ASSESSING THE ROLE OF PUBLIC TRANSPORT-ORIENTED DEVELOPMENT IN PROMOTING INVESTMENT: THE CASE OF JOHANNESBURG'S REA VAYA AND THE LOUIS BOTHA CORRIDOR OF FREEDOM

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by

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Declaration

I, the undersigned, Zinhle Ngidi, hereby declare that this research is my own work. It is being submitted in partial fulfilment of the requirements for the degree of Master of Commerce (Applied Development Economics) at the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination in this or any other university.

I further declare that:

I am aware that plagiarism (the use of someone else's work without their permission and/or without acknowledging the original source) is wrong.

I have followed the required conventions in referencing the thoughts and ideas of others. I understand that the University of the Witwatersrand may take disciplinary action against me if there is a belief that this is not my own unaided work or that I have failed to acknowledge the source of the ideas or words in my writing.

Signed at _Johannesburg_____on this_23rd__day of _September_____2019

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Signature

Abstract

Transit Oriented Development (TOD) in practice dates back to the 1880s. The definition and concept were more recently coined by urban practitioner, Peter Calthorpe in the 1980s. The concept has evolved over time, however, the fundamentals remain universally accepted. TOD is a multidisciplinary tool that can be used for the achievement of social, economic and environmental benefits. It has been observed that the popularity of TOD as an urban transformation tool has increased internationally. The outcomes on the other hand have been varied depending on the unique features of the location where it is implemented. Johannesburg is one of South Africa's pilot metropolitan areas for TOD. The Corridors of Freedom (CoF) initiative among other things aims to crowd in private sector investment into areas that are in much need of urban renewal. This paper probes the progress that has been made in achieving private sector investment in property development in the CoF between 2013 and 2017. Theories incorporating geographic and economic thought aid the contextualisation of TOD within the greater body of work within the field of development. Results show that there is private participation in the development of high-density, mixed use buildings. It is however argued that developments that have taken place so far rely heavily on the principles of property development as opposed to TOD principles.

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1. Introduction

South Africa has a dark history of racial segregation and injustices against black people which have shaped many of the physical, economic and social attributes of the country to this day. In order to bring about redress, the City of Johannesburg (CoJ) announced a plan in 2013 for the urban revitalisation of some of the areas where the effects of apartheid spatial planning are stil evident. These areas are called Corridors of Freedom (CoF) and the initial development areas are the Empire-Perth Corridor, Turffontein Corridor and the Louis Botha Corridor. The Louis Botha Corridor will be the subject of this study. The CoJ's development plan for the CoF is the creation of mixed-use development nodes which have mixed income residential units, high density residential accommodation, commercial buildings as well as facilities for education, health, leisure and recreation (City of Johannesburg, 2018a). Not only are these projects aimed at bringing about social cohesion, they are also expected to create areas with high density, mixed-use properties and to bring about economic opportunities within proximity to the residents. This method of urban planning has come to be known as Transit Oriented Development (TOD). TOD is a multidisciplinary method for urban design and research on the topic spans various areas of specialisation.

Johannesburg's Rea Vaya Bus Rapid Transit (BRT) system is expected to be the backbone of the transit corridors. It is anticipated that the Rea Vaya will be the life line of the transit corridors, providing an accessible and reliable service for mobility along the corridors. Global BRT (2018) defines a bus corridor as a section of road with a minimum distance of three kilometres which has lanes that are exclusively reserved for use by a chosen bus service or services. The Rea Vaya's system embodies common features of transit corridors globally in that it has a dedicated bus lane with signal priority at traffic lights, there are designated platforms for boarding and it has visible branding which is displayed on the buses and the stations. The Wits School of Architectural Planning (in collaboration with other partners including the CoJ) was involved in an extensive study along the CoF which included collecting data over a period of 18 months and conducting 1 200 interviews with different stakeholders along the routes. They have since released a series of studies that cover international case studies, the demographic make-up of the CoF and conditions of work and life along the CoF among others. Although the studies are extensive, the focus on the outcomes of TOD is narrow. This can be attributed partly to the fact that the studies were conducted in the first 3 years of the concept being launched therefore the potential to measure outcomes was limited.

Nonetheless, one of the studies found that there was a small number of new developments in the Louis Botha Corridor as a result of the CoF initiative, particularly in the Orange Grove precinct. However, the scale at the time did not warrant further analysis (Harrison, 2016). City officials also revealed that there is a growing interest in the development of affordable housing in the area. There are currently incentives in place that are meant to drive private sector partnership in developing selected areas in the city.

The layout of the paper is as follows. The first section provides a historical background into South Africa's urban development process. This section highlights the historical events which shaped spatial planning in South Africa, focusing not only on the policies of the apartheid era, but tracing it back to its distant colonial origins. This is viewed as key to contextualising the modern configuration of geographic spaces not only in Johannesburg but in South Africa more generally. An overview of TOD literature is done next, incorporating international experiences, South Africa's Gautrain case study and the obstacles that are associated with TOD. The last section then provides analysis of the information gathered from the CoJ. This is presented under findings and analysis based on information compiled by the municipality's Transformation and Spatial Planning division with data presented from 2013 to 2017. It is concluded that although there has been an increase in the applications for town planning in the Louis Botha corridor and early indications show that developers are building mixed use buildings, it cannot be said definitively that TOD is causing this demand. The Louis Botha corridor has many characteristics that make it an attractive investment area for private developers.

2. Research question

1) The study aims to ascertain whether there has been an increase in the volumes of property development in the Louis Botha corridor from 2013 onwards. Of particular interest is the demand for property development by private developers. The city continues to invest in transport infrastructure, transport, bulk infrastructure and other developments within the CoF with the aim of preparing for development and crowding in private participation.

2) The study seeks to learn whether the composition of developments is changing in accordance with the CoJ's plans of developing high density, mixed use and mixed income buildings. The two research questions will be answered through the analysis of various records kept by the CoJ. The aim is to add to the limited base of outcome assessments that are focused on the CoF.

3. Study approach

3.1. Hypothesis

International case studies indicate that TOD can result in changes in land use around transit corridors. In the first instance, the study predicts that a positive change will be seen in the amount (quantity) of properties being developed along the Louis Botha corridor. The availability of a reliable transport system that allows ease of transit access into an area and investment in urban development by government are elements that have the potential to crowd in demand for private developments. Secondly, government incentives seek to reduce the costs of developing property and are aimed at stimulating specific types of developments. This is expected to therefore contribute to a change in the composition of property along the Louis Botha corridor in line with government's envisaged mixed-use properties for residential and commercial purposes, mixed income residential units and high density structures.

3.2. Research methodology

The study is based on desktop research and information gathered from the municipality's City Transformation and Spatial Planning division. The research in terms of the stated objectives is focused on private developments and the trends in these developments since the announcement about the CoF initiative. A case study approach is used focusing on the Louis Botha corridor. Information was gathered through meetings with relevant officials at the municipality who provided background information and access to relevant documents and datasets. Information gathered concerned town planning applications, current property developments and the city's incentive schemes. It has been analysed and presented under the findings and analysis section. Examples of aspects analysed include the trends in town planning applications between 2007 and 2017, current property developments in the CoF, the available as well as proposed development incentives and types of developments taking place in the corridor of interest. The findings that are reported are based on extensive review of available literature and secondary data from the CoJ. Data from 2007 to 2017 has been analysed, providing comparative data in order to establish whether the development trends in the five years prior to the announcement of the initiative were different to what has been recorded after 2013.

Rather than defining the physical characteristics of the Louis Botha corridor which is the basis of many studies done so far, this paper seeks to add to the accumulation of a repository of

studies focusing on development outcomes. The outcomes that the study seeks to unveil are whether there has been property development in the corridor, whether the development is attributed to the CoF initiative and whether it is in line with the city's mixed land-use goals? This approach Belzer and Autler (2002) argue is a more effective way of measuring success rather than simply looking at whether elements of a project have been built or not. One of the key objectives of the CoF initiative is the creation of densely populated areas that have vibrant commercial areas and basic social services within close proximity of the residential areas. The city plans to attract private developers to invest in multi income residential property and commercial developments within the CoF. These elements will be discussed under the findings section.

The case study approach which is the method used in this study is the most popularly used in research on the topic. International case studies support the use of transit development as a mechanism for urban development. The repository of international TOD studies comprises many years of academic and institutional research conducted about specific neighbourhoods within cities globally, but studies on the CoF have been limited to the areas of transport studies and town planning which is usually within Engineering departments. Published work on the CoF in South Africa is more recent covering Transportation Economics (Venter, 2016; Seftel and Peterson, 2014), regional transformation (Ballard, Dittgen, Harrison and Todes, 2017), Engineering and Built Environment (Ndebele and Ogra, 2014; Harrison, 2016; Croese, 2016 and Kollamparambil, 2016).

3.3. Limitations of the study

3.3.1. Use of secondary information. The use of secondary information presented a challenge in that it was not tailored to the needs of the study. There was a vast amount of information that had to be filtered in order to answer the research questions and meet the objectives of the study. Trend analysis conducted by the Transformation and Spatial Planning team looked at volumes of town planning applications between 2007 and 2017 with no distinction on what types of developments the applications were for. Consolidated information on the developments that are taking place in the corridor was obtained. The absence of set requirements for the report and a change in staff members working on the list resulted in differences in the details contained in the report. As a result inferences on the types of developments that are taking place in the Louis Botha corridor were based on information from one year, 2016 in accordance to available information.

3.3.2. Lack of control over the quality of information received. Efforts were made to ensure that the information is as accurate and complete as possible. The graphs presented in the findings and analysis section were obtained from the City Transformation and Spatial Planning division.

4. Theoretical framework

4.1. Spatial Economics

One of the fundamental pursuits of economic thought is the allocation of scarce, finite resources towards the satisfaction of infinite human needs. In spatial economics, allocation is viewed in the context of space and positioning of economic activity. It is concerned with explaining how the distribution of wealth and people interact with location, land and transport. Space or distance has the power to shape economic behaviour. The principles that underpin spatial economics are 1) location and 2) the cost of transportation which influences the movement of people, goods and services (Rietveld, 1994). Theories such as New Economic Geography (NEG) which was developed in the 1990s are a result of the re-recognition by Economists of the importance of Geography in economic analysis (Clinch and O'Neill, 2007). NEG in its simplest form seeks to understand the phenomenon of inequality in spatial development (Garretsen and Martin, 2010). Early contributions on NEG were made by Krugman (1991) and later expanded on by other authors. The rise of globalisation and the importance of strategic regional ties are among the manifestations that have resulted in the re-awakening of Economics to the importance of geographical analysis in recent times. NEG has been the subject of much criticism particularly by Geographers who question whether the mathematical calculations that are used by Economists adequately express factors such as culture, institutional and social settings which are elements of geographical settings (Garretsen and Martin, 2010). Notwithstanding this, NEG and its extensions fall under the broader area of spatial economics.

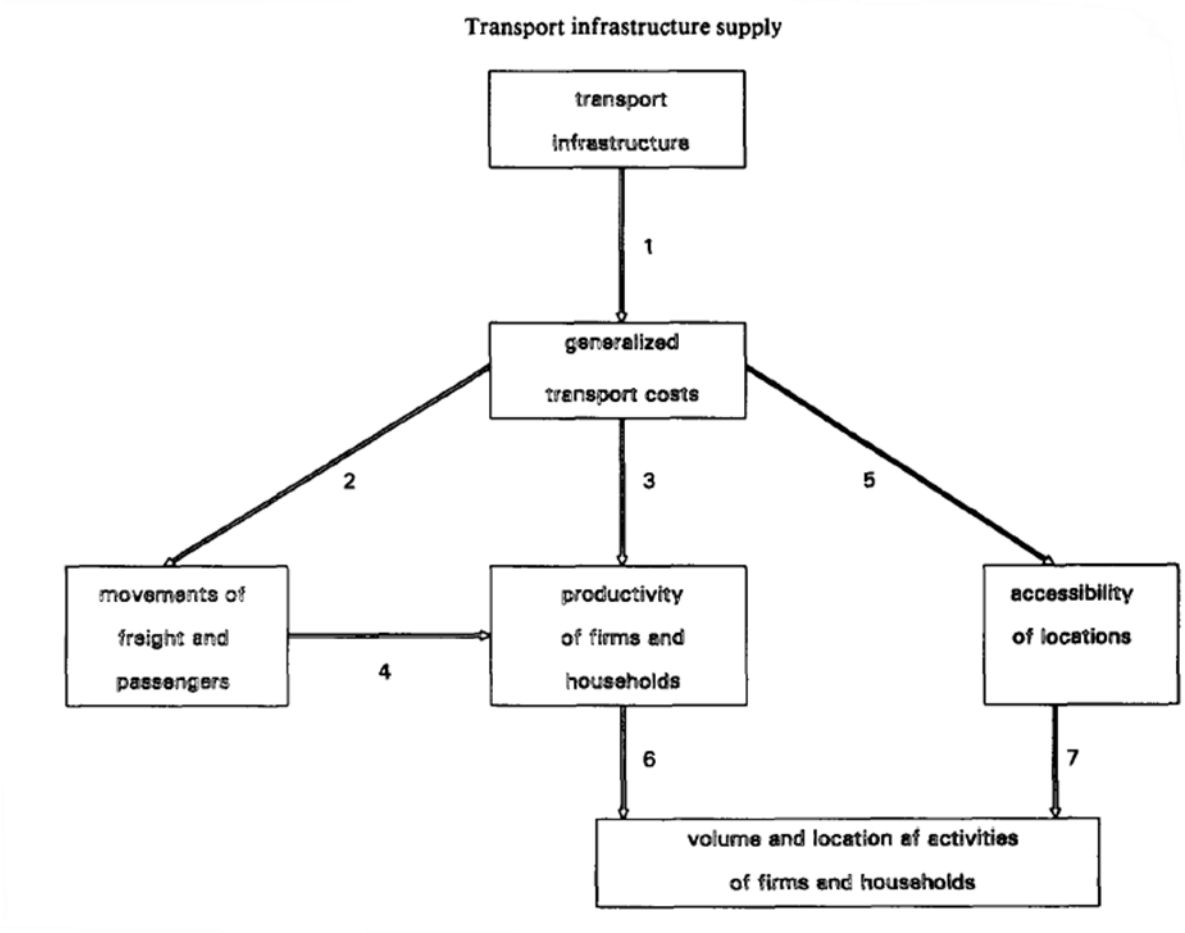
4.1.1. Spatial economic effects of the availability of transport

With the growing interest in TOD, different disciplines in academia and professional practice apply different yard sticks to determine the effectiveness of this policy tool. Since the late 1980s, various studies have been done to ascertain the relationship between transport infrastructure and economic performance (Melo, Graham and Brage-Ardao, 2013). A study of

the spatial economic changes that come about through the development of transport infrastructure is an approach that is used in Economics and Transport Planning, commonly in instances where the project is in operation. Another, more commonly used approach in Transport Planning is cost benefit analysis. Spatial economic analysis looks at the changes in economic productivity and relocation behaviour following the introduction or improvement of transit systems in an area (Rietveld, 1994). The main premise of this theory is that the availability of efficient transit systems results in general cost savings for commuters through lower transport costs and there is improved accessibly to areas which were otherwise not easy to reach.

The relationship between transport infrastructure and the spatial economy can be viewed in two ways. 1) The reduction in transport costs leads to savings in fuel, vehicle maintenance and other costs due to people travelling shorter distances at a constant speed with a reduction in traffic congestion. 2) Productivity improves as transport behaviour changes for the better in a specific region. Research on effects of transport infrastructure on productivity has produced varied results, however, the results tend to indicate more positive effects on regional economic growth through roads relative to other modes of transport (Melo, Graham and Brage-Ardao, 2013; Li, Wen and Jiang, 2017). On the commercial side this can entail improved delivery frequencies, savings on transport related capital costs and access to other markets with ease. For individuals it can mean access to places of work with ease and the ability to access other employment markets that were previously difficult to reach. Overall expansion in regional labour markets can be a possibility as people living in the region can easily travel to places of employment and the ease of accessibility of the region can result in the expansion of economic activity or population (Rietveld, 1994). A similar view is expressed by other authors who illustrate the interdependence of transportation and the urban form. Higgins and Kanaroglou (2018) do this by recognising that improvements to transport infrastructure impact accessibility positively, that in turn shapes land use, changes in land use facilitate different travel patterns which ultimately have an influence on the transport infrastructure requirements going forward.

Figure 1: Benefits from improved transport infrastructure



Source: Rietveld (1994)

Rietveld uses a graphical illustration to demonstrate the flow of benefit from the availability of improved transport infrastructure and services. Of importance in Figure 1 above is flows 6 and 7 which illustrate that with the availability of quality transportation infrastructure, ultimately productivity of both firms and households improves which may result in an increase in economic activity and relocation of the population into these areas (Rietveld, 1994). This method is of relevance to this study due to its focus on the impact of transit related developments on spatial reconfiguration. In essence, spatial economic analysis is an investigation into the externalities (be it spatial, economic or otherwise) that result from the introduction or improvement of transit systems. It is a common impact study tool and can also be used to conduct initial assessments of the existing state of affairs to determine areas of further investment.

5. Understanding the historical context of South Africa's urban spatial design

The issue of the country's spatial divide has become a topic of political discourse and has sparked the interests of professionals from various disciplines. Although it is a currently discussed topic, it cannot be viewed in isolation from its historical roots. It is worth considering the historical background into the significant events that have shaped the country's spatial setting to provide the necessary context. The aim is to highlight how these events have shaped spatial development and the effects they continue to have in South Africa to this day. The approach followed is an adaption of a method used by Geographer Christopher (1983) who's analysis of urban history dates back to its colonial medieval origin with the first form of formal segregation traced back to the 19th century.

Colonial spatial design – from 1652

The highly fragmented nature of cities in South Africa was not always so designed. The country, like many others south of the Sahara experienced colonisation at the hands of white European settlers (first Dutch then later British). The first reported permanent settlers arrived in 1652, establishing what has been known as the first European settlement (Maylam, 1995). With no indigenous settlement planning in place, there was initially little done to define boundaries for segregation, thus native black people who were labourers lived within close proximity to their European employers. Although segregated spatial design had not been fully developed, there was a notable division created by differences in social class. The basis of one's social class and wealth was defined by the style of housing the individual possessed (Christopher, 1983). With the rise of imperialism after the 1850s, english dominant classes introduced structural segregation (Christopher, 1983). They applied their own urban and economic ideals which led to the creation of human settlements specifically for them. Black natives who were labourers occupied locations in the periphery of these white settlements.

In additional to the class and racial divide, the settlement system had an element of gender segregation particularly in mining areas. Single-sex hostels were developed in order to accommodate migrant mine workers. Only 25% of the population lived in the urban areas and this comprised mainly of the white minority (Maylam, 1995). Laws were enacted by the colonial settlers that further deepened the spatial divide. The most prominent of these were the:

- Natives Land Act of 1913 – following largescale land dispossession, this Act was the first piece of legislation that instituted segregation, allocating only 7% of arable land to black people (South African Government, 2018).
- Natives (Urban Areas) Act 1923 – the Act empowered local authorities to create separate residential areas for black people and to exercise control over settlement in these areas (O'Malley, 2018).

Apartheid spatial planning – from 1948

The apartheid era which came with the Afrikaner ethnic political party (the National Party) being in power saw the enforcement of laws which furthered the geographic segregation of people according to race. Only this time, it was in favour of the Afrikaners. Apartheid spatial planning was no different to colonial design as it resulted in the majority of black people being concentrated in the outskirts of the city, in peripheral areas where there was limited access to reliable transport, basic services, access to economic opportunities and limited growth prospects. Many Acts were passed to make segregation legal and systematic, one of the pillars being the Group Areas Act. The Group Areas Act of 1950 underpinned the formation of the apartheid city in a system of urban apartheid (Christopher, 1983). The Act and many others after it served to control the geographic location of people from different racial groups. Each racial group had defined areas where its people could reside, work and do business. The urban areas which had better service provision and work areas were reserved for white people. Social class was largely determined by race. The apartheid government advanced a process that had begun when similar land acts were adopted while the country was under colonial rule. From colonisation to apartheid there was a consistent pattern of racial segregation and resistance to any degree of integration. From the 1923 Native (Urban Areas) Act to the 1950 Group Areas Act and policies that followed such as the urban native administration and influx control, the continuities were more striking than the dissimilarities.

Johannesburg after apartheid – 1994

Although apartheid ended in 1994, its legacy is still noticeable in the geographical divide in South Africa's cities. Johannesburg, which is the focal area of this study, has large township areas located in the outskirts of the city centre with density levels that are much higher than the

urban areas in some instances. The pattern of population growth in Johannesburg townships as well as informal settlement areas in the fringes of existing townships has been similar to that of metros such as Durban, Nelson Mandela Bay, Cape Town and Buffalo City. What has been observed is that the growth in population in townships and peripheral areas has been more significant than what has been observed in suburban areas (CSIR, 2015). Some residential areas in Johannesburg (as is the case in other parts of the country) are still largely laid out along racial lines. Added to the racial divide that was prominent under apartheid is the vast difference in social class that affords a minority the opportunity to live in sheer opulence while a larger share of the population lives on the extreme opposite side of the scale. This speaks to the inequality that has become synonymous with life in a country where polarities of wealth and abject poverty exist in close proximity to each other (see figure 5). Many townships are now a sad reminder of the 'exclusion by design' of black people in South Africa (Pernegger and Godehart, 2007).

The historical processes that led to the current structural design of the city were methodical, well thought out and implemented meticulously, without wavering over a long period during colonisation and apartheid. The results of processes implemented to reverse structural issues in the city have been slow. Like in many countries globally, urbanisation trends continue to increase in South Africa. Johannesburg is considered to have higher levels of urban sprawl relative to other cities in the country; a trend that has been exacerbated by the high use of private cars enabling the decentralisation of employment, commercial and leisure opportunities away from residential areas. Transport policy has continued to focus on improving infrastructure for cars while a considerable number of people use informal and formal public transport systems. The population within the CoJ is anticipated to grow from 4.3 million to 7 million people by the year 2040 (City of Johannesburg, 2018a). This projected growth serves as one of the premises for focusing on spatial projects and is in line with global patterns as the United Nations Development Programme (2018) forecasts (under the sustainable cities and communities sustainable development goal) that two-thirds of the world's population will be living in urban areas by the year 2050.

The contextual outline presented here serves as a foundation to the study. The literature review which follows builds on this by providing a synopsis of the urban development tool (TOD) that is being used by the CoJ in an attempt to undo the structural designs of the past.

6. Literature review

Johannesburg, like many other metropolitan cities in the world faces real challenges and requires policies that will ensure the long-term development of the city. The issues include traffic congestion on urban roads due to high dependence of commuters on personal vehicles and inadequate formal public transport systems, the increase in air pollution and greenhouse gas emissions, concerns over a growing population around central city areas and the resultant loss of open spaces and rising house prices in the metropolis limiting home ownership opportunities for a large part of the population (Bertolini, Curtis and Renne, 2009). Additionally, there is a challenge of growing urban sprawl which presents a multitude of negative social, environmental and economic effects. Townships in particular are spatially separated from the urban centre with real challenges in gaining access to the city and heavy reliance on the informal minibus taxi industry. The CoF initiative focuses on the inner city as the core of Johannesburg and developments around it will create mixed use nodes connected by functional public transport systems and more efficient land use moving outward from the core (City of Johannesburg, 2018a). Besides the poor economic and social conditions that are rampant in settlements on the outskirts of the city, one of the main issues that has been highlighted by the CoJ is the long travelling distances people are subjected to in order to get to urban economic areas and places of work. The National Household Travel Survey conducted by Statistics South Africa (2003) found that the average travel time between home and work for commuters making use of public transport is 59 minutes (one-way), for more than 1.3 million commuters. Additionally, it was found that 16.4% of Gauteng residents spend upwards of 20% of their monthly income on transport (Statistics South Africa, 2003). Increasing urban sprawl results in the people living in the outskirts of the city who are usually in the lower income groups having to spend a large portion of their income on transport relative to those who are more affluent, mostly living in suburban areas with access to private vehicles.

TOD is one of the tools that can be used in addressing the issues mentioned above. It is not a panacea but nonetheless a good start to achieving mixed-use areas that offer residents the option to use different means of transit (include walkways and cycle lanes), different, more affordable housing options and easy access to market places through re-shaping existing neighbourhoods around transit stations. The overarching desire with TOD is the creation of a more compact urban form that will contribute to the transformation of the city into an economic hub with far reaching social and environmental benefits.

6.1. TOD: Overview

6.1.1. TOD in Johannesburg – what informed the decision to use it?

The CoF initiative was first announced by the then Mayor of the CoJ Mpho Parks Tau at the 2013 state of the city address. One of the main guidelines that documents the city's vision in terms of the CoF is the Strategic Area Framework (SAF) which has been drawn up for each corridor. The SAF is the basic planning and implementation instrument of the CoF. In essence it outlines the CoF vision, details the desired spatial responses, the projects and programmes that are required, provides the special context for future developments, provides a guideline for investment, and outlines requirements and opportunities for development (City of Johannesburg, 2014). It does not exist in isolation but was developed in the context of the broader national, provincial and local policies that are in place. These include the National Development Plan (national policy) which was drafted in 2012, the 2011 Gauteng Spatial Development Framework and its revised versions (provincial policy), the 2011 Growth and Development Strategy (local policy), the Integrated Development Plan (local policy), the Urban Development Framework (local policy) and the Spatial Development Framework (local policy) among others.

6.1.2. Defining TOD

In literature concerning TOD the definition often focuses on the physical attributes of developments in the TOD area. For example, Muley, Bunker and Ferreira (2009) define TOD as the creation of medium to high density developments that generally consist of a combination of residential, employment and shopping opportunities within walking distance to each other and within an easy walk to a major transit stop. This definition focuses on the physical developmental features often called the built elements of a transit area, being centred on the construction of new buildings or redevelopment of existing ones with a design or orientation that facilitates transit use. More conservative definitions, which the previous one does not fall under, explicitly mention the potential to reduce private car use to a minimum. There is an emphasis on the association between TOD and a modal shift to more sustainable forms of public transit as well as non-motorised travel in the form of walking and cycling. Carlton (2007) describes it as a way of reducing the use of private cars and minimising urban sprawl. According to the TOD Institute (2018), driving can be reduced by up to 85% in TOD areas.

Interestingly, many experts have defined TOD making transport the central point of the explanation:

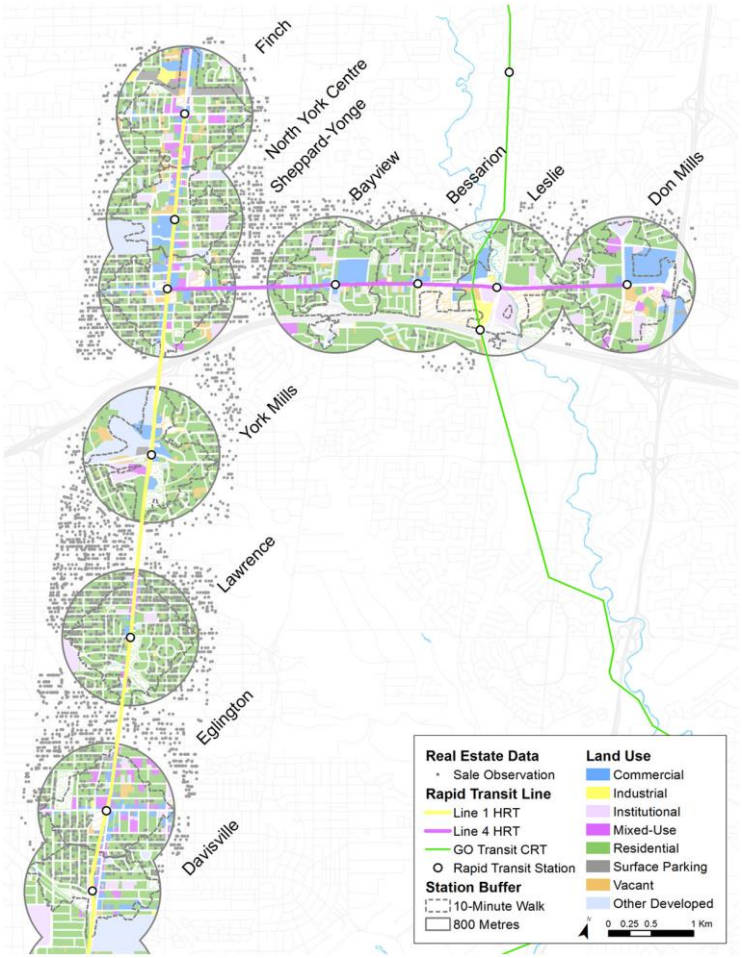
- UTTIPEC (2009) defines it as any development focused around a transit node.
- From a Civil Engineering and Transport Studies perspective, it is urban development that by design both supports and depends on public transport (Bickford, 2016).
- A definition adopted by the City of Johannesburg (2014) is that TOD is an approach focused on mixed land use developments in proximity to transit stations or transit corridors. It further emphasises the importance of redeveloping the existing urban form around transit nodes.

These definitions are largely focused on the physical structures that are built rendering many projects a 'success' on the basis of the physical TOD elements being in place. The problem with this is that the existence of physical characteristics does not guarantee performance. For example, just because the Rea Vaya exists it cannot be assumed that it is being successfully used. Belzer and Autler (2002) call for a focus on outcomes as a measure of success. This is the method that is used in this paper.

While multiple definitions of TOD have emerged, the fundamentals appear to be the same in all contexts. The arguments for opting for TOD among other development tools are similar despite the different contexts. The basic philosophy in all contexts is centred on the promotion of urban development around transit nodes and their stations in order to support the use of the chosen mode of transport that is often provided by government (Curtis, Renne and Bertolini, 2009). The focus is on creating public transport systems that will connect existing and future key areas of development. Standard components include the development of mixed-use properties, densification of areas around public transport routes, the creation of pedestrian-oriented walkways, green spaces such as parks for leisure, limited parking space for private cars in central business areas and the provision of multi-income level housing options (TOD Institute, 2018; Curtis, Renne and Bertolini, 2009; Dittmar and Ohland, 2012). The mode of transport that underpins a transit corridor differs, with the train and BRT systems being the most commonly used.

Globally, TOD has attracted the interest of policy makers at all levels as a tool for urban regeneration and the establishment of densely populated urban areas which conform to requisite environmental standards. In addition, research about TOD has been highly interdisciplinary, appealing to experts from disciplines such as Architecture, Town Planning, History, Geography, Real Estate, Anthropology, Sociology and other social disciplines. Implementation of TOD requires a strong backing of policy incentives and regulations to create an environment that embraces TOD principles (Transportation Research Board, 2004). The tools that are commonly used to make this form of development a success include investment usually by government into station area planning and other capital investments geared towards the chosen mode of public transport in a transit corridor. The introduction of density bonuses and incentives are popular methods for encouraging densification of areas (Calitz, Wallace and Burrows, 2013). This is particularly true in instances where the vision is the development of affordable housing. Some of the most progressive TOD areas stipulate land-use requirements such as the restriction of vehicle parking areas in favour of environmentally friendly bicycle parking mandates and walkways. The tools employed in TOD have been found to limit the role of developers to areas that are economically depressed or neighbourhoods that are in ruins (Transportation Research Board, 2004) much like the areas chosen for the CoF initiative.

Figure 2: Example of transit corridor mapping - Toronto, Canada



Source: Higgins and Kanaroglou (2018)

Toronto in Canada is known for having embraced transit as a method of guiding growth long before the term TOD was conceptualised. Figure 2 above illustrates Toronto's transit corridors and land use mixes in different transit nodes. It provides a good picture of how a transit oriented design can be. Three different transit lines connect the different areas in the city. Developments are clustered within 800 metres to the stations, the majority of which are central to each area design. In each area, locations that are a 10 minute walk away from the station are mapped out. These areas display the most mixed uses of land relative to locations closer to the 800m perimeter. Surface parking around the stations is almost non-existent, with only the Finch and York Mills stations showing small allocations for parking. Residential use is the most prominent land use in all the areas although all of them indicate the presence of other structures. The figure provides a good illustration of how a city can be designed around transit.

6.1.3. Origins of TOD and underlying principles

Although the existence of TOD can be traced back to the 1800s in Europe, its acceptance as a formal urban planning tool and the coining of the name are more recent. Pojani and Stead (2017) write that TOD was an intrinsic planning principle used in many European countries, the earliest developments being traced to Garden Cities of England in the 1800s. The central theme with Garden Cities was the creation of densely populated areas, that were self-sufficient (consisting of places of work, residence, commercial areas, etc), had plenty of green spaces and were linked by road or rail (Davis and Rosenberg, 2017). Variations of this form of urban planning were spread to other parts of Europe under names such as "The Finger Plan" in Copenhagen, Denmark and the "Planetary Cluster Plan" in Stockholm, Sweden (Cervero, 2006). Warner (1962) and Kellet (1969) are examples some of the early researchers into the developmental potential of TOD. Their work focused mainly on what was known as streetcar suburbs; simply the development of property along railway corridors. Warner (1962) presented a study of the growth experienced in Boston's streetcar suburbs between 1870 and 1900. Kellet (1969) on the other hand did a much wider study, looking into the impact of railways in Victorian cities over the period.

The actual term TOD, however, was formally introduced to theory by an urban practitioner Peter Calthorpe in the 1980s (Carlton, 2007). Over the past three decades, it has evolved and expanded from primarily having theoretical meaning within urban planning to an all-encompassing development tool with benefits being economic, environmental and social.

TOD is not only defined in terms of the physical changes that it can bring. There are underlying characteristics and features of TOD that are internationally recognised and often called principles of TOD. Newman (2009); TOD Institute (2018); Bickford and Behrens (2015), all provide a comprehensive list of commonly accepted principles for TOD that can be summed up as follows:

1. Mixed land use - residential, retail, commercial and community land uses around the station;
2. Preservation of the natural environment;
3. Defined pathways which prioritise pedestrians and cyclists over vehicles;
4. Medium- to high-density development within proximity to stations;

5. An efficient, integrated and reliable public transport system;
6. Ease of access to the public transport station or stop;
7. Reduced parking spaces for private cars;
8. Accommodation for different income groups.

The 8th principle above is often categorised under the first principle (mixed land use). In South Africa, however, there are issues of inequality and the need for social cohesion which are direct factors of spatial planning methods adopted in a deliberate effort to bring about racial segregation. Thus, the creation of living spaces where people from different social classes can reside is one of the key objectives of the CoF initiative. Different variations of the principles exist depending on the intended outcomes of the TOD projects. This notwithstanding, the first six principles cited above are standard and appear to be applicable across the board. In addition to these the TOD Institute (2018) stipulates certain retail developments that have to be in place at or directly fronting the station in order for it to serve as the catalyst for major development.

A concept that is more generally used is that of the 6 D's in TOD. This can be viewed as a succinct list of general areas within which all the above mentioned principles can be categorised. The idea here is that although there are many characteristics that make up a TOD area, there is an overlap between many of the elements which can be broadly classified within the 6 D's framework. Design, Diversity, Density, Distance, Destination, and Demand management are the six components of the framework. These important elements in TOD are extracted from (Ogra and Ndebele, 2014). The first 'D' variable is *design* which speaks to the physical elements of the transit area such as walkways, cycle paths, parks and accessibility to transit routes. Carefully thought out mixed land uses reshape the urban form for the better and increased transit ridership. *Diversity* is similar to design in that it speaks to the availability of various amenities within a given area. Diversity, however, is expanded to considerations of achieving balance in the public realm and various social groupings such as different races, genders, ages, social classes and ethnicities all in the same area. In essence it is about achieving diversity in land use and population. *Density* is the idea that by concentrating residential areas, workplaces, retail shops and other amenities within the same area, better and more integrated land use is achieved. In addition, the availability of major transport nodes within walking distance promotes the uptake of more sustainable transport modes. *Distance* speaks to the sustainability and viability of the transport system which is dependent on transit routes being easily accessible. This includes accessibility of stations which should be achieved without the

use motorized transport. *Destination* accessibility is premised on the notion that the transit system must be efficient in ensuring greater mobility and swiftness in moving people within the city. Other objectives include reducing travel time and removing unnecessary hassles for transit users. The last variable is *demand management* which is the efficient use of transportation resources by reducing vehicle trips. This can involve the implementation of area-wide policies to manage peak work hours.

Cervero and Kockelman (1997) used three of the principles in the 6 D's framework; density, design and diversity. The shortened version of the framework was used to test how the three elements influenced travel demand in the San Francisco Bay Area. When the principles of TOD are applied correctly economic agglomeration occurs. This as defined by the South African Property Owners Association (2016) is the economic benefits that ensue as a direct result of residential areas being in close proximity to commercial and business (work) areas. The project in Johannesburg seeks to change the social fabric of certain areas in the city by addressing historical structural issues that hinder social cohesion between different racial groups and different social classes. These are some of the benefits that have been associated with TOD. The full spectrum of TOD benefits is discussed next.

6.1.4. TOD Benefits

The benefits of TOD are varied. When the benefits are realised it is often an indication that the objectives that were set out during planning have been achieved. Benefits can spread to areas beyond the transformation of the urban design. This is one of the reasons why TOD has increased in popularity among policy makers and the academic community. An important element that contributes to a well-functioning city is the integration between land use and transport planning. In the first instance, the regulation of land uses is one way of curbing urban sprawl (City of Johannesburg, 2014). When residents have access to all necessary amenities within proximity to each other, the need for private car use is reduced and this leads to the next point. With shorter distances between places, individuals will be able to make shorter, more frequent trips with the use of public transport, cycling or walking. Reduced parking space, lanes exclusively allocated for the public transport system to improve travel times and the accessibility of the transport system combined can reduce the attractiveness of private car use.

The TOD Institute states that there are benefits for the environment, general lifestyle and the economy which are considered in the table below.

Table 1: Benefits of TOD

Benefits OF TOD	**Areas of benefit**
Private car use is limited thus reducing traffic congestion, accidents as well as environmental and noise pollution. UTTIPEC (2009) identified a modal split of 45% and 55% respectively for public and private transport use in Delhi, India. The capital city's TOD roadmap is targeting a 80%-20% split by 2021.	Environmental Social Health and well-being
The cost of road management, maintenance and expansion reduces over time.	Economic
People experience a higher quality of life. They can live, work and play in the same area. This can translate to other benefits in people's health and their social wellbeing.	Social Health and well-being
Urban areas are revitalised, stimulating local economies.	Social Economic
It is expensive to provide services efficiently when there is urban sprawl. A more compact city makes it possible for service delivery to improve. Compact cities use more sustainable infrastructure including parks, bike lanes and pedestrian pathways.	Economic Social Environmental
TOD areas promote healthier lifestyle habits such as walking, cycling and spending time outdoors in communal parks.	Social Health and well-being
Savings can be realised in the cost of transport. According to a study conducted by the Regional Transportation Commission of Southern Nevada (2018), people living in	Social Economic

suburban areas spend approximately 25% of their income on transportation while people in transit areas spend 9% of their income.	

Information source: TOD Institute (2018)

As discussed here, TOD has many benefits that make it a sustainable development approach that encompasses environmental sustainability, social advancement and economic development. The following section highlights some of the international experiences and the benefits that have ensued from TOD.

6.2. International case studies

Europe is known for having some of the oldest urban areas designed along transit routes. The continent is also well-regarded for its reengineering of the concept of TOD through technological innovations in transit and logistics, reforms which include the privatisation of rail transit, a focus on sustainable development and spatial planning that has moved with the times (Pojani and Stead, 2014). The Netherlands as well as Scandinavian nations Denmark and Sweden specifically have attracted attention from many researchers for their early adoption of planning systems based on designs similar to TOD principles (Cervero, 2009). On the other hand, Canada is one of the first countries in North America to have city planning with characteristics of TOD, with Toronto being the city that has numerous documented successes. It is for this reason that many studies looking into TOD include Canada in case studies. Additionally, both in North America and Europe governments continue to implement TOD. Important components discussed in the case studies below are the area (city), transit system being used, time in existence and the outcomes that have been measured in the case study areas. This is done for uniformity and ease of assessment. What has been observed about the countries analysed below is a general acceptance of the importance of integrating land use, transport planning and infrastructure planning in order to meet the needs of modern cities that embrace concepts of efficiency, sustainability, accessibility, economic advancement, social cohesion and an enhanced quality of life for the citizens.

Case study 1 - Canada

Canada has some of the oldest transit systems in North America and extensive studies have been done to assess the impact of these on land use. TOD in the country became a topic of

interest in the 1990s in an attempt to reconfigure land use patterns and curb urban sprawl. In Toronto, however, development of compact nodes around stations was first witnessed on the Yonge subway line in the 1950s and 1960s, long before TOD as a development tool was a fully established concept (Canadian Urban Transit Association, 2004). In fact, Toronto is hailed as an example for other jurisdictions due to the city's rich history of using transit to achieve growth (Higgins and Kanaroglou, 2018). The most popular mode of transport in the city is the train, however, there are BRT systems in operation.

Toronto in particular saw a substantial rise in development and population growth in the ten-year period after the construction of the rail transit system (Knight and Trygg, 1977). Today, every five years the Transportation Tomorrow Survey (TTS) is conducted in Canada. The survey provides important information on urban travel patterns which is used by local and provincial government to make decisions on investments, transport planning and future developments (Data Management Group, 2018). A study conducted by Crowley, Shalaby and Zarei (2009) using the TTS found a strong positive association between walkable access routes, lifestyle changes and the use of a transit system. According to the study, individuals located less than 200 metres away from a subway station showed the highest preference for walking and use of the public transport system then those who were further away. This was also true of vehicle ownership which was lower for people living within a 200 meter radius to the station.

Case study 2 - Europe

Cervero (2009) asserts that Europe has the most fully developed TOD globally. Planning for growth in urban areas has formed part of the planning processes since the early days of the Finger Plan and the Planetary Cluster Plan. Corridors were defined early on, often before the population growth in areas of interest was realised. Rail infrastructure was also built to channel growth into desired areas. Allocation of green spaces and ensuring that developments do not infringe on these spaces was a common feature of early development plans. In essence, these countries have managed to control urban spaces through a balancing act of careful transport (rail) planning and intermixing land uses. Stockholm in Sweden has seen benefits of these deliberate urban planning efforts. Car dependence in the capital city is low relative to other major cities globally. Careful planning has ensured that there is a directional flow between residential and commercial areas along rail corridors, resulting in 55% of commuters using the train and travelling in one direction during peak hours (Cervero, 2009)

Case study 3 - Australia

TOD in Australia has been viewed as a tool that assists in the achievement of land use and infrastructure objectives. The south east of Queensland is recognised as the fastest growing region, with its population making up approximately 58% of the total population of Queensland (James, 2009). With this in mind and expected growth in population in the region by at least 50%, interventions chosen incorporate a focus on economic, environmental and social goals in line with the principles of TOD in order to manage the growth. Since the early 1990s government and the private sector have worked to advance TOD in various areas across the south east region. The most popular modes of transport are trains and buses. Passengers are able to transfer between modes of transport through use of a single electronic "go" card. A dedicated, state-led development authority, the South Bank Redevelopment Authority, which was set up for the development of land south of the Brisbane River has over the years transformed the area into a mixed-use urban precinct (James, 2009). It has become popular for its recreational facilities. Government and the private sector worked together to achieve this where the former managed the land use and urban planning and the latter have been tasked with ongoing management of the area. Queensland Government (2018) plans to further take advantage of the benefits of TOD through the Mango Hill project, Varsity Lakes station precinct and Corinda TOD, all projects that are at different stages of planning. What is common between these projects is that development has been put out to tender with the aim to achieve it through private developers. There is also a commitment to incorporate different land uses in and around station precincts. According to James (2009) the private sector has been key to the delivery of TODs in Queensland, particularly in areas where large numbers of residences have to be developed.

Case study 4 - United States of America (USA)

Twenty first century metropolitan areas in the USA are experiencing a surge in transit use and investment. The current trend sees most cities including plans for rail and bus rapid systems in their urban planning processes, with some even collaborating to plan rail systems that link different metropolitan regions (Belzer and Autler, 2002). TOD projects in the USA target specific objectives which are relevant for the improvement of the spaces in the areas of interest. Typically, projects are designed around commuter rail stations. San Francisco in America is also a case that is widely studied. The city introduced the Bay Area Rapid Transit (BART) system in 1972. Along with provision of a rail transit system, the city introduced incentives for

buildings developed based on proximity to BART stations (Cervero and Landis, 1997). As in the case of Toronto, the BART system has been acknowledged for an increase in property development in San Francisco albeit at a moderate rate than was initially expected. Arlington County in Virgina has speared ahead of other counties in the development of high-rise, mixed-use developments along rail corridors and the commitment to implementing transit supportive development (Cervero, 2009). The county has achieved the revitalisation of neighbourhoods into clusters of mixed-use developments through harnessing the convenience of Metrorail. Car dependency in the USA is high, therefore one can imagine that the implementation of TOD can present challenges. Poticha and Wood (2009) document challenges in the USA in relation to building mixed-use TOD housing in the USA, increasing land prices around stations, limited funding for development of affordable housing, complex funding structures for mixed income housing, onerous requirements for TOD developments and communities objecting to development of low-income housing in their neighbourhoods. The downsides to TOD which can be experienced universally are expanded on later in the paper.

Case study 5 - Singapore

Accelerated urbanisation in Singapore has necessitated a focus on the development of efficient, cost effective public transportation systems. It was discovered as early as the 1960's that Singapore's land scarce landscape required a mass transportation system as part of its future urban growth strategy. The Mass Rapid Transit (MRT) system which started operating in 1987 is considered the backbone of the country's public transport system (Chye, 2019). The MRT has an extensive rail network which connects passengers with other modes of transport, mainly buses. The focus has been on leveraging urban mobility and transport infrastructure to stimulate social and economic development. The four policy instruments identified by Chye (2019) in the implementation of TOD in Singapore are 1) the continuous investment in increasing and improving public transport capacity, 2) urban planning that supports different land uses, 3) using incentives to promote investment around transit areas and to encourage use of public transit modes and 4) encouraging private sector participation and the use of technology in transit development. With this case study, the lesson for other developing countries is that the success of TOD in Singapore was through constant incremental and deliberate efforts over a long period that have shaped the way cities are designed and have influenced the behaviour of people who reside in those cities. An example of these efforts is the limiting of private car use through traffic management policies that have been in place since 1972 which levy additional surcharges on vehicle owners.

In all these examples other determinants are linked to the impact of transit systems on land use. These include development policies adopted by local governments, development trends within the regions, availability of land or property to develop and physical attributes of the areas (Knight and Trygg, 1977). "An honest assessment of local and regional market conditions, land availability, trends toward income diversity or segregation, the capacity of local for-profit and non-profit developers and specific regulatory barriers is a very important first step towards identifying the right mix of tools and strategies" (Poticha and Wood, 2009). These are elements that will be examined in the Louis Botha case study in the analysis and findings section.

As part of the greater elements of the TOD plans in Johannesburg, plans around the integration of the Rea Vaya, Passenger Rail Agency of South Africa (PRASA) locomotives and the Gautrain are being considered. The ensuing case study presents findings of the effects of the introduction of the Gautrain on property development.

6.3. Case study in the South African context - the Gautrain and property development

Mushongahande, Cloete, and Venter (2014) conducted a study in which they sought to establish the impact of the Gautrain on property development around station precincts. The study focused on the Pretoria, Midrand and Rosebank stations for the period 2000 to 2011. The findings were mixed for the 3 locations. The Pretoria station which is located in an area that was considered to be already densely populated before the introduction of the Gautrain, experienced modest, rather slow development following the announcement of the Gautrain project (Mushongahande, Cloete, and Venter, 2014). This is attributed largely to a shortage of land available for development. The Midrand station was a greenfield project, built on vacant land. At the time of the study, six properties had been developed in the area post announcement of the Gautrain project and these comprised mostly residential properties with only one being an office building (Mushongahande, Cloete, and Venter, 2014). Rosebank saw the highest number of developments at different stages of the development process; 47 in total. Prior to the announcement of the Gautrain project, the area already had characteristics of TOD. Mixed-land use was present, the area was easily accessible through different public transport services, there were tourist attractions and well-kept pedestrian walkways. The conclusion was that the evidence showed property development in the focus areas was driven by real estate fundamentals (location, prior mixed-use properties, availability of land and good design) and that the success of TOD could not be viewed in isolation but was ultimately dependant on these principles (Mushongahande, Cloete and Venter, 2014). The varied experiences of the areas that

were studied depended greatly on the level of development within these areas that existed prior to the introduction of a transit system. In addition to this the Gautrain runs through mostly affluent corridors where property markets are lucrative.

6.4. Obstacles to implementing TOD

The success of TOD is generally measured on built elements. As a result, there is limited research on its failures or shortcomings. For example, a high-rise building with mixed uses (shopping centre, office spaces and residential) built next to a transit station may be marked as a success in the implementation of TOD. This building may have a big area allocated to vehicle parking spaces for the shopping centre which often defeats the purpose of parking restrictions that are to be imposed in TOD areas in order to reduce private vehicle use. Additionally, there is limited research into the failure to achieve even built elements, with most research being focused on the USA. The outcomes of TOD on the environment, social and economic status are areas that need to be researched further. The common challenges highlighted here are not necessarily unique to transit related developments, however, some are more prevalent in TOD as opposed to conventional developments.

The challenge of changing the urban form. Belzer and Autler highlight the difficulty of completely changing development patterns in areas which are already established on conventional designs. They focus specifically on projects in the USA, many of which failed to achieve TOD objectives. Generally the existence of suburbs whose development was based on single use patterns results in the TOD projects bringing transit into the areas without much change in the design of the neighbourhood into a more compact urban form (Belzer and Autler, 2002). Many TOD projects thus end up being made up of traditional suburban developments that are located next to transit. Various elements add to the complication of changing an already established neighbourhood into a transit-oriented and not a transit-adjacent area. Communities within areas demarcated for TOD may not be in agreement with the proposed changes which could change the character of their neighbourhoods. Consultation processes with stakeholders often take long and considerations for property rights (among other things) make it impossible for government to implement density and mixed-use requirements without public participation. Therefore, public buy-in is key to the realisation of TOD.

Availability of funding. Another often globally cited obstacle is the limited availability of funding for mixed use, mixed income property developments. Affordable housing is still perceived as an area where government should play a key role regarding financing be it through

incentives for developers, the provision of grants for low-income earners to be able to rent such residents, funding of such developments or any combination of these. Mixed-use, mixed-income developments are relatively new concepts therefore new financing structures have to be considered to make them financially viable for the developers and the financiers.

Institutional issues. Institutional complexities are universally documented as being a common hindrance to the achievement of TOD objectives. These include complex, time consuming application processes for developments, confusion on roles that are to be played by local authorities and transit agencies which often have overlapping responsibilities and unfavourable zoning codes (Belzer and Autler, 2002). In addition to this, local government authorities usually have conflicting budgetary priorities as they have to find a balance between implementing projects initiated by national government and projects catered for the specific needs of their local jurisdictions. The existing regulatory framework may not be supportive of TOD, requiring lengthy review processes for changes to be effected.

Rising property values. As noted earlier in the case study of the USA, the increasing attractiveness of TOD areas results in property values rising. This carries a risk that low-income residents can be priced out of TOD areas thus rendering efforts to achieve inclusivity through this development method futile. Rising land prices also serve as a barrier to entry for small emerging developers.

Perceived risks that come with TOD. Although there is growing interest on TOD, there is often scepticism on its potential outcomes when it is first introduced to an area. The long time horizon for benefits to be realised makes it harder for stakeholders to commit to this development tool. For example, residents of a neighbourhood may not accept it on the basis that the introduction of mixed-income, high density developments may bring about uncertainty on and potentially depress property values. Risks and costs attached by developers and lenders to TOD may be higher than normal developments due to the numerous requirements that have to be adhered to.

Some of the challenges that have been highlighted are relevant to the Louis Botha CoF and will be explored further in the next section. The findings and analysis section draws on the literature that has been reviewed to analyse data on the private developments taking place in the Louis Botha corridor.

7. Findings and analysis

7.1. The Louis Botha CoF

Three corridors have been defined to connect people to job markets and to "re-stitch" (change) the city as it has been termed in CoF documents. These are the Empire-Perth, Turffontein and Louis Botha corridors. The starting point of the Empire-Perth corridor is Soweto, Johannesburg's (and the country's) largest township by size of the population, to the city centre; the Turffontein corridor is from Turffontein to the city centre, incorporating many suburbs in the southern part of Johannesburg and the Louis Botha corridor extends from the city centre to Sandton along Louis Botha Avenue which serves as one of the major arterial routes in the city (Rubin, 2018). Each corridor has its own SAF that outlines among other things their unique features and envisioned development. Key commonalities between the corridors are that the central business district (CBD) is a key link and the neighbourhoods either contribute to urban sprawl or are old suburbs in need of revitalisation or both.

Salient features of the Louis Botha CoF

The suburbs along Louis Botha have establishments dating as far back as the 1920s. They consist predominantly of low-density, single-family homes with big yards. The structures are relatively old resulting in clusters of neighbourhoods with rather shabby aesthetic as opposed to the character and charm that is found in architectural designs such as those in old Italian towns. Urban decay plagues many residential areas, particularly the inner parts of the route. Maintenance of several multi-storey residential buildings in the route has been neglected for many years, as a consequence, slum like conditions exist. Some buildings have also been found to be overcrowded where as many as six families were found to live in a 100 square metre flat apartment (City of Johannesburg, 2014). The idea is that, by directing public investment into an area that is run-down and has little appeal to private investors, TOD can revitalise it into a modern and vibrant 21st century urban area. The corridor is made up of largely residential areas at its southern end which is closer to the city's CBD. Further north of the corridor there are commercial and industrial areas like Wynberg, Bramely and the fast-growing financial hub of the South African economy, Sandton (City of Johannesburg, 2014). The corridor already has a relatively good mix of commercial and residential areas, however, these are generally not within proximity, the distinction being that the southern areas are largely residential while the north comprises residential and commercial areas.

Although much of the media's attention has been on Orange Grove and Norwoord, other areas along the corridor include Berea, Yeoville, Houghton, Bellevue, Bramley, Alexandra and Wynberg among others. They include a mixture of affluent suburbs, middle class areas and townships. Property prices along the corridor on average have grown ahead of the Johannesburg Municipality average (City of Johannesburg, 2014). Figure 3 is a graphical representation of the corridor. Unlike the Turffontein corridor, the Louis Botha corridor has a more linear arterial link with targeted development areas falling on either side of the transit route. The neighbourhoods are already established and vacant plots for new developments are limited. As a result developments taking place in the corridor will in all probability be refurbishing of old buildings or rezoning, demolitions and rebuilding. The Louis Botha corridor already has a vibrant transport route that is serviced by taxis and metro buses. Louis Botha Avenue itself has a long history that dates back to the 1880s where it was used as the main wagon track connecting Johannesburg to the capital, Pretoria (City of Johannesburg, 2014).

Part of the plan with the CoF project is to densify well located areas that just need to be upgraded to achieve social inclusion and other development outcomes. This is seen as quicker and more cost effective than developing completely new areas in the outskirts of the city. Attractive characteristics of the Louis Botha corridor are:

- Its link to major industrial, commercial and retail hubs;
- An existing, multi modal transport system;
- Areas like Orange Grove that have a high demand for rental apartments;
- Residents from different income levels;
- Formal and informal trade settings;
- Existing social service structures;

There is a plan to move the City's regional offices into this corridor. The envisioned development is a mixed-use building with office spaces and residential units. This is a project that is being undertaken by the Johannesburg Property Company (JPC) in the Watt interchange in Alexandra and commenced with demolitions taking place from July 2018. New road links will be built to incorporate BRT lanes and a new underground bus station. The aim is develop the interchange into a transit hub.

7.1.1. Spatial Economy of Louis Botha corridor

- The corridor is currently well serviced by multiple transport modes. Unlike people living in areas south of the city (like Soweto), one ride can get people travelling from neighbourhoods within the corridor to places of work in the north and the CBD. As such, its revitalisation will most likely rest heavily on its intrinsic features (like positioning between two major commercial centres) as opposed to the availability of a new transit system.
- Land availability is limited in the corridor. The prevalence of freestanding, single household properties in an area as strategically positioned is considered to be inefficient use of land (City of Johannesburg, 2014). The city anticipates that space for high-rise residential buildings will be created through the conversion of multiple single house stands which can be combined and rezoned for new developments. In this instance, conversions are likely to materialise in situations where the existing property owners agree to sell. Negotiations are carried out by private parties under willing buyer, willing seller arrangements. The City does not intervene in these cases save for when said property is earmarked for a development project that is owned by the municipality.
- Various properties zoned for commercial use are being utilised for low level trading (e.g tuck shops) and other informal trading activities. These buildings have the potential to be converted into mixed-use buildings through the consolidation of freehold stands.
- Wynberg, Marlboro and Kew are industrial areas that are in much need of investment to scale up the extent of industrial activities in those areas. This notwithstanding, early indications of development interest show that private sector demand is directed towards residential developments.
- According to Poticha and Wood (2009):
    - *Local and regional market conditions* – the corridor is located in-between Johannesburg's CBD and Sandton, places that serve as key economic and employment clusters not only for the city but also for the country at large. The corridor has an active informal sector, especially along Louis Botha Avenue.
    - *Land availability* – freely available land that can be developed is limited. The corridor has long existing neighbourhoods that are not necessarily accommodating of the city's growing population.
    - *Trends towards income diversity or segregation* – demographics within the corridor are mixed. For example, Orange Grove has higher densities mainly as

a result of overcrowded living spaces, many people walk to places of employment and there is diversity in terms of race, income levels, religious belief and age groups of the residents. Norwood on the other hand has benefited from its proximity to the northern suburbs, making it an area for mostly middle-income groups. The population in the corridor has grown from predominantly white to mostly black people. There is also a large community of foreign migrants from countries such as Zimbabwe, Nigeria and the Democratic Republic of Congo. Residents are mostly people who are employed, seeking employment, business owners or unemployed, with a small number of pensioners and those who are studying (Kollamparambil, 2016).

7.2. Political Economy of TOD in the Louis Botha CoF

7.2.1. Institutional setting

Within the municipality there are individuals who are responsible for the different CoF's. Other departments that are directly and indirectly involved with transit corridors in general and the CoF particularly are:

Table 2: Departments involved in CoF initiative

Department	**Responsibilities**
Development Planning Department	• City transformation
Development Management	• Evaluation of land use management applications. • Obtaining inputs from other departments on land use management applications. • Setting development controls.
Draft Spatial Development and Urban Development Frameworks	• Coordination of other departments to obtain inputs.

	• Stakeholder engagement – private sector and the public.
Transportation Department	• Planning and design of BRT stations. • Operation of BRT.
Johannesburg Development Agency (JDA)	• Implementer of transport projects for BRT with regards the public environment upgrades adjacent to the stations. • Infrastructure issues: negotiated with other departments on projects. • Coordination of spatial development.
Johannesburg Property Company (JPC)	• Identification of municipal-owned land. • Purchase and sale of land for the metro. • Preparation of land for development (e.g. rezoning). • Marketing of land for lease.

Information source: South African Property Owners Association (2016)

The Spatial Development Framework (SDF), revised in a periodic cycle of three years, embodies the spatial vision of the municipality and captures the essence of how this vision will be achieved. The CoF initiative will be an execution of the vision of spatial transformation set out in national and provincial frameworks such as the National Development Plan and the Integrated Urban Development Framework. As such, it has garnered support for financial injections from public funds and has been the focus for changes in the municipality's frameworks (Gauteng City Region Observatory, 2017). That said, there is still a balancing act that has to be done by the city to ensure that its budget accommodates all the development needs of the city while incorporating provincial and national projects. The involvement of

multiple municipal divisions in TOD projects has been cited in international studies to contribute to confusion on the roles and responsibilities of different areas. For example, there is an overlap between the duties of the transport department and the JDA pertaining to the BRT system. Add to this the normal red tape of government departments when it comes to processes that need to be followed for implementation of projects, it can be expected that delays may occur at all phases of the project.

In 2016 coalition governments took control of four of South Africa's largest cities, Johannesburg being one of them. This marked a historic event in democratic South Africa as the ruling party had single party control of these metros since the start of democracy. In Johannesburg (as is the case in other cities) the change in leadership brought about uncertainty on the continuity of projects such as the CoF initiative that were initiated by the African National Congress (ANC). Although the Democratic Alliance (DA)-led coalition government has committed to continuing with the project, it can be expected that there will be changes which may lead to further delays. The politics of it have started to play out as there is proposed name change from CoF to TOD corridors. Commonly when there is a change in governing parties, there is an attempt by the new leading party to prioritise interventions that are initiated by them or to make changes to existing plans in order to put their own stamp in them. There is a possibility of another change in political power in the city as a result of two things. Firstly, coalitions in two of the four major cities that were taken over from the ANC have proven to be fragile and unpredictable. In-fighting between coalition partners and threats to remove DA officials from mayoral positions have been experienced in Nelson Mandela Bay and Tshwane municipalities. This is telling of the uncertainty that comes with such arrangements and can lead to a break up of coalitions and change of power. Secondly, much of the negative sentiment on the ANC was linked to corrupt senior leaders. The change in leadership that took place in 2018 has brought a renewed sense of hope to many. With this in mind coupled with the ailing relationships between coalition partners, the chances for the ANC regaining the city are probably much higher than they were in 2016. In essence therefore, another change in government may result in further delays to the CoF project and potentially there could be an overhaul of certain aspects of the plans.

7.2.2. Geographic and social setting

- Public participation – there have been reports of a negative reception of the CoF initiative by people currently living in the Louis Botha corridor. A study by the

University of the Witwatersrand's School of Architecture and Planning uncovered that there are fierce tensions between the city and mostly the middle income residents of the corridor. The source of the tension is the uncertainty that has surrounded the CoF initiative. The public participation processes have been found by some residents to be inadequate (Appelbaum, 2016). There is also fear from perceived risks related to a decline in property value, displacement of poor residents due to unaffordable rentals and unfavourable lifestyle changes that residents may have to endure.

- The uncertainty has also been fuelled by reports of opportunistic estate agents who have been advising people in the corridor to sell their properties before the values depreciate (Appelbaum, 2016). Some residents only learned about the city's plans when they were approached by estate agents.
- The corridor is home to some of the biggest Jewish communities in the country. In accordance with religious beliefs these communities are often build around places of worship. Building of new residential blocks and densification of such areas will thus require extensive consultations with these communities and the meeting of minds such that each party's needs are met with compromises being made.
- Middle- and high-income earners in the corridor will seek to protect their property value. Two undesirable scenarios can be the consequence. Members of these communities can be a source of resistance to proposed developments. It is already evident from initial public engagements that the residents have relatively high bargaining power and that the implementation of the initiative is not without some negative sentiments. Secondly, there is potential for the disgruntled residents to migrate to other areas which will counteract efforts to achieve income diversity in the corridor. An example of an instance where the residents have exercised their bargaining power in the corridor is the case of the Norwood Orchards Residents Association (NORA) versus the municipality. In summary, the city planned to build high rise inclusionary housing properties in Patterson Park, however, the residents sought to protect their quality of life and property values. The planned developments were also viewed as being more beneficial to the developers instead of the existing and future residents. NORA has represented the residents in various engagements with municipality representatives. Suggestions of the of the association range from the reduction of building heights and density levels to the increase of parking ratios in the proposed developments. NORA has submitted an appeal of the municipality's plans. The

association has acquired the services of Town Planners and Legal representatives in pursuit of a positive outcome in this ongoing matter.

- The City has limited scope to intervene in the sale and re-development of properties that do not conform to the required density standards. Market forces thus have a high bearing on the success of the corridors.
- The participation of private developers in the development of residential units is common internationally. The challenge in the city is that a sizeable share of the population that needs housing is made up of people who cannot afford to pay a monthly rental. As a result these individuals will not be able to occupy the residential units requiring a rental. Additionally, without direct control over what rental is ultimately charged, there is potential for private property owners to increase rental prices if demand for units increases further pricing out individuals at the lower end of the income spectrum.

7.3. Facilitation of TOD in the Louis Botha corridor

The success of the CoF initiative is underpinned by the Rea Vaya BRT which will enable people to effectively travel in and out of the CoF. The availability of a reliable bus system is also anticipated to contribute to lower use of private vehicles, thereby reducing hazardous emissions into the environment. The Rea Vaya is one of the CoJ's tools for the enhancement of existing and future transit corridors. The plan is for it to connect with other modes of transport including the Gautrain and PRASA stations in order to enhance mobility in and around the City. Most of the previous studies have focused narrowly on the Rea Vaya bus service; its operationalisation, the views of the communities along the bus routes, utilisation levels and its overall success considering the sizeable investment that is being made. The studies neglect to contextualise the Rea Vaya in the greater framework of urban regeneration initiatives. The Rea Vaya is an aspect of the CoF initiative and an important one at that. However, the success of the bus service is highly dependent on the achievement of the goals set out for the CoF. Densification of the chosen areas and the creation of vibrant markets within these areas is anticipated to drive demand for the Rea Vaya; a goal set to be realised by the year 2040.

Figure 4 lists the planned capital expenditure of the city according to the available Louis Botha SAF. The city is using a phasing in approach with funding packaged under a 10-year capital instrument plan (City of Johannesburg, 2014). The largest allocation is towards electricity

projects which fall under City Power. This is followed by housing with an allocation estimated at 18% of the total capital plan. According to the SAF the role of the City in this regard will be the facilitation of private sector investment in the development of affordable housing. Consequently, spending under the housing allocation is directed mainly towards the provision of bulk infrastructure, extension of incentives as well as housing schemes such as subsidies. Some of the existing and proposed incentives are expanded on next.

Incentives

The Gauteng Province government has a variety of incentive schemes in place which are aimed at increasing investment and fostering development within the province. In the suite of incentives aimed at shaping property development in the city are the CoJ's inner city rebate and higher density rebate. The former is extended to property developers who redevelop property within the inner city for mixed use with 20% allocated to commercial use and the remaining 80% reserved for residential use (Government Investment Incentives, 2018). The benefit is a rate rebate of 40%. Property developers enjoy a 20% rebate for developing high density properties with 70% or more dwellings per hectare. These are among a myriad of other investment incentives which use other forms of collaborative efforts. Higgins and Kanaroglou (2018) highlight development incentives as one of the tools that are used in TOD for land-use change, along with public capital spending on transit and accommodating zoning.

Incentives are an integral part of the development process that the city is striving towards. The CoJ is in the process of developing incentives which are aimed at further inducing private sector investment within the CoF. Faster development application processes, more permissive development rights and rates rebates are among the broader groups of incentives under consideration. The CoJ has used incentives before but these have been found to be applicable only at the development stage. Proposed CoF incentives include interventions at earlier stages. For example, the possibility of faster processing of development applications augmented by proactive interventions such as the identification of development-ready sites which are pre-approved for zoning and development (Harrison, 2016). This ensures that some of the preparation work that would normally be done by the developer is done by the city beforehand. Delays in the development application process are part of the leading stumbling blocks for property developers and the costs involved at times serve as a deterrent, therefore this intervention is anticipated to be effective in contributing to improving the attractiveness of development in strategic areas. Incentives for developments in the CoF are currently

accommodated under the existing incentive programmes of the city like the Urban Development Zone tax incentives and developers follow the normal development policies and processes. There are however processes in place to expedite applications for development in the corridors on a case by case basis.

Under the new building incentive, developers within areas such as the CoF who adhere to the CoJ's requirements pay 25% of the rates amount for up to two years and thereafter they get rates cuts of 50% in the first year of operation (City of Johannesburg, 2018b). The Louis Botha corridor in particular is considered to have the potential to attract private sector investment in affordable housing as it is perceived to have comparatively lower risk and higher rental demand (Harrison, 2016). Although going forward, qualifying developments in the CoF can continue to benefit under the city-wide incentive plans, there are packages that are being designed specifically for the purposes of urban revitalisation projects. The SAF considers the possibility of an incentive package that will cater for special economic clusters to guide the nature of development that takes place in those areas. In the pipeline is the Inclusionary housing policy. The policy which is currently in draft form caters for rental housing only. To qualify for incentives under the policy, 20% of residential units in a development must be for low- and middle-income earners (City of Johannesburg, 2018c). Proposed incentives include discounts on parks contributions for the inclusionary housing units as well as tax rebates. Parks contributions can go up to R20 000 per unit in normal developments. These include the laying of bulk infrastructure through government agencies such City Power, Joburg Water and Roads Agencies. It is envisioned that rebates on these compulsory taxes will reduce the cost of development and thus attract emerging developers as well. Although the corridor-specific incentives have not been finalised, there is evidence of investment in mixed use, high density buildings by private developers as can be seen in the following section.

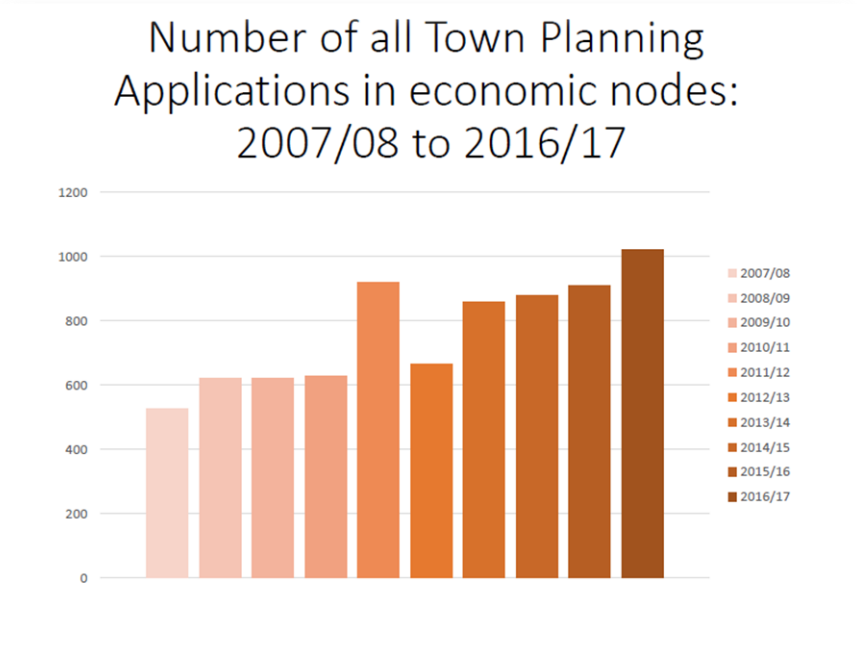
7.4. Property developments in the Louis Botha CoF

The city is investing in transport infrastructure in the Louis corridor as is the case in the other two corridors. Construction of stations and bus lanes is largely still in progress. On the contrary construction along Empire Road which covers the city's top institutions of higher education has been completed and the BRT system is operational. The city has invested in a number of projects that are running concurrently with the BRT project. These include various bulk infrastructure installation projects, construction of the Orchards clinic in Orange Grove, the

Patterson Park multipurpose centre and recreational parks. By investing in these basic developments the city hopes to crowd in private investors in other areas.

The city's Transformation and Spatial Planning unit completed a task wherein all town planning applications within the key economic nodes were charted in order to understand what trends have developed between 2007 and 2017. The outcomes of the exercise are illustrated in the graphs below. The data used was obtained from the Town Planning Application System which is used for managing all planning applications received by the municipality.

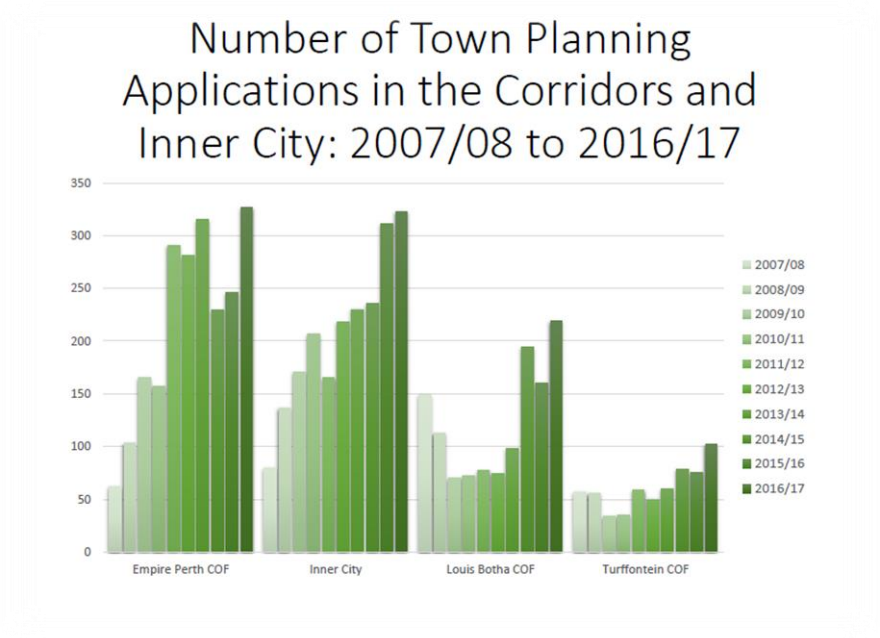
Graph 1: Town planning applications in all economic nodes in Johannesburg



Source: City of Johannesburg (2018d)

On a city-wide level the economic nodes have experienced a more consistent increase in town planning applications from 2013/ 2014. Prior to this period the trend was stagnant, with a spike only in 2011/ 2012. This graph is a representation of approximately 40 economic nodes within the city. The inner city, Sandton and Midrand are the nodes that have the most notable increase in town planning applications.

Graph 2: Town planning applications in the CBD and the CoF

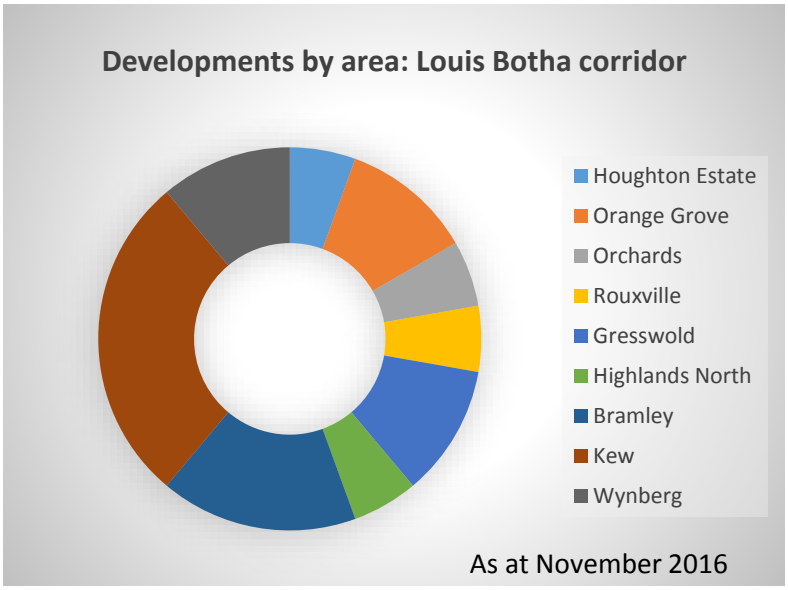


Source: City of Johannesburg (2018)

Within the the CoF, the results have been similar to the city-wide experince in that town planning applications have increased in the latter years of the analysed period. There are differences, however. A steady upward trend starts at varying periods for each corridor. The Empire Perth corridor has registered higher volumes of applications while the Turffontein corridor shows the least. The increase in applications in the Louis Botha corridor from 2014 has surpused previous years. Although a decrease was registered in 2015/ 2016, the level of applications remained higher than the period 2007 to 2013. This may be an indication of an increase in the attractiveness of the corridor following the announcement of the CoF initiative in 2013, but, it cannot be established wheter the applicants acted on the basis of the annoucement. The application process is purely for the registration of applications for town planning with no questionaire to determine the driving forces behind the applications. There is also no distinction between development and property types (residential, commercial, industrial, etc). Notwitstanding this, volumes of town planning applications are a positive early indication of development demand. The following analysis will focus on the private, high density developments that are taking place in the Louis Botha corridor.

Information presented in graph 4 and table 3 below is populated and kept manually in a spread sheet format. It is collated by the City Transformation and Spatial team for internal reporting purposes.

Graph 3: Share of total developments by area



Source: City of Johannesburg (2018d)

Table 3: Developments in the Louis Botha corridor in 2016

Area	*Volume*	*Land area (m^2)*	*Total units*	*Type of development*	*Stage of development*
Houghton	1	4 738	59	Residential rentals	Construction
Orange Grove	2	3 957	133	Residential rentals with mixed use elements	Construction of phase 1 and rezoning of phase 2
Orchards	1	1 032	39	Residential rentals with mixed use elements	Building Plans Phase 1 in circulation. Rezoning for Phase 2 in Progress
Rouxville	1	4 400	177	Affordable residential rentals with mixed use elements	Building plan submission
Gresswold	2	4 437	144	Affordable residential rentals with mixed use elements	Zoning submission
Highlands North	1	1 980	123	Residential rentals with mixed use elements	Zoning submission
Bramley	3	8 772	172	Residential rentals with mixed use elements	One development under construction and the

					other two in zoning submission.
Kew	5	27 253	996	Affordable Residential Rentals with mixed use elements	Building plan submission and pre-submission
Wynberg	2	50 519	559	Residential rentals with mixed use elements	Recommended for approval at tribunal
Total	**18**	**107 088**	**2 402**		

Information source: City of Johannesburg (2018d)

The City's Transformation and Spatial Planning team also compiled a list of private developments that were at different phases within the CoF in 2016. Graph 4 and table 3 above provide information on the developments within the Louis Botha corridor in 2016. Eighteen developments were recorded, the highest concentration being in the Kew and Bramley areas. The developments are all undertaken by private developers for residential rental units. All developments have mixed use elements barring the Houghton estate building which is a single use development (residential units). The mixed use developments are made up mostly of residential units with a few spaces for non-residential activities. The only two buildings that have a higher allocation towards non-residential purposes are in Kew. Only three of the developments had affordable residential units. These rental units have a rental range between R1 500 and R4 000. The cost of affordable housing according to the draft inclusionary housing policy must make up at most 30% of the individuals monthly income whether rented or owned (City of Johannesburg, 2018c). Two of the developments are targeting higher income groups. The Houghton development consists of 59 units with a rental of R7 800. A development in Kew has a rental range of R6 700 to R7 800. The rest of the developments have rental ranges of R2 500 to R7 410.

7.5. Case study findings

The corridor is predominantly residential and developments taking place indicate a continuation of this tendency. In contrast, areas that are serviced by the Gautrain were residential and had vibrant high-end commercial activity already before its introduction. The availability of vacant land to develop high-rise office buildings has been a contributing factor to these developments, particularly in Midrand. What becomes evident from the material

presented in this section is that the data that was availed for this study is not enough for a definitive conclusion. There are however six key findings that can be highlighted:

1. It is difficult to trace developments from application to completion of the development. The information retrieved from the city's records included other applications which are not relevant for this study. For example, the information collated by the municipality contains government applications, agricultural applications as well as applications with unresolved or undetermined zoning. It does not also show whether the applications are for the development of properties that are aligned to TOD principles. More importantly, it was noted that with rezoning applications there we inconsistencies with the level of detail that was available, particularly for older applications.
2. Property planning applications viewed here as an early indication of demand for property development in the Louis Botha corridor have increased since 2014 but have spiked in the three-year period from 2015 to 2017. These applications may include conversions of property by existing residents who want to modify their properties for their own benefit. It can thus not be concluded that the increase in town planning applications will translate to an increase in the volumes of developments taking place in the corridor. Due to time constraints and the scope this study, it was not feasible to request all data related to property developments and to reconcile it from where the applications are lodged to where the developments are completed. It was also not possible to visit the locations to track the progress of development.
3. The developments being tracked by the city are reported to have mixed use elements. There are multi-storey buildings catering for different income groups. This notwithstanding, there is an element that has proven to be important in driving the types of developments envisioned for TOD areas. International case studies show that incentives are key to promoting investment in property. TOD incentives are ordinarily put in place much earlier on in the TOD planning process. It thus follows that accelerated effort to finalise and implement CoF specific incentives will contribute to increasing the attractiveness of property investments in the CoF.
4. An interesting observation was that with the minimum rental amount for the developments in the Louis Botha corridor development compiled list being R1 500 it means that people targeted for these developments should earn at least R5 000 per month for the rental amount to be at most 30% of their income as per the provisions of the inclusionary housing policy. This excludes many South African's who are the most

desperate for housing. To put this in context, at the end of 2018 the South African president signed bills into law for a R3 500 monthly national minimum wage which covers many categories of work. Individuals within this income level are priced out of these rental units since 30% of their income would be R1 050. Additionally, as alluded to before, the informal sector in the Louis Botha corridor is an important means of survival for many who rely on informal businesses and employment. It is difficult to regulate income in this sector and it may well be that income levels are below the minimum wage threshold. It has been established that the Louis Botha corridor is a mixed income area and government interventions should take this into account.

5. In the study on the impact of the Gautrain on property development the limited availability of land to develop in Pretoria was highlighted as a contributing factor to lower developments being seen. Similarly, the Louis Botha corridor has limited vacant land which may be a contributing factor to there being no large commercial developments taking place. The experience mostly in America has been that TOD areas see an increase in rental rates as demand increases. The Louis Botha corridor also has a relatively high demand for rented accommodation. It is thus envisioned that TOD will serve to enhance the attractiveness of the corridor. Apart from the measurement of TOD elements, it will be worthwhile to observe the rental trends in the corridor going forward. Affordability of accommodation will contribute to shaping the demographic make up of the corridor.
6. Completion of impact studies involves inherent challenges mainly due to the time needed to observe project effects to their entirety. The study would have benefitted from interviews with developers and residents in the corridor.

The Louis Botha corridor is already well serviced by public transport (mostly taxis and buses). What the initiative can achieve is increased densification, an additional transport system and the improvement of the visual appeal of neighbourhoods. The Rea Vaya will compete with other modes of transport, including private cars, with its main competitive advantage being that it has dedicated lanes to reduce time spent in traffic. With a larger lower income demographic expected to move into the corridor to occupy low income units, the city's BRT system will have to be the most cost-effective alternative in order to attract these new riders.

To drive these points home the final section of this paper presents concluding remarks, addressing areas that will be key to the successful realisation of the goals that have been set for the CoF initiative.

7.6. Key considerations for the city to be cognisant of

1. In South Africa there is still a culture of home ownership. Societal norms still attach much value to the ownership of a house, usually located on a plot of land that the resident can claim ownership to. A house remains an important symbol of social standing. This attachment to single stand, single family houses is also a potential stumbling block for the speed of transformation of the corridor as the people who own these dwellings in the priority areas may not be willing to sell their homes in order for apartment buildings to be built. Countries in more affluent continents where cities are dominated by skyscrapers and rental accommodation have a renting culture and single stand homes are found in the country (village) areas.

2. The timeline that has been set for the transformation of the CoF is ambitious. There have already been delays in the building of the Rea Vaya stations in the Louis Botha and other corridors. Notwithstanding the construction delays which are a common occurrence with big projects in the country, complete change of the social fabric will take at least a few decades. The city may use the completion of the built elements as a sign of success in the development of a transit community, however, the real success will lie in the achievement of the social, environmental and economic outcomes.

3. The case of Louis Botha is similar to that of the cities studied by Belzer and Autler (2002). The area has established neighbourhood settings and the residents are active in ensuring that the CoF developments do not disturb the current way of life. There is a risk of the creation of a transit adjacent neighbourhood, meaning that the transit system may be put in place but the limited availability of land and complexities around changing physical elements of neighbourhoods may present challenges that could hinder the application of complete TOD principles.

4. The goal of creating state of the art urban communities through the CoF initiative is noble and perhaps worth pursuing, however, there are shortcomings with using TOD. TOD is often used as a solution for all urban development deficiencies (Dittmar and Ohland, 2012). The issue with this view is that TOD may not be the best for transit users, the residents or the selected areas. For instance, the expectation with the CoF initiative is that the development of property in the areas among other things will create

demand for these areas from business owners and people looking for residential properties. This kind of Say's Law thinking is unsound given that demand for property is driven by factors such as credit availability, rate of interest, rural-urban migration as well as business growth and confidence in a region to name a few (Collins and Ghyoot, 2012). More attention has been paid to supply side investments rather than developing demand for the CoF (Kollamparambil, 2016).

5. Maintaining the benefits of the BRT system in terms of ensuring high quality performance consistently, keeping costs low to make it accessible to people at different income levels and maintaining a high ridership (by discouraging the use of private cars) can become a challenge in the long term (Croese, 2016). High maintenance and bus replacement costs can lead to a rise in the fare which ultimately discourages riders from using the bus.

6. An issue that has been identified with using TOD is that of public participation. The strategy that the CoJ has employed to create public awareness around the developments is in the form of information-sharing sessions, which Kollamparambil (2016) argues is not an effective way of creating long-term relations with stakeholders. The success of TOD depends largely on real engagement and consultation with the people in the affected communities especially considering that TOD often involves some level of inconvenience for residents, be it relocation of people for purposes of creating trunk routes for the transit system or the destruction of green spaces for retail developments. There is a downside in TOD if it is not governed to promote inclusivity. It can result in the displacement of low-income households leading to these households being concentrated in areas that are less desirable to investors thus contributing to the issues of inequality, urban sprawl and exclusion (Lane, 2017). The CoJ has taken the potential risk of low-income residents being priced out of the area into account and as such there are incentives in place for developments that have mixed income housing units. The challenge with this is that the government has limited control over the price that will be charged by the private owner for the units. If demand increases, there is potential that the price of units meant for low income residents can increase to levels that are unaffordable for the residents.

7. It can be expected that there will be obstacles to the implementation of a project of this magnitude. Successful implementation in general has proven to be an area that needs development in the public sector. One of the contributing factors is the political cycle which is short for an administration to see though their planned long-term developments. The time horizon for Johannesburg's growth and development initiatives is more than 20 years (to 2040) whereas a political party's term is 5 years.

8. TOD is a new concept to South Africa. In the Louis Botha corridor particularly there is uncertainty over how the envisioned developments will affect property prices. There is wide media coverage of the frustrations of the current residents with the uncertainty that has become a characteristic of the initiative. On this basis, property owners may sell while they believe they can. Largescale 'migration' of current residents, may hamper the city's plans to improve social cohesion.

8. Conclusion

A multidisciplinary approach has been used in this study, drawing themes from History, Geography, Town Planning, Economics and various combinations of these fields. In the beginning the historical context set the scene on the foundation of the spatial challenges in urban areas across the country. The prevailing spatial woes should not be viewed in isolation from historical developments. Although inherited, these issues are ongoing in Johannesburg and have been further worsened by settlements built in the fringes of existing townships in peripheral areas. It was established that the consideration of Geography in economic analysis is important, particularly in studies that incorporate spatial considerations. International case studies indicate a growing interest in TOD although the experiences of cities globally have been mixed. Investment in transit does not only stimulate the economy. It also directly improves the lives of low-income residents by providing a reliable service that is cost effective. The outcomes that were the focus of this study were the volumes and compositions of property developments by private investors in the Louis Botha corridor. The findings indicate that there has been an increase in applications for property development in the corridor. It has also been established that private developers are investing in mixed use properties with some having affordable housing units. Although this is the case, real estate investment is not only driven by transit. The availability of a reliable, efficient and affordable transit system can have a positive impact on development trends, however, it cannot exclusively be credited with driving these trends (Belzer and Autler, 2002). It cannot be said definitively that TOD is exclusively responsible for developments in the corridor that has been studied. Elements such as its geographic positioning between major economic hubs, the social class of the residents, the presence of industrial areas and an already bustling transit system all make the corridor an attractive investment area. The fact that there is a focus on making it a transit corridor may enhance its attractiveness, possibly resulting in higher densification. The achievement of a complete change in the neighbourhoods from single stand homes to high rise residential apartments is a goal that may prove to be more difficult to achieve. TOD areas still compete with other sites for development, with transit being one of many other factors that make an area attractive to developers.

9. References

Appelbaum, A. (2016). Contestation, transformation and competing visions: A study of Orange Grove and Norwood. Report 7. Spatial Transformation through Transit-Oriented Development in Johannesburg Research Report Series. *South African Research Chair in Spatial Analysis and City Planning*. Johannesburg: University of the Witwatersrand.

Ballard, R., Dittgen, R., Harrison, P. and Todes, A. (2017). Megaprojects and urban visions: Johannesburg's Corridors of Freedom and Modderfontein. *Transformation: Critical Perspectives on Southern Africa*. Vol. 95, No.1, pp. 111-139.

Belzer, D. and Autler, G. (2002). Transit Oriented Development: Moving from rhetoric to reality. Discussion Paper. *The Brookings Institution Centre on Urban and Metropolitan Policy*. [Online]. Available: http://www.china-up.com:8080/international/case/case/810.pdf [Accessed 31 May 2018].

Bertolini, L., Curtis, C. and Renne, J. L. (2009). Introduction. In: Bertolini, L., Curtis, C. and Renne, J. L. (eds). *Transit Oriented Development. Making it happen*. Burlington: Ashgate Publishing Company. pp 3-23.

Bickford, G. and Behrens, R. (2015). *What does Transit Oriented Development mean in a South African context? A multiple stakeholder perspective from Johannesburg*. [Online]. Available: https://repository.up.ac.za/handle/2263/57751 [Accessed 05 December 2018].

Bickford, G. (2016). *Transit Oriented Development in the South African context: An analytical review of Johannesburg's recent urban policy and strategy*. [Online]. Available: https://open.uct.ac.za/handle/11427/20406 [Accessed 29 November 2018].

Calitz, E., Wallace, S. and Burrows, L. R. (2013). *The impact of tax incentives to stimulate investment in South Africa*. Working Paper No 19. Department of Economics, Stellenbosch University: Stellenbosch. [Online]. Available: https://www.ekon.sun.ac.za/wpapers/2013/wp192013/wp-19-2013.pdf [Accessed 01 June 2018].

Canadian Urban Transit Association (2004). *Transit-Oriented Development: Smart growth in action*. Issue paper 9. [Online]. Available: http://cutaactu.ca/en/node/488 [Accessed 12 December 2018].

Carlton, I. (2007). *Histories of Transit-Oriented Development: Perspectives on the development of the TOD concept*. Institute of Urban and Regional Development. Berkeley: University of California.

Cervero, R. and Kockelman, K. (1997). Travel demand and the 3Ds: Density, Diversity and Design. *Transportation Research*. Vol. 2, No. 3, pp. 199 – 219.

Cervero, R. (2006). *Public transport and sustainable urbanism: Global lessons.* [Online]. Available: https://www.researchgate.net/publication/242572143_Public_Transport_and_Sustainable_Urbanism_Global_Lesson [Accessed 05 December 2018].

Cervero, R. (2009). Public transport and sustainable urbanism: Global lessons. In Curtis, C., Renne, J.L. and Bertolini, L. (eds). *Transit Oriented Development: Making it Happen*. Surrey: Ashgate Publishing Limited.

Cervero, R. and Landis, J. (1997). Twenty years of the Bay Area rapid transit system: Land use and development impacts. *Transport Research Part A: Policy and Practice*. Vol. 31, No. 4, pp. 309-333.

Christopher, A. J. (1983). From Flint to Soweto: Reflections on the colonial origins of the Apartheid city. *The Royal Geographical Society*. Vol. 15, No.2, pp. 145-149.

City of Johannesburg (2014). *Louis Botha Avenue development corridor: Strategic Area Framework.* [Online]. Available: https://drive.google.com/drive/folders/0B2v6abwVoMI3OFpKdFBJbDcybnM?%3Busp=sharing [Accessed 28 November 2018].

City of Johannesburg (2018a). *2017/18 Integrated Development Plan Review*. [Online]. Available: http://www.gauteng.gov.za/government/departments/co-operative-governance-and-traditional affairs/Documents/IDP%20for%20the%20City%20of%20Joburg.pdf [Accessed 04 June 2018].

City of Johannesburg (2018b). *Corridors of Freedom development incentives*. [Online]. Available: http://www.corridorsoffreedom.co.za/index.php/development-incentives [Accessed 04 June 2018].

City of Johannesburg (2018c). *City of Johannesburg inclusionary housing: incentives, regulations and mechanisms*. Draft policy for public comment: 28 February 2018.

City of Johannesburg (2018d). *Economic nodes*. City Transformation and Spatial Planning, City of Johannesburg.

Clinch, J. P. and O'Neill, E. (2007). Applying Spatial Economics to national spatial planning. *Regional Studies*. Vol. 43, No. 2, pp. 157-178.

Collins, T. and Ghyoot, V. (2012). *An introduction to commercial property finance, development and investment*. Pretoria: Unisa Press.

Croese, S. (2016). International case studies of Transit-Oriented Development corridor implementation. Report 3. Spatial Transformation through Transit-Oriented Development in Johannesburg Research Report Series. *South African Research Chair in Spatial Analysis and City Planning*. Johannesburg: University of the Witwatersrand.

Crowley, D.F., Shalaby, A.S. and Zarei, S. (2009). Access walking distance, transit use and Transit-Oriented Development in North York City center and Toronto, Canada. *Transportation Research Record: Journal of the Transportation Research Board*. Vol. 12, No. 2110, pp. 96-105.

CSIR (2015). *Indicator – population change – density per hectare per subplace 1996-2011*. (Prepared in support of SACN – State of the Cities Report 2015).

Curtis, C., Renne, J.L. and Bertolini, L. (2009). *Transit Oriented Development: Making it Happen*. Surrey: Ashgate Publishing Limited.

Chye, B. (2019). *Transit-Oriented Development in Emerging Cities: Principles from Singapore*.[Online].Available: https://www.google.co.za/amp/s/www.oxfordurbanists.com/magazine/2019/3/9/transit-oriented-development-in-emerging-cities-principles-from-singapore%3fformat=amp [Accessed 23 September 2019].

Data Management Group (2018). *Transportation Tomorrow Surveys*. [Online]. Available: http://dmg.utoronto.ca/ [Accessed 12 December 2018].

Davis, J.E. and Rosenberg, G. (2017). *International Precursors: Garden cities*. [Online]. Available: http://www.cltroots.org/the-guide/foreign-born-pioneers-precedents/garden-cities [Accessed 05 December 2018].

Dittmar, H. and Ohland, G. (2012). *The new transit town: Best practices in Transit-Oriented Development*. Washington DC: Island Press.

Garretsen, H. and Martin, R. (2010). Rethinking New Economic Geography models: Taking Geography and History more seriously. *Spatial Economic Analysis*. Vol. 5, No. 2, pp. 127-160.

Gauteng City Region Observatory. (2017). *A political economy analysis of transit corridors*. [Online]. Available: http://www.gcro.ac.za/research/project/detail/a-political-economy-analysis-of-transit-corridors/ [Accessed 21 January 2019].

Global BRT (2018). *Corridor indicators*. [Online]. Available: https://brtdata.org/indicators/corridors/corridor_name [Accessed 04 June 2018].

Government Investment Incentives (2018). *Municipal and provincial incentives: Gauteng*. [Online]. Available: http://www.investmentincentives.co.za/municipal-and-provincial-incentives/municipal-and-provincial-incentives-gauteng [Accessed 04 June 2018].

Harrison, K. (2016). Transit corridors and the private sector: Incentives, regulations and the property market. Report 4. Spatial Transformation through Transit-Oriented Development in Johannesburg Research Report Series. *South African Research Chair in Spatial Analysis and City Planning*. Johannesburg: University of the Witwatersrand.

Higgins, C. and Kanaroglou, P. (2018). Rapid transit, transit-oriented development, and the contextual sensitivity of land value uplift in Toronto. *Urban Studies*. Vol. 55, No.10, pp. 2197-2225.

James, B. (2009). The property sector as an advocate for TOD: The case of south east Queensland. In Curtis, C., Renne, J.L. and Bertolini, L. (eds). *Transit Oriented Development: Making it Happen*. Surrey: Ashgate Publishing Limited.

Kellet, J. (1969). *The Impact of Railways on Victorian Cities*. London: Routledge.

Knight, R. L. and Trygg, L. L. (1977). Evidence of land use impacts of rapid transit systems. *Transportation*. Vol. 6, No. 1, pp. 231-247.

Kollamparambil, U. (2016). Multiple words and experiences: Conditions of life and work along the Corridors of Freedom. Report 9. Spatial Transformation through Transit-Oriented Development in Johannesburg Research Report Series. *South African Research Chair in Spatial Analysis and City Planning*. Johannesburg: University of the Witwatersrand.

Krugman, P. R. (1991). Increasing returns and economic geography. *Journal of Political Economy*. Vol. 99, No. 1, pp. 483-499.

Lane, B. G. (2017). *Governance of inclusive Transit-Oriented Development in Brazil*. Working Paper No 1. World Resources Institute. [Online]. Available: https://www.wri.org/sites/default/files/Governance_of_Inclusive_Transit-Oriented_Development_in_Brazil_0.pdf [Accessed 12 August 2018].

Li, J., Wen, J. and Jiang, B. (2017). Spatial spillover effects of transportation infrastructure in Chinese New Silk road economic belt. *International Journal of e-Navigation and Maritime Economy*. Vol. 6, No.1, pp. 1-8.

Maylam, P. (1995). Explaining the Apartheid city: 20 years of South African urban historiography. *Journal of Southern African Studies*. Vol. 21, No. 1, pp. 19-38.

Melo, P. C., Graham, D. J. and Brage-Ardao, R. (2013). The productivity of transport infrastructure investment: A meta-analysis of empirical evidence. *Regional Science and Urban Economics*. Vol. 43, No. 1, pp. 695-706.

Muley, D., Bunker, J. and Ferreira, L. (2009). Investigation into travel modes of TOD users: Impacts of personal and transit characteristics. *International Journal of ITS Research*. Vol. 7, No. 1, pp. 3-13.

Mushongahande, R., Cloete, C. E. and Venter, C. J. (2014). Impact of the Gautrain on property development around station precincts. *Journal of the South African Institute of Civil Engineering*. Vol. 56, No. 1, pp. 2-10.

Ndebele, R. and Ogra, A. (2014). *A place-based approach to spatial transformation: A case study of Transit Oriented Development (TOD), Johannesburg*. [Online]. Available: https://ujcontent.uj.ac.za/vital/access/manager/Repository/uj:4936 [Accessed 10 January 2019].

Newman, P. (2009). Planning for Transit Oriented Development: Strategic principles. In Curtis, C., Renne, J.L. and Bertolini, L. (eds), *Transit Oriented Development: Making it Happen*. Surrey: Ashgate Publishing Limited.

O'Malley, P. (2018). *The heart of hope - South Africa's transition from Apartheid to Democracy*. [Online]. Available:

https://omalley.nelsonmandela.org/omalley/index.php/site/q/03lv00000.htm [Accessed 03 February 2019].

Ogra, A. and Ndebele, R. (2014). *The role of 6Ds: Density, Diversity, Design, Destination, Distance, and Demand Management in Transit Oriented Development (TOD)*. Conference Paper: Neo-International Conference on Habitable Environments (NICHE 2014). [Online]. Available: https://www.researchgate.net/publication/268813431_The_Role_of_6Ds_Density_Diversity_Design_Destination_Distance_and_Demand_Management_in_Transit_Oriented_Development_TOD [Accessed 10 December 2018].

Pernegger, L. and Godehart, S. (2007). Townships in the South African geographic landscape – physical and social legacies and challenges. [Online]. Available: http://www.treasury.gov.za/divisions/bo/ndp/TTRI/TTRI%20Oct%202007/Day%201%20-%2029%20Oct%202007/1a%20Keynote%20Address%20Li%20Pernegger%20Paper.pdf [Accessed 25 November 2018].

Pojani, D. and Stead, D. (2014). Dutch planning policy: The resurgence of TOD. *Land Use Policy*. Vol. 41, No. 1, pp. 357-367.

Pojani, D. and Stead, D. (2017). *The urban transport crisis in emerging economies*. Cham, Switzerland: Springer International Publishing.

Poticha, S. and Wood, J. (2009). Transit oriented for all: Delivering mixed-income housing in transit served neighbourhoods. In Curtis, C., Renne, J.L. and Bertolini, L. (eds). *Transit Oriented Development: Making it Happen*. Surrey: Ashgate Publishing Limited.

Queensland Government (2018). *Department of Transport and Main Roads: Upcoming transit oriented developments*. [Online]. Available: https://www.tmr.qld.gov.au/Community-and-environment/Planning-and-developments [Accessed 14 January 2019].

Regional Transportation Commission of Southern Nevada (2018). *Disparity Study*. [Online]. Available: https://www.rtcsnv.com/about-the-rtc/disparity-study/ [Accessed 25 November 2018].

Rietveld, P. (1994). Spatial economic impacts of transport infrastructure supply. *Transportation Research Part A: Policy and Practice*. Vol. 28A, No.4, pp. 329-341.

Rubin, M. (2018). There's many a slip 'twixt the cup and the lip: Questioning spatial transformation through Johannesburg's Corridors of Freedom. In Myambo, M. (ed). *Reversing urban inequality in Johannesburg*. Johannesburg: Routledge.

Seftel, L. and Peterson, B. (2014). *Achieving sustainability in BRT implementation in the city of Johannesburg*. [Online]. Available: https//repository.up.ac.za/handle/2263/45531 [Accessed 10 January 2019].

South African Government (2018). *1913 Natives Land Act centenary*. [Online]. Available: https://www.gov.za/1913-natives-land-act-centenary [Accessed 03 February 2019].

South African Property Owners Association (2016). *Developing a collective approach to mixed-use development in Transit-Oriented Development precincts*. [Online]. Available: http://www.sacities.net/wp-content/uploads/2016/PDF/TOD%20Report%202016-web%20version.pdf [Accessed 28 November 2018].

Statistics South Africa (2003). *National Household Travel Survey*. [Online]. Available: http://www.statssa.gov.za/publications/P0320/P03202013.pdf [Accessed 25 November 2018].

TOD Institute (2018). *Transit Oriented Development*. [Online]. Available: http://www.tod.org/ [Accessed 29 November 2018].

Transportation Research Board (2004). *Transit-Oriented Development in the United States: Experiences, challenges and prospects*. [Online]. Available: https://www.nap.edu/read/23360/chapter/1 [Accessed: 04 October 2018].

United Nations Development Programme (2018). *Sustainable Development Goals. Goal 11: Sustainable cities and communities*. [Online]. Available: http://www.undp.org/content/undp/en/home/sustainable-development-goals/goal-11-sustainable-cities-and-communities.html [Accessed 04 June 2018].

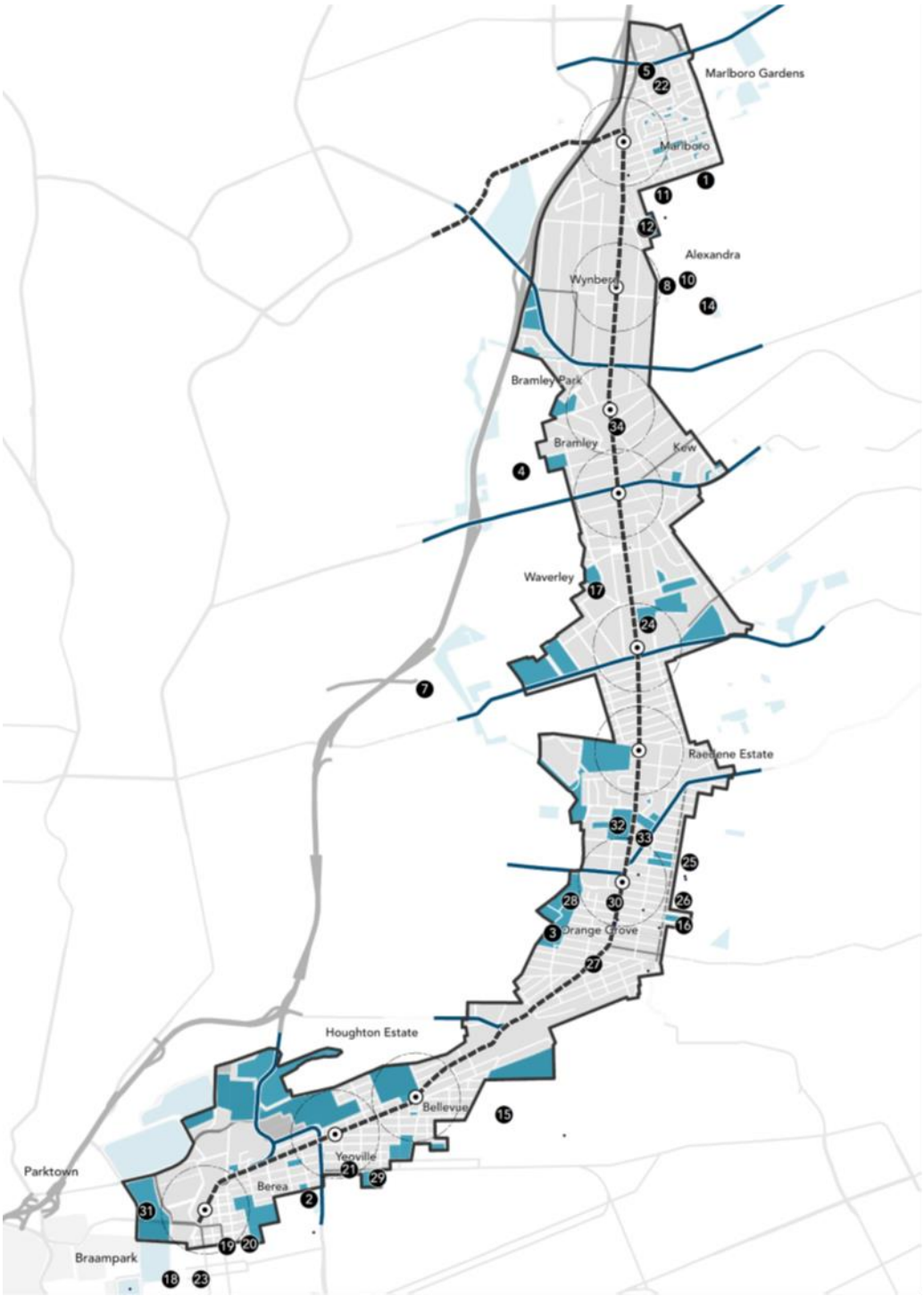
UTTIPEC (2009). *Transit Oriented Development: The roadmap*. [Online]. Available: http://www.uttipec.nic.in/upload/uploadfiles/files/8729211245.pdf [Accessed 29 November 2018].

Venter, C. (2016). Assessing the potential of bus rapid transit-led network restructuring for enhancing affordable access to employment – The case of Johannesburg's Corridors of Freedom. *Research in Transportation Economics*. Vol. 59, No. 1, pp 441-449.

Warner, S. B. (1962). *Streetcar Suburbs*. Cambridge: Harvard University Press.

10. Appendix

Figure 3 - Louis Botha Corridor



Source: City of Johannesburg (2014)

Figure 4 - Louis Botha Corridor Capital Program

REF		NAME		
MAP REF	CIMS ID	PROJECT	ESTIMATED BUDGET	CHAMPION
	33126	Charltendale Park Upgrade	R 5,000,000.00	JCP
	33123	Orange Grove Park Upgrade	R 7,500,000.00	JCP
	33124	Rumarais Park Upgrade	R 4,000,000.00	JCP
	33825	Paterson Park Redevelopment	R 11,000,000.00	JCP
	33828	6 New Local Parks	R 10,000,000.00	JCP
	33827	Dan Pienaar Park Upgrade	R 3,000,000.00	JCP
	33826	Yeoville Park Upgrade	R 4,600,000.00	JCP
		Orchards and Bagleyston Distributor	R 2,000,000.00	Cpower
		Glenhazel distributor	R 1,900,000.00	Cpower
		Orange grove distributor	R 1,300,000.00	Cpower
		Sunningdale distributor	R 4,500,000.00	Cpower
	32811	New Substation at Sandringham	R 100,000,000.00	Cpower
	22490	New Service Connections (City Power)	R 56,250,000.00	Cpower
		Alex stadium	R 4,500,000.00	ComDev
		Alex library	R 500,000.00	ComDev
		4th Avenue Clinic, Alex	R 2,300,000.00	ARP (JDA)
		Thoko Ngoma Clinic, Alex	R 3,430,000.00	ARP(JDA)
		Yeoville Sports and Rec	R 1,250,000.00	ComDev
	33373	Upgrading of Hillbrow Recreation Centre	R 500,000.00	ComDev (JDA)
	24598	Redevelopment of the Paterson Park Recreation Centre	R 50,500,000.00	ComDev
		Esselen Street Clinic	R 21,000,000.00	Health
	33852	Orchards Clinic: New Facility	R 31,000,000.00	Health
	33771	Housing Capital Projects across the Corridor	R 89,400,000.00	Housing
	33857	Pocket Places - Small urban spaces within the Corridor	R 15,660,000.00	JDA
	33856	Orange Grove Triangle Development (Public Space)	R 7,900,000.00	JDA
	33791	Sewer Projects within the Corridor	R 10,000,000.00	JW
	26878	Upgrade of Water Infrastructure (Randjeslaagte District)	R 600,000.00	JW
	33786	Water Projects within the Corridor	R 55,000,000.00	JW
	33834	Upgrading of Pieter Roos Park	R 1,500,000.00	JCP

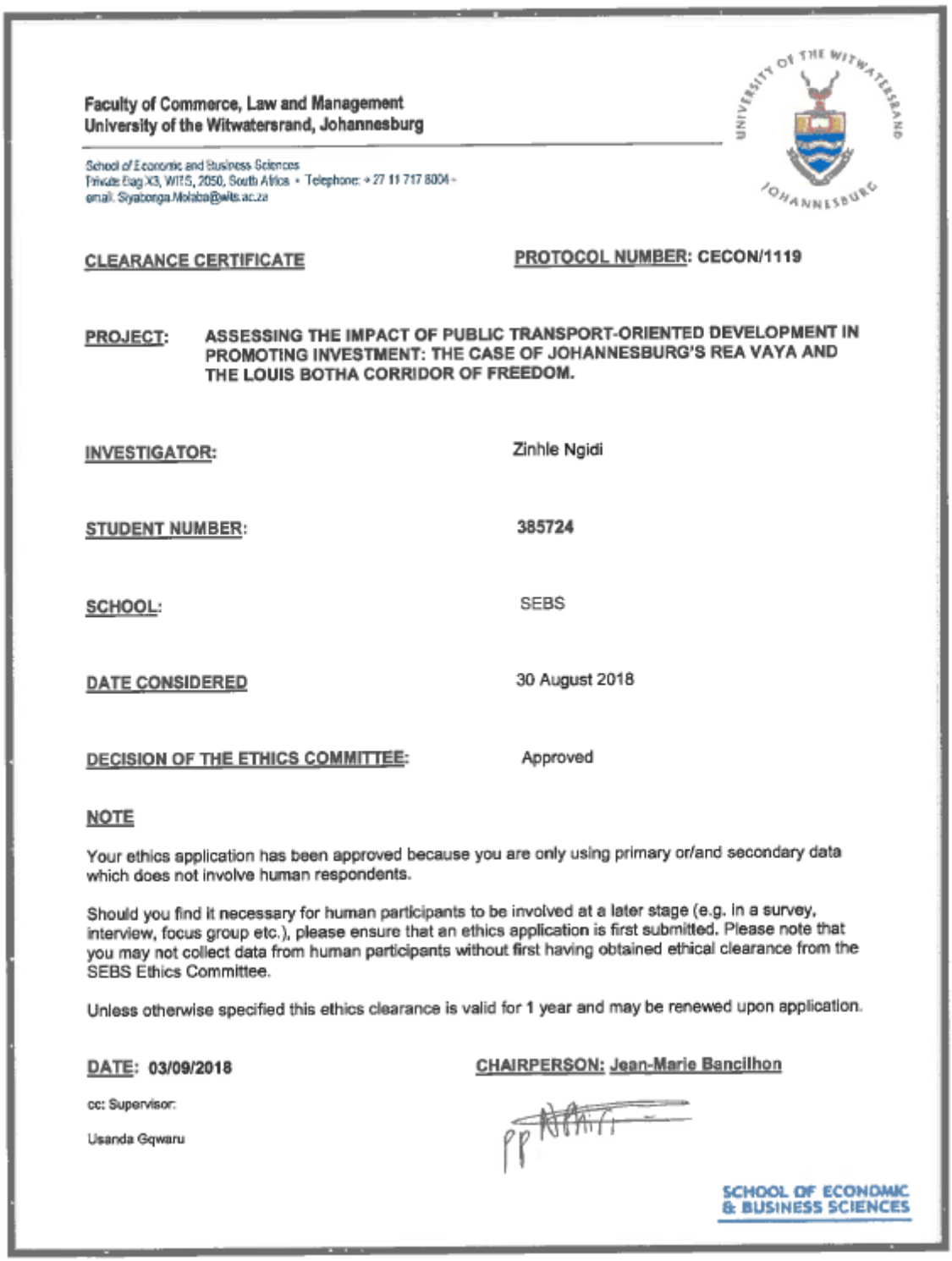
Source: City of Johannesburg (2014)

Figure 5: Bloubosrand (left) and Kya Sands (right)

Source: Miller (2018)

Figure 5 shows the stark reality of the inequality that plagues South Africa's urban areas. Depicted above is the leafy suburb of Bloubosrand on the left and an informal settlement in Kya Sands on the right. The two areas are separated by a street yet there are vast differences in living conditions.

Figure 6: Ethics Clearance



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UNIVERSITY OF THE WITWATERSRAND JOHANNESBURG

CLEARANCE CERTIFICATE **PROTOCOL NUMBER: CECON/1119**

PROJECT: **ASSESSING THE IMPACT OF PUBLIC TRANSPORT-ORIENTED DEVELOPMENT IN PROMOTING INVESTMENT: THE CASE OF JOHANNESBURG'S REA VAYA AND THE LOUIS BOTHA CORRIDOR OF FREEDOM.**

INVESTIGATOR: Zinhle Ngidi

STUDENT NUMBER: **385724**

SCHOOL: SEBS

DATE CONSIDERED 30 August 2018

DECISION OF THE ETHICS COMMITTEE: Approved

NOTE

Your ethics application has been approved because you are only using primary or/and secondary data which does not involve human respondents.

Should you find it necessary for human participants to be involved at a later stage (e.g. in a survey, interview, focus group etc.), please ensure that an ethics application is first submitted. Please note that you may not collect data from human participants without first having obtained ethical clearance from the SEBS Ethics Committee.

Unless otherwise specified this ethics clearance is valid for 1 year and may be renewed upon application.

DATE: 03/09/2018 **CHAIRPERSON: Jean-Marie Bancilhon**

cc: Supervisor:

Usanda Gqwaru

pp

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