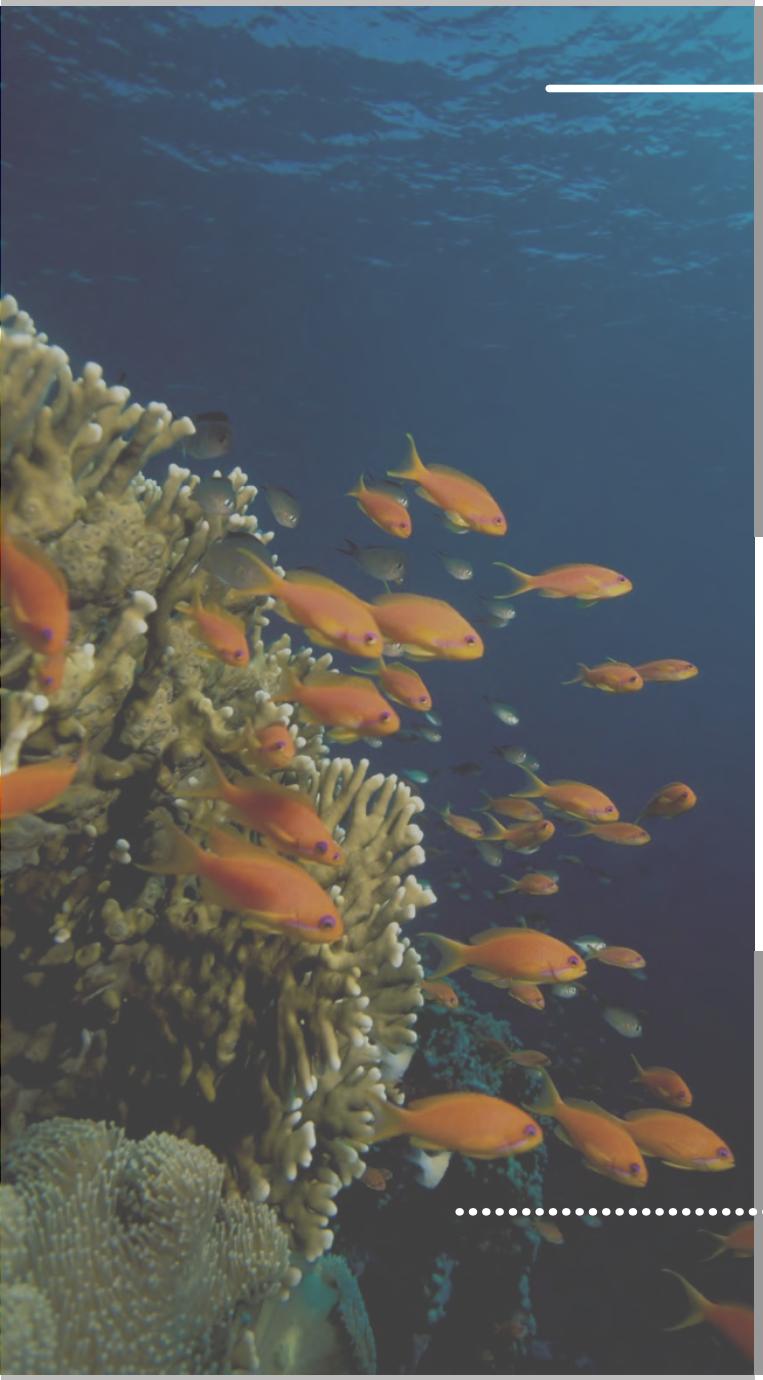

AQUATIC SCIENCE PARK

an interactive architecture in marine environment

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WE SHALL NOT CEASE
FROM EXPLORATION,
AND THE END
OF ALL OUR
EXPLORING WILL BE
TO ARRIVE WHERE
WE STARTED
AND KNOW THE PLACE
FOR THE FIRST TIME

• • •

T.S. Eliot

This dissertation is submitted in partial fulfilment of the requirements for the degree of

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2020

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Supervisors:

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All the work contained in this document is entirely my own, unless otherwise stated.

ABSTRACT

This dissertation is a design exploration for the development of an aquatic science park that is simultaneously functioning as a ferry terminal, at the water's edge of Maputo bay, in Mozambique. The project primarily seeks to redefine the edge as a space of interaction between humans and marine environments.

The dissertation addresses the needs of researchers from different institutions around the country for a research facility catering for marine environment issues. The proposal also intends to re-establish a ferry that was discontinued due to construction of a suspension bridge across Maputo bay linking two districts namely Maputo and Katembe. The new bridge is not pedestrian friendly, therefore the need for an alternative link. The research facility will be a place where visitors can experience the marine world and learn about species from waters around the world.

The dissertation presents the researcher's attitude toward the creation of "in-between" place by blurring the lines between distinct realms, such as manmade and nature, public and private sectors, activities on land and in water, etc. The blurring process is the subject of this thesis; its development responds to the conditions and needs within the existing context and is stated in the programmed requirements.

The dissertation will prove that the re-establishment of the ferry coupled with a new research facility could improve connectivity between the Katembe district and Maputo city and also transform the area into a more integrated ecological system to protect and conserve water.

ACKNOWLEDGEMENTS

I would like to express my appreciation toward several people. I owe my deepest gratitude to my supervisors, Prof. Jan Smit, Petria Smit, Hein Raubenheimer, Prof. Jonathan Noble and Annemarie Wagener for having graciously contributed their time and expertise to the development and completion of this thesis.

I must express my special thanks to my lecturer and friend Jako Olivier for the contribution of his knowledge, encouragement and inspiration since the day I set my foot at the Department of Architecture.

And finally, I would like to acknowledge my family and friends for their magnificent support... even when the skies were not as clear as they are now. I am indebted to my daughter Nivalda for her support, patience and endurance throughout this odyssey.

CONTENTS

CHAPTER 04
Design synthesis

CHAPTER 05
Technical Report

Figure 1.1. Deep-sea Coral Reefs (EMAS, 2011: 25)

Introduction

All creatures have depended on the waters of the earth for their survival. The rivers, lakes, oceans and seas have been a source of nourishment, migration and mystery throughout history. In the process of drinking and finding food in the water, humans developed a fascination for water and devised means to swim through or float on the water.

We discovered distant lands, using water as a means of transport. Great tales were told about the power of the sea and the remarkable creatures that live beneath its surface but now, unfortunately, we are finding ways to destroy the water and with it the aquatic life (Cromie, 1966: 35).

Not only humans but all living things stand or fall together. Or rather human is of all such creatures least able to stand alone. If we think only in terms of our own welfare, we are likely to find that we are losing it (Bendiner, 1981: 147).

Urban waterfronts, where the land of city meets a body of water, are unique and finite resources representing the best opportunities for community enhancement and enrichment. On the other hand, waterfronts are also high risk areas, where water-related disasters could seriously affect the long-term sustainability of our urban environment. This dissertation focuses on the relationship of the city with its waterfront. The design will start by studying the city of Maputo at large scale where waterfronts play an important role in its urban planning policy.

The mechanism of waterfront transformation will be investigated and aimed at finding out which strategies to adapt and what resilience means in terms of urban waterfronts in a rapidly transforming city.

Some representative urban projects on the waterfront will be examined and summarize spatial models applied on the waterfront with distinct policies.

Finally, it will be demonstrated that an urban waterfront is an "osmotic interface" which should be more correctly envisaged as a network of places, functions, additions and hinges between the city and its water environment. We clarify that waterfront areas represent a multidisciplinary and multi-tasking issue from the perspective of urban resilient development.

STRUCTURE OF DOCUMENT

The dissertation is structured in four sections. The first section contains an overview of the physical context and its impact on the organisation of the building.

The second section explores the location of various use-forms on the site.

A design synthesis - that is, a process of combining pieces of knowledge into a meaningful whole is considered in the third section. In this section, an overall building organisation and forms are developed.

And the final section critically investigates the structural components of the design with regards to its various constituents used to put the building together.

RESEARCH METHODOLOGY

Figure 1.2. Research Methodology (Chandra & Hareendran, 2017: Online)

The following research methods will be explored in this study:

+ Touchstone. An abstract representation to capture the essence of the project. In other words, it is a tool to convey central idea.

+ Conceptual Framework is used as a guide for research and design development to analyse conceptual ideas .

+ Precedent and case studies. Local and international examples will be critically analysed in order to establish current typological characteristics. Programmatic precedents will also be investigated.

+ Literature review. A survey of related literature including the following topics in substantiation of the argument: the threshold, the in-between, the edge and boundaries.

+ Personal Interviews. Conduct interviews with local community, researchers and students from biological sciences to examine the need for the facility.

+ Site visit. A visit to Maputo, Mozambique. This will entail visiting the proposed site as well as prominent colonial and modernist buildings to draw inspiration from.

+ Site analysis. Document current site conditions including slope, vegetation, views to and from the site, orientation, access, neighbouring buildings, prevailing wind, sun paths, etc.

INTRODUCTION

CHAPTER 01

1.1 Project Rationale and Background

1.1.1 INTRODUCTION

This chapter provides a project rationale and background of the physical context geared to the typological and morphological investigation of the existing city fabric on various scales, ranging from the scale of the city to the scale of the building.

1.1.2 THE NEED FOR RE-ESTABLISHING THE FERRY IN MAPUTO BAY

The waterborne public transport system across Maputo Bay is currently managed by TransMaritima S.A., a state owned company. Transmaritima SA presently serves one destination in Greater Maputo, a ferry for passengers from mainland Maputo to Inhaca Island. Both use the same terminal in Baixa. Until November 10th, 2018 there was also a service carrying passengers, vehicles and goods from Maputo to Katembe district but this was withdrawn due to construction of suspension bridge across Maputo bay.

According to Deacon (2011) six vessels used to operate in the Maputo Bay from the existing terminal comprising of:

• Two large passengers, vehicles and goods ferries alternating between Maputo city and KaTembe district (Figure 1.3). These vessels used to operate 7 days a week with up to 18 return services daily moving an average of 4000 commuters every day and carrying up to 20 vehicles per trip.

• Three privately owned small vessels provided an alternative water taxi service on the same route between Maputo city and KaTembe (Figure 1.4). These boats, nicknamed "Mapapais" run on a needs basis rather than a regular schedule. They operate seven days a week between 06:00 and 19:00. They can carry up to 30 passengers.

• And finally, a scheduled three times a week ferry service to Inhaca Island catering primarily for tourists (Figures 1.5, 1.6 & 1.7).

Figure 1.3

Figure 1.4

Figure 1.5

Figure 1.6

Figure 1.7

Figure 1.3. Passengers and cargo ferry (JiMBoUK, 2007: Online)

Figure 1.4. Tourists ferry (Ramji, 2011: Online)

Figures 1.5, 1.6 & 1.7. Small vessels (Deacon, 2011: 5)

1.1.3 KATEMBE'S PLANT SPECIES

SHORE AND HILLSIDE

Figure 1.8. Plant species near the site (Author, 2020)

TREES

MANGROVE
Rhizophora mangle
KANUKA
Fuscospora truncata
TITOKI
Alectryon excelsus
HARD BEE CH
Leptospermum scoparium
KARAMU
Coprosma robusta
T K OUKA
Cordyline australis
NIKAU
Rhopalostylis sapida
AKEAKE
Dodonaea viscosa
KOHEKOHE
Dysoxylum spectabile
KOTUKUTUKU/ TREE FUCHSIA
Fuchsia excorticata
BLACK BEECH
Fuscospora solandri var solandri
FIERCE LAN CEWOOD
Pseudopanax ferox
SOUTHERN RA TA
Metrosideros umbellata
NGAIO
Myoporum laetum
TOTARA
Podocarpus totara
HOROEKA
Pseudopanax crassifolius
COOK S TRAIT K WHAI

1.1.4 MANGROVE DEGRADATION IN MAPUTO

Mangroves are amongst the most productive marine ecosystems on earth, they are habitats for a large number of fishes and marine invertebrates in their early life cycles. The mangrove prop-roots create a special underwater habitat, especially during the breeding and early stages of the fish lives (El-Regal & Ibrahim, 2014: 72).

Despite the vital role of mangroves as nursery grounds for juveniles of some reef fish species, several studies have revealed a significant decrease in mangrove forests, primarily due to heavy human pressure. Beside human influences, mangroves are also suffering from climate change (Moussa, 2017: 328). According to Rahman & Asmawi (2016), habitat destruction through human pressure has been the major cause of mangrove loss.

There are various causes of mangrove destruction, ranging from high demand for land for housing and industries, agriculture conversion, the need for fuelwood and land reclamation for urban development (Rahman & Asmawi, 2016: 661).

Mangrove wood is hard and insect-resistant. The harvesting of mangroves for timber and fuel, like basic fishing techniques, has been practised for thousands of years (WWF, 2020: online).

Figure 1.9. Mangroves at Inhaca Island, Maputo (Costa & Ribeiro, 2017: Online)

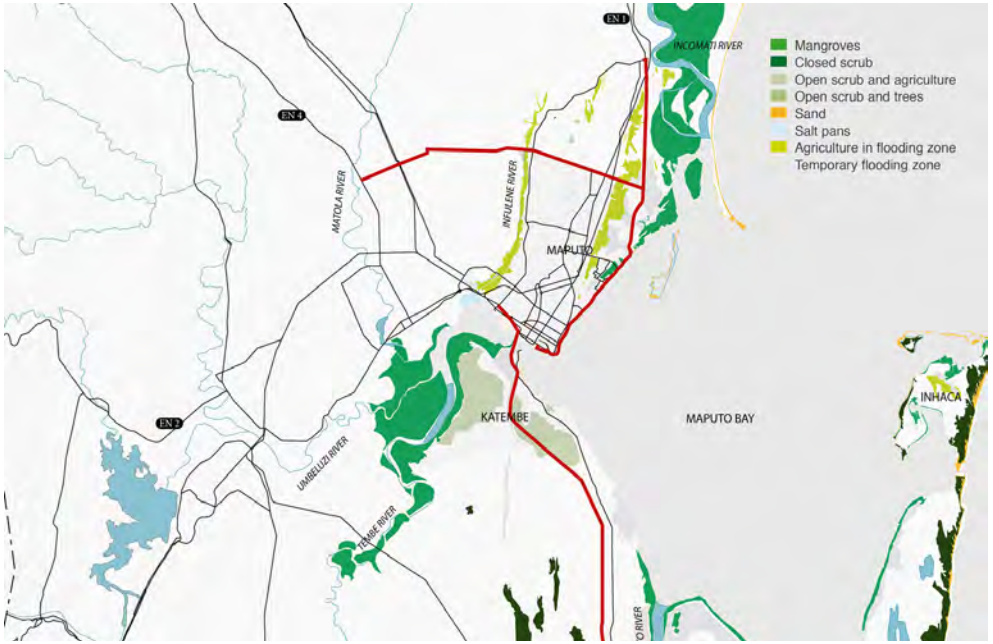


Figure 1.10. Coastal ecosystems of Maputo Bay (Costa & Ribeiro, 2017: Online)

1.2 TOUCHSTONE

The research section of this document will begin with a brief discussion of the touchstone. The central idea behind the project is to redefine architecture and its relationship with nature.

In our ever changing world, how can buildings and infrastructure be designed to both protect the environment and withstand it?

The proposal seeks to implement 'resilient design principles' to develop a research facility that respect and respond to the environment on its surroundings. Sustainable design principles are inherent in resilient design, as minimizing additional environmental impact and protecting limited natural resources (Kranbuehl, 2016: online).

For the purpose of this study, seven resilient design principles, as set out by Kranbuehl, will be implemented to inform the design process, namely:

01. Transcend scales;
02. Protect the natural environment and resources;
03. Anticipate interruptions and adversity;
04. Simple, passive, and flexible space;
05. Durable materials and systems;
06. Locally available, renewable resources and;
07. Diverse and redundant systems

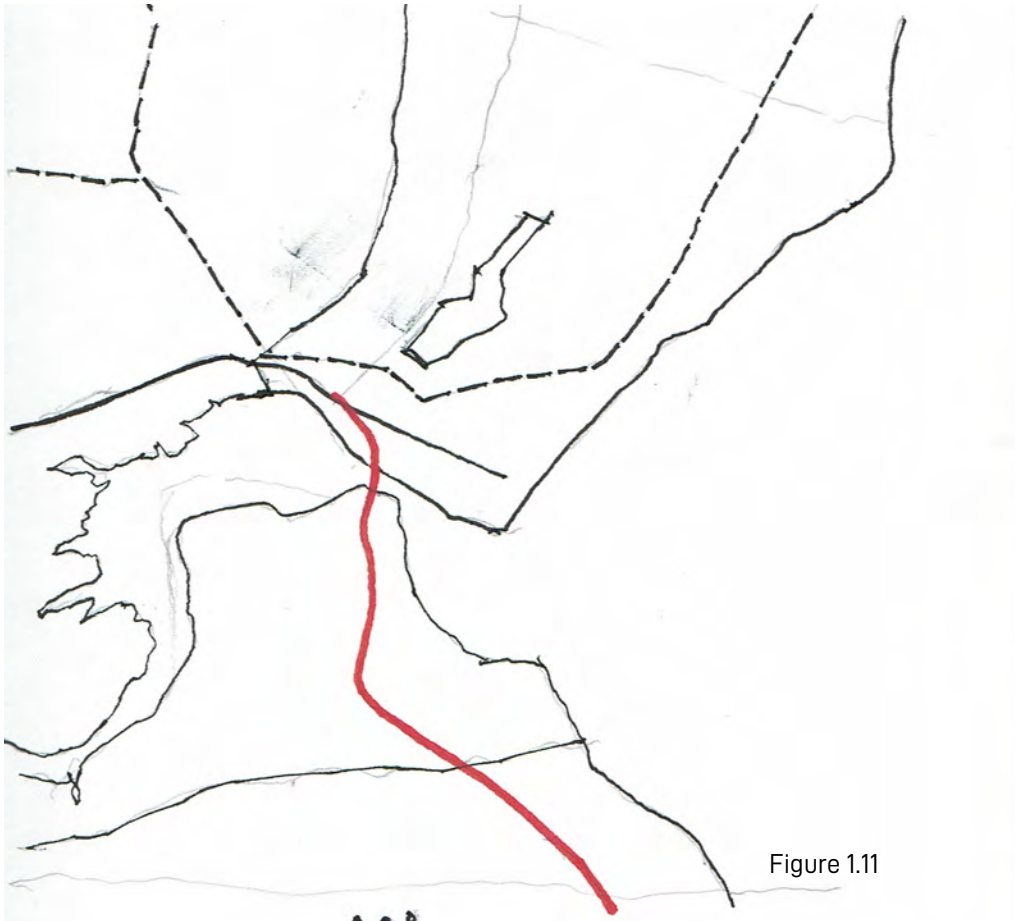


Figure 1.11

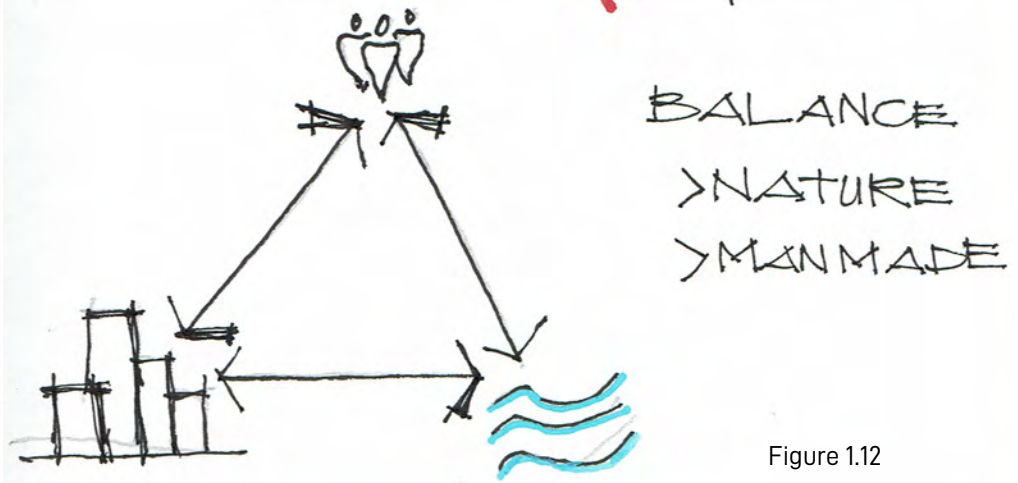


Figure 1.12

Figure 1.11 & 1.12 Map and skech illustrating the relationship between the city, water and people (Author, 2020)

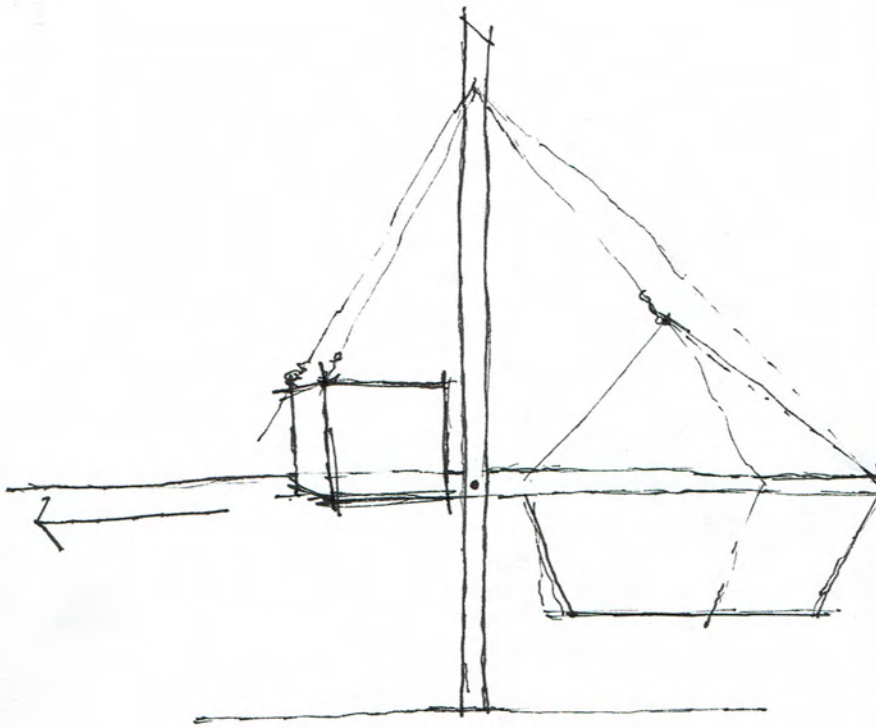


Figure 1.13

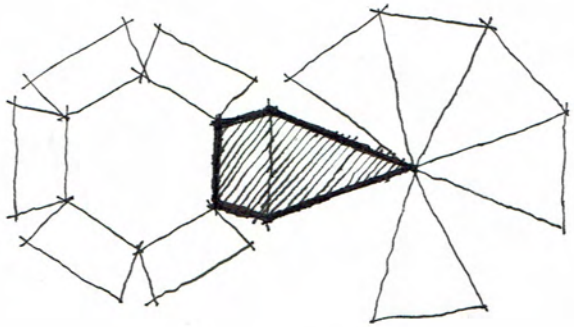


Figure 1.14

Figure 1.15

Figures 1.13, 1.14 & 1.15. Sketches and model of the touchstone (Author, 2020)

1.3 Thesis Statement

Figure 1.16. The Maputo-Katembe Bridge under construction in 2017 (GAUFF, 2020: 4-5)

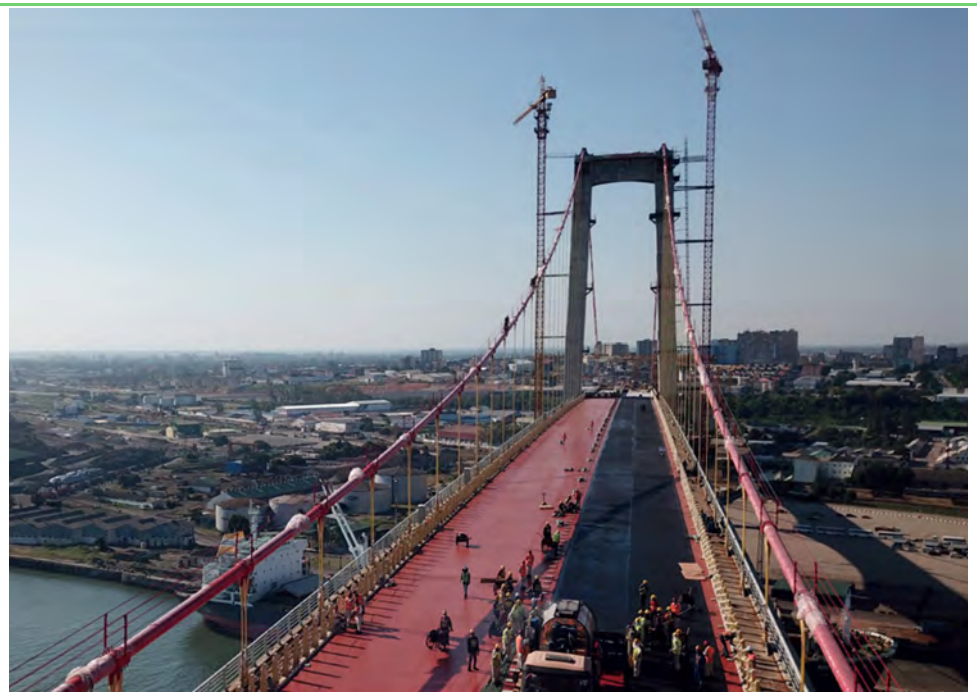


Figure 1.17. The Maputo-Katembe Bridge under construction in 2017 (GAUFF, 2020: 18)

Figure 1.18. The Maputo-Katembe Bridge (Macauhub, 2018: Online)

For a long time Mozambicans have envisioned making the country accessible from north to south via roads and motorways and in particular, to create a connection from Maputo city to KaTembe district. Thanks to the transport connection to the Southern coastal region, a development corridor was created, primarily providing tourism infrastructure, as planned in the KaTembe District Master Plan (GAUFF, 2020: 3).

The KaTembe district is located on the southern bank of Maputo Bay; the district today is sparsely populated when compared to other districts within the Great Maputo (BETAR, 2016: 2). KaTembe remained underdeveloped and isolated from the rest of Maputo city, primarily due to lack of physical infrastructure. Before the Maputo-Katembe Bridge[1] was built, the only connection to the city was by ferry.

The country's infrastructure network is a rapidly growing focus area, where the Maputo-Katembe Bridge represents a further step towards the continuous improvement of the national network. The direct link between the capital city and Kwazulu Natal, in South Africa, is considered a trade route capable of launching economic growth to the next level. The creation of this trade corridor is part of the national development masterplan, which provides for the inception of infrastructures to support tourism and, consequently, for the generation of new jobs, for growth and for the development of the southern region of the Maputo Province (GAUFF, 2020: 5).

1. The Maputo-Katembe bridge is a suspension bridge across Maputo Bay with a main span of 680m and a total length of 3 km; its construction started in 2014 and was completed in 2018.

1.4 Client Profile

Figure 1.19. Logo of Eduardo Mondlane University (The Ocean Foundation, 2020: Online)

Figure 1.20. Logo of the City of Maputo Municipality (Infromoz, 2020: Online)

The proposed research facility will be financed and run by a joint venture between two institutions, namely the Department of Biological Sciences, Eduardo Mondlane University and the City of Maputo Municipality through their National Strategy and Plan of Action for Conservation of Biodiversity in Mozambique (2015-2035) with additional funding through PPP (Public-Private Partnership).

Figure 1.21. Marine researchers diving (EMAS, 2011: 6)

RESEARCHERS

STUDENTS

COMMUNITY

Figures 1.22, 1.23 & 1.24. Illustration of users (Adapted from PNGio, 2020: Online)

1.5 User Profile

Figure 1.25. Maputo: boarding the ferry to Catembe (Zug55, 2012: Online)

The research facility will primarily house researchers from the Department of Biological Sciences, Eduardo Mondlane University to conduct studies in the areas of aquatic energy conduction, biology and aquatic infrastructure. The project is also anticipated to accommodate students from local universities and in addition the local community. The aquatic science park will bring together the brightest minds in the field of marine biology and alike from across the world, ranging from biologists to engineers.

1.6 Typology

1.6.1 PRECEDENT STUDY 01: LISBON OCEANS PAVILION

Architects: Cambridge Seven Associates
Location: Parque das Nações, Lisbon, Portugal
Project Year: 1994-1998
Size: 215,000 square feet
Type: Aquarium

The Oceans Pavilion (Oceanário de Lisboa) was designed by Peter Chermayeff, principal of Cambridge Seven Associates, for Portugal's world exposition - EXPO '98, the final world's fair of the 20th century. The typology of this building is an aquarium. The central idea behind the design of the aquarium was "all of the world's oceans form one great sea" (Ivy, 1998: 106) and this was the theme and unifying element of the Oceans Pavilion. A huge, 1.22 million- gallon tank, 110 feet square and almost 22 feet deep, lies at the heart of the pavilion, informing the architecture and organizing the aquarium around the concept: the interrelationship of global waters.

The facilities built in the run up to the 1998 event were planned to both host a world class event and be incorporated into the city at later stage (Clark, Huxley & Nemecek, 2010: 10). The theme of the fair was "The Oceans: A Heritage for the Future" and this was reflected in the regeneration that took place.

Figure 1.26. Exterior View (Bernhardt, 2017: Online)

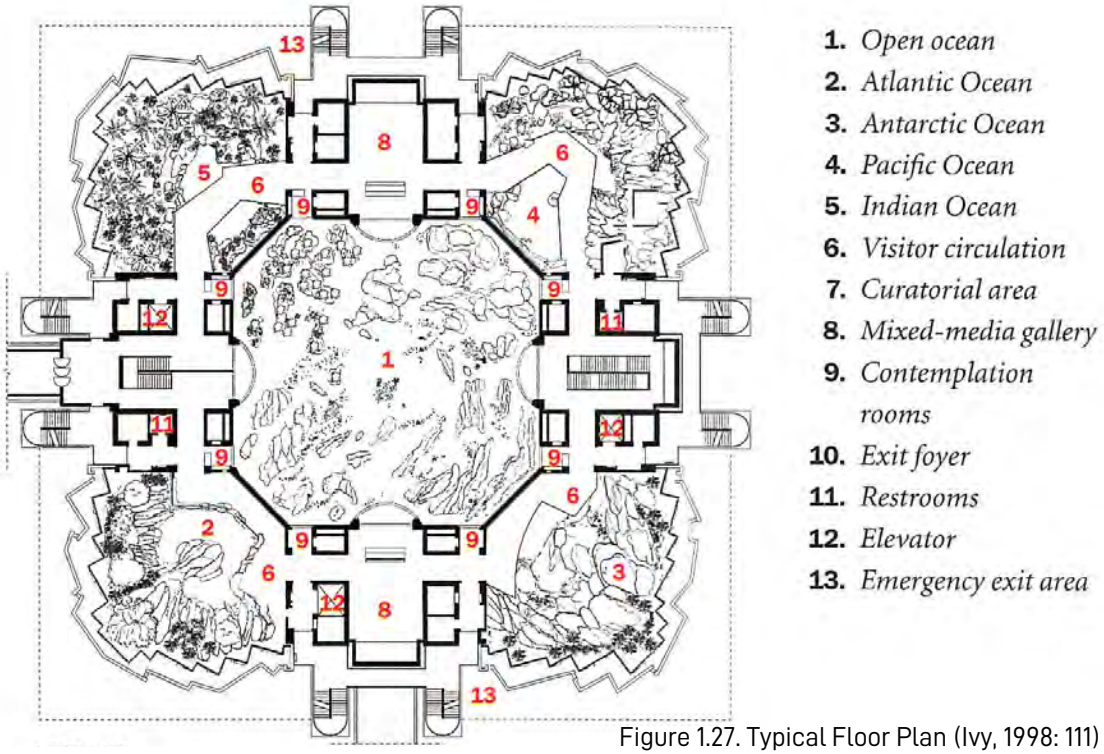


Figure 1.27. Typical Floor Plan (Ivy, 1998: 111)

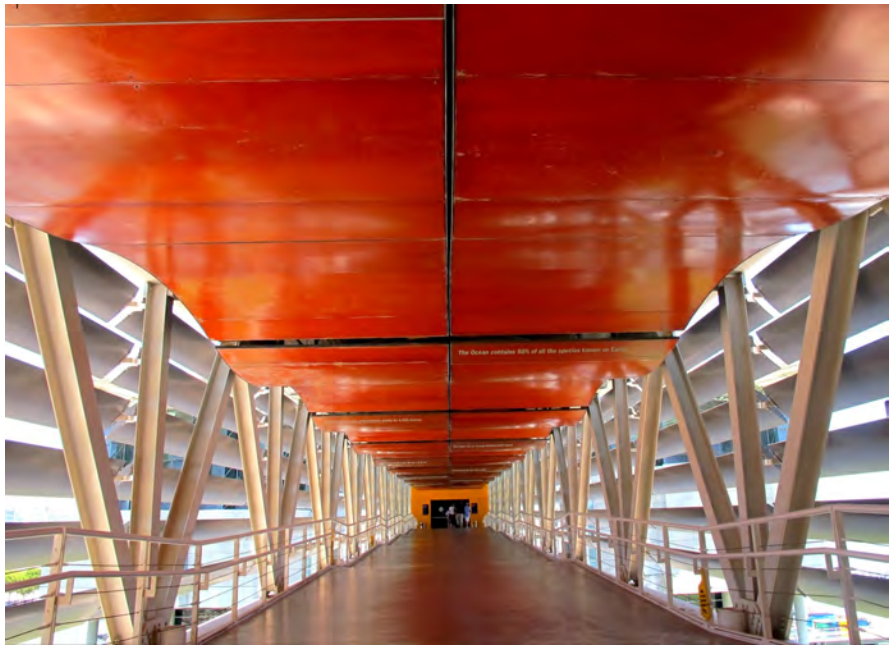


Figure 1.28 Oceans Pavilion Bridge (Bernhardt, 2017: Online)

The EXPO facilities were deliberately positioned in a decaying ex-industrial district on the north bank of the River Tagus, which was subsequently transformed into a waterfront for the city.

A two-level bridge (figure 1.29) connects the aquarium and the support building, where tickets are sold and groups congregate. Along the wall of the support building is an intriguing mural made of blue and white Portuguese tile. Metal stairways wind up the sides of the aquarium. Glass roofs and glazing at the four corners admit daylight. A cross section of the Oceans Pavilion (figure 1.29) shows the clear span provided by the external truss system. The topography of the ocean environments is also clear, with the shore structures tucked into the glass-roofed corners and the adjacent tanks.

Lessons learnt

The Lisbon Oceans Pavilion attempts to bridge a guff between the Lisbon's past and its future, between pessimism and optimism, decline and growth. This guff is expressed in the physical face of the city, in the contrast between its declining historic core and the emerging new developments on its periphery.

The aquarium is a perfect example of blurring the lines between marine life and the human realm. Enveloped by marine life around them, the visitors are earth-bounded interlopers at the Oceans Pavilion.

The building features stone walls systems for exterior envelopes and a truss system topped by masts and petal-like glass-and-steel canopies. The detailing of the building allows indirect daylight to bathe different surfaces and model the shadows, creating a magical sense of positive spatial presence.

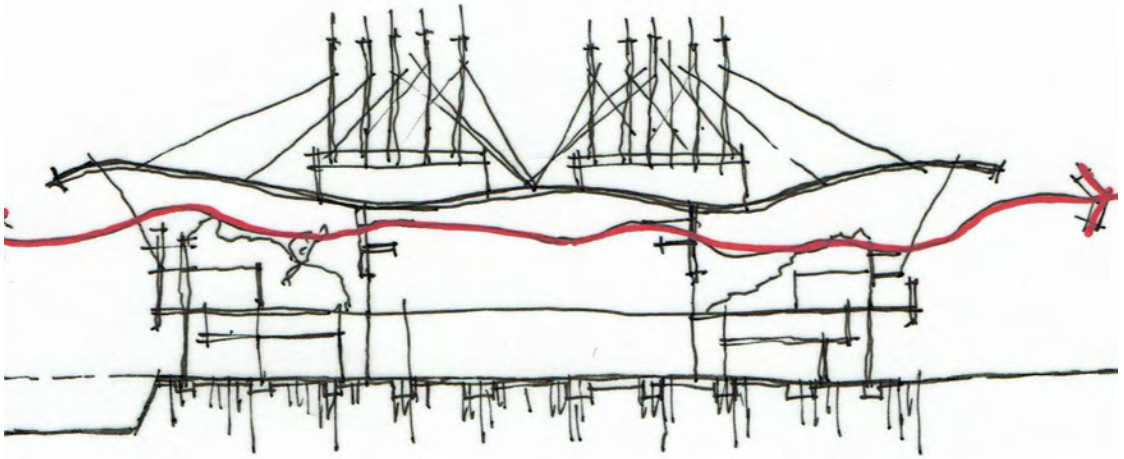


Figure 1.29. Cross section showing clear spans (Adapted from Ivy, 1998: 108)

1.6.2 PRECEDENT STUDY 02: MARINE EDUCATION CENTRE IN MALMÖ

Architects: NORD Architects
Location: Malmö, Sweden
Project Year: 2016
Size: 700.0 sqm
Type: Research Centre

Figure 1.30. View from sea (ArchDaily, 2020: Online)

The Marine Education Centre in Malmo, designed in 2014 by NORD Architects as a competition entry, is a learning facility that explores the effects of climate change on marine life. The key concept for the centre is to "blur the distinction between architecture and landscape" (Rosenfield, 2014: online) while simultaneously serving as a teaching device in environmental issues.

The proposal blends indoor and outdoor spaces under a huge roof where landscape and building become one entity. The project features programs such as flexible learning spaces, floating laboratories on small removable pontoons, underwater sea binoculars as well as teaching signs on the seabed.

Moreover, the building itself is promoting a sustainable approach and the roof expresses a performative combination of sustainable concepts and technique. All technical installations like water handling and circulation, solar energy production and consumption and ventilation were all on display in competition proposal and part of the total learning experience on resources and sustainability (Rosenfield, 2014: online).

Figure 1.31. Section _ Scale: N/S (ArchDaily, 2020: Online)

Lessons learnt

This Community Facility has proven that architectural spaces have the ability to act as a social engineer within a specific context. This building has proved to be more than a centre, but rather a community generator by providing a more legible and coherent complex that the community understands. The facility has successfully engaged with the site from edge to edge through a simplification of the design synthesis and the choice of materials. While not a broad and complicated brief, the response has addressed complex issues such as sustainability (figure 1.32).

In essence, the Marine Education Centre has achieved its primary objective of providing innovative solutions to maximise energy efficiency and thus, reducing environmental impacts. The building has been designed to set a new precedent in environmental education. Sustainable strategies used include passive heating and ventilation systems, solar energy panels and a rainwater collection system.

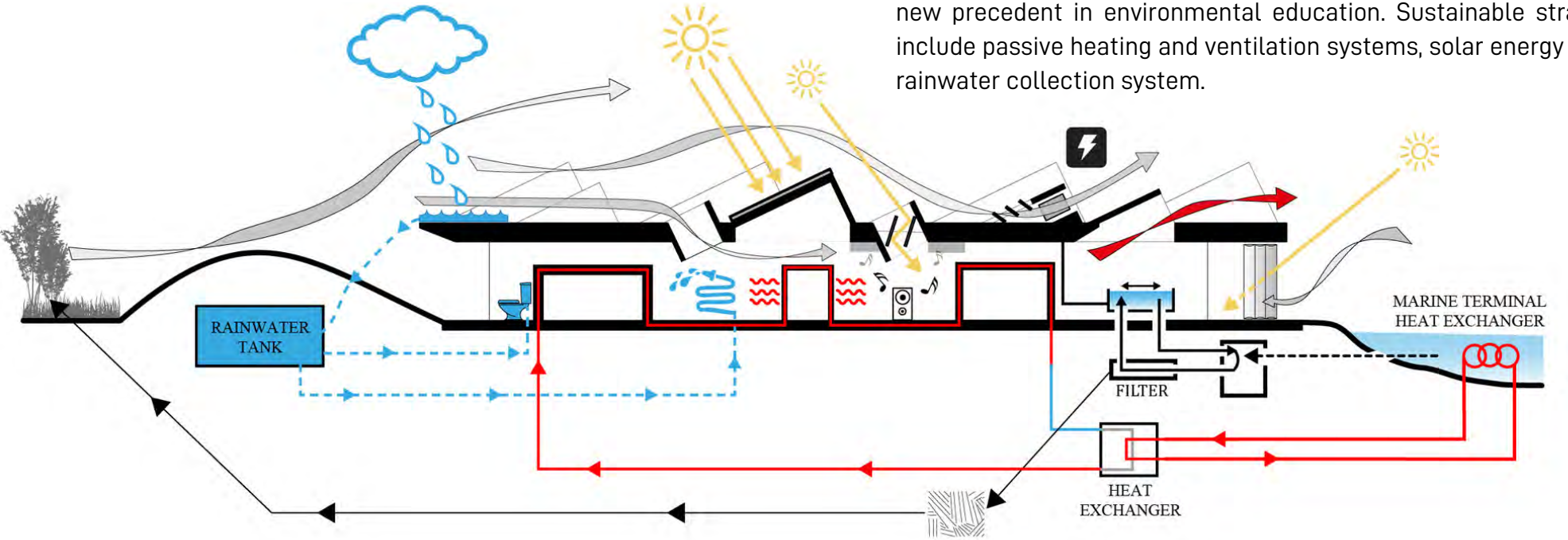


Figure 1.32. Sustainability study diagram (ArchDaily, 2020: Online)

GROUNDING

CHAPTER 02

2.1 Research Question

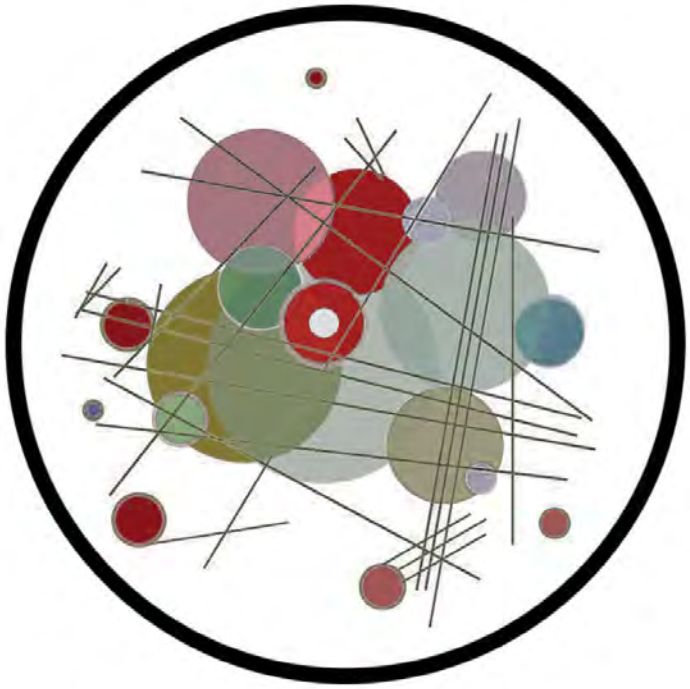


Figure 2.1. Circles in a circle by Kandinsky (Adapted from Bauhaus Movement, 2020: Online)

How can architecture act as a device for preserving a fragile ecosystem in the KaTembe district by transforming the existing ferry terminal into a new ecological corridor that encourages interaction between people and marine life?

2.2 Community Comments

PASSIVE RECREATION- PICNIC AREAS

ACCESSIBLE PARK AND WATERFRONT
"make it easier for the older people"

DOG RUN WOULD BE AN ASSET / NO OFF-LEASH

MULTI-USE AMPHITHEATRE / PERFORMANCE SPACE

PROGRAMME TO EMBRACE SCHOOL

SHADY GROVES, SUMMER SHADE
"plant lots of trees"
"salt tolerant plantings are desired"

COMMUNITY GARDENS
"place to sit on the grass without geese"

BICYCLE OPPORTUNITIES FOR CHILDREN

VIEWS OF GREAT MAPUTO
"interact with the sunset"

MORE WATER PLAY / WATER FEATURE
"water feature would be nice to provide cooling"

BEACH / WATER ACCESS / RESTROOM / PICNIC AREA
"like the beach at Ponta do Ouro"

ECOLOGICAL EDUCATION/ ECOLOGICAL CENTRE

RAIN WATER HARVEST
"catch the rain water"

INTIMATELY SCALED "LEARNING AREA/ READING AREA"

OPEN TO PUBLIC

PARK MANAGEMENT IMPORTANT:
PARK SURVEILANCE

ALCOHOL A CONCERN AT CONCESSION
"access to ferry without having to buy beer"

CONCERN THAT ACTIVE AREAS WILL SERVE NON-RESIDENTIAL POPULATIONS SUCH AS OUTSIDE SPORTS ORGANIsATIONS

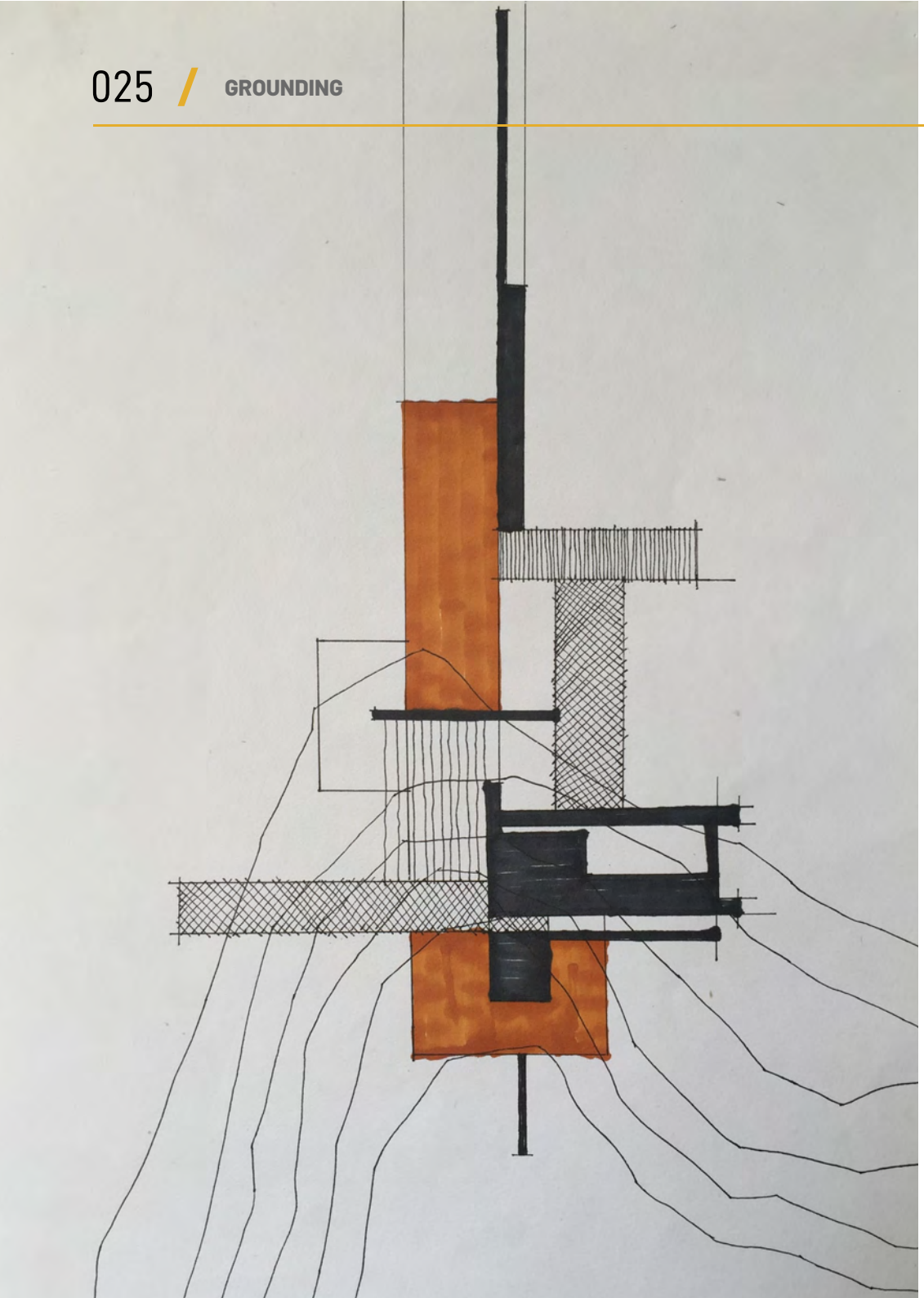
PUBLIC RESTROOMS

BENCHES/ SEATING
"bench at the end of 2nd avenue"

LIGHTS ALLOW ACTIVITY TO CONTINUE AFTER DARK
"no lights after dusk on the active recreation fields"

MISSING TENNIS + BASKETBALL (1/2 COURT) + VOLLEYBALL
"basketball is fine as long as it is not adjacent to resident's backyards"

ADOLESCENT PLAY AREAS
"invent something for the 12 year old boys to do"



2.3. CONCEPTUAL EXPLORATION

2.3.1 CONCEPT 01

+ LINEARITY
+ CONNECTIVITY
+ GRID AS SPACE

The site's landscape suggests a much calibrated space that can maximize the interaction between people and marine environments. By organising space in a linear setting, people need to constantly negotiate the space and obstacles. The people visiting the research facility will be able to walk, run, jump and rest on a series of spaces between water and land.

Figure 2.2. Diagram of Concept 01 (Author, 2020)

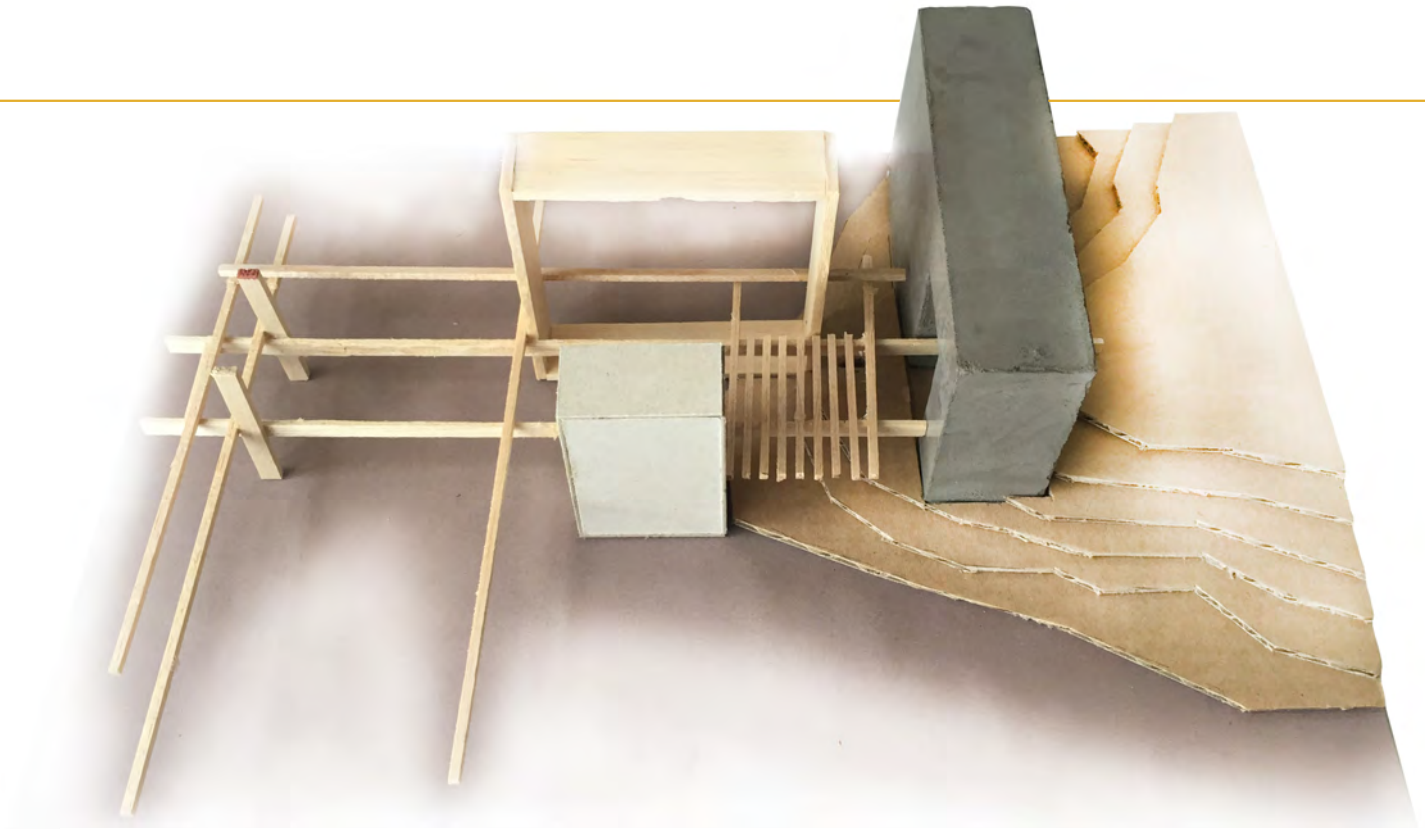


Figure 2.3. Photo of conceptual model (Author, 2020)

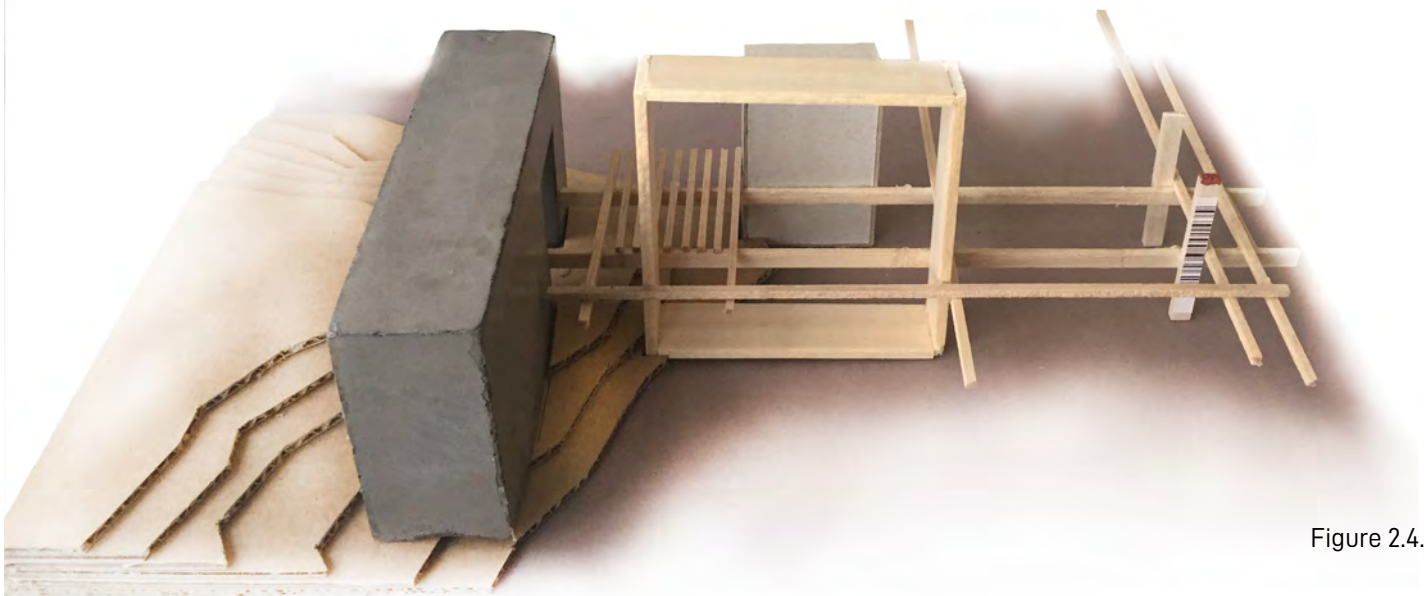


Figure 2.4. Photo of conceptual model (Author, 2020)

2.3.2 CONCEPT 02

+ JUXTAPOSITION
+ DISCOVERY/ EXPLORATION
+ PATH AS VOLUME

The second concept addresses the existing ferry terminal as a landscape, allowing users to experience the juxtaposition of architecture and water as they navigate through the building. The design weaves together land and sea while giving fresh vitality through its framing of the ocean and the Maputo unique skyline.

Figure 2.5. Diagram of Concept 02 (Author, 2020)

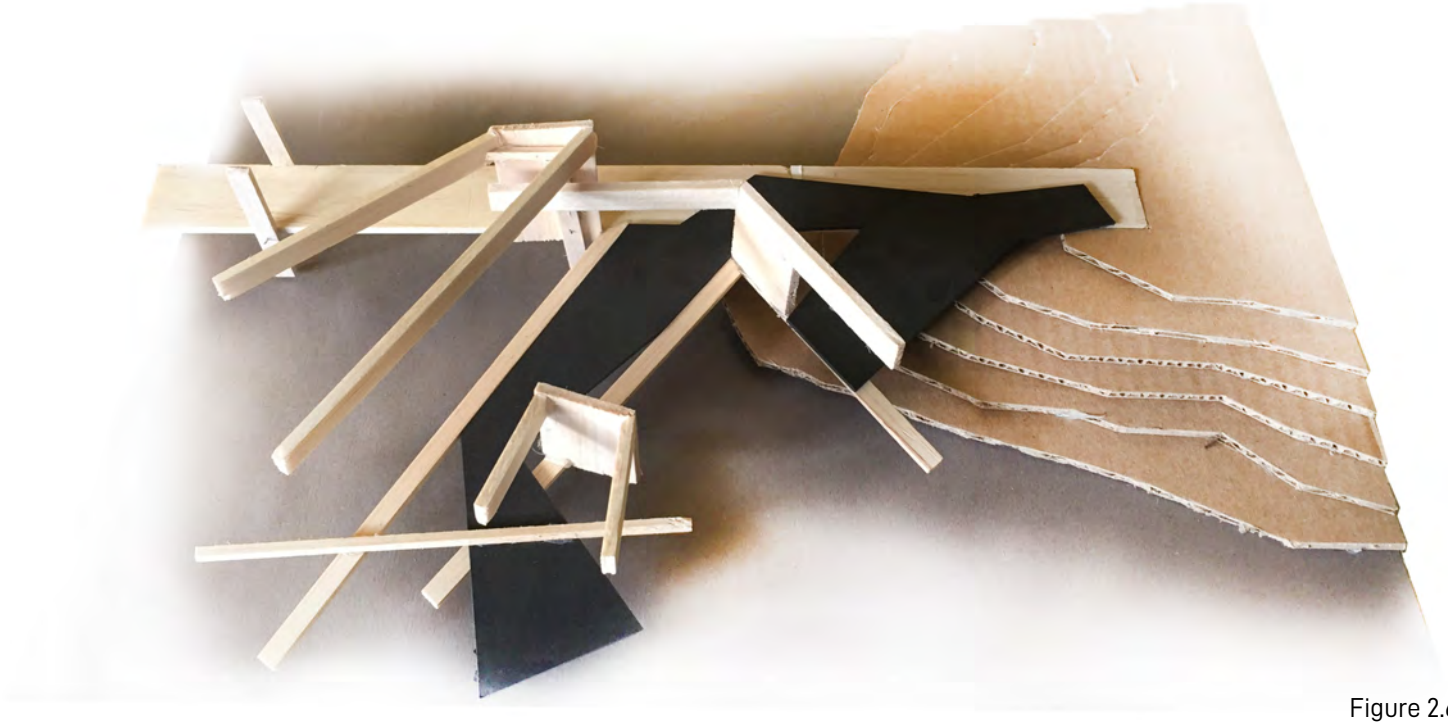
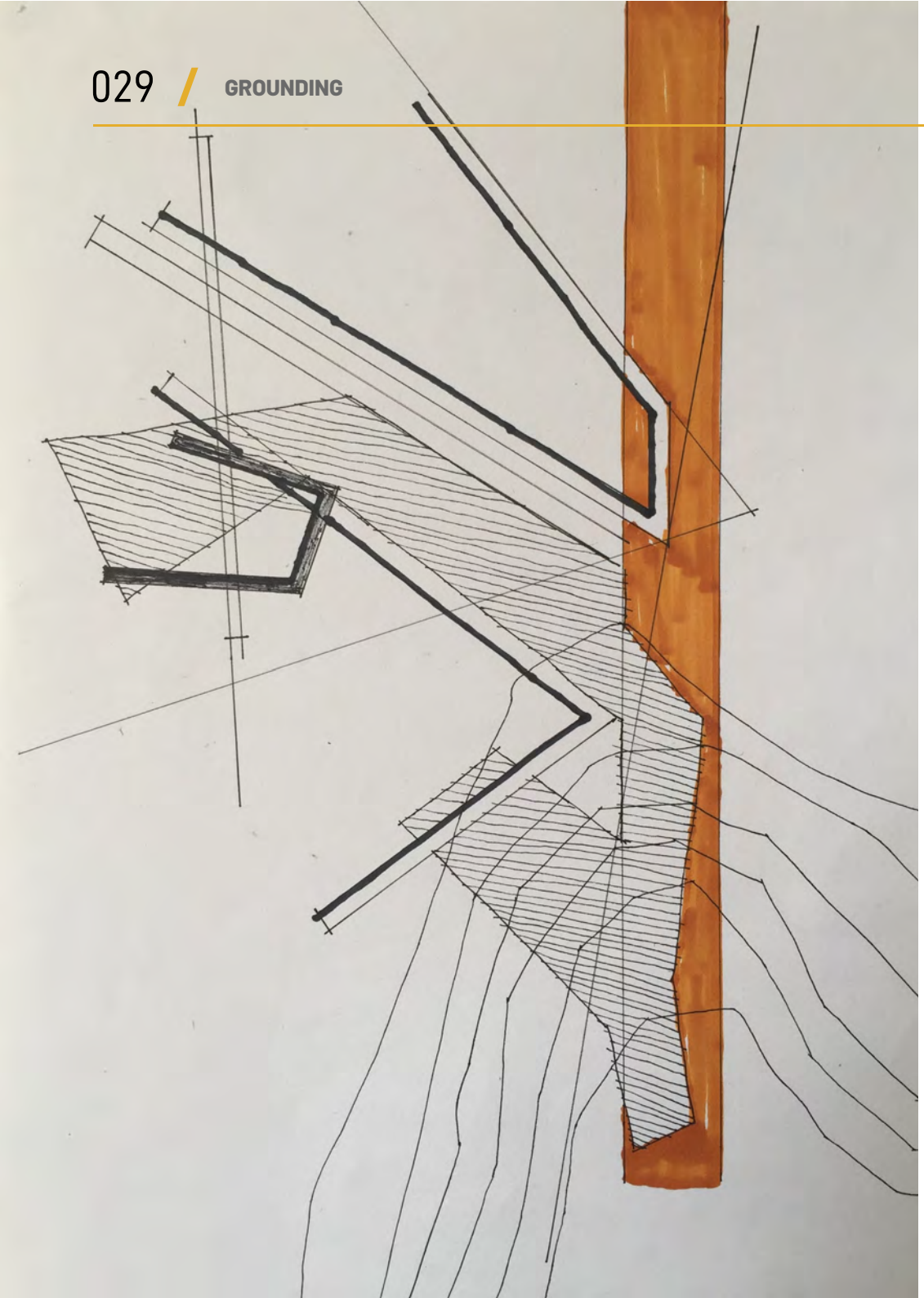


Figure 2.6. Photo of conceptual model (Author, 2020)

Figure 2.7. Photo of conceptual model (Author, 2020)



2.3.3 CONCEPT 03

+ BLURRING EDGES
+ MOVEMENT
+ TRANSFORMATION

The shore by its nature is a movement. Be they movement of water, the movement of sand, the movement of air and ultimately the movement of people. The shore is also a transformation.
Transformation of ebb into flow, transformation of dusk into dawn, transformation of matter into sand, transformation of daytime heat into evening coolness.

Users can freely navigate through all spaces of the building and may choose where they want to be, outside under the canopy, inside the building or on the beach. All movement inside and through the building is fluid and not limited by sharp corners or visual barriers.

Figure 2.8. Diagram of Concept 03 (Author, 2020)

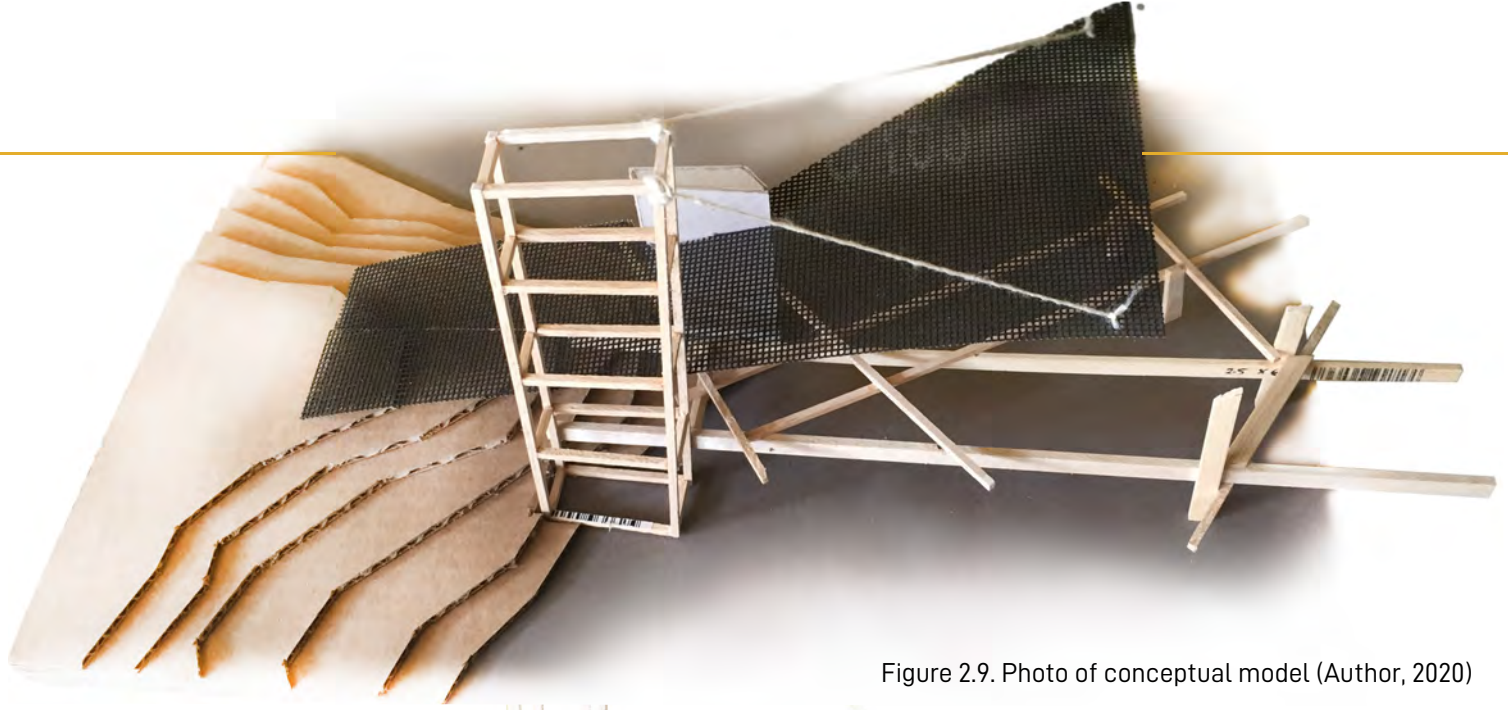


Figure 2.9. Photo of conceptual model (Author, 2020)

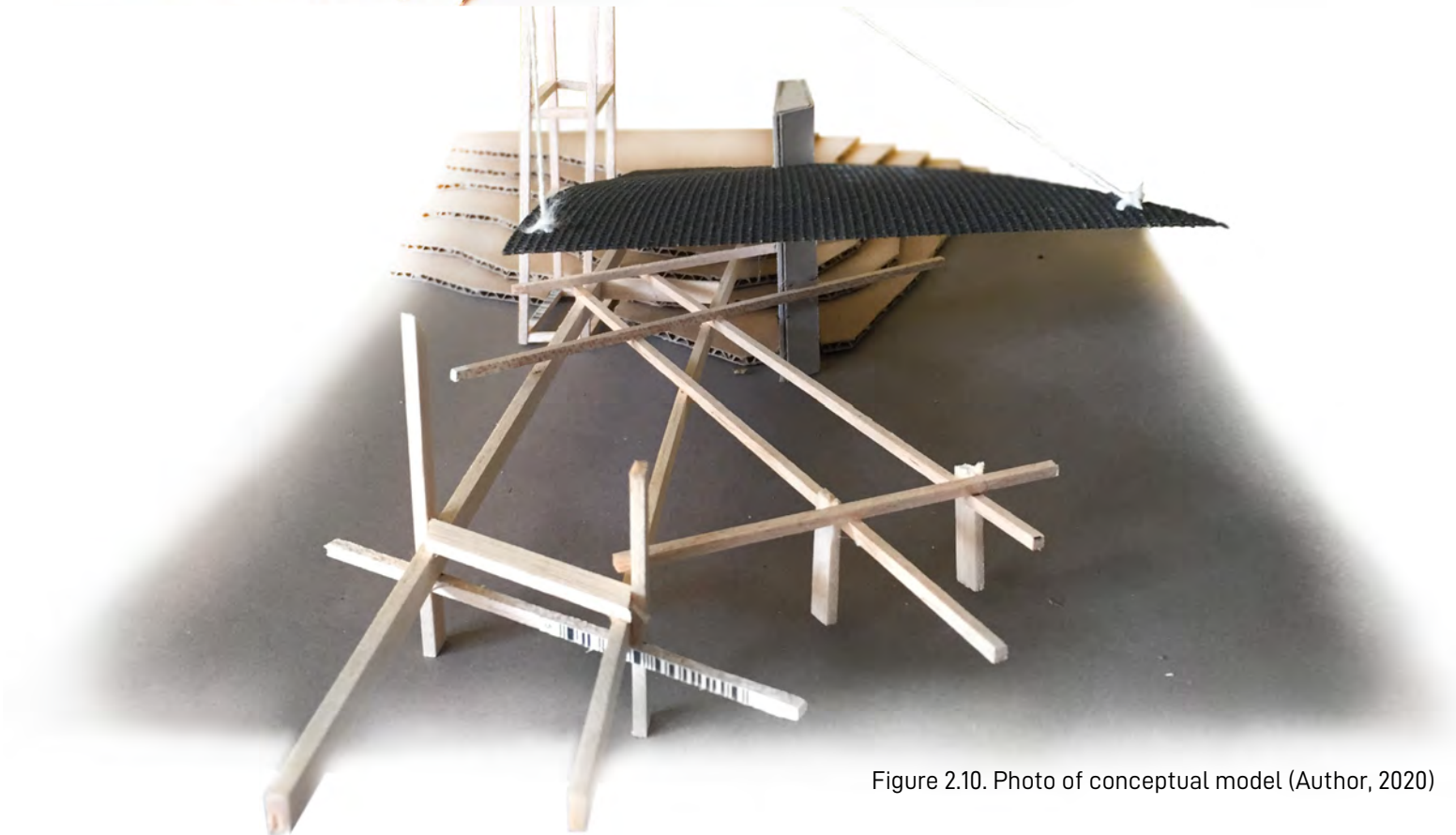


Figure 2.10. Photo of conceptual model (Author, 2020)

Figure 2.11. Aerial photo (Wade, 2015: Online)

2.4 THEORETICAL GROUNDING

INTRODUCTION

A literature review will provide the reader with a theoretical discourse that will be used as a main morphological informant towards determining a design solution.

2.4.1 Edges and the In-between

The in-between in architecture is pertinent to the concept of juxtaposition of spaces and/or places as manifestation of contrasting conditions. According to Dutch architect Aldo van Eyck (1968: 104) the in-between is defined as "the architectural reciprocity reconciling between two extremes such as the inside and the outside, public and private", an articulation between spaces with a transitional realm. The in-betweens are not two realms that can exist independently, provided each contains the characteristics that make the existence of the other. Therefore, the in-betweens are perceived as potential, undesignated spaces "that can develop into places responsive to at least two sets of conditions at the same time (Kleinsasser, 1981: 92).

In order to understand the concept of environmental juxtaposition, the in-between spaces must act as medium to express forms that lead to experience of spatial-relations. In this sense, forms are not limited to physical shapes but they can also mean patterns, modes and structures depending on the way the in-between is constructed (Langer, 1967: 24). For instance, through different spatial arrangements, different use of materials and their textures or colours as well as different gradations of light and temperature, the user of space receives stimuli that lead them to sensations of being inside or outside. The more expressive this contrast becomes the richer the relationship they establish.

The recognition of the in-between in architecture lies in space-forms: an in-between space, a distinct environmental realm or layer that is established by the attachment to primary and dominant spaces also as a means of separateness and linking as an element of transition.

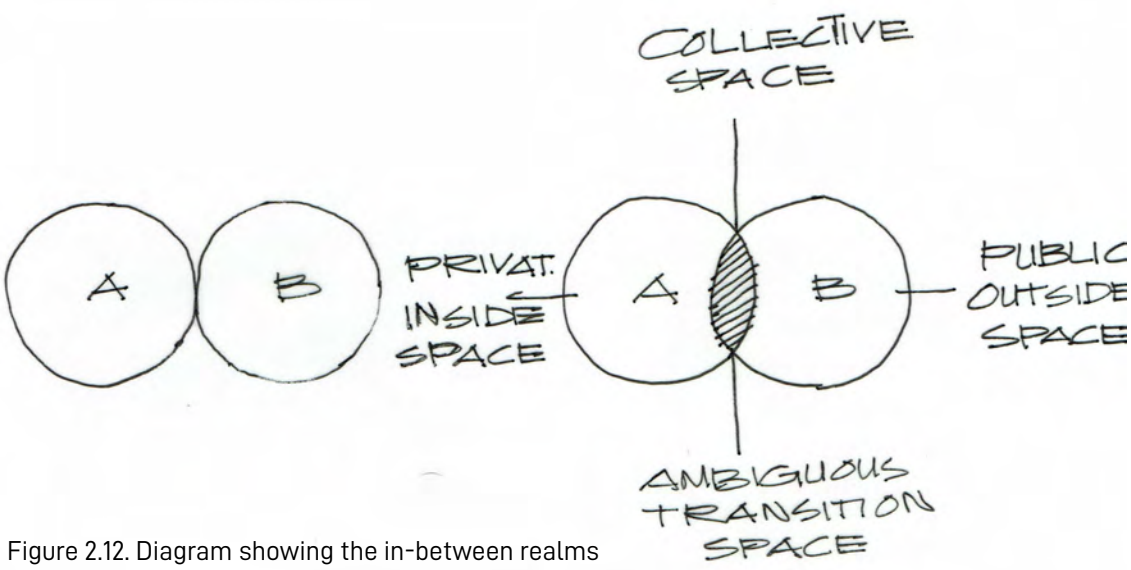


Figure 2.12. Diagram showing the in-between realms (Author, 2020)

Figure 2.13. Passage Choiseul - 1910 (Hotel Etats Unis Opera, 2018: Online)

Moreover, in-between spaces exist in public and urban realms as much as in architecture. Most common in-between forms in public realms are defined as the boundaries and/or edges of places such as arcades, niches of a façade, colonnades and promenades create the condition of spaces within the space or articulated spaces at the transitional zone-an edge zone (Gehl, 1987: 150-155).

The exterior and interior space cannot always be established as absolute entities. These often assume a greater degree of complexity, changing their identity and unfolding on several levels. Thus, ambiguous spaces are born which lie between being inside and outside. The Parisian arcades (Figure 2.13) are perfect example of ambiguous spaces, making the relation between exterior and interior assume, in many cases, a complex and reversible meaning. Thus, with modernity we would see a series of architectural experiences that would bring about a significant change in spatial relations. The traditional interior, as a closed space as opposed to the outside, loses importance, becoming more open and receptive to receiving what goes on outside.

Considering the quality of transition, use and "figure-ground", in-between realms can be distinguished from left-over space. The term itself, suggests a space as residue; left behind when a space or a building viewed as figure is placed on the location as ground (Alexander, Ishikava & Silverstein, 1977: 518).

Despite spatial between-ness, a left-over space stands still as a negative, void and shapeless void; therefore, surrounding spaces or buildings remain isolated and are deprived of integrated spatial relationships. This means, left-over space cannot function as transitional element. On the other hand, well designed and articulated in-between spaces create positive, potential uses and transition, with the "distinct and definite shape of a room" their configuration, shape and function are as important as those of spaces or buildings in the context. With quality of potential enclosure and interpenetration with other domains, in-between realms might be seen as figures against the ground of surrounding domains or buildings: "figure-ground reversal" (Alexander, et al., 1977: 519).

In-between realms may vary in spatial conditions, but their form is constructed by the same structures of being between-ness of designated realms and functioning as concurrent mediums of divisions and coherence as transitional modes. They simultaneously overlap and reveal two or more domains, as a configuration of intermediary space.

On one hand, in-between domains are embodied in architecture and clearly understood. On the other hand, in the art of place-making, the in-between has not yet been defined in place-form as the in-between place: an environment which provides relationships to juxtaposing places. The proposed place-form does not lie only in geographical sense but refers to a living realm-the way a place is designed-holding the ontological presence as an entity of being. From the phenomenological point of view, the essence of place: cultivating and dwelling, ultimately "being" presents itself within a clearly established realm that depends on the nature of bounded structure. Heidegger puts in these terms, "A boundary is not that at which something stops, but, as the Greeks recognized, the boundary is that from which something begins its presencing" (Frampton, 1993: 275).

To conclude, the in-between place-form bears an examination regarding the synchronization of the composite terms of the in-between and the place. In other words, an in-between realm presents itself as the in-between functionality of place. Rather than a bounded, ended place in its form, a place of the in-between setting needs to perform as in-between modes: being located in the intermediary and tangible ways of which this subtle layer establishes characteristic relations between juxtaposing domains: its transition and reconciliation nature.

2.5 MAPUTO CITY

ORIGINS
+ DEVELOPMENT

2.5.1 INTRODUCTION

This section offers a historical overview of urban development in Maputo, including a more detailed analysis of the recent urban expansion. This is followed by a section describing town planning in the post-Independence period.

2.5.2 DEVELOPMENT OF MAPUTO

Maputo is a port city and capital of Mozambique, formerly (until 1976) known as Lourenço Marques derived from the Portuguese trader who first explored the region in 1544. The local indigenous people, *the Rongas* nicknamed the city 'Xilunguine', which meant "the white man's place" (Jenkins, 2009: 91). The city lies along the north bank of Maputo Bay, previosly Espírito Santo Estuary of Delagoa Bay, an inlet of the Indian Ocean.

In 1721, the Dutch first established a temporary settlement as a coastal trading post. A few years later the British took control of the post and transferred it to the Portuguese in 1781.

The Portuguese finally developed a permanent settlement around a Portuguese fortress in 1787. Created a city town in 1887, it superseded the town of Moçambique as the capital of Portuguese East Africa in 1907 (Lotha, 2007: online).

Figure 2.14. Map of Maputo (Author, 2020)

1876

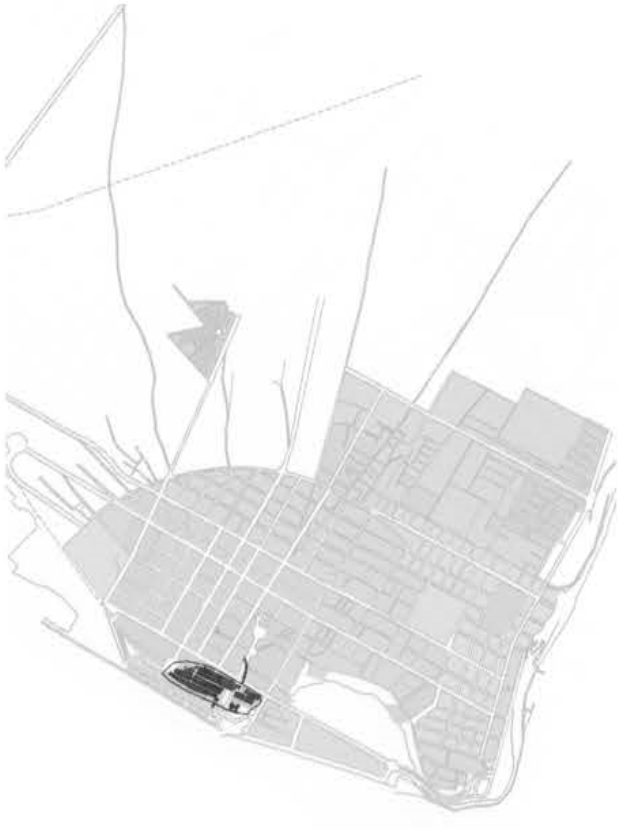


Figure 2.15. Fort and trading settlement on an island swamp - 1876 (Adapted from Jenkins, 2009: 92)

1887

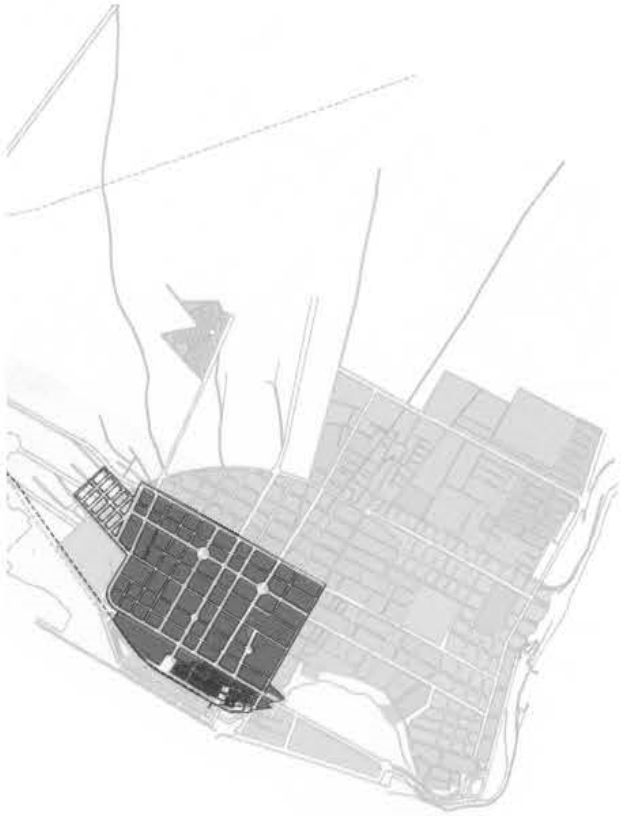


Figure 2.16. First phase of swamp reclamation and formal street grid - 1887 (Adapted from Jenkins, 2009: 94)

1900

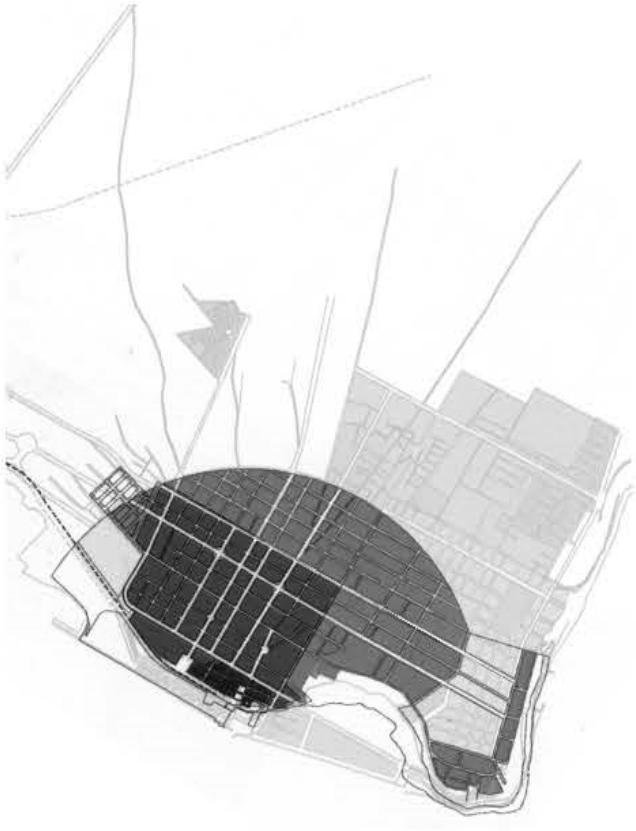


Figure 2.17 The city showing the 2 km radius layout and extension of street grid - 1900 (Adapted from Jenkins, 2009: 94)

1940

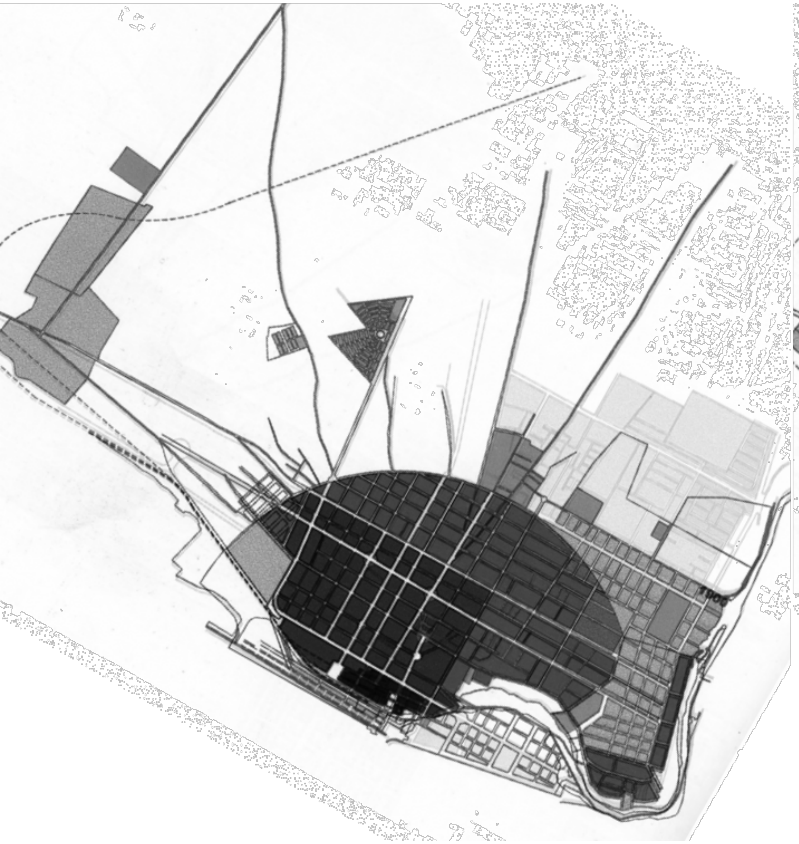


Figure 2.18. Second phase of swamp reclamation and organic extension - 1940 (Adapted from Jenkins, 2009: 96)

1955

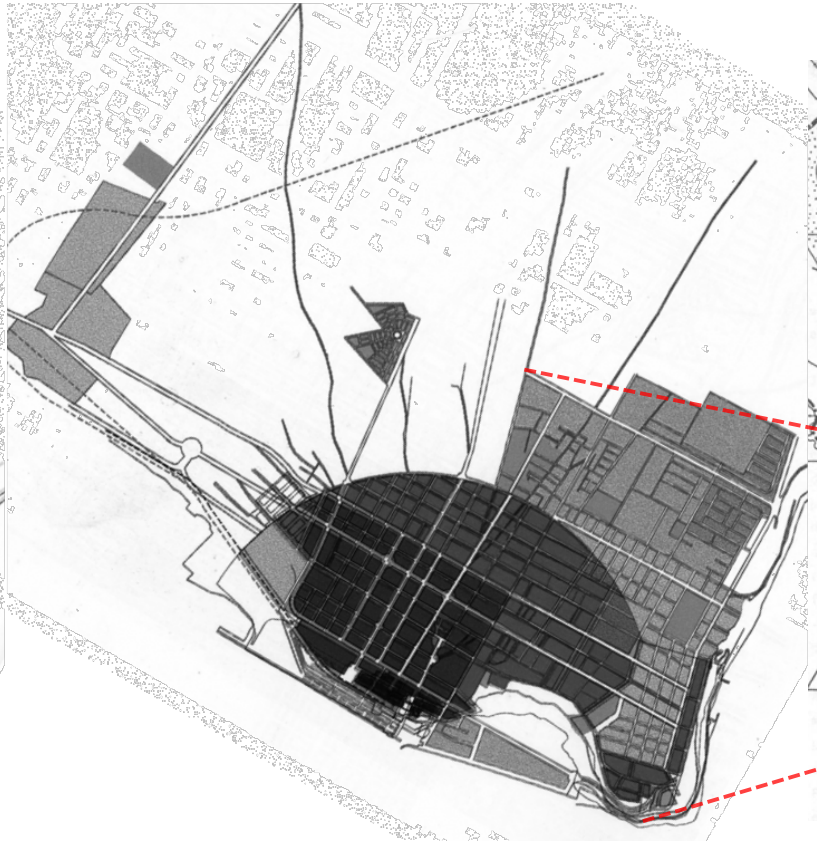


Figure 2.19. Extension of the city to the north - 1955 (Adapted from Jenkins, 2009: 99)

1985

Figure 2.20. Post-independence rapid peripheral expansion of the city due to informal settlements- 1985 (Adapted from CMM, 2008: 41)

2.5.3 ARCHITECTURAL CHARACTER

Essentially the architectural history of Mozambique has not been much different to that of South Africa. In broad terms, it is characterised by a similar colonial history, by the comparable importation of Victorian and Art Deco styles as well as by the same influence of early modernist tendencies in the 1930s. With urban growth in the 1960s, a mature modernism emerged, amidst which exemplary buildings by architects such as JJ Tinoco and Pancho Guedes became points of reference. In Maputo today, despite the relative isolation of Mozambique since 1974, the state of architecture is not dissimilar to that of contemporary South Africa.

Figure 2.21. Natural History Museum, 1911 (Whittle, 2018: Online)

Figure 2.22. The CFM (Caminhos de Ferro de Moçambique) railway station, 1908 (Wolf, [n.d.]: Online)

Figure 2.23. The City Hall, 1947 (Author, 2019)

Figure 2.24. Abreu, Santos and Rocha building by Pancho Guedes, 1954-1956 (Brandão, 2010: Online)

Figure 2.25. Abreu, Santos and Rocha building by Pancho Guedes (Cerisier, 2014: Online)

Figure 2.26. Cathedral of Our Lady of the Immaculate Conception by Marcial Simões de Freitas e Costa (Whittle, 2018: Online)

Figure 2.27. O Leão Que Ri "the smiling lion" by Pancho Guedes, 1956 (Bell, 2015: Online)

Figure 2.28. Tivoli Hotel (Jenkins, 2015: Online)

Figure 2.29. Casa Paulino "Paulino residence" by José Forjaz (José Forjaz Arquitectos, 2003: Online)

Figure 2.30

Figure 2.31

Figure 2.32

Commercial developments, the proliferation of tourist-related facilities and recent gated residential enclaves are increasingly making up much of the current architectural scene, albeit in a context where urban infrastructure provision is neglected. Over the past decades Mozambique has not been exempted from the 'post-modern' disposition which has prevailed elsewhere in the world.

In architectural terms, this tendency has been manifested in a condition of unprecedented stylistic incoherence. With this has come an unusual obsession with form, as well as the veneration of the singular architectural object. Augmented by normative town planning ideas, new buildings seldom contribute towards the making of the public domain, as they typically lack 'urban generosity' and ignore the broader questions of economic, social and environmental sustainability. With this condition, the cities of Mozambique, like the South African cities, have remained as polarised conurbations divided between the rich and the poor - despite the achievement of independence and democracy in the nation states that make up our region.

Figure 2.30. Edificio TAP "TAP Building" (Jenkins, 2015: Online)

Figure 2.31. Abreu, Santos and Rocha building by Pancho Guedes, 1954-1956 (Weate, 2011: Online)

Figure 2.32. Edificio Tonelli "Tonelli Building" (Jenkins, 2015: Online)

2.5 The Site

Figure 2.33. World Map highlighting Mozambique (Adapted from SnowFleikuN, 2010: Online)

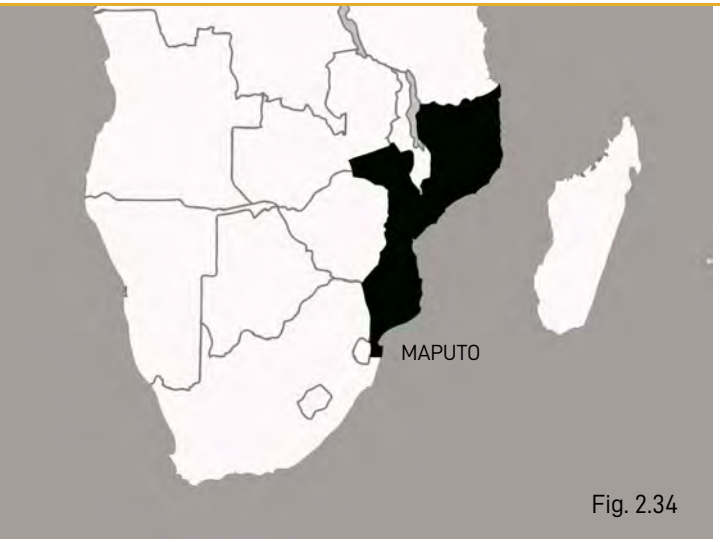


Figure 2.34. Location of Mozambique within Southern Africa (Adapted from Dill, [n.d.]: Online)

Figure 2.35. Katembe district within Maputo Province (Adapted from BETAR, 2016: 3)

Figure 2.36. The site in the immediate surroundings (Adapted from Google Earth, 2020: Online)

At present, Maputo, the capital of Mozambique is growing with mind-numbing speed, filling up the lowlands with people, as all the highlands are increasingly being built on or covered. The chosen site is located on the south bank of Maputo bay in KaTembe district where an obsolete ferry dock is and offers views directly across the bay towards Maputo city. Forming a tip of land into the sea, the site is waterfront and city gateway and mangrove sanctuary. Many areas of coastal wetlands near the site have been lost or fragmented, as a result of reclamation for development.

These wetlands, which generally acted as a flood basin for Katembe district, are now unable to fulfill their purpose and thus increase flood magnitude and its elongation period. This approach to land development is affecting the resilience of the city. This disturbance of the environment can be termed an 'ecological disaster', making the situation worse for the people of Maputo city. An analysis of the pre-urban and post-urban context will show how the situation worsens with unwise and unplanned decision-making and not respecting the hydrology and its functions. The important observation is, that the strategy of 'flood-free land' should be transformed to 'flood-free building ' in the new innovative housing model in this context, which can relate to our society and culture.

SITE VIEWS

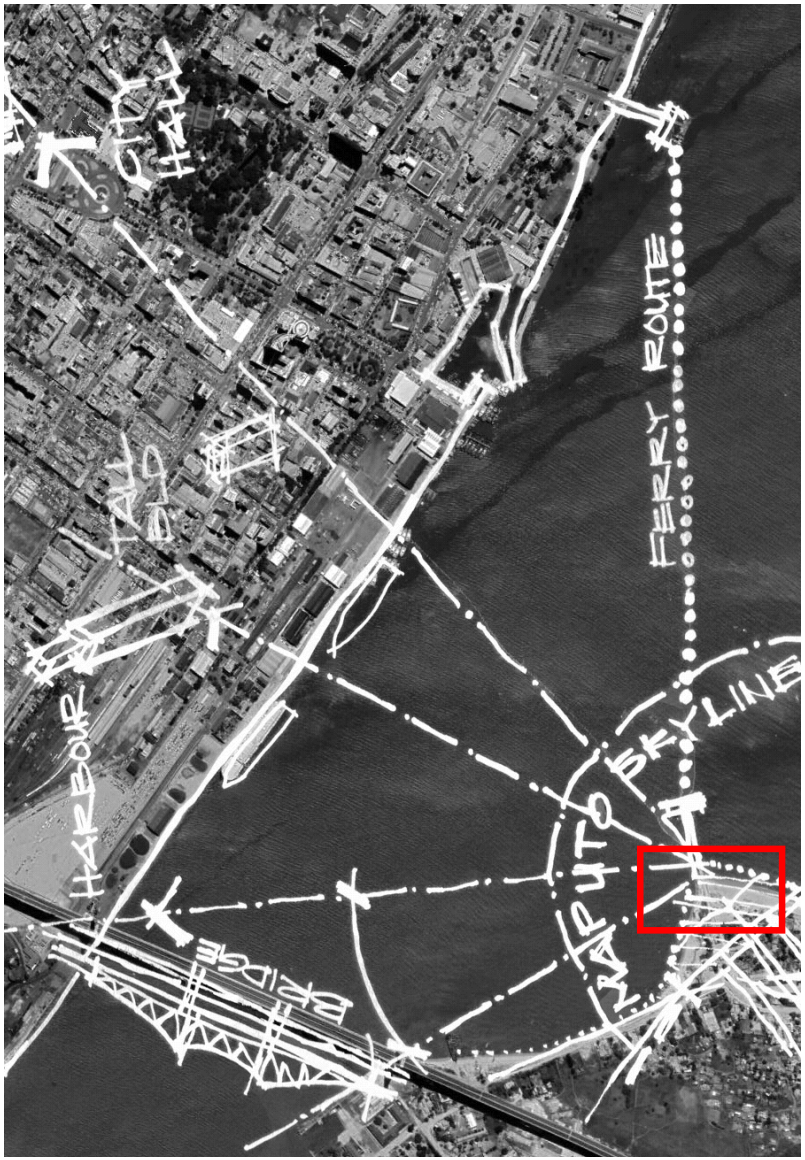


Figure 2.37. VIEWS FROM THE SITE TO GREAT MAPUTO (Author, 2019)

N

THE SITE IS DEFINED BY THE ICONIC SKYLINE, BOTH BY DAY AND NIGHT

Figure 2.38. NORTHWEST VIEW (Author, 2019)

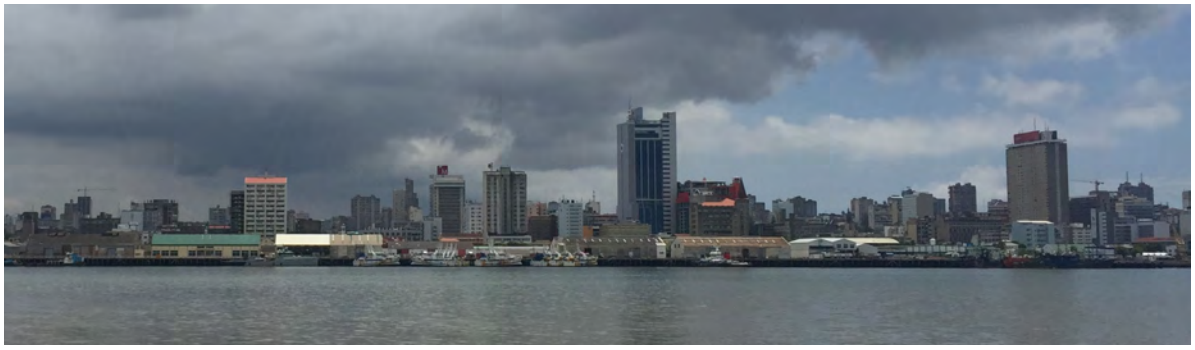


Figure 2.39. NORTH VIEW (Author, 2019)

Figure 2.40. NORTH EAST (Author, 2019)

SITE VIEWS

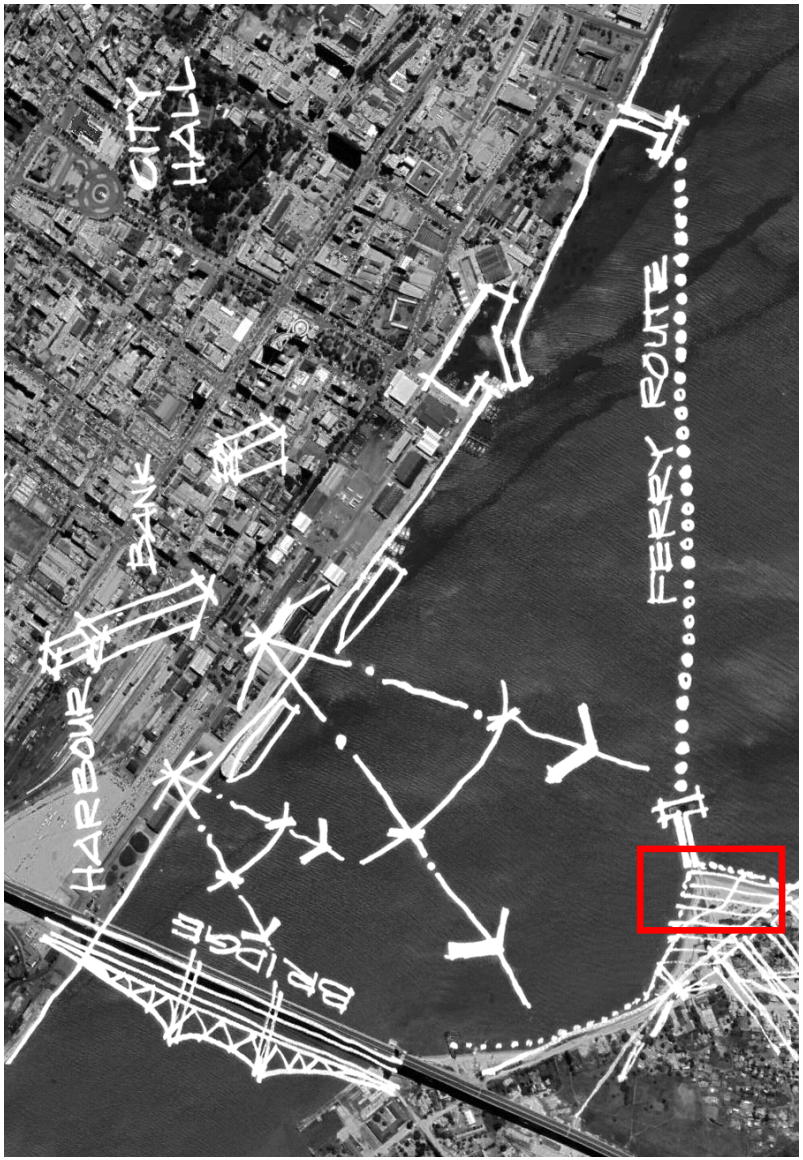


Figure 2.41. VIEWS FROM THE GREATER MAPUTO TOWARD THE SITE (Author, 2019)

N

THE SITE IS VISIBLE ACROSS THE HORIZON OF THE MAPUTO BAY

Figure 2.42. SOUTH VIEW (Brito, 2009: Online)

Figure 2.43. SOUTHWEST VIEW (Author, 2019)

Figure 2.44. SOUTHEAST VIEW (GAUFF, 2020: 16)

2.5.1 GUIDING PRINCIPLES

COMMUNITY HISTORY

Figure 2.45. View towards Maputo (Remane, 2008: Online)

FLEXIBILITY IN DESIGN

Figure 2.46. Surquillo Mercado (Travel and Leisure, 2020: Online)

ECONOMIC & CULTURAL GROWTH

Figure 2.47. Jardim Botânico Tunduro (Tripadvisor, 2020: Online)

EFFICIENCY IN OPERATIONS

Figure 2.48. Agricultura de sequeiro (Action Aid Mozambique, 2020: Online)

COMMUNITY CULTURE

Figure 2.49. Informal trade (Mailindo, 2007: Online)

NATURAL ENVIRONMENT ENHANCEMENT

Figure 2.50. Bairro Katembe (Author, 2020)

COMPLETE STREETS

Figure 2.51. Bike-friendly cities (Blumberg, 2019: Online)

COMMUNITY VALUE

Figure 2.52. Machamba (Action Aid Mozambique, 2020: Online)

2.6 Programme

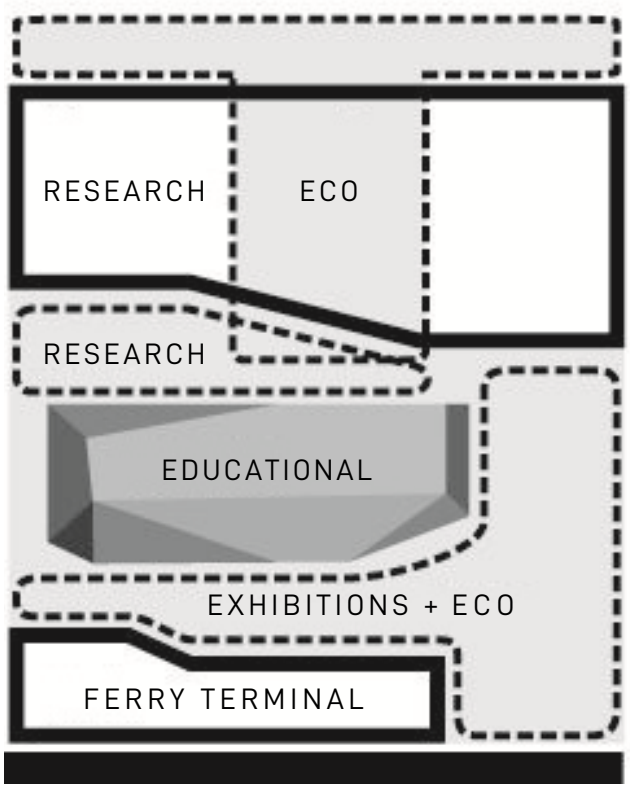


Figure 2.53. Functional diagram (Author, 2020)

The proposed science park and ferry terminal is a multi-functional building, in which the subunits such as research facilities, educational spaces, temporary and permanent exhibitions, outdoor exhibition areas and the natural spaces are located in such a manner that allows different users' profile to navigate through the building without disruption between activities.

2.6.1 ACCOMMODATION LIST

GROUND FLOOR

A. PUBLIC

i. TICKET BLOCK

01. Ticket Office	27m2
02. Storage	4m2
03. Male Ablution	12m2
04. Female Ablution	14.6m2

ii. EAST WING

05. Reception	37.4m2
06. Foyer/ Info Desk	88.5m2
07. Gift shop/ Waiting area	109m2
08. Temporary Exhibition	50m2
09. Coral Reef Exhibition	150m2
10. Aquatic Habitat Gallery	160m2
11. 2 x Admin offices	25m2
12. Male Ablution	16m2
13. Female Ablution	20.4m2
14. Storeroom	12m2

WEST WING

15. Foyer	75m2
16. Storeroom	20.9m2
17. Male Ablution	18m2
18. Female Ablution	24m2

FIRSTFLOOR

B. SEMI-PUBLIC

ii. EAST WING

19. 2 x Teaching Labs	150m2
20. Storeroom	25.8m2
21. 2 x Consultation offices	28m2
22. Male Ablution	16m2
23. Female Ablution	18m2

ii. WEST WING

24. Pre-assembly	75m2
25. Lecture hall	215m2
26. Balconies	40m2
27. Passage	50m2

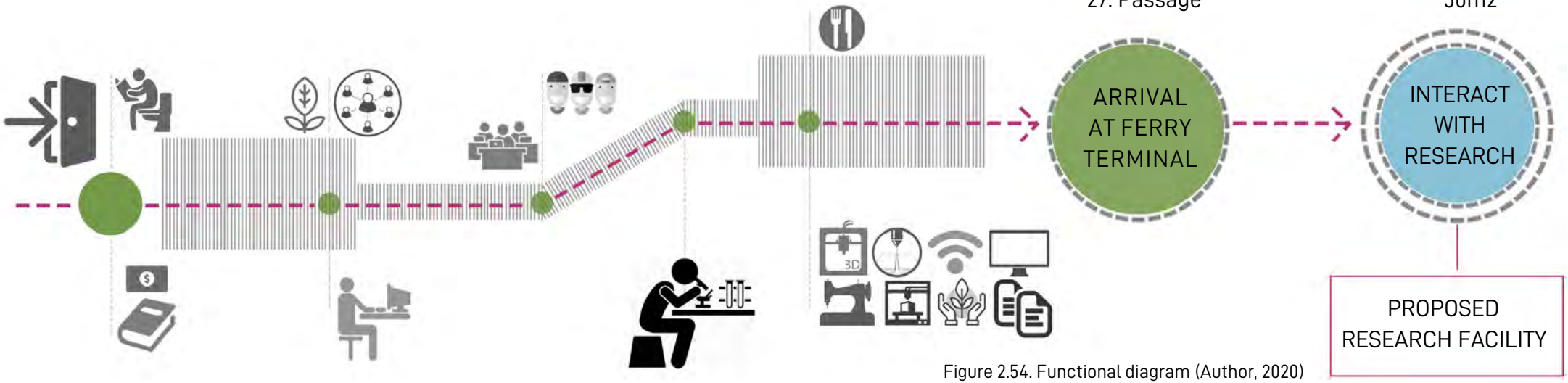


Figure 2.54. Functional diagram (Author, 2020)

SECOND FLOOR

C. PRIVATE

ii. EAST WING

28. 2 x Research Labs	200m2
29. Boardroom	70m2
30. Open Office	50m2
31. Lounge	28m2
32. Male Ablution	16m2
33. Female Ablution	18m2
34. Storeroom	12m2
35. Passage	50m2

ii. WEST WING

36. Boardroom	40m2

THIRD FLOOR

D. PRIVATE

EAST WING

37. Reception	10m2
38. Restaurant	120m2
39. Kitchen	24m2
> Cold room	20m2
> Dry room	10m2
40. Storeroom	15m2
41. Male Ablution	16m2
42. Female Ablution	18m2
43. Terrace	245m2

TOTAL	**2 447m2**

2.6.2 CORAL REEF EXHIBITION

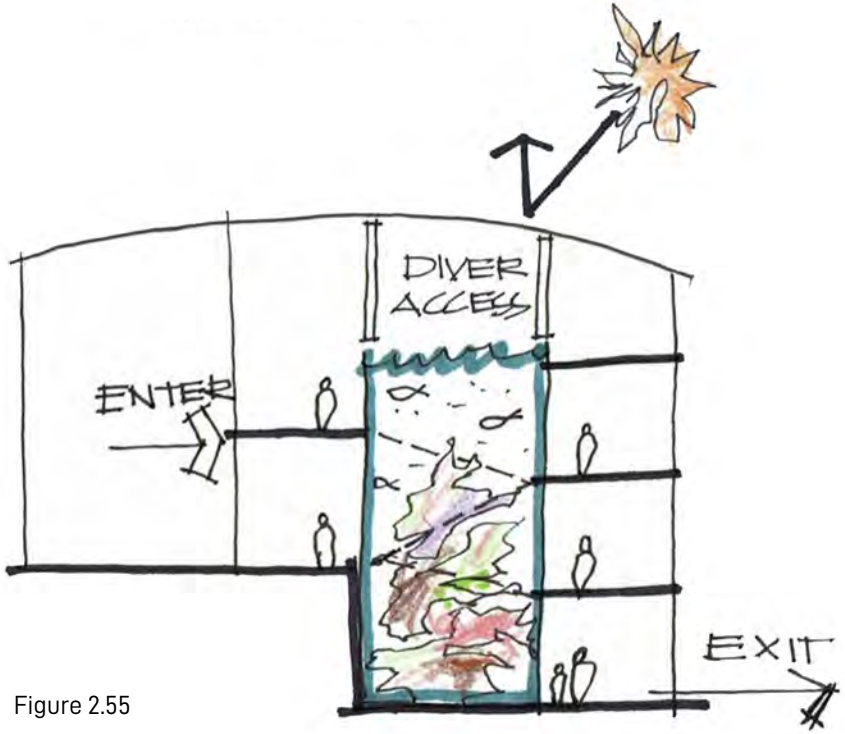


Figure 2.55

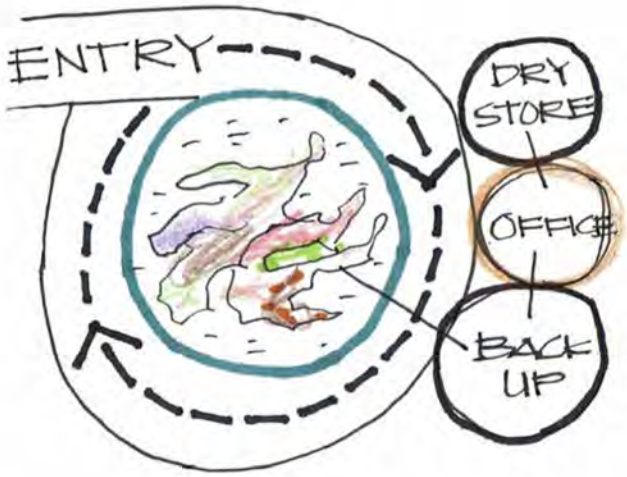


Figure 2.56

Figures 2.55 & 2.56. Diagrammatic section and plan of the Coral reef exhibition (Author, 2020)

2.6.2.a) SPECIES

Trigger fish
Rabbit fish
Parrot fish
Angel fish
Coral catfish
Hawkfish
Bluestripe snapper
Oriental grunt fish
Unicornfish
Grouper
Cowfish
Puffers
Trunkfish
File fish
Mullets
Butterfly fish
Forceps fish
Triggerfish

2.6.2.b) REQUIREMENTS

> Saline water;
> 20,000 gallon capacity tank;
> Total viewing in the round;
> Diver access;
> Artificial lighting (simulate day and night cycles);
> Temperature control (McCosker, 2002: online and Ngeku, 2014: 2).

2.6.2.c) DESCRITPTIONS

Multiple level viewing can provide the visitor with scenic displays of the coral and fish varieties offered in the reef.
A multi-sensory (kinesthetic) approach to this exhibition would allow visitors, particularly children to experience the small creatures.

2.6.3 AQUATIC LIFESTYLES GALLERY

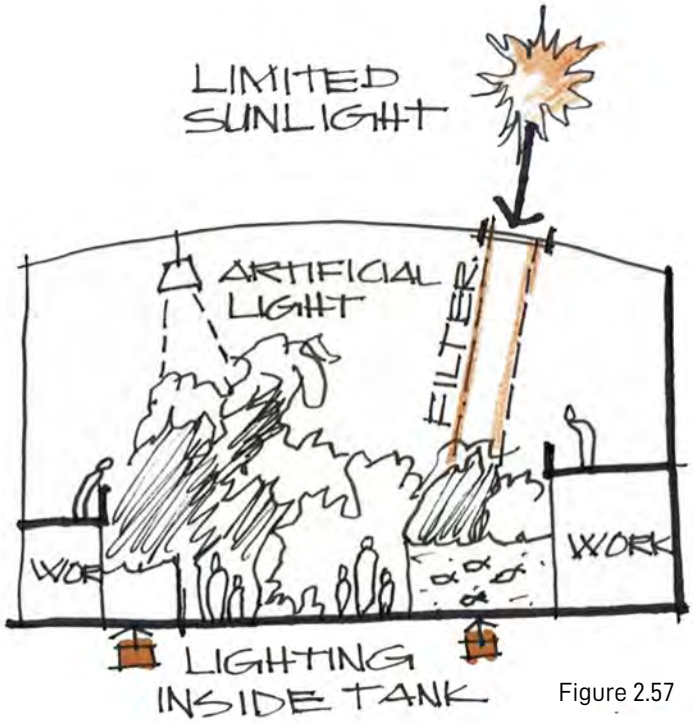


Figure 2.57

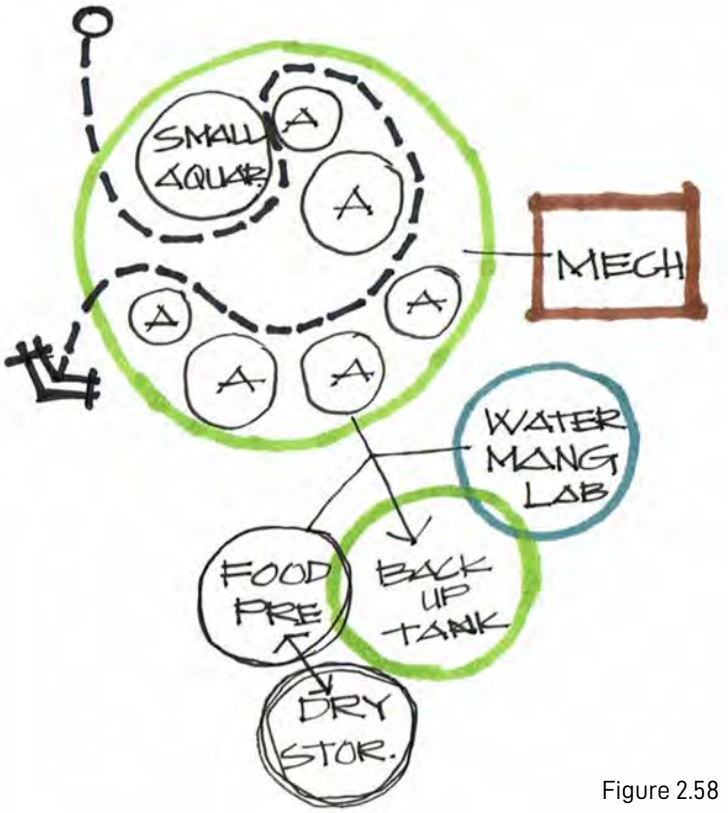


Figure 2.58

Figures 2.57 & 2.58. Diagrammatic section and plan of the Aquatic lifestyles gallery (Author, 2020)

2.6.3.a) SPECIES

Electric eels
Upside-down catfish
Electric catfish
Sea horses
Trumpet fish
Snakehead fish
Lizard fish
Clown anemone fish
Elephant nose fish
Puff fish
Hog fish
Zebra fish
Archerfish
Jaw fish
Frog fish
Fireworks fish
Leaffish
Butterfly fish

2.6.3.b) REQUIREMENTS

> Saline and freshwater;
> Separate small tanks;
> Touch tank;
> Temperature control;
> Artificial lighting (McCosker, 2002: online and Ngeku, 2014: 2).

2.6.3.c) DESCRITPTIONS

This gallery will contain and display smaller aquaria with a variety of species. Comparisons between the small niches will demonstrate convergent and divergent evolutionary concepts, cryptic coloration, mimicry, electric field generation and territoriality.

MAKING

CHAPTER 03

3.1 URBAN DESIGN FRAMEWORK

The purpose of the urban design framework is to establish parameters which will promote a vibrant, integrated and sustainable marine environment.

The figure-ground theory will be used to inverstigate the relationships created between merging circulation paths, hard versus soft surfaces, masses against voids within the site and its surroundings. It will then be possible to identify zones of conflict and draw connections between spaces in the urban context.

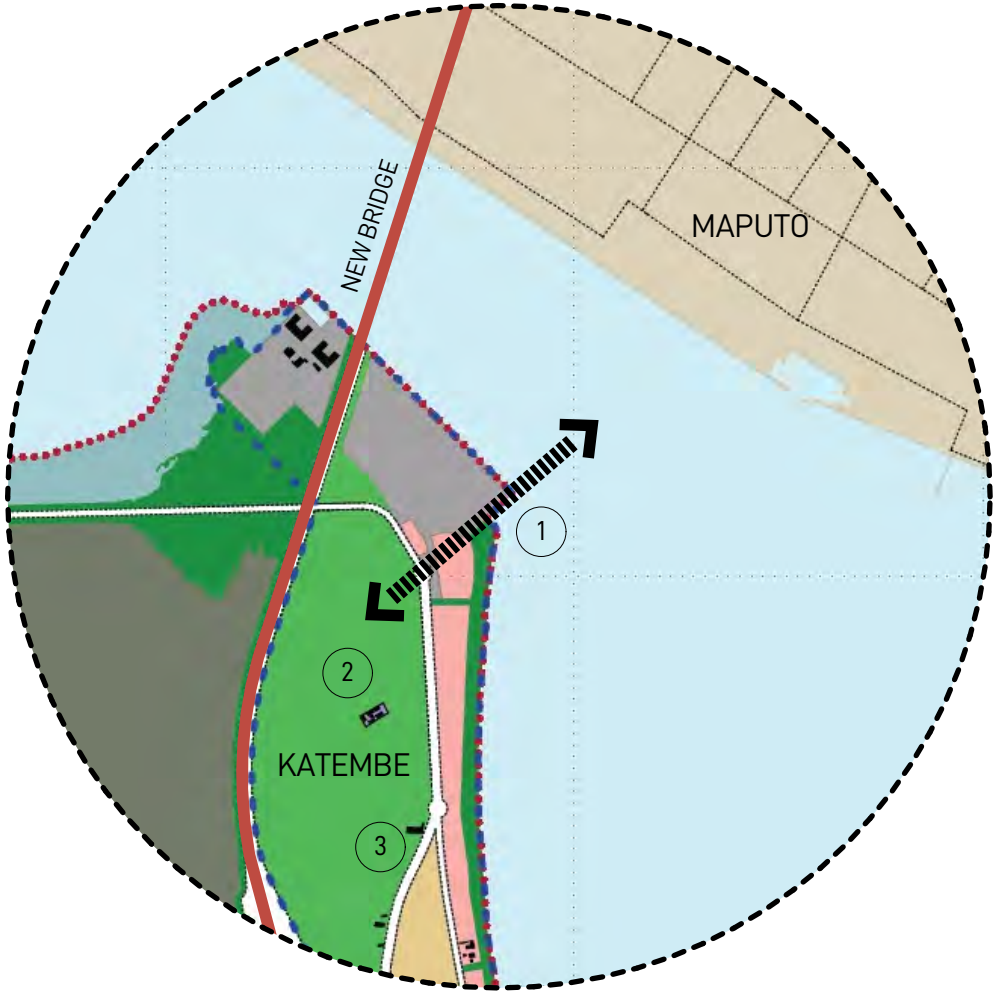


Figure 3.1. Key framework area (Author, 2020)

1. Reconnect the sea to the city
   Re-establish the ferry terminal
2. Enhance walkability across the neighbourhood
3. Develop main arterial roads

Land use

- Wetlands (Permanent wet)
- Wetlands (Seasonally wet)
- Conservavtion area
- Proposed urban areas
- Informal settlements re-blocking

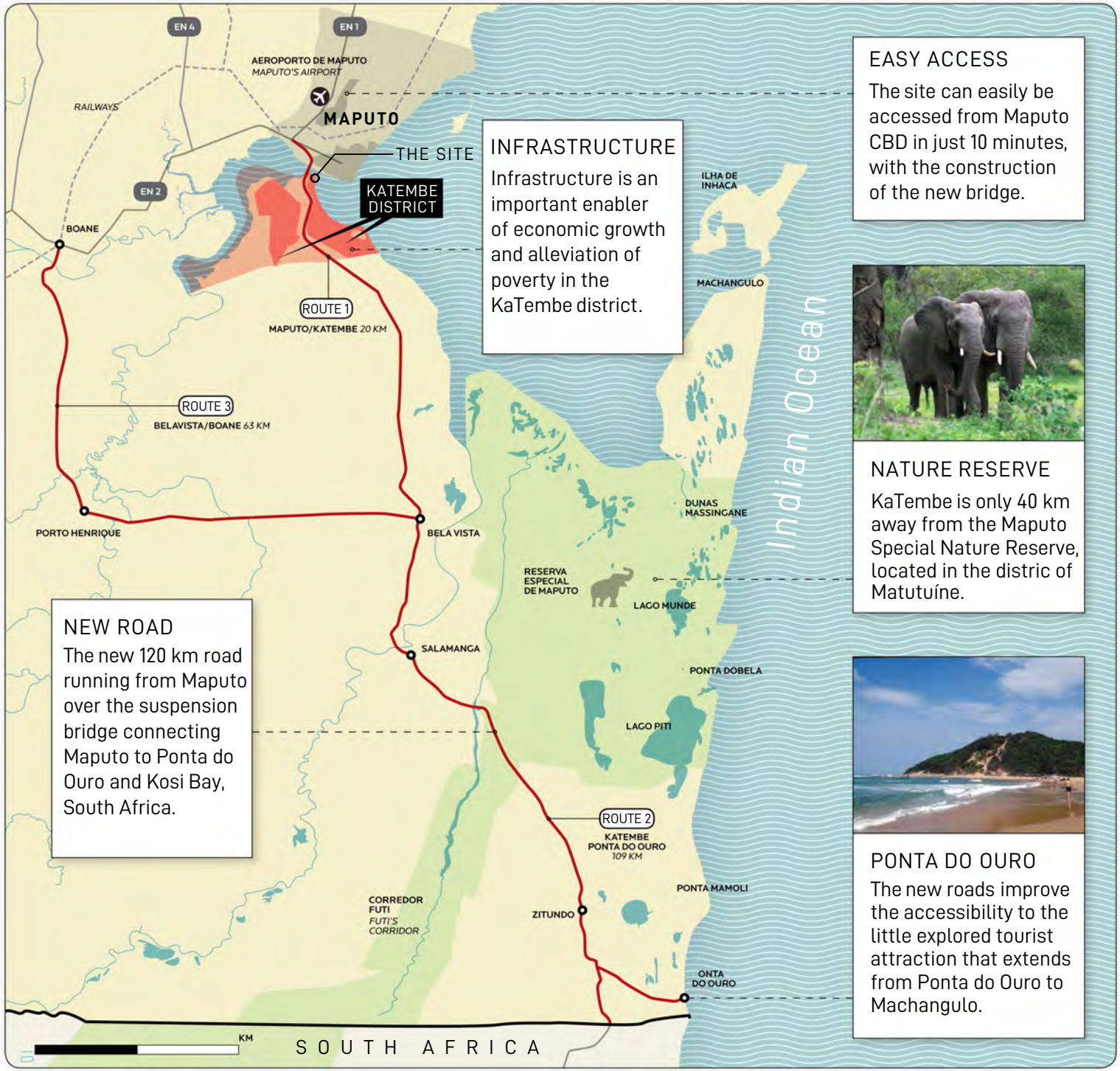



Figure 3.2


Figure 3.3

Figures 3.3 & 3.4. Photos of the new bridge (BETAR, 2016: 3)

3.1.1 ACCESSIBILITY

The constuction of the Maputo – KaTembe bridge and the road network connecting Maputo to Ponta do Ouro and the road section from Bela Vista to Boane is a crucial starting point for the sustained urbanization of new KaTembe. This makes it possible to quickly access the Maputo Nature Reserve, Ponta do Ouro and South Africa (BETAR, 2016: 03).

Figures 3.4 Maputo road network (Adapted from BETAR, 2016: 3)

3.2 LAND-USE ZONING

Figure 3.5. Functional zoning map (Adapted from BETAR, 2016: 5)

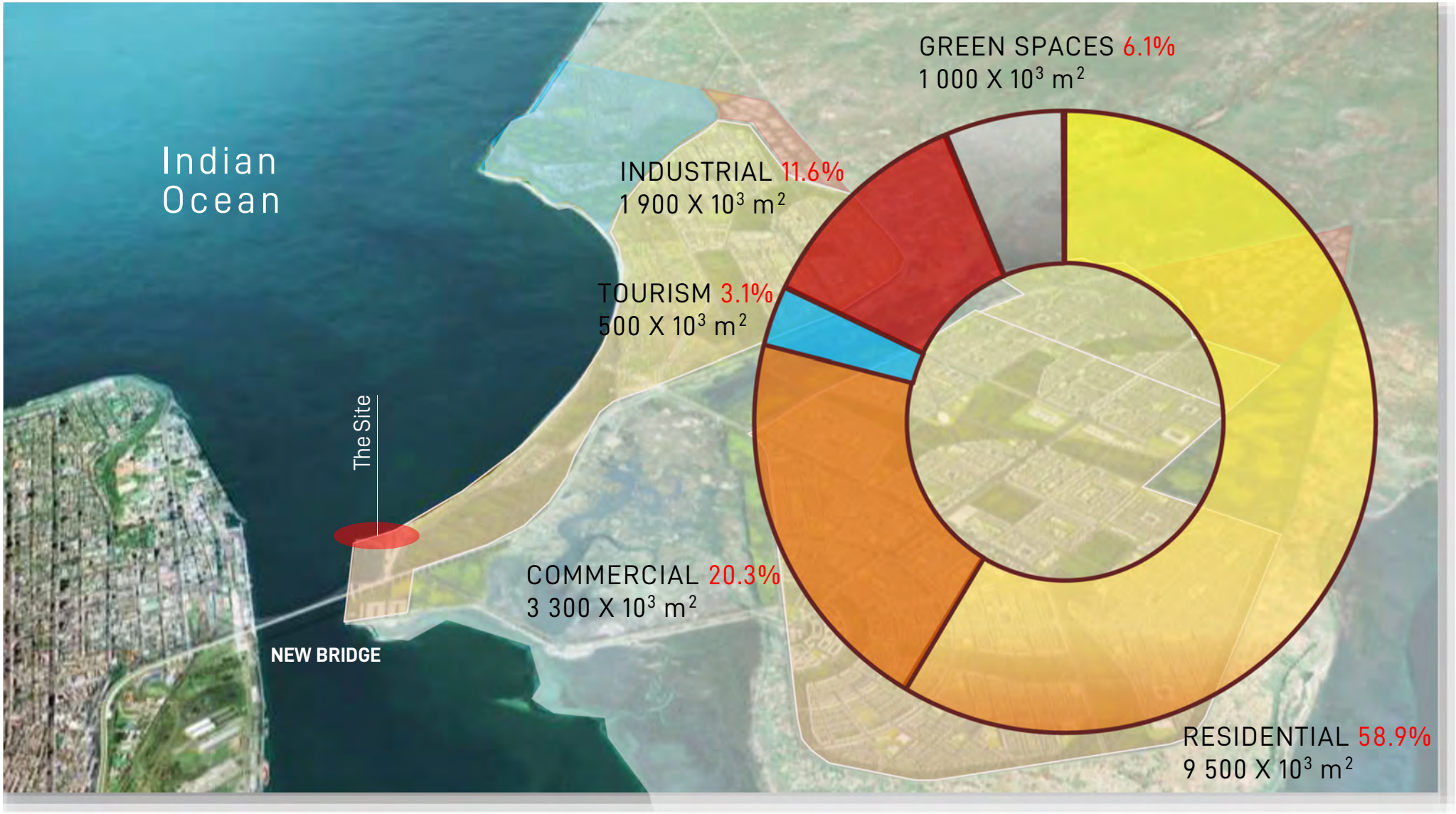


Figure 3.6 Pie chart displaying functional zoning per area (Adapted from BETAR, 2016: 4)

3.3 Morphology

3.3.1 PRECEDENT STUDY 01:
MUSEU DAS PESCAS (FISHERIES MUSEUM)

Architects: José Forjaz Arcquitectos
Location: Maputo, Mozambique
Project Year: 2008
Type: Museum

The Museu das Pescas (Fisheries Museum) is a competition entry of 2008. Situated on the edge of one of the more important public squares within Maputo, the design investigates questions of maritime themes and phased development (José Forjaz, 2008: Online).

Here, with pursuit for structural economy, the possibility of building transparency is explored in the creation of a large 'nave'-like space, the construction and detailing of which draws on boat-building traditions. In addition to and in synthesis with individual architectural programmes, the site contexts and the manipulation as well as treatment of light, the form of these buildings is also an expression of the structural solution.

Figure 3.7. Exterior view (José Forjaz Arquitectos, 2008: Online)

Figure 3.8. Interior view (José Forjaz Arquitectos, 2008: Online)

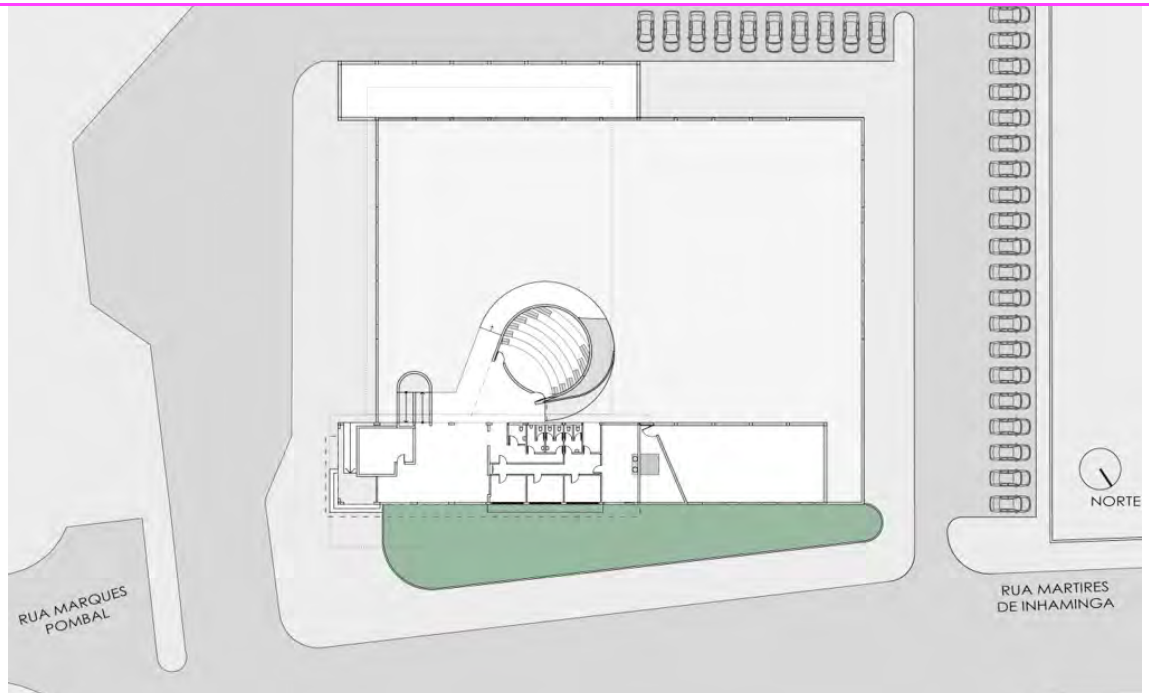


Figure 3.9. Floor plan (José Forjaz Arquitectos, 2008: Online)

In this experimentation with structure and technology, there is always the concern with the 'tension' between the global and the local, as well as the acknowledgement of the developmental context of Mozambique. This is done, not as a refutation of universal technological values but more in recognition of the necessity to 'reconcile technique through culture'.

A central quality of Jose Forjaz Arquitectos' work has been their capacity to interpret the characteristics of the sites/ places for which the projects are conceived. There is always an appreciation and interpretation of the topography of the site which informs the design concepts and the making of micro- urban environments. More than just the understanding of the site, it is evident in this work that design demands of us the ability to interpret the requirements of the architectural brief by connecting it with the fundamental opportunities of the site (Le Grange, 2009: 10).

Lessons learnt

The sensitivity towards context and place has been applied to the Museu das Pescas within the larger Mozambican context. In this work of José Forjaz Arquitectos there is evident an ongoing critical dialogue with the tradition of modern architecture. However, with such allusions, what remains fundamental is the clear conceptual basis of the project, which in turn gives it its individual unity and formal coherence. And ultimately, what the museum manifests is a reworked and more pertinent version of modernity - a modernity appropriate to the local developmental context and the sub-tropical climate of Mozambique.

Needless to say, these individual design principles are not considered separately in the execution of the work, but are rather synthesised in the act of architectural invention. Together, they have enhanced the human experiential qualities of the building. The remarkable accomplishment of this work is the consistent achievement of all the virtues of 'good building' - of order, of a balance, of coherence and elegance. Here the building form is the result of reason, of honesty and modesty.

3.3.2 PRECEDENT STUDY 02:
POST INDUSTRIAL APPALACHIA

Instructors: Ed Ford and Luis Pancorbo
Location: Nuttallburg, West Virginia, USA
Project Year: 2017
Type: Public Facility

"The project, located along the former rail spur at the base of the site is a new interpretive and educational facility. Coal, once collected from the top of the mountain was transported to the former rail yard by a conveyer system, terminating at the bottom of the town. Using the architectural detail as the major driver of the building tectonics, the intervention consists of a series of heavy timber trusses cantilevered out over the river from supported by steel support towers" (Shea, 2017: Online).

Figure 3.10.Exterior view (Shea, 2017: Online)

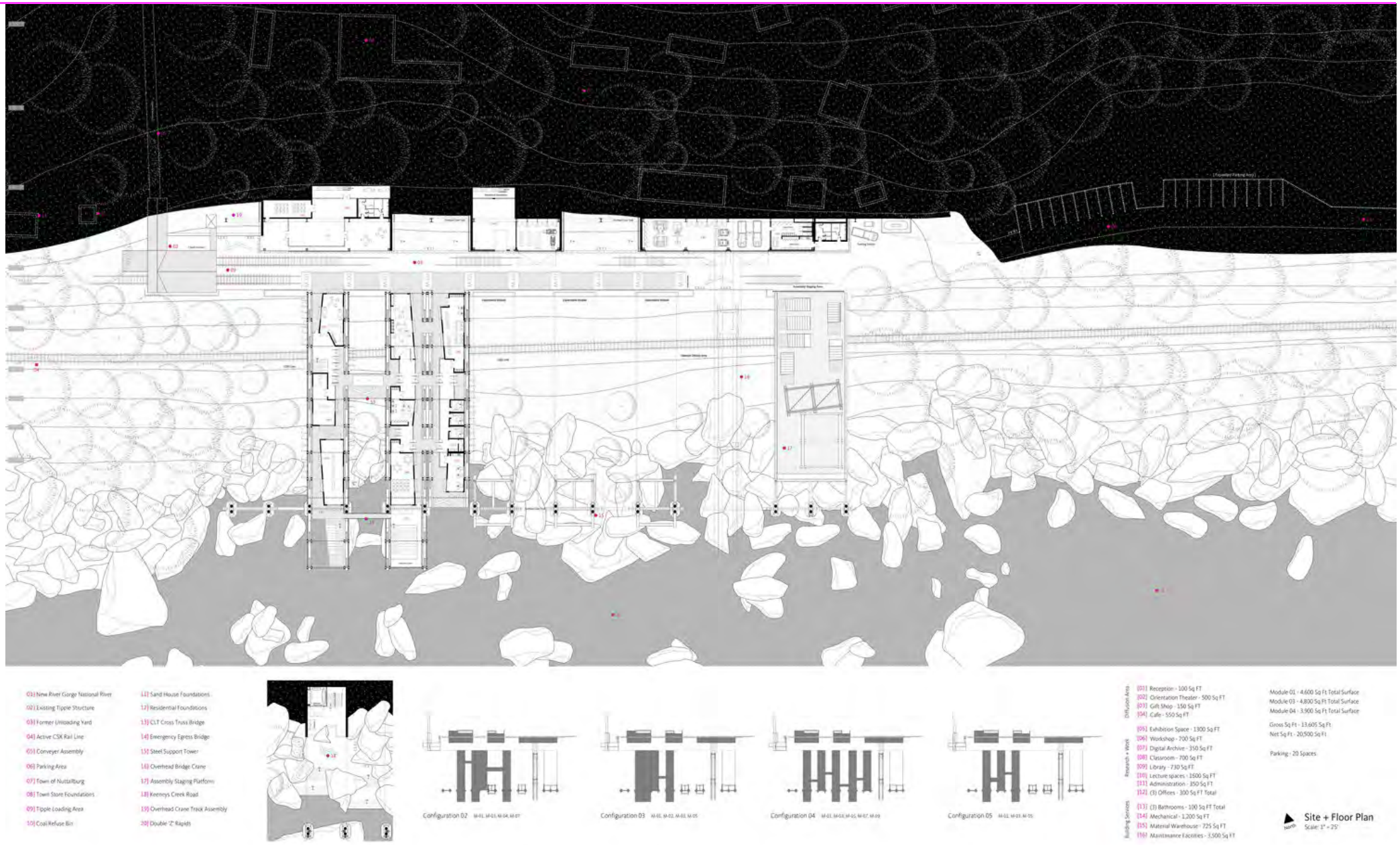


Figure 3.11. Floor plan view (Shea, 2017: Online)

Figure 3.12. Longitudinal section (Shea, 2017: Online)

Figure 3.13. Perspective (Shea, 2017: Online)

Figure 3.14. Conceptual model (Shea, 2017: Online)

Lessons learnt

Innovative place-making encourages people to explore and participate in their surroundings. The most engaging buildings are those that invite us to take part on many levels, that stimulate all of our senses as well as our intellect. Interaction does not necessarily mean we have to be bombarded by loud music, brilliant colours or video monitors. Rather, the best places invite us to think and propel beyond what we encounter in our day to day routines. At its most basic level, the Post Industrial Appalachia is purely recreational. But what makes this building succeed is the visceral relationship it fosters between people and place. The building is not static structure; interaction is implicit.

At Post Industrial Appalachia, bridges act as sutures; visitors crossing them actively take part in the process of bringing a city and its long-neglected waterfront together. Other gateways, nodes, paths and landmarks in the park welcome an interplay between people and objects, as well as between structure and nature.

Beyond interaction, a sense of history sets this project apart - it has a multilayered origin and unfolding story. The Post Industrial Appalachia, was once industrial waterfront. Through its evolving history, the place gains a new relevance that inspires participation.

DESIGN SYNTHESIS

CHAPTER 4

4.1 Design Exploration

ILLUSTRATIVE VIEW AT WATER'S EDGE

CONCEPTUAL SKETCH

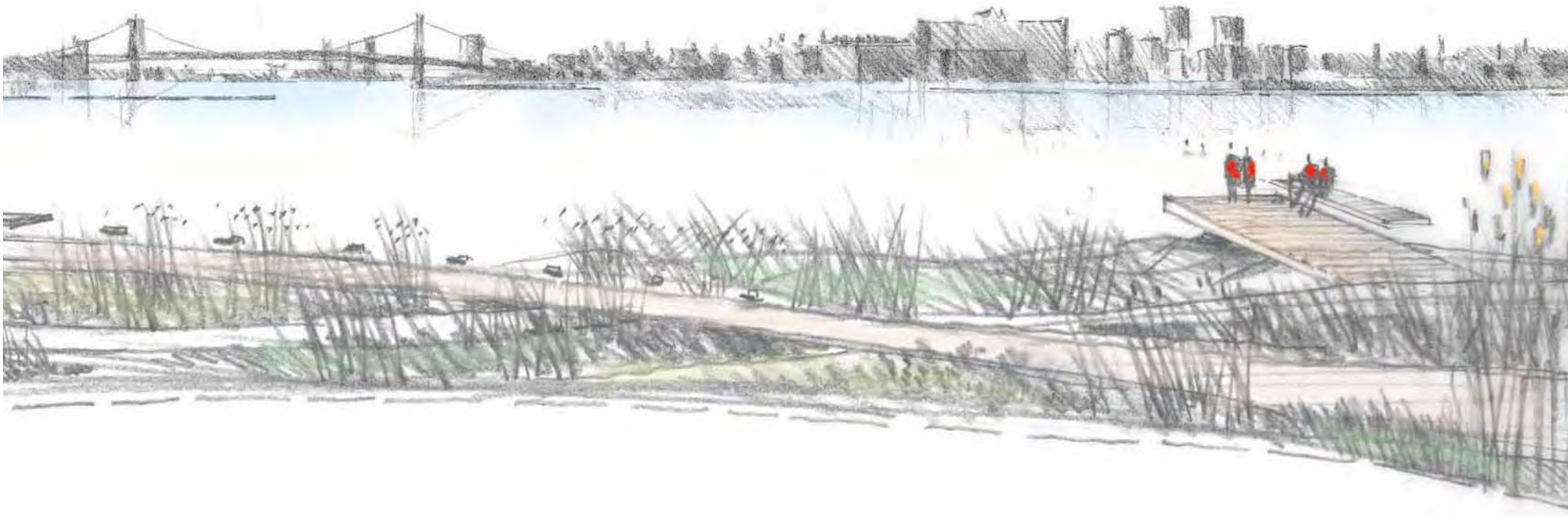


Figure 4.1. Conceptual sketches (Author, 2020)

ILLUSTRATIVE VIEW AT GREEN SPACE

CONCEPTUAL SKETCH

Figure 4.2. Conceptual sketches (Author, 2020)

ILLUSTRATIVE VIEW AT THE FERRY DOCK

CONCEPTUAL SKETCH

Figure 4.3. Conceptual sketches (Author, 2020)

ILLUSTRATIVE VIEW FROM FERRY DOCK

CONCEPTUAL SKETCH

Figure 4.4. View from the site towards the Greater Maputo (Author, 2020)

ILLUSTRATIVE VIEW FROM VIEWING DOCK

CONCEPTUAL SKETCH

Figure 4.5. Conceptual sketches (Author, 2020)

ILLUSTRATIVE VIEW AT VIEWING DECK

CONCEPTUAL SKETCH

Figure 4.6. Conceptual sketches (Author, 2020)

4.2 Initial response to the site

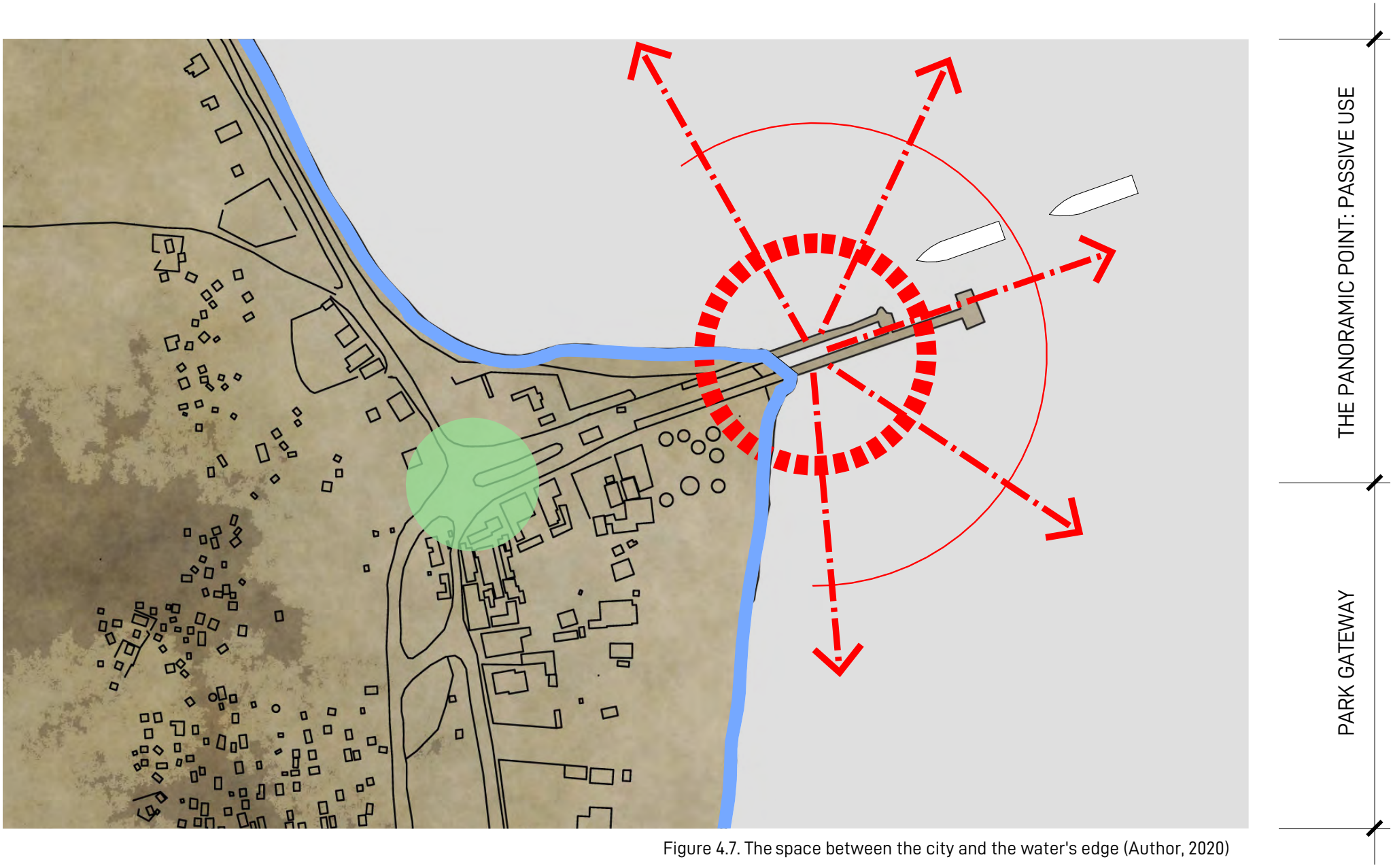


Figure 4.7. The space between the city and the water's edge (Author, 2020)

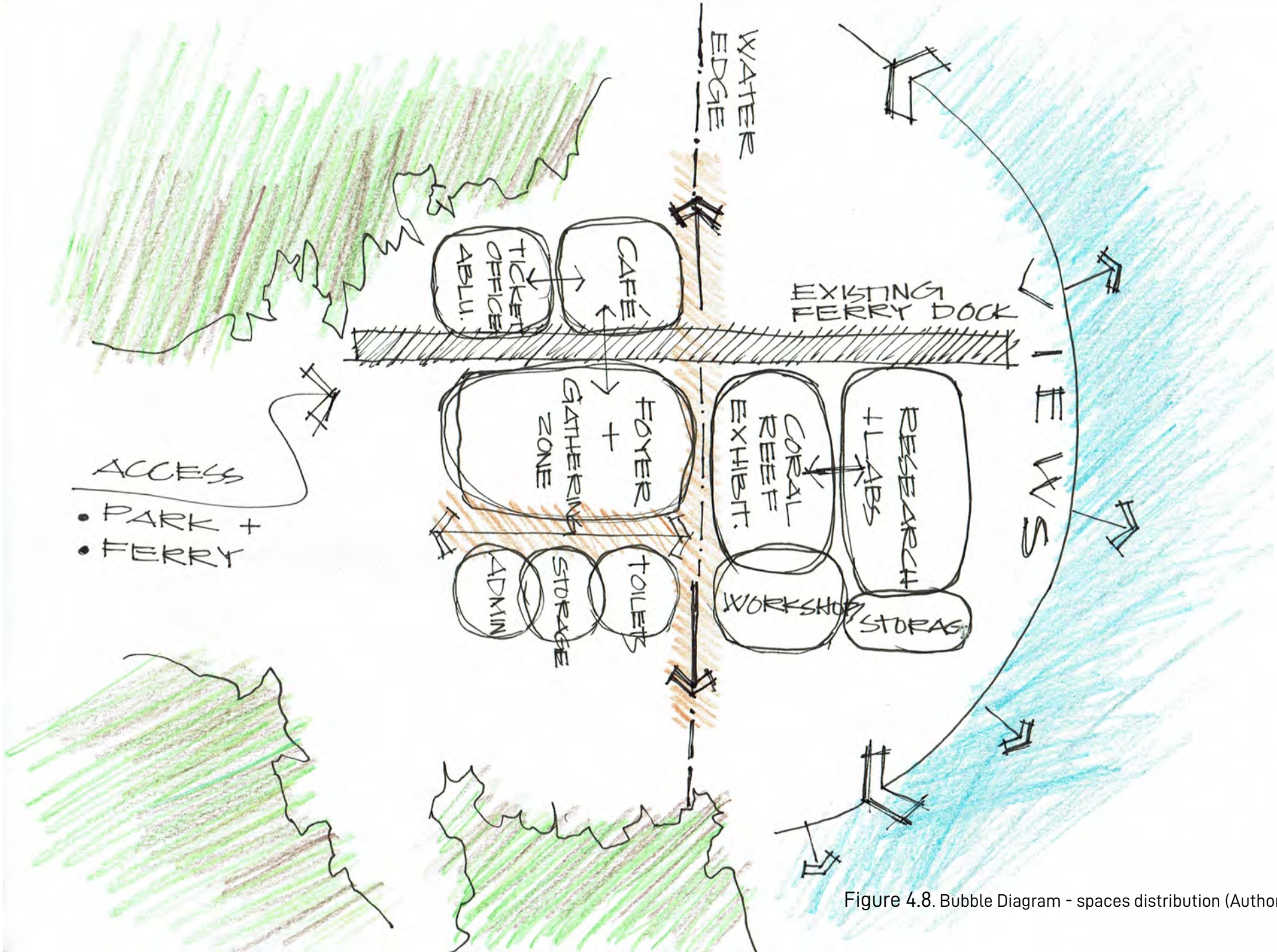


Figure 4.8. Bubble Diagram - spaces distribution (Author, 2020)

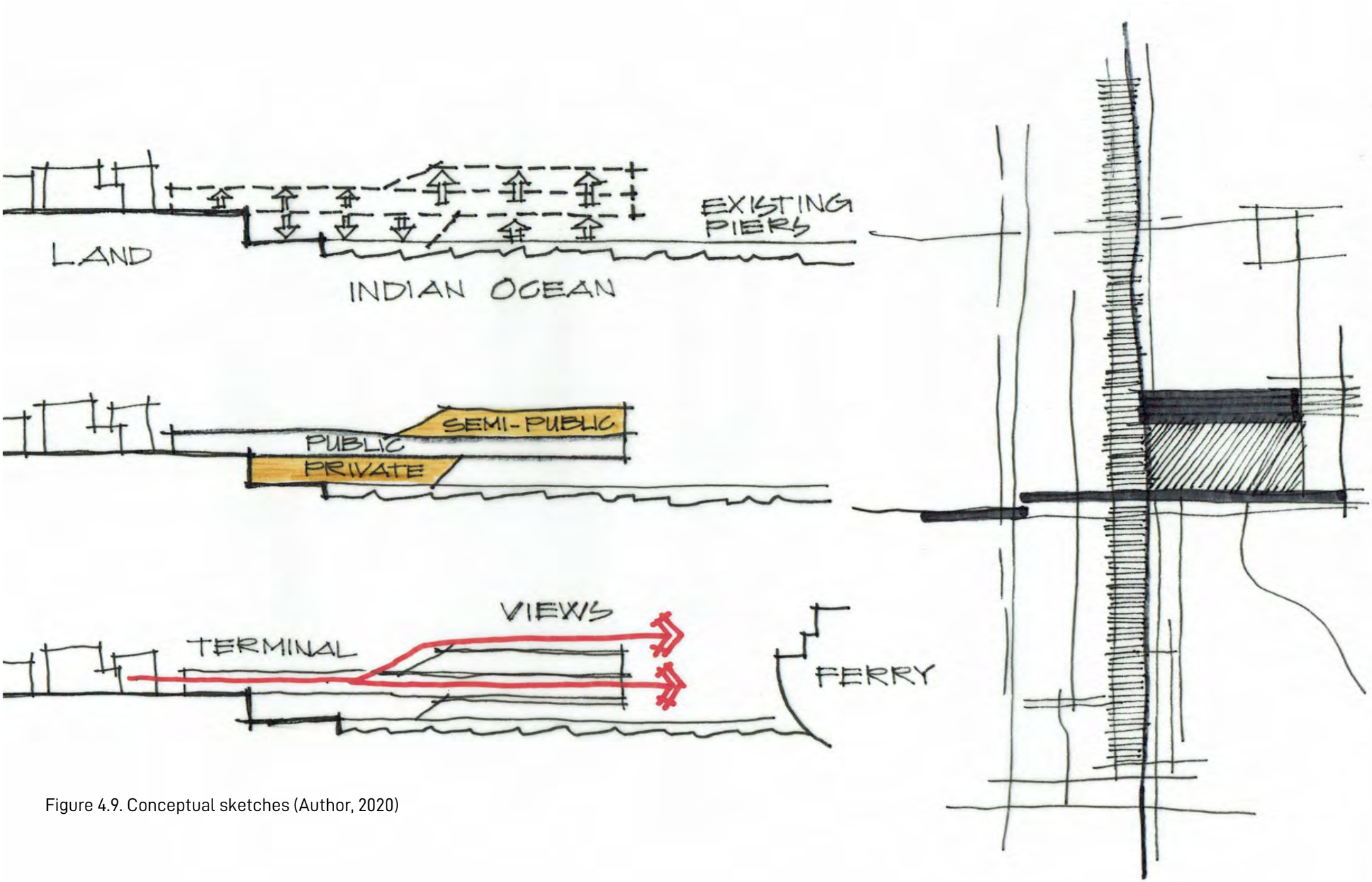


Figure 4.9. Conceptual sketches (Author, 2020)

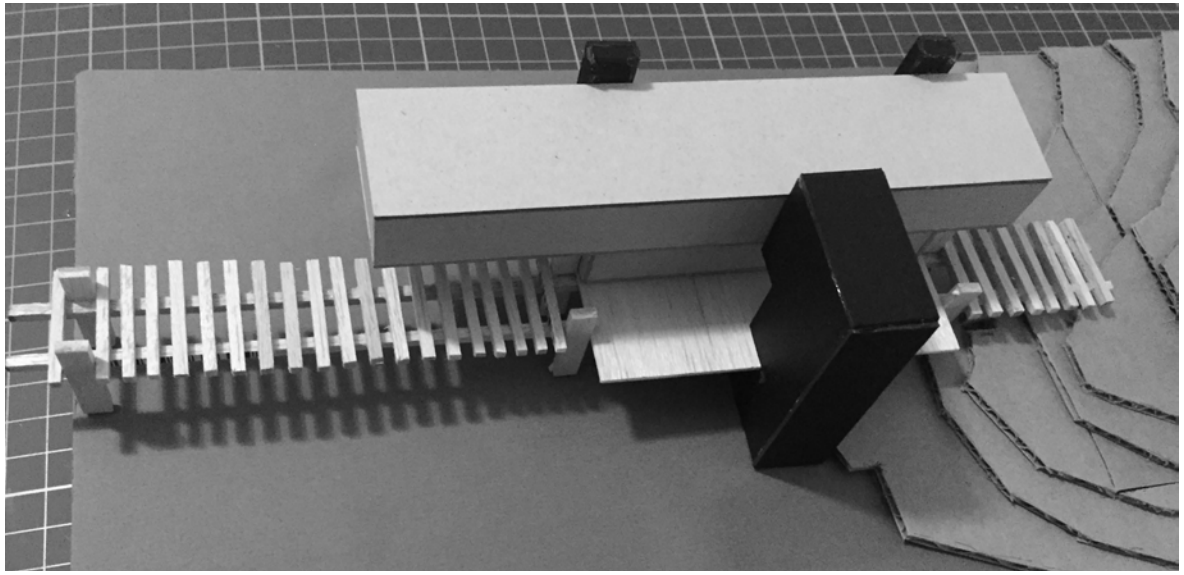


Figure 4.10. Photo of conceptual model (Author, 2020)

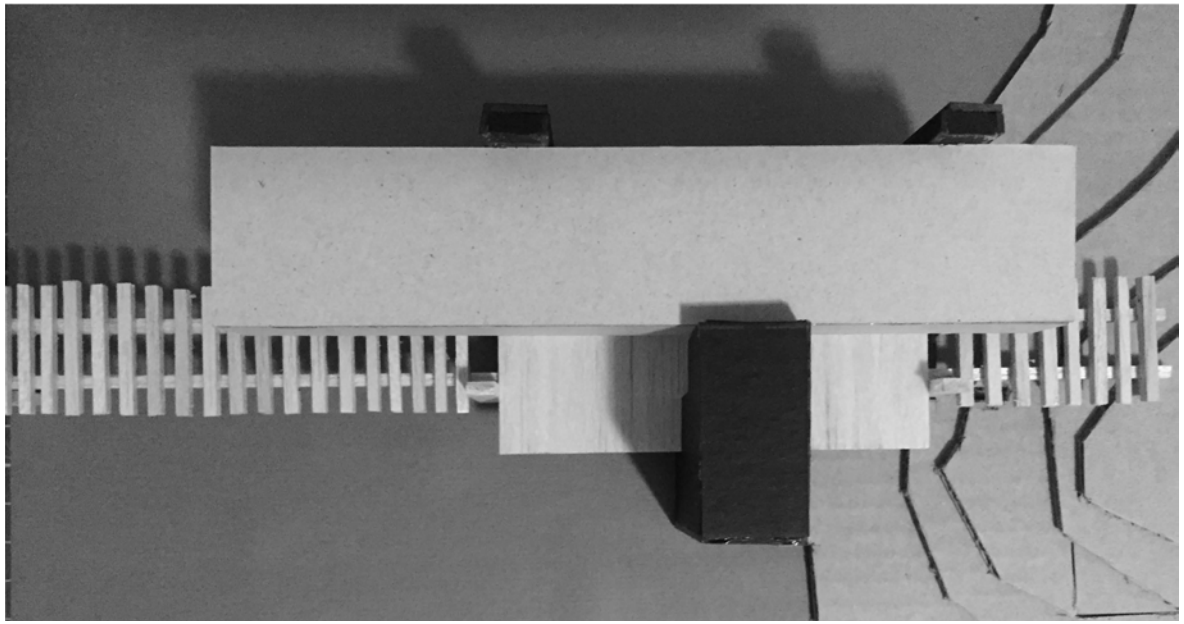


Figure 4.11. Photo of conceptual model (Author, 2020)

4.3 Design Development

4.3.1 FIRST PROPOSAL

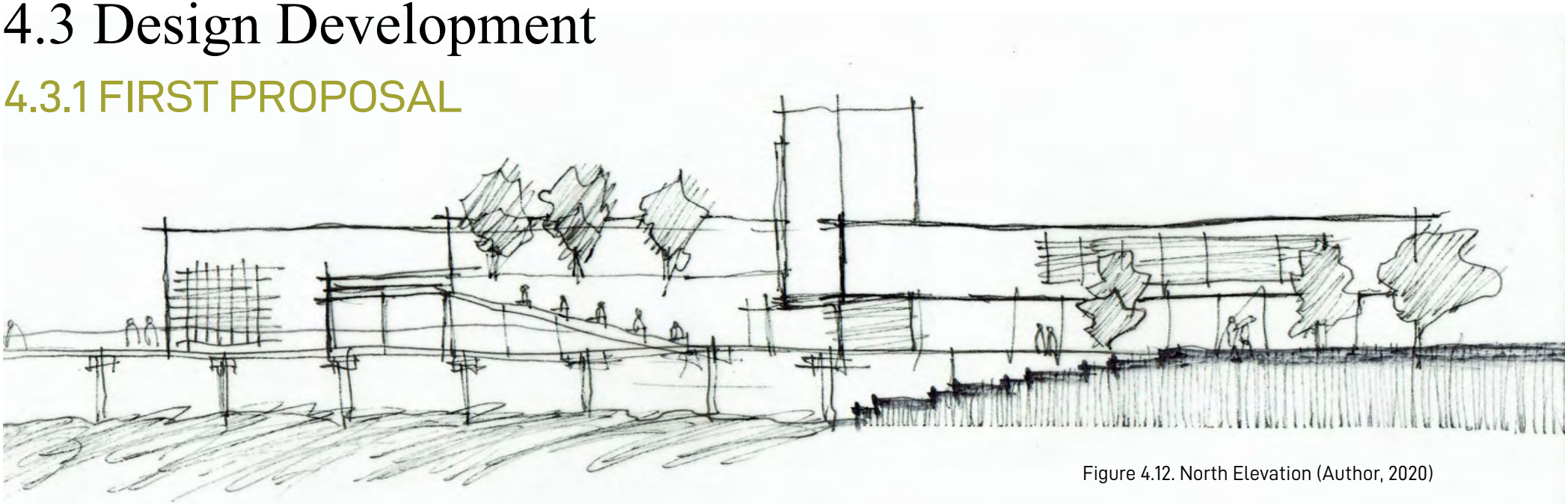


Figure 4.12. North Elevation (Author, 2020)

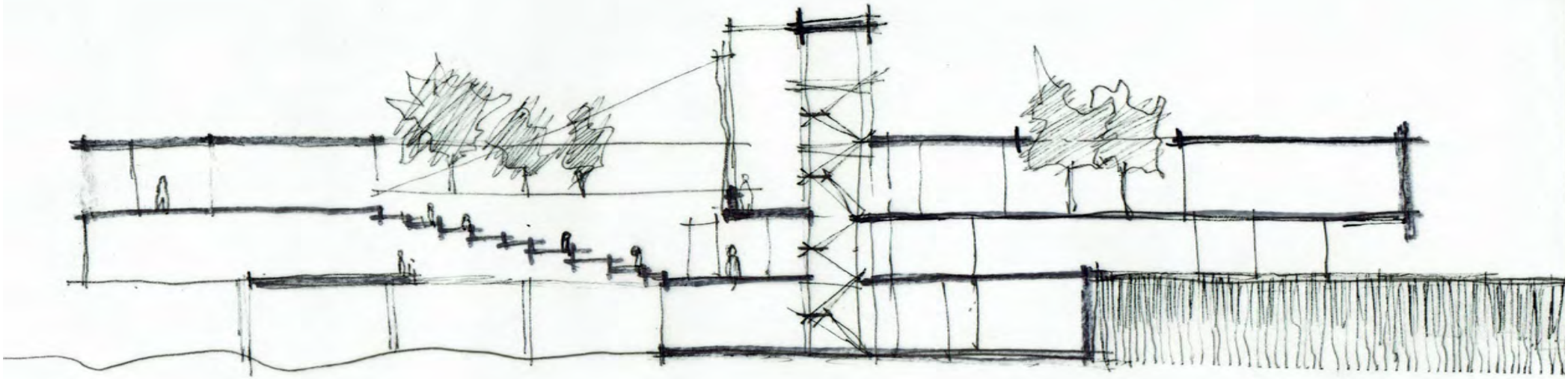


Figure 4.13. Longitudinal section (Author, 2020)

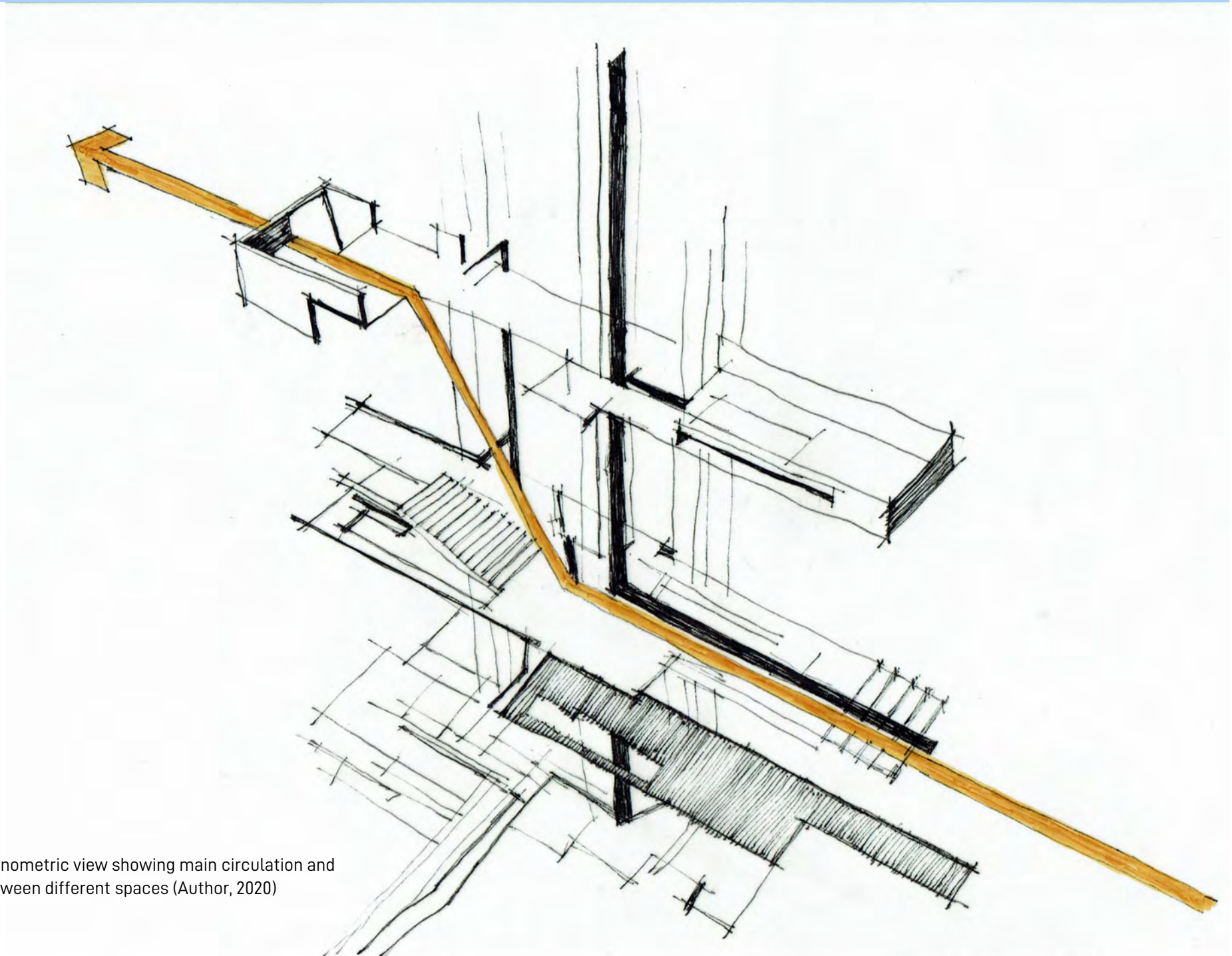


Figure 4.14. Axonometric view showing main circulation and connection between different spaces (Author, 2020)

Figure 4.15. Roof profile study (Author, 2020)

ROOF PROFILE STUDY

The pleated steel design of the canopy mimic the water waves. The roof captures storm water for irrigation and provides solar power for the park

Figure 4.16. Longitudinal section (Author, 2020)

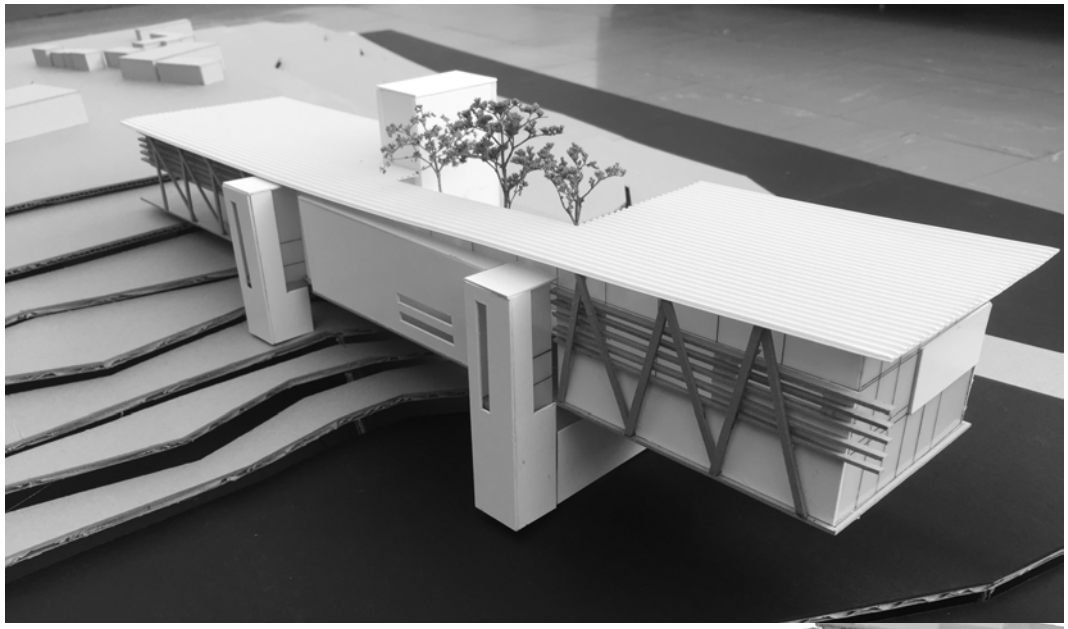


Figure 4.17. Photo of model (Author, 2020)

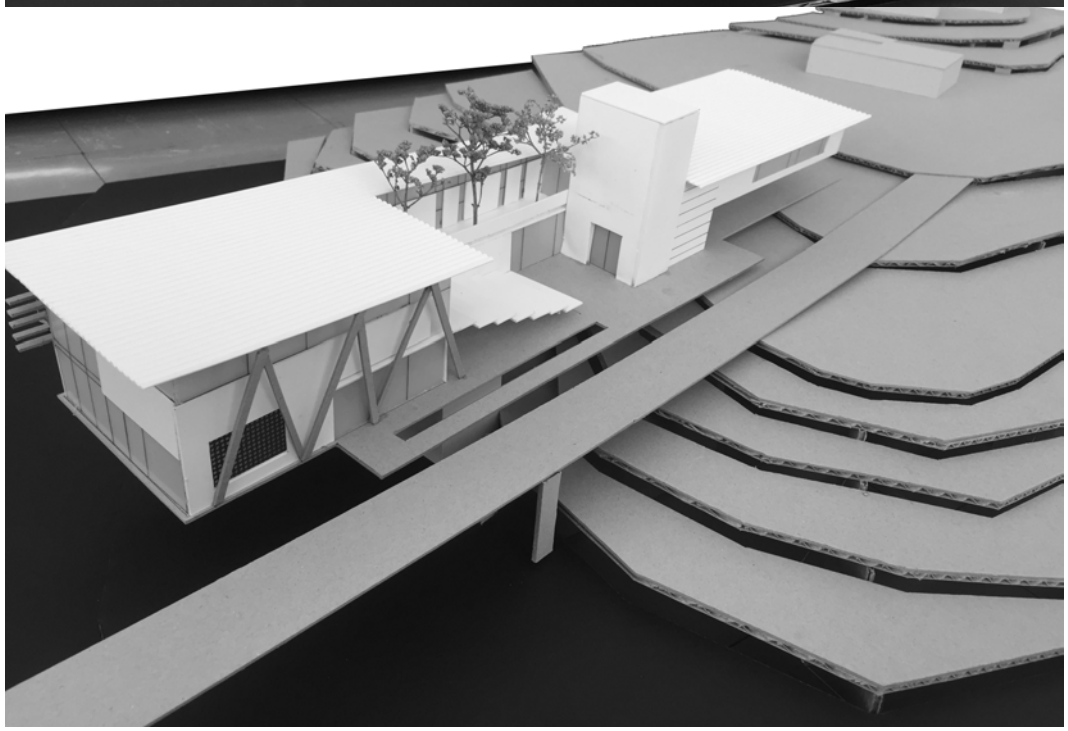


Figure 4.18. Photo of model (Author, 2020)

4.3.2 SECOND PROPOSAL

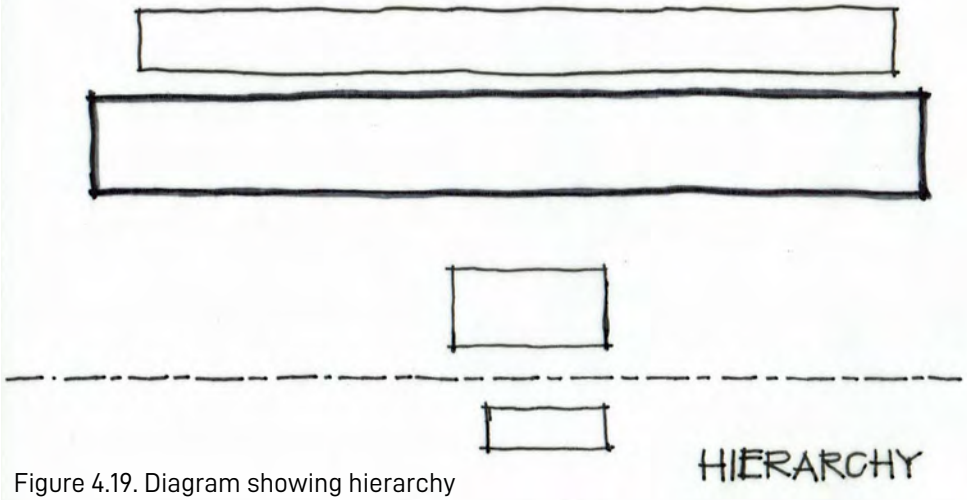


Figure 4.19. Diagram showing hierarchy of spaces (Author, 2020)

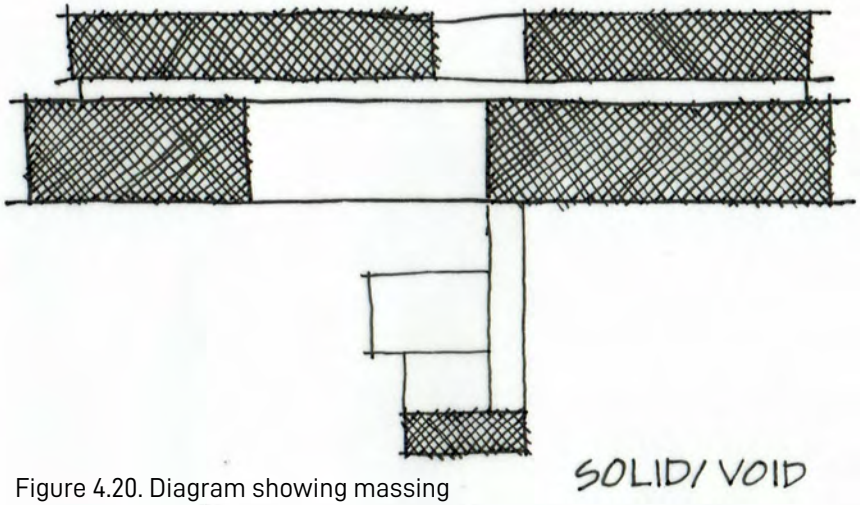


Figure 4.20. Diagram showing massing (Author, 2020)

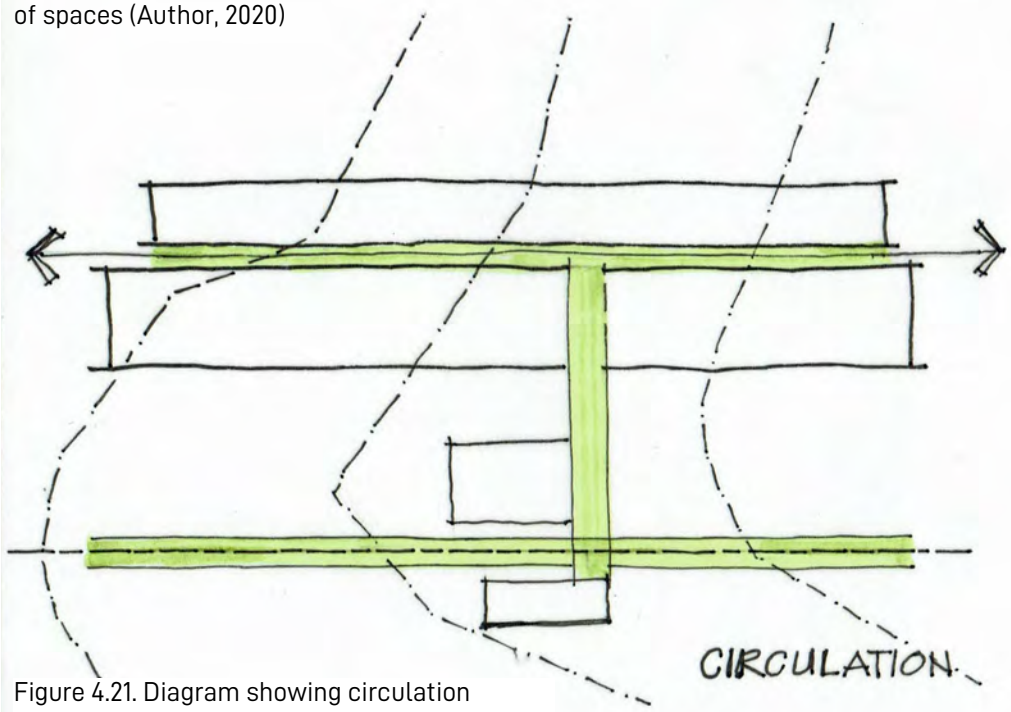


Figure 4.21. Diagram showing circulation (Author, 2020)

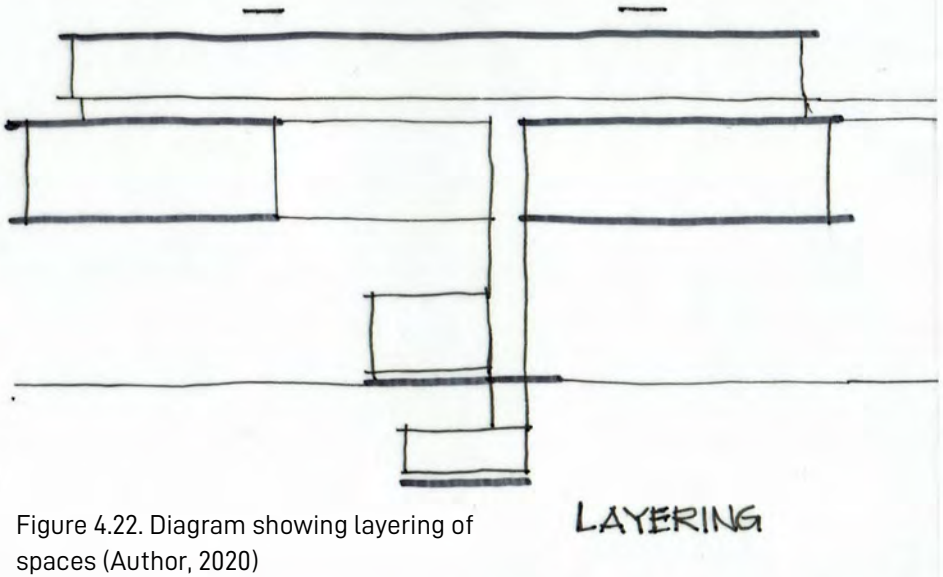
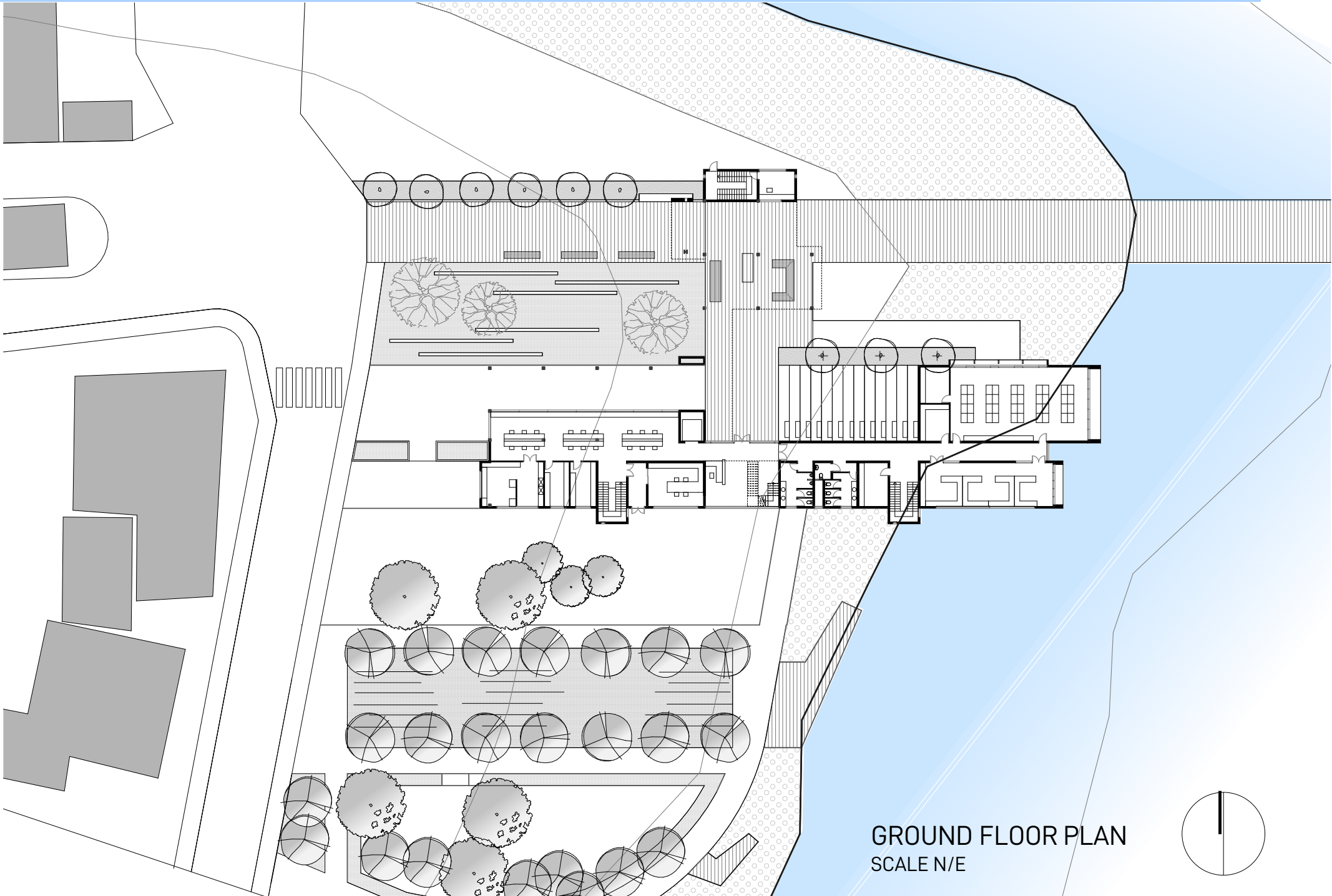
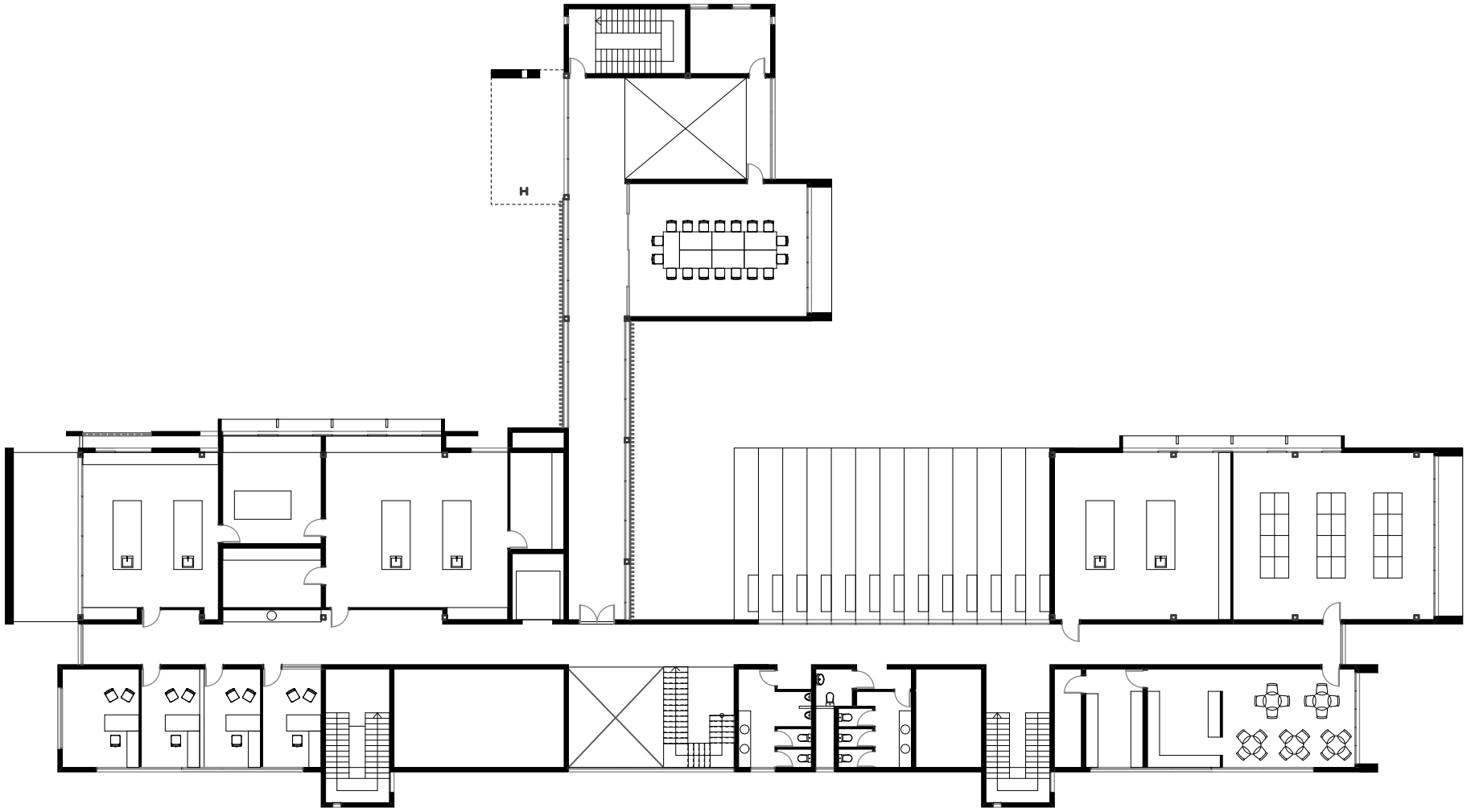


Figure 4.22. Diagram showing layering of spaces (Author, 2020)



GROUND FLOOR PLAN
SCALE N/E



GROUND FLOOR PLAN

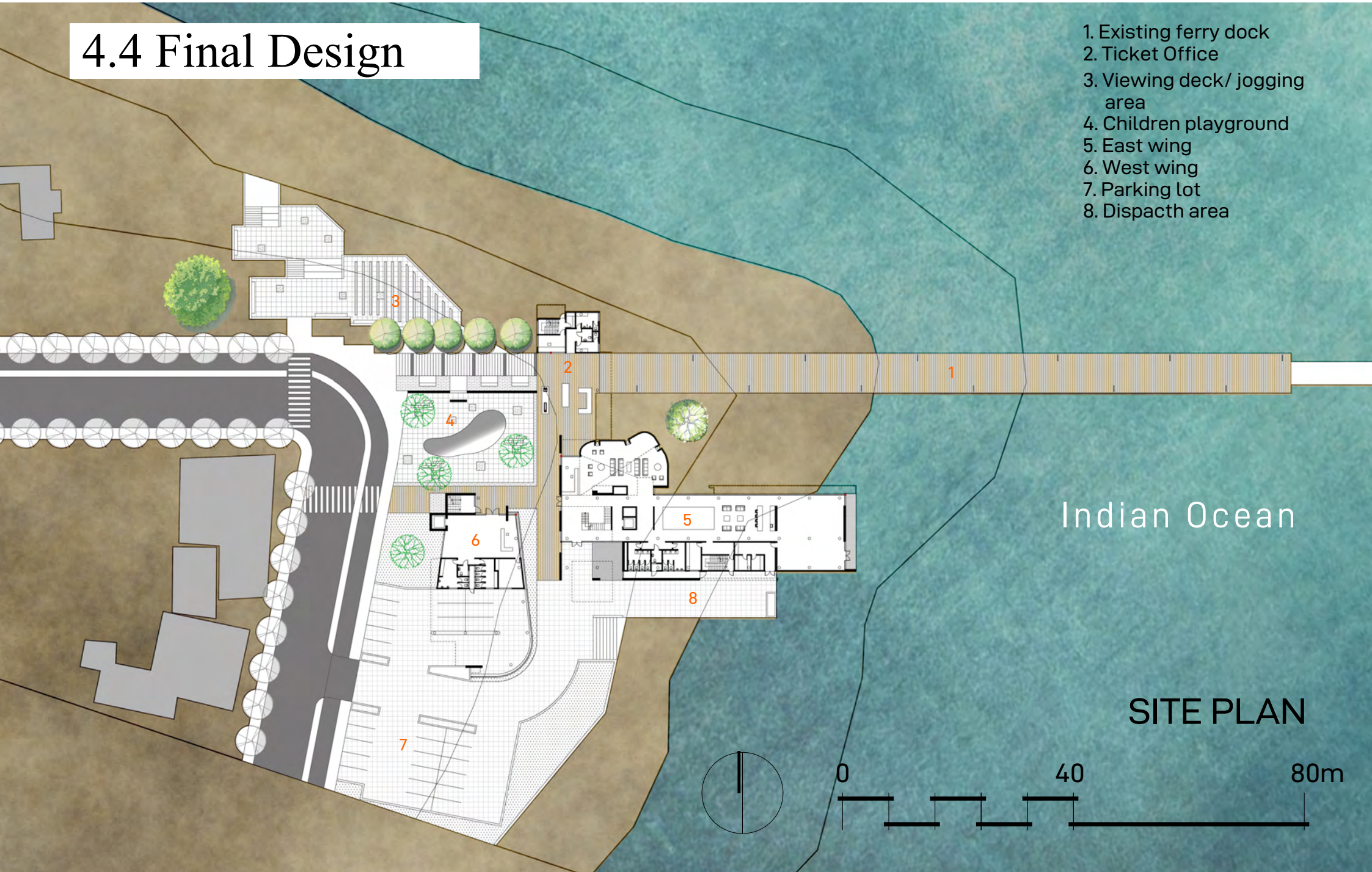
0 7 14 28 m

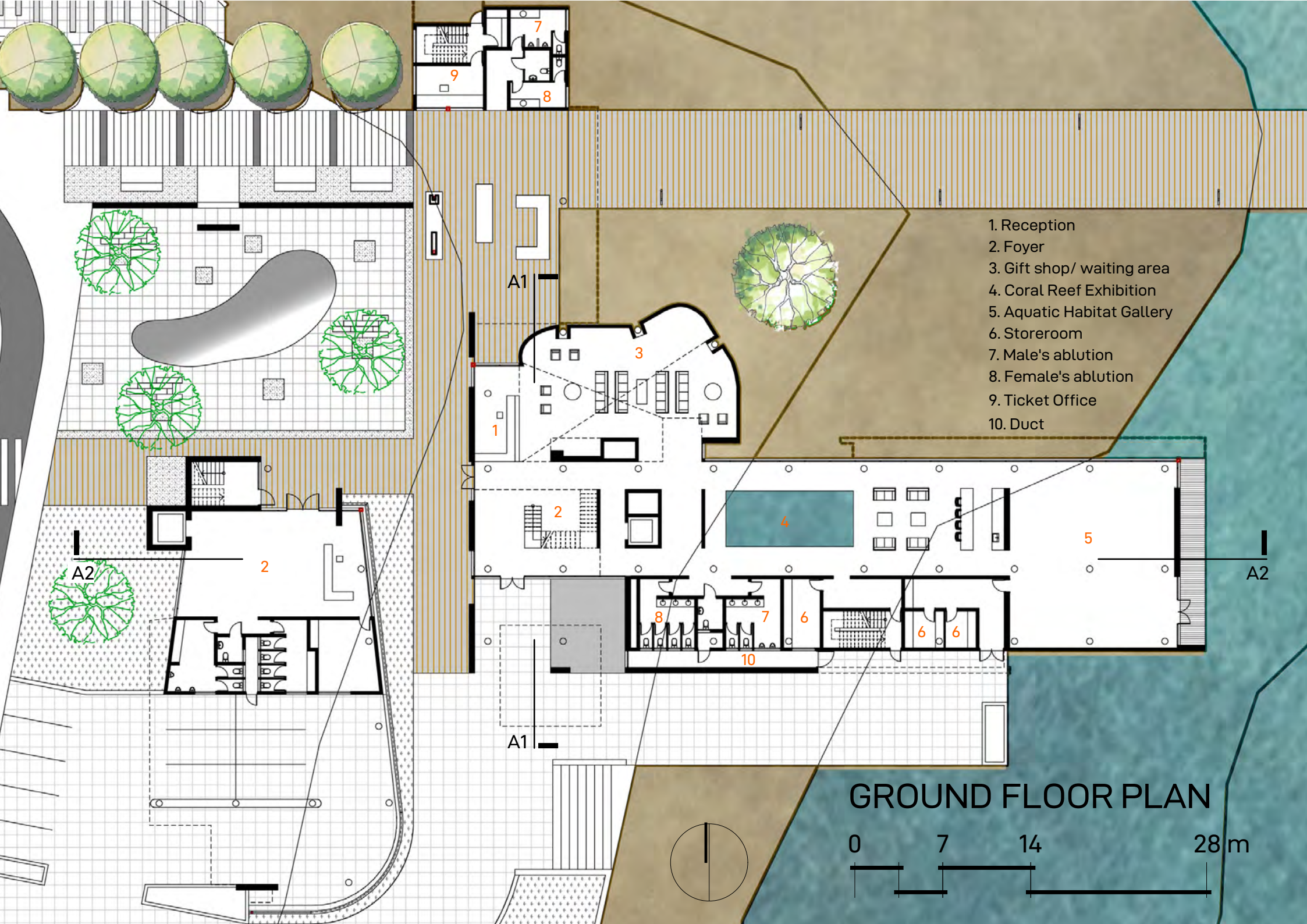
Figure 4.23. Photo of model (Author, 2020)

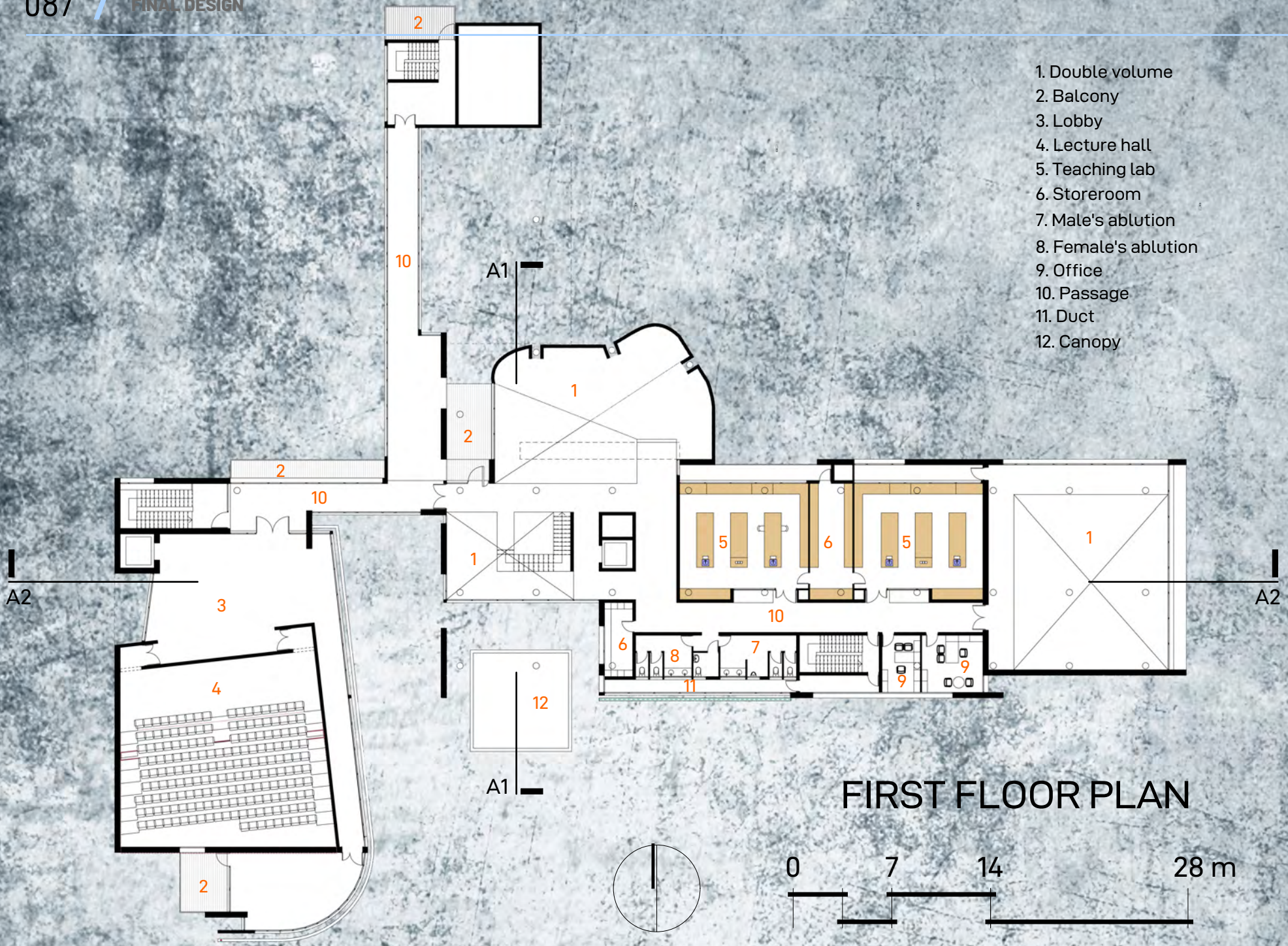
Figure 4.24. Photo of model (Author, 2020)

Figure 4.25. View towards open air amphitheatre (Author, 2020)

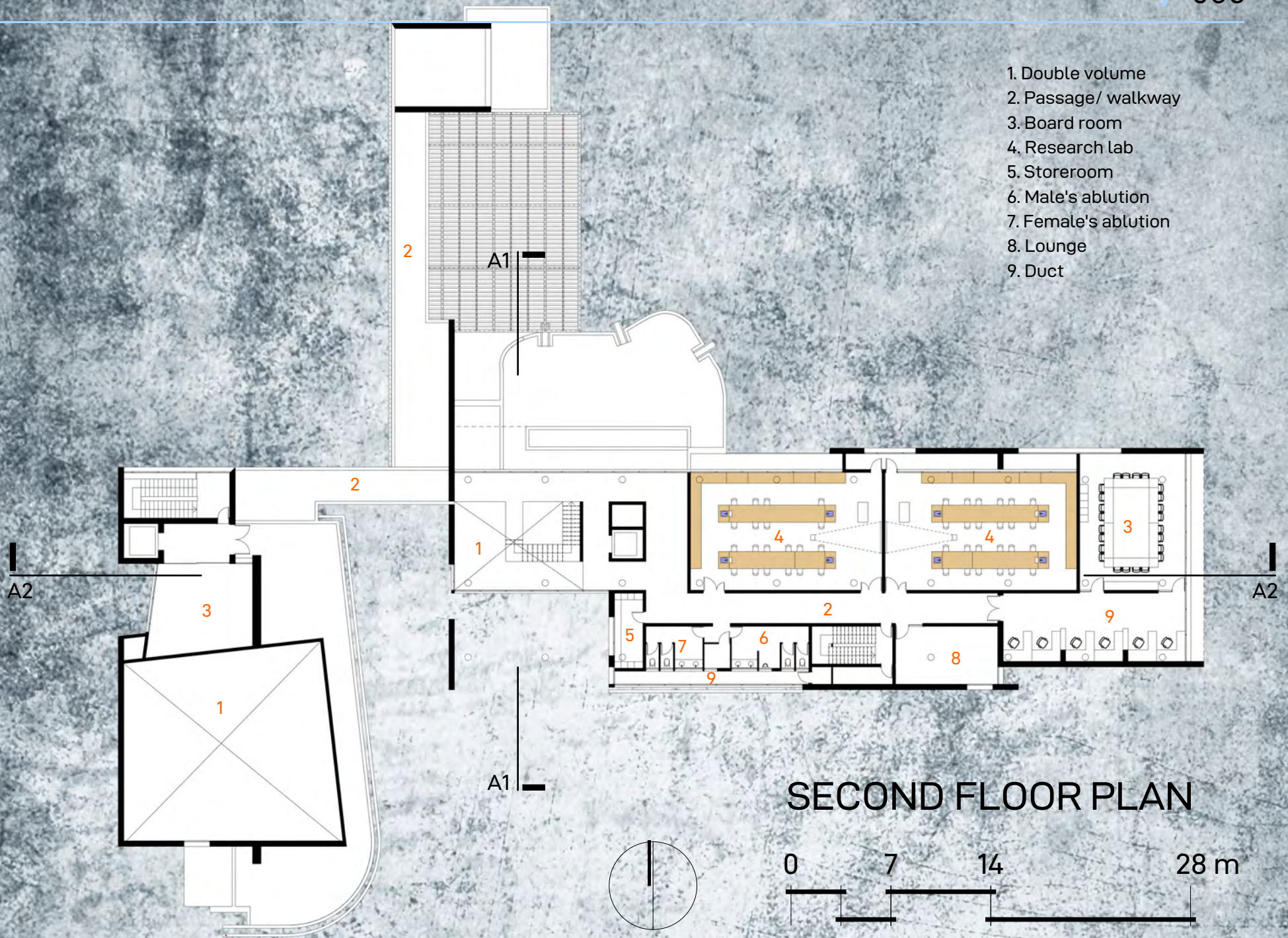
4.4 Final Design




1. Reception
2. Foyer
3. Gift shop/ waiting area
4. Coral Reef Exhibition
5. Aquatic Habitat Gallery
6. Storeroom
7. Male's ablution
8. Female's ablution
9. Ticket Office
10. Duct
A1
A1
A2
A2
GROUND FLOOR PLAN
0
7
14
28 m


1. Double volume
2. Balcony
3. Lobby
4. Lecture hall
5. Teaching lab
6. Storeroom
7. Male's ablution
8. Female's ablution
9. Office
10. Passage
11. Duct
12. Canopy
A1
A1
A2
A2
FIRST FLOOR PLAN
0
7
14
28 m

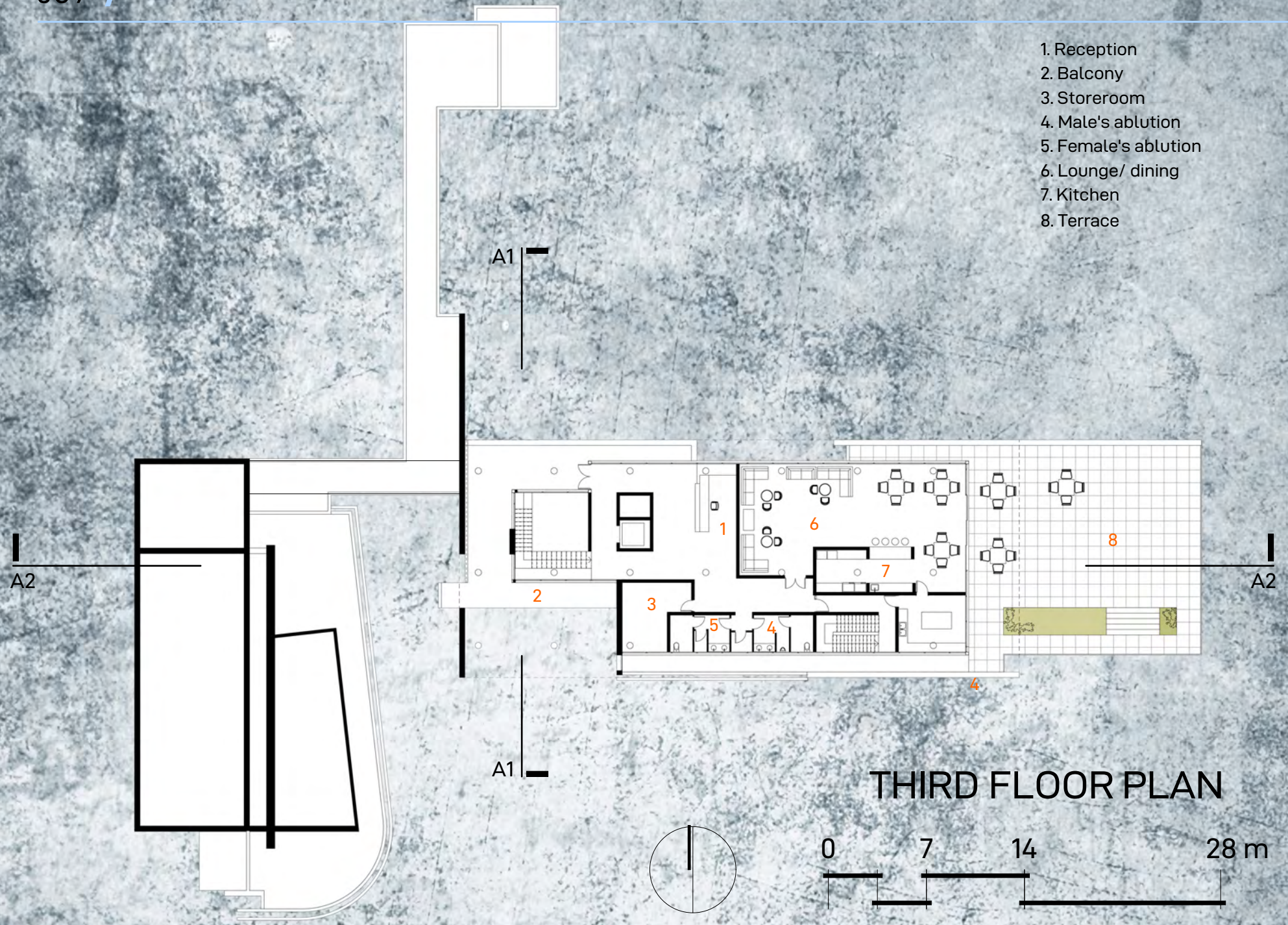
1. Double volume
2. Passage/ walkway
3. Board room
4. Research lab
5. Storeroom
6. Male's ablution
7. Female's ablution
8. Lounge
9. Duct



SECOND FLOOR PLAN

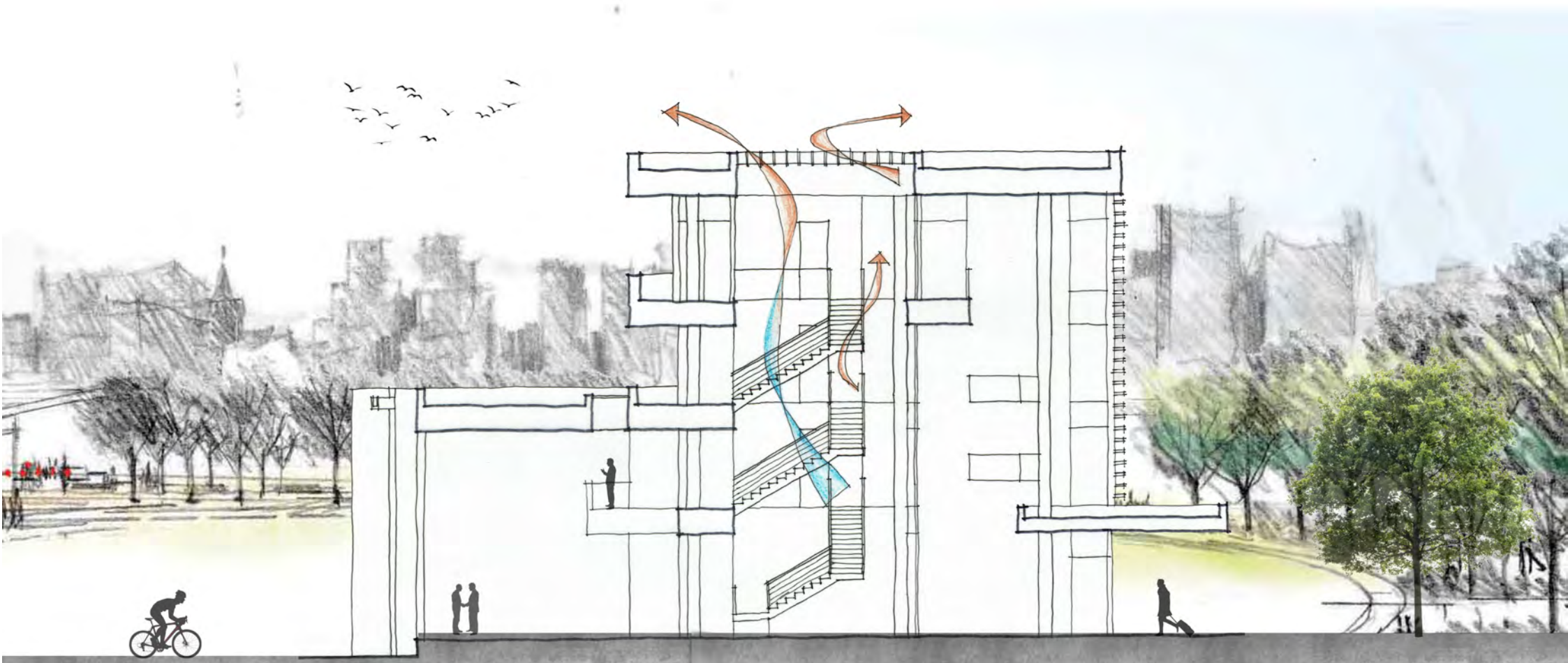
0 7 14 28 m

1. Reception
2. Balcony
3. Storeroom
4. Male's ablution
5. Female's ablution
6. Lounge/ dining
7. Kitchen
8. Terrace



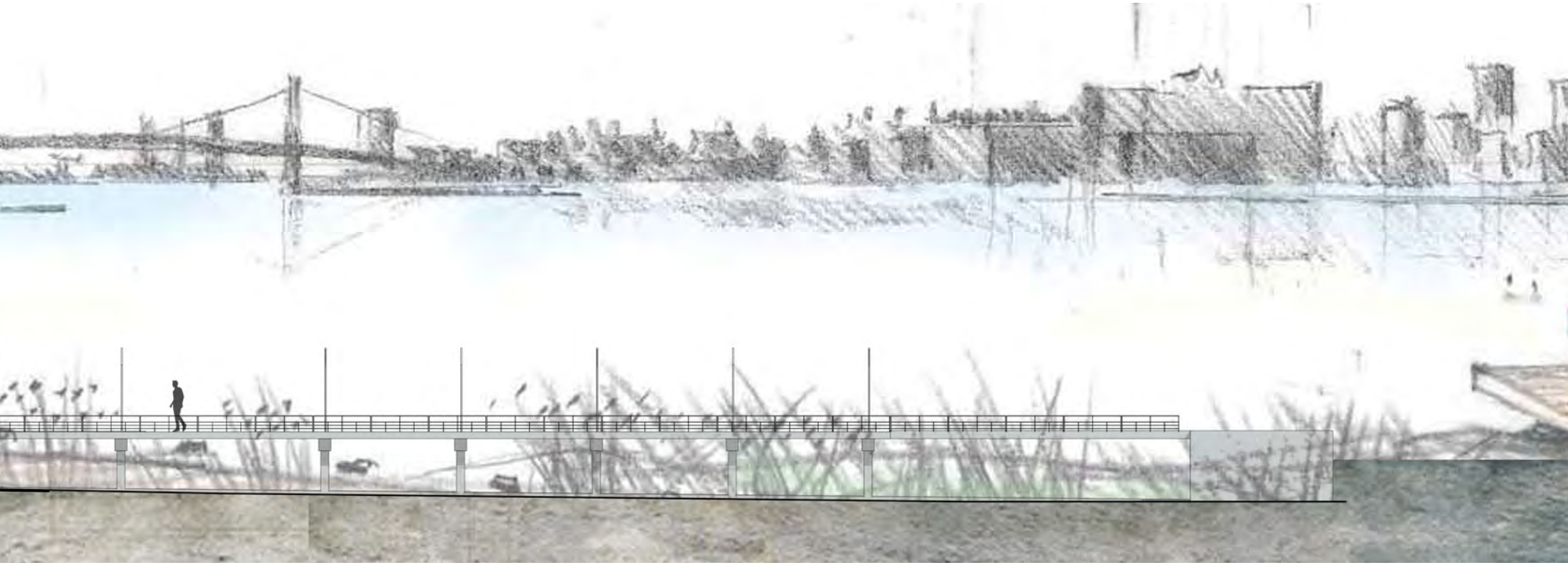
THIRD FLOOR PLAN

0 7 14 28 m

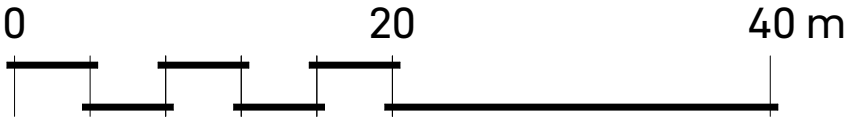


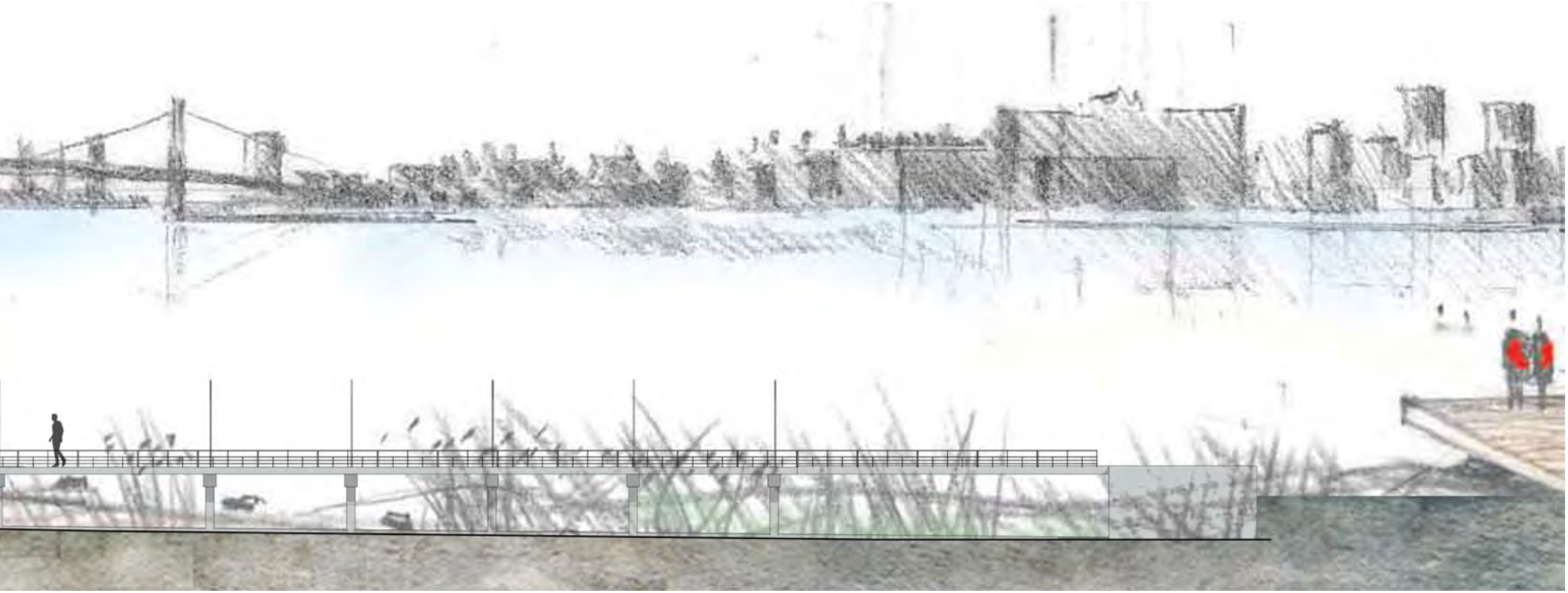
CROSS SECTION _ A1

0 10 20 m

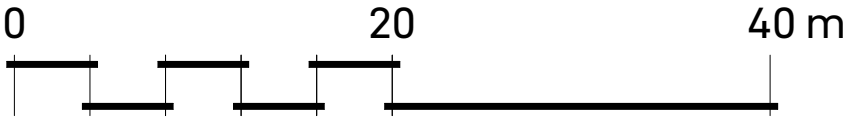


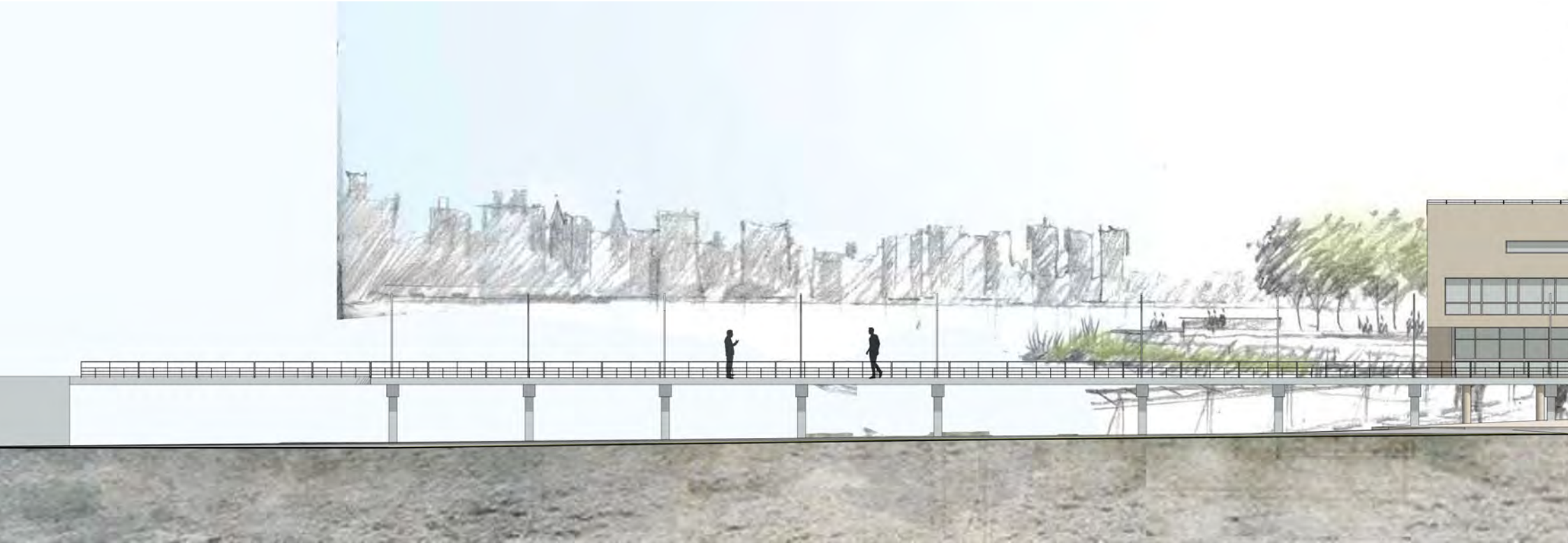
LONGITUDINAL SECTION _ A2



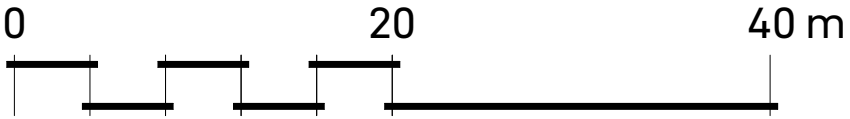


SOUTH ELEVATION





NORTH ELEVATION



EAST ELEVATION

0 20 40 m

WEST ELEVATION

0 20 40 m

Figure 4.26. RENDERING: SEEN FROM RESEARCH LAB (Author, 2020)

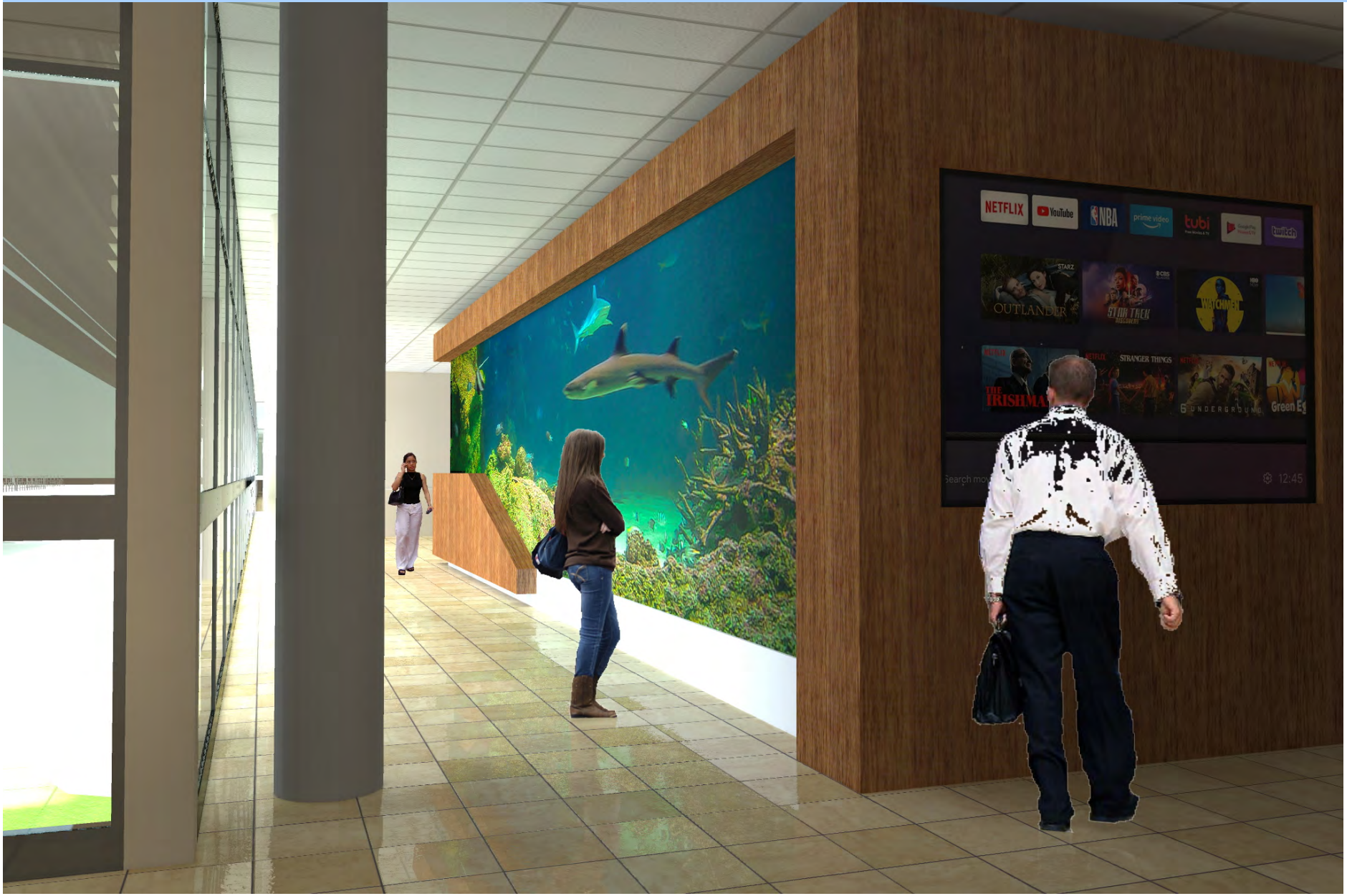
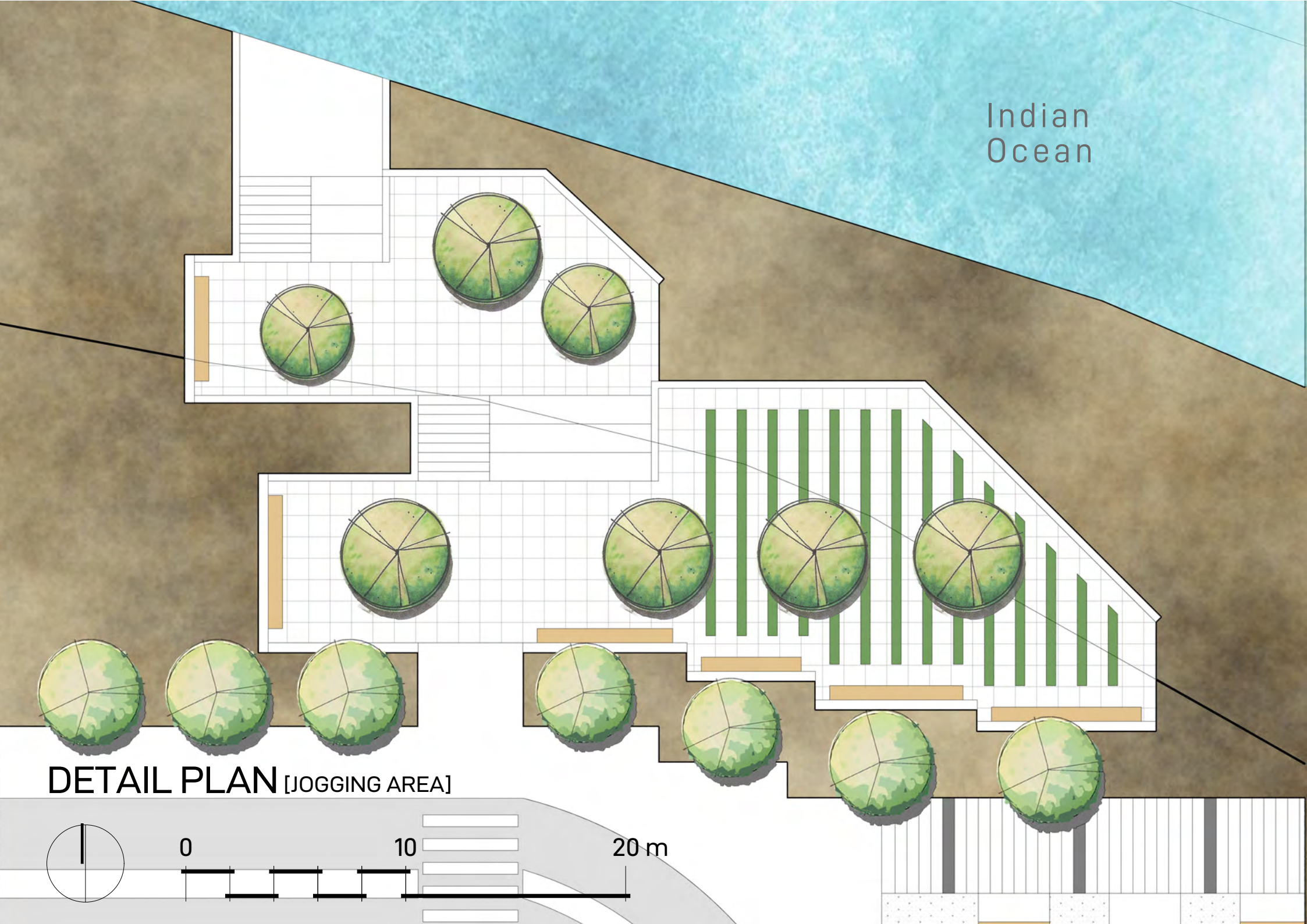


Figure 4.27. RENDERING: SEEN FROM CORAL REEF EXHIBITION (Author, 2020)

Figure 4.28. RENDERING: VIEW FROM MAIN ENTRANCE (Author, 2020)

Figure 4.29 RENDERING: VIEW FROM THE DOCK
(Author, 2020)

Figure 4.30. RENDERING: VIEW FROM MAIN ENTRANCE (Author, 2020)

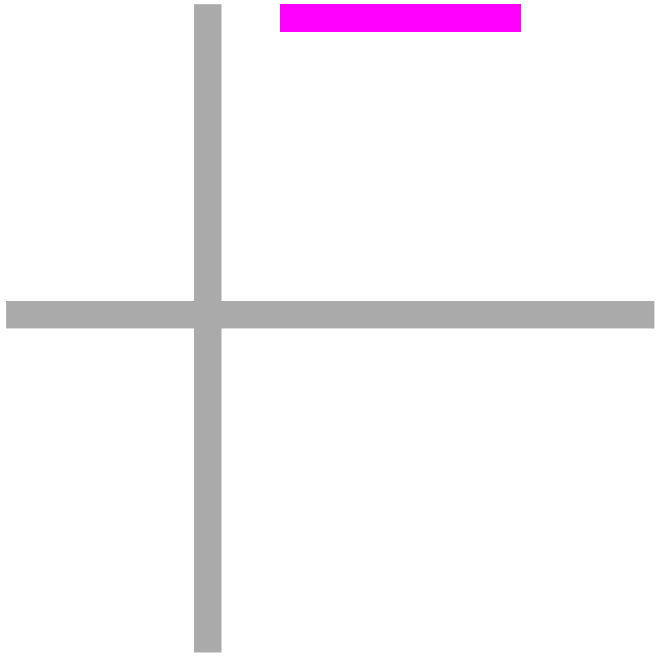


DETAIL PLAN [JOGGING AREA]

Figure 4.31. RENDERING: VIEW JOGGING AREA(Author, 2020)

TECHNICAL REPORT

CHAPTER 5



5.1 Introduction

The aim of this structural report is to critically investigate the structural components of the design with regards to its various constituents used to put the building together, its sustainability and respectable finishes applied. Moreover, the structural philosophy will be explored through a conceptual process of a construction touchstone to further broaden the theoretical platform that the structure embodies.

Through evaluating the site, climate and the typological requirements of the design, a construction approach will be set forth and identified to effectively and contextually address these particular needs of the design. In essence, the technical resolution is strongly rooted in the design concept which was discussed earlier in the document.

5.1.1 AN OVERVIEW OF THE PROPOSED PROJECT

This dissertation challenges the largely site-specific and quantitative interpretation of sustainability that persists in the Mozambican design and construction industry, and proposes instead a broader set of parameters that can harness the potential of the built environment to promote and support essential cultural change (CaGBC, 2003: Online; Buchanan, 2011: Online; Vallance, Perkins & Dixon, 2011: 342). After more than two decades in which the quantitative approach has failed to deliver either international consensus or any measurable mitigation of climate change, is safe to say that sustainable design must now go beyond technological fixes, and embrace a fundamental rethinking of our relationship with the biosphere and with one another. Thus it is advocated that the design of the built environment must engage in more holistic ways of thinking that have emerged in disciplines such as philosophy, psychology, economics and social sciences, among others (Esbjörn-Hargens, 2010: 143; Wilkinson & Pickett, 2010: 347). As a framework it has been taken the philosophy of integral theory proposed by Ken Wilber, which advocates a problem solving methodology that reflects both objective and subjective realities (Esbjörn-Hargens, 2010: 174). In architecture this requires us to go beyond quantitative technical and material solutions and consider social, cultural, psychological and other qualitative implications of design (Buchanan, 2012b: 5). Based on a review of precedent studies from across Mozambique and beyond, the dissertation argues that sustainability must embrace the concept of an interrelated and interdependent 'system of systems' - a civic ecology that includes natural, social, economic and technical synergies, and operates at a variety of scales, beyond the physical boundaries of each project.

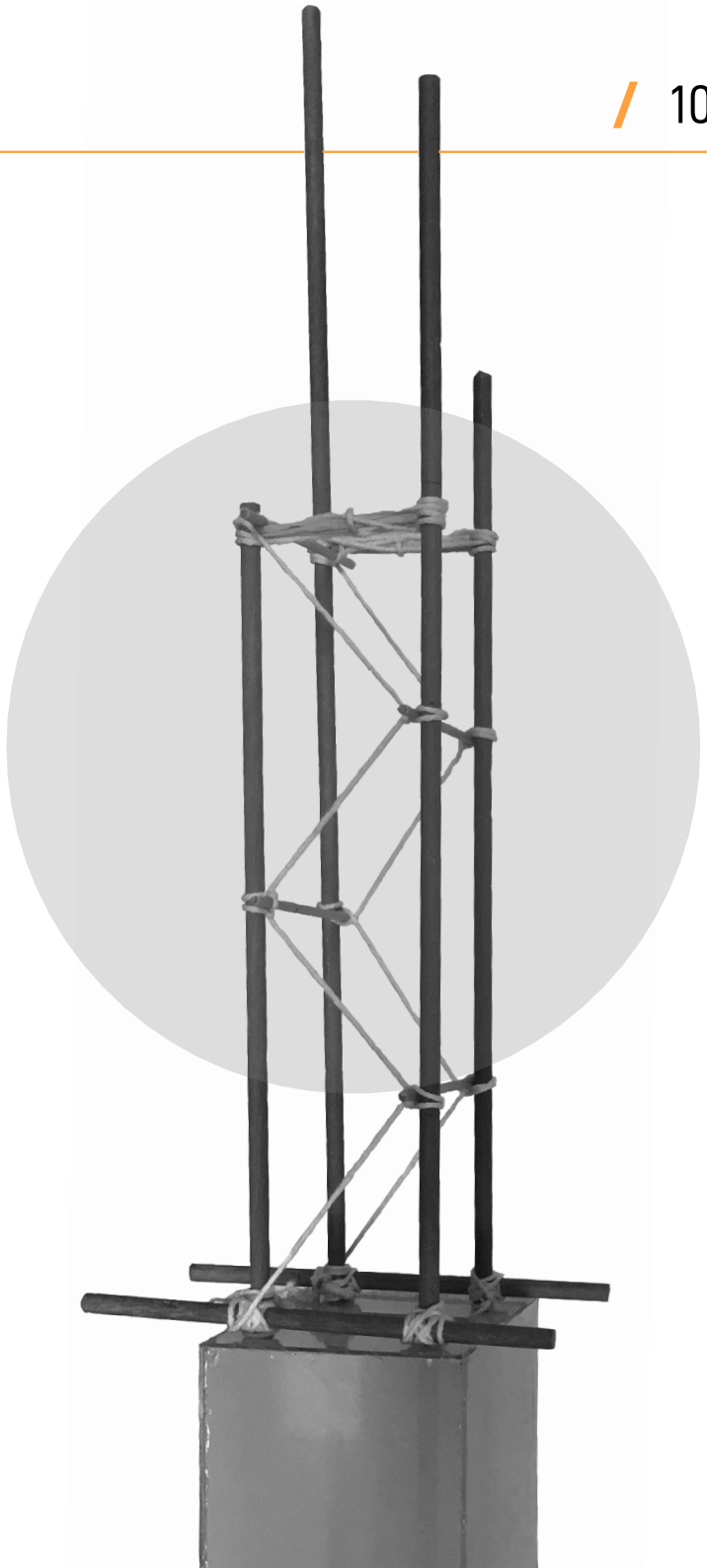


Figure 5.1. Photo of structural touchstone (Author, 2020)

5.2 Environment and micro climate

5.2.1 PROPOSED SITE

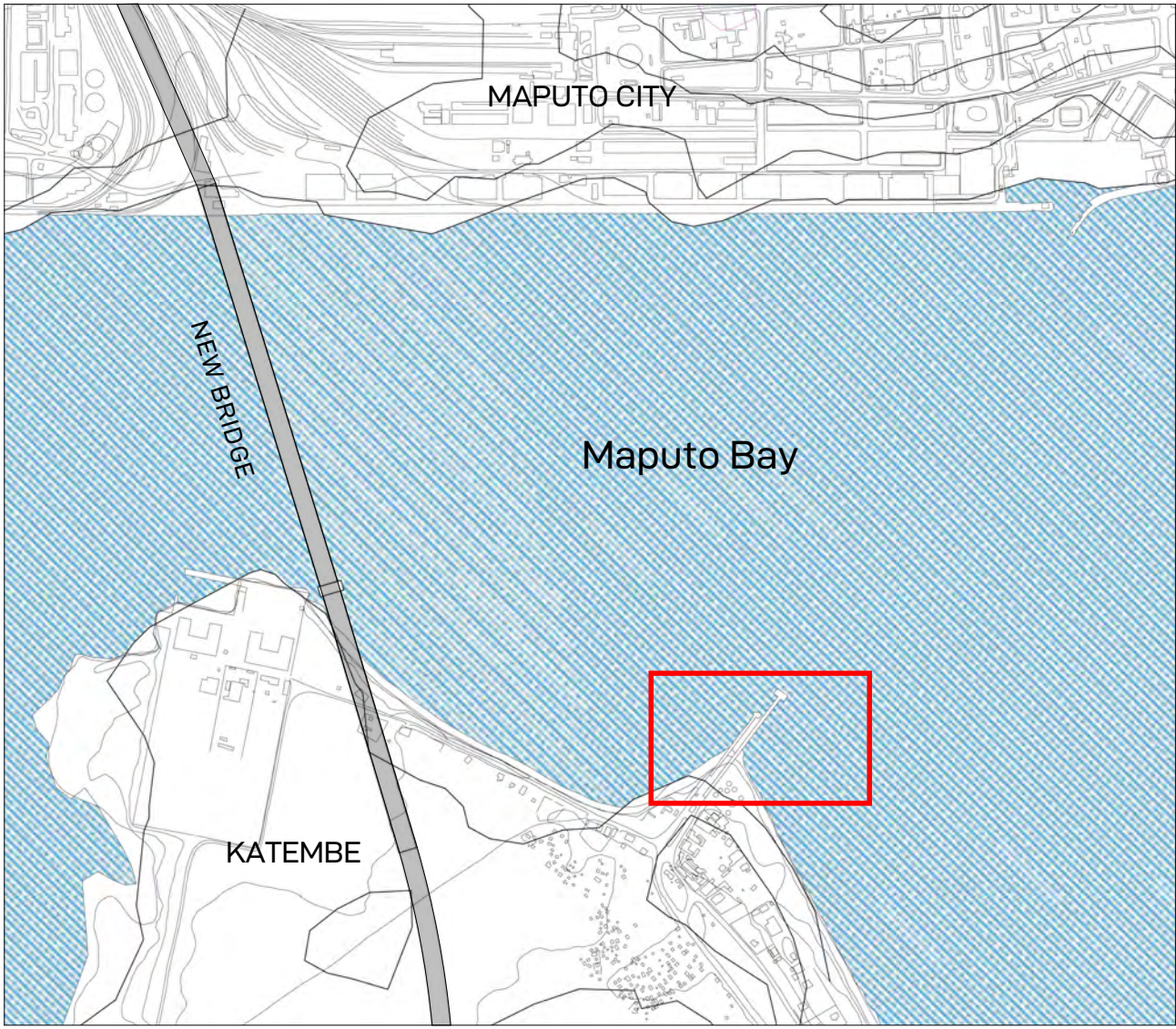
By critically analysing the proposed site's topography, urban fabric, vegetation and climate factors one can better understand the nature of the site and how to respond to it. The proposed site is located on the south bank of the Maputo Bay, in KaTembe district, Mozambique has potential to be transformed into a waterfront for the city. The site used to be a ferry terminal but now is no longer in use due to the construction of a suspension bridge across de Maputo bay. The site has an existing morphology; it has a ferry dock that will be integrated in the new proposal.

5.2.2 CLIMATIC CONDITIONS

Maputo has a tropical climate and lies on 48m above sea level. According to Köppen-Geiger system the climate here is classified as Aw. The average annual temperature is 22.7 °C in Maputo (Figure 5.2). The annual rainfall is 781 mm (Climate-Data, 2020: online).

Summer: Hot and humid, but the sea breeze diminishes the heat substantially.

Winter: Cool, dry with less rainfall than in summer.



LOCALITY PLAN SCALE1: 10 000

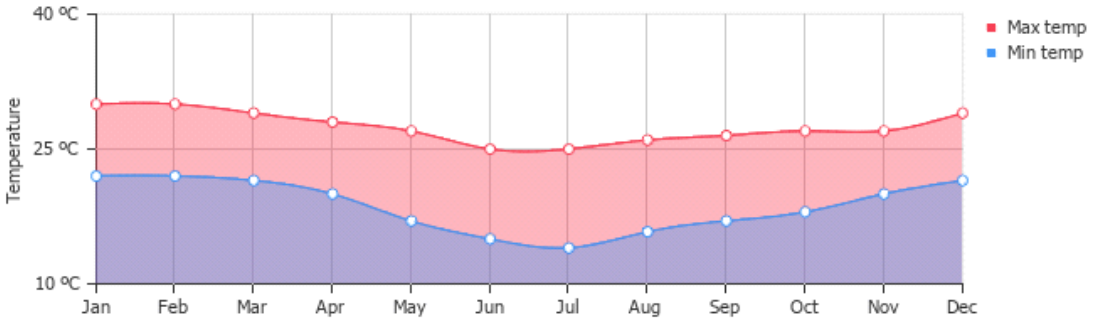


Figure 5.2. Maputo's average temperatures in winter and summer (Weather & Climate, 2019: online)

5.2.3 TOPOGRAPHY

The site, situated on the water's edge of Maputo Bay is relatively flat. However, the site slopes toward the Indian Ocean (Maputo bay) which runs from South to North. The proposed development thus slopes 2m towards the north.

5.2.4 VEGETATION

The site does not have any major trees or existing plants. The design will thus aims to incorporate more green spaces to soften the area to create a likable space that attracts people.

5.2.5 SOIL

The soil type of this area is predominantly declared as inner red sand dune. These dunes are composed of reddish, brownish and yellowish wind sands, consolidated by vegetation. The dunes are located inland, generally not far from the present coastline, but they are not part of the current active dune system.

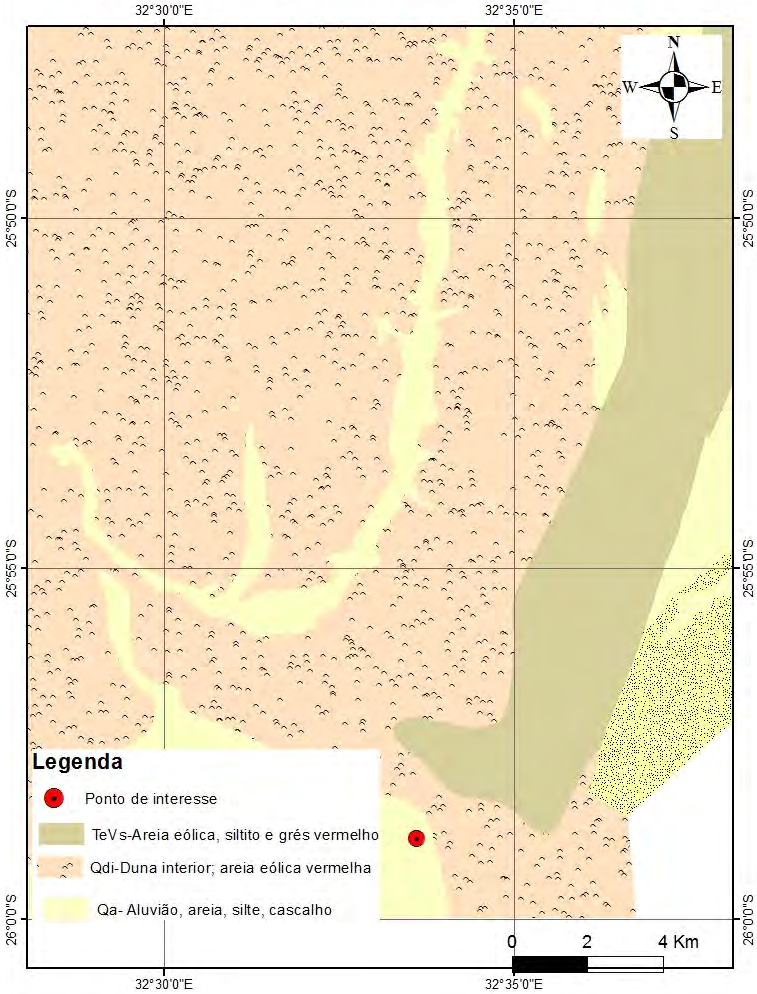
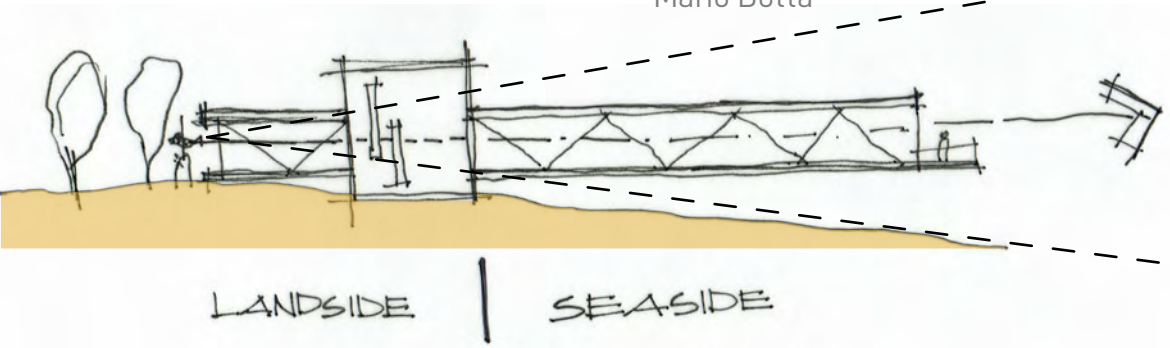


Figure 5.3. Geology of Maputo (Ministry of Mineral Resources and Energy, 2019: online)

5.3 Touchstone and structural philosophy

> ‘ Architecture is a violation of landscape; it cannot simply be integrated, it must create a new equilibrium. ’
>
> Mario Botta



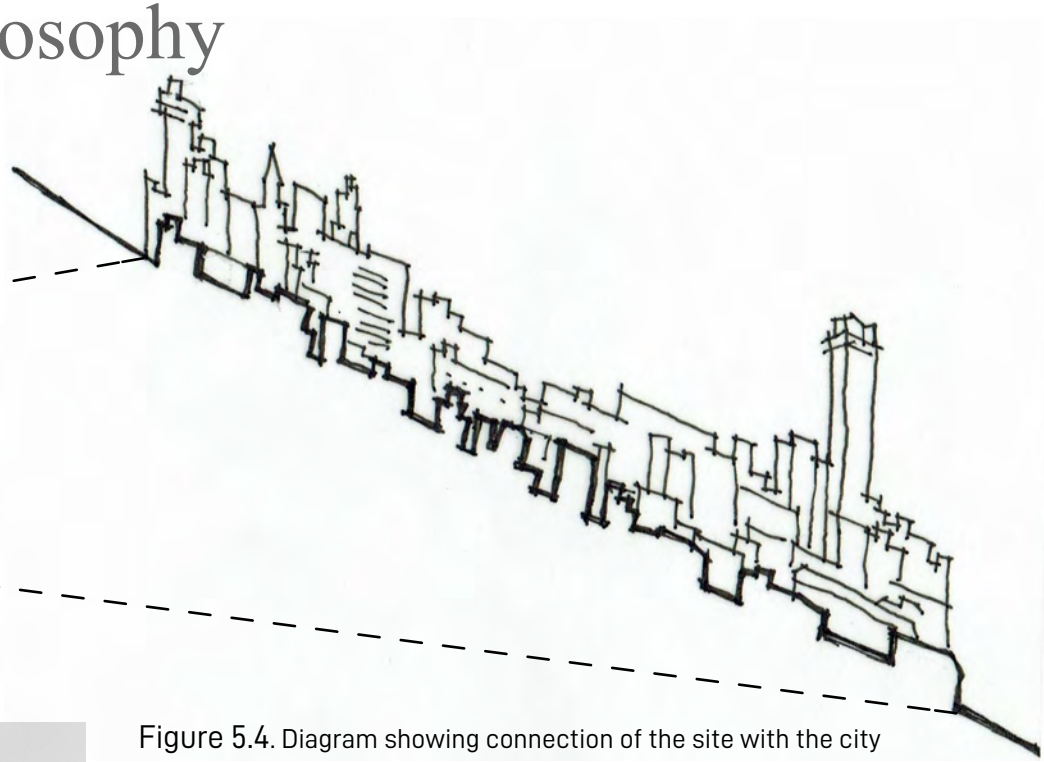


Figure 5.4. Diagram showing connection of the site with the city (Author, 2020)

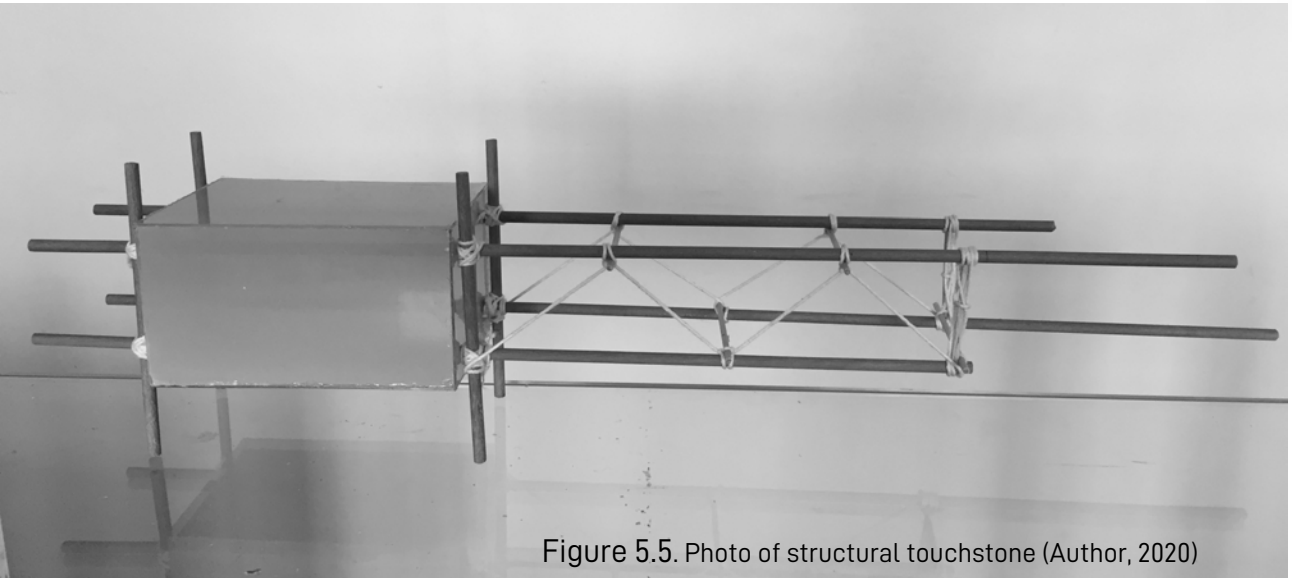


Figure 5.5. Photo of structural touchstone (Author, 2020)

With the above in mind, one must work cleverly to navigate the complexities of the coast to design a building that makes the most of, but does not negatively impact, the local environment.

The structural touchstone was derived through a process of abstraction and conceptualization of the initial design process and reaction. As a response, the structural touchstone is another form of expression of the main design objective, a linearity, connectivity and movement thus creating a new connection between humans and marine life of the KaTembe district.

Timber

- renewable and environmentally responsible
- high strength to weight ratio
- good workability
- natural durability
- high tolerance of short duration loads (Crossman & Simm, 2004: 5)

Figure 5.6. Timber construction (Bayside Group, 2016: Online)

5.3.1 MATERIALITY

Materials and construction methods in a coastal environment should be resistant to:

> flood and wind damage;
> wind-driven rain;
> corrosion;
> moisture and;
> decay due to sunlight, aging, insects, chemicals, temperature or other factors (FEMA, 2013: Online).

Steel

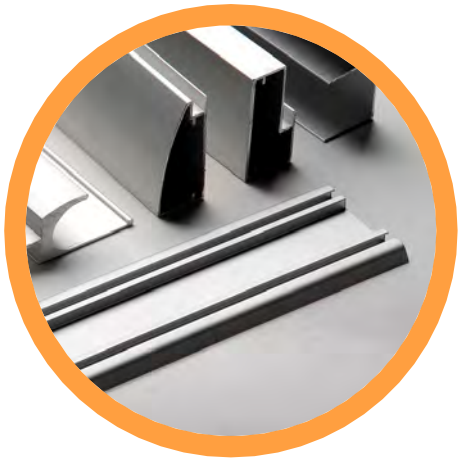
- Strongest of all coastal constuction material
- Easily installed
- High tensile stregth
- No height limitation However, it requires a protective coating applied periodically.

Figure 5.7. Steel construction (Indiamart, 2020: Online)

Concrete

- Extremely strong
- high compressive stregnth
- must be specifically designed
- natural durability

Figure 5.9. Concrete panel (ArchiExpo, 2020: Online)



Aluminium

- Aluminium and its alloys have excellent resistance to corrosion.
- However, it's important to choose the right aluminium alloys because they perform differently in saltwater enviromnents.

Figure 5.8. Aluminium construction (STSI Holding, 2018: Online)

Stone

- Colour and stregnth;
- structure of the stone may be stratified (layered) or unstratified;
- wide diversity of textures; Despite its heavy, solid materiality, one can still work with it to achieve diverse forms. (Zilliacus, 2016: Online)

Figure 5.10. Stone texture (Grossgasteiger, 2020: Online)

5.4 Precedent Study

LA QUINTANA LIBRARY PARK

Architects: Ricardo La Rotta Caballero
Location: Medellín, Antioquia, Colombia
Project Year: 2007
Size: 14,800 square feet
Type: Public Library

5.4.1 INTRODUCTION

The aim of this precedent study is to critically analyse the La Quintana Library in Medellin, Colombia in terms of its design, technical resolution and construction strategies. Through communicative sketches, images and photos the library will examine the site conditions, tectonic and stereotomic structures, sustainability considerations and the building components. This will become a crucial part in developing a technical resolutio for the dissertation in design.

The library was designed by Ricardo La Rotta Caballero, is located on the North-western outskirts of Medellin, Colombia. The library is one of five public park libraries that offer various educational facilities and programs to assist the local community. The term "library park" speaks about multifaceted combinations of spaces and architecture that link public and green spaces with a typological library as a platform. The building is 1400m2 in size and includes facilitates such as reading rooms, internet facilities and educational play spaces (ARQA, 2013: Online)

Figure 5.11. Library Exterior View (ARQA, 2013: Online)

The design of the library was fundamentally driven by the existing water channel, thus, in turn the spatial quality of the building is based on a longitudinal plan that creates a linear park through the building. Furthermore, the building, doesn't just act as a park but, rather as a place of transition through making con-nections with different neighbourhoods in the area through streets that link to the library. The main linear axis that the library forms within the urban fabric receives large amounts of people flowing through it. It is on this axis that the building consists of two big blocks. The lower block, of a passive nature, constitutes the book collection and computer laboratory facilities which exist in a more closed, inclusive area and the upper block, active in nature, is in an open-air public square space for social interactions, and contains a business development centre and a cafeteria (ARQA, 2013: Online).

5.4.2 ENVIRONMENT AND MICRO CLIMATE

Figure 5.12. Locality Plan N/Scale (ARQA, 2013: Online)

The site is located in the Aburra Valley on the western side of the Northern Andes Mountains. The city of Medellin sites approximately 1500meter above sea level and has a cool tropical, wet climate. The city is known as the "City of Eternal Spring" due to its relatively warm temperatures throughout the year (Farjado, 2012: 18). Based on this warm temperature, the original vegetation of the valley consisted of Andean forest, which covered the entire area except the steepest slopes and the marshy areas in the bottom of the valley (Pérez 1993:63).

The La Quintana Library has responded well to the topography in which it is situated. The libraries construction and urban landscaping is articulated to fit into rather than being placed on the earth. The building integrates itself into the site and becomes an abstraction of the landscape through its construction methodology.

Figure 5.10

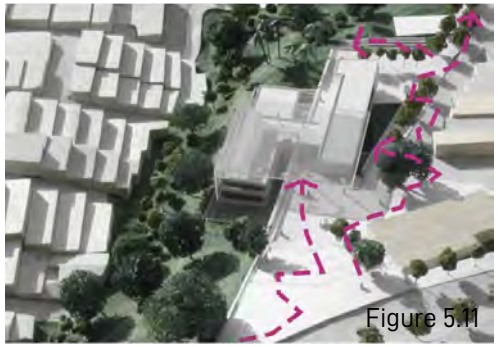


Figure 5.11

Figures 5.13 & 5.14. Illustrations indicating site responsiveness of the scheme (ARQA, 2013: Online)

In addition, the building further narrates with its environment by becoming a form in the place by folding itself and being formed like mountain contours. The design and construction relates back to the folded mountain in its structure and form. The library re-sponds particularly well in the way it defines itself down the slope of the natural mountain scape. This is achieved through stepping the landscape at various intervals forming a progressive walk way through the building and down the site (Curquico, 2013: Online). Through manipulating the earth (cut and fills process) and creating these terraces the environment is enhanced and the library exists in unison with the earth.

5.4.3 USER BEHAVIOUR AND REQUIREMENTS

Figure 5.15. Site Plan indicating nods for social interaction (ARQA, 2013: Online)

The library is critically located in the centre of various neighbourhoods, thus, the library becomes a central beacon between the various neighbourhoods. The general public of the city of Medellin were in drastic need of an educational facility that was accommodated with an improved public social space. As a reaction, La Rotta, the architect successfully identified this need through concentrating on the public spaces which happen around the building through circulation routes which connects various spaces.

The community regards the library as a beacon within the city as it positively addresses the need of the community through providing, computers that are connected to the internet, book collections specializing in different topics, exhibition and recreation rooms, and outdoor greenspace zones where guests can relax and enjoy spontaneous gatherings.

5.4.4 FORM AND FUNCTION

The design and structural approach of the library was set out as two independent volumes that materialise through concrete boxes which are located at two different levels due to the contextual topography. The lower block is developed through a series of concrete columns, which extends to the exterior of the building, into an open terrace where a semi-translucent structure covers the entire space (ARQA, 2013: Online).

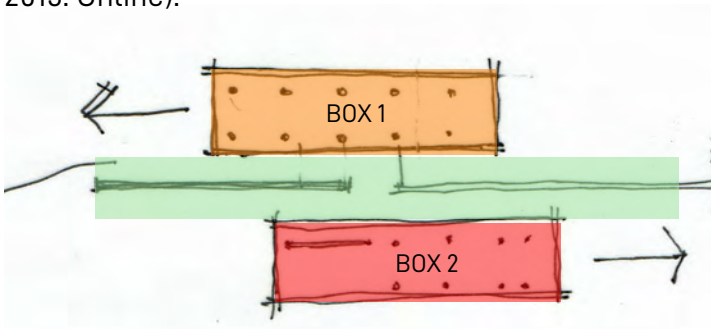


Figure 5.16. Analytical diagram (Author, 2020)

Figure 5.17. Striking form becoming part of the natural landscape (ARQA, 2013: Online)

This semi-translucent structure is constructed with a primary horizontal element, which functions as a cover, as well as a vertical plane which unfolds from the closed off northern side of the building facing the creek. This structure is formed with a flat steel profile supported by wooden slats, while, when extended a vertical enclosure retains only towards the wooden sections (ARQA, 2013: Online).
The idea behind this structural panel is for the user to perceive this timber pergola as a single entity which assists the user to visually incorporate the green of the creek into the area of the library. Likewise, the screen additionally acts as a bioclimatic function, a sunscreen light filter and the natural circulation of air.

In this sense, a continuous presence of internal and external spaces and the interplay of light is created. The structure and tectonic nature of the library is thus highly driven through the materiality of the building.
The lower block houses the administrative offices, auditoriums and the community care centre. From here, a circular cut in the slab allows one to have a visual connection with the library; which is reached by a sweeping staircase. The library, the primary function of the building, is a large double volume space where various activities occur, such as; computer labs, reading spaces and small class rooms. Along the exterior edge of the concrete walls, that define this space, one can find a ramp leading to a large showroom. The ramp becomes an integral part of the design by making the movement through the building an experience, rather than a space of transition only.

Figure 5.18. Pergola (ARQA, 2013: Online)

Ultimately, the form and function of the library aims to create a constant relationship between the city, the creek and the natural landscape in which it sits through fragmenting the internal, external and transition routes. This is achieved through the composition of various materials (timber, concrete thus interplay of stereotomic and tectonic), structures (grid of concrete and steel columns) and soft spaces [grass and water] (Curquico, 2013: Online).

5.4.5 HORIZONTAL AND VERTICAL CIRCULATIONS

The library makes uses of two types of circulation, namely: staircases and ramps.

5.4.5. a) RAMPS

The ramp occurs between the lower and upper level of the site. Thus, the design suggests sensitivity toward handicapped users. The library part of the design is accessed by the ramp from the lower level; therefore everyone has access to the most important part of the complex. The ramp adds a particular fluidity and flexibility to the circulation that makes it easy for all users. The ramp thus becomes a transition space of interaction.

5.4.5. b) STAIRCASES

The use of a continuous staircase is applied throughout the building to create a relationship between the levels on site. This continuous staircase (figure 5.20) is designed and constructed to allow for a smooth transition between the levels through making use of small risers and larger treads.

Figure 5.19. Exterior view from the ramp (ARQA, 2013: Online)

Figure 5.20. Exterior view (ARQA, 2013: Online)

5.4.6 STRUCTURAL DETAILING

5.4.6 a) STEEL FRAME

Together, with the concrete columns, a steel frame is introduced which allows the library to have internal free spaces and curtain walls. The use of steel was chosen due to its great strength and flexibility. Steel has the ability to bend and flex without cracking when the structure is pushed to one side by wind or earth movement.

5.4.6 b) IN-SITU CAST CONCRETE WALLS

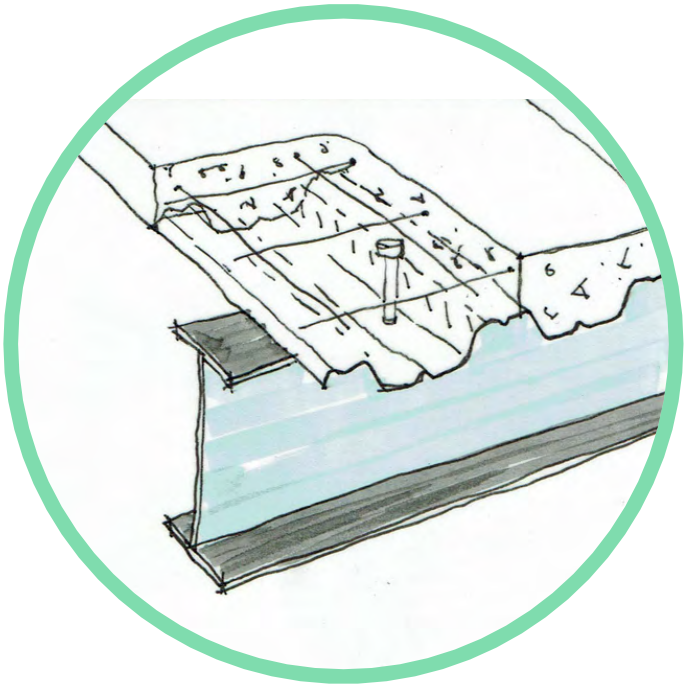
Due to the large slope or fall on site the construction called for large in situ cast concrete walls to carry the load of the earth pushing down onto the bottom of the earth.

5.4.6 c) PARKING DETAILS AND STANDARDS

The building is situated in the centre of various neighbourhoods. Thus, the design and the lifestyle of the city allow the users to access the building through public transport and by foot. The only parking that was provided is for the permanent staff. Hence, 15 parking bays were provided and about 10 motor-bikes parking's.

5.4.7 CONCLUSION

The library has proven to be a public building which redefines and re-establishes a public realm in the city of Medellin through its simple form and spaces between the buildings.
Through making use of simple material and construction methods the spaces of the building have proven to be one which is equally important internally and externally. The architect cleverly manipulated the slope of site to create spaces for sitting and circulation at the same time.



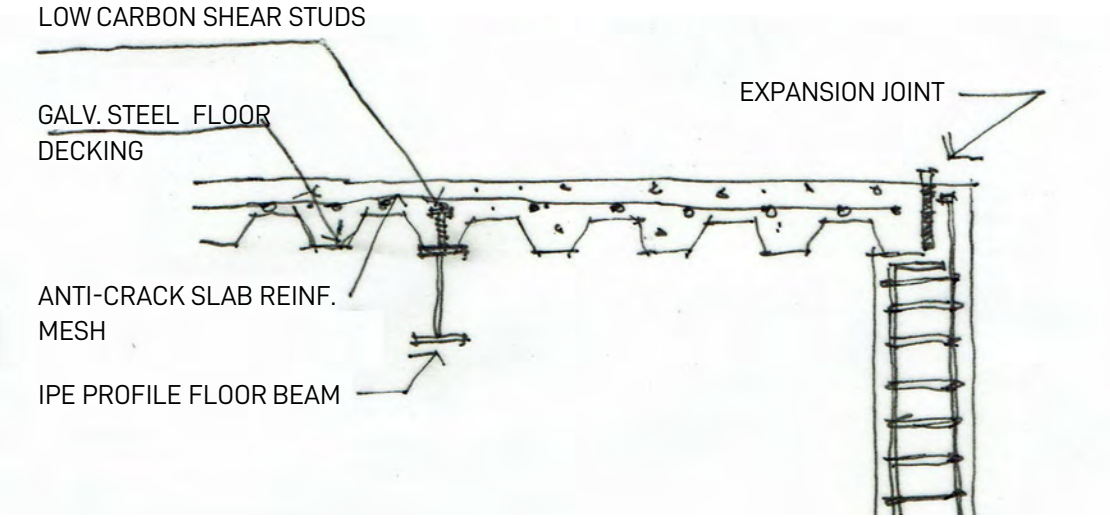


Figure 5.21 Typical steel decking concrete floor detail (Author, 2020)

5.5 Sustainability report

5.5.1 OPEN SPACE AND SUSTAINABLE IDENTITIES

INTERPRETIVE CORRIDORS

STREETS BECOME EDUCATIONAL AND INTERPRETIVE CONNECTORS THAT FEATURE HISTORICAL, ENVIRONMENTAL AND COMMUNITY INITIATIVES

Figure 5.22. Photo collage (Adapted from Evelly, 2013: Online)

STORMWATER INFRASTRUCTURE

INTEGRATED STORMWATER MANAGEMENT INCLUDES POSSIBLE STREESCAPE REMEDIATION, STORMWATER CATCHMENT AND REUSE

Figure 5.23. Photo collage (Adapted from Evelly, 2013: Online)

ROUTES, PATHS, CIRCUITS AND OVERLOOKS

A LAYERED PATH SYSTEM PROVIDES A WATERFRONT ESPLANADE, LOOPING ACTIVITY CIRCUITS AND PANORAMIC OVELOOKS, PARK FOYERS FRAME ENTRANCES AT THE URBAN EDGE WHILE PATH ARMATURES PROVIDE ACCESS TO THE TIDAL ECOSYSTEM.

Figure 5.24. Photo collage (Adapted from Evelly, 2013: Online)

PROGRAMME OPPOTUNITIES

ACTIVE AND RECREATIONAL PROGRAMME ARE ARRAYED IN THE NORTHWEST SECTION OF THE PARK WHILE A PASSIVE AND LEISURE PROGRAMME ARE INTERWEAVED WITH NATIVE ECOLOGICAL COMMUNITIES IN THE SOUTH

Figure 5.25. Photo collage (Adapted from Evelly, 2013: Online)

ECOLOGICAL OPPOTUNITIES

A SEQUENCE OF ECOLOGICAL COMMUNITIES STRANDS THROUGH THE PARK WITH TIDAL SYSTEMS AT THE WATER'S EDGE AND UPLAND PLANTINGS INHABITING HIGHER GROUND.

Figure 5.26. Photo collage (Adapted from Evelly, 2013: Online)

5.5.2 FAÇADE DESIGN

A key innovation of the building is the double-skin façade that has a system of automatically controlled blinds between the internal double-glazed system and the external single-glazed skin which will track the sun as it moves across the building.

The inside skin forms the building envelope. Heat captured between the inner and outer skin during the summer is ventilated outside through natural convection. In the winter, this hot air is captured between the two skins, forming a warm blanket, protecting the building from the elements. The high-performance façade reduces solar heat gain while maximising the natural light penetration into the building.

The architectural concept called for large areas of glass and for this to be as transparent as possible. Normally this would result in energy wastage through solar gains in summer and heat loss in winter. There would also be problems with glare in all seasons, resulting in discomfort for the occupants. These issues are exacerbated by the siting of the building at the water's edge and subject to glare from the sea as well as the sky.

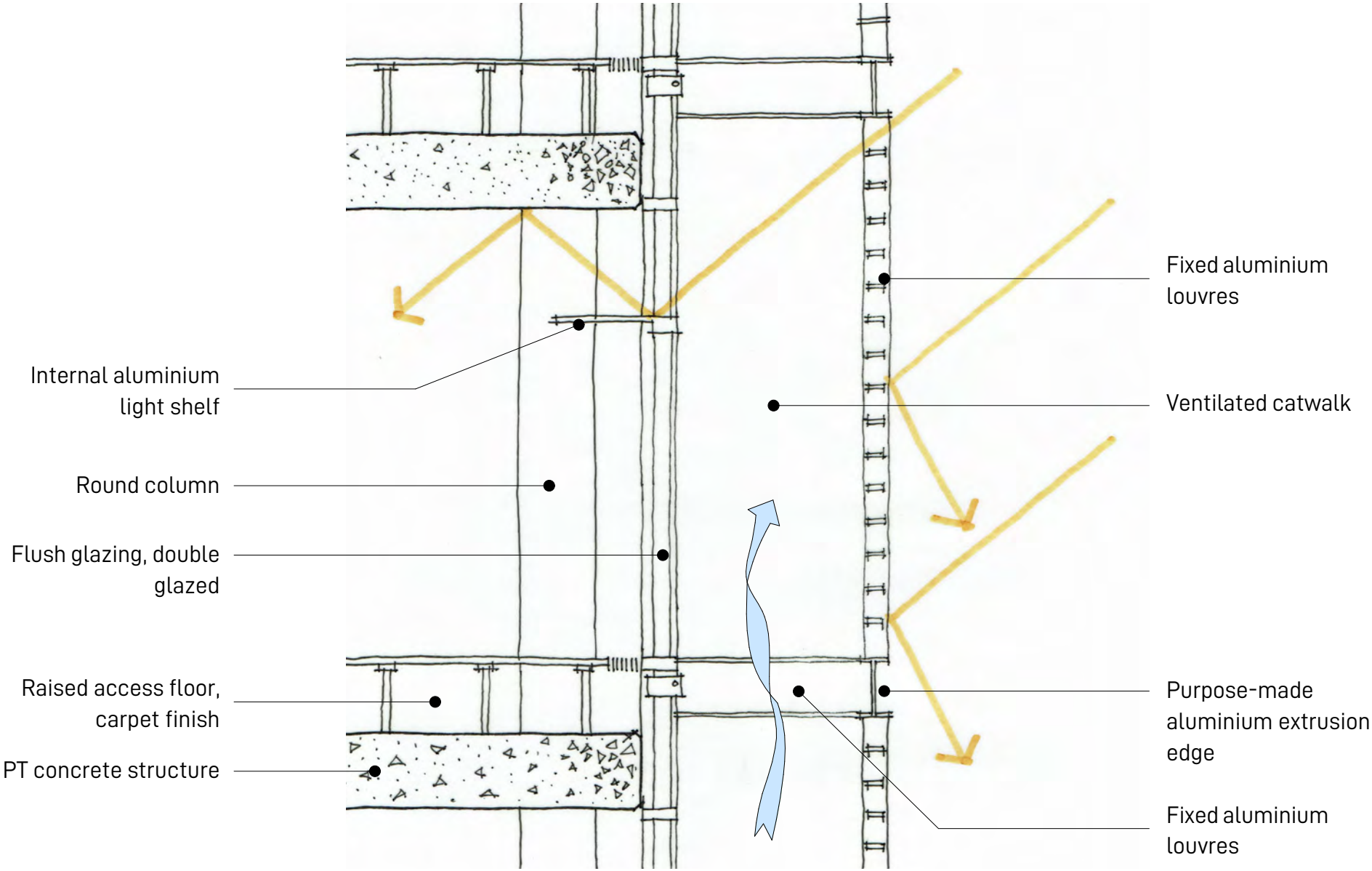


Figure 5.27. Edge detail (Author, 2020)

5.5.3 BREEZE BLOCKS

The period of Mozambican architecture between the 1930s and 1960s has always been internationally recognized as one of the most important in the architectural history of the country by the Mozambican Academy. This period, known as modern architecture, has been evaluated in relation to the treatment of environmental issues and solutions for passive conditioning developed by Mozambican architects of the time, such as Pancho Guedes, Joao Tinoco and Jose Forjaz. The influence of colonial architecture, which has been studied in the treatment of the envelope of buildings, is presented as the greatest contribution from that historical period for the development of modern architecture at a national and international level.

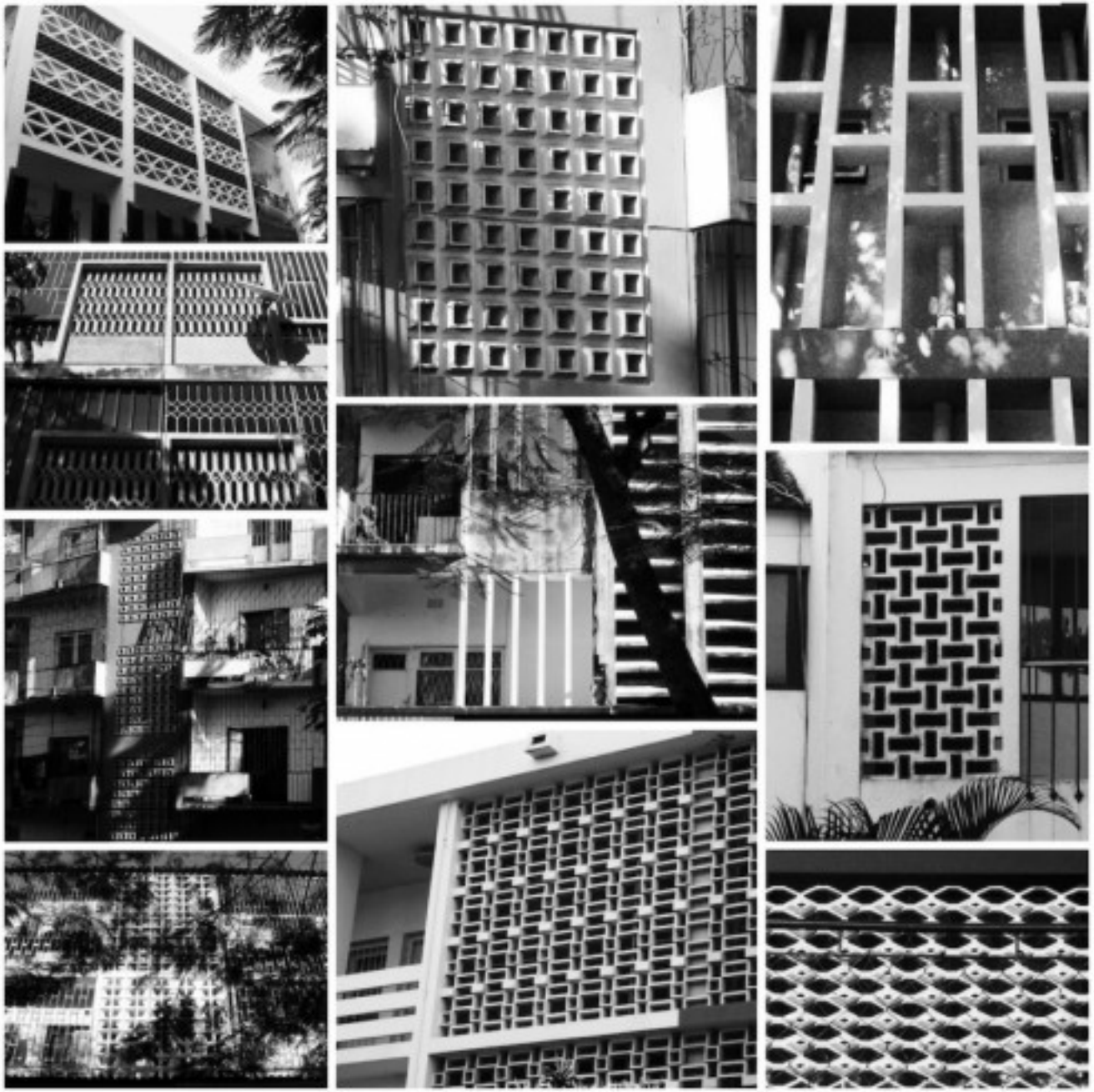


Figure 5.28. Typical breeze blocks used in Mozambique (Adapted from Design Indaba, 2014: Online)

Figure 5.29. Entrance of Instituto Missionario das irmas do Precioso Sangue (1997) (José Forjaz Arquitectos, 2020: Online)

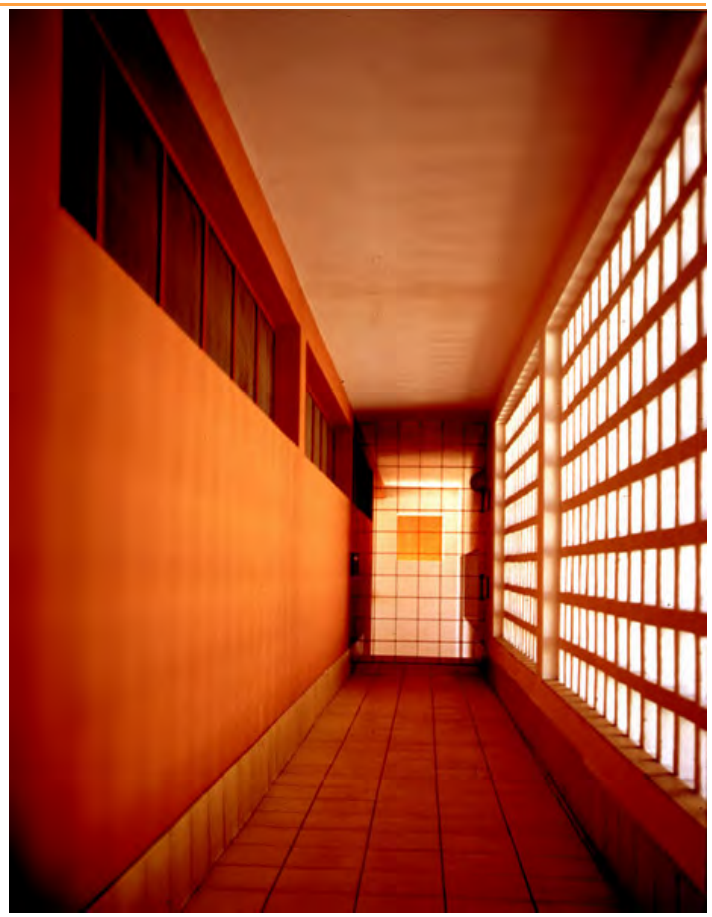


Figure 5.30. Passage of Instituto Missionario das irmas do Precioso Sangue (1997) (José Forjaz Arquitectos, 2020: Online)

Within the range of work the response to context is not limited to an interpretation of the physical site only, but also to the local climate- in each of the buildings investigated, simple environmental concerns have been considered - long before 'green' architecture had assumed its current fashionable status. With such responses have come formal design decisions, such as the insistence on cross-ventilation and the careful control of sunlight - responses that have affected the plan and sections of buildings as well as their formal composition. More recently, and more comprehensively, the large-scaled Instituto Missionario das irmas do Preciosos Sangue project (Figures 5.29 and 5.30) incorporates the collection of rainwater, the recycling of grey water and the harnessing of solar energy.

Figure 5.31. Hallway of Instituto Missionario das irmas do Precioso Sangue (1997)
(José Forjaz Arquitectos, 2020: Online)

Figure 5.32. Detail of breeze block at Caracol condominium (2004)
(José Forjaz Arquitectos, 2020: Online)

Figure 5.33. Entrance of Caracol condominium (2004)
(José Forjaz Arquitectos, 2020: Online)

This attention to climate has also obviously informed decisions about the use of appropriate materials. In an economy of scarcity where high transport costs prevail, the use of local materials obviously makes sense. Typically brick (or concrete block) walls, concrete floor and roof slabs, and marble or clay tile floors allow for a high thermal inertia. Breeze-block screens, which have become a 'trademark' of their work, are often employed to control the sub-tropical sun and also to deal with issues of security. Where budgets allow, timber screens/shutters, of the wonderful local hardwood Chanfuta (*Afzelia quanzensis*) are used sparingly.

Related to the issue of context is the purposeful engagement with technology and construction that is inherent in all the work. There is within this body of work a relentless quest for an economy of structure and for a structural integrity from which an honest formal architectural expression is derived. With this exploration different themes of construction have over the years been investigated.

5.6 Conclusion

As a community in Mozambique a space should be identified, claimed to serve as a platform where communities can access their past and furthermore tie a direct link to their relevance in a larger world, where their origin is rooted. A new spatial intervention in areas stretches out to communities to initiate a process whereby they can also play a pivotal part to the functioning and narrative of the city.

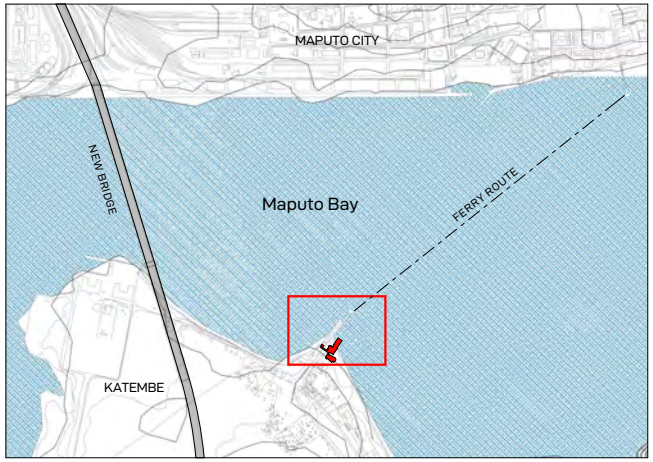
This new 'public realm' should exist as a container which connects and brings urbanism, modernity, history and culture into context with another. It should have the ability to transform the individual within the space to look back into the past with a specific nostalgia, but more importantly have the ability to excite them for the future - a reconceptualised framework. The purpose of this is to achieve levels of tolerance, trust and understanding necessary to support a truly democratic city. The role of designers is to inflate the built environment with memory as key in spatial planning and design (Mammon & Patterson, 2005: 2).

As architects and designers are seeking more meaningful and creative outlets through which they can utilise their skills to create a more just and sustainable world. New standards of education and practice are emerging and a shift in priorities is beginning to reveal itself in an attempt to address the world's most pressing problems.

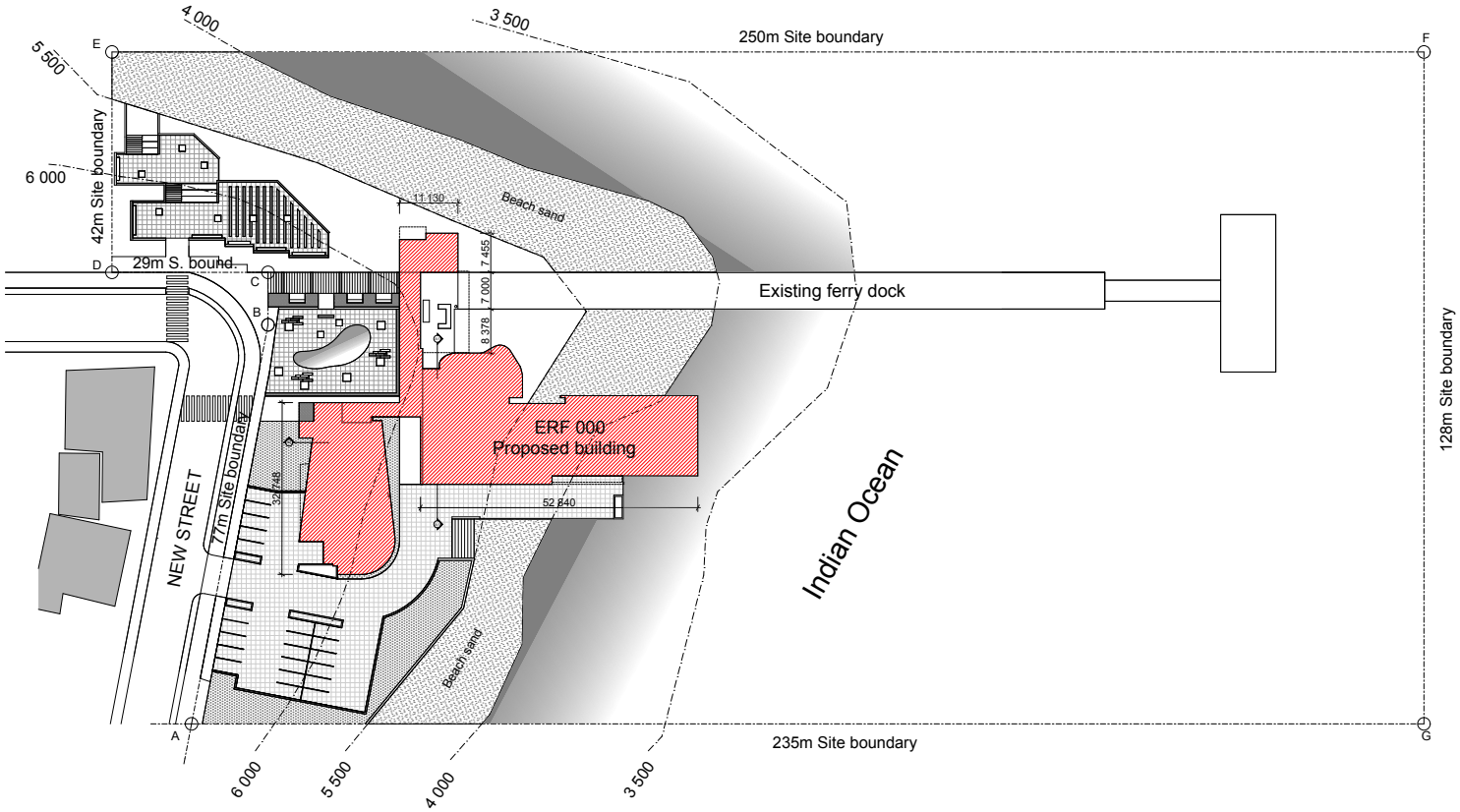
With urbanisation taking place at a faster rate than expected, it is important to address the needs of entire communities as well as break away from the traditional practice of architecture which can under-emphasise the social component of design. Embedded within this is a call for inclusive design - design that is reflective of the unique qualities of individual communities but also meets the needs of multi-dimensional populations. Although there is an increase in social impact programmes geared toward architects and designers, there is still a shortage of options available in universities for individuals to get involved in projects that make a difference.

5.7 TECHNICAL DOCUMENTATION

LIST OF DRAWINGS	
DRAWING NO.	DRAWING DESCRIPTION
PP995/T500-01	LOCALITY PLAN AND SITE PLAN
PP995/T500-02	GROUND FLOOR PLAN
PP995/T500-03	FIRST FLOOR PLAN
PP995/T500-04	SECOND FLOOR PLAN
PP995/T500-05	THIRD FLOOR PLAN
PP995/T500-06	ROOF PLAN
PP995/T500-07	SOUTH, NORTH AND WEST ELEVATIONS
PP995/T500-08	EAST ELEVATION AND SECTIONS A1 & A2
PP995/T500-09	SECTIONS A3 & A4



LOCALITY PLAN
SCALE 1 : 10 000



SITE PLAN
SCALE 1 : 500

GENERAL NOTES

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2. THIS DRAWING REFLECTS STANDARDS CURRENT AT THE TIME OF PRODUCTION AND WILL NOT BE UPDATED IN ACCORDANCE WITH CHANGING LEGISLATION.
3. DRAWING WAS PREPARED IN ARCHICAD FORMAT. DRAWINGS EXPORTED IN OTHER FORMATS MAY DIFFER, REFER TO ORIGINAL DRAWING FOR TRUE FORMAT.

REVISIONS

NO.	DATE	DESCRIPTION

KSB KARABO BENZANE

STUDENT
KARABO BENZANE 2013037375

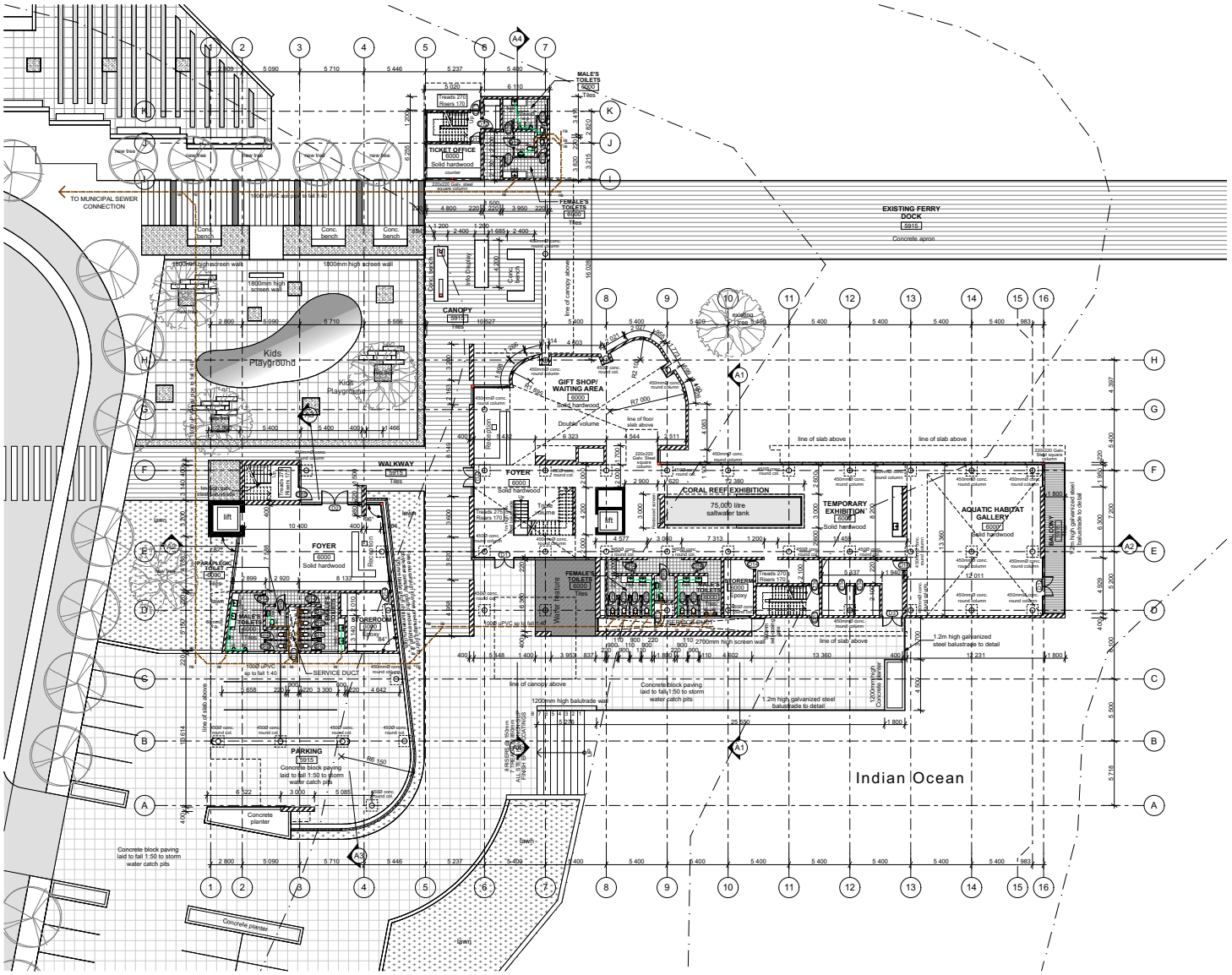
CLIENT
EDUARDO MONDLANE UNIVERSITY

PROJECT TITTLE
PROPOSED AQUATIC SCIENCE PARK, DEPARTMENT OF BIOLOGICAL SCIENCES, KATEMBE, MAPUTO MOZAMBIQUE

DRAWING TITTLE
LOCALITY PLAN AND SITE PLAN

SCALE @A1	DATE	DESIGNED BY
AS SHOWN	08.12.20	K.B.
PROJECT NO.	CAD FILE	CHECKED BY
T500	M.ARCH	H.R.

DRAWING NO.	REVISION
PP995/T500-01	T0



GROUND FLOOR PLAN

SCALE 1:200

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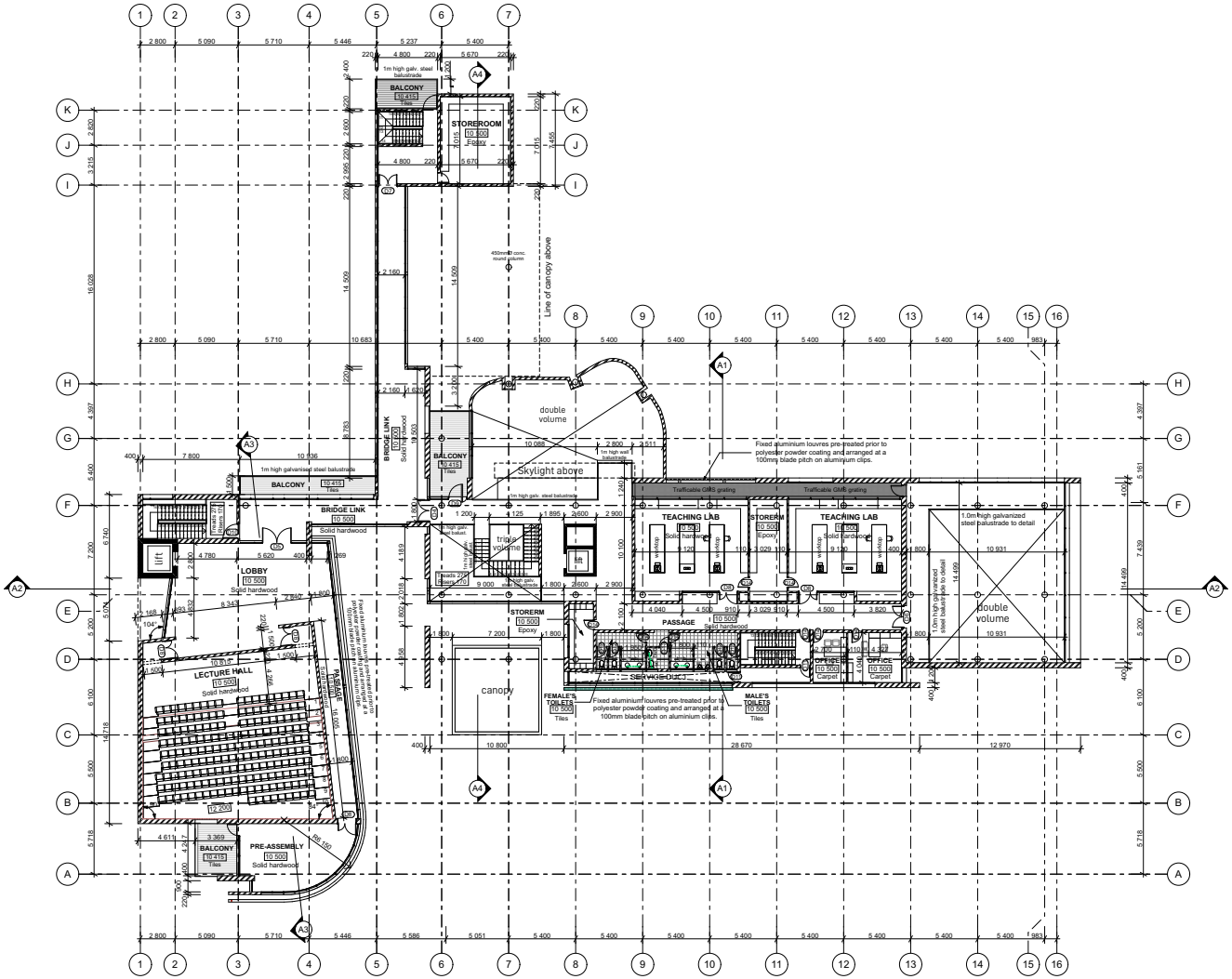
PROPOSED AQUATIC SCIENCE PARK, DEPARTMENT OF BIOLOGICAL SCIENCES, KATEMBE, MAPUTO MOZAMBIQUE

DRAWING TITTLE
GROUND FLOOR PLAN

SCALE @A1	DATE	DESIGNED BY
AS SHOWN	08.12.20	K.B.
PROJECT NO.	CAD FILE	CHECKED BY
T500	M.ARCH	H.R.

DRAWING NO.	REVISION
PP995/T500-02	T0



FIRST FLOOR PLAN

SCALE 1:200

GENERAL NOTES

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PROPOSED AQUATIC SCIENCE PARK, DEPARTMENT OF BIOLOGICAL SCIENCES, KATEMBE, MAPUTO MOZAMBIQUE

DRAWING TITTLE
FIRST FLOOR PLAN

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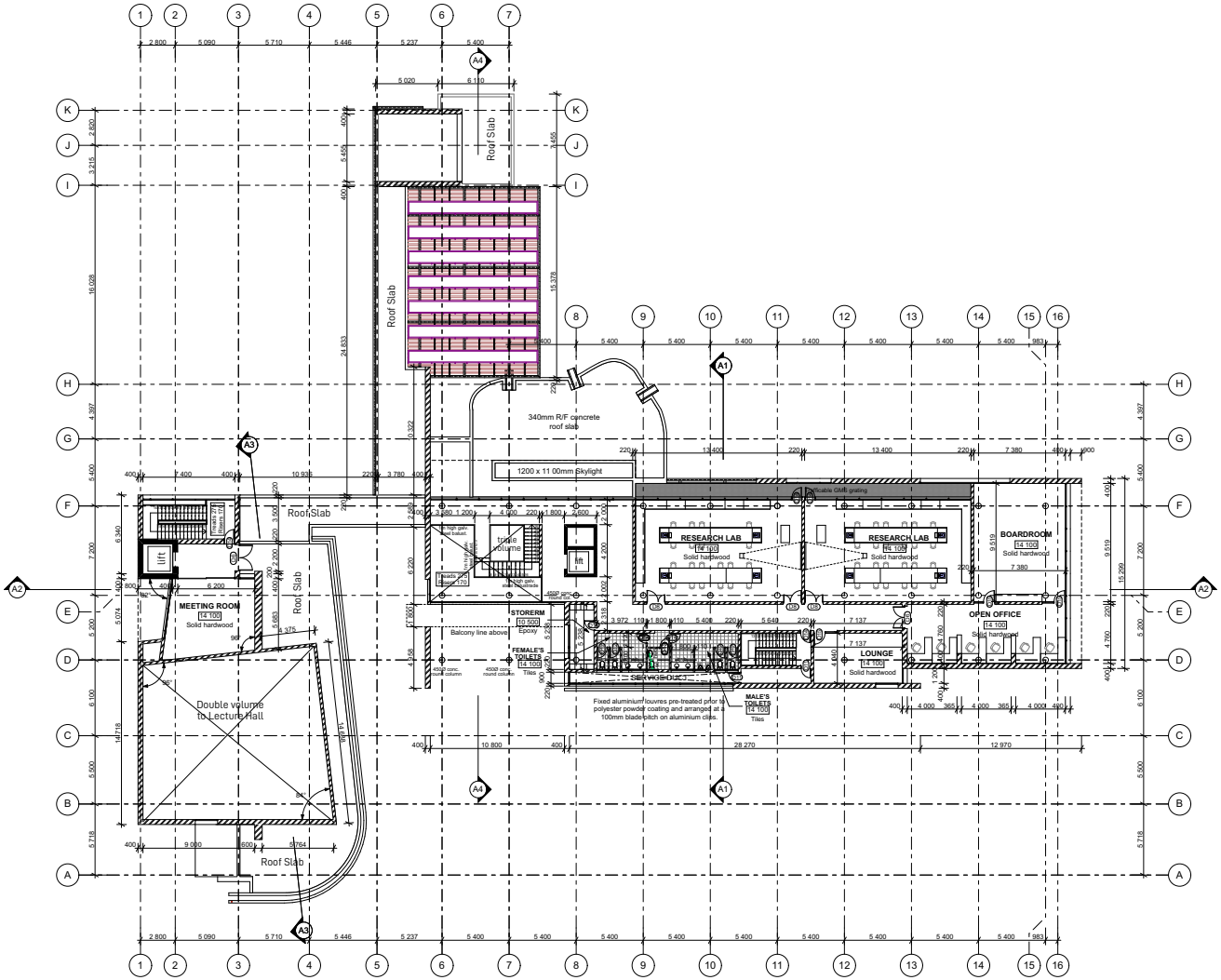

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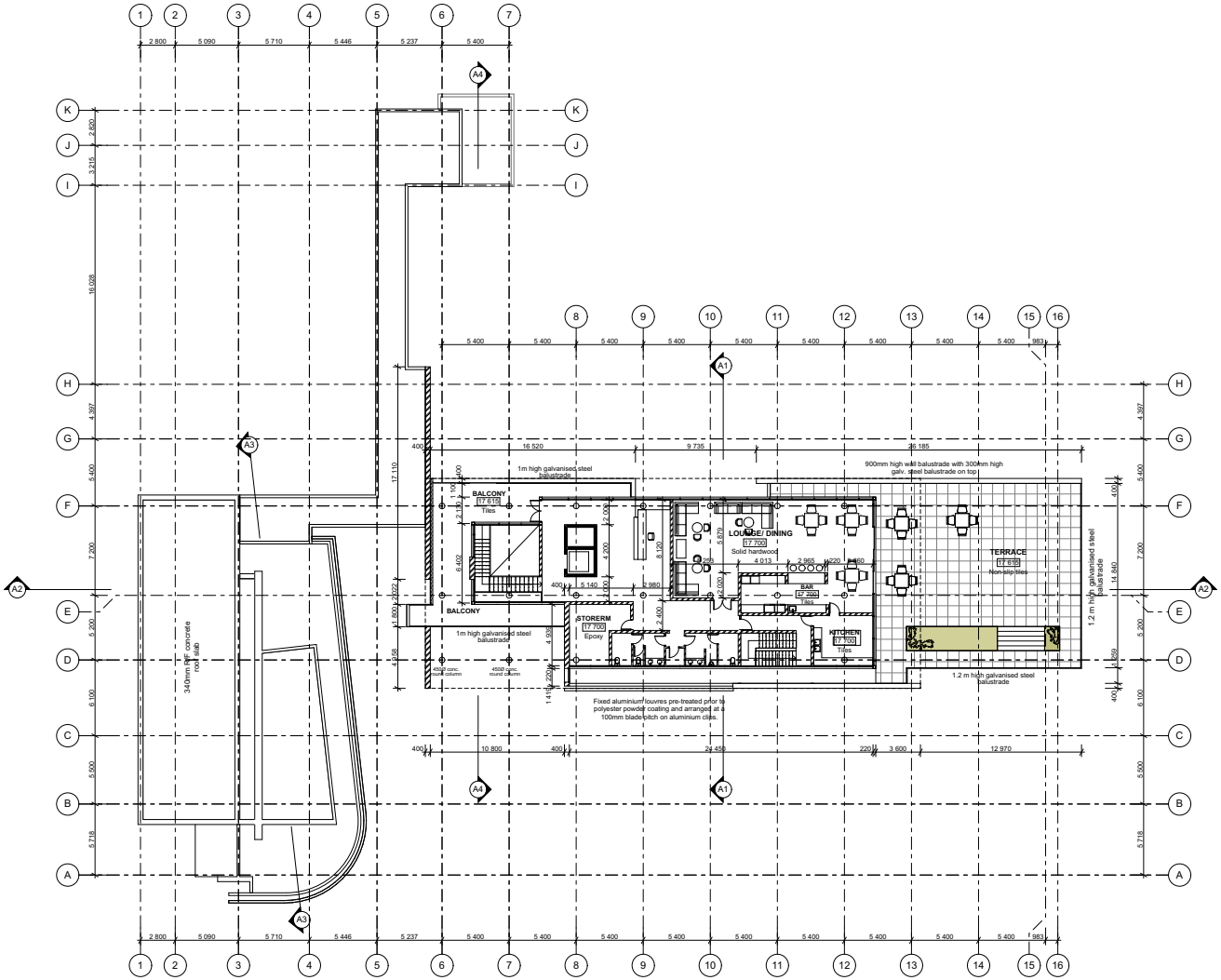

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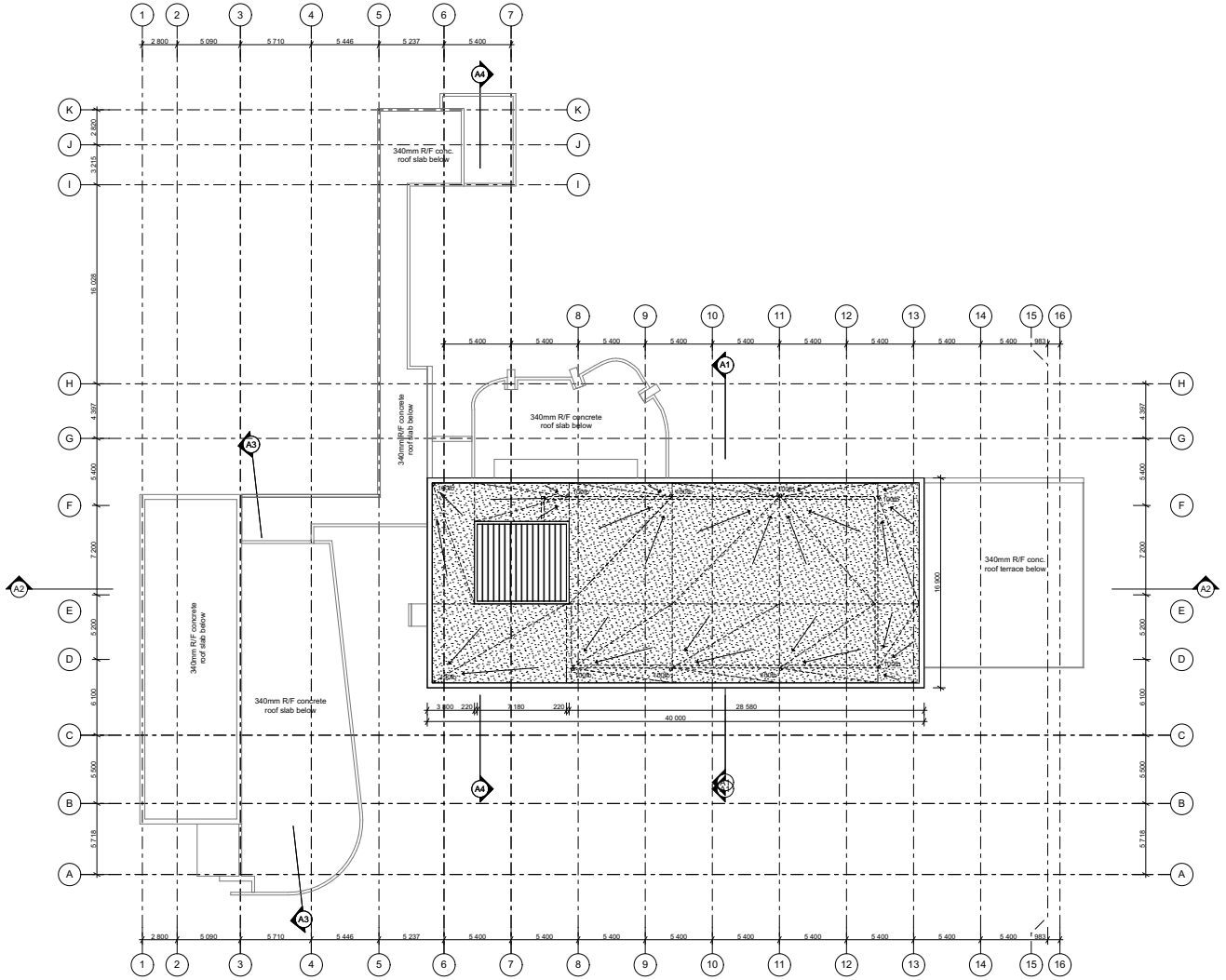

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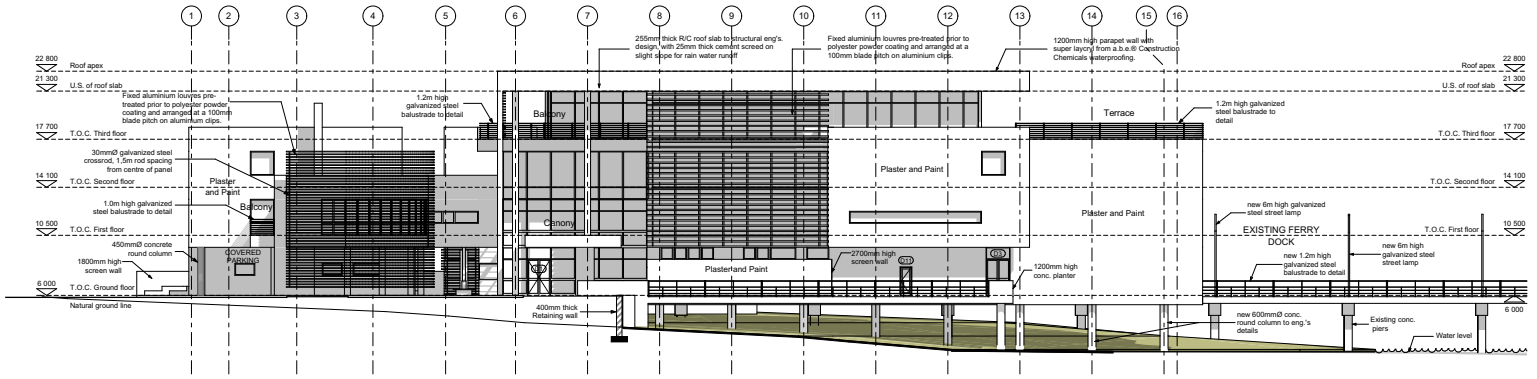

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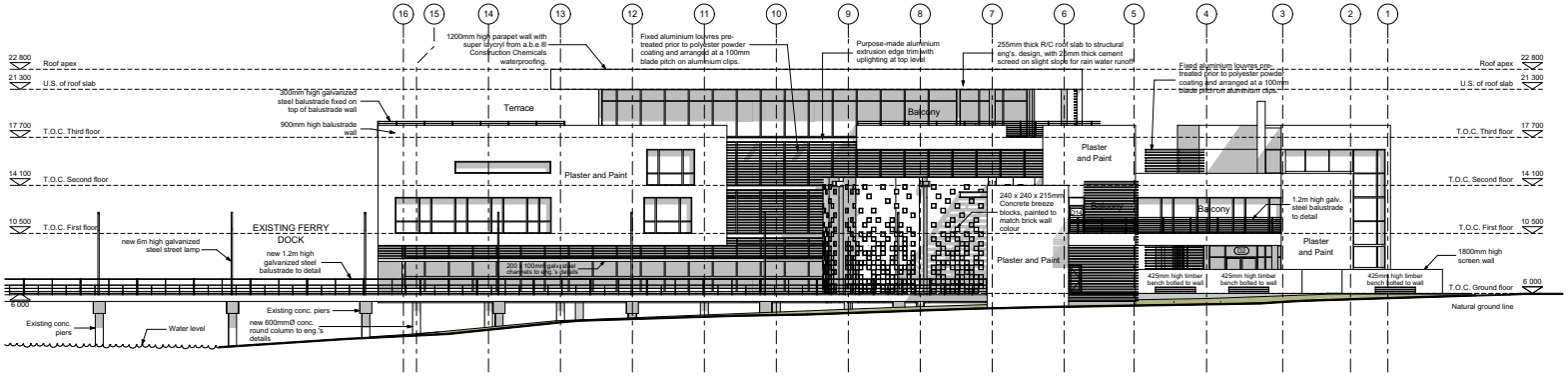

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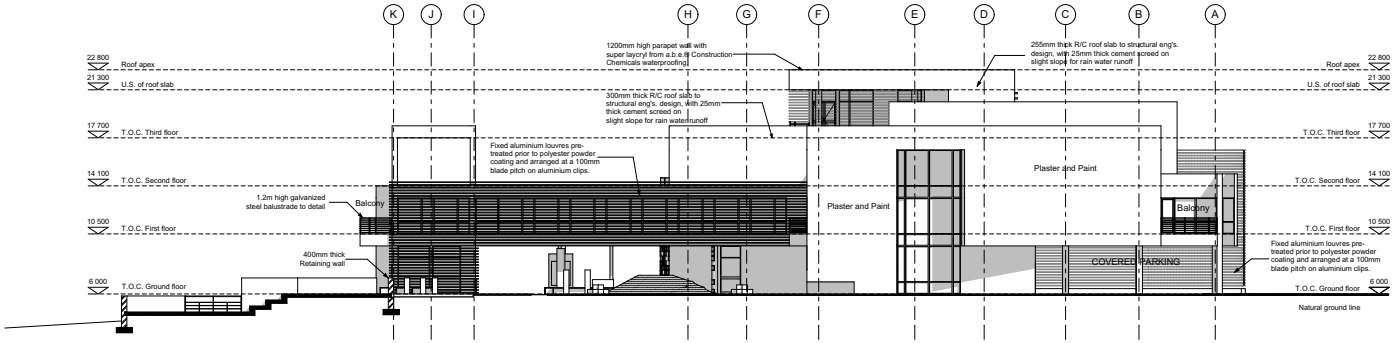
SCALE 1:200



WEST ELEVATION
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DRAWING TITTLE
SOUTH, NORTH AND WEST ELEVATIONS

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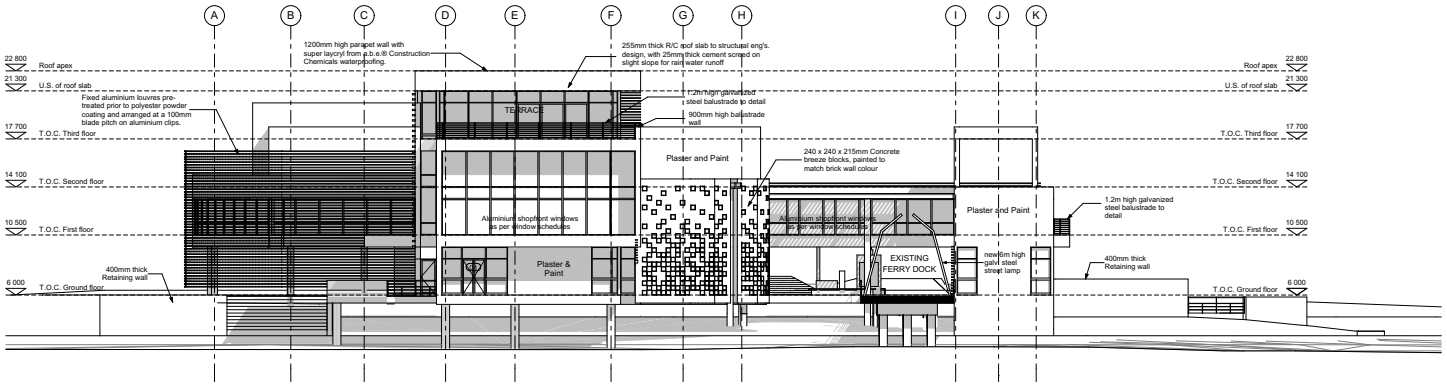

EAST ELEVATION
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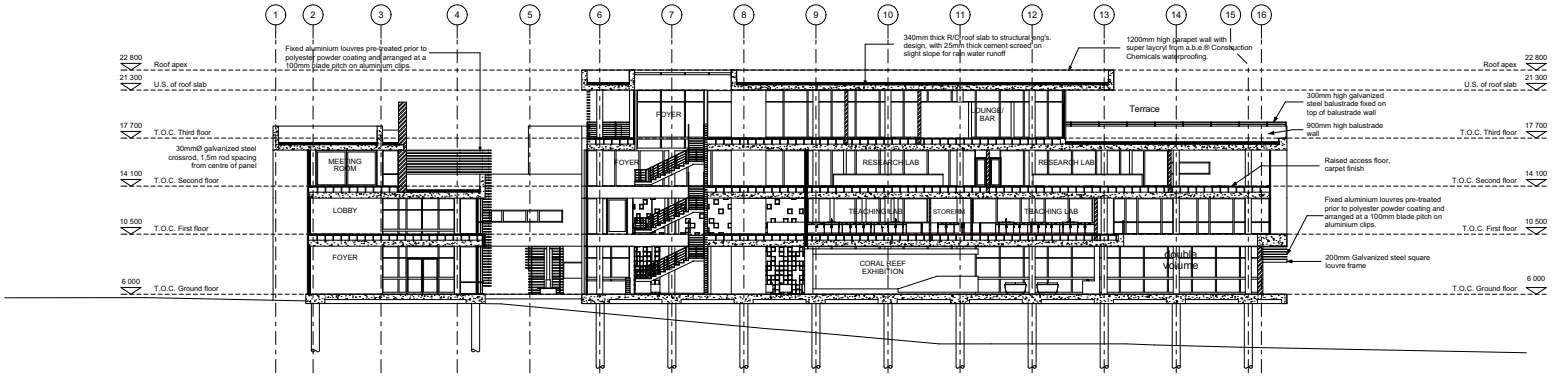

SECTION - A2
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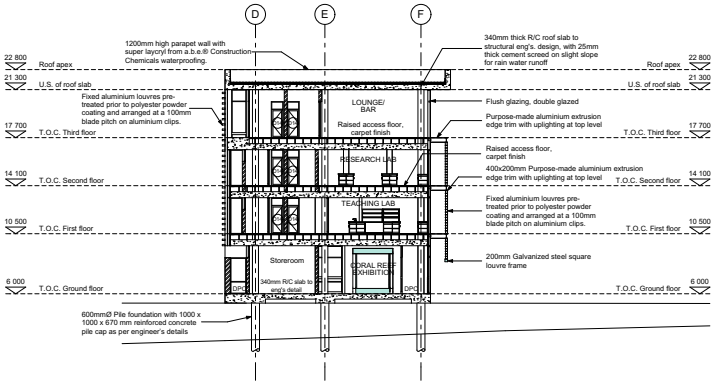

SECTION - A1
SCALE 1 : 200

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DRAWING TITTLE
EAST ELEVATION AND SECTIONS A1 & A2

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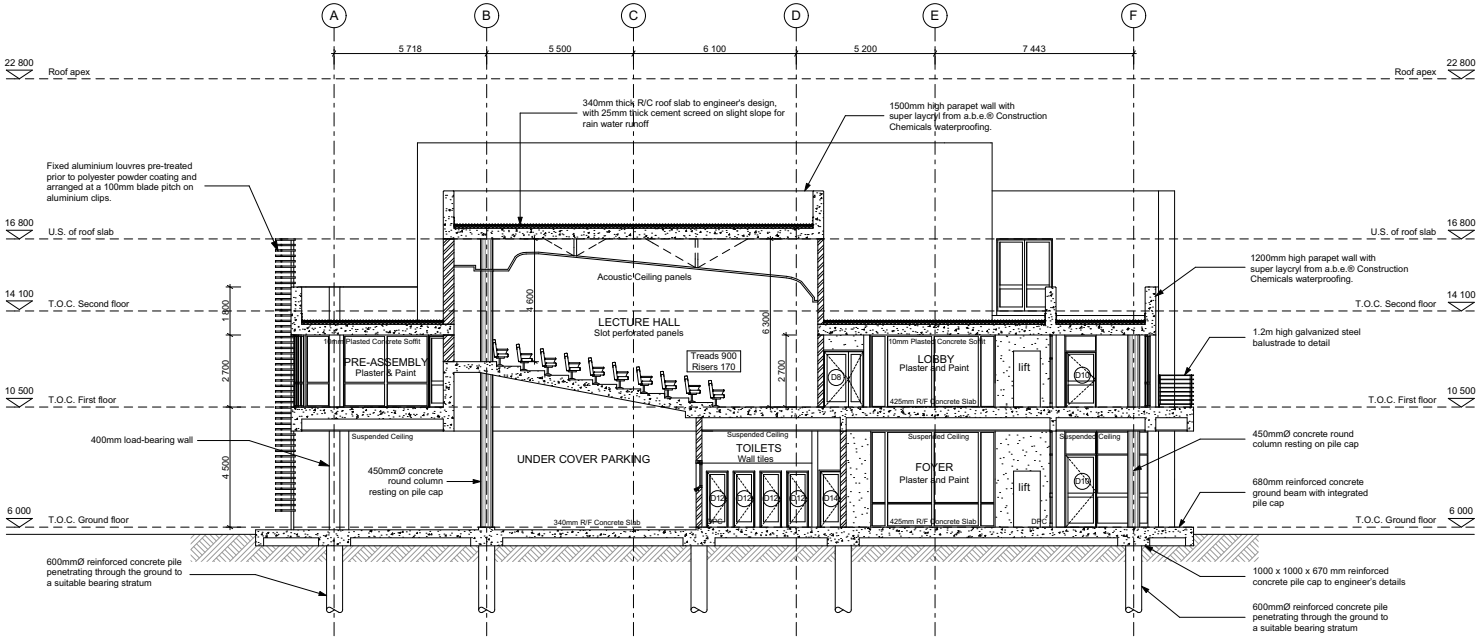

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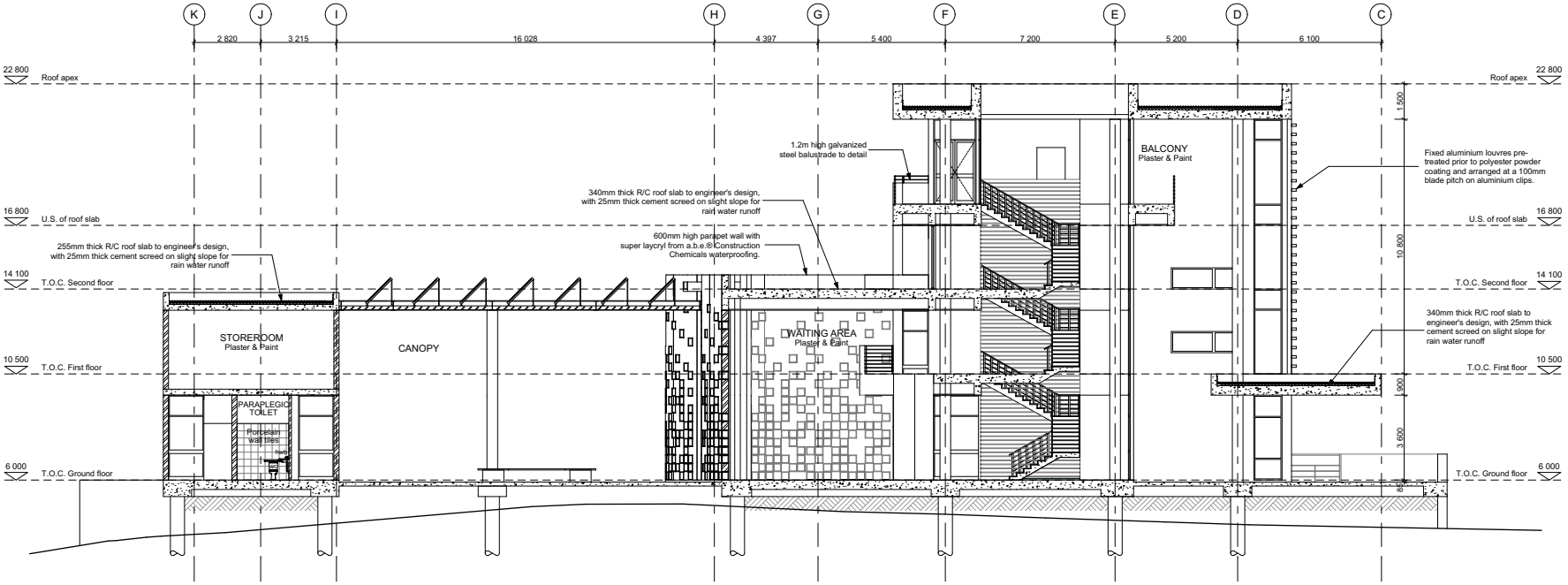
SCALE 1:100



SECTION - A4

SCALE 1:100

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DRAWING TITTLE
SECTIONS A3 & A4

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> “Learning without reflection is a waste; reflecting without learning is dangerous.”

CONFUCIUS, *ANALECTS*

i. Reflection

Resources for designing an aquatic science park were somewhat limited. After assembling what I could from libraries, I found that I only had a few of the pieces of the puzzle with little sense of how they would need to fit together. In order to compensate for this deficiency of information, I conducted a series of precedent studies of similar typology and/or theme of enquiry which would enable me to fill in the gaps. The pieces and possibilities of what such a facility could offer started to reveal themselves to me.

The issues of siting a research facility at the Katembe ferry dock were my first major hurdle. The impact on the city beach did not favorably impress the people in the surrounding neighbourhoods. The community feared that the construction of the facility would result in restricted access to the beach, as well as impinging on the serenity of their own properties. Considering the impact of aquariums in other cities, this concern was not without reason.

The next problem was the need for the aquatic science park to reflect and express the place where is sited, thus drawing for inspiration on local culture. Associated with this position there is a profound regard for history and a dialectical materialist understanding of it, which in turn has informed my appreciation of architectural history.

Through a commitment towards upholding the abovementioned values and design principles I resisted an engagement with the unsustainable practice of suburban development, and with the destructive threat of an emerging mass tourism that is being wrought on Mozambique. With such beliefs I have opposed the growing perception that architecture is only about 'form' and I have opposed the false veneration of the architectural object. And by doing so, the work demonstrated that good architecture, well-considered urban design and responsible planning decisions, in this time of political and economic uncertainty, can contribute towards improving the built environments of our post-colonial and post-modern condition.

In conclusion, the overall scheme of the aquatic science park met the ideas set forth in my thesis statement. The design challenges were solved by referring back to that statement and setting up a dialogue from which I could draw ideas for possible solutions. I embraced the technology in the design and I believe the work has made an indelible impression on the reconstruction of an architectural culture in Mozambique.

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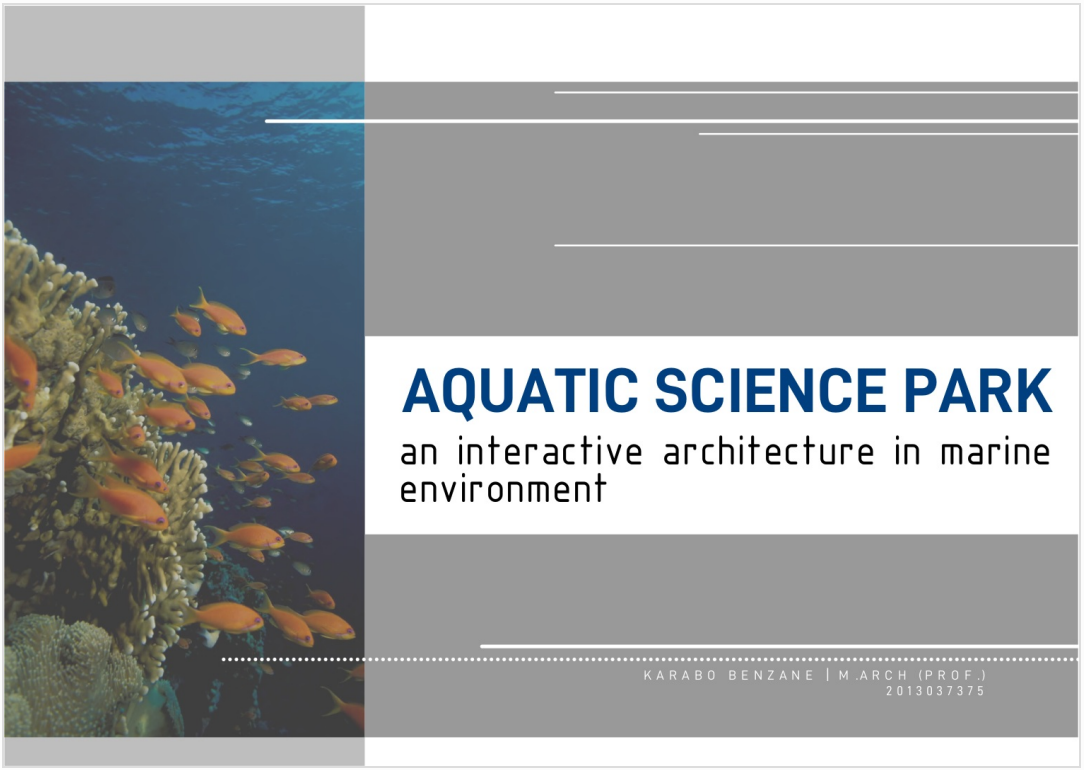

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