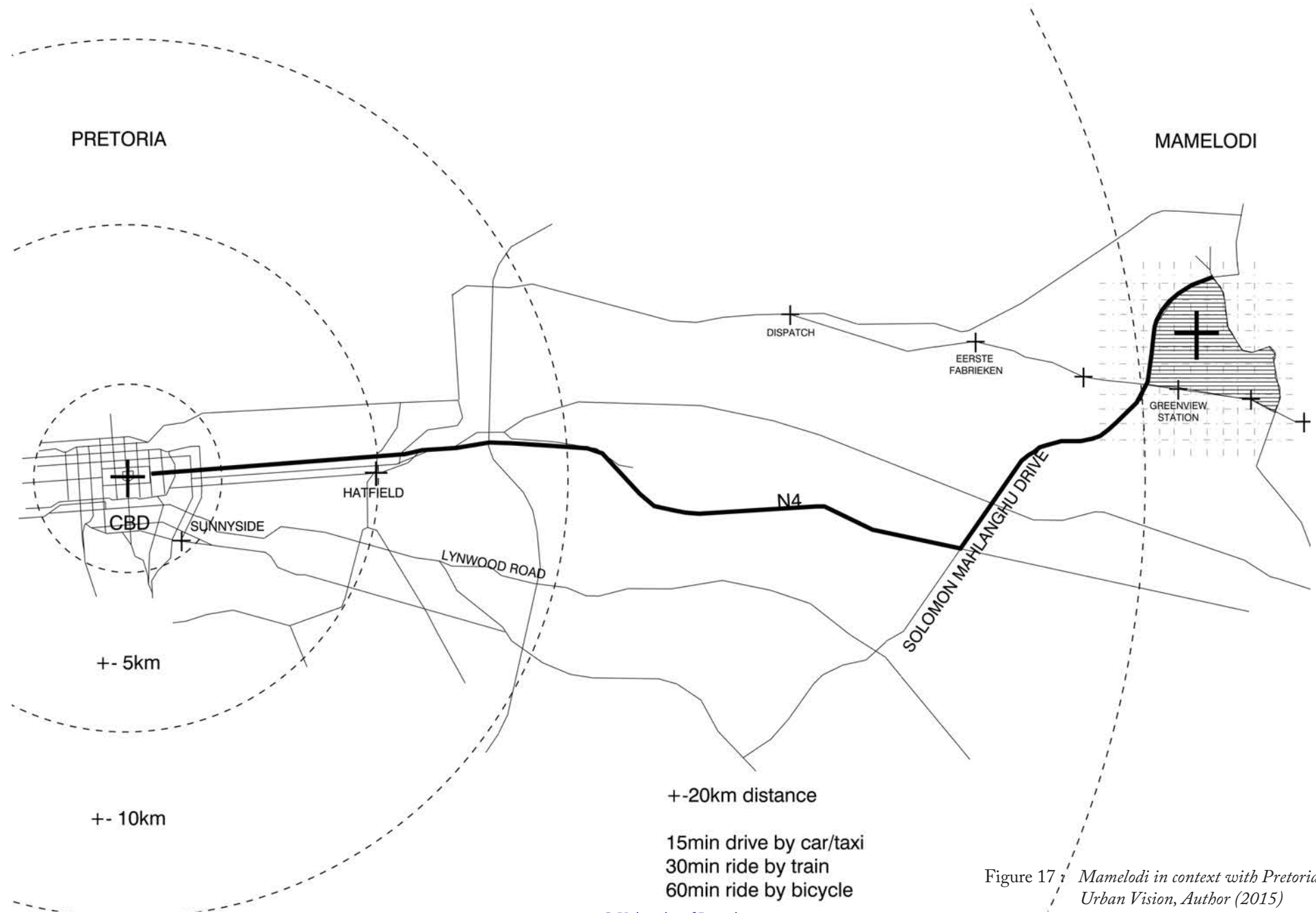*2.1 Narrative Introduction*

Day-in and day-out, the working class migrate to and from Phomolong, yet there are those who remain; the *Forgotten*. An amalgamation of groups who live in the cracks of the fragment-ed community, who have the potential of becoming the binding agents for a pot once shattered.

Within these deposits, an accumulation of different networks have started to take root and the combination of these compo-nents has become clay-like. A sticky, fine-grained earth, which is unstable to build on, but also, has the potential to become a beautiful and fragile ceramic, or a solid and stable form of masonry.
Yet with all the different characters at play, incoherence takes place; the friction of interests and intentions might lead to the shattering of this fragile equilibrium.

The exponential increase of the gaps in the dry and fragmented surface, through the lack of basic services and infrastructure, add to the moment of critical mass or boiling point within the community. Once again it is the *Forgotten* community who is constantly faced with these cracks, impacting on their quality of life, denying them a sense of place and cultivating a loss of identity.

PRETORIA

MAMELODI

DISPATCH

EERSTE
FABRIEKEN

GREENVIEW
STATION

CBD

HATFIELD

SUNNYSIDE

LYNWOOD ROAD

N4

SOLOMON MAHLANGHU DRIVE

+- 5km

+- 10km

+-20km distance

15min drive by car/taxi
30min ride by train
60min ride by bicycle

Figure 17 : *Mamelodi in context with Pretoria,
Urban Vision, Author (2015)*
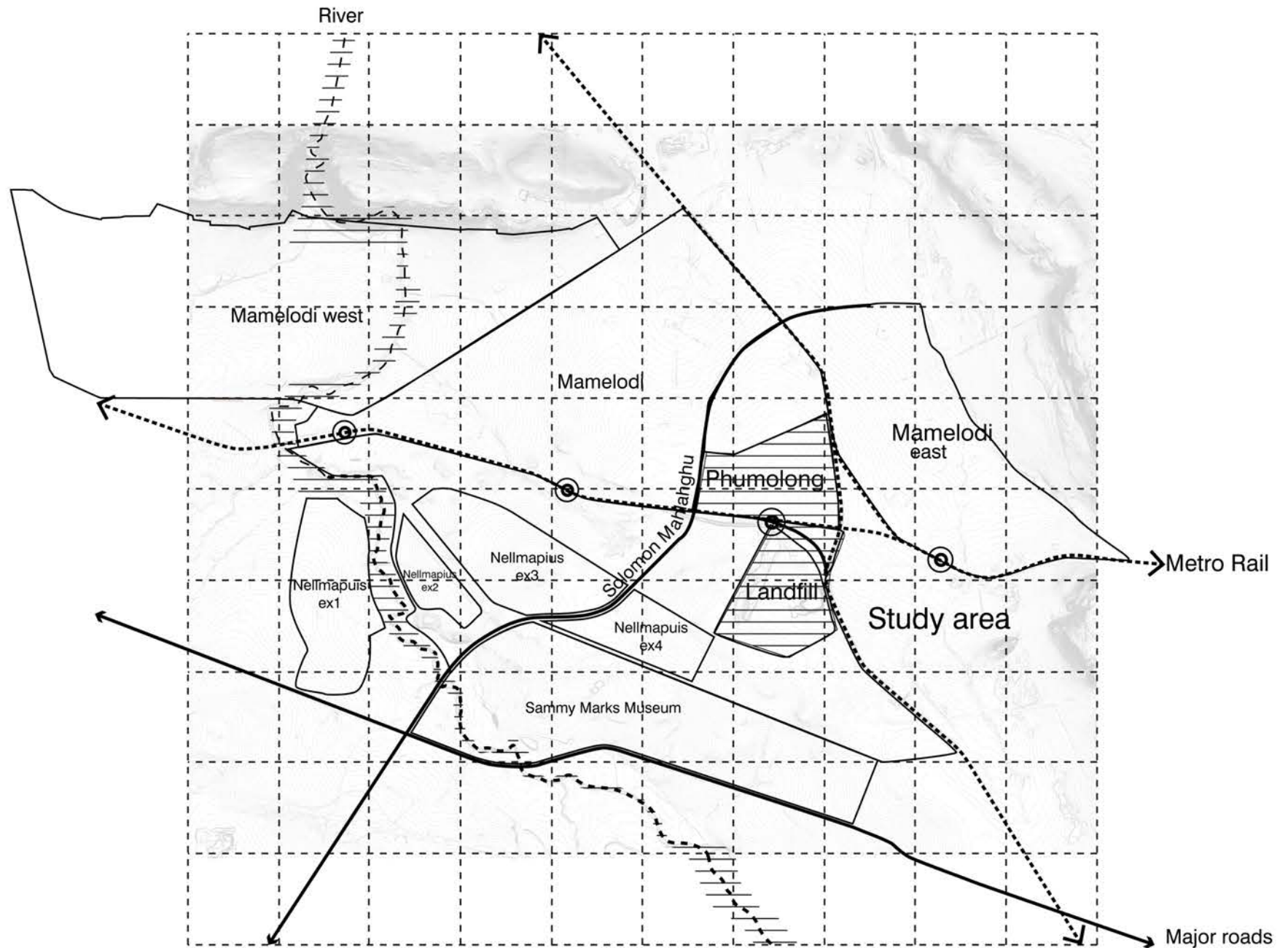
Figure 18 : *Mamelodi as greater context, Urban Vision, Author (2015)*

Gridded electricity
Illegal connections

High economic activity
Economic activity

Agriculture
Recreational space
Creche
Water-points
Community gathering space
Tavern

Major roads
Train lines
Paved roads
Dirt roads and foot paths
Taxi stops
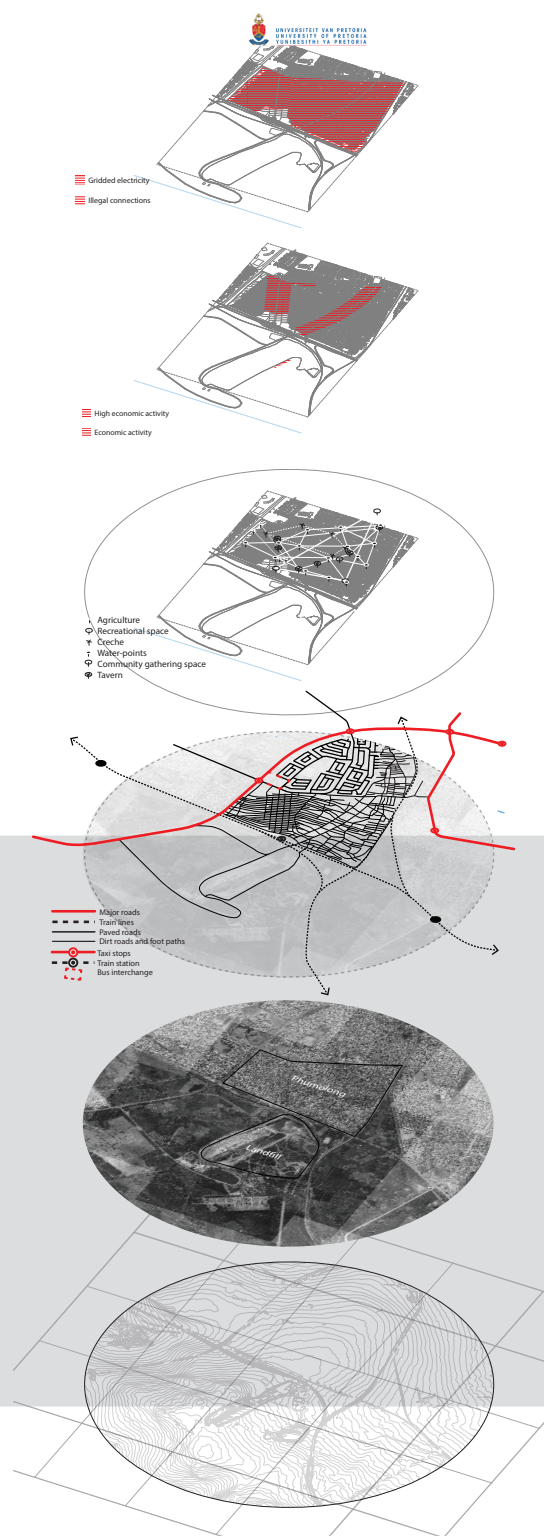Train station
Bus interchange

Figure 19 : *Overlay of Mapping diagrams,*
Urban Vision, K. Freimond (2015)

34

The separated township of Mamelodi has a history of being borne from need. Physical devices of colonialism can be seen in and around the context of Mamelodi, in the spatial separation, barriers and limited access *(Lynch 1981)*.
The dense deposits of people who occupy the central community of Phomolong experience placelessness more severely than other formalized areas of Mamelodi.

The urban and economic conditions between Pretoria and Mamelodi (situated 20km east of Pretoria central) on a broader scale, has become greatly polarised in terms of infrastructure and sanitation, yet economical and urban development in both areas continue to grow *(Graafland 2012)*.

> *Commonly, these colonial settlements are bipolar cities…. Old and new, crowded and extensive, disorderly and orderly, poor and rich, native and foreign (Lynch 1981).*
> *Society, as its history unfolds, can make an existing heterotopia function in a very different fashion; for each heterotopia has a precise and determined function within a society and the same heterotopia can, according to the synchrony of the culture in which it occurs, have one function or another (Foucault 1984).*

Society consists of different dimensions and to formulate an adequate architectural response the different dimensions (such as economic, technological, political, social and cultural) should be understood and integrated, as well as the changing conditions surrounding these dimensions *(Graafland 2012)*.

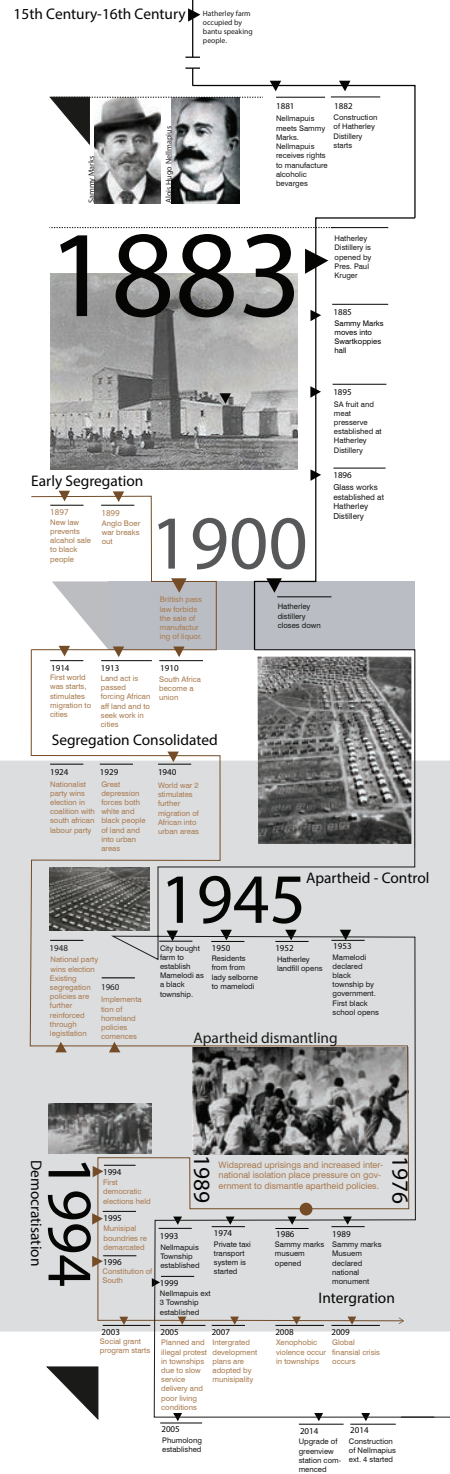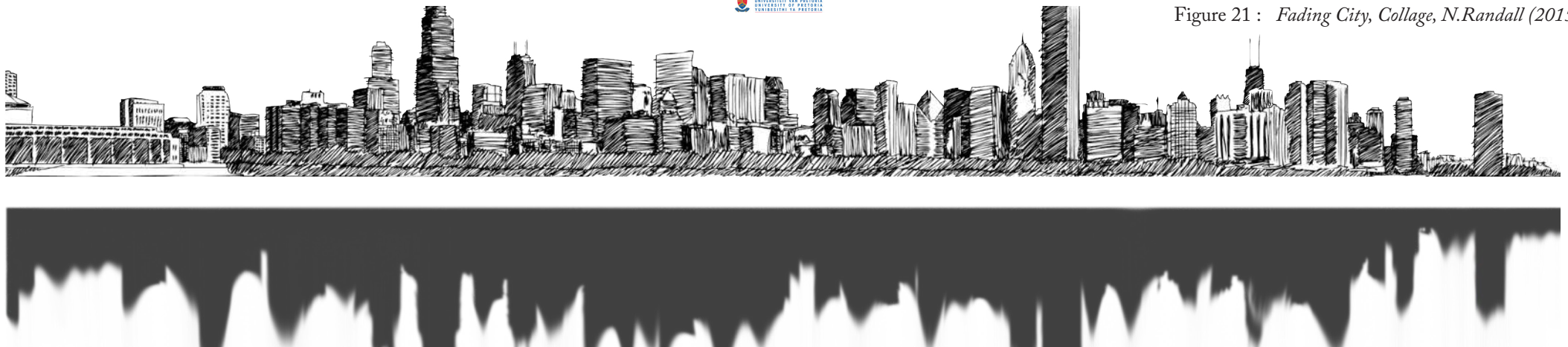**15th Century-16th Century** — Hatherley farm occupied by bantu speaking people.

1881 Nellmapuis meets Sammy Marks. Nellmapuis receives rights to manufacture alcoholic bevarges

1882 Construction of Hatherley Distillery starts

Sammy Marks

Alois Hugo Nellmapius

1883

Hatherley Distillery is opened by Pres. Paul Kruger

1885 Sammy Marks moves into Swartkoppies hall

1895 SA fruit and meat presserve established at Hatherley Distillery

1896 Glass works established at Hatherley Distillery

Early Segregation

1897 New law prevents alcahol sale to black people

1899 Anglo Boer war breaks out

1900

British pass law forbids the sale of manufacturing of liquor.

Hatherley distillery closes down

1914 First world was starts, stimulates migration to cities

1913 Land act is passed forcing African aff land and to seek work in cities

1910 South Africa become a union

Segregation Consolidated

1924 Nationalist party wins election in coalition with south african labour party

1929 Great depression forces both white and black people of land and into urban areas

1940 World war 2 stimulates further migration of African into urban areas

1945

Apartheid - Control

1948 National party wins election Existing segregation policies are further reinforced through legistlation

1960 Implementation of homeland policies comences

City bought farm to establish Mamelodi as a black township.

1950 Residents from from lady selborne to mamelodi

1952 Hatherley landfill opens

1953 Mamelodi declared black township by government. First black school opens

Apartheid dismantling

1989

1976

Widespread uprisings and increased international isolation place pressure on government to dismantle apartheid policies.

1994 First democratic elections held

1995 Munisipal boundries re demarcated

1996 Constitution of South

1993 Nellmapuis Township established

1974 Private taxi transport system is started

1986 Sammy marks musuem opened

1989 Sammy marks Musuem declared national monument

1999 Nellmapuis ext 3 Township established

Intergration

Democratisation

1994

2003 Social grant program starts

2005 Planned and illegal protest in townships due to slow service delivery and poor living conditions

2007 Intergrated development plans are adopted by munisipality

2008 Xenophobic violence occur in townships

2009 Global finansial crisis occurs

2005 Phumolong established

2014 Upgrade of greenview station commenced

2014 Construction of Nellmapius ext 4 started

Figure 20 : *Historical Timeline, Urban Vision, K. Freimond (2015)*

Figure 21 : *Fading City, Collage, N.Randall (2015)*

2.2   The city as memory

In architectural discourse we are predisposed to evaluating the relative success or failure of a built work solely on its formal, spatial, or aesthetic qualities that is to say, the purely architectural. Herman Hertzberger, however, reminds us that too often the relationship between the building and the story behind it (…) is missing (1999 7). (Carter, n.d.)

This story begins as a slowly fading memory, from Bantu Nomads settling on the Hatherly farm in the 14th century. The historic Hatherley farm also saw one of Pretoria's first industrial movements, Eerste Fabrieke. The Hatherley distillery was built in 1883, by Sammy Marks and Alois Hugo Nellmapius, however it closed down due to a law prohibiting the sale and manufacturing of alcohol in 1900, after the South African war *(Nieuwoudt 2012)*, adding to a separate temporal layer of the common physical palimpsest *(Lester 2009)*.

In the context of humanitarian architecture – particularly that within development projects – this issue is of parmount importance. By story we mean the process the ways in which an architect or design team work with the intended inhabitants or users of a given project (Carter, n.d.).

During 1945, the city of Pretoria bought the Hatherly farm and established it as a black township *(Walker 1991)*. From this, the township of Mamelodi was born. Soon after the transaction, segregation laws were implemented and people were relocated from Lady Selbourne to Mamelodi. By 1953 the first black school and the Hatherly landfill was opened. Originally the landfill was meant to be far away from human settlements. With the ever expanding Mamelodi, however, we now see a large informal settlement, Phomolong, to the north of Hatherley landfill, was established in the early 2000's.
After 1994 people flocked to the city from rural areas, and in 2005, Phomolong was established as a temporary solution to the housing crisis. Poor service delivery, riots and xenophobic attacks are still contextual constants in the present state of Phomolong *(Lester 2009)*.

These memories all add to the strata of the study area.

1958

1964

1968
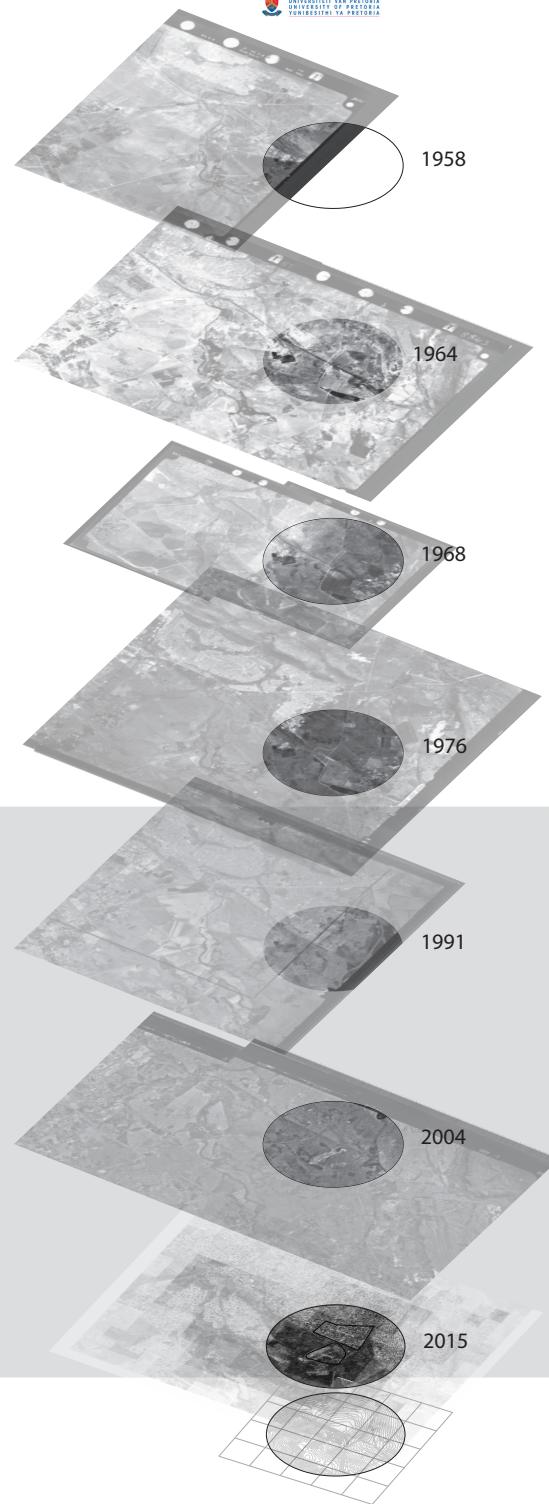
1976

1991

2004

2015

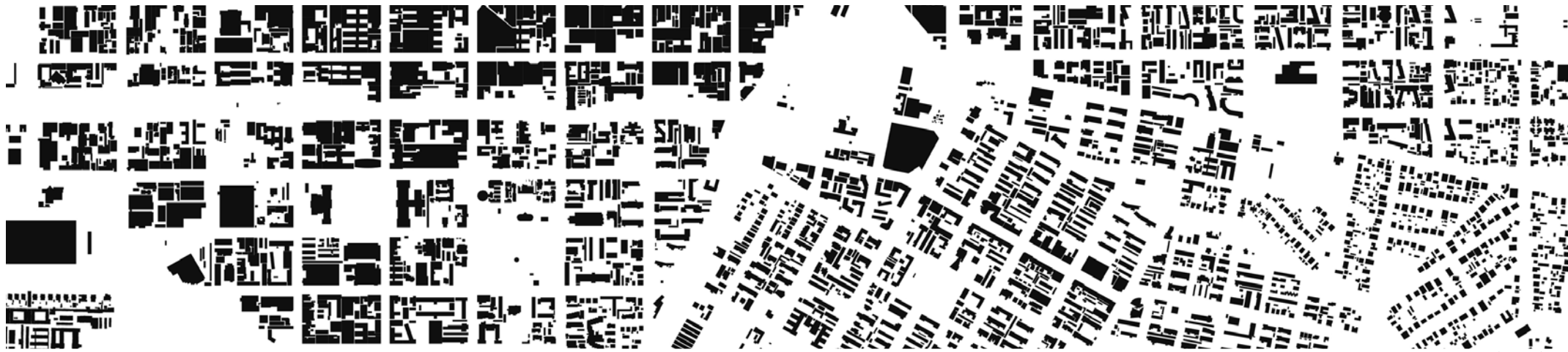Figure 22 : *Overlay of Aerial photo's, Urban Vision, K. Freimond (2015)*

Figure 23 :   *Nolly map of Pretoria CBD, Diagram, N.Randall (2015)*

2.3   The city as data

The Mamelodi economy is relatively small and is predominantly vested in general government services, financial and business services, manufacturing, trade and transport and ommunication. Transport is predominantly vested in the rail network, taxi and bus industry. Light industrial activities also occur in the area with emphasis on motor related and building industry activities. Overall, the local economy is strongly supported by the informal trade sector – as evident from the high representation of informal activities distributed and concentrated at specific points throughout the area. (Tshwane Metropolitan Municipality, 2014)

According to the Census of 2011, Mamelodi stretches over 49.19km² with 110 703 households, and 334 577 people. The most commonly spoken language is Sepedi and the average monthly income per household is less than R3000.00.   Phomolong, in which the study area falls, was established in 2005 and houses 27 164 people over a space of 6.07km2, all of which who live in shacks. In the region of Mamelodi, there are 12 schools, 10 clinics, 2 police stations and 1 university, none of which are located in the area of Phomolong *(Census 2011)*.

Residents of Mamelodi are largely transit dependent (Tshwane Metropolitan Municipality, 2014). Hence the development of the Greenview station was undertaken by the Passenger Rail Agency of SA (PRASA) and this investment leads to the possibilities of further development to take place around the new train station.

Figure 24 : *Photographs taken during a site vist, showing pedestrian view of Phomolong, Urban Vision, K. Freimoth and M. Mkizi (2015)*

2.4.1 SWOT Analysis

Within this broader landscape of socially motivated architecture exists the particular situation of the development project, which is largely a post-war and post-colonial phenomenon. This is not to sug¬gest that projects aimed at helping the poor did not exist prior to the second world war, but rather that the era of development (Esteva 1992 6), in the truest sense, did not begin until the late 1940s (Carter, n.d.).

To come to a greater understanding of the context of Phomolong, a *SWOT analysis* was done. This was based on the observations during one of the site visits and from issues derived from the informal interviews with the SANCO community leaders. The *SWOT analysis* formed part of a collective urban vision proposal. The collective group focussed on the greater area of Phomolong and the Hatherley landfill as the study area.

Strengths

The boundaries of Phomolong are well defined, by Solomon Mahlanghu road on the Western edge and the rail tracks on the Southern side, controlling the patterns of growth. To the west, Solomon Mahlanghu forms an almost impassable barrier, while the train tracks to the south serve as both a hindrance and an asset. It is in spite if this that Phomolong's location is its greatest asset, it finds itself centrally located, surrounded by opportunities on all sides. This central location translates into a high volume of people, moving their way through the community toward faster, more efficient transportation. Along the main movement routes, informal trade has developed and shows the possibility of further development to take place.

Weaknesses

Phomolong experiences peak times of activity and a lack of municipal infrastructure, such as waste removal, refuse disposal and grid electricity. This was established through the mapping exercises undertaken during site visits as well as *Census 2011*. There is also a lack of civic space and public facilities such as public ablutions, poor water drainage of the clay-like soil conditions as well as the smell from the landfill, intrude on public spaces. Illegal dumping as well as pit toilets are in abundance which leads to an overall lack in sanitation and hygienic environment.

Opportunities

Because of its current state, Phomolong has opportunity for large scale improvements through small catalytic interventions such as landmarks, lighting, increase in passive surveillance and formalisation of pedestrian routes. This is in referral to a similar approach as the Violence Prevention through Urban Upgrading (VPUU) (*VPUU 2014*) in Kayelitsha, Cape Town. This was one of the lenses through which the urban vision was approached. It is hoped that this development would then in turn lead to the stabilisation as well as growth of economic structures, allowing the community to disseminate their own future, rather than thrusting an exterior perspective of formalisation on the community.

Threats

According to the *Census of 2011*, 5146 crimes were reported in Mamelodi, hence it can be deduced that general safety is an issue (*Census, 2011*). Due to the unstable soil conditions, shacks are often flooded, alluding to possible construction issues. The illegal dumping and proximity of the landfill have added to an ever growing number of pests about the streets.
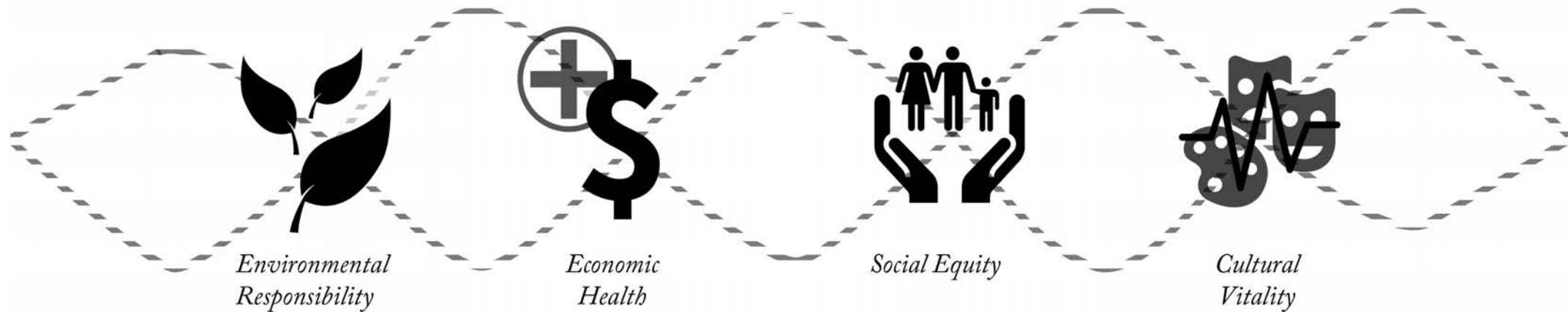
Figure 25 : *Aerial Photograph of site, N. Randall (2015)*

Environmental Responsibility   Economic Health   Social Equity   Cultural Vitality

Figure 26 : *Aerial Photograph of site, N. Randall (2015)*

2.4.2 Conclusion

From these observations, the following community needs were deduced:

- Running and potable water which is available on the residential plots, but not at public spaces, should be established.
- Electricity is a problem, with illegal pirating of electricity off the grid; therefore an alternative should be investigated.
- After typological studies had been done, a secure and safe shelter alternative should be proposed.
- There is a lack of recreational space, public ablutions at transport points and public laundry facilities. Similarly, four crèches were removed during the mass eviction of October 2014 (This can be seen on Google Earth images, and was referred to by an employee on the Greenview Station construction site, however, no documented proof has been found) creating a lack of space for children to be looked after within the community.

In response to the above mentioned community needs, a sustainable approach to all design interventions in the new imagined context was proposed.
The interventions are to strive to make allowance for the four pillars of sustainability.

The four pillars include Environmental Responsibility, Social Equity, Economic Health, and Cultural Vitality *(sustainablekingston.ca 2015)*.
These four pillars are seen as drivers for interventions and help with the deduction of appropriate design responses, to create resilient and sustainable structures and interventions. These pillars not only help to develop a sustainable environment but also a sustainable and integrated community structure *(sustainableantigonish.ca, 2015)*.

> *Sustainability is an economic, social, and ecological concept. It is intended to be a means of configuring civilisation and human activity so that society and its members are able to meet their needs and express their greatest potential in the present, while preserving biodiversity and planning and acting for the ability to maintain these ideals in definitely (Schutte, 2008).*
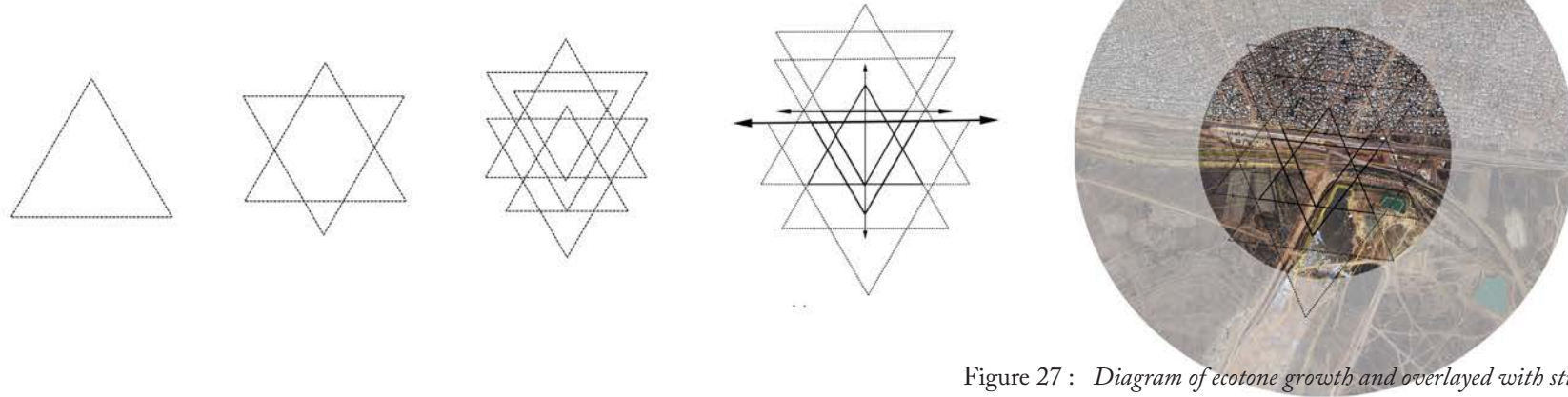
2.5   The ecotone at Greenview

An *ecotone* is defined as

> *Ecological zones where two distinct ecosystems overlap or grade into one another, they contain an abundance of diverse species and a complex set of exchange dynamics (Pendelton-Jullian 2009).*

Taking a closer look at the severe boundary created by the railway tracks, we find that it has become a lifeless edge, despite the high levels of activity it sees on a daily basis. In this transitional zone, communities and networks overlap and start to grind into one another, blurring the edges, but at the same time amplifying certain traits of each opposing element. These networks allow for the opportunity of the strengthening of these social systems through architecture and the housing of these interactions.

> *They are areas of disturbance, catalysed by the differences in the two ecosystems, and they are often zones of conflict as well (Pendelton-Jullian, 2009).*

By applying the theory of *ecotones* to social ecologies rather than biological ecologies, the crossing becomes a disturbed and tense space, owned by none but used by all: A heterogeneous space in tension due to its lack of ownership being taken.

> *The implication within all these discussions is that work at the edge is unfettered and unencumbered by the inertia of core activity. It is more open to radically transformative and innovative forces and processes. These forces and processes, if tapped into, can re-shape and transform the core, something that the core will not do under its own constraints and conditions—under the shear inertia of its own historical operations. In these discussions edge and core are separate and unique fields of activity—discrete in their operations except for moments of catalytic communication (Pendelton-Jullian, 2009).*

These spaces of high activity can then be seen as the nodes where intervention should take place, formalising the interactions to promote further growth.

44

2.6.1 The Community

One thunderstorm later and the gravel roads have quenched their thirst. People try to navigate the puddles and women are doing laundry while the sun is out. Her child is playing around her feet and enjoying the sludge slipping through those little fingers.

The tightly knit typologies are like a mesh that misleads one's perception of distance and proximity. There is only one beacon, the *Apollo* light, the meeting place. You would hear the time and place of the next community meeting, from the back of a 'bakkie' through a megaphone. The sound reverberating from the corrugated metal sheets, used as walls by so many.

In this space, throngs of entrepreneurs own established shops, lining the main link to the train station. The train station has become a symbol of hope; the promise of further development has reignited the community's resilience to their current forgotten state.

Over the course of fifty odd years it has become clear that development projects are most successful when they are low-cost and small in scale, when they respond to the needs of a specific target group and involve the beneficiaries themselves in the planning and implementation process (Smillie 1991: 114 in Carter n.d.).

Decisions are cumulative, leaving a strong legacy for each successive generation of inhabitants (Lynch 1981).

The Community Leader

He is welcoming & kind,
known & respected.
He speaks for them, yet consults
& listens to their grievances.

His greatest wish is that no one
should go to bed hungry, yet
this is the reality...
His greatest want is for this
generation to have it easier than
the previous.

Yet not all agree & where these
two opposing social ecotones
meet, friction is paramount.

The Nyaope Kids

They are the prowlers in the
streets, the shadows in the night,
driven by their strong desire
for more...

Their actions are desperate &
lead to vandalism of the existing
infrastructure.

Mothers worry & fathers warn
against,
yet they are the occupants of
unoccupied space. They move on
the peripheries, the fringes between
non-place & place.

Slowly going nowhere & increasing
in numbers, becoming a perpetual
anomaly.

The Guerilla Gatherers:

He sees the value in what others
see as scrap. To him a carpet becomes
insulation and a tyre has the
potential to become sandals.

Yet his roof leaks & he is cold in
winter, for there is no one in the
vicinity who is willing to buy what
he has scavanged & the depot
owner pays less than the effort it had
taken. Rummaging through the
landfill, abiding by the rules of the
hierarchy & extracting valuable
objects.

At heart an entrepeneur but labeled
as an opportunist.

The Neonates:

Curious & eager to play, learn &
achieve. They are hardly aware
of the fact that it is 5h30am & still
dark outside, when they greet their
mothers.

Too little space for too many kids,
but other than being watched by
an older sibling or playing at their
mothers feet as she does the laundry,

this is what they know.

Figure 28 :   *Diagram of ecotone growth and overlayed with study area, Author (2015)*

46

2.6.2 The characters at play

The current investigation takes the position that humanitarian architecture can only be successful – by which we mean ecologically, economically and culturally sustainable – if it the process is participatory and involves community organization (Carter, n.d.).

Phomolong compromises of a few main characters, who construct the community into territorial divisions. This is a complex situation which can be observed yet not fully understood. Focussing on where these characters interact and connect (*ecotones*) was the aim of the investigation of the social systems.

A highly decentralized decision process, in which the immediate users of a place make the decisions about its form, is a powerful ideal. It reinforces their sense of competence, and seems more likely to result in a well fitted environment, than if they are excluded (Lynch, 1981).

Yet within this condition of diversity (people from Limpopo, Mpumalanga and other provinces, residing together), a loop has developed. Going about their daily ritual activities, in an environment which is simultaneously changing (growth in populous and inhabitants) and regressing (municipal infrastructure is not maintained nor advanced to suit the growth).

Within the existence of an interdependence upon each other, such as the situation of the child caretakers, a platform of stagnation (no progression in education) in their current communal situation is established. We find the children who are tended to by unskilled or aged dependents, without the necessary training to provide the needed development for this new generation (*UNICEF 2007*) As well as the gatherers, there are guerrilla (not following the norm of working for money, but rather harvesting from the landfill) employees, who raid the landfill, in search of objects of value to sustain their livelihoods.

Together these groups are stuck in a vicious cycle; where the undeveloped child leads to an unskilled dependent and becomes an addition to the guerrilla employees.

Since a good start in life is critical to the physical, intellectual and emotional development of every individual, poverty in early childhood can prove to be a handicap for life. Poverty denies children their rights to basic education, primary health care, adequate nutrition and safe water and sanitation. Poor children are likely to pass poverty onto their children when they grow up, perpetuating the poverty cycle (UNICEF 2007).
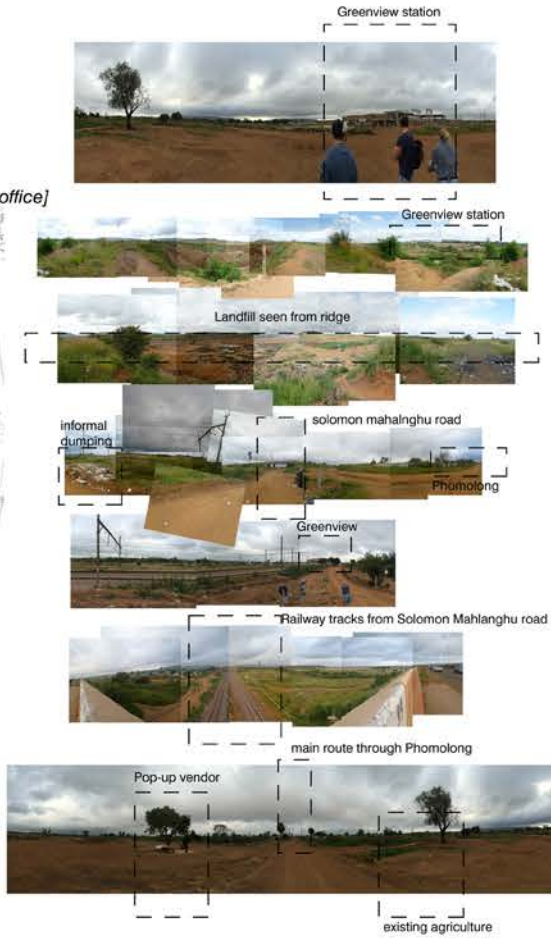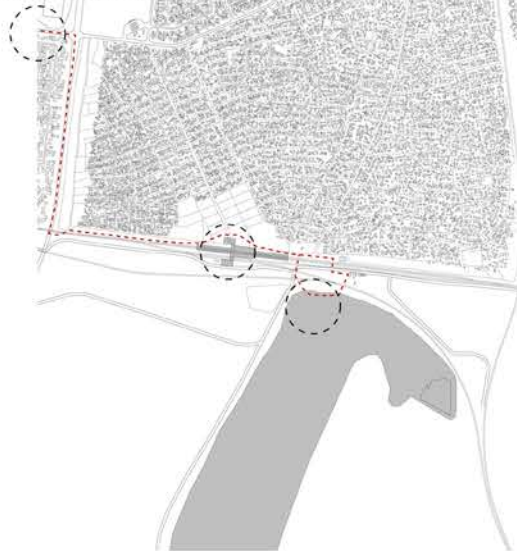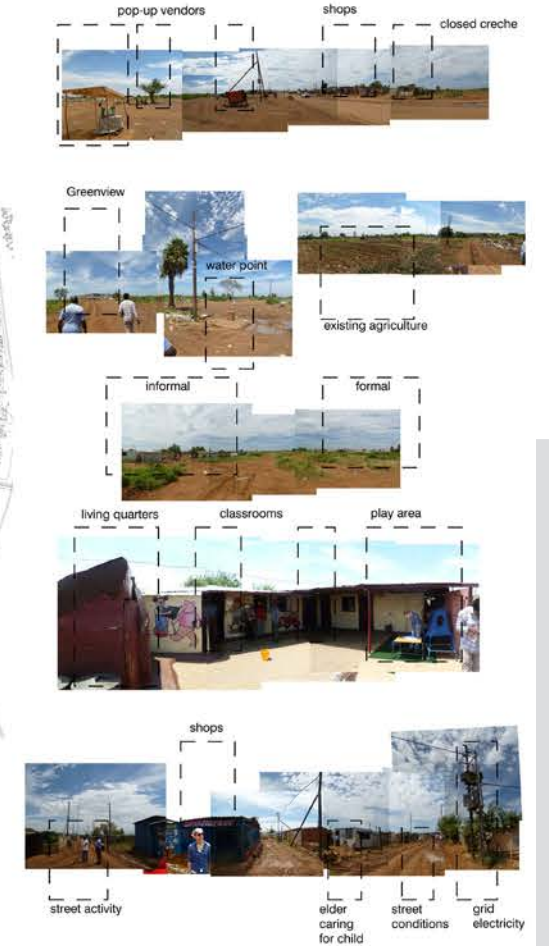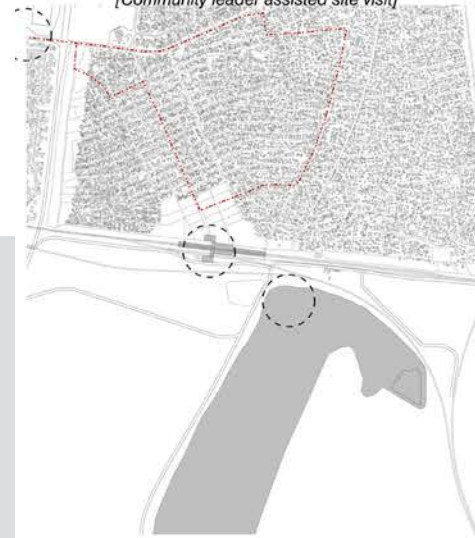
Figure 29 : *Routes taken during site visits with photographs, Urban Vision, Author (2015)*

2.7   *Existing tissue of site*

The existing state of Phomolong is due to a mass eviction of households in October 2014, surrounding the Northern edge of the new Greenview train station upgrade. This has left an open and desolate space, where few people interact with the space, except for people travelling to and from the train station. There are also pop-up vendors inhabiting the space, selling food to passers-by. The Southern edge is divided from the community by the railway tracks and a man-made ditch. Yet an informal soccer field has been created on the Southern side and people (mostly gatherers) cross the tracks to the landfill. People were seen jogging up and down the landfill cap for exercise.

The new train station is of a scale which amplifies the small scale of the informal settlement shacks, separated by the monumental open piece of land between the two entities.

> *This problem of the human site or living space is not simply that of knowing whether there will be enough space for men in the world but also that of knowing what relations of propinquity, what type of storage, circulation, marking, and classification of human elements should be adopted in a given situation in order to achieve a given end. Our epoch is one in which space takes for us the form of relations among sites (Foucault, 1984).*

Foucault's statement can be interpreted in that it is the in-between spaces, the links between activities and rituals that lends a place its character. Hence the interpretation of these in-between spaces through architecture has the possibility of formalising the series of social systems to strengthen the collective idea of a place.
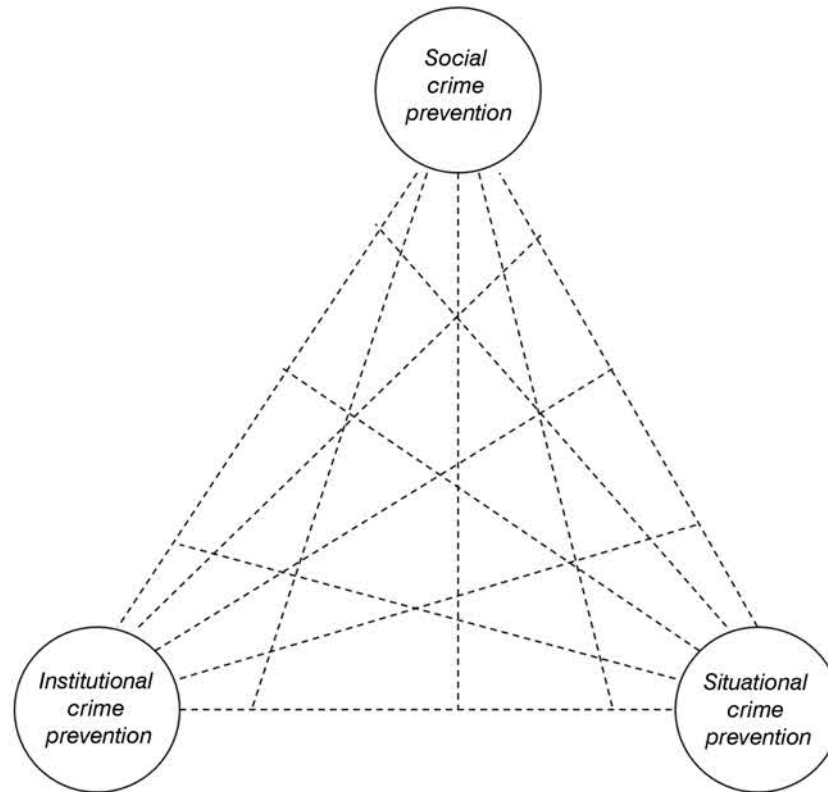
Figure 30 : *VPUU strategy* , *VPUU (2015)*

2.8   *The city imagined*

The proposed urban vision looked at the *Violence Prevention through Urban Upgrading* model as a precedent to incorporate a similar methodology into the design approach *(VPUU 2014)*.

VPUU analysis
The Violence Prevention through Urban Upgrading was a dual initiative between The City of Cape Town and the German Development Bank. The project is located in Khayelitsha, Cape Town, South Africa, and was implemented from 2006-2014. The project consists of an urban planning strategy that focussed on activity nodes along main pedestrian routes to and from transport nodes. This created an activity spine with increased passive surveillance and safety through social engagement on a 24 hour basis *(VPUU 2014)*.

The project spans over 4 neighbourhoods thus reaching out to almost 20 000 people.
The VPUU has a very clear approach and methodology, following a set of principles to support a participatory design approach, which allows residents to take owner-ship of the proposed interventions *(VPUU 2014)*.
The VPUU methodology focuses on analytical and statistical data for a baseline survey; a prioritisation process with community members to deduce which interven-tions should be ranked from most important to least important. These two elements helped to develop a strategy which informs individual interventions. The interven-tions were developed in cooperation with resident bodies. Implementation also focused on using local resources and skills *(VPUU 2014)*.

A key focus of VPUU is to create well managed and maintained spaces from the start. The model of intervention is based on an integrated approach between social and institutional dimensions to improve the socio-economic situation.

Their strategy matrix consists of the following divisions *(VPUU 2014)*.
*   Prevention focusses on Lifelong learning and includes Early
    Childhood Development, schools and employment and income generating economic development.
*   Cohesion which focusses on the community social capital includes community mobilisation, community delivery of services and urban management.
*   Protection focusses on community policing, and includes spatial planning, public safety as well as the legal and justice aspects of activities.
*   Research and development, focusses on facts, and includes programme planning, information sharing and research and capacity building.
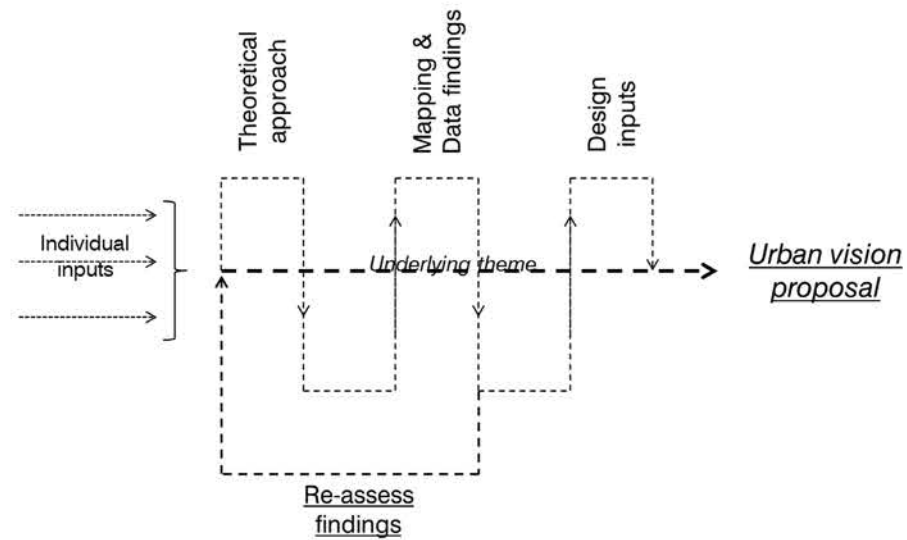
Figure 31 : *Urban Vision Methodology diagram, Author (2015)*

2.9.1   Urban framework approach

It proposes that when community participation is facilitated as sensitively as a delightful work of architecture, it has the ability to become a catalyst for further growth and improvement far beyond the initial scope of a design project (Carter, n.d.).

Through the generation of a collective group proposal, the opportunity for development was established on the northern and southern edges. By reinforcing spaces where social and typological ecotones overlap, new places for the remaining community are created. Existing main routes between the transportation nerve center, (Solomon Mahlanghu road) consists of a bus terminus and informal taxi rank, and Greenview station, are formalized and exaggerated. This is to facilitate public movement through the enhancement of existing networks. Taverns, grocers and informal shops are found in close proximity to one another, as well as social networks which overlap, were considered as main informants.
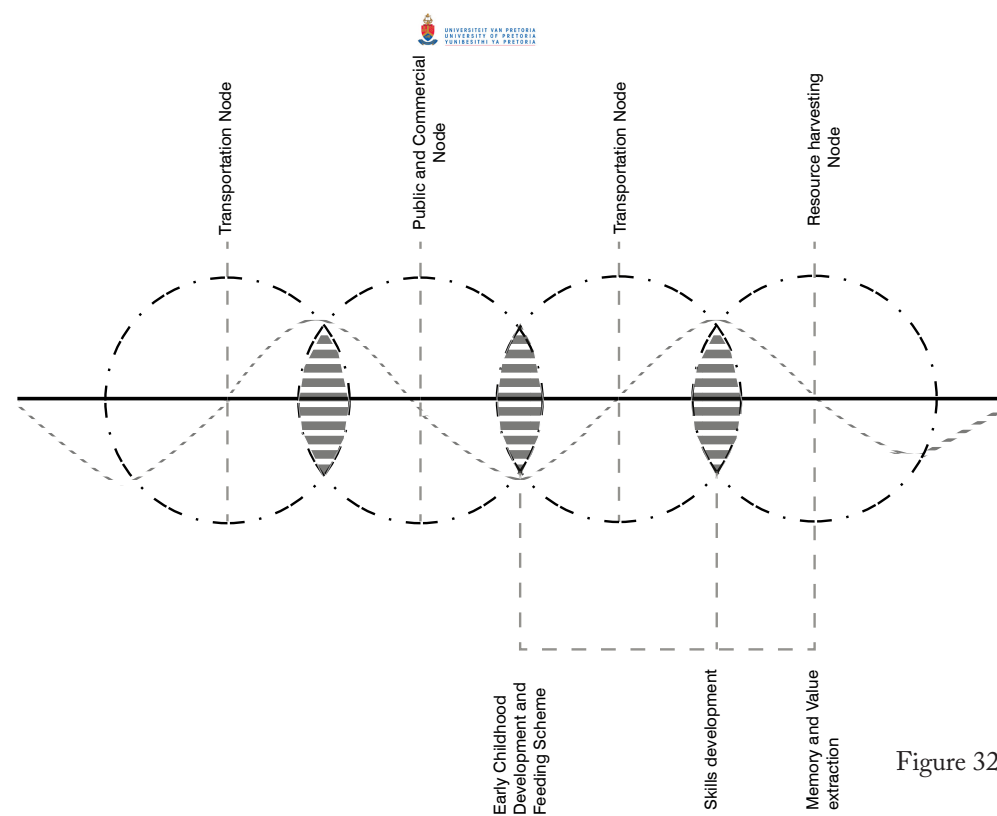
Figure 32 : *Urban Vision Methodology for proposed interventions, diagram, Author (2015)*

The urban proposal focusses on the increase of *passive surveillance (VPUU 2014)* through the densification around existing public and residential squares, as well as open visual links and the introduction of functional landmarks. Proposing that the squares have 24 hour multi-functional programmes, within the new defined precincts (commercial-, civic-, and production precinct). This should promote diverse users entering passively controlled spaces, which increases safety for children and women in these spaces.

The unhindered movement to and from the station is promoted through the amplified activity spines. The proposed sites for further intervention will focus on strengthening the link between the landfill and Phomolong. To promote further development on the southern side of the railway, a recreational precinct was considered. The two green areas are proposed to become *Bamboo Balcooa* plantations. This would introduce a new sustainable resource for construction within the community.

Figure 33 : *Precinct plan with footprints, Author (2015)*

1
Formalisation of Existing

year 1

Road formalisation
Taxi rank
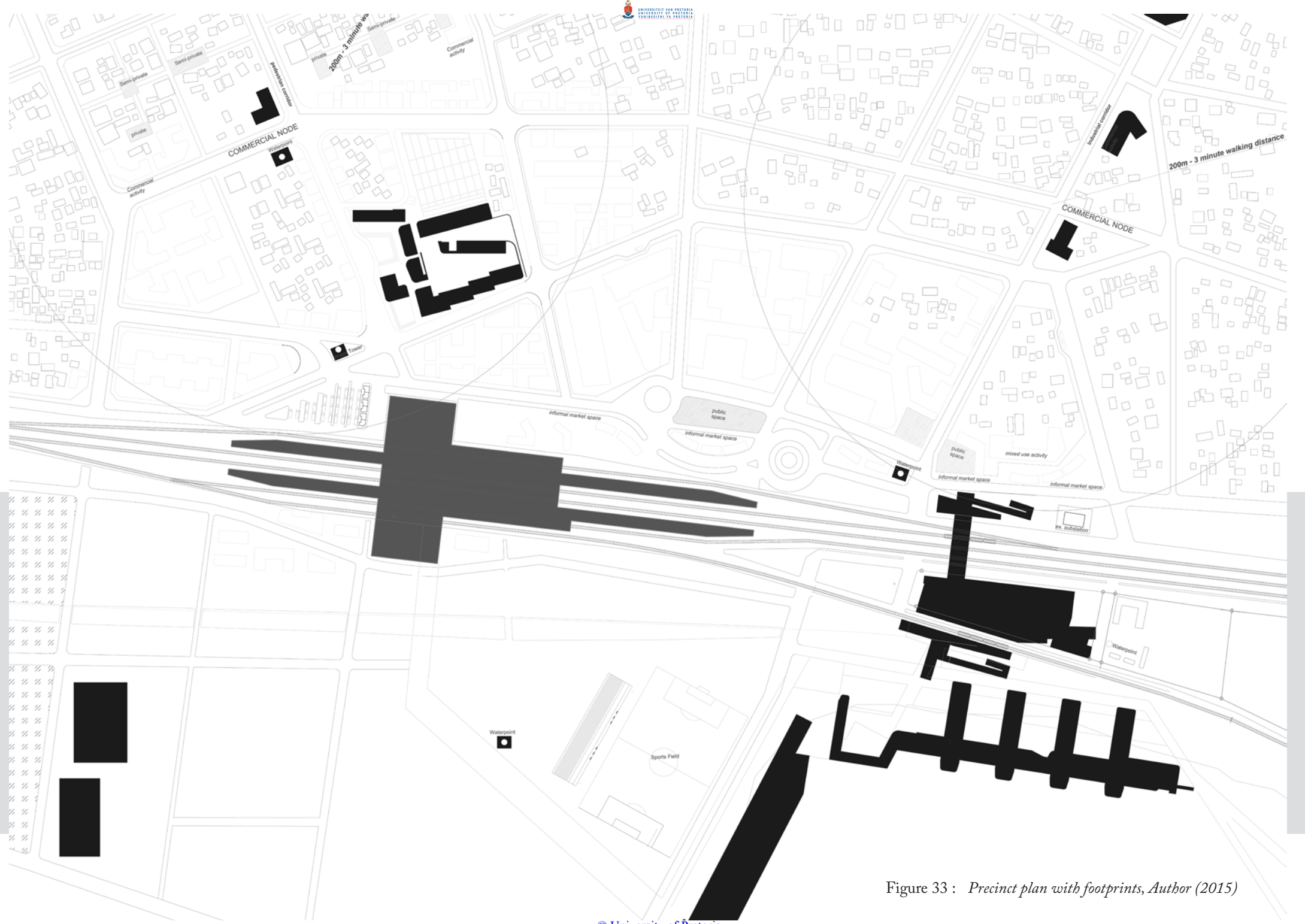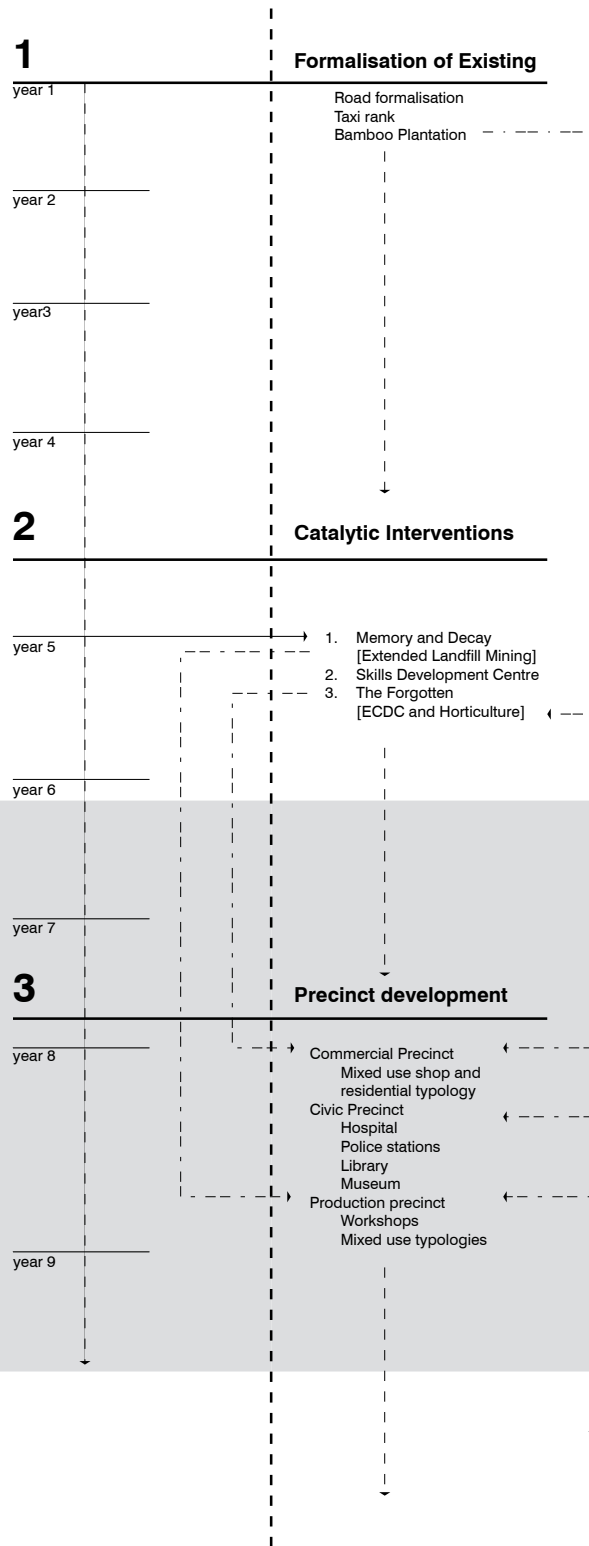Bamboo Plantation

year 2

year3

year 4

2
Catalytic Interventions

year 5

1. Memory and Decay
   [Extended Landfill Mining]
2. Skills Development Centre
3. The Forgotten
   [ECDC and Horticulture]

year 6

year 7

3
Precinct development

year 8

Commercial Precinct
  Mixed use shop and
   residential typology
Civic Precinct
  Hospital
  Police stations
  Library
  Museum
Production precinct
  Workshops
  Mixed use typologies

year 9

BAMBOO PLANTING AND HARVESTING STRATEGY:

1. Water harvesting strategy
   storm water catchment
   for winter drip irrigation
   yield per annum:

   1 year

   nursery plant preperation
   shading cloths
   for establishment of root
   system (shallow root system)

   hole (30cm deep)
   and mound (1m radius)
   preperation

2. Phase 1 Planting

   3 years

   plant beginning of rainy season
   November

   mulsh put around plant

   Give 5liter water immediatly
   after planting (greywater can be used)

3. Split culms for
   Phase 2 planting

   2 years

   mark culms with coloured
   ropes for different age groups

4. Harvest phase 1
   yield:

   1 year

   harvest in dry season
   June

   2 weeks in Kiln to dry and
   smoke (insect repelant)

5. 2nd harvest phase 1
   split culms for phase 3
   yield:

   1 year

6. Harvest phase 2
   yield:

   4 years

7. Harvest phase 3
   yield:

DATA:

Lifespan: 50+ years with 20-40% harvest
Bamboo balcooa clump can be harvested after 5 years
Yield: 312 plants /ha @ 20% harvest
      47.8 tons/ha
      287 tons/ha biomass per annum
Water
needs: 5000l iter per clump per year

Root
Systems: clumping (non-invasive)
      running (invasive)

Viable species: Venda sacred bamboo (clumping)
      African Alpine Bamboo (clumping)
      Balcooa Bambusa (clumping)

Strengths: Fast growing (3-4 years per harvest)
      Lightweigth (vs steel and concrete)
      Elastic
      Multiple uses (construction material, furniture,
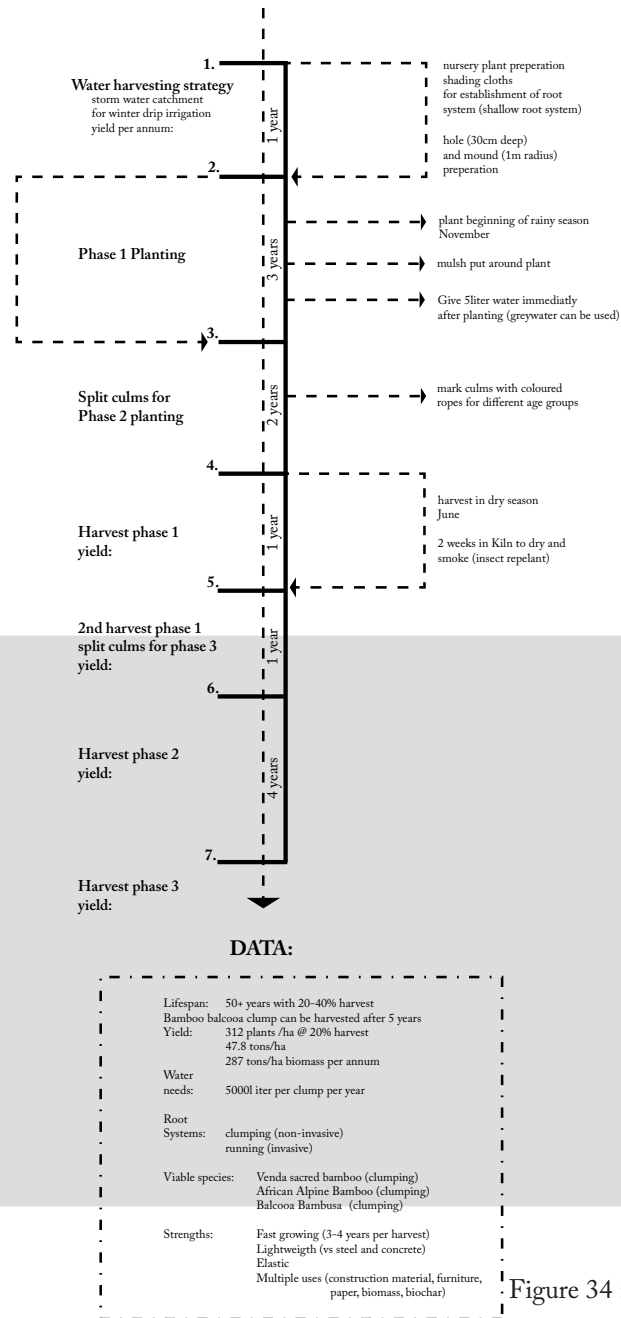   paper, biomass, biochar)

Figure 34 : *Urban Phasing, Diagram, Author (2015)*

Figure 35 : *Fleeting and long term memory, Author (2015)*