Bridging the Divide

An Exploration of the Intensification of Voortrekker Road Corridor as a means to Restructure the City of Cape Town

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Abstract

After nearly two decades of democracy, South African cities remain inequitable, exclusionary and spatially inefficient. This dissertation argues that the adaption of the principles of modernism by apartheid spatial planning has resulted in the formation of settlements that are characterised by sprawl, separation and fragmentation. Using Cape Town as a study, it can be demonstrated that the urban form and structure of South African cities has been affected by urbanisation and in-migration furthermore increasing levels of poverty and unemployment have had significant social, environmental and financial consequences.

Therefore, in order to challenge conventional development models in the city and to achieve inclusive growth, this dissertation makes a case for urban corridor intensification in Cape Town. By working across a number of site scales, from metropolitan to precinct scale, this dissertation presents a development framework for the Voortrekker Road Corridor. This framework argues for the intensification of the “economic backbone” of the metropolitan to spatially restructure the city’s inefficient and inequitable form. This framework proposes that the spatial intensification of the Voortrekker Road Corridor will improve integration and equitable access to economic and social opportunities throughout the city. Therefore, this dissertation establishes a framework to enable choice, opportunity and spatial equity in Cape Town.

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List of Acronyms

BRT – Bus Rapid-Transit
CBD – Central Business District
CFR – Cape Floristic Region
CoCT – City of Cape Town
DCGTA - Department of Cooperative Governance and Traditional Affairs
CSIR – Council for Scientific and Industrial Research
CPUT – Cape Peninsula University of Technology
DEADP – Department of Environmental Affairs and Development Planning
DRDLR – Department of Rural Development and Land Reform
du/ha – Dwelling Unit per Hectare
FET – Further Education and Training
GTP – Greater Tygerberg Partnership
IDP – Integrated Development Plan
IUDF – Integrated Urban Development Framework
ITDP – Institute for Transportation and Development Policy
LUPA – Land Use Planning Act
MSA – Municipal Systems Act
NDP – National Development Plan
NEMA – National Environmental Management Act
NMT - Non-motorised Transport
PRASA – Passenger Rail Agency of South Africa
PSDF – Provincial Spatial Development Framework
PSO – Provincial Strategic Objectives
SDF – Spatial Development Framework
SPLUMA – Spatial Planning and Land-use Management Act
SUDS – Sustainable Urban Drainage Systems
TCT - Transport for Cape Town
TOD – Transit-Oriented Development
UCT – University of Cape Town
UWC – University of the Western Cape
WCG – Western Cape Government

1. Introduction

After nearly two decades of democracy, South African cities remain fragmented, exclusionary and spatially inefficient (Harrison & Todes, 2015). There are three reasons for this. Firstly, the legacy of modernism and apartheid planning has led to the creation of sprawling settlements that are characterised by inward facing neighbourhoods. Secondly, state and private sector investment has reinforced inequitable settlement patterns of land ownership (Napier & Ntombela, 2006). Thirdly, due to the high price of land within cities, state or subsidised housing has been developed primarily on the periphery of cities (Urban LandMark, 2011b). Thus, historically racially segregated settlement patterns and inequalities are entrenched and in South African cities it is the urban poor who are affected (CoCT, 2014a).

The apartheid system emphasised racially segregated development and "inscribed deep divisions into the geography of [cities] through population controls, forced removal and separate, unequal governing institutions" (Turok, 2001:2350). In addition, apartheid planning adapted and warped the spatial ideology of modernism in order to apply its principles of separation (Dewar & Todeschini, 2004). The foundation of modernism was based on the idea of the power of technology to "set society free" and great emphasis was placed on the dominance of the car (Dewar, Louw & Povall, 2012:2). The scale of settlements after the 1930s was restructured to accommodate the needs of vehicular mobility, as opposed to social need and pedestrian accessibility (Dewar & Todeschini, 2004). Moreover, the concept of movement was distorted by apartheid planning "to create spatial barriers to dislocate and separate the urban poor" (Mammon & Ewing, 2006:7).

As a result, apartheid ideology became physically ingrained in the inequitable and inefficient spatial form and arrangements of South African cities. These inequalities are exacerbated by mobility limitations. Consequently, it is the country's poorest citizens who are required to spend large amounts of their time and most of their income travelling long distances in order to reach centres of employment and social facilities (CoCT, 2012e). Thus, making the poor the "least able to afford the costs of urban sprawl" (CoCT, 2012e:29). In cities such as Cape Town, the majority of the low-income population travels an average of 60 to 90 minutes from home to work each day (CoCT, 2014a). This pattern of development limits equitable access to socio-economic opportunities and amenities in the city and contributes to the ever-growing divide between rich and poor (CoCT, 2012e).

Furthermore, as urbanisation continues to increase, so will urban sprawl, poverty this results in many people living in overcrowded informal settlements with poor living conditions (Swilling, 2006). If the growth of South African cities continues to develop in this way, this would mean that its cities would remain "fragmented, divided and inaccessible for the majority of its citizens" (Mammon & Ewing, 2006:8). Thus, change is required to "radically transform previously fragmented apartheid cities" (Mammon, Ewing & Patterson, 2008:2). Arguably, a new approach is needed: one that challenges conventional development models in order to achieve inclusive growth and change.

1.1. Urban Corridor Intensification and Transit-Oriented Development

To achieve inclusive growth it is necessary to improve the urban performance of South African cities (Dewar & Todeschini, n.d.). Urban performance can be improved by significantly increasing net densities and by restructuring urban environments to make them more intensive by including a mixed-use design. This will support the provision of efficient and viable transportation and will aid in decentralising social and economic activities (Mammon & Ewing, 2006). However, intensification cannot occur ubiquitously, rather "it must be structurally driven" (Dewar & Todeschini, n.d.21). There are two ways of accomplishing this, through corridor intensification and Transit-Oriented Development (TOD).

The notion of an urban corridor "represents a broad (at least a kilometre wide) band of mixed-use activity continually intensifying around one or, more commonly, a hierarchically interlinked systems of transportation routes or spines" (Dewar, 2011:245). The principle role of urban corridors is to connect communities by breaking down the fragmented structure of the modernist city. This can be achieved by increasing the intensity of accessibility to key destinations or nodes along the corridor route or spine (Mammon & Ewing, 2006). These points of intersection facilitate a rhythm of stopping and starting and provide places for interaction (Mammon & Ewing, 2006). Thus, the concept of an urban corridor has the potential to play an integral role in urban restructuring as it can improve equitable access and integration within a city.

TOD refers to "development that is physically oriented to a public transport station" (UN-Habitat, 2013e:32). The underlying principle of TOD is to support not only the viability of public transportation, but also includes cycling and walking (ITDP, 2014). TODs also promote higher densities around transport nodes particularly train stations, which increases accessibility to living and working opportunities. Greater intensification around transport nodes attracts a mix of land uses and supports the provision of high quality public and civic spaces (UN-Habitat, 2012c). Through the clustering of mixed-use activities, TODs increase convenience. This can encourage people to walk and cycle to destinations, which can lead to healthier settlements and environments (Wilkinson, 2006).

1.2 Research Aim

Building on the above theory, the aim of this dissertation is to investigate the ways in which it is possible to spatially restructure the form of South African cities through corridor intensification and TOD. Using Cape Town as a case study, this dissertation argues that through the investment in a citywide system of corridors there is great potential to improve and re-order the city's urban environment into a more compact, equitable and integrated form. This will also aid in managing urban growth in a more sustainable way. This dissertation will demonstrate these ideas through the formulation of a development framework for the Voortrekker Road Corridor, located in Cape Town.

1.3 Locating the Study Area

Cape Town has been selected as the main study focus of this dissertation, because it is representative of some of the key urban challenges found within South African cities (Turok, 2001) (figure 1.1). It is a “starkly polarised city” and is characterised by high levels of urbanisation, increasing poverty and large disparities between income and spatial equality (Turok, 2001:2350). Provoost aptly describes Cape Town as city where “apartheid is set in stone and poured in concrete” (2015:26).

In order to investigate the potential of urban corridors to restructure the city of Cape Town, this dissertation will examine the role of the Voortrekker Road Corridor within the city. The Voortrekker Road Corridor is approximately 16 km in length and is located between Salt River Circle and Stikland Bridge and is the physical centre of the municipal area (ULI, 2014:10) (figure 1.2). Due to its central location and its proximity to Cape Town and Bellville’s Central Business Districts (Cape Town’s second metropolitan node), it is considered the “economic backbone” or “blood vessel” of the city and has the ability to connect Cape Town metropolitan with surrounding disadvantaged areas (VCRID, 2016:3). Therefore, it has the potential to restructure and integrate the southern and northern parts of the city to achieve greater spatial equity and inclusivity (CoCT, 2012:34).

Figure 1.1 Locating Cape Town within South Africa
(Source: Map Afrca, 2016)

Figure 1.2 Locating Locating the Voortrekker Road Corridor within Cape Town
(Source: Author, 2016; GIS Technical Library, UCT)

1.4 Method

The method that has been used in this dissertation is informed by the design approach. The design approach involves a cyclical and re-iterative process as opposed to a linear one (Dewar & Uytenbogaardt, 1991). It has four key stages, these include: context, concept, programme and plan formation (Behrens & Watson, 1996). Although these stages are listed in a sequential manner, they have been followed and used in a circular and integrated way, to continuously refine and improve research and the design components in this dissertation. These stages are discussed in greater detail below:

Context

There are two components that form part of the contextual analysis that need to be considered. These include an examination of an area's socio-economic and physical context (Behrens & Watson, 1996). An analysis of an area's physical context or key elements of public structure can be used to gain a more detailed understanding of the area or place. These elements have been "traditionally used to order the landscape" and consist of green space, all modes of movement, public spaces, facilities and institutions (Dewar & Todeschii, 2004:42). These analyses should be undertaken across a range of scales to inform concept formation and decision-making (Dewar, Louw & Povall, 2012).

Concept

The formation of a concept involves an understanding of normative concerns that leads to the identification of guiding principles (Behrens & Watson, 1996). These principles should delineate the performance qualities that need to be achieved in an urban environment. These principles may have spatial implications and can be illustrated through a series of diagrams. Concept formation can also aid in determining the "highest and best use" of an area within its broader context (Dewar & Louw, n.d.16). As both concept formation and contextual analysis relate to and inform each other, these two phases should be carried out simultaneously.

Programme

The formulation of a programme aids in establishing what "quantities and qualities of uses" are needed within an area (Behrens & Watson, 1996:56). In order to develop a programme, it is first necessary to consider what urban qualities are desired within a site before quantities are calculated. For example, a need for resource efficiency and accessibility may necessitate that public facilities such as schools, sports fields and libraries are clustered. This will then influence the number of facilities and land required in that area (Behrens & Watson, 1996). Therefore, concept formation and contextual analysis inform the programme phase. Programme formulation also aids in determining the budget needed for the phasing and implementation of projects (Dewar & Uytenbogaardt, 1991).

Plan Formation

The formation of a plan or framework consolidates the contextual analysis and concepts at number of scales (Behrens & Watson, 1996). Within this process, concepts are adapted to meet the constraints of the site context, which allows for new ideas to emerge (Dewar & Uytenbogaardt, 1991). This process can be described as a "package of plans" approach (Dewar, Louw & Povall, 2012:25).

Within the design method, a "package of plans" approach is used to analyse the study areas across a range of scales (Dewar, Louw & Povall, 2012:25). This approach will aid in developing appropriate concepts and suitable design responses for development proposals at different stages (Wilkinson, 1994). It seeks to ensure that there is integration and "consistency of thought across scales" (Dewar, Louw & Povall, 2012:25). At each scale, a framework concept identifies the minimum actions needed to give clear direction to the plan. These actions represent interventions that are carried through to smaller scales. Within this dissertation, the following scales have been used:

1. Metropolitan scale (1:300 000) or 400 000
2. Sub-metropolitan scale or site scale (1:70 000)
3. Precinct / Local area scale (1:5 000)

The largest scale examines the metropolitan area. A conceptual framework is developed to consider and define the role of the site and its integration within the larger urban or regional system. It is followed by a second sub-metropolitan or site scale. The development framework formulated at this scale is aligned with the metropolitan framework, but it is adapted to ensure that the site is integrated with the surrounding areas. This framework aids in identifying a smaller precinct for "more detailed urban design attention" (Dewar, Louw & Povall, 2012:25). The precinct scale is the third and last scale that is studied in this dissertation. It outlines the design controls and guidelines for the site, to ensure that development is appropriate and that the quality of the urban environment is maintained. An analysis is conducted at each scale to inform the formulation of a concept and corresponding framework. At each scale, more detail of the study area is revealed, which in turn informs the overall plan.

1.5 Document Structure

This dissertation consists of three key parts. Firstly, it establishes the urban problem and significant challenges in the context of South Africa and Cape Town. Secondly, it outlines a theoretical framework to respond to these challenges and to give direction to the plan. Thirdly, the principal ideas and concepts defined in the theoretical framework are adapted to formulate a development framework for the study area, to guide future growth. The dissertation then concludes by presenting a summary of the key findings and interventions that were formulated in this dissertation. The following section presents a detailed chapter break down of the document structure.

Chapter 2: Urban Challenges in South Africa's Cities

This chapter explores how modernist and apartheid planning ideologies have influenced spatial planning and the growth of South African settlements. It is argued that a modernist approach to planning under the regime of apartheid has resulted in persistent urban challenges in South Africa's cities.

Chapter 3: Locating the Problem in Cape Town

This chapter examines the historical and contemporary patterns of Cape Town's development and considers how the role of the state and planning practices has contributed to the growth of its spatial form. This chapter also assesses how Cape Town's existing spatial patterns result in a number of negative social and environmental consequences that will continue to occur if they are not addressed.

Chapter 4: Theoretical Framework

This chapter formulates a theoretical framework that gives direction to development of a spatial plan. It outlines the broader global urban challenges that impacts on cities and that need to be considered in decision-making. It also delineates a set of values and principles to guide planning interventions. Performance qualities are then identified to determine how best to restructure Cape Town's existing settlement patterns. This chapter then concludes by outlining the legislative and policy context within which urban management takes place.

Chapter 5: Urban Growth Management

This chapter argues that a new approach is required to radically transform the dominant spatial patterns of development in Cape Town. It then outlines the key directives needed in order to restructure dominant spatial patterns and manage urban growth in the city. These include the promotion of more compact city form through urban corridor intensification and TOD.

Chapter 6: Metropolitan Framework

This chapter develops a metropolitan framework for the city of Cape Town. It begins by conducting a contextual analysis of the city. From this analysis a conceptual framework is formulated to guide future development strategies and interventions. This conceptual framework is expanded on throughout this dissertation to ensure there is consistency of thought across scales.

Chapter 7: Voortrekker Road Corridor Development Framework

Building on the metropolitan framework, this chapter examines the role of the Voortrekker Road Corridor in Cape Town. An in-depth analysis of the study area is undertaken and a number of opportunities and constraints are identified. This analysis then aids in the formulation of a development framework, to provide interventions of prioritised investment to restructure the city's spatial form and to increase equity throughout the region. This framework then informs the selection of a precinct plan within the study area for future design attention.

Chapter 8: Precinct Development Plan

This chapter presents a detailed precinct plan for the Parow Golf Club. The objective of this chapter is to show how the concepts of the development framework can be applied at a local scale and translated into a layout proposal. Design principles and guidelines are also outlined to inform the configuration and implementation of the precinct plan.

Chapter 9: Implementation Framework

This chapter identifies the prerequisite key projects needed to implement the Vortrekker Road Corridor development framework. It outlines the principal role players, responsibilities and timeframes that are required in order to carry out these key projects.

2. Setting the Scene: Urban Challenges in South Africa's Cities

The majority of South Africa's urban development has taken place since the 1930's and it has been informed and shaped by two distinct ideologies: modernism and apartheid (Dewar, Louw & Povall, 2012). The focus of this chapter is to examine how these two different schools of thought have influenced spatial planning and the growth of South African settlements. It is argued that a modernist approach to planning under the ideology of apartheid has resulted in severe urban challenges in South Africa's cities. Therefore, a new approach is required in order to radically transform these dominant spatial patterns of development. In this chapter, the central principles of modernism and apartheid will be analysed in order to understand and respond to the key challenges that are entrenched in South African settlements and planning practices.

2.1 Modernism

At the beginning of the twentieth century, through the advancing development of technology, the notion of the machine was celebrated and as a result, the conception of modernism was born (Hughes, 1988). The origin of urban modernism took place in Europe and the United States and was rapidly disseminated around the world (Dewar, Louw & Povall, 2012). Internationally, urban modernism "consciously broke with the tradition of millennia of settlement-making… to rethink completely the structure and form of towns and cities, in order to create the 'good' urban life for all" (Dewar & Todeschini, 2004:10). As a result, the principles of modernism are deeply ingrained within urban planning and have had a profound influence on its practice in South Africa. The urban model of modernism was based on the central principles of the freestanding building unit, separation, the promotion of neighbourhood cells and the power of technology to "set society free" (Dewar, Louw & Povall, 2012:2). These principles will be discussed in detail below:

Modernism within the scope of planning promoted the concept of the freestanding building unit, enclosed by space, as the ideal of urban life (Carmona et al., 2010). This concept resulted directly in the increase in the aspiration for suburban living in contrast to city dwelling (Dewar & Todeschini, 2004). This "anti-city ethos" is found even in the lowest income communities where due to economic constraints, plot sizes are very small with very little vegetation or private space (Dewar & Todeschini, 2004:10).

The notion of separation was another principle of modernity (Carmona et al., 2010). Daily activities were split according to the concept of live, work, play and move with the intention that this divide would lead to a more efficient use of these activities (Dewar & Todeschini, 2004). This concept was developed in order to "reduce conflict between activities" and to optimise the operation of each distinct activity (Dewar & Todeschini, 2004:11).

Furthermore, the model of "the neighbourhood unit" was promoted, which consisted of inward oriented settlements with social and economic facilities at their centre (Behrens & Watson, 1998:81). These units or cells were hierarchical in nature and made up a larger cell, which was "served by a higher order centre" (Dewar & Todeschini, 2004:11). These inward facing neighbourhoods were thought to enhance a sense of community, however they were not integrated within the larger urban system. In fact, they were often characterised by buffer zones, a separation tool that used open spaces to isolate settlements so that they are only accessible from highways and high-speed routes (Schensul, 2008). Figure 2.1 is a diagram from the nationally accepted guidelines for low-income settlement making in South Africa in 1994 (Dewar & Todeschini, 2004). This diagram illustrates how the modernist model of a divided neighbourhood unit, scaled for vehicular movement was entrenched in urban planning practices and as an ideal urban form.

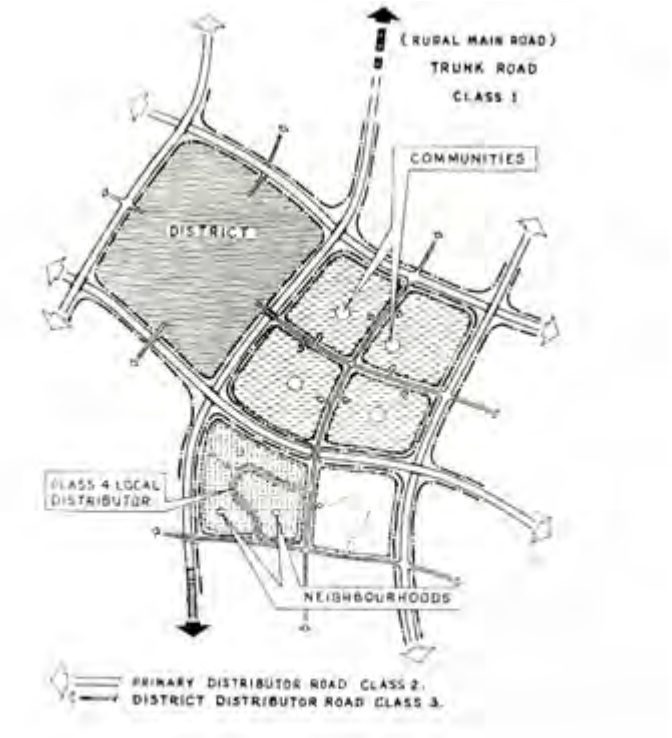


Figure 2.1: South African Settlement Guidelines: An Interpretation of the Modernist Model

(Source: Dewar & Todeschini, 2004)

Ultimately, under the influence of modernist thinking, neighbourhoods were created to accommodate "engineering efficiency… not social need" (Dewar & Todeschini, 2004:11). There existed a steadfast "belief in the power and ability of technology to overcome social and natural constraints and to transform the nature of society" (Dewar & Todeschini, 2004:11). This concept resulted in the ascendancy of the motor vehicle in the design of towns and cities. Movement routes were designed based on the assumption that in the future everyone would own one or more cars. Consequently, the formation of settlements was structured around these movement routes, and they were designed to accommodate the scale of cars as opposed to pedestrians (Carmona et al., 2010). This conviction in technology completely over turned the process of settlement-making; "the city was perceived as machine: a collection of discrete, inter-related parts" (Dewar & Todeschini, 2004:11).

In South Africa, the adoption of the principles of modernism resulted in the development of sprawling, fragmented and delocalised settlements (Todes, 2010). The emphasis placed on the importance of vehicular mobility led to formulation of numerous freeways and limited-access routes that created barriers across the urban fabric (Dewar & Todeschini, 2004). These routes dramatically altered patterns of access within cities and resulted in the development of "introverted shopping centres, office parks, theme parks and the like" (Dewar & Louw, n.d.5). Consequently, the character of the urban environment was forfeited at the cost of technological efficiency and little concern was given to the role of public spaces and streets as places for social activities and interaction. These factors were then further exacerbated by the political ideology of apartheid that procured the precepts of modernism and warped them in order to intentionally separate communities (Dewar & Todeschini, 2004).

2.2 Apartheid

The overarching ideology of the apartheid state was to "to divide South Africa into racially and ethnically segregated territories" (Harrison & Todes, 2015:151). The notion of separation was used to assign different racial groups "homelands" and this resulted in the forced removals of black and coloured communities into racially homogenous areas on the periphery of cities (Schensul, 2008:290). In South Africa, the principles of modernism were exaggerated and manipulated in order to spatially implement the ideology of apartheid (Todes, 2010). Particular emphasis was placed on the three key modernist principles of separation, the neighbourhood unit and the need for high-speed movement (Dewar & Todeschini, 2004).

The notion of "desirable use separation" that was derived from modernism was extended to include racial separation under the apartheid regime (Dewar & Todeschini, 2004:13). Black and coloured racial groups were physically separated from the white population and cut off from economic opportunities, as well as social and institutional facilities such as hospitals, municipal or governmental departments (Schensul, 2008). As a result, this principle of separation exacerbated the "direct correlation between race and class in South Africa" (Dewar & Todeschini, 2004:13). It was often the poorest communities that were moved to the periphery of cities, which required them to travel distances of up to 60-70 kilometres in order to reach centres of employment and social opportunity (Dewar & Todeschini, 2004). This has resulted in the perpetuation of a cycle of poverty and a widening gap between rich and poor in South Africa.

The concept of the neighbourhood unit or cell was also distorted to further separate one class or race from another. Instead of enclosing neighbourhood units with green open spaces to connect residents with the environment, they were enlarged as buffer zones to increase the degree of separation between communities (Dewar & Todeschini, 2004). It was also seen as a useful security measure as it "limited [the] number of access and egress points to and from these cells" (Dewar & Todeschini, 2004:13). Consequently, these buffer areas have become deserted environments that are unsafe and often use as deposits for discarded waste (Dewar, Louw & Povall, 2012).

Furthermore, movement was used to facilitate the mobility of cars and trains as opposed to encouraging pedestrian accessibility and convenience (Dewar & Louw, n.d.). The apartheid system was entirely reliant on these high-speed routes in order to connect the disjointed parts or cells of the city (Dewar & Todeschini, 2004). These routes or "space-bridgers" were designed to accelerate singular movement due the increased distances between places of employment, social amenity and residence (Dewar & Todeschini, 2004:13). As a result, transportation subsidies were needed to support the "polarisation and imbalances" in South African cities (Turok, 2001: 2352). As a consequence these inefficient movement systems continue to impose costs on "individuals, businesses and the environment through travelling time, congestion and pollution" (Turok, 2001: 2352).

2.3 The Legacy of Apartheid and Modernism: Contemporary Urban Challenges

The adoption of modernist principles warped by apartheid planning has resulted in number of contemporary urban challenges that continue to negatively impact on South Africa's cities (Turok, 2001). After more than two decades of democracy, social inequalities are still prevalent and very little has changed in terms of the spatial form and structure of settlements (Harrison & Todes, 2015). Consequently, South African settlement patterns are characterised by low densities, delocalised communities and fragmentation (Dewar, 2011). These spatial patterns are the result of engrained "conservative institutional and social practices" as well as competitive land markets (Turok, 2001:2350). A review of these contemporary trends and challenges is presented below.

Institutional Fragmentation

Up until July 2015, South Africa was still operating under many planning laws that were considered to be fragmented and unjust (Ogle, 2015). These laws contributed to making urban land markets inequitable for the poor (Urban LandMark, 2010). They had negative effects on economic development in terms of land investment and also failed to address unequal spatial patterns (Ogle, 2015). Furthermore, these laws lead to deferrals in the registration of title and additionally incurred large costs when dealing with the transfer of property (Napier & Ntombela, 2006). This resulted in knock on effects as it made the (administrative) process of housing delivery difficult, time consuming and expensive (Urban LandMark, 2010). Most of these laws have since been repealed and significant changes have been made to legislation involving land use planning and management (Ogle, 2015). However, urban land markets are still not working well for the poor (Urban LandMark, 2010). Therefore, there is a need to move towards creating more inclusive and equitable processes that increase the poor's access to urban land markets.

Urban Land Markets

State and private sector investment reinforces inequitable settlement patterns of land ownership (Napier & Ntombela, 2006). For Urban LandMark, "urban land that would give poor people the means to create wealth is in high demand" (2011:1). As a result, the poor are pushed to the outskirts of cities because of the high price of land and housing in better-situated areas (UN-Habitat, 2013). Furthermore, due to competitive land markets, the state often does not have the financial and administrative capacity to acquire valuable land in order to supply housing for the poor (Urban LandMark, 2011). Therefore, spatial disparities are further entrenched as state or RDP (Reconstruction and Development Programme) housing is increasingly developed on the periphery of cities, "often further removed from urban centres than even the historical townships" (Napier & Ntombela, 2006:3). In addition, these types of settlement patterns are further exacerbated by in-migration that includes well-established social networks that attract migrants to these areas (Dewar & Todeschini, 2004). Many households have invested a large amount of their limited resources "in making life as comfortable as possible in these remote locations" (Dewar, 2000:210). However, there are no formal land markets in these areas due to their poor location and a lack of investor confidence (Dewar, 2000).

Private Development

Low-income settlements are largely considered by private investors to be hostile environments and therefore high-risk areas for investment (Dewar & Todeschini, 2004). Although there has been a significant amount of public investment into these remote areas since 1994, it is distributed too sparsely to alter the "dominant negative image" (Dewar & Todeschini, 2004:17). Therefore, the centres of cities remain areas of prioritised private sector investment (Napier, 2008). Employment opportunities are created in these areas "through industry, commerce or residential development" (Napier, 2008:6). Hence, current spatial forms are intensified by social and economic inequalities as they limit access to these centres of employment (UN-Habitat, 2013b). This means that South African residents living on the outskirts of cities need to spend more of their time and a large portion of their income travelling longer distances in order to reach places of work and public facilities (CoCT, 2012b). In addition, environmentally "unique and desirable landscapes" are highly sought after by the wealthy and development in these area is often found beyond the urban edge (Dewar & Todeschini, 2004:24). In an attempt to respond to private developer initiatives, public infrastructural investment follows and as a result sprawling development occurs (Dewar & Louw, n.d.).

Housing Policies

There are very few options for the poor to enter into the formal land market (Smit, 2008). Currently, the only "formal" option available is subsidised housing, which "is not strictly part of the land market, but a state allocation of resources" (Urban LandMark, 2010:5). Additionally, this housing option offers very little choice in terms of location, size, cost and tenure (Smit, 2008). It further reinforces the modernist model of the "single storey freestanding unit" as the principal form of low-income housing in South Africa (Dewar & Todeschini, 2004:17). The resulting spatial form is a sprawling cover of "non-differentiated freestanding little houses" with a lack of integration between street space and dwelling unit (Dewar & Todeschini, 2004:25). Furthermore, subsidised housing is provided to those who qualify in terms of "income, household structure and residence status" and households may be on waiting list for a number of years before they can gain access to subsidised housing (Napier & Ntombela, 2006). As a result, there has been an increase in a "vibrant informal market" in South African cities (Napier & Ntombela, 2006:2).

Figure 2.2: An Example of Subsidised Housing in Cape Town (Source: CoCT, 2014b)

Informal Settlements

As a result of inequitable urban land markets, South Africa has seen a subsequent increase in informal settlements and backyard dwellings (Napier & Ntombela, 2006) (figure 2.2). This is created by an increase in urbanisation and rising unemployment. In 2011, 13,6% of South African residents lived in informal housing (SSA, 2016). The number of people living in informal settlements and backyard dwellings in the country brings to light the importance of accessibility to well-located land and affordability when deciding where to live (Smit, 2008). For Smit, the increase in the number of informal settlements highlights the significance of location, as often, informal settlements are found to be better located in comparison to greenfield RDP housing (2008). However, the people who reside in informal settlements are the often the most vulnerable to a number of risks such as natural fires and floods, as well as crime, social violence and evictions (Pieterse & Provoost, 2015). In addition, these settlements contribute to the “fragmented nature” of South African cities and in turn shape the form of city as opposed to being a response to it (Dewar & Todeschini, 2004:20).

Figure 2.3: An Informal Settlement in Cape Town (Source: CoCT, 2014b)

2.4 Spatial Consequences

The aforementioned urban challenges that are a consequence of modernist and apartheid ideologies manifest in the spatial form and structure of South African cities. As a result of these influences, South African cities are characterised by three principal spatial patterns: sprawl, separation and fragmentation (Dewar, 2011). These spatial patterns have had a significant impact on the country's citizens, as well the natural and urban environment and are examined in detail below.

2.4.1 Sprawl and Environmental Degradation

Sprawl refers to the outward spread of settlements "in a haphazard manner" (Dewar & Todeschini, 2004:20). Urban sprawl can result in a loss and degradation of agricultural, recreational and natural land and resources, such as water (CoCT, 2012b). The degradation of these resources negatively affects the ecological goods and services they provide such as food security (CoCT, 2012b). The degradation of natural land can also lead to a loss of public or recreational amenity (Dewar, Louw & Povall, 2012). According to Dewar, in South Africa "agricultural and natural landscapes have been, and are still being, aggressively destroyed" (2000:211). An additional effect of sprawl is that it results in an increase in energy use, particularly with regards to transport, as people are required to travel longer distances in order to reach places of employment (CoCT, 2012b). This leads to more CO2 emissions and air pollution, which has negative impacts on human health and the environment (Dewar & Todeschini, 2004).

2.4.2 Fragmentation and Separation

The concept of fragmentation relates the "grain of the urban fabric" (Dewar, 2000:211). In South Africa, the grain of its cities is coarse as settlements are scaled to enhance vehicular mobility and development predominantly takes place in form of separate components or cells of land (Dewar & Todeschini, 2004). These cells are bordered by highways or buffers of open space that limit integration. As a result, the notion of separation is extended in the settlement structures and exemplifies the separation of land uses, urban elements, and racial and income groups. The separation of these different components leads to a reinforcement of racially homogenous and mono-functional settlements (Pieterse & Provoost, 2015).

2.4.3 Mobility versus Accessibility

Sprawling and low-density settlement patterns in South Africa necessitate the development and maintenance of a large number of movement routes (Dewar, 2011). Mobility refers to the enhancement of high-speed vehicular movement as opposed to accessibility, which encourages proximity to living places and centres of employment (Dewar, 2011). Accessibility promotes pedestrian movement and reduces the need for vehicular mobility. Due to the prioritisation of vehicular mobility and sprawl in South Africa, contemporary settlement patterns are unsustainable as they increase the amount of expenditure needed for infrastructure and service delivery (CoCT, 2012b). In addition, densities are too low to facilitate the provision of affordable and efficient public transportation (Dewar, Louw & Povall, 2012). As a result, sprawling patterns of development limit equitable access to socio-economic opportunities and amenities. Therefore, inequalities are ingrained in the spatial form and structure of South African cities and it is the poor who live on the outskirts of cities that are the most affected (Dewar, 2000).

2.4.4 Poor Quality Public Spaces and Inadequate Facilities

Public spaces should act as "extensions to the private dwelling unit" and enhance the quality of the surrounding environment (Dewar, 2011:243). These spaces play an important part in the lives of the poor, as their homes are often overcrowded. However, in South Africa, the quality of public spaces is mostly of a poor standard (Dewar, 2000). This is because they are costly to maintain and they are not designed to the human scale of the public environment. As a result, these places are typically unsafe and hostile environments that attract crime-related activities.

Furthermore, there is an inadequate provision of social facilities in the townships of South African cities (Dewar, Louw & Povall, 2012). Access to social facilities is dependant on "whether or not a particular neighbourhood is prioritised" (Dewar, 2000:212). In addition, the use of these facilities is dependant on the income-levels of those who live there; if the residents are poor it is less likely that they will be able to afford the cost of certain facilities (Dewar, Louw & Povall, 2012). As a result, some facilities such as schools are "overcrowded while others are underutilised" (Dewar, Louw & Povall, 2012:5).

2.5 Need for a Paradigm Shift

The apartheid system and the ideology of modernist planning have "left deep scars on the spatial structure of [South African] cities, towns and rural areas, and the lives of millions of individuals and households" (Turok 2001:2354). It is fundamentally clear that the economic and social forces of these ideologies "did not suddenly expire with the advent of democracy" (Turok, 2001:2350). As a result, the majority of settlements are "inherently dysfunctional" and unsustainable (Dewar, Louw & Povall, 2012:1). Therefore, the greatest challenge with regards to spatial planning in South Africa is the need to restructure settlements in order to increase densities and make them "more efficient, equitable and sustainable" (Dewar, Louw & Povall, 2012:6).

For Dewar and Todeschini there are number of interrelated characteristics that need significant improvement in order to restructure and enhance the urban performance of South African settlements (2004). These characteristics include:

- The compaction of urban settlements in order to reduce and contain sprawl;
- Increase densities and intensify along public transport routes to enable the efficient and viable provision of public transportation and adequate social facilities, thereby encouraging economic and social opportunities;
- Break down the "neighbourhood unit" structure of settlements through the enhancement of activity routes in order to connect and re-stitch the existing urban fabric;
- Creation of a more decentralised pattern of social and economic opportunities in order to increase their accessibility.

In order to achieve these characteristics it will take make years and considerable effort to be realised (Dewar & Todeschini, 2004). Nonetheless, they can be achieved through sustained investment implemented in long-term planning and the application of new directions in policy frameworks with regards

Figure 2.4: Sprawl in Cape Town (Source: CoCT, 2014b)

3. Locating the Problem in Cape Town

Cape Town is representative of the many generic urban challenges found in South African cities. This chapter examines the historical and contemporary patterns of Cape Town's development and considers how the role of the state and planning practices has contributed to the growth of its spatial form. The key urban challenges in South African cities that were outlined in the previous chapter will be used as a framework to analyse how they have resulted in and continue to intensify present-day problems in Cape Town. This chapter will also assess how these existing spatial patterns result in a number of negative social and environmental consequences that will continue to persist if they are not addressed.

3.1 The City of Cape Town

The city of Cape Town is world-renowned for its rich biodiversity and natural beauty (CoCT, 2014b). It is a port city located on the southwest coast of South Africa. The city falls within the Cape Floristic Region (CFR), which is recognised as a world heritage site, "the smallest yet most biologically diverse of all the plant kingdoms" (CoCT, 2014b:143). Cape Town's natural resources contribute to making the city a unique and attractive place to live. Its economy is dependent on the smaller towns surrounding Cape Town, such the Saldana port, Malmesbury, Paarl and Hermanus (CoCT, 2012a). The residents in these areas contribute to the city's labour force, consumer catchment area and transport infrastructure (CoCT, 2012b). They also form part of the agricultural and tourism areas that encompass the city.

3.2 The Historical Development of Cape Town

Cape Town is the oldest city in South Africa and therefore its development is a result of number of forces and trends that have shaped the form and structure of its urban fabric (Dewar & Uytenbogaardt, 1977). The purpose of this section is to examine how Cape Town has developed spatially. An overview of the city's historical development will aid in establishing why certain development patterns have occurred and continue to take place in the city. These spatial patterns have had a direct impact on contemporary development and they reinforce persistent urban challenges in the city.

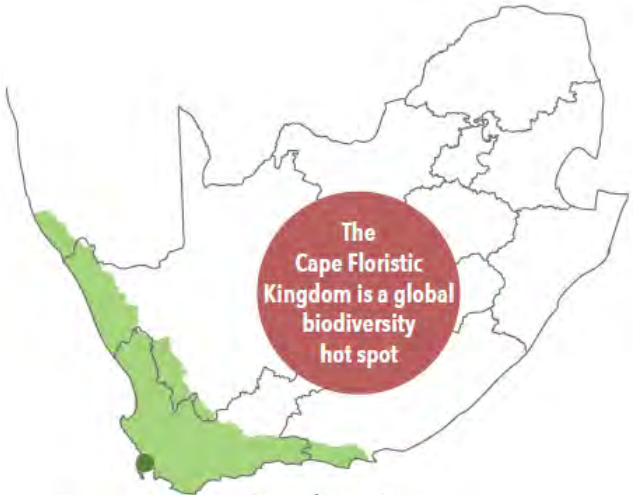
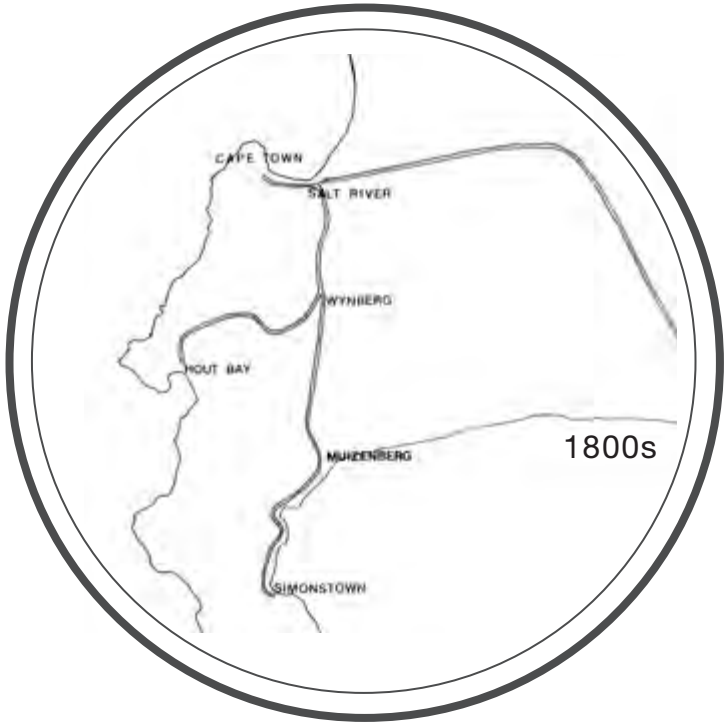


Figure 3.1: The Cape Floristic Region (Source: CoCT, 2014b)

3.2.1 Early Development (1652 – 1930)

The development that took place in Cape Town before 1920 has been described as "evolutionary developed areas" (Dewar & Uytenbogaardt, 1977:17). This form of development occurred over a long duration of time "through a process of action and reaction" (Dewar & Uytenbogaardt, 1977:17). This means that development in one area resulted in a counter reaction of development in another area. Development was dependant on and took place in relation to structuring elements such a roads and railway lines, which connected inner Cape Town with its surroundings. As these areas related to linear structuring elements, the resulting form of the developing city occurred in a linear pattern (figure 3.2).

Four main "arms" of development took root during this period. These arms or corridors moved towards the south to Simonstown, towards the east to Paarl, towards the north to Saldanha and towards the west to Sea Point. Main Road, that connects the city bowl to Simonstown, is one of the oldest and most established corridors in the metropolitan. The construction of the railway line in 1862 reinforced its role as a "main structuring route" (Dewar & Uytenbogaardt, 1977). The relationship between road and railway station attracted a variety of uses such as residential, commercial and manufacturing. Similarly, the adjacent corridors were characterised by a mix of land uses and accommodated people from a mix of incomes.



Early development in Cape Town also responded to the local typography and the natural environment. The presence of Table Mountain provides shelter from the strong winds which blow from the north-west and south-east (Dewar & Uytenbogaardt, 1977). There is abundant vegetation and its sloping terrain enhances the environment and its unique scenic views. Furthermore, these well-established and older areas have much better access to the major employment and social opportunities of the Central Business District (CBD), which still generates the most economic activity in the city (Turok & Watson, 2001).

3.2.2 Planned Development (1930 – 1994)

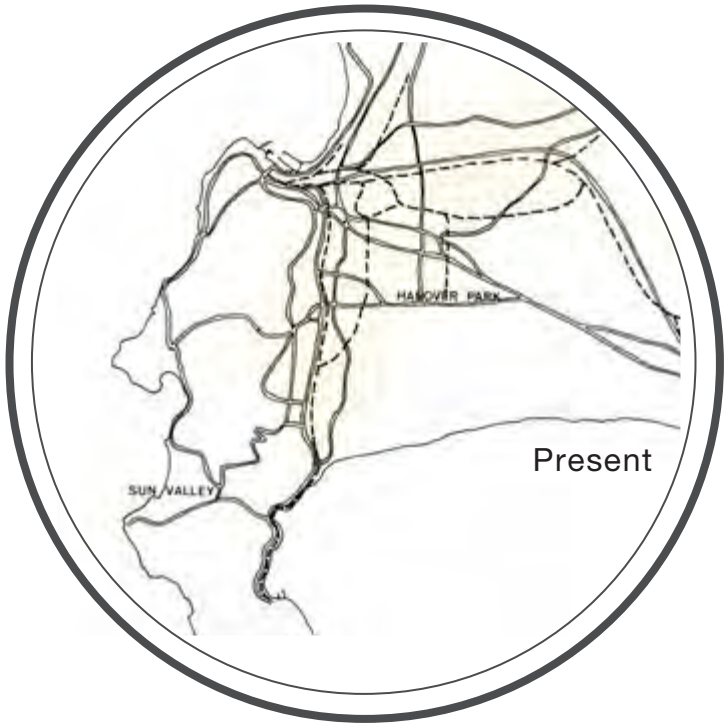
The second stage of development that influenced the spatial formation of Cape Town is referred to as "planned development" that occurred in the post-war and apartheid era (Dewar & Uytenbogaardt, 1977:19). This development arose in response to three key forces: population growth, the arrival of the motor car and the advent of the planning profession (Dewar & Uytenbogaardt, 1977).

Figure 3.2: The Historical Development of Cape Town 1800s
(Source: Dewar & Uytenbogaardt, 1977).

In the 1920s, an exponential increase in population growth had a significant effect on the spatial development of Cape Town (Dewar & Uytenbogaardt, 1977) (figure 3.3). The developmental "process of action and reaction" was not fast enough to accommodate the rapid rate of growth. As a result, comprehensive planning and mass construction practices were used to develop large areas of land (Dewar & Uytenbogaardt, 1977).

In addition, the emergence of the motor car completely altered the linear structure of the city, as "people were no longer tied to fixed-line transportation systems" (Dewar & Uytenbogaardt, 1977:19). This resulted in development moving further away from established settlements. Infill development began to occur and predominantly took place between the southern and eastern corridors in areas such as the Cape Flats (Dewar & Uytenbogaardt, 1977). This tendency was intensified by "racially based residential segregation" (Turok & Watson, 2001:120). The introduction of the Group Areas Act led to the designation of separate areas according to ethnicity (Turok & Watson, 2001). Townships were built on the periphery of the city as "dormitory suburbs" with inadequate housing, infrastructure and facilities (Turok & Watson, 2001:120). The direct relationship between race and income in South Africa meant that the majority of the people who were forcibly removed to live on the outskirts of the city were poor and therefore dependent on public transportation.

Figure 3.3: The Historical Development of Cape Town: Planned Development 1940s
(Source: Dewar & Uytenbogaardt, 1977).



As a result of a rapid increase in population growth, large areas had to be developed in order to accommodate people in a short space of time. Consequently, planning as a profession emerged in order to respond to this growing pressure (Dewar & Uytenbogaardt, 1977). Development ceased to occur as an organic reactionary process and instead was replaced by “planned development” that was conducted by professionals as a scientific process (Todes, 2010:415). Planning practices were influenced by and adapted from other countries to include modernism. Most of the thinking behind the development that occurred during this period was a direct response to the supposed limitations of areas developed in the evolutionary period in Cape Town (Dewar & Uytenbogaardt, 1977).

3.2.3 Contemporary Development (1994 - Present)

The majority of development that has occurred in Cape Town has been influenced by the dominant ideology of modernism and the political dogma of apartheid. Therefore, the resulting spatial form of the city is characterised by low-density sprawl, delocalised communities and separation (figure 3.5). The organisation of the urban structure still reflects the policies of apartheid such as the Group Areas Act. The wealthier and predominantly white population tend to live in areas of higher

Figure 3.4: The Historical Development of Cape Town: Contemporary Development (Source: Dewar & Uytenbogaardt, 1977).

natural amenity, close to centres of employment. These areas are usually well serviced with educational and social facilities (Turok & Watson, 2001). Whereas, most of the black, coloured and Indian population live in areas that are underserviced and far away from centres of employment (Dewar & Louw, n.d.). As a result, Cape Town can be described as is a starkly divided and an inequitable city. However, contemporary development and public and private investment continues to exacerbate and reinforce these spatial patterns (Turok & Watson, 2001).

The majority of private sector investment and job growth occurs in or adjacent to affluent suburbs in the north and west of the metropolitan area (Turok & Watson, 2001). These areas are also prioritised for middle and high-income housing, which is characteristically built within private gated communities encircled by high walls. Conversely, public sector investment in infrastructure and services continues to concentrate its resources in poorly located areas, where the cost of land is cheapest (Turok & Watson, 2001). Furthermore, investment is focused on the delivery of subsidised housing, as opposed to providing areas for productive activities (Turok & Watson, 2001). Currently, social facilities are organised in a fragmented and sporadic manner, which means an opportunity is lost to enrich the quality of the public realm in areas that are otherwise characterised by harsh and unaccommodating environments.

Spatially, the city has developed in a radial pattern (CoCT, 2012b). Cape Town's radial transport routes carry large amounts of people and goods into the CBD daily (Turok & Watson, 2001). This spatial pattern results in car-oriented development, as high volumes of movement are required to transport people to and from centres of employment. The road network and public transport system is highly inefficient and it is characterised by traffic and congestion. Furthermore, railway lines and highways form barriers across the city and limit movement, particularly between the southern and northern parts of Cape Town (CoCT, 2012b). For many people in the city who cannot afford to own a car, travel is costly and inefficient (Mammon & Ewing, 2006). Therefore, the current city structure is increasingly becoming more polarised and inequitable. It is the poorest people who have to spend a large proportion of their income in order to travel long distances to reach centres of opportunity and employment (Mammon & Ewing, 2006).

Although contemporary development in Cape Town demonstrates characteristics of evolving in a polycentric manner, these patterns of development have been established without taking into account "socio-economic integration or functionality" (CoCT, 2012b:30). An example of this decentralised development can be seen in the form of leap-frog sprawl that occurs in areas such as Somerset West. Furthermore, governmental officials encourage private development as they seek to increase their tax base by endorsing development of any kind. The rising increase in unemployment means that any opportunity to create additional

Figure 3.5: An Example of Separated Communities in Cape Town (Source: Miller, 2016)

jobs continues to influence the approval of new commercial development, despite the greater social costs and affects on the functioning of the city (Turok & Watson, 2001). As a result, spatial patterns of development are entrenched in the form and structure of the city and it is the poor who are the most affected.

3.3 Contemporary Urban Dynamics

The consequences of the aforementioned spatial patterns of development in Cape Town "impose major costs or externalities on individuals and society" (Turok & Watson, 2001:125). Some of the implications of the city's sprawling, fragmented and segregated urban structure include: operating costs for public services, as well as environmental, economic and socio-political costs (Turok & Watson, 2001). In addition to these key issues, this section analyses the external drivers and trends that influence Cape Town's development. These trends and dynamics also impact on the city's patterns of spatial growth and change.

3.3.1 The Costs of Urban Sprawl, Fragmentation and Separation

Cape Town's contemporary urban structure exacerbates the key development issues of poverty, unemployment and inequality (Dewar & Uytenbogaardt, 1991). Its spatial form is economically inefficient and environmentally unsustainable. It is evident that, it has a direct impact on lives of the people who live in the city, specifically the poor. Sprawling urban growth increases the cost of providing public infrastructure and services. The cost of servicing low-density suburbs is higher, because the increased distance between homes means that more pipes, electric cables and concrete need to be supplied (Turok & Watson, 2001). Moreover, the large distances between centres of employment, households and facilities create extremely high operating costs for road-based public services such as solid waste collection (Turok & Watson, 2001). Additionally, the expansive distances between places and low-density sprawl make the provision of public transport difficult (UN-Habitat, 2013b). The residential thresholds are too low to offer an efficient and cost-effective service and as a result forms of public transportation are highly subsidised by the state (CoCT, 2012b). Cape Town's public transport is "characterised by its declining quality in terms of service infrastructure, reliability and frequency" (CoCT, 2012b:23). This is a result of public financial limitations and a lack of capital investment, particularly with regards to the rail network (CoCT, 2012b).

The greatest impact of the city's fragmented spatial form and inefficient public transport systems is the cost that the poor are required to spend on travel. This depletes their already "inadequate disposable incomes" and traps them within a cycle of poverty (Turok & Watson, 2001:126). Furthermore, it has been suggested that the continuous spatial separation of low-income people in concentrated enclaves in the city, aggravates crime in these areas. Additionally, the cost of maintaining public open spaces in poorer areas in the city has resulted in them becoming "havens for criminal activity" (Turok & Watson, 2001:125). For example, schools resort to abandoning large areas of sports grounds and playing fields, as they have insufficient funds to maintain these sports facilities (Turok & Watson, 2001). As a result, the quality of these environments can be described as sterile and unforgiving places to live (Dewar & Todeschini, 2004) (figure 3.6).

Additionally, densities are too low to create opportunities for small businesses to grow (Dewar, Louw & Povall, 2012). Furthermore existing highways create impermeable barriers between neighbourhoods and limit access to local markets. This restricts the conditions for the development of self-generating economic activities to occur. Moreover, there are very few places for street trading to take place (Turok & Watson, 2001). As the unemployment rate continues to increase, households

Figure 3.6: An Example of a Neglected and Sterile Urban Environment in Cape Town (Source: CoCT, 2014b)

are forced to find innovative ways to generate their own income (Dewar, Louw & Povall, 2012). Consequently, informal trading and markets occur in unregulated environments that can cause health and safety issues (Southworth, 2007).

Another cost of urban sprawl is the affect it has on the natural and rural environment (Turok & Watson, 2001). It places an additional strain upon Cape Town's natural resources, such as its agricultural and critical biodiversity areas. These factors impact on the availability of well-located land for low-income housing (CoCT, 2012c). Land is a non-renewable resource and its minerals, aquifers and watercourses are being lost or degraded by uncontrolled urban encroachment and pollution. Furthermore, traffic and congestion increase the amount of carbon and CO2 emissions (CoCT, 2012b). This damages and negatively affects air quality and natural amenities in the city. Many of these natural assets significantly contribute to the tourism economy, which make Cape Town an attractive and desirable place to live.

3.3.2 Key Trends

In addition to the many consequences regarding Cape Town's existing spatial form, there are a number of key trends that aggravate these issues. Firstly, the dynamic of population growth places the city under significant amounts of pressure to provide employment opportunities, infrastructure and services (CoCT, 2012b). A conservative estimate predicts that Cape Town's population will increase from 3,82 million in 2011 to 4,26 million in 2031, which represents an increase of 440 000 people (CoCT, 2012c). Moreover, it is anticipated that the city's growth will continue to increase considerably each year as a result of urbanisation and in-migration (CoCT, 2012b). The majority of people who move to the city of Cape Town are likely to be looking for work to enhance their quality of life. Arguably, the greatest challenge that the city must address is the need to accommodate this burgeoning population.

Secondly, the issues of poverty and unemployment are interdependent and pervasive (Dewar & Uytenbogaardt, 1991). In 2010, the proportion of people in the city living in poverty was 19,7% (WCG, 2014). The rate of unemployment in Cape Town increased from 19,2% to 24,9% between 2005 and 2013. Furthermore, youth unemployment (aged 15-24 years) is the largest age group in the city who are unemployed. The high youth unemployment rate suggests that this demographic will have difficulty finding jobs, as most of these people (approximately 60%) did not complete matric. Therefore, they are unlikely to find permanent and adequate paying employment. Moreover, the informal sector only makes up 8,7% of employment in the city (CoCT, 2014b). As the city has such a high unemployment rate, the informal economy should be encouraged to play a more significant role in the local economy.

Thirdly, due to urbanisation and in-migration Cape Town continues to attract growth. Consequently, a housing backlog has emerged and the number of informal dwellings has increased. In 2010, 17,1% of Cape Town's residents lived in informal housing and 10,4% in backyard lodgings (CoCT, 2012c). The housing backlog for the municipal area in 2012 was estimated at 380 000 units (CoCT, 2012b). As the demand for housing continues to escalate and the backlog of housing increases, it is highly probable that there will be a growth in informal settlements. Therefore, there is an urgent need for adequate housing delivery and infrastructure in already over-populated informal settlements (CoCT, 2009a). However, finding well-located and affordable land for housing that can contribute to more efficient and integrated settlements remains one of the greatest challenges in the region (CoCT, 2012b).

3.4 Conclusion

This chapter outlined the historical development of Cape Town and argued that its contemporary spatial form aggregates an extensive range of social and environmental costs on the metropolitan area. It is evident that these existing settlement patterns are unsustainable and it is the poor who bear the weight of these consequences (Dewar, Louw & Povall, 2012). The implications of the city's sprawling and separated urban environment cannot be ignored. This has resulted in the creation of an inequitable and fragmented spatial form. If these challenges are not actively managed and addressed, they will be extenuated by external issues such as population growth and youth unemployment. Therefore, it is necessary to respond to these challenges in order to improve existing living environments and access to basic services. The next chapter of this dissertation will analyse approaches to settlement making in order to develop a normative framework to guide the spatial development of the city.

4. Giving Direction: Theoretical Framework

It has been argued in previous chapters that settlement patterns in South African cities are “inherently dysfunctional”, unsustainable and inequitable (Dewar, Louw & Povall, 2012:1). Therefore, the greatest challenge to future development is to “contribute to the improvement of historical settlement performance” (Dewar, Louw & Povall, 2012:1). In order to resolve the urban challenges found in South African cities such as Cape Town there is a need to allow for more appropriate planning. This chapter will formulate a theoretical framework to give direction to the development of a spatial plan.

This chapter consists of four parts. Firstly, it will examine the broader global urban challenges that impact upon our cities and that need to be considered in decision-making. Secondly, it will delineate the values and principles to guide planning interventions. Thirdly, performance qualities will be identified to determine how to restructure Cape Town’s existing settlement patterns. Fourthly, the chapter will outline the legislative and policy context within which urban management takes place.

4.1 Urban Challenges in the Global Context

In addition to the contemporary urban challenges facing South Africa and more locally in Cape Town, are a number of international tendencies that affect and will continue to affect the growth and development of cities worldwide. These key issues can exacerbate the already prevalent problems found in the country and need to be considered and addressed to improve existing living environments. This section has identified five global urban challenges and trends that directly impact on cities.

4.1.1 Urbanisation

More than half the world’s population currently resides in cities. By 2050, it is estimated that this number will increase to two-thirds (UN-Habitat, 2012a). However, most urbanisation is expected to take place in cities that are not equipped to accommodate this rapid influx of people, since the majority of population growth will occur in the cities of developing countries. It is projected that these cities will need to accommodate “an additional 1.3 billion people by 2030, compared to 100 million in the cities of the developed world” (UN-Habitat, 2012a:v)

This large-scale increase in people presents a number of significant challenges for the world’s cities and the people who live in them. As urbanisation continues to increase, so will poverty, urban sprawl and the need for food security (Dewar & Louw, n.d.4). Similarly, the number of people living in informal settlements will continue to grow, as people are unable to afford the cost of land and housing in cities (Dewar & Louw, n.d.). In sub-Saharan Africa alone, 62% of people live in informal dwellings (UN-Habitat, 2012a). Furthermore, urbanisation has a dominant affect on the natural ecosphere, as cities consume large amounts of materials, land and energy (Barles, 2010). As a result of population growth, it is anticipated that cities in developing countries will “triple their land area between 2005 and 2030” (UN-Habitat, 2012a:v).

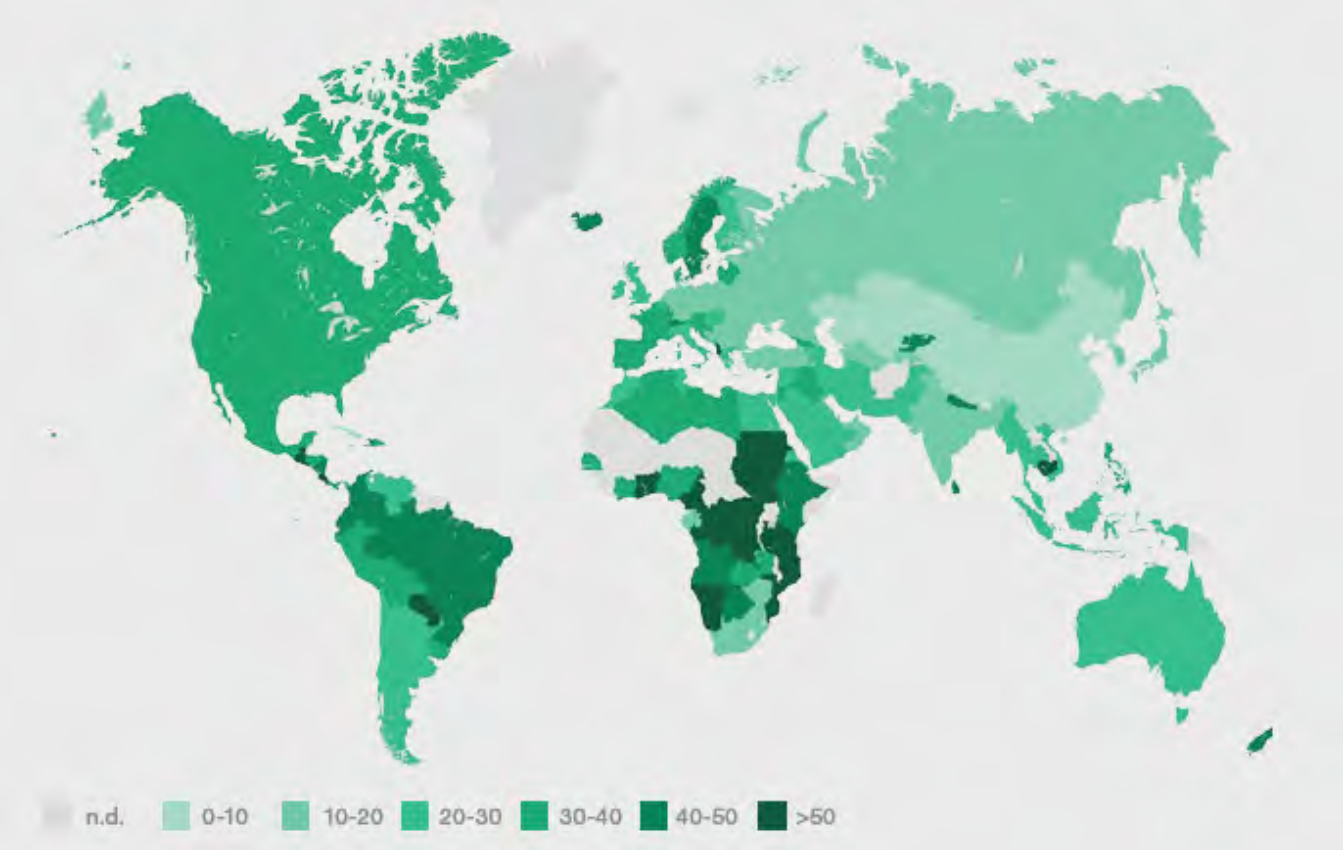
Despite the new challenges that have arisen as a consequence of urbanisation, it presents an opportunity to ameliorate the way that human settlements are shaped and formed. Historically, the creation of compact, interactive and shared spaces has resulted in many advantages (UN-Habitat, 2012a). Some of these advantages include the possibility to enhance wealth through agglomeration, to use services and resources more efficiently thereby enhancing people’s quality of life (UN-Habitat, 2012a). Therefore, urbanisation should be perceived as an opportunity to improve access to services and economic and social opportunities (UN-Habitat, 2013b).

4.1.2 Climate Change

Climate change is considered to be “one of the most determinant change factors of our time” (UN-Habitat, 2012b:104). The environmental impact of fossil fuel use in urban environments, specifically the by-products of oil, is a major contributor to climate change (UN-Habitat, 2009). Conversely, the global economy is dependent on the fast and efficient delivery of people and goods over long distances (UN-Habitat, 2009). Therefore, there is a connection between climate change and an oil-based economy (UN-Habitat, 2009). Emissions from cars and other forms of transport

have significantly increased the amount of greenhouse gas emissions in the atmosphere and have further contributed to global warming (Figure 4.1). However, the majority of cities, specifically those in developing countries, "continue to prioritise motorized transport and related urban infrastructure" (UN-Habitat, 2013b:27). As a result, critical biodiversity areas, wetlands and agricultural land are being lost or degraded by uncontrolled urban encroachment and pollution.

Figure 4.1: CO2 Emissions from Transport, Percentage of Total Fuel Combustion (Source: ARUP, 2016:27)



Another negative effect of climate change involves natural disasters such as severe storms and floods, an increase in sea level and limited access to water (UN-Habitat, 2009:xxii). The mitigation of these environmental impacts is particularly important in countries with poorer residents (UN-Habitat, 2009:xxii). These citizens are more likely to live in informal settlements and areas susceptible to natural hazards due to the high cost of land and housing in better-situated areas (UN-Habitat, 2013:27). In developing countries, 40% of informal dwellings are situated in regions "threatened by floods, landslides and other natural disasters" (UN-Habitat, 2009:xxii). Furthermore, rising temperatures due to global warming may lead to drought, flood and fire risk, which will result in a decline of the agricultural sector. Climate change can also negatively affect critical biodiversity and result in resource scarcity. Therefore, developing ecologically sustainable approaches that mitigate against the effects of climate change and reduce the vulnerability of environments and the residents in these areas should be a major concern for the world's cities.

4.1.3 Natural Resource Depletion

The natural resources that make up the biophysical environment form the basis of all primary economic activities such as agriculture, forestry, fishing, and mining (Gasson, 1998). These natural resources provide raw materials, energy, food, water, land and environmental and social services that support human activities (McKenney & Kiesecker, 2016). Humans are dependent on these resources in order to survive as they form part of our "life-support systems" (McKenney & Kiesecker, 2016:5). However, when comparing global ecological footprints to the earth's available capacity, at the present rate of resource consumption the capacity of earth is being exceeded by 30% (UN-Habitat, 2012). Furthermore, 60% of the natural resources and ecosystems that provide goods and services that support human activities are being destroyed or expended in an unsustainable manner (UN-Habitat, 2012). It has become increasingly evident that "nature is not infinite, it has limits and those limits are about to be exceeded" (Acosta, 2010:1).

It is imperative that the earth's natural resources are effectively and efficiently managed so as to ensure economic growth, environmental quality and sustainable development (Lewis, 2016). The manner in which natural resources are used and managed has economic, social and environmental repercussions that "extend beyond the borders of single countries or regions and affect future generations" (Lewis, 2016). However, despite living during a period of extreme climate change, the pressure to use the earth's natural resources to meet the demand of growing economies continues to escalate (Acosta, 2010). According to McKenney and Kiesecker, in the next two decades future developments in energy, mining, agriculture and urban growth "could cumulatively impact 20% of remaining natural lands globally" (2016:5). Therefore, it is necessary to develop and adapt to new approaches to achieve ecologically sustainable development without endangering the global ecological balance of the earth's resources and ecosystems.

4.1.4 Water Scarcity

Water is essential to life and it is a vital finite resource (UN-Habitat, 2012b). Water supply and water quality are two ecosystem services that are carried out by water catchments and the natural vegetation found in watercourses and wetlands. However, pollution and waste dumping in natural environments endanger animal habitats, critical biodiversity and natural carrying capacities (UN-Habitat, 2012b). Furthermore, polluted water in combination with the depletion of aquifers and changing rainfall patterns because of climate change will affect the health of people as well as the global economy (Berntell, 2014). In 2010, it was estimated that 884 million people did not have access to piped water or a clean water supply (UN-Habitat, 2012c). Without access to clean water it is likely that there will be an increase in disease and mortality, particularly in developing countries (UN-Habitat, 2012a).

The threat of water scarcity is already affecting the livelihood of the 2.4 billion people who currently live in water-scarce areas (UN-Habitat, 2012c). This number is expected to increase to 52% by the year 2050 (UN-Habitat, 2012c). By 2030 it is projected that 65% more water will be needed to satisfy increasing energy, industrial and urban requirements (Berntell, 2014). Therefore, water scarcity places a significant amount pressure on business operations and global value chains. Furthermore, with the global increase in urbanisation, water shortages are likely to threaten the economies of developing countries, trapping the poor in a cycle of poverty (Berntell, 2014).

Water scarcity is a global crisis (Berntell, 2014). The world's watercourses traverse international boundaries and therefore water demands in one country may have "a ripple effect across the world" (Berntell, 2014:20). Furthermore, as cities contain the majority of the global population, they are the principal consumers of resources and are also the most liable for the amount of waste produced annually (UN-Habitat, 2012b). A new approach to the management of resource flows and waste disposal is therefore required. It is necessary that local governments address the way that resources are used and disposed as they have pressing economic, environmental, socio-political consequences.

4.1.5 Food Security

As cities grow larger and develop outwards in a sprawling pattern, the amount of land available for food production and ecosystem services will decrease (UN-Habitat, 2012a). Thereby limiting the capacity of cities to safeguard food security. By 2030, the international demand for food is expected to increase to 40% (Berntell, 2014). However, water scarcity increases the risk of a deficit in agriculture production (Berntell, 2014). Moreover, access to food is becoming increasingly more difficult in developing countries (Dewar, 2011). Access in this instance does not relate to food supply, but rather to a household's ability to pay for or barter for food in addition to paying for health services, education and transportation expenses (UN-Habitat, 2010).

Inequitable access to food and other basic needs increases the poor's susceptibility to a number of diseases. Malnutrition and hunger are direct consequence of the persistent rise in food prices in urban areas (UN-Habitat, 2010). The buying power of wealthier people in urban areas contributes to food inflation, and as a result, the poor cannot afford to buy sufficient amounts and types of food. This condition is reflective of a "silent emergency" (UN-Habitat, 2010:104). The price of food will only increase with the onset of climate change, causing droughts and flooding which impacts on the agricultural industry (Dewar, 2011). It is projected that the inflation of food prices could "push 100 million people in low-income countries deeper into poverty" (UN-Habitat, 2010:104). Therefore, the current food crisis experienced by the poor necessitates that there be a fundamental shift in the way that food is produced, distributed and handled for the urban market.

4.1.6 Fossil Fuel Dependence

The use of oil as an energy source has both facilitated and promoted urbanisation (UN-Habitat, 2009). Its ease of accessibility enabled the development of low-density and sprawling urban environments, or suburbia, which relies heavily on movement via private cars. Moreover, the global economy is dependent on trade and the ability to move both people and goods economically and efficiently over long distances (UN-Habitat, 2009). It is projected that within the next ten years that the world will reach peak oil extraction (UN-Habitat, 2012:vi). As a result, there is likely to be an exponential increase in the price of fuel, transportation, food and other imports.

Importantly, fossil fuels contribute to greenhouse gas emissions, which have a major impact on the environment and hence climate change (UN-Habitat, 2009). Between 1950 and 2005, the number of global carbon emissions from fossil fuel incineration increased by approximately 500%. Consequently, the use of fossil fuels has contributed to a rise in the earth's air temperature (UN-Habitat, 2016). It was documented that 2015 "was the hottest year in history", with the average global temperature increasing by 0.75°C (UN-Habitat, 2016:16). Therefore, it is evident that cities need to adopt new renewable forms of energy and that the use of fossil-fuel dependent forms of transportation must decrease (Dewar, 2011). The impacts of greenhouse gas emissions can be ameliorated through the promotion of more dense and compact built environments, as well as through non-motorised transportation (NMT) (Dewar, 2011).

4.1.7 Economic Globalisation and Increasing Structural Unemployment

Globalisation and economic restructuring have had a significant impact on labour markets, results in an increase in the service sector and information technology and a decrease in the manufacturing sector (UN-Habitat, 2009). Economic restructuring in combination with the impact of the global economic recession, climate change and the mechanisation of labour practices has resulted in numerous job losses in the agricultural and manufacturing sector (UN-Habitat, 2016). As cities become larger, more interconnected and competitive, it is the low-skilled and uneducated people living in developing countries that are most affected (Dewar, 2011). Globalisation can also result in entrenched income inequalities and "exacerbate the urban divide" between the rich and poor (UN-Habitat, 2010:91). Furthermore, it is likely that there will be an increase in the informal economy in developing countries because of rising unemployment. Increasing poverty and inequality as well as a rise in the informal sector will need to be addressed by local governments in order to sustain inclusive economic growth.

This section of the chapter has examined the key urban challenges and tendencies that affect the global population. It was found that if urbanisation continues to increase at its present rate, natural resources will be depleted and the impact of climate change will increase. It is evident that the planet's resources can no longer be used indefinitely or as a depository for wastes. Therefore, it is necessary that planning interventions reassess the "carrying capacity and resilience of nature" (Acosta, 2010:5). At a local scale, it is necessary to consider how these many challenges have consequences for economic growth, poverty and access to services. If cities such as Cape Town are to prosper, they must improve access to adequate shelter, water, food and renewable forms of energy and enhance the quality of life for all of its citizens (UN-Habitat, 2012).

4.2 Values and Principles

The field of planning is deeply rooted in "strong normative or value-based foundations" (Dewar & Louw, n.d.10). These values and principles are significant, as they impact on and determine the shape and form of settlements (Fainstein 2005). Moreover, these values and principles provide justifications for planning decisions and aid in the formulation of a logical argument, as opposed to opinion (Dewar & Louw, n.d.). Therefore, any entry point to planning interventions should commence with the values that planning aim's to achieve (Dewar & Uytenbogaardt, 1991).

The following interconnected values and principles that are discussed in this section are informed by ethical considerations and seek to respond to the strategic issues outlined in the previous section. It is argued that there are three key foundations in which planning values should be grounded (Dewar & Uytenbogaardt 1991). These are humanism, spatial justice and ecological sustainability.

4.2.1 Humanism

The concept of humanism acknowledges that the key function of planning human settlements is to ameliorate the lives of people and to satisfy human needs (Dewar & Louw, n.d.). However, the discipline of urban planning occurs within a context of rapid population growth, urbanisation and vast environmental and technological changes. In the face of these global trends and tendencies, it is necessary that their consequences be considered when planning for people and their needs.

There are two kinds of human needs: individual and collective needs. Individual needs refer to the essential human requirements that must be satisfied in order to enhance the lives of people (Dewar & Louw, n.d.). This can also relate to interventions that create the conditions for people to improve their own circumstances. Collective needs, or group needs, occur when people live in a social environment. When planning for human's collective needs, it is necessary to begin with the "lowest common denominator: people with disabilities: people moving on foot; and people without access to large amounts of resources" (Dewar & Louw, n.d.10). If the formation of settlements is based on assumptions, it is likely that these assumptions are not actualised the settlement quality will be poor. Moreover, it is the poorer population that are the most affected.

4.2.2 Spatial Justice

The principle of spatial justice requires that spatial and social development inequalities are addressed through improved access to land. A just city or region is an area that is socially inclusive and provides all of its residents with equal "access to the benefits of the city" (Fainstein, 2005:124). These benefits include an affordable urban mobility options that enables access to social, recreational and economic opportunities. It also refers to a group's ability to receive quality education, to live in adequate housing and to access high-performing urban environments (Fainstein, 2010). Furthermore, spatial justice entails the formation of human settlements that have the potential to enhance the population's standard of living. Additionally, this principle involves the improvement of economic inclusion and sustainable economic growth to enrich the lives of people and their capabilities.

4.2.3 Ecological Sustainability

Ecological sustainability refers to the conservation of natural resources (Pieterse, 2011). As the world's population and urbanisation continues to increase, so does the pressure upon the earth's natural resources such as land, water and climate (Gasson, 1998). Therefore, it is imperative that society learns "to live within the limitations of the biological and physical environment" (Goodland & Daly, 1996:1003). This requires that the amounts of natural resources that are harvested are kept within capacity so that they can be renewed, and that the amount of waste released does not degenerate the environment (Barles, 2010).

In order to preserve and protect the natural environment and its resources, it is necessary that urban planning decisions be made from a "conservationist perspective" (Dewar & Louw, n.d.10). For Dewar and Uytenbogaardt, conservation relates to three key concepts, namely balance, regionalism and resource sensitivity (1991). Firstly, the notion of balance refers to the need for equilibrium between human activity and the natural landscapes within which those activities take place. Before any human intervention or action on the environment ensues, it is necessary that ecological determinants are considered and respected. Secondly, regionalism involves the recognition of the interdependent relationship between people and nature. The character of a place, the human activities and the occurrence of culture in that place form the foundation or "the territorial basis of civilisation" (Dewar & Uytenbogaardt 1991:13). Thirdly, the concept of resource sensitivity acknowledges the importance of natural resources to sustain and support human life. Natural resources need to be used in an ecologically sustainable manner in order to preserve its benefits for future generations to come (Pieterse, 2011).

To conclude, urban planning interventions can shape and affect urban and natural environments and the people who live in them. Therefore, planning as a discipline "is only defensible as an activity if it is believed that it will deliver a future that is 'better' than that which would result without it" (Campbell and Marshall, 1999:476). This section has argued that planning interventions and decisions should be guided by the principles of humanism, spatial justice and ecological sustainability,

in order to respond to the contemporary realities and urban challenges that occur within cities. The following section examines the performance criteria that should give direction to the planning and design of quality urban environments.

4.3 Performance Criteria

In planning theory, for Dewar and Uytenbogaardt, there are a series of "universal needs and requirements which must be satisfied" in the formation and design of urban environments (1991:14). It was argued in the previous section that the built environment should provide its users with equitable access to the city and its opportunities (Bentley et al., 1985). This section identifies the urban performance qualities that offer a city's inhabitants a greater variety of choice, which in turn contributes to the creation of more inclusionary environments. In a city such as Cape Town, where its built form is characterised by inequitable socio-spatial patterns, it is necessary to examine how performance qualities could contribute to the improvement of its settlement organisation.

An examination of these performance qualities will later aid in informing planning and design decisions carried out in this dissertation within the context of Cape Town. It is important to note that none of these qualities are more significant than the other rather they need to be considered in terms of how they enhance the performance of a settlement as a whole. Secondly, it is not possible to achieve all theses qualities equally, "trade-offs are required depending on circumstances" (Dewar & Todeschini, 2004:107).

4.3.1 Balance

There are two components of balance that are essential to settlement making (Dewar & Uytenbogaardt, 1991). The first is balance between people and nature. It requires that that equilibrium is maintained between "the three fundamental landscapes of society: wilderness, rural and urban" (Dewar & Kiepiel, 2012:31). This will ensure that the harmony amongst people and the areas in which they live is sustained (Dewar & Uytenbogaardt, 1991). This quality also relates to the ways in which culture and historical practices are formed over time, as a result of human activities that are carried out in urban environments (Dewar, Louw & Povall, 2012). It is argued that this connection must be protected as it forms the foundations of society.

The second component of balance refers to the principle of ecological sustainability. For Gasson, it is necessary to recognise that cities function as a metabolism (2007). The urban-industrial metabolism is a concept that looks at the city as an ecological system, with its own process of production and management of materials (Evans, 2011). Urban-industrial metabolisms are normally linear and therefore consume the natural ecosystems that are required to sustain people and ecosystems within cities (Odum, 1993). This process then results in negative and damaging effects on environmental ecosystems (the atmosphere, water and soil) (Barles, 2010). In order to achieve ecological sustainability, the throughputs such as energy and other resource flows must be optimised (Dewar, Louw & Povall, 2012). In terms of outputs, wastes need to be recycled back into the system "through the development of closed-loop metabolisms" (Gasson, 2007:5). Where possible, the use of renewable energy resources should be maximised in order to reduce the amount of wastes that negatively impact on environments.

4.3.2 Equity

"Positive urban environments are equitable" (Dewar & Uytenbogaardt, 1991:19). Equity does not mean that all the components of a city should be the same (Dewar, Louw & Povall, 2012). Rather, it implies that the structure and form of cities should "enhance positive urban activities and processes of urban life" (Dewar & Uytenbogaardt, 1991:19). In spatial terms, it refers to the equitable access to the opportunities of a city (Dewar, Louw & Povall, 2012:32). For Fainstein, equity occurs when those who are vulnerable and have limited choices are able to access a wide range of activities by foot or by public transportation (2005). Public transport and walkability increases accessibility to living and working opportunities. Furthermore, it is more environmentally sustainable as it reduces people's reliance on the use of private vehicles (UN-Habitat, 2013a:32).

4.3.3 Diversity and Choice

An equitable city can be evaluated according to its diversity and choice (Fainstein, 2010). Diversity in this instance refers to a people's ability to access a mix of land-uses and housing choices (Fainstein, 2010). Environments should offer a range of experiences and mix of uses for different income groups, as it enhances "the degree to which people can use a given place

for different purposes" (Bentley et al., 1985:9). Furthermore, diverse settlements relates to life-style choice. People should be able to choose to live in more urban spaces with greater intensities or greener areas with a lower intensity (Dewar & Uytenbogaardt, 1991). Secondly, the notion of choice has a modal component (Dewar & Todeshini, 2004). Modal choice, "provides people with a greater independence and control of their own lives by allowing them to fit their individual needs" such as travelling by foot, bike or public transport (Dewar & Todeschini, 2004:11).

4.3.4 Integration

In a country like South Africa that is characterised by fragmented urban environments, planning integrated and socio-spatial equitable settlements should be of paramount importance. The principle of integration is concerned with improving the components of a settlement in order to enhance their social, cultural and economic role (Dewar, Louw & Povall, 2012). The concept of continuity is central to the principle of integration and it relates to movement, the urban fabric and green space (Dewar, Louw & Povall, 2012).

Firstly, continuity of movement defines the lines of greatest accessibility in an area. Because of their accessibility, these movement lines are optimal locations for activities that require high degrees of exposure (Dewar, Louw & Povall, 2012). Naturally, activities that require the largest amount of public support will gravitate towards these places of highest accessibility. This tendency ensures that public facilities are used more effectively and are supported by a greater variety of people. Additionally, these movement lines can aid in connecting fragmented local areas together.

Secondly, continuities of urban fabric refers to the need to re-stitch disjointed and delocalised settlements. This can be achieved through continuities of movement such as activity corridors, to ensure that the urban fabric functions as a coherent system (Dewar, Louw & Povall, 2012). Thirdly, continuities of green space are needed for natural regeneration, biodiversity and habitat migration and selection. In addition, it is important to ensure that people have access to nature and its benefits (Dewar, Louw & Povall, 2012).

4.3.5 Sense of Place

There are a number of key features that contribute to the creation of a sense of place (Behrens & Watson, 1996). Firstly, the sense of place involves the identification and "celebration of the natural, cultural and historical uniqueness of different places" (Dewar & Uytenbogaardt, 1991:20). The diverse and unique characteristics of an area should be enhanced, as opposed to promoting uniformity (Behrens & Watson, 1996). Secondly, the quality of urban places should be balanced with natural systems in order to ensure that settlements are appropriately structured in accordance with the requirements of nature. Thirdly, the distinct attributes of a place should enhance the legibility of that area (Dewar, Louw & Povall, 2012). Legibility refers to how easily people can navigate and orientate themselves in an environment (Bentley, et al., 1985). The qualities of a place provide landmarks to the users of those environments and influence their overall "image of the city" (Lynch, 1960:46). Finally, the creation of "special places" should have a social and recreational function in order to enhance community life (Dewar, Louw & Povall, 2012:34). These special places act as an anchor point in communities and play a fundamental role in the creation of a sense of place (Behrens & Watson, 1996).

4.3.6 Safety and Security

The creation of settlements that are safe and secure should be a primary concern in the planning process. A lack of safety from crime and violence is a key factor that can negatively impact on the quality of an urban environment (Dewar & Todeschini, 2004). Persistent crime in an area can result in multiple socio-economic costs to a community, as it can discourage investment and cause social fragmentation (UN-Habitat, 2012c). Moreover, it has been found that poor quality urban environments can exacerbate these social issues (UN-Habitat, 2012c). Surveillance, or the concept of "eyes on and in the street" is a central element of urban design that can aid in crime prevention (Jacobs, 1993:277). Furthermore, elements such as exposure and legibility can enhance urban safety (Dewar, Louw & Povall, 2012).

The principle of safety also refers to the need for protection from natural hazards and vehicular accidents (Dewar, Louw & Povall, 2012). However, engineering concerns for safety "such as efforts to reduce conflict between cars and pedestrians can result in the creation of sterile and hostile environments (Dewar, 2011:243). Therefore, although planning for safety is important, it should not be done to the detriment of other urban performance qualities that contribute to the uniqueness and diversity of an area.

4.3.7 Efficiency

Efficiency, in the context of planning, refers to efficiency of resource use (land, water, energy) to the greatest degree possible in urban environments (Dewar, Louw & Povall, 2012). This principle has a number of implications for the urban form

of settlements. Primarily, it is concerned with finding a balance between the need for rapid mobility for freight and the need for accessibility via public transportation and NMT (Dewar, Louw & Povall, 2012). It also involves the promotion of a compact city form. The concept of "compactness" supports higher densities and reduces urban sprawl (UN-Habitat, 2013a). It also results in more resource-efficient environments, as the increased density of city or a region can aid in reducing the cost and provision of bulk services such as water, sewerage and electricity (Gasson, 2007). This principle adheres to a mix of land uses in an area, thereby encouraging and facilitating pedestrian movement between activities. This in turn can lead to a decrease in carbon emissions because of a reduced dependency on private vehicles.

In conclusion, this section identified the different qualities that are "central to positive urban performance" (Dewar & Uytenbogaardt, 1991:19). An examination of these qualities will aid in informing the planning and design of an area in Cape Town. This concept of place making will guide the layout of transport routes and the distribution of amenities in areas, to meet the needs of the people living there (Beherns & Watson 1996). The following section will discuss how these qualities inform and enhance the "nature of plan".

4.4. The Nature of Plan

The nature of plan is an essential planning tool that impacts on the quality of urban environments (Dewar & Uytenbogaardt, 1991). There are two different modes of thought about the appropriate nature of urban plans, namely programmatic and structural approaches (Dewar & Louw, n.d.). This section will outline these two different approaches to planning and design in order to discern how best to achieve the concepts of place making that were discussed in the previous section.

4.4.1 Programmatic Approach

Programmatic approaches to settlement making arose from the ideology of modernist planning (Dewar & Todeschini, 2004). This approach is primarily concerned with the distribution of land uses and it is guided by a "positivist, rational comprehensive" perspective (Dewar & Todeschini, 2004). In this approach the spatial requirements of an area are "scientifically" determined according to a range of thresholds to generate a spatial budget (Dewar & Louw, n.d.). The desired land use patterns are then more or less rationally divided and allocated in a settlement according to this logic (Friedmann, 2005). The process of settlement making is seen as a comprehensive and a "control-centred approach" that is aimed at achieving a more balanced urban environment (Sandercock, 1998:88).

However, a land-use driven approach to planning is "entirely ineffective" (Dewar, 2011:244). The settlements that result from this form of planning are inherently sterile and hostile environment. This is a consequence of a number of key assumptions made by the comprehensive or programmatic approach. The first is the notion that urban environments can be managed and controlled by "scientific knowledge and technology" (Njoh, 2008:20). In practice, the future form of cities cannot be predicted and based on premises and calculations (Dewar & Todeschini, 2004). The dynamics of urban growth are determined by numerous external factors. Therefore, when the conditions of an environment inevitably change, settlements are often left with large expanses of residual space waiting for proceedings to "catch-up" (Dewar & Louw, n.d.12).

The second is that comprehensive planning is based on the incorrect assumption that each land parcel has a desirable and optimal use (Dewar & Todeschini, 2004). Rather, a mix of different activities can and should be located in a variety of areas. The "static and rigid" nature of comprehensive plans only facilitates the prevention of activities from occurring (Todes et. al, 2010:415). Prescriptive land use planning cannot generate those urban activities that result from personal choice (Dewar & Todeschini, 2004).

Thirdly, programmatic approaches are primarily concerned with engineering efficiency, which takes precedent over the needs of people and the environment (Dewar & Louw, n.d.). As a result, the performance qualities that contribute to the vitality of urban environments are lost (Dewar & Todeschini, 2004). This tendency can be observed in the large numbers of residual spaces which are left behind in settlements, because planned social facilities such as schools and health amenities were not provided. When these facilities are provided, they are often poorly equipped and are not maintained. In developing countries such as South Africa, this is aggravated by the limited amount of financial resources that are available to satisfy the needs of people. Consequently, these spaces fragment the urban environment and are characterised by crime and violence.

Lastly, as this approach is based on the separation of different land uses. This results in the creation of large amounts of movement systems (Dewar & Todeschini, 2004). These routes are needed to connect the disparate land uses in a settlement. As a result, settlements are scaled to the needs of the car to optimise mobility (figure 4.2). Nonetheless, despite the negative consequences of programmatic approaches to planning, it is still widely adopted and practiced (Dewar, Louw & Parnell, 2013). Essentially, a shift in thinking is required in order to move towards a non-programmatic approach to planning.

Figure 4.2: Large Amounts of Vehicular Movement Needed to Travel in Cape Town (Source: Mccain, 2016).

4.4.2 Structural Approach

The central concern of the Structural approach (non-programmatic approach) is to enable the creation of positive urban environments that perform well for all their inhabitants (Dewar & Todeschini, 2004). This approach to planning is not static. Rather, it seeks to respond to the dynamics of change and growth through a better understanding of the needs of people.

Structural approaches are dissimilar to pragmatic approaches in a number of ways. Firstly they seek to enhance the quality of a settlement as a whole, instead of prioritising the function of any singular part (Dewar, 2011). It is recognised that in order for a settlement to perform well, compromises may need to be made. Secondly, this approach is centred on the creation of choices. Plans are enabling and flexible as opposed to being prescriptive. Thirdly, spatial distributions are not prescribed directly through a top-down approach. Instead, emphasis is placed on the "logic of access" in order to facilitate a set of broadly determined outcomes (Dewar & Todeschini, 2004:40). Fourthly, they are more concerned with "the accommodation and celebration of human activities in space" rather than land use planning (Dewar, 2011:244). Central to structural approaches are the concepts of structure, space and minimalism. These ideas will be discussed in further detail below.

Structure

Structure is the design tool traditionally used in settlement making to give order to the built environment (Dewar, 2011). The key elements of public structure consist of green space, all modes of movement, public facilities and services (Dewar & Todeschini, 2004). In planning and design, these elements are organised and synchronised to form "a geometry of point, line and grid" (Dewar, 2011:244). The geometry that is created are by the means in which these components are co-ordinated and provides a "system of locational choice" so that all activities can respond to this according to their own needs (Dewar & Todeschini, 2004:41).

A key component of the "spatial logic of structure" relates to the concept of access (Dewar, 2011:244). The geometry that is created through the organisation of the public elements of structure forms an "accessibility surface" across the built

environment (Dewar, 2011:244). This establishes a system of reference of higher or lower accessibility in an area. These different levels of access to various types of activities and facilities create a hierarchical and differentiated pattern of order. However, as every activity has its own requirements in terms of accessibility, these must be complied with in order to allow for the "efficient and viable" use of the activity (Dewar & Todeschini, 2004:42). These requirements refer to differences in the need for public exposure and privacy. Therefore, a structural system creates a logical order to which any activity can respond, thereby providing opportunity for a range of choices for to take place.

Space

At the centre of non-programmatic approaches to settlement making is the establishment of "complex, hierarchical networks of access that gather activities" (Dewar & Todeschini, 2004:44). Similar to a hierarchy of access, a hierarchical system of public spaces can contribute to the organising structure of settlements (Behrens & Watson 1996). High quality public spaces enhance community life and should contribute to the "identifiable character" of a place (Dewar & Todeschini, 2004:118). The hierarchy of public spaces creates a system for the logical position of public facilities. Facilities that require the greatest degree of exposure and use should therefore be located in highly accessible areas (Behrens & Watson 1996).

Structural approaches to the planning and design of settlements require that these various levels of hierarchy (of access and space) are seamlessly integrated into a framework. Frameworks aid in establishing "a logic of publicness and privacy, within which all activities… can find a place in terms of their own requirements for accessibility" (Dewar, 2011:244). It is recognised that the spatial quality of a framework positively contributes to the performance and spatial quality of an urban environment.

Minimalism

A key component of structural approaches is the concept of minimalism (Dewar, 2011). Structural plans should stipulate the minimal actions necessary to guide decision-making, while at the same time enabling flexibility for all stakeholders to "enrich the emerging reality" (Dewar, 2011:245). The principle of minimalism is central to plans for three reasons. Firstly, it enables frameworks to adapt to unanticipated circumstances. Secondly, it is process-orientated and qualitative. Structural approaches are not fixated with "comprehensive end-states" (Dewar, 2011:244). This approach encourages the creation of complex and integrated environments, as opposed to promoting monotony. Thirdly, it seeks to provide a variety of choice, thereby increasing people's accessibility to socio-economic opportunities. In developing countries such as South Africa, plans should disperse facilities and services as widely as possible so that a greater range of people can access the benefits of an urban environment. This principle relates to an increasing spatial justice and inclusivity.

In conclusion, programmatic planning approaches are rigid and make preconceived assumptions about the needs and movement of people (Todes, 2008). In reality, settlements are complex and dynamic environments. As a result, plans should accommodate the requirements of a variety of people who inhabit an area. Furthermore, structural plans should facilitate and enable the creation of settlements that are sustainable, flexible and that positively impact on the communities who live there (Watson & Agobola, 2013). The purpose of plan is to guide design making for all participants involved, while creating robust urban environments that are responsive to change and the needs of people (Dewar & Uytenbogaardt, 1991). The following section will examine how plans must adhere to relevant legislation that is prescribed by the state and province.

4.5 Legislative and Policy Context

This section outlines the legislative and policy context within which a development plan functions in South Africa. It will also present a brief overview of the themes and policy informants that give direction to planning interventions.

4.5.1 Key Legislation

It is a legal requirement that planning frameworks are aligned to national and provincial laws and policy (DRDLR, 2011). The key environmental and planning legislation that have a bearing on the formation of a development plan are outlined below.

The Constitution of the Republic of South Africa (Act 108 of 1996)

The Constitution "sets out the rights and duties of the citizens of South Africa" and delineates the structure and roles of the

three spheres of government (national, provincial and local) (CoCT, 2012a:14). It is also the supreme law of the Republic, meaning that any law or conduct, which conflicts with the Constitution, is invalid (Ogle, 2015a). In terms of spatial planning, each sphere of government must ensure that they give effect to the fundamental human rights outlined in the Bill of Rights of the Constitution. Some of these rights include: the right to the environment, housing, property rights, access to information and the right to just administrative action.

Spatial Planning and Land-use Management Act (SPLUMA, Act 16 of 2013) and the Western Cape Land Use Planning Act (LUPA, Act 3 of 2014)

The objective of SPLUMA is to provide a uniform and comprehensive system of spatial planning and land use management in South Africa (Ogle, 2015c). It also aims to integrate and align the roles and responsibilities of national, provincial and local spheres of governance (WCG, 2016). The purpose of LUPA is to consolidate legislation in the Western Cape Province that relates to spatial planning and to co-ordinate public investment. These two acts serve as a framework to regulate, maintain and promote normative standards and development principles for spatial planning (CoCT, 2015c). These principles should be considered when making planning decisions and aim to "guide the sustainable use and development of land" (Ogle, 2015:16). There are five key principles, these include: the promotion of spatial justice, resilience, sustainability, efficiency and fair administration (CoCT, 2015).

The National Environmental Management Act (NEMA, Act 107 of 1998)

NEMA relates to all fields of environmental management and protection, namely: resource conservation and exploitation, pollution control and waste management, and land use planning and development (Ogle, 2015b). The Act recognises the fundamental right to the environment as demarcated in Section 24 of the Constitution. It also outlines a set of principles that must be adhered to and applied when environmental plans are prepared or when decisions are made that relate to the protection of the environment (CoCT, 2012a). The principle of sustainable development is a key component of the Act. Some of the other significant principles include: precaution, prevention and "the polluter pays principle" (the costs of remedying environmental degradation) (Ogle, 2015b).

The Municipal Systems Act (MSA, Act 32 of 2000)

The MSA requires that every municipality formulate an Integrated Development Plan (IDP), of which a Spatial Development Framework (SDF) is a constituent (DRDLR, 2014). The objective of the IDP is to guide and inform spatial development and implementation through planning (Cullinan, 2016). It also outlines the municipality's budget and capital expenditure framework. Conversely, the SDF is a "cross-sectorial plan" and is required to correspond with the IDP (CoCT, 2012a:15). Furthermore, it must provide a long-term strategy for the municipality and "direct and coordinate public investment spatially through the five-year IDP" (CoCT, 2012a:15).

4.5.2 Policy Informants

A number of policy informants provide guidance and direction to spatial development proposals and interventions. The national, provincial and local policies and strategies that inform spatial planning in the Cape Town metropolitan are outlined below.

National Development Plan (2011)

The aim of the National Development Plan (NDP) is to "eliminate income poverty and reduce inequality" by 2030 (WCG, 2013:11). The NDP outlines spatial priorities to enhance the nation's capabilities. These include focusing on urban and rural transformation, improving infrastructure and enhancing environmental sustainability and resilience (WCG, 2013). Aspects of the NDP that relate to human settlements and are focused on improving public transport, developing settlements closer to economic opportunities, as well as increasing employment opportunities in informal settlements (National Planning Commission, 2012). Of particular relevance to the Cape Town context is the plan's advocacy to increase urban densities, prevent the development of housing in isolated locations and to transform the national space economy.

Western Cape Provincial Spatial Development Framework (2013)

OneCape 2040 establishes a long-term economic vision for the Western Cape Province. This vision is aligned with objectives set out by the NDP and Western Cape Government's Provincial

Strategic Objectives (PSOs) (Drakenstein Municipality, 2014b:14). OneCape 2040 aims to realise a vision of "a highly-skilled, innovation driven, resource efficient, connected, high opportunity and collaborative society" (WCG, 2013:12). The Provincial Spatial Development Framework (PSDF) delineates specific policies in order to realise the OneCape 2040 vision. The PSDF aims to a create a "resilient, inclusive and competitive Western Cape with higher rates of employment producing growing incomes, greater equality and an improved quality of life" (WCG, 2013:12).

Cape Town Integrated Development Plan (2012-2017)

The City of Cape Town's Integrated Development Plan (IDP) formulates a "strategic framework that guides the municipality's planning and budgeting" over a five-year period (CoCT, 2015:8). The objective of the IDP is to make the city a more inclusive place to live by improving the economic independence of its citizens. This necessitates that the municipality provides economic opportunities "in which investment can grow and jobs can be created" (CoCT, 2015:8). Furthermore, the vision of the IDP is to provide quality services to all residents in the city. The municipality aims to achieve these objectives by expanding on the pillars of: the opportunity city, the safe city, the caring city, the inclusive city and the well-run city. These five pillars aid in identifying the priority areas in the city and towards which they will allocate funding.

Cape Town Spatial Development Framework (2012)

The purpose of the Cape Town Spatial Development Framework (SDF) is to plan for and manage future growth and change in the city over a twenty-year period (CoCT, 2012b). This plan ensures that growth occurs in a sustainable and equitable manner (CoCT, 2015). The SDF outlines the "spatial ideas and building blocks" that will inform decision-making and that will give affect to the future vision for Cape Town (CoCT, 2015:14). This vision states that by 2040 Cape Town will be:

A place of possibility and innovation, with a diverse urban community and all the opportunities and amenities of city life, within a natural environment that supports economic vibrancy and inspires a sense of belonging in all (CoCT, 2012b).

4.6 Conclusion

The values, principles and normative planning approach discussed in this chapter have provided the direction for the proposal of a development framework to be outlined in the chapters that follow. These factors should be considered when making planning decisions, as they aim to guide the equitable and ecologically sustainable use and development of land. This chapter has identified the performance qualities that enhance urban environments. These qualities inform the planning and design process and spatially give affect to the values and principles that have been discussed. Finally, this chapter examined the legislative and policy context with which the development frameworks must comply. Chapter five will expand on this theoretical framework, delineate the strategies required to plan for and accommodate urban growth.

5. Urban Growth Management: Towards a Sustainable Urbanisation Model

The previous chapter outlined a theoretical framework to guide decision-making and development interventions. The key urban challenges to be found in these global cities were identified. Arguably, the greatest challenge that faces human settlements is urbanisation and the associated needs that it accrues. In developing countries such as South Africa, its cities are characterised by unsustainable and inequitable spatial patterns, urbanisation and population growth which continues to place more pressure on these already prevalent issues (CoCT, 2015a). Therefore, it is necessary to plan for and accommodate growth in South African cities. This chapter outlines the approaches required in order to manage urban growth more sustainably in the city of Cape Town. These include the promotion of the concept of a more compact city form through Transit-Oriented Development (TOD) and corridor intensification.

5.1 A Compact City

Cape Town's population is expected to increase from 3,7 million in 2011 to 5 million people by 2030 (CoCT, 2012a). This represents a growth rate of approximately 3% per annum (CoCT, 2012a). This growth trajectory combined with limited municipal resources and high levels of unemployment suggests that informal development will continue to increase. In addition to the challenges of urbanisation and population growth, Cape Town is characterised by social exclusion and separation (Provoost, 2015). As discussed in previous chapters, Cape Town's sprawling and fragmented urban fabric is ecologically, economically and socially unsustainable. Therefore, a new approach is required in order to accommodate growth and to address the legacies of socio-spatial fragmentation in the city. This can be achieved through the implementation of a compact city form.

5.1.1 The Need for Compaction

The principle of compaction promotes higher built areas and residential population densities (UN-Habitat, 2012b). The objective of this spatial form is "to intensify urban economic, social and cultural activities" in order to improve the sustainability of a region's natural, urban and rural environment (UN-Habitat, 2012b:13). There are a number of benefits associated with compaction. One of these benefits includes a decrease in air pollution as there is less need for vehicular movement (UN-Habitat, 2012d). Secondly, the increased density of a city can aid in reducing the cost and provision of bulk services such as water, sewerage and electricity (Gasson, 2007). However, in addition to these advantages, there are four key reasons that make compaction an imperative in "unmaking the spatial vestiges of apartheid" (Provoost, 2015:38).

Firstly, the rate of poverty, inequality and unemployment in Cape Town is significantly high (Provoost, 2015). In order for people to become financially independent, they are required to generate income through small business ownership (Dewar, 2000). However, small businesses need "intensive, vibrant local markets" in order to flourish (Dewar, 2000:212). When cities are compact and intensive, they have higher population thresholds to support economic endeavours (CoCT, 2012b). Furthermore, densification reduces the distances that need to be travelled between economic transactions, this factor thereby decreases the costs for low-income households to start or own small enterprises (UN-Habitat, 2012d).

Secondly, more than two thirds of households in South African cities do not own a car (Moosajee, 2014). Therefore, pedestrian movement is the only form of affordable travel for most city dwellers (Dewar, 2000). This necessitates that cities accommodate the needs of the pedestrian by creating humanly scaled urban environments that are accessible by foot. Arguably, the principle of compaction can aid in improving spatial justice as it increases accessibility to socio-economic opportunities within the city (CoCT, 2012b). Dense city forms also provide the thresholds to support the provision of efficient and affordable public transport systems (UN-Habitat, 2012b). Thus, the principle of compaction can increase connectivity as well as providing a variety of movement choices for a number of different users.

Thirdly, Cape Town is characterised by a racially homogenous, "fragmented patchwork of gated communities, poor townships and even poorer informal settlements" (Provoost, 2015:38). Hence, there is a great need for social inclusion and integration. In a compact city there should be a mix of land uses and housing choices thereby facilitating and encourage social integration (UN-Habitat, 2013). Dense urban environments could improve

equality in Cape Town by situating people closer to public amenities, employment and training opportunities. This would directly assist the poor, who mostly live on the periphery of the city, by saving the large financial and personal costs of travelling to and from employment (Turok, 2011). Therefore, the creation of a liveable and "culturally diverse central city with a lively public realm and shared services" could encourage social interaction and improve inclusivity throughout the city (Turok, 2011:12).

Fourthly, fertile agricultural land and critical biodiversity areas are being consumed by sprawl and outward expansion (Turok, 2011). Urban development places pressure on the city's valuable natural resources, which are also areas of great scenic beauty and amenity (CoCt, 2012b). Additionally, sprawl necessitates large amounts of transport movement throughout the city and therefore increases the amount of air pollution that is emitted (CoCt, 2012b). Contrariwise, a compact city form supports the protection of environmentally sensitive and agricultural land, as less land will need to be developed. It necessitates that land is developed only in areas that are identified and suitable for urban growth (UN-Habitat, 2012d). As a result, the promotion of a compact urban form in the city of Cape Town will aid in combating the effects of and discourage sprawl.

5.1.2 Obstacles to Compaction

From an examination of the above key urban challenges in Cape Town, it is evident that there is greater need for compaction. However, in order to increase urban densities in the city there are a number of social and economic difficulties that need to be considered (Fataar, 2015). Firstly, the revenue of government officials is dependent on taxes on land development (Dewar, 2000). Therefore, this has established a perspective that "any development is positive" (Dewar, 2000:216). As a result, private developers have monopolised the land market and continue to shape the spatial structure of the city (Provoost, 2015).

Secondly, due to the high price of land in the inner city and the need to respond to housing backlogs, subsidised housing is persistently developed on "cheaper peripheral land" (Dewar, 2000:217). This is aggravated by the national housing policy that endorses low-density spatial patterns of development (Fataar, 2015). Subsidised housing promotes the model of one single dwelling unit per household with a minimum plot size of 300-450m2 (Dewar, 2000). This limitation "makes a mockery of legislated calls for compaction" (Dewar, 2000:217).

Thirdly, urban densities are decreasing as people aspire to live in suburbia (UN-Habitat, 2012d). Suburban living represents the image of a "good urban life" (Dewar, 2000:210). This image is formulated by people's contemporary experience of urbanity (Schoonraad, 2000). As a result, South Africans have "anti-urban values" and desire to live in low-density areas with large gardens (Schoonraad, 2000:227). Furthermore, people resist the idea of living in a compact city because of misconceived perceptions as to what it may look like (UN-Habitat, 2012b). High-densities are often thought to be synonymous with overcrowding and congestion (UN-Habitat, 2012b). Therefore, it is necessary to radically shift mind-sets as to the advantages of living in a dense, intensive and mixed-use built environment.

For Turok, compaction could "provide the means to shift the growth trajectory of [the] city in a more efficient, equitable and sustainable direction" (2011:3). However, in order for this to occur, policies and practices need to be altered. This requires "political will" to support the need for compaction in South African cities (Dewar, 2000:217). The recently approved Integrated Urban Development Framework (IUDF) aims to achieve this by guiding urban growth towards a "sustainable model of compact, connected and coordinated towns and cities" (WCG, 2016:16). The next section outlines the ways that a compact city form can be realised as well as some of approaches outlined in the IUDF.

5.2 Promoting a Compact Urban Form

The promotion of a compact urban form, although essential, cannot be applied everywhere throughout the city (Dewar, 2011). Intensification will need to be applied selectively to begin the implementation of the restructure of the spatial form of Cape Town. It is argued that there are two key approaches that aid in achieving greater compaction, these include corridor development and TOD (UN-Habitat, 2012b).

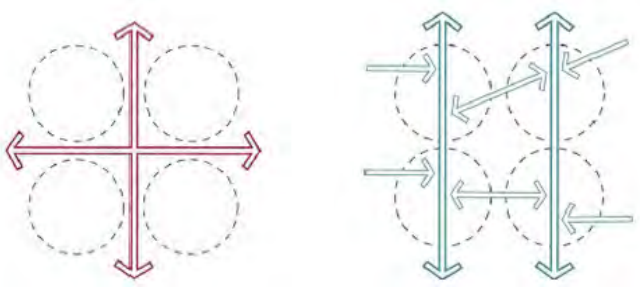
5.2.1 Urban Corridor Development

For Turok, there are three significant structural components of cities, "employment, housing and the transport connections between them" (2001:2350). These elements have a profound effect on the degree to which cities function efficiently and equitably (Turok, 2001). They are vital resources for people, as their access to them has a proportional affect on their standard

of living (Turok, 2001). Therefore, it is necessary to consider the role of transportation and movement as a structuring component in South Africa's settlements (Dewar & Todeschini, 2004). Urban corridors can be seen as a means to achieve this, as their objective is to increase mobility and restructure the cell-like forms of the modernist city (Dewar & Louw, n.d.).

Urban corridors represent "a broad band of mixed-use activity continually intensifying around one or, more commonly, a hierarchically interlinked system of transportation routes or spines of different degrees of continuities" (Dewar, 2011:245). This interlinked system of routes knits together the local communities that they pass through. Thereby, breaking down the introverted nature of neighbourhood cells (Dewar, 2011). Thus, urban corridors act as "space integrators", as they connect communities along their length (Dewar & Todeschini, 2004:59). Corridors are the antithesis of limited-access routes or "space bridgers" that create barriers between communities (Dewar & Todeschini, 2004:59). Space bridgers are designed to carry large numbers of people over expansive distances and contribute to dividing up the city into disparate "boxes" or cells (Dewar & Todeschini, 2004:59). This concept is illustrated in figure 5.1.

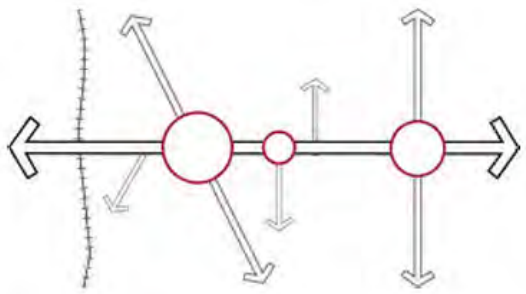
Figure 5.1: Space Bridgers to Space Integrators (Source: Botha, 2015)



In addition to connecting communities, corridors encourage intensive activities to agglomerate or cluster along its length (Dewar, 2011:245). Activities that require the greatest accessibility will converge at different points, resulting in a hierarchy of activities. These different activities form energy points along the spine of the corridor and grow together over time like "beads on a string" (Dewar, 2011:245) (Figure 5.2). This concept aids in integrating communities by linking people with key activities and destinations (Mammon & Ewing, 2006). Furthermore, corridors support a "rhythm of stopping and moving", which creates opportunities for personal interaction and encounter (Mammon & Ewing, 2006:5). Ideally, corridors should accommodate a range of movement options, specifically NMT and public transport thereby increasing accessibility to a greater range of activities along its length. This also increases equitable access to different parts of a city, as inhabitants are not limited to using services within their local area.

Moreover, corridors consist of "hierarchically differentiated systems of larger and smaller corridors" (Dewar, 2011:245). Smaller corridors correspond to and traverse the main corridor

Figure 5.2: Illustration of an Urban Corridor Concept Developing along a "String of Beads" (Source: Botha, 2015)



spine and encourage NMT flows. Public facilities, such as schools, increase the amount of pedestrian and bicycle movement along these minor routes. Therefore, these facilities should be strategically positioned and clustered in order to ensure that adjoining walkways and cycle lanes are as safe as possible.

However, high residential densities are integral to achieving adequate thresholds to support public amenities, public transportation and commercial activities along urban corridors (UN-Habitat, 2012b). It is argued that densification should predominately occur along public transport routes and in and around urban nodes and modal interchanges in order to increase these thresholds (UN-Habitat, 2012b). The City of Cape Town's densification policy outlines ways that greater compaction can be achieved within areas of the city (figure 5.3). These include developing areas such as greenfield sites that correspond to the municipality's planned growth direction (CoCT, 2012b).

The concepts discussed above, explored the role of individual corridors. However, the concept of an urban corridor can also be used to examine the city as a whole, this can be utilised to understand how contemporary spatial patterns move and are situated across the urban fabric. Corridors should never be seen as a singular entity; rather their role should be examined as "part of an emerging system of corridors" (Dewar, n.d.64). A greater understanding of corridors within the larger city system can aid in identifying underperforming areas in need of public investment. Therefore, this approach is a powerful mechanism in the co-ordination of both economic and spatial planning budgets (Dewar, 2011). This approach can be applied as a tool

to restructure areas within a city through greater intensification around an interconnected system of larger corridors (Dewar, 2011).

The implementation of a number of different initiatives can strengthen corridor development and intensification (Dewar, 2011). These initiatives range from housing infill projects to the improvement of public transportation, NMT and quality public facilities along the length of a corridor (Dewar, 2011). However, it is important to note that corridors cannot be seen as short-term solutions to development problems (Dewar & Todeschini, 2004). Rather they are the result of more intensive activities responding to flows of movement (Dewar & Todeschini, 2004). Furthermore, the success of urban corridors is "dependant on their frequent start-stop nature" (Dewar & Todeschini, 2004:66). These points of intersection attract a number of large and small-scale activities and enable pedestrians to traverse the route.

To summarise, there are a number of benefits associated with corridor development. Firstly, corridors facilitate "equity of access" (Dewar, 2011:246). Increased densification along corridors supports the provision of efficient and affordable public transportation. Secondly, corridor development breaks down barriers between communities. The reduced distances between activities increases accessibility to services and facilities and encourages interaction and integration between people (CoCT, 2012c). Thirdly, corridor intensification supports small business generation. Points of higher and lower intensity attract different levels and types of private investment, which foster a mix of formal and informal economic and social opportunities (Dewar, 2011). Hence, it can be argued in the context of Cape Town, where there is a great need for integration and access to socio-economic opportunities, the application of a corridor approach has the potential to enhance "equitable urban access and urban restructuring" (Mammon, 2005:35).

5.2.2 Transit-Oriented Development

The IUDF aims to manage urban growth in South Africa through the promotion of compact city form and Transit-Oriented Development (TOD) (WCG, 2016). TOD refers to "development that is physically oriented to a public transport station" (UN-Habitat, 2013:32). The underlying principle of TOD is to support not only public transportation, but also the most essential forms of movement, cycling and walking (ITDP, 2014). TODs also promote higher densities around transport nodes, which increases accessibility to living and working opportunities (UN-Habitat, 2012d). Therefore greater intensification around transport nodes attracts a mix of land uses and supports the provision of high quality public spaces (UN-Habitat, 2012d).

The above features of TOD have numerous interconnected advantages. Firstly, station-area development that is compact and dense enables more people to live, work, or go to school within walking distance of a station (MARTA, 2010). By increasing access to public transport, TODs decrease the amount of time and money spent travelling and enable residents to save more of their income. They also reduce the need to use private vehicles and are therefore more environmentally sustainable (UN-Habitat, 2013). It is estimated that TODs can lower car use by half and save households approximately 20% of their income that they would have spent on car-related expenses (UN-Habitat, 2012d). Furthermore, increased densities around stations will support the cheaper provision of bulk services such as water, sewerage and electricity, thereby improving resource efficiency.

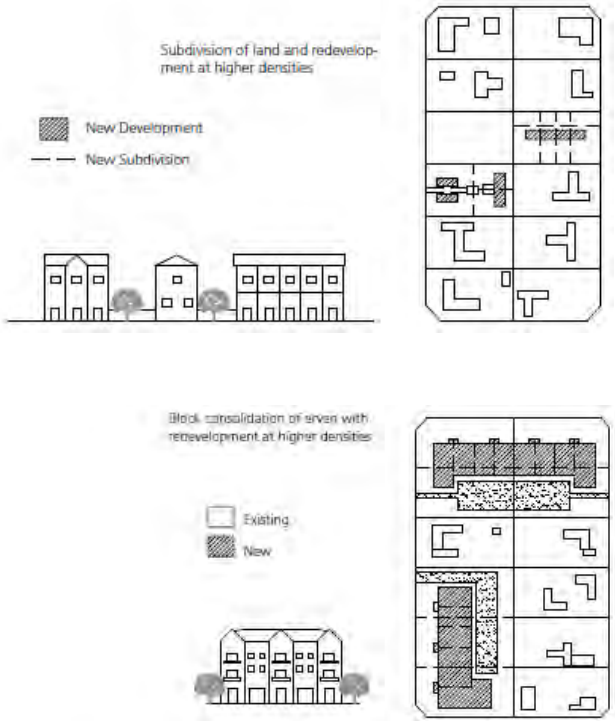


Figure 5.3: Subdivision of Land and Redevelopment at Higher Densities
(Source: UN-Habitat, 2012d)

Secondly, TOD encourages pedestrian movement (MARTA, 2010). TOD is predominantly positioned within a radius of 800m from a transport stop, which translates to a comfortable walking distance of 10 minutes (UN-Habitat, 2012d). In order to ensure that TOD is safe and comfortable for pedestrians, the notion of liveability and humanly scaled environments is brought to the forefront of settlement design. Furthermore, landscaping, street-lighting and public spaces are used to enhance the quality of the public realm. In this instance "the street becomes an extension of a neighbourhood's liveable space – a place to walk, chat and play" (UN-Habitat, 201a3:32). As a result of TOD, the movement of cars becomes secondary to the movement of people (UN-Habitat, 2013a). The prioritisation of NMT also increases connectivity at human scale, which strengthens inter-relationships between communities (UN-Habitat, 2013a:30).

Thirdly, TOD should provide "a rich mix of land uses" around stations (MARTA, 2010:6). When there is a clustered mix of uses and activities within an area, such as residences, workplaces and retail, daily commutes become shorter and more walkable (ITDP, 2014). By offering a wide range of uses that function at different times, streets become more lively and safe (ITDP, 2014). This in turn encourages more pedestrian and cycling activity, which creates "a vibrant human environment where people want to live" (ITDP, 2014:23). A mix of uses also relates to a mix in housing prices. Providing residents with a range of affordable housing options for different income groups increases choice and promotes inclusivity. The following precedent is an example of the application of the TOD.

Precedent: Medellin, Colombia

In 2004, a Metrocable system was installed in the city of Medellin and was "the world's first modern urban aerial cable-car public transport system" (UNEP) (figure 5.4). Before this transport system was put in place, the city was characterised sprawling growth, poor living conditions and crime hotspots (Coupe, Brand & Davila, 2013:55). This intervention enabled residents who previously had limited access to the inner city to move more freely throughout the region. According to UN-Habitat, "improved access has stimulated employment and social integration" as well as saving residents large amounts on daily transport costs (2012b:125).

In the context of Cape Town, the implementation of TOD could aid in addressing the limitations of accessibility throughout the city. It arguably has the potential to restructure unbalanced spatial patterns by increasing mobility via public transportation and NMT, allowing people to move more easily and quickly throughout the city. Not only does TOD increase accessibility, but it also reduces traffic congestion and carbon emissions as fewer cars will need to be used (CoCT, 2012b). This will aid in preserving air quality and will protect environmental assets and ecosystems. Lastly, by providing residents with a wide range of choices through the promotion of mixed-use environments, this will enable Cape Town to become a more equitable and inclusive place.

Figure 5.4: Metrocables in Medellin Colombia
(Source: Coupe, Brand & Davila, 2013)

5.3 Conclusion

In Cape Town, it is essential that future growth is planned for in an equitable and sustainable manner in order to enhance the "benefits for people, the environment and the economy" (CoCT, 2012a:26). In this chapter the principle of compaction was identified as a potential model for restructuring and shaping urban growth in the city. Two approaches were examined to aid in the implementation of compaction; these include corridor development and TOD. It was argued that if these two approaches were actualised, Cape Town could become a more accessible and integrated urban environment. The principles and approaches that were discussed will be used to make a case for the intensification and restructuring of underperforming parts of the city in the chapters that follow.

6. Metropolitan Framework

As argued previously it is essential to plan for growth and respond to the urban challenges found in Cape Town. This chapter seeks to establish a development framework to aid in the spatial reconstruction of the city. In order to achieve this, a “package of plans” approach will be adopted to give direction to this framework (Dewar, Louw & Povall, 2012:25). This involves analysing the Cape Town study area at three scales: metropolitan, sub-metropolitan and a precinct scale. From these analyses a conceptual framework will be formulated to guide future development strategies and interventions.

6.1 Contextual Analysis

In order to plan for future growth in Cape Town, it is necessary to understand the context of the region. This section will analyse the primary elements of public structure that make up the metropolitan study area. These elements include Cape Town’s natural systems, movement systems and higher order institutions.

6.1.1 Natural Systems

The city of Cape Town functions “within a set of interlinked natural systems” (UN-Habitat, 2012c:13). Human life is dependent on these natural systems or resources such as biodiversity, water and land (UN-Habitat, 2012c). Additionally, Cape Town’s unique mountains, coastline and landscapes contribute to making the city “desirable place in which to live” (CoCT, 2014:133). The natural environment also forms a large part of the tourism economy and acts as a social, recreational and educational amenity. Hence, it is necessary to examine the connections between the city’s built environment and the natural environment in which it is located. This understanding will aid in determining where development should not occur in order to preserve and protect the city’s natural resources capital.

Figure 6.1: Natural Systems (Source: Author, 2016; GIS Technical Library, UCT)

Biodiversity

Cape Town lies within the Cape Floristic Region (CFR) (CoCT, 2014b). The CRF has been declared by UNESCO as a world heritage site and it is "the smallest yet most biologically diverse of all of the plant kingdoms" (CoCT, 2015a:43). It has also been identified as a "global biodiversity hot spot" as it has one of the largest amounts of endemic species in the world (CoCT, 2015a:43). Over 70% of its plant species are unique to this region (CoCT, 2014b). It is a region of local, provincial and international ecological importance, as well as an economic resource in terms of tourism for the municipality.

However, over two thirds of the natural vegetation within Cape Town is classified as "endangered" or "critically endangered" and more than 300 plant species are vulnerable to global extinction (CoCT, 2014b:143). A large extent of biodiversity loss is attributed to urban and agricultural growth over the last century. As a result, many critical biodiversity areas are susceptible to increasing fragmentation and isolation. The fragmentation of an area "disrupts ecosystems and natural processes", which impacts negatively on their functioning (UN-Habitat, 2012c:10). It is critical to ensure the protection of the city's natural resources as without them, the ecosystem services and benefits that they provide will be degraded and lost.

Water

Rivers and wetlands are arguably the most important ecosystem services in Cape Town as they are needed for agricultural production, industrial and domestic use, as well as providing recreational and cultural benefits. The quality of water in the municipality is of significant concern, as it can impact on aquatic life, freshwater ecosystems and the export market for agricultural goods (CoCT, 2014b). Furthermore, produce that is irrigated with water that is of poor quality cannot be imported into the European Union (Europegap standards) (WCG, 2015). A large number of Cape Town's rivers and coastal waters have been ecologically degraded as a result of alien vegetation, urban development and agricultural activities (river modification, water abstraction and runoff of pollutants) (WCG, 2015:33). Additionally, an increase in urbanisation and resulting development pressure have contributed to the "declining quality of water resources" (CoCT, 2012b:22).

Further, South Africa is a water-scarce environment. In Cape Town, the greatest challenge is to retain the existing water and sanitation services, while also providing new services to a growing population in an ecologically sustainable manner. This involves equalising the urban demand for water with the supply for agriculture and food production (CoCT, 2014). Combined with the effects of climate change, such as the predicted decline in rainfall and the increase in temperature, it is likely that water scarcity will increase in Cape Town (WCG, 2013). Therefore, water demand management is crucial in order to ensure that water resources are protected and used as efficiently as possible.

Land

Urban expansion in the city of Cape Town is increasing at a rapid rate. Approximately 650 hectares are consumed per year, however there is evidence that this growth is slowly decreasing (CoCT, 2012b). It is estimated that development will take up all the land that is suited to urban growth in the next 50 to 60 years (CoCT, 2012b). As a result, agricultural and biodiversity resources are likely to become gretaly endangered. Urban sprawl has eroded significant natural environments and agricultural land has become reduced to "islands" (WCG, 2016:79). The loss of agricultural land poses a threat to food security in the city, specifically will the loss of land situated closer to urban markets.

6.1.2 Movement Systems

Accessibility is central to "achieving an urban form that is environmentally sustainable, socially equitable and inclusive" (UN-Habitat, 2013:27). Research has also shown that accessibility is critical in developing a service economy (CoCT, 2014b). In a country like South Africa, where a large proportion of the population will never own a car, affordable public transportation should be an essential structuring element of the city. This section examines the movement limitations in Cape Town as well as the different forms of transportation used throughout the city.

Radial Movement Patterns

The city of Cape Town has developed in a radial pattern and requires large amounts of movement to access commercial, employment and residential activity (CoCT, 2012b). Urban growth has expanded from the centre of city outwards towards the north and north-west, as well as towards the south-east with the establishment of townships and informal settlements. Due to the city's radial pattern, the road network and transport system is highly inefficient and this is exacerbated by infrastructure upgrading backlogs and a lack of maintenance. These backlogs then further limit movement, particularly between the south and north of the city (CoCT, 2012b).

Inefficient Public Transportation

A large number of Cape Town's facilities and employment opportunities are located in the western and northern part of the city. Because of the lack of public transport and poorly serviced railway system, many of the poorer residents living in peripheral areas do not have sufficient access to these services. These spatial inequalities hinder economic development and perpetuate social fragmentation. Commuters who live far from the city centre and other major economic nodes can also expect to travel an average of 60 to 90 minutes a day (CoCT, 2014b). Further, the cost of public transportation for the low-income population accounts approximately 45% of their monthly household income (TCT, 2015). If the spatial inequalities in the city are not addressed, the cost of public transportation will continue to consume already limited household budgets, restricting access to employment, education and social amenities.

In addition, the quality of public transportation in Cape Town is synonymous with "declining quality in terms of service infrastructure, reliability and frequency" (CoCT, 2012b:23). In particular, passenger rail is overcrowded and underserviced (TCT. 2015). Moreover, public transportation does not operate as an integrated system as each mode of movement falls under the responsibility of a different spheres of government. As a result, it is difficult to switch from one travel mode to another (Dewar & Louw, n.d.). Further to this the population densities using public transport are too sparse which creates a less efficient public transport and infrastructure provision.

Car Dependency

As a result of Cape Town's sprawling spatial form and "decaying formal public transport services" there has been a resultant increase in the minibus taxi industry and private car use (Schalekamp, 2010:92). The use of private and company vehicles increased from 37,8% in 2009 to 42% in 2012 (CoCT, 2014b). Over the same period, minibus and metered taxis were the second most used mode of transport, followed by trains and buses. This has far reaching consequences as private cars and minibuses require more road space to carry the same number of passengers (Schalekamp, 2010). These modes of transport consume large amounts of non-renewable forms of energy that contributes to air pollution.

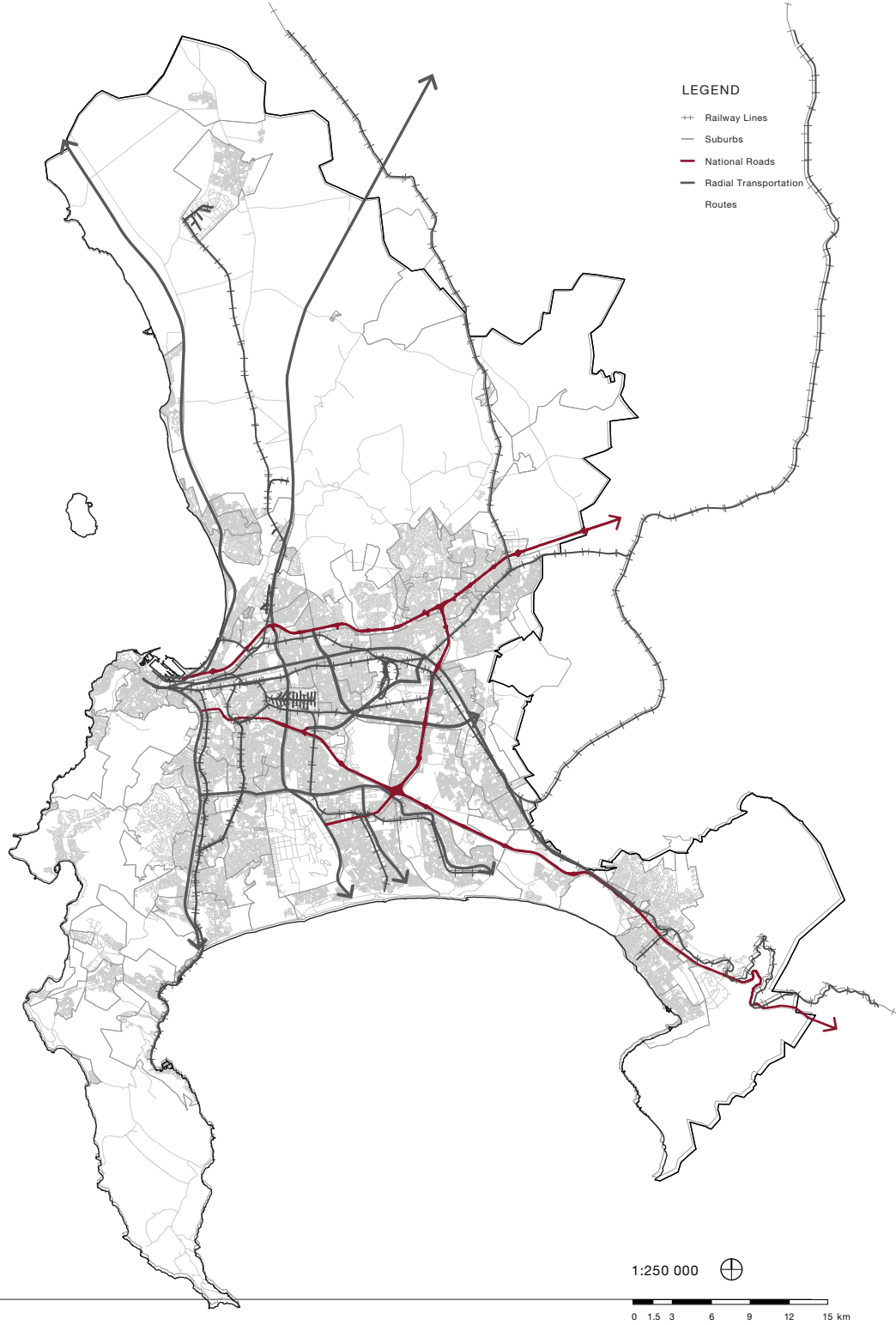


Figure 6.2: Radial Movement Patterns (Source: Author, 2016; GIS Technical Library, UCT)

Congestion

The structure and form of the city has generated excessive amounts of movement and has resulted in costly infrastructure, energy consumption and social separation. Consequently, traffic congestion is "an intensifying feature of daily life" (Dewar & Louw, n.d.55). Freight movement and travel during peak hours of the day increases congestion at interchanges and on busy roads (CoCT, 2012b). This contributes to carbon emissions, wastes personal time and money and decreases economic performance (CoCT, 2009). Therefore, in order to reduce private car use and transport-related air pollution, it is necessary to enhance existing public transport systems. This will also increase accessibility throughout the city and ensure that transport is more efficient and ecologically and financially sustainable.

6.1.3 The Economy

The equality of a city is arguably dependent on its ability to distribute the benefits and opportunities resulting from economic growth to all citizens. However, as a result of the rapid increase in urbanisation in Cape Town it is necessary to stimulate the economy in order to continue to create employment opportunities and to allow for reinvestment. This section will examine the economic performance of the city of Cape Town, as well as its sector trends. These trends have implications for the spatial form and structure of the metropolitan. Their affects need to be considered in order anticipate future needs and where development might occur.

The Regional Economy

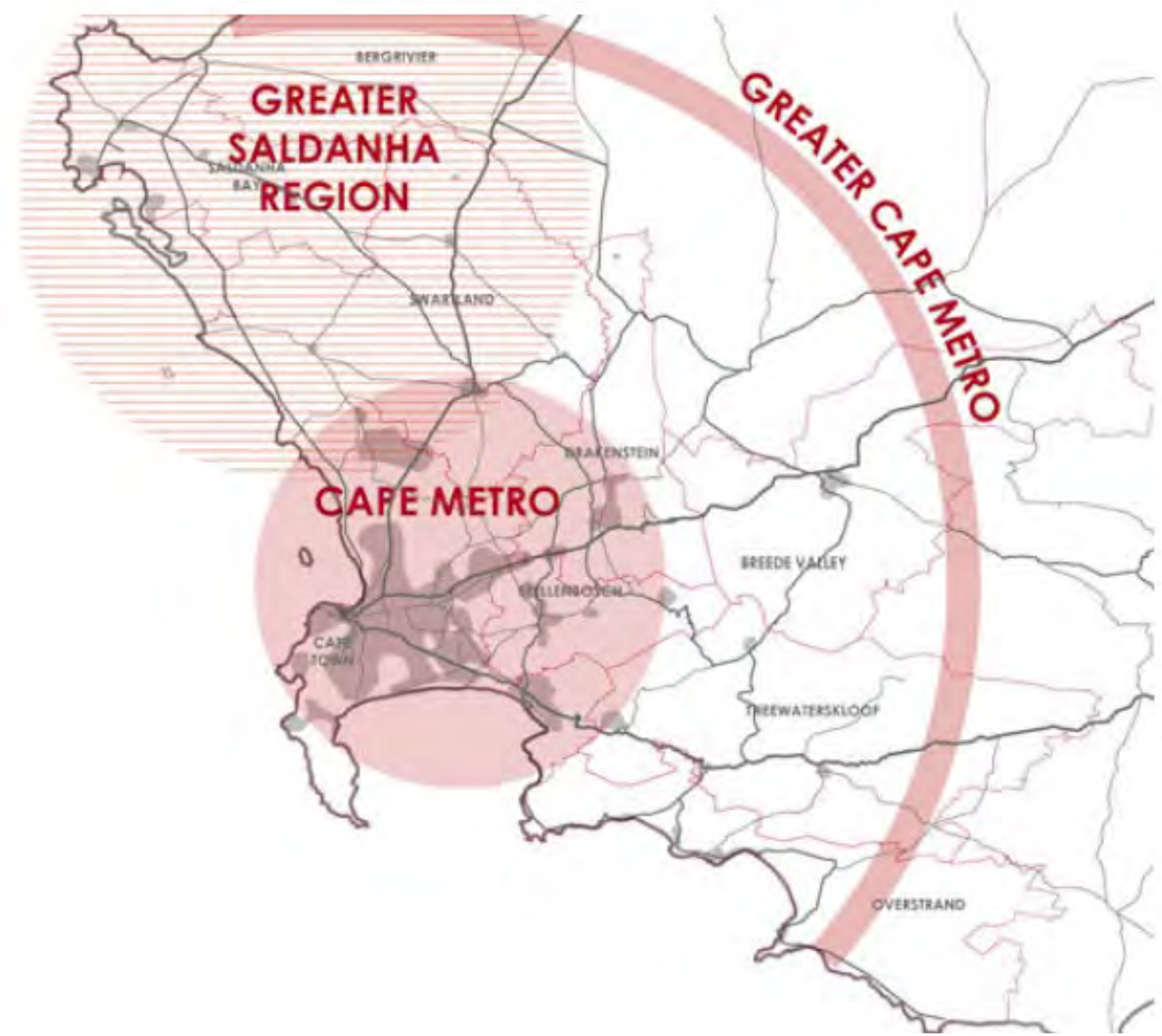


Figure 6.3: The City within a Region (Source: WCG, 2016)

Cape Town is the second largest economy in South Africa, it accounts for 73% of the Western Cape's GDPR (WCG, 2015). The economy in Cape Town extends across its municipal boundaries and is interdependent on the surrounding municipalities in the Western Cape Province (CoCT, 2012b). Cities and towns such as Saldanha, Malmesbury, Paarl, Stellenbosch and Hermanus, which are found within a 100 km radius of Cape Town, make up the city's functional region (Figure 6.3). Some of the principle regional economic interdependencies include a commuting labour force, transport infrastructure and the agricultural and tourism areas surrounding the city (CoCT, 2012b). Furthermore, the city's close proximity to its port, airport and other city logistics systems are an important contributor to its economic growth.

Cape Town's regional market is comparatively small in relation to the global economy; therefore connections between national and international markets are crucial for city firms (CoCT, 2012b). However, as a result of the close linkages between Cape Town, the municipalities in the Western Cape Province and the national economy; the city is impacted upon by the current state and the economic fluctuations in the national economy (WCG, 2015). The global economic recession had a significant affect on the regional economy. The city has managed to grow at a rate of 1,5% per annum during "the recessionary period" (2008 - 2009) (WCG, 2015:20). Nonetheless, its growth rate between "the recovery period" (2010 - 2013) of 2,7% per annum has been unable to meet its 2005 - 2013 trend growth rate of 3,4% (WCG, 2015:20).

Sector Trends

Cape Town's overall growth is dependent on different sector trends and their growth rates (WCG, 2015). Cape Town has moved towards a largely service driven economy, with an increase in the finance, business services, wholesale and retail trade and transport and logistics. Whilst other sectors such as agriculture and manufacturing have shown a decline in growth (CoCT, 2014a). The manufacturing sector has declined at rate of 0,8% (CoCT, 2014a). This statistic does not reflect the lack of importance of this sector, but rather the de-industrialisation of Cape Town. Due to the change in focus of various industries in the region, many workers have inappropriate skills sets as result this contributes to unemployment. Hence, emphasis should be placed on skills development in order to ensure that there is inclusive economic growth in the city.

Urban Form

Cape Town's CBD is the largest business, tourism and cultural centre in the city, Bellville CBD is the second most predominant economic node in the metropolitan and has a significant number of service sector activities and public institutions (CoCT, 2012b). Most economic opportunities are found within these two nodes. However, with an increase in the finance and the service sectors there has been a rapid growth of decentralised nodes such as Century City and Tygervalley. This reveals a demand for new office development and indicates a "long-term shift towards a polycentric city" (CoCT, 2014a:117).

The spatial dynamics of the city are characterised by both nodal and linear forms (CoCT, 2012b). Linear in terms of economic activities that are concentrated along urban corridors that radiate outwards from the CBD, such as Voortrekker Road that connects to the Belleville CBD. Other urban corridors include Main Road that extends out to the Southern Suburbs and Durban Road that extends to the Tygervalley area. These corridors present opportunities for economic intensification, connecting significant nodes throughout Cape Town. Voortrekker Road specifically accounts for a large percentage of employment across all sectors of the economy and is described as the "economic backbone" of the city (CoCT, 2015a:15).

As a result of the city's radial transportation routes there are generally poor north-south movement linkages in Cape Town. This limits connectivity to economic nodes and corridors, especially for the poorer communities in the Metro Southeast (Khayelitsha, Mitchells Plain, Delft, and Nyanga) Moreover, very little formal economic activity occurs in these areas, as private investors continue to avoid the south-eastern areas of the city (CoCT, 2012b).

The informal sector accounted for 9% of the total number of people employed in 2013 (CoCT, 2014a:110). Informal economic activity takes the form of wholesale and retail trade, transport and communication and informal agriculture. Because of the high level of unemployment in Cape Town and recent job losses because of the decline in agriculture and manufacturing industries, more people are likely to start working in the informal sector. However, there is currently a lack of informal trading infrastructure and traders are largely

confined to overcrowded low-income areas (CoCT, 2012). Many workers in the informal sector carry out their businesses in unprotected and unsecured places and this forms a significant feature in the urban environment in towns and cities. Nonetheless, the informal economy can be seen as a means to reduce unemployment, therefore it is essential that the informal sector is strengthen and supported.

6.1.4 Public Institutions

Public institutions and facilities "provide an essential collective support system for the urban population" (CoCT, 2012b:74). If these facilities are easily accessible, they have the potential to increase the quality of life of citizens (CoCT, 2014a). Therefore, it is necessary to ensure that in a resource-constrained country such as South Africa, that amenities and services are accessible and socially inclusive for all residents. This section will examine some of the higher order public institutions in Cape Town and how well these facilities service the population.

Healthcare

Good health is fundamental to achieve and maintain a high standard of living. Cape Town has a number of healthcare facilities situated in the metropolitan area. These include: 10 hospitals, 41 community day centres, 96 fixed clinics and 27 mobile clinics (WCG, 2015). The statistics indicate that Cape Town appears to be well serviced in terms of health care facilities. However, the dispersal of facilities and services within the municipality may limit accessibility to services depending on geographic location. Figure 6.4 represents the distribution of institutions and facilities within the city and indicates that the Metro Southeast is underserviced. Yet, this area has one of the highest population densities in the city and makes up more than a third of the municipality's population (CoCT, 2012b:25). Therefore, Cape Town can be described as a spatially inequitable city as public facilities are unequally spread throughout the metropolitan (CoCT, 2012b:20).

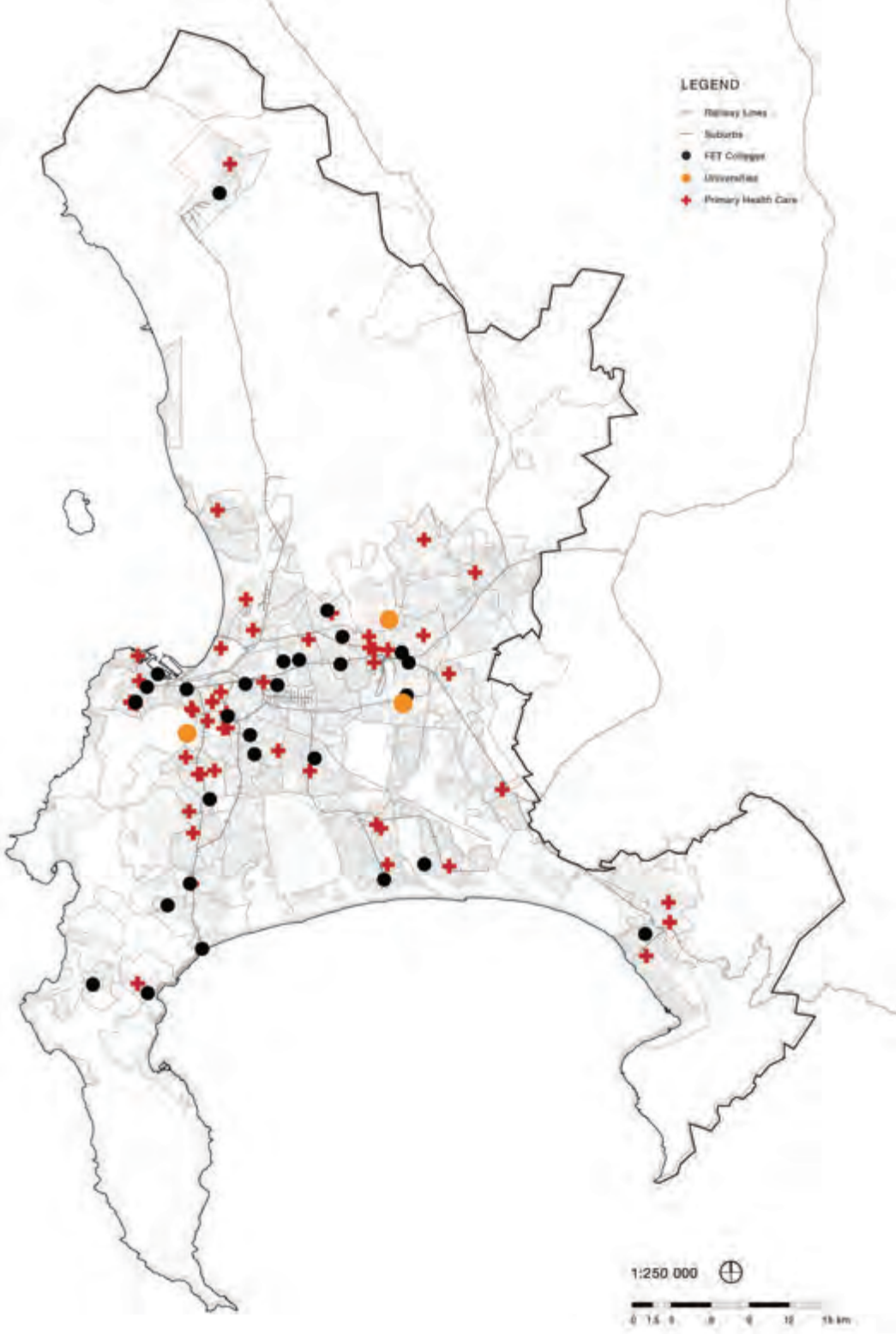


Figure 6.4: Distribution of Public Institutions in Cape Town
(Source: Author, 2016; GIS Technical Library, UCT)

Education

Education and training can improve career opportunities and has a direct influence on income. An improvement in the population's education can lead to an increase in employment, income and municipal revenue (WCG, 2015:4). Education can be considered one of the most important means to enhance competitiveness in the economy (WCG, 2015:4). Economies are increasingly being driven by knowledge and innovation and this requires skilled people. Cape Town has a total of 27 public Further Education and Training (FET) Colleges located in the city (WCG, 2015:6). In addition, there are a number of universities found within the metropolitan, these include: the University of Cape Town (UCT), the University of the Western Cape (UWC), the Cape Peninsula University of Technology (CPUT) and the University of South Africa's smaller campuses. However, most of these tertiary facilities are located in the northern part of the municipality as indicated in figure 6.4. This means that some students are required to travel long distances in order to access higher education.

An examination of the natural systems, movement and public institutions in this section has identified a number of key challenges within Cape Town. This analysis will aid in developing a metropolitan conceptual framework for the city. This framework will determine how best to plan for future growth, whilst responding to and addressing the existing problems and needs within the municipality.

6.2 Conceptual Framework

The above analysis examined the spatial structural elements of the city, namely the city's natural systems, movement systems, economy and public institutions. The ways that these elements interconnect creates opportunities for spatial intervention at various scales. This section will outline a conceptual framework that aims to achieve a compact urban form and structured urban growth. This framework will establish the manner in which natural resources can be preserved and protected. Additionally, actions will be presented to restructure the inequitable spatial form of Cape Town in order to ensure that there are more balanced levels of services and a more decentralised distribution of economic opportunities. This conceptual framework will guide development strategies and interventions and will aid in identifying a site for future development in the city.

Figure 6.5: Proposed Green Space Corridor (Source: Author, 2016; GIS Technical Library, UCT)

6.2.1 Natural Landscape and Resource Framework

Ecological sustainability is necessary to support life and it involves the conservation of natural resources (Pieterse, 2011). Cape Town's natural assets need to be protected and preserved to safeguard critical ecological processes that are needed for living organisms as well as for agriculture production. In times of climate change and water scarcity, the city's ecosystem services must be conserved in order to support agricultural related industries and to increase food security. Furthermore, Cape Town is renowned for its rich biodiversity and indigenous vegetation. Natural attractions such as Table Mountain, the Kirstenbosch Gardens and the city's numerous wine farms situate Cape Town as a popular tourist destination, which contributes to the local economy.

A city's growth can impact negatively on the natural environment. However, an ecologically sustainable urban form can be achieved by reducing the city's ecological footprint and by optimising the benefits received from natural systems (UN-Habitat, 2012b). This framework aims is to guide development so that agricultural soils, important biodiversity and ecosystems are conserved. It also endeavours to protect the aesthetic quality and character of landscapes for residents to benefit and enjoy. This requires that environmental impacts are mitigated and that the pollution of land, air and water is reduced. Moreover, in order to combat the effects of climate change, the city's existing natural resources need to be utilised in a more efficient and ecologically sustainable manner.

Likewise, the spatial form of the city should be improved to become more compact, thereby preserving natural resources such as valuable agricultural land and water. Development should only occur in areas of low ecological value "to protect ecological processes that provide ecosystem services" (UN-Habitat, 2012c:18).

A hierarchical network of green systems is fundamental to achieving "liveable" and compact cities (UN-Habitat, 2012b:20). An interlinked system of natural environments, ranging from extensive agriculture to a small play park, should stipulate the main structuring elements of an urban settlement (Dewar & Kiepiel, 2012:31) (figure 6.6). Using a system of green corridors, this framework aims to connect the various landscapes in Cape Town and to determine where development should be restricted (Dewar & Kiepiel, 2012). Green corridors promote connectivity between natural systems and species and allow them to move between environments (Forman, 2008). This concept prevents ecological fragmentation and protects elements of the natural landscape, such as aquifers, streams and vegetation (UN-Habitat, 2012c). It is argued that an open space network should be established in Cape Town in order to connect the different biodiversity habitats found within the city (figure 6.5). This network can use man-made elements such as parks and tree-lined streets as part of its corridor network or it can consist of natural elements such as agriculture, wetlands and rivers (UN-Habitat, 2012c).

This framework proposes that by enhancing the open space network in Cape Town that environmentally degraded areas can be rehabilitated and restored. This can be achieved by protecting critical biodiversity and ecosystem services through the concept of interconnected green corridors, which will aid in strengthening fragmented natural environments and ecosystems (UN-Habitat, 2012c). Water resources should also be restored and managed by implementing buffer zones around 1:100 flood lines in order to protect hydrological systems from urban development and the dumping of waste and chemicals. Buffer areas can provide valuable habitats for aquatic species and they can also function as recreational spaces (CoCT, 2014).

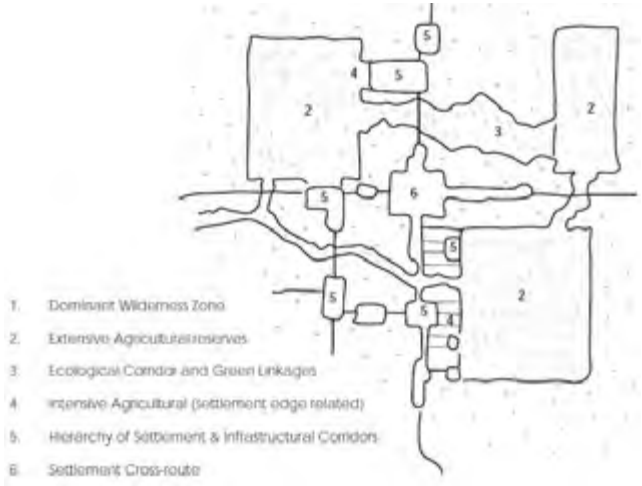


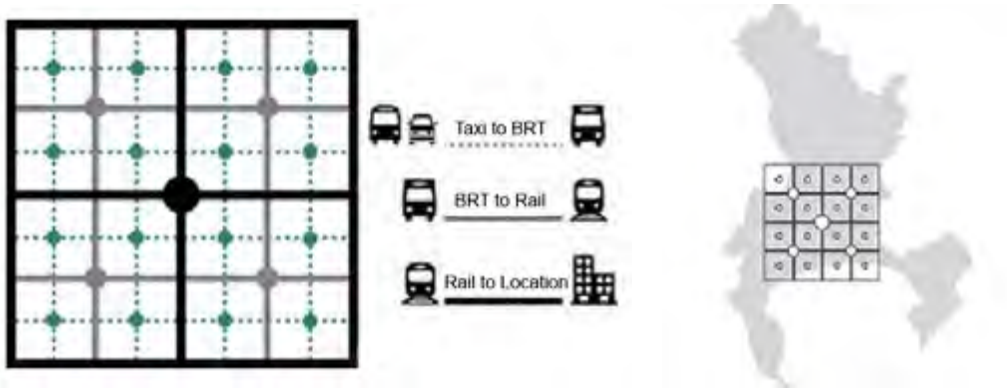
Figure 6.6: Maintaining the Balance Between Landscapes (Source: Dewar & Kiepiel, 2012)

6.2.2 Urban Corridor Concept

The city's spatial form is characterised by radial transport routes and sprawling, fragmented settlements with few mobility options between them. These characteristics restrict access to socio-economic opportunities in particular the lower-income residents living in the Metro Southeast. Furthermore, accessibility is limited between the northern and southern parts of the region due to the barriers formed by the railway lines and highways that create limited access routes. In order to address these spatial inequalities, accessibility must be enhanced in order to make Cape Town a more equitable place to live.

Increased accessibility can be achieved by reorganising the spatial form of the city through an integrated transport system and a multidirectional accessibility grid. The objective of this concept is to increase connectivity to all parts of the city through the integration of different modal interchanges and feeder systems that close the city's open-ended, radial transport networks. Using the concept of an accessibility grid, a hierarchy of movement will be established and informed by the distances that need to be travelled to different services, facilities and places of employment (figure 6.7). Ideally the city's population will be able to access a public transport interchange within a 1,5 km walking distance (Behrens & Watson, 1996). This concept aims to reduce private car dependency and to maximise choice and efficiency (CoCT, 2012b). Moreover, the purpose of this grid is to cohesively unify and structure Cape Town's public transport system so as to facilitate efficient and seamless movement from rail to BRT (Bus Rapid-Transit), to feeder networks (taxi's and minibuses), to forms of NMT.

Figure 6.7: Diagram Representing an Accessibility Grid Concept (Source: Botha, 2015)



This concept will require upgrading the existing railway system and enhancing linkages and stations that can accommodate high volumes of passengers. Furthermore, the BRT system should run alongside major development routes and act as feeder service to the railway system. In addition, safe and demarcated NMT paths should be created so as to encourage walking and cycling. The aim of this framework is to increase accessibility, allowing people to move more easily and quickly throughout the city and in turn it will reduce traffic congestion and carbon emissions (CoCT, 2012b).

Another concept related to movement systems involves enhancing existing connecting routes and identifying new accessibility linkages in the city. This can be achieved by applying an urban corridor concept at the metropolitan scale. The existing role of emerging corridors in the city can be intensified in order to connect impoverished parts of the city (figure 6.8). The resulting form creates a grid-like network, connecting and integrating the city's existing radial movement channels. Furthermore, these routes can be enhanced so as to attract private and public investment, which can facilitate the generation of economic and social opportunities. This will aid in the creation of new economic nodes, dispersing economic growth so that it is not only centred in the existing urban cores. Therefore, a more equitable spatial regional form can be realised. Urban corridors also provide the means to enable compaction along their routes, thereby promoting the sustainable use of resources and preservation of the natural environment.

Of particular relevance to this concept is the role of the Voortrekker Road Corridor. Positioned between the Cape Town and Bellville CBDs, it has the potential to strengthen the connections between these two economic nodes. By enhancing the role of this corridor through high-intensity urban development, a mix of different land uses and public transport services will be

supported (CoCT, 2012b). By further activating this activity route, north and south through linkages can be enhanced, thereby connecting the fragmented form of the city. Furthermore, Voortrekker Road has been identified as one of the city's "integration zones", a strategic area delineated for targeted investment (WCG, 2016:57). These zones are prioritised for compaction and TOD. The next chapter will explore the role of this corridor in greater detail, as a means to restructure and unlock the economic potential of Cape Town.

6.2.3 Public Institutions

The contextual analysis studied in the previous section determined that public facilities are unequally distributed throughout Cape Town (CoCT, 2012b:20). In order to make settlements more integrated and equitable, it is necessary to increase accessibility to the opportunities and services available in the city. These must be clustered at strategic places (Dewar & Todeshini, 2004:55). As noted in the previous section, the hierarchy and distribution of public facilities should be determined by the hierarchy of the accessibility grid. Therefore, they should converge at points of the highest accessibility such as transport interchanges (CoCT, 2012b:34). This will also enable the multi-functional use or sharing of facilities. Sporting facilities can be grouped with community halls, libraries and clinics to ensure that they are accessible to the greatest number of people. This is crucial to "increase the efficiency and sustainability of social service delivery" (Dewar & Todeshini, 2004:58).

In order to achieve this concept, this framework promotes the clustering of public facilities adjacent to or in walking distance of TOD. The process through which these mixed-use nodes can develop around public transport interchanges is illustrated in figure 6.9. It depicts the grouping of public facilities and connecting them along the accessibility grid, which can then be reinforced through the establishment of a green network. This concept will aid in integrating public transport systems and NMT with public spaces, to better connect adjacent

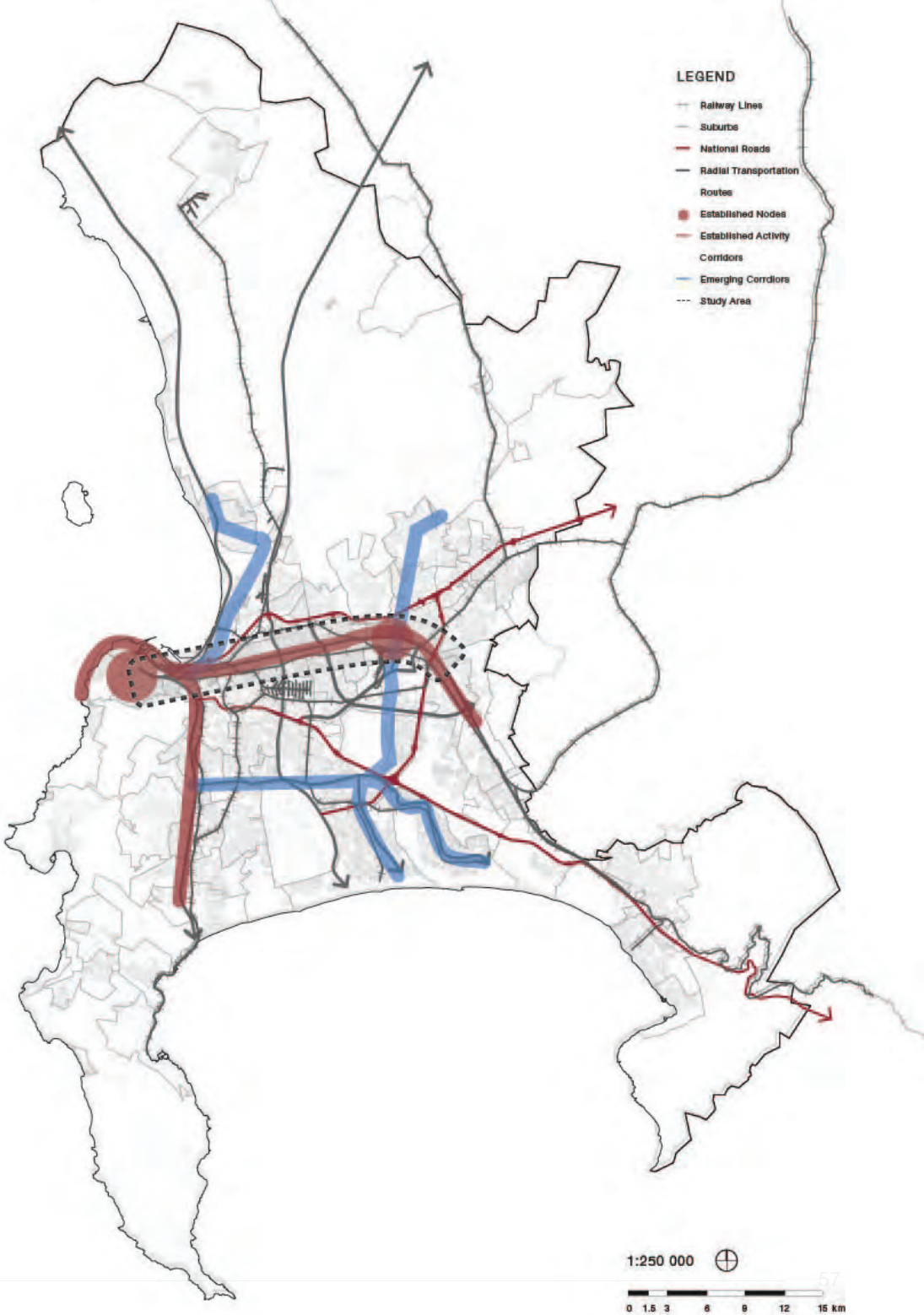


Figure 6.8: Closing the System through Urban Corridors (Source: Author, 2016; GIS Technical Library, UCT)

communities and increase accessibility to Cape Town's cultural and natural assets. It is also essential to improve the population's access to quality education in order for people to enter the formal job market. Hence, this concept will improve the population's access to education by linking facilities with transport nodes.

6.3 Conclusion

This chapter analysed the metropolitan context of Cape Town according to the structuring elements of green systems, movement systems and public institutions. This analysis aided in the formulation of a conceptual framework to guide spatial growth and to address the city's fragmented, sprawling and segregated urban structure. It was proposed that three concepts could aid in addressing these challenges. These concepts include: an open space network, an accessibility grid with intensified corridors and the clustering of facilities around TOD. Voortrekker Road Corridor was identified as a key activity route within the city that arguably has the potential to restructure Cape Town's spatial form. The next chapter will move down in scale to further analyse the role of the Voortrekker Road Corridor in promoting spatial equality and economic opportunity in the metropolitan.

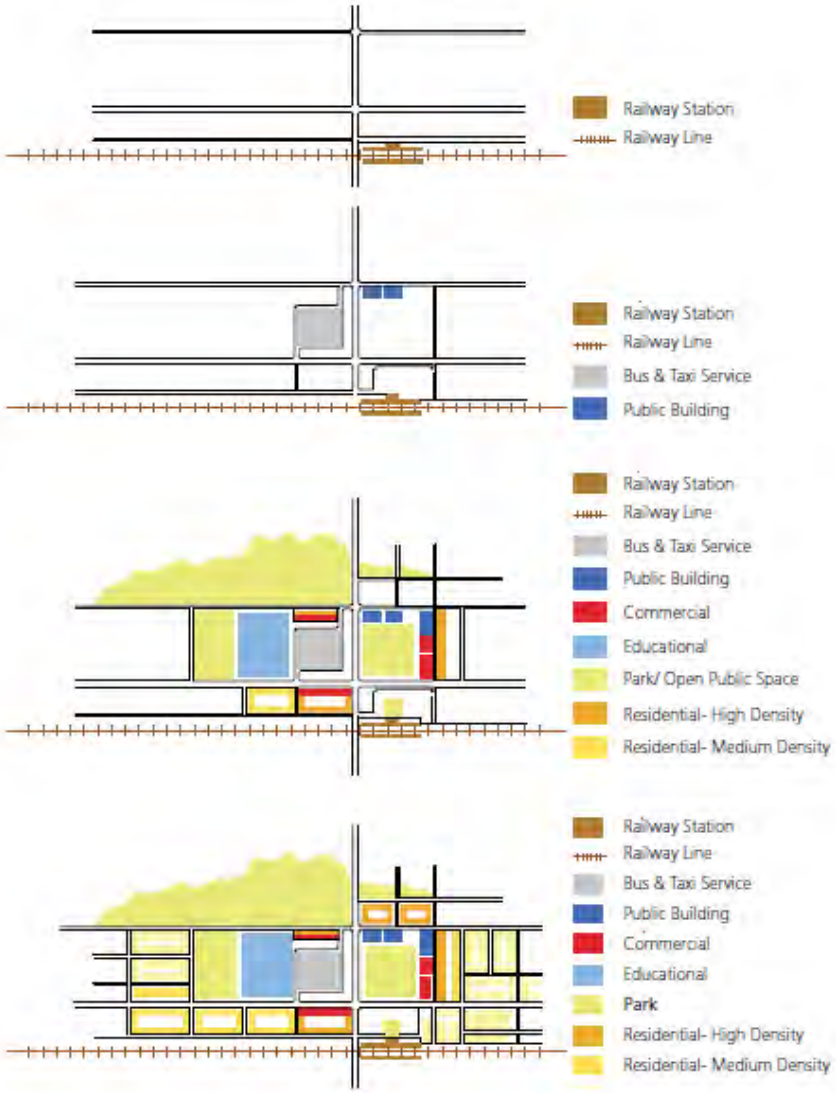


Figure 6.9: The progressive development of a node around transport interchanges (Source: UN-Habitat, 2012b).

7. Voortrekker Road Corridor Development Framework

Cape Town is a growing city, but it is also a city that is deeply fragmented and characterised by spatial and social inequalities (Harrison & Todes, 2015). In order to respond to growth and to address the existing inequalities and spatial fragmentation, a range of interventions are needed. Building on the metropolitan framework discussed in the previous chapter, this section will examine the role of the Voortrekker Road Corridor in Cape Town. This analysis will aid in formulating a development framework that provides interventions of prioritised investment to restructure the City's spatial form and to increase equality throughout the city. This chapter will also inform the selection of a strategically located priority area to establish a precinct within the corridor for further design attention.

7.1 Locating Voortrekker Road Corridor in Cape Town

The Voortrekker Road Corridor is approximately 16 km in length and is located between Salt River Circle and Stikland Bridge this is the geographic centre of the municipal area (ULI, 2014). Due to its central location, it is described by the city as the "urban core corridor", connecting Cape Town's and Bellville's CBDs along its length (CoCT, 2012b:34). The corridor also supports a large proportion of the city's formal and industrial employment opportunities (CoCT, 2014). In addition, the corridor is anchored by a transport system that supports mixed-use activities, such as retail, commercial, industrial and residential uses (TCT, 2014).

Urban corridors that connect local areas, specifically those that carry public transportation and allow stopping in movement along their length, "represent important energy flows in cities" (Dewar & Louw, n.d.58). The Voortrekker Road Corridor is one of the economic backbones of the city and is a vital activity route within Cape Town (CoCT, 2012b:15). There is potential to enhance its role and shift the spatial dynamics of the metropolitan area (CoCT, 2012b). The corridor presents an opportunity to connect surrounding areas of Cape Town through the intensification of activities along its spine and the creation of a linked network of TODs. This would increase accessibility through the city towards surrounding disadvantaged and neglected areas, particularly in the Metro Southeast. This framework argues that increased accessibility through and along the route can unlock opportunities for strengthened economic development and environmental management in the region. The enhancement of the Voortrekker Road Corridor could therefore connect residents to areas of socio-economic opportunity and encourage socio-spatial integration.

7.2 Historical Development of Voortrekker Road Corridor

The contemporary form and function of Voortrekker Road Corridor is a reflection of historical urban development in Cape Town (CoCT, 2014b). It is identified as the most "mature corridor in the city". It originated as a wagon path in 1680, providing connections to the port of Cape Town and the agricultural hinterland in Paarl, Stellenbosch and Malmesbury (CoCT, 2012b:34). In 1860 the railway line was introduced and it supported commercial, residential and industrial growth around stations (GTP, 2014). As a result, the smaller towns centres of Maitland, Goodwood, Parow and Bellville were formed along the route (GTP, 2014).

However, by 1945 the prevalence of private vehicles began to dominate the growth of the city, which resulted in sprawling growth towards the northern suburbs and the construction of high-speed movement routes such as the N1 highway in the 1950s). Later, this led to the expansion of decentralised office and retail mall development (CoCT, 2014b). Shopping centres such as Tygervalley Centre (1985), N1 City (1989), Canal Walk / Century City (2000) were constructed at interchanges along the N1. This led to decline in the retail and economic development along the corridor. Before the N1 highway was constructed, Voortrekker Road was the primary access road connecting Cape Town's city centre and Bellville's CBD (GTP, 2014). Nonetheless because of its strategic location it has the potential to be used as a catalyst to restructure the city.

7.3 Contextual Analysis

In order to focus the development framework, it is necessary to examine the role of Voortrekker Road Corridor in terms of the broader natural and urban systems that were discussed in the previous chapter. This section begins with an analysis of the site's biophysical landscape in order to determine where development should not occur. This analysis will be followed

by a study of the movement systems, public services and institutions and settlement patterns. This section concludes by identifying the key opportunities and constraints located within the Voortrekker Road Corridor.

For the purpose of this dissertation, the study boundary of the Voortrekker Road Corridor is defined by walkability. In a city where the majority of the population does not own a car, the city's residents should be able to access its opportunities and benefits optimally by foot or via public transportation. For this reason, the width of the corridor is defined as a 1,5 kilometre strip on either side of Voortrekker Road. This distance enables a comfortable walking distance of approximately 20 minutes (Behrens & Watson, 1996).

7.3.1 Biophysical Systems

The biophysical environment of any area is a combination of four interconnected systems: land (soil and geology), water, climate and biodiversity (Gasson, 1998). An analysis of these systems will aid in determining where land could be developed or where the natural environment should be protected and conserved. A set of criteria has been formulated to ascertain the development potential within the Voortrekker Road Corridor in terms of these categories (table 7.1).

No-Go or Keep assets intact: Development should be restricted in these areas, as the resources are vital in supporting human and natural life as well as economic activity (DEADP, 2011). These resources also include natural or cultural heritage assets.

Tread lightly: Only low-impact development should be considered in these areas, as these resources are sensitive to certain forms of man-made or environmental impacts such as soil erosion or flooding (DEADP, 2011).

Suitable for development: The biophysical systems do not fall into either of the above categories and could therefore support urban development (DEADP, 2011).

	Guidelines	Criteria	Indicator	Development Restrictions
Geology	Avoid geological hazards	Foundation Conditions		No-Go
Soils	Development and Foundation conditions	Clay Content	15%	Suitable
	Preserve natural conditions	Agricultural Potential	Medium to Higher	Tread lightly / Opportunity
	Preserve natural conditions	Building Sand		Suitable
Topography	Avoid steep slope development	Slope	9 degrees	Moderately suitable
	Avoid developing ridges		9-15 degrees	Unsuitable
Climate	Avoid areas exposed to prevailing winds	High Point Hilltops	Avoid wind exposed peaks	No-Go
	Avoid cold slopes		SW-NE axis	Mitigate with design measures
	Avoid cold and wet slopes		South Facing slopes	No-Go
	Avoid developments in frost belts	Prone in River courses	S-E facing slopes	No-Go
Hydrology	Hazard avoidance	Wetlands		No-Go
	Protect river and ground water quality	Large rivers	30 to 50m buffer	No-Go
		Minor rivers	15 to 30m buffer	No-Go
		Flood plains		No-Go
		Aquifers	Sensitive / threatened	No-Go
Biotic Systems	Protect	Biodiversity Areas	Core 1 and Core 2	No-Go
			Buffer 1 and Buffer 2	No-Go
			Intensive Agriculture	Tread lightly / Opportunity
		Metropolitan Open Space System	Non-negotiable priority areas	No-Go
	Migration of species		High Priority	No-Go when linking areas of Biodiversity
			Medium Priority	
			Partial Open Space	

Table 7.1: Land suitability criteria (Source: Author, adapted from Gasson 2007)

Geology

The rock formations of an area form “the foundation of its physical environment” (CoCT, 2011a:5). An area’s geology is determined by hydrological and weathering systems, which influence the varieties of soils and the indigenous fauna and flora of an area (Oberholzer, 2011). The geology of Voortrekker Road Corridor is characterised by two geological types: Malmesbury Group shales and Sandveld Group sands (CoCT, 2011b). The Malmesbury Group consists of dark grey mudstones and lighter coloured sandstones that are found on the foot slopes of the Tygerberg and Durbanville Hills. The Sandveld Group is a result of windblown sand: it is made up of reddish-grey, unconsolidated quartzose aeolian sand located in the central portion of the corridor. Neither of these forms is geologically unstable: they offer no constraints to development.

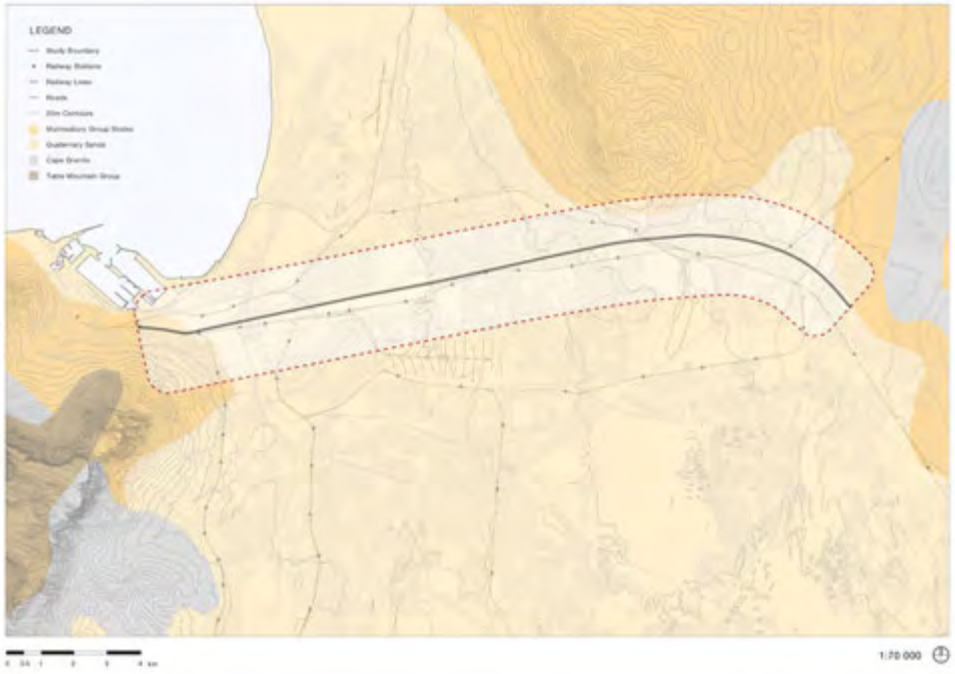


Figure 7.1: Geology (Source: Author, 2016; GIS Technical Library, UCT)

Soils

The formation of soils is influenced by climatic processes and the “mechanical and chemical weathering” of different geological rock types (CoCT, 2011a:9). Soils have two significant functions. They support both plant and animal life, and economically they have the potential to support agricultural production (Oberholzer, 2011). A large proportion of the corridor is covered by soils with a diagnostic ferrihumic horizon, which are bleached sandy soils (CoCT, 2011b). These soils have the potential to be hardened or cemented and therefore are suitable for development. There are areas in the corridor with red and yellow apedal soils that are “structureless and generally nutrient poor”. They are therefore not appropriate for agricultural production (CoCT, 2011a:9). The Tygerberg Hills have highly variable soils that are suited for agriculture. This land should be protected from urban development in order to conserve its properties.

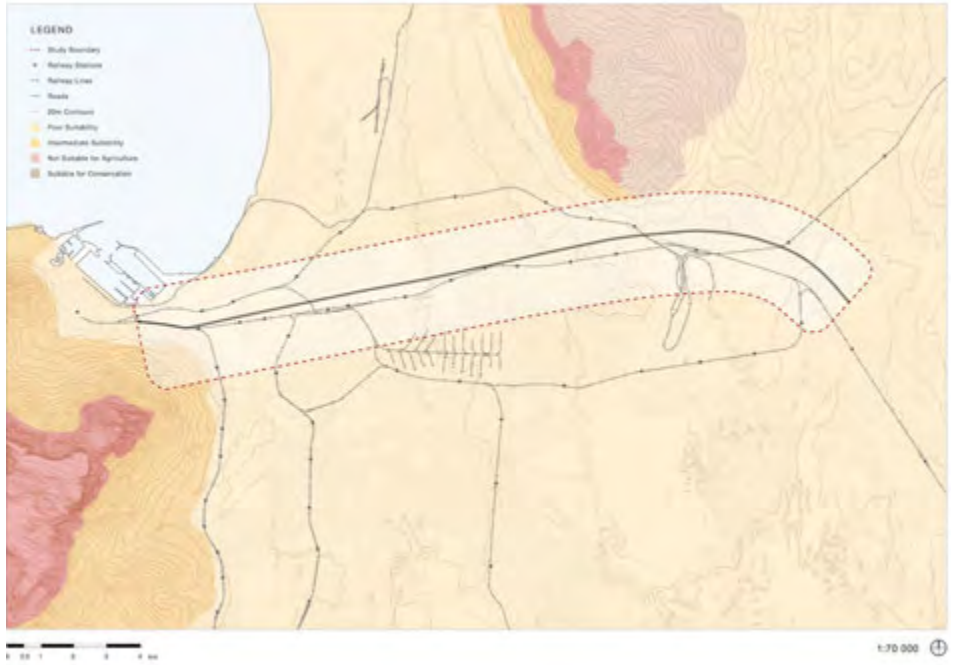


Figure 7.2: Soils (Source: Author, 2016; GIS Technical Library, UCT)

Topography

Topography is determined by the geology and soils of an area (Oberholzer, 2011). There are a variety of different morphological units, categorised by slope, rock type and surface material found within the study area. The landscape is predominantly flat which is characteristic of the Cape Flats area that include Pinelands, Maitland and Langa (CoCT, 2011a:9). The largely flat typography of the study area poses no restrictions for development. The most prominent topographical features are Table Mountain, Durbanville Hills and Tygerberg Mountain that border the study area. These mountain ranges contribute to the identifiable character of Cape Town and are widely recognised for their natural beauty (CoCT, 2014a).

Climate

Cape Town is characterised by a mild Mediterranean climate, with warm, dry summers and rainfall in the winter. The winter rainfall period is between May and August while the dry summer period is between October and February (CoCT, 2011a:12). Rainfall areas depend largely on local topography. Additionally, the study area experiences north-westerly winds in the winter months and a strong south to south-easterly wind during the summer (Oberholzer, 2011). In the summer, wind speeds can reach up to 50 kilometres per hour, which has implications for human comfort and must be considered in the design and orientation of buildings.

Hydrology

Table Mountain is the source of the smaller rivers and streams in the study area (CoCT, 2011a). There are four significant rivers that run alongside and traverse the Voortrekker Road Corridor these include the Salt, Liesbeek, Black and Elsieskraal Rivers. All of these rivers are partially canalised, which has lead to a loss of indigenous riparian vegetation and their ecosystem functioning (CoCT, 2011a). Treated effluent, storm water runoff from buildings and roads and alien vegetation and fish contribute to the low water quality of these rivers: consequently, the health of these rivers systems has been categorised as fair to poor by the River Health Programme (CoCT, 2011a). Any development that may have a further impact on the biodiversity or hydrological functioning of the river systems should be avoided. A buffer area of 30-50 metres around these rivers is proposed in order to preserve various ecosystems and to accommodate flood zones. Only low-impact activities such as public open space areas should be accepted in these buffer areas.

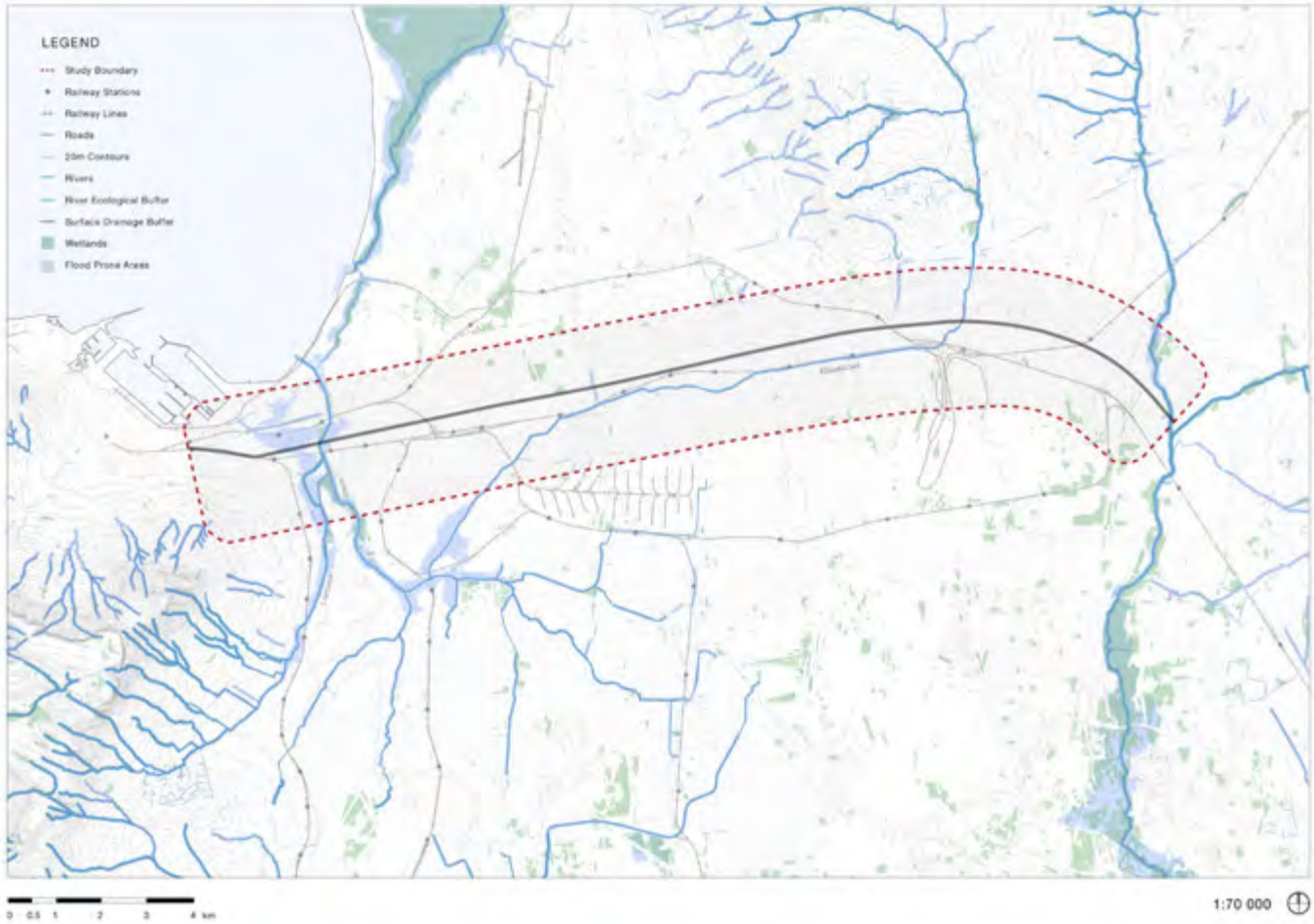


Figure 7.3: Hydrology (Source: Author, 2016; GIS Technical Library, UCT)

The predominantly flat topography of the Voortrekker Road Corridor suggests that the land may have difficulty draining excess water and therefore sustainable urban drainage systems (SUDS) may need to be implemented.

Biodiversity

Cape Town falls within the Cape Floral Region. It is a significant natural asset and contributes to the city's tourism economy (CoCT, 2011b). Many of the vegetation species that are found within the study area are categorised as endangered or critically endangered (figure 7.4). These species include Cape Flats Dune Strandveld, Cape Flats Sand Fynbos, Peninsula Sandstone Fynbos, Peninsula Shale Renosterveld Swartland Silcrete Renosterveld and Swartland Shale Renosterveld (figure 7.5). A large portion of the vegetation in the study area "has been transformed and fragmented by development" (CoCT, 2009). Pressures such as the growth of alien vegetation and illegal dumping of materials contribute to the degradation of these natural resources. Significant conservation areas within and surrounding the study include the Raapenberg Bird Sanctuary, Cape Flats Nature Reserve, the Tygerberg Hills Nature Reserve and Table Mountain National Park. These biodiversity priority areas should only support low impact activities such as passive recreation and conservation. Development that may significantly impact on these environments should be restricted.

7.3.2 Movement Systems

When analysing movement systems it is important to distinguish between accessibility and mobility. Accessibility refers to continuous stop start movement; whereas mobility refers to high speed, freight movement (Dewar & Todeschini, 2004). If accessibility routes function well, this would mean that people should be travelling less as they encourage more intensive activities to occur along these access routes (Dewar & Todeschini, 2004). However, in South Africa, mobility or limited access routes are far too prevalent and act as barriers. They fragment cities into disparate parts. In Cape Town, on average these routes break up the city into 2x2 kilometre squares.

The objective of this section is to analyse the hierarchy of movement routes and public transportation systems in the Voortrekker Road Corridor in order to determine the patterns of accessibility within the study area. This analysis will inform how the site can be restructured to enhance spatial equality throughout Cape Town.

Figure 7.4: Conservation and Biodiversity Zones (Source: Author, 2016; GIS Technical Library, UCT)

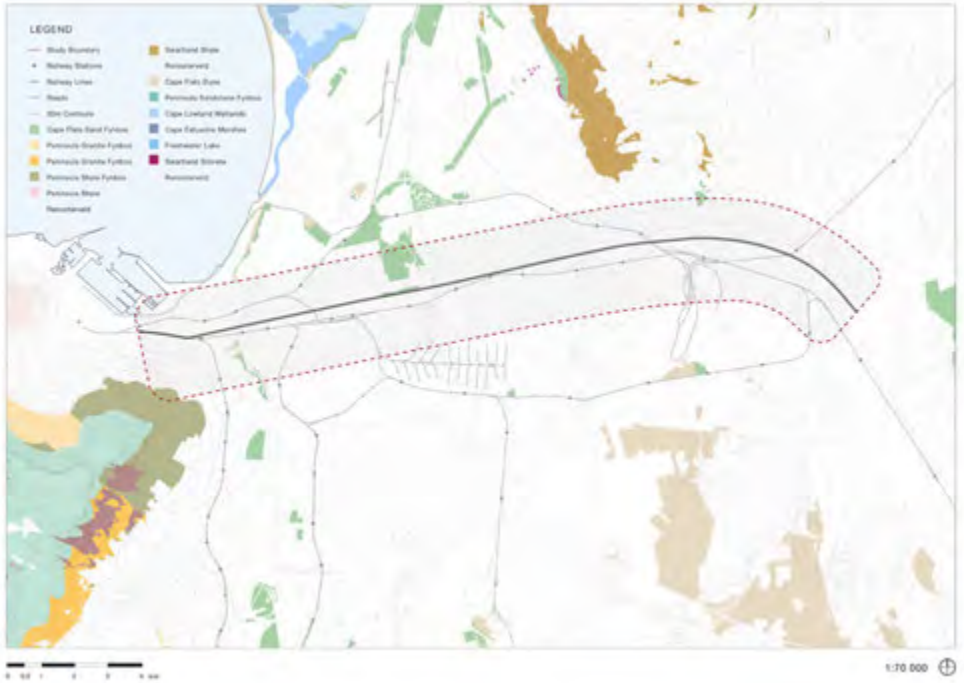


Figure 7.5: Vegetation (Source: Author, 2016; GIS Technical Library, UCT)

Movement Hierarchy

Movement routes have different characteristics that facilitate or limit accessibility in an area. There are three types of routes that make up the movement hierarchy in Cape Town: freeways, primary arterial routes and secondary arterial routes (CoCT, 2012b). The hierarchy of movement in the Voortrekker Road Corridor is shown in figure 7.6. Freeways provide a “mobility function” and restrict access to surrounding land uses (CoCT, 2012b:83). These routes, such as the N1 and N7 divide the study area into smaller introverted neighbourhoods, which limits accessibility between them.

Primary arterial routes promote both mobility and accessibility, with variations in travel speed and land use intensity along their length (CoCT, 2009a). These routes allow for interruptions in movement, which encourages nodal activities such as commercial and business development. However, these development routes, such as Frans Conradie, have the potential to be downgraded to encourage accessibility and NMT along their spine.

The role of secondary arterial routes within urban corridors was introduced in chapter 5. They are characterised by mixed-use and medium to high-density development. These routes encourage integration between communities as they increase accessibility. Voortrekker Road Corridor is the primary arterial route in the study area. As the main corridor route it has the potential to be intensified in order to increase connectivity through and the northern and southern parts of Cape Town, as well as linking the two major significant metropolitan nodes, Cape Town centre and Bellville.

Public Transportation

The different modes of public transportation in the study area are illustrated in figure 7.7. There are four principal modes of transportation: railway, bus and minibus-taxis and NMT. The Voortrekker Road Corridor is well serviced in terms of passenger railway transport and stations (CoCT, 2011b). Bellville Station is a “significant transport interchange” and enables intermodal connectivity across the city of Cape Town (CoCT, 2011b:34). However, the railway lines that run alongside the Voortrekker Road Corridor form a “barrier effect”, limiting north-south movement connections to surrounding areas (CoCT, 2012b:14). Buses and minibus taxis operate along higher order routes and connect passengers to railway stations and commercial, retail and residential areas.

Figure 7.6: Movement Hierarchy (Source: Author, 2016; GIS Technical Library, UCT)

Figure 7.7: Public Transportation (Source: Author, 2016; GIS Technical Library, UCT)

There are high levels of congestion throughout the study area as a result of the high levels of private car ownership (CoCT, 2011b). Congestion predominantly occurs during the morning and in the evening peaks when people commute to and from work. This is problematic as fuel emissions from cars significantly increase the amount of greenhouse gas emissions and further contributes to global warming and climate change (UN-Habitat, 2009). In addition, there are equal numbers of residents who are reliant on public transport (rail, bus and taxi) and non-motorised forms of transport (CoCT, 2011b:33). Pedestrian movement is found predominantly around transport interchanges specifically along Voortrekker Road (CoCT, 2011b). Therefore, any future interventions should accommodate the needs of the pedestrian in order to ensure human comfort, safety and accessibility.

7.3.4 Public Institutions and Facilities

For Behrens and Watson, the most significant "structuring elements of urban settlements are public institutions and facilities" (1996:68). These intuitions and facilities need to serve an area's existing and growing population. This section will assess whether there are adequate services for the residents who live in the study area. An estimate of the number of facilities that are needed is based on guidelines set out by the CSIR. These guidelines have been determined by demand thresholds and the time and distance required to access these services (CSIR, 2012).

However, demand thresholds "are not universally applicable" as they may depend on a variety of socio-economic factors (Behrens & Watson, 1996:145). Nonetheless, these standards can be used to determine how well an area is serviced. Public institutions and facilities should be distributed throughout an area so that they are as accessible to the public and the hierarchy of a facility should determine where it is located in space (Behrens & Watson, 1996). Higher order facilities such as hospitals should be accessible via public transportation and lower order facilities such as clinics by foot. Table 7.2 represents the time and distance standards for various facilities. These standards will be used to assess the spatial equality of the study area. This section will also establish how many additional public amenities should be provided in the study area.

Table 7.2: Public Facility Distance and Time Standards
(Source: Author, adapted from Behrens and Watson, 1996; CSIR, 2010)

	Distance (meters)	Walking Time (minutes)
Educational Facilities		
Crèche's	1000	20
Primary School	1500	30
Secondary School	5000	NA
Health Facilities		
Mobile Clinic	1000	20
Clinic	1000	20
Day-Hospital	2000	40
Community Hospital	5000	NA
Social Facilities		
Mobile Library	1000	20
Library	1500	30
Community Centre	1500	30

Table 7.3: Hierarchy of Institutions and Facilities
(Source: Author, adapted from Behrens and Watson, 1996; CSIR, 2010)

Higher Order	Hospitals
	Tertiary Education Facilities
	Sports Stadiums
Middle Order	Secondary Schools
	Adult Learning Centres
	Clinics
	Sports Clubs
	Sports Fields
	Libraries
	Municipal Offices
	Post Offices
	Police Stations
	Fire Stations
	Information Centres
Middle / Lower Order	Primary Schools
	Playground/Pocket parks
	Community Centres
	Religious Centres
Lower Order	Pre-Primary Schools
Mobile	Mobile Clinics
	Mobile Post Offices

Health

In South Africa, access to healthcare is based on a system of referral, from clinics, to community health centres and to hospitals (Western Cape Government, 2015). Therefore, clinics should be the most accessible form of healthcare in an area. According to CSIR standards, clinics should be located within 2-5 km of public transportation or 1,5 km for pedestrians (2010). From the distribution of health facilities illustrated in figure 7.8, it appears as if the Voortrekker Road Corridor is relatively well serviced. However, it is important to note that these services support not only the surrounding study area, but also under-serviced and disadvantaged areas such as the Metro Southeast. There are also two healthcare facilities that are over-utilised in the southern portion of the corridor and should be upgraded or expanded (CoCT, 2014b).

Education

The accessibility of education facilities such as schools and libraries that include media centres can positively contribute to academic performance (WCG, 2015). The number of facilities and staff in a school can also influence the quality of a child's education (CoCT, 2014b). The level of school utilisation in the Voortrekker Road Corridor was determined by a study undertaken by the WCG Department of Education. It was found that the majority of primary schools in the area are not over-utilised (CoCT, 2014b). However, there are a few secondary schools located in Parrow and Bellville that are over-utilised, particularly in the southern portion of the study area. This may be a consequence of the large number of students who live in the Metro Southeast who commute to schools in the Voortrekker Road Corridor study area, because there are insufficient education facilities where they live. There are a number of community libraries and regional libraries (CoCT, 2014b). It is however anticipated that these educational facilities may need to be expanded in order to accommodate the existing and growing population of the study area.

Sports and Recreation Facilities

Public open spaces and sports facilities perform an important recreational and social function in cities (Beherens & Watson, 1996). In poorer areas, these spaces often act as an extension of the people's homes (Beherens & Watson, 1996). Along the Voortrekker Road Corridor there are a large number of sports facilities (playing fields and courts), which make up 61 Ha of the study area and an additional 216 Ha of land consists of parks (CoCT, 2014b). These facilities are mainly well maintained

Figure 7.8: Public Institutions (Source: Author, 2016; GIS Technical Library, UCT)

Figure 7.9: Educational Facilities (Source: Author, 2016; GIS Technical Library, UCT)

in the north of the Voortrekker Road Corridor. However, in the southern part of the corridor these areas are characterised by vast expanses of residual public spaces (CoCT, 2011b). Some of these spaces could be consolidated to increase densities and to retrieve land for educational facilities and low-income housing. In particular, there are 15 golf courses in Cape Town of which 4 are located in the study area. These facilities cater for a predominately wealthy and small portion of Cape Town's population (Monroe & Ting, 2015). It is argued that some of these spaces could be utilised more efficiently and equitably if they were transformed and opened up to a larger proportion of the public.

7.3.5 Housing

Poor socio-economic conditions exist in areas south of the Cape Town-Bellville railway line. These areas are characterised by poverty, crime and dangerous public spaces (CoCT, 2012b). In general, there is a lack of integration between income groups, housing shortages and degraded urban and natural environments (CoCT, 2012b). Additionally, there are a significant number of informal backyard dwellings and seven informal settlements located in the area (CoCT, 2014b). This highlights the need for additional affordable housing in the Voortrekker Road Corridor.

As urbanisation and in-migration continue to increase new amenities, infrastructure and well-located land for low-income housing will need to be provided. The study area has large tracts of vacant or underutilised land that has the potential to be developed. Land rights would need to be attained in order to create housing opportunities and services within the corridor (CoCT, 2014b). Furthermore, the residential dwelling densities within the study area are very low, with an average gross density of 9 dwelling units per hectare (du/ha) (CoCT, 2014b). Because of the large number of public transport interchanges along the corridor, there is potentially significant opportunity to increase these residential densities.

Figure 7.10: Land Ownership (Source: Author, 2016; GIS Technical Library, UCT)

7.4 Opportunities and Constraints

Drawing on the previous analysis, the following section will present an evaluative synthesis of the constraints and informants in the Voortrekker Road Corridor study area. It identifies the central challenges that need to be addressed as well as the key areas that can be optimised in order to direct future development. These constraints and informants are illustrated in figure 7.11 and 7.12.

	Constraints	Opportunities
Natural Systems	- Degraded Environment as a result of urban sprawl - Threatened ecosystems and polluted rivers	- Expand protected areas by intensifying existing green networks - Restore the water quality of rivers by restricting development within 1:100 year flood lines
Movement Systems	- A high prevalence of limited access routes restricts accessibility and fragments the urban fabric. - The Cape Town – Bellville railway creates a barrier affect and limits north and south movement across the corridor. This also results in congestion along these routes - Degraded public transportation due to overcrowding - Lack of pedestrian scaled environments	- There is potential for the mobility function of roads to be downgraded to increase pedestrian accessibility and to intensify mixed-use and high-density activities along corridor edges. - TOD can promote compactness, thereby reducing the need for large amounts of movement - Improve north south linkages throughout the site in order to increase connectivity to surrounding areas in the city.
Economy	- A lack of accessibility in the study area and low densities limit investment and opportunities for self-generated income - Urban decay and crime discourage investor confidence in the study area	- Strengthen commercial activities along the Voortreker Road Corridor spine to increase accessibility to employment opportunities - Formalise trading spaces to improve the informal economy - Enhance the interface between the built and public environment to improve the quality of the urban environment
Public Institutions and Facilities	- There is an excess of under-utilised parks and under-serviced public facilities such as sports fields. Some education facilities are over utilised as they service a people who live outside the Voortrekker Road Corridor	- Consolidate under-utilised parks and sports fields to uncover land for low-income housing or mixed-use activities - Cluster public facilities so that they are maintained and used more efficiently by the public
Settlement Systems	- The introverted and sprawling character of neighbourhoods ensures that there is a lack of integration between communities and this is exacerbated by high-speed movement routes - The frequency of backyard dwellings and informal settlements suggest there is high demand for well-located and subsidised or affordable housing in the corridor	- Open up underutilised land for affordable housing, thereby increasing integration in the study area - Increase densities through infill development to reduce the effects of urban sprawl and to increase the thresholds for small business and viability of public transportation

Table 7.4: Opportunities and Constraints (Source: Author, 2016)

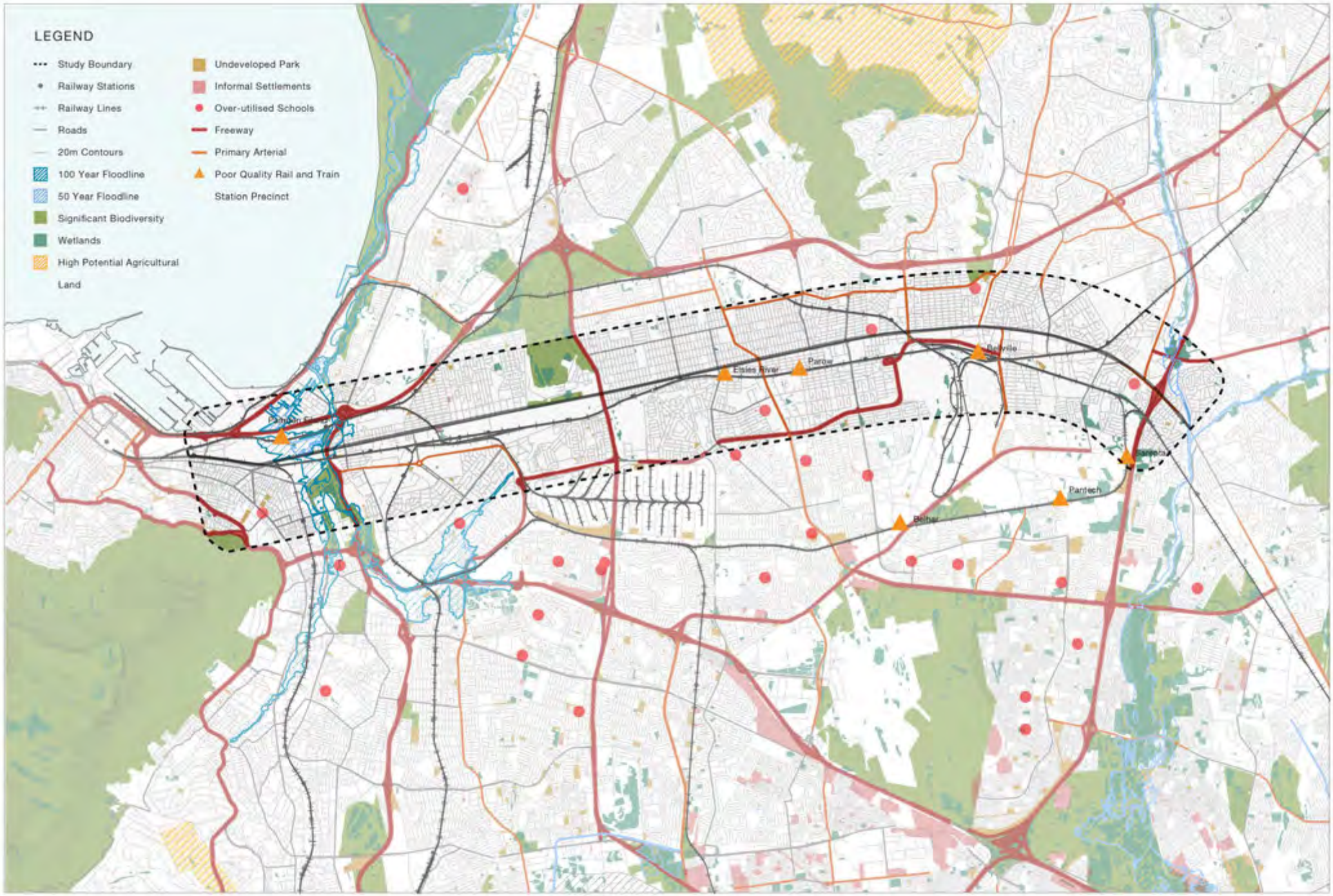


Figure 7.11: Constraints (Source: Author, 2016; GIS Technical Library, UCT)

1:70 000

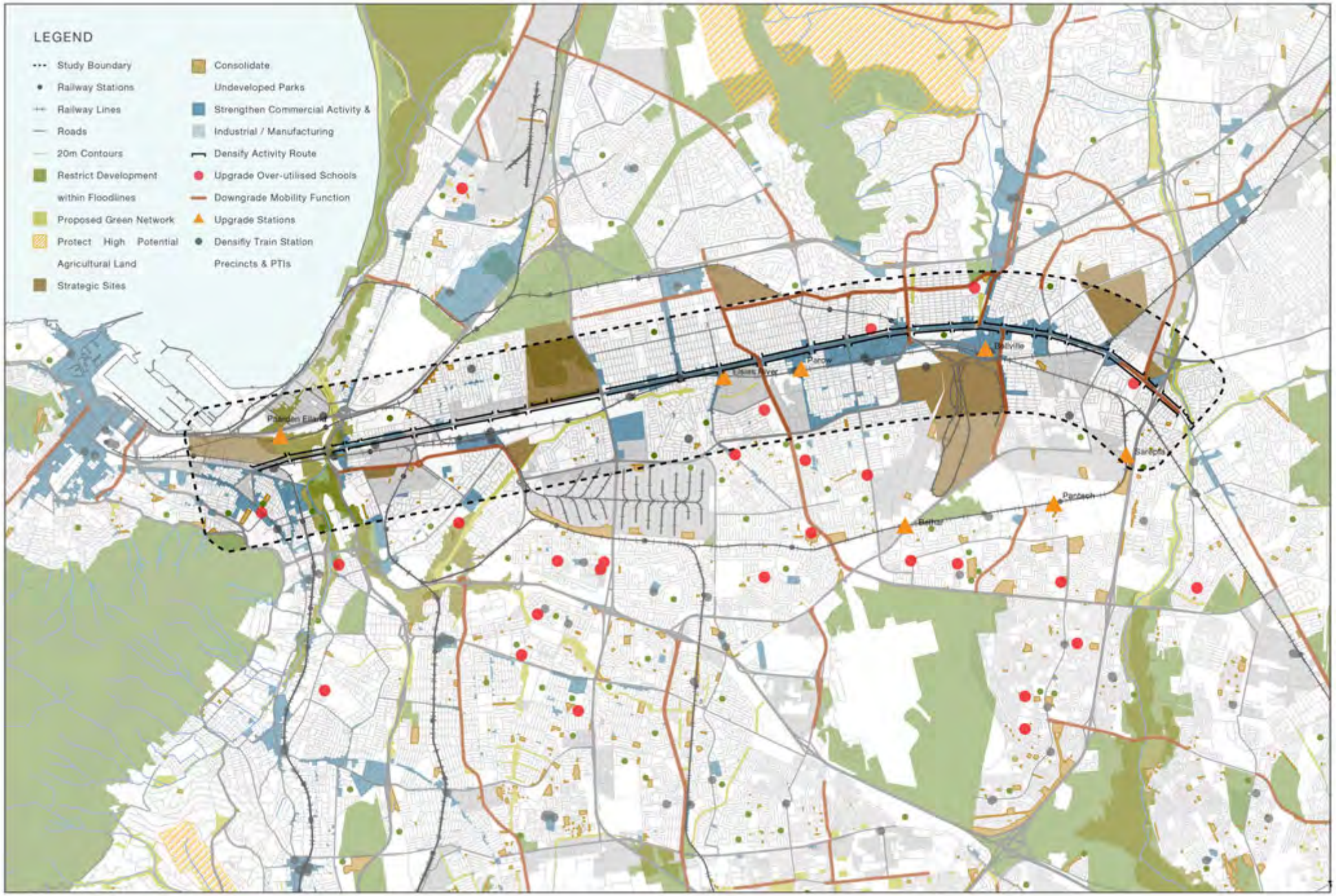


Figure 7.12: Opportunities (Source: Author, 2016; GIS Technical Library, UCT) 1:70 000

7.5 Development Framework

Drawing from the metropolitan conceptual framework and structuring elements that were defined in the previous chapters, this section will establish a development framework to guide growth and change in the Voortrekker Road Corridor. This development framework places particular emphasis on strategies to restructure the spatial form of the corridor. It is argued that the applied principles of TOD and corridor intensification have the potential to restructure both the Voortrekker Road Corridor and the city of Cape Town's urban environment, thereby increasing integration and equality throughout the region. This section will begin by outlining the key principles of the conceptual framework that this spatial development aims to achieve.

7.5.1 Conceptual Framework

The foundation of the metropolitan conceptual framework is based on the notion of accessibility. This is key "to making spatially equitable, integrated and sustainable cities" (Dewar & Louw, n.d.56). Through urban corridor development and TOD, this framework aims to establish a hierarchy of accessible elements of public structure (green space, movement, public facilities) that will enhance the role of the Voortrekker Road Corridor as an intensive, interconnected and mixed-use area. This development framework includes five strategic directives to guide public and private investment in the study area. These directives give effect to the guiding principles outlined in chapter 4. These principles include: compaction, balance, ecological sustainability, integration, choice and efficiency.

7.5.2 Green Systems

The objective of this framework is to guide development so that agricultural soils, important biodiversity and ecosystems are conserved. It aims to protect the aesthetic quality and character of landscapes for residents to benefit and enjoy. This requires that environmental impacts are mitigated and that the pollution of land, air and water is reduced. Likewise, the spatial form of the Voortrekker Road Corridor should be improved to become more compact, thereby preserving natural resources such as valuable agricultural land and water. In addition, ecologically degraded areas should be rehabilitated and restored. In order to achieve these objectives, the following strategies have been identified:

Conservation Areas and Green Corridors

From the biophysical analysis of the study area it was found that the principal rivers and critical biodiversity are degraded and polluted. Therefore, the Voortrekker Road Corridor's natural assets need to be protected and preserved to safeguard ecological processes that are needed for living organisms, as well as for agricultural production. This framework delineates significant ecological corridors and conservation areas that form part of a biodiversity network that can strengthen the fragmented natural environments that support ecosystems such as Elsieskraal River and the Cape Flats Nature Reserve (figure 7.13). It is suggested that a buffer zone of 30-50m surrounds various ecological systems to connect biodiversity areas and protect hydrological systems from urban development and the dumping of waste and chemicals. These enhanced green networks or corridors can also function as recreational spaces such as mixed-use parks. Therefore, the protection of the study area's natural landscape can improve residents' access to quality green spaces and recreational amenities.

Precedent: Zagreb, Croatia

Zagreb, the capital city of Croatia, has undergone rapid urban growth over the last few decades (UN-Habitat, 2012b). However, its natural biodiversity and associated ecosystems contribute to the culture and heritage of the city. Zagreb has managed to maintain and protect its rare and threatened biodiversity areas and species "through appropriate guidance, regulation and enforcement" (UN-Habitat, 2012b:55). The city has also introduced a number of "special ecology education programmes" in schools to improve community ownership and the protection of the natural environment (UN-Habitat, 2012b:55). Furthermore, the city recognises the public benefits attained from nature. As a result, entry to conservation areas is free for students and pensioners. There are also a number of ecological recreational amenities in the city such as the Plitvice Lakes National Park that offers leisure activities such as walkways and hiking trails (figure 7.14).

Figure 7.14: Plitvice Lakes National Park (Source: http://www.np-plitvicka-jezera.hr/en/)

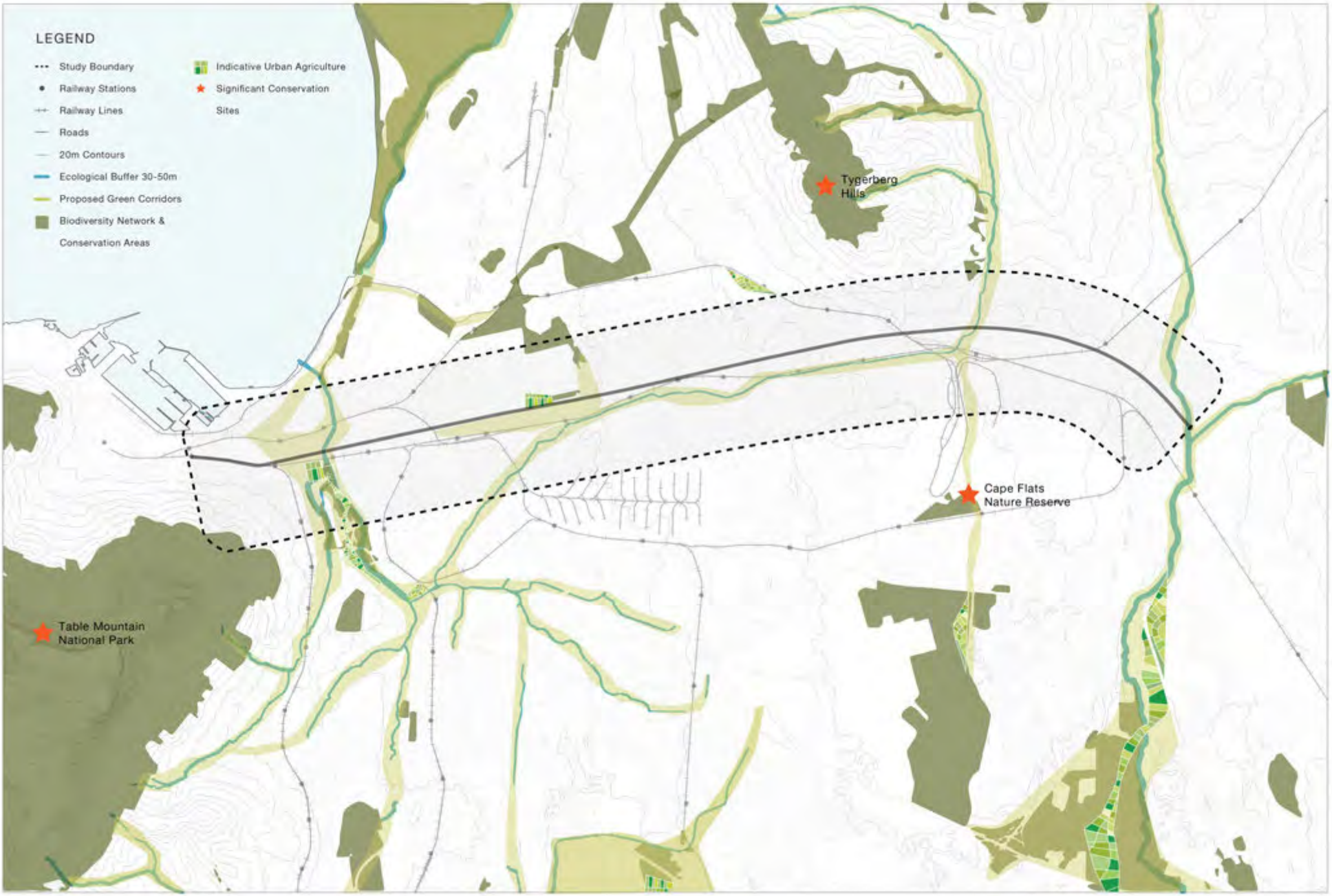


Figure 7.13: Green Systems and Open Space Network (Source: Author, 2016; GIS Technical Library, UCT) 1:70 000

Urban Agriculture

Opportunities also exist to increase food security in the study area by establishing small scale food trading and encouraging local production and protection of agricultural land. An increase in food security would create more employment opportunities, encourage informal trade and it would increase households' access to quality fresh food. Urban agriculture can also be associated with learning centres involved with environmental education and awareness. This would assist in improving the general knowledge of health and nutrition, thereby creating a healthier population. Peri-urban agriculture could be linked with schools to enhance this educational function and to promote practical learning. Therefore, urban farming could be introduced on underutilised sports fields or the outer edges of buffer zones and along green corridor networks. This could aid in improving the connectivity between ecosystems in order to counter the effects of ecosystem fragmentation.

Precedent: Dar es Salaam, Tanzania

In the city of Dar es Salaam, food security was an issue of national importance subsequent to the droughts in the 1970s and 1980s (UN-Habitat, 2012b). In order to assist households to become self-sufficient, the government supported urban agriculture by assigning areas to be used for urban farming. It was recognised that urban agriculture could create employment opportunities and increase the city's resident's access to food. In 1992, a development plan was formulated to support agriculture skills training and to protect urban farming activities from development (UN-Habitat, 2012b). As a result, 90% of the city's vegetables are cultivated in open spaces and home gardens and sold to generate an income (UN-Habitat, 2012b). Urban agriculture has aided in decreasing "farm-to-table distance", thereby improving food security and employment opportunities in the city (UN-Habitat, 2012b:24).

7.4.2 Public Transportation and Movement Systems

Accessibility is limited between the northern and southern parts of Cape Town as a result of the number of radial freeways and railway lines that restrict permeable movement. Therefore, the objective of this framework is to increase accessibility throughout the Voortrekker Road Corridor to unlock economic development and to achieve greater social integration in the city. It is argued that the applied principles of TOD and corridor intensification have the potential to restructure the city's spatial form and increase equality throughout the metropolitan. Through the application of the concept of an accessibility grid that was outlined in the previous chapter, this framework will establish a hierarchy of movement and an interdependent integrated transport system in the study area. This accessibility grid will aid in creating a logically designed access along the corridor that facilitates choice and increases efficiency.

A Flexible Accessibility Grid

An accessibility grid consists of a series of interconnecting arterial and secondary roads that link public transportation to feeder networks and NMT (CoCT, 2012b:32). This grid

Accessibility Grid	Span	Associated Nodal Development	Scale of Operation	Areas of Land Use Intensification
Primary	8-16 km	Corridor/strip development/urban nodes	Citywide	Corridor / strip development/urban nodes
Primary	4-8 km	Corridor/strip development/urban nodes	Sub-metropolitan	Corridor / strip development/urban nodes
Secondary	2-4 km	Strip/urban node	Inter-district significance	Strip development / urban nodes
Tertiary	1-2 km	Strip/urban node	Inter suburb	Usually urban nodes
Quaternary	0.5-1 km	Usually nodal	Suburb	Usually nodal

Table 7.5: Accessibility Grid and Areas of Intensification (Source: CoCT, 2012b:23)

0 0.5 1 2 3 4 km

Figure 7.14: Movement Hierarchy (Source: Author, 2016; GIS Technical Library, UCT) 1:70 000

Figure 7.15: Public Transportation (Source: Author, 2016; GIS Technical Library, UCT)

establishes a hierarchy of movement, this allows for fast speed mobility (freeways and primary arterial routes), to medium to high speed development routes, to urban corridors or activity streets and lower order streets that encourage more mixed-use or residential activity along their lengths (table 7.5). This accessibility grid aids in formulating a "pattern of access" that determines a hierarchy of public facilities and public space in the urban environment (Dewar & Todeschini, 2004:87).

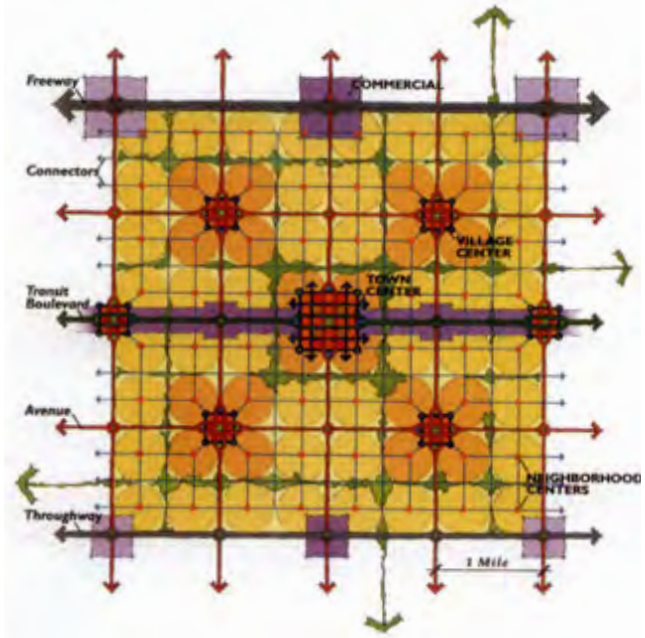


Figure 7.16: Accessibility Grid (Source: Haas, 2008)

Figure 7.17: Stroget Pedestrian Street

Precedent: Copenhagen, Denmark

Streets form the foundation of a city as they connect people and can act as communal public spaces (Moudon, 1991). Streets can also enhance the "the social life of cities" (Francis, 1991:26). In Copenhagen, architect and urbanist Jan Gehl has promoted the use of non-motorised forms of transport to enhance the "liveability" of streets (UN-Habitat, 2013a:31). In 1962, Copenhagen made a transition towards an increased use of bicycles as an alternative to motor vehicles (UN-Habitat, 2013a). Streets such as Strøget, were also pedestrianised to form part of city's public space network. Therefore, it is the pedestrian and not the car that is the key structuring component in the consideration of planning and design decisions. Furthermore, movement routes in the city should be clearly demarcated and designate areas for pedestrians, cyclists and other forms of movement. This provides citizens with a variety of modal choice that enables people to be more self-sufficient and therefore increases connectivity.

Precedent: Munich, Germany

Munich is the third largest city in Germany, with a population density of 16 000 people per km2 in the city centre (Perspective Munich, 2013). The city's transport system includes underground railway, suburban trains and a network of trams and buses (Planning South Australia, 2008). Since the 1970s, regional policy has prescribed that future growth must be supported through public transit (Planning South Australia, 2008). As a result, development in the city is predominantly transit oriented. More recently, the city has adopted an urban development strategy entitled the "Perspective Munich", which is centred on improving the integrated transport network (Perspective Munich, 2013:17). It has successfully managed to strengthen public transportation systems and increase NMT by introducing park and ride schemes and improving the cycle paths in the city. Consequently, 63% of the city's residents use public transportation and NMT (Perspective Munich, 2013). This development strategy aided in increasing choice, accessibility and reduced the city's reliance on the use of private vehicles.

7.4.3 Economic Development

The Voortrekker Road Corridor study area has a relatively high rate of employment, however 11,6% of the population is unemployed (CoCT, 2014b). Economic trends suggest that Cape Town is moving towards a service-based economy. Therefore, it is necessary to consider new ways of up-skilling a largely unskilled labour force. Increasing the population's access to education should be one of the highest priorities in the region. It is also essential to examine how new forms of inclusive economic growth can be generated, in order to enhance the livelihoods and prosperity for all of the city's residents. This framework argues that it is necessary to optimise the number of quality education facilities within the corridor to promote learning. It also suggests that the role of the informal economy should be improved to create economic opportunities for the low-skilled labour force.

The corridor has a number of educational facilities: schools, universities, colleges and skills training centres located along its length. These facilities should be upgraded where they are over-utilised in order to strengthen their capacity. Furthermore, the roles of these facilities should be enhanced, as they are critical in attracting industries and businesses to locate and invest in the region (UN-Habitat, 2012b). However, in order to promote inclusivity it is necessary to increase access to schools and public facilities such as libraries. This could be achieved by investing in public transport, ICT infrastructure and by upgrading libraries in the under-serviced southern portion of the corridor. This would enable communities in Metro

Southeast to easily access public facilities, thereby increasing literacy and spatial equality. In addition, improved accessibility to educational institutions in the area will encourage "a continuous cross-pollination of ideas and flows of knowledge" (UN-Habitat, 2012b:34). This will stimulate innovation and foster economic growth.

Moreover, in order to harness economic opportunity along the Voortrekker Road Corridor, urban renewal is required to reduce crime and to enhance the quality of the street environment. This can be achieved through street cleaning, landscaping and the implementation of street furniture (UN-Habitat, 2012c). These improvements have the potential to stimulate private investment and can contribute to the "sense of place" of the area (UN-Habitat, 2012c:50). These conditions can also aid in encouraging strip retail and commercial activity to develop along the Voortekker Road Corridor (Dewar & Louw, n.d.). Points of high exposure at interchanges provide opportunities for nodes to cluster in response to starting and stopping traffic (UN-Habitat, 2012c). Increased densities around these nodes would reinforce thresholds and attract people to these points of intersection. A revitalization of this corridor will invigorate the study area and situate it as an attractive place to invest, interact and learn.

Furthermore, the informal economy can be invigorated by improving access to small-scale farming and trading, thereby supporting urban livelihoods. As mentioned in the green systems framework (section 7.4.1), it is necessary to identify areas for peri-urban agriculture, such as allotment gardens and nearby schools, to make small plots of agricultural land available to enhance the informal sector. This intervention could improve food security and address unemployment in the study area. Moreover, in order to diversify and strengthen the informal economy, access to quality public infrastructure and facilities such as street vending stalls should be improved. Informal trading can be connected with station forecourts to increase the exposure of these markets. Arguably these areas could become unique public spaces that contribute to quality of the urban environment (Dewar & Louw, n.d.).

Precedent: Barcelona, Spain

Before the 1980s, Barcelona was characterised by urban decay and was recovering from an economic crisis (Bakici, Almirall & Wareham, 2013). However, in order to prepare for the 1992 Olympics, urban regeneration projects were implemented to improve neglected areas in the city (Bakici, Almirall & Wareham, 2013). Emphasis was placed on the renewal of public parks, plazas and schools. The revitalisation of these amenities improved the quality of life and economic performance in the city.

More recently, the city has shifted attention to developing a knowledge economy through the conception of "22@ Barcelona" (UN-Habitat, 2012b:34). This project is aimed at increasing knowledge exchanges between universities, work places and industries in order to create a "culture of entrepreneurship" (UN-Habitat, 2012b:34). Central to this initiative has been the creation of economic clusters through the provision of formal and informal workspaces and lively public environments. Between 2000 and 2010, 200 hectares of underutilized industrial space was recovered for public parks, entertainment facilities, bike lanes and public transportation (UN-Habitat, 2012b). As a result, Barcelona has situated itself as a city of innovation and learning and as "one of the most favourable business locations in the world" (UN-Habitat, 2012b:35).

Precedent: Durban, South Africa

Warwick Junction is the city of Durban's primary transportation interchange and at its centre it houses a dense populous informal market (Asiye eTafuleni, 2015). Prior to 2002, it was characterised by unsanitary conditions and criminal activity. In order to improve the unsafe environment of Warwick Junction, a public participation process was implemented to work with street traders and key stakeholders in the area (UN-Habitat, 2016). As a result of this process, new bridges and pedestrian paths were created, as well as a multi-functional herb traders market (figure 7.18). In addition, new storage facilities were provided, which were rented out to street traders (Asiye eTafuleni, 2015). The renewal of the market led to a reduction in crime and an improvement in the traders' working environment. It is estimated that between 1997 and 2002 that 14 000 jobs have been created (UN-Habitat, 2016:58). This case study demonstrates how public participation can lead to an increase in economic opportunities and commercial activity through small-scale investment.

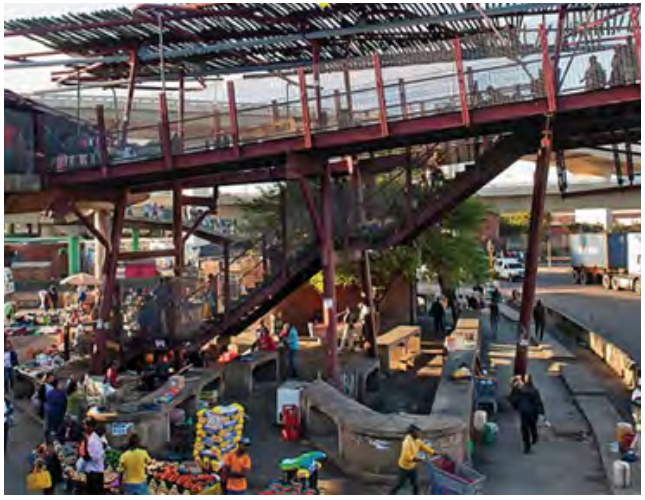


Figure 7.18: Warwick Junction (Source: Asiye eTafuleni, 2015).

7.4.4 Public Institutions and Facilities

Public spaces and institutions epitomise “the focal point of community life” and provide areas for social interaction, celebration and events (Behrens & Watson, 1996:69). This framework argues that it is necessary to increase the equity of access to quality public spaces and facilities in the Voortrekker Road Corridor. This objective can be achieved by providing fewer but improved public amenities along the corridor. Furthermore, in order to enhance equity, a range of public spaces and institutions should be accessible for all of the study area’s residents. This framework outlines three orders of public spaces and institutions and proposes that this hierarchy should be linked with the accessibility grid outlined in section 7.4.2. A well-defined hierarchy of public spaces, institutions and movement systems will contribute to the “identifiable neighbourhood character” of the corridor (CSIR, 2000:5.8.1).

The three orders of public spaces and institutions include: primary, secondary and tertiary facilities, which are illustrated in table 7.6. This hierarchy aids in establishing which facilities require greater levels of exposure and privacy along the accessibility grid (Dewar & Todescini, 2004). The highest order tertiary facilities (universities, hospitals, market squares and community halls) should be located along the most accessible routes and interchanges in particular the Voortrekker Road Corridor. As these amenities are located on routes with public transportation, they will be accessible to a greater number of people in the city. This directive will aid in increasing efficiency, convenience and choice in the city (Dewar & Louw, n.d.). Secondary and primary facilities such as schools, sports fields and clinics should be located on lower order routes and residential streets so that they service the surrounding community.

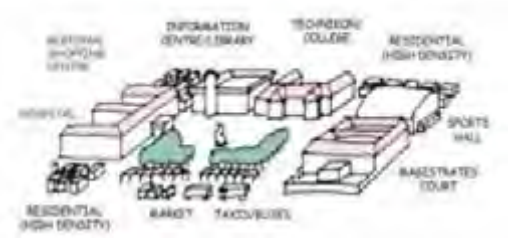
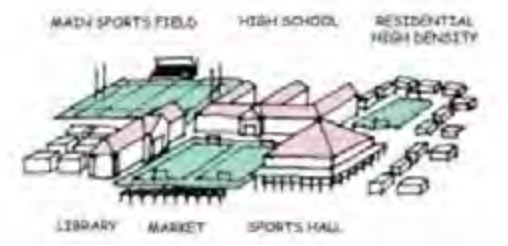
Hierarchy	Facilities	Example
Primary **These facilities serve an entire region, metropolitan or city such as hospitals and universities. They are located at the most accessible location to which the greatest number of people have access.**	Public transport interchange Hospital Community centre and hall 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 thresholds 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	

Table 7.6: Hierarchy of public spaces and (Source: Author; CSRI, 2000; City of Cape Town, 1999; CNdV Planning and Design, 2013)

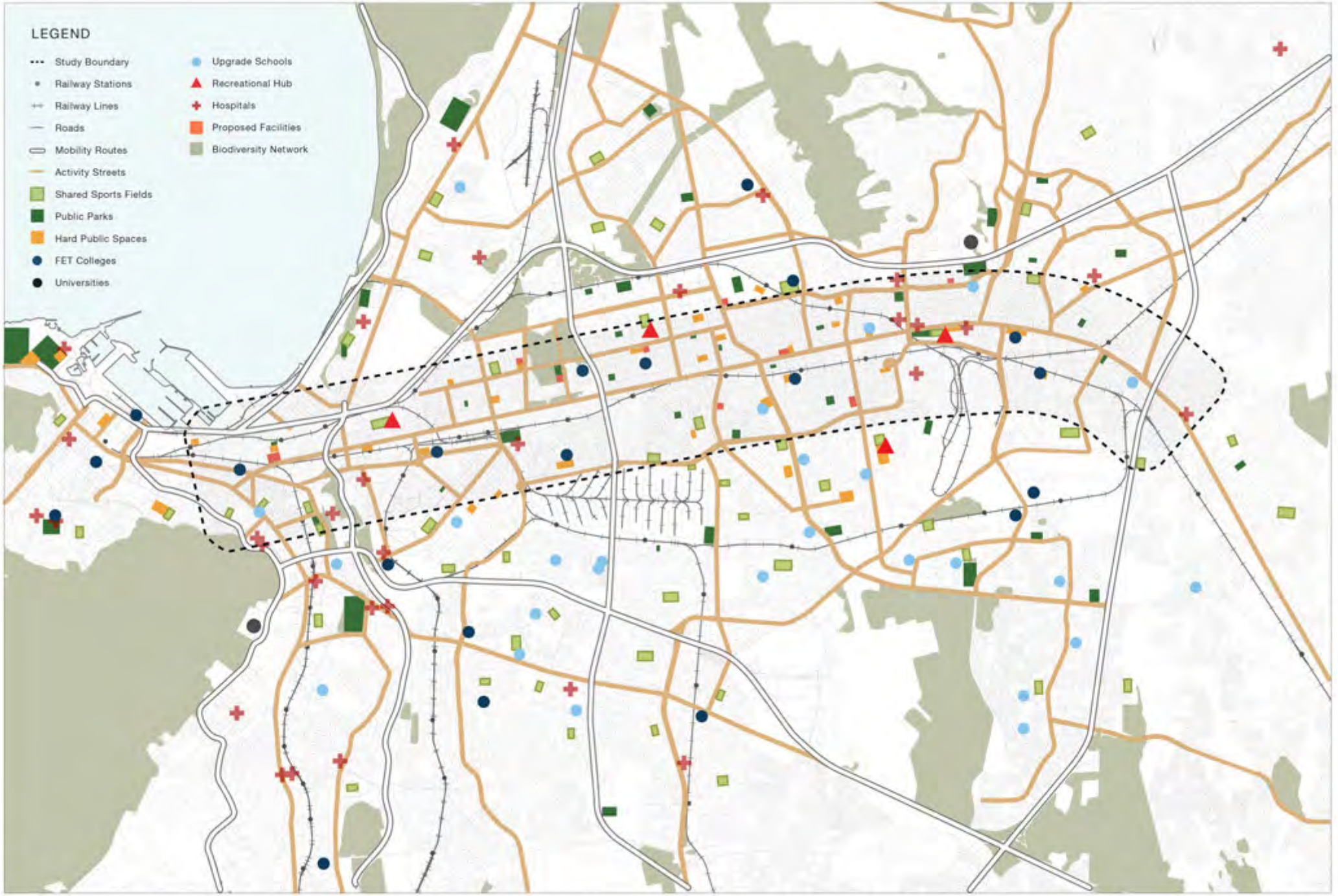


Figure 7.19: Public Institutions and Facilities (Source: Author, 2016; GIS Technical Library, UCT).

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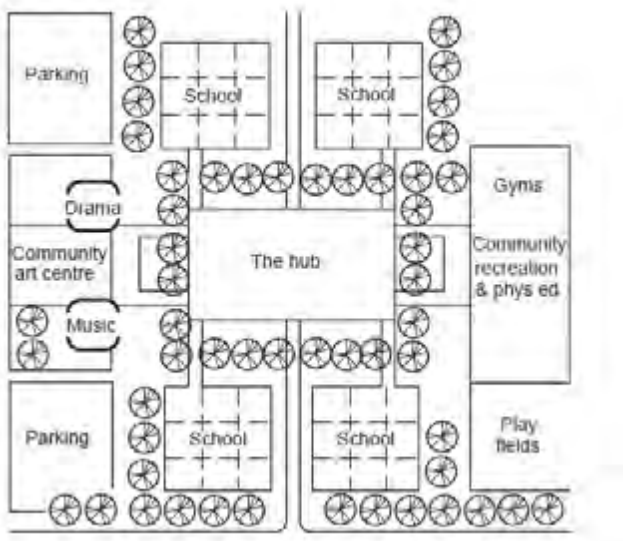

Figure 7.20: Diagram of an educational facility cluster (Source: CSIR, 2000)

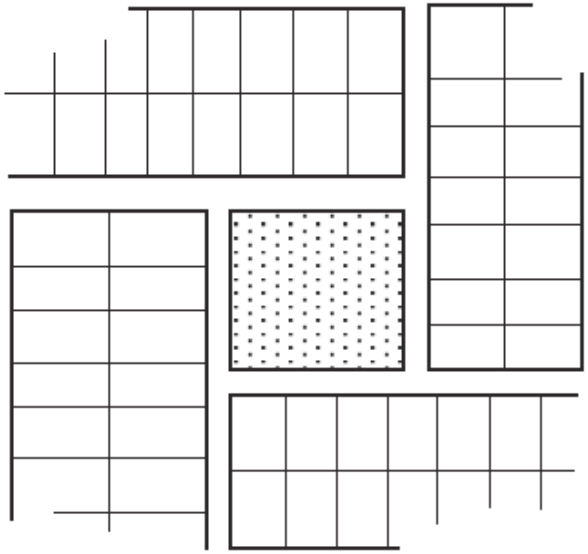

Figure 7.21: Small intimate park with effective surveillance from adjacent sides (Source: CSIR, 2000)

However, in a city that has limited financial resources, it is necessary to ensure that these facilities are well-maintained and that they positively enhance the quality of life of the city's residents (CoCT, 2009a). This framework argues that there is potential to anchor primary schools and high schools with multi-purpose public amenities in the Voortrekker Road Corridor (figure 7.19). Expansive school sports fields can be clustered so as to create a space for mixed-use sports facilities and recreational hubs, allowing these areas to become "special places" for interaction and enjoyment (Dewar & Todeschini, 2004:58). The mixed-use quality of these facilities will ensure that they are used throughout the day and evening. Sports clubs could gain access to the facilities in the afternoons and they could be used for social events in the evening. This intervention would also open up and retrieve valuable land within the city that could be converted to well-located affordable housing.

Currently, the Voortrekker Road Corridor has 19 secondary schools located in its study area (CoCT, 2014b). Their sports facilities account for 61,3 hectares of land in the corridor (CoCT, 2014b). According to the CSIR, if these facilities are clustered and reduced to a minimum size of 2,6 hectares, approximately 20 hectares of land can be retrieved in the study area (2000). Furthermore, there is an additional 216 hectares of public parks that have the potential to be consolidated for infill housing and mixed-use activities. Figure 7.21 illustrates a small playing field that could be used as a park after school hours. It is enclosed in a pinwheel shape with high-density development from all sides, which contributes to surveillance (CSIR, 2000).

Precedent: Caracas, Venezuela

In the Caracas in Venezuela, imited land, overcrowded informal settlements and high crime rates made it unsafe, in particular for children to practice sports and play outdoors (UN-Habitat, 2016). In the Chacao's Barrio La Cruz neighbourhood a vertical gymnasium was created to replace a degraded sports field (figure 7.22). This four-storey sports facility also functions as a cultural and recreational centre. The establishment of this infrastructural hub now attracts 15 000 users a month and contributed to revitalising the area (UN-Habitat, 2016). Furthermore, by creating a safe public environment, this multi-use sports facility has aided in reducing crime in the neighbourhood. This intervention has enhanced community life and provided the neighbourhood with a sense of pride and ownership of their public environment. Four more public gyms will be constructed in the city and will be connected with a Metrocable station and amenities such as libraries and an outdoor market.

Figure 7.22: Vertical Gymnasiums in Caracas, Venezuela (Source: UN-Habitat, 2016)

7.4.5 Settlement Systems

Urban sprawl consumes valuable land and infringes on critical biodiversity and agricultural resources. It also requires that people travel longer distances, which leads to higher carbon emissions and climate change. Therefore, it is necessary to increase the density of the Voortrekker Road Corridor study area to promote a more compact urban form. The principle of compaction results in more “resource-efficient” environments and can be achieved by increasing residential densities through infill development (UN-Habitat, 2013:30). Moreover, compaction has the potential to increase social integration and connectivity as it facilitates NMT, situating people closer to public amenities, employment and residences.

A compact city form can be realised in the study area by developing the large expanses of vacant and under-utilised land abutting the Voortrekker Road Corridor. This framework has identified a number of public spaces as well as state-owned land that can support infill development and restructure the area through TOD and corridor development. These sites are illustrated in figure 7.23 and include Culemborg, Wingfield, Transnet and Stikland, Conradie and Tygerberg Hospital (CoCT, 2014b). If these sites were to be developed it would open up a minimum of 472 hectares of land for new facilities, low-income housing and other urban generators (CoCT, 2014b).

There should be an increase in density along the principle activity corridors and public transport interchanges. Intensification should vary according to need and desired land use. In order to promote TOD and a compact urban form, infill densification should occur within 500-1500 m or 5-20 minutes walking distance from transport hubs and along activity corridors (UN-Habitat, 2012e). Connecting people with public transportation, a mix of land uses would increase spatial equality and efficiency. It also ensures that there are adequate thresholds for public transport systems (CoCT, 2014b). The Voortrekker Road Corridor study area currently has residential density of 9 dwelling units per hectare (du/ha) (CoCT, 2014b). However, a minimum density 35-40 du/ha is required to support scheduled transportation services. Furthermore, a density of 40-50 du/ha is needed for BRT services and a minimum of 60-75 du/ha is a prerequisite density for TOD (UN-Habitat, 2012e).

Nonetheless, density configurations should maintain the character and form of certain heritage areas and the natural environments in order to prevent a negative impact upon the character of the area. Ideally, three to five storey buildings should be introduced to achieve the densities needed to support TOD and a compact city form (CoCT, 2012a). Taller buildings, ranging from six to eight storeys can be positioned at strategic points or transport interchanges to increase legibility and orientation within the study area. These buildings could be landmarks or mixed-use institutions that contribute to the identifiable character of the corridor.

Land Use

In terms of land use, this framework proposes that a broad mix of high-intensity urban development should be concentrated along the major corridors within in the study area. Indicative land uses can be strengthened through infill development and incremental upgrading. The primary activity route, the Vootrekker Road Corridor should be intensified, specifically around the transit nodes to allow for a range of commercial, residential, light manufacturing and industrial activity to develop along its length. Secondary spines or corridors (predominately north and south linkages) should accommodate medium to high residential and commercial development (40-60 du/ha) and should include a mix of district facilities such as clinics, schools and play parks. Tertiary streets require less exposure and may be used for lower density residential activity, however densities in these areas should increase to 25-40 du/ha. Lower order facilities such as crèches and community gardens may be located in these areas. The objective of these land use guidelines is not to be prescriptive and static, but rather to indicate where suitable land uses should occur in order to situate the Vootrekker Road Corridor study area as a diverse, lively and mixed-use place (figure 7.24).

Precedent: Malmo, Sweden

Bo01 Malmo is an industrial port in Sweden that was transformed to make way for high-density housing (Austin, 2013). Built in 2001, Bo01 now has a density of 120 persons per hectare (City of Melbourne, 2010). Different building typologies and block sizes have been developed to create a mixed-use and diverse urban environment. With buildings ranging from two to five storeys in height, this case study illustrates that buildings do not need to be high-rise to achieve a compact city form. The high density of this town ensures that the provision of bulk services such as water, sewerage and electricity is less expensive and more resource efficient (Austin, 2013). The district was also planned to reduce the need for car use and as a result a number of pedestrian paths, a cycle network and a public transport system was implemented. Furthermore, quality public spaces such as parks, green roofs and paths offer places for relaxation and are natural habitats for more than 50 plant species (Austin, 2013). Bo01 is an example of a compact urban settlement that contributes quality of an urban environment, through carefully considered green spaces and an attractive public realm.

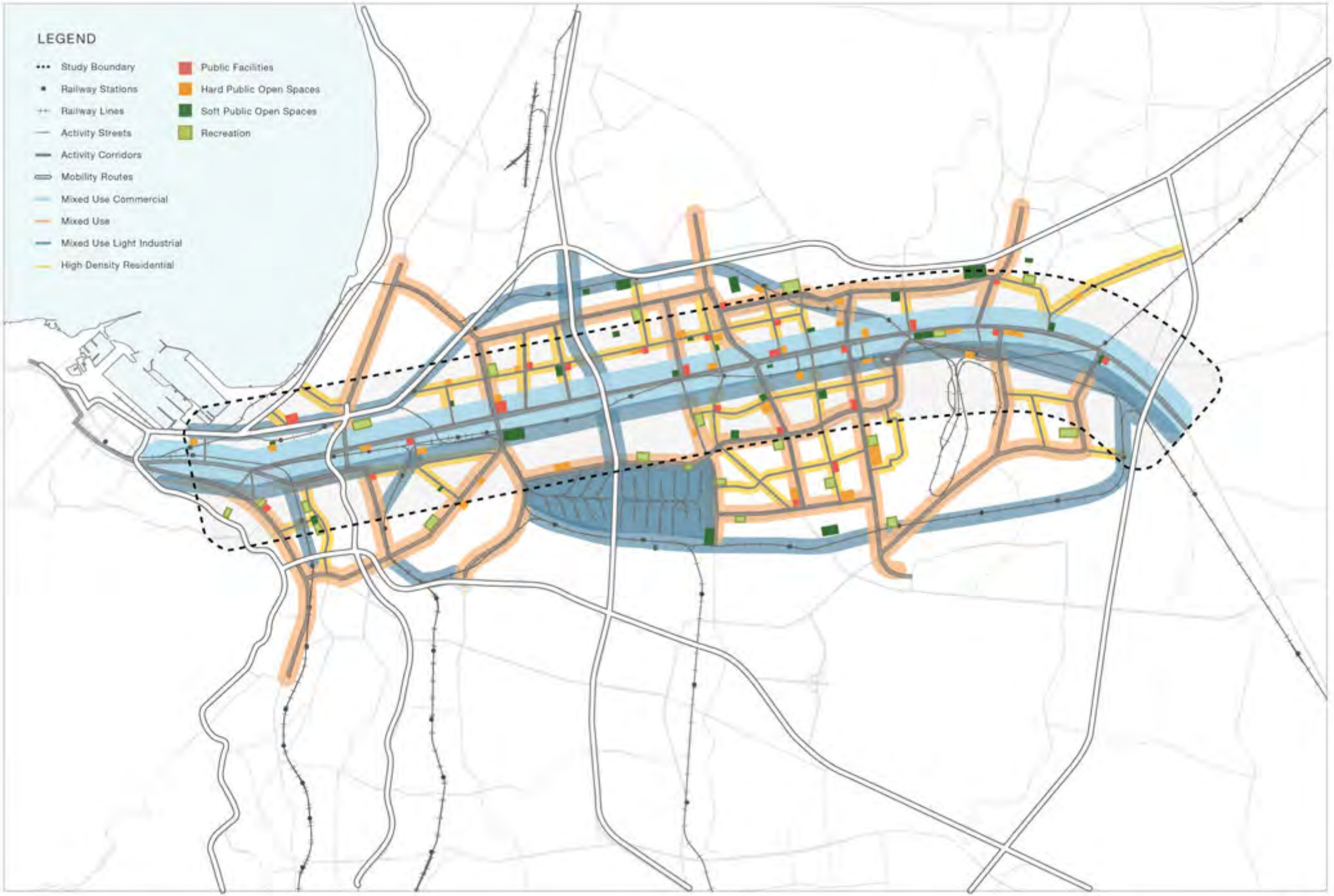

Figure 7.23: Conceptual Land Use and Areas identified for intensification (Source: Author, 2016; GIS Technical Library, UCT).

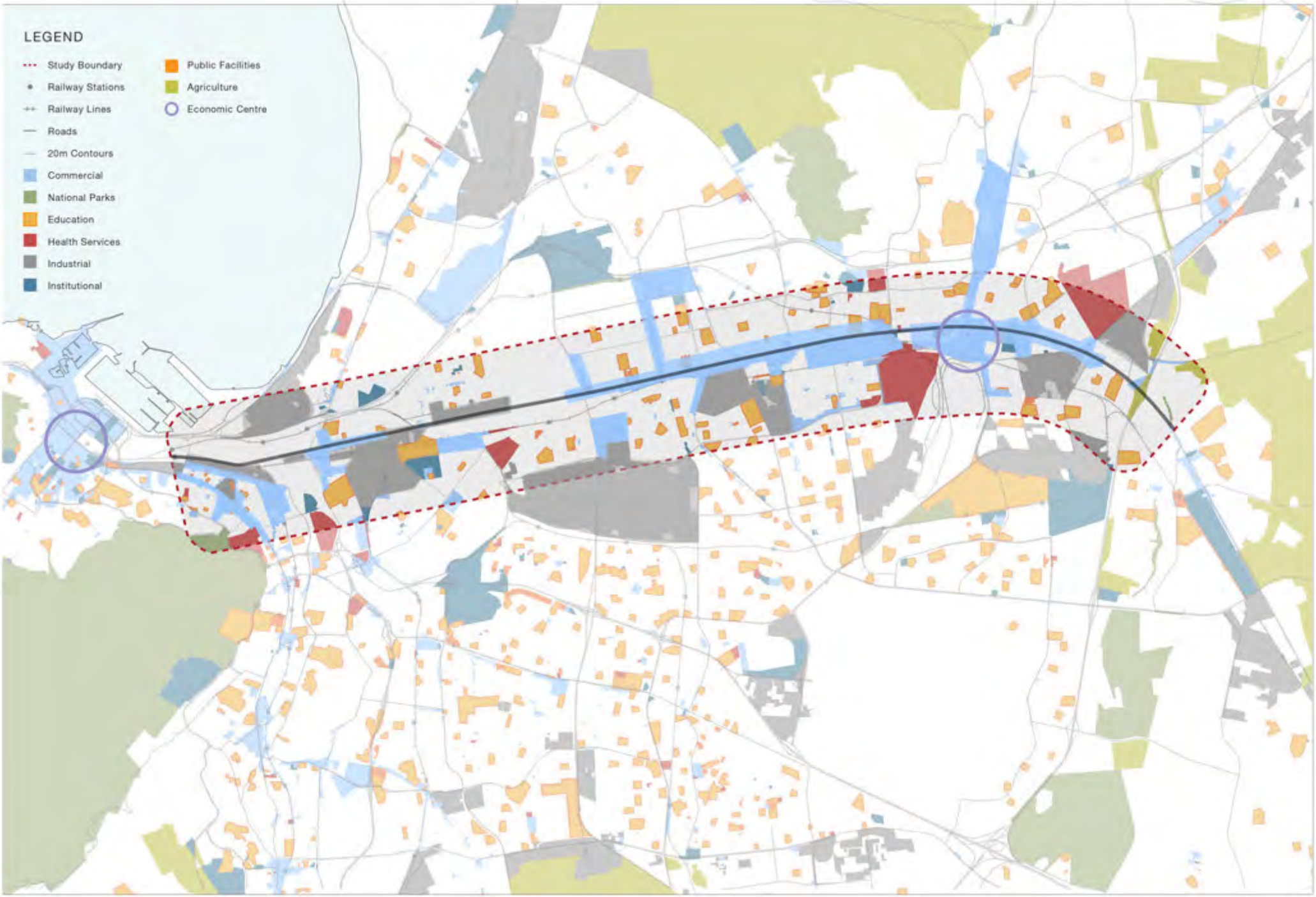

Figure 7.24: Indicative Land Use (Source: Author, 2016; GIS Technical Library, UCT). 1:70 000

7.5 Composite Development Framework

A synthesis of the Voortrekker Road Corridor development framework is shown in figure 7.26. The key directives of the framework are spatially designated to guide and inform future development. However, these strategies are conceptually illustrated and therefore require the formulation of more detailed district or precinct plans. This dissertation has selected one pilot precinct in the study area to show how the development framework activates smaller areas within the site.

7.6 Identification of a Pilot Precinct

The Parow Golf Course has been identified as a priority precinct within the Voortrekker Road Corridor study area. The site has been selected because it is large tract of land (780 m2) located within 13 minutes drive of the Bellville CBD. In Cape Town it is necessary to restructure the spatial form of the city to achieve greater equity and integration. Hence, it is argued that an exclusive and underutilised golf course offers an opportunity for redevelopment for the public good. The golf course currently functions solely for the use of golf members and paying guests in Parow (Parow Golf Club, 2016). It also acts as a buffer between the residential areas along Voortrekker Road Corridor and the northern suburbs.

In comparison to the existing members of Parow Golf Club there are approximately 380 000 households who require access to affordable and well-located housing and recreational space in the city (CoCT, 2012b). It is therefore contested that this golf course that is used by a relative privileged few, is not the most optimal use of this land. It is proposed that the state reclaim the golf course to re-integrate poorer communities into the core of the city. This will unlock well-located land for mixed use, high-density development. Furthermore, it will position people closer to economic opportunity and amenities along the Voortrekker Road Corridor. The recreational green space of the site could also be opened up to become more accessible to a larger community and provide a strengthened sense of place in the sprawling suburbs of Parow.

7.7 Conclusion

Building on the metropolitan conceptual framework, this chapter formulated a development framework for the Voortrekker Road Corridor. A biophysical and contextual analysis of the study area was also conducted to ascertain the key challenges within the study area. These findings were then synthesised in the form of a constraints and informants map. From these findings, the principle directives of the development framework were conceptualised. These directives include:

- Conservation and protection the site's natural systems and amenities,
- Increasing connectivity through the study area through an improved public transportation system and accessibility grid,
- The facilitation of inclusive economic development through the investment of learning facilities and the informal economy,
- The improvement of quality public spaces and institutions to enhance the public realm,
- The promotion of a compact city form to increase TOD and urban corridor densification

Through the proposed interventions outlined in this framework, it is argued that spatial equity and integration could be achieved. The intensification and restructuring of the site through TOD and urban corridor development will ensure that those opportunities for ecological sustainability, increased accessibility, economic growth and prosperity will follow. In order to give affect to this framework a pilot precinct has been identified for future development. The next chapter will formulate a layout plan for the site and will outline the key interventions that are needed to shift spatial development within the Vootrekker Road Corridor.

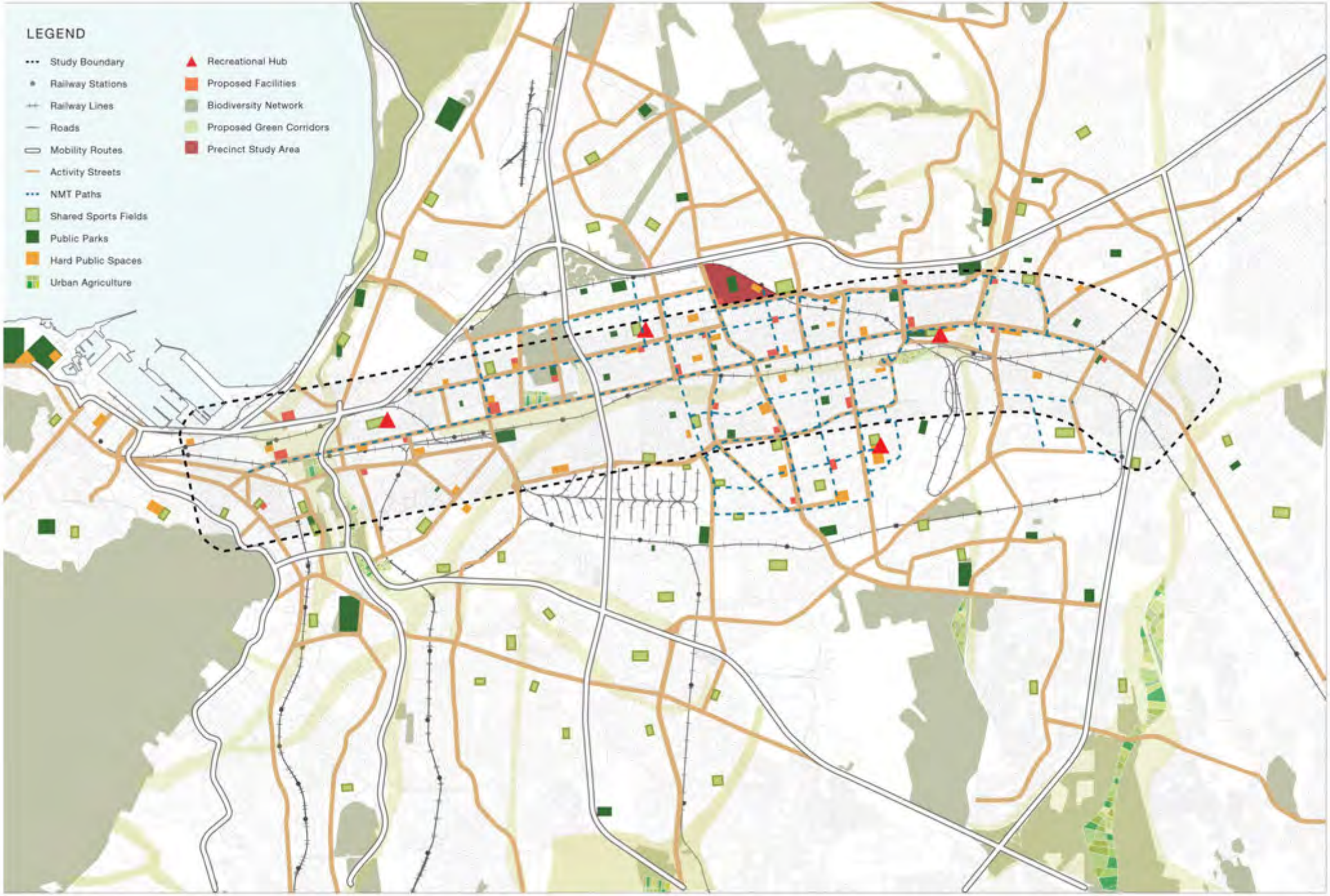

Figure 7.25: Composite Development Framework (Source: Author, 2016; GIS Technical Library, UCT). 1:70 000

8. Precinct Development Plan

This chapter represents a detailed precinct plan for the Parow Golf Club. It has been proposed that ownership would revert to the municipality. The objective of this chapter is to show how the concepts of the development framework can be applied at a local scale and translated into a layout proposal. Design principles and guidelines are also outlined to inform the configuration and implementation of the precinct plan. This plan will determine the location of elements of local public structure (green space, movement of all modes, public institutions and public space) (Dewar, Louw & Povall, 2012:42). In addition, this plan will highlight specific areas within the precinct that require priority investment, to give affect to the objectives delineated in the Voortrekker Road Corridor development framework.

8.1 Locating the Precinct Study Area: Parow Golf Course

Parow Golf Club is situated on the axis of Giel Basson and Frans Conradie Drive in the northern portion of the Parow suburb. The 78 hectare site is characterised by green open space and is bordered by the club house and residential buildings on the western and southern edges of the study area. A large wetland is centrally located on the site and contributes to the aesthetic quality of the golf course. In terms of movement, the site is accessible either by car and mini-bus taxi or by De Grendal train station situated in the northwest portion of the study area. The golf course currently forms a triangular shaped buffer between the Parow and Northern Suburbs communities and therefore has the potential to connect and integrate the surrounding neighbourhoods with the Voortrekker Road Corridor.

8.2 Urban Performance and Guiding Principles

This section will outline the required urban qualities and design guidelines that will inform the spatial layout of the development plan for Parow Golf Club. The built environment should enable equitable access to the city and its opportunities (Bentley et al., 1985). The following planning and design criteria offer a greater variety of choice for a city's inhabitants and aid in the establishment of more inclusionary and positive urban environments. These urban qualities vary with scale and include both settlement and local scale performance guidelines.

Equity of access: the linkage of movement routes "affects where people can go" (Bentley et al., 1985:9). Urban environments should provide a range of well-defined and legible paths or routes for its users to navigate and move through a city (Lynch, 1960). The concept of permeability, "the number of alternative ways through an environment" is particularly important for people who do not own cars (Bentley et al., 1985:10). Pedestrians should be able to access economic opportunities and amenities by foot or within walking distance of public transportation. An integrated public transportation system is a means to increase accessibility to living and working opportunities. This is more environmentally sustainable and reduces people's reliance on the use of private vehicles (UN-Habitat, 2013:32).

Choice: environments should offer a choice of lifestyle experiences from public to private and a mix of uses for different income groups, as it enhances "the degree to which people can use a given place for different purposes" (Bentley et al., 1985:9). Choice in this instance can refer to increasing access to range of housing types with different levels of affordability. Choice can also refer to movement (Dewar & Todeschini, 2004). Urban environments should provide citizens with a variety of travel options, as modal choice enables people to travel with greater ease depending on their individual requirements, such as walking, cycling or high-speed rail or bus.

Efficiency: compact urban forms promote higher densities and "resource-efficient" environments that aid in reducing sprawl (UN-Habitat, 2013:30). A compact urban form improves the affordability of service provision such as water, infrastructure and electricity. Efficiency can also refer to the clustering of public facilities according to their hierarchical function, to encourage the sharing of resources (Behrens & Watson, 1996). This will increase accessibility to these resources and will also ensure the cost of maintaining these facilities is minimised. Further, in order to increase efficiency, sites such as public open spaces should have multi-functional uses. These spaces should be integrated with storm water management systems and wastewater treatment facilities.

Ecological sustainability: urban systems should respect and "work harmoniously with nature…recognising ecological interdependencies" (CoCT, 2012b:15). To ensure the preservation of the natural environment, critical biodiversity and natural systems should be protected to safeguard optimal ecosystem functioning. This can be achieved through the enhancement of continuities of green space and ecological

corridors (Dewar & Louw, n.d.). It is also important to recognise the recreational function of the natural environment. Natural landscapes contribute to the "identifiable character" of a place and can enhance community life (Dewar & Todeschini, 2004:118). Therefore, these natural assets should be protected and conserved through ecologically sustainable processes for future generations to enjoy. Ecological sustainability can be achieved through the promotion of a compact urban form, NMT and moving towards renewable energy resources.

Equity: high quality public institutions and facilities should be concentrated at points of highest exposure to increase accessibility to opportunities located within an urban environment (Dewar & Todeschini, 2004). The clustering of these amenities can attract potential consumers to the area. They should therefore be linked with service points and hard, multi-use public spaces. To create the conditions for local economic development and informal trade, it is necessary to provide the infrastructure for self-generating employment, such as flexible workspaces, places for interaction and market stalls for traders (Behrens & Watson, 1996). The intensification of activity corridors and corresponding through-routes can increase economic opportunities by creating the thresholds to support large and small-scale consumer activities.

Spatial Quality: at a local scale the principles of place making should be investigated with greater detail. Specific emphasis should be placed on the quality of the public realm such as streets, public spaces and parks as the principal structuring elements of urban environments (Behrens & Watson, 1996). These places should become centres for social interaction and events that contribute to community building (Dewar & Todeschini, 2004). In order to enhance the sensory and aesthetic experience of these spaces, the public realm should be humanly scaled, and should provide a sense of enclosure and comfort. Moreover, people should be able to orientate themselves within a space according to "visual cues" (Bentley et al., 1985:10). These visual cues contribute to the character and identity of an area. In addition, these areas should be well defined to ensure that there is ownership of public spaces. Creating active frontages and surveillance will also ensure that these spaces feel safe and enjoyable (Dewar & Todeschini, 2004).

All of these qualities should be considered in the spatial design of a settlement. This would result in the enhancement of the urban performance and experience of the urban environment (Dewar & Todeschini, 2004). In practice however, it will be necessary to modify and adapt these guiding principles according the context of the chosen study area (Bentley et al., 1985). This process is explored in the conceptual development of the public structuring elements of the precinct plan in section 8.4.

8.3 The Dimensions of the Layout Plan: Blocks and Subdivisions

In the mid twentieth century, the modernist approach to separate the elements of urban structure into distinct parts and to prioritise high-speed vehicular movement led to the transformation of traditional urban settlements (Carmona et al., 2010). As a result, the city block was designed to accommodate cars and not people (Francis, 1991). Freestanding buildings were also a characteristic of modernist design (Dewar & Todeschini, 2004). In traditional urban settlements, the built fabric was dense and buildings were built up against each other and the street, creating the "walls" of open space (Carmona et al., 2010:85). However, the modernist preoccupation with the need for distinctive freestanding buildings contributed to the fragmentation of urban space and the urban block system. Hence, it is necessary to return to design of human-scaled, "integrated and connected, finely meshed grids" (Carmona et al., 2010:85).

Settlements that are designed for cars result in course-grained (large residual spaces between buildings) and are highly

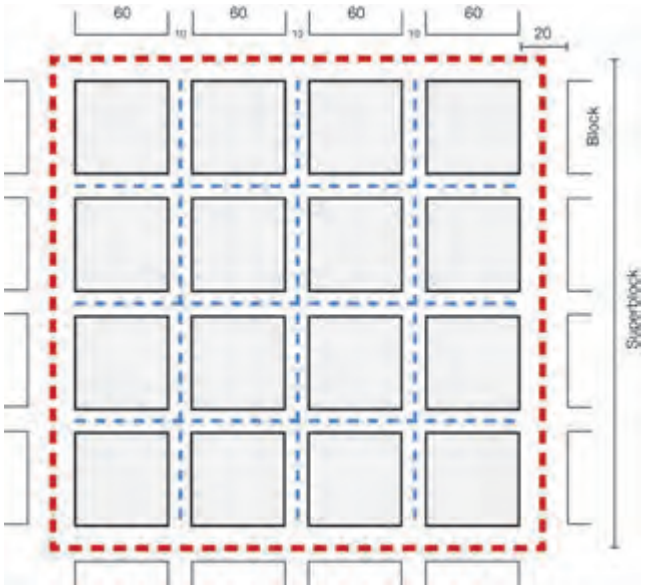

Figure 8.1: Diagram of a super-block (Source: Author, 2016)

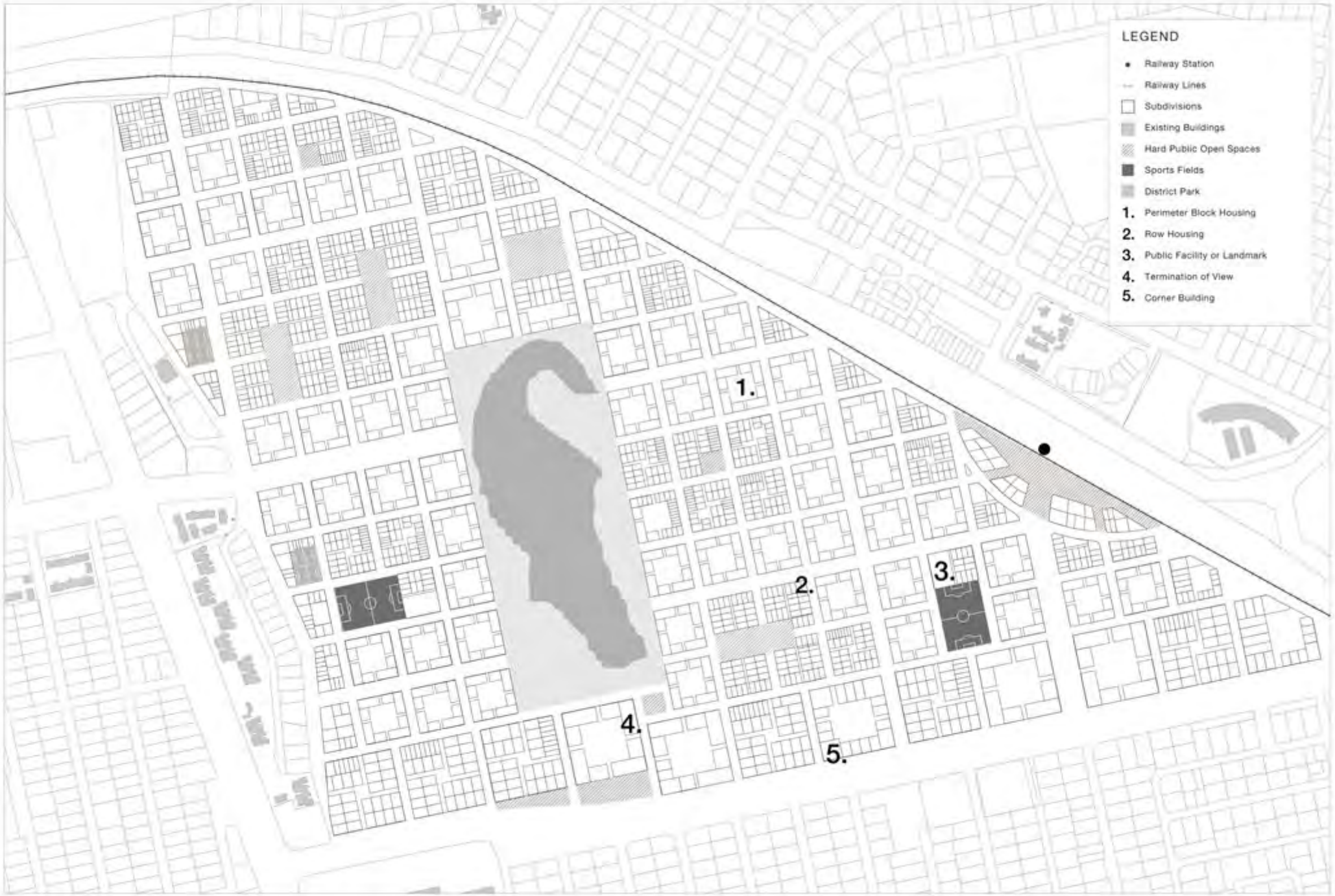

Figure 8.2: Dimensions of the Layout Plan (Source: Author, 2016) 1:2 000

inconvenient urban environments (Dewar & Todeschini, 2004). Therefore, in order to increase equity of access for all citizens it is necessary to design for pedestrians as opposed to planning for a car dominated urban environment. After the "constraint of movement on foot is broken" the different elements of public structure can then considered (Dewar & Todeschini, 2004:55). Hence the concept of walkability should be cast at the forefront of planning and design decisions. Block width and length determine the "facilitation of easy pedestrian circulation" (Behrens & Watson, 1996:146). However, in an urban settlement it is also necessary to provide movement channels that can transport people and services efficiently from place to place. Using the concept of a superblock, pedestrian movement and vehicular mobility can both be accommodated.

A superblock is made up a grid of smaller blocks where the main mobility occurs on the roads on the outside of the superblock (figure 8.1). The roads within the superblock should be used for low-speed movement and mix of NMT activity. This system sets up hierarchy of movement and can support the provision of efficient BRT to run along the higher order routes abutting the superblock. A block system of 60 x 60 m internal blocks has been established to enable ease of pedestrian movement (Behrens & Watson, 1996). This block size emulates Cape Town's traditional block layout in the CBD. This allows for greater through connections and ease of pedestrian access. When the internal blocks are combined with designated through routes, an urban grid layout is formed to make up a superblock of 300 x 300 m. A distance of 300 m corresponds to a comfortable walking distance of less than 5 minutes and thereby facilitates both pedestrian and vehicular movement.

Service reticulation is another key element of block layouts and subdivision patterns. The efficiency of a layout plan can be increased by reducing the length of service runs (in the form of pipes and cables) to the number of erven that they serve (Behrens & Watson, 1996). The length of roads and the length and cost of service runs are dependent, therefore the use of shorter road lengths create a more cost effective and efficient layout plan.

In terms of subdivision patterns, the narrower the frontage of an erf, the more efficient the layout plan will be (Behrens & Watson, 1996). Narrow erf frontages and smaller plot sizes reduces the length of service reticulation and increases the gross density of blocks. A suggested frontage of 5 to 8m is advised to improve efficiency and to enhance the quality of the urban environment. Narrower frontages increase the surveillance or number of "eyes on the street", activating the streetscape by creating clearly defined edges. Conversely, different access requirements and housing typologies need to be considered when determining erf sizes.

In order to improve the flexibility of the site layout and to accommodate different uses, a range of erf sizes are provided in the layout plan. A mix of larger and smaller erven will ensure that commercial and industrial activities can operate from residential plots (Behrens & Watson, 1996). A variety of erf sizes are also provided to allow for an assortment of housing types, from larger erven (approximately 200-500m2) for perimeter block housing and smaller erven (approximately 65-120 m2) for row housing. However, commercial activity and small-scale businesses need to be located in areas with greater accessibility. Therefore, larger erven should be positioned in central locations and front onto higher order roads that receive large amounts of foot traffic and access to public transportation service. Figure 8.2 illustrates the site layout with a range of erf sizes, allowing for small-scale retail, manufacturing and residential land uses.

To conclude, in order to integrate fragmented settlements, this layout plan aims to accommodate a variety of functions and uses, as opposed to mono-functional uses that were a characteristic of modernist planning. The objective of this block and subdivision structure outlined in this section is to facilitate choice and to create an inclusive and connected precinct that enhances public life.

8.4 Design Guidelines and Layout Features

There are number of visual elements and layout features that improve enhace the urban performance of the layout plan. These elements and features can enhance the spatial quality of the public realm and contribute to overall aesthetic experience of the urban environment. Features such as landmarks, contrasts of enclosure and corner buildings, should be strategically integrated throughout the layout plan to enrich the sense of place and character of an area. It is argued that these urban design elements contribute to the image of the "whole" settlement, which is "greater than the sum of the individual parts" (Carmona, et al., 2010:184).

For Dewar and Todeschini in order to improve the spatial quality and urban performance of the built environment, it is necessary to "return to the design of streets and public spaces as opposed to roads and parking lots" (2004:91). Streets are

movement paths that encourage and facilitate a variety of activities to take place along their edges (Dewar & Todeschini, 2004), whereas roads function as thoroughfares for vehicular movement and are mono-functional in nature (Carmona, et al., 2010). Streets form the foundation of an area or settlement because they connect people, and they can act as communal public spaces, "the social life of cities" (Francis, 1991:26).

It is argued that the character of streets should be enhanced to make them more "visually dynamic" (Carmona, et al., 2010: 183). Streets with a strong visual character are clearly defined and create a sense of enclosure (Jacobs, 1993). Enclosure is determined by the height-to-width ratios of buildings and the street, which psychologically creates a sense of "comfort" for pedestrians (Dewar & Todeschini, 2004). According to Carmona, et al., a ratio of 1:1 is considered the minimum requirement "for comfortable urban streets" (2010:183). Figure 8.3 provides an example of a street in Bo-Kaap, Cape Town that creates a sense of enclosure and spatial definition with its tall building facades and verandas.

Figure 8.3: Definition and Enclosure in Bo-Kaap Cape Town (Source: Zhang, 2016)

Buildings and landscaping create spatial definition or edges within the public realm (Dewar & Todeschini, 2004). Clearly defined edges can aid in demarcating entrances to buildings, streets and spaces and also indicate the transition from public to private spaces (Carmona, et al., 2010). This concept can be described as legibility. Lynch defines legibility as the individual's ability to read or move through a space and these images of a place influence their overall "image of the city" (1960:46). There are a number ways that legibility can be enhanced in an urban settlement. This section examines how design elements such as street liners, landmark buildings, and landscaping can promote legibility.

Street liners can be used to demarcate edges of streets and public spaces. They are characteristically narrow buildings with short frontages that vary in height (Fawcett, 2003). These buildings create a "strong sense of human presence" within the public realm (Carmona, et al., 2010:192). This precinct plan promotes the use of street liners to decrease the threshold between public and private spaces and to increase intensive activity along streets. Different setbacks are provided to enable choice and to create visual interest for observers who move within the urban environment (Carmona, et al., 2010). These setbacks create opportunities for small gardens, balconies or "spill out areas" for cafes and restaurants, depending on their size. Setbacks create "pinch points" which signify a gateway space upon entering a node or significant area (Dewar & Louw, n.d.71). Figure 8.4 depicts street liners along a road that lead up to a pinch point.

Landmarks are another point of reference that can be used mark the entrance to a street or a public space (Jacobs, 1993). They can take the form of a building, natural landscape or even a storefront (Lynch, 1960). Landmarks are "frequently

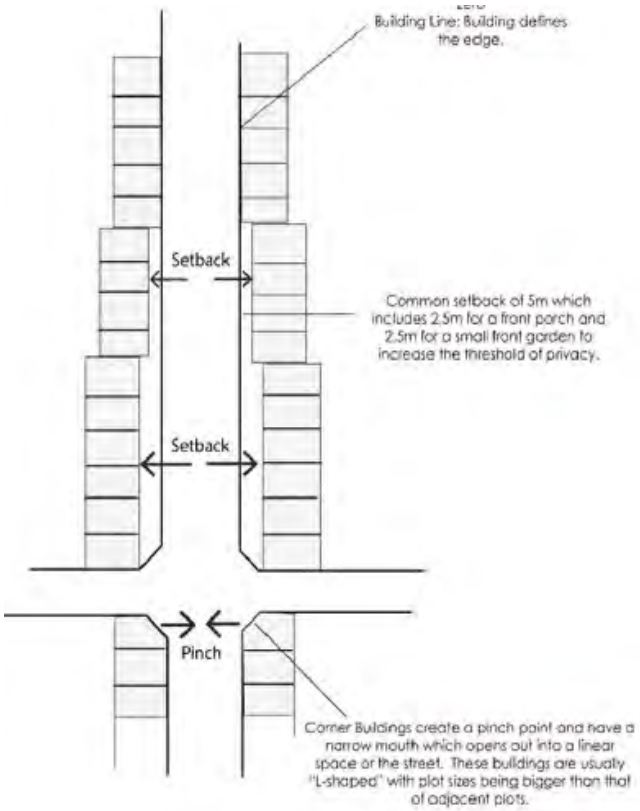

Figure 8.4: Street Liners and Pinch Points (Source: Bassa, 2015)

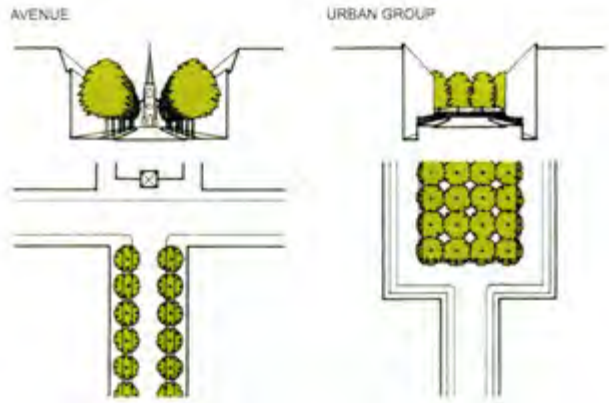

Figure 8.5: Design Strategies for Street Trees (Carmona, et al., 2010).

used clues of identity" and help orientate the viewer in a neighbourhood or district (Lynch, 1960:48). This layout plan makes use of landmark buildings to lead the viewer to and from the study area. There are two types of landmark buildings that are strategically positioned throughout this precinct plan; these include corner buildings and T-junction buildings.

Corner buildings can be used to create a visual hierarchy within the study area. These buildings may have a height of up to 7-8 storeys in order to signify important intersections. Corner buildings are located at highly accessible points and have two active edges. These buildings could therefore be optimally used for retail or commercial activity. Larger plot sizes are required to accommodate these land uses. In addition, the design of corner buildings should be carefully considered as they have the potential to enhance the identifiable character of the precinct. The buildings can be used to create visual interest and to heighten the aesthetic "richness" of the urban environment (Carmona, et al., 2010:190). In Barcelona, Spain, corners are splayed to mark the arrival into a space and the design of the building creates and enhances visual interest (Figure 8.6).

T-junctions occur where two streets join perpendicularly. These locations create movement patterns that culminate at a single point. To enhance the legibility of these areas, the visual termination of the street should be anchored by a landmark or building of importance "that brings the eye to rest" (Carmona, et al., 2010:183). It is argued that these buildings should have a significant role within the overall layout plan as they mark the visual end-point of the street and attract movement energy. For the purpose of this precinct plan, these landmark buildings have a strong institutional or community function, such as places of worship, libraries or museums. The height of the street frontages can be reduced to increase the visibility of these buildings. For example In Church Street in Stellenbosch, the roads converge in a T-junction and pull movement towards the focal point at the end of the street, the church centre (Figure 8.7).

In order to contribute to the legibility of the study area, landscaping and paving of forecourts can be used to signify the entrance to important institutional buildings or public spaces such as a civic square. Within the study area, trees should be planted along the avenues of principal streets "to reinforce or complete the sense of spatial containment within an urban space" (Carmona, et al., 2010:200). The canopy of these trees also serves to protect pedestrians from the sun or from passing cars adjacent to pavements (Carmona, et al., 2010). When indigenous trees are used, the character of the urban environment is enhanced. These trees can also form part of a system of green corridors that promote biodiversity and operate as migration corridors for birds and animals (Dewar & Louw, n.d.). Figure 8.8 illustrates two design strategies for types of street trees, in the form of an avenue or an urban group. The use of these landscaping types would contribute to the distinctiveness of the area.

Figure 8.6: Corner Buildings in Barcelona, Spain (Baussels, 2016)

This section examined how different forms of layout features have the potential to enhance the quality of streets and improve legibility within an urban environment. The design features outlined in this section are to be implemented strategically throughout the layout plan and will contribute to the identity and character of the precinct.

8.5 Structuring Elements of the Precinct Development Plan

This section delineates the structural elements and concepts of the layout plan and provides guidelines for the future development of the Parow Golf Club site. The objective of this precinct development plan is to illustrate how the different elements of public structure (green spaces, movement, public facilities and spaces) can be applied and to part of the Voortrekker Road Corridor development framework. The concept builds upon the notion of an urban corridor and TOD, as a means to restructure the spatial form of the city to facilitate choice, spatial equity and opportunity. This concept is based on the principal that the intensification of corridors and TOD increases accessibility throughout an area and sets up a

Figure 8.7: Church Street, Stellenbosch (Van de Houd, 2013)

system for a variety of activities (large and small) to be located within an urban settlement (Dewar & Louw, n.d.).

The Parow Golf Club has been selected as a pilot project because of its close proximity to the Bellville CBD and the Voortrekker Road Corridor. De Grendal train station is located in the northwest entrance could be improved upon through TOD to shift the spatial dynamics of the area. With limited access to quality public spaces in the city, Parow Golf Course should be re-established as a mixed-use development, with attractive public spaces to create a sense of place and community that is often missing in South African settlements. In order to achieve this, emphasis would be placed on the quality of the public realm, for it is the core of urban settlements (Dewar & Louw, n.d.). This plan also aims to accommodate a mix of activities through a flexible block layout and a range of plot sizes and housing typologies. This will aid in enhancing the quality and efficiency of the urban settlement and will create opportunities for a mix of new activities to locate in the area.

The objective of this precinct plan is to establish a framework that will transform the Parow Golf Course into a neighbourhood centre that provides citizens with a mix of activities including a strong central civic component. Multiple public spaces will be interspersed throughout the urban fabric. A central park is proposed to hold the precinct area together and to create an opportunity for recreation and learning. This park has the potential to serve the larger Voortrekker Road Corridor area and to include surrounding communities. In addition, new facilities will be optimally positioned across the precinct to serve both existing and new residents. These facilities will be located along the accessibility grid to enable equity and choice. This plan aims to create an intensive, compact and mixed-use area that will “enable more people to benefit from the convenience of city living” and to create opportunities for small business generation (Dewar & Louw, n.d.200). These ideas are illustrated in the precinct development concept shown in figure 8.8. The following sections will outline in greater detail the different structural elements that support the precinct development concept described above.

8.5.1 Public Spaces and Facilities

The structuring elements in framing the precinct study area aids in establishing a hierarchy or logic to which the primary public elements of the settlement can be located. This hierarchy is based on the notion of equity, that all citizens should be able to access an intensive, well-serviced and active urban environment. A number of new public facilities and public spaces will need to be provided to accommodate the high-density population that will be living in the area. The recreational role of the precinct is also likely to increase as the settlement expands. The highest order public institutions and public spaces are clustered and positioned along key routes and streets to increase their accessibility and exposure. This will improve and strengthen the quality of the public environment, as the clustering of these amenities will encourage resource sharing and integration (Dewar & Louw, n.d.).

There are three principle public spaces in the layout plan; these include a central park, a civic square and a station forecourt. Secondary and tertiary public spaces consist of smaller courts and pocket parks and that are located along secondary streets or within perimeter blocks. These public spaces offer varying degrees of privacy and exposure to the community. Higher order public spaces should be multi-functional so that they can be used for a number of diverse activities such as social gatherings, farmers markets and informal trading. As these spaces are located at points of high accessibility, their exposure can be utilised to create opportunities for small businesses. In addition, plots for urban agriculture are integrated throughout the precinct. These plots can be linked with market spaces to promote food security and to support income generation.

It is envisioned that the large park, located at the centre of the study area, will become a district amenity for the surrounding neighbourhoods and larger public within the Voortrekker Road Corridor study area. The water feature at the core of the park can be used for paddling and other recreational uses. A number of paved pedestrian and cycle paths will be implemented to run along the waters edge. The boundary of the park will be clearly defined by dense buildings and a number of indigenous trees. The buildings that border the edge of the park should have active frontages that overlook the park to create passive surveillance. It also proposed that an eco-learning centre is located adjacent to the park in the south-western portion of the site. This leaning centre can create opportunities for agriculture-related skills training.

8.5.2 Movement Systems

There are three orders of movement within the study area. These include primary streets or corridor boulevards, secondary streets and tertiary streets. The objective of the integrated movement network is to promote qualities of “street” as opposed to “road” that were discussed in section 8.4. By shifting the focus of settlements from accommodating the efficiency of cars to people, the quality of urban settlements can be enhanced to create to become places for activity, interaction and vibrancy.

Figure 8.8: The Precinct Development Plan (Author, 2016)

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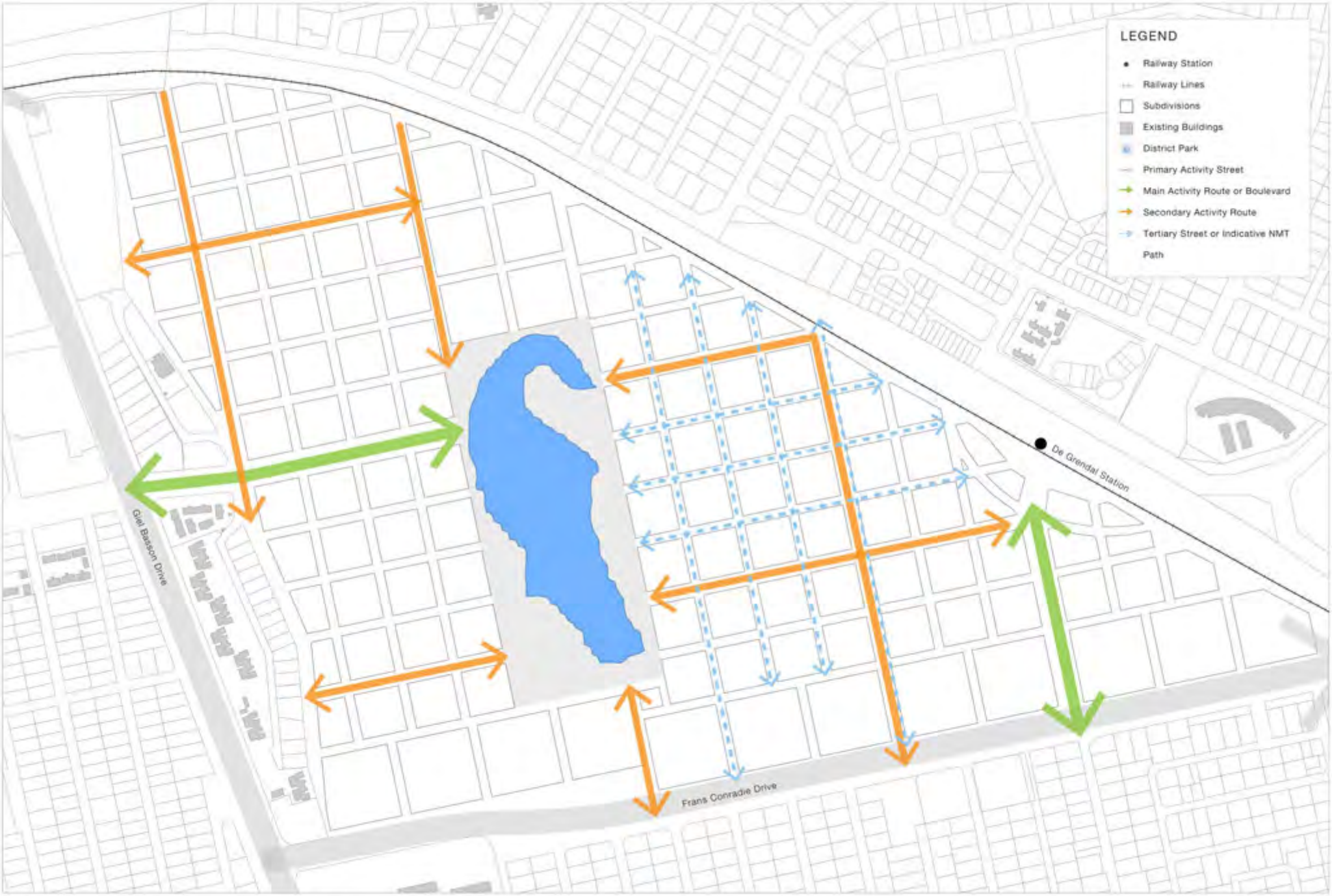

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Figure 8.9: Conceptual Movement Systems (Source: Author, 2016)

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The primary system of movement in the study area consists of north-south and east-west connections and caters for pedestrians, cyclists and public transportation (figure 8.9). These streets function as boulevards and are the key entrances into the site. They also connect the precinct with larger sub-regional routes. These boulevards not only create flows of movement, but they have characteristically large pavements, street furniture and are lined with closely spaced trees (Jacobs, 1993). They promote leisure, walking and act as great public spaces (Jacobs, 1993). La Ramblas, is an example of a boulevard located in Barcelona (figure 8.10). This boulevard has a generous pavement and one movement lane that runs in each direction with a very large median that acts as a linear park. A number of active uses are located along the edge of the boulevard such as restaurants, retail activities and cafes, which attract a large number of people to the space.

In terms of public transportation, the study area is served by both a train and a bus system. BRT runs along the north-south and east-west access bordering the site. These routes increase accessibility throughout the study area. Wide walkways have been proposed to encourage NMT activity within the site. In order to make streets more comfortable and walkable it is necessary to ensure that the built form is humanly scaled and that landscaping is used to make the public realm more vibrant and attractive (UN-Habitat, 2013). Traffic calming techniques such as speed humps and planting trees along streets can make streets safer for pedestrians and cyclists and therefore make them more liveable (UN-Habitat, 2013)

8.5.3 Green Open Spaces and Landscaping

The Parow Golf Club is predominantly a Greenfield site with a number of existing wetlands. The wetlands define the boundaries where development should not occur. It is proposed that these significant natural features are enhanced as conservation areas and recreational spaces. They also have the potential to serve as active green spaces providing relief between the proposed high-density developments for the site. As the wetlands are an ecologically sensitive environment additional studies would be required to protect this section of the site but it could be developed as an educational and recreational space for the residents, similar to Green Point Park.

In addition, a system of interlinked, ecologically significant green corridors will be demarcated within the study area in order to ensure the protection of existing biodiversity, vegetation and water systems. In some cases modified green corridors in the form of tree-lined streets can be used to connect important species and natural systems. Within this precinct, street landscaping is used to emphasise the hierarchy of streets that lead people to important destinations or public spaces. It is also proposed that indigenous trees and hedging be planted along the northwest boundary of the site, adjacent to the railway to act a sound buffers from passing trains.

8.5.4 Housing

In order to create the thresholds needed for TOD, it is necessary to increase the residential density of the Parow Golf Club precinct. This will also aid in promoting a compact and efficient urban form and provide housing for a greater number of people. An optimal density of 60 ha is required to support TODs. However, it is argued that densities can be increased up to 200 du/ha in some areas to improve thresholds and to reduce the cost of serviced land. High densities can be achieved by providing a range of housing typologies in the study area. Some of these housing typologies include perimeter blocks, three to four storey walk-up flats, semi-detached housing and row housing (UN-Habitat, 2012b). Table 8.1 represents density configurations of these housing types. It is proposed that taller buildings are located along higher order accessibility routes in order to increase the average net density of the study area.

Furthermore, the principal of choice is a key consideration in proposing a housing typology that would influence the precinct plan. Urban environments that facilitate choice provide citizens with a range of affordable housing options that offer varying

Figure 8.10: La Ramblas, Barcelona (Source: Heritier, 2009)

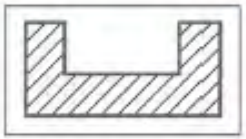
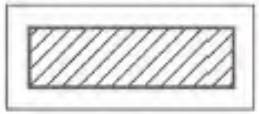
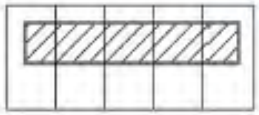
degrees of exposure and privacy. The configuration and use of different forms of housing typologies contributes to the urban character of an area. Therefore, the position of buildings within layout plan must be carefully considered. Building placement can aid in creating gateways or terminating vistas in important civic structures such as meeting halls or places of worship. Buildings located close to the street edges also increase service efficiency and passive surveillance (Behrens & Watson, 1996). For example, the semi-detached row houses in Bo-Kaap create active interface with the public realm. Some of these buildings have raised balconies, which aid in defining the edges between the private and semi-public domain. In addition, the buildings form the "walls" of the street, creating a sense of enclosure and comfort, which in turn encourages pedestrian activity. This precinct plan prescribes that buildings should have setbacks of 3-5m to enhance the quality of the public realm. It is advised that parking should be located behind buildings in shared courtyards.

In terms of land use, all of the buildings that are located along the edges of superblocks should promote mixed-use activity and have heights of up to six storeys. The ground floor of these buildings may accommodate commercial or retail activity with offices or residential units above. These buildings should be designed to allow for flexibility, meaning that they would be able to be changed from offices to residential units and vice-versa. This concept will aid in encouraging mixed-use activity to occur throughout the precinct. It will also ensure that different activities can be supported depending on market demand (Dewar & Louw, n.d.). Areas adjacent to the railway line, in the northwest corner of the precinct could be demarked for light industrial and manufacturing uses. These buildings could be used to buffer the sound effects of passing train. There location will also increase the efficiency of industrial and manufacturing activity, as their proximity to the railway line will improve the distribution of goods. An indicative land use plan for the site is shown in figure 8.11 and Table 8.2.

Due to the high level of accessibility of Frans Conradie Drive, the southern portion of the site that is designed with larger plot sizes to accommodate mixed use and commercial activity. This will create opportunities for small retail shops or restaurants to locate on the ground floor, with living spaces above.

At the entrance to the train station, the creation of a large civic square is proposed. A community hall, a public library, small restaurants and stores border this square. It is envisioned that this public space will function as the core of the eastern precinct that can be used for concerts and markets for small-scale trading. Ideally, this space would be used a place of cultural gathering, where people could go for relaxation during their lunch hour or for after work recreation. Its multi-purpose nature would ensure that it is used by a range of people and different age groups, which will contribute to its continued and active use throughout the day.

Table 8.1: Desired Densities and Housing Typologies (Source: Botha, 2015)

HOUSING TYPOLOGY	NETT DENSITY	HEIGHT	TENURE	PLOT LAYOUT	EXAMPLE
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		

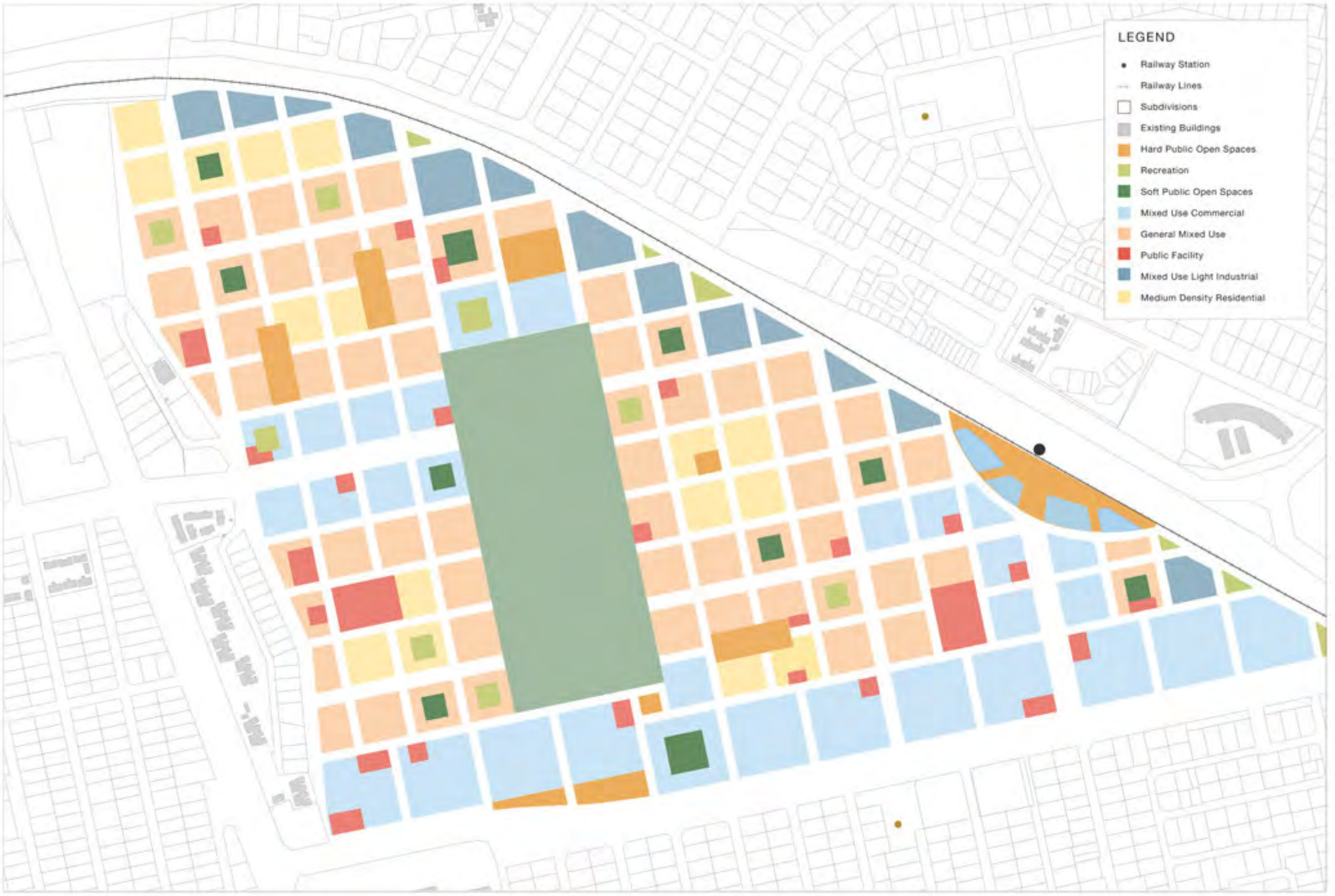


Figure 8.11: Indicative Land Use for the Parow Golf Precinct (Source: Author, 2016)

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In the east of the precinct a secondary school is grouped with an additional primary school and crèche. Sports fields, a library and a multi-use agricultural plot are clustered with the educational buildings to increase the efficient usage of the facilities and to promote the flexible use of the educational area. The public library that is located adjacent to the sports fields can be linked with a coffee shop. The school facilities can be used after school hours as a skills centre to promote small businesses. This will enhance the character of the precinct as an intensive, mixed-use and learning focused area.

This precinct development plan argues that the Parow Golf Club should be developed to promote a compact urban form and to provide an intensive, active and affordable living environment for prospective residents. A compact urban form can accommodate more households by using less land and reduce the cost of infrastructure provision (Behrens & Watson, 1996). In order to achieve compaction and improve thresholds for TOD, this layout plan aims to increase the average net density of settlement from 8 du/ha to approximately 120 du/ha. This section will determine the number of facilities, services and housing needed to accommodate the future population.

It is estimated the site will be able to provide 4 680 dwelling units if it is developed at a net density of 120 du/ha. The average household size in Cape Town consists of 4 people (WCG, 2015). This means that the site has the potential to accommodate a population of 18 700 people. Table 8.3 outlines the number of facilities needed in the study area to serve a population of this size. These calculations have been determined according to CSIR standards and use population thresholds and minimum size requirements. This programme has also calculated the amount of land needed for these facilities. However, it is likely that less land will need to be used for development, as most facilities will be clustered to increase efficiency. In addition, maximum travel distances have been included in this table, although it is argued that these facilities should be accessible within a maximum walking distance of 1,5 km (approximately 15 minutes walking time) or via public transportation (CSIR, 2000).

Land Use	Percentage of Site	Hectares
Movement	20	15,6
Open Space	10	7,8
Commercial	8	6,24
Industrial	4	3,12
Housing	50	39
Public Facilities	8	6,24
Total	100	78

Table 8.2: Proposed Land-use Plan (Source: Author, 2016)

Facility	Hierarchy	Minimum Population Threshold	Maximum Travel Distance (km)	Minimum Size (ha)	Facilities Required	Land Required (ha)
Recreation						
District Park	Tertiary	20 000	10	6 - 10	1	10
Community Park	Secondary	2 000	1 - 2	1	9	9
Neighbourhood Park	Primary	1 000	0.5	0.05	18	9
Sports Field	Primary	15 000	2	0.02	2	0.04
Education						
Secondary School	Secondary	6 000 – 10 000	2.25	2.6 - 4.6	3	7.8
Primary School	Primary	3 000 - 4 000	1.5	1.4 - 2.4	6	8.4
Nursery School	Primary	2 400 - 3000	0.5	0.02	6	1.2
Health						
Local Clinic	Primary	5 000	2	0.1	4	0.4
Social Services						
Library	Secondary	5 000	1.5	0.013	4	0.0.52
Community Centre	Secondary	10 000	1.5	0.5	2	1
Place of Worship	Primary	2 000	1.5	0.015 – 0.3	9	0.2
Civic Services						
Post Office	Primary	11 000	2	0.05	2	0.1

Table 8.3: Development Programme for the Parow Golf Club Precinct (Source: Author, 2016)

8.6 Conclusion

This chapter formulated a precinct development plan for the Parow Golf Club. The precinct was selected as a strategic area for development because of its close proximity to the Bellville CBD and the Voortrekker Road Corridor. It was argued that the golf course could be developed to improve spatial equality in the study area, creating opportunities for people to access a dense, vibrant and mixed-use urban environment. It was also proposed that De Grendal train station located in the northwest entrance of the site could be improved through TOD to shift the spatial dynamics of the area. The site has the potential to increase accessibility through the northern suburbs towards the Voortrekker Road Corridor, thereby knitting the fragmented suburbs along the corridor together. This would give affect to directives set out in the development framework, restructuring the spatial form of the city to make it a more connected, inclusive and equitable place for all of its citizens. As a result, this chapter established a precinct plan that provides a variety of plot sizes, housing types, public spaces and facilities.

9. Implementation Framework

The objective of this chapter is to identify the key projects needed to implement the Vortrekker Road Corridor development framework. This implementation framework will outline the principal role players, responsibilities and timeframes that are required in order to carry out these key projects. In addition, this framework will delineate the investment priorities and programmes for the Voortrekker Road Corridor, which requires collaboration between public and private sectors in order to guide investment.

9.1 Approach

In order to implement the Voortrekker Road Corridor development framework, a "highly coordinated, systematic and collaborative approach" between the different spheres of government, the private sector and civil society is required (DCGTA, 2016a:3). Furthermore, an understanding of the roles and responsibilities of the various stakeholders is needed in order to realise the objectives of the development framework. This requires strong leadership and political resolve to manage and support the implementation of the development framework and its key interventions.

If partnerships between communities, the private sector and other levels of government are well structured, this will mobilise support in order to attain the resources needed to implement local plans and deliver services within the Voortrekker Road Corridor. According to the DCGTA, "when these various groups collaborate and are driven by the same vision and agenda, the desired urban transformation can be achieved" (2016a:3). Hence it is necessary to leverage the resources of multiple role players in order to increase access to funds, knowledge and managerial skills that are needed for projects. One such way to achieve this is through partnerships with Community-based Organisations (CBOs) and Non-governmental Organisations (NGOs) as well as through public private partnerships (PPPs). Furthermore, engagement with local communities can "mobilise residents' energy and resources and make projects progress faster" (UN-Habitat, 2012d:150).

Additionally, decision making with regards to planning for growth and development should be more inclusive and equitable. Decisions should be made and informed by working together with communities that have been previously disadvantaged, and who have been excluded in the development (or lack thereof) of their settlements. A communicative and collaborative approach to decision-making processes could also help empower citizens by facilitating mutual learning and understanding between different communities and cultures (Sandercock, 1998). According to Fainstein, "greater citizen input could be instrumental in affecting urban development" (2005:124).

Furthermore, in order to attract investment opportunities, there is a need for stronger inter-departmental cohesion as well clearer outlines for project timeframes. Therefore, investment can be encouraged in the Voortrekker Road Corridor study area through an improved alignment between institutions, policies and strategies. Moreover, it is necessary to consider the "investment readiness" of priority projects with regards to land and infrastructure. There should be incentives put in place that establish the time required to attain land use rights. This is necessary in order to reduce the administrative burden in the region so that there are guaranteed processes and timeframes that will allow for investment. This can be achieved by implementing standards for the efficient processing of business applications (DCGTA, 2016b).

9.2 Key Projects

The following priority projects will outline the different interventions that should take place over the next five to twenty years. These projects have been identified because they have the ability to unlock development potential in the Voortrekker Road Corridor. Furthermore, these projects have been prioritised as a means to allocate the City of Cape Town's municipal resources as efficiently as possible. This is particularly important in context of the region where there are large disparities between the rich and poor, which is exacerbated by the spatial structure of the study area. Therefore, the prioritisation of projects and accountability and transparency between stakeholders is essential in order to make a substantial impact in the region. The following key projects, implementation mechanisms, role players and timeframes are outlined in Table X below.

In order for this framework to be successfully implemented, it will be reviewed every five years to monitor and assess its progress, as well as to readjust or reprioritise projects if necessary. Furthermore, the identification of these strategic projects will require the development and implementation of detailed local area plans to the "catalyse development spinoffs" (DCGTA, 2016a:20). An example of a detailed local

area plan was outlined in the previous chapter. This plan could be used as a precedent for how future development along the Voortrekker Road Corridor should occur.

9.3 Conclusion

This chapter formulated an implementation framework for the Voortrekker Road Corridor development framework. It outlined the key interventions and actors needed to give affect to the objectives set out in the development framework. These interventions are descried in the short, medium and long term and will be monitored and evaluated every five years. The next and final chapter will outline the key conclusions and recommendations for the study area.

Project	Objective	Timeframe	Implementing Agents	Funding	Priority
Green Systems					
Rehabilitate water quality of rivers and critical biodiversity areas	Protect and conserve the corridor's cultural and environmental assets in order to safeguard critical ecological processes Restore quality of water for agricultural production Improve equitable access to quality natural environment	Short to long term (on-going) (3-20 years)	Cape Town Municipality, Greater Tygerberg Partnership, Working for Water, Berg Catchment Management Agency, SANBI	Private Sector Partnership, Cape Nature, Working for Water Deapartment of Environmental Affairs, Department of Agriculture	High
Movement					
Establish an integrated transport system, link train stations with BRT and NMT	Increase accessibility to socio-economic opportunities Improve integration and connectivity Improve north – south linkages	Short to medium term (2-7 years)	Cape Town Municipality PRASA, Department of Transport, Private Developers	PRASA, Private Land Owners, Local Businesses Transport for Cape Town	High
Upgrade stations along Voortrekker Road Corridor	Connect with integrated transport station Stations should be linked with upgraded forecourts or public spaces Support informal traders by formalising trading spaces	Short term (2-5 years)	Cape Town Municipality, PRASA, NGOs, Local Community, Department of Transport, Greater Tygerberg Partnership Department of Trade and Industry	Municipal Department Budget, Private Developers, PRASA, Private Business Owners, Private Land Owners	Medium
Economic Opportunity					
Increase intensification along the primary accessibility grid	Prioritise mixed-use and infill development Reduce the effects of urban sprawl Support thresholds for public transportation and small businesses Support light industry and business activities	Short to long term (on-going) (2-20 years)	Department of Trade and Industry, Private Business Owners, Private Land Owners, Department of Human Settlements		High
Identify areas for urban agriculture in centralised locations	Optimise forward linkages in the agro-processing sector and agri-business sector – increasing employment opportunities Improve access to small-scale farming and trading, thereby supporting urban livelihoods and the informal sector as a means to address poverty and improve food security	Medium to long term (on-going) (6-15-20 years)	Cape Town Municipality, Private Sector, Department of Agriculture, NGOs Working with energy, Department of Energy,	Private Land Owners, Local Businesses, Municipal Department Budget Clean Technology Fund, WC Provincial Green Cape Initiative	Medium
Upgrade over-utilised schools and introduce more learning centres	Enhancing education and increase the number of skills training facilities	Short to medium term (4 -7 years)	Educational Institutions NGOs	WCG Schools Infrastructure Backlog Grant,,	Medium - High
				Infrastructure Development Improvement Programme Private Investors,	
Urban Form and Character / Land Use Intensification					
Manage urban growth through the promotion of a compact city form	Increase densities adjacent to train stations (TOD) and principle activity corridors Improve equitable access to public amenities Reduce the need for vehicular movement	Short to long term (on-going) (2-20 years)	Cape Town Municipality, Private Sector,	Department of Human Settlements	High
Cluster public facilities and public spaces	Distribute amenities according to hierarchy and need for accessibility / exposure, particularly at transport interchanges Increase efficiency and accessibility to public amenities Encourage resource sharing Consolidate under-utilised parks and sports fields to uncover land for low-income housing or mixed-use activities, such as recreational hubs	Short to medium term (4 -7 years)	Cape Town Municipality, Private Sector, Educational Institutions Department of Heath SANParks	Department of Human Settlements, WCG DEADP, WC Provincial Green Cape Initiative Schools Infrastructure Backlog Grant, Infrastructure Development Improvement Programme Private Investors,	Medium
Improve quality of the public realm through landscaping and quality public spaces	Attract business / commercial investment Increase safety and reduce crime Encourage NMT activity	Short term (3-5 years)	SANParks Cape Nature Cape Town Municipality	Private Developers, Local Business Owners, Public Works Programme	Medium - High

Table 9.1: Implementation Framework (Source: Author, 2016)

10. Conclusion

It has been more than twenty years since the achievement of democracy in South Africa, however its cities remain fragmented and characterised by spatial and social inequalities (Harrison & Todes, 2015). The legacy of modernist and apartheid planning has resulted in sprawling settlements that are typified by inward facing neighbourhoods that require people to travel long distances in order to reach centres of employment and amenities. Moreover, it is specifically the poor who are forced to live on the outskirts of cities that are affected. Thus, the ever-growing costs of "fragmentation, sprawl and segregation for individuals, society, the economy and the environment cannot be neglected" (Turok & Watson, 2001:119).

This dissertation has argued that a new approach is required, to challenge conventional development models to achieve inclusive growth and change. As a result, this study has explored the concept of urban corridor intensification and TOD, as a means to restructure the fragmented, inequitable and inefficient spatial forms of South African cities. This research has identified that these two approaches could aid in the critical restructuring of South African cities such as Cape Town, to increase accessibility, inclusivity and spatial equity. In order to make this case, a development framework for the Voortrekker Road Corridor was formulated. Working across a number of scales (from metropolitan to precinct), this dissertation demonstrated how the concept of urban corridor development and TOD could be realised.

A package of plans approach was used to outline the three scales for this framework. These scales included a metropolitan, sub-metropolitan and precinct scale. This method ensured that an analysis was conducted at each scale to inform the formulation of an appropriate concept and corresponding development plan framework to guide decision-making (Dewar, Louw & Povall, 2012). The objective of this method was to ensure the consistency of thought across the three scales.

The key outcome of this research led the formation of a development framework for the Voortrekker Road Corridor that identified the principle actions needed to guide future growth and investment. The underlying concept for the development framework was based on the principle that the intensification of urban corridors and TOD increases efficiency and accessibility throughout an area and sets up a system for a variety of activities (large and small) to locate within an urban settlement (Dewar & Todeschini, 2004.). This concept therefore facilitates choice, opportunity and spatial equity. From this concept a number of interventions were outlined. These interventions were defined according to primary elements of public structure: green spaces, movement, public facilities, public spaces and institutions.

The result of these proposed interventions for the Voortrekker Road Corridor development framework aimed to:

- Conserve and protect the site's natural systems and amenities;
- Increase connectivity throughout the study area through an improved public transportation system and prioritised pedestrian movement;
- Facilitate inclusive economic development through the investment in clustered learning facilities and the informal economy;
- Enhance the quality of public spaces and institutions to improve the public realm;
- Promote the design of a compact city form through the resultant intensification along activity corridors and around TOD.

In order to achieve these characteristics it would take many years and considerable effort to be realised (Dewar & Todeschini, 2004). Nonetheless, this could be achieved through sustained investment, long-term planning and directive criteria with regards to development.

This dissertation has argued that if this framework were to be realised it would shift the spatial dynamics of the Voortrekker Road Corridor to achieve spatial equity, integration and inclusion, locating people closer to opportunities of employment and amenity. It would also ensure that opportunities for ecological sustainability, increased accessibility, economic growth and prosperity would follow. Hence, from this research and the formulation of a development framework it was found that increased corridor intensification and TOD along the Voortrekker Road has the potential to restructure the spatial form of Cape Town.

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