

URBAN LANDSCAPE LABORATORY:

A public industry for the research and development of rice and fisheries.

By Rainer E. Engberts

Decommissioned Cotex Ltd Textile Mill.

Chumbuni

Zanzibar

6.0848°S, 39.1253°E.

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Client: Department of Urban Planning and Villages,
Zanzibar.

Theme: Productive Landscapes

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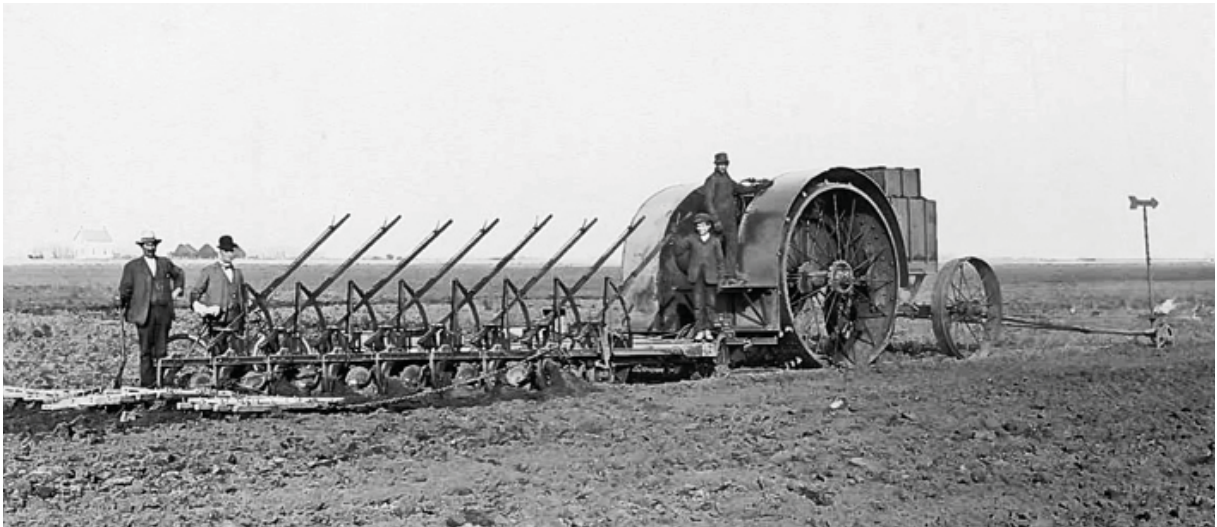


Figure 01: Machine intruding into the landscape.

This dissertation forms the Landscape Architectural component of a combined proposal and critique on a framework proposed by the Department of Urban Planning and Villages for the Chumbuni area in Zanzibar. [Fertile Grain forms the Architectural component].

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Thank you Fourie Pieterse and Prof Vosloo for the mentorship and guidance throughout the year.

Mein Gott, mein Vater und mein Partner. Ohne dich ist nichts möglich. Demütig danke Ich dir.

ABSTRACT

Landscape had significance to society once. The significance of these landscapes was associated with agronomic practices, a spiritual connection to nature, and a platform for social interaction within the community. To date, the sense of significance landscapes once had to human culture, has been lost. In the spirit of time, man has actively exiled himself from nature and its productive processes.

This dissertation focuses on the adaptive reuse of an urban drosscape. The decommissioned Cotex Ltd. textile mill is located in a densely formed urban environment, where the process of de-industrialisation and rapid urbanisation has transformed the rural environment into an ever expanding informal settlement.

The concept of a landscape machine represents the possibility to return a productive programme to a formerly functional and industrious land use, while at the same time reassuring that economic, social and ecological components establish in the urban setting. The concept of public industry becomes evident.

The aim of the project is to design a productive landscape that functions between man, the remaining post-industrial relics of the textile mill and the urban landscape of Chumbuni. The design integrates the existing industrial heritage to feed new social and educational programmes through means of a productive landscape, which in turn will address urban issues and propose rehabilitation strategies for the area. The landscape intervention will act as a hybrid landscape, encouraging the exiled man to return to 'nature' and to research, as well as test, sustainable landscape machines which are appropriate and functional to the urban environment.

The landscape design investigates the potential to integrate the agricultural and recreational experiences, in order to generate a new landscape typology for urban wastelands. The proposed programme celebrates the productive heritage of Zanzibar and incorporates this into the processes and experiences of crop cultivation, regional culture, social interaction and ecological development, as proposed products.

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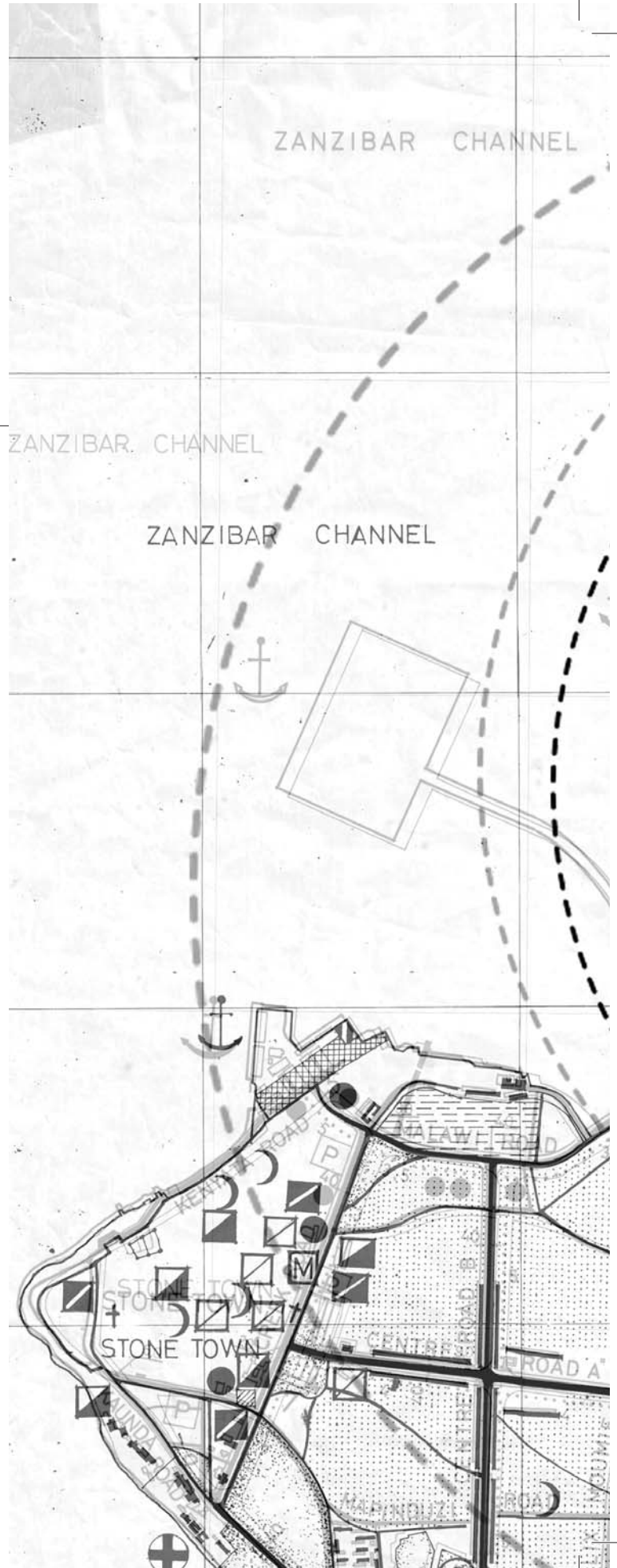


Figure 02. Framework collage with site location. Author, 2014.

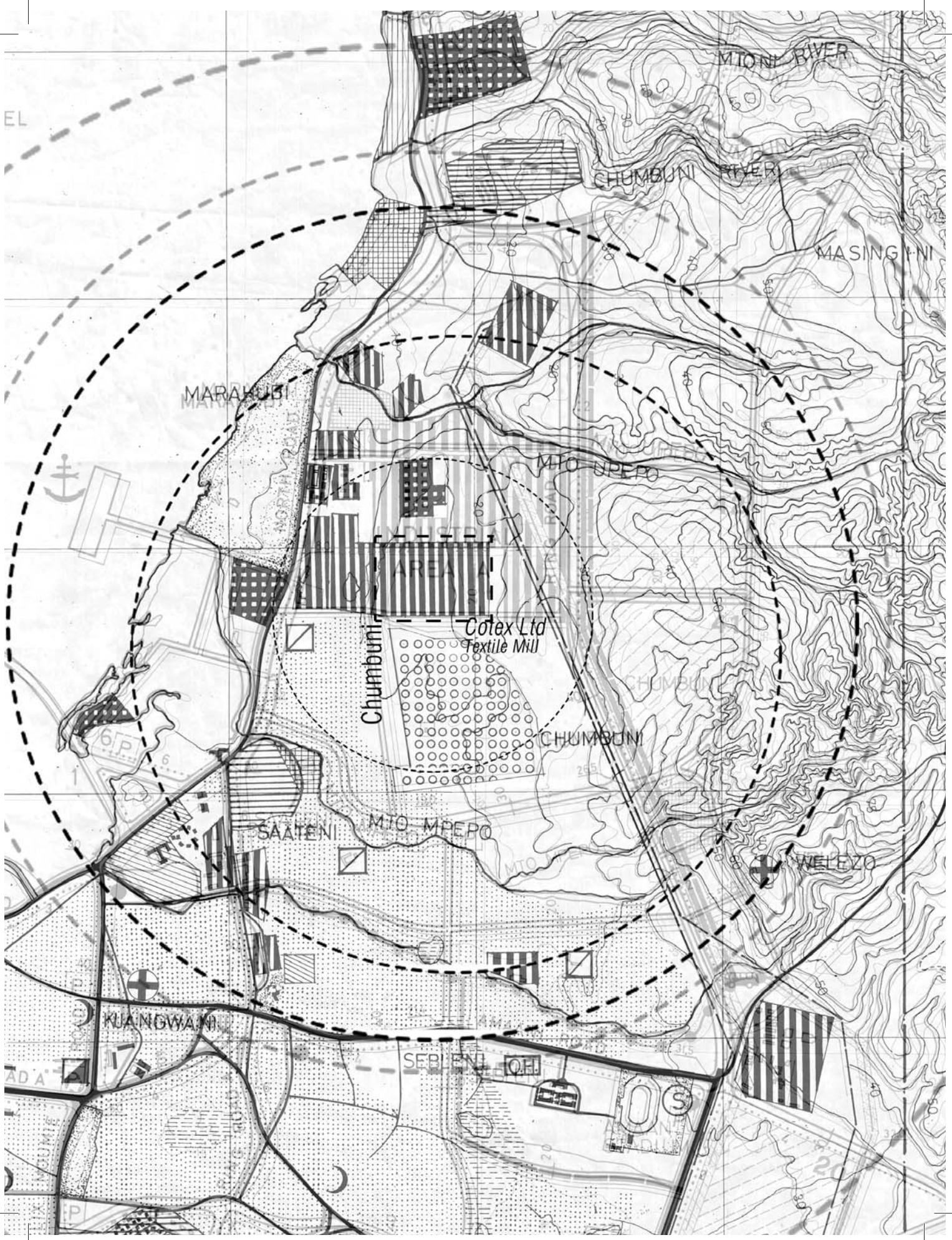


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01.01_INTRODUCTION

Unguja Island, more commonly known as the island of Zanzibar, is a sanctuary to countless layers of history and memory. Over time, these layers of the reminiscent past gave Zanzibar its unique character and identity. In space and time, many different cultures visited, migrated to or ruled the islands [Unguja and Pemba] mainly for the benefits of trade as well as production [Lanchester, 1923:19].

Arabs, Persians and Indians were motivated to use Zanzibar as their central base for trade voyages between the Middle-East, India and Africa [Lanchester, 1923:24]. Monsoon winds carried more than thousands of slaves from the African continent into the rest of the world. Later on, the Portuguese Empire, as well as the British Empire, exploited Zanzibar's central location on the east-coast of Africa, to supply their ships and to strategically control trade dealings from international protectorates back to their motherland. For many centuries the trade and production capacities on the naturally fertile archipelago moulded the identity of Zanzibar.

In the mid-1980s the free trade policy was introduced which allowed for an increase in foreign investment and tourism, but also an increase in foreign imports. As a result, trade and production-based industries decreased or shut down due to rising competition from cheap foreign imports.

In recent past, Zanzibar has shifted its economic focus. Contemporary Zanzibar is exploring an alternative approach to celebrate its unique identity, namely to solely increase the tourism industry. It is evident, however, that the original sources of influence on the zanzibarian identity have been neglected and forgotten. This can be perceived in the scarcity of locally available products, underutilisation of

agriculture resources and the rapid deterioration of productive as well as industrial areas. Various abandoned agriculture fields and industrial areas will soon develop themselves into a network of drosscapes, as defined by Alan Berger [2007:232].



Figure 03: Sultan's Palace of Wonders, Zanzibar, Stone Town.



Figure 04: Princess of Mtoni, Seyyida Salme.



Figure 05: Arab Slave Traders, East Africa.

01.02_PROBLEM IN CONTEXT

Zanzibar has lost its central location in the trade and production industry on the East African Coast. It has lost its capability to supply, firstly, local demands and, secondly, international demands for locally produced goods. This new sense of incapability weakens the very productive identity it employs to attract tourists from all over the world.

The decrease of local trade and production in the last 30 years [Office of Chief Government Statistician, 2012] has shifted and changed the identity of Zanzibar, which brings several issues and problems to the urban composition of Zanzibar City.

Due to sprawling and urbanisation, the urban environment is consuming the rural setting, where 'cities eat cultural and rural landscapes, urban eats rural, and rural eats wilderness' [Geuze & Skjonsberg, 2013:32]. Yet within the city context of Zanzibar, vast areas of industry and commerce have developed into exiled territories and forgotten spaces, fragmented into the urban landscape of the city. These spaces become empty pockets of land, which contribute towards unsustainable functions to the city.

01.03_STUDY AREA

The study is focused on a network of waste lands of open space which is located in the Chumbuni area in Zanzibar City. The study area is located to the north-east of the historic centre of Stone Town, and the international seaport [refer to Figure 07].

In accordance with the Zanzibar planning frameworks of 1958, 1968 and 1982, the greater Chumbuni area has always been reserved as a multi-programmed industrial and agricultural area. In the last three decades, many industrial operations, which have been located in Chumbuni, have shut down, allowing the area, to a large extent, to develop into an informal residential settlement.

At the present time, the network of waste-land and open space acquires a very limited programme. Individual sites operate in isolation and therefore at minimum capacity. The study calls for a 'landscape machine' that has the potential to introduce productive, social and ecological processes to the Chumbuni area.

Because of its urban quality, the site most suitable to test the hypothesis and research questions of the dissertation, is an abandoned industrial site on the northern periphery. Previously, the large industrial structure functioned as a textile mill, but at present is decommissioned, where the warehouse facades imitate empty shells in a fine urban grain.

Figure 06: Map of East African Coast and Zanzibar. Author, 2014.

01.04 _ SITE SELECTION

The Department of Urban Planning and Villages of Zanzibar have identified certain problem areas in Zanzibar City, which include the lack of services, infrastructure and recreational spaces. These areas acquire urgent attention on an urban and site specific scale. Graduate students from several international universities in countries, such as the Netherlands, Sweden and South Africa were invited by the Department to explore and investigate these problem areas and propose feasible solutions.

The Chumbuni site classifies as a high priority for the Department as the context and site holds great potential for architectural and landscape architectural interventions. Therefore, a team composed of an architect and a landscape architect [Author] from the Department of Architecture at the University of Pretoria, are working together to identify urban

and site-relevant problems simultaneously realising an integrated design intervention.

A combined interest and incentive by the Department, several investors and the design team exists to successfully develop and re-appropriate the Chumbuni area within the city's context. In addition, the success of the project must also contribute to the Revolutionary Government of Zanzibar's vision to transform Zanzibar City into the foremost metropolitan city on the east coast of Africa

The post-industrial site provides the opportunity to devise solutions that would address the infrastructural issues of rapid urbanisation, introduction of productive landscapes and the rehabilitation and reintegration of urban wastelands into the context of the East African city.



Figure 07: Nollie Map of Zanzibar Town. Author, 2014.

01.05_HYPOTHESIS

Urban wastelands hold the latent potential to be reclaimed and regenerated through the application of productive as well as performative landscape functions.

The rehabilitated landscapes will provide social, economic and environmental yield, allowing the diverse landscape processes to be measured and regulated. Reclaiming the industrial areas in Chumbuni as functional urban space will inspire a resilient and productive reconstructed environment.

01.06_RESEARCH QUESTION

1.6.1 _Can landscape architecture provide suitable rehabilitation strategies for urban waste lands?

1.6.2 _Can a post-industrial site in Chumbuni be reclaimed and regenerated within the urban context?

1.6.3 _Can landscape architecture introduce a performative and productive environment in a post-industrial site located in Chumbuni?

01.07_AIMS AND OBJECTIVES

The analysis and mapping of the existing economy, local ecology, tourism, social conditions as well as the character and identity of Zanzibar will be used to propose a design framework for the post-industrial land use sites.

The design strategy will invoke the art of engagement for spatial, programmatic and ecological planning. Coordinated strategies, including social, rehabilitation and productive strategies, will inform design decisions when considering the reuse and regeneration of the post-industrial site. These strategies will also propose appropriate design principles for framework and site-specific interventions.

01.08_RESEARCH METHODOLOGY

The dissertation will respond to available quantitative information, for instance governmental statistical abstracts and reports. Qualitative research strategies will also be included to introduce a well-founded theoretical as well as practical intervention to the context and site.

This dissertation will also address site-specific problems through the research of theory and study of precedents to

identify possible problems and opportunities at a range of scales. The potential of landscape architecture as an effective design medium will be explored, which will respond to issues and unlock new regenerative, resilient and adaptive capacities.

The study of images, precedents - existing as well as theoretical, informal interviews and literature research will be used as a basis to address the diverse aspects of landscape architecture, from strategy and process planning to spatial quality and tectonics.

the various aspects thereof. The author will focus primarily on the issues that are relevant to landscape architecture. The Department of Urban Planning and Villages of Zanzibar will be responsible for the successful implementation of this landscape design proposal.

01.09_CLIENT AND USER IDENTIFICATION

According to the Chumbuni Report of 2011 [Anon, 2011], which has been compiled by the Department of Urban Planning and Villages, the site in the Chumbuni area belongs to the Ministry of Information, Culture, Tourism and Youth. However, the Department of Urban Planning and Villages is mandated to give professional advice and explore an appropriate design proposal for the area.

The design intervention will translate a strong public interface and will therefore impact on, and improve the urban environment for current users, comprising of a small-scale agriculturists community, the temporary users, general inner city residents and tourists. New users will be introduced to the site through new design programmes, which will include education, market spaces, micro industries and recreation.

01.10_ASSUMPTIONS AND DELIMITATIONS

It is assumed that the 'Proposed Chumbuni Framework' of this dissertation is approved by the city council of Zanzibar. The framework will be incorporated by the author and will not limit the concept and design application expressed in the dissertation.

Available documented information of the greater industrial study area is limited or inaccessible. It is assumed that the industrial buildings are not older than 50 years and offer limited or no heritage value.

This dissertation covers a broad theoretical base, across various scales, rendering it impossible to cover all aspects at every scale. Consequently, this dissertation abstains from quantifying proposed or existing architectural elements and

02. CHAPTER TWO | Man and his Environment

02.01_INTRODUCTION

In this part of the dissertation, the intentions of man and his relationship within the environment is described. The influence of man on earth is not a modest one. Man is constantly reshaping his environment to harvest renewable and non-renewable resources. Therefore, man's assertive relationship towards his environment develops a distinctive character.

02.02_ORIGIN OF SETTLEMENTS

By about 25000 BC, the physical and organic evolution of the Homo sapiens is considered to have come to an end and the 'modern' processes of cultural evolution started [Morris, 1994:03]. Man was continuously in search for fertile land, which would allow him permanence in residence, as food resources would be available within reach of their shelter.

The History of Urban Form [Morris, 1994:04] cites that it is a generally accepted belief that the development of settled agriculture was the essential prerequisite for the evolution of urban settlements. The agricultural revolution created a sense of economy with an increasing food producing basis, therefore enabling a social unit to expand, resulting in the formation of small settlements within the natural environment. Society could successfully adopt an aggressive attitude towards their surrounding nature and advanced to the active exploitation of the organic world [Morris, 1994:04].

'Humankind started to exercise some measure of control over the supply of food through systematic cultivation of certain forms and plants, notably the edible wild grass seeds, ancestors of barley and wheat, and by the domestication of animals' [Morris, 1994:03]. The human population has developed as an active partner with nature, instead of a parasite of nature. This indicated the first steps in man's emancipation from the dependency of the external and 'wild' environment.

The island of Zanzibar are suitable examples, where settlements have originated and consequently expanded due to the exploitation of the naturally fertile land mass by means of fresh water sources and agronomic interventions. In the past, chiefs, sultans and revolutionary governments seized permanence of residence on the islands, due to the continuing availability of life-sustaining natural resources.

In contemporary Zanzibar, man as an urban dweller has to re-appropriate himself with the natural environment once more. The sustainable processes of the natural environment, not necessarily the setting, must be emphasised for the survival of urban settlements.

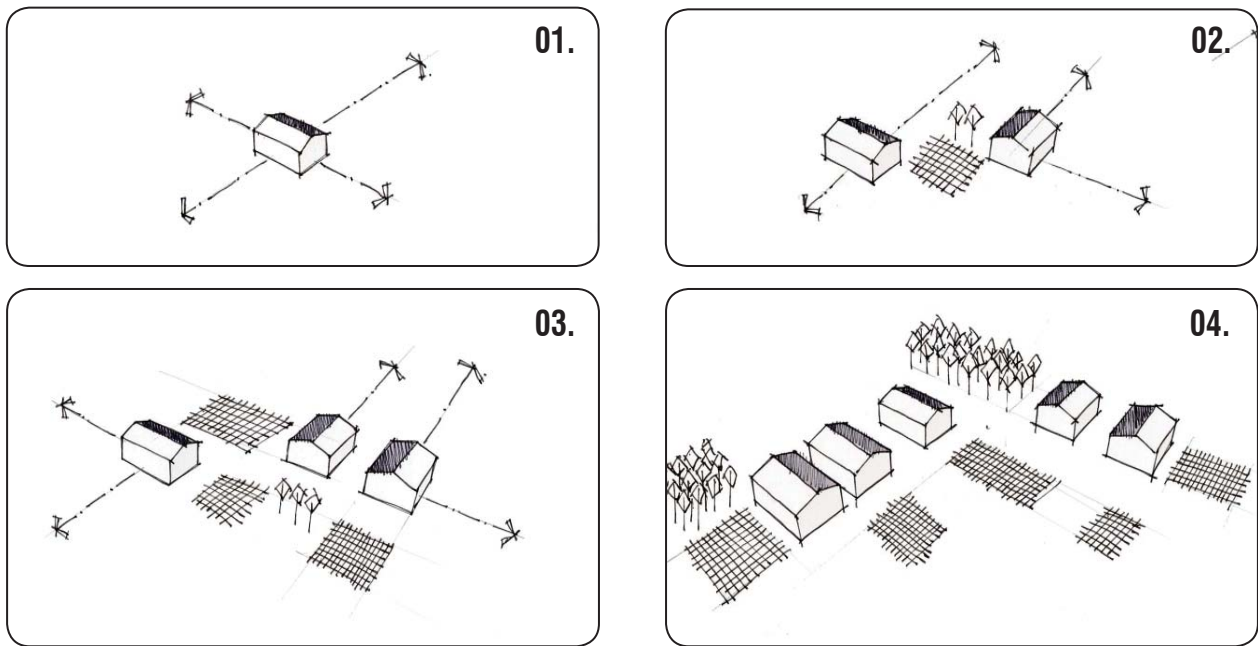


Figure 08: Timeline representation of settlement establishment. Author, 2014.

02.03 WATER

The characteristic of water becomes an important design driver for any landscape intervention. The life-sustaining aspect, the movement and the recreational quality of water is incorporated into the landscape design process.

02.03.01 The Nature of Water

Water. We ourselves are made of it. All living things, humans, plants and animals alike are principally water creatures. Without water we could not live for more than a few days. With water we can survive, create civilisation, play with it, manipulate it and make works of art to express the joy of living [Jellicoe & Jellicoe, 1971:09].

There is a natural poetry in water as it creates endless and dynamic patterns on the surface of the earth. In turn, these patterns have influenced human lives in art and philosophy. These patterns can be natural or man-made and can be anything from the formal little garden to the outline of a entire city [Jellicoe & Jellicoe, 1971:09].

02.03.02 Water in Use

According to Jellicoe and Jellicoe [1971:14], two major conditions for water use must be accepted: It must be kept in motion or it will stagnate, and except for evaporation, its movement in nature is governed by the law of gravity. The

movement of water seems almost timeless. It is biological and follows the laws of nature. For that reason water is not only poetic but also scientific, a work of biological engineering [Jellicoe & Jellicoe, 1971:09].

Large rivers and lakes can be considered the source of art in the water landscape. Human settlements expand along the riverbanks and shorelines. Man used water to transport goods, people, transport water in constructed channels to irrigate the fields and used bodies of water as defensive lines.

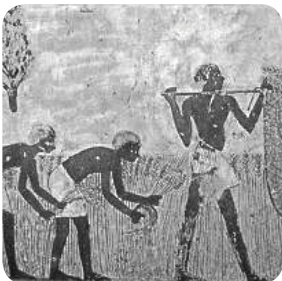
02.03.03 The Philosophy of Water

The Nile Valley symbolises future life. Persian Paradise Gardens symbolise heaven brought to Earth. 'Quietness and action are together the essence of all water design. Each has a philosophy of its own and the two together are most beautiful when seen in combination' [Jellicoe & Jellicoe, 1971:31].

Parallel to the philosophical scale, water influences the association of ideas. The idea of water within the landscape, rather than the reality, plays a considerable part in the creation of ideas and meditation for the mind and eye [Jellicoe & Jellicoe, 1971:31].

Images on opposite page from top to bottom: Figure 09: Adam and Eve. Figure 10: Agricultural Crops. Figure 11: Agricultural work. Figure 12: Egyptian depiction of Men working in the fields.

02.04 _MAN AND AGRICULTURE RITUALS



'Watching the sky form clouds, watching the birds fly low, looking at the colour of leaves and roots to learn about the biological clockwork. Learning that nature is repetitive when circumstances do not change, but knowing that no new year provides the same circumstances' [Roncken, 2011:102].

Many of the rituals in the quote stated above have not only enriched agricultural rituals of production and yearly rituals working on the field, harvesting crops and marking livestock, but have also established a culture of agriculture and hence laid the foundations for culture in general. The beauty of an agricultural landscape is the interconnection between different landscape elements and continuous human ritual. Such landscapes include the body, mind and society as a whole.

Evocative rituals, such as summer and harvesting festivals, do not only relate to the agrarian work itself, but also include a social and cultural expression. But over time, agrarian rituals have changed into urban rituals and consequently the people who perform them become more urban and less agrarian [Roncken, 2011:102]. The rhythm of rituals is broken.

Can the different relationships between food, harvest and labour that coincide within forgotten agrarian rituals be reintroduced into a complex urban context?

02.05 _A PUBLIC INDUSTRY

The setting of the industrial site within a dense residential area motivates that the local community has to be involved in the design, as well as operational processes of the landscape intervention. The concept of public industry is introduced, where the community is an integrated mechanism in the living functions of the productive landscape. The public acquires agency or stewardship of the landscape, allowing local economic and educational development. Additionally, research and testing programmes, conducted by the research facility, regulate and control the environment of the productive landscapes.

The productive and educational programmes introduce the basic principles for a productive, yet social landscape, where through transparency new programmes can be attached to the intervention to accommodate future development.

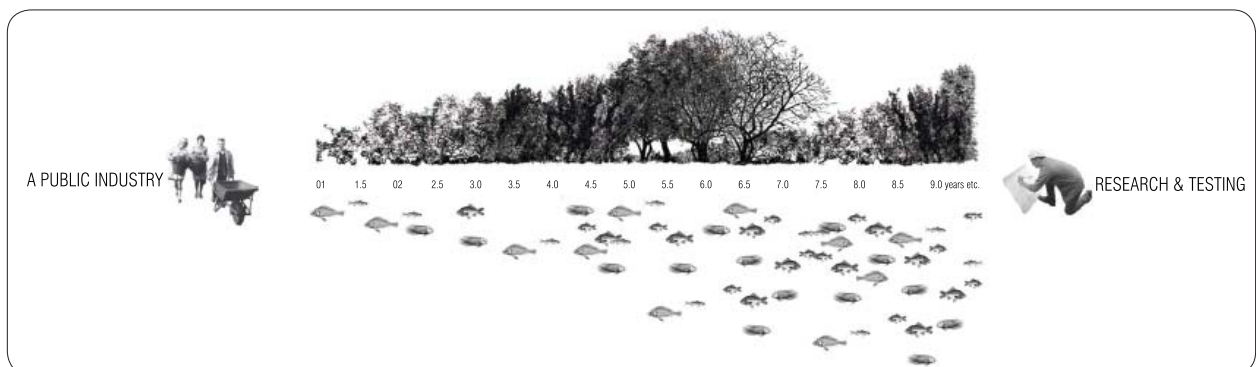


Figure 13: Landscape industry. Author, 2014.

030 | **02.06_PRODUCTIVE LANDSCAPES IN ZANZIBAR**

Topographically, Zanzibar is relatively flat. The soils of Zanzibar can be categorised as firstly, deep soils and secondly, hard coralline limestone [Lanchester, 1923:09]. The deep soils are found on the western part of the islands and are very fertile, allowing for permanent agriculture. Coral rag soils occupy the eastern part of the islands and can be characterised by a thin layer of soil pockets and coral outcrops. This soil type is of less fertile quality and most dominantly forest vegetation has established itself in these areas.

The diverse and fertile soil characteristics of the land allows for the many land use patterns to establish themselves within the landscape. In 1982, based on 1977 aerial photographs, about 80 different land use patterns were identified [Anon, 2010].

This indicates that different sectors, such as agriculture, livestock, forestry, industry and tourism, to only mention a few, make up different land use patterns. When combining the different land use patterns, they make up a complex network of land use matrixes and landscape mosaics.

On Unguja Island alone, productive landscapes make up around 35.7% of the total land use patterns [Anon, 2010]. Agricultural land, forest plantations and other agrarian areas make up the basis of productive landscapes that have been carved into the existing landscape by human hand.

Nonetheless, productive landscapes in contemporary Zanzibar are in a vulnerable state. Due to various socio-economic problems, many plantations are poorly managed or totally abandoned, which drastically reduces the productive capacities of these landscapes. The future of these landscapes may transform into 'post-agricultural landscapes' as explained by Kerkstra [2004], where landscapes shaped by agrarian processes and productivity are transformed into hostile landscapes of agrarian imagery, with no anatomy for future land use matrixes.



Figure 14: Plantations, Zanzibar.



Figure 15: Coconut Plantations, Zanzibar.

Figure 16: Contextual Photographs. Author, 2014.



02.07_AVAILABLE RESOURCES AND CARFTS

Different productive land-use patterns yield a variety of renewable and non-renewable resources. Considering the context of Zanzibar, the origin of available resources can be classified into three main categories:

- 01] Local production
- 02] Imported from the mainland [Tanzania]
- 03] Imported from remote locations [Asia and Middle East]

Readily available materials from the island are mainly resources that are easily available in nature, such as coral stones, sand and clay bricks, coconut trees, and lime. On the other hand, materials imported from the mainland are already processed resources, for instance steel, timber, cement, glass and 'tanga' stones.

Due to the rapid development of tourism on the island in the last three decades, a large amount of local inhabitants have neglected their original working skills to occupy tourism-based employment, such as freelance tour and adventure guides, tourism managers and taxi drivers.

For that reason, local craft-related professions have decreased in urban areas, allowing for the influx of a foreign work force. Craftsmen that still operate in urban areas include carpenters, boat builders, tool makers, blacksmiths and masons to only name a few.

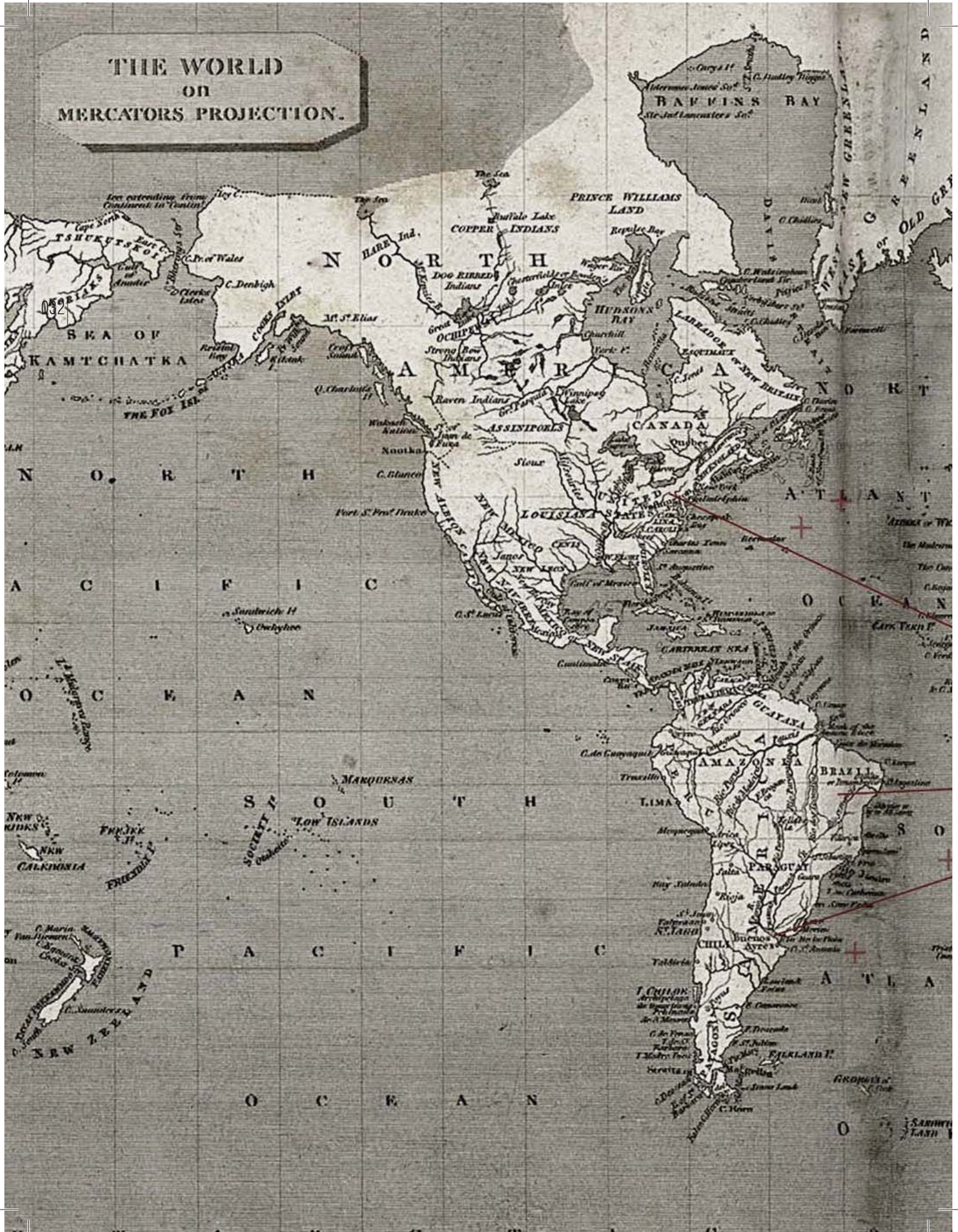
02.08_CONCLUSION

In time, the influence man has on the environment can be represented as a beneficial relationship for humankind. The images of transitional urban environments do not necessarily morph smoothly into a gradual sequence of imagery. The concept of palimpsest becomes evident. This concept is used to describe how different generations alter the landscape created by their ancestors. Whenever the landscape is remodelled and rebuilt, evidence of the former uses remain.

Zanzibar Town has established itself around the favourable conditions for productive landscapes in a natural environment. The flow of resources from these productive landscapes to local markets, town centres and eventually into the rest of the world, has imprinted its character and identity onto the fabric of the historic town.

Later on, industrialisation and mass production introduced a new relationship between man and his environment. But in contemporary Zanzibar, due to the consequences of deindustrialisation, man's relationship with the productive landscapes and artefacts is rapidly deteriorating.

At present day, these landscapes and artefacts are decaying and exiled from the city context. They have transformed into lost or forgotten spaces, but the palimpsest of space and time is still manifested into the landscape.



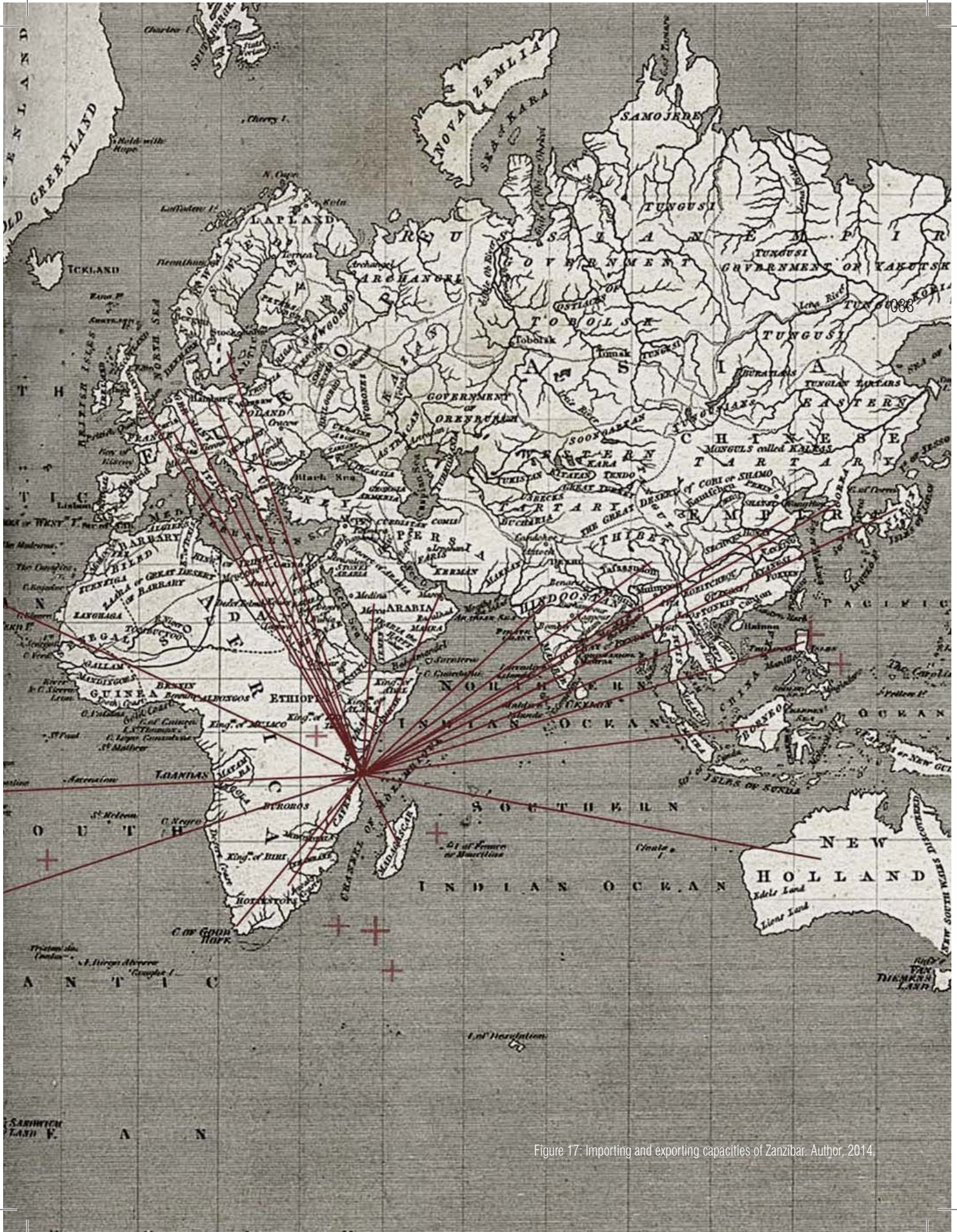


Figure 17: Importing and exporting capacities of Zanzibar. Author, 2014.

03. CHAPTER THREE | Revealing the Potential

03.01 _ INTRODUCTION

In collaboration with an architect, a group was formed to conceptualise a new programmatic framework in the Chumbuni area.

The 'Proposed Chumbuni Framework' provides a design proposal to which architecture and landscape architecture can effectively respond to. The programmatic framework maintains that the context and content [architecture and landscape architecture] are interwoven into an overall uniform concept. This framework will therefore provide guidelines for the detailed design interventions by representing large scale systems, strategies and design solutions.

An analysis of the Chumbuni area and its existing frameworks, including large scale development proposals by the Department of Urban Planning and Villages in Zanzibar, were also completed to inform the overall framework design strategies.

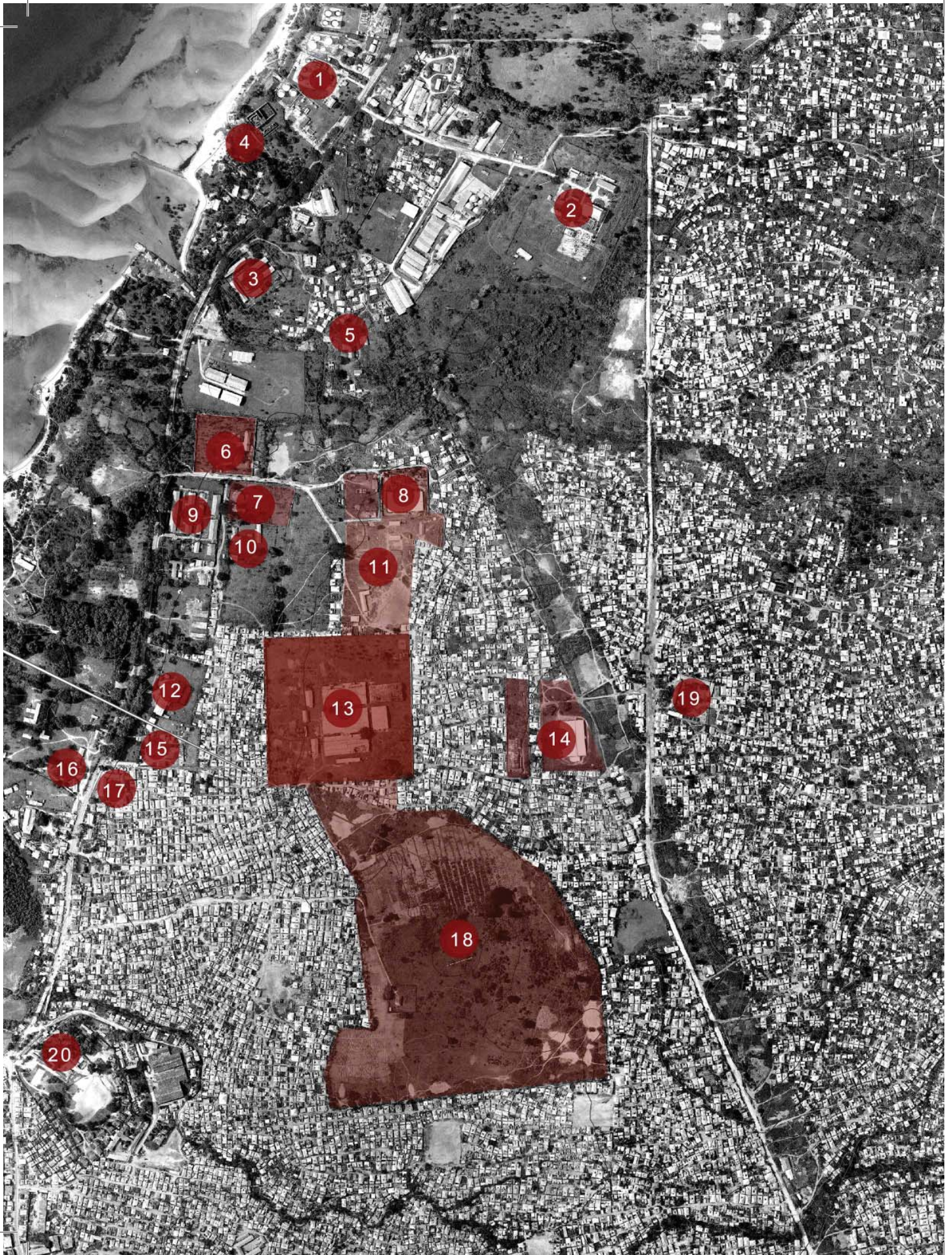
A programmatic framework will be proposed for the Chumbuni area at the end of Chapter 04 together with proposed conceptual strategies and sections.

03.02 _ SITE PROXIMITY AND POTENTIAL

According to the various planning frameworks of the past, the greater Chumbuni area has been zoned for three main uses: a transmitter station, industry and smaller agricultural establishments on the northern fringe.

The study area is in close proximity to the Central Business District of Zanzibar City [3 – 4 km], the international seaport [3 km], various fresh produce markets [such as Darajhani Market, Forodhani Night Market etc.] and the central transport hub in Malindi [2 – 3 km], which accommodates 'dala dala' [buses], taxi's and scooters.

This close proximity of the site to important nodes and destinations provides an opportunity to propose a landscape intervention that is interwoven with existing urban fabric and public systems. The proposal will encourage improvement of the Chumbuni area, but at the same time allowing the greater Zanzibar City to once again experience a healthy urban environment.



The network of waste-lands and open space are polluted, degraded or informally cultivated. The network of drosscapes has the potential to re-establish vanished ecological processes, including productive functions that can be beneficial within the greater context.

Local fresh produce markets and street vendors in Zanzibar City strengthen the demand for agronomy in the city. Local craftsmen require a constant supply of quantitative as well as qualitative provisions, reassuring the claim for locally produced materials and products. Through the reactivation of several productive industries in the Chumbuni area, urban agriculture will increase the availability of fresh produce and locally produced materials in the urban setting. Therefore, re-energising the network of drosscapes and open-spaces into performative, productive landscapes and processing plants will be advantageous to the society, economy and environment.

Figure 18 Legend:

- 01. Mtoni Fuel Depot
- 02. Saateni Electrical Substation
- 03. Shoe Factory*
- 04. Mtoni Palace Ruins
- 05. Coconut Oil Factory
- 06. Dairy*
- 07. Coconut Oil Factory
- 08. Warehouse*
- 09. Cigarette Factory*
- 10. Cattle Research Centre
- 11. Chicken Farm*
- 12. Feed Mill
- 13. Cotex Ltd Factory***
- 14. Afrochem Ltd Factory*
- 15. Soft Drinks Factory*
- 16. Veterinary Department
- 17. Primary School
- 18. Transmitter Station*
- 19. Clinic*
- 20. Secondary School

[*urban wasteland]

Figure 18: Context Map. Author, 2014.

03.03_CONTEXT CHARACTERSITICS

Similar to most African cities, Zanzibar City is a city that is rapidly urbanising and is facing major social, economic and environmental deficiencies which are challenging the resilience of the city.

Due to the consequences of rapid centralisation to urban centres in the 21st century, the Chumbuni area has reprogrammed itself and developed into an informal residential settlement.

Opposing the fine grain residential areas, large-scale warehouses and factories are located on the northern periphery of the site. These distinct and dominant architectural typologies have for many decades formed, the identity of the district as a productive cityscape, but are no longer operational.

Several informal, as well as formal, open spaces exist within the context. These open spaces have different programmes within the public realm and have adopted the forms of their functions in the community. Public interaction on all of these open spaces is evident, as some spaces are safeguarded for recreational as well as agricultural uses and other spaces are polluted and used as dumping sites.

Open space wastelands and abandoned warehouse or industrial sites form a large-scale drosscape network [refer to Figure XX]. The various drosscapes have lost their relationship to the context and regressed into isolated urban islands, displaced into the backdrop of a dynamic residential area.

03.03.01_Social Potential

'Harvest, fertility and labour deliver a temporary performance that shapes not only the land, but also society' [Roncken, 2011].

The Chumbuni site is situated on the periphery of a multi-programme urban background, with adjoining industrial, agricultural and residential establishments enveloping the site. Working within an urban context, the social potential of a landscape intervention is probed.

03.03.01.01_Informal Interviews and Dialog with the Agricultural Community

Listening to the opinions and ideas of the local community can provide additional, but foremost, valuable information. Due to a Swahili-English language barrier, only informal interviews and conversations, assisted by a translator, could be conducted.

Information, such as infrastructural elements, available resources and agricultural land-use patterns concerning the immediate site and the context were shared, which could not be derived from aerial photographs, additional maps and spatial frameworks was shared. The data collected during these conversations with the local community carried additional value to the planning and design processes of the landscape intervention

03.03.01.02_Zanzibar City Fresh Produce Markets

Zanzibar, especially Zanzibar City, consists of a whole network of diverse markets. Spice, textile, timber and fresh produce markets play an important economic, as well as social role in the local communities.

The various market spaces in Zanzibar City attract local in-

Figure 19: Context and Site Photographs. Author, 2014.



habitants from various proximities to trade and barter goods. Public interactions between street vendors, suppliers and customers are evident, creating a social atmosphere that is unique to the specific market scene and Zanzibar in general. This social atmosphere is also willingly experienced by tourists from all over the world. The vastness and open-endedness of the social network amongst market-related human interactions highlights the social potential a multi-programmed agricultural intervention has.

03.03.01.03_ Community Intervention on Site

The idea of 'public industry' is a basic concept to encourage the surrounding communities to participate in the design and planning processes of the site. The term 'public industry' allow the communities to become functional entities in the landscape intervention not only during the conceptual and construction phases, but also in the course of an operational phase. The landscape intervention becomes a productive industry, which is driven and maintained by society.

Furthermore, in the dissertation 'Mamelodi as a case study for urban agriculture in South Africa' [Moloto, 1995], the author investigates the social interaction and implications that productive landscapes, more particular urban agriculture, have for the local communities and households directly associated with urban agriculture practices and rituals.

Moloto concludes that urban farming provides a platform for social interaction with other people. Vegetable gardens and agricultural plots are places for social interaction. Moloto [1995:89] states that urban farming develops new friendships within communities, where the members lend tools, assist in weeding, watering and in some cases even sharing the agricultural produce with one another.

03.03.02_ Economic Potential

An agricultural intervention on the site will not only signify the economic potential of the site, but it will also, in general, benefit the greater city context. Contemporary Zanzibar, contrary to its past, has drastically reduced its capacity to export locally cultivated, produced and manufactured products, and in turn records more imported goods.

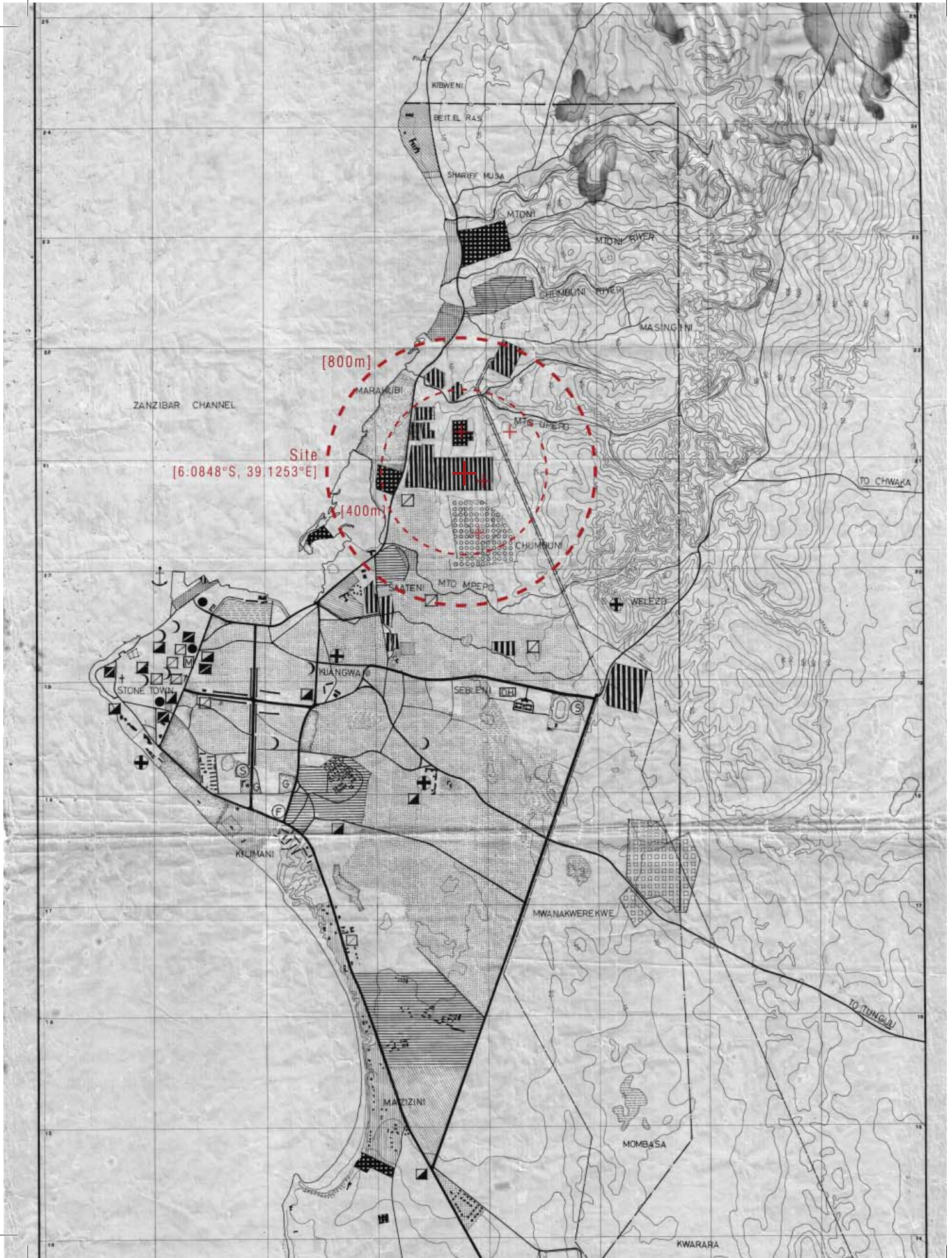
According to the Zanzibar Statistical Abstract [2010], the balance of trade [imports versus exports] has been steadily declining since 2006. In the year 2006, the balance of trade was negative 72041.00 million TSh, in the year 2010, negative 111 230.10 million TSh and according to these values the current balance of trade 2014 can be estimated to negative 150419.00 million TSh [Anon, 2010].

Introducing a production based agronomic intervention on the site, with the emphasis to rehabilitate and connect the surrounding drosscape network to the production cycle, will show great economic potential and increase Zanzibar's future exporting capacity.

03.03.03_ Environmental Potential

In the current neglected and rapidly degrading state of the drosscape and open space network, several environmental issues have to be addressed to increase the environmental potential for a productive landscape intervention. A proposed productive landscape intervention has the potential to mitigate possible environmental issues that occur off and on the site.

Unsustainable stewardship of land by local residents and government has resulted in innumerable man-made environmental issues. Environmental concerns such as flood-



ing, erosion, inorganic waste disposal, loss of fauna and flora and unsustainable water management can be resolved by the successful implementation of productive landscape strategies.

03.04_ PROBLEM STATEMENT

The isolated form of the study area, caused by the strong enforcement of zoning policies and a chain-link boundary fence, has led to the development of a distinctive 'untouched' character of the site.

The manifested separation between site and its urban setting has resulted in a disconnectedness of activities and energies from the rest of the city. A strong contrast exists between the City of Zanzibar and the Chumbuni area, as well as the Chumbuni area and the site.

041

03.05_ 1982 PLANNING FRAMEWORK

Over the past century, several urban planning frameworks were compiled by different external contributors. At first, the British Colonial Empire and later East Germany and the Chinese Republics were responsible for producing numerous urban planning schemes of Zanzibar City.

According to the Department of Urban Planning and Villages, the Chinese framework of 1982 is considered to be the most recent framework of Zanzibar's metropolitan area and is regularly used as a reference source for present and future town planning developments.

It is clear that the framework of 1982 is out-dated and that the present urban conditions and land-use patterns are direct results due to change over time. The site in the Chumbuni area, north of the transmitter station [marked with a circle hatch] in figure XX is surrounded by multi-programme spaces, such as residential [fine dot hatch], industrial [thick line hatch] and agricultural [thick grid hatch]. Several natural features, such as the close proximity of the coastline, the Mto Upepo River to the north, the Mto Mpepo River to the south and a large mountain escarpment to the east, also envelop the site.

The site has a central location in a multi-programme network of spaces. This renders the site the possibility to directly and indirectly interact with its surrounding context and functions.

03.06_ PROPOSED 2011 FRAMEWORK

In the year 2011, the Department of Urban Planning and Villages compiled a written report on the Chumbuni area. Several investigations and analysis of the site were done to determine a suitable proposal for an appropriate new use in the Chumbuni area.

In general, the Planning Department identified that the Zanzibar City, as an unplanned city, is facing major problems such as lack of social services and economic infrastructure, which jeopardise Zanzibar's business competition with Tanzania and East Africa [Anon, 2011].

Figure 20: Proposed Land-use plan from 1982 Framework. Author, 2014.

Therefore, the focus of the design intervention, according to the Department, can be divided into three priority groups:

P.01 Infrastructure for social services / socio-cultural facilities

P.02 Ministry of Education of the Arts / Arts and drama education facilities

P.03 Ministry of Health / Health facilities.

042 | In conclusion, the Department of Urban Planning and Villages recommends that culture and art will be a major catalyst for social and economic development in the Chumbuni area. Zanzibar, as the hub for the Swahili culture combined with its strong tourism-based economy, will benefit by the implementation of infrastructure for modern art and social services [Anon, 2011].

03.07 REVIEW OF PROPOSED 2011 FRAMEWORK

The strongly defined boundaries around the transmitter station and the abandoned industrial sites have for long periods of time prevented any interaction between the site and the context. The site, therefore, developed into an urban island. The proposal made by the Department of Urban Planning and Villages, suggests several alternative design proposals with a strong mixed-use recreational incentive.

The design proposal, on the other hand, does not relate to any adjoining residential, industrial or open-space areas presented in the context of the site. The design plan stays fixed within the defined boundaries that were constructed more than 50 years ago. With very limited access points, the site will remain an isolated system within a fine grain urban context.

The design proposal is, to a certain extent, very formalistic, where little regard has been shown for possible future developments in an informal setting. The transition of scale and grain from the context to the design proposal, and vice versa, has been neglected.

The design loses its capability to encourage a more multi-functional use of land and does not adaptively reuse or respond to existing architecture and landscape architecture. The proposed framework does not create the opportunity to integrate existing industrial structures and abandoned land into the design programme. The proposed design should act in response to the dedicated land, for instance urban agriculture which will in turn provide economic and educational opportunities.

The site, in general, has many urban concerns. A sensitive design approach has to be followed. Firstly, appropriate infrastructural elements and land-uses have not been carefully considered. For instance, infrastructure can be implemented that will prevent flooding and erosion, but will allow for successful water management to agronomic land-uses.

Secondly, the Department's design proposal does not form a relationship between current and historic site conditions. In time, the direct context and site were transformed and distorted by various man-made and natural events. These events are responsible for the formation of particular site characteristics and opportunities, such as construction, agriculture and fertile soil due to flooding. Specific land uses and infrastructure have to be designed as integrated landscape features and in accordance with existing site conditions.

044

The documented 'Chumbuni Report' and the proposed framework plans do not necessarily relate to each other and, are therefore in conflict with one another. The current design development for the proposed framework by the Department of Urban Planning and Villages indirectly prevents the opportunity for a new landscape typology to be introduced into the city, which can be both productive and uplifting to the Chumbuni residents.

03.08 CONCLUSION

It is important to comprehend that two overall issues influence the proposal of the Chumbuni area. Firstly, the 1982 City Framework is an out-dated planning strategy. At present, it forms the basic guideline for town planning in Zanzibar, but it is unable to address rapid evolving urban issues in the city. Secondly, the proposed site framework by the Department of Urban Planning and Villages does not relate to the programmes, architecture, landscape and lack of infrastructure in the direct context and if established, will operate in isolation, once again creating an urban island.

The site and the context demonstrate complex urban issues. Decision making and design processes must become telescopic, sliding across different scales and interventions, no longer defined by a single profession, but rather by trans-disciplinary and trans-boundary collaborations [Belanger, 2013:20]

04. CHAPTER FOUR | Framework

04.01 INTRODUCTION

For the development of a productive and living landscape framework to be successful, the outline of the allocated Chumbuni site has to be expanded. Several open spaces, drosscapes and public spaces are included to form a network of spaces.

Various spatial zones have different land-use patterns. The landscape design was informed by investigating past and present land-use patterns, such as movement patterns, housing patterns, natural processes and infrastructural systems, to predict possible future land-use patterns.

External sources of activities and energies are amplified and attached to the proposed framework. These will have catalytical reactions, allowing new energies along with activities to re-introduce and establish within the framework.

The concept 'boundaries of exchange' and 'openness' becomes central to the framework, as it is 'an interface that allows for the modulation of the relations and exchanges between the living system and the external environment' [Tiezzi, Cecconi & Marchettini, 2010:03]. External and internal mechanisms must work in cohesion to allow for resilient developments to follow.

04.02_FRAMEWORK PRECEDENT STUDY

Two framework precedents, from different time periods, were selected and examined to illustrate previous solutions and possible future approaches to framework design.

04.02.01_Boston Emerald Necklace

By Frederick Law Olmsted, 1896

048

Location: [42.3261°N, 71.1144°W]
Boston, United States, North America

Description: The Emerald Necklace is a network of parks, which comprises nearly half of Boston's park acreage. The chains of parks are linked by different landscape elements such as movement paths and waterways. The interconnected link between the different parks increases the resilience of the total network of parks. The park design allows for ecological and natural processes to establish themselves within the urban context.

For example, more than 300 000 people live within the watershed area. The design of the park assists with the management of stormwater in an urban setting and regulates the water drainage of the area.

Review: Despite the fact that the park design can be dated back to 1896, the project demonstrates several landscape urbanism principles. The Emerald Necklace exhibits that urban landscapes and green open spaces cannot establish themselves and/ or function as isolated pockets of land. The network of parks illustrates that landscapes, instead of buildings, are the most basic, and presumably the most important building blocks of a city to ensure that ecologically healthy cities are developed.

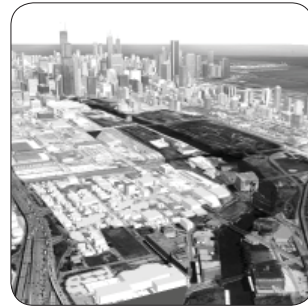


Figure 22: Digital aerial view.



Figure 23: Aerial view.

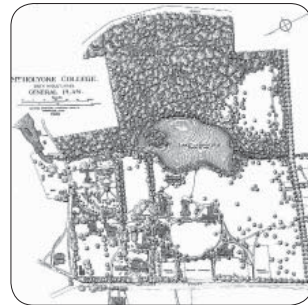


Figure 24: Plan extract of Park.



Figure 25: Plan of Emerald Necklace showing connected parks.

04.02.02_Park Supermarket

By van Bergen Kolpa Architects, 2010

Location: [52.4132°N, 4.9165°E]
Randstad, the Netherlands, Europe

Description: Van Bergen Kolpa Architects developed a spatial development model for a landscape supermarket, which is situated in the metropolitan area of Randstad. The site was once recognised as the country's icon for food production. Presently, due to rapid urban expansion, the site is situated in inner city locations and is under pressure of climate change, rising water tables and so forth.

The architects posed the question whether the site could play a new role in food and recreational needs for the Randstad population. The park supermarket follows the concept of an agrarian landscape park in a city, where the content of different sections in the contemporary 'supermarket' park are cultivated and sold directly on a 1600 hectare site.

Review: Globally speaking, food production is becoming an increasingly important aspect to consider for landscape architects not only in second or third world developing countries, but also in developed countries. Open space within the urban context cannot have, as in the past, a mono-function, but must consist of several programmes, strategies and functions.

The 'Park Supermarket' design expresses the possibility that parks can have multiple functions, such as food production and water management, but can also fulfil the necessities for recreational uses to society. The forms and functions of agrarian production and practices in the landscape can be manipulated and utilised to develop a new design language for landscape design.



Figure 26: Perspective of Park Supermarket.

04.03_EXPERIMENTAL MAPPING

04.03.01_Exploration of non-boundaries

An experimental mapping exercise was completed to investigate the concept of 'non-boundaries'. As previously mentioned, the existing site is enclosed by a large chain-link fence. This strict boundary between the site and the context has become a prominent landscape feature, emphasising the differences between the site and context.

050

A certain area for investigation was identified. The area is located on the boundary where the chain link fence separates the site's agricultural activities from a residential area that is situated in a low lying area, which regularly floods.

The relationship between the site and context were sketched. The negative and positive space of the figure ground in the residential area is synchronised with agricultural activities on site. The drift of the advancing and receding water flooding the area was also integrated into the conceptual diagram.

The various diagrams were then set out next to each other. The different compositions of the diagrams reveal several new land-use patterns and spatial relationships where the prominent impact of the peripheral boundary disappears.

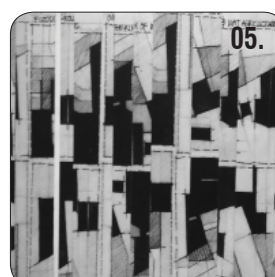


Figure 27: Exploration of non boundaries. Author, 2014.

04.03.02_Exploration of urban grain

The site in Chumbuni is located in a context with a fine urban grain. Different patterns of urban development exist within the context, but the mixture of formal and informal developments is perceived to be the most dominant grain formation.

Understanding the different developments and densities of the urban grain can provide a deeper understanding of how to appropriate form and function to the site. Various aspects were mapped and investigated, for instance the transition from fine to large grain developments or how open spaces are confined or even defined by urban grain developments.

For example, the architectural elements of the industrial and residential areas are evidently in contrast with each other. The industrial architecture is spacious, linear and coarse grained contrary to the fine grained residential areas with limited open spaces and rather organic formations.



Figure 28: Fine Urban Grain.

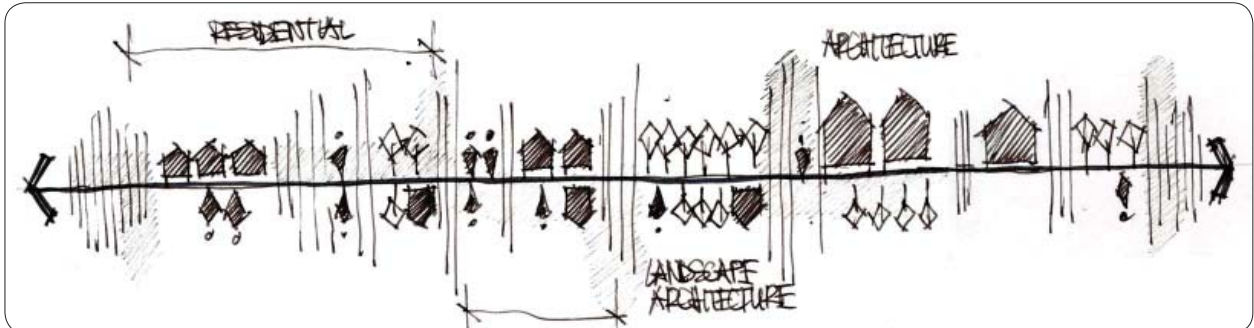


Figure 29: Exploration of urban grain. Author, 2014.

04.04 WATER AS A DESIGN DRIVER

Water, within the context of the site and surrounding environment, is a valuable resource, but also deemed a major urban issue. During the bimodal rain seasons, water is used to sustain agromorphic developments, but a large amount of stormwater runoff is responsible for the flooding of low-lying residential areas. The land is moulded by water.

The water design process followed a rational decision methodology. Water renders several opportunities and constraints in the Chumbuni area which need to be explored. The design process was initiated considering water availability mainly for water treatment strategies, urban agronomic practices and recreational uses.

052

Five major catchment areas have been identified that can provide water harvesting options to the proposed framework. The individual catchment areas were analysed to determine volume and quality of runoff water.

On a framework level, the stormwater runoff from the different catchment areas is directed into infrastructural systems. The proposed infrastructure is responsible for harvesting and transporting the water runoff into a network of water storage facilities.

Different infrastructural systems are employed. Large amounts of water are discharged into bioswales. These vegetated channels delay the peak flow during heavy rainstorms and treat the water quality close to the source. Bioswales and constructed wetlands can be considered 'soft-scape' infrastructure elements and deliver water to retention dams, which provide water to framework functions, such as aquaculture and irrigation. Bioswales and constructed wetlands are also considered to be passive recreational features in the landscape design. These landscape features provide multiple functions to the framework and support the underlying principle of a productive and living landscape.

Other infrastructural systems, such as 'hardscape' channels, are integrated with 'softscape' systems. Engineered channels are designed to increase flow rate and efficiency, and can be eco-lined with reno mattresses, which can provide plant growth and habitat creation. 'Hardscape' channels will be responsible to efficiently transport water amongst water storage facilities or through dense constructed environments, where the exact water flow patterns have to be established.

The main storage facilities proposed for the framework are constructed water reservoirs for aquaculture practices, retention and detention dams. Comparable to the multi-functionality of bioswales and wetlands, retention and detention dams contribute specific recreational values to the site and become a prominent landscape feature. Water storage facilities are interlinked with each other, aiming to accumulate the maximum amount of water on site and to distribute water to numerous landscape functions.

The harvesting, flow and storage of water become important aspects to consider on a framework level. The different interaction stages between the public, landscape and water direct the design strategy which infrastructural systems require. Water informs the layout of landscape mosaic. Several land-use patterns interact with water and are therefore dependent on a constant supply of water that is of certain quality. Water as a design driver is a vital informant, as landscape elements and features are shaped and manipulated to conform to its nature and function.

04.05_ URBAN DESIGN PRINCIPLES

The term 'Landschaft' in the German language can be defined as the environment of a working community, a setting comprising dwellings, pastures, meadows and fields [Corner, 1999:154]. The term 'Landschaft' can be consequently related to the German word 'Gemeinschaft', which refers to the forms and ideas that structure society in general.

054

Taking into consideration that the terms 'Gemeinschaft' and 'Landschaft' are tightly inter-related, the translated definition of 'Landschaft' signifies a profound and intimate relationship, not only among the elements of architecture and landscape architecture, but also among the patterns and matrixes of occupation, activity and space, bound within a certain time frame [Corner, 1999:154].

Understanding the definition of 'Landschaft', where performance and event assumes conceptual precedence over appearance and sign [Corner, 1999:155], the 'Proposed

ments, flows and variations, and when combined these land-use patterns form a multiplicity of landscape mosaics.

It is important that nature and culture are meshed together in the proposed framework. Land-use patterns must include and retain natural processes as well as human activities. 'Nature includes the biological pattern and physical processes entwined in vegetation, wildlife populations, species richness, wind, water, wetlands and aquatic communities. Culture integrates the diverse human dimensions of economics, aesthetics, community social patterns, recreation, transportation and sewage/ waste handling' [Dramstad et al, 1995:10].

To be able to look to the future, specific land-use patterns plus the framework proposal in its entirety must be able to support diverse activities in time, even activities that cannot be determined in advance. Therefore, the emphasis of the design shifts here from forms of urban space to processes of

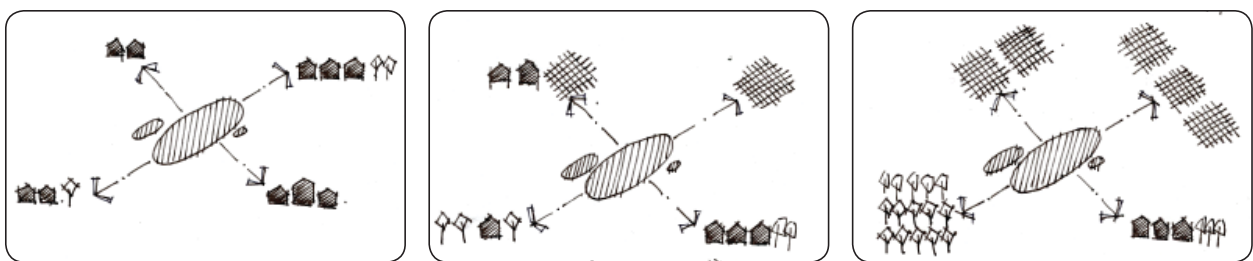


Figure 31: Framework Design Principles.

Chumbuni Framework' was arranged around the principle of different land-use and spatial patterns.

Landscape can be described as an urban surface of functioning matrixes of connective tissue that not only organises objects and spaces but also dynamic processes and events that move through them [Wall, 1999:237].

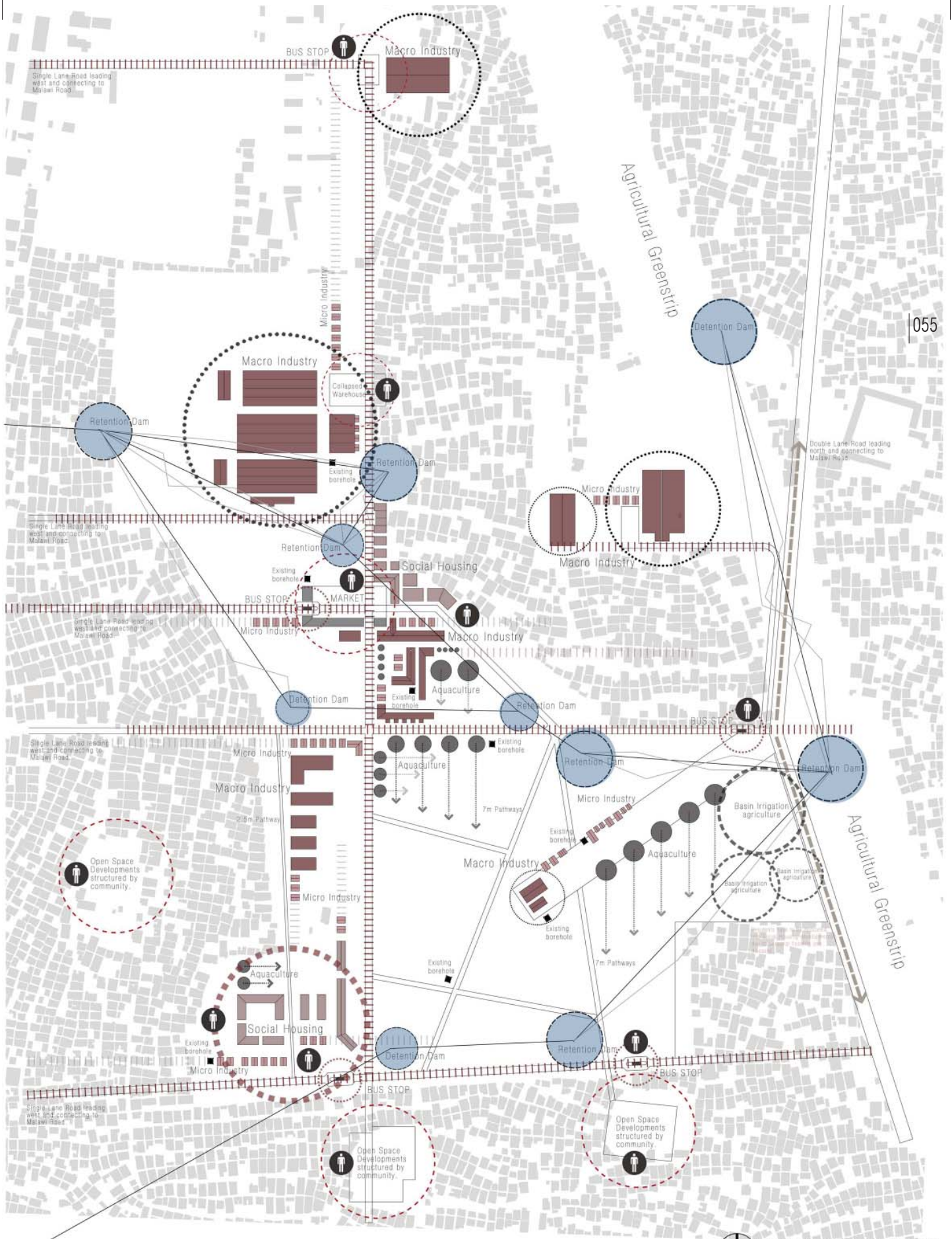
Various combined land-use patterns form a large heterogeneous area. The different spatial programmes and functions fit together into an overall conceptual design of landscape elements and regional ecology [Dramstad, Olsen & Forman, 1995:13].

The proposed framework consists of several land-use patterns, each contributing a different function to the landscape. Land use patches, corridors and matrixes control move-

urbanisation [Wall, 1999:238].

In conclusion, the proposed framework must be able to continuously develop its land-use programme and function with flexible, dynamic and resilient design interventions. In a sense, the framework must become the 'staging ground for unfolding future events' [Wall, 1999].

Figure 32: Framework Plan 01. R. Engberts & G. de Kock, 2014.



055

1 Framework System Strategy
Scale 1:2000

04.06_PROPOSED LARGE SCALE INTERVENTIONS

04.06.01_Residential and commercial

The residential area in Chumbuni has been classified by the Department of Urban Planning and Villages as an informal settlement. The unregulated construction of simple brick and mortar houses has produced a fine grained urban texture. Due to the uncontrolled expansions of these settlements, basic infrastructure and services are absent. This resulted in uncontrolled flooding of residential developments in low-lying areas during monsoon season.

Due to unhealthy urban issues, several residents have to be relocated into formal housing, which has been integrated into the 'Proposed Chumbuni Framework' and the fine urban grain. These housing developments are multi-storey buildings with mixed use / commercial opportunities, such as market and storage space on the ground level, and can accommodate 8-10 families. Each of these housing developments is centred around a courtyard with small scale agricultural interventions.

The formal housing developments are proposed on the periphery of the productive landscape core, performing as a transitional threshold between the existing fine grain residential area and the newly 'Proposed Chumbuni Framework'.

04.06.02_Micro and Macro Industries

As briefly discussed in the previous chapters, the Chumbuni area has a strong history linked to local industries and productivity. Although many industrial plants and warehouses within the framework are abandoned and derelict at present, the heritage and history is still relevant.

Micro and macro industries are reintroduced into the framework. At present, Chumbuni has a fragmented identity [which is not necessarily a negative aspect] as this area has been transformed and redeveloped into multiple land-use programmes in the last 50 years. With the reintroduction of various scaled industrial interventions, the local identity will be reinstated and reinforced. These industries will provide an economic catalyst as well as a potential driver for the Chumbuni area and for the country.

Similar to the mixed-use housing concept, micro industries will provide a number of transitional thresholds between the public interface and the productive domain of the framework.

Transitional thresholds are established to defined spaces between macro industries, fine grain residential areas and productive landscapes.

04.06.03_Infrastructure

Infrastructure is thought to only be relevant to the civil engineering profession. It must however be understood that infrastructural systems such as management of water, waste, food production, transport and energy, in an ever changing context of a city, cannot simply be engineered as in the past. They become design processes that lead to the formation of new spatial morphologies and performative ecologies [Belanger, 2013:20].

Hard and fixed infrastructure is replaced by landscape infrastructure. The design of landscape infrastructure is softer, promoting ecological processes with awareness of environmental services on a micro and macro scale. Landscape infrastructure remains operative, productive and performative by forming an infrastructural landscape with new morphologies and topologies [Belanger, 2013:20].

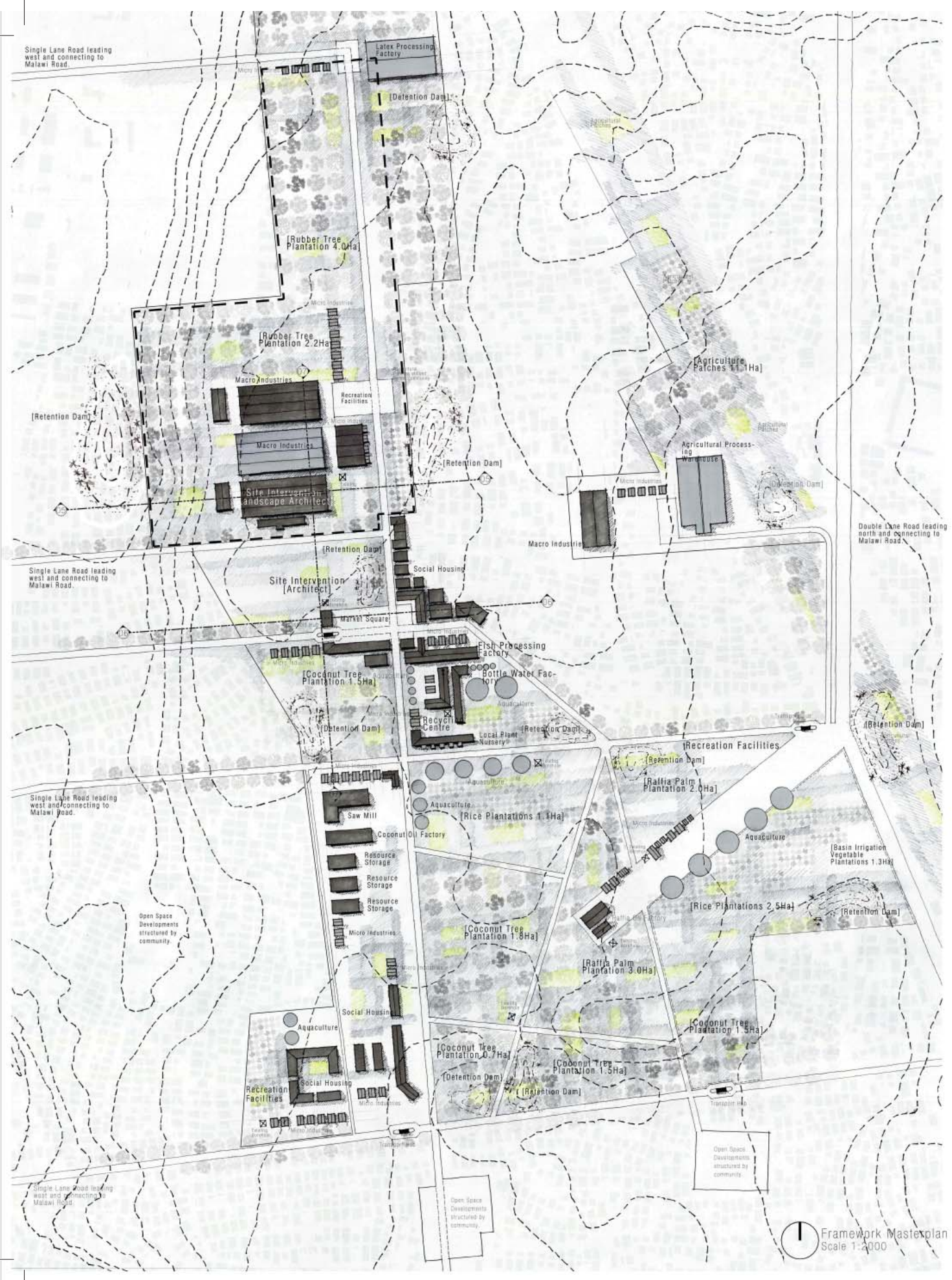
The implementation of landscape infrastructure reclaims lost biophysical processes and reintegrates ecological flows into the framework. The design strategy will provide greater flexibilities and adaptive potentials to accommodate natural offsets and peak flows more efficiently.

04.06.04_Agronomic cultures

Agronomic practices form an integral part of the productive and living landscape concept. The various cultivation processes maintain a cultural reference point for the people of Zanzibar, as different farming rituals have been essential to the population for many centuries.

The landscape performance can be measured by the input of resources and output of products. In essence, the proposed agronomic cultures have to be in a closed-loop system. Local and on site resources will be reused as input resources, where all necessary preparation and manufacturing processes will occur on site and the output of products will be sold to local markets and informal vendors.

Figure 33: Framework Plan 02. R. Engberts & G. de Kock, 2014.



Framework Masterplan
Scale 1:3000

04.07_'PROPOSED CHUMBUNI FRAMEWORK'

The 'Proposed Chumbuni Framework' focuses on the concept to re-establish the connection between the network of drosscapes and the context, where the existing character of the area is retained.

The main objective for the proposed framework is to reintroduce productive and living systems back into the network of derelict spaces. By means of productive landscapes and landscape infrastructure the framework is reconnected with the city, and urban issues such as flooding and food security are addressed.



Figure 34: Perspective of Micro Industries. R. Engberts & G. de Kock, 2014.

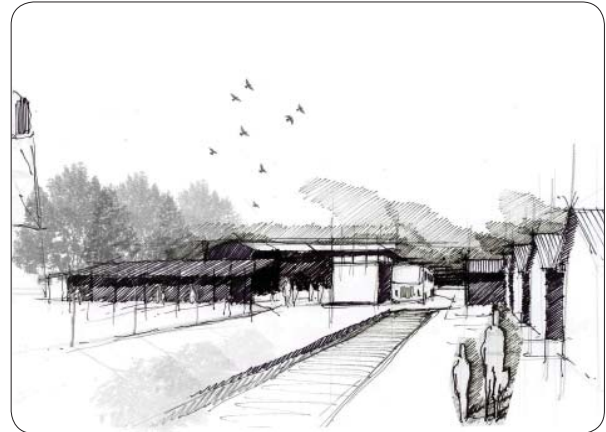


Figure 35: Perspective of bus stop and market area. R. Engberts & G. de Kock, 2014.

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Figure 36: Perspective of Aquaculture installation. R. Engberts & G. de Kock, 2014.

04.08_CONCLUSION

The proposed framework starts to break away from its isolated form and reconnects with its surrounding context. Re-appropriating the site with multiple new programmes, functions and activities will provide social, economic and environmental advantages without losing the character and identity of the context.

The framework proposes long-term solutions where the strategies are more important than a static framework product. The framework can adapt, re-adapt and transform itself over time to respond to the ever changing demands and programmes of the future.

Figure 37: Framework Plan 03. R. Engberts & G. de Kock, 2014.

060

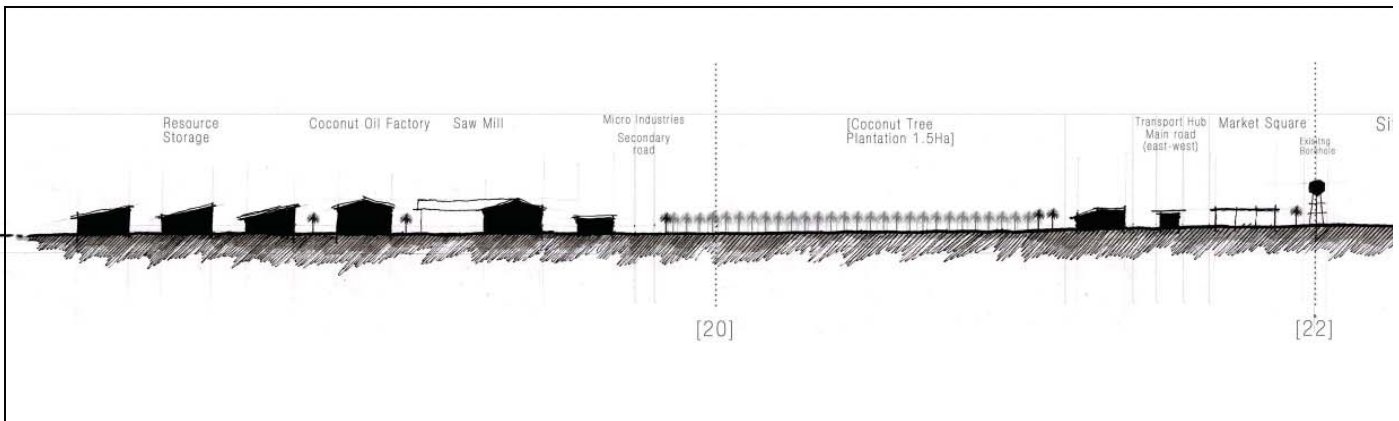
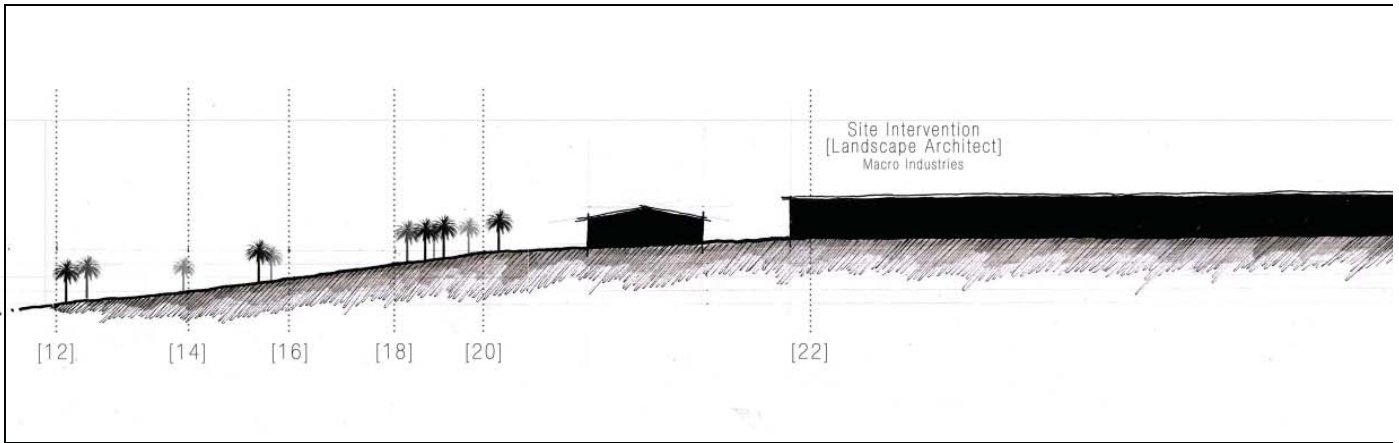
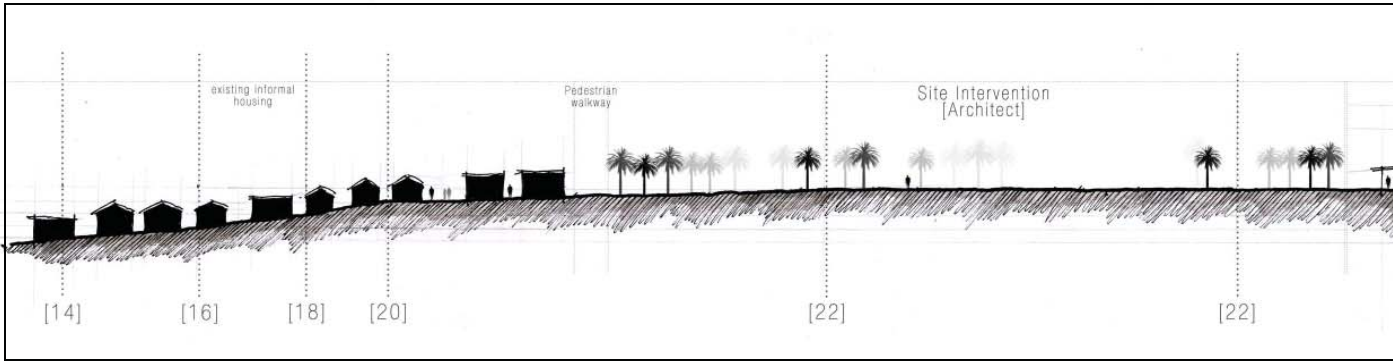
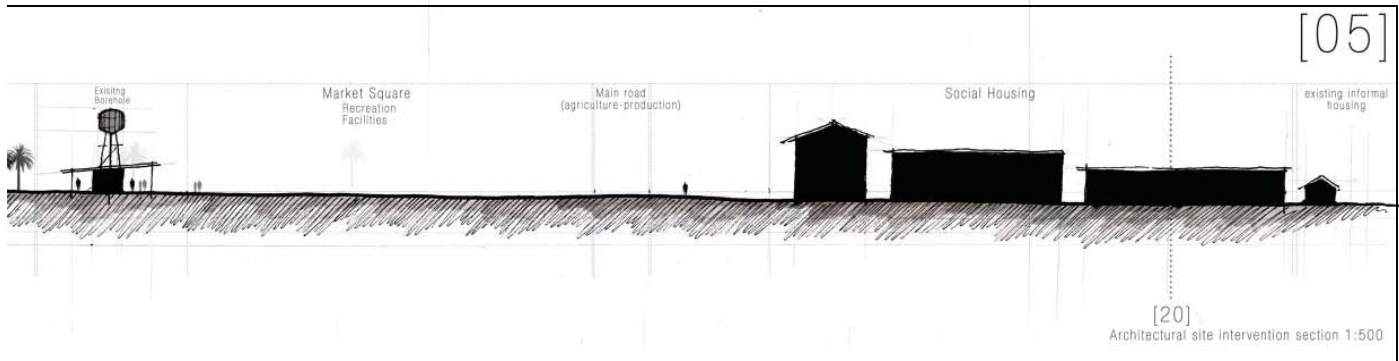
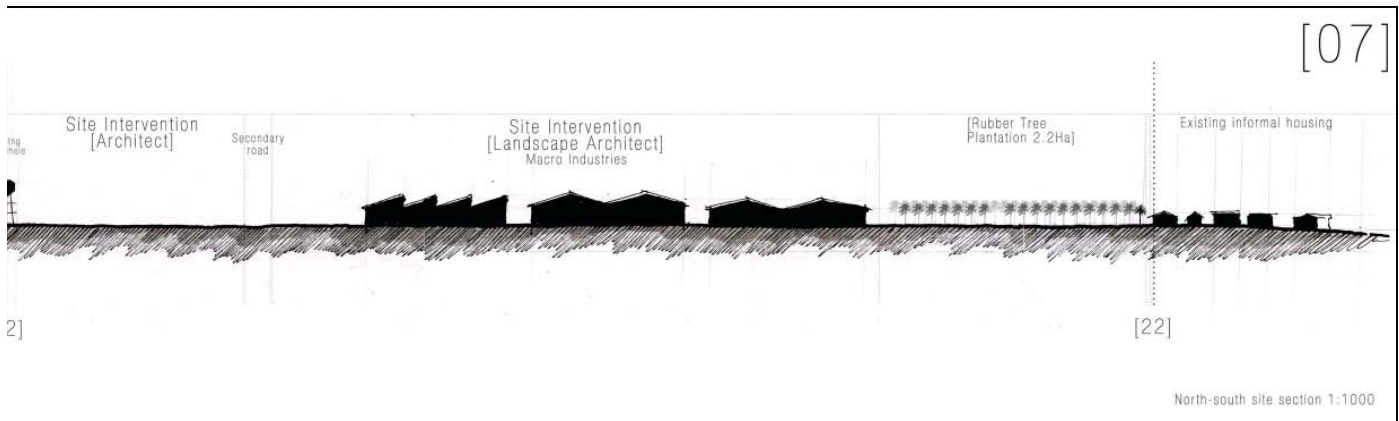
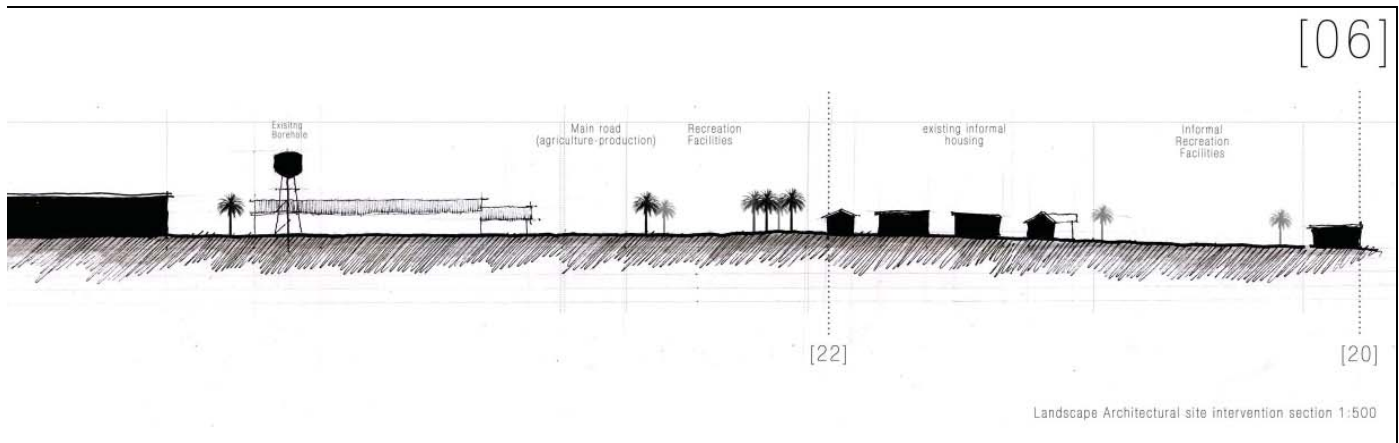


Figure 38: Framework Sections. R. Engberts & G. de Kock, 2014.



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05.CHAPTER FIVE | Theoretical Premise

The theoretical framework consists of two main parts. The relevant theory is discussed and related to conceptual design exploration. The combined theoretical framework is applied to the design development in Chapter 06.

PART ONE: NEW TERRITORIES FOR THE EXILED

The traditional concept of an urban park is a band-aid concept. The invention was created to liberate urban victims of their self-made, yet untamed, metropolis and guide them back into 'nature'.

The great parks of the 19th century fulfilled the promise of an urban nature, an illusion of utopia and paradise, but were conceived largely as an antidote to the ills of an industrial era [Geuze & Skjonsberg, 2013:30].

Today, cities are ever expanding and built on rural landscapes. Urbanisation is continuously breaking down or intervening in the fragile harmony between man and the natural environment. Since man has become, foremost an urban dweller, he is constantly searching for nature and is always striving to re-establish the lost connection.

05.01 THE CONSTANT SEARCH FOR NATURE

As early as ca. 45 BC, the Roman writer Cicero investigated the concept of different natures. In the classical text, *De natura deorum* 'The Nature of the Gods', he commented that an alternative nature exists. He states that a first and second nature exists [Cicero, 2008:102].

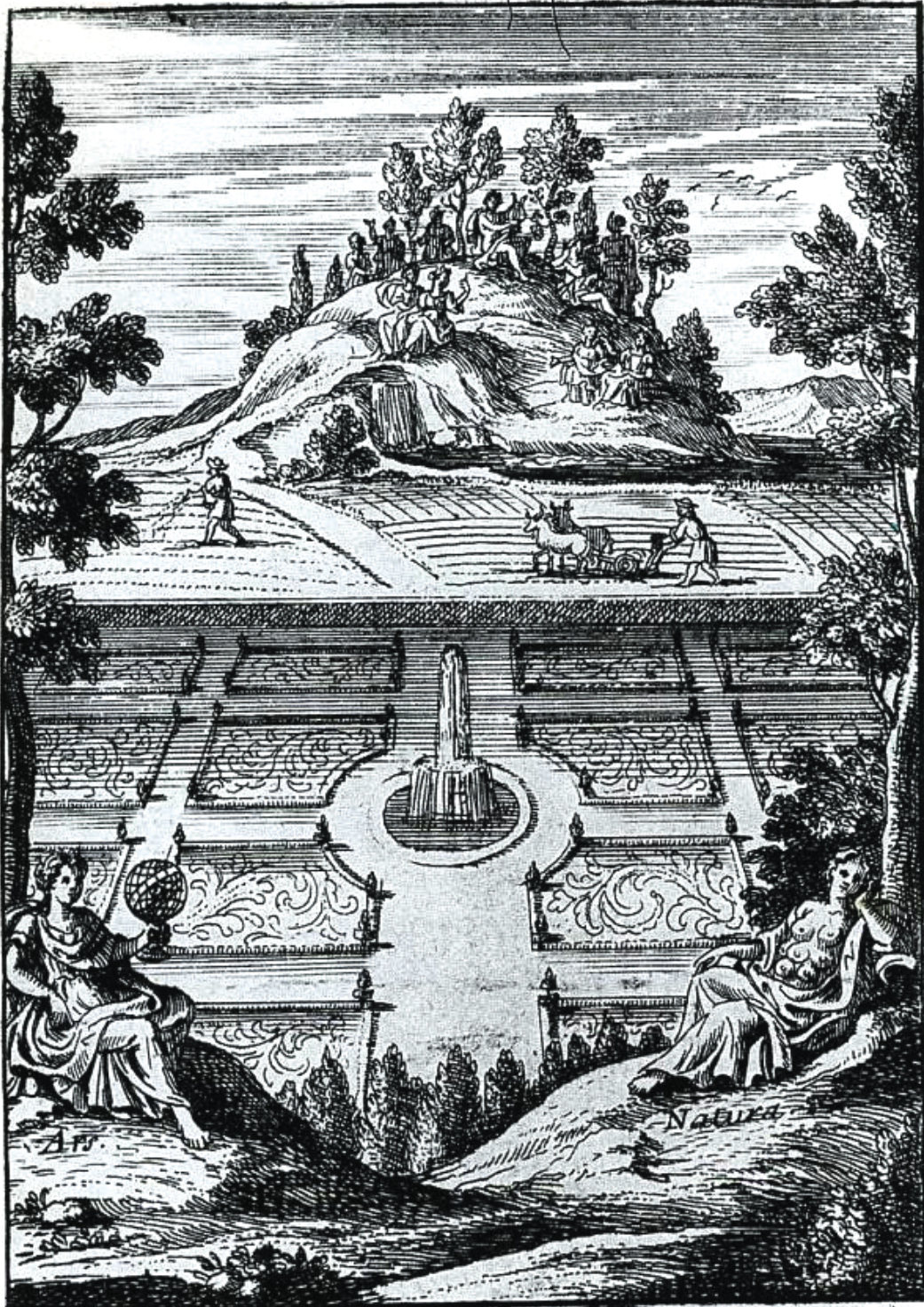
Cicero describes the 'natural world' as the primal or first nature, consisting of both, the raw materials for human industry and the territory of the gods. It is an unmediated nature or wilderness that is untouched by human hand and imagination. Cicero then defines the second nature as the world of citrus and olive groves, orchards and green pastures [Dixon, 2000:34]. He continues to describe the landscape

of second nature: 'We sow corn, we plant trees, we fertilize the soil by irrigation and we dam the rivers and direct them where we want. In short, by means of our hands we try to create as it were a second nature within the natural world' [Dixon, 2000:33].

At present time, this second nature can be explained as cultural landscapes: agriculture fields, urban developments, bridges, roads and other man-made infrastructural elements. It describes how agriculture and urban developments have been carved out of the first nature.

Acknowledging the allusions of Cicero, humanist Jacopo Bonfadio identified a third nature in the physical world. Bonfadio started to explain the landscape in a trio of natures, where the third nature had a greater scale of hierarchy of human intervention [Dixon, 2000:34]. Bonfadio's remarks 'For in the gardens the industry of the local people has been such that nature incorporated with art is made an artificer and naturally equal with art, and from them both together is made a third nature, which I would not know how to name' [Dixon, 2000:33].

It is clear that the third nature becomes a landscape that invokes in the later space making what we call landscape architecture. It becomes more sophisticated, more deliberate and more complex in the mixture between culture and nature than the agricultural land, as described by Cicero in his 'second nature'. The third nature emphasises the physical reworking by the cultural forces that organise human habitations and gardens in the landscape, where agrarian practices have been interchanged with theory and visual with verbal [Dixon, 2000:34].



CURIOSITEZ
DE LA NATURE ET DE L'ART

Figure 39. Trio of Natures.

05.02 _MAN'S INTRUSION BACK INTO NATURE

'There is an alienation of urban society from environmental values and cultural connections with the land. The technology that sustains the modern city has now touched every corner of human life, every landscape and wilderness, no matter how remote' [Hough, 1984:01].

The transition of the trio of different natures from the first to the third nature exemplifies the intent of man to intrude into nature. In essence, the second and third nature have been carved out of the primal nature or so called first nature. According to Oelschlager [1991:11] 'Once the agricultural turn was made, philosophy and theology sprang forth with a vengeance', and the idea of wastelands, badlands, hinterlands and wilderness was born.

Ultimately, nature has transformed into a separated object. It has been decontextualised and the third nature has taken its place in an artificial context, taking on the appearance of something 'natural', a pastoral image of nature. Man has created imagery of nature in urban developments, displaying wrongful emancipation and rhetorical outcome for the transformation of nature.

Leo Marx [1964:24] writes that the pastoral ideal is not just an art form but a mode of consciousness and in itself a social problem. Marx contends that through this pastoral ideal, man wants to live in a 'middle landscape' situated between nature's primitivism and civilisation's authority.

In the 21st century major metropolitan cities are decentralising and expanding. 'Cities eat cultural and rural landscape. Urban eats rural and rural eats wilderness' [Geuze & Skjonsberg, 2013:32]. Man's intrusion into nature is quickly becoming a commonality. Rapid urbanisation and de-industrialisation has put the landscape central to the interplay between social facts and aesthetic values [Smith, 1957:202].

The sketch of Hawthorne's 'Sleepy Hollow' by Currier and Ives, depicts a pastoral 'natural' scene that is shattered by a locomotive's shriek and transformed into an awareness of urban industrial power. The recurring image of a machine, which represents technology and industrialisation, in the landscape is more than an aesthetic representation of disharmony. It is in fact, a symptom of social conflict between the pastoral ideal and the growth of technology.



Figure 40: Hawthorne's 'Sleepy Hollow' by Currier and Ives.



Figure 41: Expansion into the natural world, Bradford, England.

05.03_DEATH TO NATURE

All natures are equal. In the 21st century, humans want to believe in the existence of nature and 'true wilderness'. As humans we often struggle to see ourselves as part of nature and consequently, we struggle to take responsibility for it [Bihan, 2012]. There is a cultural belief that nature is still a primordial and untouched condition, but nature is dead. The true existence of wilderness is dead.

'Mount Everest with its abandoned oxygen canisters and dead bodies, is an eloquent reminder of how first nature can be colonized physically as well as metaphysically. The problem is that once we get there to see it, it will no longer be, the wilderness' [Dixon, 2000:55].

Nature has become a controlled environment; a landscape created by humans and ultimately converted into examples of second and third Nature. In fact, every corner of the earth is marked, measured, laid out or has been occupied in some way or another [Geuze & Skjonsberg, 2013:22].

05.04 _THE URBAN DROSSCAPE

The whole world is deindustrialising and the world is urbanising, boosting the production of urban 'waste landscapes'. Inevitable 'waste landscapes' or what Berger [2006:199] refers to as drosscape, merge out of two primary processes. Firstly, rapid horizontal urbanisation or urban sprawl. Secondly, abandoned land within urbanised regions, after economic and production regimes have ended.

The definition of dross has mostly negative connotations and can be described as something worthless or rubbish [Oxford Dictionary, 2014]. 'The term drosscape implies that dross, or waste, is scaped, or resurfaced by new human intentions' [Berger, 2006:210]. For that reason drosscapes are dependent on the production of waste landscapes by other types of developments in order to survive.

The identified study area in Chumbuni forms part of a network of drosscapes. The network of drosscapes includes predominantly abandoned and derelict post-industrial warehouses and factories. Subsequently, the primary process of deindustrialisation has formed the 'waste-land' and is subsequently saturating urbanised regions, such as the Chumbuni area, with waste landscapes [Berger, 2006:211].

The character of the study area is determined by the architectural typology and layout of industry and local production. Additionally, the character is influenced by damaged vegetation, polluted natural water systems and contaminated soils. The productive history of the Chumbuni is imprinted into the fabric of the region and, to a great extent, forms part of the character and identity of post-industrial area.

At present time, the study area is essentially static and awaits innovative design strategies to reintegrate the 'waste landscape' with new programmes back into the city context of Zanzibar. 'Cities are not static objects, but active arenas marked by continuous flows and transformations of which landscapes, buildings and other hard parts are not permanent structures but transitional manifestations' [Berger, 2006:203].

The challenge therefore is to reintroduce flexible yet robust functions and aesthetics to the study area by re-establishing the opportunity for the area to attach itself to the flow of energies and resources once again. The design intervention within the study area must not be modest, but should address and improve landscape deficiencies of the urban environment on a regional scale.

The drosscape requires a design strategy that is capable of adapting and changing to the circumstances of the urban environment, while concurrently avoiding being too open-ended to succumb to future schemes [Berger, 2006:211].

05.05_NEW TERRITORIES FOR THE EXILED

The ancient cities of the world had a limited relationship with nature other than a proximity to natural resources, such as fresh water, and strategic considerations for access and defence [Geuze & Skjonsberg, 2013:33]. In the industrial era, the human population ignored nature completely. Humanity cleared forests, built motorways, greened deserts, defeated the seas and willingly exiled themselves from nature.

The migration to urban centres and the subsequent industrial exploitation of the natural resources has reshuffled the urban surface. The 'in-between' surfaces left over by the forces of urbanisation and deindustrialisation have developed into new territories, which display an on-going struggle between economics and nature [Lerup, 1995:88].

Within the current urban context the exiled find themselves searching for the presence of 'nature', yet they restrain themselves by living in urban centres that intrude and destroy the rural landscape.

The 'in-between' spaces provide the opportunity to reconnect with 'nature', but due to current urban complexities, 'urban nature', of a sublime illusion of paradise, contributes nothing to the city.

New territories for the exiled should adopt social and infrastructural forms that encourage nature and space producing potentials. These new spaces must respond to the challenges of formalising the city and its systems in ways that acknowledge, understand and deliver new productive ecologies that coalesce into 'wilderness' and 'nature' [Geuze & Skjonsberg, 2013:33].

05.06_PRECEDENT STUDY

'I haunted that place and discovered: no sensuous earth forms, but dead level wasteland; no craggy rock cropping's, but peaks of rusty roofs; no thickets, but a maze of tubes and pipes; no sacred forest, but towering totems of iron; no seductive pools, but pits of tar; and no plants, not even invasive exotics, had been able to secure a root hold in 15 years. It needed a new vision.' – Richard Haag [Weilacher, 2008:108]

068 | 05.06.01_Gas Works Park

By Richard Haag Landscape Architect, 1970

Location: [47.6460°N, 122.3350°W]
Seattle, USA, North America

Description: The nine hectare recreational park can be seen as landscape architecture's first successful attempt to deliberately build industrial relics into the design of a modern urban park. Gas Works Park is situated on the site of a former refinery that produced gas from coal to supply the City of Seattle. In 1956, the plant was decommissioned and the highly polluted site, with the rusting ruins of the refinery and disastrous ecological foot-print, developed into a forgotten waste-land.

Richard Haag noticed the abandoned area in 1969 and was fascinated by the 'ghostly spirit' of the place [Weilacher, 2008:108]. He argued to preserve many of the industrial elements of the ruins and include them into the landscape design at the time, mainly for aesthetic reasons. This idea was seen as progressive, as industrial monuments were unfamiliar at the time.

At the present time, however, the park is a recreational and leisure park for the direct urban context. The place has re-established itself as an urban park, prominently sited on the North shore of Lake Union with a view of Seattle.



Figure 42. Industrial Structures.

Previous use: Gas refinery

Current use: Recreational and leisure park

Review: Richard Haag took the first successful approach to provide industrial sites with a post-industrial use, but unfortunately the concept of post-industrial land-uses did not develop further. Today Gas Works Park appears like an ordinary designed leisure park, with industrial monuments placed on the highest point of the site. It is fascinating in its appearance but puzzling in terms of its significance and accessibility to the public, as the industrial ruins are fenced off for safety reasons [Weilacher, 2008:109].

The concept of the park still pays homage to the rich Olmstedian legacy found in America [Weilacher, 2008:109] and aims to provide users with a superficial green paradise, crafting a park featuring 'forgotten works', but not integrating the landscape with the context, industrial elements and environmental problems more progressively.



Figure 43. Industrial Structures.

05.06.02_Landschaftspark Duisburg-Nord

By Latz + Partners, 1990

Location: [51.4803°N, 6.7801°E]
 Duisburg, Germany, Europe

Description: Landschaftspark Duisburg-Nord is one of nearly a hundred projects forming part of the body IBA-Em-scher Park in the Ruhr district of Germany. The programme addressed the ecological and economic rehabilitation of disused and highly polluted industrial land-use sites. In the past, the Ruhr district has been affected by large-scale and intensive industrialisation, but in the past two decades, structural change of deindustrialisation has drastically reformed the area.

The site of the park comprises a surface fragmented by infra-structural elements, such as motorways, roads, railway lines, walls and industrial facilities where it is impossible to recognise the original landscape. The design intervention sought to recover the landscape which has been shaped by previous manufacturing and industrial activities, and to reprogramme the site's surface with new activities for a public space.

Main activities and landscape experiences are designed around important industrial monuments, allowing for full interaction between the visitor and the industrial heritage. The landscape design encourages active participation and exploration with the post-industrial site where old industrial structures are transformed through adaptation and new interpretation into such sites as Sinter Park, which comprises a water park, atmospheric light installation, various play parks for climbing and scuba diving, as well as an ore bunker gallery.

The 230 hectare decommissioned iron smelting works has engaged a recreational function in a densely populated industrial region, where the successful metamorphosis from a polluted industrial complex to a healthy urban park is

Figure 44. Spatial arrangements.



evident. Additionally, the rehabilitation strategies for the site have provided the disturbed urban context with sustainable ecological, economic and social renewal programmes, also including future urban development opportunities.

069

Previous use: Iron and steel works

Current use: Recreational and leisure park

Review: By means of the Landschaftspark Duisburg-Nord, Latz + Partner produced a project which forms precedent for quality building and planning standards for the environmental, economic and social transformation of old industrialised sites. The developed and reinterpreted landscape creates a new urban syntax, where existing patterns and fragments formed by intensive industry are interlaced into a new and generative urban function.

The industrial site has been reprogrammed with innovative activities that function on different levels, but the character as well as the identity of the previous industrial programmes were respected and successfully integrated into the developments of the design.

As with many other identified drosscapes in the Ruhr district, the Landschaftspark sustains not only quality of life in its surroundings, but becomes a landscape hybrid for ecological and environmental restoration to a damaged post-industrial site.



Figure 45. Industrial Structures and Landscape.

05.06.03_Zeche Zollverein Shaft XII

By Heinrich Böll Architect BDA DWB in collaboration with OMA Studio, 2010

Location: [51.2911°N, 7.2387°E]
Essen, Germany, Europe

Description: Zeche Zollverein coal mine industrial complex, which is situated in the Ruhr district near Essen, can be considered as one of Germany's most important industrial landmarks. Founded in 1847, the mining complex survived the great wars and was continuously upgraded and improved over time. Towards the end of the 20th century most heavy industries around the Ruhr area were shut down, including the coal refinery in Essen. The once famous Ruhr district lost the driving force behind its former industrial identity.

In 2001, UNESCO added Zeche Zollverein to the list of World Heritage Sites after an inclusive urban renewal and post-industrial land-use master plan was developed. Shaft XII is the central shaft of the Cultural Heritage Site. Built in the Bauhaus style, the shaft is considered to be the most prominent structure in the mining complex, where ultimately, the architectural structure turns into a monument.



Figure 47. Reintroduced activities and functions.

The reprogrammed post-industrial complex is now open to visitors, being one of the most popular sights in Essen. The relics of industrial tools and processes which were used for many years to extract and transform earth's fossils into living energy are openly exhibited and can be freely experienced by the public.

Landscape architecture provides the platform for various activities and programmes to establish themselves on and along the periphery of the site. The landscape design unites new recreational and leisure activities with existing industrial architecture, along with proposed contemporary architecture.

Previous use: Coal mining and refinery

Current use: World Heritage Site & Recreational and Leisure Park

Review: The identity of the Ruhr district's industrial period is established in the architectural expression of the complex. The new design interventions respect and commemorate the original identity of the site, producing a fusion of architecture, landscape architecture, ideology and industry.

The landscape intervention entails various design intentions. The landscape successfully encompasses multi-use activities, educational informers and spatial experiences among existing industrial structures and proposed architecture.

The Zeche Zollverein Heritage Site is a progressive piece of landscape architecture and architecture which first and foremost commemorates the human passion for transforming the world and at the same time, the impossibility of doing so, the exhaustion that comes with it, and the aesthetic ideals that surround this motion [The Humping Pact, 2014].

070



Figure 46. Reintroduced activities and functions.

05.06.04_Parco Dora

By Latz + Partners, 2004

Location: 45.0667°N, 7.7000°E]
Turin, Italy, Europe

Description: Turin rapidly developed into the leading industrial centre for automobile factories and large ironworks for the Italian automobile corporations in 1899. The structural changes of the economy followed by deindustrialisation, similar to that of the Ruhr district in Germany, brought large inner-city industrial areas to their knees and were almost completely abandoned in the mid-eighties.

The idea for Parco Dora was to syndicate a 37 hectare area consisting of several former devastated industrial sites into an integrated urban landscape. The character of the area involves partly deconstructed industrial relics and the rehabilitated fluvial system of the Dora River, which was previously covered by cast in-situ concrete slabs.

Through carefully designed squares and promenades the landscape intervention links up to the surrounding area and forms entrance points to the park. Hidden gardens, water gardens and elevated walkways reveal the interplay between contemporary landscape design and industrial architecture. Multi-functional events areas, plazas, galleries and light exhibitions are integrated into the programme of the park.



Figure 48. Reintroduced activities and functions.



Figure 49. Introduced Landscape.

071

Previous use: Automobile industries and iron works

Current use: Recreational and leisure park

Review: The regeneration of the drosscape into an urban park will complete the metamorphosis of the area. The landscape will offer sport, entertainment, recreation and leisure opportunities to the local residents, city inhabitants and tourists.

The landscape design will give the city back their river, which has been exploited, degraded and made inaccessible through the expansion of industrial plants. The design methodology will keep the character and identity of the harsh industrial past in the city district alive by way of retaining and re-appropriating pre-existing structures such as tanks, steel pillars and smokestacks into the landscape design.

Summary of Precedent Studies

Decommissioned industries and factories, especially heavy industrial complexes with high pollution levels, effortlessly develop into forgotten spaces in the urban environment.

The precedent study emphasises that the effects of deindustrialisation and urbanisation are evident in all parts of the world, including Zanzibar. The reviewed precedents indicate that forgotten or lost spaces are the ills of an irresponsible society, and through the application of various landscape strategies, post-industrial sites can be rehabilitated and reintegrated into the urban fabric.

072

Respecting the existing character and re-appropriating the remaining architecture where possible, reclaimed post-industrial sites can become landmarks and important cultural centres in society.

05.07 THEORETICAL DESIGN EXPLORATION ONE

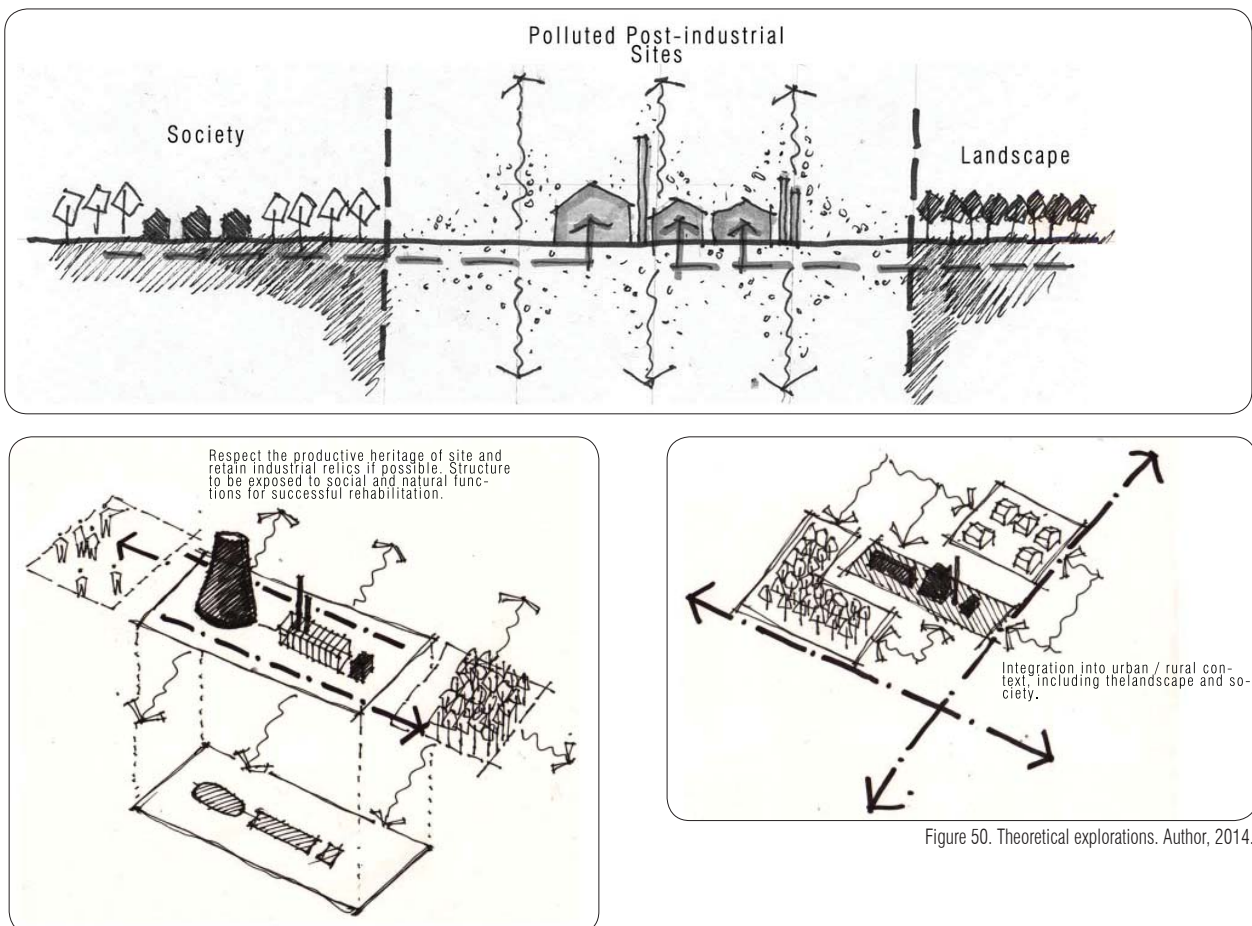


Figure 50. Theoretical explorations. Author, 2014.

PART TWO: RETURNING TO SECOND NATURE

Over time, the constant formation of cities has deformed the cityscape into fragmented and isolated spatial programmes. Urban environments have converted from multi- to mono-programmed functions, resulting in socially, economically and environmentally unsustainable settings.

The rapid transformation of cities has isolated agronomic practices from the urban environment. The connection between farming practices and the urban environment has to be re-established, to allow for the successful integration and interaction between urban, economic and ecological structures.

05.08_RETURNING TO SECOND NATURE

According to Geuze and Skjonsberg [2013:30] a vibrant city needs three basic things: good social interaction, good infrastructure and nature. Taking into consideration the succession of nature from a 'First to Third Nature', as discussed, contemporary planning and architecture have stubbornly continued to cherish the illusion of urban nature to be authentic and true.

The symbiosis between city and urban nature is misunderstood, as the 'green' of a park will not bring a healthy world. The combination of culture and art, as defined by the 'Third Nature', has often resulted in loud statements of overdesigned park architecture, on the one hand expressing a desire for liveliness and cultural significance, and on the other displaying an attempt to create an idealistic wilderness [Geuze & Skjonsberg, 2013:30].

The essential characteristic an urban landscape needs to survive is to return to the 'Second Nature'. The 'Second Nature' is defined as the territory where man is manipulating and transforming nature into a cultivated and productive landscape in order to survive.

Past and present generations have assumed that the concept of 'Second Nature' is a condition, which is only applicable to rural landscapes. Understanding that, the urban metabolism of cities require a constant supply of natural resources, agriculture and recreation, demonstrating that performative and productive landscapes have an equal significance in urban settings. The generative potential of 'Second Nature' can be implemented comprehensively in the rural and urban spaces.

It is possible to anticipate local biotopes, regulate water management, and reintroduce larger ecological systems into an integrative, performative and productive 'Second Nature' [Geuze & Skjonsberg, 2013:34]. Consequently, a new and orchestrated nature is created, which entails genuine substance of productive performance, and can surpass the original nature in accommodating humanity's immodest presence on earth.

05.09_A ROMANTIC VISION

'Watching the sky form clouds, watching the birds fly low, looking at the colour of leaves and roots to learn about the biological clockwork. Learning that nature is repetitive when circumstances do not change, but knowing that no new year provides the same circumstances' [Roncken, 2011:102].

The romantic vision of farming as being almost totally devoted to working with both hands and a focused mind on the natural material must be wrong. The simplification of agriculture marks it extraordinary and archetypal [Roncken, 2011:102]. Contemporary agriculture is not about romantic beauty anymore, it is about production and delivery, input and output ratios.

It has therefore developed into working with and against abundant natural factors, which are mostly in conflict with each other to form a productive landscape, capable to produce with the highest efficiency. Contemporary agriculture includes natural development, competitive economies and society, which has been formed by the culture of agriculture, but has exiled agriculture to rural areas. The beauty of a productive landscape lies exactly in this interconnectedness with landscape elements and human ritual [Roncken, 2011:103].



Figure 51 Agriculture romanticised in Art.



Figure 52 Agriculture romanticised in Art.

05.10_PRODUCTIVE LANDSCAPES

Productive landscapes are, in principle, real living landscapes and not the obvious museum pieces of landscape that society wants to keep as cultural reference point [Roncken, Stremke & Paulissen, 2011:69]. Essentially, the latter mentioned typology of landscape is static and has mostly a solitary experience within an unreal perfected decorum [Waite, 1997:57], where every landscape resembles a beautiful romantic painting.

Productive landscapes are measured by their landscape performance and their capabilities to yield, for instance, agricultural fields, rehabilitate brownfield sites, garbage dumps and water treatment plants. They should be able to benefit directly from living mechanisms instead of imitating them in high-maintenance copies [Roncken et al., 2011:69].

Productive landscapes embody the elements of scientific knowledge and artistic oeuvre as the fundamental principle for system design, where the landscape is not fixed but relates to dynamic processes in the landscape. These landscapes challenge the familiar standards of beautification and instead become productive, sustainable and revelatory parts of the future.



Figure 53. Agriculture fields mosaic.

05.11 LANDSCAPE MACHINES

The principles of productive landscapes can be closely linked to the concept of landscape machines. The concept of landscape machines is in essence, as Roncken [2011:53] describes, an attempt to converge designerly imagination with scientific knowledge.

“The difference between the currently dominant nature-leisure landscape and a landscape machine is the priority of the latter for landscape services not only to protect and understand nature but also to feed those processes that sustain nature’s resilience and thereby harvest all the by-products and spin-off effects that we need as human beings” [Roncken, 2011:72].

In this case, a productive landscape contains integrated elements of a machine i.e. techno-sphere and natural ecosystems, i.e. bio-sphere, to emphasise the complex relationship between human and landscape, thus the function of a machine is in direct relationship with landscape processes [Roncken, 2011:71].

As briefly discussed above, a productive landscape can contain a manifold of functions within its setting. In a modern age, productive landscapes have developed new types of

productivity and are not strictly adhering to the norm of agriculture, as previously recognised. The interaction between living components and introduced materials as input can result in multiple forms of outputs. While acting according to the order of natural processes, productive landscape can, for example, produce cleaning processes, food production, diverse biodiversity and renewable energy.

In ‘The Machine in the Garden’ [Marx, 1964:102] tells us about the rapid and overwhelming intrusion of the machine into the pastoral landscape, where the machine ‘obliterates all sense of mystery in nature and mankind’ [Ebbatson, 2009:35]. The combination of landscape and machine has evoked a certain stigma in the public’s imagination, where a Victorian hard-cast machine has a parasitic reaction on the beautiful landscape, resulting in a destroyed nature, garbage heaps and perhaps even large quantities of concentrated toxins [Roncken et al., 2011:71].

Instead, the machine aspect is evaluated as a carefully designed landscape which is capable to respond to dormant landscape processes and catch up with natural balances. Consequently, the machine is enhancing the performance of the landscape and provides more abundant biotopes,

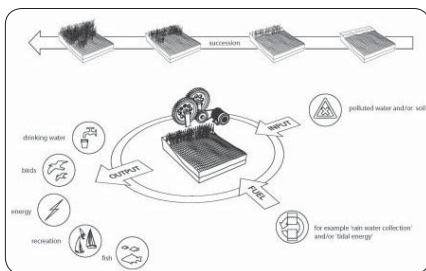


Figure 54. Conceptual Landscape Machine.

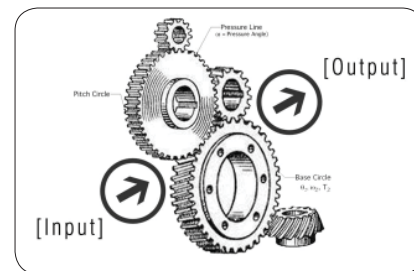


Figure 55. Conceptual Landscape Machine. Author, 2014.

which form the basis for human engagement and delivery of diverse ecosystems [Roncken, n.d.].

The landscape machine is rather 'grown' instead of being manufactured. Therefore, in principle, the landscape machine strategy is conceptualised and developed over a specific time period, which can be described according to three basic stages [Stremke, Roncken & Pulselli, 2012:54]:

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- 01.** Initial stage: During the initial stage the machine may depend on non-renewable resources.
- 02.** Growth stage: The growth stage is transitional due to various parallel successions that interact.
- 03.** Yield stage: In the yield stage the landscape functions entirely on the basis of renewable resources and provides the maximum amount of eco-systemic services.

Productive landscapes are included into the natural environment to address existing malfunctions in the physical environment [Roncken, n.d.]. These landscapes therefore consist of naturally occurring and human induced processes matched in time and space. Natural and human processes are 'productive' but not critically self-sufficient at first, but at a later stage display a long-term sustainable perspective.

Humans exist in nature, as well as in cities. Living systems are not bound to biotic and abiotic preference alone, but also to a certain extent to human interaction. A relationship between humans and landscape, consumers and productivity, must be established for the successful implementation of landscape machines into urban life.

The landscape machine progresses into a social experiential resource, where the aesthetic interaction explores the authentic sources of a contemporary sublime according to our modern experiences and not those of our romantic forefathers [Roncken et al., 2011:70]. Social aesthetics and recreation are challenging landscape architecture instead of conforming to the familiar standards of beautification and pastoral imagery.

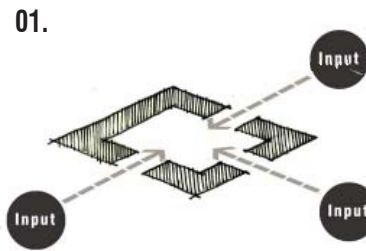


Figure 56: Initial Stage. Author, 2014.

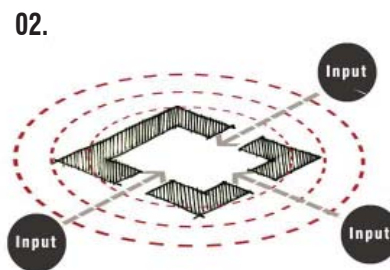


Figure 57: Growth Stage. Author, 2014.

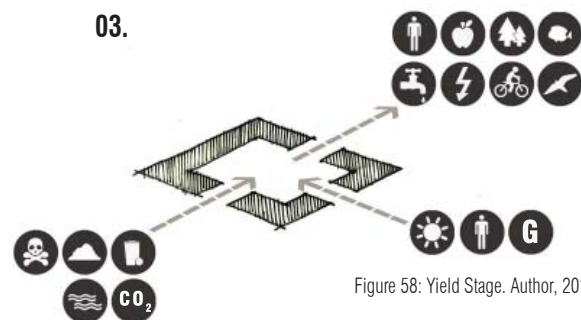


Figure 58: Yield Stage. Author, 2014.

05.12_PRECEDENT STUDY

The two precedent studies investigated in this section of the dissertation have been conducted by landscape architecture students at the University of Wageningen in the Netherlands and are based on a strong theoretical premise. Research, as well as design solutions, attempt to regulate economic and environmental activities to explore innovative solutions in the clash between nature and society.

05.12.01_Dredge Landscape Park

By A. Herrebout and G. de Vries, 2007

Location: [52.3000°N, 4.7000°E]
Haarlemmermeer, the Netherlands, Europe

Description: The inland water system of the urbanised Dutch delta consists of polluted dredge layers which have deposited over time, causing both drainage and environmental problems.

The solution proposed in the Dredge Landscape Park is that 12 million m³ of polluted dredge is shipped to a 300 hectare site in the Haarlemmermeer polder, where it will be decomposed and cleaned with ecological cleaning techniques over time. Over a 20 year period the polluted dredge is cleaned and the landscape will evolve into an urban park.

The different water and soil pollutants in the dredge are used to grow a unique park, where, for instance, vegetation fixates heavy metals in a heavy metal garden; artificial dunes of cleaned dredge soil regulate different water levels and cleaning processes. The park is connected to bicycle and car routes, as well as boat skippers.

Previous use: Polder structure of fields

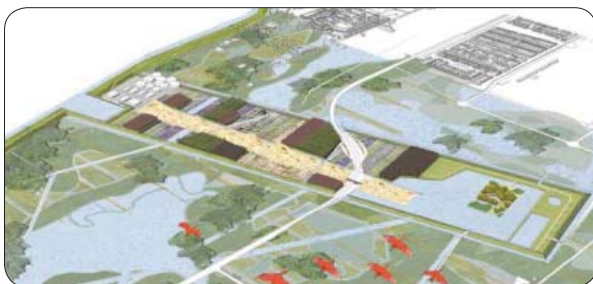


Figure 59: Dredge landscape in Context.



Figure 60: Landscape Machine processes and function within the landscape.

Review: The landscape design proposes a robust framework as a basis, where in time, natural processes and cultural forces have a free hand to clean polluted water and soils to eventually progress the site into a landscape park.

The phasing of different functions in relationship to time becomes an important design aspect to consider. Throughout these different phases, the park will develop a diverse range of functions, embrace diverse ecologies and explore different aesthetics.

In complex settings, such as urban environments, the landscape design has to immediately reflect the exact architectural intentions for many successive years. Urban parks and landscapes are living systems and need the capacity to adapt to an ever changing environment.



Figure 61: Transformed Landscape.

05.12.02_Saline Polders

By A. Molpheta and B. van Wonderen, 2009.

Location: [51.5833°N, 3.7501°E]
Noord-Beveland, Netherlands, Europe.

Description: The Saline Polders project proposed a landscape based infrastructure for the production and cultivation of saline aquaculture crops that simultaneously include recreational, natural and coastal defence purposes.

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The aquaculture landscape will produce fish, mussels and other saline crops in a closed cycle of nutrients and waste, with no additional freshwater intake. The site of the multi-purpose aquaculture infrastructure sustains salt-based agriculture and aquaculture, while increasing productivity and natural ecologies. With the expansion of the hinterland recreation, leisure and nature developments can embrace the productive historical landscape features and scenery.

Previous use: Bio-industrial farm

Review: The proposed landscape intervention is in essence a productive landscape producing a variety of crops. But unlike the conventional productive landscapes of the 21st century, the productive landscape has more layers of interaction with the landscape, namely recreation and the establishment of natural ecologies. The proposed landscape becomes a basis for sustainable relationships to form between society, the environment and the local economy.

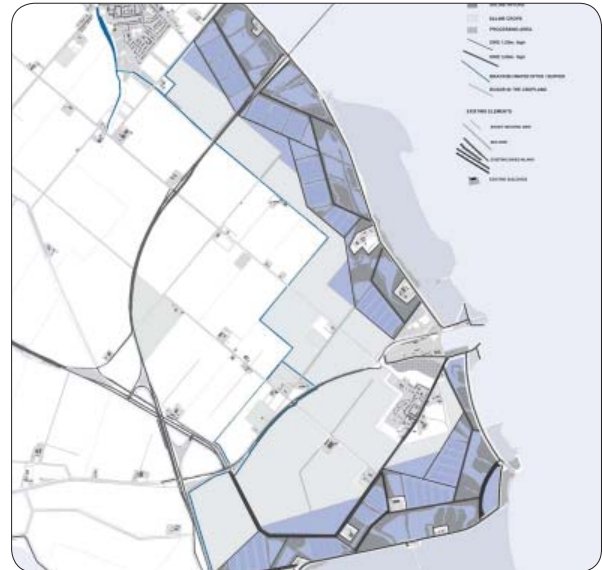


Figure 62: Saline Polders Regional Plan.

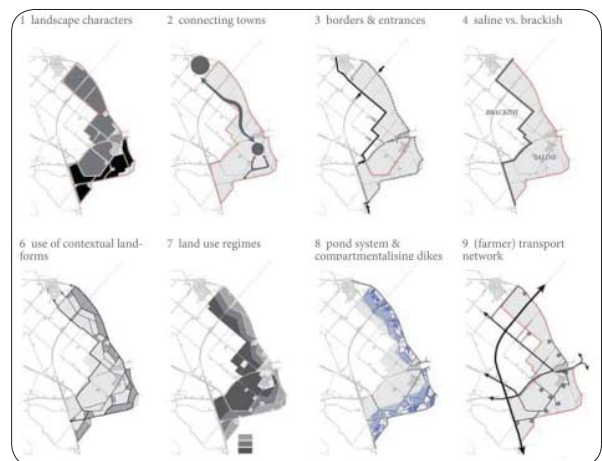


Figure 63: Design informants.



Figure 64: Saline Polders Aerial View.

05.12.03 Summary of Precedent Studies

The two proposed landscape interventions discussed in the precedent study indicate that landscape design can no longer have a mono-functional approach. The two landscape interventions break away from the landscape architectural design norm and propose totally new and innovative functions, where the product is less important than the overall landscape strategy.

The landscape strategy will ensure a robust, yet dynamic landscape intervention, that can adapt and change to accommodate future developments and uses, while still enhancing recreational uses as well as ecological and productive processes. Both interventions function as grown 'landscape machines', converting unfavourable conditions into resilient productive landscapes, where the efficiency of the machine can be measured by the input and output ratios, establishment of natural ecologies and human interaction with the landscape.

05.13 THEORETICAL EXPLORATION TWO

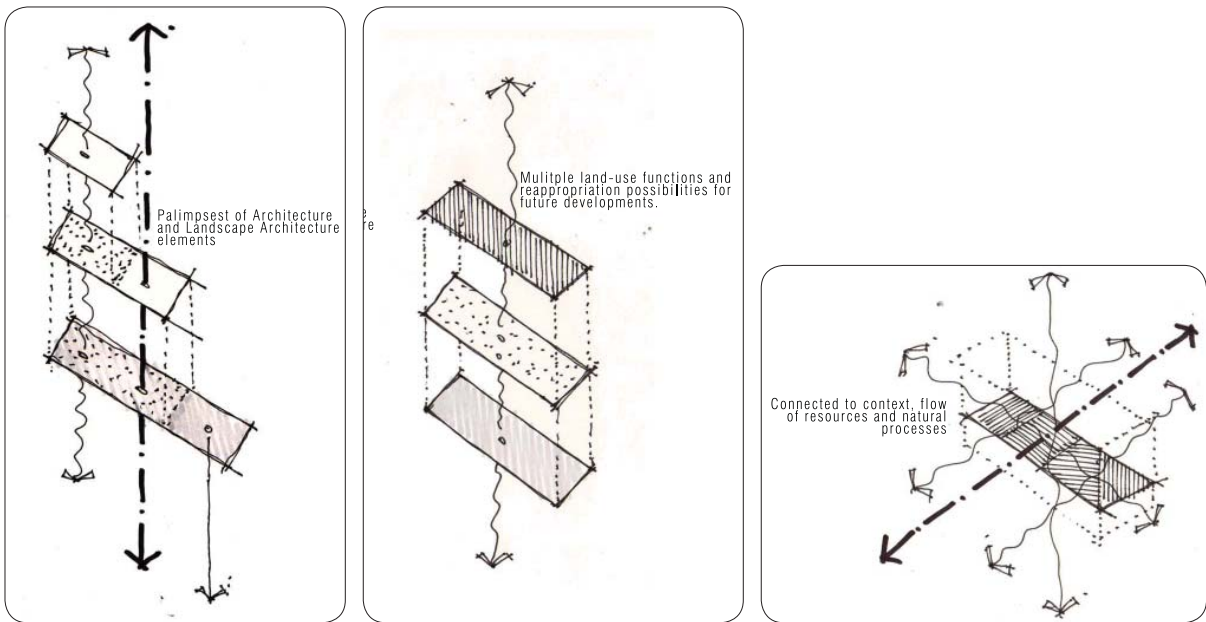


Figure 65. Theoretical exploration. Author, 2014.

05.14 CONCLUSION

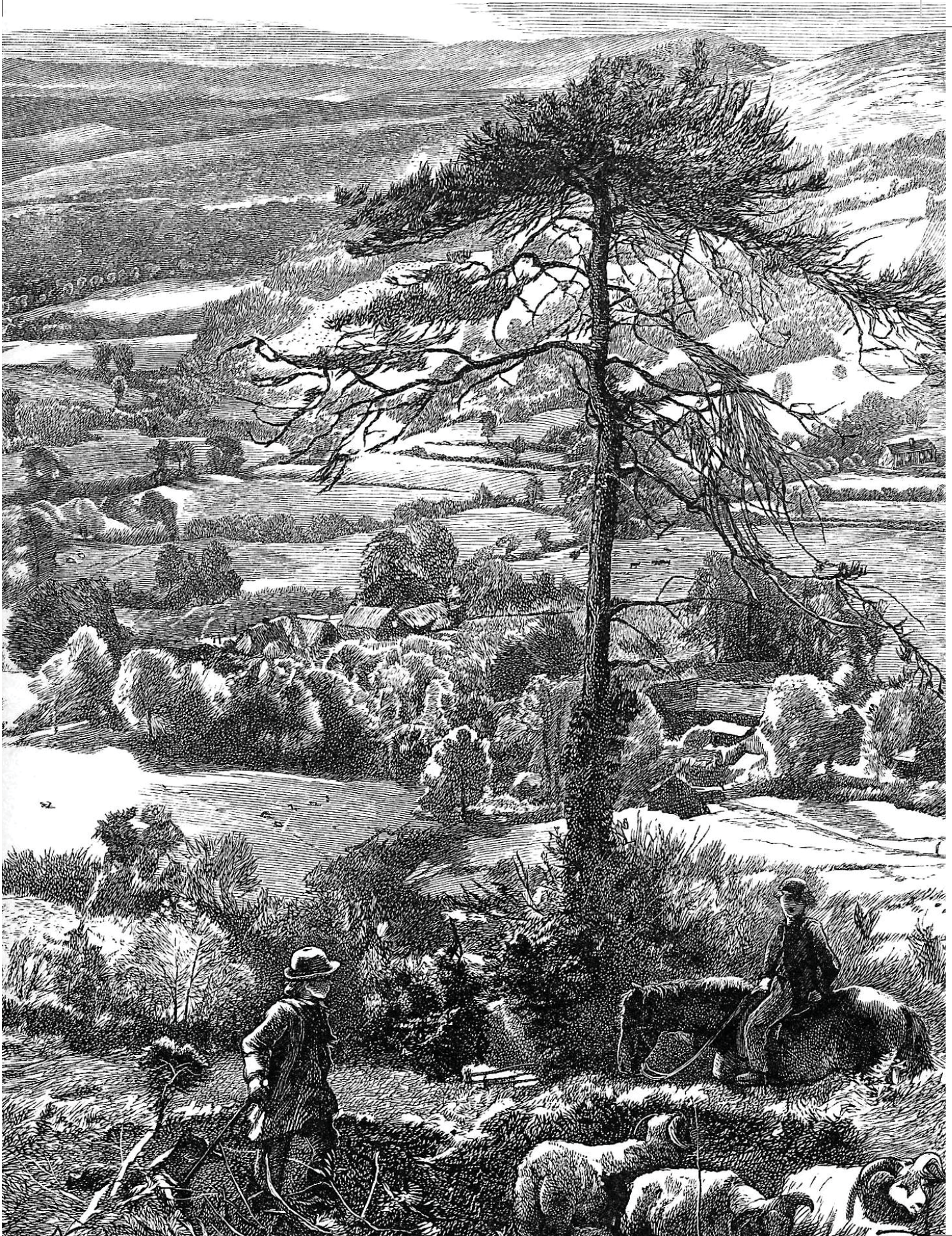
'Rather than sentimentally leaving traces of industrial occupation, imagine abandoned military bases, airports or railways sites, polluted industrial and coastal areas, all proactively converted into wilderness – not by wait and see but by the strategic implementation of a clever design that dramatizes a new nature' [Geuze & Skjonsberg, 2013:34].

Despite society's possessions of advance technology and civilizations continuity of knowledge we still have parks in the urban setting and farms in the rural setting, and an incomplete city [Geuze & Skjonsberg, 2013:35].

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The relationship between man and his environment is fragile. Urban landscapes can no longer rely on the illusion of paradise for their existence in harsh urban environments. Landscape architecture must in principle become an open-ended sustainable strategy, based on performative and productive integration with deep patterns of nature in it. This composed landscape must be redefined and could even surpass original nature in accommodating man on earth.

Figure 66. Man intrusion into nature.



_LOCATION

The site is located on the northern periphery of the study area, and includes the industrial remains of a decommissioned textile mill, which manufactured yarn and dyed textiles until the mid-1980s, before shutting down. At present time, only the abandoned industrial structures remain as evidence of the sites productive heritage.

Most of the large warehouses are structurally capable to be re-appropriated with new uses, except for the southern and north-eastern warehouses, where the roof and wall structures have concaved and only the structural steel skeleton remains.

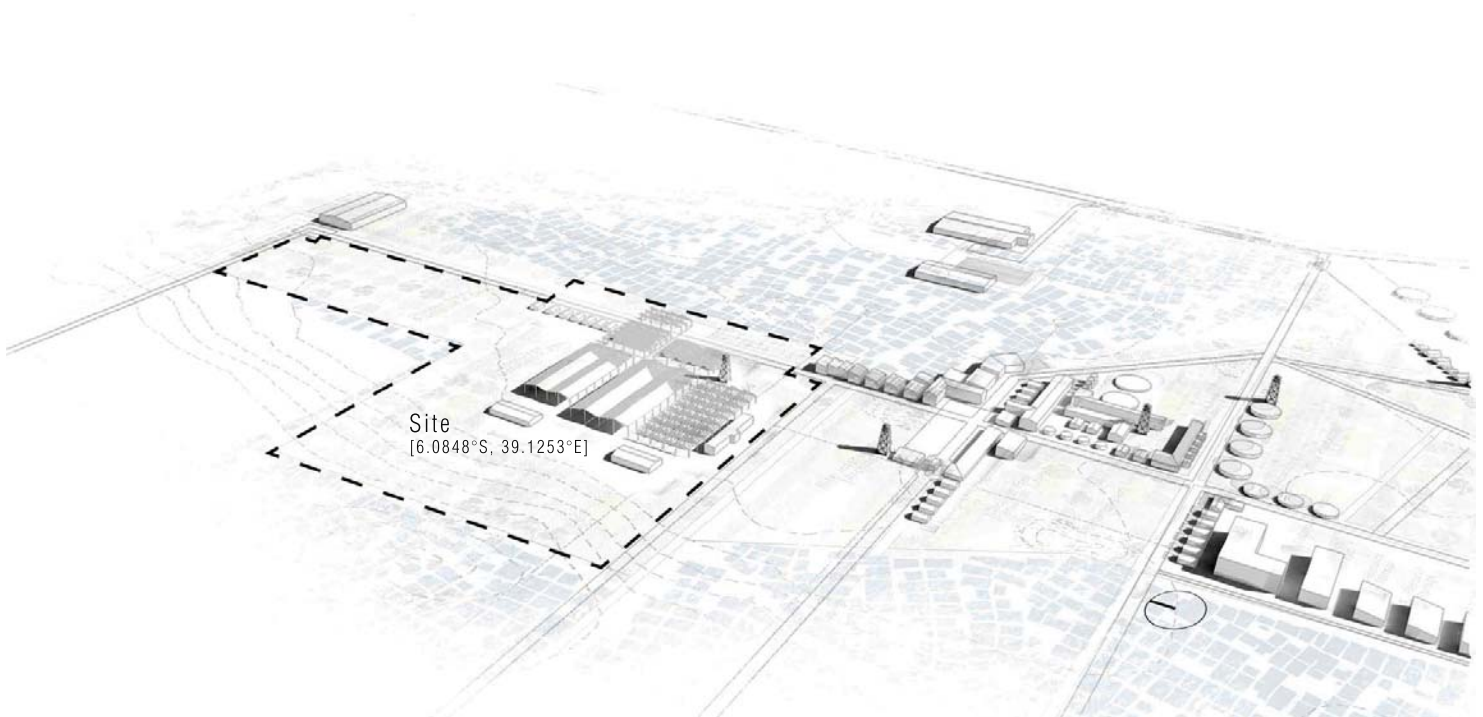
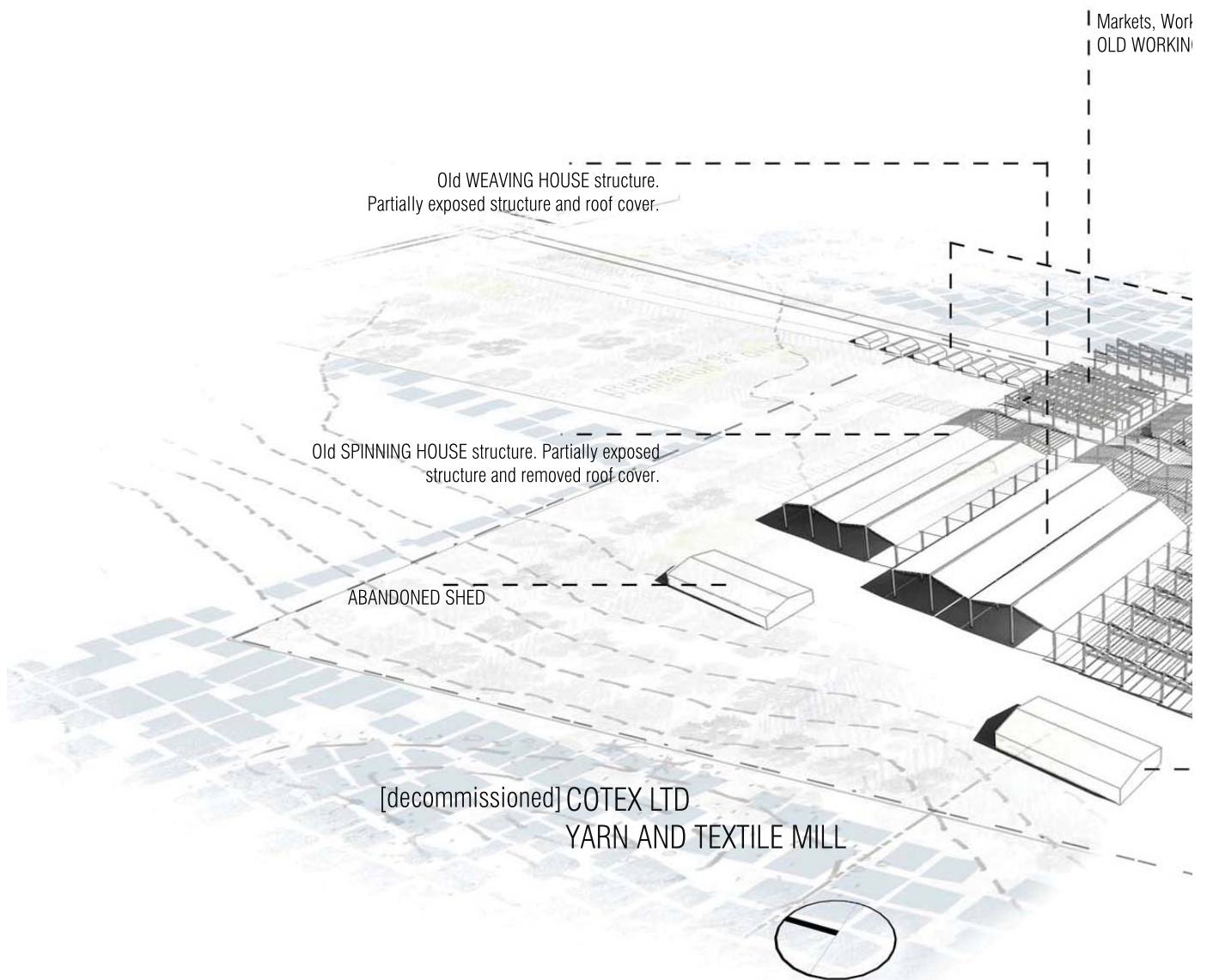


Figure 67. Site location within context. Author, 2014.



kets, Workshops and micro industries into
WORKING SHEDS.

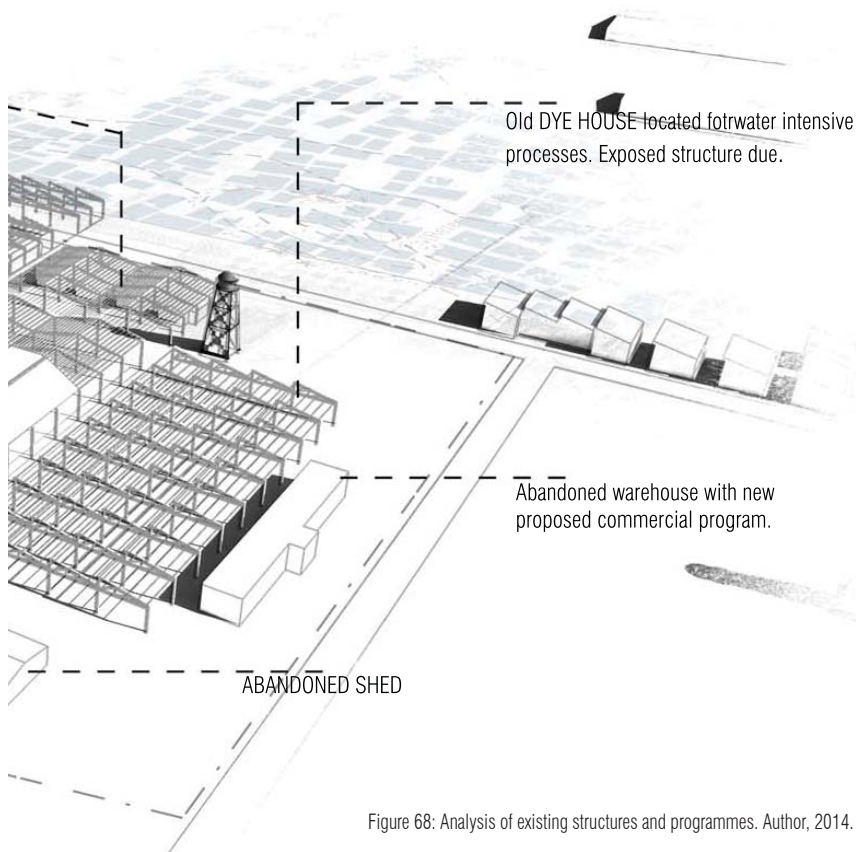


Figure 68: Analysis of existing structures and programmes. Author, 2014.

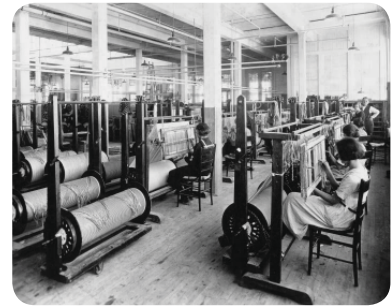


Figure 69: Textile and Yarn Processes.

PART I: SITE INFORMANTS

BIOPHYSICAL ASPECTS

086 | 06.01 CLIMATE AND WATER

The island of Unguja is in close proximity to the equator, resulting that the island is warm and humid year round, with limited average temperature fluctuations of 03 °C. The average temperature is 25.7 °C, but officially, summer and winter peak in December and June respectively.

Although minor rainfalls occur every month, Zanzibar has bimodal rainfall seasons which are dependent on the two monsoon seasons. November to January rainfalls are associated with the northeast monsoon winds [called in Swahili Kaskazi] and March to May rainfalls with the southwest monsoon winds [called Kusi].

Monthly Precipitation in [m]:

January	0.089	February	0.056
March	0.153	April	0.401
May	0.255	June	0.068
July	0.048	August	0.047
September	0.050	October	0.097
November	0.226	December	0.194

The site falls within a large catchment area, however due to the fine grained urban condition and absent infrastructure, most water is channelled into informally constructed water canals to flood open and vacant areas in the attempt by residents to control stormwater run-off. As a result, swamps, low lying open areas on the site and some residential areas are flooded for several months after heavy rains, harvesting diseases such as malaria, intestinal worms and diarrhoea related sicknesses.

The water from stormwater run-off is of low quality and should not be used directly for human consumption. Solid as well as chemical pollution is a problem in the Chumbuni

environment and water has to be treated first before being used for alternative practices.

The mountain escarpments to the east of the site create a vast catchment area. The surface area of the catchment area is covered with impermeable and permeable materials. An average run-off coefficient of 0.45 was used to calculate the amount of stormwater run-off. A total area of 48.7 Ha generates an approximate 369476.3 m³ of stormwater run-off per year.

Eight wells are located on the site. These wells can provide clean, potable water to the design programme. Water can be pumped and transported into various storage facilities, such as dams or reservoirs, or can support on site irrigation systems.

06.02 SOILS AND TERRAIN

On a large scale, the archipelagos of Unguja and Pemba islands are considered to comprise very fertile soil, which is in general ideal for farming and agronomic practices.

Low-lying areas on site are exposed to seasonal flooding. Stormwater run-off from the eastern escarpment transports a great deal of organic materials onto the site and deposits the nutrients and organic matter in low lying areas, where it helps to fertilize the soil. This fertile soil has a grey-dark colour and a rather rough texture.

Yellowish soils are evident on high-lying areas, which indicate well drained to moderately drained soils. This soil type also devises high agronomic potential.

Due to the large size of the site, various contour heights exist. Overall, the site has no drastic level changes, with slope changes between 2-7% along the site, allowing for gentle slopes.

06.03_FAUNA AND FLORA

The flora composition of the site consists mainly of low growing species, except for a few well established trees, namely *Cocos nucifera*, *Milicia excelsa*, *Terminalia cattapa* and *Olea woodiana*. Weeds, veld grasses and small shrubs are covering open pieces of land which are not used for cultivation purposes.

For the most part, cultivated plants for agricultural purposes are growing on the site. Long row plantations of viazi [yams] and cassava [beetroot starch] exist. Ndizi [banana] trees and nazi [coconut] trees are growing close to the boundaries of the site and on the fertile pieces of land [due to seasonal flooding], mahogo [spinach], tungule [tomato] and mchele [rice] are cultivated.

Only limited fauna is visible on the site, such as free roaming kuku [chicken] and n'gombe [cattle]. Due to the seasonal flooding of certain areas on the site, it is assumed that also amphibious species, as well as some native bird species occur on site.

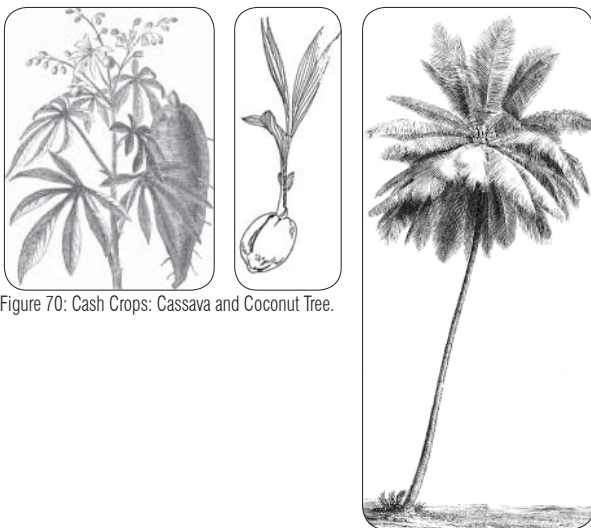


Figure 70: Cash Crops: Cassava and Coconut Tree.

CULTURAL ASPECTS

06.04_ARCHITECTURAL ELEMENTS AND INFRASTRUCTURE | 087

The area of Chumbuni can be classified by two major architectural typologies, namely residential and industrial. The residential area has been classified as an informal settlement. Houses are mostly constructed from locally manufactured cement bricks with corrugated sheet roofing.

The industrial areas can be identified by large industrial warehouses and factories, which are generally fenced off to prohibit access or informal expansion of residential areas into industrial land. The architecture consists primarily of structural steel portal frames with brick infill and corrugated roof sheeting.

Attributable to the informal expansion of the residential areas, basic services and infrastructure is lacking. Restricted and, to some extent, unregulated electricity is supplied from the Saateni substation, located north of Chumbuni. Vehicular dirt roads are mostly eroded and not regularly maintained. Waste services are absent, compelling residents to litter and dump renewable and non-renewable waste on open land and riverine systems.

Water is a serious concern in the area. Basic stormwater infrastructure is lacking, allowing large residential areas to flood during the rain seasons. Several water points have been established in the area, but water is of reduced quality.

06.05_ACTIVITIES

For many years the sole purpose of the site was for the production of textiles and yarn. Due to the intensive industrial processes in the industrial areas and the importance of the transmitter station to the government, most industries and open sites were fenced off creating strong boundaries between the rapidly expanding informal settlement and the site. Presently, the chain-link fence still exists but sections of the fence have been broken down, allowing partial access

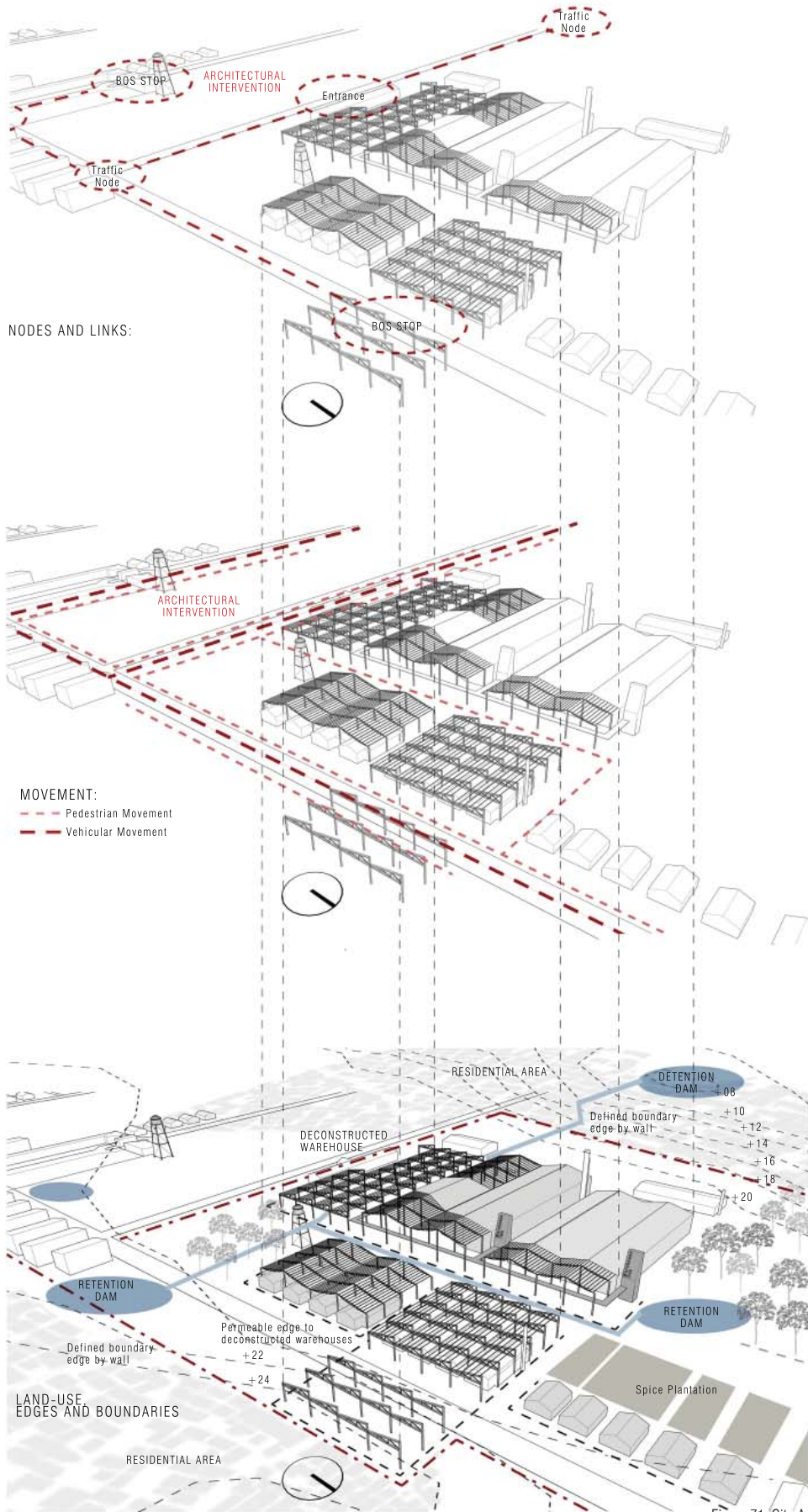


Figure 71: Site Analysis. Author, 2014.

to the site. The most prevailing human activity on site is agriculture. Urban farmers cultivate a variety of crops which are either sold to close by fresh produce markets or grown for personal use.

To escape the fine grained urban texture of Chumbuni, residents living in close proximity occasionally use the open space for recreational and leisure purposes.

06.06 SYNTHESIS

According to the analysis of the site in context, the following opportunities and challenges have been identified, which are to inform the design development:

Main opportunities such as linkage and connection to surrounding residential areas, introduces pedestrian movement and other urban functions to the site. Except for two warehouses, the existing industrial structures can be re-appropriated and reused as formal space, such as markets and industries. Sufficient surface area is available to allow the site to adopt multiple economic, social and environmental functions.

The primary challenges are to regulate and manage the flow of stormwater in a residential area. Special design considerations have to be made to connect the surrounding low density housing to the site, without encouraging informal residential development onto the site. The pollution and environmental degradation due to industrial processes has to be considered and addressed through landscape design.

06.07 CONCLUSION

The synthesis of collected data informs a design that responds to find suitable solutions for the problem areas while contributing to a productive and social place making strategy. The disturbed areas should be rehabilitated, the site should be reconnected to the direct context and the site should provide the users with a healthy and safe environment through inclusive design principles.



Figure 72: Site and Context Photographs. Author, 2014.

PART II: PROGRAMME

06.08_INTRODUCTION

The proposed landscape programme consists of an agricultural park that researches and cultivates different rice and fish species. The primary focus of the facility is to incorporate and test the bio-systemic cultivation conditions as well as processes of various rice and fish species in a controlled environment.

The design programme is inter-related with the programme of an agricultural research and education facility, where the landscape intervention is conclusively developed into

a landscape laboratory for testing, researching yet also productive activities.

As a response to the issues regarding the public interaction and the inclusive vision of the proposed framework, markets, workshops and studios are included to influence the public perception of education and urban agriculture. The public interaction will attempt to re-establish and foster the forgotten relationship between man and his 'second nature'.



06.09_A BIO-SYSTEMIC INDUSTRY

'Modern consumers think of seafood as a healthy supplement to a traditional meat-based diet. Supermarkets offer frozen or fresh seafood of great variety. Good restaurants the world over have a variety of seafood on offer, even if they are not located in a coastal area. Typically, a consumer will associate fishermen and fishmongers as supplier of this food. Yet, the chances are that some, if not most of what is on offer in restaurants and supermarkets originates from some form of aquaculture' [Kaiser, 2012:233].

Aquaculture is an ancient activity of human culture. Ancient settlements of China, Egypt and Rome dating back more than 4000 years ago provide early examples of traditional fish farming forms. Today, fish farming is driven by technology, where nearly all fresh or salt water species can be intensively cultivated. The practice of aquaculture can establish bio-systemic relationship between different crops, where for instance fish farming can be combined with rice production to increase production yields.

The programme of the design intervention includes a bio-systemic productive landscape. The agronomic practice of rice and fish cultivation proposes a new landscape typology in an urban area. The previous synthetic production processes of the industrial site have been replaced by a living productive landscape based on natural processes and materials. The fish and rice paddies will form the main landscape element in the design intervention and will respond to the problematic hydrological issue on site. Additionally, it will provide an educational landscape to the research facility, social landscapes for the public user and local micro factories and workshop will attach to the circular metabolism of the productive cycle transforming tributary materials into valuable bi-products.

The unconventional laboratory establishes itself as a hybrid landscape, where the composite function encapsulates social, economic and environmental components.

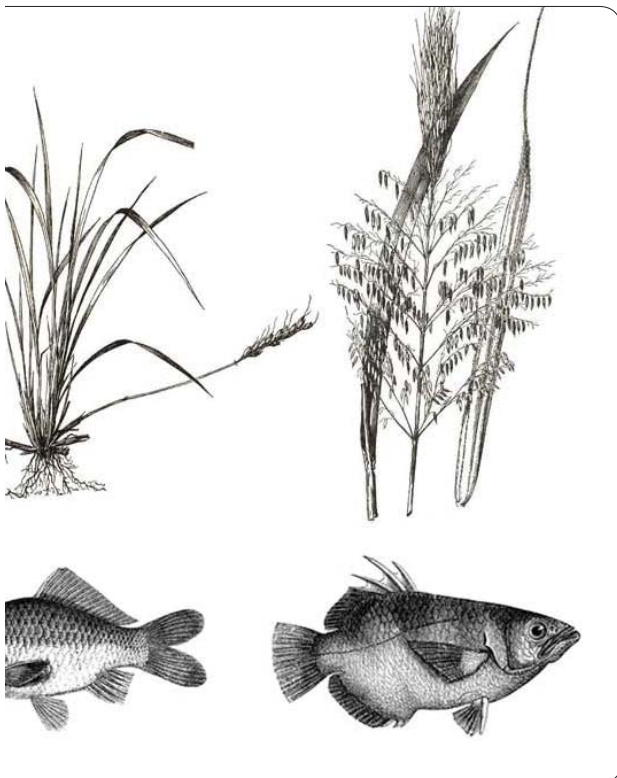
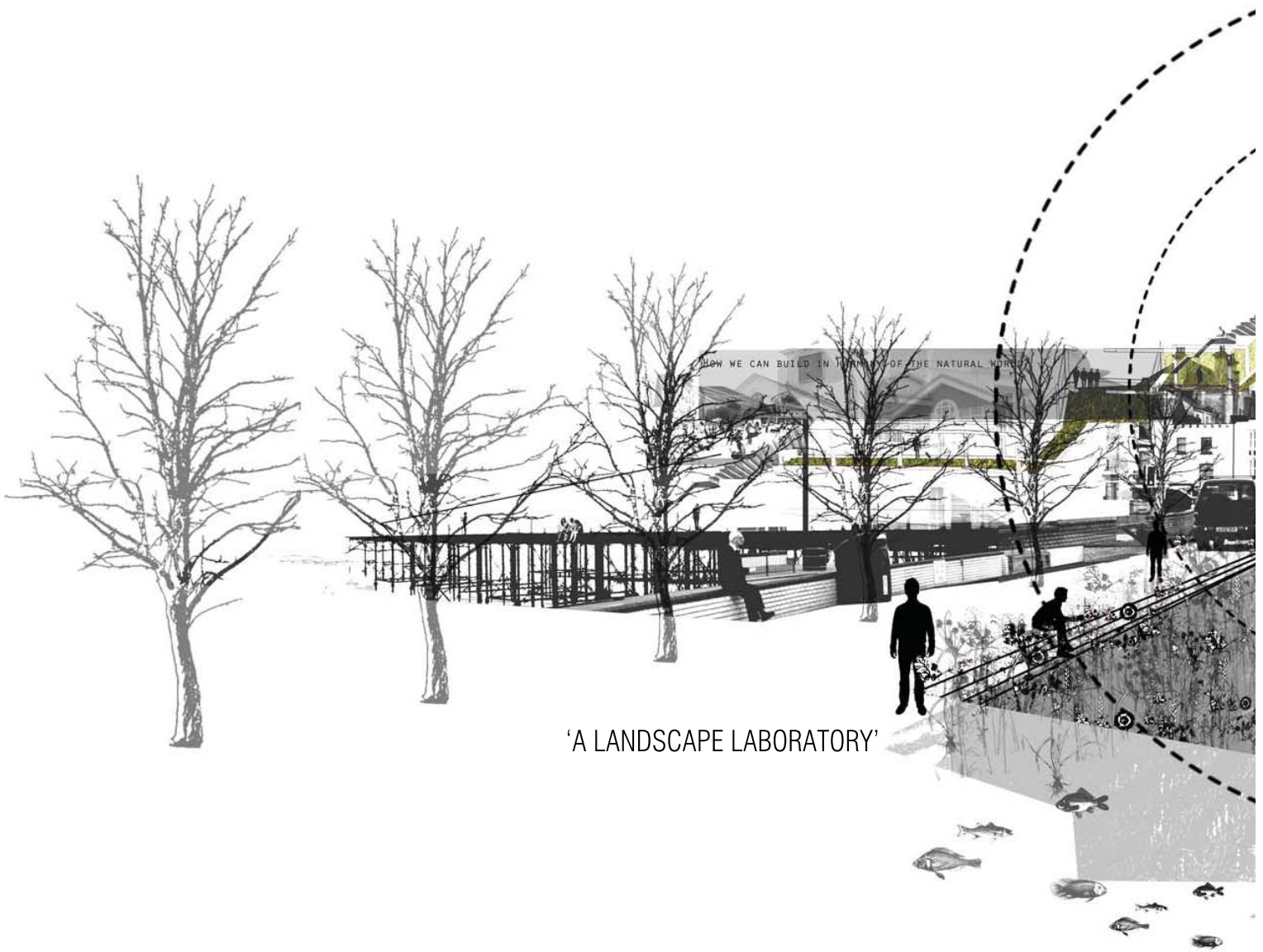
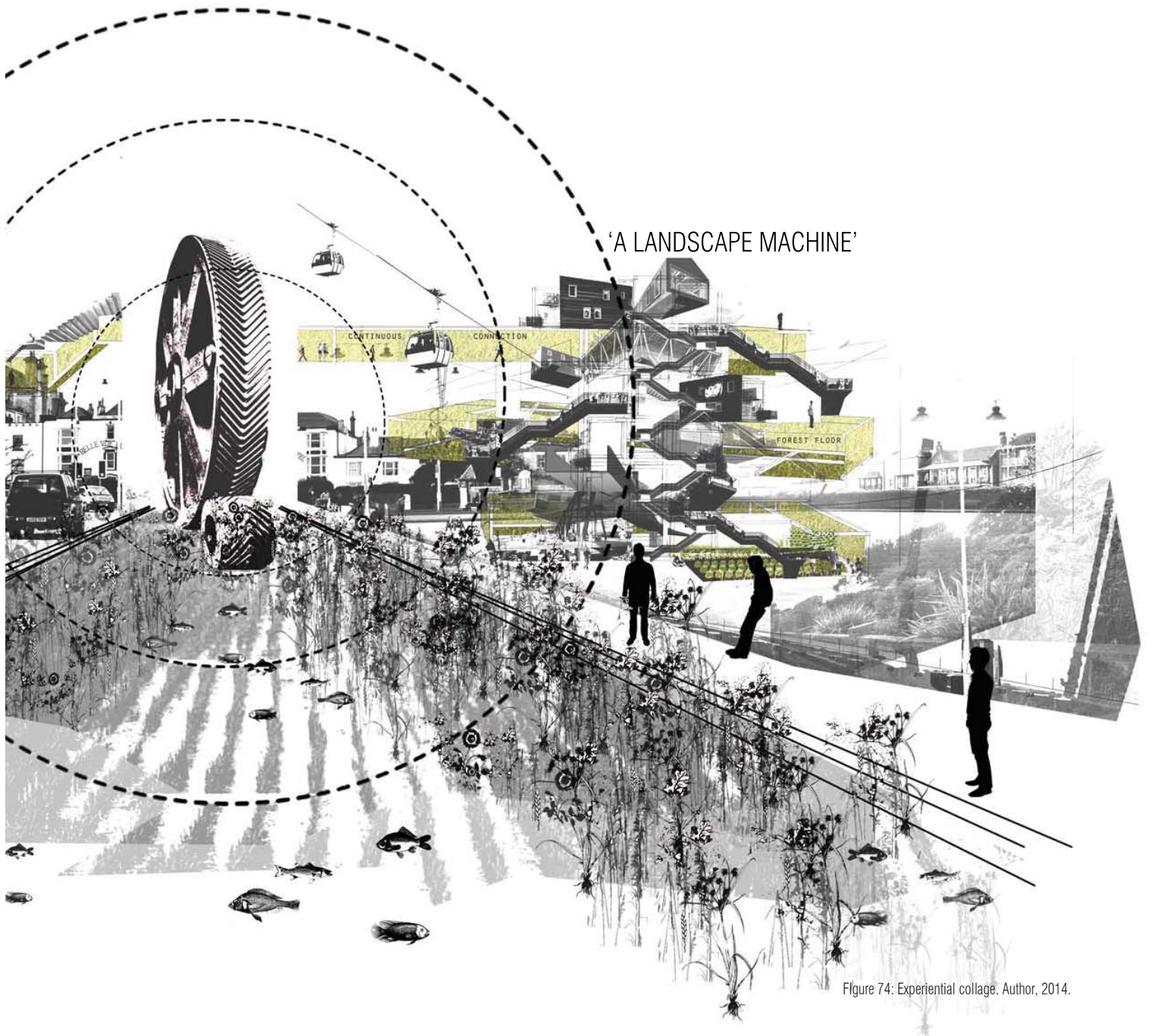


Figure 73: Various rice and fish species. Author, 2014.



'A LANDSCAPE LABORATORY'



'A LANDSCAPE MACHINE'

Figure 74: Experiential collage. Author, 2014.

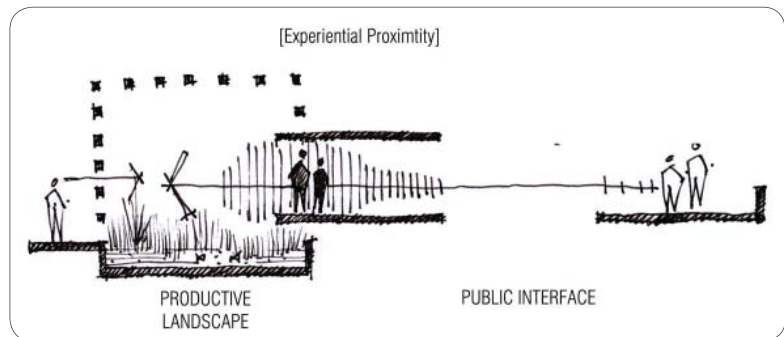


Figure 75: Concept diagram of Experiential proximity. Author, 2014.

06.10_A PUBLIC INTERFACE

Industrial sites have a limited response to the user, as they are created for the sole purpose to efficiently manufacture and produce. The adjoining issues in the relationship between man and industry including the spatial neglect for man within industrial sites urges the programmatic response to introduce a public interface.

As a productive landscape that relies on traditional methods of cultivation and harvesting, the programme extends its function in the form of markets, workshops and studios for the public to interact with nature and craftsmanship. This specific arrangement aims to educate the user to

understand the natural processes and periodical changes of the productive land as the seasons change. It also displays how materials are processed and formed, which encourages the transferring of knowledge and skill-based trades of an artisanal origin.

This threshold between landscape and architecture becomes an experiential ground, where the programme interacts with the user and existing industry programmatically as well as spatially. The experiential ground becomes the departing point for further investigations for theoretical, conceptual and technical developments.

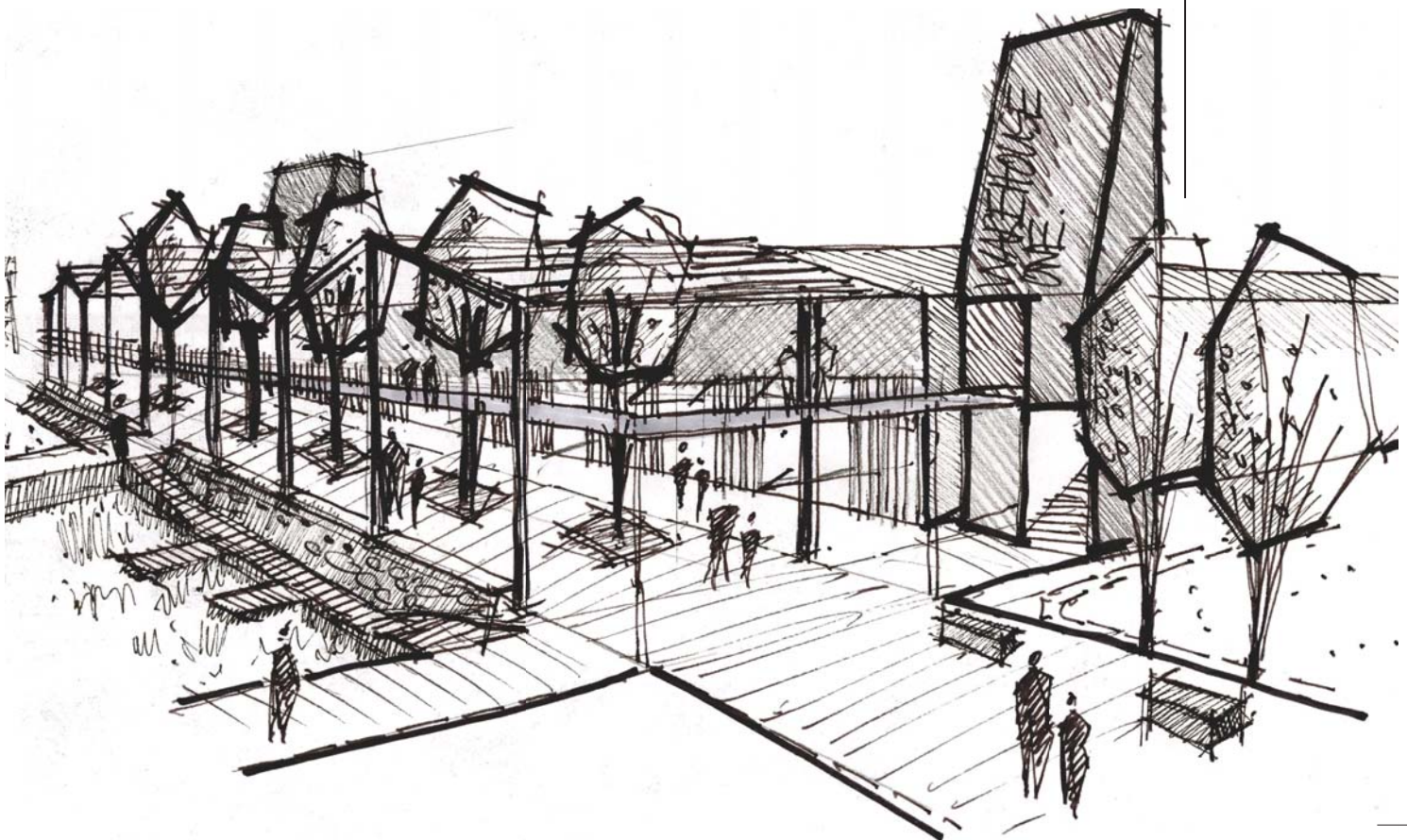
PART III: DESIGN DEVELOPMENT

095

'...the usual design process proceeds from a guiding conceptual image down to the detail, this architecture develop from real experiential situations towards an architectural form. As drawings, in fact, thesis buildings might sometimes appear vague, fragmentary or incomplete, as the design aims solely at qualities arising in the lived experiential situation.'

Pallasmaa, Hapticity and Time, 2000.

Figure 76: Perspective of integration of Landscape and Industrial warehouses. Author, 2014.



06.11 EXPERIENTIAL PROXIMITY

Due to the large scale of the existing industrial structures and the vast size of the site, the exact setting of the proposed productive landscape is investigated. Through the exploration of scale and experiences of different spaces, as referred to more specifically in the theoretical chapter, the landscapes interventions presence on site is considered in terms of the interventions proximity to the existing.

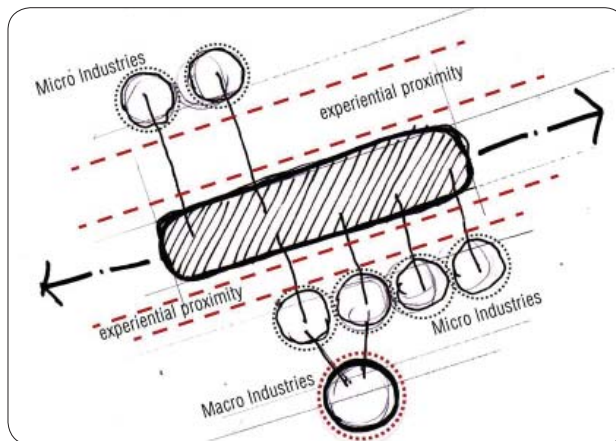
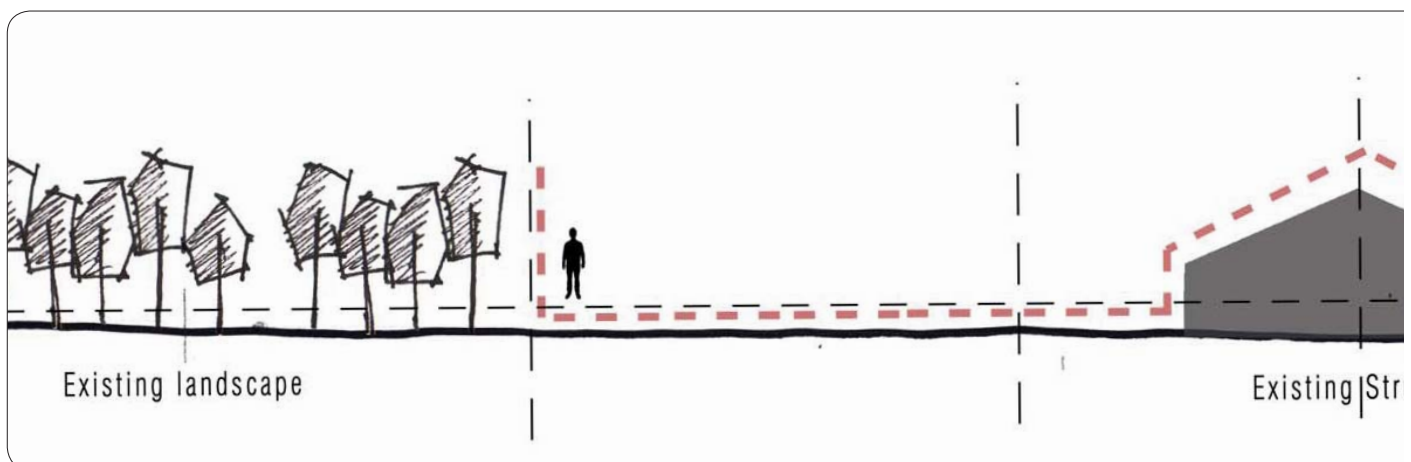


Figure 77: Conceptual understanding of experiential proximity on site. Author, 2014.



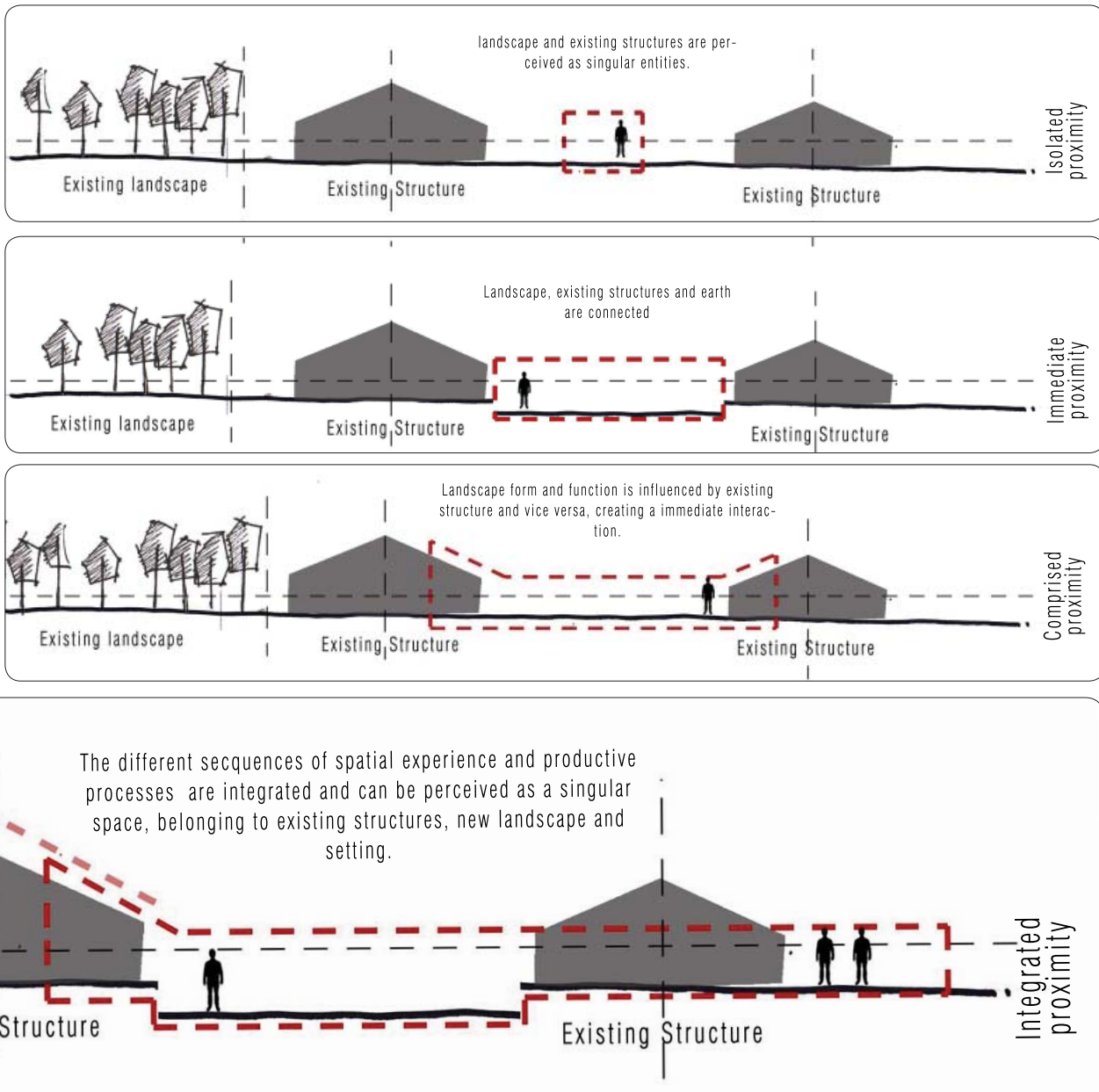


Figure 78: Investigation of experiential proximity on site. Author, 2014.

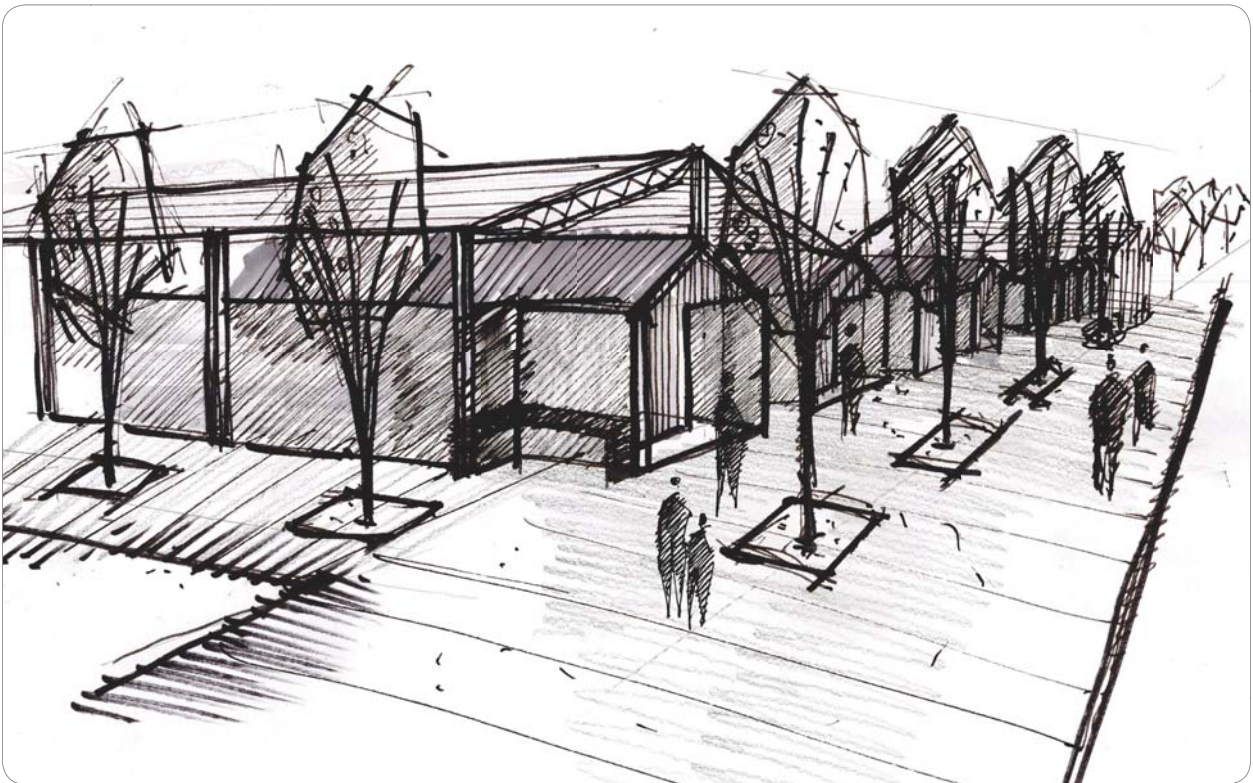


Figure 79: Perspective of market place. Author, 2014.

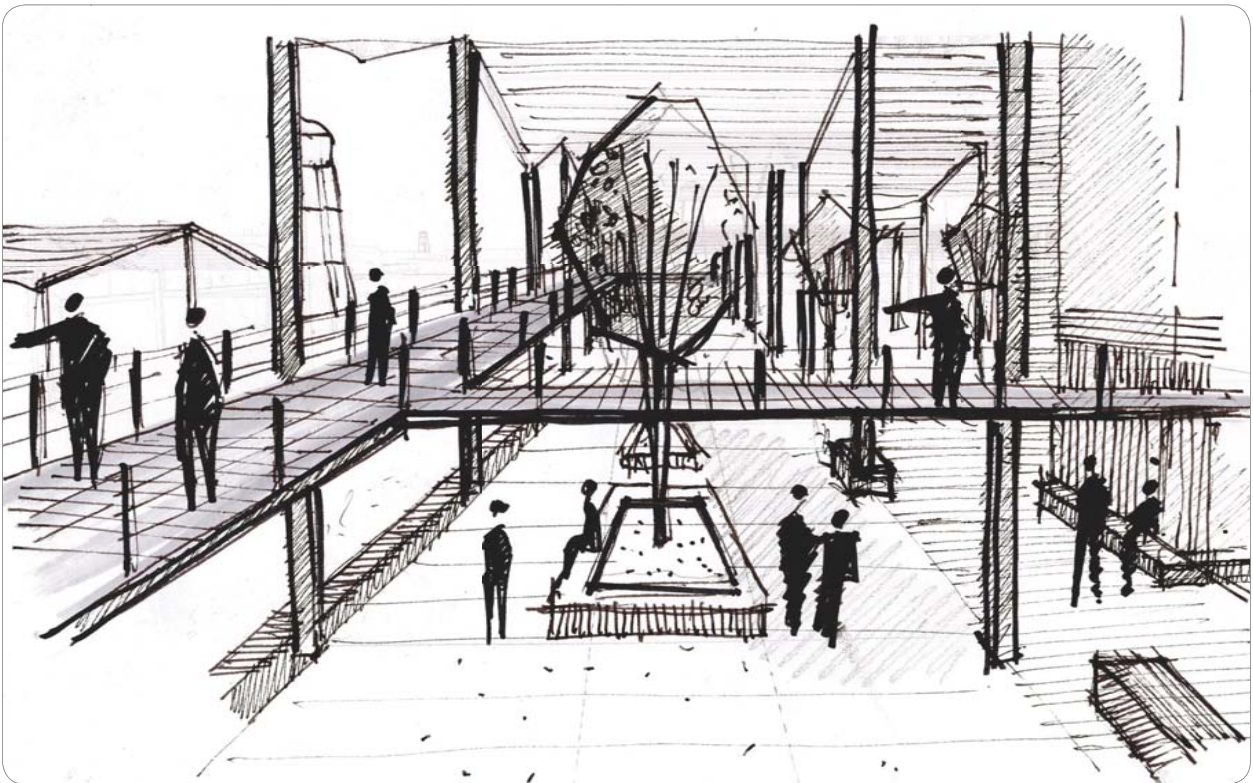
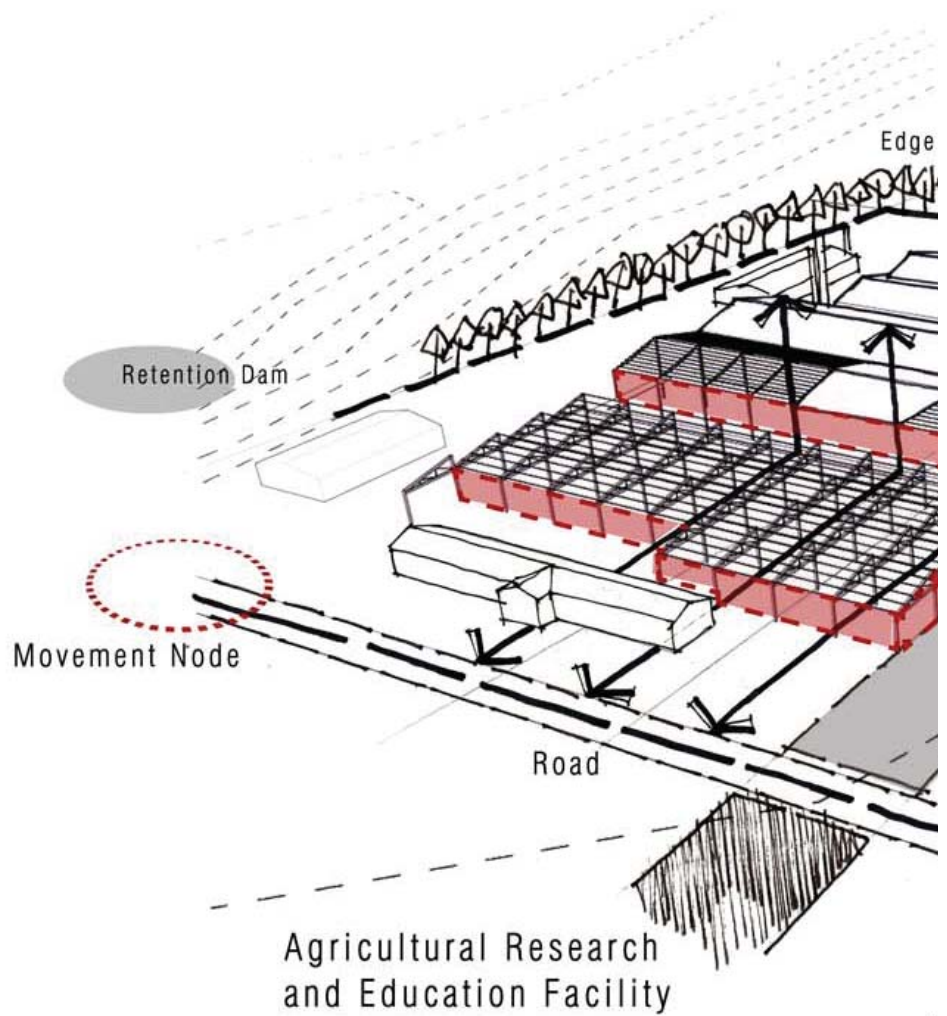


Figure 80: Perspective from elevated walkway. Author, 2014.



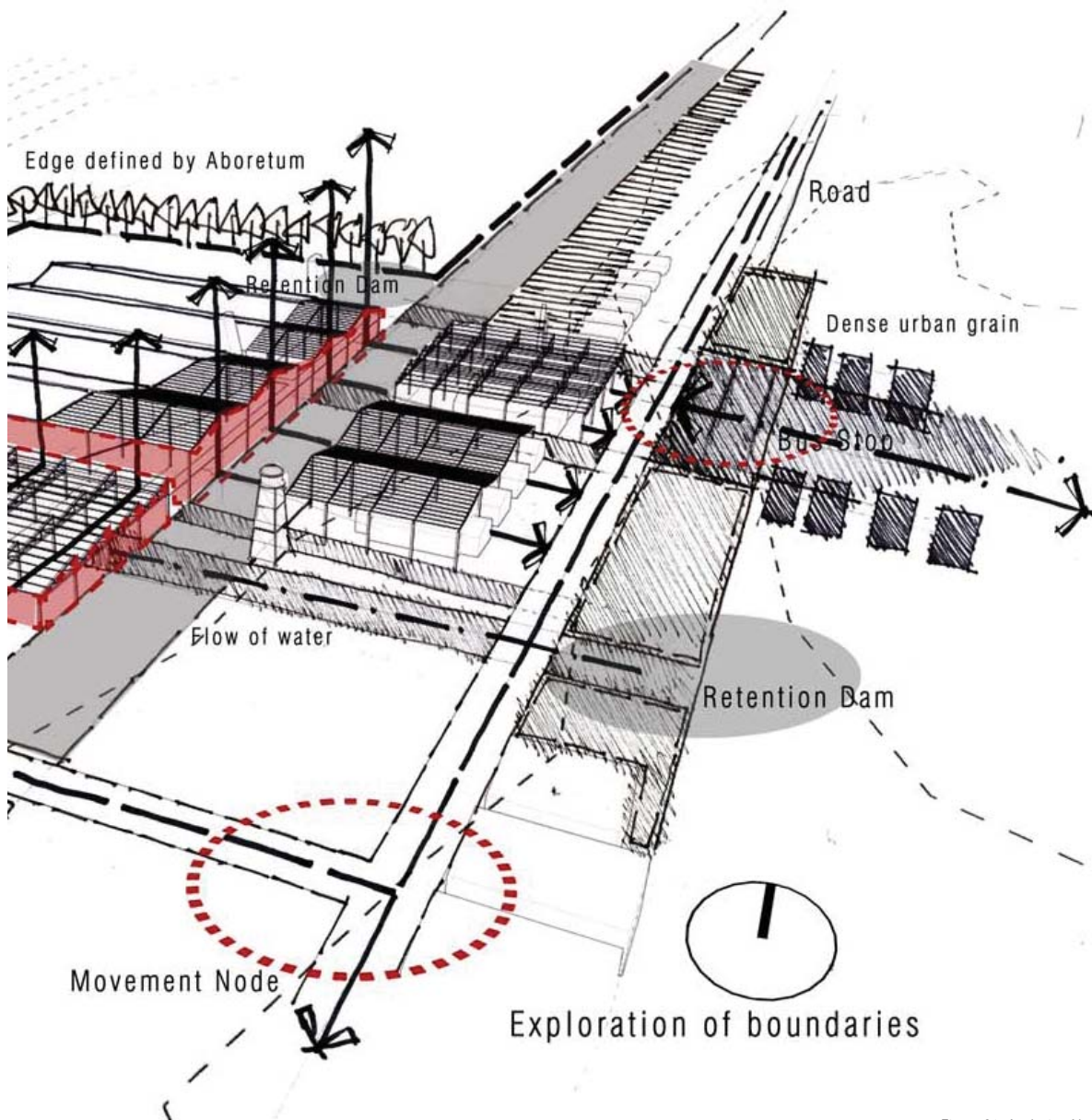
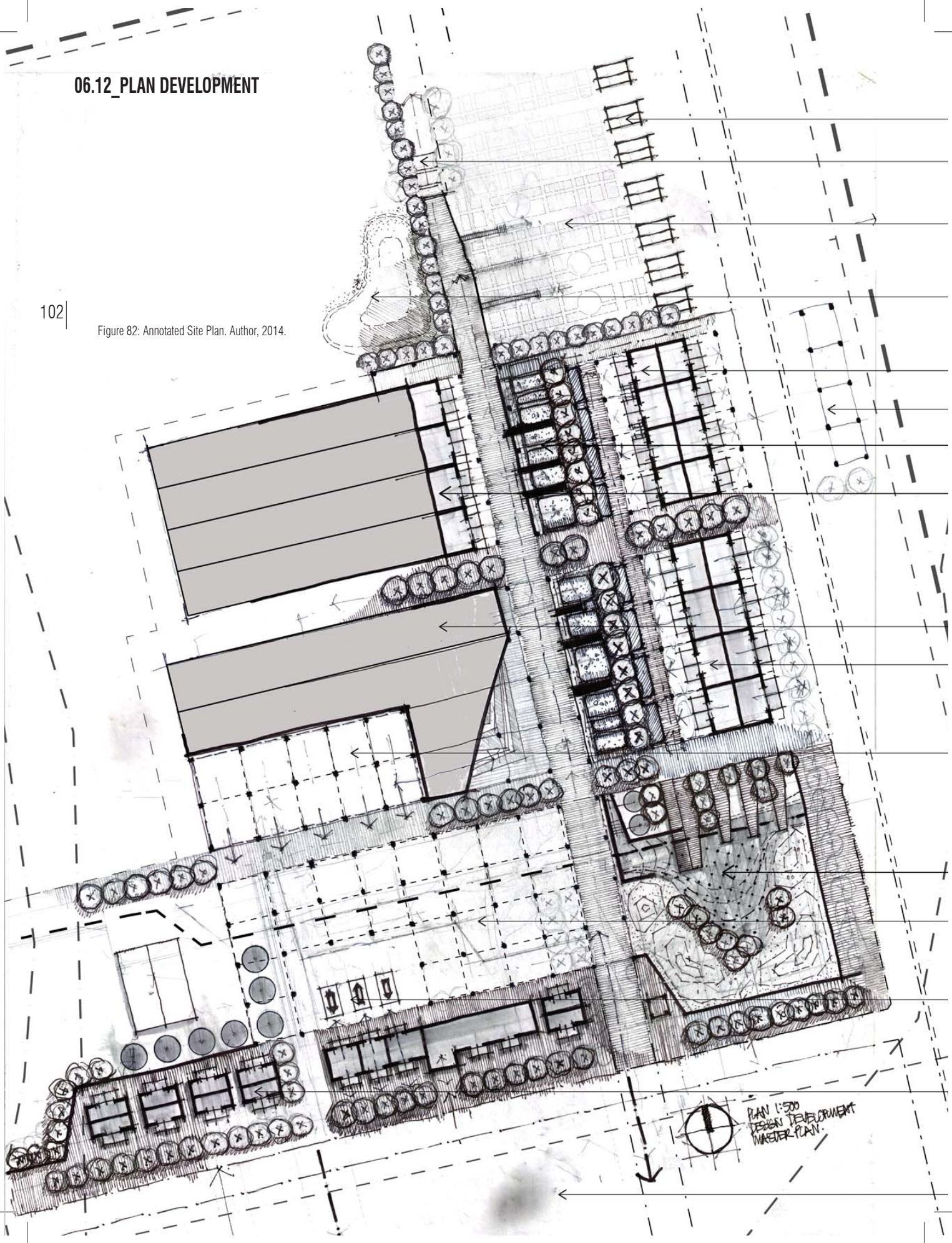


Figure 81: Analysis of boundaries and edges. Author, 2014.

06.12_PLAN DEVELOPMENT

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Figure 82: Annotated Site Plan. Author, 2014.



PLAN 1:500
DESIGN DEVELOPMENT
MASTER PLAN.

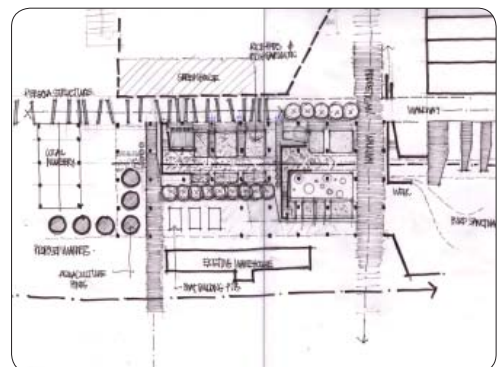
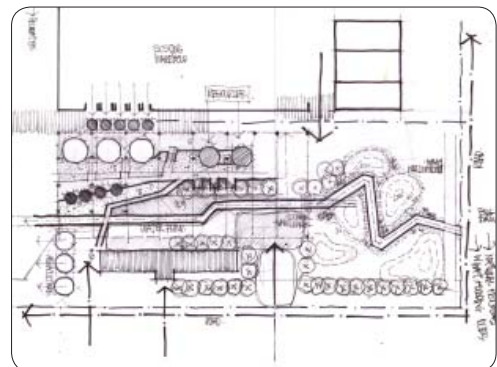
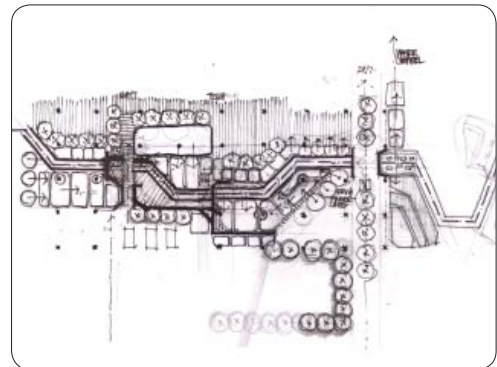
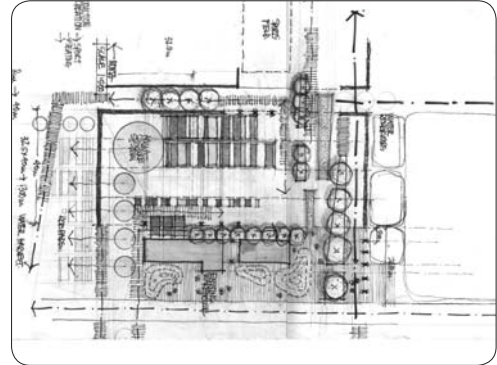
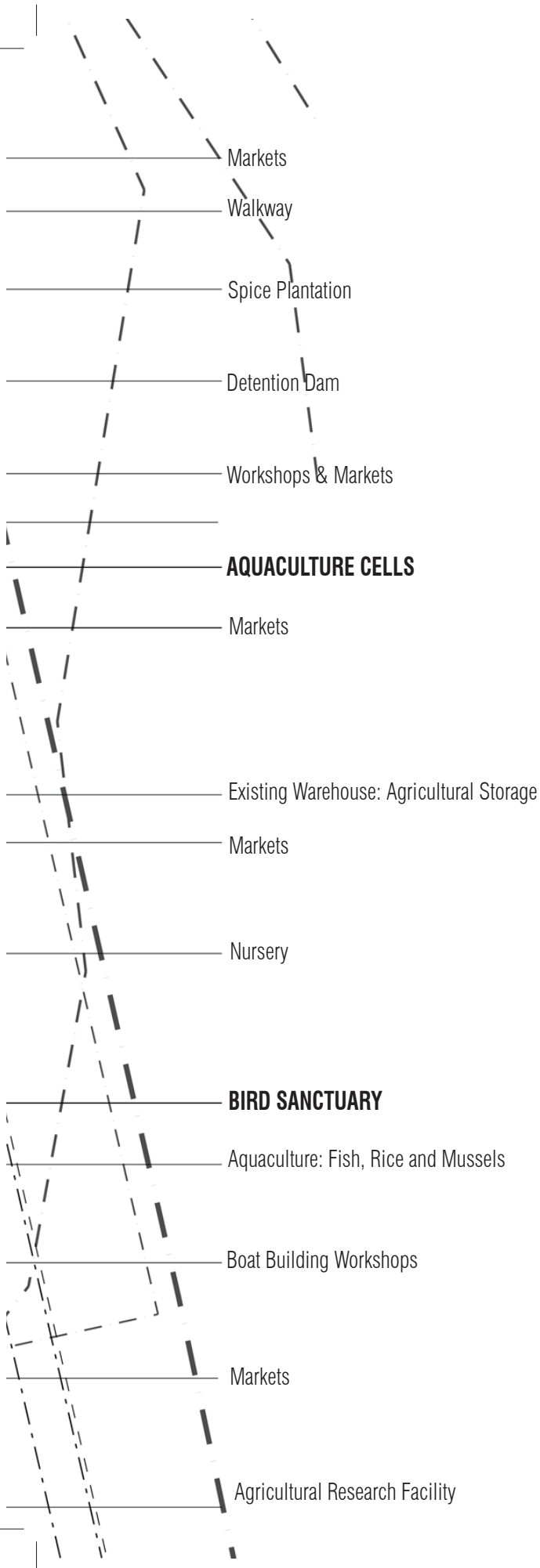
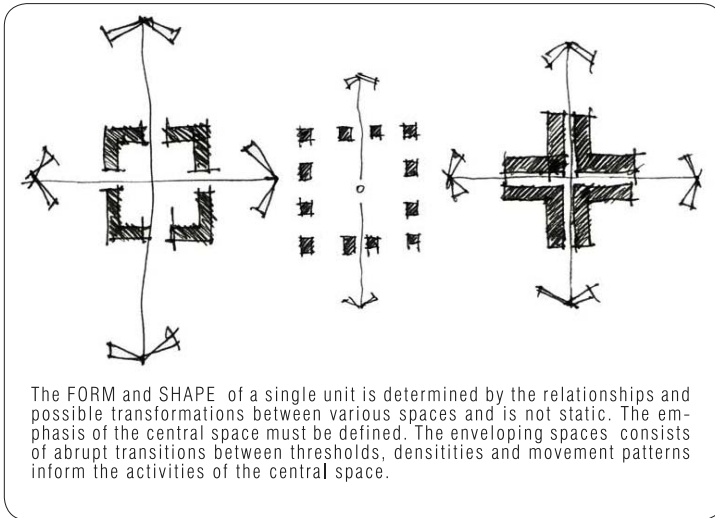


Figure 83: Plan Development. Author, 2104.

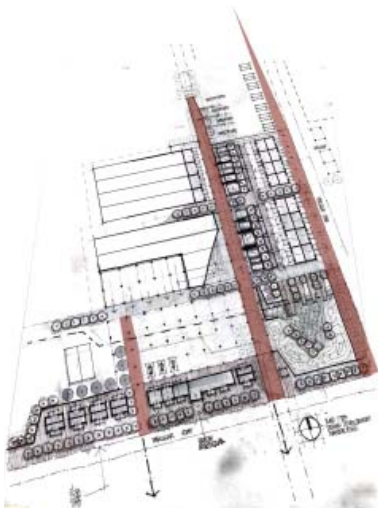


The plan has been developed to emphasize the different experiential spaces within the landscape intervention, where man is introduced to the existing structures and consequently exposed to a variety of systems and processes. Markets, workshops and micro industries respond to the productive heritage of the post industrial site, but are also firmly integrated into the production and natural processes of the

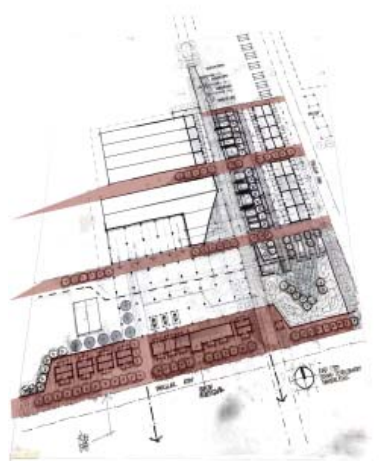
landscape, which presents crops fields and experiential landscapes.

The plan responds to the strict geometry and rigidity of the existing structures, yet allows the user to move through a sequence of hierarchy in space, experiencing different spatial entities and natural processes.

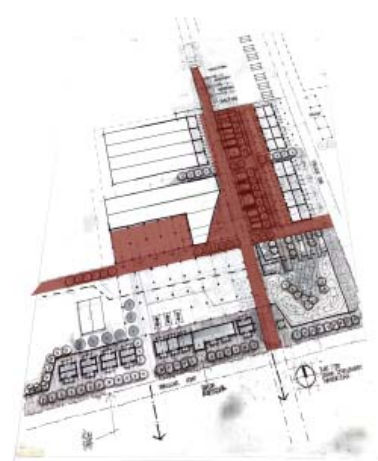
06.13_SPATIAL ANALYSIS



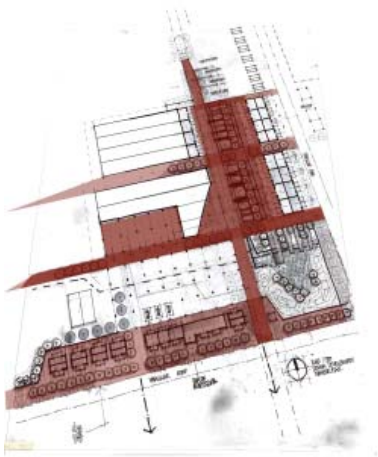
Primary Movement.



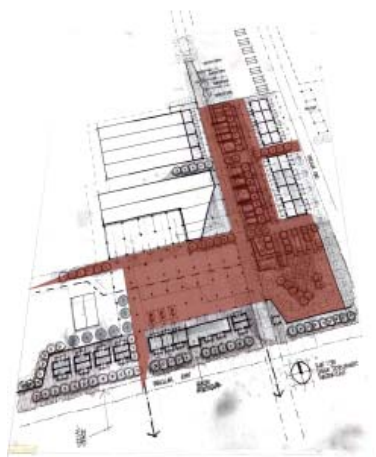
Secondary Movement.



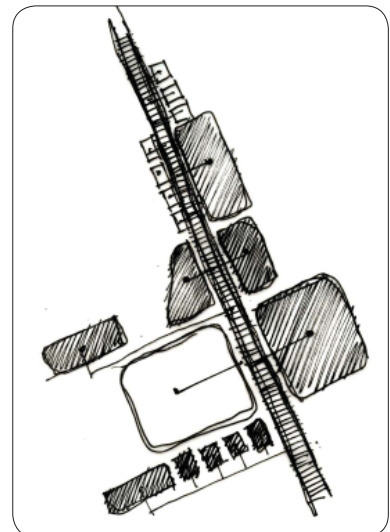
Programmes attach to axes.



Programmes establish on edge.



Integrated experiential proximity.



Activation of Axis

Figure 84: Spatial analysis. Author, 2014.

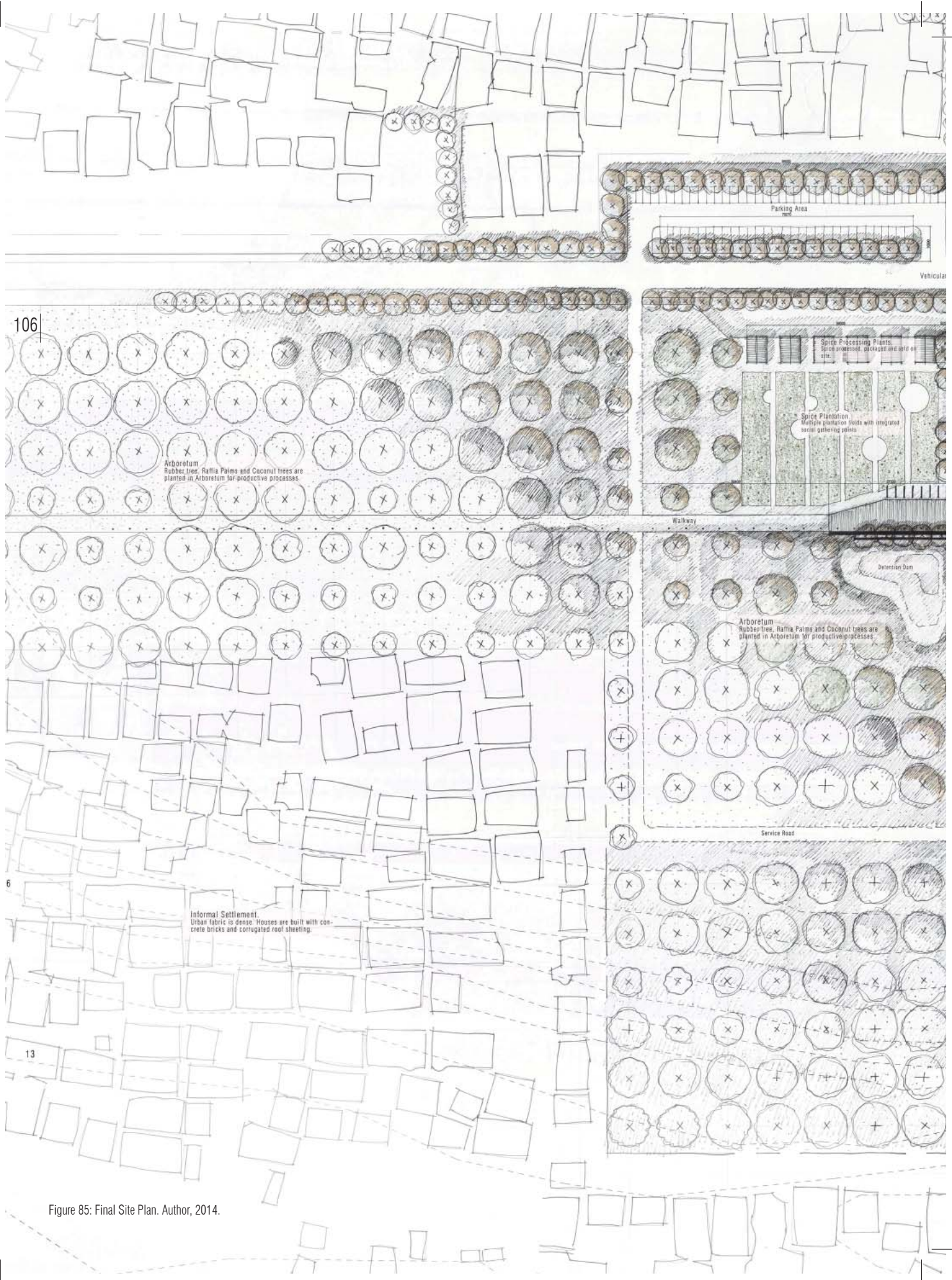
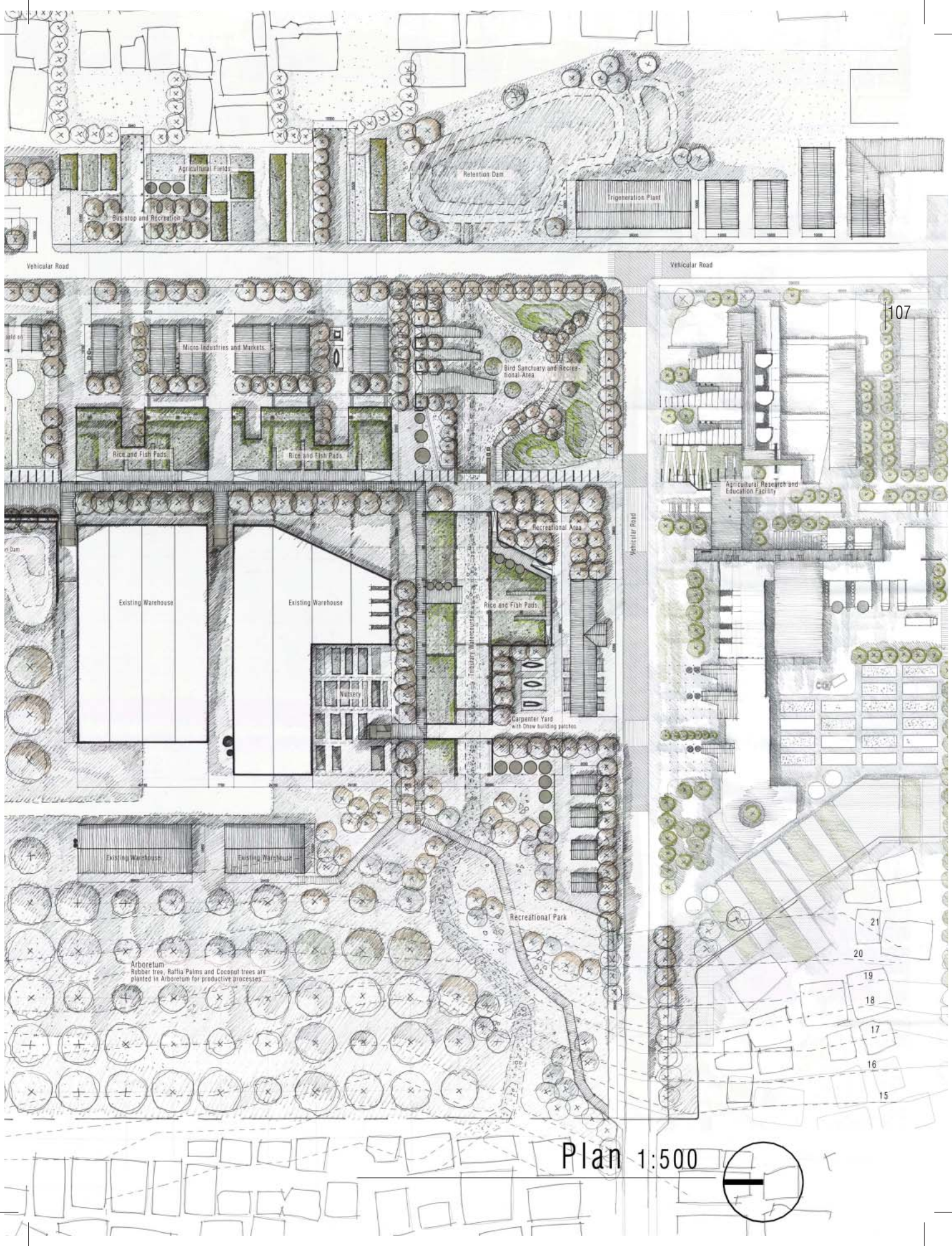
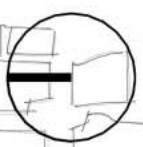


Figure 85: Final Site Plan. Author, 2014.



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Plan 1:500



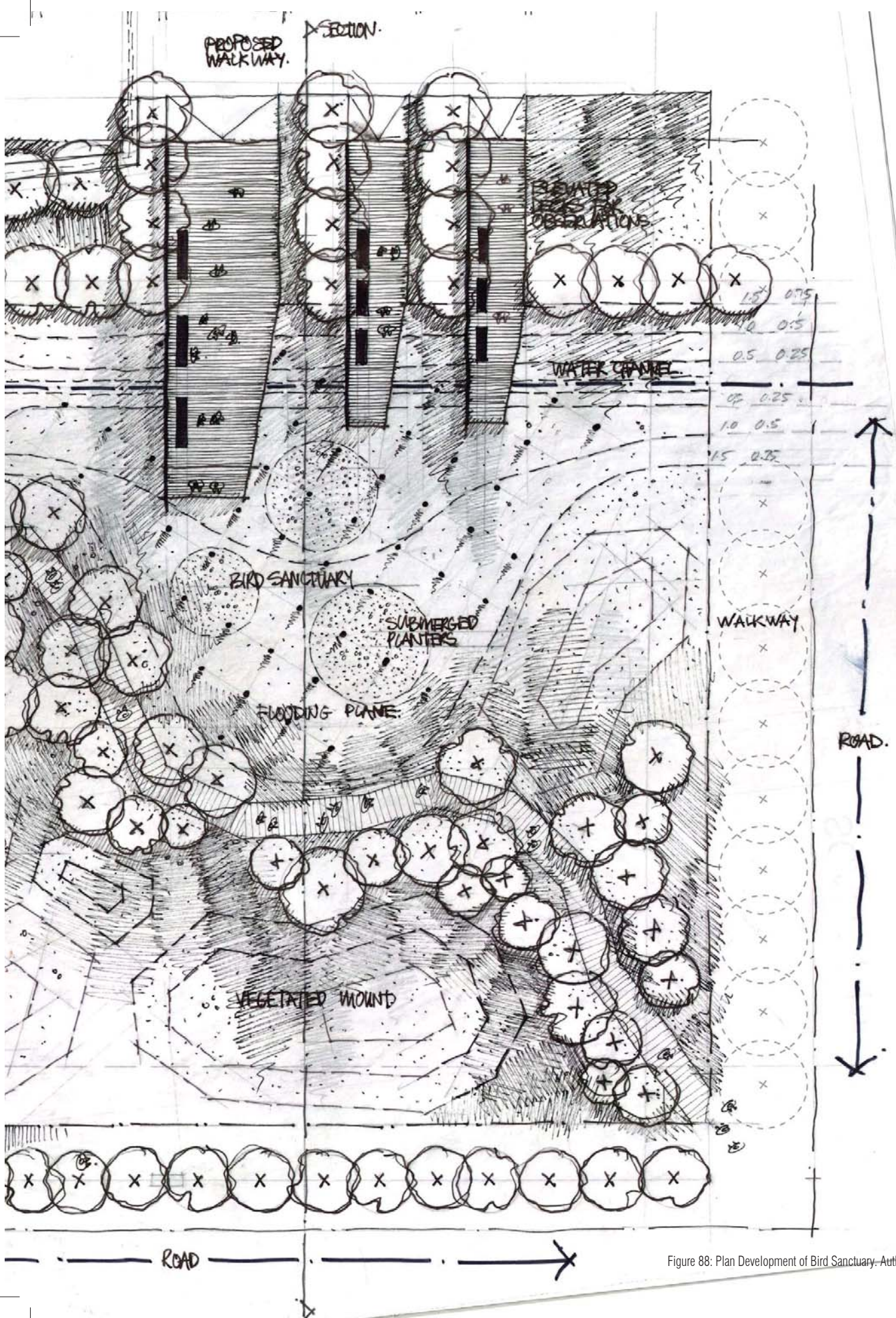


Figure 88: Plan Development of Bird Sanctuary. Author, 2014.

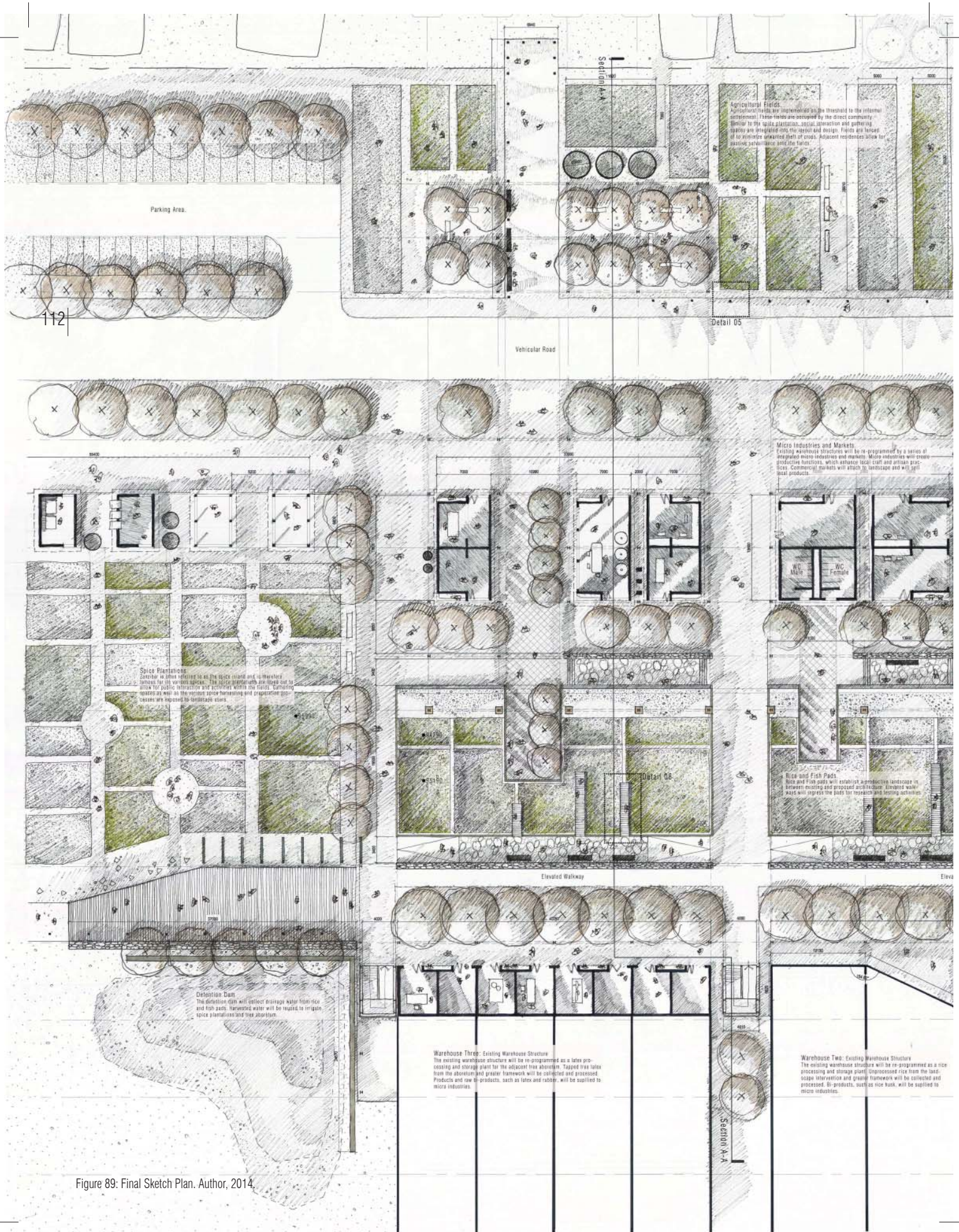
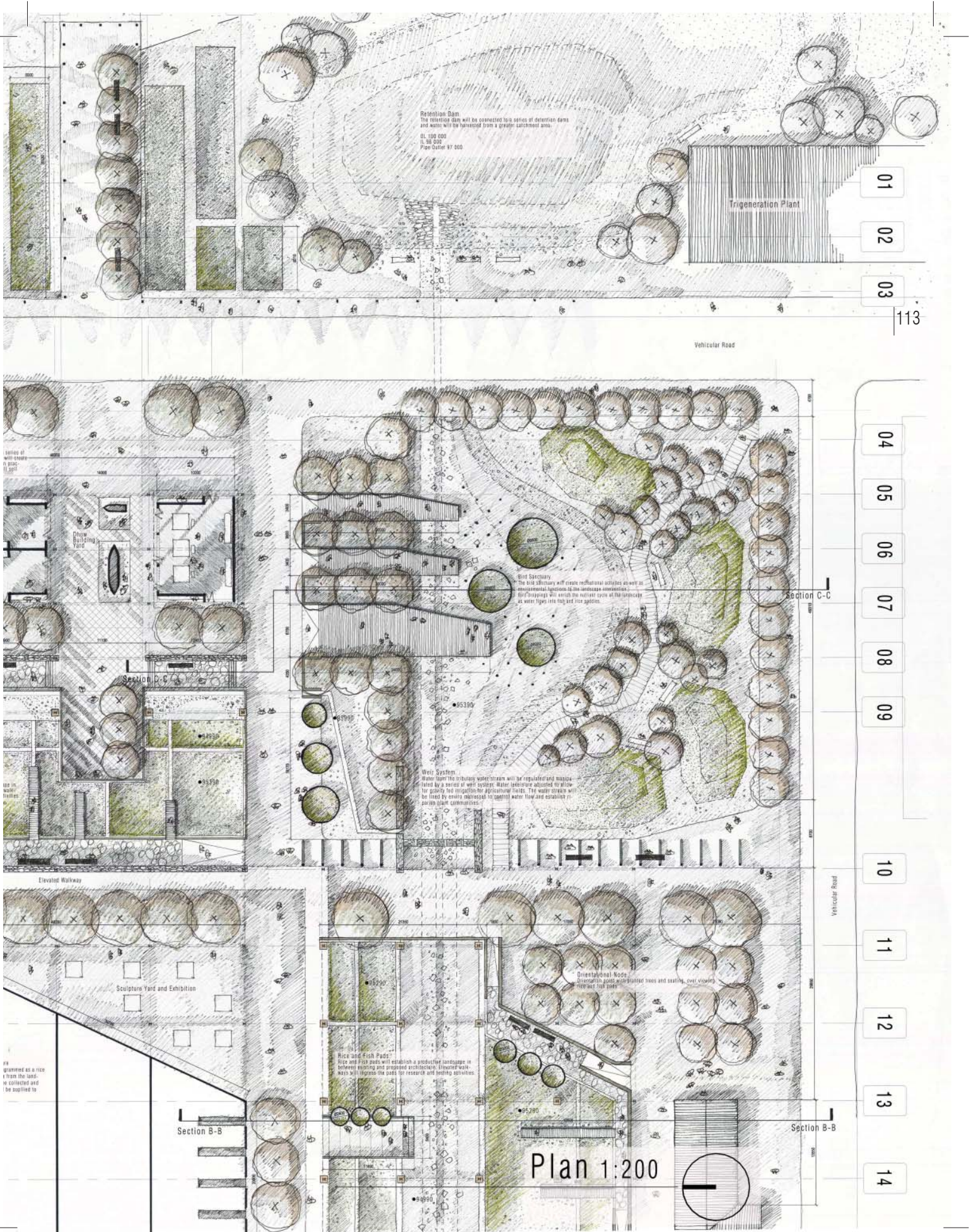
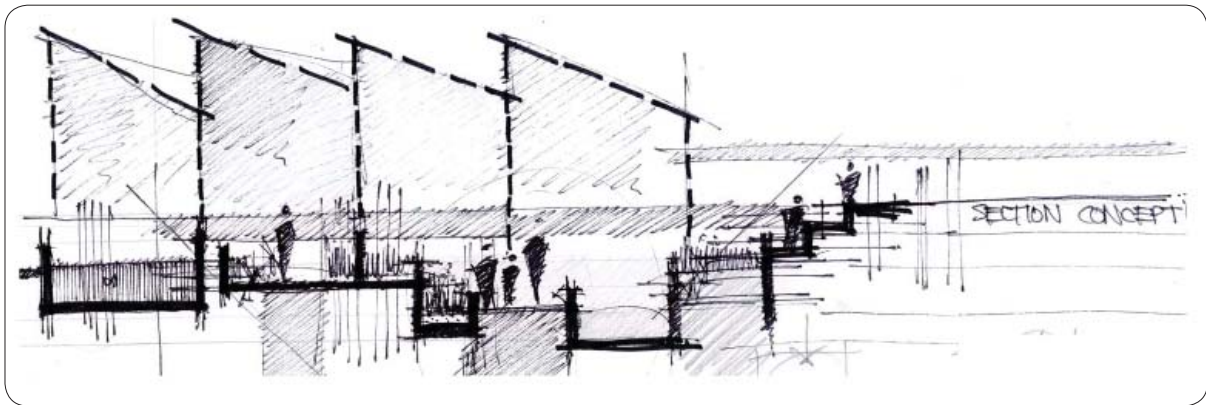


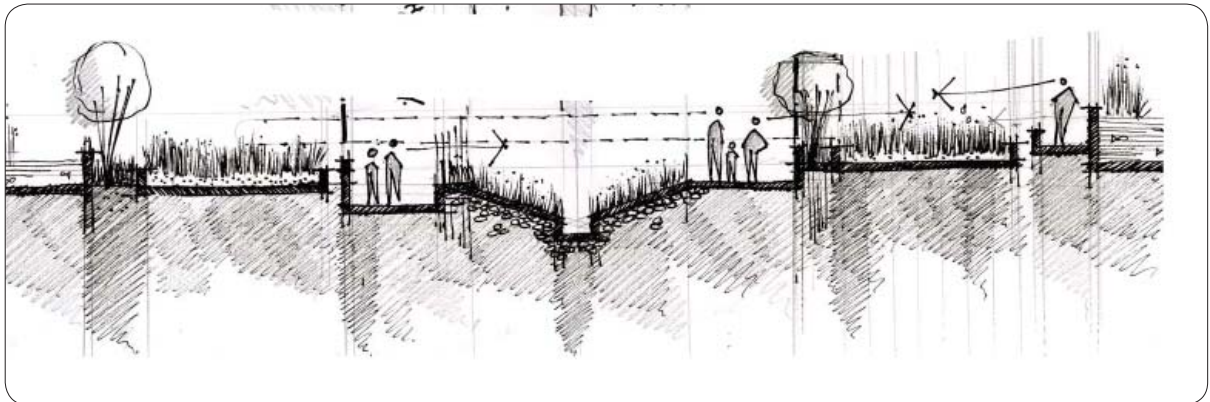
Figure 89: Final Sketch Plan. Author, 2014.



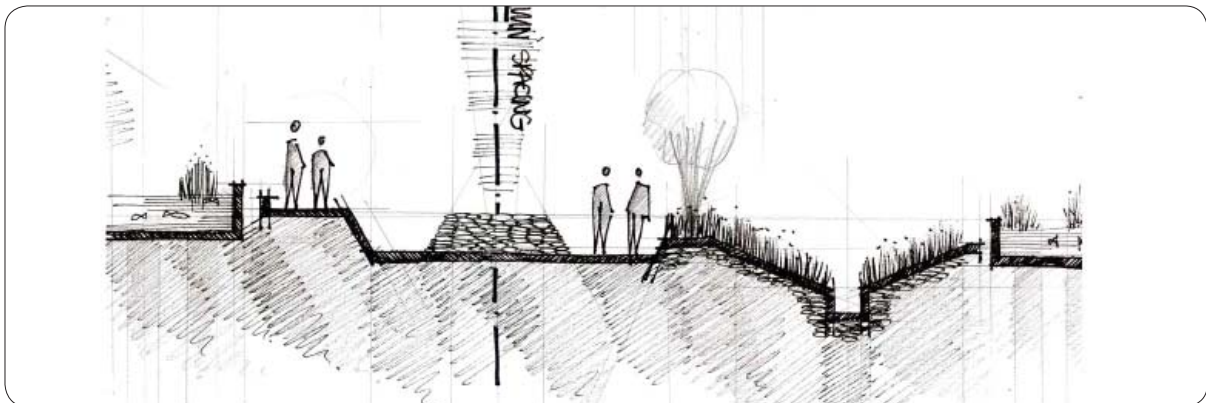
06.14_SECTIONAL DEVELOPMENT



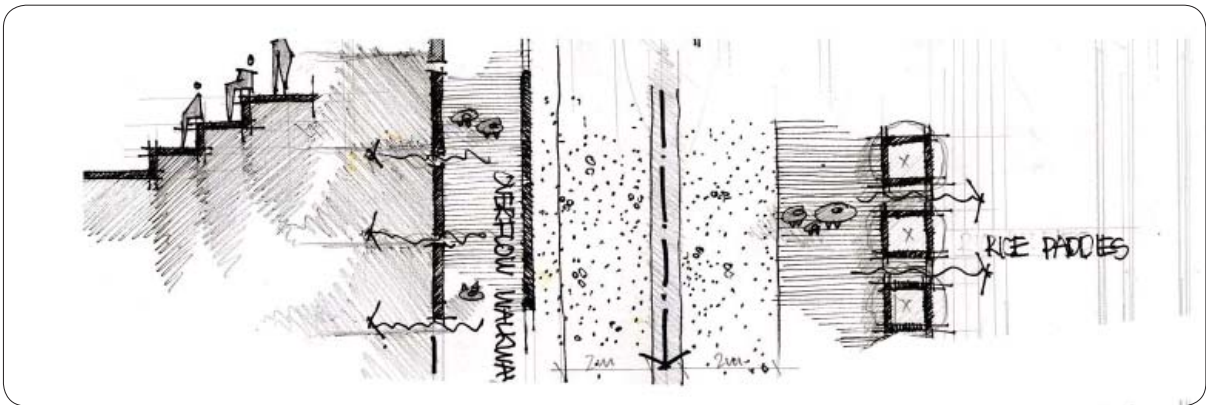
Level manipulation within deconstructed warehouse.



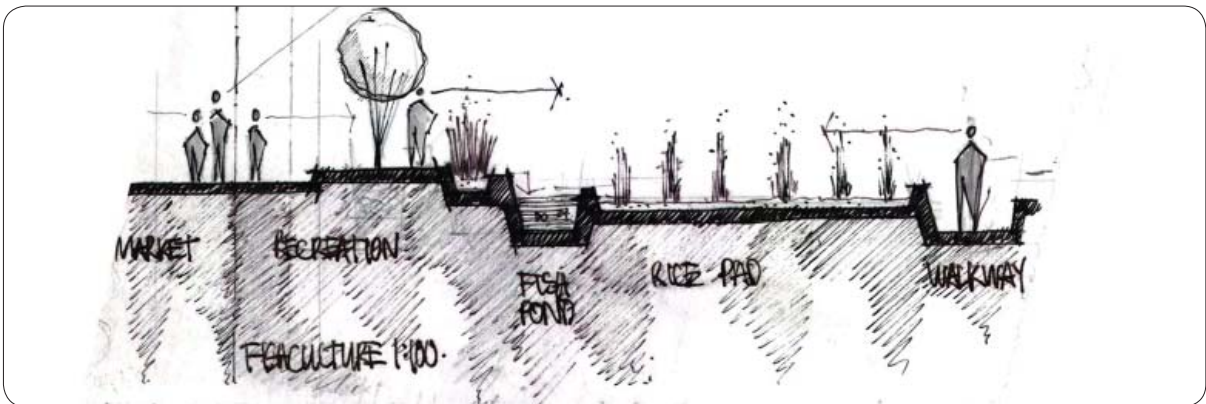
Tributary watercourse introduced into landscape.



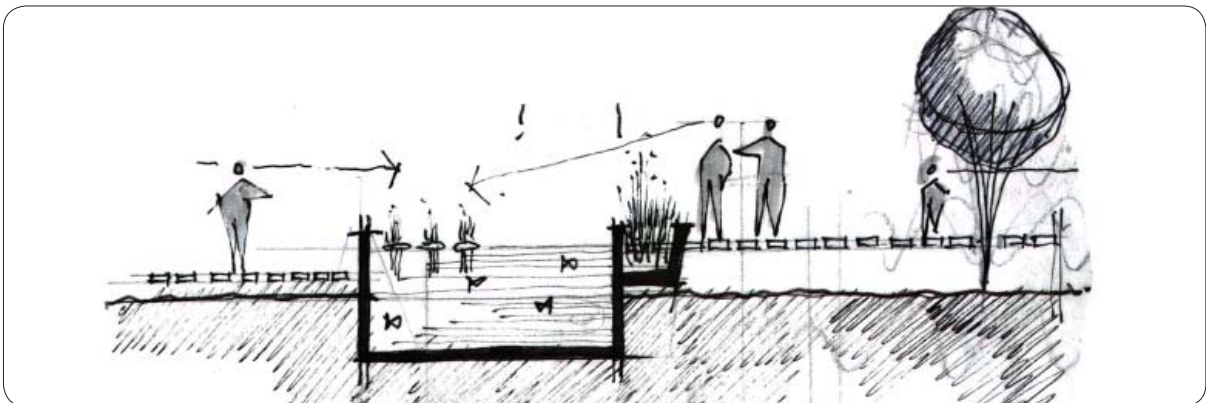
Treatment of column spacing in landscape design.



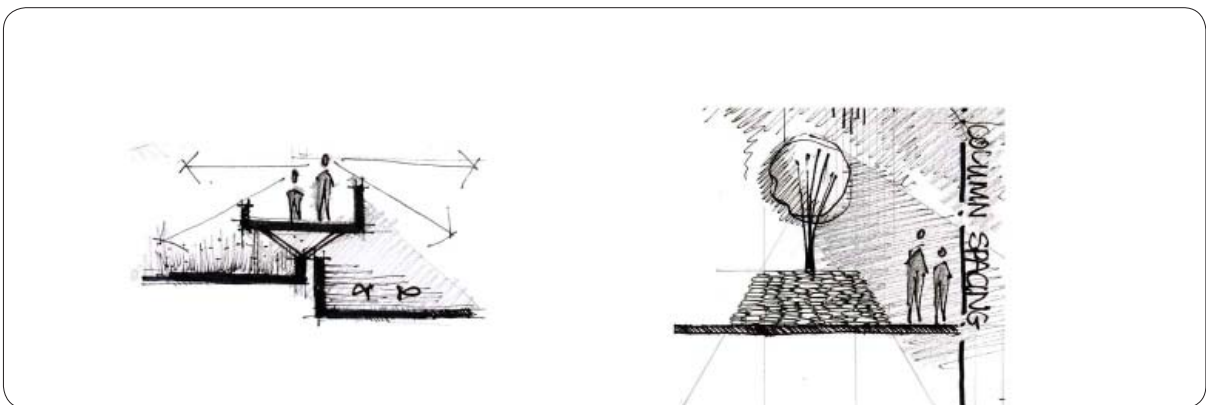
Movement route along watercourse.



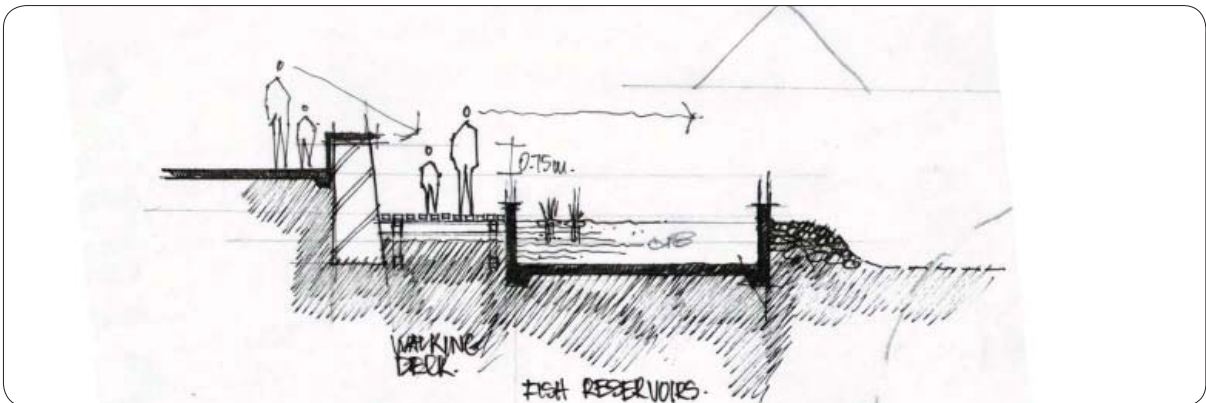
Level manipulation for aquaculture.



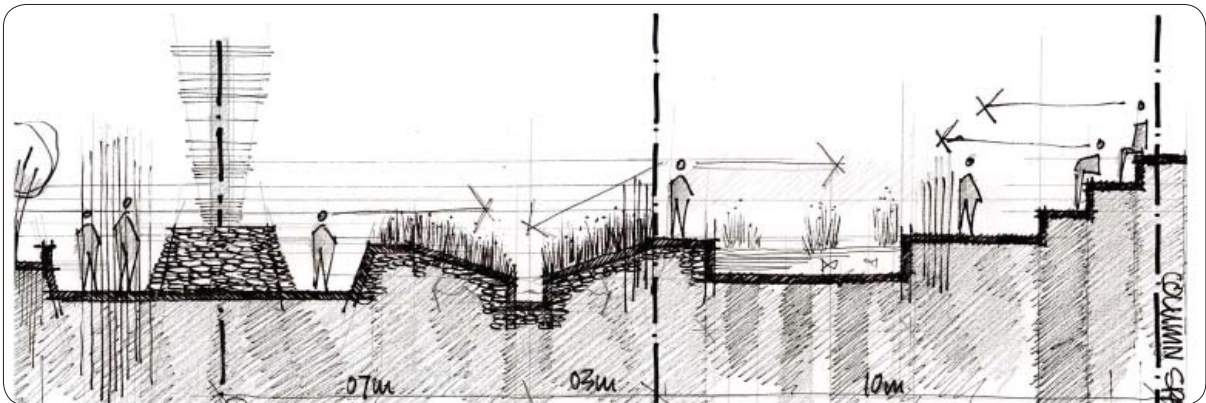
Threshold exploration between aquaculture and social space.



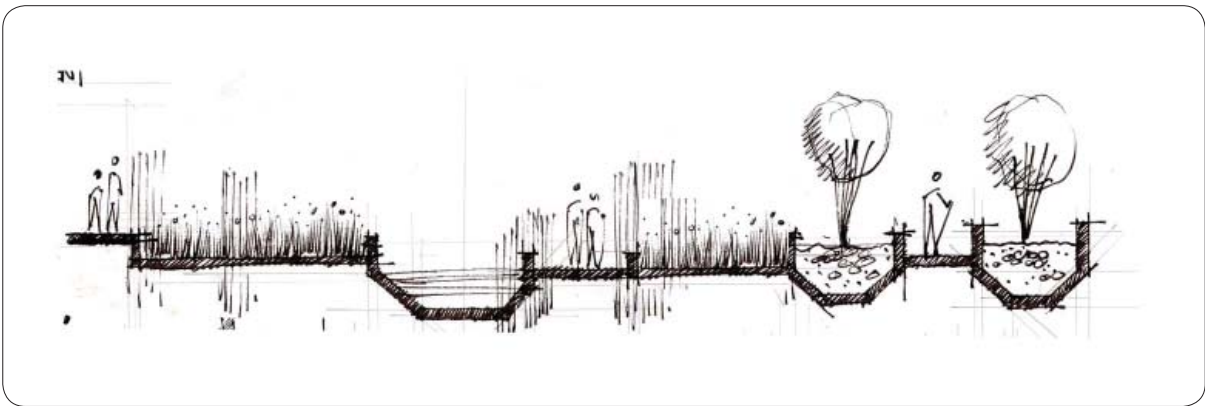
Elevated walkway and tree planters



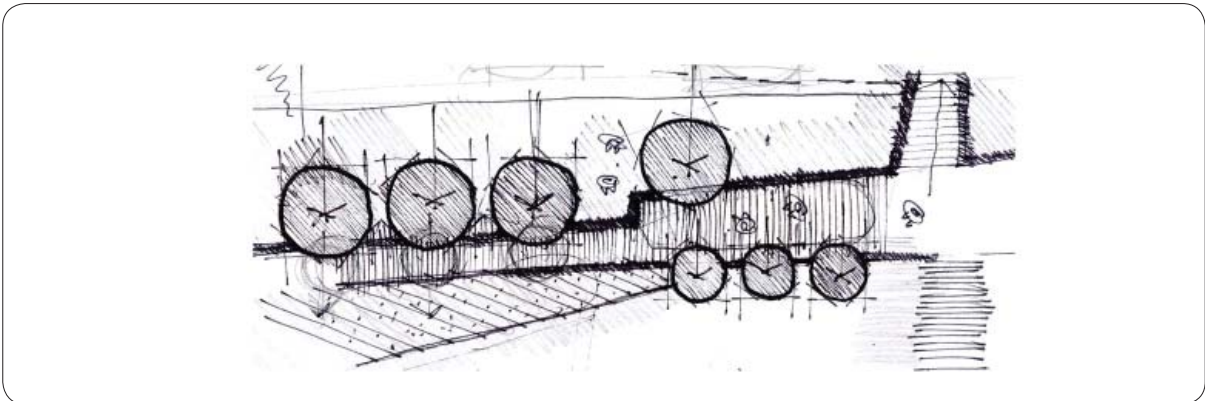
Threshold between aquaculture and movement routes



Column spacing and level manipulation



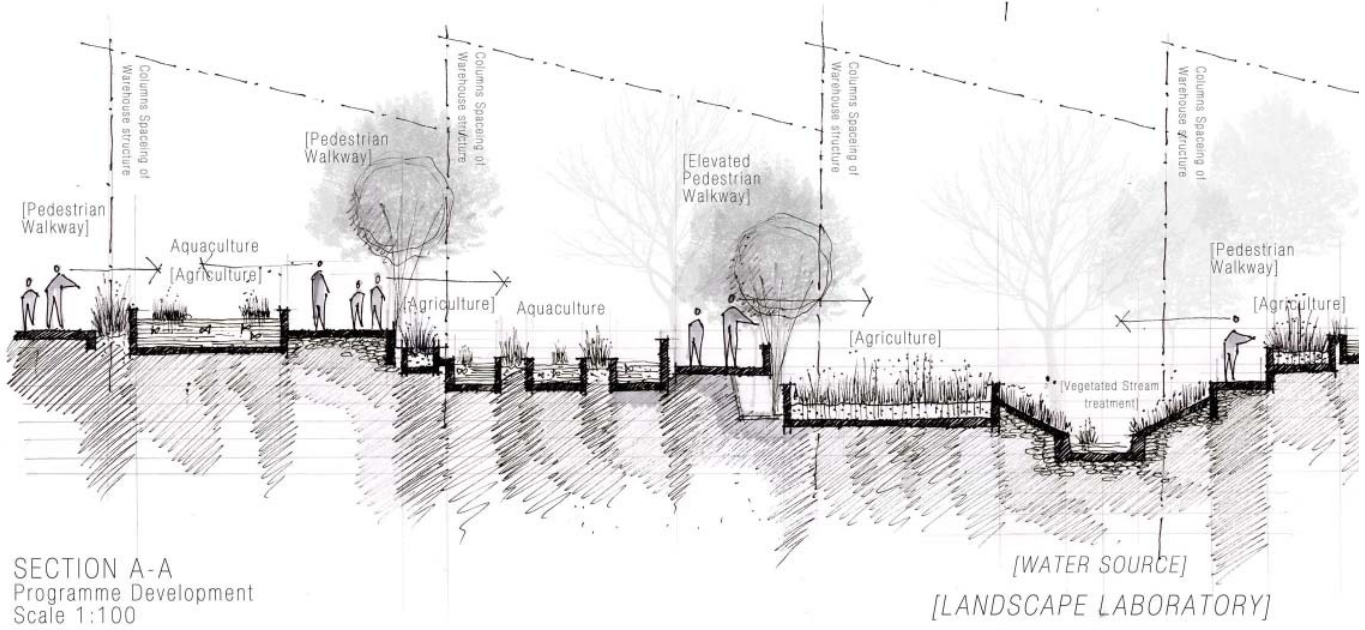
Aquaculture installation and walkways



Aquaculture installation and walkways

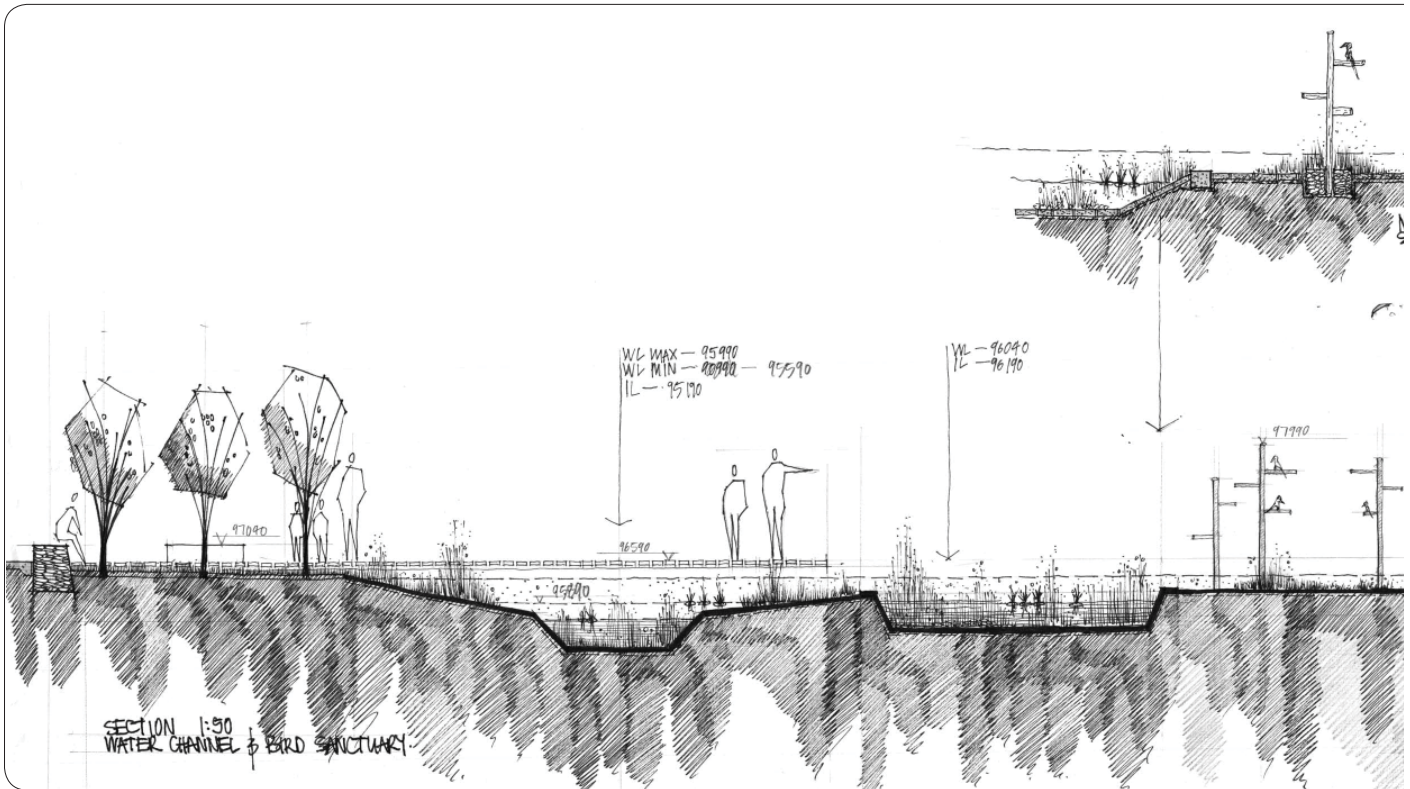
Figure 90: Sectional Development. Author, 2014.

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SECTION A-A
Programme Development
Scale 1:100

[WATER SOURCE]
[LANDSCAPE LABORATORY]



SECTION 1:50
WATER CHANNEL & BIRD SANCTUARY

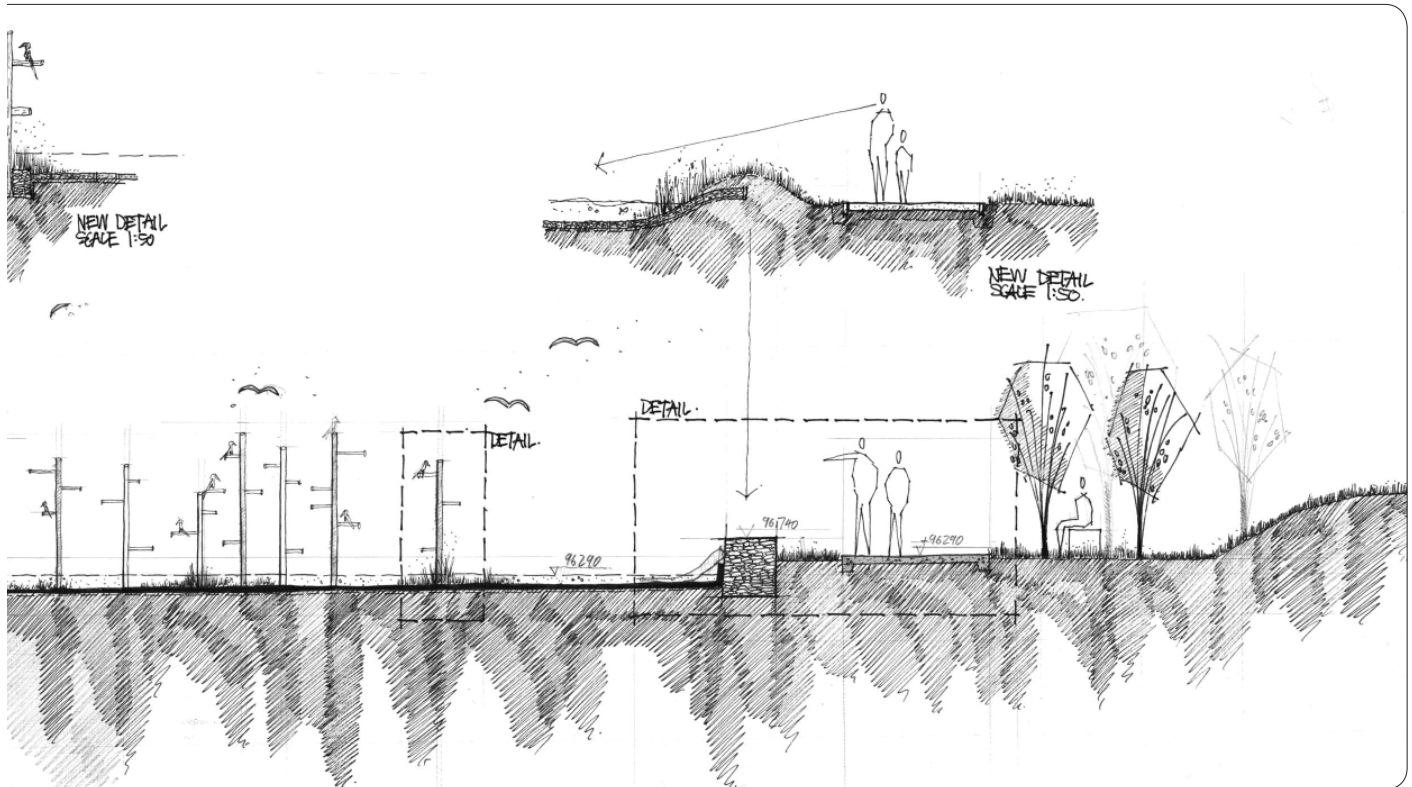
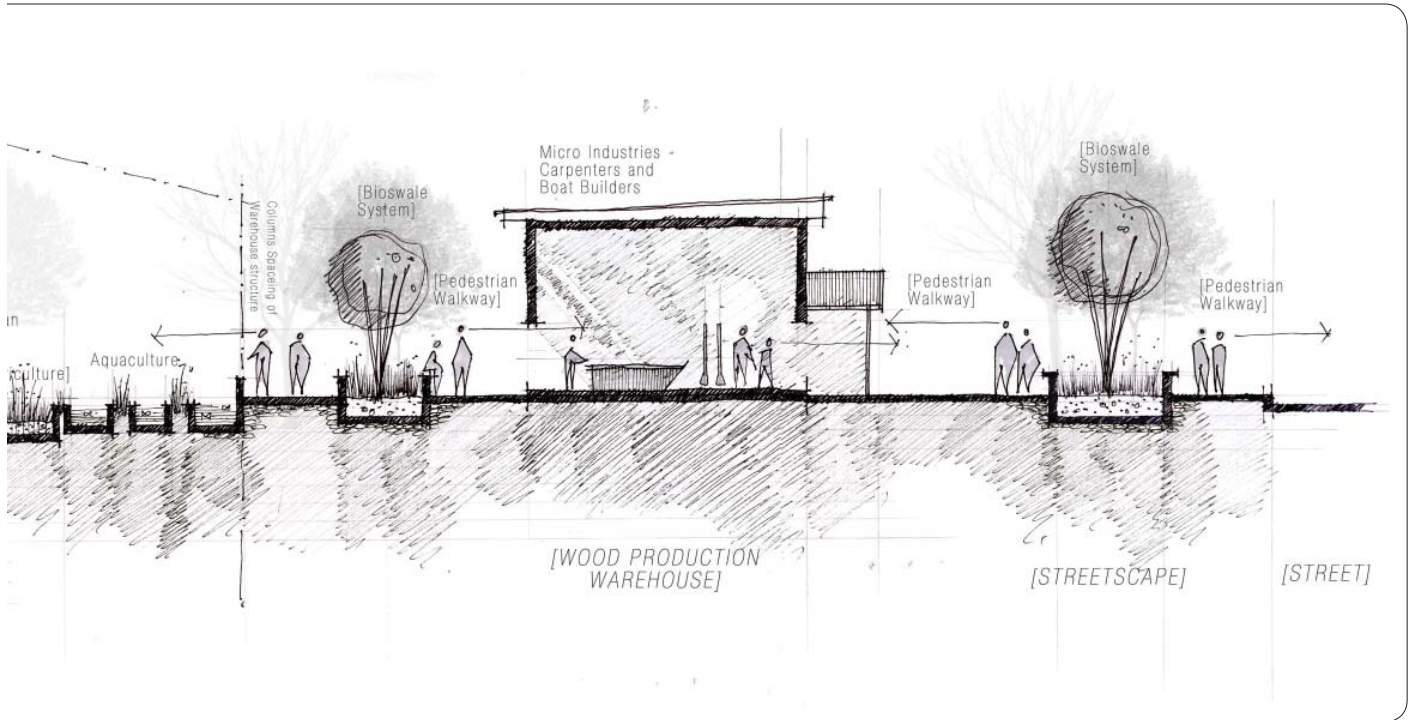
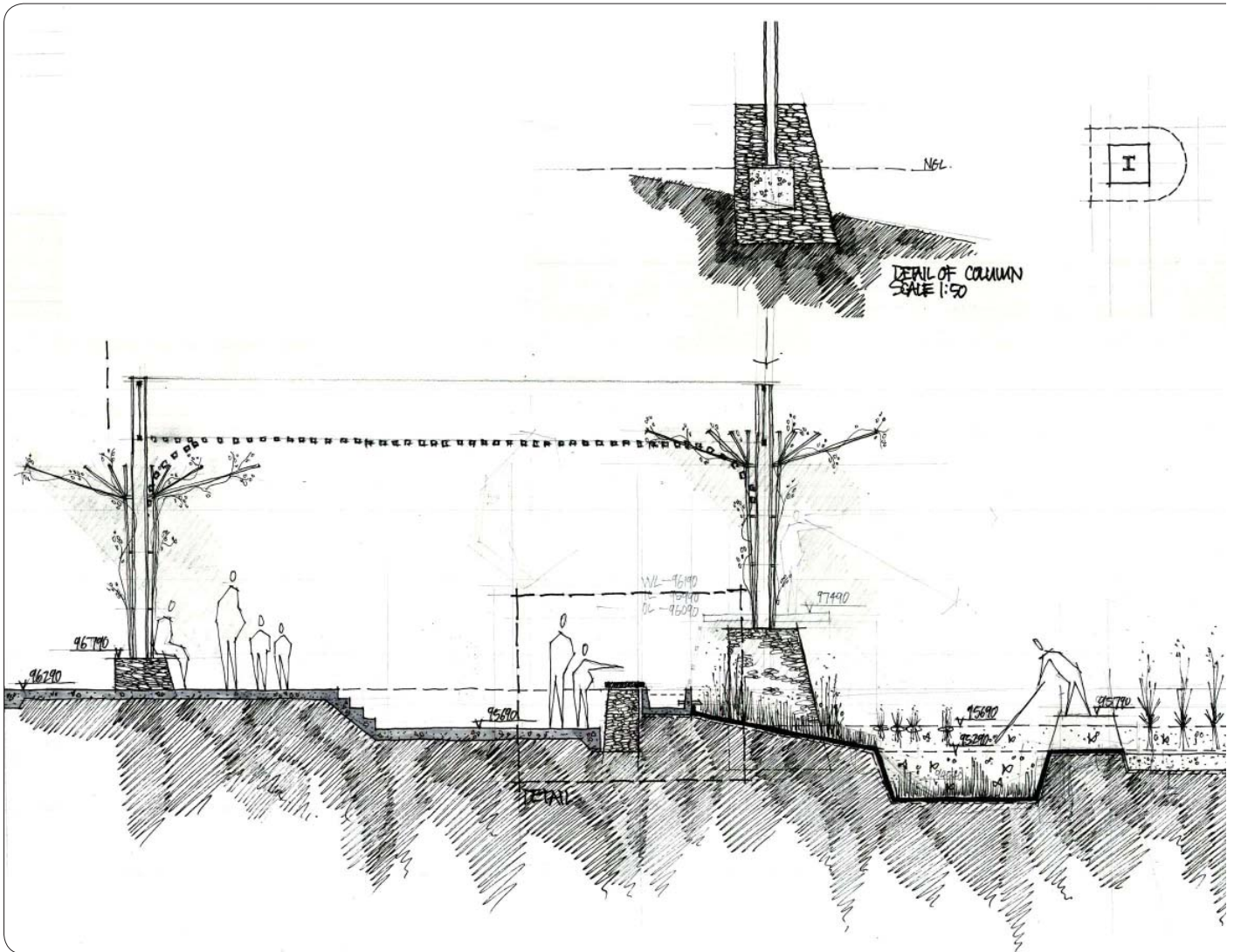


Figure 91: Sectional Development. Author, 2014.



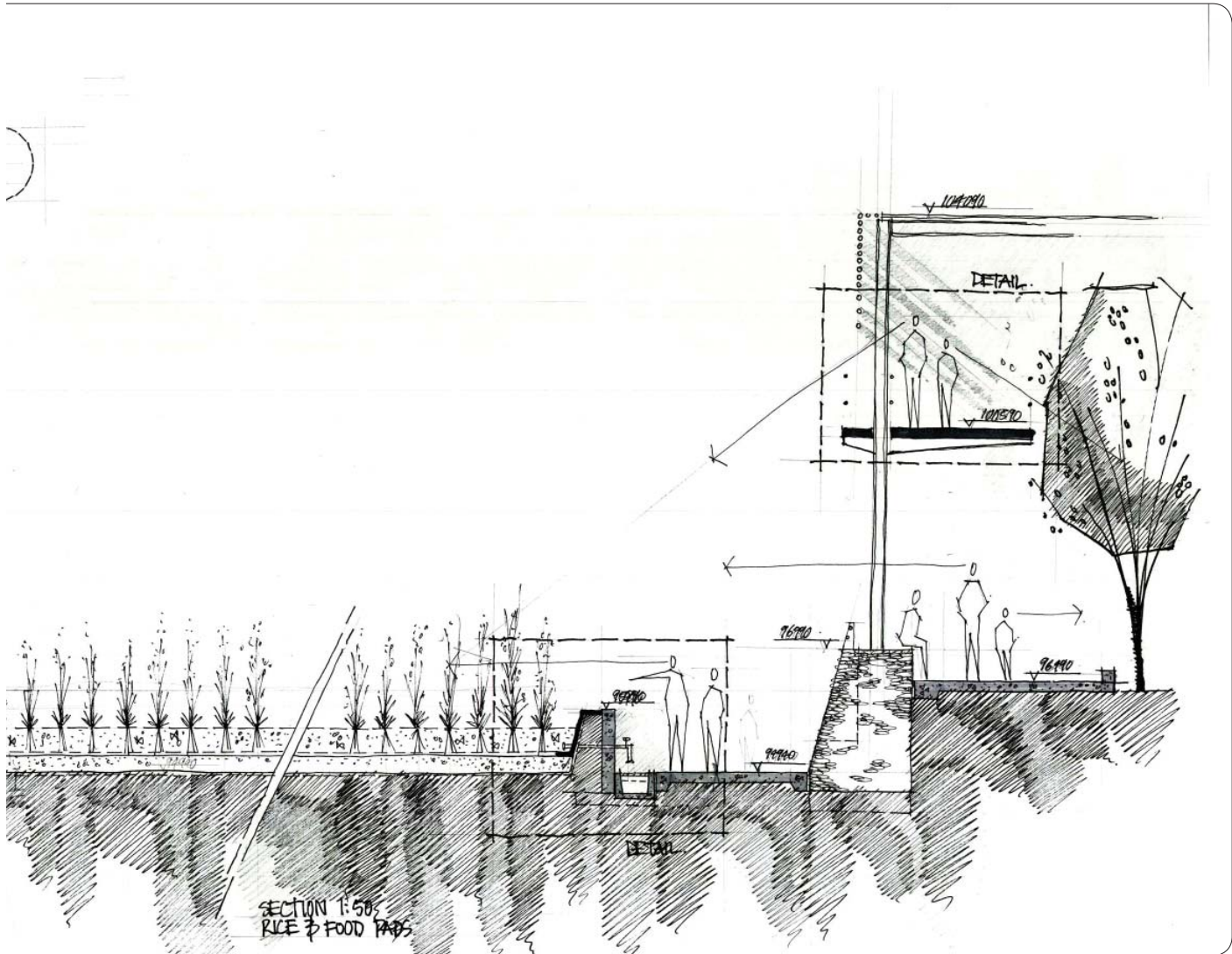
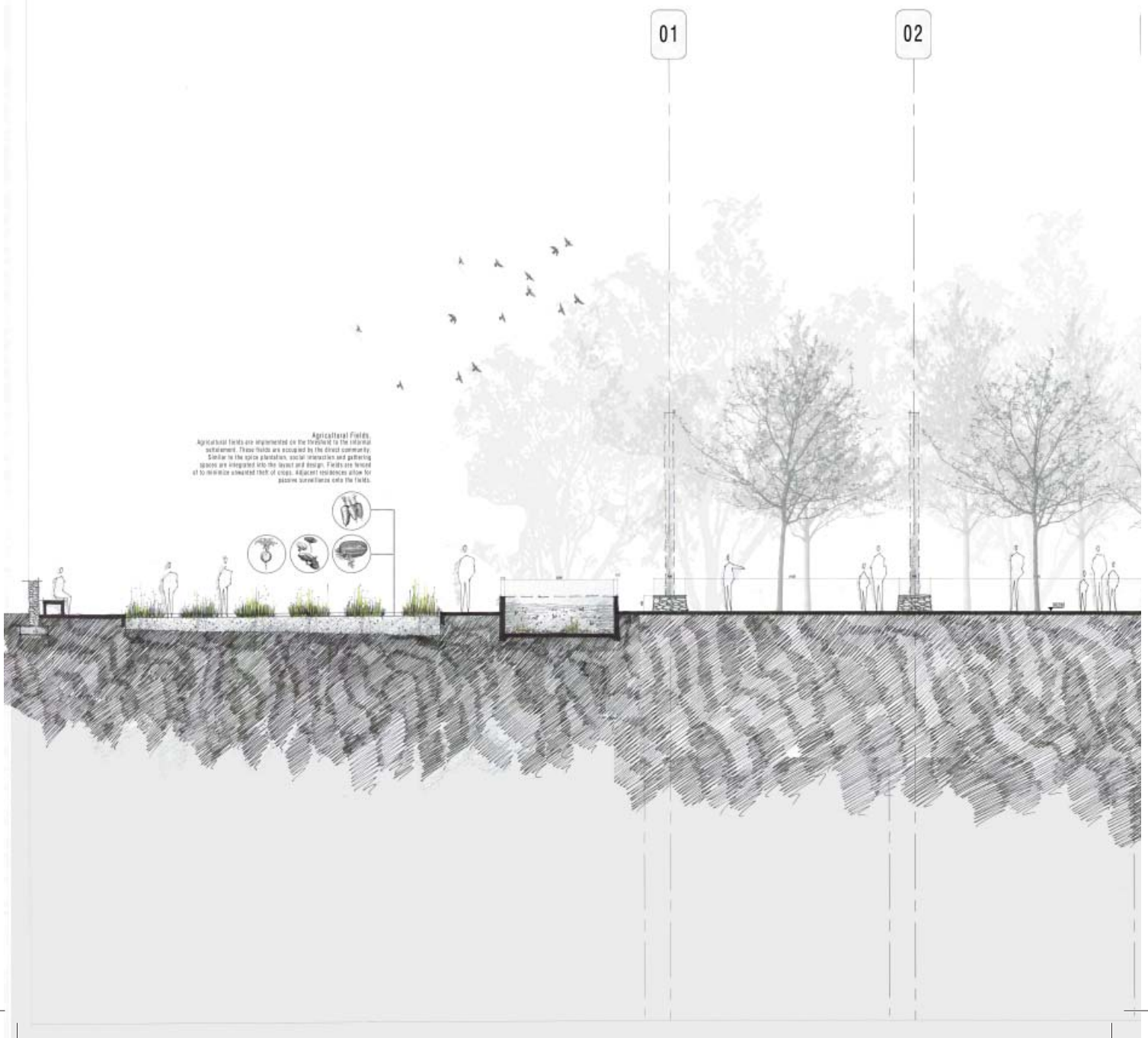
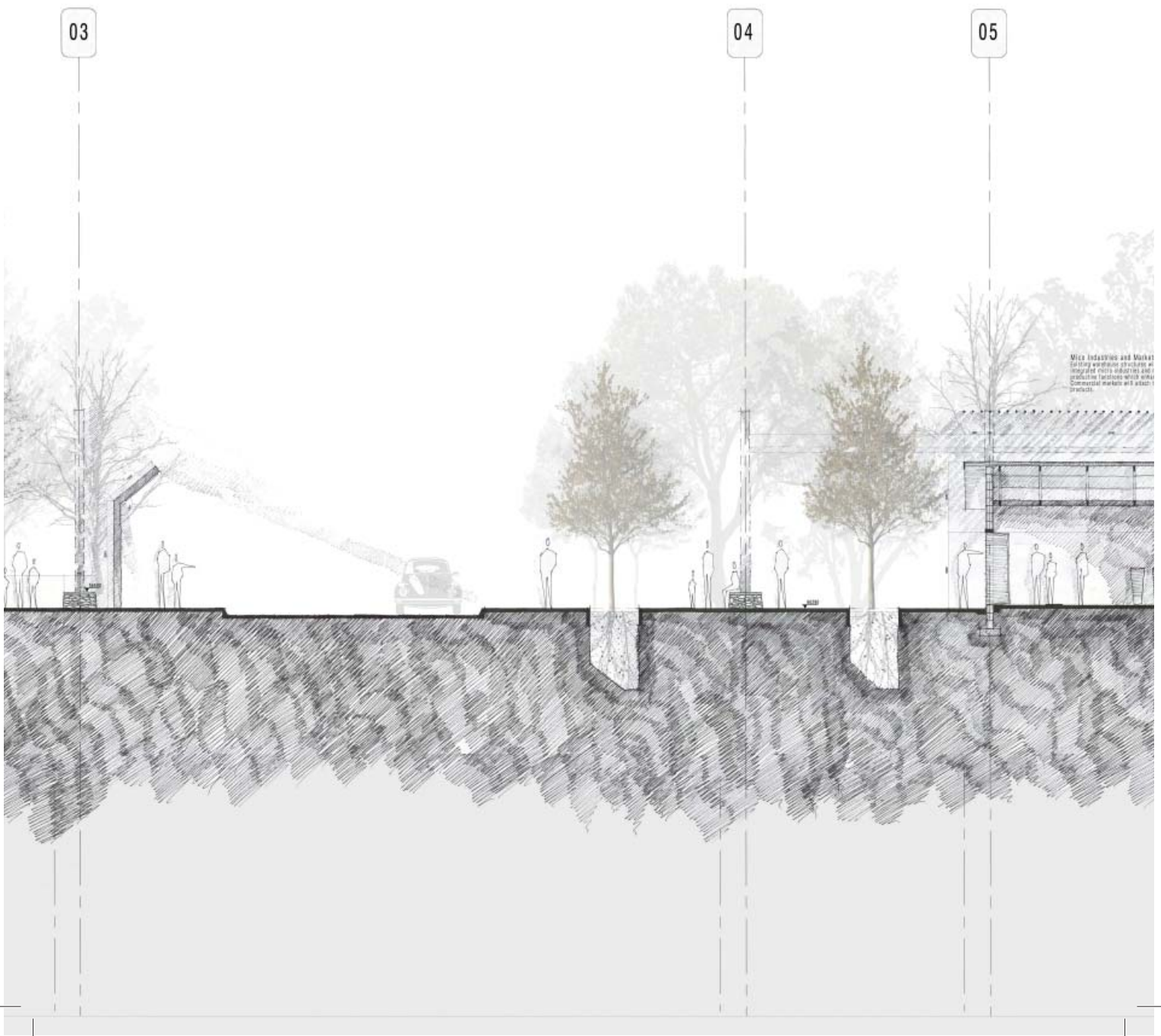
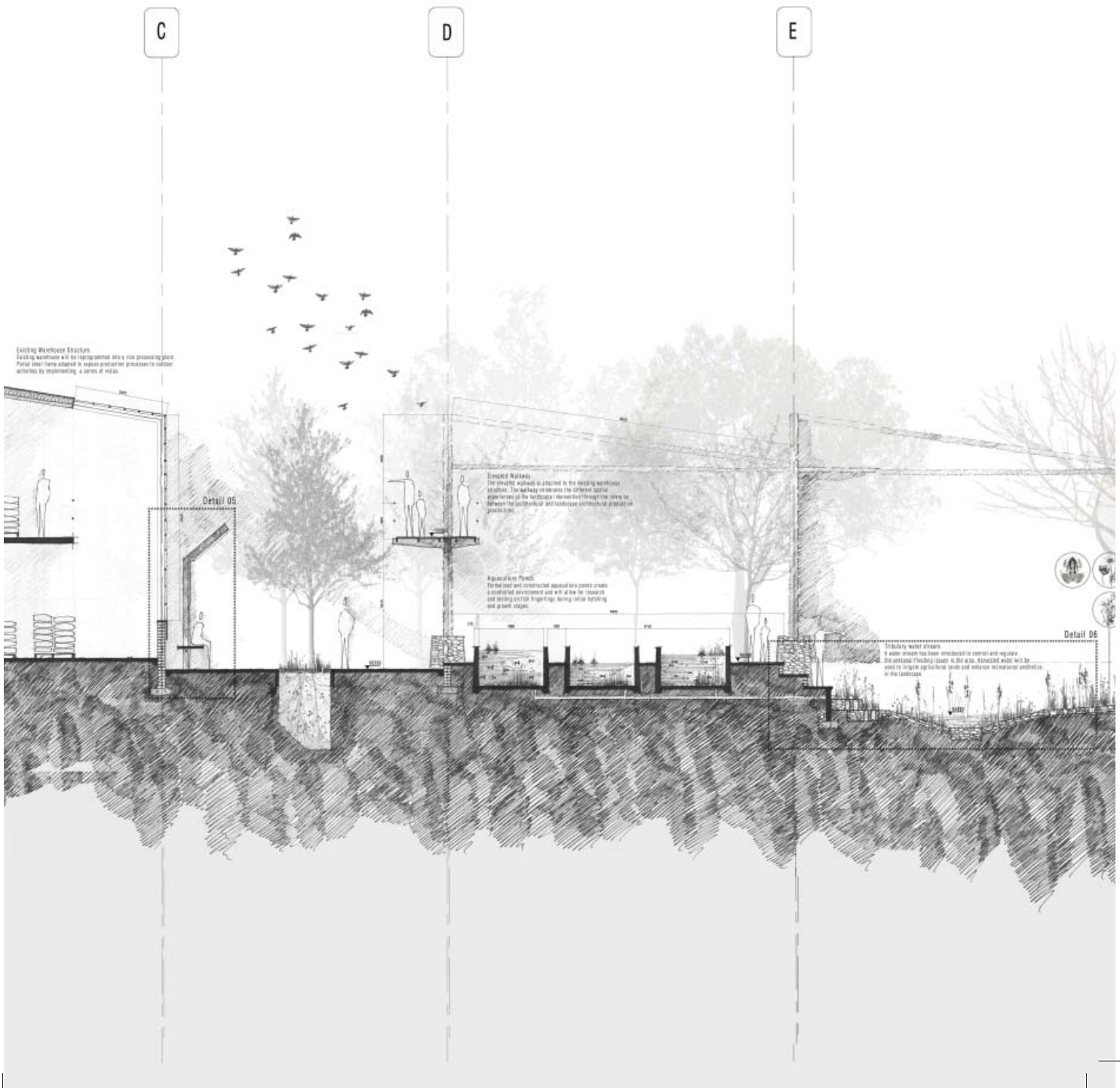
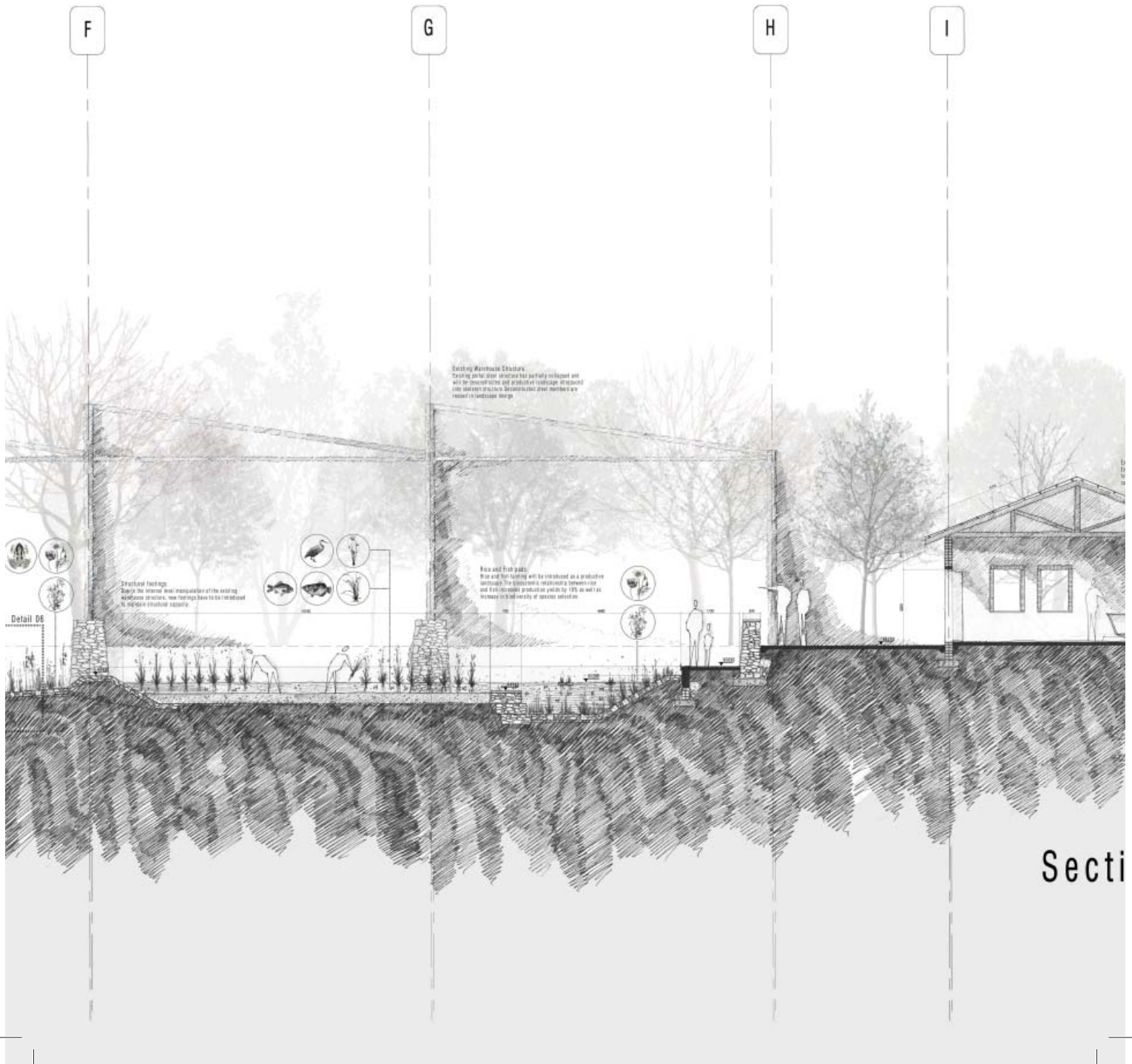


Figure 92: Sectional Development. Author, 2014.









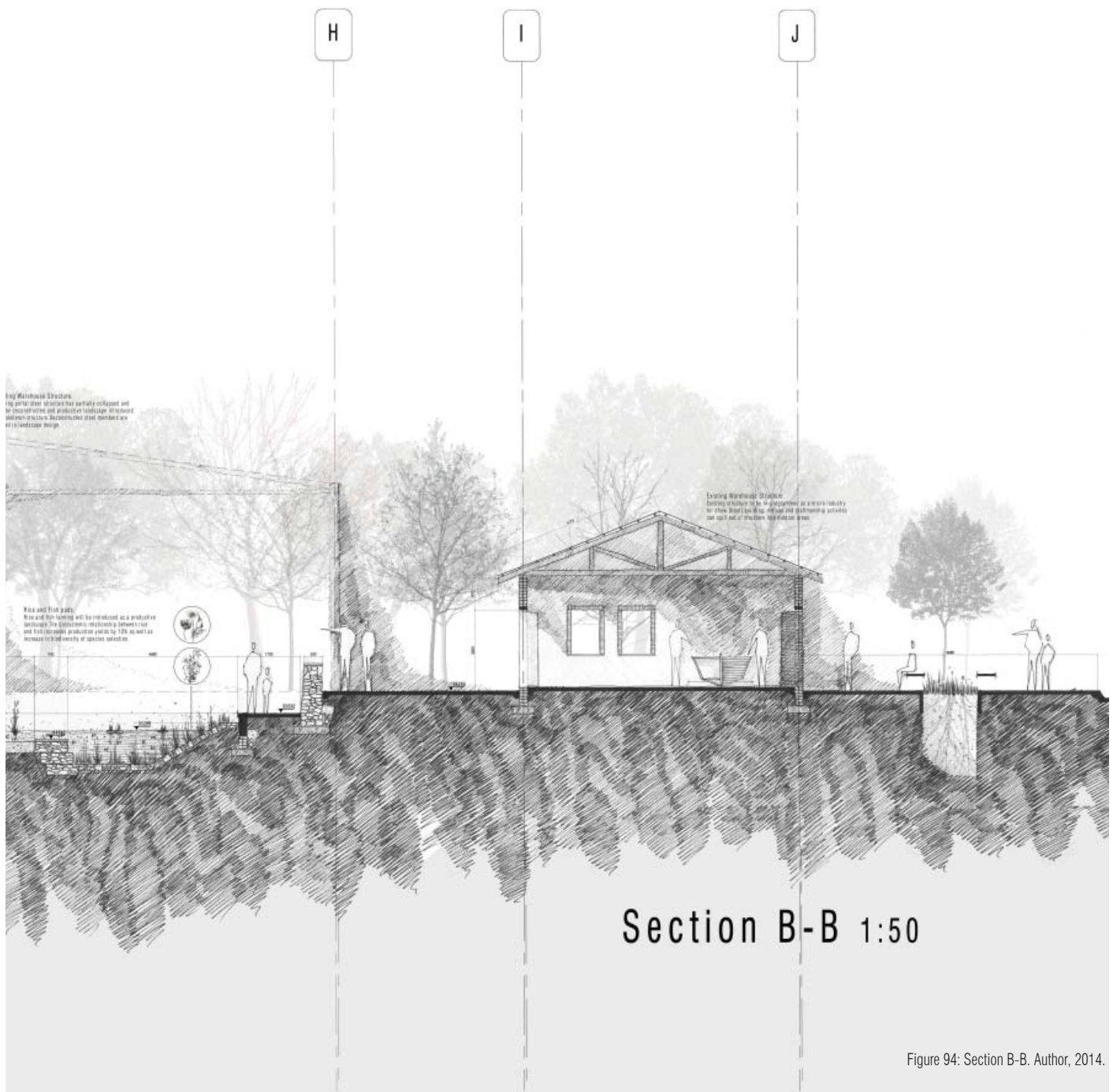
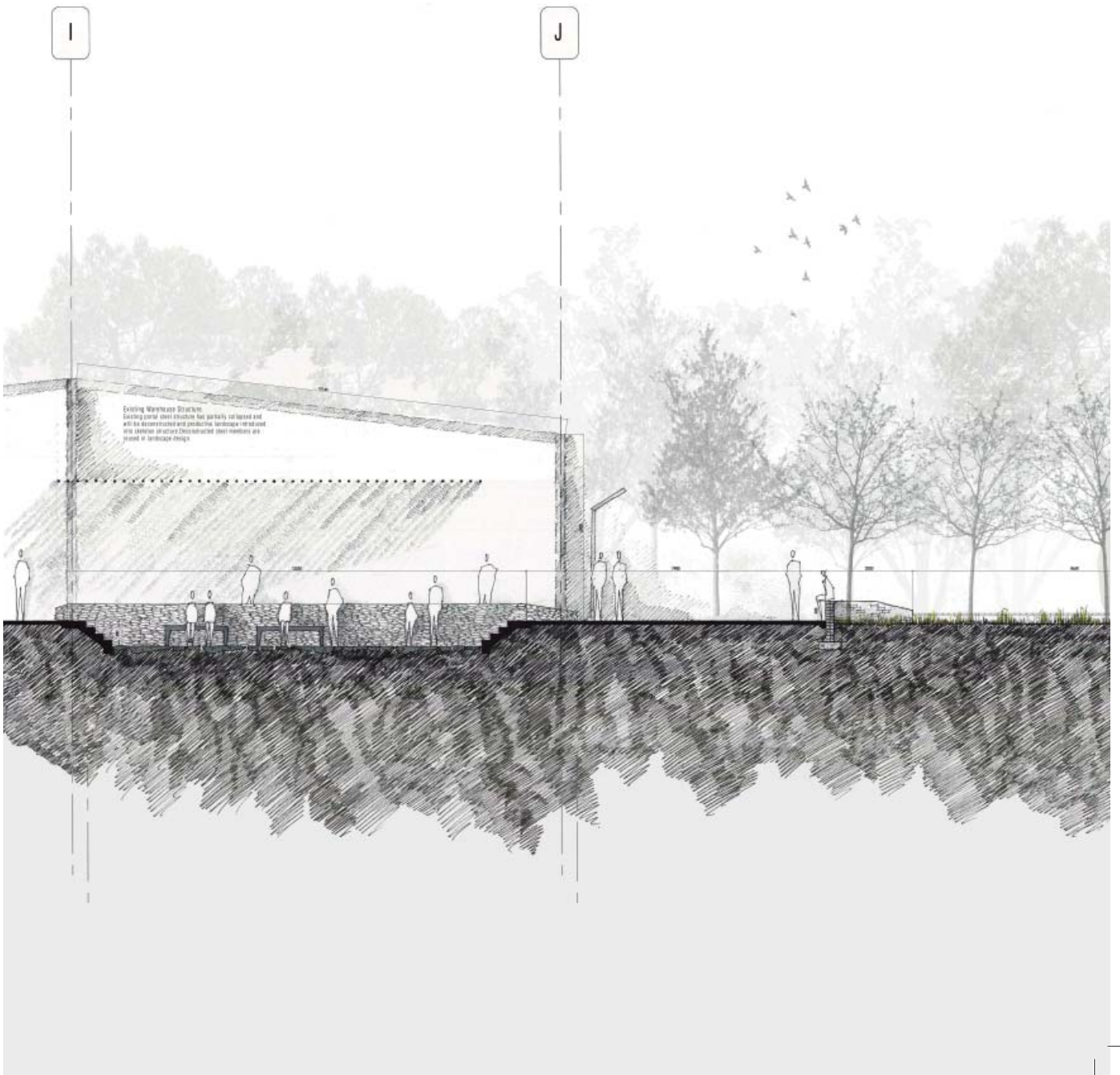
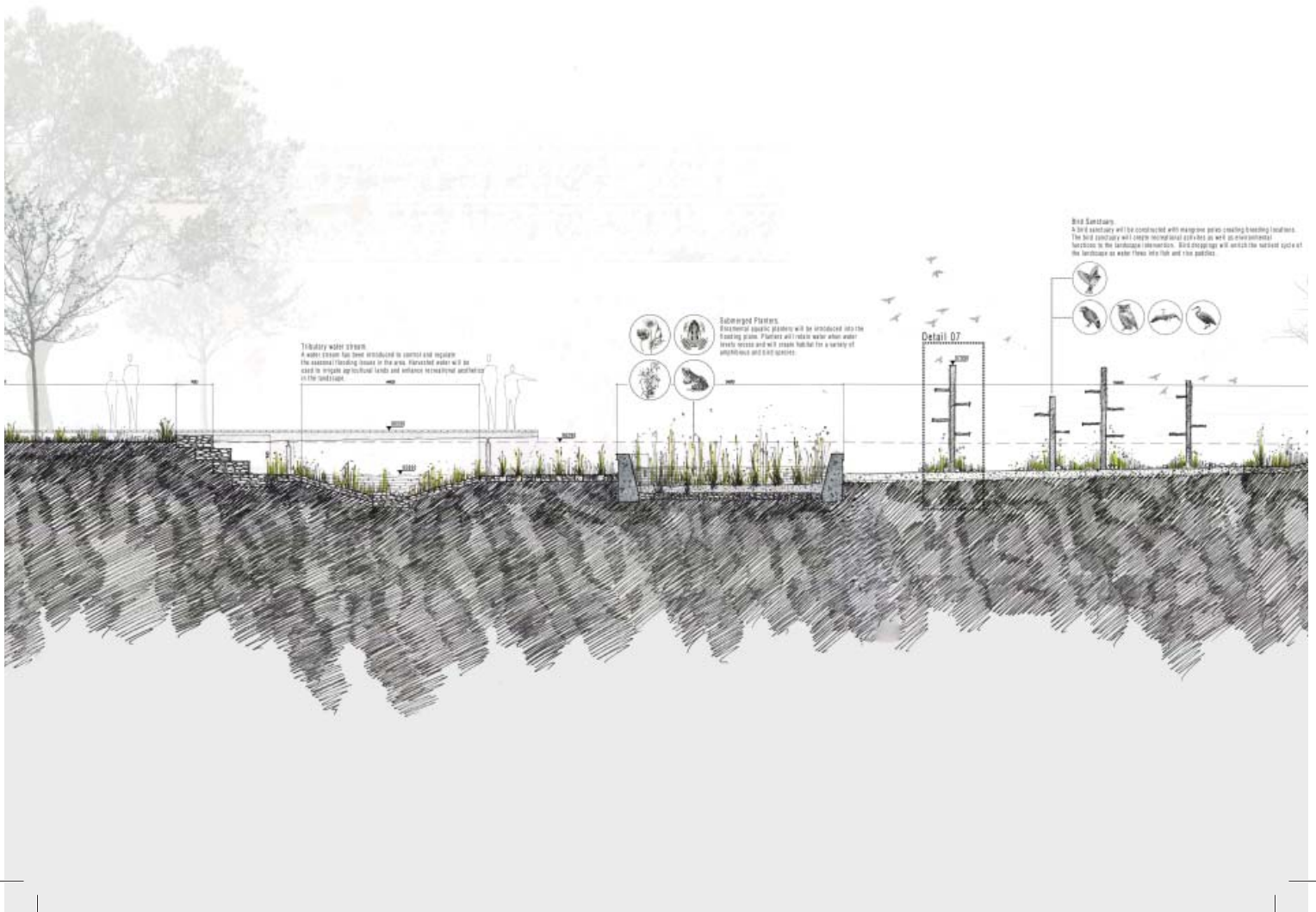
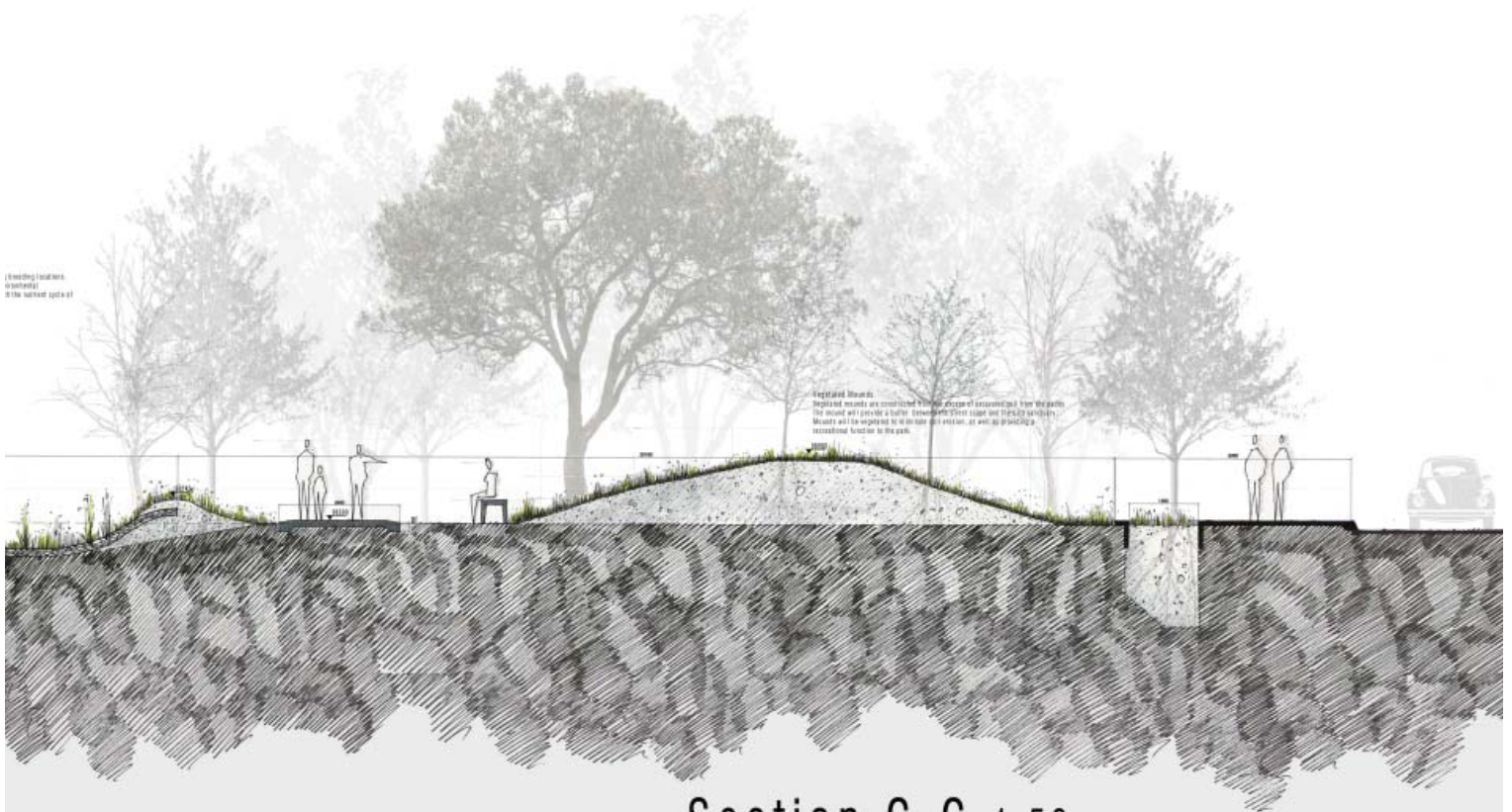


Figure 94: Section B-B. Author, 2014.







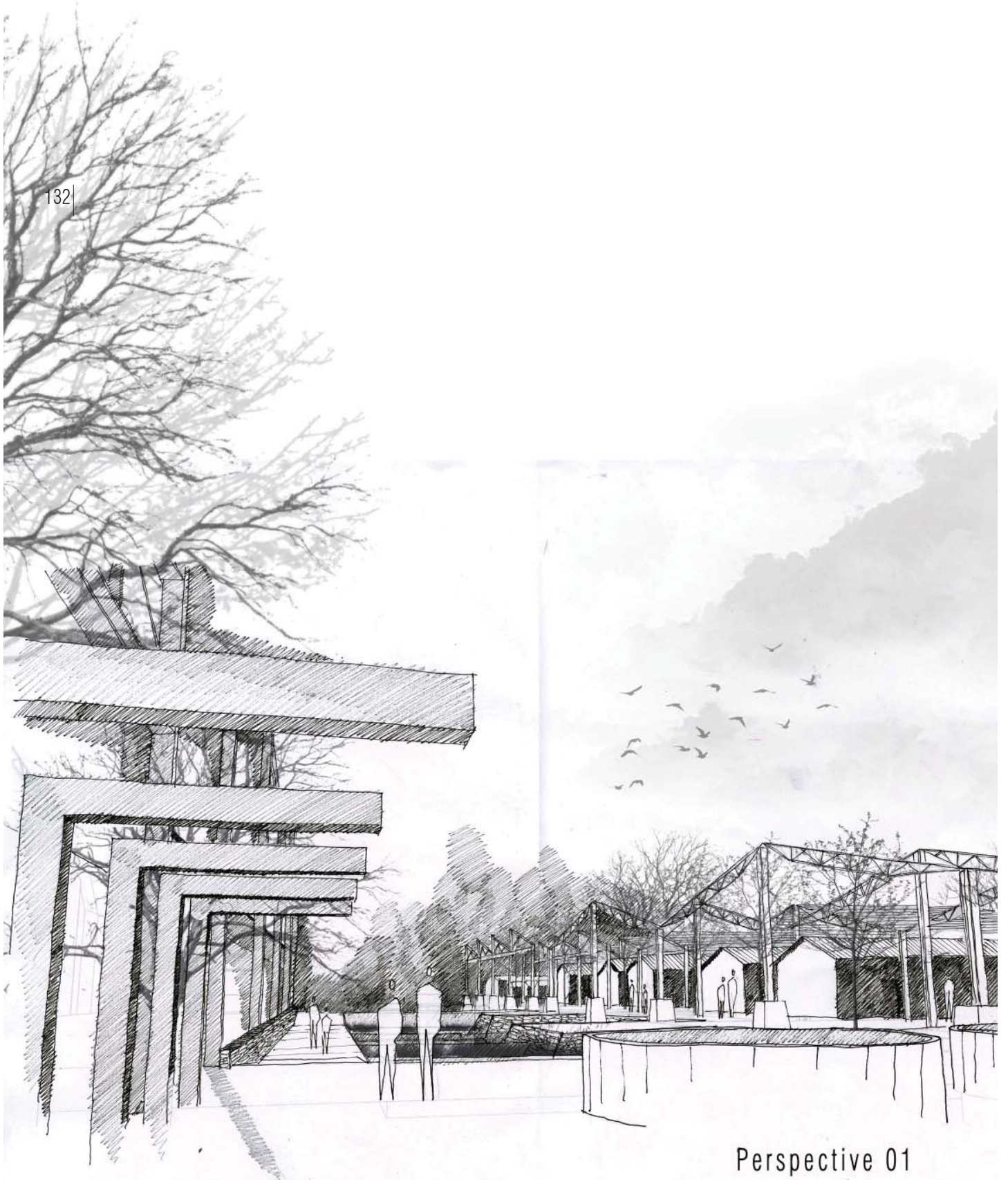
Existing road level
is indicated
in the section above

Vegetated Mounds:
Vegetated mounds are constructed to provide a buffer between the path and the road. The mounds will provide a buffer between the path and the road. Mounds will be planted to provide a natural function to the path.

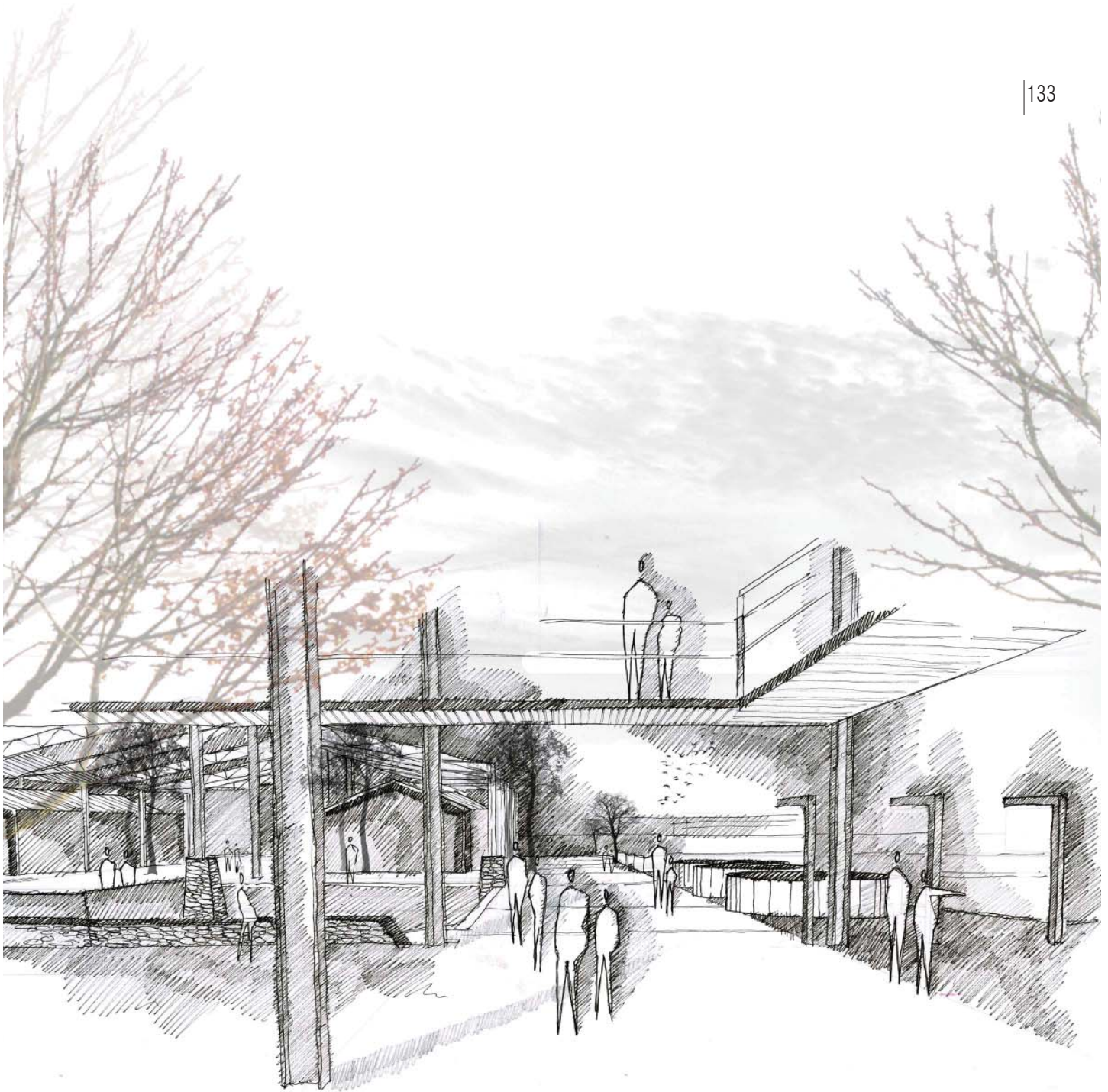
Section C-C 1:50

Figure 95: Section C-C. Author, 2014.

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Perspective 01



Perspective 02

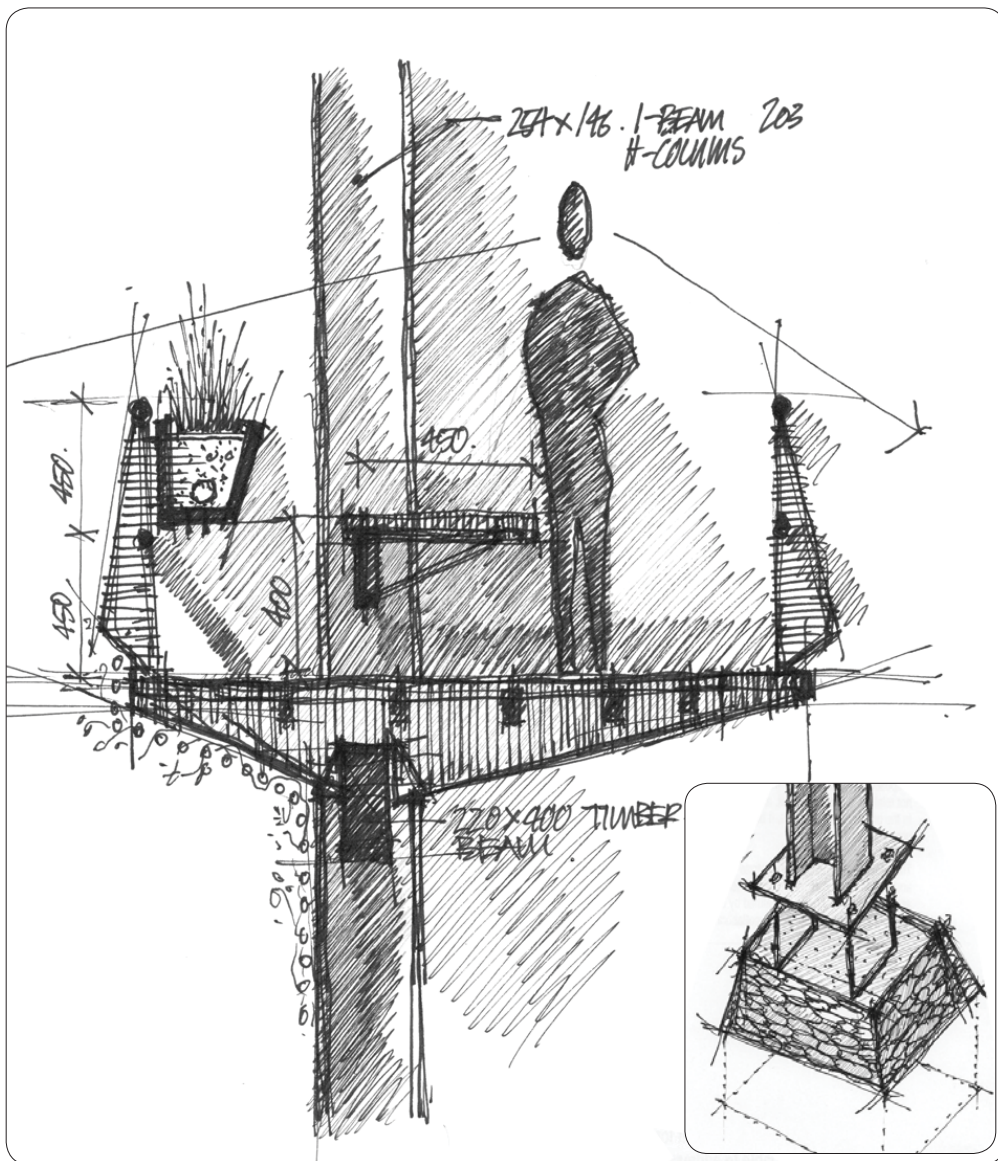


Figure 96: Technical exploration of walkway. Author, 2014.

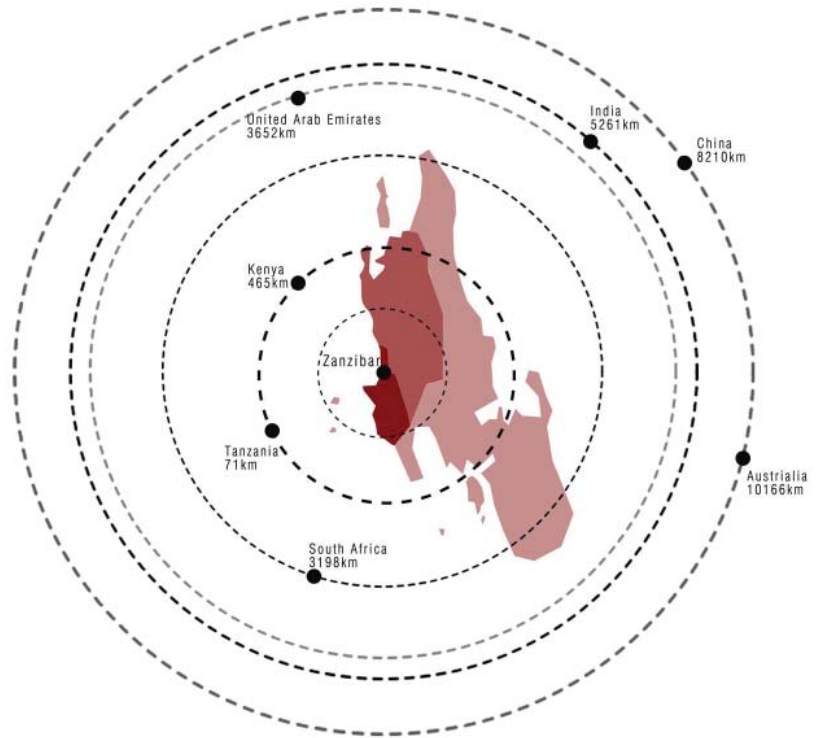


Figure 97: Construction material import. Author, 2014.

07.01 INTRODUCTION

A walkway, a pergola or axis exists for reasons beyond itself. It is more than the pleasure of a straight line across the paper. Landscape elements must be explored and understood by various techniques of establishment.

Elements of landscape architecture must provide a tangible and intangible purpose, where the purpose of space making and detail design are of equivalent value and in a sense create a cohesive added dimension to the landscape intervention.

In the Elements of Architecture, Sir Henry Wotton [1624:04] prospects that 'There is a Lordship likewise of the Eye as of the Feet which must be fedde, both with extent and varieties.' Wotton engages the concept, that a straightforward connection exists between seeing and moving, that feet follow sight.

The statement by Wotton is valid, but the connection between seeing and moving is arguably more complex. The visual mastery of a landscape is significant and must not only be appreciated by a variety of forms, but also by a variety in textures, colours and smells. A direct relationship between the earthly world and additional human senses are dominant.

Landscape architecture is a poly-sensual experience, therefore design must become the lordship of feet and sight and must additionally be experienced by all senses.

This chapter explores the technical aspects of the project. The detail design development correlates to the theoretical framework inclusive of design principles discussed in the previous chapters. The philosophy behind the technical development will determine sustainable construction strategies, water management schemes and material as well as plants selections.

07.02_PROPOSED TRANSFORMATION PHASES

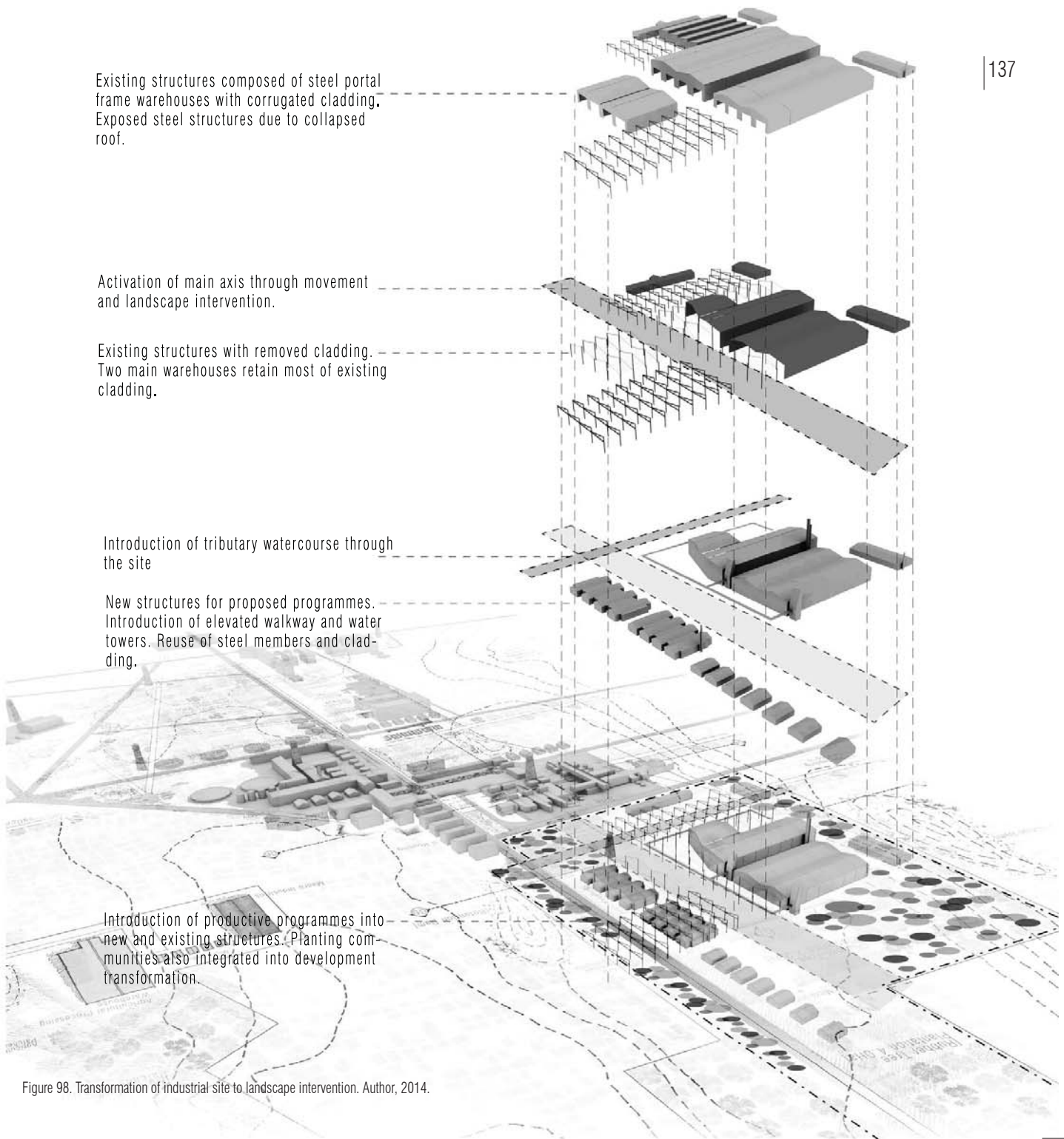


Figure 98. Transformation of industrial site to landscape intervention. Author, 2014.

07.03 TECHNICAL APPROACH

The architectural form and materiality of the post-industrial site is dissimilar to the traditional built environment on the Zanzibar Island. As a result, the existing building typology has a distinct character within the existing urban fabric of the city.

Suitable materials and construction methods have been considered, that would propose a contributing connection between the dissimilar architectural typologies of industry and tradition. The materials and construction methods used in the landscape intervention that have been selected to respond to the existing industrial character of materials on site.

Furthermore, including local materials in the material palette will encourage an architectural relationship between the site and urban context, conveying a new dimension of materiality into the post-industrial site. It is essential, however, that the proposed and existing materials create a unified narrative. In addition, the materials will relate to the character of the site and urban context.

By implementing the technical approach, the landscape intervention will emphasise the history and character of the industrial landscape, along with promoting the establishment of a new landscape typology, through new space-making and material qualities, onto the site.

Proposed materials should be locally manufactured to promote skills developments and craftsmanship amongst the locals in the surrounding communities. The materials that will be reused from the post-industrial site will include salvaged steel plates, profiles and sheeting from the warehouse structures, wood from eradicated alien invasive tree species, recycled concrete blocks from the buildings floor slabs and foundations that are demolished or transformed. Concrete blocks from the 4m high boundary wall can also be salvaged.

07.03.01 Concrete Blocks

Concrete floor slabs and foundations blocks from the demolished or transformed warehouses will be recycled and used in paving details, cladding of retaining walls as well as terraces and the construction of water weir systems.

07.03.02 Steel Profiles

C-channel steel profiles will be salvaged from the deconstruction of existing portal frame warehouses and will be

reused to construct the elevated walkways and decks, steel frames for vertical vegetation, artificial ponds for freshwater fisheries

07.03.03 Corrugated Steel Sheeting

S-profile sheeting will be salvaged from the deconstruction of the existing portal frame warehouses and will provide material for the construction of micro industries and market spaces. Additionally, corrugated steel sheeting will be used to construct water reservoir tanks and artificial ponds for the freshwater fisheries.

07.03.04 Soil conditions

The topsoil on site has been exposed to extended period of flooding and consists of large amounts of decomposing organic material, which helps to fertilise the soil. For that reason, the topsoil from the site and the transmitter station is considered fertile and has to be carefully managed. After all heavy construction has been completed, the fertile topsoil will be reapplied to agricultural patches, plant beddings and rice pads.

07.03.05 Alien vegetation

Alien invasive plant species such as *Maesopsis eminii*, *Corida alliodora* and *Mangifera indica* will be eradicated from the environment. The salvaged wood will be treated and reused for walkway decking, outdoor furniture as well as detail design elements etc.

07.03.06 Vegetation

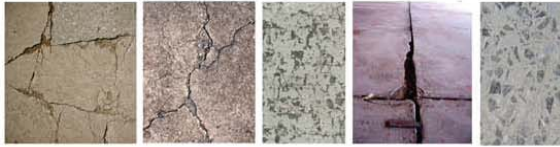
Existing indigenous vegetation will be retained on the site and included into the design of the landscape intervention where possible. Plants used in the project can be categorised into productive plants, performative plants and ornamental plants. Plants, such as cultivated rice and spices are exotic species, but become productive plants for agronomic practices. Performative and ornamental plants introduced to the site will be indigenous to the East African Coastal biome.

07.03.07 Additional materials

Clay bricks, cement stabilised soil, coral stone, limestone, concrete tiles (made from crushed coral stone and mortar), high density mangrove poles, gabion walls, reno-mattresses, and extra steel elements are proposed as additional construction materials for the landscape intervention on the post-industrial site.

07.04_MATERIAL PALETTE

EXISTING / LOCAL MATERIALS



Concrete floor slabs and foundations



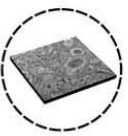
Low quality clay and cement bricks.



Locally available coraline limestone, coral rock and sandstone



Locally available coraline limestone, coral rock and sandstone



Locally available coraline limestone, coral rock and sandstone



Steel profiles and sheeting from industrial site



Alien and invasive tree species will be eliminated and wood treated and reused. Mangrove poles for basic construction.

PROPOSED MATERIAL



Recycled concrete blocks for pavers, terrace construction and stream stabilisation.



Local produced red clay, rice husk and cement bricks.



Local natural stone resources used in gabion construction for retaining and soil stabilisation.



Local natural stone resources used in gabion construction for retaining and soil stabilisation.



Coral stone and cement composite pavers



Steel profiles and sheeting reused for construction.



Panga Panga and East African Padauk will be imported from Tanzania and used for structural timber members.

07.05 WATER STRATEGY

A sustainable water strategy must be demonstrated in the design of the landscape. On a larger scale, the sites catchment area could be identified. Storm water run-off from the eastern escarpment will be harvested in an integrated hydrology system, which consists of various bio-swales, retention and detention dams as well as constructed infrastructure.

The topography of the site is sloping from east to west with

an increase in gradient existing at the western end of the site. The natural flow of run-off water also follows the gradient of slope. The water strategy is formalised to harvest and control the storm water run-off from the catchment areas and the site. The water strategy demonstrates various sustainable design principles and techniques to control and manipulate water on site for different programmes, such as irrigation, water storage and retention for aquaculture.

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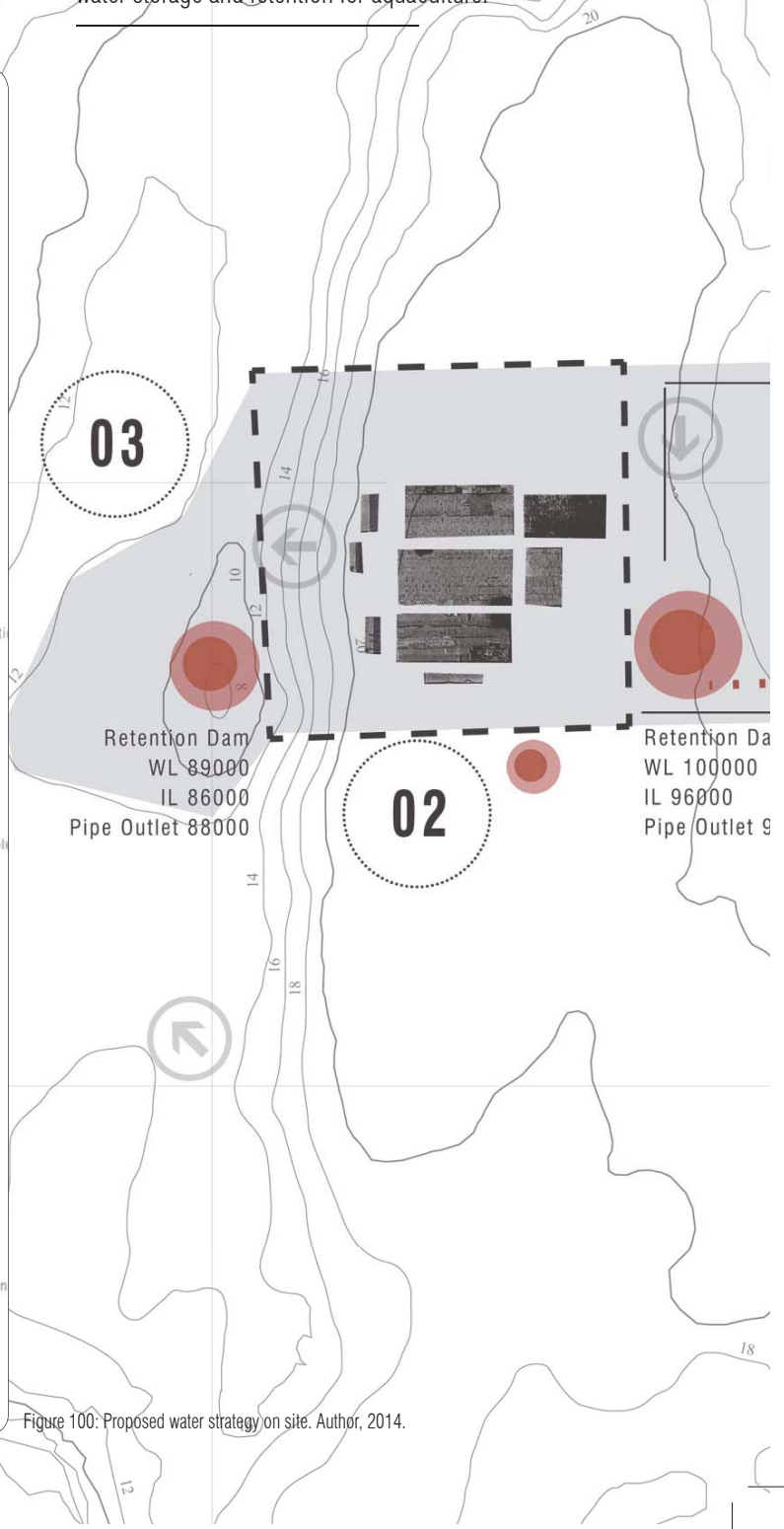
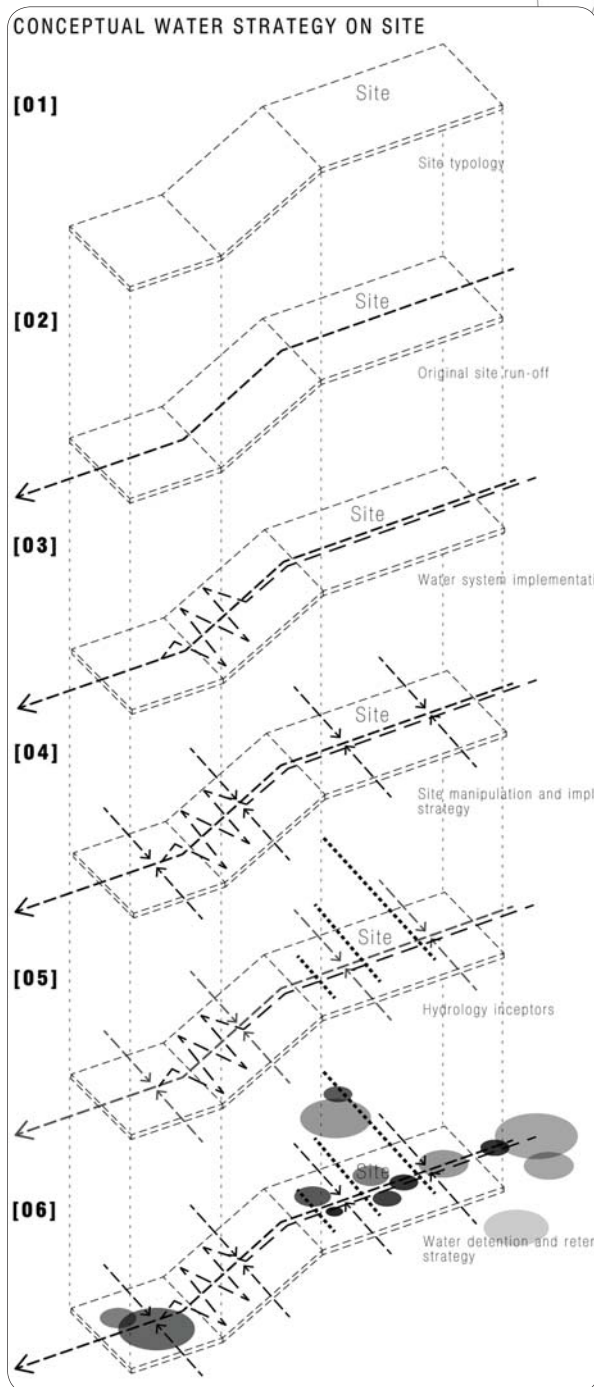


Figure 100: Proposed water strategy on site. Author, 2014.

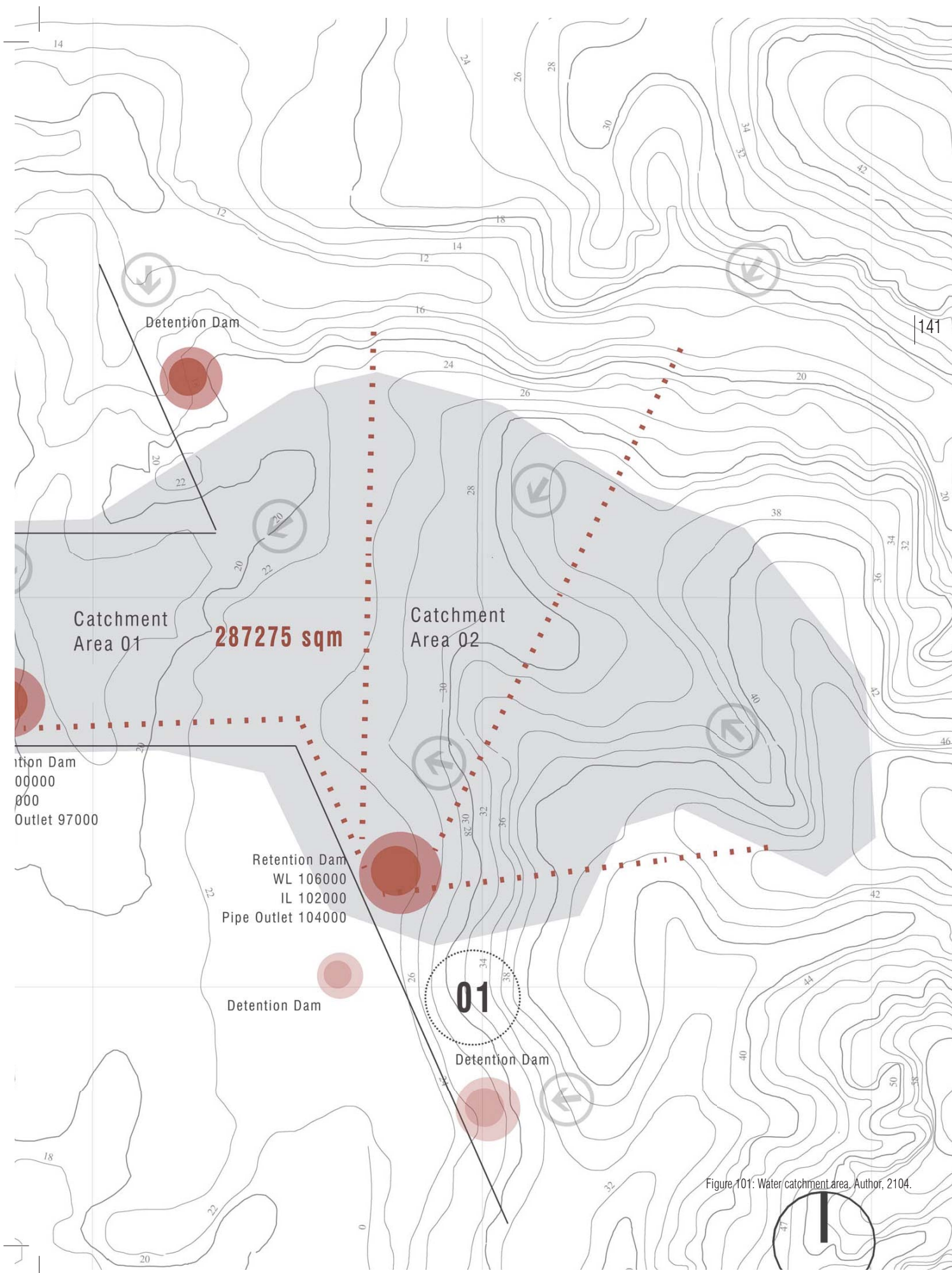


Figure 101: Water catchment area. Author, 2104.

07.06_PLANTING STRATEGY

It is important that the plant selection supports regional appropriate plants. Therefore, the underlying intention of the planting strategy is to control and eliminate exotic invasive species plus conserving and restoring native plant communities. Existing native species will be reserved on site and new planting communities will be introduced that will minimise soil disturbances and enhance local biodiversity for flora and fauna. Plants selected for the design intervention will relate to the proposed design approach and programme.

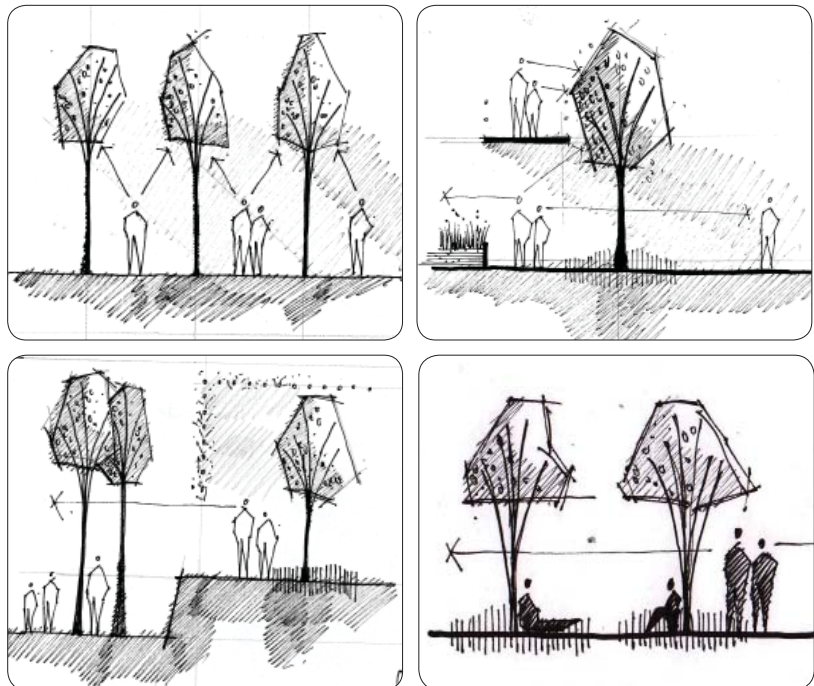


Figure 102: Conceptual plant design. Author, 2014.

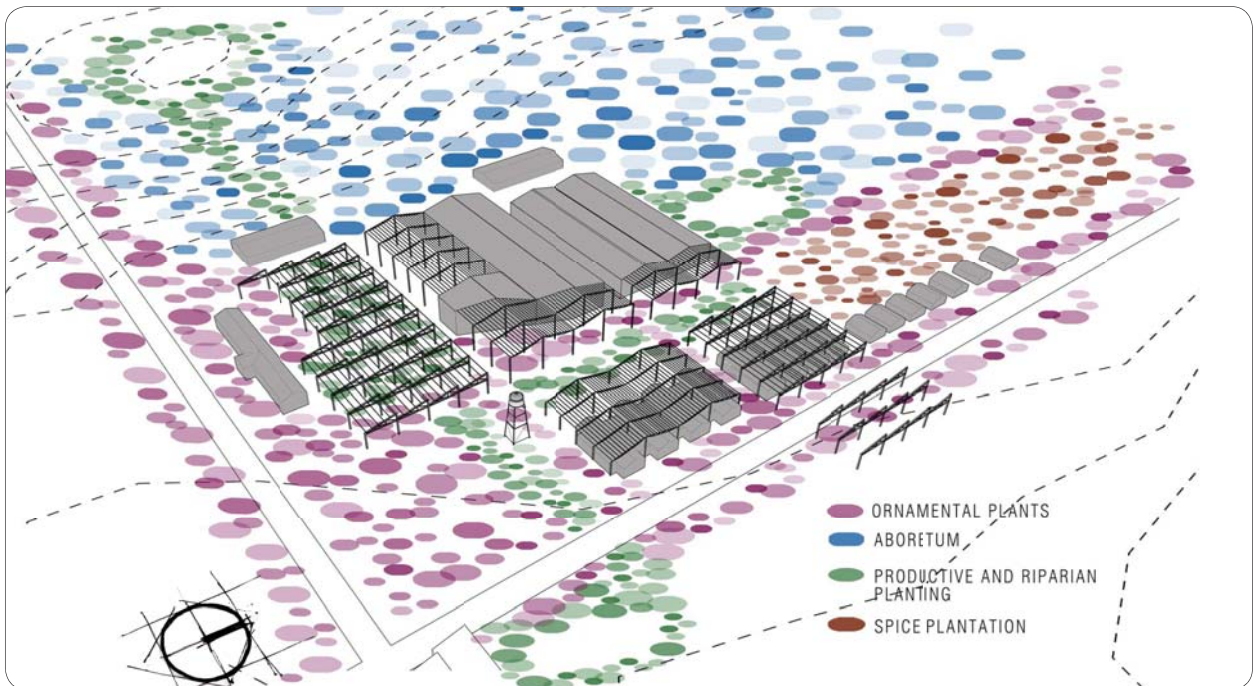


Figure 103: Planting strategy. Author, 2014.

01_LARGE TREES:



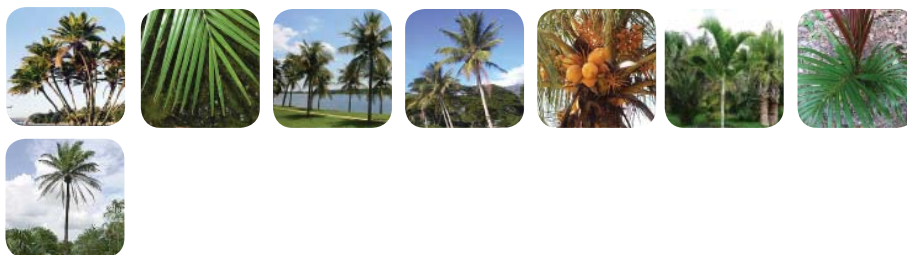
01. *Azelia quanzensis*, 02. *Erythrophleum suaveolens*, 03. *Manikara sansibariensis*, 04. *Markhamia zanzibarica*, 05. *Milicia excels*, 06. *Terminalia cattapa*.

02_MEDIUM TREES:



01. *Barringtonia racemosa*, 02. *Lansea schweinfuthii*, 03. *Delonix regia*, 04. *Spathodea campanulata*, 05. *Cordia sebestana*, 06. *Calophyllum innophyllum*, 07. *Brexia madagascariensis*.

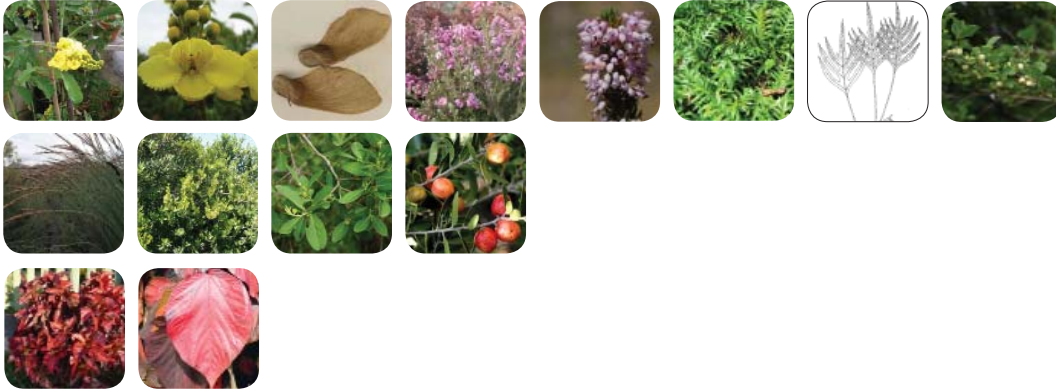
03_PALMS:



01. *Phoenix reclinata*, 02. *Cocos nucifera*, 03 *Dypsis pembana*, 04. *Elaeis guineensis*.

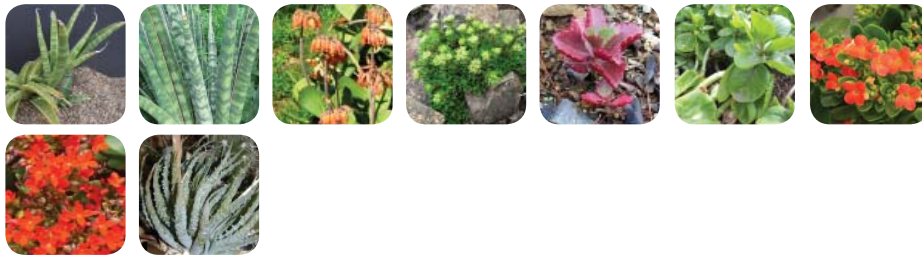
04_SHRUBS:





01. *Suregeda zanzibarensis*, 02. *Pyrostria bibracteata*, 03. *Antidesma venosum*, 04. *Acridocarpus zanzibaricus*, 05. *Erica maliensis*, 06. *Phymatodes scolopendria*, 07. *Flueggea virosa*, 08. *Mystroxylum aethiopicum*, 09. *Acalypha wilkesiana* 'Macrophylla'

05_ALOE AND SUCCULENTS:



01. *Sensevieria ethiopica*, 02. *Cotyledon barbeyii*, 03. *Crassula crassipes*, 04. *Kalanchoe petitiiana*, 05. *Kalanchoe blossfeldiana*, 06. *Aloe pembana*.

06_HERBACEOUS PERENNIALS, GROUNDCOVERS AND BULBS:



01. *Xyris* sp. [including *X. ornithoptero*, *X. mallocephala*, *X. mentiensi*, *X. prophyrea*], 02. *Dissotis rotundifolia*, 03. *Panicum brevifolium*, 04. *Fimbristylis dichotoma*, 05. *Cyperus* sp. [including *C. tenax*, *C. lancealotus*, *C. pumilus*, *C. pelophilus*], 06. *Flagellaria quineensis*.

07_AQUATIC PLANTS:



01. *Nymphaoides* sp. [including *N. indica* subsp. *occidentalis*, *N. bosseri*, *N. thunbergiana*, *N. elegans*, *N. brevipedicellata*], 02. *Utricularia gibba*.

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08_CLIMBERS AND LIANA'S:



01. *Rhoicissus revouilii*, 02. *Rawsonia lucida*, 03. *Chrysophyllum lanceolatum*

Figure 104: Planting Palette. Author, 2014.

07.07_AGRICULTURAL SPECIFICATION

07.07.01_Arboriculture


[ar-bor-i-cul-ture] 'noun // the cultivation of trees and shrubs' [Oxford Dictionary, 2014]. Several productive landscapes in the 'Chumbuni Framework Proposal' will include various arboretums where certain trees will be cultivated.



200 TREES

[Coconut Palm] // Cocos nucifera


Plant spacing 7.0m x 7.0m = 200 plants/ ha // 80-100 nuts/ tree/ year // 30-45l / day irrigation // uses include wood, leaves, fruit and coir.



140 TREES

[Raffia Palm] // Raphia farinifera

Plant spacing 9.0m x 9.0m = 140 plants/ ha // 25-30 tonnes of fruits/ ha/ year // 100-150l/ day irrigation // uses include leaves, fruit and oil.




480 TREES

[Rubber Tree] // Hevea brasiliensis

Plant Spacing 4.6m x 4.6m = 480 plants/ ha // 30-35g latex per tapping per tree = 3024kg/ year/ ha // uses include wood and latex.

07.07.02_Agriculture:

[ag-ri-cul-ture] 'noun // the science or practice of farming, including cultivation of the soil for the growing of crops and the rearing of animals to provide food, wool and other products' [Oxford Dictionary, 2014].




21T/ HA

[Rice] // Oryza glaberima x sativa

The cultivation of rice is well established in sub-Saharan Africa. Rice can be harvested every 4 months // 21tonnes of produce/ ha/ year // 20% husk as bi-product.

07.07.03_Aquaculture

[aq-ua-cul-ture] 'noun // the rearing of aquatic animals or the cultivation of aquatic plants for food' [Oxford Dictionary, 2014].



25T / HA

[Fish]

Breeder colony male to female ratio 1:5 // 2-4 fish/ sqm // dykes max 1 meter deep // catfish *Clarias sp.* & mudfish *Channa striate* = 5-10% [species composition] // carp *Cyprinus carpio* = 10-15% // tilapia *Oreochromis niloticus* = 75-85% // harvest 2.5-3.5 kg of meat/ sqm.

07.08_ENERGY STRATEGY

Waste management and removal services in the Chumbuni area are lacking and residents are responsible for the removal of their own waste. Unfortunately, waste is not treated or recycled and is littered and dumped in open or abandoned places. In the context of Zanzibar City, waste is a huge concern, as dumping sites are a health risk to the local residence and pollute the environment.

In the framework design, the issue of waste, especially inorganic waste is addressed. Waste collection and recycling points have been incorporated into the function of the framework. At these points, waste is sorted and rubbish with no sustainable value is processed for energy generation.

The strategy is that the tri-generation plant provides energy for all the functions in the framework. Energy for landscape lighting, water pumping and micro industries will be sup-

plied from the tri-generation plant.

A secondary system has also been installed. Photovoltaic panels will be installed on the Northern roof pitches of the warehouses. The generated energy can be used for basic landscape functions, such as water pumping.

The possibility exists, to provide local residents with energy for the exchange of their waste. The new perception of waste removal and energy generations will encourage the local community to actively participate in cleaning the urban area and supporting sustainable energy generation.

Changing the perceptions and related behaviours of the local residents, in regards to waste recycling, enhances the social and environmental component within the landscape intervention.

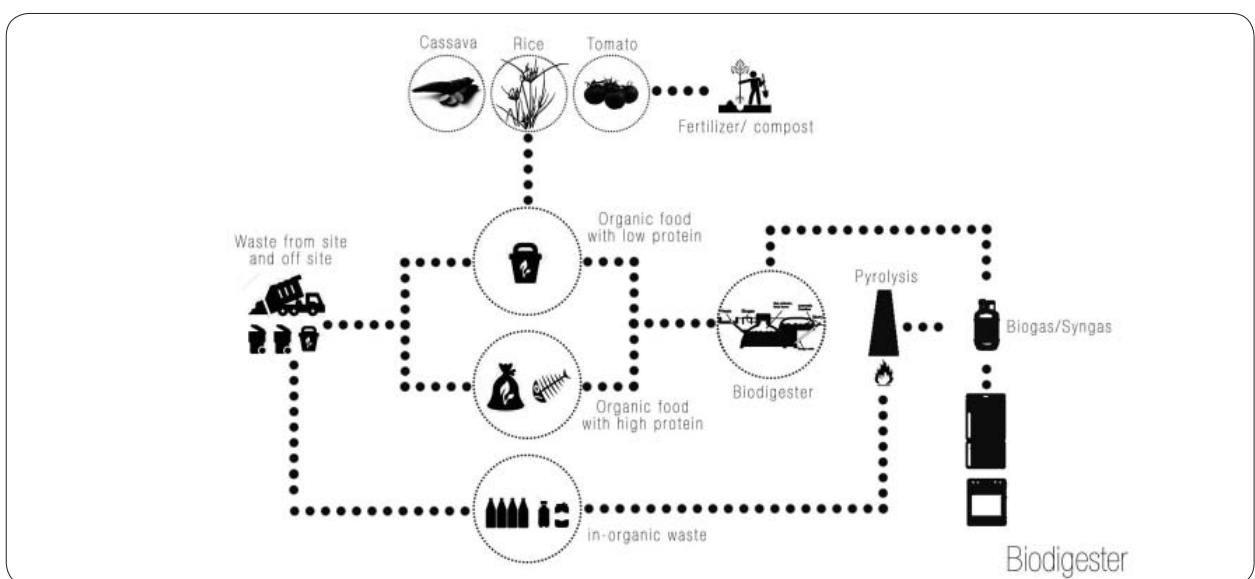


Figure 105: Biodigester System. Author, 2014.

07.09 CONSTRUCTION CONSIDERATIONS

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Due to the sites close proximity to the surrounding residential area, special considerations have to be made during construction and maintenance operations. Construction operations have to be closely monitored. Pollutants and disturbances have to be controlled and retained on site. Construction and demolition materials have to be reused and recycled, if possible, or have to be disposed responsibly. Construction processes have to prevent the destruction of indigenous vegetation and already established ecosystems. The design proposal supports responsible extraction of raw materials, sustainable material manufacturing processes and proposes regionally available materials. Due to limited

available materials and craftsmanship in Zanzibar, numerous materials and construction details have to be pre-fabricated and imported to Zanzibar. This proposes that structural elements have to be designed for adaptability and disassembly. The design philosophy consists of educational and productive concepts. These design perceptions are also embraced throughout the construction phase. Employing local craftsmen, artisans and workers will encourage the transfer of construction skill and knowledge, as well as providing employment in an informal settlement, supporting the local economy.

07.10 TECHNICAL INVESTIGATION

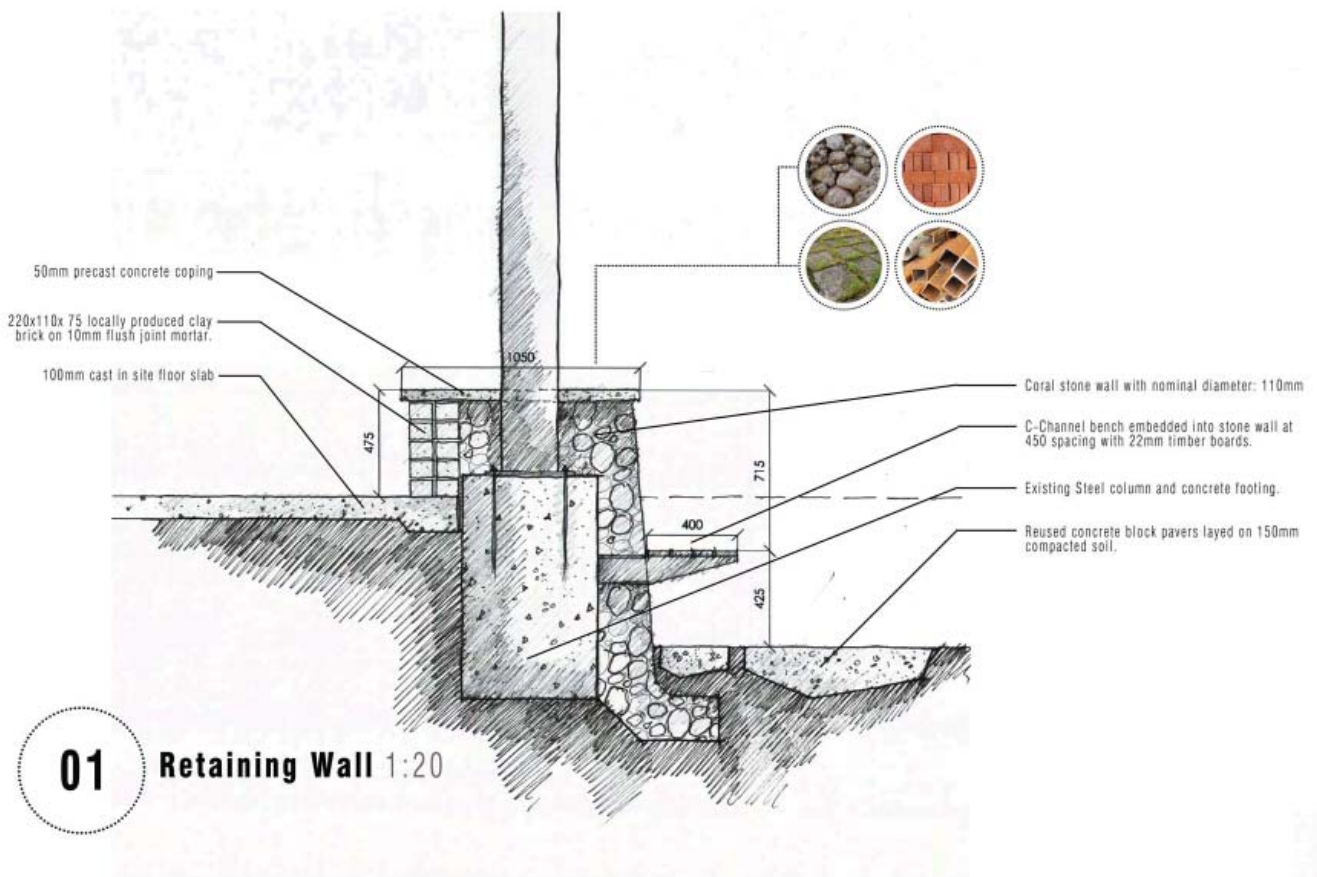


Figure 106: Foundation Detail. Author, 2014.

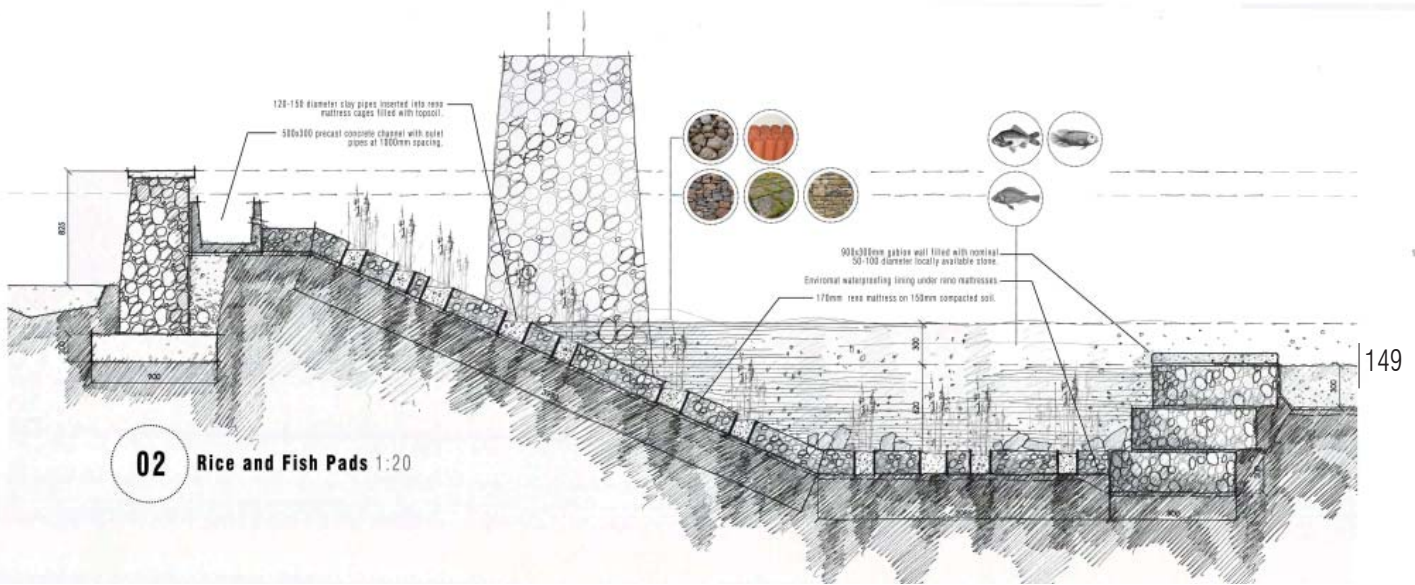


Figure 107: Pad Construction Detail. Author, 2014.

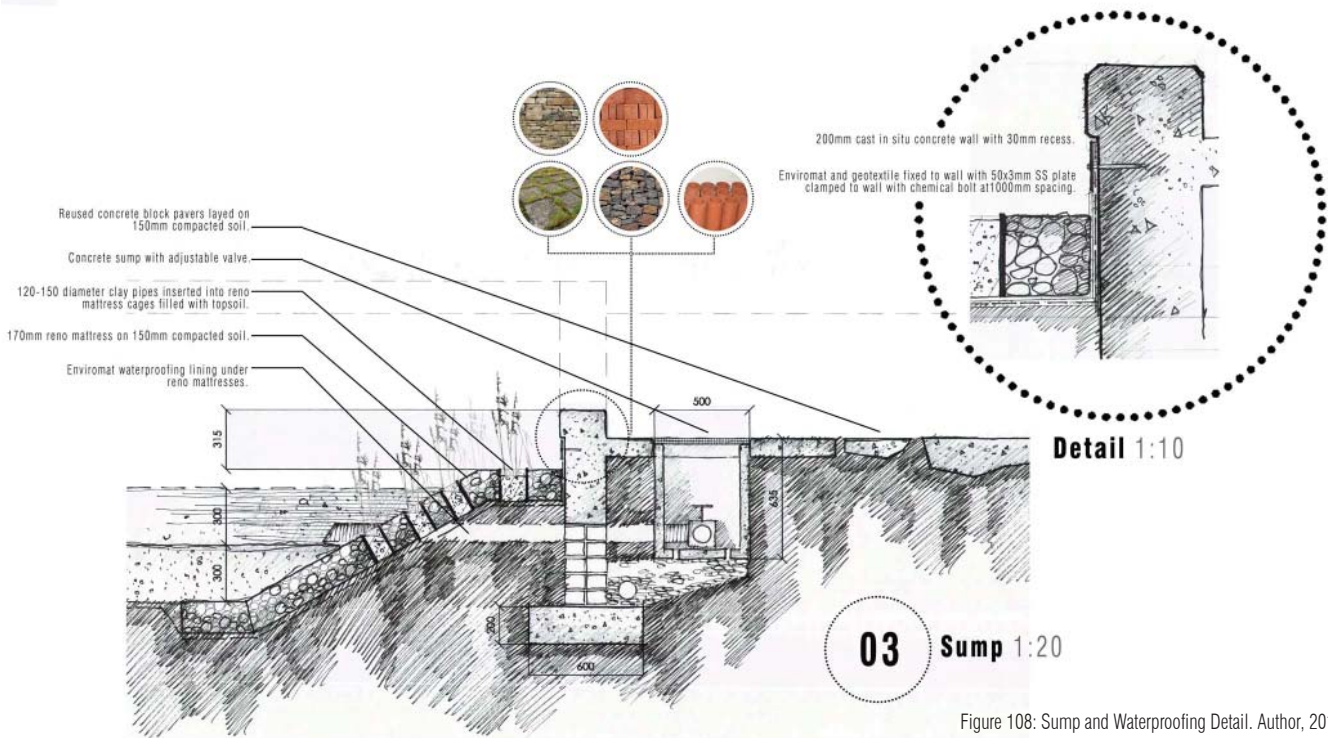
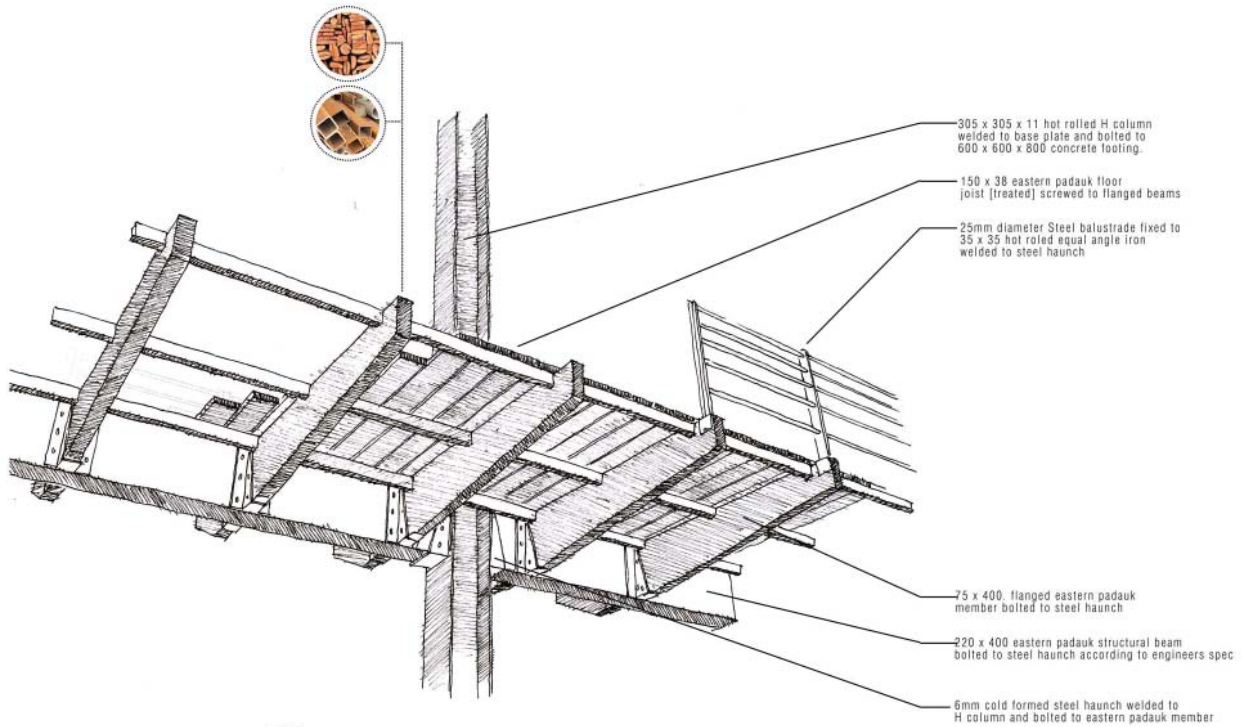


Figure 108: Sump and Waterproofing Detail. Author, 2014.

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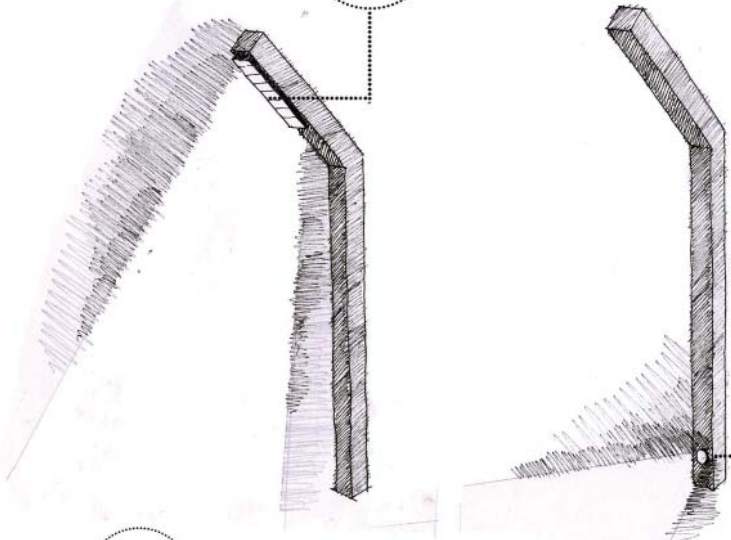
04 Elevated Walkway 1:20

Figure 109: Elevated Walkway Detail. Author, 2014.

The BEKA CH Lighting Range has been designed for general area lighting where good optical control is required in conjunction with contemporary architecture.

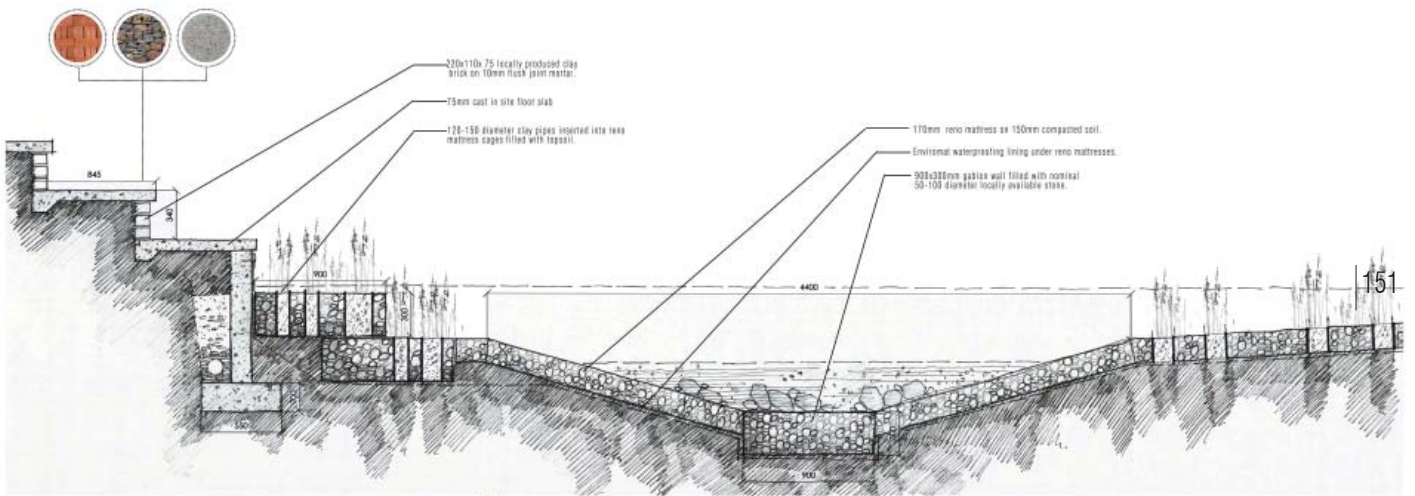


The BEKA LEDlight-mini is designed for decorative energy-efficient lighting applications.



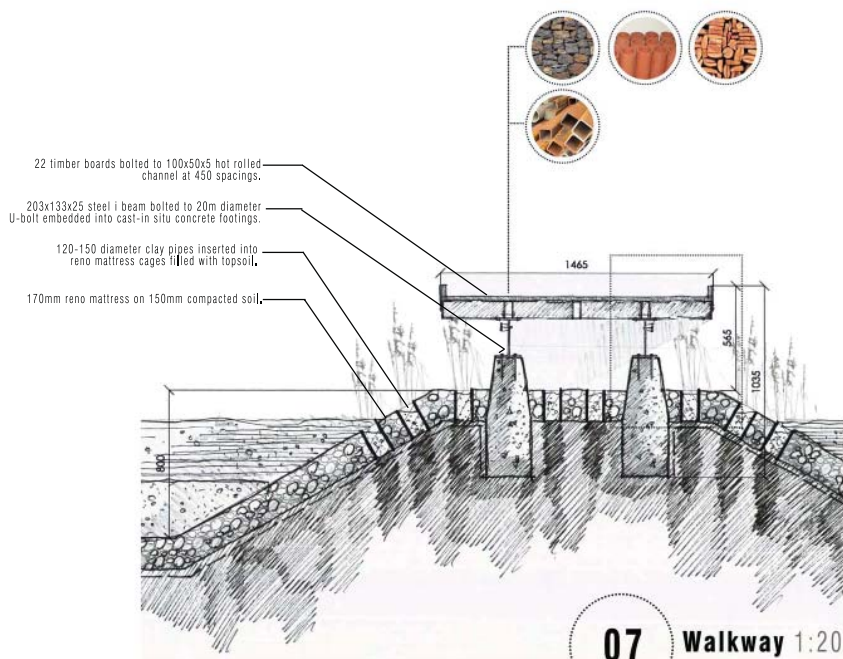
05 Lighting Fixtures

Figure 110: Lighting Fixture. Author, 2014.



06 Tributary Watercourse 1:20

Figure 111: Watercourse and Retaining wall Detail. Author, 2014.



07 Walkway 1:20

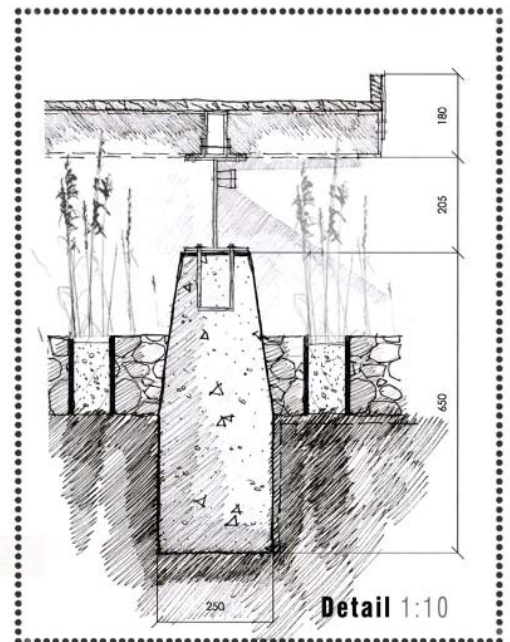


Figure 112: Walkway Detail. Author, 2014.

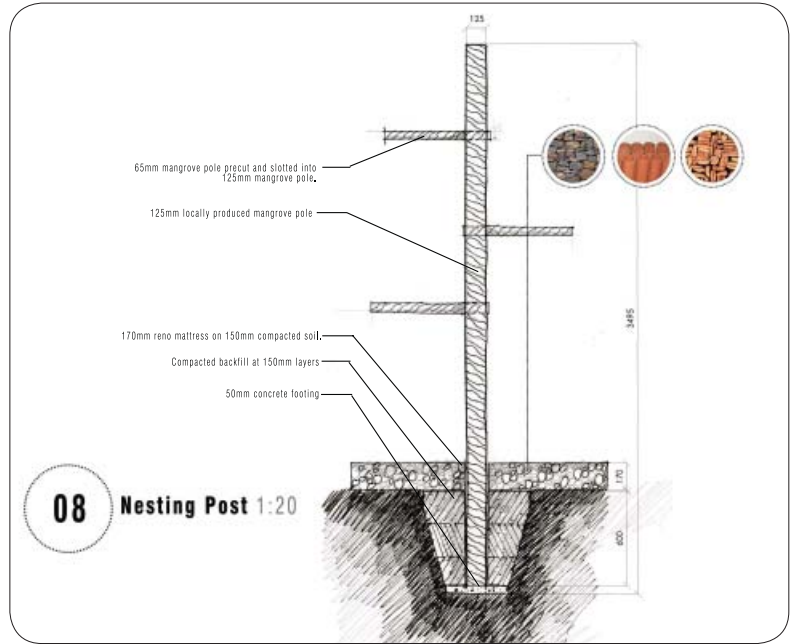


Figure 113: Bird Post. Author, 2014.

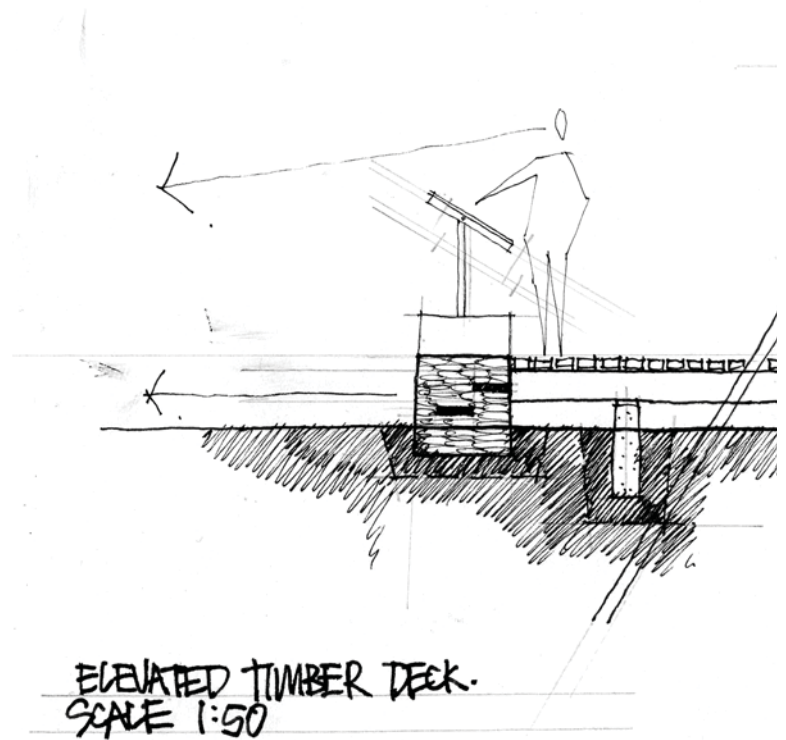


Figure 114: Construction Development Section. Author, 2014.

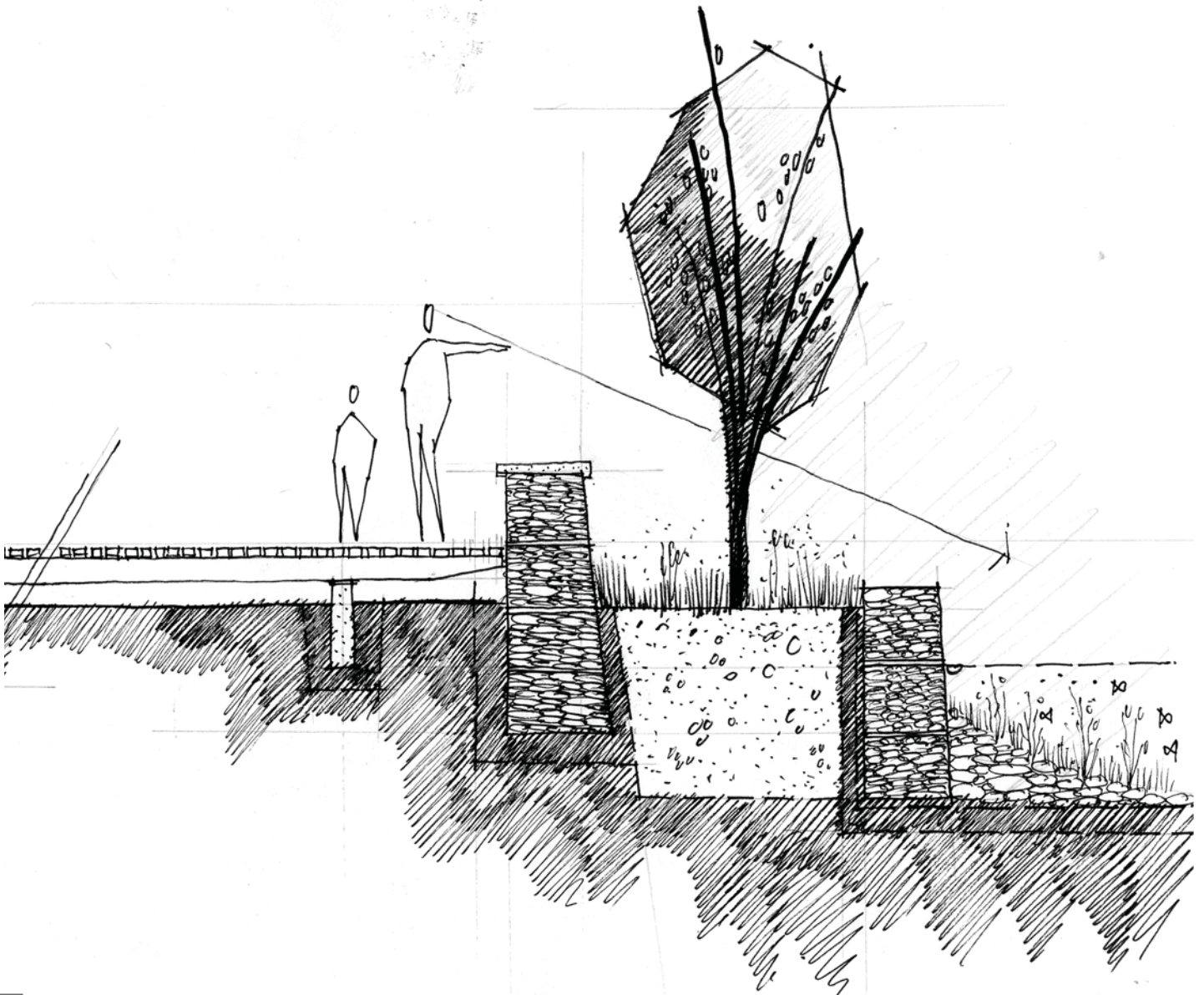
07.11_CONCLUSION

This chapter has demonstrated how the technical development relates to the theoretical framework and overall design concept of the productive landscape.

The technical resolution of the project responded to the fact that landscapes are not static. It is clear, that landscapes change according to seasons, water ingresses and recedes into the landscape, trees flower and that night and day depict different characteristics in the landscape.

The material selection process is influenced by the local culture, responding to existing cultural construction methods

and architecture. The various design interventions proposed to transform a forgotten industrial site into a productive hub, aspires to build a sustainable community that can grow and cultivate crops, educate the public on agricultural and ecological processes, tutor craftsmanship, create employment and markets for members of the community as well as create a healthy recreational and leisure environment to the people of Zanzibar. | 153



08. CHAPTER EIGHT | Conclusion

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The Chumbuni area has been used as the primary hub for industry on the island. As a result, the character and qualities of the area gave reasons for the emergence of a unique relationship between man and his productive environment. Throughout this dissertation the author focused on the functional and productive role the landscape intervention has, mediating between the post-industrial programme and an ever expanding informal settlement. The study and design strategies therefore responded to create a landscape which can align with the characteristics of a productive landscape, but also integrate educational and recreational functions within its programme. This approach initiated the adaptive reuse of the post-industrial landscape of Chumbuni on a variety of scales. The detail design intention was to acknowledge and combine the agrarian, productive, educational and social experiences into a combined proximity, creating a new landscape typology within the industrial environment.

The design intent aimed to function as an additional layer to the urban context, where the landscape programme initiates new functions, as well as reintroduces previously forgotten practices and rituals back into a productive environment, which, essentially, embody the potential to uplift the social and economic environments of Chumbuni. The Urban Landscape Laboratory can adapt, evolve and grow to generate efficient rice and fish outputs, it can address urban and infrastructural issues of the area and it can create a social and educational landscape for the surrounding community and integrated research programmes.

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