Addressing car dependency in Cape Town

Reviewing how the City's mobility and spatial frameworks can transcend car-oriented urbanism

A dissertation submitted in partial fulfilment of the requirements for the degree of
Master of City and Regional Planning

By
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Submitted on
28th October 2022

In the
School of Architecture, Planning and Geomatics

At the
University of Cape Town

Title page

The working title of the research project: Post-car-dependent urban futures: Planning toward ending car-oriented urbanism in Cape Town

Project period: June to October 2022

UCT MCRP Minor Dissertation Credits: 120 Credits (1200 hours)

The final title of the dissertation: Addressing car dependency in Cape Town: Reviewing how the City's mobility and spatial frameworks can transcend car-oriented urbanism

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Dedication

I dedicate this dissertation to my mother, Linda, and my immediate family, the Mpanang'ombe and Chipyoza families.

Acknowledgements

Firstly, I would like to acknowledge my supervisor, Tania Katzschner, for your guidance, compassion and encouragement throughout the dissertation process. I couldn't have been able to complete this undertaking without you—I will remain ever grateful.

Secondly, I would like to acknowledge the Master of City and Regional Planning programme staff during both the Honours and Master's years of study: Tania Katzschner, Tanja Winkler, Nancy Odendaal, Cecil Madell, Nobukhosi Ngwenya, and all other lecturers, tutors, administrative staff and guests. Thank you for making these two years a worthwhile once-in-a-lifetime learning experience and opportunity. Thank you for your help, advice, care and understanding.

Thirdly, my acknowledgements go to my Bachelor of City Planning Honours and Master of City and Regional Planning classmates for the camaraderie, support community and warm co-learning experience.

Next, I would like to acknowledge the UCT Built Environment Library staff: Dianne Steele, Mervin Wewers, and Noziphiwo Sigwela. Thank you for the study support and the study break chats.

I would also like to acknowledge my Malawian friends at The Millstock: Godfrey Kadzuwa, Major Mwawa, and Edda Mkombezi. Thank you so much for being my close support system during my studies. Thanks for the meals, chats and laughter.

Additionally, I would like to thank my therapist, Irieza Fortune. Thank you for always being there and for working with me through my challenges.

Next, I would like to thank my family and friends for the long WhatsApp calls that kept me connected with home. Special thanks to my mothers, sisters, brothers, uncle and cousins—you know yourselves!

Lastly, I would like to acknowledge the financial contribution made towards my studies from the JW Jagger Centenary Gift Scholarship for 2022.

Abstract

This dissertation presents research conducted by Wrixon Mpanang'ombe titled 'Addressing car dependency in Cape Town: Reviewing how the city's mobility and spatial frameworks can transcend car-oriented urbanism'.

The research stems from a background of the need to address problems associated with the dominance of cars in cities. The problems include carbon emissions contributing to climate change, road safety issues, pollution and other public health challenges, but also inequitable accessibility favouring private car users, among many other problems. Also, the research is motivated by and in response to the argument by Newman and Kenworthy (2015) that cities are experiencing an end to car dependency. However, since this argument is made based on Global North contexts, researching what an end to car dependency might imply for Southern cities is very relevant.

Therefore, this research situates in Cape Town to explore how the City of Cape Town is currently dealing with the issue of transitioning away from car dependency and car-oriented urbanism. The research explores this by deploying an analysis of the discourse around issues addressing car dependency and car-oriented urbanism in the City's key transport and spatial planning frameworks. The frameworks were analysed through a series of assessment criteria that were derived from the literature review.

Three main gaps emerged through the research: (1) the reluctance to call out car dependency as a major transport problem in the city, (2) the focus on costs for low-income groups in the City's transport planning objectives while overlooking the car dependency in medium- and high-income groups, and (3) the inadequate spatial alignment of plans with the varying urban fabrics (i.e., based on Newman's and Kenworthy's (2015) theory of urban fabrics) and therefore not positioned to leverage the potential of rejuvenating urban fabrics as a pathway toward ending car dependency. The research further suggests that to address these gaps, the key frameworks should be repositioned to explicitly name car dependency as a major problem for the urban mobility system, but also the various urban fabrics should be mapped and aligned with the City's transport and spatial plans and land use policies.

Contents

List of tables

List of figures

CHAPTER ONE

Photo source: https://www.iol.co.za/news/south-africa/western-cape/traffic-congestion-in-cape-town-costs-the-city-r28bn-a-year-38043565

Introduction and research design:

The issue of car dependency and car-oriented urbanism in Cape Town

1.1. Introduction: The issue under investigation

This dissertation explores the issue of cities that are planned and designed in a manner that promotes the ownership and use of private motor vehicles (i.e., cars) as the primary, convenient or preferable mode of transportation within the city. This results in car-oriented or car-centric urbanism in which car dependency becomes the norm for the city's inhabitants whereas urban activities are organised with the assumption that cars are the dominant mobility option (Assmann, 2020; Cervero, 2013, p. 48; Newman & Kenworthy, 2015d; Nieuwenhuijsen & Khreis, 2016). However, there are many problems associated with this form of car-oriented urbanism[1] including environmental issues such as carbon emissions from cars contributing to global warming and climate change, and inequitable access to opportunities for poor residents without cars (ibid). Therefore, with the need for urgent action against climate change and growing socioeconomic inequalities within cities (ibid), cities need to transition away from city planning practices that promote the use and ownership of cars thereby exacerbating car dependency.

A case study on Cape Town is used to explore the issue under investigation in this dissertation. The case study assesses how the City[2] of Cape Town currently deals with the issue of transitioning away from or ending car-oriented urbanism and car dependency within the city. Furthermore, this dissertation explores possible interventions to the problem of car dependency and car-oriented urbanism based on the theory explored in the

[1] In this dissertation, the terms "car-oriented urbanism" and "car-oriented urban development" are used interchangeably. Both 'urbanism' and 'urban development' are used to refer to urban development processes and the way of life of urban residents that result from the type of urban development processes emerging in the city.

[2] In this dissertation, the term City of Cape Town refers to the municipal planning authority for the territory of the Cape Town metropolitan area. Furthermore, the City of Cape Town (i.e., the municipal authority) is also presented as simply "the City" or "City" with the capital letter 'C'. Whereas the use of "city" or "the city" with the small letter 'c' refers to the geographical territory of the Cape Town metropolitan area.

literature review. Therefore, this dissertation works towards recommending appropriate interventions that can lead Cape Town toward an urban future that is less dependent on cars[3].

To this end, this introductory chapter presents a brief background on the problems associated with cars in cities, in general, before establishing the problem of car-oriented urbanism in Cape Town. Thereafter, the aim of the research is presented followed by the research questions and justification for the research. Expanding on the background and justification for this research, the first part of this chapter ends with a short reflection section on the researcher's motivation for conducting this research project. The second part of the chapter presents the research design discussing the research methods and techniques used to answer the research questions including limitations and ethical considerations. The third part of the chapter briefly discusses the philosophical position and normative values guiding the researcher in the study. Finally, the fourth part of this chapter presents an overview of the structure of the entire dissertation.

1.1.1. Background: Problems associated with cars in cities and 'the end of car dependency'

Since the beginning of the mass production of automobiles (i.e., cars) in the early 20th century, cities have been transformed to accommodate cars, particularly with modernist planning ideals of the post-World War 2 era (Assmann, 2020; Brown et al., 2009; Newman & Kenworthy, 2015d). By the turn of the 21st century, cities around the world had grown to become dominated by cars (ibid). As a result, there have been many social and

[3] In this dissertation, the term "cars" or simply "car" is used to refer to private motor vehicles also known as private automobiles; however, this excludes other automobiles used for non-private forms of mobility such as those used as taxis or for ride-hailing platforms such as Uber.

environmental problems that are attributed to the rise of the dominance of cars in our contemporary car-oriented cities.

The social and environmental problems related to car dependency and car-oriented urbanism affect many aspects of life for urban residents in a number of ways. One of the aspects of urban life that are significantly impacted by car dependency and car-oriented urbanism is public health and safety. Car-centric cities present road safety challenges to people walking on foot (also referred to as pedestrians) particularly children, the elderly but also people with visual or hearing impairment or different movement abilities who may be at risk of getting hit by cars because cars are prioritised in movement paths such as streets (Bieda, 2016; McLeod & Curtis, 2022; Nieuwenhuijsen & Khreis, 2016). Furthermore, high rates of mortality and morbidity due to car crashes and other car-related accidents is another problem associated with cars in cities (Bozovic et al., 2021; Nieuwenhuijsen & Khreis, 2016).

Health issues such as respiratory diseases are also further exacerbated in cities that are car-oriented because of air pollution resulting from exhaust fumes from combustion engines and particulate matter generated from the movement friction between rubber tyres and tarmac (Mueller et al., 2021; Nieuwenhuijsen & Khreis, 2016). Furthermore, car-oriented cities promote sedentary lifestyles that contribute to incidents of non-communicable diseases such as heart-related diseases which put pressure on public health systems (ibid).

For social aspects of urban life, car-oriented urban development is associated with inequitable mobility and access with a bias towards car mobility resulting in better accessibility for private car users than users of other mobility modes (McIntosh et al., 2014; Newman & Kenworthy, 2015d, 2015f; Nieuwenhuijsen & Khreis, 2016). High levels of noise pollution and disintegration or fracture of neighbourhoods because of car-oriented road infrastructure create barriers to human connectivity and negatively impact liveability of cities (Brown et al., 2009; Dewar & Todeschini, 2004a, 2004b; Nieuwenhuijsen & Khreis, 2016).

Environmental problems associated with cars in cities include the disruption of connectivity and flows in natural systems because of increasing need for paving for road

surfaces and parking surfaces (Girardet, 2010; Newman, 2020; Newman & Kenworthy, 2015d; Nieuwenhuijsen, 2021; Yang et al., 2022). Furthermore, the constant need for road widening in car-oriented cities continues to encroach on the limited urban green spaces and ecologies left in contemporary built environments (ibid). Additionally, cities that are designed to be car-oriented promote private automobile mobility which is one of the main contributors to the carbon footprints of cities (ibid). Therefore, the car dependency created in car-oriented cities contributes to increasing fossil fuel dependence in society (ibid). Hence, this dependency on fossil fuels in turn leads to more greenhouse gas emissions further exacerbating climate change (ibid).

Also, car-oriented urbanism contributes to the urban inefficiencies caused by traffic congestion. Car-oriented cities are said to perpetuate a vicious cycle of continued congestion and car-based public infrastructure spending to lessen traffic congestion only for car usage to increase (Cervero, 2013; Dewar & Todeschini, 2004a, 2004b; Ewing & Cervero, 2017; Hrelja, 2019; Mueller et al., 2021; Newman & Kenworthy, 2015d; Nieuwenhuijsen et al., 2019). This congestion cycle further perpetuates sprawling urban development, and as a result, it becomes difficult to deal with sprawl due to high private car dependency (ibid). The need to deal with congestion in cities also creates inequitable public infrastructure spending because the focus becomes road expansion projects at the disregard for investments in public transport and other mobility modes that are more equitable such as non-motorised transport (Brown et al., 2009; Dewar & Todeschini, 2004a). Furthermore, car-centric urbanism encourages a consumption culture which further drives extraction and exploitation of ecological systems and further generates more waste that puts pressure on the environment.

Because of all these problems discussed above, the issue of transitioning away from heavy car dependency and car-oriented urbanism becomes critical for cities to address. Since the realisation of the car-related urban problems began manifesting, cities across the world have worked to strategise on how to deal with the challenges albeit through uncoordinated efforts isolated to disciplinary siloes for instance transport planning versus

spatial planning (Cervero, 2013; Grossmann et al., 2021). Furthermore, a more holistic and integrated approach to addressing issues of car dependency and car-oriented urbanism is even more pertinent at the face of the increasing need for deeper transformation because of the climate crisis and increasing levels of urban inequality (ibid).

Nonetheless, when the focus is on reducing the climate and ecological impacts of urban transport but also on ensuring access equity in cities, the strategy widely used for combating car dependency has been transitioning cities toward increasing public transit coverage and use (Cervero, 2013; Grossmann et al., 2021; Newman & Kenworthy, 2015d). However, this is critiqued because the transitions still follow conventional transport planning which is focused on engineering, economic and operational efficiencies to satisfy travel demand (Cervero, 2013; Filippi, 2022; Grossmann et al., 2021; Newman & Kenworthy, 2015f). However, there is an argument that the traditional transport planning approaches are still problematic because they primarily operate on assumptions that the private motor vehicle is the starting norm, and do nothing to deal with transitions away from private car ownership and dependency as a solution for addressing urban transport-related ecological and social inequity challenges (Banister, 2008; Filippi, 2022; Hull, 2008; Newman & Kenworthy, 2015d, 2015f).

Apart from these problems manifesting due to car-oriented urbanism, however, Newman and Kenworthy (2015d) argue that the world has reached the end of the dominance of private car mobility in cities—the end of car dependency. Newman and Kenworthy (2015d) in the preface to their 2015 book, 'The end of Automobile Dependence', suggest that:

> "We are thus in a new era that has come much faster than we had predicted: the end of automobile dependence. The planning paradigm that enabled cities to be built around the car is now virtually dead; a different kind of city can now be envisaged and each day sees more evidence of its reality

being implemented for economic, environmental, and social reasons." (Newman & Kenworthy, 2015c, p. xiii)

Newman and Kenworthy (2015d) go on to suggest that "cities are now competing on how quickly they can reduce their automobile dependence" (Newman & Kenworthy, 2015d, p. 2). The claims made by Newman and Kenworthy (2015d) are based on the conclusions of their research done for over four decades investigating car-oriented urbanism (Newman & Kenworthy, 2015g). Their results corroborate with the 'peak car' phenomenon in which car use is predicted to have passed its maximum (Gao & Newman, 2018; Mildenberger & Khare, 2000; Newman & Kenworthy, 2015g; Webb, 2019). As Newman and Kenworthy (2015d) elaborate: ""Peak car use" suggests that we have reached the peak of growth in car use and the end of building cities around cars as the primary goal of planning—at least in the developed world" (Newman & Kenworthy, 2015d, p. 5).

The thesis of 'the end of car dependence' by Newman and Kenworthy (2015d) is an incredible basis for investigating what the end of car dependency means in the context of Cape Town where the current research presented in this dissertation is situated. However, the thesis by Newman and Kenworthy (2015d) is based on data from the Global North which shows different trends of car-oriented urbanism than trends in the Global South (Newman & Kenworthy, 2015a). Therefore, it is interesting to investigate how the City of Cape Town is addressing the issue of car dependency as a case in the Global South at a time when the phenomena of 'peak car' and the end of car dependency are being experienced in the Global North while private car mobility is on the rise in the Global South (Newman & Kenworthy, 2015a).

Therefore, as discussed to this point, the social, environmental and economic problems presented in cities by car dependency and car-oriented urbanism as well as the trends showing the end in car dependency warrant research to investigate how cities are dealing with car dependency as a problem. This is because in order to effectively deal with the problems that car dependency and car-oriented urbanism presents in cities, it is first important to understand how cities are currently dealing with the issue within their contexts

so that appropriate solutions can be proposed and implemented. This research, hence, is an attempt to assesses how cities (i.e., using the example of Cape Town) are prepared in the quest to transition away from car dependency and car-oriented urbanism.

> "This is the end of automobile dependence, and most of all it means an end to the twentieth-century planning paradigm that assumes car dependence in all of its rules, planning tools, and visions for urban development." (Newman & Kenworthy, 2015c, p. xiv)

1.1.2. Problem statement: Car dependency and car-oriented urbanism in Cape Town

Like in many cities across the world, the problems associated with car-oriented urbanism as already discussed also manifest in Cape Town. Private car mobility is the predominant mode of transport in Cape Town (accounting 42.78% of all commutes between residences and workplaces) with an increasing trend towards private car mobility while the use of public transport particularly rail transport is declining (City of Cape Town, 2021b). The declining trend in rail transport use has resulted in shifts towards the increased usage of minibus taxis, therefore increasing vehicle usage of roads (City of Cape Town, 2021b). Of all commutes between places of residence and workplaces, public transport accounts for about 34% with trends of decreasing bus and train usage while there is increasing usage of mini-bus taxis (City of Cape Town, 2021b). Including mobility using shared private cars, the total proportion of private car usage for work commuting is close to 45% (City of Cape Town, 2021b). Therefore, with the current levels of car usage but also the trends around car usage in Cape Town, it is critical to investigate how the city might transition away from car dependency and car-oriented urbanism.

To this end, it would be important to evaluate how the City of Cape Town deals with the issue of working towards transitioning away from car dependency to deal with the social, economic and ecological challenges presented by cars in cities but also to prepare for 'peak

car'. Furthermore, the conventional planning approaches used by the city have established that the city has low densities in a sprawled urban form which makes operating public transit systems less viable because of insufficient ridership thresholds for efficient transit operations; hence the transition away from car dependency becomes even more critical for evaluation in this sort of transit-inefficient urban form (Allansson & Kajander, 2017; City of Cape Town, 2017; Cooke et al., 2018; Dewar, 2015; Dewar & Todeschini, 2004a, 2004b). Also, the city is yet to restructure its apartheid- and modernist planning-influenced urban form, which leaves high densities in low-income areas of the metro southeast spatially mismatched with existing priority corridors earmarked for TOD (e.g., Voortrekker and Main Road corridors) and (economic) opportunity nodes (City of Cape Town, 2018b; Dewar, 2015). Consequently, the city's low-income residents spend as much as 45% of their incomes on daily commutes to and from work (City of Cape Town, 2017, 2018a, 2018b); hence the imperative to begin thinking about a future less dependent on private car mobility in the city.

1.1.3. The aim of the research

The aim of the research presented in this dissertation is to explore how the City of Cape Town's key (spatial and transport) planning frameworks[4] deal with addressing the issue of working towards transitioning away car dependency and car-oriented urbanism (i.e., car-oriented planning and city design) to enable urban futures that are less dependent on private car mobility as a pathway for addressing car-related social, economic and ecological problems. The key frameworks in question are the City's Comprehensive Integrated Transport Plan (CITP), the City's Municipal Spatial Development Framework (MSDF), and the City's Development Management Scheme (DMS), which is the zoning scheme as per Schedule 3 of the Municipal By-Law (City of Cape Town, 2015, 2018a, 2018b). Furthermore,

[4] In this research and throughout this dissertation, the term framework as used in the context of "key transport and spatial planning frameworks" refers to both policy documents and plans.

the research aims to establish how these frameworks (i.e., the CITP, MSDF and DMS) can be improved towards enabling a future Cape Town that is less dependent on private car mobility together with its associated problems.

1.1.4. Research questions

The main research question that this research answers is: Do the City of Cape Town's key planning frameworks (i.e., the CITP, MSDF and DMS) address the issue of transitioning away from car dependency and car-oriented urbanism (i.e., car-oriented planning and city design) to enable a less car-dependent urban future as a pathway for addressing the various social, economic and ecological challenges presented by car dependency? If so, how? If not, what are the changes or improvements to the key planning frameworks (CITP, MSDF and DMS) that need to be made to enable planning towards a less car-dependent future Cape Town?

1.1.5. Significance of the research

The findings of this research have the potential to be utilised by the City but also other interested parties to guide policy reform or to review the current key planning frameworks. This dissertation suggests interventions and provides policy recommendations for improving the approaches for transport planning, (forward) spatial planning and land use management guidelines that would put Cape Town on the path towards transcending car dependency and car-oriented urbanism. Additionally, the research highlights examples of possible interventions by the use of appropriate precedents in line with the research findings. Also, the research flags issues requiring further research and areas requiring detailed intervention planning and design. Lastly, the research findings have the potential to contribute to academic insights on mobility and spatial planning toward transitioning away from car dependency in cities. The findings of this research have the potential to

inspire further research and intervention ideas for other cities in South Africa, Africa, the Global South, and beyond.

1.1.6. Motivation for conducting the research

This section presents a brief summary of the reasons the researcher decided to conduct this research.

The researcher was initially interested in understanding issues of spatial justice and the right to the city in Cape Town but also issues of socio-ecological justice. However, after an initial literature search, the researcher realised that issues of spatial injustice in the city were usually connected to the lack of well-located affordable housing in the city, yet the everyday lives of the disadvantaged residents were still shrouded in daily transport struggles because of the city's spatial mismatch between residential areas and areas of economic opportunity. Therefore, the researcher's interest moved to trying to understand the transportation struggles. An initial literature search revealed the challenges with making public transportation viable in the city. Therefore, the researcher initially set out to conduct research on understanding how to make public transport "work" in Cape Town. The interest in public transportation was also influenced by the researcher's interest in contributing to climate justice. Nevertheless, after consultation with the research supervisor and further literature scoping, the issue of car dependency and car-oriented urbanism which is linked to making public transport systems and entire transport systems "work" emerged as the focus of this research.

This research also presented the opportunity for the research to learn more about how transportation planning relates to urban planning since transportation forms an integral part to the functionality of cities, and the researchers Master of City and Regional Planning studies did not include an extensive transportation planning component. As Grossmann et al. (2021) note:

> "Transport is the source of multiple forms of ecological damage and one of the hardest to decarbonize sectors of the economy. The problem is largely one of "car dependence," i.e. the progressive entrenchment of high levels of car ownership and use. Traditional approaches to transport planning and policy-making are part of the problem, as they tend to accommodate and encourage increasing levels of car use." (Grossmann et al., 2021, p. 10)

Therefore, the motivation for conducting this research is two-fold: (1) to advance the understanding of planning for transportation systems that enable climate justice, socio-ecological justice and spatial justice; and (2) to advance the understanding of integrated transport and spatial planning.

1.2. Research methods

1.2.1. Methods applied

This dissertation answers the main research question using a qualitative research strategy because investigating the issue under study requires a critical assessment of key planning frameworks documents and the research question does not seek for answers that require any quantification as would be the case for quantitative methods. The case study method is used as the primary research method because it allows the opportunity for an in-depth exploration (Flyvbjerg, 2011; Yin, 2009) of the issue of car dependency and car-oriented urbanism as related to mobility and spatial planning in Cape Town. The case study method is also the most appropriate for this research because the study is clearly delimited forming a unit of analysis (ibid) with boundaries including the spatial territory of the City of Cape Town and the City's key transport and spatial planning frameworks that include the CITP, MSDF and DMS.

Answering the research questions requires unpacking and understanding how certain terms crucial for the investigation are defined across contexts. Such terms particularly include car-dependence, car-oriented, car-centric, car-dominant, or car-dominated cities, planning and design but also what a less car-dependent, car-less or car-free city means. Jacobs (2006) argues that, in research like the presented investigation, it is important to "examine the ways in which certain words, currently prevalent in urban policy discourse, are deployed by policy makers" (Jacobs, 2006, p. 48) to avoid misunderstandings. This is achieved by deploying the discourse analysis method complementary to the main research method (ibid). Therefore, this research uses discourse analysis as the second research method to investigate the use and understanding of the critical terms underlying the main research question in the key transport and spatial planning frameworks' documents within the case study based on assessment criteria derived from academic literature.

The discourse analysis deployed for this research follows the critical discourse analysis (CDA) approach since "discourse functions ideologically" (Jørgensen & Phillips, 2002a, p. 63). Critical discourse analysis acknowledges that written work and discussive practice influence social practice (Jørgensen & Phillips, 2002a). Therefore, since the research explores how the issue of car dependency and car-oriented urbanism is reflected in written documents in the form of the City's key transport and spatial planning frameworks, and how that discursive practice reflects on the City's objectives for the development of Cape Town, a critical discourse analysis lens for analysis becomes a crucial methodological tool for answering the research questions.

The strengths and limitations presented by the methods on the research are discussed in the following two sub-sections:

1.2.1.1. Case study strengths and limitations

The main advantage of using the case study method is the in-depth exploration which allows the findings to have "more detail, richness, completeness, and variance" (Flyvbjerg,

2011, p. 301). Furthermore, the depth of details and insights in the research findings because of using the case study allowed the formulation of further subsidiary research questions as the research unfolded (Flyvbjerg, 2011), thereby strengthening the relevance of the research.

The second advantage is that the case study method allows the findings to be grounded within the local context (Flyvbjerg, 2011; Yin, 2009), which is important for enabling future planning interventions in the context. In addition, the case study method enabled the researcher to appreciate the context-dependent dynamics of the issue being explored (Flyvbjerg, 2006), hence providing an invaluable learning experience.

The other advantage of the case study is that it allows flexibility in the research approach hence facilitating an iterative approach to allow the case to evolve over time (Flyvbjerg, 2011). Thus, the quality of findings and the lessons from the case were not restricted by rigidity of approach, which might have been the case with other methods. Because of the flexibility, the case study method allowed for triangulation of data sources to understand issues from multiple perspectives since research activities and techniques were not limited (Flyvbjerg, 2006) thus enabling the collection of data from multiple sources (Yin, 2006).

The major limitation of the case study method is that the findings from this research will not be generalised (Flyvbjerg, 2011). However, since the case is said to provide the often underrated "force of example" (Flyvbjerg, 2006, p. 228), it was nonetheless still the best applicable method for answering the main research question. However, to overcome the lack of generalisation limitation, the research is presented in a manner that explicitly states the intention of not generalising from the findings.

To overcome the other case study limitation of the possibility for researcher verification and selection bias which might arise because the researcher might have more control in defining and determining who would constitute the case (Flyvbjerg, 2011), the research is explicit about researcher positionality going into the research to ensure that the research findings do not further a personal agenda unrelated to actual research findings (Yin, 2009).

1.2.1.2. Discourse analysis strengths and limitations

The advantage of using a discourse analysis approach is that it allows explicit recognition that varying uses of language, specifically the meaning of words, differ among people across different social and technical domains; thus cannot be taken for granted when answering research questions that require a common understanding of the terms asked (Jørgensen & Phillips, 2002b). Also, discourse analysis allows for assessing how certain terms are used by social and professional groups (ibid). Therefore, discourse analysis is very appropriate for this research because the whole research is centred around assessing how issues of car dependency and car-oriented urbanism are presented and dealt with in the City's key transport and spatial frameworks. Further, apart from forming a theoretical criteria base for analysing the planning frameworks documents and other data collected through oral or written means, discourse analysis will provide a means for reconciling "ideological conflicts" (Jacobs, 2006, p. 40) within data during analysis. Since "theory and method are intertwined" in discourse (Jørgensen & Phillips, 2002b, p. 4), the use of discourse analysis will strengthen the research findings because theoretical insights emerge by analysing how words and terms are used or understood by research participants or in policy documents.

The limitation of discourse analysis, which Jacobs (2006) warns should be avoided, that sometimes researchers may be selective with their analysis; thereby choosing a narrative that only strengthens their argument or preconceived notions. To deal with this limitation, the research clearly defines what would constitute as discourse in this research as well as declaring assumptions beforehand to identify what confirms and contradicts those assumptions. In this research, discourse constitutes the way in which issues of car dependency and car-oriented urbanism (i.e., including all other related terms such as car dominance, car-centric development, etc.) are used as well as what they mean in the context of the City's key transport and spatial frameworks.

1.2.2. Research techniques

This section provides a summary of the research process followed in the process of writing this dissertation. The research techniques utilised are highlighted.

The main research techniques used for data collection include: (1) Conducting a desk literature study to develop a conceptual framework and criteria for assessing the key transport and spatial planning frameworks documents (CITP, MSDF and DMS) in line with the main research question. Afterwards, the research included (2) conducting a desk review of the CITP, MSDF and DMS documents to answer the main research question based on the criteria derived from the literature study. Furthermore, the research also involved (3) conducting key informant interviews to triangulate the data. Preferably, the key informants would have included key officials involved in the City's transport planning, spatial planning and development management processes. However, because of the research's timeframe of four months, it was not adequate to initiate the approval processes required to obtain permissions to engage City of Cape Town officials. Additionally, the research was limited in scope to simply satisfy the requirements for the Master of City and Regional Planning dissertation. Therefore, the research only sought limited key informant interviews with leading experts on the research's subject matter with Cape Town experience.

Following data collection, the next technique (4) involved analysing the data using thematic analysis as based on the assessment criteria derived from the literature review for the purpose of observing trends, patterns, paradoxes, gaps or discrepancies with the data, and arriving at conclusions. The final technique (5) involved the graphical representation of some of the research suggestions for possible interventions.

The literature study involved both content analysis and some discourse analysis as analytical tools while analysing the literature on issues such as car-dependency, car-oriented city planning and design, sustainable transport, transport justice, post-automobile urbanism, car-less cities and car-free cities. The literature review chapter presents the literature review findings; however, the literature review is presented to highlight the

assessment criteria that were used for the analysis of the City's key transport and spatial planning frameworks.

1.2.3. Ethical considerations

This research upheld the highest regards of ethical considerations in line with the conditions for the ethical clearance given on the research by the University of Cape Town's Ethics in Research Committee of the Faculty of Engineering and the Built Environment (see Appendix 1). The ethical issues and measures provided are presented in the consent form and information sheet that was used to obtain informed consent before interviews (see Appendix 2).

Still, the ethical issues that were considered include the protection of data as well as maintaining confidentiality and anonymity apart from seeking informed consent from participants.

1.3. Philosophical position and normative values

The researcher's philosophical position going into the research project is that at the time when the world is facing increasing levels of socio-economic inequality and the global climate crisis, addressing issues of socio-ecological justice should take precedence with all forms of public decision-making including city planning and design processes.

We are experiencing a world in which the signs of climate disaster are becoming more apparent. Yet also the current world order of capitalism but also universalism based on Western ideals as well as positivism have proven to be limited and somewhat interlinked with ecological disaster and bent on upholding the current status quo of unjust socio-ecological relations. Therefore, the researcher's position is that socio-ecological justice entails repairing of ecological systems from the harm created in the current anthropocentric world order. The goal, however, is not resetting to a point before anthropocentrism which

is practically impossible, but to conduct human affairs with the intention of progressively restoring socio-ecological systems and relations in a manner that may begin reversing anthropocentrism. Therefore, the researcher believes that ending car dependency and car-oriented urbanism can be one of the pathways for enabling socio-ecological justice.

1.4. The structure of the dissertation

This first chapter of the dissertation has presented the issue under investigation, the aim of the research, the main research questions, the research methods and techniques used to answer the main research questions, ethical considerations and the philosophical position of the researcher. Chapter two presents a literature review highlighting key academic debates on the issue of car dependency and car-oriented urbanism as well as car-free cities including issues faced with transitions away from car dependency and car-oriented urbanism. Chapter three presents the contextual analysis of the case of Cape Town providing findings on the evaluation of the CITP, MSDF and DMS. Chapter four presents the recommendations for the improvement of the City's key transport and spatial planning frameworks and proposes interventions that may put Cape Town on the transition part towards ending car dependency and car-oriented urbanism. Chapter five presents an implementation plan for the proposed interventions presented in chapter four. Chapter six provides a conclusion of key takeaways from the research and recommends areas that require future research before concluding with the researcher's reflections on the learning journey provided by the dissertation process.

CHAPTER TWO

Photo source: https://www.enca.com/south-africa/police-warn-new-robbery-ploy-n2-highway

Photo source: https://www.iol.co.za/capeargus/news/so-what-comes-next-for-unfinished-bridge-on-the-foreshore-71a11355-9de6-4b91-a7c8-dc6ee2f5a82c

Literature review

2.1. Introduction

Chapter One introduced the problem of car dependency and car-oriented urban development that this dissertation explores. The aim of the research was introduced as exploring how the City of Cape Town's key (spatial and transport) planning frameworks deal with addressing the issue of working towards ending car dependency and car-oriented urbanism (i.e., car-oriented planning and city design) as a pathway for addressing the numerous socio, economic and ecological problems associated with car dependency in cities. The first chapter also introduced that this research deploys the case study method and some critical discourse analysis is applied as an analytical lens. However, before evaluating the City's key urban planning and transport planning frameworks in line with the main research question regarding how *the City of Cape Town's key planning frameworks (i.e., the CITP, SDF and DMS) address the issue of ending car-dependence (i.e., car-oriented planning and city design)*, this second chapter provides a literature review of the relevant academic theoretical insights on the matter of the research.

The literature review includes key academic work on the subject matter of the research. Academic publications reviewed were identified following a search of keywords on the Scopus (Web of Science) database. Further key literature was identified through citations within the initial literature sourced through the Scopus database.

The literature review is structured into seven sections. The first section provides an overview of the approach taken with the literature review highlighting some theoretical reams that have not been considered such as issues of the human-nature divide as it relates to car dependency and car-oriented urban development but also theories on perspectives of more-than-human multispecies cities as well as multispecies planning and car-free cities. The second section provides a brief overview of the debates around how to deal with cars in integrated transport and land use planning at the face of the sustainable transport paradigm, climate justice, spatial justice and transport justice and equity. The third section discusses the framing of car-oriented urbanism and car dependency highlighting the characteristics and problems associated with car-oriented urbanism and the framing of what car dependency might mean. Next, the literature review turns to highlight the key

issues in the quest to transition cities away from car dependency and car-oriented urbanism by framing the characteristics of what post-car-oriented urbanism might entail but also what ending car dependency might mean by briefly highlighting the theory of urban fabrics. The fifth section provides an overview of the theory of sustainable transitions looking at the multi-level perspective on sustainable transitions but also the conditions necessary for successful transitions away from car-oriented urbanism and car dependency as well as the challenges with transitions away from car dependency and car-oriented urbanism. Thereafter, a section is provided on the assessment criteria that were derived from the literature review and used for evaluating the Cape Town case study. Lastly, the conclusion summarises the key findings from the literature review.

2.2. The approach to the literature review

The focus of this literature review is on understanding the key issues that frame the terms associated with the main research question presented in Chapter One. Therefore, this literature review does not explore some important theories concerning the matter of cars in cities however critical. This decision was taken in order to narrow down the scope of the literature study and focus more on the theories contextualising the research question. The reason being that the research question would be understood better and be answered well with the good theoretical grounding. Therefore, some of the critical literature not explored in this literature review include:

- The relationship between the human-nature divide and car-oriented urbanism
- The literature on more-than-human multispecies cities
- Multispecies planning and car-free cities
- The psychology and social symbology of the car
- The philosophical scope of whether car-free cities can truly exist
- The full history of the emergence of cars in cities and the full history of attempts to rid cities of cars

Additionally, this literature review does not fully explore the issue of transport planning, spatial planning, integrated land use and transport planning, spatial justice, climate justice, the details sustainable transportation nor the details of transport justice and equity. Although all these bodies of literature are closely related to the research topic, the field is large. Therefore, the literature review assumes some prior understanding of these issues and only highlights some specific aspects from these theoretical domains that are closely linked to the discourse around car dependency and car-oriented urbanism.

2.3. Can integrated transport and land use planning enable radical transitions?

Integrated transport and land use planning are premised on a coordinated approach for simultaneously achieving transport planning goals with spatial transformation goals in cities (Cervero, 2013). However, issues of car-oriented urbanism continue manifesting in the face of integrated transport and land use planning. In transportation research, there is a bit of contestation on what ought to be the ultimate urban transportation objectives for integrated land use and transport planning; whether ensuring a sustainable transport paradigm shift to enable climate justice or whether ensuring transport justice and equity should be the ultimate priority considering the spatial mismatch and injustice experienced in cities (Cervero, 2013; Martens, 2016).

Furthermore, Grossmann et al. (2021) note that there are different theoretical standpoints within transportation research regarding how to deal with cars and car dependency in transport planning. "Transport poverty studies sometimes conclude that the ideal solution would be expanding access to cars—while noting that this may raise environmental concerns; sustainable transport studies tend to conclude that reductions in car ownership and use are required—while noting that this may raise social equality concerns" (Grossmann et al., 2021, pp. 11-12). However, Grossmann et al. (2021) further call for a coordinated approach of socio-ecological justice lens when viewing the issue of addressing car dependence in transport planning to overcome "the intellectual dead-end of conceptually separating social and ecological justice within mainstream transport research and its critical counterparts. An alternative approach would be to explicitly interlink

social and ecological problems and struggles while highlighting the political economic structures underlying both" (Grossmann et al., 2021, p. 12) .

Therefore, to effectively deal with the problems that car dependency and car-oriented urbanism presents in cities, it is first important to understand how cities are currently dealing with the issue within their contexts of integrated transport and land use planning before solutions can be proposed and implemented. Hence, the need for this research to assesses how transitions away from car dependency and car-oriented urbanism are currently being addressed (i.e., using the example of Cape Town).

2.4. The framing of car-oriented urbanism and car dependency

The number of cars, car ownership and car usage is on the rise in emerging economies and developing countries (Nieuwenhuijsen & Khreis, 2016) yet not much is discussed in the literature for some developing regions, particularly Africa. Therefore, research on how an African city like Cape Town can transition to a future not dominated by cars is important. However, the definitions of what can be considered car dependence, car-dominated urban settings and car-oriented urban development or urbanism are crucial.

Newman and Kenworthy (2015d) argue that car dependence occurs when citizens particularly urban residents find themselves in a state of a lack of choice of urban mobility options. This is a condition when it is more convenient and efficient to use private cars as a mode of mobility in urban areas, than it is to use any other mode (ibid). Therefore, this state can be considered a state of a lack of choice in which using other modes becomes less efficient and inconvenient (ibid). As a result, residents use other modes of transport mostly because they cannot afford owning and using private cars (ibid). This in turn leads to a vicious cycle of car domination in urban spaces which can be referred to as being car dominated (McIntosh et al., 2014; Newman & Kenworthy, 2015d).

On the other hand, the use of the term car-oriented urban development or urbanism (i.e., the entire kind of urban way of life) is used widely across literature with not concise definition (see for example Assmann, 2020; Daqrouq & Anjomani, 2019; Gao & Newman, 2018; Heinonen et al., 2021; McIntosh et al., 2014; Van Eenoo et al., 2022).

Nonetheless, the general connotation of the use of the term car-oriented seems to be in reference to the preferential treatment of cars as a transport mode to a point that it dictates all other forms of development and urban life is premised on the assumption that private cars are the norm (ibid).

Nevertheless, the understanding of how cities can be considered car-oriented or car-dependent may be expounded by exploring the characteristics that are considered to indicate that cars are dominant or domineering in urban space (i.e., car-dominated or car-oriented city characteristics.

2.4.1. Characteristics of car-oriented cities

Generally, there are two main schools of thought regarding the characteristics of car-oriented cities. One is centred around car dependence of urban residents more as a behaviour attribute (Daqrouq & Anjomani, 2019; Heinonen et al., 2021; Van Eenoo et al., 2022). Whereas the other is more focused on the physical form of urban areas in terms of how they are structured to prioritise cars in urban space (Dávalos et al., 2016; Heinonen et al., 2021; McIntosh et al., 2014; Newman et al., 2016). However, these perspectives are usually intertwined within the literature on car-oriented urbanism and car dependence thus are not independent of each other.

From the perspective of car dependence as characteristic of residents' preference for private car mobility (i.e., behavioural attributes), a car dependent or car-oriented city may be seen as the one where the share of the cumulative distance covered by cars per capita is greater than the total distance covered by all urban mobility modes combined; however not including walking (Daqrouq & Anjomani, 2019; Newman et al., 2016). In other words, car-oriented cities are characterised by higher total proportion of vehicle kilometres travelled (VKT) (Daqrouq & Anjomani, 2019; Van Eenoo et al., 2022), and therefore the reduction of VKT may be regarded as reduction of car dependence thus transitioning away from car-oriented urbanism.

Noting that "when [the] car mode share increases in a city, the amount of land used for transportation also increases" (Nieuwenhuijsen & Khreis, 2016, p. 254), the first

characteristic of car-oriented cities based on the form of the built environment is the amount of land that is taken up for infrastructure that supports cars such as roads and parking space (Dávalos et al., 2016). And there is evidence of an exponential relationship between the increase of modal proportion of cars and the land requirements to support car infrastructure (Dávalos et al., 2016; Nieuwenhuijsen et al., 2019). Yet there is also evidence that much of the infrastructure constructed and taking up urban space for car use is underused because because such infrastructure like car-park requirements are over estimated, and a single car could be considered for the infrastructure requirements of many premises yet the spaces are usually unused (Agatz et al., 2021; Dávalos et al., 2016; Van Eenoo et al., 2022).

Another built environment characteristic of car-oriented cities is the proportion of streets and movement paths in general that is allocated to cars versus human beings. Some theorists argue that if the proportion of space taken by cars in public right of ways exceeds 25 percent, that can be considered car dominated urban environments; hence a characteristic of car-oriented urbanism and car dependence in cities (Dávalos et al., 2016). Moreover, apart from the proportion of roadways and streets taken up by cars, the design qualities of the physical built form of the streets or roads also reveal the extent of car domination in urban spaces (Assmann, 2020; Dávalos et al., 2016; Newman et al., 2016). Therefore, it is pertinent to intervene in the urban design of cities when transitioning cities away from car dependence and car-oriented development. Nonetheless, there is another argument that a characteristic of car-oriented urbanism can also be seen as the term 'pedestrian' which marginalises human beings in urban space and is applied as an after-thought when designing streets and roads (Dávalos et al., 2016; Van Eenoo et al., 2022). The argument further goes to suggest that for cities to transition toward post-car-dependent futures, there is a need for the re-centring of the human being in public spaces and public right of ways by ending the reference to people as pedestrians to returning to the term 'citizens' of the public space (Dávalos et al., 2016). That way, the needs of human being as the common denominator of public space will be given more consideration over

cars that are considered as private property (Dávalos et al., 2016; Newman & Kenworthy, 2015b; Newman et al., 2016).

The other major characteristic of car-oriented cities is based on the structure of land uses in cities. Cities with mono-functional neighbourhoods and rigid single land use zoning are considered as car-oriented since they encourage the mobility of residents between land uses and result in less transit-efficient urban forms that can easily be navigated by private car mobility (Dávalos et al., 2016; Haarstad et al., 2022; Newman & Kenworthy, 2015d). However, the literature is not conclusive to what extent an urban form with segregated land uses can be considered car-oriented. However, mixed use urban districts are considered a requirement for transitioning away from car dependence (Dávalos et al., 2016; Newman & Kenworthy, 2015b, 2015d; Newman et al., 2016).

2.4.2. The framing of car dependency

Newman and Kenworthy (2015d) set out some observations on what can be framed to be car dependency. The key underpinning factors car dependency that they identify are mostly related to what is happening in the urban form and in the urban infrastructure realm. The key factors for car dependency in cities identified include sprawling low densities, the centralisation of jobs in central cities and other nodes where there are significantly insufficient residential densities as compared to the jobs (i.e., the polarisation between workplaces and residences), transport infrastructure that significantly support private car mobility that are exclusive, while there is insufficient public transportation coverage and performance (Newman & Kenworthy, 2015d).

2.4.3. Problems associated with car-oriented urbanism and car dependency

Arguably one of the most prominent problems associated with cars in cities is the contribution of mobility-related carbon emissions to global warming and climate change. Dominant car usage as the primary mobility option means that there are many cars on roads and streets that contribute to carbon emissions instead of other mobility options such as walking, cycling or mass public transit, therefore, this leads to higher per capita urban carbon footprints which exacerbate the global climate crisis (Nieuwenhuijsen, 2020; Yang

et al., 2022). Furthermore, the dependency on private car mobility intensifies fossil fuel dependence in society thereby hindering efforts to transition to cleaner energy resources to mitigate climate change (ibid).

From a social perspective, one of the main problems associated with car-oriented cities is inequitable mobility and access (Nieuwenhuijsen & Khreis, 2016). A focus on private car mobility might result in cities that have good accessibility to workplaces and other economic opportunity nodes for car users while people without cars may find it difficult to access similar opportunities and amenities (Dewar & Todeschini, 2004a; Newman & Kenworthy, 2015d). Consequently, there is a burden on lower-income residents who cannot afford cars, and therefore end up using inefficient public transit, paratransit or other informal transportation means further worsening their access disadvantage (ibid).

Road safety for pedestrians is another issue that cars pose in cities (Bieda, 2016; Hrelja, 2019; Nieuwenhuijsen & Khreis, 2016). Car-centric cities have road safety challenges, particularly to vulnerable pedestrians such as children, the elderly, people with different movement abilities, or streetside informal traders who may be at risk of getting hit by cars if cars are prioritised on the streets. Therefore, there is a need for cities to become friendly for people of all abilities by making streets and cities less car-centric (ibid). Additionally, road safety issues associated with cars may also include accidents between cars (i.e., the collision of vehicles) at intersections or on roads and highways (Bozovic et al., 2021; Nieuwenhuijsen & Khreis, 2016).

The accommodation of cars in cities leads to the disintegration of neighbourhoods and spatial marginalisation (Brown et al., 2009; Dewar & Todeschini, 2004a, 2004b). In most cities across the world, the construction of highways or conversion of streets to roads with the intention of increasing the speed of car traffic has led to the fragmentation of neighbourhoods because the high-speed roads become barriers fracturing well-established neighbourhoods (ibid). Consequently, roads that prioritise the speed of car movement create barriers to integration and human connectivity between neighbouring communities separated by cars (ibid). Furthermore, cars contribute to noise pollution especially in locations close to highways or major roads but also in car-oriented streets (Nieuwenhuijsen

& Khreis, 2016). Therefore, the noise might affect the liveability in such places in heavily car-dependent cities.

The increasing need for road and parking infrastructure due for cars in car-dominant cities means the need for more paving (ibid). This might disrupt connectivity and flows in natural systems for instance preventing natural groundwater recharge because paved surfaces seal off soils (Girardet, 2010; Nieuwenhuijsen & Khreis, 2016). Moreover, the water that is prevented from percolating because of widescale paving of surfaces for roads and parking might also wreak havoc on cities by resulting in flooding especially when there is inadequate drainage infrastructure but also due to extreme and uncertain rain events predicted with climate change (ibid). Beside car-related paving such as parking lots being impermeable surfaces, they also intensify urban heat island effect (Nieuwenhuijsen & Khreis, 2016). Furthermore, paving for road widening or for increasing parking spaces encroaches on urban green spaces and ecologies, hence, displacing urban green cover (Girardet, 2010; Nieuwenhuijsen & Khreis, 2016).

The dominance of cars in cities is also associated with numerous health problems that include respiratory diseases due to air pollution from exhaust fumes and car tyre-particulate matter from car breaking because of the presence of a large number of intersections or car stoppages in urban environments (McLeod & Curtis, 2022; Nieuwenhuijsen, 2020; Nieuwenhuijsen & Khreis, 2016). Air pollution may also prevent outdoor activities therefore affecting the outdoor experience in public spaces within cities (Nieuwenhuijsen & Khreis, 2016).

Another health challenge associated with cars in cities is the increasing incidence of non-communicable diseases such as heart-related diseases due to the sedentary lifestyle promoted by car-dependent living (ibid) which in turn puts pressure on public healthcare systems.

Apart from the indirect impacts on the healthcare system, cars directly contribute to urban inefficiencies arising from congestion (Dewar & Todeschini, 2004a; Mueller et al., 2018; Nieuwenhuijsen et al., 2019; Nieuwenhuijsen, 2020). Car-oriented cities are also said to perpetuate a vicious cycle of continued congestion in which new roads are constructed

or existing roads are expanded with the intention of reducing congestion but end up inducing demand for car usage further intensifying congestion problems (Cervero, 2013; Dewar & Todeschini, 2004a; Ewing & Cervero, 2017; Hrelja, 2019).

The quest to deal with congestion by expanding roads also leads to inequitable public infrastructure spending (Brown et al., 2009; Dewar & Todeschini, 2004a). This is because road expansion projects are capital intensive therefore prioritising car-based road infrastructure upgrades usually involves forgoing investments in more equitable public transit and active mobility infrastructure (Brown et al., 2009; Dewar & Todeschini, 2004a; Newman & Kenworthy, 2015d; Nieuwenhuijsen, 2020).

When road expansions temporarily reduce traffic congestions (i.e., before induced demand returns and increases congestion), some urban residents may be lured to suburban living because of the temporary easiness of daily car commuting that may be achieved with widened roads (Brown et al., 2009; McIntosh et al., 2014; Newman & Kenworthy, 2015d). Consequently, a vicious cycle of sprawled low-density developments that are inefficient for the viability of public transit systems may ensue (ibid). Therefore, dealing with sprawl and high dependence on private car mobility further becomes even more challenging while the other car-related social, environmental and health problems persist and intensify within cities (McIntosh et al., 2014; Newman & Kenworthy, 2015d; Nieuwenhuijsen et al., 2019).

Furthermore, congestion challenges may lead to the promotion of isolated gated communities that may be developed with the promise of providing congestion-free urban living by integrating employment, residential and leisure activities in a single location while their underlying concern may simply be profit-making (Dewar & Todeschini, 2004b; Graham & Marvin, 2001). Proliferation of such communities may lead to further socioeconomic and spatial fragmentation of the city (i.e., splintering urbanism) (ibid).

As discussed thus far, there are many urban challenges related to cars. These problems associated with car-oriented urbanism are interconnected and lead to vicious cycles of ripple effects with increased car dependency in cities. One such ripple effect is on how cars drive a culture of consumption within cities (Graham & Marvin, 2001; Mildenberger & Khare, 2000). The car-related consumption culture includes the constant changing of car

models that fuels natural resource extraction and exploitation for materials—which is even more controversial for the supply chain of electric vehicles (EVs) because of issues of unethical conduct in the extraction of cobalt which is a critical raw material in EV production (Wellings et al., 2021). Other issues with the consumption culture of vehicles include waste related to scrap materials and oils from vehicle servicing further adding pressure on ecological systems (Mildenberger & Khare, 2000; Van Wee et al., 2000).

2.5. Quests to transition away from car dependency and car-oriented urbanism

Transitioning away from car dependency and car-oriented urbanism towards what can be termed as post-car-dependent urban futures (sometimes referred to as car-free urban futures) can have varying meanings. Assmann (2020) notes that efforts to eradicate cars from urban spaces started almost as immediately as the automobile became widely accessible in the early 20th century. However, the resistance against cars in private space initially led to interventions that inadvertently made the car dominant in urban space displacing humans to the margins as pedestrians (Assmann, 2020). Such interventions are what Assmann (2020) referred to as being based on the theory of 'disentanglement'. The initial concerted efforts of urban planning and transport planning in ending the 'car-oriented city' became prominent in the period between the 1950s till the 1970s (ibid). The disentanglement theory was that to rid cities of cars they had to be separated from urban environments therefore the interventions gave rise to highways or freeways which would redirect cars away from streets (Assmann, 2020; Newman & Kenworthy, 2015d). However, this disentanglement only led to further motorisation of cities because the disentangled paths fully dedicated to cars or prioritising car movement led to increases in car speeds and illusions of improved safety thereby luring more motorists and a shift to more private car mobility (ibid).

Efforts to end or transition away from car-oriented urbanism have continued into the contemporary era. However, it is important to understand what such a transition might entail because other theorist suggest that even without intentional transitioning

interventions, the era of the private car is already here (Newman & Kenworthy, 2015d). Newman and Kenworthy (2015d) argue that the world's cities are already experiencing declining levels of car ownership and private car mobility, and further argue that planning for post-car-dependent cities can capitalise on such trends to expedite the transitions. However, the data that Newman and Kenworthy (2015d) use to premise their arguments are limited since they only focus on Western (Global North) cities. Nonetheless, it is still relevant exploring how cities can transition to post-car-dependent future because even at the face of a 'natural' decline in private car mobility, urban planning for car-less or car-free cities is critical since current urban forms would have to be transformed to adapt to the predicted realities.

In the contemporary era, however, transitioning towards post-car-dependent urbanism is usually conceived as aiming for 'car-free' cities (Brown, 2017; Glazener et al., 2022; Loo, 2018; Nieuwenhuijsen et al., 2019; Nieuwenhuijsen, 2021; Nieuwenhuijsen & Khreis, 2016; Selzer, 2021; Selzer & Lanzendorf, 2022). The conceptualisations of the transition mostly include reducing the number of private motor vehicles used for mobility (i.e. private mobility) in cities (Nieuwenhuijsen & Khreis, 2016); i.e., shifting towards private car-free cities. Some cities have announced that their goal is to transition towards cities without private motor vehicle mobility thus becoming partly private car free cities for example European cities like Oslo, Helsinki, Hamburg and Madrid (Nieuwenhuijsen & Khreis, 2016). On the other hand, other cities' mission to simply reduce motorised traffic on roads by using strategies such as "car free days, investing in cycling infrastructure and pedestrianization, restricting parking space and considerable increases in public transport provision" (Nieuwenhuijsen & Khreis, 2016, p. 252).

Motivations for transitioning away from car dependence and car-oriented urbanism vary and include reducing greenhouse gas emissions while aiming for "environmentally friendly and citizen-focused mobility means"(Nieuwenhuijsen & Khreis, 2016, p. 252). The other motivation and assumption is that by decreasing the levels of motorised traffic, cities become more conducive for active mobility such as walking and cycling, and this might in turn improve the health and wellbeing of residents because improved outdoor air quality

due to the reduction in air pollutants emitted by cars, while at the same time with active forms of mobility residents would improve their physical strength and wellbeing (Nieuwenhuijsen & Khreis, 2016). Therefore, the motivation in this regard is the public health benefits both long- and short-term that might ensue following the transition to car-free or partially car-free cities.

Another motivation is improving social contact, thus integration and social cohesion in cities in an era of increasing inequity and socioeconomic inequalities (Nieuwenhuijsen & Khreis, 2016). A shift toward more active mobility and public transit usage might provide the opportunity for urban residents of various socioeconomic statuses to interact in public space or in public transit. Improving road safety is another reason (Nieuwenhuijsen & Khreis, 2016).

Apart from social and public health concerns for car dependence and car-oriented urbanism, other reasons given for the shift towards car-free cities or ending car dominance in cities is the infrastructure provision and maintenance challenges that cities face such as the constant need for road repairs due to road damage or the regular need for expansion of roads due to congestion (Nieuwenhuijsen & Khreis, 2016). Furthermore, oil dependence has been cited as another reason for the need to transition away from car dependence and car-oriented urbanism due to 'peak-oil' (i.e., the expected depletion of oil resources due to increasing demand yet fossil fuels are non-renewable) (Nieuwenhuijsen & Khreis, 2016). Also, due to 'peak-oil', the cost of fossil fuels is increasing thereby fossil fuel dependent consumption patterns and lifestyles are increasingly becoming more expensive on top of their environmental unsustainability (Nieuwenhuijsen & Khreis, 2016).

Another motivation is that cars and their related infrastructure requirements such as more road space and parking space take up so much space in cities that can be reallocated to other land uses such as for more housing especially much needed affordable housing in many cities across the world (Nieuwenhuijsen & Khreis, 2016). Additionally, freed car space can provide the opportunity to regreen cities by introducing more urban vegetation and open green public spaces for urban residents as well as hard and soft open spaces (Nieuwenhuijsen & Khreis, 2016).

How to achieve the plans for car-free or car independent cities is another critical issue of concern. Car free cities can be achieved through urban and transport planning policy innovations, however, that may strongly be influenced and be dependent on the context in which the policies are applied (Nieuwenhuijsen & Khreis, 2016). Furthermore, policy innovation should also be directed at residents' behaviours (Nieuwenhuijsen & Khreis, 2016).

The argument for focusing on urban planning and design as a pathway towards achieving the envisaged car-free cities is that urban form and character influences urban behaviour such us the decisions that residents make on the choice of transport mode but also the transportation patterns that emerge including how transportation is planned (Nieuwenhuijsen & Khreis, 2016).

2.5.1. Characteristics of post-car-oriented cities

Conceptualisations of car free cities or cities that are not dependent on cars has been a subject of academic curiosity since the late twentieth century for example by the works of Crawford who published a book in 1996 which theoretically proposed the design of car-free cities of up to a million residents (Nieuwenhuijsen & Khreis, 2016). Crawford's proposals were further refined in subsequent publications (see Crawford, 2000 and 2009) (Nieuwenhuijsen & Khreis, 2016).

Proposals for reducing car usage, ownership or both have become more popular in the contemporary era, and have continuously become more bold and radical (Nieuwenhuijsen & Khreis, 2016).

While some cities like Hamburg have announced that they intend to transition to a private car free status by 2034, others simply have plans to have car-free zones within the cities, particularly within city centres and dense mixed-use districts (Nieuwenhuijsen & Khreis, 2016).

For car-free urban districts interventions include banning private cars from accessing the streets of such zones, introducing more active mobility infrastructure such as pedestrianizing streets and providing new bicycle lanes, restricting car access only to

residents of the district while reducing infrastructure requirements for cars (e.g., lifting mandatory minimum parking requirements), improving public transport access, and introducing 'mobility-on-demand' services also referred to as 'mobility-as-a-service' (Nieuwenhuijsen & Khreis, 2016). Other interventions that cities have done include starting with temporary measures such as car-free days on some days of the week in certain urban districts (Nieuwenhuijsen & Khreis, 2016). However, one of the critics is that these interventions are usually not done at the city-wide scale, rather since they are implemented in some areas of the city, the interventions thus simply divert car traffic to other areas outside the car-free zones (Heinonen et al., 2021; Nieuwenhuijsen & Khreis, 2016; Van Eenoo et al., 2022). Therefore, there is a need to study urban planning strategies and interventions for transitioning away from car dependence that may be proposed for implementation at the city-wide metropolitan scale.

Another caution with policies and interventions that primarily target reducing the number of private cars is that while essential service cars such as police vehicles, ambulances and the like are not prohibited, delivery cars are also not prohibited, hence, if the interventions does not include transformation of land uses, the trips taken by private cars can be diverted to delivery or service vehicles (Nieuwenhuijsen & Khreis, 2016). Therefore, delivery and service vehicles may continue dominating urban space hence transitions might only be achieved in eradicating private car mobility. However, working towards complete transition from car dependence should include interventions in the built form and land uses within the urban space (Nieuwenhuijsen & Khreis, 2016). How to deal with heavy vehicles considered critical for logistics within and between urban areas should also be considered in plans for transitioning away from car dependence (Nieuwenhuijsen & Khreis, 2016).

2.5.2. What ending car dependency might mean and the theory of Urban Fabrics

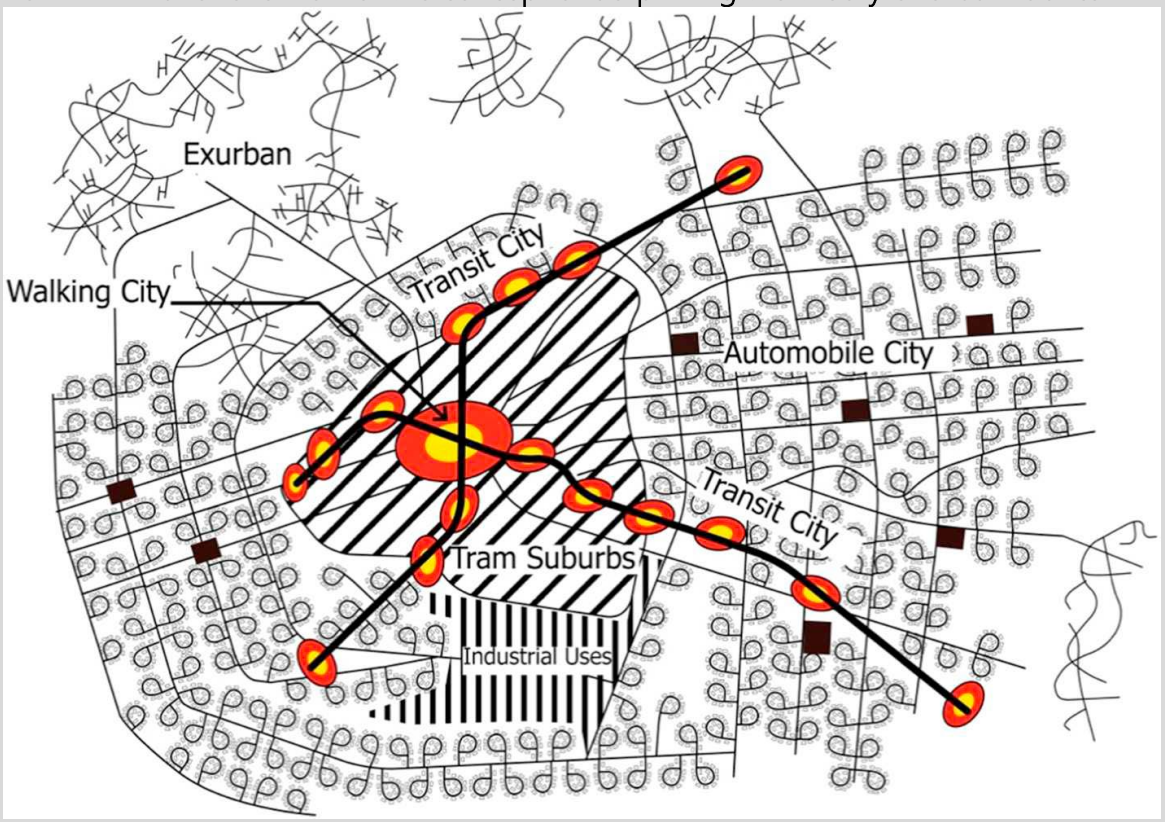
Newman and Kenworthy (2015e) provide a framing of what ending car dependency might entail. This includes the significant reduction of the private car mobility modal share while also increasing the levels of public transport significantly (Newman & Kenworthy, 2015f).

Newman and Kenworthy (2015e) propose the 'theory of urban fabrics' as a pathway for addressing car dependency. The urban fabric theory proposes that cities should recognise that different parts of the city were developed during times that favoured certain specific modes of transport (i.e., walking, public transit such as tramways, and the automobile), and that working to revitalise these areas should be the best starting point for addressing car dependency because these are low-hanging fruit.

Therefore, Newman and Kenworthy (2015e) argue that the urban fabrics should be recognised through mapping, and respected by providing urban design guidelines and transport system requirements that optimise on the urban form in these various fabrics. The goals for each of the urban fabrics defined by Newman and Kenworthy (2015e)have been used to frame the interventions explored in Chapter Four.

> "Any city can look carefully at its different urban fabrics and then begin to set out how its elements, functions, and qualities can be better expressed in these distinct urban fabrics. Transportation infrastructure and appropriate urban design elements should then be built to enable reaching the goals of no more than 25 percent automobile use in the walking city fabric, no more than 50 percent automobile use in the transit city fabric, and no more than 75 percent automobile use in the automobile city fabric. With this in place, any city will find a different urban quality will emerge, and it will not be automobile-dependent." (Newman & Kenworthy, 2015e, p. 140)

Box 2.1 – A brief overview of the concept underpinning the theory of urban fabrics



(The concept of urban fabrics – Image source: Newman (2020))

2.6. The theories of sustainable transitions and the multi-level perspective on sustainable transitions

The theories of sustainable transitions particularly based on the multi-level perspective emerged from the field of science and technology studies (Geels, 2002). The basic premise of the theory is to understand that there are interrelated dynamics between socio-technical systems, socio-technical regimes (i.e., the rules informing the systems) and the actors and social groups within the systems (ibid). Therefore, for sustainable transitions to emerge there is a need for the socio-technical system to evolve (ibid). However, this socio-technical system evolution occurs at three levels concurrently which are referred to as the multi-level perspective of sustainable transitions. These include the niche level, which is the most basic level in which changes in technology or ways of doing things are tested. Governing the niches are a system of rules that are based on established institutions or social groups; this is the regime level. The regime level then fosters hardcore establishments such as infrastructure development to accommodate the regime requirements, which form the landscape level of the socio-technical system (ibid). The landscape level is the hardest to change during transitions because it is embedded in the regime's established and normalised way of viewing and experiencing the world (ibid).

2.6.1. Conditions for success for transitions away from car-oriented urbanism and car dependency

To effectively restrict private car usage as well as reduce private car dependence, some conditions have to be met to facilitate the transition. Nieuwenhuijsen and Khreis (2016) argue that perhaps the most important factor for success towards private car-free urban spaces is the provision of alternatives to car users that may be deemed reasonable and appealing. This is important because the alternative mobility options have to provide similar levels of satisfaction as what car users get from their private automobile mobility but also have additional benefits so that people may be lured off of their cars that many regard as more convenient (Nieuwenhuijsen & Khreis, 2016). However, the argument for post-car-

dependent urbanism needs to move beyond the current arguments for public health benefits, climate action, and socio-economic access equity because evidence has suggested that these factors have not significantly influenced whether or not car users are likely to shift from private car mobility (Heinonen et al., 2021). Therefore, the argument for using the spatial structuring potential of urban planning and design but also built environment land use management to create urban fabrics that intrinsically promote car-free urbanism becomes much more pertinent (Newman, 2020; Newman et al., 2016).

Other conditions that may be considered essential for transitions to post-car-dependent urbanism include ensuring the availability of reliable and efficient public transport systems, appealing pedestrian spaces and provision of public open green spaces in places formerly occupied and dominated by car infrastructure (Nieuwenhuijsen & Khreis, 2016). However Heinonen et al. (2021) argue that apart from providing an alternative more sustainable and liveable urban system of reliable public transit, more green space and inviting pedestrian space, the prerequisite condition to be met would have to be the change in public perception towards some of these promoted incentives like good public transport. For example, Heinonen et al. (2021) found that a significantly determining factor of whether car-dependent urban residents may switch to using public transit was their perception of public transit as an option only for poor residents. Therefore, there is a need to transcend the attachment of private mobility with wealth or higher socio-economic status but also the stigmatisation of public transit (Heinonen et al., 2021).

Furthermore, there is little known on whether the conditions toward post-car-dependent urbanism are dependent mostly on residents' choices of mobility mode (i.e., their preference for private cars) or to what extent changes in the actual urban form may be the prerequisite condition. Despite many theoretical insights that urban planning and design but also transport planning policies are the best intervention areas for challenging car dependence in cities, research on the connection of what specific characteristics of the built environment (i.e., urban form) and their impact or influence in changing private car mobility cultures is inconclusive (Heinonen et al., 2021; Nieuwenhuijsen & Khreis, 2016). Some have argued that the reason for the unclear relationships between built environment

interventions and behaviour changes such as mobility mode choice is in part due to the lack of evaluation of observed changes before and after car-free urban policy innovations and interventions or due to the poor reporting of the actual characteristics of the changes introduced by car-free interventions (Nieuwenhuijsen & Khreis, 2016). In other words, there seems to be a focus on car-free cities plans or strategic transport and urban development plans that various cities have adopted and implemented, but there is lacking evidence on the monitoring of progress achieved with such plans in order to inform the further improvement of the strategies (Nieuwenhuijsen & Khreis, 2016). With no city having successfully achieved, private car-free status or car-independent (Nieuwenhuijsen & Khreis, 2016), empirical evidence of the progress achieved with various post-car-dependent interventions in cities across the world remains an area for further research.

2.6.2. The challenges with transitions away from car dependency and car-oriented urbanism

There are some challenges that can be anticipated with the transition towards post-car-dependent urbanism. One of the challenges according to Nieuwenhuijsen et al. (2019) is overcoming the car lobby. The automobile industry is considered influential in the establishment of the dominance of the car in cities and the automobile lobbying interest groups are said to be actively involved in opposing or sponsoring opposition to interventions targeted at reducing automobile influence in cities (Newman & Kenworthy, 2015b; Nieuwenhuijsen et al., 2019; Nieuwenhuijsen, 2020). The automobile lobby rather focus on promoting transitions towards electric vehicles and autonomous vehicles, which do not disrupt car dependence and simply replaces current car-oriented urbanism with purportedly sustainable car mobility (ibid).

Another challenge that might be faced by transitions toward post-car-dependent urbanism is the reproduction of 'mono-culturing' (Haarstad et al., 2022). Haarstad et al. (2022) caution that innovations and plans for car-less or car-free cities risk reproducing the same consequences that private car mobility presented on cities if interventions end up creating a 'monoculture' of other mobility modes instead of allowing for choice and parity

between mobility modes (ibid). By creating a monoculture, there is risk of creating urban environments that only work well for certain groups of people, whereas creating choice might mean creating inclusive urban spaces (ibid). However, choice does not mean allowing domination of cars in cities for the sake of them being an option to other residents. Rather, the argument of Haarstad et al. (2022) is that for interventions for post-car-dependent urbanism to be considered successful, their goal should be on creating robust diversity of urban mobility options that are scalable to the city-wide scale and that do not accommodate private cars in a disproportional manner or at the expense of other modes.

2.7. The assessment criteria for evaluating the Cape Town case study

From the literature review, the following criteria were derived to guide the rest of the research:

The assessment criteria include establishing how the key frameworks position humans in urban space in the context of car dependency and navigate the language around humans in urban space. This criterion includes evaluating whether the key frameworks address perceptions and social values attached to cars by the city's residents and the intended actions or strategies that the key frameworks put in place to address the issues in this regard. Also, the criterion on the positionality of humans in urban space included how the frameworks consider the spaces dedicated to people against the spaces dedicated to cars, whether this space is considered as a prerequisite or an afterthought consideration. Also, this criterion extends to the consideration around the prioritisation of connections between humans and their urban and natural surroundings at the face of impacts of cars in cities such as health and safety, pollution, climate change, and human-nature connection in general.

The second set of assessment criteria used were around the recognition of car dependency as an issue and recognising the need for transition within the key frameworks under study. This included evaluating trends in the use of cars in the city as observed by what is happening to the trend of Vehicle Kilometres Travelled (VKT) per capita per

population size. Other trends of note include the centralisation of jobs and economic opportunities, density, levels of public transport use (i.e., public transit use per capita and in particular the proportion of rail mode usage), the availability of parking in high density mixed use urban nodes or the Central Business District (CBD), road length dedicated to cars per capita, as well as carbon emissions from cars. Additionally, the criteria on recognising car dependency as an issue included evaluating how the key frameworks address trends in the use of private cars, car ownership (i.e., numbers of cars per population; cars/1000 people), and replacing car culture. Another consideration for the criteria on the recognition of the issue of car dependency was the evaluation of what is happening to travel-time budget limits.

Another set of criteria derived is concerned with the allocation of transportation infrastructure. This allocation includes the prioritisation levels of infrastructure requirements for private cars, for example, the requirements or consideration for on-street parking and on site or off-street parking. Infrastructure allocation assessment included trends and objectives around allocation of roadway or freeways/highways to accommodate a high capacity of private car traffic and other road-based traffic. This includes the trends around urban space dedicated for reserved rights-of-way for public transit operations against the amount of urban space dedicated for roadways or freeways in favour of private cars. Also included in the assessment criteria around infrastructure allocation is the infrastructure dedicated to public transport services and to facilitate public transport use. Infrastructure allocated for rail services is of particular attention in this set of criteria. Furthermore, the infrastructure allocation criteria also established the level of prioritisation of the modal speed competitiveness of public transport (and rail in particular) against private cars. Also evaluated was how the key planning frameworks address the modal split especially the percentage of daily trips by non-motorised transport modes such as walking and cycling as well as the proportion of motorised trips undertaken by public transport. The last aspect of infrastructure and service allocation in relation to cars is the relative share of car usage in all travel distances covered by urban transport (i.e., the relative car share of personal kilometres of travel (PKT)).

The next set of criteria was on the conditions of the transport system that would enable the transition away from cars. These criteria intent to establish the readiness of the city in shifting mobility patterns away from car usage and included evaluating the available mix of modes and choices for as many and as diverse trips across the city. Also, the focus is on the amount of space taken up by cars versus other modes in streets and other mobility paths, as well as the considerations around how cars impact the experience of non-motorised modes of transport within shared mobility paths. Furthermore, the conditions for transition under evaluation included assessing the perceptions of the car as a necessity or simply as a "useful tool" but also how these perceptions are changing or being change by the key planning frameworks under study. The last condition is on the matter of having real competitive mobility options to access most activities without requiring cars.

The theory of urban fabrics as proposed by Newman and Kenworthy (2015e) of recognising the co-existence of the walking city fabric, the transit city fabric and the automobile city fabric in the city's spatial form as a strategy towards ending car dependency was another assessment criteria used to evaluate the key transport frameworks. The assessment criteria included assessing how the City's key frameworks are recognising the different fabrics, respecting them in their considerations and taking action to rejuvenate the fabrics or planning such action.

The last set of assessment criteria pertained to the theory of sustainable transitions studies (STS) in particular the multi-level perspective (MLP) (Geels, 2005). For the criteria around sustainable transitions, the evaluation included establishing how the City's key planning frameworks acknowledge the socio-technical landscape and regimes that are favourable to cars and the need to change the landscape in the long term and the regime in the short to medium terms. Other evaluations with the STS criteria included establishing how the City's frameworks address regime shifts and changes needed to support the transition away from car dependency. Lastly, the STS assessment criteria included the evaluation of niches of initiatives currently implemented or earmarked for the implementation to address car dependency and car-oriented urban development.

2.8. Conclusion: The key insights from the literature review for evaluating the City of Cape Town's frameworks

This literature review has established that the extent to which cities are car-oriented or car dependent can be determined by evaluating the modal proportion of private car mobility, the total vehicle kilometres travelled (VKT), the proportion of land used for land uses and infrastructure that supports private car mobility, the proportion of road space dedicated to cars against other uses especially walking, and the urban design qualities of public space and streets. Reducing the city's modal proportion of private car mobility and VKT but also land lost to car infrastructure and supporting land uses are some of the main goals to achieve with any plans for post-car-dependent urbanism. Additionally, improving public space and street spaces to prioritise human beings and other mobility modes such as active mobility and public transit should be the other goal. Nevertheless, the literature review has also established that interventions for improving pedestrianisation (or the change of focus from pedestrian planning to planning to prioritise citizens), increasing the provision of public transit, and reclaiming land lost to car spaces for other land uses should be implemented together with or as viable alternatives that should have more value addition to residents than private cars. This value addition should transcend stigmatisation and other existing negative perceptions of some mobility modes or urban forms and design. Additionally, interventions for post-car-dependent urbanism should avoid replacing the monoculture of private cars with another monoculture by ensuring diversity and choice.

A summary of the assessment criteria and their associated parameters is presented in below (in table 1). These criteria established through the literature review will be used to evaluate how the City of Cape Town's key city planning and transportation frameworks address the issue of transitioning toward post-car-dependent urban futures in the next chapter.

Table 1. A summary of assessment criteria for the evaluation of the City's key transport and spatial planning frameworks

Assessment criteria	Evaluation parameters (checking how the key spatial planning and mobility frameworks address these aspects)

Recognition of the issue of car dependency and the need for transition	• Vehicle kilometres travelled (VKT) per capita per population size • Centralisation of jobs and economic opportunities • Density • Transit service levels per capita • Proportion of rail mode • Transit use per capita • Parking availability in the CBD/urban nodes • Numbers of cars per population (cars/1000 people) [car ownership] • Road length per capita • Trends in car use • Replacing car culture • Carbon emissions • Travel-time budget limits
Transport infrastructure allocation in relation to private car mobility	• Private transport infrastructure (e.g., on-street parking and off-street parking requirements) • Freeway availability • Parking availability in CBD and urban nodes • High-capacity automobile roadways • Reserved rights-of-way for transit operations vs roadway/freeway dedication for cars • Public transit service levels and use • Level of rail service and use • Modal speed competitiveness of transit (and rail in particular) • Modal split (% total daily trips by NMT modes; % total motorised trips by transit) • Relative car share of personal kilometres of travel (PKT)
The necessary mobility system conditions for enabling transitioning away from car dependency	• Mix of modes and choices available for as many and as diverse trips

	• Cars taking less urban space (doing less urban damage) • Change of perception from the car as a necessity to simply "useful tool" • Having real competitive mobility options to access most activities without requiring cars
Addressing the various urban fabrics: walking, transit, automobile (based on the urban fabrics theory by Newman and Kenworthy (2015e)	• Recognising the different fabrics • Respect for the different fabrics • Rejuvenating the different fabrics
Recognition of necessary sustainable transitions dynamics shifts to allow transitions from car dependency and car-oriented urbanism	• Acknowledgement of socio-technical landscape and regimes favourable for cars and need to change the landscape in the long term • Regime shifts and changes • Implementation of relevant niches
The centrality of the human in urban space and repositioning the human in transport discourse	• Language around human space (pedestrians?) • Consideration of humans' claim/right to urban space (afterthought vs prerequisite) • Connectivity between humans (and with the natural setting and surroundings; health and safety, pollution, climate change, human-nature connections) • Perceptions and social values attached to the automobile

CHAPTER THREE

Photo source: https://www.thesouthafrican.com/news/cape-town-road-closure-n1-northern-suburbs-march-2019/amp/

Contextual analysis

3.1. Introduction

The problem of car dependency and car-oriented urban development in Cape Town was introduced in the first chapter. Furthermore, the first chapter introduced the aim of the research which is to evaluate how the City of Cape Town's key transport and spatial planning frameworks address the issue of ending car dependency and car-oriented urban development in Cape Town. The second chapter provided a literature review that culminated with theoretical conceptions of what transitioning away from car dependency and car-oriented urban development might entail in the context of the current research. Additionally, the previous chapter framed the issues that this dissertation responds to. This third chapter introduces the case study and presents the status quo in the context of this research. The third chapter, therefore, presents an analysis of the case study and includes discourse analysis concerning the subject matter of the research.

This chapter is structured by first providing an overview of the delimitations of the case study before exploring the institutional and regulatory context within which the City's key transport and spatial planning frameworks being evaluated operate. What follows next is the evaluation of the key frameworks (i.e., the Comprehensive Integrated Transport Plan, Municipal Spatial Development Framework, and Development Management Scheme). Lastly, the chapter concludes with a summary of the key findings from the contextual analysis.

3.2. The overview of the case study context

The case study focuses on the geographical territory of the City of Cape Town (the administrative territory under the authority of the City of Cape Town metropolitan municipality) (see Figure 1). Apart from the geographic delimitation of the case study (i.e., the City of Cape Town's administrative territory), the case study particularly focuses on matters of urban transportation planning, spatial planning and land use management in the city.

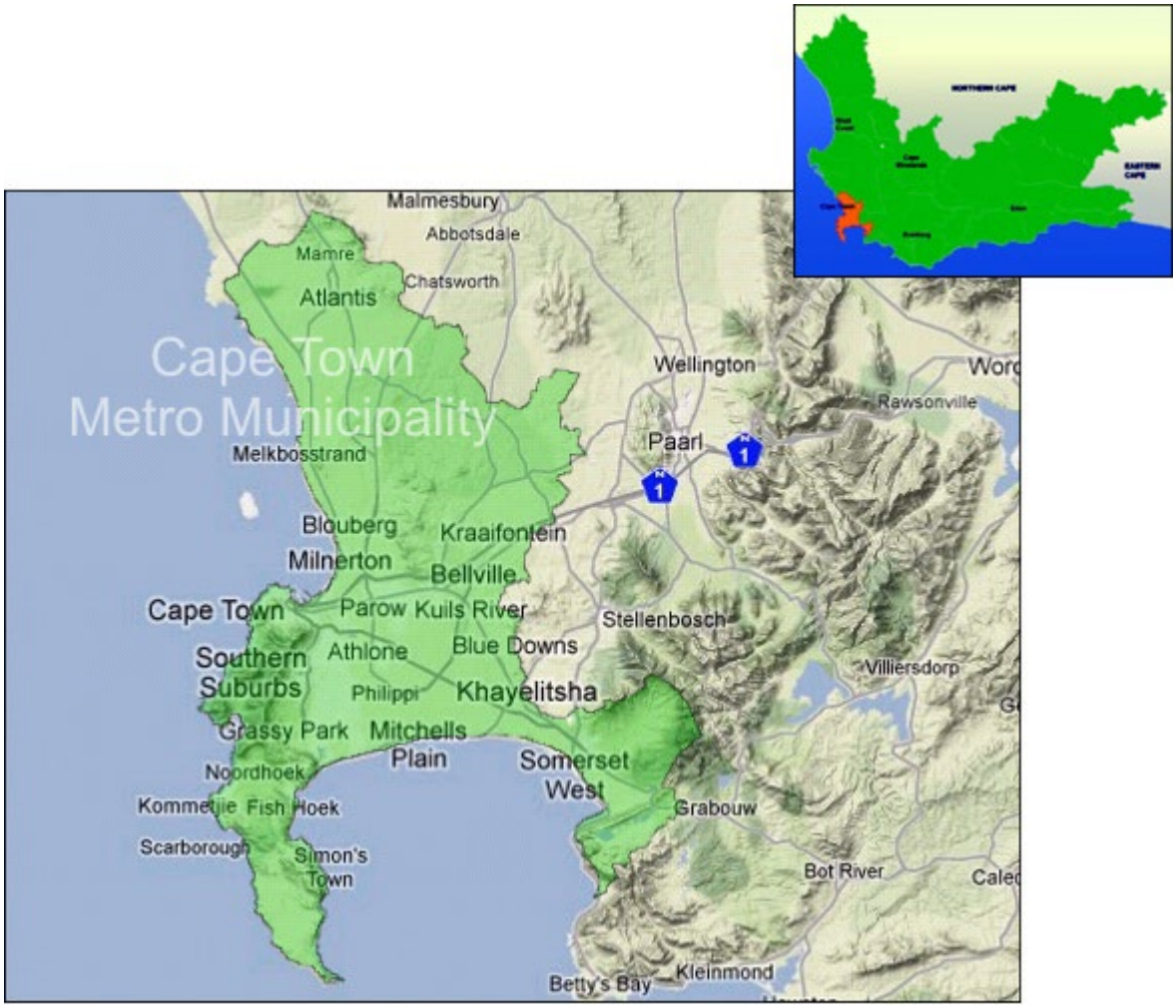


Figure 1. The City of Cape Town territory context within the Western Cape Province of South Africa (Source: Western Cape Government (https://www.westerncape.gov.za/your_gov/33))

Cape Town is a city located on the cape peninsular at the southern tip of the African continent. The city is situated in the Western Cape province of South Africa, and is the only metropolitan region within the greater Western Cape province (Figure 1). The city lies on the Cape Peninsular on the Atlantic Ocean coast. Cape Town is nestled between the peninsular mountain ranges (anchored by the famous Table Mountain) along the western edge of the peninsular and the mountainous terrain of the world renown Cape Winelands to the east; with flat terrain (i.e., plains) in between. Therefore, much of the Cape Town's built form is restricted to the plains that are also referred to as the Cape Flats. This geography of the city has therefore been a main structuring element for the urban form of Cape Town (City of Cape Town, 2018b).

Movement systems form another significant spatial structuring element in the city of Cape Town (Figure 2). The city of Cape Town is the gateway to the Western Cape province

hosting the province's largest and main sea point as well as the only international airport in the province. Three main national roads converge in the city and connect Cape Town to the rest of the country. The N1 heads out in the north-east direction connecting Cape Town to other provinces such as the Free State and Gauteng, which is home to the country's economic hub, Johannesburg, and administrative capital, Pretoria). The N2 heads east to the Indian Ocean coastal provinces of Eastern Cape and KwaZulu Natal. The N7 heads north and connects Cape Town with the Northern Cape province and the country of Namibia.

Figure 2. Conceptual map showing the Cape Town context (Source: https://www.south-africa-tours-and-travel.com/map-of-cape-town.html)

Furthermore, the city's history has been another significant spatial structuring element in Cape Town. The past of racialised spatial injustices and forced removals that

located people classified as Coloured and Black (i.e., during the colonial and apartheid eras) to the urban peripheries on the Cape Flats still influences the contemporary spatial injustices as the city still bears a significant remnant of the apartheid spatial form, which makes the city one of the most spatially unjust in the world (Turok et al., 2021). Consequently, the current urban form has a polarised imbalance between resident and employment densities (Figure 3). This is because in the past colonial and apartheid spatial policies creating large densities of people in the dormitory townships on the edge of the city requiring the people to commute daily to places of work in the previous white-only demarcated areas (Dewar, 2015; Dewar & Todeschini, 2004b; Turok et al., 2021). This spatial mismatch (see Figure 4) continues unfolding in present times but has now become a mismatch that further perpetuates socio-economic inequality (Turok et al., 2021).

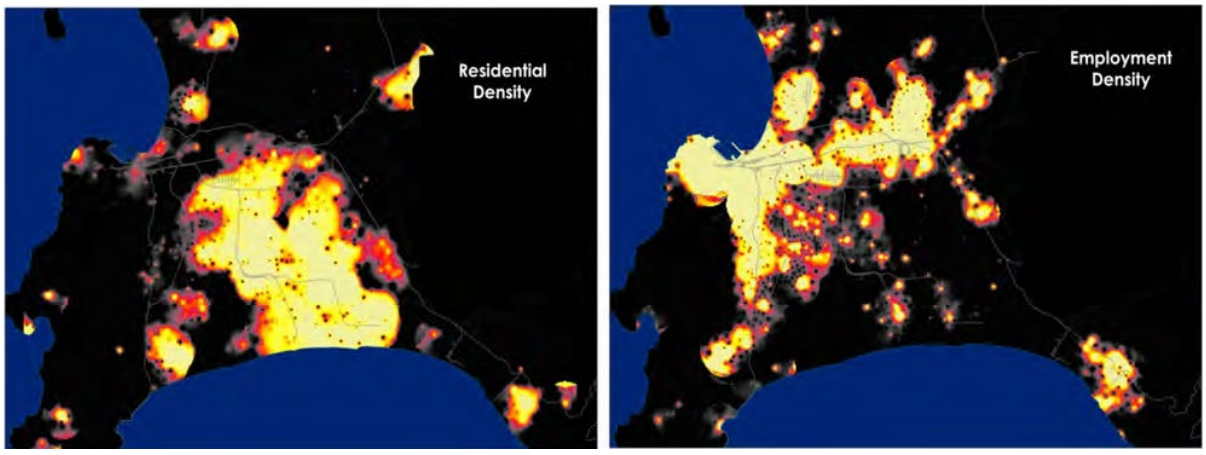


Figure 3. The contrast between residential and employment density in Cape Town (Source: City of Cape Town (2018b))

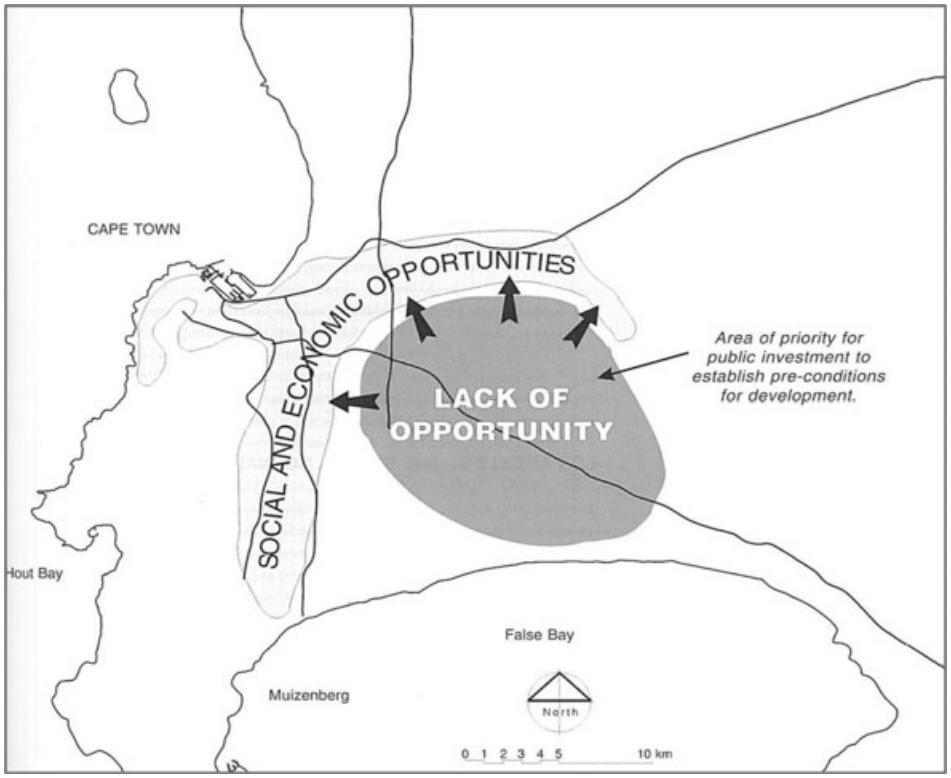


Figure 4. Spatial mismatch between areas of opportunity and areas with lacking opportunities corresponding to the townships of the Cape Flats (Source: Turok et al. (2021))

The population of the city was projected to be 4,488,546 in 2019, with a population growth rate of the city of 2.1% (City of Cape Town, 2021c, p. 143). And according to the municipal government, the city is currently not facing rapid population growth, rather the growth has stabilised (City of Cape Town, 2021c). The city of Cape Town is sprawling with densities of about 1 840 people/km, which is often cited in relation to being quite low for successful public transport systems considering the sprawled nature of the city (City of Cape Town, 2021b). However, this generic density does not include spatial variations of the density. Higher population densities correspond to the townships on the Cape Flats which are spatially mismatched from areas of opportunities (City of Cape Town, 2021b; Turok et al., 2021)

Cape Town's transportation system is quite fragmented composing of various actors, stakeholders and mobility service providers (City of Cape Town, 2018a). Private mobility is the dominant mode of transportation and public transportation systems are perceived poorly among residents (City of Cape Town, 2021a). The general perceptions around public transport include that public transport options are inefficient, not safe because of incidents of violence between stakeholders within the public transport sector

particularly the minibus taxi industry (City of Cape Town, 2018a). Furthermore, public transport option are perceived as not secure because of high crime incidents that occur in the city and often associated with attacks during waiting times at public transport stops and stations (City of Cape Town, 2018a, 2021b).

Out of all the commuters in Cape Town, 38.6% use private cars (City of Cape Town, 2018a). Of these private car mobility users, 11.01% are low-income commuters (4.25% of all commuters), 51.68% are low-medium income commuters (19.95% of all commuters), 23.63% are medium-income commuters (9.12% of all commuters), and 13.68% are high-income commuters (5.28% of all commuters) (City of Cape Town, 2018a). The remainder of commuters use public transport and non-motorised mobility modes such as walking and cycling (although the proportion of commuters using non-motorised modes for commuting, i.e., as utility hence not for recreation is less than 10%) (City of Cape Town, 2018a). Of public transport commuters, 95% are low and low-middle income residents (City of Cape Town, 2018a).

In terms of the total number of trips made in the city, the mobility modal split is 51% private car transport, 47% public transport, and 2% non-motorised transport (data from 2018; used for the Urban Development Index 2019) (City of Cape Town, 2021a, p. 44). Of all commuters, only 11% have full flexibility when it comes to modal choices (City of Cape Town, 2021a, p. 44). The average travel time during morning peak travel is 21 minutes for private car transportation, and 48 minutes for public transport (City of Cape Town, 2021a, p. 44). Whereas for the top five destinations for commuters, the average distance covered is 8km for private car travel while it is 17km for public transport travel (City of Cape Town, 2021a, p. 44).

For commuters within the 10% lowest income bracket, the proportion of incomes used for transportation costs is 43.1%, which is a far worse situation than the optimal 10% transport costs proportion which is the national objective based on international experiences (City of Cape Town, 2018a). Low-income residents who form 47% of the city's employed residents, on average use 17% of their income on public transport (City of Cape Town, 2021a, p. 44). For low-income commuters using private cars, the average proportion

of transport costs is 35% of their total income (ibid). Forming 45% of the city's employed residents, medium-income commuters on average spend 3% of their incomes when using public transport while they spend on average 23% of their incomes if using private cars (ibid). On the other hand, high income commuters form only 8% of the city's employed residents and spend on average 1% of their incomes if using public transport or 9% of their incomes if using private cars (ibid).

Since the main research questions seeks to understand how the City of Cape Town is currently dealing with the issue of car dependency and car-oriented urban development, this section has highlighted the statistics around the use of private cars in relation to the population of the city. Next is an overview of the institutional context of transport and spatial planning in Cape Town, which is the sector that the case study is situated.

3.3. The institutional and regulatory context for integrated transport and land use planning in Cape Town

Issues of car dependency and car-oriented urbanism lie at the heart of integrated transport and land use planning. This dissertation explores how the City deals with addressing these car dependency issues by evaluating three key transport and spatial planning frameworks. These frameworks are a product of, shaped by or influenced by some national, provincial and municipal institutional and regulatory frameworks. This section therefore gives a brief overview of the institutional and regulatory context for the key transport and land use planning frameworks under study (i.e., the Comprehensive Integrated Transport Plan, Municipal Spatial Development Framework, and Development Management Scheme).

The CITP is informed by the City's priorities as set out in the Integrated Development Plan (IDP) for the term of office that the CITP is in force (City of Cape Town, 2018a). The development of the CITP is guided by or based on the Minimum Requirements for the Preparation of Integrated Transport Plans which were developed and enforced by the [national] Department of Transportation (ibid).

On the other hand, the MSDF is developed in accordance to the guidelines stipulated by the Spatial Planning and Land Use Management Act of 2013 (SPLUMA) which

gives effect to the parameters of the MSDF (City of Cape Town, 2018b). SPLUMA as well as the Western Cape Land Use Planning Act of 2014 give effect to the municipal by-law which includes the DMS and regulates land use management in the city (City of Cape Town, 2015).

3.4. How the City of Cape Town's key transport and spatial planning frameworks address car dependency and car-oriented development

Establishing how the City is dealing with the issue of car dependency and car-oriented urban development in Cape Town in this research involves evaluating the CITP as the key transport planning framework, and the MSDF and DMS as the key spatial planning frameworks. These key frameworks were evaluated against assessment criteria established through the literature review in Chapter 2 (also see Table 2 below).

Table 2. Criteria for evaluating the key transport and spatial planning frameworks

Assessment criteria	Questions guiding the evaluation of the CITP, MSDF and DMS
Recognition of the issue of car dependency and the need for transition	Does the CITP, MSDF and/or DMS acknowledge the following issues? If so, how? If not, what are the gaps? • Vehicle kilometres travelled (VKT) per capita per population size • Centralisation of jobs and economic opportunities • Density • Transit service levels per capita • Proportion of rail mode • Transit use per capita • Parking availability in the CBD/urban nodes • Numbers of cars per population (cars/1000 people) [car ownership] • Road length per capita • Trends in car use • Replacing car culture • Carbon emissions • Travel-time budget limits

Transport infrastructure allocation in relation to private car mobility	Does the CITP, MSDF and/or DMS acknowledge the following issues? If so, how? If not, what are the gaps? • Private transport infrastructure (e.g., on-street parking and off-street parking requirements) • Freeway availability • Parking availability in CBD and urban nodes • High-capacity automobile roadways • Reserved rights-of-way for transit operations vs roadway/freeway dedication for cars • Public transit service levels and use • Level of rail service and use • Modal speed competitiveness of transit (and rail in particular) • Modal split (% total daily trips by NMT modes; % total motorised trips by transit) Relative car share of personal kilometres of travel (PKT)
The necessary mobility system conditions for enabling transitioning away from car dependency	Does the CITP, MSDF and/or DMS acknowledge the following issues? If so, how? If not, what are the gaps? • Mix of modes and choices available for as many and as diverse trips • Cars taking less urban space (doing less urban damage) • Change of perception from the car as a necessity to simply "useful tool" • Having real competitive mobility options to access most activities without requiring cars
Addressing the various urban fabrics: walking, transit, automobile (based on the urban fabrics theory by Newman and Kenworthy (2015e)	Does the CITP, MSDF and/or DMS acknowledge the following issues? If so, how? If not, what are the gaps? • Recognising the different fabrics

	• Respect for the different fabrics • Rejuvenating the different fabrics
Recognition of necessary sustainable transitions dynamics shifts to allow transitions from car dependency and car-oriented urbanism	Does the CITP, MSDF and/or DMS acknowledge the following issues? If so, how? If not, what are the gaps? • Acknowledgement of socio-technical landscape and regimes favourable for cars and need to change the landscape in the long term • Regime shifts and changes • Implementation of relevant niches
The centrality of the human in urban space and repositioning the human in transport discourse	Does the CITP, MSDF and/or DMS acknowledge the following issues? If so, how? If not, what are the gaps? • Language around human space (pedestrians?) • Consideration of humans' claim/right to urban space (afterthought vs prerequisite) • Connectivity between humans (and with the natural setting and surroundings; health and safety, pollution, climate change, human-nature connections) • Perceptions and social values attached to the automobile

The following sections present the findings from the evaluation of the CITP, MSDF, and the DMS. The CITP covered most of the relevant issues regarding the subject matter therefore was assessed at length, followed by the MSDF. The DMS was evaluated selectively, focussing on requirements for parking, streets, and the Public Transit Overlay Zones.

3.4.1. Assessment of the Comprehensive Integrated Transport Plan

The aim of the CITP is to work as a framework that guides the City in enabling the achievement of the implementation of an integrated urban transport system (i.e., integrating transport and land uses) that is intermodal (i.e., allowing options for choices of

mobility modes for people in the city) and interoperable (i.e., a transport system in which users of various modes do not put special or extra effort to make the system work well for them) (City of Cape Town, 2018a). The evaluation of the CITP follows the criteria presented in the previous section (above) by firstly establishing whether the CITP recognises car dependency as a problem followed by establishing how the CITP deals with infrastructure allocation to cars. The assessment then moves to evaluating how the CITP sets up conditions for the transition away from car dependency before evaluating how the CITP approaches the various urban fabrics in the city. Next the CITP is evaluated against sustainable transitions theory to establish how it acknowledges the need for landscape and regime changes, and understanding the niches necessitated by the CITP regarding the transition away from car dependency. Lastly, an overall assessment of the CITP is made concerning how people are centred in the CITP before concluding with key findings, gaps and limitations of the analysis.

3.4.1.1. Does the CITP recognise the issue of car dependency and the need for transition?

The CITP is mainly presented as the blueprint for the operations of the city's transport planning functions as conducted by the Transport Directorate also known as the Urban Mobility Directory which was formerly the Transport and Urban Development Authority (TDA) at the time of the current CITP's approval. In other words, the CITP is used as the roadmap for implementing the Transport Directorate's mission and vision (City of Cape Town, 2018a). The mission of the Transport Directorate is enabling "the social, economic and spatial transformation of Cape Town through the provision of integrated transport" (City of Cape Town, 2021a, p. 8), and the vision for the integrated transport is "an efficient, integrated transport system for all – implemented sustainably" (City of Cape Town, 2018a, p. 35). The CITP therefore provides policies, strategies and projects aimed at addressing problems or issues that are identified by the City as impeding the achievement of the integrated transport vision (City of Cape Town, 2018a, p. 55).

The mission and vision do not directly engage with the issue of car dependency or car-oriented urbanism therefore there's a need to unpack the underlying definitions of the

terms that are used by the CITP to describe the mission and vision to establish whether and how the issue of car dependency and car-oriented urbanism is being addressed. The CITP defines the terms underpinning the envisaged vision for integrated transport: For the term 'efficient', the CITP refers to "achieving maximum productivity with minimum wasted effort or expense for the City and customer alike" (City of Cape Town, 2018a, p. 37). The term 'integrated' in the CITP refers to "the integration of, and synergy between, modes of transport, the ticketing system and the relationship between scheduled and on-demand transport. It also means the relationship and synergies between the transport system and network, and the built environment" (City of Cape Town, 2018a, p. 37). The term 'transport' in the context of the CITP is used to refer to "public, private, [non-motorised transport (NMT)] and freight transport as it relates to road and rail [...also including] the network on which this transport operates and the related facilities" (City of Cape Town, 2018a, p. 37). The term 'system' as used by the CITP "encompasses the physical transport-related systems: traffic management, signalling, transport enforcement and related data management systems, governance systems and legislation" (City of Cape Town, 2018a, p. 37). The term 'for all' as outlined in the Transport Directorate's vision and the CITP is used to refer to "a transport system that is accessible to all the citizens of and visitors to Cape Town regardless of their income group and ability or disability" (City of Cape Town, 2018a, p. 37). The term 'implemented' in the CITP means "services [...] delivered that ensure the reduction of the costs of transport users' Access Priorities, according to the [City's Transport Development Index (TDI)], so that users can see the benefits of sustainable, effective and data-driven transport systems" (City of Cape Town, 2018a, p. 37). Whereas the term 'sustainably' means that "the transport system is environmentally friendly and can be maintained so that it is fiscally and financially sustainable over the long term" (City of Cape Town, 2018a, p. 37).

As can be observed in the definitions of the terms used for the City's integrated transport vision outlined in the paragraph above, the issue of car dependency or the need to transition away from car-oriented urban development in the city is not featured directly in the integrated transport vision. The question then becomes whether the fine details of the CITP raise car dependency as an issue of its own merit worth addressing through the

CTIP. The CITP presents the status quo of the city's transport system (including the main transport problems that the City aims to address with the CITP) through the Transport Register (TR) which is compiled "in accordance with the Minimum Requirements of Annexure 1 of the Minimum Requirements for the Preparation of Integrated Transport Plans, 2016 (Government Notice No. 40174)" (City of Cape Town, 2018a, p. 45).

The TR presents a list of 14 main transport problems that the CITP addresses (City of Cape Town, 2018a, p. 55). These main transport problems provide insight on how the CITP recognises the issue of car dependency and car-oriented development. The range of problems on the list include the lack of integration between transport and land uses to the spatial mismatch of the city at the disadvantage of the city's poorest residents who live far from opportunities and have poor access to public transport but also incur high transportation costs in relation to their incomes (ibid). Although the problem of car dependency is not listed as one of the main problems on its own, six of the 14 main problems imply issues with car-oriented urban development (ibid).

Two of the main problems presented by the TR as pertinent for the CITP to address are focused on the deterioration of the commuter rail services in the city due to declining and poor-quality passenger railway service delivery by the service provider, the Passenger Rail Agency of South Africa (PRASA), and due to public vandalism of infrastructure supporting rail services (ibid). These issues are said to have contributed to the massive decline of the passenger rail modal share in Cape Town and subsequently contributed to the increase in the use of road-based mobility modes (ibid). Therefore, the resultant pressure on the road network due to increased road usage and congestion are considered as problems that the CITP should address. However, these main problems are silent on whether the congestion issues are experienced in the first place because of car dependency. This is because although there are trends in the increased use of road-based public transport as people shifted away from the declining rail services, the trends in road usage have shown congestion was a problem historically even when passenger rail use was at its peak (City of Cape Town, 2018a).

The problems around increased congestion in the city are presented in a way that implies that the decline of rail use is the main cause of increased congestion and no attachment of blame or causality is placed on car dependency as being the problematic trend in the city. However, the TR in the CITP does not provide data showing the correlation implied between rail decline and increase road despite highlighting that the private car modal share has been the dominant one all along before rail decline. The problems underlying congestion in the CITP have therefore not been directly attributed to car dependency.

There are three other main transport problems identified by the CITP that directly relate to the issue of car dependency and car-oriented urban development. The first of these problems is the recognition of the trend in which residents increasingly purchase cars and use private car transport as a function of their increasing income. The TR in the CITP note that "monthly household income of R7 000 is generally regarded as the point when a household could afford a car (and that households purchase a car at the earliest possible time to improve their ability to obtain a better job or retain their current one)" (City of Cape Town, 2018a, p. 55). The CITP's recognition of this trend in increased car ownership with upward social mobility can be interpreted as some form of recognition that car dependency is increasingly becoming the norm in Cape Town and cars are perceived as aspirational. However, this problem as presented in the CITP not as an issue of car dependency in general, but simply as an issue with the modal shift from public transport which in effect makes public transport systems less efficient with loss of users. This focus on the modal shift rather than car dependency itself is best represented by the statement that follows the description of the problem of increased car ownership with increasing incomes: "The City therefore needs to ensure that existing and new phases of PT are designed to discourage this modal shift and also to benefit the majority of the population" (City of Cape Town, 2018a, p. 55).

The other main problem related to the issue of car dependency and car-oriented urban development identified in the CITP as per the TR is that "non-social residential development [i.e., private market led housing development] continues to be driven by the

availability of land to accommodate the private car, and not by the availability of transport" (City of Cape Town, 2018a, p. 55). This problem directly deals with the trend of continued car-oriented urban development in the city. This problem is recognised as a manifesting in the spatial domain as the CITP expresses that "this means that the trend of sprawl, that gained momentum over the past four or five decades with the rising popularity of the private car, continues unabated despite policy and legislative changes that aims to reverse this trend" (City of Cape Town, 2018a, p. 55). However, even this problem is framed in manner that does not directly place car dependency as an underlying problem or the problem on its own.

The other main problem identified in the CITP which relates to car dependency and car-oriented urban development concerns the trend in which continued car-oriented urban development in the city is impeding the necessary service thresholds for public transport efficiency (City of Cape Town, 2018a). The CITP notes that "the low levels of service of the PT system creates a significant barrier to commercial development around transit, since the market for choice land uses also choose to continue favouring car-based development in the absence of competitive alternative transport" (City of Cape Town, 2018a, p. 55).

The CITP also identifies traditional transport planning modelling assumptions of proportional modal growth as another main problem which relates to the issue of car dependency and car-oriented development because that might maintain the status quo in terms of modal split which might perpetuate car dependency further (City of Cape Town, 2018a). The CITP notes that "transport planning must therefore accommodate for a growth rate higher than that of the population traditionally transport planning assumed a proportional growth in all modes" (City of Cape Town, 2018a, p. 55). Additionally, the CITP recognises the need to shift away from current modal split, however, this is not framed in a manner that directly imply a transition away from car dependency. Rather the focus is on enabling the modal split to meet mobility demand without specifying whether the demand to be made is still in favour of private car mobility: "this plan must consider the total person trips and determine an appropriate and desirable modal split to meet the demand" (City of Cape Town, 2018a, p. 55).

The main transport problems identified by the TR in the CITP show that the CITP do not present car dependency as a problem on its own but indirectly acknowledge the problem and the need for transitions away from the dependency. However, although car dependency is not directly pin-pointed on its own, the main problems in the CITP do not shy away from identifying car-oriented forms of development as problematic.

In terms of the assessment criteria used concerning the recognition of car dependency and the need to transition away from car-oriented development, the CITP through the TR does not focus on cars themselves as the problem therefore the TR data is not focused on: 1) the trends happening to total vehicle usage in relation to the total population as measured by VKT per capita per population size (however this attribute is implied through the data); 2) the trends around car ownership in terms of number of cars per population (i.e., cars/1000 people); and 3) trends concerning the amount of roadway space dedicated to cars per capita.

The TR fulfils the trends around mobility between residences and areas with the centralisation of jobs and economic opportunities, density, levels of public transit use and service provision including the modal share of passenger rail services, restrictions, or limits on travel-time budgets. The data from the TR informed the transport needs assessment underpinning the CITP. The transport needs assessment chapter of the CITP defines the overall problem statement that the CITP aims to address. And because of the problems outlined in the TR do not directly identify car dependency as an underlying problem, and the focus is on congestion, the decline of rail and the poor access to public transport, the transport needs assessment consolidates the high cost of transport as the overall problem that the CITP should address. The CITP uses the City's Transport Development Index (TDI) as the tool for establishing transport needs and priorities in the city. The CITP notes that "the purpose of the TDI is to quantify the cost of access of the various users in the city [...] the TDI quantifies the "User Access Priorities" in terms of monetary values and includes all aspects of the cost of access, i.e. social, economic and environmental costs" (City of Cape Town, 2018a, p. 141). Costs as defined by the TDI refer "to direct (financial: fares, fuel, etc.) and indirect (economic) costs" (City of Cape Town, 2018a, p. 143).

Since the TDI focuses on access costs for various segments of residents, and the CITP identify high costs of access particularly as the overall problem with Cape Town's transport system, the focus of the CITP's interventions is on the reduction of the cost of access (City of Cape Town, 2018a). Therefore, the main focus of the CITP is not on issues of car dependency although addressing car-dependent urban development, e.g., through the City's TOD strategy, is acknowledged as a pathway towards the reduction of costs envisaged by the CITP.

3.4.1.2. CITP's transport infrastructure allocation

The CITP deals with transport infrastructure allocation through the Public Transport Plan (PTP) and the Transport Infrastructure Strategy (TIS), the Travel Demand Management Strategy, and the Non-Motorised Transport Plan (NMTP) (City of Cape Town, 2018a). The PTP gives effect to the Integrated Public Transport Network Plan 2032 (IPTN) which is a package of plans for the City's envisioned integrated transport vision that includes the route network, the business plans and operations plan.

The CITP's strategies and plans aim for increased public transportation usage, overall reduction of private car use. However, the CITP's plans and strategies do not specify targets for the reduction of space requirements for private transport infrastructure (e.g., on-street parking and off-street parking requirements), freeway availability, parking availability in CBD and urban nodes, high-capacity automobile roadways (City of Cape Town, 2018a). Neither do the plans and strategies specify targets for increasing the reserved rights-of-way for transit operations vs roadway/freeway dedication for cars, increasing public transit service levels and use, increasing the level of rail service and use, increasing the modal speed competitiveness of transit (and rail in particular). The PTP, NMTP and IPTNP also do not specify optimal modal split (i.e., the intended increase goal in percentage of total daily trips by NMT modes or the goal targets for the increase in total motorised trips by transit) or the targets for decreasing the relative car share of personal kilometres of travel (PKT) (i.e., the modal share of cars). Therefore, these are gaps and limitations for the CITP as it relates to addressing the issue of car dependency.

3.4.1.3. Mobility conditions for transitioning away from cars

The CITP sets goals for the improvement of the mix of modes and choices available residents through the IPTNP and NMTP. However, the extent of the flexibility in choice and options for the modes to offer as many and as diverse trips is not specified. As already discussed before, the CITP does not account for the space taken up by cars nor provide targets for ensuring that cars take less urban space (i.e., directly doing less urban damage). The CITP also does not have specific goals for changing of perceptions about the car from the current status quo of viewing the car as a necessity to simply being regarded as a 'useful tool'. Furthermore, since the CITP is silent on the matter of ending the dominance of cars in Cape Town, the CITP does not provide a sufficient pathway for enabling real competitive mobility options to access most activities without requiring cars; rather, the focus is on increasing access to other modes but not on making the other modes more competitive than cars.

3.4.2. Key findings from the assessment of the key spatial planning frameworks - the MSDF and DMS

The Municipal Spatial Development Framework (MSDF) is the strategic spatial plan developed to guide the spatial manifestation of urban development in the city of Cape Town (City of Cape Town, 2018b). The Development Management Scheme (DMS), on the other hand, sets out the City's land use management zoning scheme that is part of the City's by-law (i.e., a legal mandate) (City of Cape Town, 2015). The DMS gives effect to the City's strategic priorities set out in the MSDF by providing a mandatory legal basis for guiding urban development to achieve the priorities envisaged in the MSDF.

> "Cape Town's Municipal Spatial Development Framework (MSDF) is required by law to translate the vision and strategy of the Integrated Development Plan (IDP) into a desired spatial form for the municipality. It should inform public and private investment decisions and represent the different, and sometimes contested, spatial implications of the physical, social and economic and environmental sectors… It represents

> a framework for long-term growth and development, including a spatial vision, policy parameters and development priorities to support Cape Town achieve a reconfigured and inclusive spatial form and structure." (City of Cape Town, 2018b, p. 1)

Whereas, the objective of the DMS includes:

> "[the] regulation of use rights and control of the use of land; [and the] facilitation of the implementation of policies and principles set out in relevant spatial development frameworks and binding policies and principles set out in and in terms of national and provincial legislation." (City of Cape Town, 2015, p. 23)

Both the MSDF and the DMS are informed by the CITP when it comes to matters of transportation in Cape Town. Therefore, the focus of this contextual analysis chapter has been on the CITP for the findings on the criteria regarding the recognition of car dependency as a main problem within the transport system, the criteria on the allocation of transport infrastructure, and the criteria concerning whether the current transport system's mobility modal share conditions can allow for a transition away from car dependency. Nonetheless, this section provides observations made on the MSDF and DMS regarding the assessment criteria that is spatially inclined that include checking whether the City's planning frameworks acknowledge and respect the various urban fabrics in the city based on the theory of urban fabrics.

The MSDF was assessed for fulfilling the urban fabrics criteria of recognising the walking, transit, and automobile city fabrics. However, the spatial strategy of an urban core zone as used by the 2018 MSDF (see Figure 5) does not specifically follow the logic proposed by Newman and Kenworthy (2015e) because it covers the whole area of the inner urban core in a uniform manner. Based on the MSDF's internal logic, however, the MSDF is

to be regarded as a conceptual plan for spatial development. Nevertheless, the MSDF utilises a transit-oriented development approach with corridors and nodes (Figure 6). However, while this approach is in line with the thinking around urban fabrics, nodes and corridors treat the entire space demarcated as of uniform fabric when there are finer grain urban fabrics that exist within the area that require special strategies.

Furthermore, in the context of Cape Town where an integrated public transport system (Figure 7) is yet to be achieved; hence a current system in which there are various different actors in the public transport sector (for example see the routes of scheduled buses and paratransit in Figure 8 and Figure 9), alignment or corridors need to take cognisance of some finer grain variations of the urban fabric. This misalignment between transit routes, however, is another limitation that the MSDF fails to account with regards to recognising the various urban fabrics. Therefore, the MSDF is limited in its potential to guide the recognition, respect and rejuvenation of the various urban fabrics to aid the goals of reducing the modal share of cars across the various urban fabrics.

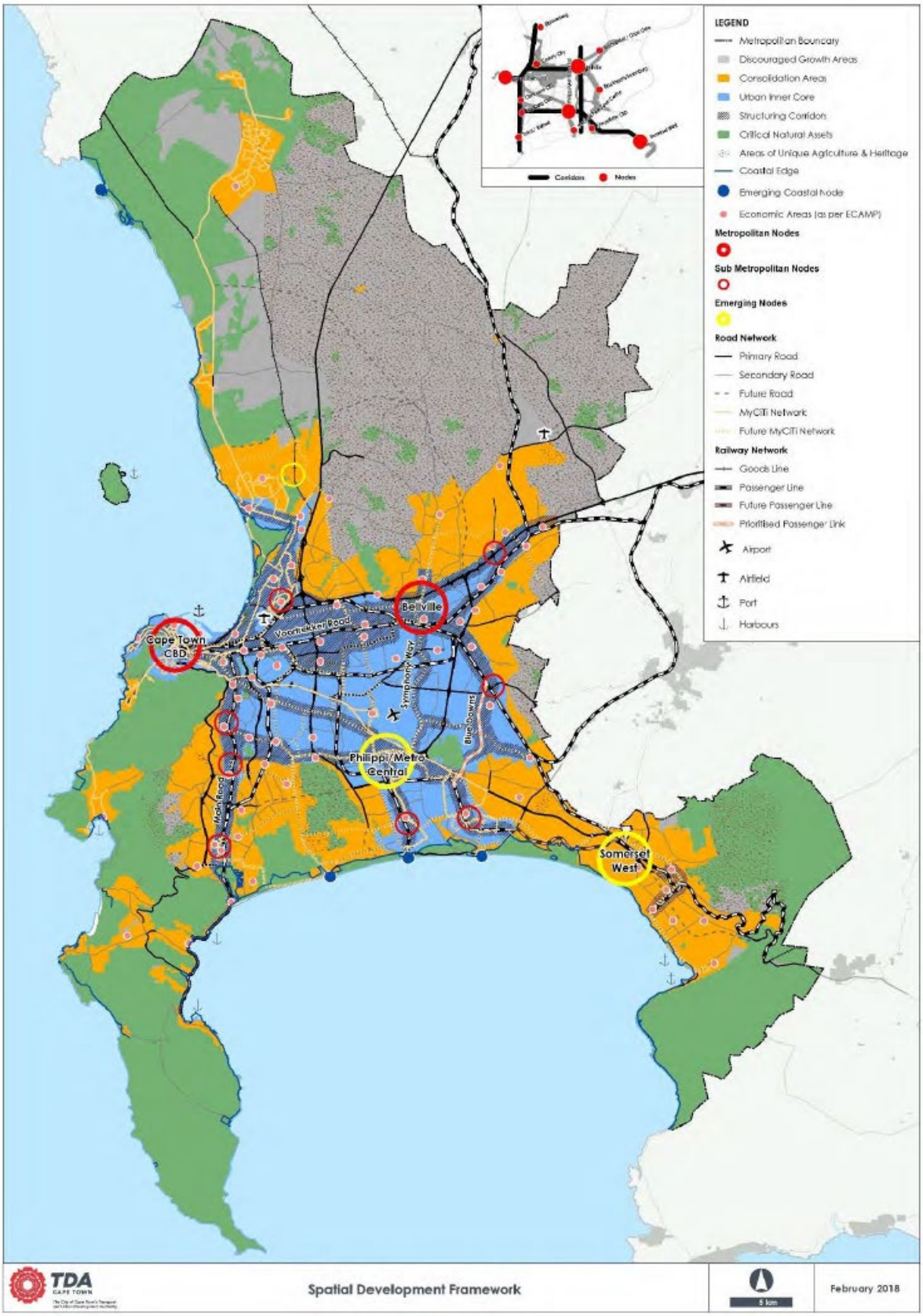


Figure 5. The 2018-2023 Cape Town Municipal Spatial Development Framework highlighting the inner urban core in blue (Source: City of Cape Town (2018b))

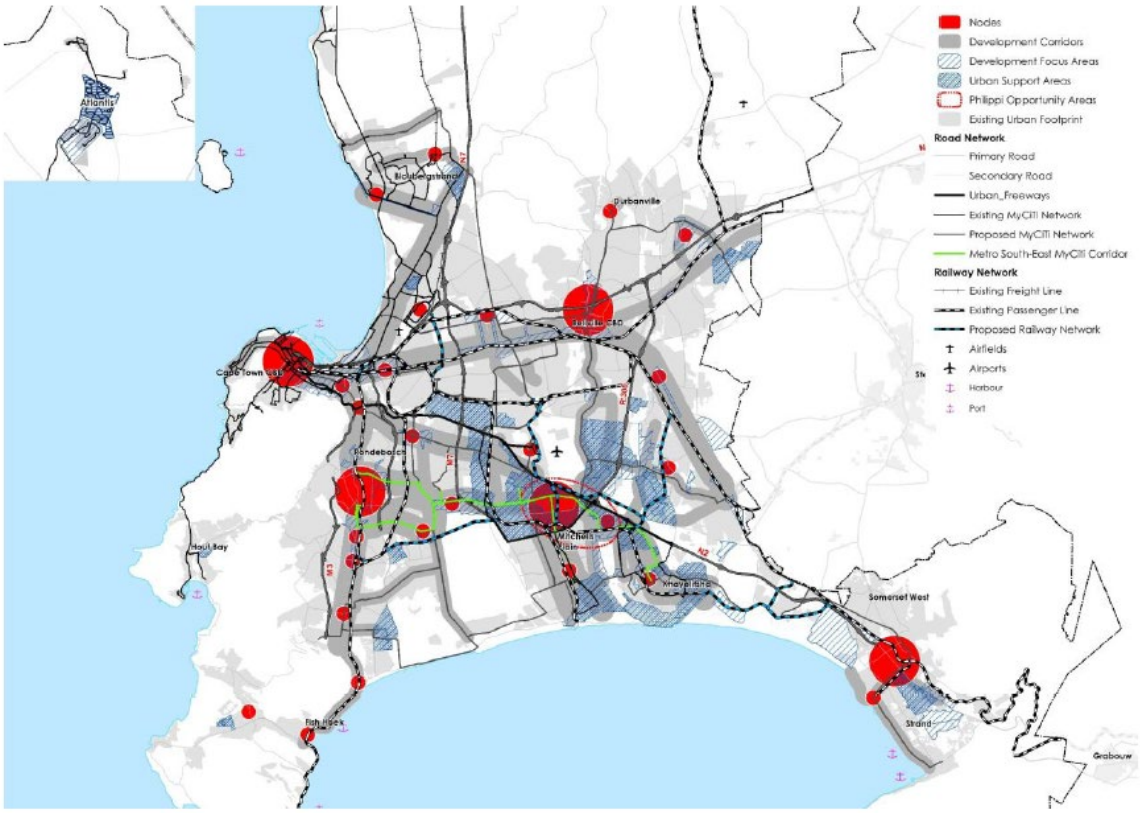


Figure 6. The system of nodes and corridors informing the MSDF (City of Cape Town, 2018b)

On the other hand, since the DMS provides land use management regulation based on the requirement laid out in the other frameworks (i.e., the MSDF and CITP), the DMS is a more flexible tool for enabling the transition away from car dependency. However, the DMS currently does not specify any attributes to deal with the issue of car dependency apart from the Scheduled Public Transport Accessibility Overlay Zones (SPTAOZ) that are included as required by the CITP (City of Cape Town, 2015). These SPTAOZ are based on the pedestrian sheds of mainly train stations (Figure 10). However, the transit pedestrian sheds areas around train stations are formed in different urban fabrics, therefore, the lack of distinction between the pedestrian sheds is a limitation regarding how the DMS acknowledge the various urban fabrics.

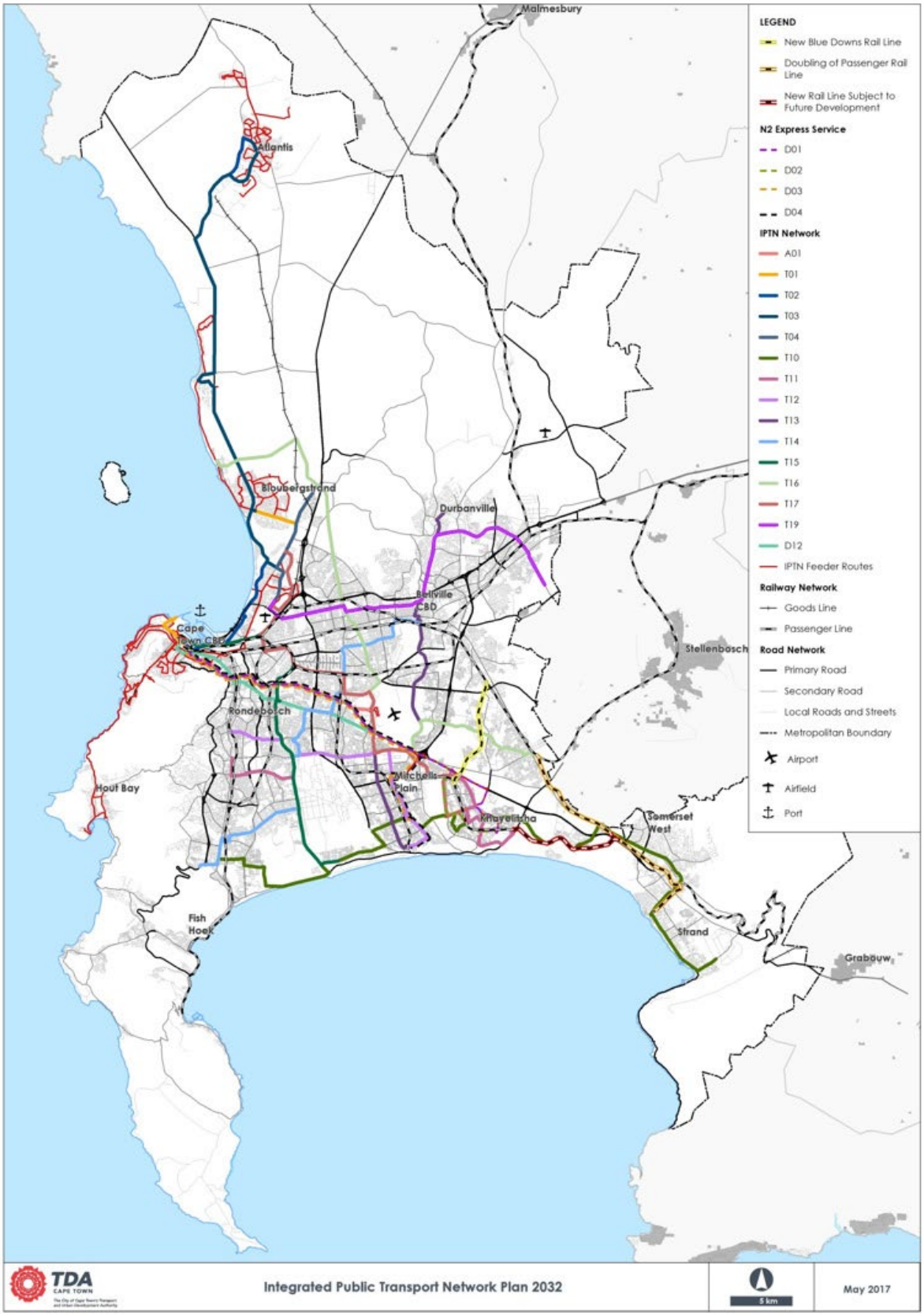


Figure 7. The 2032 Integrated Public Transport Network Plan (City of Cape Town, 2018a)

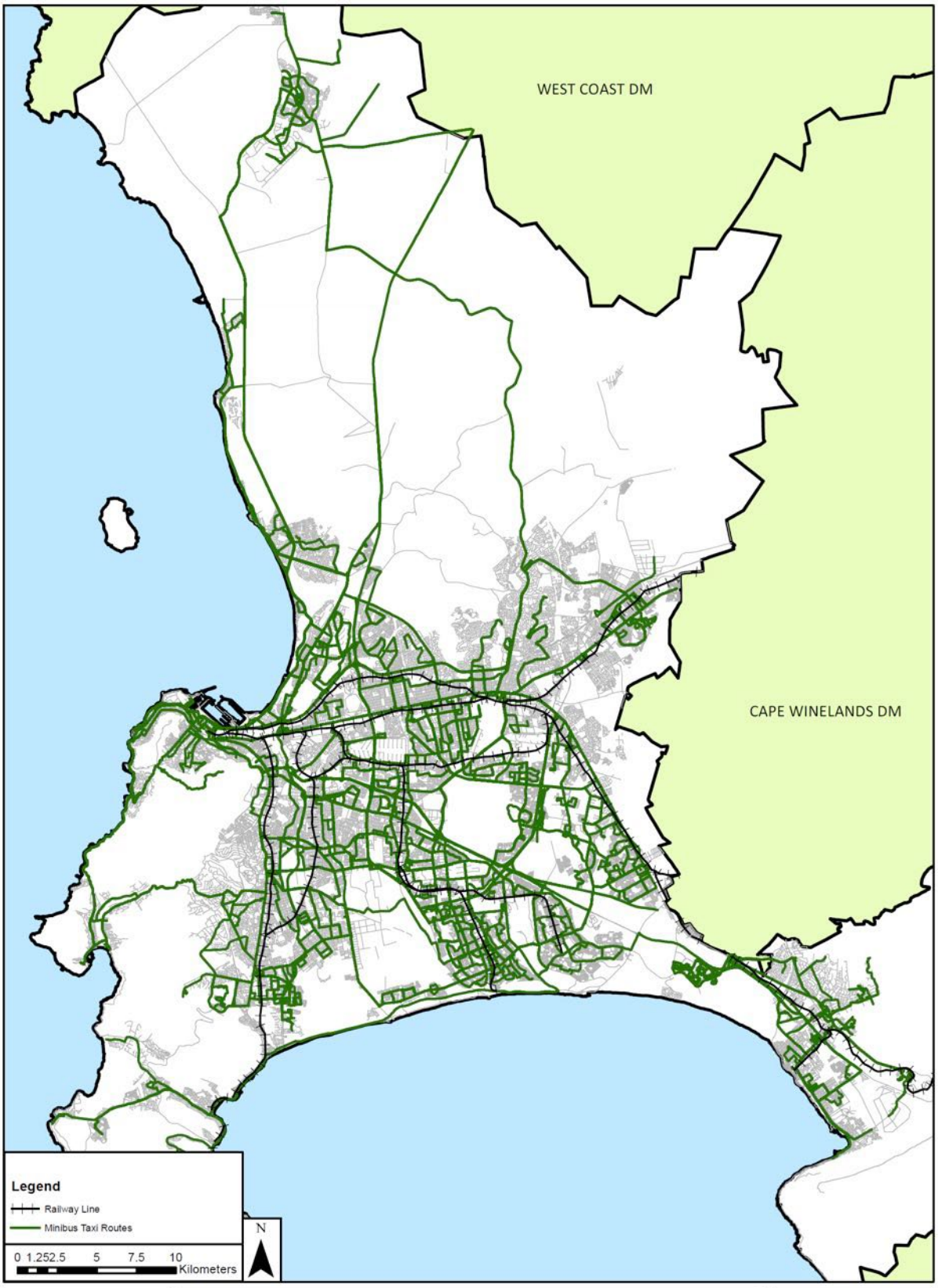


Figure 8. Minibus taxi routes in Cape Town (Source: City of Cape Town (2014))

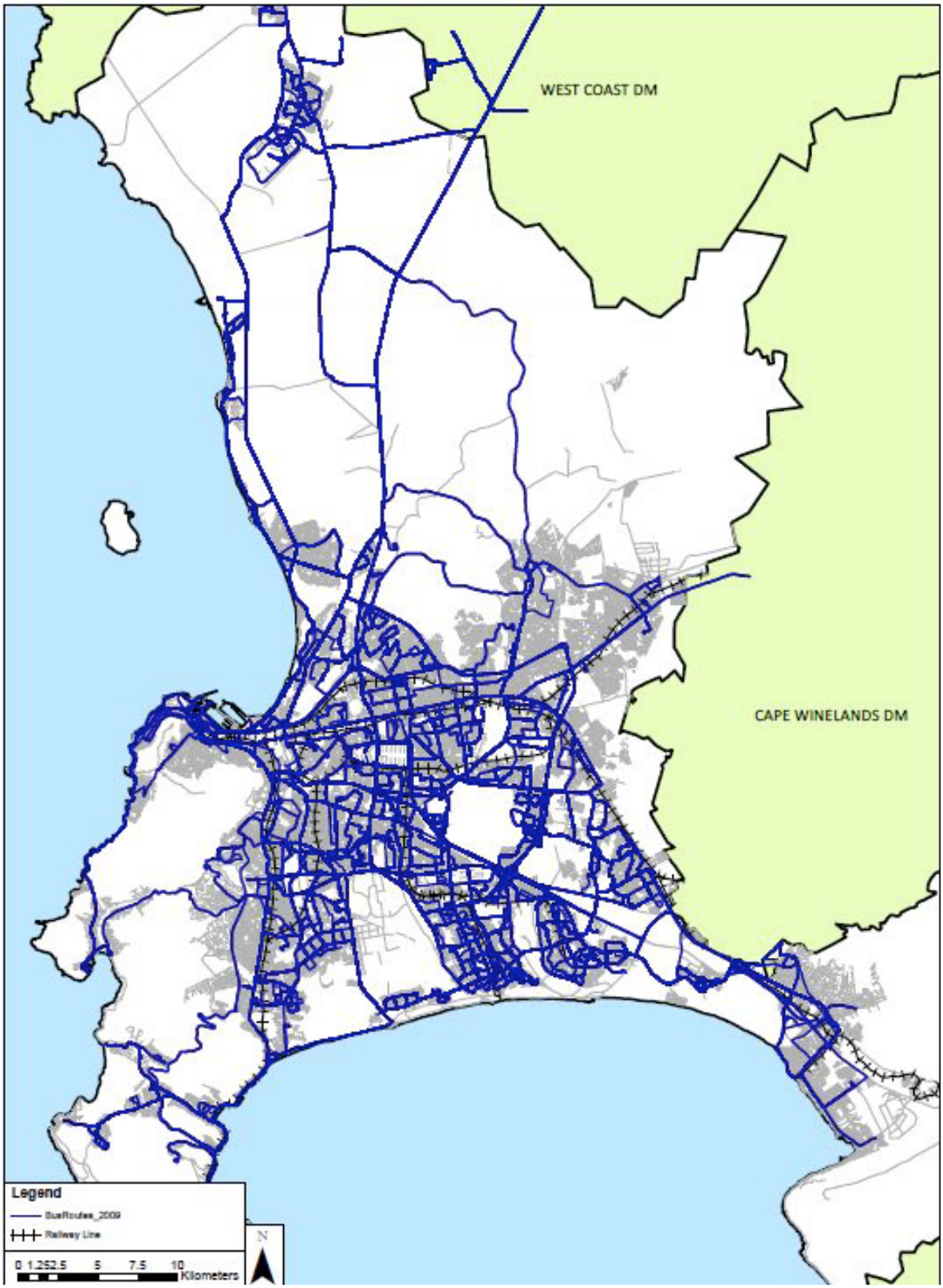


Figure 9. Scheduled bus routes (Source: City of Cape Town (2014))

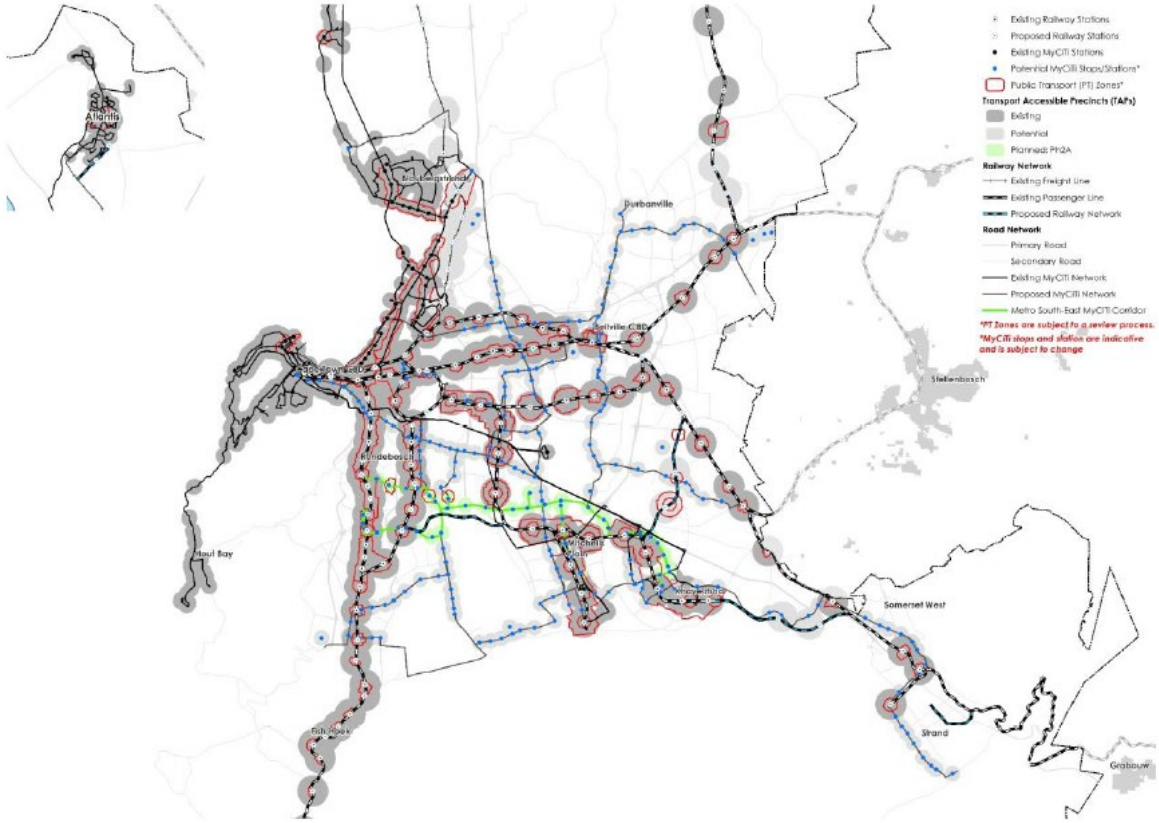


Figure 10. The Public Transport Accessible Precincts on which the DMS's Scheduled Public Transport Accessibility Overlay Zones are premised (City of Cape Town, 2018b)

3.4.3. Overall assessment on the sustainable transition criteria and the positionality of the human against cars in urban space

The overall assessment was on whether the CITP, MSDF and DMS provide the necessary conditions for sustainable transitions. These key frameworks are silent on acknowledging that the current socio-technical landscape is favourable for cars and that there is need to change the landscape in the long term. However, both the CITP and MSDF recognise regime shifts and necessary changes required to enable more sustainable forms of planning that might create the conditions for sustainable mobility.

Lastly, on the matter of centrality or positionality of the human being in urban space, the language used in the CITP, MSDF and DMS, people are considered as pedestrians. And in the CITP assumptions the human being does not take precedence rather the various mobility modes and technologies are centre-stage. This is exemplified by the infographic

on the CITP cover page that does not feature any person walking or cycling as modes of transport rather focussing on road-based modes with the exception of the train (Figure 11).

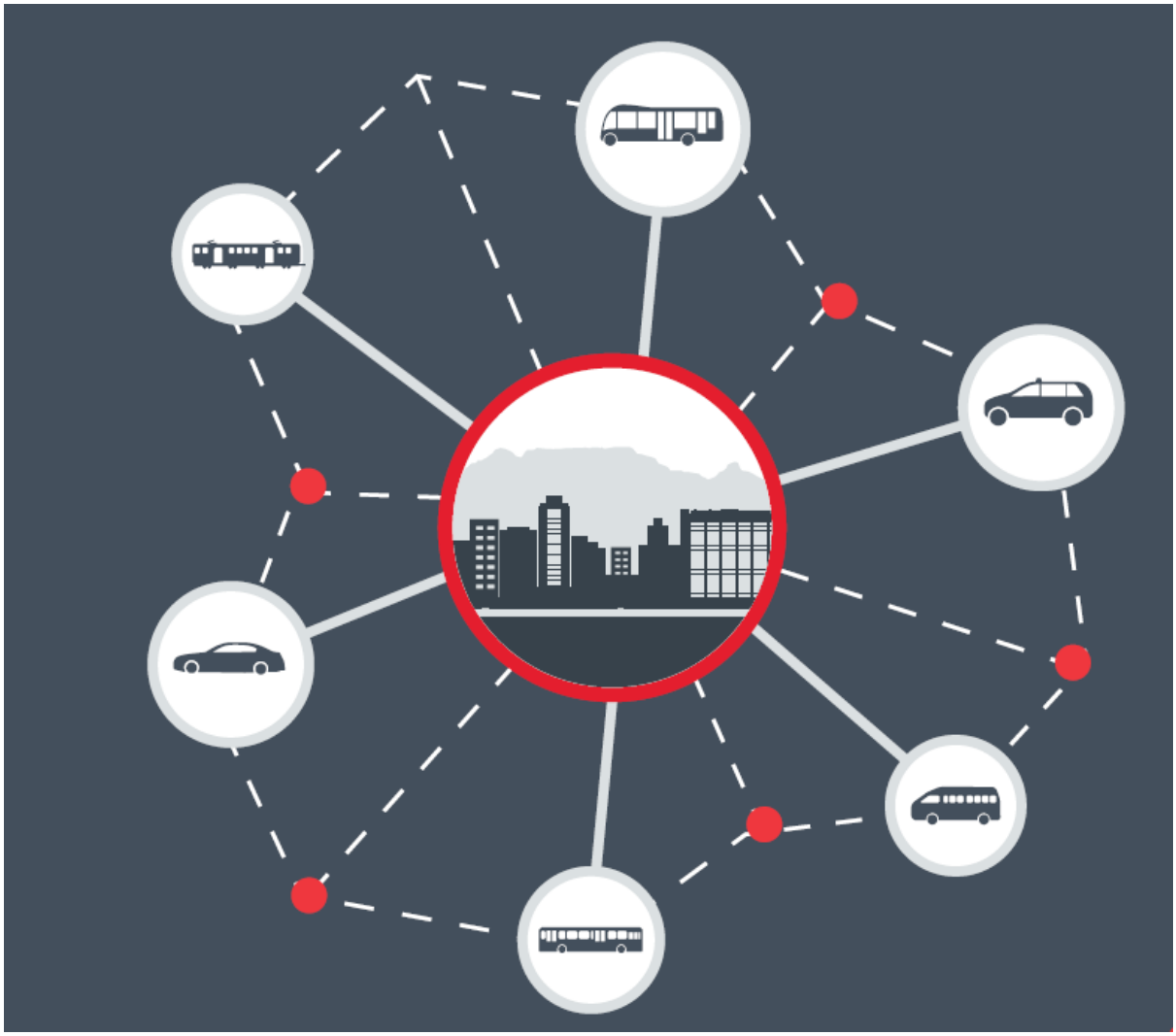


Figure 11. The cover page of the CITP features an infographic showing cars, buses and a train but no humans or any non-motorised transport mode (Source: (City of Cape Town, 2018a))

3.4.4. Conclusion from the contextual analysis

In conclusion, in the CITP there is some recognition of the issue of car dependency and the need for transition. However, this is not done explicitly as discussed in this chapter. There seems to be a reluctancy to call out car dependency as a major problem on its own. The discourse in the MSDF and the DMS also alludes to the recognition of car-oriented urbanism. But the spatial frameworks are limited in how they approach the issue of car-oriented urbanism because they rely on the transportation priorities set out in the CITP.

Therefore, the CITP is the framework for intervening in order to explicitly make the issue of car dependency as a priority for the City.

Regarding transport infrastructure allocation in relation to private car mobility, the CITP lacks concrete targets in relation to the assessment criteria used for evaluation. Therefore, targets need to be set for intervention. The lack of targets also applies to the issue of envisioning or aiming for a particular modal share that reduces car dependency. This is another gap area needing intervention.

With regards to the theory of urban fabrics, the spatial plans as well as the associated mobility plans seem to have been developed to prioritise and optimise the rejuvenation of the urban fabrics as a pathway for transcending car dependency.

The other issues that require attention are the positionality of humans in urban space and the discourse around enabling successful sustainable transitions to shift the transport socio-technical system towards significantly reducing car dependency in the city. However, this gap can be addressed by first intervening to resolve the first three gaps identified above.

CHAPTER FOUR

Photo source: https://andyandjudi.com/2015/04/14/downtown-cape-town-guided-walking-tour/st-georges-pedestrian-mall/

Intervention:

Repositioning the City's key transport and spatial planning frameworks to better tackle car dependency

4.1. Introduction

The third chapter of this dissertation answered the first part of the main research question: 'How are the City's key transport and spatial planning frameworks addressing the issue of car dependency and car-oriented urbanism?' This fourth chapter answers the second part of the main research question: 'How can the City's key transport and spatial planning frameworks be improved towards transitioning away from car dependency and car-oriented urbanism?' Answering this second part is carried on into the following chapter on implementation (Chapter Five).

The contextual analysis in Chapter Three identified three main gaps in the City's key transport and spatial planning frameworks regarding the need to transition away from car dependency and car-oriented urban development: 1) The reluctance to call out car dependency as a problem of its own merit. 2) The focus on costs for low-income groups in transport objectives while overlooking the car dependency in medium- and high-income groups. 3) The inadequate spatial alignment of plans with the varying urban fabrics and therefore not positioned to leverage the potential of rejuvenating urban fabrics as a pathway toward ending car dependency. This chapter discusses interventions to the City's key transport and spatial planning frameworks that can help address the identified gaps.

This interventions chapter unfolds in two parts. First, proposed changes for the CITP, MSDF and DMS are presented for the frameworks to reflect car dependency as a problem in order to strengthen the existing arguments against car-oriented urban development as presented in the framework documents. This first part focuses on changes to the CITP responding to the first two identified gaps. Secondly, following the theory of urban fabrics, proposals are made on how to spatially align the plans presented in the key transport and spatial planning frameworks with urban fabrics. This second part focuses on how the MSDF can spatially align with the urban fabrics and how the DMS can be utilised to facilitate this alignment, responding to the third identified gap. The proposed intervention is for the City to develop transport and spatial development guidelines for the corresponding urban fabrics. However, this dissertation does not comprehensively develop the guidelines for each urban fabric identified in Cape Town. Rather, the focus is on providing preliminary

suggestions on how to map the urban fabrics and align transport and spatial planning frameworks to the urban fabrics accordingly. Preliminary mapping of Cape Town's urban fabrics is used for the illustration of the proposed intervention. Lessons from two precedent cases of urban fabrics mapping from Finland and Australia are also presented in text boxes. The lessons from these precedent cases provide further insight and inspiration into the suggestions made in the Cape Town context.

4.2.Redefining the City's main transport problems and priorities

Improving the City's key transport and spatial planning frameworks towards enabling the transition away from car dependency and car-oriented urbanism in Cape Town requires interventions to address the first two main gaps identified by the analysis of the frameworks. There is a need to call out car dependency as a problem and the need to rethink the focus of the objectives of transport planning to go beyond improving accessibility for lower income groups in terms of lowering transportation costs but also expand the aims for sustainable transport transitions for medium and higher income groups.

Of the three key transport and spatial planning frameworks evaluated for this study, the CITP is the framework of focus in terms of setting transport objectives in the City. The MSDF spatial objectives are presented in relation to the transport objectives set out in the CITP. The DMS in turn is informed by the strategic goals for urban development in Cape Town as set out in both the CITP and MSDF with the purpose of guiding and regulating urban development processes toward achieving the objectives set out in the CITP and MSDF. Therefore, rethinking and redefining the main transport problems and priorities to explicitly reflect car dependency as an underlying transport problem requires intervening in the CITP. Hence this section on redefining the City's main transport problems and priorities focuses on recommending changes to the CITP, which in turn would accordingly inform necessary changes in the MSDF and DMS.

4.2.1. Firstly, name the problem

The starting point for all interventions toward a transition away from car dependency and car-oriented urbanism should be calling out the underlying issue of car dependency as the main problem. Currently, all of the City's key transport and spatial planning frameworks in

Cape Town acknowledge the realities of car-oriented urban development and lifestyles in the city. However, not naming car dependency as the main problem that is underlying the vicious cycle of car-oriented urbanism prevents the development of appropriate strategies to root out all the other problems that stem from the condition of rooted car dependency such as congestion and the struggling neglected public transport system. Not naming car dependency as a problem also works to sustain a broken system that misleads in thinking that solutions to the system such as widening roads to alleviate traffic congestion can improve the transport system only for the symptoms such as congestion to continue resurfacing.

Therefore, it is imperative that car dependency should be included as one of the main transport problems in Cape Town because the main problems inform the strategic goals that the City devises to overcome them; hence, become the priorities. This main problem of car dependency should thus be reflected in the CITP so that transportation planning priorities can be redefined accordingly and be well-repositioned to address the car dependency issue. The changes in the CITP as per the revised main transport problems and priorities should therefore be the basis for any transport considerations in the MSDF and DMS.

For the CITP to reflect car dependency as one of the main problems, the changes should start in the Transport Register chapter of the CITP because that is the evidence base for the transport objectives that are set by the CITP. The Transport Register currently includes the analysis of demographic and socio-economic data, an assessment of the public transport system in Cape Town (including levels of services, stakeholders and user profiling), but also congestion and the conditions of roadways. Currently, the demographic and socio-economic data in the Transport Register include "the population and profile of Cape Town by income, age, education and car ownership" (City of Cape Town, 2018a, p. 45). While the data on car ownership is collected for the Transport Register, what is missing is a detailed assessment of car usage levels in terms of total distance covered per capita not just the number of trips or average commuting times to and from work; and in relation to the usage of other modes particularly public transit in terms of distance per capita across income

groups but also spatially. Therefore, in order to include car dependency as one of the main transport problems in the city, the Transport Register needs to be updated to include a detailed assessment of trends in car usage and ownership in relation to the whole transport system.

Additionally, beyond data from the Transport Register, the CITP also relies on data from the City's Transport Development Index (TDI) when establishing transport issues and problems in the city. Therefore, the TDI needs to be revised accordingly too. The TDI is used to determine the baseline state of Cape Town's transport system (City of Cape Town, 2018a). The data collected for the TDI is currently structured to provide an overview of the direct and indirect costs of access priorities for transportation user groups, but also benchmarks the performance of the city's transport system against other cities using the Arthur D Little Urban Mobility Index 2.0 (City of Cape Town, 2018a). The CITP notes that the "TDI quantifies the "User Access Priorities" in terms of monetary values and includes all aspects of the cost of access, i.e. social, economic and environmental costs" (City of Cape Town, 2018a, p. 141). However, the environmental costs are only accounted for in the data used for benchmarking against other cities and not in the indirect costs for the various transport user groups. The indirect costs used for the existing TDI include flexibility (i.e., mobility options), safety (i.e., of mode), travel time, congestion (i.e., time stuck in traffic), crime, and reliability of mode (City of Cape Town, 2018a). Therefore, to collect evidence for the problem of car dependency, there is a need to expand the indirect costs for user groups to include environmental and public health costs for all the various modes. This way, a good picture of costs related to private car mobility can be reflected in the TDI.

By including car usage levels in terms of distance covered per capita (i.e., not simply trip numbers) relative to public transport distance covered per capita in the Transport Register as well as including environmental and public health costs across various transport user groups in the TDI, adequate evidence can be provided to show the extent of the levels of domination of private car mobility in the entire transport system. This evidence should therefore inform the CITP's Transport Needs Assessment chapter which "describes the transport-related issues, problems, and needs of Cape Town and its residents based on the

Transport Register" (City of Cape Town, 2018a, p. 141). The evidence would therefore support the naming of car dependency as one of the main problems in the Transport Needs Assessment that informs the transportation objectives for the city. Thus, naming car dependency as a problem will have a solid basis in the CITP's discourse.

Once car dependency has been reflected in the CITP's transport issues as a major challenge, the MSDF should also be revised accordingly to reflect the problem of car dependency. When it comes to the main transportation problems, both the 2018-2023 MSDF and the current 2022 MSDF draft only acknowledges that Cape Town is South Africa's most congested city and the transport cost burden for low-income groups (City of Cape Town, 2018b, 2022). Therefore, the role of car dependency in both congestion and its implications in maintaining the current public transport challenges should be addressed by explicitly including the assessment of issues of car dependency and its spatial implications in the MSDF status quo analysis of the city's main challenges and opportunities. The inclusion of car dependency analysis together with its spatial implication in the MSDF should assist in the appropriate spatial and design interventions to lessen car dependency and car-oriented development in line with the urban fabrics theory (further presented ahead in this chapter).

After the CITP and the MSDF have been revised to reflect car dependency as a major transport and urban development problem in Cape Town, the DMS can then be updated accordingly. Apart from the necessary changes to the land use zoning scheme that may be required to align with the revised strategic urban development objectives in the CITP and MSDF addressing car dependency, of particular attention would be changes to the DMS's Chapters 11 regarding transportation zoning, Chapter 15 on parking requirements, and Chapter 19 which facilitates the establishment of overlay zones to enable achievement of the City's strategic development objectives such as transit-oriented development (TOD).

Overall, naming car dependency as the main problem underlying Cape Town's transport system that experiences congestion challenges and poor public transport accessibility is the first step toward interventions for addressing car dependency and car-oriented urbanism. Next, the City's visions should reflect the issue.

4.2.2. Secondly, set goals toward a less car-dependent city

Goals for a car-free or car-less city may seem extremely daunting, impossible or might be polarising because of the radical ideal presented by the words 'free' or 'less' can be interpreted as having total absence of cars in the city (Newman & Kenworthy, 2015b). However, instead of focusing on the debates about the practicality of achieving car-free or car-less status, the goal should be on achieving a transport system that is significantly less dependent on private car mobility as the dominant mobility mode.

With the revised transport priorities aiming for a less car-dependent city, integrated land use and transport planning should consider developing a set of targets for less car dependency. Currently, the City's transport vision as presented in the CITP's Chapter Two is geared towards achieving "an efficient, integrated transport system for all – implemented sustainably" (City of Cape Town, 2018a, p. 37); with objectives that include enabling "car-competitive public transport for the benefit of the community" (City of Cape Town, 2018a, p. 42). However, while the objective of ensuring car-competitive public transport is important for the transitions away from car dependency and car-oriented urbanism, the CITP lacks specific targets for dealing with the private car modal share because currently car dependency is not identified as a main problem on its own. Although the CITP's Chapter Eight presenting the City's Travel Demand Strategy has an objective to reduce "the demand for car use in peak periods, especially single-occupancy car use" (City of Cape Town, 2018a, p. 189), it lacks specific long-term targets for reducing private car usage across the city; rather it mainly focuses on parking management solutions within the inner city. Therefore, there is a need to restructure the transport vision and objectives as well as the associated targets set out in the CITP. The (re)structuring of targets for transport system objectives should be done as presented below based on the criteria developed through the literature review (Chapter Two).

Target 1: A specific vision for significantly reducing the private car modal share.

While the current transport objectives in CITP allude that this is a current objective. As already discussed in the previous chapter (Chapter Three), the CITP is more focused on preventing an increase in the private car mobility modal share for lower-income groups.

However, this is not sufficient for reducing the overall modal share of private car mobility. Furthermore, although there are objectives to improve the use of non-motorised transport (NMT) modes for utility across all income groups, the CITP does not specify specific goals in terms of desirable modal split that the plans are working towards.

Therefore, the recommendation regarding setting targets for reducing the modal share of private car mobility is that the CITP should be revised to reflect a vision of a specific transport modal split that the City should work toward enabling in a specific timeframe. For example, the vision statement on the desirable target modal split might be framed as follows:

'The City of Cape Town's main transport planning objective is to reduce private car mobility to less than 40 percent of the mobility modal split by the year 2040.'

This target should be considered in relation to targets for all other modal shares. Hence the target set should be that of an optimal modal share split including envisaged increases in public transport use across all income groups and the increase of the NMT share (for utility not recreation; i.e., walking and recycling for necessary mobility other than for recreational purposes) across all income groups. Therefore, the optimal modal split vision statement with targets for public transport and NMT can be framed as follows, for example:

'By 2040, increase the share of public transport to a minimum of 50 percent across all income groups with an increase of the public transport modal share to 40 percent for medium- and high-income groups… Also, increase the share of utility NMT to more than 30 percent for medium- and high-income groups.'

Furthermore, because various parts of the city might have their own mobility modal splits. It would be important to have fine-grain targets for modal split depending on districts and local areas so that appropriate spatial interventions can be used depending on the area.

Target 2: Reducing or reversing car ownership trends.

Currently the CITP does not have any strategy for reducing or versing car ownership trends despite acknowledging that the private car modal share is increasing with increasing

levels of car ownership in the city (City of Cape Town, 2018a). Upward social mobility is also identified as correlating with increasing car ownership (City of Cape Town, 2018a).

Aiming for a reduction in car usage by setting a vision for a desirable modal split in line with Target 1 above should be considered together with another target for reducing car ownership. The CITP together with other planning frameworks should be clear on specific targets for reducing car ownership. The starting point would be to include a comprehensive analysis of car ownership trends across all different demographic and socio-economic groups (as discussed in the previous section on naming car dependency as one of the main problems). The target for reducing levels of car ownership should therefore be considered in response to the trends in car ownership identified. This analysis of car ownership should be included in the Transport Register chapter of the CITP. An improved understanding of the drivers of car ownership across various demographic and socio-economic groups should also extend to understanding the spatial dynamics of the trends. This understanding of car ownership can help with the development of appropriate transport and land use planning strategies that can facilitate the reduction of vehicle ownership and enable transitions towards a less car-dependent city. For example, the target for reducing car ownership can be framed as follows:

'By the year 2040, the City aims to facilitate the reduction of car ownership levels to 50 percent of current levels through interventions in public transportation and non-motorised transit across all income groups as well as through spatial restructuring.'

Furthermore, the target for reducing vehicle ownership should be considered and specified in a quantifiable manner so that performance of the strategies towards achieving this target can be tracked for monitoring and evaluation purposes.

Target 3: Specific increase in the length of exclusive right-of-way road infrastructure for public transport against the total length of new roadways for cars.

This target would include considering an increase to exclusive bus lanes. These exclusive roadways for public transport should not only include the routes for the MyCiti IRT but also for other buses such as subsidised bus services like Golden Arrow as well as

paratransit. This target area is only significantly considered by the 2032 Integrated Public Transport Network Plan (IPTN) which forms part of the CITP.

However, the recommended improvement with the target of increasing exclusive rights-of-way for public transit is to present this increase in relation to the total roadways to be developed over the same specified period. Therefore, the target should be on increasing the ratio of exclusive road-based rights-of-way for public transport against all roadway development for cars. The statement for the target on increasing exclusive right-of-way for public transport might be framed in line of the following:

'By the year 2040, exclusive right-of-way for public road-based public transport (e.g., buses and trams) should constitute at least 40 percent of the total road network surface area.'

Additionally, the target for exclusive roadway for public transport should also be done at finer grain local area scales in line with the varying urban fabrics present in the urban form (more discussed in the following section on the mapping of urban fabrics).

Target 4: Reclaiming and reallocating roadway space currently dedicated to cars.

This target is for the incremental redirection of infrastructure allocation from private cars to spaces for walking and other non-motorised modes such as cycling. This target should include specific budgetary allocation targets for the reallocation of roadway space. This reallocation can also include setting targets for flexibility and multifunctionality in the use of road space. For example, setting schedules for temporary road closures to restrict through traffic at certain times or on certain days.

The CITP should, therefore, specify targets for the amount of road space to be reclaimed from car use over a specified time period. The target may be framed in the line of the following statement:

'By the year 2040, space from roads that are not necessarily high mobility paths will be incrementally be reclaimed for the use of people through urban design interventions therefore converting these roads into people-centred streets and public spaces. The target would be to reclaim up to 50 percent of the roadway space in such identified places by 2040.'

The priority for reclaiming and reallocating roadway space to people and for non-motorised transport should be areas that are already high in human activity whether due to higher residential densities or mixed land use activity.

Target 5: Coupling goals for reducing carbon emissions from cars directly with goals for reduced car usage.

This target concerns making explicit connections between the car share of Cape Town's carbon footprint with private car usage. Currently, the Transport Register chapter of the CITP does not include the accounting for carbon emissions attributed to private car mobility. Therefore, the intervention should be to set specific targets to reduce the car share of carbon emissions with the decreasing car usage.

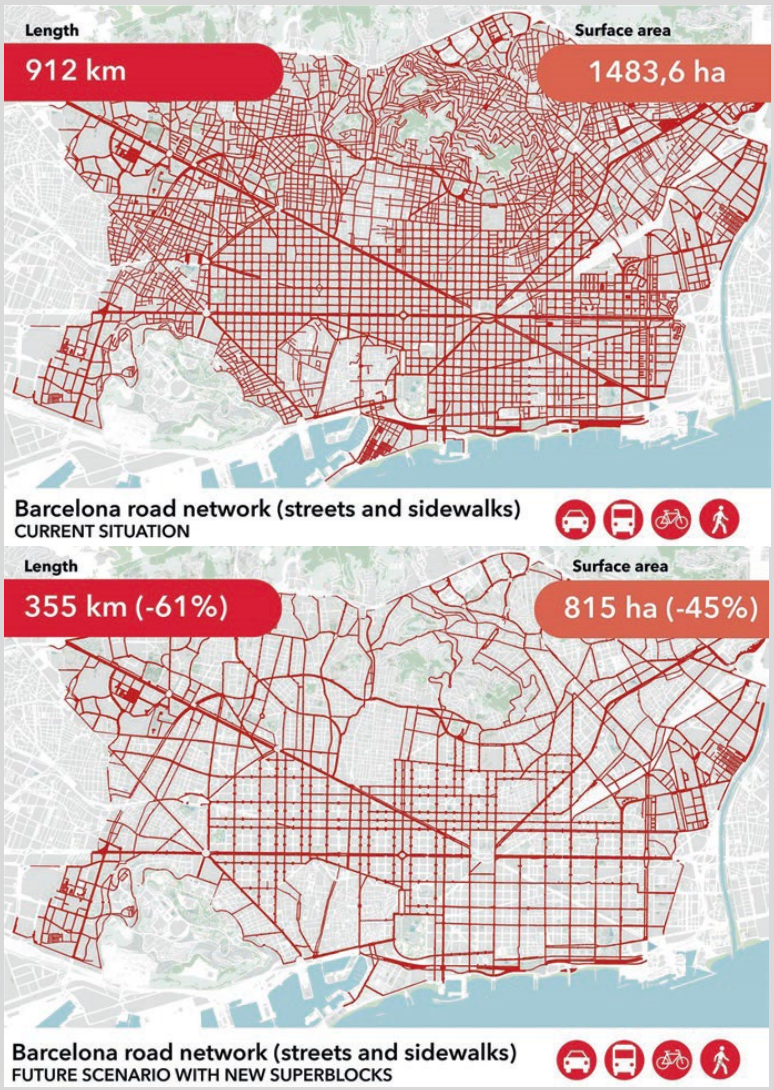
Target 6: Recentring people in the discourse on mobility modes.

This target concerns the repositioning of human beings in the discourse around public transport. This entails the shift from pedestrians as secondary considerations in rights-of-way to primary users. Therefore, the revision of the CITP should consider explicitly stating and protecting the status of people as primary inhabitants of urban space and walking (people-on-foot) as the primary mobility option.

For instance, it is surprising that the CITP's Transport Register, on which the City's transport priorities are based, does not include an assessment of walking environments of the city; whereas it assesses road conditions for cars and has an assessment of public transport systems and their associated infrastructure requirements. Therefore, the public realm for people on foot is overlooked in the analysis. This might imply that walking is not considered as a mobility option that is significant or necessary in relation to the other engineered systems. Therefore, a good first step might be to recentre human beings in the transport planning discourse would be to include the analysis of walking conditions beyond the physical quality or availability of pavements. Rather, the Transport Register should include evaluating the psychological and cultural aspects (i.e., less tangible aspects) of walking experiences around the city. Furthermore, this kind of assessment can be considered the primary assessment on which all the other analysis of the Transport Register can be developed on.

A precedent example for inspiration on how Cape Town can set goals towards reducing car dependency is presented in Box 4.1.

Box 4.1 – The 2014 Urban Mobility Plan



One of the initiatives that emerged from the 2014 Barcelona Urban Mobility Plan was the explicit targets set to reduce the levels of exclusive infrastructure for dedicated to private car mobility. This was emphasised with the specific goals to reclaim streets for people through the now-famous concept of superblocks. The picture above shows the current street network prioritising cars (as at the time of the study) and the picture below is the envisioned scenario that they targeted. The plan was renewed in 2018 and updated for the period between 2019 and 2024. (Rueda, 2019)

4.3.Mapping urban fabrics

For the MSDF and DMS, the proposed change is to spatially define transport zones based on the type of existing urban fabric in the area. Whether the area is oriented towards walking or cycling, readily available public transport access, or depending on whether car mobility is the only available option in that part of the city. The urban fabrics mapping should set transport system goals, infrastructure allocation and prioritisation goals, and built-form goals for the various areas corresponding to the walking, transit, and automobile urban fabrics at the metropolitan scale. This urban fabrics mapping should support the redefined goals in the sections above. The mapping should be in line with the urban fabrics theory by the suggestions of Newman, Kosonen, and Kenworthy (Newman et al., 2016).

Areas corresponding to the walking city fabric, transit city fabric, and automobile city fabric should be mapped. Furthermore, apart from the MSDF, the IPTN plan and the City's NMT Strategy should be realigned with the urban fabrics mapped. The DMS therefore should be updated with the land use management guidelines that should respect the existing urban fabrics of the various areas and take advantage of the existing fabric as the starting point to rejuvenate the urban fabric so as to optimise the spatial form conducive to walking, cycling or public transport. Priority should be given to the walking and transit fabrics.

The walking city fabric should include areas in already established nodes, existing PTA zones, public transport interchanges. The walking city fabric should also include some areas that could possibly be retrofitted around suburban malls or business parks where there is existing intense mixed uses potential and intense human activity. The target should be that of not more than 25% private car modal share and at least 75% space in rights-of-way should be dedicated to human beings (these targets have been inspired by (Newman & Kenworthy, 2015e).

The transit city fabric should include areas along existing public transport routes (as well as future extension possibilities). The transit city fabrics should strengthen the existing PTA zones, but should have varying development parameters depending on local fabric as well as whether the area is supported by rail or BRT routes. Some of the development

guidelines should include the removing parking restrictions/requirements. The target should be that of not more than 50% modal share for private cars and at least 50% space dedicated to public transport exclusive rights-of-way.

Unique to the study area might be the addition of the paratransit city fabric. This is recommended because of the context of Cape Town. The areas corresponding to the paratransit fabric have higher residential densities characteristic of the walking city fabric, walking is the primary mode within the areas despite having inadequate or inexistent infrastructure for non-motorised transit, there is high use of public transport but mostly unscheduled paratransit, high levels of informality (both residential and trade) yet there are also better fine grain mixed uses. This is a contextual situation that is not accounted for in the in the urban fabrics theory by Newman and Kenworthy (2015e), hence, the guidelines for this fabric are identified as a recommendation for future research. Extensive research is required in order to establish how the 'paratransit' urban fabric can be respected and rejuvenated as part of the urban fabrics strategy to facilitate the transition away from car dependency. The target can be that of 50 to 75 percent modal share of private cars, however, this is only a speculative estimate. Actual targets should be developed following the research findings on the paratransit fabric.

Lastly the automobile city fabric should include strategies for restructuring suburban malls into nodes in line with retrofitting suburbia theories by Dunham-Jones and Williamson (2009). The retrofitting suburbia theory concerns using infill development to consolidate densities in car-dominated suburban areas by utilising suburban wastelands such as parking lots at shopping malls to develop mixed use precincts thereby retrofitting the low density areas with higher density precincts that introducing an urban character (Dunham-Jones & Williamson, 2009). Therefore, in areas that are significantly automobile dependent, the spatial transformation strategies should take this retrofitting suburbia approach. The target can be that of not more than 75 percent modal share of private cars.

4.3.1. The process of mapping urban fabrics

The urban fabrics should be mapped by considering the city's historic growth areas (Figure 12), land use zoning (Figure 13), population density (Figure 14), and the existing public

transport system (Figure 15). The historic growth areas can reveal areas that were developed or grew in relation to public transport, walking or in the automobile era. This data can then be overlayed with existing land uses which might also reflect whether areas are better oriented to serve the automobile, public transport or non-motorised transport. Population densities can further nuance the emerging classification of urban fabrics; the same way would the existing public transport accessibility in the various areas.

The overlap of areas developed before the 1950s (i.e., before the automobile age) with high levels of mixed uses, intense human activity, high population and opportunity density, with or without major train stations or public transport interchanges can be determined as corresponding to walking urban fabrics. Therefore, these areas should be respected and rejuvenated to maintaining their walking city urban fabric character.

Areas with the overlap of proximity to public transport (i.e., train stations, public transport interchanges or scheduled bus stops, e.g., MyCiti routes) with high to medium levels of mixed land uses and population or opportunity activity density can be regarded as transit city fabrics. The goal in the transit city fabric should be to optimise the public transport usage and non-motorized transport feeding to the transit stations or stops. The characters discussed for the transit city fabric should, like the other fabrics, should be already in existence and interventions should capitalise on that.

The areas characterised by single residential land uses without proximity to any forms of public transport or paratransit services can be regarded as the automobile city fabric. The spatial strategies in such fabrics should include identifying opportunities for infill development and introducing non-motorised traffic infrastructure to and from the consolidated infill developments.

As already flagged above, the paratransit fabric requires further research to understand how to intervene. Nevertheless, the preliminary mapping of urban fabric areas that require further fine grain analysis are presented in Figure 16. This preliminary mapping of Cape Town's urban fabrics is simplified taking inspiration from the mapping case of small Finnish towns (Box 4.2). However, further details are required in the case of Cape Town in line with the urban fabrics mapping done in Perth, Australia (Box 4.3) that focused on

creating an accessibility index for every area within the city. This idea can be implemented in Cape Town to complement the TDI. The comprehensive mapping of urban fabrics should inform the MSDF update but should also recognise civic nodes (Figure 17) and incorporate then in the framework.

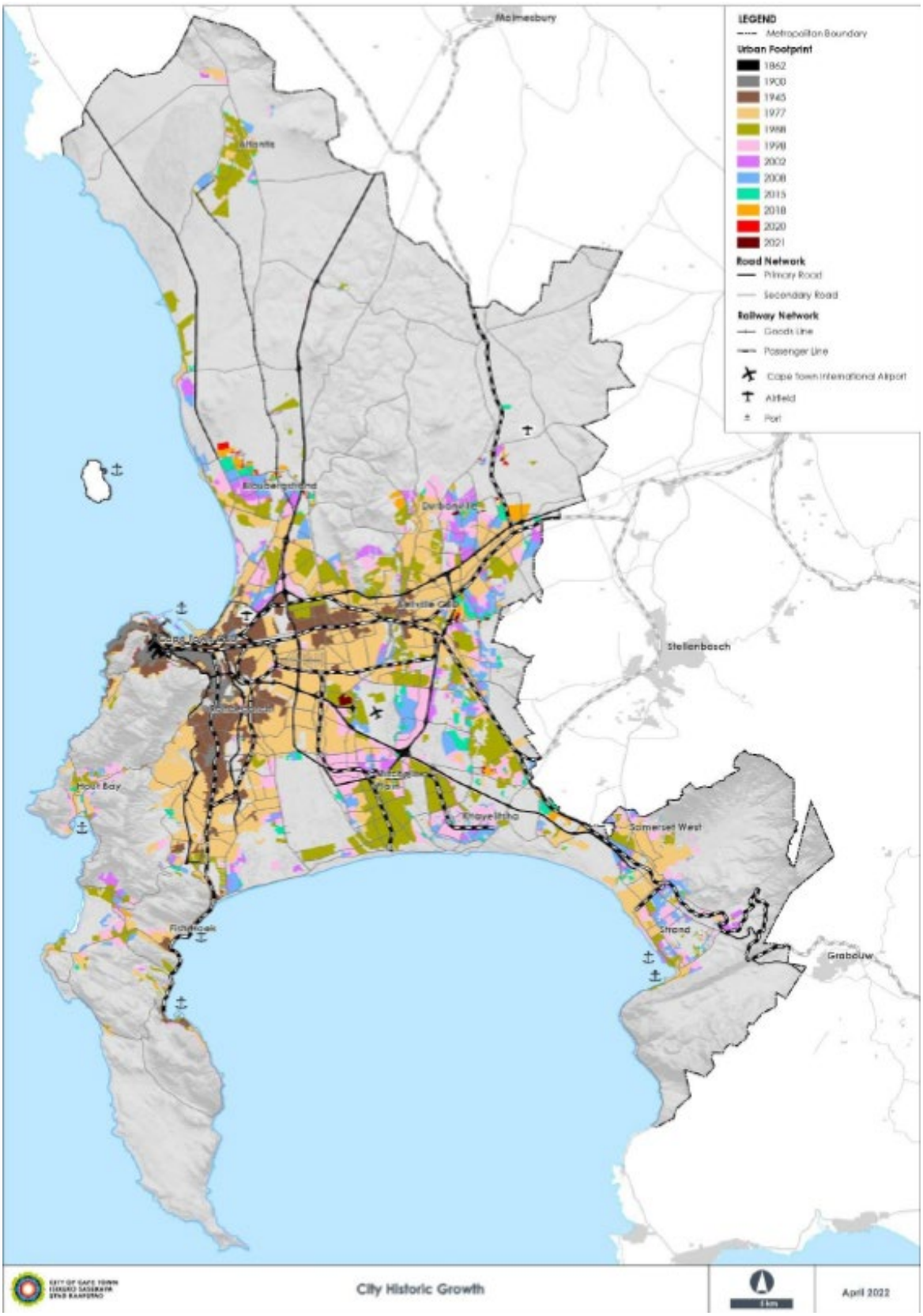


Figure 12. Cape Town's Historic Land Uses (Source: City of Cape Town (2022))

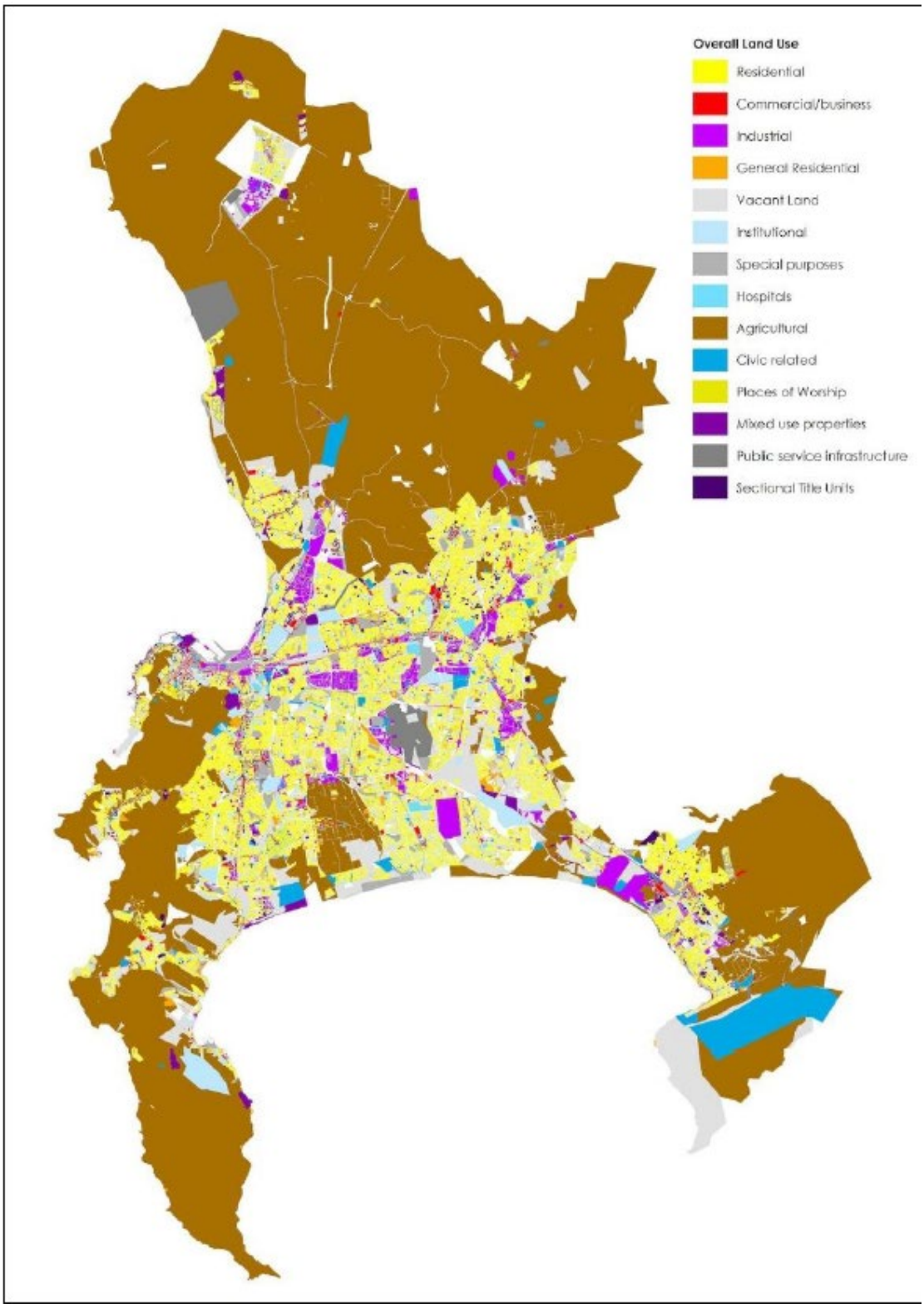


Figure 13. Land use zoning (Source: City of Cape Town (2022))

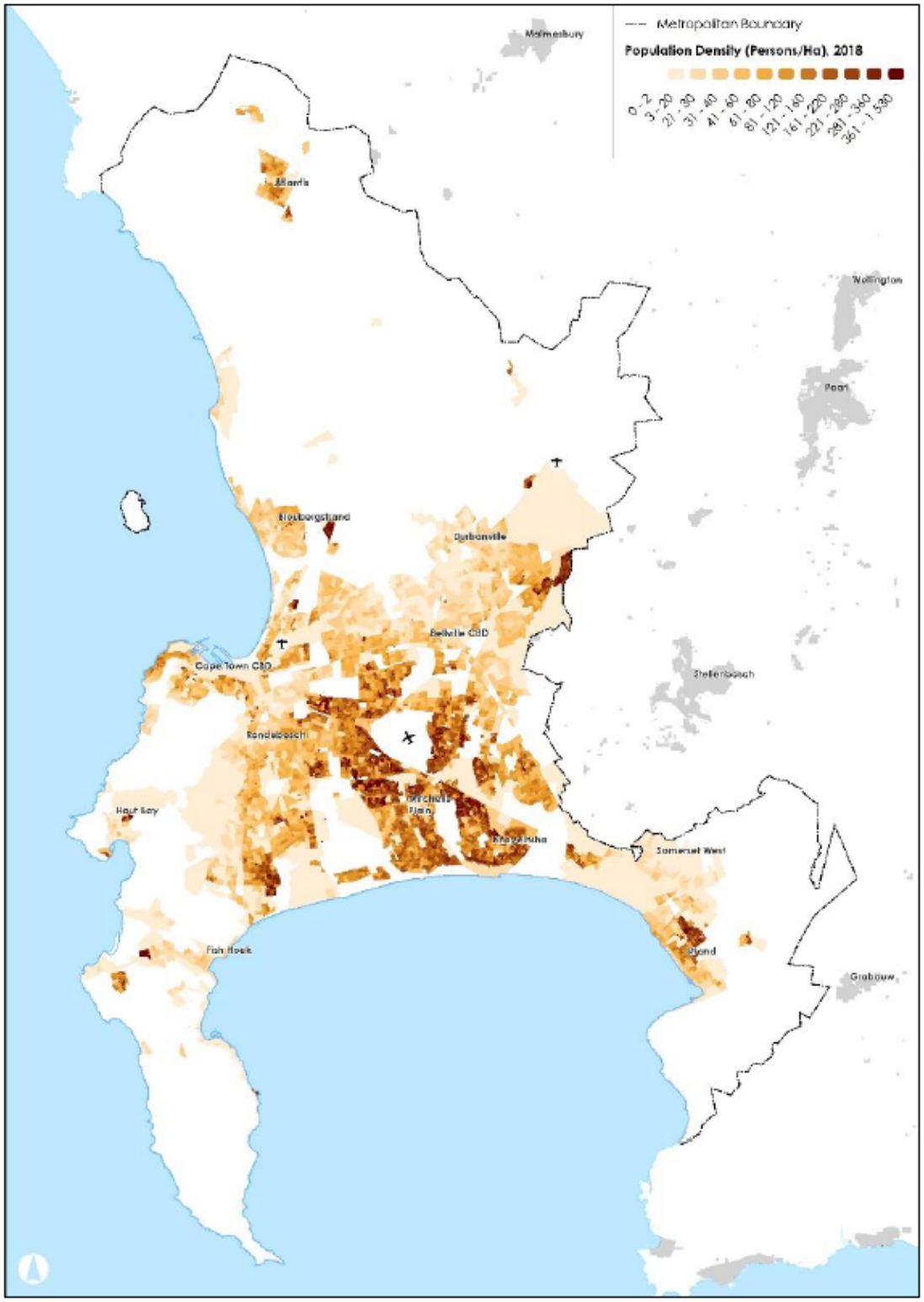


Figure 14. Population density (Source: City of Cape Town (2022))

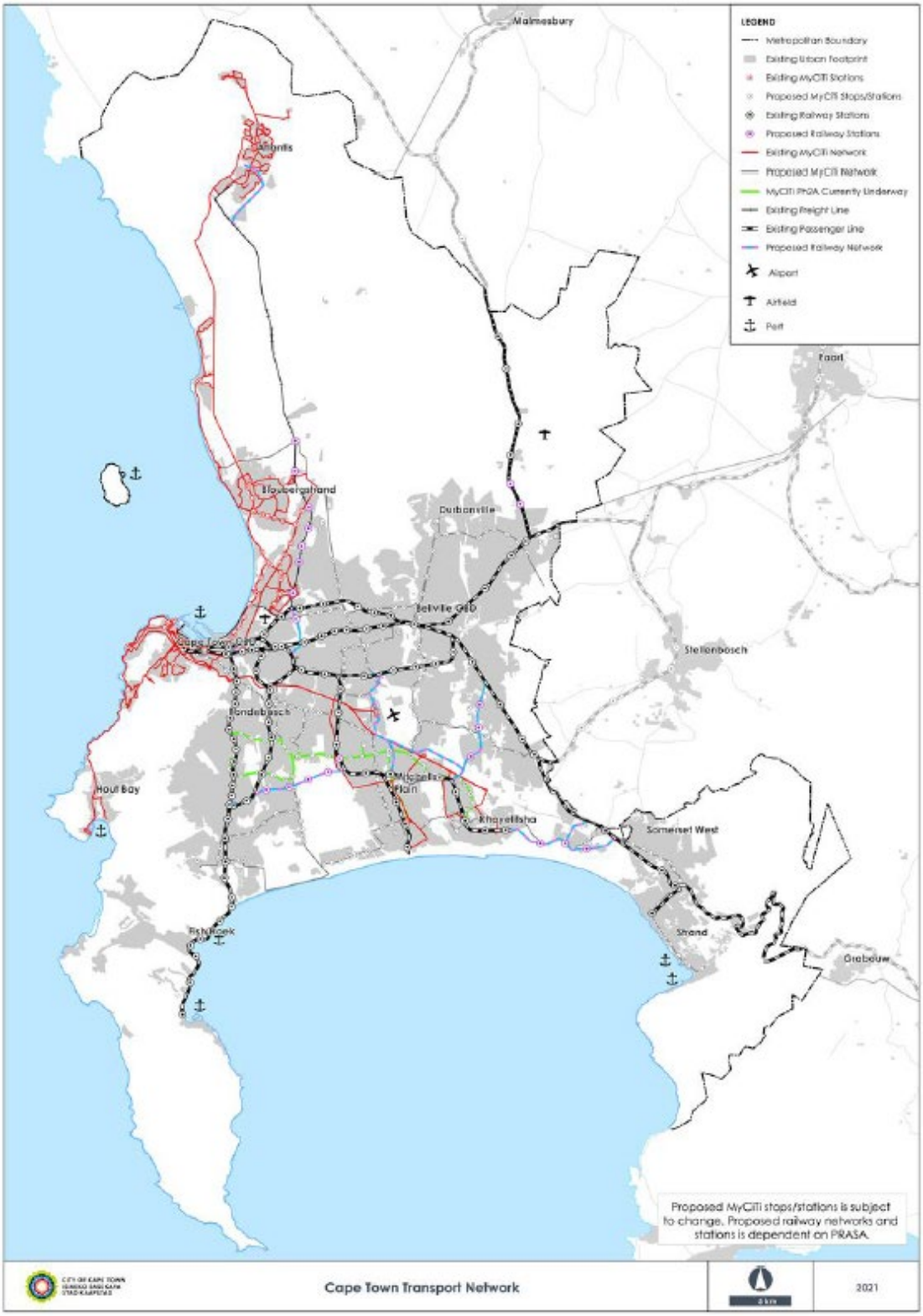


Figure 15. Transport network (Source: City of Cape Town (2022))

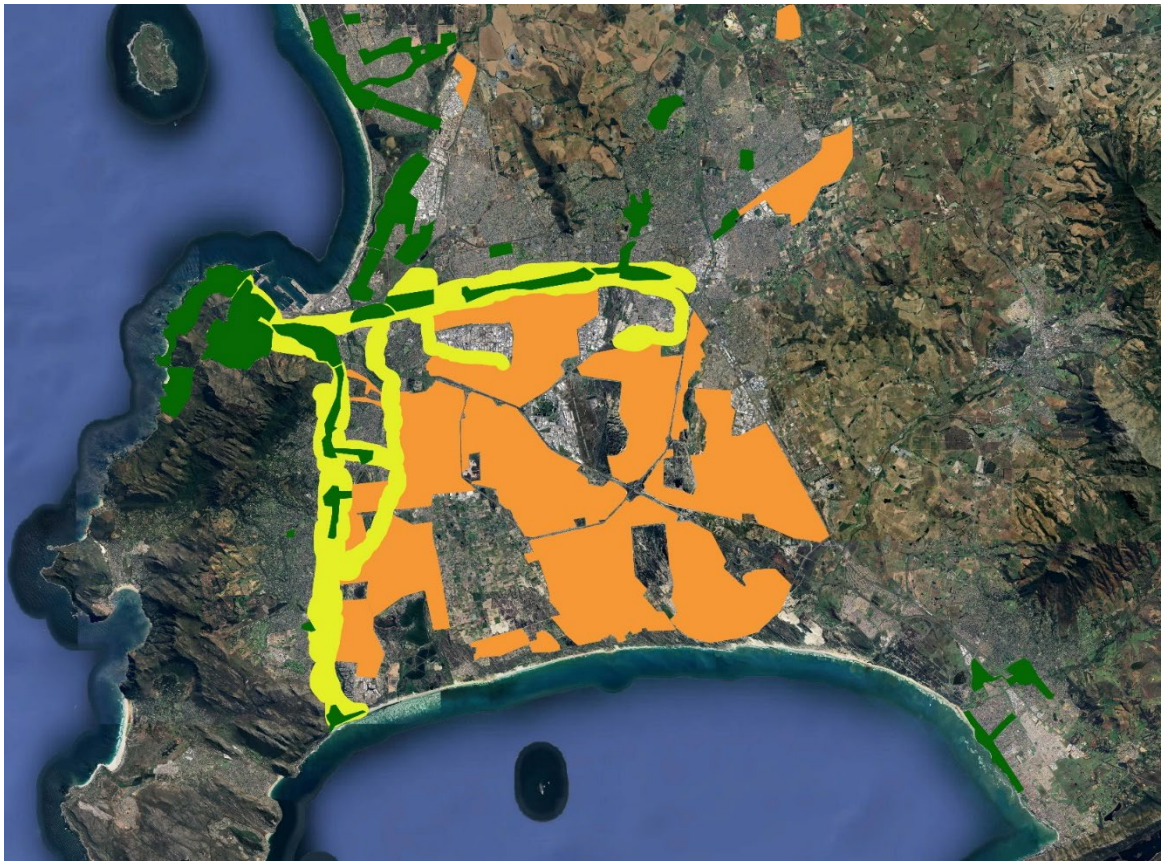


Figure 16. Preliminary urban fabrics mapping; green for walking city fabrics, yellow for transit city fabrics, orange for paratransit fabrics, the rest of the area is mainly automobile city fabric (Source: Author's own)

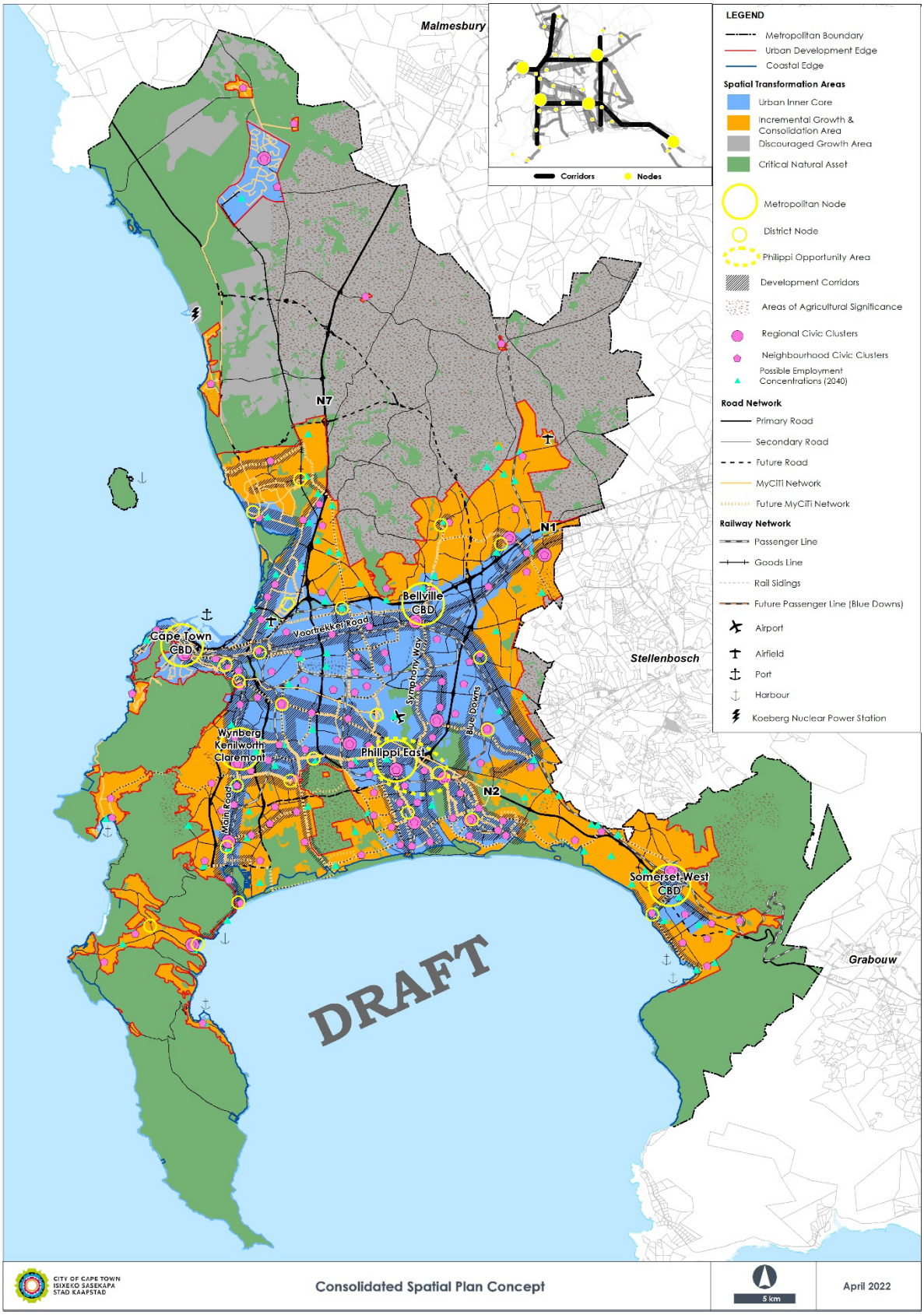
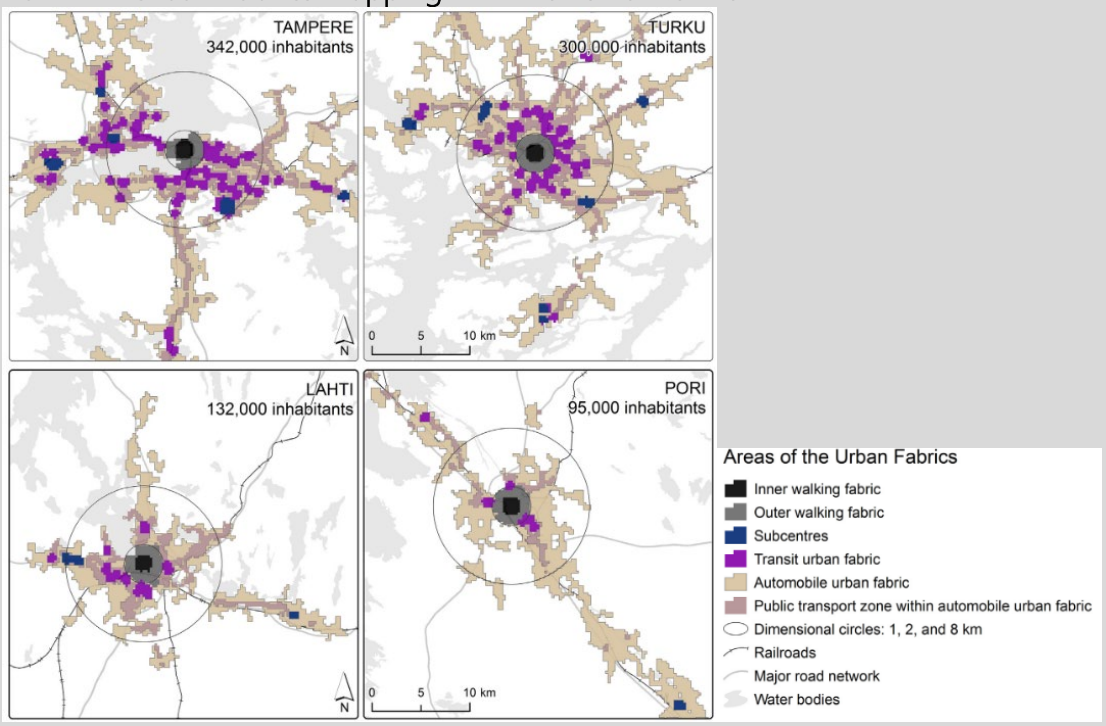


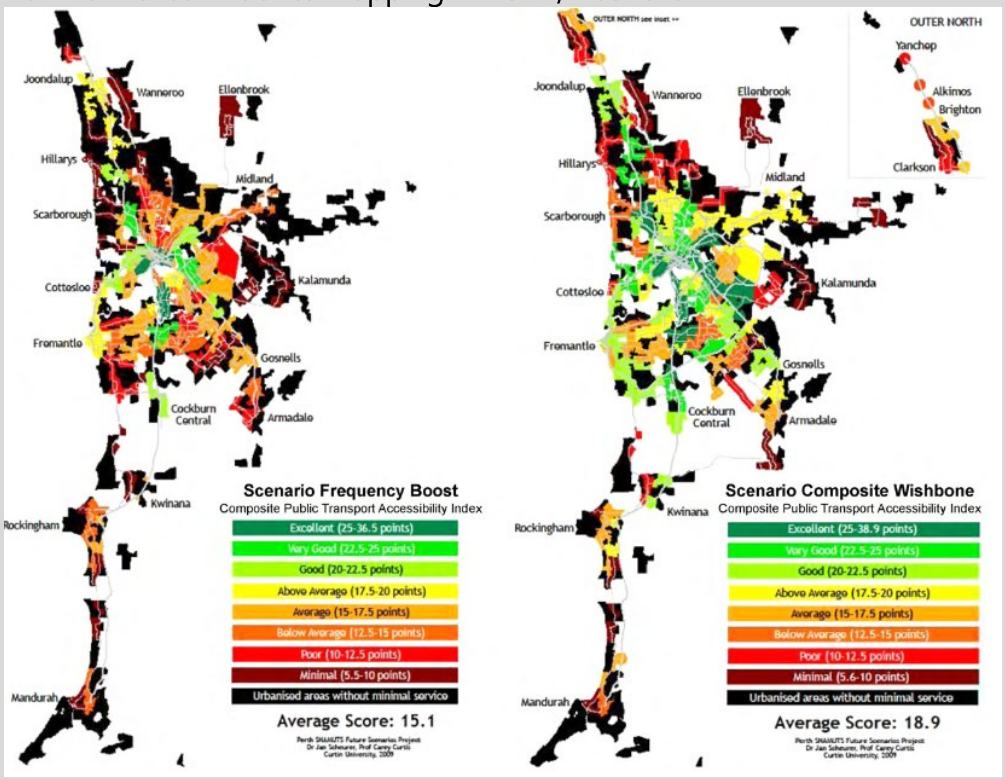
Figure 17. The draft MSDF showing civic nodes in purple (Source: City of Cape Town (2022))

Box 4.2 - Urban Fabrics mapping in Finnish small towns



The project used "a GIS-based method to identify and delineate areas of walking, transit and automobile urban fabrics in four Finnish city regions. Existing delineation that [identified] public transport supply [was] used as a starting point and a reference. The emphasis [was] on delineating the boundary between areas of transit fabric and areas of automobile fabric. The methodology [relied] on an overlay analysis and thresholds for three variables that [represented] basic determinants of the transit fabric in intermediate city regions. [The determinants included] the combined density of the population and jobs, the proximity of bus stops with a sufficient level of transit services, and the availability of grocery shops within walking distance. The results [were] tested using data on modal share and car ownership. The results show that with the inclusion of two new variables (density and grocery shops) the delineation is more accurate for identifying those areas that accommodate a higher share of carless households and sustainable transport modes compared to those with only public transport supply. The results show the similarities of each fabric area type in different cities and great differences between fabric areas inside each city region, which indicates that the application is useful. It also reveals the need for more detailed analysis." (Helminen et al., 2020, p. Abstract)

Box 4.3 - Urban Fabrics mapping in Perth, Australia



The urban fabrics mapping in Perth, Australia was part of the SNAMUTS project that aimed to improve efforts for integrated transport and land use planning by studying fine grain accessibility to public transport. The mapping study spatially represented the levels of accessibility in the city as a baseline to initiate plans for improving public transport accessibility across the city. This was coupled with goals for an envisaged future scenario that the city should aim for. This entire mapping process led to the development of the public transport accessibility index. This is an example of the potential that mapping urban fabrics present. The mapping of urban fabrics in Perth "demonstrated the power of visual mapping in driving home the concept of 'land use transport integration', particularly in highlighting places with good transport network accessibility but poor land use opportunity. The visual mapping proved effective in 'talking' to the wider community too. The focus on a simple before–after comparison following a network reconfiguration package can be replicated quite straightforwardly: in Perth, we have been able to keep pace with subsequent (more minor) timetable and network changes, allowing SNAMUTS to provide an ongoing longitudinal documentation of network performance." (Curtis & Scheurer, 2010, p. 103)

4.3.2. Land use and urban design guidelines for the urban fabrics

The DMS should be used to facilitate the rejuvenation of the urban fabrics. Urban Fabrics Overlay Zones should be adopted for protecting the most valuable walking city fabrics as well as the transit city fabrics. The zoning scheme should be reviewed to take cognisance of the varying urban fabrics.

In the walking city fabric the priorities should include maintaining narrow streets, public space that includes parks and public squares, street furniture, improving permeability in the area with short blocks, removing setbacks and encouraging build-to-lines, mandating high densities, removing minimum parking requirements, having wide pavements, providing and prioritising non-motorised transport infrastructure, and encouraging fine grain mixed-use activities (Newman & Kenworthy, 2015e). In the transit city fabric priorities should include exclusive rights-of-way for public transport especially for road-based transit, high mixed-use activities adjacent to public transportation stations and stops, improved walkability towards the public transport stations and stops, provision of adequate non-motorised transport infrastructure to feed to the public transport stops and stations, and high densities with increasing densities with proximity to public transport stations and stops. The City's TOD strategy can apply in the transit and walking fabrics and should be prioritised where there are existing fabrics to support transport instead of areas that would require extensive development or conversion of land uses.

On the other hand, automobile fabrics should not be protected by overlay zoning. However, the land use guidelines in the automobile city fabric should be geared towards introducing land uses for self-sufficiency to shorten travel distances, e.g., by introducing facilities near to residences to minimise the need to drive. Incrementally elements of the walking and transit city fabric should be introduced where appropriate. Also, the retrofitting of underutilised land into mixed use precincts should be encouraged.

A summary showing an example of the land use guidelines for the various fabrics is presented in Table 3 below:

Table 3. Urban fabrics development guidelines to be prioritised (Adapted from (Newman & Kenworthy, 2015e))

Walking City Fabric	Transit City Fabric	Paratransit City Fabric	Automobile City Fabric
Prioritise: • Narrow streets • Public space; parks and squares • Street furniture • Permeability • No setbacks • Highest densities • No parking requirements • Wide pavements • NMT infrastructure • Fine grain mixed-use activity	Prioritise: • Exclusive transit rights-of-way • High mixed-use activity adjacent to transit stops • Improved walkability nearest to transit • NMT leading to transit • High densities but densities increasing with proximity to transit stops	Research gap because it exhibits densities characteristic of walking cities; walking is a primary mode; but insufficient walking or NMT infrastructure or design qualities; no defined transit routes; fine grain mixed-use activities present but mainly informal; high levels of informal settlements.	Prioritise: • Introducing land uses for self-sufficiency to shorten travel distances • Introducing elements of walking/transit city fabric where appropriate • Retrofitting underutilised land into mixed-use precincts • Introducing facilities near residences

4.4. Conclusion

In conclusion, the interventions to improve the City's key transport and spatial planning frameworks towards transitioning away from car dependency and car-oriented urbanism include naming car dependency as one of the main transport problems in the city and setting a vision of targets to reduce levels of car use, reallocate infrastructure from cars, and reposition human beings in the transportation discourse. These changes should be accompanied by the mapping of urban fabrics in order to optimise their spatial structure and design qualities to lessen car dependency in the walking city fabric and transit city fabric, while reducing car dependency and car-oriented development in the city as whole. However, considering the context of Cape Town, the majority of lower-income residents

residing in the Cape Flats are also in areas that do not align with the three main theoretical urban fabrics; hence residing in what has been termed the paratransit city fabric. Therefore, further research on the paratransit city fabric has been recommended as pertinent for the application of the urban fabrics theory in Cape Town.

CHAPTER FIVE

Photo source: https://openstreets.org.za/news/take-myciti-mitchells-plain-2-april

Implementation:

An action plan for transitioning Cape Town away from car dependency and car-oriented urbanism

5.1. Introduction

The fourth chapter of this dissertation started answering the second part of the main research question: 'How can the City's key transport and spatial planning frameworks be improved towards transitioning away from car dependency and car-oriented urbanism?' Chapter four discussed suggestions for the necessary interventions that can effectively respond to the current gaps identified through the evaluation of the key transport and spatial planning frameworks in the contextual analysis (Chapter Three). The interventions identified include redefining the City's main transport problems and priorities by calling out and naming car dependency as one of the main transport problems in Cape Town in the CITP and setting goals for reducing car dependency as the City's main transport priories. The interventions also include the mapping of the various urban fabrics (walking, transit, paratransit and automobile), developing land use management and urban design guidelines to optimise and rejuvenate each corresponding fabric, and spatially aligning the existing transport and spatial plans with the mapped fabrics to respect and rejuvenate them. This chapter continues answering the research question concerning how to improve the City's key transport and spatial frameworks towards transitioning away from car dependency and car-oriented urbanism.

This chapter focuses on the implementation of the identified interventions discussing relevant stakeholders responsible for implementing the interventions, timeframes, phasing of implementation, implications for budgeting, financing mechanisms, and the legal and regulatory requirements. The implementation chapter unfolds by first setting a brief statement on the theoretical requirements for implementing sustainable transitions since the implementation of the interventions would be a process of sustainable transitions as highlighted in the literature review (Chapter Two). Thereafter, the implementation chapter presents an implementation action plan followed by a phasing plan for the implementation. Before concluding, the chapter turns to a discussion on the conditions to facilitate the implementation of interventions.

5.2. Sustainable transitions requirements for the implementation of interventions

There is a need for reversing path dependence and lock-in (Geels, 2005) of car dependency while creating a new paradigm facilitating path dependency and sustainable lock-ins. Need to understand 'lock-out' from car dependency. Additionally, there is need for extensive understanding of the current socio-technical context that is more favourable to cars as per the findings of the contextual analysis. Also, there is a need to then understand how to shift the current socio-technical context into one that is more favourable to less car dependency.

The dynamics of sustainable transitions required are presented in the implementation matrix below.

5.3. Implementation action plan for the interventions

This section presents the tabulation of the action plan for the interventions suggested in Chapter Four. The implementation matrix presented in Table 4 includes the necessary considerations and enabling conditions for implementation. The implementation strategy should consider various factors that should facilitate the implementation that include considering spatial targeting policies for the various urban fabrics and prioritising some of the identified fabrics over others. Another critical issue for the implementation is to ensure cross-stakeholder but also trans- and interdisciplinary collaborations between departments and sectors. Table 5 presents the phasing plan for the implementation.

Table 4. The implementation matrix for the suggested interventions

Intervention	Scope of Implementation	Sustainable transition levers (multi-level perspective dynamics)	Stakeholders responsible	Implications for funding	Implications for governance and regulatory frameworks	Timeframe of intervention	Level of priority and importance
Redefining the City's main transport problems and priorities	Strategic-level priorities to be reflected in the documents of the CITP and other associated documents	A shift in the socio-technical regime influencing the landscape development level of transitions in the long run	The City's Urban Mobility Directorate to lead in collaboration with the City's other departments	Utilising the same funding for annual CITP reviews	Need for changes in the Minimum Requirements for the Preparation of Integrated Transport Plans developed at the national level by the Department of Transport. Further changes need to be accommodated in the City's	One to three years of review	A high priority and significantly important for addressing the issue of car dependency; and a short-term to medium-term goal

Intervention	Scope of Implementation	Sustainable transition levers (multi-level perspective dynamics)	Stakeholders responsible	Implications for funding	Implications for governance and regulatory frameworks	Timeframe of intervention	Level of priority and importance
					Integrated Development Plan		
Naming car dependency as a major transport problem	Strategic-level priorities to be reflected in the documents of the CITP and other associated documents	A shift at the socio-technical regime level to influence shifts at the landscape level of transitions and to inform niche-level shifts	The City's Urban Mobility Directorate to lead in collaboration with the City's other departments	Utilising the same funding for annual CITP reviews	Need for changes in the Minimum Requirements for the Preparation of Integrated Transport Plans developed at the national level by the Department of Transport. Further changes need to be accommodated in the	One to three years of review	A high priority and significantly important for addressing the issue of car dependency; and a short-term to medium-term goal

Intervention	Scope of Implementation	Sustainable transition levers (multi-level perspective dynamics)	Stakeholders responsible	Implications for funding	Implications for governance and regulatory frameworks	Timeframe of intervention	Level of priority and importance
					City's Integrated Development Plan		
Changes to the Transport Register	Updating the Transport Register methodology and analysis presentation to allow for the generation of appropriate data to support the issue of car dependency as a major problem	Shifts at the socio-technical regime level of transitions	The City's Urban Mobility Directorate to lead	Utilising the same funding for annual CITP reviews	Need for changes in the Minimum Requirements for the Preparation of Integrated Transport Plans developed at the national level by the Department of Transport. Further changes need to be accommodat	One to three years of review	A high priority and significantly important for addressing the issue of car dependency; and a short-term to medium-term goal

Intervention	Scope of Implementation	Sustainable transition levers (multi-level perspective dynamics)	Stakeholders responsible	Implications for funding	Implications for governance and regulatory frameworks	Timeframe of intervention	Level of priority and importance
					ed in the City's Integrated Development Plan		
Reviewing the Transport Development Index	Updating the Transport Development Index methodology and analysis presentation to allow for the generation of appropriate data to support the issue of car dependency as a major problem	Shifts at the socio-technical regime level of transitions	The City's Urban Mobility Directorate to lead	Utilising the same funding for annual CITP reviews	Need for changes in the Minimum Requirements for the Preparation of Integrated Transport Plans developed at the national level by the Department of Transport. Further changes need to be	One to three years of review	A high priority and significantly important for addressing the issue of car dependency; and a short-term to medium-term goal

Intervention	Scope of Implementation	Sustainable transition levers (multi-level perspective dynamics)	Stakeholders responsible	Implications for funding	Implications for governance and regulatory frameworks	Timeframe of intervention	Level of priority and importance
					accommodated in the City's Integrated Development Plan		
Changing the discourse in the CITP and MSDF	Revising the CITP and MSDF documents	Shifts at the socio-technical regime level of transitions	The City's Urban Mobility Directorate and the Urban Planning and Design directorate	Utilising the same funding for annual CITP and MSDF reviews	Changes need to be reflected in and enabled by the Integrated Development Plan	One to three years of review	A high priority and significantly important for addressing the issue of car dependency; and a short-term to medium-term goal
Setting goals for a less car-dependent city	Strategic-level priorities to be reflected in the documents of the CITP and other	Shifts at the socio-technical regime level of	The Intermodal Planning Committee that is established under the	Utilising the existing funding for the Intermodal	Need for changes in the guidelines for establishing	One to three years of review	A high priority and significantly important for addressing the

Intervention	Scope of Implementation	Sustainable transition levers (multi-level perspective dynamics)	Stakeholders responsible	Implications for funding	Implications for governance and regulatory frameworks	Timeframe of intervention	Level of priority and importance
	associated documents	transitions initiating shifts at the landscape level	requirements of the National Land Transport Act 2009	Planning Committee's work	the Intermodal Planning Committee to allow for the composition of the committee to include all necessary competencies for undertaking the scope of the intervention		issue of car dependency; and a short-term to medium-term goal
Updating the City's transport vision	Reviewing the CITP document and the other frameworks documents (i.e.,	Shifts at the socio-technical regime level	The City's Urban Mobility Directorate to lead	Utilising the same funding for annual CITP reviews	Changes need to be reflected in and enabled by the	One to three years of review	A high priority and significantly important for addressing the

Intervention	Scope of Implementation	Sustainable transition levers (multi-level perspective dynamics)	Stakeholders responsible	Implications for funding	Implications for governance and regulatory frameworks	Timeframe of intervention	Level of priority and importance
	MSDF and DMS); but also revising the other documents informed by these key frameworks	of transitions			Integrated Development Plan		issue of car dependency; and a short-term to medium-term goal
Setting Target 1: A specific vision for significantly reducing the private car modal share	Revising the CITP and subsequent discourse update in the City's other documents	Shifts at the socio-technical regime level of transitions with implications for shifts at the landscape level	The City's Urban Mobility Directorate to lead as guided by the Intermodal Planning Committee that is established under the requirements of the National Land Transport Act 2009	Utilising the existing funding for the Intermodal Planning Committee's work; also, allocate additional funding as necessary	Changes need to be reflected in and enabled by the Integrated Development Plan; also, there is a need for changes in the Minimum Requirements for the Preparation of Integrated	One to three years of review	A high priority and significantly important for addressing the issue of car dependency; and a short-term to medium-term goal

Intervention	Scope of Implementation	Sustainable transition levers (multi-level perspective dynamics)	Stakeholders responsible	Implications for funding	Implications for governance and regulatory frameworks	Timeframe of intervention	Level of priority and importance
					Transport Plans developed at the national level by the Department of Transport.		
Setting Target 2: Reducing or reversing car ownership trends	Revising the CITP and subsequent discourse update in the City's other documents	Shifts at the socio-technical regime level of transitions with implications for shifts at the landscape level	The City's Urban Mobility Directorate to lead as guided by the Intermodal Planning Committee that is established under the requirements of the National Land Transport Act 2009	Utilising the existing funding for the Intermodal Planning Committee's work; also, allocate additional funding as necessary	Changes need to be reflected in and enabled by the Integrated Development Plan; also, there is a need for changes in the Minimum Requirements for the Preparation	One to three years of review	A high priority and significantly important for addressing the issue of car dependency; and a short-term to medium-term goal

Intervention	Scope of Implementation	Sustainable transition levers (multi-level perspective dynamics)	Stakeholders responsible	Implications for funding	Implications for governance and regulatory frameworks	Timeframe of intervention	Level of priority and importance
					of Integrated Transport Plans developed at the national level by the Department of Transport.		
Setting Target 3: Specific increase in the length of exclusive right-of-way road infrastructure for public transport against the total length of new roadways for cars	Revising the CITP and subsequent discourse update in the City's other documents	Shifts at the socio-technical regime level of transitions with implications for shifts at the landscape level	The City's Urban Mobility Directorate to lead as guided by the Intermodal Planning Committee that is established under the requirements of the National Land Transport Act 2009	Utilising the existing funding for the Intermodal Planning Committee's work; also, allocate additional funding as necessary	Changes need to be reflected in and enabled by the Integrated Development Plan; also, there is a need for changes in the Minimum Requirements for the	One to three years of review	A high priority and significantly important for addressing the issue of car dependency; and a short-term to medium-term goal

Intervention	Scope of Implementation	Sustainable transition levers (multi-level perspective dynamics)	Stakeholders responsible	Implications for funding	Implications for governance and regulatory frameworks	Timeframe of intervention	Level of priority and importance
					Preparation of Integrated Transport Plans developed at the national level by the Department of Transport.		
Setting Target 4: Reclaiming and reallocating roadway space currently dedicated to cars	Updating the Transport Register to include GIS data mapping the space dedicated to car infrastructure; Revising the CITP and subsequent discourse update in the City's other documents	Shifts at the socio-technical regime level of transitions with implications for shifts at the landscape level	The City's Urban Mobility Directorate to lead as guided by the Intermodal Planning Committee that is established under the requirements of the National	Utilising the existing funding for the Intermodal Planning Committee's work; also, allocate additional funding as necessary	Changes need to be reflected in and enabled by the Integrated Development Plan; also, there is a need for changes in the Minimum Requirement	One to three years of review	A high priority and significantly important for addressing the issue of car dependency; and a short-term to medium-term goal

Intervention	Scope of Implementation	Sustainable transition levers (multi-level perspective dynamics)	Stakeholders responsible	Implications for funding	Implications for governance and regulatory frameworks	Timeframe of intervention	Level of priority and importance
			Land Transport Act 2009		s for the Preparation of Integrated Transport Plans developed at the national level by the Department of Transport.		
Setting Target 5: Coupling goals for reducing carbon emissions from cars directly with goals for reduced car usage	Reviewing the Transport Register analysis to highlight data on carbon emissions from cars; Revising the CITP and subsequent discourse update in the City's other documents	Shifts at the socio-technical regime level of transitions with implications for shifts at the landscape level	The City's Urban Mobility Directorate to lead as guided by the Intermodal Planning Committee that is established under the requirements of the National	Utilising the existing funding for the Intermodal Planning Committee's work; also, allocate additional funding as necessary	Changes need to be reflected in and enabled by the Integrated Development Plan; also, there is a need for changes in the Minimum	One to three years of review	A high priority and significantly important for addressing the issue of car dependency; and a short-term to medium-term goal

Intervention	Scope of Implementation	Sustainable transition levers (multi-level perspective dynamics)	Stakeholders responsible	Implications for funding	Implications for governance and regulatory frameworks	Timeframe of intervention	Level of priority and importance
			Land Transport Act 2009		Requirements for the Preparation of Integrated Transport Plans developed at the national level by the Department of Transport.		
Setting Target 6: Recentring people in the discourse on mobility modes	Revising the CITP and subsequent discourse update in the City's other documents	Shifts at the socio-technical regime level of transitions with implications for shifts at the	The Mayoral office to establish a special task force for discourse review	Allocate IDP funding for this undertaking	Changes need to be reflected in and enabled by the Integrated Development Plan; also, there is a need for changes in	One to three years of review	A high priority and significantly important for addressing the issue of car dependency; and a short-term to medium-term goal

Intervention	Scope of Implementation	Sustainable transition levers (multi-level perspective dynamics)	Stakeholders responsible	Implications for funding	Implications for governance and regulatory frameworks	Timeframe of intervention	Level of priority and importance
		landscape level			the Minimum Requirements for the Preparation of Integrated Transport Plans developed at the national level by the Department of Transport.		
Mapping urban fabrics	GIS mapping to be reflected in and to inform all of the City's mapping for strategic transport and urban development plans and policies	Shifts at the socio-technical regime level of transitions with implications for shifts at the	The City's Urban Planning and Design Directorate in conjunction with the Urban Mobility Directorate to form a special working group	Allocate IDP funding for this undertaking	Changes in integrated land use and transport planning policy	Two to five years	A high-priority but also a medium-term goal

Intervention	Scope of Implementation	Sustainable transition levers (multi-level perspective dynamics)	Stakeholders responsible	Implications for funding	Implications for governance and regulatory frameworks	Timeframe of intervention	Level of priority and importance
		landscape level but also shifts at the niche level of transitions by allowing experimentation with different kinds of urban development in the designated urban fabrics areas	for urban fabrics mapping				
Developing an urban fabrics framework for reducing car dependency	GIS mapping to be reflected in and to inform all of the City's mapping for	Shifts at the socio-technical regime level of	The special working group for urban fabrics mapping to lead as	Allocate IDP funding for this undertaking	Changes in integrated land use and transport	Two to five years	A high-priority but also a medium-term goal

Intervention	Scope of Implementation	Sustainable transition levers (multi-level perspective dynamics)	Stakeholders responsible	Implications for funding	Implications for governance and regulatory frameworks	Timeframe of intervention	Level of priority and importance
	strategic transport and urban development plans and policies	transitions with implications for shifts at the landscape level but also shifts at the niche level of transitions by allowing experimentation with different kinds of urban development in the designated urban fabrics areas	formed by City's Urban Planning and Design Directorate in conjunction with the Urban Mobility Directorate		planning policy		

Intervention	Scope of Implementation	Sustainable transition levers (multi-level perspective dynamics)	Stakeholders responsible	Implications for funding	Implications for governance and regulatory frameworks	Timeframe of intervention	Level of priority and importance
Designating areas for walking city fabrics rejuvenation	GIS mapping study to determine appropriate areas	Shifts at the socio-technical regime level of transitions with implications for shifts at the landscape level	The special working group for urban fabrics mapping to lead as formed by City's Urban Planning and Design Directorate in conjunction with the Urban Mobility Directorate	Allocate IDP funding for this undertaking	Changes in integrated land use and transport planning policy	Two to five years	A high-priority but also a medium-term goal
Designating areas for transit city fabrics rejuvenation	GIS mapping study to determine appropriate areas	Shifts at the socio-technical regime level of transitions with implications for shifts at	The special working group for urban fabrics mapping to lead as formed by City's Urban Planning and Design Directorate in	Allocate IDP funding for this undertaking	Changes in integrated land use and transport planning policy	Two to five years	A high-priority but also a medium-term goal

Intervention	Scope of Implementation	Sustainable transition levers (multi-level perspective dynamics)	Stakeholders responsible	Implications for funding	Implications for governance and regulatory frameworks	Timeframe of intervention	Level of priority and importance
		the landscape level	conjunction with the Urban Mobility Directorate				
Designating areas for retrofitting walking- and transit-oriented development within automobile city fabrics	GIS mapping study to determine appropriate areas	Shifts at the socio-technical regime level of transitions with implications for shifts at the landscape level	The special working group for urban fabrics mapping to lead as formed by City's Urban Planning and Design Directorate in conjunction with the Urban Mobility Directorate	Allocate IDP funding for this undertaking	Changes in integrated land use and transport planning policy	Two to five years	A high-priority but also a medium-term goal
Designating areas for paratransit city fabrics	GIS mapping study to determine appropriate areas	Shifts at the socio-technical regime level of	The special working group for urban fabrics mapping to lead as	Allocate IDP funding for this undertaking	Changes in integrated land use and transport	Two to five years	A high-priority but also a medium-term goal

Intervention	Scope of Implementation	Sustainable transition levers (multi-level perspective dynamics)	Stakeholders responsible	Implications for funding	Implications for governance and regulatory frameworks	Timeframe of intervention	Level of priority and importance
		transitions with implications for shifts at the landscape level	formed by City's Urban Planning and Design Directorate in conjunction with the Urban Mobility Directorate		planning policy		
Conducting research to better understand paratransit city fabrics and develop appropriate interventions for paratransit city fabric	Research study	Shifts at the socio-technical regime level of transitions with implications for shifts at the landscape level	The special working group for urban fabrics mapping as formed by City's Urban Planning and Design Directorate in conjunction with the Urban Mobility Directorate should lead in	Allocate IDP funding for this undertaking	Informing transport planning and land use policy changes	2 years	A high priority and significantly important for the success of the urban fabrics intervention

Intervention	Scope of Implementation	Sustainable transition levers (multi-level perspective dynamics)	Stakeholders responsible	Implications for funding	Implications for governance and regulatory frameworks	Timeframe of intervention	Level of priority and importance
			commissioning the research study in collaboration with research institutions				
Establishing urban fabrics overlay zones	Amending the by-law (i.e., DMS) to accommodate overlay zones as a strategic development objective	Shifts at the socio-technical regime level of transitions with implications for shifts at the landscape level but also shifts at the niche level of transitions	The special urban fabrics mapping working group to recommend amendments for Council approval	Allocate IDP funding for this undertaking	Changes in integrated land use and transport planning policy and spatial planning policy	Three to five years	A high-priority but also a medium-term goal

Intervention	Scope of Implementation	Sustainable transition levers (multi-level perspective dynamics)	Stakeholders responsible	Implications for funding	Implications for governance and regulatory frameworks	Timeframe of intervention	Level of priority and importance
		by allowing experimentation with different kinds of urban development in the designated urban fabrics areas					
Developing land use management and urban design guidelines for walking city fabrics overlay zones	Spatial planning and urban design research study; but also, an amendment to the by-law (i.e., DMS)	Shifts at the socio-technical regime level of transitions with implications for shifts at the landscape	The special urban fabrics mapping working group to recommend amendments for Council approval	Allocate IDP funding for this undertaking	Changes in integrated land use and transport planning policy and spatial planning policy	Three to five years	A high-priority but also a medium-term goal

Intervention	Scope of Implementation	Sustainable transition levers (multi-level perspective dynamics)	Stakeholders responsible	Implications for funding	Implications for governance and regulatory frameworks	Timeframe of intervention	Level of priority and importance
		level but also shifts at the niche level of transitions by allowing experimentation with different kinds of urban development in the designated urban fabrics areas					
Developing land use management and urban design guidelines for	Spatial planning and urban design research study; but also, an amendment to	Shifts at the socio-technical regime level of transitions	The special urban fabrics mapping working group to recommend amendments	Allocate IDP funding for this undertaking	Changes in integrated land use and transport planning policy and	Three to five years	A high-priority but also a medium-term goal

Intervention	Scope of Implementation	Sustainable transition levers (multi-level perspective dynamics)	Stakeholders responsible	Implications for funding	Implications for governance and regulatory frameworks	Timeframe of intervention	Level of priority and importance
transit city fabrics overlay zones	the by-law (i.e., DMS)	with implications for shifts at the landscape level but also shifts at the niche level of transitions by allowing experimentation with different kinds of urban development in the designated urban fabrics areas	for Council approval		spatial planning policy		

Intervention	Scope of Implementation	Sustainable transition levers (multi-level perspective dynamics)	Stakeholders responsible	Implications for funding	Implications for governance and regulatory frameworks	Timeframe of intervention	Level of priority and importance
Developing land use management and urban design guidelines for special paratransit city fabrics	Spatial planning and urban design research study; but also, an amendment to the by-law (i.e., DMS)	Shifts at the socio-technical regime level of transitions with implications for shifts at the landscape level but also shifts at the niche level of transitions by allowing experimentation with different kinds of urban	The special urban fabrics mapping working group to recommend amendments for Council approval	Allocate IDP funding for this undertaking	Changes in integrated land use and transport planning policy and spatial planning policy	Three to five years	A high-priority but also a medium-term goal

Intervention	Scope of Implementation	Sustainable transition levers (multi-level perspective dynamics)	Stakeholders responsible	Implications for funding	Implications for governance and regulatory frameworks	Timeframe of intervention	Level of priority and importance
		development in the designated urban fabrics areas					
Developing land use management and urban design guidelines for special automobile city fabrics that require retrofitting with walking and transit city fabrics	Spatial planning and urban design research study; but also, an amendment to the by-law (i.e., DMS)	Shifts at the socio-technical regime level of transitions with implications for shifts at the landscape level but also shifts at the niche level of transitions by allowing	The special urban fabrics mapping working group to recommend amendments for Council approval	Allocate IDP funding for this undertaking	Changes in integrated land use and transport planning policy and spatial planning policy	Three to five years	A high-priority but also a medium-term goal

Intervention	Scope of Implementation	Sustainable transition levers (multi-level perspective dynamics)	Stakeholders responsible	Implications for funding	Implications for governance and regulatory frameworks	Timeframe of intervention	Level of priority and importance
		experimentation with different kinds of urban development in the designated urban fabrics areas					
Updating the City's mobility and spatial plans to align with the mapped urban fabrics	Revising the City's mapping and key transport and spatial planning frameworks	Shifts at the socio-technical regime level of transitions with implications for shifts at the landscape level	The City's Urban Mobility Directorate and the Urban planning and Design Directorate	Allocate IDP funding for this undertaking	Changes in integrated land use and transport planning policy and spatial planning policy	Three to five years	Medium-term goal

Intervention	Scope of Implementation	Sustainable transition levers (multi-level perspective dynamics)	Stakeholders responsible	Implications for funding	Implications for governance and regulatory frameworks	Timeframe of intervention	Level of priority and importance
Aligning the mapped urban fabrics with the Integrated Public Transport Network Plan (IPTN)	Revising the mapping for the IPTN	Shifts at the socio-technical regime level of transitions with implications for shifts at the landscape level	The City's Urban Mobility Directorate and the Urban planning and Design Directorate	Allocate IDP funding for this undertaking	Changes in integrated land use and transport planning policy	Three to five years	Medium-term goal
Aligning the mapped urban fabrics with the non-motorised transport (NMT) strategy and plans	Revising the mapping for the NMT Strategy and plans	Shifts at the socio-technical regime level of transitions with implications for shifts at the	The City's Urban Mobility Directorate and the Urban planning and Design Directorate	Allocate IDP funding for this undertaking	Changes in integrated land use and transport planning policy		Medium-term goal

Intervention	Scope of Implementation	Sustainable transition levers (multi-level perspective dynamics)	Stakeholders responsible	Implications for funding	Implications for governance and regulatory frameworks	Timeframe of intervention	Level of priority and importance
		landscape level					
Aligning the MSDF with the mapped urban fabrics	Revising the mapping in the MSDF and the GIS analysis for the contextual analysis of the MSDF	Shifts at the socio-technical regime level of transitions with implications for shifts at the landscape level	The City's Urban Mobility Directorate and the Urban planning and Design Directorate	Allocate IDP funding for this undertaking	Changes in spatial planning policy	Three to five years	Medium-term goal

5.4.The Phasing plan for implementation

Table 5. The phasing of the implementation for the interventions

Intervention	Implementation phasing plan					
	2023	2024	2025	2026	2027	2028
Redefining the City's main transport problems and priorities						
Naming car dependency as a major transport problem						
Setting goals for a less car-dependent city						
Mapping urban fabrics						
Developing an urban fabrics framework for reducing car dependency						
Conducting research to better understand paratransit city fabrics and develop appropriate interventions for						

Intervention	Implementation phasing plan					
	2023	2024	2025	2026	2027	2028
paratransit city fabric						
Establishing urban fabrics overlay zones						
Updating the City's mobility and spatial plans to align with the mapped urban fabrics						

CHAPTER SIX

Photo source: https://www.ier.co.za/why-is-the-n2-so-dangerous/

Conclusion:

Lessons and recommendations for transitioning Cape Town away from car dependency

6.1. Introduction

This chapter concludes the research developing on findings from the first five chapters. The first chapter set the context for the research presented in this dissertation by giving some background information on the research problem as well as setting the research aims and questions for the study. The first chapter also provided a road map of the methods and techniques used to answer the research questions in order to satisfy the research aims. The second chapter presented a literature review exploring key theoretical insights regarding the current research. The third chapter provided an analysis of the case study in line with the research questions and aims. The fourth chapter discussed suggestions for interventions to address the research findings and gaps from the contextual analysis presented in the third chapter. The fifth chapter suggested an overall preliminary implementation framework for the interventions identified in the fourth chapter.

This chapter discusses the conclusions of the research presented in this dissertation. The chapter unfolds by first providing a brief discussion of the significant research findings from the research process before providing answers to the main research questions asked in the first chapter (Introduction and research design). Thereafter, the chapter provides an overview of the limitations encountered through the research process. Next, recommendations for future research that have emerged from this current research are discussed. Finally, the chapter ends with some reflections on the entire research process and concluding remarks to wrap up the dissertation.

6.2. Significant findings from the research

From the first chapter, the significant findings include establishing that cars as well as their dominance in cities present many challenges to urban dwellers, the urban economy as well as the environment. These problems associated with cars include road safety concerns, air pollution, noise, carbon emissions contributing to climate change, inequitable access favouring private car users, and public health concerns such as non-communicable diseases resulting from sedentary lifestyles. These problems justify the need to transition away from car-oriented urbanism.

Nevertheless, the first chapter also identified the trends of 'peak car' and the end of car dependency as established by Newman and Kenworthy (2015d). Furthermore, since the trends of ending car dependency in cities as argued by Newman and Kenworthy (2015d) are based on Global North contexts, the first chapter also established that it is therefore important to investigate what this means for transport and urban planning across all contexts; but more so important in the Global South where 'peak car' is yet to be reached. Furthermore, the first chapter established that considering the numerous environmental, social and economic problems associated with cars in cities, and the issue of trends showing the end of car dependency, research exploring how cities are addressing the issue of transitioning away from car dependency is pertinent. As such, this research used the case of the City of Cape Town using discourse analysis to understand how the City through its key transport and spatial planning frameworks is currently dealing with the issue with the aim of exploring how to improve the frameworks in order to facilitate the transition away from car dependency and car-oriented urbanism.

The second chapter (i.e., the literature review) established many important insights; however, there were some significant findings established. The first significant finding from the literature review is that the literature but also theoretical and conceptual perspectives on the research's subject matter are varied. Therefore, the research could not explore all the perspectives rather a focus that is very relevant to understanding the transitions away from car dependency and car-oriented urbanism would have to include exploring how car-oriented urbanism and car-oriented cities can be framed but also what transitioning away from car dependency and car-oriented urbanism might entail.

The literature review, therefore, has established that characteristics of car-oriented urbanisms are quite well understood with research focusing on many aspects of how cars dominate the urban landscape. For instance, the how cars are given priority in the city's movement paths particularly in streets. Chapter Two's finding included establishing the assessment criteria:

- Recognition of the issue of car dependency and the need for transition
- Transport infrastructure allocation in relation to private car mobility

- The necessary mobility system conditions for enabling transitioning away from car dependency
- Addressing the various urban fabrics: walking, transit, automobile (based on the urban fabrics theory by Newman and Kenworthy (2015e)
- Recognition of necessary sustainable transitions dynamics shifts to allow transitions from car dependency and car-oriented urbanism
- The centrality of the human in urban space and repositioning the human in transport discourse

These assessment criteria were used to evaluate the case study in Chapter Three. The significant findings from the analysis were: 1) the reluctance to call out car dependency as one of the main transport problems in the city, (2) The focus on costs for low-income groups in transport objectives while overlooking the car dependency in medium- and high-income groups. (3) The inadequate spatial alignment of plans with the varying urban fabrics and therefore not positioned to leverage the potential of rejuvenating urban fabrics as a pathway toward ending car dependency.

The fourth chapter suggests that to address these gaps, the key frameworks should be repositioned to name car dependency as a major problem but also map the various urban fabrics based on the theory of urban fabrics explored in the literature.

6.3.Answers to the research questions

To ensure the rigour of the research process, it is important that the research questions asked at the beginning of the research are addressed, and that the research findings address the research questions adequately. This section presents brief answers to the main research question asked in the introductory chapter.

Do the City of Cape Town's key planning frameworks (i.e., the CITP, MSDF and DMS) address the issue of transitioning away from car dependency and car-oriented urbanism (i.e., car-

oriented planning and city design) to enable a less car-dependent urban future as a pathway for addressing the various social, economic and ecological challenges presented by car dependency?

For this first part of the main research question, the answer in simple terms is that yes, the City's key transport and spatial planning frameworks do engage with issues of car-oriented urbanism and have some strategies in place. However, this research established that this is not adequate in order to transcend car dependency in the city depending on the assessment criteria that this research used as derived from the literature review.

If so, how? If not, what are the changes or improvements to the key planning frameworks (CITP, MSDF and DMS) that need to be made to enable planning towards a less car-dependent future Cape Town?

To answer the second part of the main research question, firstly it has already been established above that the City inadequately deals with the need to transition away from car dependency in Cape Town. The gaps identified through this research include, the reluctance observed in the documents to call out car dependency as an issue of its own merit, mobility priorities that are important for improving accessibility to socio-economic opportunities for lower income groups but the same priorities meaning overlooking the issue of car dependency as a system lock-in challenge, and lastly the research established that the spatial plans and frameworks do not adequately align with the various urban fabrics present in the city therefore not well positioned to leverage the potential that revitalising them accordingly can contribute towards transcending car dependency in the city.

The improvements that have to be made to the City's key spatial planning and transport planning frameworks should include prioritising car dependency as a major transport system problem and realigning repositioning the spatial plans to recognise, respect, and rejuvenate the various urban fabrics as a pathway for transcending car dependency in the city.

6.4.Limitations to the current research

The first key limitation to this research is methodological. The research would have benefitted significantly to the inclusion of views from the City if they had been included for follow up interviews on the findings from the assessment of the documents. Theis would have improved the accuracy of the findings because some aspects could have been mis-interpreted and, therefore, some of the findings could be subject to speculation based on the researcher's understanding of the documents.

The second limitation was lacking sufficient time to wrap up the research with follow up key informant interviews with experts to adequately triangulate the research findings. Furthermore, this limitation further contributed to another limitation of the researcher's unfamiliarity with the internal workings of the City of Cape Town in order to develop a robust implementation framework.

The third major limitation was the decision made by the researcher to limit the scope of the research particularly the literature review to a few critical bodies of literature despite the topic being very broad.

Lastly, another key limitation for the research was the release of the updated CITP for public comment a week before the submission of the dissertation. Therefore, some of the findings presented in this research might have been addressed or might have changed in the new version.

6.5.Recommendations for future research

The main recommendations for future research emerging from this study include:

- Research into how the understanding of car ownership can help with the development of appropriate transport and land use planning strategies that can facilitate the reduction of vehicle ownership and enable transitions towards a less car-dependent city.

- Research into the trends of 'peak car' within the Cape Town context need to be fully understood in terms of when 'peak car' is expected. This will enable the development of appropriate interventions that would effectively respond to the issue of car dependency and accelerate the transitions away from car dependency.

6.6.Reflections and concluding remarks

The two key overall reflections from the research process include the following:

- Since the research was planning research, it extended into the realm of thinking about interventions and how they would be implemented. The implementation part was the most challenging to consider because of the researcher's unfamiliarity with the internal structures of the City of Cape Town as an organisation, rather, the researcher relied on guidance from the City's documentation under review. However, the researcher identified that some structures such as the City's Urban Mobility Directorate have been restructured a couple of times since the publication of the planning frameworks that were analysed in this research.
- The second main reflection on the research process is that the approach for analysing discourse was challenging especially when deciding what constitutes discourse as was already noted in the literature review (Jørgensen & Phillips, 2002b). Additionally, deciding how to approach, write and present the analysis done in this research was another challenging aspect of the research process. This challenge was further reinforced by the process of deciding the analytical lens through which to assess the documents (i.e., how to derive assessment criteria from the literature review).

As an overall concluding remark to the research, it is important to acknowledge that the research explored a unique approach to investigating the issue of planning towards ending car dependency in cities. Other than starting with or aiming for a car-free ideal, the research focused on trying to understand what is already being done in the context and identifying

limitations and gaps that need to be addressed based on the theoretical assumptions from the literature.

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Appendix 1: Approved research ethics clearance

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

ETHICS APPLICATION FORM

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

APPLICANT'S DETAILS		
Name of principal researcher, student or external applicant		Wrixon Mpanang'ombe
Department		Architecture, Planning & Geomatics
Preferred email address of applicant:		mpnwri001@myuct.ac.za
If Student	Your Degree: e.g., MSc, PhD, etc.	Masters in City & Regional Planning
	Credit Value of Research: e.g., 60/120/180/360 etc.	120
	Name of Supervisor (if supervised):	Tania Katzschner
If this is a researchcontract, indicate the source of funding/sponsorship		
Project Title		Post car-dependent urban futures: Planning towards ending car-oriented urbanism in Cape Town

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

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

APPLICATION BY	Full name	Signature	Date
Principal Researcher/ Student/External applicant	Wrixon Mpanang'ombe		June 10th, 2022
SUPPORTED BY	Full name	Signature	Date
Supervisor (where applicable)	Tania Katzschner		June 10th, 2022

APPROVED BY	Full name	Signature	Date
HOD (or delegated nominee) Final authority for all applicants who have answered NO to all questions in Section 1; and for all Undergraduate research (Including Honours).			
Chair: Faculty EIR Committee For applicants other than undergraduate students who have answered YES to any of the questions in Section 1.	Prof. H. von Blottnitz		6 July 2022

Page **1** of **1**

Appendix 2: Consent form and information sheet

SCHOOL OF ARCHITECTURE, PLANNING AND GEOMATICS
University of Cape Town
Private Bag x3, Rondebosch 7701
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UNIVERSITY OF CAPE TOWN – MASTER OF CITY AND REGIONAL PLANNING

June 2022

Information Sheet & Consent Form for Key Informant Interview Participants

Statement to be read out to an interviewee by a student about to undertake an interview for the purposes of a master's dissertation

Introduction
Hello, my name is Wrixon Mpanang'ombe. I am a postgraduate student at the University of Cape Town currently conducting research toward fulfilling the dissertation requirement for the degree of Master of City and Regional Planning. As part of the research, I would like to ask you some questions since you were identified as a key informant on the research topic. I would appreciate your responses as they will help me with answering the research questions and achieving the aim of the research. The working title of the research is 'Post-car-dependent urban futures: Planning towards ending car-oriented urbanism in Cape Town'.

About the research
The research explores the issue of cities that are planned and/or designed in a manner that promotes the ownership and use of private motor vehicles (i.e., cars) as the primary or preferable/convenient mode of transportation within the city. There are many problems associated with cities that are planned in this car-oriented or dependent manner such as carbon emissions contributing to climate change, congestion, respiratory diseases due to air pollution, unsafe streets for pedestrians due to the prioritisation of vehicle movements, the neglection of public infrastructure spending on public transport (because of the focus on highway maintenance and widening for cars) resulting in expensive and inefficient transportation means for poor residents, and the list goes on. To deal with such problems, there is a need for cities to transition away from city planning practices that promote the use and ownership of cars. Therefore, my research project investigates how the City of Cape Town's key transport and spatial planning policies address the issue of transitioning away from car-oriented/dependent urban development. Furthermore, the research plans to propose interventions that can lead Cape Town toward a post-car-dependent urban future.

Your participation is voluntary
Please understand that your participation is voluntary and that it is your individual choice to participate or not. Should you decide not to participate, there will be no adverse consequence. If you choose to participate now and change your decision later, you may withdraw your participation at any time without giving any reason and doing so will have no adverse consequence. Furthermore, if you choose to revoke your participation later, the data collected from you will not be used in the research and will be deleted from the research database. Nonetheless, I would greatly appreciate your participation if you choose to allow me to interview you and include the information obtained in my research.

Arrangements for the interview
The interview will be conducted at your convenient time and place. You may choose to have the interview conducted in-person (only if it is within Cape Town) or online via platforms such as Zoom or Microsoft Teams

(or any other platform of your convenience). Unfortunately, there will be no payment or reimbursement of costs incurred for online connectivity or any other costs associated with your participation. Additionally, please understand that your participation is for research purposes therefore there will not be any direct benefits to you. Also, there is no anticipated risk of harm to you or anyone else due to your participation. However, if for whatever reason you would like to discontinue the interview, you are free to do so at any point.

Anonymity and confidentiality
I can promise that your name, address or any other personal details will not be revealed in any way whatsoever in my dissertation or any publication that may be produced from this research. The information collected from this interview will not be recorded or stored in any way that reveals your identity and links you to the data. No sensitive or personal information will be collected through the interview.

Sharing and use of data
The data obtained from this interview will only be used for the purpose of the dissertation and any publication that may result from this research. The raw data (i.e., the interview notes or recordings) will not be shared with any other person other than the researcher nor will it be released or stored in the public domain. Nevertheless, you will be given the opportunity to verify the accuracy of the information obtained through the interview as the draft dissertation document or sections of the research report will be made available to you for verification so that any distortions can be corrected.

Supervision
This research is being supervised by Ms Tania Katzschner, an academic staff member in the Faculty of Engineering and the Built Environment at the University of Cape Town. Her contact details are tania.katzschner@uct.ac.za or 021 650 2381 (cell 083 634 7887).

Further details
If you have any complaints regarding my conduct, queries or need any additional details, please do not hesitate to contact my supervisor through the contact details given above. If you want to revoke your participation, please contact me through email at MPNWRI001@myuct.ac.za or call on 078 330 2489 (WhatsApp: +265 999 766 166).

Permissions required
Please note that for the purpose of accurately capturing the data obtained through the interview, it would be preferable to voice-record the conversation for later transcription (online engagement may require video recording although you are not obliged to have your video feed on). Nonetheless, any recording will only be done after you provide your verbal consent before the interview begins. The interview may proceed without recording, and if you choose so, I will rely on live notetaking to capture the data. The research does not require photographs to be taken. As the participant, you will also be allowed to state if there are some parts of the interview that you do not want to be included in the research.

Consent
I the undersigned, on this ____ day of the month of _____ in the year 2022, give my consent to participate in this research in line with the conditions stipulated above. (You will be given a copy of this signed consent form)

---------- ------ ----------

Name and signature of participant (interviewee) Signature of student/researcher