Micro-dynamics and Macro-processes

A Maputo-Johannesburg comparative study of intra-household decision-making and state investment in transit

Gauteng report

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Contents

Executive summary

This report presents the findings from the Gauteng City-Region component of the research project entitled “Micro-Dynamics and Macro-Processes: A Maputo-Johannesburg Comparative Study of Intra-Household Decision-Making and State Investment in Transit”. The project was initiated in January 2020; fieldwork was delayed due to the COVID-19 pandemic but was eventually conducted between August 2020 and April 2021. The report begins with a brief introduction, outlines the objectives of the study, and provides a detailed summary of the context of transport in the Gauteng City-Region .

The main methodological approach for this study was qualitative and comprised two components. The first component focused on three case study sites, Denver, Westbury, and Thembisa, all neighbourhoods in the Gauteng City-Region selected for their varying levels of access to transport, housing typologies, and demographic characteristics. In each site, households were invited to participate through existing contacts and through community focus groups. Participants were selected to represent a range of household compositions, sizes, and ages. Each participant was provided with a smartphone preloaded with a mobility tracking application, and their movements were tracked over two weeks. In addition, participants were joined to a WhatsApp group in each neighbourhood and were invited to share photos, audio files, videos, and messages about their experiences using transport and moving around the city-region. This period was followed by an in-depth interview either conducted in person or over the phone, depending on the current COVID-19 regulations.

The second component of fieldwork focused on transport policy and policymakers. With the help of postgraduate students who were part of the project, the project team conducted a desktop review of transport policy history as well as current policy and recent transport infrastructure investments in the Gauteng City-Region. Following this, the researchers conducted a series of interviews over the phone or by video call with key informants involved in transport in the Gauteng City-Region at provincial as well as municipal levels. The research team conducted a thematic content analysis on these interview transcripts as well as on the transcripts from the interviews with residents in each case study site.

The findings from the first component reveal insights into the micro-dynamics of residents’ experiences of transport in the Gauteng City-Region. The data reveals that the transport needs and uses for family members are diverse within households and across all three case studies. Decision-making regarding household responsibilities also varies but is frequently tied to those members who earn an income, whilst most transport decision-making focuses on the cost of the transport mode. This means that women and children do not frequently participate in the decision-making regarding their transport needs. The cost of transportation plays a disproportionate role in shaping mobility for households as well as other basic needs such as food.

Many participants felt that they had very little choice in their mode of transport. Their reasons ranged from the availability of transport in their neighbourhoods or destinations to the cost of the transport mode. Safety and security were major concerns for many of our participants and included the fear of crime or sexual harassment whilst accessing or using transport as well as the condition of vehicles and the standard of driving. These conditions had been

exacerbated by the COVID-19 pandemic through the reduction of transport options and routes and through perceptions of an increase in crime.

The findings from the second component focused on transport policy and implementation and show that despite significant investment by the post-apartheid government in both policy and implementation, transport remains poorly integrated. Key informants are aware of many of the challenges facing this sector and are working to address them, but government resistance to and mistrust of the minibus taxi industry remains significant.

Our methodological approach to the research has enabled us to compare the macro-processes of transport policy and the perspectives of transport policymakers with the everyday experiences of households in three neighbourhoods highlighting the dynamics at a micro-level. This has highlighted two dimensions of disjuncture: firstly, that of a disconnect between the provision of transport and people's actual identified needs; and, secondly, that of precarity or vulnerability embedded in the transport systems in the Gauteng City-Region. These dimensions reflect our respondents' experience at the interface between daily lives and the state (present or absent) of transport infrastructure. The indifference this encapsulates is embedded in multiple aspects of the transport system and respondent's daily journeys. The dimension of precarity is reflected in the way that respondents have to adapt to both their own changed circumstances and the rapidly changing transport conditions. These disjunctures reveal some of the challenges that transport policymakers face in designing and implementing transport systems that are responsive to the needs of residents of the city-region in the context of high levels of poverty and unemployment and in the wake of the devastating effects of the COVID-19 pandemic. Whilst this research has provided some insights into these challenges, further investigation is needed to better understand the interplay between macro-processes and micro-dynamics of transport in the city-region, and what it means for the everyday lives of the people who reside there.

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Introduction

In late 2019, the Volvo Research and Education Foundation (VREF) approved eight exploratory projects for funding within a programme on “Mobility and Access in African Cities” (MAC). These projects are being carried out by interdisciplinary teams of researchers under the leadership of project leaders who are based at universities in sub-Saharan Africa.

Our study examined household mobility, access, and decision-making, and located these everyday experiences in relation to government transport plans, policies, and investment. This study — of “micro-processes” at the household level and “macro-processes” of transport infrastructure and planning — occurred comparatively across two city-regions, Gauteng City Region in South Africa and Maputo/Matola[1] in Mozambique. Our set of research questions linked first to internal household dynamics and resource decision-making, second to public transport investment and use, and third to the interface between them. The research team came from the South African Research Chair in Spatial Analysis and City Planning (SAandCP), the Gauteng City Region Observatory (GCRO), and the Centre for Urbanism and Built Environment Studies (CUBES), all at the University of the Witwatersrand; the Faculdade de Arquitectura e Planeamento Físico, Universidade Eduardo Mondlane; and the Departments of Architecture at the ETH Zurich and the University of Liechtenstein.

Contemporary processes of urbanisation arise from a complex relationship between economic, environmental, and social needs as mapped onto space. As the physical spaces of our large urban areas continue to grow through these processes, questions of mobility and access are becoming ever-more important in seeking to create sustainable, equitable cities (Büscher and Urry, 2009; Schönfelder and Axhausen, 2003). Whilst the study of infrastructural systems like transportation are clearly linked with social aspects of urban development, there are often discrepancies between the kinds of research questions asked and the methodologies used to investigate user needs and practices in these respective areas (Axhausen, 2008; Cresswell, 2011). Following Flick (2009: 25), quantitative data can be used to establish patterns of mobility, but qualitative data best reveals why they occur. Furthermore, comparing urban areas can yield significant insight into the diverse and shared challenges of mobility and access (Parnell and Robinson, 2012; Roy, 2014).

Studies of transport users’ needs have generally focused on urban populations or sub-groups of the population — for example, disaggregating transport data by gender or race, or examining the needs of school-going children (Bräuchler and Ménard, 2017; Di Masso et. al, 2019; Laurier, 2002). However, few studies explore the dynamics of difference, such as noting the multiplicity and variety of household configurations (Spiegel et al., 1996) or the varied responses within the same household, i.e., how men, women and children within a household have varying transit and mobility needs and challenges. In low-income households, decisions concerning household resources can have a significant impact on financial outcomes (Guvuriro and Booysen, 2015) and on quality of life. This is especially

[1] Our study spanned Maputo and a small part of Matola. However Maputo Metropolitan Area (MMA), aka Greater Maputo, is a large area and includes Maputo, Matola, Boane, and Marracuene – much larger than our study area.

true when households are spending significant portions of their income on transit: recent research data shows that, in households in South Africa earning the national minimum wage, transport costs can account for as much as 39% of income earned (PEJD, 2019). The high cost of transport and the decisions made may influence the life choices and opportunities that are available to different members of the household. This project examines household dynamics, maintaining where possible an underlying awareness of intersectionalities of identity, such as how race, age, gender, and gender-roles combine to inform or influence individuals' mobility choices and access patterns. These layers need further exploration in future research. Using a nuanced approach is crucial if policymakers and researchers are to understand how different users' needs come together in households, and how this might affect decisions about spending for individuals within families and households and, consequently, choices around transport modes.

Research has shown how state policies impact household dynamics: "For instance: prolonged youth education and increased youth unemployment (increased restrictions related to the labour market) will delay the exit from the parental home; […] and viable old age pensions will decrease the proportions of elderly moving to their children's households" (Vogel, 2003: 397). However, what is less known is how household choices impact state policies. Household decision-making is crucial for understanding development issues (Guvuriro and Booysen, 2015). An examination of household decision-making around transport has significant relevance for urban development and transport policy, as these household choices often differ from common planning approaches operating under the assumption that specific spaces and populations correspond to predictable mobility patterns.

At the larger scale, this research project assists in understanding and analysing how households and individuals engage with formal and paratransit systems, and if and how large-scale investments into infrastructure and transport benefit the targeted groups and achieve the required objectives, including enhancing access and mobility. The study is thus able to examine what happens at the interface between top-down state-driven transit, mobility, and public space investment as well as non-state-driven, less formal modalities and the micro-politics of decision-making and resource usage, which in turn affect questions of mobility and access (Raub et al., 2011). In both city-regions, Gauteng and Maputo, despite public and private investment in public transport (in Gauteng, Metrobus, Rea Vaya, and Gautrain,and in Maputo-Matola, buses (Transportes Publicos de Maputo (TPM)), informal taxis (chapas, minibus taxis, and "my love" trucks) are still the most used modes of public transport. The Rea Vaya bus rapid transit system (BRT) in Johannesburg has consistently demonstrated very low ridership figures (less than 5% in some of the poorest areas, according to a recent study). Furthermore, both cities experience high levels of traffic congestion and, as a result, are increasingly investing in road infrastructure projects, to improve road conditions for the minority who can afford cars (Bowker, 2015; Cebola, 2016; Suleman, 2019). This indicates a basic disconnect between the demands and needs of lower-income communities and the investment of the state into these infrastructures. However, the question of why such a disconnect exists is not well studied or understood. Understanding transport decision-making of households is crucial to discerning the mobility patterns of individuals but also the implementation of transport and planning policies. Our findings have the potential to influence policy and to create more equitable and just cities.

The research began in January 2020, and we successfully held a team workshop in Maputo in the first weeks of March 2020. However, the COVID-19 pandemic was looming and shortly thereafter both South Africa and Mozambique implemented lockdown restrictions which limited movement and other activities. Our fieldwork was, therefore, unavoidably delayed. In August 2020, following the end of the first wave of COVID-19 infections and the lifting of some restrictions, the Gauteng team was able to start fieldwork with a pilot project in Denver, Johannesburg. This pilot was largely conducted remotely, with some in-person interviews after some weeks when there was a further reduction in COVID-19 infections and restrictions. This enabled fieldwork to begin in the two other sites in Gauteng and in Maputo across all three case-study sites. The data collection and interviews were concluded in April 2021 following some necessary delays due to the second wave of infections in South Africa during December 2020 and January 2021.

This report focuses on the Gauteng component of the research.

Objectives of this study

Overall, the study intended to:

- understand how differences in household composition and decisions made within households impact the take-up of large state projects, and how this in turn impacts their success and sustainability.
- show the extent to which household decisions and practices intersect with or diverge from transport investments and the extent to which access is enabled through these.
- provide a clearer sense of who within households benefits and gains greater access from large-scale infrastructure investments and why.
- strengthen an existing but limited relationship between Wits University and Eduardo Mondlane University through both student- and staff-led research, in each case providing exposure to a different context and an opportunity for shared learning.
- assist with transport-related curriculum development, an area of study identified for strengthening in the urban planning programme at Wits, which would benefit greatly from the transnational research.
- build the capacity of younger or less-experienced researchers and postgraduate students in comparative research and mixed-method approaches.

Context

The Gauteng City-Region and its urban growth over the years

Gauteng province is the economic hub of South Africa and arguably of the African continent. It generates more than a third of South Africa's GDP. The province is nestled between the provinces of Mpumalanga, Limpopo, Free State, and North West. Gauteng's borders enclose a small area of land — less than 2% of South Africa — but it is the most populous

province with a quarter of South Africa's population. More than 15.5 million people live in Gauteng (StatsSA, 2020), of which 6 million live in Johannesburg and 4 million in adjacent Ekurhuleni. Gauteng has seen substantial growth over recent decades and this growth is largely due to in-migration from neighbouring provinces and countries: people in search of better economic opportunities and an improved quality of life (Municipalities of South Africa, 2021).

Despite the concentration of people and activities, Gauteng's geography is highly uneven, with wealthy suburbs and economic nodes some distance from the majority of townships and informal settlements. Gauteng's inequality is high, with a Gini coefficient of 0.6 (StatsSA, 2019), resulting in socio-economic issues such as a high rate of poverty, unemployment, and crime. The inequality of the area can also be seen in the infrastructure and services available. Townships and informal settlements often lack basic services such as sanitation, water, and public transport.

In addition to its provincial government, the province has several layers of local governance. The province houses five municipalities: the three metropolitan municipalities of the City of Johannesburg (CoJ), the City of Tshwane (CoT), and the City of Ekurhuleni (CoE); and the two district municipalities of the West Rand and Sedibeng. The two district municipalities are each further divided into three local municipalities. Each of these spheres of government has a distinctive role and delivers specific services, but there are many overlapping services and roles which can complicate the delivery of services such as transport infrastructure.

Gauteng has a diversity of transport infrastructure, including a good road network, minibus taxis, buses, bus rapid transit systems and two rail services. Following the discovery of gold in the area in the 1880s, rail networks were constructed within the province and to the ports of Cape Town, Durban, and Maputo (then known as Lourenço Marques), establishing a good rail network in the city-region from the beginning. Gauteng is also well serviced by road, with the national routes N1, N3 and N12 linking it to other South African urban nodes and a substantial local highway and road network. Although private cars are not the dominant mode of transport in Gauteng, transport planning supported private transport in Gauteng for decades. As a result, Johannesburg was listed as the second-most congested city in South Africa in 2020 (Pishue, 2020), and traffic congestion is a growing concern in the province.

Partly in response to this congestion but also to a number of other reasons, national, provincial, and local governments have made substantial investments in transport infrastructure in Gauteng in recent decades. These investments can be summarised in three major projects: the construction of the Gautrain rapid rail network, connecting the urban centres of Johannesburg, Tshwane, Midrand, and OR Tambo Airport; the implementation of bus rapid networks, first developed in Brazilian cities, in the province's three metropolitan municipalities; and the upgrading of the city-region's highway network, particularly the ring road that connects the province's major urban nodes .

Mobility challenges in the Gauteng City-Region : Mobility as metropolitan structuring element

Public transport is regarded as the third largest concern of people in South Africa, preceded only by education and health. The primary concern is with the quantity and quality of the service provided (Heyns and Luke, 2016). The provision of public transport is, however, more challenging for the government amidst increasing urbanisation, inward migration, and provision of other essential services (Walters, 2013). Scholars have identified several challenges with transport in South African cities: accessibility, poor urban form, cost of travel, over-reliance on walking, and inadequate coordination between government layers (Thomas, 2016). Additionally, policymakers have identified as major challenges the unreliability of transport systems and the absence of regularly updated data on public transport services (Department of Transport, 2016). Lastly, commuters echo these challenges and further include dissatisfaction with road infrastructure conditions and personal safety, observed as crime at ranks, bus terminals and stations and bundled with the violence in the taxi industry (Luke and Heyns, 2016; Chakwizira et al., 2011). Below we elaborate briefly on seven major challenges: accessibility, urban form, transport affordability, unreliability, environmental impact, governance and safety.

Accessibility

Good public transport accessibility is a major indicator of an efficient public transport system. Accessibility refers to the ease with which a commuter can reach a destination using a particular transport mode to access opportunities, goods, and services (Venter et al., 2019; Litman, 2020). Consequently, reduced public transport accessibility leads to social injustice and socio-spatial inequalities, where persons are unable to access basic services, such as healthcare and education (Boschmann and Kwan, 2008). In Johannesburg, transport inaccessibility is more pronounced in low-income communities, which are mainly located on the periphery of the city, requiring public transport to travel to the urban nodes where most economic opportunities are located (Kgatjepe and Ogra, 2016).

A typical consequence of inaccessible transport is that 42% of Johannesburg residents are unable to reach employment opportunities due to an inadequate public transport network (Venter et al., 2019). The limited reach and choice of transport in some areas also perpetuates captive users, who may be exploited financially (Mthimkulu, 2017). Inaccessibility also increases overall travel time, a higher risk of crime and exposure to harsh weather (both sun and rain) when commuters are forced to walk long distances to access transport (Mokgukulushi et al., 2018).

Urban form

The city layout is an integral part of transport provision and management, the building block of any public transport network (Mthimkulu, 2017). In the Gauteng City-Region, the main concern pertains to the lack of integration between land use and transport planning, the location of low-cost housing on the peripheries, and urban sprawl (Department of Transport, 2016). The latter concern is more pronounced in Johannesburg due to its greater economic

prospects, attracting persons from neighbouring provinces and countries in search of better economic opportunities (Walters, 2014).

The Gauteng City-Region has seen substantial growth in the number of residential buildings — some 60% since 2001 (Hamann et al., 2020). This growth varies in form and includes backyard dwellings and informal settlements, gated communities and the construction of state-funded houses for low-income households (RDP houses). Much of this development has occurred on the outskirts of urban nodes. In many cases, state-funded housing has extended township areas and has therefore exacerbated some of the apartheid spatial planning, although there are some exceptions, such as Cosmo City (Charlton, 2014). The growth of gated communities has also impeded sustainable development of the city-region as many of these developments have not been accompanied by upgrades, expansion, or development of the public transport infrastructure (Todes, 2012). This is despite planning policy, such as Johannesburg's spatial development framework, that has encouraged residential and economic development connected to an efficient public transport system. Mismanaged and unplanned development, especially low-density development, can limit the feasibility of providing a sustainable public transport network (Wray et al., 2014).

Transport affordability

Transport affordability is one of the pressing issues of public transport provision in the global South (Venter, 2011) and is identified as one of the main challenges in the South African National Transport Master Plan (NATMAP). In general, travel costs refer not only to commuter fares but also infrastructure provision costs and funding mechanisms, such as subsidies. Commuting in the Gauteng City-Region is the most expensive on the continent with commuters from the poorest households often spending at least 21% of their monthly earnings on transport (Wray et al., 2014). Transport costs per household have consistently increased over the years, with some exceeding the total household income (Harrison et al., 2003).

The high cost of travel in Gauteng is related to the city-region's spatial form and travel inefficiencies. Residents living on the urban outskirts must travel long distances to economic opportunities and amenities and therefore spend more on transport (Chakwizira et al., 2014). The lack of affordable transport options is particularly concerning in the city-region where a large proportion of households is struggling with inequality and poverty.

Unreliability

The reliability of public transport is vital to commuters as it indicates the extent to which a public transport system can be trusted. It is expressed as the consistent presence of services and use and adherence to schedules (Abreha, 2007). There are multiple modes of public transport options in the Gauteng City-Region, which mainly use schedules, except minibus taxis (paratransit) which operate a full capacity system (departing when there are sufficient passengers). However, public transport schedules are seldom adhered to due to multiple issues including crime (e.g., cable theft affecting both train systems and traffic lights), traffic congestion, and mechanical failure.

The lack of reliability and communication has led to a high level of dissatisfaction amongst commuters. Metrobus and Putco bus commuters report being unsatisfied with inadequate communication about service availability and insufficient reliability (Luke and Heyns, 2017). Taxi commuters also note dissatisfaction with the availability of transport during inclement weather or night travel; in some cases, fares are increased under these conditions (Mtizi, 2017). The deterioration in the reliability and quality of rail and bus services has led to their underutilisation and has pushed commuters towards taxis and private car usage (Wray et al., 2014; SEA, 2017), which have their own limitations.

Environmental impact

Globally, transport planners and policymakers are reducing the environmental impact of public transport through shifts towards more sustainable or green mobility through renewable fuels or changes in propulsion technologies. South Africa is the biggest emitter of greenhouse emissions in sub-Saharan Africa (WRI, cited in Pegels, 2010) and the transport sector contributes 70% to total energy use and 38% to total emissions in a typical South African metropolitan city (SACN, 2016). Consequently, addressing the environmental impact of transport in Gauteng is a major challenge, and there are several impediments to achieving more sustainable mobility in the city-region. The inadequacy of the current public transport system has seen an increase in the use of private cars for mobility, thus increasing traffic congestion and vehicle emissions (Wray et al., 2014). Most transport options are poorly maintained (Mtizi 2017), which worsens their pollutants as an ageing fleet is one of the leading causes of vehicle emissions due to lack of adequate emission abatement technology (Liebenberg-Enslin et al., 2013).

Governance

Transport governance is particularly important in the South African context where there is a lack of synergy in the multiple disciplines charged with designing, developing, implementing, and maintaining public transport networks (Mthimkulu, 2017) and in the government and municipal structures and layers assigned to plan and provide public transport (Wray et al., 2014). There is also a lack of integration amongst the various modes and trip interchanges available in cities (Department of Transport, 2016). The National Land Transport Transition Act of 2000 recognised this challenge and initiated the mandate to develop integrated transport plans for cities. Despite this injunction many departments still operate in “silos”, negating integration of public transport projects. An example of this is that the construction and operation of the Gautrain and Rea Vaya BRT systems operate independently instead of being part of a bigger integrated transport plan (Walters, 2014). This disconnect is challenging as efficient and effective public transport provision requires clear and focused governance and institutional arrangement (Stanley and Lucas, 2014).

Safety

In addition to the mobility challenges discussed earlier, commuters have expressed dissatisfaction with road infrastructure conditions and personal safety: particularly crime at

minibus taxi ranks, bus terminals, and stations, and crime combined with the violence in the minibus taxi industry (Luke and Heyns, 2016; Chakwizira et al., 2011).

Whilst the Rea Vaya BRT service is regarded by commuters as an acceptable public transport option, other bus services, taxis, and trains require vast improvement (Luke and Heyns, 2016). Problems experienced with minibus taxis include violence in the industry, poor driver behaviour, and sexual harassment (Mthimkulu, 2017; Chakwizira et al., 2011; Mtizi, 2017). Commuters' experiences of bad driver behaviour are described as drivers rushing to get more customers (Mthimkulu, 2017) and drivers ignoring traffic rules and regulations (Mtizi, 2017). Although commuters find buses safer than minibus taxis, mobility challenges persist with unreliability and inflexibility, as most buses (Metrobus and private buses) have rigid routes that do not cater for the dynamic travel of commuters (Luke and Heyns, 2006). Additionally, the Metrobus service does not provide enough bus stops, forcing commuters to walk excessive distances or use connecting modes to access transport (Mtizi, 2017). As a result, many commuters continue to over-rely on walking to get to their destinations, a key challenge in the city-region (Thomas, 2016).

The above brief review of literature on transport in Gauteng reveals that there are substantial challenges to achieving sustainable mobility for residents in the city-region. Our research examines many of these challenges in more detail at both the household level — reflecting on commuter experiences — and the macro-level — the understanding of key transport stakeholders and policymakers. In the following section we turn to the immediate context in which the research was carried out, focusing on the situation of the coronavirus pandemic.

Vulnerability of mobility in urban and suburban areas in the face of the COVID-19 pandemic

The World Health Organisation declared COVID-19 a pandemic in March 2020; by mid-2021 the virus had infected approximately 80 million people worldwide, with around 1,8 million deaths (Basu and Ferreira, 2021). The first official case in South Africa was reported by the South African Department of Health on 5 March 2020. The virus apparently entered the country through a flight from Italy (Pillay and Scheepers, 2021). Ten days after the report of this first case, South Africa entered a state of disaster as defined by the Disaster Management Act of 2002, and lockdown was subsequently initiated. The lockdown was one of the harshest in the world and brought multiple restrictions. The most important one was that for five weeks South African residents were not allowed to leave their homes for anything other than essential work, buying food, and accessing healthcare. As travel is paramount in accessing basic services but was identified as a key site of potential transmission, transport became a critical industry to manage in curbing the spread of the virus.

Impact of COVID-19 on public transport

Transport has been affected by a number of changes brought about by the COVID-19 pandemic. The first is the regulations and restrictions introduced by the government from March 2020 with the objective of limiting the spread of the virus. The second is how people's

mobility shifted in response to the threat of the virus or changes in their employment. The third is driven by extensive damage and loss of infrastructure during the period of inoperation.

Epidemiologists quickly identified public transport and general mobility as a high-risk activity for the spread of COVID-19 (Zhen et al., 2020). Recommendations for mitigating the spread of the virus on public transport varied from avoiding the use of public transport (or limiting passenger numbers) to increasing ventilation, wearing masks, and sanitising (Zhen et al., 2020). In response to the pandemic, the South African government implemented COVID-19 regulations beginning with a hard lockdown of ultimately five weeks. The nature of this lockdown, at what was called “Level 5” of the COVID-19 control measures, restricted all movement (including walking) outside of the homes except for essential services (restricted to buying groceries and accessing healthcare services). Travel across international or provincial borders was prohibited, train services (both Gautrain and Metrorail) were suspended, and some minibus taxi routes and ranks in high-density areas were suspended (Pillay and Scheepers, 2021).

At the end of the five weeks (extended from an original three weeks), South Africa entered into a series of lockdown levels during which various restrictions were eased and adjusted. Public transport services providers were required to clean and disinfect their vehicles regularly, to enforce passenger mask-wearing, and to adhere to the curfew which allowed travel only between 05:00 and 21:00, although these hours were adjusted for the different levels of lockdown. The main requirement, however, was the limit in loading capacity: taxis were allowed to carry only 70% of their vehicle capacity, buses 50%, and private vehicles 60% (Department of Transport, 2020). The minibus taxi industry was very quick to object to this restriction, and by 16 July 2020 minibus taxis were allowed to operate at 100% capacity as long as all passengers were wearing masks (Bruwer et al., 2021).

As restrictions on mobility eased from Level 4 onwards, passengers began to use transport infrastructure again, although changes in behaviour and economic conditions meant a limited recovery for the transport sector. However, people’s mobility remained low as a form of self-protection following guidelines promoted by governments and health authorities (Kakderi et al., 2021). There has been a decline in the proportion of people travelling to work, to look for work, and to study, and an increase in the proportion of Gauteng residents whose main purpose of their most frequent trip was to go shopping (Culwick Fatti, 2021). In addition, the length of people’s trips has decreased, suggesting that people are travelling shorter distances and accessing amenities closer to home (Culwick Fatti, 2021). Both of these behaviour shifts would reduce the frequency and length of passenger trips.

Economic conditions have also impacted ridership. Nationally, several major industries including mining, manufacturing, hospitality, and transport decreased in growth between 65% and 75% during the second quarter of 2020 (Moneyweb, cited in Luke, 2020), further weakening an already struggling and shrinking economy. This meant that fewer people were economically active, and many who did have work were working from home. All modes of transport saw reductions in the number of passengers, although some modes more than others, with Metrorail services being worst affected. In August 2020, the Passenger Rail

Agency (PRASA) was experiencing a reduction of 97% when compared to 2019 levels (Bruwer et al., 2021), in part caused by extensive vandalism and looting of the train infrastructure when services were suspended.

Reduced numbers of passengers was not the only economic impact on the transport industry. Service providers also had to ensure that vehicles were regularly disinfected and that drivers and other transport workers were provided with personal protective equipment (PPE). To an extent, buses and trains were able to comply with the regulations due to government-provided subsidies; but private businesses and minibus taxis had to bear these additional costs of limiting the transmission of the virus. This led to the introduction of financial relief by the government. From June 2020, the Department of Transport made available a R1,135 billion relief package to the taxi industry, although these funds are only available to taxi operators that meet a number of conditions, many of which are part of a broader formalisation process (Bruwer et al., 2021).

The restrictions placed on mobility and the transport industry impacted other businesses as well as access to healthcare during the pandemic. Restrictions and reduced frequencies or routes reduced the availability of public transport, which resulted in some citizens being unable to access healthcare facilities for medical care such as consultations, the maintenance treatment of chronic diseases, antenatal care, etc. (Peden and Kobusingye, 2020). In Gauteng, transport contributes to local economies such as fruit and vegetable street sellers, food preparation, informal car mechanics, and other informal traders, which rely on the operation of the sector, including through locating close to taxi ranks and transport interchanges. The reduction in transport operation thus had a cascading effect on people's ability to earn an income within the transport sector and in closely related businesses.

Overall, the COVID-19 pandemic highlighted existing mobility challenges and revealed aspects that were not prioritised previously. The government restrictions showed the financial instability of the transport sector and how various public transport options were managed as silos, lacking integrated transport management. The financial pressures spilt over into reduced accessibility for commuters, as long-term reduced transport services resulted in fewer transport options. Ultimately COVID-19 revealed that under normal and abnormal conditions commuters bear the brunt of public transport network inefficiencies and inequalities.

With this as context for the study, we turn to describe the methodology adopted.

Methodology

Methods used for components A and B

Calling on a diversity of disciplinary approaches and building on several previous studies by various members of the research team, this project used a mixed-methods approach. Combining live collection of detailed mobility data with qualitative methods and interviews provides considerable insight into the daily patterns of mobility of individuals within families

and households as well as the context for why some journeys are made, and into the decisions made around transportation and the location of activities such as work and school.

The methodological approach was divided into two components. Component A focused on the micro-dynamics of the household and included focus groups, mobility tracking on a smartphone, communication via the WhatsApp messaging service, and guided interviews. Component B examined the macro-processes of transport infrastructure planning and implementation and comprised a policy review and interviews with key stakeholders and policymakers. This section provides more detail into the methods used in conducting this research.

Component A focused on households as the key unit of analysis. The first phase of the research was a focus group discussion, in each neighbourhood (except one where the COVID situation at the time did not allow it), held with a broader group of residents representing as much diversity in household structure and composition as possible. Through a discussion on the challenges of transport within their neighbourhoods, the focus group satisfied two intentions: it introduced the project to a wider group of potential respondents; and offered some important insights into the everyday experiences of transport of residents. It also provided the basis to select a subset of households to participate in further aspects of the study.

The focus groups asked the following questions:

- What are your biggest challenges around transport? Or, what are the biggest problems that you and your family experience around getting around the city?
- What forms of transport do you like the most?
- What forms of transport do you and your family use on a daily basis?

We held focus groups in two of the three case study sites in Gauteng: Westbury and Thembisa. In Denver, we decided to forego the focus group because, when we started the fieldwork, COVID-19 infection rates were still very high, and we did not want to risk a gathering of respondents. However, we had previously conducted a similar study in Denver in 2019, and this enabled us to select respondents to participate in the study remotely.

Each focus group had 10–15 people, and from that a subset of respondents was chosen to go forward into the next phase of the study. Consideration for participation was given to race, language, household composition, and length of residence in the neighbourhood or city. Once selected respondents agreed to participate in the second phase of the study, they downloaded the mobility tracking app onto their phones, and the research team established a WhatsApp group for each area. All respondents were credited with data for their phones to cover the costs of the mobility mapping and communication on WhatsApp with the group as well as the researchers. The app monitored the respondents' mobility for two weeks, and during that period a set of prompts were sent on WhatsApp to ask respondents about their daily lives. Respondents answered with voice notes, autophotography, and written responses.

The key idea in using the smartphone app and mapping technology was to get closer to "everyday mobilities", or the individual pathways that people took as they went about the

routine activities of their daily lives. The app, developed by Lindsay Howe and Markus Ringel, had been used in several prior studies (Howe, 2021) and is particularly well-suited for research in the Southern African context (cf. Aker and Mbiti, 2010; Hövel et al., 2014). The application collects volunteered geographic information (VGI), integrating geospatial data — GPS locations and modes of transportation — with surveying functions as well as interactive features for the user. This is something the phones already log — called “mobile sensing” — and so the app collects this modal, distance, location, and route information and writes it into a database. The app collected data for each participant for two weeks (with their knowledge and approval). It could be viewed by the participant themself on their device; it was sent to a server with a 48-hour delay and a randomly generated I.D., in order to ensure anonymity in the collection and storage of personal data. Below are some examples of the interface and maps produced from the data collected.

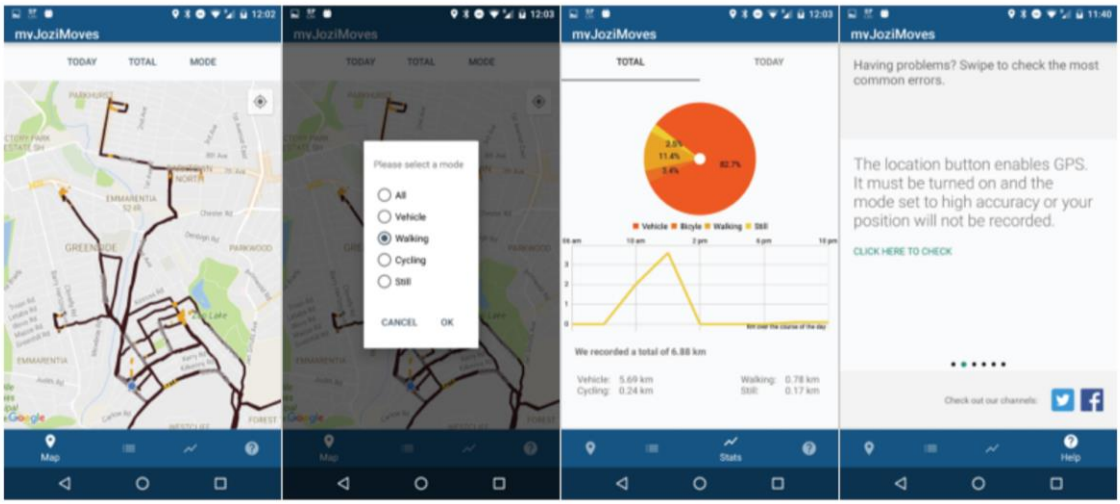

Figure 1: Screenshots of the mobility tracking app by the research team during the testing phase of a 2016 version of the application

Figure 2: Map of a day in Denver in September 2020 (with the green line indicating vehicular travel and the yellow line indicating someone looking at their phone whilst in a taxi). The “markers” indicate each time a data set (including GPS-position, mode of transportation and time stamp information) was recorded by the smartphone application. Mapping by Lindsay Howe and Chantal Bekkering

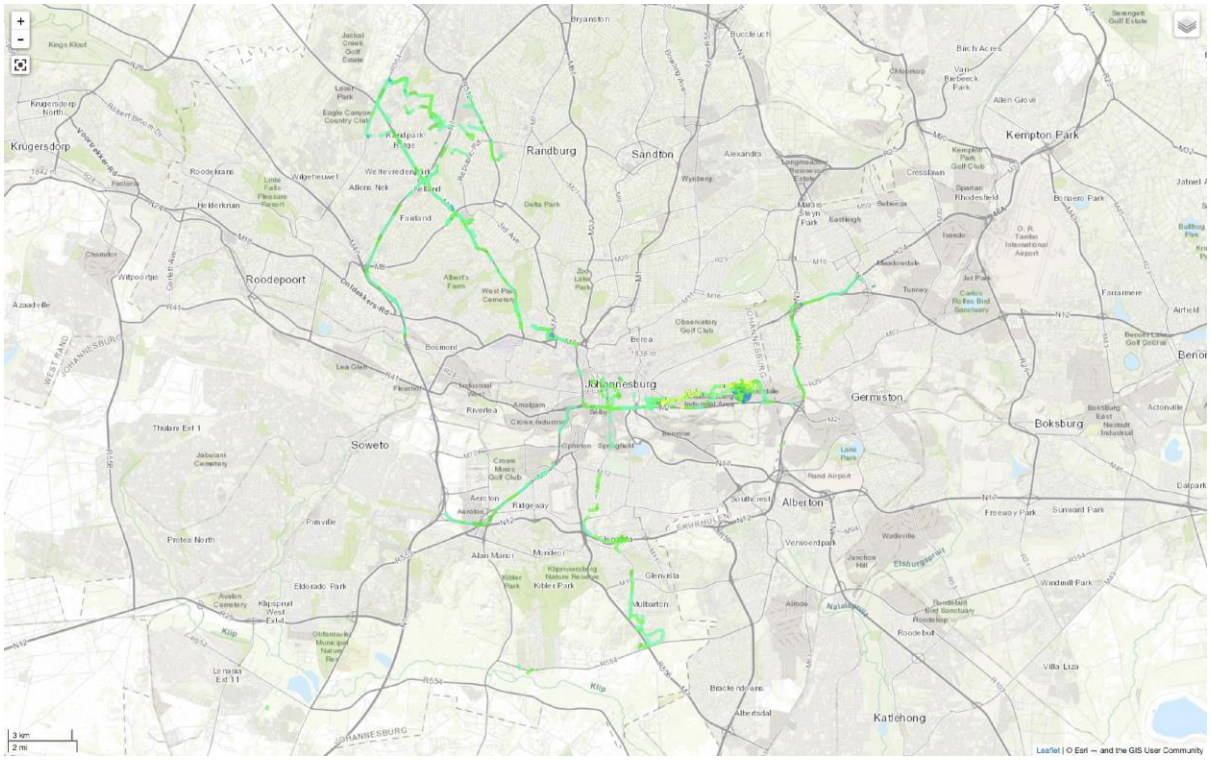

Figure 3: A map showing all Denver participants' pathways, destinations, and modes of transport for one week in 2020 (work destinations in taxis moving away from Denver indicated by the green lines of vehicular travel). Map by Lindsay Howe and Murielle Morger

Figure 4: Map of all Thembisa participants' mobility for two weeks in 2021 with each "marker" indicating each data point collected (representing work destinations all over the Gauteng City-Region in taxi or private car). Map by Lindsay Howe and Murielle Morger

At the end of the two-week tracking period, and once the researchers had reviewed the mobility and WhatsApp data collected, participants were engaged in an in-depth interview discussing transport decisions and mobility patterns and asked questions about resources and distribution of resources for transport. Where possible these interviews were done face to face, but because the COVID-19 infection rates were high at the time, many took place by phone. These interviews were conducted in each participant's language of choice .

Transcripts in English were compiled into online word processing platforms and grouped according to the different case study sites. Thematic content analysis was conducted by all researchers who coded the transcripts using tools such as highlighting and commenting functions.

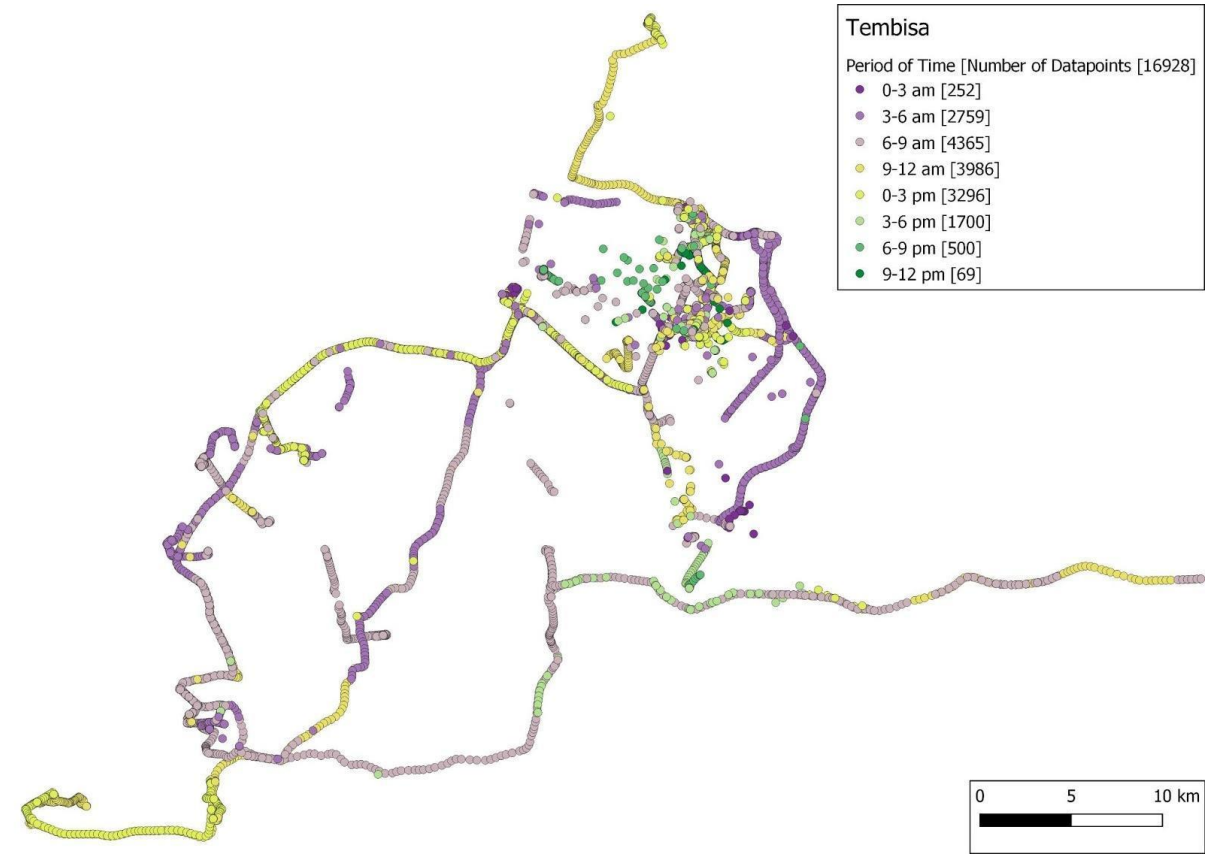

Figure 5: Map of all Thembisa participants' mobility according to different time periods of the day. Map by Johannes Herburger

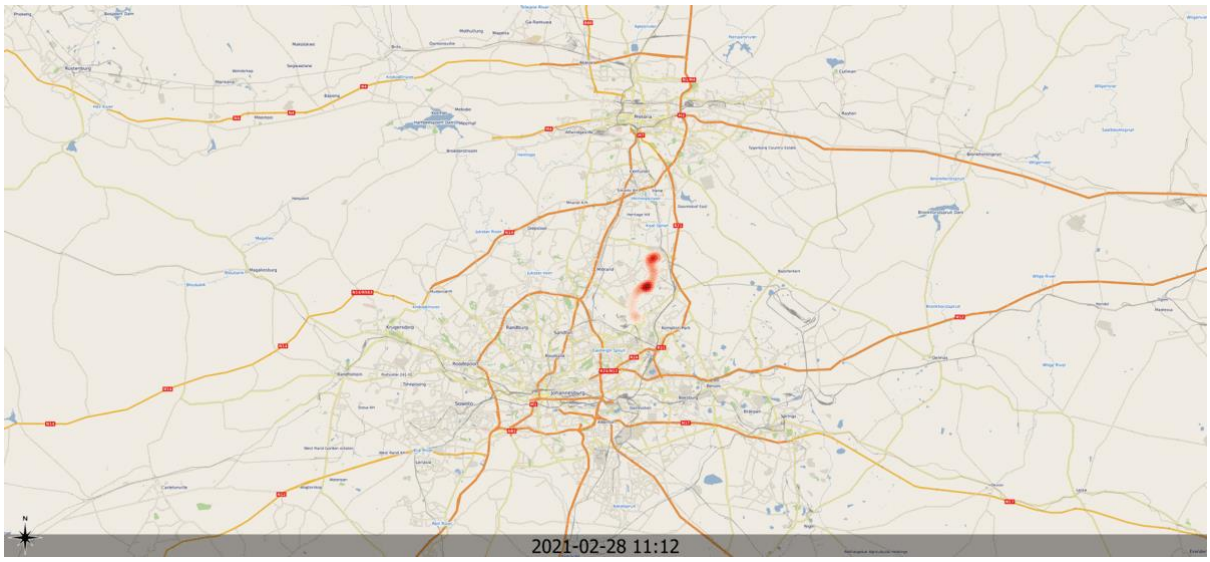

Figure 6 (GIF): Map showing the individual participants' mobility from Thembisa over a 24-hour period (print version includes a screenshot of this animation). Map by Johannes Herburger

Component B of the research focused on the macro-level regarding public transportation plans and investment. This review was conducted by the researchers and by postgraduate students who were involved in the project and who had attended the field trip to Maputo in March 2020. The students collected plans, documents, and information regarding state investment in public transport and analysed this information in preparation for the second joint research workshop (involving both the Gauteng and Maputo research teams).

A second phase of this research component was to conduct key informant interviews. Researchers from the study team interviewed key transport officials, decision-makers, and providers about the performance of public transport and investment. The key aim of this phase was to get a sense of the policy and programmatic direction of the state. Questions centred on what had been and what was the state's investment in public transit over the last ten years, what thinking had governed their strategies, and what the future of transit looked like. Interviews were conducted with respondents from the Gautrain Management Authority, the Gauteng Department of Transport, and the transport departments of the City of Johannesburg and City of Tshwane. Although interviews with National Treasury and the City of Ekurhuleni were attempted, these were not possible in the end. The interviews were semi-structured and conducted using online communication platforms such as Zoom and Microsoft Teams. The interviews were transcribed and then, similar to the interviews in Component A, the transcripts were compiled into an online word processing document, where all team researchers conducted thematic content analysis.

Case study sites

The overall research project focused on six study sites, half of which are based in Gauteng and the other half in Maputo. As this report focuses on Gauteng, we discuss here the study sites of Denver and Westbury, located in the Johannesburg metropolitan area, and Thembisa, situated in adjacent Ekurhuleni. The main criterion for their selection was their proximity to nearby main public transport nodes and large transport infrastructure projects. All three sites satisfied this criterion. Denver is located along main roads (the M2 highway and Main Reef Road) and railway system; Westbury lies along main roads, giving the area access to the Johannesburg city centre and nearby industrial areas; and Thembisa is situated close to the R21, allowing for easy access to both Johannesburg and Tshwane. The area is also relatively close (at approx. 14 km) to the Gautrain station in Midrand. All three sites are located close to the railway line, and Westbury and Thembisa are close to a BRT system, Rea Vaya and Harambee respectively.

Figure 7: Map of Gauteng province showing all three case study sites. Map by Yashena Naidoo

Apart from mobility access, the study sites also reflected a range of demographic characteristics including a mixture of family structures, i.e., nuclear families and single-parent households; ages of children; socio-economic positions; and race. Furthermore, the sites offered different residential conditions, i.e., industrial, township, and suburb; and study participants of different cultural backgrounds. Overall, the varying dynamics of the study participants, locations, and infrastructure provided a solid base for the collection and comparison of rich and detailed data. This section introduces the three Gauteng case study sites selected to understand the micro-processes and nuances of household mobility, access, and decision-making.

Denver

Denver is a small industrial area wedged between major arterial roads and a railway line. The area is in the heart of greater Johannesburg's east-west mining belt with old mining areas south of Denver and residential suburbs to the north of the area. The main formal residential accommodation in Denver is the Denver Men's Hostel built during the apartheid years to house the labour force working in the nearby mines or factories. In more recent decades, two informal settlements have grown around the hostel. Therefore, housing in Denver comprises both the formal and informal, with 27% formal housing, 30% apartment buildings, and 43% informal housing (StatsSA, cited in Kgantsi et al., 2018).

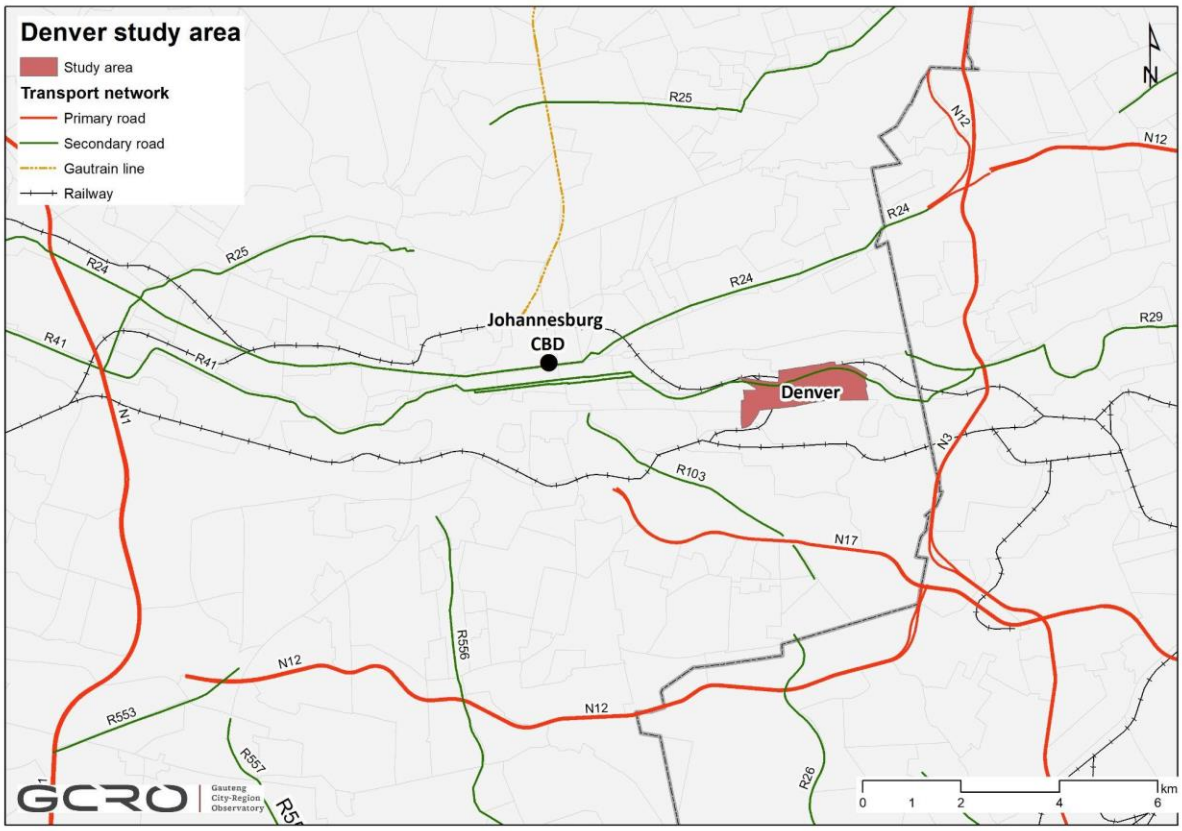

Figure 8: Map showing the location of the Denver case study site. Map by Yashena Naidoo

As a result of the nature of the limited residential accommodation available in Denver, the demographics of the area have a particular composition. Denver's population is predominantly male (approx. 60%) and consists of black residents, largely of Zulu background (Mathiba, 2019). Many residents have migrated from Kwa-Zulu Natal and support the Inkatha Freedom Party, a political party with a strong presence in their ome province. Denver has a high unemployment rate (45,7%), coupled with an elevated demand for housing. To be close to employment opportunities in the area and surrounds, some residents live in overcrowded abandoned buildings and warehouses (Scorgie et al., 2017; StatsSA, cited in Kgantsi et al., 2018).

Road infrastructure and public transport accessibility

Denver is located close to multiple transport access points: the M2 highway, Main Reef Road, a railway line, and taxi routes (Mathiba, 2019). It is well placed because of its close proximity to Johannesburg's central business district and to the mining and manufacturing belt. Denver was identified as part of Johannesburg's Corridors of Freedom project, specifically the Western Gauteng Corridor which runs along the mining belt and connects Roodepoort, Selby, Florida, Benrose, and Heriotdale (Kgantsi et al., 2018). Despite the intention to connect Denver as part of this route, the area is not located within the BRT route, and the nearest BRT stations, Bertrams and Westgate, are each approximately 8 km away. As a result, residents require a connecting mode to access the system, which leads to extended travel time and costs.

Denver has access to Metrorail passenger services run by PRASA through the adjacent railway line. Despite PRASA initiating a project to purchase new rail stock and refurbish existing signalling and track infrastructure (Wray et al., 2014), rail infrastructure in Johannesburg has continued to deteriorate in recent years. The refurbishment project includes Benrose and Germiston stations, located approximately 4 km and 10 km from Denver, but the refurbishment has been further hampered by a continued increase in theft, vandalism, and the burning of rail infrastructure during the COVID-19 lockdowns (Mabena, 2020). Consequently, non-operational stations such as Benrose are likely to remain closed for the foreseeable future.

Main mobility challenges

Although Denver is centrally located and has good access to public transport, in practice there is limited accessibility to the cheapest forms of public transport (rail and BRT), forcing residents to use other modes of travel such as minibus taxis and walking. This is significant in a low-income area like Denver where residents rely on odd jobs in construction, domestic occupations, and informal trading to sustain themselves (Kgantsi et al., 2018; Mathiba, 2019).

This is compounded by the fact that Denver is primarily an industrial area and therefore lacks many residential amenities such as basic infrastructure and services, shops, and health facilities. The high unemployment rate and the reliance on unstable and informal jobs mean that transport costs are high and a concerning factor for residents. Consequently, residents rely on walking to travel despite poor walking conditions, inadequate walk paths, and poor to non-existent street lighting.

Gendered travel challenges

A number of general conditions in Denver with regard to housing and transport impact women disproportionately. The lack of residential amenities and affordable transport limit women's mobility and economic employment opportunities (Willan et al., 2020). Denver has a high crime rate and women fear being robbed, raped, and killed (Mathiba, 2019). This exacerbates the safety and security concerns amongst women using public transport (Vanderschuren et al., 2019). Safety and security concerns are aggravated by the unreliability of public transport, where public transport is sometimes unavailable during a time that urban low-income communities require it (Lucas, cited in Teffo et al., 2019). There is a high reliance on informal labour and trading which is generally female-dominated and requires women to travel to work or to goods, often outside of peak hours. This increases the reliance on walking, which increases vulnerability to weather conditions such as cold/wet weather and crime. Often footpaths created by residents are of poor quality, i.e., unpaved, in overgrown and muddy areas, and with poor lighting (Potgieter et al., 2006). Women experience multiple socio-economic issues, and the inadequacy of the public transport system worsens the situation.

Westbury

Westbury, our second case study area, is a largely working-class suburb in the City of Johannesburg, bordering Sophiatown and Newclare. The area was designated “coloured”[2] under apartheid. It was established in 1967 when coloured residents were forcefully removed from the nearby Doornfontein and Pageview (Halim, 2018). The area has a population of approx. 13 500 people, is predominantly occupied by coloured residents, and faces socio-economic issues including a high unemployment rate, poverty, crime, drugs, and gangsterism (Klug, 2016; Dannhauser, cited in Ngoma, 2016). Westbury is not far from the Witwatersrand mining belt, and at the peak of mining in Gauteng, the area attracted people due to increased employment opportunities arising from the mining and manufacturing industries. In recent years Westbury has had a 37% unemployment rate (Klug, 2016), which is relatively high for South Africa.

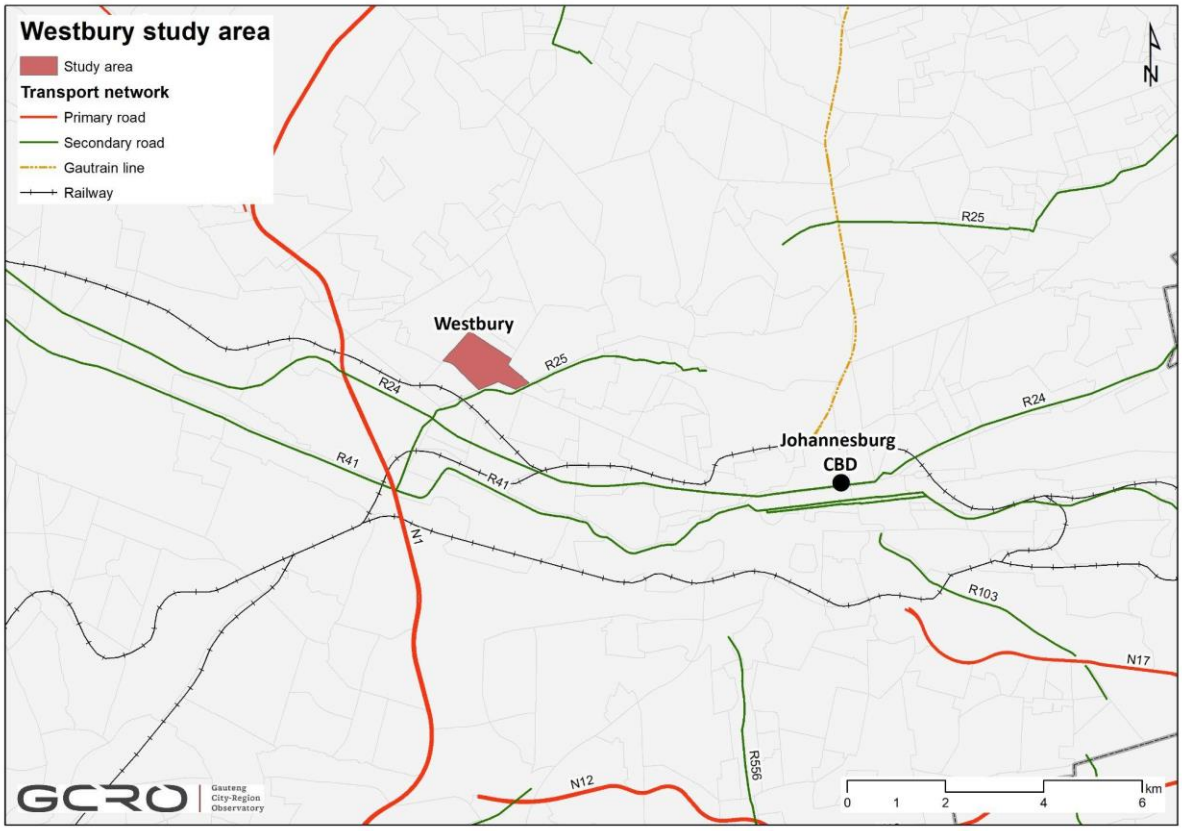

Figure 9: Map showing location of Westbury case study site. Map by Yashena Naidoo

Westbury is linked to one of the new bus rapid transit routes and has recently seen other forms of infrastructure investment in the area. It is also close to existing railway services with Westbury and Newclare railway stations. We selected this area as a case study site because

[2] *Coloured* is a South African term that describes people of mixed racial descent but has also become a cultural identity. It continues to be an official reference for population groups in South Africa.

of its demographic component — the mainly coloured population group in residence — and its relation to the new BRT system.

Road infrastructure and public transport accessibility

Westbury is well located due to its proximity to Johannesburg's central business district, and Westbury residents have access to multiple modes of public transport, including the Rea Vaya BRT system, buses, taxis, and trains (Ngoma, 2016). However, there are several reasons why accessibility in Westbury remains limited. The layout of Westbury suburb was designed to combine pedestrian and vehicle space and to allow streets to organically evolve as the then apartheid government wanted to limit road infrastructure costs (Chapman, 2015). This convoluted urban layout continues to reduce accessibility and causes long travel times with no dedicated space for walking or proper road infrastructure for vehicles (Chapman, 2015). It is also a safety and health risk as "there is little distinction between vehicular roads, pedestrian paths, recreational space and dumping grounds" (Chapman, 2015: 15). In summary, Westbury's layout is "impermeable" (Chapman, 2015: 15).

Westbury was included in the city's Rea Vaya BRT system as part of its Corridors of Freedom project. But usage of the BRT system remains low, for several reasons (Klug, 2016). The main reason cited by residents was that they do not require it; and yet, inversely, those who did use it reported improved access to the area and surroundings (Klug, 2016). Other reasons include an increase in crime around the route and the high cost of fares. There is also a lack of knowledge about cost-effective payment measures, such as the card and point system (Klug, 2016). In addition, the BRT services have ceased operating in the area and, as such, they are inaccessible to commuters.

As part of the Corridors of Freedom project, a pedestrian crossing bridge was constructed in Westbury and Steytler and Kretzschmar Streets were upgraded. The main purpose was to improve residents' safe access to travel options, as the bridge was built to connect the railway line with the Rea Vaya route (Leibbrandt, 2017). Although the bridge is currently being used, future maintenance may not happen as there is uncertainty about the ownership of the asset (Klug, 2016). The Corridors of Freedom project also planned to connect walking and cycling routes to public transport nodes in Westbury by building cycle and walkways around certain streets. This would not only allow for easy incorporation of non-motorised transport into the transport system and easier access to public transport but would also reduce pedestrian–vehicle accidents in the area due to wider walking spaces and higher kerbstones (Halim, 2018). However, whilst the Corridors of Freedom project has brought investment in infrastructure to Westbury, the inner trunk roads are neglected and not well integrated into the project (Leibbrandt, 2017). The result is that even with multiple modes of public transport available, Westbury residents predominantly walk or use taxis (Klug, 2016).

Main Mobility Challenges

As mentioned earlier, despite significant investment in transport infrastructure, there remain challenges to accessibility and mobility in Westbury. There is inadequate pedestrian infrastructure and road accessibility due to narrow internal roads, which stem from poor urban planning (CoJ, nd). The area further shows deficient links between public transport

and the suburb. A high crime rate in the area hinders the safety and security of residents, particularly women and children, whilst walking and thus contributes to immobility. Lastly, the depreciation of rail infrastructure and reduction of bus services present a challenge for Westbury public transport users (Klug, 2016).

Gendered travel challenges

Westbury has a high rate of crime and gangsterism (Klug, 2016; Chapman, 2015; Halim, 2018). This particularly impacts the women and children who are most vulnerable to crime in communities and in public transport specifically (Mabaso, 2019). Women in the area rely more on walking to travel around the neighbourhood and run errands, which includes childcare (Klug, 2016). Women using public transport experience robberies (sometimes armed robberies), pickpocketing, and sexual harassment, and the abuse is worse in minibus taxis, with reports of rape (Mabaso, 2019). The low ridership of Rea Vaya in Westbury is partially influenced by the crime experienced along the BRT route (Klug, 2016). Crime against women in Westbury is not limited to the use of motorised transport, as evidenced by the death of a woman who was shot whilst walking to access healthcare at the Rahima Moosa Mother and Child Hospital (Kajee, 2018).

Thembisa

Much larger than our other two case study sites, Thembisa (formerly Tembisa) is the second biggest township in South Africa. It is located east of Midrand in Ekurhuleni municipality, approximately 30 km north of Johannesburg's central business district and 30 km south of that of Pretoria. Thembisa has a population of approximately 463 000 persons (StatsSA, 2012; COGTA, 2020). It was first established in 1957 by residents forcefully removed from Midrand, Germiston, and Kempton Park (South African History Archive, 2021). As a result, the area still maintains strong connections to these economic centres and sources of employment. Thembisa's economy is driven by retail and property developments strengthened by the range of housing available: informal settlements, RDP houses, and houses bought with a mortgage. The area has a vibrant economy of backroom subletting, boosted by its profitability to the lessor and its affordability to the lessee.

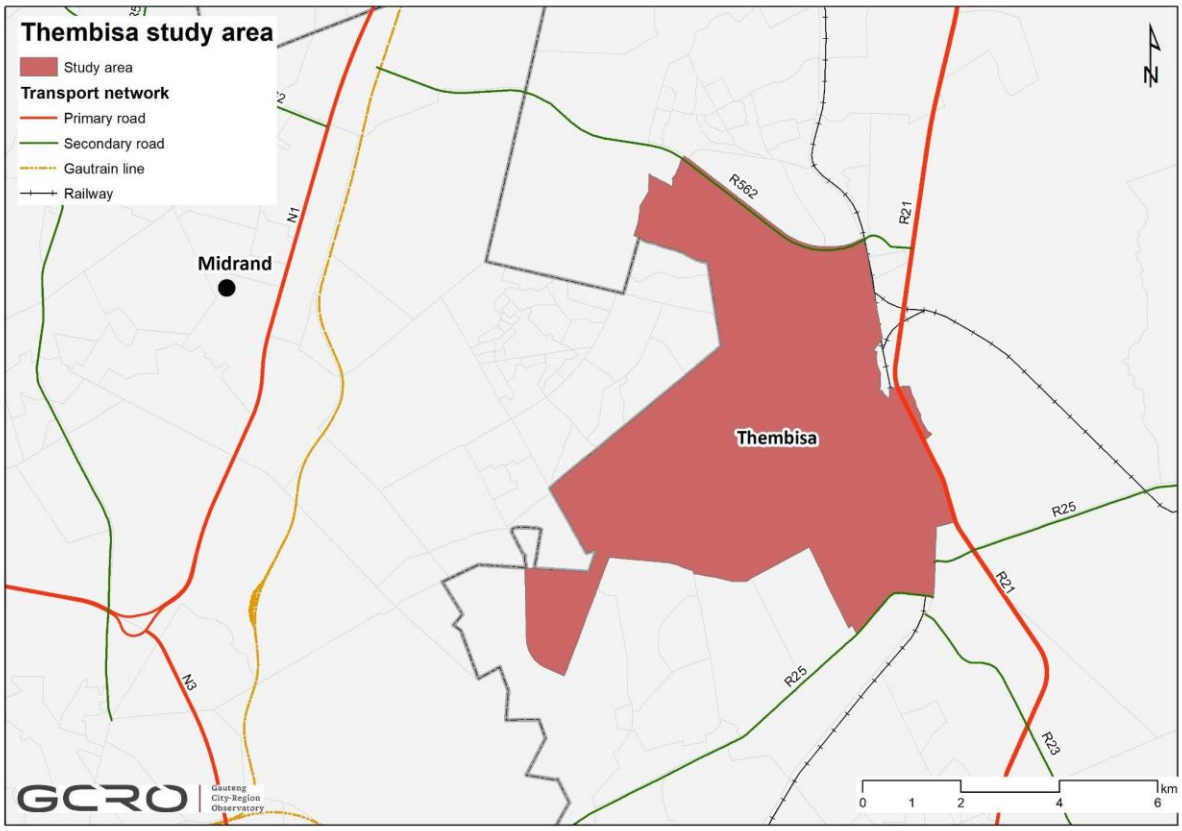

Figure 10: Map showing location of Thembisa case study site. Map by Yashena Naidoo

The various housing types enable the township to accommodate people of varying economic classes, contributing to Thembisa's high density, although it is predominantly populated by black Africans with lower incomes. Thembisa is currently served by the minibus taxi industry and rail services and is not that far from one of the Gautrain rapid rail stations, relatively speaking. It has also been identified as part of a proposed BRT bus route by Ekurhuleni Metropolitan Municipality. We selected this area because it has some different demographics to our other case study sites and is earmarked for future transit interventions. In addition, Thembisa is part of a growing node between Johannesburg and Pretoria (Midrand) but is simultaneously still some distance from the cores of the two main cities.

Road infrastructure and public transport accessibility

Residents of Thembisa enjoy access to multiple modes of public transport, including minibus taxis, BRT, trains, and buses. However, in practice, minibus taxis are the dominant mode in the area. Bus services in Thembisa are primarily used for long distance travel to areas outside of the province. Local bus services only run during peak hours (Maliba, 2010) and operate from two depots, Germiston and Boksburg (City of Ekurhuleni, 2021). Thembisa is part of the planned Harambee BRT system in the city of Ekurhuleni which connects Thembisa to Kempton Park, OR Tambo international airport, and Vosloorus (COGTA, 2020). The intention of the service is to provide residents affordable and easy access to economic opportunities with reduced travel time (Sirivadidurage and White, 2012).

Thembisa residents also have access to the rail service which connects Thembisa to Pretoria and Johannesburg (Wray et al., 2014). However, as in our other case study sites, this accessibility advantage is limited by the collapse of Metrorail and the consequent severely reduced services.

As a result of these bus and rail challenges there is a vibrant minibus taxi service, which operates both locally within the township and regionally to the urban centres of Midrand, Kempton Park, and Vosloorus. The local minibus taxi service collects commuters across the township and delivers them to the taxi rank from where they can catch a “regional” taxi to other areas. The local service can even be free of charge depending on where commuters are located within the townships; it improves public transport accessibility and travel time for commuters not close to the taxi ranks. Although this taxi service is more accessible than other available public transport options in Thembisa, a lack of efficient route and network planning can mean multiple connections for commuters and an oversupply of taxis (Maliba, 2010). There is some recognition of these issues as the City of Ekurhuleni intends to work with the taxi industry to reduce public transport fragmentation by constructing more and easily accessible taxi ranks (City of Ekurhuleni, 2021). Traffic conditions in Thembisa are exacerbated by the poor condition of the roads with many still unpaved (Wray et al., 2014). Ultimately, without regular access to rail transport, residents in Thembisa pay much higher costs for transport in the area (Venter, 2014).

Main Mobility Challenges

As with many former townships in South Africa, there are limited economic opportunities and other amenities in Thembisa. This means that residents have to travel further to access work, education, and healthcare. The previous section outlined the many transport modes available to residents, but there are issues with all of them. Bus and rail are inadequate with optimal operation only during peak hours. In addition, rail is even more inaccessible than bus because of the poor state of its infrastructure. Minibus taxi services are the most reliable, but they can be expensive and inefficient; they also rely on road infrastructure, which is poorly maintained. Part of this inefficiency is related to traffic congestion in Thembisa caused by poor urban planning, high population density, an oversupply of taxis, and the dominance of cars as travel mode.

Gendered travel challenges

Many women in Thembisa are involved in the informal economy, selling fresh produce, meat, and cooked meals (Ramashapa, 2018). These businesses require to make many trips, often with multiple connections en route to obtain stock, and the additional costs incurred in doing so (May and Rogerson, 1995). Women (predominantly) also make multiple trips daily in the course of caring for children, with responsibilities such as dropping off and picking up children at creche or preschool. Such ‘trip chaining’ journeys increase travel time and cost because the transport system focuses on one-dimensional or one-directional travelling (Ng and Acker, 2018). Public transport remains a challenge for these women with businesses and childcare responsibilities.

Most women prefer to use taxis and other paratransit public transport options due to their flexibility but are concerned about safety and security (Ng and Acker, 2018). Women have reported multiple forms of abuse whilst using public transport or paratransit, such as verbal (e.g., catcalling), visual (e.g., staring), and physical (e.g., groping) (Vanderschuren et al., 2019). In the worst cases, it includes men exposing themselves and rape (Mabaso, 2019). In 2019 there were 172 sexual assault and 137 rape cases reported in Thembisa (COGTA, 2020). These statistics coupled with the general high crime rate in the area mean that Thembisa women are vulnerable to abuse in public transport or when walking to and from a transport node. Additionally, the township's dense urban form — with housing encroaching on the streets and the absence of dedicated walkways — can combine with the crime rate to make walking uncomfortable and unsafe. These conditions disproportionately impact the women of Thembisa.

Each case study site was carefully selected to provide variety in terms of demographics, location within the Gauteng City-Region, and access to new and existing public transport infrastructure. Whilst each case study provides differences in facets, such as population group and socio-economic status as well as location, the brief summaries above indicate that there are significant similarities in issues and challenges around mobility and transport. Many of the public transport systems available, such as buses or rail, are not operating as they should due to poor planning or lack of maintenance. The use of minibus taxi services predominates in all three case study sites. And all three sites suffer from high levels of crime, which impact the safety and security of women in particular.

Findings

This section of the report provides the results from the different components of the research. The first component examines internal household dynamics and resource decision-making, the second explores public investment in transit and use, and the third component brings these two lenses on transport together to understand some of the disjunctures between transport planning and provision and the needs of residents in Gauteng.

A: Internal household dynamics and resource decision-making

Household dynamics

This section of the report shares findings that explore how households make decisions around transport, specifically who uses which transport modes and how transport spending is allocated.

Summary of participants and households

The following is a summary of the number of participants in each of our case study sites (a full summary table is provided as an annexure):

- Denver: 12 participants (8 women, 4 men) from 9–10 households
- Westbury: 10 participants (7 women, 3 men) from 7 households
- Thembisa: 14 participants (6 women, 4 men) from 11 households

Many participants lived in multigenerational households with 3 generations. In Denver, monthly household incomes ranged from R2 500 to R7 500 with many participants relying on social grants and income from renting out shacks. Spending on transport ranged from nothing (participants chose to walk instead of using public transport) to as much as 34% of the monthly household income. Monthly household income in Thembisa ranged from R3 200 to at least R13 500 and transport spending was from 10% to 35%. In Westbury, monthly household income ranged from at least R4 000 to R30 000. Proportional spending on transport ranged from very little (2%) to 13% of household income. In lower income households transport accounted for a considerable proportion of the monthly budget — in some cases more than a third of spending.

Household mobility

Across all three case study sites, the research findings show that household members seldom use the same mode of transport for their daily mobility needs even in households with access to a car. In many cases, children used different modes in order to access school such as scholar transport, walking, or minibus taxis. The study also shows that children's mobility can be severely affected by a number of reasons. Some parents are unable to travel with their children because of the additional cost of fares on some transport modes. In relation to the COVID-19 pandemic, parents faced regulations where they could not enter certain places with their children or faced substantial stigma for potentially exposing their children to the risk of contracting the disease. One mother described how the expense of travelling with her children has stopped her bringing them with her on journeys:

> There's a long time since they've [her children] travelled with me due to financial problems because I have to pay and everything, so usually […] It's been a long time since I've went with them anywhere. Alright, so it's cheaper for you to go alone to do these things. (JT2, Thembisa)

These findings indicate that there can be substantial variation within households regarding mobility.

Household and transport decision-making

We asked participants about decision-making regarding domestic responsibilities and expenses as well as, explicitly, regarding mobility. Decision-making processes vary across the households and case studies with no discernible trend. Some decision-making is consultative within the household; in others, participants make decisions on their own.

Several households had traditional gender relations and roles when it came to making decisions, with this left up to the male members of the household. However, decision-making was also strongly tied to the members who earn or have money; and decision-making was frequently referred to in terms of the household budget and spending. A few of our participants mentioned including their children in the decision-making, but this was relatively rare across our case studies. This female participant from Westbury described the decision-making in her household as follows:

> If there is a decision to be made, then me and my husband will sit, and we would speak about it. If it needs him more than me, I would say, "You make the decision," then we'll go with it because he's the father and the head of the family and everything. But we usually sit and speak about it. (MW1, Westbury)

Many transport decisions are based on the available budget and the cost of transport, and compromises are made in the process:

> We first look at the important stuff, like this much is for transport, then we break them all down till we get to the food […] If it was up to her [MD1's partner], I would use taxis all the time, but due to money issues we realised that the money was not enough and we would end up starving in the house. So, if it's like that, I will walk. I will get used to it, I am a human being. (MD1, Denver)

This participant highlights how important the cost of transport is in the household's monthly budget — being more important than food — but also how this budgeting shapes the mode of transport that family members use. In the instance above, it is the father who is opting to walk instead of paying for transport, but in many households, because decision-making sits with the male head of the household, women and children have fewer options when it comes to accessing transport and managing their own mobility.

> It's very far because, if you take a taxi from Pretoria to Kergert [...] it's R35 per person…So I go there with the kids, so R35 each, the small kids…The other ones they are paying, from 3 years upwards they are paying a full price. (OT1, Thembisa)

Conclusions on household dynamics and decision-making

Our household data reveals that the transport needs and use for family members are diverse within households and across all three case studies. Decision-making in households regarding household responsibilities also varies but is frequently tied to those members who earn an income, whilst most transport decision-making focuses on the cost of the transport mode. This means that women and children do not frequently participate in the decision-making regarding their transport needs. The cost of transportation plays a disproportionate role in shaping mobility for households as well as other needs such as food.

Travel patterns and experience of transit

In both Maputo/Matola and Gauteng, our respondents showed extensive use of paratransit and of walking. We use this term *paratransit* broadly to refer to non-state provided transport, including minibus taxis or chapas, but also e-hailing services such as Taxify, Bolt, or Uber in the South African context, which were used by some respondents.

Many study respondents from the Gauteng City-Region reported that they have few, if any, options for transport, because alternatives are unaffordable, not within a reasonable distance, or unsafe: “There are no buses or trains that do come this side, it’s only taxis” (TT1, Thembisa).

One of the interesting findings was the little use that was made of the Rea Vaya BRT system by our Westbury participants, who have this service very close to their neighbourhood. One explanation seems to be that the closest BRT station was extensively damaged some time ago during protests about other service delivery problems in the area (unrelated to transport); apparently because of this damage, the bus no longer stops there. Westbury was one of the areas where respondents at times made use of e-hailing.

In terms of experiences, the majority of participants’ experiences of transport ranged from unpleasant to treacherous and even dangerous, in different ways. Many of the participants worried about the safety of family members, especially when it came to children travelling — even adult children having to travel into the evenings and at night:

> It makes me worry, especially my daughter, my first daughter. Anything can happen, anywhere. Anything can happen, They can take their bag. They can rape her, They can do anything, whatever they want to her. That’s why I don’t want her to come late at home. (TT2, Thembisa)

The concern of participants extended beyond public transport and included walking, with many anxious to protect their children from walking alone. Children’s walking was limited to walking to and from school in groups, and certain areas were restricted to children unless they were accompanied.

Many participants were equally concerned for their own safety whilst walking or using public transport. Participants made use of various strategies to avoid dangerous situations. Some participants used alternative transport methods, in some cases with additional expense, to avoid being a victim of crime:

> Okay with Bolt it’s much comfortable, it’s better, it’s safer, it’s clean. It’s only you and the kids and the driver and my husband in the car…But then in a public transport, it’s claustrophobic, it’s a lot of people. I don’t think that’s a safe option, to be with the kids in the taxi. (MW1, Westbury)

> It’s more convenient for me to go with a taxi to town because if you look at it with the crime rate, especially with the hijackings going around in Joburg areas…So I prefer a taxi because, not that I like it, but it’s for me more

> convenient because my car is safer. Then I don't have to stress about it, because like nowadays they steal a lot in car. (DW1, Westbury)

These behaviours, driven by safety concerns, may have different and contradictory results, as these quotes illustrate. MW1 prefers to use an e-hailing service to a minibus taxi because she feels it is safer, whilst DW1, also from Westbury, prefers using a minibus taxi for fear of being hijacked in his car.

Some participants travelled in groups whilst using e-hailing services or met up with other commuters along the way in order to avoid being vulnerable whilst walking: "You feel unsafe because in the morning it's tough… you meet up with these boys who can rob you and rape you…I walk with people I meet along the way" (VT1, Thembisa). Another strategy was to avoid speaking up in a minibus taxi to avoid verbal abuse. These strategies formed part of participants' daily struggles with accessing and using public transport in the Gauteng City-Region.

Another component of safety was the concern about the standard of driving and of the public transport vehicles themselves. A number of participants commented on reckless or dangerous driving and speeding on the part of minibus taxi drivers, giving a sense of their vulnerability to traffic accidents and concerns about this.

There is thus considerable stress and anxiety associated with travel, and for many it is also inconvenient. "Waiting" was a key theme that featured in many participants' transport experiences: waiting in queues, waiting for minibus taxis to fill up before they could depart, waiting until peak times for taxis to start operating again. For some these waiting periods stretched to hours: "Sometimes I go to work and finish early, around 12:00 pm maybe I'm done, and I have to wait till like 4:00 pm, and I have to wait, because you wait in a taxi, Ja, it's tiring…At the same time it's quicker with a taxi" (JT2, Thembisa). There is usually little or no physical comfort for commuters during these periods: no shelter from sun or rain, no seating, no toilets, and so on. Once people have boarded the transport there are frequently crowded conditions, and sometimes restrictive rules: typically, people are not allowed to eat in the vehicles.

Respondents were very sensitive to the price differences between modes of transport. For example, in Denver the termination of the train service during the COVID-19 lockdown had a material impact: for some people, the alternative of using minibus taxis was simply unaffordable, and at least two of our respondents had to resort to walking. As noted earlier, for some respondents transport costs form a high percentage of their income.

Impact of COVID-19

As discussed in the Context section of this report, the COVID-19 pandemic had a substantial impact on public transport and mobility patterns in Gauteng, as well as on the methodology we could use. This section briefly examines how our respondents experienced the effects of the pandemic on their mobility and everyday lives.

Many of our participants changed their behaviour, in line with guidance from the state. They wore masks in public and whilst using transport and regularly sanitised their hands. However, several participants expressed concern that regulations were not always enforced and that minibus taxi drivers seldom ensured compliance:

> In the beginning they behaved well. However, now we don't get sanitised, and people are not wearing their face masks. For myself, because I'm working at the Department of Health, I need to speak out in the taxi, and I see other drivers don't like that if I speak out. […] I have to speak out and say, "Guys, please wear your face masks, COVID-19 is not over yet". You can see that a certain driver does not like that, even if they don't show it. […] I always have my sanitiser with me if they don't have it in the taxi. I make them sanitise and tell them that this thing is not over yet. (DD1, Denver)

For some participants the lack of enforcement of regulations and social distancing in minibus taxis led them to change their modes of transport, with several choosing to use e-hailing services which they perceived to be safer with regard to the risk of contracting COVID-19. This was because e-hailing services were better regulated and had fewer people in the car, and the passengers were able to open windows and ensure that there was sufficient ventilation. Other participants were forced to find alternative transport options when the trains stopped running. One participant used his car more and complained about the increased cost of doing so:

> We are travelling less. […] A litre of petrol is R15…But when I used to travel on the train…if I'd bought return tickets, I could go to town…the return was R7 and for small kids R5. So I would travel every weekend because it was cheap. The train was cheap. So now we have to pour petrol […] You even take out money unnecessarily, so that's how it is. (XD1, Denver)

Some participants were concerned about travelling with their children or families. As mentioned in the section on Household Mobility, some experienced stigmatisation when they travelled with their children as other passengers felt and loudly expressed that they were putting their children at an unnecessary risk: "But now since it's lockdown I don't go with her [daughter] because they will ask where we are going with children…are we trying to kill our children?" (SD1, Denver).

The COVID-19 pandemic has also had a profound impact on Gauteng's economy, with many people experiencing job losses or reduced working hours and pay (Maree et al., 2021). For some of our participants this impacted their mobility, with fewer reasons to be mobile. One young man noted: "Even now I can't even look for work. Before, I was able to wake up and go job hunting" (PD1, Denver). For several participants, the economic impact has meant that they have seen an increase in crime, as there are more people who are hungry and desperate, and this has impacted the way that they travel.

> Since people have lost their jobs, you find that when you are on your way to work, some know that they can mug you and take your phone because

> they are no longer working and you are […] The route that I take…George Goch [Hostel] is a very problematic place…and I pass there every day. So…a lot of people are no longer working, crime has increased […] You as a working person will be the food of those who aren't working. (XD1, Denver)

These quotes also indicate some of the psychological aspects of the pandemic, such as feeling judged by others, or the anxiety that comes with heightened forms of inequality.

Some of these changes and concerns are short-lived and will pass as the pandemic becomes less pronounced, whilst others like the issues of criminality or the need to use cars as the train system has been wrecked are permanent. However, these findings indicate that, overall, the COVID-19 pandemic often exacerbated existing inequalities — both in regard to transport, and to accessing opportunities in the greater urban fabric of the Gauteng City-Region, in which those living in precarity shouldered a wide variety of disproportionate burdens. It is these changes and concerns that are important considerations for transport planning into the future and indicate the range of factors that are considered by commuters when choosing their transport modes and routes.

Mapping "activity spaces"

The following series of maps shows the areas within which the respondents moved and the number of days they spent within a certain area. It is a demonstration of what collecting volunteered geographic information can reveal about the spatial practices of everyday life (Howe, 2021). The darker the area, the more time the respondents spent there. Four participants were selected to analyse in detail through GIS mapping. We specifically chose four people who had reported movement on most of the days of the study, to highlight their typical activities and the potential of utilising the smartphone app methodology.

First, an explanation of the technology and what it produces. The GIS mapping process entails: 1) a combination of convex and concave hulls to create the activity areas for each day; and 2) an algorithm that counts the number of overlaying hulls and produces a new layer with the specific number of overlaying areas. Sometimes straight lines exist where, in all likelihood, a more complex route may actually have been taken. This is due to missing data points, often resulting from a lack of mobile phone signal or GPS capacity. Despite this weakness, the maps still show from where to where the movement happened and indicate the modes and modalities of the transport.

The map of Participant 17, from Thembisa, deviates from the others in that he has two "hot spot areas" where he spent more than 5 days (see Figure 11 below). The other three respondents primarily have one activity hot spot, presumably their homes, from which their daytime and night-time activities start (see Figures 11, 12,13, and 14 below).

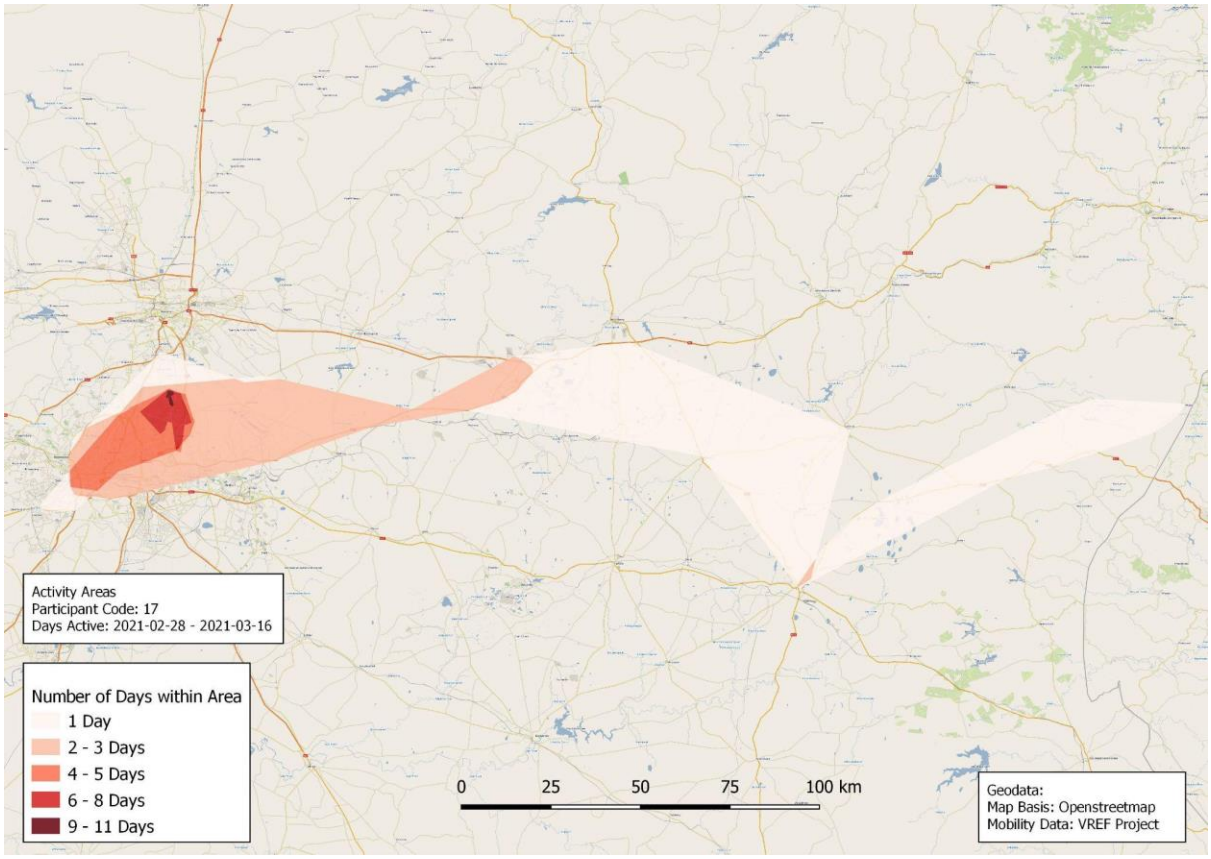

Figure 11: Map showing locations of Participant 17 at the Thembisa case study site over a two-week period. Map by Johannes Herburger

Figure 12: Map showing locations of Participant 20 at the Thembisa case study site over a two-week period. Map by Johannes Herburger

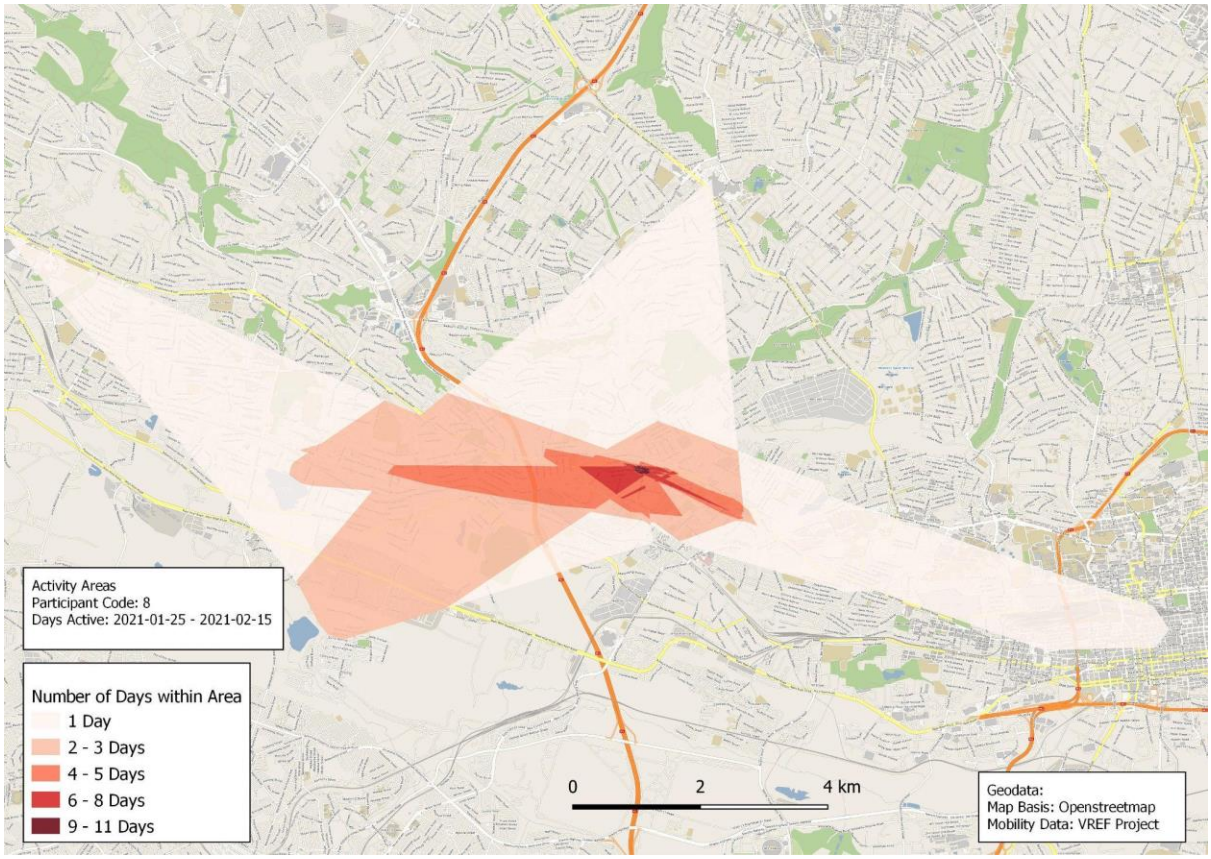

Figure 13: Map showing locations of Participant 8 at the Thembisa case study site over a two-week period. Map by Johannes Herburger

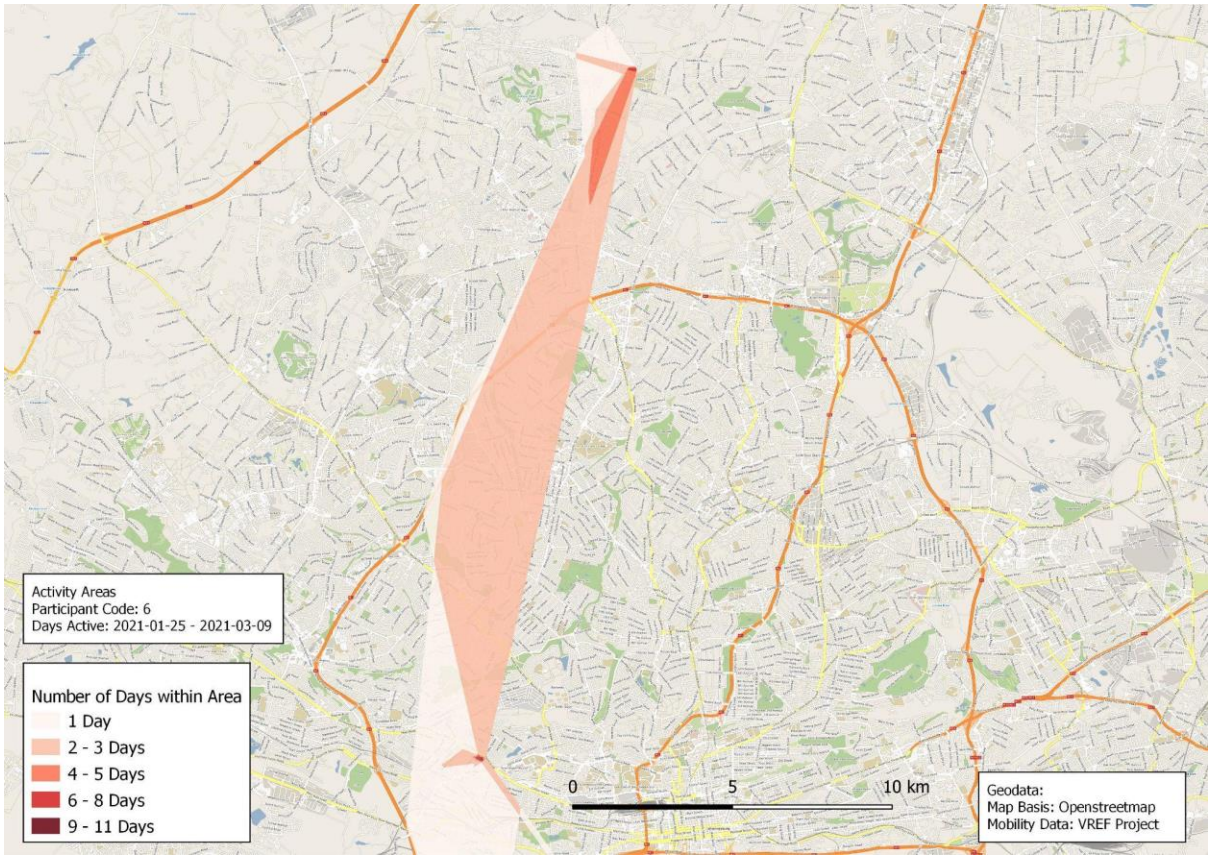

Figure 14: Map showing locations of Participant 6 at the Thembisa case study site over a two-week period. Map by Johannes Herburger

In this section on household dynamics, we focused mainly on internal household dynamics and resource decision-making. As these maps show, evaluating data in comparison between people and locations can yield insights into the everyday spatial practices that shape the Gauteng City-Region, and can perhaps lead to additional policy recommendations. In the next section we turn to public investment in transit and key informant perceptions of usage.

B: Public investment in transit and key informant perceptions of usage

This section showcases a review of transport policy at the national, provincial, and municipal level followed by findings from key informant interviews with transport officials.

National and provincial policies on mobility and transport

South Africa has undergone multiple changes in public transport policy, over the last four decades. Legislation has focused on the provision of efficient transport to all citizens across rural and urban areas, the inclusion of multiple modes into the transport system, funding

mechanisms, and better management of transport by various governmental structures. The following section gives a synopsis of public transport from 1977 to current times in three subsections: the first examines transport policy in the late-apartheid period; the second, legislation in the post-apartheid period until 2009; and the third, current policies.

Transport policy 1977–1994

Public transport policy in South Africa runs parallel to the county's politics. In 1977, the Road Transportation Act was introduced, with the main purpose of deregulating the transport sector from the use of motor carrier certificates and transport volume limits. The act brought notable changes by subsidising buses and covering losses incurred by Transnet (then called SA Transport Services) (Khosa, 1995). Bus subsidies were not only a transport measure but also favoured the apartheid government laws of racial separation, enabling the cheap transportation of the black labour force that was largely located outside the city in informal settlements and townships (Walters, 2014). The subsidy system, however, was "inefficient, expensive and unpopular" (*Financial Mail*, 19 May 1988, cited in Khosa, 1995: 174), as it was open to corruption from service providers overclaiming tickets sold and distance travelled (Walters, 2014).

Over the years, subsidising transport became unsustainable amidst increasing protests against rising transport costs and the apartheid government's financial crisis. Additionally, bus companies began to complain about competition from the minibus taxi industry which was gaining popularity in black townships (Khosa, 1995). As a result, commissions and investigations were established by the apartheid government, including the National Transport Policy Study, consisting of multiple advisory committees including the South African Black Taxi Association. One of the main recommendations of the advisory committee was to introduce interim contracts, where existing bus contracts were converted to fixed-price contracts lasting for three years, whilst a new competitive tendering system was piloted. Another major recommendation was to legalise the operation of 16-seater minibus taxis as a form of short- and medium-distance travel. These recommendations formed the basis of the 1986 White Paper on National Transport Policy (Walters, 2014). The minibus taxi industry was formally legalised through the 1988 Deregulation Act and led to a dramatic decrease in the ridership of subsidised private bus services such as Putco: from 353 million passengers in 1983 to 82 million in 1994 (Vegter 2020). This increased the need for more subsidies from government whilst also increasing the cost of transport provision.

Transport policy 1994–2009

The democratic government in 1994 inherited a public transport system that was underperforming and unable to meet all citizens' mobility needs (Khosa, 2001). Consequently, the provision of adequate public transport was a concerning and urgent matter for the democratic government (Thomas, 2016). The transport challenges were intended to be managed through the White Paper on National Transport Policy of 1996. The policy enacted a tendering system for subsidised buses, where operators were required to tender to provide services (Walters, 2013).

The policy took a particular view on taxis as it intended to formalise the industry by registering taxis as businesses with operating licenses. The permits granted would be subject to route or network determination and travel demand. Furthermore, the policy indicated that the industry would be given “financial and technical” assistance to allow it to compete for government transport contracts (Department of Transport, 1996). Interestingly, there was no mention of subsidies for the industry.

Regarding commuter rail services, the policy declared that rail infrastructure would be owned by the national government until provincial governments were ready to take over. The policy further intended to shift from deficit financing towards a concessions system for improved competitiveness (Walters, 2013). The concession system allows government to outsource the operational aspect of the system to a transport authority at an agreed price. This form of financing was meant to improve the level of service rendered to the commuter and make rail fares competitive to other modes of public transport (Department of Transport, 1996).

The 1996 White Paper ushered in the Moving SA Strategy of 1998. One of the major plans of the strategy was to focus transport provision on corridors and to promote competition amongst modes of transport through a tendering system which would select the mode that provided the best service and was most cost-effective for a corridor. The document argues that public transport only becomes viable in densely populated corridors where riderships of more than 30 000 passengers per day can be assured (Freeman, et.al., 2001).

In 2000 the National Land Transport Transition Act (NLTTA) was promulgated. It defined, for the first time, that transport authorities were to manage transport. Their functions included management of competitive tendering, including negotiated contracts for previously excluded persons. A major element of the NLTTA was the move towards integrated (public) transport planning. One of the legislative requirements of the NLTTA was to provide a five-year strategy on integrated land use and public transport developments. The National Land Transport Strategic Framework 2006–2011 therefore served as a five-year framework for integrated land use and transport planning, focusing on the implementation of integrated transport planning projects within cities (Department of Transport, 2006).

At a provincial level, Gauteng enacted the 1997 Gauteng White Paper on Transport Policy. The main policy aimed to regulate and promote efficient, sustainable, and affordable public transport. The policy also planned to integrate transport planning with land use and to adequately manage state facilities (Hanyane, 2011). Gauteng satisfied the requirements of the NLTTA of 2000 with the Gauteng Transport Framework Revision Act of 2002. This act addressed transport management issues of institutional arrangement and efficient transport planning systems (Hanyane, 2011). In the same period, the province also enacted the Gauteng Public Passenger Road Transport Act of 2001 and the Gauteng Transport Infrastructure Act of 2001. The former primarily focused on ensuring the registration of operators and adherence to the law. The latter focused on basic and detailed designs before the construction of any provincial road (Hanyane, 2011). Both acts were an attempt to get public transport operators, specifically minibus taxis, to abide by the law and to incorporate more rigid route planning in the province.

In 2005 the Gauteng province released the Gauteng Growth and Development Strategy. The focus was on specific issues including traffic congestion, multimodality, affordability, and the reduction of private car usage (Hanyane, 2011). In 2007, two major policy documents were published by the National Department of Transport that directly affected local and provincial government: the Public Transport Strategy; and the Public Transport Action Plan, Phase 1 (2007 and 2010). According to Walters (2013: 36), they intended to "give direction to public transport management as well as to make provision for the introduction of bus rapid transit (BRT)". These objectives were to be achieved through the implementation of the national rail plan which included refurbishing 2000 rail coaches; implementing the 2006 taxi recapitalisation programme, which involved the scrapping and replacement of 75 000 taxis; and streamlining subsidised bus services by making 30% of the bus fleet tender compliant. Another major element was the provision for integrated rapid public transport networks (Walters, 2013). The goal was to have 85% of all city dwellers within a 1 km distance from a rapid public transport network by 2020 (SACN, 2016). These documents were the foundation for the BRT systems across the major cities in the province, i.e., Are Yeng in Tshwane, Harambee in Ekurhuleni, and Rea Vaya in Johannesburg.

Current policies

In 2009, the National Land Transport Act was enacted, replacing the NLTTA of 2000. The major change was the allocation of public transport management to metropolitan and local government departments. The new act created new institutional structures applicable to the licensing of operators and the provision of permits for long-distance passenger transport and requirements for integrated public transport plans. Following this, in 2011, the national Department of Transport released the National Development Plan (NDP), which had the overall aim of eliminating poverty and reducing inequality by 2030. The policy focused on specific measures of improvement across sectors. It emphasised financial investment and resolution of public transport policy challenges, including improved road infrastructure and incentives for public transport usage (National Planning Commission, 2012). The responsibility of public transport provision remained on the shoulders of local government.

The first phase of the NDP, the period 2010–2015, was to focus on using existing transport assets, involvement in public–private partnerships projects, and expanding passenger rail services (National Planning Commission, 2012). In Gauteng, the latter was supposed to be achieved through the PRASA-Gauteng re-signalling project, which aimed to refurbish and re-signal passenger rail infrastructure across the province. The project is ongoing and had major setbacks due to "corruption and mismanagement" at PRASA and vandalism of much of its infrastructure (Phillips, 2022).

The second phase of the NDP, the years 2016–2020, was to be driven by the concept of transit-led development, where transport would stimulate local economies, benefitting urban residents. The City of Johannesburg's BRT project aligns with some of these aspects as it aimed to grow the economies of previously disadvantaged communities, mainly located on the periphery of the city, through job creation and access to other economic opportunities (CoJ, nd). The NDP has been criticised for not yet achieving the goals as set out for this period (Luke and Heyns, 2016). The third phage, for the period 2021–2025, was to focus on ensuring energy efficiency and renewable energy in the transport sector.

In 2016 the National Transport Master Plan (NATMAP) was published, to run alongside the NDP. It aimed to address major transport-related issues by the year 2050. The document had multiple objectives, including the provision of sustainable and affordable public transport that is multimodal and inclusive of non-motorised transport. The plan also aimed to improve infrastructure and focus on human and financial capital (Department of Transport, 2016). NATMAP identified the country's transport challenges and listed measures to resolve them. One of NATMAP's key directions was to secure subsidies for all modes of public transport, for the benefit of the user (Department of Transport, 2016). This is somehow seen as learning from the disarray of the bus contracts and tension due to the lack of subsidies for the taxi industry. The document also spoke about developing guidelines for public transport planning.

In describing the current situation, the NATMAP 2050 stated that:

> Inappropriate modes are used along key corridors and the demand for subsidised passenger transport services usually outstrips the available capacity. Regardless of the cost implications and distances, passengers who are able to afford rail or bus services revert to taxis, due to the flexibility and, in some instances, lower cost of that service. In circumstances of higher volumes and longer distances, bus and rail transport are more sustainable and cost-effective. A well-integrated passenger transport system, characterised by appropriate modes for specific corridors, is critical in improving the affordability levels. (NATMAP, 2016: 8:2)

Therefore, to improve public transport, NATMAP suggested that there need to be more transport options available and that these options needed to be safer, more reliable, and superior in quality. However, in addition to introducing a modern, integrated, high-quality, affordable, and customer-focused public transport system, the plan also intended to improve the safety, security, resilience, reliability, and efficiency of the public transport network (NATMAP, 2016).

The main public transport issues identified by NATMAP are: lack of integration; competition between transport modes; corridor competition; and the difficulties experienced with the taxi recapitalisation project. Other issues identified, relating to land use, are: urban sprawl; land use integration; and spatial division. Regarding infrastructure, the issues of maintenance, ticketing, and universal access are amongst the most important ones identified.

In addressing these issues, NATMAP focused broadly on the need to promote mass public transport — for integrated transport interchanges, densification along corridors, and land use planning. Another interventions proposed was to carry out an in-depth investigation of the existing BRT model to either improve its sustainability or to intervene in its future role for South African cities (NATMAP, 2016).

At a provincial level, in 2011 Gauteng released the Gauteng Spatial Development Framework, known as the GSDF 2030. The GSDF 2030 is based on four spatial development strategies that address six spatial objectives. These are: connectivity, liveability, conservation, concentration, viability, and diversity (GPDRT, 2011). The GSDF

2030 states that the Gauteng City-Region aims to promote safe, affordable, and convenient public transport and non-motorised transport (GPDRT, 2011). The GSDF emphasises more efficient movement of people to jobs and opportunities, improving the lives of the residents of marginalised areas, and improving the economy by developing nodes, corridors, and township economies (Peberdy et al., 2017).

To some extent, the GSDF 2030 recognises the role of the minibus taxi industry, stating that they are more responsive to changing passenger needs; and yet the policy states that the industry cannot serve as a long-term mass transit option for the province. On the other hand, it suggests that commuter rail in the province is well developed and connects the main destinations. It recommends investing less in road infrastructure and focusing more on upgrading the rail network. It further states that the province has a comprehensive rail system, despite the dysfunctional state it is in currently due to under-investment, and that provincial government should do what it can to help build on and extend this capacity GPDRT, 2011).

In 2013, the Gauteng government released the Gauteng 25-Year Integrated Transport Master Plan, known as ITMP25. The vision of ITMP25 is “an integrated and efficient transport system in Gauteng that promotes sustainable economic growth, skill development, and job creation, fosters quality of life, socially includes all communities and preserves the environment” (GPDRT, 2012; Wray et al., 2014: 3). It is a framework intended to assist the government to introduce a world-class, sustainable transport system that prioritises public transport and promotes the province’s social, economic, environmental, and cultural goals (GPDRT, 2012). The plan has eight long-term interventions which include a feasible public transport network and the establishment of commuter rail as the backbone of public transport (Wray et al., 2014).

As part of the key short-term initiatives, the ITMP25 seeks to establish a transport authority, develop a “one-province, one-ticket” system, and transform the taxi industry. It is clear from the ITMP25 that Gauteng is focused on transport management within the province and on the establishment of rail corridors.

With regard to the current public transport policy, it is clear from this row of policies that South African cities are focusing on mass public transit, such as rail and BRT (especially NATMAP and ITMP25). The thinking behind this shift is in line with the overall vision of progression and advancement. The current systems, it seems, are backward and a means of pollution and congestion; they need to be subsidised by faster, safer, more efficient, and more reliable mass transit. In addition, the policies seem to focus more on corridor development and transit hubs, that is transit interchanges, with one-ticket systems and fare integration for seamlessness.

The policies recognise that the minibus taxi industry will require maintenance (taxi recapitalisation) and support (in terms of taxi ranks and other associated amenities), but there are limited forward plans for this development. The ITMP25 notes that “for the (taxi) industry to benefit from the government’s IPTN [integrated public transport network] plans, there would need to be restructuring and reorganisation of the industry into larger operating entities, in order for the industry to optimally exploit and benefit from participation in more

formalised and profitable service opportunities. This may also entail access to further financial support from Government" (GPDRT, 2012: 73). This would mean that the taxi industry needs to recognise the value added by government and agree to be part of the overall structures that govern transport in the province.

Besides these aspects, the policies largely recognise the taxi industry as a feeder service along the rail or BRT corridors.

Overall, the South African public transport policy path appears long and bumpy. A trend is however observed from the various legislation enacted over the years. Firstly, the responsibility as to which level of government provides public transport has been a recurring challenge; later legislation has placed it on the shoulders of local government. Yet, as most local governments struggle with financial and human capital, policy implementation is likely to lag (Walters 2013). Secondly, plans to reinvigorate rail passenger transport remain big, unrealistic, and insufficiently prepared. Thirdly, subsidies have remained a challenge, ranging from over-subsidisation in the apartheid-era to a lack of subsidies for taxis at the present moment. Lastly, policies have indicated the need for transport planning to operate in an integrated system as opposed to silo projects, evidenced by legislation requiring integrated transport plans as basis for offering contracts. However, the implementation of this policy measure remains insufficient.

Findings and reflections on Gauteng transport policy and implementation

This section is informed by interviews with a number of key informants in the transport sector in the Gauteng City-Region (see methodology section). In general, transport investments do not prioritise the kind of modes and services our participants were predominantly using. In Gauteng, it is clear that in respect of minibus taxis the focus has largely been on regulation, although there has been some investment in large taxi ranks and measures to handle the important issue of the relationships between the BRT system and minibus taxis. However, there has been little attention on integrating minibus taxis operations into the overall transport system (although some infrastructure initiatives are underway). And there has been little commuter-centred investment (for example in micro-infrastructure) relative to the centrality of paratransit in people's daily lives in our case study sites.

Key transport initiatives noted by our expert respondents included the BRT initiatives of the last decade or so in the three metropolitan areas of Johannesburg, Ekurhuleni and Tshwane. Initiatives linked to paratransit include the taxi rank upgrades in Centurion (Tshwane) and, significantly, the large international long-distance and cross-border transport hub for buses and minibus taxis, along with a retail component, underway in Johannesburg, signalling a long-overdue intervention purportedly also aimed at the comfort of the long-distance traveller. These interventions are also intended to ensure greater organisation of the taxi industry and forcing greater obedience to by-laws. The main thrust of the interventions into the minibus industry centres around control, as there was a general sentiment that the industry is uncontrolled and does largely what it wants, flaunting local regulations.

For a number of years there has been the intention to develop a coherent transportation authority that can coordinate transport across the city-region. This was supposed to be the Transport Authority of Gauteng (TAG), the establishment of which according to one news report “forms part of the Gauteng Growth and Development Strategy (GDS), which underlines the need for the provincial transport system, including that of public transport, to facilitate effective and efficient mobility of people, as well as that of goods and services, as a vital element for the growth of any modern economy” (Liedtke, 2020). The establishment of the TAG was supposed to have been completed by the end of 2020, however the COVID-19 pandemic has led to severe delays; at the time of writing, the TAG had not been fully established and there was still an acting CEO and board.

There have also been other delays that have affected transport in the province. Key amongst them have been delays in revising the Transport Integrated Plan, which is considered to lead policy. The latest version is from 2013. The provincial department has been looking to revise it but has yet to do so. There is, however, a general opinion that since transport plans and infrastructure have long-term time horizons and do not change much over a five-year period, it would make more sense for the plans to be revised every 10 years or more and that the current plan is still relevant.

There were also a number of initiatives that have been taking place across the province. Although there is a great deal of ambivalence towards the minibus taxi industry among government officials, there are attempts at integrating it into other transport offerings. Formal organisations seem to be trying to integrate with taxis, but it seems Gautrain is the only one that is getting it right. It has contracted out certain feeder routes to taxi organisations and has integrated these into its coherent transport network. The BRTs have worked and continue to work to incorporate with taxi associations but not necessarily with taxis themselves. This has meant buy-out options and negotiations rather than integration of taxis into the overall transport and BRT networks. However, the formal organisations see taxis as extremely important and, as an official put it, “paratransit has become very critical recently. I think the biggest reason is being that the collapse of PRASA”. The role of paratransport is described well by a provincial official who explained that taxis are “always picking up the slack, and ensuring people are still getting to their destination”.

There is a strong push in the government to finance projects that increase road capacity. Informants spoke about reducing car dependency and moving towards sustainable transport. In terms of planning, officials argue “that people must make use of public transport and that you don’t allow for parking bays and so on for development”. However, it is uncertain how this plan integrates with the minibus taxi industry or the BRTs that are already in place.

There are a number of issues with the existing buses (Metro, BRT, Putco), especially around funding, subsidies, and management. Putco seems to stand between the province and the city. The BRTs are not getting the ridership they require to become feasible. Overall, the contracted bus services do not seem to be performing well and are generally considered unreliable and unable to traverse popular routes needed by commuters.

Rail has been the worst affected over the last years. PRASA is seen as dysfunctional and in decline, with substantial stock lying dormant and numerous routes that are not operable or

operating at the barest minimum, with commuters complaining that the service offered is unpredictable and dangerous. Although there have been numerous promises of turning PRASA around, nothing concrete has yet come into effect.

There was a general sense from respondents that there are major issues with regard to implementation, budget, and data collection in the transport sector and that the lack of data is a key issue when trying to push forward any of the changes that the officials would like to see made. According to a provincial official: “You have to collect data and sometimes it really takes you two years just collecting this data”.

Overall transport in the Gauteng City-Region seems to be facing a number of challenges. The departments in question, both at the provincial and the municipal level, are well aware of them and are trying to address them. However, the biggest problem seems to be the resistance and mistrust many in government have of the minibus taxi industry — even if the spokesperson for the taxi industry was optimistic that things would change under the new MEC for transport with whom the industry feels there is the possibility of a good working relationship.

C: Interface between the macro-scale and the micro-scale

In this section we bring together the findings from the micro-dynamics of households with the macro-processes of transport investment and policy.

Indifferent infrastructure

Ideally infrastructure should respond to the everyday needs and daily experiences of the people who use it. Steele and Legacy argue that we need to “extend the lens through which we see infrastructure: as relational; ecological; as everyday practice; as inherently political; as embedded in questions of human and non-human justice and equity, fiscal transparently, institutional accountability” (Steele and Legacy, 2017: 2). However, many of our findings about transport infrastructure in Gauteng (and Maputo) showed how little infrastructure responded to the everyday needs of its users, how apolitical it was considered, and how little it contributed to justice and equity. As such we see infrastructure as “indifferent” and understand this indifference in two ways, drawing on the Oxford Language Dictionary: “1. having no particular interest or sympathy; unconcerned; 2. neither good nor bad; mediocre”. The transport infrastructure, as we demonstrate below, is largely uncomfortable, unsafe, and the opposite of ergonomic — not designed for people or their needs.

Some of the commuters discussed how the infrastructure was indifferent to people’s needs:

> For me, those places are not right because sometimes as a passenger you arrive as the taxi has just left the rank from town to come to Denver so, because there is nowhere to sit, there are no chairs, you stand. (KD1, Denver)

> It is difficult to stand especially for old people…You must remember that the city is not travelled by young people only, even grannies that get their social grants…We have those grannies who don't want to get assistance from their children because they [the adult children] take their money, so they end up coming to the city themselves…She can also take a taxi. It becomes really painful when that person leaves a certain shop with heavy things, and now they don't know who is going to help them to get to where they need to catch the taxi…When she gets to the rank, maybe the taxi hasn't arrived, and she's standing now. (KD1, Denver)

> If the queue is very long, and then you are at the back, you'll be outside like the taxi rank, you are queueing outside because there's a shelter but that shelter cannot accommodate all of you. If the queue is very, very long, then others are… [in] the sun and the rain, they are catching them, ja…You are standing. The only place that you sit is when you are in the taxi [laughing]. (JT2, Thembisa)

Others agreed and said that "there are no comfortable places, no" (GW1, Westbury) and that "you'll stand and burn and get wet waiting for a taxi. There's nothing [no facilities]" (LW1, Westbury).

Even the highly designed and very expensive BRT and Gautrain are seen as indifferent to the routes that many people generally need and travel. The vast majority of respondents in this study had never used them and little intention of using them:

> I have never, but I'd say that our challenge as people who live in Denver is that you'll never find the BRT travelling around here. You will find the BRT in town. I say that because the BRT has particular routes. If you travel in a BRT lane with your car you get a R1 500 fine. (KD1, Denver)

The issues seemed to be that the routes did not go where the majority of respondents travelled. In addition, the infrastructure surrounding payment and boarding was seen as not user friendly and quite intimidating.

However, it is not just the state that is indifferent to discomfort. One of the respondents narrated how a BRT station had been vandalised and the pieces sold off, without any concern for the implications for the users:

> I won't say that it's comfortable because since people have lost their jobs, everything that is metal is being cut and taken to the scrapyard. There were chairs before, even at the station, benches were there, but now…because they were metal, they have all been cut, and they no longer exist. Anything that is plastic…there's also a place that takes plastic scraps. There's nothing that isn't getting sold, so there's nothing. (XD1, Denver)

Even trying to deal with the lack of infrastructure becomes problematic as nothing is set up to assist passengers. One of the respondents said that even carrying an umbrella to try and deal with the rain or the strong sun becomes difficult on a taxi:

> I don't want to lie…Even if it rains there are no shelters. Where we get on the taxi at Delvers, there are no shelters there. If it's superhot, you will feel that heat, there are no shelters unless you have an umbrella. When you get into the taxi with your wet umbrella, it becomes a problem. (SD2, Denver)

People become part of the infrastructure that make the transport system operational. These components include the police and Metro Police (e.g., Johannesburg Metro Police Department), the queue marshals and even the passengers themselves. Respondent SD2 from Denver mentioned that the taxis are not safe and that the doors do not "close properly" implying that passengers are forced to find ways to keep the doors closed when they travel and keep themselves safe.

There is also a great deal of indifference towards people's time. Forcing them to wait in arduous conditions for long periods shows there is a lack of care about people's comfort and their other responsibilities. Numerous respondents spoke about the different aspects of waiting that they are subjected to: waiting in queues; waiting for marshals to assign them to taxis; waiting for taxis to be full so that they will depart; waiting for e-hailing services; or even waiting for friends and family members to be ready to take them to places. Passengers are at the mercy of other people and systems and through this their sense of agency is significantly diminished.

Resilience, endurance, and precarity

A number of interviews reflected the issue of people's lives and actions as a form of resilience in the face of difficult situations, which raised for us the related theme of endurance but also of precarity. In the discussion in this section the notion of resilience is used to mean "coping with short-term disruptions and adapting to long-term changes" (Lerch 2017). Coping and adapting are key strategies, across both short-term and long-term time frames. Endurance is a related concept, used here to mean a more gritty or resigned form of carrying-on. Precarity refers to "life worlds characterised by uncertainty and insecurity" (Waite 2009), and the narratives of several participants' lives reflected this uncertainty, as well as perhaps fragility: limits to being able to withstand change/shocks, i.e., resilience is not endlessly possible. Present in a number of participants' travel journeys is vulnerability: the probability of being exposed to risk of various kinds, including physical hazard from passing vehicles or whilst travelling in an unroadworthy or recklessly driven vehicle, or the possibility of assault or other crime.

Whilst forms of adaption were evident amongst several participants, for some this could be viewed as a forced adaption, when the mode of travel had to be changed because a service was terminated or prices rose, or because a change in personal circumstances such as unemployment made it necessary. One example is the suspension of commuter trains during the hard lockdown in response to COVID-19 in 2020. This short-term disruption

became a long-term change when the rail infrastructure was extensively dismantled and stolen during this period. Various participants, particularly in the Denver case study, had to switch modes. Referring to his partner, BD2 reported that “after the trains got affected and they are no longer available, she was forced to go and use taxis. Not that it was her decision. She is forced to”. He himself could not afford the change: “I don’t have money to pay for a taxi fare. I am forced to use my legs” (BD2, Denver). For a Thembisa participant there were both time and cost impacts: “if there was no COVID, I will still be using the train because it is more cheaper and it doesn’t have a traffic…So it is much faster than the taxi” (MT1, Thembisa). But MT1 has adapted to the increased cost of taxis. The lack of trains also meant that some participants’ reach or journey footprint was significantly curtailed — they simply did not travel as much or as far:

> We are travelling less. There’s no transport…because even if the car can be present, everything is expensive. A litre of petrol is R15…But when I used to travel on the train…if I’d bought return tickets, I could go to town…The return was R7 and for small kids R5. So I would travel every weekend because it was cheap. The train was cheap. (XD1, Denver)

For another participant, the adaption over time was from journeying along with her children for shopping and other excursions, to travelling alone, as she could not afford the cost of all the fares:

> There’s a long time since [the kids have] travelled with me, due to financial problems because I have to pay…It’s been a long time since I’ve went with them anywhere…It’s cheaper for you to go alone to do these things. I have to bring something for them, maybe a clothing, I have to know their right size, I have to fit them and take it back for the right size and all that. (JT2, Thembisa)

In other cases, adaption could be viewed as more voluntary or self-initiated, switching behaviour to manage inconvenience. MT1 leaves for his nightshift extra early: “I leave the house around 5:00 pm or to 6:00 pm…I’m avoiding standing at the queues and stuff so I’d rather be early than late” (MT1, Thembisa). VT1 also avoids the queues and other aspects of taxi journeys that she finds unpleasant: “That is why I use a lift club. Yoh Randburg you can cry. The queues and the queue marshals there, they are not good and the taxi drivers, drive rough” (VT1, Thembisa).

Other people have found an opportunity within the transport sector. In PT1’s case (Thembisa), he has used his driving skills from a job he was retrenched from in 2018 to provide transport services to and from work for people in his area needing to commute in the late evenings.

Whilst at one level all those having to make a change can be viewed as resilient in the sense of adapting and “coping” at some level, the notion of enduring tries to capture the impact on those for whom the change is particularly burdensome, adding a layer of gruelling hardship about which they have no choice or control. This example has been cited earlier in the document to illustrate transport cost constraints, but here the focus is on the endurance the words reflect:

> If it was up to her [partner] I would use taxis all the time but due to money issues [I can't]. We realised that the money was not enough and we would end up starving in the house. So, if it's like that I will walk, I will get used to it, I am a human being. (MD1, Denver)

Other forms of endurance are to do with putting up with a situation, obeying/deferring, or accepting what one is powerless to change. An example would be managing the stress of being the person ending up in the passenger seat next to the taxi driver and having to count the money and help the driver with issuing change: "Oooh, sometimes it's stressful. If you get a rude driver, you don't even know R16.50 times what what, how much is this" (JT2, Thembisa). Another form of endurance is having to wait, as noted above, including to pass lengthy periods of time until a taxi is ready to depart, as it is not viable for taxis to drive during off-peak times when they do not have a full load and there is no alternative transport:

> And then when I am knocking off, I have to stay at the rank until the taxi is getting full. If it's not full, the taxi is not going to come out…Sometimes if you knocking off, maybe you knocking off at around 5:00 pm, you're going to stay at the rank until 6:00 pm until the taxi is full…Each and every day we are getting used to. (TT2, Thembisa)

Several of our participants reflect the forms of insecure work with low and fluctuating incomes that many South Africans endure in a context of massive unemployment. Some of this is physically onerous as well as hazardous. Respondent PD1from Denver, close to the former mining belt of Johannesburg, operated as a "zama zama", an informal reclaimer of residual gold in abandoned mines. She no longer works underground after a recent collapse in the excavation hole but does the surface work. She is the only woman amongst the group of men working that area, "hustling" for herself: she goes "to the mountain to collect stones which may have gold. Then I come back and then I hammer the stones, after that I put them in a machine and then I crush them and then I go and sell. I burn the stuff before I go and sell" (PD1, Denver). Her daily travel is also filled with hazards: being stopped by traffic police who might fine her or confiscate her goods, which happens regularly, and walking with her cart along busy roads to the settlement where she has built a corrugated iron shack to live in.

Other respondents talk of the impact of COVID-induced unemployment or poverty on their meagre businesses or earnings. JT2 from Thembisa had the number of domestic work days reduced when one of her employers lost the job; and OT1, also from Thembisa, found that customers who had bought clothes from her on credit were unable to pay their monthly rates as they had not worked enough days to earn enough.

In a different form of vulnerability, XD1 in Denver, was now exposed to increased physical threat and crime exactly because he had a job. He earned money in a context where many have lost their work.

This section on indifferent infrastructure and on resilience, precarity, and endurance reflects key findings in respect of our respondents' experience at the interface between daily lives and the state (present or absent) in transport infrastructure.

Conclusions

In three different case study sites in the Gauteng City-Region, the research informing this report explored household movement patterns, access to and use of transport, and the way in which decisions about these were made within the household. It also examined what government was prioritising and where it was investing in terms of public transport and considered how the household experiences in three study sites related to this. As part of the larger comparative research project, our colleagues at the Universidade Eduardo Mondlane conducted a similar study in Maputo/Matola in Mozambique. The conclusions here relate to the Gauteng component of the research, as discussed in this report, but we also note some of the comparative points that have emerged.

Although our three case study sites — Denver, Westbury, and Thembisa — reflect differences in relation to public transport access, there are many similarities across the responses from our participants. A number of respondents lived in multigenerational households, and in most cases there were different modes of transport used within a household. In some cases there were also limits to the mobility of some household members such as children, due to transport costs and other factors. Decisions about transport spending were linked to those in the household who bring in income, and decision-making reflected concerns about the household budget and spending. The cost of transportation was a highly significant factor driving types of transport used and frequencies of movement, and curtailed some activities.

In both the Gauteng City-Region and in Maputo/Matola respondents felt their transport options were very constrained because alternatives are unaffordable, not within a reasonable distance, or unsafe. In both contexts there were high levels of walking and use of paratransit (non-state provided transport), including minibus taxis, called chapas in Maputo/Matola, but in the Gauteng City-Region also e-hailing services such as Taxify, Bolt, or Uber. Our Westbury case was well served by formal public transport in the form of a BRT system but this was little used by our respondents for various reasons.

Across our study sites for most respondents there was anxiety and discomfort involved in their travel experiences. For some the journeys were unpleasant, tedious, or inconvenient (with long periods of waiting experienced by many respondents), but for others there were additional concerns for their physical safety. These included vulnerabilities to crime associated with journeying on foot, as well as hazards within the use of vehicular transport. Periods of waiting for paratransit are usually unsupported by forms of passenger infrastructure, such as shading, seating, or toilets.

Our research was conducted during periods of lockdown associated with the COVID-19 pandemic, which affected our respondents in various ways. A major impact in the Gauteng City-Region was the closing of rail services during the “hard lockdown” and the subsequent stripping and theft of rail infrastructure. This, coupled with major problems in the running of the passenger rail agency, has had a severe impact on respondents who had used the train service for its low cost, despite its variable reliability.

In terms of public transport policy, there has been increasing responsibility placed on local government. Policies tend to focus on mass public transit such as rail and BRT, along with freeway improvement projects through national and provincial spheres of government. Whilst there is recognition that the minibus taxi industry plays a crucial role in transporting people across the Gauteng City-Region, comprehensive strategies to integrate this into the transport system as a whole are lacking, despite particular initiatives such as managing the relationship with the BRT system. Interventions into the minibus industry seem largely oriented towards regulation and control, with the industry perceived as operating outside of authority. Some government infrastructure projects such as major taxi ranks support the minibus taxi industry, but there is little by way of micro-infrastructure for commuters across the system given the major role this form of transport plays in daily lives.

In a much-needed positive development, a transport authority is currently being established to coordinate transport across the Gauteng City-Region, though its operation have been delayed by the pandemic. In conjunction with other transport agencies at different levels of government, this authority will need to grapple with major problems ranging from dysfunctional passenger rail and weak bus systems to how paratransit can be supported and integrated.

The transport infrastructure most used by our respondents in Gauteng (and Maputo/Matola) was paratransit, but also public transport in the form of trains and buses, when available. Overall, our study found that this infrastructure responded little to the everyday needs of its users and in this sense contributed little to accessing the city in fairer and more equitable ways. We perceived much of the infrastructure as “indifferent”, in a variety of ways. These included indifference for the comfort and security of its users, for the time they spent waiting, and for what it cost them to travel. In effect, our respondents were at the mercy of a transport infrastructure which was not structured to be in service of their needs.

Although our respondents demonstrated great resilience in the face of this indifference, precarious lives were made more vulnerable by the failures of public transport: having to walk long distances through unsafe areas because the train was no longer available and minibus taxis were too costly, for example. Whilst some adaptations to circumstances reflected agility and coping mechanisms, for some respondents this clearly added another layer to already extreme hardship through circumstances beyond their control. For a number of participants, public transport deficiencies contributed to difficult lives and increased their poverty.

Our methodological approach to the research has enabled us to compare the macro-processes of transport policy and the perspectives of transport policymakers with the everyday experiences of households in three neighbourhoods, revealing the dynamics at the micro-level. This has highlighted two dimensions of disjuncture: firstly, that of a disconnect between the provision of transport and people’s actual identified needs; and, secondly, that of precarity or vulnerability embedded in the transport systems in the Gauteng City-Region. These disjunctures reveal some of the challenges that transport policymakers face in designing and implementing transport systems that are responsive to the needs of residents of the city-region in the context of high levels of poverty and unemployment, and in the wake of the devastating effects of the COVID-19 pandemic. Whilst this research has provided

some insights into these challenges, further research is needed to better understand the interplay between macro-processes and micro-dynamics of transport in the city-region.

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Annexure

Overall summary of participants

- Denver: 12 participants (8 women, 4 men) from 9–10 households
- Westbury: 10 participants (7 women, 3 men) from 7 households
- Thembisa: 14 participants (6 women, 4 men) from 11 households
- Respondents in bold are from the same households as other respondents

Participant	**Household**	**Work**	**Accommodation**	**Monthly household income (per month)**	**Transport expenditure (per month)**
Denver					
PD1	2 adults + 3 grandchildren (ages 3, 3, 6) PD1 and 28-year-old daughter	Zama	3-room shack	± R3 200 including child support grants	R400–500 (16%)
MD1	2 adults MD1 lives with partner (BD1)	Security guard	2-room shack, renting	–	More than R500
BD1	2 adults BD1 lives with partner (MD1)	Odd jobs	1-room shack, renting	R4 000–5 000	R500 (10%)
BD2	1–2 adults BD2 lives with partner	Works in the community	1-room shack	R2 500–R3 500	Does not use public transport
DD1	2 adults + 2 children (ages 9, 15) + 1 adult nephew who left the house because of the pandemic	Community health worker	1-room shack, renting	R3 500 from work (sent as remittance home) R1 400 from grants R600 from shack rental Total: ± R5 000	R112 (2%)
SD1	4 adults (partner + 2 adult children) + 2 grandchildren	Cleaner (CWP)	Owns 4-room shack	Just over R4 000 including grants	R120 (3%)

				and rental income	
XD1	2 adults + 2 children (ages 6, 13) XD1 lives with wife (SD2)		Owns a brick shack, also has a space in the hostel	Wife earns an income so does not know	Less than R500 — has a car
SD2	2 adults + 2 children (ages 6, 13) + 2 adult children (18, 23) who sleep at the hostel SD2 lives with husband (XD1)		2-room shack	R3 000 (wife) + R5 000 (husband) Total: R8 000	R1 200–1 300 — mostly on transport between JHB and KZN (16%)
KD1		Community safety patroller	1-room shack owned Rents out 2 other shacks	R2 500 + R700 (rental income) Total: ± R3 200	R450 on transport and petrol (14%)
ZD1	1 adult ZD1 lives alone	Community healthcare worker	1-room shack	R7 500	Walks so does not spend money on transport
ND1	2 adults + 1 child ND1 lives with adult child and grandchild		1-room shack	R5000	R1 700 (34%)
LD1	LD1 no longer lives in Denver, lived with Bongumusa		2-room shack	R7 500	R1 600 (21%)
Westbury					
MW1	2 adults + 4 children (18m, 6, 12, 13) MW1 lives with husband (EW1)	Works at supply chain company	1-bedroom brick cottage	R11 500	R1 400–1 500 (respondent only) (13%)
EW1	2 adults + 4 children (18m, 6, 12, 13) EW1 lives with wife (MW1)			R1 2000	R1 500 (13%)

DW1	2 adults + 2 children DW1 lives with wife (CW1)	Retrenched	2-bedroom house	At least R4 000 but it is not clear where these funds come from	R350 on 1 child's transport (9%)
CW1	2 adults + 2 children (17, 18) CW1 lives with husband (DW1)	Unemployed	2-bedroom house	Some money from retrenchment package and UIF	R350 on 1 child's transport
GW1	4 adults (father, brother and his partner) + 4 children (3 nieces and nephews and 1 child)	Unemployed	3-bedroom house	Unknown to respondent	Unknown to respondent
LW1	5 adults + 4 children "I stay with my three siblings, my two sisters and my one aunt and my four nephews and my grandmother"	Ad hoc employment, studying	3-bedroom house	R6 000	R100 (grandmother's transport costs) (2%)
MW2	2 adults + 3 children (7, 11, 11) MW2 lives with partner and children	Community facilitator? Has an NPO	3-bedroom house	R1 0000	At least R1 000 (10%)
NW1	3 adults + 3 children NW1 lives with mother, friend and 3 nieces	Talent manager	4-bedroom house, renting (on church yard)	–	Unknown — does a lot of walking
VW1	2 adults + 2 children VW1 lives with partner (TW1)	Unemployed (IT)	1-bedroom house	R20 000–R30 000	R2 000 (7–10%)
TW1		Works for some sort of nursing/care agency that is based in UK	1-bedroom house in a complex	–	R2 000
Thembisa					

TT1	2 adults + 7-year-old child TT1 lives with partner (MT1)	Cleaner	4-room house	R4 000 per month combined household income, both are working	R800pm (only respondent) (20%)
MT1	2 adults + daughter MT1 lives with partner (TT1)	Part-time retail worker	4-room house	R7 000–8 000	R700–800 (including cigarettes) (10%)
ZT1	2 adults + a small child ZT1 lives with partner (MT2) (another 6-year-old child lives with other family close by)	Unemployed	A backroom	R6 000+ per month household income (includes a child support grant)	R1 000–R1 200 for both adults (20%)
MT2	2 adults + a small child MT2 lives with partner (ZT1)	Receptionist at an airport hotel	Renting a backroom	–	R1 000–1 300
PT1	4 adults + 3 children (5, 9, 15, 20, 21) PT1 lives with wife (TT2) and children	Self-employed driver transporting people	Own house	At least R3 200	Unclear, possibly R3 000 on petrol
TT2	2 adults + 5 children TT2 lives with husband (PT1)	Was merchandiser at Clover, now retrenched	Own house	3 childcare grants	–
TT3	3 adults + a child (14, 20, 25)	Unemployed	Own house (+ renting out rooms)	–	–
TT4	3 adults + 6-year-old child	Previously employed, now focusing (by choice?) on family business (catering/cooked food +?)	4-room house, respondent has his own outside room (+ another room for rental)	R5 000–R10 000 (varies)	R2 500–R3 500 (R800 for scholar transport for daughter) (35%)

JT1	3 adults + 1 6-year-old child JT1 lives with brother, his partner and daughter	Courier	4-room RDP house	R13 500 + brother's income (unknown)	
OT1	3 adults (adult child, 25) + 1 child (7), 1 grandchild (4) OT1 lives with husband	Cleaner (3 days a week)	Renting 2 and a half rooms in a house	R1 600 + R2 000–3 000 Total: approx. R3 600	
VT1	1 adult + 2 children (12, 18) VT1 lives with children		2-bedroom house	R9 000	R2 600 for the whole family (28%)
JT2	1 adult + 2 children (12, 15) lives with children		Backyard room, renting, unclear if it is a brick structure	R1 900–R2 500	R600 (24%)
MT1	lives with 2 sons and 3 grandchildren (husband lives in Limpopo)		House	R12 000	–
KT1	1 adult + 2 children (13, 15)		Renting a backroom	R12 000	R680 (6%)