Fighting the Sprawl:

Restructuring the seam between the rural and urban landscapes through consolidation, integration and intensification in Cape Town.

Pieter Johann Louw

Urban Design Research Project | Master of Urban Design | University of Cape Town | 2019

Supervisor: Dr Kathryn Ewing

Declaration of Free License

I hereby:

1. Grant the University free license to reproduce the above thesis in whole or in part, for the purpose of research;

2. Declare that:

2.1. The above dissertation is my own unaided work, both in conception and execution, and that apart from the normal guidance of my supervisor, I have received no assistance apart from that stated below;

2.2. Except as stated below, neither the substance or any part of the thesis has been submitted in the past, or is being, or is to be submitted for a degree in the University or any other University.

2.3. I am now presenting the thesis for examination for the Degree of Master of Urban Design.

Pieter Johann Louw
Student Number: LWXPIE008

Signed by candidate

Acknowledgments

Firstly, my lecturer and supervisor, Dr. Kathryn Ewing, for her unwavering support, guidance and enriching insights leading up to, and throughout this research project.

My classmates for their camaraderie and engaging discussions. The external lecturers for their feedback to assist in strengthening the argument. The interviewees for providing invaluable contextual background.

A special thanks to Piet Louw and David Dewar for their support and sharing of their incredible knowledge.

And last but not least, my family and especially Maryke, for the emotional support and motivation to carry this project through.

"This edge joins two marginal worlds of little quality, a situation with the appearance of a common catastrophe"
(Desvigne, 2016)

Fighting the Sprawl:

Restructuring the seam between the rural and urban landscapes through consolidation, integration and intensification in Cape Town.

Abstract

The central theme of this research project is the relationship between humanity and the environment. Specifically where this relationship is at its biggest conflict, where settlements and open space meet, on the peripheries of cities.

Traditionally, the settlement form of the Cape maintained a dynamic balance between the landscapes of society; wilderness, rural and urban. This balance was disrupted through Modernism and Apartheid planning which lead to segregated, fragmented and low density urban landscapes.

Through outdated planning policies, engineering standards and speculative development models, this balance is still increasingly disrupted, manifested in the form of lateral sprawl. The urban landscape, which is considered by the status-quo as the dynamic landscape, places growing pressure on the rural and wilderness landscapes.

The need to restrict the lateral growth of cities is globally recognised and one unsuccessful tool utilised in the Greater Cape Town Metro to prevent urban sprawl, is the urban edge policy.

This research project argues that a line that exists only on paper, such as an urban edge policy which promotes compaction, is not a sufficient mechanism to address urban sprawl. Compaction is only one aspect of mitigating sprawl.

It argues that the edge is a landscape, not a line and explores the notion that a spatial proposition is necessary that consolidates and integrates the rural and urban interface zone, and restructures the peripheral urban landscape. That this landscape could, through consolidation, integration and intensification, target and mitigate the drivers of sprawl.

Table of Contents

01

Introduction

Fig.1.1 More open space, less cars. [ ]

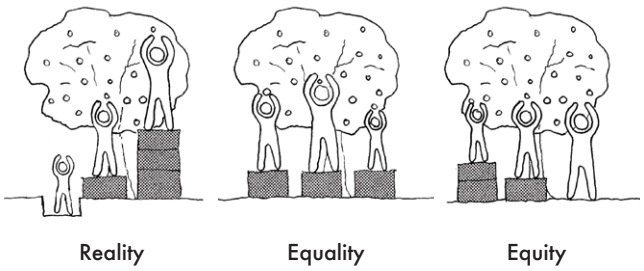


Fig.1.2 Opportunities. (Author's own)

This Urban Design Research Project emerged from an interest in the relationship between humanity and its environment. And specifically where this relationship is at its biggest conflict. Where settlements and open space meet, on the ambiguous edges, the peripheries of cities.

1.1 Positionality

The author is a self-confessed biophiliac that believes that people are instinctively connected to the natural world and that this connection between humanity and nature, needs to be maintained and celebrated.

This connection to nature, does not imply that all natural areas and open space needs to be preserved, but rather that they need to be conserved. Dewar and Uytenbogaardt (1991) refers to preservation as "to preserve" or "to prevent change". Whereas conservation refers to the necessity to achieve a dynamic balance between humanity's activities and the landscape as resource on which these activities are played out. This landscape is not necessarily always a pristine natural landscape, but also refers to cultural landscapes, agrarian landscapes and urban landscapes. The resources within these landscapes also need to be sensitively utilised to maintain this balance. Some landscapes however, should be preserved, and left untouched by humanity for the uninterrupted utilisation of it by other species and natural processes.

The so-called clients of urban design in these landscapes, especially those of the urban and agrarian, are people. The conservation of the landscapes is therefore, ultimately for the ongoing sustainable use of them, for humanity. Humanity in this context, represents all of humanity, irrespective of race, class or political ideology. (Dewar & Uytenbogaardt, 1991) The author believes in empowering and equitable human environments, with a focus on the public aspects of the built environment that enables people to help themselves through natural, social and economic structures. The reality is that our post apartheid South African cities are not equitable and are generally not growing with the interest of the greater public at heart. Therefore the status quo needs to be disrupted and the so-called business as usual approach needs to be challenged.

The author's values are based on 'Public Good' values and these values will remain an underlying thread throughout the research project. These values are encapsulated within the overarching principles of Ecology, Food Security, Accessibility, Diversity, Identity and Economy.

With this Research Project the author hopes to challenge the status quo by providing a compelling counter argument to the on going unstructured and fragmented urban growth of our South African cities and towns.

1.2 Approach

The author supports the notion of a non-programmatic approach to urban design. This approach is centred around the concept of the optimisation of "the quality of the whole rather than maximising the operation of any of the parts." (Dewar & Todeschini, 2004) It is driven by the concept of providing an equitable environment that accommodates all people and their activities in an empowering manner. And not through, as is currently the case, environments that are dependant on particular technologies and minimal standards.

Urban design is not a static approach with a final implemented master plan vision, but rather one that, through the understanding of universal human needs, can accommodate change and growth. Ryan (2017) refers to this as Plural Urbanism and that, "incompletion is the dirty secret of urban design, since incompletion goes against the Platonic ideal of finished form." Urban design takes a long time to

realise, and things will change over time to adapt to people's needs, clients, economics, design, fashion and politics.

According to Dewar and Todeschini (2004), the main aim of the non-programmatic approach to settlement making, "is the creation of complex, hierarchical networks of access which gather activities, events and urban elements according to their relative need in terms of exposure and privacy." With this approach, it is important to establish a strong structural system, which sets up "a logic of exposure and privacy to which any activity can respond." The structural system offers numerous opportunities, choices and adaptability without imposing limitations on lifestyle. The more opportunities and choices there are, the better the structural system. The complex patterns associated with the structural system, allows for activities to find their place within the larger system.

The challenge with this approach is to do the least and gain the most. In other words, understand what the minimum actions required are that will direct growth towards the desired public outcomes. Dewar and Todeschini (2004) refers to this as minimalism, and that to generate complexity, minimalism needs to be at the heart of the non-programmatic approach. With this approach, there is enough freedom in the system, for advantage to be taken from the ingenuity and creativity of the city's many everyday urbanists. The city becomes a product of many designers. As Ryan (2017) titled his book, "The Largest Art", it enforces the notion of the incremental nature of urban design and introduces the concepts of plural scales, plural time, plural history, plural owners, plural designers and plural form. Essentially, the structure proposed or reinforced by the urban designer, serves as the armature to these plural activities, with many outcomes possible responding to the unique dynamics of the people and time.

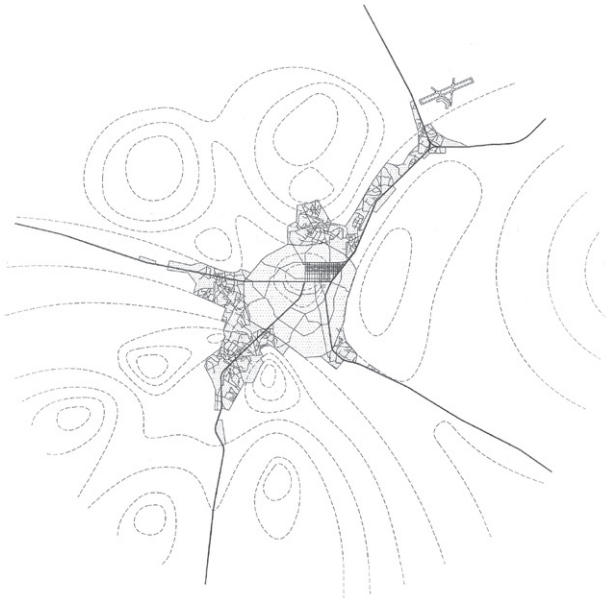


Fig.1.3.1 Growth. The city expands along arterial routes and into the hills. The periphery is in constant flux as the population rapidly grows.

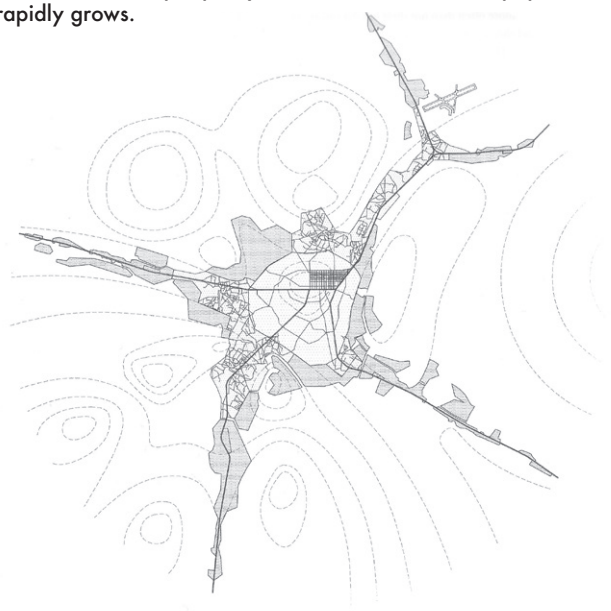


Fig.1.3.2 Unguided Growth. The city continues to grow outward with increasing traffic and undesigned settlements.

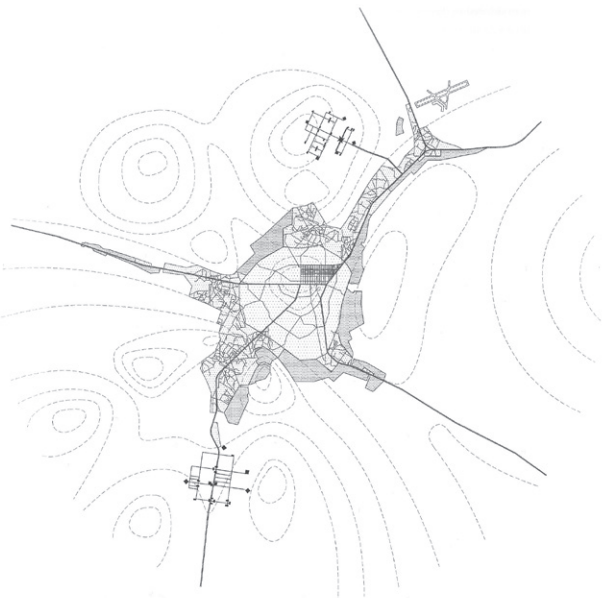


Fig.1.3.3 Urban Design Strategy. Shaping and directing growth with infrastructure and public facilities.

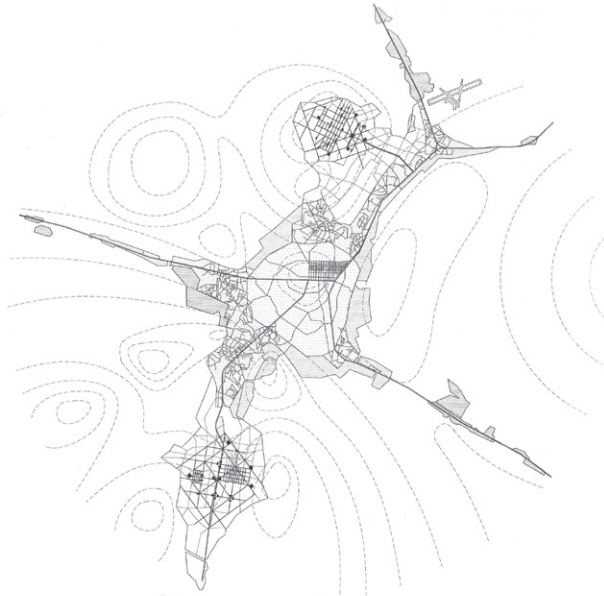


Fig.1.3.4 Plural Urbanism. The city continues to grow in all directions, but plural urbanism distinguishes the city with its new peripheral centres that emphasises nature and organises form.

Fig.1.3. Peripheral Centres. (Ryan, 2017)

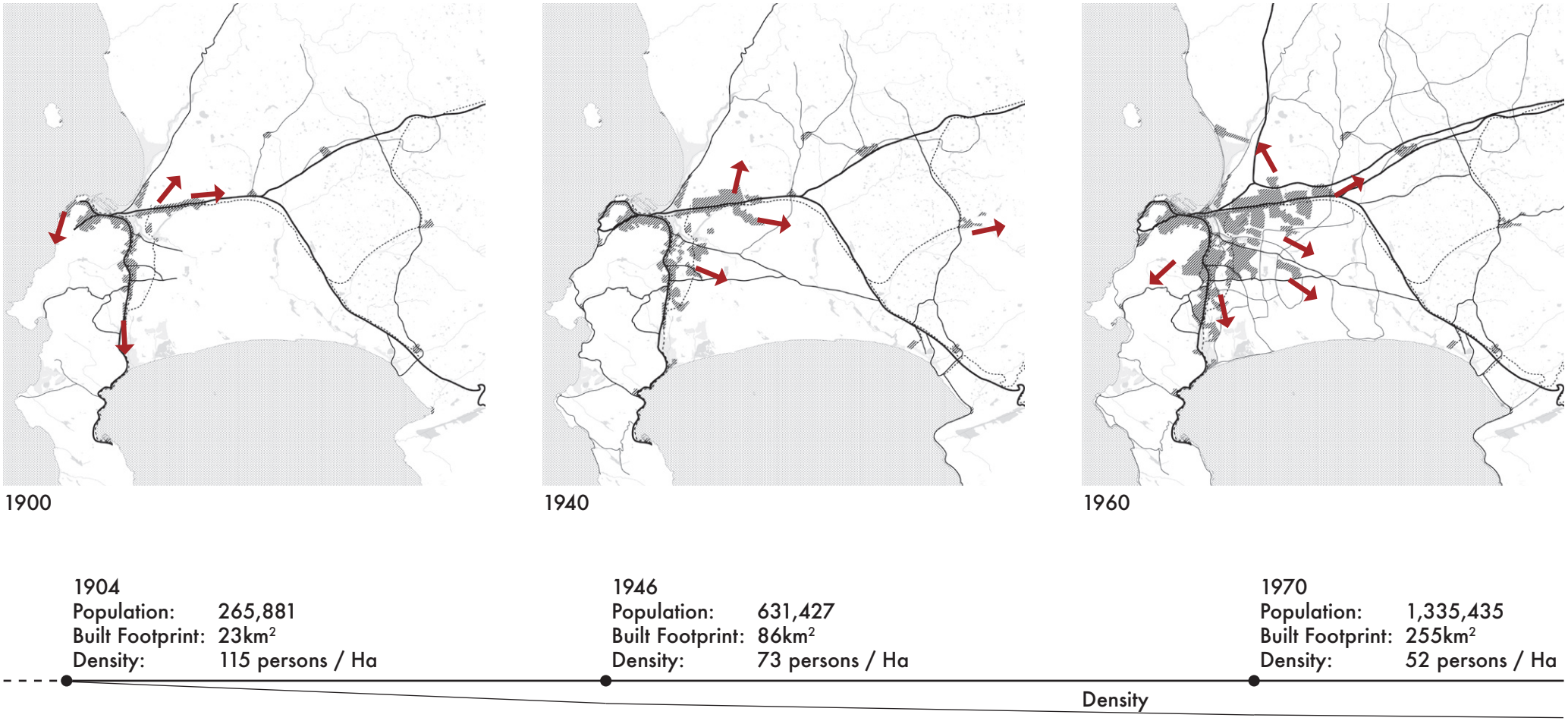
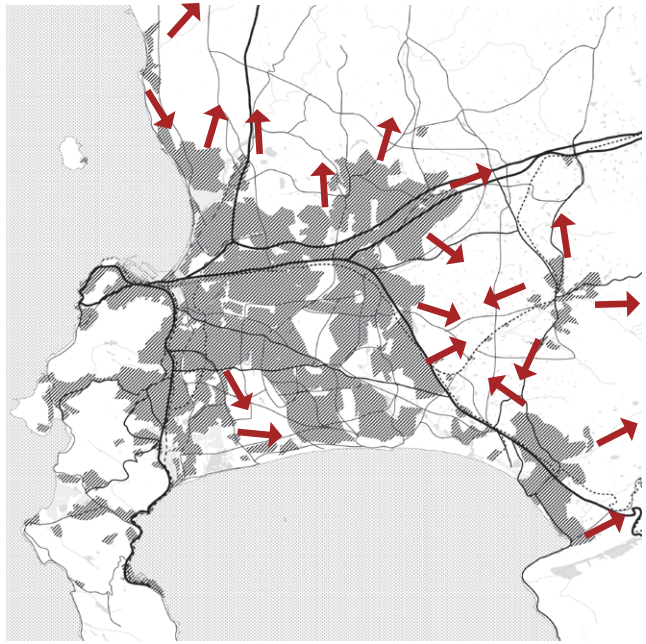


Fig.1.4 Urban Morphology of the Greater Cape Town Metro from 1900 - 2010. (Author's own)

1980

1990



2010

2001
Population: 2,893,247
Built Footprint: 774km²
Density: 39 persons / Ha

2011
Population: 3,740,026
Built Footprint: 959km²
Density: 39 persons / Ha

Density

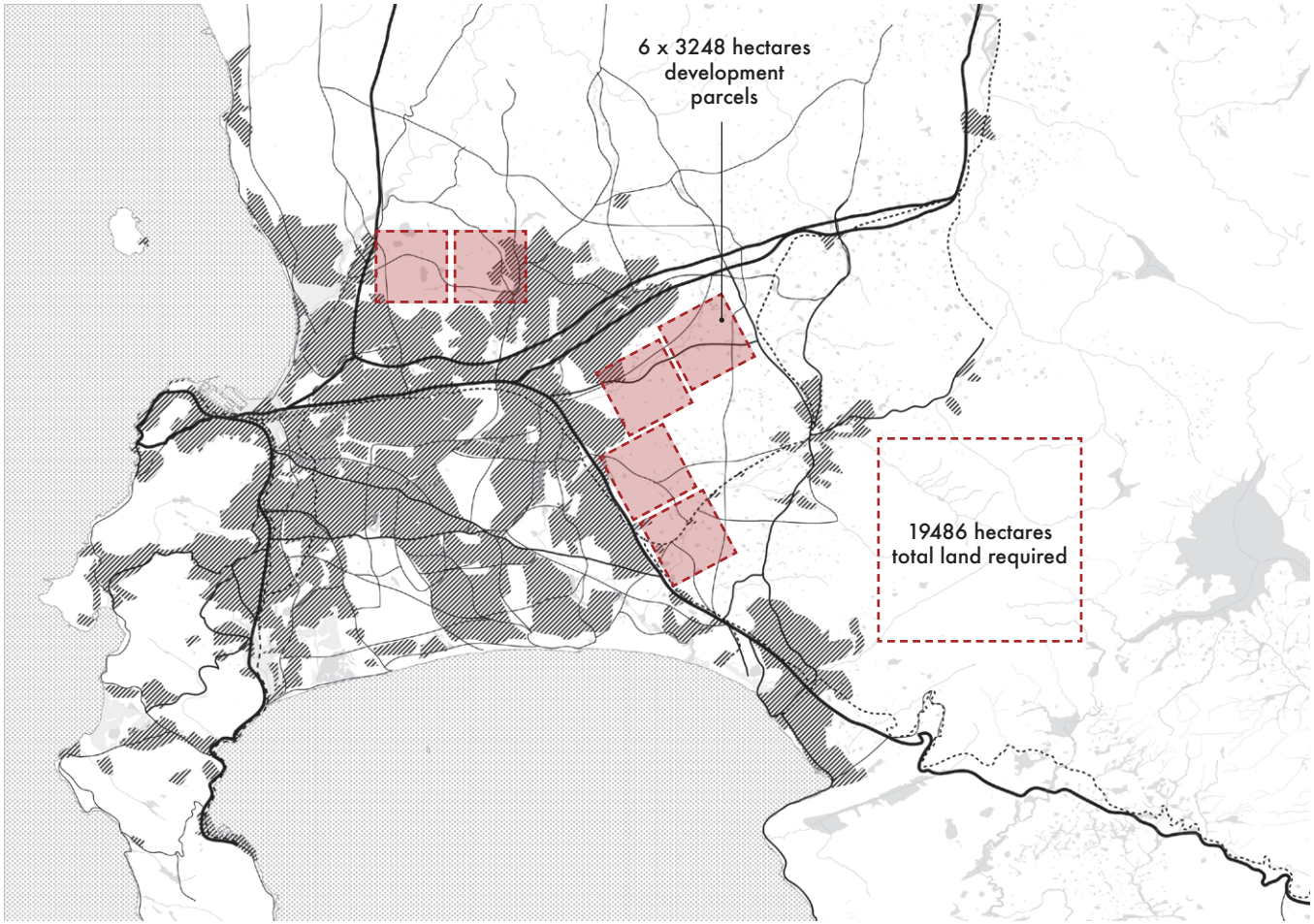


Fig.1.5 Land requirements for the 2030 Cape Town Metro.
Illustration of the amount of land required by 2030 should Cape Town develop at the projected growth rates and at its current density. A total of 19486 hectares of land will be required should the city continue its low density development trend of 39 people per hectare. Illustrated here in red as 6 x 3248 hectares of dispersed development parcels overlaid on the urban footprint of 2011, when the last census survey was carried out. This does not take into account the growth of Stellenbosch and Drakenstein Municipalities. (Author's own)

1.3 Problem Statement

According to Stats SA (2019) the population of Cape Town in 2011 was 3,740,026. Based on growth rates, the City of Cape Town (2018) projects that the population will reach 4.5 million in 2030. That is an increase in population of 759,974. If the city keeps developing at its current low density of 39 people per hectare, the amount of land required from 2011 to 2030 to accommodate the growing population, would be 19 486 hectares. That is a total land requirement of almost 14x14 km.

The Socio-Economic Profile (Western Cape Government, 2017) estimates a much higher number, with the population of Cape Town in 2018 already at 4,232,276.

These are only projections and speculations based on past trends, but what they do illustrate (fig 1.5), is that Cape Town and its surrounding towns, will continue to face growing population pressures and if no spatial alternative to the low density growth is found, will continue to expand its built footprint, swallowing ecological sensitive areas and productive agricultural land. Another concern is the quality of the form of growth, which has been characterised in the last 60 years, by sprawling, monotonous built landscapes with residual left over spaces, with an overall lack of urbanity. Where land will be made available for future growth, and the extent to which it will further creep into open space, is unknown. Perhaps the question we should ask, is if the current low density, sprawling form of urban growth can be sustained and what other alternative forms of space provision should be considered that is equitable and in interest of the public good.

It has been widely argued that the social and environmental consequences associated with the expansion of the city's geographical footprint is unsustainable, and that outward growth needs to be restricted to allow for compaction of the existing city

form. This notion of compaction has been around in Cape Town for some time, and one method that was implemented to guide and shape lateral growth, was introduced in 2001, the urban edge line. However, this line was omitted from the 2018 Cape Town Municipal Spatial Development Framework, which according to Horn (2018), "This action suggests a notable shift from a conservative growth approach to one that appears to support a neoliberal urban growth agenda." Evidence shows that the urban edge, when used as a spatial planning instrument, did to some extent curb the consumption of land. However, the fact that the line has been removed from current policy, alludes to its lack of creditability and overall failure.

Perhaps it is not merely sufficient to draw a line, that exists only in policy, which describes little of what the spatial outcomes on either side of the line should be. According to Dewar (2000), compaction is not a sufficient condition and it needs to be done in combination with considerable restructuring of the existing city form.

1.4 Proposition

According to Southworth and Owens (1993), since the early 1900's, the urban cores of cities have been the main focus of renewal and revitalisation projects and the city edges mostly ignored. Rather than addressing the large expanses of the urban peripheries to develop into well performing urban environments, the focus of urban designers have been limited to a criticism on its sprawling and fragmented character. "...the urban fringe is being constantly created and developed. As currently conceived, it faces severe problems. But the ever-expanding urban fringe offers a unique opportunity to test and adopt innovative urban design solution. Alternative models of the urban fringe must be developed, presented, and evaluated." (Southworth & Owens, 1993)

Desvigne (2016b) talks about the edge that joins two peripheral worlds of little quality. On the one side rural and the other side urban, turning their backs onto one another. The only relationship they have are that they are both in the state of being on the periphery. "Only the invention of a very particular kind of space can begin to reverse it."

As alluded to in the problem statement, policy alone is not a good enough tool to fight the sprawl on the peripheral edges of the city, and that there is a need for a designed spatial outcome that integrates and consolidates the surrounding landscapes. There is therefore an alternative, one that reconsiders the periphery of the city as a larger integrating landscape and not a single line. This research project explores whether a wider line, an interface zone, a seam between the urban and rural, could help in fighting the sprawl. Consequently, the following research questions were formulated to mediate this enquiry:

Why is urban sprawl bad, what is driving it and why has it not been successfully contained?

How can the fragmented urban and rural landscapes on the periphery of the sprawling city, be consolidated and intensified to direct future spatial growth?

What are the spatial structuring devices that can be designed to integrate stranded communities back into a larger urban and rural system?

The research project aims to contribute to the theoretical knowledge of mitigating lateral sprawl, through the intensification and consolidation of the fragmented urban form on the periphery of the city.

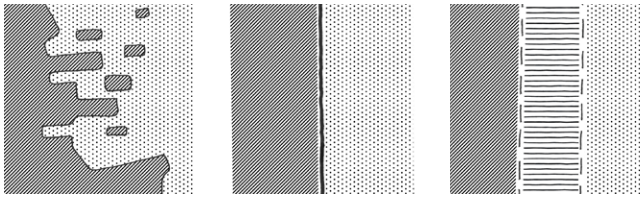


Fig.1.6 Urban edge definitions.

Fig.1.7 The sprawling low density and fragmented form of Cape Town's periphery. (Author's own)

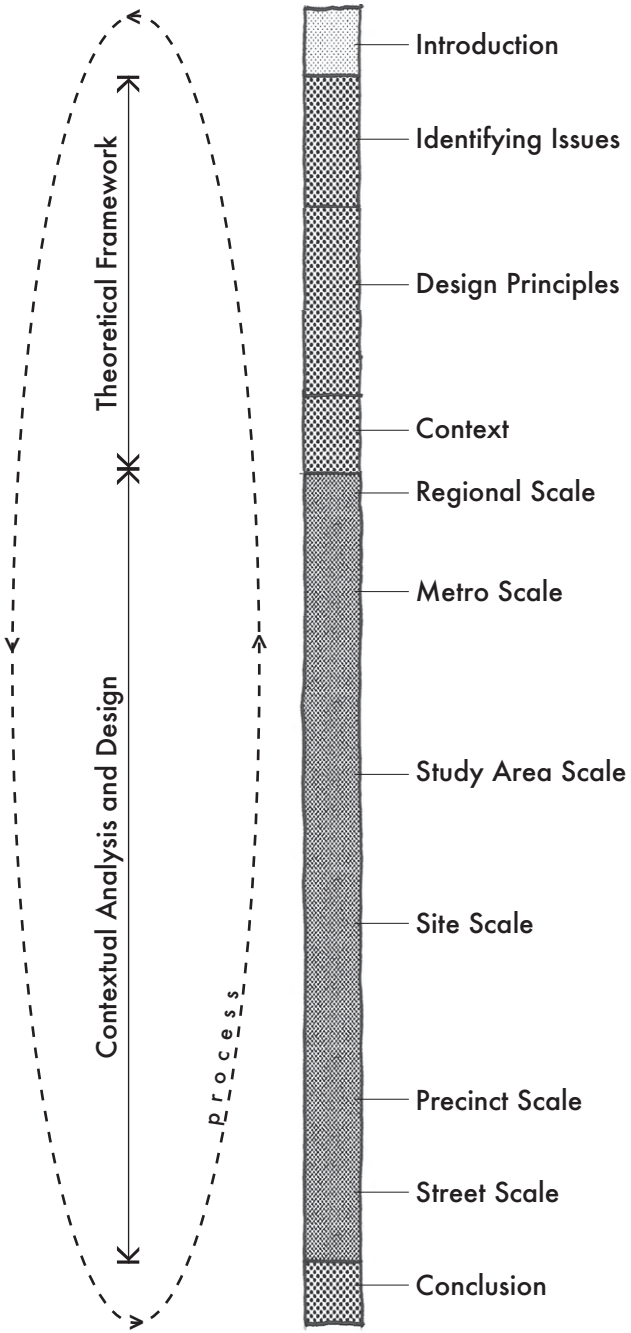


Fig.1.8 Document structure. (Author's own)

1.5 Research Methodology

This research project is research through design, guided by a theoretical framework.

1.5.1. Research Methods

The theoretical aspect of the research is that of qualitative research under the critical theory paradigm. It is subjectivist in the sense that the values of the author, as outlined in the positionality section above, have mediated the enquiry.

The methods used in conducting the research are presented here in a linear order, although it was an iterative process. The methods are:

i. Theory and literature related to settlement expansion and compaction, with relevant precedents, forms the theoretical framework and main structure of the document.

ii. Design principles were formulated from the theoretical framework.

iii. Semi-structured interviews, which were conducted with a planner and urban designers from the City of Cape Town, a planner and an economist from the University of Cape Town, and an urban designer in private practice. The aim of these interviews was to gain a contextual understanding of the dynamics of the city's peripheries.

iv. Documentation collation of the natural and built landscapes of Cape Town and its surrounding municipalities, to set up a series of accurate base maps. These were sourced from the City of Cape Town's GIS database, UCT's Digital Archives, South African National Biodiversity Institute's GIS database, and National Geo-spatial Information from the Department of Rural Development and Land Reform. In most cases, ground truthing of this information was undertaken.

v. Policy review with relevance to the topic. These policies are the GCMRSIF, IDP, Cape Town MSDF and Stellenbosch MSDF.

vi. Assessment of the spatial structure and form of the landscapes, that constitute the Cape Town Metropolitan Area, was done through the value system formulated by the author and substantiated by the theoretical framework and design principles. This process lead to the identification of a suitable site for research purposes.

vii. Design responses were undertaken to test the design principles formulated through the theoretical framework. The design response is therefore informed by, and based on, the theoretical framework.

1.5.2. Design Method

The research project was undertaken in a cyclical manner with continuous refinements and reinterpretation of the different stages in the process. First of all, a global problem was identified and contextualised, then the theoretical framework was used to further analyse this problem and assist with the formation of an idea to solve this problem. The idea was creatively further developed through principles, strategies and tools that directly addresses the problem. The strategies and tools were creatively applied to the context to inform a design. Then a process was formulated to establish how the plan will be implemented. The process was then repeated continuously to refine and increase the levels of detail of all the stages.

With a complex regional problem such as the topic

of this research project, it was necessary to think and work across all the scales, with the larger scale every time informing the scale below it and then through a cyclical process of working through the scales, improved levels of refinement were achieved. The scales referred to, are highlighted in figure 1.9. As required by SPLUMA (Act 16 of 2013), the plans at each scale take the form of frameworks and not land use plans.

The author believes that design is not opinion based, but based on an argument formed through principles, supported by evidence and compiled through a rigorous method, which unfolded as follows in this project:

- Site observations were undertaken and analyses were done on all scales and base maps were generated;
- A number of site visits were then undertaken to ground truth these maps
- A sub regional analysis was done to establish the context of the project
- A sub-regional concept was done to illustrate the relevance of the chosen site, to define where development should not go and to formulate a structural framework plan;
- Analysis was then done at site and environs scale to produce a composite constraints and informants map, which together with the design principles, guided the concept design;
- Key target areas that would unlock the structural plan and guide where capital investment should be spent, were identified;
- Within these target areas, detailed design resolution was undertaken with performance qualities of the public spaces, as primary concern.

1.5.3. Research Limitations

- Limited engagements with planners, economists and engineers during the design process has had limitations on the intra-disciplinary aspect of the design outcome. There were no interactions with land surveyors, freshwater ecologists, botanists, heritage consultants, landscape architects, sociologists, traffic engineers and bulk infrastructure engineers.

- Due to the large site area, and its fragmented nature, no direct community engagement has taken place.

- Site observations have been undertaken and analysed in a subjective manner and only provides a snapshot of activity in a short timeframe. Therefore the reliability of the design outcomes, have their limitations.

1.5.4. Document Structure

Chapter 1, this chapter, is an introduction to the research project.

Chapter 2 identifies overarching issues. It starts off with the relationship between humanity and its environment, and how a balance needs to be maintained. It explores why and how lateral urban sprawl is disrupting this balance and why it has not been successfully contained. It then looks at a number of case studies to further the investigation and to assist with the design.

Chapter 3 sets the scene of the sub-regional context the project will be located in.

Chapters 4, is the design response through all of the scales.

Chapter 5 concludes the study through addressing the research questions, which aims to add to the theoretical knowledge of the chosen topic.

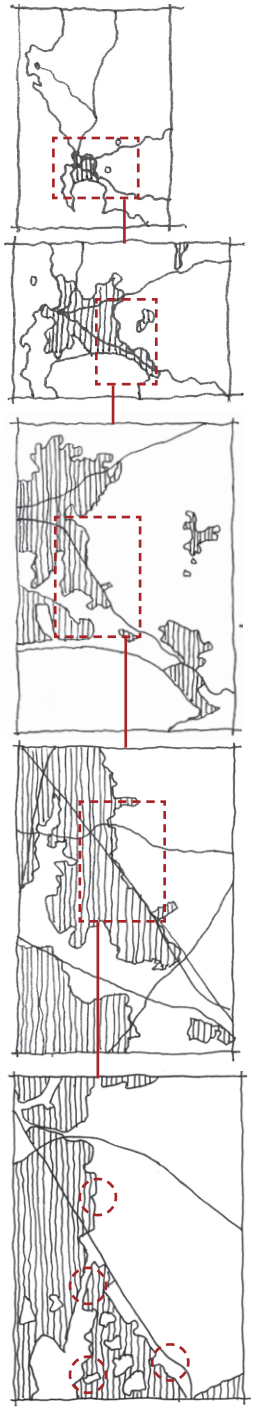


Fig.1.9 Working across scales. (Author's own)

Fighting the Sprawl: Restructuring the seam between the rural and urban landscapes through consolidation, integration and intensification in Cape Town.

02

Theoretical Framework

2.1 Our Relationship with the Environment
- 2.1.1 Regionalism
- 2.1.2 The Landscapes of Society
- 2.1.3 Maintaining Balance
- 2.1.4 The seam between urban and rural

2.2 Disrupting the Balance
- 2.2.1 The Sprawl
- 2.2.3 Modernism and Apartheid
- 2.2.3 Spatial structure resulting from sprawl
- 2.2.4 The relationship between sprawl and inequity
- 2.2.5 Sprawling economy
- 2.2.6 Defining the limits of settlement expansion
- 2.2.7 The need for compaction
- 2.2.8 Design Structure

2.3 Case Studies
- 2.3.1 Five Finger Plan
- 2.3.2 Design of Los Angeles 1967
- 2.3.3 Medellin, Columbia
- 2.3.4 Issoudon Landscape Plan
- 2.3.5 Bandar Shahpour
- 2.3.6 The Desakota

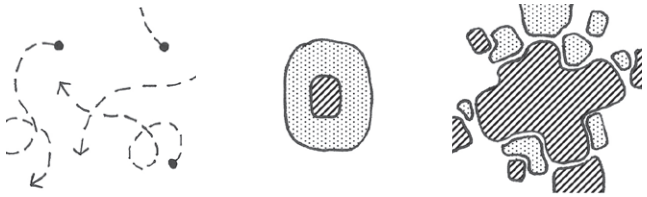


Fig.2.1 Human Settlement Evolution. (Author's own)

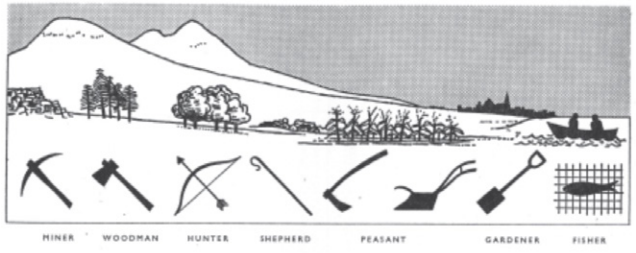


Fig.2.2 Valley Section. (Geddes, 1915)

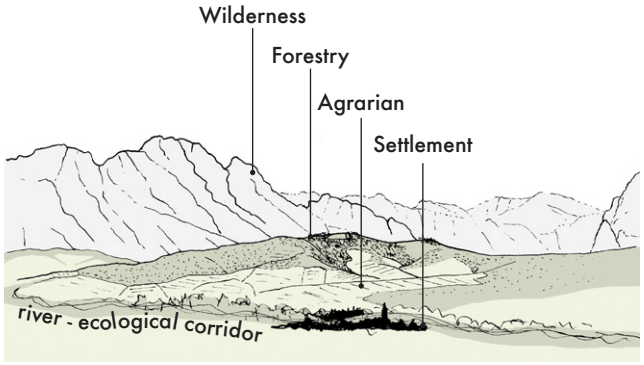


Fig.2.3 Balance between Landscapes of Society: Vertical transition from natural to cultural landscapes in the Cape. (Author's own)

2.1 Our Relationship with the Environment

2.1.1. Regionalism

Patrick Geddes developed the valley section that depicts an ideal regional-urban condition. The longitudinal section begins up in the mountains, following the course of a river down a valley into the plains and finally into an estuary on the coast. He argued for a number of different occupations or trades along the section and if harmony existed between the humans inhabiting and working that particular environment, that human societies and settlements would emerge as depicted in the section. Small communities would be situated high up the mountains and progressively becoming larger settlements as you make your way down along the slopes, eventually culminating in a capital at the coast (Welter, 2019). The valley section essentially tests the idea of a valley region and it describes humanities development from hunting, pastoral, agricultural to the commercial societies of today. What is important here is how the environment dictates the settlement patterns along the slope and how their unified regional efforts contribute to sustaining the capital.

Dewar (2019), reiterates there are support systems that structures the settlement on a regional scale, and these need to be understood and reinforced. Calthorpe and Fulton (2001) confirms this notion of what they call, the Regional City. That we live in a "…metropolitan community that forms one economic, cultural, environmental and civic entity." The regional structure is quite a complex form consisting out of a layering of networks of communities, open space, economic systems and cultures. The overall wellbeing of the region, depends on the interconnectedness of these networks. It can also not be dominated by one network. The regional city has become what the city used to be, the heart of culture and the framework for the economy.

2.1.2. The Landscapes of Society

The generic landscapes referred to here are the built up urban domain, the rural agrarian landscape and the natural environment. According to Dewar and Uytenbogaardt (1991), humanity's environment is a continuum of urban, rural and wilderness landscapes.

Weller (2016) adds another dimension to this and warns against perceiving the city set as set against the backdrop of nature. He argues that the "city is now everywhere, and the world is hybridized, denatured, co-evolving ecology of our own making." And that it would be detrimental to our future if we continue to engineer and shape our environment without a thorough understanding of ecology.

This understanding of ecology is further reinforced by Ndubisi (2002) from a scientific perspective, that natural ecosystems consist out of a series of interconnected physical and chemical processes that are connected through the flow of energy and material. He argues that for an ecosystem to be stably functioning, these processes need to be in equilibrium. According to Ndubisi (2002), "The landscape is the geographical template for undertaking ecological planning". Landscape here, refers to the totality of the natural and cultural features on the land. These features are the visible features such as rivers, forests, hills and mountains and according to Dewar and Uytenbogaardt (1991) also includes the manufactured landscapes of dams, hedges, avenue planting and agrarian land.

Ndubisi (2002) further states that the totality of these features reflects the culture of the landscape's inhabitants and forms the basis of the *genius loci*. As needs of the inhabitants change over time, features in this landscape are altered and shaped to suit the emerging needs. Dober (1969) supports this notion and refers to the *genius loci,* or sense of place, as "the sum of all the environmental characteristics that distinguish a part from the whole." That the sense

of place is man-made, that the contrast between the rural and urban landscapes, are deliberate. These modifications to the features are sometimes done in harmony with the natural processes and at times it alters the processes. It is important to realise that these actions on the landscape affects the total landscape and the sense of place. Ndubisi (2002)

It will become more challenging to control these actions on the landscape, as humanity is now moving towards planetary urbanization and the UN estimates that by 2030, two thirds of the world's population will live in cities. This immense relocation of humanity into urban centres on a global scale, is as a big shift in humanity (Kriken, Enquist, & Rapaport, 2010), as in 10 000 BC during the first agricultural revolution when the *Homo sapiens,* hunter gatherer groups started settling around agricultural productive land and formed the beginnings of civilization. (Zeunert, 2017)

(Kriken et al., 2010) contemplates whether city designers are ready for this massive shift as we move into the, as Zeunert (2017) states, the epoch of the anthropocene. And whether city designers are armed with the relevant principles, strategies and tools to receive and plan for the emergence of *Homo urbanus* and make this shift as positive, people centred and dignified as possible. Kriken et al. (2010) seem to not think so as evidence exists in most cities of this lack of solving issues such as overcrowding, pollution, extended commuting, monotony of urban landscapes and a lack of positive open space. To this list, Zeunert (2017) adds the issues of human induced climate change, fossil fuel addiction, lack of fresh water, and economic dominance overriding all attempts to rectify the issues.

So what relevance does this hold for cities in the 21st century? With the increasing global migration of people to cities, and population growth within them, it is clear that to maintain a balance of sustained global ecological functioning, the role and nature of cities will have to be seriously reconsidered.

2.1.3. Maintaining Balance

Form whichever perspective one looks at this relationship between humanity and its environment, it is obvious that there is tension that exists between these landscapes and that a positive balance needs to be achieved and maintained.

Dewar and Uytenbogaardt (1991) argue that to achieve this, the threatened landscapes, the collective open space, should be perceived as the dynamic positive element that guides urban growth. It is therefore important not to establish where urban development should go, but to establish where urban development should not go. Dewar and Uytenbogaardt (1991) puts forward that the fundamental quality of a landscape should remain in its current or natural state and that the landscapes of lesser quality, be positively improved as urban places. The status quo is precisely the opposite of this. The sprawling edges of cities are seen as the positive element of growth and open space is left as residual and leftover land.

2.1.4. The seam between Urban and Rural

According to Isikhungusethu Environmental Services, Dewar, and Louw (2017), the balance between the three landscapes of society need to be established at the regional scale. When considering a city at its regional scale, it becomes easy to distinguish these 'rooms' that the region consists of. Some rooms are rural, some are wilderness, some are just great urban parks. To achieve a dynamic balance, large 'rooms' of wilderness and rural space needs to be reserved and linked by a system of green corridors to reinforce ecological linkages. This then creates a green matrix with hierarchies of settlements occurring in the spaces between this matrix, and in response to regional movement routes. (fig 00)

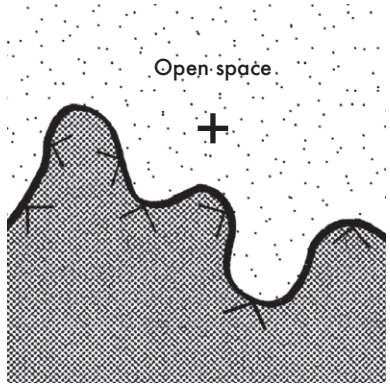


Fig.2.4 Open space guiding urban growth.

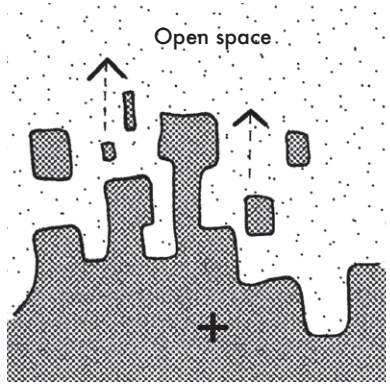


Fig.2.5 Sprawling edge guiding urban growth. (Author's own, adapted from Dewar and Uytenbogaardt, 1991)

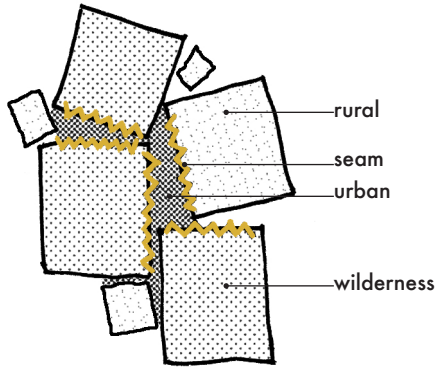
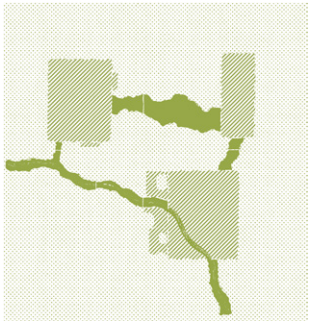
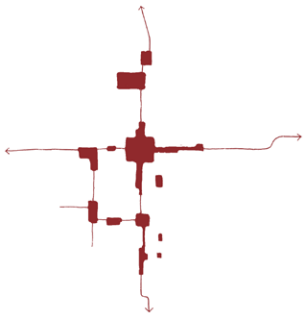


Fig.2.6 The Seam between urban and rural. (Author's own)



Open space and ecological linkages



Urban settlements and regional routes.

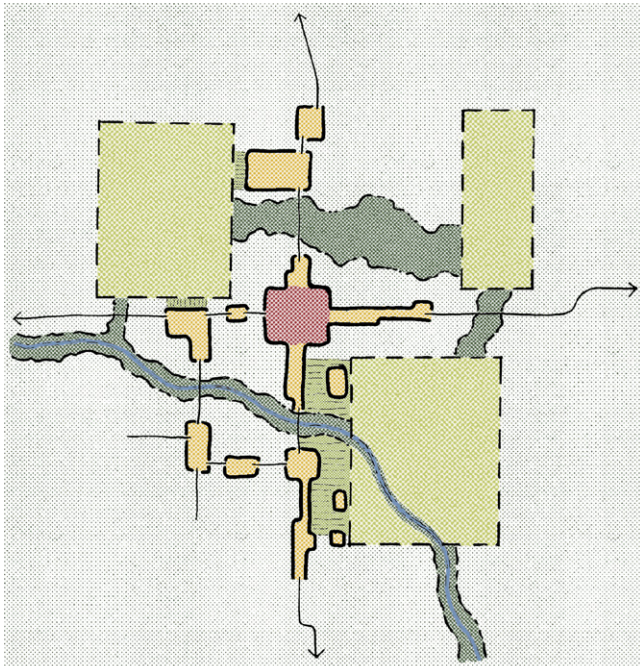


Fig.2.7 The regional landscapes of society. (Isikhungusethu Environmental Services, Dewar, and Louw, 2017)

The proximity and interconnectedness of these overlaid networks, provide opportunities for synergies between the landscapes. For instance, agricultural production can take place close to its markets and support systems. The wastes generated by the urban systems could be used to irrigate agricultural land. (Isikhungusethu Environmental Services et al., 2017)

The interface zones, the seams between these rooms or landscapes, are what ties them together. It is in these seams, at the confluence of different landscapes, where the biggest opportunities lie to create unique environments, but also it is at these seams where the highest possibility of conflict exists.

2.2 Disrupting the Balance

2.2.1. The Sprawl

The fact that uncontrolled growth and urban sprawl usually occurs on the peripheral edges of cities, growing into, along and over these seams between urban and rural, means that it has the potential to disrupt this balance of the landscapes.

Some of the negative impacts directly caused by uncontrolled growth and low density sprawl, are the loss of biodiversity, loss of natural resources, and loss of food producing agricultural land. It destroys the sense of place, resulting in large sterile and monotonous landscapes that place burdens on local governments by increasing the geographical footprints to be serviced. It increases the travelling distances and costs and leads to low population densities which reduces economic opportunities (Dewar & Uytenbogaardt, 1991). Ultimately it places immense strain on the wilderness, rural and urban landscapes. It typically negatively affects the environment, society and economy. It is therefore not a sustainable method of settlement growth.

Calthorpe and Fulton (2001) argues that people perceive sprawl differently. Some see it as a true reflection of humanity – consumptive and fractured. Others see it as a cancer that eats away at land and culture. Calthorpe and Fulton (2001) defines sprawl as "a post-war strategy housing a growing middle class in low density places, knitted together by the car." This is relevant to some extent to the South African context, although the structure and form of sprawl in South Africa is somewhat unique. According to Dewar and Todeschini (2004), the planned growth of South African cities since the 1930's was dominated by both the Modernist and Apartheid ideologies.

2.2.2. Modernism and Apartheid

The ideology of Modernism was based on the complete reconceptualization of the traditional city's structure and form. Freestanding structures surrounded by open space become the building blocks of the city and promoted suburban values as opposed to urban values. Plans were programmatically driven and consisted of a collection of parts that were rationally distributed. Activities were separated through zoning schemes and the private motor vehicle became the instrument to navigate through these environments. It was believed that everyone would own a motor vehicle, so the travelling between the mono-functional areas, was not seen as a problem. There was also a strong belief in the neighbourhood unit. Which, according to Dewar and Todeschini (2004), was essentially the grouping of dwelling units into self contained neighbourhood units with public and commercial facilities at their centres. Vehicular traffic through the units were discouraged and units were separated form each other by non ecologically significant green buffer zones and high speed limited accessways. Motor vehicle orientated engineering efficiencies and standards dominated and pedestrian movement was discouraged. Urban performance qualities and social need was ignored. The city

became machinelike with emphasis on maximising the operations of the individual parts. Essentially, the modernist model, is a sprawling anti-city, designed to the scale of the motor vehicle.

The other ideology that guided urban structure and form, which is unique to South Africa, was Apartheid. According to Dewar and Todeschini (2004), the spatial concepts of apartheid were based on the principles of modernism, but were adapted and distorted to suit its own agendas. The modernist notion of separation was extended to include racial separation. Certain races were forced out of the city centres and, because there was a link between race and class, it ended up being the poorest people who were moved to the peripheries of cities. The neighbourhood unit was also used as control mechanism to ensure that economic activities could be excluded from these areas, and with the limited entrances and exits to these units, they could easily be closed off during times of social unrest. Like with the modernist ideology, apartheid relied on high speed limited accessways to navigate the fragmented city. Many households, especially those that were marginalised, could not afford a motor vehicle and could therefore not capably take part in the economies offered by the city centres.

The 'Blue Book', 'Green Book' and 'Red Book', provided minimum standards to guide planners and local authorities. And according to Behrens and Watson (1996), the guidelines initially promoted suburban settlement, but with the realisation that this was unsustainable, the model was basically just downscaled. "Concerns for urban form and the quality of urban environments have largely been substituted by concerns relating to administrative ease, civil engineering issues, capital costs and public participation procedures."

The apartheid ideology has been abolished, but its spatial legacy is still very evident today. Consequently, Dewar (2000) states that apartheid together with modernism, has resulted in three spatial characteristics evident in South African cities and towns, that of low density, fragmentation and separation.

2.2.3. Spatial structure and form resulting from sprawl

Southworth and Owens (1993) identifies three patterns of sprawling growth:

- Concentric growth, which is the typical pattern of urban expansion, where growth radiates form an identifiable centre.
- Instant growth, which refers to a rapid pace of development and an almost single action of transformation.
- Scattered growth or leap-frog sprawl, which is usually associated with increased mobility.

These patterns of low-density sprawling city edges formlessly spread out at staggering rates, destroying in its wake, agricultural and natural landscapes. It causes fragmentation with a coarse urban grain because development usually occurs in disconnected parcels of land, bounded by freeways or further segregated by buffers of open space. The human and environmental consequences of these formless urban structures and forms, are appalling according to Dewar (2000).

Over time, as cities have grown, these sprawling edges of the city have been consumed by more sprawl. Where they once were on the peripheries, they are now embedded and the new sprawling edges are even further from the urban centres. "Sprawl now seems at once out-dated and, for many, increasingly unaffordable."(Calthorpe & Fulton, 2001)

According to Calthorpe and Fulton (2001), from a modernist influenced point of view, towns and cities, changed to conurbations of subdivisions, malls and

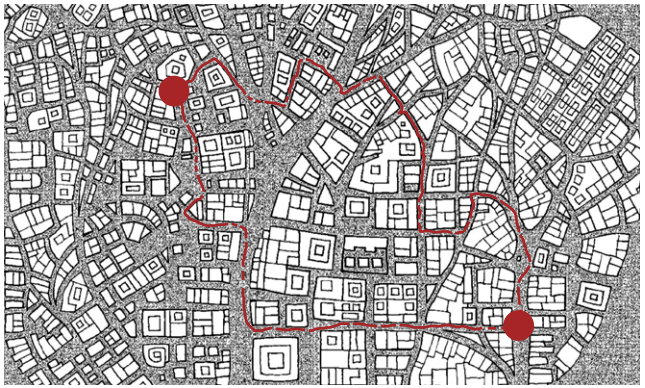


*Fig.*2.8 Traditional city form with an accessibility surface. To get between these two points, a person moves through a continuum of public space. It offers choice of route and many opportunities. (Marshall, 2005)

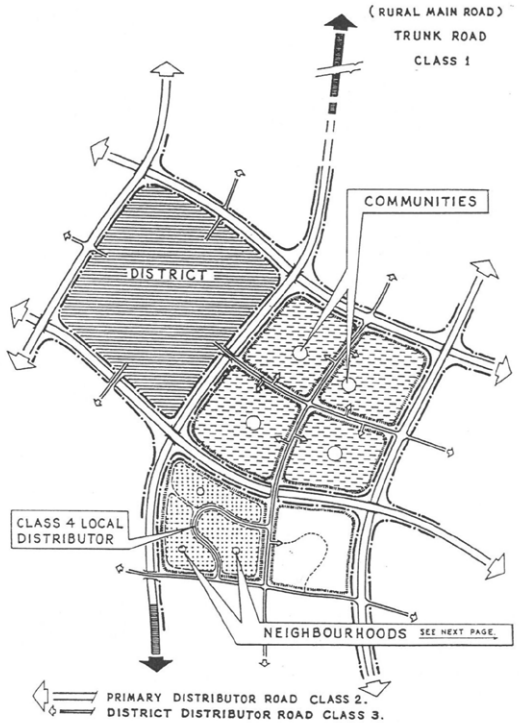


*Fig.*2.9 The Neighbourhood unit characterised by limited movement routes that fragments the city form. (Dewar and Todeschini, 2004)

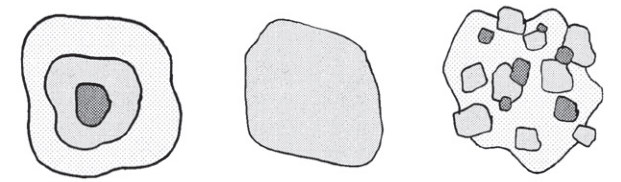


Fig.2.10 Patterns of sprawling growth. Drawing by author, adapted from Southworth and Owens (1993).

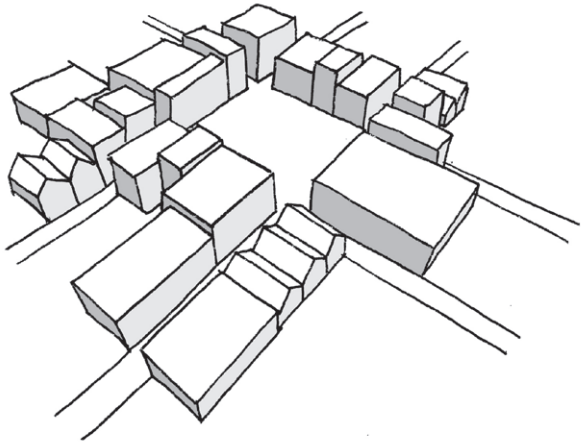


Fig.2.11 Traditional city form. (Author's own)

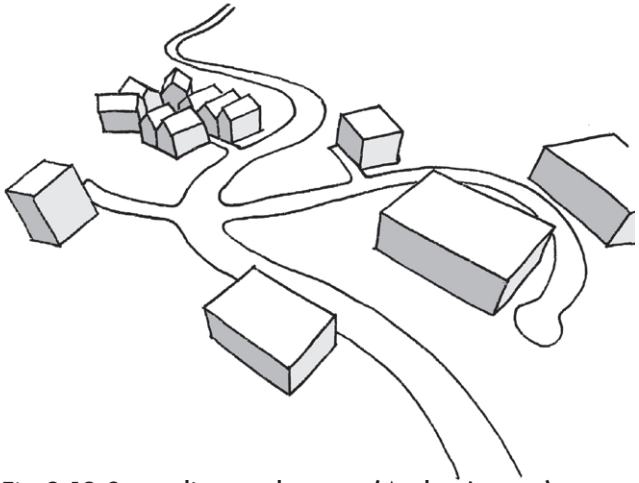


Fig.2.12 Sprawling settlement. (Author's own)

office parks, spread out into the landscape beyond any proportion to population growth. The landscape is now dominated by the private motor vehicle and the urban landscape changed from an urban industrial economy to a decentralized service economy.

As stated previously, the situation in South Africa is unique. One could argue that there are essentially two forms of sprawl. The sprawl caused by those that choose to live in the peripheral suburbs and private estates and who can afford the transport related costs. The other form being the urban poor who have no choice but to live on the peripheries and cannot afford transport costs to reach the city centre, where most opportunities are located. Some of these urban poor were forcibly moved to peripheries, or cannot afford better centrally located areas, and others have no choice but to live in informal settlements on the peripheries.

According to Dewar (2000), these sprawling settlement forms, generate enormous amounts of movement at unsustainable costs in terms of energy consumption, infrastructure and pollution. They are characterised by roads and not streets. The vehicular routes are increasingly upgraded to limited accessways that create impenetrable barriers between neighbourhood units. These then limit opportunities for small economies to flourish as the segregation caused by the roads diffuse the local markets. Access to public facilities is neighbourhood dependent and scattered in a non-hierarchical manner. The quality of public space is universally poor, even in the wealthier suburbs and private estates, but especially problematic for the poorer neighbourhoods as their dwellings are overcrowded and public space is where they spend most of their time. Buildings also fail to define, protect and give scale to these public spaces. Sprawl is fracturing local communities and emptying the city centres.

Duany, Plater-Zyberk, and Speck (2001) argues that sprawl has been allowed to continue, because of its seductive simplicity. According to them it consists out of five homogenous components that always occur independently, which is true to the South African context too, but the form of these are unique. These components may be adjacent to each other, but because of the dominant characteristics of sprawl, they will always be strictly segregated. The main components are:

1. Housing subdivisions located in neighbourhood units that consist of mostly residences. Some of these are products from the national housing policy, which promotes diffused, low-density forms. Others are gated communities manifested as leap frog sprawl, and are usually recognised by their local name that often pays tribute to the resource that they have displaced; 'Croyden Vineyard Estate', 'De Wijnlanden', 'La Montagne', 'Kelderhof Country Village', etc. These speculative developments usually occupy large, previously agricultural land, that is privatised and the public space within them, if provided, is not publicly accessible to the greater city. Another sub-component is the growing informal city, which is characterised according to UN Habitat (2014), by illegal housing of poor quality, overcrowded living conditions, inadequate access to infrastructure and insecure residential tenure.

2. Commercial centres or strip development that are exclusive for shopping and not places people are likely to walk to. They are easily recognised by the large parking lots between them and the road. These are also usually crowded around the large traffic intersections or along limited accessways .

3. Office and Industrial parks that are exclusive for work. Usually recognised by free standing boxes in parking lots. They are imagined as pastoral workplaces isolated in nature, but they are more often than not, surrounded by highways and not countryside. 'Technopark' outside Stellenbosch is a good example of this. The Cape Town city centre is also experiencing a similar sprawl, that of large tracts of consolidated parcels of land with vertical isolated towers sitting on parking lots.

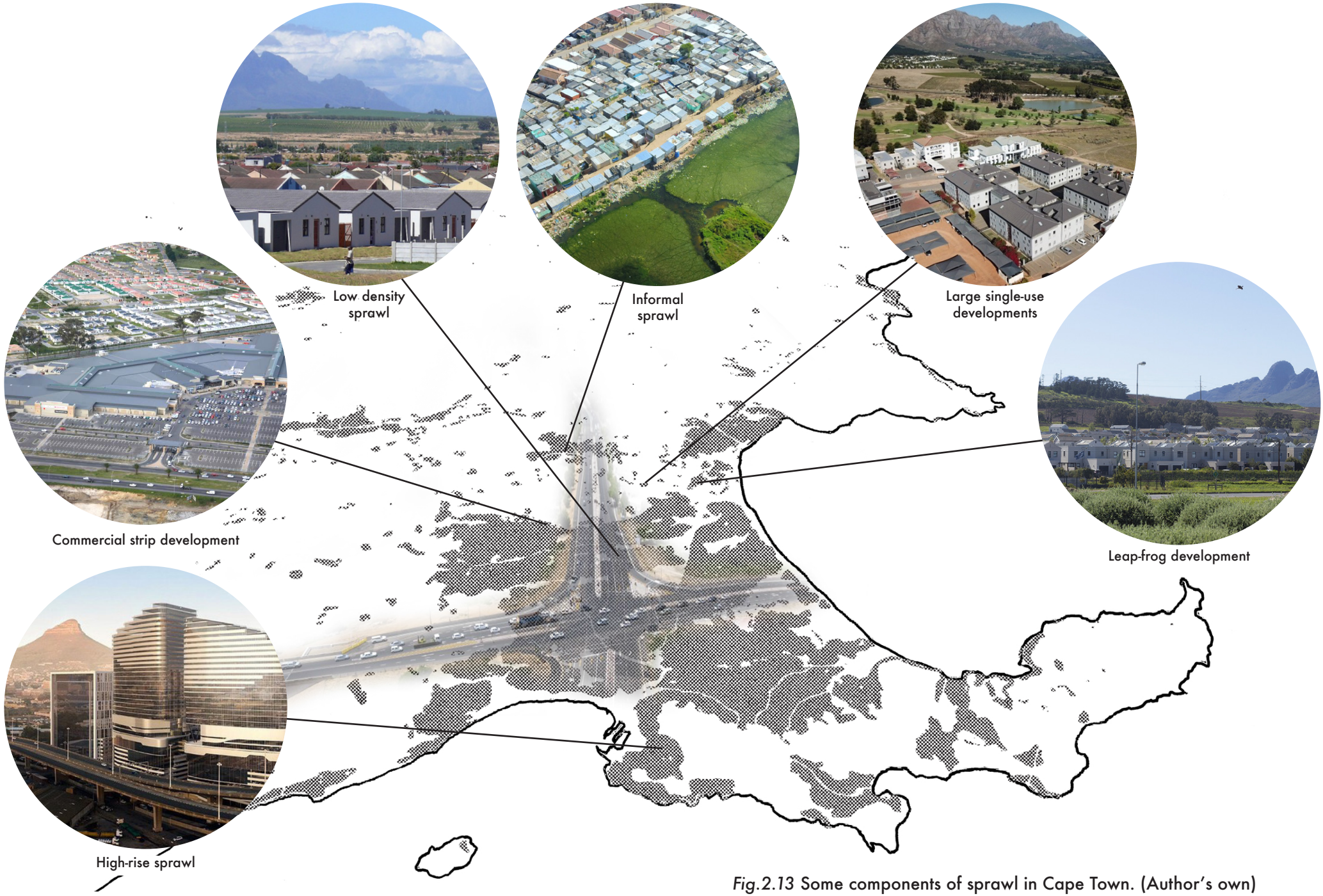


Fig.2.13 Some components of sprawl in Cape Town. (Author's own)

Fig.2.14 Model T Ford. The impact of the private motor vehicle on city form.

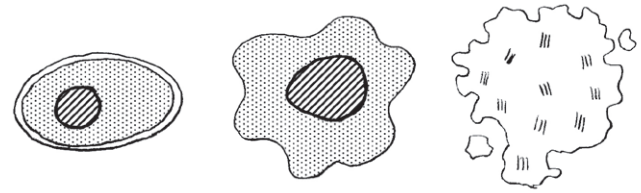


Fig.2.15 City as an egg. Drawing by author, adapted from Cedric Price.

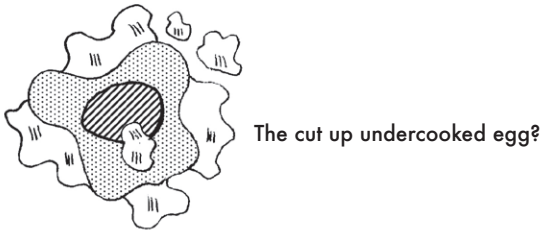


Fig.2.16 The post apartheid city. (Author's own)

4. Civic Institutions and public facilities like town halls, churches, schools and other gathering places. Traditionally these buildings served as focal points and ordered the urban fabric and the public space. In the low density sprawling landscape, their forms do not represent what they are, they are usually large, unadorned and have no structural logic.

5. Limited accessways and roads required to connect the other components. Since all uses are separated in this landscape, people spend unprecedented amount of time travelling in private automobiles from the one place to the next. These transport routes are usually the first marks left on the converted landscape and become the highest order structuring element within this fragmented landscape (Southworth & Owens, 1993). They are exclusionary elements as they serve only those who can afford to make use of it. According to Dewar and Uytenbogaardt (1991), they are space bridgers and not space integrators.

Southworth and Owens (1993) further state that the role of Traffic Engineers in shaping the form of the peripheral city should not be underestimated. Minimum road widths, cross-sections, street hierarchies, traffic control patterns such as the loop and cul-de-sac, all directly influence the spatial character and sense of place. Southworth and Owens (1993) elaborates and identifies several distinct road patterns associated with urban edge growth: speculative grid-iron; interrupted parallels; incremental infill; and various forms of cul-de-sacs and loops. The length of streets and number of intersections, cul-de-sacs and loops all define the route options when navigating through the area and directly influences the urban quality and sense of place. The transition from the more traditional grid structure to the more closed and discontinuous structure, has impact on the accessibility surface of the urban form and further leads to segregation within these neighbourhoods.

There are also the infrastructural and modified natural components that are scattered throughout this sprawling landscape. These are, to name a few: drainage canals; water treatment plants; overhead powerlines; chain link fences and high boundary walls; open space from exaggerated building setbacks and useless buffers of open space between compatible land uses; trees that serve no ecological function other than to shade automobiles in parking lots.

The Cedric Price diagram (fig.2.15) of the "The City as an Egg" shows the evolution of the city from an ancient city, to the modern city (Weller, 2016). One can't help to think how Price would have sketched the 'egg' for the post apartheid city. (fig 2.16)

2.2.4. The relationship between sprawl and inequity

In this landscape of isolated land uses, fragmented forms and roads, the city becomes a landscape of isolated people. Some travel by motor vehicle from home to remote workplaces, others are stranded where they live because of a lack of public transport or non-motorised transport options. The neighbourhood units they live in have minimal civic and public space that could serve as a common ground to bring people together.

In this sprawling suburban landscape, the wealthy and mobile can build a complex and rich personal network of associations and opportunities across the region. They can afford to choose who to interact with, based on similar interests, income, age and race. For the remainder of society, this landscape leaves them stranded on the isolated islands of the neighbourhood units.

Calthorpe and Fulton (2001), suggests that sprawl and inequity are interconnected problems, and that both emerges from destructive metropolitan patterns. At a regional level, sprawl exacerbates inequity and growing inequity, in turn, causes more sprawl.

Neither problems can be effectively dealt with, if the two problems are not addressed together. However, inequity is a much larger issue than sprawl which is a recent phenomenon, and a solvable problem. The causes of sprawl are known and can be directly dealt with. Inequity, on the other hand, is an eternal problem, that has existed long before sprawl, in small towns, rural areas and industrial cities. Inequity is not only caused by the physical environment, but also by a wide range of human feelings and emotions such as greed, elitism and racism.

Fighting sprawl will not end inequity, but and end to inequity cannot be achieved without addressing sprawl.

2.2.5. The economy of sprawl

With sprawl having such a negative effect on the urban form that it directly influences ecological, social and economical processes, why has it not been successfully halted in the post apartheid era?
It is probably partly to be blamed on economical dynamics. In the words of Mcgaffin (2019), "A developer will build on the moon." The greenfields land on the city's peripheries is easier to develop than those of brownfield infill sites closer to the city's core. The developer rights are less complicated, and the infrastructure and transport upgrades that the city provides on the peripheries of the city, makes it economically attractive to develop here. However, the form of the developments are of such low density, that it makes it economically unfeasible to locate businesses on the peripheries and the sprawling developments are therefore mostly limited to residential, with little regard for public space. People still need to travel vast distances to the city centre for employment opportunities and other social needs.

It seems like a lost battle and one can't help to wonder, where this seemingly endless growth will terminate?

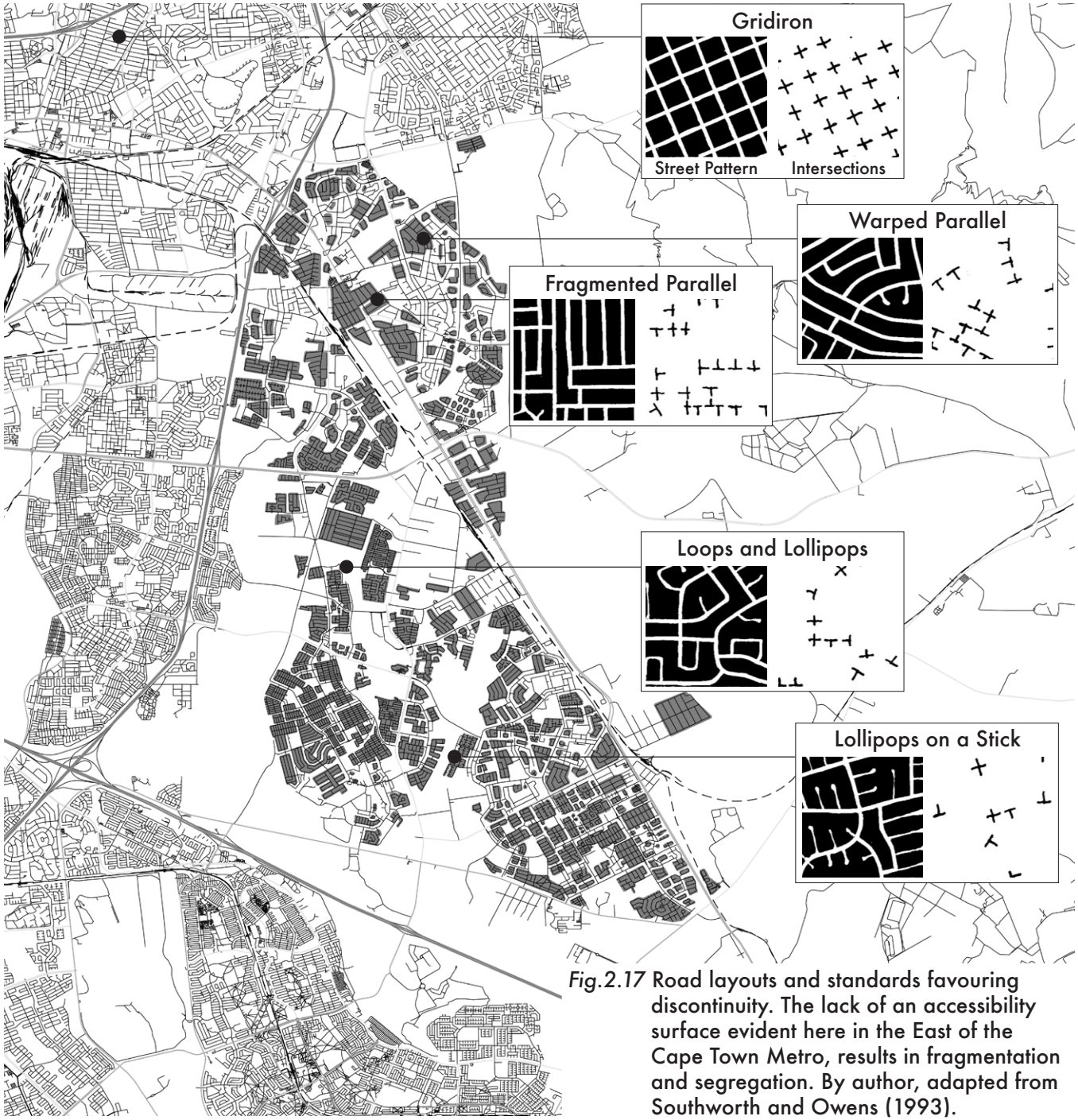
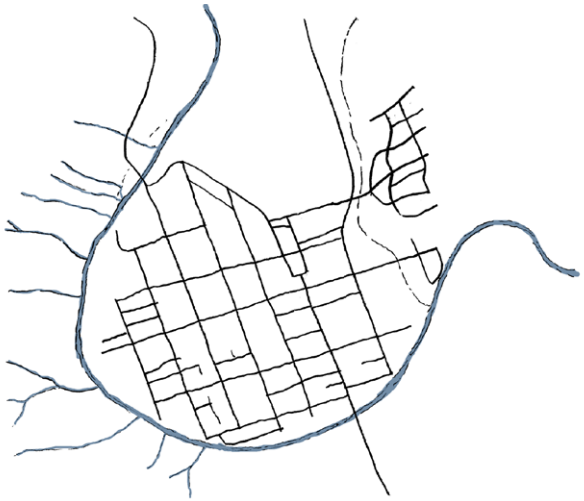
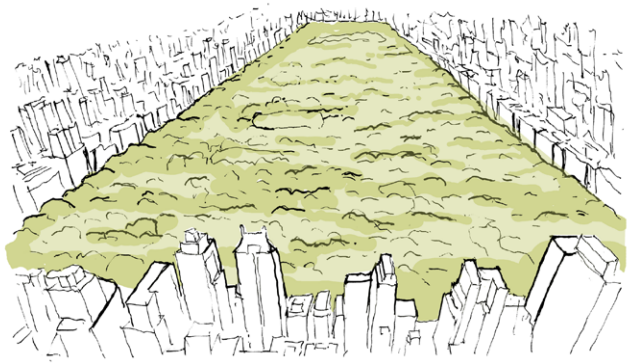


Fig.2.17 Road layouts and standards favouring discontinuity. The lack of an accessibility surface evident here in the East of the Cape Town Metro, results in fragmentation and segregation. By author, adapted from Southworth and Owens (1993).

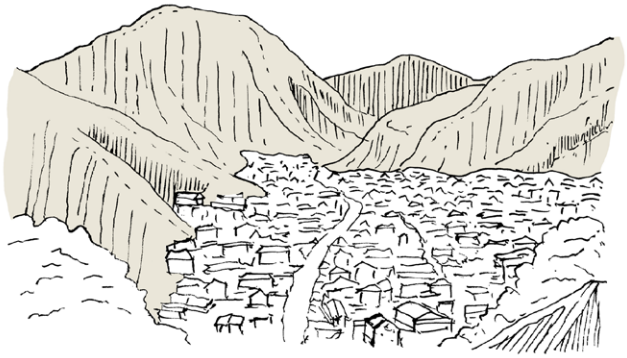


Water as edge - Graaff-Reinet, South Africa.

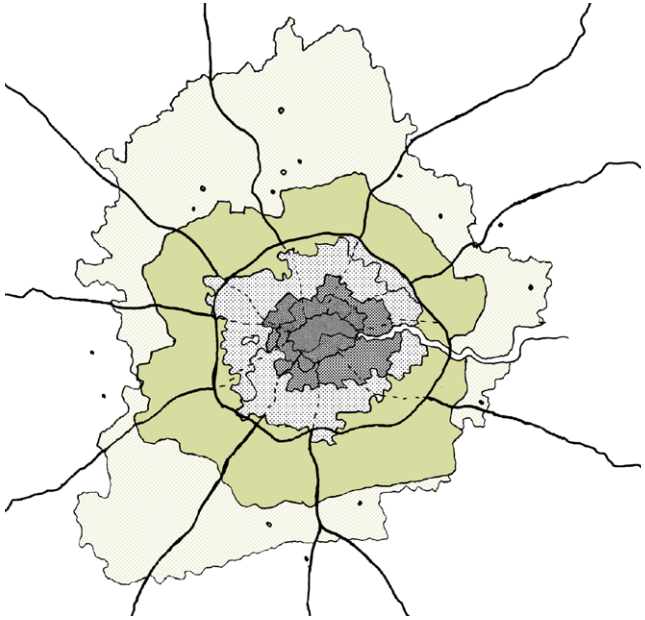


Open Space as edge, Central Park, New York.

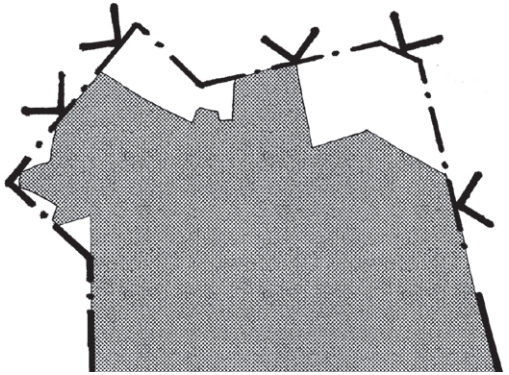
Wall as edge. City fortification - Plan of Paris in1300's.



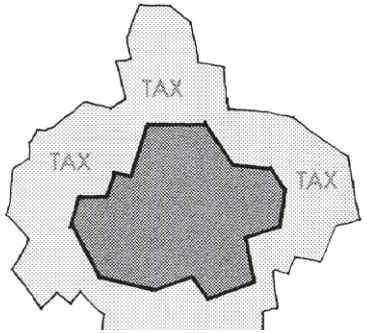
Landforms as edge - Idanre, Nigeria,



Greenbelt as edge - Abercrombie Plan, London.



Line as edge. Urban edge policies.



Economic restrictions as edge.

Fig.2.18 Some methods of defining the edge of settlement expansion. (Author's own)

2.2.6. Defining the limits of settlement expansion

Settlements are usually structured around natural features and these features guide their expansion and sometimes define their edges. Water in the form of the ocean, wetlands and rivers could define an edge to expansion, so too do landforms. But how is the edge of settlement expansion defined in the absence of natural features? It could be done through policy around the protection of areas of ecological significance, around collectively determined open space, through man made physical features like those of traditional city fortification, urban edge policies or according to Dober (1969), through economic restrictions.

In South Africa, those edges of the settlements, which are absent of natural features that would normally guide growth, urban edge policies are usually used to contain, control and guide the lateral expansion. According to Sinclair-Smith (2013), urban growth boundaries (UGB) are globally used to curb urban sprawl. However, the implementation of them is frequently contested. There needs to be adequate land reserves available within their demarcated areas to accommodate urban growth. If the boundary is too tight it could suppress economic development and lead to decreases of land availability and increases of land prices. If the boundary is too generous, it could result in unchecked urban sprawl with its associated environmental, social and economical costs.

Sinclair-Smith (2013) further states that urban economists are aware of the market distortions that promote excessive sprawl. Commuters from the peripheral suburbs are currently not paying the full costs of the extensive transport and bulk infrastructure that they rely on, the costs of road congestion is not taken into account and the benefits of open space is not realistically priced. The economists are generally in support of the UGB as a tool for compaction and

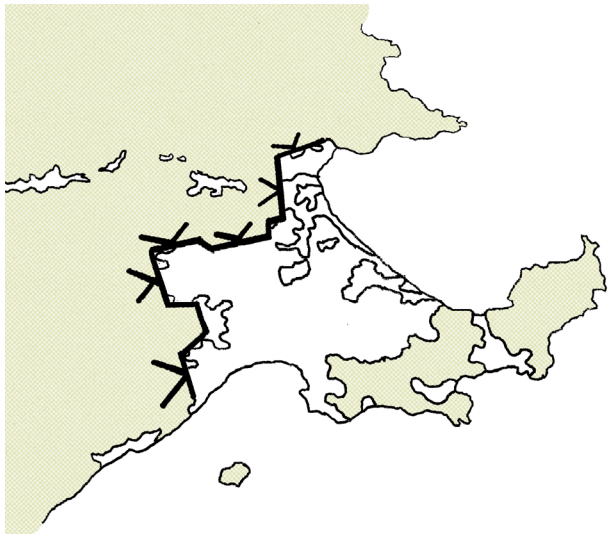


Fig.2.19.1 How to contain this laterally expanding city?

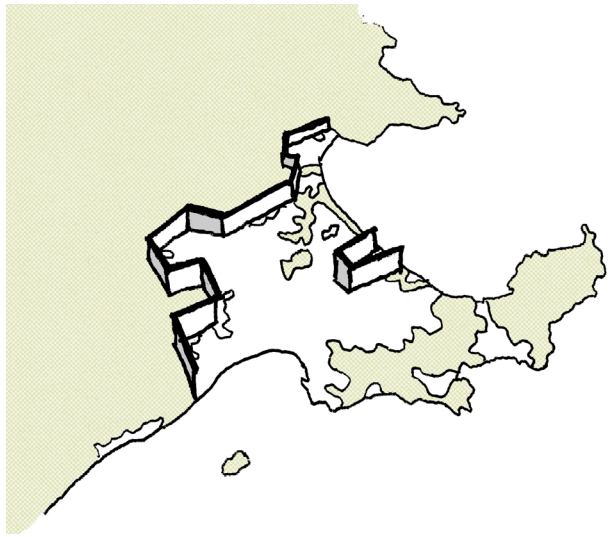


Fig.2.19.2 Erect a fence or a border wall that ignores ecological processes, social and economic structures.

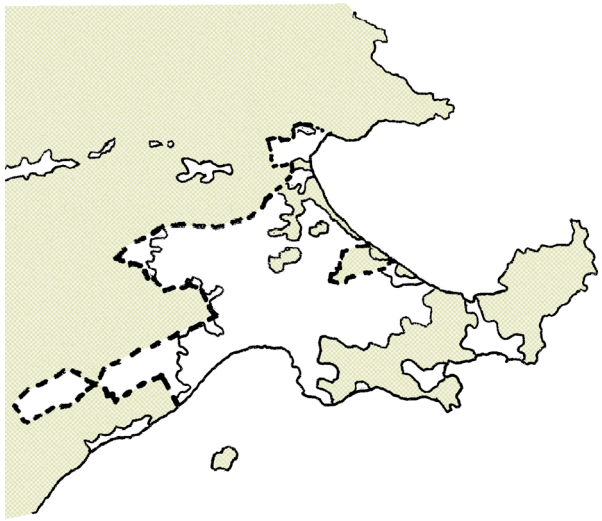


Fig.2.19.3 Use an Urban Edge Policy that is essentially only a line on paper with no spatial prescription or regard for the landscapes on either side.

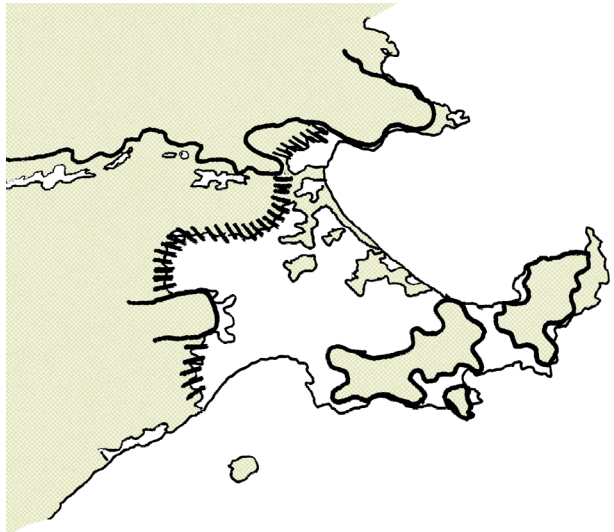


Fig.2.19.4 Or does it require a spatial solution, where the edge is a landscape, not a line.

Fig.2.19 Defining the limits of settlement expansion in Cape Town. (Author's own)

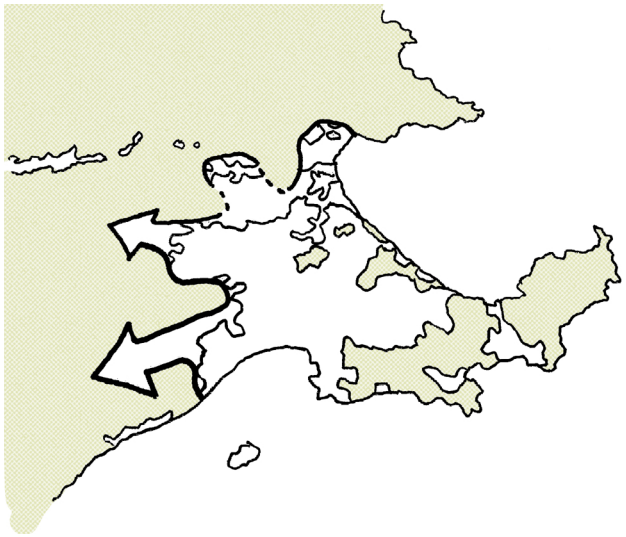


Fig.2.20 Encouraging explosion. (Author's own)

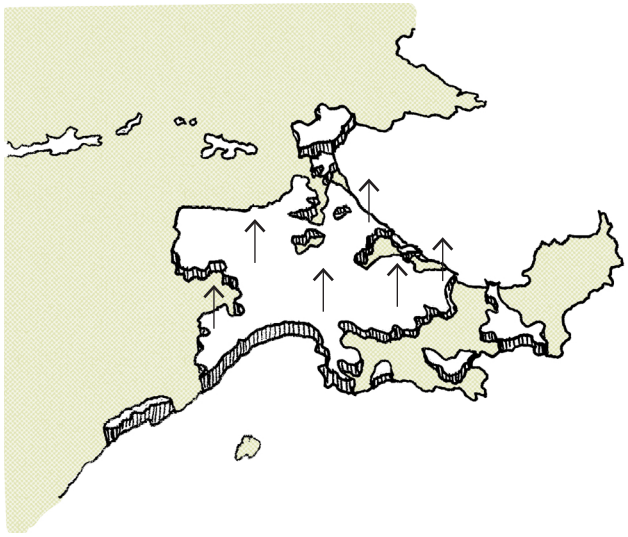


Fig.2.21 Compacting the City. (Author's own)

consequently correcting these market distortions. Some economists however favour market-based instruments such as road tolling, development tariffs and fuel and parking tariffs.

According to Sinclair-Smith (2013), the negatives associated with UGB according to economists are that they are:

- Imprecise mechanism capable of doing more harm than good if set too restrictively;
- Scepticism in the ability of state planners to determine best location for development;
- It does little to limit travel times and distances;
- It is ineffective relative to road tolling to control sprawl and promote densification;
- They do little to improve urban efficiencies;
- That UGB's may lead to higher densities on the city's periphery.

UGB's may also be inappropriate and difficult to implement in the Global South where the poor frequently inhabit the peripheries and partake in survivalist activities such as urban agriculture. Although in such cases the compaction associated with UGB's could bring public transport and other services to these peripheral communities (Sinclair-Smith, 2013). He further states that, in cities of polycentric growth, UGB's may be inappropriate. Also, that in cities, where regional coordination is lacking, the UGB may shift development to the neighbouring municipal administration with less strict development controls, resulting in leap frog sprawl. Which might explain why the Urban Edge Policy has been withdrawn from the latest Cape Town Municipal Spatial Development Framework.

Nevertheless, these policies usually just consist of a line on paper and do not prescribe what the spatial form on either side of this line should be. As in the words of Desvigne (2016b): "This edge joins two marginal worlds of little quality, a situation with the appearance of a common catastrophe. There is neither confrontation nor recognition between them. They both turn their backs on one another. This edge is most often marked by simple fencing, through which no connection or exchange is established from either side: they share nothing more than this state of being on the fringe."

2.2.7. The need for compaction

The structure and form of South African cities and the pressures it places on the peripheries, makes a compelling case to prevent further expansion of the geographical footprints and according to Dewar (2000), to promote compaction in the management of urban growth.

Dewar (2000) states that the necessity for compaction consists of three key interrelated factors:

- Employment generation, which can be achieved through intensification, diversification and specialisation;
- Non-motorised transport, which is the only mode of transport for a growing majority of the population and consequently, urban environments need to be scaled to the pedestrian;
- Public transport, which can only be efficiently provided it the threshold levels are high enough. Low density developments, make this unsustainable.

Essentially, the motives for compaction would be to reduce movement, reduce air pollution and dependency on fossil fuels, to maximise on current infrastructure and public facilities, and to increase service levels and convenience. However, compaction alone by defining the limits of settlement expansion through urban edges, would not be a sufficient condition for improved urban performance. It needs to be strategically and selectively undertaken through restructuring of the patterns of accessibility and urban opportunities.

According to an interview with Dewar (2019), public transport could be used as a powerful tool to restructure and resolve integration. There is consequently a case to make for restructuring of the compacted city to start in the corridor.

2.2.8. Design Structure

In these two figures from Paul Klee (Bacon, 1974), basic design structure is represented through the central line. The figure, 'Discipline', represents individual works developed off the central line, through an identifiable discipline of rhythm and form. In the figure, 'Freedom' individual work is expressed as independent statements trying to differentiate it from its neighbour. However, in both these figures, the individual works are anchored back into the strong central line, which consolidates the composition into a whole. In Bacon's words, "yet the whole has a kind of unity only because of the powerful cohesive effect of the central line of movement, which binds them all together and from which they derive their strength."

According to Dewar and Uytenbogaardt (1995), positive urban environments are characteristically complex. This complexity cannot be designed, but spatial structure can be used to give direction in the urban growth. The function of structure is to generate a range of opportunities to which individuals and groups can respond to, to meet their needs. The structure must be logical and legible and promote an amount of predictability of responses.

Dober (1969) defines design structure as: "Design Structure is an organising principle through which parts and pieces are brought together into a unified shape and form." It is a means of establishing an order within the landscapes of society, while responding to the technical requirements of developing the physical forms essential for community life.

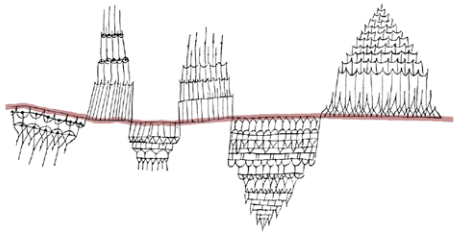


Fig.2.22 Discipline. Drawing by Paul Klee. (Bacon 1974)

Fig.2.23 Freedom. Drawing by Paul Klee. (Bacon 1974)

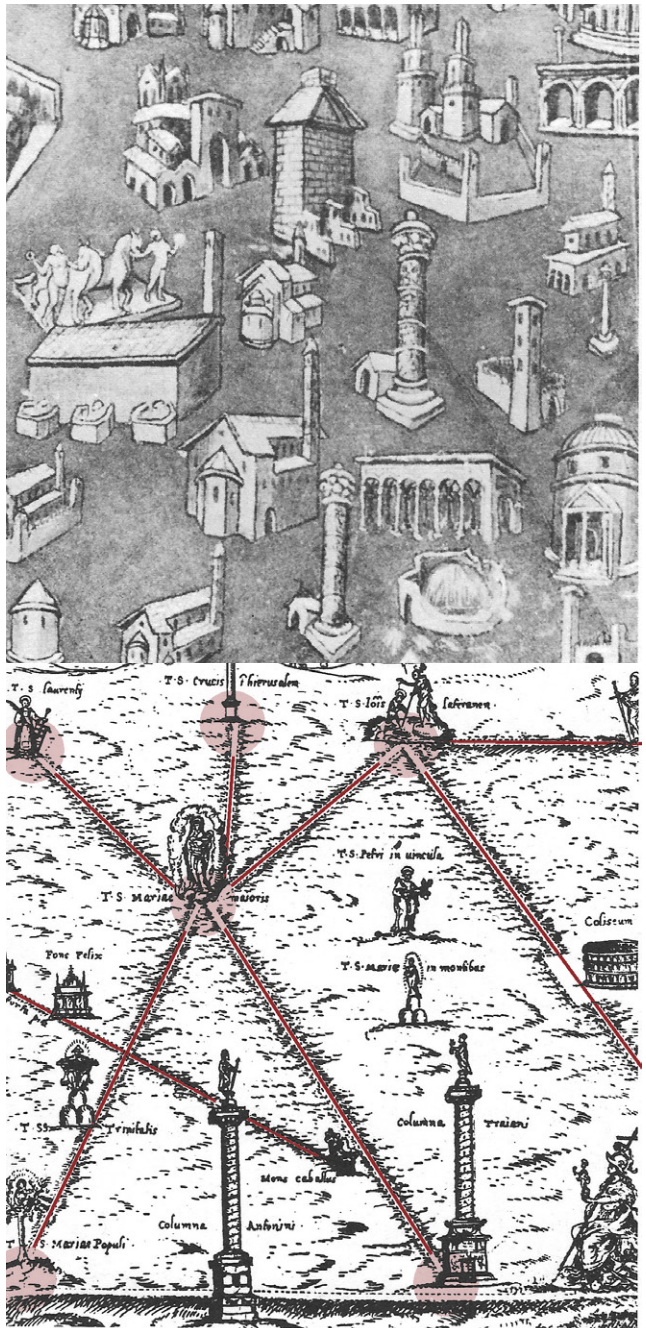


Fig.2.24 Structure as a tool to order the fragmented urban form. (Bacon 1974)

2.3 Case Studies

2.3.1. The Finger Plan, Copenhagen.

According to Ministry of the Environment (2015), the Five Finger Plan is characterised by the following main themes:

1. That urban development should take place in core urban regions (hand) and peripheral urban regions (fingers).
2. Public transport infrastructure in the form of regional, suburban, metro and light railway services integrated with a general road network. The finger structure therefore provides convenient and affordable accessibility through multiple modes of transport.
3. An open space network in the form of green wedges, between the peripheral urban regions (fingers). This open space network contains regional outdoor recreation and agriculture. The plan ensures that the areas between the fingers, the open space network, remain accessible to all residents in the metropolitan region.

By using these three main themes as tools to guide future urban growth, the finger plan has successfully helped to prevent urban sprawl in Copenhagen (Ministry of the Environment (2015).

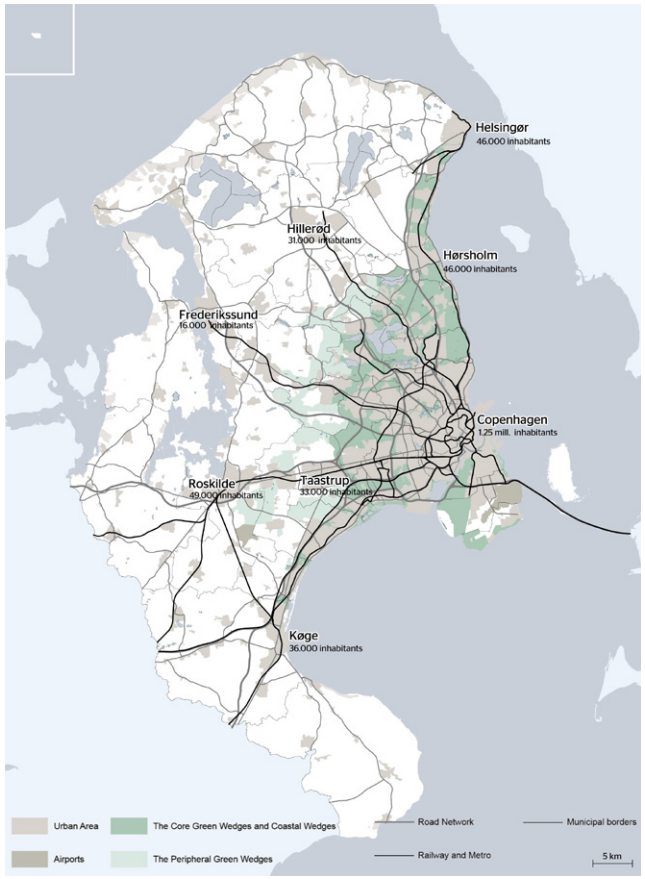


Fig. 2.25 The Greater Copenhagen Area. (Ministry of the Environment, 2015)

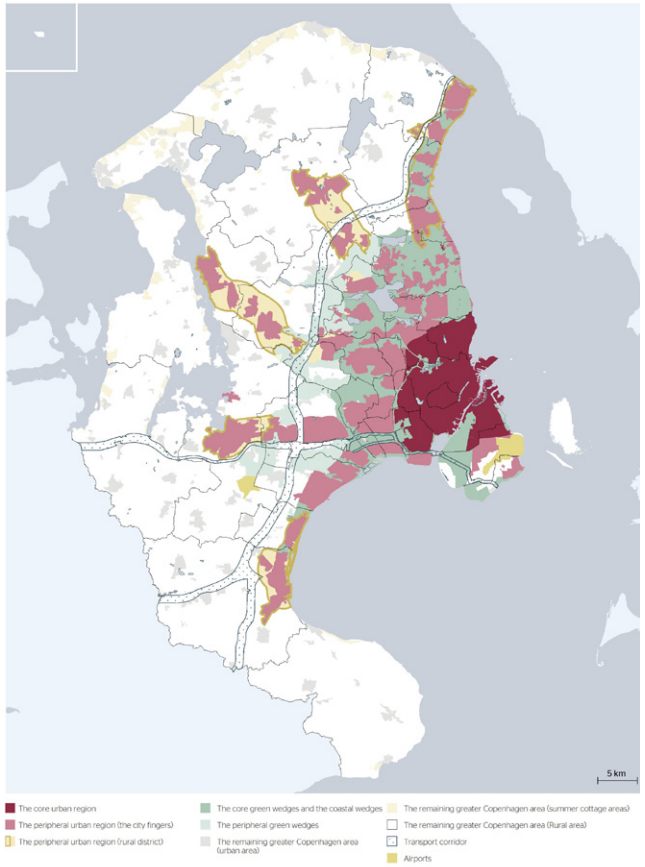


Fig. 2.26 The Four Geographical Areas. (Ministry of the Environment, 2015)

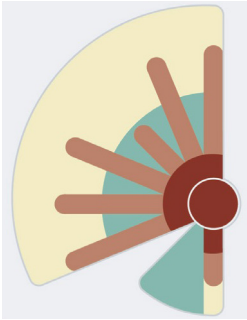


Fig. 2.27 The finger city structure: City and green wedges

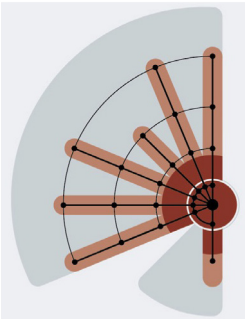


Fig. 2.28 The finger city structure: City and transport infrastructure

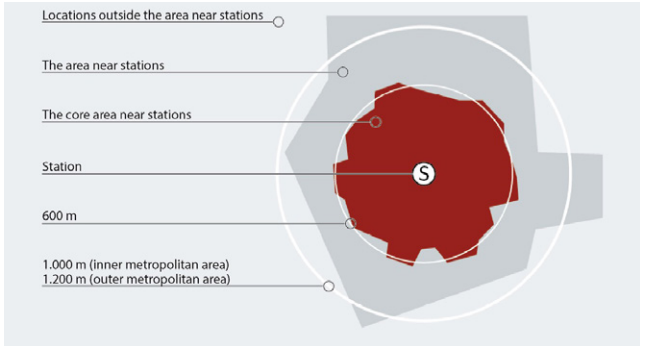


Fig. 2.29 Facilities clustered within walking distance, around train stations.

2.3.2. Promoting Structurally Informed Intensification through Corridor Thinking: Design of Los Angeles 1967.

Los Angeles is characterised by low densities and widespread urbanisation that was made possible by its extensive freeways. It is continuing to grow through people migrating in and through natural population increase. To cater for this growing population, urbanisation outside of the city limits is growing at a staggering rate. This rapid growth has lead to monotonous, low quality urban environments with little concern for amenities and open space, and the visual and environmental impacts are severe. (Dober, 1969)

This study presents two options for Los Angeles to improve its urban environment. The one is to continue to try and cope with present trends and hope that some new technology would be able to fix its perils. The resultant landscape, shown here as the dispersion concept, would resemble something similar to the urban landscape that is currently evident in Cape Town.

The other concept, the Corridor Concept, promotes structurally informed intensification. It proposes an approximately 3km wide band (defined by easy walking distance) of intensified, mixed use development, structured around a central spine, or high street, that contains public transportation. The corridor becomes a target for new development and allows for infill projects, making it viable to establish public transportation along it and promote small-scale economic activities.

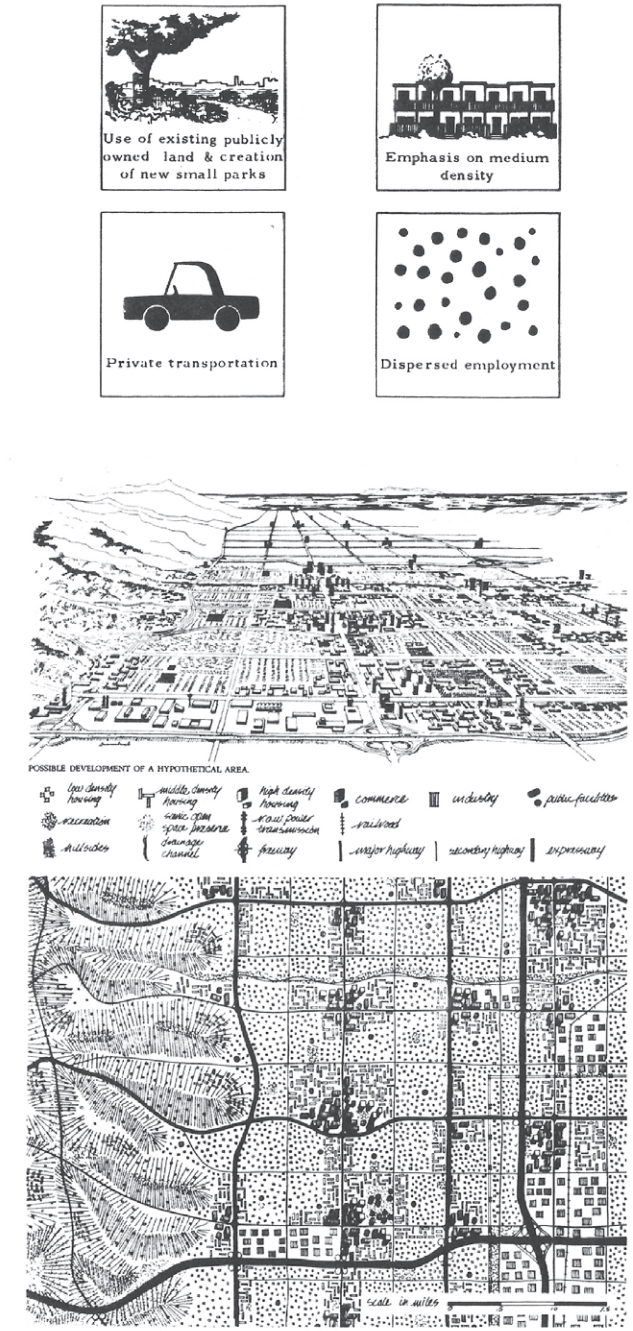


Fig. 2.30 Dispersion Concept. (Dober, 1969)

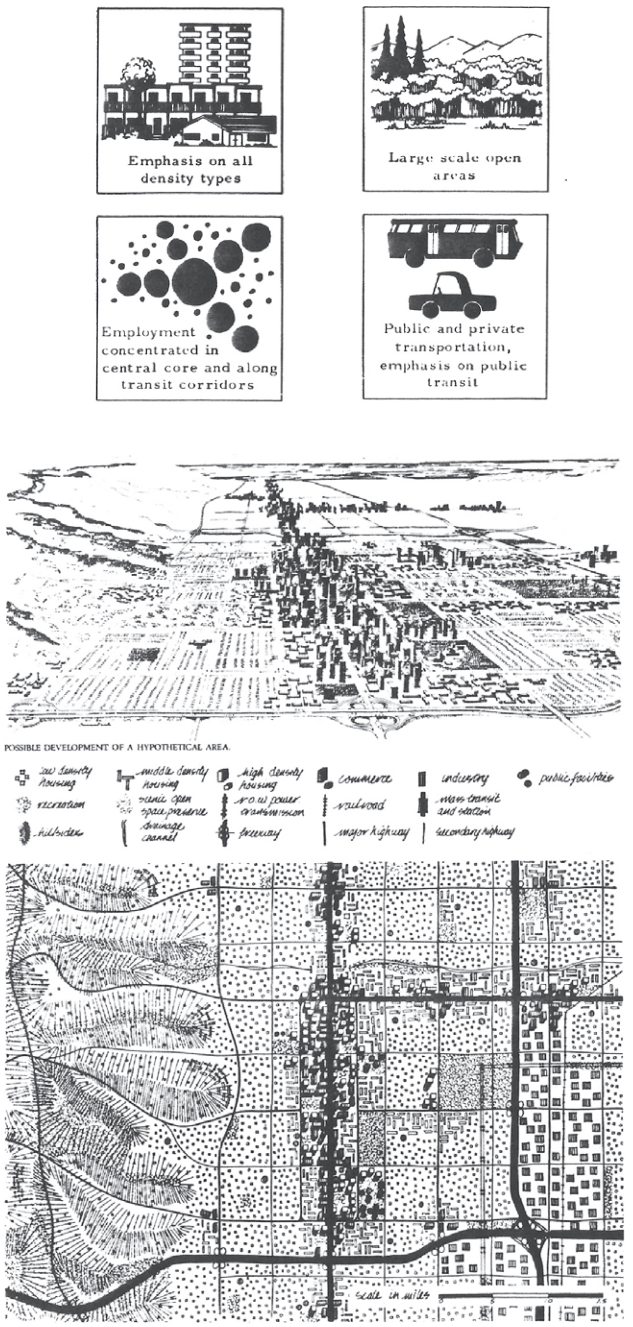


Figure 2.31 Corridor Concept. (Dober, 1969)

2.3.3. Open Space as Structuring Element: Issoudun Territoire, France.

According to Desvigne (2016a), the city of Issoudun in France has experienced recent sprawling growth and the city has become more monotonous and losing much of its geographical legibility, with the city's perimeter characterised by fragments of agricultural plots and residential areas. The introduction of a new structural legibility was proposed to counteract these spatial issues, through re-examining the approach to manage the limits between the urban and the rural and to transform the river valleys crossing the city.

The project's aim was not to impose a green ring around the city, but rather to reinforce and transform the concentrically laid out agricultural parcels that responds to the topography. Collectively, these parcels become an open space network, the new structuring element of this transformed landscape. Routes and ecological corridors link them and they can accommodate many functions associated with open space, such as sports fields and schools in response to the needs of the city.

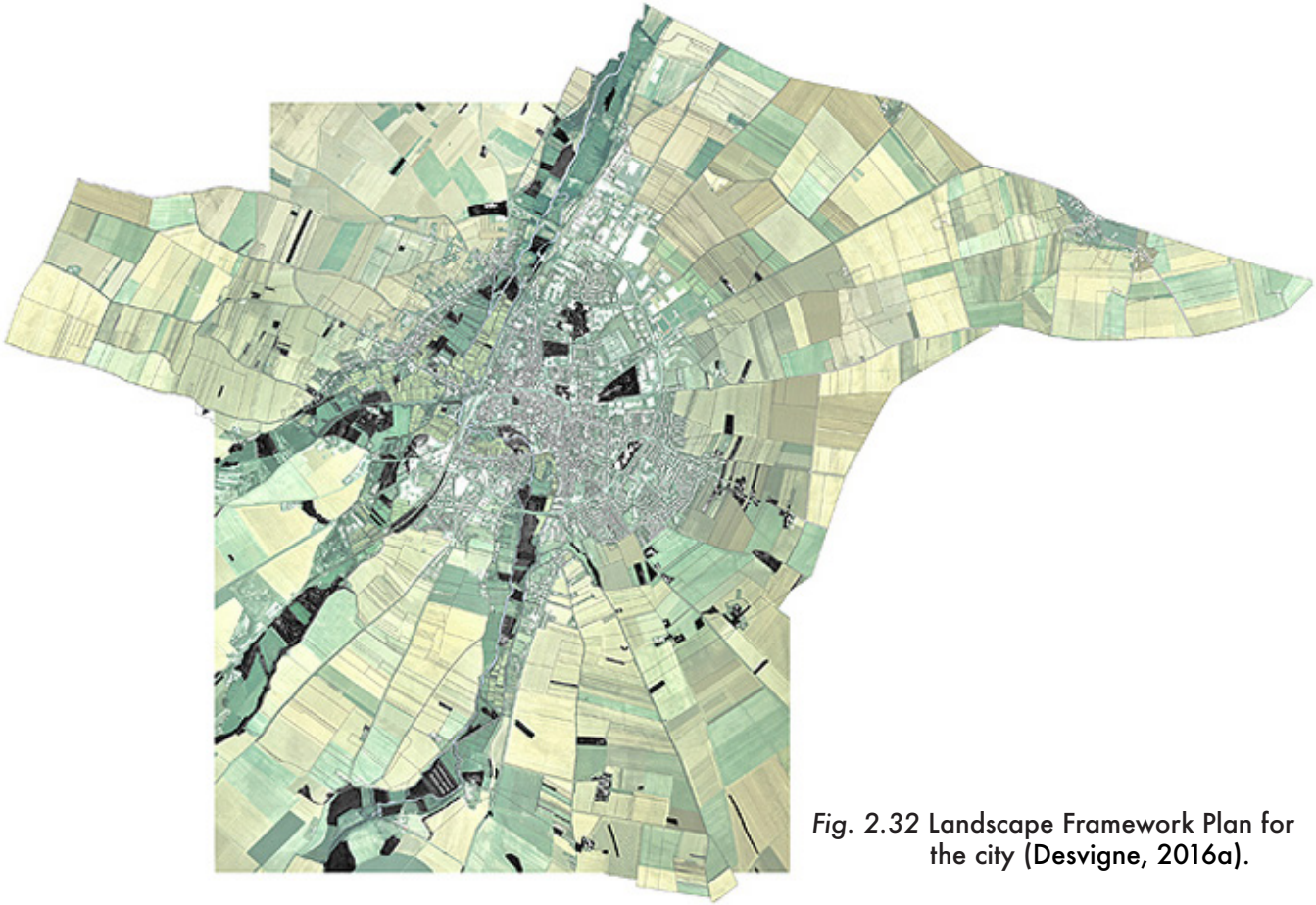


Fig. 2.32 Landscape Framework Plan for the city (Desvigne, 2016a).

Fig. 2.33 Fragmented city form (Desvigne, 2016a).

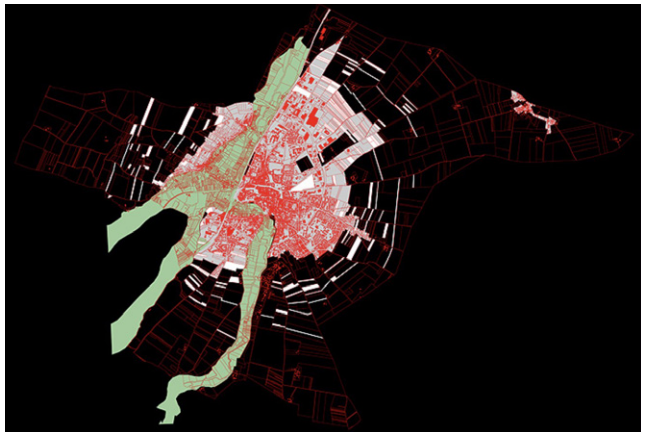


Fig. 2.34 Presence of Valleys (Desvigne, 2016a).

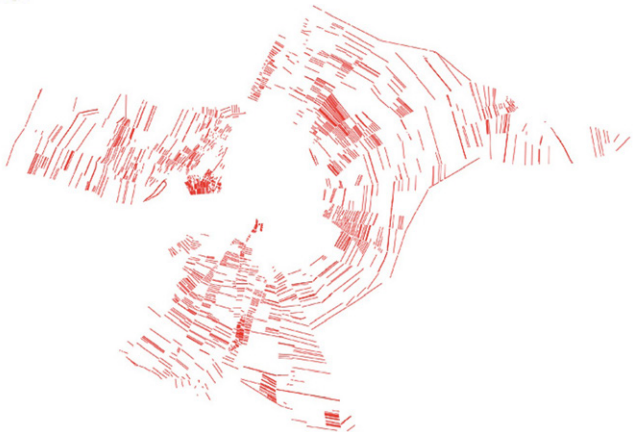


Fig. 2.35 Agricultural parcels (Desvigne, 2016a).

2.3.4. Water as Structuring Element: Bandar Shahpour, Iran.

This precedent explores how water could be used as a structuring element in the rural and urban landscape. According to Golany (1983), water of the Jarrahi River is stored in a detention reservoir and flows in an open, visually prominent and publicly accessible, channel along the town's main boulevard, the Chahar Bagh. The natural gradient of the landscape is shaped to form small valleys and ridges to allow for the water network to be gravity fed. The water flows through subsidiary branches parallel to the street network and is channelled to the edges of the town and to the agricultural zones beyond the perimeter of the settlement, for irrigation purposes.

The irrigation system and streets, establish the orientation of the settlement's buildings in a climate responsive manner and water is used throughout in the form of pools and fountains at important activity nodes to set up the spatial hierarchy of the settlement. Slender, water-storing towers are used throughout as orientation devices in the settlement.

The elements that collectively establish the water structure of the settlement are; an irrigation system for a regional park, the Jarrahi River that is transformed into a lake, irrigation channels running through the Chahar Bagh, pressurised irrigation of low density areas, water tanks in shapes of minarets, surface water storage, waste water treatment with recycling facilities for agricultural use.

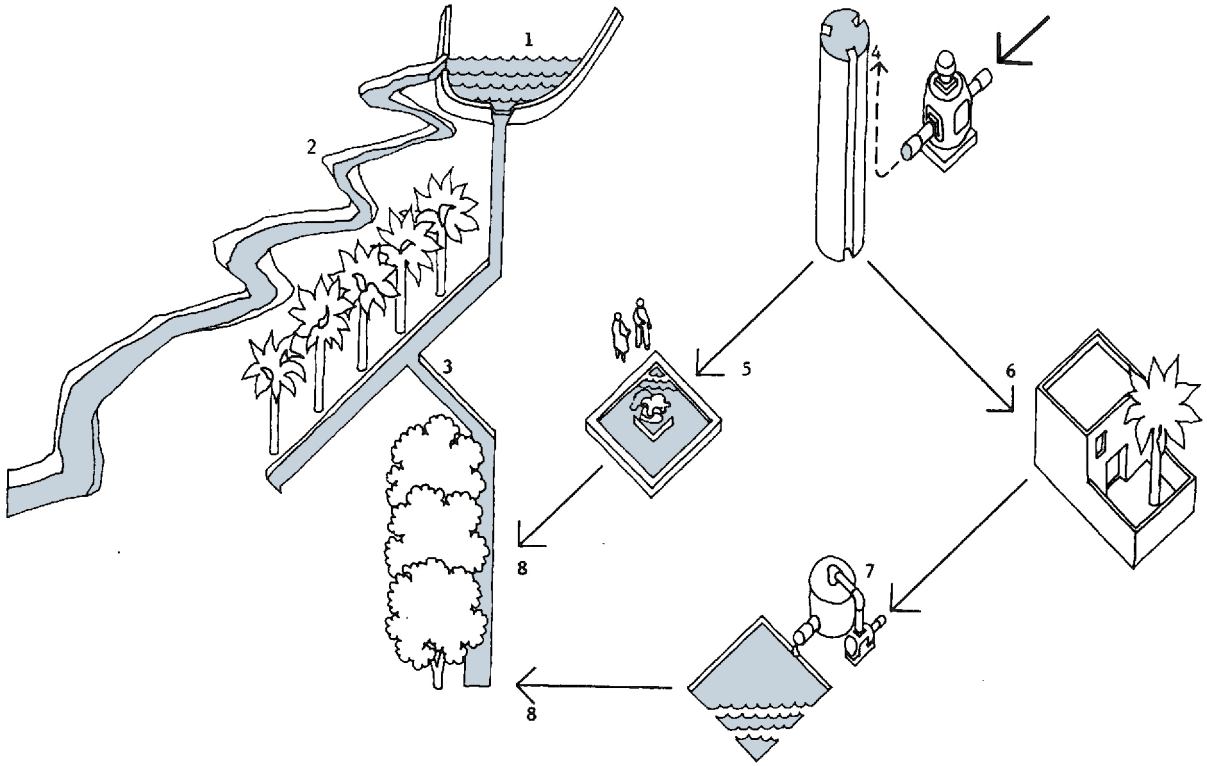


Fig. 2.36 River irrigation and potable water system: (1) retention basin to control flooding; (2) natural river flow; (3) man-made gravity-flow channel for irrigation of public places; (4) gravity storage tanks; (5) irrigation of minor open spaces; (6) domestic use; (7) water treatment; (8) recycling to town irrigation. (Golany, 1983)

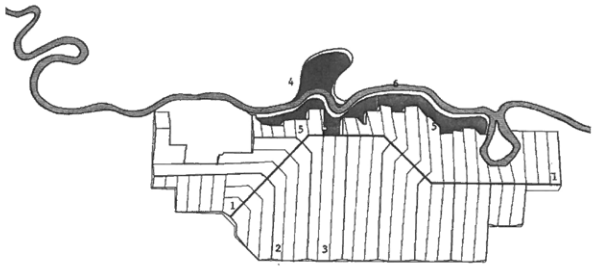


Fig. 2.37 Site shaping and preparation to create valleys and ridges to establish a gravity fed water network. (Golany, 1983)

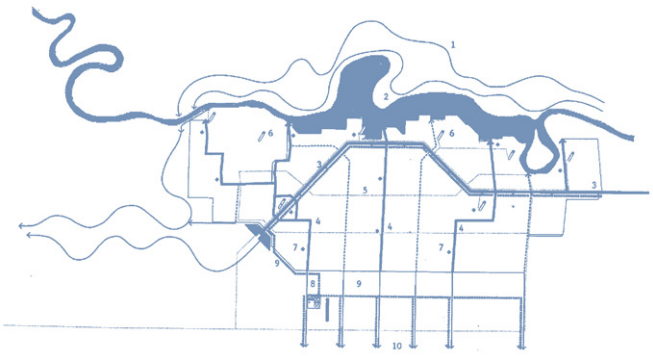


Fig. 2.38 Water as settlement structuring element. (Golany, 1983)

Fig.3.1 The Seam between urban and rural. Cape Region. (Author's own)

03

Setting the Scene

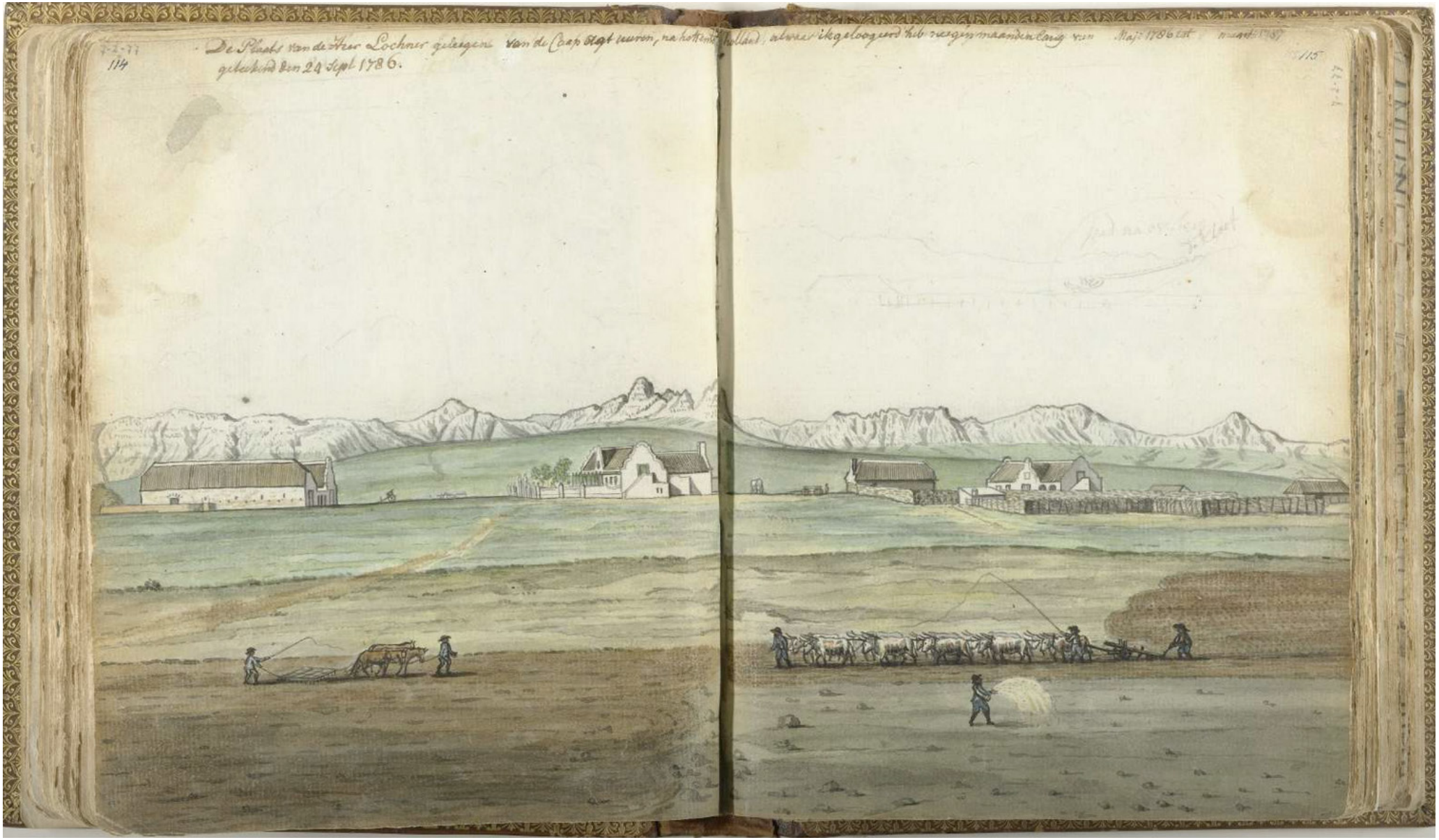


Fig.3.1 Plaats 'Vergenoegd; van de heer Lochner. (Brandes, 1786)

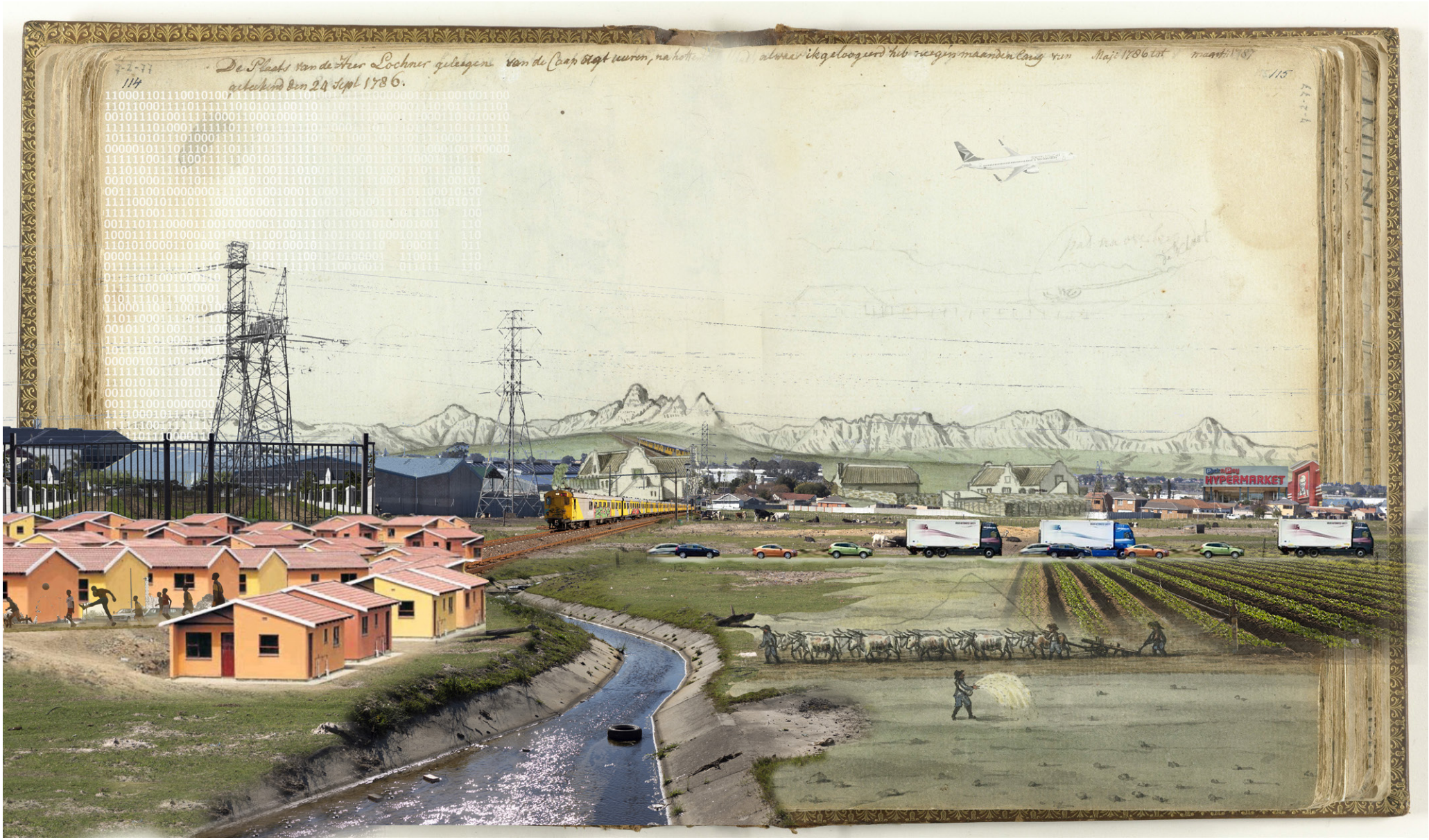


*Fig.*3.2 Photomontage by author to 'update' the 1786 painting of the Vergenoegd farm.

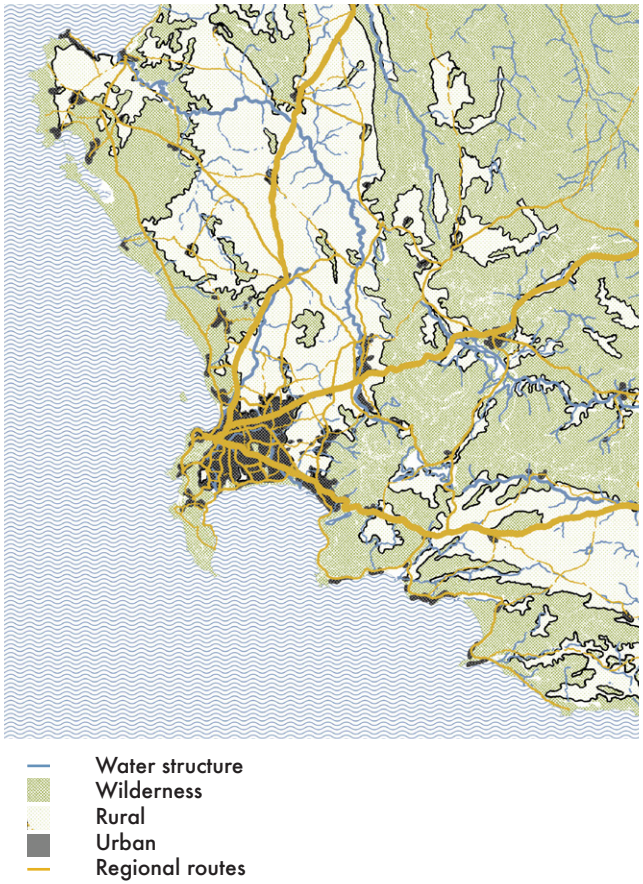


Fig.3.3 Regional Setting. (Author's own)

3.1 Context

3.1.1. Locating Cape Town within its regional context

Cape Town is eccentrically located on the south-western tip of South Africa, on the shores of the Atlantic Ocean. In terms of its global significance, it is strategically located as a shipping stop over between Europe and the East and is well located for future trade with the BRIC. It is also an internationally sought after tourist destination with natural, scenic and heritage attractions. The region is one of the top international fruit export regions and considered the intellectual hub of sub-Saharan Africa nations (Western Cape Government, 2019).

Its global connections consist of the ports of Cape Town and Saldanha, the Cape Town International Airport, major road and rail linkages into Africa and it's digitally linked with the world through undersea cables.

The Greater Cape Town is the main urban centre of the Western Cape province and functions within a regional spatial structure, with surrounding settlements, transport networks, agricultural resources and natural systems, all interacting and dependent on each other. According to the City of Cape Town (2018), these structures and their interactions with each other, need to be preserved and enhanced to ensure that they support the economy, services and maintain food security.

3.1.2. The site of Cape Town

Cape Town with its imposing mountain ranges, rugged coastlines, sandy plains, abundant wetlands and unique flora, is internationally regarded as amongst the most beautiful regions in the world. It is characterised by the southern and western coastal areas, the mountains of the Cape Peninsula to the west and the 'Mountains of Africa' to the east, with a coastal sandy plain between them. Within these there are the character areas of the Swartland and the Voorberge.

Initially the formal settlement of Cape Town was laid out on the lower slopes of Table Mountain. Streets with the names of Buitenkant, Buitengracht and Buitensingel, formed the outer edges of the early 1800's Cape Town. During this time, there were also other smaller outlying villages scattered around the Peninsula, but the expense and inefficiency of providing services to them through multiple authorities, resulted in them all being unified under one authority. The merger with Cape Town took place in 1913 and the Municipality of Cape Town was formed with new outside boundaries in the form of beacons, property edges and rivers, as described in the Cape Town Unification Ordinance. (Wylie, 2016)

The initial development pattern was in a linear form along a rail and road transport corridor down the southern arm of the peninsula. From the mid 1900's, apartheid policies had a fundamental impact on the spatial growth of the city, through forced segregation and the relocation of certain races to the peripheries of the city. This lead to long unaffordable commuting distances to the eccentrically located central business district where most job opportunities existed. Growth was in the form of urban sprawl and the geographical footprint of the city was 30 times greater in the year 2000 than the initial footprint a 100 years prior (City of Cape Town, 2018). The low density sprawling pattern continued to the southeast metro with the

housing provided through the RDP housing scheme. Middle class suburban sprawl spread to the north, northeast and the southern peninsula. The residential densities are mainly located in these areas.

Employment densities and commercial activities are however currently located in the central business district, the Main Road southern activity corridor and along the Vootrekker Road corridor. A telephonic interview with Mcgaffin (2019) gave a reason for this as the construction costs in the city centre are the same as on the peripheries, but with the diluted market, it is not economically sustainable yet for commercial activities to shift to the outer lying areas where most people reside in vast footprints of low density sprawl.

The CTMSDF (City of Cape Town, 2018), refers to the city's space economy as a "network of inter-connected and inter-dependent productive urban nodes where the vast majority of the city's firms and formal jobs are clustered." On a metropolitan level, Cape Town CBD and Bellville are the main nodes, with sub-metropolitan nodes and emerging nodes throughout the city. It identifies, amongst others, Blackheath as a sub-metropolitan node and Somerset West as an emerging node. In terms of mobility, it states that 17% (500 000) of the population of Cape Town do not have access to any other transport mode other than walking or cycling, that 95% of public transport users are from the low to medium income groups and that the low income groups which are typically located on the peripheries of the city, need to spend around 45% of their monthly incomes to reach economic opportunities. The City aims to support existing private and public transport networks and has committed to an Integrated Public Transport Network, with the MyCiti network and an upgraded and expanded rail network forming its basis. It also states that the city's current unsustainable spatial form, places a burden on the urban poor, which are predominantly residing on the south-east and peripheral margins of the city.

3.1.3. Policy review

For a better understanding of the context it is essential to understand the policy framework. The overarching themes within the policies that were reviewed looked at compaction, integration and intensification. The policies that have been reviewed are:

- Western Cape Land Use Planning Guidelines: Rural Areas – March 2019 (WCLUPG)
- Greater Cape Metro Regional Spatial Implementation Framework – Final Report 2019 (GCMRSIF)
- Five-Year Integrated Development Plan – July 2017 – June 2022 (IDP)
- Cape Town Municipal Spatial Development Framework – Council approved 2018 (CTMSDF)
- Stellenbosch Municipal Spatial Development Framework - Final Draft for advertising June 2019 (SMSDF)

i. WCLUPG:
It aims to consolidate agricultural landscapes and prevent their further fragmentation, to provide for land and agrarian reform, improve the economic viability of farming, facilitating diversification of production, promote enterprise opportunities within food system and to promote sustainable farming practices. (Government, 2019) It further states that through land reform, it aims to create opportunities for agricultural holdings on the urban fringe. It stresses that integrated land development planning of this peripheral urban landscape, should ensure that urban expansion is structured and directed away from agricultural land, suitable agricultural land and ecologically sensitive areas.

ii. GCMRSIF:
The outcomes of the GCMRSIF, is to strive for "a competitive regional space-economy that re-energises and shares growth; and an integrated network of regional settlements that provide resilient, sustainable, quality and inclusive living environments for a

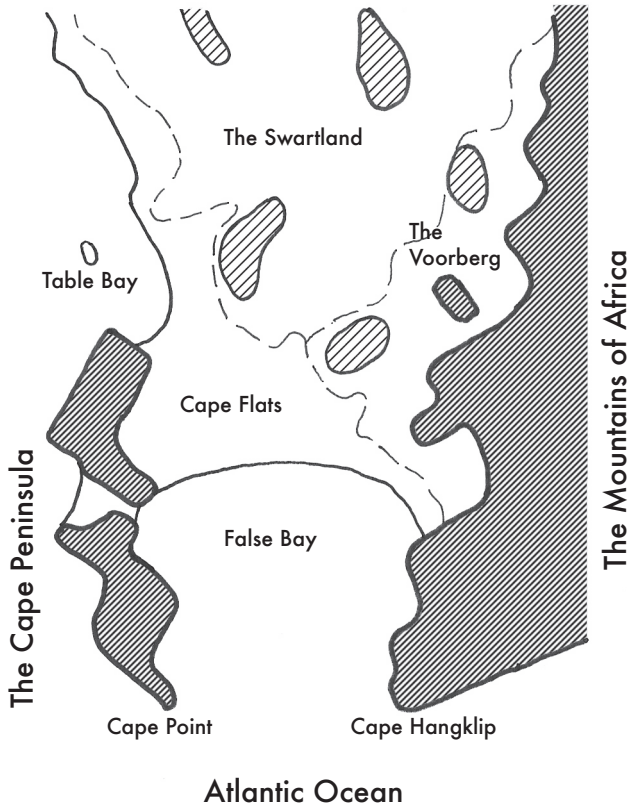


Fig.3.4 Sense of Place of the South Western Cape. Drawing by author, adopted from Gasson. (Dewar and Uytenbogaardt, 1991)

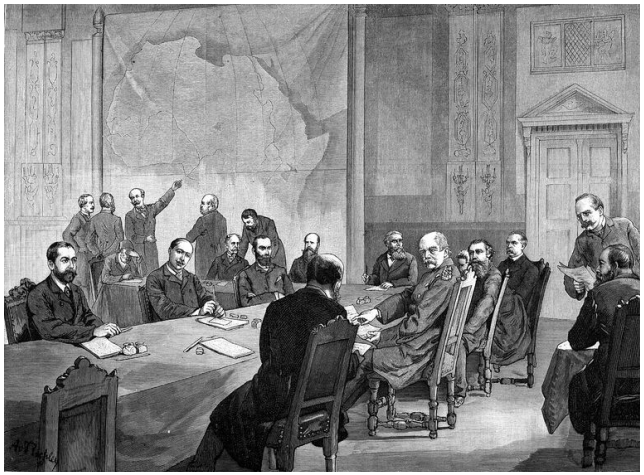


Fig.3.5 Congo Conference of 1884-85. Arbitrary lines placed on paper that does not acknowledge natural or cultural dynamics.

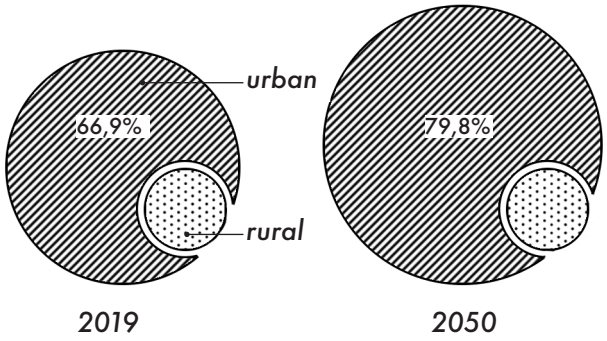


Fig.3.6 Percentage of population urbanised in South Africa, current and projected. Drawing by author. Statistics sourced from United Nations, 2018.

growing population" (Western Cape Government, 2019). A central concern is with the nature of the future growth of the functional region of the Greater Cape Metro. The policy has no control over the rate of demographic and economic growth.

iii. IDP:
The IDP lists 11 priorities that the City of Cape Town should aim for: positioning the city as a globally competitive city; leveraging technology for progress; economic inclusion; resource efficiency and security; safe communities; excellence in basic service delivery; focussing on delivering basic services to informal settlements; dense transit-orientated growth and development; efficient and integrating transport system; integrating communities; and operational sustainability (City of Cape Town, 2017). The IDP seems to place a focus on infrastructure delivery, with new road projects, basic service delivery, formalisation of informal areas, etc as ways to reach these 11 priorities. Essentially, the IDP proposes technological solutions to reform the city and it fails to elaborate on the spatial qualities that would be required to realise the 11 priorities.

iv. CTMSDF:
The spatial vision and concept of the 2018 CTMSDF, is to restructure the urban form and functionality of the city, through the following three tools: Transit-Orientated Development and land use intensification in and around the corridors and nodes; avoiding natural and manmade risks; and preserving the natural assets of the city. (City of Cape Town, 2018) The CTSDF 2012 had an emphasis on land use and the urban edge, whereas, the CTMSDF 2018 seeks to progressively transform Cape Town's form and function on a metro-scale. It implies that it seeks to curb sprawl and segregated development in favour of inclusive integrated development. It identifies "no go" areas to protect and enhance critical natural areas. It puts forward that urban development needs to respect and develop sensitively to the presence, role and function of natural assets. Areas of agricultural significance, needs long term protection. These areas include land that is currently cultivated, has been cultivated in the last 10 years, has soil potential to be cultivated or has high value grazing capabilities. It is in favour of compaction and intensification of the urban form. It further identifies four Spatial Transformation Areas based on investment priority, the Urban Inner Core (priority), Incremental Growth and Consolidation Areas (priority), Discouraged Growth Areas (zero) and Critical Natural Areas (to maintain asset). The chosen site of this research project, is located within all four of them.

With the removal of the urban edge policy as growth controlling instrument from the latest CTMSDF, the city is shifting its focus to manage growth in centres of encouraged densification that supports transit-orientated development in the urban core. The city discourages peripheral expansion by stating intent not to extend utilities and services to the peripheries in the short term.

v. SMSDF:
The SMSDF has seven key principles which are: to maintain and grow the natural assets; respect and grow the cultural heritage; direct growth to areas of lesser natural and cultural significance and focus development on areas where different modes of transport intersect; the different roles and functions of settlements need to be clarified and respected; different elements of movement structure need to be clarified; aim for balanced and sustainable communities; focus energy and resources on certain catalytic areas (Stellenbosch Municipality, 2019). The SMSDF has an urban edge policy, which allows for quite extensive expansion of the overall geographical footprint of the town and the smaller settlements located within it jurisdictional boundary.

The policies seem to all favour sustainable growth and the protection of natural and cultural resources. Transit-orientated development is encouraged, which in its current spatial outcomes, seems to favour mobility and not accessibility. Many of the identified activity corridors in the CTMSDF, are in actual

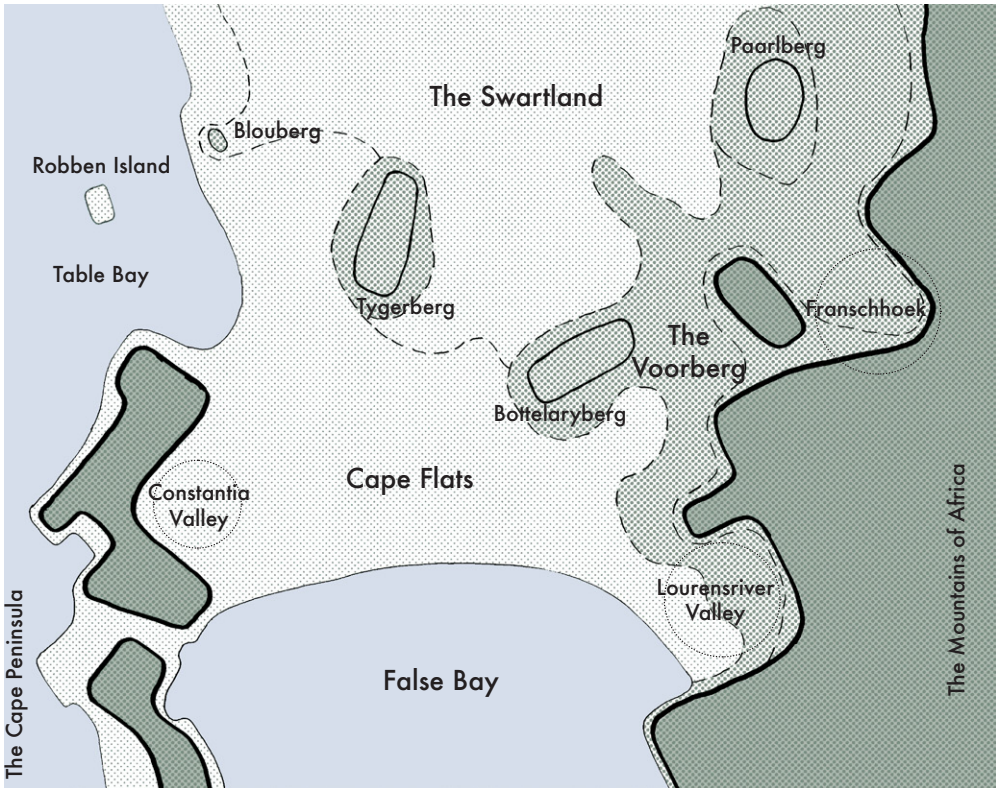
fact limited accessways lined by large commercial activities, therefore not promoting NMT movement and contradicting the policies of integration and inclusivity. Another concern is that Stellenbosch favours expansion with an any-development-is-good attitude, whereas the City of Cape Town is inward growth focused. An interview with a City of Cape Town official, who preferred to remain anonymous, confirmed this, and he highlighted that the City of Cape Town has identified certain corridors and nodes where growth and investment will be focused on, whereas the city's neighbour, Stellenbosch, wants to tie into the peripheral infrastructure of the City of Cape Town, which will dilute the vision of compaction of the CTMSDF. The same official warned that Stellenbosch needs to realise its role within the regional framework of the Greater Cape Town Metro, and that a collective restructuring effort between municipalities is needed. This was the aim of the GCMRSIF, but it has not been very successful to date. Therefore, to curb sprawl and consolidate the built and open space network, the regional structure needs to be understood and reconceptualised across jurisdictional boundaries.

3.2 Metro Scale Analysis

In this next section, the Greater Cape Town Metro is analysed and interpreted to gain an understanding of its sub-regional connections, dependencies and structure, in terms of the natural, cultural and built landscapes. This will inform the development potential at the Metro scale, which will in turn lead into a concept design at Metro Scale. From this, the concept will be refined dropping down in scale.

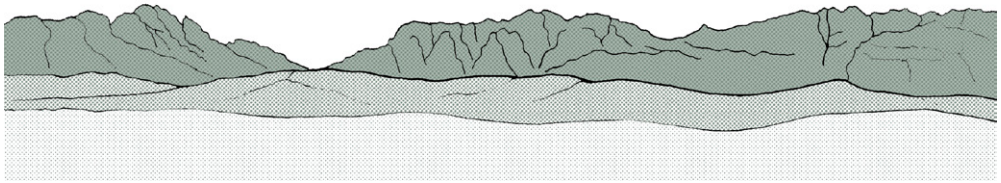
Fig.3.7 The site with the Cape Flats, Table Mountain and the Peninsula in the background. (Author's own)

3.2.1. Sense of Place and Character Areas

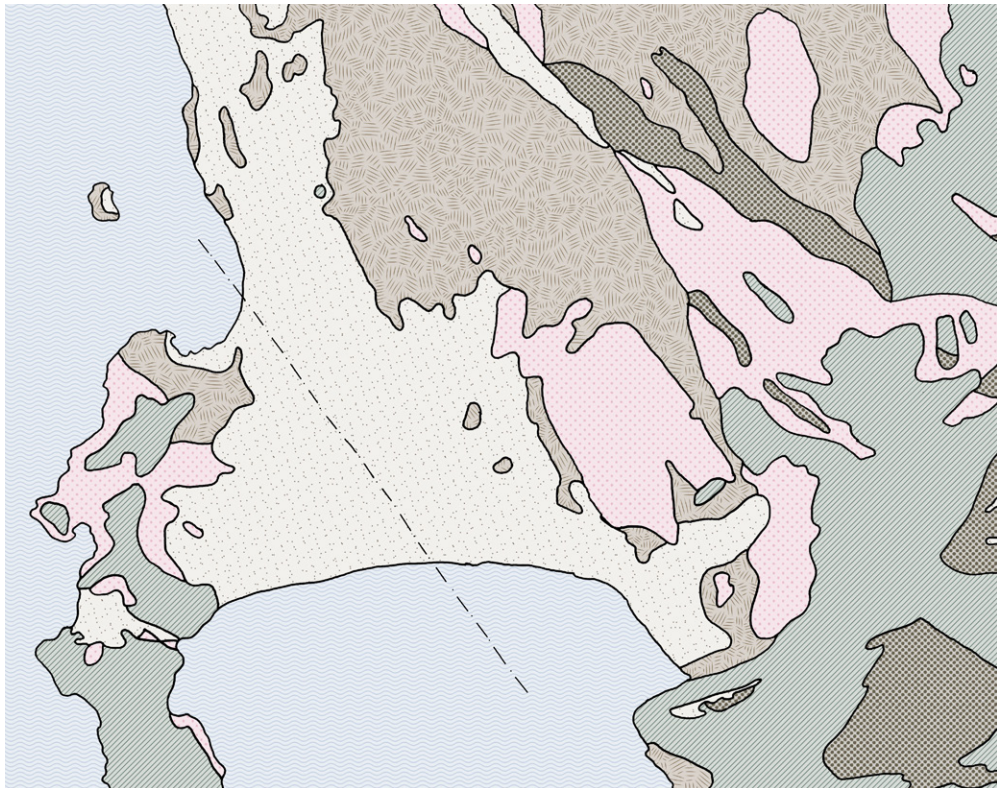


Key:

- Mountain Zone
- Foothill Zone
- Plains Zone



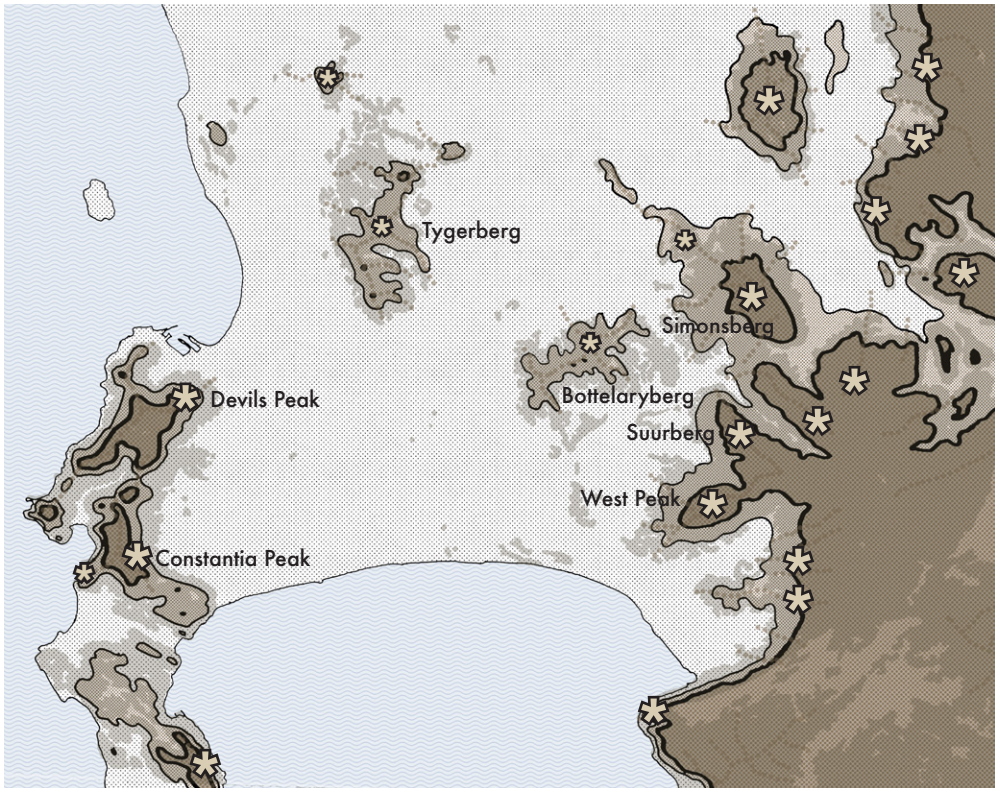
3.2.2. Geology



Key:

- Alluvium, sand calcrete
- Malmesbury shale
- Shale, sandstone
- Table Mountain sandstone
- Cape Granite
- Geological faultline

3.2.3. Dominant Landforms



Key:

- Foothill Zone
- Mountain Zone
- Minor Peak 400m+
- Major Peak 1000m+
- Ridgeline

3.2.4. Water Structure

Key:

- River
- Wetland
- Dam

0 3 6 9 15 30km

3.2.5. Soil Suitability - Agricultural

Key:

Soil of agricultural potential

3.2.6. Agricultural Footprint

Key:

Extent of agricultural footprint

3.2.7. Remnant Natural Vegetation

Key:

Extent of remnant natural vegetation

3.2.8. Protected Natural Areas

Key:

World Heritage Site
Nature Reserve
Biosphere Reserve
Marine Reserve

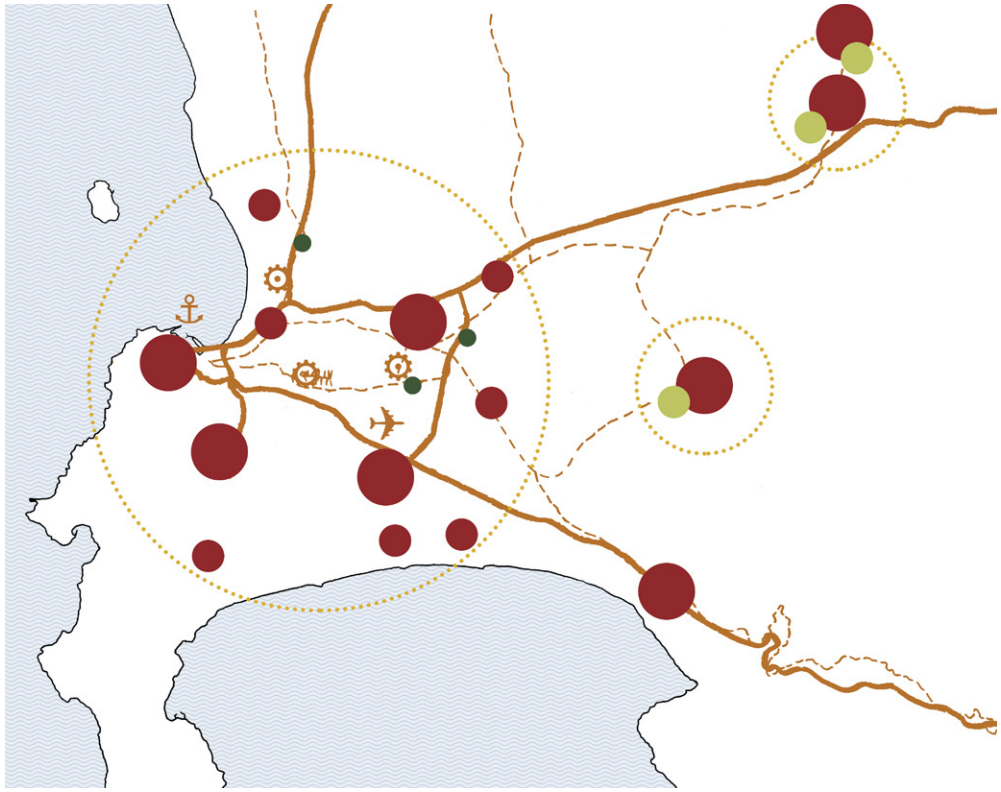
0 3 6 9 15 30km

3.2.9. Dominant Movement

Key:

- Sub-regional routes
- Mobility structure
- Rail network
- IRT network

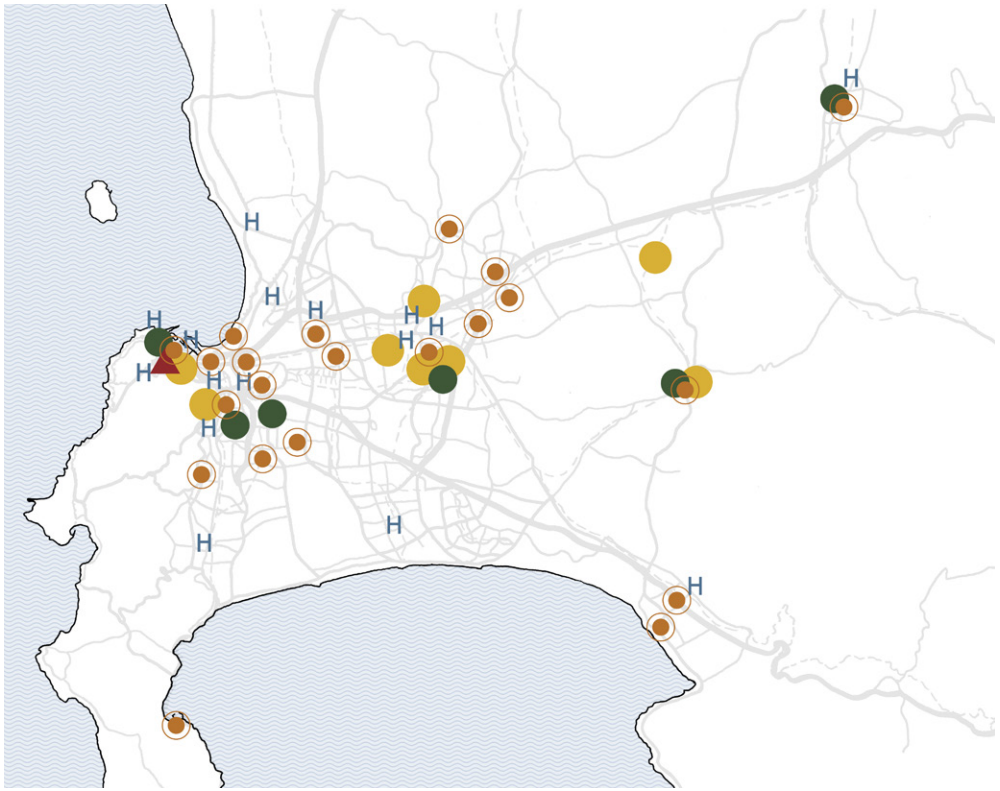
3.2.10. Economic Structure



Key:

- Regional Centres
- Economic nodes
- National and regional freight corridors (road and rail)
- Cape Town International Airport
- Sea port
- Inland port
- Agricultural service centres
- Agricultural distribution centres

3.2.11. Higher Order Institutions



Key:

- Parliamentary complex
- Primary Civic buildings
- Places of Learning
- H Hospitals of regional significance
- Major sports stadiums

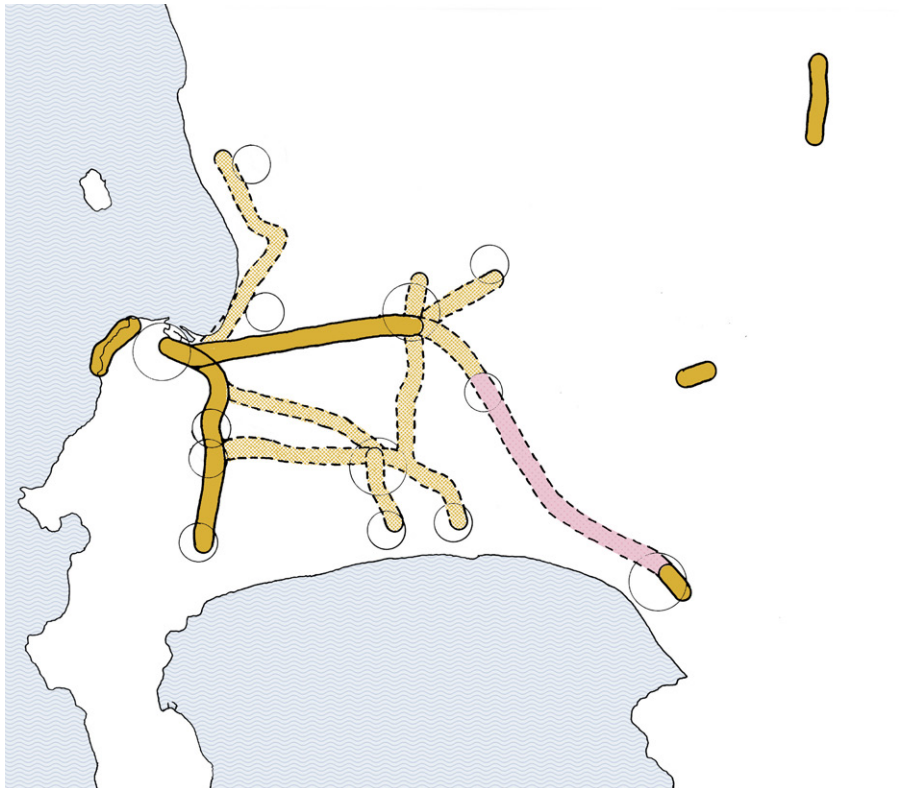
3.2.12. Utilities and Infrastructure

Key:

- Main electrical line
- Eskom substation
- Bulk water pipeline
- Water works
- Refuse dump
- Recycling plant

0 3 6 9 15 30km

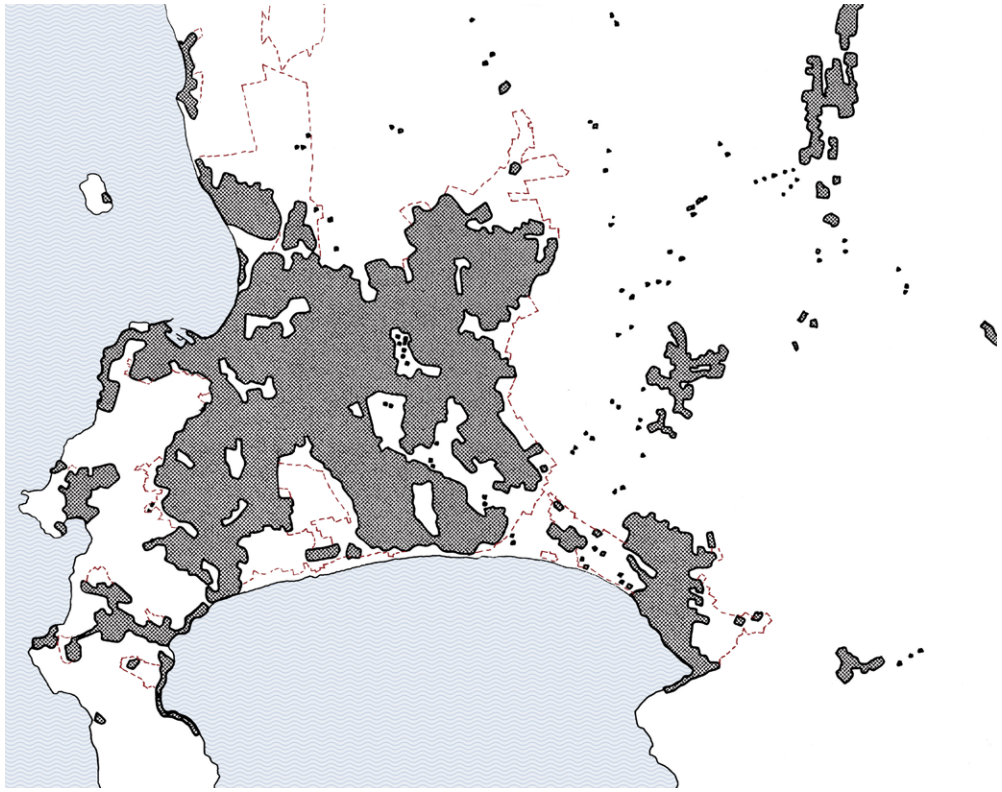
3.2.13. Activity Corridors



Key:

- Existing urban activity corridor
- Emerging activity corridor (currently transit orientated route)
- Potential future activity corridor

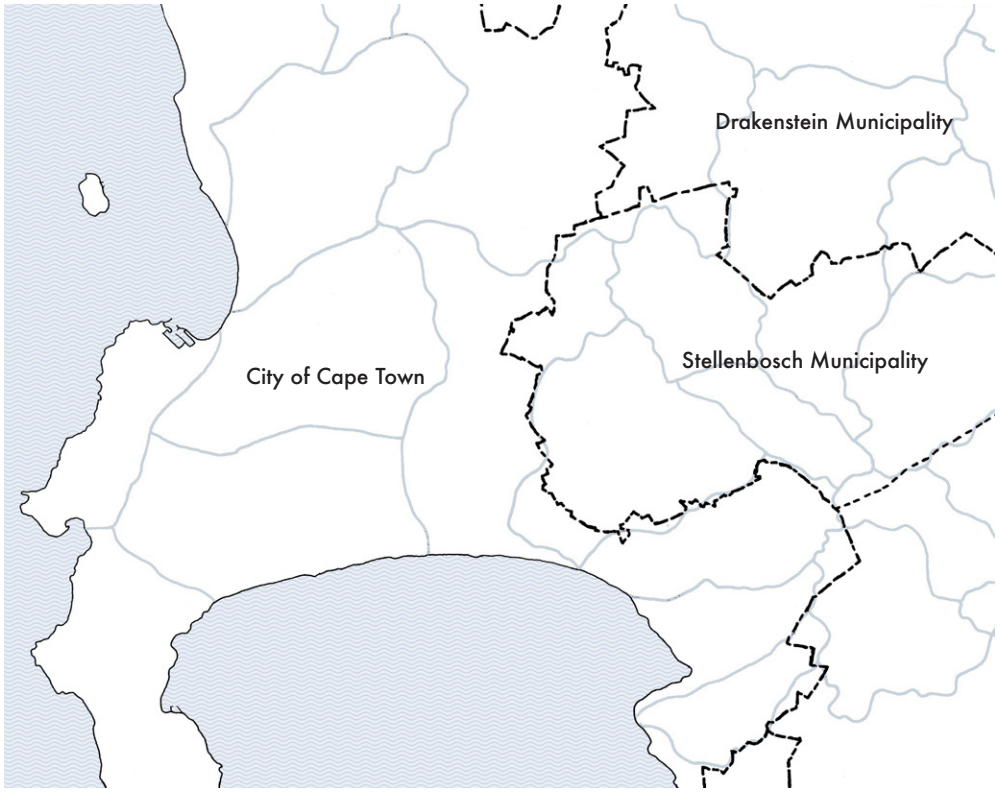
3.2.14. Built Footprint



Key:

- Extent of Built-up domain
- Urban Edge of 2016

3.2.15. Jurisdictional Boundaries



Key:

- - - Jurisdictional boundary
——— Natural watershed

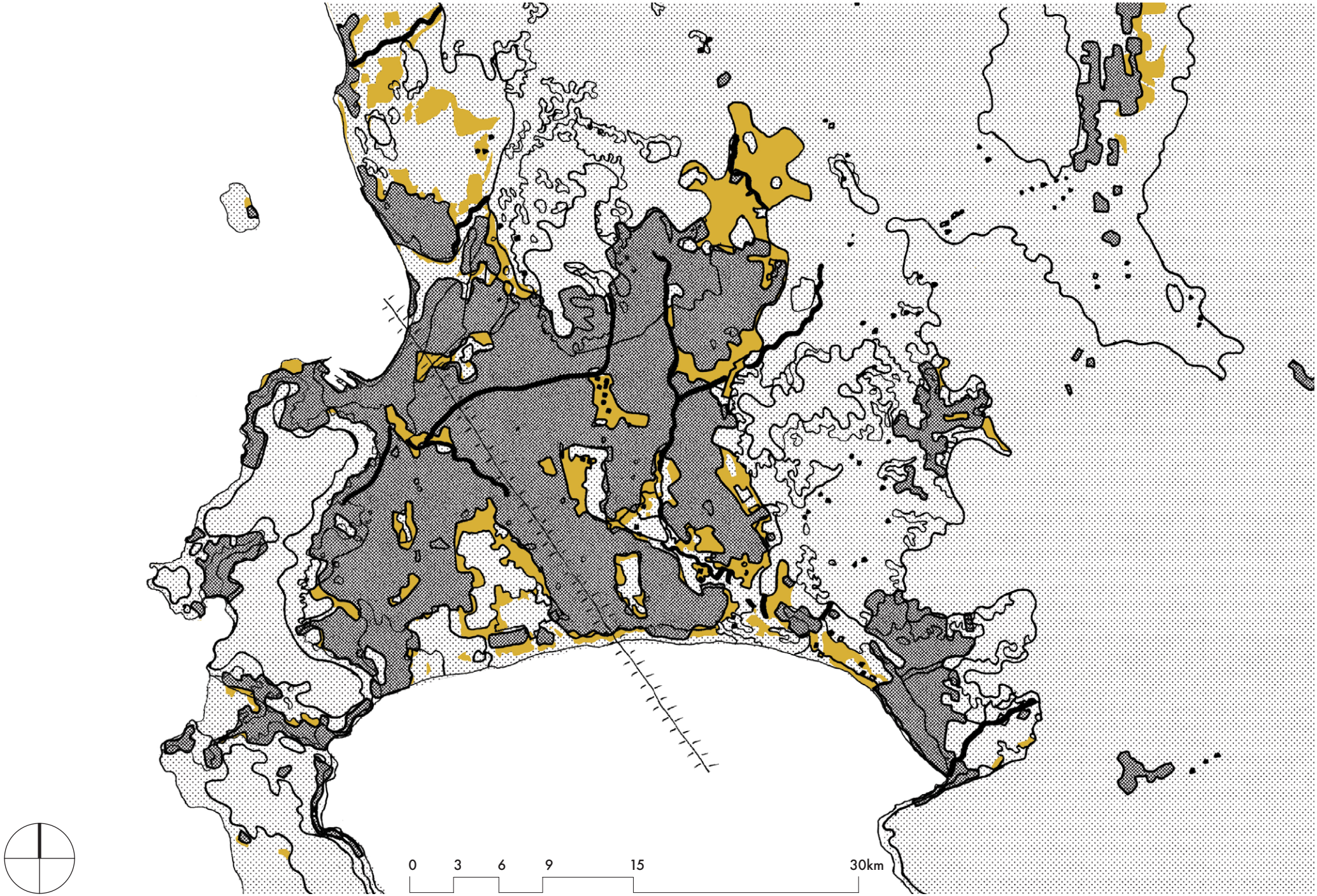
0 3 6 9 15 30km

3.3 Metro Scale Composite Constraints and Informants

Based on the principles and values from preceding chapters and indicators from Isikhungusethu Environmental Services et al. (2017), development indicators have been formulated. Selective layers from the series of maps, based on the indicators, are extrapolated and overlaid onto a single map, the composite and constraints map, to determine where future urban expansion should not go. This forms the basis of the contextual argument in terms of defining the limits of settlement expansion and where infill opportunities could take place.

The indicators are as follows, based on where development should not go:

Geology	No development on fault lines
	No development on valuable resources
Topography	No development on slopes steeper than 9°
	No development on dominant peaks and ridgelines
	No development below the 5m contour line to mitigate sea level rise
Hydrology	No development in flood plains, river corridors, wetlands or seepage areas
	No development on aquifer recharge areas
	No development on areas prone to flooding
	Avoid contamination from landfills, effluent disposal and cemeteries
Soils	No development on soils of medium to high agricultural potential
	No development on unstable soil
Fauna and Flora	No development on protected and endangered habitats
	Maintain migration corridors
	Avoid habitat fragmentation
	Favour brownfields sites
Climate	Develop on north facing slopes
	Avoid areas with high wind exposure
Land use	No development on productive agricultural land
Sense of Place	No development on natural elements that contribute to sense of place
Cultural	No development on sites of heritage or cultural value
	Protect scenic routes and keep them in open space
	Acknowledge gateways
	No development on public parks
Infrastructure	Reinforce pattern of current bulk services
Social	Reinforce existing social facilities
	New development to work with existing settlement patterns


0
3
6
9
15
30km

04

Analysis and Design

4.1 Design Principles, Strategies and Tools

4.2 Analysis and Design at the various scales

4.1 Design Principles, Strategies and Tools

Themes have been identified through the theoretical framework and case studies, and will form the main principles guiding the design. The Principles are:

- Ecological Biodiversity
- Food Security
- Water Scarcity
- Sense of Place
- Accessibility
- Pedestrian Priority
- Diversity
- Small Scale Economic Opportunities

To realise these principles within the design, three strategies have been identified based on the problems associated with sprawl. The three major negative spatial characteristics of sprawl are:

1. Low density
2. Fragmentation
3. Separation

Consequently, to fight sprawl and restore a balance within the landscapes of society, the following three spatial characteristics will form the strategies of the design intervention:

1. Intensification
2. Consolidation
3. Integration

To implement these strategies, a set of tools is presented as a kit of parts. These tools will be implemented in certain key target areas to achieve the desired outcome. The design is therefore a contextual realisation of the theoretical framework.

The contextual refined strategies with the sets of tools to achieve them, are listed below. They are not listed in order of priority for implementation. Some are merely policy reviews that will not require massive amounts of public capital expenditure, and others are more radical. The strategies are:

4.1. Activation and Intensification of Van Riebeeck Road.

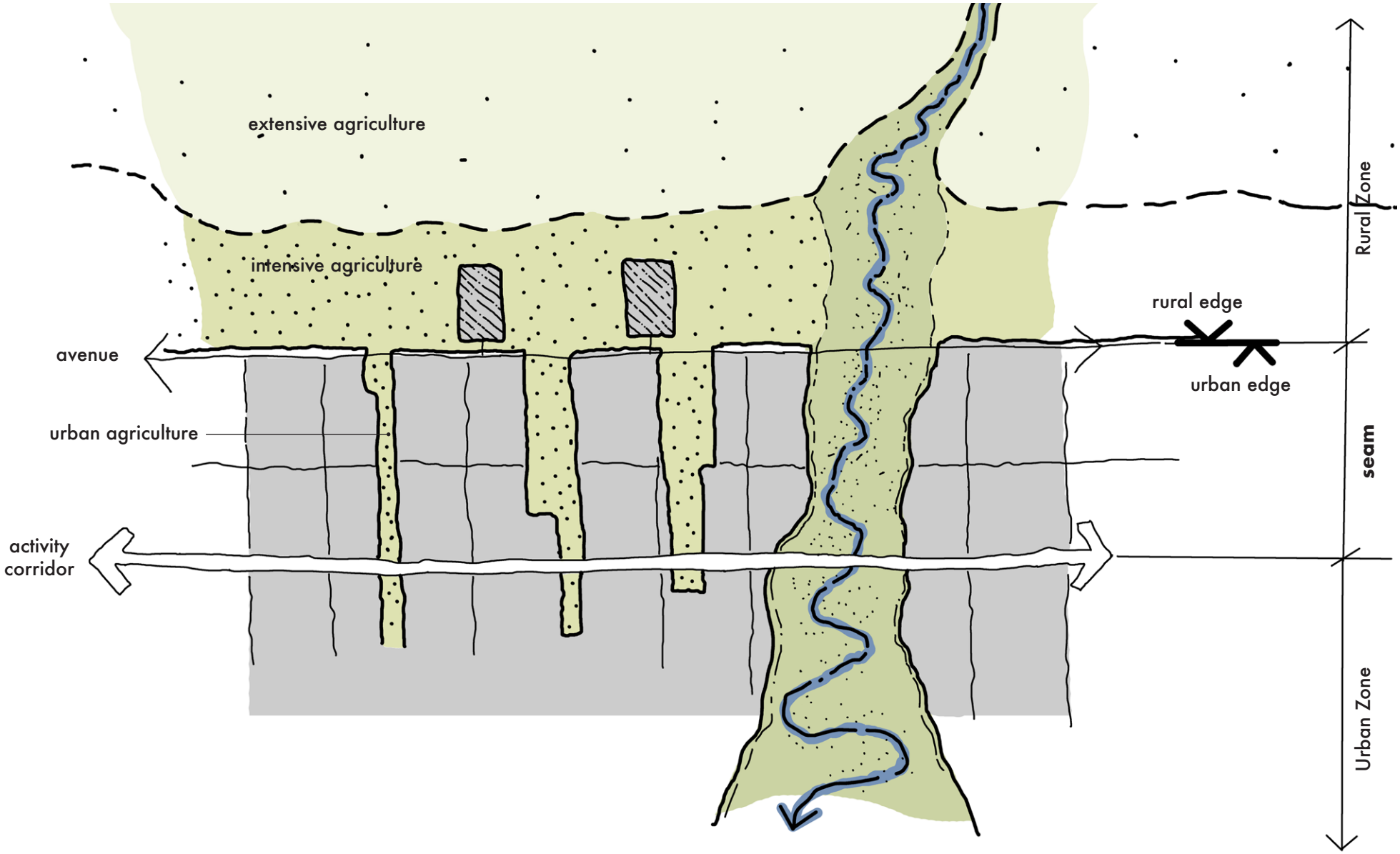
4.1.1. Downgrading the road from a limited accessway to an activity street to allow the extension of the Voortrekker Road corridor.
4.1.2. Improving the accessibility surface along this street, through the introduction of a new grid system that ties the existing neighbourhood units into it.
4.1.3. Strategic relaxation of zoning restrictions to allow for intensification.
4.1.4. Implementing 0m building lines and increased height parameters along Van Riebeeck Road.
4.1.5. Improving Non-motorised transport infrastructure.

4.2. Consolidation of the open space network and improving the engagement with it.

4.2.1. Revitalization and conservation of key ecological corridors and the absolute protection and rehabilitation of remnant natural vegetation, with linkages between these patches.
4.2.2. Clear site specific edges established on the interfaces between the urban and open space.
4.2.3. Redesign of the canal systems and the engagement with them, through the implementation of a new agricultural irrigation system.
4.2.4. Land left vacant for future road extensions and other strategically located parcels of public land, to be used for agrarian reform through a land restitution process.
4.2.5. Establishing a system of riverfront recreational trails.
4.2.6. Public parks, sports facilities, school fields and cemeteries to be incorporated into the open space system.

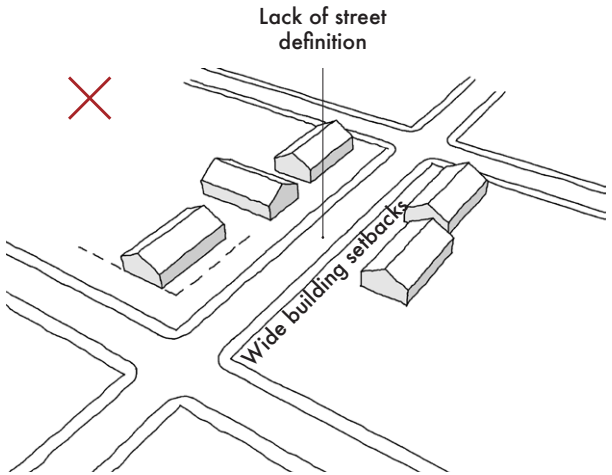
4.3. Integration through establishment of public structure.

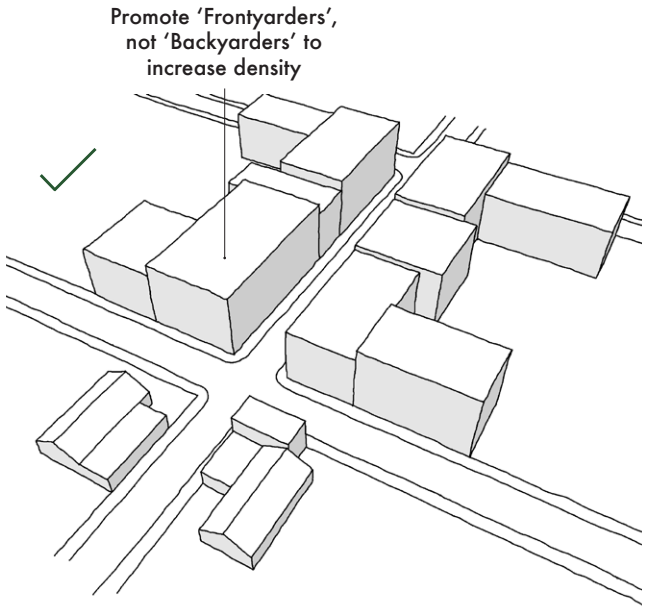
4.3.1. Secondary activity nodes to be reinforced around train stations and existing public facilities and new facilities and public expenditure to be focused around these.
4.3.2. System of secondary activity corridors established to link these activity nodes back into the larger system established by the Van Riebeeck Road activity corridor.



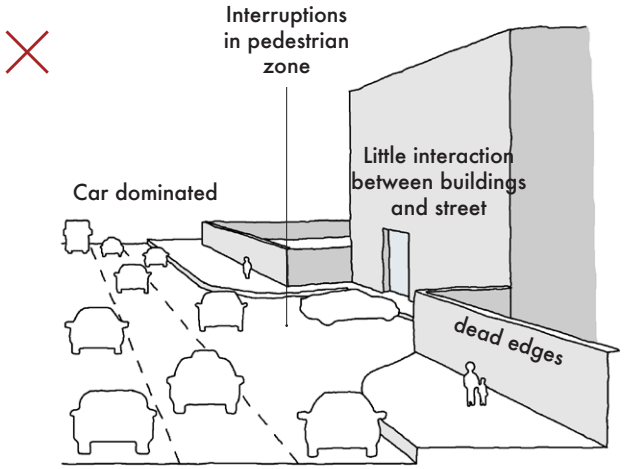
The Integrating Seam in relation to urban corridor thinking

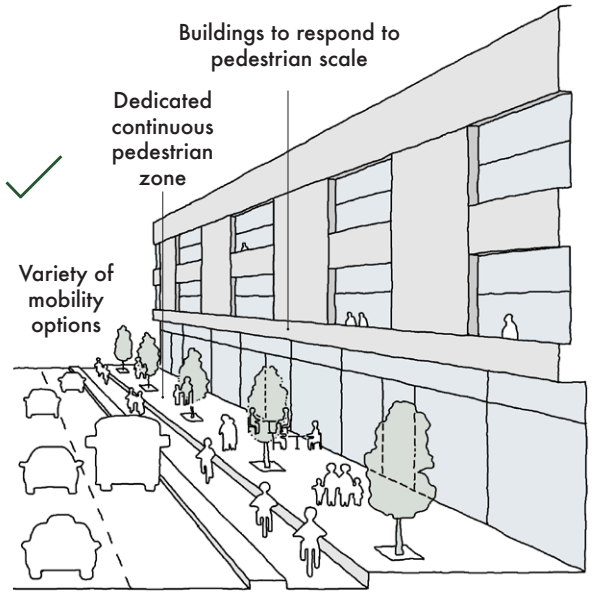
Strategically implement 0m front building lines and increase height parameters.



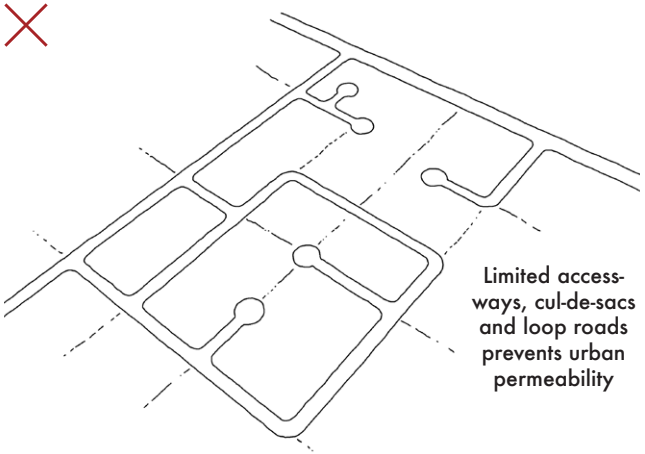


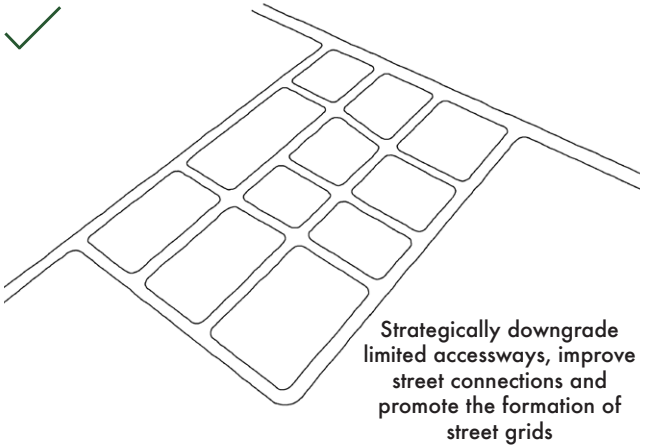
Prioritise and improve Non-motorised transport.



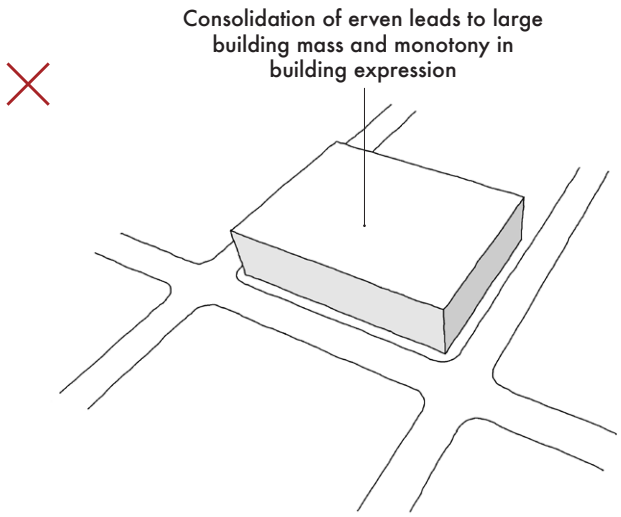


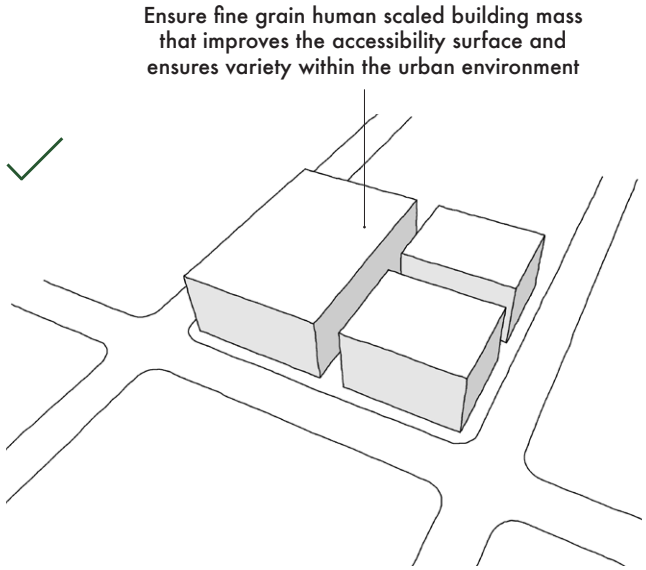
Improve accessibility surface.



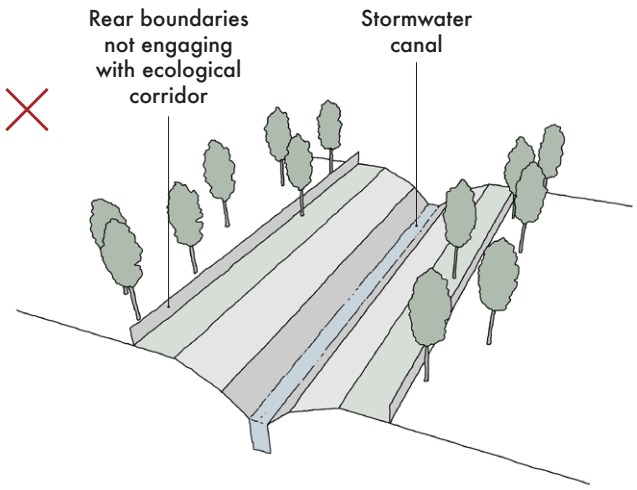


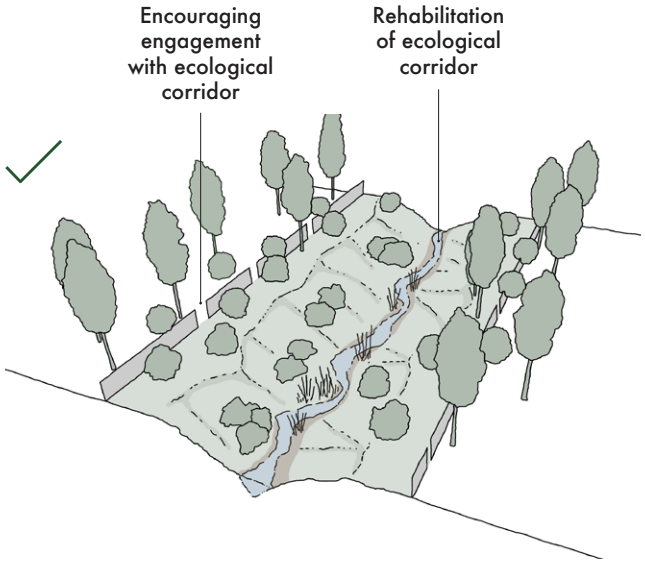
New development to promote fine grained urban fabric.



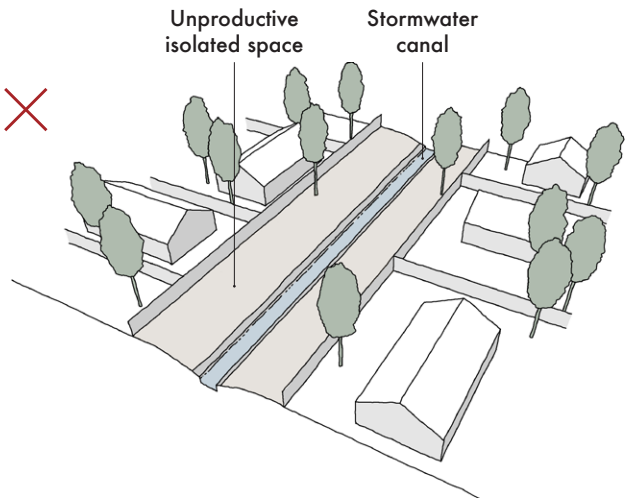


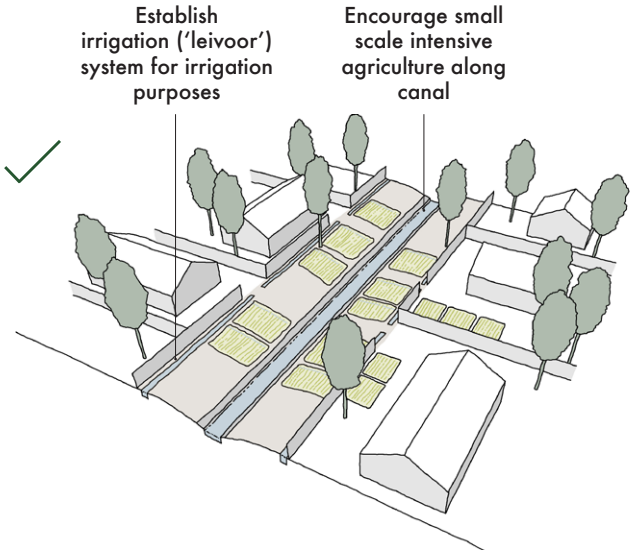
Revitalize and conserve key ecological corridors.





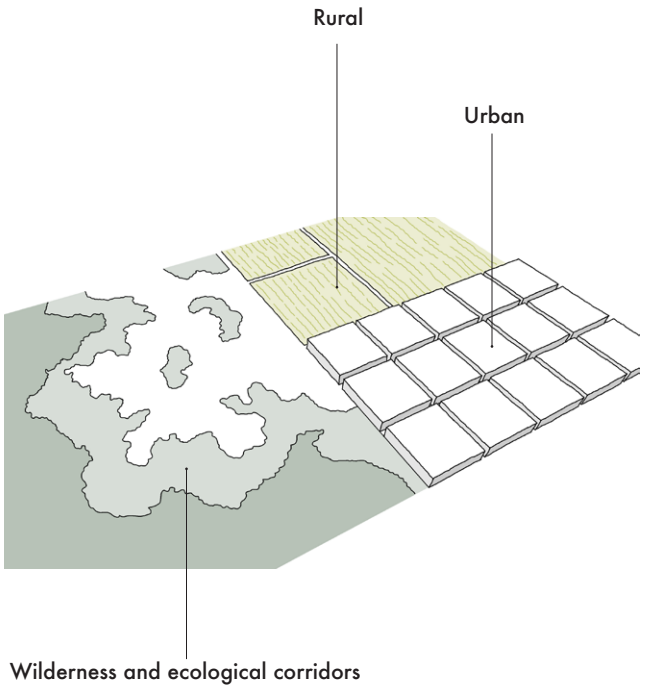
Redesign canal systems and the engagement with them.





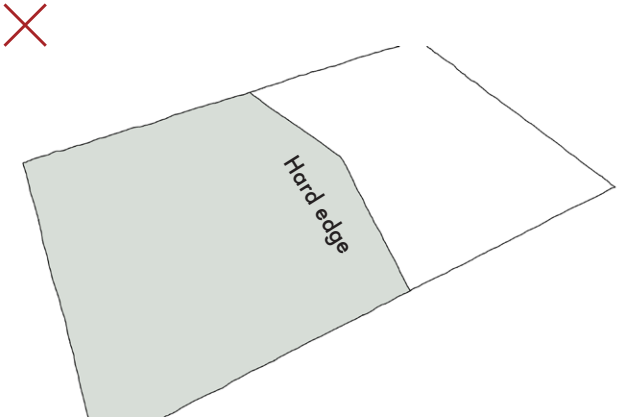
Maintain and promote relevant edge conditions on wilderness, rural and urban interfaces.

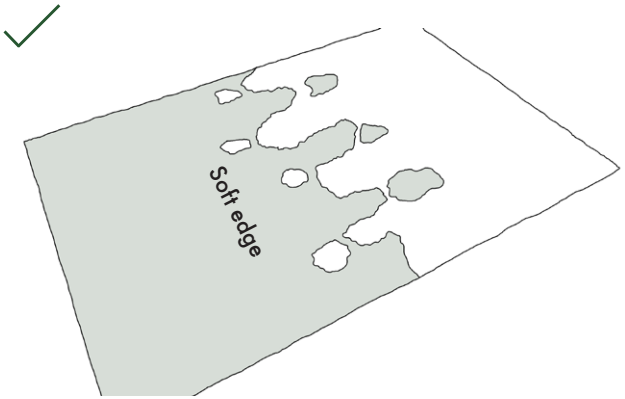
Human edges to be straight, simple and hard.



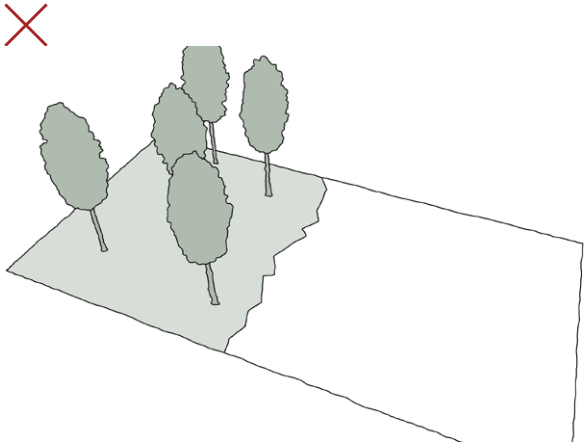
Natural edges to be curvilinear, complex and soft.

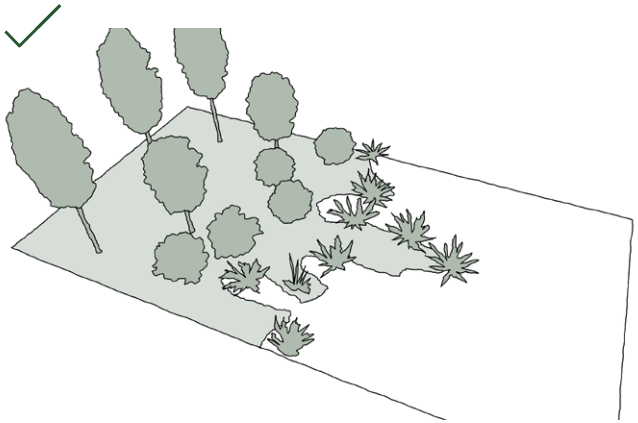
Ensure soft natural edges.



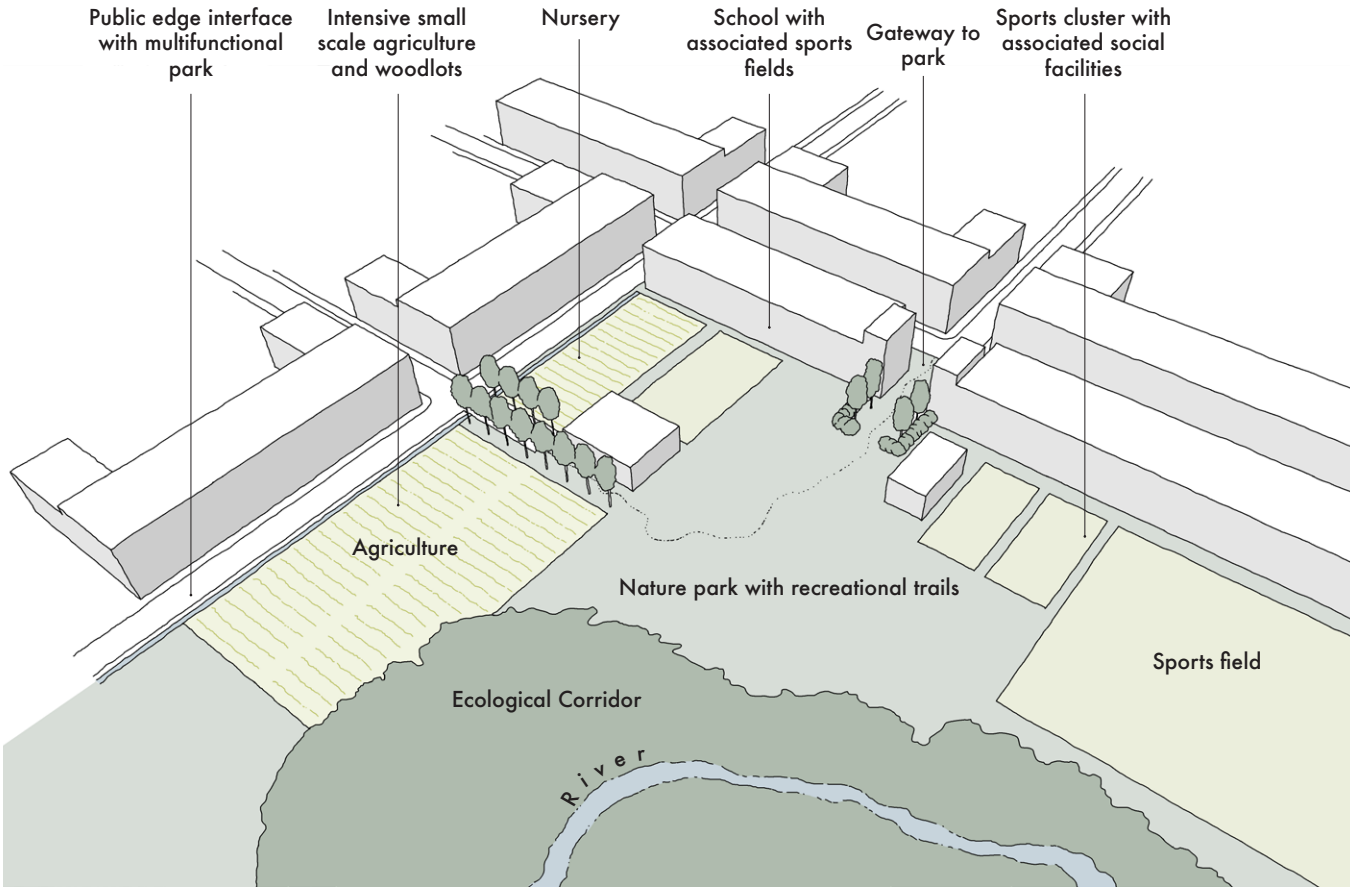


Promote structural diversity along natural edges.





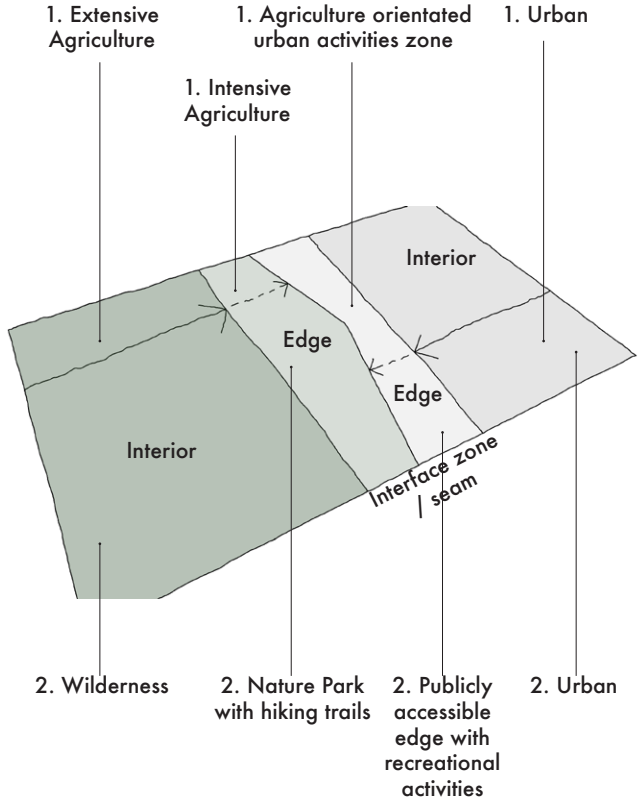
Promote multi-functional parks to consolidate open space network and improve public engagement with it.



Ensure edges are wide enough so they can act as filters.

Edges not to act as barriers, but to act as filters between landscapes to mitigate the influences of the landscapes on each other, but to also integrate them.

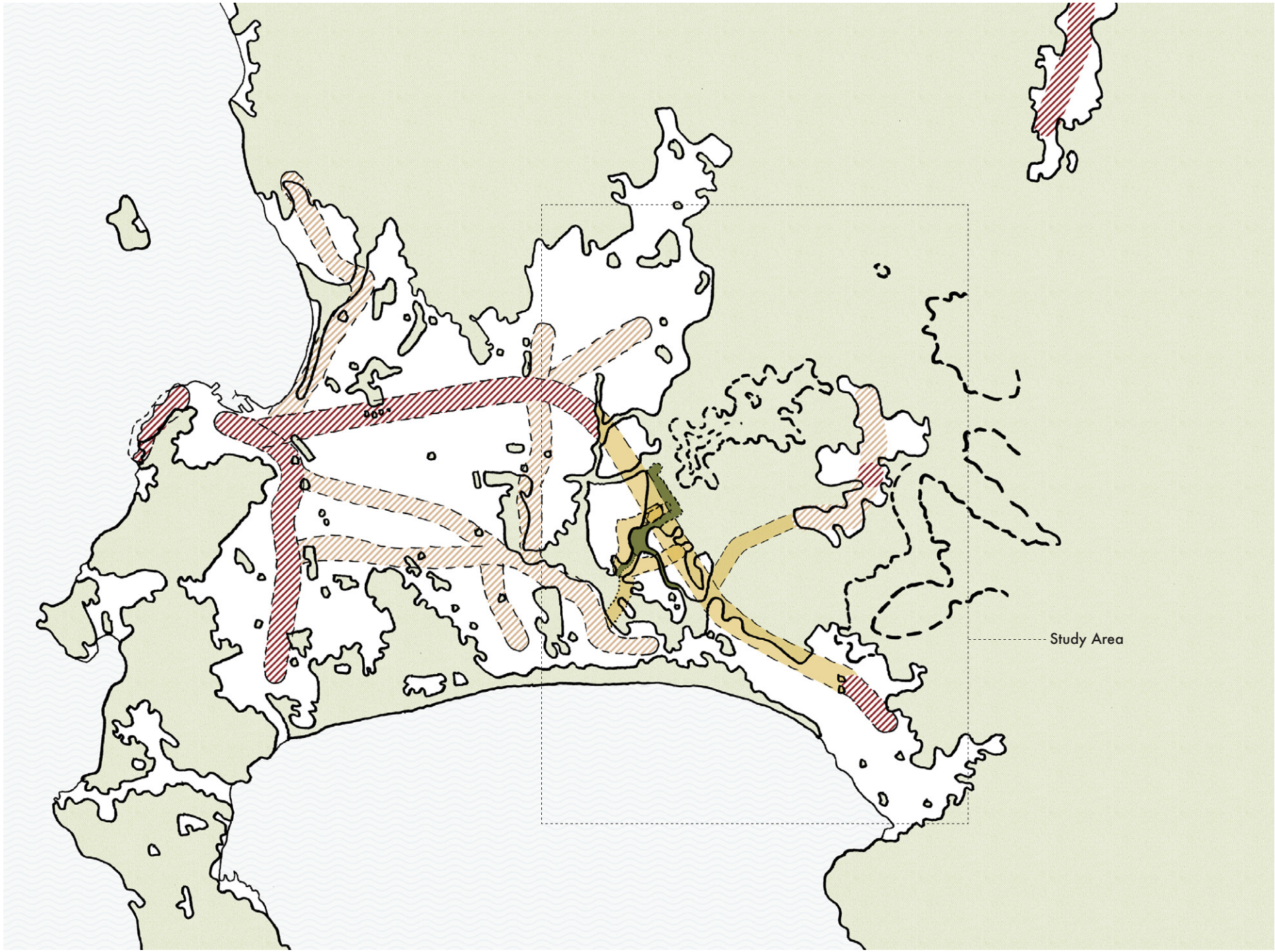
Two examples:



Concept of Open Space Corridors and Integrated Urban Activity Corridors

Key:

- Open space network
- Existing urban activity corridor
- Emerging urban activity corridor (currently transit orientated)
- Proposed activity corridor
- Proposed ecological and agricultural corridor to promote open space continuities


Study Area

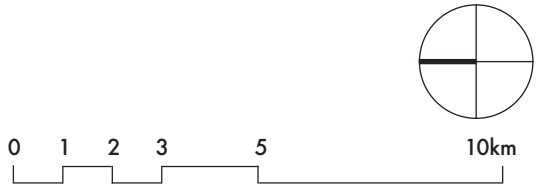
Study Area: Analysis

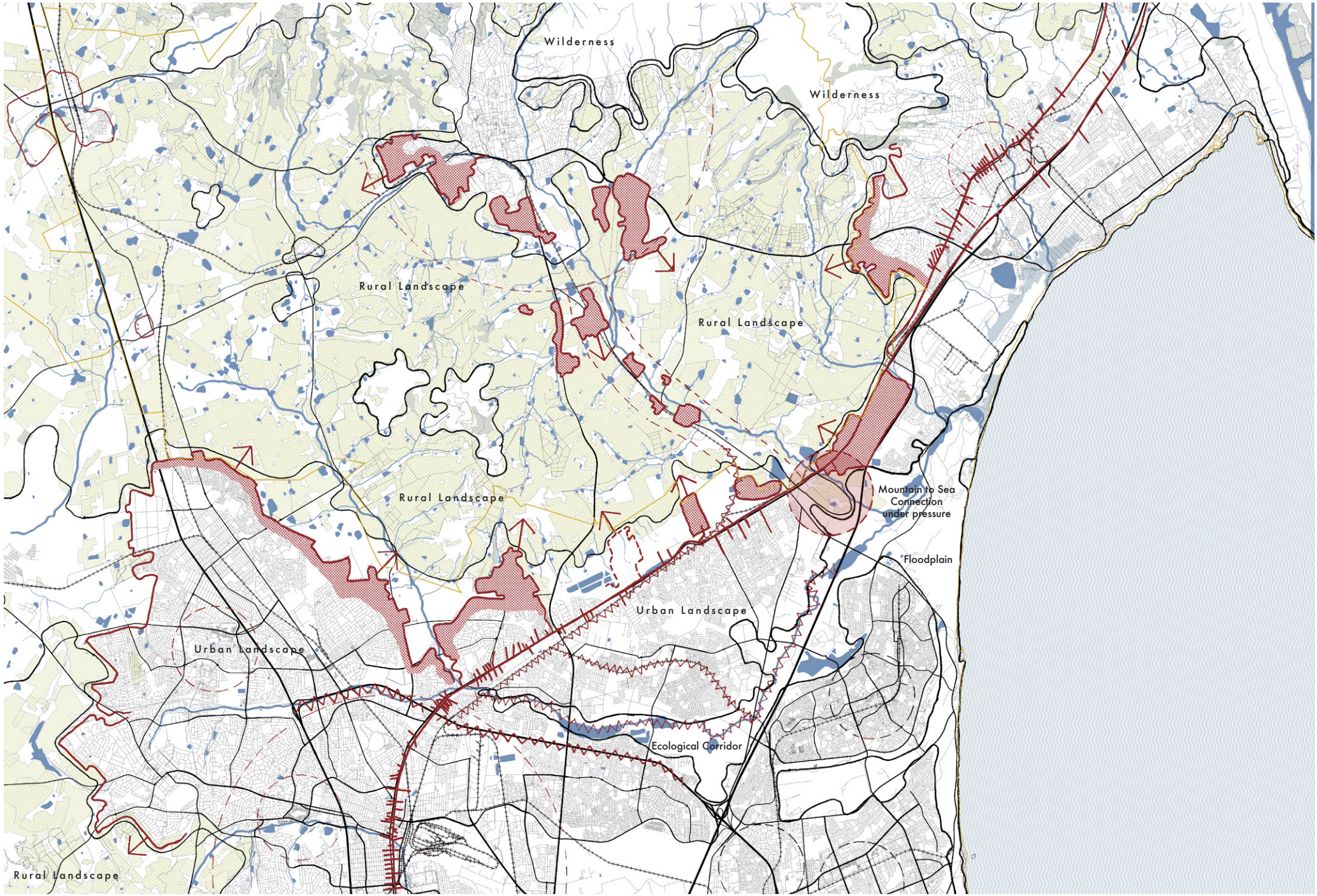
Key:

Sprawling Edge

Barriers

Accessibility surface along Voortrekker and Van Riebeeck Road




Wilderness
Wilderness
Rural Landscape
Rural Landscape
Rural Landscape
Mountain to Sea
Connection
under pressure
Floodplain
Urban Landscape
Urban Landscape
Ecological Corridor
Rural Landscape

Study Area: Conceptual Framework

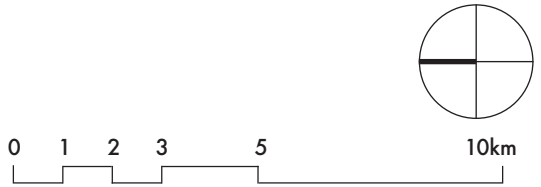
Key:

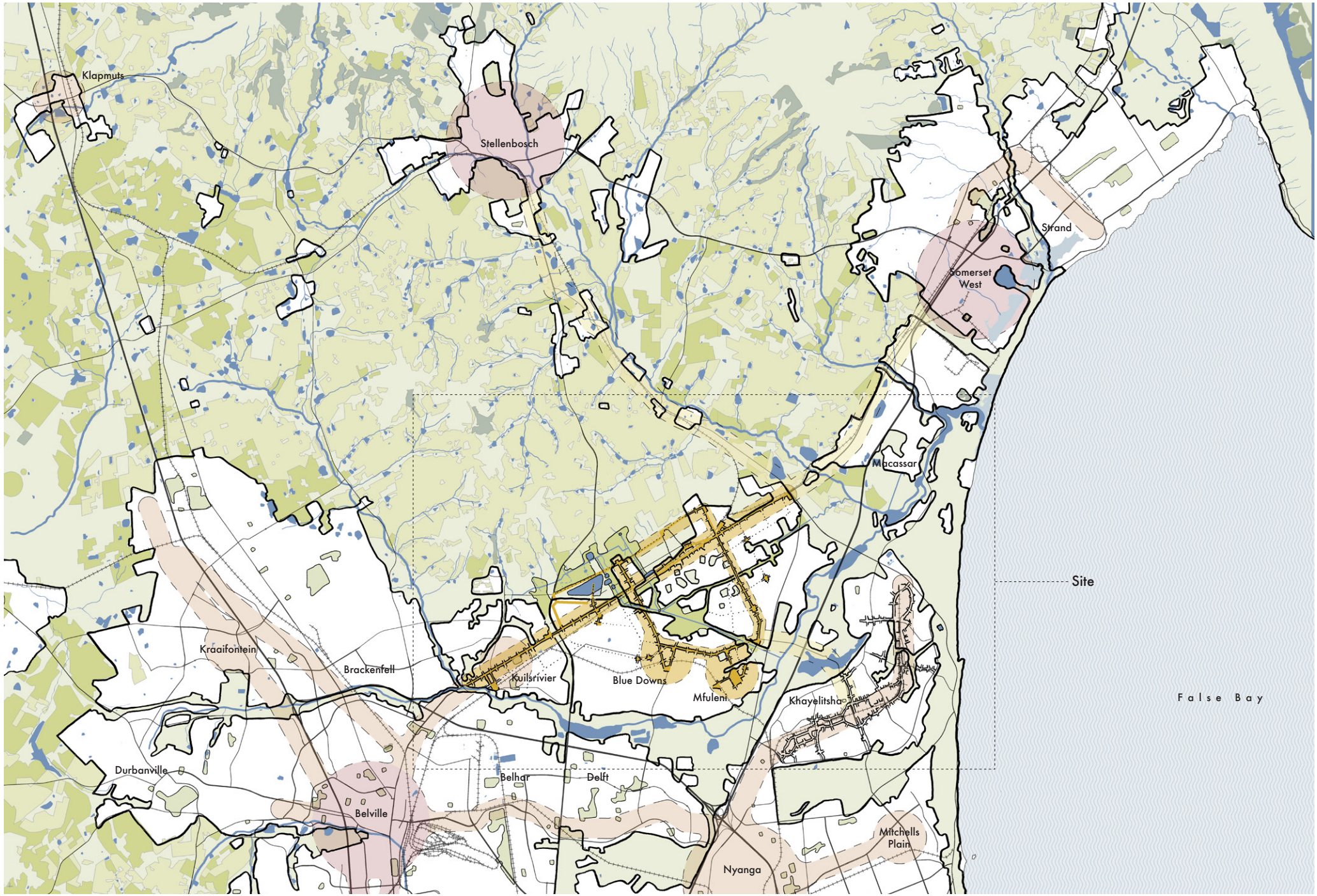
Water Structure

Open Space Network:
Extensive Agriculture
Intensive Agriculture
Ecological corridors, protected areas, natural vegetation, public parks, sports facilities, school fields.

System of Integrated Activity Corridors:
Existing Activity Corridor
Emerging Activity Corridor (currently transit orientated route)
Proposed Activity Corridor
Future Activity Corridor

Dominant Public Structure

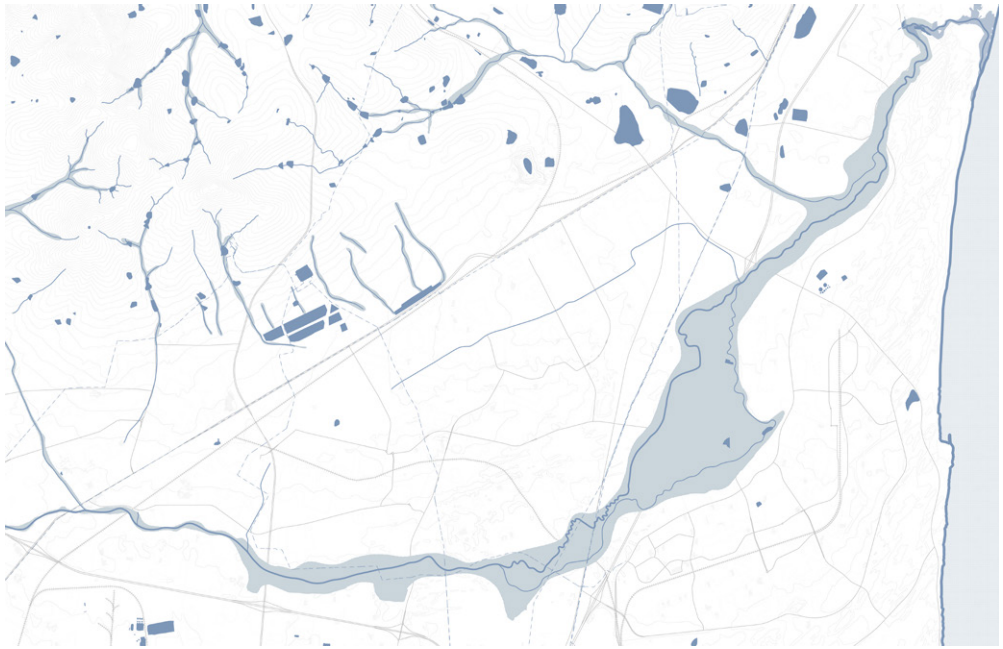



Klapmuts
Stellenbosch
Strand
Somerset West
Macassar
Site
False Bay
Kraaifontein
Brackenfell
Kuilsrivier
Blue Downs
Mfuleni
Khayelitsha
Durbanville
Belhar
Delft
Belville
Mitchells Plain
Nyanga

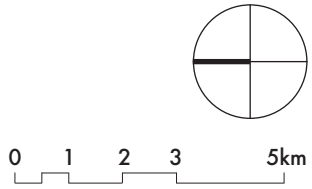
Dominant Landforms

Contours 50m intervals
Contours 10m intervals
Storm surge and sea level rise 10m contour line
Major peaks
Ridgelines

Water Structure



River (Perennial and Non-perennial)
Floodplain
Dam
Potable water pipeline



Open Space Network

Ecological Corridors, Protected Areas, Natural Vegetation, Extensive and Intensive Agriculture, Pastures, Public Parks, Sports Facilities, School Fields.

Agricultural Structure

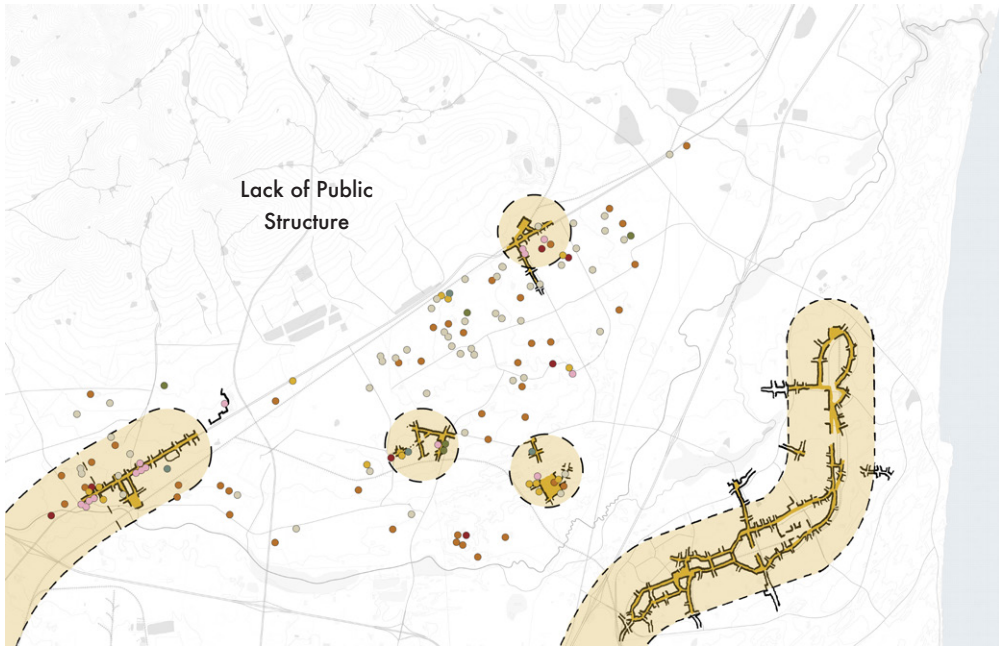
Extensive Agriculture
Intensive Agriculture
Pastures

0 1 2 3 5km

Accessibility Surface

Street continuity
Train Stations
BRT Network

Urban Activity Nodes and Corridors



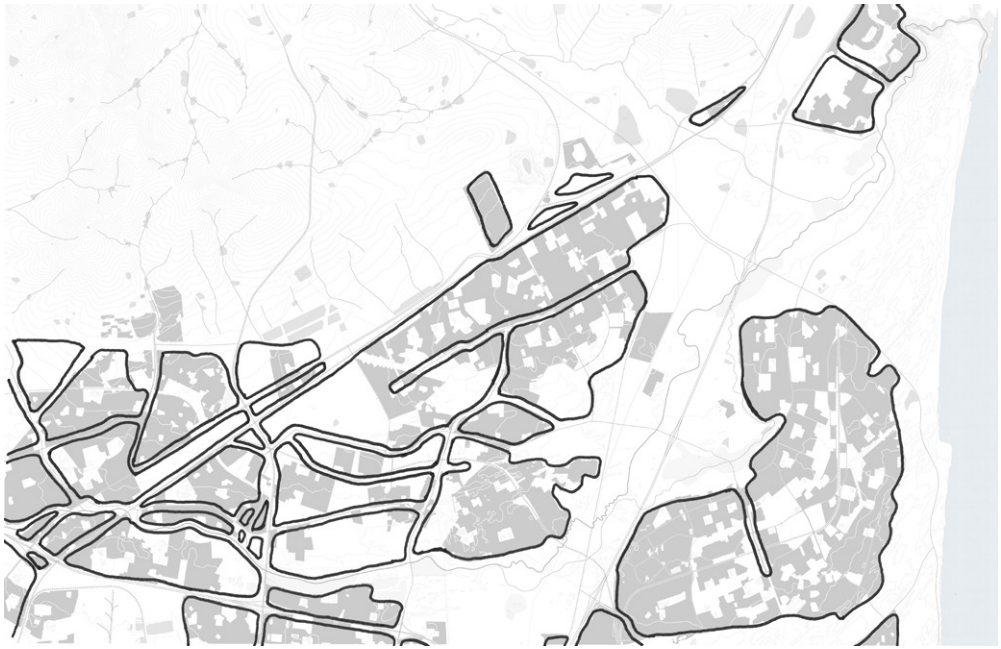
Urban Activity Nodes and Corridors
Dominant Public Structure
Clusters of Public Facilities

0 1 2 3 5km

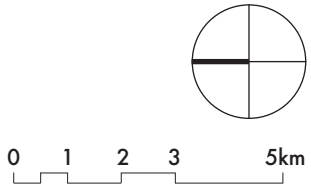
Natural and Infrastructural Barriers

River / Canal
Limited Accessway
Railway
Powerline
Utilities and Infrastructure
Gated Communities

Segregated Development Parcels



Development Parcel outline
Built footprint



Site: Composite Constraints and Informants

Key:

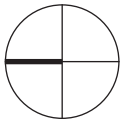
Water Structure

Open Space
Protected Natural Area
Agriculture (Intensive and Extensive)
Built Footprint

Major peaks
Ridgelines

Dominant Mobility Structure
Railway line
Powerline
Utilities and Infrastructure

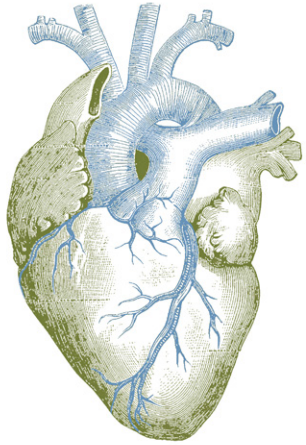
Police Station / Fire Department
Community Facilities
Sports Facilities
School
Church
Commercial node




Bottelaryberg
Blackheath water treatment plant
Stormwater detention
Stormwater canal
Van Riebeeck Road
Stormwater channel
Voortrekker Road
Kuilsrivier
R300
Belville Marshalling Yard
Future Blue Downs Railway
N2
Vergenoegd Provincial Heritage Site
Eersterivier
False Bay

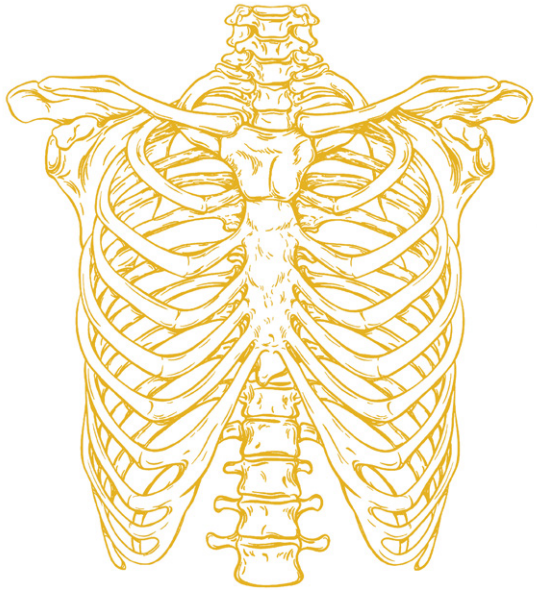
‘Green Heart’

Water as structuring element, allowing the rural to push into the urban landscape through agriculture and rehabilitated publicly orientated ecological corridors.

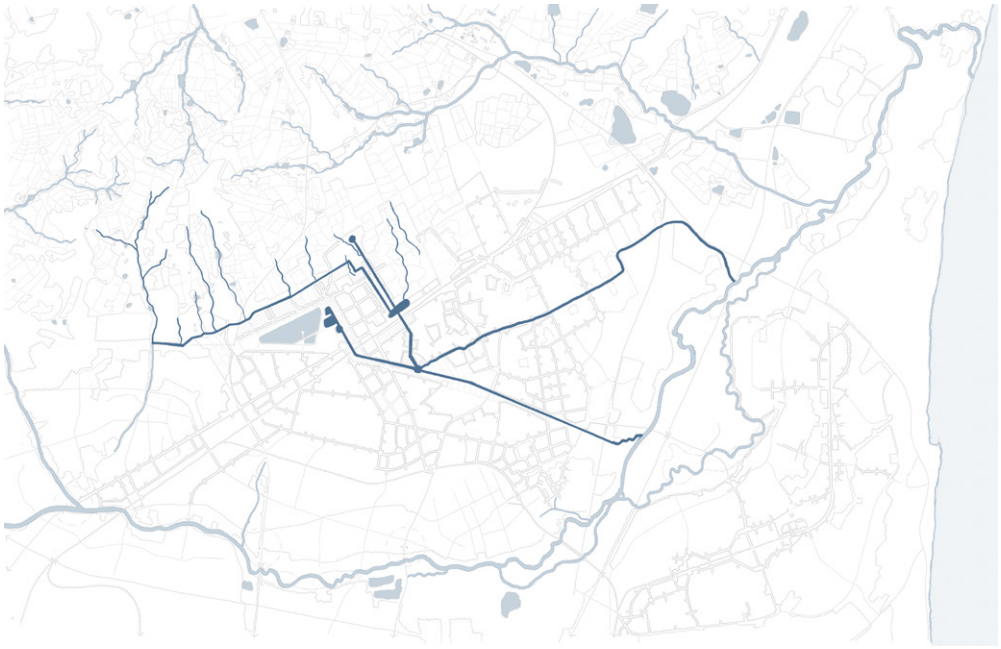


Public Structure

Public space and clusters of public facilities become the main element of structure that consolidates the urban form and guides future urban growth through intensification.



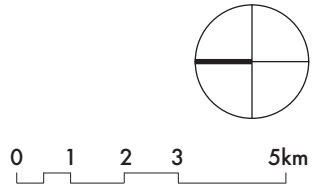
Water Structure



- System of Irrigation Canals ('Leivore')
- Dams related to Irrigation System
- Natural Water Structure

Open Space Network

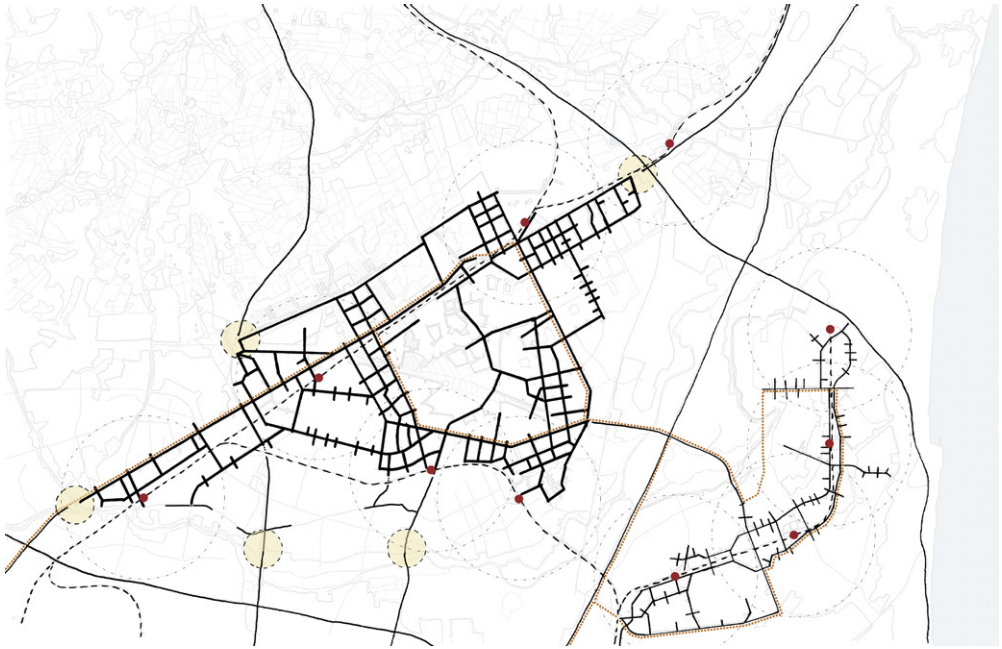
Ecological Corridors, Protected Areas, Natural Vegetation, Extensive and Intensive Agriculture, Pastures, Public Parks, Sports Facilities, School Fields.



Agricultural Structure

Extensive Agriculture
Intensive Agriculture
Pastures

Accessibility Surface



Structural Grid
Gateways
Train Stations
BRT Network

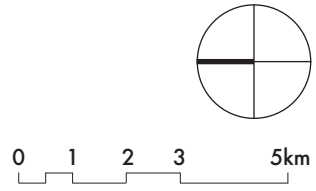
0 1 2 3 5km

Sense of Place

Winelands: On Foothills and along Eersterivier Valley
Kuilsriver Floodplain
'Vergenoegd' Historic Farmstead
'Green Heart'
Recreational Activity Node

Integrated Activity Corridors System

System of Integrated Activity Corridors
Connection between Corridor Systems
Dominant Public Structure
Clusters of Public Facilities



Site: Framework

Key:

Water Structure

Public Structure

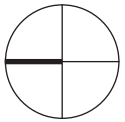
Open Space Network:
Extensive Agriculture
Intensive Agriculture
Ecological corridors, protected areas, natural vegetation,
public parks, sports facilities, school fields and cemeteries.

Proposed new superblock

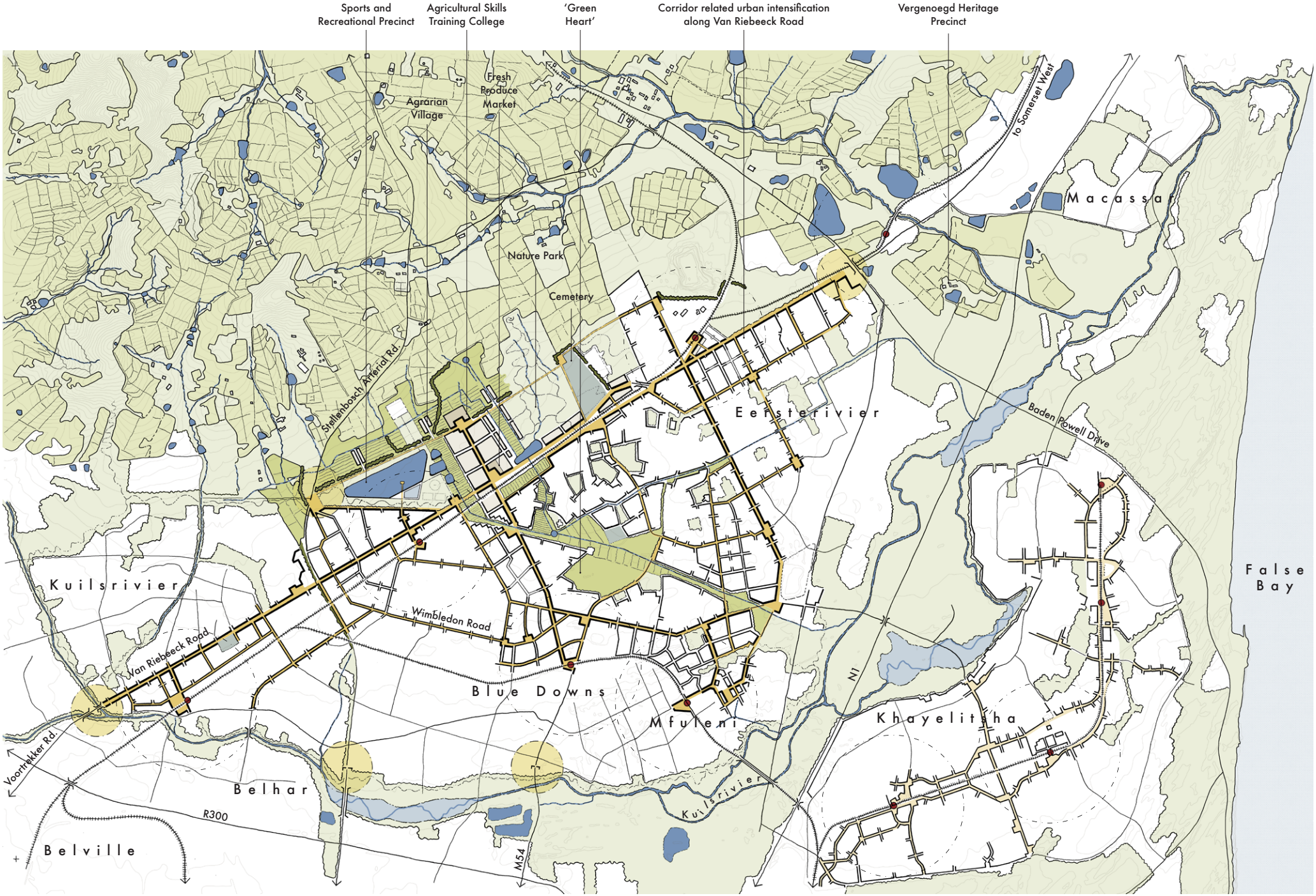
Train station

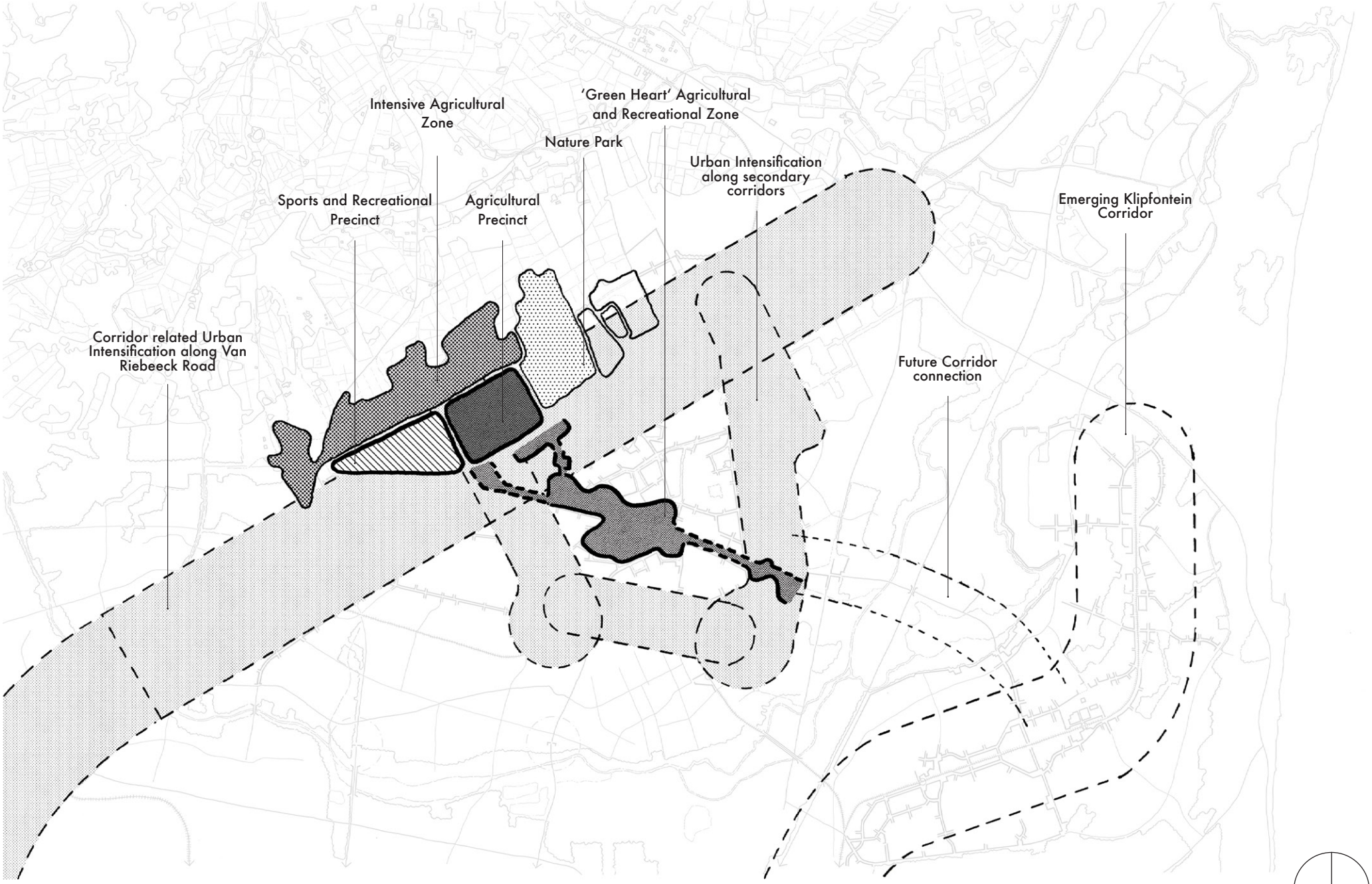
Gateway and Forecourt Spaces

Structural Planting

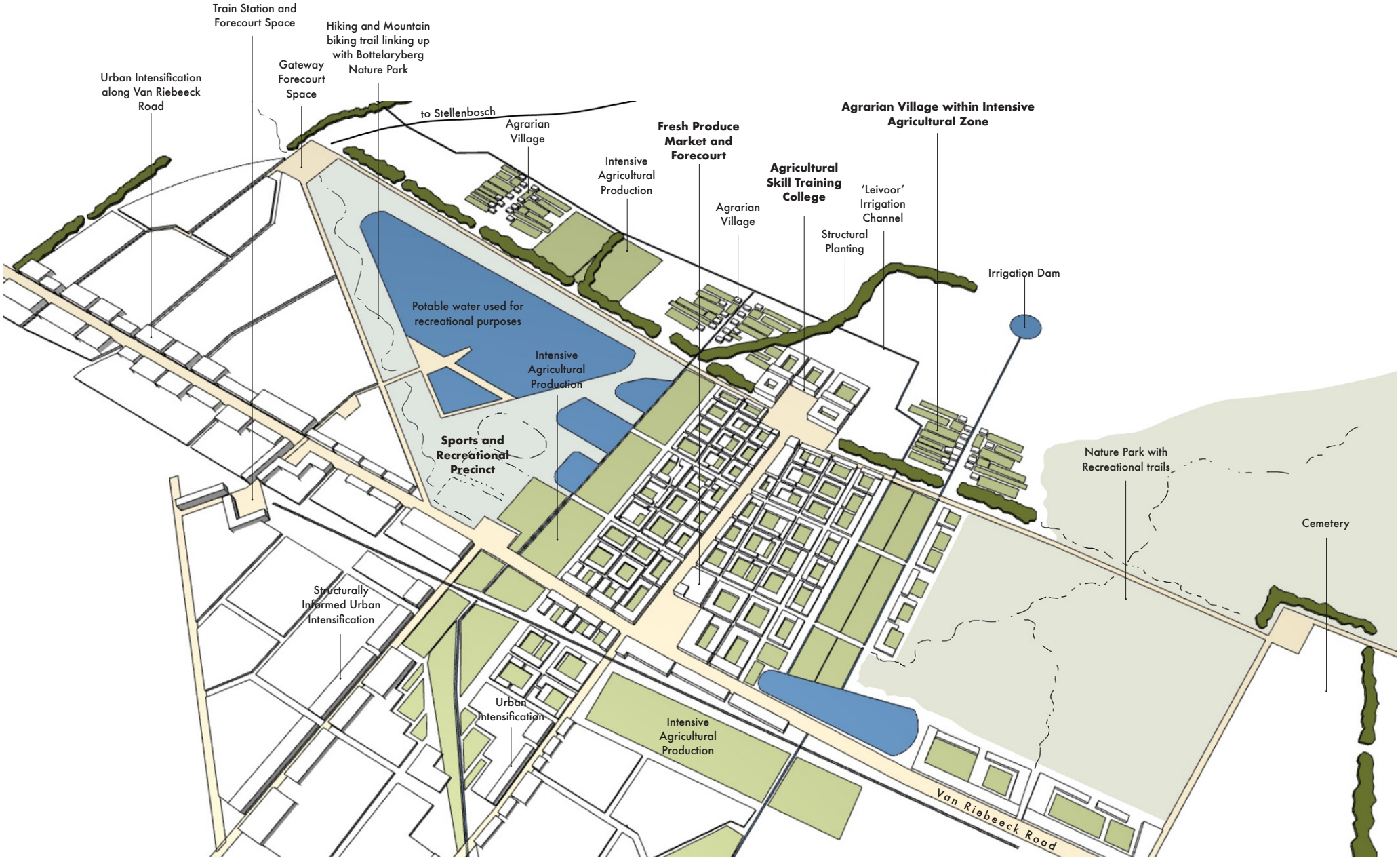


0 0,5 1 2 3 5km

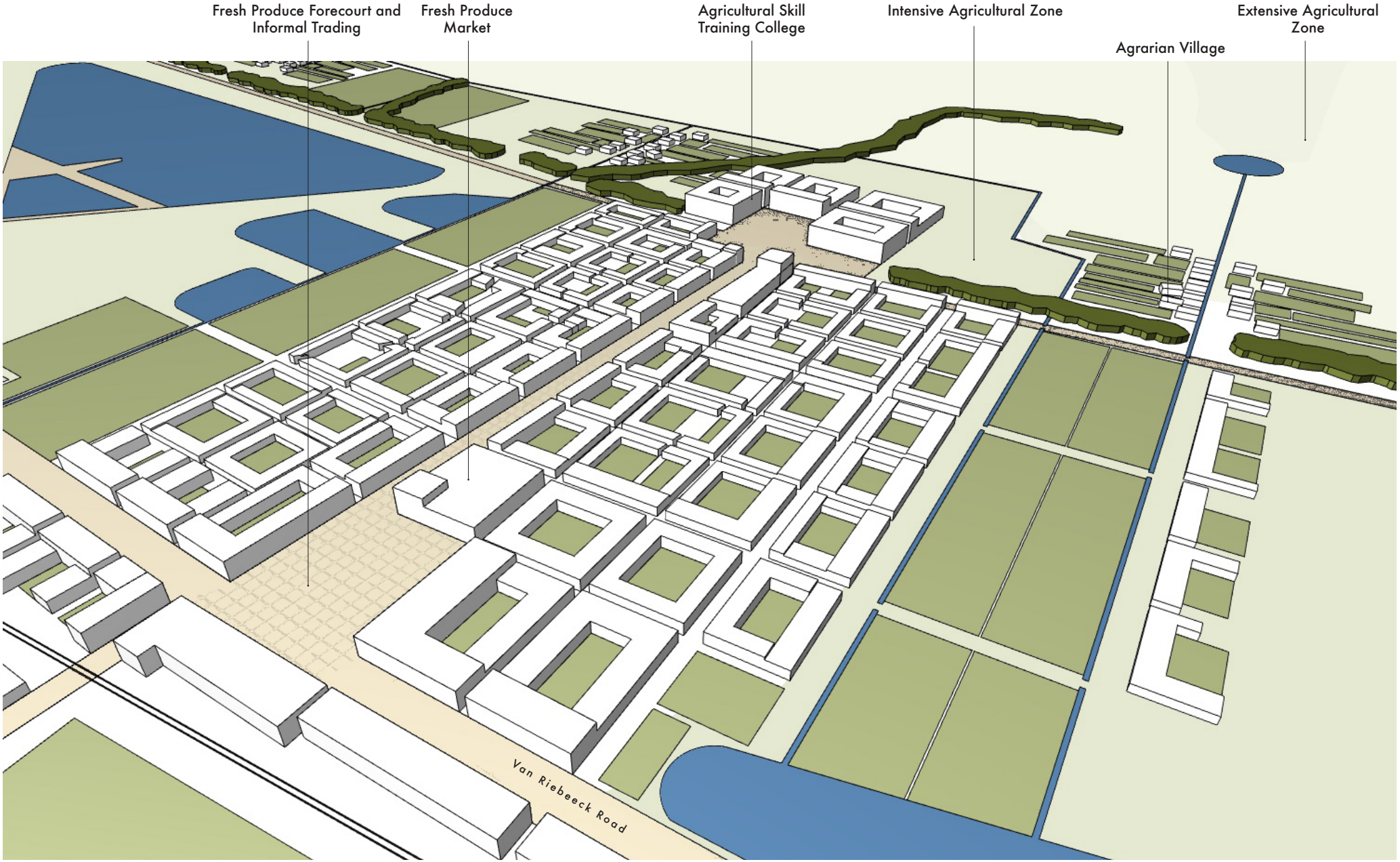

Sports and Recreational Precinct
Agricultural Skills Training College
'Green Heart'
Corridor related urban intensification along Van Riebeeck Road
Vergenoegd Heritage Precinct
Agrarian Village
Fresh Produce Market
Nature Park
Cemetery
Stellenbosch Arterial Rd
To Somerset West
Macassar
Eersterivier
Baden Powell Drive
Kuilsrivier
Van Riebeeck Road
Wimbledon Road
Blue Downs
Mfuleni
N1
Khayelitsha
False Bay
Voortrekker Rd
Belhar
R300
Belville
M54
Kuilsrivier



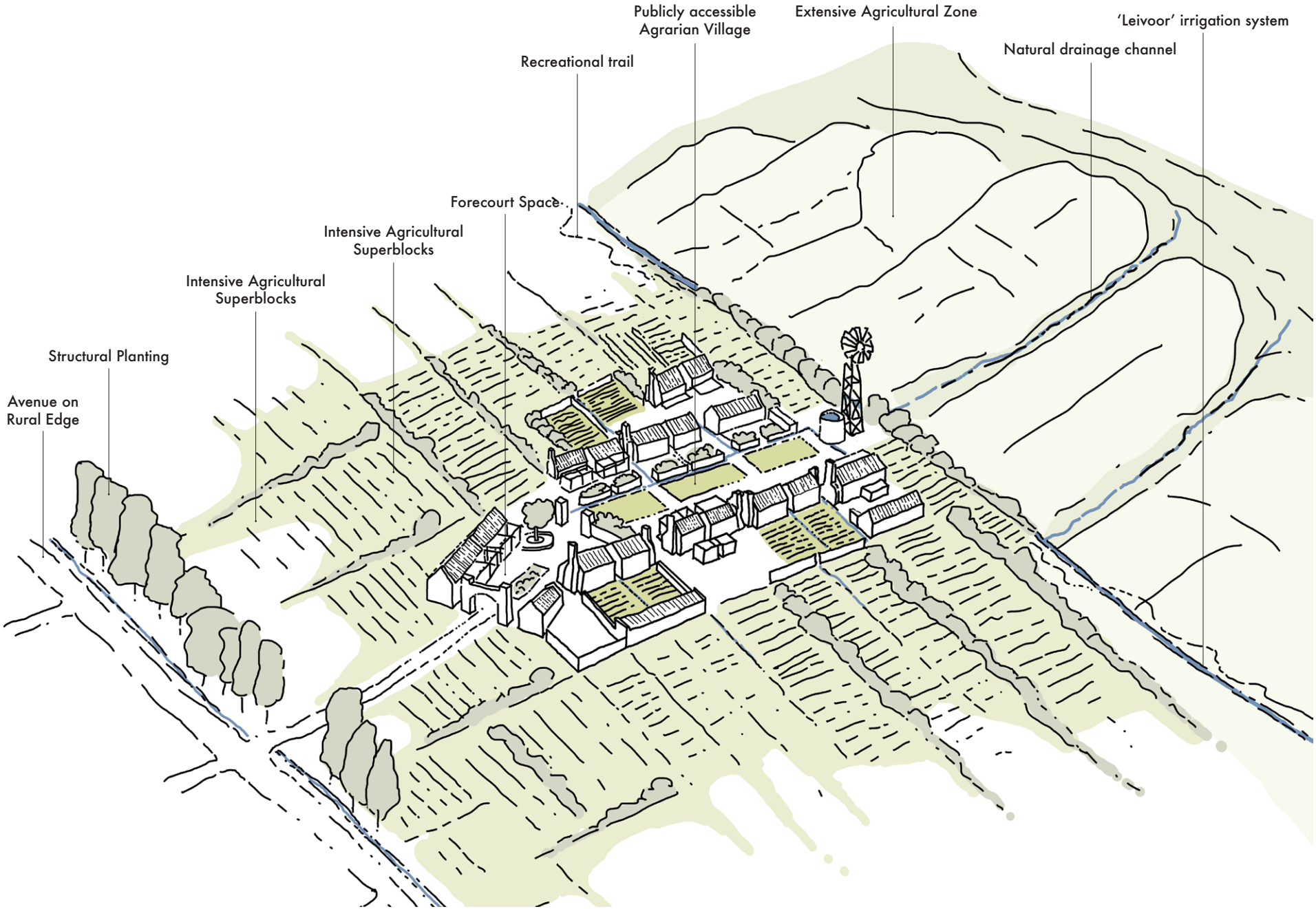
Identifying Precincts and Action Areas for Intervention



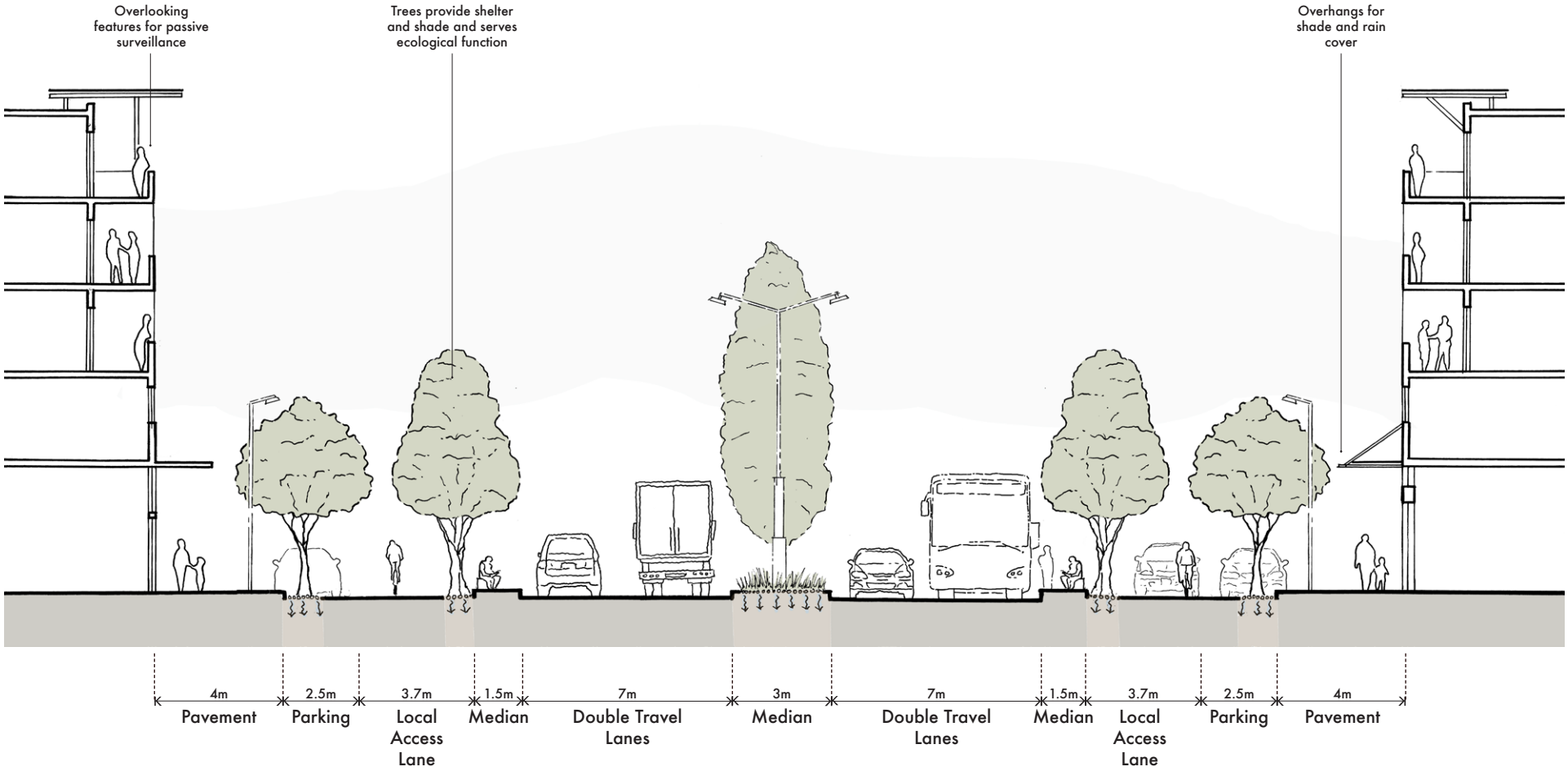
Perspective View of Rural and Urban Seam



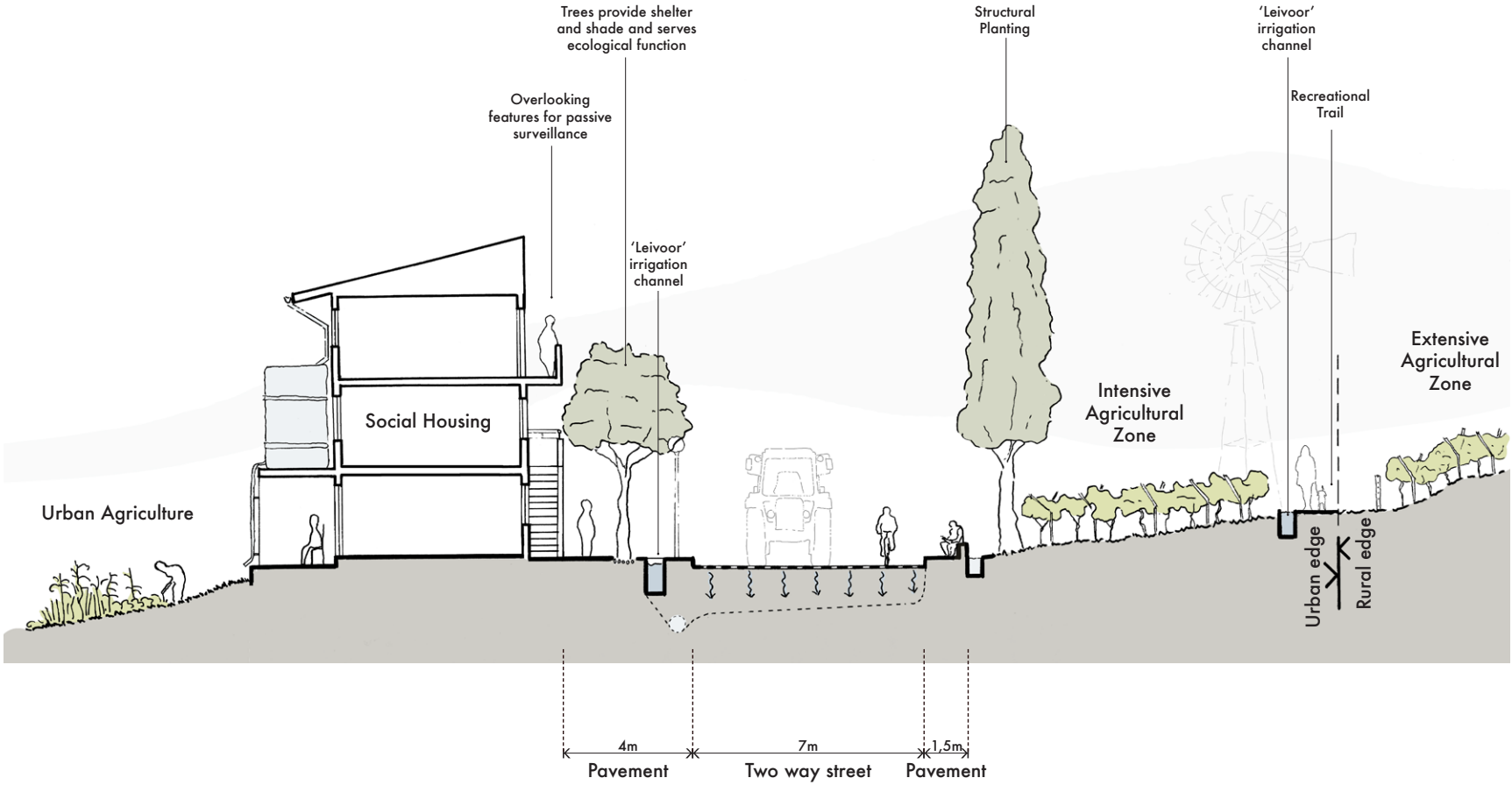
Perspective View of Agricultural Precinct



Perspective View of Agrarian Village within Intensive Agricultural zone



Section through Van Riebeeck Road



Section through Avenue on Rural Edge

05

Small-scale Economic Opportunities | Diversity | Accessibility | Pedestrian Priority | Sense of Place | Water Scarcity | Food Security | Ecological Biodiversity

Photomontage of the Rural Urban Interface Zone

5 Conclusion

The aim of the research project was essentially to research the negative effects of lateral urban sprawl, understand why it is taking place in Cape Town, why conventional ways to prevent it has failed and to propose an alternative to fight it, to ensure the sustainable growth of the peripheral city. The following thee research questions were formulated:

1. Why is urban sprawl bad, what is driving it and why has it not been successfully contained?

The research confirmed the suspicion that sprawl upsets the balance of the landscapes of society through the continuous pressures it is placing on agricultural land and natural environments. It was disappointing to realise that policies initially guided by modernism and apartheid thinking, has left an enduring culture of low density, fragmented and segregated settlement making, to this day. The massive role that the private motor vehicle is playing in our cities for the sake of economic efficiencies and convenience for a limited segment of the population and the negative effects this is having on the city's sense of place.

The containment of the sprawling urban form is an ongoing global challenge and the solution to this, was from the outset of the project, known to be a very complex inquiry. That question has largely remained unanswered as it emerged through the research, that this is not purely a spatial resolvable problem. It is a complex social and economical problem that manifests itself in a spatial manner. Spatially addressing it, could cure it, but it needs to be tackled at the root cause. That research falls outside the scope of this research project.

2. How can the fragmented urban and rural landscapes on the periphery of the sprawling city, be consolidated and intensified to direct future spatial growth?
3. What are the spatial structuring devices that can be designed to integrate stranded communities back into a larger urban and rural system?

The design proposal that emerged through the research seems very realistic as it followed a strict logic that is based on facts. The fact that no community engagement took place does not detract from the response and the outcome would have been much the same, as the design is merely establishing new, and reinforcing existing, structure within the community, based on values of the public good. It is not prescriptive, and it allows for flexibility and customisation to suit current and future needs. The response ties in with the different policies that were reviewed. Ultimately the design response addresses the spatial characteristics caused by sprawl and it might be naïve, but with the right partnerships and strategic funding, the implementation of certain strategic target areas, could positively transform aspects of the study area to establish urbanity within and enrich the public life.

References

Bacon, E. N. (1974). *Design of Cities*. Middlesex, England: Penguin Books.

Behrens, R. B., & Watson, V. (1996). *Making Urban Places: Principles and Guidelines for Layout Planning*: Juta Academic.

Brandes, J. (1786). Plaats 'Vergenoegd; van de heer Lochner. In. Rijksmuseum.

Calthorpe, P., & Fulton, W. (2001). *The Regional City: Planning for the End of Sprawl*. Washington, DC: Island Press.

City of Cape Town. (2017). *Five-year Integrated Development Plan: July 2017 – June 2022*.

City of Cape Town. (2018). *Cape Town Metropolitan Spatial Development Framework*.

Desvigne, M. (2016a). Issoudun Territoire, Issoudun, France. Retrieved from http://micheldesvignepaysagiste.com/en/issoudun-territoire

Desvigne, M. (2016b). Widening the Edges: Grand Paris 2009. Retrieved from http://micheldesvignepaysagiste.com/en/widening-edges

Dewar, D. (2000). The Relevance of the Compact City Approach: The Management of Urban Growth in South African Cities. In Jenks & Burgess (Eds.), *Compact Cities: Sustainable Urban Forms for Developing Countries* (pp. 209-218). London: Taylor and Francis.

Dewar, D. (2019, 29 August 2019) *Interview Questionnaire 01: Urban Corridor as a structuring element, defining the limits of settlement expansion, Voortrekker Road Corridor, Cape Town./Interviewer: P. Louw*.

Dewar, D., & Todeschini, F. (2004). *Rethinking urban transport after modernism: lessons from South Africa*: Routledge.

Dewar, D., & Uytenbogaardt, R. S. (1991). *South African Cities : A Manifesto for Change*. Cape Town: Urban Problems Research Unit, University of Cape Town.

Dewar, D., & Uytenbogaardt, R. S. (1995). *Creating vibrant urban places to live : a primer*. Cape Town: Headstart Developments NewHCo.

Dober, R. P. (1969). Environmental Design.

Duany, A., Plater-Zyberk, E., & Speck, J. (2001). *Suburban nation: The rise of sprawl and the decline of the American dream*. New York: Macmillan.

Geddes, P. (1915). *Cities in evolution: An introduction to the town planning movement and to the study of civics*: Williams & Norgate.

Golany, G. (1983). *Design for arid regions*: Van Nostrand Reinhold Company.

Government, W. C. (2019). *Western Cape Land Use Planning Guidelines: Rural Areas*.

Horn, A. (2018). Letting go: Evaluating spatial outcomes and political decision-making heralding the termination of the urban edge in Cape Town, South Africa. *Elsevier*(78), 176-184.

Isikhungusethu Environmental Services, Dewar, D., & Louw, P. (2017). *Guidelines for the Provision of Open Space in South Africa*. Retrieved from http://www.ruraldevelopment.gov.za/legislation-and-policies/file/5087-guidelines-for-the-provision-of-space-isikhungusethu-environmental-services

Kriken, J. L., Enquist, P. J., & Rapaport, R. (2010). *City Building: Nine Planning Principles for the Twenty-first Century*: Princeton Architectural Press.

Marshall, S. (2005). New York: Spon Press.

Mcgaffin, R. (2019, 26 September 2019) *Interview Questionnaire 01: Urban Corridor as a structuring element, defining the limits of settlement expansion, Voortrekker Road Corridor, Cape Town./Interviewer: P. Louw*.

Ministry of the Environment, D. (2015). *The Finger Plan: A Strategy for the Development of the Greater Copenhagen Area*. Copenhagen: The Danish Nature Agency Retrieved from www.naturstyrelsen.dk

Ndubisi, F. (2002). *Ecological Planning: A Historical and Comparative Synthesis*. Maryland: John Hopkins University Press.

Ryan, B. D. (2017). *The Largest Art: A Measured Manifesto for a Plural Urbanism*. Cambridge, MA: MIT Press.

Sinclair-Smith, K. (2013). Methods and Considerations for Determining Urban Growth Boundaries—an Evaluation of the Cape Town Experience. In.

Southworth, M., & Owens, P. M. (1993). The evolving metropolis: studies of community, neighborhood, and street form at the urban edge. *Journal of the American Planning Association, 59*(3), 271-287.

Stats SA. (2019). Local Municipality: City of Cape Town. *Statistics by place*. Retrieved from http://www.statssa.gov.za/?page_id=993&id=city-of-cape-town-municipality

Stellenbosch Municipality. (2019). *Spatial Development Framework: Final Draft for Advertising*.

UN Habitat. (2014). Practical Guide To Designing, Planning And Implementing Citywide Slum Upgrading Programs. In. Nairobi: UNON.

Weller, R. (2016). The City Is Not an Egg: Western Urbanization in Relation to Changing Conceptions of Nature. Retrieved from https://static1.squarespace.com/static/56b5181b2eeb812c64499929/t/5a70ee3f085229e1f7455dff/1517350464896/thecity_is_not_an_egg.pdf

Welter, V. M. (2019). Post–war CIAM, Team X, and the Influence of Patrick Geddes. Retrieved from http://www.team10online.org/research/papers/delft1/welter.pdf
Western Cape Government. (2017). *Socio-economic Profile: City of Cape Town*.
Western Cape Government. (2019). *Greater Cape Metro Regional Spatial Implementation Framework Final Report July 2019*.
Wylie, D. (2016). *The Urban Edge: A Spatial Planning Tool Or Device For Land Development Management: A Western Cape Perspective*. (LLM Environmental Law). University of Cape Town,
Zeunert, J. (2017). *Landscape Architecture and Environmental Sustainability: Creating Positive Change through Design*. New York: Bloomsbury Publishing.

APPLICATION FORM

Please Note:
Any person planning to undertake research in the Faculty of Engineering and the Built Environment (EBE) at the University of Cape Town is required to complete this form **before** collecting or analysing data. The objective of submitting this application *prior* to embarking on research is to ensure that the highest ethical standards in research, conducted under the auspices of the EBE Faculty, are met. Please ensure that you have read, and understood the **EBE Ethics in Research Handbook** (available from the UCT EBE, Research Ethics website) prior to completing this application form: http://www.ebe.uct.ac.za/ebe/research/ethics1

APPLICANT'S DETAILS		
Name of principal researcher, student or external applicant		Pieter Johann Louw
Department		Architecture and Planning and Geomatics
Preferred email address of applicant:		pieterjohannlouw@gmail.com
If Student	Your Degree: e.g. MSc, PhD, etc.	Master of Urban Design
	Credit Value of Research: e.g. 60/120/180/360 etc.	60
	Name of Supervisor (if supervised):	Kathryn Ewing
If this is a researchcontract, indicate the source of funding/sponsorship		
Project Title		FIGHTING THE SPRAWL! UNLOCKING URBAN GROWTH OPPORTUNITIES ALONG CAPE TOWN'S LIMITED ACCESS ROUTES.

I hereby undertake to carry out my research in such a way that:

- there is no apparent legal objection to the nature or the method of research; and
- the research will not compromise staff or students or the other responsibilities of the University;
- the stated objective will be achieved, and the findings will have a high degree of validity;
- limitations and alternative interpretations will be considered;
- the findings could be subject to peer review and publicly available; and
- I will comply with the conventions of copyright and avoid any practice that would constitute plagiarism.

SIGNED BY	Full name	Signature	Date
Principal Researcher/ Student/External applicant	Pieter Johann Louw		**29 Apr 2019**

APPLICATION APPROVED BY	Full name	Signature	Date
Supervisor (where applicable)	KATHRYN EWING		29/04/2019
HOD (or delegated nominee) Final authority for all applicants who have answered NO to all questions in Section1; and for all Undergraduateresearch (including Honours)	NANCY ODENDAAL		20/5/19
Chair : Faculty EIR Committee For applicants other than undergraduate students who have answered YES to any of the above questions.			

DECLARATION OF FREE LICENSE

I, PIETER LOUW, student number LWXPIE005, hereby;

a) Grant the University free license to reproduce the above thesis in whole or in part, for the purpose of research.

b) Declare that;

1. The above thesis is my own unaided work, both in composition and execution, and that apart from the normal guidance of my supervisor, I have received no assistance apart from that stated below;
2. Except as stated below, neither the substance nor any part of the thesis has been submitted in the past, or is being, or is to be submitted for a degree in the university or any other University.
3. ~~I am now presenting the thesis for examination for the Degree of Master of Landscape Architecture."~~

PLAGIARISM DECLARATION

1. I know that plagiarism is wrong. Plagiarism is to use another's work and pretend that it is one's own.
2. I have used the Harvard convention [or insert appropriate] for citation and referencing. Each contribution to and quotation in this project from the work(s) of other people has been attributed and has been cited and referenced.
3. This project is my own work.
4. I have not allowed, and will not allow, anyone to copy my work with the intention of passing it off as his or her own work.