

Landscape [re]Mediation

A strategized landscape intervention that explores the functional, aesthetic and cultural value of trees as design informant



In accordance with Regulation 4(e) of the General Regulations (G.57) for dissertations and thesis, I declare that this dissertation, which I hereby submit for the degree Master of Landscape Architecture (Professional) at the University of Pretoria, is my own work and has not previously been submitted by me for a degree at this or any other tertiary institution. I further state that no part of my dissertation has already been, or is currently being, submitted for any such degree, diploma or other qualification.

I further declare that this dissertation is substantially my own work. Where reference is made to the works of others, the extent to which that work has been used is indicated and acknowledged in the text and list of references.

University of Pretoria
2018

ABSTRACT

Dissertation title: Landscape [re]Mediation. A strategized landscape intervention that explores the functional, aesthetic and cultural value of trees as design informant

Site description: A parcel of land bordering a former Crown Gold Recoveries Mine, across the road from Makause informal settlement.

Address: Main Reef road, Driefontein 87-IR Portion 222, Germiston, Ekurhuleni.

GPS co-ordinates: -26.196338, 28.169948

Clients: Crown Gold Recoveries (Pty) Ltd, City of Ekurhuleni, Department of Agriculture, Forestry and Fisheries

Research field: Environmental Potential

Submitted in fulfilment of the partial requirements for the degree of Masters in Landscape Architecture (Professional) in the Department of Architecture, Faculty of Engineering, Built Environment and Information Technology, University of Pretoria.

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This dissertation identifies and explores a case of environmental injustice that has manifested itself physically along the Ekurhuleni Mining Belt.

The injustice is broken down into its social and environmental components; investigating its relation to both the people and the(ir) environment. The project sits within a context of an informal settlement (Makause) that has established itself next to a former Crown Gold Recoveries mine. The piece of land lying between the mine dump and the settlement is the chosen site in which a socio-ecological relationship is proposed. Through regenerative theories, this relationship is anticipated to grow into a self-evolving and resilient form of stewardship for the environment. The overall intention lies in guiding both the users and the site to reach their full regenerative capacity.

The proposed design and programs of phytoremediation, agroforestry, arboretum, and tree nursery anticipate this organic nature of growth and change overtime.

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DEFINITIONS OF TERMS

Environmental Justice: A “broad concept which sees the environment as including not just nature, but also the home, the neighbourhood and the workplace. It places the well-being of people ... at the centre of environmental, social, political and economic relationships. It is essentially a political concept in that it recognises that the poor and powerless in our society invariably bear the brunt of environmental degradation such as polluted air, polluted water, inadequate housing, lack of refuse removal, etc. Environmental justice means correcting these inequalities and allowing all people to benefit from a clean, healthy, aesthetic and sustainable environment, regardless of their status in society” (Enviropaedia.com, 2018).

Eco-consciousness: An informed state of awareness where an individual understands their part in the whole; their mutually beneficial relation to the natural environment, their role in the greater system of living things.

Ecoliteracy: “the ability to understand the natural systems that make life on earth possible, including understanding the principles of organization of ecological communities (i.e. ecosystems) and using those principles for creating sustainable human communities” (Mang and Reed, 2018:1).

Ecological sustainability: “a biocentric school of sustainability thinking that, based on ecology and living systems principles, focuses on the capacity of ecosystems to maintain their essential functions and processes, and retain their biodiversity in full measure over the long-term”; contrasts with technological sustainability based on technical and engineering approaches to sustainability” (Mang and Reed, 2018:1).

Ecology: “the interdisciplinary scientific study of the living conditions of organisms in interaction with each other and with the surroundings, organic as well as inorganic.

Ecosystem: “the interactive system of living things and their non-living habitat”” (Mang and Reed, 2018:1)

Ecosystem concept: “a coherent framework for redesigning our landscapes, buildings, cities, and systems of energy, water, food, manufacturing and waste” through “the effective adaptation to and integration with nature’s processes.” It has been used more to shape an approach than as a scientific theory” (Mang and Reed, 2018:1).

Regenerative Design: “a system of technologies and strategies, based on an understanding of the inner working of ecosystems that generates designs to regenerate rather than deplete underlying life support systems and resources within socio-ecological wholes”(Mang and Reed, 2018:2).

Regenerative Development: “a system of technologies and strategies for generating the patterned whole system understanding of a place, and developing the strategic systemic thinking capacities, and the stakeholder engagement/commitment required to ensure regenerative design processes to achieve maximum systemic leverage and support, that is self-organizing and self-evolving” (Mang and Reed, 2018:2).

Regenerate: “(American Heritage Dictionary of the English Language)

- To give new life or energy to; revitalize; to bring or come into renewed existence; to impart new and more vigorous life;
- To form, construct, or create anew, especially in an improved state; to restore to a better, higher or more worthy state; refreshed or renewed;
- To reform spiritually or morally; to improve moral condition; to invest with a new and higher spiritual nature;
- To improve a place or system, especially by making it more active or successful.”

(Mang and Reed, 2018:2)



MANIFESTO

This project is based on the premise that designed landscapes cannot be fully resolved and implemented in one stroke. Rather; time and resultant change need to not only be taken into consideration, but used as tools to guide the project. It has thus been decided that a prescriptively detailed, fully-completed final design does not suit the nature of this project. Rather than design within the bounds of definite detail, it is more appropriate to initiate a series of interventions that plan for anticipated change. As a result, this project takes on a slower, less definite approach; one that allows the design to manifest itself overtime.

The project follows on Nabeel Hamdi's stance on change; to anticipate it through the balance of interventions with organic development. His design philosophy is centered around the concept of "catalyst – of practical interventions with strategic objectives..." (Hamdi, 2010:xvii).

Ismail Serageldin's Architecture of Empowerment (Serageldin, 1997) speaks to this approach, discussing the idea of building as process, rather than product. This links to the process of change, which cannot be unlocked if design remains fully at the hand of the designer.

The proposed design intervention occurs alongside an informal settlement and therefore needs to respond accordingly. The informality and fluid nature of such settlements results in many uncertain variables. As a result the design is to some extent open ended.

Architecture of empowerment/just architecture^[1] specifically focusses on finding spatial opportunities that allow poor, marginalised communities to take ownership of their shared space (Serageldin, 1997:10). In order to achieve this, the design is more suggestive than prescriptive in its detail.

Rem Koolhaas' definition of New Urbanism (Koolhaas, 1995) is adapted to this project. He describes the approach as one that does not meticulously define or configure objects in their place but rather one of staging^[2] uncertainty, of planting potential in places, creating fields that accommodate liquid processes; a reinvention of space.

- The project is a strategy that is understood and resolved on a masterplan level.
- The design comes in the form of broad stroke interventions that set the scene for finer detail to occur.
- The finer detail is suggested and guided, but not fully prescribed.
- Sketchplans, details and other technical investigations/ presentations are prepared for the sake of conceptual or theoretical explorations. They do not serve as final designs.

1- Here, "just" refers to justice. 2- "Staging meaning "method of presenting..." or "temporary platforms arranged as support for..."



01 INTRODUCTION

PROBLEM STATEMENT
ISSUES
HYPOTHESIS
RESEARCH QUESTIONS
LIMITATIONS
DELIMITATIONS
ASSUMPTIONS

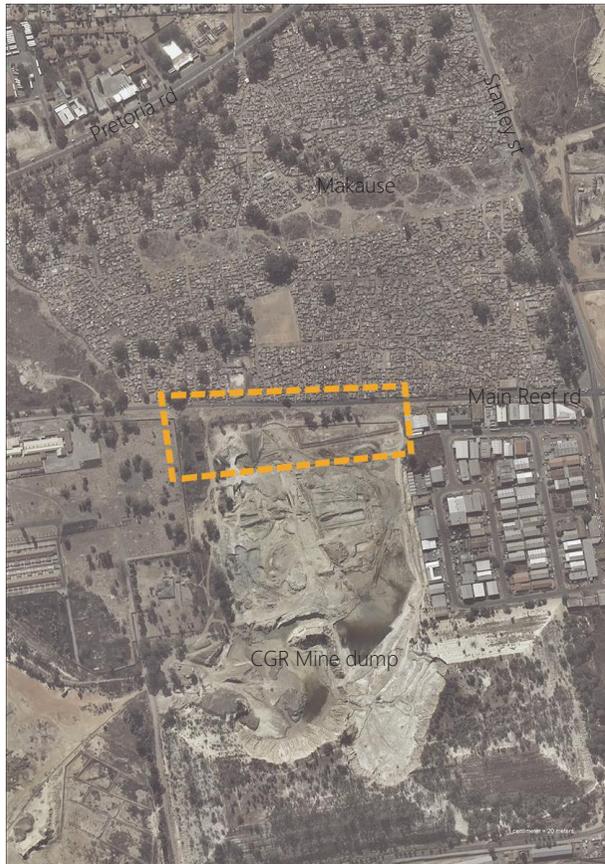


Figure 1.1 Site Aerial (ArchGIS 2018)

INTRODUCTION

This dissertation is developed from an identified spatial manifestation of environmental injustice along the Erkhurleni Mining Belt. The project site lies between an overcrowded, poverty-struck informal settlement (Makause), and a former Crown Gold Recoveries Mine that contributes to environmental waste and as a result negatively impacts on human health. This scenario displays two damaged entities; a human community and a natural community. The investigation focusses on this interchange; between the community, and the damaged mine-affected land that lies adjacent.

As a means of bringing these entities (human and landscape) together and positively aiding them forward, a spatial solution is proposed; space being identified as the plane at which these two interact. To achieve this, regenerative theories are applied. The end-goal is a landscape intervention that creates and facilitates a self-evolving socio-ecological system that evolves overtime. This intervention should further foster a sense of stewardship, which will as a result see the project mediate between the people and the global future^[1].

PROBLEM STATEMENT

Environmental injustice presents a case of poor, marginalized communities that often bear the brunt of degraded environments. Both the social and the environmental aspects of this injustice are in weakened states; physically evident on the

project's chosen site. The theory of Regenerative Development and Design can however, be used as an approach to addressing the fragmentation between people and environment. The theory supports a new way of understanding the interrelationship between human communities and natural communities (socio-ecological relationship), as well as the potential to expand on the capacity of the solution to continuously regenerate itself over time. A landscape intervention can thus serve as the platform at which this interrelationship can develop. It will be a spatially tangible solution to the spatially evident scenario.

ISSUES

The dissertation identifies issues which are scaled down from broader general issues, to a defined and focussed design issue. As further discussed in the following chapters; the issues are from the broad theme of environmental injustice, to its manifestation in the urban context; the numerous mine dumps and connected informal settlements in Ekurhuleni, and then eventually the site specific issues that can be addressed through a design proposal.

The design issue is the fact that the site is a physical middle ground between an environmental issue and a social issue. On the one side, there is a poor community that lacks equal/open access to space, land, and economic opportunities. The other side presents a derelict piece of land that remains so due to its proximity

[1] Global future refers to one that will result from the global environmental crises caused chiefly by climate change. If the world's population does not actively change habits and become ecologically aware, this future will come sooner and with more intense effects.

to the mine dump.

The case, although site specific, is common in the precinct. Access to these parcels of land is limited and dependant on the mine companies that should/are in the process of rehabilitating the former mines. If mines are not rehabilitated, the parcels of left over land will always be lost, ill-used, or completely inaccessible. The opportunity lies in exploring ways for the surrounding communities to access this land and through use, start integrating it back into the urban fabric. However, this should occur with or without reliance on mine dumps being rehabilitated.

Landscape architecture lies right between social and environmental themes. The design issue identified is a result of a spatial scenario, which means there is a need for a spatial response. Landscape design offers that spatial solution, where the proposed intervention becomes the setting in which ideas manifest. The project will therefore use the site as a means to bring the two initially separate social and environmental issues together and develop their interdependence to the desired state.

HYPOTHESIS

Regenerative theories can lead to many ways of improving people's relationship to the natural environment. The angle this project takes is one of developing the ecological competency of a chosen community. If this is achieved through the programs of agroforestry, an arboretum, and

a tree nursery the result does not just last and benefit only that community at only that time, it benefits communities still to come, and for a time that lasts into the future, changing the way people relate and view their place within the earth and their role and responsibility towards it.

RESEARCH QUESTIONS

How can a phased landscape intervention of phytoremediation, agroforestry, arboretum, and tree nursery introduce and facilitate a socio-ecological relationship?

How can the proposed programs incorporate and respond to both the needs of the community and the needs of the site?

How can the programs help develop ecological awareness in the Makause community?

How can the design guide the project's development, instead of fully prescribing each portion of the project to final, definite detail that is not open for variation or alteration?

How can the design anticipate growth and resultant change over time, yet still allow the project to function in each phase of its lifetime?

LIMITATIONS

The Environmental Management Plan of the CGR (Crown Gold Recoveries) mine dump next to the site was not accessible, therefore some information is assumed through conclusions from other sources.

Soil and water tests could not be conducted in order to get accurate records of the levels of toxicity on site.

DELIMITATIONS

As certain aspects of the project goes beyond the scope of landscape architecture, it is noted that in a real world scenario, a project team combining mine rehabilitation, soil, geology, and remediation experts would be involved.

ASSUMPTIONS

Hypothetically, permission for this project to take place would be granted by Crown Gold Recoveries Pty. The project would be funded by City of Ekurhuleni and the Department of Agriculture, Forestry and Fisheries.

It is assumed that when the CGR mine dump clearance is completed and approved, rights will return to City of Ekurhuleni.

As with the Primrose Precinct Draft Plan (to be discussed in the following chapter), it is assumed the CGR mine dump will be rehabilitated and transformed into a portion of a large sports precinct.



Figure 1.2 State of the land parcels between mine dumps and informal settlements (Author 2018)



BACKGROUND
URBAN MAPPING
URBAN VISION
PROPOSED FRAMEWORK
SITE ANALYSIS
SWOT

02

CONTEXT

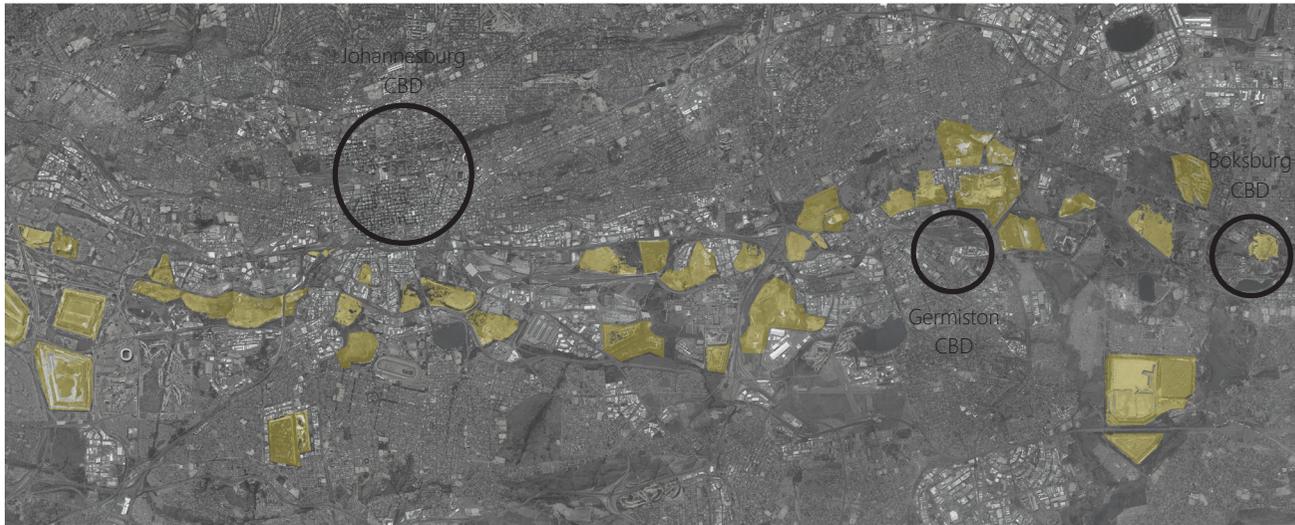


Figure 2.1 Mining belt - Mines indicated in yellow (Author 2018)

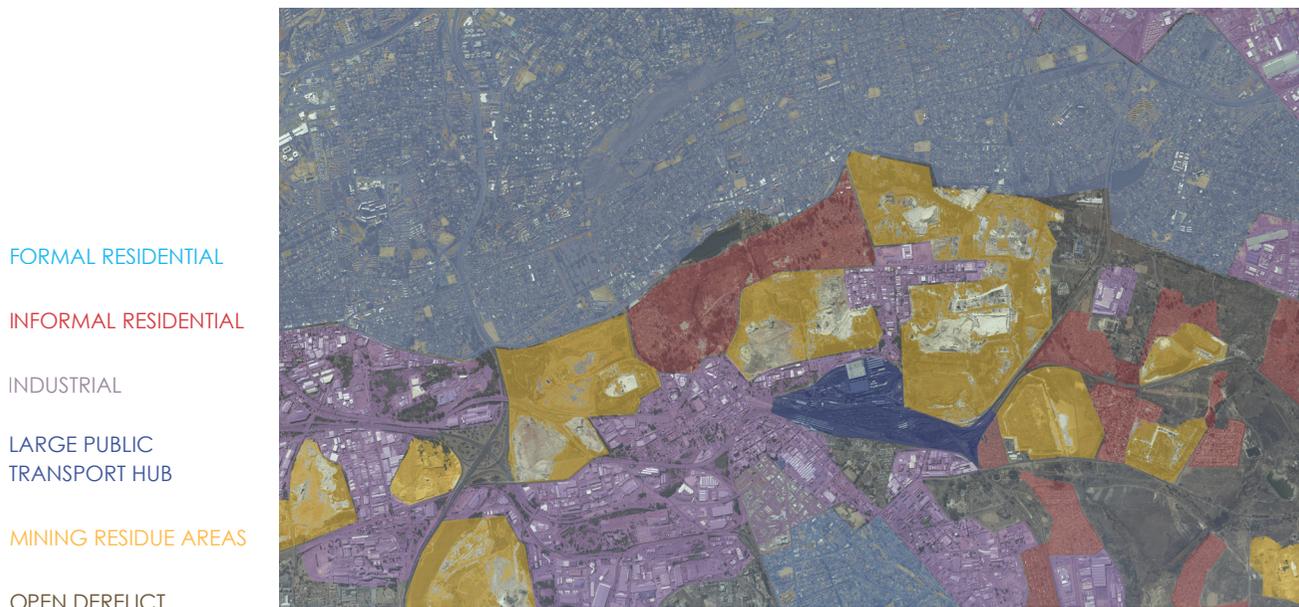
BACKGROUND

The Gauteng region historically hosts a large number of gold mines; most of which are no longer operating (MapAble (Pty) Ltd - Online Mapping, n.d.). The majority of these mines occur in an east-west direction. This collection is referred to as the Mining Belt; spanning for approximately 80km, across the southern part of Johannesburg, well into Ekurhuleni (IYER Urban Design Studio, n.d.).

Typically, settlements evolved alongside this mining belt, due to mining activities and the geological features of the ridges. As settlements grew and evolved, the mining belt became a visual and physical barrier (IYER Urban Design Studio, n.d.); separating the province's northern regions and southern regions.

With the decline in industry in the 70s, most mining operations relocated; leaving behind vacant land which was quickly taken up by mostly former migrant labourers of the mines (Tang and Watkins, 2011). The land grew into informal settlements and increased in size and density especially after Apartheid, with migration laws being transformed. People from rural areas moved to these settlements in seek of job opportunities or in order to join migrant labourer family members (Tang and Watkins, 2011).

Of the informal settlements found in Johannesburg and Ekurhuleni, about a quarter of them are within the mining belt; which translates to 400 000 people (IYER Urban Design Studio, n.d.). The gold mine dumps still carry traces of



FORMAL RESIDENTIAL

INFORMAL RESIDENTIAL

INDUSTRIAL

LARGE PUBLIC
TRANSPORT HUB

MINING RESIDUE AREAS

OPEN DERELICT

Figure 2.2.1 Precinct current land-use (Author 2018)

cyanide; which was used for extraction processes (Tang and Watkins, 2011). The toxic nature of cyanide has led to major negative effects on human and environmental health. These effects have been reported on for many years.

URBAN MAPPING

The immediate surrounds of the chosen site is a combination of built-up residential (Primrose), defunct mines, informal settlements, and industrial and commercial land-uses (Fig. 2.2.1). This presents a mixture of social, economic and environmental issues, some of which are identified as needs and thus opportunities to build up on. The issues identified include; severe poverty, lack of affordable education and healthcare services, lack of safety (human and environmental), overcrowded living environments, lack of open public space, lack of access to land, and harsh, degraded open spaces (intense sun exposure, eroded ground layer, dumping/excessive litter etc.)

Social context

The site falls under Ward 21 of Ekurhuleni (Fig. 2.3), which houses approximately 40 000 people (Wazimap.co.za, 2018). The statistics illustrated in Figure 2.4 paint a picture of the present; showing evidence of a need for environmental, economic and social interventions.

Physical context

The presence of former mines in the precinct (Fig. 2.5) has resulted in land that cannot

currently be used or accessed. It is also the reason for derelict/degraded land parcels that border the mines and urban circulation routes (as depicted in Fig 1.2). These parcels are often too small to be taken over, or too close to the mine tailings. Overall they are perceived as unsafe, and thus sometimes become prime crime spots.

The overcrowded conditions of the various informal settlements, along with lack of service delivery, water and sanitation leads to a number of destructive habits and undesired visual impact. Residents in informal settlements utilize leftover land for refuse dumping which has over time become excessive. Some parts are used for daily activities such as circulation, waste gathering and recycling, group sports, and micro-economic activities.

Conclusions

On an urban scale, various spatial issues need to be addressed (most of them influenced by environmental, social and economic factors). If these needs are addressed on the urban scale, the framework will serve as a platform for the intentions of this project.

URBAN VISION

Basis

This dissertation proposes an urban framework that addresses the above mentioned needs. It is developed initially from existing urban frameworks, namely the 2015 Ekurhuleni

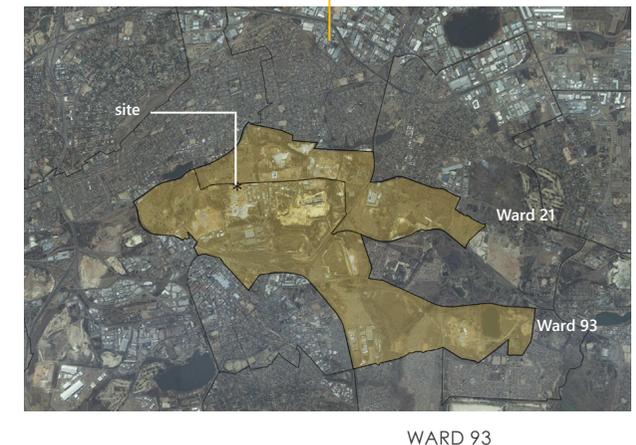
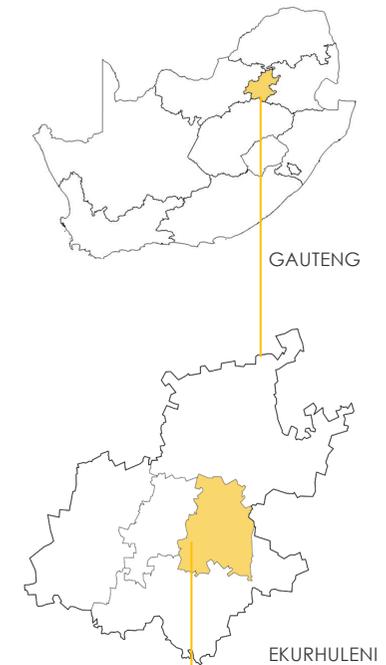


Figure 2.3 Locality (Author 2018)
(Site falls under Ward 93. Makause settlement falls under Ward 21)



Figure 2.4 Statistics of Ward 93 and 21 adapted from Wazimap.co.za (Author 2018)

Metropolitan Spatial Development Framework (Ekurhuleni Metropolitan Municipality, 2015), the Ekurhuleni Mining Belt Strategic Assessment (IYER, n.d), the Primrose Precinct Draft Plan (IYER, 2017), which are analysed and then adapted in line with the project vision and intentions.

The following is a summary and critical review of each of the existing frameworks (see summary in Fig. 2.7):

The Ekurhuleni Metropolitan Spatial Development Framework (MSDF):

Core principles are based on the 2013 Spatial Planning and Land Use Management Act (SPLUMA). They are; Spatial Justice, Spatial sustainability, Efficiency, Spatial resilience, and Good administration.

The Act cites under Spatial Justice: “past spatial and other development imbalances must be redressed through improved access to and use of land by disadvantaged communities and persons” (Ekurhuleni Metropolitan Municipality, 2015). This aspect becomes a point of departure for both the dissertation’s proposed framework and the overall project intention.

The MSDF is also guided by the Ekurhuleni Growth and Development Strategy 2055, which is used as a strategy to meet the combined goals of government, private sector, and civil society. The end-goal is a Sustainable City by the year 2055.

Physical aspects:

A need for open space and biodiversity has been identified. The spaces are proposed to be established from within the metropolitan and local areas, corridors, neighbourhoods, existing parks and lastly the mining belt. There are however, many issues identified that need to be resolved before achieving the goal. The issues included the scarcity of land within the urban areas, the fact that about 80% of natural open space is privately owned, and thus difficult to access and conserve, the fragmentation of these various spaces, the polluted and degraded state of the natural spaces, and the apartheid spatial legacy; which sees poor communities having very little access to open spaces and affluent communities having plenty.



Figure 2.5 Mine residue in precinct (Author 2018)

Social aspects:

The MSDF acknowledges a need for facilities that support health and emergency services, social services (such as cemeteries and community halls), education, and recreation. It further found that there is not enough of these facilities to support the population of the municipality.

Economic aspects:

The unemployment rates continue to rise year by year. Of those employed, a small percentage of people (amounting to 107 000) are informally employed. The RSDF identifies agriculture as an income generator and employment opportunity. It has also been noted that the CBDs of the



Figure 2.2.2 Spatial scenario prevalent in precinct (Googlemaps 2018)

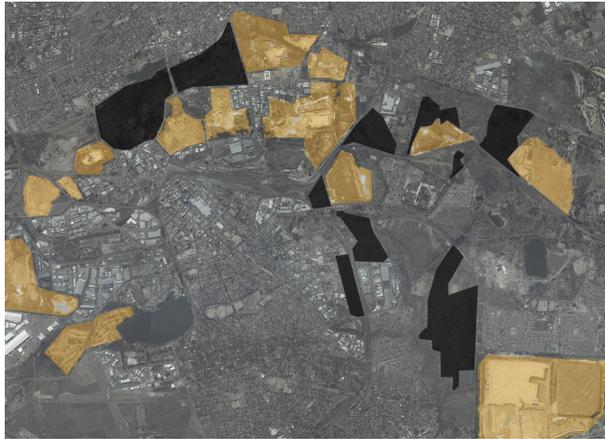


Figure 2.2.3 (Author 2018)
Occurance of informal settlements (in black) in precinct. (mines in orange)

municipality are experiencing economic decline.

Institutional aspects:

Various regions of the municipality are assigned different roles. Region A, in which the site is located has been assigned to enhance and protect the existing urban fabric, to aid in urban expansion and to provide essential infrastructure.

Combined aspects:

This dissertation's urban vision selects some key identified objectives from the MSDF to build on to develop its urban framework. These objectives are:

- Integrate the disadvantaged communities into the urban fabric,
- Promote sustainable livelihoods development,
- Promote sustainable development,
- Create a sustainable and functional open space network

The MSDF acknowledges that the reclamation and rehabilitation of mine dumps is a long term process. Although it does not specify what exactly these spaces will/should be, it emphasizes both the importance and the potential the spaces hold.

The frequent occurrence of informal settlements in Ekurhuleni is noted. The solution proposed by the MSDF is that they either be

upgraded, formalized or relocated.

It also proposed a land-use that combines social, environmental and economic inputs. The zone that the site falls under has been allocated to urban farming. However the land identified for this activity is also in demand for development, and will most probably as a result be used for this purpose.

The document proposes mixed land use, which will aid in promoting a local economy, in reducing fragmentation of spaces, and with the provision of public services. It also proposes a few strategies that promote social mixing, such as mixed housing typologies. The intention here is to remove generational marginalization and exclusion of poorer communities and rather allow equal opportunities and access to people of all classes.

In essence, the intentions of the MSDF are to “address the social needs of people living and working in the area now and in the future, and create opportunities to contribute to the establishment of sustainable communities” (Ekurhuleni Metropolitan Municipality, 2015).

Critique:

The document has more data and opinions on the urban issues identified than it does on specific/definite solutions to those issues. It is vague; and rather offers an array of options, tentative plans and possible solutions. It forms a good guide, but does not prescribe what exactly is to be developed where. However, this helps

ground future developments within a planned vision, prescribing, without necessarily limiting growth.

Ekurhuleni Mining Belt Strategic Assessment

The document was drafted in order to assess the potential of the land covered by the mining belt. It identifies spatial issues that are a result of the mining belt. One of the issues is the large risk around the case of human settlement and proximity to mine dumps. Acid mine drainage is another issue of concern, along with illegal mining.

A number of ideas/strategies on how to transform the mining belt area are presented, the overall intention being to reshape the “racially and economically segregating” buffer into a “mixed use, vibrant growth area that bridges the historic spatial divide” (IYER, n.d) . There is mention of potentially linking Soweto with the western corridor areas, and exploring how the mining belt can be utilized for the expansion of the Johannesburg inner city.

This transformation of the mining belt is proposed by new road linkages and infrastructure, re-integration of areas affected by former/current mining activities, job creation, rehabilitation of degraded land and dealing with acid mine drainage, and coordination with the mining industry.

The proposal for the mine residue areas is to remediate through phytoremediation, with supportive programs such as woodlands and

nurseries. Dumps and tailings are proposed to become spaces for alternative energies such as solar, wind and/or biomass. Acid Mine Drainage is proposed to be treated through various spatial interventions such as wetlands, channels etc. Figure 2.8 is a diagrammatic explanation taken from the document. This strategy/system will be adapted into the dissertation’s framework.

Critique

Unlike the MSDF, this document is more specific in terms of identifying specific programs that can be applied to the mine residue areas. Further, these programs are a good fit for a more environmentally centred approach. There is more attention paid to the spatial legacy of apartheid and discussion of various ways to address this. This is also the only document that discusses a possible link to Soweto.

Primrose Precinct Draft Plan

This document was drafted as a means to plan and guide future development of the precinct. As so with the Ekurhuleni MSDF, the main principles are taken from SPLUMA. It continues on from the MSDFs vision of the precinct as one of urban development and mixed use.

It is presented through the lens of Sustainable Urbanism (Fig. 2.9). Of its 7 points, Productive Systems, Green Structure, Social Inclusivity, and Sustainable Services are particularly noted for this dissertation. A number of proposals have

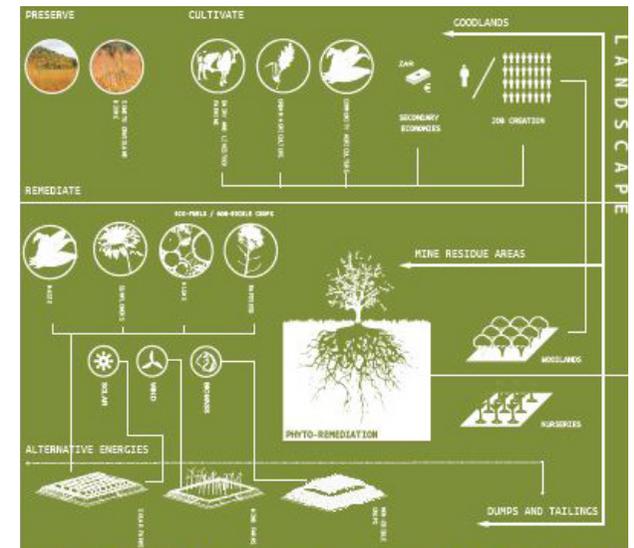


Figure 2.8 Landscape strategies proposed for Ekurhuleni Mining Belt (IYER 2018)



Figure 2.9 Sustainable Urbanism 7 points (Author 2018)

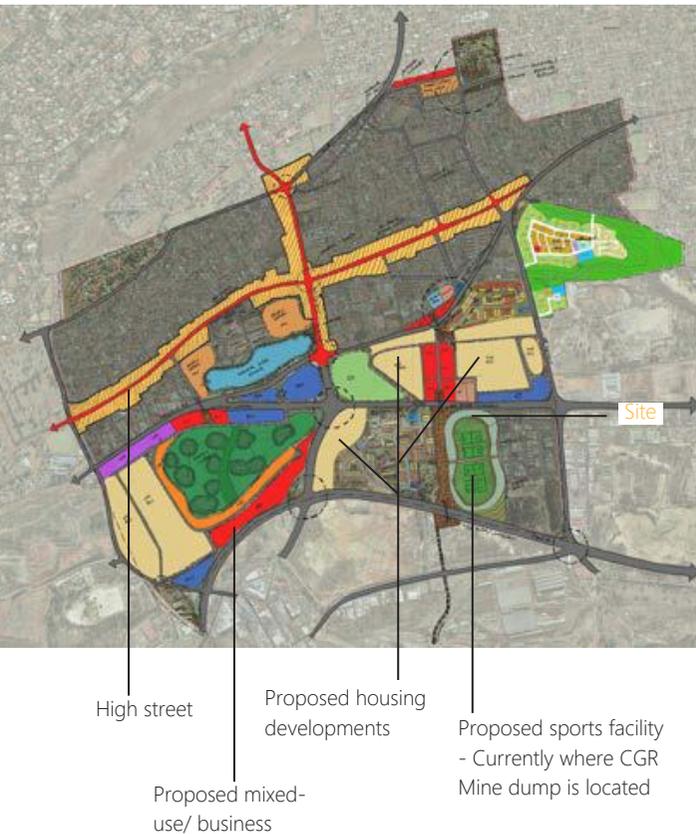


Figure 2.10 Primrose Conceptual Vision Framework (IYER 2018)

been identified and thus selected to be included into the dissertation's framework;

- Restoration and enhancement of natural functioning systems
- Green space, ecological space, productive green space, high performance buildings
- Urban environments that address needs of all, particularly those with limited means

Development proposals - Figure 2.10

The Primrose Precinct Draft Plan acknowledges a need for residential development as a response to the amount of informal settlements occurring. It also proposes industrial, open space and business developments. Specifically to do with the site; the informal settlement (Makause) it is situated across from is proposed to receive 4230 housing units. This development is to be on the direct west of the site.

The document proposes the Makause informal settlement to be formalized, with the aid of 2 housing projects; one which will be on the land immediately left of the site, the other to be north of the settlement. These projects will have supporting buildings/functions such as a church, community facility, pre-schools, businesses, and open public space. The intention to add residential developments continues towards a north-east portion, above the current Makause location. Most of the lower part is proposed to be mixed-use or housing.

Crown Gold Recoveries (CGR) mine dump is to become a sports facility, accompanied by a 'social facility' (in brown). The portion across Main Reef road is dedicated to businesses, accompanied by mixed-use developments (which will be where Makause currently is).

Critique

Developing formal housing and a sports precinct over an area that hosts a number of informal settlements does not fully resolve issues currently faced by these communities, nor does it offer innovative ways to grow individuals or sustain them overtime. It assumes a new or different type of resident that would not be faced with issues meeting basic daily needs as of those from Makause or any other informal settlement. The proposal appears to skip a primary level (enablement, basic needs etc.) and instead provides its end-goal, without physical plans on how to get there.

There is no apparent link to place, no thought applied to making meaningful reference to its historical development. There is a total wipe out and rebuild approach, which misses an opportunity to carry the remnants of this place along with its people into a newer and time-relevant precinct.

EXISTING FRAMEWORK	BASE	AIM/OBJECTIVE	PROPOSAL	DEVELOPMENT PROPOSAL	CRITIQUE
Ekurhuleni MSDF	2013 Spatial Planning and Land Use Management Act (SPLUMA), Ekurhuleni Growth and Development Strategy 2055	Spatial Justice, Spatial sustainability, Efficiency, Spatial resilience, and Good administration, Sustainable City by 2055	<ul style="list-style-type: none"> Address past spatial and other development imbalances Access to and use of land by disadvantaged communities Open space and biodiversity Civic facilities Employment Urban expansion 	<ul style="list-style-type: none"> Reclamation/ rehabilitation of mine dumps upgrade, formalize or relocation of informal settlements Mixed land use 	Vague and non-specific
Ekurhuleni Mining Belt Strategic Assessment		To assess the potential of the land covered by the mining belt	<ul style="list-style-type: none"> Integration of areas affected by former/current mining activities Job creation Dealing with AMD Use of mining belt for the expansion of the Johannesburg inner city 	<ul style="list-style-type: none"> New road linkages and infrastructure Rehabilitation of degraded land Phytoremediation with woodlands and nurseries Dumps to become spaces for alternative energies such as solar, wind and/or biomass. AMD - wetlands, channels etc. 	Proposals specific and in line with more environmentally centred approach
Primrose Precinct Draft Plan	SPLUMA, Sustainable Urbanism	To guide future development		<ul style="list-style-type: none"> residential development industrial, open space and business developments Formalize Makause CGR Mine – sports precinct 	Proposes programs that do not address immediate needs of poor communities, non-innovative solution to the life of the place, seems tabula-rasa

Figure 2.7 Summary of existing frameworks (Author 2018)

EXISTING FRAMEWORK	TO BE ADAPTED INTO DISSERTATION'S FRAMEWORK
Ekurhuleni MSDF	<p>Concept of Spatial Justice – “improved access to and use of land by disadvantaged communities and persons.”</p> <p>Community facilities</p> <p>Agriculture as income generator</p>
Ekurhuleni Mining Belt Strategic Assessment	<p>Re-integration of areas affected by former mining activities</p> <p>Rehabilitation of degraded land</p> <p>Remediate mine residue areas – Phytoremediation, Woodlands, Nurseries, Turn tailings sites into spaces for alternative energies</p>
Primrose Precinct Draft Plan	<p>Ecological space, productive green space, green space</p> <p>Urban environments that address needs of particularly those with limited means</p> <p>Industrial, open space and business developments</p> <p>Formalizing Makause</p>

Figure 2.11 (Author 2018)
From existing frameworks to dissertation's framework

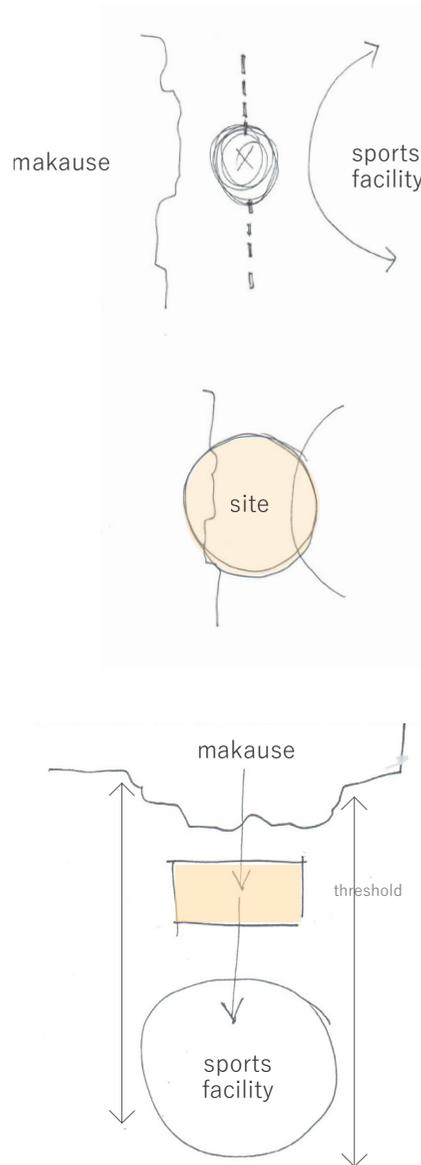


Figure 2.12 Diagram illustrating how the site becomes a physical merger (Author 2018)

Conclusion and way forward

The Ekurhuleni Mining Belt Strategic Assessment proposal is what suits this project best. Although the Primrose Precinct Draft Plan does not fully meet the needs of the existing community, re-visions a slightly different community for the precinct, and proposes green spaces that are more for focussed on public use, rather than the natural environment; some aspects will be adapted. The intention is to combine the ideas from the existing framework and merge them into a framework that will support the proposal on site.

Figure 2.11 shows all points from the three discussed existing frameworks that will be adapted into this dissertation's framework. The framework accepts the proposal of a sports facility replacing the CGR mine dump. However, this dissertation uses the site as a means to get to arrive at that point (missing link discussed in earlier critique). The site will then be used as a figurative mediator, merger, and bridge between of the Makause community's disadvantaged state and a future improved state, between current lack of opportunities and a future of more opportunities, between poverty and advantage (from seeking basic daily needs, to enjoying sports and recreation). – Fig. 2.12

PROPOSED FRAMEWORK

As mentioned, the framework adapts points from the Ekurhuleni MSDF, the Ekurhuleni Mining Belt Strategic Assessment, and the Primrose Precinct Draft Plan (Fig. 2.11). It is phased to occur overtime. It proposes that all the former mines be re-integrated into the urban fabric (Fig. 2.13) through socio-ecological, green-industrial, civic, and housing projects/programs.

It anticipates the growth of the informal settlements (e.g. Fig. 2.14) and proposes that they be formalized, and progressively use their surrounding mine dumps (Fig. 2.13) as a source of land for environmentally-focused programs, such as woodlots, bio-fuel, and agriculture (which would help to economically enable), as well as recreational green spaces such as sports facilities and open public spaces. These programs become the bridge between the people residing within the communities and the land area covered by the mine tailings, as well as a future improved state.

Key civic functional buildings/programs such as clinics, schools, and community halls are also proposed, along with a responsive road/transit network, which would link to urban centres and the greater precinct (Fig. 2.15).

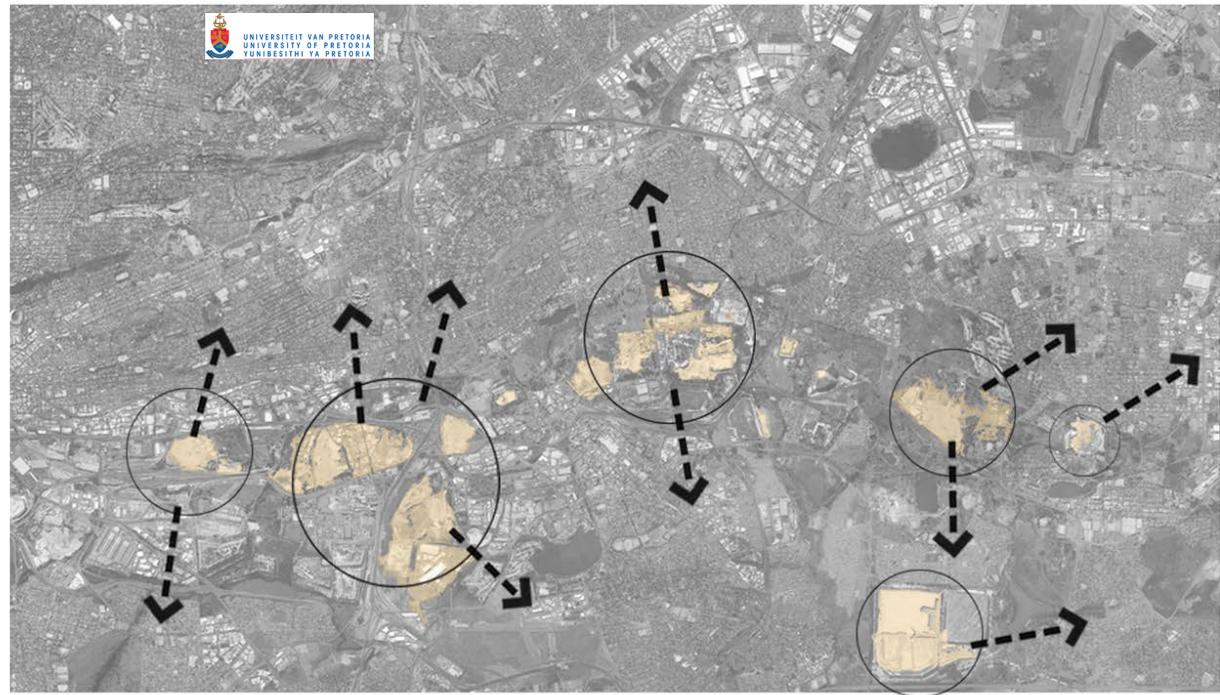


Figure 2.13 Re-integration of mines into Germiston urban fabric (Author 2018)



Figure 2.14 Anticipated growth and expansion of informal settlements (deep red) into currently vacant land (faded red) (Author 2018)

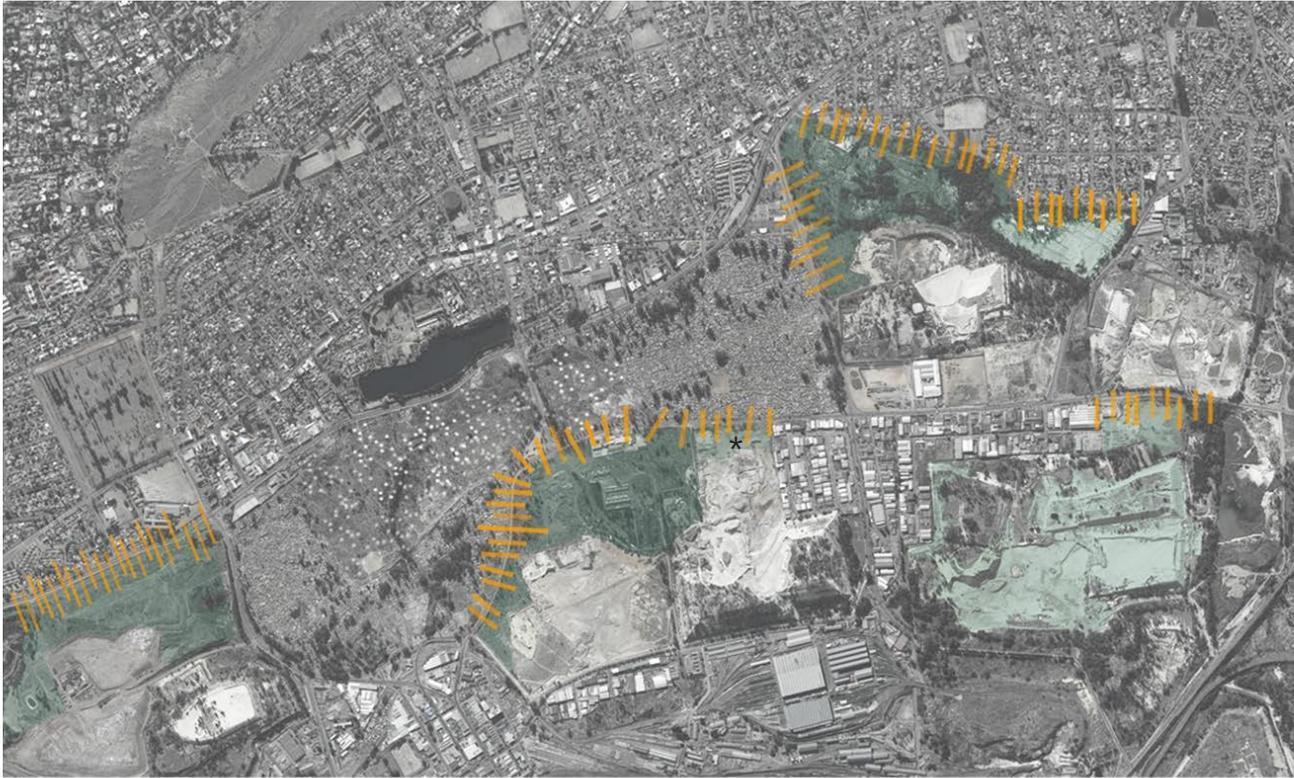


Figure 2.15 (Author 2018)

Progressive access to mine residue areas with by incorporating socio-ecological systems that address social and environmental needs. Programs may be agriculture, open public space, plant nurseries etc.



Figure 2.16 (Author 2018)

Infrastructure that establishes and strengthens nodes, connections to greater Germiston area, improves legibility, circulation, access, (achieved through improved road and sidewalk conditions, public transit stops, traffic control, street landscaping, signage) - in orange
Civic functions/community facilities, programs that help catalyze and thereafter support each new introduced program (skills centers, community halls, libraries, clinics, schools, lecture facilities etc)



- Civic/Community
- Industrial
- Business, Mixed-use

Figure 2.17 (Author 2018)
Industrial and economic development, as well as housing developments. A number of programs assigned to former mine sites. These programs feed off each other and as a result work as a whole to create a green, resilient precinct.

SITE ANALYSIS

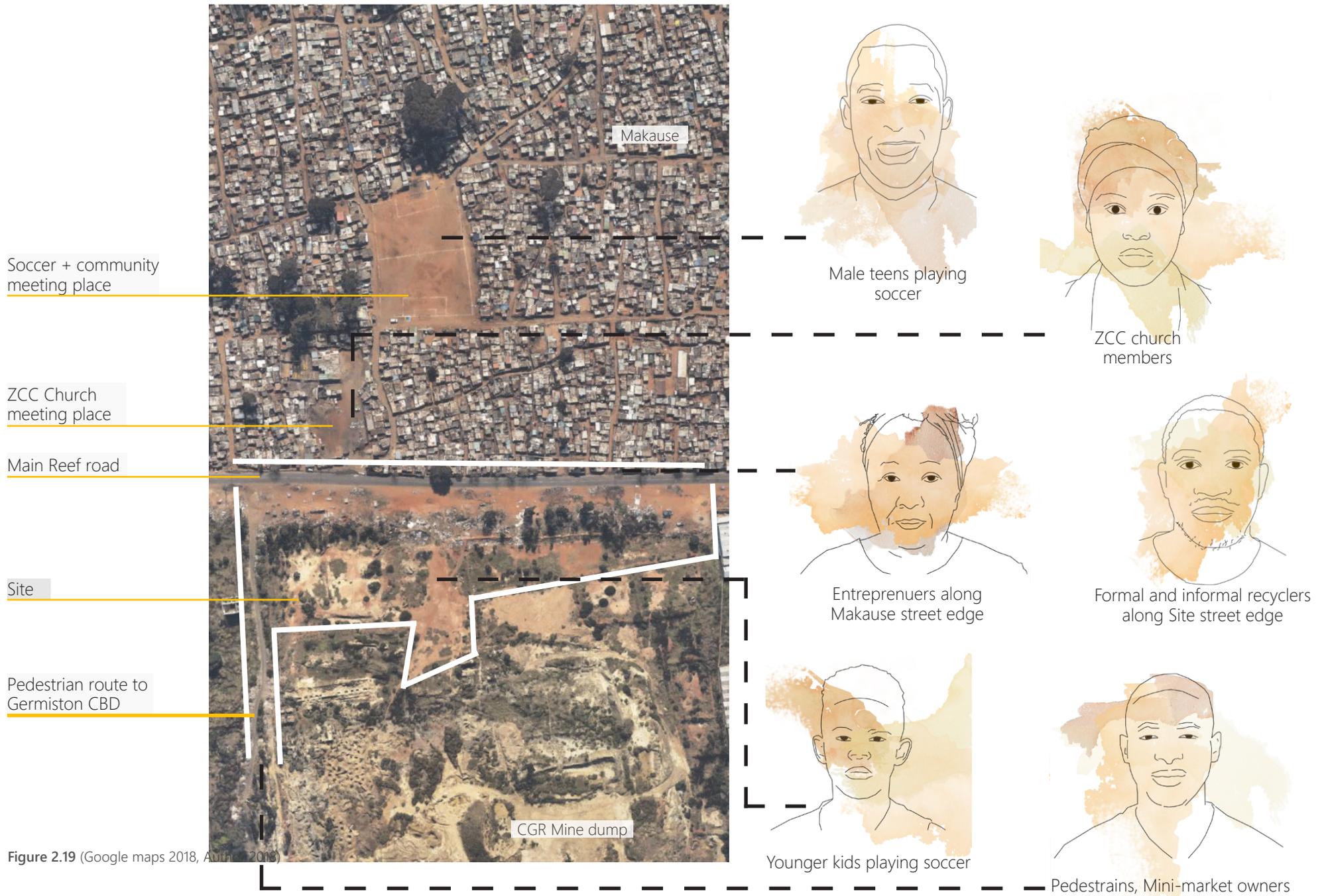


Figure 2.19 (Google maps 2018, Author 2018)

Makause residents

Due to ethical clearance constraints, a dissertation conducted on this community (Ngonyama, 2013) is used in order to gain knowledge and perspective on the state of the settlement. It reveals first-hand details that give an idea of the daily challenges that residents face.

In the introduction; it brings forward the point that many members of the community, although often lacking access to proper housing, food, safety, and employment, choose to stay in the settlement due to the fact that it is closely located to job opportunities and amenities. Further, some residents have lived in Makause for “many years; thus social capital exists in the community”.

It also relates the establishment of the settlement; initially as a temporary place for former miners in the 1980s. After apartheid, the settlement expanded.

Through a series of interviews, Ngonyama found a common occurrence of the reliance on social grants as a source of income and additionally that many do not have stable jobs. Monthly incomes of residents are meagre, levels of scholar education are often incomplete, or when completed to matric or college level; the people do not manage to get jobs.

A resident is quoted: “On daily basis we experience poverty, we eat poverty, we smell poverty, you go outside you see poverty, people die because of poverty and poverty is everywhere in Makause”.



School students



Employed commuters



Elderly



Young children



Unemployed mothers



Illegal miners

Figure 2.20 (Author 2018)



Figure 2.23 (Author 2018)
ZCC Church meeting place



Figure 2.25
(Author 2018)
Along Main Reef rd



Figure 2.21 (Author 2018)
Independent waste-reclaiming
as a source of income



Figure 2.22 (Author 2018)
Tuckshops, Spaza shops, Food-selling as a source of income



Figure 2.24 (Author 2018)
Madzibaba religious members
worshipping in open field



Figure 2.26 (MapAble 2018)
Aerial covering Makause, CGR Mine dump,
Primrose.



Figure 2.27 (Author 2018)
Current economic activities occurring on site - Makeshift markets, Wood-work, Furniture recycling and selling



Figure 2.28 (Author 2018)
Small informal agricultural lot



Figure 2.30 (Author 2018)
Waste-reclaimers store recycling material in makeshift enclosure for easy access to official recycling trucks moving and collecting along Main Reef rd.



Figure 2.29 (Author 2018)
Evident need for safe, clean open space for recreation



Figure 2.31 (Author 2018)
Pedestrians use throughfare to walk to Germiston CBD. Rubble continues all the way until CGR mine dump

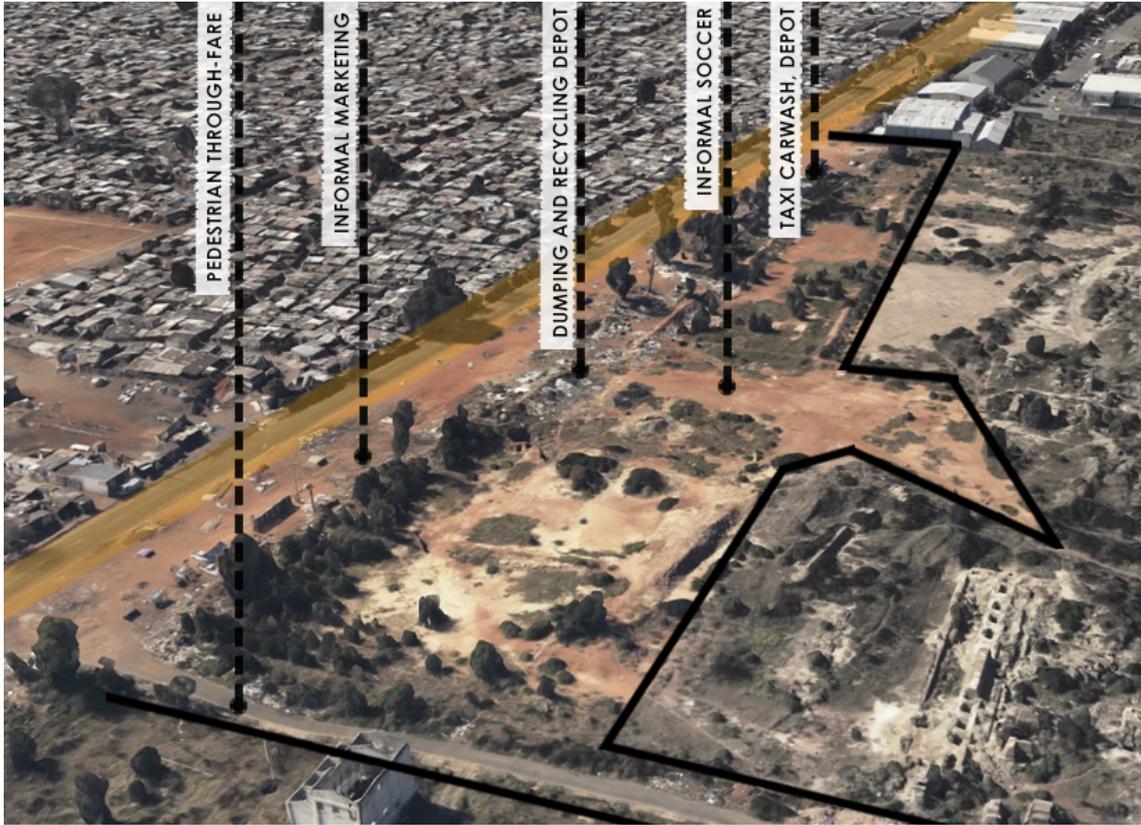


Figure 2.32 Areas of activities on site (Author 2018)



Figure 2.33 Panorama of site showing some current activities (Author 2018)



Figure 2.34 (Google maps 2018)



Figure 2.35 Panorama showing opposite side of site (Author 2018)

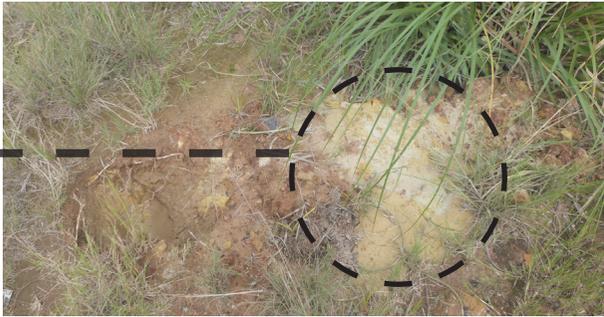


Figure 2.36 (Author 2018)
Sandy soils. Yellow colour indicates presence of toxins; typically cyanide and other metals that result from mining activities



Figure 2.38 (Author 2018)
Soil layer eroded and degraded through human activities



Figure 2.37 Current vegetative state of site (Google maps, Author 2018)

Eroded and degraded soil layer throughout site

Invasive weeds

Eucalyptus tree species

Figure 2.39 (Arch GIS, Author 2018)
Fall on site

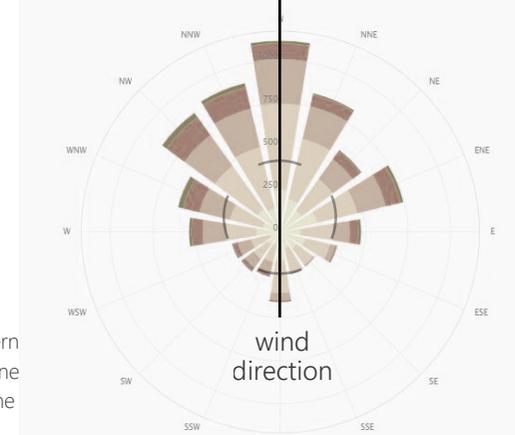
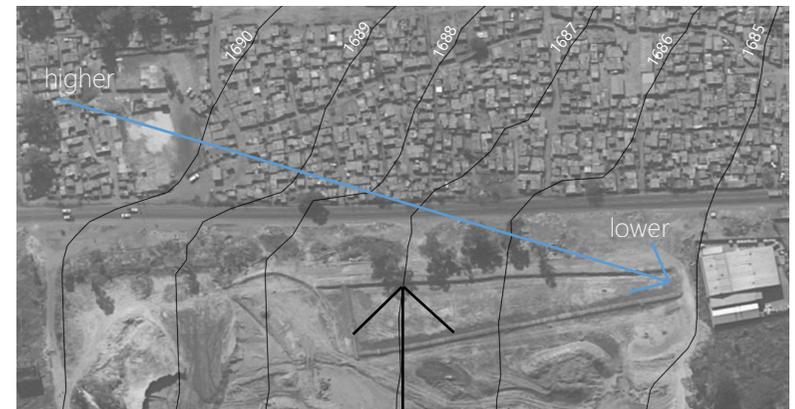
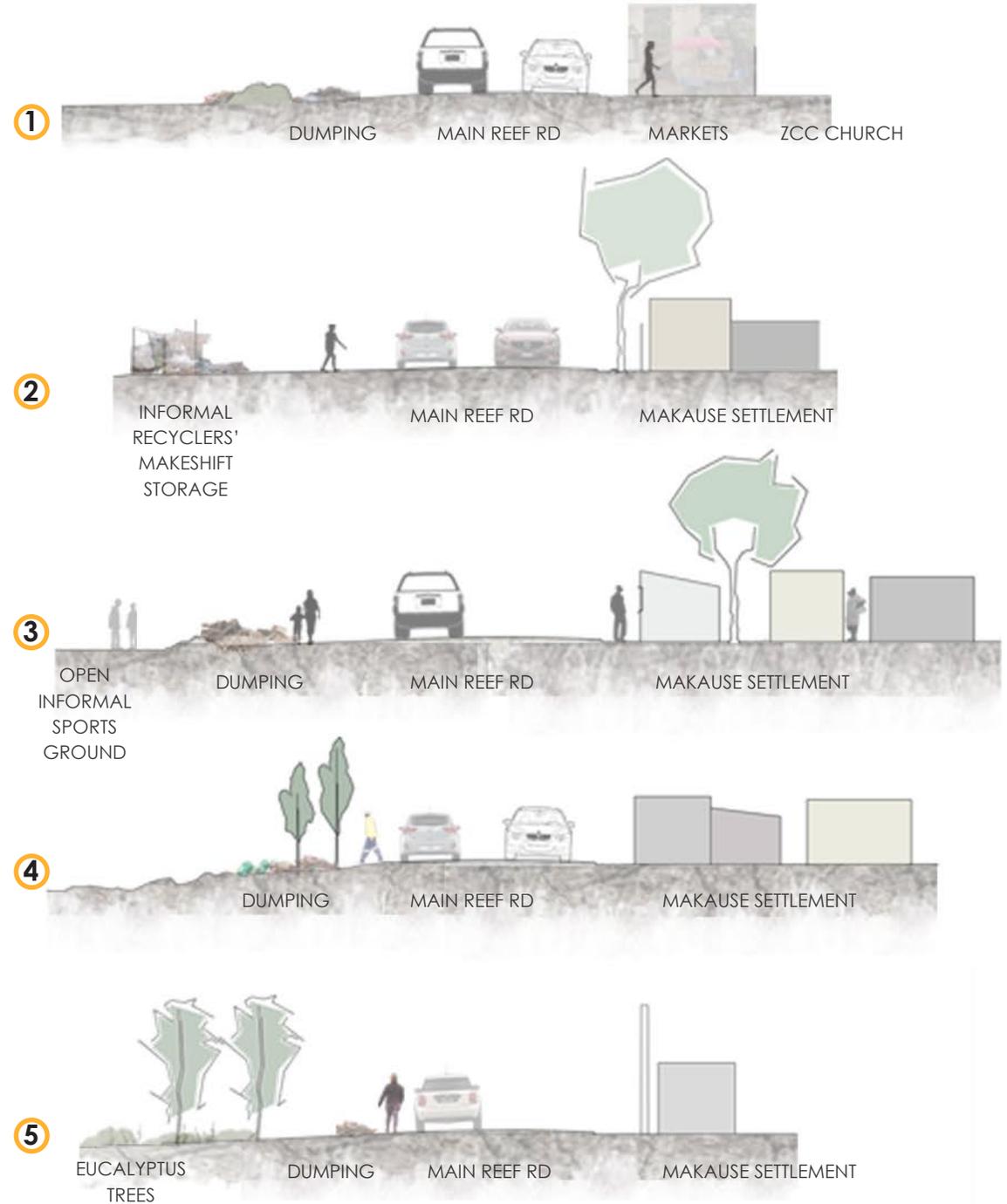


Figure 2.40 (meteoblue.com 2018)
Wind flows predominantly in a northern direction, meaning toxic dust from mine dump is constantly moving towards the settlement



Figure 2.41 (Author)
Street sections from site to settlement





STRENGTHS | Site is located along a main road which connects it to the greater area. There are current activities that give an indication of the community's sense of place, needs, and people.



WEAKNESSES | The main road may restrict movement between the community and the site. The mine is being rehabilitated. The process restricts access to the area it covers.

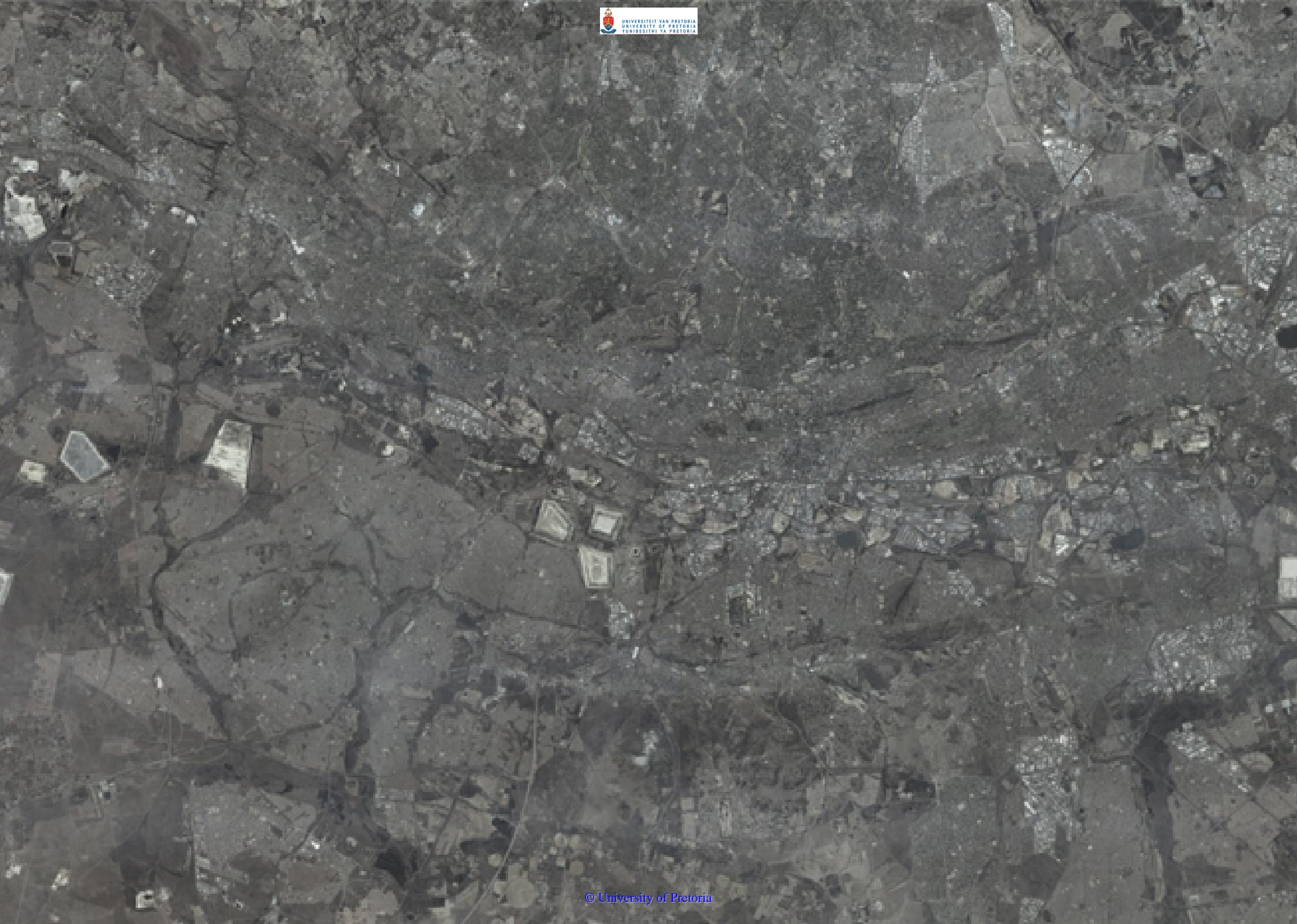


OPPORTUNITIES | To stitch/merge the community and the land together.



THREATS | Land tenure - the community is on private land and may be relocated any time. Future use of the rehabilitated mine dump might not suit the future established site.

Figure 2.42 (Author) SWOT summary



03

THEORY

REGENERATIVE DEVELOPMENT AND DESIGN
JUSTICE

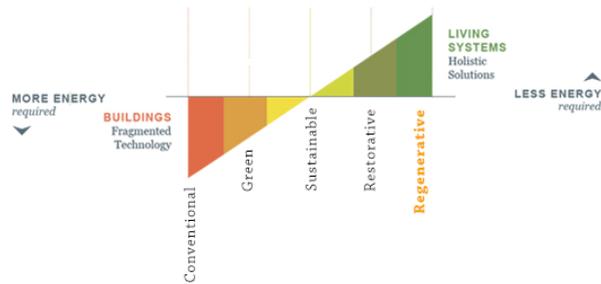


Figure 3.1 Regenerative theory trajectory (propublicobono.org 2018)

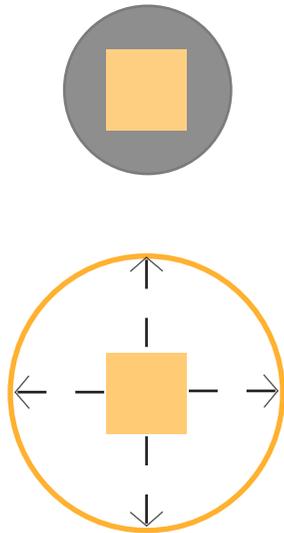


Figure 3.2 (Author 2018)

SCENARIO

The rapidly intensifying global environmental crises of the 21st century have led to an increase in referral to sustainable practices and principles within the built environment. Although the concept of sustainability is evolving, it is currently understood as the aim for resource efficiency, and minimal or neutral environmental impact (Mang and Reed, 2018:9).

However, the current goal of sustainable design is not enough. Simply reducing environmental impact or using resources efficiently does not fully address the magnitude of the issues posed by the global environmental crises. It is clear that the built environment needs to aim further than just sustainability (Fig. 3.1). Jenkin and Zari (Mang and Reed, 2018:9) state the need to aim for “net positive environmental benefits for the living world”. This means design that does not function for its benefit alone, but that develops and contributes to the greater natural environment (Fig 3.2).

Regenerative Design is defined as: “a system of technologies and strategies... that generates designs to regenerate rather than deplete underlying life support systems and resources within socio-ecological wholes” (Mang and Reed, 2011: 2). Regenerative theories can therefore be seen as an extension of sustainability; where the approach is much more comprehensive and integrated. Whole-systems thinking; a holistic understanding of social, ecological, environmental, and other related systems opens up avenues of explorations of the reversal of

degeneration. This approach is aimed towards the active regeneration of both human and natural systems.

How can a landscape design intervention develop a system of regeneration? How can this system be structured so as to allow for eventual self-evolution? Further; how can the system grow from and create a net-positive environment?

HISTORY OF REGENERATIVE THEORIES - Fig. 3.3

The presented problem; that of a negative state of the environment, occurring alongside a human community, although now more prevalent on a global scale; is not a new occurrence. The early 20th century saw the effects of overcrowded, unhealthy and deteriorated environments of many towns that had developed within the Industrial Revolution.

The Garden City Movement; rooted in Ebenezer Howard’s Garden Cities of To-morrow was a solution presented as an urban plan and one of the earliest spatial manifestations of the idea of “ecological thinking applied to human settlement” (Mang and Reed, 2011: 3). Garden Cities were designed with the intention of connecting people back with nature, an opposition from the industrial town environment (PlanningTank, 2018). Here; the model was a utopian ideal of the merged benefits experienced in a ‘town’ environment and those experienced within a ‘country’ environment (Fig. 3.4).

Ecological thinking, and its application on human settlements grows from a whole-systems

approach; which can be traced back to the works of biologists Patrick Geddes and Arthur Tansley (early 20th century), who both understood various entities as interlinked and united by system; e.g. the city as a living organism, or organisms and their environments as one whole system (Mang and Reed, 2011: 3, 4). If a human community is understood to be one interlinked system with its physical environment; it leads to the conclusion that one cannot establish itself from the other. A human community cannot successfully thrive independent of a complimentary natural community. Further, that complimentary natural community cannot thrive without positive input from the human.

Mathematician Jon Bennett's pragmatic approach to whole-systems thinking ^[1] was adapted by theorist Charles Krone, who also developed systemic frameworks (in the 1960s-70s); his being directed towards the potential of regenerative capacity within systems (Mang and Reed, 2011:5). This link between Bennett's theories and Krone's resultant framework emphasizes the need to gain a deep understanding of a given system and from there; develop its capacity to regenerate.

It should be noted that neither Krone, nor Bennett, nor Geddes and Tansley were architects. Hence their theories were not fully understood/applied to spatial design. However, improving from the earlier mentioned Ebenezer Howard, Ian McHarg, a landscape architect was able to further the application of ecological thinking on human settlement. His book Design

with Nature, a seminal collection for both the field of landscape architecture, and regenerative theories; presented an ecological view on urban landscape design; urban planning based on an understanding of natural systems. Ecological sustainability^[2] is, according to academics within the regenerative field; the foundation of regenerative development and design.

Another iteration of ecological thinking with a design implication that was developed was the combination of human and food production systems that imitate natural ecological communities; or in a simple term: Permaculture. This man-made ecosystem was encouraged to maximize self-sufficiency and showed the possibilities of meeting human needs without depleting natural resources (Mang and Reed, 2011:5). Permaculture was the first ecological design iteration to introduce regenerative capacity as a performance measure within the built environment. This would mean an evolution of human and natural systems; where as mentioned earlier; one compliments and thrives through the other and thus functions as an integrated system.

There then comes the question of the success and durability of such wholly integrated systems. If such a co-evolving system were to be developed and allowed to function, how long would it last? The question arises due to an awareness of the voltaic nature of human systems. What guarantees a long-term participation from the human component of a system? John Tillman Lyle's book Design

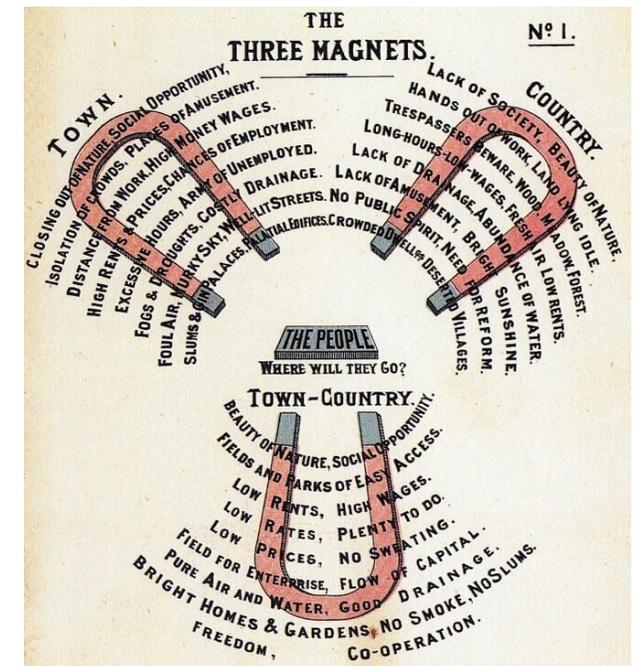
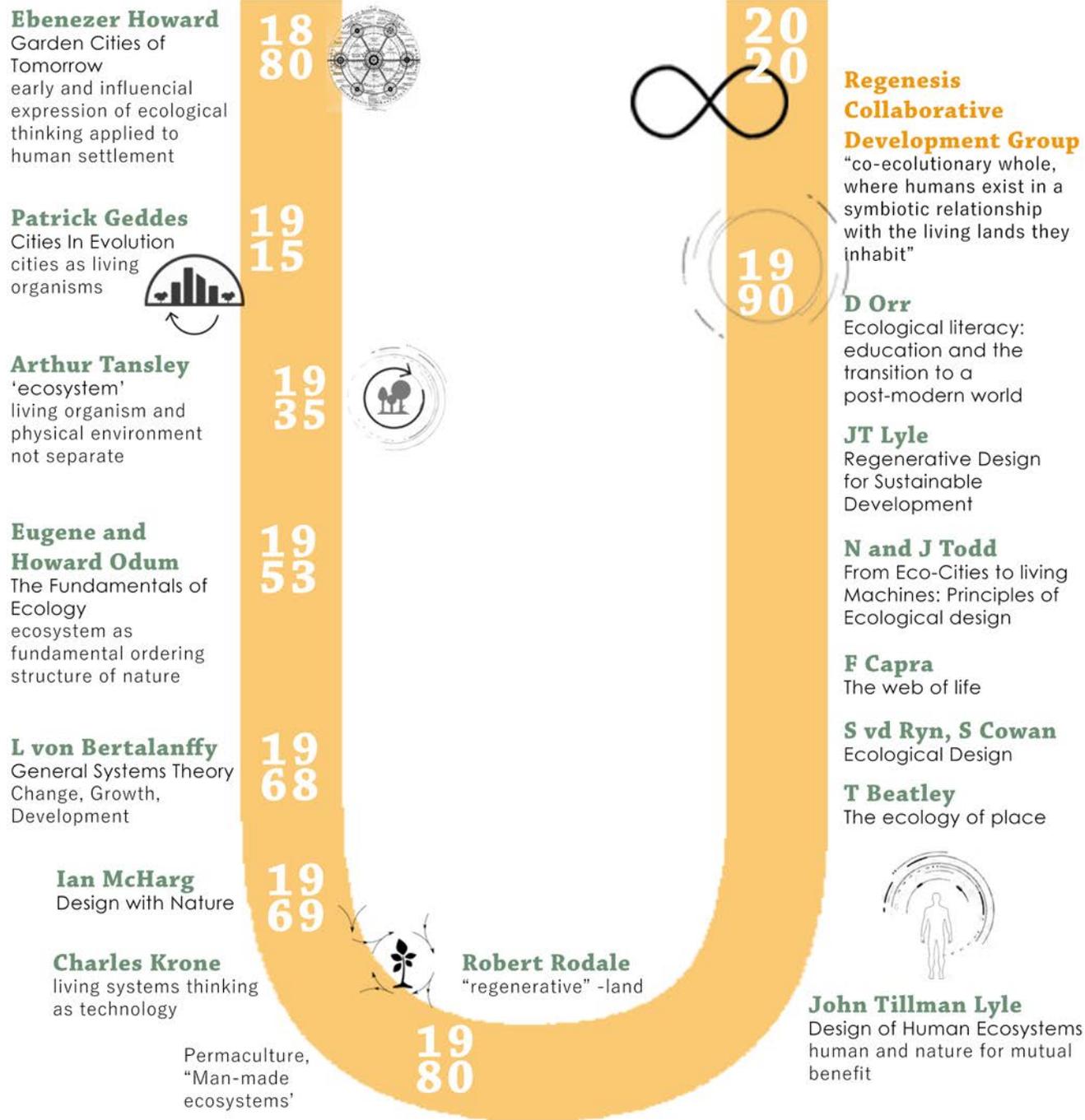


Figure 3.4 Garden City Movement (planningtank.com 2018)

[1]- Bennett developed a discipline of systemic frameworks that were used to decompartmentalize and understand wholes which consisted of participant human communities (Mang and Reed, 2011:5). This field developed the understanding of systems as "insights into degrees of organisation" (Blake, n.d.).

[2]- Ecological sustainability: a biocentric school of sustainability thinking that, based on ecology and living systems principles, focuses on the capacity of ecosystems to maintain their essential functions and processes, and retain their biodiversity in full measure over the long-term"; contrasts with technological sustainability based on technical and engineering approaches to sustainability (Mang and Reed, 2011:5).



of Human Ecosystems (1984) touched on this theme. He argued that a designer's understanding of ecological systems needed to be linked to human values as a means to increase the durability of the system proposed (Mang and Reed, 2011:5). This proves true in that if an intricate socio-ecological system is developed; attaching parts to human values could increase its chance of long-term success.

Ecoliteracy, a term that came about in the 90s describes the ability to understand the workings and principles of natural systems (McBride et al., 2013). Within the argument of this dissertation; the term is further understood as a tool that can be used to help expand on the human component of any given socio-ecological system, which as mentioned would increase the success and durability of such a system.

Some academics within the regenerative field however, believed ecological sustainability practices were not addressing the primary causes of environmental problems; which they believe to be cultural and psychological. They believed environmental problems to be a result of the fractured relationship between the human and the natural. Lyle's works had started to hint at this need for a new way of thinking, of which the Regenesis Collaborative Development Group developed further as a shift in human thinking; from the current view of being a separate entity from nature to one of being symbiotically linked to the inhabited land. This group went on to develop these regenerative theories to present day; on which the term Regenerative

Figure 3.3 (Author 2018)

Development and Design is founded. This theory, led by this group of academics will be the main source of research at which the dissertation departs.

THE APPLICATION

As the goal is to develop and establish a co-evolving landscape (of human and land), there is an obvious need to ensure that there is informed awareness within the human component. (The current state of the environment on a global scale and that found on the actual site shows evidence of a lack in knowledge or positive participation in regenerative efforts). The people forming part of the system to be proposed need to be fully conscious of the need to become one with the connected natural environment.

There needs to be a dedicated awareness of human health's dependence on eco-systemic health and vice versa, but further; for this combination to contribute to the health of the whole living world. This new way of thinking might be named "bio-becoming" (Mang and Reed, 2011:14); an elevation in one's perception of the individual and collective role within the living world. This new thinking plays key in this venture. It is extremely vital that human perception be altered if a regenerative system is to be introduced and become successful. This is where the earlier mentioned term eco-literacy becomes relevant; where design is used to teach and develop ecological competency to people. As the author of Ecological literacy: education

and the transition to a post-modern world (1992) David Orr put it; "Design inevitably instructs us about our relationships to nature and people that makes us more or less mindful and more or less ecologically competent. The ultimate object of design is not artifacts, buildings, or landscapes, but human minds." (Fig. 3.5)

It is from this point, that the project pursues eco-consciousness in human settlement.

DEEPER MEANING

How then, does a design intervention develop eco-consciousness in people? Further, how could such an intervention work on the specific site?

A starting point can be the alignment of systems to place-specific aspects. The distinct character of a place can be positively exploited in order to get it to be considered valuable by its people. People would need to feel that they are actively contributing to the health of place, they essentially need to partner with place. Their deep connection with place will drive the formation of an attachment to it, an attachment that can be relied on to develop into a form of stewardship. Therefore not only will the place be wholly integrated with the people, its lifetime has a greater chance at lasting as long as, and possibly longer than them.

Applying this specifically on site means tuning into its character; latching onto what is currently occurring on site (makeshift markets, informal recycling/waste reclaiming, various forms of group activities, and circulation). An

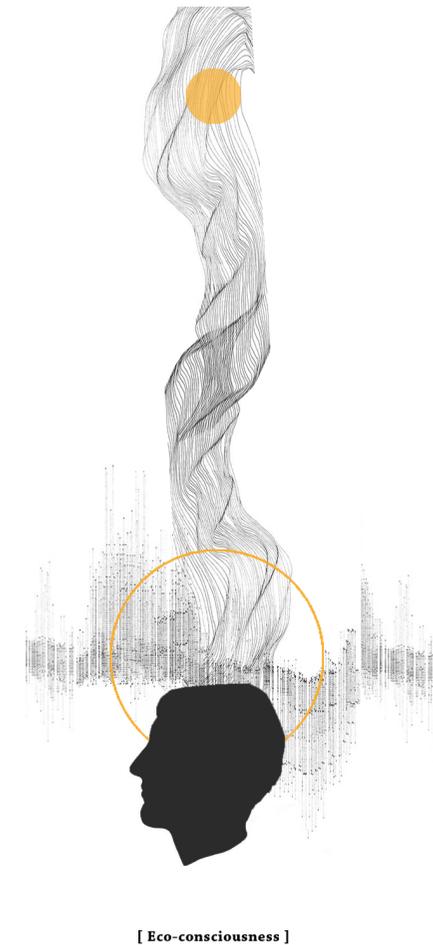


Figure 3.5 (Author 2018)

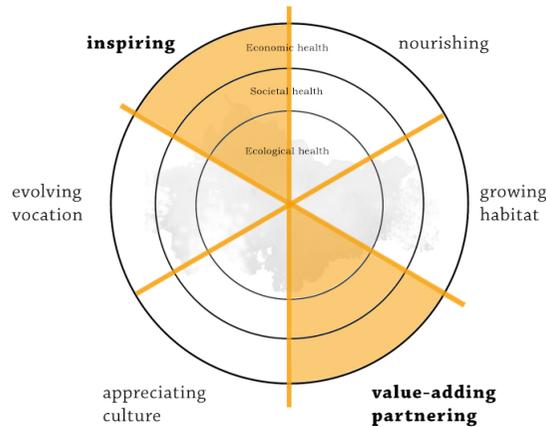


Figure 3.6 (Regenerative Collaborative Group 2011)

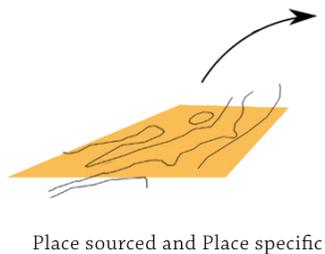


Figure 3.7 (Author 2018)

[3]- People, cultures, and as a result communities vary from one place to another. It can thus be assumed (from statistical analyses and observation) that the Makause settlement, a black and disadvantaged community would have a different combined inner landscape than that of another non-disadvantaged community.

understanding of why these activities take place specifically on this site has been interpreted as a need for outdoor, free space, a need to engage in activities that better the community's livelihood, and a need to connect to the rest of the precinct. If these identified needs are overlaid onto a program that directly bridges into an ecological process (or a process that involves a natural component of the site), their combination can mediate between the people and the place. The established acknowledgement and reliance of one on the other will be what creates a partnership which should over time result in a concerted effort of stewardship.

A further step could involve the expansion of this human connection to place. The design can be targeted towards growing an emotional resonance (Mang and Reed, 2011:21), a unique sentiment that triggers both a participatory response and a desire to foster and care for the environment. This sentiment can be attached to an individual's inner core, their internal programming. The idea of the 'inner landscape' is suggested by the Regenes Group as a connection point to the will one has to steward their environment.

An individual's inner landscape can be understood as his/her internal realm, a collection of emotions and relations to the outer world. It can combine themes infused in spirituality, beliefs, human nature etc. (Wilhoit, 2011). Already one can anticipate that the results of one community's collective inner landscape will be quite different to another's [3]. Hence this search

into the Makause informal settlement's collective inner landscape will definitely be place sourced and place specific; returning to the earlier mentioned primary step, which was to align a system to place specific aspects.

The last step is developing that above mentioned will; the sense of responsibility an individual or community would hold towards the place they inhabit. The Essential Living Processes framework, developed by the Regenes Group helps frame the means in which this can be practiced. Of the 6 aspects (Fig 3.6) presented, two (Inspire and Value-adding partnering) will be used. Inspire is defined as "fill with the urge or ability to do or feel something" or "create (a feeling, especially a positive one) in a person" and accompanied by words such as influence and generate (Inspire, n.d.) Value is defined as "the regard that something is held to deserve; the importance, worth, or usefulness of something" or "principles or standards of behavior; one's judgement of what is important in life", accompanied with words such as gain and significance (Value, n.d.)

For the design intervention to reach regenerative capacity, the ecological, societal and economic health of the place would need to be inspired and partnered through attachment to place-specific values. The proposed program needs to be one that fills people with the urge to contribute to the health of the(ir) place, to attach value to the(ir) place and its systems, to gain from these systems, and to alter their perceptions from their current state, to one that

is eco-conscious.

A benchmark has been set to guide the outcomes of the project in order to ensure it reaches its full regenerative potential. Four goals have been selected, namely; Place sourced and place specific, Evolutionary, Qualitative dimensions, and Focus on central processes enabled by physical structures (Fig 3.7).

In finer detail, the goals mean a place sourced intervention that goes beyond the current capacity of a regenerative system, but specifically reaches for improvement over time and through any changes in environmental conditions. An intervention that allows for reliance on the will of the people to sustain and care for it, and one that latches onto and expands on processes that are put in place by physical structures.

JUSTICE

The design will also serve to promote justice, responding to the main issue identified within the project; Environmental injustice. The proposal will need to address the forms of injustice that are evident on site, from the lack of tenureship (or perhaps just an intangible sense of ownership of land) and the result thereof, the degraded state of the site (beyond just a swift engineered clean-up) and its resultant effects on the sense of place, as well as the resultant restricted access to the full site, and the quality of the experience of any given individual walking past, through, or using the site.

Just spaces consider these factors and dignify their users. They display equality and fairly share benefits that would otherwise be exclusive to advantaged groups. They also allow for programs that address the direct needs of a community; even through simple considerations like provision of shade, seating and paths.

The book 'Architecture of Empowerment' (Serageldin, 1997) describes the fate of many poor, marginalized communities all around the world. It further offers ways in which architects can and should respond to such settings. Just architecture is humane, it is considerate, appropriate, and community inclusive. The book urges architects to design with a sensitive consideration for the poor by posing the question: Is it possible for architects to design in a way that increases the empowerment of people and communities?

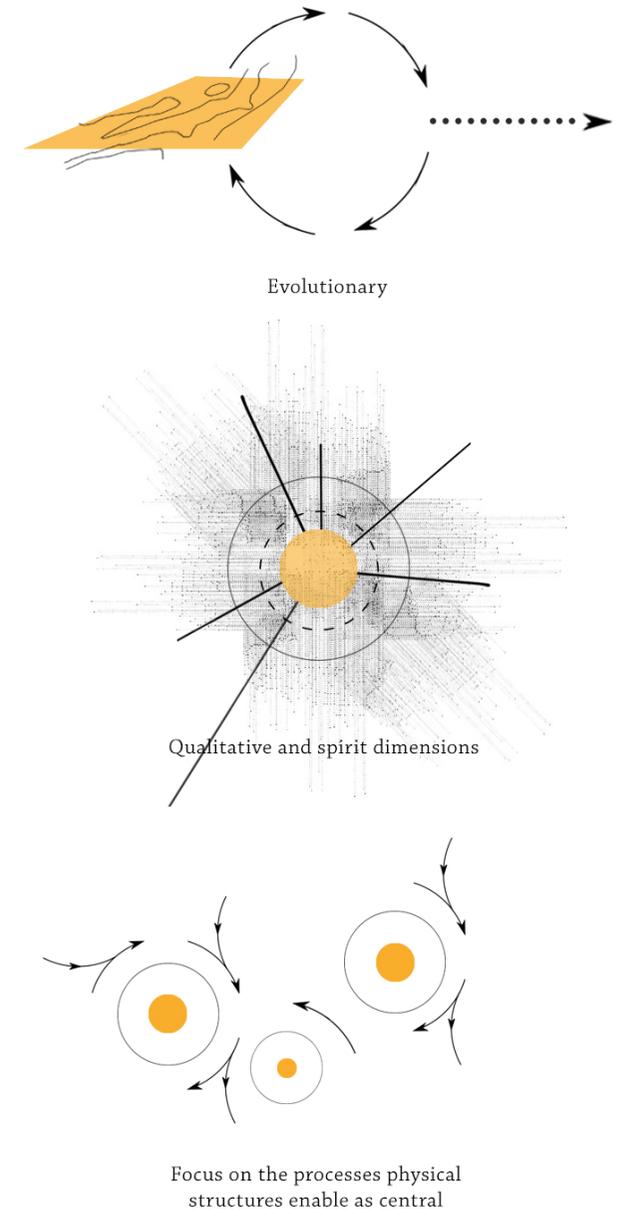


Figure 3.7 (Author 2018)

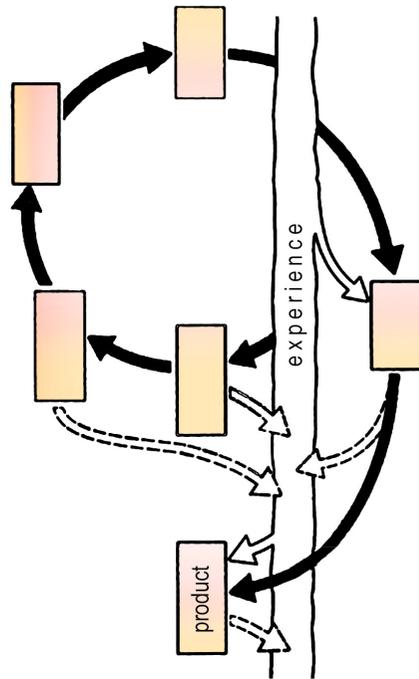


Figure 3.8 (Author 2018)

What is key in this type of architecture is successfully achieving freedom of the community to take ownership of the public space beyond immediate surrounds of the home. This will be done if there is a strong sense of community (based on a grown social capital that contributes to an improvement of well-being), where everyone is involved and has a role to play. Just architecture aims at making people feel part of the building and development process, where the experience lies in the process as opposed to only the final product (Fig 3.8). People must be allowed access to their surroundings; the platform on which their futures might unfold, and have control over that future.

CONCLUSION

Regenerative theories have not been fully explored within the built environment. The historical overview discussed earlier showed the development of this theory from other fields such as biology and science, with very few developments in landscape architecture. The Regenerative Collaborative Group speaks of a small, but nevertheless present growth of projects that employ this approach. This dissertation aims to contribute to this emergence, by investigating the possibilities of a design solution that is grounded in the Regenerative Development and Design approach.

The theme of environmental justice is linked to multiple discourses and has as a result; been widely discussed in other fields; such

as sociology, philosophy, politics, planning. Its multi-faceted nature thus makes it difficult to tackle merely from a landscape architectural lens. Admittedly, environmental, social and spatial injustice cannot be solved by landscape architecture alone. However; this predicament does not mean it is an impossible attempt. David Harvey, author of the book *Justice, Nature & the Geography of Difference* (2010) suggests tackling the processes that lead to the injustice, as a way to address environmental injustices. Despite this point, there remains a need for a spatial solution (a design) in that environmental justice embodies physical space and among other things, its relation to people. Landscape architecture is placed on the nexus of social and environmental issues, thus reinforcing the need to tackle this issue, however complex it may be.



04

CONCEPT

PROJECT INTENTIONS
PROJECT IDEAS
FINAL CONCEPT/SUMMARY



Figure 4.1 Concept vision (Author 2018)

PROJECT INTENTION

An imaginary scene (projected initially on assumptions, but later confirmed by literature) has been generated as the context in which the concept is born. It is an exaggeration of the current state of global environmental affairs; where people are in complete oblivion in terms of the strain the environment is under, primarily as a result of human impact. No one knows what each's role is in relation to the natural world. Destructive habits continue, resources continue to be depleted, man's impact on the earth gets worse, day by day. The idea of a mutually beneficial relationship between nature and man has never been tested. Rather, what is common is a fractured relationship, where one cannot harmonize with the other.

The concept is thus generated as a means to counteract the above scene. It offers a way to higher, deeper understanding of an individual's relationship to his environment, leading him from a dismal state of oblivion, to an enlightened state of being one with nature. The above scene, although exaggerated, is a reflection of real-world issues, some of which have been identified on site. The effects of destructive human habits are seen in the disturbed soil layer, the piles of rubble collecting along the site, the contaminants in the soil caused by years of extracting gold from the previously non-disturbed and healthy natural ridges of Gauteng.

The concept is then broken down into tangible and intangible aspects that will be used to guide the design. This will tie the theoretical argument

to the design development and proposal; by helping to generate ideas of program, and resultant design interventions.

The intangible

The intentions of the project are partly steered towards certain aspects that do not appear in a physical sense. These aspects are linked to things such as the inception of ideas, human experience or perception. For this project; the design aims to steer people towards ecological-consciousness. It works towards guiding a user to a state of awareness that may have not previously been entered, using an interchange between former engrained knowledge, and new introduced knowledge. It will play between the planes of what was formerly familiar, and what could and should be normal practice ^[1].

The intentions above can be compared to what is often termed as 'enlightenment' in religion, where there is some form of psychological progression from a lower, less awakened state, to a pinnacle in one's whole, a heightened state of understanding. For this project, the aim is to have this similar progression but in specific relation to people and their natural environment. A guided movement from mere consciousness of the natural environment, to an understanding of the need for a mutual relationship between human and nature, and thereafter the role of each in the larger ecological and global context.

The design should go beyond didactics, beyond merely teaching or informing, but influence,

move, or change the thoughts and actions of people exposed to it. It should conceive ideas within users that catalyze a chain reaction between external idea, internal thought and resultant external action (Fig. 6.2). Through conscious and subconscious thought, a user will learn to change habit and opinion.

The tangible

What is targeted here, is a physical manifestation of time, growth and change. This is formulated upon the understanding that the journey to an awakened state is not one that is quick to reach its destination. It would take time for the intended progression to be achieved. The design is to show evidence of change between the now, the then, and the there (Fig 6.3). It is to become a compilation of memory, vision, and revision; the tangible form of that layered development of space.

An example of this vision is the simple growth and interchange of trees overtime, with the resultant effect on individual spaces; from the specifically ordered and young premature forms in the initiation phase; to the organic, larger scale and established forms in later phases. As the trees and vegetation grow, the spaces they cover will evolve and take on different identities, and meet user needs in different ways.

[1] Normal practice should be actions such as responsible disposal of waste, having knowledge of the impact one's habits may have on the environment, taking care when using resources that are under threat such as water.

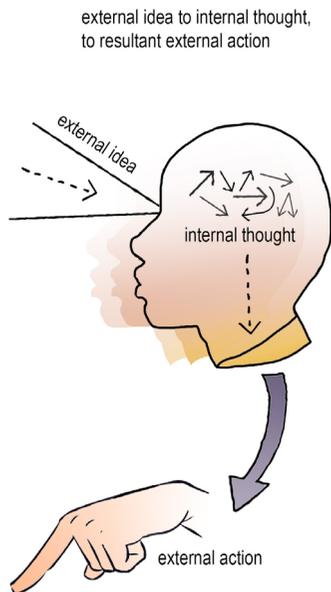


Figure 4.2 (Author 2018)

PROJECT IDEAS

As this project is to involve a remediation process, connects to a larger framework, and is to an extent dependent on the state of the adjacent CGR mine; the above introduced concept around growth and change overtime becomes possible. The development of the project over a number of years opens up various opportunities of exploration and programmatic responses.

Each response or exploration; is framed within the understanding that it will change over time. For example, an exploration of the planting design has led to it being ordered in a way that allows for it to change, but to an extent remain within the bounds of the original intention. Another example is that the spatial implications of phytoremediation (the grid ordering of trees, the cut tree stumps) are designed to leave traces that can continue into the future, even when the remediative function has reached its completion.

As these ideas were being developed, certain metaphors (or images came to mind that could help the ideas transition into specific applications on the project.



Figure 4.3 (Author 2018)

Layers

The first image projects a series of planes (be it ecological or social or economic) that are layered on top of each other to generate design, programs, and space.

Here; an overlay of ecological, social, economic,

and historic layers (see Fig. 8.4 in Chapter 8 and Fig. 5.5 in Chapter 5) is to take place in such a manner, that different types of users are in one way or another reached by the project intentions. This combination also allows for a richer and stronger potential in movement towards the goal. Ecological issues can reach a more manageable scope when coupled with social aspects. In turn, the social can be positively affected by the addition of an economic layer. And finally, having an awareness of the historical context, will add to a more holistic outcome.

Temporality and Permanence.

As with seasons, tides, moon cycles and day cycles; there is an interplay between temporality and permanence. Certain aspects are constant, never changing, while others come and go. As the nature of the project is to grow and as a result change overtime, some aspects will be in effect short-term. Their function may either be replaced, or fully seized, to make allowance for another. Some aspects of the design will be permanent, either in the sense that they were introduced from the very beginning and remain present through-out, or that from inception, they fulfill the very same function; constant.

FINAL CONCEPT/ SUMMARY

In more definitive terms, what will change are things that are not necessary for the whole lifetime of the project. These things include interventions placed for the purpose of phytoremediation, such as the resultant plant species, or programs introduced that would accompany the initiation of the entire project. These include agriculture and soil amelioration. What will come and go is the presence of vegetation, especially in the initiation phase. As specific phytoremediative plants reach full saturation, they will be removed and replaced with fresh ones, until toxins are successfully removed from the soil. This cyclical process will, although changing within itself, present a constant presence of vegetation. What is to remain permanent is the presence of a human component throughout the lifetime of the project. From initiation, the bringing together of people and the natural environment will be targeted; that relationship being further and further expanded on until eco-consciousness is reached.



Figure 4.4 Landscape as Remediator (Author 2018)



Figure 4.5 Landscape as Mediator (Author 2018)



Figure 4.6 Landscape as Experience (Author 2018)



05

PRECEDENT

HARMONY GOLD REHABILITATION PLAN
KOUNKUEY DESIGN INITIATIVE (KDI)
GREENPOP FOUNDATION
SAPPI KHULISA PROJECT
NAGELE
MICHEL DESVIGNE



Figure 5.1.1 KDI Kibera project (i2ud.org 2018)

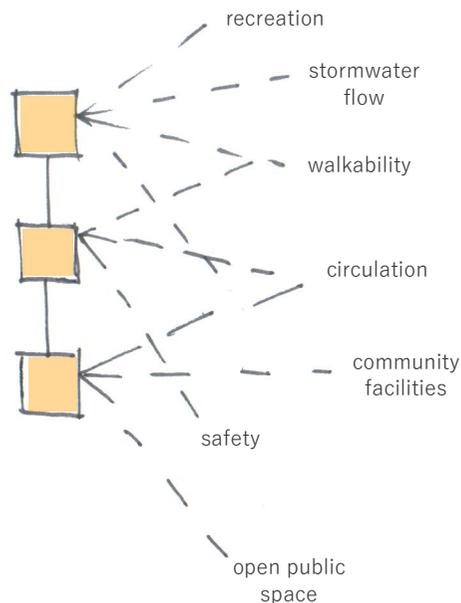


Figure 5.1.2 KDI precedent (Author 2018)
Simple interventions that cover wide array of needs.

The precedents considered were selected for a number of reasons. The intention was to find out how sites such as the one chosen for this dissertation are being rehabilitated, and thereafter find appropriate programs that speak to the overarching concept, but also meet the needs and intentions identified for the site (and project as a whole) ie. Programs that include remediation, economic activities, sealing of socio-ecological relationships, and green public space. As this project is not one that commonly occurs, some of the precedents are not architectural, and rather inform program or concept. The architectural precedents chosen (Nagele and MDP Projects), inform the design development. Both focus on trees as design tool.

HARMONY GOLD REHABILITATION PLAN (Promethium.co.za, n.d.)

The rehabilitation plan is developed in the context of defunct mines that remain inaccessible and unchanging over many years and therefore serves as an example of what can and is being done to resolve this issue in the local context.

Harmony Gold is a South African mining company that has come to realise that within the issue of climate change, merely rehabilitating mines to compliance with the MPRDA (Mineral and Petroleum Resources Development Act) is not enough. The company has as a result proposed a more improved, value-adding form of rehabilitating mined land. They have developed

a long-term rehabilitation strategy that either proposes that former mined land become carbon sinks (through mass planting of species such as Giant King Grass, Sorghum, and Sugar Beet which have high sequestration potential), or turns this land into sources of renewable energy (by planting energy crops that can be harvested and used as biogas that can replace the fossil fuels currently used by the company's metallurgical plants).

This proposal will not only transform mine dumps from hazardous sites into green spaces, it will change the legacy of breaking down the land for its resource to one of building it up for its resource. It also serves as a sustainable solution worth considering given the large amount of land in Gauteng that is covered by the mining belt. The proposal further anticipates job creation; an aspect of social and economic responsibility that can be included in projects such as these.

What is taken from this precedent and applied to the dissertation is the aspect of mass planting species and thereafter harvesting them for biogas that can be used as a bio-fuel.

KOUNKUEY DESIGN INITIATIVE (KDI)

A designing community development organization that partners with communities living in poverty. It acknowledges that poverty is not only economic, but social and environmental as well. As a result, it provides holistic solutions that inclusively tackle the multifaceted nature of poverty. The solutions are always well-inclusive

of the communities; they become the labour, the social capital, the implementers.

Kibera public space project (Kounkuey Design Initiative, 2014) – Transformation of an abandoned space in the slum environment of an informal settlement in Kenya to an activity hub of service, economy, amenity and recreation. It started from a community vision that the residents had for their environment. The result was simple interventions that cover a wide array of needs.

What is taken from this precedent is the idea of simple, yet design-guided interventions that are implemented by the community, that create spaces that meet a variety of needs. – Fig. 5.1.2

BEYOND ENTROPY ANGOLA (Archello, 2018)

A project proposed for the highly dense city of Angola. It simply proposed the mass planting of a common cane plant in open spaces around the city’s suburban buildings. The cane plant holds many useful properties; such as filtration of dirty water, fast growth, and carbon dioxide absorption; all of which addresses problems occurring in the overly dense city. The proposed spaces will become a new type of public space; a combination of garden, cleaner, and resource (the biomass is to be used for electricity).

This project is an example of a simple, yet powerful and innovative intervention. Not every spatial solution comes in the form of grandiose and stereotomic design; sometimes issues may

be solved independently by plants.

Fig. 5.2.2

GREENPOP FOUNDATION NPC (Greenpop, 2018)

This project is considered for its active efforts in fostering a sense of stewardship in people, as well as its contribution to the relationship between people and natural environment.

GreenPop is a non-profit organisation that initiates environmentally focussed projects in Sub-Saharan Africa. The aim is to address environmental issues such as climate change, conservation, or rapid urbanization through socially inclusive solutions. These solutions may be reforestation festivals (as in Platbos Reforest Fest 2017; a project involving the planting of 8000 trees in the southernmost forest in Africa (GreenPop, 2017)), or regeneration projects (as with the Eden Regeneration Project which was developed after the damage caused by the fires along the garden route in 2017. The project covers 5 themes: Urban Greening, Reforestation, Alien Clearing, Eco-Building, and Environmental Art).

This organisation functions through collaborations with other organizations or individuals who have the expertise to deal with environmental issues. However, beyond that; it actively involves people. It acknowledges the need to foster a sense of stewardship in society and to seal the relationship between humans and nature.



Figure 5.2.1 Beyond Entropy proposal (Archello 2018)

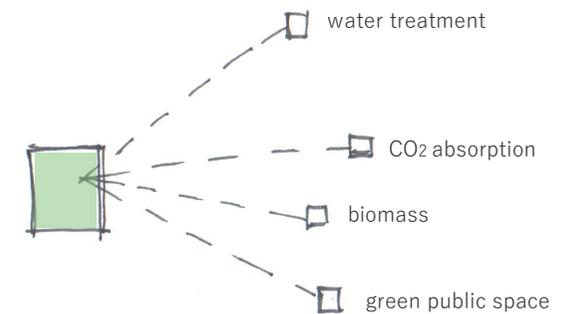


Figure 5.2.2 Entropy (Author 2018)
1 intervention - many solutions



Figure 5.3 GreenPop Reforest Fest (greenpop.org 2018)



Figure 5.4 Sappi Khulisa (SA Forestry Online 2018)

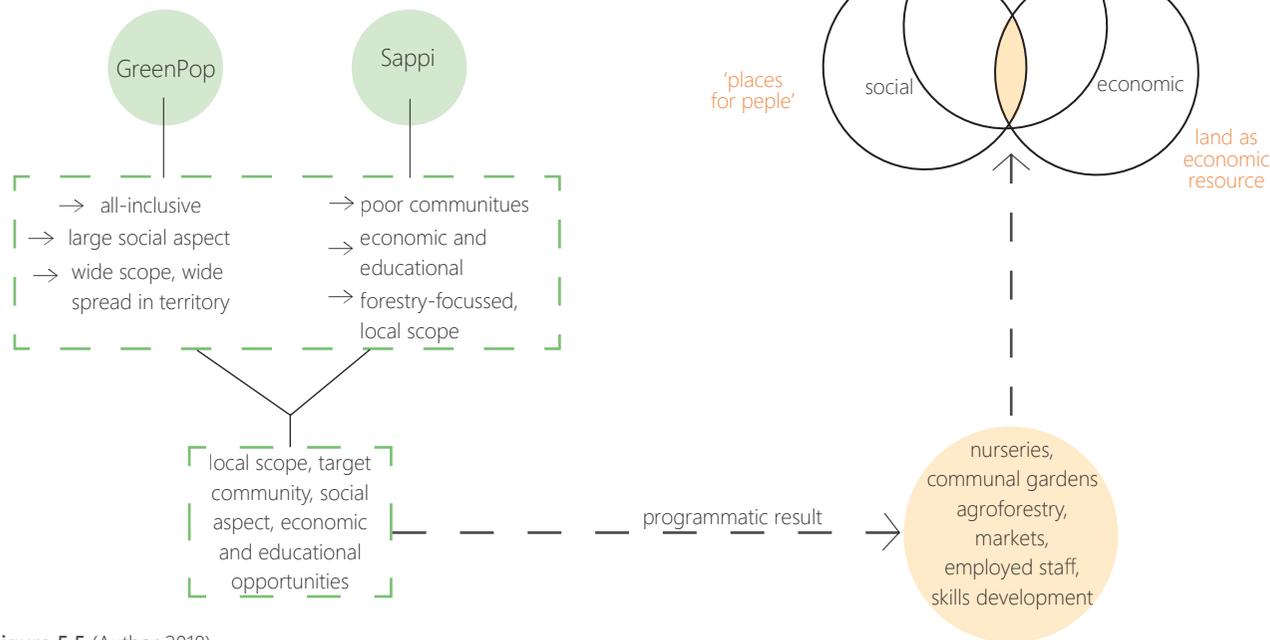


Figure 5.5 (Author 2018)
How principles taken from GreenPop and Sappi to programs to a design target/guide

SAPPI KHULISA (SA Forestry Online, 2018)

This project is a tree farming scheme that has been running since the 80s. The overall idea is to go beyond the target product (timber), and develop the people who grow the trees, be it farmers, or rural communities. The program offers skills training and actual resources that enable people to engage in the field. The goal is to educate and develop the people that form part of the labour force in forestation, to include smaller, less formal growers in the field, and to help ensure sustainable practise of sourcing from the land.

Other than the program, Sappi houses a high-tech nursery dedicated to developing and growing hybrid tree species for a mass future supply of timber. The nursery currently employs 180 staff and works towards a 2025 vision of a high quality variety of hardwoods.

The project is an example of the linking of land resources to human capital and an accompanying landscape program. This combination not only leads to economic opportunities, but becomes a way of sealing a human component to a natural one, and in effect establishing a socio-ecological mutualistic relationship, where one depends and benefits from the other.

NAGELE

The Dutch town of Nagele is an example of the use of trees as a design tool and space creator. The town is made up of a combination of wild,

to productive, to cultivated, to urban landscapes that are all tied together by different mass tree planting typological designs. The original designs were done by Aldo van Eyck (Gill, 2018).

Van Eyck strategically placed trees so as to have them serve as a means to relate people to their environment. The long life-span of the trees allowed the spaces they covered to change overtime; season to season, experience to experience. The trees contribute to a layering and overlapping of spaces, forming thresholds and transitions between the various larger landscapes.

He played with design principles and objects such as barriers, filters, contrasts, retreats, networks, enclosures, transparency, and articulation; all of which heightens the human experience. The article: The grove as an urban tree planting type: The case of Nagele (Gill, 2018) summarizes the design strategies as follows; framing and fragmentation of a whole; repetition of similar volumes; the relation of built forms to natural ones; and overlapping, layered geometries.

Much design inspiration and thought is taken from this example. Not only are the trees a form of a design, their combined presence in the town offer an alternative version of an urban environment. This example also inspires ideas for program, and ways of heightening the human experience of a site.

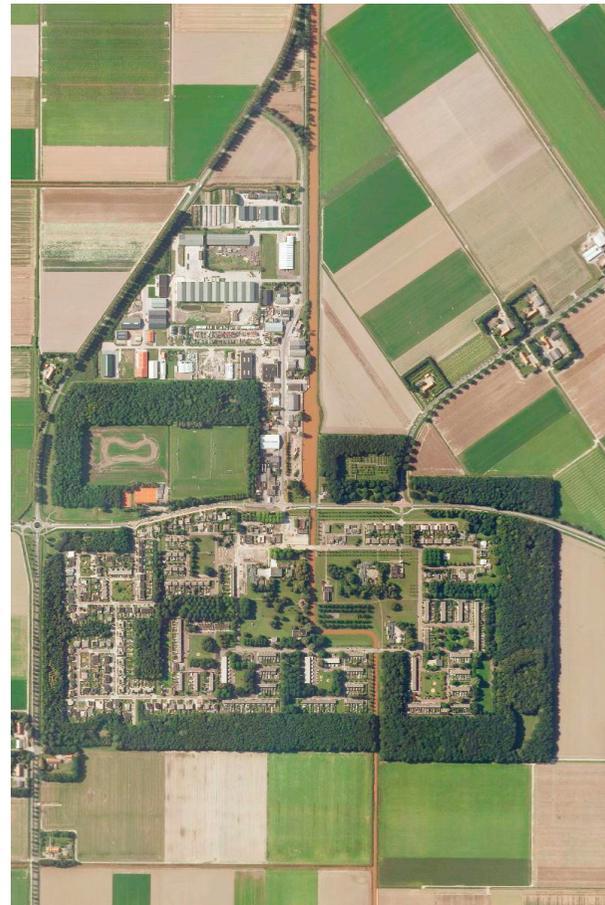


Figure 5.7.1 Aerial image of Nagele (Google images 2018)

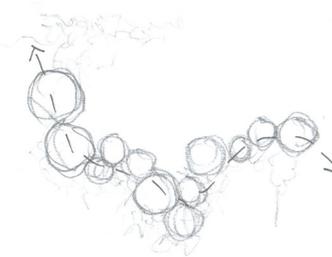


Figure 5.7.2 Interpretation of 'trees as network' (Author 2018)

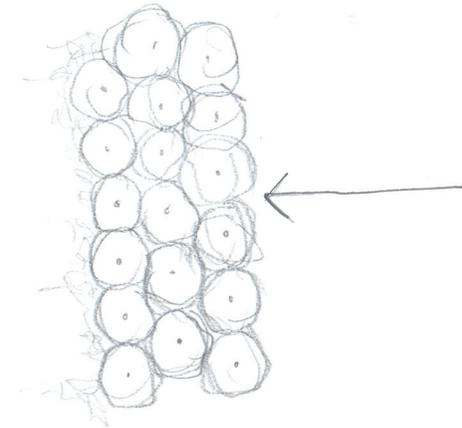


Figure 5.7.3 Interpretation of 'trees as barrier' (Author 2018)

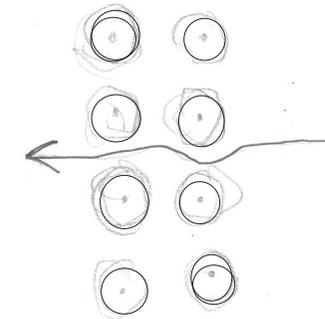


Figure 5.7.4 Interpretation of 'trees as filter' (Author 2018)

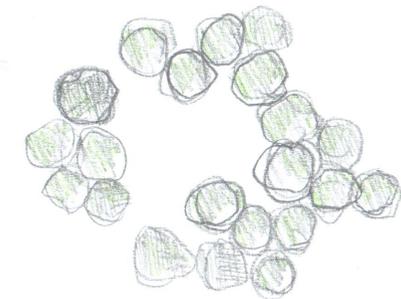


Figure 5.7.5 Interpretation of 'trees as enclosure' (Author 2018)

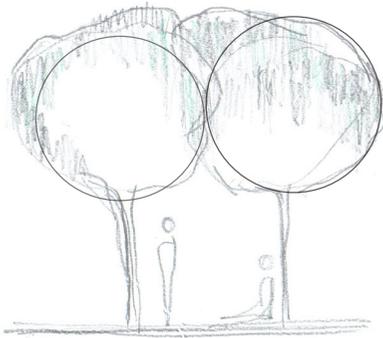


Figure 5.7.6 Interpretation of 'trees as retreat' (Author 2018)

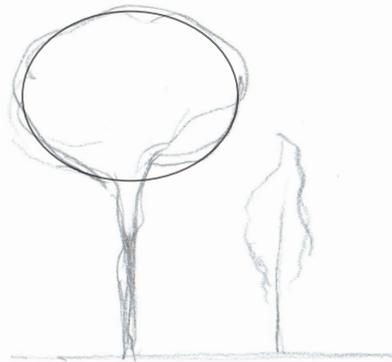


Figure 5.7.8 Interpretation of 'contrast' (Author 2018)



Figure 5.7.7 Interpretation of 'transparency through trees' (Author 2018)

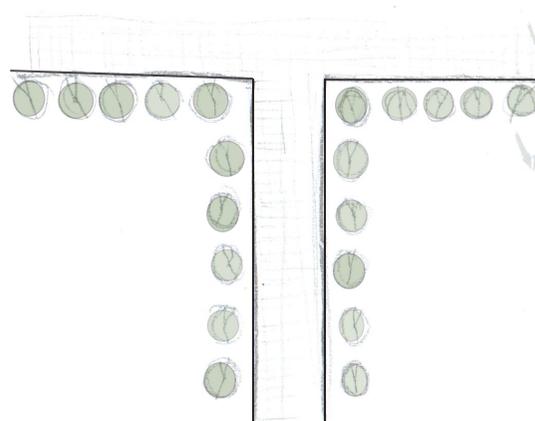


Figure 5.7.9 Interpretation of 'using trees to articulate space' (Author 2018)

MICHEL DESVIGNE PAYSAGISTE PROJECTS

Many of the MDP projects (Micheldesvignepaysagiste.com, n.d.) are centred around the use of trees as the main design tool or feature. The final designs are often simple and according to specifically structured arrangements, sometimes playing between a recreation of typologies found in a natural undisturbed environments; such as field, forest, wild; eg the Paris-Saclay project (Micheldesvignepaysagiste.com, 2018). Desvigne continuously explores layout, growth over time, and space creation, and almost always resolves these aspects with a grid layout that exhibits various tree grouping typologies.

As there are similar variables, his format is can be applied to this project. Despite his rigid and linear way of setting out trees and plants, there remains a successful space-making element in each design.

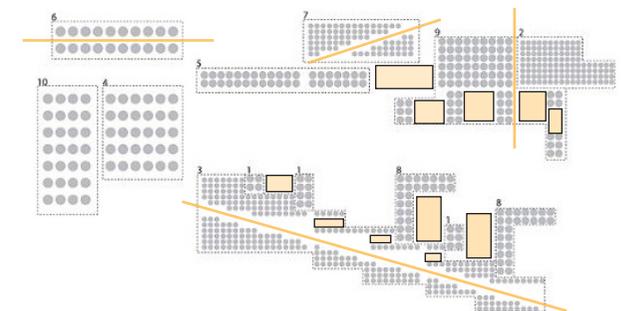


Figure 5.8.1 Simplified sketchplan of Michellin Corbett, India. Mass and void within ordered grid formation (Micheldesvignepaysagiste.com 2014, Author 2018)



Figure 5.8.2.1 Paris Saclay. Woodland typology
(Micheldesvignepaysagiste.com 2013)

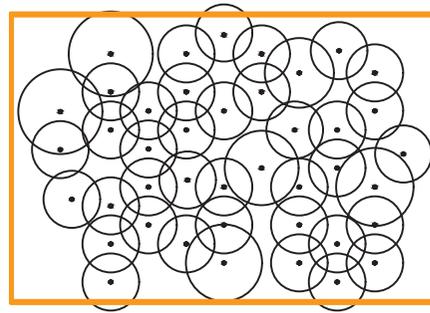


Figure 5.8.2.2 Woodland
(Author 2018)

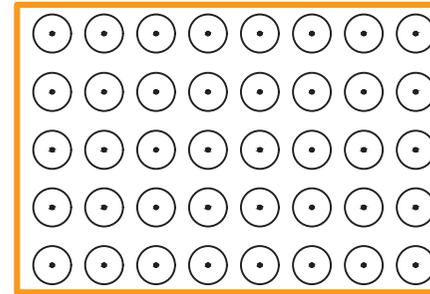


Figure 5.8.2.3 Woodlot
(Author 2018)

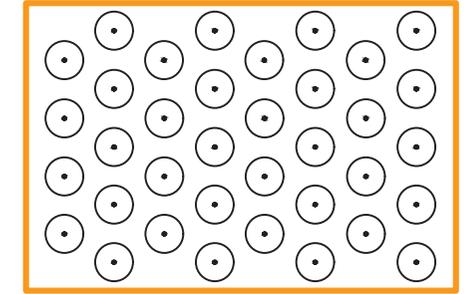


Figure 5.8.2.4 Quinquinx formation
(Author 2018)



Figure 5.8.3.1 Paris Saclay. Field typology
(Micheldesvignepaysagiste.com 2013)

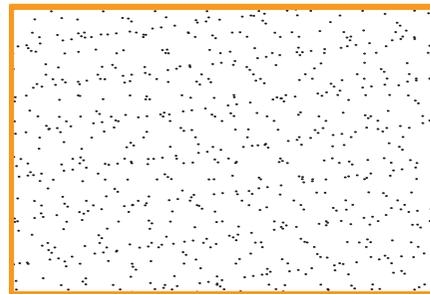


Figure 5.8.3.2 Field
(Author 2018)

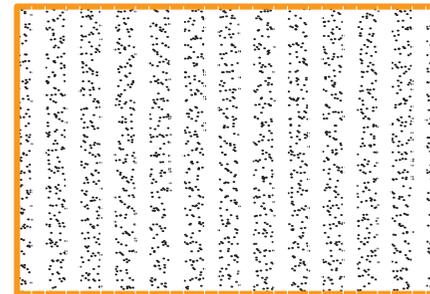


Figure 5.8.3.3 Field of crops
(Author 2018)

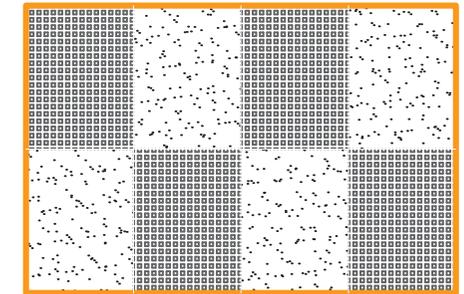


Figure 5.8.3.4 Field of alternating agricultural lots
(Author 2018)



Figure 5.8.4.1 Paris Saclay. Meadow typology
(Micheldesvignepaysagiste.com 2013)

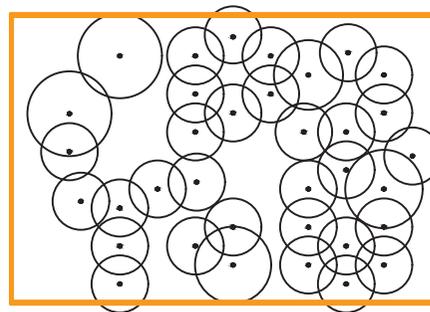


Figure 5.8.4.2 Meadow in woodland
(Author 2018)

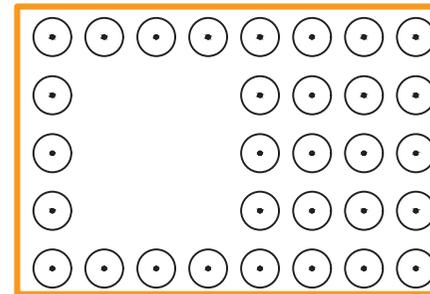


Figure 5.8.4.3 Formalised break in linear tree arrangement
(Author 2018)

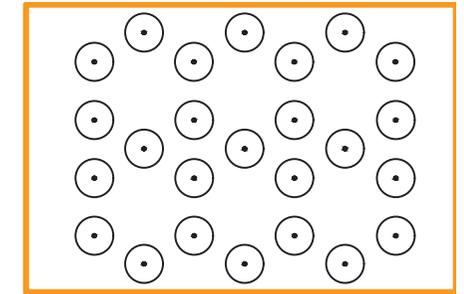


Figure 5.8.4.4 Repetitive break in tree layout
(Author 2018)

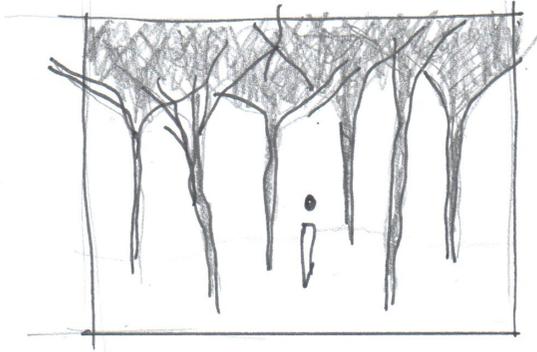


Figure 5.8.2.5 Forest (Author 2018)

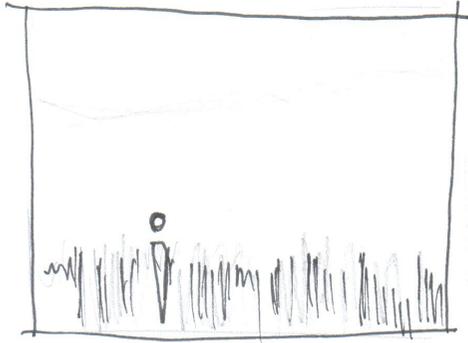


Figure 5.8.3.5 Field (Author 2018)

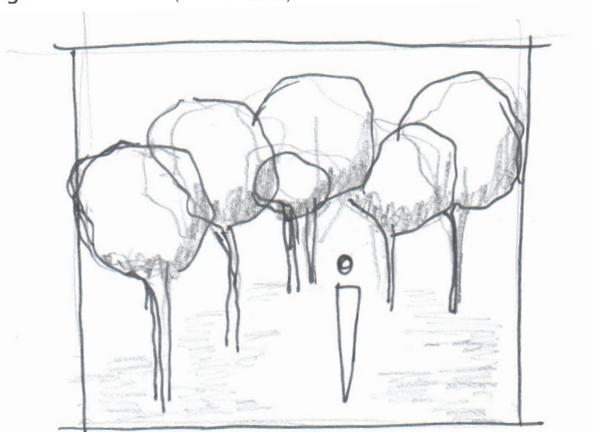


Figure 5.8.4.5 Field (Author 2018)

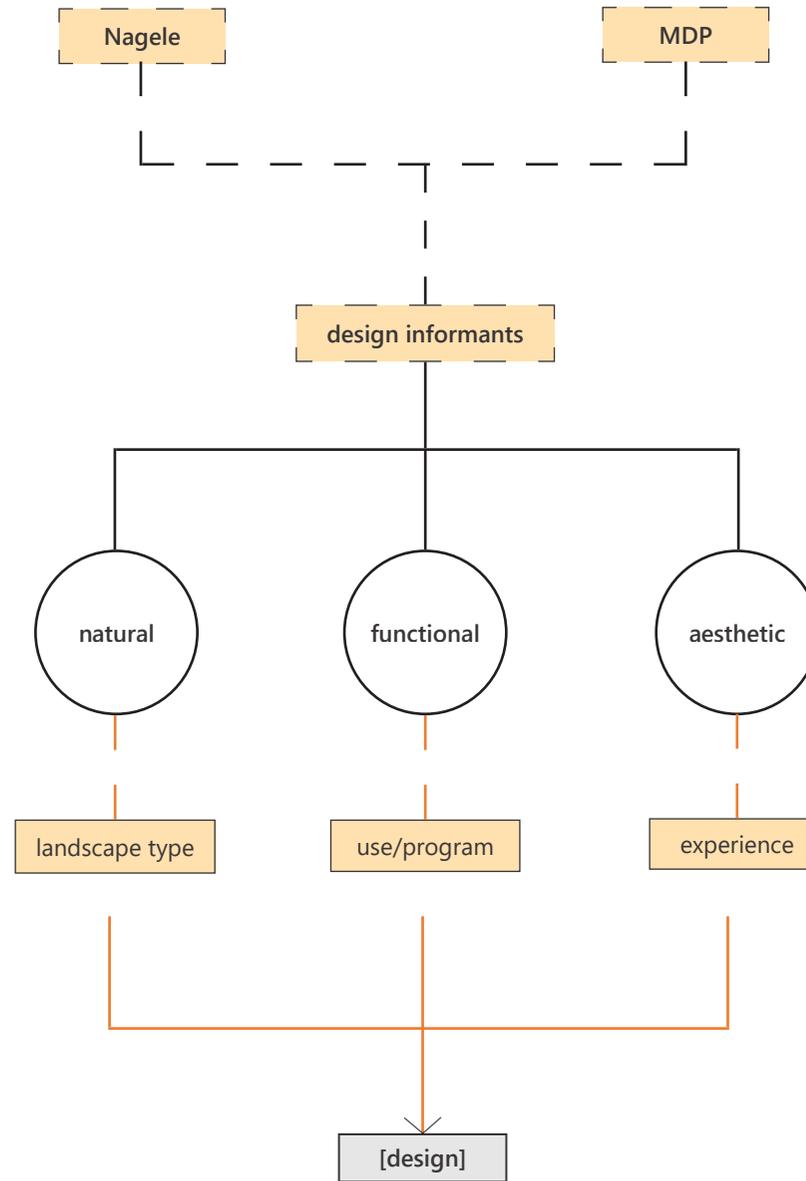


Figure 5.8.9 (Author 2018)



06 PROGRAM

OVERALL PROGRAM
PHASE 1: INITIATION
PHASE 2: AGROFOREST
PHASE 3: ARBORETUM
PHASE 4: +TREE NURSERY

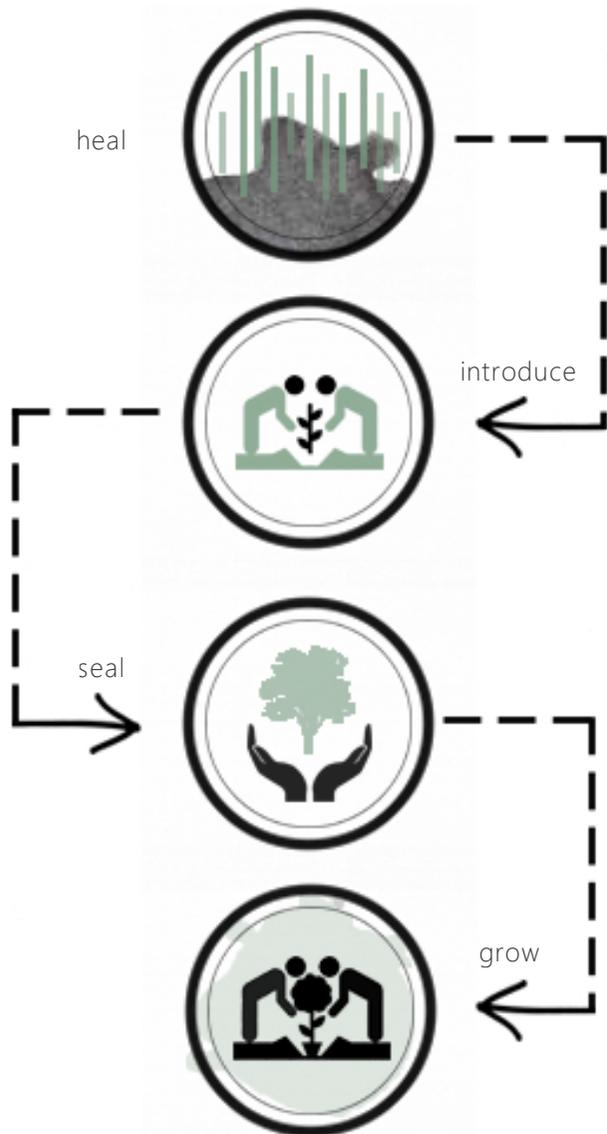


Figure 6.1.1 (Author 2018)

OVERALL PROGRAM

The main programs include agroforestry, arboretum, and nursery. Sub-programs are markets, gardens, and recycling.

As the phases of the project change, various programs evolve from one to the other (Fig 4.1). The calculated timeline of these phases is discussed in Chapter 7.

Through the lens of regenerative theory; it is understood that allowing a program to grow and change with its natural and human components, guides it towards a self-evolving nature. Phasing will not only aid in extending the lifetime of the project (in order to allow full breach of its regenerative potential), it helps with practicalities of managing the proposed interventions. Not all programs can be established and operated at the same time, as not all resources will be readily available from the onset. As a result, each phase will require different inputs from different stakeholders. However, each will build up from the preceding other.

The programs were chosen based on needs and issues identified from the urban framework, feasibility vs scale/ spatial constraints, and the process of mine rehabilitation (currently occurring on the mine next to the site). As a result; they respond to economic, social and environmental needs, and attempt to tie them altogether and respond to all, through one centralized program at a time. Hence the choice of programs is a result of the economic state of the community, a longer term vision for the site,

and a response to unjust conditions. This led to programs that fall under remediation, agriculture, stewardship and economic enablement.

PHASE 1 - INITIATION

This phase is extremely vital in order to initiate the project. It includes markets structures on the street edge; a continuation of what is already currently occurring on site, and the solution to the environmental degradation.

There are various chemical, physical and biological ways of dealing with contaminants in soil and water, but the one chosen needed to respond to the overall environmental vision, the associated programs, and space-making opportunities.

Phytoremediation will be the strategy applied to deal with removing and stabilizing the toxins from the soil. This process will be aided by a water system that will help leach the toxins from the soil. An informal site nursery will be established for the purpose of supplying the operation with plant species that can withstand the harsh conditions of the site.

The phytoremediation process will be carried out through dense tree planting, groundcovers, and a soil mix; all selected specifically for their ability to break down, immobilize, translocate, or adsorb the contaminants in the soil, or filter contaminated water.

Strategy

As the trees and plants grow, establish strong root systems, and absorb contaminants, they

will be cut back or removed with the intention of gradually replacing these species with more the intended permanent species, as well as to make pockets of spaces that allow for human experience to occur.

PHASE 2 - AGROFOREST

[To overlap with the initiation phase. As the phytoremediation species start to be cut back and replaced, this phase will start to operate. The agricultural component will initially be introduced on a soil layer separate from the ground soil. Thereafter, it will be planted into the ground's soil. This phase, as with the initiation phase, will be guided by a remediation specialist].

This phase of the project will propose an Agroforest. Agroforestry is a system that combines agricultural crops with trees and shrubs. It is practiced for its benefits in diversifying agricultural land uses and increasing productivity, ecological health and overall ecosystemic soundness (Regenerativeagriculturedefinition.com, 2018). Research has shown that agroforestry is more profitable than pure agriculture or pure forestry (Department of Agriculture, Forestry and Fisheries, 2017) which is why it has been adopted in many parts of the world. It is considered to be a form of regenerative agriculture (Regenerative Agriculture: A Definition, n.d.), meaning it forms part of the movement towards regenerating the environment by tying human and ecological systems to place, with anticipated evolution and growth.

The combination of mass planting of trees and agriculture will primarily ensure two things; an opportunity for the community to source from the land and start a micro-economy from its produce. The other, will be a continuation of the reversal of the degeneration of the physical/ ecological environment. Further benefits results include simple and practical provisions, such as shade, and a cooler microclimate. The forest will also provide a new identity to the site and create opportunities for community engagement and team building, unifying the various components to an interlinked system. The book 'With People in Mind' (Kaplan, Kaplan and Ryan, 2012) supports this very point; highlighting the results that come from community engagement in tree planting; a sense of ownership/territoriality, pride, and collective identity.

The large number of benefits of employing agroforestry on site go beyond merely addressing the identified issues. Not only does this strategy help restore degraded/eroded land and remediate polluted soils, it brings large contribution to the maintenance of soil fertility, a larger capacity for nutrient cycling, controls soil erosion, increases production of material for compost, diversifies production yield (e.g. fire wood and timber in addition to crops), has a larger capacity to mitigate effects of climate change, provides of a larger and more diverse habitat to animals, and a resilient source of economy(Singh Karki, n.d.).

Another reason behind the choice of this program is the need to step forward from



Figure 6.2 Phase 1 (Author 2018)



Figure 6.3 Phase 2 (Author 2018)



Figure 6.4 Phase 3 (Author 2018)

traditional agricultural methods that are at present widely practiced in South Africa. Community projects that employ agriculture as a program are mostly one-dimensional and monoculture (Department of Agriculture, Forestry and Fisheries, 2017). Research on more sustainable, yet locally achievable methods has led to this program, which is also being practiced in many 3rd world countries.

The sub-programs in this phase include markets (some of which will be directly linked to the fresh produce), ‘farming’ or agriculture (the site is meant to be farmed from scratch and thereafter maintained by the community (with the aid of composting heaps, soil remediation, small livestock), and so is the mass planting of the trees)) and other usual daily activities such as pedestrian circulation, gathering, sitting, or waiting.

PHASE 3 - ARBORETUM

[To begin when more than 80% of the species on site have become those that will permanently remain, and the contaminants have successfully cleared].

The introduction and establishment of the Agroforest served as the ‘survival’ phase in that it addresses the immediate economic needs of the community. It allows for that initial introduction to the natural component of the socio-ecological relationship to be established. The phase served as a first bridge between the people and their environment, engaging them in an activity that restores or reminds them of their relationship

to the natural world. It does the same to the natural environment by beginning to recover it to a healthier state. Further, it served a form of environmental justice, where the degraded environment that the community has had to live in, is improved.

The following phase will then become the introduction of a sense of stewardship. An Arboretum has been proposed to serve this purpose. As there will already be an established supply of trees on the site, the structured conservation of them will be easy to adapt. This transition from agroforestry to conservation will see a reduced focus on productivity or yield, but a larger one on growing a reserve; a move from sourcing to contributing; stewarding.

To add value to this partnership between people and their place, parts of the arboretum will house trees identified to have cultural significance to various groups residing in the settlement. This will mean they will have access to trees that might have before only been available in their places of origin. Some of these trees have an attached spiritual value and as a result are used for religious rituals.

For the ecological health, the arboretum means a permanent state that is established and of increasing resilience. Its presence will mean carbon sequestration, a stronger biodiversity and healthier state of the environment. Further, this program is scale appropriate; it can be contained and managed on 50000m² site.

PHASE 4 - ADDITION OF TREE NURSERY

The addition of a tree nursery ties the entire series of phased programming together with a common binding theme, that gives the site a sense of permanence beyond its own boundaries. A nursery also offers a formal and ordered system of income, which will contribute to its running and that of the arboretum.

The agricultural aspect of Phase 1 will have been relocated to pockets in the then formalized settlement and other former mine tailings site. This will be in response to the anticipated knowledge transfer into the community and proposed changes in the precinct based on the urban framework. Another reason for the relocation is the size constraints of the site; such a venture is not sustainable in the long term.

A medicinal garden will be a sub-program that belongs partly to the nursery and partly forms an extension of the aspect of cultural significance within the arboretum. It will be the only truly remaining aspect of an agricultural/cultivational system. There would therefore need to be another program that can fill the gap and continue to economically contribute to the community.

This nursery will thus serve as a longer term establishment that mediates between the conservational aspect of Phase 3 and the economic aspect of Phase 2. It will also serve as a link to a greater pool of commercial and social systems (as it will be linked to other regional nurseries through the municipality) and will be

open for business to any member of the public.

Result

The phasing of programs from agroforest to arboretum, to arboretum and nursery is strategically ordered to first target the people, establish their relationship to place, develop that relationship and grow their appreciation to it, and then foster a sense of stewardship for their environment, and finally insert a means at which that socio-ecological relationship can evolve and be sustained over time.



Figure 6.5 Phase 4 (Author 2018)

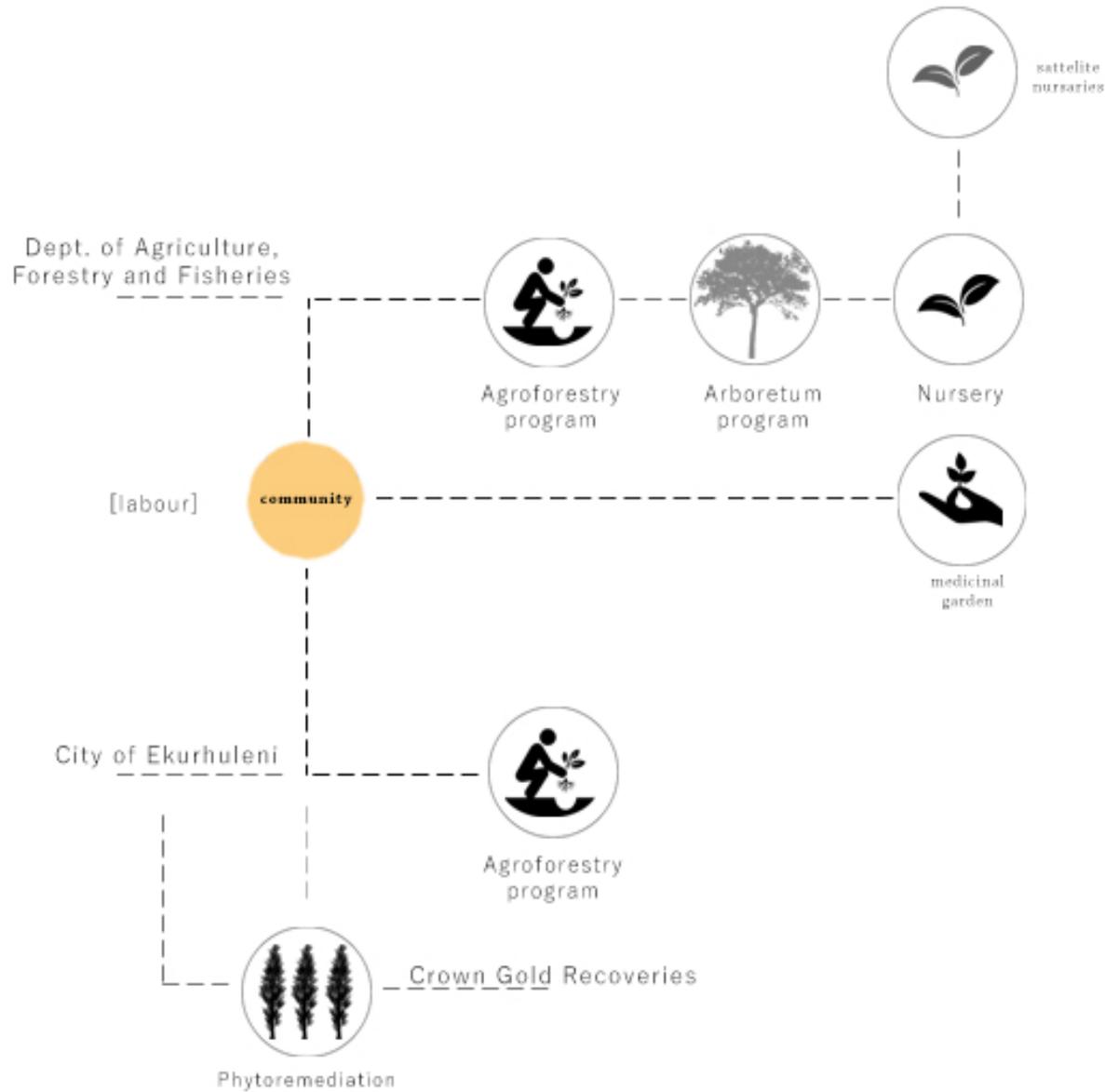
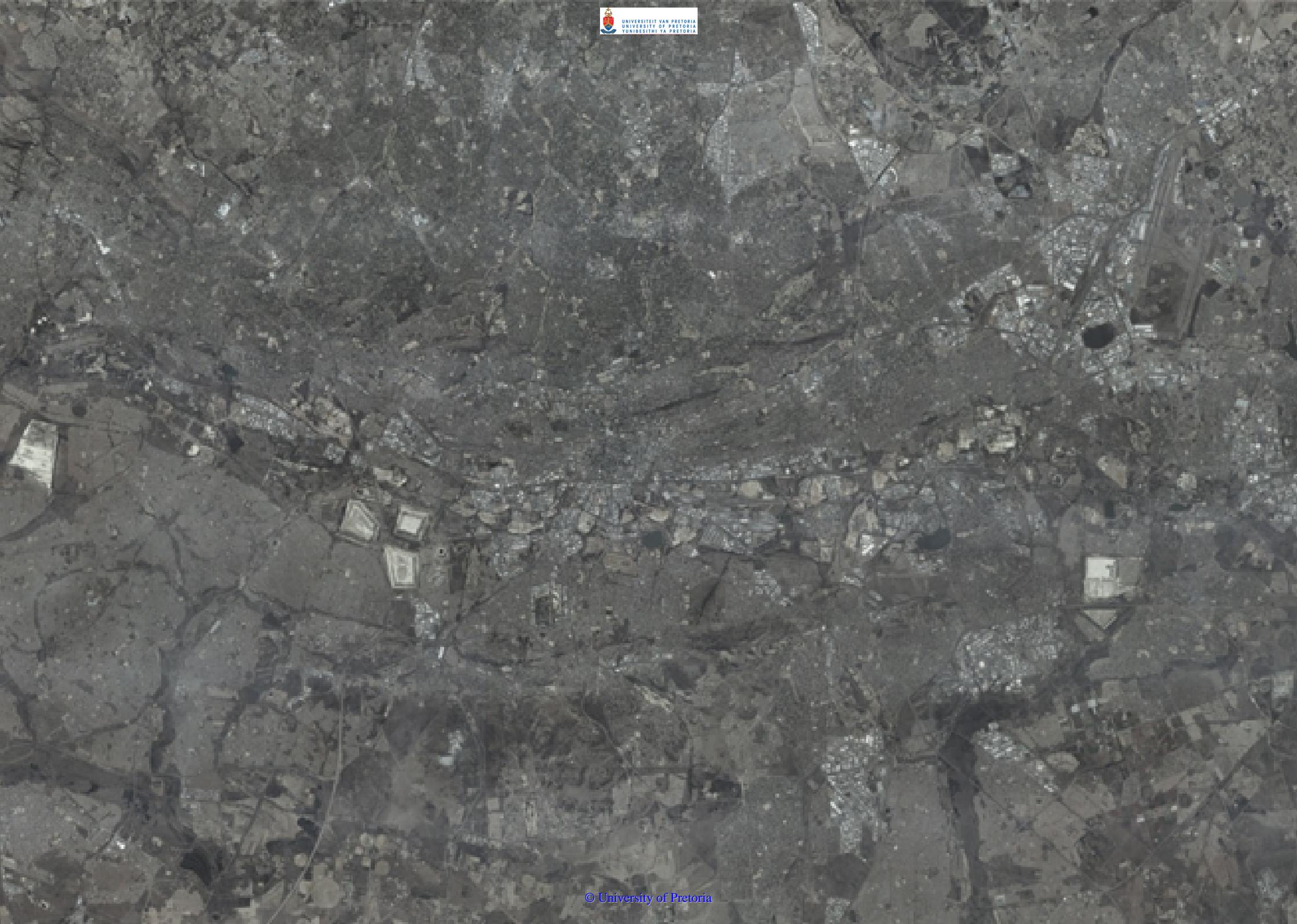


Figure 6.1.2 Diagram illustrating the funding and aid structure that would be in place to allow the project to function (Author 2018)



07

TECHNIFICATION

STRUCTURE
TIMELINE
ZONING
SYSTEMS
MATERIALITY

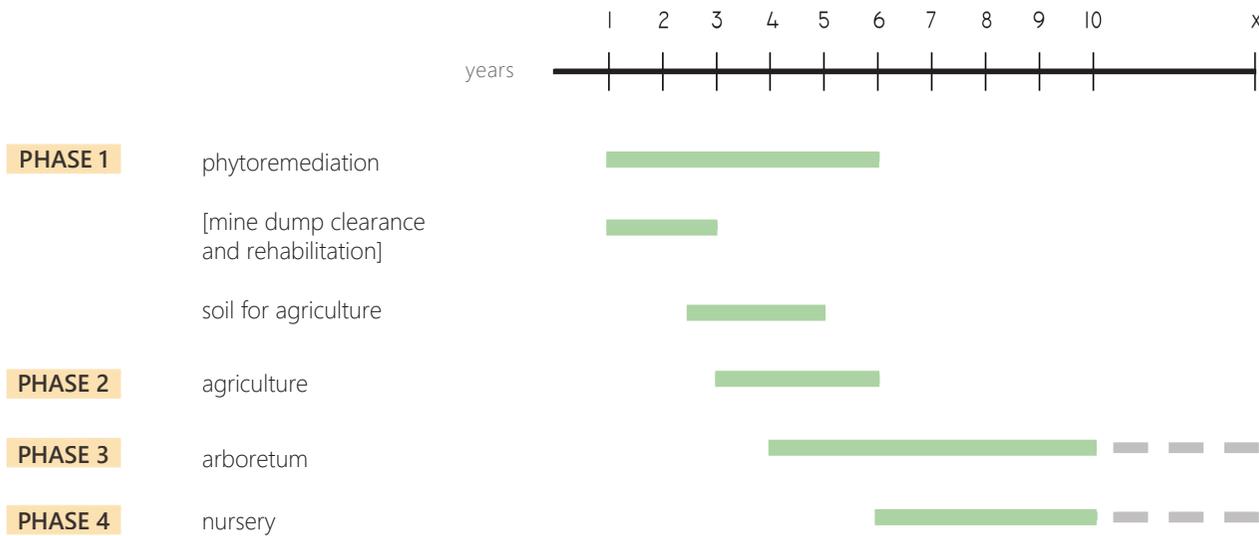


Figure 7.1 Timeline of phases (Author 2018)

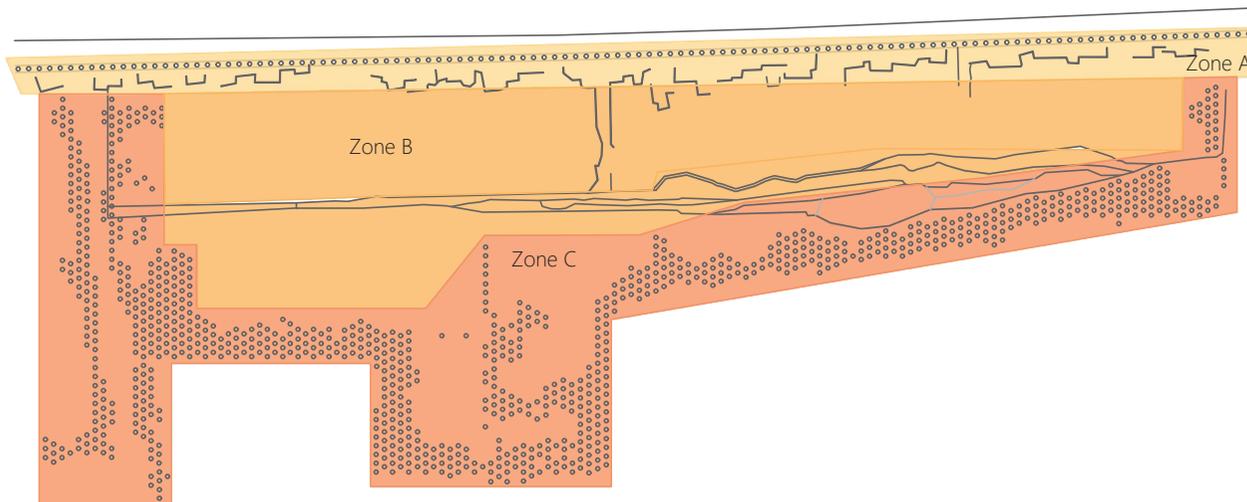


Figure 7.2.1 Zoning of remediation program areas (Author 2018)

TECHNIFICATION

This chapter focusses on the technical aspects of the project. The design explorations that have resulted from the ‘technics’ will be discussed in the chapter that follows.

As stated in the opening Manifesto, this project is resolved on masterplan level. This means that the overarching systems and technical aspects are specifically developed to function in the intended order. Thereafter, (beyond the systematic and technical function) the design is allowed to evolve over time. The masterplan level is thus a structure that helps direct the development of the intervention. It serves as a set of rules/guides that reference how each part makes the whole. This supports the notion of staging moments, where the landscape is manipulated in order to steer it towards the intended vision.

STRUCTURE

The manner in which the design is technified takes on a pragmatic approach, giving guidance to the anticipated fluid nature of the development of the design; both within and between phases. As the design relies on the growth of trees and vegetation, planting and replanting, and other similar activities, there will be a means of controlling and determining these activities so that the design takes shape as proposed. Further, the design will be assembled mostly by human labour, which will need various forms of guidance and structure.

As a result, certain physical design guidelines have been developed, that will guide Phase 1 of the project. This will provide a base for the rest of the phases. The guidelines include the lay-out of the proposed phytoremediation plants and trees, the zoning of areas on site that divides between low, medium to high intensity of treatment, a timeline that determines what is to follow after what, and what needs to occur before what, an on-site water system, as well as a soil amendment system. Each of these aspects will be discussed in further detail.

TIMELINE

As mentioned in earlier chapters, the project is to develop and evolve over a number of years. The following timeline illustrates the various times and phases that are proposed (Fig. 7.1). Each phase, although beginning during the development of the previous, is dependent on the establishment of the previous one. For example; Phase 2 will only begin when the adjacent mine has been successfully remediated and cleared. This will allow for an assured guarantee of safe agricultural activities on the site's soil.

ZONING

The site has been divided into 3 areas, each to undergo an appropriate treatment depending on a number of conditions. The conditions include; the proximity of the area (zone) in relation to the mine dump, the existing and new contours

(some areas will be of a lower height/level than others), the current vegetation (Eucalyptus trees which have good phytoremediation abilities, and are thus assumed to have been to some extent remediating the site since they were planted), observed (and confirmed with a mining expert) site conditions such as soil colour (the soil closer to the mine dump has a yellow tint (indicating the presence of cyanide), whereas the site itself is of red-brown soil), and lastly the presence of human activities (areas currently with more human activities are more eroded than those simply covered by vegetation) .

Zone A - Low intensity remediation

Currently contains Eucalyptus trees and other invasive groundcovers, along with human activities. Topsoil layer eroded and degraded by these activities.

Recovery strategy to focus more on the re-establishment of a healthy soil layer. Indigenous leguminous species proposed; which will support this process over a longer, less-hurried time frame.

Zone B - Medium intensity remediation

Also currently containing Eucalyptus trees and invasive groundcovers. Some human activities on a portion that is clear of vegetation and as a result eroded.

Recovery strategy will target both the issue of degraded soil, as well as the issue of possible toxins in the soil. Indigenous leguminous species

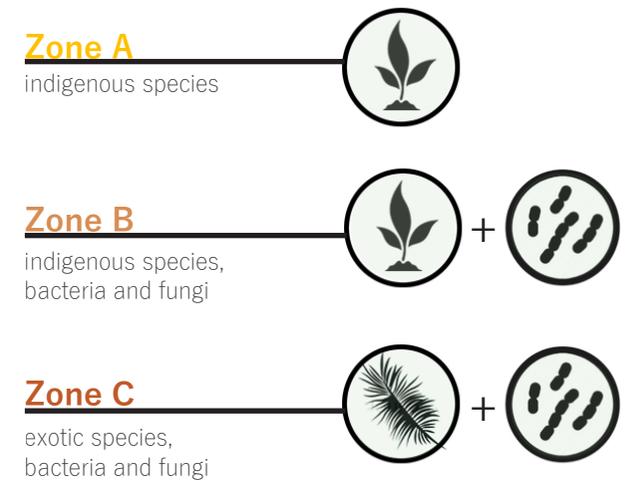
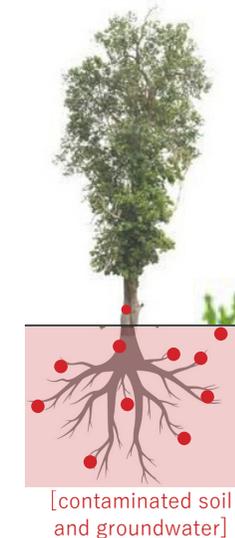


Figure 7.2.2 (Author 2018)

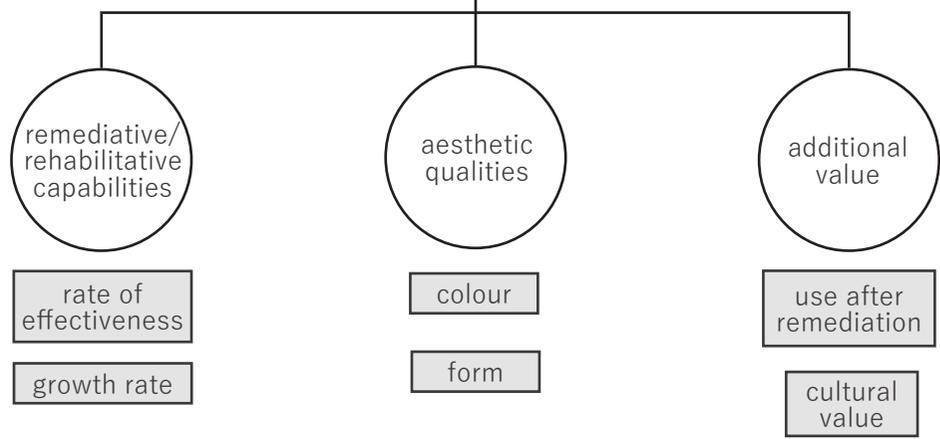


Phytoremediation mechanics anticipated:

- Phytodegradation - break down contaminants
- Phytostabilization - immobilize contaminants
- Rhizofiltration - absorb and filter
- Phytohydraulics - uptake water
- Phytoextraction - uptake and store

Figure 7.3 (Author 2018)

PLANT SELECTION



Populus hybrid

One of the top tree choices for phytoremediation projects all over the world. Fast growing tree. Effective in removing contaminants from soil.

Deciduous. Can reach 40m in height. (3-5m p/a). Long and thin shape; scale, arcade, order/structure. Bark changes colour with time

Roots do not die when tree is cut at stem; remediation can continue after tree removal for some months.

Acacia trees and other

Legumous. Large nitrogen-fixing capabilities. Rebuilds soil structure by increasing organic matter. Positive role in ecosystem function.

Most have a spread crown that can create 'roof' plane. Various colours from barks, flowers, seeds and leaves. Provides contrast with Poplar trees.

Cultural associations. Can become a 'historical' backdrop for the site's later development. Mass planting results in effective carbon sequestration.

Groundcovers

Some highly effective remediators, some highly effective in nitrogen fixing and soil stabilization. Many typically function as pioneer species

Many contribute to a 'field' typology (of crops or of grassland). Seasonal; change colour and form throughout the year.

Some (e.g. Sorghum) can be harvested for biofuel. Mass planting results in high carbon sequestration.

are also proposed, with an addition of a consortium of locally available bacterial species and fungi (named in Soil discussion). The consortium contains species that have strong remediation capabilities.

Zone C - High intensity remediation

This zone is proposed to be on the lowest level of the site. It will as a result, be more exposed to any possible contamination that might originate from the adjacent mine dump.

The recovery focuses on remediation. Species proposed are exotic species that can successfully remediate contaminated soils. There will, as with Zone B, be an addition of a soil mix to aid the process.

SYSTEMS

Trees and vegetation

A specifically measured grid (3.5 x 3.5m) has been proposed that determines the spacing of the Phase 1 trees and the groundcovers. This grid was selected for various reasons; to maximize root coverage of the soil, as a consideration of the space taken when the trees have grown larger, the space needed if the trees are to be cut down, and lastly the human experience (either visual or being physically within) of the spaces.

The trees were selected according to their remediation and soil amendment capabilities, their ability to thrive in sandy and acidic soils, as

Figure 7.4.1 Reasons behind plant selection (Author 2018)

well as their aesthetic qualities when laid out in a specific format. Thereafter, they are selected for their significance or value to various cultural groups in Makaase.

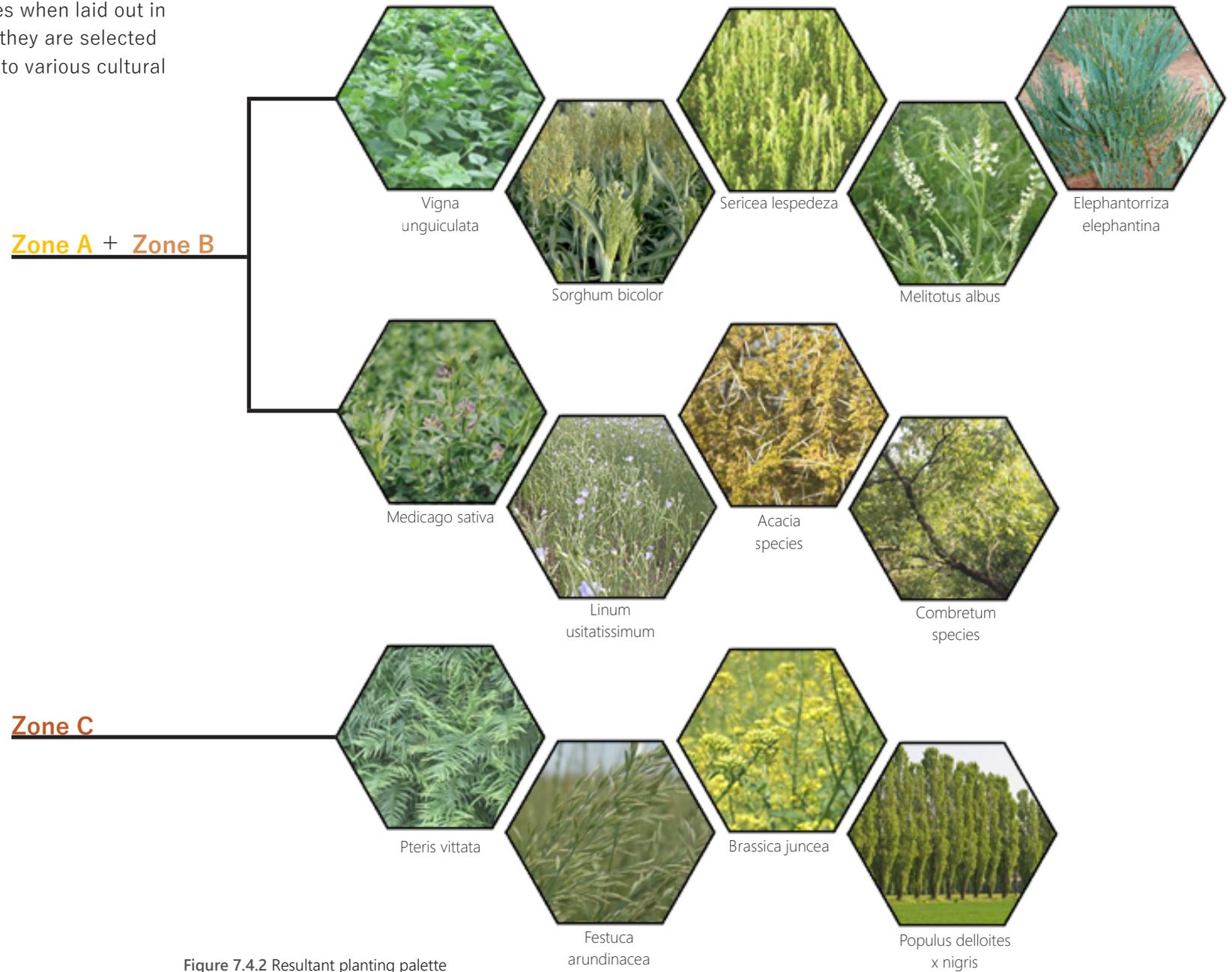


Figure 7.4.2 Resultant planting palette

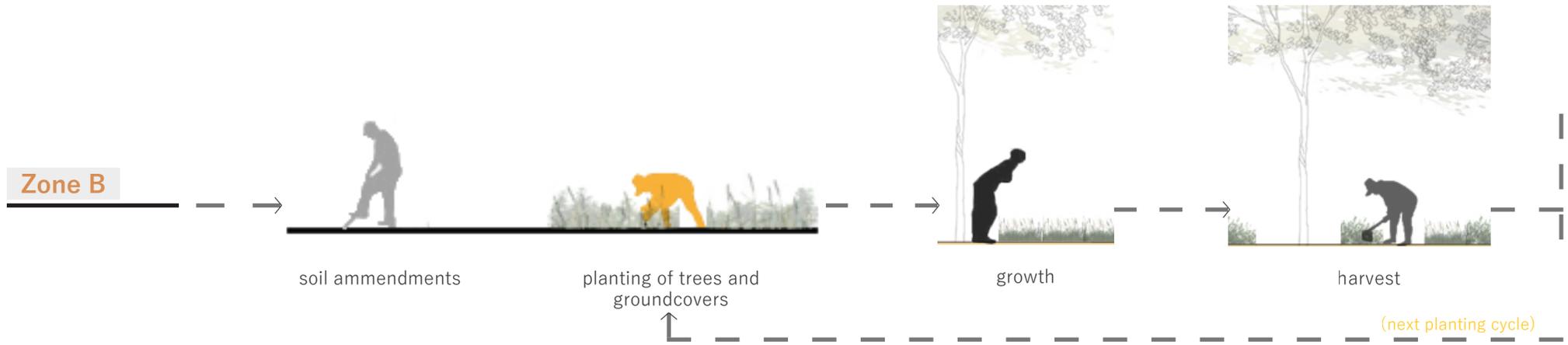
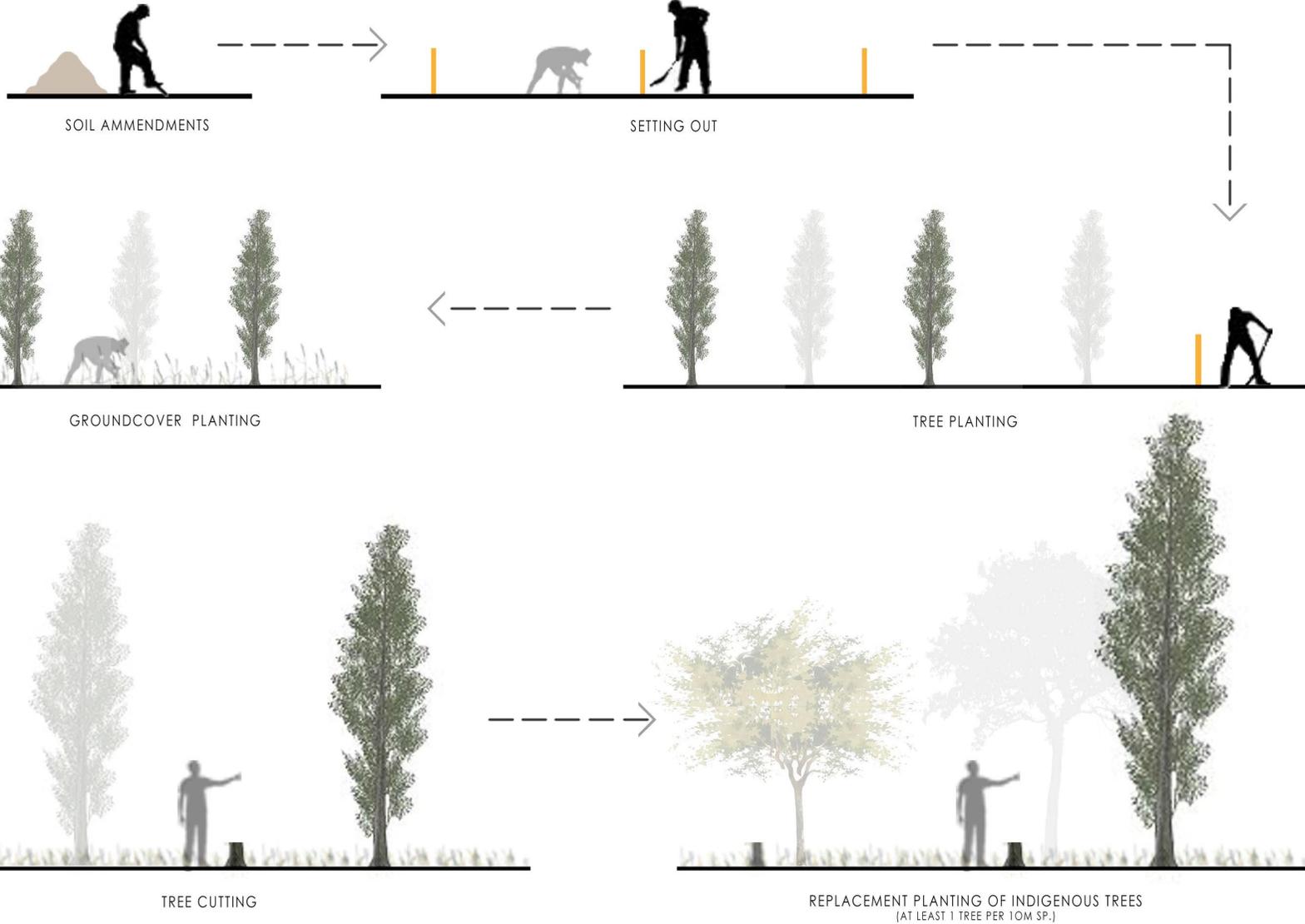
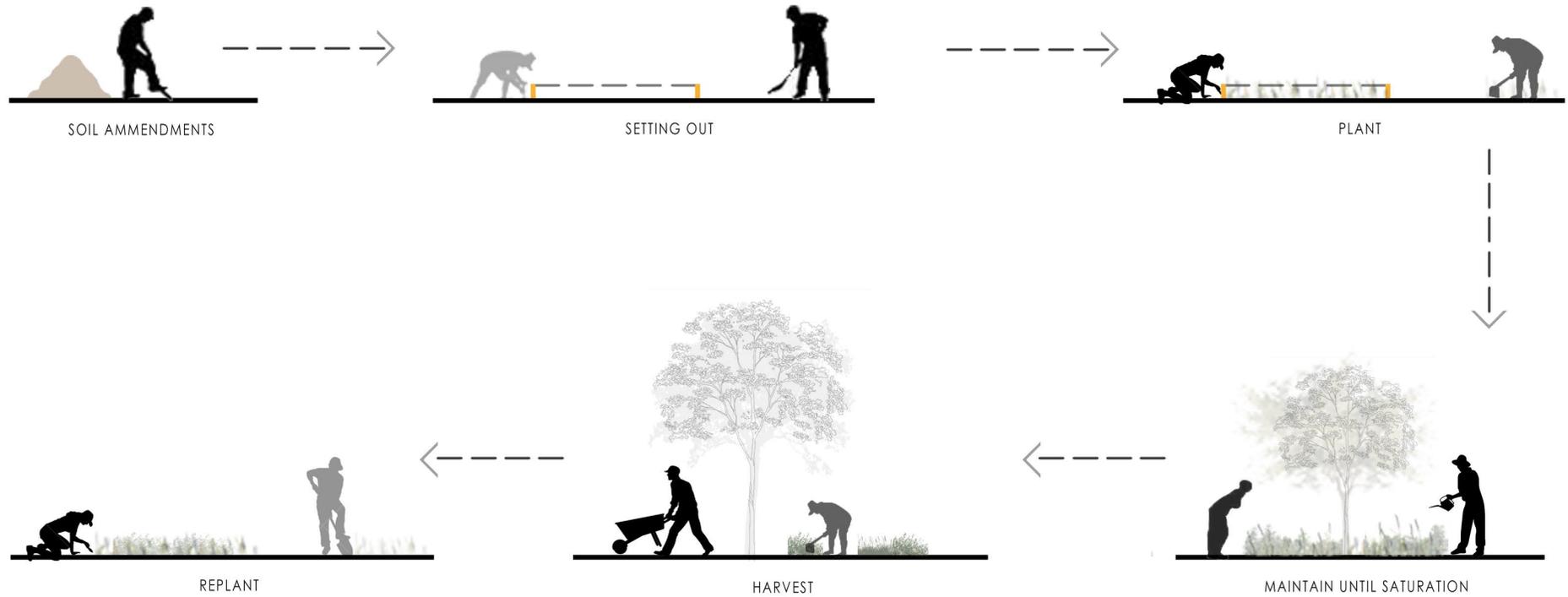


Figure 7.5 Planting process (Author 2018)

Zone C



TREE ESTABLISHMENT PROCESS



GROUNDCOVER ESTABLISHMENT PROCESS

Figure 7.5 (cont.) Planting process (Author 2018)

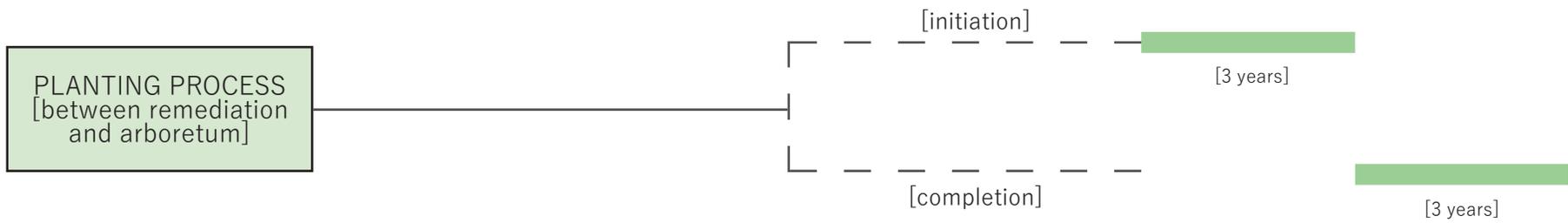


Figure 7.6 Planting process timeline (Author 2018)

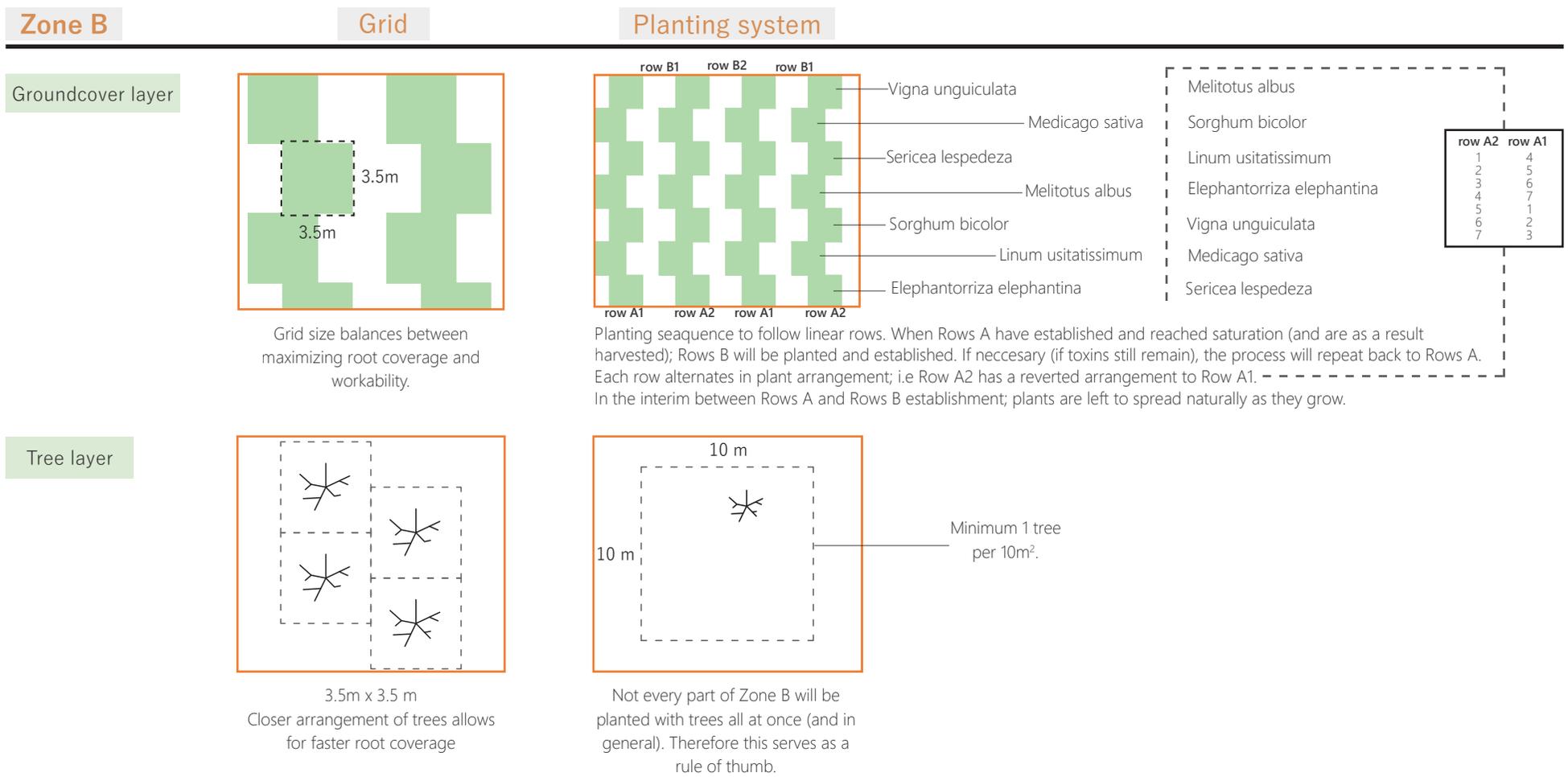
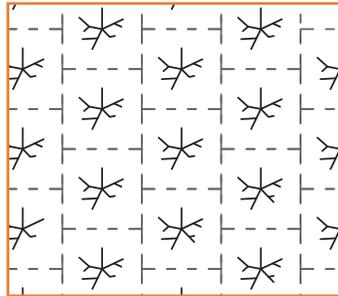


Figure 7.7 Zone B Planting systems (Author 2018)

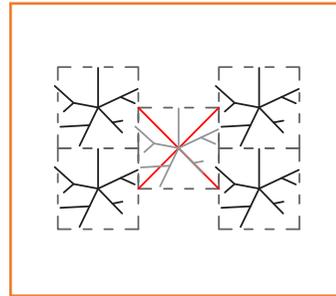
Zone C

Tree layer [Poplar trees]

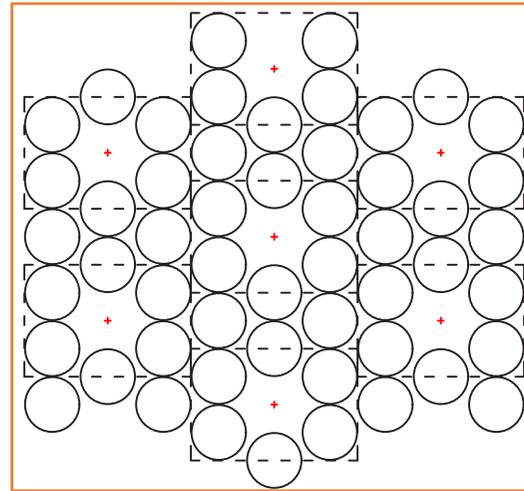


3.5m x 3.5 m

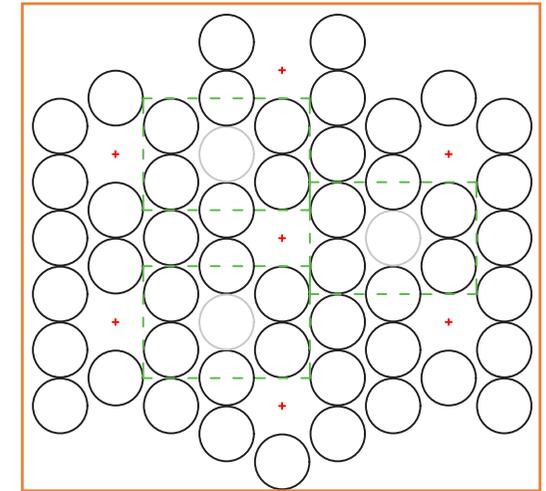
Closer arrangement of trees allows for faster root coverage



Grid results in quincunx formation. When cutting down begins, center trees will be removed first



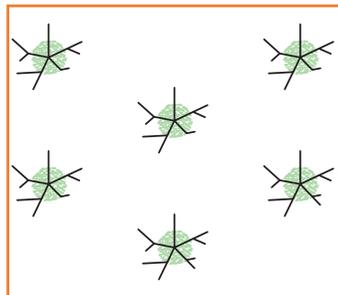
First layer of tree cutting



Second layer of tree cutting.

(By this stage, replanting will begin. Location of new indigenous trees will be at labourers' discretion).

Groundcover layer



When trees are planted, groundcovers are planted around them to help establish them

Figure 7.8 (Author 2018) Zone C Planting systems

SOIL

It is concluded that water is more of an issue than the soil. Sandy soils do not absorb and retain as well as other soils, which in this case works as an advantage. For the most part, the toxicity of the soil is dependent on the toxicity of the water. If contaminated water is removed, the soil is virtually free of added contamination. However, if soil contaminants are removed, water (on site) might not necessarily be free from possible contamination as it might be affected by contaminated groundwater.

The eroded state of the soil as well as the presence of toxins calls for soil amelioration, (and the above discussed phytoremediation). Besides the planting of vegetation; the soil will be recovered through the use of two techniques; the previously mentioned fungi and bacteria mix (consisting of locally available taxa of *Pseudomonas*, *Bacillus*, *Alcaligenes*, *Acinetobacter*, *Burkholderia*, *Ascomyllum*, *Streptomyces*, and *Scenedesmus*), and Lasanga garden beds (Fig. 7.9).

These techniques will rebuild the soil, recover it to a healthy state, introduce a new and improved rhizosphere, and provide topsoil that will be able to support agricultural and cultivational activities.

For the agricultural lots; on-site compost heaps (made up of gathered green litter from Zones A and B) are added to the system. The heaps will be in the form of manual Windrows (Fig. 7.10); piles of organic waste laid in linear rows and covered with black bags to compost in the sun.

They are then manually flipped over, resulting in compost that was sitting at the bottom to end up at the top and vice versa. This process is repeated until desired quality compost is achieved.

As an anticipation of this process, space has been allocated accordingly - to be discussed further in Chapter 8.

Both the Lasanga garden beds and the manual Windrows are strategies that are easily implementable and appropriate for a community project setup. The process they entail accommodate (and need) manual labour offered by non to semi to fully skilled groups. They are examples of affordable solutions that can be learnt and taken home to be re-adapted.

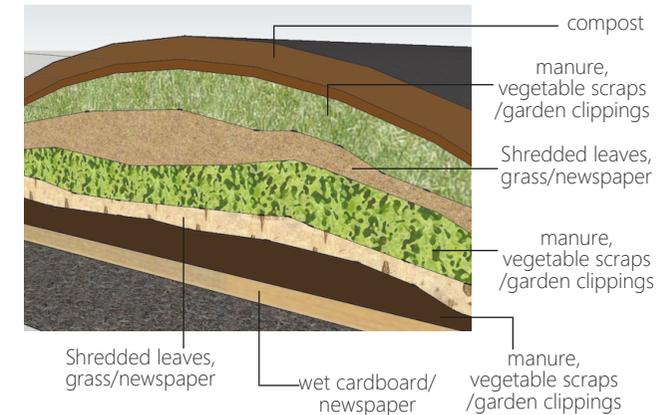


Figure 7.9 (thespruce.com 2018) Lasanga garden bed layers. Technique to be used in Zone B in Phase 1, and then Zone C in Phase 2. To be used placed in linear rows on site

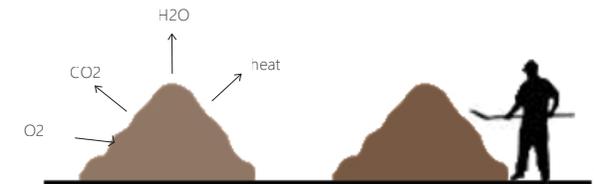


Figure 7.10.1 (Author 2018) Manual windrows. Intended to be spaced 1200mm apart in order to allow space for circulation and movement of compost from one row to the next. (This process will be done weekly).



Figure 7.10.2 (redhookwaterstories.org 2018) Example of manual windrow.

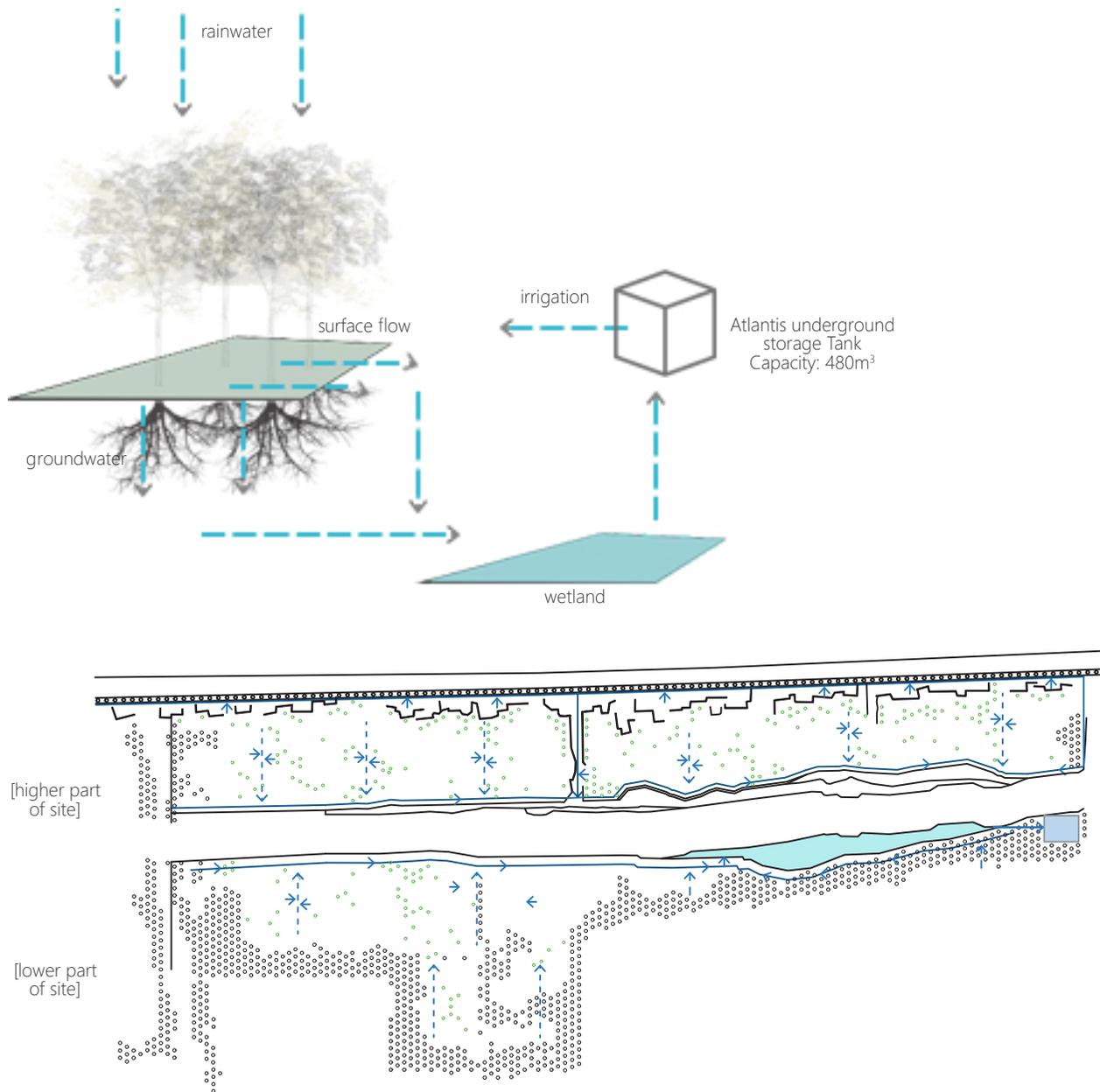


Figure 7.11 (Author 2018) Stormwater leaching system, System on site plan. Water collected into sub-surface drains (agricultural drains, shallow trenches, and pipes to enter wetland, pass through silt trap, and then be stored in underground tank.

WATER

The initial aim of the water system is to aid the remediation of the site. Therefore the continuous capturing and use of stormwater will contribute to leaching the soil of its contaminants. As water continuously moves through the system, it will progressively wash out toxins (Fig. 7.11). Thereafter, the water system will function for the irrigation of the programs introduced after the initiation phase.

There are 2 main issues that are connected to water; Acid mine drainage (AMD), and the presence of toxins in the water. The latter, will be resolved through the proposed water system, which includes a wetland that contains species for phytoremediation (Fig. 7.12), as well as the completion of the adjacent mine dump rehabilitation. When this is done, contamination of groundwater, soil, or stormwater that may have travelled between the mine dump and the site would've been dealt with.

As for AMD, on a larger precinct and perhaps even a regional scale; that issue is very much dependent on the rehabilitation of mine dump sites. On a site scale, as mentioned before, once CGR Mine is successfully rehabilitated, contaminants would have been dealt with and no longer a threat to the site.

Irrigation - Fig. 7.13.1 and 7.13.2

This process is anticipated to be manual, as is the majority of the implementation and

maintenance aspect of the project. - The act of physically watering the developing landscape contributes to the development and well-being of those engaging in it.

Water pipes from the storage tank are laid out in a way that accommodates for a Turf valve every 15 meters squared (based on the average size of a hose pipe) - Fig. 7.13.2. This choice aids in the control of water use (valves, unlike taps, can be concealed just below the surface, away from unsuspecting users). However, on the northern strip of the site plan (where the markets are situated) actual taps are proposed to be installed when water has reached healthy levels. This provides opportunity for open water sources to use for cleaning/washing material etc, and in as mentioned; later phases (Phase 4) for drinking (in Phase 1 the water will not be safe for drinking). Solar panels (located where storage tank is) are used as a source of power to pump the water from the tank (lowest part of site) to higher parts of the site.

Calculations - Fig. 7.14.1

Initiating Phase 1 demands more water than what can be captured on site. As a result; the Phase is divided into sub-phases. Each sub-phase is directly matched to the Zones A, B and C (see Fig. 7.2.1). Figure 7.14.2 illustrates the process in terms of division and time. As one Zone establishes, water thus becomes available for the next Zone, leaving the first with some for maintenance.

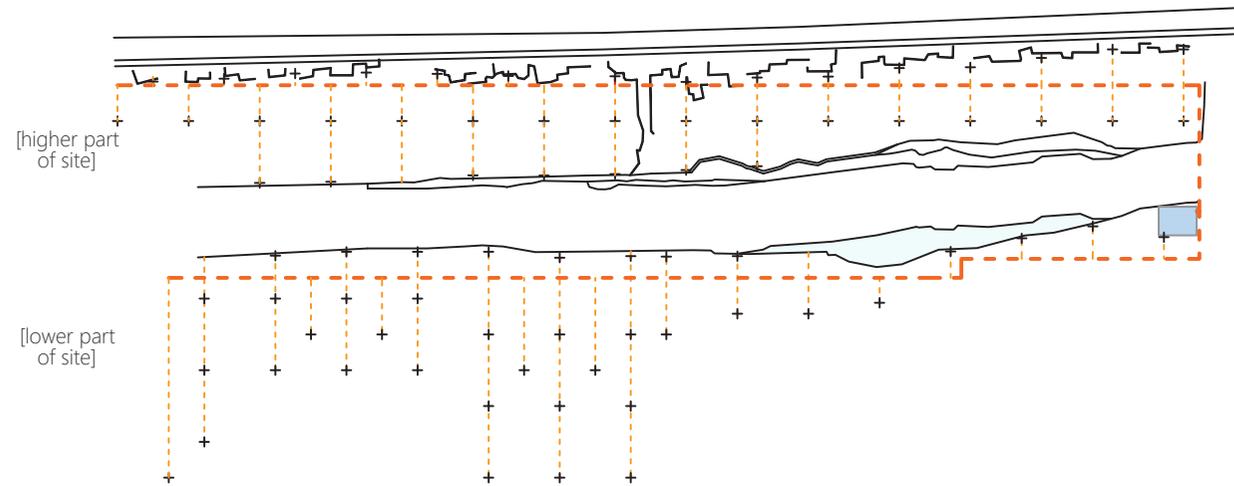


Figure 7.13.1 (Author 2018) Irrigation plan

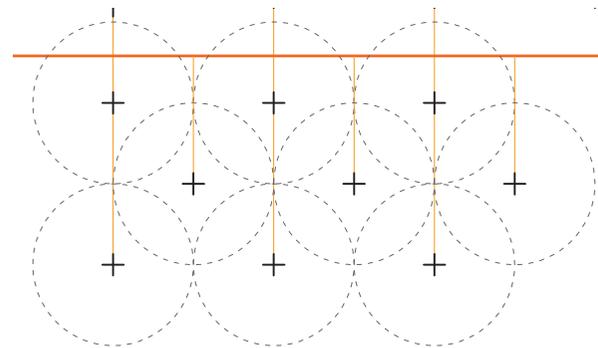


Figure 7.13.2 (Author 2018) Water points allow for 15m radius

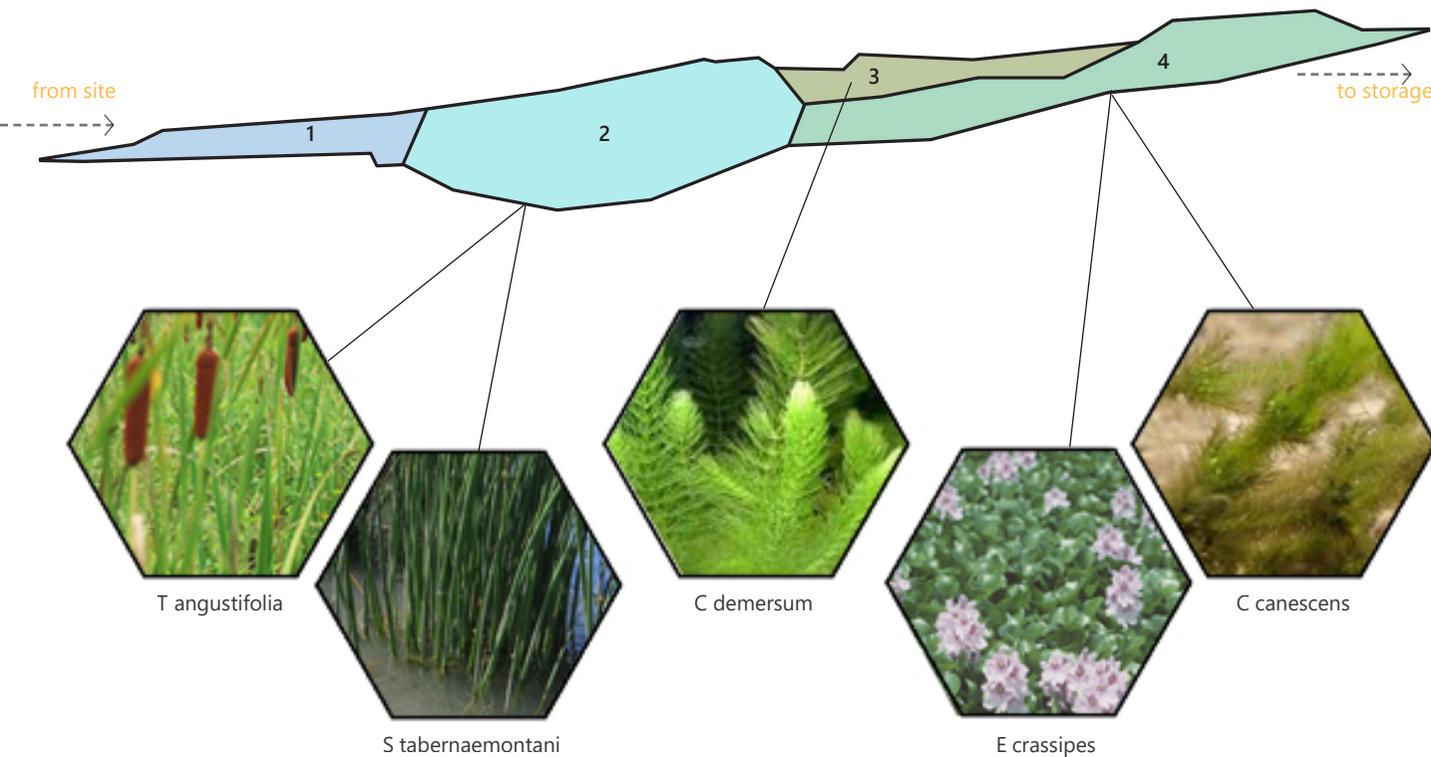


Figure 7.12 Wetland zones and plants (Author 2018, images taken from en.wikipedia.org)

Wetland

The need to treat water and remove contaminants it may carry can lead to a number of techniques. However, the most feasible solution is a wetland. The wetland will receive stormwater captured from the surfaces and then circulate it through a series of zones containing plant species that are able to remove various metals from water. Some species selected are considered invasive, yet the nature of the issue calls for non-conventional techniques.

For control, the wetland and its accompanying vegetation will function under constant monitored conditions. When Phase 1 of the project (phytoremediation) has reached completion, the wetland will be removed.

Zone 1 captures and retains the stormwater entering the system. It releases water slowly into the next zone. The next; Zone 2 hosts the deep water plants - *Typha angustifolia* and *Schoenoplectus tabernaemontani*. Zone 3 contains the shallow submerged plant species - *Ceratophyllum demersum*. The last zone; Zone 4 contains the floating plant species - *Eichhornia crassipes*, and the submerged plant species - *Chara canescens*. This order imitates the sequence in natural rivers; from land to marginal, to shallow, to deeper water.

	Phase	Objective	Demand		Total Demand	Yield	Implication
			Trees	Vegetation			
Initiation	PHASE 1	establish	1367 trees = 827 856ℓ p/m	8195.25 m ² = 164 000 ℓp/m	991 856 ℓ p/m	ave. 459 000 ℓ p/m	Phase 1a, 1b, 1c *
Agroforest	PHASE 2	maintain	no new trees	4054 m ² = 81 000 ℓp/m	324 250 ℓ p/m	ave. 459 000 ℓ p/m	
		agriculture	116 fruit trees = 70 250ℓ p/m	1730 m ² = 173 000 ℓp/m			
Arboretum	PHASE 3	establish	226 new trees = 136 866ℓ p/m	no new vegetation	335 524 ℓ p/m	ave. 459 000 ℓ p/m	
		maintain		4054 m ² = 81 000 ℓp/m			
		agriculture	77 fruit trees = 11 658ℓ p/m	1060 m ² = 106 000 ℓp/m			
+ Nursery	PHASE 4	establish	74 new trees = 44 814ℓ p/m		379 554 ℓ p/m	ave. 459 000 ℓ p/m	
		maintain		4054 m ² = 81 000 ℓp/m			
		nursery	253 740 ℓ p/m				

Figure 7.14.1 (Author 2018) Calculations of water demand vs yield

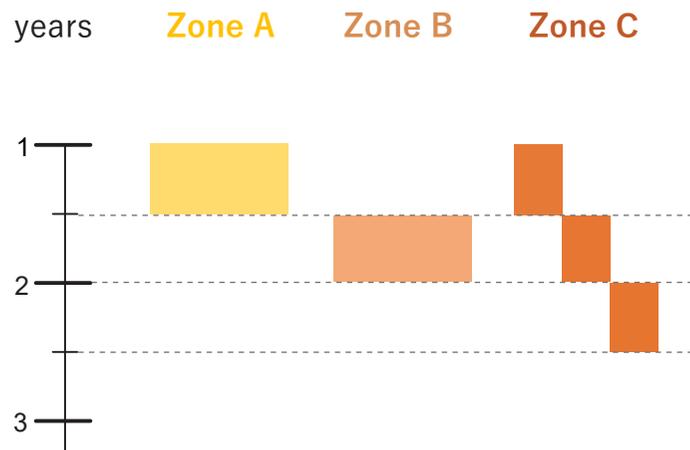


Figure 7.14.2 (Author 2018)

Implications of water demand vs yield - resultant timing of establishing Zones A, B and C. Water yield will be used for the Zone that is being established at that time.

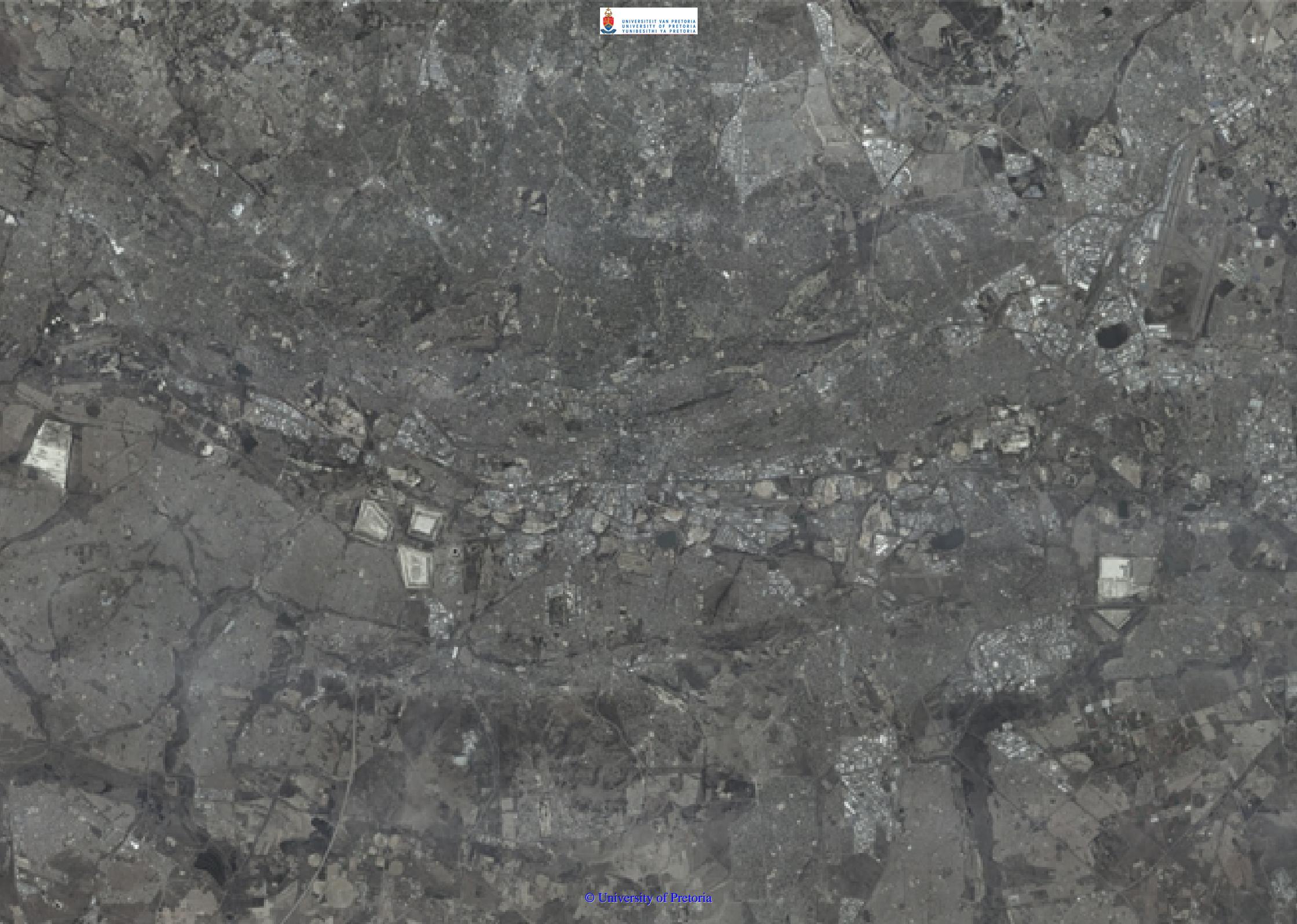
MATERIALS

The majority of the design is vegetated and as a result dependent of natural materials to create various spaces. The few built forms are made of materials selected for their regional appropriateness, availability and ability to be recycled or sourced from scraps (brick), and visual effect (steel and glass. Steel that is treated so as to rust overtime (and therefore mimic the appearance of corten steel). This combination presents a weathered appearance that visually communicates a passing of time. Glass connects spaces, makes contributes to good surveillance, and allows for a visual continuity through spaces that are physically separate.

Specifics of what materials are used where, will be explored in the next chapter.



Figure 7.15 (Author 2018) Materiality



08 DESIGN DEVELOPMENT

RESPONDING TO THE 'MASTER' STRUCTURE
PREVIOUS ITERATIONS
PHASE 1 DESIGN
PHASE 2 DESIGN
PHASE 3 DESIGN
PHASE 3 DESIGN
GARDEN DESIGN
CONCLUSION

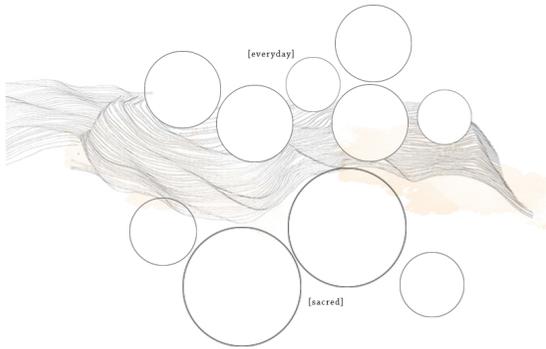


Figure 8.1 Sacred and utilitarian space within a landscape setting (Author 2018)

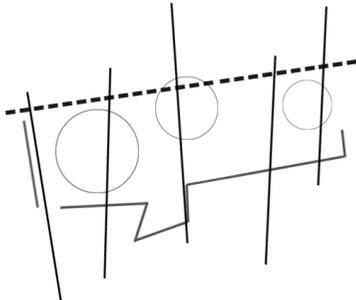


Figure 8.2 Aspect of connecting to site through current 'openings'/ 'roads' from Makaanse is carried over into current design (Author 2018)

DESIGN DEVELOPMENT

RESPONDING TO THE 'MASTER' STRUCTURE

As established in the opening manifesto, this project largely remains open-ended, fluid, and non-prescriptive. However, in order to ensure that this is achieved, a system that informs function and design was established. This system (mostly set by the Technification in the previous chapter) will therefore guide the design in order to unlock its identified potential, and lead it to the envisioned state. The explorations and investigations to follow were aimed at developing:

1. Spatial implications of the 'Master' structure
2. Physical ways of developing the parts that make the Master plan
3. Ways of ensuring the design develops in a manner that responds to the 'Master' structure.

This chapter will therefore discuss explorations of the system; how the order set in technifying can be applied to/ has influenced spatial design, how the experience can be manipulated (within the set masterplan structure) through application of design principles taken from the Precedent chapter. How can the Natural, Functional, and Aesthetics (as illustrated in Fig. 5.8.9) be merged into a design that works within the set master structure? Is there a way of designing

for interaction between the process of manual land-making and growth of vegetation? How can the project's concept of 'building as process', of anticipating growth and change over time become a tool to inform design?

PREVIOUS ITERATIONS

Earlier versions of the design were focussed on responding to the spiritual, cultural, human-natural, and value aspect of stewardship. The programs were an interplay between sacred and utilitarian space within a landscape setting (Fig 8.1). Although the direction, some programs and design changed, some aspects were adapted into the 'final' design - Fig 8.2.

PHASE 1 DESIGN - Phytoremediation

This phase overlays and responds to ecological, social, and economic issues (Fig. 8.4). The intention is to address each of the issues through a combined design intervention. In order to achieve this, there needed to be a program (as discussed in Chapter 6) that tied all themes together, thereafter a design that allowed for the interaction between ecological, social, and economic aspects to occur.

The design behind the remediation

Design opportunities for exploration are found in the structure set for this process, as discussed in the previous chapter. These include; the

grids set-out for trees and groundcovers, the development (growth and thus change) from initial planting, to establishment, to repetition of process.

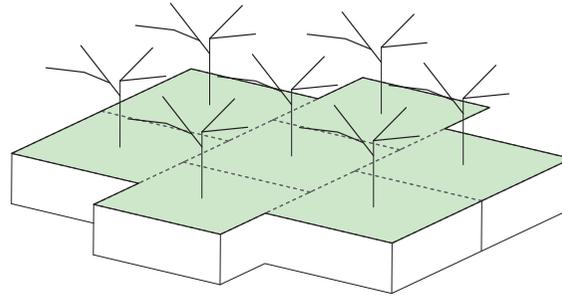


Fig. 8.3.1 Explorations of tree arrangements: Quincunx

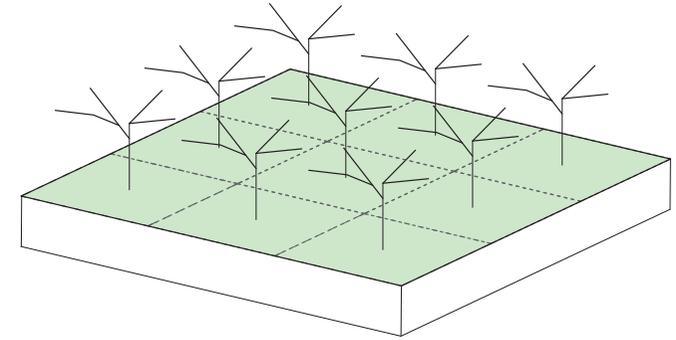


Fig. 8.3.2 Explorations of tree arrangements: Grove

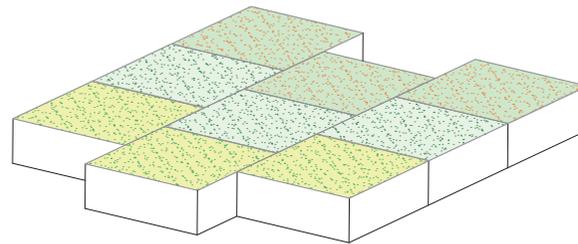


Fig. 8.3.3 Explorations of groundcover layout

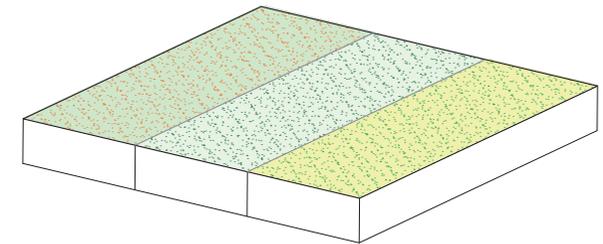


Fig. 8.3.4 Explorations of groundcover layout

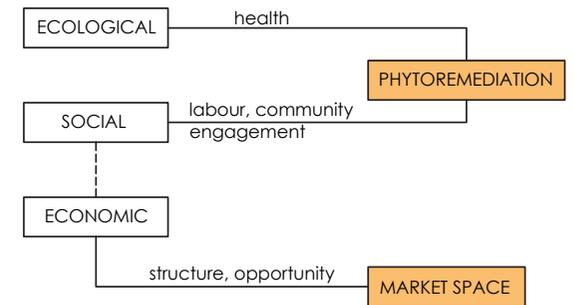


Figure 8.4 (Author 2018)

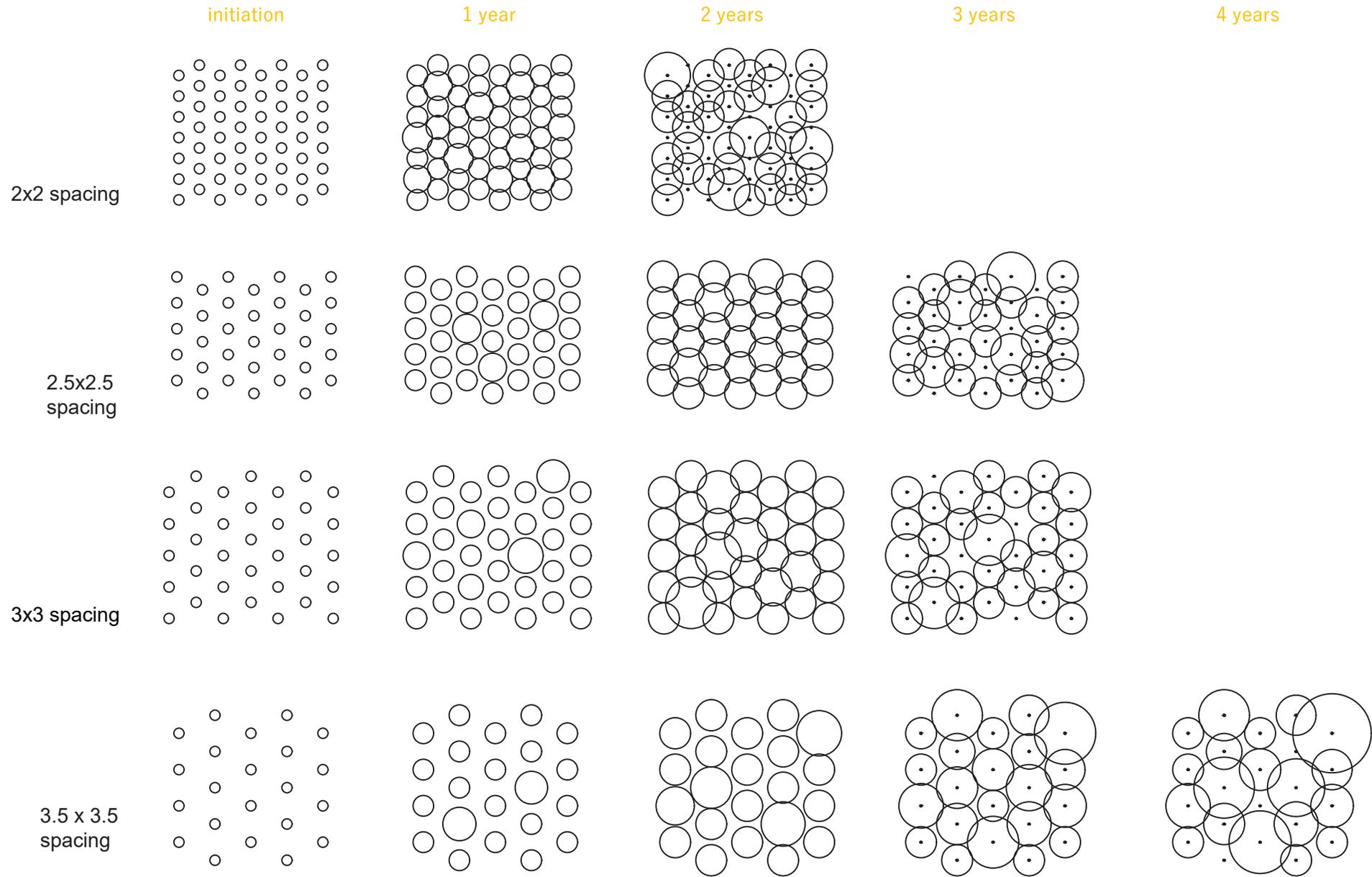
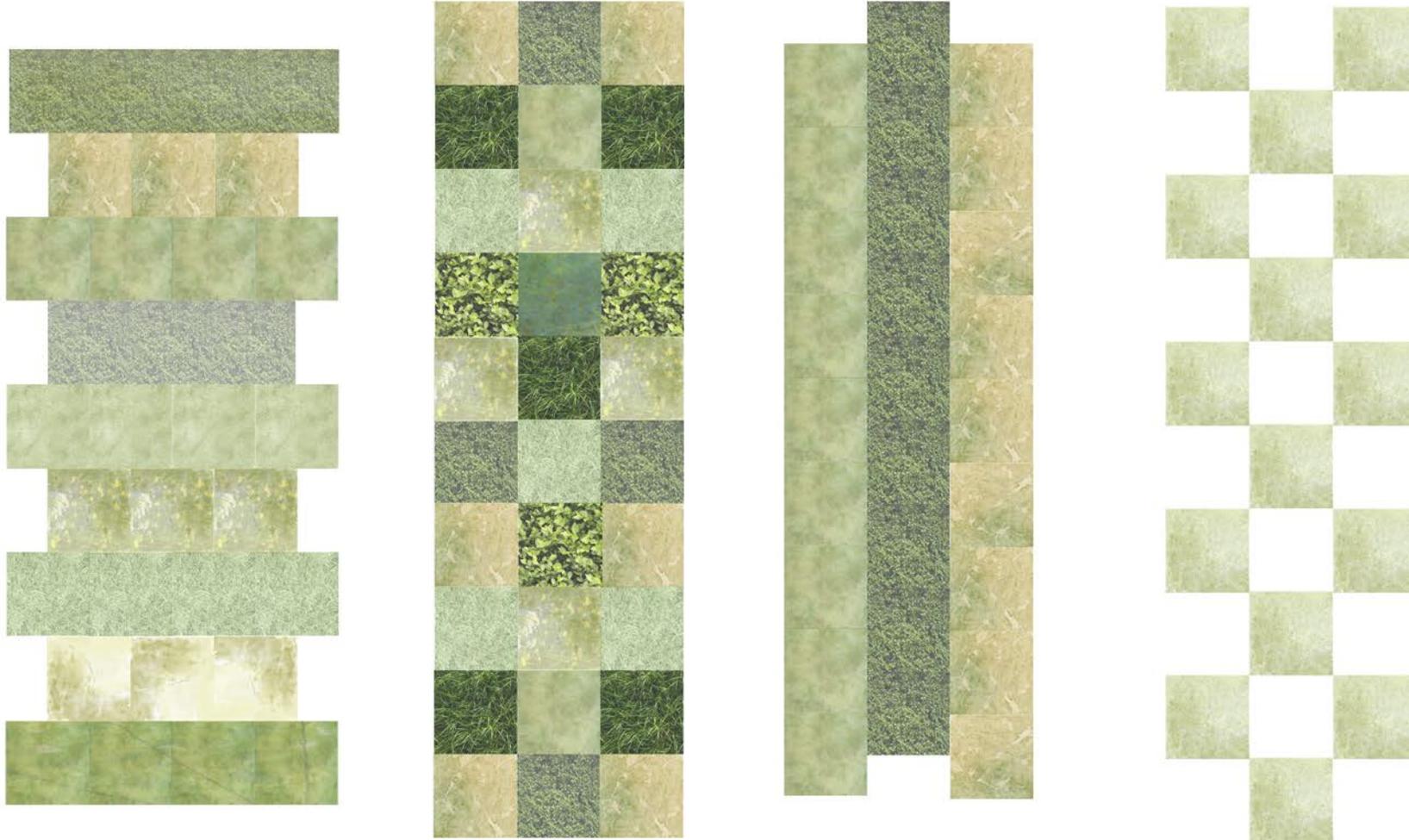


Fig 8.3.5 Explorations of tree spacing and the growth overtime. The closer they are placed, the faster they overlap and need cutting back. (Author 2018)



Rows of different species planted in different seasons over time

Rows of different species arranged in alternating order, row to row, block to block

One species per row.

Checkerboard planting. Thereafter, plants are left to grow freely.

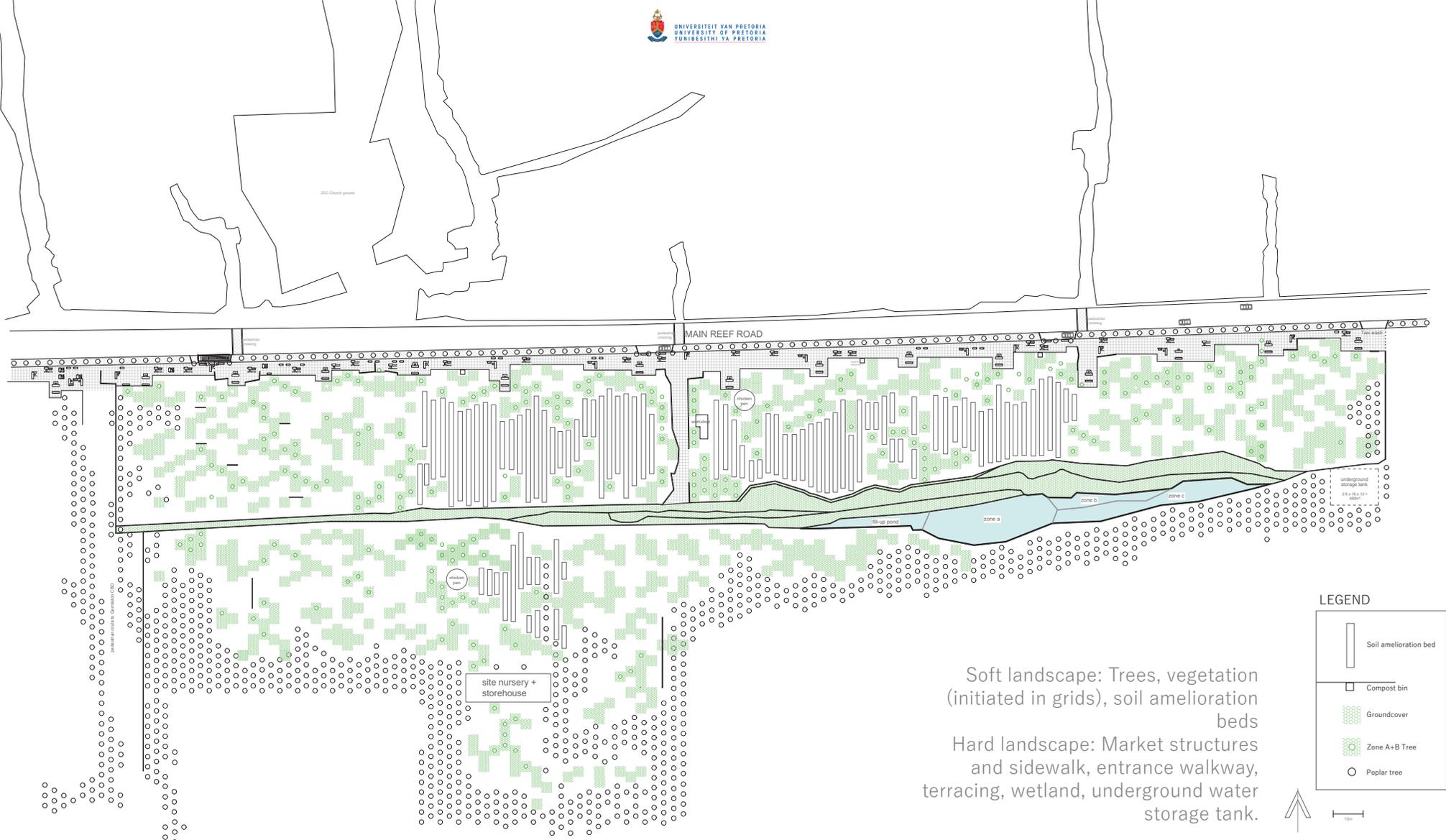
Fig. 8.3.6 Explorations of groundcover layout (Author 2018)



Figure Exploration of Poplar tree height, to human scale



Exploration of sequencing of planting vegetation



Soft landscape: Trees, vegetation (initiated in grids), soil amelioration beds
 Hard landscape: Market structures and sidewalk, entrance walkway, terracing, wetland, underground water storage tank.

Phase 1 Master plan.

From the on-set, it was found necessary to manipulate the contours of the site in order to resolve technical issues (stormwater management, remediation (separating the high intensity area (Zone C) from the lower intensity areas (Zone A and B), and to accommodate use and circulation of the site. The 'scar' in the landscape, discovered as the contour lines of where the former mine used to reach thus became an inspiration to overlay a part of the history of the site. This line (the line designed mid-across the plan) is a series of terraces that descend from the top level of the site (5m high) to the bottom level of the site. This gesture also makes reference to the concept image (see Figure 4.1 in Chapter 4), where there is an ascension and descension between deeper knowledge/understanding and lesser informed states. The bottom part of the site will in a later Phase; house a Tree nursery. This can be a literal/tangible object that speaks to the idea of 'deeper knowledge'. The top edge of the site, right along Main Reef road is proposed to have markets. The markets are designed in a manner that mimics the organic grain of the settlement. In the Phases to follow, (when the site becomes more accessible to users) the walkways that enter into the site are designed to follow a similar language.

PHASE 2 DESIGN - Agroforest

This phase is a combination of a changeover between itself and the previous phase, a new program, and growth. The design therefore plays between older and newer planted zones, agricultural spaces, and the presence of larger trees. The removal of some of these trees (ones planted to remediate) would begin, as a result leaving traces of the initiation program. The removal follows the method of cutting down trees at their stem. Spaces that have undergone this process will take on a different identity, a different experience (Fig. 8.5)

What was explored here (previously presented in Fig. 7.8), was the order/sequence of tree removal and how it can contribute to the spatial design.

As seen from the architectural precedents; design can abstract or mimic a natural landscape (field, forest or meadow) and re-adapt the essence into its own. A similar approach was taken with the agricultural spaces, except that they mimic man-made landscapes. They are laid out in long linear rows, as is done on farms. The design aimed to bring together functional, aesthetic, and natural considerations. As a result; the layout considers the movement of those working in the spaces (function), the interaction between crop, shrub, and tree (function), the sensory experience (aesthetics), as well as practicalities such as access control and movement, collection or sorting of harvested crops (function) (Fig 8.6).

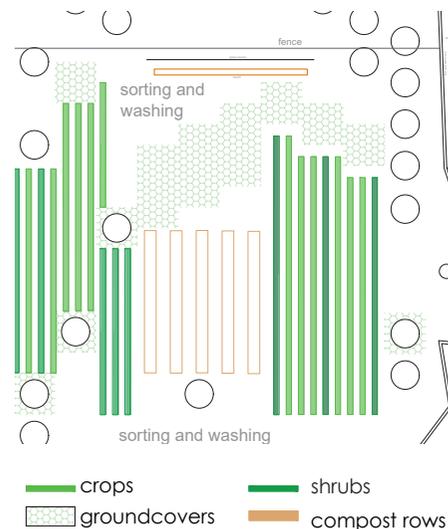


Figure 8.6.1 Agricultural areas design (Author 2018)



Figure 8.5.1 Spaces left after trees are cut down



Figure 8.6.2 Agricultural areas (Author 2018)

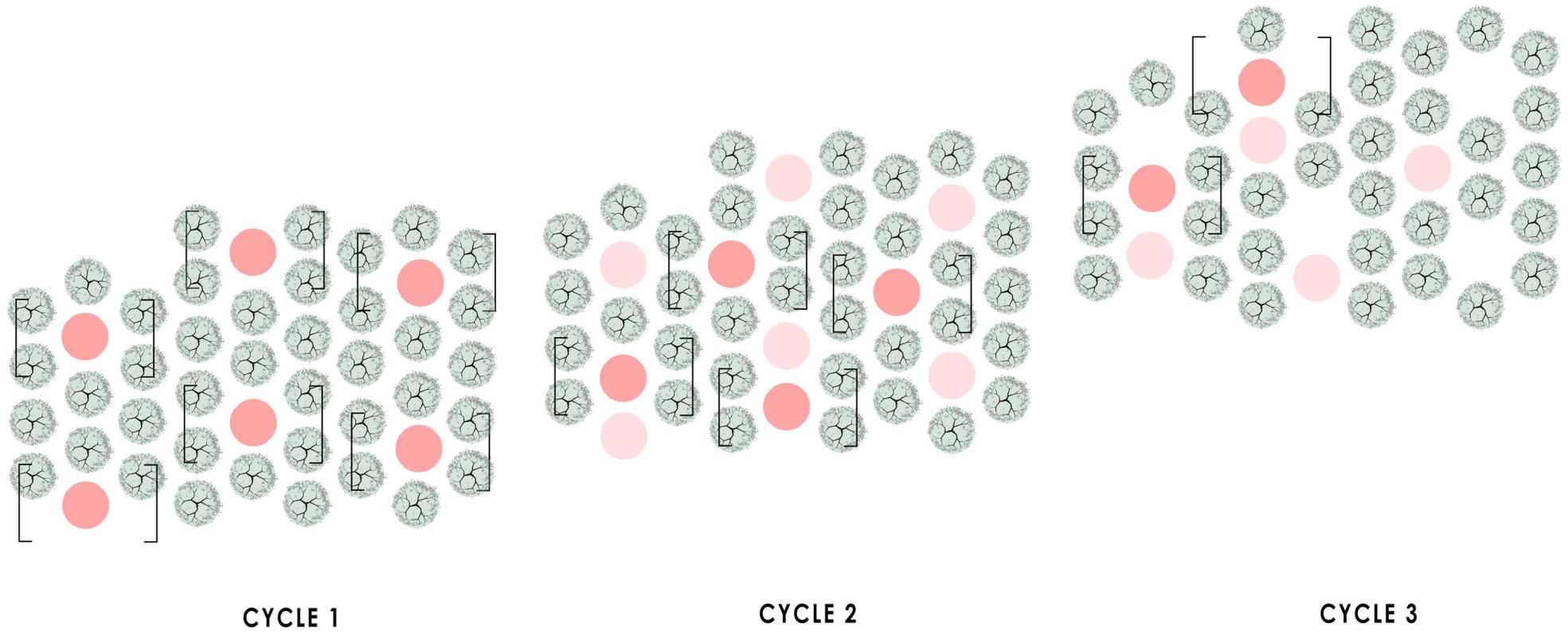


Figure 8.5.2 Exploration of sequence in which Poplar trees will be removed (Author 2018)

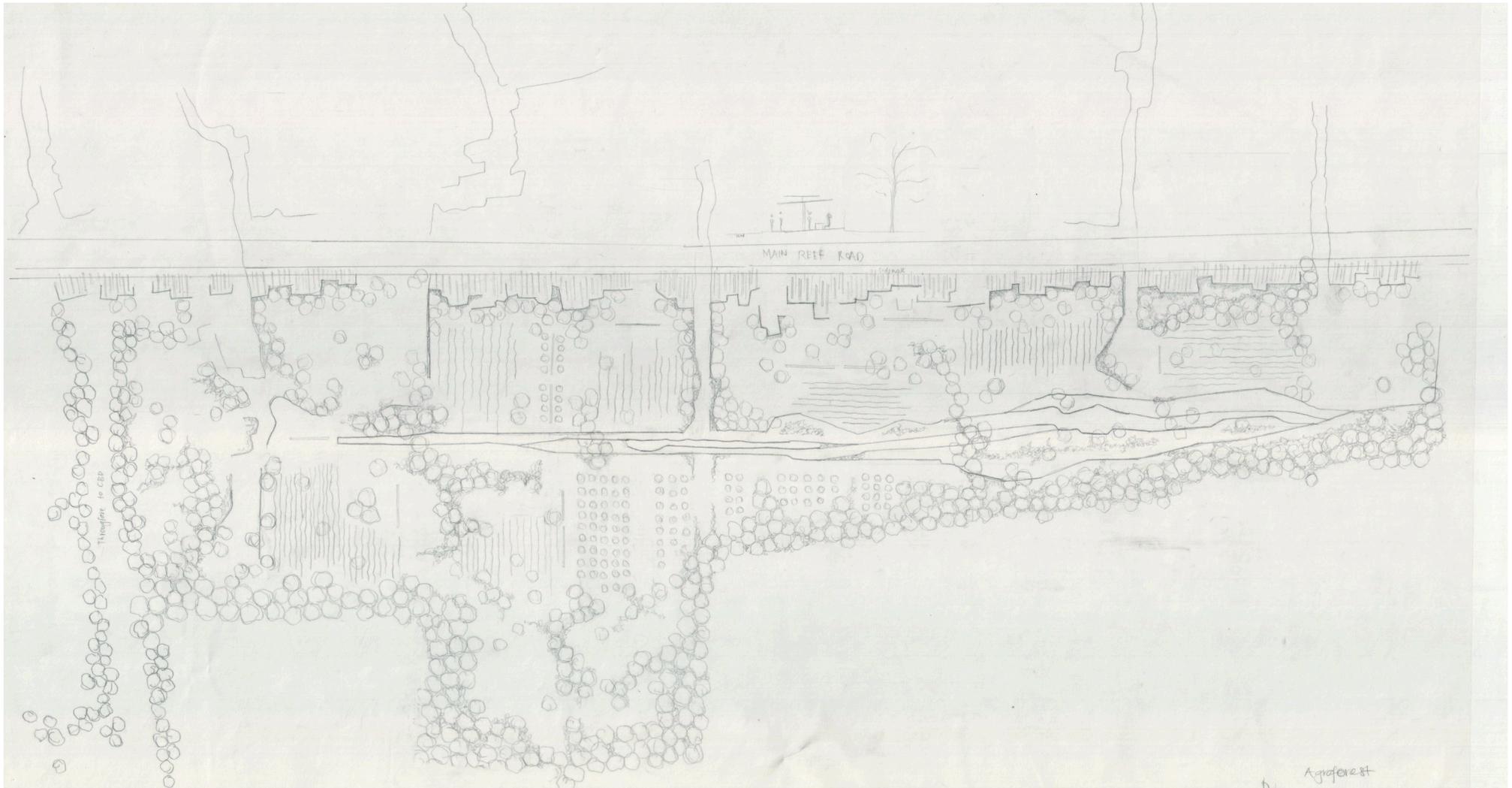


Figure 8.7.1 (Author 2018)
Iteration of Phase 2



PHASE 2 - AGROFOREST

Figure 8.7.2 Phase 2 Master plan. Fences are incorporated into the design to aid in the management of the agricultural areas. More access is available and possible to the site than the previous phase; walkways that connect directly from the community to the site are added.



Figure 8.7.3 (Author 2018)
Cross section through site illustrating space allocation, height changes, and various programs.



SECTION A-A



Figure 8.7.4

Agricultural lots crops chosen specifically for ability to grow in sandy and acidic soils

PHASE 3 DESIGN - Beginning of an arboretum

This phase facilitates the beginning of the conservation aspect of the project; the arboretum. As remediative trees are cut down, they will be replaced by trees that support the arboretum. This process is fluid, and dependant on space available at the time, current/ anticipated use of the space, user experience (e.g. provision of shade), and complimenting earlier established trees.

Individual spaces are left open to allow the establishment of various gardens within the arboretum (the choice of where these spaces will be is left open for the community to decide. The gardens are to house trees identified to be of cultural value. Each garden will through a simple and easily implementable design, signify the value of each tree with the use of colour, contrast, emphasis, pattern, unity and rhythm.

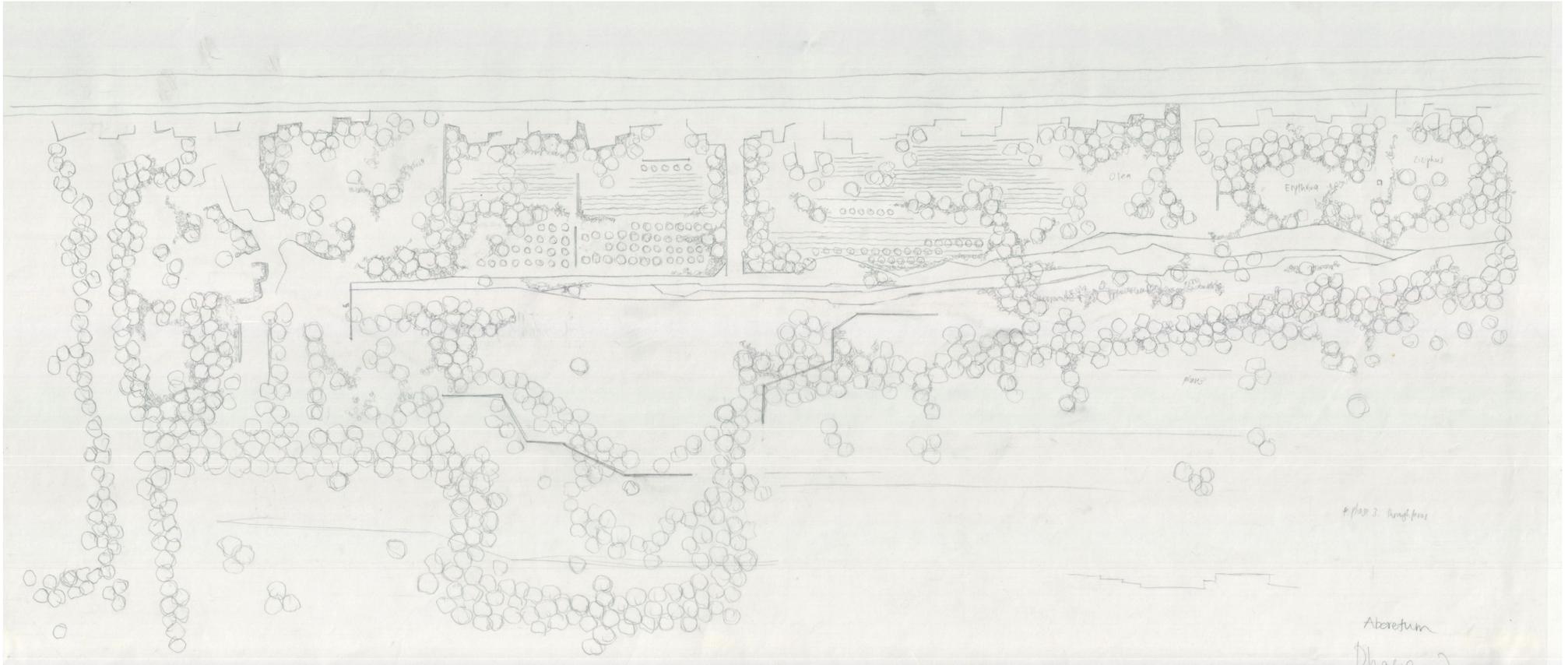


Figure 8.8.1 (Author 2018)

Iteration of Phase 3. The idea was to already build structures that were in place, that would become the base layer or 'historical' point of reference for the coming tree nursery to be established on.



PHASE 3 - ARBORETUM

Figure 8.8.2 (Author 2018) Phase 3 Master plan.

The agricultural aspect of the program is re-condensed to a smaller area. The project focus balances between establishing the arboretum from the existing layered base, and continuing with agriculture. This Phase also sees the removal of the wetland, affording more space to develop and utilize.

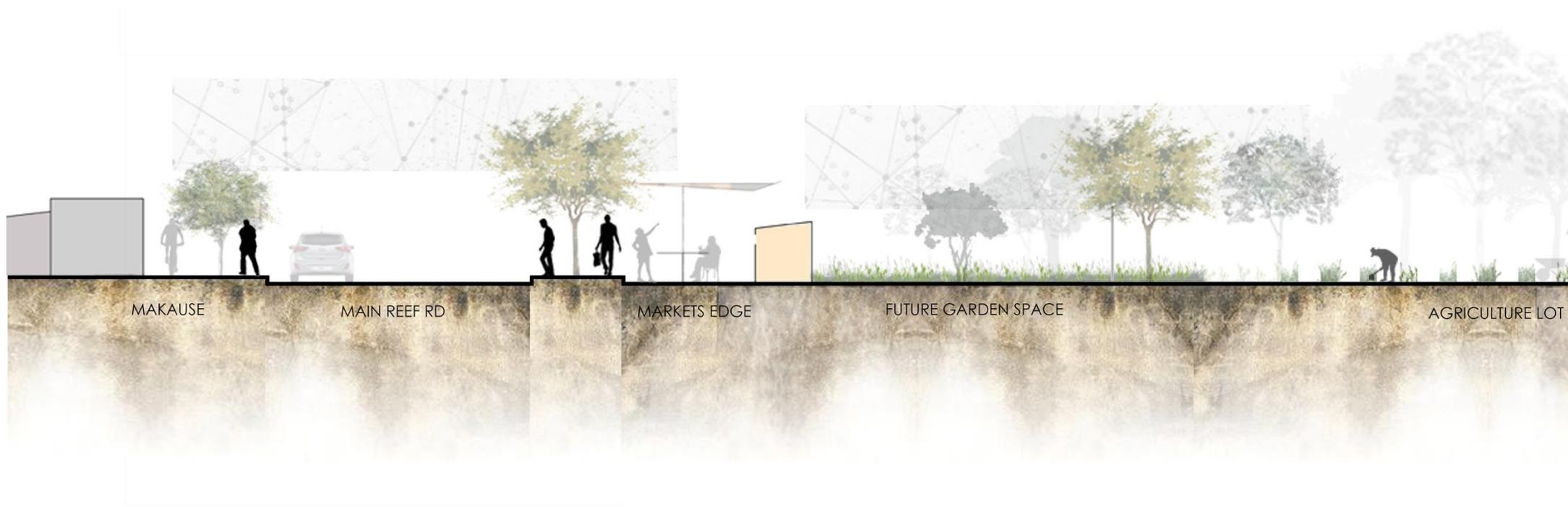
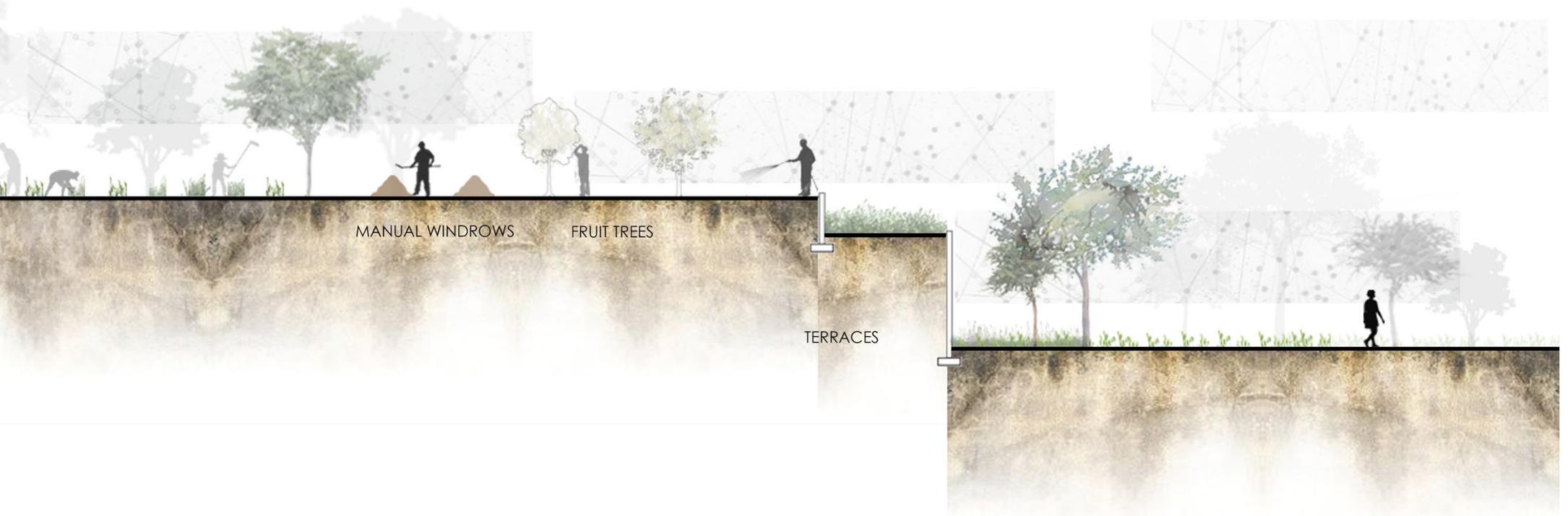


Figure 8.8.3 (Author 2018)
Cross section through site illustrating space allocation, height changes, and various programs.



SECTION B-B

PHASE 4 DESIGN - Addition of commercial Tree Nursery

The phase incorporates an established tree nursery that works along with the arboretum. In earlier phases, an informal site nursery is used as a supply to the initial planting, (the plants are established on site to ensure their ability to grow in harsh conditions). Aside from the arboretum this tree nursery becomes a supplier to the community, the public, and other larger nurseries.

It is designed in a similar linear fashion, that responds to the over-arching linearity that has become a constant for the design (between phases, between 'Master' structure and design response of its smaller parts. The idea is to have a mixture of visual screening, movement control, transition (between arboretum and nursery), visual continuity, and subtle change between various spaces. (Fig. 8.9)

The lower part of the site (where the nursery is located), would also have become for connected to the upper part, with the addition of access points and routes. As time passes and trees establish, grow, and take form, as the arboretum finds its identity; various spaces can become moments similar to meadows in a forest (Fig 8.10).

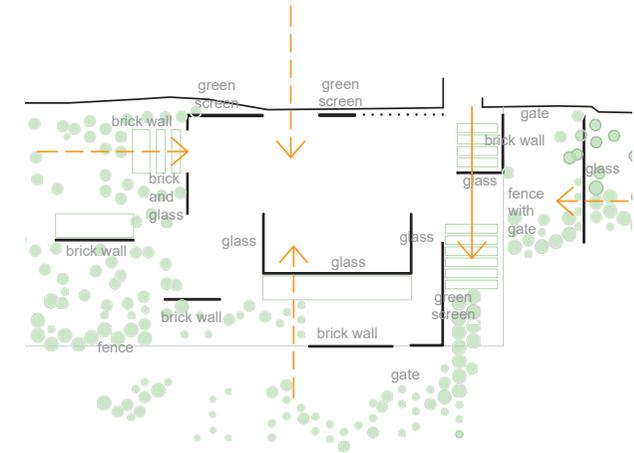


Figure 8.9 (Author 2018)
General design of nursery



Figure 8.10 (Author 2018)
Spaces become moments similar to settings in natural, undisturbed environments

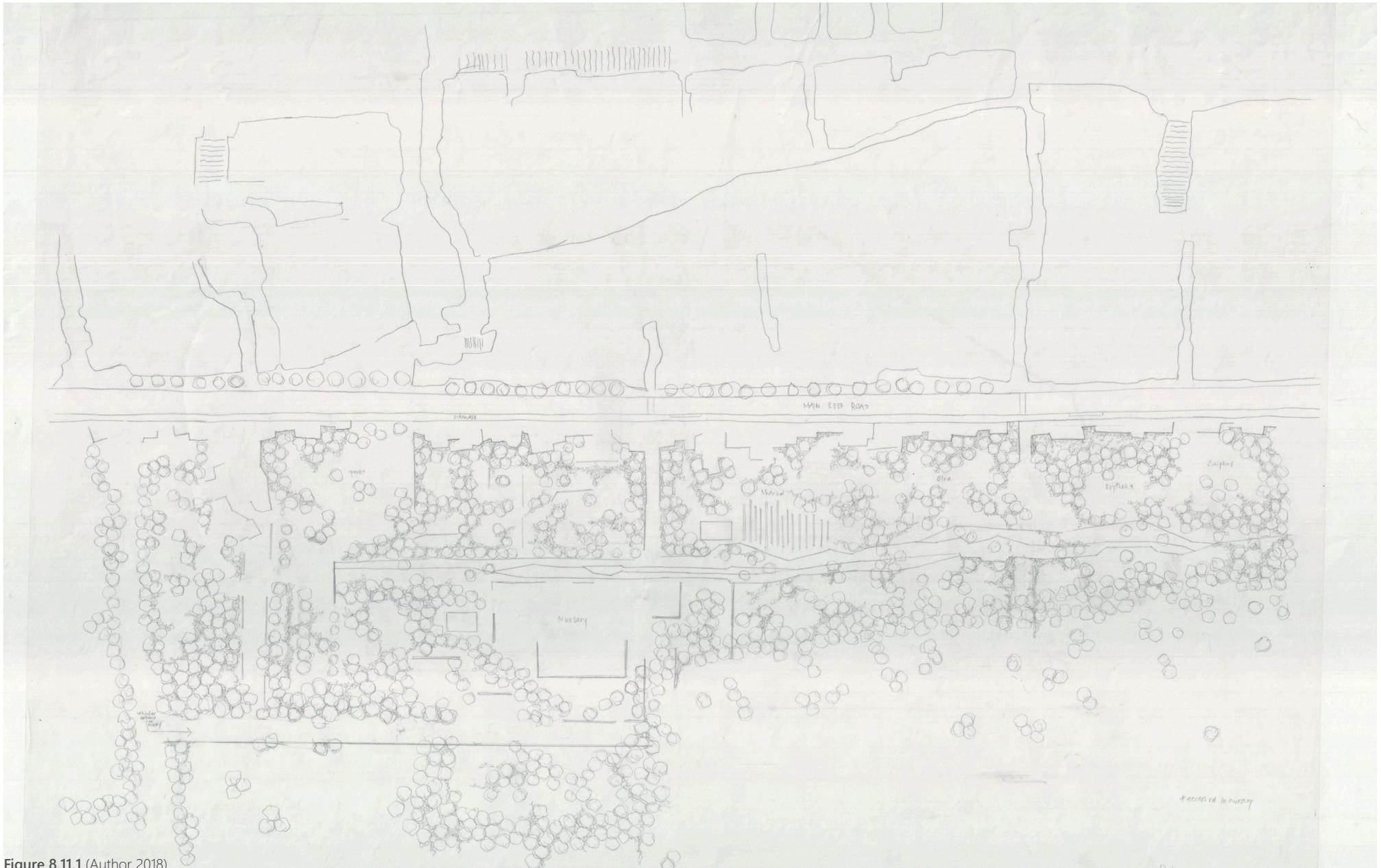
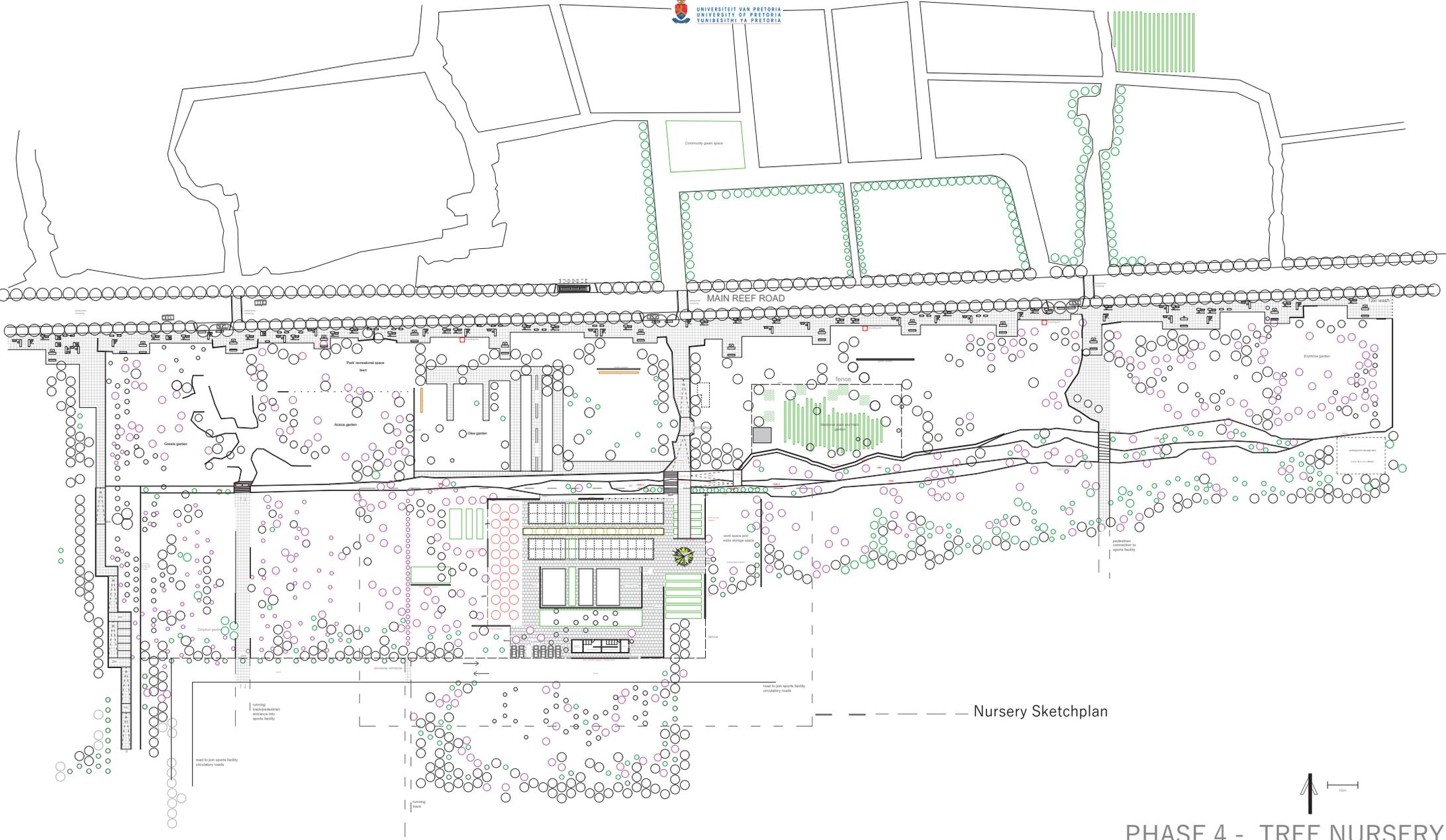


Figure 8.11.1 (Author 2018)

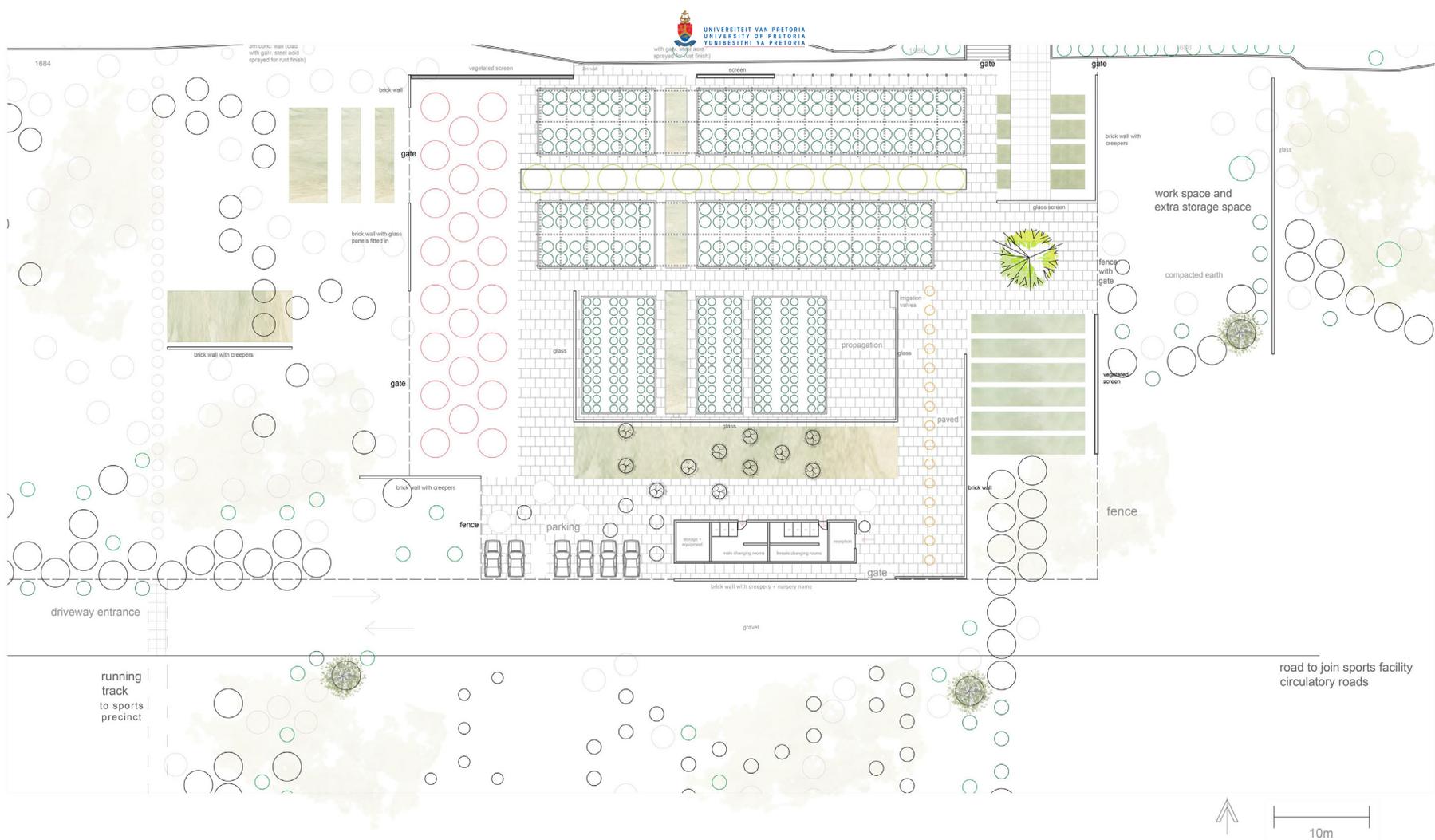
Iteration of Phase 4 - Nursery responds/develops form structures placed in Phase 3. Agricultural aspect moved and adapted into settlement community, (which at this point should be have been formalized).



Nursery Sketchplan

PHASE 4 - TREE NURSERY

Figure 8.11.2 (Author 2018) Phase 4 Master plan
As a sub-program; a medicinal garden (which will work in connection the nursery) is designed into a space that was previously used for agriculture.



NURSERY STETCHPLAN



gravel driveway



paved high circulation portions



brick walls



green screens



steel terrace walls (on northern edge)



glass screening

Figure 8.11.3 (Author 2018) Nursery Sketchplan
Designed to allow day to day functioning, but also integration with previous layers

sidewalk

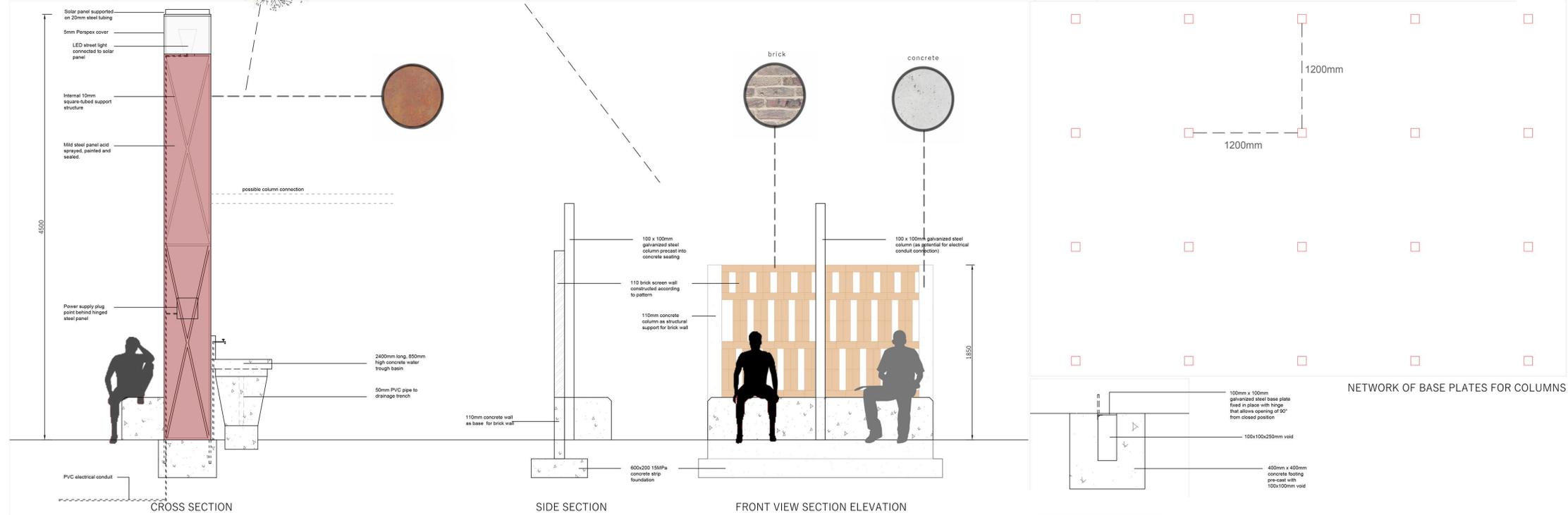
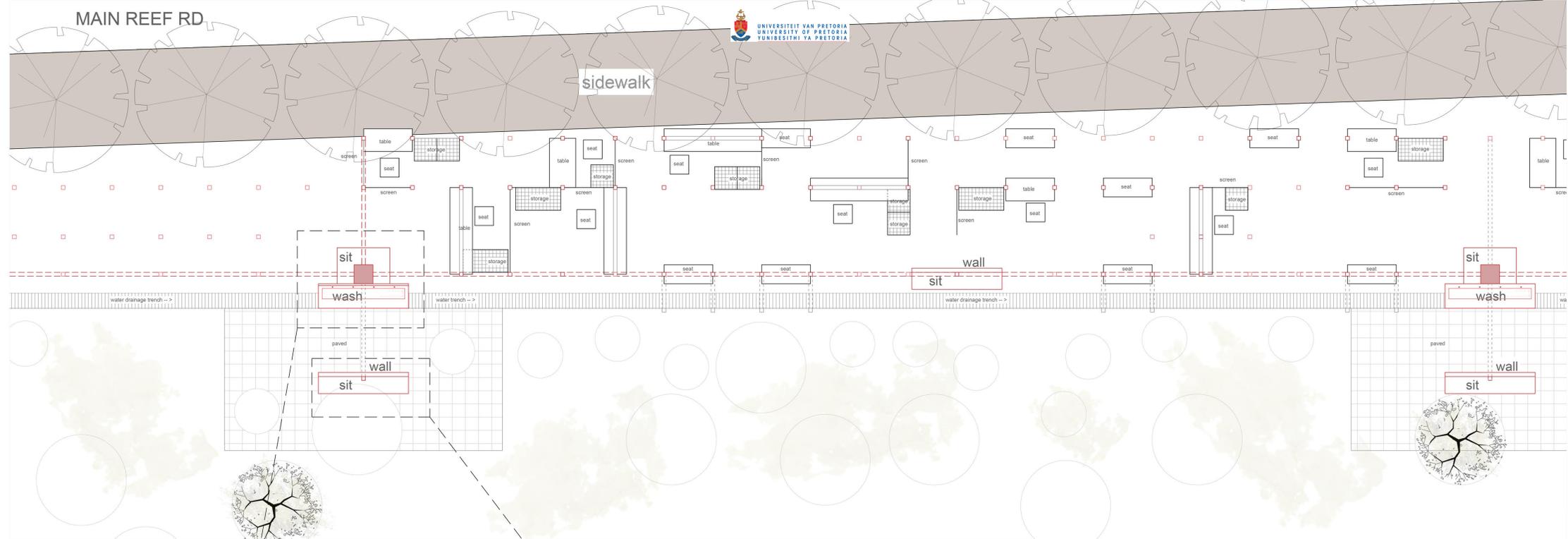
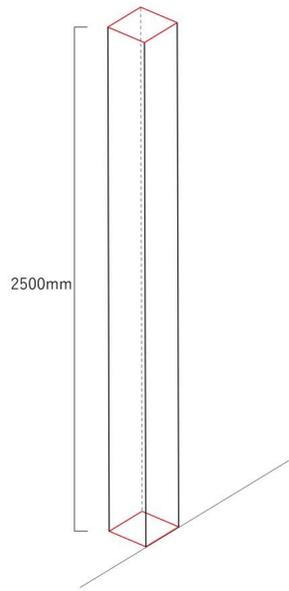


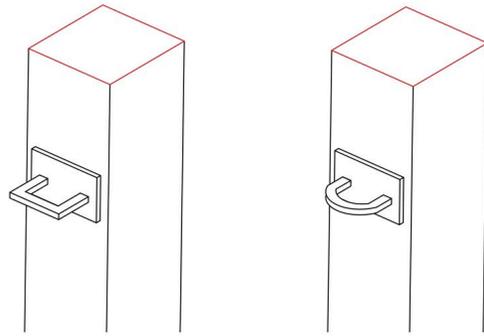
Figure 8.12 (Author 2018) Market (along street edge) details

Designed to be configured according to user needs and preferences. Permanent structures (anchor points) are: Water points (and power) which located every 15m.

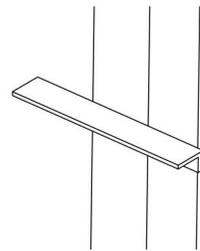


2500mm

100x100mm GALV. STEEL COLUMN



HOOK TYPES: WELDED ON 80x80x5mm STEEL PLATES WELDED ON COLUMN



50x50mm IRON ANGLE CLEAT

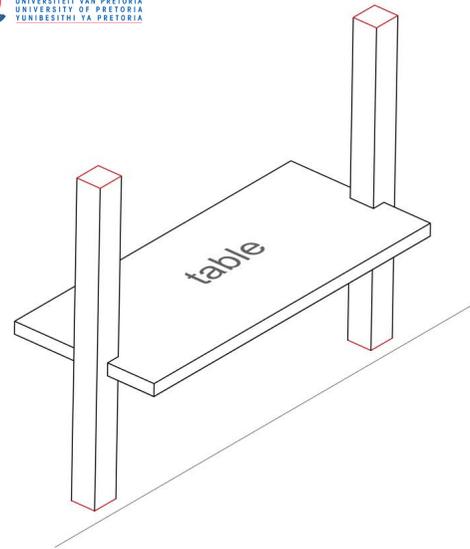
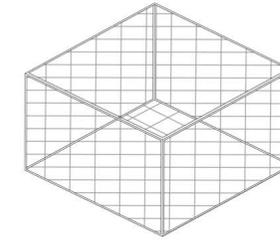
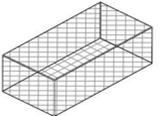
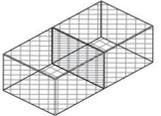
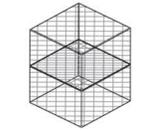


TABLE CONFIGURATION OPTION

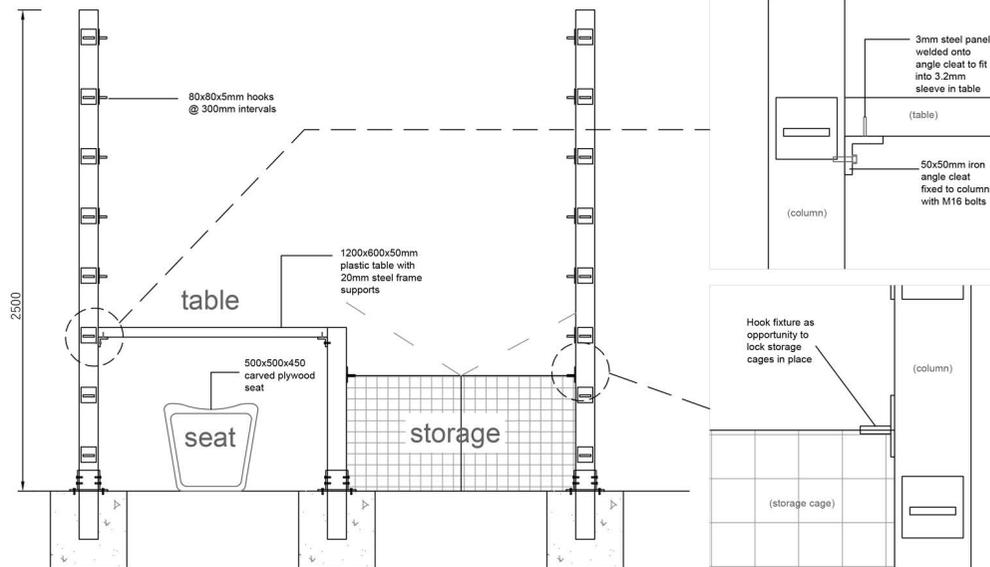


600x600x600mm GALV. STEEL STORAGE CAGES FIT WITH WIRE MESH

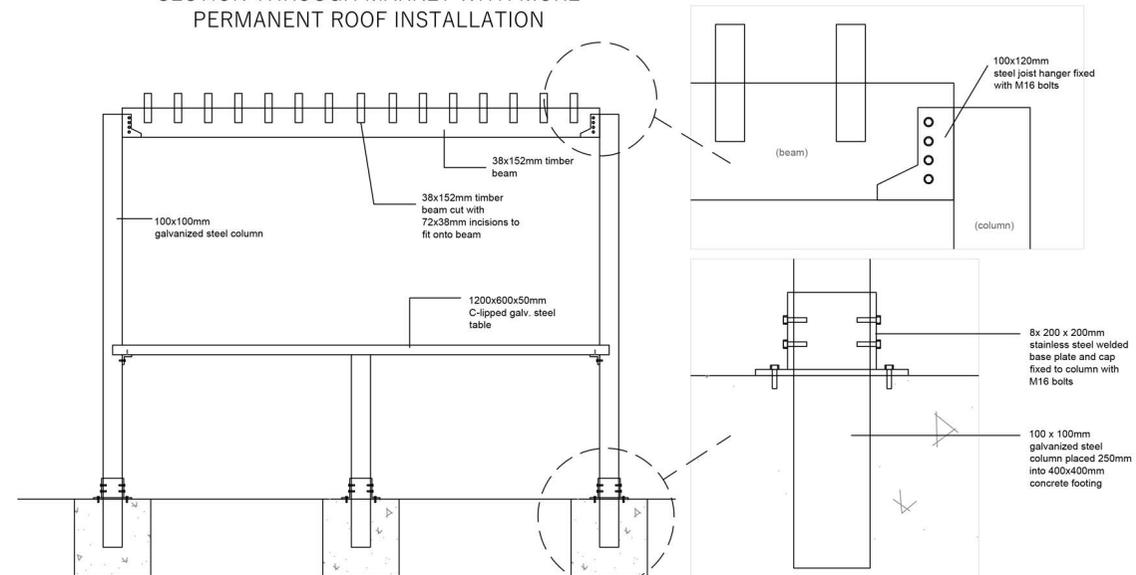


CONFIGURATIONS AND OPTIONS

SECTION THROUGH TYPICAL STARTER MARKET

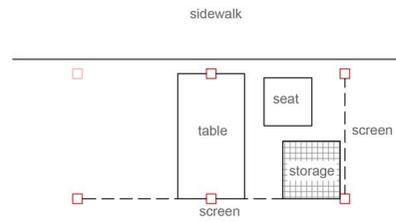
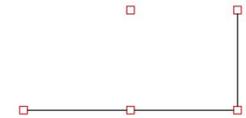
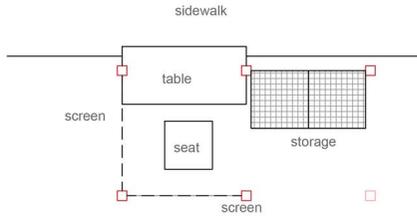
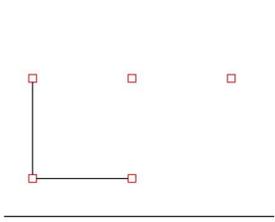


SECTION THROUGH MARKET WITH MORE PERMANENT ROOF INSTALLATION

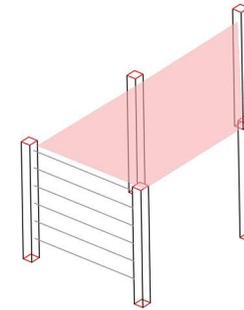
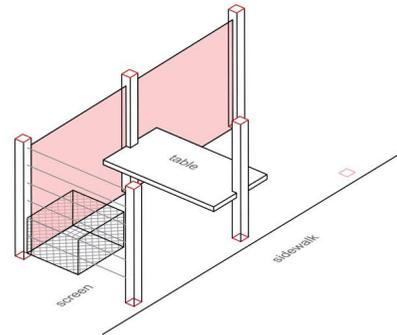
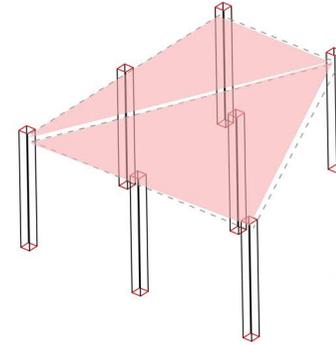
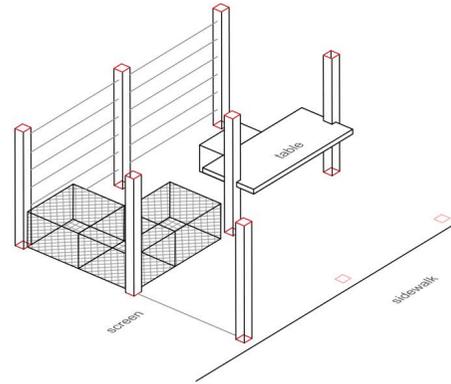


Configurations

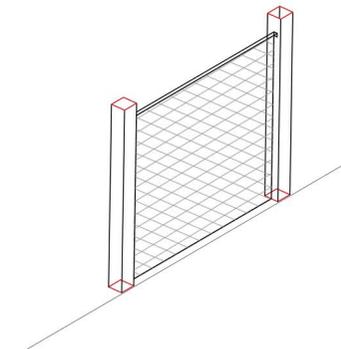
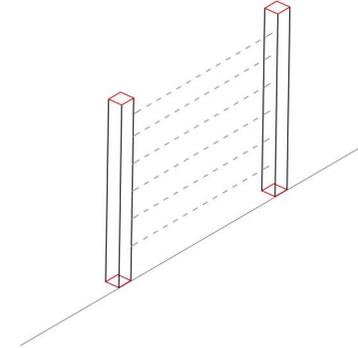
LAYOUT



SHADING

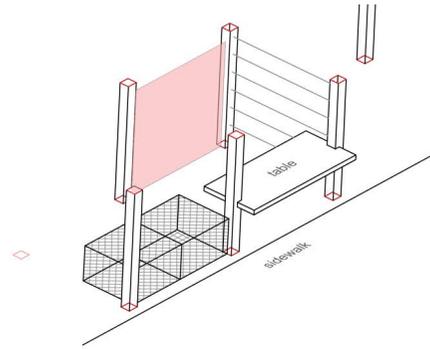
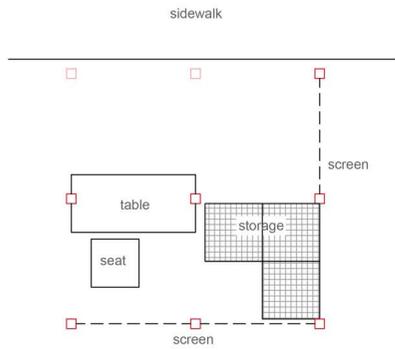
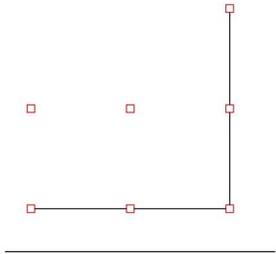


SCREENING

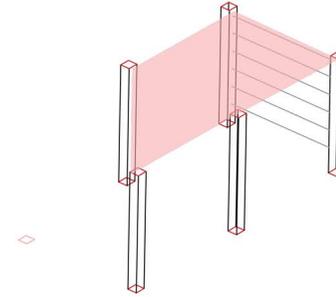


Variety of configurations, shading and screening options to allow users to maintain individuality, yet remain within pre-designed boundaries of over-arching structure

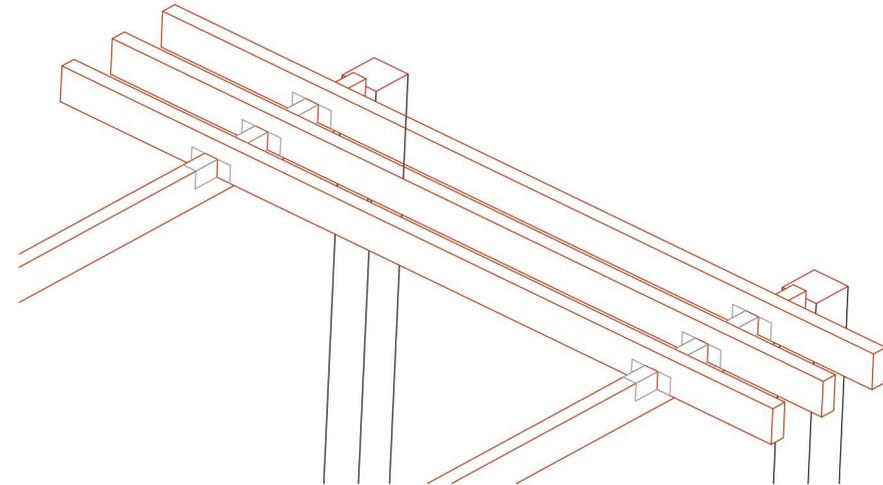
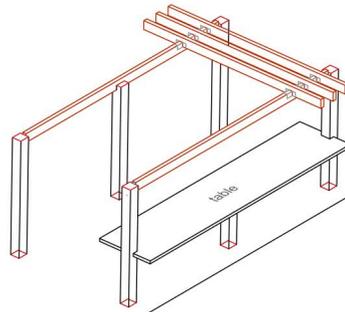
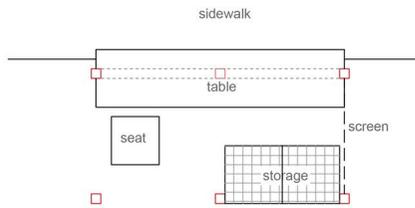
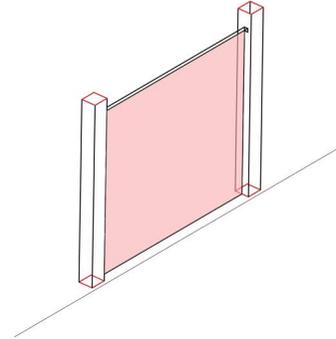
LAYOUT



SHADING



SCREENING



GARDEN DESIGN

These gardens will house identified significant trees/trees of cultural value to cultures mapped in Makause community (based on Ward statistics). The trees include *Olea europaea* subsp. *africana*, *Erythrina lysistemon*, *Zizphus Mucronata* etc. The garden design is also given an overarching structure. The structure sets up a frame/system that oversees two things; how the design can unfold (within the/in relation to the concept of time and change), and how they are to be manually developed over time to reach the vision. The system is summarised simply as an alternation between intervention and growth (Fig. 8.13.2).

Olea garden

Significance

The *Olea europaea* subsp. *africana* is of medicinal value to the Xhosa people (Cocks, Dold 2008). They use the leaves and bark to make concoctions that treat ailments such as high blood pressure (Joffe 2011).

Detail

This tree is evergreen (meaning its crown form remains largely the same throughout the year), but presents a multi-dimensional appearance through its double sided colour leaves. It is slow growing, and can reach a height of up to 14 m (Venter 2005), meaning if the tree grows to this

height, the scale may provide and 'roofed' or sheltered overhead user experience. The roots are aggressive, meaning built structures would be affected overtime. The bark is a good source of quality timber, meaning users may possible want to source this part of the tree as well.

User experience and design

It is therefore anticipated that users might want to harvest parts of the tree (bark and leaves) to take home and use or sell. To balance between harvesting the tree and experiencing the space; raised and lowered built planters are proposed. The raised; will help keep those trees away from human disturbance. The lowered planters will allow easier access to trees as they could grow out of reach.

The design of the space as a whole takes on a linear arrangement; in reference to the previous agricultural aspects of the site in earlier phases. The plants are selected from the colour palette displayed by the *Olea* tree (Figs. 8.15.3). to complement and enhance its visual qualities. They thus become a horizontal projection/ abstraction of the tree.

The garden is to be manually developed over time, from a few rows of plants and tree planters; to eventually an entire garden of young and old, raised and lowered *Olea* trees. This time-reliant process allows for that interchange between intervention and growth; where users get to experience, use and shape the space as it develops.

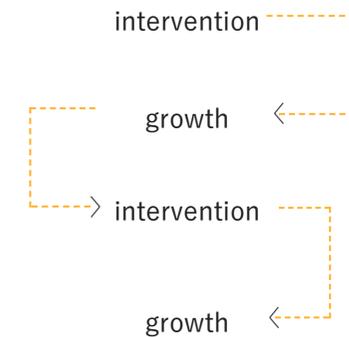


Figure 8.13.2 (Author 2018)

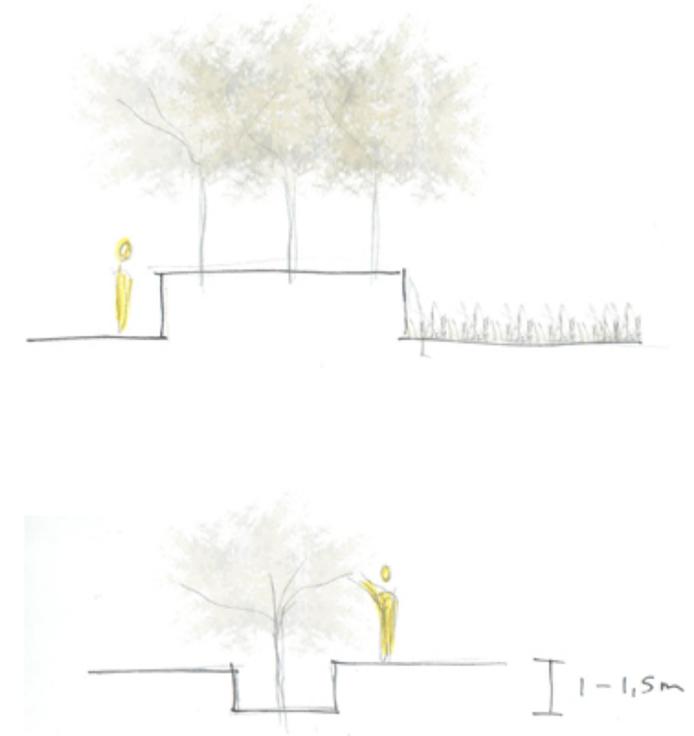


Figure 8.15.1 (Author 2018)

Explorations of *Olea* garden planter structures

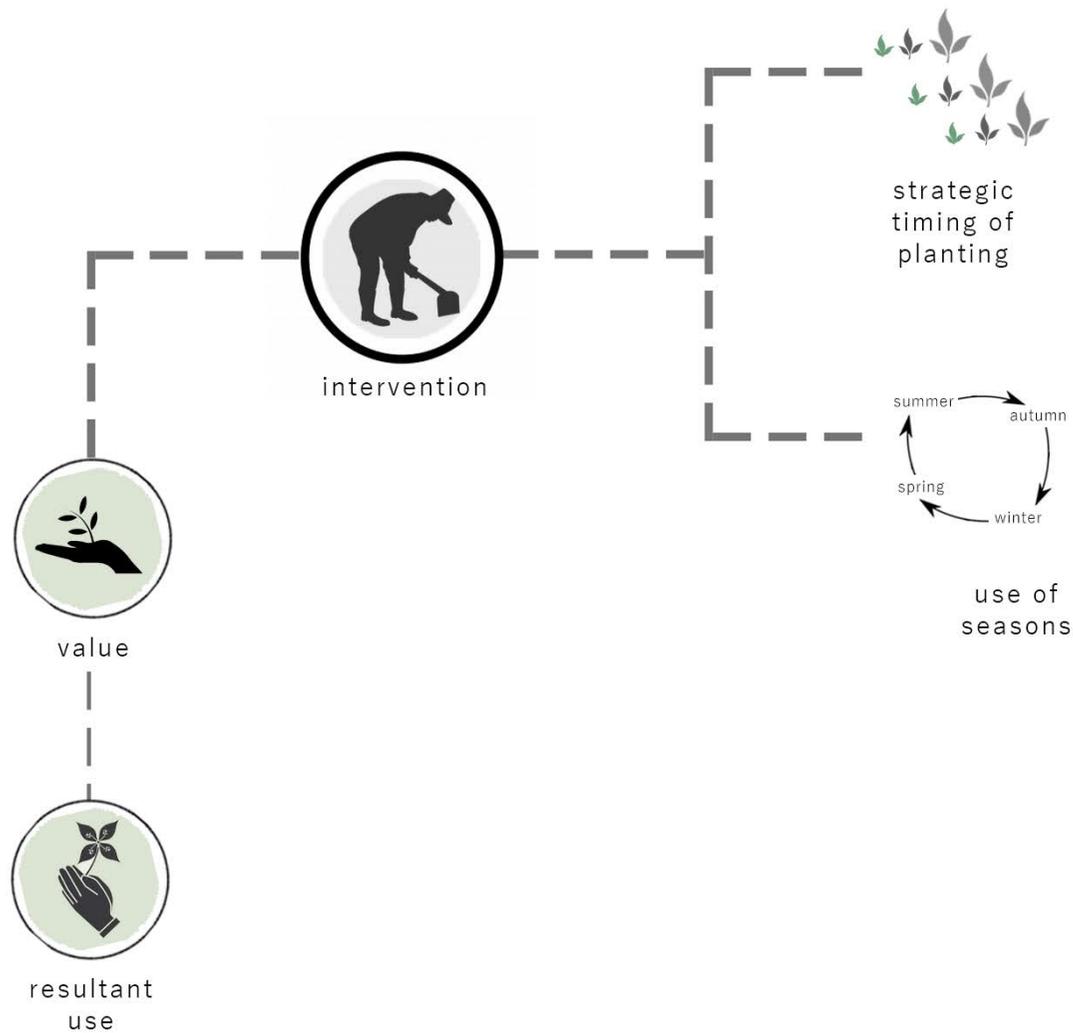


Figure 8.13.1 (Author 2018) Garden development strategy
Interventions will be based on identified anticipated human use. It will then be developed in co-ordination to seasons, planting and timed cycles

• Umnquma (Xhosa) •

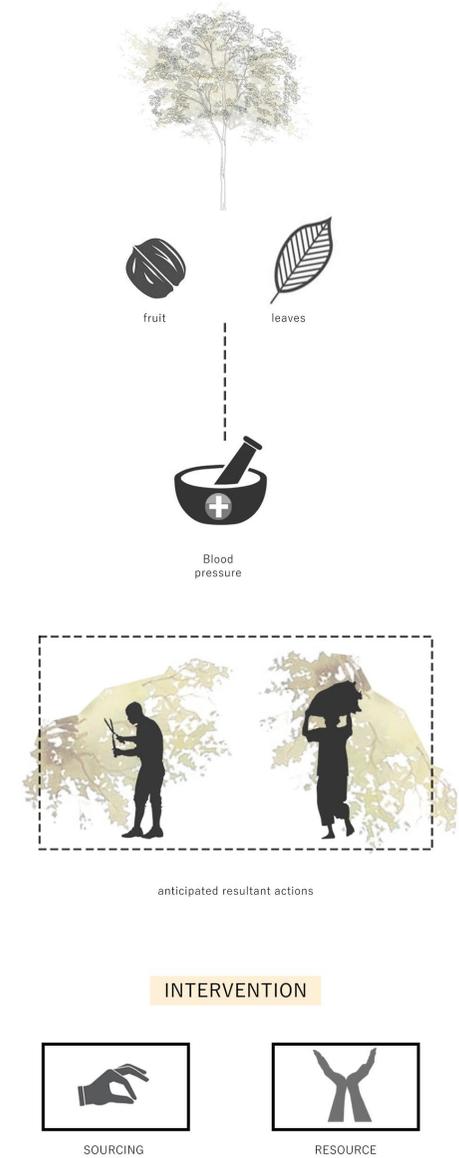


Figure 8.14 (Author 2018) Olea garden rationale
As a result of its value, the tree might be sourced by users of the garden; therefore the intervention will be a balance between sourcing, and building a resource

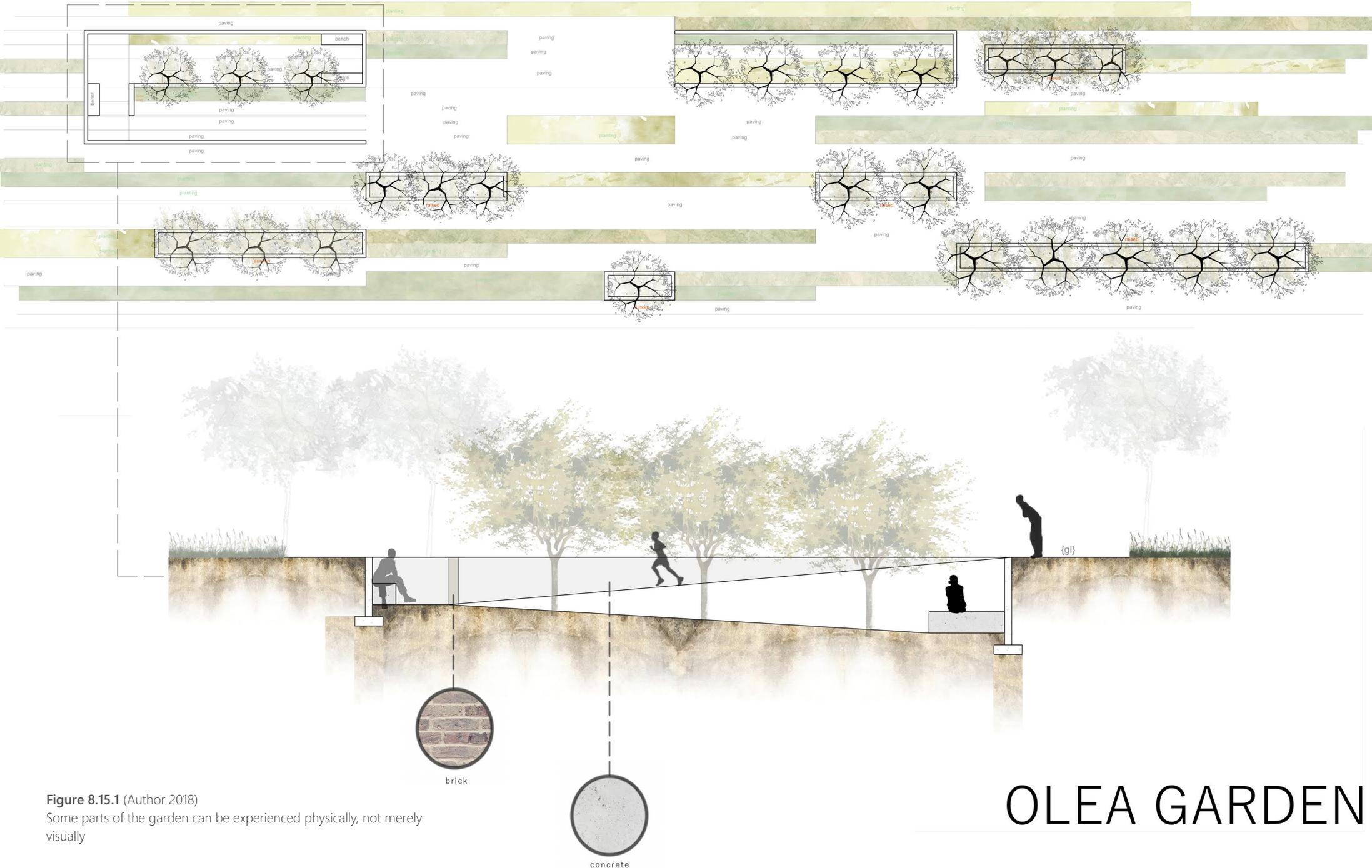


Figure 8.15.1 (Author 2018)
Some parts of the garden can be experienced physically, not merely visually

OLEA GARDEN

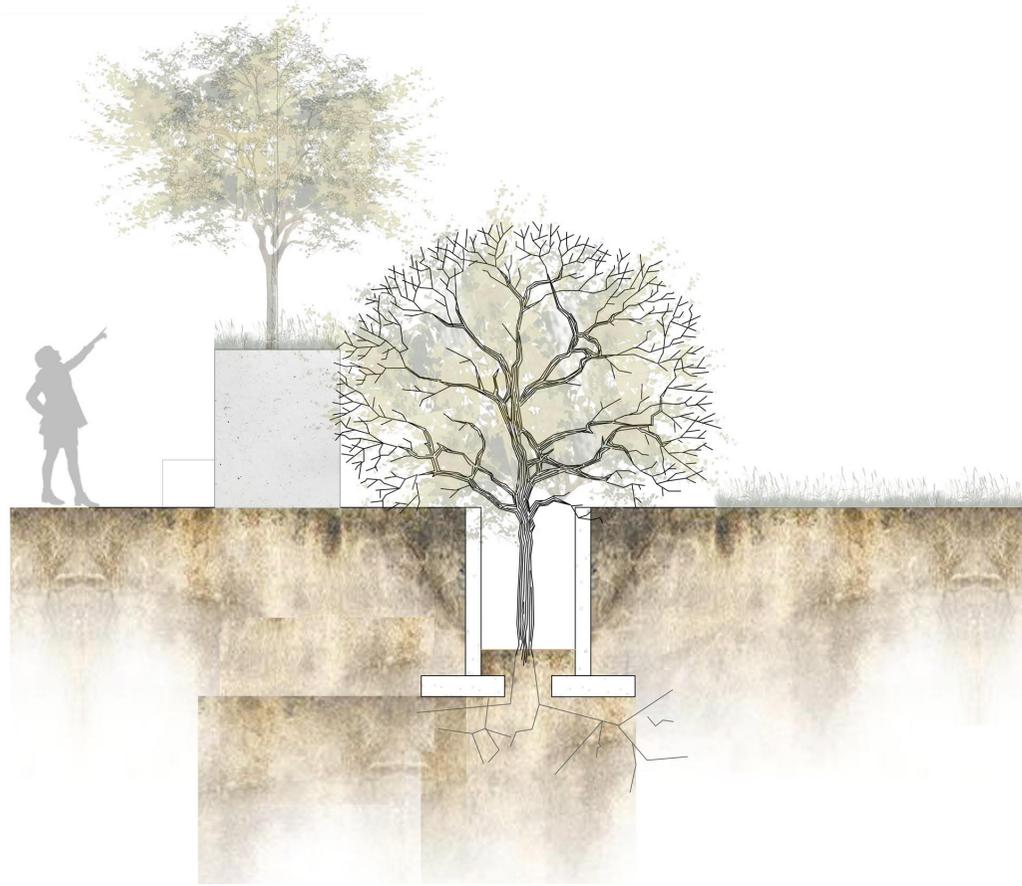


Figure 8.15.2 (Author 2018)
Raised and sucken planters



Colour palette



Grasses such as *Aristida aequiglumis*,
A.congesta, *A. junciformis*, *Brachiaria*
serrata, *Eragrostis chloromelas*,
Bewsia biflora, *Alloteropsis semialata*
subsp. *eckloniana* etc.



Figure 8.15.3.2 (thegardener.co.za
2018)
Olea colours as colour (and plant)
palette generator for garden

Figure 8.15.3.1 (Author 2018)
Olea garden with palette

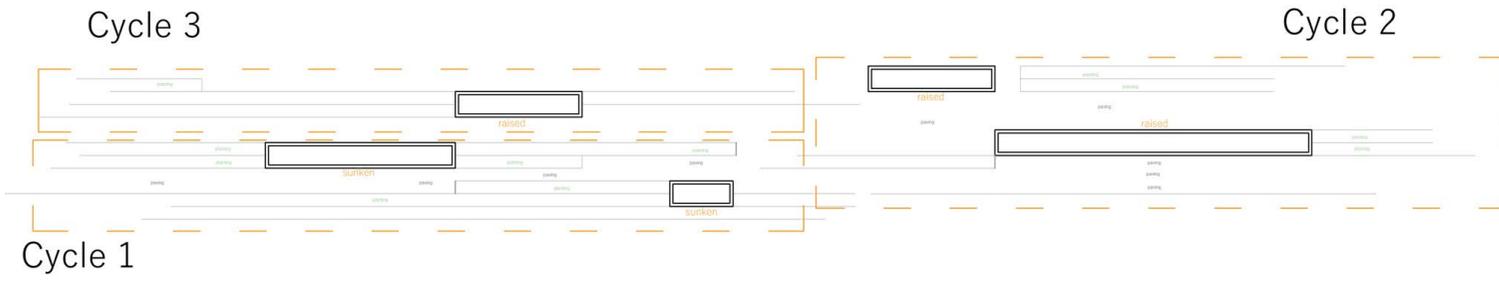


Figure 8.15.4 (Author 2018)
Intervention cycles allowing garden to develop over time



Figure 8.16 (Author 2018)
Exploration of mood/user experience of Olea garden

Erythrina garden

Significance

The Erythrina lysistemon is in many cultures; associated with luck, positive energy, prosperity and favoured aesthetics.

Detail

This tree is deciduous, flowering when its leaves have fallen, and thus becoming bright red and attractive towards the end of winter.

It reaches heights of 12m, but the crown is round and sparse; meaning it would need constant maintenance if it is to accomplish the garden's vision. The tree's fast growth rate (Venter 2005:154) will allow the garden to establish in a fairly short space of time, which is advantageous.

User experience and design

It can be anticipated that users will enjoy the experience of the tree's qualities and engage with its spatiality. They might even take parts of the tree in order to grow it in their own yards.

The design will thus focus on enhancing this user experience, alluding to its magical/fantastical qualities.



Figure 8.17 (Author 2018) Illustration of idea for Erythrina garden space
An overhead projection of the tree as space shaper



Auspicious



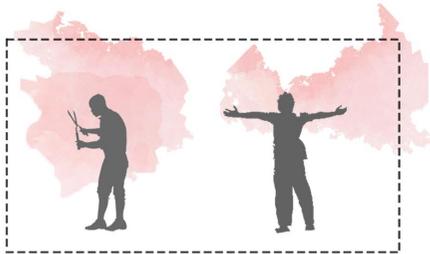
Good luck



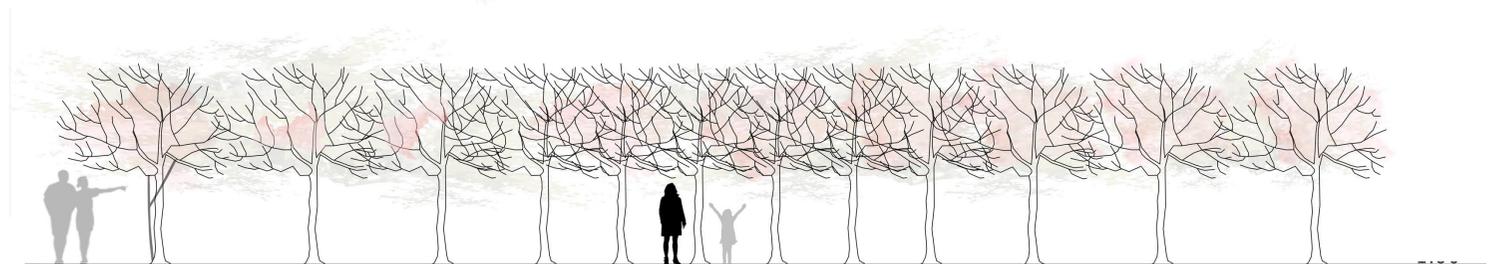
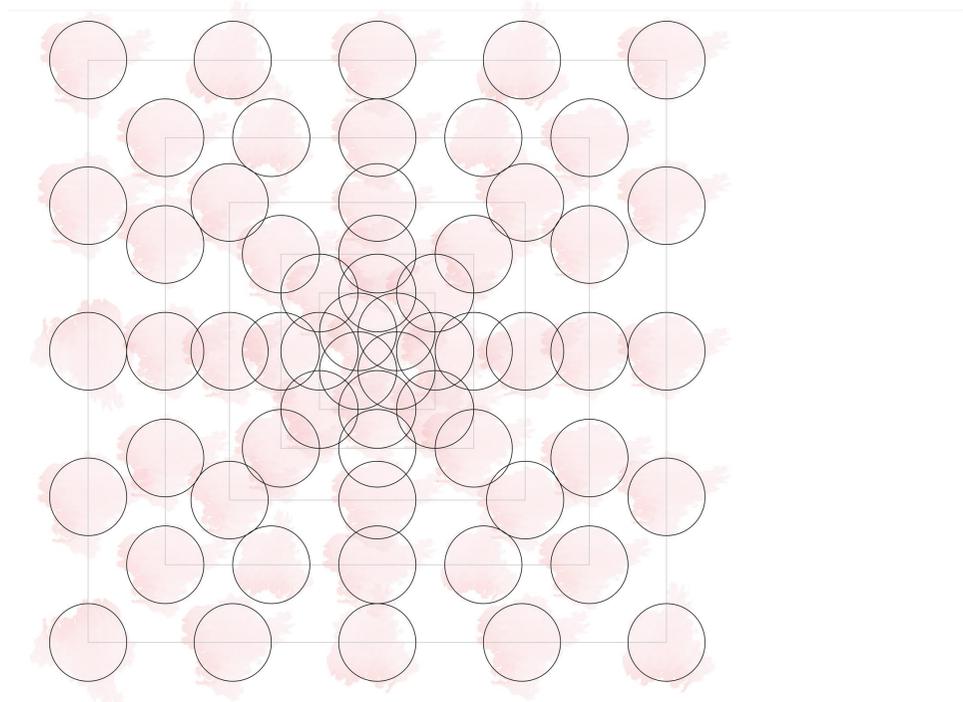
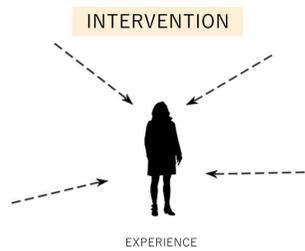
"Magic"



Aesthetics



anticipated resultant actions



ERYTHRINA GARDEN

Figure 8.19.1 (Author 2018) Erythrina garden exploration
Higher intensity of trees (and experience) as one reaches the center of the garden

Figure 8.18 (Author 2018) Erythrina garden rationale
The tree associations lead to an intervention that focusses on the spatial experience of the tree

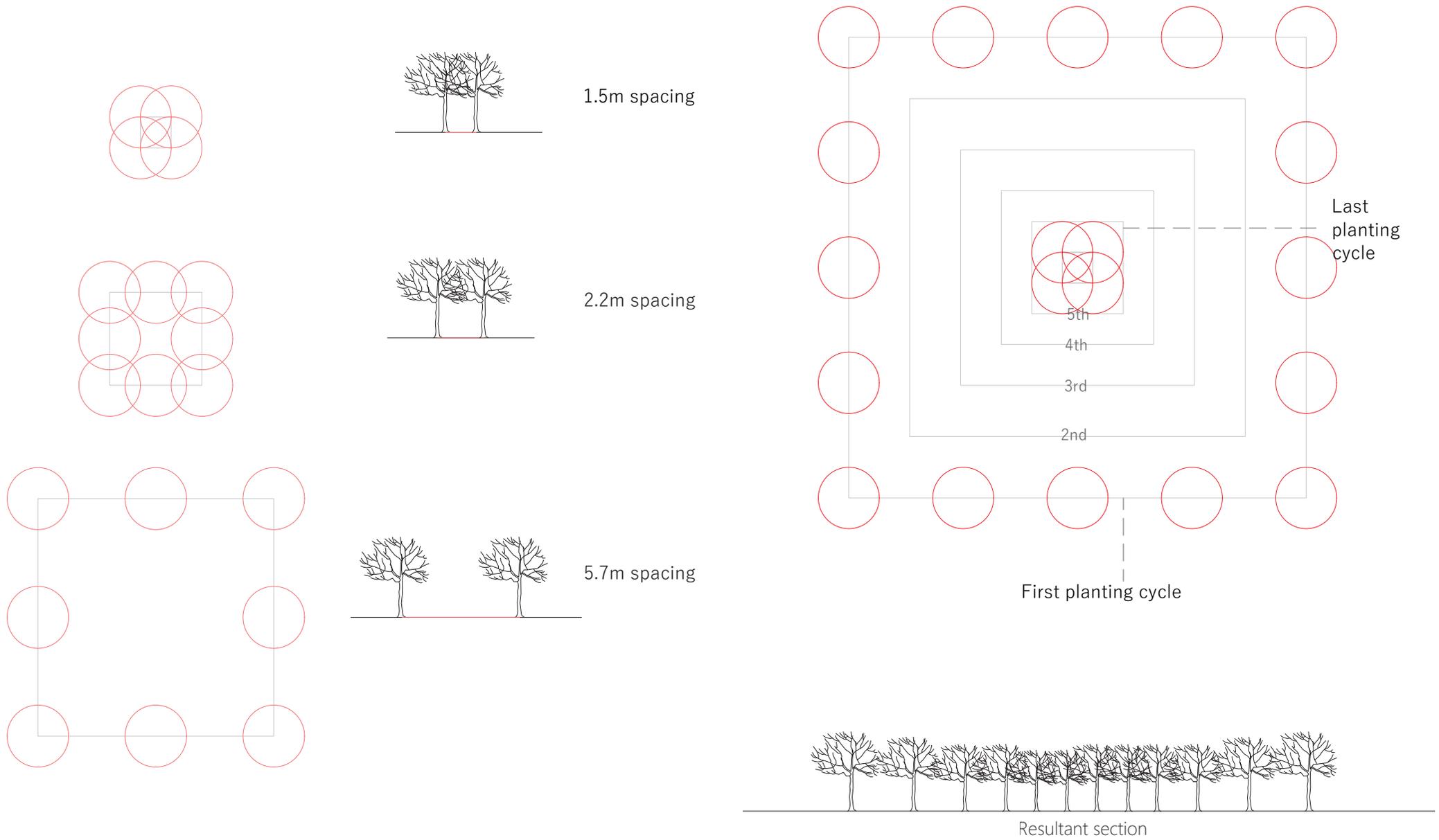
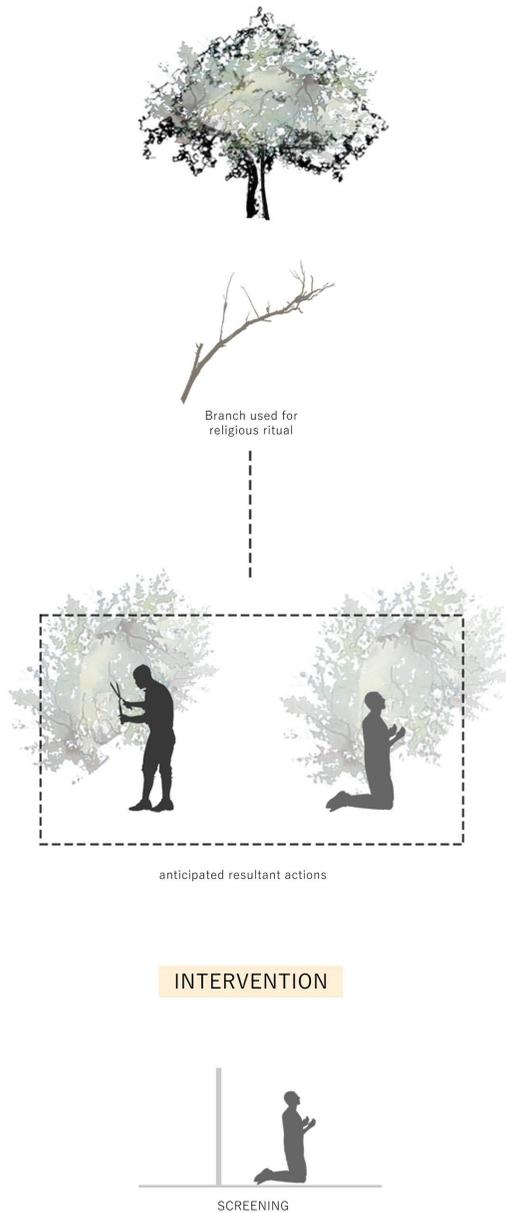


Figure 8.19.2 (Author 2018) Erythrina garden explorations

• uMlahlankosi (Zulu) •



Ziziphus garden

Significance

The *Ziziphus mucronata* has been identified to be of religious significance to the Zulu people. It is used in rituals involving laying deceased persons to rest (Mkhabela 2013).

Detail

Branches of the tree are what is used to engage in this ritual. The ritual may begin from the time the branch is found, which would mean the garden space needs to accommodate moments such as these.

The tree grows an open and wide crown, creating a compact understory that can nestle a shelter.

User experience and design

It is therefore anticipated that users might want to cut off branches from the tree, spend some time within these trees, or take parts of it in order to grow their own. The garden will accommodate for such activities, offering simple interventions that can be occasional screens for privacy, and seating. The idea is to begin with a few interventions, and then with time; the community will be able to build up on what is initially implemented.

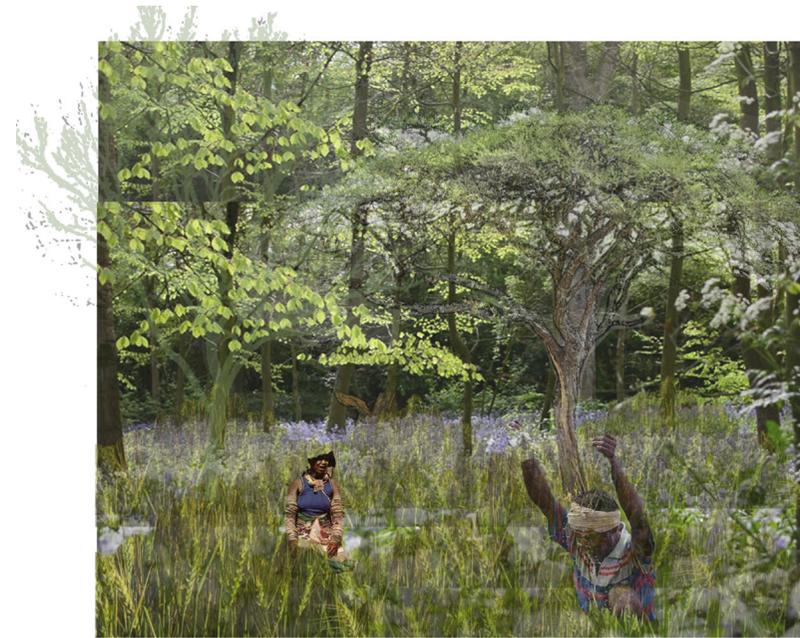
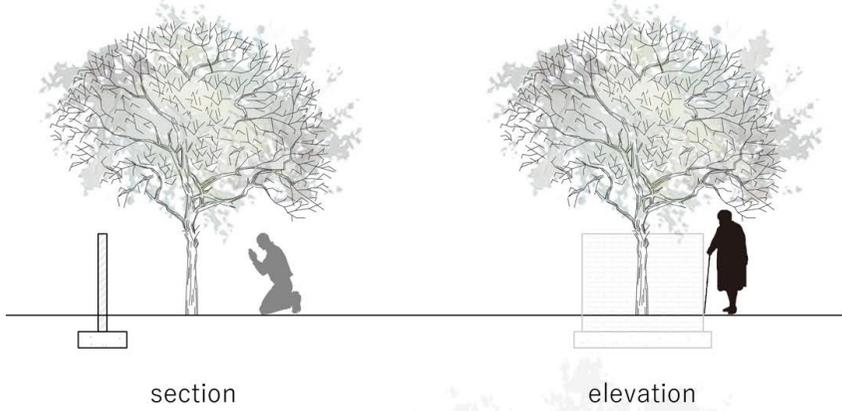


Figure 8.20 (Author 2018) Ziziphus garden rationale
It is assumed the tree will be sourced, and/or be used for religious rituals

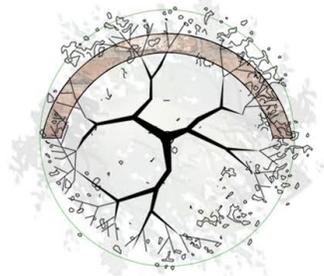
Figure 8.21.1(Author 2018) Ziziphus garden vision



Figure 8.21.2 (Author 2018) Ziziphus garden vision



straight 1.5m wall



curved wall



additional
interventions by
community:
brick walls

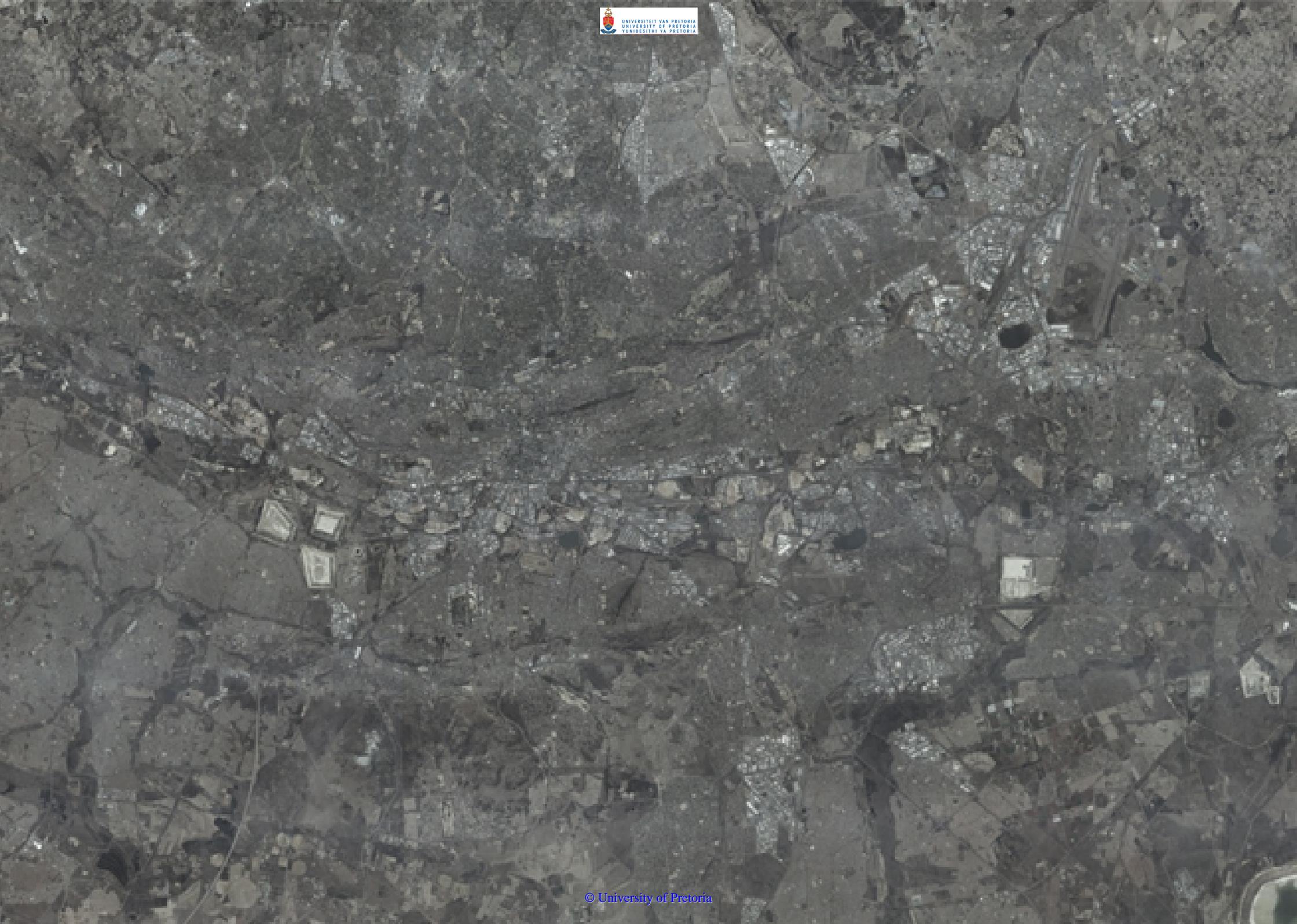
ZIZIPHUS GARDEN

Figure 8.22 (Author 2018)

CONCLUSION

The intention of the explorations were to find ways to guide the development of the site and help it reach the vision. If this project were to be implemented in a real-world scenario; the designs (as relating to design development, not technification systems which are not designed to be open for alteration) can be seen/understood as a set of instructions that can be handed over to the community to use to build the landscape. The building process of including time and resultant change will keep the development open for the community to have a level of freedom in giving personalized identity to their place.

As for the gardens of significant trees, the method proposed of using anticipated actions from users, and then time as a tool to manipulate the each garden so as to reach its vision can be used as a means of generating more gardens. These gardens are what give identity to the arboretum; each both being 'built' by and chosen/decided on by the community.



09 CONCLUSION

CONCLUSION

The dissertation began by identifying a broad issue that was found to have manifested itself into a spatial form (environmental injustice carries socio-ecological aspects that for the most part, relate to physical space). As a result, a landscape intervention became an appropriate solution. In order to implement the solution in a way that brought together a human community and an ecological community, that lengthened the lifetime of the project, and that imbedded meaning to the target users; regenerative theories were applied. These theories go beyond sustainability; and rather focus on developing the regenerative capacity of socio-ecological systems, and generating a will within people to become stewards of the(ir) environment.

Thereafter, programs that merged the needs of the site and those of the Makause community were identified. These programs were Phytoremediation, Agroforestry, and Arboretum, and a Tree Nursery. From there, a system that allowed the co-functioning of each program over a number of years was developed. The intention was to grow and guide both the human, and the natural components to a better state. Further, this process not only anticipated a uniting of the components into one mutually-dependant relationship, but worked to instil a sense of stewardship in users so as to ensure responsible habits that would build future, resilient landscapes - The argument here was that establishing a landscape was only half

of the solution. There needs to be a change in human perception; in how we relate to the natural environment. Only when habits change from those that deplete and degrade, to ones that build and renew, can landscapes reach full regenerative capacity.

The design was developed from the basis set by the 'Master structure', which was based on an overlay of the technical aspects of the project. This afforded the opportunity for a means of generating refined detail aspects such as the development and identity of the tree gardens with an anticipation of growth and resultant change; remaining suggestive, not prescriptive, and using time as a tool that informed space. This would allow users to take ownership of their landscape, and their perception and understanding to positively develop as the site developed.

Overall, the dissertation explored two themes/theories that have been widely discussed and analysed in fields other than landscape architecture. Socially and environmentally themed issues, although at times prompted by political, economic or institutional conditions; continuously overlap into the field, and as a result create design opportunities that can contribute to a greater solution. The current global state of the environment is moving to worse conditions than what is already being experienced. Professions in the built environment need to actively contribute to solutions. Further, people need to gain greater awareness of the environmental crises being experienced and

make positive changes.

Although South Africa is a developing country and bearing large scale issues surrounding inequality, poverty, and slow progress, there is a definite opportunity to latch onto what is available and use it to transform people, their environments and perhaps most importantly; their perceptions. Eco-consciousness can be developed through site specifically adapted landscape interventions that include programs of agroforestry, arboretums and nurseries. This acquired sense of stewardship will be largely what takes the globe to a better, healthier future.

Reflections and Further studies

A project of this nature might have benefitted if it had more freedom for community engagement. This could have given the design development more first-hand information to work with, as well as allowed an easier flow of information between the community members and the design strategy; which largely encapsulates the landscape vision.

A further investigation could be conducted on tracing whether this same project (in terms of programs and design) can be applied to another, different community, and how far the project could develop (if for example the community is not as disadvantaged and has more open access to public space – how much value would such a project have?). An extension to the investigation might look into how the project would develop if the aspect of phytoremediation was not necessary; whether the additional programs

would remain the same or change, whether the project timeline could remain as long, and the effect that the change in planting choice would have on the design.

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SINCERE GRATITUDE TO

My family and friends
Dayle Shand
Johan Prinsloo