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The Responsiveness of Public Transport Systems to the Development of Urban and Economic Nodes in Johannesburg

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A research report submitted to the Faculty of Engineering and the Built Environment, University of the Witwatersrand, Johannesburg, in partial fulfilment of the requirements for the degree of Master of Science in Development Planning.

Johannesburg, 2016

Declaration

I declare that this research report is my own unaided work. It is being submitted to the Degree of Master of Science to the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination to any other University.

…….
(Signature of Candidate)

……day of ……, ……
(Day) *(Month)* *(Year)*

Abstract

Over the last decade national, provincial and local governments within South Africa have paid considerable attention to the benefits and need for an effective and reliable public transport system to meet the social challenges facing South African cities. The development of public transport systems is viewed as a tool to alleviate poverty and unemployment, as they provide access to opportunities and services previously out of reach. In Johannesburg the Spatial disparities created during the apartheid era continue to divide the city along the lines of class and race, and serve to marginalise low income groups located on the periphery, far from economic centres. Over the last 10 years urban and economic growth in the west of Johannesburg has occurred at a rapid rate giving rise to numerous informal settlements and government subsidised homes. These developments occurred without the development of public transport systems isolating low income residents. This study seeks to examine the extent to which public transportation systems are responding to the growth of new urban and economic nodes in Johannesburg in a manner that supports the interests and needs of the city's low income residents.

The study investigates the cases of the Gautrain and Rea Vaya. The study evaluates the systems through an analysis of the state's public transportation plans and policies and the challenges and successes of each system, taking into account what are the state's current and future public transport plans and how are they responding to urban and economic growth in the west of Johannesburg.

Through the use of spatial data, the study examines the spatial and economic trends in Johannesburg, the location of the urban poor and the effects of changes in commuter patterns. The study takes into account current and future urban and economic trends and examines the way in which public transport systems can make a positive impact upon the urban poor. This evaluation is done through an analysis of international literature and best practices that can be used in the development of public transport systems that are responsive, effective and reliable. Key respondents were interviewed to examine the impediments facing the development of responsive

public transport systems and how this affects low income commuters in Johannesburg.

Through the use of numerous forms of data including maps, policy documents and key respondent interviews, study reveals that future transport developments see the Gautrain and the Rea Vaya expanding to the west of Johannesburg. These developments will only occur in the late future, leaving low income residents without a formal means of public transport for many years to come. Low income residents within these regions lack the means to access opportunities and services. Research into the phenomenon reveals that in order to address the challenges faced by the urban poor in the west a more dynamic and integrated approach is required in the development of public transport systems in Johannesburg. These findings provide a critical understanding the development of public transport systems and the impediments that restrict the responsiveness of public transportation development in Johannesburg.

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Acronyms

CBD	Central Business District
CoJ	City of Johannesburg
CSIR	Centre for Scientific and Industrial Research
BRT	Bus Rapid Transit System
GCRO	Gauteng City Region Observatory
GDP	Gross Domestic Product
GDRT	Gauteng Department of Roads and Transport
GGP	Gross Geographic Product
GIS	Geographic Information Systems
GVA	Gross Value Added
ITP	Integrated Transport Plan
JSE	Johannesburg Stock Exchange
NDP	National Development Plan
PIS	Participant Information Sheet
PPP	Public Private Partnerships
PRASA	Passenger Rail Agency of South Africa
SACN	South African Cities Network
RSDF	Regional Spatial Development Framework
TOD	Transit Orientated Development
UN	United Nations

Chapter 1

Introduction

1.1. Background

Transport can play a key role within the city, in that it promotes greater accessibility to social services, economic opportunities and education, and may also contribute towards the formation of an inclusive city. Lefebvre examines “how new spaces of representation could promote new forms of empowerment” (Preston and Raje, 2007: 151) and perceives one’s access to employment, education, health services and leisure activities as essential in the day-to-day lives of residents. A public transport system plays an important role in providing residents, particularly low income residents, with access to these services and amenities (Ahmed *et al*., 2008). It facilitates the mobility of urban residents and in doing so provides greater accessibility to all income groups.

In recent decades transport development initiatives and the significance of public transport systems have gained traction in developing and developed countries, with numerous countries in Latin America, Asia, Europe and Africa investing significant proportions of their Gross Domestic Product (GDP) in transport development projects (Mitric, 2013). This interest in the development of public transport infrastructure is in response to the growing pressure on road infrastructure and the need to increase accessibility to opportunities within cities while promoting social justice and development goals.

Over the last decade, South Africa has embarked on similar projects that have been launched with the primary goal of developing efficient and effective transport systems. These developments are intended to connect people to economic hubs of the city while promoting other forms of social and economic development within municipal boundaries. The development of transport systems has been prompted by the need to increase accessibility and mobility of low income groups, promote the use of public transport, prevent urban sprawl, reduce carbon emissions and shift people away from private vehicle usage. The promotion of public transport within

South African cities responds to the concern that investments in road infrastructure are extremely costly and current road networks cannot cope with the increasing demands of road users within the region (GDRT, 2013). More importantly, public transport has the ability to increase the accessibility of those who were and still are affected by spatial policies created during the apartheid era (National Planning Commission, 2011). The development of public transport infrastructure and increased patronage in the public transport system is regarded by both academics and city officials as the most sustainable solution, providing numerous benefits to address social and economic challenges currently facing South African cities.

The dominance of the private motor vehicle in cities around the world, including Johannesburg, has created divisions along the lines of class, in that those who make use of public transport do not have a choice and cannot afford private motor vehicles to facilitate their needs (Ahmed *et al.*, 2008; Thakuriah *et al.*, 2013). Low income groups are the most vulnerable when there is a lack of investment in public transport infrastructure. According to the UN-Habitat's State of the World Cities Report 2010/2011 (2010), Johannesburg is regarded as one of the fastest growing cities in the world, but also as one of the most unequal. As a result of spatial policies implemented during the apartheid era, the city is divided and host to a number of spatial disparities between regions and communities around Johannesburg (Harrison and Todes, 2013). These spatial disparities are still noticeable today and play a crucial role in the lives of those who are located in the various regions of Johannesburg. The city is fragmented with divisions along the lines of class and race. Low income residents tend to live on the periphery and to the south, far from opportunities. These spatial disparities result in high transportation costs and long travel times, which consume a large proportion of their income, making long distance travel more expensive and inaccessible for those who cannot afford to use the current public transportation system (Farber *et al*., 2014). The spatial inequalities that exist are primarily due to the location of opportunities that vary within the city and are no longer dominant within the Johannesburg CBD.

1.2. Problem Statement

Johannesburg has a polycentric form (Todes, 2012) which is derived from numerous economic hubs located in the north and north western areas. These are notably, the Johannesburg CBD, Rosebank, Sandton, Woodmead, Rivonia, Fourways and Randburg. These economic hubs are located along the ring road freeway system, notably the western bypass (N1) and the M1 freeway. Opportunities for employment and other economic activities are located in numerous areas across the metropolitan region and neighbouring municipalities and are not necessarily centred within the Central Business District (CBD) or in close proximity to residential enclaves. The polycentric urban form of the metropolitan region serves to support the argument proposed by Klug *et al*. (2014) that Johannesburg and adjacent municipalities should be understood as operating as part of a broader city region, rather than isolated entities.

Access to opportunities remains largely through the use of private motor vehicles or the taxi industry. Marginalised groups located on the periphery may be quite remote from public transportation systems which limits their access to opportunities within the metropolitan region (CoJ, 2013a). As a result, numerous public transport initiatives have been launched in Johannesburg to facilitate a modal shift in the metropolitan region and promote the development of sustainable public transport systems that are able to meet the needs of marginalised groups.

In the last decade the City of Johannesburg (CoJ) and Gauteng Department of Roads and Transport (GDRT) have paid considerable attention to the development of transport infrastructure in and around the Johannesburg Metropolitan region. These are notably the Gautrain, a provincial project, and the Rea Vaya, a municipal Bus Rapid Transit (BRT) system, first initiated in 2002 and 2008 respectively (Todes, 2014).

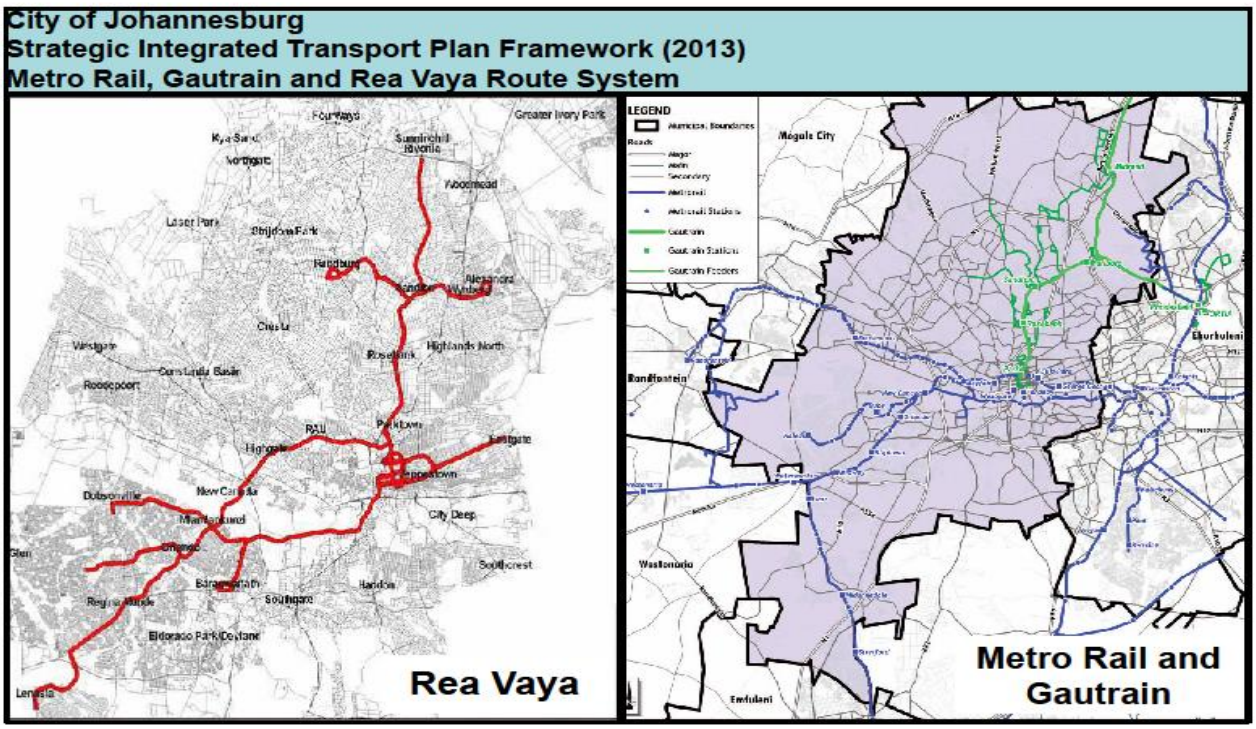


Figure 1.1: Major Public Transport Routes in Johannesburg (Source: CoJ, 2013b)

The Gautrain is a high-speed rail system, which initially sought to connect economic hubs within the broad Gauteng region, such as OR Tambo Airport in Ekurhuleni Municipality, the Pretoria CBD and the Johannesburg CBD. The Gautrain in its initial phase of development, connected emerging hubs, such as Sandton and Rosebank, with further developments planned to the west of Johannesburg to Lanseria Airport as the region develops in the future (GDRT, 2013).

The Rea Vaya system is part of a broader CoJ flagship project, branded the Corridors of Freedom. It seeks to re-stitch the city and draw together the spatial disparities created during the apartheid era through a system that extends from Sandton to the south of Johannesburg, and to previously disadvantaged areas, including Soweto, Sophiatown and Westbury (CoJ, 2013a).

The development of public transport systems is costly and has become less feasible in recent years (Vasconcellos, 2003). In order to mitigate costs, both systems have

been developed through public private partnerships (PPP). The Gautrain was developed by the Bombela Concession Company, through a joint venture with the GDRT, and currently operates the system (Maqutu, 2015). The Rea Vaya was developed by the CoJ and is operated by PioTrans, a partnership between nine taxi operating companies and the municipal government (Kumar *et al.*, 2012). While these institutional arrangements have assisted in mitigating the costs associated with the development of public transport systems in Johannesburg, the cost of development has placed significant constraints on each system. These constraints can be viewed in terms of their route determination and their ability to reach developing and developed areas within Johannesburg.

These public transport systems were developed due to a number of concerns regarding current public transport systems, notably that they make use of transport and route models developed 20 years ago that fail to respond to the recent growth trends within the metropolitan region. These models have previously been used to determine the routes for numerous bus operators within Johannesburg and the broader Gauteng region, which has not been modified in recent years and only operate on profitable routes (GDRT, 2013). This transport model excludes emerging growth nodes within Johannesburg, particularly those located in the north-west, where rapid urban and economic growth is experienced. More importantly, investments in rail have not occurred in over 20 years and fail to address changes in the urban form of numerous cities in South Africa, including Johannesburg (GDRT, 2013; National Planning Commission, 2011). The lack of development and investment in these systems has had a negative effect on the urban poor who are located on the periphery and rely on public transport systems to access employment opportunities and services.

Urban growth is occurring further northward towards Pretoria, away from former townships in the south, a shift that occurred in the post-World War II period and continues to this day (Mubiwa and Annegarn, 2013). The northward growth experienced in Johannesburg means that residents need to travel long distances and to numerous locations in order to access employment opportunities and

services. The only way to address this problem is through the provision of public transportation systems that respond to changes in urban and economic trends. Poor linkages between different modes of transport and the development of a transport system that does not respond to these changes results in poor accessibility to destinations and reduced mobility of residents.

Mokonyama and Mubiwa (2014) argue that increased mobility results in improved accessibility to opportunities within a city and is an essential component of the everyday lives of residents within Johannesburg. Increased levels of accessibility to opportunities available within the metropolitan region can only be achieved through a responsive public transport system that is able to adapt to changes in the direction of private and public investment in the city. Changes in the urban environment should inform transport policies and the direction of public and private sector investment in Johannesburg (Ahmed and Pienaar, 2014). Transport policy should respond to the needs of commuters and increase their accessibility to employment opportunities and services (Ahmed *et al*., 2008). Noland (2007) argues that public transport routes and fares should be based on consumer benefits and be dynamic enough to cope with land use changes in the city. This dynamic approach to transport development should be done to support sustainable economic activity, and as Tilahun and Fan (2014) note, transport policies should be matched with job opportunities in order to benefit not only economic sectors but also disadvantaged residents. Johannesburg has one of the fastest growing economies in the world (UN-Habitat, 2010), with numerous economic hubs located around the metropolitan region making the responsiveness of public transport systems to these new growth points crucial in meeting both the present and future needs of commuters. In light of this, transport development within the Johannesburg region should be dynamic and flexible in order to respond to urban growth and settlement patterns within the city.

1.3. Research Question

To what extent are public transportation systems responding to the growth of new urban and economic nodes in Johannesburg in a manner that supports the interests and needs of the city's low income residents?

1.3.1. Sub-questions

- How can public transport systems positively impact the urban poor by responding to growth in settlements, economic activity and changing commuter patterns?
- What factors impede the responsiveness of public transport systems to the needs of low income commuters, and to the imperatives of economic growth in Johannesburg?
- What are the current and future economic growth trends and spatial patterns in Johannesburg?
- What are the state's public transportation plans?

1.4. Aim and Objectives of the Study

The study seeks to consider urban and economic growth trends within Johannesburg and explore how recent public transport developments are responding to changes in settlement patterns, economic activity and changing commuter patterns within the Johannesburg Metropolitan region.

The study is concerned with the socio-spatial implications of current transport plans and actions that can be taken in facilitating the development of an inclusive and spatially just urban environment. It is interested in understanding the way in which transport development affects urban form, economic development and property values and how this impacts upon low income residents within the metropolitan region.

The study explores government's response to emergent growth nodes in the west of Johannesburg in providing the appropriate public transport mechanisms to meet the needs of low-income commuters. It also explores the influence of infrastructure costs

on the development of public transportation systems and how they affect the development of a responsive public transport system.

1.5. Rationale

Through a careful examination of spatial policies and transport system development in the Johannesburg Metropolitan region, this research seeks to build on recent studies conducted within Johannesburg regarding transportation systems. This includes work conducted by the South African Chair on Spatial Analysis and City Planning, the Council for Scientific and Industrial Research (CSIR) and the South African Cities Network (SACN). This recent work has explored the changing urban environment and public transportations systems, and recent collaborative endeavours, such as Changing City, Changing Space (2014), that details these changes in Johannesburg's urban form over the last 40 years. This research will add to these studies through an analysis of the relationship between transport systems and urban growth in Johannesburg, as well as the socio-spatial implications associated with transport infrastructure planning and investment.

Studies such as, 'BRT Impacts at a Neighbourhood Level (2015), conducted by Weakley and Bickford, and The Effects of BRT System as a Poverty Alleviation Strategy (2012), conducted by Vaz and Venter, focus specifically on one or more public transport systems within the metropolitan region. These studies illustrate the effectiveness of the BRT system and its ability to increase the accessibility and mobility of low income earners, although not necessarily very poor urban residents. This research shall examine numerous modes of public transport in the metropolitan area in an attempt to formulate a broader overview of public transport development in Johannesburg. This type of study builds on work conducted by the CSIR, GCRO and SACN which has explored the link between spatial fragmentation in South Africa and public transport development.

Furthermore, the study takes into account the challenges and achievements of developments in Johannesburg and how they compare to that of public transport

developments locally and abroad. A study of this nature is relevant and necessary, as it provides insight into the socio-spatial dynamics of transport systems and the extent to which they may be facilitating the development of an inclusive and socially just urban environment. The study achieves this by examining the complexity of public transport development and the trade-offs made in the development of new public transport systems in the metropolitan region.

1.6. Research Method

The research follows a qualitative case study approach. A qualitative case study approach offers the researcher a deeper understanding and an explanatory approach to the phenomenon being studied (Maxwell, 1998). According to Baxter and Jack (2008:444) “a qualitative case study approach is an approach to research that facilitates the exploration of a phenomenon within its context using a variety of data sources.” This research method ensures that the focus of the study is not explored through one lens, but rather a variety of lenses and sources of data which allow multiple facets of the phenomenon to be revealed and understood (Baxter and Jack, 2008). The qualitative case study approach is the best method to use given the complexity involved in the development of public transport systems, as they make use of spatial, economic and social data in the development of public transport plans. Numerous forms of data need to be collected including maps, economic data, spatial transport plans, and social data and policy documents. A variety of factors need to be taken into account and analysed in order to focus specifically on the challenges and experiences seen in the Johannesburg metropolitan region and how they affect low income commuters.

A case study approach will be used, with the Gautrain and Rea Vaya as the case studies, in order gain a deeper understanding (Yin, 1994) of the development of public transport systems and the phenomenon of socio-spatial patterns in the region. Through the careful examination of these two transportation systems, we are better able to evaluate current and future public transport systems and how they are responding to urban growth within the region. The case study approach used is the most effective means to conduct the research as it allows the researcher to explore

the phenomenon taking place in the development of public transport systems locally and how they compare to international trends. The Gautrain and Rea Vaya are the most recent developments with future developments planned for the next 20 years. Through the use of the qualitative case study approach we are able to examine the effects of these systems on low income residents using numerous data sources. The case study provides a broad overview of the systems and focuses specifically on the phenomena that has occurred in the initial stages of their development.

In order to answer what are the state's current and future public transportations plans, what are the urban and economic trends in Johannesburg and where low income residents are located, maps are required. Maps are required to illustrate the data spatially and correlate the data with policy documents in order to obtain a greater understanding of what is being displayed.

Interviews are utilised as the primary means to evaluate policies and plans regarding the future spatial and economic changes that have occurred and where growth is most likely to occur in future. The interviews will focus on the impact that these public transportation systems have on the urban poor and how best to equip them with an equitable means of public transport to increase their accessibility and mobility throughout Johannesburg. The use of interviews in the study correlates with Baxter and Jack (2008) notion that the case needs to be evaluated through multiple lenses in order to obtain a greater understanding of the phenomena experienced.

The main task of interviewing is to understand the meaning of what the interviewees say as well as to pursue in-depth information around a topic (Kvale, 1996). Yin (1994) emphasises this point and states that interviews need to be conducted in order to gain a deeper understanding and present competing explanations for the same phenomena. The purpose of interviews in the study is to provide explanations for government's responses to urban and economic growth in the Johannesburg Metropolitan region and the likely socio-implications for this response. Through a careful examination of these responses, the researcher is able to evaluate the

challenges faced by government and successes experienced in addressing changes in economic patterns, urban growth and commuter patterns.

1.7. Data Collection

Information and spatial data relating to unemployment, settlement patterns, economic growth and population density have been displayed spatially using the GCRO's interactive mapping system. These maps are used to gain a more accurate understanding of where urban and economic growth has occurred over the last 10 years and where growth is most likely to occur in future. These trends are displayed spatially in order to establish the extent of the need for the development of transport systems within districts to the west of Johannesburg.

Regional Spatial Development Frameworks (RSDFs) collected using online sources have been analysed in relation to the spatial data collected in order to assess the challenges facing low income commuters in the west of Johannesburg regarding public transport systems and the development of emerging nodes in the west. These RSDFs provide an understanding of where the urban poor are located and the correlation between their location and developed and emerging economic nodes in Johannesburg.

The Data obtained from Quantec and Stats SA illustrates growth in terms of Gross Value Added (GVA) and employment, which is illustrated in the form of tables and figures. Economic data is divided into the various business sectors, namely primary, secondary and tertiary sectors to illustrate the different types of opportunities available and the trends that have occurred over the last 20 years.

Current and future public transport systems are displayed spatially using geographic information systems (GIS) using data obtained from the GDRT. This data has been used to illustrated current and future developments of the case studies selected and current modes of public transport currently being used in Johannesburg.

In order to understand the phenomena experienced in the case studies and obtain a greater understanding of the spatial data presented, the following needed to be analysed in relation to the spatial data presented:

(a) Transport policy documents, including the GDRT (2013) 25-Year Integrated Transport Master Plan and the CoJ's Integrated Transport Development Plan were used to assess where current public transportation systems are located, where future developments are planned and when these plans take effect.

(b) Qualitative data collection in the form of key respondent interviews were used to obtain their views regarding current public transportation systems, future public transportation plans and its response to changes in the urban form of Johannesburg. More importantly, key respondent interviews were used to assess how these public transportation plans should cater to the transportation needs of the urban poor within the Johannesburg Metropolitan region.

Respondents were selected based on their position within government and their experience in the field of planning and public transport development. These included experts in the field, planning professionals and researchers of the South African Chair on Spatial Analysis and City Planning, transport specialists from the SACN, a Senior Manager within the Council for Scientific and Industrial Research (CSIR) and Senior Managers within the GDRT.

Interviewees were contacted directly and interviews arranged at a time and place of their convenience. Interviews were conducted in a semi-structured manner with a list of questions devised prior to the interviews, which can be found in the annexure. All respondents were asked the same questions

allowing room for deviation based on their understanding and area of expertise.

Responses were then analysed in relation to policy documents depicting economic and urban growth in Johannesburg, the location of the urban poor in relation to the growth and how future public transport development plans aim to address issues relating to accessibility and mobility

1.8. Limitations of the Study

The intention was to interview 10-15 experts and specialists in the field of transport development and planning. After numerous attempts to contact individuals from universities, government departments and research organisations, many of the interviewees selected failed to respond to any form of communication. The lack of responses received limited the number of interviews conducted to 6.

Unfortunately, interviews could not be conducted with officials from the City of Johannesburg, despite numerous attempts to contact them. An interview with the CoJ would have been important as the municipality is responsible for the development of the Rea Vaya system, as well as the development of integrated transport plans for the Johannesburg Metropolitan region. The lack of response meant that information had to be collected in the form of policy documents and could not include recent activity and plans that have not been published.

In addition, given time and resource constraints, the scope of the study focused on two modes of transport, the Gautrain and the Rea Vaya, and could not include a detailed account of the future plans of bus and rail systems. Attempts were made to contact Metro Bus and were met with no success.

1.9. Ethical Considerations

All participants have been informed about the aims and objectives of the project, as well as the nature of the questions posed to them during the course of the interview process. Interviewees have been approached electronically/telephonically. Each interviewee was provided with and received a verbal description of the participant information sheet (PIS) and consent form prior to the interview. These documents are included in the Annexures. Interviews were scheduled according to the availability of the interviewee. Prior to conducting the interview, the terms and conditions of the interview were discussed, including the prohibition of any form of compensation for their participation in the interview process and their permission to an audio recorded interview to be used for the purposes of the research project. Interviewees were informed of their right to choose what information can and cannot be used.

In accordance with the University of the Witwatersrand's policy on research ethics, the dignity, rights and well-being of participants interviewed will be protected and confidentiality ensured. No information, whether obtained through verbal communication or private documents, will be used without the interviewees' consent so as to protect the credibility and anonymity of the interviewee. The risks associated with human participants will be minimised and the researcher will act in the full interest of potential participants, while taking into account the needs of the researcher in addressing the research topic and providing an in-depth analysis of core concepts relating to transport development and urban growth within Johannesburg.

1.10. Report Structure

The report is divided into seven chapters.

Chapter One introduces the study and the problem statement, illustrating the need for the research and how the research will be conducted in order to answer the questions identified.

The aim of the second chapter is to provide an overview of literature collected. Important concepts and terms will be discussed in conjunction with international studies relating to public transport development and the manner in which it serves to address problems relating to the development sustainable public transport systems, accessibility and mobility and citizen involvement. More importantly, this chapter shall explore the problems associated with the development of public transportation systems that are responsive to the needs of the urban poor.

Chapter Three will provide a historical background of transport development in the Johannesburg Metropolitan region exploring the link between transport systems and urban and economic growth. In addition, this chapter illustrates where urban growth is occurring at present in relation to the location of the urban poor and the location of businesses and areas of economic growth in the metropolitan region. More importantly, what public transport systems are currently being utilised by the urban poor and why they are utilised by the urban poor.

Chapter Four introduces the case study and the findings relating to transport policy in Johannesburg. Policy documents relating to future public transport developments will be analysed and discussed, illustrating why the Gautrain and Rea Vaya have been developed in recent years and what are their future plans. This chapter will illustrate the challenges and the successes of each system, taking into account the aims and objectives of each public transport system.

Chapter Five examines the socio-spatial aspects of public transport developments illustrating the complexity associated with the development of public transport systems and how the development of public transport systems has the ability to

exclude certain demographic groups based on their location and desired destination. The results obtained through the interview process will be used to compare the policy intentions of local and provincial government with the views of key respondents.

Chapter Six serves to analyse the findings, illustrating the differences between local and international experiences and what needs to be implemented to ensure that the development of public transport systems meets the needs of the urban poor and increases their accessibility and mobility throughout Johannesburg.

Finally, Chapter seven shall provide conclusions based on the research and how the research has provided a greater understanding of the development of public transportation systems and its implications in meeting the needs of low income commuters. The chapter will conclude with recommendations for the development of public transportation systems that are able to meet the needs of low income residents in the Johannesburg Metropolitan region, particularly those located in the west of Johannesburg.

Chapter 2

Literature Review

2.1. Introduction

The development of public transport systems needs to take into account numerous factors, in order to develop public transport systems that are efficient, effective, and sustainable. These factors include the demographics of the region, socio-spatial factors, urban growth, economic growth and changing commuter patterns. This chapter seeks to provide a critical framework for the study and in doing so, discuss the factors that lead to the development of an inclusive, efficient and effective transport system that responds to urban and economic growth patterns and benefits the urban poor. The study takes into account international and local best practices and policies and how they are used to facilitate the development of responsive public transport systems that meet the needs of the urban poor.

2.2. Public Transport

Public transport refers to modes of transport, both public and private, which are available for public use. These modes include both multi occupancy vehicles, such as minibuses and buses, and single occupancy modes of transport, including shuttle services and excluding private motor vehicles (CoJ, 2013a). Public transport includes non-motorised modes of transport, such as bicycles, which are sustainable mobility options that are less harmful to the environment than private motor vehicles and facilitate the mobility of individuals through shared services, such as bicycle sharing schemes that operate in Europe, Asia and America.

Public transport may be perceived as a merit good; that is a service that is considered deserving of public investment. In any given city region opportunities vary from location to location, and individuals need to be afforded a basic level of mobility and accessibility to access employment opportunities and basic services. The provision of a public transport system should provide each citizen with a basic level

of mobility (Preston and Raje, 2007) to afford everyone equitable levels of access to opportunities within a city region.

The primary objective of public transportation systems is to enhance accessibility and mobility throughout a city region in order to promote social, economic and environmental goals (Banister, 2000). In urban contexts, where private motor vehicles have taken precedence, the development of public transportation systems is crucial to those who are unable to afford private motor vehicles. However, public transport systems affect each demographic and income group differently depending on usage and its ability to respond to the needs of commuters who rely on the service for their daily commute. Should a public transportation system exclude developing areas or new economic growth nodes, the system could be regarded as limiting the opportunities of those who cannot access these locations (Manual *et al.*, 2015).

Public transport systems provide differential experiences for users of different income groups and sectors of the economy. Marchese (2006) argues that urban residents with a low time demand make use of public transport systems, whereas those with a high time demand cannot afford to make use of the public transport system due to its perceived inefficiency and unreliability. The term time demand is defined by the time constraints of an individual on a daily basis. Time demand can be seen as the number of meetings one needs to attend in a day, how many trips to and from the office one needs to make or the number of things that need to be completed within a single working day (Marchese, 2006). These differences could be seen in different sectors of the economy that differentiate between workers in both skilled and semi-skilled professions. In light of the differential demands of commuters, greater emphasis needs to be placed on the development of an affordable, reliable and efficient public transportation system. The primary goal of public transport development should be to meet the demands of all users at an affordable cost and the ability to increase the accessibility and mobility of the urban poor throughout the city.

2.3. Challenges Facing Public Transport in Developing Countries

Currently, many of the world's cities experience unprecedentedly low levels of accessibility, despite increased mobility worldwide. Urban sprawl and urban migration continue to place pressure on public transportation systems. Access to opportunities, services and leisure activities remains largely through the use of private motor vehicles (UN Habitat, 2013). According to UN Habitat (2013:110) "the access and mobility of the urban poor is constrained by: city planning, socioeconomic characteristics, transport facilities and the availability of transport services." These problems are experienced in both developed and developing countries.

In the context of developing countries, the development of public transport systems is challenging. In Africa, Asia and Latin America people are divided along the lines of class and race making it difficult to develop efficient and effective public transport systems. Brazil faces the same challenges and constraints as those seen in Johannesburg, regarding the development of public transport systems. According to Miranda *et al.* (2014), the urbanisation process has been characterised by divisions along the lines of class, where large proportions of the urban poor reside on the periphery with limited access to opportunities and services. These disparities and the lack of public transport facilities exclude residents from participating in both the labour market and the development of the city (Miranda *et al.*, 2014).

2.4. Accessibility and Location

There is a strong correlation between time and distance between work and home and the manner in which it affects the likelihood of an individual maintaining a job or securing one. The notion is known as the "Spatial Mismatch Hypothesis" (Harrison and Todes, 2013:5). The spatial mismatch hypothesis is based on external factors that include the cost of commuting long distances and the productivity of workers based on commuting times. The location of an individual is an integral component and one of the leading factors of the hypothesis (Harrison and Todes, 2013). It

provides insight into the effects of location based exclusion that serves to exclude individuals and renders them vulnerable and unequal.

Locational determinants that lead to socio-spatial exclusion include existing land use patterns, existing public transport facilities available to residents and alternative modes of transport offered to residents (Loo *et al*., 2015). Loo *et al.* (2015) argue that existing land use patterns, existing public transport systems and alternatives act as both a facilitator and a barrier in accessing opportunities. The private motor vehicle still plays a pivotal role in society, given the high level of mobility that it offers individuals and their ability to access numerous locations around the city region (Loo *et al*., 2015).

Public transportation systems are viewed as a key solution in the spatial mismatch between residential locations and economic opportunities (Tilahun and Fan, 2014). The provision of public transport systems serves as a necessary social service that seeks to empower lower income groups who have no other means of accessing employment opportunities and services (Thakuriah *et al*., 2013). Marcharis and Bernadini (2015:178) define the development of public transport systems as “a set of possible human activities that organise, optimise or facilitate the movement of people from one location to the next” to meet their daily needs. The lack of adequate transport systems offered to people directly affects their ability to access employment, education, healthcare and social networks (Lucas, 2012). Long and costly commutes used to access opportunities hinder the ability of the urban poor to access resources and opportunities.

2.5. Policy Approaches for the Development of Sustainable Public Transport Systems

The primary objective of public transport development is to develop sustainable public transport systems that meet the three dimensions of sustainable development including economic development, environmental protection for both current and future generations and the promotion of social development goals (Le Clercq and

Bertolini, 2003). Le Clercq and Bertolini (2003:39) argue that “for mobility to be sustainable, it must improve accessibility while avoiding disruptions in societal, environmental and economic well-being that more than offset the benefits of the accessibility improvements.” The emphasis of public transportation systems needs to be placed on increasing the accessibility and mobility of residents through the provision of public transport systems and its ability to meet the needs of all users.

Sustainable public transport is defined as “providing basic requirements to meet societies and the economies mobility needs” (Williams, 2005:5). Transport systems need to be affordable and safe and provide residents with an adequate level of accessibility (Banister, 2000; National Planning Commission, 2011).

A balance needs to be achieved between economic and social development goals, where the benefits associated with social development goals needs to remain a priority and take precedence (Mitric, 2013). In a city where divisions are created along the lines of race, class, income, location, public transportation policies and development need to ensure that the urban poor have the means necessary to access opportunities and services. The development of public transport systems need to continuously improve their accessibility and mobility options through the development or improvement of public transport systems.

In order to address the problem associated with accessibility and mobility the UN Habitat and World Bank have made numerous recommendations in order to promote accessibility and mobility while developing sustainable public transportation systems. In accordance with UN Habitat (2013) these recommendations include:

a) Increased densities along public transport corridors,

b) Finding alternative and suitable modes of transport based on the needs and budgets of individual governments

c) Linking transport planning and land use planning,

d) Coordinating and integrating public transport systems

e) Developing public transport systems through public private partnerships (PPPs) in order to mitigate the costs associated with the operation and development of public transport systems

f) Promoting public participation and engagement in the development and implementation of public transport systems (Mitric, 2013)

One of the core principles of sustainable transport and mobility is the establishment of participatory frameworks in order to ensure sufficient support from users, according to the UN Habitat (2013). The use of participatory frameworks does not only ensure sufficient support for the development of public transportation systems but, more importantly, participatory frameworks ensure that the determination of routes and fares are aligned to the needs of commuters (Sagaris, 2014).

Numerous stakeholders need to be involved throughout the development process to ensure that everyone's needs are met. Diversity needs to be promoted and actors from all sectors, including private, government and civil society, need to be involved in the planning and development process. According to Hrelja (2015) broad participatory processes ensure that consensus is reached and everyone has an understanding of what needs to be accomplished and how best to reach the objectives of the project. Sagaris (2014) argues that in order for the development of public transport system to be sustainable, civil society needs to be included and diverse groups consulted in order to increase patronage in the system and ensure that it meets the needs of residents of all income groups.

Broad participatory networks are essential and ensure that public transport systems are sustainable and effective in meeting the needs of commuters. A public transport system that is not developed through participatory frameworks fails to achieve its intended objectives and in turn fails to be sustainable. The development and responsiveness of a public transport system is essential in increasing the mobility and accessibility of those who rely on it for their daily commute. However, should that system fail to transport users to their intended destination the system will fail to

gain the necessary patronage to be sustainable. Transport modelling needs to incorporate users in the formulation of routes and fares in order to determine what is feasible and what is sustainable. Without the incorporation of a diverse group of stakeholders transport models will not be effective (Sagaris, 2014). Public transport systems are developed for people, primarily the urban poor, who rely on the service every day to access opportunities and services. Therefore, the urban poor should be included in the process and ultimately help shape and select the modes of public transport being developed and the models used to determine routes and fares.

However, public transportation systems need to continuously adapt and change to the urban form of the city in order to provide both current and future generations with equitable access to opportunities and services. A responsive and adaptable service ensures an equitable means of transport that is able to increase their accessibility and mobility throughout the city. In order to develop a responsive public transport systems, an extensive public transportation model needs to be incorporated that benefits the urban poor and provides commuters with a reliable and efficient public transportation system. Numerous modes of public transport need to be integrated and aligned. Officials need to examine old and new public transportation systems in order to determine which systems need to be developed further and which systems need to be replaced (Valderrama and Jorgenson, 2008). This is a process that requires long term planning and the ability to monitor and evaluate each system, assessing the impact and effectiveness of these systems and determining whether resources could be allocated in a more beneficial way (GDRT, 2013). New modes and new ways of looking at transport need to be considered and evaluated in terms of their costs and perceived impact.

2.6. Transport Models Based on Urban Form

The models used to determine routes and modes of public transport need to be dynamic, constantly evolving to changes in the urban form, and incorporate a number of factors. These factors include the location of urban and economic growth, emerging economic and residential growth nodes and the desired location and direction of travel of commuters. There are two types of models, as indicated by the

UN Habitat (2013); Urban forms with a single urban and economic core and urban forms with multiple urban cores. These urban forms can also be described as being monocentric or polycentric

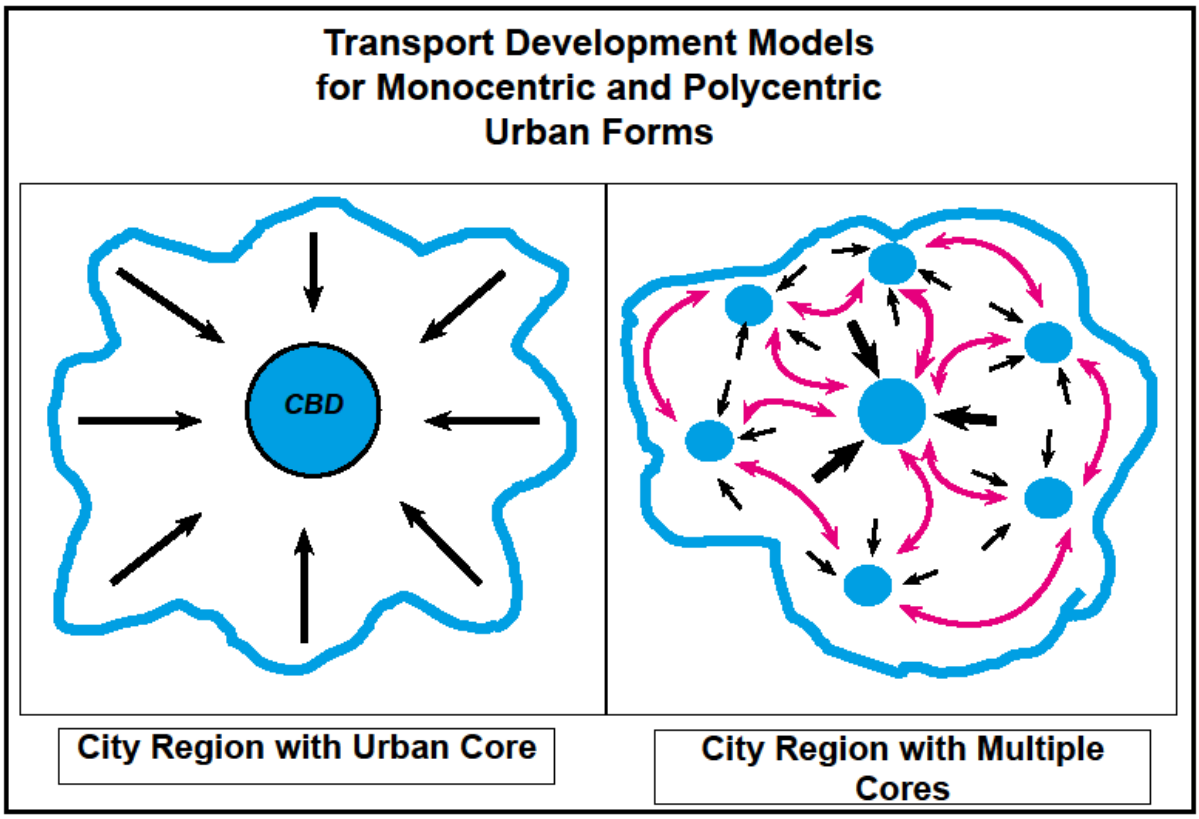


Figure 2.1: Monocentric and Polycentric Transport Development Models (source: UN Habitat, 2013:82)

Figure 2.1 illustrates the two urban forms with lines illustrating the directions of travel that a public transportation system should provide within each model. Urban forms with a single urban and economic core need only have routes allowing people to enter from multiple directions into the centre. Within this model the majority of people within the city region need to access the core from numerous locations around the city region and in doing so provide an equitable means of access.

The second illustration shows an urban form with several nodes and the numerous directions of travel needed to be performed by a public transportation system. A polycentric urban form needs to ensure that residents are able to move from one node to the other seamlessly, in a way that allows them to gain access to a range of opportunities and services. The UN Habitat (2013) recommends that an artificial core needs to be established within a polycentric urban form to serve as a transfer point allowing commuters to move from one node to another through the centre.

The two models differ in both size and scope. The first deals with only a single core and need only provide links to the core, while the other needs to provide numerous links and numerous transfer points. The second model requires an extensive network in order to provide a service of this nature. The development of this network would require an innovative solution and a cost effective mode that is able to provide a safe, reliable and effective service.

2.7. BRT model of Public Transport

Internationally, increasing numbers of decision makers have come to understand that Bus Rapid Transit (BRT) systems can deliver the same benefits as that seen in the development of metro rail systems at a fraction of the costs. The first BRT system was established in Curitiba, Brazil in 1974 through a reform of the bus sector. At the time there were 321 private and informal bus operating companies. The development of the system in Curitiba included the provision of exclusive bus lanes and trunk and feeder systems. The municipality covered infrastructure costs through numerous multinational development banks including the World Bank and Inter-America Development Bank in order to expand the system in 1977 and 1990 respectively (Hook, 2005).

Since then numerous countries around the Americas, East Asia and Africa have implemented BRT systems, with the primary goal providing an affordable and efficient means of transport to citizens (Mitric, 2013). The use of the BRT system is

based on the total costs associated with the development of the system which are low when compared to that of rail based systems.

In order to render a metro rail system sustainable, for every one kilometre developed 14 000 people need to be located within a 1km distance of the system. The BRT only requires 3000 people within a 1km distance of a station making it a suitable choice for countries facing fiscal constraints and who require an extensive public transport network (UN Habitat, 2013). The development of BRT systems is not only sustainable but also cost effective and provides a suitable alternative to be used in developing countries. The difference in costs between rail based systems and the BRT allows cities and governments to develop extensive networks that are able to reach communities located on the periphery.

However, low density environments, much like that of Johannesburg, still face challenges relating to the number of people who make use of public transportation systems and the number of people located in close proximity to public transportations systems. These challenges result in the inability of a public transport system to sustain itself, as there are too few users and a low demand for public transport services. In order for public transportations systems to be sustainable a sufficient number of people need to make use of the service within a short distance to generate sufficient income to recover operational and development costs. In order to address the problem and promote the use of public transport systems, a Transit-Orientated Development (TOD) model is promoted by the UN Habitat (UN Habitat, 2013).

2.8. Transit-Orientated Development (TOD) Model

The use of the TOD model is in accordance with the World Bank's recommendations that urban transport needs to be the focus of urban development, given the rapid urban sprawl experienced in both developed and developing countries around the world. In light of the recommendations made by the World Bank, numerous countries throughout Africa, the America's and Asia have made significant developments in

transport in order to address the problem of urban sprawl and low density development that is neither sustainable nor conducive to the operation of public transport systems (Mitric, 2013).

High density development promotes the use of public transport and increases patronage in public transport systems. Increased densities assist in sustaining a cost effective transport system, as high passenger volumes increases the sustainability of the system (UN Habitat, 2013). High density, compact cities also have the ability to increase an individual's access to a variety of services and functions that cities accommodate, in conjunction with the optimisation and efficiency of costs associated with service delivery. Compaction promotes the use of public transport and creates walkable and liveable urban forms (CoJ, 2011; Weakley, 2015). The development of high densities cities in sustaining a public transport system is a point reiterated by Hayashi and Tomita (2003), as they argue for the integration of land use planning and transport planning.

The use of the TOD model also provides numerous benefits for low income residents. Harrison and Todes (2013) state that the TOD model may be used to facilitate the migration of low income residents from the periphery to the inner city where opportunities are highest. In this way, the mobility and accessibility of low income residents is increased and they can reduce their transportation costs by moving closer to the inner city. The estimated saving that low income residents can expect is a saving of 10% on transportation costs (Harrison and Todes, 2013). Behrens and Wilkinson (2003) argue that transport and land use planning need to go hand in hand to bring people closer to employment centres and social services. In doing so, their quality of life will improve and transportation costs will be reduced by reducing their proximity to centres of opportunities.

However, the TOD model is not without its flaws and may give rise to a number of negative consequences. These flaws include an infrastructure overload if not accommodated prior to development, traffic congestion and parking problems,

pedestrian congestion and congestion associate with the use of public transport facilities (Weakley, 2015). The TOD model may also prevent access to low income residents through increased property values and associated land use changes.

2.9. Property Values and Investments in Public Transport

There are numerous challenges and disagreements as to the use of the TOD model. Studies conducted in London, England, and Glasgow, Scotland, reveal that homes located within 500m of an underground rail station are worth more than 10.5% when compared to homes locate 1500m away. However, this is not uncommon and is a global phenomenon, as argued by Pagliara and Papa (2011). In the United States properties located within a half mile radius of public transport stops, primarily rail, increase by a margin of 41% better than those outside of a half mile radius. Studies conducted in New York reveal that property values decrease by 15-20% for every block away from the New York subway system (Gautrain, 2015b).

This increase in property values allows us to question the effects of the TOD model and question whether it is possible to bring people closer to the inner city through the development of transport corridors. According to Williams (2005:2) “there is considerable uncertainty about the extent to which the manipulation of the urban form can contribute to sustainable mobility at all in the face of broader socio-economic and cultural trends” or whether compact urban forms are the most effective solution when referring to sustainable transport. A straight forward relationship between commuter patterns and urban form cannot be assumed when looking at heterogeneous urban populations. Very little is known about socio-economic variables and urban form and how it influences travel behaviour. There is a need to understand how commuter patterns are influenced (Williams, 2005).

2.10. Social Exclusion and Investments in Public Transport

Social exclusion is relational and based on the fact that something or someone is doing the excluding. In this regard, social exclusion can occur between groups of

people (Beall et al, 2002) and has both spatial and non-spatial aspects (Harrison and Todes, 2013). Social exclusion can be seen as an exclusionary factor based on class and income, where access to resources can be viewed as a privilege.

The differential impacts of public transport development, as seen above, can be viewed in terms of affordability, safety, travel time and accessibility to employment opportunities (Manual *et al*., 2015). The complexity surrounding public transport development can negatively affect the urban poor. According to Thakuriah *et al*. (2013) investments in transport systems are likely to have a number of trade-offs that have the ability to create an imbalance in terms of the benefits associated with the system. Some people tend to be better off while others fail to benefit at all. Public transport systems need to take into account a broad number of factors including the location of people in relation to jobs, income, the reliability and efficiency of the system, affordability and adaptability of the system to meet the needs of residents (UN Habitat, 2013).

Inequalities created through investments in public transport may be linked to a spatial mismatch between transport systems, the location of jobs and the location of different income groups. The spatial aspects of social exclusion includes geographic exclusion which is based on the location of an individual relative to the time demand associated with travel and distance to opportunities (Lucas, 2012). Time demand involves the opportunity costs associated with the utilisation of public transport systems (Marchese, 2006). Opportunity costs are related to the loss of one opportunity or resource for another. Public transport plays a significant role in the lives of those who are unable to afford private motor vehicles. Low income groups rely on public transport systems for their daily commute and to access employment opportunities and services.

2.11. Public Engagement

The adverse effects associated with the development of public transportation systems requires a more innovative approach to transport planning and

development. Government officials and planners need to re-examine current practices and find new ways of developing transport systems. Increases in property prices and the use of the TOD model can have negative effects on the urban poor and hinder social development gains that can be made through the development of public transportation systems.

In light of the challenges faced by local and provincial governments in the development of public transport systems, Vascencellos (2003) recommends that the public be engaged in the implementation and development of public transport plans. Sagaris (2014) argues that only through the involvement of civil society and commuters can the development of public transport systems be sustainable, as their involvement ensures sufficient support for the model used. The inclusion of diverse groups of stakeholders, civil society and commuters needs to be an integral part of the development process. Transportation plans need to be balanced, taking into account social and economic aspects, and involving a number of interests groups in order to achieve the maximum desired outcome without the negative effects on the urban poor (Manual *et al*., 2015).

Public transport systems needs to follow a bottom-up policy making approach, taking into account the needs of the customer and individuals who utilise public transportation systems on a daily basis to access opportunities, particularly the urban poor. This type of development entails planning and developing transport systems around the needs of individuals, understanding commuter patterns and where economic opportunities lie (SACN, 2009). Preston and Raje (2007) state that extensive surveys and stakeholder discussions need to be held where officials may engage with diverse groups of stakeholders and obtain numerous forms of data to be used in the development of public transport systems. This process needs to be conducted in order to determine preferred destinations of individuals relative to their location when formulating transport plans and policies in conjunction with the impact that fares have on low income residents.

Officials also need to understand the cost implications of public transport systems on low income individuals and how it affects their transport choices (SACN, 2009). The availability of public transport systems is not enough should the costs associated with mode of transport be unaffordable to low income residents (Lucas, 2012). The social benefits associated with investments in transport systems need to exceed that of the cost of the system in order to meet the needs of low income individuals (Townroe and Dabinett, 1995). The development of public transport systems needs to focus on the social benefits of the system and how they may promote accessibility and mobility for low income groups. The cost of development should be secondary to that of the potential impact the system may have on the lives of the urban poor.

The benefits of public transport systems are intra-generational and extend beyond the present. The provision of public transport systems that are affordable and serve to increase accessibility and mobility within the metropolitan region should be viewed as a long term investment.

2.12. Conclusion

Public transportation systems are essential in the day to day lives of the urban poor, providing them with a means of access and mobility to employment opportunities and services. Globally accessibility and mobility remain a challenge and has become a cause for concern. This challenge is particularly difficult in developing countries where people are divided along the lines of class and race and are located on the periphery of city regions. These divisions were created during the colonial period but still persist today.

The challenges facing accessibility and mobility have led to the formulation of best practices, formulated by the UN Habitat and the World Bank in order to mitigate the problems. These practices include the integration of land use and transport planning, integrating public transport systems, promoting public engagement in the development and implementation of public transport plans and the formulation of

PPPs to mitigate the costs associated with the development of public transport systems.

The recommendations serves to illustrate the manner in which public transport systems need to be developed in order to positively impact the urban poor by responding to growth in settlements, economic activity and changing commuter patterns. While these guidelines do promote the use of public transport systems and promote accessibility and mobility, public transport systems have differential impacts. These impacts can serve as both a facilitator and a barrier to the urban poor who rely on public transport systems to access employment opportunities and services on a daily basis.

In turn, not all of the recommendations yield benefits for all demographic groups, leading to the exclusion of low income groups. The differential impacts associated with the development of public transportation systems needs to be re-examined and evaluated through inclusive and participatory planning practices that are able to ensure that the needs of low income groups are met. The inclusion of low income groups is based on the fact that they are the most vulnerable group and are dependent on public transport systems for their daily commute and do not possess the necessary means to own private motor vehicles. In order to mitigate the effects of transport planning on the urban poor, policies and procedures and future development plans need to be assessed and evaluated to assess their impact on the urban poor who require and affordable and effective means of public transport.

Public transport systems need to continuously adapt to changes in the urban form of a city and provide access to developed and emerging economic nodes. Careful attention needs to be paid to the development of a city region, taking into account where growth is occurring and where growth is most likely to occur in future.

Chapter 3

Spatial and Economic Changes in Johannesburg

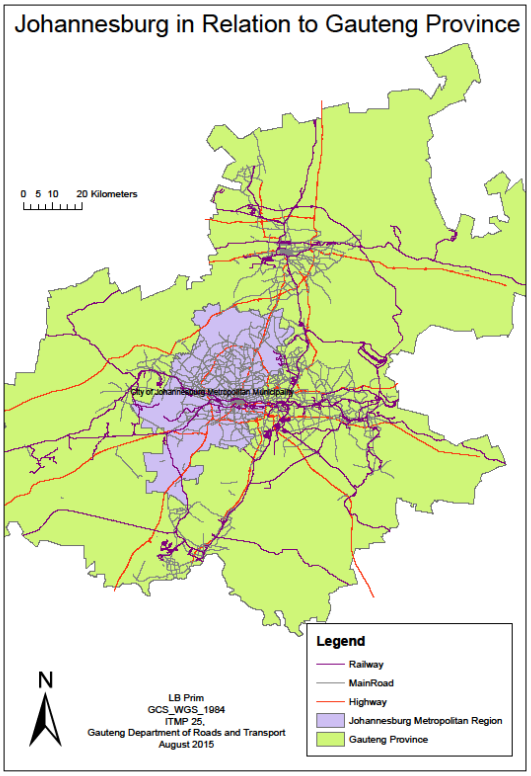


Figure 3.1: Gauteng Province (source: GDRT)

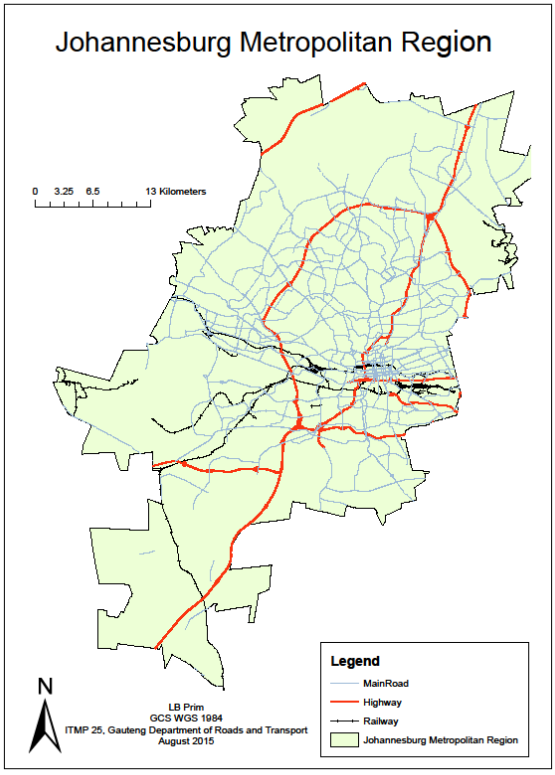


Figure 3.2: Johannesburg Metropolitan Region (source: GDRT)

The Johannesburg Metropolitan region is located in Gauteng Province, South Africa, between Tshwane and Ekurhuleni municipality. Together the three municipalities form part of a broader economic region in both Gauteng and South Africa. While the region may be considered the dominant economic region in South Africa, inequalities exist on the lines of race and class dating back to the colonial era all the way to the present.

Johannesburg is one of the fastest growing cities in the world (UN Habitat, 2010) and the largest economic region in South Africa (Quantec, 2014). The metropolitan region has an estimated population of 4.5 million, as stated in the 2011 census, and is growing rapidly at a rate of 3.2% per annum according to Stats SA. Migrants from

all over South Africa and Africa migrate to the region in search of employment opportunities (CoJ, 2013a).

This chapter seeks to understand the social and economic trends in Johannesburg. The chapter shall examine past, current and future urban growth trends, the location of businesses and economic development in relation to the urban poor and the socio-spatial problems relating to the accessibility and mobility of the urban poor.

The chapter shall discuss the aforementioned themes through the use of maps obtained from the Gauteng Department of Roads and Transport (GDRT), the Gauteng City Region Observatory (GCRO) and information obtained from Quantec and Stats SA. Through the use of maps obtained from the GCRO and an evaluation of Regional Spatial Development Frameworks (RSDFs), the location of the unemployed and urban poor will be illustrated and analysed in relation to economic and business growth in the Johannesburg Metropolitan region.

3.1. Early Transport Development in Johannesburg

In 1886 gold was discovered in Johannesburg. The discovery led to the rapid development of the area which was connected to towns and cities to the east and the west of the Southern Transvaal, as it was previously known (Mubiwa and Annegarn, 2013). The development of the region led to the inauguration of the railway in 1890, which sought to connect mining industries in the east and west with Johannesburg (Beavon, 2001). The railway line stretched across the region to Boksburg, in the east, and Krugersdorp, in the west. The railway development played a significant role in the development of businesses in the Johannesburg CBD, as it influenced the pattern of shopping, attracting people from all over the Southern Transvaal transporting mined goods and facilitating the movement of people (Beavon, 2001).

In the years that followed numerous public transport systems were developed in order to facilitate the movement of people and goods and stimulate economic growth in the region. These public transport systems included the horse-drawn tram system and later the electric tram system, which was the most significant of all public transport developments in Johannesburg prior to the advent of the private motor vehicle. These public transport systems provided the retail and business industry with a significant boost by facilitating interregional movement of people and goods and increasing the accessibility of the area (Beall *et al.*, 2002). More importantly, the electric tram system made peripheral areas more accessible and paved the way for urban and residential developments away from the CBD (Beavon, 2001).

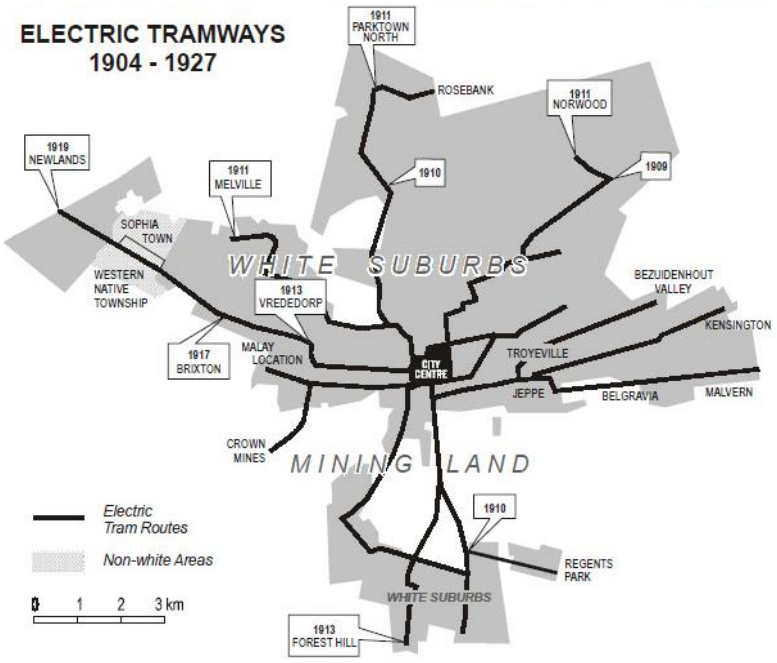


Figure 3.3: Electric Tram Routes and Stations Established at Different Dates (Beavon, 2001:8)

The electric tram system was efficient and ran within regular intervals of 10-15min, transporting people to and from the CBD. Unlike the horse-drawn tram, the electric tram could promote access to peripheral areas that were previously out of reach to residents (Beavon, 2001). The ease of accessibility, the enhanced mobility provided to residents and the development of residential developments around the system led to what Chapman (2015) describes as the first Transit-Orientated-Development

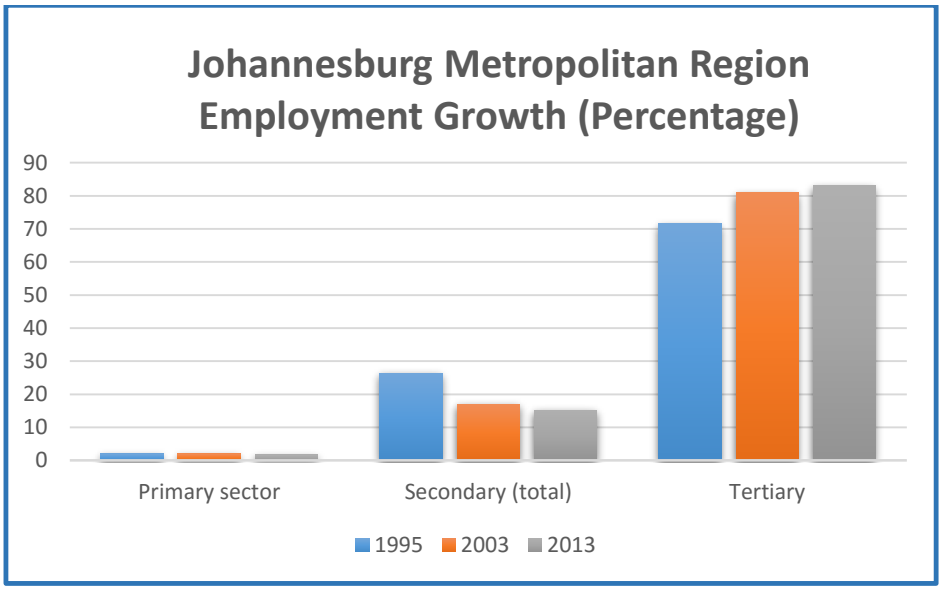
(TOD) model used in Johannesburg. Public transport systems shaped the urban form of Johannesburg and in many ways can be viewed as one of the most important morphological shifts in Johannesburg's history (Chapman, 2015).

3.2. Economic Restructuring in the Late 20th Century

The mining sector was the dominant economic sector in the early years of Johannesburg's development. In 1931 the mining sector accounted for 31% of the total labour force in the area. Over the years a number of changes took place that saw the mining sector account for only 8% of Johannesburg's total labour force in 1970. In only a short space of time the area shifted away from mining to a metropolitan economic region with a high degree of tertiary sector employment (Beavon, 2001).

The tertiary sector experienced significant growth levels throughout the 1980s and onwards, leading the economy of the metropolitan region. In 1970 the tertiary sector accounted for 54% of the region's gross earnings with 37% of the labour force employed in tertiary activities (Beavon, 2001). In 2004 the sector accounted for three times that seen in the manufacturing sector (Kracker-Selzer and Heller, 2010).

Table 3.1: Employment Growth per Sector (source: Quantec)



Over the last forty years primary and secondary sectors of the economy have declined. In order to combat the problem export-led growth strategies were adopted but failed to gain any traction (Kracker-Selzer and Heller, 2010). Between 1980 and 1994 a total of 16 000 jobs were lost in the manufacturing sector and led to 446 establishments closing down (Tomlinson, 1999). This trend continues to exist, as the majority of employment opportunities available lie within the tertiary sector, as illustrated in Table 3.1. Primary and secondary sectors have continued to decline with the tertiary sector employing over 80% of the workforce in the region. According to Kracker-Selzer and Heller (2010), low income jobs serve as complementary services to the growth of the tertiary sector and in many respects service their needs.

The decentralisation of the CBD from the 1950s onwards led to a number of businesses migrating to the northern suburbs. Between 1975 and 1995 the growth experienced in the northern suburbs was double that experienced in the CBD. This growth was due to the attractiveness of the area and the wide range of goods and services available (Beavon, 1998). The CBD was less attractive and led to the displacement of offices further north. In 1996 only a quarter of the top listed Johannesburg Stock Exchange (JSE) companies remained in the CBD. However, it is important to note that large commercial banks have remained in the CBD despite the migration of many businesses to the north (Tomlinson, 1996).

3.3. Northward Growth in Johannesburg

Development in the north began in 1950 and continued throughout the 1960s. In 1970 the northern suburbs experienced a massive boom with the development of Sandton, Illovo and Rosebank (Todes, 2012; Mabin, 2014). Increased accessibility predicated by the dominance of the private motor vehicle led to the development of urban sprawl in what Kracker-Selzer and Heller (2010) describe as one of the most sprawled cities in the world, where the growth of the northern suburbs have coincided with the decline of the CBD. The emergence of the private motor vehicle

and the urban sprawl associated with an increase in the accessibility and mobility of peripheral areas was not synonymous with Johannesburg. The trend occurred globally during the same time period and was led by private sector investment (Czegledy, 2003).

The rapid growth of the northern suburbs was led primarily by the private sector in Johannesburg. Goga (2003) argues that the growth of the northern suburbs was spurred on by an over accumulation of capital relative to investment opportunities within Johannesburg. The lack of investment opportunities within Johannesburg were due to sanctions imposed on South Africa at the time and the pressure placed on the Apartheid government, by the international community. However, in order to secure their investment, tenants were poached from the CBD (Goga, 2003).

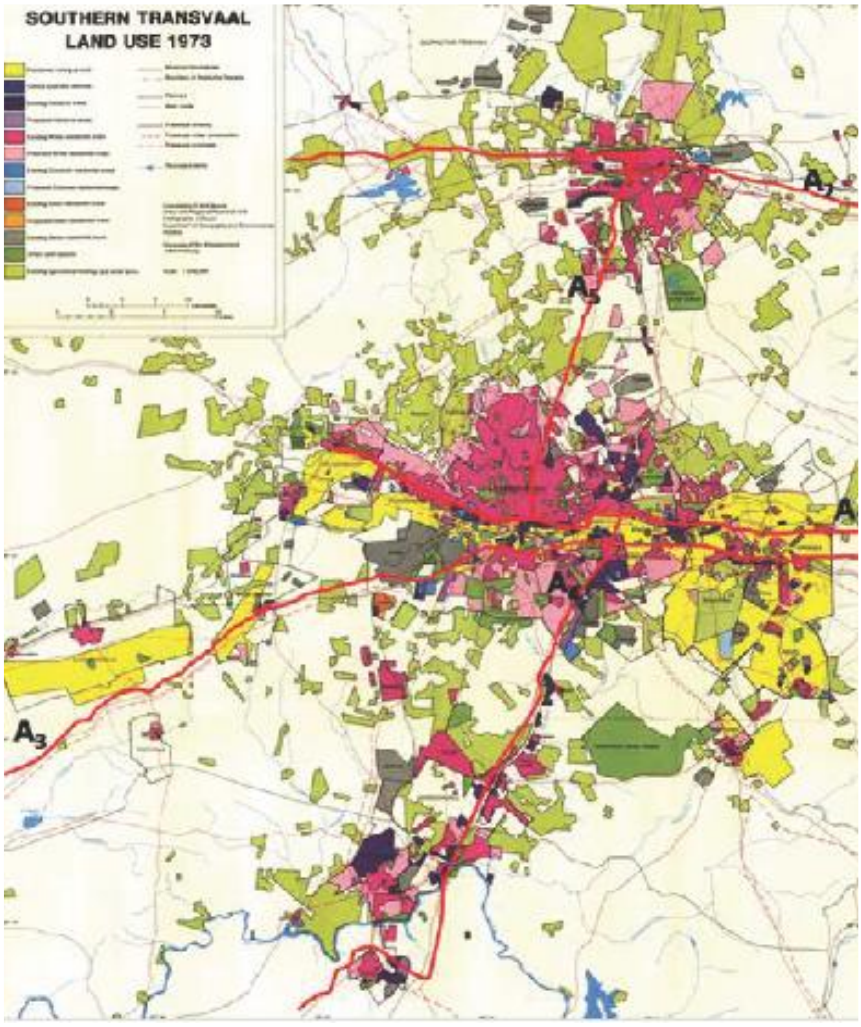


Figure 3.4: Land Use Patterns in 1973 (Mubiwa and Annegarn, 2013:18)

Development in the north was primarily for white residents and led to division along the lines of race and class within the metropolitan region. Whites were located in the north, while non-white workers were located in the south with employment opportunities moving further and further away as northward development continued throughout the region (Beall *et al.*, 2002).

3.4. Spatial Development in the South

Contrary to the development that occurred in the north and in response to the demand for land within Johannesburg, the 1950s were characterised by the displacement of non-white residents to the periphery. The displacement of non-white citizens led to the establishment of Soweto, Eldorado Park and Lenasia (Tomlinson *et al.*, 2003). The implementation of these policies symbolised the division of people on racial lines and signified the disparities between the north and south of Johannesburg (Mabin, 2014).

In order to facilitate the movement of people from the south to the north, to supply the manufacturing industry with a cheap labour force, investments were made in road and rail infrastructure. Townships were connected to the CBD by the extension of the railway system and the establishment of the PUTCO bus service. The heavily subsidised PUTCO bus service was used to transport people from the townships to the CBD where employment opportunities lay within the primary and secondary sectors of the economy (Mubiwa and Annegarn, 2013; Beall *et al.*, 2002).

The segregation seen during the Apartheid era changed in 1994, following South Africa's first democratic election. Affluent middle income non-white households who could afford to move out of the townships into the suburbs moved northward. The migration of these residents was done in order to gain access to opportunities in the north, given the lack of transport facilities available to facilitate the movement of people from the south to the north in a car orientated environment. Previously designated white areas became multiracial as more and more non-white residents moved into the suburbs. By 2011 it was estimated that non-white property owners

accounted for 40-60% of the population in northern suburbs (Harrison and Todes, 2013). Figure 3.5, below, illustrates these changes and shows the differences in the racial composition of the centre of Johannesburg in 2001 compared to 2011, when more and more non-white residents migrated northward.

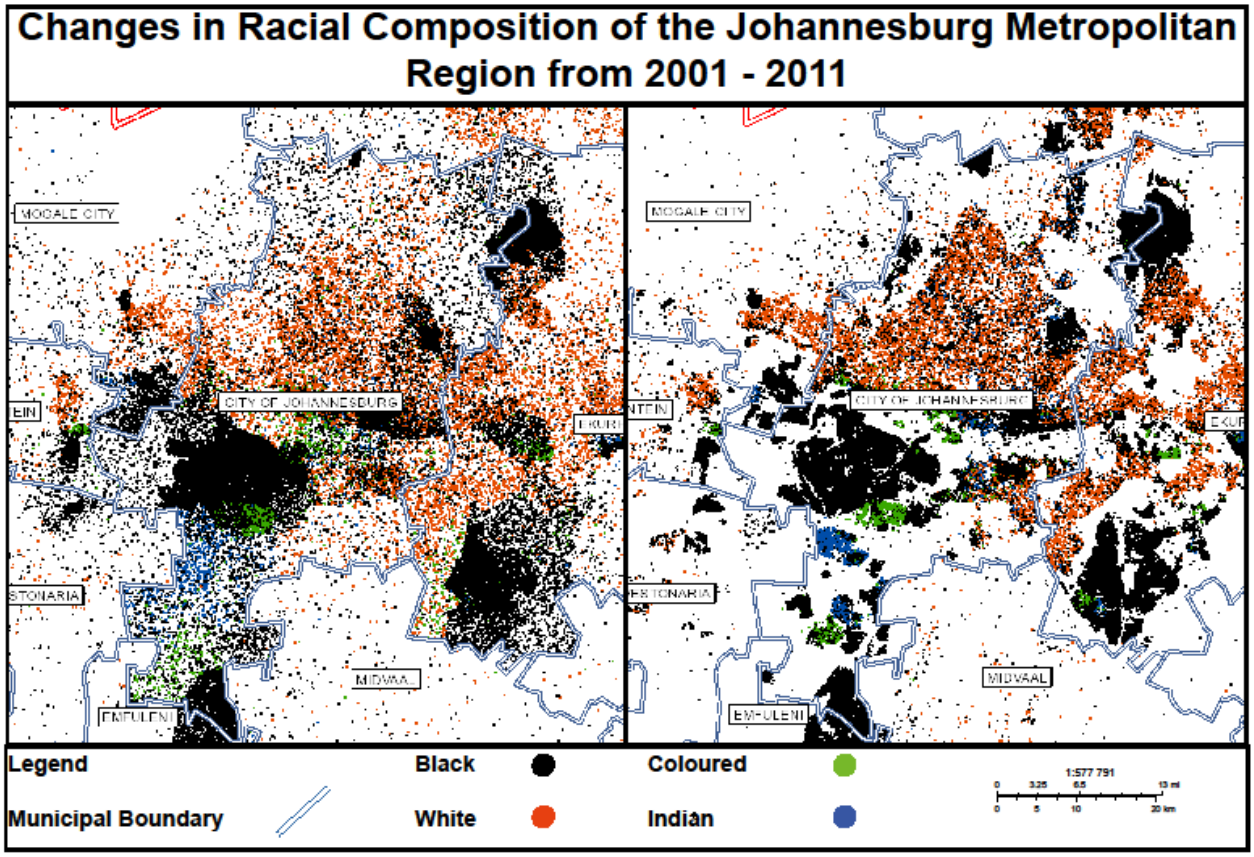


Figure 3.5: Changes in the Racial Composition of Johannesburg between 2001-2011 (source: GCRO)

This changed the dynamics of the area and marked the deracialisation of the area with “new geographies of exclusion”, Beall (2002:49), given the division between low and high income workers. Kracker-Selzer and Heller (2010), in agreement with Beall, state that there is strong evidence to suggest that the further a community is away from Sandton the lower the proportion of upper and middle class households. In turn, the further a community is from Sandton the higher the percentage of its population are low income residents. These differences were predicated by the change in the

economy and decentralisation of the CBD. These changes led to the decentralisation of the CBD, as businesses were located in numerous locations around the Johannesburg Metropolitan region (Tomlinson, 1996).

3.5. North Western Growth in Johannesburg

Growth experienced in the north western quadrant, namely Region A and B as illustrated below, is in response to the increasing number of economic opportunities that lie within the tertiary sector, that have arisen over the last 20 years. The area is car orientated with numerous gated complexes and townhouses that house middle to high income residents, while the poor are located on the periphery (Todes, 2012). Growth is experienced along the western bypass (N1) that serves as a mobility spine to new investors (Tomlinson, 1999).

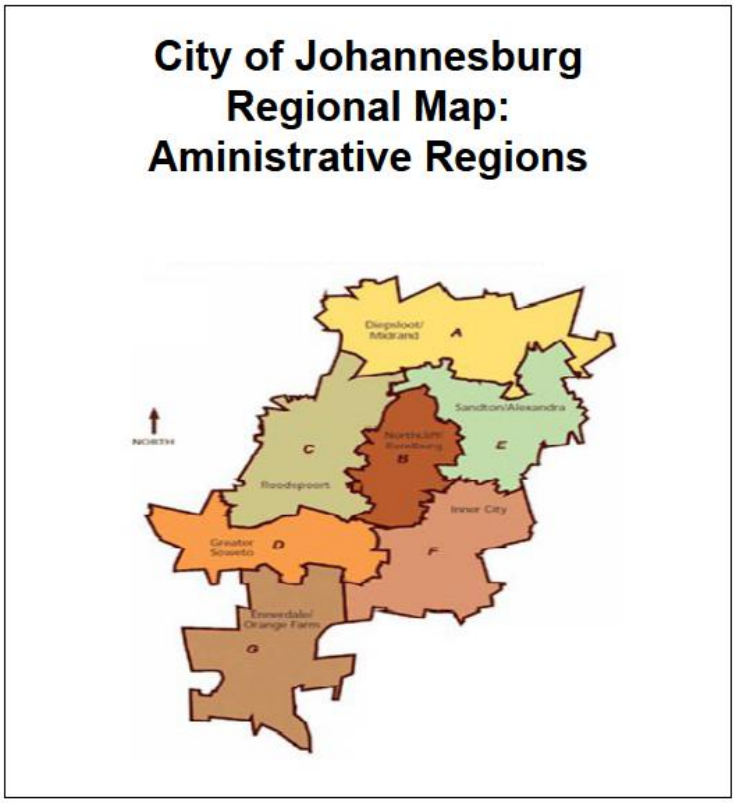


Figure 3.6: City of Johannesburg Administrative Regions

(source: http://www.joburg.org.za)

The spatial growth of Johannesburg is illustrated by Figure 3.7 (below) and shows various concentrations of growth experienced on the periphery of Johannesburg, particularly in the north towards Midrand. The area is classified as Region A, according to the City of Johannesburg Metropolitan municipality, and includes Fourways, Kya Sands, Kyalami, Midrand, Cosmo City and Diepsloot. While the growth in the area has been rapid over the last 25 years, there have been numerous challenges that need to be addressed.

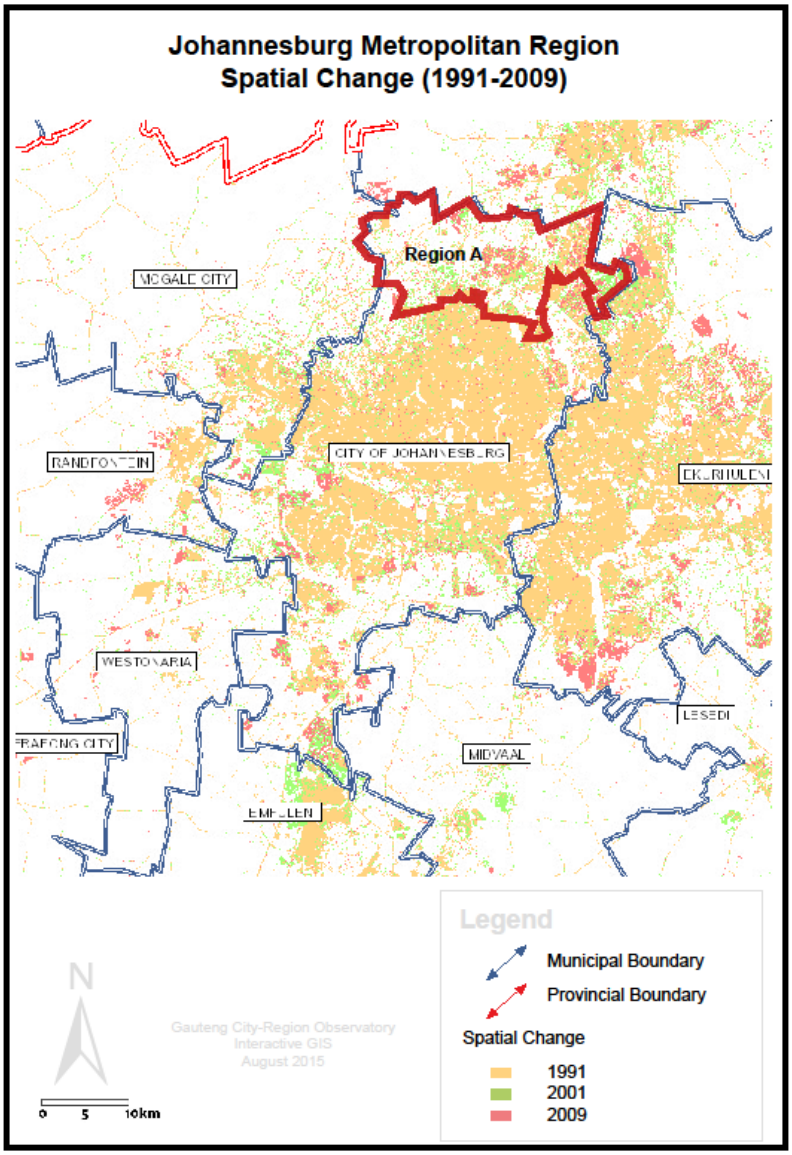


Figure 3.7: Spatial Change in the Johannesburg Metropolitan Region (1991-2009) (GCRO)

There is an absence of a range of facilities in the area, including but not limited to the provision of bulk infrastructure such as water, sanitation and electricity and social amenities such as schools, clinics and religious facilities (Todes, 2012). The area is currently under pressure, as roads and infrastructure cannot sustain the rapid growth and there are no formal means of public transport in the area (CoJ, 2010). High levels of congestion are experienced within the area, as it is car orientated environment with high density developments and no public transport alternatives. According to Klug and Naik (2008) in 2008 the Fourways area and neighbouring areas have been classified as the fastest growing areas in South Africa in terms of development applications received over a four year period.

Amongst other problems experienced, a number of informal settlements have developed on the periphery, including Diepsloot with over 200 000 residents (Rea Vaya, 2014) and social housing schemes (Harrison and Todes, 2015). These are classified as marginalised areas with poor levels of infrastructure and high levels of poverty and unemployment. These settlements lie on the periphery in the north western region of Johannesburg, which results in long commutes with no formal means of transportation. The taxi industry is the dominant form of transport for residents who need to access economic opportunities in the area and surrounding areas (CoJ, 2010). These marginalised areas lie in isolation, distant to opportunities present within the metropolitan region making them vulnerable to unemployment and poverty with no way of making their way out of these conditions. This is due to the fact that they are located more than 20km away from Sandton and 30km away from the CBD (Haferburg, 2013).

3.6. Industrial and Commercial Growth in the North West of Johannesburg

In 2004 only 36% of Johannesburg's total output was produced in the CBD while 52% was produced collectively in a number of economic nodes around the metropolitan region. The figure below further confirms Johannesburg's polycentric form with numerous economic nodes and growth points located throughout the

region (Todes, 2012). This growth is not only experienced in the north but in the west too.

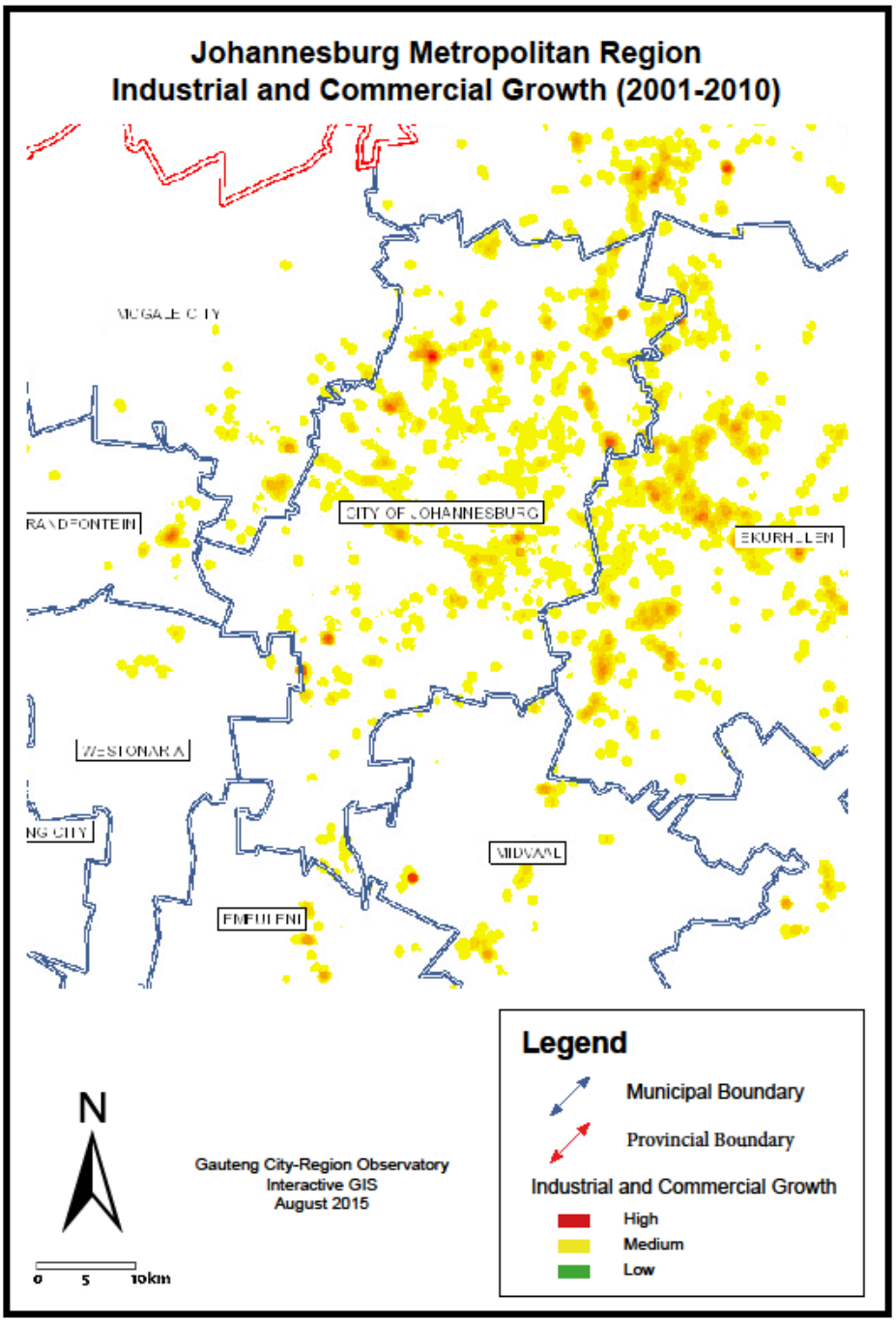


Figure 3.8: Industrial and Commercial Growth (2001-2010) (source: GCRO)

Figure 3.8, above, illustrates industrial and commercial growth experienced between 2001 and 2010. The figure clearly illustrates the concentrations of growth that have arisen in the north western region of Johannesburg. The map clearly illustrates a polycentric form with opportunities located in the north and west with lesser concentrations of growth in the south. Tomlinson (1996) states that this is primarily due to the locations in the north that are equidistant to Tshwane and the Johannesburg CBD, in what is to be viewed as a broader economic region in Gauteng and not only Johannesburg. Businesses within the Johannesburg Metropolitan region, Tshwane and Ekhuruleni form part of a greater economic region within Gauteng and need to be viewed in this manner, as argued by Klug *et al.* (2014).

3.7. Location of Unemployed and Marginalised Residents

According to StatsSA, in 2011 Johannesburg has a recorded total of 2 261 490 economically active people and an unemployment rate of 25%. The majority of residents within Johannesburg have not completed their secondary education. The unemployment rate amongst the youth is high and currently stands at 31.5%.

Figure 3.9 (below) illustrates the data geographically and shows where the highest proportion of unemployed residents are located. The highest concentrations are located in the south, east and west of the Metropolitan region. These clusters occur primarily on the periphery, away from the city centre and businesses. The location of unemployed clusters of people is a trend that occurred through segregationist policies implemented during the Apartheid era and continues today producing high unemployment and poverty rates in the Johannesburg Metropolitan region. However, clusters in the west can be attributed to social housing developments, as illustrated earlier, in the west of Johannesburg that have served to marginalise people and locate them away from economic centres of the city region (Haferburg, 2013; National Planning Commission, 2011).

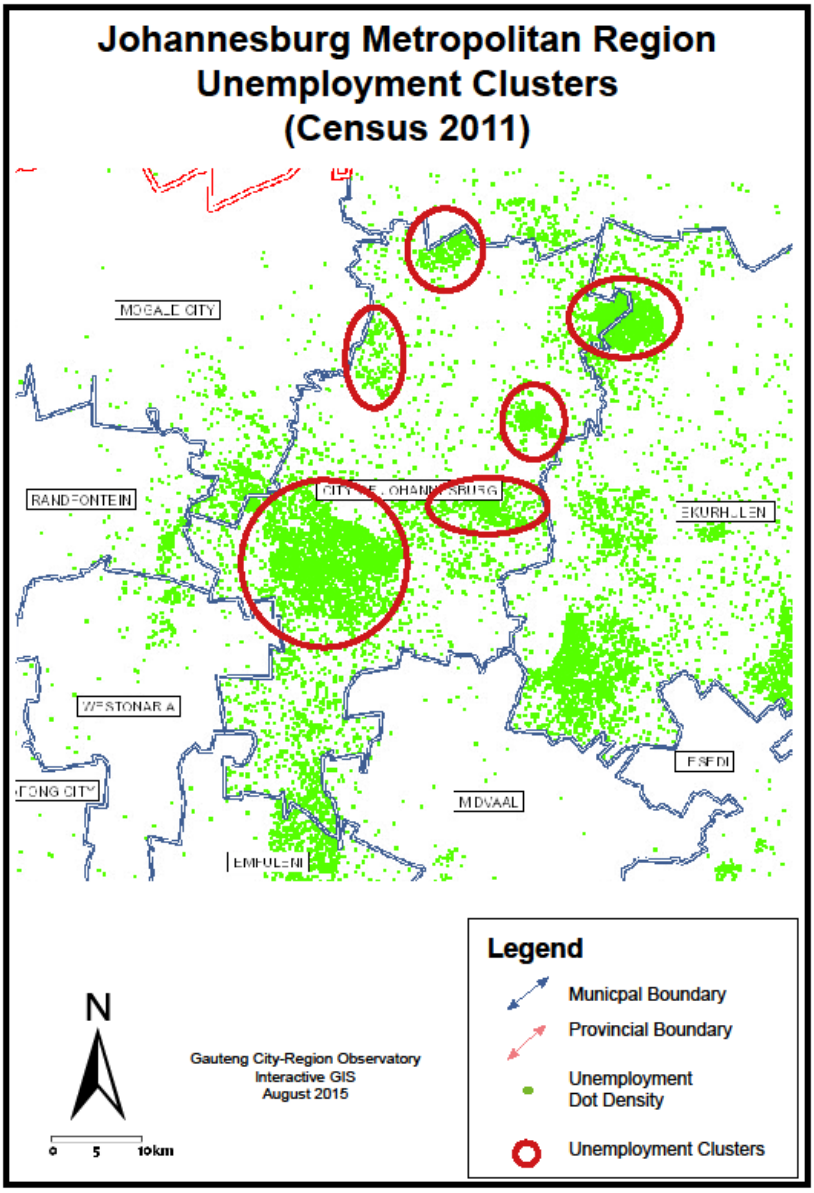


Figure 3.9: Largest Unemployment Clusters in Johannesburg

(source: GCRO)

In many ways, the high unemployment and poverty rates experienced call for greater accessibility and mobility of these residents in order to access employment opportunities and services throughout the region. Unemployed residents located on the periphery to the south, east and west need an effective public transport system

that is able to increase their accessibility to opportunities and services which are located in numerous developed areas in the north and centre of Johannesburg.

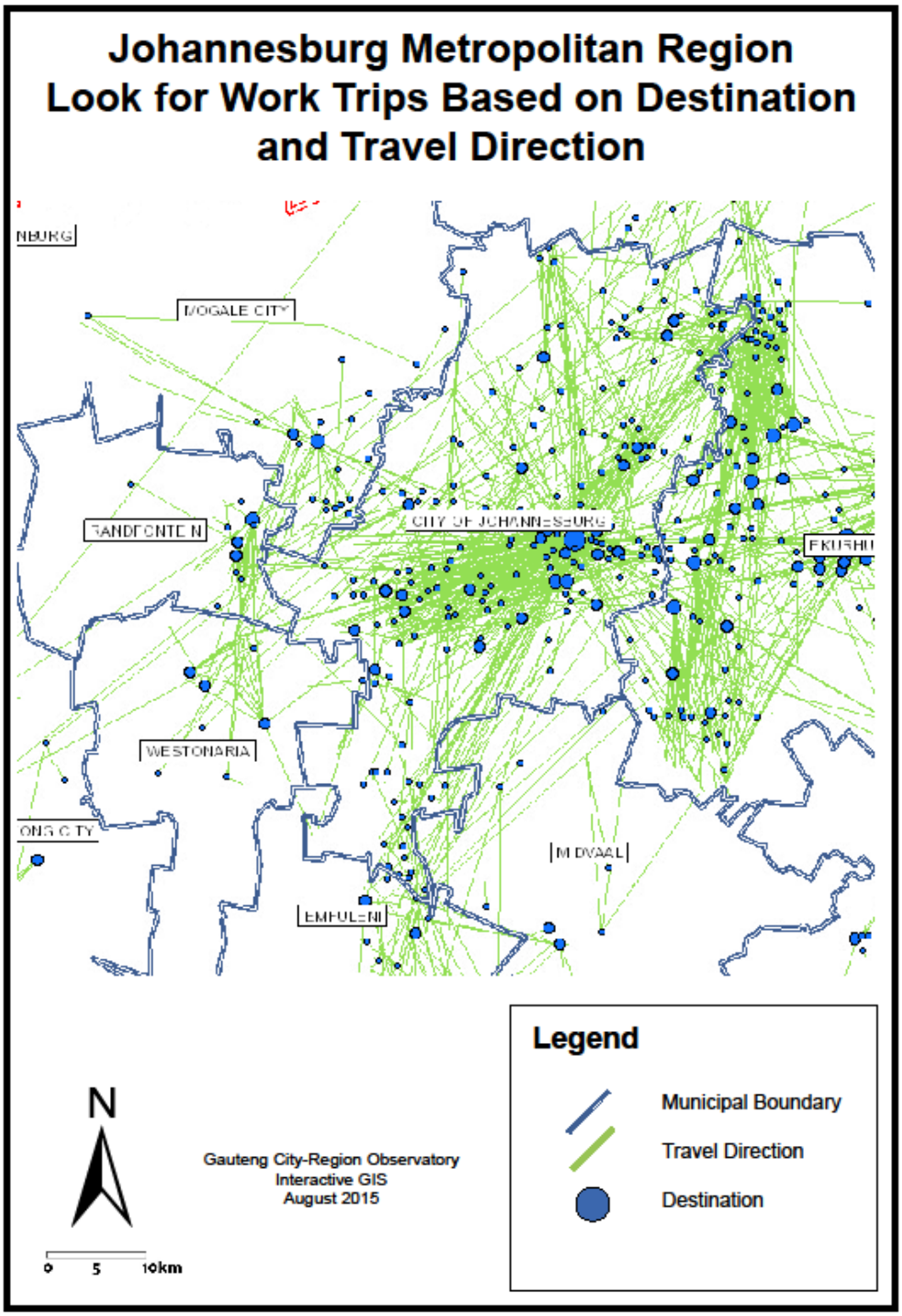


Figure 3.10: Look for Work Trips Based on Travel Direction and Destination (source: GCRO)

Figure 5.5 illustrates the patterns and travel direction of those looking for work in the Johannesburg Metropolitan region. The figure illustrated above is based on a Quality of Life Survey conducted by the GCRO in 2011. As seen in Figure 5.5 above, people travel from all corners of the metropolitan region in search of employment opportunities. These include areas to the west, south, north and east of the metropolitan region. More importantly, Figure 5.5 illustrates the complexity of commuter travel patterns and the numerous locations that commuters travel to in order to access employment opportunities.

3.8. Conclusion

Since 1886 when gold was first discovered in Johannesburg, the area has experienced numerous periods of development and growth. Over the last 100 years numerous changes have occurred in the metropolitan region that have changed both the urban and economic landscape. These changes have resulted in the segregation and marginalisation of the urban poor.

The initial stages of growth within the Metropolitan region show a strong and effective relationship between land use planning and transport planning. The relationship between the two promoted the use of public transport and facilitated transit-orientated development in the metropolitan region. However, the dominance of the private motor vehicle altered the relationship and prioritised the private motor vehicle, increasing the mobility of those who could afford private motor vehicles and reducing the accessibility of those who were and are still unable to purchase private motor vehicles.

Current urban and economic trends show emerging urban and economic nodes are being developed in the west of Johannesburg in an environment dominated by the private motor vehicle with no means of formal public transport systems. These emerging nodes provide numerous opportunities for employment but without public

transport systems, unemployed and low income residents are unable to access these opportunities or those located within the metropolitan region.

Large clusters of unemployed residents are located on the periphery and are in need of public transportation systems in order to access opportunities and services. The distance between economic nodes and the location of the urban poor and the lack of public transportation facilities in the area isolates them and limits their accessibility and mobility. More importantly, the findings illustrate the complexity of commuter patterns in a complex urban and economic region and the numerous locations sued by low income residents to access employment opportunities. More attention needs to be paid to the accessibility and mobility of these residents in alleviating poverty and unemployment through the provision of effective and efficient public transport systems.

Chapter 4

Public Policies and the Development of Public Transport Systems in Johannesburg

The provision of an efficient, reliable and sustainable public transport system has posed an enormous challenge in the post-apartheid era. Over the last decade numerous initiatives have been launched, including the development of the Rea Vaya and the Gautrain, to address the problem. These developments have occurred in response to the challenges government has faced over the last two decades, such as the alleviation of poverty, increasing access to employment opportunities and services to the urban poor and the development of liveable urban forms.

This chapter seeks to illustrate what are the state's public transportation plans, examining current and future public transport systems and plans. In addition to public transport plans, local and provincial policies will be analysed and discussed in order to evaluate their position and objectives in the development of affordable and reliable public transport systems in Johannesburg.

Furthermore, the case studies will be introduced and analysed through the use of maps obtained from the GDRT, illustrating their routes and proposed routes to be developed in future. In addition, this chapter shall examine whether current and future public transport developments appear to be responding to urban economic growth in the north western region of Johannesburg.

4.1. Post-Apartheid Government's Approach to Public Transport Development

In 1996, following South Africa's first democratic election, the introduction of the White Paper on National Transport Policy signalled the importance of transport development in South African cities (Mubiwa and Annegarn, 2013). The White Paper

was created due to the increasing importance of public transport in enhancing the accessibility and mobility of residents and meeting social and development goals in South Africa, following a tumultuous past of segregation and racial discrimination. The progress made in the White Paper was however, offset by a number of social development goals that have competed for funding over the years due to fiscal constraints (National Planning Commission, 2011), including but not limited to the provision of social housing, education, unemployment and poverty reduction. While the development of transport systems continued to compete for funding in South Africa's young democracy, urban development continued to occur in an environment dominated by the private motor vehicle, creating a number of disparities between those who could afford private motor vehicles and those who rely on public transport for their daily commute, as illustrated in Chapter 3.

In recent years the development of public transportation systems has gained traction and have been discussed in the National Development Plan (NDP) and Joburg 2040 Growth and Development Strategy. The NDP calls for the development of public transportation systems that are both affordable and reliable, providing previously disadvantage groups with an equitable means of public transport. The NDP recognises the lack of investment in the development of public transportation systems and calls for a more integrated approach that is able to integrate land use planning and transport planning (National Planning Commission, 2011). The Growth and Development Strategy developed by the CoJ (2011) reiterates this point and calls for the development of public transportation systems that are able to link land use planning and transport planning through the development of transport corridors that seek to bring people closer to opportunities within the city centre (CoJ, 2011).

Public transport systems are defined in terms of acceptability, accessibility, availability and affordability, in terms of the NDP (National Planning Commission, 2011). In Johannesburg and South Africa as a whole, transport systems form part of a broader basic service catering to significant proportions of households who are unable to afford private motor vehicles to facilitate their daily commute to work and school. High levels of poverty within the Johannesburg Metropolitan region requires

that public transport systems reduce household expenditure on transport and enhance the accessibility and mobility of low income households (CoJ, 2013a; National Planning Commission, 2011). Through the provision of a reliable and affordable means of public transport low income households can increase their access to employment opportunities and obtain better access to social services, such as clinics, educational and religious facilities (SACN, 2009).

The national and local guidelines set by the NDP and Growth and Development Strategy have led to the development of a local and provincial integrated transport master plan. These are namely the GDRT (2013) 25-Year Integrated Transport Master Plan and the CoJ (2013a) Integrated Transport Plan. These plans recognise the need for a more integrated approach to transport planning and the development of liveable urban forms that can aid in the migration of people to urban and economic centres and increase the mobility of low income groups.

More importantly, these plans recognise the inefficiencies of current public transport systems and the lack of investment in public transport systems since South Africa's first democratic election. These are notably the municipal bus services and rail based systems.

4.2. Current Modes of Public Transport in Johannesburg

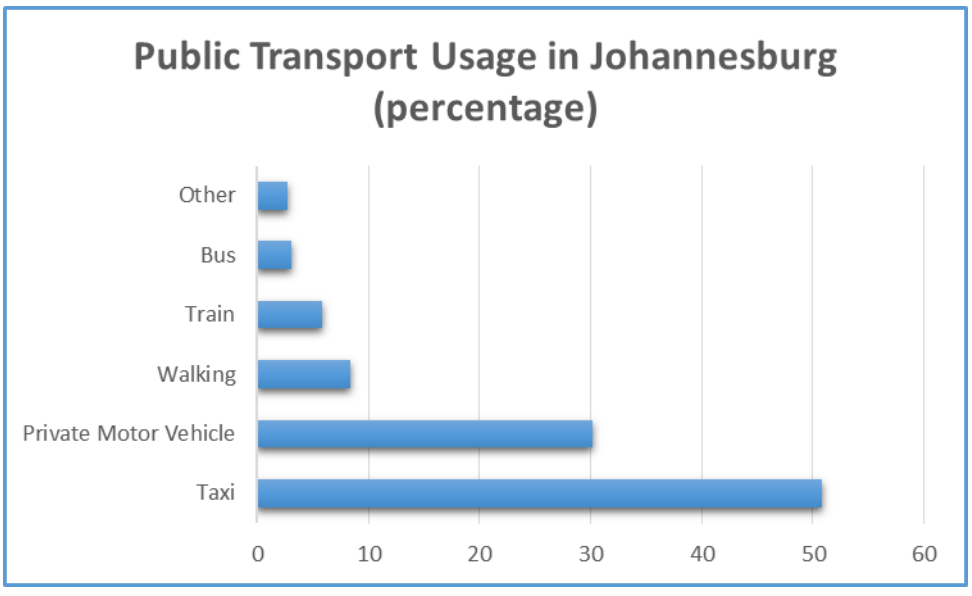
In order to facilitate their daily commute, low income households make use of numerous forms of public transport including the Metrobus, PUTCO bus, Gauteng Coaches, Metro Rail (under the authority of the Passenger Rail Agency of South Africa (PRASA)), the taxi industry, and Rea Vaya (CoJ, 2013a).

However, these transport systems all operate independently, each under different authoritative bodies. The rail system is operated by national government and bus services are divided between the provincial and local governments. The differences in authoritative bodies has led to a lack of integration between the systems and

limited their efficiency in the provision of a reliable and efficient means of public transport. More importantly, the lack of coordination has led to the designation of routes that is based on the most profitable routes, with little to no attention paid to the social benefits relating to accessibility and mobility throughout the Johannesburg Metropolitan region (GDRT, 2013). The inability to designate routes based on commuter preferences and needs has led to the decline of state funded public transportation systems, as patronage in state funded public transport systems has decreased over the years.

Table 4.1 illustrates public transport usage figures in Johannesburg, as stated by the GCRO Quality of Life Survey conducted in 2011. This table shows the dominance of the taxi industry followed by private motor vehicle usage in the metropolitan region and more importantly, how the rail and bus systems fail to attract commuters.

Table 4.1: Transport Usage in Johannesburg, according to GCRO Quality of Life Survey 2011 (source: Weakley, 2015:4)



Over the last 5 years rail and bus transport systems have been under scrutiny for the lack of development over the last two decades. According to the GDRT (2013) 25-Year Integrated Transport Master Plan no investments have been made in the

national rail system, which has resulted in constrained mobility and accessibility for those who make use of the network. Lack of investment in the system has compromised its effectiveness. The lack of development can been seen in Figure 4.1, below, and illustrates the deficiencies of the rail system, as system makes use of previously designated routes to the east, west and south of the metropolitan region. The rail systems was developed in the 19th century to transport passengers and goods, with further developments initiated in the 1940s with the development of Soweto (Beavon, 2001). Since then, no investments have been made in the development of the passenger rail system. The lack of investment has resulted in the failure of the system to provide access to economic nodes or residential areas in the north and north western region of Johannesburg, where opportunities are the greatest, as illustrated in Chapter 3.

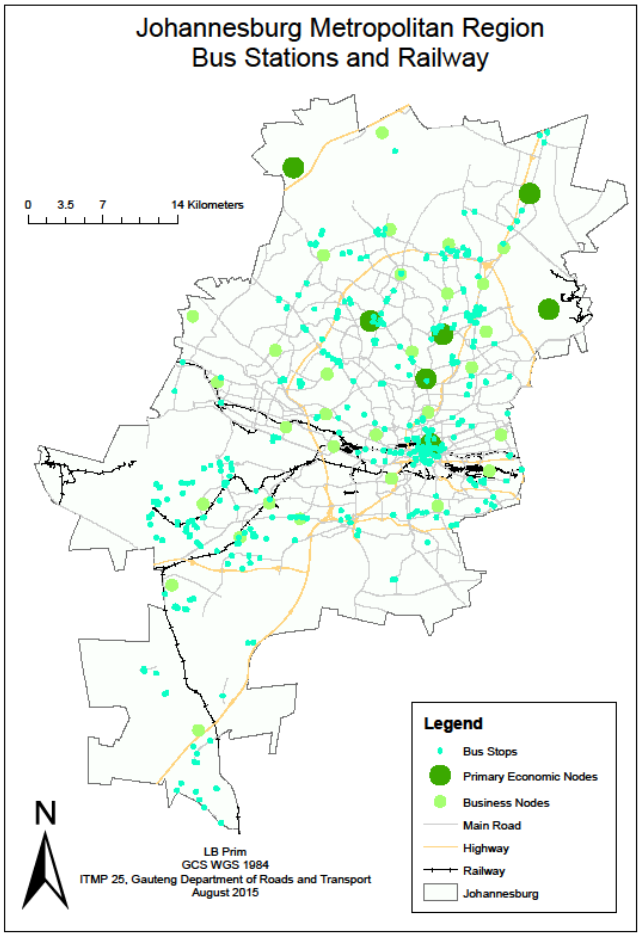


Figure 4.1: Rail and Bus Network in Relation to Economic Nodes

(source: GDRT)

The lack of development and inadequacy of the bus and rail systems has led to the taxi industry being the dominant form of transport in Johannesburg and South Africa, as a whole (GDRT, 2013). The taxi industry emerged in 1976 in response to northward growth in Johannesburg with no means of transport for Black, Coloured and Indian residents located in the south. Taxis provided a meaningful and much needed service to residents located in the north western region of Johannesburg, 20-30km away from the urban core (Beavon, 2001). Prior to 1987 the taxi industry operated illegally, however, the legalisation of the industry led to a number of public investments in the industry. These investments include the provision of taxi ranks and facilities over the last 20 years, illustrating their importance throughout the metropolitan region (Mubiwa and Annegarn, 2013).

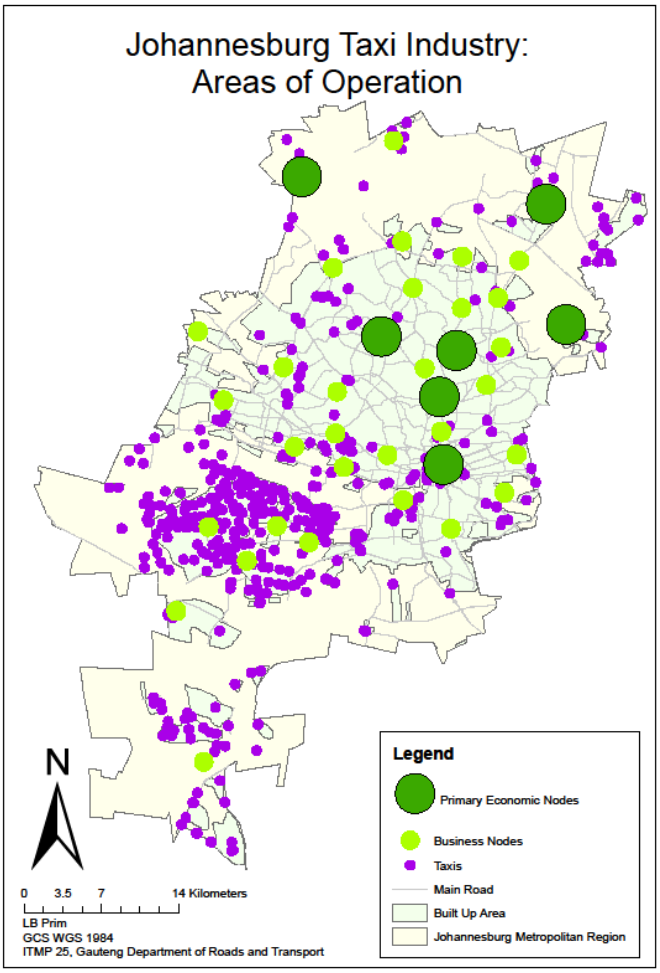


Figure 4.2: Johannesburg Taxi Industry (source: GDRT)

Figure 4.2, above, illustrates the areas in which the taxi industry operates in Johannesburg and clearly shows the extent to which the industry has developed over the years and the extent to which they have kept up with urban and economic development trends both formal and informal. The concentration of taxis is directly proportional to the demand for the service by the urban poor. The reach of the taxi industry stretches from the south to the north, east and west of the metropolitan region. The system is well adapted to the polycentric urban form of the metropolitan region and provides the urban poor with an essential service. A service that currently, government has been unable to provide, as noted above. The taxi industry is ideally suited for low density areas, as it is dynamic and flexible and can access locations that are inaccessible to state funded public transport systems. The system also requires less funding than other public transport systems making it more affordable (Schmidt, 2014). More importantly, the service offered by the taxi industry is unmatched, with no equal given the large number of taxis who operate within the region (GDRT, 2013) and the efficacy of their response to emerging growth nodes, as stated in Chapter 3.

4.3. The Development of Efficient and Reliable Public Transportation Systems

The challenges seen in state public transportation systems and the dominance of the taxi industry has led government to explore the possibilities of new public transportation systems and develop reliable and efficient systems (GDRT, 2013). This search has led to the development of the Gautrain and Rea Vaya BRT system.

Over the last 10 years a considerable amount has been invested in the development and upgrading of public transport infrastructure within the Johannesburg Metropolitan region. These developments include the development of the Rea Vaya Bus Rapid Transit (BRT) system in 2008, the Gautrain in 2002 and the provision of new taxi ranks. In accordance with the CoJ (2013a) Integrated Transport Plan, these developments were initiated in order to address the current challenges facing Johannesburg with regard to accessibility and mobility in the region. The development of public transport systems serves to improve the quality of life for both

present and future generations (CoJ, 2013a). This is based on Relogle and Hughes' (2012) notion that the manner in which cities develop their transport systems will ultimately determine the sustainability of urban life for both current and future generations.

In accordance with the GDRT's (2013) 25-Year Integrated Transport Master Plan, CoJ (2011) Growth and Development Strategy and the CoJ (2013a) Integrated Transport Plan, the development of the Gautrain and Rea Vaya have 7 primary objectives:

1. Increase patronage in the public transportation system
2. Reduce carbon emissions by attracting private motor vehicle users
3. Integrate public transport systems
4. Create liveable urban forms and promote infill development and economic develop around transport corridors
5. Prevent urban sprawl
6. Develop sustainable public transport systems through public private partnerships (PPP)
7. Alleviate poverty and unemployment by increasing accessibility and mobility to opportunities

4.4. Case Study 1: Gautrain

The Gautrain was first initiated in 2002, by the provincial government, and was viewed as a "Game Changer", as described by Senior Managers within the GDRT (pers. comm. 7 August 2015), in the development of transport systems in South Africa. The Gautrain is a high speed rail system and is able to transport a large number of passengers in a short space of time to economic hubs throughout the broader Gauteng region (GDRT, 2013). The Gautrain coincides with integrated transport systems in Europe, as illustrated by Janic and Reggiani (2001), with integrated ticketing systems for Gautrain Rail and Gautrain Bus services, efficient

information systems, park and ride facilities, and reduced transfer fares. The system is unique in South Africa.

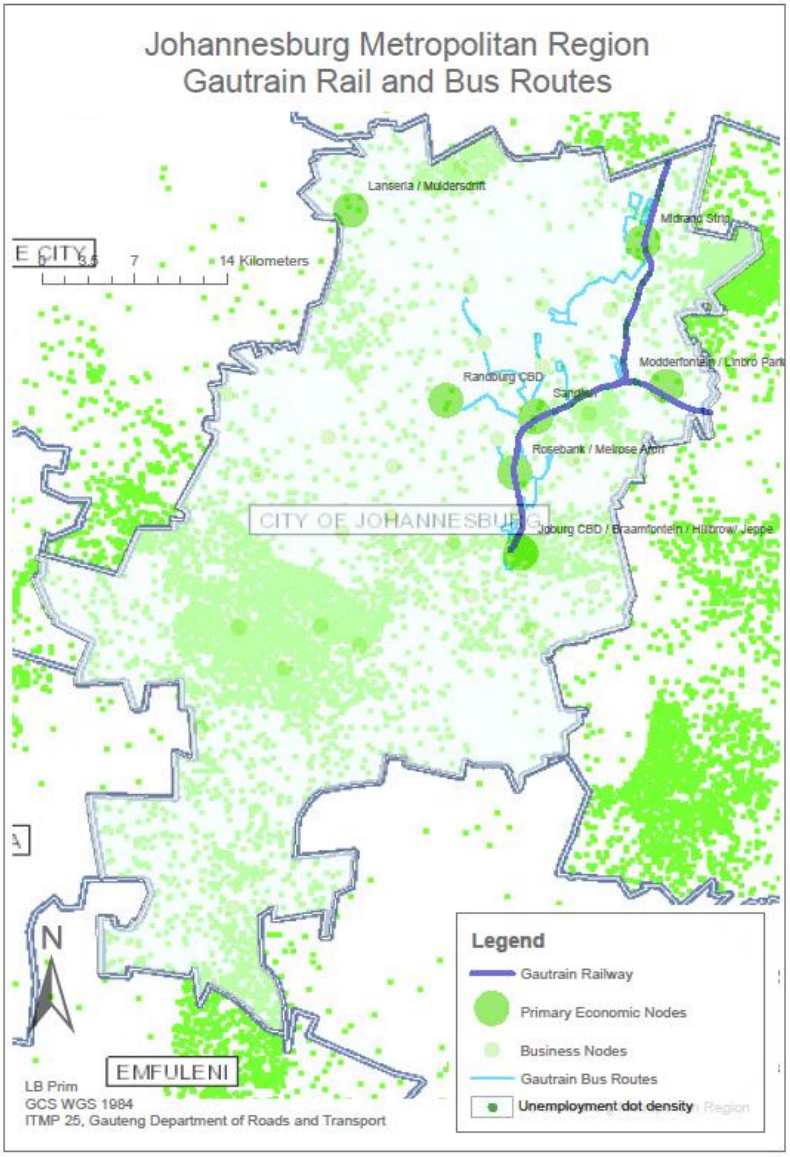


Figure 4.3: Gautrain Bus and Rail Routes (source: GDRT)

The Gautrain came into operation in three phases. The first phase was operationalised in 2010 and served as a link between Sandton and OR Tambo International Airport and a commuter line between Rhodesfield, Tshwane, and Sandton. Subsequent phases of the Gautrain were operationalised in 2011 and included a Rosebank station and Pretoria station with an additional phase at Park

station, Johannesburg, in 2012. Currently there are ten stations in the development of the Gautrain, with five stations located in Johannesburg. These stations include Park Station, Rosebank, Sandton, Marlboro and Midrand (CoJ, 2013a). The stations and the routes can be seen in Figure 4.3, above, as they move further northward.

The Gauteng provincial government, in agreement with the Bombela Concession Company who operate the Gautrain system, have agreed to subsidise the system should the system not reach its projected numbers on an annual basis. In recent years the provincial government has paid a subsidy of R830 million in 2013 and R1 billion in 2014 to cover the operational costs of the Gautrain (Maqutu, 2015). The system currently transports over 48 000 passengers per day, with 30% of its users using the Gautrain Bus service (CoJ, 2013a). According to Senior Managers within the GDRT (pers. comm. 7 August 2015) the system has reached its projected number of passengers. Due to growing interest in the system, the GDRT has proposed to develop the system further that will see the system extend towards the north western region of Johannesburg towards Lanseria Airport. Additional extensions will see the network expand to the southern and western regions of Gauteng towards Soweto, Vereeniging, Klerksdorp and Rustenburg in the long term future in order to capture the market and promote the use of rail throughout the region (GDRT, 2013). The development of this extension is primarily due to the limited coverage of the system at its current stage of development, as the system does not extend to emerging nodes in the west of Johannesburg (Maqutu, 2015). The limited coverage currently seen is a problem that can only be addressed as part of a long term development strategy. However, it is important to note that feasibility studies are still being conducted and nothing has been finalised as yet (GDRT Senior Managers, pers. comm. 7 August 2015) and given the high costs associated with the fares of the Gautrain, future developments will not benefit the urban poor despite plans to develop an extensive network.

The Gautrain is part of a broader transport development strategy in the region and seeks to create a modal shift from car to public transport in the region by targeting middle class individuals. The decision taken by the GDRT in the development of the

Gautrain was based on the fact that middle class individuals currently make up the majority of private motor vehicle owners in the region (GDRT Senior Managers, pers. comm. 7 August 2015). The system is geared towards middle and high income private motor vehicle owners bringing about criticism from the media and public regarding the total cost of development and costly fares that fail to meet the needs of the majority (Todes, 2012).

4.5. Case Study 2: Rea Vaya Bus Rapid Transit System

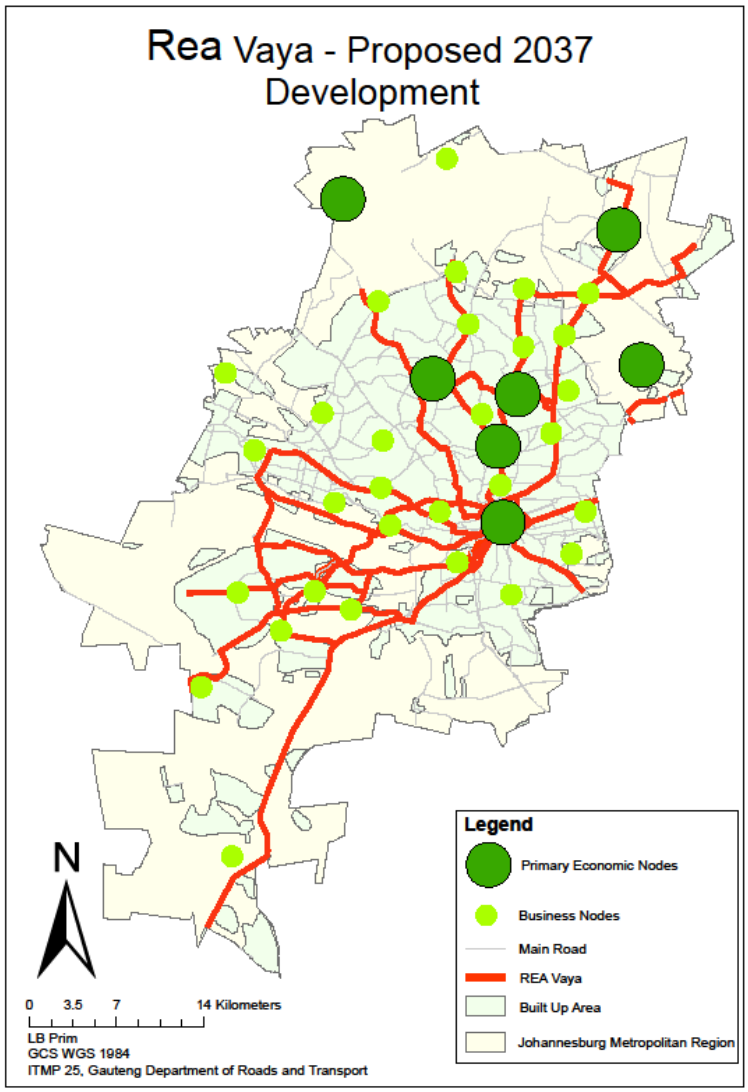


Figure 4.4: Rea Vaya Proposed Development in Relation to Economic Nodes (source: GDRT)

The Rea Vaya was a local initiative, funded and facilitated by the City of Johannesburg through the Public Transport and Infrastructure Grant administered by the National Treasury (CoJ, 2013a). The system is a Bus Rapid Transit (BRT) system with dedicated bus lanes, feeder and complementary routes, bus stops placed less than 500m apart allowing it to transport high volumes of passengers ina short space of time throughout the metropolitan region (Gautrain, 2015a). The system is modelled around the TransMilenio system in Bogota, Columbia, where City of Johannesburg officials attended a working tour in order to learn more about how the system should be modelled prior to its implementation (Bickford, pers. comm. 18 August 2015a).

In the context of Johannesburg, the aim of the system was to deliver a greatly improved public transport system to marginalised communities in order to reduce factors of exclusion that relate to accessibility and poverty (Vaz and Venter, 2012). Ambitions to relieve poverty and increasing accessibility for the urban poor have led to the planning of an extensive network with links to informal settlements such as Diepsloot (Rea Vaya, 2014), Alexandra and marginalised areas to the south such as Lenasia, to development in the north (CoJ, 2010).

The Rea Vaya development will occur in numerous phases, as seen in Figure 4.5 below. Currently the system is in the first phase of development with the construction of Phase 1C currently taking place (Bickford, pers. comm. 18 August 2015b). The development of the BRT system first began in 2007 with the construction of trunk routes extending from Ellis Park Stadium in the east to the CBD and Soweto. Subsequent phases see the system developing into a network extending to the east, north and west of the metropolitan region (CoJ, 2013a).

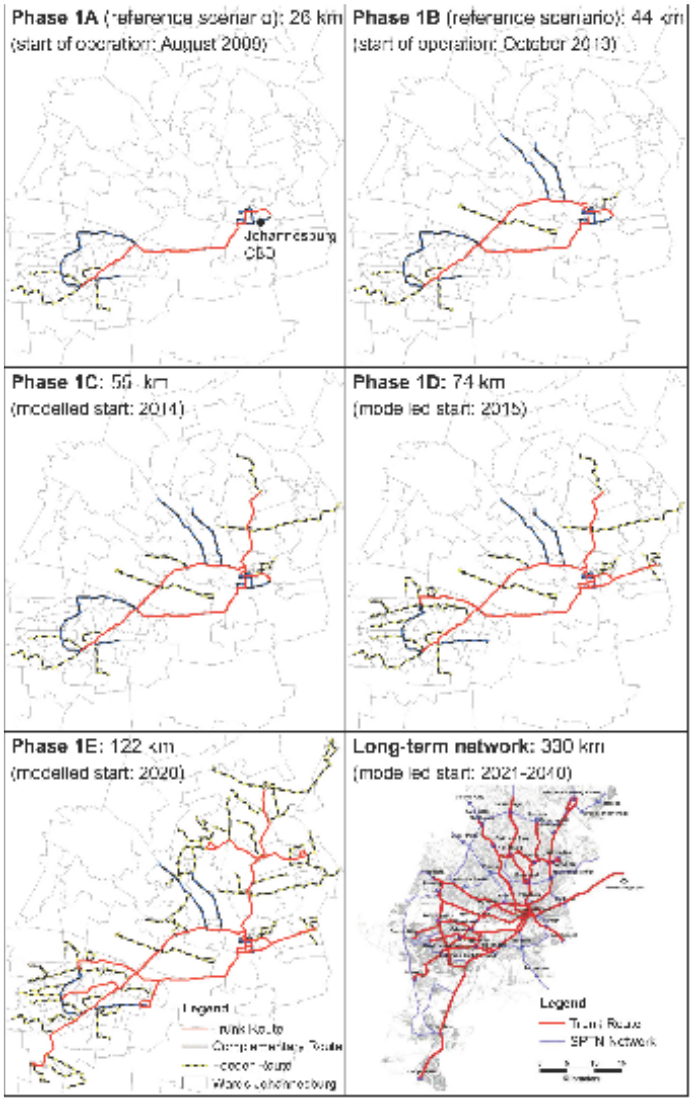


Figure 4.5: Rea Vaya Development Phases (source: Bubeck *et al.*, 2014:62)

The Rea Vaya system uses a monocentric transport model, modelled around the Johannesburg CBD despite the fact that the metropolitan region has numerous economic nodes and emerging nodes. The CoJ (2011) Growth and Development Strategy recognises the polycentricity of Johannesburg and the need for a polycentric transport model but this has not been included in the plans.

In addition to the model used, the estimated completion date is 2037, leaving residents in the north western region without a suitable means of transport for many years to come. The development of the model, as illustrated above, show that the

Rea Vaya network began in the south and is extending northward. Regions to the west will only feature at a later date. More importantly, the use of the monocentric model contradicts the Growth and Development Strategy and reinforces transport models used in the past that are centred around the CBD.

The Rea Vaya planned to transport 136 000 passenger/day in their initial projections, however, this target was not reached and the system has experienced low passenger volumes. Recent studies indicate that the Rea Vaya transports a mere 3800 passengers/day and not the 136 000 passengers/day as predicted (Bubeck *et al.*, 2014), a point reiterated in an interview with Senior Managers within the GDRT (pers. comm. 7 August 2015b).

In a study conducted by Vaz and Venter (2012) that took place in Soweto, Vaz and Venter's findings reveal that the Rea Vaya is used by a mere 30% of individuals travelling to work and is the second most used transport system after the taxi within the area. The development of the BRT has failed to attract people who primarily use private motor vehicles and who rely primarily rely on public transport for their daily commute. A plausible explanation for the phenomenon could be the limited network of the BRT system, as the majority of commuters looking to enter the northern suburbs (16%) and western regions (13%) of the metropolitan region make use of either the taxi or private motor vehicles. Given the findings of the research, the BRT service does not significantly enhance accessibility in terms of the destination of commuters or origin of the system (Vaz and Venter, 2012) and only serves a select group of users within Johannesburg.

In a study conducted by Bickford (2015a) he states that while the focus of the BRT system is poverty alleviation, studies conducted indicate that these improvements are skewed towards middle income households and not low income commuters as intended. One of the primary factors is the price of the service that is unable to compete with the passenger rail service and the taxi industry over time. People with

higher spending capacities are more likely to use the system and congregate in areas like Diepkloof and Orlando to make use of the Rea Vaya (Bickford, 2015a).

4.6. Promote Infill Development and Densification

In order to alleviate poverty and increase the accessibility and mobility of the urban poor, one of the more pertinent strategies is to promote infill development and densification, allowing low income residents to move closer to the inner city. The aim is to develop liveable urban forms where motorised and non-motorised public transport systems are prioritised and people are brought closer to employment opportunities and services within Johannesburg (CoJ, 2011).

The project first began with the development of the Gautrain, in 2002, that has seen numerous exclusive developments emerge around stations and along Gautrain routes (GDRT Senior Managers, pers. comm. 7 August 2015; CoJ, 2013a). These developments have not only promoted densification along transport corridors but has promoted economic development in the region (Gautrain, 2015b). This objective is part of a long term plan that was initiated in order to meet current development goals within both Johannesburg and the broader Gauteng Region. These development goals include both economic, environmental and social development goals and were developed in order to address complex issues that exists in Johannesburg and Gauteng. Public transport development is complex and needs to utilise resources efficiently to meet long term economic, social and environmental challenges (GDRT Senior Managers, pers. comm. 7 August 2015). The Rea Vaya has embarked on the same strategy through the “Corridors of Freedom” project, first initiated in 2008. The project sought to re-stitch the urban form of Johannesburg and promote densification along transport corridors providing the necessary impetus to promote development and encourage residents to move closer to economic nodes in Johannesburg (CoJ, 2011; CoJ, 2013a).

Through the densification of areas surrounding transport corridors and the development of efficient and effective public transport systems, public transport

systems are able to capture the market and, in doing so, ensure that they are sustainable (GDRT, 2013; CoJ, 2013a). This strategy is based on the notion that densification can provide an appropriate number of users that can assist in maintaining and sustaining public transport systems (GDRT, 2013).

4.7. Public Transport Sustainability through Public Private Partnerships (PPP)

The development of public transport systems is costly and requires large amounts of capital, resources and passenger volumes to ensure that it is sustainable. The number of social and economic issues that exists and need to be addressed means that the development of public transport systems has to compete for funding and resources. The number of issues and the severity of these issues makes it extremely challenging to develop new public transport systems and sustain these systems (National Planning Commission, 2011).

In 2012 the estimated cost of the Gautrain was R29.2 billion with work in progress that would amount to R26 billion. The total cost associated with the Rea Vaya Phase 1A amounted to a total of R1.9 billion, with Phase 1B amounting to an estimated R1.8 billion and Phase 1C at an estimated R4.5 billion, making it extremely costly to develop and maintain (CoJ, 2013a). According to Senior Managers within the GDRT (pers. comm. 7 August 2015) loans taken out to develop the Gautrain have been granted in the form of dollars with the repayment rates finalised in dollars per month and year. Should the rand weaken the costs associated with the system will increase.

In order to mitigate the costs, the development of the Gautrain and Rea Vaya were facilitated through public private partnerships. The Gautrain was developed alongside the Bombela Concession Company who are part owners and operate the system (GDRT, 2013). The Rea Vaya followed the same funding model as the system is operated by the Rea Vaya business unit, PioTrans, a shared company. PioTrans was established as result of successful negotiations with 9 taxi operating

companies and is a shared company comprised of 316 private sector shareholders with a 66.7% stake in the Rea Vaya. The remaining 33% is owned by private stakeholders and the City of Johannesburg (Kumar, 2012).

These PPPs are necessary to ensure the sustainability of the infrastructure and reduce the risk imposed on government through the development of public transport infrastructure. New solutions need to constantly be developed, explored and tested in order to combat complex social and economic problems and ensure their sustainability.

4.8. Conclusion

Over the last two decades both local and provincial government have invested large amounts of capital and resources in the development of public transportation systems in the Johannesburg Metropolitan region. These investments were based on the inadequacies of state funded public transport systems and the lack of investments in public transport infrastructure, prior to 1994, which has led to the dominance of the taxi industry.

Investments in public transport systems have attempted to serve broad social, economic and environmental goals and objectives. These objectives include the alleviation of poverty, creating a model shift among private motor vehicle owners and promoting infill development and densification along transport corridors to promote economic development in Johannesburg and the broader Gauteng region.

The Gautrain and Rea Vaya were developed in order to meet these socio-economic goals and increase the accessibility and mobility of commuters in Johannesburg. The Gautrain has a limited network and future plans see the system moving westward. The Rea Vaya is currently in its initial phases but has an extensive network that will be developed over the next 20 years. This will see development move northward and westward towards low income communities.

While these developments are extensive, they have not been integrated limiting their efficacy. In addition, the Rea Vaya and Gautrain target different income groups and as such, not all investments made in the development of public transport systems benefit low income households who are in need of an affordable and reliable means of public transport.

The future development plans of the Gautrain that see the network extend to the west of Johannesburg will not be to the benefit of low income households located on the periphery. Rea Vaya is moving westward but this will only occur in the medium to long term future. This response limits the usage of the systems to low income residents located in the west, resulting in the taxi industry being only means of transport available to low income residents in the west of Johannesburg who need to access economic hubs in the north, south and east of Johannesburg. More importantly, the taxi industry has been the most responsive means of public transport in Johannesburg to date, as the network is extensive and dynamic and responds to urban and economic growth effectively. These challenges in the development of public transport systems call for a careful analysis into the factors that are impeding the ability of state funded public transport systems to respond to the needs of low income groups.

Chapter 5

Key Respondent Interviews and the Factors that Impede the Development of Responsive Public Transportation Systems

The purpose of this Chapter is to present the responses of the key respondents and discuss how public transportation systems are functioning. What are the factors impeding the development of a responsive public transportation system that is able to meet the needs of low income commuters in Johannesburg.

Key respondents were selected based on their knowledge and expertise in the field of transport development and planning. These respondents included Senior Managers within the Gauteng Department of Roads and Transport (GDRT), a Senior Manager within the Council for Scientific and Industrial Research (CSIR), Prof. Philip Harrison from the South African Chair on Spatial Analysis and City Planning, and Geoffrey Bickford from the South African Cities Network (SACN) who has conducted extensive research on public transport systems and urban development and growth in Johannesburg.

The responses documented in this chapter are based on questions posed to interviewees during the course of the interview. The same set of questions were presented to each respondent (see annexures) in order to derive competing explanations for the phenomena experienced in the development of public transport systems in Johannesburg. These questions took into account the current status of public transportation in Johannesburg, urban and economic growth trends in Johannesburg, the development of the Rea Vaya and Gautrain and their effectiveness and response to the needs of low income commuters. The chapter illustrates the challenges faced by each system in increasing the accessibility and mobility of low income residents.

5.1. The Location of Poor in Relation to Urban and Economic Growth in Johannesburg

The urban form of a city region is shaped by transport systems, as was seen in the early development of Johannesburg. Development occurred around the rail system, tram system and later by the construction of freeways to facilitate the movement of private motor vehicles. In the latter part of Johannesburg's development, land use planning and transport planning operated independently of each other creating a disjuncture between the two (Harrison, pers. comm., 24 August 2015). The lack of integration between land use planning and transport planning, as stated by all respondents, has led to urban sprawl and created a pattern of growth that is not inclusive, isolating low income residents and restricting their access to opportunities and services. According to the Senior Manager at the CSIR (pers. comm. 26 October 2015) and the Senior Managers at the GDRT (pers. comm. 7 August 2015) the urban form of Johannesburg has expanded so much so, that many of the services provided by government, including public transport, are out of reach to the urban poor, isolating them.

In the past, government departments worked in silos with no form of integration or cooperation which led to urban development in the absence of public transport and social amenities (GDRT Senior Managers, pers. comm. 7 August 2015). The Senior Managers at the GDRT (pers. comm. 7 August 2015) allude to the fact that post-apartheid housing schemes operated independently with no link between social housing schemes and transport departments. Government subsidised homes were developed on the periphery in the west of Johannesburg and outside the bounds of employment opportunities and social services, isolating low income individuals and limiting their access to employment opportunities. Social housing policies sought to provide low income individuals without access to homes but failed to take into account the long term impact of these schemes in the absence of public transport (GDRT Senior Managers, pers. comm. 7 August 2015).

All the respondents interviewed indicate that the growth of the city and lack of integration between where people are located and where business and economic

growth is occurring, is due to the lack of integration between land use planning and transport planning. This problem has led to a disjuncture between the two and the continuous uncontrolled expansion of the metropolitan region.

Harrison (pers. comm., 24 August 2015) states that opportunities are located throughout the Johannesburg Metropolitan region with too few options to access these locations. The taxi industry is the most dominant form of public transport in the region, as stated by all respondents, and will continue to be the dominant form of transport based on its ability to increase the accessibility and mobility of low income commuters in Johannesburg. Land use planning and transport planning need to be integrated and afford residents an effective and reliable means of public transport that is able to increase their accessibility and mobility throughout the region (Harrison, pers. comm., 24 August 2015).

The Senior Manager at the CSIR (pers. comm. 26 October 2015), Bickford (pers. comm. 18 August 2015b) and the Senior Managers at the GDRT (pers. comm. 7 August 2015) indicate that both provincial and local municipalities are working to align land use planning and transport planning. However, this requires long term planning and a strategic response to both land use planning and public transport development in the metropolitan region (GDRT Senior Managers, pers. comm. 7 August 2015). In order to address the problem provincial and local governments have opted to use the transport-orientated development (TOD) model in the development of the Gautrain and Rea Vaya (Bickford, pers. comm. 18 August 2015b).

5.2. Transport Sustainability and High Density Development

The TOD model is used in numerous countries around the world in order to address the challenge associated with urban sprawl and low density development. The model is used as a strategy to develop high density urban forms that are able to provide the numbers necessary to sustain public transport systems and ensure that patronage in these systems is increased (Bickford, pers. comm. 18 August 2015b). All

respondents interviewed state that the use of the TOD model is essential in bringing people closer to the city centre where opportunities and services are the greatest. Through the promotion of the TOD model, the expectation is that more people will use public transportation systems, economic development will increase and the densities needed to sustain public transportation systems will be provided (Bickford, pers. comm. 18 August 2015b).

The use of the TOD model is necessary in order to promote compaction and densification that is able to sustain public transportation systems (GDRT Senior Managers, pers. comm. 7 August 2015). According to the Senior Managers at the GDRT (pers. comm. 7 August 2015), low density developments seen in Johannesburg are unable to provide the necessary numbers to sustain public transportation systems. In addition to the low density development in Johannesburg, current perceptions regarding public transportation systems has deterred private motor vehicle owners from using public transportation systems (Bickford, pers. comm. 18 August 2015b). Bickford (pers. comm. 18 August 2015b), notes that perception is one of the strongest driving forces determining the use of public transport in Johannesburg and in numerous cities around the world. Should middle class individuals perceive that a system caters to the poor they will resist using the system (Bickford, pers. comm. 18 August 2015b). However, the development of an exclusive system increases its attractiveness and could be viewed as a pull factor for middle to high income commuters (GDRT Senior Managers, pers. comm. 7 August 2015).

In order to quell the problem, the Gautrain has been developed for middle to high income users. The development of the system seeks to alter perceptions of public transport in Gauteng and in doing so create a modal shift and increase patronage in state funded public transportation systems (GDRT Senior Managers, pers. comm. 7 August 2015). The Rea Vaya has been developed to be an all-inclusive system directed at the urban poor and commuters located in the south of Johannesburg. These systems aid in attracting users and promoting high density development

around public transport stations and corridors, but do serve to exclude certain groups (Bickford, pers. comm. 18 August 2015b).

5.3. Investments in Public Transportation Systems and Property Values

Studies conducted in recent years show that there exists a strong correlation between the development of public transport systems, like the BRT and Gautrain, and land value increases. This increase in property values is known to occur around stations particularly the Gautrain stations within Johannesburg. Through the development of the Rea Vaya system and the initiation of the Corridors of Freedom project, the expectation is that the same type of development will be seen around Rea Vaya stations. However, the Gautrain has given rise to exclusive developments that do not target low income residents and should this occur around Rea Vaya stations, the cost of properties might deter low income families from moving closer to the inner city. Similar results have been reported in Cape Town, as the development of the BRT has given rise to exclusive developments within the urban core. Provisions on the part of lower social groups have not been taken into consideration by private property developers (Bickford, pers. comm. 18 August 2015b).

Bickford (pers. comm. 18 August 2015b) argues that more research needs to be conducted in order to determine the full extent of these developments and how they will impact the urban poor in the future. Currently, little has been done to examine developments around BRT stations but as the network develops more research will need to be conducted to examine the effect of the development of the Rea Vaya on property prices (Bickford, pers. comm. 18 August 2015b). According to the Senior Manager at the CSIR (pers. comm. 26 October 2015) government needs to model these impacts and take into account social and economic effects of transport development. Currently, we do not conduct sufficient research into the development of public transportation systems but it is something that is important and needs to be considered prior to the development of public transport systems and plans (CSIR Senior Manager, pers. comm. 26 October 2015).

Other pitfalls associated with high density development have been documented in recent years. Studies conducted by the CSIR have revealed that high densities have resulted in high car ownership and car use throughout the city. This increase in car ownership can be seen in the north western region of Johannesburg, as congestion on the roads is high and the region lacks the necessary infrastructure to address the problem. Density in isolation creates numerous problems and needs to be re-examined (CSIR Senior Manager, pers. comm. 26 October 2015).

5.4. Dynamic Transport Modelling

The problems associated with high density development requires a different approach to public transport planning and development in Johannesburg. Harrison (pers. comm., 24 August 2015) states that current public transportation plans need to be strategic and connect commuters to both developed and emerging economic nodes through the development of a network that responds to the polycentric form of the region and increases the accessibility and mobility of commuters. The Senior Manager at the CSIR (pers. comm. 26 October 2015) reiterates the point made by Harrison and states that the models used by officials are not dynamic and fail to respond to changes in commuter patterns and urban form. A more dynamic model needs to be incorporated where cities like Amsterdam and Rotterdam can be studied. These regions have a polycentric form and have incorporated a transport model that is able to respond to changes in the urban form. A more dynamic network and public transport plan needs to be developed and implemented throughout the city region. The polycentricity of a metropolitan region is not problematic in the development of public transportation systems and needs to be re-examined. The question we need to raise with regard to public transport development in Johannesburg is whether “we are looking at transport development in a dynamic way or are we trying to redo what has been done before. In other words, recreate what was previously there before” (CSIR Senior Manager, pers. comm. 26 October 2015). Currently, we are not looking at the development of public transport systems in a way that can respond to the challenges faced by South African cities (Harrison, pers. comm., 24 August 2015).

An analysis of the Rea Vaya system in recent years reveals that the Rea Vaya is unable to reach the projected passenger volumes forecasted prior to its development (GDRT Senior Managers, pers. comm. 7 August 2015). The argument posed by Bickford (pers. comm. 18 August 2015b) is that the development of the Rea Vaya is still in its initial phases. The network first needs to be established and developed in order to provide a meaningful impact and attract users to the system. The complete network is extensive but needs to be completed and this takes time and money. Only once the development of the BRT reaches its final phases of development will one be able to assess its effectiveness (Bickford, pers. comm. 18 August 2015b). According to the Senior Manager at the CSIR (pers. comm. 26 October 2015) the proposed network of the Rea Vaya is one of the largest in the world and needs to be completed before we can ascertain its impact in increasing the accessibility and mobility of commuters.

The inclusion of an extensive public transport network, such as that of the Rea Vaya, is costly and requires capital and resources in order to develop a network that is able to reach every suburb and neighbourhood (Bickford, pers. comm. 18 August 2015b). The service offered by state funded public transportation systems is based on a fixed route system. Routes are assigned and developed with little to no degree of flexibility (CSIR Senior Manager, pers. comm. 26 October 2015). The informal taxi industry is dynamic and flexible and able to change its routes based on demand, which has led to their dominance in the region. Numerous attempts have been made on the part of government to incorporate the taxi industry in the development of integrated transport plans, as taxis are well suited to serve as feeder systems to transport people to Rea Vaya stations. However, the taxi industry is more than just a public transportation service, it is a business. The independence of the industry has led to a number of failed negotiations in the past. However, 9 taxi companies have agreed to cooperate with the CoJ and currently operate the Rea Vaya system (Bickford, pers. comm. 18 August 2015b).

Furthermore, the impact of public transportation systems cannot be evaluated in isolation. An analysis needs to be conducted with both old and new systems. Public

transportation systems need to be integrated and the sum of all its parts evaluated in order to gain an accurate understanding as to the impact of public transportation systems on the urban poor (Harrison, pers. comm., 24 August 2015). Provincial government is working towards the integration and coordination of public transportation systems in both Johannesburg and Gauteng. However, the integration of these systems is a long term plan and requires an evaluation of current and future transport developments and the total costs associated with the development and upgrading of public transport infrastructure (GDRT Senior Managers, pers. comm. 7 August 2015).

According to the Senior Manager at the CSIR (pers. comm. 26 October 2015) state funded public transport systems require capital and resources to develop and operate these systems. The funding of an extensive and highly subsidised system can only take place in economies of scale that are able to fund and maintain these systems. The difficulties associated with the costs of development and the operation of public transport systems can be seen in the funding of the Gautrain and Rea Vaya, as large proportions of the funding received is allocated through government subsidies (CSIR Senior Manager, pers. comm. 26 October 2015).

5.5. Costs associated with Investments in Public Transport

In recent years both the Gauteng Provincial Government and the CoJ have faced difficulties in recovering the costs of development and operational costs. The subsidy provided to each system is high and unsustainable at present (Harrison, pers. comm., 24 August 2015; CSIR Senior Manager, pers. comm. 26 October 2015). However, the Senior Manager at the CSIR (pers. comm. 26 October 2015) has revealed that while the Rea Vaya is only able to recover 40% of its costs through fares, public transport systems like the Metrobus only recover approximately 18% of their operational costs through fares.

The development and operation of public transport systems requires government funding. Economies of scale, as seen in Europe and America, are able to support the

development and operation of public transport systems. The development of public transportations systems occurs despite the low densities that exist in numerous countries abroad. The sustainability and cost recovery rate of public transportation systems abroad is based on the size of the economy that is able to subsidise the costs associated with development and operation of public transportation systems. In order to develop sustainable and effective public transportation systems, local and provincial governments need to consider the costs associated with the development of public transportation systems and ask to what extent they can afford to develop and operate public transportation systems and how this will influence the cost of fares in the future (CSIR Senior Manager, pers. comm. 26 October 2015).

However, Harrison (pers. comm., 24 August 2015), stresses the importance of affordable public transport in South African cities, given the high levels of inequality and poverty following South Africa's tumultuous past, and states that "the social benefits associated with the development of public transport systems should always outweigh the costs." The Senior Manager at the CSIR (pers. comm. 26 October 2015) reiterates this point and states that the costs associated with the development and operation of a public transportation system is important but the cost of doing nothing places enormous pressure on the city. "While residents may be dependent on cars and informal modes of transport at this present moment in time, there needs to be an alternative for people to use" (CSIR Senior Manager, pers. comm. 26 October 2015).

5.6. Trade-offs in the Development of Responsive Public Transport Systems

The primary focus of a transport system and plans need to increase the accessibility and mobility of commuters. Low income commuters who rely on the service every day, need a reliable and efficient system that is able to meet their needs and increase their accessibility throughout the city. The provision of public transportation systems in meeting the needs of low income commuters entails an affordable and reliable transportation system that is able to increase accessibility and mobility within the region (Harrison, pers. comm., 24 August 2015).

However, the development of public transport systems has to compete with a number of other issues that ensue in present day South Africa. These issues include healthcare, housing, education, social services and a number of other provisions made by government. This makes it extremely challenging to meet the needs of all users. Resources need to be used in a strategic manner that is able to address a number of development goals in the region (GDRT Senior Managers, pers. comm. 7 August 2015).

The development of public transport systems has a number of objectives and goals that need to be met to address social and economic challenges in both Johannesburg and Gauteng. The Gautrain was developed with two primary objectives. The first objective is to promote economic development in the region through the development of an economic corridor that is able to attract investors, link economic hubs in the Gauteng region and promote economic growth and densification. The second is to create a modal shift from car to public transport in the region by targeting middle class individuals who comprise the largest proportion of private motors cars owned (GDRT Senior Managers, pers. comm. 7 August 2015).

The development of the Rea Vaya differ from that of the Gautrain in that it was developed to provide low income residents in the south of Johannesburg with an affordable, efficient and reliable public transport service. The Rea Vaya, much like the Gautrain, is developing a transport corridor to promoting densification but their target markets differ. In addition, the Rea Vaya system was developed with the understanding that the municipalities would be able to recover the cost of development fully through the operation of the service. However, this has not occurred and has led to the subsidisation of the service through the local municipality's tax base. The outcome of this has had an influence on the fares associated with the system, as recent studies indicate that the system is skewed towards middle income commuters and not low income commuters as previously envisaged (Bickford, pers. comm. 18 August 2015b).

The Gautrain and Rea Vaya make use of a user pay financial model that seeks to recover operational and development costs through fares. This model limits the degree to which these systems are able to minimise the cost of fares, as both systems need to be sustainable. Currently, the GDRT and CoJ are cross subsidising the development and operational costs of the systems through their tax base (Bickford, pers. comm. 18 August 2015b). “The real question that remains is the extent to which provincial and local governments are able to continue to fund these systems and keep fares low, given that the Gautrain and Rea Vaya have plans to develop further” (Bickford, pers. comm. 18 August 2015b).

5.7. Conclusion

The development of public transport systems in Johannesburg is complex given the polycentric form of the region. The disjuncture between land use planning and transport has led to urban sprawl and the development of government subsidised homes on the western periphery of Johannesburg. These developments have led to the marginalisation of low income communities in the western periphery with no means of accessing opportunities and services.

In recent years local and provincial governments have responded to the challenge and have developed both the Gautrain and the Rea Vaya with the hope of integrating land use planning and transport planning. The aim has been to bring people closer to opportunities and services in the inner city through the development of transport corridors that are able to promote densification and infill development. However, the development of these systems have encountered a number of impediments that have limited the responsiveness of public transport systems to the needs of low income commuters.

Increases in property values experienced around the Gautrain stations serve to exclude low income residents. The same result is expected to occur around Rea

Vaya stations, however, the system is in its initial phase of development and more research needs to be conducted in future to evaluate the outcome of the project. Should the same result occur, low income residents will be deterred from moving into the inner city leading to the development of an extensive network that reaches all suburbs and neighbourhoods.

More importantly, the development of an extensive network is costly and requires capital and resources. The Gautrain and Rea Vaya make use of a user pays finance model with the aim of recovering these costs. However, none of these system have been able to recover their costs, which has led to the subsidisation of the systems. Questions have been raised as to the extent to which this will continue and how this will affect low income commuters in future.

In addition to the costs associate with development of public transport systems, the models are not dynamic and are unable to adapt to changes in urban and economic trends and changing commuter patterns. A more dynamic and flexible model is required that is able to meet the needs of low income commuters. Low income commuters require a public transportation system that is affordable and provides access to employment opportunities and services. In order to meet the needs of low income commuters more work needs to be done in the development of public transportation systems and an evaluation of the impacts of these systems on the urban poor.

Chapter 6

Analysis and Discussion

This chapter seeks to analyse the findings presented in previous chapters and present a critical understanding of the information presented. The chapter will explore the themes presented in each chapter and examine the differences and similarities between the data sources. The chapter seeks to understand whether the development of public transportation systems in Johannesburg is meeting the interests and needs of the urban poor and what needs to be done to address the challenges they currently face.

6.1. Accessibility and Mobility of the Urban Poor

Inadequate levels of accessibility and mobility are experienced globally. The lack of affordable and reliable means of public transport have resulted in inadequate levels of accessibility for the urban poor, primarily in developing countries. These inadequacies have led to a number of social challenges relating to unemployment and poverty.

People are divided along the lines of race and class in an environment dominated by the private motor vehicle. The private motor vehicle offers owners a high degree of mobility throughout a city providing them access to numerous opportunities and services. The urban poor are unable to afford to private motor vehicles and rely on public transport systems to facilitate their daily commute. However, current means of public transport in Johannesburg are unable to afford the urban poor with an equitable means of transport that is able to adapt to changes in urban and economic trends, settlement patterns and changing commuter patterns.

Over the last 60 years development has continued to occur in the northern suburbs and most recently the north western region of Johannesburg. These growth trends

have led to development of a polycentric urban and economic region with employment opportunities available throughout the metropolitan region and not within a single economic core.

The division between the north and south of Johannesburg continues to exist, however, these patterns have changed. The city is no longer divided between north and south but has numerous urban cores throughout the metropolitan region. Urban development in the west has occurred at a rapid rate with too few social amenities and government services. In addition, housing policies promulgated by the post-apartheid government saw the development of social housing schemes on the periphery of the metropolitan region, primarily the west of Johannesburg. These developments occurred in the absence of public transport systems and basic services, leaving residents with no means to access employment opportunities and services. The only means of public transport available to them is in the form of the informal taxi industry. A dynamic public transportation service that is not only their only means of public transport but the dominant form of public transport in the metropolitan region and South Africa as a whole.

International literature, as discussed in Chapter 2, suggests that informal modes of public transport are utilised in numerous developing countries around the world and provide an essential service to the urban poor. Informal modes of transport increase the accessibility and mobility of the urban poor in the absence of state funded public transport services. The inability of the state to provide an equitable means of public transport that is able to increase the accessibility and mobility of the urban poor gives rise to informal modes of transport that need to fill the gap.

Recent urban and economic growth trends have led to development of a polycentric urban and economic region with employment opportunities available throughout the metropolitan region. Polycentric urban regions are complex, in that development occurs in numerous locations around a city and not within a single node or region. The complexity of polycentric urban regions results in complex commuter patterns

and settlement patterns, as commuters need to access numerous locations around the city in order to access employment opportunities and services. International literature suggests that transport models need to be modified in order to provide access to these locations in order to increase their accessibility and mobility throughout the city. The national, provincial and local government recognises the complexity of the urban form of Johannesburg and the numerous locations that need to be accessed by the urban poor. However, the development of public transport plans fail to incorporate public transport models that are able to adapt to changes in commuters patterns and urban and economic growth trends.

6.2. Current Public Transportation Systems

In the past the dominant forms of public transportation were the bus and rail system. In recent years patronage of the bus and rail system accounts for a mere 8% of commuters in Johannesburg. No investments have been made in the development or expansion of the rail system making them ineffective and unresponsive to changes in urban and economic growth trends.

Despite the ability of a bus system to adapt to changes in urban and economic growth, the current bus system has failed to adapt and only operates on profitable routes, as stated in Chapter 4. The system is heavily subsidised but has failed to provide an effective and reliable service to commuters that is able to increase their accessibility and mobility throughout the metropolitan region. The inability of the bus system to adapt to changes in the urban form of Johannesburg has occurred despite the subsidies received from government to operate the system and provide an essential service. The bus system is only able to recover approximately 18% of its operational costs through fares, as discussed in Chapter 5.

The current rail and bus system are ineffective and unable to respond to changing commuter patterns and urban and economic growth trends due to its use of transport models created 20 years and the lack of investment in these systems, as stated by

the GDRT (2013) 25-Year Integrated Transport Master Plan. These inadequacies have led to the development of new public transport systems to fill the gap.

6.3. Public Transportation Development in Johannesburg

In the wake of South Africa's first democratic election, officials recognised the need for the development of public transport systems in ensuring that an equitable level of access and mobility is provided to citizens of South Africa. Transport development in Johannesburg and Gauteng followed these simple guidelines, based on international best practices for the development of public transportation systems. These guidelines correlate with recommendations made by the World Bank and UN Habitat for the development of public transportation systems to be used as a tool to increase accessibility and mobility. These guidelines include:

a) Linking land use planning and transport planning

b) Prevent urban sprawl through the development of transport corridors

c) Integrate public transportation systems and development new public transportation systems

d) Promote infill development through the development of transport corridors

e) Reduce carbon emissions by promoting the use of public transportation systems

f) Alleviate poverty and inequality by increasing the accessibility and mobility of the urban poor

These guidelines were used to guide the development of the Gautrain and Rea Vaya in 2002 and 2008 respectively. However the development of the Gautrain and Rea Vaya differ in their overall objectives. The Gautrain is geared towards middle and high income commuters while the Rea Vaya is geared towards low income commuters.

The Gautrain serves to develop an economic corridor and promote a modal shift in the region and encourage motor vehicle owners to use public transport. The system is exclusive and does not include low income commuters. Current proposals see the system developing westward but the development will not include the urban poor based on the costs associated with fares and their overall development objectives.

The Rea Vaya targets the urban poor and has plans to develop an extensive network in Johannesburg. Future developments will see the network develop to the north, south, east and west. However, developments in the west will only occur at a later point in time, leaving low income residents without a formal means of public transport for many years to come.

More importantly, the systems makes use of a user pay model that seeks to recover all the costs of development and operational costs through fares. The potential impact of this model will lead to an increase in fares that is unaffordable and excludes low income groups. Recent studies and key respondent interviews suggest that despite the Rea Vaya system being geared towards low income residents, the system is attracting middle income commuters. The limited accessibility offered to commuters by the Rea Vaya network, in its initial phases of development, have led to low passenger volumes and an inability of the system to recover its costs.

The guidelines used in the development of each system is selective and does not incorporate all of the guidelines, as recommended internationally for the alleviation of poverty and unemployment. International guidelines recommend the development of an affordable and efficient public transportation system that caters to the needs of the urban poor. The focus of public transport development should be geared towards increasing the accessibility and mobility of the urban poor. In order to accomplish this goal, a degree of subsidisation needs to provided, as stated by key respondents. The cost of doing nothing can only lead to a number of social, environmental and economic development problems in the future.

6.4. "We Cannot Judge a Single System but Rather Look at the Sum of All Systems as a Whole" (CSIR Senior Manager, pers. comm. 26 October 2015)

One of the overarching comments made during the course of the interviews conducted has been that people should not be over critical and judge a single system but rather judge the sum of all public transportation systems. Given that each system targets a different income group, it is possible to assess each system individually and determine whether the development of the system will provide a meaningful service to low income residents in the future. Future plans see the integration of public transportation systems but what will this entail given their differential priorities and target groups.

The bus system currently operates on the most profitable routes, the rail system has not been developed in over twenty years but remains the most affordable for low income commuters, the Gautrain is geared towards middle and high income commuters and the Rea Vaya targets low income commuters but has been skewed towards middle income users, according to recent studies.

The primary objective of a public transportation system is to increase the accessibility and mobility of commuters, particularly low income commuters, who rely on the public transport for their everyday needs. Only through the provision of an effective and reliable public transportation system that responds to changes in urban and economic growth patterns can low income residents gain access to employment opportunities and services. Given the facts presented, the only public transportation system that currently seeks to enhance the accessibility of low income residents is the Rea Vaya. Nevertheless, its limited network and coverage and the costs associated with its fares mean that it is unable to attract the very poor.

In order to address the problem, other options and models have been utilised. These options include the promotion of the TOD model in the development of both the Gautrain and the Rea Vaya.

6.5. The Compact City: What are the Possibilities?

Both the Gautrain and the Rea Vaya have promoted the TOD model in order to bring people closer to the inner city, closer to employment opportunities and services. The model, theoretically, produces a number of benefits for the poor. However, realistically the development of public transportation systems has led to the exclusion of low income residents, as exclusive property developments have taken place increasing property values around public transport stations and in surrounding areas, as discussed in Chapter 4. While this has only occurred around Gautrain stations, the Rea Vaya is only in its initial stages of development and could lead to the same outcome in the near future.

The phenomenon experienced in Johannesburg is not synonymous with Johannesburg and occurs globally, particularly around rail based public transportation systems, as discussed in Chapter 2. The findings relating to increases in property values are common and can be seen in numerous cities around the world. These challenges are unavoidable and need to be considered prior to the implementation of the TOD model when stipulating the aims and objectives of its use in a city, like Johannesburg, that is facing numerous social challenges relating to unemployment, poverty and inequality.

The use of the TOD, while attempting to create a just urban form has encountered a number of challenges relating to the exclusion of low income residents. These challenges and negative consequences have the ability to exclude the urban poor and prevent them from moving further northward towards employment opportunities and services in the future.

More importantly, in a metropolitan region that has a polycentric form with numerous urban and economic hubs, where are low income residents meant to move in order to be closer to their places of employ and in order to access public services? As

stated earlier, the Rea Vaya model is centred around the CBD and provides numerous points of access to the CBD but has a limited network and cannot facilitate the needs of commuters who wish to access economic hubs to the west of Johannesburg, at this moment in time. Low income and unemployed residents are located in the west and south of Johannesburg through segregationist policies of the past, state housing schemes in the post-apartheid era and the development of informal settlements and do not possess the means to move out of their present situation. The possibility of an increase in property values along transport corridors brings into question the manner in which they would be able to afford to move closer to the inner city centre. A more dynamic approach is required to address the problem.

6.6. A Dynamic Approach to Public Transport Development in Johannesburg

A new approach to the development of public transport systems needs to be employed to address the challenges facing the accessibility and mobility granted to the urban poor, one which involves the public in the decision making process. The adoption of a new approach is required to assist in providing the urban poor with a suitable and equitable solution to the challenges currently facing low income commuters that relates to accessibility and mobility.

Chapter 2 and 5 make reference to the use of a dynamic model that is able to facilitate the development of public transportation systems in regions synonymous with a polycentric urban form. The model proposes the strategic placement of public transport stations in developed and emerging economic nodes in order to facilitate the movement of people throughout the city region. Currently, the model being used in not dynamic fails to integrate complex and changing commuter patterns to urban and economic growth trends.

Figure 6.1 (below) was developed by the researcher based on Look for Work Trips based on Travel direction and Destination, as illustrated by the GCRO, and the

incorporation of the model proposed in chapter 2 by the UN Habitat (2013). The Figure allocates numerous stations around the metropolitan region in order to facilitate the movement of people from one economic or urban node to the next. Travel patterns have been incorporated along with an artificial core, as stated in Chapter 2, which is located in the Randburg CBD.

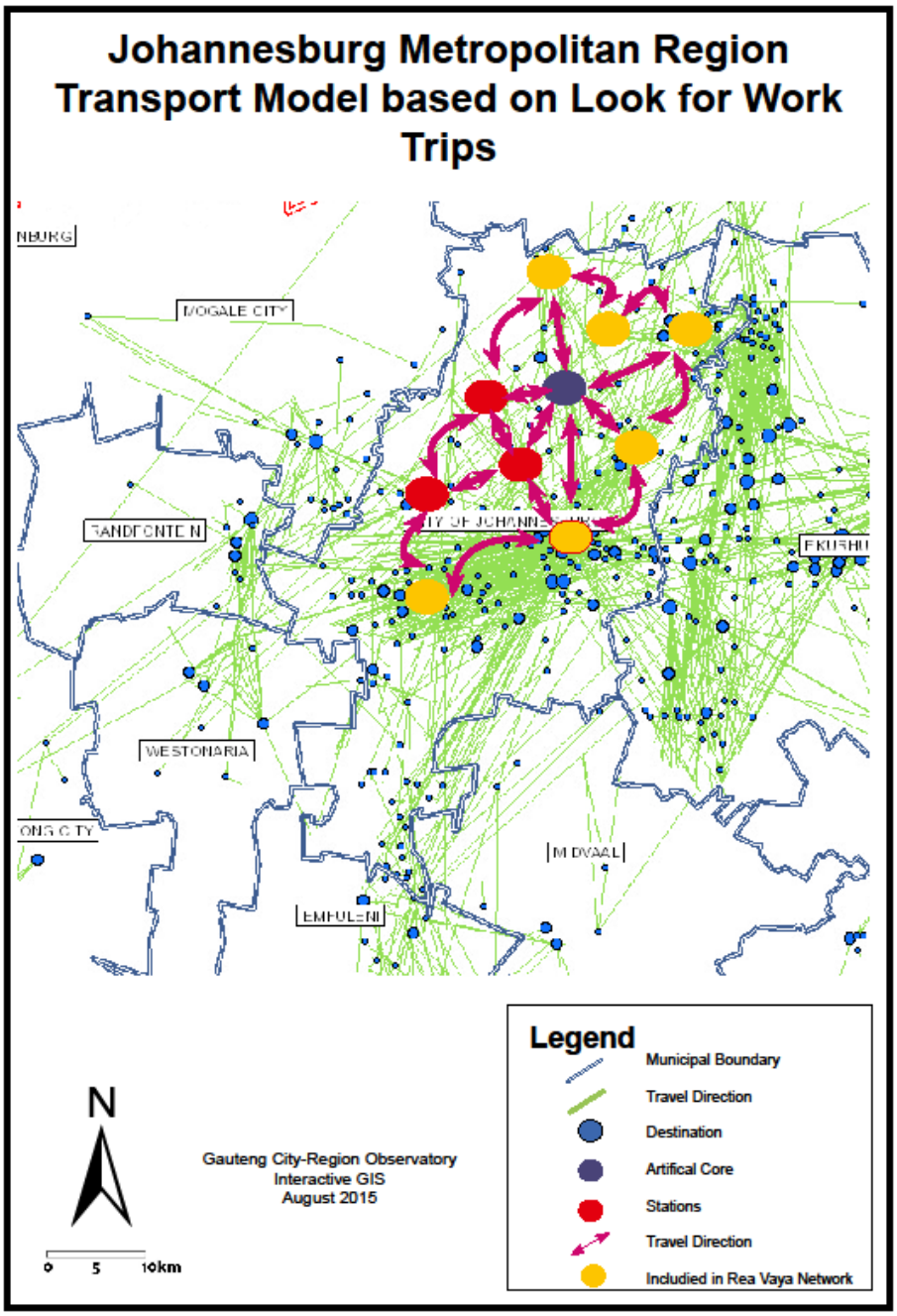


Figure 6.1: Adapted Transport Model based on Look for Work Trips in Johannesburg

Numerous nodes of the Rea Vaya 2037 proposed plan have been included and show that model does provide a degree of flexibility. However, nodes need to be included in the west, as illustrated in the Figure above, that are able to provide residents to the west with a reliable and efficient means of public transport. The model uses the Rea Vaya plan as a basis, based on the low costs associated with the development of the system when compared to that of the Gautrain, and its objective to increase the accessibility and mobility of low income residents.

Funding is a problem and will continue to hamper the development of public transportation systems in Johannesburg. However, as stated in chapter 5, the social benefits should always outweigh the costs and based on the differences in funding directed at the Gautrain, when compared to that of the Rea Vaya, the inability of the Rea Vaya to develop an extensive network needs to be questioned. The Rea Vaya operates on 15% of the total operational budget paid out to the Gautrain on an annual basis. This difference in costs needs to be re-examined and questions raised as to whether these costs can be directed towards other forms of public transport in the region that are able to provide an essential service.

A reliable and effective public transportation system needs to be provided, as it is a merit good and does aid in alleviating poverty by increasing an individual's accessibility to employment centres. The development and operational costs of public transportation systems should be subsidised by government, given the social challenges facing Johannesburg and South Africa as a whole. More importantly, the public needs to be consulted in order to assess the benefits and socio-economic impediments of public transportation development in Johannesburg. Key respondent interviews indicate that the manner in which plans are developed currently fails to assess the long term implications of public transport developments. Assessments need to be conducted and the inclusion of diverse groups of stakeholders in the development of public transport plans prior to the implementation of these systems. The low passenger volumes and the increases in property values associated with the

TOD model, as discussed in Chapter 4 and 5, are clear indications that the public has not been consulted in the development of these systems.

6.7. Public Participation in the Development of Public Transportation Systems

Public participation is a useful tool in tackling problems associated with the development of public transportation systems. Through the involvement of diverse stakeholders challenges and pitfalls can be dealt with and worked through, as argued in Chapter 2. The involvement of diverse stakeholder groups will ensure sufficient support by the public and promote the use of the system. The needs and interests of different groups can also be addressed and included in the development of public transportation systems, as the determination of routes and fares can be arranged so as to meet the needs of low income commuters. This form of citizen involvement can ensure the sustainability and effectiveness of the system that can benefit both commuters and government in time to come.

6.8. Conclusion

The development of public transport systems is used as a tool to alleviate poverty and inequality throughout the world. Public transportation systems accomplish this by increasing the accessibility and mobility of the urban poor throughout a city region. In recent years national, provincial and local governments in South Africa have paid considerable attention to the benefits of public transport systems, which has led to the development of the Gautrain and Rea Vaya.

These systems target different markets and have different priorities. There are similarities in the overall objectives of the systems but these similarities have been seen to exclude low income residents. The Rea Vaya is a low cost project compared to the Gautrain and has the ability to provide a meaningful service in future. However, the system is currently skewed towards middle income commuters and

due to the limited network is unable to increase the accessibility and mobility of the urban poor in the west of Johannesburg at this moment in time.

The two systems also make use of a user pays finance model that seeks to recover all operational and development costs fully. The use of the model has the potential to exclude low income residents in the future, as an increase in costs associated with the systems could lead to an increase in fares that are unaffordable and deter low income commuters.

Low income commuters in the west currently have very few formal means of transport and have limited access to opportunities and services. The development of the two systems will see them provide residents with a suitable means of transport in the future. However, the models used are neither flexible nor dynamic and cannot cope with changes in commuter patterns or urban and economic growth trends. In addition, the use of the TOD model to bring people closer and minimise the complexity associated with the development of public transport systems has led to the development of exclusive property developments along Gautrain routes. These developments serve to exclude the urban poor, and while the Rea Vaya has not attracted the same interest, there is a possibility that property developments around Rea Vaya stations might yield the same results in time to come. In light of these developments, the development of public transport systems does not meet the interests and needs of the urban poor.

Chapter 7

Conclusion

This study sought to examine the extent to which public transportations systems are responding to the growth of new economic nodes in the Johannesburg in a manner that supports the interests and needs of the city's low income residents. The study took into account the modes of public transport that need be put in place and how they can assist in ensuring urban and economic growth patterns positively impact the urban poor, incorporating changes in settlement patterns, economic activity and changing commuter patterns. In order to address the research question the study looked at the current and future urban and economic growth trends and spatial patterns in Johannesburg and how the state's public transport plans are responding to these trends. More importantly, the study examined the factors that impede the provision of public transport systems that respond effectively to the needs of low income commuters.

These themes were discussed through a careful examination of international best practices, the use of spatial maps and policies to examine urban and economic trends, policies and spatial maps to determine the states future public transport plans and, through the use of interviews, the impediments of these plans that prevent it from meeting the interests and needs of the urban poor.

7.1. The Impact of Public Transportation Development on the Urban Poor

Public transportation systems are a merit good and are essential in the day to day lives of those who rely on public transportation systems for their daily commute. In metropolitan region dominated by the private motor vehicle, providing users with a high degree of mobility, low income commuters need an effective and reliable public transport system that is able to increase their accessibility and mobility throughout the city region.

Public transportation systems are used as a tool to address challenges associated with poverty and unemployment, as it allows the unemployed to access opportunities and services. The development of an efficient and reliable public transportation system increases the likelihood of an individual acquiring and maintaining a job by increasing their access to opportunities.

In light of the benefits associated with the development of public transportation systems, numerous countries around the world have invested in the development of public transportation systems. Over the last decade Johannesburg has invested in two new public transportation systems including, the Rea Vaya and the Gautrain, in order to address the challenges currently facing metropolitan region, regarding the accessibility and mobility of the urban poor.

7.2. Inadequacies of Public Transportation Systems in Johannesburg

Public transportation systems in Johannesburg are neither integrated nor aligned and offer differential services to commuters. Bus companies are aligned to the metropolitan municipality and operate on profitable routes developed over twenty years ago. Much like the bus system, the rail system has not been developed in over twenty years but does provide low income residents in Soweto with a link to the Johannesburg CBD. These public transportation systems have failed to respond to changing commuter patterns and urban and economic growth in the metropolitan region.

The inadequacies of state funded public transportation systems have led to the dominance of the informal taxi industry which provides a meaningful service to low income households, particularly those in the west of Johannesburg. The taxi industry is the most responsive public transportation service in Johannesburg and South Africa as a whole. The transport model used by the taxi industry is flexible and continuously adapts to changes in urban and economic growth trends. The dynamic service offered to commuters is unmatched with no equal.

7.3. Public Transportation Development in Johannesburg

In 2002 the Gautrain, a high speed rail system, was developed through a joint venture. The system serves to stimulate economic development, connect economic nodes in the broader Gauteng region and attract middle to high income users to public transportation systems. The system is one of a kind in South Africa but the service provided is exclusive and excludes low income commuters through costly fares and limited routes. The Gautrain was developed to address a broader development objective in Gauteng and in doing so promote the use of public transportation by middle and high income users and develop an economic corridor in the broader Gauteng region. The strategy has been efficient and has seen a number of private motor vehicle owners make use of the system. This strategy might be viewed as exclusionary but given the number of development goals within Gauteng and Johannesburg, the system has reached its objectives in promoting economic development and densification along the economic corridor. The system is a success and while it might exclude low income commuters, the overall objectives of the system has the potential to benefit low income households in Johannesburg and the broader Gauteng region.

The Rea Vaya BRT system, first developed in 2007, was developed in order to provide a reliable and efficient public transportation system to low income commuters that is able to increase their accessibility and mobility. The system targets low income commuters but studies in recent years reveal that the system attracts middle income commuters and not low income commuters as intended. The system, in its current phases of development, is limited and is unable to provide users with a diverse network that allows them to access numerous economic and urban nodes in the metropolitan region, particularly those located in the west of Johannesburg.

Johannesburg is a polycentric region and requires a more dynamic model that integrates developed and emerging economic nodes in a manner that can increase

the accessibility and mobility of the urban poor. The development of a public transport systems in Johannesburg is complex and requires long term planning and resources. Numerous factors need to be considered and evaluated in terms of cost and changes in urban and economic growth trends. The Gautrain and Rea Vaya are currently in their development stages and it will take a long time before they can provide low income commuters, particularly those in the west with an essential service.

7.4. Dynamic Transport Modelling

Commuter patterns in polycentric urban regions are complex and require numerous stations that need to be placed strategically in order to facilitate the needs of commuters and increase their accessibility and mobility to employment opportunities and services. The Rea Vaya incorporates many of the economic nodes in Johannesburg but promotes limited accessibility in emerging economic nodes. More nodes need to be incorporated into the transport model in order to address the current challenges facing commuters with regard to accessibility and mobility in Johannesburg.

The use of a dynamic and extensive model is costly but the social benefits need to outweigh the costs. The development of a BRT system is significantly cheaper than that of rail based systems and can reduce the costs associated with the development of an extensive network. The model needs to be developed further, as other public transport development strategies, such as the use of the TOD model, have failed to yield their intended benefits.

7.5. Long Term Planning and Development

In light of the current challenges experienced, key respondents state that these challenges have occurred in the initial phases of the development of public transport systems in Johannesburg. Public transport development is a long term commitment and requires time and patience in order to yield its intended benefits. The benefits of

public transport development are intergenerational and while they may not yield benefits for the current generation, the next generation will benefit from these developments. People need to be aware of the long term benefits and avoid scrutinising public transport systems or plans in their initial stages.

The urban poor located in the west of Johannesburg may not have an equitable means of public transport at the moment but the development of the proposed Rea Vaya development plan sees the system extend to the west in years to come. Furthermore, provincial and local governments have been working to develop an integrated transport plan to link the various public transport systems in Gauteng. Should the systems be linked in future, the Gautrain may provide the urban poor with an essential service. However, before this can happen, the systems need to be linked and the development of the Gautrain and Rea Vaya need to be completed before assessing their impact on the urban poor.

7.6. Recommendations

1. Expand current bus operating models in order to provide the urban poor in the west of Johannesburg with an equitable means of public transport. The development of these systems needs to act as temporary solution while the Rea Vaya develops
2. Provide the informal taxi industry with the necessary infrastructure to operate in the west of Johannesburg. Currently, the taxi industry is the only form of public transport available to residents located in informal settlements in the west. Local government needs to provide the industry with the infrastructure necessary to continue to operate in these regions and provide these residents with an essential service
3. Integrate the Rea Vaya and Gautrain and provide a level of subsidisation that is able to lower fares and attract low income users to these systems. The subsidisation of public transport systems is a global phenomenon and needs to be provided. A user pay finance model that influences fares structures deters low income commuters who rely on public transport to facilitate their daily commute

4. Promote public participation in the development of public transportation plans in order to adjust fares and routes more effectively in a manner that meets the needs and interests of the urban poor and responds to changes in commuter patterns and settlement patterns
5. Provide greater access to information that ensures that residents are aware of the long term goals of public transportation systems in order to generate support and understanding amongst the public
6. Monitor and evaluate the effectiveness of the Rea Vaya and Gautrain and make adjustments, where applicable. Johannesburg is complex and has experienced rapid urban growth in recent years. These trends need to be monitored and plans adjusted during the course of development. The proposed development of the Rea Vaya sees the complete system develop in 2037. Numerous changes can occur during this time and these changes need to be included in the development of the system.

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Annexures

PARTICIPANT INFORMATION SHEET

The Responsiveness of Public Transport Systems to Urban Development in the West of Johannesburg

Greetings

My name is Lyle Brice Prim and I am currently a full time student studying towards a Master of Science (MSc) in the field of Development Planning in the School of Architecture and Planning (SOAP) at the University of Witwatersrand. I am currently investigating the extent to which current and future public transport development plans are responding to recent patterns of urban growth, particularly to the west of Johannesburg. My focus lies in exploring whether public transport plans will contribute towards empowering citizens by increasing their accessibility to economic opportunities in these new nodes. This research project seeks to build on recent studies conducted within Johannesburg regarding transportation systems and development. This is terms of where growth is occurring in Johannesburg and how transport systems and policy have responded to this growth. In this regard, the research will illustrate their implications with regard to accessibility in the Johannesburg metropolitan area and how they affect commuters both wealthy and poor through the development of spatial policies and transport policy.

I am inviting you to be part of the study through an interview process. The interview will take no longer than 30min to an hour of your time. The place and time of the interview will be decided upon by you, the interviewee, depending on your availability. During the course of the interview you will be asked questions regarding your perception of the current transport system, how it respond to changes in the built environment and how you perceive government's direction on spatial policy and transport planning within Johannesburg. The interview will be recorded using an audio recorder and hand written notes.

You have been selected to participate in this study due to your expertise within the planning and transport fields and your knowledge of spatial policy and patterns within Johannesburg. Your participation is voluntary, you may refuse to answer any questions that make you uncomfortable, and you may withdraw at any time without penalty or loss. You will receive no payment or other incentives for your participation.

Your participation will be completely anonymous and you will not be personally identified in the final report. You will be referred to as a researcher or a specialist in the field of planning, transport studies and urban studies. However, your organisation may be identified, given its role and standing. The results of the interview and your personal views will not be linked to you in the final report. In the event that I use direct quotations from this interview, please note that your identity will not be revealed. Any comments that you make that you deem "off the record" or similar, will not

be quoted. Further, any information that you share will be kept confidential and can only be accessed by me on a password protected computer. There are also no foreseeable risks associated with your participation.

The research undertaken is solely for academic purposes and once completed will be available electronically and can be accessed publicly.

If you have any questions, concerns, or comments or if you would like a copy of the final report, please feel free to contact me at 0607159W@wits.ac.za or my supervisor, Ms Amanda Williamson at amanda.williamson@wits.ac.za or 011-717-7713.

_____.

Lyle Prim
MSc DP Student: University of the Witwatersrand, Johannesburg

FORMAL (SIGNED) CONSENT FORM

I hereby confirm that I have been informed by the student researcher of the purpose, procedures, and my rights as a participant. I have received, read and understand the written participant information sheet. I have also been informed of:

- ☐ the nature of my participation in the form of an interview
- ☐ the reasons for why I was selected to participate in the study
- ☐ the voluntary nature, refusal to answer, and withdrawing from the study
- ☐ no payment or incentives
- ☐ no loss of benefits or risks
- ☐ anonymity
- ☐ confidentiality
- ☐ how the research findings will be disseminated

I therefore agree to participate in this study by taking part in the interview process

I AGREE / DO NOT AGREE to an audio-recorded interview.

_____ _____

Signature Date

Interview Questions

1. What is defined by Public Transport?
2. What are the future plans for transport development in Johannesburg, and what guides/informs them?
    a. Can we please start with the BRT (Rea Vaya) and their development plans and then move on to the Gautrain
    b. What are your comments in terms of appropriateness, feasibility and accessibility of the systems?
3. What is the tension between the economic imperatives of Gautrain, and equity imperatives of BRT and what this mean for both integrated, sustainable and transformative transport planning, and restructuring urban form.
4. Do they address changes in Johannesburg's spatial form, given the growth experienced in the west of Johannesburg?
5. How do you perceive these changes with regard to accessibility for low income residents?
6. Do these developments provide a satisfactory means of access to opportunities in Johannesburg?
7. What are the alternatives that are being used by low income residents?
8. How are informal modes of transport, such as taxis, being incorporated into transport plans?
9. Are non-motorised options a possibility?
10. What do you propose should occur with regard to transport development in order to develop an inclusive system?
11. What are the most feasible/sustainable options given the high costs associated with transport development?
12. How are transport systems contributing to restructuring the metropolitan area in a positive/constructive manner (e.g. compact development along corridors/nodes, and polycentricity)

13. Are they exacerbating the situation (unsustainable sprawl, fragmentation, isolation, dual systems for rich and poor, etc.)?