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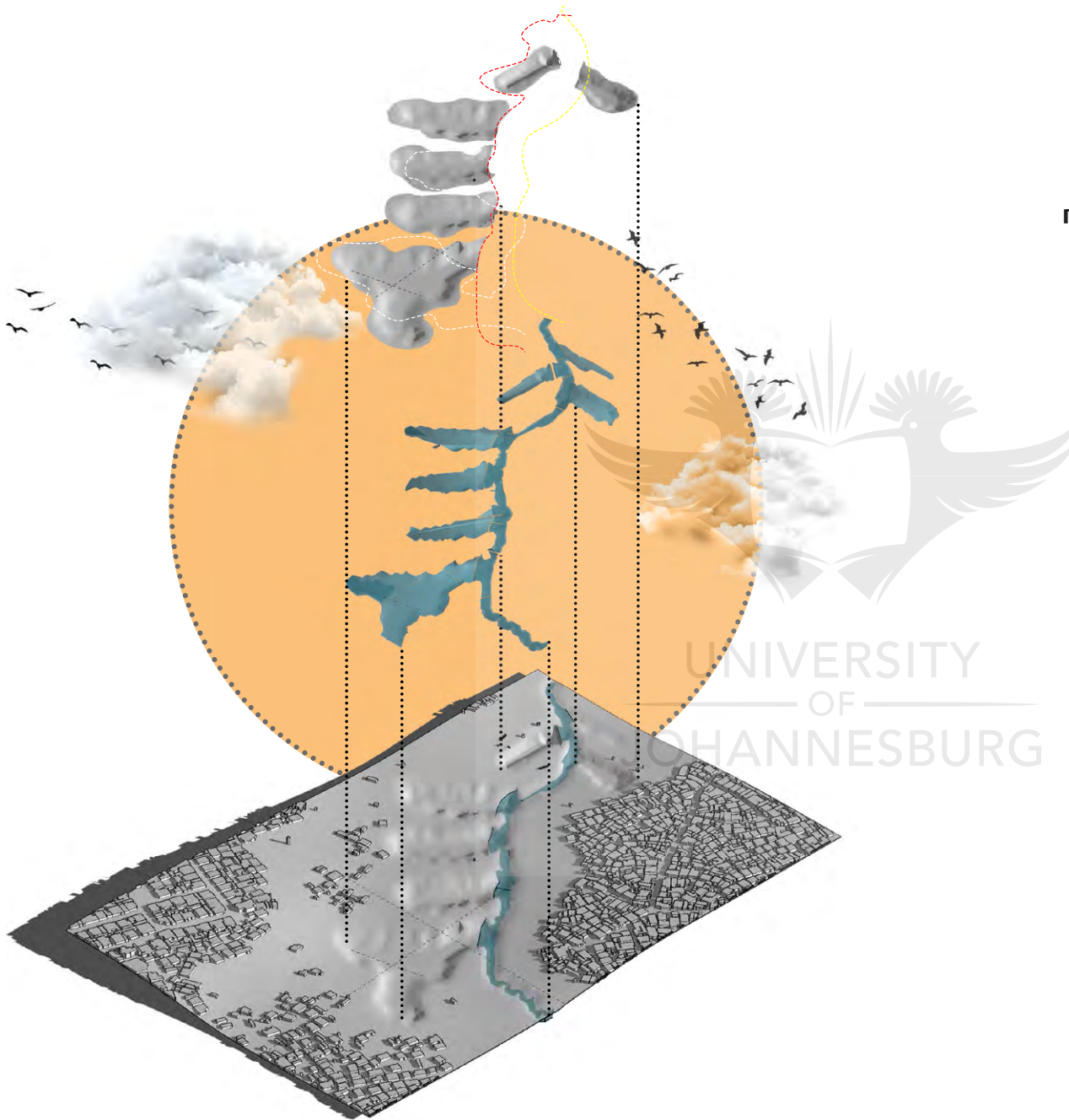
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**Adaptive Floodplains: Re-imagining
resilient Landscapes on the Msimbazi
River Basin in Dar es Salaam**

University of Johannesburg

M Tech (Prof) Architecture 2020

Major Design Project Portfolio

Boniswa P.Duma

217092175





Architecture as frozen poetry



“At the time of compiling this portfolio ,I’ve had difficulties explaining my ideas as I often get misunderstood.

However I find sketching, imagery and mapping simple for communicating. As a result I am caught comparing architecture between frozen music and poetry.”

Boniswa P.Duma



2012

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FRAMING STATEMENT

Remembering Landscape(s) – Investigating Green Infrastructure in Dar es Salaam

“What defines a character of a city is its public space, not its private space. What defines the value of the private assets of the space are not the assets by themselves but the common assets. The value of the public good affects the value of the private good. We need to show every day that public spaces are an asset to a city.”

UN-HABITAT Executive Director Joan Clos i Matheu “We need to demystify the aesthetic contributions of landscape architects and architects and release the “new magic” of design inherent in the new dimensions of systemic information available to us. Green infrastructure connects designers to social, economic, legal and engineering expertise around the systems that enable our lives.” Jochen Rabe

Context: Dar es Salaam

As city located on the east coast of Africa, Dar es Salaam provides an ideal study public open spaces and nature on the city and also the impact of human development on nature. The word Anthropocene, coined by Nobel Prize winner Paul Crutzen describes a new

world era, which recognizes the increasing influence of human activities on the biological, geological and atmospheric systems of the Earth. Cities affect natural open spaces directly by encroachment due to urban development and sprawl and many times encroachment is on sensitive landscapes.

This may lead to loss of sensitive landscape like wetlands resulting in loss of diversity on terms of flora and fauna. Cities on the coast, like Dar es Salaam may experience systematic change such as sea-level rise which may lead to loss of urban infrastructure and also loss of habitat for plant and animal life. For cities, the latter change due to systematic atmospheric change is much harder to control and predict. Cities will have to find ways to educate the public of future strategies for development of green infrastructure based on a number of principles that includes environmental justice, resilience and climatic responsibility. The city of Dar es Salaam is expected to have over 20 million people by the 2050.

The biggest impact of its growth will be development on open spaces systems as the increased populations builds housing for dwelling. Some of these open spaces are sensitive landscapes, like the Msimbazi Valley a natural wetlands drainage system, are already

under increased pressure to be built on. Loss of flora and fauna due to growing residential area around the valley has already began. Mangrove forests are the unique habitat of Msimbazi Valley that are under severe threat from exploitation through agriculture, aquaculture and coastal development.

Strategies for the future protection for the Mangrove landscapes are needed against encroaching settlements Unit 15(X) in 2020 will use Msimbazi Valley and ancient Pugu Forest Reserve in Dar es Salaam as case studies, using three selected sites to study how the natural systems of Msimbazi lower basin and the forest reserve can respond to the anthropogenic interference by human activities.

Three sites will be explored through the theme of remembering in order to imagine resilient green infrastructure for the city of Dar es Salaam. The aim is to define the three sites as part of a strategic network of high quality natural and semi-natural areas with other environmental features which are designed to deliver a wide range of ecosystems services and to protect biodiversity within the Msimbazi Valley and Pugu Forest of Dar es Salaam.

This strategy challenges Unit 15X students (as planners and designers) to explore public green infrastructure

in order to understand and interpret deeply the relationship between social and natural systems within urban settings. The three sites that will be explored include: communities adjacent Mangrove forests ; flood plains in wetlands and indigenous forest ecosystems.

These are naturally resilient systems which are under threat due to human development and encroachment. Unit 15X aims to define green infrastructure that overlaps social systems with these unique ecosystems.

Problem:

As the population of the city of Dar es Salaam continues to grow, public open spaces, natural and designed continue to shrink in size due to legal or illegal infrastructure development resulting in loss of biodiversity both in terms for flora and fauna. The ecological importance of open spaces is undervalued as their resources are over exploited for day to day needs, neglecting their mitigation role in changing global climatic and hydrological systems.

Increasingly public open spaces need to become part of city planning strategies in order to respond efficiently to needs of increased

urban population and climate change brought about by global warming.

The Purpose statement: Unit15X challenges the silo-approach to planning and designing of public open space and green infrastructure by introducing an experimental interdisciplinary project to planning and architecture students who engage with wide range of stakeholders in public space and green infrastructure. The outcomes are in most case not entire predictable at the outset of the project.

Unit15X challenges students to develop means of representation that defines the changes in natural and social systems and argues that static 3D drawings are not emphatic means to interpret new innovations in world that is undergoing unpredictable change due to anthropogenic activities. Students will investigate through graphic and textual representations of how social and natural systems may emerge, evolve, collapse and re-emerge as dynamic processes of resilience- challenging the notion of static 3D representation.

Methodology: Unit 15X’s method of investigation is through the process of abduction i.e. research by design (formulation of new designs) through an engaged interaction with the context. Design exploration will be undertaken in a systematic way so that the investigations enhance understanding

of relationship of public open spaces as they are and the possibility of what they may become in a rapidly changing urban context. Unit 15X uses a mixed methods for research that include, inventory of existing open spaces, analysis of case studies to develop design propositions and synthesis of new designs at different scales in response to evolving social and ecological context.

The theoretical framework that underpins Unit15X’s theme is informed by a range of planning, ecological and design paradigms that include: ecological design, landscape urbanism, new urbanism, green infrastructure, green urbanism, smart cities, and resilient cities, inclusive cities, hybrid cities and denatured cities and the UN’s New Urban Agenda on public space.

Unit15X objectives are as follows:

- To introduce students to challenges of planning and designing public open spaces in Africa
- To transform designers’ static thinking on design of public space and green infrastructure to recognize the long-term consequences of social-ecological systems.
- Introduce planning and design students of systems thinking for transformative design investigation and experimentation that extends beyond the confines of a site.
- To introduce students to propositional design strategies for open spaces.



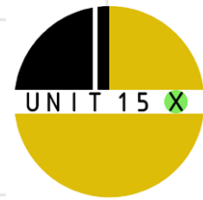
Unit 15X Lead supervisor delivering a welcome note in Tanzania, World bank.



A teacher delivering a home lecture on permaculture in Tanzania.

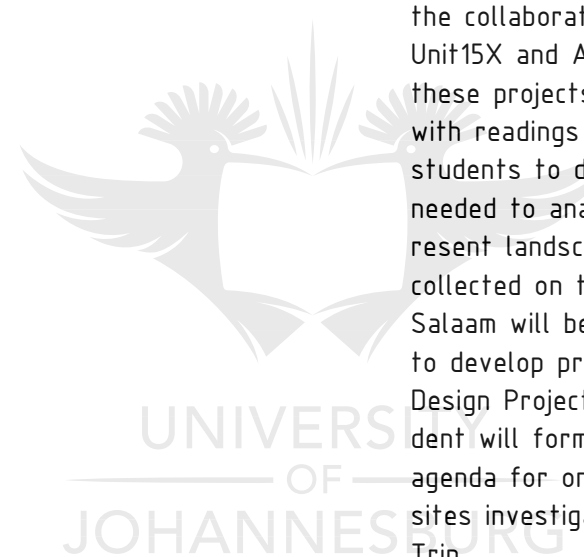


Students of Unit 15X and Ardi university visit Kinondoni Municipality at the council chamber with the Senior officials.



GSA GRADUATE SCHOOL OF ARCHITECTURE

2020 YEAR PROGRAMME



SEMESTER 1

The beginning of Q1 comprises of a projects that begins to discuss the issues of public space. It also starts the collaboration process between Unit15X and Ardhi University. Each of these projects will be accompanied with readings and tasks to enable students to develop spatial tools needed to analyse, record and represent landscape as a totality. Data collected on the Field Trip to Dar es Salaam will be the main resource used to develop proposals for the Major Design Project (MDP). In Q2. Each student will formulate their own research agenda for one of the three selected sites investigated during the Field Trip.

The programme has four main stages:
Q1: Theme Exploration- short projects
Q2: Context Production- site reconnaissance and seminars

SEMESTER 2

M2 students will develop longer projects that translates the theoretical, conceptual and contextual understanding of public spaces into foundations for their Major Design Project. The Dissertation comprises four main parts:

- Part 1: MAJOR DESIGN PROJECT
- Part 2: HISTORY & THEORY DISSERTATION
- Part 3: DESIGN REALISATION PORTFOLIO
- Part 4: PROFESSIONAL PRACTICE COURSEWORK/SUMMARY & ESSAY

Q3: Project Synthesis- project realisation/ thesis explorations
Q4: Project Resolution- individual representation.

Unit 15(X) Major Design Projects will include the following:

1. Public Open space for all (the poor, the elderly, women and children)
2. Public Open Space in response to water bodies
3. Ecological design for public spaces
4. Cultural practices - ritual and religious spaces
5. Water Infrastructure in Urban spaces
6. Residential Open spaces
7. Natural Habitat- design that enhances the natural habitat - the fauna and flora - to flourish in a symbiotic manner with humans.

Briefs: 2020
Research is at the core of our work. Briefs are seen as triggers to deepen, widen and strengthen the inquiry. Some briefs will follow a "research for design" approach which involves gathering, analysing and ordering information in preparation for design.

Some briefs will adopt a "research on design" methodology where in investigations primary focus on the outcomes of design exercises. Our quest though is to 'develop new knowledge through the design process', that is "research by design" also referred to a design research.

Design research uses design processes to create and test knowledge, drawing from various disciplines.



Site visit to the Mangrove area in Tanzania during semester 1.

“Re-imagining resilient Landscape on the Msimbazi River Basin in Dar es Salaam”

EXPANDED ABSTRACT & PROPOSAL

This projects imagines a resilient landscape along the Msimbazi River Basin that will enhance existing ecology, agriculture and economic activities.

Dar es Salaam has experienced increasing catastrophes with the annual flooding of the Msimbazi River for far too long. Flooding in the Msimbazi river basin destroys infrastructure. It paralyses the transportation networks and livelihoods. It hinders economic efficiency and most importantly, it threatens the health and safety of Dar es Salaam’s residents. The city’s population growth is also one of the fastest in the world and an estimated 70% of urban development is unplanned. This results in an increase in the number of people living in wetlands and the inhabitants of wetlands as they encounter a number of problems that include flooding, crime, encroachment, structural failure of their housing units as they are prone to waterborne diseases

In Tanzania, the World Bank has also conducted an extensive research of mitigation strategies for transforming the Msimbazi Basin into a beacon of urban

resilience. This research shall explore further flood control interventions that would allow the flood prone settlement to co-exist with the conditions of the wetlands and mangroves along the Msimbazi Basin.

This projects speculates about creating adaptive landscape on the Msimbazi River Basin by terracing and curving a system of attenuation ponds as a horizontal agricultural buffer enhancing the aqua ecology on the flood plain. This allows ecological livelihoods to continue both in dry and rainy seasons without the natural disturbance and having to rebuild every now and again.

Project investigation is mapped out in comparison of dry and rainy season. The montages portray the livelihoods of the sukuma and masaai ethnic groups who practice home mixed farming. Their subsistence crops are mainly maize millet, sugar-cane, cassava, banana and vegetables.

To apply resiliency the floodplain is terraced to 3 levels where a series of ponds is created on the lowest level. This allows the floods to be contained up to a 100 year flood line. Mangrove trees are planted on the river edges while agricultural programs on the terraced levels take place as homage to mixed home farming. Recreation and play occurs on the upper terrace as a passive strategy to restrict informal

encroachment. The Major design project focuses on programs of aqua activities, agriculture and recreation to instil resiliency and sustain livelihoods of the informal settlers as the most affected citizens during a rainy season.

Crops arrangement is as per study of evapotranspiration where the crops are planted in accordance to the amount of water they need. The agricultural crops as well as the materiality of the terraced seating, decking, shade and vegetation is vernacular to Tanzania.

This research will draw its theoretical framework from contrapuntal design process which will use practical representation methods of critical visual studies (Dee: 2004). Dialogic drawings will display both the ‘what’ and ‘how’ the latent potential of the Msimbazi River floodplain and how responsive settlements places may be conceived and shaped. This include conventional architectural techniques of plan sections and scaled models as contrapuntal landscapes.

ECOLOGICAL LIVELIHOOD

Refers to a persons means of securing the basic necessities of life without leaching off nature.



CULTURAL ECONOMIC EMPOWERMENT

Seeks to juxtapose narratives, languages and diverse cultural identities, as part of a broad educational project that seeks to benefit and uplift the community through its' traditional teachings.

TRADITIONAL SYSTEMS

Societies with traditional economies that relies on customs, history, and time-honoured beliefs. Belief is Based on agriculture, fishing, hunting, gathering, or some combination of them. They prefer to use barter instead of money.

AGRICULTURAL DREDGING

Is a process used to remove accumulated sediment from the banks or sides of a river, lake, stream whilst creating a plain to plant crops.



PERMACULTURE

Is a set of design principles centered on whole systems thinking. It uses these principles in a growing number of fields from regenerative agriculture, rewilding, and community resilience.

PHYTOREMEDIATION

The technologies that use living plants to clean up soil, air, and water contaminated with hazardous contaminants.

EVAPOTRANSPIRATION

The process by which water is transferred from the land to the atmosphere by evaporation from the soil and other surfaces and by transpiration from plants.

FLOOD RETENTION

is an area that has been designed and designated for the temporary or permanent retention of flood waters during rain or flood events.

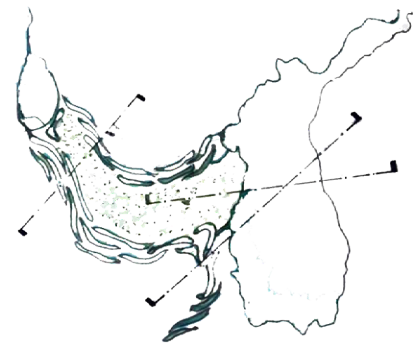


NOMADIC PASTORALISM

Is a form of herding when livestock are herded in order to find fresh pastures on which to graze. Maasai nomads follow an irregular pattern of movement, in contrast with Sukuma where seasonal pastures are fixed.

BUFFER ZONE

An area of land designated for seasonal flood protection.

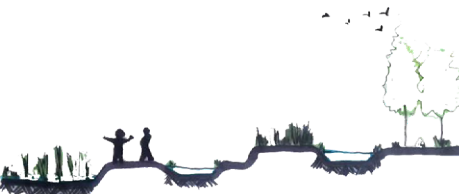


LITTORAL SHELF PLANTING

A shoreline in a water pond that is planted with native aquatic vegetation normally located by an out flow structure. The purpose of a littoral shelf is to help filter out the nutrients and minerals in the water prior to it leaving the pond via the out flow structure.

BIOSWALES

Channels designed to concentrate and convey storm-water runoff while removing debris and pollution.



Remembering Public Space

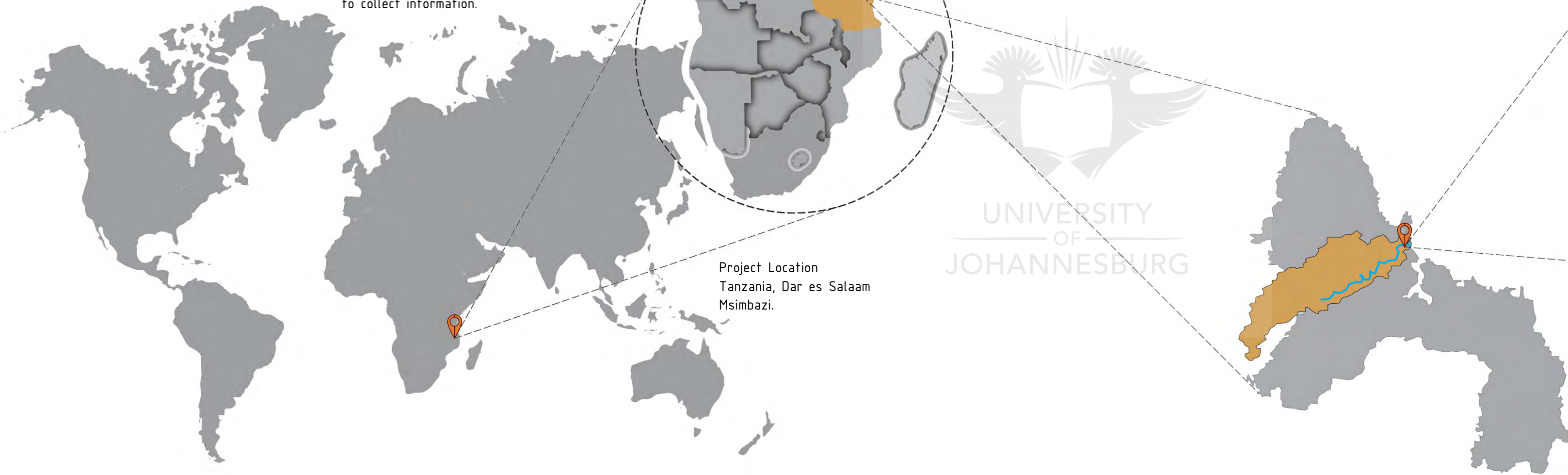
Quarantine
Alternative Futures of Msimbazi River Basin

INTRODUCTION TO THE PROJECT

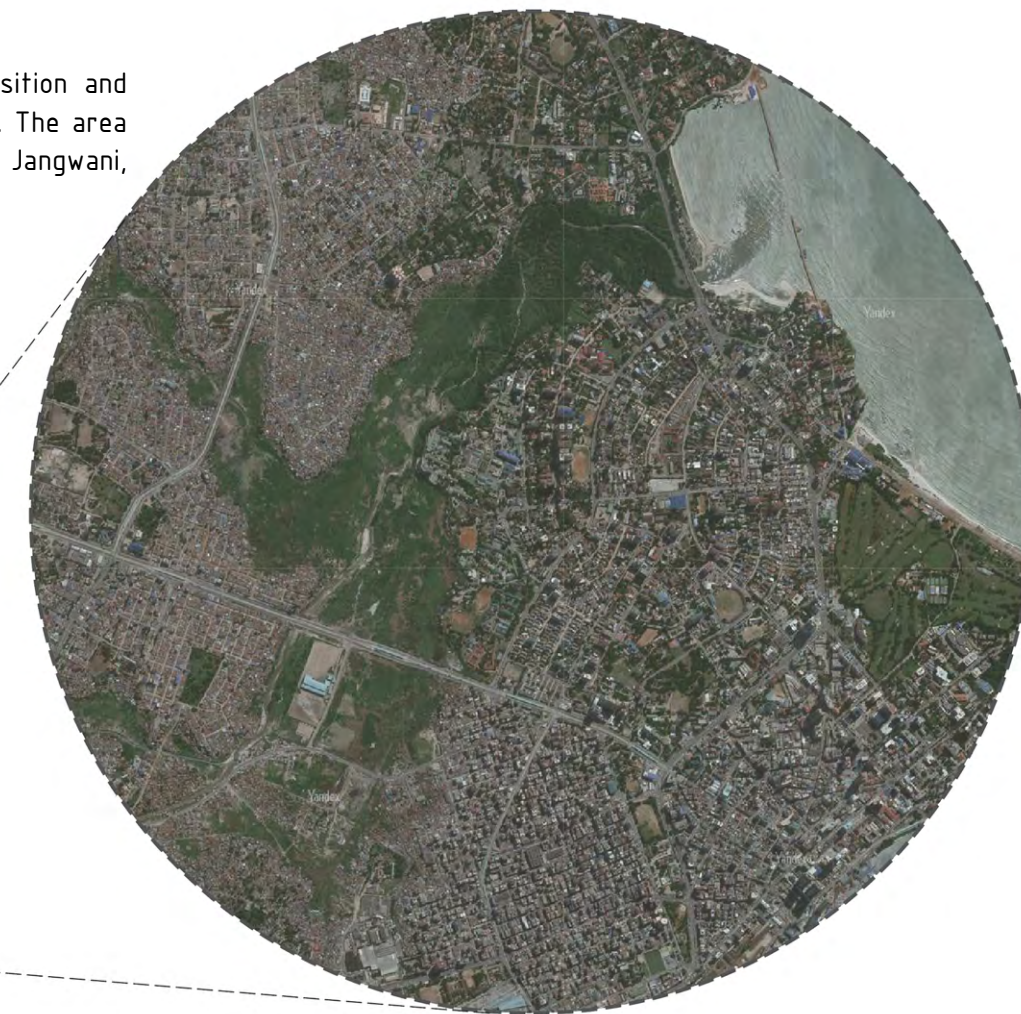
This Master Thesis in Landscape Architecture presents a design intervention for the Msimbazi flood plain in central Dar es Salaam, Tanzania. The thesis is a result of a Field Study trip from World Bank, which enabled students to travel to Tanzania in March 2020 to collect information.

We applied with the objective to study the Msimbazi river basin in Dar es Salaam and the specific site choice later included both wet land and mangrove area on Msimbazi river due to its complex layers that are interlinked and central location in the city. The project is divided into three parts,

the analysis, the theoretical position and the design exploration proposals. The area in focus is the area between Jangwani, Mkwajuni and Selander bridges.



Project Location
Tanzania, Dar es Salaam
Msimbazi.



Map showing location of Msimbazi flood plain in central Dar es Salaam, Tanzania.

Investigation of the Msimbazi River Basin

Stitching the site together

The floodplain investigation was conducted with Open Street Map and contributors, under an open license.

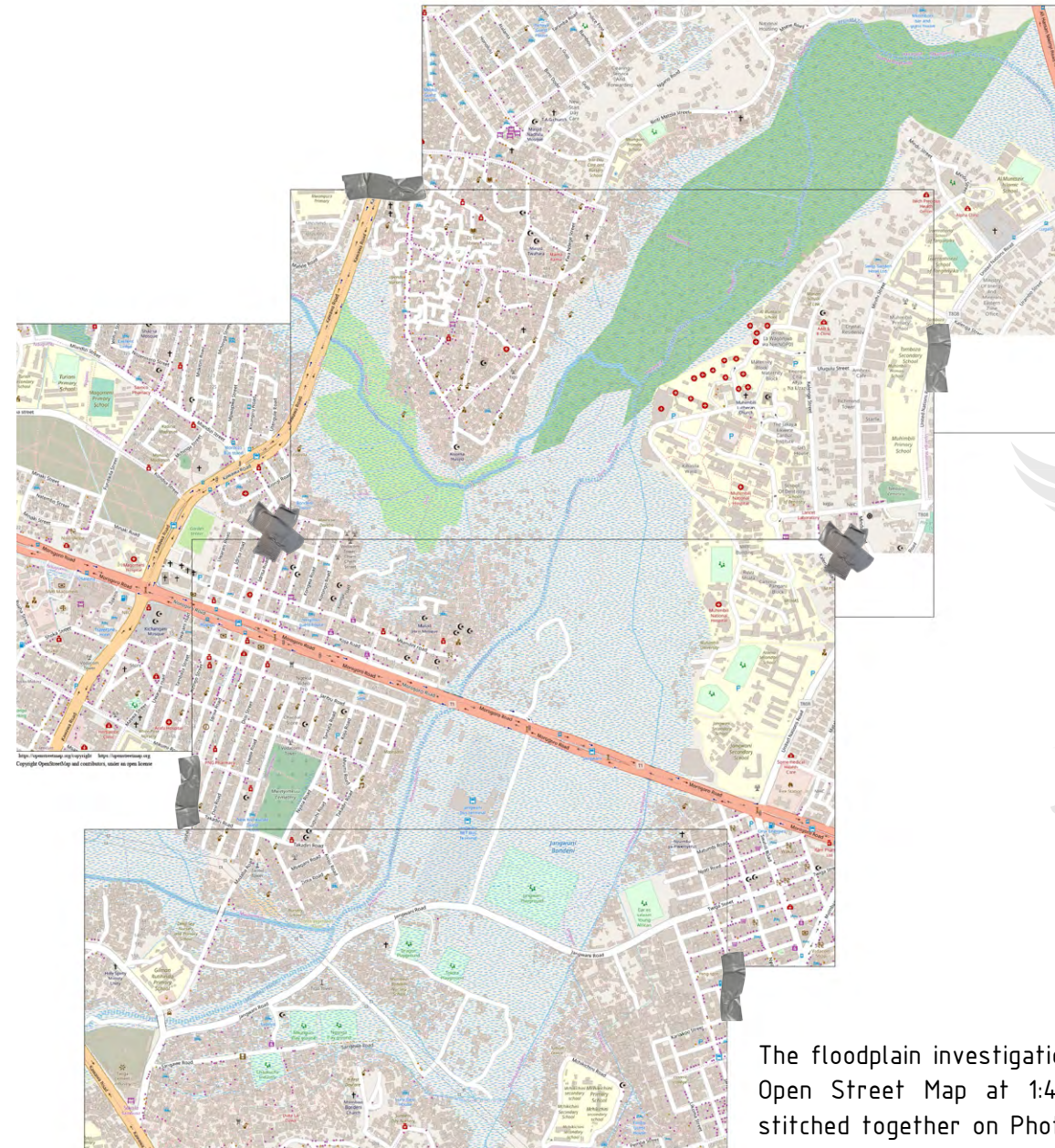
The other data was collected during site visit and represented in different methods.



Site visit to the Mangrove area with police officials in Tanzania.



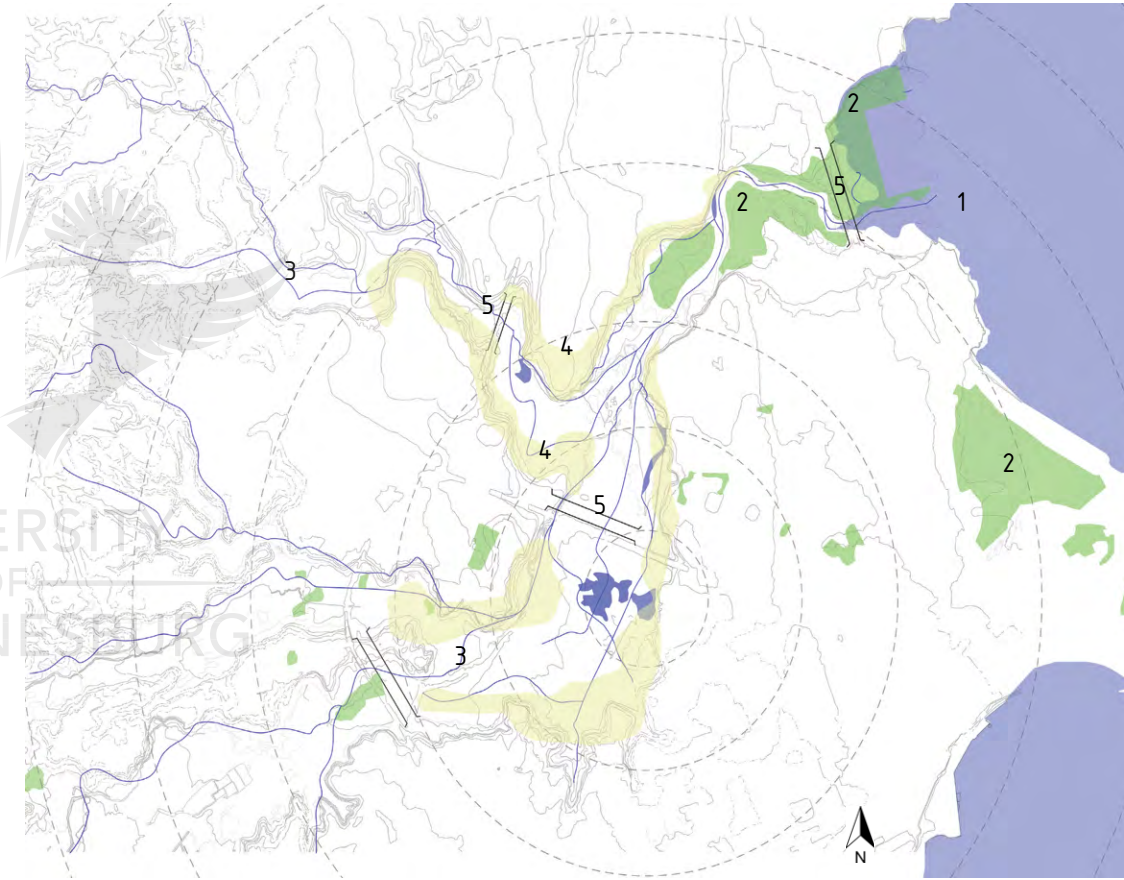
Site visit to the Mangrove area in Tanzania.



The floodplain investigation from Open Street Map at 1:400 and stitched together on Photoshop.

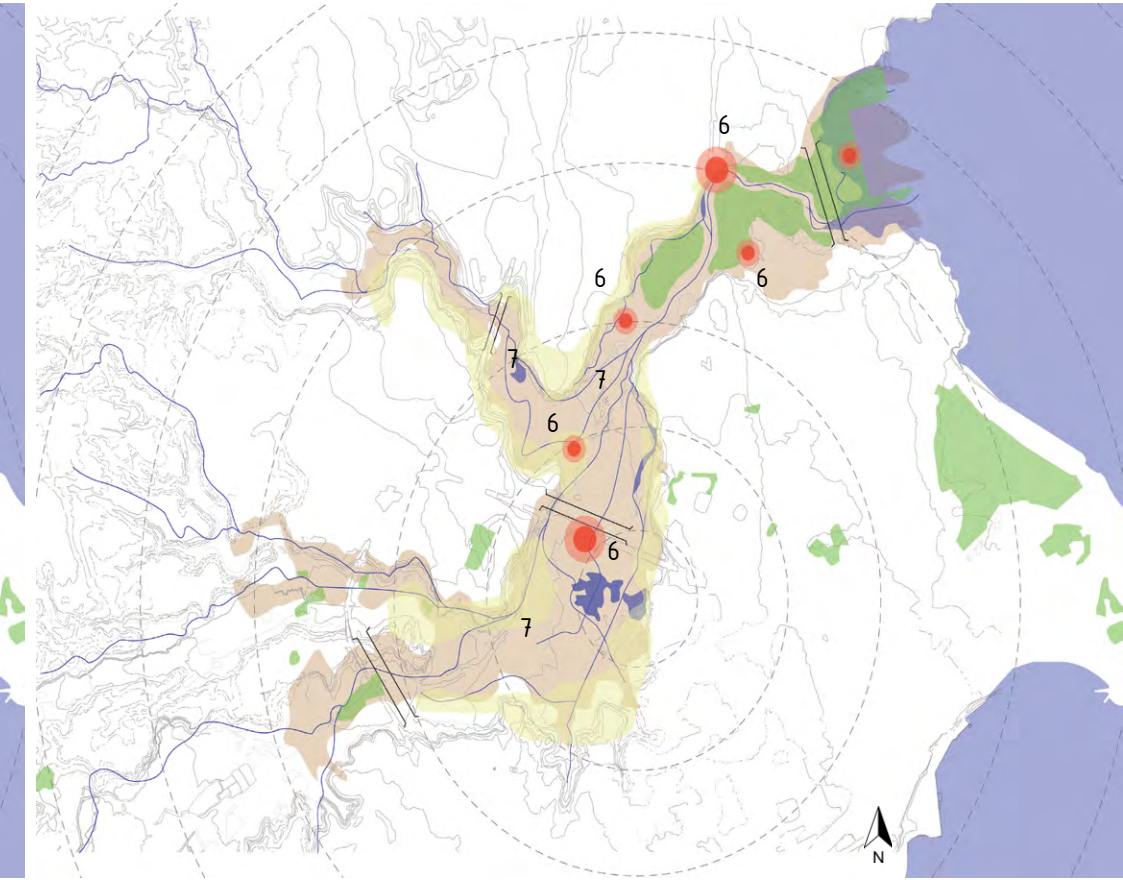
Dry Season

The floodplain investigation findings represented by mapping the layers of concern that will be addressed in this project.



Rainy Season

Rural livelihoods are collapsing and many people are migrating into the edges of the city for various reasons. This results in an increase in the number of people living in wetlands and the inhabitants of wetlands encounter a number of problems that include flooding.

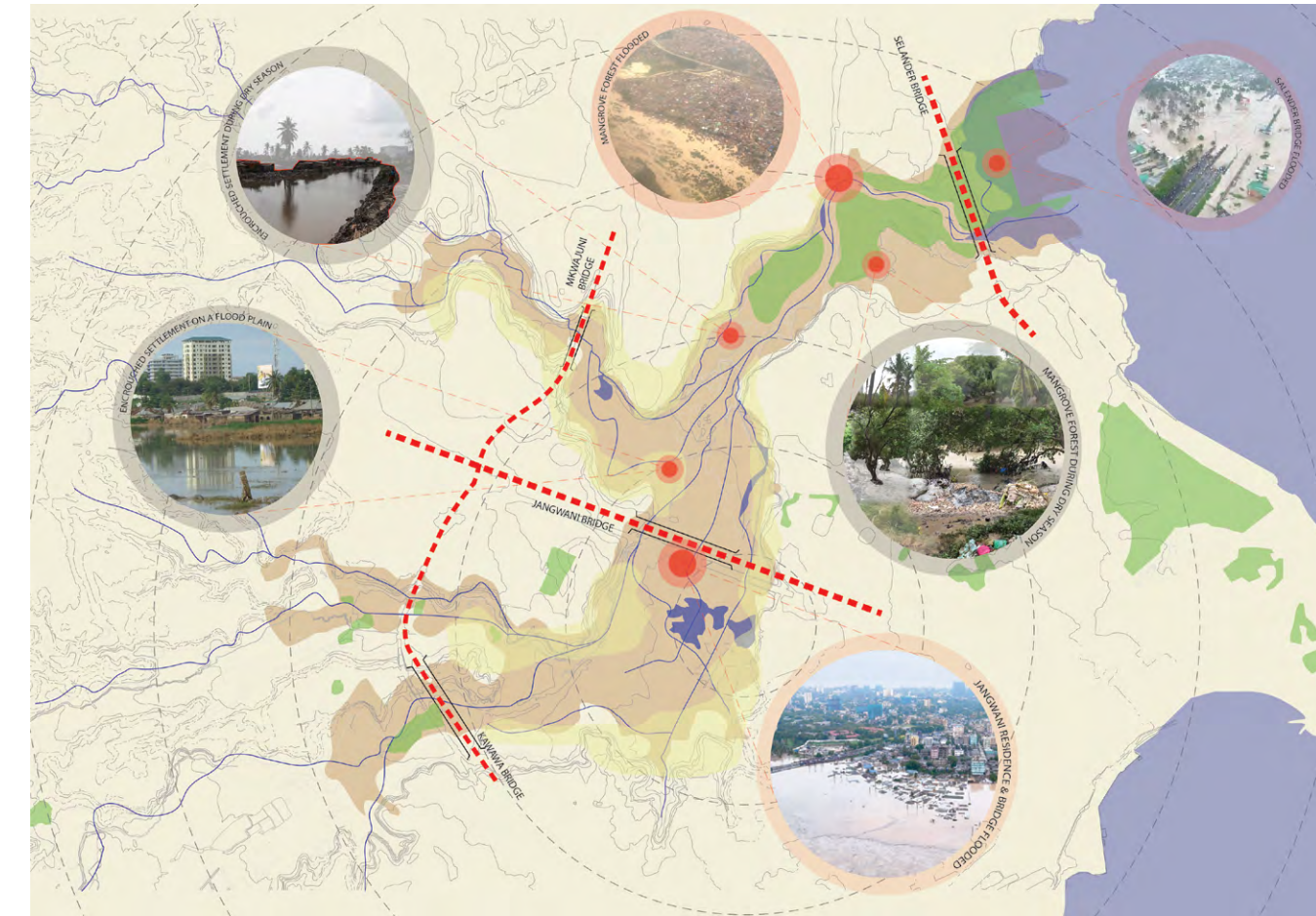


LEGEND

Indian Ocean	1	Settlements	4
Vegetation	2	Bridges	5
River stream	3	Points of interest	6
		Flooding	7

Msimbazi Flood Plains

Dar es Salaam has lived with the annual flooding of the Msimbazi River for far too long. The residence of Dar es Salaam have come to fear the times when dark clouds appear over the city. Residence have come to anticipate severe flooding with every rainy season. Flooding in the Msimbazi river basin destroys infrastructure. It paralyses the transportation networks and livelihoods. It hinders economic efficiency and most importantly, it threatens the health and safety of Dar es Salaam's residents.



Figure; Mapping of the flooded Msimbazi river basin with images of the catastrophe at certain points.



MANGROVES

Msimbazi River Basin

One of the urban rivers in Dar es Salaam that is currently facing severe problems due to the rapid urban development, pollution and flooding, is the Msimbazi River. It flows across Dar es Salaam city, north of the Central Business District and discharges into the Indian Ocean. The mangroves plain are severely degraded and pollution levels in the river have reached such high percentages they can no longer provide basic functions needed by the habitat.



WETLANDS

The natural flood plain surrounding the Msimbazi river has historically been vegetated and thus managed to handle the large amounts of excess water that enters the areas during rain seasons. However, due to the recent urbanization and lack of planning, large parts of the flood plain have been built upon. These dwellings are mainly informal settlements which get flooded every year, forcing the inhabitants to evacuate threatens the health and safety of Dar es Salaam's residents.



SITE INFORMANTS

Community Activities

On the massive settlements of Msimbazi are several different ethnic groups, many of which are still living in a way that's loyal to its own traditional customs. One of these is the Maasai and Sukuma.

They've been known across history as formidable warriors and hunters, although raising cattle has been, and still is, their main activity.

Then the 20th century came along and turned much of what was known as ethnic territory into wildlife reserves and national parks. This also led to the government beginning to pressure the tribes to give up their traditional semi-nomadic lifestyle revolving around herding, in favour of adopting a more settled and sedentary lifestyle of farming.

However, apart from some exceptional cases of Maasai people who moved into the city to get educated, to this date the ethnicity has remained persistent in their pursuit of their traditional way of living.

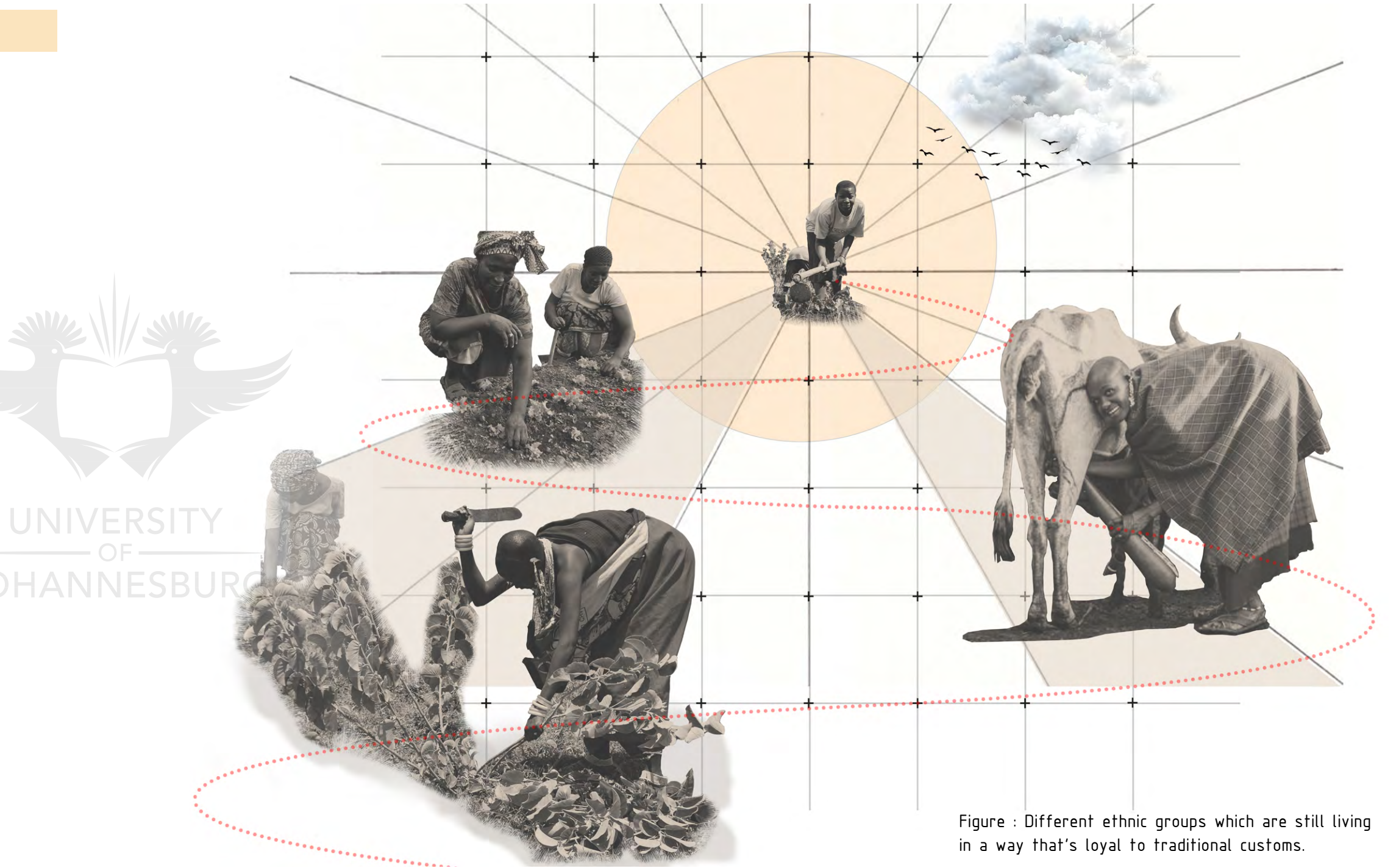


Figure : Different ethnic groups which are still living in a way that's loyal to traditional customs.

Cultural Community Activities

The Sukuma practise mixed farming, and were also hunters. Boys take the cattle to graze in the plains/communal grazing land. During the dry season they graze in the woodlands.

One of the reasons that the Maasai's cattle hold so much value because it is a form of currency, being traded for an array of goods. Another reason is because it's their main source of food and resources—skin and leather is used for shields and bedding, while dung is smeared on the walls of the houses. But beyond that, they have a genuine and deep relationship with their cattle, withholding the belief that it's their duty to take care of all the cattle in the world. As such, they lean into their semi-nomadic lifestyle in search of pastures with food and water for the cattle.

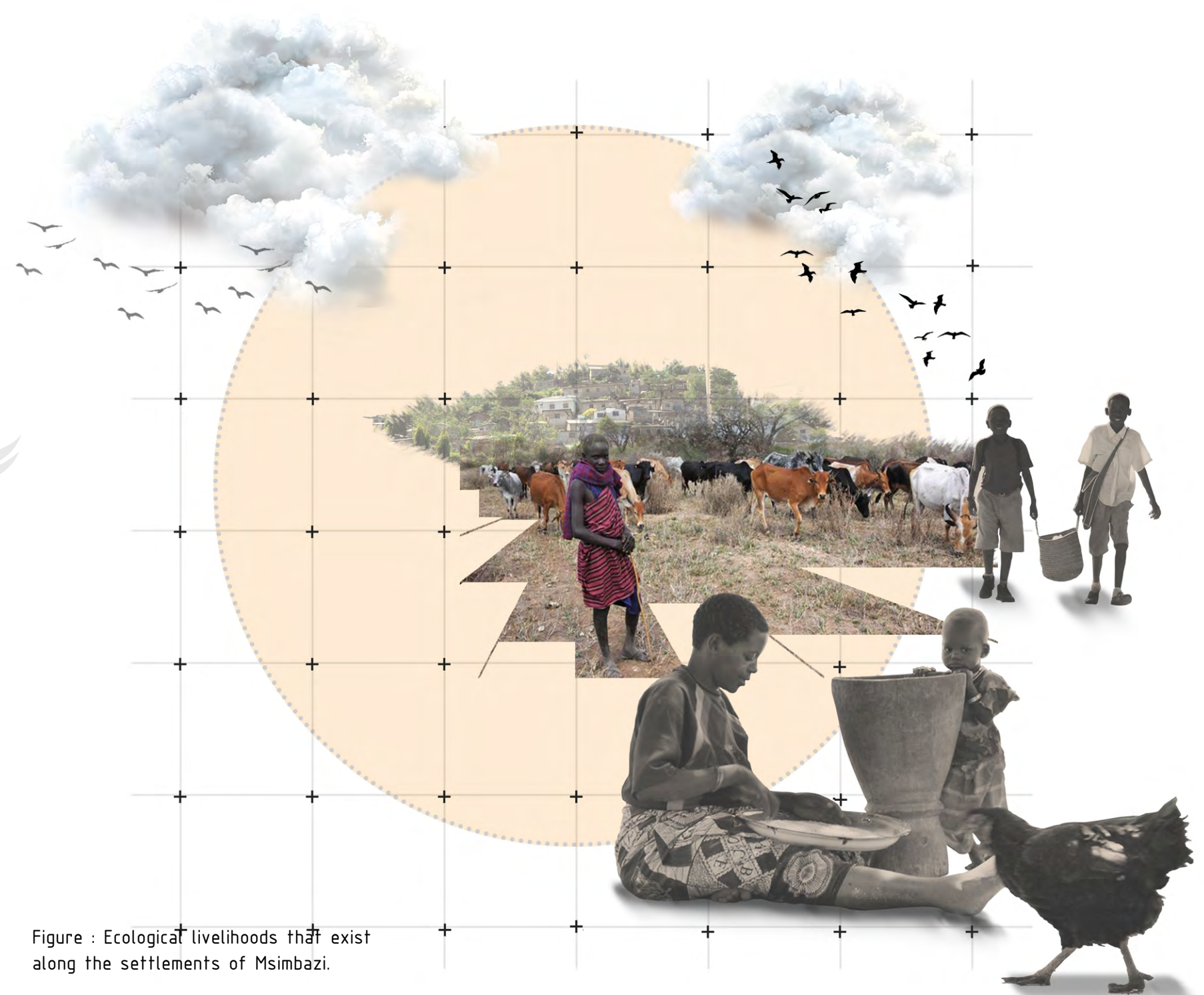
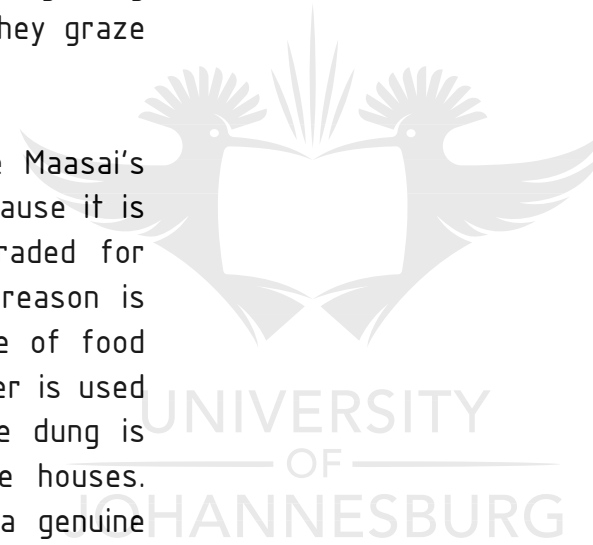


Figure : Ecological livelihoods that exist along the settlements of Msimbazi.

Agricultural Community Empowerment

The subsistence crops of the Basukuma are mainly maize, millet, rice, sugar-cane, cassava, sweet potatoes and vegetables. Dry seasons harvest the reed for roof thatching. Livestock is slaughtered only during ceremonies, rituals, and large family gatherings. Nowadays the occasional cow and goat are sold for money to cater for educational and family needs.

Today Tanzania celebrates the annual farmers' holiday called Nane Nane day, which takes place on 8th August each year.

Farming and markets are thoroughly loved across Tanzania.

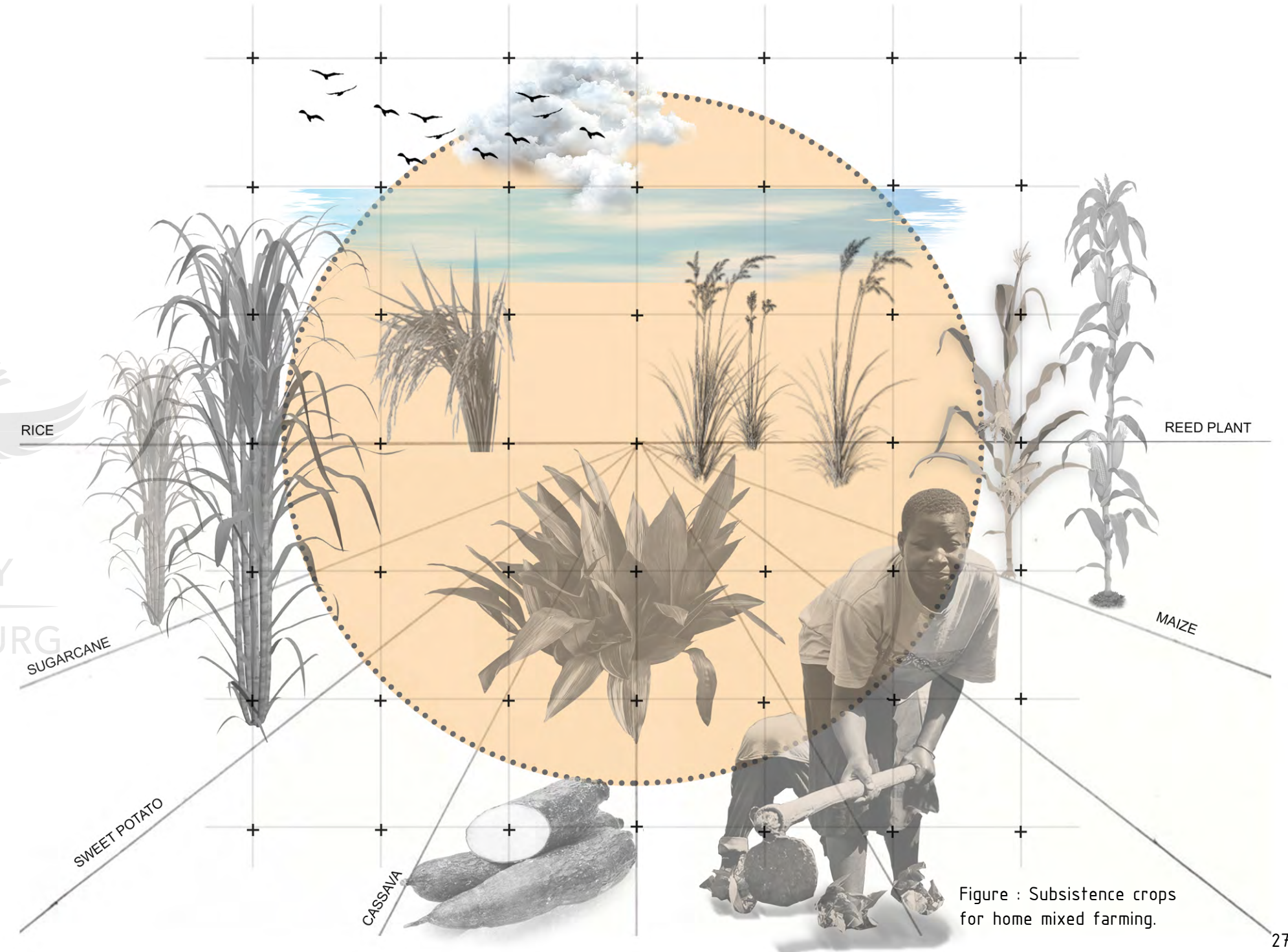
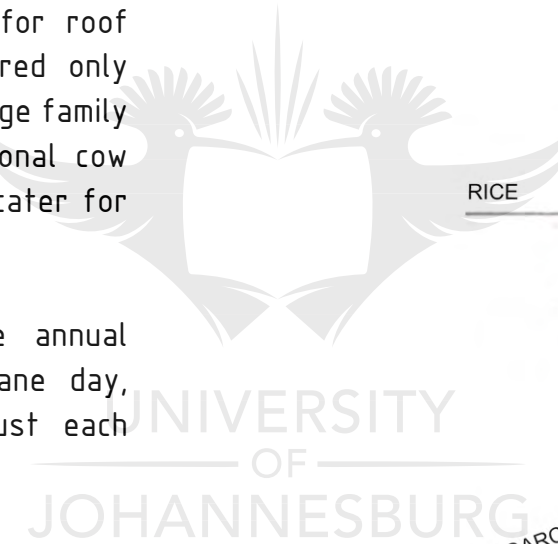


Figure : Subsistence crops for home mixed farming.

Culture & Tradition

One of the reasons that the Maasai's cattle hold so much value because it is a form of currency, being traded for an array of goods. Another reason is because it's their main source of food and resources—skin and leather is used for shields and bedding, while dung is smeared on the walls of the houses. But beyond that, they have a genuine and deep relationship with their cattle, withholding the belief that it's their duty to take care of all the cattle in the world. As such, they lean into their semi-nomadic lifestyle in search of pastures with food and water for the cattle.

It is also believed among the group, as well as some other African ethnic groups, that a man's wealth is measured by the quantity of their wives, children and cattle.



Figure : The importance of cattle to the Maasai people and nomadic herding for grazing fields.

Traditional Systems : Culture & Tradition

Though their cattle is the main source of nourishment, other animals like goats and lambs may be occasionally eaten.

Although they live on the settlement, livestock ownership is still practiced and these animals face challenges of polluted grazing fields. This results in several livestock diseases that may be passed during consumption.

The culture of circumcising young boys is not allowed to be discussed outside the ethnic groups.

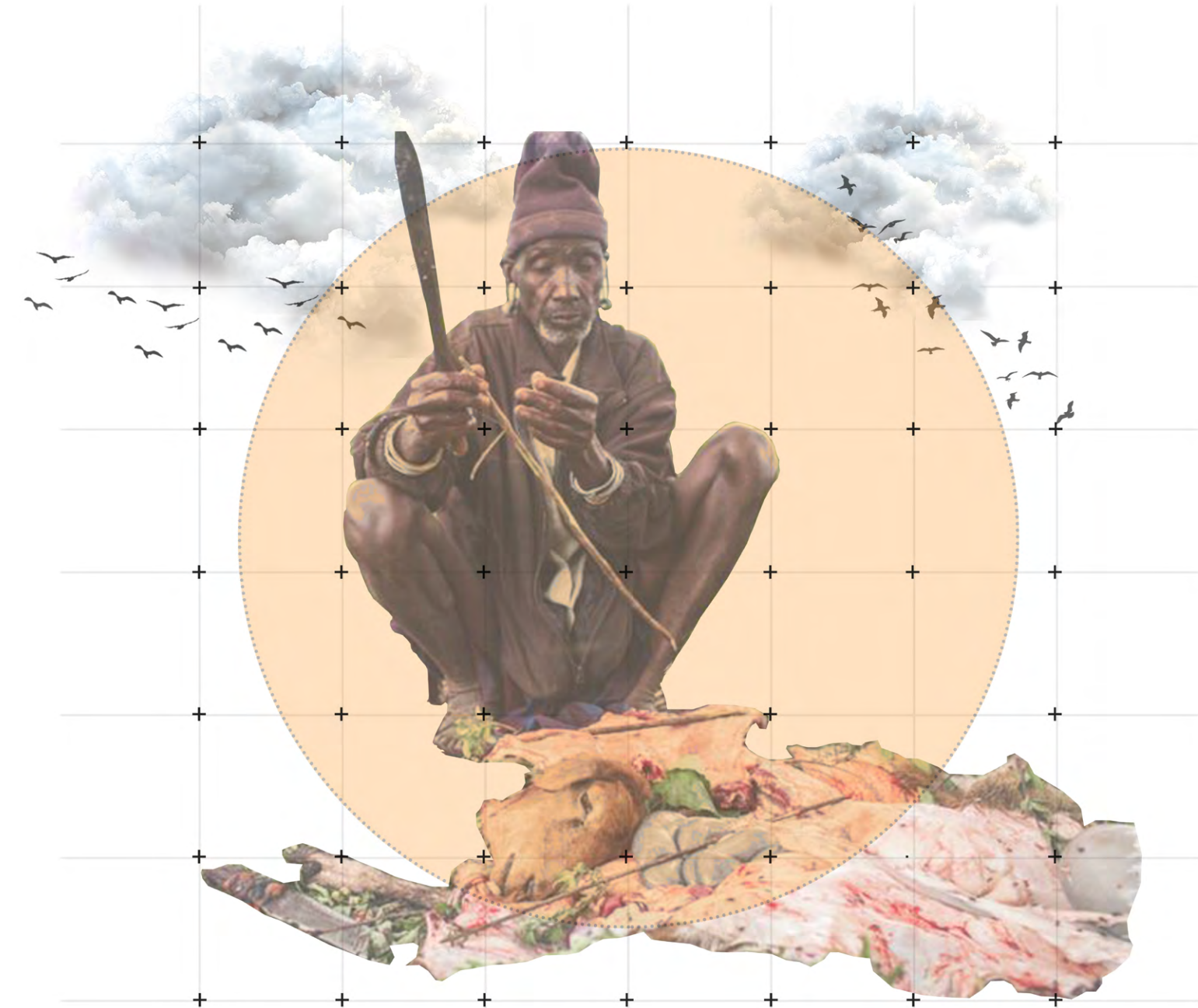
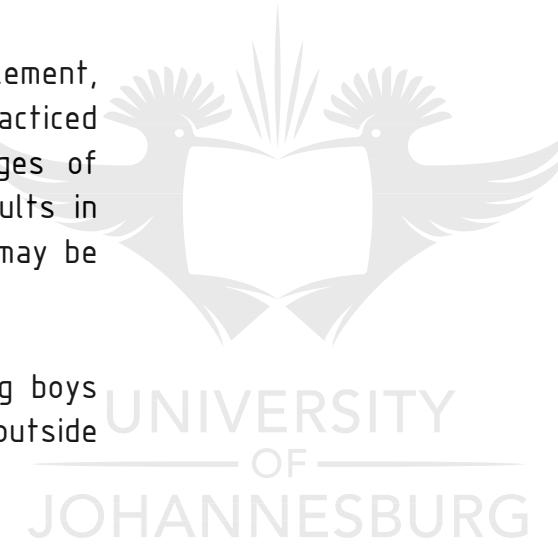


Figure : Livestock diseases that may be passed during consumption due to polluted grazing fields

Traditional Systems :
Culture & Religion

Their traditional belief system is monotheistic, with their god carrying the name Engai, and having manifested in two forms: the benevolent black god and the vengeful red god. Laibon, similar to a priest or a shaman, is the religion's most important figure, with a role of healing and prophecy, among others.

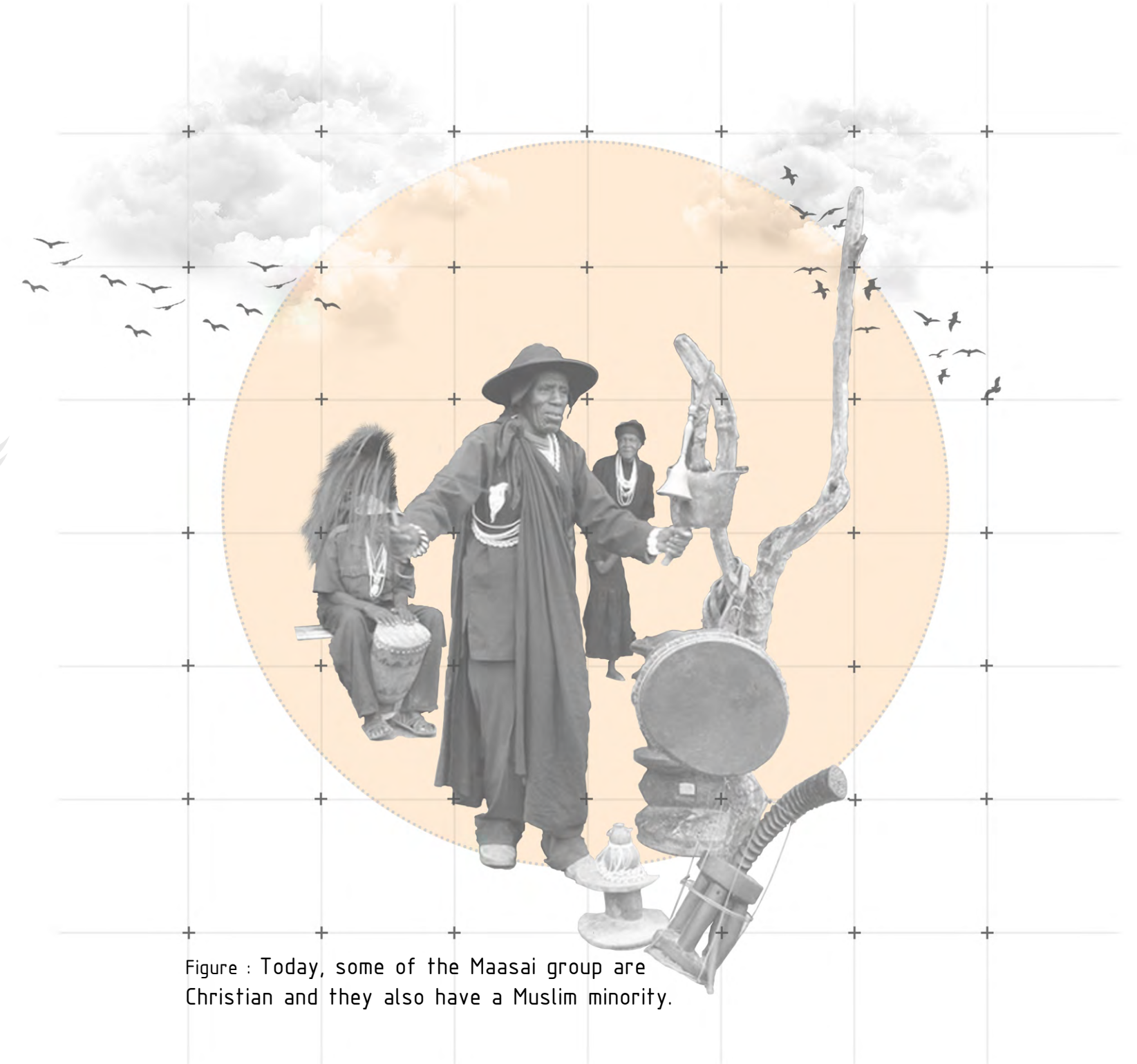
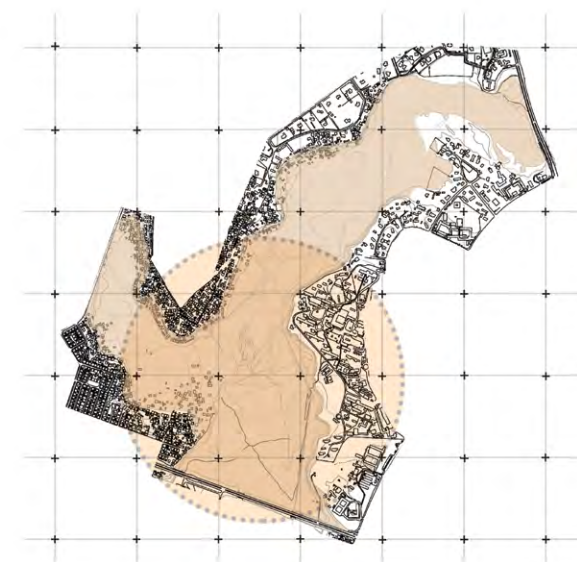


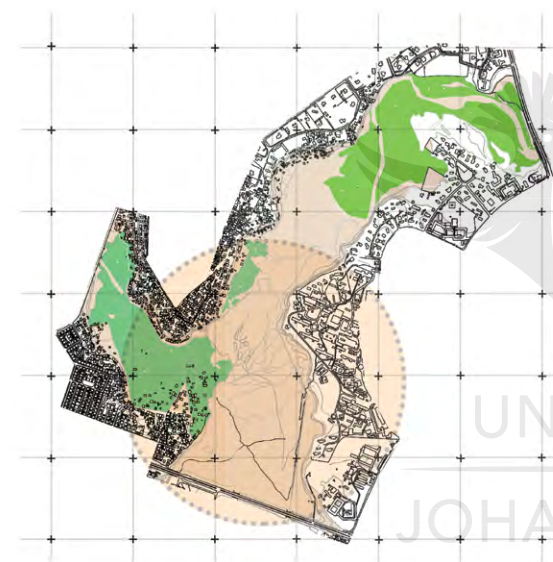
Figure : Today, some of the Maasai group are Christian and they also have a Muslim minority.



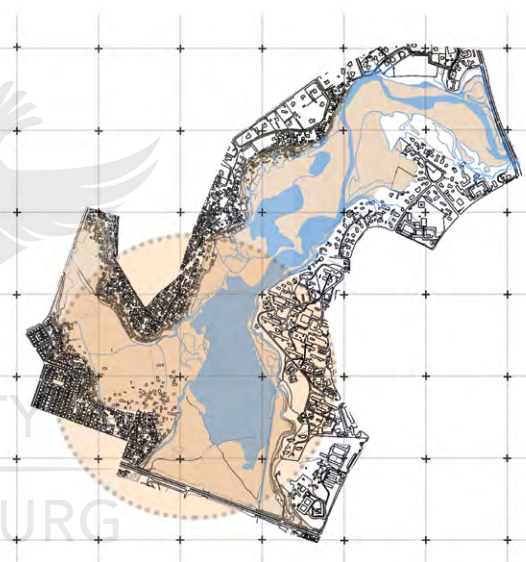
Mangrove and Wetland River-basin



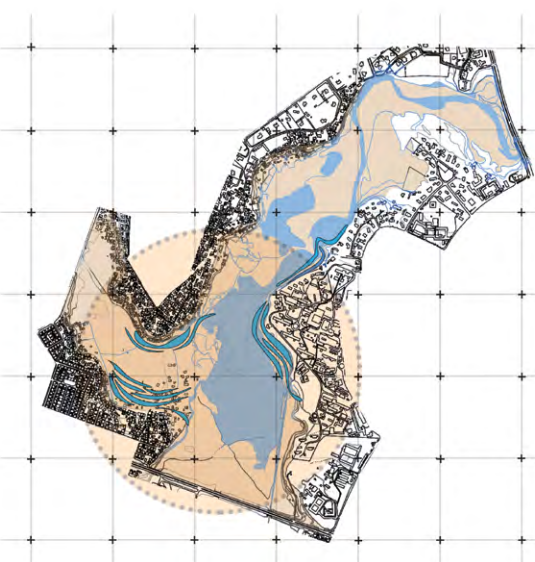
Flood plain and Settlements



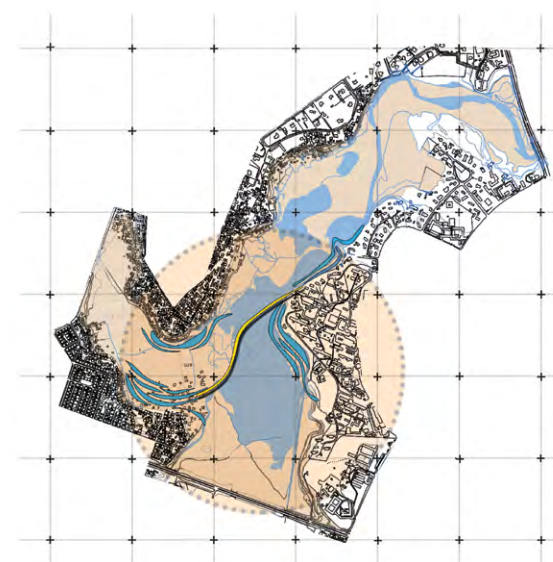
Agricultural Permaculture Activities



Restoration and Preserving the river



Bioswales ponds to remove pollutants



Infrastructure that promote livelihoods

Intervention: Flood Control

#9. The New Urban Agendas the implementation of the New Urban Agenda contributes to the implementation and localization of the 2030 Agenda for Sustainable Development in an integrated manner, and to the achievement of the Sustainable Development Goals and targets, including Goal 11 of making cities and human settlements inclusive, safe, resilient and sustainable.

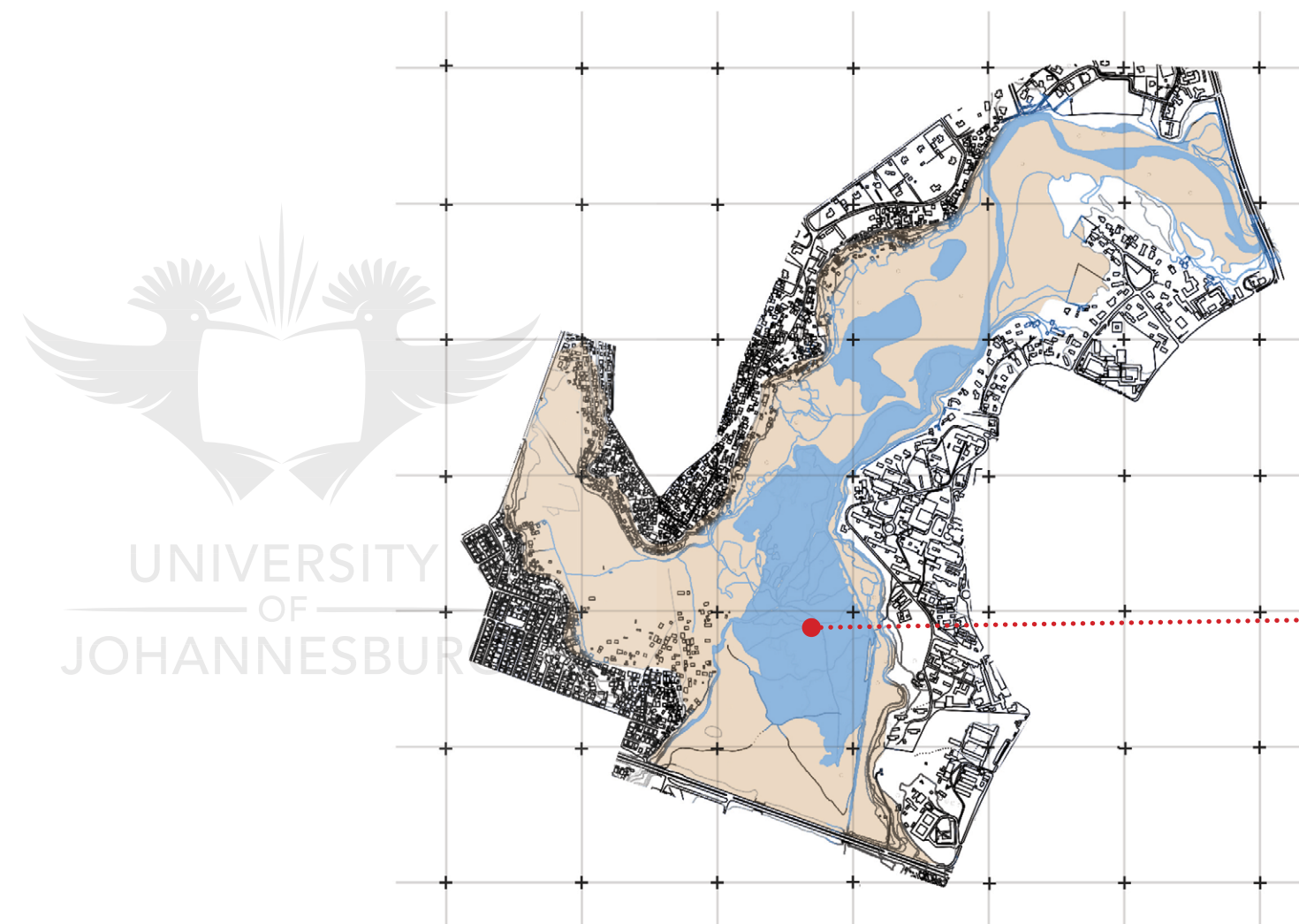


Figure : Restore and preserve the river

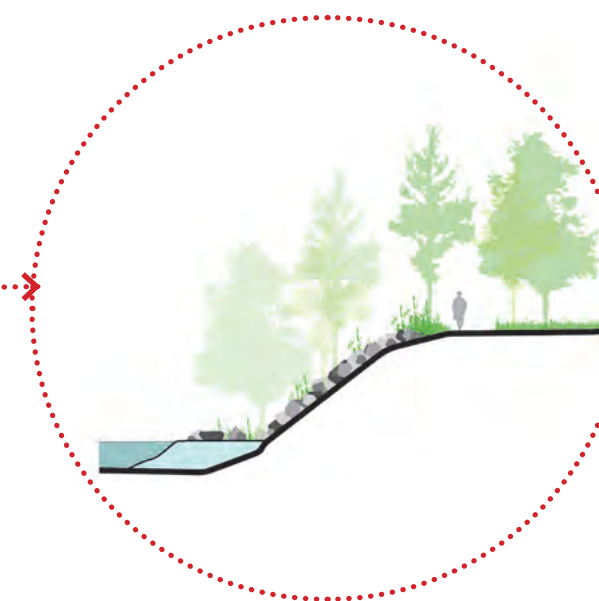


Figure : River dredging to create buffer during a flood

Intervention of Bioswales Ponds

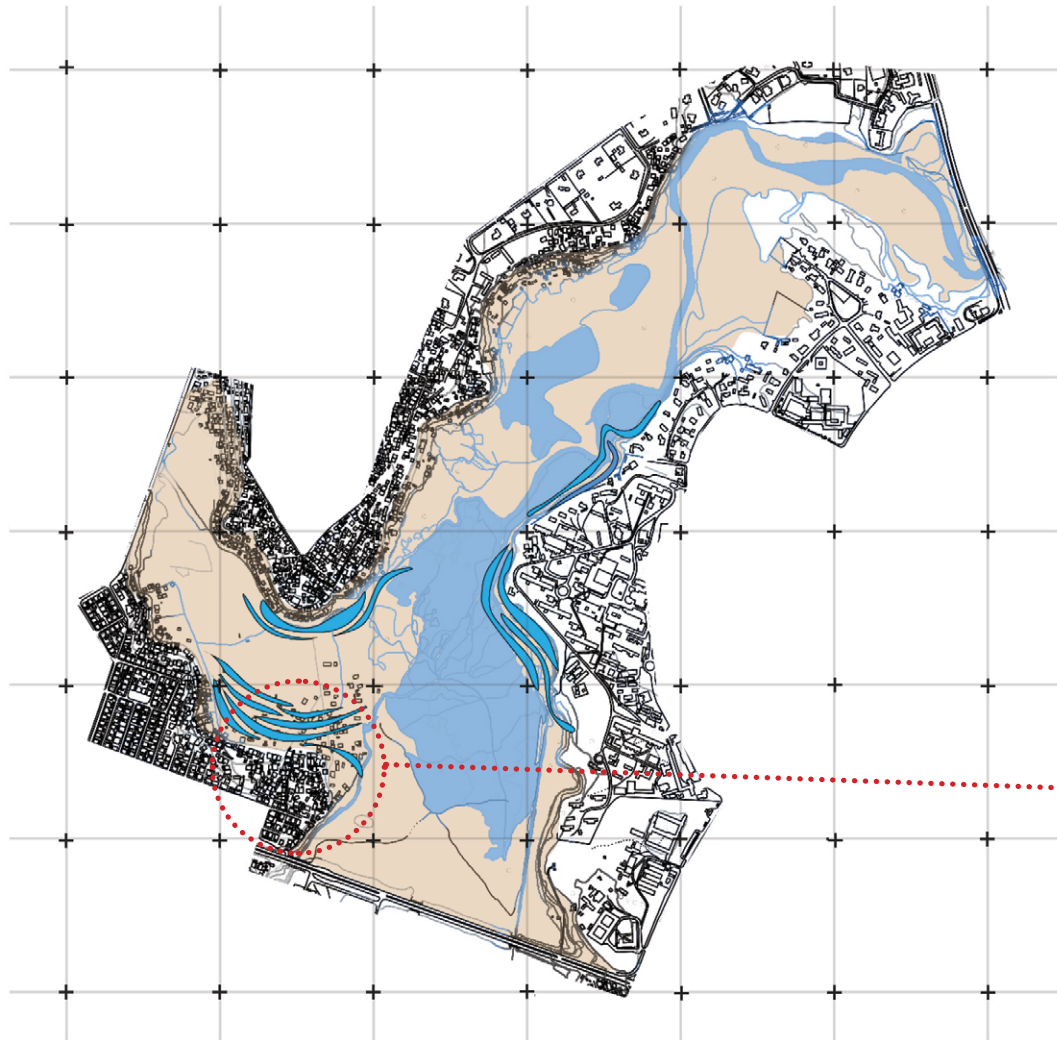


Figure : Preserve the river and remove pollutants using bioswales ponds.

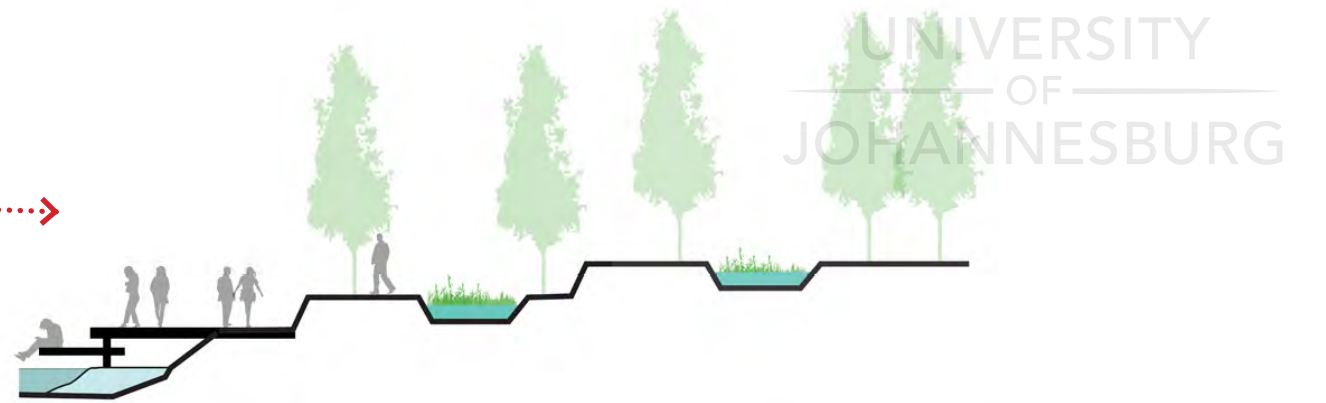


Figure. Section of Terraced Bioswales



Figure : Perspective of Terraced Bioswales with public activities.

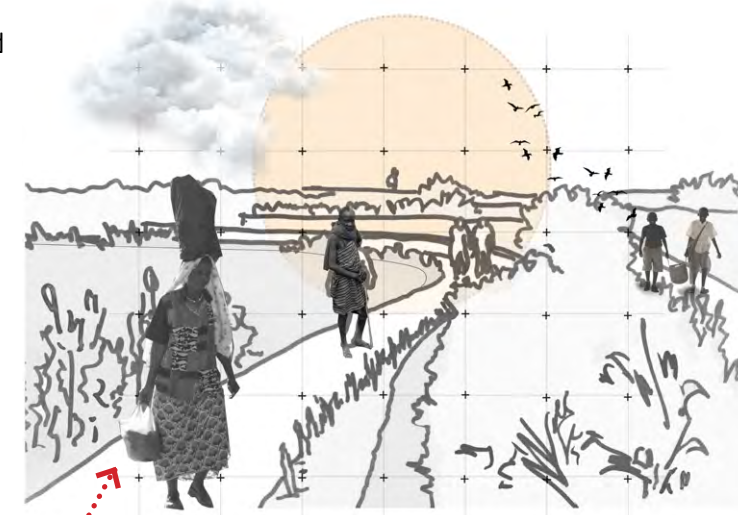
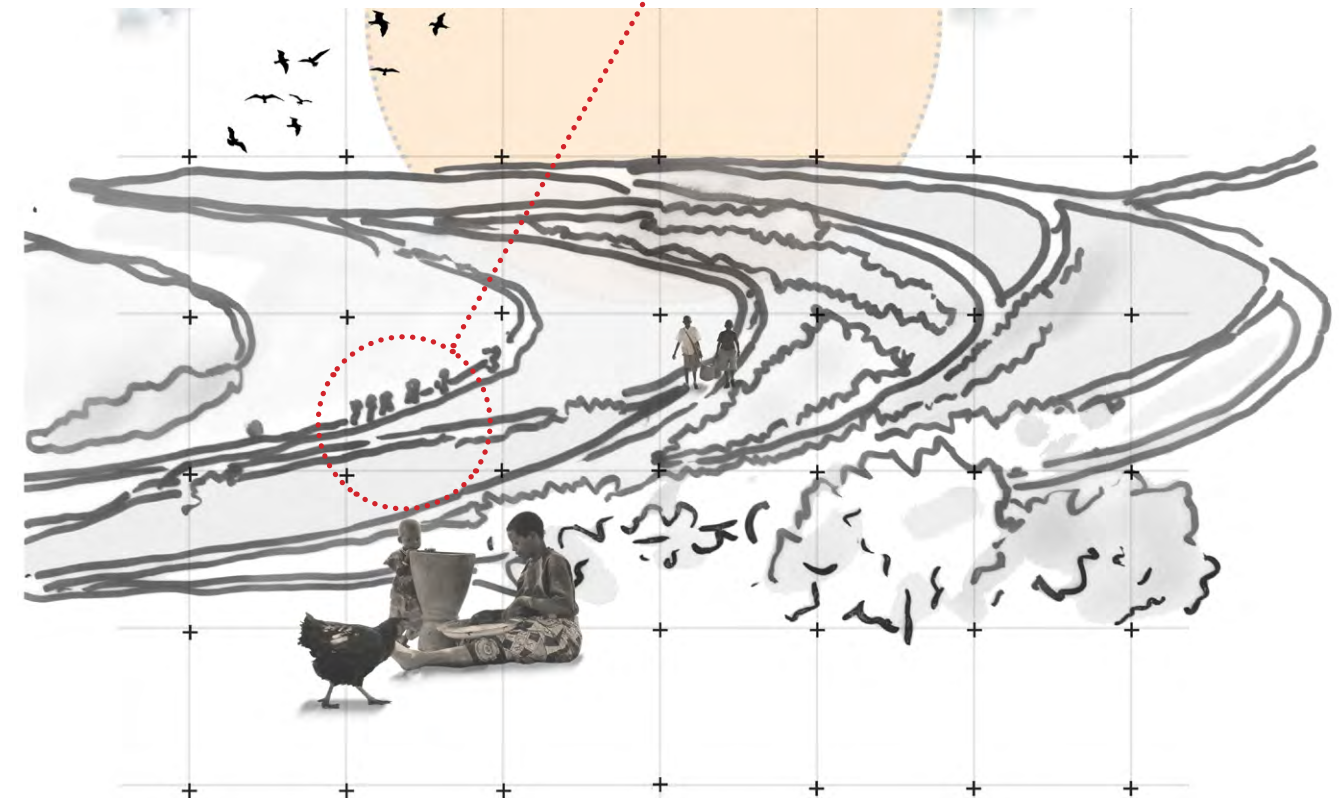


Figure : Landscape of Terraced Bioswales



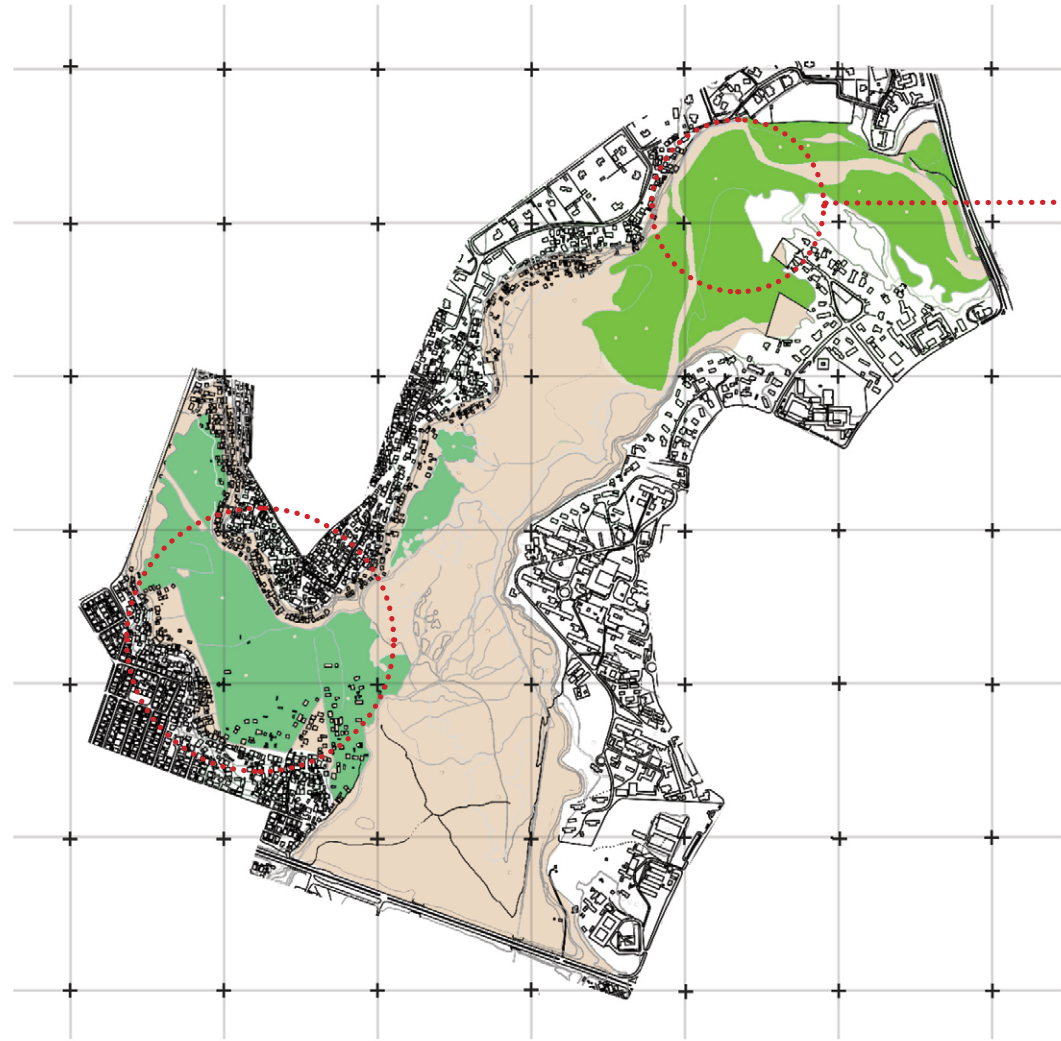


Figure : Mangroves area.



Once the water has been cleaned off the solid waste by the bioswales, large parts of the area will now be available for use by the local inhabitants for growing vegetables.

The flood plain (soil) in which the plants currently grow is highly polluted and the whole area houses large amounts of garbage sprinkled across the plain.

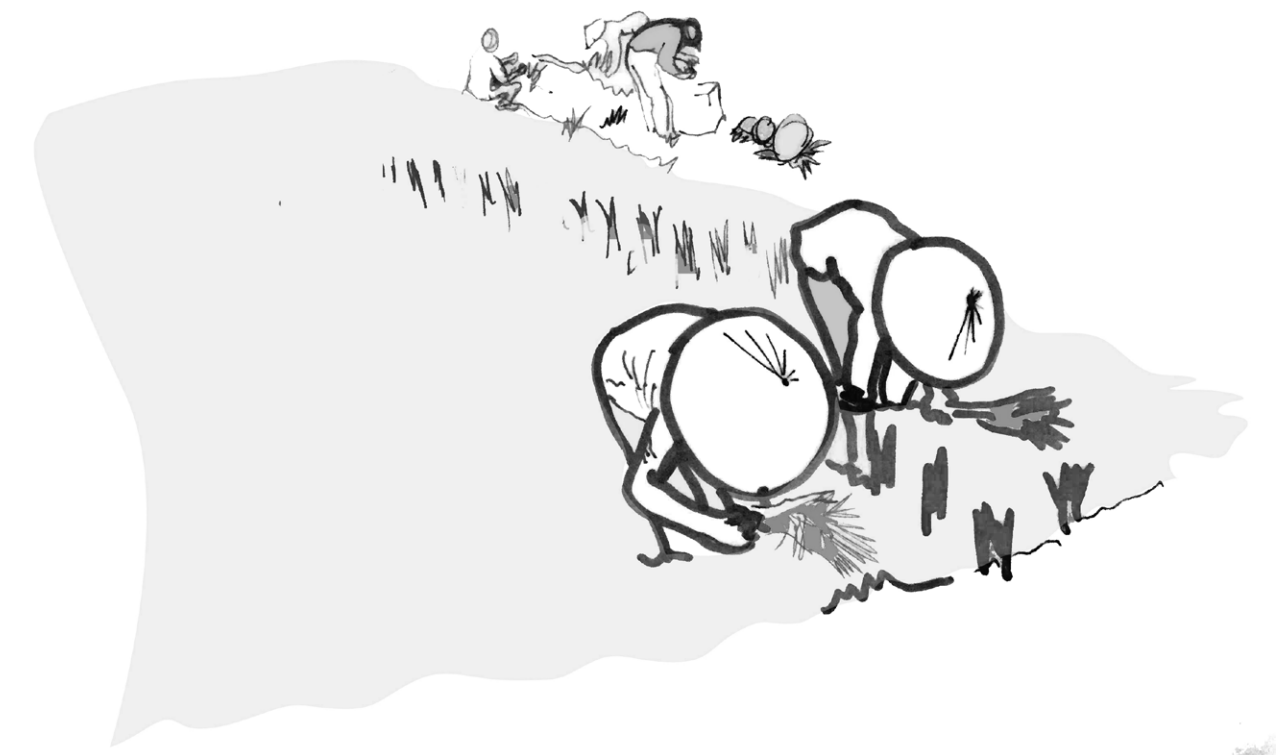


Figure : Perspective sketch of an Agricultural Permaculture on wetlands.

Figure : Agricultural Permaculture Activities.

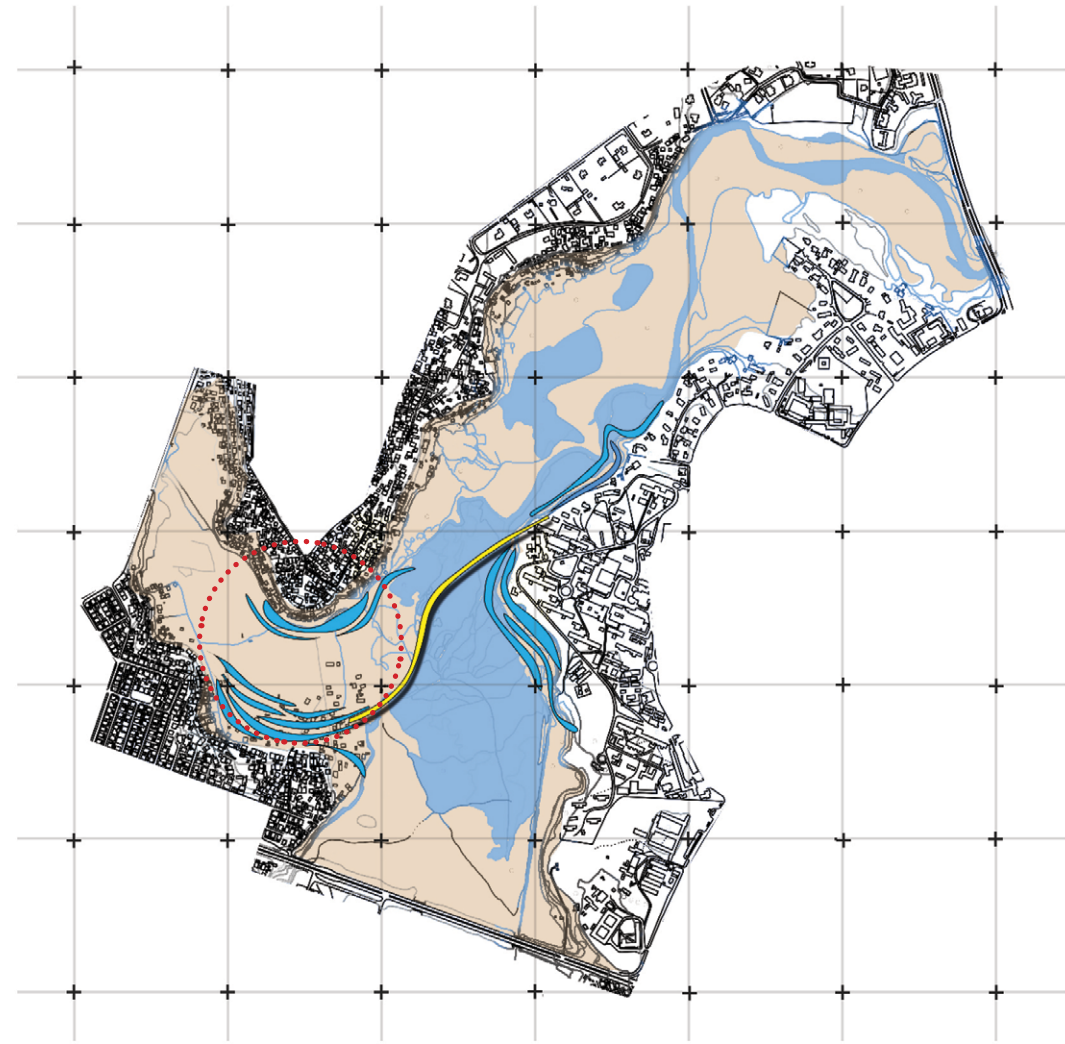


Figure : Paths encourage Social and economic activities



The path and platforms on the ground level, following the cut and fill water filtration land form a network of paths built into the ponds and mound ring allowing the public activities to continue.

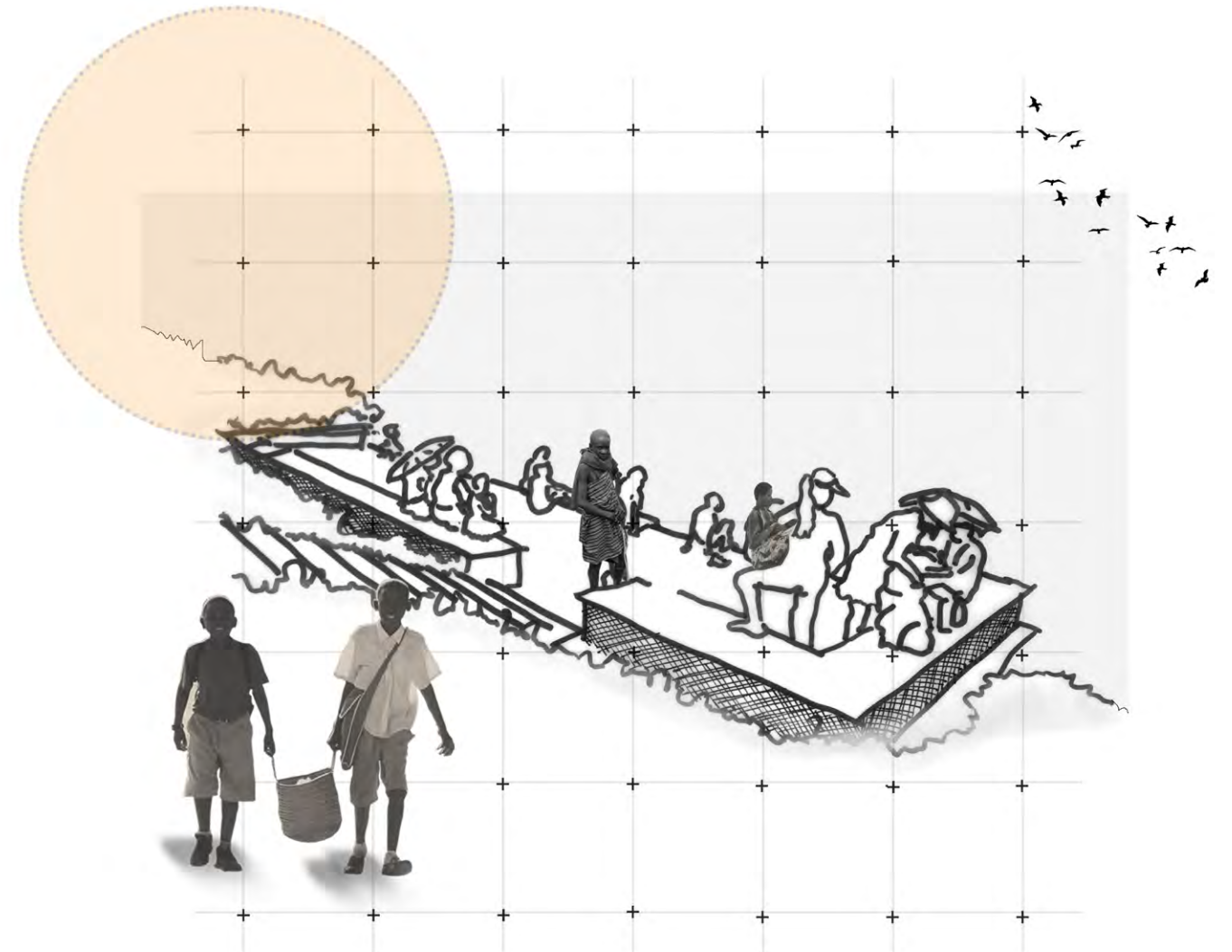


Figure : Perspective sketch of social areas on wetlands.

Infrastructures that promote Ecological Livelihoods

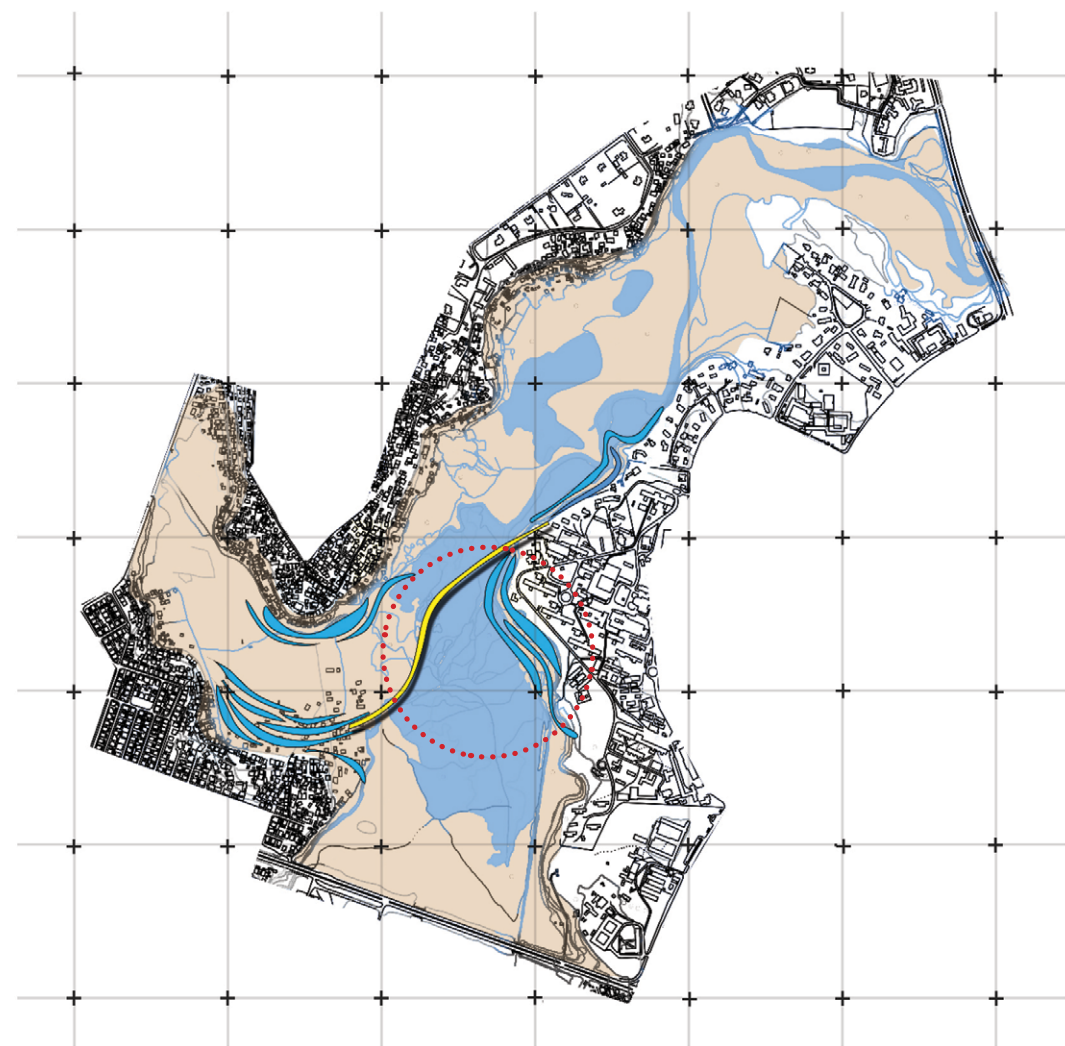
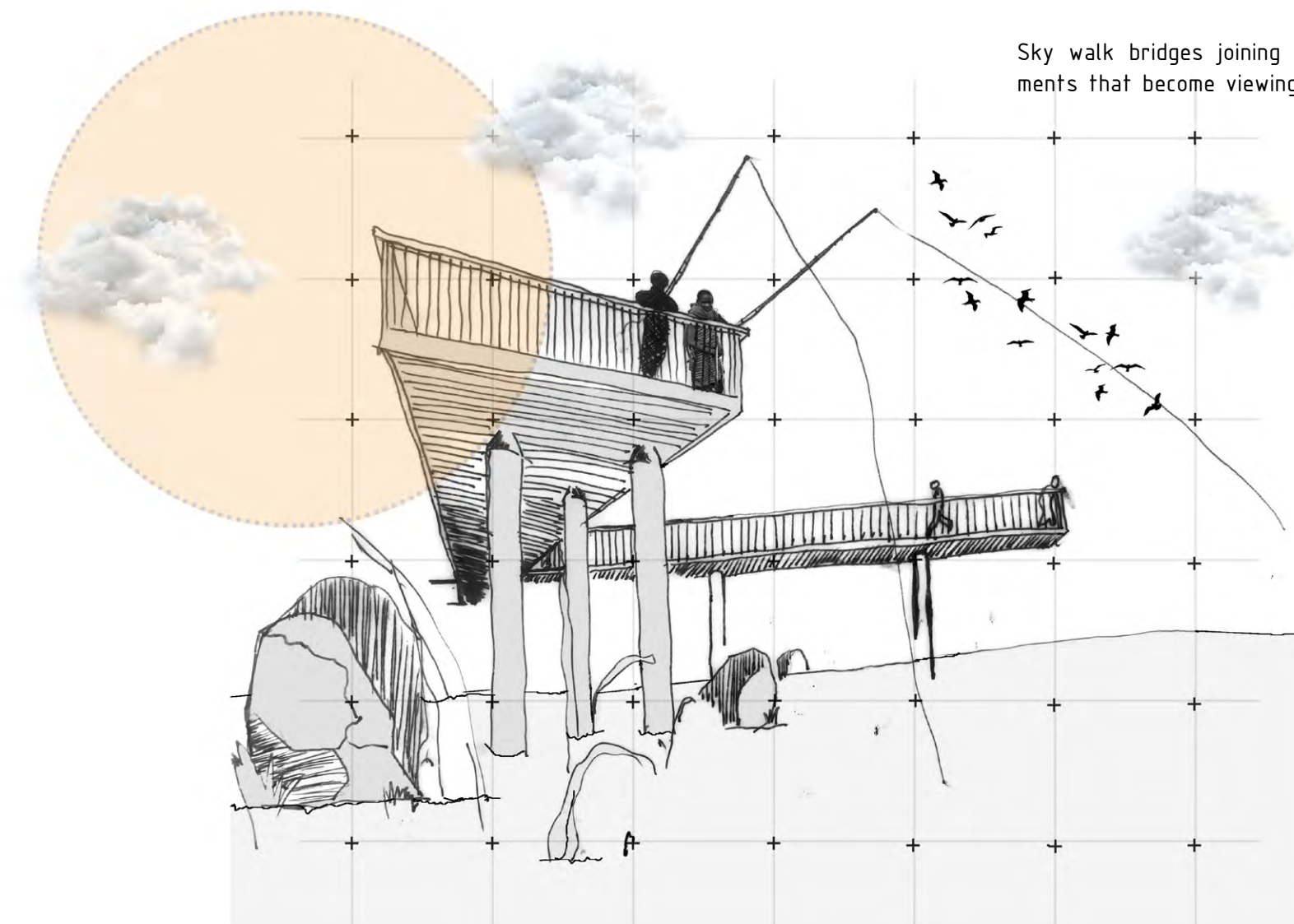


Figure : The Proposed Infrastructure is envisaged to resist floods of up to 5 meters.

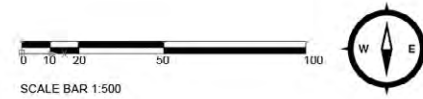
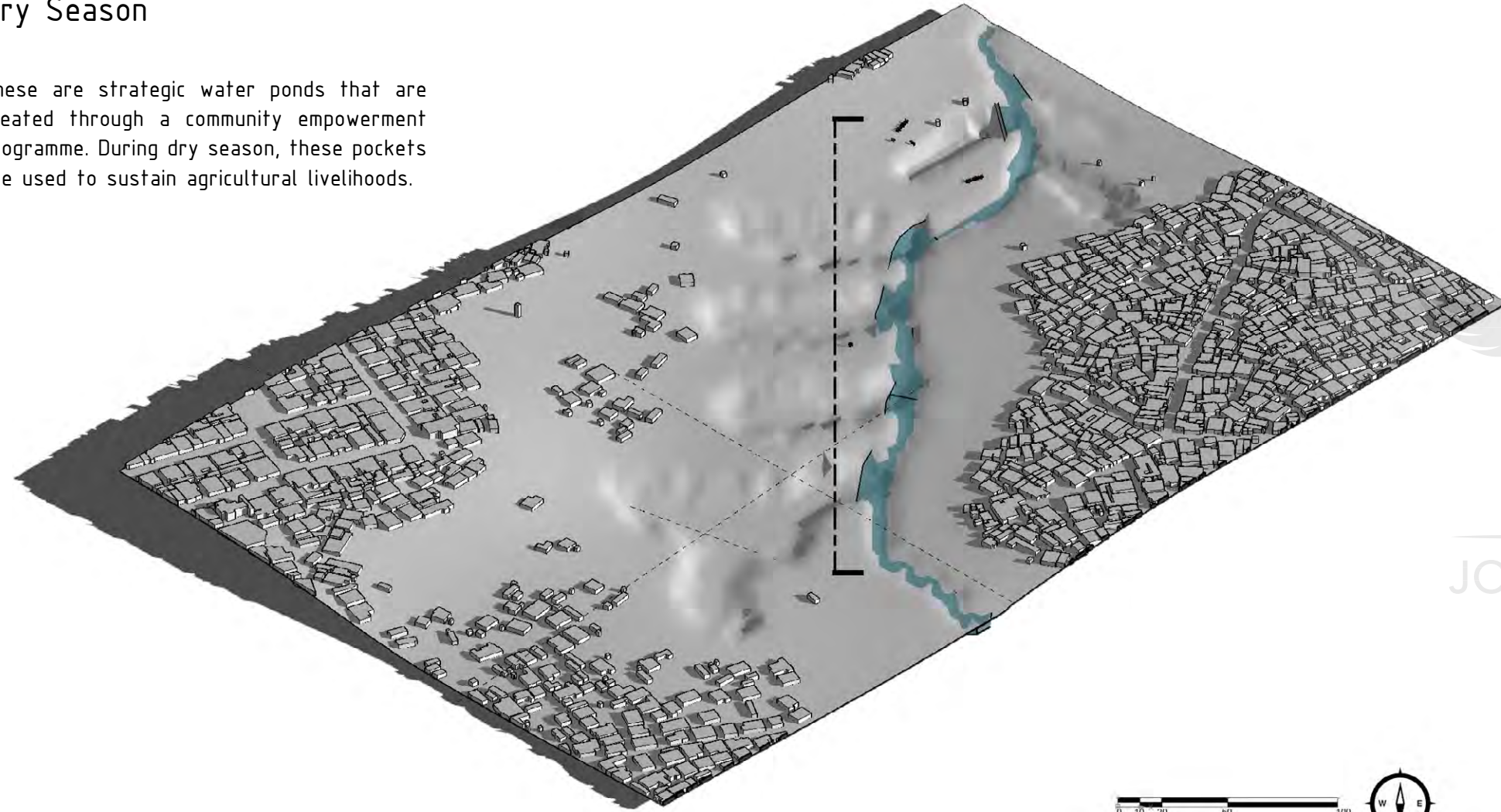


Sky walk bridges joining the three settlements that become viewing and fishing piers.

Contrapuntal Intervention 2 : Ponds

Dry Season

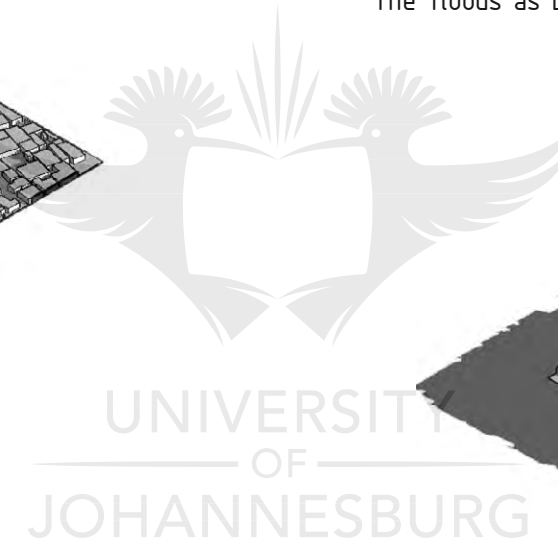
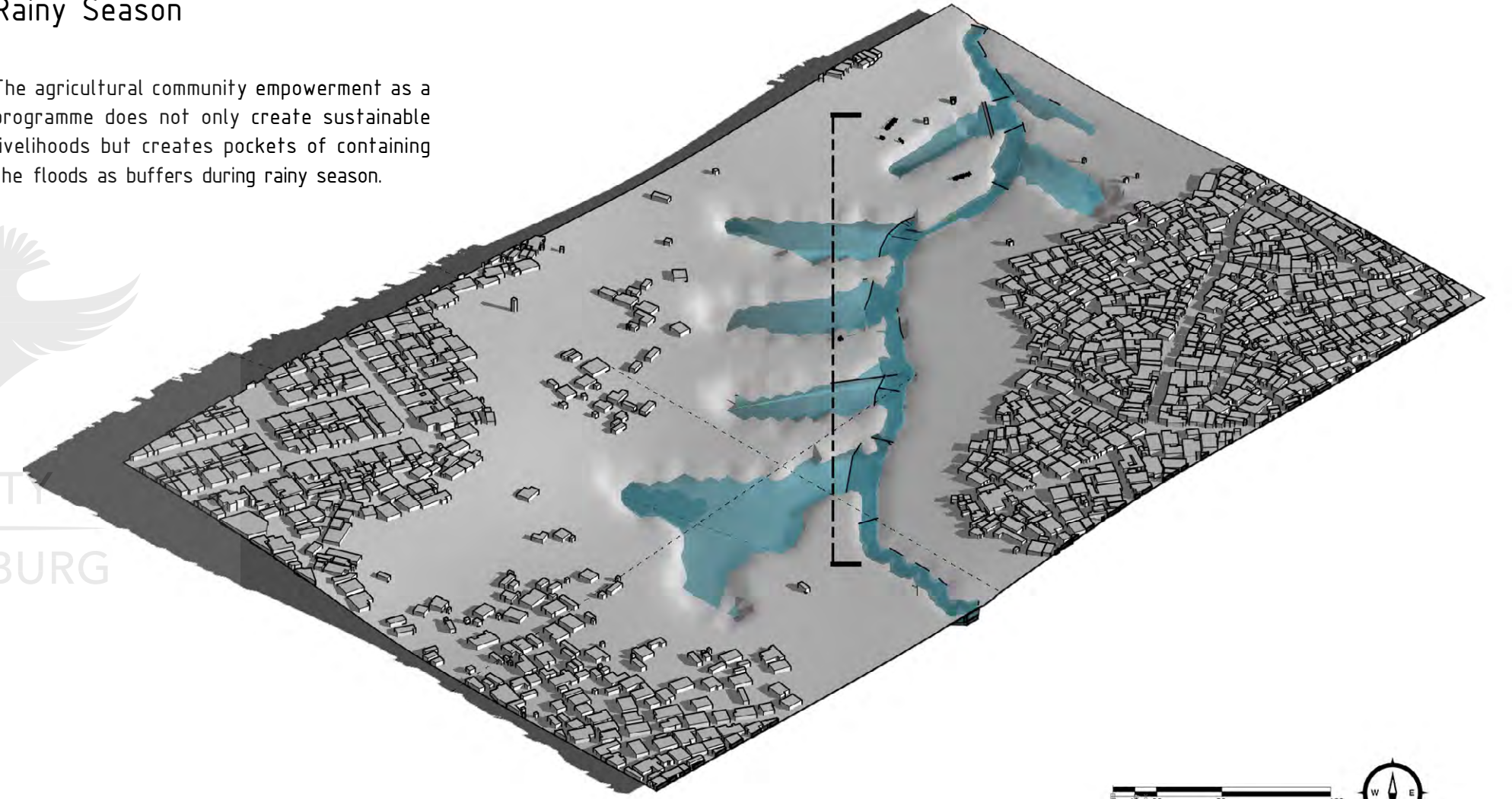
These are strategic water ponds that are created through a community empowerment programme. During dry season, these pockets are used to sustain agricultural livelihoods.



Contrapuntal Intervention 2 : Ponds

Rainy Season

The agricultural community empowerment as a programme does not only create sustainable livelihoods but creates pockets of containing the floods as buffers during rainy season.



Ecological Livelihoods

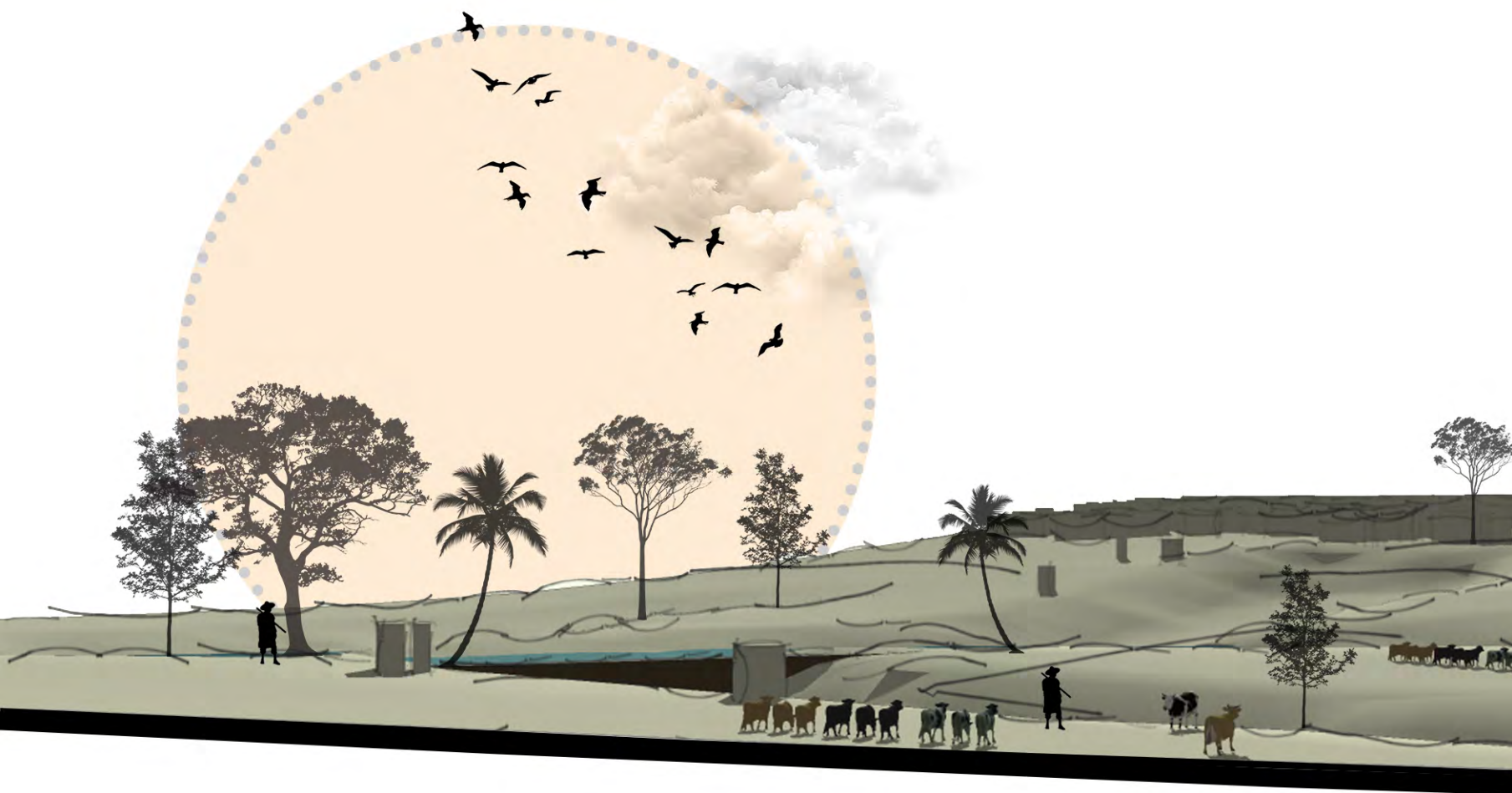
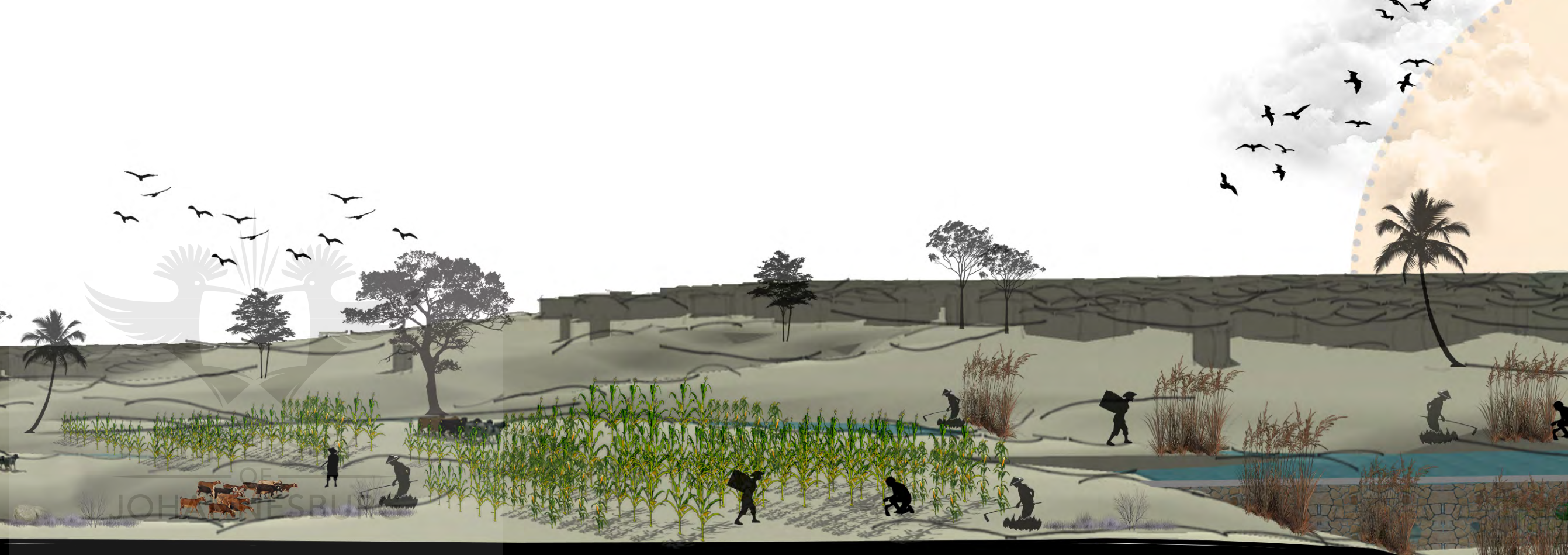
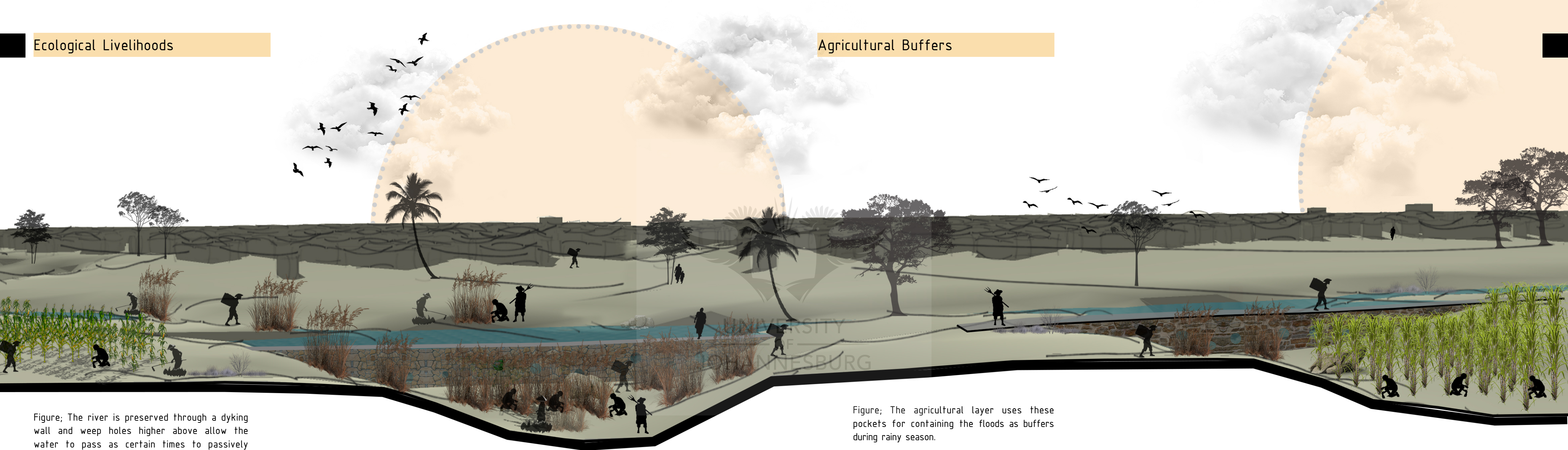


Figure ;During dry season, these pockets are used as grazing fields as they are fertile and moist from the flood.

Agricultural Landscapes



Figure; The agricultural community empowerment as a programme to create sustainable livelihoods for informal settlers.



Figure; The river is preserved through a dyking wall and weep holes higher above allow the water to pass as certain times to passively water the crops on the buffer area.

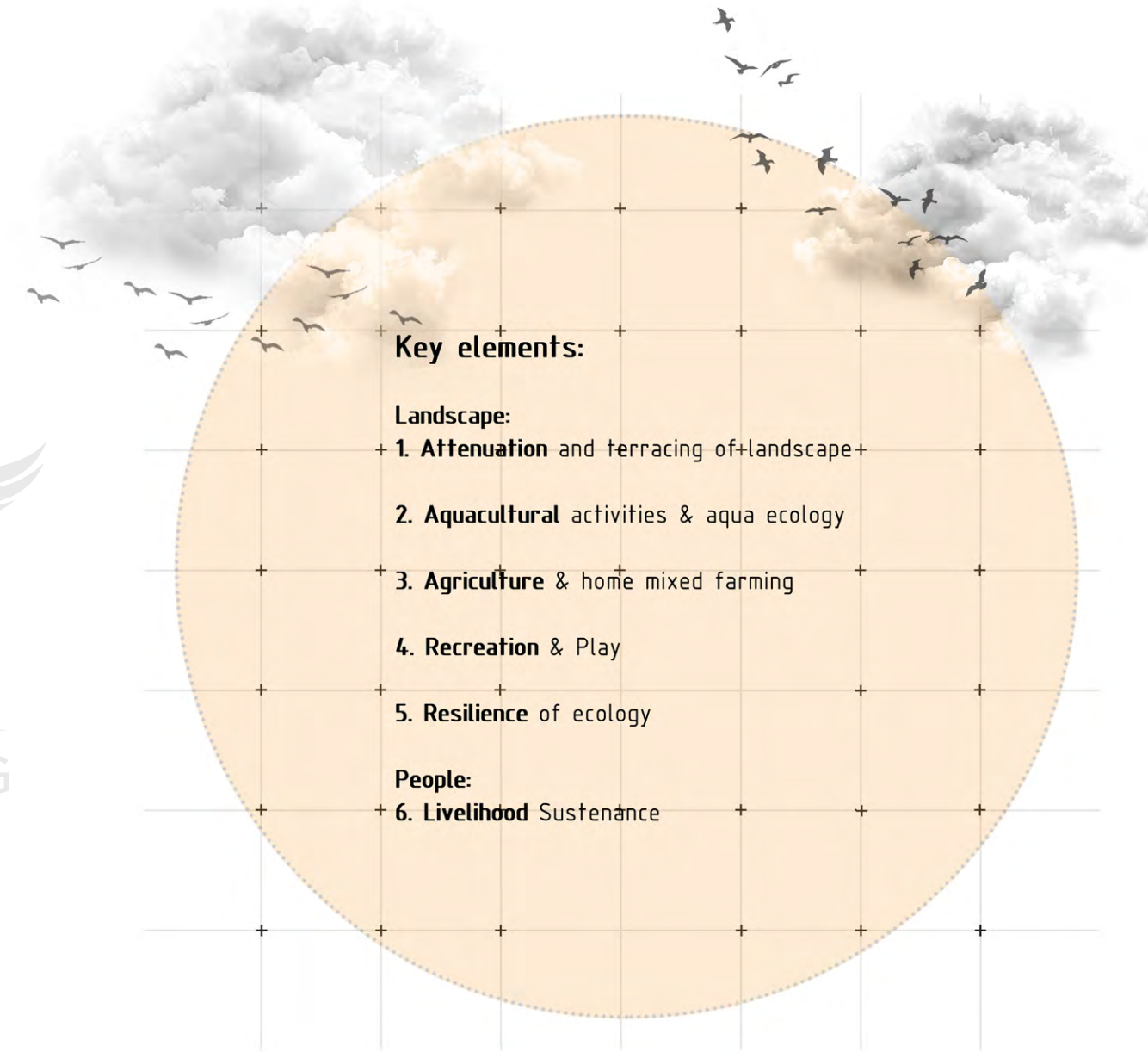
Figure; The agricultural layer uses these pockets for containing the floods as buffers during rainy season.

The culture and tradition of Tanzania must and will be preserved at all cost as a sense of cultural integrity. This project speculates about creating adaptive landscapes on the river basin by creating dynamic pond systems as a horizontal cultural buffer. Natural landscape of the Msimbazi river basin will be manipulated to curve a system of attenuation ponds that become an identity of african resiliency.

This project theoretically applies lessons from nature through the design of controlled flood ponds (bioswales) strategically designed to resist floods through a social facilitation process of cultural integration. This intervention tests the traditional system of farming by community terracing the flood plain to act as horizontally voided buffers for the flood. The intervention aims to preserve the river whilst removing solid waste, debris, and pollutants.

These ponds become attenuation facilities during rainy seasons that regulate the amount of water within a floodplain. This allows ecological livelihoods to continue both in dry and rainy seasons without the natural disturbance and having to rebuild now and again.

These ponds will enhance river livelihoods, encourage agriculture, aquaculture, and recreation. This terrace is envisaged to contain floods of up to 9 meters over a 100 year flood line and will create a system that allows passive early detection of floods. (Hulse and Gregory: 2004).



Spatial Resolution

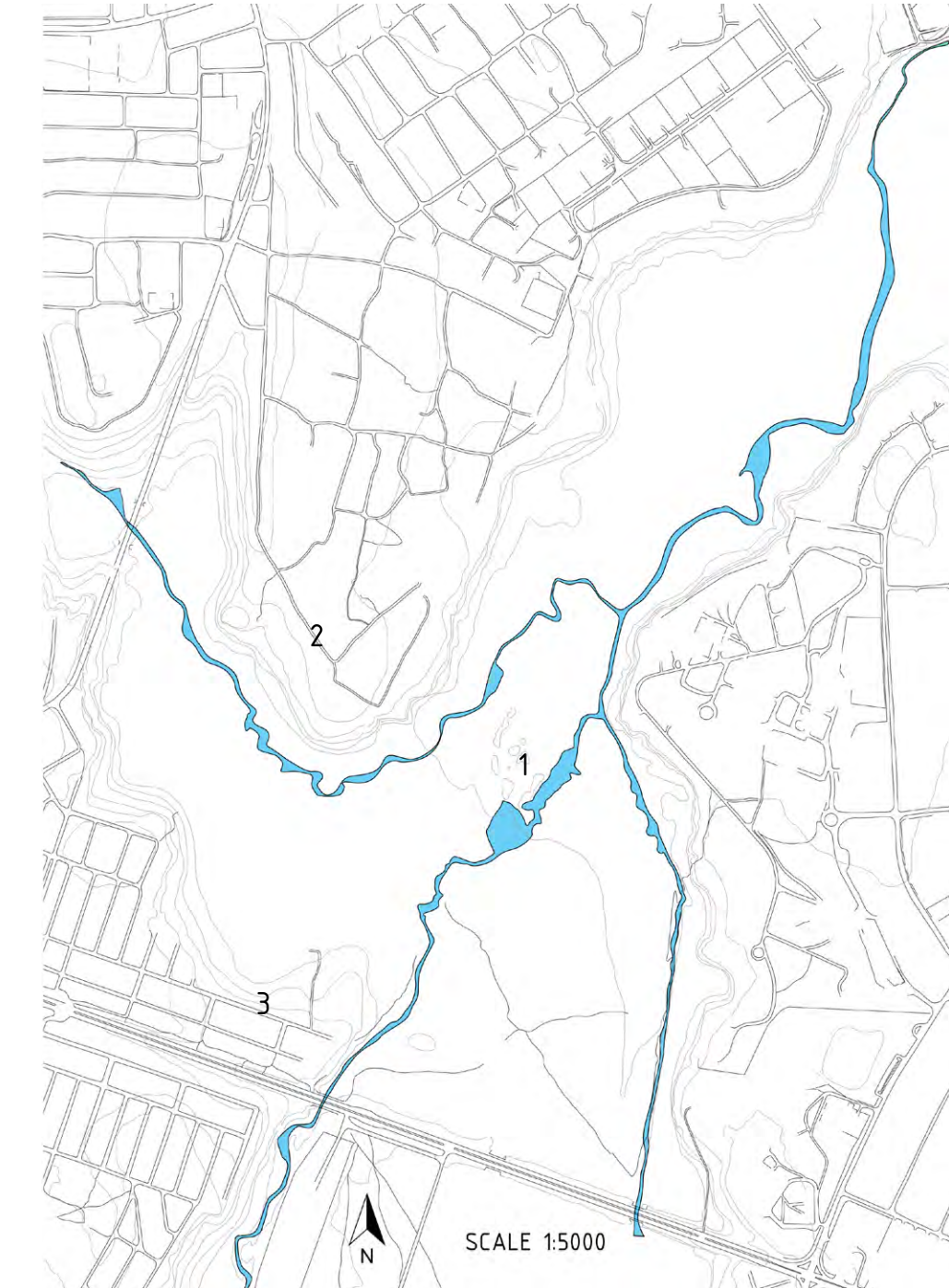
Resolving the 6 elements of a manifesto into a landscape spatial practice (real life project).

<u>Element / Spacial Practice</u>	<u>Purpose</u>	<u>Tectonic Requisition</u>	<u>Materiality</u>	<u>Context</u>
Agriculture	Enhance Mixed Home Farming	Terraces	Topography & Vegetation	Grazing Fields
Aquaculture	Sustain Ecology & Learning	Water & Fish Farming	Aqua Ecology	River / ponds
Recreation & Play	Restrict Informal Settlement Encroachment & Enhance leisure	Terraces	Landscape	Park
Attenuation	Retain Flood / grazing field	Ponds	Soil & Water	Floodplain
Livelihood Sustenance	Sustain Livelihoods	Economic empowerment	Aqua Activities, Mixed Home Farming	Settlement
Resilience	Mitigate floods & Prevent soil erosion	Terraces	Ecology (Mangrove Trees)	Floodplain

Projective Landscape

Goal: Appropriating the 6 elements of a manifesto into a spatial practice (real life project). Contrapuntal layers of Scale, Materiality, Tectonics Requisition, Textures and Contextual Intelligence. Process requires practical application ascending from theories on previous exercises, knowledge and information to real-world situations. This is an external, interactive process that involves both adapting to and modifying an environment to accomplish a desired goal.

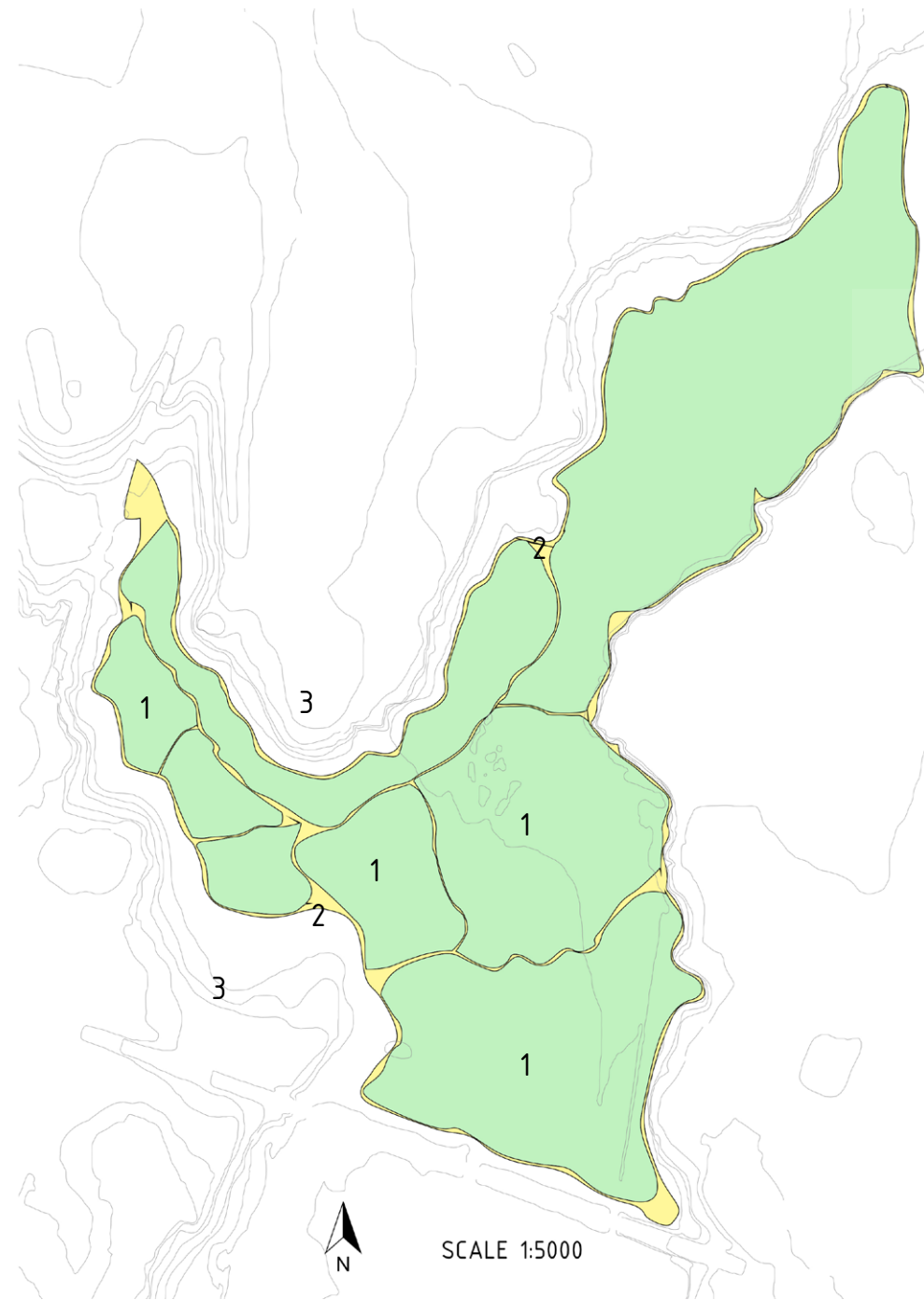
Figure, Infrastructure network and Natural systems that inform Spatial Resolution at 1:5000 mm scale.



- 1 Existing River line
- 2 Landscape / Contours
- 3 Infrastructure Network

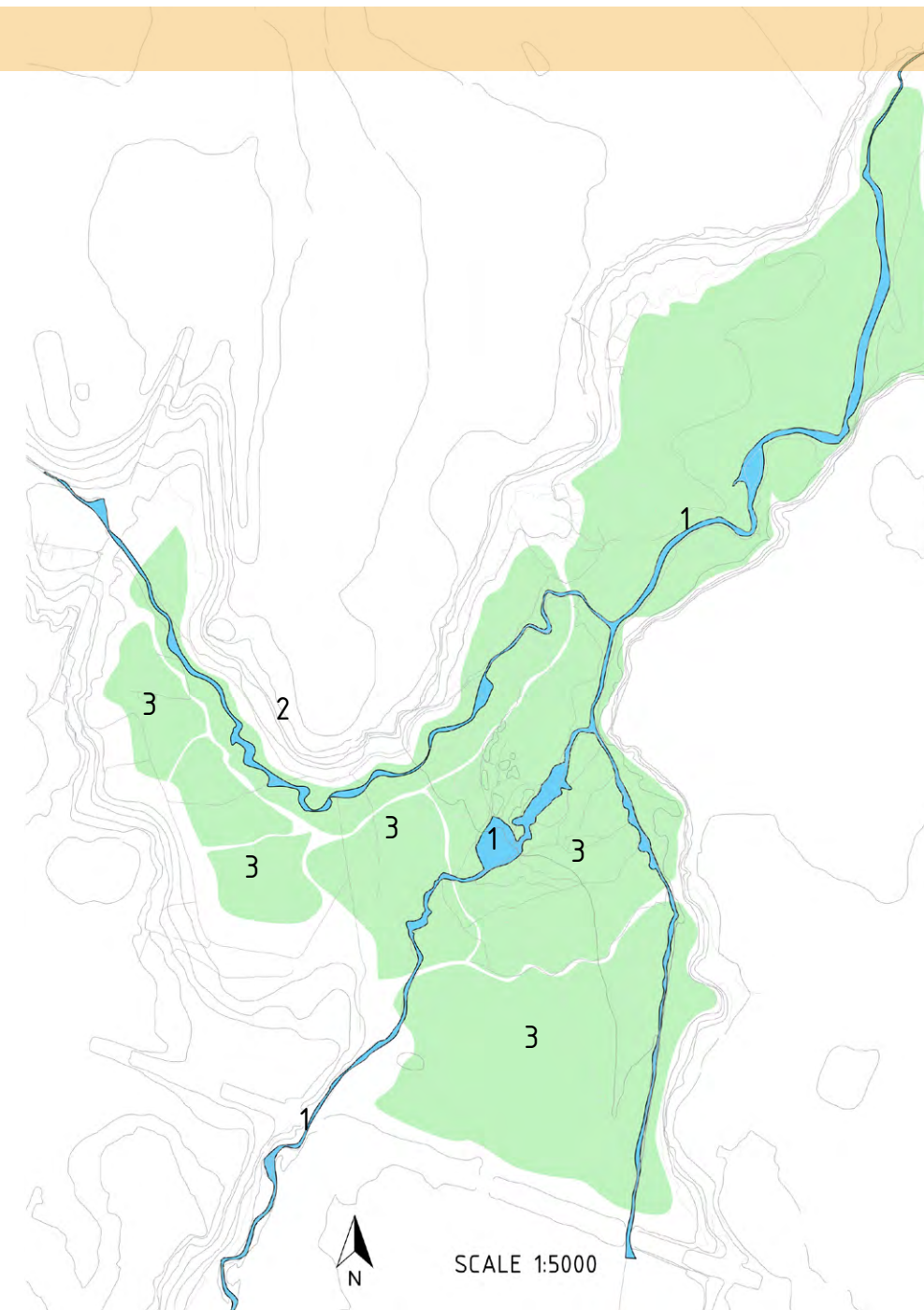
Figure, Community grazing fields for subsistence crops derived from the Basukuma ethnic group. Mainly maize, millet, sugar-cane, cassava, sweet potatoes and vegetables. Dry seasons harvest the reed for roof thatching.

- 1 Agriculture plains
- 2 6km System of dykes
- 3 Landscape / 1m Contours



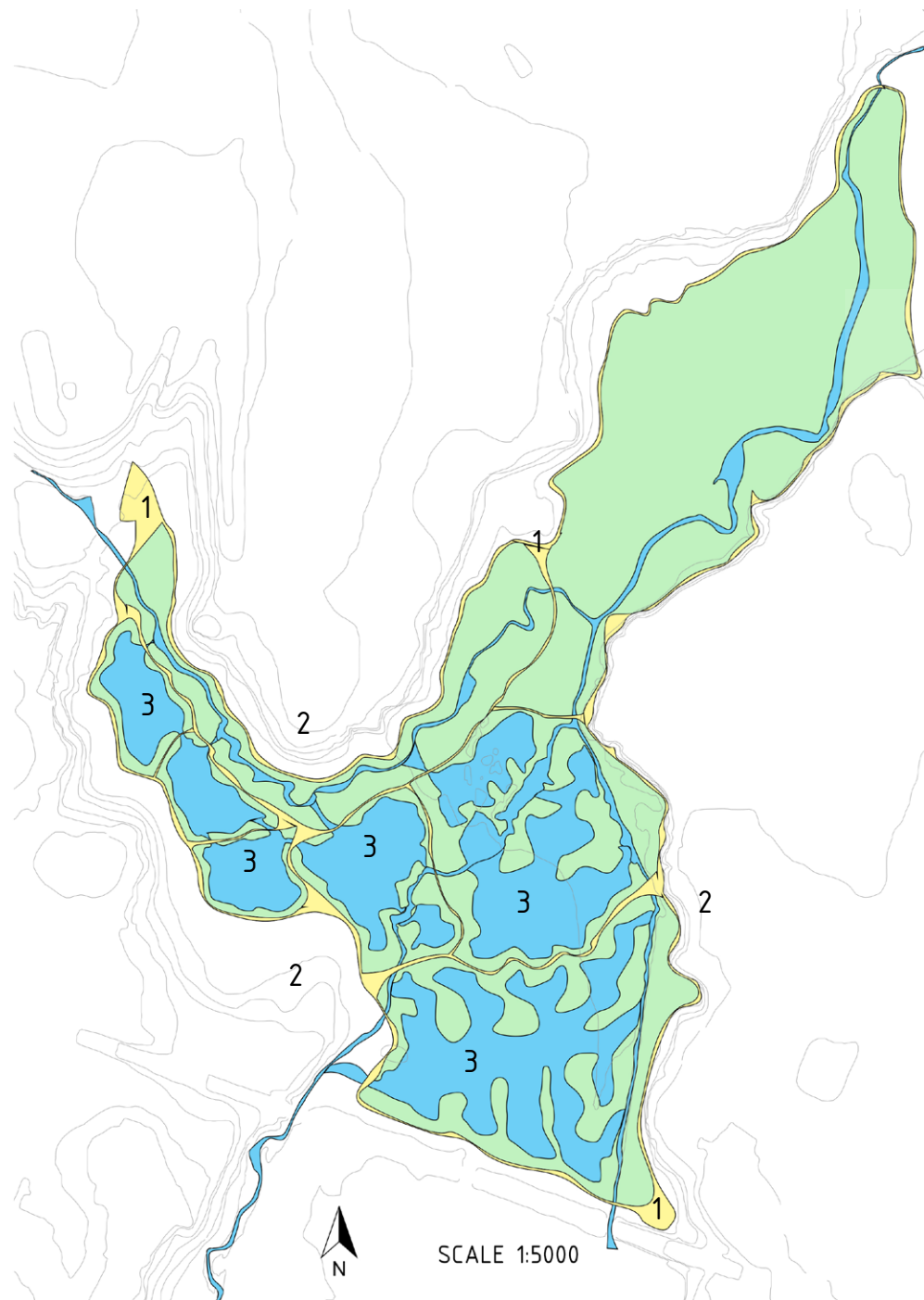
Figure, Existing river line natural systems that inform the grazing fields.

- 1 Existing River line
- 2 Landscape / Contours
- 3 Agriculture and grazing fields.



Figure; Mapping of a plausible scenario generation of a pond system to retain floods.

- 1 6km System of dykes
- 2 Landscape / Contours
- 3 Ponds



zzz



Figure, Infrastructure network and Natural systems that inform Spatial Resolution at 1:5000 mm scale.



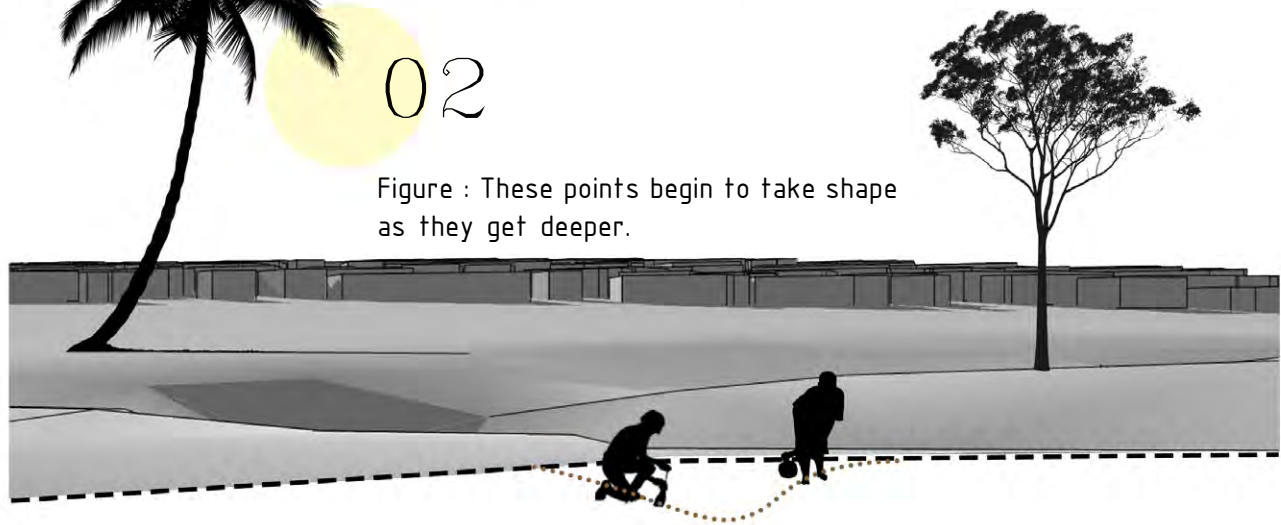
01

Figure : Community dredging the floodplain at specific points.



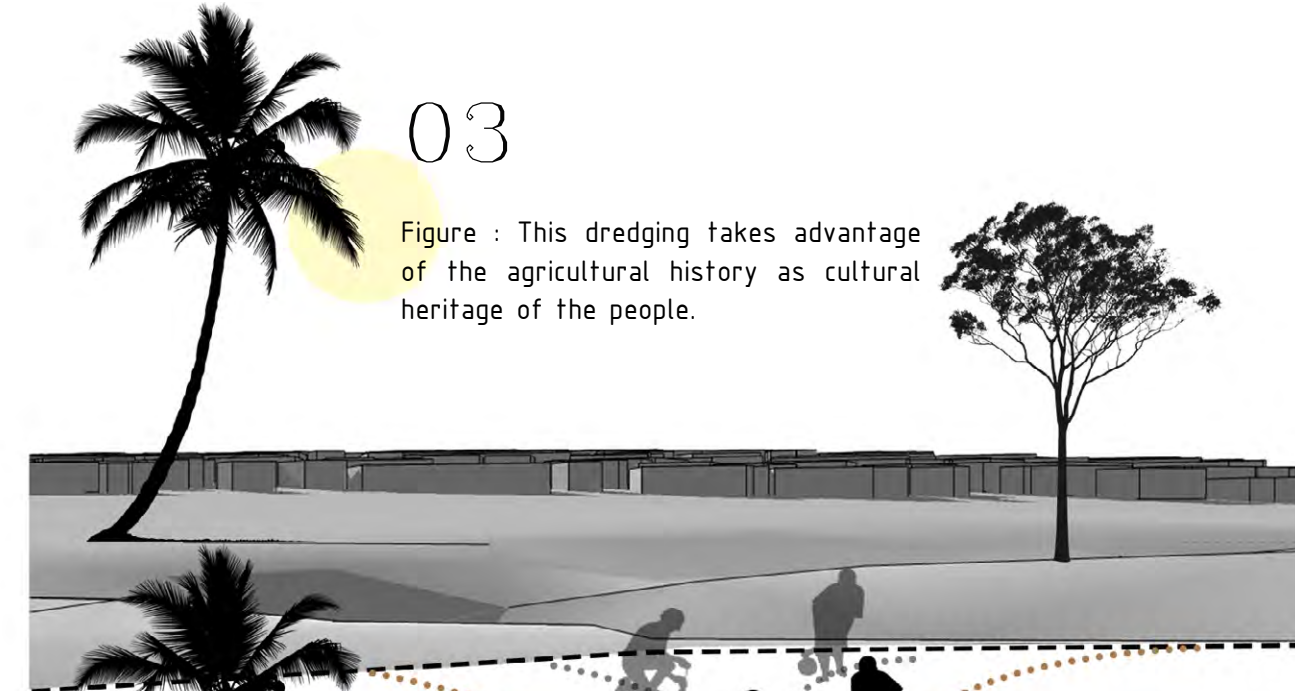
02

Figure : These points begin to take shape as they get deeper.



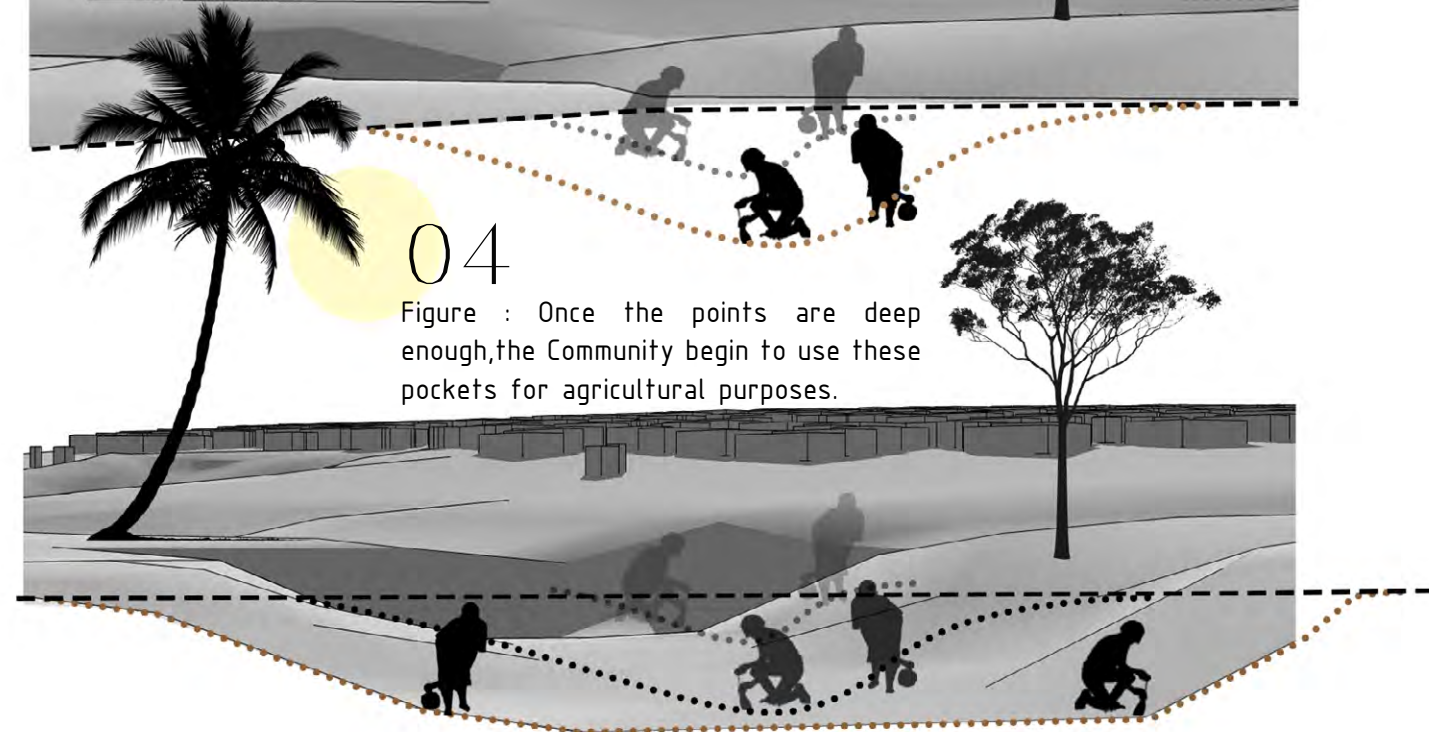
03

Figure : This dredging takes advantage of the agricultural history as cultural heritage of the people.



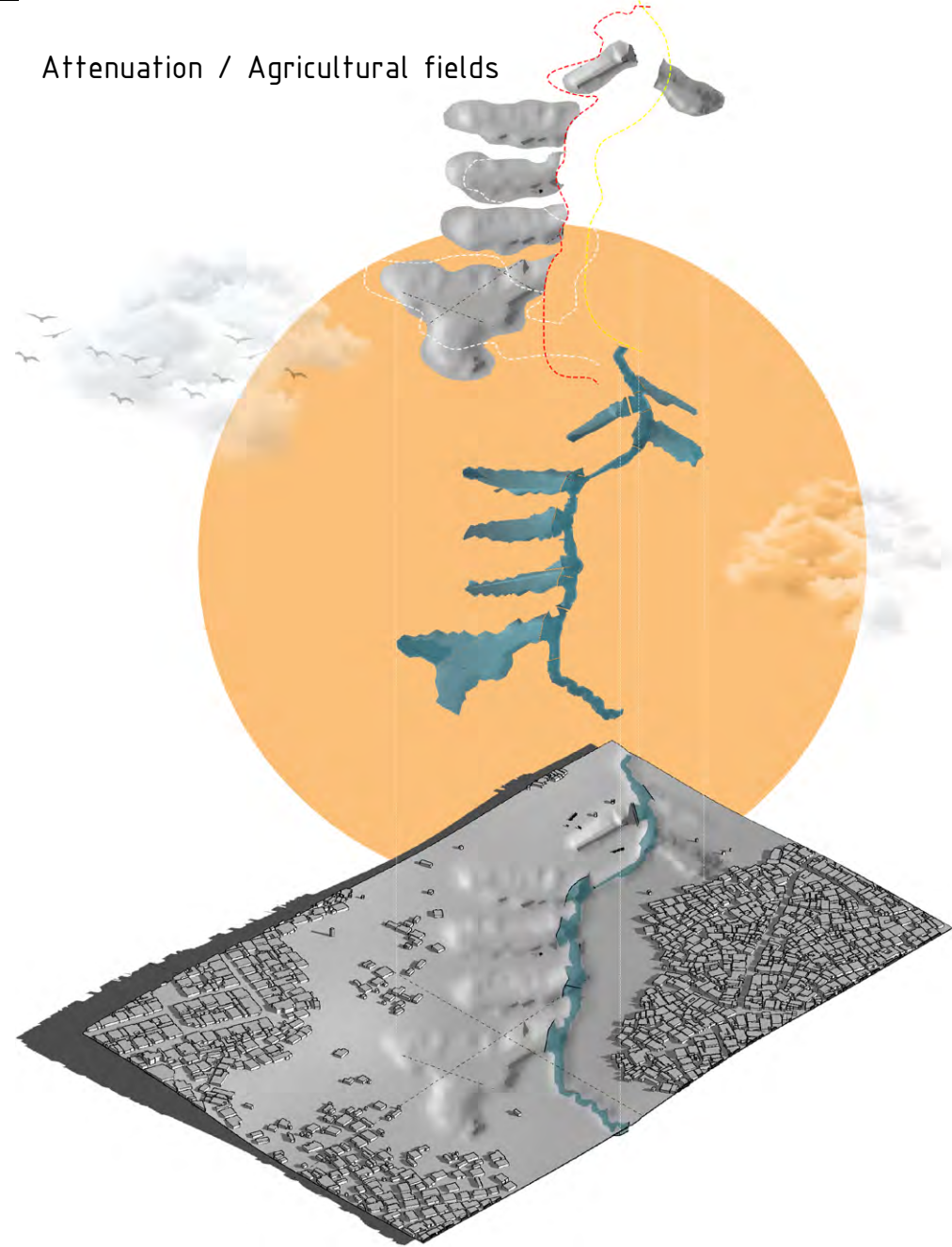
04

Figure : Once the points are deep enough, the Community begin to use these pockets for agricultural purposes.



Multiple Systems

Attenuation / Agricultural fields

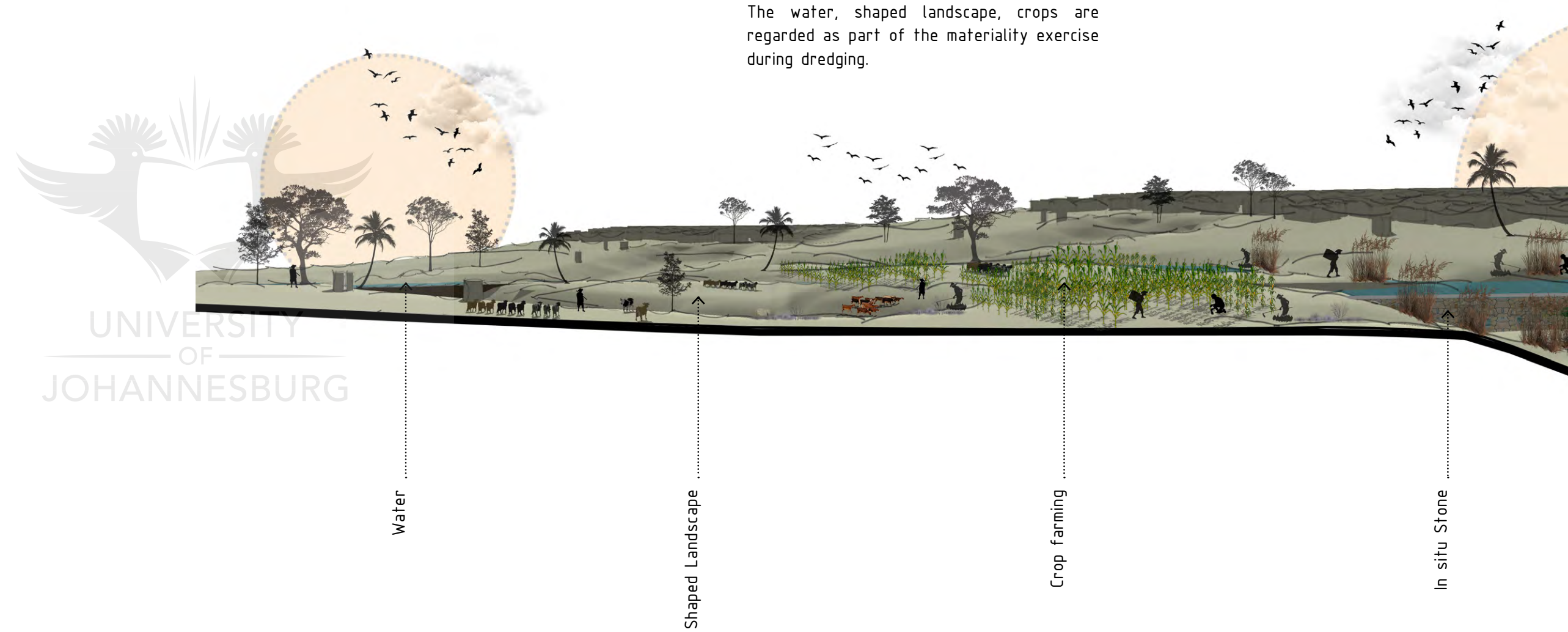


These are strategic water ponds that are created through a community empowerment programme. During dry season, these pockets are used to sustain agricultural livelihoods.

Figure; Mapping of a plausible scenario of a pond system to retain floods. This was an initial attempt and once the ponds are full the catastrophic flood is not avoided.

Materiality

Attenuation / Agricultural fields



The water, shaped landscape, crops are regarded as part of the materiality exercise during dredging.

In this section we will use Jonas (2001) ideas to building scenarios of the future. Scenario-building is the process of reflected involvement. It invites open communication and participation in creating new information and knowledge. It can be performed only by participating persons/stakeholders/authors that influence and themselves are influenced in the process.

Possible future scenario.

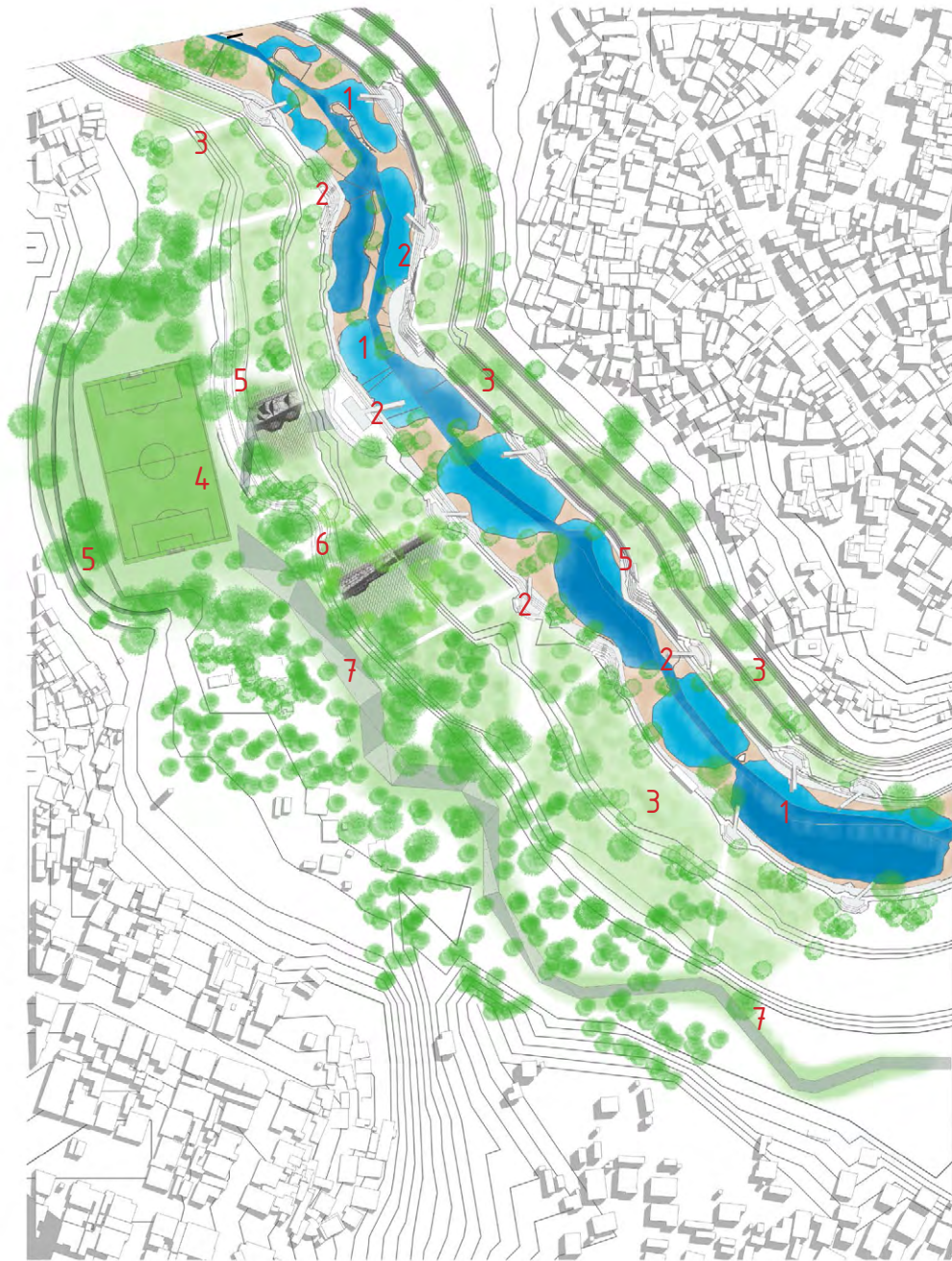


Figure; A speculative invitation to an event based on Massey's framing of 'landscape as an event' (2005),



Major Design Project

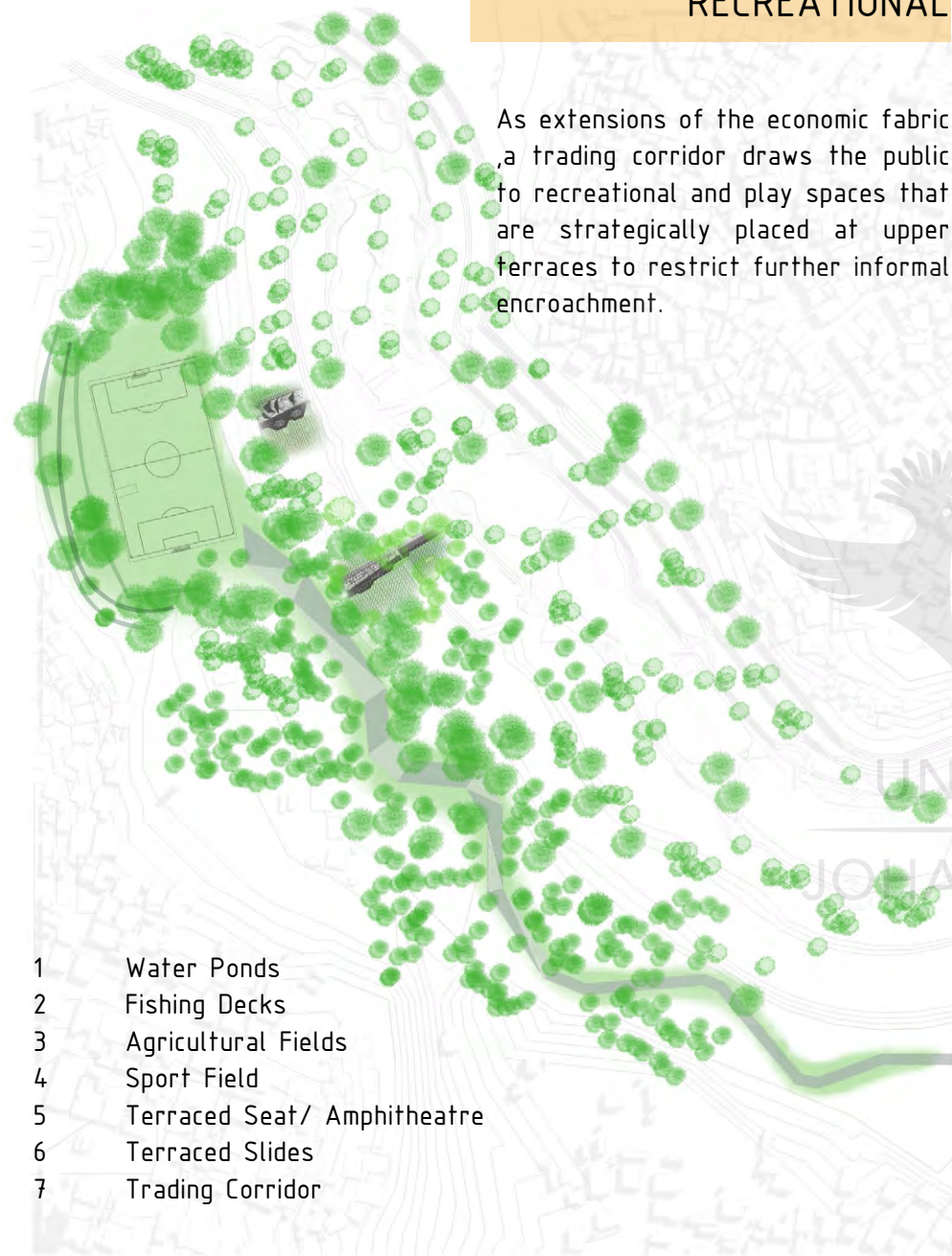




- 1 Water Ponds
- 2 Fishing Decks
- 3 Agricultural Fields
- 4 Sport Field
- 5 Terraced Seat/ Amphitheatre
- 6 Terraced Slides
- 7 Trading Corridor

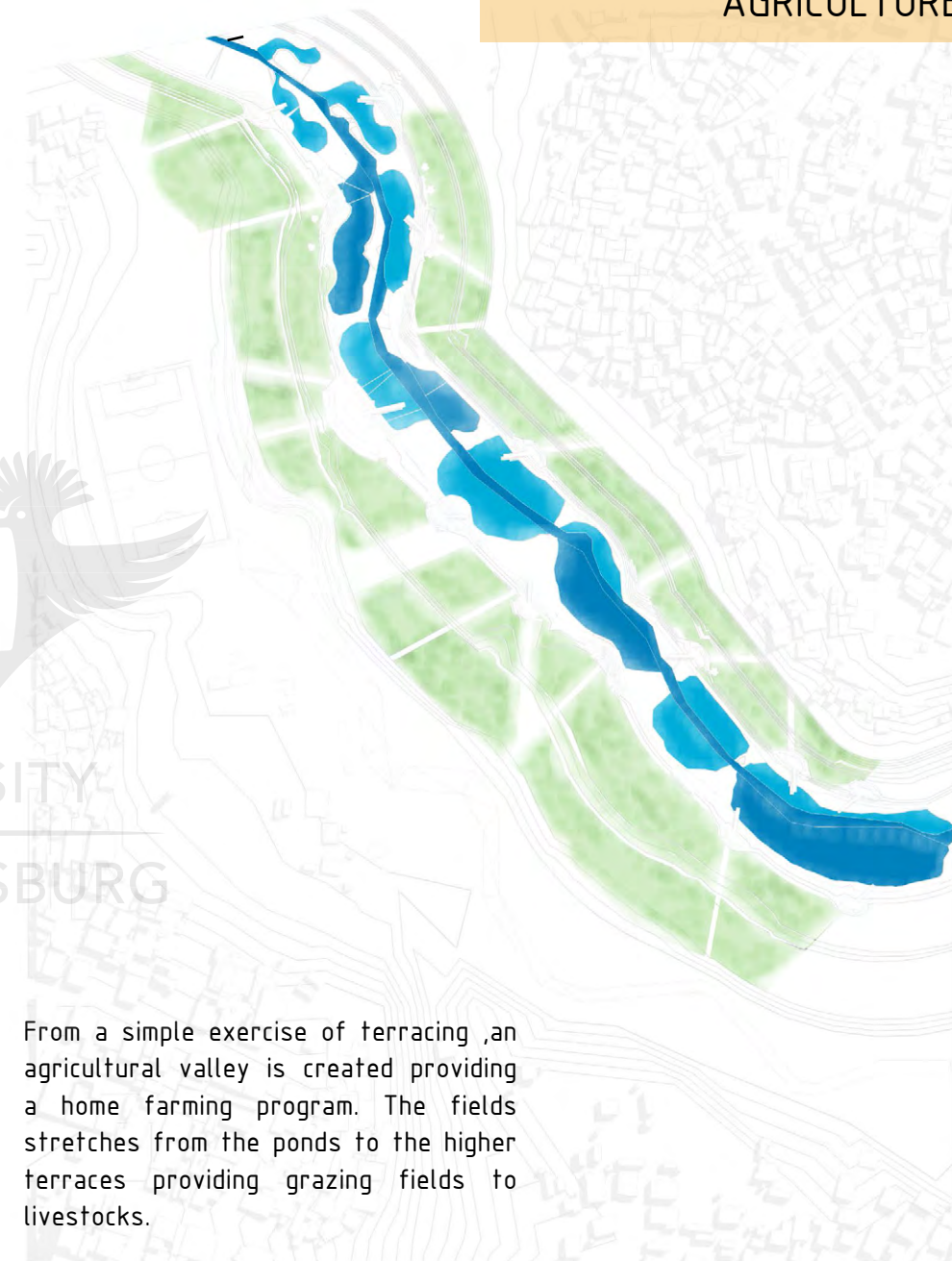
RECREATIONAL

As extensions of the economic fabric ,a trading corridor draws the public to recreational and play spaces that are strategically placed at upper terraces to restrict further informal encroachment.



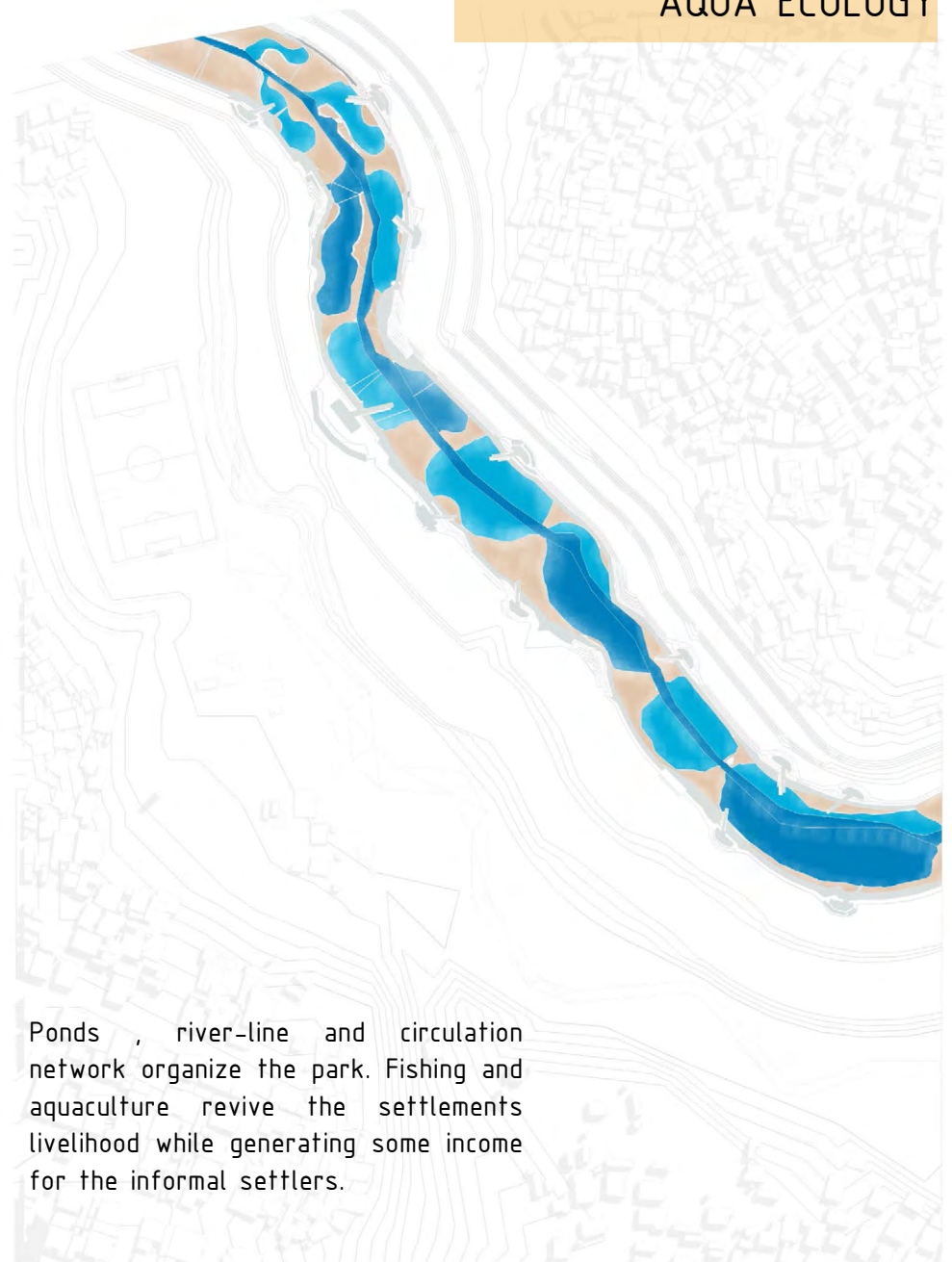
AGRICULTURE

From a simple exercise of terracing ,an agricultural valley is created providing a home farming program. The fields stretches from the ponds to the higher terraces providing grazing fields to livestock.



AQUA ECOLOGY

Ponds , river-line and circulation network organize the park. Fishing and aquaculture revive the settlements livelihood while generating some income for the informal settlers.



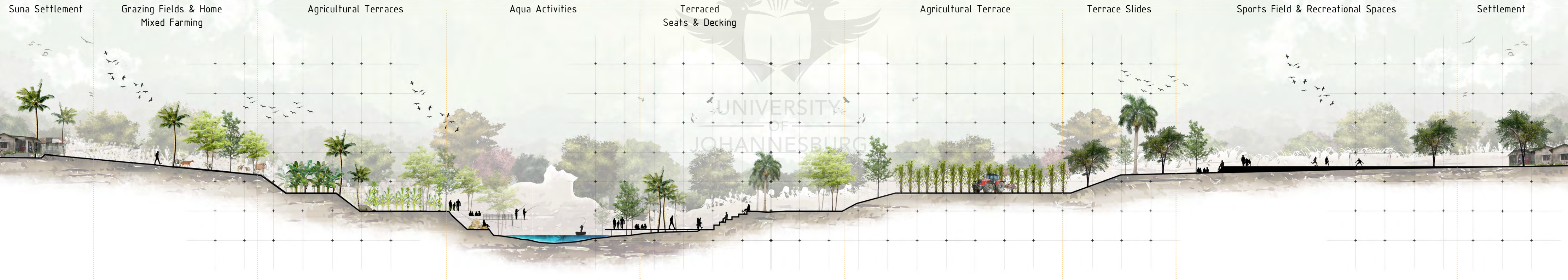
Scenario Generation

Section of the terracing intervention on Msimbazi river basin.

Fishing and aquaculture revive the settlements aquatic activities livelihood while fishing decks and edge platforms enhance the leisure and recreational functionality.

From a simple exercise of terracing ,an agricultural valley is created providing a mixed home farming program. The fields stretches from the ponds to the higher terraces providing seasonal grazing fields to livestock.

As extensions of the economic fabric ,a trading corridor draws the public to recreational and play spaces that are strategically placed at upper terraces to restrict further informal encroachment.



Figure; A 3 meter section along the terraced river basin.



Figure; Vegetables are planted at the top terrace next to the residents to further encourage home farming.



Figure; Banana requires ever moist loamy soil and therefore planted on lower terrace.



Figure; Cattle are herbivores that graze on the terraces seasonally. They will feed on reed plants for their digestive system.



Figure; Both Sugar cane and maize requires least water and is planted on the middle terrace.



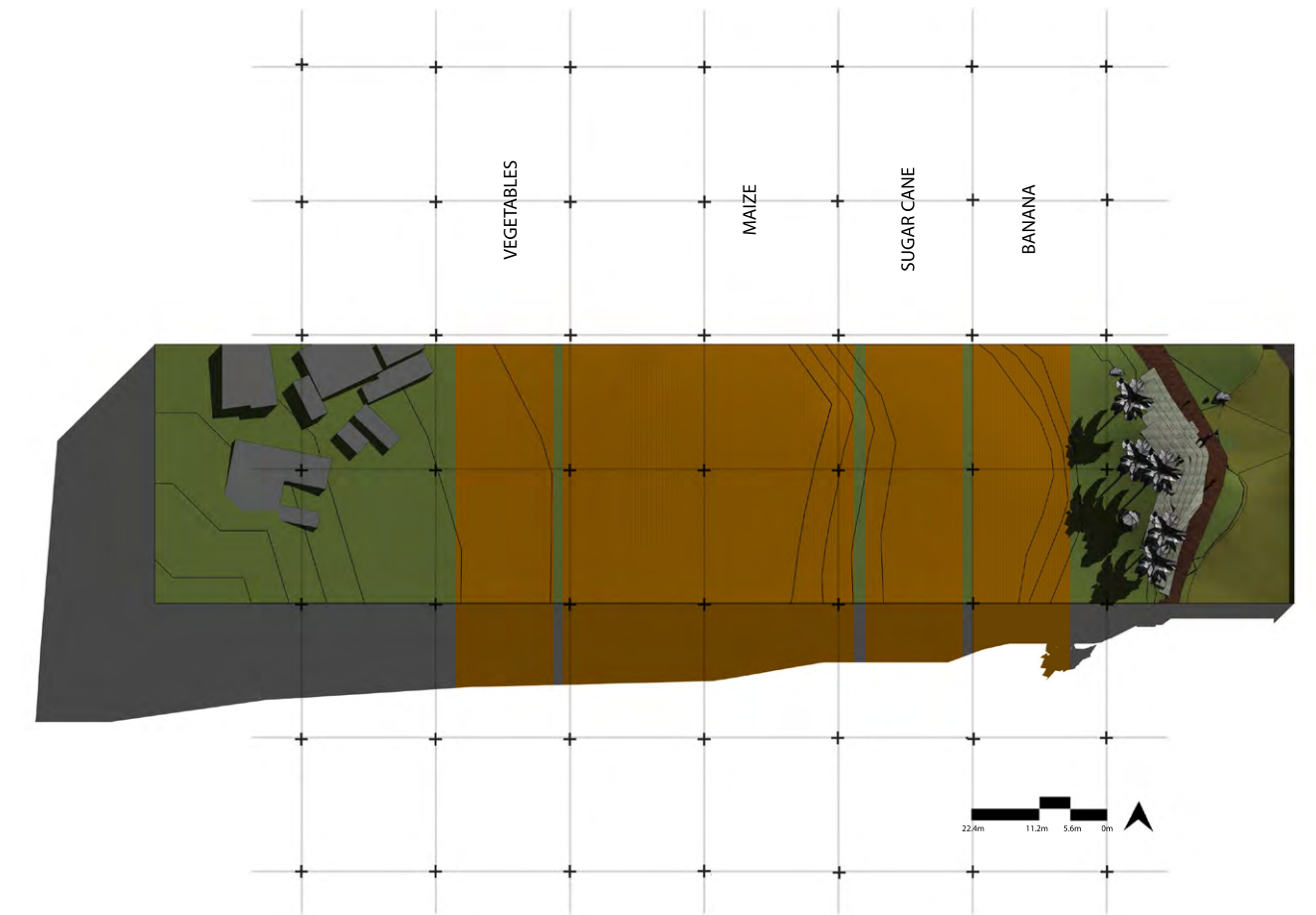
Figure; Maize requires least water and is either planted on the middle terraces.



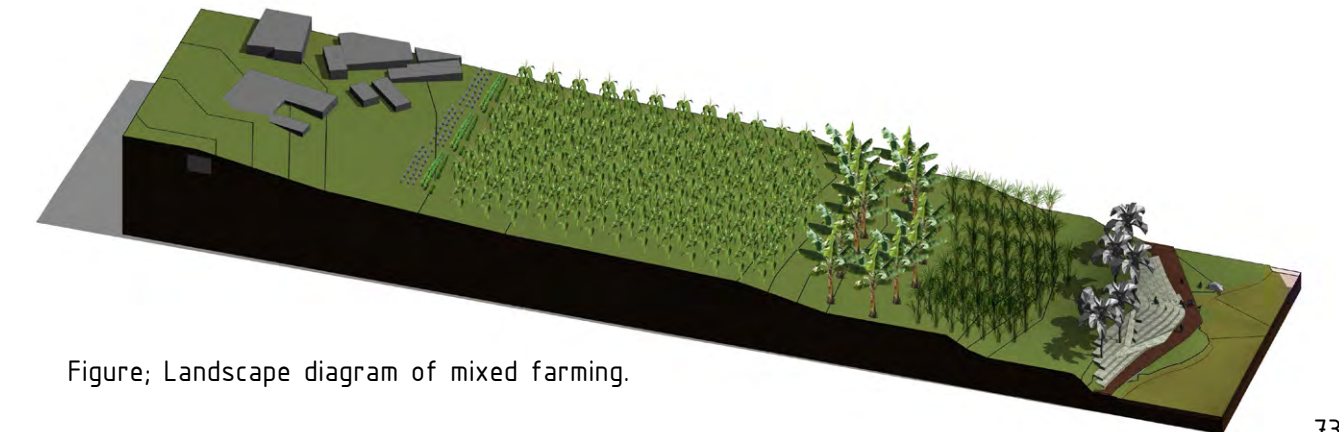
Figure; Goats are also herbivores that are home farmed on the settlement.



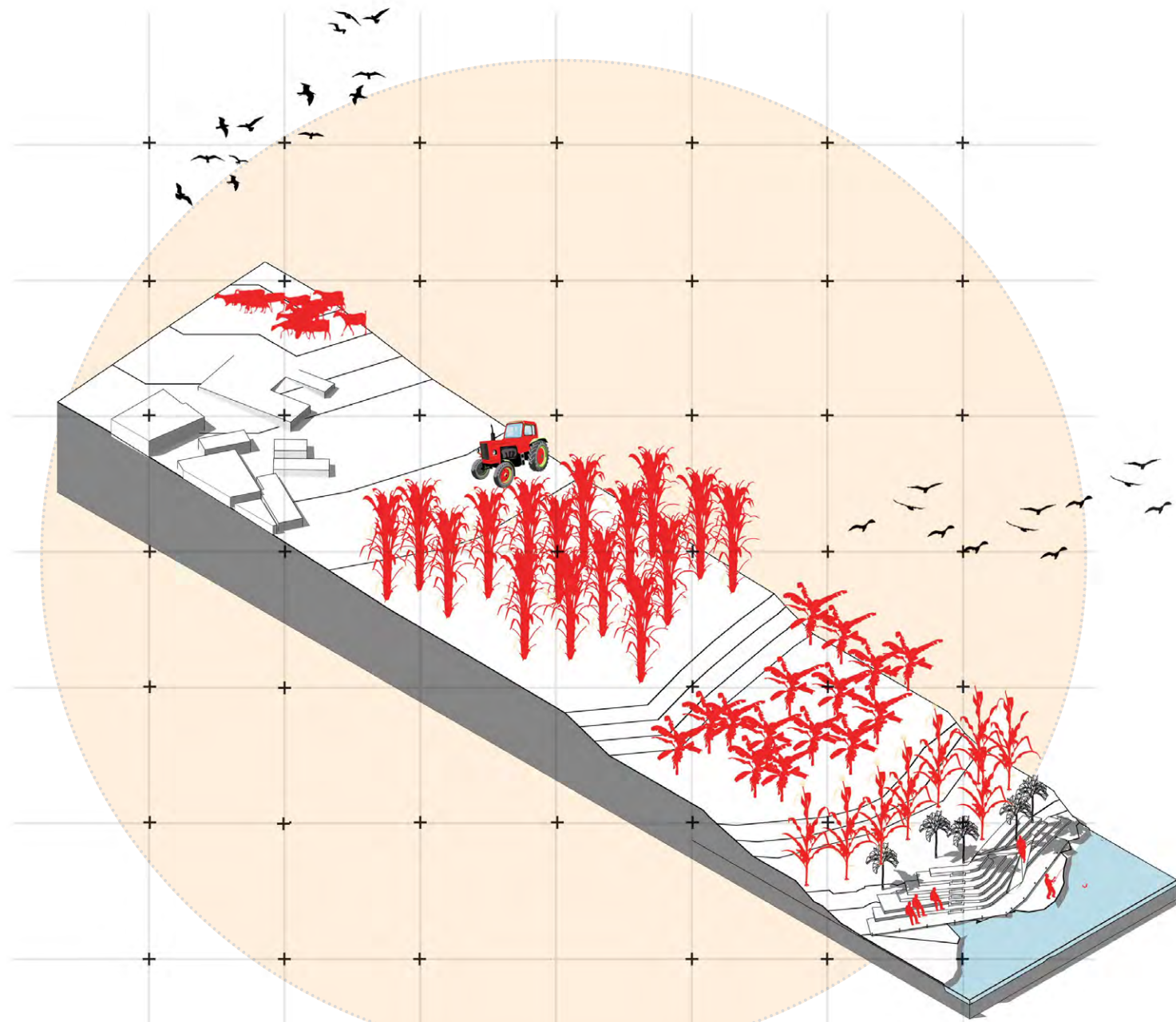
Figure; Key plan of the location on the terraces where crops are best planted.



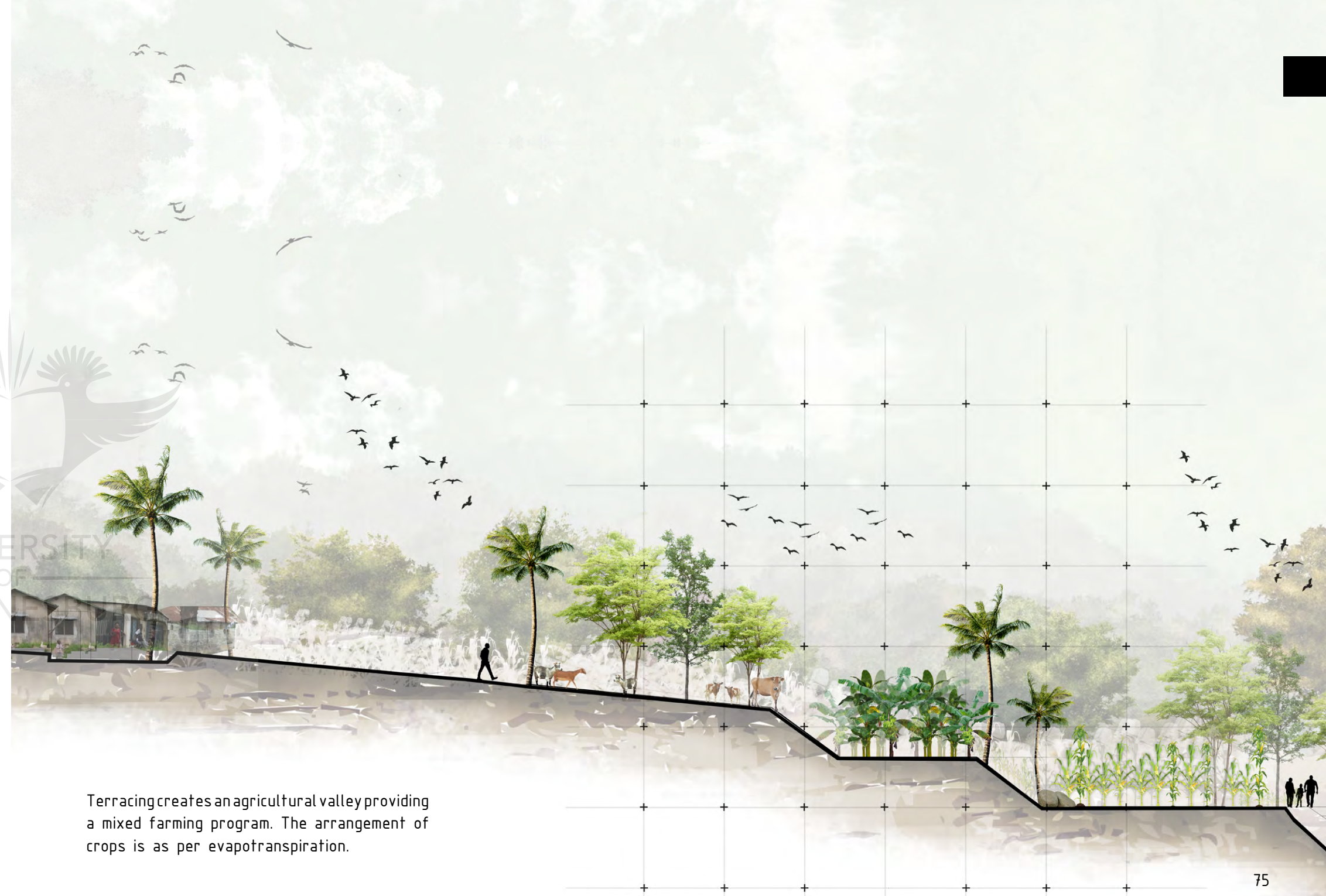
Figure; Landscape plan of the arrangement of crops according to their water consumption.



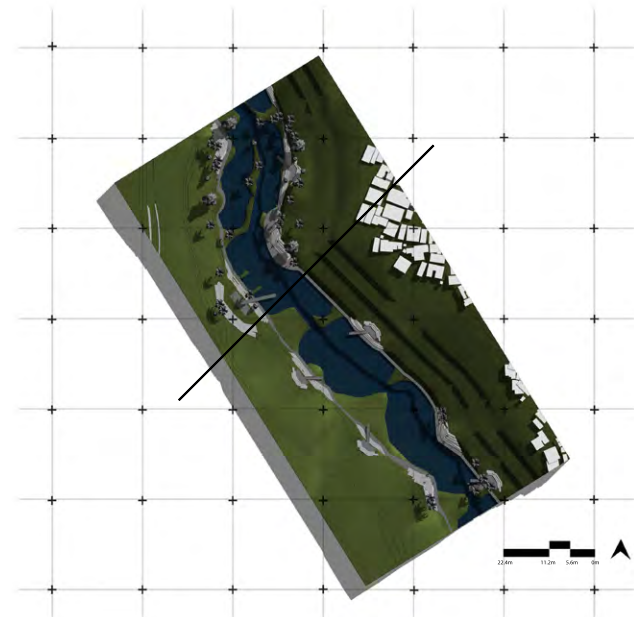
Figure; Landscape diagram of mixed farming.



Figure; Axonometric montage of the agricultural terraces as home mixed farming.



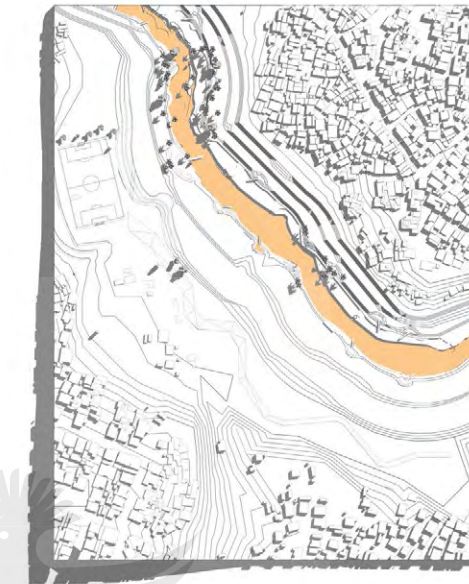
Terracing creates an agricultural valley providing a mixed farming program. The arrangement of crops is as per evapotranspiration.



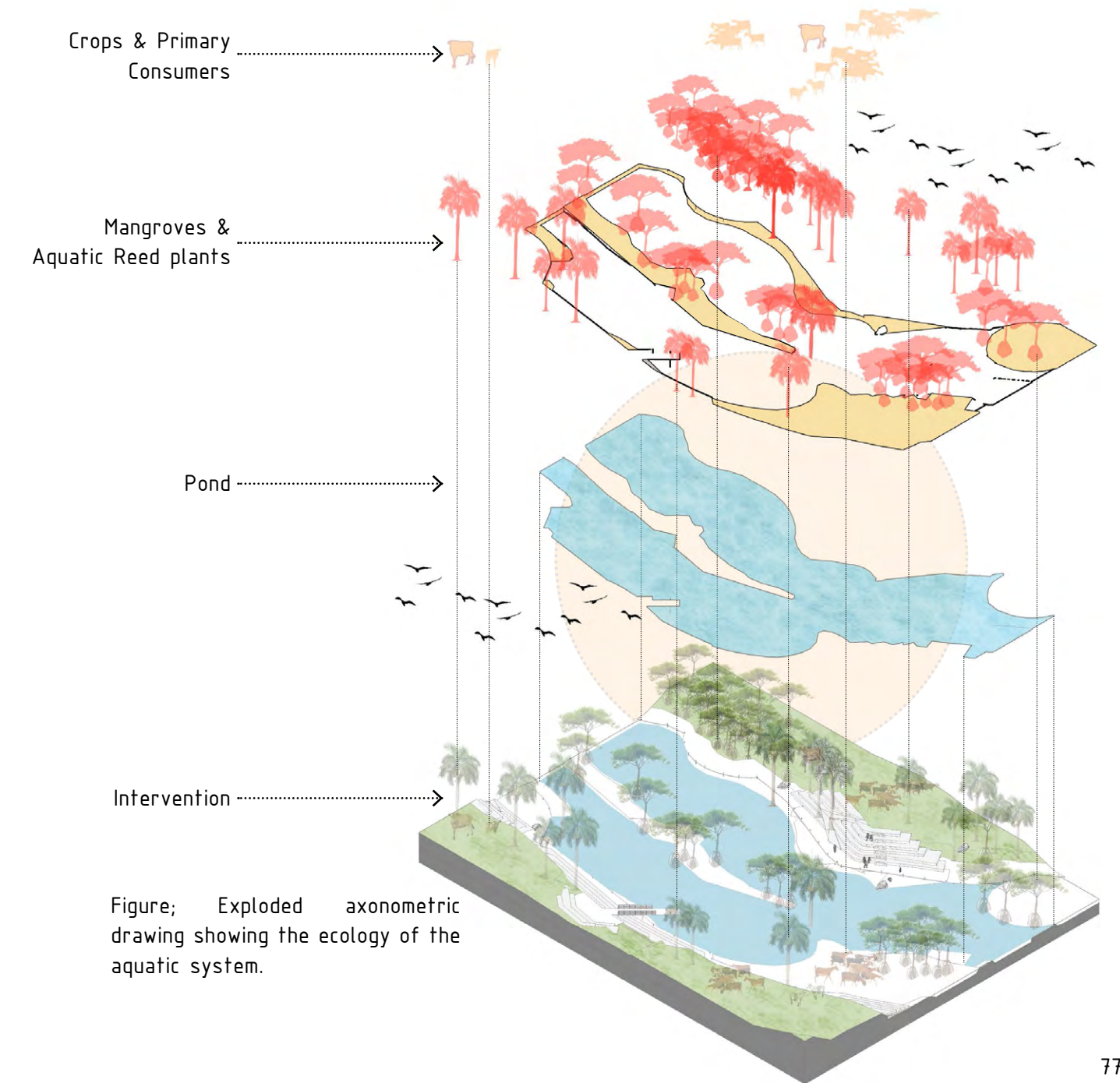
Figure; Contextual plan of the location on the terraces where ponds are located.



Figure; Landscape diagram of pond systems.



Figure; Key plan of the ponds location relative to context.



Figure; Exploded axonometric drawing showing the ecology of the aquatic system.



Figure; Mangrove trees play an important role in prevention of soil erosion and applying resiliency on river edges.



Figure; Reed plants on shoreline ponds are immune to dry and rainy seasons. In Tanzania this plant is used for roof thatching.



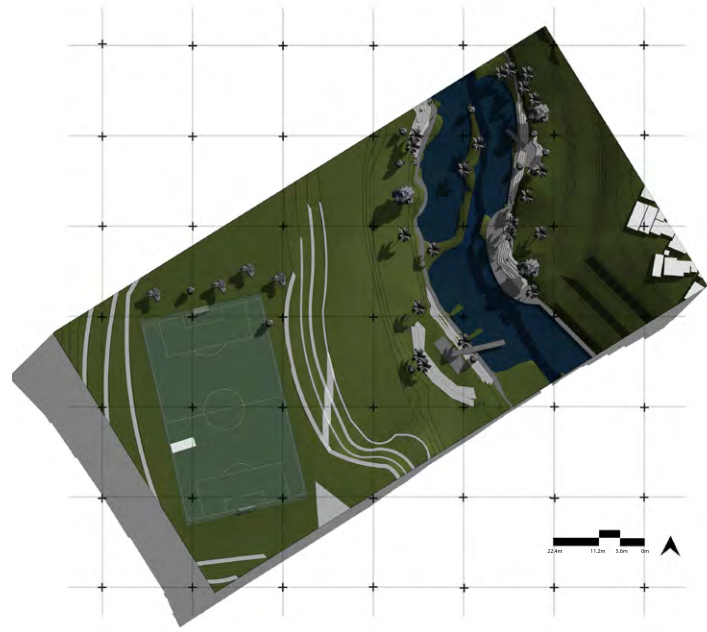
Figure; The Tanganyika lake sardine is one of east Africa's endemic fish. This fish prefers lakes as it builds its' habitat around the mangrove roots.



Figure; Starling killdeer wader or commonly known as shorebird.



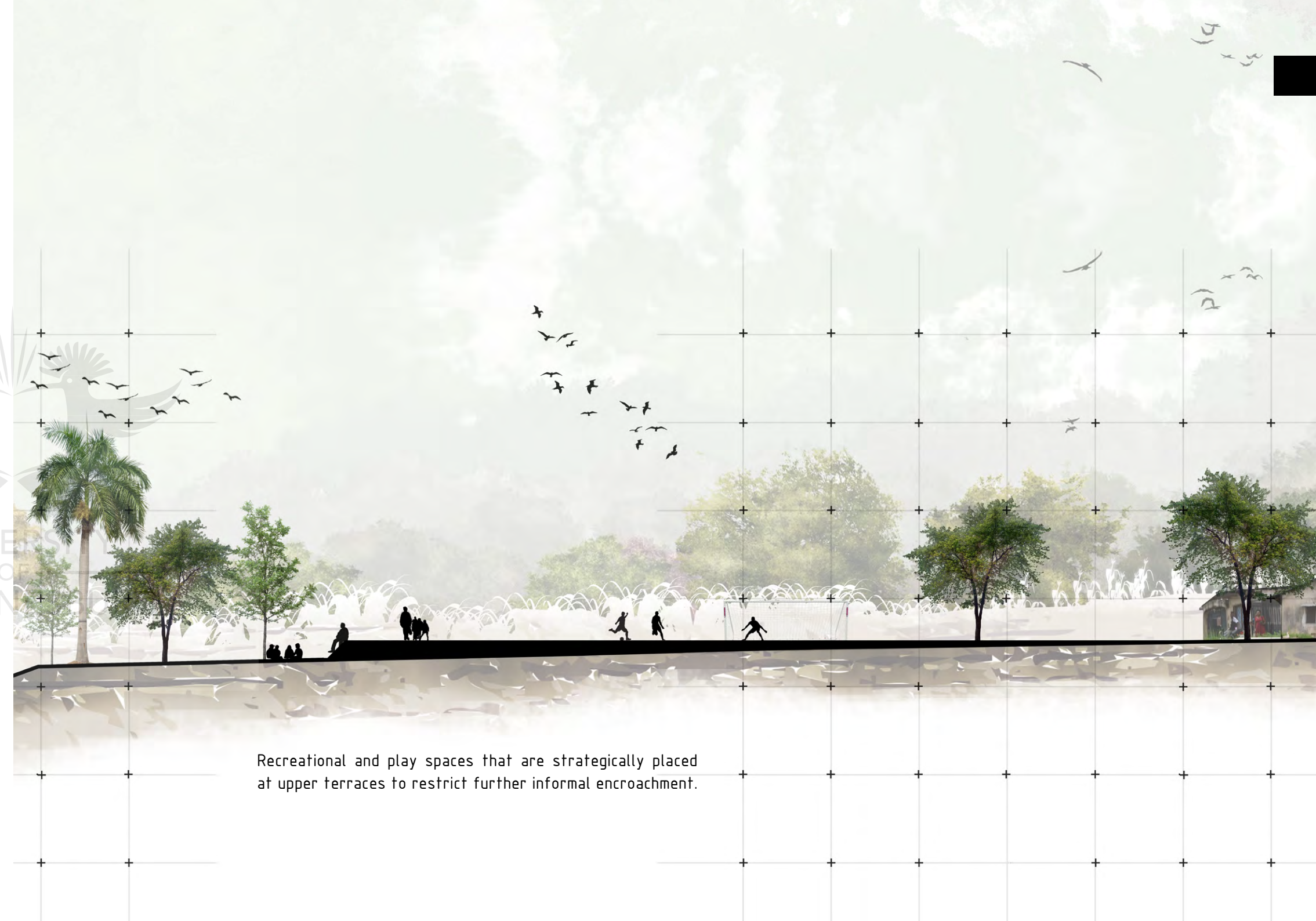
Fish farming and aqua activities revive the settlements livelihood while generating some income for the informal settlers.



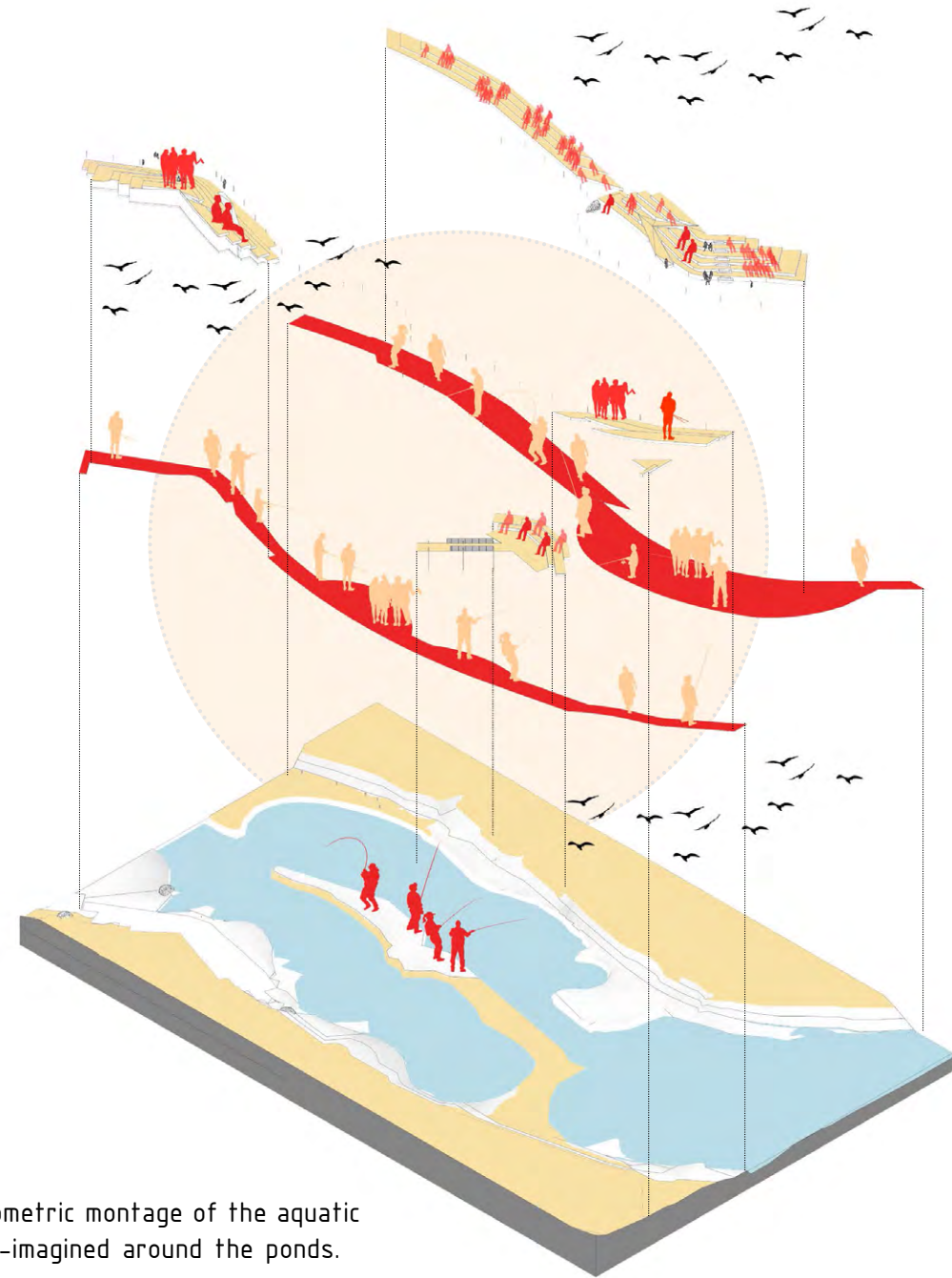
Figure; Contextual plan of the location on the terraces where sports & recreation is located.



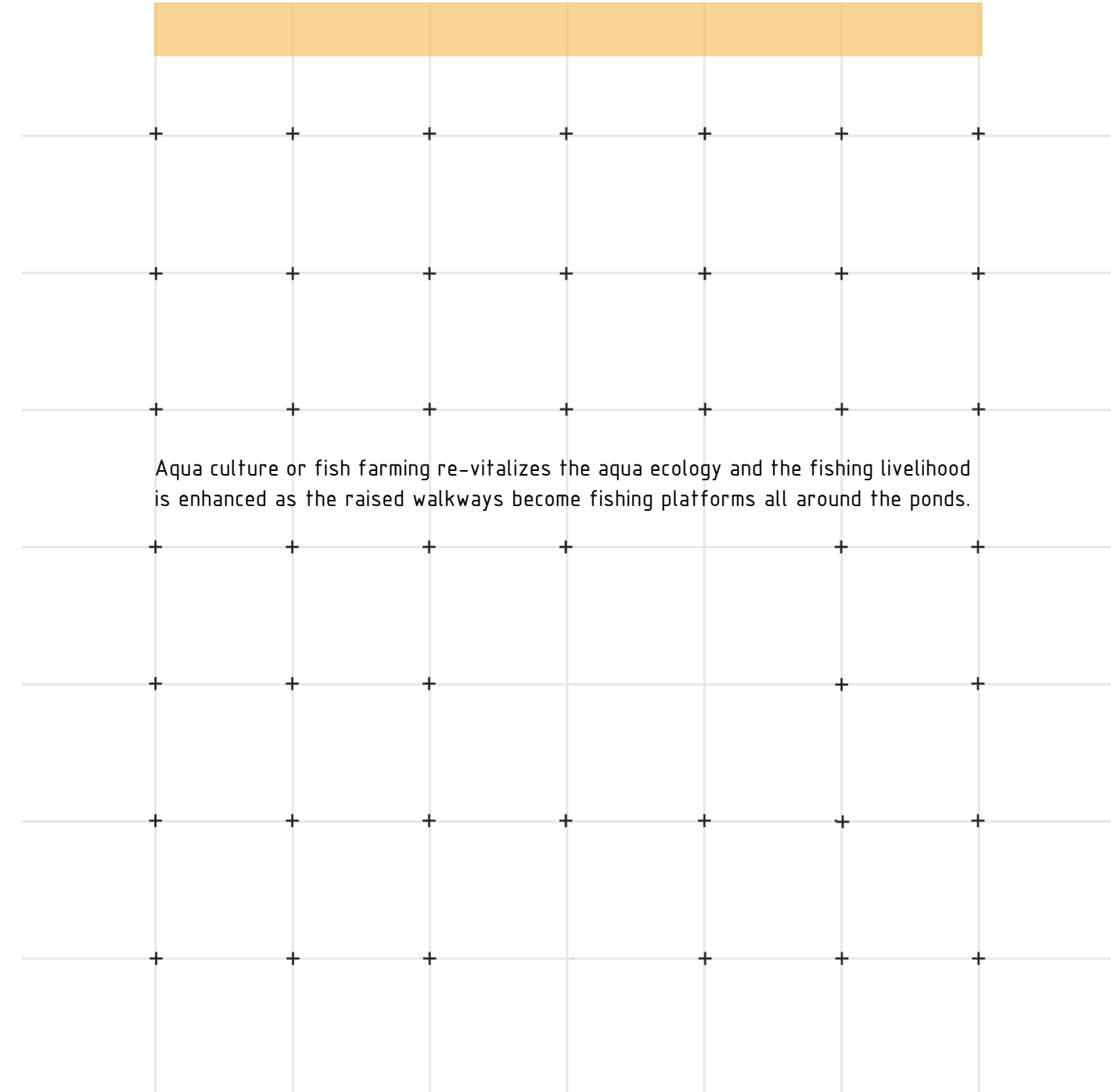
Figure; Landscape axonometric diagram of sports and recreation.



Recreational and play spaces that are strategically placed at upper terraces to restrict further informal encroachment.

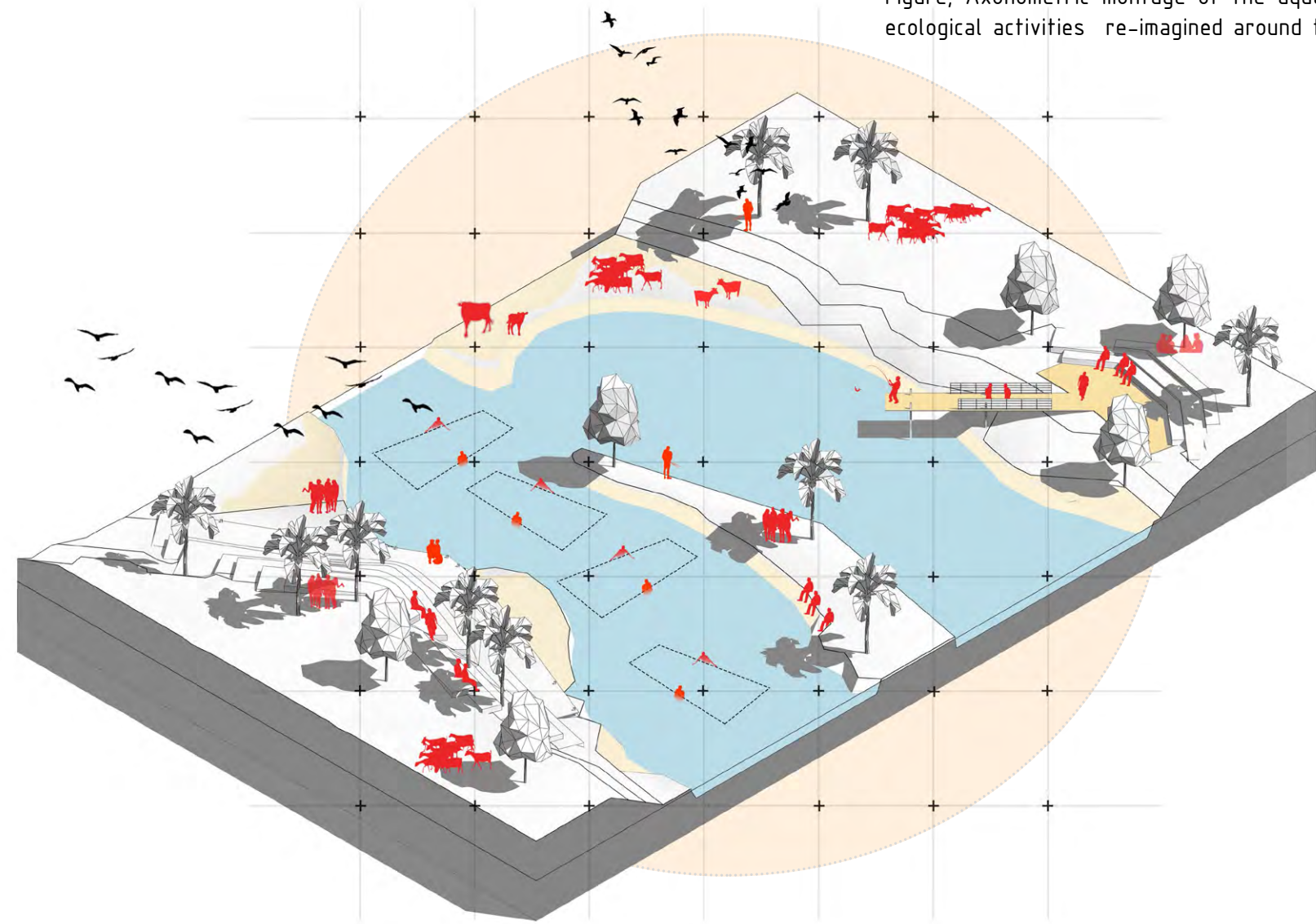


Figure; Axonometric montage of the aquatic activities re-imagined around the ponds.

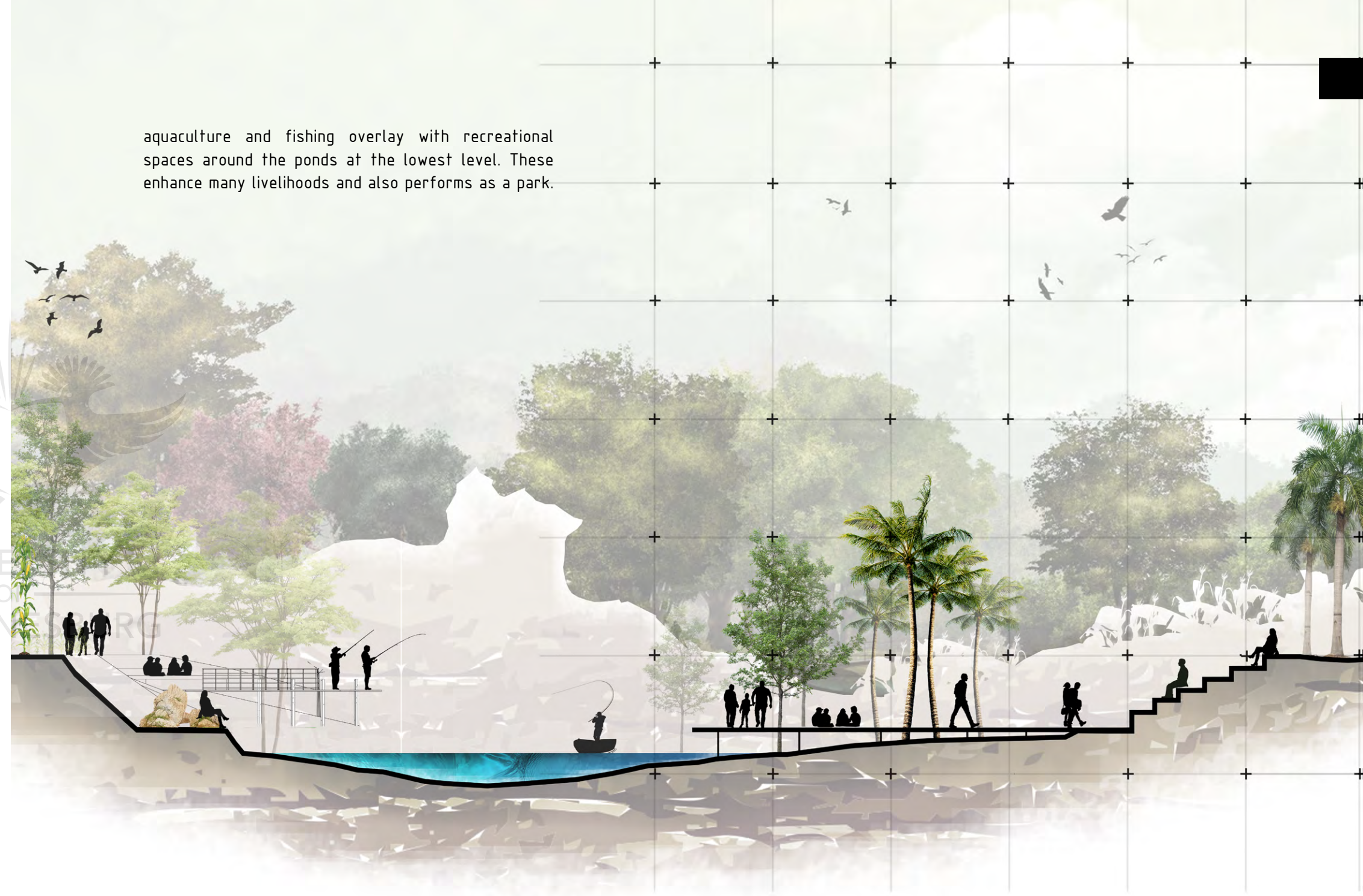


AQUA ACTIVITIES

Figure; Axonometric montage of the aquatic and other ecological activities re-imagined around the ponds.



aquaculture and fishing overlay with recreational spaces around the ponds at the lowest level. These enhance many livelihoods and also performs as a park.





Figure; Modelling the site. 1



Figure; Modelling the site. 2

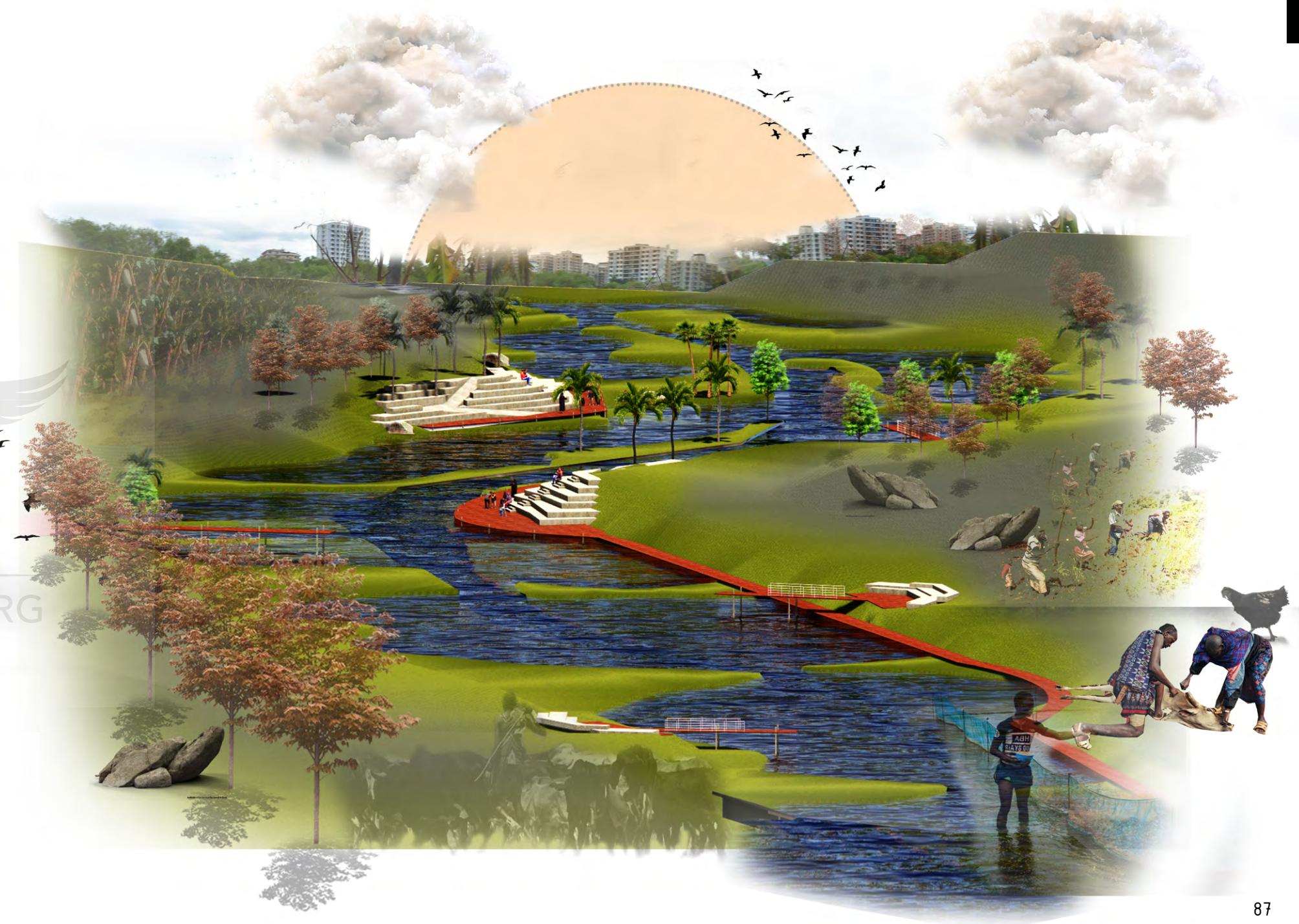


Figure; Modelling the site. 3



Figure; Re-imagining spaces in-between by using play dough & miniature.

Aqua Activities
Recreational Park
Agricultural Terraces

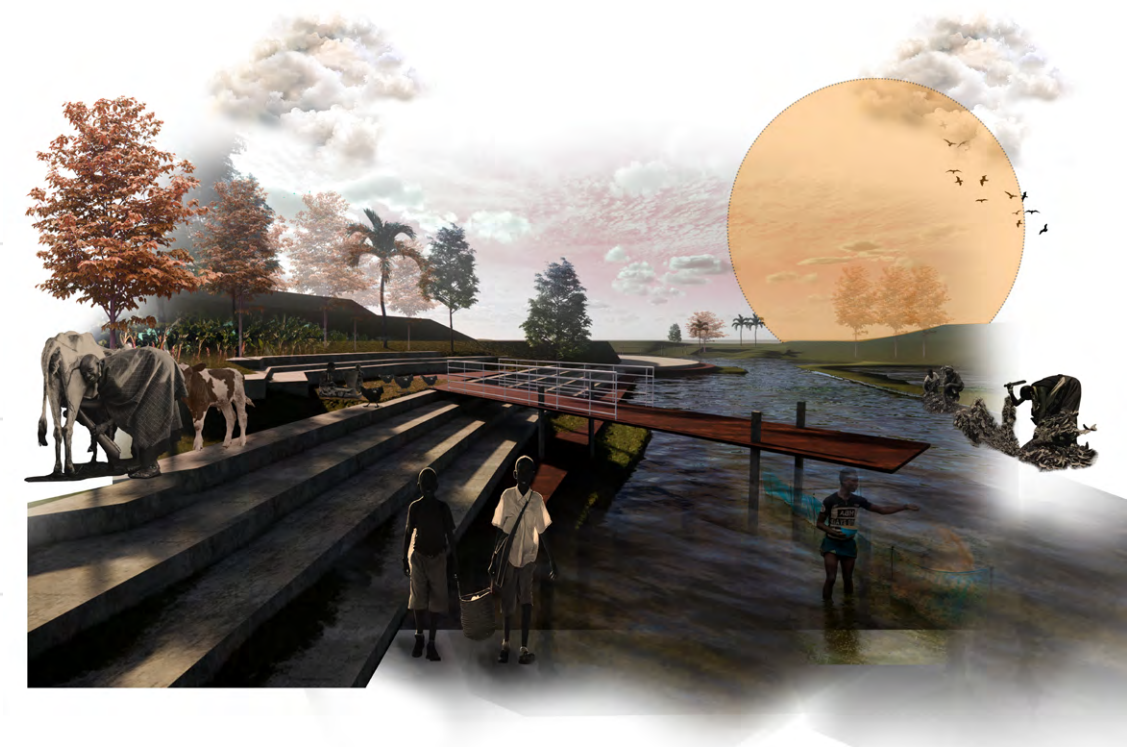
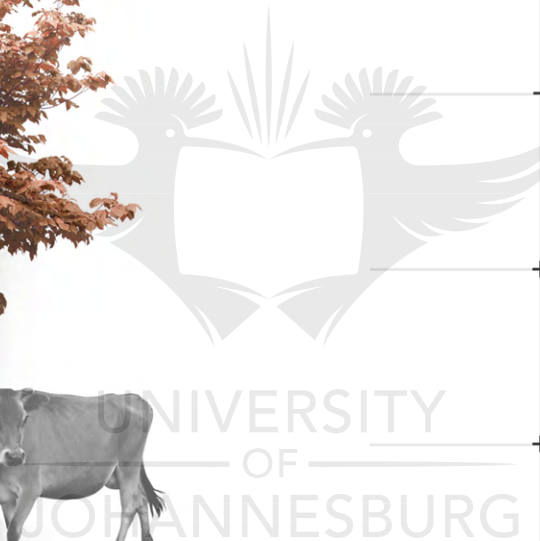




Recreational Areas

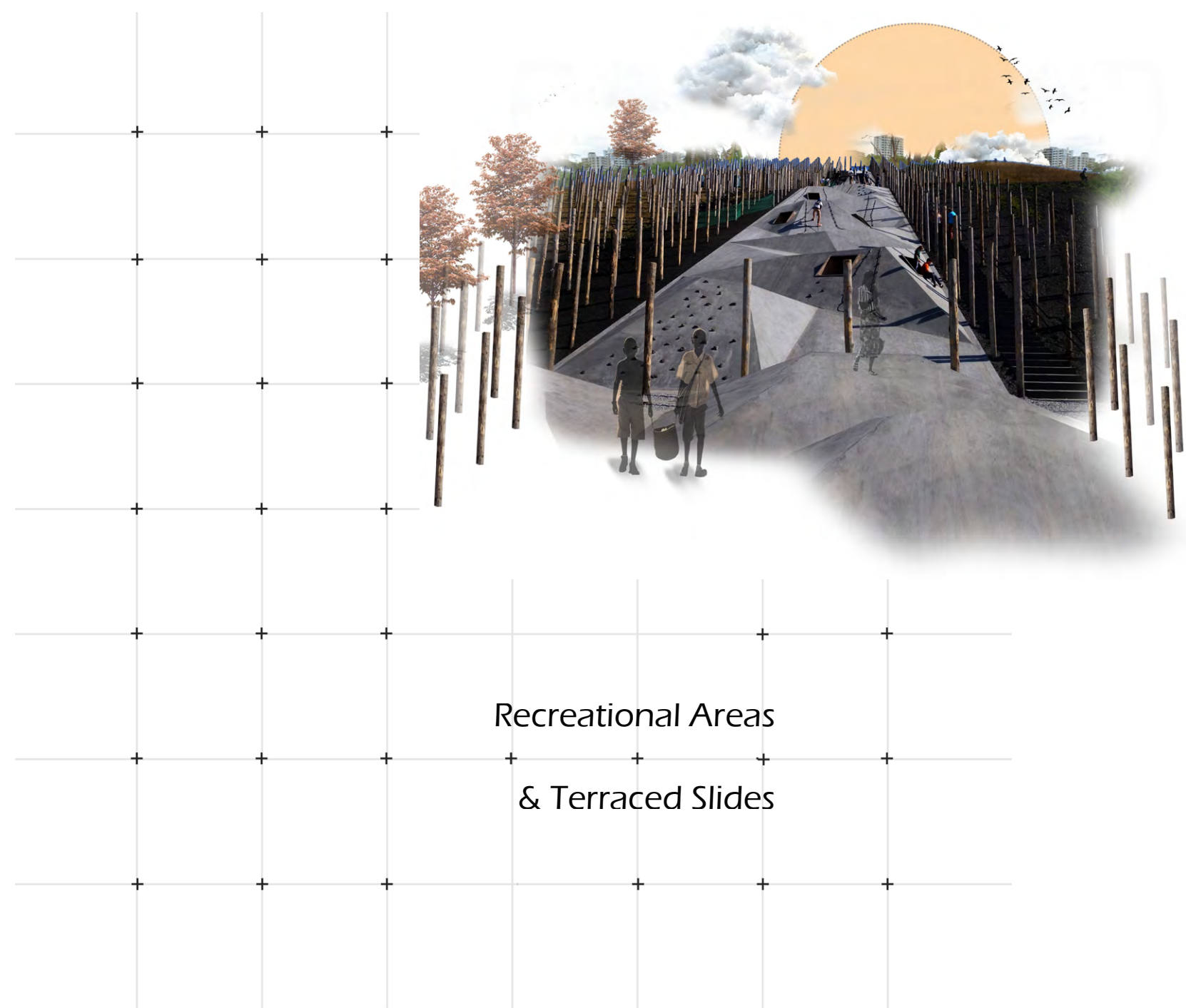
Fishing Decks

Raised Walkways

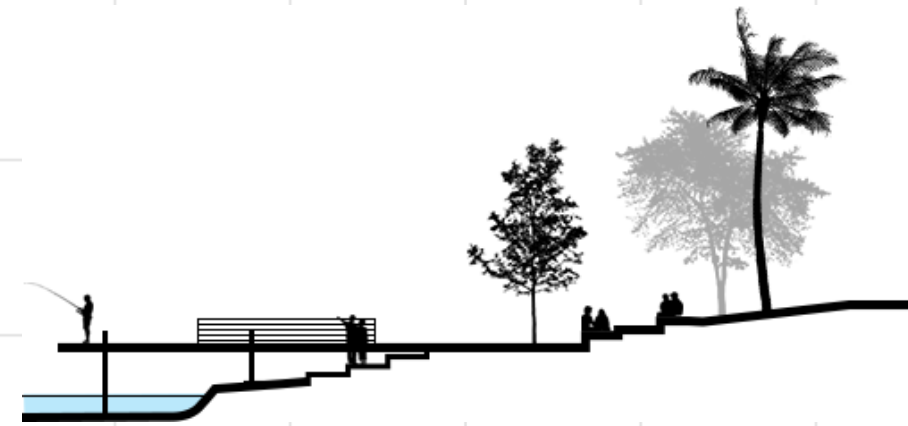




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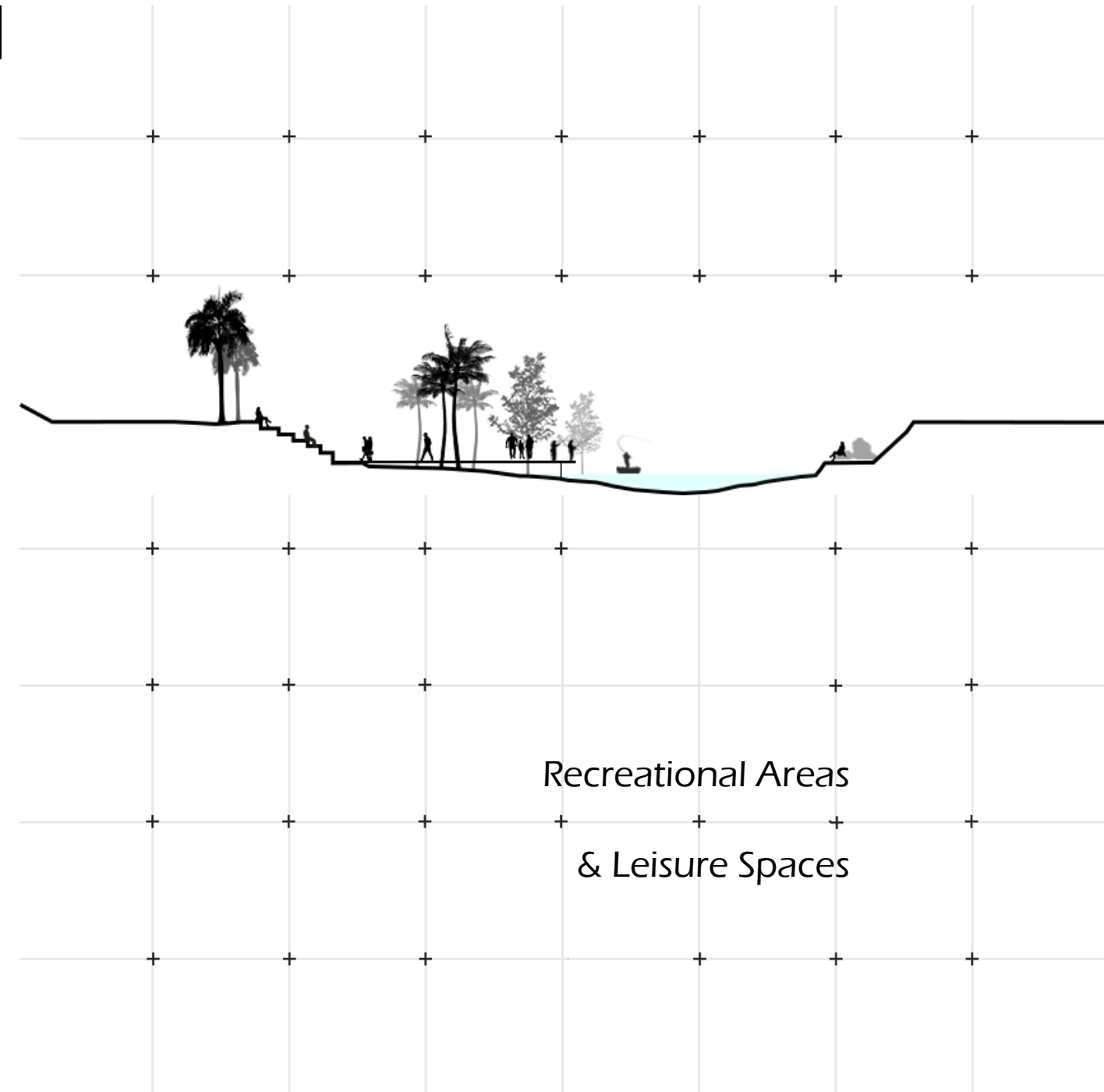


Recreational Areas
& Terraced Slides



Recreational Areas
& Terraced Seating





Recreational Areas
& Leisure Spaces



Project Reflections



This section highlights' explorations that were unsuccessful and summarises the aspects that have been learned in relative to Architecture and re-imagining resilient landscapes of the Msimbazi river basin.

Explorations that were failure.

Biomimicry in Landscape Architecture

It has been recorded prior to any natural disasters that animals portray strange behaviours. From the elephants in Indonesia using their big feet's to feel the geophysical vibrations of an earthquake a week prior to the disaster. To the dolphins making strange noises on the pier hours before a disastrous tsunami in Japan. Over time it seems that nature has had a way of communicating and humans have been missing all the signs. For this hypothesis, we turn to nature for answers on adaptation through a process of biomimicry. To narrow down the speculation, the following questions have been posed.

1. How does nature view flooding?
2. What are the adaptations of nature during this phase?
3. Which species can be examined in relation to adapting with abundant and scarce water conditions?
4. How can we apply resilient findings from nature to a flood prone area?

In response to these questions, plant adaptation behaviours will be observed and narrated into a project of resilient settlement through a theoretical approach of biomimicry. The initial is the buoyancy adaptation of a water lily that uses its stalk for both nutrient storage that anchors it 'self to the ground via roots and the light leaf morphologically structured to float and collect sunlight whilst performing photosynthesis. During drought season, the plant feeds on the nutrient stored in its long thick stalk that remain hidden under the muddy plain whilst releasing oxygen.

This process is called "Respiration" and the architecture paradigm has labelled it energy efficiency. However there are other strategies we draw from this process that enables us to create a proposal. Just like how a vaccine works whereby one is given the virus in small dosages but is actually boosting resistance of the virus until the body produces enough antibodies to be immune to the virus.



Highlight :

Biomimicry is not duplicating form but manipulating the gestural of performance from natures' design into a desirable outcome.

"In the search for genuinely sustainable building design and technology - designs that go beyond conventional sustainability to be truly restorative - we often find that nature got there first."
Pawlyn, M. 2011

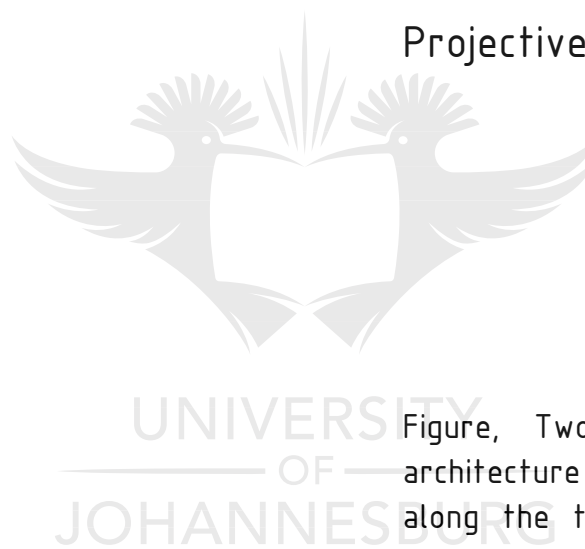
Reflecting 2

Explorations that were failure.

Projective Landscape

Figure, System of Dykes applied to contain ponds. These systems evolve to recreational hiking trails and trading corridors.

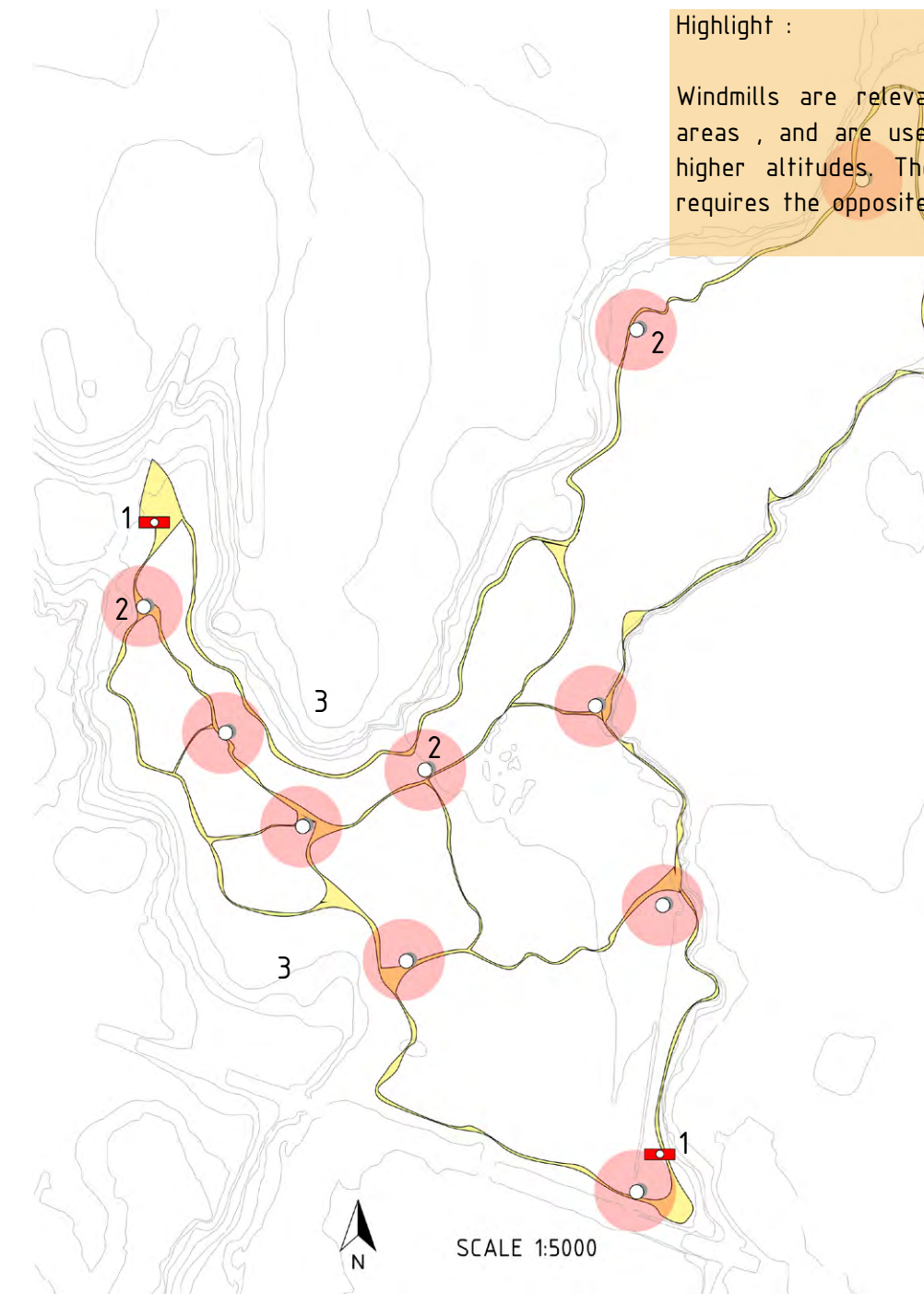
- 1 6km System of dykes
- 2 Landscape / 1m Contours



Projective Landscape

Figure, Two entry points of vernacular architecture and ten windmills as artefacts along the trail. The top two are used as sawmills by locals to cut the mangrove as per regulations. The others are used by Nomads to maintain the grazing fields.

- 1 Entry Nodes
- 2 Windmills / Sawmills
- 3 Landscape / 1m Contours



Highlight :

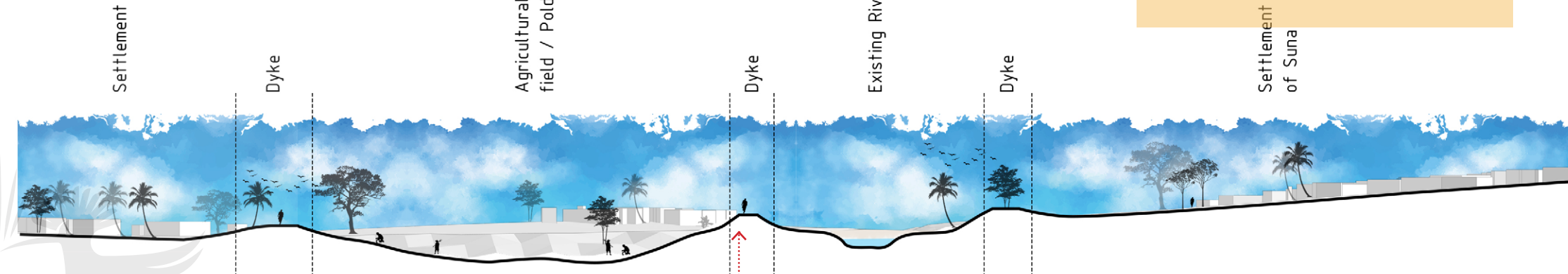
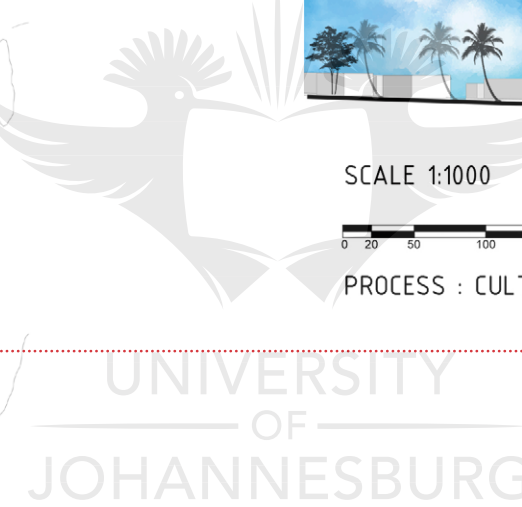
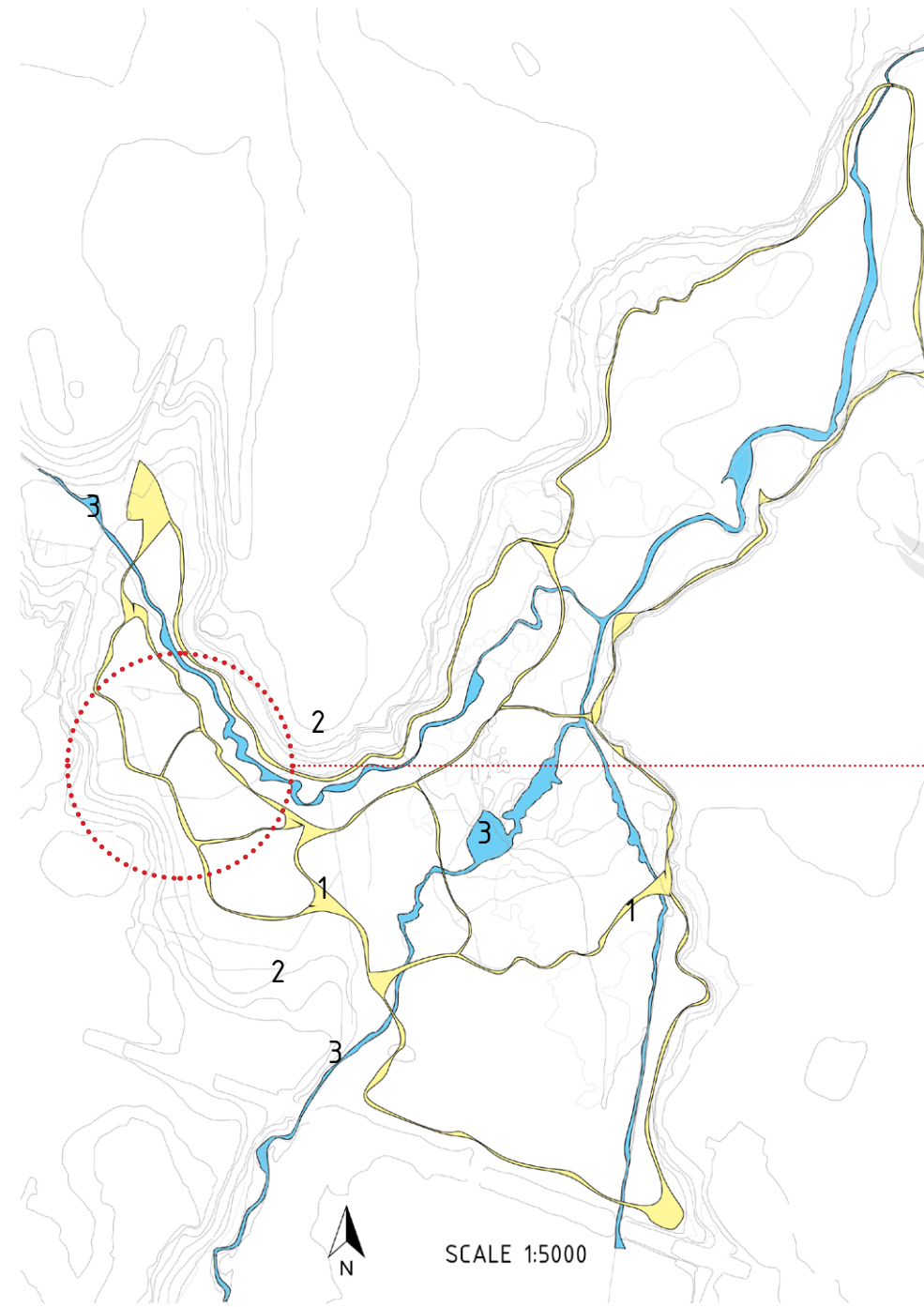
Windmills are relevant to water tight areas , and are used to lift water to higher altitudes. The site intervention requires the opposite.

Explorations that were failure.

Multiple Systems

Figure, System of Dykes applied to contain ponds/polders. These systems evolve to recreational hiking trails and trading corridors.

- 1 6km System of dykes
- 2 Landscape / 1m Contours
- 3 River line



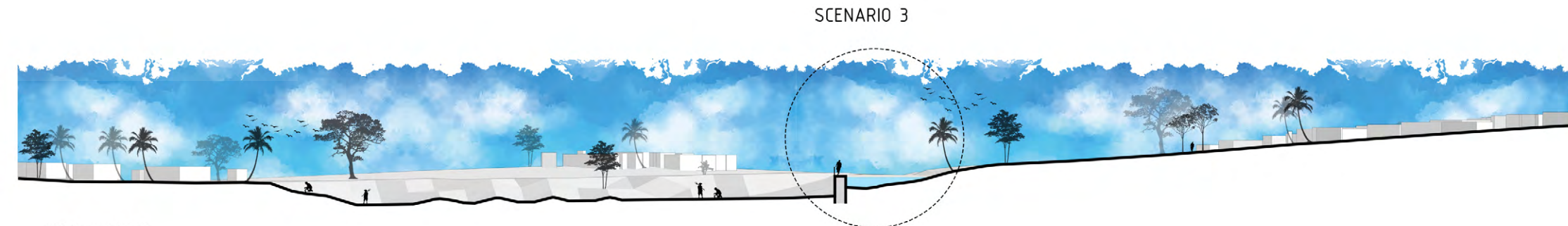
SCALE 1:1000



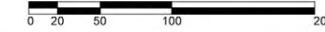
PROCESS : CULTURE OF FARMING AS AN AGRICULTURAL BUFFER

Highlight :

Site flooding requires dredging below natural ground level and not building barriers above natural ground level.

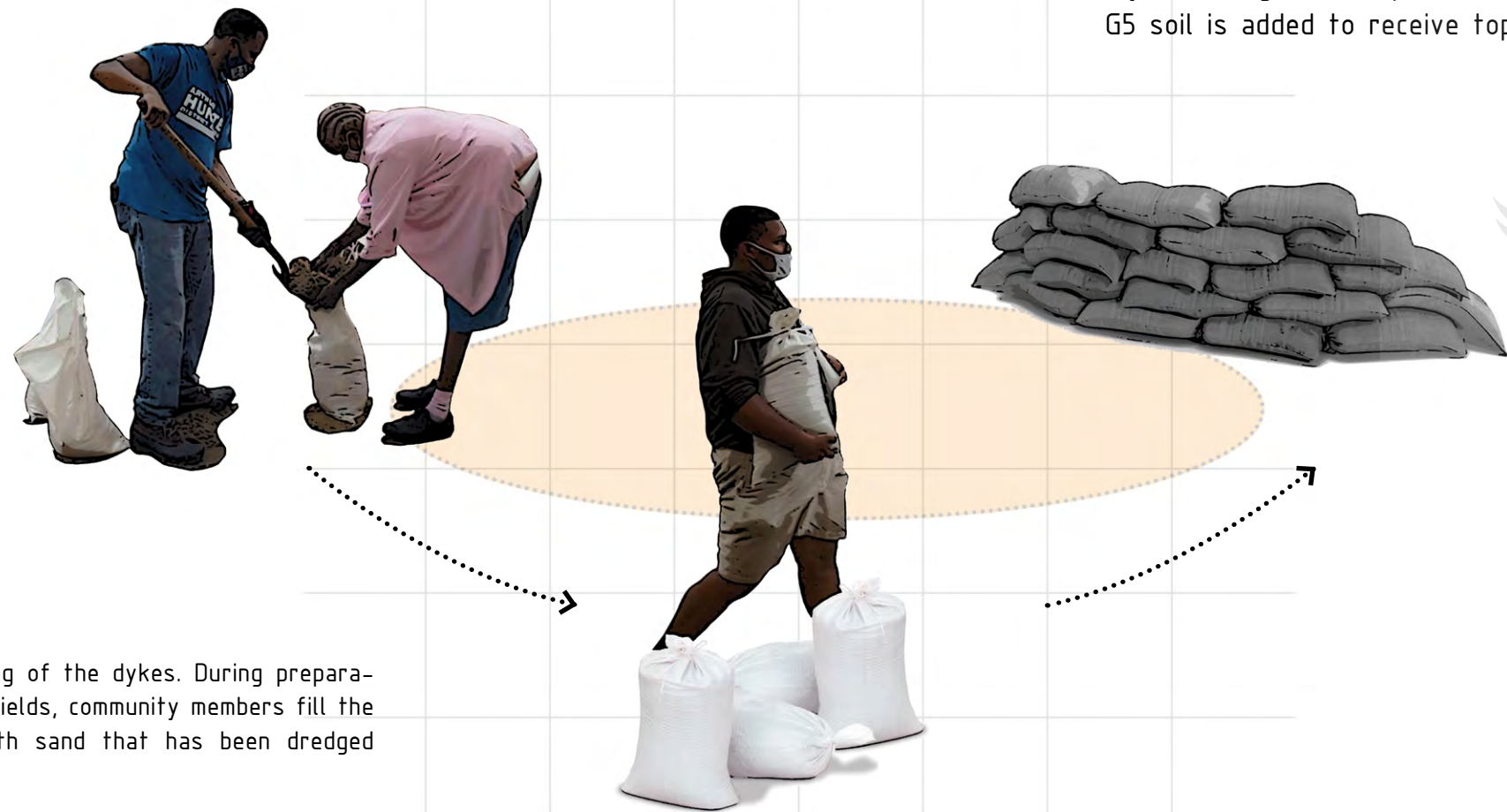


SCALE 1:1000



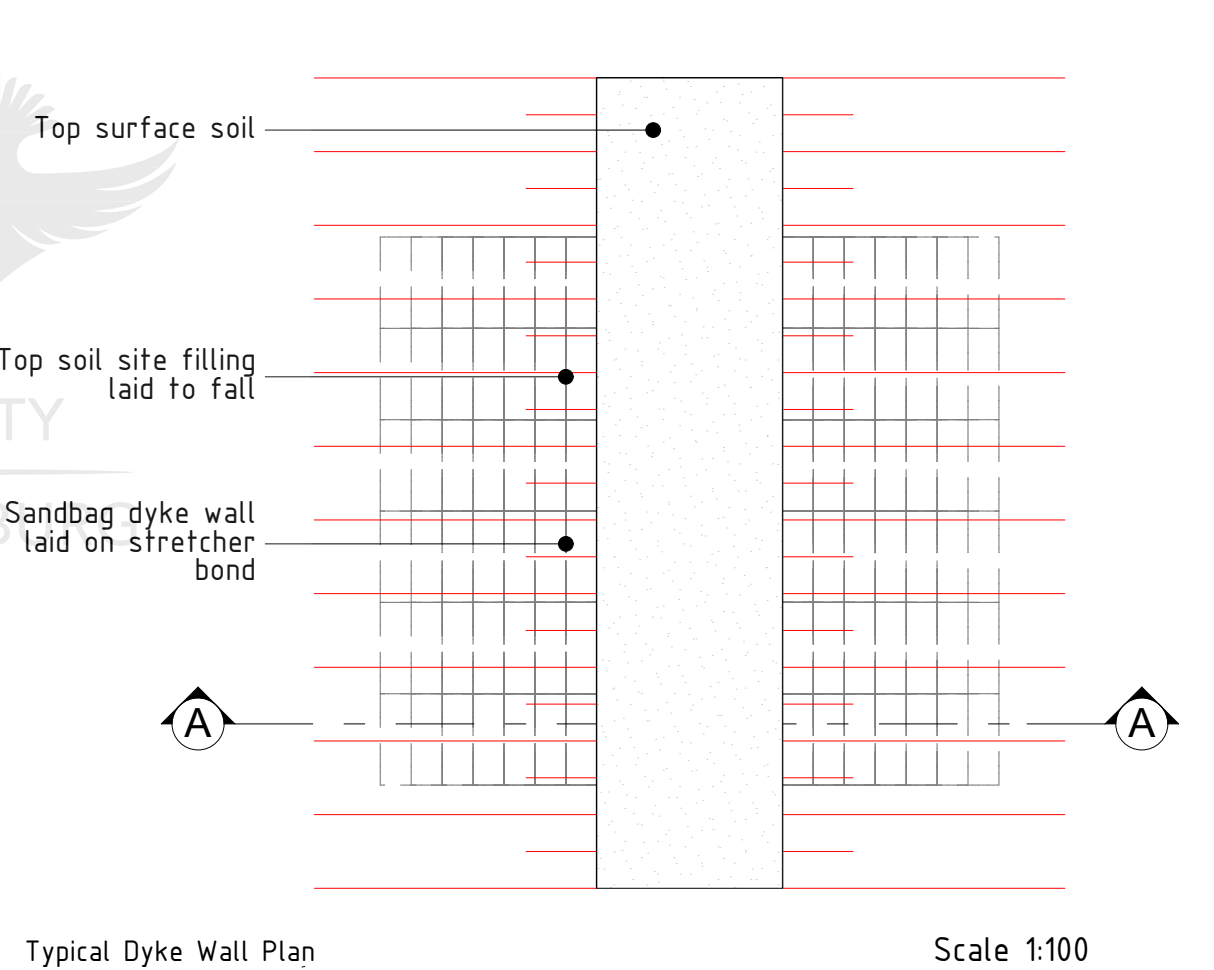
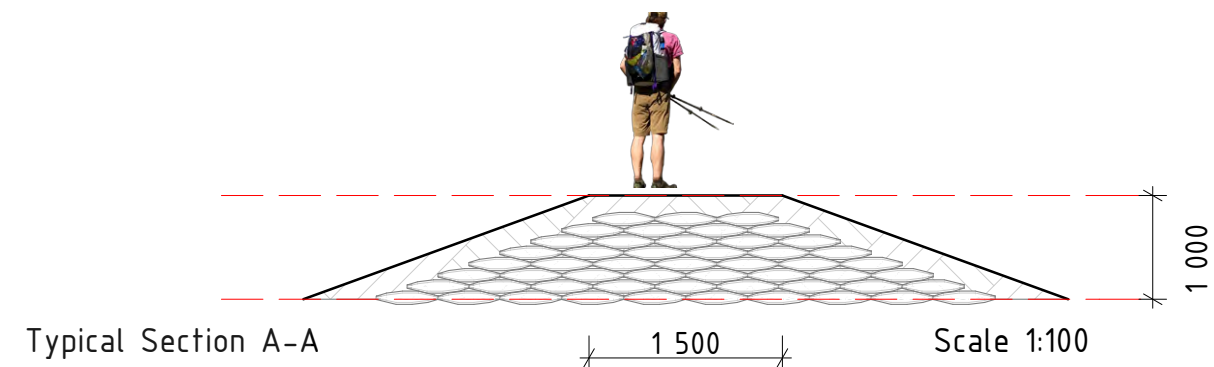
Explorations that were failure.

Materiality



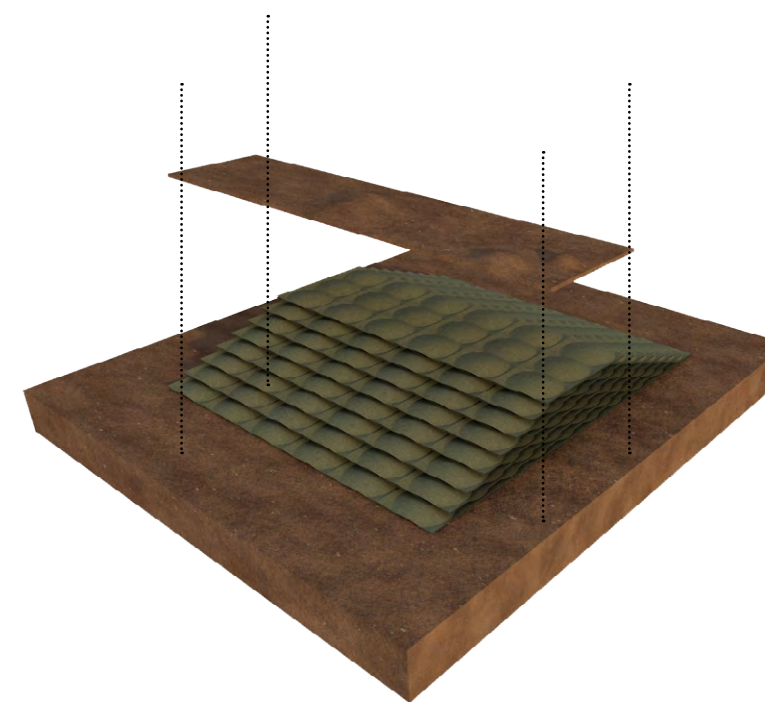
Figure; Making of the dykes. During preparation of the fields, community members fill the sandbags with sand that has been dredged out.

Figure, Sandbags are then stacked in stretcher bond to instil stability and are layed at a gentle slope. Another layer of G5 soil is added to receive top soil.



Typical Dyke Wall Plan

Scale 1:100



Typical Dyke Wall 3D

Highlight :

Site flooding requires dredging below natural ground level and not building barriers above natural ground level.

Scenario Generation

02_Preservation

Figure; A scene where the clouds are gathering and the heavy rains are beginning to shower down on the settlements. The residence rush to collect their only temporary hope for keeping the storm-water away. Will a bag full of sand on the doorway be enough or maybe this is just another passing cloud.

Future scenario to be avoided.



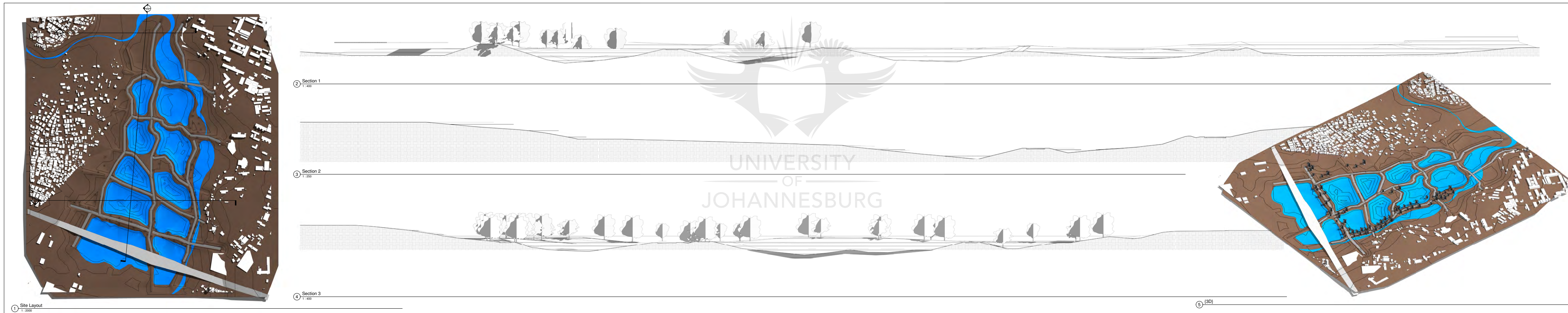
Highlight :

The intention was a creating a scenario to be avoided and not a "how to avoid flood" scene.

Reflecting 5

Explorations that were failure.

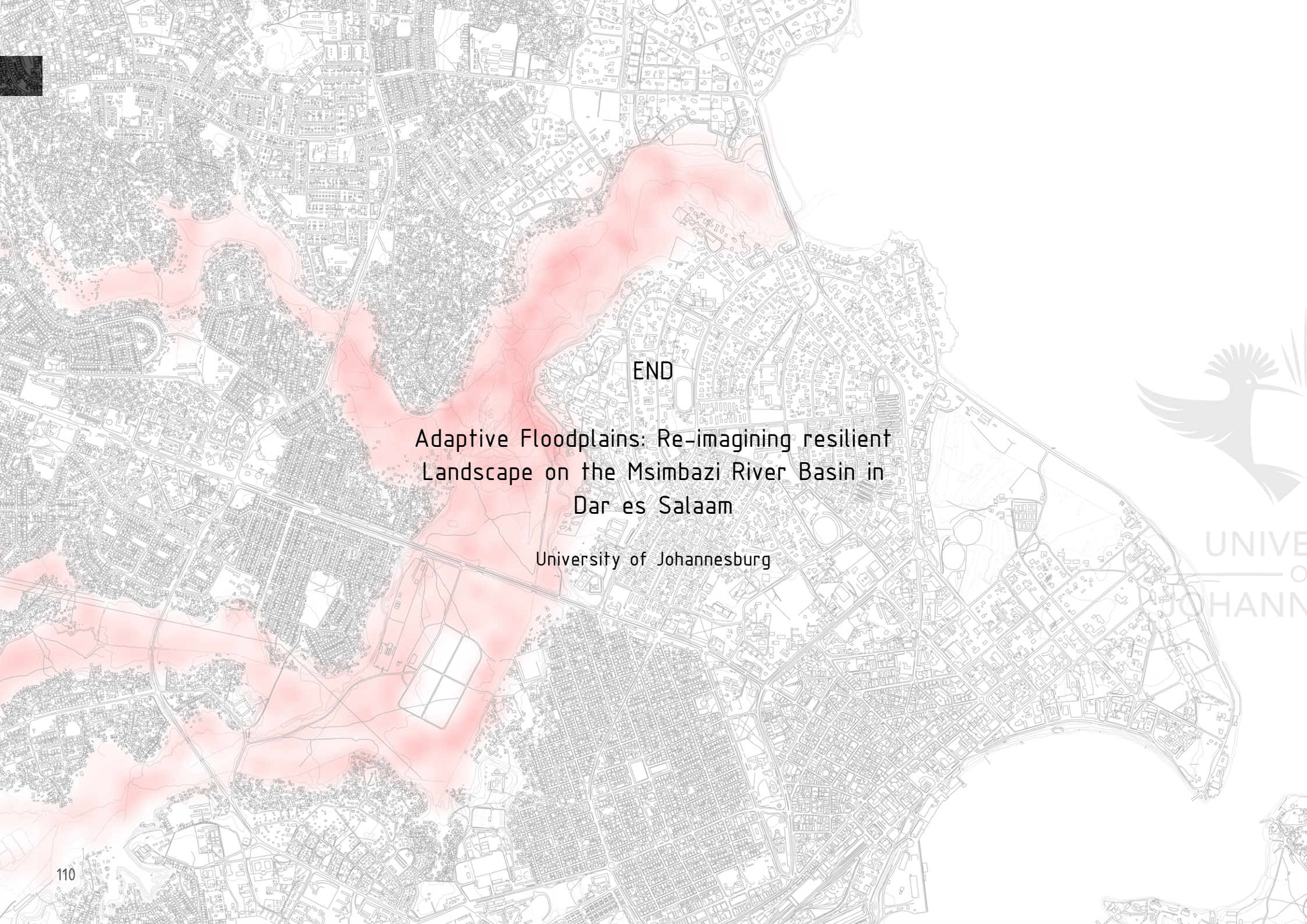
Figure; A 3 meter section attempt.



Highlight :

Methods of polder and dyke design from a precedent study in Netherlands. Historical context of Netherlands states that the land was under the water and interventions were based on strategies to design with water. Tanzania is the opposite of the above and floods are seasonal. After this failed exercise, I applied terracing and the result was the current MDP.

Using the correct computer program for specific results is also vital.



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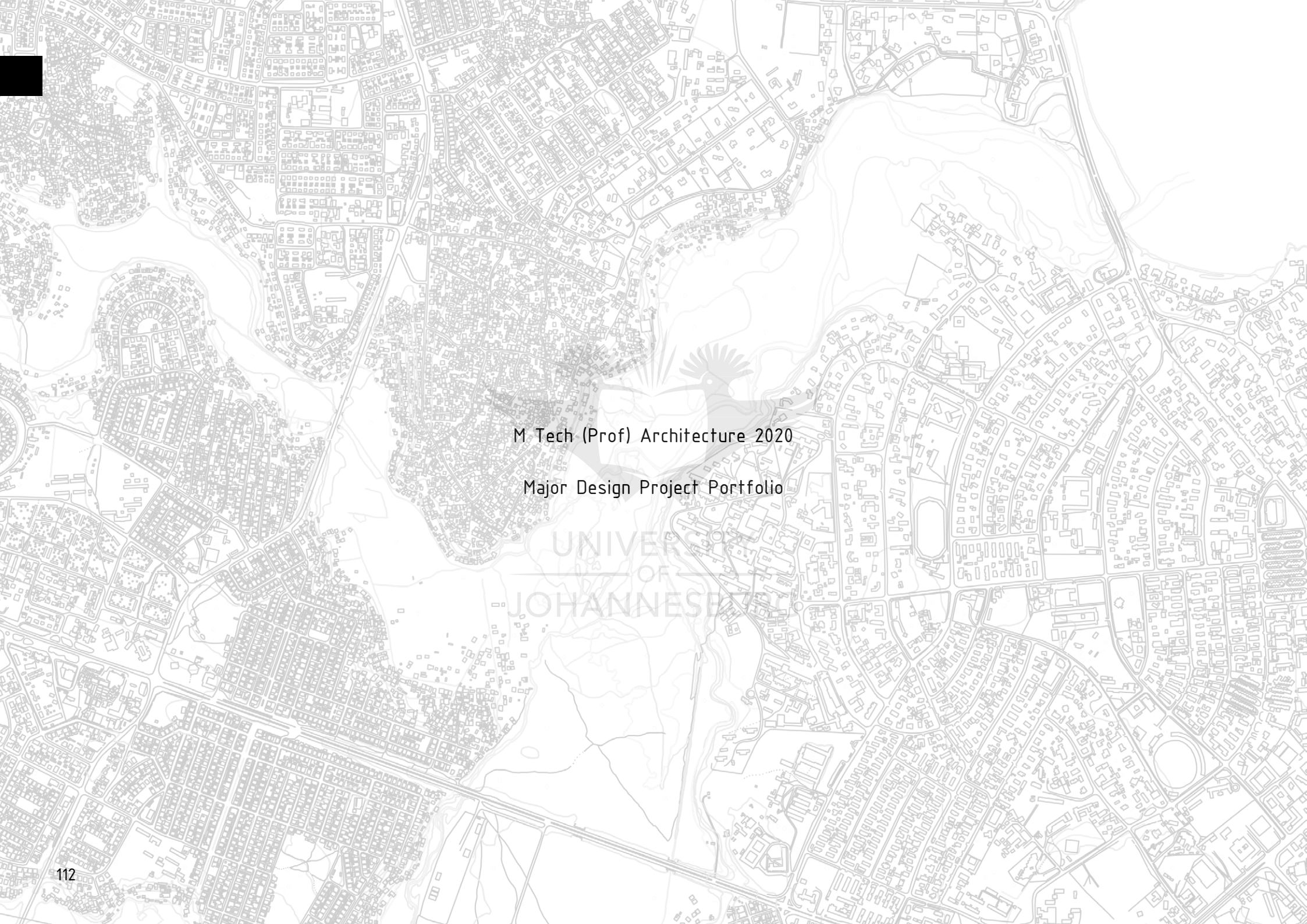
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