

DEVELOPMENT OF THE NORTHERN GROWTH CORRIDOR IN CAPE TOWN:

TOWARDS A MORE SUSTAINABLE CITY



MARI BOTHA

DISSERTATION FOR A MASTERS IN CITY AND REGIONAL PLANNING | UNIVERSITY OF CAPE TOWN | OCTOBER 2015

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Development of the Northern Growth Corridor in Cape Town:

Towards a more sustainable city

Dissertation submitted in partial fulfilment of Masters of City and Regional Planning

School of Architecture, Planning and Geomatics

University of Cape Town

October 2015

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ABSTRACT

The urban form of many South Africa cities is often considered unsustainable as it is based on the modernist and apartheid city models which have led to urban sprawl, fragmentation and the separation of land uses and activities within cities. These trends of development are exacerbated by the current high levels of urbanisation, population growth and in-migration that many metropolitan areas of the country are experiencing. Cape Town is experiencing significantly high levels of growth which is accompanied by increasing levels of poverty, unemployment and inequality. This growth is also causing uncontrolled urban development that is encroaching into valuable agricultural land and sensitive environmental areas.

This dissertation seeks to demonstrate how urban growth should be accommodated and managed in Cape Town to meet the needs of urban residents and to promote a more sustainable urban environment. There are limited future spatial growth options available in Cape Town as valuable agricultural land, coastlines and topographical constraints limit possible future growth options. The dissertation presents a development framework for the area to the north of Durbanville in Cape Town. The analysis which was undertaken on the site revealed that it is environmentally sensitive and has valuable agricultural land. The plan therefore proposes a system of dense and integrated urban corridors that are enclosed by intensive agricultural activity to minimise the negative effects of development on the site. This form of development gives rise to opportunities to reduce urban sprawl and to bring urban residents closer to economic and social opportunities. Ultimately the plan advocates for a more sustainable and inclusive urban environment that represents the great need for accommodating future growth in Cape Town.

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ACRONYMS AND ABBREVIATIONS

BRT	Bus Rapid Transit System
BNG	Breaking New Ground Housing
CoCT	City of Cape Town
CTSDF	Cape Town Spatial Development Framework
EIA	Environmental Impact Assessment
IDP	Integrated Development Plan
IPCC	Intergovernmental Panel on Climate Change
LED	Local Economic Development
LUPA	Land Use Planning Act
MSA	Municipal Systems Act
NEMA	National environmental Management Act
NGC	Northern Growth Corridor
NMT	Non-Motorised Transport
NDP	National Development Plan
PSDF	Provincial Spatial Development Framework
RDP	Reconstruction and Development Programme
SDF	Spatial Development Framework
SPLUMA	Spatial Land Use and Management Act
WCDOH	Western Cape Department of Health

GLOSSARY

ACCESSIBILITY: The ability of people to move around an area and reach places and facilities, including elderly and disabled people, those with young children and those encumbered with luggage or shopping.

BIODIVERSITY: The whole variety of life encompassing all genetics, species and ecosystem variations, including plants and animals.

BOULEVARD: A wide street in a town or city, typically one lined with trees.

CHARACTER: The appearance of any rural or urban location in terms of its buildings, landscape and the layout of streets and open spaces, often giving places their own distinct identity.

CONTEXT: The setting of a site or area, including factors such as traffic, activities and land uses as well as landscape and built form.

DENSITY: A measurement of the degree to which a piece of land or a site is built on. Often expressed as a number of units, or habitable rooms, per hectare.

DESIGN CONCEPT: An expression of one of the basic design ideas at the heart of an urban design framework, design guide, development brief or a development.

FORM: The layout (structure and urban grain), density, scale (height and massing) and appearance (materials and details) of development.

FRONTAGE: The part of a building that faces public areas and typically includes the main entrance. Architecturally it is normally the most interesting part of a building.

GATEWAY: Elements such as bridges, buildings, spaces, junctions or landmarks that announce arrival to the town, or one of its quarters.

INFRASTRUCTURE: Basic services necessary for development to take place, for example, roads, electricity, sewerage, water, education and health facilities.

LANDMARK: A building or structure that stands out from its background by virtue of height, size or some other aspect of design.

LAYOUT: The way buildings, routes and open spaces are placed or laid out on the ground in relation to each other.

LEGIBILITY: The ease with which a place can be understood and navigated. Highly legible places have obvious routes and are easy to pass through.

MIXED USE: Provision of a mix of land uses, such as residential, community and leisure uses, on a site or within a particular area. A mix of uses within a building, on a site or within a particular area. 'Horizontal' mixed uses are side by side, usually in different buildings. 'Vertical' mixed uses are on different floors of the same building.

MOVEMENT: People and vehicles going to and passing through buildings, places and spaces

NODE: Node is simply a term used for the idea of an activity center or an area where traffic, money, information, or other flows come together.

OPEN SPACE: All open space of public value, including not just land, but also areas of water (such as rivers, canals, lakes and reservoirs) which offer important opportunities for sport and recreation and can act as a visual amenity.

PERIMETER BLOCK: The preferred block structure, whereby the fronts of buildings sit to the rear of the pavement and face the street, and the backs face each other around a courtyard.

PUBLIC INSTITUTIONS: buildings such as police stations, town halls, theatres and libraries, that are essential elements in the townscape.

CHAPTER 1: INTRODUCTION

1.1 PROBLEM

The urban configuration of South African cities has created sustainability problems since it is based on the modernist and apartheid ideologies of low density development that contributes towards urban sprawl, fragmentation and separation of functions, land uses and activities. This has had devastating impacts on South African cities. Valuable agriculture land as well as sensitive environmental land has been destroyed. Cities generate large amounts of movement which have a negative impact on energy consumption, pollution and infrastructure. Poverty and inequality in urban areas have worsened as it is the poor who are affected the most. Public transport is inefficient and many poor households are essentially trapped in their remote locations (Jenks & Burgess, 2000). These trends of development are exacerbated by the current high levels of urbanisation that many metropolitan areas in the country are experiencing, Cape Town being one of them.

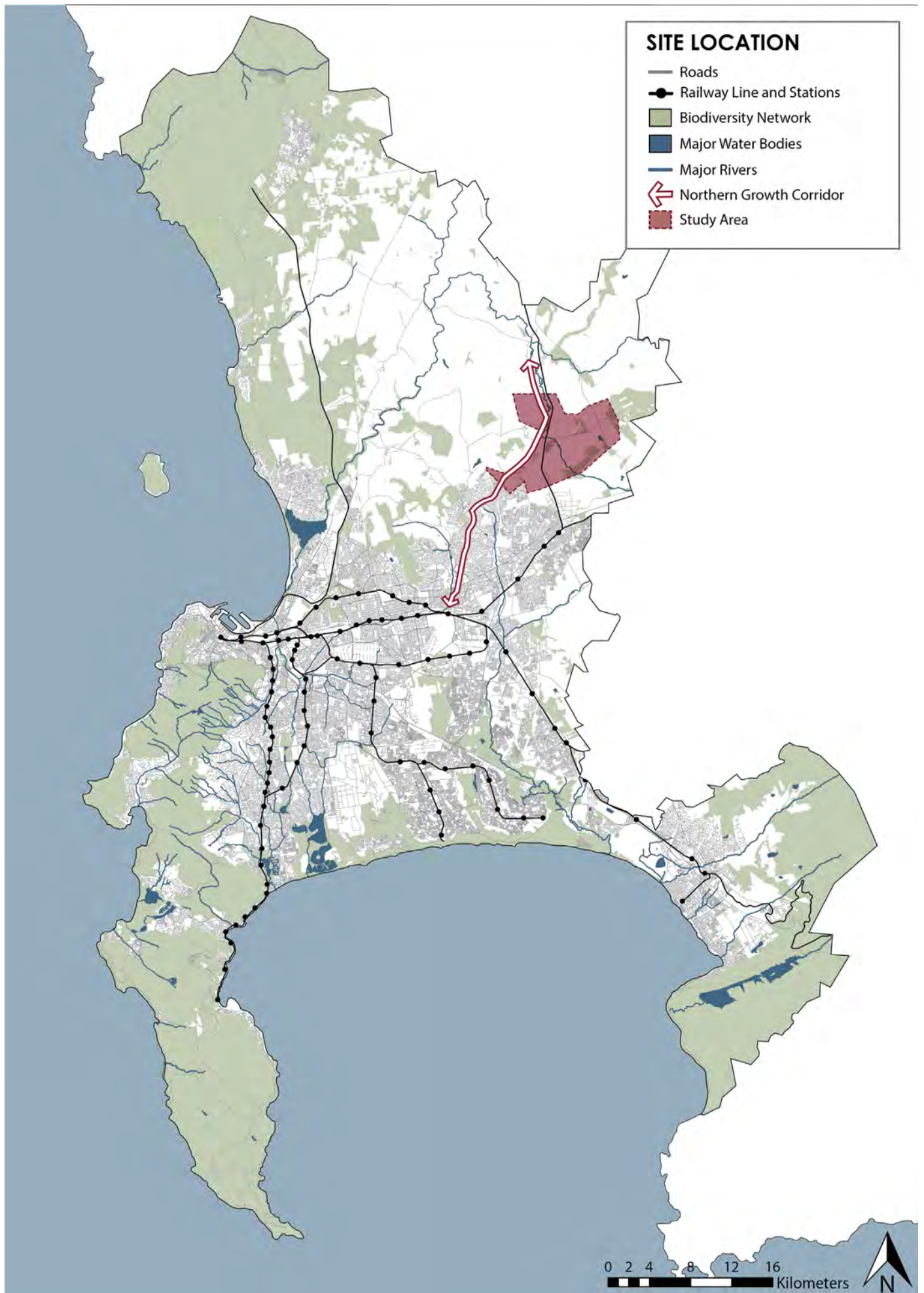
Before the 1940s Cape Town was well structured around corridors which were well served by public transport and facilities. Development was located in moderate climates around the bottom of the Table Mountain slopes. After the 1940s Cape Town experienced rapid urbanisation from population growth and rural in-migration. The modernism and apartheid ideologies were the dominant planning ideologies used during this period which resulted in the city form being characterised by sprawled, fragmented and separate development. Newer parts of the city, especially low-income neighbourhoods, are located in hostile areas and far from economic and social opportunities. Much of the middle and upper income population live in these historic corridors or in wealthy suburbs while the poor occupy former homelands and informal settlements (Southwood, 2007). There is immense pressure being brought to bear on the city to come up with a spatial solution to accommodate population growth. The overarching issues in this dissertation need to be addressed to ensure that Cape Town's urban fabric is contained and that an equitable pattern of accessibility is established.

1.2 PURPOSE

This dissertation seeks to demonstrate how urban growth should be accommodated and managed in Cape Town to meet the needs of urban residents and to promote a sustainable urban environment. There are limited future spatial growth options available in Cape Town. The valuable agricultural land to the east and north, the ocean to the west, the False Bay coastline to the south and topographical constraints limit Cape Town's possible growth direction (City of Cape Town, 2012a). The two most notable options for future growth include the west coast growth corridor and northern growth corridor. This dissertation focuses on a site in the northern growth corridor as an option for future urban development in Cape Town. The various planning frameworks presented in this dissertation do not demand that everything should be planned and controlled: they require only certain physical actions be taken to inform and guide decisions towards a more sustainable urban form (Dewar & Uytendogaardt, 1991).

1.3 LOCATION OF STUDY AREA

The development framework addresses the area to the north of Durbanville which falls part of the northern growth corridor. This corridor includes a core urban component, rural hinterland, agricultural areas and many well-known wine estates. The urban area has socio-economic inequality with high income, low-density residential areas and low-income, poorly serviced residential areas in Fisantekraal. There are many significant environmental attributes in the corridor that include high potential agricultural land, cultural landscapes, a number of rivers and streams, mineral extraction areas and a highly productive aquifer (The City of Cape Town, 2011). The environmental sensitivity of the site has demanded that the framework takes a sensible approach towards the conservation of valuable agricultural land and threatened environmental areas. Urban development is concentrated along the proposed activity corridors within the site to direct development away from these areas and to provide opportunity for intensive agriculture activities. Map 1.1 shows the study area in Cape Town.



Map 1.1: Site located within The Northern Growth Corridor in Cape Town (Source: Author; GIS Technical Library, University of Cape Town)

1.4 DESIGN METHOD

This section presents an overview of the design method, process and approach which is developed in this dissertation. The design method is concerned with how things ought to be and specifies ways in which the foreseeable future can be made possible. The designer needs to be able to predict the effects of the proposed design as well as specify the various actions that are required to bring the proposed design into effect. The objective of designing becomes less concerned with the final product and more concerned with the process of establishing settlements and the changes that society is expected to make in order to adopt the final product and also to benefit from it (Jones, 1970). The design method is fundamentally influenced by the designer's values and ethics. These values and ethics are made explicit at the start of the planning process to ensure that the design is consistent with these values and ethics (Behrens & Watson, 1996).

1.4.1 DESIGN PROCESS

The design method is a normative and cyclical process rather than a linear one. The cyclical design process has four main stages which include the concept, context, programme and formation of the design. Figure 1.2 provides an indication of the kinds of interrelationships that are involved in the designing method (Behrens & Watson, 1996).

CONCEPT

The concept is concerned with understanding the nature of the problem as opposed to understanding the symptoms of the problem, as well as identifying the role and the best use of the site. The issue with understanding the site involves uncovering the significance of the site in its broader regional systems on which it could potentially have an impact. This uncovers the site's potential to contribute towards its broader context. The product of this process is conceptual diagrams that illustrate 'what should be'. This is the start of the design process which involves the application of the concepts to the site. The diagram is warped to fit the context but the idea is not destroyed (Dewar & Louw, n.d).

CONTEXT

The context requires a detailed understanding of the various factors impacting on the site. There are two central questions that drive this process. The first is where development should not go and the second is identifying contextual factors that inform design. The information that informs these central questions includes the natural landscape (geology, soil, landforms, climate, hydrology, biodiversity, heritage and design factors) and man-made elements (movement, public facilities, and economic activities). The product of this phase is a composite opportunities and constraints map that shows all the relevant information needed to inform design decisions (Dewar & Louw, n.d).

PROGRAMME

The programme formulates the quantities and qualities of uses on the site. The estimates of developable land allows for the estimation of the number of people who can occupy and use the site, the number of dwelling units that can be constructed and the number of public facilities required to support the estimated population (Behrens & Watson, 1996).

DESIGN FORMULATION

The design formation involves the bringing together of the concepts and contextual analysis at a range of scales. The concepts are warped to meet the demands of the context but the idea is not destroyed (Behrens & Watson, 1996). The various scales are discussed further in the next section.

1.4.2 DESIGN APPROACH

The dissertation is based on a system that is known as a 'package of plans' approach which is an alternative to the 'masterplan' approach to development which requires a composite detailed proposal to be submitted to the municipality for approval in its entirety before the development can commence (Wilkinson, 1994). The 'package of plans' approach recognises that projects are planned and developed at different stages. This enables the approval process as well as development of individual land units to occur at different stages. These individual sites need to comply with an approved development framework and specified bulk limitations of the entire site (Century City, 2005). The biggest advantage of this ap-

proach is that it enables decisions to be made within the framework by means of which the municipality and developer can gain a better understanding of the problems of the area. The development control for the project can be handled in a more flexible and interactive basis. This helps to accelerate large scale projects rapidly into the implementation phase (Wilkinson, 1994). The approach is a flexible system of managing and implementing projects and consists of a hierarchy of plans that allows for the design and approval process to occur at various levels of the planning process. This approach ensures that there is consistency across scales and it places the issues of integration central to the planning process. At each scale a framework identifies the minimum actions that are required to give overall direction (Dewar *et al*, 2012). The number of levels in this 'package' comprises the following:

METROPOLITAN FRAMEWORK

The metropolitan framework deals with the role of the site and its integration into the larger urban system.

SITE AND ENVIRONS

This is a concept at the sub-metropolitan scale and focuses on the integration of the study area and its surrounding areas.

DEVELOPMENT FRAMEWORK

The development framework has to be consistent with the sub-metropolitan framework. The process does, however, allow for some flexibility so that planning later on can respond to certain changes (Century City, 2005). The development concept lays down general planning principles for movement systems, public space and public institutions for the site and its surrounding context (Wilkinson, 1994). The various conceptual layers then informs the development plan for the chosen site which depict the planning principles that will be applied for each precinct. The development framework also identifies precincts within the site which are then carefully phased (Wilkinson, 1994).

PRECINCT PLAN

The precinct plan aims to ensure that well-defined and high quality urban environments are created that respond to the guiding principles discussed in the development framework. The

precinct design is accompanied by controls and guidelines which describe the minimum number of 'fixes' that have to be met to ensure that development is appropriate. These include issues such as building lines, height coverage, landmark buildings, the treatment of corner buildings, amongst others (Dewar *et al*, 2012).

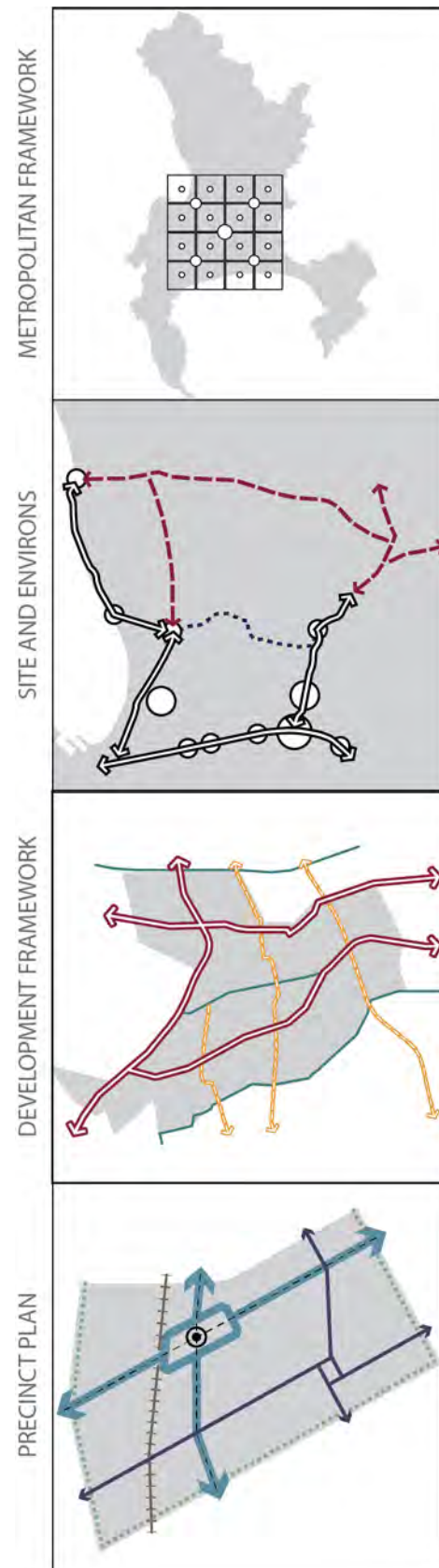


Figure 1.1: Package of Plans (Source: Author)

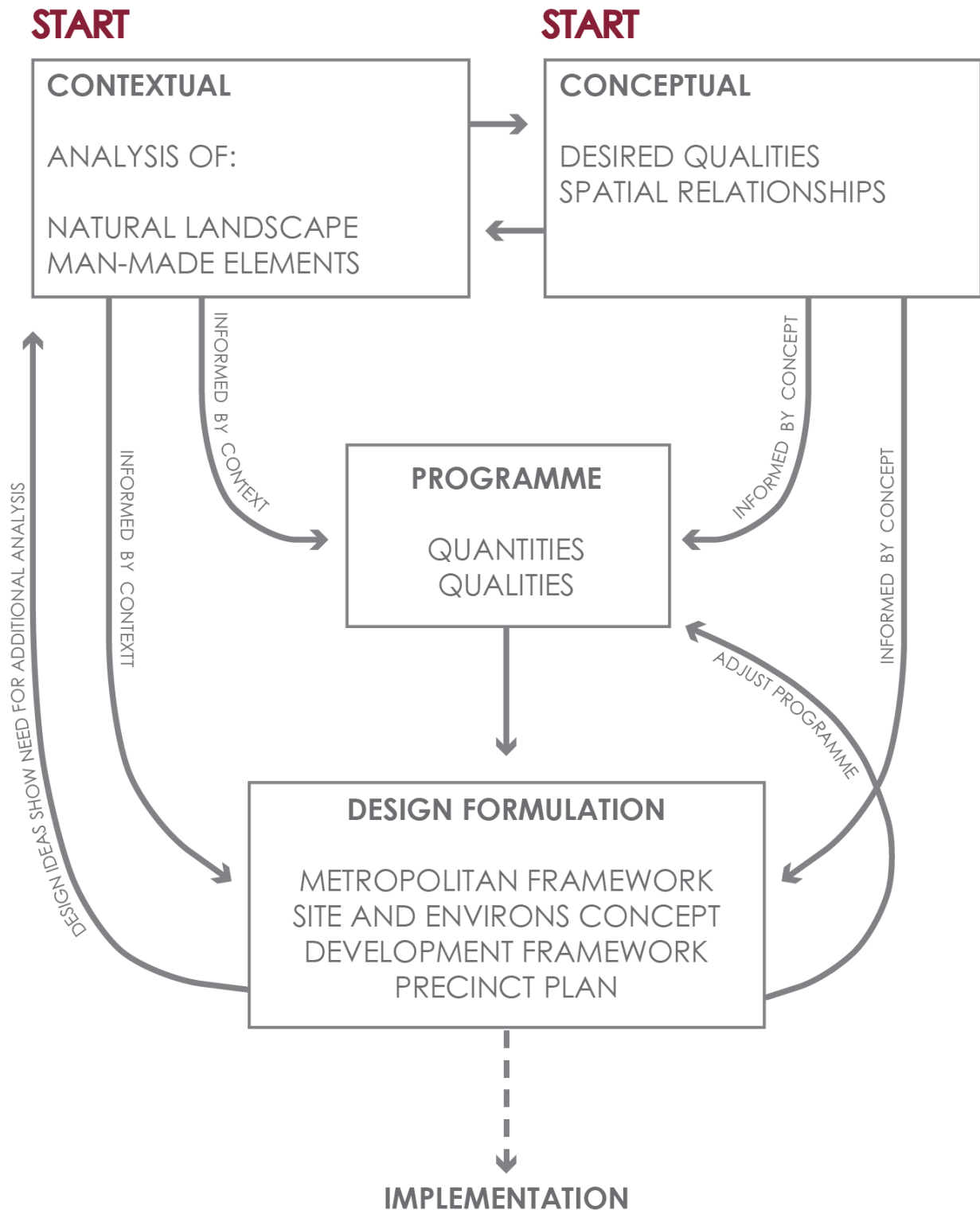


Figure 1.2: Method used in dissertation (Source: Author; Behrens, Watson, 1996)

1.5 STRUCTURE OF DOCUMENT

The document is structured in the following way: Chapters 2 to 5 lay down the theoretical argument that gives direction to chapters 6 to 12.

CHAPTER 2: LOCATING THE PROBLEM

This chapter looks at the causes and consequences of the dominant spatial patterns in South African cities that result from urban structure and form.

CHAPTER 3: UNDERSTANDING CAPE TOWN

This chapter analyses the dominant spatial and development trends that have informed the growth of Cape Town and the physical urban patterns that have resulted from these.

CHAPTER 4: CONCEPTUAL FRAMEWORK

This chapter outlines a brief philosophical position about the values and ethics that the researcher used in the compiling of this dissertation.

CHAPTER: 5 URBAN GROWTH MANAGEMENT

This chapter outlines the various ideas that were used in formulating the planning frameworks on how urban growth should be handled.

CHAPTER 6: GIVING DIRECTION

This chapter is concerned with setting the direction of urban growth management. It seeks to define the needs that should be satisfied through urban growth management and the various urban qualities that contribute towards positive urban environments.

CHAPTER 7: METROPOLITAN FRAMEWORK

This chapter provides an overview of the most relevant contextual characteristics of Cape Town. It focuses on green systems, public facilities and movement systems. It also summarises the main conceptual changes that are necessary to create a more compact and sustainable city.

CHAPTER 8: SITE AND ENVIRONS

This chapter includes the site and environs analysis and identifies opportunities and constraints for the broader site. It also proposes a sub-metro concept for the chosen site.

CHAPTER 9: DEVELOPMENT FRAMEWORK

This chapter proposed a development concept for the development of the northern area of the Durbanville corridor as well as a development framework plan for a site located within the development concept. The development framework provides planning guidelines for the site and identifies precincts within the site.

CHAPTER 10: PRECINCT PLAN

This chapter identifies the precinct plan as well as control and guidelines for the plan.

CHAPTER 11: IMPLEMENTATION

This chapter is comprised of the various institutional arrangements that are required to implement the design as well as the phasing of the plan, monitoring and review and the land budget for the site.

CHAPTER 2: SOUTH AFRICAN URBAN CHALLENGES

This chapter looks at the causes and consequences of the dominant spatial patterns in South African cities that result from urban structure and form. It is argued that it is no longer possible to continue with 'business as usual' and that significant change is crucial (Dewar *et al*, 2012).

2.1 GENERIC CHALLENGES IN SOUTH AFRICAN CITIES

Most of the environmental and social consequences that result from the form of South African cities suggest that the current pattern of urban development is not sustainable (Jenks & Burgess, 2000). The majority of South African settlements are dysfunctional. This is largely because of the historical development paths they have followed. Urban fabrics outlive many generations. Therefore, the patterns that result from historic development paths represent the urban legacy of current as well as future generations. The main challenge that underpins new settlement developments is to contribute towards the improvement of historical settlement performance. An understanding of the current challenges of South African settlements is essential for any spatial development plan (Dewar *et al*, 2012). South African cities have experienced rapid urbanisation. Just over a hundred years ago only a small proportion of the population lived in cities. Today, the country can be seen as an urbanised society. The majority of this growth has happened around the four main metropolitan areas of Johannesburg, Cape Town, Durban, Port Elizabeth and Pretoria. The majority of this urban growth has occurred amongst the poorest population. The dominant tendency is towards a younger and poorer urban population. Accompanying this growth are increasing levels of poverty, unemployment and inequalities within cities (Dewar & Uytenbogaardt, 1991).

2.2 CAUSES OF GENERIC PROBLEMS

The generic structure and form of South African cities have been shaped by two ideologies, namely modernism and apartheid (Jenks & Burgess, 2000). Most of the urban growth that has taken place in South African cities has occurred

since the 1940s which means that most developments have been influenced and shaped by modernist and apartheid ideologies (Dewar *et al*, 2012).

2.2.1 MODERNISM

Urban modernism first emerged in Europe and in the United States in the 1920s but rapidly spread to other countries, including South Africa. For the first time urban planners turned their backs on traditional settlement-making practices. The model of modernism was based on a number of key spatial ideas (Dewar *et al*, 2012):

- **Separation:** There was a concern with separation. Activities such as working, living, recreation and movement were consciously separated into mono-functional areas. This was because of the desire to reduce conflict between activities and to maximise the function of each separate activity. There was also a concern with the separation of pedestrian and vehicular movement (Dewar *et al*, 2012).
- **Technology:** Modernism was dependent on the ability of technology to overcome social and natural constraints and to transform society and nature. In an urban sense there were two forms of technology that dominated. Firstly was the dominance of the motor car, an unchallenged assumption was that every household would own a motor car, despite the fact that in South Africa the majority of households are poor and will never afford a car (Dewar, 2011). Secondly was the elevator which allowed buildings to expand vertically (Dewar *et al*, 2012).
- **Free-standing buildings:** Individual free-standing buildings became the building block of cities where historically public open spaces defined by a collection of buildings were seen as the primary structuring element of cities (Dewar *et al*, 2012).
- **De-emphasis of the street:** Emphasis was placed on roads instead of streets. Roads are engineered and only accommodate the movement of cars. Streets, on the other hand,

are multi-functional spaces that accommodate movement as well as human activities such as walking, playing, social interaction and street-based trading (Dewar, 2011).

SPATIAL MANIFESTATION

The modernist planning model expanded to include two other concepts which were taken from other social movement such as the Garden Cities movement (Dewar *et al*, 2012):

- The neighbourhood unit: There is a belief in the concept of the neighbourhood unit where dwellings are grouped into 'neighbourhoods' that have community and commercial facilities located at the centre. Movement systems are inward orientated towards the centre in an attempt to create a sense of community (Dewar, 2011). These various cells are not integrated with one another but are only linked by movement routes (Jenks & Burgess, 2000).
- Suburbia: The 'good life' for all urban residents was seen as suburbia. The focus of suburbia was on single-storey, free-standing houses that are on their own parcel of land. This became the building block of settlements and became the ideology of good urban life, even in poor communities (Jenks & Burgess, 2000).

2.2.2 APARTHEID

The second ideology that has shaped South African settlements were the political ideologies of apartheid which was formalised in 1948 when the Nationalist Government of DF Malan came into power. At the centre of the policy was the idea of separate development. Different race groups were allocated to different homelands throughout the country. 'Non-whites' could only enter 'White' areas if they had a pass stating that their labour was required (Dewar *et al*, 2012). Spatially the ideas of modernism were compatible with the apartheid ideology. Apartheid planners embraced and exaggerated key ideas that were used under the modernist ideology (Jenks & Burgess, 2000):

- Separation: The modernist concept of separation of land uses was extended to include the separation of different racial groups. The scale of segregation was distorted and large numbers of people of colour were moved across the country to areas with few or no employment opportunities. Since there is a high correlation between race and class in South Africa, the poor population had to travel the furthest to reach economic opportunities (Dewar *et al*, 2012; Jenks & Burgess, 2000).
- The neighbourhood unit: The model of the 'neighbourhood unit' was used with 'non-white' neighbourhoods: access to and from these neighbourhoods occurred at only a few places which made it relatively easy to control and secure if social unrest occurred (Dewar *et al*, 2012).
- Free-standing villas: The idea of free-standing villas was warped into pockets of large housing developments that are surrounded by buffers. The green buffers, however, became isolated and dangerous (Dewar *et al*, 2012).

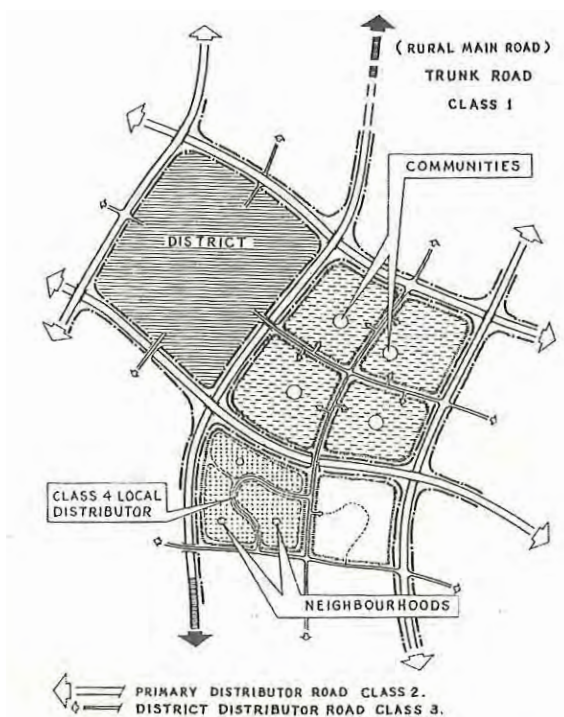


Figure 2.1: Interpretation of Modernist Model in South Africa
(Source: Dewar, Todeschini, 2004)

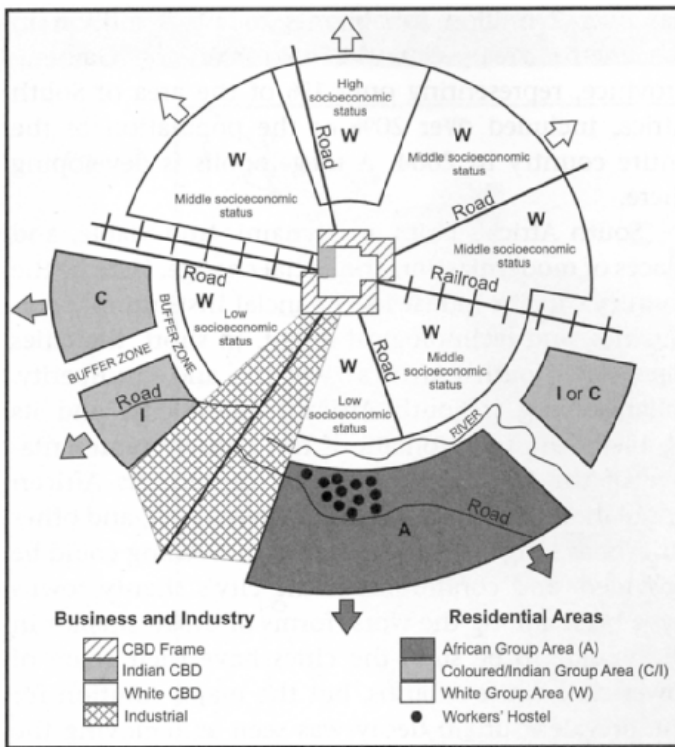


Figure 2.2: Example of an apartheid city model (Source: <http://people.uwec.edu/>)

2.3 SPATIAL CONSEQUENCES

The spatial consequences of the modernist and apartheid ideologies are sprawl, separation and fragmentation. These have had devastating impacts on South African cities (Dewar *et al*, 2012).

2.3.1 ENVIRONMENTAL DEGRADATION

Low-density sprawl has spread over agricultural and natural landscapes, destroying productive land and sensitive environmental areas (Dewar *et al*, 2012). The wealthy usually target the unique natural landscapes for privatisation and this frequently affects the natural landscape negatively in the process. In many cities air pollution is reaching alarming levels, vehicles being the major contributors to this. The toxins such as sulphur dioxide and nitrogen dioxide that are emitted by vehicles threaten human health and negatively impact the aspects of the environment such as water and air quality (Dewar & Todeschini, 2004).

2.3.2 LARGE AMOUNTS OF MOVEMENT

City structures have caused enormous amounts of movement. The historical patterns of development and low-density sprawl obstruct the provision of efficient public transport and mitigate against pedestrian movement. This system also generates large amounts of one-way traffic during

peak hours which drops dramatically during non-peak hours throughout the week. This pattern of movement as well as low density sprawl makes the provision of larger capacity modes of public transport unviable. The current lack of public transport throughout South African cities has two major consequences. The one is that many households are forced to own cars and the other is the growth of a weakly-regulated mini-bus taxi industry. The net effect has been that these two occurrences do not complement the larger capacity train and bus system but rather directly compete against them for long distance routes. This has led to an increase in the number of cars on the road, thereby escalating the number of accidents as well as pollution (Dewar, Todeschini, 2004).

2.3.3 INCREASING POVERTY AND INEQUALITY

The form of cities has significantly exacerbated the key social problems of poverty and inequality which co-exist in South African cities. These two problems have mostly racial and spatial dimensions. The concentrations of poverty lie predominantly within black Africans communities, mainly concentrated in former homelands and on the periphery of cities. The poor are either forced to purchase their own cars or to spend large proportions of their income on using public transport to access opportunities within cities. As many poor residents are unable to do either, they are trapped in space and are unable to travel to seek employment or to pursue opportunities within cities. South Africa is considered to be the most unequal and inefficient country in the world, with a high Gini coefficient of 63.4. (Dewar *et al*, 2012).

2.3.4 INEFFICIENT SOCIAL FACILITIES

Densities in cities are too low to support adequate levels of social facilities. The neighbourhood unit concept prescribes each neighbourhood to be dependent on its own internal resources for social support. In cases where the population of a neighbourhood is poor, the level of support is therefore low and if facilities cannot be provided, it is difficult for people to access these essential facilities in other neighbourhoods. This has resulted in some facilities, such as schools, being overcrowded while others are under-utilised (Dewar *et al*, 2012).

2.3.5 ECONOMIC INEFFICIENCY

Densities in cities are too low to create the vibrant local markets which are required for the growth of self-generating economic activity and for the diversification of urban economies. As unemployment in South Africa increase, more people are forced to generate their own livelihoods (Dewar *et al*, 2012). Cities do not accommodate locations for local markets. Informal trading therefore occurs in unregulated conditions that create health, safety and access problems (Southwood, 2007).

2.3.6 POOR QUALITY PUBLIC SPACES

The quality of public spaces in cities is poor despite the fact that there are large numbers of people that spend a considerable amount of time in these spaces (Dewar *et al*, 2012). Because most poor households are overcrowded, public spaces essentially become the 'living room' of poorer neighbourhoods where people go to socialise and 'escape' from their daily struggles. Most buildings fail to define and protect public spaces. This results in places of enormous community importance such as markets, community centres and station forecourts being dusty, wind-swept, uncomfortable and degraded. There is little or no attention given to these public spaces (Southwood, 2007).

- Integration of different modes of transport to ensure efficient switching of modes and to ensure that each mode plays its own role; and
- Creation of a more decentralised pattern of social and economic opportunities.

These achievements are not a short-term proposition and will take decades to be realised. They are nevertheless achievable and will require sustained investment that will need to be established immediately and sustained over the long term (Dewar & Todeschini, 2004).

2.4 NEED FOR A NEW APPROACH

It is clear that South African cities are unsustainable. One of the greatest challenges that planners are facing is to restructure settlements at a variety of scales to make them more equitable, efficient and sustainable (Dewar *et al*, 2012). For any significant improvement to be made to the urban performance of these cities, Dewar and Todeschini have identified the following interrelated characteristics that will need to be achieved (Dewar & Todeschini, 2004):

- Compaction of urban settlements to contain sprawl;
- Increases in densities to support economic and social opportunities;
- Intensification along movement routes to ensure the viability of public transport;
- Breaking down the neighbourhood unit structures by promoting activity routes that link the urban fabric together;

CHAPTER 3: LOCATING THE PROBLEM IN CAPE TOWN

This chapter gives background to the Cape Town Metropolitan and analyses the dominant planning attitudes that have historically informed the growth of Cape Town as well as the physical urban patterns that have resulted from these. This chapter also seeks to demonstrate how the generic challenges of South African cities as mentioned in the previous chapter have had an impact on the spatial form of Cape Town.

3.1 REGIONAL CONTEXT

Cape Town plays an increasingly important role within the South African context and is a large contributor to the national economy. Cape Town has a large concentration of people, services, infrastructure and resources. Over 65 per cent of the Western Cape's population resides within the municipality and the city generates 76 per cent of the province's GDP and around 11 per cent of the national GDP. The city is also a major service centre for education, shopping, health, employment and attracting people within the region and beyond. Cape Town can be seen as a functional city region that has many linkages across the municipal boundaries (see Map 3.1). Since Cape Town's current sprawling development is encroaching into the natural and rural areas within the municipal boundaries as well as outside, a challenge is to ensure that the natural and rural areas are protected and effectively integrated into the rest of the region. The future growth and development of Cape Town are therefore interlinked with the region (City of Cape Town, 2006; Pieterse, 2010).

FUNCTIONAL LINKAGES

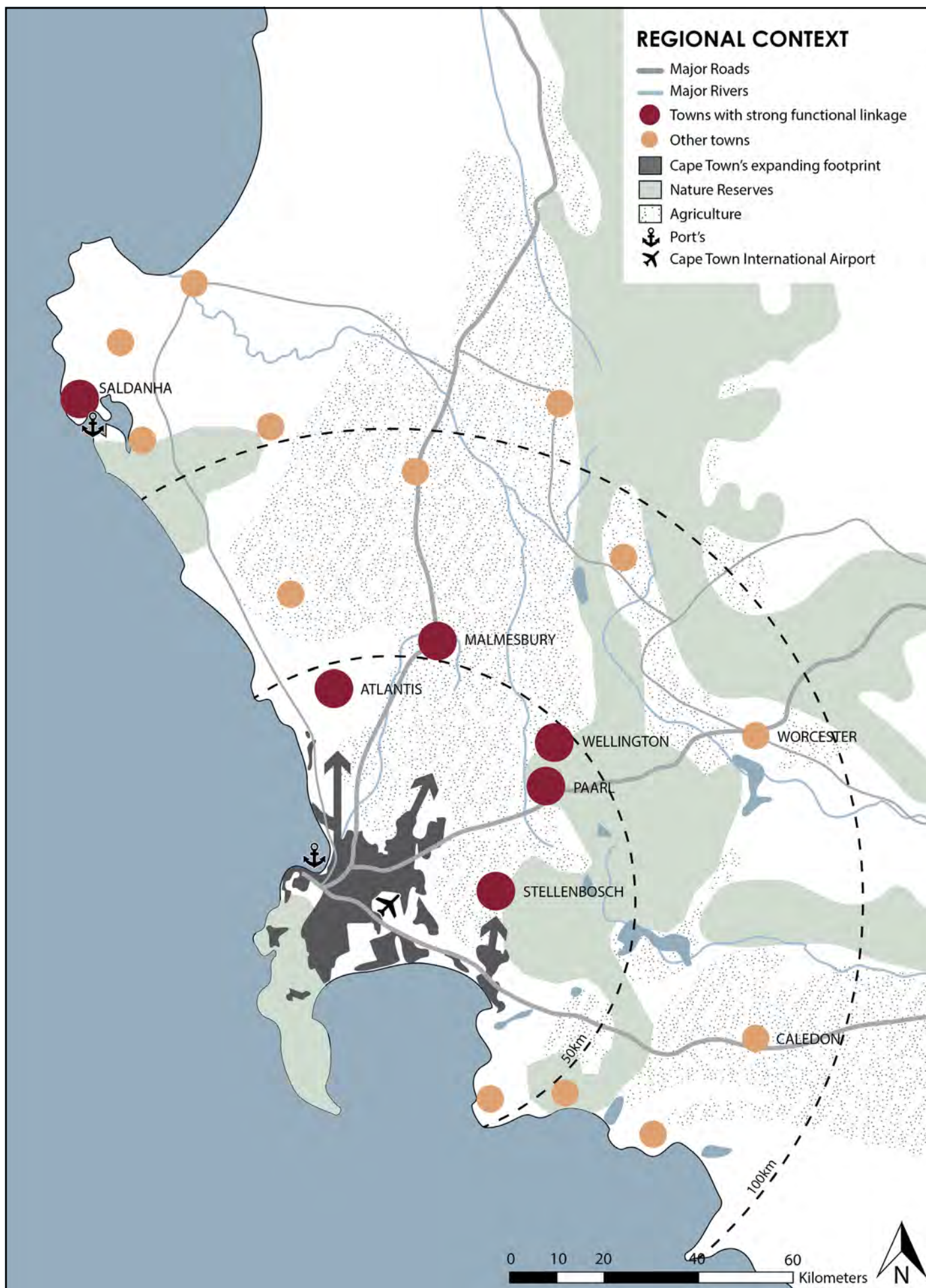
The links between Cape Town and the surrounding towns are growing. Saldanha's function as well as physical proximity to Cape Town makes it a natural stakeholder. A significant proportion of the economic activity of the Overberg, West Coast districts and Cape Winelands also fall within the Cape Town Functional Region (Pieterse, 2010). Cape Town's water is drawn from far away while new landfill and waste sites will most likely be located outside of the municipality's boundary. The natural resources as well as valuable agriculture land surrounding the municipality

are constantly being put under pressure (City of Cape Town, 2006).

REGIONAL INFRASTRUCTURE

Some of the key strategic infrastructure includes Cape Town's port and the port of Saldanha which is expected to be a catalyst for large scale industrial development. Another major infrastructure element is the Cape Town International Airport which is located at the centre of the municipality. These large-scale infrastructures have a direct impact on the pattern of economic activity, investment as well as employment in the functional region. It is therefore important that these economic assets are used to maximise economic growth, create employment opportunities and decrease the current spatial patterns of exclusion (City of Cape Town, 2006).

Cape Town should not absorb all the surrounding towns in its growth path. The unique identities, growth opportunities and functions of these towns need to be preserved and respected (City of Cape Town, 2012a). Cape Town requires co-ordination and planning that transcend the boundaries of the municipality and encompass the wider hinterland through economic linkages, commuter flows and shared facilities. Therefore many of Cape Town's challenges transcend the boundary of the municipality and need to be addressed at a more regional scale (Pieterse, 2010).



Map 3.1: Cape Town Regional Context (Source: Author; City of Cape Town, 2006)

3.2 THE EVOLUTION OF CAPE TOWN

This section examines the development of metropolitan Cape Town to understand the factors that have influenced its physical development. The current structure and form of Cape Town are the outcome of a complex range of influences. From the historical overview a number of main tendencies and patterns have been identified (Dewar *et al*, 1990).

3.2.1 HISTORIC URBAN GROWTH PHASES

Dewar and Uytendogaardt (1977) identify two types of development that have dominated Cape Town's growth: the first type of development is 'evolutionary development' that was dominant before the 1920s and the second is 'planned development' that occurred after the 1920s. The different phases of growth in Cape Town can be seen in Map 3.2.

EVOLUTIONARY DEVELOPMENT PHASE

Evolutionary development dominated the development before the 1920s. Dewar and Uytendogaardt (1977) have identified two characteristics of these evolutionary developed areas.

Firstly, development was not predetermined: the areas grew organically over time through a process of action and reaction where a particular reaction in one place caused actions in another.

Secondly, development did not occur in isolation: it was related to major structuring elements such as the roads and railway lines. These linked the initial settlement in Table Bay with its surrounding areas and caused a linear form of development to occur. Four main corridors developed during this time, namely the southern corridor to Simonstown, the eastern corridor to Paarl, the northern corridor to Saldanha and the western corridor to Sea Point. The earliest developed corridor and the most dominant was the southern corridor where Main Road connected Table Bay with Simonstown. This was later reinforced by the construction of the railway in 1862 (Dewar & Uytendogaardt, 1977). This pattern of development was modified in the following years but the basic structure has remained as the dominant form in Cape Town (Dewar *et al*, 1990).

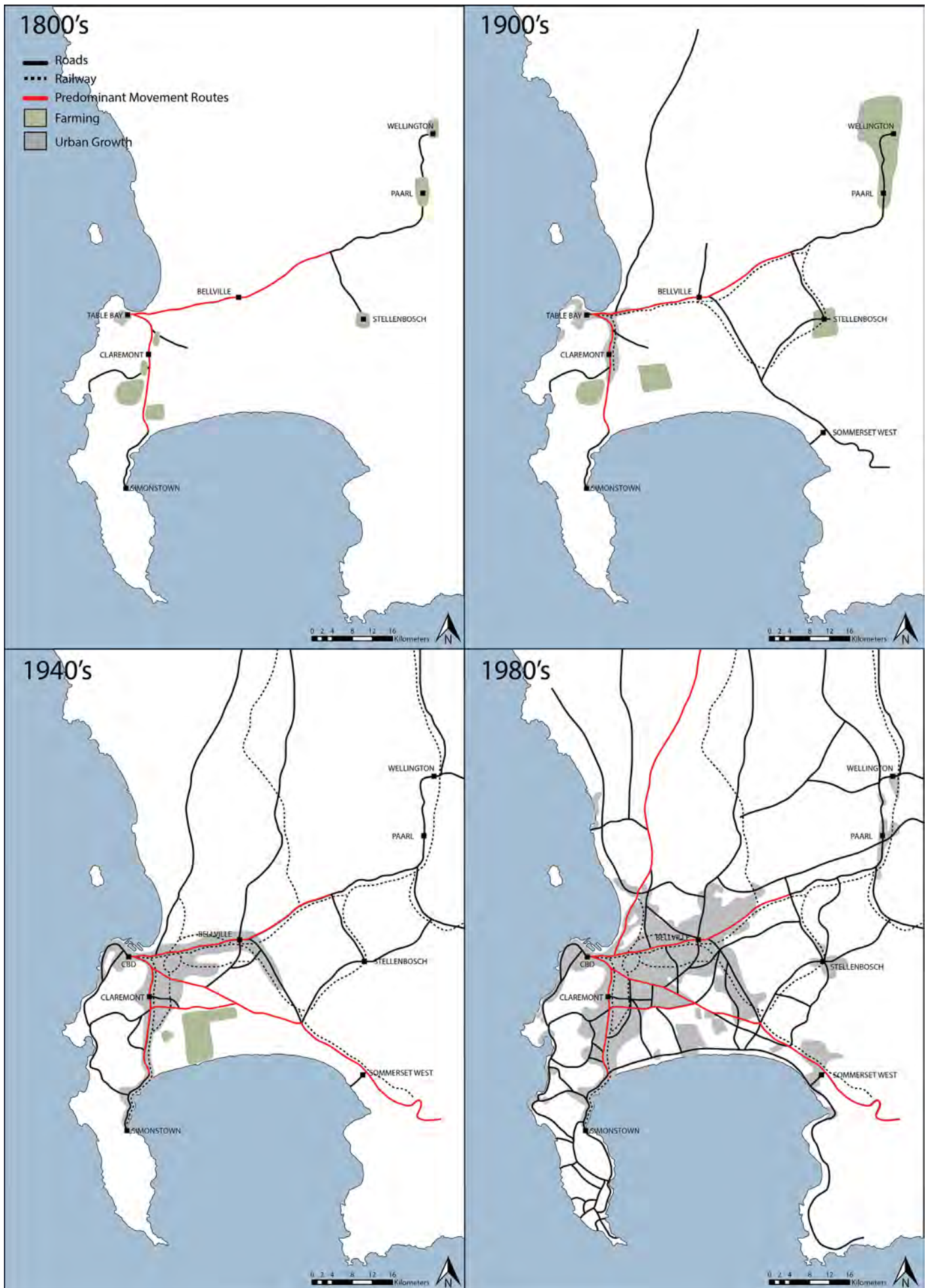
PLANNED DEVELOPMENT PHASE

The second type of development that dominated development after the 1920s was planned development. Dewar and Uytendogaardt (1977) identify three characteristics of these planned developed areas.

Firstly, the exponential population growth that occurred after the 1920s had a marked effect on Cape Town's pattern of development. The previous process of action and reaction could not keep up with the population growth. Subsequently, large areas were developed through comprehensive planning.

Secondly, the motor car had a number of effects on the pattern of development. People were no longer tied to the fixed lines of transport systems. This led to a loosening of the linear structure of development, resulting in development moving further out from the initial older settlements and infill development occurring between the previous linear corridors. The largest development was the Cape Flats, located between the southern and eastern corridors. As most of the population growth occurred within poorer communities, they were the ones who were relocated to the Cape Flats. This trend was reinforced by the by the Group Areas Act which demonstrated the separation of ethnic groups.

The third factor that affected the development pattern was the emergence of planning as a profession. The rapid population growth necessitated the development of large areas in short periods of time. Growth was no longer reactionary but rather entirely planned by professional planners. Planning practices were dominated by concepts that were either borrowed or adapted from other countries. The older evolutionally developed areas, however, still accommodated economic and social activities better than the newer planned developments. The type of economic activities that responded to the new pattern of development were labour intensive industries. This new pattern of development was characterised by separation, fragmentation and sprawl (Dewar & Uytendogaardt, 1977).



Map 3.2 : Growth of Cape Town (Source: Author; Dewar, Uytenbogaardt, 1977; Dewar *et al* 1990)

3.2.2 PHYSICAL SETTING

Another difference between the evolutionally developed areas and the planned developed areas is the prevailing natural environment. Cape Town falls within a Mediterranean climate which has dry warm summers and wet, cold winters. The city's micro-climate, soils and vegetation are affected by the presence of Table Mountain. The initial evolutionally developed areas all developed around the bottom of Table Mountain. The mountain provides protection from strong winds from the north-west and south-east. It also provides fertile soils and higher rainfall which allows for vegetation growth. The Cape Flats, however, have none of these advantages. The area used to be part of the sea floor and is now a flat plain which is low lying and covered in sand deposits. The area is exposed to strong winds and the water table is very high, which in combination with high rainfall results in flooding in the winter times. There are two differences which have resulted from the physical structure of Cape Town. The older evolutionally developed areas have better access to economic and social opportunities than the other areas. The people who live in the newer areas have to spend large amounts of time and money daily to travel to and from work. This has resulted in the poor becoming even poorer. The newer areas also do not have any of the natural advantages that the older areas have. The built environment in these newer areas has to provide weather protection and a sense of 'place' that the natural environment provides in the older areas. However, it has failed to do this (Dewar & Uytendogaardt, 1977).

3.3 SPATIAL STRUCTURE

As a result of various influences that have formed South African cities, there are a number of spatial patterns that can be identified in Cape Town. Dewar and Uytendogaardt (1991) have identified three spatial patterns that dominate the others. The practice of modernism has ensured that sprawl, fragmentation and segregation have characterised Cape Town (Dewar, 2011). These can be seen on Map 3.3.

3.3.1 SPRAWL

The overall spatial pattern of Cape Town is dominated by non-directional, low-density sprawl. The

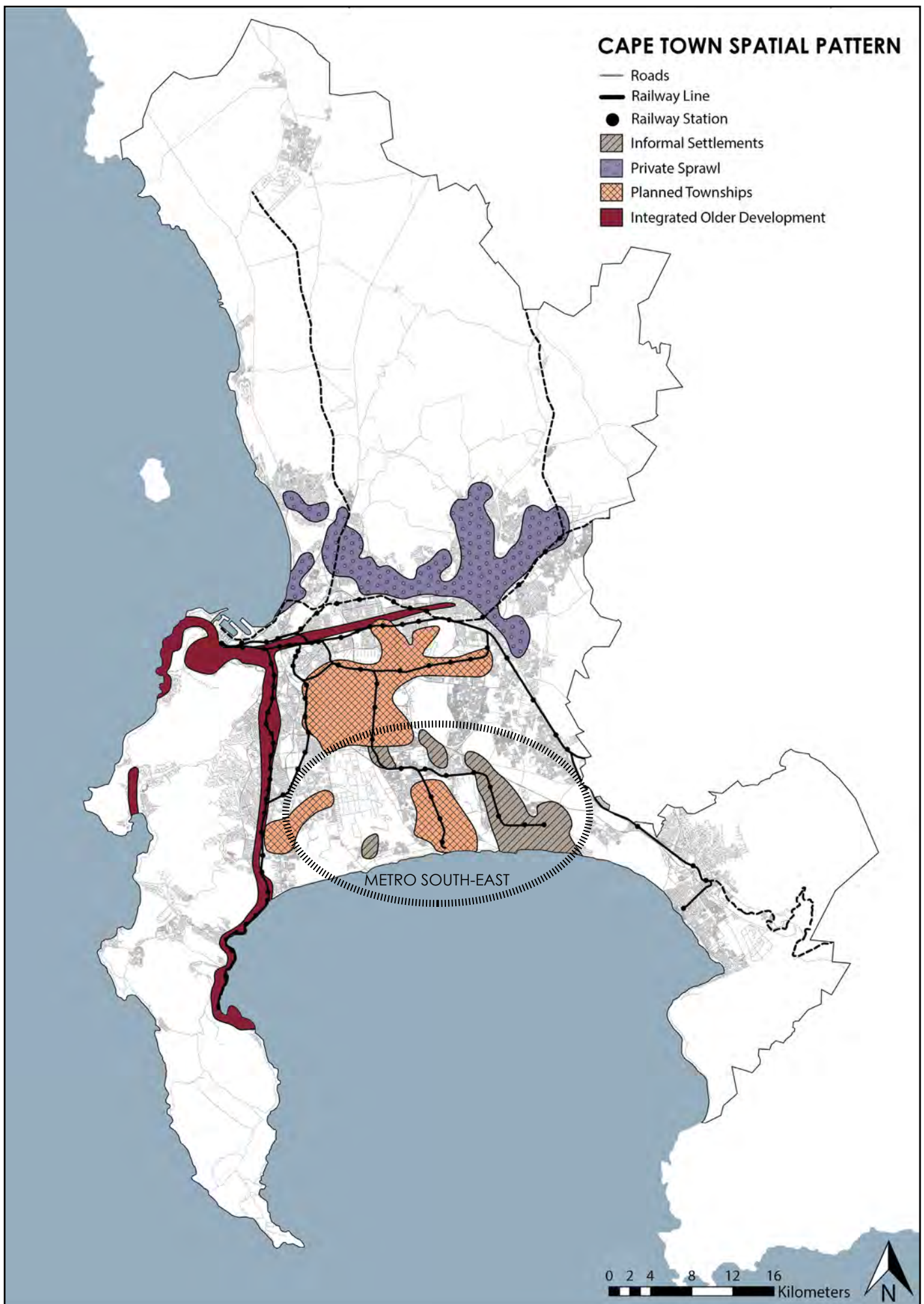
structural pattern is fragmented by the neighbourhood unit where housing is focused inwards on community centres. Pockets of development are relatively isolated and linked by freeways that bridge rather than integrate adjacent spaces. Kahn (1977) identifies three types of sprawl in Cape Town. The first is sprawl by higher income groups, developers target places of beauty. These low-density suburbs promote private single-storey dwellings on a large plot with access for cars. This contributes to the loose character of the urban fabric. This can be seen in Durbanville, which is moving further out into the countryside. Second is the search for land by authorities wanting to develop low-cost housing. New formal housing developments are large and are situated on consolidated sites, usually on the periphery of the city. Third are illegal informal settlements located on the periphery of established settlements (Kahn, 1977).

3.3.2 FRAGMENTATION

The grain of the urban fabric is coarse which is as a result of development that has occurred in small pockets of land or 'cells' that are linked by freeways or green buffers (Jenks & Burgess, 2000). The consequence of this fragmentation is high transport costs, marginalised communities, increased pollution, pressure on biodiversity areas and pressure to develop unsuitable land. This fragmentation also makes it difficult to provide well located and efficient infrastructure and services (City of Cape Town, 2012a).

3.3.3 SEPARATION

The legacy of apartheid has left a large number of poor people living on the periphery of the city, far away from economic opportunities. There is a large distribution of work, commercial and job opportunities, as well as social facilities along the older areas of the city while the Cape Flats is very poorly served. The majority of the rich are white people who live in the established activity areas that offer social and economic opportunities. The majority of the poor are coloured and black people who live on the Cape Flats. The metro south-east has the highest population of all the suburbs and a low percentage of job opportunities. Densities vary across these areas with the middle to upper income areas having low densities and the low income areas have significantly higher densities (Kahn, 1997).



Map 3.3 : Cape Town's Spatial Structure (Source: Author; Dewar, Uytenbogaardt, 1991)

3.4 URBAN GROWTH

Rapid urbanisation in Cape Town is putting pressure on the city as there is an increasing demand for access to infrastructure and services in urban areas. One of the major challenges that the city is facing is how to accommodate the needs of the growing population who are most likely to be unemployed, poor and homeless. This section will look at Cape Town's demand for basic municipal services, housing, land and resources (City of Cape Town, 2012a; City of Cape Town, 2014).

3.4.1 POPULATION GROWTH

The population of Cape Town has grown rapidly over the past 10 years as Figure 3.1 shows. The population grew from 2 892 243 in 2001 to 3 740 025 as per the 2011 census. Although the Coloured race represents the highest percentage of people in the city, black Africans show a significantly growing portion. This trend is expected to continue with in-migration, both domestically and transnationally. The total population is estimated to reach 4 119 505 by 2021 and 4 255 856 by 2030 (See Figure 3.1) (Statistics South Africa, 2011).

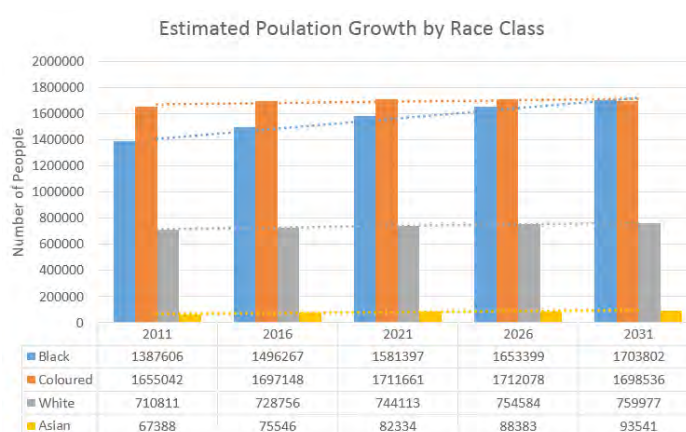


Figure 3.1: Projected Population Increase by Race (Source: Statistics South Africa, 2011)

3.4.2 INFORMAL SETTLEMENTS

One of Cape Town's biggest urban growth challenges is the increase in informal settlements and the increasing number of people living in shacks. An increase in informal housing is in line with the increase in population in the city: households living in informal dwellings increased from 19.2 per cent in 1996 to 20.5 per cent in 2011. There are currently 376 informal settlements in Cape Town

which consists of 146 488 dwellings. This suggests that Cape Town's population of poor households is increasing and that more households are relying on housing delivery (City of Cape Town, 2014a).

3.4.3 ACCESS TO SERVICES

Access to potable water in Cape Town is relatively good with 96.5 per cent of households having access. There are approximately 90 per cent of households that have access to basic sanitation services which makes it the second highest rate in the Western Cape. Household electricity access levels are relatively good: in 2013 93.9 per cent of households had access. Cape Town's household access to refuse removal services is the highest in the province with 93.9 per cent of households having access. Housing remains one of the city's greatest challenges. In 2013 only 78.3 per cent of the population had access to formal housing which makes it the lowest in the province (Western Cape Government, 2014).

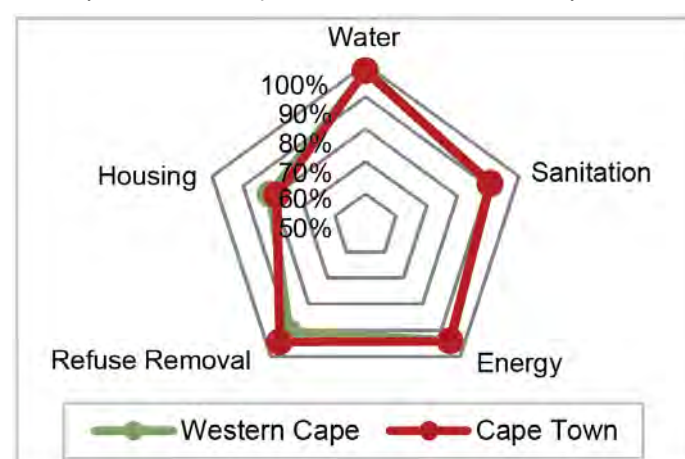


Figure 3.2: Access to basic services in 2013 (Source: Western Cape Government 2014)

3.4.4 HOUSING BACKLOG

According to the Cape Town SDF the city will need to accommodate 15 000 to 18000 new households every year while still having to address the existing housing backlog (City of Cape Town, 2012a). Table 3.1 illustrates the current housing backlog per housing category in Cape Town. The total number of units amounts to 373 641. The demand is estimated to escalate to 650 000 by 2030. If 10 000 units per annum are provided, the backlog would be 560 000 by 2030. Only if supply increase to 30 000 units per annum will the housing backlog be met by 2030 (City of Cape Town, 2010).

Category	No. of households	%
Overcrowding in CoCT rental stock	87 000	23
Overcrowding in RDP or BNG housing	70 000	23
Backyarders in formal community Residential Unit areas	41 000	19
Backyarders in RDP or BNG areas	34 000	19
Informal settlements	141 141	38
Total Households	373 641	100

Table 3.1: Cape Town Current Housing Backlog as of 2011
(Source: Statistics South Africa, 2015)

Figure 3.3 estimates the land required for subsidy housing. The first scenario assumes that 10 000 subsidy houses with an average erf size of 100m² will be delivered per annum. The second scenario assumes that a change in housing delivery policy in 2016 will result in 2 500 subsidy houses and 17 000 site-and-service sites being delivered per annum (City of Cape Town, 2012c).

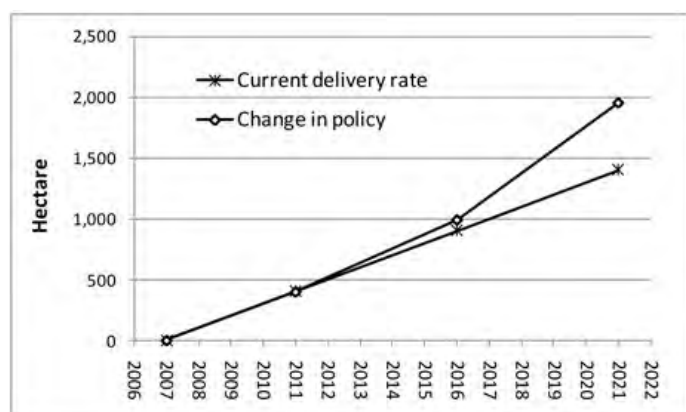


Figure 3.3: Estimates for land required for subsidy housing
(Source: City of Cape Town, 2010).

3.4.5 LIMITED LAND AVAILABLE

The size of the Cape Town Metropolitan Region is 2440km² (244 000ha). If current rates of land consumption (650 ha/per annum) continue, this would consume the majority of the land suitable for all types of development within the next 50 to 60 years. An additional factor worthy of consideration is the hazardous land use which reduces land available for development. Examples of such hazardous land use include the 16km buffer of Koeberg Nuclear Power Station, the Cape Town International Airport, flood plains river corridors and fire prone regions. Depicted in Figure 3.4 is the projected city expansion

compared with estimated land available for general urban development (residential, industrial, commercial, mixed use) within the urban edge. This suggests that there is sufficient land available for development within the urban edge until 2021 (City of Cape Town, 2010).

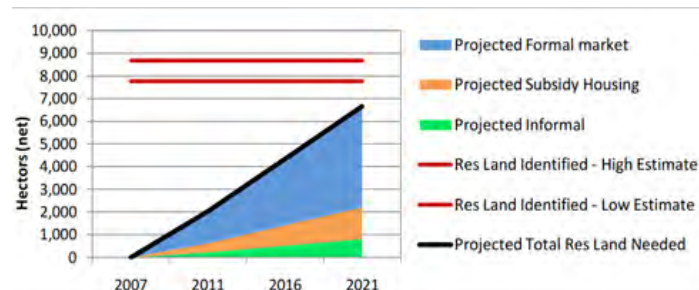


Figure 3.4: Projected residential land demand compared to residential land identified within urban edge (Source: City of Cape Town, 2010).

3.4.6 RESOURCE CONSUMPTION

The consumption of water and energy within the city is growing faster than the city's population. This has an impact on the economy and on the quality of life of urban residents, especially the poor. The demand for water and energy is exceeding the natural capacity and the city's ability to supply these resources. At current water level consumption the remaining surface water will only satisfy this demand for the next few years. The city will need to investigate costly water sources such as extracting water from aquifers, recycling water or desalinating sea water. With the city's electricity demand growing by 4 per cent a year, the CoCT lacks energy-generating capacity. The city already imports most of its power from Mpumalanga and any expansion of Koeberg's generating capacity will have a significant impact on the spatial development of the city (City of Cape Town, 2012a).

3.5 FUTURE GROWTH OPTIONS

Cape Town is faced with many challenges that are associated with rapid urban growth and the increasing need for housing, infrastructure and service delivery for the growing population. This urban growth has implications for the municipality's capacity to provide new infrastructure and services as well as the maintenance of existing stock. It is therefore necessary that the municipality manages its future urban growth while at the same time ensuring the effective and equitable provision of essential services to the growing population (City of Cape Town, 2014). There is limited future spatial growth options available in Cape Town. Koeberg Nuclear Power Station, the valuable agricultural land to the east and north, the ocean to the west, the False Bay coastline to the south and topographical constraints limit Cape Town's possible growth direction (City of Cape Town, 2012a).

Between 2009 and 2012 the CoCT conducted a trans-disciplinary planning study that was intended to inform the growth of Cape Town. The study included all land within and outside of the current urban edge. The growth options were informed by the principles of sustainable human settlements as well as by the main drivers of urban growth (population growth) and supply side drivers (suitable land, availability of bulk infrastructure). These informed the location and the extent of the growth options. Attention was given to how growth could reinforce the current Cape Town SDF's strategies of promoting a compact city form and transit-orientated development. The study modelled three medium term (25 to 30 years) and a long term (50 years) spatial growth option for the city. Map 3.5 show the spatial development options for the west coast growth corridor and the northern growth corridor (City of Cape Town, 2014c).

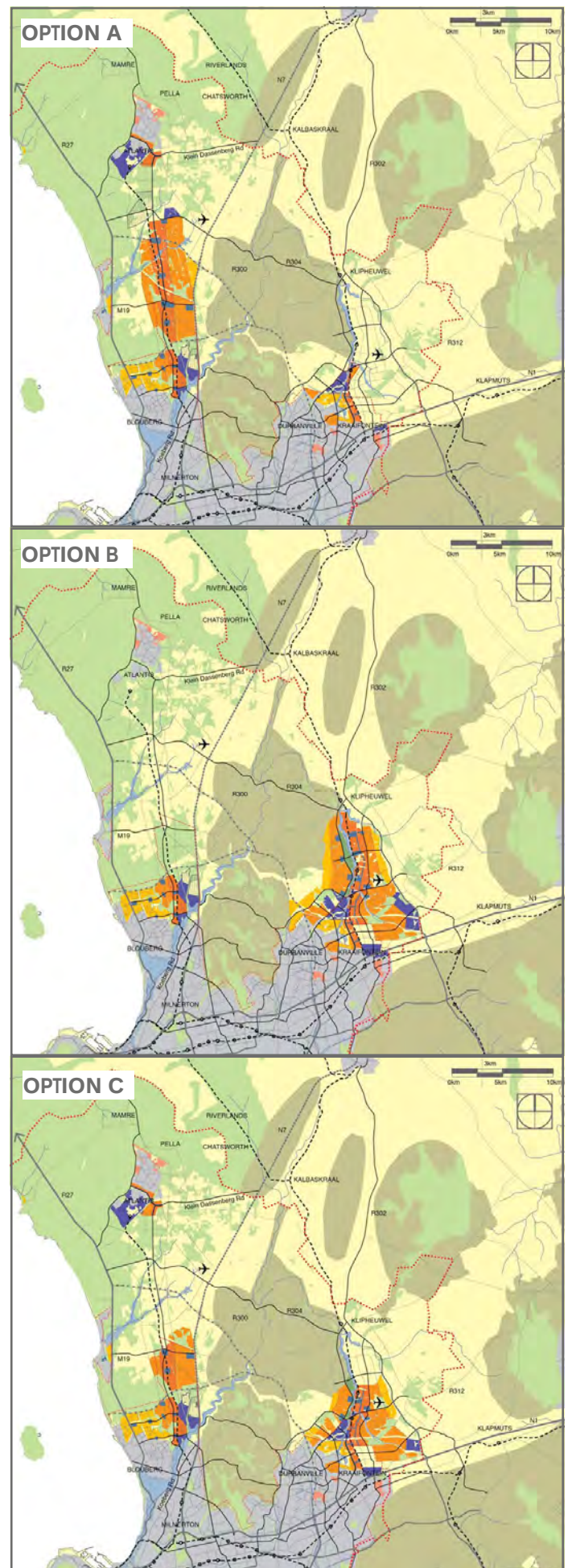


Figure 3.5: Three medium-term growth options for Cape Town (Source: <http://citythinkspace.com/>)

CHAPTER 4: CONCEPTUAL FRAMEWORK

The discipline of planning has strong value and ethically based foundations. It is the acknowledgement of these values and ethics that transforms the process of design into rational argument, as opposed to opinion (Dewar & Louw, n.d). This chapter provides an explanation of the values and ethics used in the formulation of the planning frameworks. The difference here between values and ethics is that the values are the researchers personal beliefs that will be used to make decisions regarding good and bad while ethics are seen as a set of rules that are based on the moral values. The values are very personal while the ethics are more societal.

4.1 VALUES

The planning frameworks has the ultimate objective of sustainable urban development for the Cape Town metropolitan area. Although the concept of sustainability is common, in practice it is often not fully achieved. This is partly because of the fact that everyone has a different understanding of what urban sustainability is and this has caused numerous problems among civil society, developers, and authorities (Jabareen, 2009).

The most frequently used and best understood definition of sustainable development comes from the Brundtland Commission report of 1987 that states that "...sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (Mebratu, 1998). This definition implies that development needs to cater for everyone who is currently living and at the same time avoid the irreversible use of non-renewable resources that could limit the development of future generations. The assumption is that development needs to balance economic, social and economic needs simultaneously. This is also known as the triple bottom line (see Figure 4.1). This model of sustainable development has, however, experienced considerable criticism (Pieterse, 2010).

A major weakness of this model is that it assumes that the economy, society and environment are independent of each other and leads to assump-

tions that trade-offs can be made among the three spheres. The separation of environment, society and economy has led to a techno-centric approach where issues of society and the environment are disregarded. It focuses on pollution control, lowering resource use and greenhouse gas trading rather than tackling the deeper issues or seeing the connections between society, economy and the environment (Giddings, Hopwood, O'Brien, 2002). Another problem with this model is that it is too abstract to understand how sustainable development transpires at the urban level and it does not acknowledge the political dimension of processes. Currently cities in South Africa are not sustainable: urban inhabitants as well as economic activities depend on environmental resources from outside of the city's footprint (Allen, 2009).

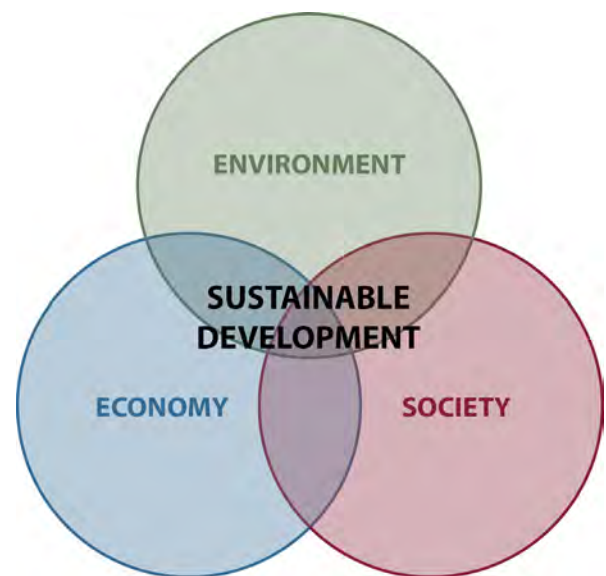


Figure 4.1: The Triple Bottom Line of Sustainable Development(Source: author)

To understand what sustainability means and how it affects cities requires a more holistic vision of the concept. Environmental, economic and social dimensions still apply but with the increase in urbanisation world-wide, the built environment also needs to be recognised as a central component of sustainability. For cities to achieve sustainable forms of urbanisation it is critical that institutional and political decisions promote the cooperation of different stakeholders with one another (Allen, 2009).

The development framework makes use of the sustainable urban development model developed in the work of the scholar Adrian Allen who acknowledges that urban development will only be acceptable and in the public interest if it is economically viable, ecologically justifiable, socially equitable, physically integrated and politically sustainable (Allen, 2009). Allen's concept of sustainable urban development is illustrated in Figure 4.2. To assess whether any development, policy or trend is moving towards sustainable urban development or against it, it is necessary to consider the relationship amongst the five dimensions that are shown in Figure 4.2 below. The outer circle represents the ecological capacity of an urban region and acts as a measure to assess whether interventions in each of the five dimension are moving towards sustainable development. The corners of the square within the circle represent the economic, social, ecological and built environment dimensions while the political dimension articulates them. The political dimension is seen as the regulating mechanism to ensure that all other dimensions remain within the boundary of sustainability. This more holistic view of sustainability challenges our understanding of cities and the multiple impacts they have on society and the environment in the process of urbanisation (Allen, 2009).

FIVE DIMENSIONS OF URBAN SUSTAINABILITY

Economic sustainability: the ability of the local economy to sustain itself without causing irreversible damage to natural resources and without increasing the city's ecological footprint (Allen, 2009).

Social sustainability: a set of actions and policies aimed to improve the quality of life but also committed to fair access and distribution of rights to use the natural and built environment (Allen, 2009).

Ecological sustainability: the impact of urban production and consumption on the health of cities and the global carrying capacity (Allen, 2009).

Physical sustainability: the capacity and ability of the built environment to support human life and productive activities (Allen, 2009).

Institutional sustainability: the quality of governance systems guiding the relationship and actions of different actors among the four dimensions. It involves the participation of civil society in all areas of decision making (Allen, 2009).

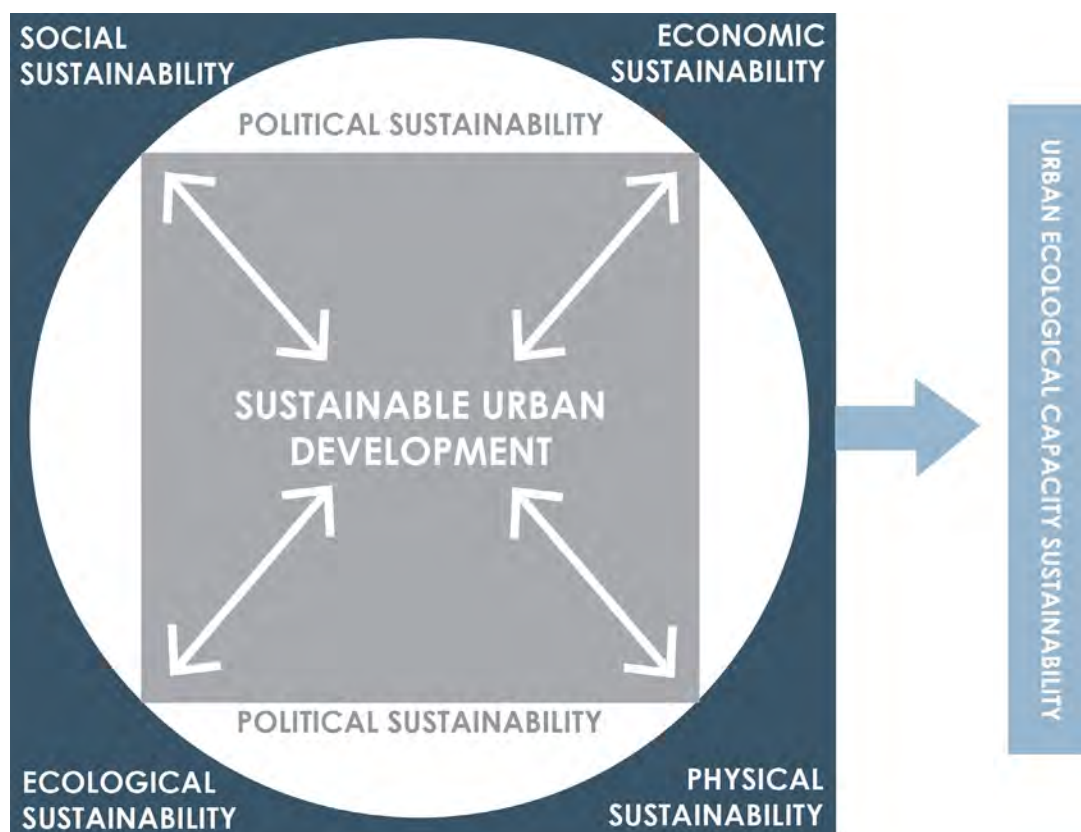


Figure 4.2: Five Dimensions of Sustainable Urban Development (Source: author; Allen, 2009)

4.2 ETHICS

Dewar and Uytienbogaardt (1991) identify two ethical pillars in which planning needs to be rooted, namely humanism and environmentalism.

4.2.1 HUMANISM

The first pillar is humanism, Dewar and Louw (n.d) state that humanism recognises that the basic function of settlement design is to improve the lives of people and to meet human needs. This concern with making human settlements occurs in a context that is dominated by rapid population growth, urbanisation and technological changes. Humans have two different kinds of needs:

INDIVIDUAL NEEDS

The first is individual needs that have to be met to enrich the lives of people. This can be done by creating contexts which give people freedom to improve their own circumstances (Dewar & Louw, n.d).

GROUP NEEDS

The second is group needs which arise when people live socially. This collective set of concerns places design within the theoretical field of 'development' (Dewar & Louw, n.d).

In satisfying these human needs the starting point is people with disabilities, people that move on foot and people that do not have access to resources. If these conditions are not met then settlements will perform poorly and it is usually the most marginalised who will be affected the most (Dewar & Louw, n.d).

4.2.2 ENVIRONMENTALISM

The second pillar relates to nature which provides resources on which human life depends. Conservation does not simply mean to 'preserve' or to 'prevent change': rather, it incorporates the following three principles:

BALANCE

There is a need for balance between human activities and the natural resources which are affected by these human activities. Any human action needs to take these natural resources into

consideration and respect them (Dewar & Uytienbogaardt, 1991).

REGIONALISM

There is an interdependence between the characteristic of a place, people's activities in that place and the emergence of culture (Dewar & Uytienbogaardt, 1991). This is also known as McKaye's triad of domains theory which is discussed further in section 7.2.1.

PLACE-MAKING

The third is the importance of the creation and protection of the qualities of a place. The values of people are influenced by the places in which that they live. Different landscapes are all important and therefore design needs to retain and work appropriately with these different landscapes which make up a place (Dewar & Louw, n.d).

RESOURCES

There is a recognition that nature provides resources which should be used to improve human life. These resources are important and therefore need to be utilised in a sustainable way. Wherever possible, the use of renewable resources should be promoted (Dewar & Louw, n.d).

The conclusion from these ethics is that planning needs to be creative. It is not about giving people what they want as people's expectations are largely determined by their experiences. It is the role of planning to show possibilities and opportunities. As Dewar and Uytienbogaardt (1991: 13) state "...it is only through this search for possibilities that planning can genuinely enrich society."

CHAPTER 5: URBAN GROWTH MANAGEMENT

Mass urbanisation and the inability of government to accommodate the increasing urban population have led to the need for urban growth management in South African cities. Urban management should aim to guide intensive urban development towards the most appropriate locations in cities and to consider the optimal use of existing infrastructure. This chapter outlines the ideas used in the formulation of the planning framework on how urban growth should be handled (Horn, 2009).

5.1 THE NEED FOR COMPACTION

Some of the arguments that are in favour of compaction include the need to reduce movement, air pollution, dependency on non-renewable resources, to make the most of existing investment in infrastructure and social facilities, and to increase the thresholds of services (Jenks & Burgess, 2000). Some of the key factors for the argument for compaction in South African cities include the following:

1. Unemployment

The unemployment rate in South African cities is very high and continues to increase. There are large numbers of people that have no option but to make a living through self-generated income from small businesses. However, a precondition for small businesses to thrive are intensive and vibrant local markets (Jenks & Burgess, 2000).

2. Movement

Movement on foot is the only affordable mode of transport for the majority of residents in South African cities. Urban environments therefore need to operate efficiently and at the pedestrian scale. This requires compaction (Jenks & Burgess, 2000).

3. Public Transport

Owing to the historical pattern of economic opportunities and the sprawling of urban growth, South African cities generate large amounts of one-way movement at peak hours and a dramatic decrease in non-peak times. This pattern of low-density sprawl makes public transport systems such as rail unviable (Jenks & Burgess, 2000).

5.2 THE COMPACT CITY CONCEPT

The primary spatial principle that was used in the preparation of the planning framework was the concept of the compact city. The compact city model is considered to be the most effective planning strategy to contain urban sprawl and develop more sustainable cities (Cereda, 2009).

Jenks and Burgess (2000: 10) defines the compact cities model approach as "...to increase built area and residential population densities; to intensify urban economic, social and cultural activities and to manipulate urban size, form and structure and settlement systems in pursuit of the environmental, social and global sustainability benefits derived from the concentration of urban functions".

The main focus of the compact city is on the provision of transport, resource efficiency, social equity, accessibility and economic viability. It is essentially a high density, mixed-use city with clear boundaries and an efficient public transport system (Jabareen, 2006). Urban compaction can be implemented in a variety of scales from urban infill to the creation of new developments. The idea of a compact city involves many strategies that all aim to create compactness and density that can solve many of the problems of today's cities. This concept is favoured because it offers the opportunity to reduce fuel consumption for travelling since facilities and services are closer together, urban land can be reused and rural land beyond the urban edge is protected (Jabareen, 2006).

The compact city model should be supported in South Africa cities for several reasons. Firstly, compact cities are efficient and allow for more sustainable modes of transport. Secondly, they are seen as a sustainable use of land as they reduce sprawl, preserve land in rural areas and encourage infill development in urban areas. Thirdly, the model promotes diversity, social cohesion and cultural development. Some also argue that the model is equitable as it offers good accessibility within cities. Fourthly compact cities

are economically viable because infrastructure such as roads and electricity can be provided cost-effectively and the high population densities are able to support local services and businesses (Jabareen, 2006).

5.2.1 OBJECTIVES

The main objectives of the compact cities concept include the following:

1. Minimise city footprint: Promoting higher density development can put an end to the large consumption of land and move cities closer to a more compact urban form (Horn, 2009).
2. Preserve agriculture and environmentally-sensitive land: Urban sprawl encroaches onto valuable agriculture land and environmentally-sensitive areas which need to be conserved and protected (Horn, 2009).
3. Improve public transport: An increase in densities in nodes and along public transport corridors can ensure efficient and accessible public transport facilities and accordingly minimise the dependence on private transport (Horn, 2009).
4. Reduce inequality: All people should have easy access to a broad range of opportunities, facilities and places. This creates two challenges: how to make existing opportunities more accessible to the majority of the population and how to create a new hierarchical pattern of opportunities (Jenks & Burgess, 2000). Creating more compact and higher density development in urban areas can ensure greater access to opportunities for all (Horn, 2009).

5.2.2 OBSTACLES

Interest in the compact city model over the past decade has been limited to developed countries such as the United States, Australia and Europe. This model should, however, be encouraged in developing countries such as South Africa. Unfortunately, there are a number of obstacles to achieving compaction in South African cities that will need to be overcome (Jenks & Burgess, 2000).

POLITICAL WILL

The co-operation of local authorities is required to slow down the speed of urban sprawl. The revenue of local government mainly comes from taxes on land development. This has created an attitude that any development is good as local government will receive more revenue. It is because of this that private sector developers have become the central players in determining the urban footprint of cities. The willingness of local government to promote compaction is necessary if sustainable urban forms are to come into being (Jenks & Burgess, 2000).

COST OF LAND

Well-located land is more expensive than land on the periphery of cities. South Africa's housing policy provides a once-off capital grant for each household earning below R3500 per month. This amount is intended to cover the costs of land, services and the top structure. Since the government is focused on providing as much housing as possible, the price of land has become the least determinant factor in housing developments and therefore they continue to be developed on the periphery of cities where land is the cheapest (Jenks & Burgess, 2000).

ANTI-URBAN VALUES

Cultural factors influence the social acceptance of the compact city model. Many South Africans have anti-urban values as they view the ideal city as made up of low-density areas separated by green-belts. This image is based on the experience that urban residents have of urban life and their inability to imagine a different way of life. Examples of what compact living could look like are needed to educate people. The government should be involved in pilot projects that support the principles of compact cities which can become a precedent for compact city living (Jenks & Burgess, 2000).

5.3 URBAN CORRIDOR APPROACH

While there have been many attempts to define the compact city model, the biggest question which remains is which approach should be used in undertaking compaction? There are significant disputes over the preferred spatial model for compaction (Jenks & Burgess, 2000). It is argued here that urban corridors are an efficient approach to promote more compact, equitable and integrated cities. While South African cities need to be intensified, it is unrealistic to create a unified high-density city. A more realistic goal is to create intensive corridors throughout the city to avoid further urban sprawl and to bring different people and functions together in a more compact settlement (Cereda, 2009). As Dewar (2011) states, intensification therefore needs to be structurally and strategically driven. Making corridors the focus of planning is a useful way to achieve this.

5.3.1 URBAN CORRIDORS

“Corridor planning is an approach which seeks to promote intensity, to encourage non-motorized and public transportation, to stimulate a mix of activity, to promote small business, to pursue urban integration vigorously and to improve equity and convenience” (Dewar, 2011: 815).

The formation of corridors can be seen in most parts of the world, especially where activities have had the freedom to respond to patterns of access. This phenomenon has, however, been discouraged in South Africa since the modernist planning paradigm. There are three reasons for this. Firstly, a central component of the modernist paradigm was to promote the separation of land uses. Corridors are opposed to this as they are intensively mixed-use zones. Secondly, another central concern of modernism was increasing mobility and the dominance of the motorcar. Corridors promote accessibility rather than mobility. Lastly, modernism was concerned with ribbon development where development was encouraged along mobility routes and discouraged along more continuous routes. It is apparent that the performance of South African cities has suffered because of these reasons and that it is time to change this way of thinking (Dewar, 2011).

5.3.2 THE NATURE OF CORRIDOR

Corridors are not solely concerned with transport, although public transport is an important aspect of corridors. They are concerned with urban issues. Corridors are a broad band of mixed use activity that intensifies around a hierarchy of interlinked transport routes. More continuous transport routes in cities represent energy flows as they carry flows of people and finance. It is because of this energy that more intensive activities tend to locate around these continuous transport routes that are places of high accessibility and therefore energy. These flows of people and finances are markets for goods and services. The higher the amount of movement is along a route, the greater potential there is for markets (Dewar, 2011).

The introverted neighbourhood cells that have been created by modernist planning have resulted in the formation of space bridges throughout South African cities. These space bridges are limited access routes that connect only a few points along their route. They create barriers between communities and result in nodes that are limited to a small number of locations. They essentially divide a city into ‘boxes’ (Dewar, 2011).

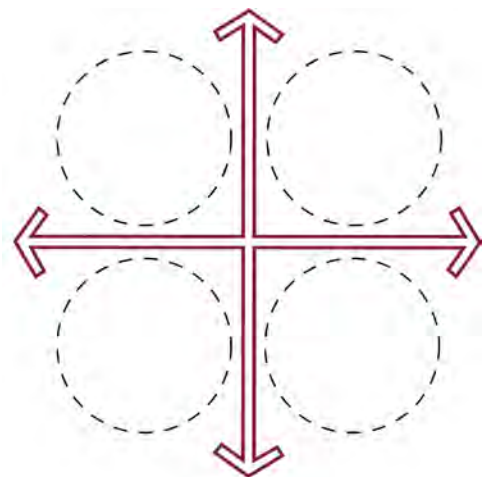


Figure 5.1: Space Bridges (Source: Dewar, Louw, n.d)

Continuous routes that tie a number of areas together through which they pass can be seen as space integrators and are able to break down these space bridges. Space integrators are stop-start routes along which intense activities occur. These routes also bring a number of local communities together through the provision of shared facilities and amenities (Dewar, 2011).

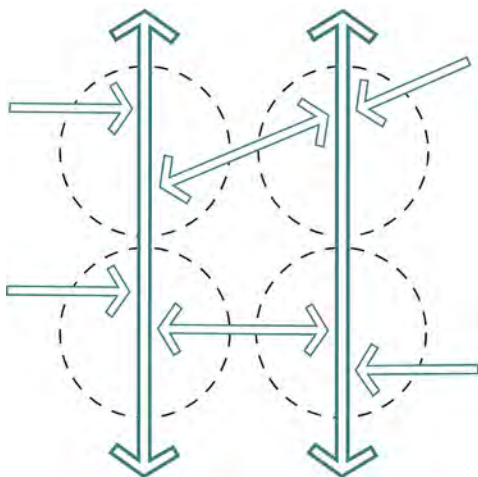


Figure 5.2: Space Integrators(Source: Author; Dewar, Louw, n.d)

Intensive activities do not normally occur evenly along the corridor: they tend to cluster at points of high accessibility along the corridor. This creates hierarchies of nodes that correspond with the hierarchies of movement. The pattern that then tends to emerge is that of ‘beads on a string’ with nodes of different activities occurring along the corridor (see Figure 5.3). Over time these nodes grow towards each other along the corridor (Dewar, 2011).

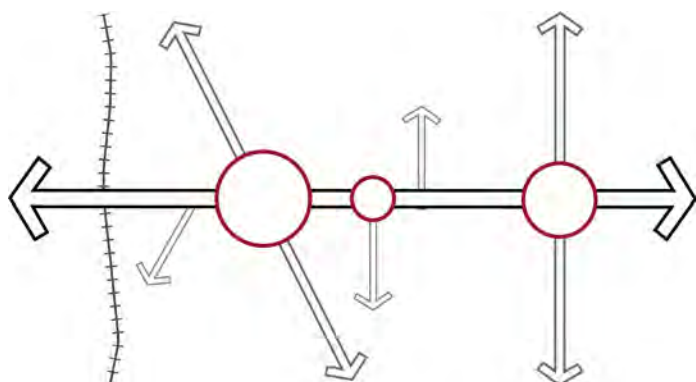


Figure 5.3: Hierarchy of Access and Nodes (Source: Author; Dewar, Louw, n.d)

Corridors are made up of a hierarchy of larger and smaller corridors. The smaller corridors align with less significant continuous routes that intersect with the main spine and respond to Non-Motorised-Transport (NMT) traffic flows. It therefore makes sense to place NMT-generating facilities, such as schools and other social services, along these smaller corridors (Dewar, 2011).

High residential densities are a prerequisite for corridors as they are needed to support public transport, commercial and retail activities. The highest residential densities should occur around

the primary activity routes and gradually become less dense further away.

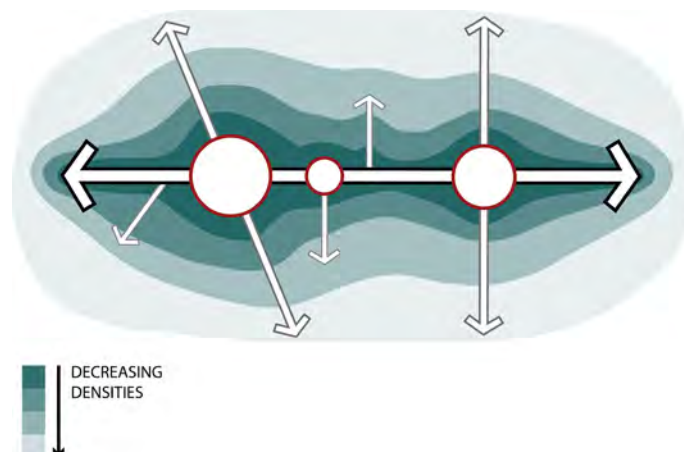


Figure 5.4: Space Integrators(Source: Author)

Corridors can be either one-sided or two-sided but they are much stronger when they are two-sided. For this to occur the width of the road must not be too excessive. The creation of pinches can reduce widths and emphasise the entry into a node (Dewar & Louw, n.d).

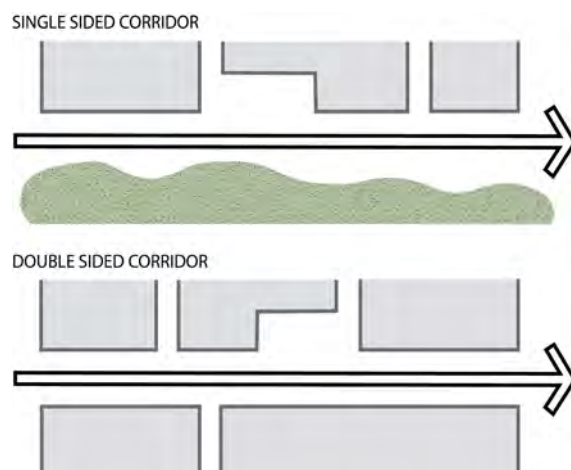


Figure 5.5: Corridor Widths (Source: Author; Dewar, Louw, n.d)

5.3.3 IMPLEMENTATION

Corridors are not a short-term solution that can be imposed: the process of developing a corridor is a long-term one. The concept of corridors is not about end-states but rather about beginnings. How quickly or slowly they develop varies with the economic and social variables of the context and this can not be anticipated. A network of corridors should be allowed to emerge over time and at different scales. The promotion of urban corridors is not a tool: it is a way of thinking (Dewar & Todeschini, 2004).

The corridor concept can be used as an instrument for city planning where the whole city is organised around an interlocking system of large corridors. Economic and spatial planning should therefore make these larger corridors the centre of their decision-making. Corridor initiatives include a variety of different projects such as housing infill projects, provision of public facilities, public transport projects, local economic development programmes and public space programmes (Dewar, 2011).

5.3.4 ADVANTAGES

There are a number of advantages that stem from making corridors a focus of planning.

- The approach promotes economic decentralisation since accessibility is co-ordinated and movement within the city is reduced.
- Along any corridor there are points of high accessibility. The price of land tends to be higher at these points. This provides a range of land prices that occur along the corridor which ensures that all activities can afford to find a place in the system (Dewar, 2011).
- The linear nature of corridors enables large and small enterprises to establish a relationship with one another. Larger enterprises generate more movement that is appropriate for highly accessible locations while smaller enterprises that do not create as much movement can locate themselves in the flow that is generated by the larger enterprises and feed off of the energy (Dewar, 2011).
- The most intensive activities automatically occur with public transportation. Since the spine of the corridor is a continuous route, which is the where public transport logically moves, equity and accessibility is promoted (Dewar, 2011).
- Corridors are able to break down urban fragmentation and increase integration as they are able to tie local areas into an integrated systems. (Dewar, 2011).
- As corridor initiatives involve a range of different projects, they are able to co-ordinate the different spheres of government as well as different departments (Dewar, 2011).

PRECEDENT: GOTHENBURG, SWEDEN

Gothenburg is the second largest city in Sweden with a population of 536 790 and an area of 448 km². In the 1960s the city expanded drastically because of the increase in jobs from the harbour and industrial sites. It expanded into the agricultural land on the periphery of the city. New developments continued to the north of the city, far from the city centre. At present the distance between the north and south part of the city is about 50km. After the city's economic collapse there was an employment crisis as industrial areas were abandoned. The result of the continuous growth of the population, the high demand for housing, the economic crisis of the city and the increase in use of private vehicles caused the city to expand and sprawl outwards to the north of the city. A comprehensive plan was created for Gothenburg in 2009. It was made up of 13 strategies to promote sustainable development. The compact city strategy was chosen as the most effective planning system to promote sustainable development. The main objectives of the plan was to develop the city centre, strengthen public transport, concentrate on key nodes and corridors, create an urban edge to preserve land for future development and promote mixed-use development. Putting the compact city model in place required wide cooperation among the different stakeholders of the city. The comprehensive plan was just the starting point and required the collaboration of public transport authorities, politicians and civil society with the municipality to combat urban sprawl (Cereda, 2009).

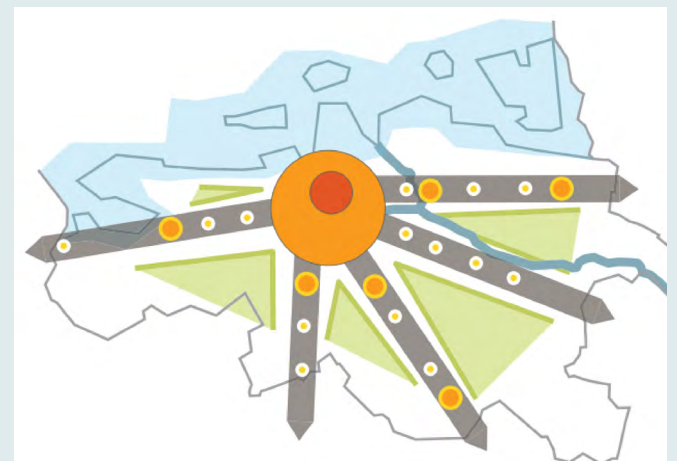


Figure 5.6: Gothenburg Regional Structure
(Source: Cereda, 2009)

CHAPTER 6: GIVING DIRECTION

It is important to understand what gives direction to urban growth management in order to resolve the various problems that South African cities are facing and to create positive urban environments. This section looks at different aspects that gives direction to urban management and that needs to be addressed in spatial plans such as global issues, performance qualities and the legislative and policy context within which urban growth management takes place.

6.1 INTERNATIONAL TENDENCIES

6.1.1 URBANISATION

Today over half of the world's population live in cities. It is expected that by 2050 an extra 2.5 billion people will be living in cities because of urbanisation and the growth of the world's population. 90 per cent of this increase is expected to happen in Asia and Africa. This means that by 2050 66 per cent of the world's population will be living in cities (United Nations, Department of Economic and Social Affairs, 2014). It is expected that most of this population growth will happen in cities in developing countries. The urban populations are stabilising in areas that are already urban, such as Europe and North America, while regions that have higher rural populations, such as Asia and Africa, are likely to experience exponential rates of urbanisation in the coming years (UN-Habitat, 2012). The types of cities that urban

dwellers reside in are diverse: about half of urban residents live in small cities with less than 500 000 inhabitants and almost one-eighth live in the 28 mega cities of 10 million inhabitants or more. The number of megacities is expected to rise to 41 by 2030 (see Figure 6.1). Where in the past most of the largest cities were found in developed countries, they are now concentrated in developing countries in Asia, Africa and South America (United Nations, Department of Economic and Social Affairs, 2014).

The rapid and largely unplanned urban growth is unsustainable, especially when the necessary infrastructure is not developed and if policies are not implemented to ensure that the benefits of living in cities are equally shared amongst inhabitants (United Nations, Department of Economic and Social Affairs, 2014). According to the World Bank, urbanisation will result in a large loss of natural land as the built environments will expand into their surroundings. It is expected that cities in developing countries will triple their land area by 2030 (UN-Habitat, 2012). Urban areas are also more unequal than rural areas as hundreds of millions of the urban poor live in slums in cities. In many cities unplanned urban growth has led to rapid sprawl, pollution, environmental degradation and unsustainable production patterns (United Nations, Department of Economic and Social Affairs, 2014). Despite these negative aspects of urbanisation, cities do have positive

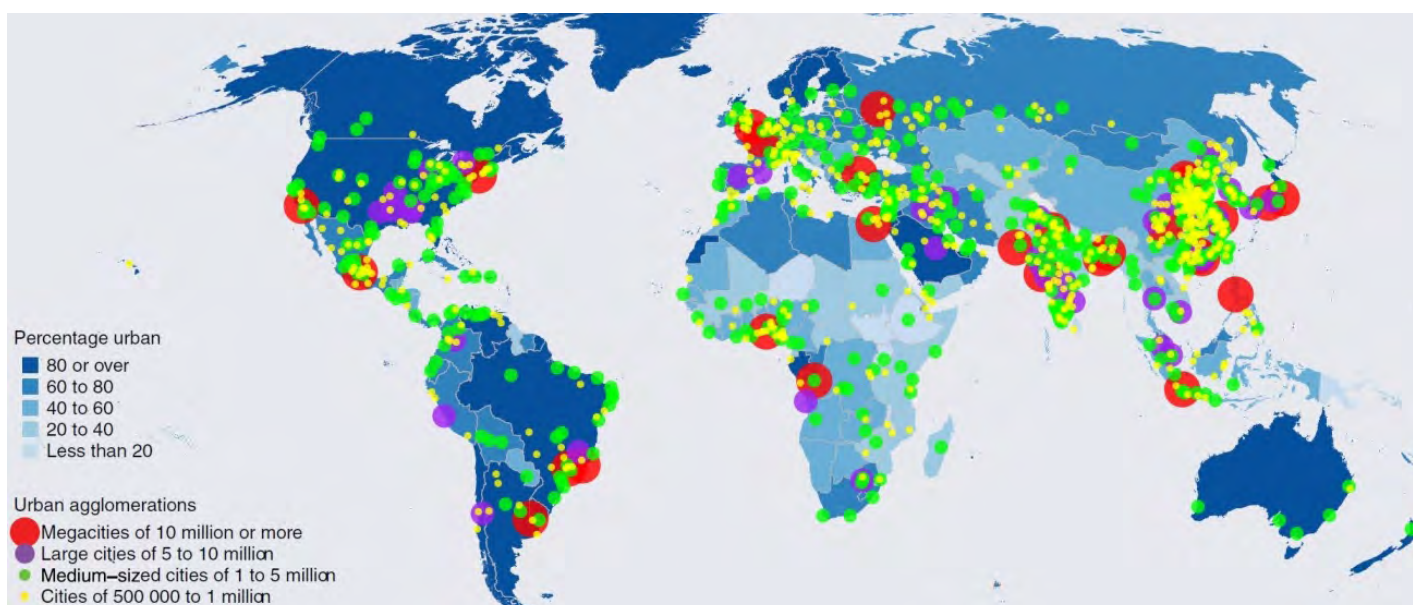


Figure 6.1: Percentage urban and location of urban agglomerations (Source:United Nations, Department of Economic and Social Affairs, 2014).

benefits for people living in them. As Jenks and Burgess (2000: 3) state, “Cities may have problems, but they are not necessarily a problem in themselves”. They provide economic opportunities for millions of people who seek to get away from restrictive rural lifestyles that may no longer be economically sustainable (Jenks & Burgess, 2000). Cities also provide inhabitants with greater access to social services such as health and education (United Nations, Department of Economic and Social Affairs, 2014).

It is therefore essential that planners realise that spatial plans cannot be comprehensive but need to be flexible to allow for uncertainties such as the rapid urbanisation that is still expected to occur in developing countries.

6.1.2 CLIMATE CHANGE

The effects of climate change are largely attributable to human activities that are increasing the amount of greenhouse gasses released into the atmosphere. The largest contribution comes from the burning of fossil fuels. Since the Industrial Revolution human influences on the climate have increased significantly. Cities only occupy 3 per cent of the earth’s surface but account for over 70 per cent of natural resource consumption and carbon emissions (UN Habitat, 2012). The increasing amounts of greenhouse gases in the atmosphere have the potential to increase the planet’s temperature to levels never experienced before (Climate Change, 2013). Climate change poses a huge risk for humans and the natural environment. Evidence of climate change is already apparent in the natural environment (IPCC, 2014).

The IPCC (2014) has identified five key risks of climate change across sectors. Firstly some unique and threatened systems (these include ecosystems and cultures) are already at risk from climate change. The number of these systems that are at risk is related to increases in temperature, particularly systems with limited adaptive capacity such as coral-reef systems and Arctic sea ice. Secondly, climate change-related risks from extreme weather events such as droughts, floods and cyclones will increase in severity as temperatures rise. Thirdly, climate change risks are not evenly distributed and will be most significantly

felt by disadvantaged communities. This can already be seen in the decrease in regional crop yield and water availability, especially in developing countries. Fourthly, global aggregate impacts will be felt from extensive biodiversity loss and loss of ecosystem services. A rise in temperature will therefore result in aggregate economic damages. Lastly, some physical systems and ecosystems will be at risk of irreversible changes. Warm water coral reefs and Arctic ecosystems are already experiencing irreversible shifts. With additional temperature increases, large and irreversible sea level rises are expected from the melting of the Greenland ice sheet which could increase sea levels by 7m (IPCC, 2014).

Climate change has led to three main realisations. Firstly, harmful emissions need to be reduced and the best way to achieve this is for cities to reduce urban residents’ dependence on motor cars. Secondly we need to conserve nature, cities footprint are expanding rapidly and usually into environmentally sensitive areas. Therefore urban compaction should be promoted to reduce the footprint of cities. Thirdly, rising sea levels are going to affect many coastal cities and planners need to ensure that no further development occurs in the 1:50 and 1:100 year flood lines.

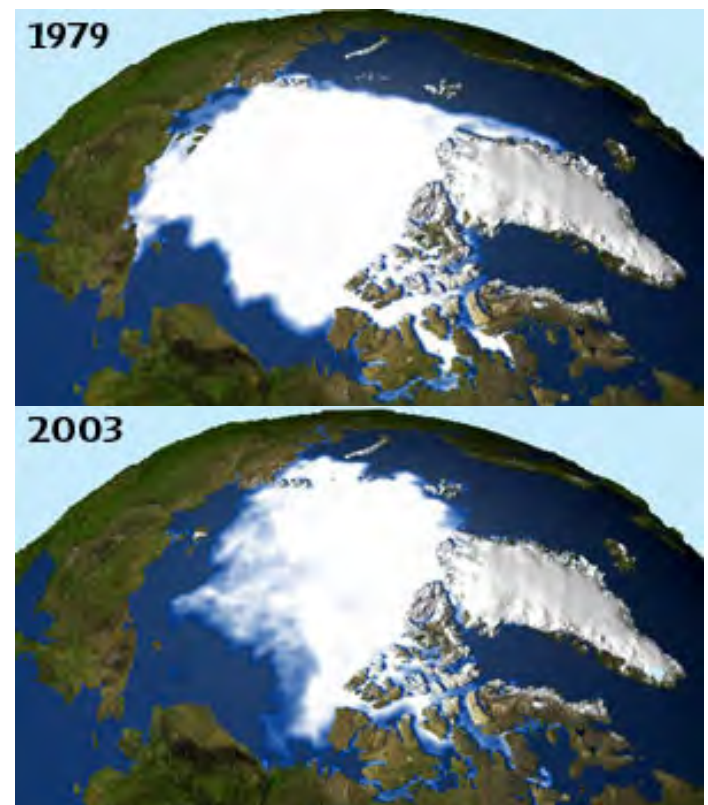


Figure 6.2: Melting Polar Ice Caps (Source: <http://www.dive-discover.whoi.edu/>)

6.1.3 FOOD SECURITY

Climate change will adversely affect all aspects of food security, including food availability, access to food, stability of food suppliers and food utilisation. Food security will be affected in many different ways, through the changes in temperature and rainfall patterns as well as the continued emission of greenhouse gases which will affect land suitability and crop yields. Climate change is also expected to increase the frequency and extremity of extreme weather events such as floods, droughts and cyclones which will cause greater fluctuations in crop yields, possibly affecting the stability of food supplies and thus food security. Climate change can also affect the ability of people to use food effectively by changing the conditions for food safety. Changing climatic conditions can cause a cycle where infectious diseases compound hunger. An example is the increase in flooding which can increase risks of an outbreak of water-borne diseases such as cholera. This can lower people's capacity to use food effectively. There are a number of studies that have shown that food prices will rise in line with increases in temperature (Schmidhuber & Tubiello, 2007).

With regard to the above, the best way to ensure food security in cities is to promote local food production through urban agriculture and to protect valuable agricultural land. Local food production can also encourage local economic development and provide jobs.

6.1.4 RESOURCE DEPLETION

The world's growing population will experience limitations in the earth's ability to support human life (UN-Habitat, 2012). The world's population is already at 7.2 billion people and is continuing to grow. The earth's resources are only able to provide for around 2 billion people at the current demand. This means that the way we are currently living is using two to three times more natural resources than the earth can provide. This is unsustainable and will result in the depletion of the earth's natural resources. The top three natural resources that are being depleted are water, oil and forests (The world counts, 2015).

WATER SCARCITY

There is a growing scarcity of freshwater resources in many parts of the world. Water has two fundamental functions: its role as a necessity for human life and its use as an economic resource. These two roles are increasingly in conflict. Human activities have already reached renewable water limits in many regions. The largest indicator of unsustainable use is the over-pumping of groundwater that is widespread in many food-producing regions and urban areas. Another sign of unsustainable water use is rivers that are now running dry when irrigation is most needed. Many aquifers and rivers already are being overstressed in meeting current water demands. The stress on freshwater systems will worsen as the global population and consumption levels increase. The major dimensions of the water scarcity challenge will be to maintain food security, with water constraints on agriculture contributing to decreased health of the aquatic environment and avoiding political instability in international river basins. Finding a way to satisfying humanity's water demand while at the same time protecting the ecological support functions of freshwater systems will be one of the most important challenges of the 21st century (Postel, 2000). Only 2.5 per cent of the world's water is fresh water and of this 2.5 per cent approximately 70 per cent is frozen. The biggest user of water is agriculture which uses approximately 70 per cent of available fresh water, followed by industries that use around 20 per cent and lastly only 10 per cent of freshwater is used for human consumption. The depletion of water resources is more serious than the oil crisis as oil can be substituted but water is irreplaceable (The world counts, 2015).

The issue of water depletion is prominent in South Africa as the country is already faced with water scarcity. The most effective way to combat this issue in cities is to protect existing water resources such as rivers and aquifers and to promote grey water recycling and local water capture. Rainwater can be harvested from roofs of buildings and from surface runoff. The harvested water can be used either for drinking, domestic use, watering gardens or for irrigation.



Figure 6.3: Drought of Lake Oroville in California, USA
(Source: <http://www.dailymail.co.uk/>)

OIL DEPLETION

The world's oil reserves are a non-renewable resource and account for 40 per cent of the total use of energy worldwide. The liquid fuels obtained from oils are used for manufacturing, transportation, building, mining, harvesting and many other uses. The *International Energy Outlook 2013* has predicted that there is enough oil to last for only 25 years (The world counts, 2015). High demand for oil will result in peak oil within the next ten years which will lead to dramatic increases in the cost of fuel, mobility and food (UN-Habitat, 2012). There are, however, means to overcome the global oil crises as efforts are underway to develop cheaper and more sustainable energy such as wind power, solar power, and other forms of renewable energy that can replace oil (The world counts, 2015).

As many urban residents worldwide rely on motor cars, there is a need to return to NMT. This will be especially difficult in South African cities as motor cars are the main mode of transport and current public transport systems are inefficient.

6.1.5 ECONOMIC GLOBALIZATION

Economic globalisation is not a new occurrence but what is new are the speed, scale, scope and complexity at which it is occurring. With improvements in technologies, the transportation of people and goods is enabled much faster. There are many benefits to globalisation such as medical advancements which have reduced mortality rates and agricultural technologies which have increased food production. It is clear, though, that the benefits of globalisation have not been spread evenly. While the conditions of many people have improved, there are many people whose conditions have deteriorated. In many countries the costs of living has increased as well as the number of poor households, particularly in cities. Inequality in many regions has been getting worse as smaller shares of income reach poorer households. There are many reports of increasing disparities between regions, cities, neighbourhoods and households. The biggest challenge that we are facing with regards to globalisation is how to share the benefits more equally and how globalisation can function as an agent for economic growth as well as an agent for social justice (UN-Habitat, 2001).

The best way to achieve this in cities, especially in developing countries, is to promote local economic development (LED) which encourages local urban residents to work together to achieve economic growth and development, thereby bringing economic benefits and better quality of life to all residents.



Figure 6.4: Inequality seen in Sao Paulo, Brazil (Source: <https://www.allianz.com>)

6.2 PERFORMANCE QUALITIES

This section looks at various performance qualities to which urban growth management must conform in order to overcome the various global issues as mentioned in the previous section and to create sustainable urban environments. There are a number of characteristics that underpin a high-performing urban environment. Some of the primary performance qualities which have given direction to the work done in this dissertation are discussed below:

EQUITY

No individuals or groups should be disadvantaged over others. An equitable urban environment enhances and promotes urban activities through its structure and form, thereby allowing residents to have easy access to these opportunities (Dewar & Uytendogaardt, 1991). Equity primarily relates to the equity of access to opportunities within cities and implies that all people should be able to conduct their daily activities easily and inexpensively (Dewar *et al*, 2012).

BALANCE

Cities are dynamic and experience continuous growth and change. This dynamism is positive as it contributes towards the diversity and urban structure of cities. There are two types of balance. Firstly, there is balance between nature and settlement. Everyone should have access to nature and actions on the ground need to be compatible with the natural conditions that are associated with the site. Secondly, is balance between urban and opportunities where all people have easy access to a range of activities and opportunities that make up urban life (Dewar & Uytendogaardt, 1995).

INTEGRATION

Positive urban environments have integration between the different elements of a city (Dewar & Uytendogaardt, 1991). This refers to social (not marginalising people), economic (accommodating large and small businesses) and cultural (accommodating diversity) elements. The concept of continuity is central to integration: there are three types that are important. The first is the continuity of movement. Continuous movement lines should tie different local areas together to break down fragmentation. This can

be achieved through the emergence of activity corridors in urban settlements. Secondly, is continuity of green spaces as they are important for biodiversity and natural regeneration. It is also important that people have access to nature. Thirdly, is the continuity of the urban fabric which refers to the need to move away from urban forms that are a collection of fragmented parts towards an urban form that is a coherent system (Dewar & Louw, n.d).

SENSE OF PLACE

Creating a sense of place is concerned with memorability and uniqueness and rejects uniformity. There are a number of factors that contribute towards the creation of a sense of place. Firstly, is the appropriateness of city form to the characteristic of the landscape. Secondly, is the quality and consistency of public spaces as well as the use of local skills and resources to meet local needs. Thirdly, is the legibility of the urban environment and the clear definition between public and private spaces as well as the use of landmark buildings. Finally, is the creation of 'special places' where people can escape the struggle of daily life and be treated with respect and dignity (Dewar *et al*, 2012).

SAFETY AND SECURITY

Safety and security include the security of tenure, food security, safety from hazards, safety from attack and security in terms of crime prevention. Emphasis should be placed on surveillance, exposure and permeability to promote safety. Designs should consider access to emergency services, and people should be able to access emergency services by foot (Dewar *et al*, 2012).

EFFICIENCY

Efficiency is concerned with minimising the energy use of cities which relates to human activities. Firstly, a compromise must be achieved between the conflicting requirements of mobility (road movement) and accessibility (dominance of NMT and public transport). Secondly, is the promotion of the compaction of urban forms to reduce sprawl and aggregate movement, to reduce the investment in infrastructure and to increase densities. Thirdly, is the promotion of mixed-use development and encouraging walking which will increase convenience (Dewar *et al*, 2012).

6.3 NATURE OF PLAN

This section will look at how to achieve the performance qualities as mentioned above. The nature of plan impacts on the quality of settlements which result from the design process. There are two different approaches to planning, namely programmatic and non-programmatic approaches (Dewar & Louw, n.d) .

6.3.1 PROGRAMMATIC APPROACHES

The programmatic approach is the most common form of plan-making under modernism. The approach is based on the principle of comprehensive rationality and is focused on land-use. Idealised land use patterns are separated and spread out in space. The approach can therefore be seen as being quantitative. Space demands are scientifically calculated on the basis of thresholds and a land use schedule is generated. Under the programmatic approach planning essentially becomes a rational, comprehensive and controlled process (Dewar & Louw, n.d).

CRITICISM

A number of criticisms have been levelled at this approach.

The first is that the kind of 'end state' planning is impossible as cities cannot be comprehensively planned and managed in this manner. It is the countless decisions taken from thousands of independent actors that actually determine the form of cities (Dewar & Todeschini, 2004). Programmatic land use planning is ineffective as it is based on the incorrect assumption that land uses can be planned when in fact they cannot. A land use plan can only prevent certain activities from occurring at places but if there is no demand for a certain land use then the plan cannot make them happen (Dewar, 2011).

Secondly, the assumption that each land parcel has an identifiable use is incorrect. Different activities actually have many options on where to locate and they compete with each other for locations (Dewar & Todeschini, 2004).

Thirdly, the scientific way of prediction is unreliable. The environments that are created always appear to be incomplete as large amounts of re-

sidual space are left lying around waiting for developments to 'catch up' (Dewar & Louw, n.d)

Fourthly, the inevitable outcome of the approach is sterility. There are a number of factors that contribute towards this. Mono-functionality is boring as positive urban environments are characterised by a mix of activities. The 'scientific' approach that is used is not concerned with public space which is actually the primary form of social infrastructure in positive urban environments. The free-standing structures that are developed on small parcels of land result in standardised development. This can be seen in the case of Delft in Figure 6.5 (Dewar & Todeschini, 2004).

Lastly, the approach is based on separation which in turn generates large amounts of movement. It has now become recognised that access within cities need to be increased while aggregate movement needs to be reduced as it is associated with economic and environmental consequences (Dewar & Todeschini, 2004).

DELFT, CAPE TOWN

The plan of Delft is a typical South African programmatic plan. The settlements is a scatter of various parts but there is nothing that holds the whole structure together (Dewar, Todeschini, 2004).



Figure 6.5 : Result of the programmatic approach in Delft, Cape Town (Source: <http://www.gettyimages.com>)

Despite these criticisms of the approach, it is still widely used (Dewar & Todeschini, 2004). For significant improvements to be made to urban qualities a paradigm shift is required. One way to achieve this is to replace programmatic approaches to planning with non-programmatic approaches (Dewar & Louw, n.d).

6.3.2 NON-PROGRAMMATIC APPROACHES

Non-programmatic approaches are different from the programmatic way of thinking in a number of respects. Firstly, this approach is concerned with the performance of a settlement as a whole and not with the maximisation of only one part. Secondly, plans are created by an integrated and interdisciplinary team as opposed to separate multi-disciplinary processes. Thirdly, the approach is not focused on land use but rather on accommodating human activities in space. Fourthly, the plan does not attempt to determine the spatial distribution of human activities through top-down decision-making that relates to land use zoning but rather manipulates the logic of access to which human activities respond to in order to create broadly predictable outcomes. Lastly the approach concentrates on creating choice instead of attempting to define the good urban life that is applicable to all people. In this way the plan is enabling rather than prescribing a way of life. The concepts of structure and minimalism are central to non-programmatic approaches (Dewar, 2011).

STRUCTURE

Structure is a device that is used in designing human settlements to order the landscape. The elements of public structure such as green spaces, movement, social facilities and public open space are manipulated and co-ordinated to create a geometry that is made up of point, line and grid. This geometry that is generated by the association of the various elements creates a logic to which all activities, whether large or small, private or public, formal or informal, can respond (Dewar, 2011).

Movement has a considerable role in this structural approach. The spatial logic of structure is informed by the concept of access. Dewar (2011: 814) states that "...the geometry created through the co-ordination of the public elements of struc-

ture generates an 'accessibility surface' across the landscape: it creates a reference system of points and lines of greater or lesser accessibility". The system is hierarchical and creates different levels of access to different opportunities.

All urban activities have their own requirements in terms of accessibility, publicness and privacy. These need to be respected to ensure that activities operate efficiently. The structural system establishes a logic of publicness and privacy to which all urban activities can respond. Through this process, choices are offered without imposing a certain form of life style for everyone. As an example, in residential areas real choice relates to choices in lifestyle, from very private living to very public living. There do, however need to be degrees of choice within limits (Dewar, 2011).

SPACE

It is possible to create a hierarchy of public spaces. In the non-programmatic approach all public spaces can be seen as social space. Public spaces are multi-functional and, when properly made, can significantly enhance the urban environment. On the other hand, when public spaces are hostile, they create hostile urban environments). This is another failure of programmatic approaches which see free-standing objects, such as buildings, as the focus of design and in this process lead to the fragmentation of the public environment. The hierarchy of public spaces creates a logic for where public facilities should be located. The role of buildings is to create and define public spaces. Facilities that are used by all urban inhabitants are located in the most prominent locations while facilities that are group specific are positioned close to, but not in, the space (Dewar, 2011; Dewar & Louw, n.d).

Non-programmatic approaches therefore integrate the hierarchy of access and the hierarchy of spaces into a framework that creates a logical structure of publicness and privacy where all activities can be located in terms of their own requirements for accessibility (see Figure 6.6). The quality of the framework contributes directly to the quality of the urban environment. In this process, the ordering concept is moulded to and informed by the local context. The concept is warped and distorted through this moulding process. This gives the plan life but the main concept may not be destroyed (Dewar, 2011).

GRAAF-REINET

Graaf-Reinet in the Eastern Cape is an example of a no-programmatic plan. It was established before the 1920s and demonstrates the flexibility and sensitivity of the non-programmatic approach. All the public elements of infrastructural such as movement systems, public spaces, social institutions and services were publicly decided and informed by the context. No land uses or activities were predetermined. This plan provides a strong system of locational choices which guides activities to locations according to their own requirements (Dewar, Todeschini, 2004).

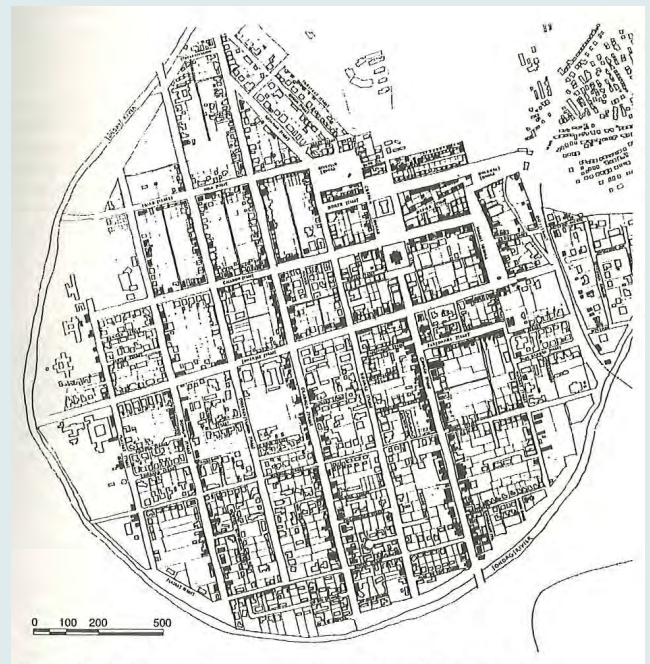


Figure 6.7: Graaf-Reinet Plan (Source: Dewar, Todeschini, 2004)



Figure 6.8: Graaf-Reinet Aerial Photo (Source: www.karooark.co.za)

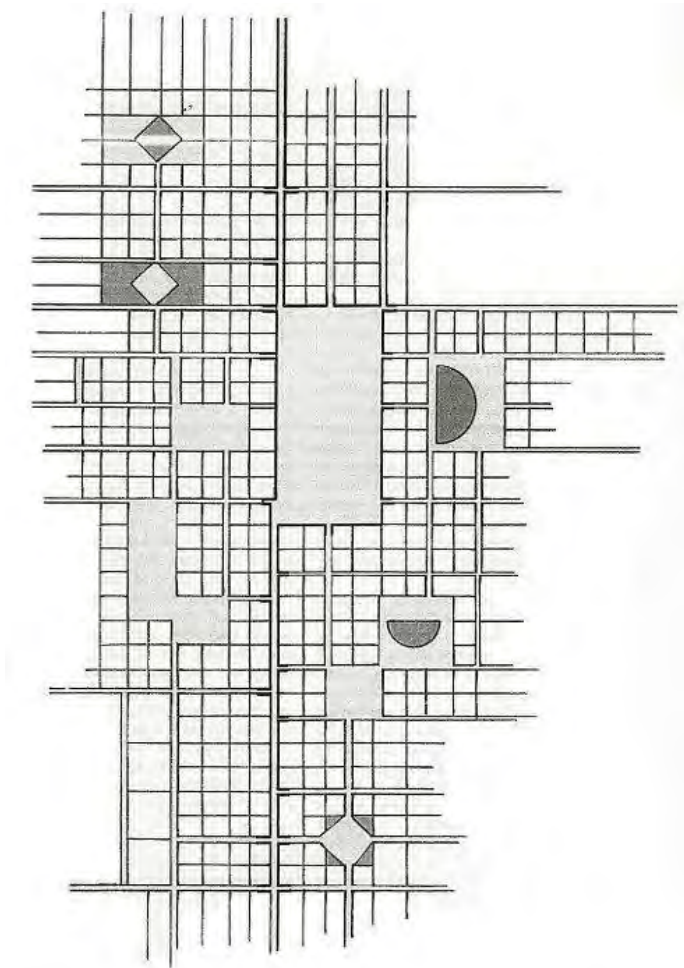


Figure 6.6: A synthesis of movement and spatial hierarchies (Source: Dewar, 2011)

MINIMALISM

A trademark of positive urban environments is that they are complex. This complexity, however, cannot be designed. It results from process. It is from this need for complexity that the search for minimalism has become central to non-programmatic approaches. When the design process is dominated by the ingenuity and creativity of only a few people, sterility and monotony are inevitable consequences. The larger a project, the truer this becomes. At each scale, spatial plans should only depict the minimum-actions that are necessary to give direction in order to allow for the ingenuity and creativity of all designs and decision-makers to enrich the urban environment. Urban development has always created income-generating opportunities. It is therefore critical, especially in South African cities, that these opportunities are spread widely throughout a city, in particular into small-scale developments. The approach is therefore concerned with process and allows a range of actors to be incorporated into the process (Dewar, 2011).

6.4 LEGISLATIVE CONTEXT

6.4.1 RELEVANT LEGISLATION

Below is a list of the most relevant planning laws that affect the development of the planning framework:

CONSTITUTION

The Constitution of the Republic of South Africa Act 108 of 1996 sets out the rights and duties of South African citizens and details governance roles and structures. The Constitution places a duty on all three spheres of government to ensure that the central rights in the various sections are attended to. Some of these central rights includes the following:

Section 26: Right to housing

Section 24: Right to environment

Section 25: Property rights

Section 32: Right to access of information

Section 33: Right to administrative Justice

NEMA

The National Environmental Management Act 107 of 1998 (NEMA) essentially gives effect to section 24 of the Constitution, which is concerned with environmental rights. The Act defines sustainable development as a means of integrating social, economic and environmental factors into planning, implementation and decision-making to ensure that development serves the present and future generations. The principle of sustainable development is particularly applicable and many housing and human settlement developments will trigger the requirement to obtain environmental authorisations. The Heritage and National Environmental Management Acts Protected Areas Acts impose additional requirements and restrictions (Earth Inc, 2010).

MUNICIPAL SYSTEMS ACT

The Local Government Municipal Systems Act, 2000 (MSA) requires each municipality to prepare an integrated development plan (IDP) that is used to manage development within the municipality. The IDP aims to guide all development in a municipal area and informs the municipal budgeting and allocation of resources. It also aims to co-ordinate the work of local and other spheres of government in a coherent plan. The

Cape Town Spatial Development Framework (SDF) is a strategic spatial framework that directs the implementation of the IDP and guides the development within the Municipality to give effect to the vision, goals and objectives of the IDP. It is a long term (20 year) plan that will be revised in line with the IDP five year cycles (Ethekweni Municipality, 2013).

SPLUMA

The Spatial Planning and Land Use Management Act, 2013 (SPLUMA) covers all spatial planning and land use management dimensions in South Africa. The Act aims to promote consistency as well as uniformity in planning procedures and decision-making. Some of the Act's objectives include addressing historical spatial imbalances and the integration of sustainable development principles into land use, planning tools and legislative instruments. SPLUMA requires that all the national, provincial and municipal spheres of government prepare SDFs. The Act also makes it mandatory that all three spheres of government need to participate in each other's processes of spatial planning and that each sphere should be guided by its own SDF when making land use and development-related decisions. It equally establishes a framework for the monitoring and review of the spatial planning and land use management system to promote greater consistency and uniformity of application procedures and decision-making (Department of Rural Development and Land Reform, 2014).

LUPA

The Western Cape Land Use Planning Act, 2014 (LUPA) complements SPLUMA and must be adopted by every municipality in the Western Cape as a local by-law. The Act lays out conditions that municipalities must achieve in their SDFs for them to be considered valid. The Act adds to the conditions that SPLUMA and the Municipal Systems Act impose on municipalities. LUPA clarifies the functions of municipalities and provincial government. This was badly needed, as the Constitution is not clear on exactly how planning powers should be split between the three spheres of government. The section of LUPA titled 'General Provisions' asks all spheres of government to coordinate and align their work so that there is no duplication of legislation and administration (Ogle, 2014).

6.4.2 FRAGMENTATION

South Africa still operates with fragmented, unequal and incoherent spatial planning and land use management systems, which often constrain land and economic development and the transformation of apartheid settlement patterns (Ogle, 2014). There are three main critiques of the various planning legislation in South Africa:

1. Multiple applications are required

Developers need to make a separate application under each of the various Planning Acts and to different departments. As an example, land use applications must be made to the municipality and the removal of restrictions must be made to the provincial department. This duplication of processes and authorisations delays planning applications with a consequent impact on the delivery of housing stock to poorer areas and with market-related developments, the holding costs are built into the price or developers simply abandon the project. These multiple laws on planning render the entire planning system inefficient, costly and confusing (Ogle, 2014).

2. Different decision-makers are involved

Different aspects of planning are dealt with by different laws. Acts such as NEMA and the National Heritage Resources Act require applications in tandem with planning legislation such as SPLUMA and LUPA. This means that different authorities from different spheres of government and different line departments make decisions relating to the same development. Given their conflicting mandates it is highly likely that these decisions may conflict (Ogle, 2014).

3. Different forms of participation are required

Each Act has its own participation provisions. Sometimes the participation can be done simultaneously, other times not. For example, the Removal of Restrictions Act and Land Use application stipulate different lengths of advertising. Sometimes the environmental participation process precedes the land use planning participation process. This leads to confusion amongst targeted group and participation fatigue. It is also expensive and time-consuming for an applicant (Ogle, 2014).

6.5 POLICY INFORMANTS

A range of national, provincial and local policies shape the development of the planning frameworks. The most significant policies are mentioned below.

NATIONAL DEVELOPMENT PLAN 2030

The National Development Plan 2030 (NDP) is a strategy that aims to accelerate growth, eliminate poverty and reduce inequality in the country by 2030. Some of the targets of the plan includes getting more people to live closer to economic opportunities, better quality public transport and more jobs in proximity to townships. To achieve these targets the NDP advocates measures to prevent housing development in marginal places, increase densities to support public transport and provide incentives for economic activities to locate adjacent to townships (Department of Rural Development and Land Reform, 2014).

WESTERN CAPE PSDF 2013

The PSDF seek to protect environmental assets, address economic and social divisions in cities and towns in the Western Cape, manage urban growth and the effects that it has on natural resources and infrastructure, and improve living conditions and the quality of urban environments (City of Cape Town, 2012a).

CAPE TOWN IDP 2012 - 2015

The IDP's vision is to promote Cape Town as a city that creates an enabling environment for economic growth and development, to deliver quality services to all residents and to be a well-governed administration. The IDP focuses on infrastructure investment and maintenance to grow the economy and to increase job opportunities (City of Cape Town, 2015).

CAPE TOWN SDF

The goal of the current SDF is to achieve sustainable, equitable and manageable growth. The SDF has four spatial concepts which should give direction to future development. These include protecting the city's natural resources, organising the city around development corridors, protecting surrounding cities from being absorbed into Cape Town's growth path and ensuring that the city is flexible and able to adapt to changes (City of Cape Town, 2012a).

CHAPTER 7: METROPOLITAN FRAMEWORK

This chapter consists of an analysis and conceptual interpretation of Cape Town's existing structure.

7.1 METROPOLITAN SPATIAL ANALYSIS

To understand the role that the chosen site plays within Cape Town, an analysis of the city is undertaken in order to identify the opportunities and constraints which will influence the site. This section includes the analysis of the city's green systems, higher order public institutions and movement system.

7.1.1 GREEN SYSTEMS

Cape Town has a unique and valuable natural environment that is made up of mountains, plains, coastlines and biodiversity. The green systems are responsible for the city's attractiveness and contributes to Cape Town's economy, but these resources are extremely limited. Natural areas are recognised for the essential services that they provide economically, socially, recreationally, educationally and in maintaining healthy living environments (City of Cape Town, 2006). Cape Town is an example of a city where biodiversity must be conserved as part of the urban fabric and be fully integrated into future spatial planning (The City of Cape Town, 2012b).

BIODIVERSITY

Cape Town is located within one of the world's six plant kingdoms, The Cape Floristic Kingdom, is a recognised UNESCO World Heritage Site and is the smallest but most biologically diverse of all the plant kingdoms (The City of Cape Town, 2012b). The Mediterranean climate has created a unique setting for the diversification of both fauna and flora. This is why Cape Town is classified as an international biodiversity hotspot (City of Cape Town, 2006). There are 18 vegetation types that occur within the City, seven of which are critically endangered, six are endangered, two are vulnerable and only three are least threatened. This makes Cape Town the city with the highest number of threatened plant species in the world (City of Cape Town, 2007).

PROTECTED AREAS

Although the City manages a number of nature reserves, they only cover a portion of the various components of Cape Town's biodiversity. The Cape Flats area has been historically under-conserved and has experienced massive urban development while areas in the Cape Peninsula have been relatively well conserved (The City of Cape Town, 2012b).

FRESHWATER

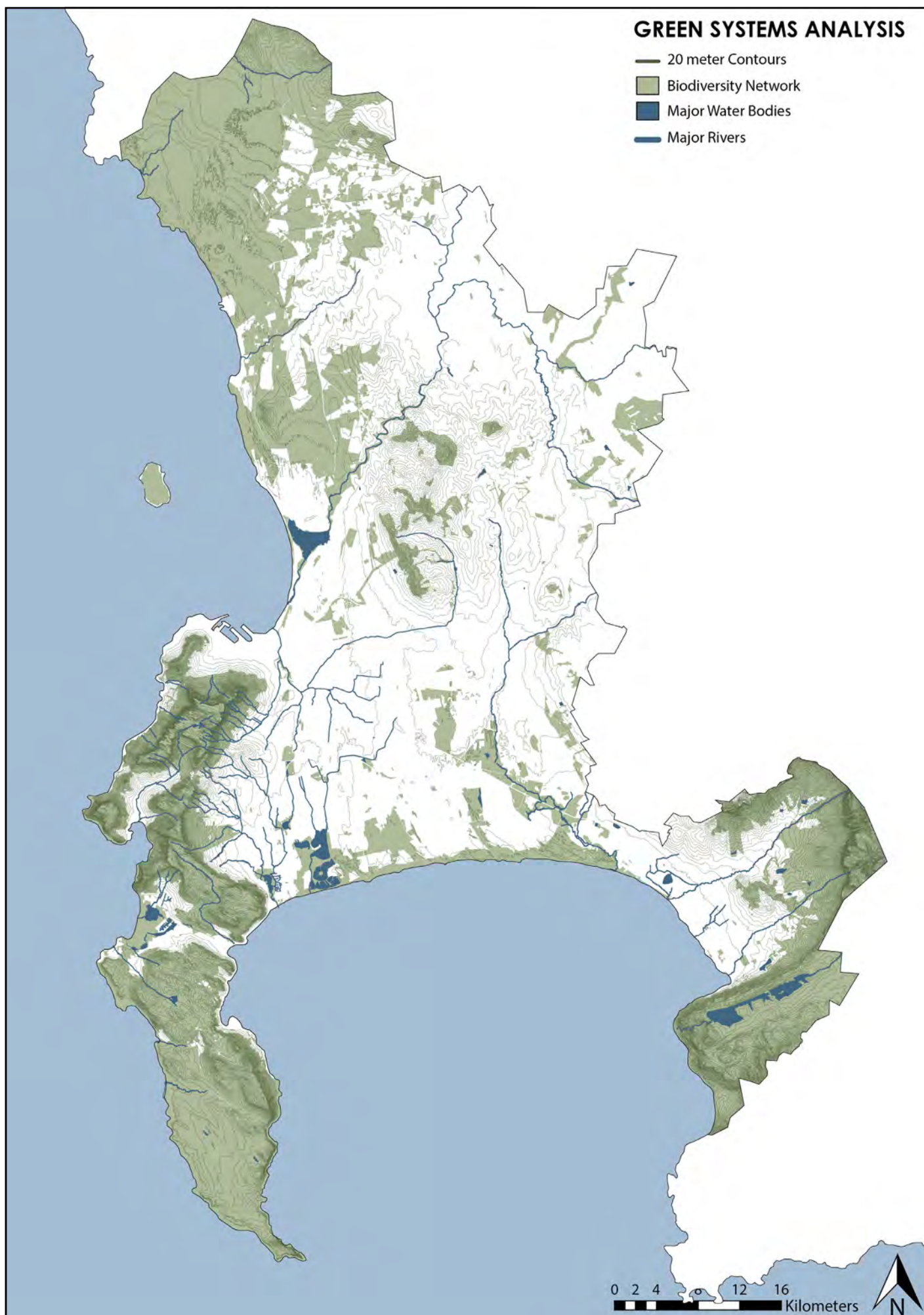
Cape Town has an extensive network of rivers and wetlands. According to Cape Town's State of Environment Report (2012) ten out of 14 river systems and nine out of 13 wetlands are in poor ecosystem health. Only three rivers and one wetland were classified to be in good ecosystem health. A threat to freshwater quality includes sewerage intrusion from storm water drainage failure and the rise in sea level which will cause saline intrusion into freshwater resources in coastal areas, especially the Cape Flats aquifer which is reserved to be used as a future water resource (The City of Cape Town, 2012b).

INVASIVE SPECIES

Invasive species are a significant problem in and around the city. This is a significant concern as they have the potential to disrupt and degrade the valuable ecosystem. Some of the problems caused by invasive species includes the depletion of water reserves, the altering of habitats which causes biodiversity loss, changes to the nutrient content of soil and the alteration of natural fire regimes (The City of Cape Town, 2012b).

ACCESSIBILITY TO GREEN SPACE

Many of the city's open green spaces are inaccessible to a large percentage of the population due to the distance that people are required to travel to reach these areas. Crime and the lack of safety are also factors which prevent people from using natural open spaces. It is clear from Map 7.1 that people in many parts of Cape Town have limited access to green open spaces. This is most notable in the central and north-eastern parts of the city. Poor access tends to be concentrated in areas with low socio-economic status, although some wealthy areas also lack access (The City of Cape Town, 2012b).



Map 7.1: Green Systems Analysis (Source: Author; GIS Technical Library, University of Cape Town)

7.1.2 HIGHER ORDER FACILITIES

Public facilities that are provided in poorly serviced areas have generally been poor. These facilities tend to be provided in an *ad hoc* manner that has resulted in duplication of facilities in some areas and an inadequacy in others (City of Cape Town, 2006).

TERTIARY HEALTHCARE

Despite the numerous initiatives and high spending on healthcare, there are still significant inequalities in health service provision and resource allocation remains a problem. The private healthcare sector serves only 15 per cent of the population but receives about 60 per cent of financial and human resources. The districts with the greatest needs have received the least resources (Sanders, Chopra, 2006). A major accomplishment for the WCDOH has been the completion of the Khayelitsha Hospital and the Mitchell's Plain Hospital complexes that now provide healthcare services to previously poorly serviced populations (Western Cape Department of Health, 2012).

TERTIARY EDUCATION

Cape Town is fortunate to have several universities located within the municipality, namely the University of Cape Town, the University of the Western Cape, the Cape Peninsula University of Technology and the University of South Africa's smaller campuses. There are a total of 27 Further Education and Training Colleges (FET) within the city. These education facilities are adequately spread across the city. However, these facilities are limited in number and many learners will have to migrate to other parts of the city to pursue higher education. The implication is that many learners will have to travel more than 5km out of their area to access higher education facilities (Western Cape Provincial Treasury, 2012).

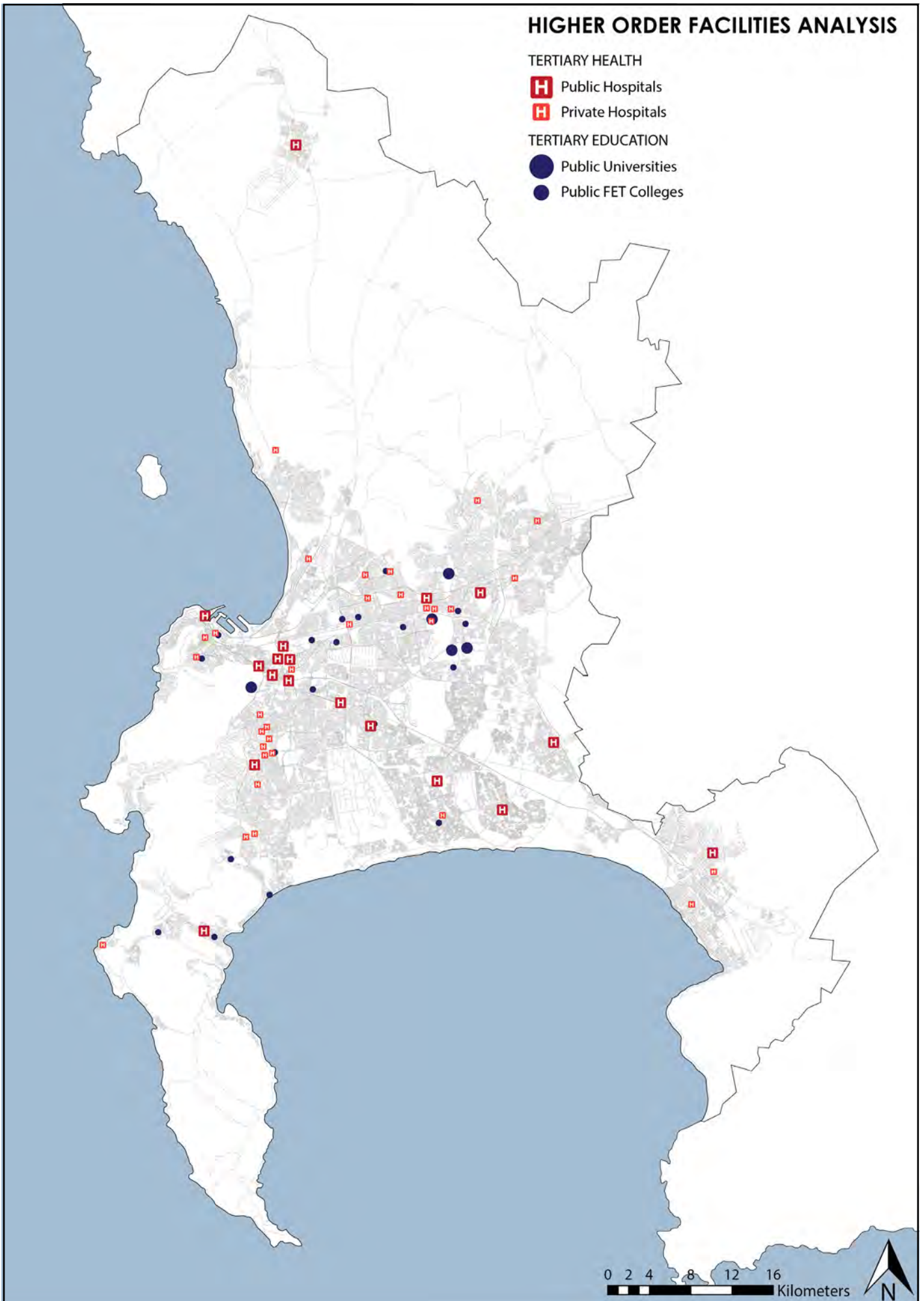
HIGHER ORDER FACILITIES ANALYSIS

TERTIARY HEALTH

-  Public Hospitals
-  Private Hospitals

TERTIARY EDUCATION

-  Public Universities
-  Public FET Colleges



Map 7.2: Higher Order Facilities Analysis (Source: Author; GIS Technical Library, University of Cape Town)

7.1.3 MOVEMENT SYSTEMS

The movement network in Cape Town consists of two main elements, which are the roads and the rail network. The road network has certain sections that are dedicated to public transport vehicles. There are approximately 25km of dedicated bus and MBT lanes that are located mostly on the N2 (City of Cape Town, 2013). The radial rail and road patterns that are focused on the CBD have resulted in few north-south linkages which do not adequately accommodate the multi-directional movement patterns that have emerged due to the decentralisation of employment opportunities and residential activity. The current pattern of low-density residential development does not support an efficient public transport system (City of Cape Town, 2006).

RAIL

The existing PRASA passenger rail network that serves Cape Town has nine routes that radiate outwards from the CBD. The network is made up of 610 km of rail tracks, with 118 stations. According to the 2012 Rail Census, there are approximately 622000 passenger trips made on an average weekday in the city (Transport for Cape Town, 2014). The stations are usually fed by mini-bus taxis, buses, private cars and walking (City of Cape Town, 2013). Rail has a negative image due to overcrowding, crime and quality of services (City of Cape Town, 2006).

BRT

The BRT system includes dedicated bus lanes, priority control at road intersections, level boarding and pre-boarding tariff validation. The MyCiti BRT system consists of a network of trunk services that operate in dedicated bus ways with a network of feeder services that distribute passengers to and from the various trunk stations. Phase 1 of the BRT links the West Coast region to the CBD and south towards Hout Bay via Camps Bay and the Civic Centre to the Airport as can be seen on Map 7.3 (Transport for Cape Town, 2014).

BUS

The conventional bus services are provided by two privately owned companies namely the Golden Arrow Bus Service and Sibanye Pty. The extent of the routes operated by the two bus companies is shown on Map 7.3. The bus servic-

es provide coverage throughout the city, mainly through direct origin to destination services which means that there are few transfer options (Transport for Cape Town, 2014).

MINI-BUS TAXI

There are approximately 565 different routes that are operated by minibus taxis in the city (see Map 7.3). The routes generally link the taxi ranks and public transport interchanges in the residential areas with the economically active areas (Transport for Cape Town, 2014). The role of taxi's has dramatically increased in recent years but this mode of transport is still not integrated into the public transport system (City of Cape Town, 2006).

VEHICULAR

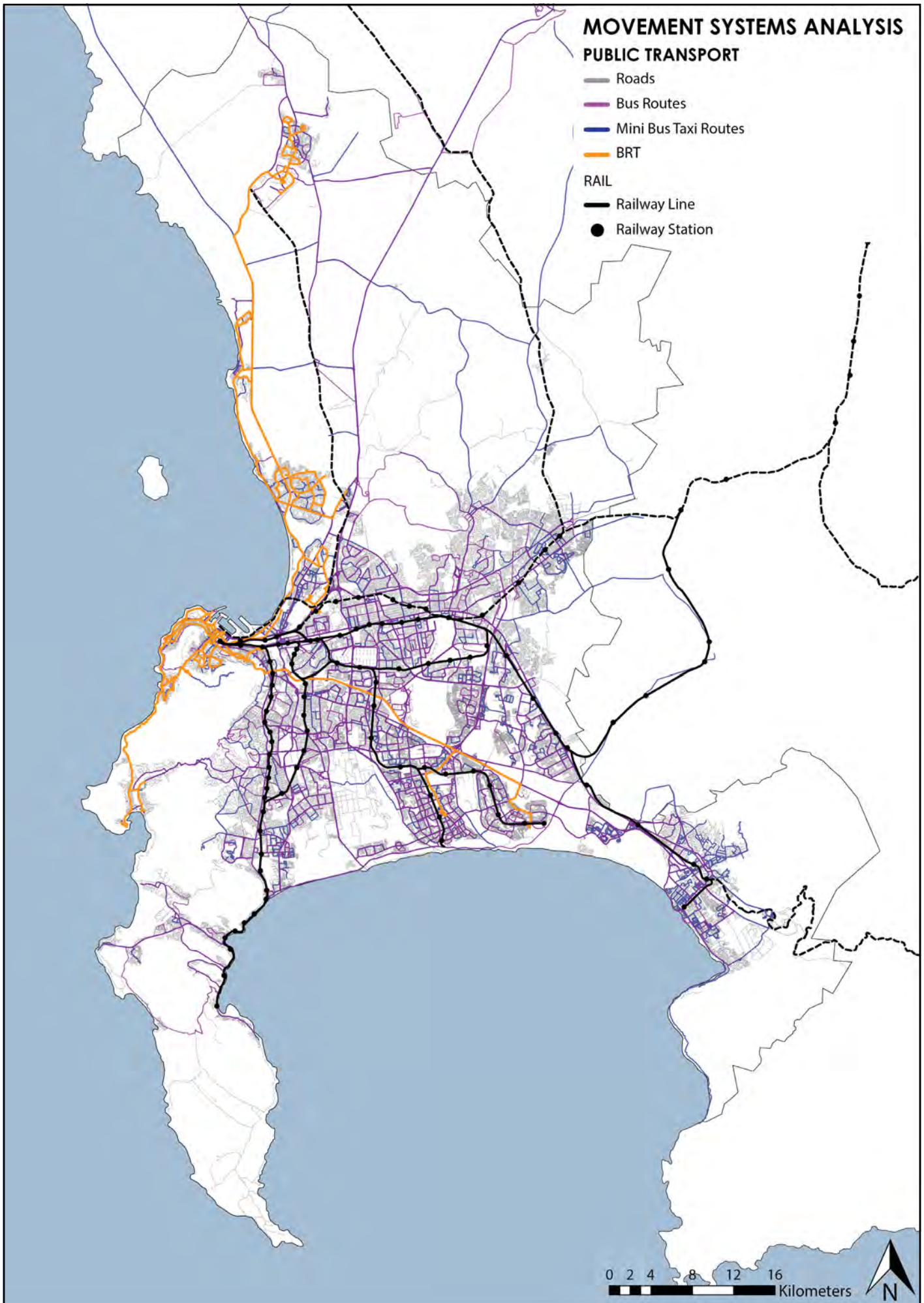
The city has over 9400 km of public roads that are divided into national, metropolitan and local roads as can be seen on Map 7.4 (City of Cape Town, 2006). Private cars are the predominant mode of transport in Cape Town and there is a large percentage of households that are dependent on cars. The Comprehensive Integrated Transport Plan for Cape Town notes that there are approximately 1 228 450 passengers that make use of private cars each day. In 2013 it was estimated that vehicle ownership was at 306 cars per 1000 people in Cape Town (City of Cape Town, 2013).

NMT

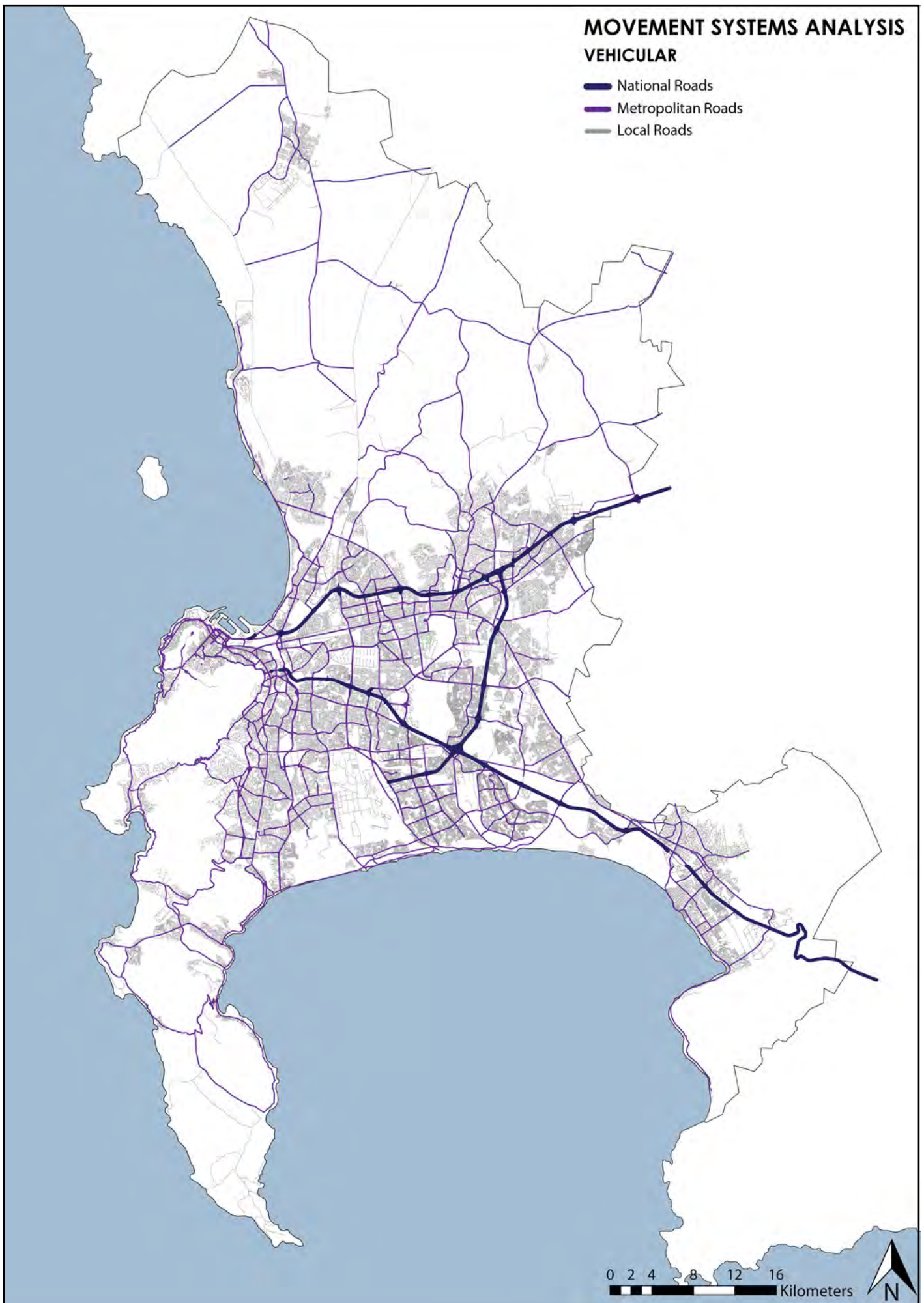
Non-motorised transport (NMT) includes walking and cycling and is a fundamental mode of transport. The municipality has already developed 435km of cycle lanes. NMT should be seen as the most important mode of public transport that needs to be promoted and accommodated in all designs (Transport for Cape Town, 2014).

MODAL SPLIT

Private transport is the preferred mode and is directly proportionate to income as the use of private vehicles decreases amongst lower income groups. The private/ public transport split is 54 per cent/42 per cent. The percentage of walking trips is 8 per cent with the highest proportion of trips taking place within low income groups (Transport for Cape Town, 2014).



Map 7.3: Movement Systems Analysis, Public Transport (Source: Author; GIS Technical Library, University of Cape Town)



Map 7.4: Movement Systems Analysis, Vehicular (Source: Author; GIS Technical Library, University of Cape Town)

7.2 METROPOLITAN CONCEPT

In response to the analysis of Cape Town, a concept for the city is presented in this section. The metropolitan concept does not demand that everything should be planned and controlled. There are several strong actions which will establish the spatial structure and form of the city and therefore inform and guide decisions which will ultimately determine the form of Cape Town. The direction of change is towards creating a more compact city that works well at the level of the pedestrian, makes maximum use of natural resources and which is respectful of its natural setting (Dewar, Uytenbogaardt, 1991). The primary elements that make up the spatial structure and which are in need of necessary management actions are the following:

7.2.1 REGIONAL OPEN SPACE CONCEPT

The primary metropolitan concept which informs the elements of the framework is the regional open space concept. Cape Town's natural assets include space-defining elements such as mountains, hills, rivers, wetlands and valuable agriculture land. These natural assets are the foundation for cultural places and human activities on the landscape. Currently urban development and sprawl in Cape Town are being pushed out of the city and into agriculture productive land and sensitive environmental areas (Todeschini, 2014).

Map 7.5 shows the wilderness and rural domains within Cape Town as well as the urban corridors that should occur along them. A central decision is not where future urban growth should go; it is about where it should not go. Large land parcels of nature and wilderness where urban development should not go should be reserved in order to retain the balance between the three domains and the unique character of Cape Town. Areas that are of great ecological sensitivity such as rivers, catchment areas and critical biodiversity areas should be reserved while areas of valuable agricultural land should be used for production. The parcels of land that are not reserved should be allowed for urban development (Dewar & Uytenbogaardt, 1991). From the map it can be seen that Cape Town's growth can be directed into two directions to the north of the current built footprint.

TRIAD OF DOMAINS CONCEPT

McKaye's triad of domains theory argues that a region is composed into three different landscapes or domains of urban, rural and wilderness. Each of these domains have specific characteristics and need to be maintained and balanced as part of urban growth management. The Wilderness domain includes natural ecosystems, the rural domain includes agriculture and forestry activities and finally the urban domain includes urban areas (Todeschini, 2014). The problem is establishing and then controlling a balance between the three domains. Before we establish the urban domain we must consider the needs of the rural and wilderness domains (Dzinotyiweyi, 2009).

From the Figure 7.1 it can be seen that the development of nodes and activity corridors should occur along the edges of the rural and wilderness domains, this serves to integrate the three domains. The buffer around the wilderness domain is used for extensive agriculture as well as markets where produce can be sold to the public. Another activity that can happen in this buffer is recycling and waste disposal from activities within the city, organic waste and so on can be used to fertilise the agricultural land. The spaces that are left between the wilderness and agriculture domain is then available for urban development to take place.

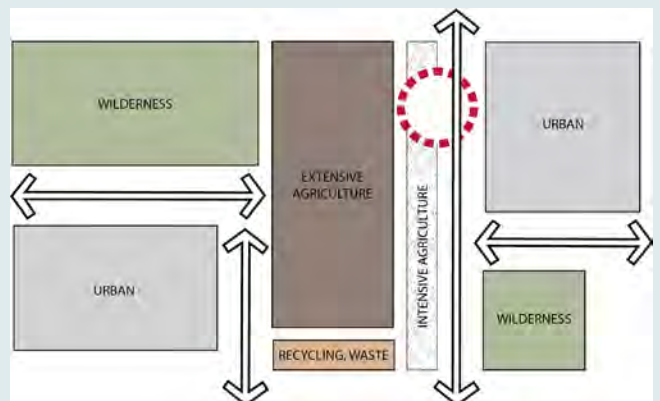
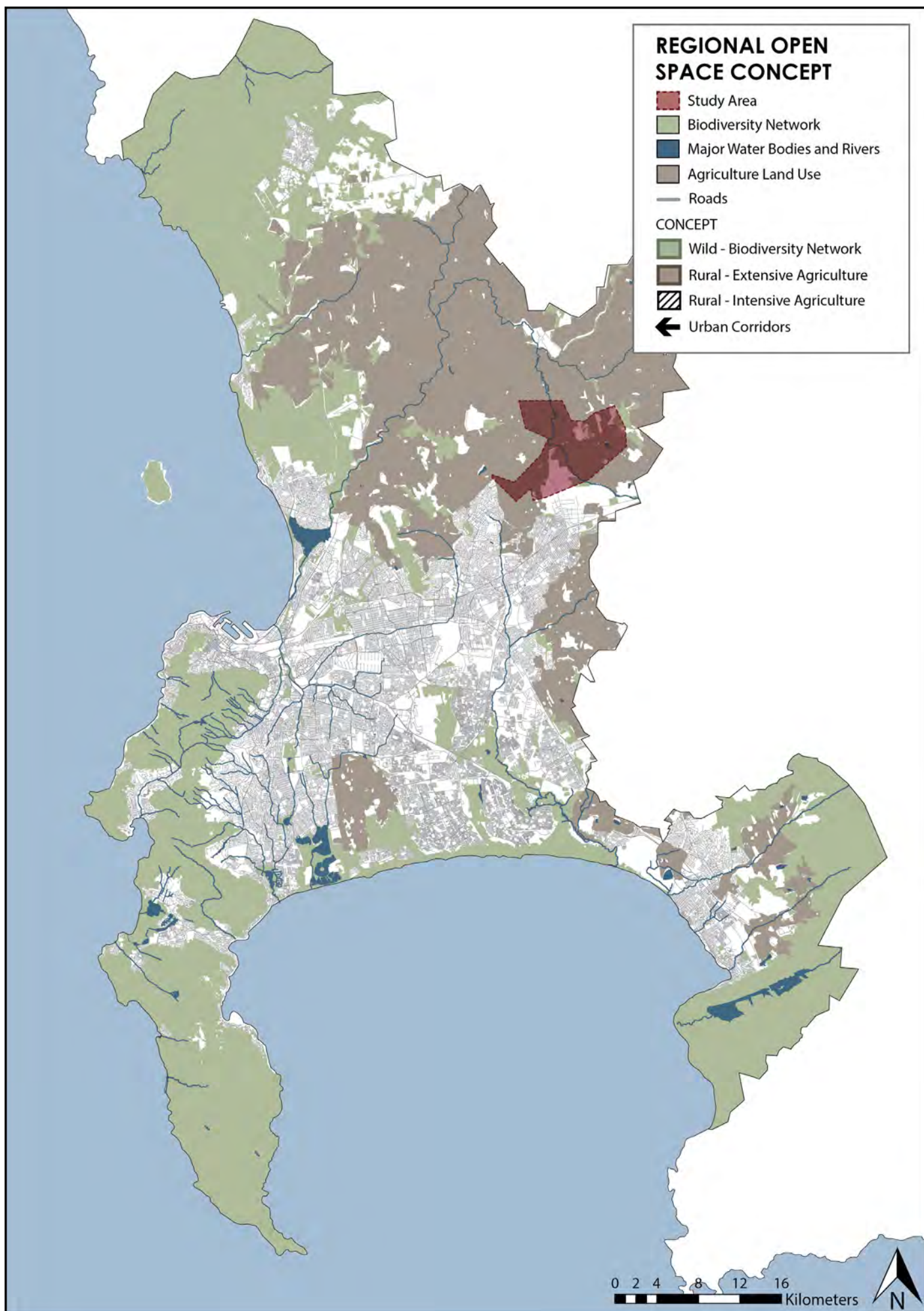
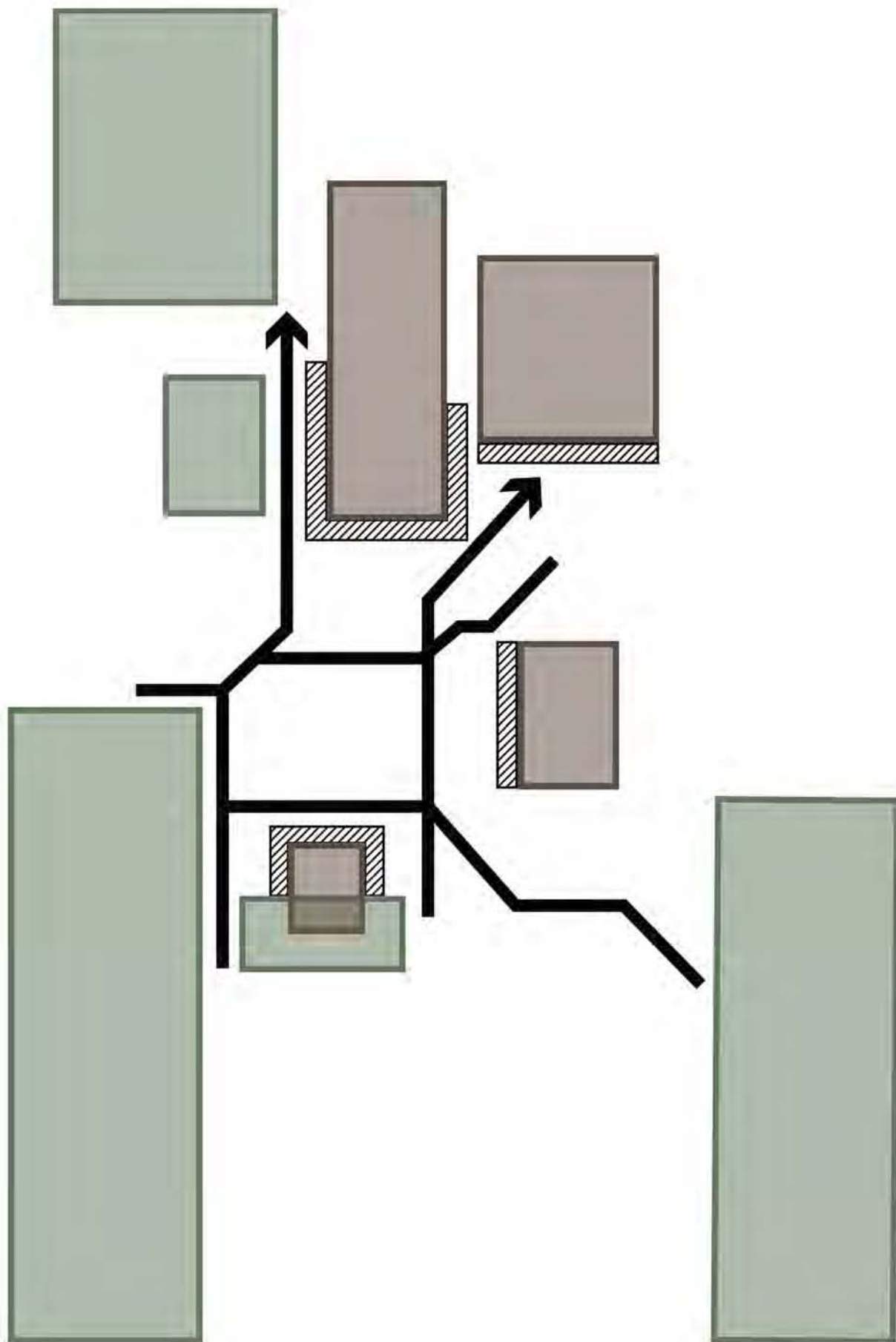


Figure 7.1: Concept diagram of relationship between triad of domains (Source: Author)



Map 7.5: Regional Open Space Concept (Source: Author; City of Cape Town 2012a)



7.2.2 GREEN SYSTEM

The current management of natural systems within the city is not satisfactory. The conservation, management and improvement of the natural resources are essential. Cape Town's natural resource base is a green system that is made up of ecological features, parks, sports fields and landscapes (Cape Town, 1999). Protecting and improving the green spaces are not just an environmental issue; these areas are important for recreational facilities for residents of Cape Town. They are also one of the biggest tourist attractions and thus have a direct economic benefit as a contributor to the tourism industry (City of Cape Town, 2006).

It is clear from Map 7.6 that Cape Town's green system is fragmented. There are many non-migrating plant and animal species that are vulnerable to the fragmentation of their habitat (Nilsson *et al*, 2013). In order to counteract this fragmentation an interlinked green web should be established within the city. Map 7.6 shows the various core areas within Cape Town and the proposed concept of ecological corridors that should interconnect them. Map 7.6 also shows the final development of ecological corridors in the city. Where possible, the ecological corridors run parallel with river systems and existing corridors throughout the city.

INTERLINKED GREEN WEB CONCEPT

An ecological corridor system consists of core areas, corridors and buffer zones. The ecological corridors create connections between the core areas. The core area and various connecting ecological corridors should have a buffer zone that will protect the areas from disruptive development while allowing low impact activities to take place. There are three types of corridors. Linear corridors are long uninterrupted strips of vegetation, stepping stone corridors consist of a series of small non-connected habitats and landscape corridors consist of diverse and uninterrupted landscape elements (Sicirec, 2015). The corridors also deliver a range of other social and environmental benefits that includes the enhancement of the local landscape, better opportunities for public access and recreational use. They cover natural landscapes such as rivers, floodplains and mountains, as well as "corridors" of unsealed land. Ecological corridors should be created to support natural systems where all areas of natural value is included into a biodiversity network to ensure the conservation of biodiversity (Nilsson *et al*, 2013).

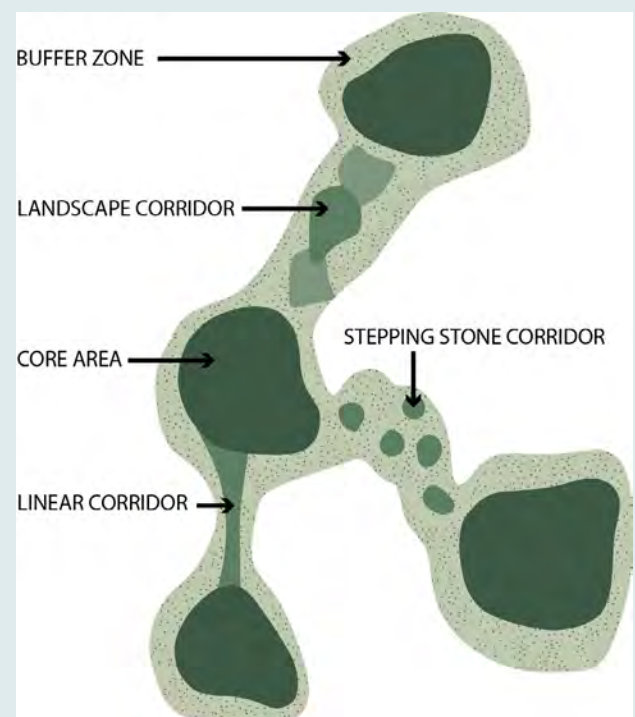
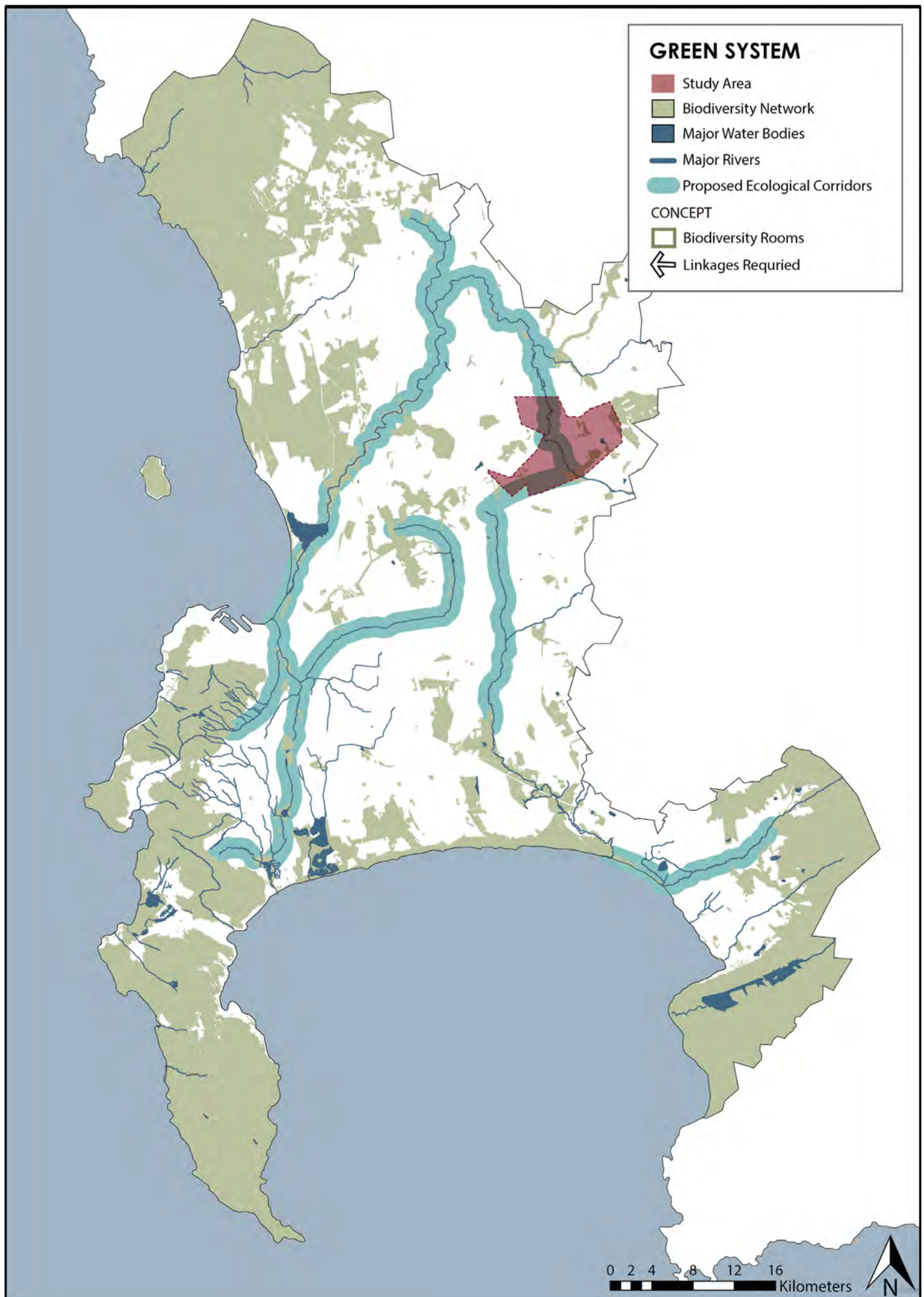
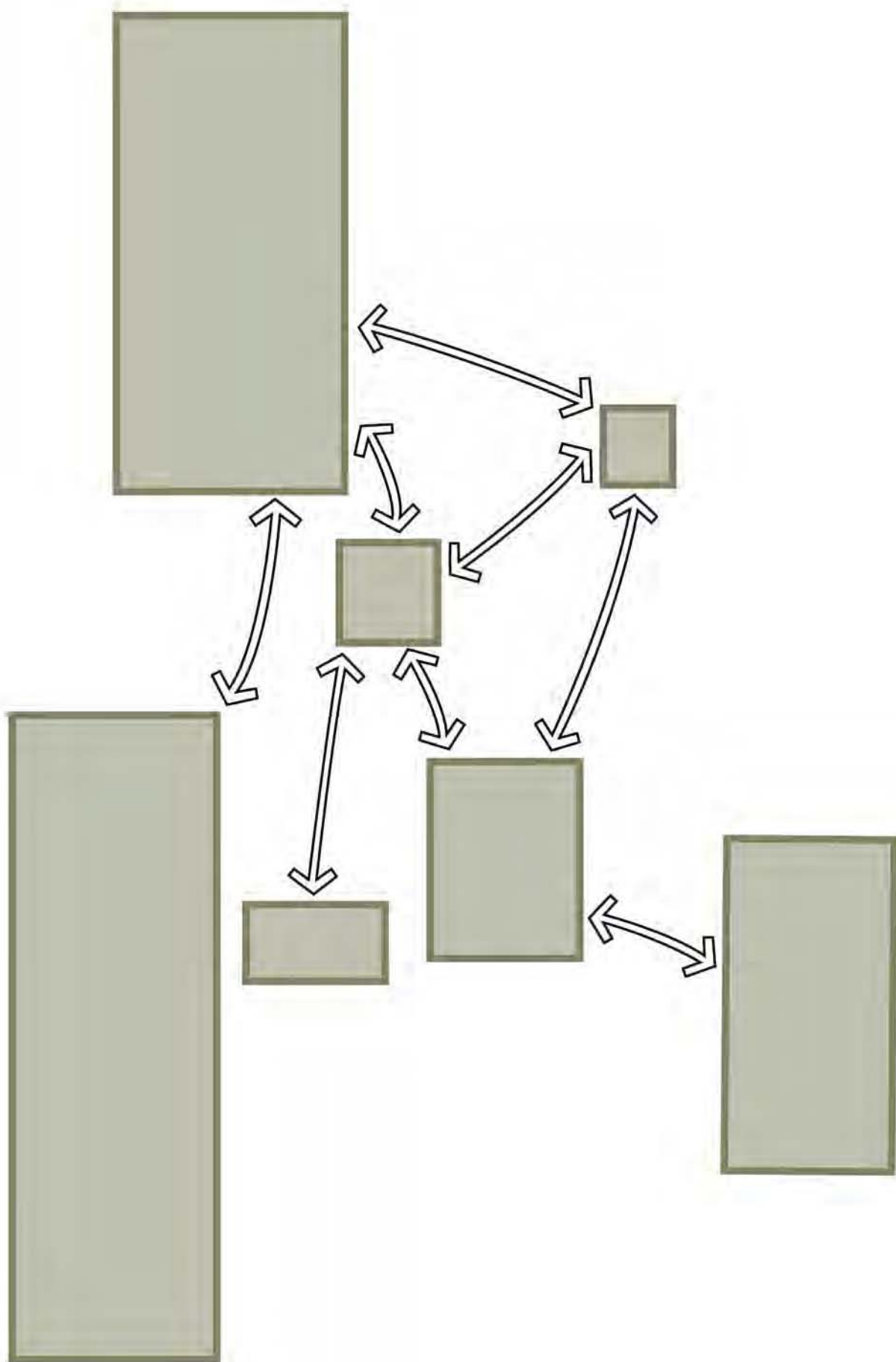


Figure 7.2: Ecological Corridor Concept (Source: Author; Sicirec, 2015)



Map 7.6: Green System (Source: Author; GIS Technical Library, University of Cape Town)



7.2.3 MOVEMENT SYSTEM

The spatial focus of the movement system is to move away from the current radial pattern of movement to create an equitable pattern of access based on a hierarchical system of public transportation systems. This requires the rethinking of the current movement patterns to help residents have access to economic opportunities and social facilities (City of Cape Town, 2006).

In order to achieve a more equitable pattern of movement and access the emergence of a network of interlocking activity systems should be promoted to accommodate a mix of intensive economic and social activities across the city. The establishment of these activity corridors are dependent upon the creation of a grid of continuous transport routes across the city. The grid should integrate different modes of public transport to maximise consumer choice and they should be reinforced by higher density development. Public facilities as well as social services should be located along this grid (Dewar & Uytendogaardt, 1991). The separation of economic and residential areas will be addressed as well as the decentralisation of community facilities and economic activities that encourage the use of private vehicles. There will also be improved public transport links between economic activities and residential areas, especially in low-income areas (City of Cape Town, 2006).

ACCESSIBILITY GRID CONCEPT

The accessibility grid identifies routes which are characterized by higher level of accessibility and hence a concentration of urban development and public transport services. In the concept the objectives of accessibility and mobility must be balanced, therefore portions of the grid map perform a mobility rather than accessibility function. The multi-directional accessibility grid that is envisioned for Cape Town lays the foundation for the design of an integrated public transportation system that will place the majority of the city's population within 1km of a public transport system (City of Cape Town, 2012a).

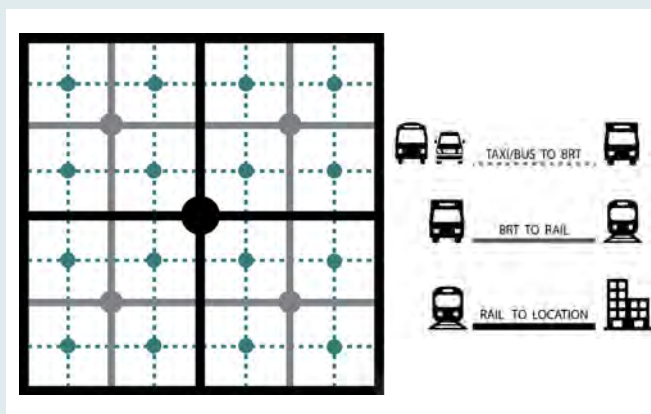


Figure 7.3: Conceptual Accessibility Grid (Source: Author)

PRIMARY TIER - RAIL SERVICE

High performance, high volume and safe public transport services for long distance commuting. This service should be provided at 16km intervals (City of Cape Town, 2012a).

SECONDARY TIER - BRT SERVICE

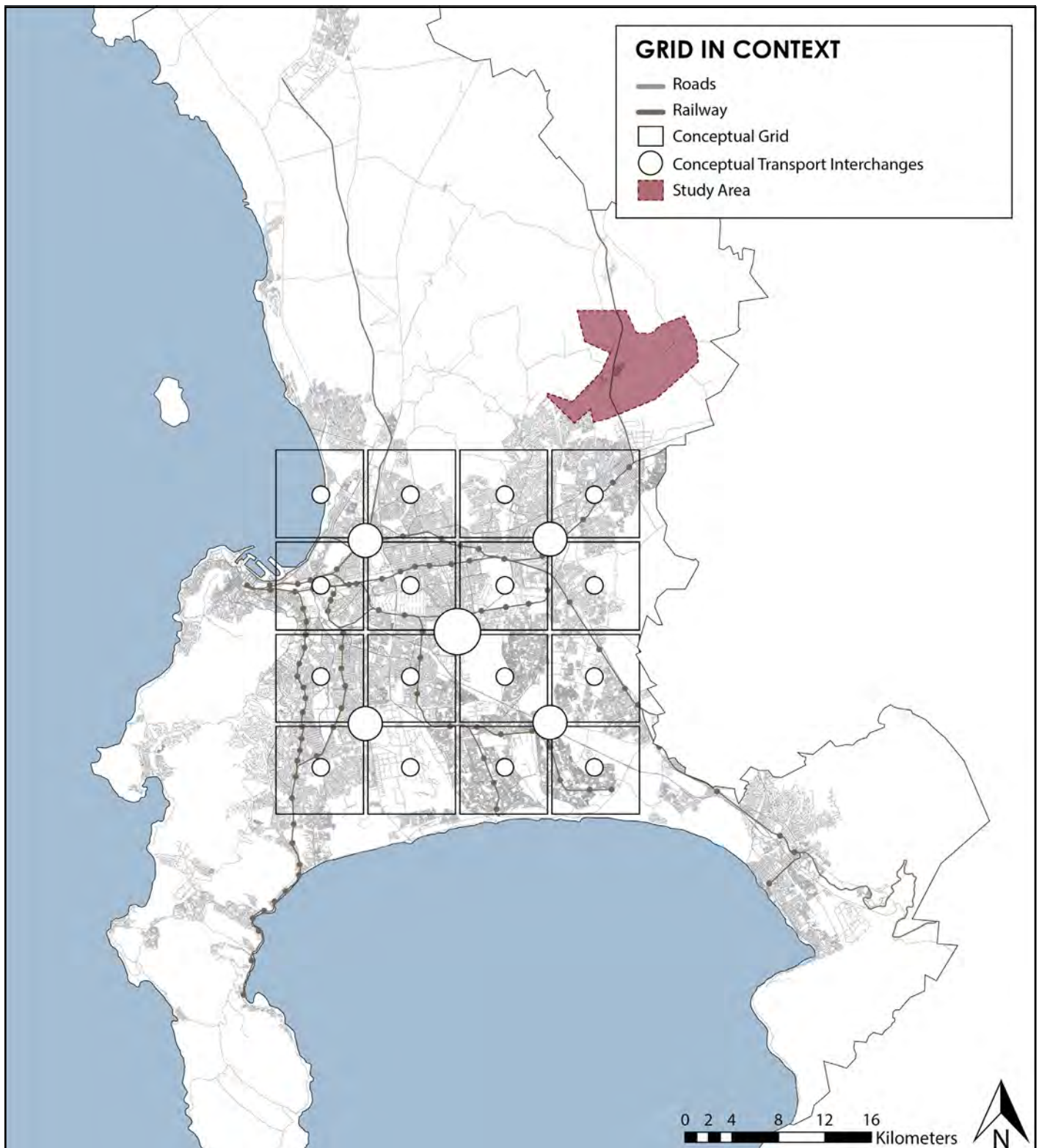
BRT trunk services to be provided by segregated right of way infrastructure that offers frequent and rapid service along major roads. This service should be provided at 8km intervals (City of Cape Town, 2012a).

TERTIARY TIER - BUS AND MBT SERVICES

Standard buses and MBT to 'feed' into the BRT and rail services, to be provided at 4 km intervals. The service should operate at a district and suburb scale along activity routes (City of Cape Town, 2012a).

THE GRID IN CONTEXT

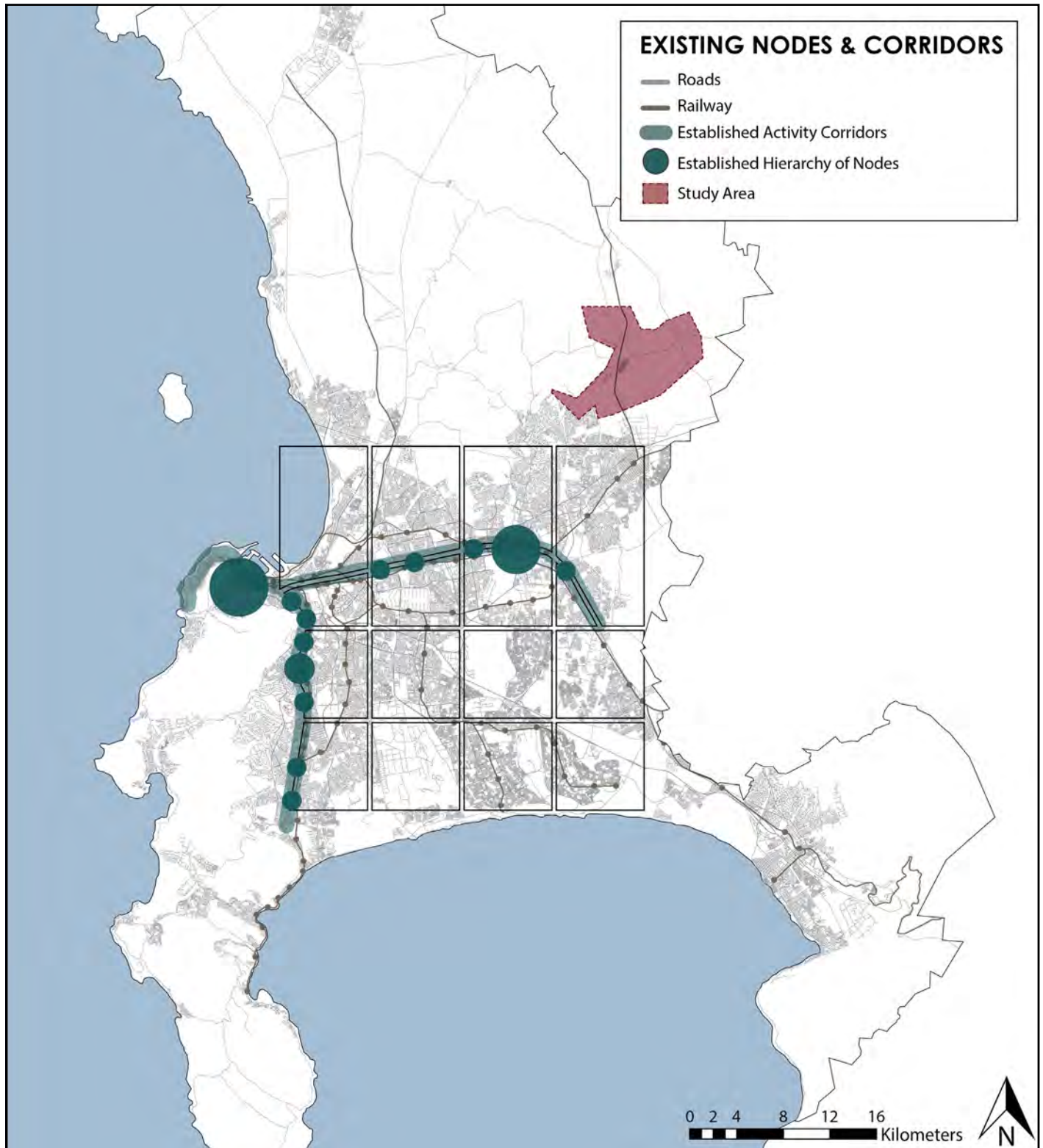
As can be seen in Map 7.7 the conceptual grid, measuring 16km x 16km is laid over Cape Town. Cape Town should be focused on a series of metropolitan activity corridors that are supported by the coordination of infrastructure investment. Activity corridors offer easy access to goods, services and people, are well serviced by movement facilities, offer a mix of land uses and facilitate ease of movement. These activity corridors already exist in Cape Town, some of these are more prominent than others (City of Cape Town, 2012a).



Map 7.7: The Grid in Context (Source: Author; GIS Technical Library, University of Cape Town)

EXISTING NODES AND CORRIDORS

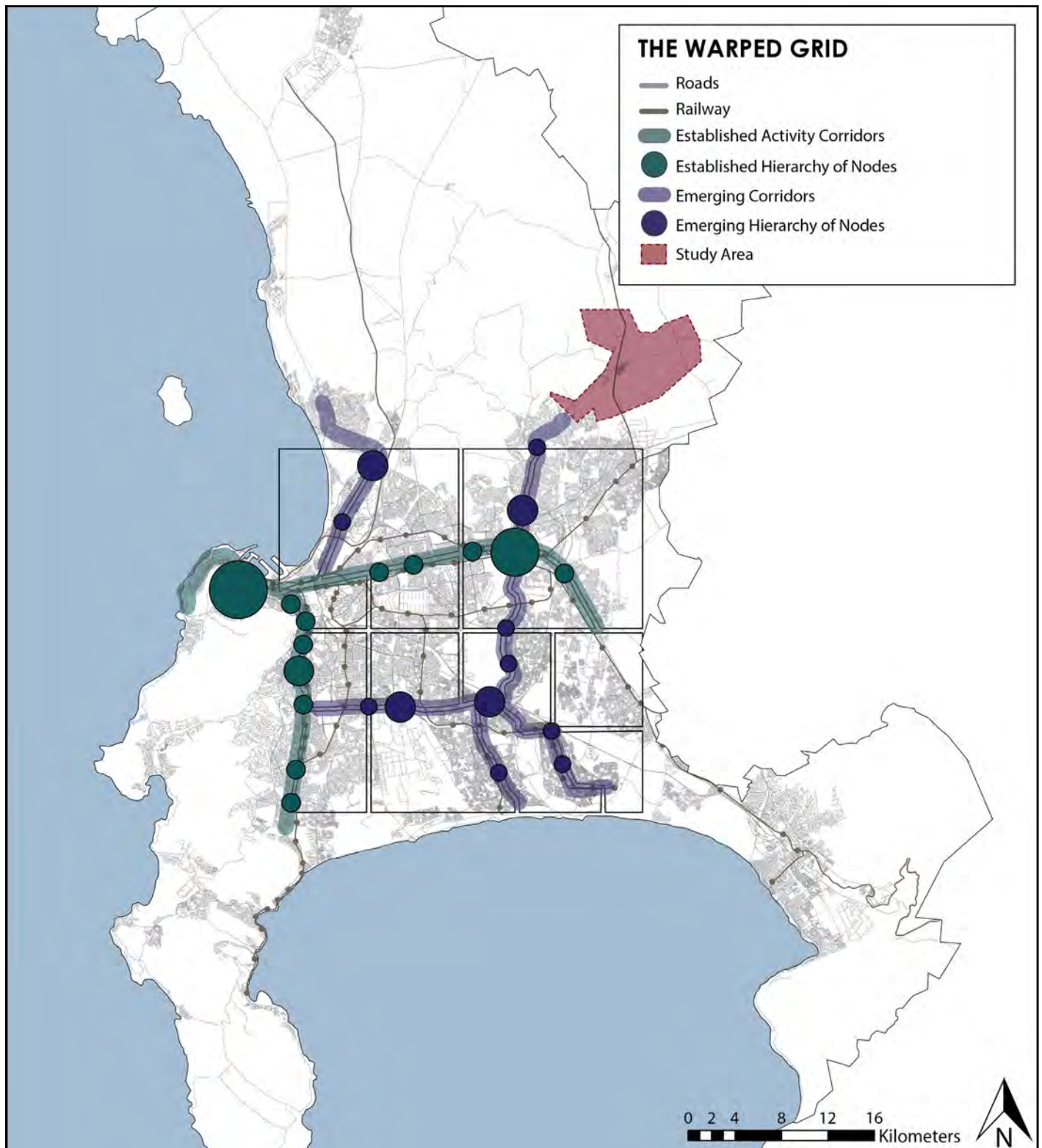
The two main corridors that exist in Cape Town are the Voortrekker and Main Road corridors, these are also the oldest development spines in Cape Town. Both of these corridors formed organically over time and followed the main public transport route at the time which was the railway line. The intensity of development is not uniform along these routes but clusters at points of higher accessibility such as where transport routes interconnect. This can be seen with the two main nodes of the CBD and Bellville along the Voortrekker corridor, and smaller nodes of Mowbray, Rondebosch, Claremont and Wynberg along the Main Road corridor (Dewar *et al*, 1990).



Map 7.8: Existing Nodes and Corridors (Source: Author; GIS Technical Library, University of Cape Town)

A DECENTRALIZED NETWORK

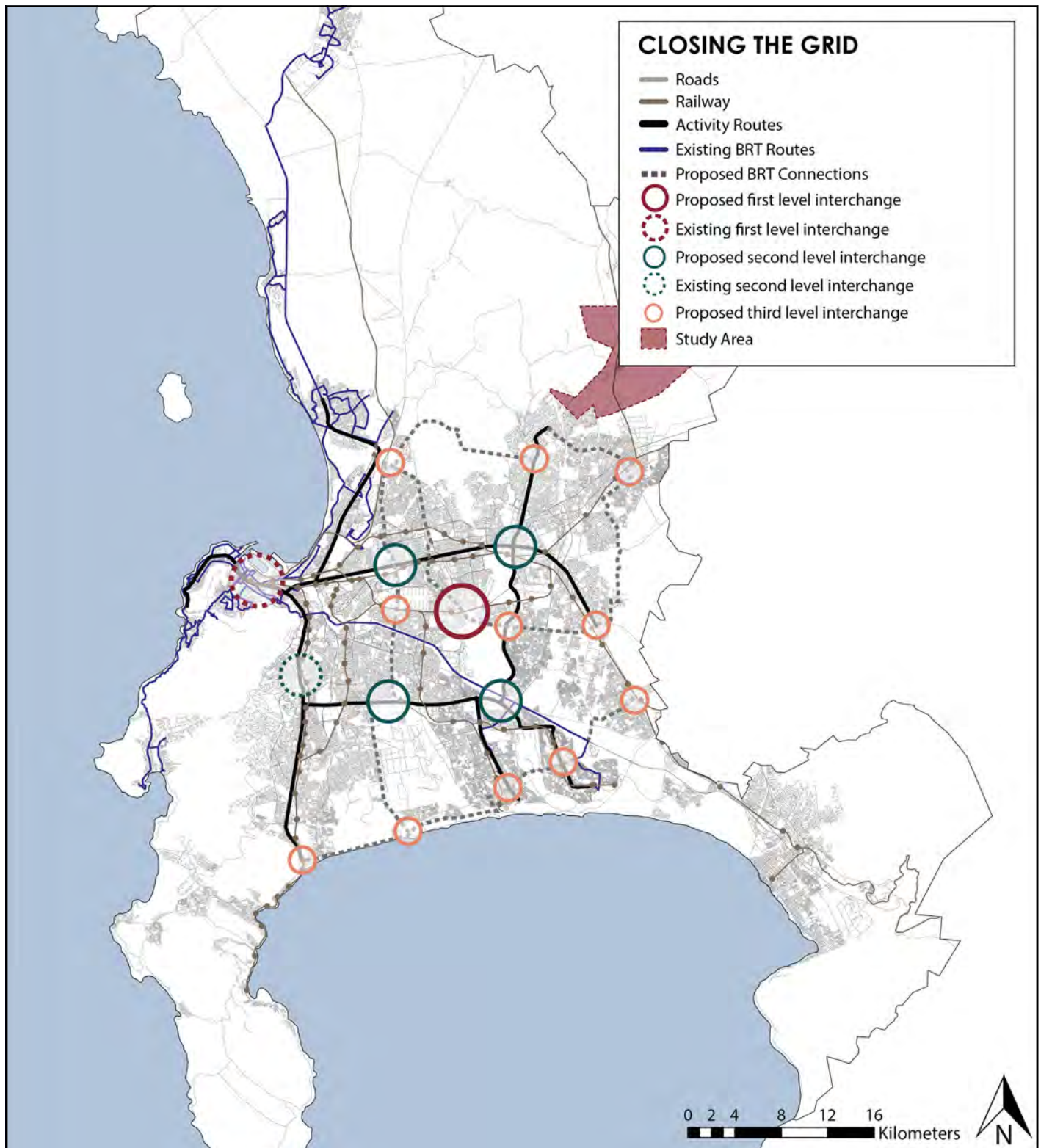
Map 7.9 shows how the existing and the emerging corridors and nodes can be connected to form a grid within Cape Town. The emerging corridors are the Lansdowne corridor, Durbanville corridor, Koeberg corridor and Symphony Way corridor. These emerging corridors should be strengthened to promote better accessibility within Cape Town. As corridors form organically and tend to respond to public transport and routes of high accessibility, different modes of public transport should run along these corridors and connect them with existing mobility routes. From Map 7.9 it can be seen that Cape Town's growth can be directed into two directions: up the west coast growth corridor or towards the northern growth corridor.



Map 7.9: The Warped Grid (Source: Author; GIS Technical Library, University of Cape Town)

MOVEMENT CONNECTORS

Public transport systems are an important element in the grid concept. These various modes of public transport need to work together to form the grid and make sure that they do not serve the same routes as the other modes of public transport. The proposal is that new BRT connections be constructed along major movement routes to connect the existing radial rail system and essentially 'close the grid'. New transport interchanges should be constructed at new cross sections as can be seen in Map 7.10. Resources should be spent on upgrading the existing rail lines and bus and taxi services should be concentrated along the activity routes as well as on other main roads that connect up with the BRT or rail system.



Map 7.10: Closing the grid (Source: Author; GIS Technical Library, University of Cape Town)

CHAPTER 8: SITE AND ENVIRONS

This chapter drops a scale to analyse the site and its surrounding environment. The chapter starts with a sub-metro concept to establish where the site should be located. The site and environs analysis begins with a bio-physical analysis of the area, thereafter focusing on the man-made elements of the area.

8.1 SUB-METRO CONTEXT

Cape Town essentially consists of pockets of development that operate in isolation and are linked by freeways and other high-speed limited access movement routes. This system emphasises only a few points such as the CBD and Bellville (see Map 8.1). Each of these pockets of development needs to be self-supporting but the densities of these areas are too low to adequately support social and commercial services. This lack of opportunities in pockets of development result in people having to travel out of the area on a daily basis. This generates large amounts of movement which causes pollution and congestion. This pattern of fragmentation needs to be broken by connecting these pockets of development with one another (Dewar & Uytenbogaardt, 1991).

8.2 SUB-METRO CONCEPT

The sub-metro concept proposes connecting pockets of existing and future development in an integrated system where the different parcels of development reinforce each other. Activity corridors should connect a number of local areas so that they can accommodate a variety of activities. These corridors should be reinforced by high density development and more intensive activities that are dependant on public transport should locate along these routes. Over time this system of activity corridors will result in a more integrated environment and a more decentralised pattern of commercial and industrial activity in the sub-metro (Dewar & Uytenbogaardt, 1991)

Map 8.1 shows the existing activity corridors, nodes and pockets of development in the sub-metro area. It also shows the pockets of development that occur in the rural areas of the

sub-metro. As Cape Town's growth is expected to grow northwards, activity corridors are proposed along the west coast and above Durbanville to direct urban growth. Map 8.1 shows the proposed corridors linking up with the existing corridors as well as proposed pockets of development where future growth in Cape Town can be directed.

NETWORK OF ACTIVITY SYSTEM CONCEPT

This concept consists of a grid of activity corridors for the sub-metro area (see Figure X). These corridors work on a 16 x 16km distance. Public transport and intensive mixed use development should occur along these corridors. High speed, limited access route is proposed to run through the centre of the grid to facilitate movement out of the area. Extensive and intensive agricultural activity is proposed to occur in the centre of this grid, between the activity corridors.

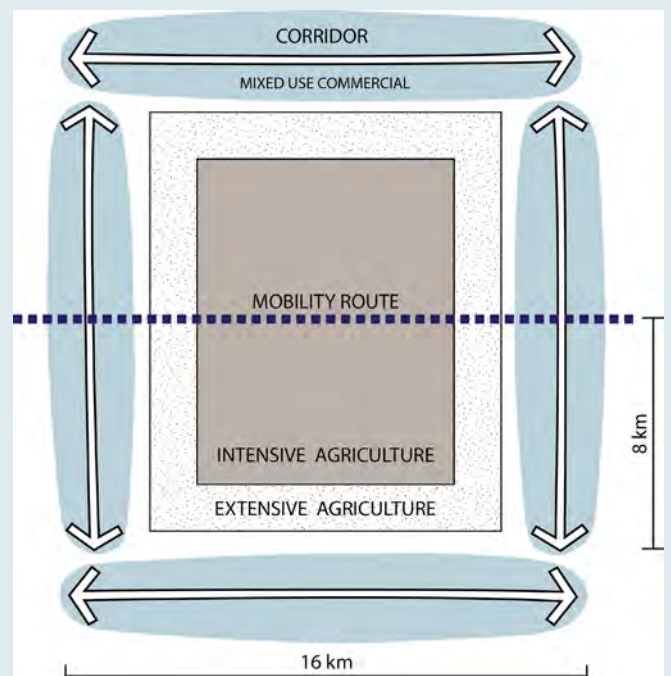
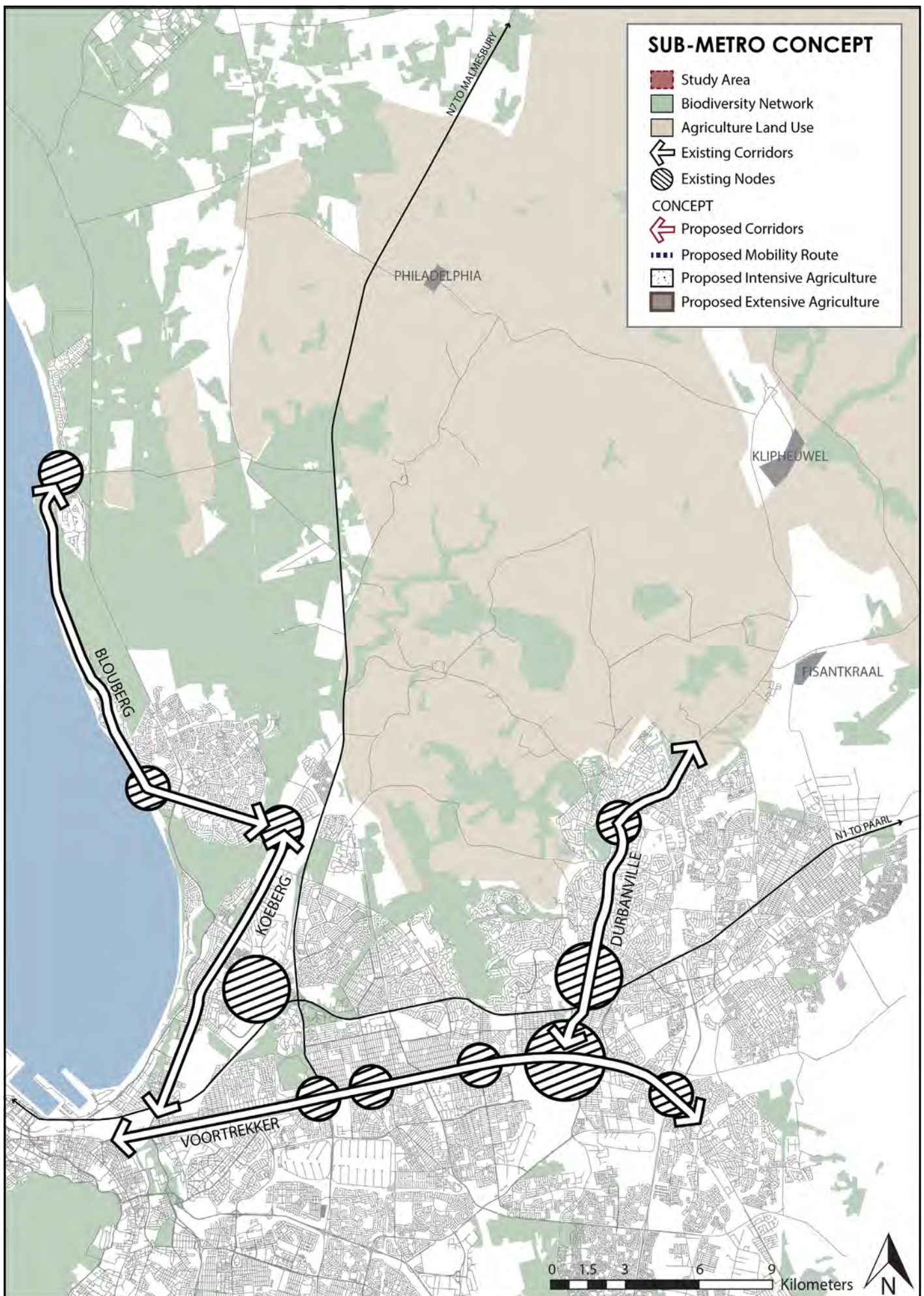
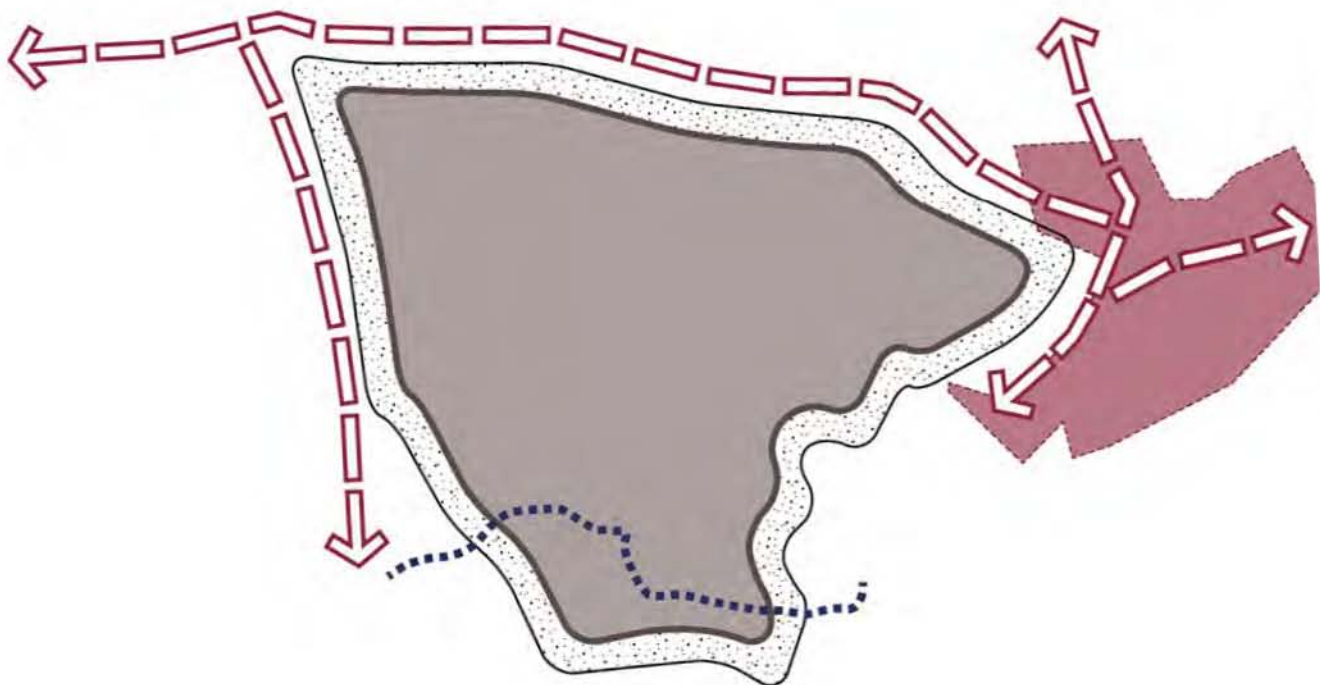


Figure 8.1: Sub-Metro Corridor Concept (Source: Author)

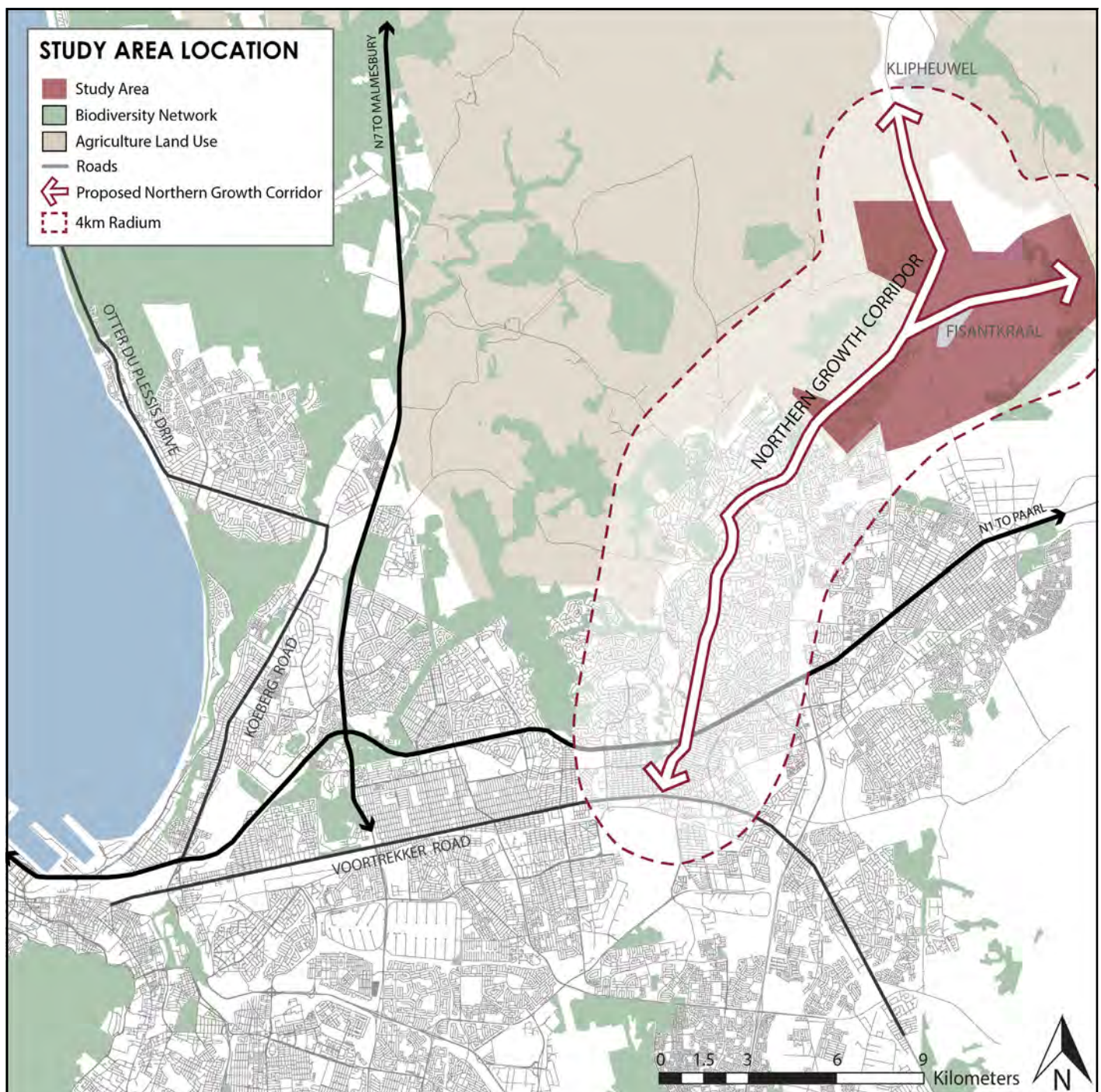


Map 8.1: Sub-Metro Concept (Source: Author; GIS Technical Library, University of Cape Town)



8.3 THE STUDY AREA

In terms of the sub-metro concept the existing Durbanville corridor should be extended northwards and vacant land north of Durbanville's built footprint should be developed intensely and structured around the activity corridors in order to direct future growth in Cape Town. The study area shows the northern growth corridor and a 4km radius surrounding the corridor. The area is characterised by a rural hinterland that accommodates the rural settlement of Fisantekraal. Over the past twenty years the area has been one of the city's main growth areas and much of the productive agricultural land has been taken up by development. The urban areas within the site are characterised as predominantly low density with many middle- to high-income suburban residential developments. Many of these residential developments are security estates that are introverted areas and have little to no relationship with the surrounding environment. There are large tracts of vacant land located north of Durbanville which provide opportunities for future higher density housing development (City of Cape Town, 2011).



Map 8.2: Location of Northern Growth Corridor and study area (Source: Author; GIS Technical Library, University of Cape Town)

8.4 HISTORICAL DEVELOPMENT

THE SETTLEMENT EMERGES

In 1655 Jan van Riebeeck sent people out to explore the hinterland of Table Bay. It was only on the third journey in 1658 that the spring in the Durbanville area was discovered. After that the area became the crossing point for most journeys to Malmesbury, Paarl and Stellenbosch. The settlement became popular mainly because of the spring there which was the best water source for many kilometres. From that point the settlement grew as more people journeyed to the hinterland and required an area to rest and obtain provisions before travelling onwards. In 1698 people started to move to the settlement to farm as the area became popular for its water and fertile soils and a village developed at Pampoenskraal around the 1790s (Du Plessis, 1998; Wesson, 1994).

THE SETTLEMENT CONSOLIDATES

In 1812, under British control, it was ruled that every settlement had to have a church and school in order to be recognised (Wesson, 1994). In 1824 farmers from the area petitioned the government for a grant of land close to Pampoenskraal for a church and school. The land was granted and by 1826 the Pampoenskraal Dutch Reformed Church was established, followed by a school. After seeing the successful establishment of the church and school, the Cape Town administration wanted the settlement to move forward. The government allocated land to the church to sell as a means to survive and to finance the church and the school. After the church had auctioned off all of its land, the settlement received an influx of people. A petition in 1836 allowed the settlement's name to be changed from Pampoenskraal to D'Urban (after Sir Benjamin D'Urban who was the governor of the Cape) as the settlement's population was increasing and its location was central and convenient (Du Plessis, 1998).

THE SETTLEMENT FLOURISHES

In 1858 the Durbanville Wagon Works was established and, under the ownership of the King Brothers, became the biggest wagon works in South Africa, producing over 300 wagons per month and employing over 250 people (Du Plessis, 1998). In 1897 the settlement established a management board that had a few members, four years later the board became a municipi-

ality. In the same year D'Urban was renamed Durbanville to prevent confusion with Durban in Kwa-Zulu Natal (Wesson, 1994).

THE SETTLEMENT LOSES MOMENTUM

Up until 1910 Durbanville's success was based entirely on the Wagon Works. After the arrival of the motor car, however, this industry closed down (Wesson, 1994). The whole Durbanville area was at a low point after having been hit by the Depression, the collapse of the Wagon Works, the Great War and the flu epidemic (Du Plessis, 1998).

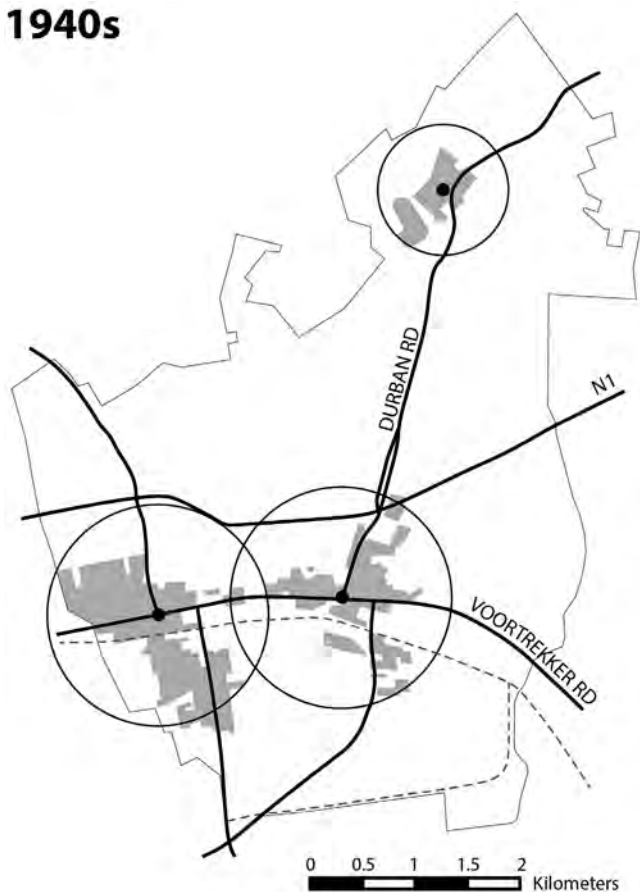
A SUBURB EMERGES

In 1944 the Municipality realised that it could not compete with Parow and Bellville's industry and decided to create a different kind of appeal. The firms of Bowling and Floyd were hired to take a look at the town and to plan its future. There were certain guidelines that included the preservation of the rural atmosphere, the creation of large open space, wide roads, large house plots, a central business district and no industry. The plan was adopted and Durbanville was launched as an attractive dormitory suburb (Du Plessis, 1998).

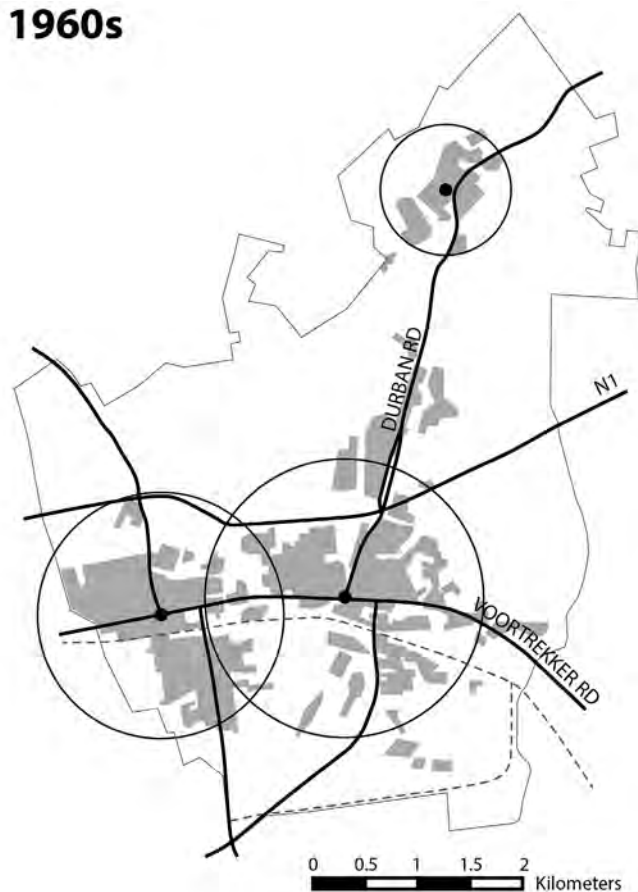
PRESENT

The area remained largely agricultural until the 1930s. The growth of the urban population has been as a result of rural-urban migration and natural population increase. Expanded urbanisation was stimulated by industrial development and a general urbanisation trend in the area in the 1930s (City of Cape Town, 2011). The suburbs have remained a nucleus of urban development, and growth in the settlement has been relatively slow compared to its neighbouring settlement of Bellville (See Figure 8.2). The pattern of growth in Durbanville has mainly been around the original nucleus and around Durban Road, but there has been little spread beyond this. The steep slopes of the Tygerberg Hills, various nature reserves, agricultural practices and quarries have been barriers to development in the area (Du Plessis, 1998). Today, Durbanville combines a village feel with strong growth in various industry sectors, including financial services, health and medical, hospitality, property, retail and services (City of Cape Town, 2011).

1940s



1960s



1970s



1980s



Figure 8.2: Growth of Durbanville and Surroundings (Source: Author; Du Plessis, 1998)

8.35 BIO-PHYSICAL ANALYSIS

8.5.1 METHOD

The bio-physical analysis follows a sequence to understand the natural landscape and to determine suitable sites for development. The analysis starts with the geology (the raw material of land) and landform of the site. The combination of these two determines the climate (the driver of weathering processes) and drainage patterns which in turn determine the type of soil, biodiversity and finally landscape character as part of a logical unfolding sequence. Limiting factors are identified such as soils, flooding, slopes as well as opportunities such as agricultural potential. The stability of the site is determined to guide site selection and to determine the suitability of the site

for various land uses (Oberholzer, 2011). The criteria that are provided in Table 8.1 are used as a screening mechanism and not as a definitive interpretation. Below are the definitions used for the various restrictions:

No-Go: Sensitive environmental areas and areas of high significance for social and economic systems. The loss or degradation of these resources should be avoided.

Tread Lightly: Sensitive environment areas where low-impact development could be considered

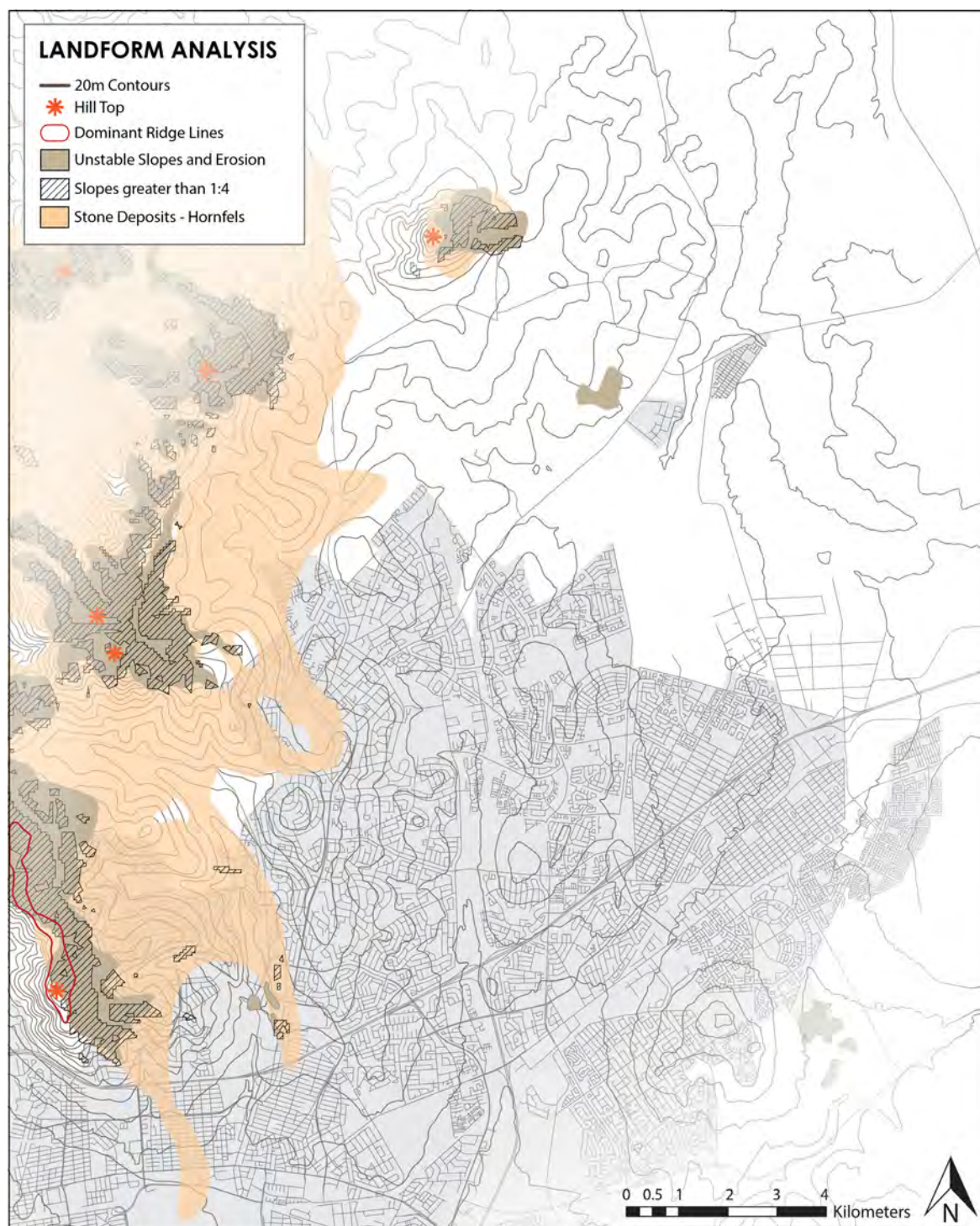
How: These are different design aspects that need to be considered for any development in the area.

NATURAL	CRITERIA	INDICATOR	RESTRICTIONS
GEOLOGY	Stability	Fault Lines	No-Go
LANDFORM	Steep Slopes	More than 1:4	Tread Lightly
	Ridge Lines	Dominant Ridge Lines	No-Go
		Other Ridge Lines	Tread Lightly
	Resources	Gold, Stone Deposits etc.	Tread Lightly
SOILS	Stability	Unstable Soils	No-Go
	Natural Resources	Building Sand, Clay, etc.	Tread Lightly
	Productive Potential	Medium/High Agriculture Potential	No-Go
CLIMATE	Human Comfort	Macroclimate, Microclimate	How?
	Wind	Wind Exposed Peaks, Hilltops	How?
	Rainfall	Heavy Rainfall Areas	How?
HYDROLOGY	Wetlands	Minimum 25m Buffer	No-Go
	Major Rivers	Minimum 50m Buffer	No-Go
	Minor Rivers	Minimum 25m Buffer	No-Go
	Ground Water	Poor Quality	Tread Lightly
	Flood Prone Areas	Minimum 32m Buffer	No-Go
BIODIVERSITY	Protected Areas	Provincial Nature Reserves & Conservation Areas	No-Go
	Threatened Ecosystems	Critical Biodiversity Areas (100m buffer)	No-Go
	Open Space System	Non-negotiable Priority Areas	No-Go if part of Biodiversity Corridor
		Other area	Tread Lightly if part of Biodiversity Corridor
LANDSCAPE CHARACTER	Significant Heritage Sites	National & Provincial Heritage Sites	No-Go
		Municipal Heritage Sites	Tread Lightly
	Design Factors	Gateways, Landmarks, View sheds, Sense of Place etc.	How?

Table 8.1: Criteria Table (Source: Author)

8.5.2 LANDFORM

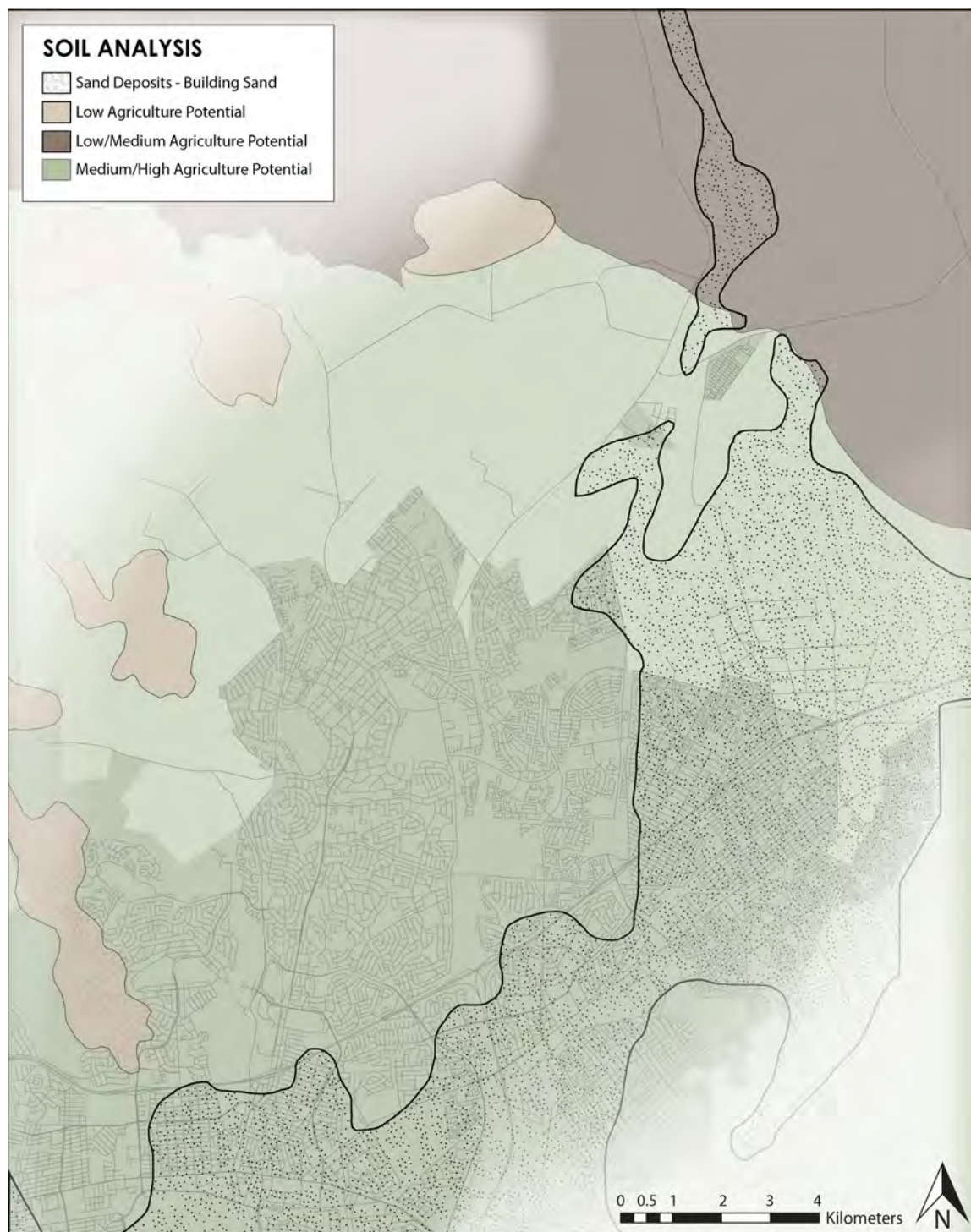
The geology of the area determines the topography by influencing the slopes and soils. The corridor is characterised by undulating hills which are typical of the Malmesbury Group. The major rivers have created a network of valleys that extend across the area. There are some higher lying areas within the corridor. In the north-western areas lies Kanonkop that has an elevation of 450m, making it the highest peak in the area. In the south-west of the area lie the Tygerberg and Durbanville Hills that reach heights between 300m and 500m, with many smaller elevated hills throughout the area (The City of Cape Town, 2011).



Map 8.3: Landform Analysis (Source: Author; GIS Technical Library, University of Cape Town)

8.5.3 SOIL

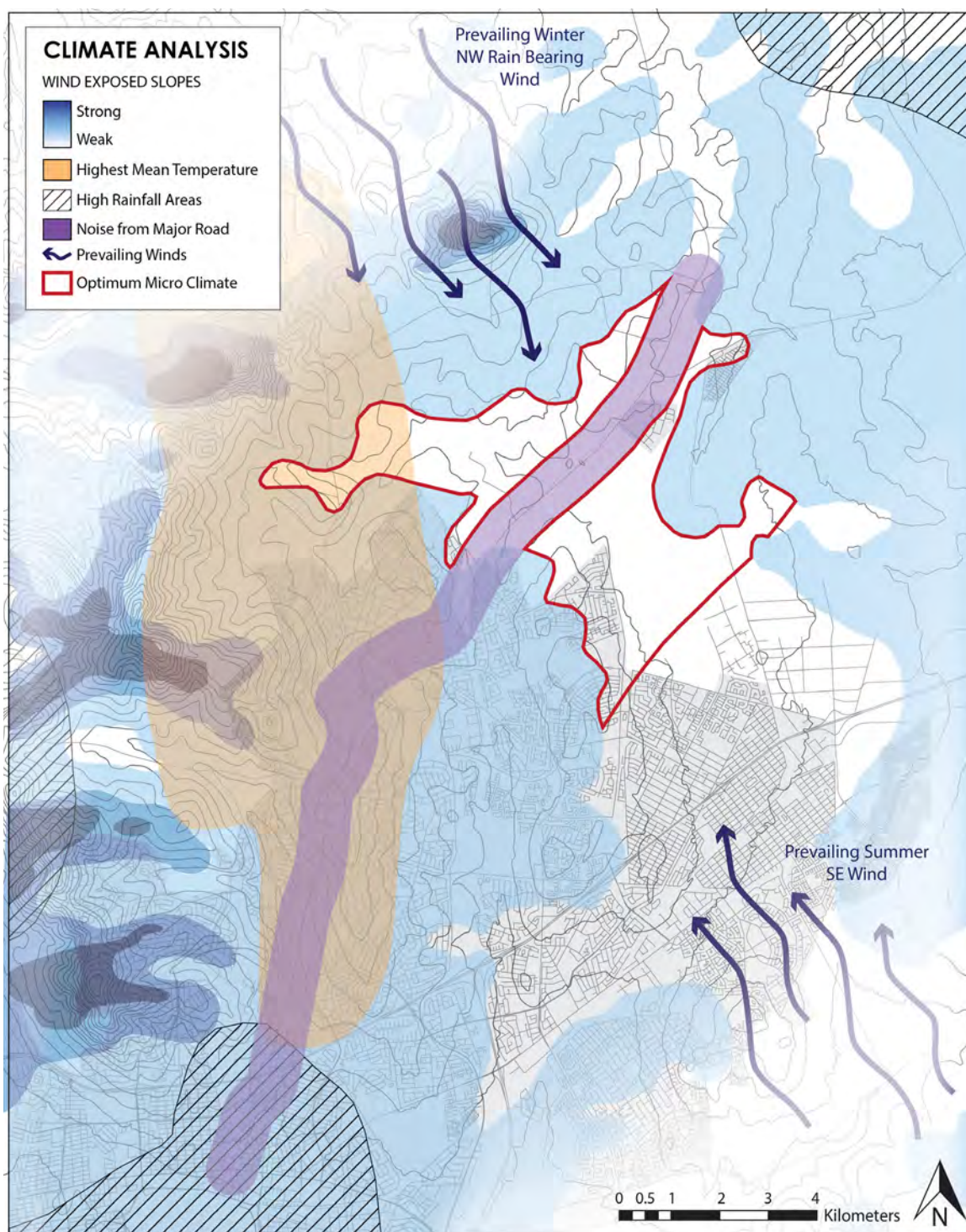
The soils in the area are nutrient rich, fertile and have superior water-holding capacity. This makes the soils not particularly vulnerable to erosion and therefore a good basis for agriculture. Agriculture is a significant contributor to the province's GDP. As can be seen in Map 8.4, the area includes a large portion of high- and medium- potential agriculture land, particularly in the northern sections of the area (Oberholzer, 2011). The area has substantial sand deposits that are of economic importance, particularly in the north of the area. These are several quarries in the area that mine sand, stone and gravel. There are concerns that there is only limited availability of unexploited sand and gravel resources and this has created conflict between the demand to mine these remaining resources and to maintain the integrity of the environments in which these resources occur. The main issue with mineral extraction in the area is the management of these minerals that occur within high- and medium-agriculture potential areas and areas of critical biodiversity (City of Cape Town, 2011).



Map 8.4: Soil Analysis (Source: Author; GIS Technical Library, University of Cape Town)

8.5.4 CLIMATE

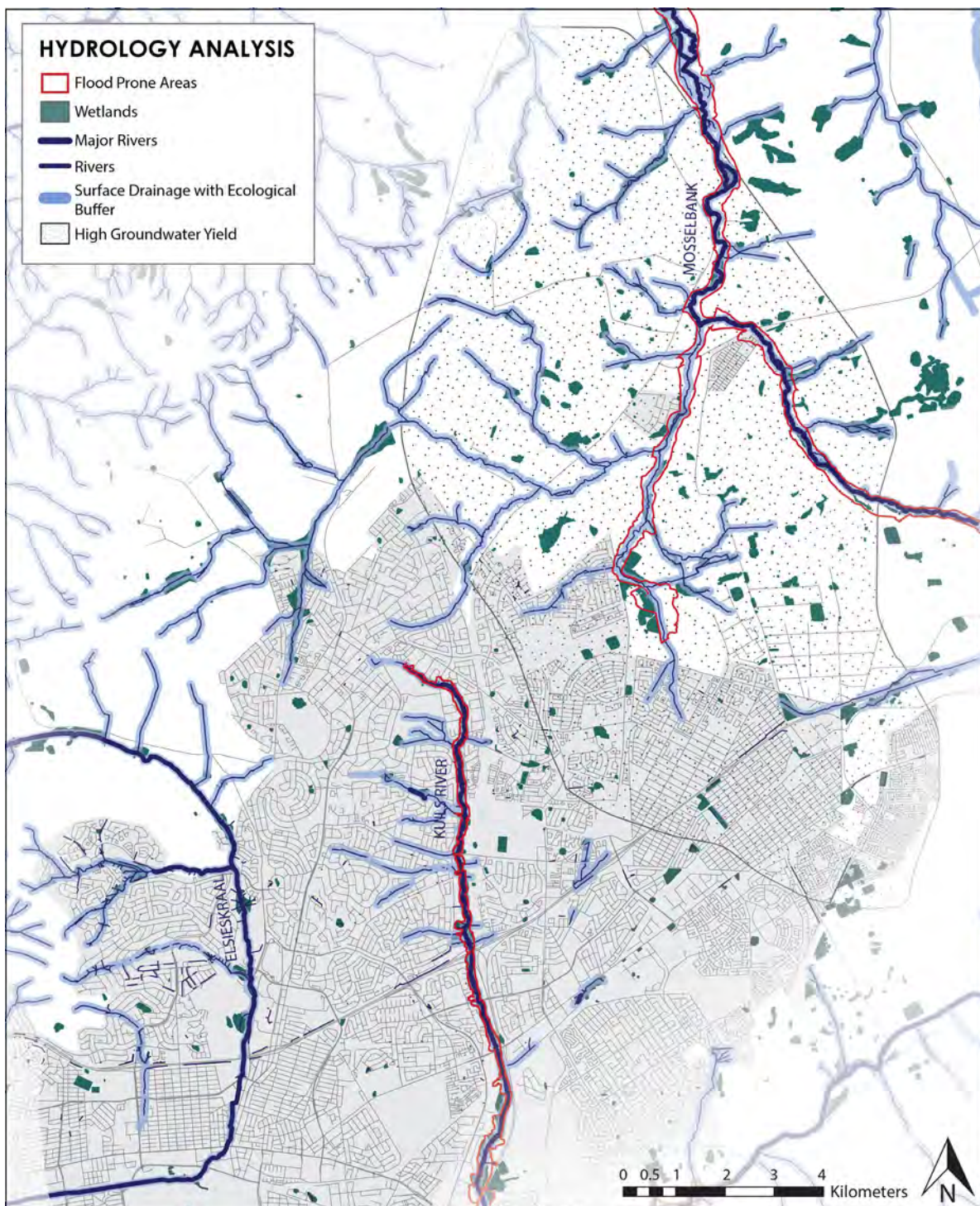
Durbanville's climate can be described as Mediterranean with hot summers and cool wet winters. The maximum temperatures in the area range between 18°C to 32°C while the minimum temperatures ranges between 6°C and 14°C. Winter is the rainy season with an annual average of 774.38mm with June and July being the wettest months. The prevailing winds in the area occur in summer and winter. The south-easterly is predominant on summer afternoons while in winter the north-westerly prevails (Kragh *et al*, 2011). The traditional settlement development tended to occupy the warmer slopes and avoid the wind exposed hilltops or the low lying areas that are subject to cold air flow (Oberholzer, 2011). On the chosen site, factors such as slope orientation, prevailing winds and wind-exposed slopes as well as noise from roads are a major consideration for development. These can be seen on Map 8.5.



Map 8.5: Climate Analysis (Source: Author; <http://gis.elsenburg.com/apps/cfm/>)

8.5.5 HYDROLOGY

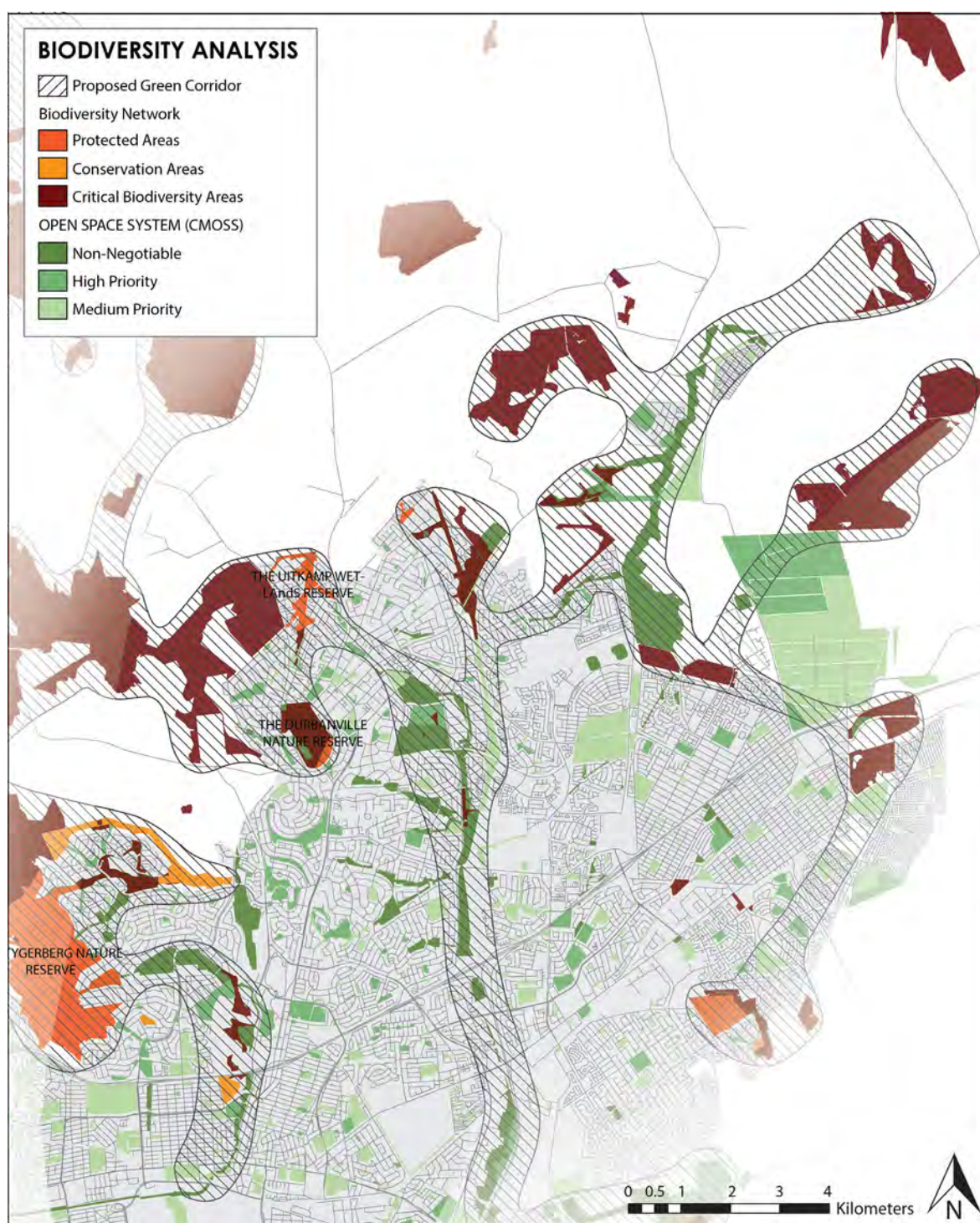
The area contains many rivers and wetlands as can be seen on Map 8.6. There are three major rivers that run through the area, namely the Mosselbank River, the Kuils River and the Elsieskraal River. Low gradients cause major flooding around the Kuils River and Mosselbank River. There are no major wetlands in the area but there are many small wetlands which are mostly limited to water courses. The highest groundwater yields are found in the north-east of the area with yields of 0.1 to 0.5 litres per second. These hydrological systems are all vital for the functioning of the area, especially during severe weather events such as high rainfall, in order to prevent flooding. All these systems are faced with a number of challenges. Flow and habitat alteration in the river systems has led to the significant loss of indigenous riparian vegetation, and disturbances such as sand mining also cause erosion and increased sedimentation in the rivers. Farming practices along the rivers disturb the natural vegetation and have led to the infestation of invasive alien vegetation along rivers, especially in the northern areas (The City of Cape Town, 2011).



Map 8.6: Hydrology Analysis (Source: Author; GIS Technical Library, University of Cape Town)

8.5.6 BIODIVERSITY

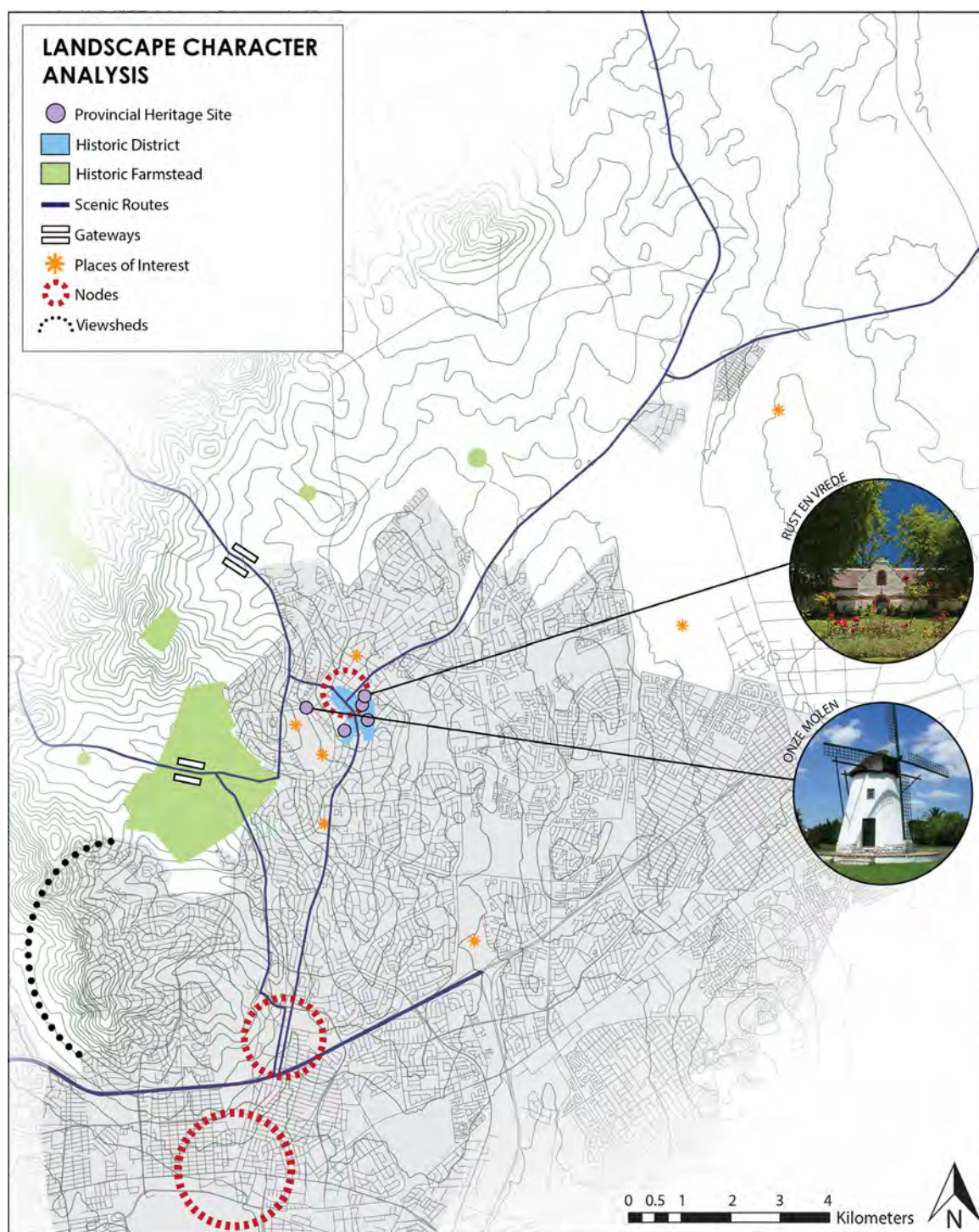
The area has very little indigenous vegetation because of extensive agriculture practices there. The remaining indigenous vegetation in the area occurs in fragments, affecting the connectivity and species' movement. Invasive alien vegetation is widespread throughout the area and has contributed to the deterioration of the natural vegetation. Critically endangered vegetation within the area are the Cape Flats Sand Fynbos, Swartland Shale and Swartland Silcrete Renosterveld. These all need to be maintained and protected. There are four important proclaimed conservation areas, namely the Durbanville Nature Reserve, the Tygerberg Nature Reserve and the Uitkamp Wetlands Reserve (see Map 8.7). The rich biodiversity in the area is under threat for a variety of reasons which include the conversion of land for agricultural practices, urban sprawl and invasive alien vegetation (The City of Cape Town, 2011).



Map 8.7: Biodiversity Analysis (Source: Author; GIS Technical Library, University of Cape Town)

8.5.7 LANDSCAPE CHARACTER

The area can be regarded as a 'romantic landscape' that is characterised by diversity. The ground is never free: it is covered by rocks, valleys and hills, and a micro-landscape is formed. Water is present in the landscape and adds a dynamic element to the place, both as running streams and quiet ponds. The romantic landscape is therefore dominated by the earth as the landscape rises up towards the sky. The variations in the surface relief create directions, define spaces and create a multitude of different places (Norberg-Schulz, 1980). The area represents a number of important cultural Landscapes which can be seen on Map 8.8. Many of the current farms and associated vineyards as well as agricultural land have historic and cultural significance. There are also significant heritage sites found in the area. Map 8.8 also shows design factors which add to the character of the landscape. The site's cultural landscape is under pressure from urban and industrial development and many of the historic farms have been either inappropriately altered or destroyed (City of Cape Town, 2011).



Map 8.8: Landscape Character Analysis (Source: Author; GIS Technical Library, University of Cape Town; <http://www.durbanville-heritage.co.za/>)

8.5.8 COMPOSITE BIOPHYSICAL INFORMANTS

Map 8.9 is a composite biophysical informants map that shows where development should and should not go in the area. The map includes three different development classifications. The 'no-go' areas include the buffers around critical biodiversity areas, wetlands, rivers and flood-prone areas. It also includes valuable agricultural land outside of the current urban edge. These areas may not be developed. The 'tread-lightly' areas include potentially productive potential resources such as sand deposits which can be mined and valuable agriculture land within the urban edge which can be farmed on. Map 8.9 also identifies where development could go: where is should go is determined by the sub-metro concept. Developable land has no restrictions and can be fully utilised for urban developed.

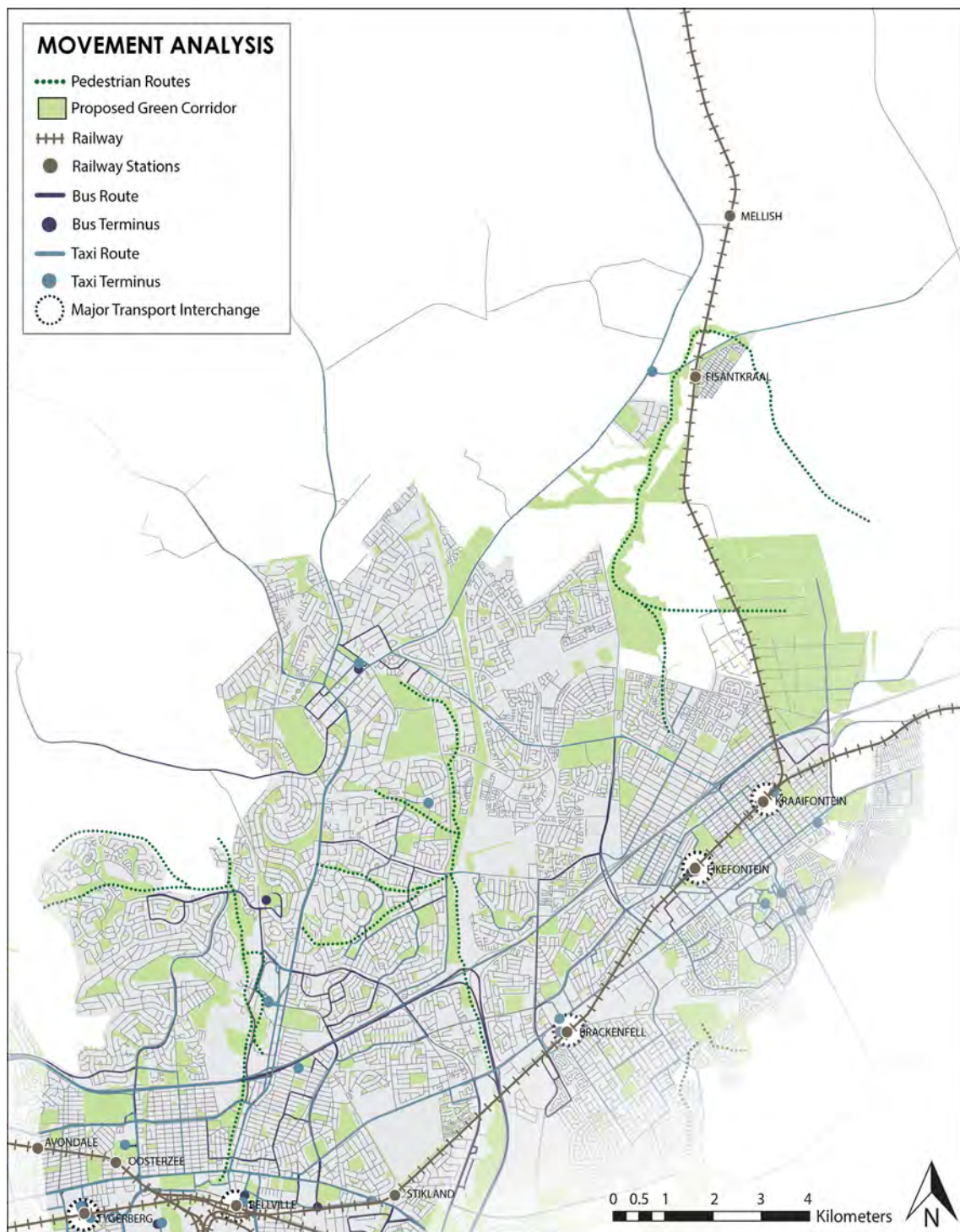


Map 8.9: Composite Biophysical Informants (Source: Author; GIS Technical Library, University of Cape Town)

8.6 MAN-MADE ANALYSIS

8.6.1 MOVEMENT ANALYSIS

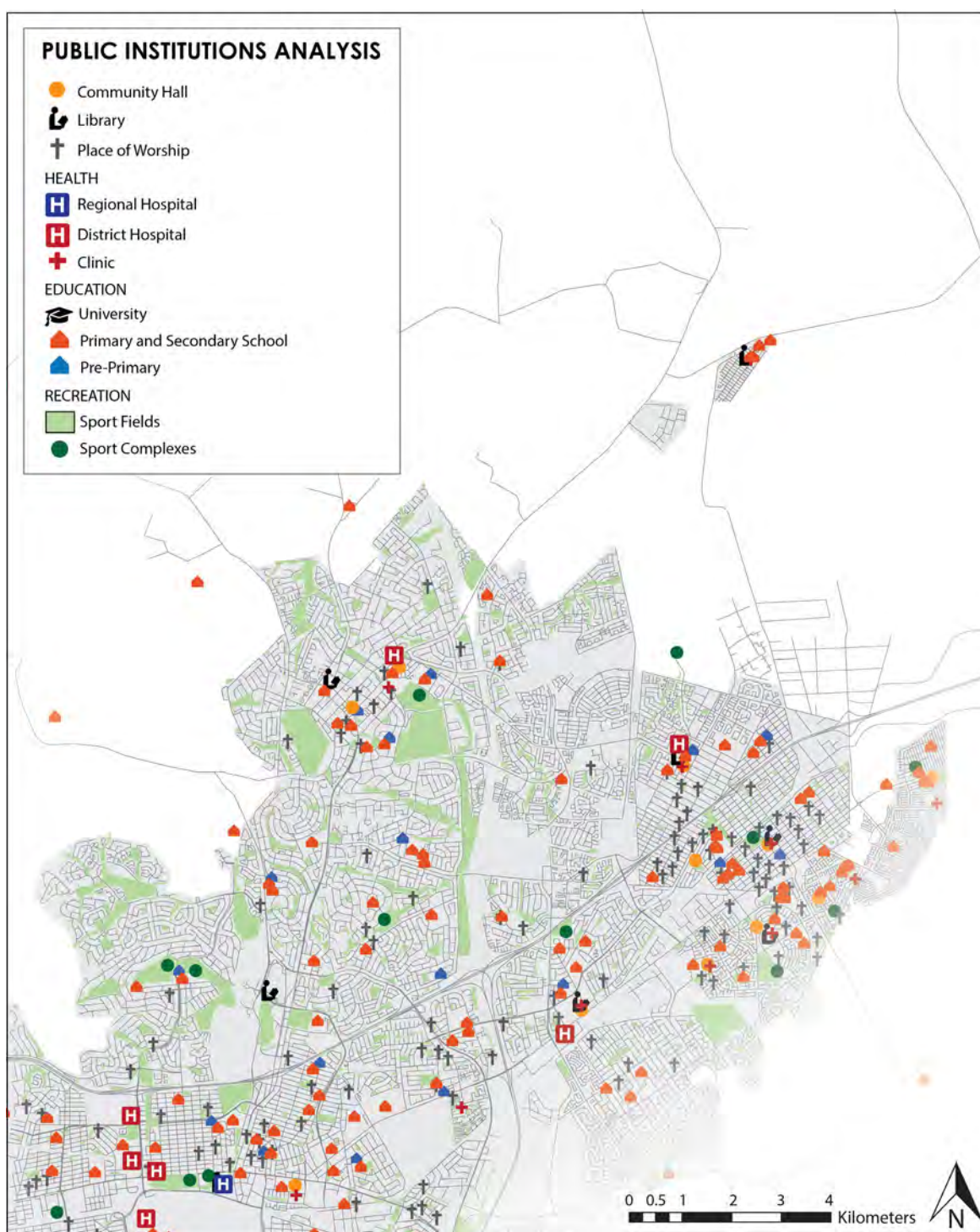
The site is well served with vehicular routes. The N1 crosses through the area and the major activity route of Durban Road crosses the N1 in a north-south direction. There is, however, significant demand for north-south and east-west movement through the site. There is a lack of linkages in the north-south direction which has caused congestion to occur on the east-west routes such as Wellington Road that travels through the Durbanville CBD. The N1 freeway provides the highest mobility function through the site and runs in an east-west direction. Durban Road performs the crucial north-south function of the site, linking Durbanville and Bellville to the N1 and further south. The Paarl/Wellington railway line passes through the southern part of the area in an east-west direction. The Malmesbury railway line runs in a north-south direction through the eastern side of the area and is primarily a freight service. The area also falls under Phase 4 of the MyCiti IRT system. There are however no definite clarity on time frames for the area (City of Cape Town, 2011).



Map 8.10: Movement Analysis (Source: Author; GIS Technical Library, University of Cape Town)

8.6.2 PUBLIC INSTITUTIONS ANALYSIS

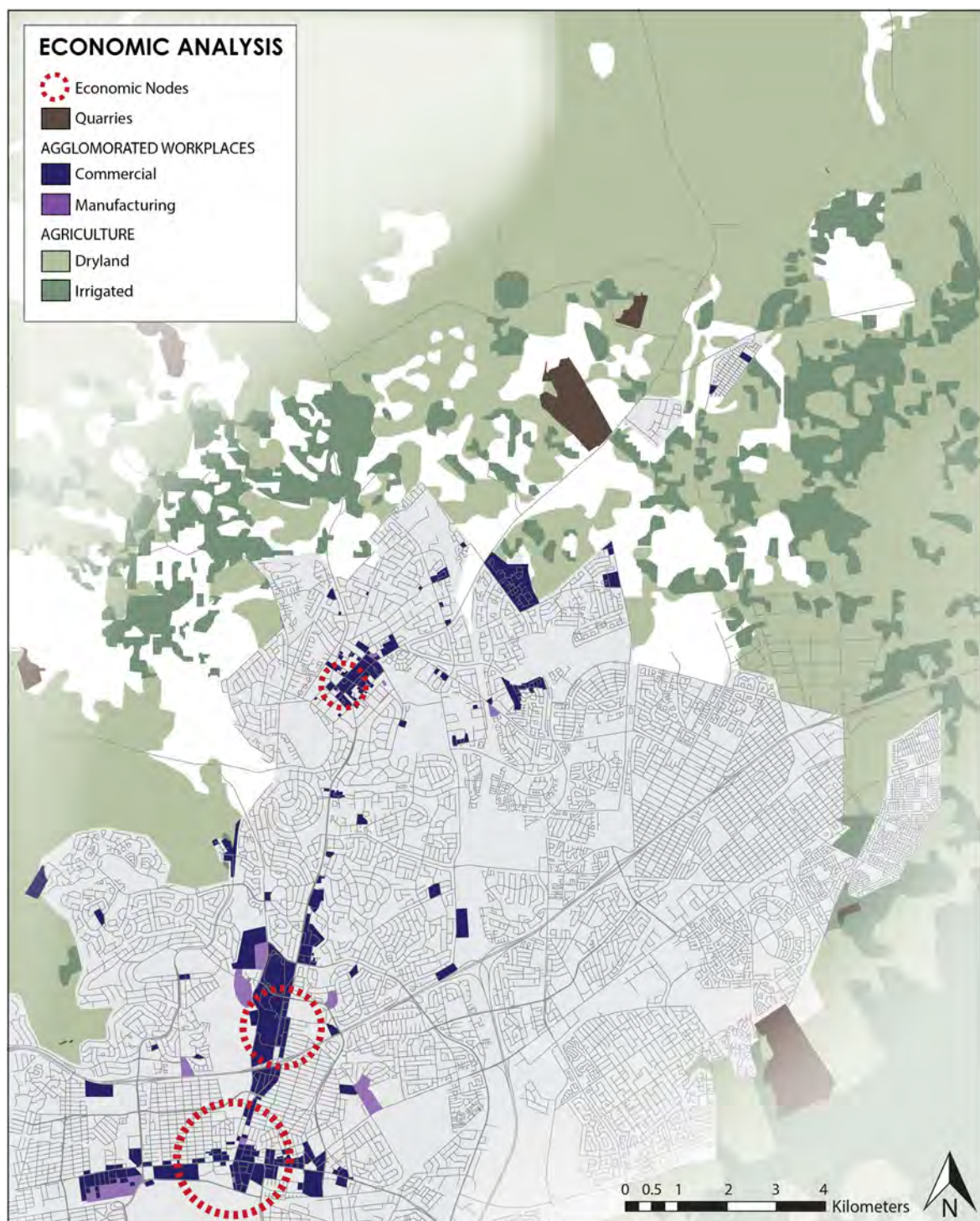
Despite being on the fringe of Cape Town, the area is well serviced with public facilities. These include institutions that cater for the religious, educational, health and cultural needs of the area's residents (Du Plessis, 1998). However, no such facilities have been provided in the outlying areas in and around Fisantekraal (City of Cape Town, 2011). The distribution of the main education institutions can be seen on Map 8.11. The schools that provide primary and secondary education are scattered throughout the residential areas: school facilities are within easy reach of pupils. The area is well supplied with tertiary education. This includes the University of the Western Cape, the University of Stellenbosch Dentistry and Medicine Faculty and the Peninsula Technikon to name a few. There are extensive medical facilities in the area. There are three state hospitals that include the Tygerberg Hospital which is one of the largest hospitals in the country, the Karl Bremer Hospital and the Stikland Hospital. Their services are strengthened by clinics. The area also has approximately 132 churches and places of worship (Du Plessis, 1998).



Map 8.11: Public Institutions Analysis (Source: Author; GIS Technical Library, University of Cape Town)

8.6.3 ECONOMIC ANALYSIS

The site includes some of the most important economic areas in the city such as the Durbanville CBDs and the Tyger Valley Waterfront Area. Most of the population are economically active as 56.3 per cent are employed: the unemployment rate of the area is 13.3 per cent (City of Cape Town, 2011). Commerce and finance occur in the business areas of Durbanville. Concentrated business activities occur in two main forms: Ribbons occurs along the main arterial route of Durban Road while centres have developed as nodes along Durban Road. There are also many shopping centres that have emerged throughout the residential areas. A recent phenomenon in the area is the emergence of the informal sector. The economic recession as well as the rising levels of unemployment has contributed towards this. Selling occurs throughout the week but gains impetus on weekends when hundreds of stalls are set up at strategic locations. Informal trading occurs along some of the main roads such as the intersection of Eversdale Road and Bethanie Road and along Durban Road, south of Old Oak Road (Du Plessis, 1998).



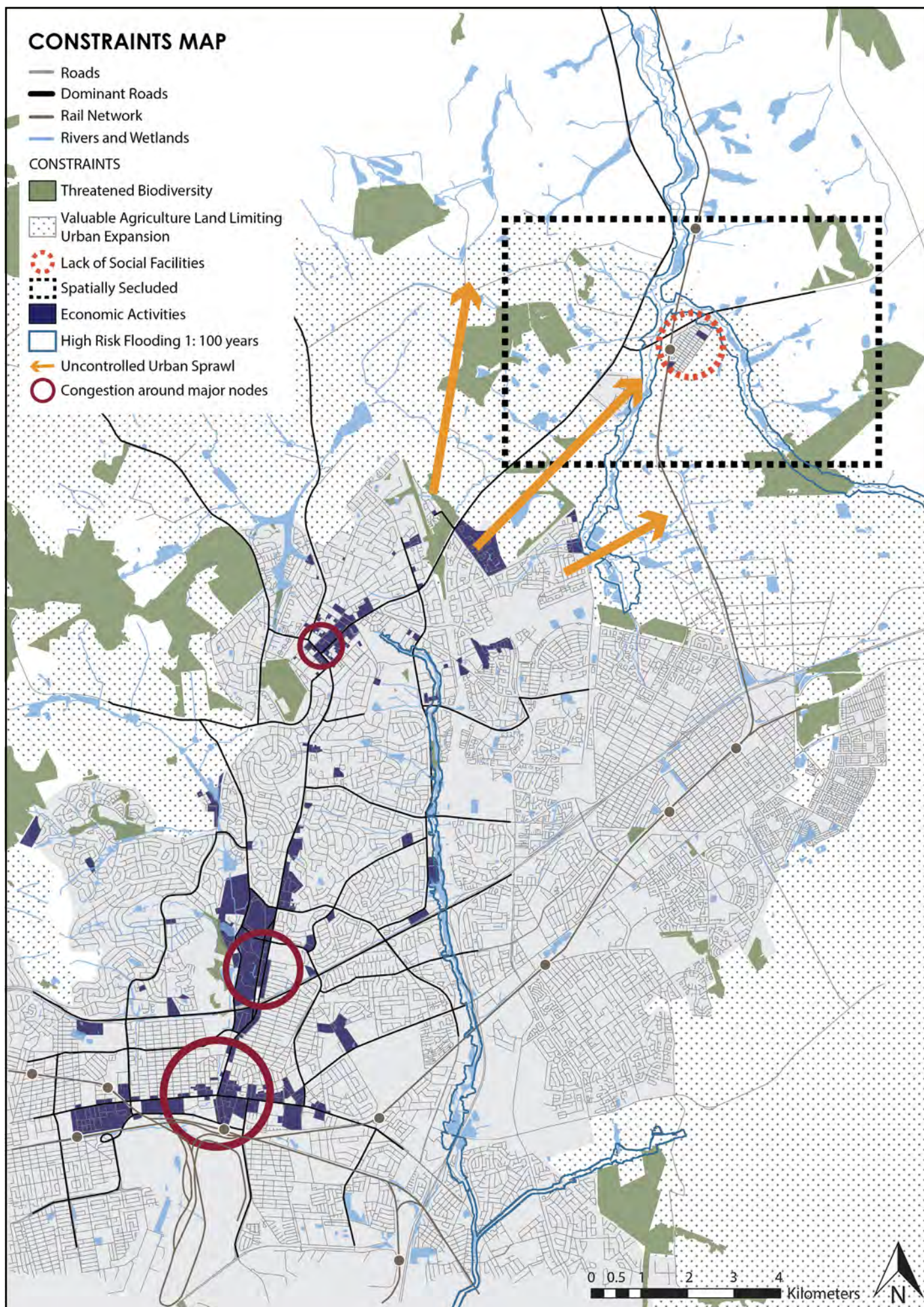
Map 8.12: Economic Analysis (Source: Author; GIS Technical Library, University of Cape Town)

8.7. COMPOSITE OPPORTUNITIES AND CONSTRAINTS

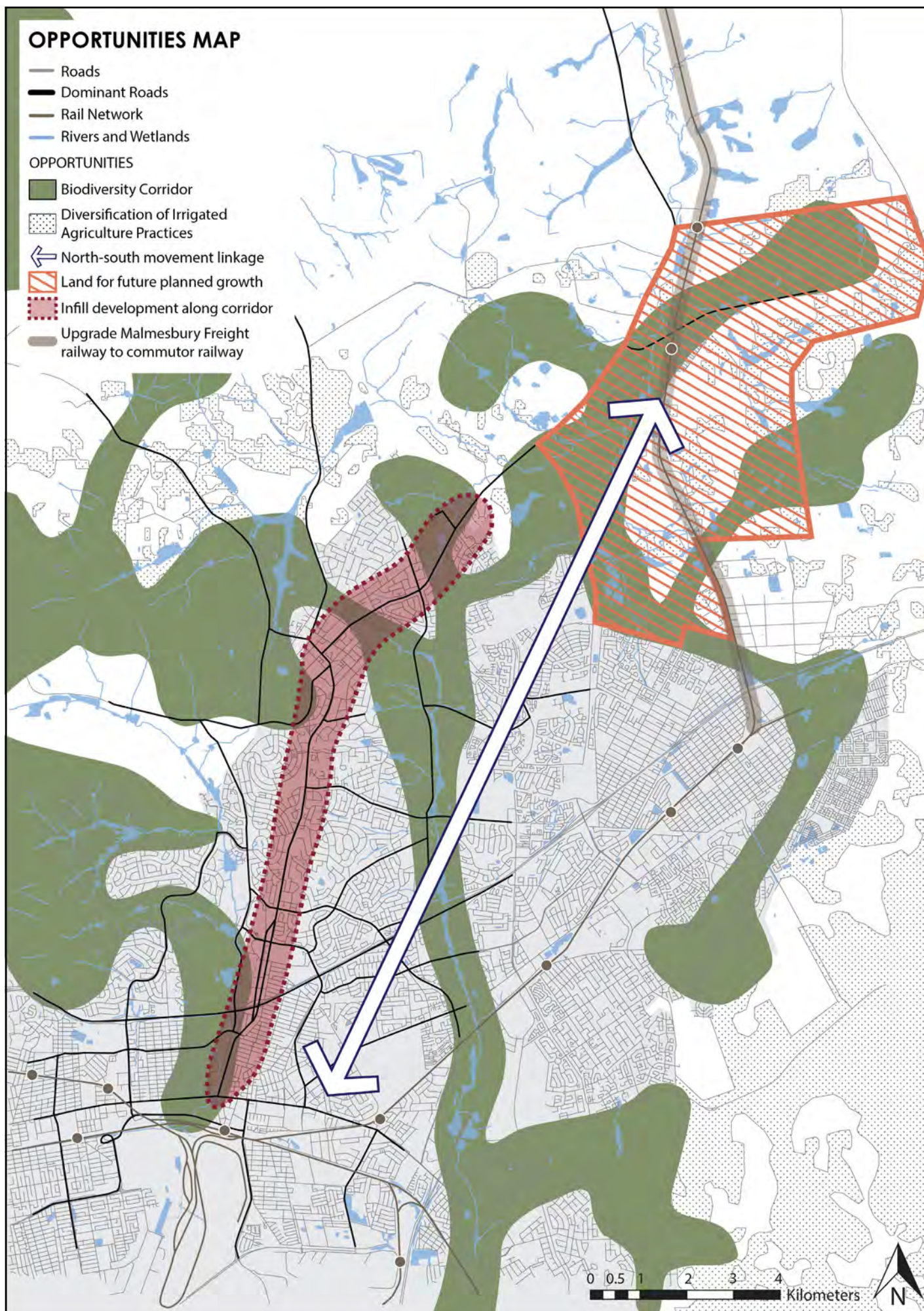
To summarise the site and environs analysis of the Durbanville Corridor, the following points reflect the most important informants that should be addressed by the development framework. In terms of the issues identified, a number of spatially-focused opportunities present themselves as areas where strategic restructuring interventions are possible. Map 8.13 shows a spatial representation of the opportunities and constraints that exist within the area.

CONSTRAINTS	OPPORTUNITIES
Degraded environment A large amount of biodiversity has been lost due to urban sprawl and agricultural practices. Inadequate water management and development within riparian areas have resulted in a threat to water resources. Pressure of agricultural and environmental resources The area is exceptionally sensitive with regard to its environment, agricultural resources, historic value and high scenic value. There is ongoing pressure for the development of these resources. Settlement pattern The area is characterised by low-density urban sprawl. Most of the residential development is introverted area and has very little relationship with its surrounding environment. Poor accessibility to the rest of the city There are poor public transport networks to and within the area, particularly the north-east areas. This makes it difficult for people living in the poorer areas to access social facilities and economic opportunities in the city. Congestion The increasing demand for transport services has led to the congestion of the main roads such as Durban Road. Spatial fragmentation The poor historic settlement patterns have resulted in limited access to employment opportunities and social facilities in Fisantekraal and rural areas, causing high levels of unemployment and poverty in the area.	Upgrade rail system The utilisation of the Fisantekraal railway line as a passenger rail system will improve movement in the area. Road Extensions The extension of north-south movement routes will increase the mobility within the area and ease congestion on the busiest roads such as Durban Road. Infill Development There are opportunities for high-density infill development along the Durban Road corridor which can increase the density of the area and promote a more compact settlement form. Consolidate urban extension There are large tracks of vacant land, mainly in the northern parts of the area, that provide an opportunity for future housing development. The municipality can consolidate this land for future development projects and protect valuable, underutilised agriculture land. Expand protected areas Conservation and protected areas can be expanded to include threatened ecosystems and CapeNature Stewardship sites. These areas can be spatially connected to support biodiversity corridors. Intensify agriculture The intensification of agricultural activity on underutilised agricultural land will improve food security and promote economic growth. Cluster public facilities Public facilities should be clustered around nodes and corridors that have good access to public transport.

Table 8.2 : Opportunities and Constraints (Source: Author; City of Cape Town, 2011)



Map 8.13: Constraints Map (Source: Author; GIS Technical Library, University of Cape Town)



Map 8.14: Opportunity Map (Source: Author; GIS Technical Library, University of Cape Town)

CHAPTER 9: DEVELOPMENT FRAMEWORK

In this chapter a conceptual framework for the area is proposed before the selection of the development framework site. The various conceptual layers for the site in its larger context informs the final development plan of the chosen site.

9.1 PURPOSE

The desired spatial direction for the area draws on the principles of sustainable urban development and the urban corridor approach. Taking into account the issues and key areas of opportunity reflected by the corridor, the spatial direction reflects a set of spatially-based ideas regarding the role of the area in the greater city context as well as the spatial performance of the area at the local level (UN-HABITAT, 2014).

In supporting sustainable urban development, the development framework seeks to:

1. promote high density urban development to alleviate sprawl and use land efficiently;
2. encourage neighbourhoods that are walkable and serviced by public transportation in order to reduce car dependency;
3. stimulate local employment, local production and local consumption;
4. promote a sustainable, socially equal and integrated community that is economically viable;
5. optimise the use of land and provide an interconnected and accessible network of streets and facilities that are safe, efficient and pleasant to use;
6. provide a variety of plot sizes, housing typologies and tenure options in order to cater for the diverse housing needs in Cape Town; and
7. accommodate future growth in the Cape Town area.

9.2 PRINCIPLES

The principles that are used are interrelated and

support one another. These principles balance population growth, economic growth, urbanisation, sustainable urban development as well as other factors in an attempt to establish a new urban system (UN-HABITAT, 2014). The development framework is based on the following principles:

HIGH DENSITY

Densification creates more compact structures that improve access to work, services and public transport. It also provides more efficient use of infrastructure. The principle addresses population growth and is a response to rapid urbanisation. To prevent urban sprawl and promote sustainable urban expansion it is necessary to achieve high density development (UN-HABITAT, 2014).

MIXED LAND USE

This principle encourages the development of a range of compatible activities and land uses close together in an appropriate location which are flexible enough to adapt over time to the changing market. The purpose of mixed land use is to create local jobs, promote the local economy, reduce car dependency, encourage NMT, provide closer public services and support mixed communities (UN-HABITAT, 2014).

EFFICIENT STREET NETWORK

This principle encourages sustainable accessibility, social interaction, public safety and access to amenities. Adequate street networks need to be developed that work for private vehicles, public transport as well as pedestrians and cyclists. A hierarchy of street networks shape the urban structure and set the pattern of development of blocks, streets, buildings and open spaces (UN-HABITAT, 2014).

INTEGRATION

This principle promotes the integration of different social classes in the same community and ensures that different types of housing typologies and tenure are provided. Social mix and mixed land use are interdependent as mixed land use leads to social mix. Social mix is a socio-spatial concept and aims to address problems such as poverty and segregation by promoting more so-

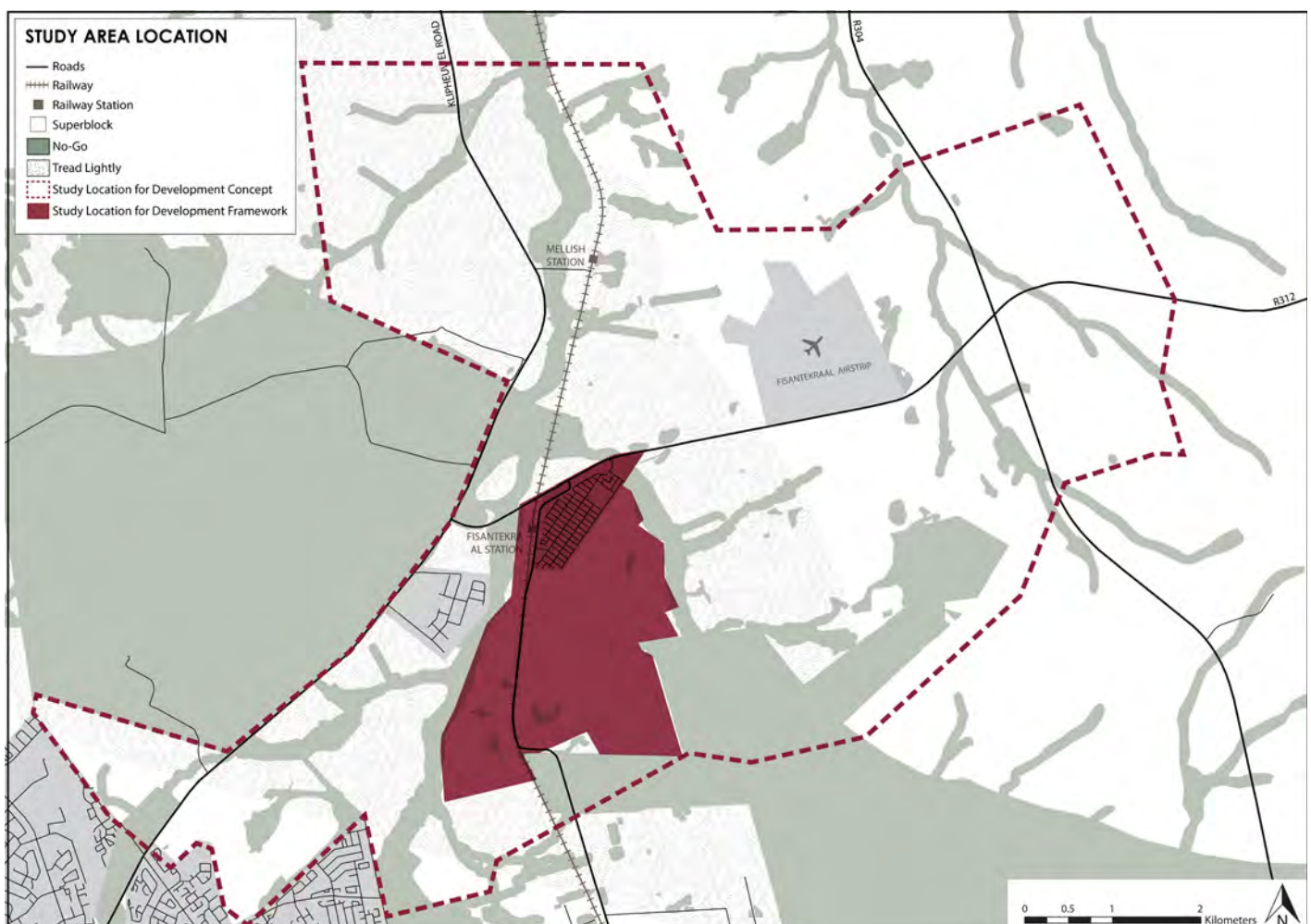
cial integration across different income groups, generating job opportunities, overcoming place-based stigma and attracting additional services to neighbourhoods (UN-HABITAT, 2014).

LIMITED LAND USE

The application of zoning has created many single-functional neighbourhoods which are the source of many problems such as congestion, segregation and car dependency. Land-use specialisations should be limited in order to create mixed land-use. Ways to achieve this are to combine compatible land uses into a neighbourhood and introduce mixed land-use zoning while respecting the city's by-laws and regulations. This principle aims to ensure the implementation of mixed-land use and to increase economic diversity in neighbourhoods (UN-HABITAT, 2014).

9.3 STUDY AREA

The area chosen for the development framework is situated 8km north of Durbanville and about 30km northeast of the CBD. The site was chosen because it forms part of the proposed northern growth corridor as proposed in the sub-metro concept in Chapter 8. This aims to direct and accommodate future growth in Cape Town. The site is situated close to the Bellville and Durbanville nodes that offer economic opportunities for the area. The area also has a variety of existing farming and mining practices which also offer economic opportunities. The existing roads and rail infrastructure and the Fisantekraal settlement mean that there is existing infrastructure which can be utilised. The site is also well integrated with the surrounding areas of Durbanville, Stellenbosch, Melkbosstrand and Paarl. Some of the constraints of the site include the vast amount of land that is classified as 'No-Go' or 'Tread Lightly' because of the environmentally sensitive nature of the site.



Map 9.1: Location of Study Area (Source: Author; GIS Technical Library, University of Cape Town)

9.4 CORRIDOR CONCEPT

The main concept that is used throughout this chapter is the corridor concept which was discussed in Chapter 5. As can be seen in Figure 9.1, the corridor covers 2km on both sides of the primary activity route. The primary activity routes carries stop-start public transport. Rapid public transport occurs on the mobility routes that are located 2km away from the primary corridor. The secondary activity corridors connect the primary activity corridor with the mobility routes. Mixed-use commercial and retail activities occur along the primary activity route and intensify around the nodes that occur along the corridor. Light industrial development is proposed on the outside of the mixed use development. High-density residential development should be concentrated along the secondary activity corridor. Agri-villages are proposed in the concept to maintain the rural character of the landscape. As the area is very environmentally sensitive and includes valuable agricultural land, the concept includes space for intensive agricultural activities which should occur in between the movement routes.

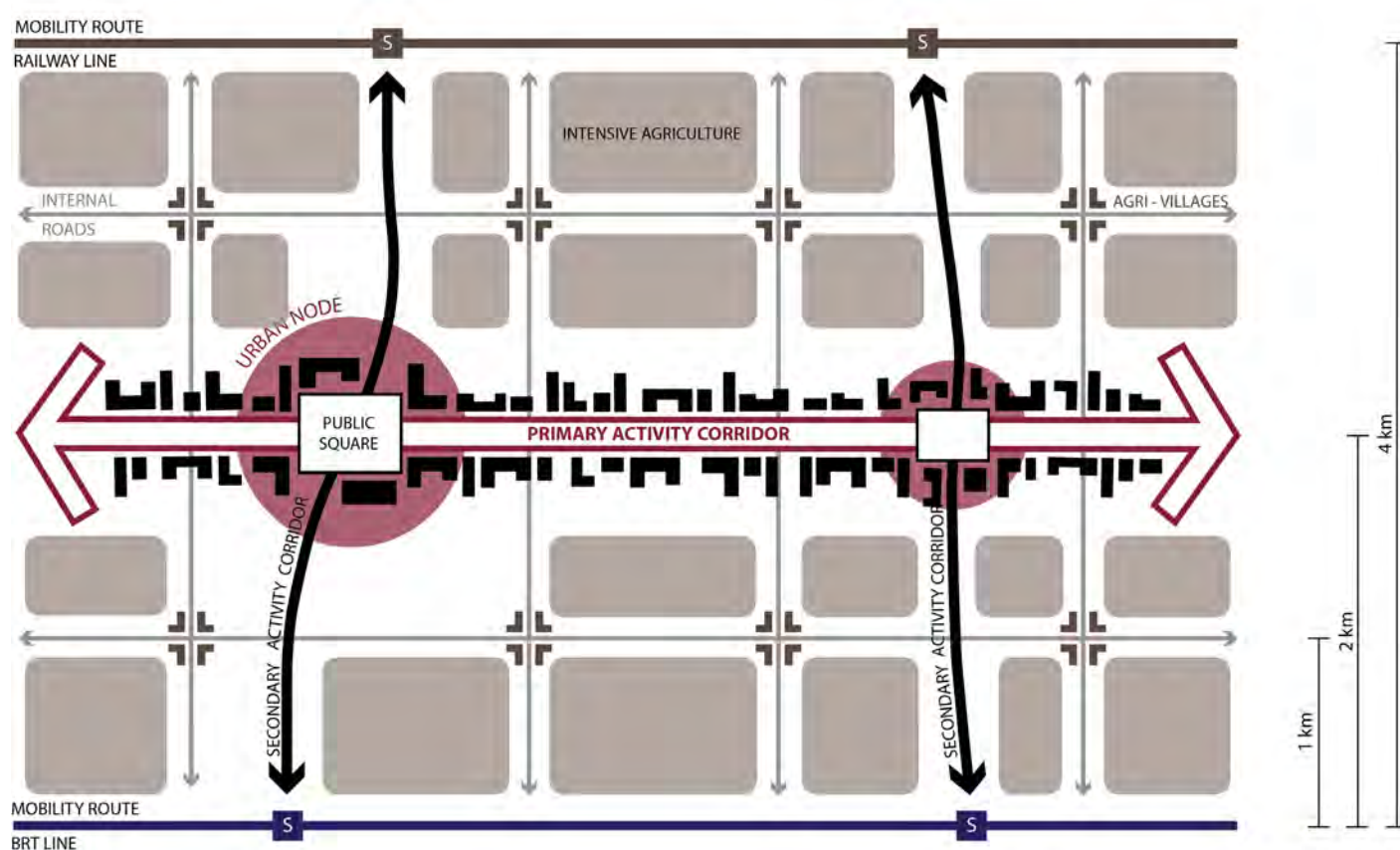


Figure 9.1: Corridor concept (Source: Author)

9.5 DEVELOPMENT CONCEPT

The development concept provides concepts for the layout, allocation of public spaces and movement system within the broader context of the site. These concepts inform the outcome of the development framework of the site. The concept seeks to structure the area through a series of design principles. The conceptual grid, movement systems and public spaces are the primary structuring elements of the contextual concept.

9.5.1 CONCEPTUAL GRID

The grid is one of the oldest structural systems used to order the landscape to make human settlements. Its power as a structural device is acquired from a number of characteristics. Firstly the grid is a clear and highly ordered system that provides constraints that allow considerable freedom of action within the grid. The constraints provide order and freedom which result from the reactions of that order. Secondly, the system can accommodate a wide range of activities and demands within the grid. Thirdly, the grid is equitable: the lines that make up the grid are movement routes which render the system multi-directional. Finally, the grid is a flexible mechanism and can change form and scale to suit the landscape on which it is imposed (Dewar & Uytendogaardt, 1995).

SUPERBLOCK

The superblock is the basic building block of the area. It is generally approximately 300 x 300m which is a comfortable walking distance (see Figure 9.2). These superblocks are defined by major thoroughfares. The superblock is then divided into thirds by a pair of internal streets. These smaller blocks are 80 x 80m, as can be seen in Figure 9.3. The design of the superblock is primarily a street-design and block-reconfiguration project. (Wang, 1996).

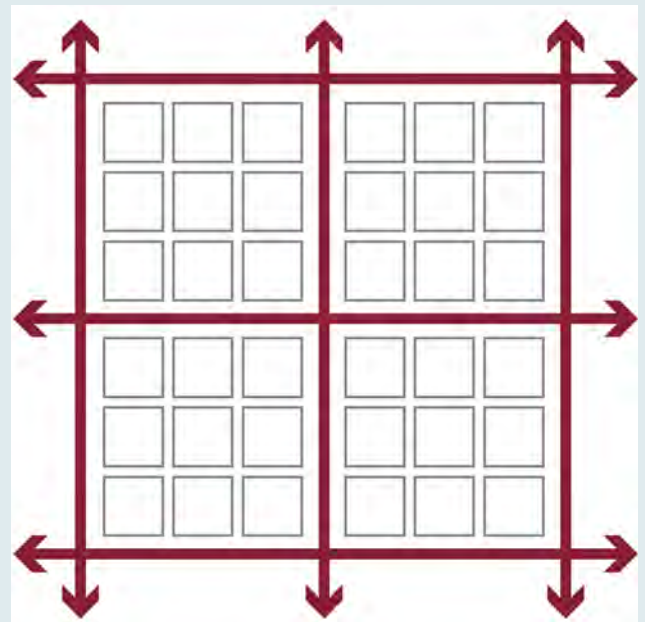


Figure 9.2: Superblock configuration (Source: Author)

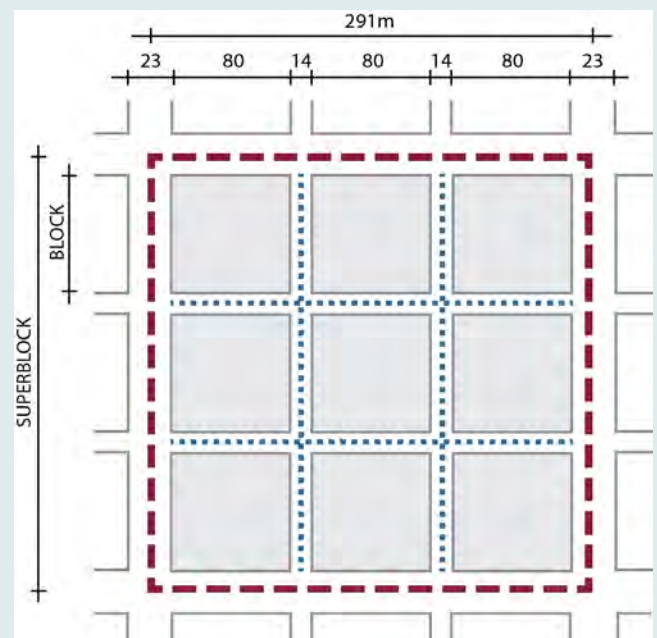


Figure 9.3: Block width and length (Source: Author)

9.5.2 CONCEPTUAL MOVEMENT SYSTEMS

The infrastructural elements of the movement system and their patterns of interconnection has an impact on the accessibility and therefore on economic and social opportunities. The movement system is used structurally to create a new and decentralised pattern of opportunities. The movement system plays a significant role in shaping the structure of the area through establishing new points of high accessibility and intense activity (City of Cape Town, 1999).

HIERARCHY OF MOVEMENT ROUTES

The movement system aims to be as interconnected as possible. Continuous routes are promoted and more continuous routes are used to order social and economic activities and facilities. This makes them as accessible as possible and integrates different parts of the area. The creation of barriers from large infrastructure such as freeways and rail lines should be reduced as much as possible by opening up access routes across them (City of Cape Town, 1999). The conceptual hierarchy of movement is seen in Figure 9.4. The primary activity corridors are determined according to the sub-metro concept discussed in the previous section and existing roads and movement within the area. The secondary activity corridors that run vertically link the primary activity corridors with the mobility routes within the area.

INTEGRATE MODES OF PUBLIC TRANSPORT

A central part of the proposal is to create a logical system of public transport interchange points. This concept is shown in Figure 9.5. The different modal combinations that are envisaged include train, tram, BRT and bus. This conceptual pattern was adjusted to the realities on the ground by identifying existing routes, potential interchanges and the intersection of continuous routes. The advantage of this concept is that it facilitates the integration of various modes of public transport and enables the different modes to be used on different routes. It also allows people to transfer to other modes of transport easily as well as to change direction to facilitate movement to different destinations (City of Cape Town, 1999).

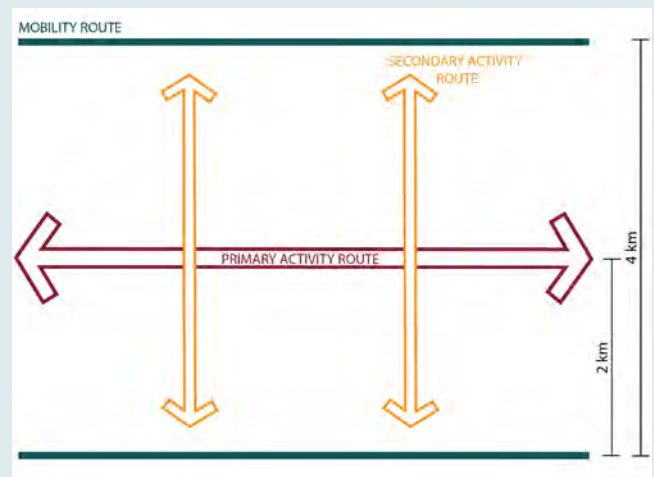


Figure 9.4: Hierarchy of Accessibility (Source: Author)

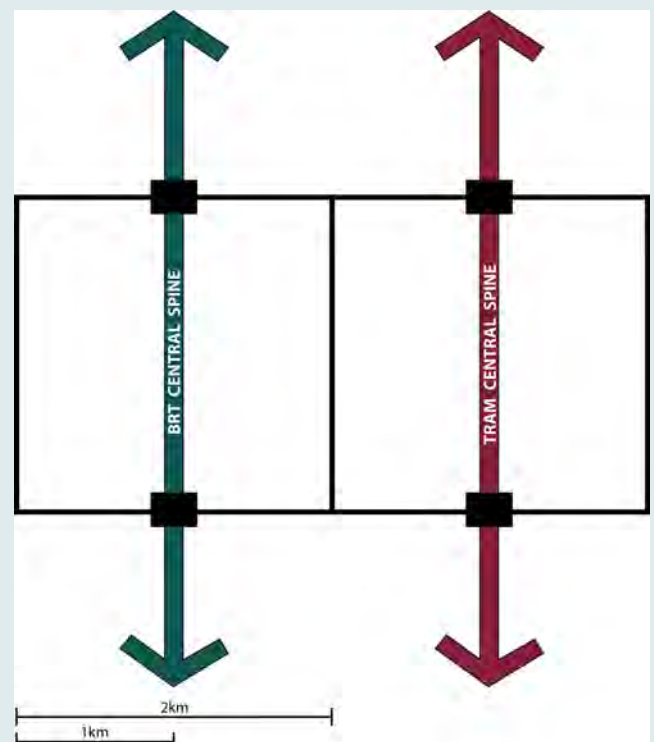


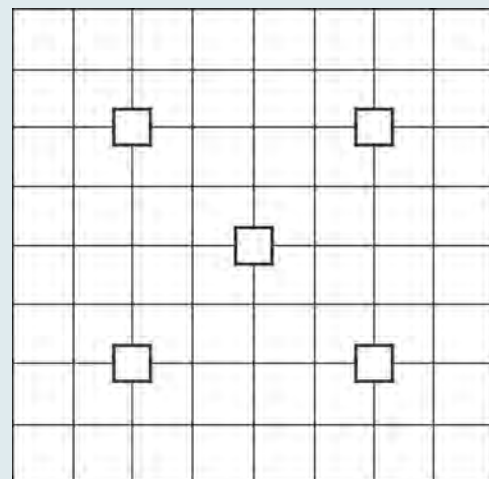
Figure 9.5: Integration of Public Transport Modes (Source: Author)

9.5.3 CONCEPTUAL HIERARCHY OF PUBLIC SPACES

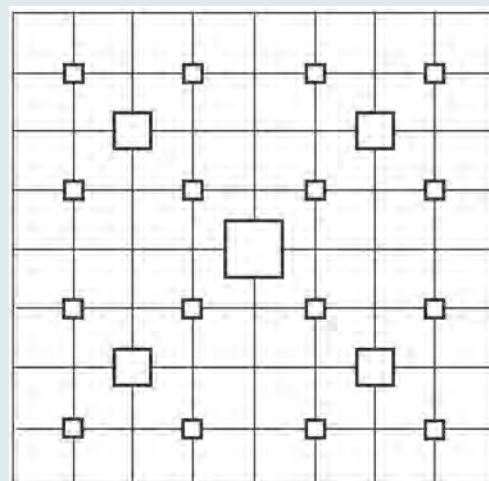
Public squares are superimposed on the conceptual grid, as can be seen in Figure 9.6. The positions of the squares and the intersections create hierarchical levels of public squares as three levels of orders emerge. The central square takes a higher level of centrality while the secondary and tertiary squares form at cross overs within the grid (see Figure 9.6). These squares attract different activities to them which in turn define the character of the squares. The lines within the grid are seen as lines of movement. From Figure 9.6 it can be seen that the hierarchy of public squares respond to the hierarchy of movement. Land uses will respond to these patterns of hierarchy. Higher order activities depend on high levels of movement and will naturally seek out the most accessible locations. This complex pattern allows for a range of activities to find their place naturally within the structure. Compatible patterns of activity and usage will emerge over time (Dewar & Uytendogaardt, 1995).

Map 9.6 shows the placement of the various public squares within the area. These squares were placed in accordance with the hierarchy of movement within the area. The primary public squares are located at the intersection of the primary activity routes while the secondary public squares are located at the intersection of the secondary activity routes. The tertiary public spaces occur at the intersection of local roads within the superblocks. These squares are places of celebration and require public investment. They need to be creatively made as the activities that occur within them make the space and determine the quality of the urban environment. The creation of a variety of shapes and sizes of space makes the grid even more complex and generates a range of urban activities (Dewar & Uytendogaardt, 1995).

PUBLIC SQUARES SUPERIMPOSED ON CONCEPTUAL GRID



HIERARCHIES OF PUBLIC SQUARES EMERGING



HIERARCHIES OF PUBLIC SQUARES RELATING TO MOVEMENT ROUTES

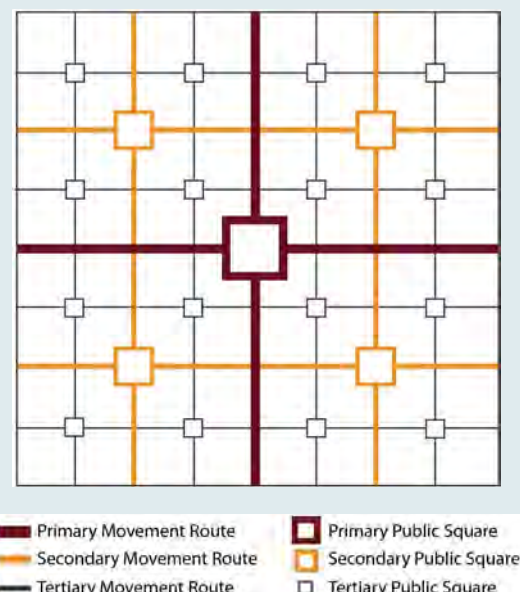
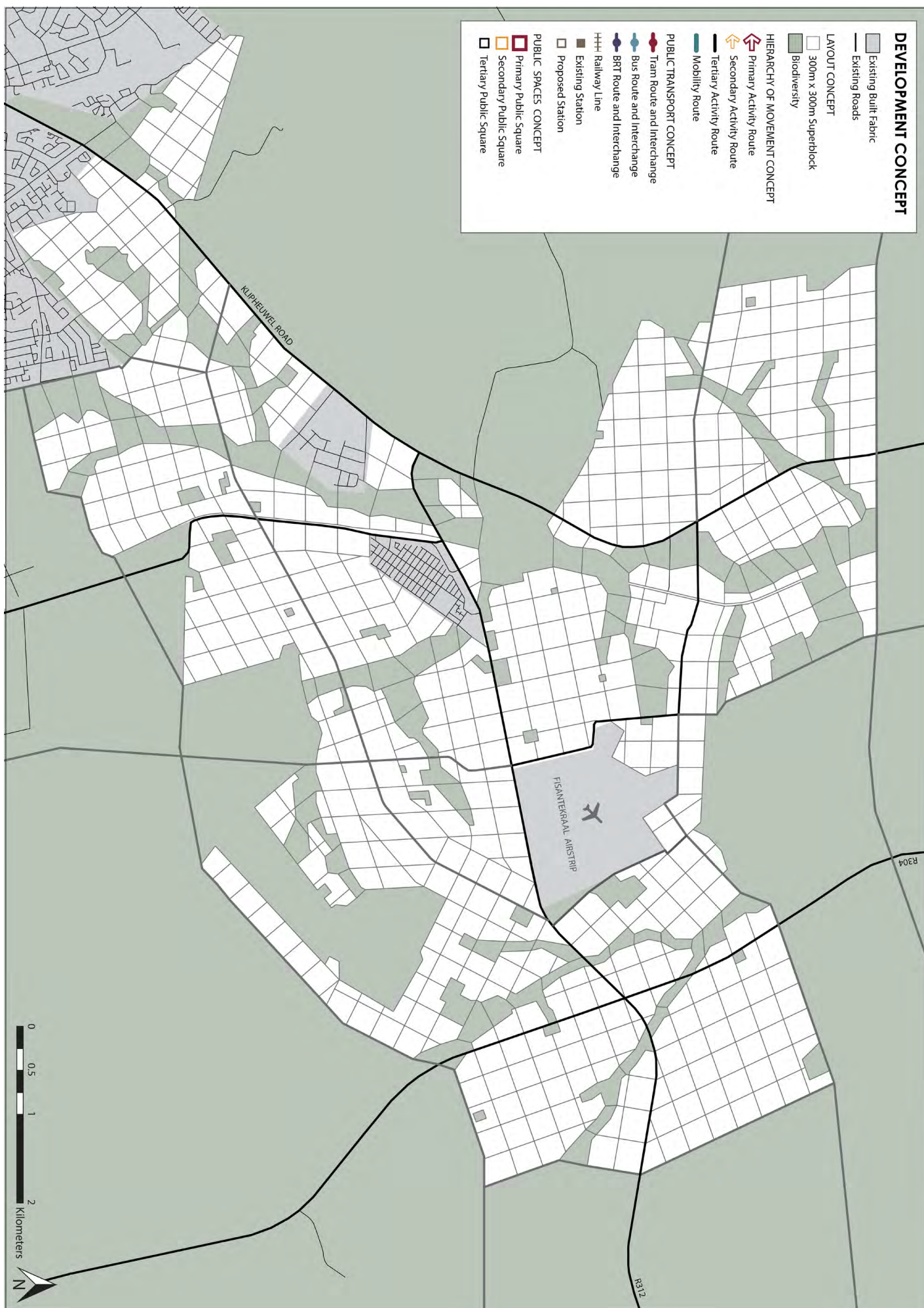
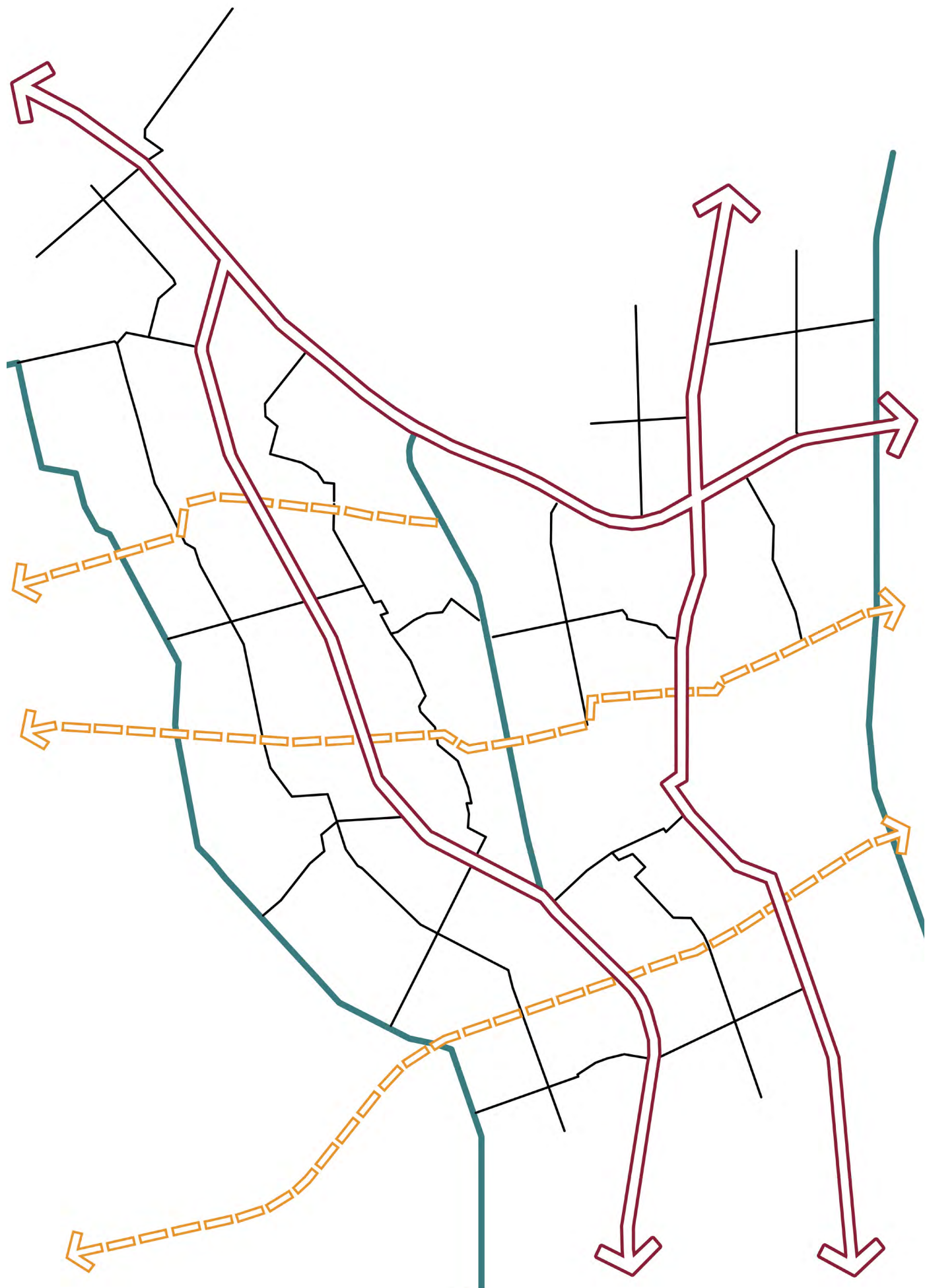
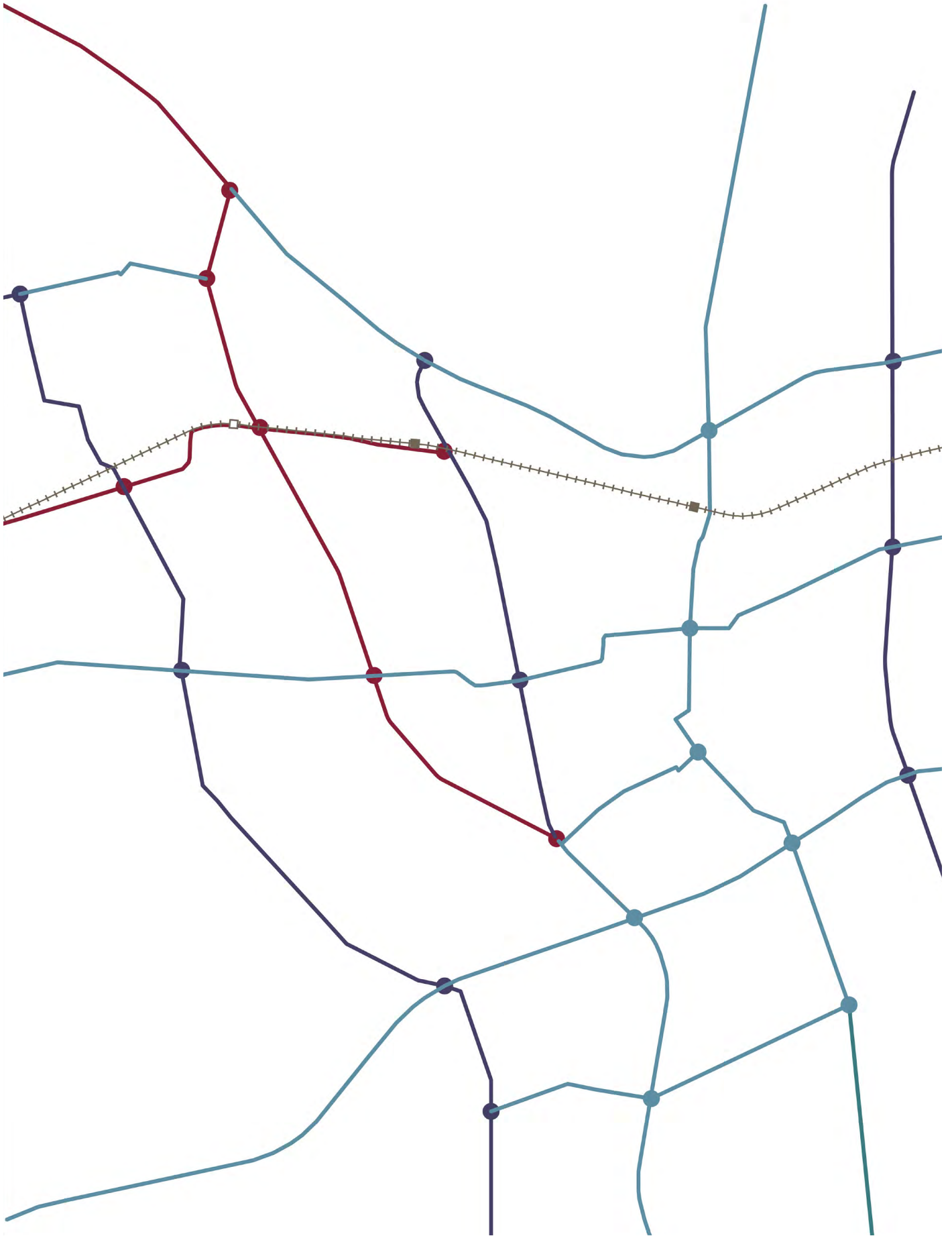


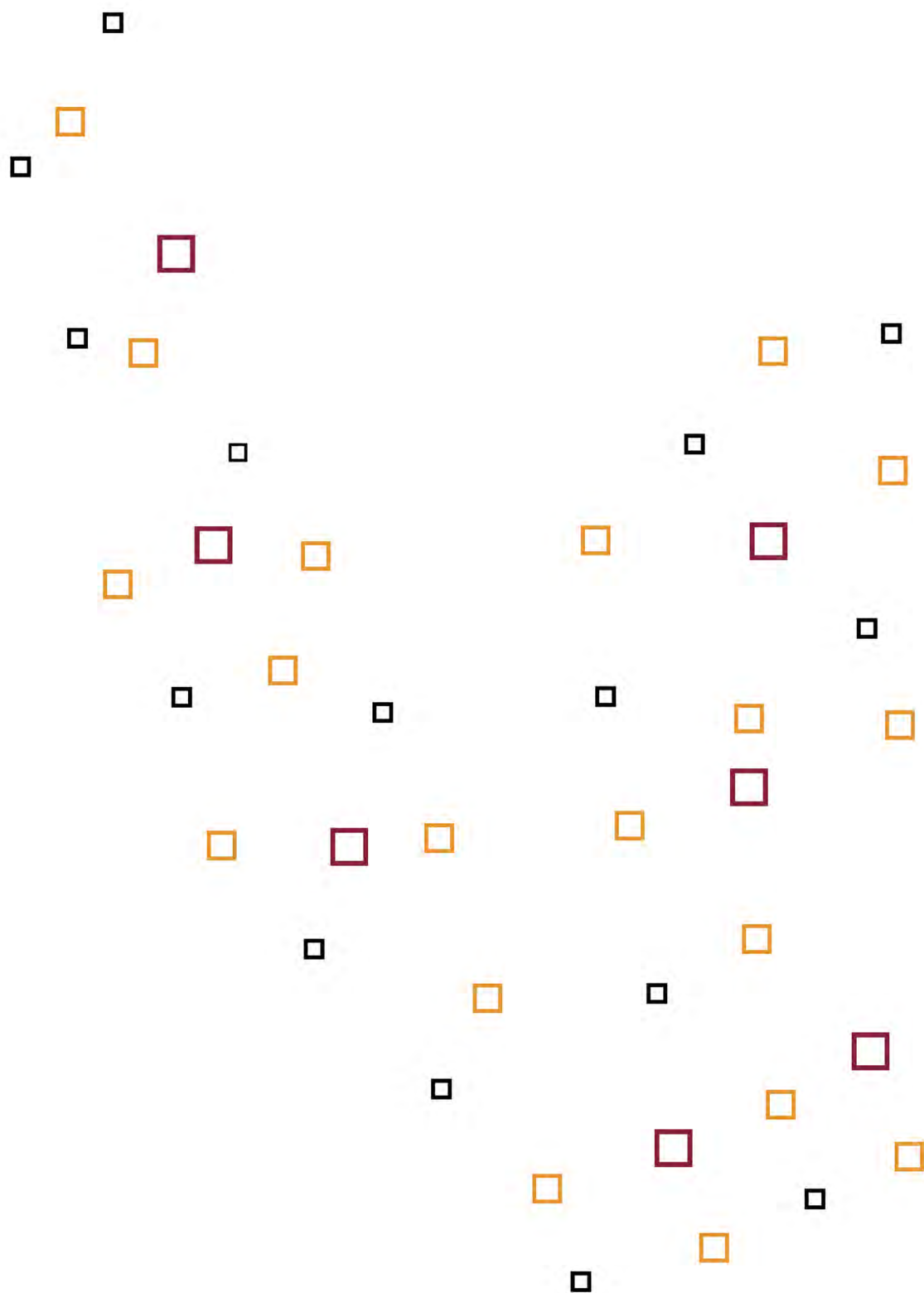
Figure 9.6: Hierarchies of public squares concept (Source: Author; Dewar & Uytendogaardt, 1995)



Map 9.2: A layered map of the contextual concept (Source: Author; GIS Technical Library, University of Cape Town)







9.6 PROGRAMME

Population growth, demographic change and household change underpin the need to plan for growth and change in Cape Town. The provision of housing and adequate social facilities needs to address the projected future demand as well as the distribution of these facilities. The programme provides the quantities and qualities of uses on the site.

POPULATION AND DWELLING ESTIMATION

Table 9.1 shows the population estimations for the area. The estimation of the number of people who can occupy and use the area is derived from the estimates of developable land (Behrens & Watson, 1996). Here 'developable land' includes areas defined as developable as well as 50 per cent of the 'tread lightly' areas. This comes to a total of 3164ha on which developed can take place. By estimating that 50 per cent of the developable area will be used for residential and that there will be a net density of 200du, it is estimated that the site can accommodate 316 400 dwelling units. As there are generally four people living in a household in South Africa, it can also be estimated that the site can accommodate approximately 1,265,600 people. Since it is estimated that Cape Town's population will increase by 515 831 people by 2013 (see chapter 3), the site plays a vital role in accommodating this growth.

PUBLIC FACILITIES

The population estimations form the basis for calculating the number of public facilities needed in the area. Table 9.2 shows the various public facilities, their population threshold, their minimum size and the required facilities for the entire site. From the Table 9.2 it is clear that many public facilities will be needed to support the proposed population for the area. This will require large amounts of land. With regard to resource efficiency and accessibility, many of these facilities, such as schools and libraries, can be clustered. This will reduce the number of facilities and amount of space required (Behrens & Watson, 1996).

	DEVELOPABLE	TREAD LIGHTLY	TOTAL
SIZE (ha)	1880 ha	2568 ha	4448 ha
CALCULATED AREA (ha)	1880 ha	1284 ha	3164 ha
RESIDENTIAL AREA 50%	940 ha	642 ha	1582 ha
INDUSTRIAL 15%	141 ha	192 ha	333 ha
COMMERCIAL 15%	141 ha	192 ha	333 ha
GREEN SYSTEM 10%	94 ha	128 ha	222 ha
MOVEMENT 10%	94 ha	128 ha	222 ha
DWELLING UNITS (at 200 du/ha)	188 000 du	128 400 du	316 400 du
POPULATION (at 4 average household size)	752 000 people	513 600 people	1 265 600 people

Table 9.1: Population Calculations (Source: Author)

FACILITY	TYPE	DWELLING	POPULATION THRESHOLD	ACCESS	MINIMUM SIZE	REQUIRED FACILITIES	REQUIRED LAND
PASSIVE RECREATION							
District Park	Higher	5000	20 000	10km	5 ha	63	316 ha
Community Park	Middle	500 du	2 000	1km – 2km	1 ha	632	632 ha
Neighbourhood Park	Lower	250 du	1 000	500m	0.05 ha	1265	63 ha
ACTIVE RECREATION							
Sport Stadium	Higher	25 000 du	100 000	15km	3 ha	12	37 ha
Sports Complex	Middle	15 000 du	60 000	10km	1.5 ha	21	31 ha
Sports Field	Lower	1250 du	15 000	2km	0.02 ha – 2ha	84	84 ha
EDUCATION							
Tertiary Education	Higher	37 500 du	150 000	Variable	Variable	8	
Secondary School	Middle	2 500 du	10 000	5km	3 ha	126	380 ha
Primary School	Middle	1 000 du	4 000	1.5km	2 ha	316	632 ha
Pre-Primary and ECDC	Lower	600 du	2 400	750m	0.03 ha – 0.05 ha	527	15 ha
HEALTH							
Regional Hospital	Higher	1 125 000 du	4 500 000	200 km	40 ha	0	
District Hospital	Middle	112 500 du	450 000	30 km	20 ha	2	40 ha
Local Clinic	Lower	30 000 du	120 000	5km	3 ha	10	30 ha
SOCIAL FACILITY							
Library	Higher	8 750 du	35 000	4km	0.1 ha – 0.2 ha	36	3.5 ha
Community Centre	Middle	2 500 du	10 000	2.5 km	0.2 ha – 0.5 ha	126	25 ha
Place of Worship	Lower	500 du	2 000	1.5 km	0.015 ha – 0.3 ha	632	9 ha
PUBLIC FACILITY							
Municipal Office	Higher	12 500 du	50 000	2 km	0.3 ha	25	7 ha
Fire Station	Middle	15 000 du	60 000	8 – 23min	1.2 ha	21	25 ha
Police Station	Lower	6 250 du	25 000	1.5 km	0.1 ha – 1 ha	50	5 ha
Post Office	Lower	2 500 du	10 000	1.2 km	0.01 ha	126	1.2 ha

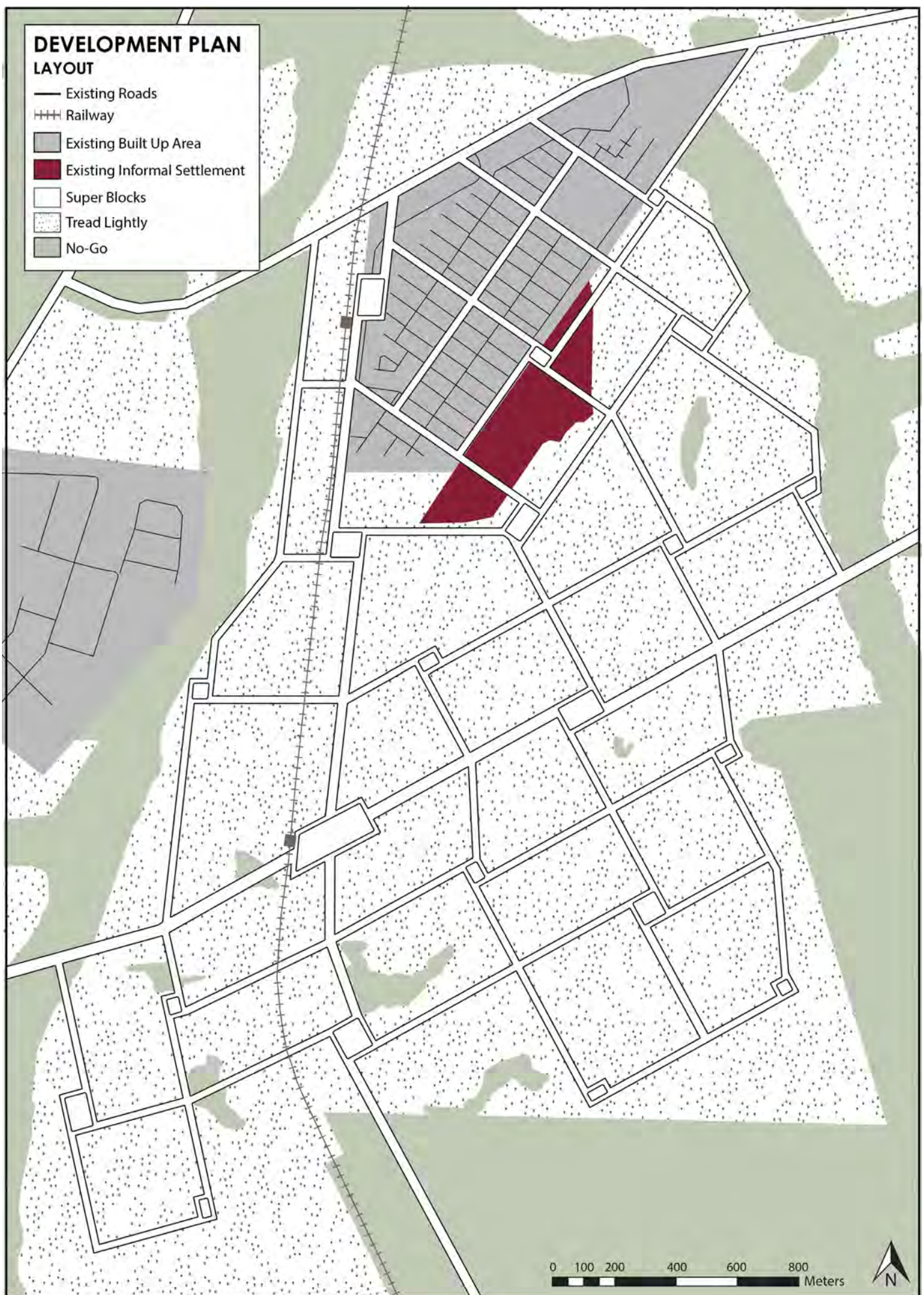
Table 9.2: Public Facilities Calculations (Source: Author; CSRI, 2012)

9.7 ELEMENTS OF THE DEVELOPMENT FRAMEWORK

The broad concepts that underpin the development plan proposal has already been discussed under the development concept in section 9.5. This section outlines the main public elements of structure: movement, transport, public open space, public facilities and green system as well as the land-use and densities of the site.

9.7.1 LAYOUT

The grid contains many opportunities for place making. The conceptual grid as seen on Map 9.2 represents only the beginning: the nature of the system can be transformed through distortion and the spaces created present opportunities for activities and facilities. The extension of the conceptual grid across the site has the potential to create large scale monotony and boredom. To avoid this, the grid can be fractured and distorted as seen on Map 9.6. Unique spaces are created by twisting the superblocks and varying them in size. This creates different spatial configurations and dynamic urban environments (Dewar & Uytendogaardt, 1995).



Map 9.6: Development Plan Layout (Source: Author; GIS Technical Library, University of Cape Town)

9.7.2 MOVEMENT

The infrastructural elements of the movement system and their patterns of interconnection have an impact on the accessibility and therefore on economic and social opportunities. The movement system is used structurally to create a new and decentralised pattern of opportunities. The movement system plays a significant role in shaping the structure of the site through establishing new points of high accessibility and intense activity (City of Cape Town, 1999). The movement hierarchy includes the following broad street classifications:

MOBILITY ROUTES

Mobility routes, such as freeways, provide long distance continuous routes within and between neighbourhoods. They typically carry high volumes of traffic at high speed (Butler & Steiner, 2007).

PRIMARY STREET NETWORK

The primary street network is the backbone of the urban street networks. These are continuous routes that run through urban areas. These streets carry most of the area's commercial and institutional uses (Butler & Steiner, 2007). The street network is a mixed-use environment where pedestrians, public transport and motor vehicles share the road space. Large commercial and retail activities could thrive due to the variety of movement types and increased accessibility of the street system.

SECONDARY STREET NETWORK

The secondary street network caters for a variety of modes of transport. The network caters for more residential and commercial activities.

TERTIARY STREET NETWORK

The tertiary streets are dedicated to residential areas. These smaller streets allow for two lanes of vehicular movement and dedicated cycle paths. This road network connects the smaller agri-villages with the secondary and primary street network.

THE RAMBLAS, BARCELONA

The Ramblas in Barcelona is an example of a multi-functional boulevard that provides sufficient space for pedestrian activities and accommodates public as well as private transportation. The wide central promenade that is lined with trees is focused for walking while the roads for automobiles are pushed to the sides of the promenade. The buildings that line and define the street are between five and seven stories. The central walkway varies in width from 11 meters wide to 24 meters. The Ramblas can be thought as a long, linear urban park (Jacobs, 1993).



Figure 9.7: The Ramblas, Barcelona (Source: <http://blog.theiaian.com>)

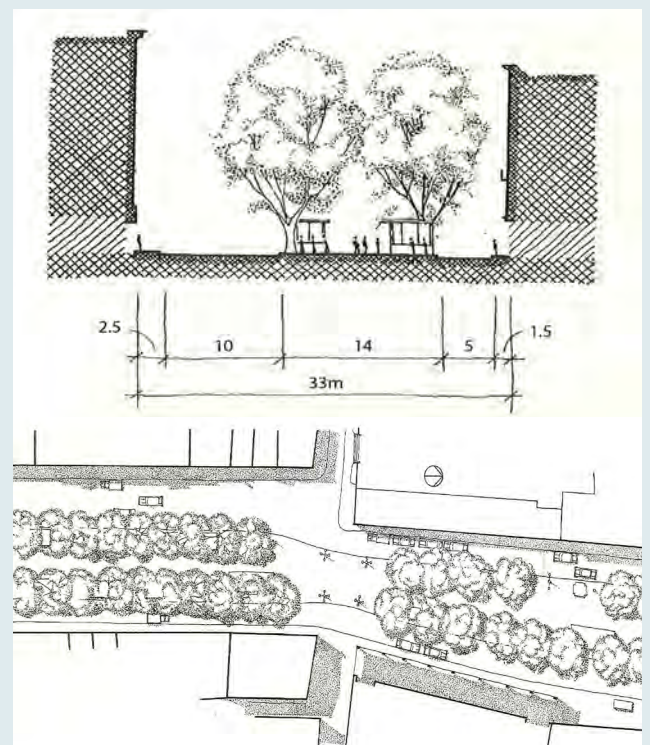
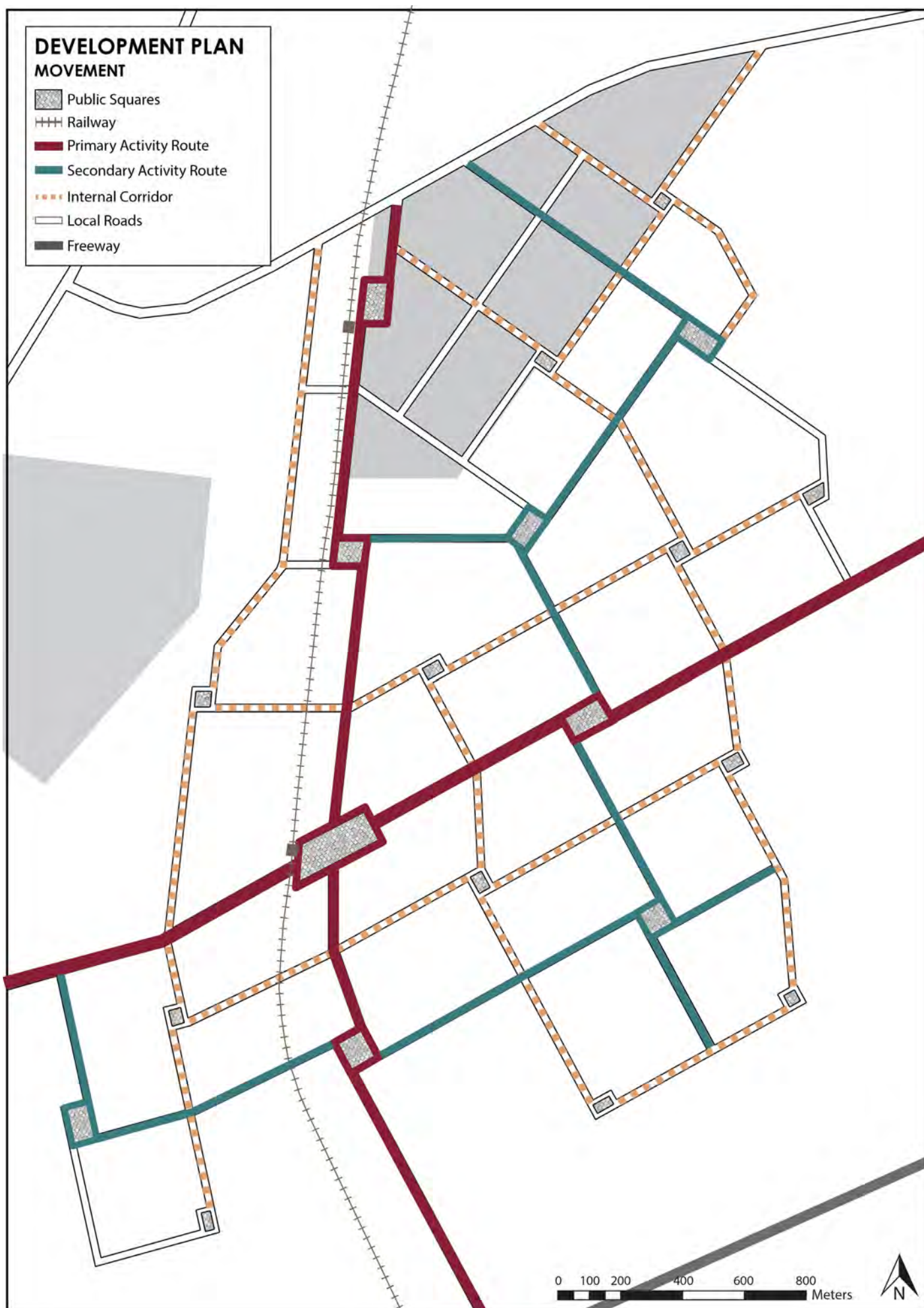


Figure 9.8: Plan and Section of the Ramblas, Barcelona (Source: Jacobs, 1993)



Map 9.7: Development Plan Movement (Source: Author; GIS Technical Library, University of Cape Town)

9.7.3 PUBLIC TRANSPORT

There is a strong emphasis on public transport as opposed to private car-based movement. The different modes of public transport are differentiated by carrying capacity, average speed and distances between stops. These modes are integrated as closely as possible. As can be seen from Map 9.8, the system allows for frequent switches of modes of public transport and direction. The existing rail system is a great asset and an attempt should be made to maximise its use and to include an additional train station (City of Cape Town, 1999).

TRAM

Trams are electric railway vehicles that are designed to fit the traffic patterns and scale of the neighbourhood. They serve medium to high volume services and run along the two boulevards. (Butler & Steiner, 2007).

BUS RAPID TRANSIT

BRT is a limited-stop service that provides a high-speed bus service operating in a dedicated right-of-way lane. BRT combines the advantages of rail with the flexibility and lower operating costs of bus services. The system makes use of transit signal priority systems to minimise delays at intersections. The BRT should include dedicated running ways, accessible and safe stations, frequent all-day service and easy-to-board vehicles (Butler & Steiner, 2007).

BUS and MBT

Buses and MBT operate on fixed schedules and routes on a roadway. These services stop at every second superblock along their routes (Butler & Steiner, 2007).

NMT

A large portion of movement on the site will be NMT which includes cycle lanes and walkways. The primary NMT route runs along the boulevards while the secondary NMT routes run between the local squares in the site.

PARIS TRAMWAY, FRANCE

Paris's tramway offers quiet, fast and comfortable mobility. The twin track routes follow a series of boulevards in the city and has stops every 450m. The tram carries almost twice as many commuters every day as local buses. Over three quarters of the routes is grassed tracks. There are broad walkways, bicycle lanes, parks, trees and art works along the tramway route that creates a place of life and a promenade (The Progressive Review, 2015).



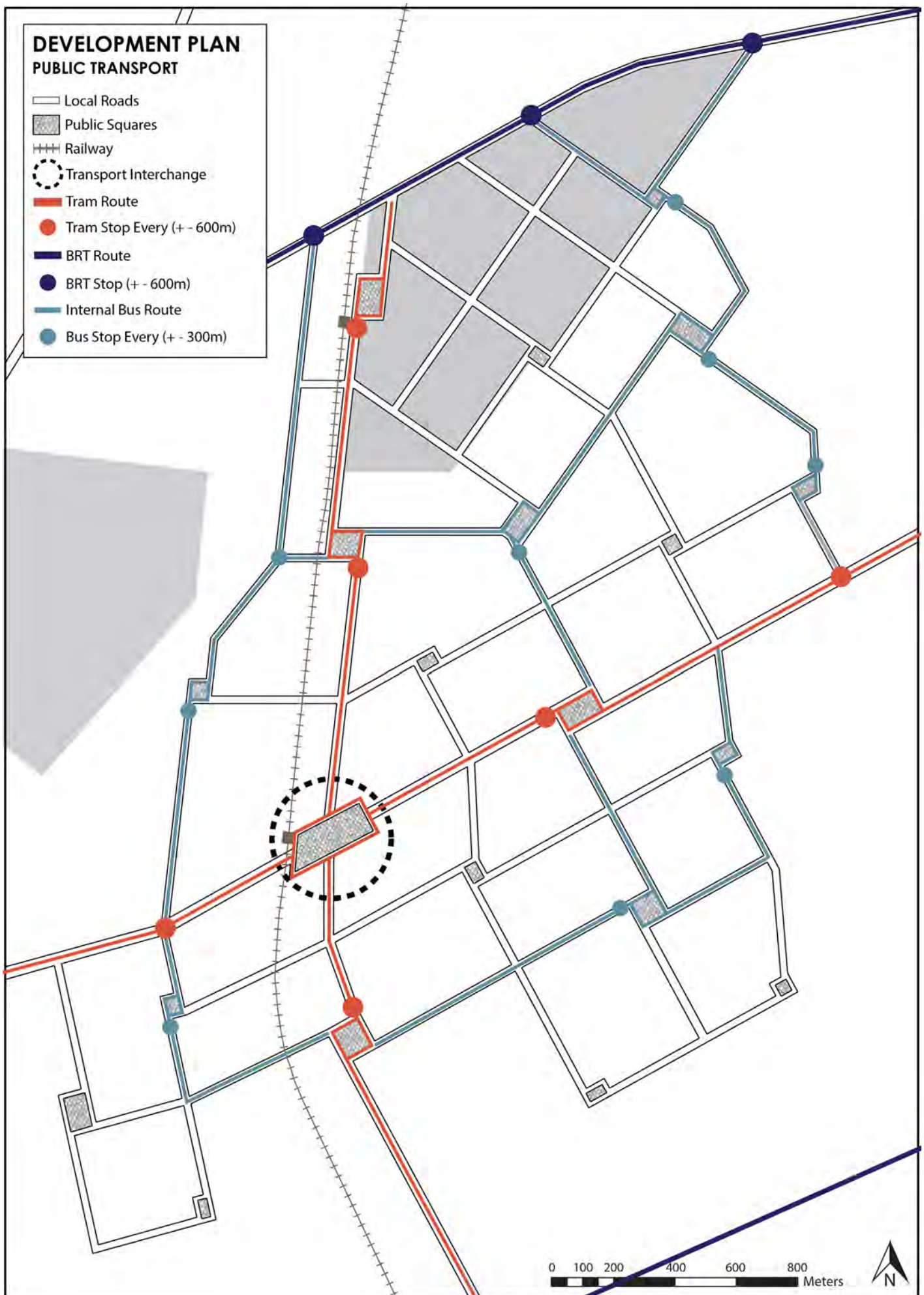
Figure 9.9: Paris Tramway (Source: The Progressive Review, 2015)

MIDTOWN GREENWAY, MINNEAPOLIS

The Midtown Greenway is a biking and walking trail across the city. The greenway is separate from the streets, this offers barrier-free bicycling which makes trips across the city fast (Midtown Greenway Coalition, 2015).



Figure 9.10: Midtown Greenway (Source: Midtown Greenway Coalition, 2015)



Map 9.8: Development plan public transport (Source: Author; GIS Technical Library, University of Cape Town)

9.7.4 PUBLIC OPEN SPACES

Public spaces are meeting places for people in urban areas and therefore should be viewed as the primary structuring element in settlements. These public spaces are important especially for poorer residents whose houses are unable to accommodate all the daily needs. Public spaces therefore act as an extension of the household. Public spaces accommodate a range of activities and good design can enhance the enjoyment of these (City of Cape Town, 1999).

HIERARCHY OF PUBLIC SPACES

The development framework incorporates a hierarchy of public open spaces that are linked with movement routes and located at points of high accessibility (see Map 9.9). This hierarchy gives order to activities. Public facilities should be associated with public spaces and be orientated around the edges of public spaces (City of Cape Town, 1999).

The design includes one primary public space that functions as the heart of the development. The square is approximately 250 x 100m and is located where the two primary activity routes intersect, making the space highly accessible. This space includes some of the highest order public facilities and provides space for informal trading. The secondary public spaces vary in shape but measure around 80 x 80m. These squares occur at the intersection of the secondary activity routes. The tertiary open spaces act as 'village greens' in the heart of the agri-villages and occur at the intersection of the tertiary movement routes.

The pinwheel concept is used at all secondary and tertiary public spaces. The concept essentially 'breaks' the grid as can be seen in Figure 9.11. The public square is located in the centre while vehicular traffic is diverted around the space. This 'break' in the grid helps to slow down vehicular traffic.

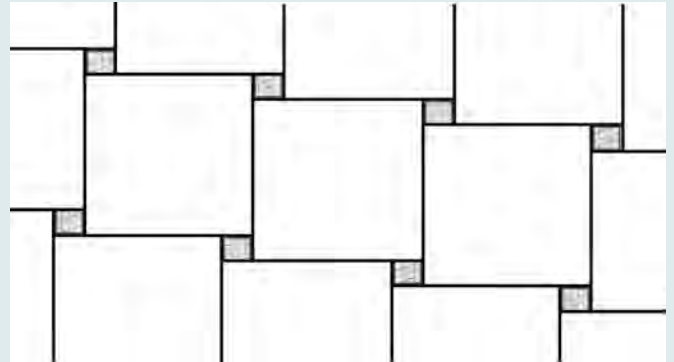


Figure 9.11: Network of public open spaces at intersection of superblocks (Source: Author; CSRI, 2000)

TRG BANA JELACICA, CORATIA

The Trg Bana Jelacica Square is a rectangular shape that measures 200m x 150m. It is the outdoor living room of the city and functions as a destination place and as a connector. There are several tram lines that go along the edge of the square and provides easy access to other parts of the city. The buildings that frame the square houses many cafés with outdoor terraces and shops that adds to the hustle and bustle of the place (Placemaking, 2015).



Figure 9.12: Trg Bana Jelacica, Zagreb (Source: <http://www.novolist.hr>)

9.7.5 PUBLIC FACILITIES

Public facilities provide essential support systems for urban residents. As resource constraints have become a reality, focusing on communal facilities and public places can reach the largest number of people. They provide places for people to interact around economic, cultural, recreational, education and social activities. If these spaces are appropriately made, they can contribute towards the identity of an urban environment by defining space and encouraging activity. This also has the potential to build a sense of community and place (City of Cape Town, 1999).

MULTI-PURPOSE FACILITY CLUSTERS

In the development framework public facilities are considered in clusters and are associated with places of high accessibility. The concept of public facility clusters is a strongly hierarchical one. The different hierarchical levels that are used throughout the plan can be seen in Table 9.3.

A cluster of multi-purpose facilities offers a range of services under one roof, such as social services, health and recreation in one location. Multi-purpose facility clusters should be located together with an urban settlement structural element such as a transport interchange, market, sports field or urban square. This concept provides a flexible grouping of facilities at accessible locations. Each cluster becomes a social hub and the size as well as number of services that are provided depends on the demands and needs of the surrounding environments. These clusters have different hierarchies from metropolitan nodes to local clusters. There are many advantages of establishing multi-purpose facility clusters. They provide convenience as all the services are located in one location and residents are able to accomplish a number of tasks in a single trip. As a result residents are able to save money and time, thus improving their quality of life. The cost in providing public facilities is also reduced as these facilities share resources, land and equipment. Other advantages include greater security, the integration of different communities and a reduction of inequalities in the provision of facilities (CSRI, 2000).

CATO MANOR, DURBAN

The Cato Manor development in Durban was envisaged as a cluster of medium and high density suburbs with the necessary shops, clinics, schools and recreational facilities that are centrally located and serviced by an efficient public transport system (CMDA, 2015).

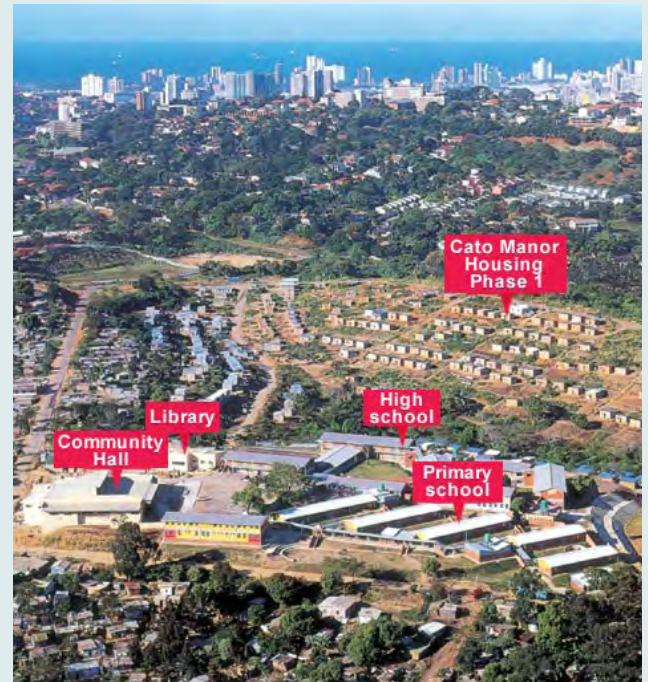
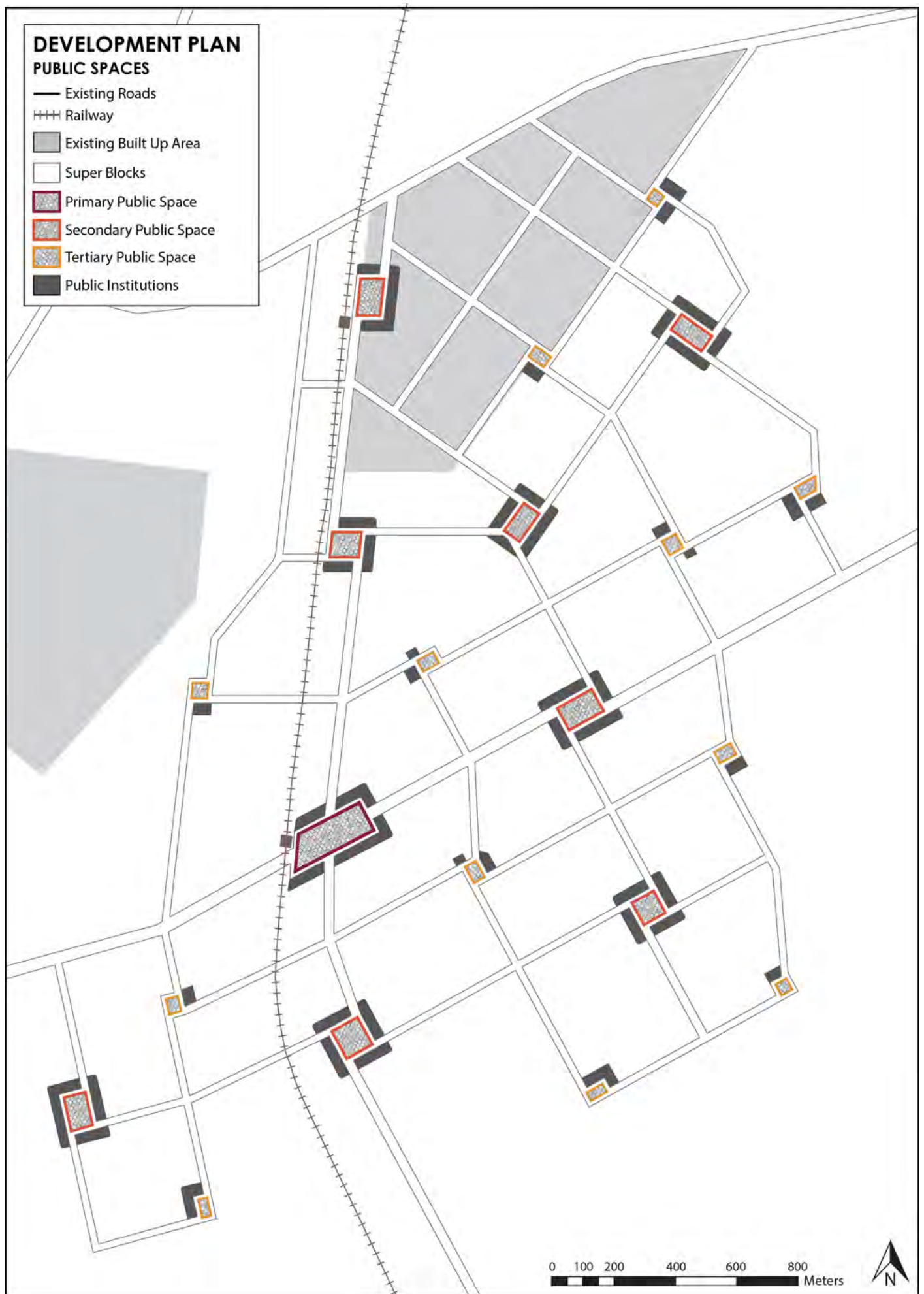


Figure 9.13: Clustering of public facilities in Cato Manor, Durban (Source: CMDA, 2015)

HIERARCHY	FACILITIES	LAYOUT	EXAMPLE
PRIMARY These facilities serve an entire region, metropolitan or city such as hospitals and universities. They are located at the most accessible location where the greatest number of people will have access to.	Public Transport Interchange Hospital Community centre and hall Library and information centre Tertiary education + secondary school + primary school + crèche Market Square and economic infrastructure		
SECONDARY These facilities serve a number of different communities such as high schools and clinics. They are essential for settlements and serve a threshold population that exceeds a single settlement.	Public Transport Terminus Secondary school + primary school + crèche Sports Field Library and information centre Clinic Park		
TERTIARY These facilities are utilised by a limited number of residents or communities such as pre-primary schools. They are provided for in the layout of residential settlements.	Public Transport Terminus Primary school + crèche Clinic Community vegetable garden Kick-about space		
LEGEND Social Facility Community Garden/ Park Public Transport Interchange Public Space Sports Fields Public Transport Route			

Table 9.3: Hierarchy of Public facilities (Source: Author; CSRI, 2000; City of Cape Town, 1999; CNdV Africa Planning and Design, 2013).



Map 9.9: Development plan public open spaces and facilities (Source: Author; GIS Technical Library, University of Cape Town)

9.7.6 GREEN SYSTEM

The green system consists of conservation areas, soft open spaces, green corridors and agriculture. A number of small parks and the development of an internal green corridor are provided to offer residents access to recreational space.

CONSERVATION AREAS

The conservation areas are areas on the site that are designated as no-go areas. These areas are to be conserved as they should not be further degraded or destroyed. A buffer of 16m is provided around these conservation areas.

SOFT OPEN SPACES

The soft open spaces, or parks, are located in close proximity to the local squares. These parks function as multi-purpose spaces and incorporate sports facilities, recreational space, green infrastructure and NMT pathways. These spaces are linked by green corridors, allowing them to become multi-functional and more accessible to the public.

GREEN CORRIDOR

The internal green corridors are approximately 30m wide and connect the various conservation areas and soft open spaces with a continuous open-space system throughout the site. The result is an integrated public open-space system. The proposed NMT routes link up with the internal green corridors and provide pedestrian and cycling pathways.

AGRICULTURE

A large portion of the area is designated as 'tread lightly'. This 'tread lightly' classification is mainly because of the valuable agricultural land that is present on the site. It is therefore critical that a large portion of land be provided for agriculture activities. This focus on agriculture aims to alleviate food security issues by making the land accessible to both commercial and community-based farmers.

PHILIPPI HORTICULTURAL AREA

The Philippi Horticulture area is made up of large scale and smallholder farmers. The area produces over 50 different crops that gets sold to retailers and restaurants and many farmers also have livestock production. The area plays a critical role in the food security of Cape Town.



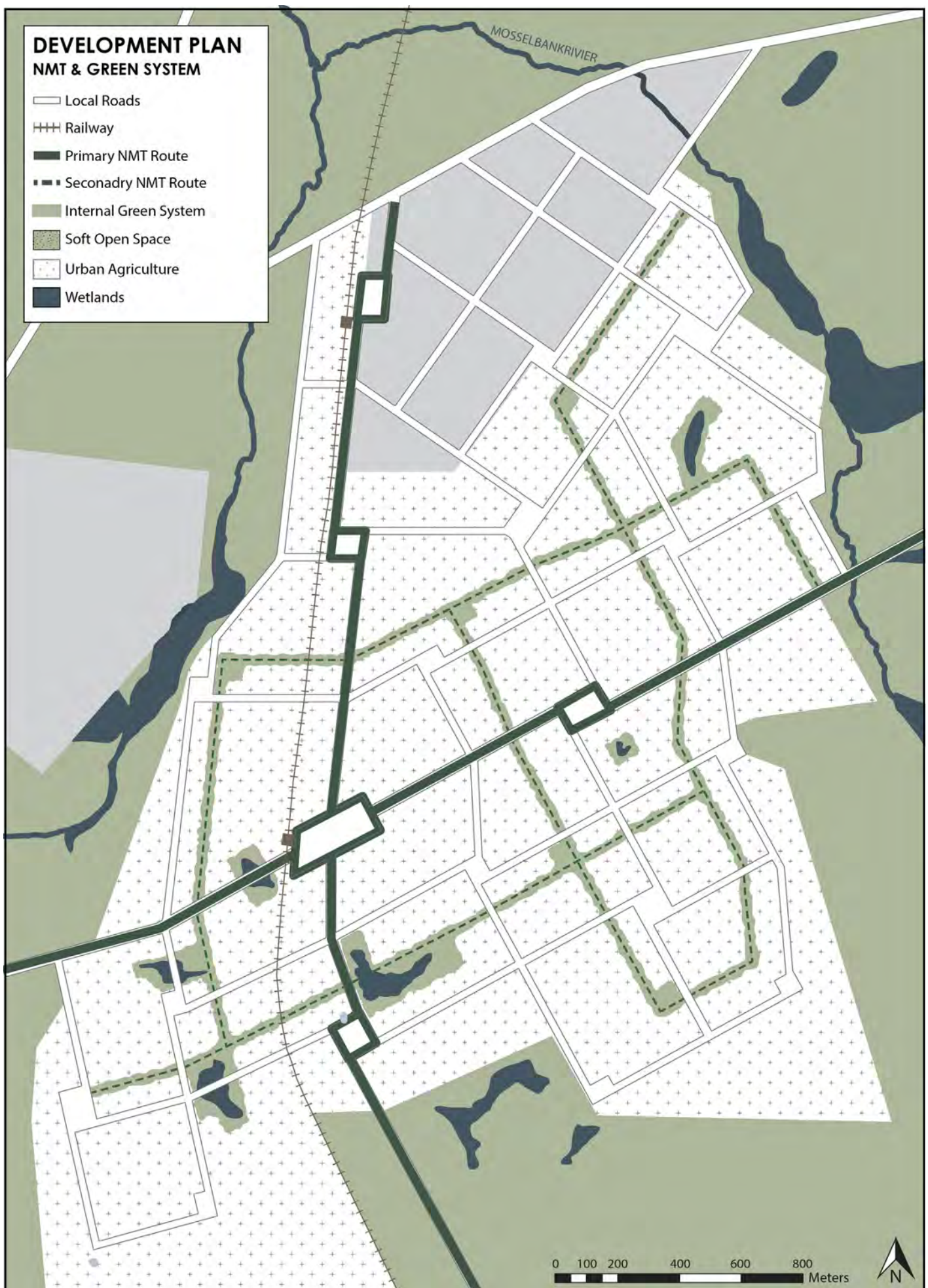
Figure 9.14: Philippi Horticulture Area, Cape Town (Source: <http://assizalovertheworld.blogspot.co.za/>)

GREEN POINT PARK, CAPE TOWN

Green Point park is a successful example of a multi-functional park in Cape Town. The space includes biodiversity areas, a network of pedestrian and cycling pathways, an outdoor gym, picnic spaces and children's playground. The park also includes the Cape Town stadium.



Figure 9.15: Green Point Park, Cape Town (Source: www.inspiredliving.co.za)



Map 9.10: Development plan green system (Source: Author; GIS Technical Library, University of Cape Town)

9.7.7 LAND USE

Map 10.7 provides an indication of the various types of land use that will best respond to the layout of the plan. This map is not intended to impose where certain activities should happen but rather provide guidelines for the site.

INSTITUTIONAL

Institutional land uses are concentrated around public squares. Institutional land use refers to public facilities such as schools, community centres and clinics.

MIXED-USE COMMERCIAL

Mixed-use commercial occurs along the primary street networks where there are high levels of pedestrian activity. Generally, the commercial activities will occur on the bottom floor of the buildings and residential activities will occur on the floors above.

RESIDENTIAL

Residential land includes a variety of affordable housing and tenure options such as row housing and apartment buildings.

INFORMAL TRADING

The public squares provide areas for formal and informal trading. The market spaces have been chosen to be in close proximity of transport interchanges to allow for pedestrian movement through the market space.

LIGHT INDUSTRIAL

Light industrial development occurs along the outside of the primary activity routes and along the railway line. These industries should accommodate the processing of agricultural products such as the manufacturing of wood, paper, food beverages and textile and leather products.

PUBLIC OPEN SPACE

The public open spaces act as communal meeting spaces and provide play areas for children, recreational areas and NMT infrastructure.

INTENSIVE AGRICULTURE

Small pockets of intensive agricultural areas have been allocated in and around residential areas to encourage locally produced food which can be sold at the market spaces.

INFORMAL SETTLEMENT UPGRADING

This area includes an existing informal settlement which should be upgraded. Refer to Annexure B on the recommended informal settlement upgrading process.

9.7.8 DENSITIES

Map 10.8 shows the various building heights within the site. The density gradient that is used in the plan is seen in Figure 9.16. The highest density occurs along the primary activity routes and around the main public square (see Figure 9.17). This is needed to support the public transportation as well as the large size of the public square. Medium density is located along the secondary activity corridors and around the secondary public squares. The lowest densities are proposed in the agri-villages within the site. This area is ideal for lower-density residential development as it contributes towards the 'village character' of the area.

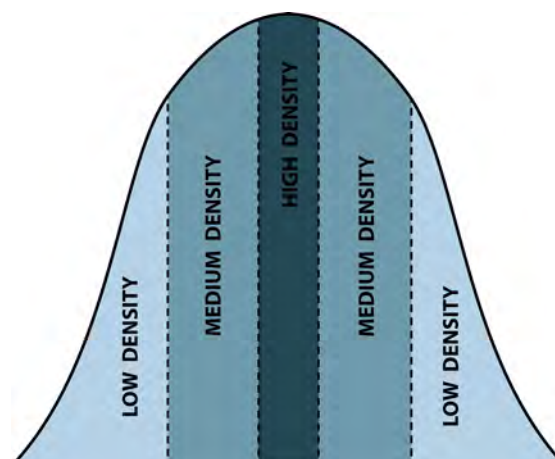


Figure 9.16: Density Gradient (Source: Author)

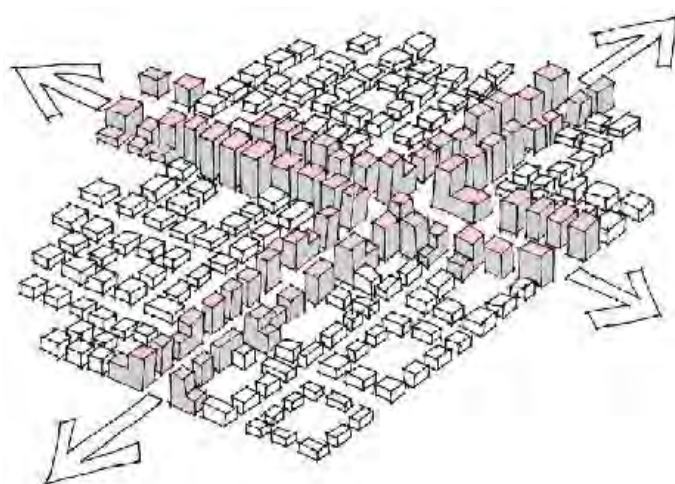
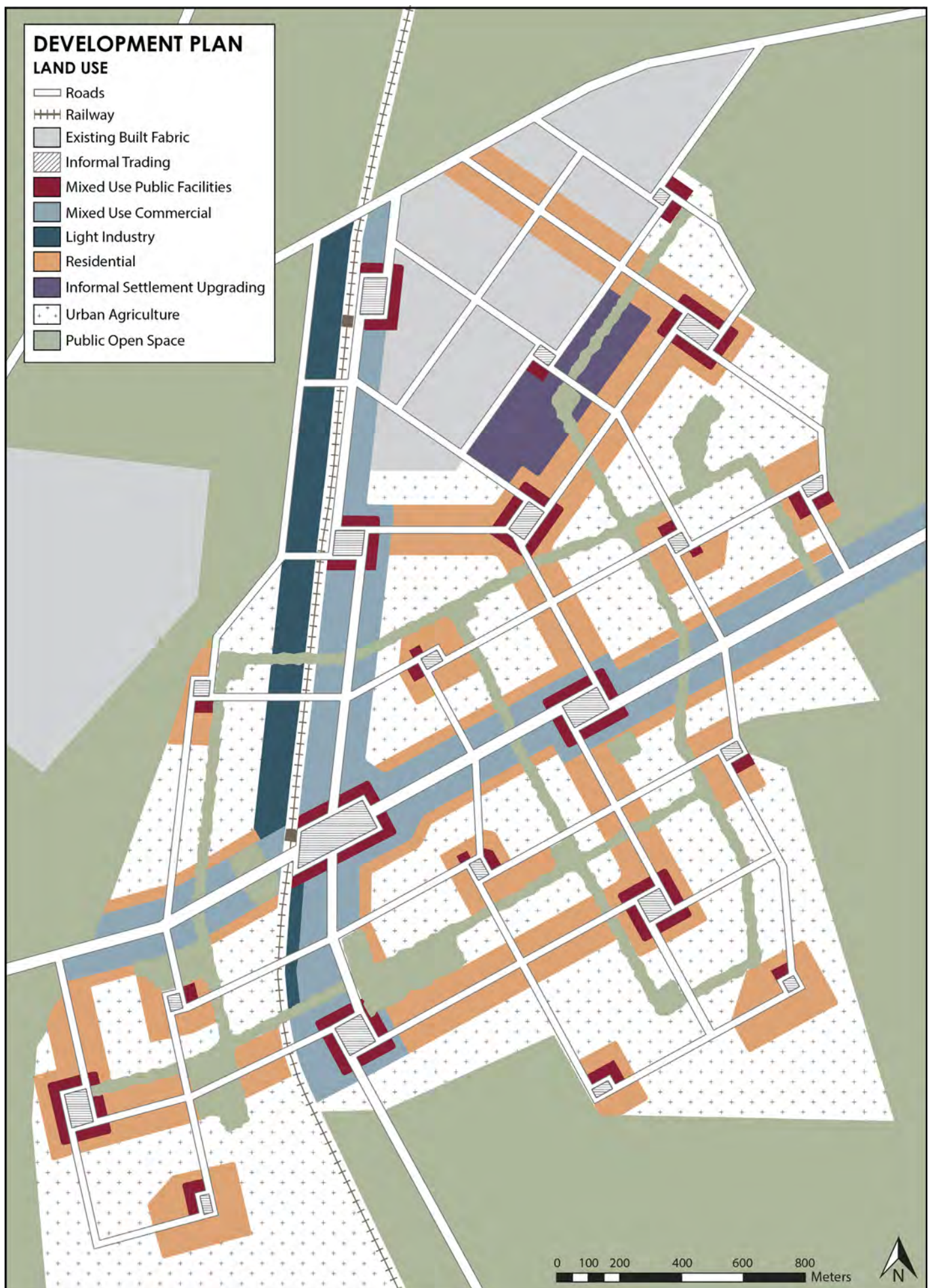


Figure 9.17: Densification along primary activity route (Source: CNdV Africa Planning and Design, 2013)



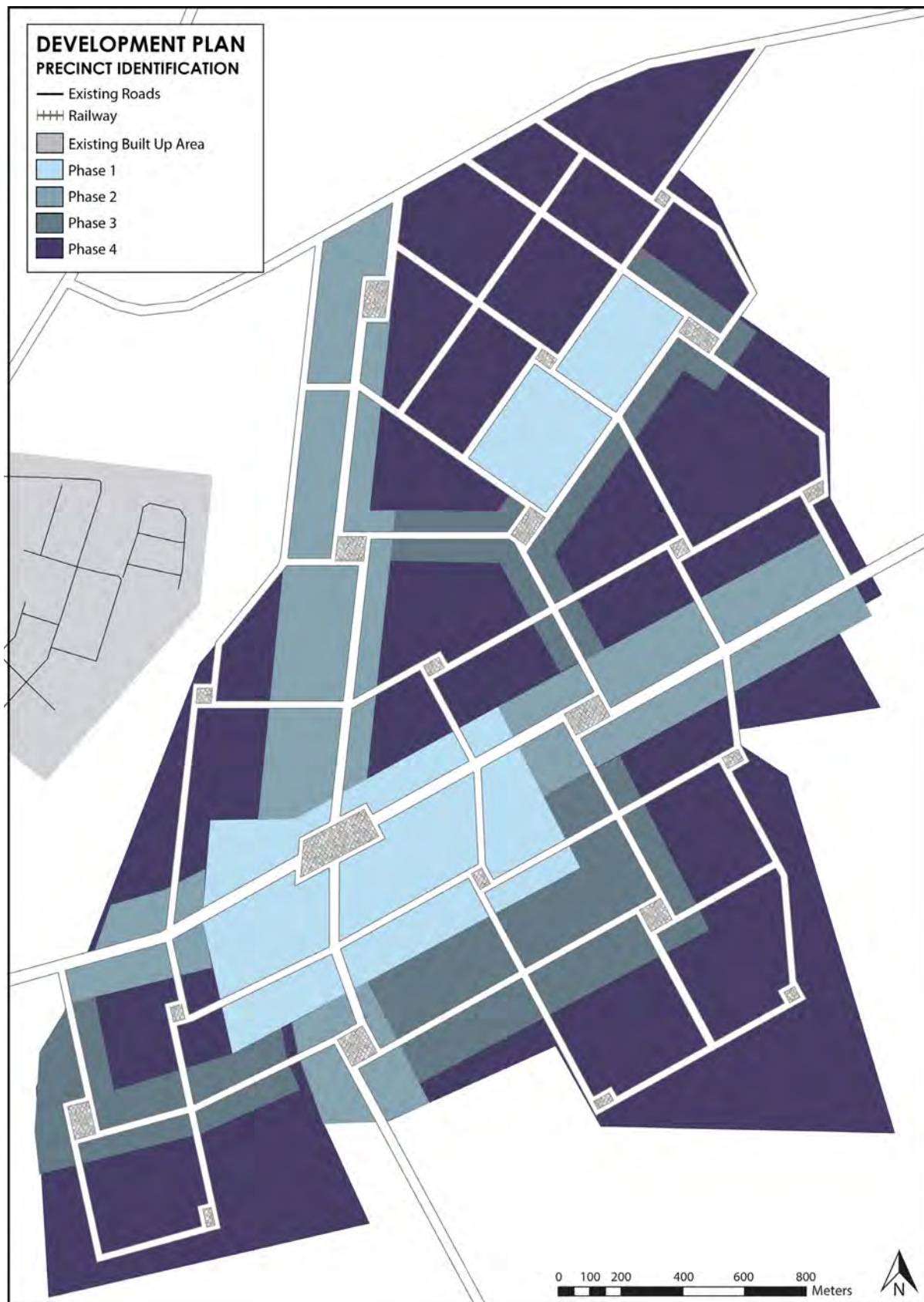
Map 9.11: Development plan Land Use (Source: Author; GIS Technical Library, University of Cape Town)



Map 9.12: Development plan Densities (Source: Author; GIS Technical Library, University of Cape Town)

9.8 IDENTIFICATION OF PRECINCTS

The scale of the development framework requires consideration to be given to phased growth and development of the site. The phasing is based on a linear and sequential conception of development. The precinct plans that are identified in the development framework are not planned in detail, except for the first precinct which will be the pilot phase (Lucien le Grange Architects & Urban Planners, NM & Associates Planners & Designers, 2010).



Map 9.13: Development plan precinct allocation (Source: Author; GIS Technical Library, University of Cape Town)

CHAPTER 10: PRECINCT PLAN

10.1 PURPOSE

The detailed precinct plan translates the conceptual layout planning principles from the development framework into a set of technical layout planning guidelines. The detailed precinct design shows the road networks, public spaces, block alignments and erf subdivisions of the site, it also identifies appropriate locations for public facilities (Behrens & Watson, 1996).

10.2 IDENTIFICATION OF PRECINCT

The chosen precinct will act as a catalytic project for the area. This can be seen in Map 10.1. The precinct was chosen because it is located within the current urban edge and is situated in close proximity to the existing settlement of Fisantekraal which . The precinct is also well connected to the surrounding areas as there is an existing road running that connects the site to the N1.



Map 10.1: Precinct Location within Development Framework (Source: Author)

STRUCTURAL ELEMENTS

The precinct is approximately 77 ha in size. The area includes a primary public square where the vertical and horizontal boulevards intersect. It also includes a small agri-village which has a tertiary public square. A green corridor runs vertically and horizontally through the precinct and connects various soft open spaces. An existing railway line runs vertically through the precinct and a new railway station is proposed next to the primary public square. Intensive agriculture occurs throughout the precinct.



Map 10.2: Precinct Structural Elements (Source: Author)

10.3 DESIGN GUIDELINES

To ensure that the precinct develops in the manner envisioned in the development framework, it is crucial that development guidelines are adopted to promote and reinforce the vision for the site. This section translates the planning principles in the Development Framework into a set of technical planning guidelines for the precinct (GAPP, Urban Solutions, 2004). The following guidelines can be seen in Map 10.3.

10.3.1 LAYOUT

The sizes of the block as well as erf sizes have significant implications for urban form. The relationship between the erf and relative positioning of residential units will determine the character of the residential urban environment.

BLOCK WIDTH AND LENGTH

The superblock is divided into thirds by a pair of internal streets. These smaller blocks are generally 80 x 80m in size. The block dimensions allow for easy pedestrian circulation and efficient service reticulation. The grid designs make reticulation services more cost-effective and easier to maintain. Stormwater drains and manholes can be located at the end of the blocks (Behrens & Watson, 1996). Annexure A shows a study of various city block sizes which was used to determine the 80m x 80m grid in the precinct.

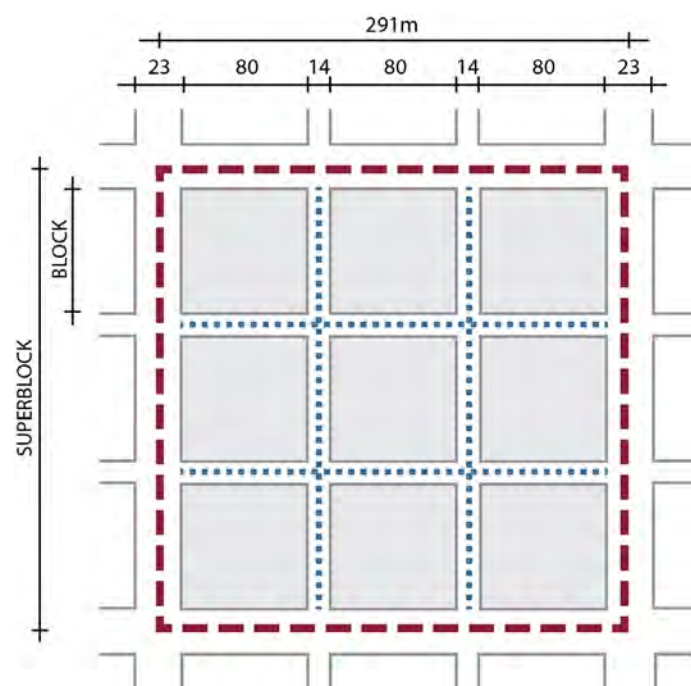


Figure 10.1: Block width and length (Source: Author)

ERF SIZES

The key considerations in determining erf width include housing types and service provision. For single-unit housing such as row housing or semi-detached housing, the greatest efficiency is achieved when erf widths are a minimum, usually 6m - 8m. Narrow erf widths increase the number of households per unit length of service run. For multi-unit housing such as apartments and walk-ups, the erf even are wider and larger and can sometimes occupy an entire block. The integration of a range of erf sizes accommodates a mix of residential, commercial and retail land uses (Behrens & Watson, 1996). In the agri-village a modular erf and block system is devised to introduce variety (Dewar & Louw, n.d). It includes the following:

A) Mixed-use units: These plots include possible living and small shops and measure 12m x 25m.

B) Urban units: These are small frontage plots that are used to create a fine-grained urban fabric and measure 8m x 25m.

C) Villa unit: These are larger plots where housing is located in the middle of the plot and measure 16m x 18m.

D) Agri unit: These are long, narrow plots that are used for farming with a house located at the street edge and measure approximately 35m x 8m.

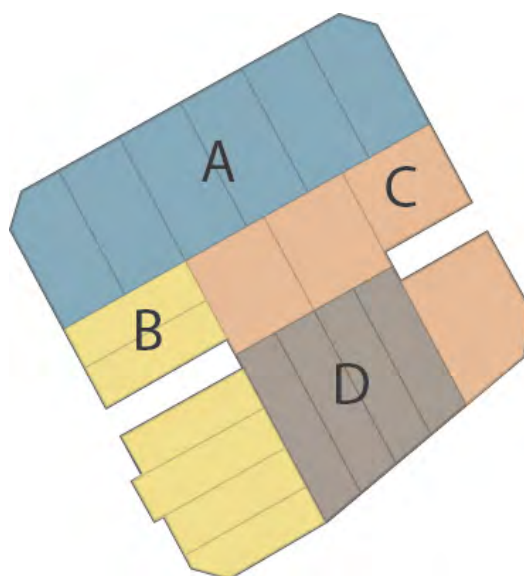


Figure 10.2: Range of block sizes as seen in the Agri-Village (Source: Author)

10.3.2 MOVEMENT

Streets are the main system of public spaces in the precinct. They are functional as they allow vehicles and people to move around and they contribute towards the life of the area (GAPP, Urban Solutions, 2004). The proposed layout allows for a hierarchy of movement within the precinct. The prominent north-south and east-west movement along the boulevard provides vehicular and NMT movement. Secondary movement systems focus on local vehicular movement. The envisaged layout of the precinct will ensure that there is easy pedestrian movement along the above routes. The street sections for the precinct can be seen in Figure 10.19.

10.3.3 OPEN SPACES AND LANDSCAPING

The precinct is designed in harmony with nature and the landscape design promotes the development of rich and varied open spaces that create beneficial micro-climates. Soft landscaping adds to the character of the precinct. Structural planting is located along the main movement routes, public squares and in the agri-villages (see Figure 10.3). Structural planting should comprise of trees so that their height and canopies can create tree lined avenues. The use of indigenous plants is encouraged and existing trees and vegetation should be preserved and linked to the precinct where possible (Carmona *et al*, 2003).

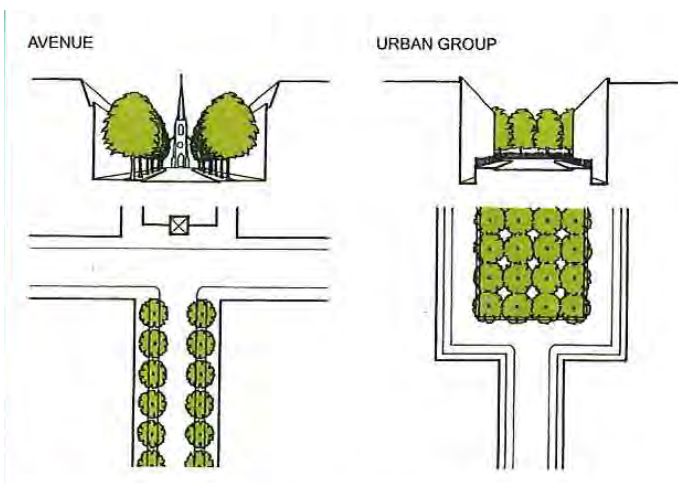


Figure 10.3: Structural Landscaping (Source: Carmona *et al*, 2003)

10.3.4 LEGIBILITY

The legibility of the precinct is created when entrances and exits, landmarks and corner buildings are clearly marked and emphasised. This established a clear understanding of the site. The creation of 'place' and legibility of an urban environment is based on the nature of spaces between buildings. Buildings have an impact on settlements and can have profound consequences if buildings do not respond to the urban environment sympathetically. It is therefore important to establish hierarchies of spaces between buildings that make an urban environment easy to 'read' or legible (Fawcett, 2003).

STREET LINERS

Street liners are thin buildings that line the edge of a street and 'encloses the space'. The buildings can be as little as 5m wide and vary in heights. These buildings should be set back no more than 5m to allow for public-private threshold space such as balconies, gardens or level changes. Street liners are mixed-use building types and have the opportunity to house retail activity on the street level (Fawcett, 2003).

TERMINATION OF VIEW

A visual termination signals the entry or exit from a street and usually happens at 'T-junctions' (see Figure 10.4). Major buildings should be positioned as visual 'stops' to streets. Ways to achieve this is to set the building back or to create variations in the facade of the building to punctuate the building and avoid monotony (Fawcett, 2003).

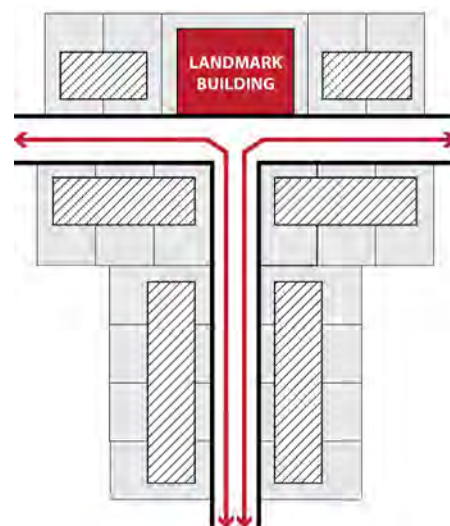


Figure 10.4: Termination of View (Source: Author)

CORNER BUILDINGS

Corners are formed by the junction of two streets and create an area of high accessibility, making the corner very significant. Corner buildings should be used as a device to intensify the corner as a visual element. Corner buildings define the street and come in a variety of typologies, as can be seen in Figure 10.5. These varieties of corner buildings serve to enrich the visual outcome and complexity and variety of the urban environment (Fawcett, 2003).

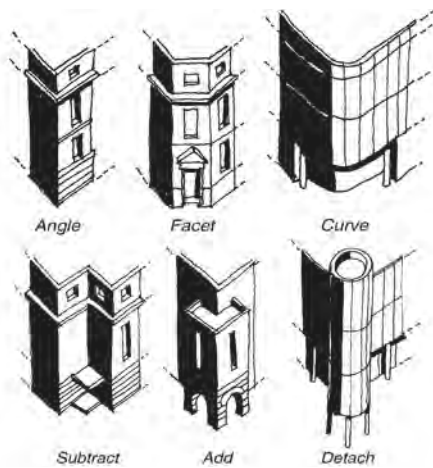


Figure 10.5: Corner Building Typologies (Source: Fawcett, 2003)

PINCH POINT

Different building set backs and corner buildings can be used to pinch a linear space. This pinch can be used to provide a visual relief along a street or slow down traffic speeds when entering a 'special' place such as a node or public square, or both (see Figure 10.7).

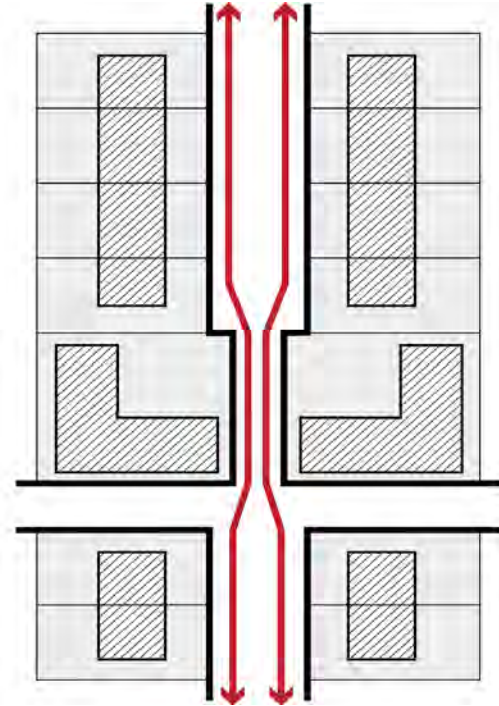


Figure 10.7: Pinch Point (Source: Author)

PERIMETER BLOCK HOUSING

The communal open space created by the perimeter housing provides the opportunity for a range of activities such as parking, hard open space, soft open space or community gardens. Figure 10.6 shows variations in perimeter block housing layout and type of courtyard uses.

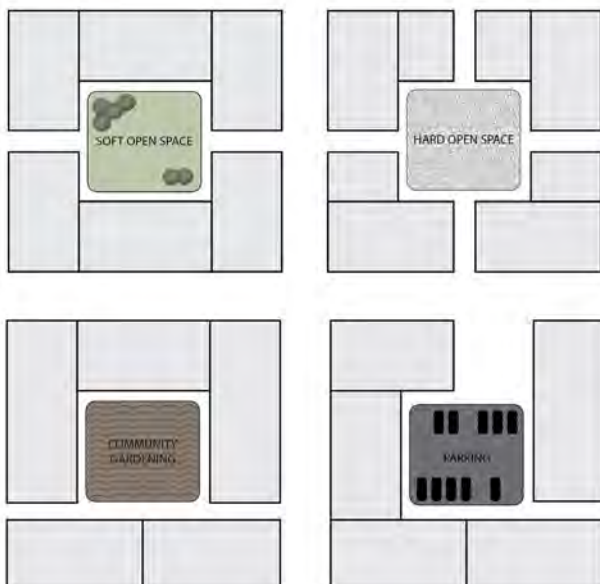
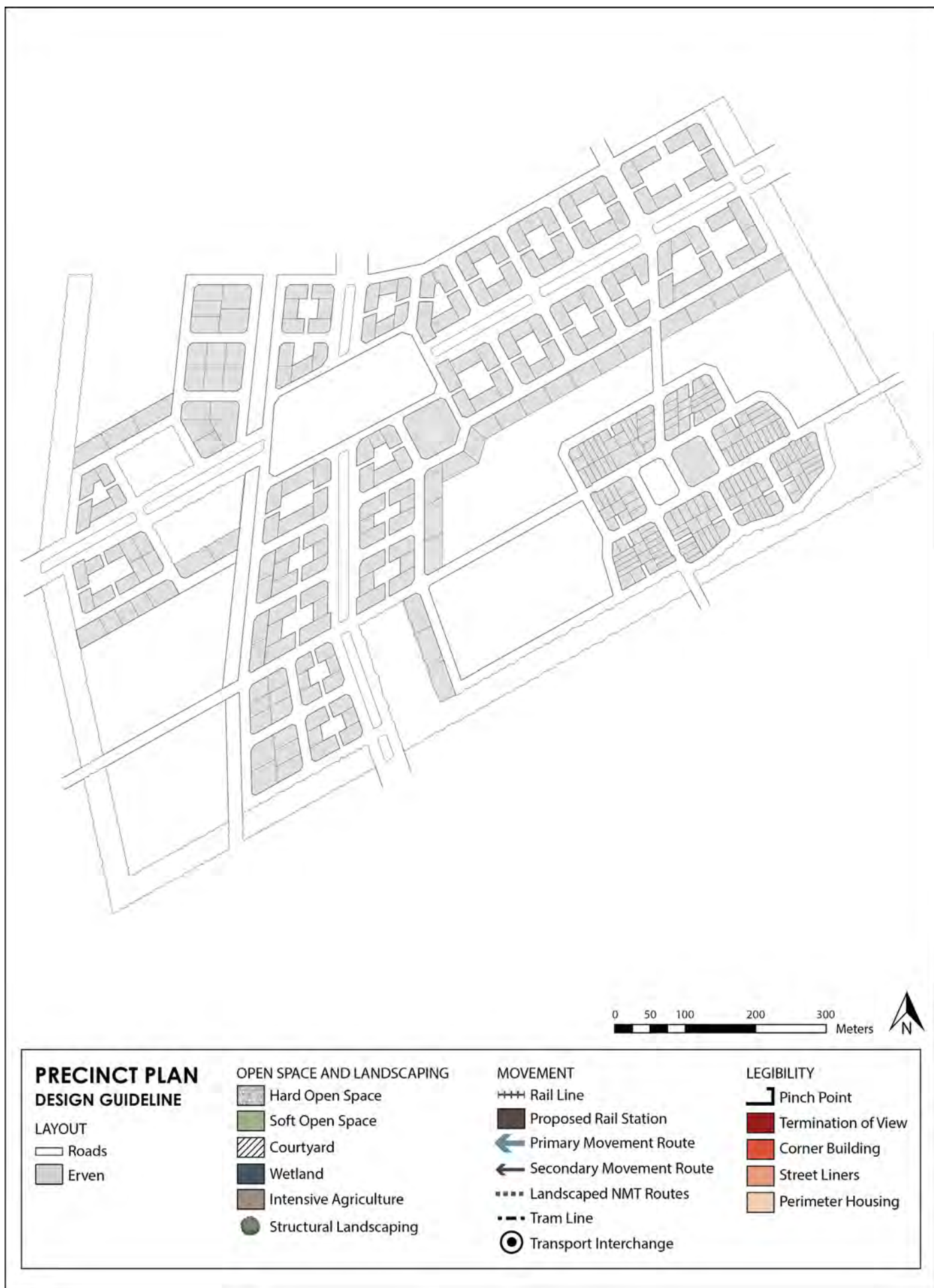
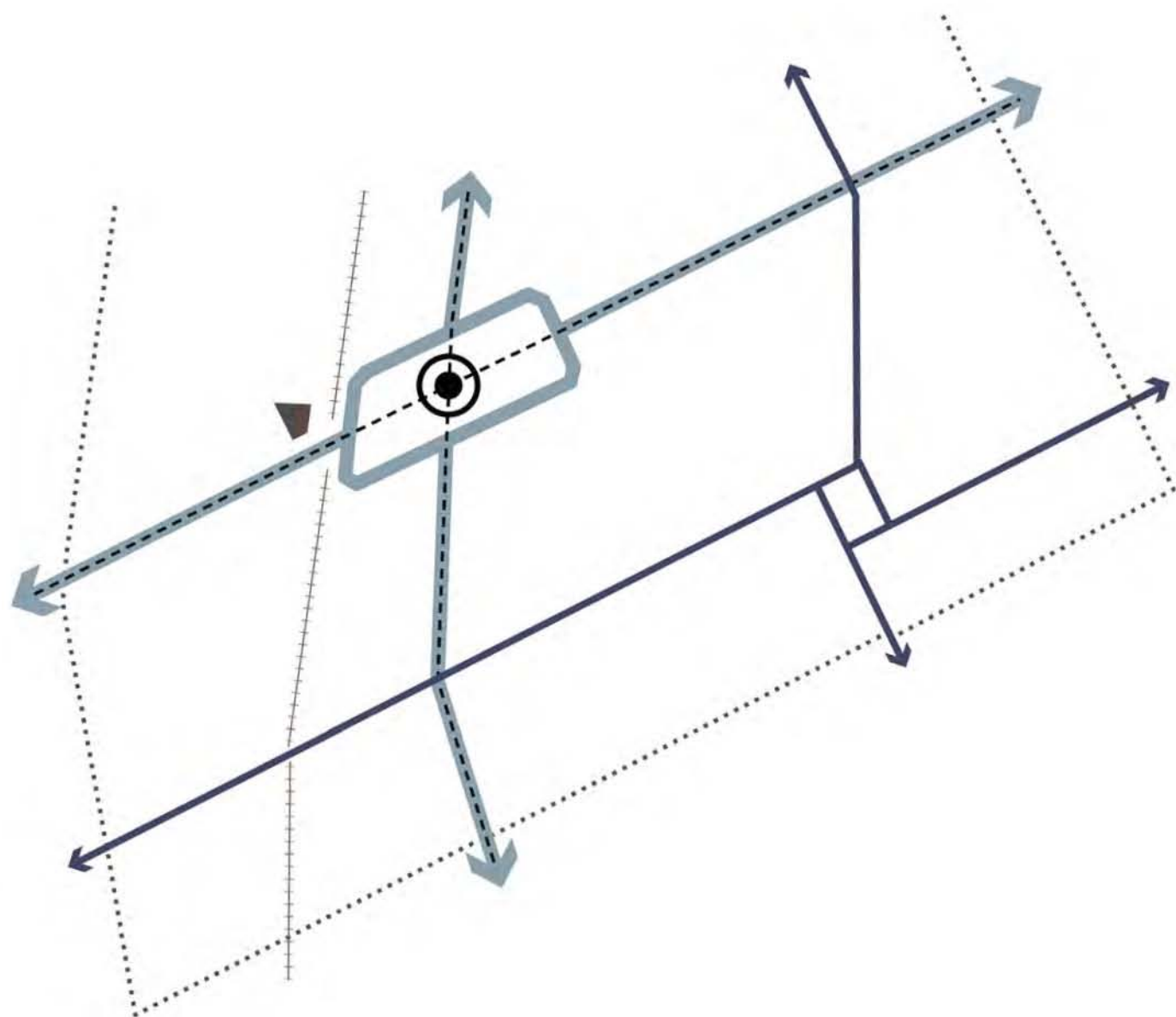


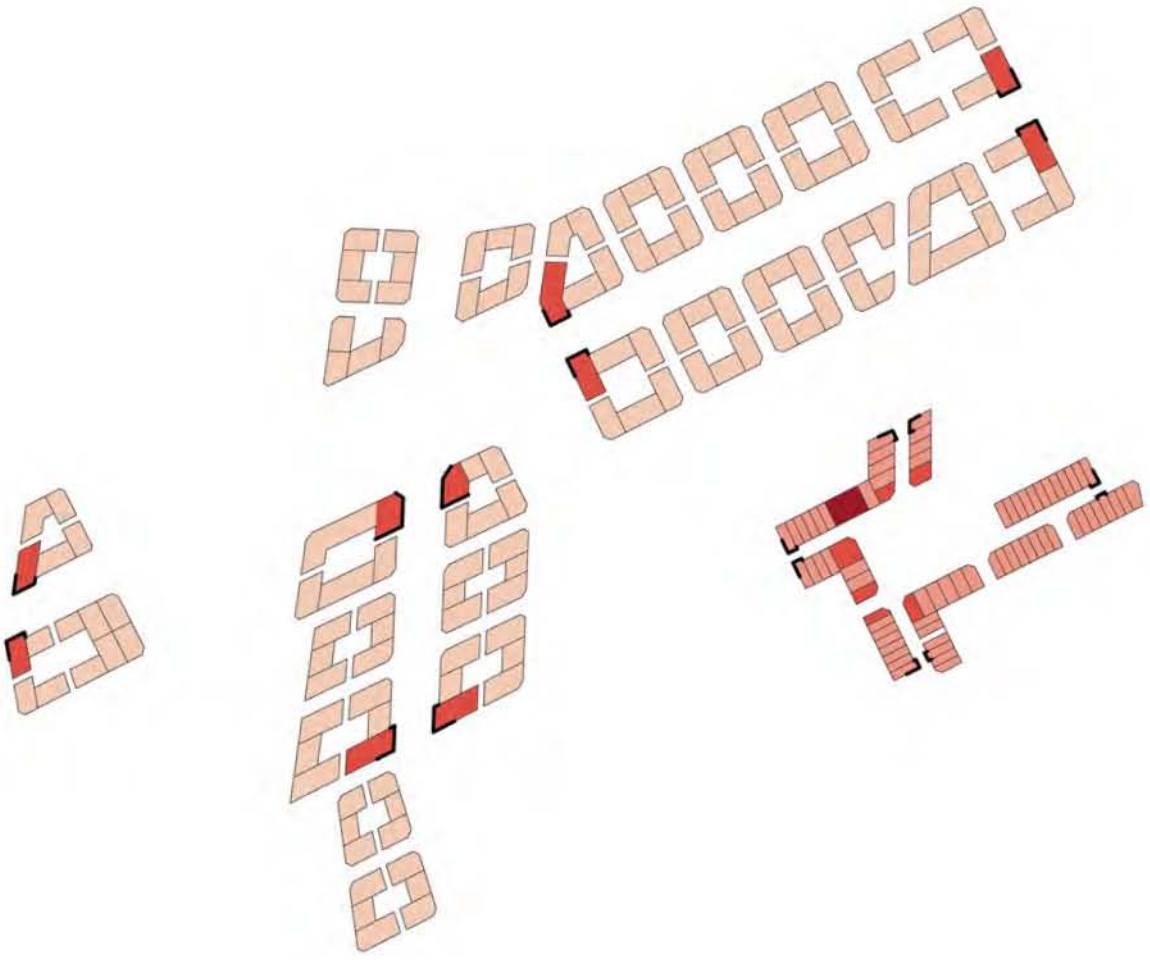
Figure 10.6: Perimeter Block Housing (Source: Author)



Map 10.3: A Layered Map of the Precinct Plan Design Guidelines (Source: Author)







10.3.8 SAFETY AND SECURITY

Buildings should be designed to have rooms such as balconies overlooking streets and public areas such as squares. Mixed-use commercial buildings should have shops or offices that face the street or public areas (ASM Consortium, 2008).

10.4 DESIGN CONTROLS

The precinct is structured by critical elements that aim to guide development over time. The controls and guidelines outline the envisaged character of the precinct. The purpose of the controls and guidelines is to ensure that the incremental development of the precinct is harmonious to establish the development of a sustainable neighbourhood.

BUILD-TO LINES

The build-to line is a regulatory tool that ensures a building frames the street and public spaces in such a way that the public realm becomes enjoyable, welcoming and encourages business. The build-to line regulates the distance between

LOCATION	SETBACK	PURPOSE
Along Boulevard, primary public square & corner buildings	Adjacent to pavement edge	Direct commercial frontage
Along secondary movement route & around tertiary public square	1.5m to 3m semi-private strip between building fronts and public pavement	- Amenity space for small garden or balcony - Functional space for rubbish-collection or meter-reading - 'Spill out area' for cafés or shops

Table 9.4: Indicative set-back distances according to locations (Source: Author; Yeang, 2000)

the front of the erf and the building facade. It indicates where the construction of a building has to occur on an erf. Erven that are on a corner are used on each side that faces a street to help define corners. The build-to lines differs at various locations as can be seen in Table 9.4.

STREET EDGE

Devices should be incorporated into the facade of buildings so that buildings 'reaches out to the street'. Shopfronts are encouraged along the

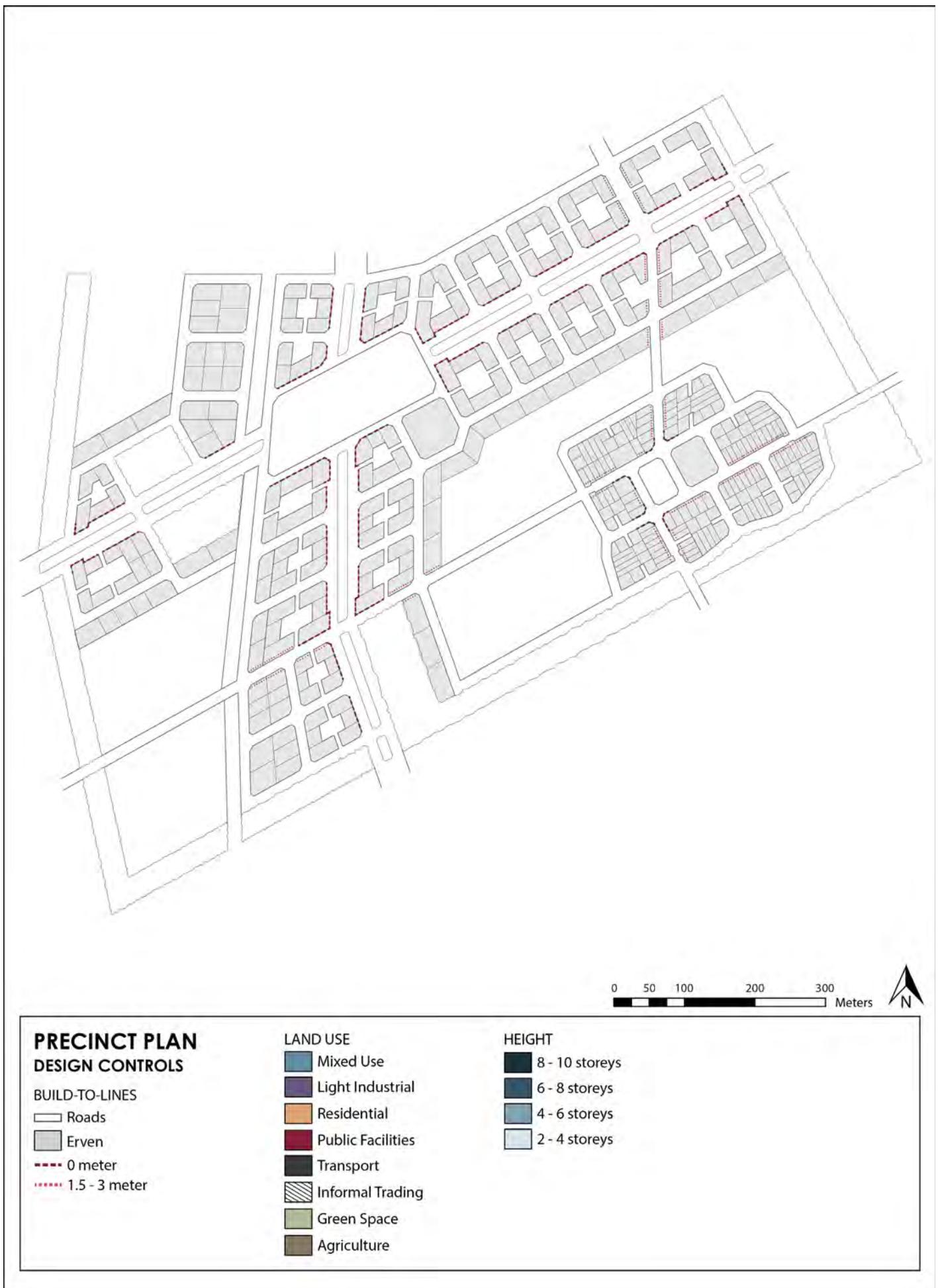
Boulevards. Balconies, windows and low boundary walls should be encouraged along residential streets such as in the agri-village. Solid blank walls should be discouraged along street edges, therefore more windows and doors should be faced onto the public realm. Level changes should be incorporated between the ground building level and pavement, with steps up to house front doors or raised terraces for restaurants, this also gives a sense of privacy and surveillance (Yeang, 2000).

HEIGHT

The precinct is intended to have buildings of different heights. Uniform heights and active building frontages around the large public squares and activity corridors are used to define the spaces and improve the urban quality. Residential development in the agri-villages has a gradual transition from a higher rise edge around the local square to a lower rise edge around agricultural and green areas. Buildings should have a minimum of two storeys.

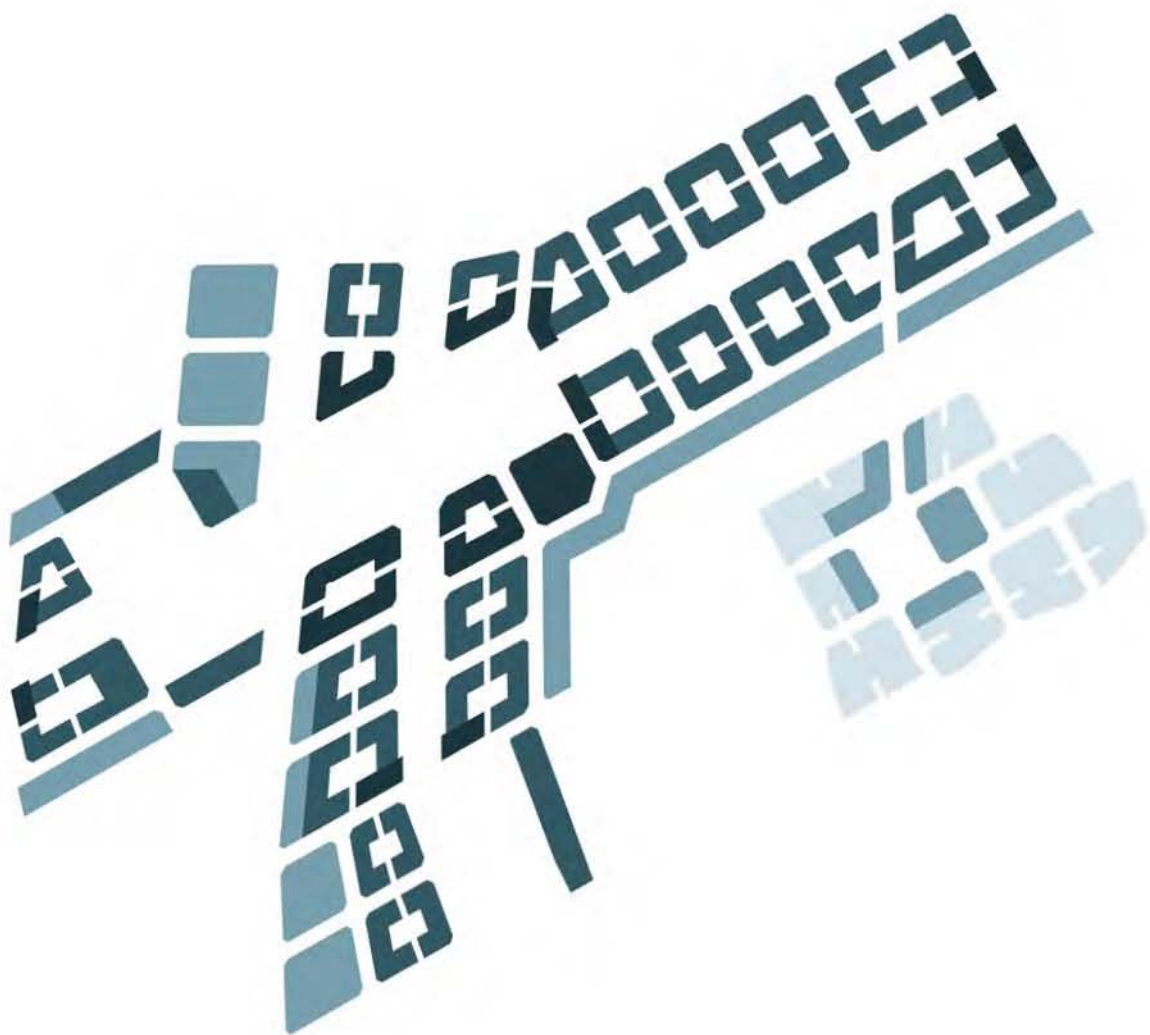
BULK AND COVERAGE

The coverage for mixed-use commercial is 75 per cent, the remaining 25 per cent is used to create open space and greenery in the development, and provide pedestrian routes. The coverage for residential development is 50 per cent with 50 per cent being for parking and open space.



Map 10.4: A Layered Map of the Precinct Plan Design Controls (Source: Author)





LAND USE

The mixture and variety of uses and activities in the precinct aims to increase choice. The various land uses as described in chapter 10 promotes a variety of uses from mixed use commercial, light industrial development and high density residential development (GAPP, Urban Solutions, 2004).

10.5 BUILDING PERFORMANCE

ENERGY EFFICIENCY

Buildings should optimise thermal performance, thermal comfort and daylight. Measures need to be put in place to reduce the need for mechanical heating and cooling, and to minimise greenhouse gas emissions. Controls include the incorporation of passive solar design techniques to optimise heat storage, using insulation in roofs/ceilings and external walls, maximising natural ventilation and using thermal mass in floors and walls that are situated in the northern side of buildings (ASM Consortium, 2008).

WASTE

The minimisation and management of waste can contribute towards the visual amenity of buildings and limit harmful impacts on the environment. Minimising waste should be relevant to all stages of a building's life-cycle. Controls include encouraging waste minimisation by reusing and recycling waste, on-site composting to be used for agriculture and the integration of waste management process in all stages of building construction (ASM Consortium, 2008).

WATER CONSERVATION

Improved water efficiency should be promoted to reduce potable water demand by re-using water that would otherwise be lost as waste water or run-off. Controls include the requirement of harvesting rainwater through rainwater tanks, urban storm water runoff through retention ponds and grey-water utilisation for landscape and agricultural irrigation (ASM Consortium, 2008).

10.6 PROPOSED SERVICES

The road and block layouts define the basic pattern of the reticulation networks. The comprehensive proposal for services for the precinct will require input from specialist consultants.

ENERGY SUPPLY

In house electricity supply will be provided in the form of prepayment metered connections. Solar geysers will be used for water heating. Above-ground cabling electricity reticulation will provide the site with electricity, telecommunications and public lighting (Behrens & Watson, 1996).

WATER SUPPLY

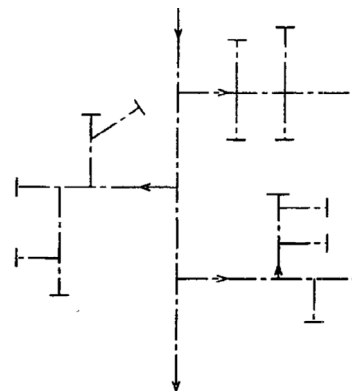


Figure 10.8: Branched Main Reticulation System (Source: Behrens, Watson, 1996).

On-site water supply will be provided through house connections where reticulated water is metered. The ring main reticulation system will be used, all pipes are interconnected and in case of breakage all households can be supplied with water from either end of the road (Behrens & Watson, 1996).

STORM WATER

On road channels will be used because the site will have low volumes of slow-moving traffic. Roads will be constructed with an inverted chamber for drainage. The existing wetlands on site will provide storage for flood water and provide a safety barrier for properties. They should be grassed and planted with trees and shrubs to prevent erosion (Behrens & Watson, 1996).

SANITATION

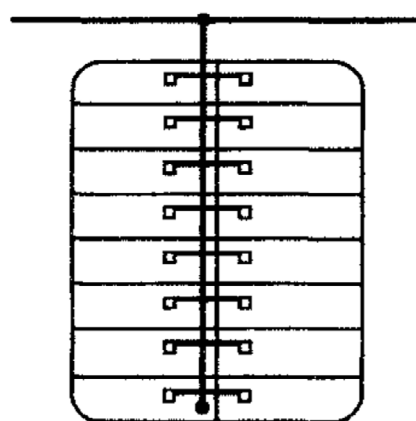


Figure 10.9: Midblock Sewer Reticulation System (Source: Behrens, Watson, 1996).

10.7 HOUSING

This section looks at the various housing typologies and tenure options available in the precinct.

10.7.1 TENURE

The residential accommodation within the area includes a variety of different forms of ownership. It will be critical to ensure a mix of tenure types to promote greater social integration (Lucien le Grange Architects & Urban Planners, NM & Associates Planners & Designers, 2010).

FREEHOLD OWNERSHIP

Freehold tenure is the traditional form of ownership where the property owners own the land and everything on the land in a title deed. This form of tenure is most appropriate for single dwelling units as its application in compact urban environments is limited (Lucien le Grange Architects & Urban Planners, NM & Associates Planners & Designers, 2010).

SECTIONAL TITLE

This form of tenure is governed by the Sectional Title Act No 95 of 1989 that relates to multi occupant buildings such as flats, apartments and town houses. Sectional title gives owners full ownership of a section of the building or property and limited use rights over communal areas. The property is managed by a body corporate that is comprised by the owners and facilitated by a professional management agent. Each unit pays a monthly levy to cover rates, taxes and long-term maintenance of the property (Lucien le Grange Architects & Urban Planners, NM & Associates Planners & Designers, 2010).

LEASEHOLD

Leasehold tenure refers to the right to occupy land or a building for a certain period of time. Leasehold differs from freehold ownership: according to the latter, the property is bought and held for an undetermined period of time, whereas leasehold refers to the renting of a property for periods of times, such as weeks or months (Lucien le Grange Architects & Urban Planners, NM & Associates Planners & Designers, 2010).

10.7.2 RESIDENTIAL HOUSING TYPOLOGIES

The following housing typologies are not exhaustive but rather focus on affordable housing and density types that are appropriate for the site. Table 10.1 provides a summary of the various attributes of the discussed housing typologies (Mogale City Local Municipality, 2011):

PERIMETER BLOCK HOUSING

The perimeter block housing typology will be used in areas with high density such as around primary activity streets and nodes. Perimeter block housing ranges from eight storeys in height to four or five storeys. This typology accommodates mixed land uses. The blocks that are closer to the activity streets should have both retail and commercial spaces that can be rented on the ground floor level in order to complement the housing on the upper floors. The inclusion of retail space on the ground floor will help to activate the public streets. The setback from the street edge must be no more than 3m. The use of colonnades should be used on activity streets where there is an intensity of pedestrian movement as this helps to define the public/private edges. This type of development has private open space at the back and public open spaces at the front. Parking should be provided in the courtyard of the housing development (Lucien le Grange Architects & Urban Planners, NM & Associates Planners & Designers, 2010; Bentley, 1985).

WALK-UPS

Walk-ups will be used along high-density areas such as secondary activity streets and around transport interchanges. This housing typology is made up of individual housing units stacked on top of each other up to four storeys high and located on a single erf. The difference between walk-ups and apartment blocks is the fact that walk-ups are accessed via a staircase. The gardens that surround the buildings are for communal use and on-site parking such as garages and parking lots is possible. This typology is cheaper to build than flats because it does not require costly lifts or the costly construction methods used for constructing high buildings. The higher densities that are obtained through this housing typology compared to semi-detached and free-standing housing make for substantial savings in infrastructure costs (Mogale City Local Municipality, 2011).

ROW HOUSING

Row housing typologies will be used to line internal activity streets. This typology has direct individual access to the street. This housing typology has a front and back outside space. These plot sizes are narrow and long, usually ranging between 3.5m to 7m wide and 15m to 18m deep. The row housing ranges from two- to four-storeyed units. A transitional or threshold space such as a *stoep* or garden should be provided at the front of the houses. Parking should be provided in the front of the houses in the streets or in shared courtyards (Lucien le Grange Architects & Urban Planners, NM & Associates Planners & Designers, 2010).

SEMI-DETACHED

Semi-detached housing will be used in medium and low-density areas. Semi-detached housing involves two housing units that are attached to each another and share one or more walls of the unit. The units are accessed from the ground and a private garden is provided in the back with possible on site-parking. Semi-detached houses should be located on individual erven of smaller

size, usually 200m², than those for free-standing units. The small erf sizes and shared walls reduce the construction and infrastructure costs compared to those of free-standing buildings (Mogale City Local Municipality, 2011).

FREE STANDING

This typology will be used in areas designated for agri-village development. These houses have a front and back external space and the plot sizes are more rectangular, ranging from 9m to 12m wide and 12m to 16m long. This housing typology should be between two to three storeys high. Parking should be provided in the front of the houses or in shared courtyards (Lucien le Grange Architects & Urban Planners, NM & Associates Planners & Designers, 2010). This stand-alone structure is situated on a single registered erf. This low-density option does not promote the efficient use of land. Therefore this housing typology should not be promoted in close proximity of busy activity streets and around public squares (Mogale City Local Municipality, 2011).



Map 10.5: Housing Typologies (Source: Author)

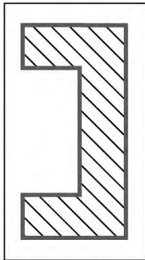
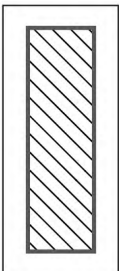
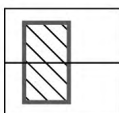
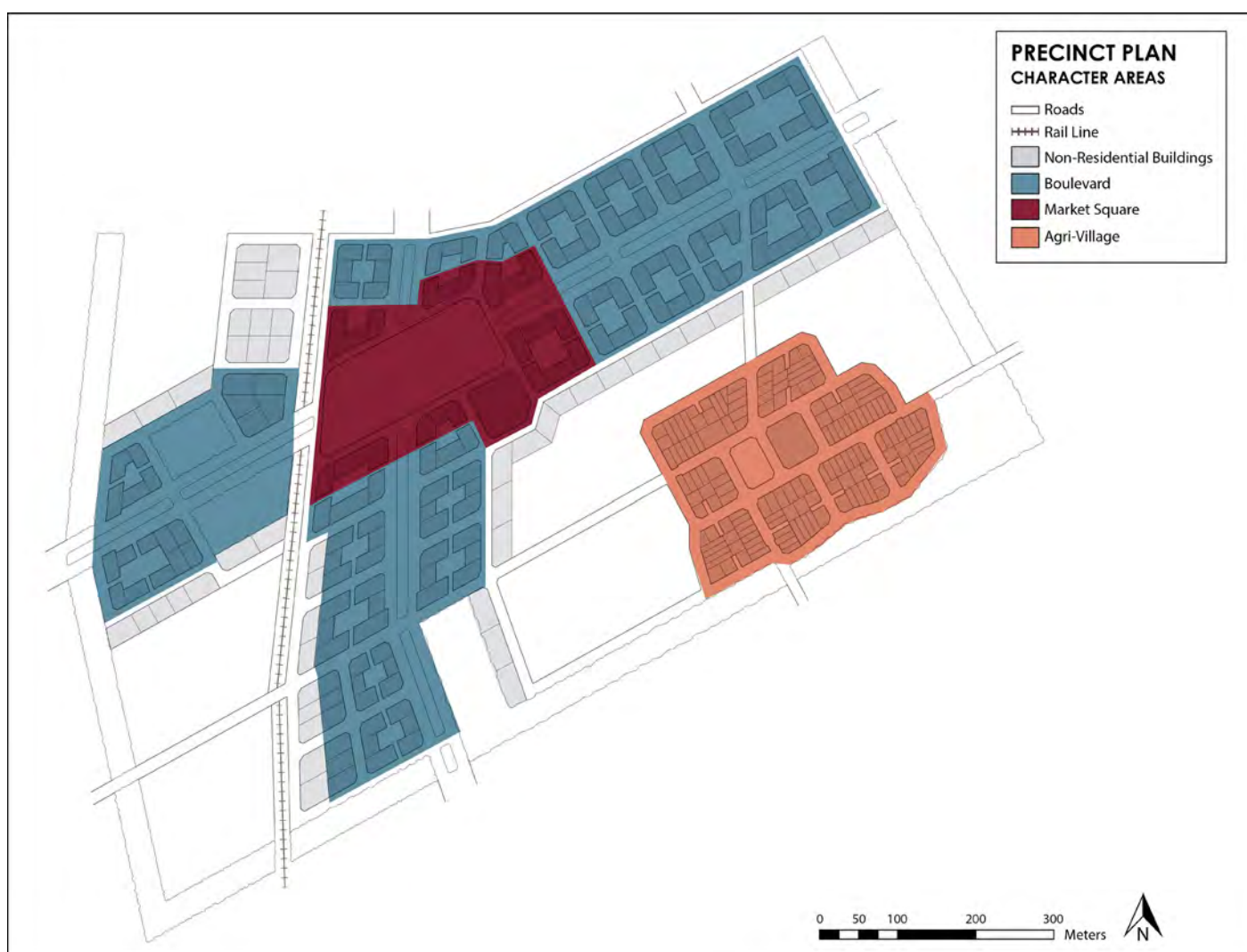
HOUSING TYPOLOGY	NETT DENSITY	HEIGHT	TENURE	PLOT LAYOUT	EXAMPLE	TARGETED INCOME GROUP				
						R0 - R3500	R3501 - R7000	R7001 - R15000	R15001 - R512000	More than R512000
PERIMETER BLOCK	100 - 200 du/ha	6 - 8 storey	Leased or Sectional Title							
WALK-UPS	100 - 150 du/ha	3 - 5 storey	Leased or Sectional Title							
ROW HOUSING	80 - 100 du/ha	2 - 3 storey	Full Title							
SEMI-DETACHED	30 - 50 du/ha	1 - 2 storey	Full Title							
FREE-STANDING	10 - 20 du/ha	1 - 2 storey	Full Title							

Table 10.1: Housing Typology Matrix (Source: Author; Lucien le Grange Architects & Urban Planners, NM & Associates Planners & Designers, 2010; Mogale City Local Municipality, 2011).

10.8 CHARACTER AREAS

There are three prominent character areas that make up the precinct plan as shown on Map X. The vision is to create an urban hierarchy that ranges from a more intense core of the boulevard to the less intense development of the agri-village and to maintain the landscape character in the area. Buildings within or close to these character areas have to take note of their particular location and be designed to contribute towards the nature of their immediate location. Features such as the relationship of buildings to the street, active façades, land uses, building heights, parking, accessibility and landscaping all have a particular relevance to these character areas. There is a clear distinction between the urban areas and the agri-village within the precinct (Northampton Borough Council, 2005).



Map 10.6: Character Areas (Source: Author)

10.8.1 MARKET SQUARE

The market square is centrally situated between the urban development and agricultural land. It is focused around the intersection of the two Boulevards and is anchored by prominent public institutions such as a city hall, municipal offices, a resource centre, library, an agricultural university campus and an ampitheatre. Buildings within this market square tend to be more monumental in both scale and character (City of St. Catharines, 2012). The square is within walking distance for most of the precinct and is part of the transportation network, connecting it with existing areas such as Durbanville. The main thoroughfare that passes the square is lined with live-work units and community facilities. The market space allows food producers to sell their produce (Duany Plater-Zyberk & Co., 2015). The public market provides assistance to informal traders to improve the access of lower-income consumers to commercial services. This market will enable many people to generate an income through a variety of small-scale retail, services and manufacturing activities (Behrens & Watson, 1996).



Figure 10.10: Informal trading (Source: <http://www.capetownpartnership.co.za/>)



Figure 10.11: Buildings framing square with active front-ages (Source: <https://commons.wikimedia.org>)



Figure 10.12: Public building faced onto public square (Source: http://www.snipview.com/q/Nearby:_Copenhagen_City_Hall)

10.8.2 BOULEVARD

The two boulevards run along the north-south and east-west of the precinct. The Boulevard includes restaurants, cafés, offices, retail, apartments and public transport facilities. Pedestrians are given a higher priority where a greenway runs along the centre of the boulevards and cycling facilities are provided. The Boulevard comprises of a high quality public realm, including a strong structure of trees, attractive paving material and well designed street furniture. The streets serve a key public transport corridor as a tram runs in parallel with the Boulevards (Northampton Borough Council, 2005).



Figure 10.13: High quality public realm (Source: <https://philaplanningjournal.files.wordpress.com>)



Figure 10.14: Active Street Frontage (Source: <https://commons.wikimedia.org>)



Figure 10.15: Tram running along Boulevard (Source: <http://de.france.fr/>)

10.8.3 AGRI-VILLAGE

The agri-village cluster stretches along the secondary movement route in the precinct. The cluster includes a variety of retail stores, restaurants and community facilities including a place of worship, clinic, sports field and primary school. Buildings are located close to the street with varied store-front design and architectural styling (City of St. Catharines, 2012). The Agri-village is surrounded by agricultural activities which ranges from community gardens to larger-scale farming cooperatives. The community is able to build its own local economy around food production, processing and sales, thereby ensuring food security. People who live in the agri-village should be encouraged to participate in the production of food. None of the villages are alike; they vary in shape and size, which is irregular to allow for natural growth. The roads throughout the village are staggered and no one road runs straight through it. There is one high street that runs through the village. The view down the high street ends in a 'landmark' building such as a church or village hall. A village square is situated to the side of the high street. The buildings within the village are generally of low density, between two and three storeys. The character of village is essentially 'simplicity'. It is not complicated, elaborate or highly developed (Sharp, 1946).

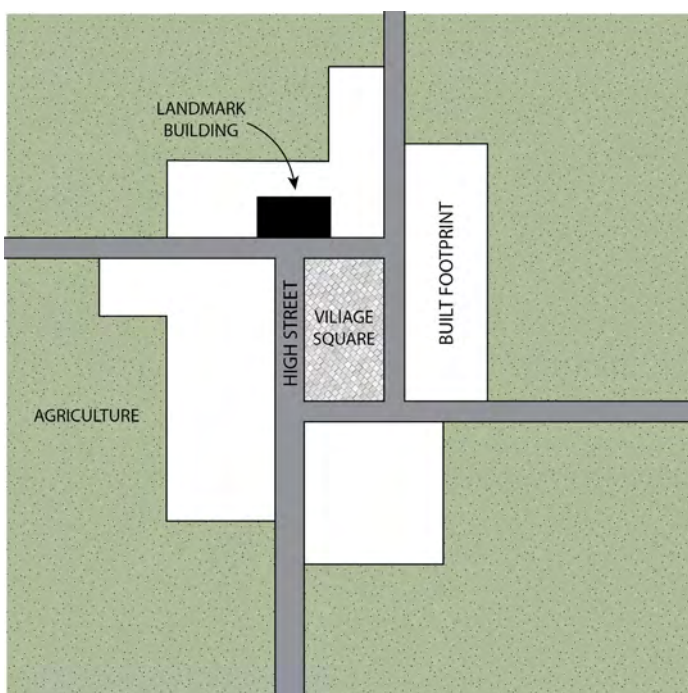


Figure 10.16: Agri-village concept (Source: Author)

CHILHAM, KENT

Chilham is a agricultural village in England. The village is centred on a village square where traditional events are held annually. At each end of the square are major buildings such as the church and a castle. The village has a pub, a restaurant, post office, sports centre, school and village hall. These are located along the main road. The houses don't have front gardens and are half timber and brick with tiled roofs (Sharp, 1946).

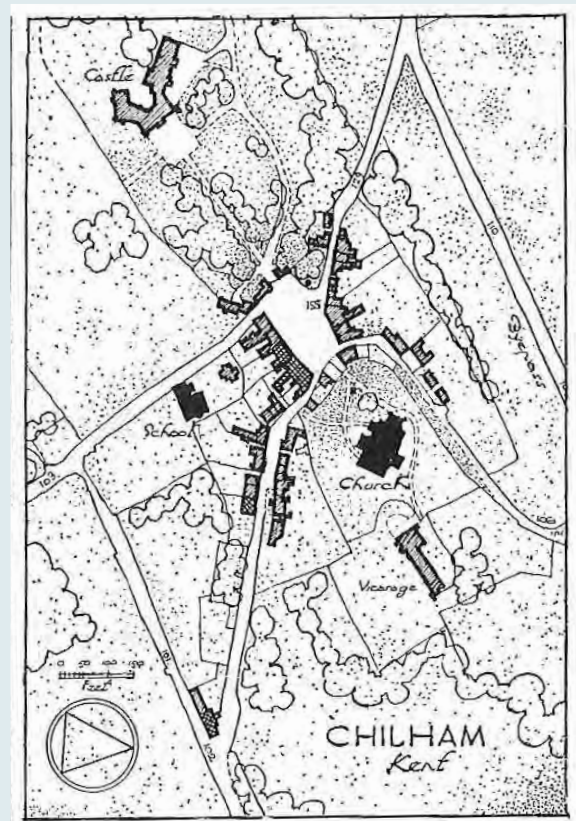


Figure 10.17: Chilham Village Plan (Source: Sharp, 1946)



Figure 10.18: Chilham character (Source: Sharp, 1946)

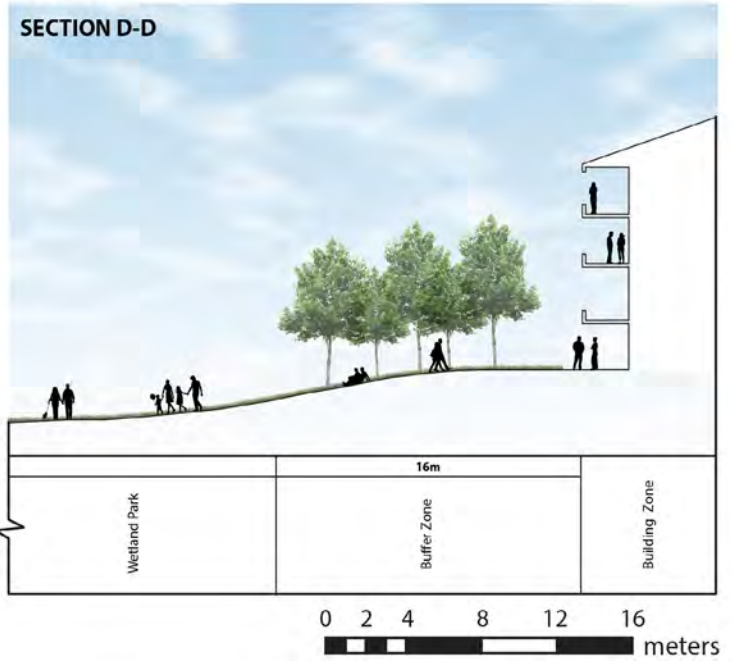
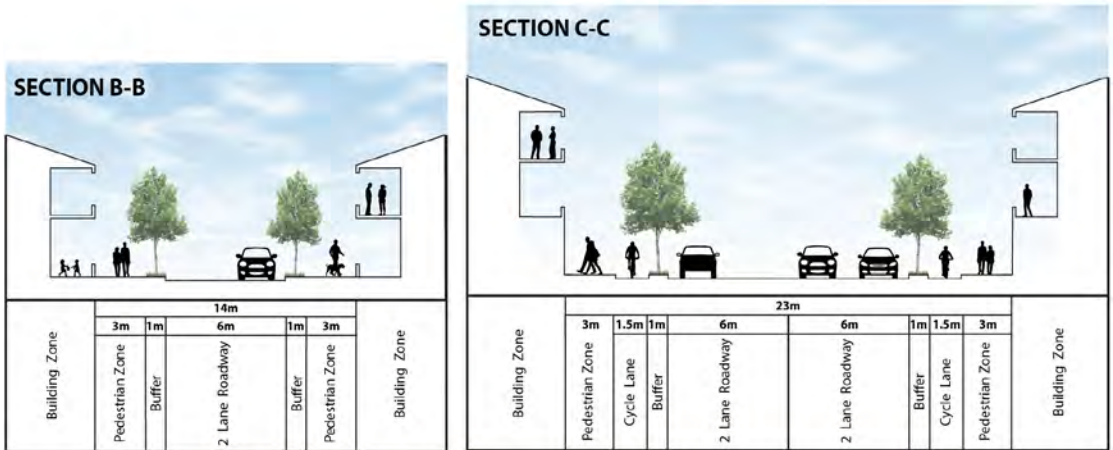
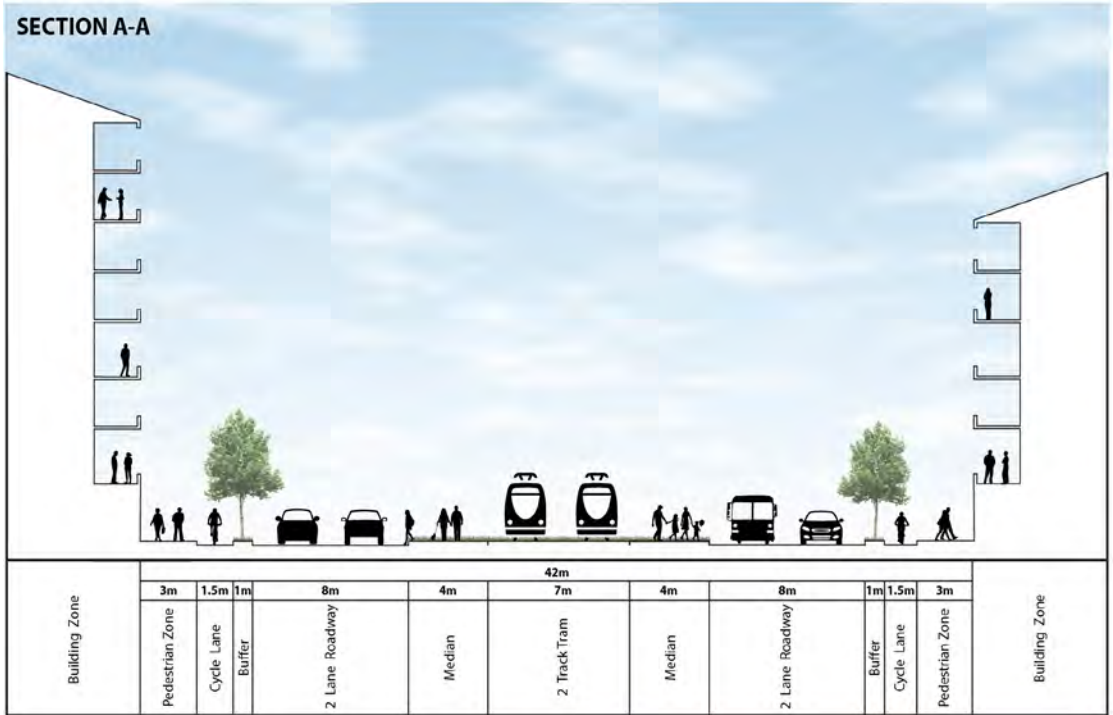


Figure 10.19: Street Sections (Source: Author)



Map 10.7: Final precinct plan (Source: Author; 3D perspective images refer to reference page)

CHAPTER 11: IMPLEMENTATION

This chapter identifies some of the key elements that are required to implement the planning frameworks. This chapter identifies ways to move from the current situation towards the proposed planning framework. It also deals with phasing which identifies a series of necessary actions (Dewar *et al*, 2012).

11.1 EFFICIENT IMPLEMENTATION

The NDP states that there are two main reasons for the failure to deliver development expectations: the failure to implement policies, and the absence of broad partnerships (National Planning Commission, 2013). Therefore the efficiency of the planning framework will depend on institutional integration, integrated development planning and co-operative governance which needs to be addressed by the three spheres of government. This can be seen in Figure 10.1 (Stellenbosch Municipality, 2014).

COOPERATIVE GOVERNANCE

Co-operative governance between the three spheres of government is critically important for the successful implementation of the SDF. Although the three spheres of government are interdependent, they do have to work together on decision-making as well as co-ordinating budgets, policies and activities (Stellenbosch Municipality, 2014).

INTEGRATED DEVELOPMENT PLANNING

Integrated development planning is a participatory approach to integrate economic, sectoral, spatial, social, institutional and environmental strategies. It is about creating cohesion across planning, implementation, monitoring and evaluation mechanisms through shared actions (Stellenbosch Municipality, 2014).

INSTITUTIONAL INTEGRATION

Alliances among different institutions need to be forged to close the gaps, minimise overlap and make management and investment in the municipality more efficient (Stellenbosch Municipality, 2014).



Figure 11.1: Imperatives for Efficient Implementation
(Source:: Stellenbosch Municipality, 2014).

11.2 INSTITUTIONAL ARRANGEMENT

For the plan to be successfully implemented, it will require coordination across the activities of many government agencies, private sector interests and the local community.

11.2.1 STAKEHOLDERS

MUNICIPALITY

The municipality has a key responsibility which relates to demonstrating commitment to the guidance of the framework. They provide leadership in the implementation of the framework, establish institutional mechanisms and monitor the performance of the plan (Stellenbosch Municipality, 2014).

PRIVATE SECTOR

The private sector are the owners of much of the land in the site area. The private sector is also a key role player in the local economy. It is therefore important that the public sector sees the framework as a mechanism that strives to promote the long-term sustainability of Cape Town (Stellenbosch Municipality, 2014).

COMMUNITY

The effective implementation of the planning framework is dependent on the community in-

volvement and collaboration in the planning and management of the plan. It is fundamental that local communities are able to participate meaningfully in the planning process (Stellenbosch Municipality, 2014).

11.2.2 PUBLIC -PRIVATE- COMMUNITY PARTNERSHIPS

The planning framework has fundamental implications for the location, nature and form of public, private and community development initiatives within Cape Town (City of Cape Town, 1999). For this reason the Municipality should establish a framework to support and guide public-private-community based programmes and partnerships. The main aim of these partnerships is to enable the municipality to cross-subsidise housing, create meaningful community empowerment and promote access to the economy for the previously disadvantaged. There are a number of strategically important partnerships that the framework should maintain and support (Stellenbosch Municipality, 2014).

11.2.3 PUBLIC PARTICIPATION

The proposed planning frameworks can not be achieved by the municipality on its own. The different investment decisions of other service delivery agents and local communities contribute towards the spatial organisation of the city. The success of the planning frameworks will depend on the extent to which other public and private initiatives respond to the municipality's direction. To facilitate this process the planning frameworks should be made available for distribution and debate. This should be backed up with other initiatives such as public meetings, inviting community members input into plans and establishing a community management advisory committee (City of Cape Town, 1999).

11.3 PHASING

The implementation of the development framework will have to be phased to address resource constraints and promote a co-ordinated development with the various stakeholders (ASM Consortium, 2008). It is not intended that all elements of the planning framework should begin at once and not all should be completed within the same

time frame. There are several primary phases of the implementation of the development framework.

PHASE 1: LAND CONSOLIDATION

Most of the land within the site is under the ownership of many different entities. Therefore the land ownership needs to be transferred into the hands of a single entity. This will require participatory processes and will make the implementation of the framework more successful. See Annexure C for current zoning and property boundaries for the study area.

PHASE 2: PLAN APPROVAL

Application needs to be submitted to the City of Cape Town to be approved by various legal and policy regulations as mentioned in Chapter 6. Some of the applications will include environmental impact assessments (EIA), land use and zoning applications and the amendment of the current urban edge.

PHASE 3: DEDICATED TEAM

A dedicated team should be set up to manage the implementation of the framework. The team should be interdisciplinary and include planners, architects, engineers, economists, environmentalists, legal experts and representatives from the local community, private developers and spheres of government.

PHASE 4: PROVISION OF BASIC INFRASTRUCTURE

The basic infrastructure that needs to be constructed includes roads, water, electricity, sewerage and stormwater services. These services should be phased in accordance with the long term roll-out of the planning framework and should be provided before the land is released. (GAPP, Urban Solutions, 2004).

PHASE 5: LAND RELEASE

Once the land has been consolidated and the basic infrastructure is completed, different sites can be released by the landowner to the market. Small pockets of land should be released to different developers at different times. A document should be prepared that indicates the vision for the area and provide all the technical information that developers should comply with (GAPP, Urban Solutions, 2004).

PHASE 6: CONSTRUCTION

The construction of the framework needs to happen incrementally. The starting point should be southern side of the site and around the existing urban development in order to make efficient use of existing infrastructure.

11.4 CATALYTIC PROJECTS

A number of catalytic projects have been identified of various sizes and types distributed throughout the site which may catalyse development, contribute to existing developments and recover confidence in the area. The catalytic projects are interventions that will be able to initiate necessary change and identify additional actions and projects, the projects will vary in the manner they are implemented. The development framework is broken down into a series of smaller projects. The identified actions can be implemented in the short term (0 - 5 years) which can be seen in Table 11.1, medium term (6 - 10 years) which can be seen in Table 11.2 and long term (11 - 20 years) which can be seen in Table 11.3. The tables also show each of the stakeholders that each project will require action from, the

relevant legislation and policies as well as funding opportunities.

11.5 MONITORING AND REVIEW

Ensuring that the planning framework remains relevant will be an-ongoing process that relies on regular monitoring and reviews of the frameworks as they are implemented. Actions will be taken to respond to emerging issues or changing demands. The implementation of the framework includes developing indicators for measuring progress and identifying opportunities or issues where appropriate. If the indicators show that the objectives of the framework are not being achieved, then a new or revised framework will need to be developed (Department of Rural Development and Land Reform, 2014).

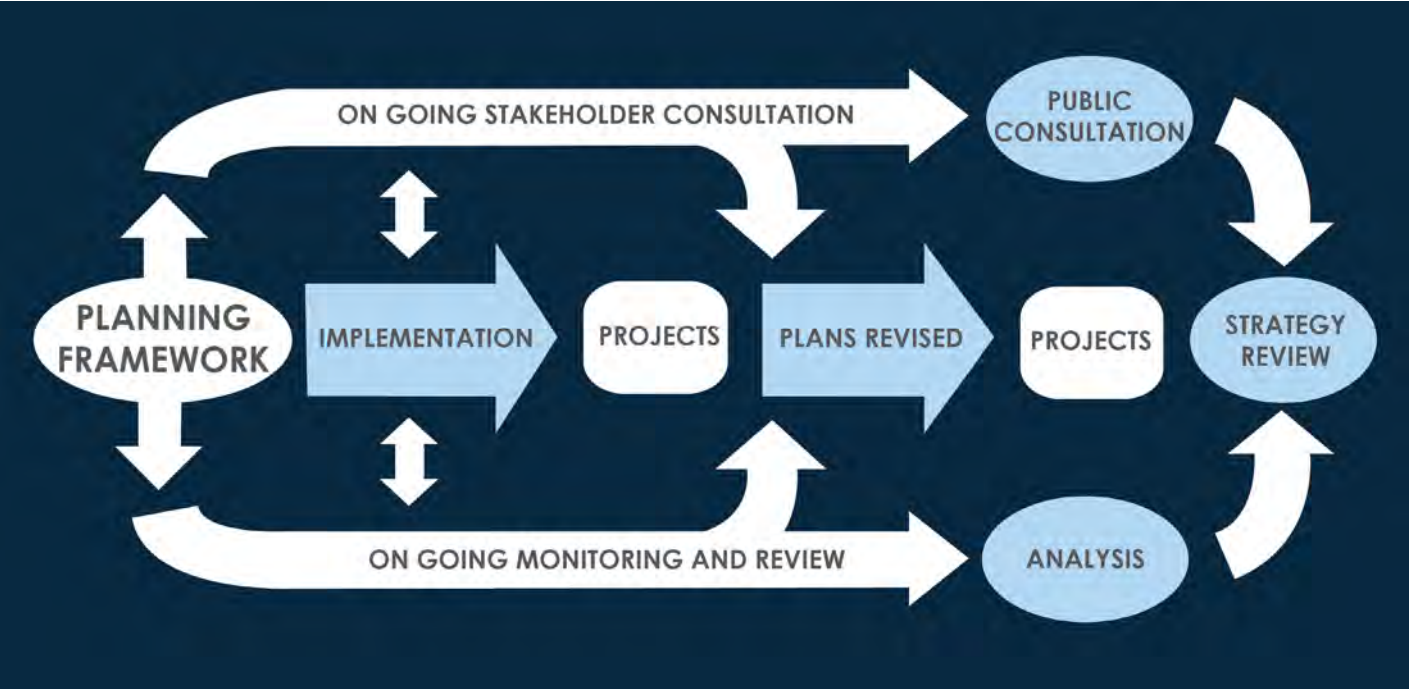


Figure 11.2: Monitoring and Review Process (Source: Author).

SHORT TERM CATALYTIC PROJECTS (0 – 5 years)			
PROJECT	STAKEHOLDERS	POLICY & LEGISLATION	FUNDING
Insitu upgrading in Fisantekraal informal settlement	- City of Cape Town - NGOs - Department of Human Settlements - Local Community	- The Housing Act (Act No 107 of 1997) - The National Upgrading Support Programme	- UISP - BNG
Various programmes aimed at protecting environmentally sensitive areas and valuable agricultural land	- SANBI - SANParks - CapeNature	- National Environmental Management: Biodiversity Act (Act No 10 of 2004) - National Environmental Management: Protected Areas Act (Act No 57 of 2003) - Conservation of Agricultural Resources Act (Act No 43 of 1983).	Municipal Department Budget
Establish Clearing of invasive alien vegetation projects	- Working for Water - Berg Catchment Management Agency - Department of Agriculture	- Conservation of Agricultural Resources Act (Act No 43 of 1983). - National Environmental Management: Biodiversity Act (Act No 10 of 2004)	
Amend Urban Edge	City of Cape Town	- Spatial Planning and Land Use Management Act (Act 16 of 2013) - Land Use Planning Act (Act 3 of 2014)	Municipal Department Budget
Upgrade Fisantekraal rail station	- City of Cape Town - PRASA - Department of Transport - Local Community	- The National Land Transport Transition Act (2000) - White Paper on National Transport Policy (1996)	- PRASA - Expanded Public Works Programme
Formulate Densification strategy	City of Cape Town	- Spatial Planning and Land Use Management Act (Act 16 of 2013) - Land Use Planning Act (Act 3 of 2014)	Municipal Department Budget
Develop Special Economic Zone for Agriculture sector in the site	- City of Cape Town - Private Sector - Department of Trade and Industry	- Special Economic Zone Act (Act No 16 of 2014) - The Agricultural Product Standards Act (Act 119 of 1990) - Skills Development Act (Act 97 of 1998) - The Business Act (Act 71 of 1991)	- Private Investors - Special Economic Zone Fund
Construct new schools	- Department of Education - City of Cape Town	The South African Schools Act of 1996	Schools Infrastructure Backlog Grant

Table 11.1: Short Term Catalytic Projects (Author).

MEDIUM TERM CATALYTIC PROJECTS (6-10 years)			
PROJECT	STAKEHOLDERS	POLICY & LEGISLATION	FUNDING
Develop Business Support Centre to support SMMEs and informal traders	- City of Cape Town - NGOs - Local Community	- Skills Development Act (Act 97 of 1998) - The Business Act (Act 71 of 1991)	Municipal Department Budget
Draw up a business plan to support light industrial development along railline	- City of Cape Town - Private Sector - Department of Trade and Industry	- The Business Act (Act 71 of 1991) - Industrial Policy Action Plan 2014/15 – 2016/17 - National Development Plan 2030	Municipal Department Budget
Upgrade existing Malmesbury railway to a commuter railline	- PRASA - Department of Transport - Spoornet	- The National Land Transport Transition Act (2000) - White Paper on National Transport Policy (1996)	- PRASA - Expanded Public Works Programme
Provide more coaches on Worcester to Cape Town line	- PRASA - Department of Transport - Spoornet	- The National Land Transport Transition Act (2000) - White Paper on National Transport Policy (1996)	- PRASA - Expanded Public Works Programme
Construct new health facilities	Department of Health	The National Health Act (Act No 61 of 2003)	Infrastructure Development Improvement Programme
Develop Agri-Processing Hub with storage facilities, informal markets, office space and training facilities	- Private Sector - City of Cape Town - Department of Agriculture - NGOs	- The Agricultural Product Standards Act (Act 119 of 1990) - Skills Development Act (Act 97 of 1998) - The Business Act (Act 71 of 1991)	- Private Investors - Municipal Department Budget

Table 11.2: Medium Term Catalytic Projects (Author).

LONG TERM CATALYTIC PROJECTS (11 – 20 years)			
PROJECT	STAKEHOLDERS	POLICY & LEGISLATION	FUNDING
Promote site as an agriculture and tourism hub by promoting agri-tourism and , protecting valuable agricultural land and promoting agri-processing	- Drakenstein Municipality - Department of Tourism - Department of Agriculture - Local Community	- Tourism Act (Act No 3 of 2014) - Conservation of Agricultural Resources Act (Act No 43 of 1983). - The Agricultural Product Standards Act (Act 119 of 1990)	- Private Investors - Municipal Department Budget
Construct new Rail station in Precinct 1	- Drakenstein Municipality - PRASA - Department of Transport	- The National Land Transport Transition Act (2000) - White Paper on National Transport Policy (1996)	- PRASA - Expanded Public Works Programme
Create Transport Interchange to connect MBT, BUS, BRT, Rail and NMT services	- City of Cape Town - PRASA - Department of Transport	- The National Land Transport Transition Act (2000) - White Paper on National Transport Policy (1996)	- PRASA - Expanded Public Works Programme

Table 11.3: Lhort Term Catalytic Projects (Author).

CHAPTER 12: CONCLUSION

South African cities, including Cape Town are performing very poorly in terms of generating urban opportunities and services that are accessible to the majority of urban residents. The current sprawling, separate and fragmented form of Cape Town is unsustainable and the management of urban growth is essential (Dewar, Uytendogaardt, 1991).

The population of Cape Town will continue to grow rapidly and the city is running out of expansion options. The Northern Growth Corridor present a possible solution to the growth pressures that the city is facing by offering sufficient land and basic infrastructure for future urban development. It is argued in this dissertation that the Northern Growth Corridor has the potential to develop into a mature activity corridor but this will require certain structural elements to be put in place such as the development of movement systems, public transport systems, public spaces and green systems (Warnich & Verster, 2004). This dissertation has provided development guidelines for a site in the northern growth corridor using the package of plans approach. It has highlighted the potential uses of the site if it is to be developed in the future. The dissertation also provides practical guidelines for the implementation process of this framework and specific design elements that need to be considered.

By implementing the ideas and proposals that this dissertation has established, the development of the site will act as a major strategic intervention that has been shaped through a spatial argument. The benefits which could result from implementing the development framework will be enormous. The natural setting of area will be protected and a close relationship between urban development and its agricultural base will be maintained. This would result in Cape Town becoming more sustainable. This would also address the scale of pedestrians and make the development a convenient and equitable place for residents to live. Vehicular movement will be reduced in the area and viable public transport systems would become the main mode of movement. This will reduce traffic, time spent travelling to work and pollution. Investment in public facilities would be more efficiently utilized and

become accessible to all (Dewar & Uytendogaardt, 1991). In conclusion the implementation of the development framework would result in Cape Town becoming a more sustainable city.

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- 3D PERSPECTIVE IMAGES USED IN MAP 10.7
1. http://www.bizjournals.com/milwaukee/blog/real_estate/2014/04/drexel-town-square-construction-starts.html#i1
 2. Author's own
 3. <http://www.aboutmyarea.co.uk/West-Midlands/Birmingham/B14/News/Local-News/135225-Kings-Heath-town-square-unveiled>
 4. <http://news.stv.tv/west-central/214171-george-square-architect-and-council-leader-to-meet-for-first-time/>
 5. http://www.bustler.net/index.php/article/tls_kva_team_wins_minneapolis_riverfront_design_competition/
 6. <http://jimleggitt.typepad.com/jim-leggitt-drawing-shortcuts/2012/02/multi-family-sketchup-digital-watercolor.html>

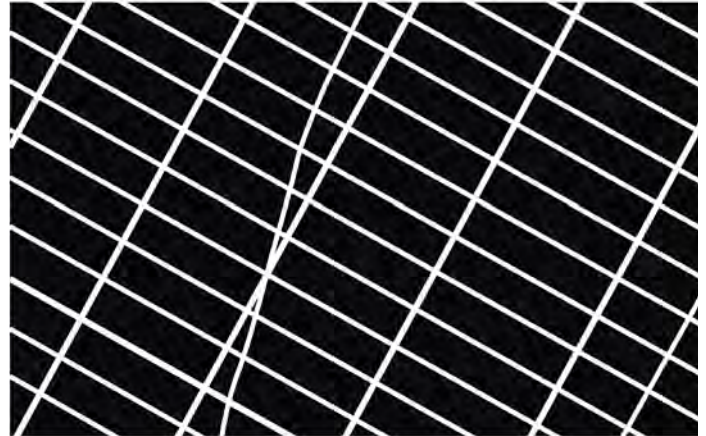
APPENDIX

ANNEXURE A: DETERMINING CITY BLOCK SIZES

NEW YORK, USA

New York's city blocks measures around 60m x 280m, this makes walking across the city a tiring task because it takes a long time to reach the next block, but moving up or down goes by more quickly. Jacobs (1961) argues that the length of the blocks restricts the location of businesses and separates building uses. Businesses can't succeed on streets as few pedestrians walk down them while businesses prosper on the avenues due to increased foot traffic (Jacobs, 1961; Postgreen Homes, 2015).

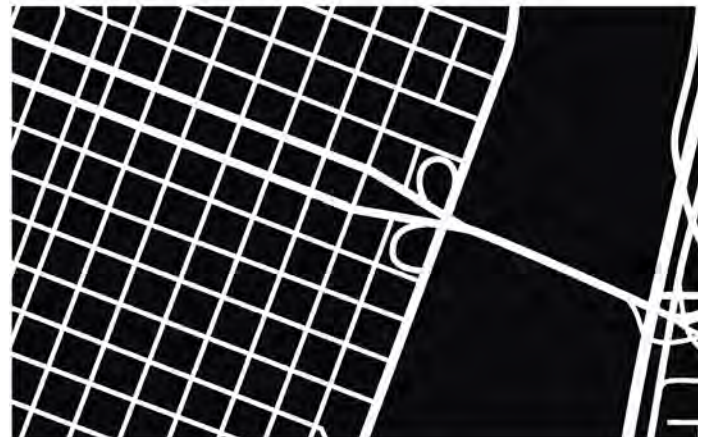
NEW YORK, USA



PORTLAND, USA

Portland's city blocks measures around 60m x 60m and are the smallest block sizes in the USA. Jacobs (1961) argues that smaller block sizes have advantages as they allows more variation in daily commute and spreads out the foot traffic around the city. The small block sizes also provides more intersections which area ideal for commercial activities. Although small block have their benefits, they also have disadvantages. Smaller block sizes means more streets which means fewer buildings per square meter which lowers overall density. Smaller block sizes also gives more land to cars and infrastructure which is costly and expensive to maintain (Jacobs, 1961; Postgreen Homes, 2015).

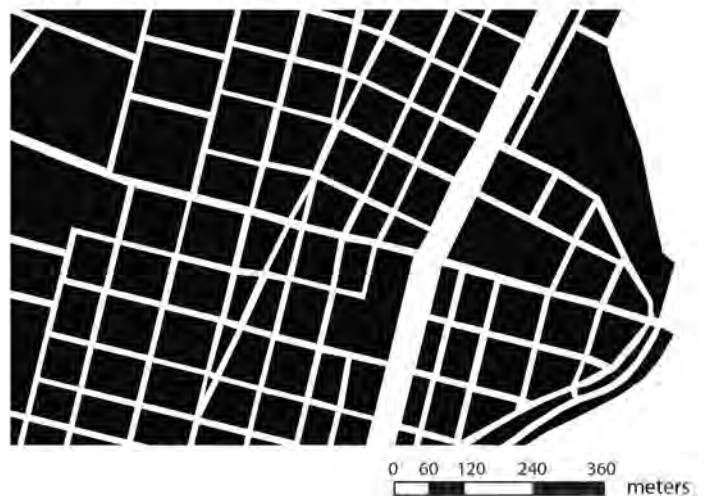
PORTLAND, USA



TURIN, ITALY

Turin's traditional city blocks measure around 80m x 80m. They are larger than Portland's in length and width and larger than New York's in width but smaller in length. Turin's city block size gives a model for block sizing and layout that is used in the detailed precinct plan. The sizes is also more conducive to social interaction than the long city blocks of New York. The block sizes are short enough to enable frequent intersections and possible paths between two points. The block sizes are also large enough to include more buildings per square meter than Portland's smaller blocks.

TURIN, ITALY



Annexure A: Determining City Block Size (Source: Author)

ANNEXURE B: INFORMAL SETTLEMENT UPGRADING

The process of negotiations with the affected households should ideally determine the settlement's formation. However, the scale of the development framework is too large to conduct negotiations with individual households. Decisions should rather be made about higher order elements of spatial structure that involves many more people. A top-down proposal that relates to the upgrading of the informal settlement is therefore necessary to guide community negotiations (Dewar & Todeschini, 2004). The main elements that relate to the upgrading of the Fisantekraal informal settlement are listed below:

URBAN SPACES

The large open spaces are gathering and social spaces. They act as places for meeting, trading or escaping from the tensions of living in an overcrowded environment. These spaces should be paved and landscaped (Dewar & Todeschini, 2004).

SOCIAL FACILITIES

The necessary social facilities such as schools, clinics and laundries should be located in association with the public spaces to help define the space (Dewar, Todeschini, 2004).

MOVEMENT GRID

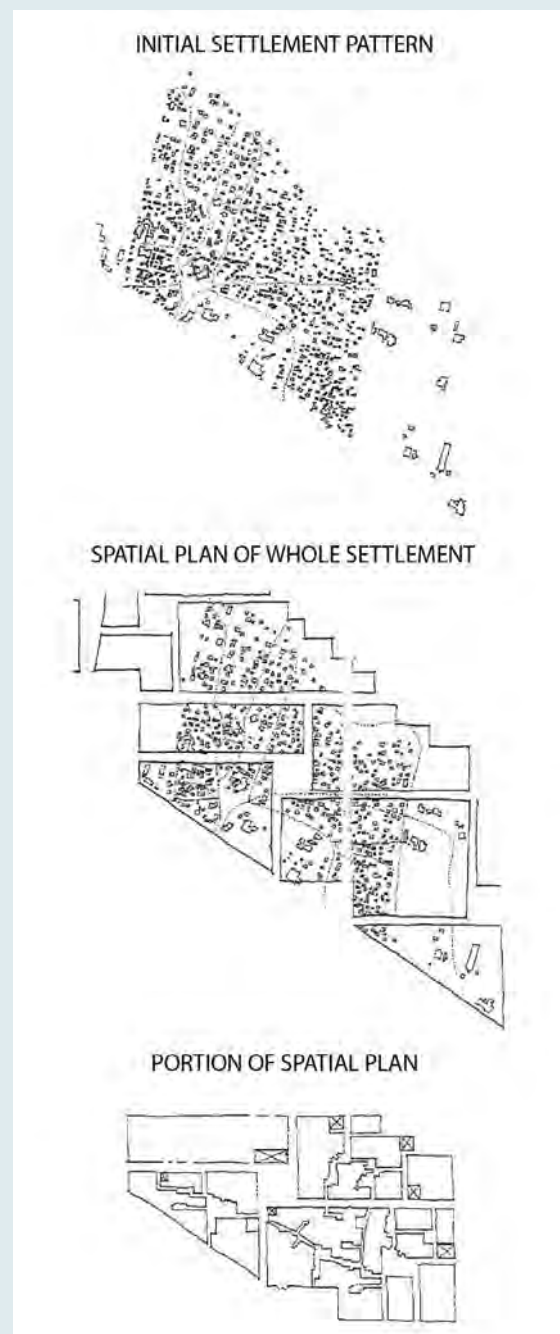
A major surfaced movement grid that links the public spaces and facilities should be provided. This is necessary to accommodate emergency services such as fire trucks. The scale of the grid is determined by the need for all residents to have access to emergency services. A fire hose is generally 65m in length and therefore the grid should ideally be 130m x 130m. Routes should be designed to be streets, not roads (Dewar, Todeschini, 2004).

UTILITY SERVICES

Utility services such as electricity, water and sewerage should follow the movement grid. This ensures that public buildings and economic activities have access to these necessary services. The provision of this network of services allows households to decide whether they want to opt-in or opt-out depending on their ability to pay (Dewar & Todeschini, 2004).

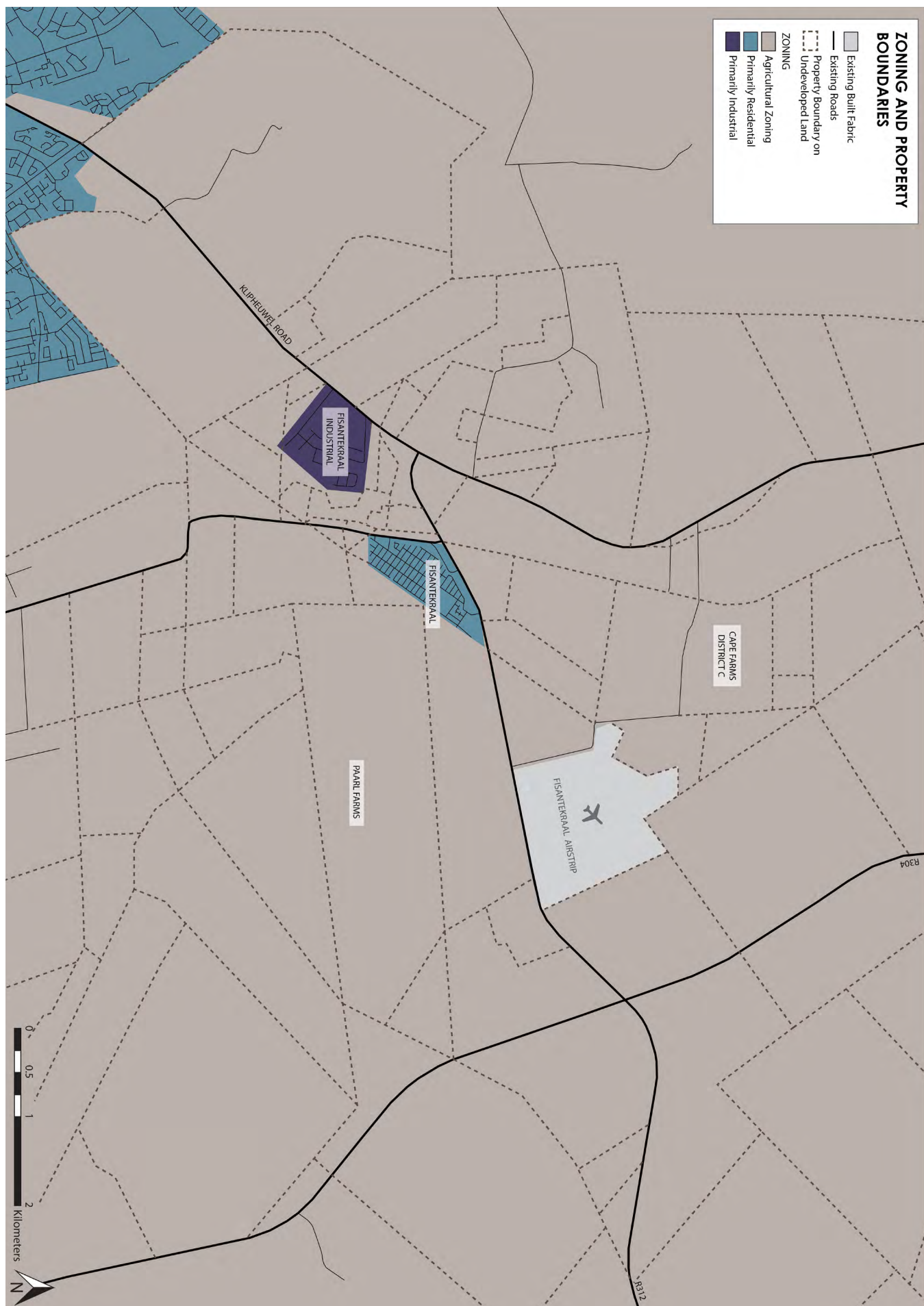
PRECEDENT: KLIPTOWN, GAUTENG

Figure 9.23 shows the 1996 schematic urban design of Kliptown. The upgrading of the informal settlement is an example that shows the main elements of upgrading an informal settlement as mentioned above. The portion of the spatial plan shows central square and the desirable locations for public facilities (Dewar, Todeschini, 2004).



Annexure B: Upgrading Proposal for Kliptown Informal Settlement (Source: Dewar, Todeschini, 2004)

ANNEXURE C: MAP SHOWING ZONING AND PROPERTY BOUNDARIES OF STUDY AREA



Application for Approval of Ethics in Research (EiR) Projects
Faculty of Engineering and the Built Environment, University of Cape Town

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/usr/ebe/research/ethics.pdf>

APPLICANT'S DETAILS		
Name of principal researcher, student or external applicant		Mari Botha
Department		School of Architecture, Planning and Geomatics
Preferred email address of applicant:		maribotha@ymail.com
If a Student	Your Degree: e.g., MSc, PhD, etc.,	MCRP
	Name of Supervisor (if supervised):	David Dewar
If this is a research contract, indicate the source of funding/sponsorship		No
Project Title		The challenges of Integrated and Sustainable Human Settlements in South African Cities

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	Mari Botha		

APPLICATION APPROVED BY	Full name	Signature	Date
Supervisor (where applicable)		Signed by candidate	28/8/2015
HOD (or delegated nominee) Final authority for all applicants who have answered NO to all questions in Section 1; and for all Undergraduate research (Including Honours).			
Chair : Faculty EIR Committee For applicants other than undergraduate students who have answered YES to any of the above questions.		Signed by candidate	