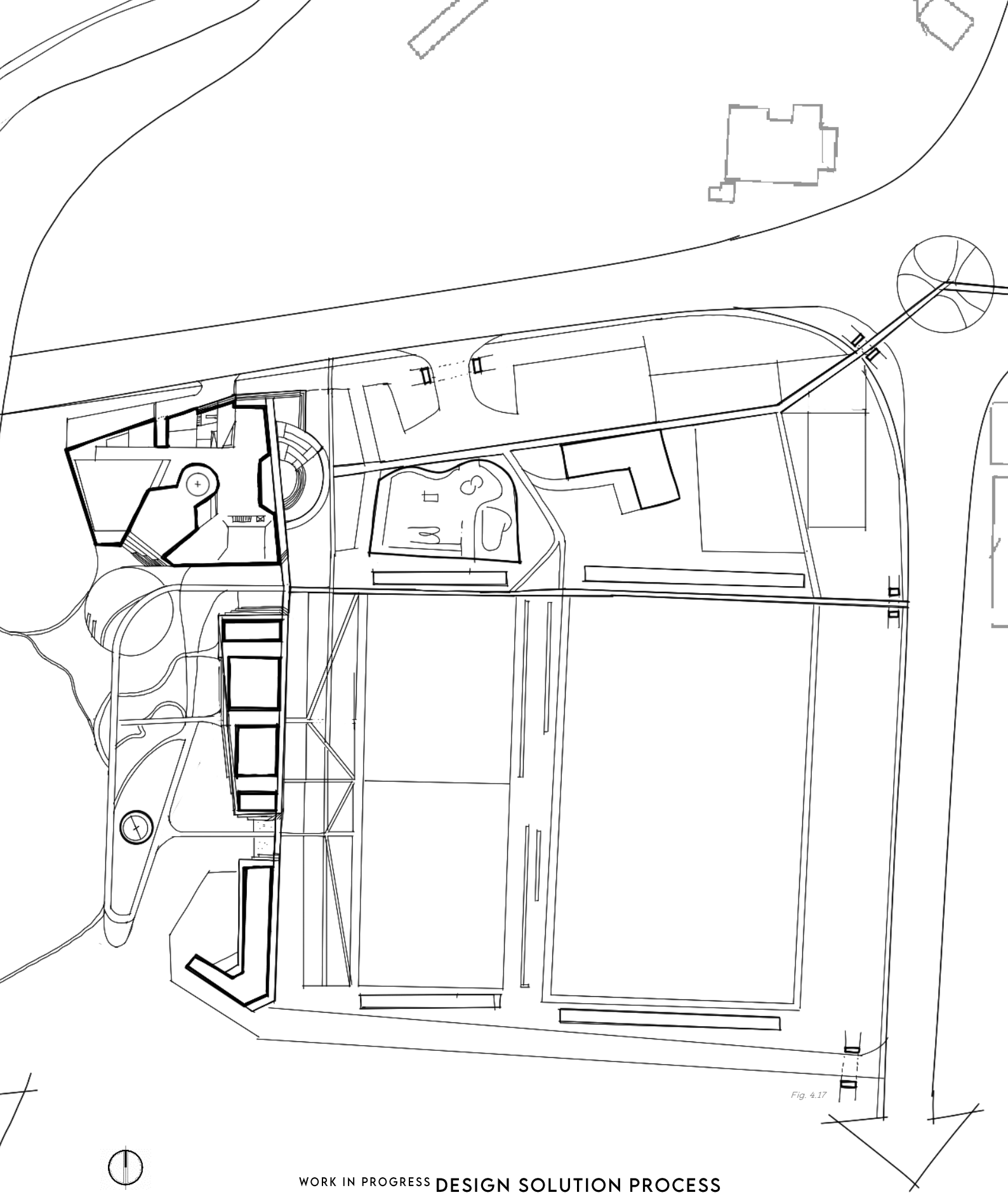
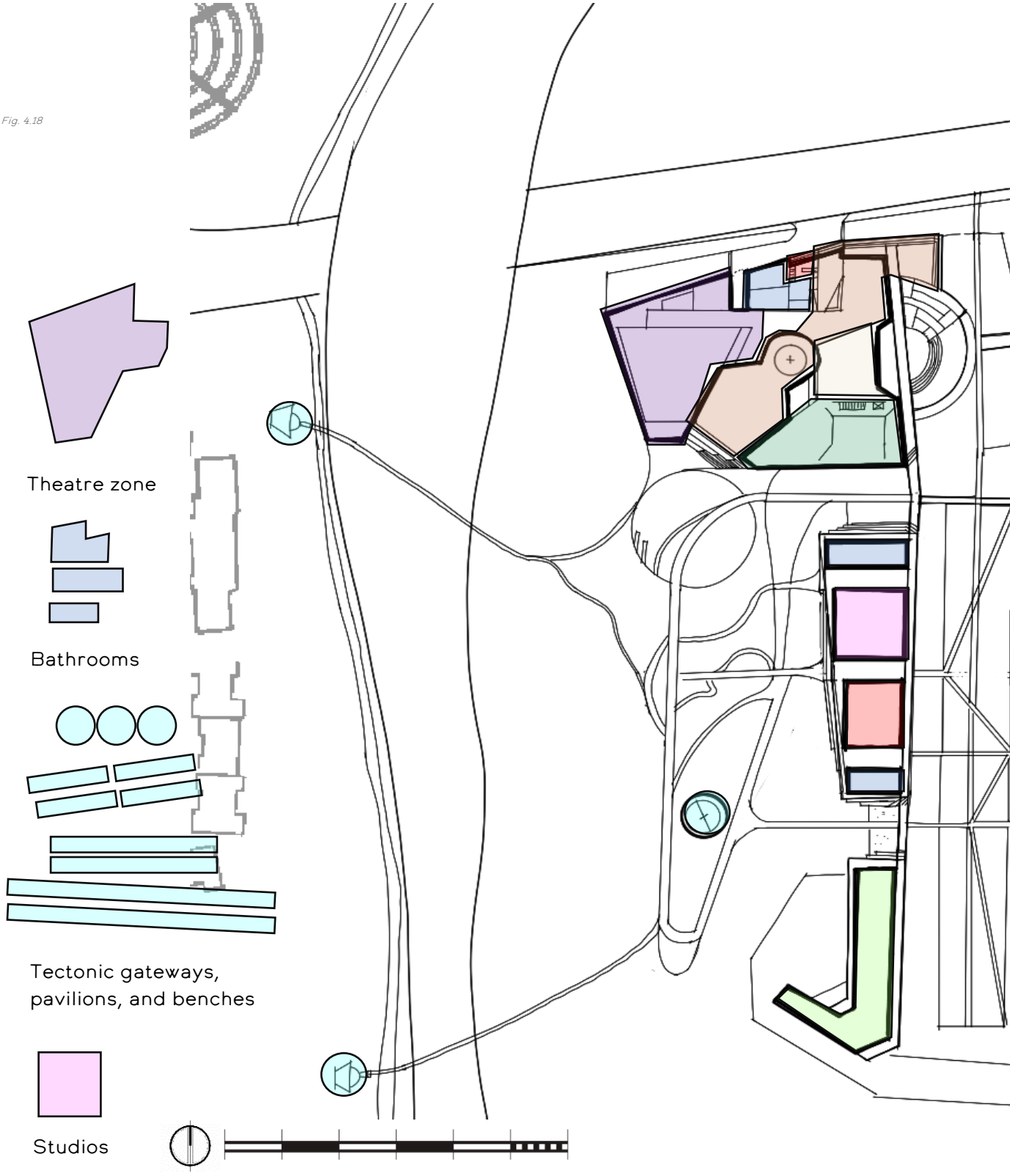


Fig. 4.17

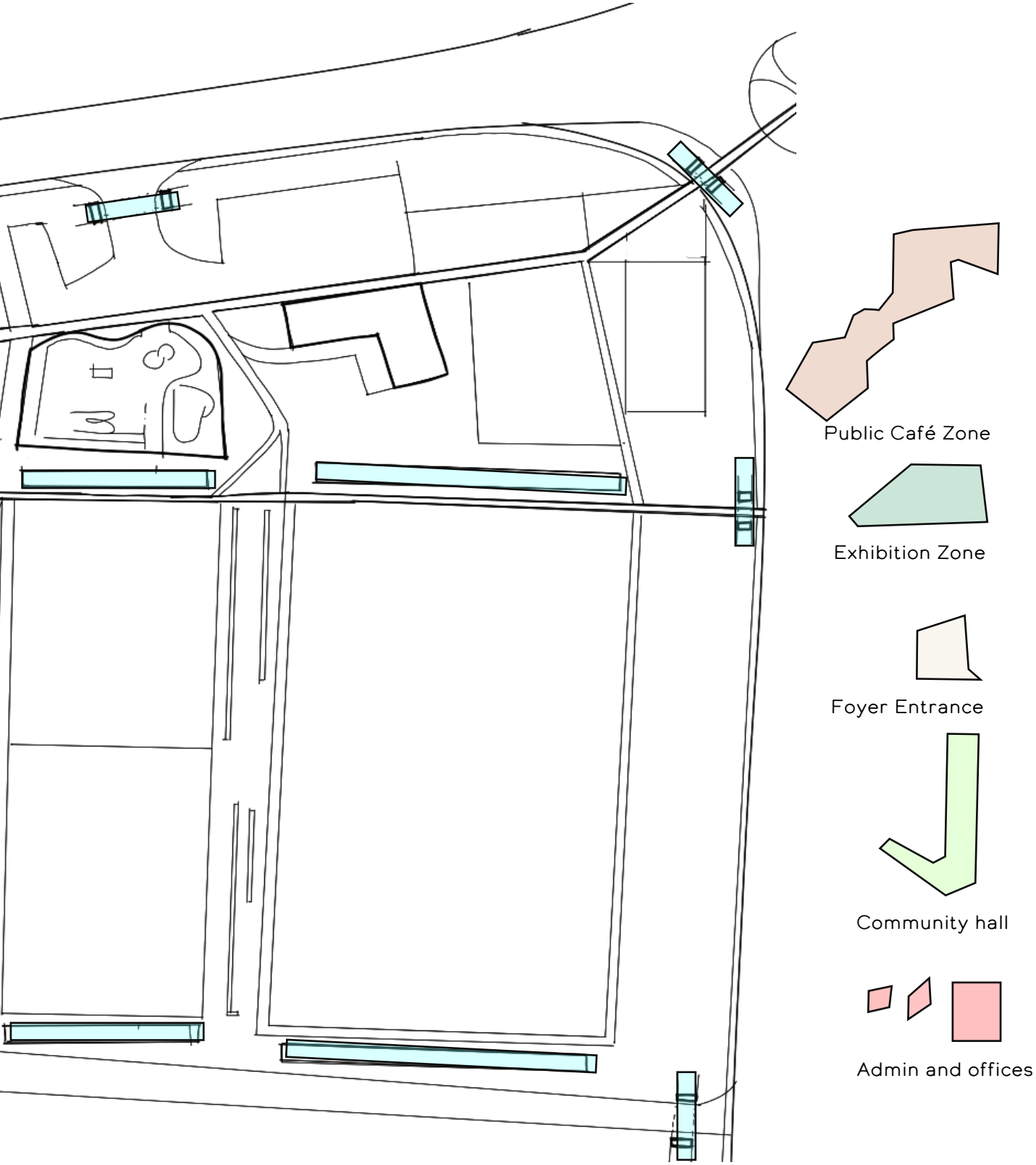
[The current design, a work still in progress. Fig. 4.17 (Source: Author)]

Fig. 4.18



WORK IN PROGRESS **SITE PLAN**

[A public study café connects the spaces of a courtyard, road, forecourt, building and gardens together through sight lines. Here is the admin block that goes to a second floor, followed by public bathrooms and the theatre zone of backstage, changeroom, stage and bar. A gracious and permeable foyer with reception and art gallery. Fig 4.18 (Source: Author)]



WORK IN PROGRESS SECTION

[This building is followed by the Lalela arts building of offices, art classrooms and bathrooms. A community hall is at the tail end with a stage and offices. Tectonic pavilions carry the language of the timber architecture through the site providing better wayfinding and landmarks along the pathing and shading for benches.]

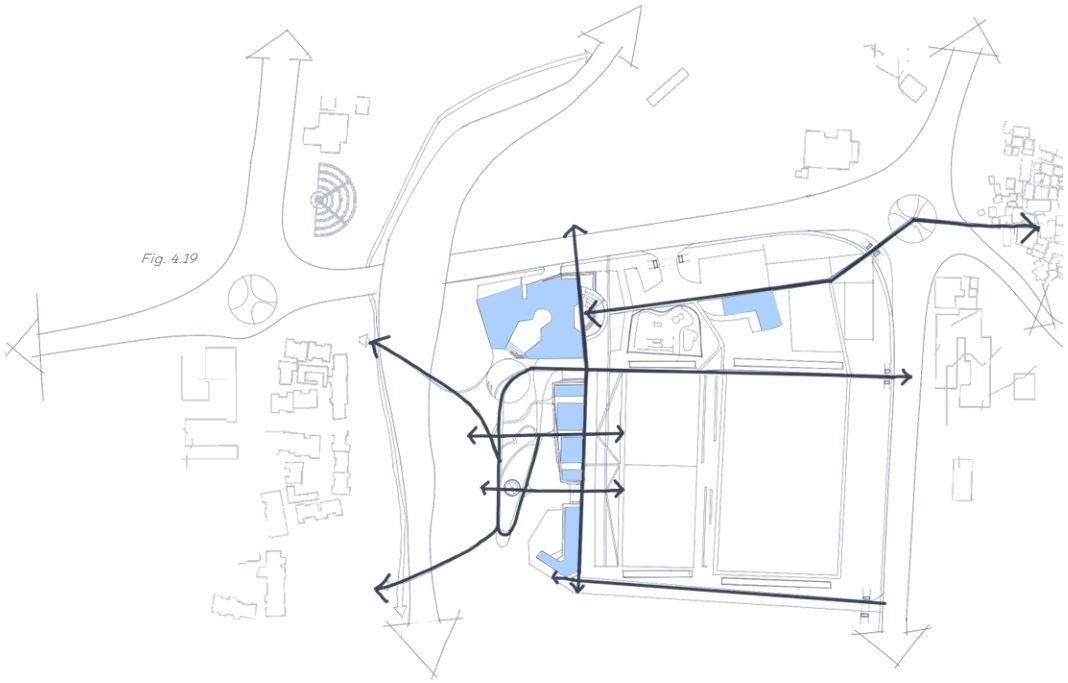


Fig. 4.19

ANALYSIS RESPONSE CIRCULATION

Fig 4.19 is Circulation and access connect space through movement, a primary circulation axis along the eastern edge reinforces a visual connection to Imizamo Yethu with perpendicular horizontal circulation connecting to the Helgrada estate. The café space on the northern edge connects pedestrian activity through the building. (Source : Author)

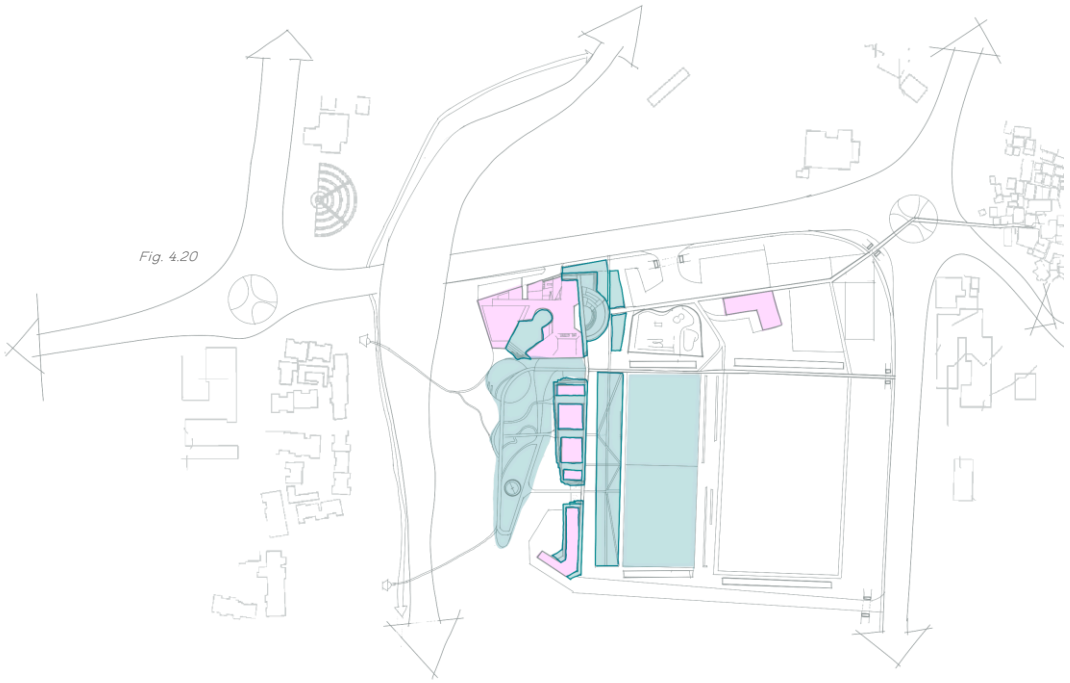


Fig. 4.20

ANALYSIS RESPONSE PUBLIC SPACE

Fig 4.20 Public space connects us through gathering. This is achieved via forecourts, new sports field, a public garden park and generous *plinthing* of the mases. The plinths provide seating and layer thresholds for more private and public space connection of gathering and interacting. (Source : Author)

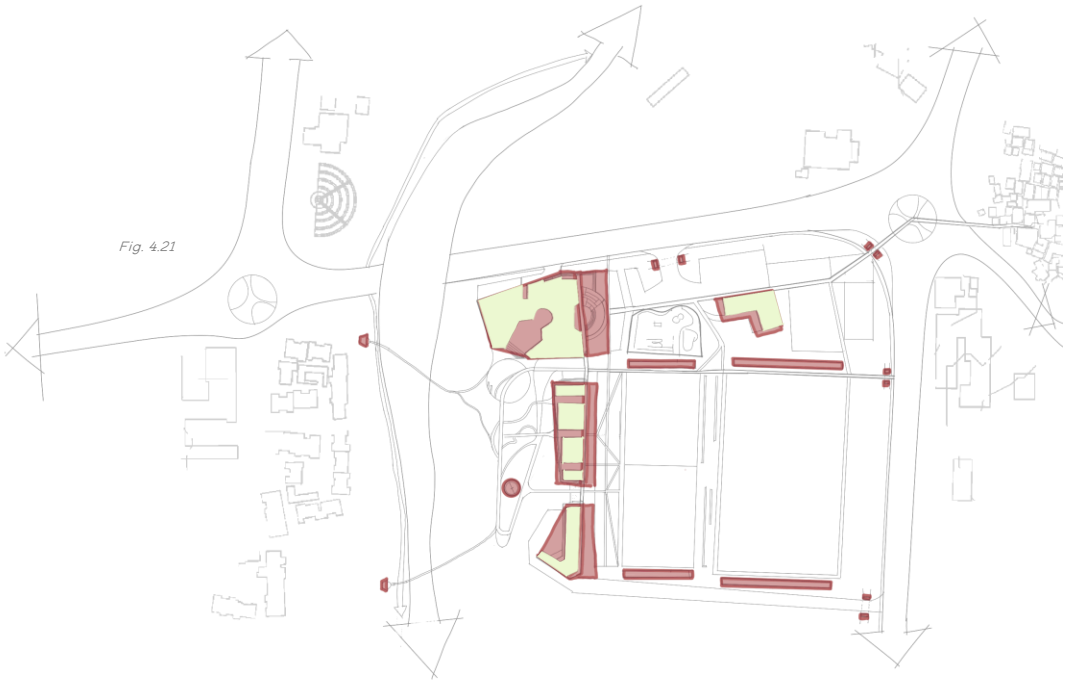


Fig. 4.21

ANALYSIS RESPONSE TECTONIC STRUCTURES

Fig 4.21 Roofs and tectonic pavilions infer thresholds and spaces to gather and connects the architectural language through the site. Finally sight lines strengthen all these elements through visual connection. (Source: Author)

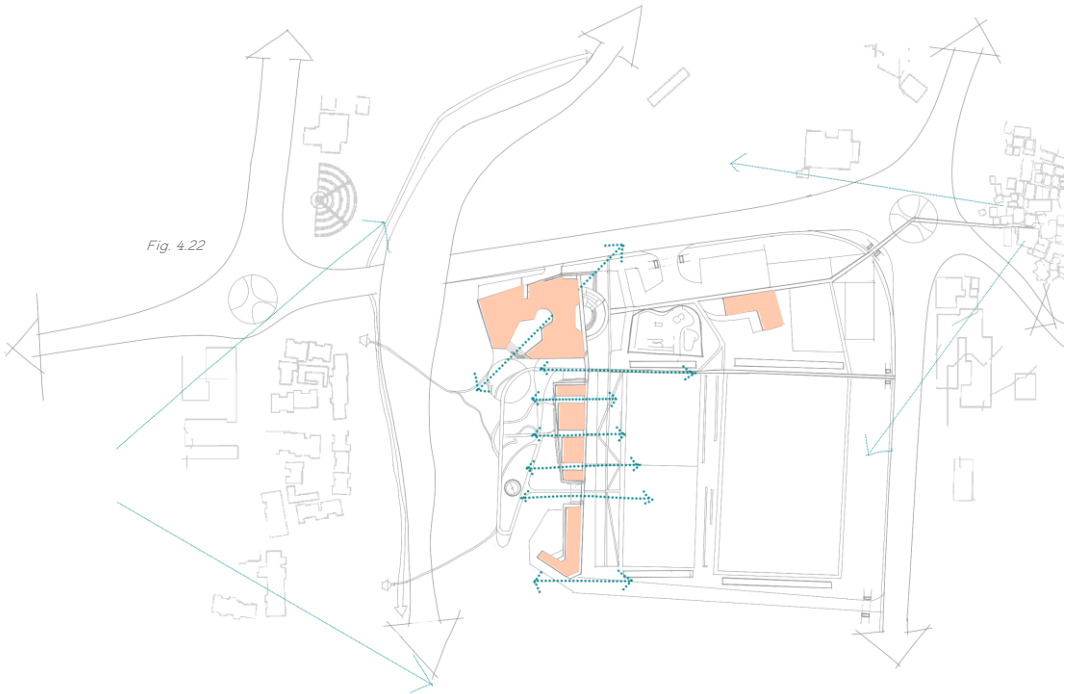


Fig. 4.22

ANALYSIS RESPONSE SIGHT LINES

Fig 4.22 Sight lines strengthen all the prior elements through visual connection. (Source: Author)

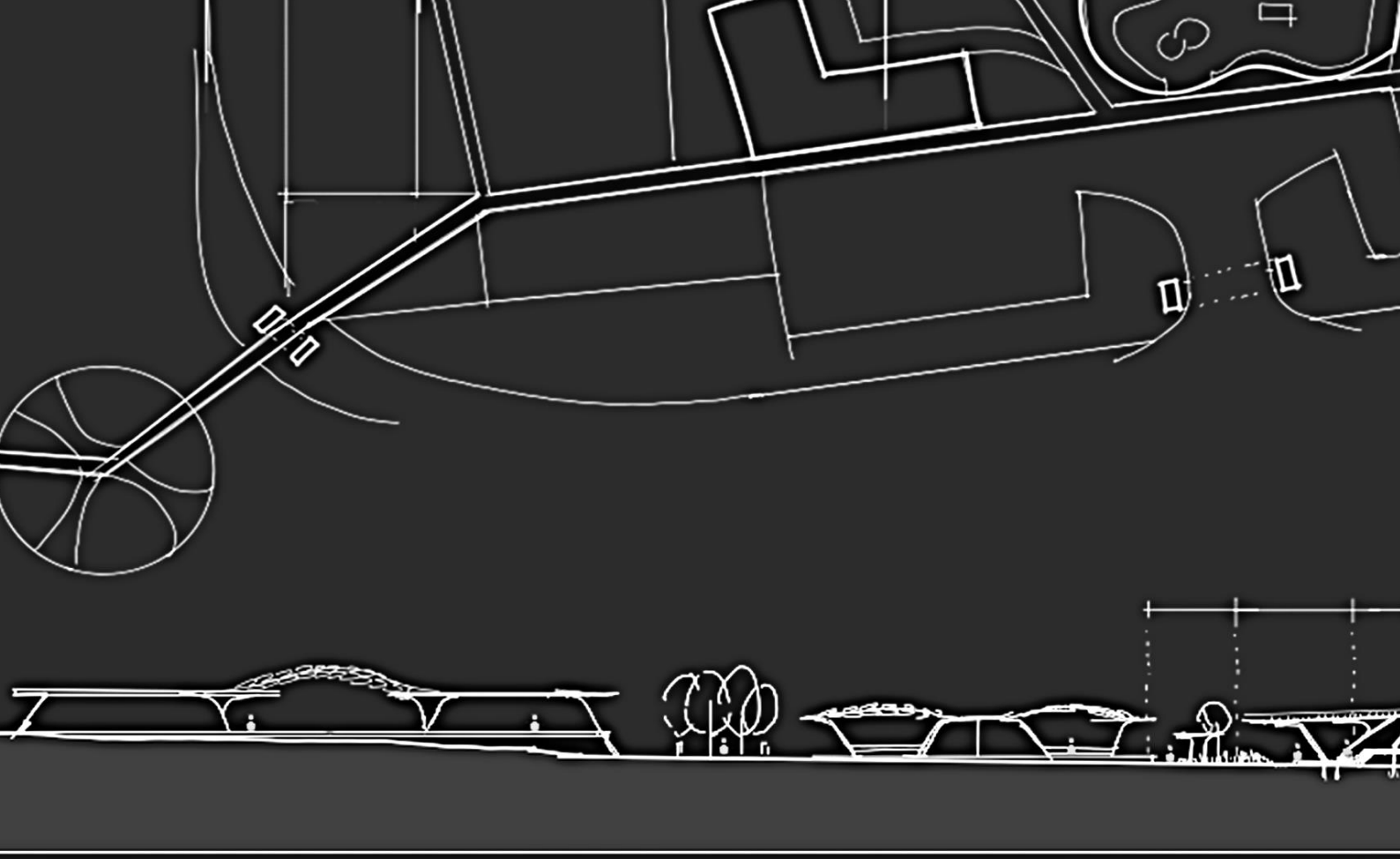


Fig. 4.23

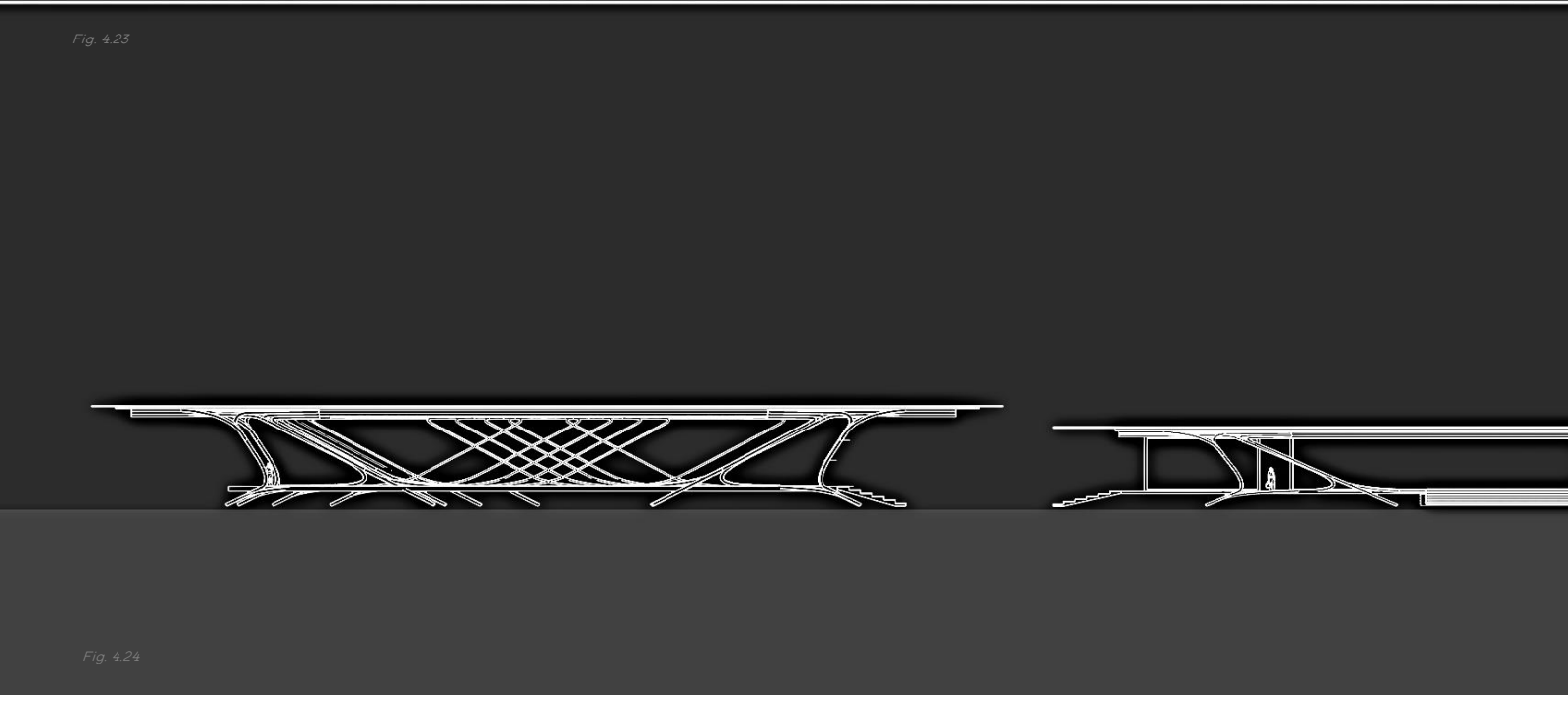
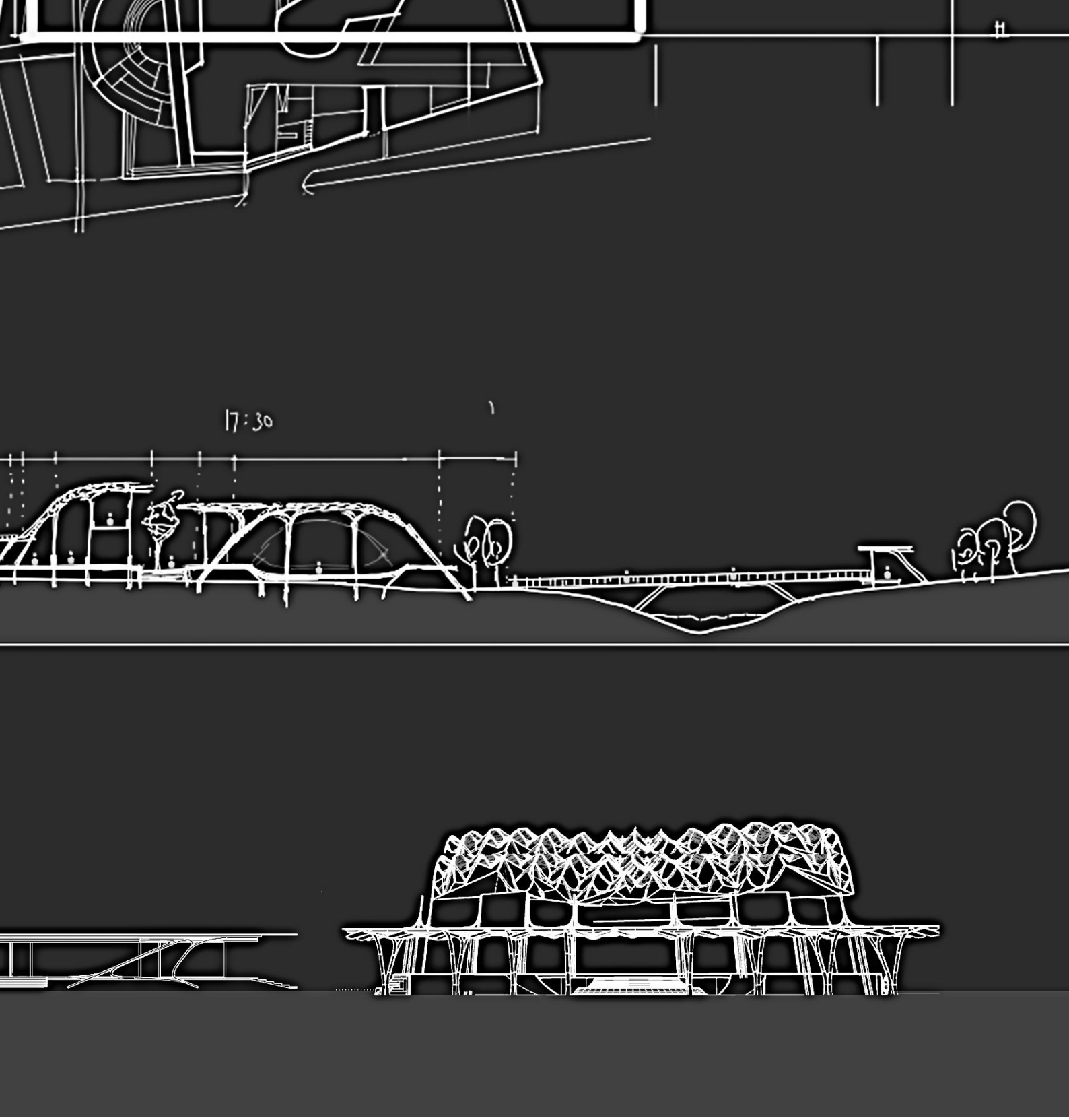


Fig. 4.24

WORK IN PROGRESS SECTION & ELEVATION

[Fig. 4.23 (Source: Author)A site section explains how different tectonics carry the language of the architecture through the site and create different spatial qualities. The thresholds of the public building have welcoming curves that form gathering spaces of forecourts. Followed by dynamic steep curves of the primary circulation, to emphasize movement. Once in the foyer, tall vertical treelike columns create stability and make the curved roof space feel comfortable.]



WORK IN PROGRESS SECTION & ELEVATION

[Fig. 4.24 (Source : Author)The elevation design is aimed to be simple and not too busy. Low scale masses of 1 storeys of the community educational centre emphasize a taller 2 or 3 storey public building. The public building is more avant-garde and connect to the mass of the other buildings through a 1 storey overhang/ eave over the public forecourts.]

Fig. 4.25

WORK IN PROGRESS SPATIAL SECTION

[Fig 4.25 (Source : Author)This spatial section to test the atmosphere. I wanted the timber elements to sit on these concrete plinths and be permeable to connect people across the building. The foyer is aimed to feel light and open and connects to the courtyard and park. Dramatic curved tectonics form a baroque theatre at the end .]

WORK IN PROGRESS **SPATIAL SECTION**

[Different thresholds of forecourts, plinths and steps gather people under the roofs. The dynamic primary corridor, the shaded pavilions, and bridges to the running trail layer the public space. The overt use of soft and sweeping curves reference the timber nautical building history of Hout Bay.]

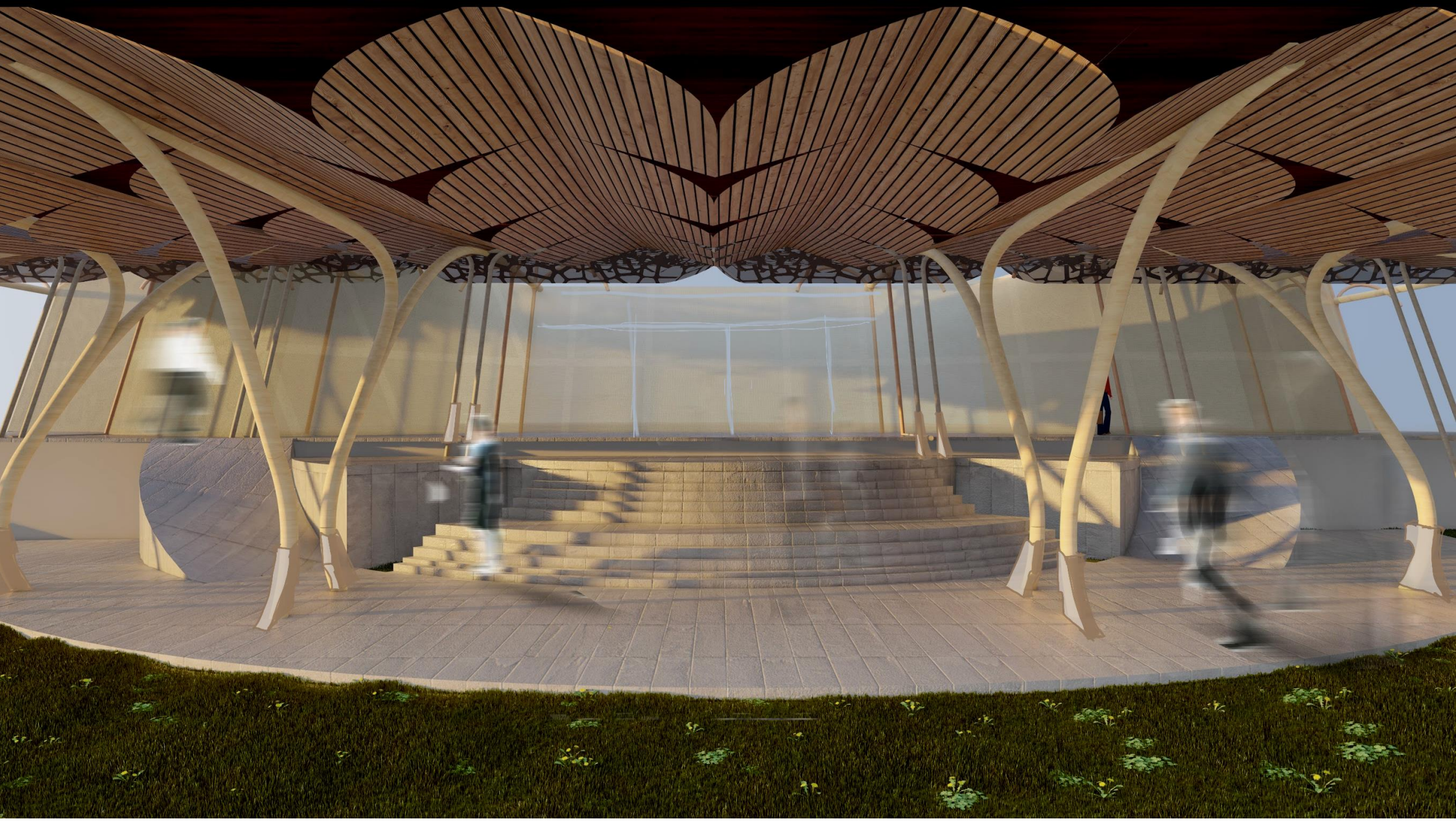


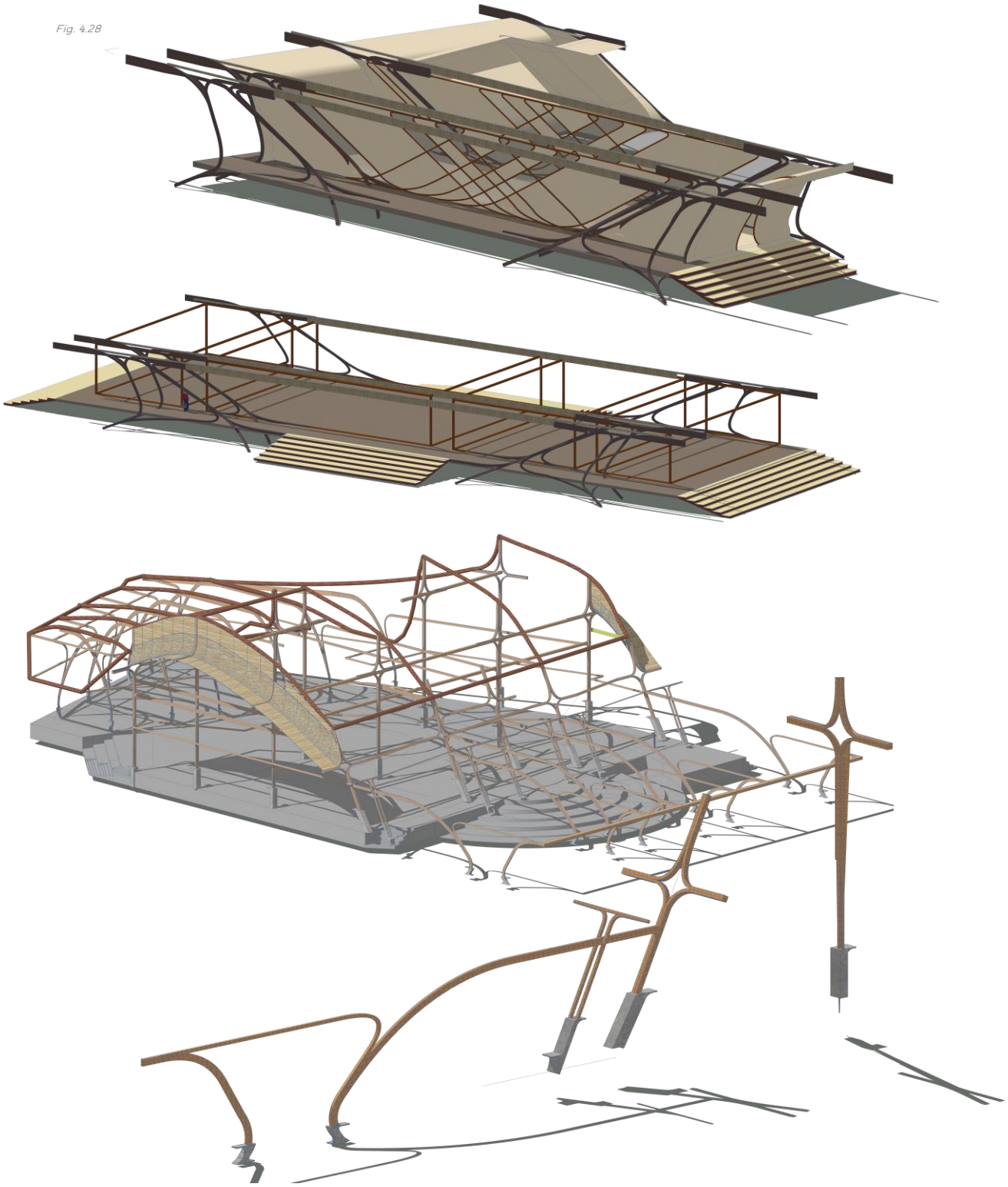
Fig. 4.26

WORK IN PROGRESS SPATIAL TESTING

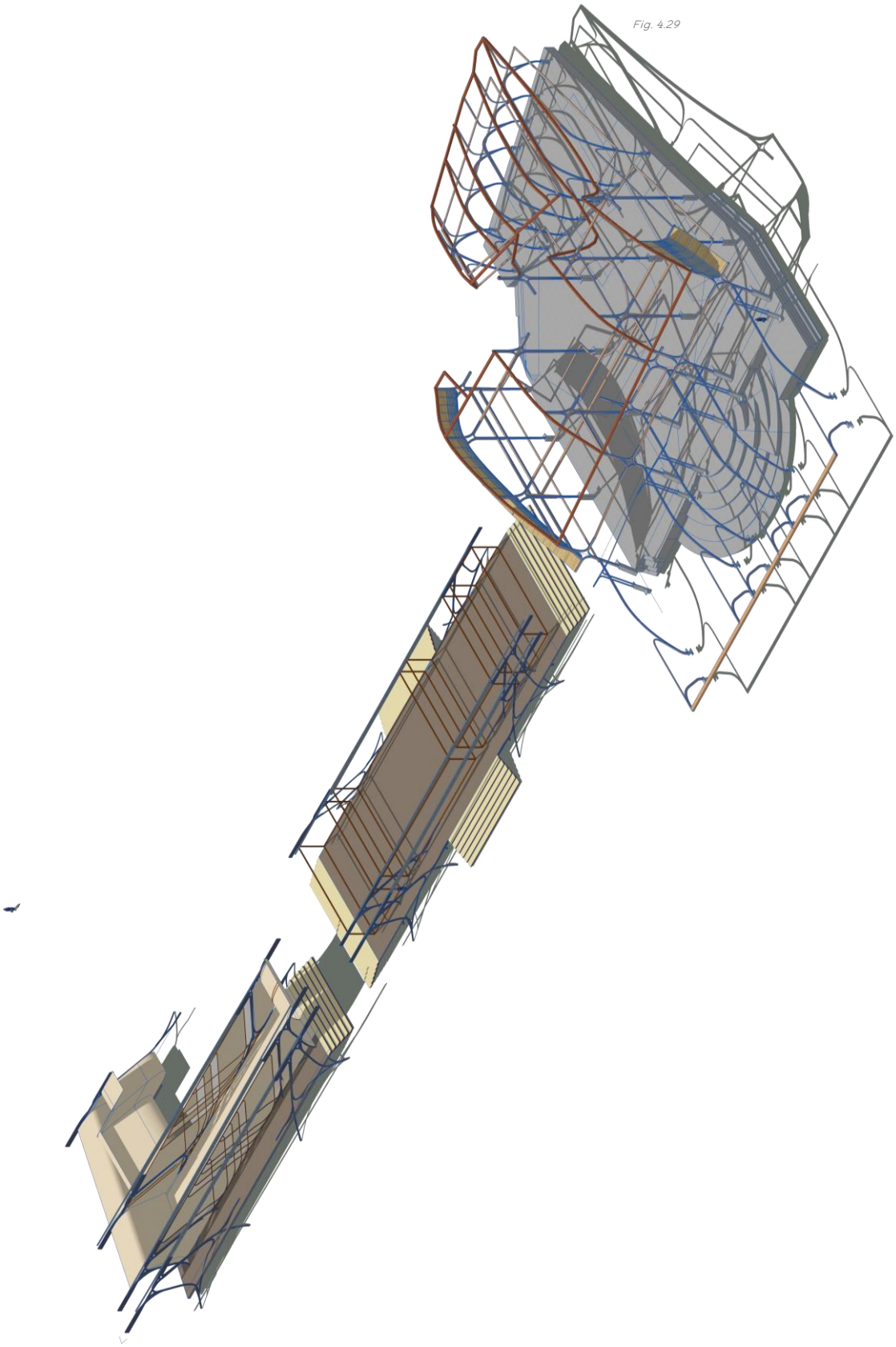
[Fig. 4.26 (Source: Author) This render tests the spatial quality of the forecourts and the soft welcoming curved timber tectonics, I want them to connect to the ground through these skinny high heel plinths.]

Fig. 4.27 (Source :Author)This spatial render of the foyer tests the architectural aim of connection and openness with tectonic. The roof is to have translucent cladding to enable light permeation. The grid-shell design is after the protea petals on our crest. An appropriate motif to reference our motto: *! ke e: /xarra //ke , Diverse People Unite*.

Fig. 4.28



[Fig. 4.28 (source: Author)Nautical-like masts tilt and carry the roof load throughout the structure]

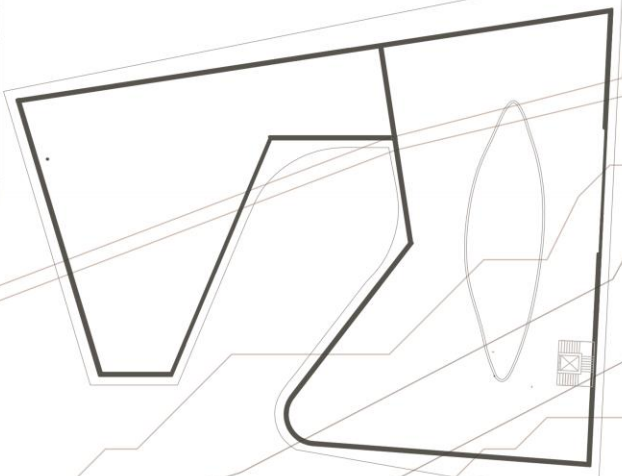


[Fig. 4.29 (Source: Author)The buildings edge is layered by an external circulation, steps and roof overhangs encourages connection with the forecourts]

THE KUNYE CULTURAL COMMUNITY CENTRE

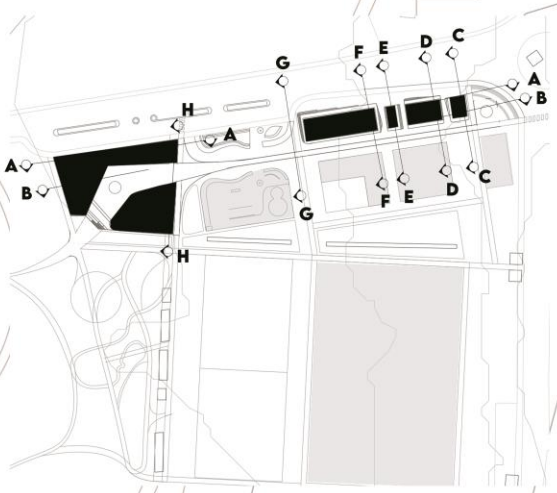
PLANS

PERFORMANCE NODE
SECOND FLOOR

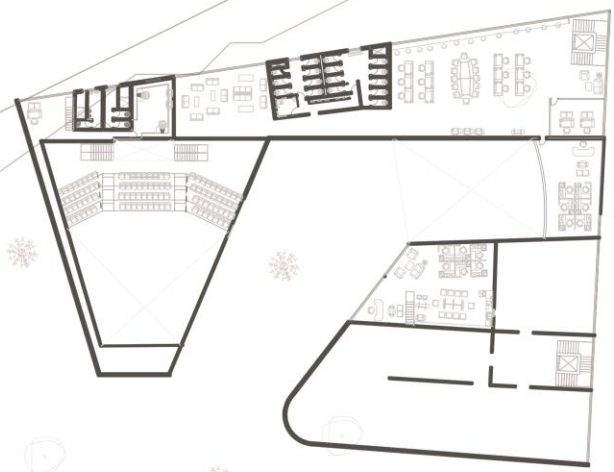


PERFORMA
MEZZA

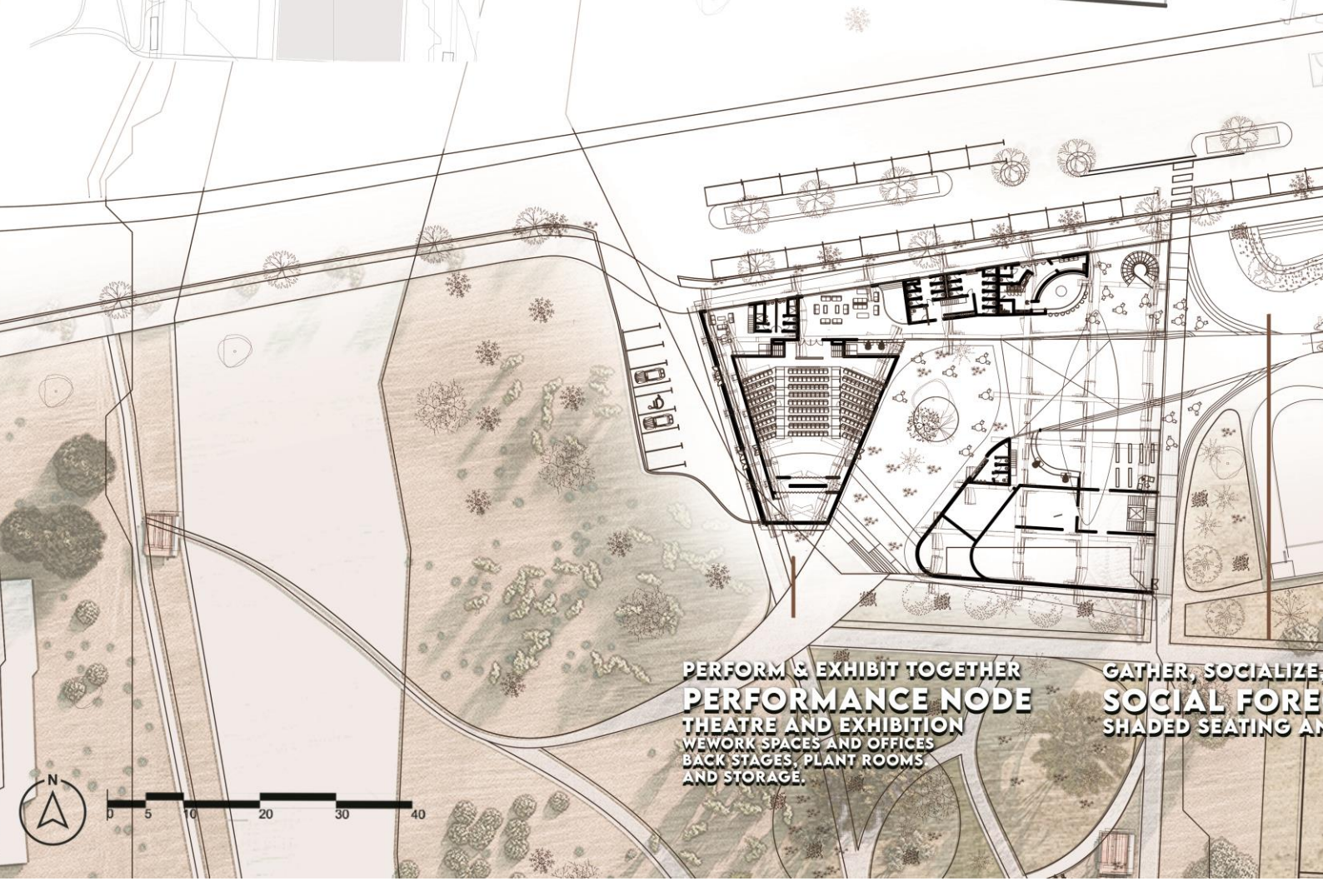
THE KUNYE CULTURAL COMMUNITY CENTRE
SECTION KEY



PERFORMANCE NODE
SECOND FLOOR



COMMUNIT
SECON

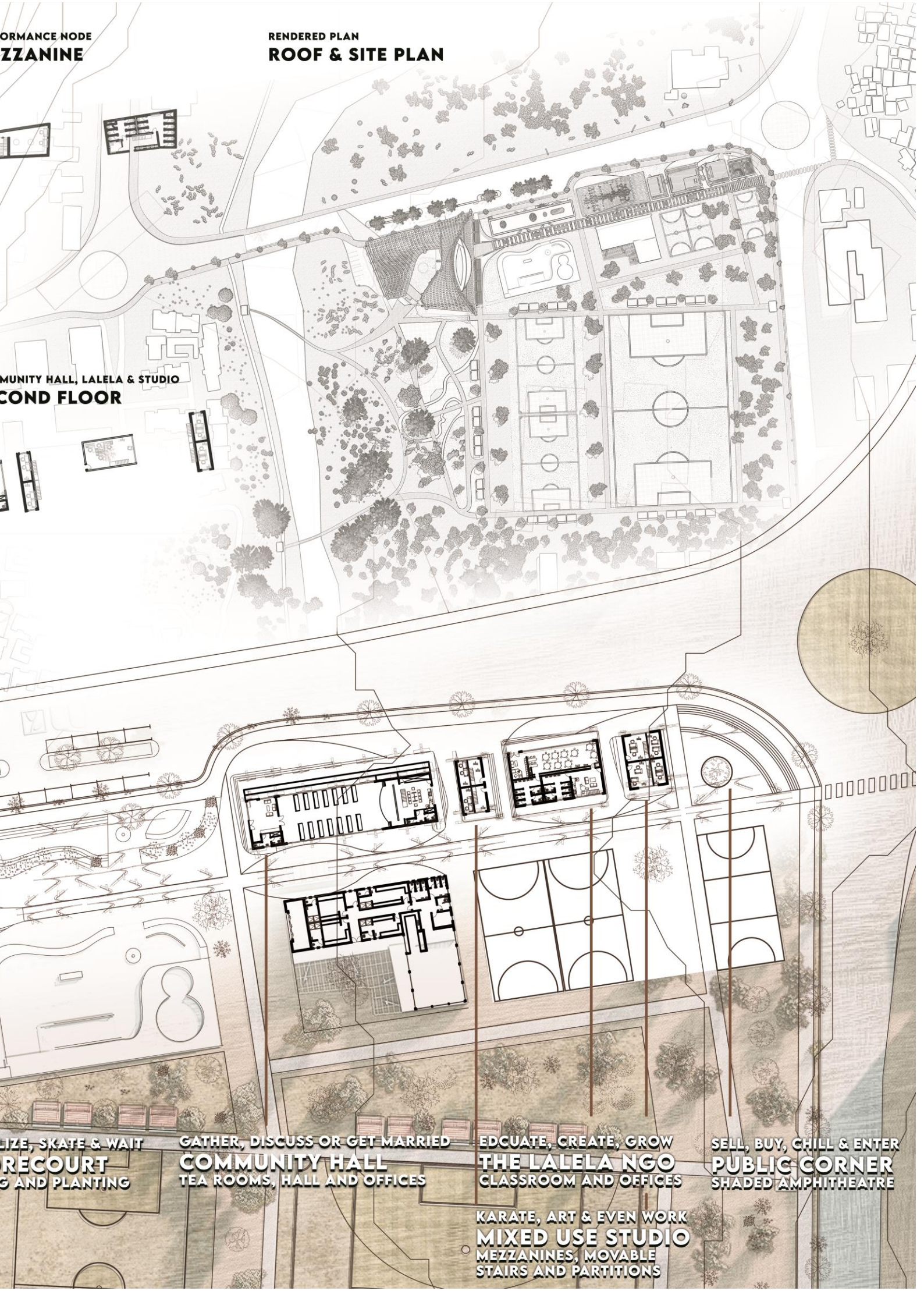


PERFORM & EXHIBIT TOGETHER
PERFORMANCE NODE
THEATRE AND EXHIBITION
WEWORK SPACES AND OFFICES
BACK STAGES, PLANT ROOMS
AND STORAGE.

GATHER, SOCIALIZE
SOCIAL FORE
SHADED SEATING AN

ORMANCE NODE
ZZANINE

RENDERED PLAN
ROOF & SITE PLAN



MUNITY HALL, LALELA & STUDIO
COND FLOOR

LIZE, SKATE & WAIT
RECOURT
G AND PLANTING

GATHER, DISCUSS OR GET MARRIED
COMMUNITY HALL
TEA ROOMS, HALL AND OFFICES

EDCUATE, CREATE, GROW
THE LALELA NGO
CLASSROOM AND OFFICES

SELL, BUY, CHILL & ENTER
PUBLIC CORNER
SHADED AMPHITHEATRE

KARATE, ART & EVEN WORK
MIXED USE STUDIO
MEZZANINES, MOVABLE
STAIRS AND PARTITIONS

SECTIONS & ELEVATIONS

CROSS SECTION C-C
MIXED USE STUDIO I

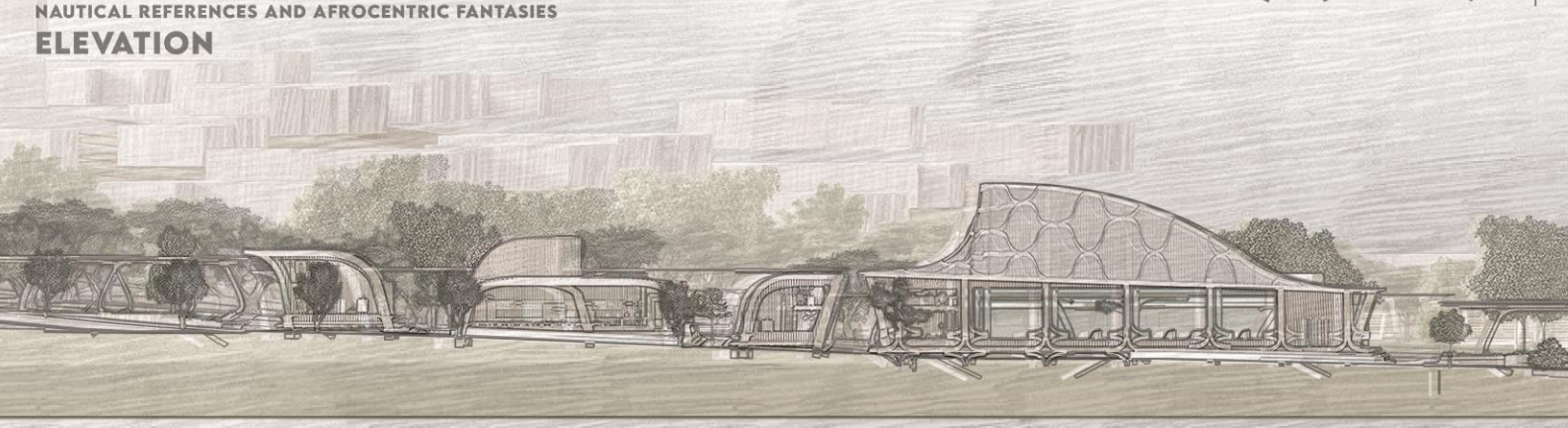
CROSS SECTION E-E
LALELA FOUNDATION

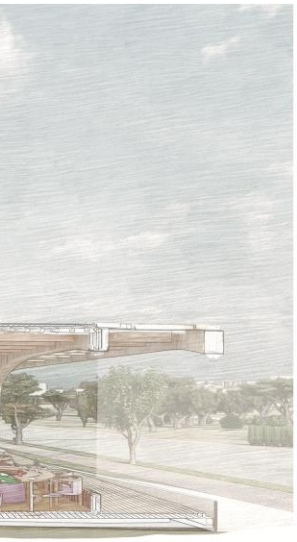
CROSS SECTION D-D
MIXED USE STUDIO II

CROSS SECTION F-F
COMMUNITY HALL

LONGITUDINAL SECTION B-B
SITE SECTION

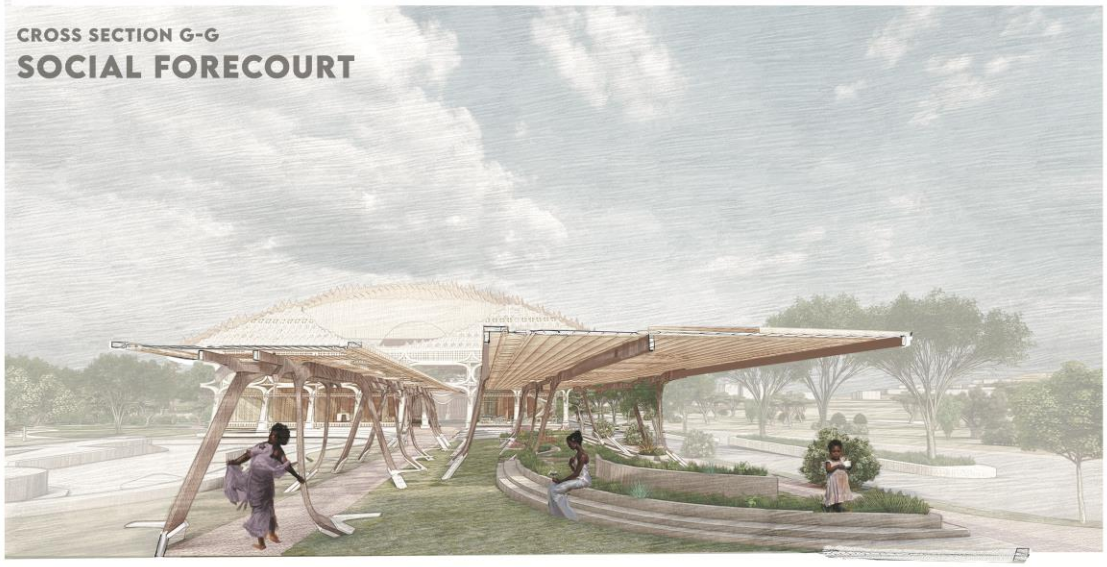
NAUTICAL REFERENCES AND AFROCENTRIC FANTASIES
ELEVATION





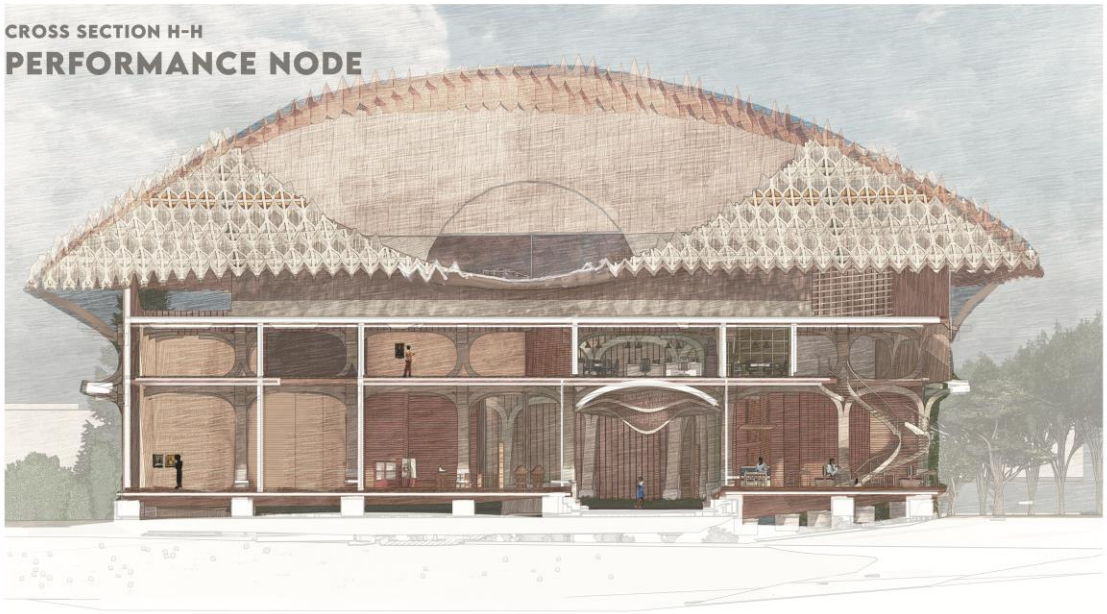
CROSS SECTION G-G

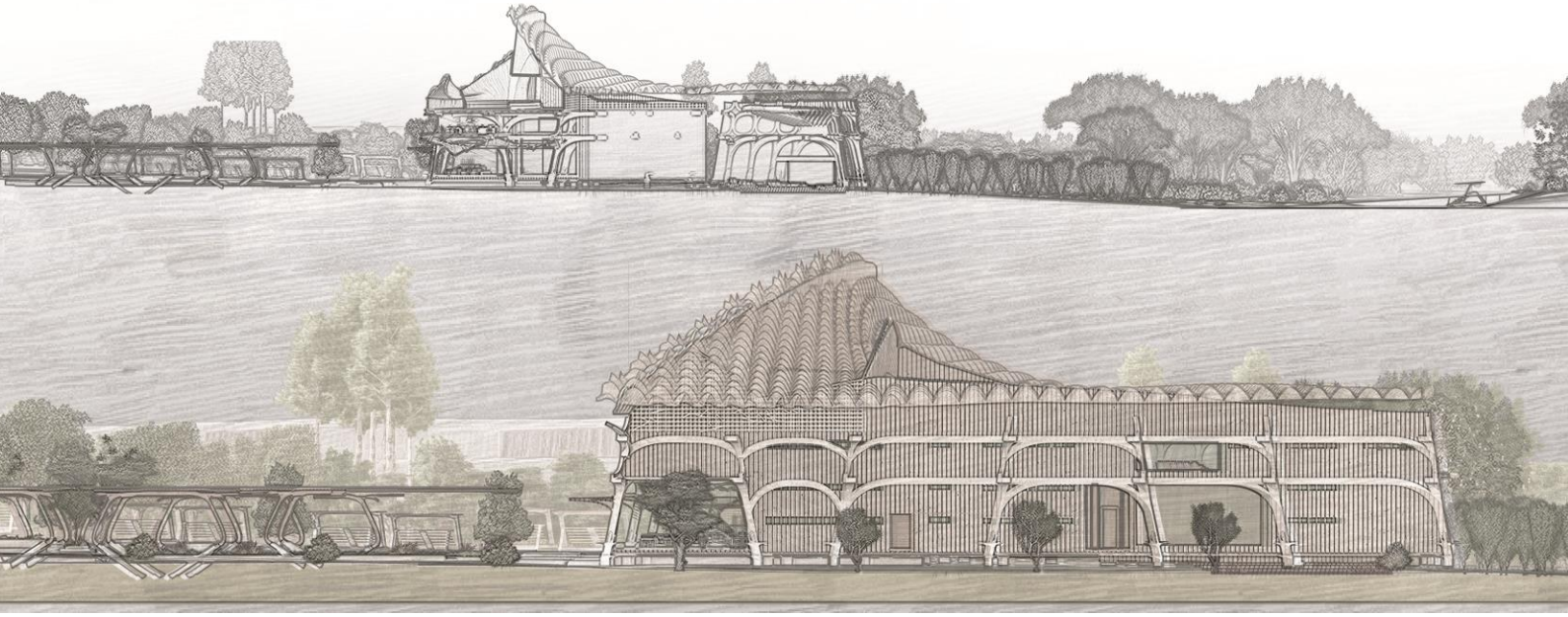
SOCIAL FORECOURT



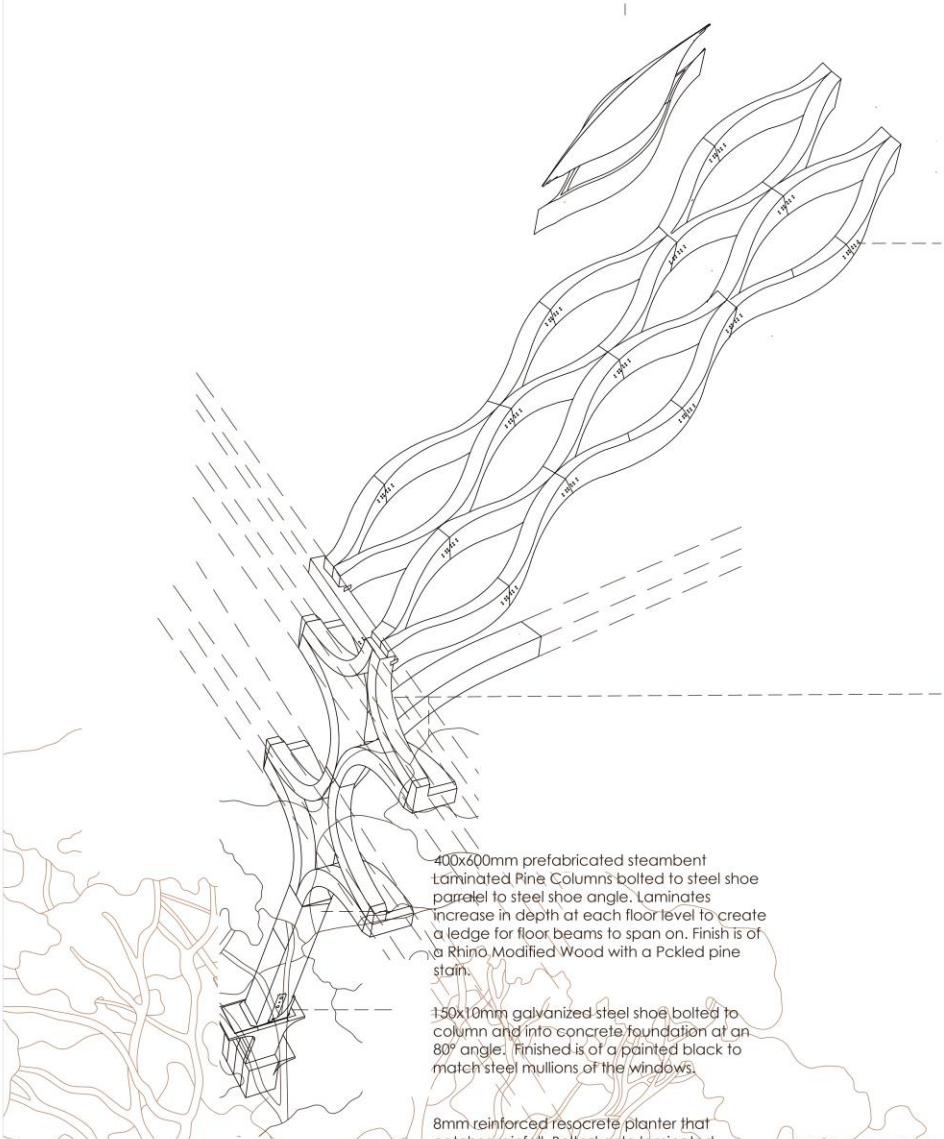
CROSS SECTION H-H

PERFORMANCE NODE





1:20 SECTION



Fibre glass panel membrane, consisting of a fibre glass shell bolted within a rhino modified timber frame, bolted onto glulaminated gridshells as protection. Panels shells vary between translucent and transparent fibreglass to timber. Shells organized in an undulating roof shape and overlap as shingled lap joints.

200x400mm prefabricated steambent glue laminated pine gridshell modules. The steambent arcs are combined as quadrants to a petal shape through bolting of counter sunk domehead screws into crucible joint plates. The frame is organized into an undulating roof shape.

The undulating gridshells join the glue laminated columns via a shiplap joint with a rectangular wedge at varying angles in lieu of undulating roof. the gridshells also join onto the perpendicular stiffener beams in the same manner.

38x114mm pine base plate timber nailed onto sole plate

38x114mm pine sole plate nailed onto timber I beam
200micron DPC sitting under sole plate and screed

300x300mm and 300 x 600mm prefabricated steambent laminated pine beam element glued and laminated onto Column. Laminates grow into columns at varying depths and are a support ledge for floor beams to span on. Finish is of a Rhino Modified Wood with a Pckled pine stain.

Drip joint

38x280mm sawn pine plank bolted to the 300x600mm beam

Aluminum step flashing extended and tucked under the interior facing timber beam to prevent water through frame permeations between every opening.

Double low e glazing set within 50x50mm galvanized aluminium mullions painted black as per NBR.

400x600mm prefabricated steambent Laminated Pine Columns bolted to steel shoe parralel to steel shoe angle. Laminates increase in depth at each floor level to create a ledge for floor beams to span on. Finish is of a Rhino Modified Wood with a Pckled pine stain.

150x10mm galvanized steel shoe bolted to column and into concrete foundation at an 80° angle. Finished is of a painted black to match steel mullions of the windows.

8mm reinforced resocrete planter that catches rainfall. Bolted onto laminated beams underneath.

50x114mm laminated pine beam that joins to the 300x300 timber beam and the below 50x220 beam through lamination. Treated as Rhino Modified Wood with a Pickled Stain.

50ømm pine pole purlin at 300 c/c set between a top laminated 50x114 laminated pine beam and a bottom 50x220 laminated pine beams that are connected to column through lamination and glue.

50x220mm laminated pine beam that joins to the 300x600 timber column through lamination. Treated as Rhino Modified Wood with a Pickled Stain.

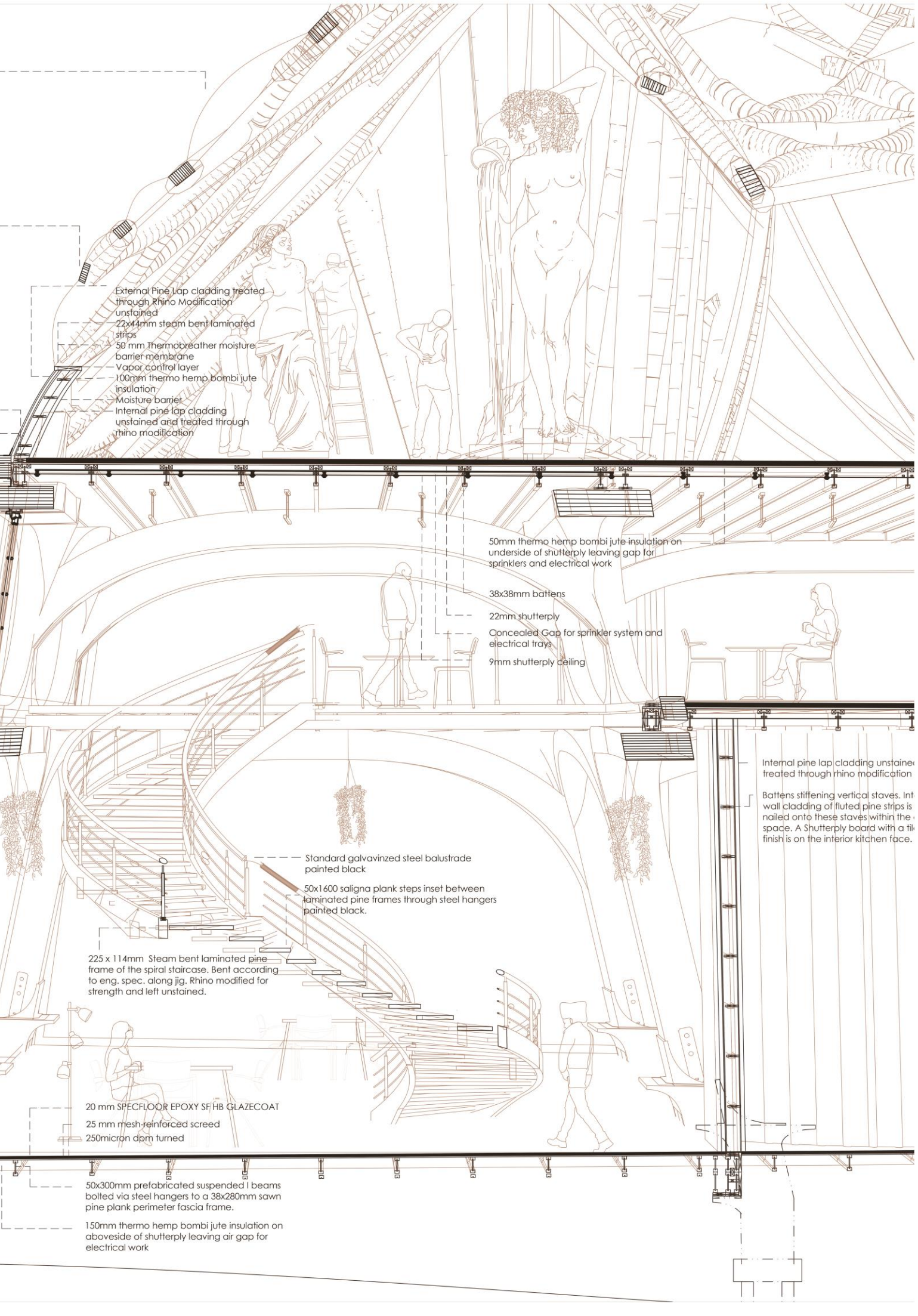
38x114mm pine base plate timber nailed onto sole plate

38x114mm pine sole plate nailed onto timber I beam
200micron DPC sitting under sole plate and screed
50x228mm sawn pine plank perimeter fasiea frames nailed on top of each other
50x50mm battens attached to shutterply above
22mm shutterply boards suspended 800mm above ground to leave space for plumbing on the underside

38x114mm timber base plate

Reinforced concrete steps and podium to engineers spec that sits upon concrete foot foundations. Casted at a 100 offset from R.C plinths

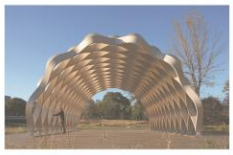
Reinforced concrete plinth to engineers spec that sits upon concrete pile foundations


External Pine Lap cladding treated through Rhino Modification unstained
22x44mm steam bent laminated strips
50 mm Thermobreather moisture barrier membrane
Vapor control layer
100mm thermo hemp bombi jute insulation
Moisture barrier
Internal pine lap cladding unstained and treated through rhino modification
50mm thermo hemp bombi jute insulation on underside of shutterply leaving gap for sprinklers and electrical work
38x38mm battens
22mm shutterply
Concealed Gap for sprinkler system and electrical trays
9mm shutterply ceiling
Internal pine lap cladding unstained treated through rhino modification
Battens stiffening vertical staves. Int
wall cladding of fluted pine strips is
nailed onto these staves within the
space. A Shutterply board with a til
finish is on the interior kitchen face.
Standard galvavinzed steel balustrade painted black
50x1600 saligna plank steps inset between laminated pine frames through steel hangers painted black.
225 x 114mm Steam bent laminated pine frame of the spiral staircase. Bent according to eng. spec. along jig. Rhino modified for strength and left unstained.
20 mm SPECFLOOR EPOXY SF HB GLAZECOAT
25 mm mesh-reinforced screed
250micron dpm turned
50x300mm prefabricated suspended I beams bolted via steel hangers to a 38x280mm sawn pine plank perimeter fascia frame.
150mm thermo hemp bombi jute insulation on aboveside of shutterply leaving air gap for electrical work

STRUCTURE ASSEMBLIES

INTERNATIONAL PRECEDENT STUDIES

SOURCE: PERKINS AND WILL

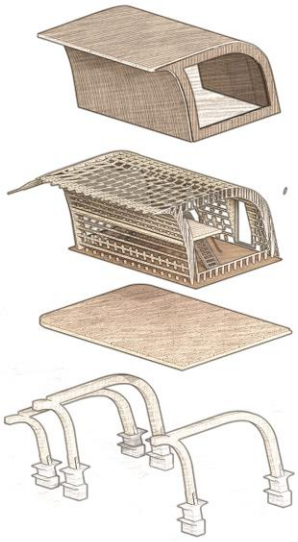


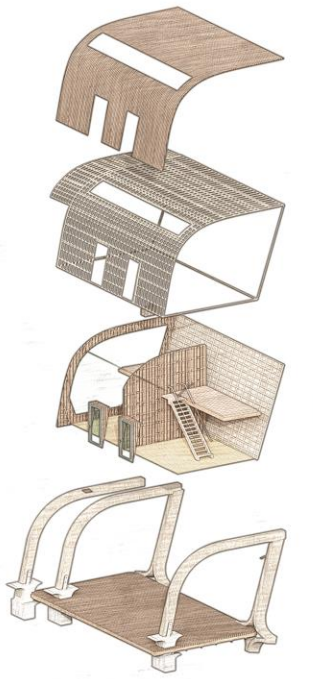
SOURCE: STUDIO GANG

VAN DUSEN BOTAN

SOURCE: PERKINS AND W

EXPLODED ASSEMBLIES MIXED USE STUDIO I & II

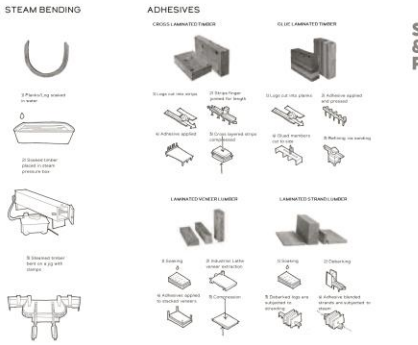




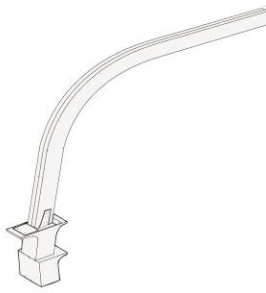
LONGITUDINAL SECTION A-A

TECH SECTION

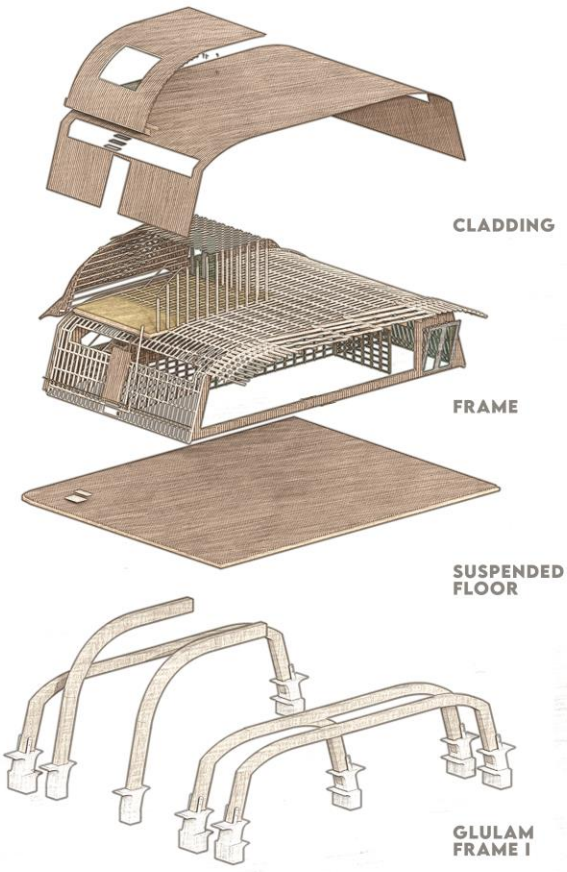
FORM COMPLEXITY EXPLORATION THROUGH ANISOTROPIC ADDITION



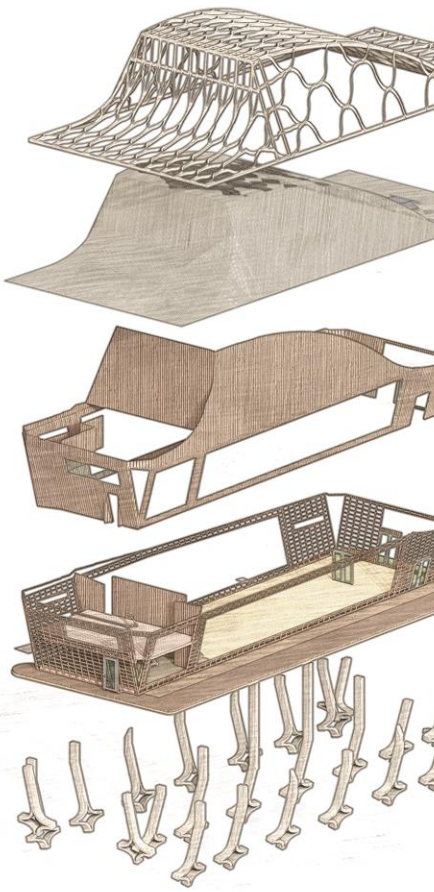
STEAMBENDING & LAMINATION PROCESSES

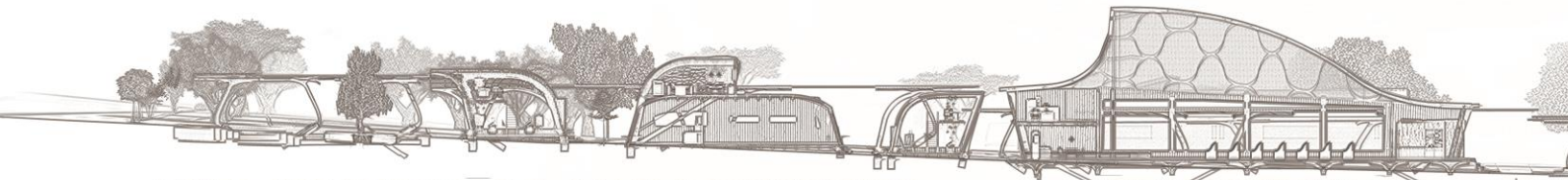


LALELA FOUNDATION



COMMUNITY HALL





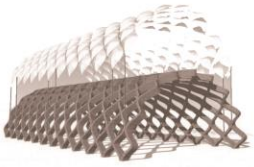
MIXED USE STUDIO I & II LALELA FOUNDATION COMMUNITY HALL

NICAL CENTRE

WILL

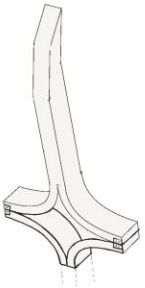
YPOLOGY I

LINCOLN PARK PAVILION

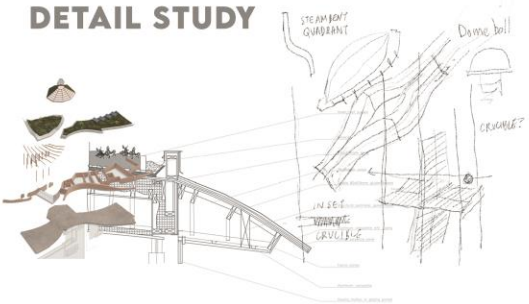


SOURCE: STUDIO GANG

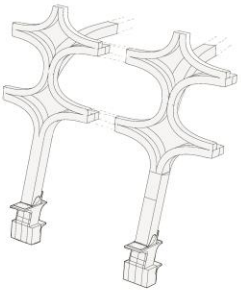
GLULAM FRAME TYPOLOGY II



DETAIL STUDY



GLULAM FRAME TYPOLOGY III



L

STANDS, GATEWAYS, SHADING

PERFORMANCE NODE

ROOF FRAME

PTFE

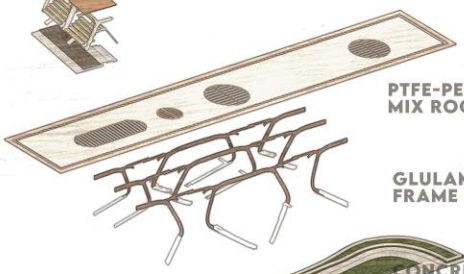
CLADDING

FRAME & SUSPENDED FLOOR

GLULAM FRAME II

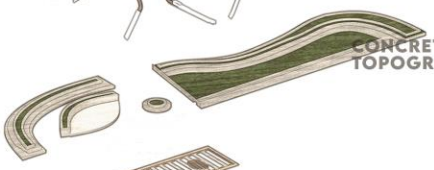
SPORTS BENCHES GLULAM FRAME I

GATEWAYS GLULAM FRAME III



PTFE-PERGOLA MIX ROOF

GLULAME FRAME III

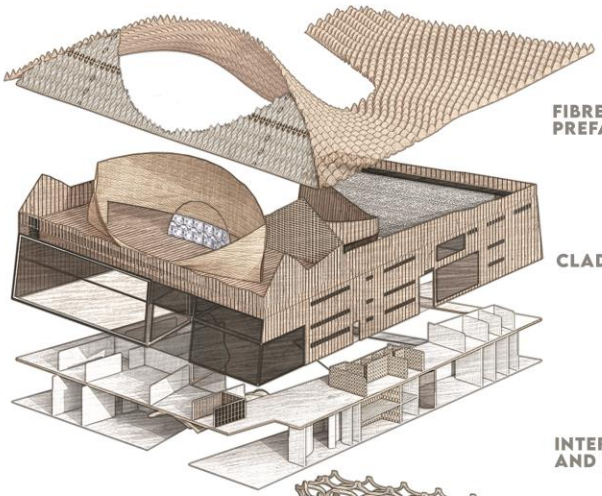


CONCRETE TOPOGRAPHY

PERGOLAS

GLULAM FRAME III

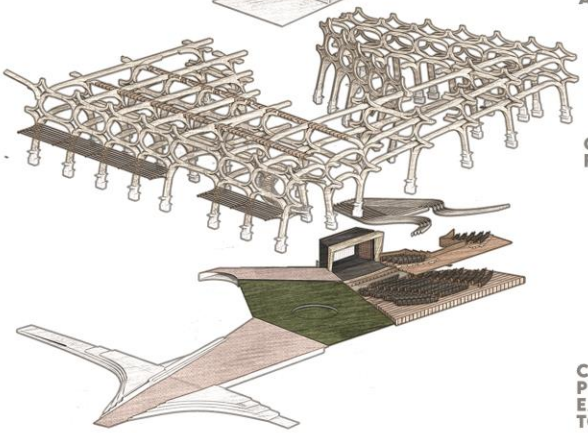
CONCRETE AMPHITHEATRE



FIBREGLASS PREFAB PANELS

CLADDING

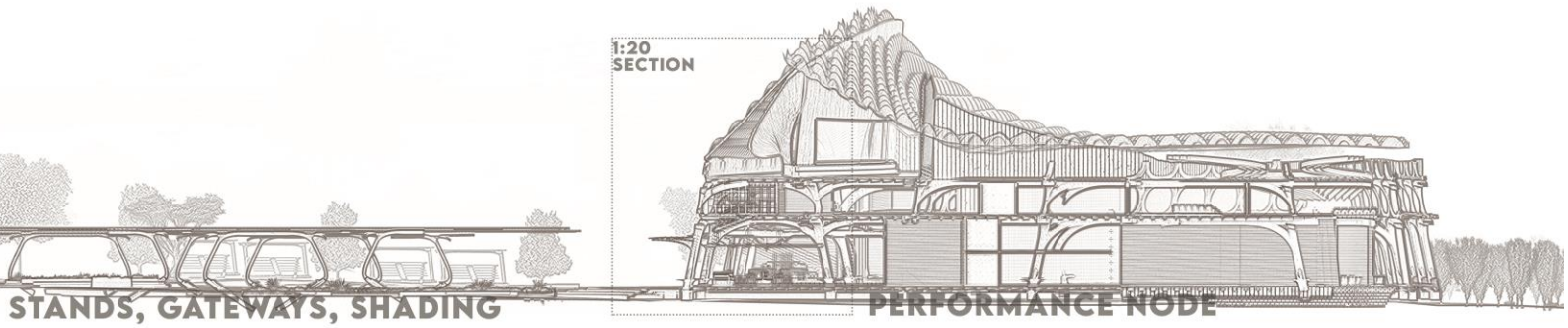
INTERNAL WALLS AND FLOORS



GLULAM FRAME III

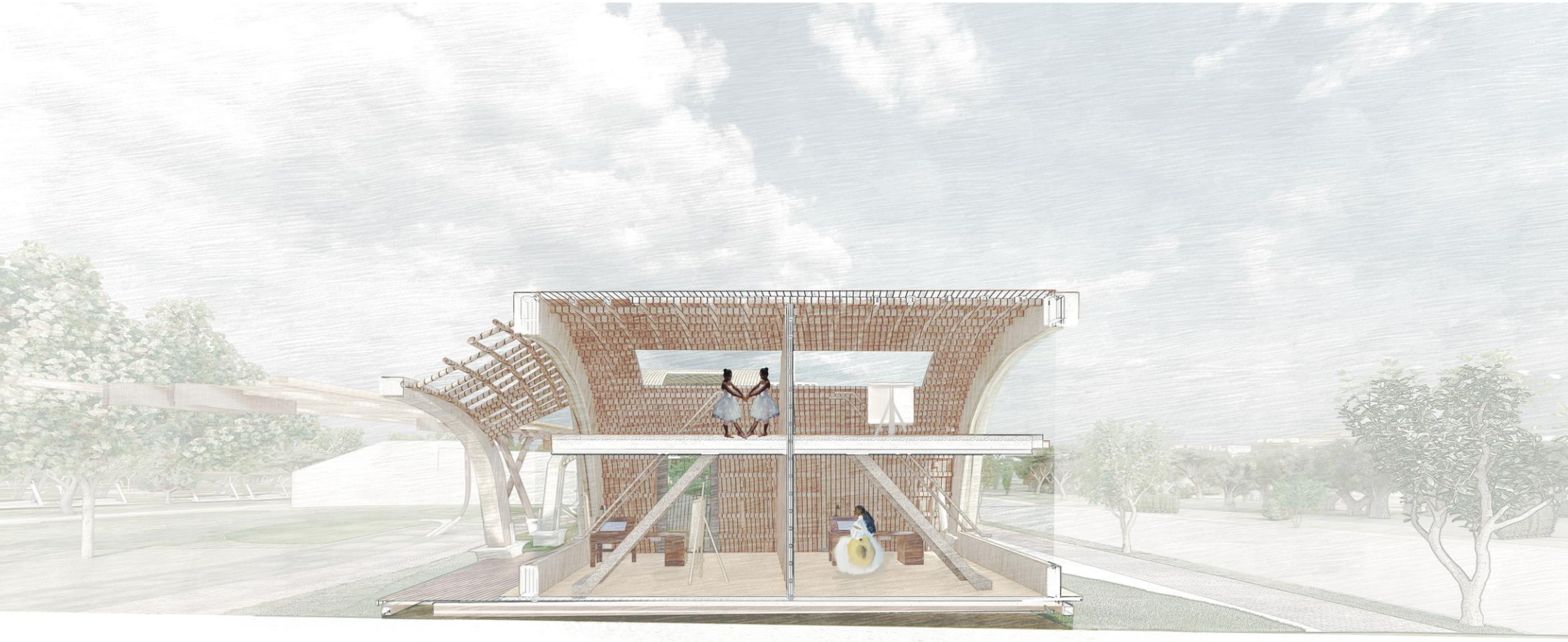
CONCRETE PLINTHS AND EARTHWORK TOPOGRAPHIES

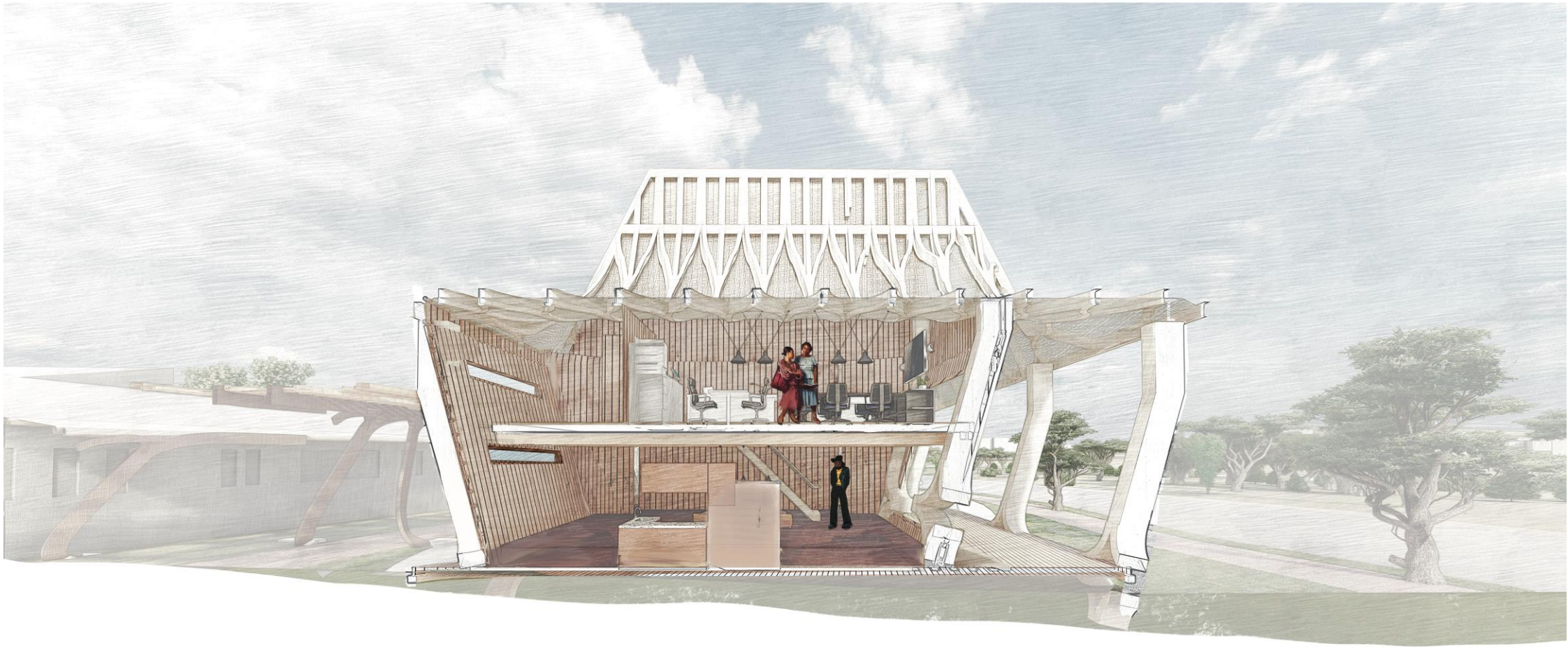
1:20 SECTION

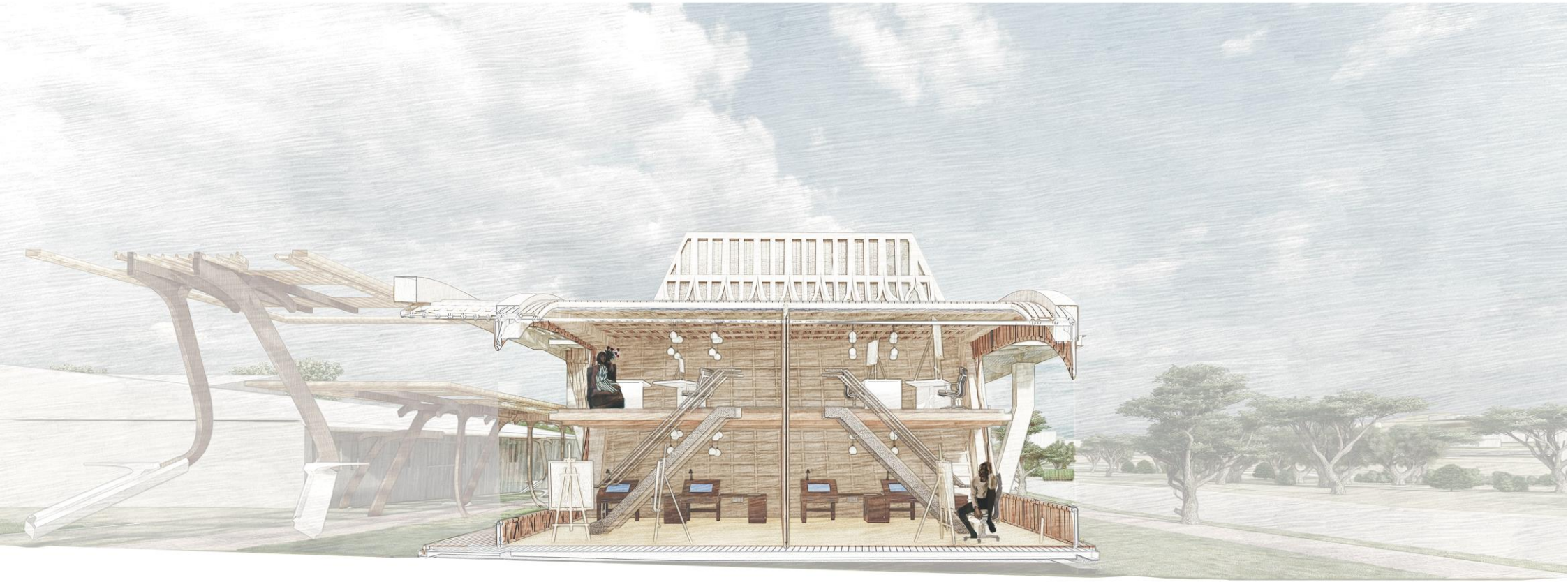


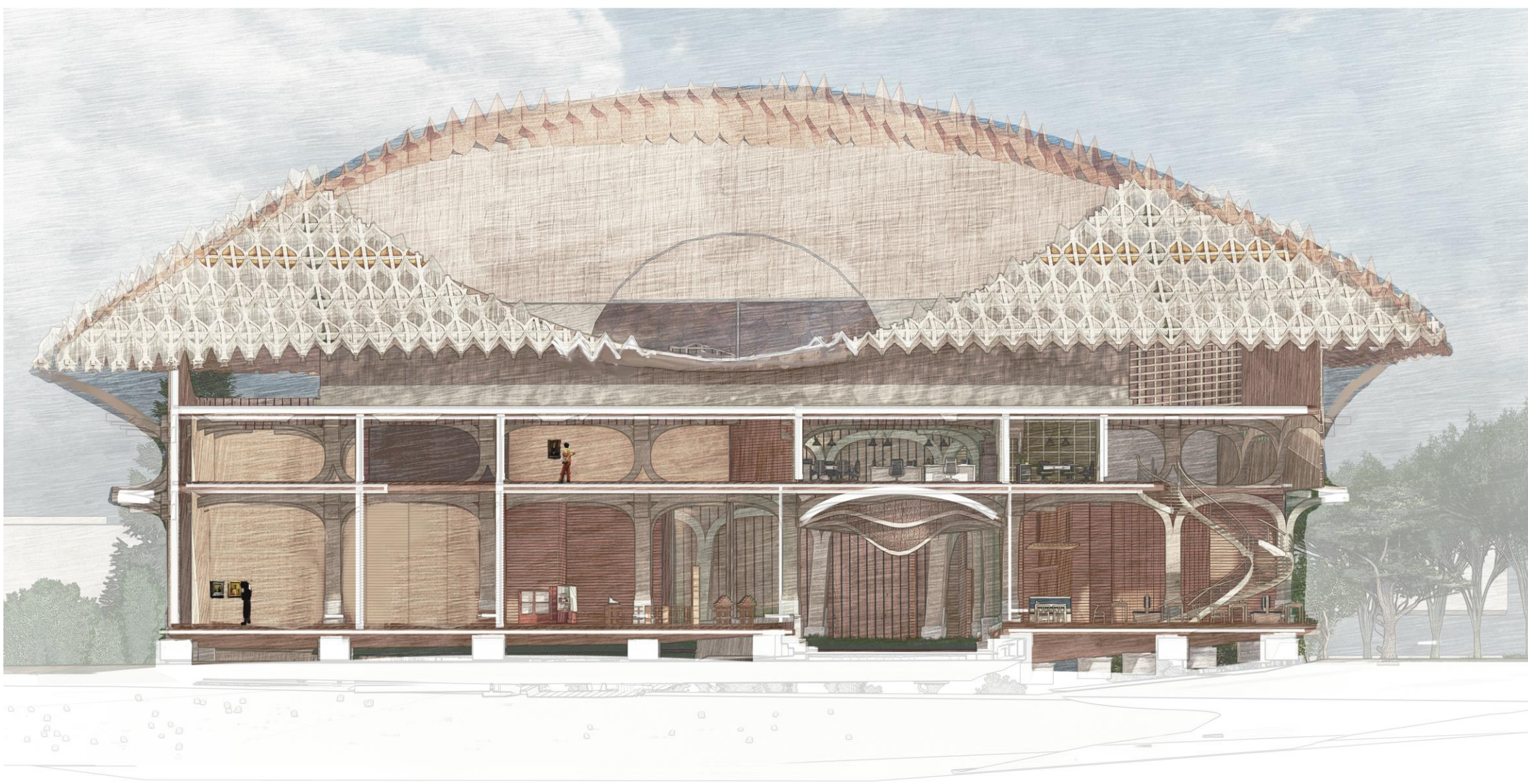
STANDS, GATEWAYS, SHADING

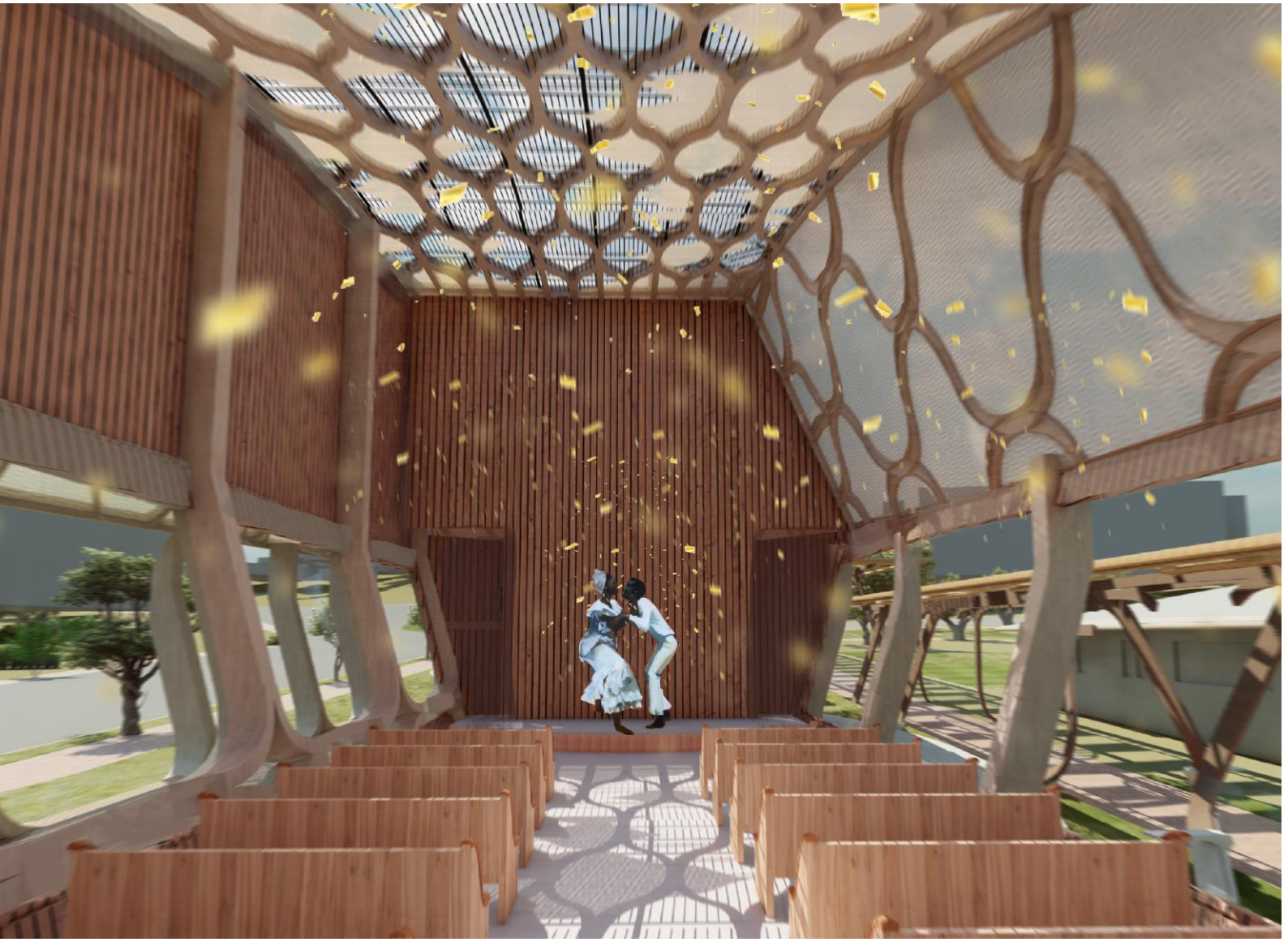
PERFORMANCE NODE

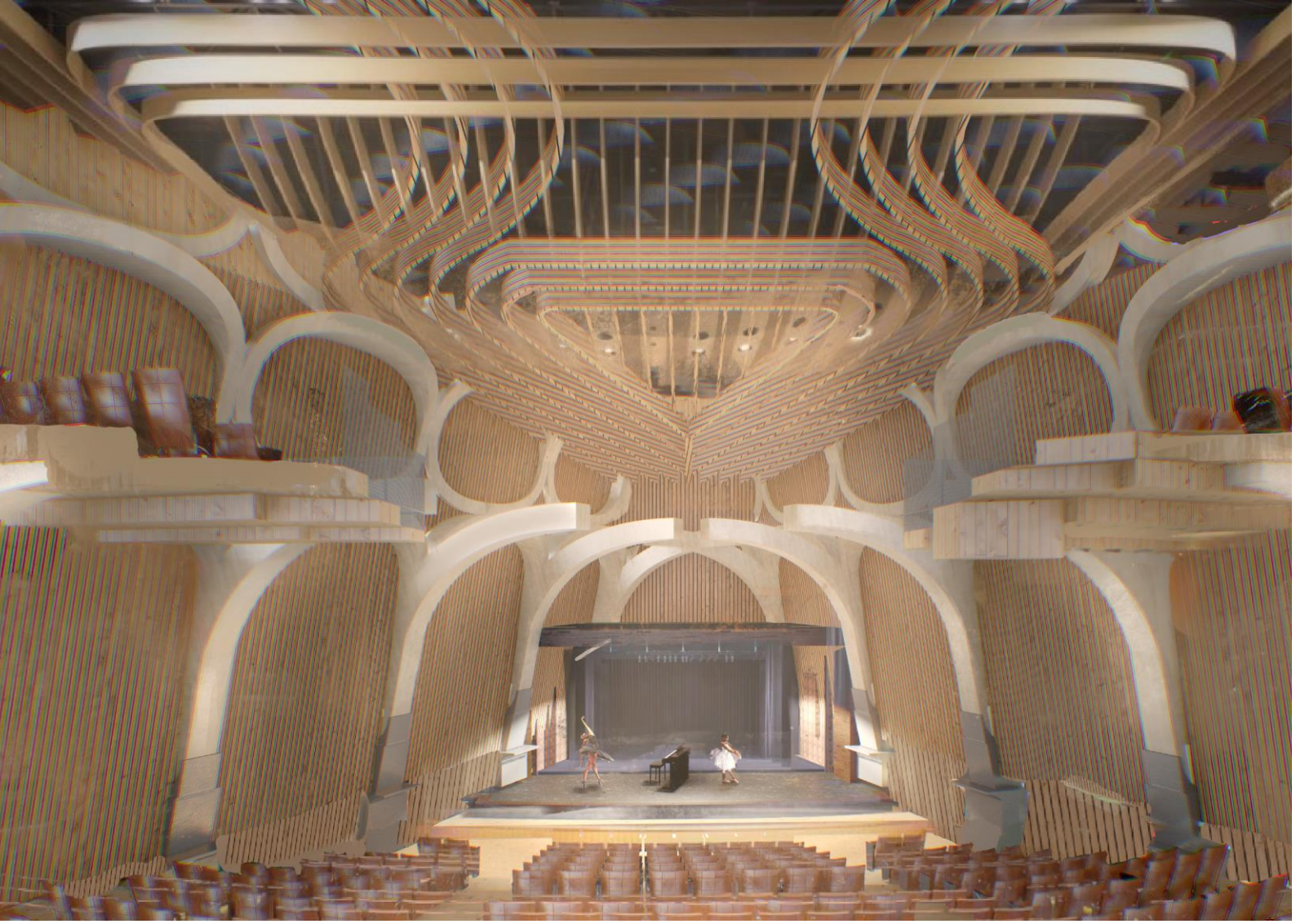












REFLECTION

"We are the bucks; a part of an endless forest."

- **adapted Xhosa Proverb**

The nature of timber tectonics is a bridge, a boat, a system of connecting people from one place to another, from one community to another and even, one forest to another. The power of tectonics is that of connection and its ability to traverse, with ontological meaning, great divides and connect us together, as people, through material celebration and appreciation across time.

With this prowess, I view timber tectonics as suited as a social healing device, not just between humans and nature, but the very interrelations between humankind through gathering under one roof. Its ontological readings of transparency, honesty and connection makes its physical readings of a form, which reaches to connect, apparent and clear.

The study and simulation provided rich architectural explorations into the material of timber with links to heritage and past cultural practice. It helped me in unpacking the question of why we do not build with timber anymore and provided an understanding of the material potential of timber.

This potential and its ontological values of roof, tectonic and connection materialize in the site development through viewing the timber tectonic attitude, of permeation and connection, as an architectural response against the current forms of cultural institutes.

The result of this, are the project's architectural forms that are united through vaulted timber grid shells with roof planes, thresholds and layered edges connecting people within a civic space.

The study of the past culture, the use of today's innovations and the design for a speculative timber future is a grand weave that represents project's ambition of referencing and connecting the past, present, and future. The project weaves people, space, and time in this regard, reconnecting us to a past forgotten timber culture and with each other across the great divides of post-apartheid.

We live in a world where we have been divided by pandemics, racism, classism, sexism, homophobia, and the digital mass media world. The climate crisis is a chance for us to reflect upon our ways of life. As architects, we have the power to recreate space in the world. We can re-examine our design thinking and help reconnect people to nature and each other through new architectural materials and public spaces within our schemes.

It is time for architects to be compassionate and courageous, to explore and experiment with our information age materials and digital innovations for a better future. We cannot heal the world in one day, or one thesis, but we can begin with a voice of compassion and the courage to start change.

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LIST OF FIGURES

ORGANIZED BY PAGE AND SECTION

ALL TITLE PAGES DONE BY AUTHOR. NORTH ASSUMED TOP.

SECTION 1: THE STUDY

[PG 10]

Fig. 1.17 Construction analysis of a Rondawel (Source: Author)

[PG 11]

Fig. 1.8 Construction analysis of an amaqhugwane (Source: Author)

[PG 12]

Fig. 1.19 Construction analysis of the Mayville House (Source: Author)

[PG 13]

Fig. 1.20 Construction analysis of the Woolsack Residence (Source: Author)

[PG 14]

Fig. 1.21 Construction analysis of Klein Rijke (Source: Author)

[PG 15]

Fig. 1.22 Construction analysis of a Tonga cabin (Source: Author)

[PG 16]

Fig. 1.23 Diagram on principals and construction systems (Source: Author)

[PG 17]

Fig. 1.24 Fig. Mapping of the export/import timber culture in South Africa (Source: Author and Collis)

Collis, V., 2014. Promoting the use of Sustainably Grown Plantation Timber in South Africa. 1st ed. [ebook] Cape Town: Collis and associates. Available at: [Accessed 8 April 2022].

Fig 1.25 Superior Strength of 5 of Radiata plantation's SA Pine's shown on a graph against pressure revealing its strong performance (Source: Author and Collis)

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[PG 18]

Fig. 1.26: Pi chart showing the relationship between different local timber plantations in South Africa (Source: Author)

Fig 1.27: Mapping of timber plantations and their privatizations (Source: Author and Collis)

Collis, V., 2014. Promoting the use of Sustainably Grown Plantation Timber in South Africa. 1st ed. [ebook] Cape Town: Collis and associates. Available at: [Accessed 8 April 2022].

[PG 19]

Fig. 1.28: Chart showing the socio-economical relation of timber plantations between government investment and employment

Fig 1.29: Graph highlighting the relationship between provincial plantations in the format of province | industry national percentage | provincial land use (Source: Author after FSA)

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Fig 1.30 Graph showing the stakeholders in the plantations of South Africa (Source : Author after FSA)

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SECTION 2: THE ABSTRACTION

[PG 23

Fig. 2.1 Symbol for roof (Source: Author)

[PG 24]

Fig. 2.2 Symbol for tectonics (Source: Author)

[PG 25]

Fig. 2.3 Symbol for Connection (Source: Author)

[PG 26]

Fig. 2.4 Schedule of timber process innovations (source: Author after Wikihow et al)

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[PG 27]

Fig. 2.5 Schedule of timber treatment innovations (Source: Author with images from Timbermaintenence.co.za et al)

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[PG 28]

Fig. 2.6 Diagram illustrating the benefits of timber as an alternative construction material (Source: Author after Collis et al)

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Fig 2.7 Schedule of a technology tree of timber (Source: Author)

[PG 29]

Fig. 2.8 Diagram of past practice and modern reinterpretation (Source: Author)

[PG 30]

Fig. 2.9: Clay and sapling experiments (Source: Author)

[PG 31]

Fig 2.10: Steam-bending and laminate tests (Source: Author)

[PG 32]

Fig. 2.11 Process of pavilion design using Rhino. (Source :Author)

[PG 33]

Fig. 2.12 Process of prototype making of a bent sapling system (Source: Author)

[PG 34]

Fig. 2.13 Process of a wattle and daub frame reinterpretation (Source: Author)

[PG 35]

Fig. 2.14 Process of making a wattle and daub frame reinterpretation prototype (Source: Author)

[PG 36]

Fig. 2.15 Process of designing a pavilion whilst reinterpreting trusses (Source: Author)

[PG 37]

Fig. 2.16 Process of making a joinery detail of a spaceframe truss (Source: Author)

[PG 38]

Fig. 2.17 Prototypes made in preparation for design investigation (Source: Author)

SECTION 3: THE SITING

[PG 40]

Fig. 3.1 Artworks I've done over the years (Source: Author)

[PG 41]

Fig. 3.2: Site Location (Source: Author after Google Earth)

[PG 42]

Fig. 3.3 Drawing of Baxter Theatre showing the harsh, secluding edges of the cultural institutions. (Source Author after Google Maps)

Fig. 3.4 Drawing of Norval Foundation showing the harsh, secluding edges of the cultural institutions. (Source Author after Google Maps)

Fig. 3.5 Drawing of Iziko Art Museum showing the harsh, secluding edges of the cultural institutions. (Source Author after Google Maps)

Fig. 3.6 Drawing of Zeitz Mocaa showing the harsh, secluding edges of the cultural institutions. (Source Author after Google Maps)

[PG 43]

Fig. 3.7 The Swedish Pavillion, The forest, dubai 2020. Timber tectonic expressed through tall gumpoles that carry the roof. Under the buildings mass, intricate space is inferred through the position of the columns, tighter columns create better spatial articulation whilst sparser spaced columns encourage connection through sight permeation and circulation. (Source: Author after Archello)

Archello. 2022. *The Forest - The Swedish Pavilion at Expo 2020 | Alessandro Ripellino Arkitekter | Archello*. [online] Available at: <https://archello.com/project/the-forest-the-swedish-pavilion-at-expo-2020> [Accessed 6 September 2022].

[PG 44]

Fig 3.8 is a map of an art route through the cape and reveals a lack of community-centric galleries. It also revealed a trend of monolithic, imposing architectural massing within those spaces, from the Zeitz Mocaa to Something Els. (Source Author with images from Archdaily et al)

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Tripadvisor, 2022. [online] Available at: <https://www.tripadvisor.co.za/Attraction_Review-g469396-d12072077-Reviews-Art_Curator_Gallery-Somerset_West_Western_Cape.html> [Accessed 6 September 2022].

[PG 45]

Fig 3.9 Forecourt analysis of the Baxter Theatre, Zeitz Moccaa and Gugu Sthebe

The baxter, Zeitz moccaa and Gugu stbehe both use forecourts as a threshold to their building and public space. However these public spaces, in the Zeitz Moccaa and Baxter, feel overwhelming due to the lack of human scaled thresholds.

Further more, the baxters forecourt is too small and privatized and the Zeitz is too large and empty. Gugu Sthebe's forecourt meets a low mass entrance, it is completely public space and not offset from the road or public circulation. This encourages a variety of activity from informal markets to children playing between the bollards and adjacent sports field. (Source: Author after Archdaily et al)

Baxter.co.za. 2022. Baxter Theatre Centre. [online] Available at: <http://www.baxter.co.za/> [Accessed 7 September 2022].

Baan, I., 2022. *Zeitz Museum of Contemporary Art Africa / Heatherwick Studio*. [online] ArchDaily. Available at: <https://www.archdaily.com/879763/zeitz-museum-of-contemporary-art-africa-heatherwick-studio> [Accessed 6 September 2022].

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[PG 46]

Fig 3.10 A Map of road arteries displace and control access to opportunities and amenities of other sub-districts in Hout Bay. The density of road structuring elements and their layouts are proof of this as seen in the disconnect between sub-districts and the reliance on the linear major roads. (Source: Author)

[PG 47]

Fig 3.11 Is a walking collage through Houtbay's sub-districts that highlights how spaces become vibrant (Dewar and Uytenbogaart), developed and deteriorate depending on sub-district class, with Imizamo being the poorest. (Source: Author)

[PG 48]

Fig 3.12 A map showing how Houtbay is divided into classist sub-divisions ranging from informal settlements to upper-class estates (Source: Author)

[PG 49]

Fig 3.13 The sprawl of Imizamo yethu is confined to the slopes of the mountain (Source: Millefoto.com)

Miller, J., 2022. *Imizamo Yethu (2018) — Johnny Miller Photography*. [online] Johnny Miller Photography. Available at: <https://www.millefoto.com/online-store/imizamo1> [Accessed 6 September 2022].

[PG 50]

Fig 3.14 Houtbay is divided into classist sub-divisions ranging from informal settlements to upper-class estates that limit walkable access to amenities (Source: Author)

[PG 51]

Fig 3.15 Apartheid white only beach area sign (Source: thoughtco.com)

Boddy-Evans, A., 2022. *What Signs Were Used to Enforce Segregation During Apartheid?*. [online] ThoughtCo. Available at: <https://www.thoughtco.com/apartheid-signs-image-gallery-4122664> [Accessed 6 September 2022].

[PG 52]

Fig 3.16 Highschools, educentres, schools are abundant around hout bay though classist divides result in some having better access to opportunities than others. (Source: Author)

[PG 53]

Fig. 3.17: Various centres of community gallery in Hout Bay. From top to bottom: Ikahaya LEthemba, Iziko Lombeni and the Hout Bay Ciivc Centre (Source: Author after Capetown.gov.za)

Facebook.com. 2022. iKhaya Le Themba. [online] Available at: <https://www.facebook.com/pages/category/Community/IKhaya-le-themba-Project-540402535975454/> [Accessed 6 September 2022].

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[PG 54]

Fig 3.18 Cultural amenities nodes. Art galleries are aimed at exclusivity. Dance and theatre schools abundant but no community theatre (Source: Author)

[PG 55]

Fig 3.19 Helen Sebidi, originally a domestic worker turned artist through encouragement from her employer (Lumvida, 2022). She has contributed to our national art culture with works like The Child's Mother Holds The Sharp Side Of The Knife, on the left, and has been awarded the Order of iKhamanga making her a national treasure. (Source: Norvalfoundation.org)

Lumvida. 2022. *Helen Sebidi*. [online] Available at: <https://lumvida.wordpress.com/2013/04/03/helen-sebidi/> [Accessed 6 September 2022].

Norvalfoundation.org. 2022. *Happy Birthday: Mmakgabo Mapula Helen Sebidi | Norval Foundation*. [online] Available at: <https://www.norvalfoundation.org/happy-birthday-mmakgabo-mapula-helen-sebidi/> [Accessed 6 September 2022].

Fig 3.20 Willie Bester is a renowned artist from one of the poorer Cape Town suburbs of Montagu (Bester, 2022). He has contributed to our national art culture through his resistant art that was ignited from his experience of forced removals. On the left is an iconic piece of his, Trojan Horse III. (Source: Contemporary-african-art.com)

Bester, W., 2022. *Home - Willie Bester - South-African Mixed Media Artist and Sculptor*. [online] Willie Bester. Available at: <https://williebester.co.za> [Accessed 6 September 2022].

Contemporary African Art. 2022. *Willie Bester*. [online] Available at: <https://www.contemporary-african-art.com/willie-bester.html> [Accessed 6 September 2022].

[PG 56]

[Fig 3.21 Strong north and south easterly winds Sun analysis to follow on building (Source: Author)

[PG 57]

Fig 3.22 Common Riparian Trees of Hout Bay (Source: Author)

[PG 58]

Fig. 3.23 Subdistrict desire lines, Amenities, schools, cultural municipal lines, Site between contesting subdistricts (Source: Author)

[PG 59]

Fig. 3.24 The site is situated in a prime location as a hearth of Hout Bay, situated between the sleepy mountains, adjacent to the renowned river and sights to the bay below, it serves a convenient spot of gathering of the residents, without excluding those at the periphery. (Source: Author)

[PG 60]

Fig. 3.25 The site is nestled between two hills with a bridge between two main roads articulating its orientation and a river cutting through the centre (Source: Author)

[PG 61]

Fig 3.26 Section Diagram of planting solutions for the Disa River Rehabilitation. Diagram highlights the regenerative flora and the major fauna that is reliant on the existing ecosystem. (Source: Author after Friends of the River)

Friends of the Rivers of Hout Bay I. 2022. *Flora | Friends of the Rivers of Hout Bay*. [online] Available at: <http://friendsoftheriversofhoutbay.co.za/biodiversity/flora/> [Accessed 6 September 2022].

[PG 62]

Fig 3.27 The site is home to many built elements. Hard drainage systems bisect the site. Recent land terracing provide fields and volleyball courts for kids to play and a large parking lot often sees chill, recreational activity. (Source: Author)

[PG 64]

Fig 3.28 Massing in a 5km radius , 1story And 2story majority (Source: Author)

SECTION 4: THE SYNTHESIS

[PG 68]

Fig. 4.1 (Source: Author)

[PG 70]

Fig. 4.2 (Source: Author)

[PG 71]

Fig. 4.3 (Source: Author)

[PG 72]

Fig. 4.4 (Source: Author)

[PG 74]

Fig. 4.5 (Source: Author)

[PG 75]

Fig. 4.6 (Source: Author)

[PG 76]

Fig. 4.7 (Source: Author)

[PG 78]

Fig. 4.8 (Source: Author)

[PG 79]

Fig. 4.9 (Source: Author)

[PG 80]

Fig. 4.10 (Source: Author)

[PG 81]

Fig 4.11 (Source: Author)

[PG 82]

Fig 4.12 (Source: Author)

[PG 83]

Fig. 4.13 (Source: Author)

[PG 84]

Fig 4.14 (Source: Author)

[PG 85]

Fig. 4.15 (Source: Author)

[PG 86]

Fig 4.16 (Source: Author)

[PG 87]

Fig 4.17 (Source: Author)

[PG 88]

Fig 4.18 (Source: Author)

[PG 90]

Fig. 4.19 (Source: Author)

Fig 4.20 (Source: Author)

[PG 91]

Fig 4.21 (Source: Author)

Fig. 4.22 (Source: Author)

[PG 92]

Fig. 4.23 (Source: Author)

Fig 4.24 (Source: Author)

[PG 94]

Fig 4.25 (Source: Author)

[PG 96]

Fig. 4.26 (Source: Author)

[PG 97]

Fig 4.27 (Source: Author)

[PG 98]

Fig 4.28 (Source: Author)

[PG 99]

Fig 4.29 (Source: Author)