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A POSTHUMANIST CRITIQUE OF PRASA'S METRORAIL INFRASTRUCTURE AND ITS CONTRIBUTION TO PERPETUATED INEQUALITIES OF THE MAJORITY, HATFIELD, PRETORIA.

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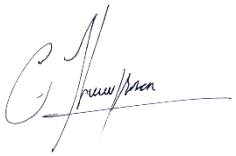
DECLARATION OF ORIGINALITY

I declare that the mini-dissertation, A posthumanist critique of PRASA'S Metrorail infrastructure and its contribution to perpetuated inequalities of the majority, Hatfield, Pretoria, which has been submitted in fulfilment of part of the requirements for the module of DIT 801, at the University of Pretoria, is my own work and has not previously been submitted by me for any degree at the University of Pretoria or any other tertiary institution.

I declare that I obtained the applicable research ethics approval in order to conduct the research that has been described in this dissertation.

I declare that I have observed the ethical standards required in terms of the University of Pretoria's ethic code for researchers and have followed the policy guidelines for responsible research.

Signature: 

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POSTHUMANISM DEFINITIONS

Non-human actors:
For this research topic the non-human actors are the tangible and intangible, living and non-living bodies which have agency over the human user. However, the posthuman critique studies the non-human as an active entity that is equal in importance to the human (Thompson 2019: 23). This equal consideration of the non-human actor challenges anthropocentricism and provides a more critical understanding of the influence of these entities in a context.

More-than- human contexts:
The more than human refers to the social contexts or dimensions where human and non-human agencies intersect and are in entanglement (Panelli, 2010: 82). It refers to a context that is considerate of the multiple perspectives of both human and non-human actors, which challenges anthropocentricism, and understand both human and non-human actors in a broader relational assemblage (Clark, 2023: 21).

Agency:
Agency does not refer to the characteristic of a human or non-human actor, but it is rather understood as an enactment, where the action of the object (the cause) materialises an effect (Barad, 2007: 176 & 214). From this perspective, non-human actors can have agency over humans.

Intra-action:
Intra-action is where multiple bodies, whether human or non-human, are understood by one another through direct interaction, entanglement, or disruption (Barad in Thompson, 2019: 22).

Entanglement:
For the application of the posthuman critique, the word entanglement should be understood as the connection between all existing and becoming entities, referring to both the non-human and human actors (Barad in Thompson, 2019: 24). In this research, entanglement does not refer to the basic intertwining of actors, but rather the mutual and independent relationships between the non-human and human actor arrangements (Barad in Thompson, 2019: 24).

ABSTRACT

This research is contextualised in the post-apartheid urban environment railway infrastructure of PRASA's Metrorail, which has inherited many stations with built forms, structures and operations informed by the apartheid era's spatial planning policies, and practices. Apartheid adapted and applied modernist principles to spatial planning, which created built environments of mono-functionality, rationality, operational efficiency, and racial segregation. This resulted in spaces of austerity which currently limits social justice, economic efficiency, and environmental sustainability. PRASA's Metrorail is currently experiencing infrastructure failure, vandalism, and crime, which has prompted the implementation of station revitalisation strategies as part of their modernisation programme. The modernisation programme aims to also reflect their values of 'safety', 'fairness and integrity', 'teamwork', 'service excellence', 'communication', and 'performance driven'. This research investigates the recently revitalised Rissik Station as a case study for similar passenger railway station typologies, to uncover inherited apartheid rational non-human systems that may persist and perpetuate inequity for its users, through a posthuman critique. Applying the posthumanist critique to Rissik Station helps reveal nuanced interactions between the entangled human and non-human actors (hard and soft infrastructures) to understand and make explicit what is implicit about the station that others the human component.

Keywords:

Apartheid, hard and soft infrastructure, posthumanism, intra-action, inequality, Hatfield, Metrorail, Rissik Station.

1 INTRODUCTION

This project aims to investigate transit and mobility infrastructure from a human and more than human perspective that recognises the identities and systemic networks of non-human and more than human urban actors and components. This process begins with desktop research that unpacks the consequences of apartheid spatial planning policies and practices in relation to transport infrastructure, and how this has contributed to inequalities experienced in apartheid and post-apartheid South Africa. This articulates the strategies of the white-Afrikaaner apartheid government to produce an efficient, rationalised, monofunctional and segregated cityscape, which resulted in demographic categorisation, racial hierarchy and othering translated into infrastructural systems and networks, that are still present in the urban environment and continues to perpetuate inequity. The chosen regional focus for this research is the Hatfield precinct - an institutional and educational precinct that was formerly declared a white-only area during apartheid, which has since seen rapid economic development. Hatfield's current mixed use economic centre is serviced by numerous public transport systems, that transports many outlying poorer users, residing in non-white communities such as Atteridgeville and Mamelodi, to the economic opportunities offered in the Hatfield precinct. The focus is on issues of infrastructural inequality and exclusion - this research investigates passenger railway station infrastructure (built during the pre-apartheid and apartheid era), to understand the implications of its rational and modernist design on its current commuter and informal trader users in this post-apartheid era. This also research analyses the position of PRASA, and their station revitalisation as part of the modernisation programme through Rissik Station, as a case study for other neighbourhood scale Metrorail stations built in the pre-apartheid and apartheid era. The station conditions at Rissik Station are analysed, understood, and interpreted using a posthuman critique of the relationships between humans and their non-human environment (hard and soft infrastructures). This is conducted through preliminary onsite observations, mapping, and interviews, to understand the current operations, functions and activities that occur in and around Rissik Station, a secondary analysis applies the posthuman critique which observes the relationships and interprets the perspectives between the human and non-human actors. The posthumanist critiques of the intra-actions between the station and users, provides a means to understand more critically the limitations and successes of Rissik so that spatial strategies, for urban designers and practitioners, may be identified and incorporated into adapting existing railway infrastructure, so that commuters can be comforted, supported, and provided for in such an environment of economic importance.

2 RESEARCH THEME

2.1 POSTHUMANISM AND ITS RELEVANCE IN HATFIELD'S MOBILITY INFRASTRUCTURE, ACCESS, AND INEQUALITY

2.1.1 SOUTH AFRICA AND INEQUALITY

South Africa, because of its unique historical experiences and evolution through colonial and apartheid movements spanning from the mid-17th to the late 20th century, inherits consequences of strong former urban planning legislation and spatial planning injustices (Berrisford, 2011: 247). Apartheid operated through complex legal structures that progressed white interests to the detriment of the non-white majority (Treffry-Goatley, 2010: 1). The apartheid racial ideology enacted by the ruling white-Afrikaner government, the National Party, constructed racial identification markers that would be used to classify and other non-white racial groups, which assisted in the administration of racial division (Hocoy, 2000: 308). This aimed to maintain and ensure white minority dominance as well as justify the subservience of the non-white majority (Hocoy, 2000: 308). This history has embodied common practices of separate development that has deeply divided many South African societies which has consequently resulted in a lack of national and social identity cohesiveness in this post-apartheid era (Treffry Goatley, 2010: 2). The non-white racial relegation saw the racial relocation of non-white individuals to urban fringes with limited and unequal access to socio-economic activity and amenities (Thompson in Dlamini, Tesfamichael, and Mokhele, 2021: 122). Crankshaw in Ballard, Parker, and Butcher, et al. (2021: 132) add support to this claim by noting that since South Africa ended legal segregation thirty years ago, residential areas that were previously only available to white people have evolved into more racially incorporated areas. Nevertheless, the bulk of neighbourhoods continue to be segregated despite these significant changes to reduce spatial inequality. Research shows that there is still racial and possibly class segregation (Beavon and Christopher in Ballard, Parker, and Butcher, et al., 2021: 132). The black working class continues to be economically deprived form residing in many of the urban areas in which they were previously excluded from due to apartheid's segregation, despite the Group Areas Act having been repealed three decades ago (Ballard, R., Parker, Butcher, et. al., 2021: 132).

The outcome of 46 years of apartheid, is an urban spatial form with a centred economic district (a composite of mono-use infrastructures), separate small areas of privilege, which also separates the low-income residential townships (Nicks, 2003: 180). These low-income residential townships provide little access to goods, services, and work opportunities which forces many users to seek economic opportunity within the central business district (which requires a significant commute in cost, time, and distance) (Nicks, 2003: 180). Or find economic

opportunity within the growing informal settlements occurring in vacant public open spaces, such as buffer strips, floodplains, and marginal land between the low-income residential areas (Nicks, 2003: 180).

Public transport gateways, that threshold these users between low-income residential areas and economic centres, is a topic within contemporary basic infrastructure development which is usually orientated around the efficiency of construction (the project duration and minimising cost) (Nicks, 2003: 181). To provide further design input that exceeds the required provisional needs beyond the alignment and sizing of basic infrastructure is often understood as an unnecessary process that sets expectations and incurs additional maintenance expenses that would surpass the authorities' operational capacity (Nicks, 2003: 181). The product of these development focuses is an urban environment that is stark and inhospitable, which also fails in achieving the third world triple bottom line of social justice, economic efficiency, and environmental sustainability (Nicks, 2003: 182).

Within the context of Pretoria, the suburb of Hatfield (the locational focus for this research) was subjected to the apartheid political powers, and inherited social-spatial outcomes from these past political ideologies of separate development and modernist planning theories. As part of Hatfield´s history, Hatfield had been declared a "white only" area by the Apartheid regime in the 1970s (Motswagae et. al., 2021) In combination these ideologies are what defined the apartheid era and the resulting unequal distribution of urban infrastructure and resources that disadvantages the non-white majority (Dewar, 2017: 27). The effectiveness of territorial settling of non-white racial groups, makes spatial planning reform and land use legislation difficult to overcome in this post-apartheid era (Berrisford, 2011: 248).

2.1.2 WHAT IS POSTHUMANISM?

The critical lens of posthumanism, applied to this research investigation, is a critique implemented to reveal the relational entanglements of social geography (the social factor investigation of people and their environment). It critiques the presumed modes of western human exceptionalism and experience, defenestrates western human primacy, and holistically considers non-human agency within an integrated social habitat of non-human agents (living and non-living) which equally contribute to the assembly of social life (Ozguc and Burridge, 2023: 475). Posthumanism urges human ideological questioning of the invented 'human', an artificially autonomous, knowable, and rational entity, which has violently categorised and subsequently separated humans from an interconnectedness between themselves, the more-than-human, and other knowledge systems (Ozguc and Burridge, 2023: 475). Posthumanism contests the concepts of the human (an identity intertwined with colonialism, sexism, and racism) that historically oppressed anything and anyone that did not classify as a white-adult-male (fully-human) (Theresa, 2021). Perpetuated by colonial knowledge and their definition of human (based on their practice of living), apartheid political powers exercised a western human ideology to racially categorise, separate and other human groups (Ozguc and Burridge, 2023: 475).

The conversion from a homogenous human discourse to a study of heterogeneity of entangled actors within a social geography paradigm, the terms non-human and more-than-human are used to broadly refer to actants of the social fabric that are not human – both living and non-living agents. The non-human entity framed in this research investigation are the interacting non-living agents, objects, artifacts, or structures in network with human actors (Zuidema, 2008: 97). These agents support, host, accommodate, promote, or constrain human actions as well as incite ethical socio-political values and commitments and conform users into prescribed programmes (Zuidema, 2008: 97 and Forlano, 2017: 21).

Therefore, an epistemology of Posthumanism is exercised to depart from anthropocentric dominance and overcome the established anthropocentric relational boundaries. This is done by fracturing foundational assumptions within modern western culture from which studies and inquiry removed, classified, and understood all things in isolation and separate from the human i.e., the autonomous agent (Bolter, 2016: 1). Posthumanism foregrounds a relational assemblage through which all human and nonhuman actors are entangled, and it reflects a rich interconnectedness between humans and more-than-human contexts (Clark, 2022: 1). This lens reorientates and re-understands the human subject, their intra-relationships within the environment (Bolter, 2016: 1), and recognises past injustices and the marginalised voices. For this research, posthumanism will be used as a critical lens to uncover underrepresentation and contribute to the social justice discourse of Hatfield's mobility infrastructure. Post humanism is introduced as a counterpoint to the dominance of human imposed systems and boundaries. By understanding human and non-human entanglements the research hopes to fracture and transform foundational assumptions established by modern western practices of classification and separation.

2.1.3 RESEARCH AIMS

Therefore, this project aims to understand issues of urban inequality by studying patterns of hard and soft infrastructure interactions in the context of urban spaces adjoining public transport gateways in Hatfield, Tshwane. The exploration of socio-spatial perspectives in reading infrastructural interactions has the ambition to develop new insights and approaches to reduce urban inequalities.

2.1.4 RESEARCH QUESTIONS

In the context of the public transport infrastructure of Hatfield, Tshwane:

- What are the patterns of hard and soft infrastructure interactions?
- What can these relationships tell us about issues of urban inequality?
- How can architects and urban designers use this understanding to develop new transformative approaches to urban segregation?

Sub-question 1: How do we more clearly define and distinguish between hard and soft transport infrastructure networks?
Sub-question 2: What characteristics of urban inequalities does the study of the hard and soft infrastructural relationships reveal?
Sub-question 3: How can a socio-spatial understanding of hard and soft infrastructure interfaces facilitate transformative approaches to urban infrastructure development?

In the context of a posthuman critique of railway station infrastructure:

- What can a posthumanist critique of the station reveal in the transformation of existing (refurbished) rail infrastructure servicing former white regions towards social equity and justice?

3 BACKGROUND

3.1 HARD AND SOFT INFRASTRUCTURES

Cities comprise of dynamic interplays between hard and soft infrastructures that ultimately affects the functional resilience or enforces the current dysfunctional perpetuation of the city form on its inhabitants, and it is the interconnectedness, between hard and soft infrastructure, that determines socio-economic community sustainability (Pagano et al., 2017: 1). Hard infrastructure manifest as the entrenched and entwined functional and physical systems and networks that operates through the softer human and non-human interfaces and networks to provide for the city, the necessary goods, or services and should ensure the untroubled functioning of the urban context (Skorobogatova, and Kuzmina-Merlino, 2017: 321 and Devenish et al. 2022: 4). Soft infrastructures are the socio-spatial urban patterns of relations that exist in and around hard infrastructure and interfaces and facilitates interactions between the hard components of the built urban fabric (Pagano et al., 2017: 1 and Devenish et al. 2021: 4). Soft infrastructures are used to assess (qualitative data), and measure (quantitative data) to understand the consequences of hard infrastructural failure, dysfunction, as well as its effectiveness (Pagano et al., 2017: 1). Hatfield's urban public transport infrastructure network is delimited to Rissik Station for this mini-dissertation investigation. Social norms, policies, customs, laws, politics, power structures, culture, governance, city inhabitant relationships and schedules are the examined soft infrastructures of influence that has articulated the development, governed investment, and regulated the functioning of infrastructural assets and their users.

In this study the hard infrastructure term will only refer to the railway station under analysis and its facilitator role (which is supported by infrastructural assets or components of the system), because of which, hard infrastructure will be referred to in singular form for this research. Whereas soft infrastructures, which relates most to and delimits the post-human investigation, will be referred to pluralistically, as it comprises of many unique systems and diverse more than human actors and influences, that holistically permeates, integrates, and regulates the user interaction and exchange in their non-human hard infrastructure context.

The apartheid era comprised of infrastructural systems that systematically limited or delimited mobility to accommodate the white minority, and control the displaced non-white majority, through restricted access of entering and exiting the city (by means of infrastructural fortification, curfew, access permits/documentation, economic opportunity discrimination and statutory requirements) (Pillay, 2002: 1). These rational systems and material actors of the apartheid government came into fruition through monitoring, mapping, organising, and documenting the urban landscape, to strategically restrict the free circulation of persons occupying certain areas (Pillay, 2002: 2). The intention was to contain and prevent the free and open social exchange between non-white and white racial groups, that could corrupt, contaminate, transgress and miscegenate the position of white power (Pillay, 2002: 2). This urban control on mobility is an extension of the western humanism (associated with enlightenment and modernity) that through rational and efficient systems constructed, maintained and othered non-white racial groups through rubrics of ethnic and racial identity classification (Pillay, 2002: 3). By 1918 railway systems of South Africa had formalised segregation between non-white and white passengers (Pirie, 1992: 671). During the 1960's, due to rapid urbanisation of non-white urban inhabitants in white privileged areas (of which obtained the necessary company permits to legally find residency) the apartheid government exercised mass expulsion to combat the rapid urbanisation process of non-white urban inhabitants (who were deemed superfluous to the white communities' needs) to peripheral 'homeland' areas, with limited housing and service provision to enforce separate development and to deflect the non-white national political and economic aspirations (Turok, 1994: 246). Othering also occurred through parsimonious investment, on already low service,

infrastructure, housing, and education provision, because of western human employer views of non-white labourers as cheap and expendable commodities, with little interest in their personal development (Turok, 1994: 246).

When it comes to urban planning, South Africa's local governments have a history of delivering top-down civil engineering services under meticulous administrative oversight (Turok 1994: 247). Due to institutional disintegration, centralized delivery of physical services, and a regulatory mentality, local governments are unable to prepare for and manage the full expansion of their local communities (Turok, 1994:247). The top-down approach in development and planning also resulted in a perception of bureaucratic, inward-looking policies at the time rather than those that responded to community members. Little thought was given to collaborating with other public, private, or community organizations to further liberal and common goals of holistic city betterment (Turok, 1994: 247).

Apartheid's overarching goal was physical racial segregation. On-site observations, however, suggest that Rissik station continues to adopt a few of these urban planning concepts decades after the apartheid era ended. At all levels of the basic planning process, a blueprint technique was used. It began with a clearly stated predetermined result and involved tirelessly pursuing it with as little third-party involvement as possible (Turok, 1994: 249).

The time, funds, discomfort, and unpredictability of long commutes will undoubtedly have an impact on the overall economy, as will worker tardiness and absenteeism rates (Turok, 1994: 251). Social discrepancies have been made worse by racial segregation. The poor, who often seek accommodation close to work areas, pay higher commute costs and are more susceptible to unemployment because of being far from jobs. The economic potential of black informal companies is likewise constrained to low-wage local markets, or informal trading, because of the townships' marginalization (Turok, 1994: 251). The outcome of the Rissik station is a top-down, inherited structure created by engineers without much thought for future development, community involvement, the concrete elements of rail stations are typically the same and consist of controlled entrance points, ticket booths, manager's offices, and platform areas (Tanzarella, T. 2012). Due to its proximity and convenience, Rissik station is analysed; just as PRASA has many stations that are identical to Rissik, therefore Rissik ends up serving as a case study for numerous small Metrorail station alterations.

To bring about interventions in the Rissik station case study, this research applies a posthumanist critique to the data analysis to clarify to make explicit what is implicit what is already understood about lived experiences at Rissik Station (Critchley in Welsh, et al., 2019: 780). Because of this, the research uses a posthumanist critique to help understand the significance of the data and move it into a discussion about how the position of authority is shared and maintained through seemingly routine, everyday activities that were previously deemed to be representational rather than active.

3.2 METRORAIL HARD AND SOFT INFRASTRUCTURE INTERACTIONS

3.2.1 METRORAIL DURING APARTHEID

Hatfield's railway system of hard and soft railway infrastructure interactions, during the apartheid era was a transparent and critical force, manipulated to effect, shape, and control the apartheid government's segregated suburbs (Mmadi, 2018: 137). Mass railway infrastructure provision served to sustain an imposed apartheid ideology of non-white and white racial residential separation and restricted integration, as well as ensuring an apartheid economy feasibility, as it provided a viable means, for non-white racial groups, to commute to their place of occupation within designated white urbanity (Pirie in Mmadi, 2018: 137). As a result, railway commutes became essential to the non-white population's work life sustainability. The monofunctional rigidity of railway infrastructure in Hatfield and its integrated systems, serviced and connected to the peripheral townships of Mamelodi and Atteridgeville (Mmadi, 2018: 137). This primary transport node and its abidance to established time schedules (that control and regulate departure and arrivals) created a platform for community and worker convergence at certain times and locations (Mmadi, 2018: 137). In the periods of waiting, railway infrastructure inadvertently hosted social exchanges of workplace and community concerns, that instils neighbourly identity and comradery, which is also evident today (Mmadi, 2018: 137).

3.2.2 METRORAIL ECONOMIC CONTEXT (PUBLIC TRANSPORT INVESTMENT)

Contemporary segregation is perpetuated by Spatial Development Initiative investment decisions made by government. These are investment assumptions, that have exaggerated urban area development, and underdevelopment of surrounding areas. These development strategies have elevated urbanisation and urban sprawl as more users fall below the poverty line and move closer to city centres for economic opportunity (Westaway in Mavundla, 2020: 1). Railway infrastructure has provided a large throughput capacity, that is a cost-effective resource to access economic opportunities situated within metropolitan areas (Westaway in Mavundla, 2020: 2). Railway infrastructure is a necessary contributor that should be used to achieve economic growth and social development to uplift and serve the disadvantaged majority (Westaway in Mavundla, 2020: 2). However, since the 1986 De Villiers Report on Strategic Planning, Management Practices and Systems and the

subsequent implementation of the Transport Deregulation act in 1988 (both limited the investments into the sub-sectors of railway operations and curtailed fiscal expenditure), Metrorail stations saw an unchanging reduction of commuter densities, resulting in train set loss, outdated or defunct technology, maintenance complications, operational incompetence, a lack of skills development as well as safety and security disquiet (Department of Transport in van Rensburg, 2021: ii). This prolonged dilapidation has drastically reduced the Metrorail's convenience and its usage (van Rensburg, 2021: ii).

Currently, PRASA's modernisation of the Metrorail, which is structured according to the Medium-Term Expenditure Framework Corporate Plan, addresses diverse key programmes aimed to revitalise the public passenger railway service following its implementation (PRASA in van Rensburg, 2021: ii). PRASA's investment in the railway system pursues station modernisation as well as acquiring new rolling stock, which is geared to recover and sustainably reinvigorate the passenger rail transport system that has experienced decades of neglect through diminished expenditure, a lack of railway maintenance and former road-favoured based transport policy structures (PRASA in van Rensburg, 2021: ii). In Mavundla (2020: 2), McCarthy highlights the need to achieve transport efficiency to improve the economic potential of an area significantly and strategically. Transport offers a highly effective strategy that mobilises both people and resources, that ramifies economic responsiveness to these potential opportunities of a country. This transport economy interconnection expresses the PRASA's necessity to attain a successful and critical delivery of their projects to improve organisational operations to contribute to the economic development of an area (McCarthy in Mavundla, 2020: 2). Mavundla (2020: 2) postulates a passenger rail environment as a judicious mechanism for improving the operational performance, that in the process, will minimise, ameliorate congestion, improve infrastructural functional and operational reliability, cater for PRASA's anticipated growth in rail passenger demand, as well as increase the organisations capability to generate revenue. This will help reorientate transport focuses and set trends to secure railways as a cornerstone of public transport for its own self-sufficiency and sustainability (Mavundla, 2020: 2), as well as offering significant economic opportunity and upliftment.

3.3 THE POSTHUMAN ANALYSIS REQUIREMENT

This mini dissertation recognises, frames, and compares apartheid policies, segregated spatial planning and its public transport investments (that resulted in railway transport infrastructure division) to PRASA's Metrorail modernisation project of the Pienaarspoort-Pretoria stations that operate within the suburb of investigation (Hatfield). The research uncovers the skewed government public transport investment of the railway line and its operations, and how these investments still perpetuate apartheid injustices of economic inequality. The paper further explores transport economic potentials to network with periphery areas of Rissik Stations to, densify economic opportunities in and around these stations, and satisfy the current commuter and adapt to future commuter needs and habits to facilitate socio-economic transformation, recovery, and equity.

Contextual consequences of apartheid decisions (made by leaders of apartheid government – the white heterosexual male ideology) are perpetuated by current government development of the Metrorail. The post humanist lens is applied as a critical framework to analyse and reflect on the contemporary Metrorail developments, and its informed implicit biases routed in apartheid injustice, that continue to disadvantage individuals economically. The post humanist lens will examine the intra-relationships, network exchanges/interfaces and intra-actions of human and non-human actors to achieve an interconnected ecology of a socially just more-than-human context.

Rose and Walton, (2015: 1) contextualises posthumanism:

> Contexts, tools, and other nonhuman factors are central to the practice and scholarship of technical communication, particularly communication design. But viewed through the lens of posthumanism, these considerations shift from factors to actors: the hierarchy between humans and nonhumans flattens, and the agency of nonhuman actors and assemblages of actors can be explicitly recognized and accounted for. Planning for the agentive capacities of human and nonhuman actors is a strategy with promise for work in social justice.

4 PROBLEM STATEMENT

As stated in the research theme of this dissertation, South Africa inherited strict spatial planning laws and urban planning inequalities as a result of its distinct historical events and evolution due to colonial and apartheid movements (Berrisford, 2011: 247). In non-white racial communities, territorial settling has had a similar impact on spatial inequality in settlement patterns, neighbourhood segregation, giving priority to the property and economic interests of white minorities, and allowing the relocation of black urban residents to remote areas outside of urban boundaries (Strauss 2019). Territorial settling in the aforementioned instance has made land use regulation and reform in the years following apartheid challenging to put into effect (Berrisford, 2011: 248). Following apartheid there has been limited holistic improvement that aligns infrastructural development, the urban space economy and capital investment with spatial planning. However, the Development Facilitation Act of 1995

No. 67 (60) states that this Act's principles are centred on the physical and social-economic integration of cities. These principles are implemented to identify informal settlements in spatial planning procedures, but they aren't applied thoroughly enough by spatial practitioners (urban planners, town planners and architects, who are employed by the state or private investors), which results in little advancement and a persistent exclusion of the informal sector from official spatial planning processes (Du Plessis, 2014: 69,85). Post-apartheid spatial practice efficacy is questioned, as deficient empirical evidence is available to assess the implementation and influence of spatial practices.

Through planning efforts geared towards desegregating the apartheid city, these practices seek to address the inappropriate placement of low-income communities as well as the unequal access to physical, economic, social, and spatial urban network opportunities. To address the aforementioned inadequacies, the urban development policy framework and supporting implementation procedures have undergone significant adjustments since the inception of the democratic period in 1994(Du Plessis, 2014: 70). The most apparent of them is the establishment of an Integrated Development Planning (IDP) system backed by a variety of sector-specific strategies and in particular the Spatial Development Frameworks (SDF) as a framework for providing spatial representation to governments' developmental vision and priorities. The SDF concept effectively replaced standard guide plans and framework plans, which were long considered a crucial part of the strategic planning strategy and the primary instrument for determining the spatial distribution of the growth of South African municipalities (Du Plessis, 2014: 70). However, the infrastructural divisions are deeply entrenched within the urban city fabric resulting in the perpetuation of legislation and policies from the apartheid era (Drakakis-Smith et al. in Du Plessis, 2014: 70). For instance, an emphasis of commuter workers as the victims of service delivery protests would not necessarily indicate that workers are not involved in such actions. This merely serves to highlight how frequently employees suffer from prolonged closures and disruptions owing to a loss of employment or income and unwittingly broadens the scope of township instability beyond its spatial setting. As a result, this calls into question not only the uncertain state of society and the employment market but also the changes associated with spatial planning during the apartheid era. Black labourers still have to go far and pay a lot of money to work in South Africa 25 years after the country's democracy was established. As a result, there is now a sort of poverty that is interrelated, whereby the weak state of society reproduces the unpredictability of the labour markets and vice versa. The commuting worker is nonetheless disadvantaged by the problem (Mmadi, 2020:10). It is speculated that the above contributes to South Africa being declared by the World Bank as one of the most unequal regions in the world (World Bank, 2022: 1).

4.1 THE GENERAL ISSUE (MACRO SCALE)

Nationwide, post-apartheid cities of South Africa resemble dysfunctional structures with persisting inequality and spatial deficiency (Donaldson and Van der Merwe in Donaldson, 2006: 344). Even though there has been a substantial spatial transformation since 1994, class-based spatial inequalities persist for decades following the apartheid era. This is true even if the core aims of cities much like Johannesburg's structural and urban development have evolved to include societal values like inclusion, spatial justice, and fair access to resources (Hofer, et. al. 2021). However, despite the government's adoption of several regulations, research shows that even current urban development initiatives fall short of meeting those goals. By separating areas of housing for white and non-white residents, South Africa's laws historically influenced urban planning patterns. According to (Kracker, et.al. 2010 and Watson. 2018 in Hofer et, al. 2021) the non-white population primarily resided in outlying townships in undesirable and overlooked areas on the outside of the city. In post-apartheid, Johannesburg along with other South African municipalities, this spatial segregation is still present. Dysfunctions begin to display themselves, such as a lack of public upkeep of infrastructure and problems with inclusion and spatial justice in the largely private housing and service industries. On a policy and project level, focusing only on a "ticking the boxes" attitude does not result in inclusive, equitable communities and urban spatial patterns; rather, it perpetuates historical geographical inequities (Hofer et.al. 2021). Characterised by radical contexts of systemised fragmentation, low-density urban sprawl, and marginalisation (of the non-white population) that was determined by systems of power and racial privilege during the apartheid era (Donaldson and Van der Merwe in Donaldson, 2006: 344). The effectiveness of the apartheid spatial-planning imposed decades of regulated and restricted access to accommodation, leisure, employment, and transport – which engendered long-distance work-travel commute patterns for the disadvantaged majority (Donaldson and Van der Merwe in Donaldson, 2006: 344). The urban spatial planning, of apartheid such as the freeway system is a product of adopting modern practices to achieve modern transport efficiency (reducing time) these practices have continued as the urban machine has continued its operation into the post-apartheid city transport systems, which comprises of car orientated infrastructure (in more developed areas) that expresses a fabric that is more accessible to users of car-based transport (Donaldson and Van der Merwe in Donaldson, 2006: 344). This perpetuates inequality, because the distribution and access to services, infrastructure and economic opportunity sets an almost compulsory requirement for user to travel by automobile, which disadvantages commuters from poorer periphery areas that commute through “semi-managed” systems of transport, such as passenger railway transport (Donaldson and Van der Merwe in Donaldson, 2006: 344). Moreover, development emphasis on hard infrastructure for private vehicles that emerged in white-areas utilised transport that was unaffordable to non-white poor majority (Czeglédy, 2004: 68). Many commuters, from poorer contexts rely on rail transport, as the cheapest means to access more developed regions (Czeglédy, 2004: 69). It becomes necessary to recognise apartheid-era white area investment and development priorities, and to rather invest in the critical role of

infrastructure to address the tensions perpetuated by fragmented spatial planning and its unequal access to social and economic opportunities (du Plessis, 2014: 70 and 79).

4.2 THE URBAN ISSUE (MESO SCALE)

The trends highlighted by Van Rensburg (2021) shows a comparable similarity to the public investments in Hatfield which generates urban development that enables a context of changing economic opportunity. In the City, Hatfield is a major location for industry employment and needs to be revitalized. There will undoubtedly be new opportunities because of the region's rapid growth and future development, in addition to new obstacles (University of Pretoria, 2020). If viewed alongside the rest of the city, Hatfield has a significant concentration of office and retail space, making it a metropolitan node (University of Pretoria, 2020). However, the property sector has suffered recently, particularly in the office market, where the current office vacancy rate is 16.2% (University of Pretoria, 2020). Although the area's younger, primarily student, population adds vibrancy and variety that is uncommon in many other parts of the city, the area has suffered socioeconomically because of a lack of leisure spending and the brief stay of students (University of Pretoria, 2020). For people, who do not reside or 'belong' to this context, they are disjointed from this economic evolution, which further removes their means to control and contribute to this urban economic process, limiting their right to the city which further perpetuates systems of inequality. According to Hatfield´s precinct plan the population tends to be younger and is racially and ethnically diverse. Most Hatfield's people are young, economically inactive, and unemployed (University of Pretoria. 2021). The Pienaarspoort-Pretoria railway serves as a critical mediator and backbone between the two contexts and should therefore not only limit the amplitude of economic disparity, but aid in reconciliation and economic benefit of the disadvantaged majority. Similarly, PRASA's most recent corporate plan (MTEF, 2021) emphasizes specific station possibilities for investment for the economic improvement of neighbouring communities, bridging separations in areas affordably, fostering safety and reliability to ensure that all South Africans have access to formerly inaccessible sources of income, social spaces, and services (MTEF 2021: 8 The Hatfield metro-rail stations, nevertheless, do not show any signs of these station investments or economic development.. As a result, these stations remain mono-functional and dysfunctional in processes to remedy social inequity. The Hatfield Metrorail provides passenger rail services along the Pienaarspoort-Pretoria railway line at the stations Loftus Versfeld Park, Rissik, and Hartebeesspruit (le Rou, 2009: 11). According to the Metropolitan Core Urban Development Framework, Hatfield is meant to develop into a thriving, safe, mixed-use, reliable urban area that restores investor credibility, by promoting the development of an appealing, captivating network of interconnected activities and public spaces that strengthen the pedestrian and public transportation conditions (le Roux, 2009: 11). If Hatfield is to increase its sense of community and to retain a sense of place to address previous spatial planning injustices, economic opportunities must encompass and develop into a space that is accessible for all people to reside, come together, work, visit, stroll, and be captivated in (Le Roux, 2009:16). South Africa has highlighted economic and social transformation through several policy statements and investments in the infrastructure of public transportation since the country's democratisation in 1994. These investments specifically aim to lower inequality, unemployment, and destitution (Gumede in Ndwandwe, 2020: 988).

However, Cilliers and Camp (in Ndwandwe 2020: 988) point out that the South African government still develops policy tools that sound good on record, but practical contributions success is limited due to a lack of investment and funding. This helps to explain why problems like poverty, unemployment, and disparity continue to exist (Ndwandwe, 2020: 988). The municipal Regional Spatial Development Frameworks, which place more emphasis on densification, do not emphasize the creation of activity hubs at important junctions along densification corridors, which will promote the growth of small businesses and job creation. As more people are compelled to live in subpar circumstances in places with little improvement in business operations and few opportunities for prospective entrepreneurs - poverty, unemployment, and inequality will continue to grow (Ndwandwe, 2020: 990).

4.3 THE HATFIELD TRANSPORT INFRASTRUCTURAL ISSUE (MICRO SCALE)

Hatfield's Rissik Metrorail Station, built in the 1940s, offers great economic opportunity, the station's vendors have fostered social engagement beyond the station's gates and fences, but neither infrastructure nor development is supporting these activities, the activities surrounding this area seem to go unnoticed, marginalized, and unaddressed (Van der Wath, 2009: 22). The array of events and activities taking place outside the station is not supported by the infrastructure and development and thus remains unnoticed and undervalued (Van der Wath, 2009: 22). The only building with an open street frontage along Festival Street, near the station, is the cafe; all other buildings are surrounded by barriers and are fenced off. Further investigation reveals that the station and Moja Gabedi, a nearby old city landfill that the University of Pretoria turned into a lovely garden with flowing streams, produce, plants, and free therapy on-site, are both fenced off (University of Pretoria, 2021). The railway line intervention is an exposed railway infrastructure, that transects the Hatfield precinct, physically informing its current urban form. Its lack of modernisation, responsiveness, intra-action, and economic networking (beyond the physical infrastructure), the station becomes uninviting (le Roux, 2008: 32). The barriers surrounding the University of Pretoria Hatfield campus and Rissik Station support the idea that the location exemplifies spatial governance which regulates commuter access, as well as limiting the built urban fabric interfaces and exchange and networking economic opportunities along the walkway routes from station to commuter destinations (le Roux, 2008: 32). Many people view the railway system as unsafe and unreliable, there are well-known issues with the

security officers at the PRASA Metrorail, because of PRASA/Metrorail's failure to prioritize commuter safety, their service falls short of meeting their obligations to ensure passengers' safety (Saferspaces, 2018). To plan, build, and control an effective and integrated transport system for the Gauteng province for the ensuing 25 years, the Gauteng 25-Year Integrated Transport Master Plan (GITMP25) was created. According to the GITMP25's vision statement, by the year 2025, Gauteng will have a built and cost-effective transportation network that supports sustainable growth in the economy, skills development, and employment opportunities, promotes quality of life, economically includes all communities, and preserves the environment (Gauteng Province - Roads and Transport, 2013 in Laabmayr, 2019: 1).The Gauteng Metrorail caters to a target market of commuters who cannot afford private transportation or more dependable public transportation options. However, the Metrorail service's quality has declined, and it is now noted for being unpredictable with frequent service disruptions and cancellations (Laabmayr, 2019:1). In response to declining operational performance, the loss of passenger support, and declining revenues, PRASA's Medium-term Expenditure Framework aims to address PRASA's plan on working toward retaining and recovering customers while gaining new business (PRASA, 2021: 15). However, little capital investments are being made in the system - though on-site observations of the recently renovated Rissik and Hartebeesspruit stations, it is evident that little to no further modernisation as per PRASA´s MTEF has occurred, other than infrastructural and railway asset upgrades. The University of Pretoria's new entrances on campus, the Gautrain, University Road resurfacing, and Bunting Road are just a few examples of missed opportunities in terms of infrastructure upgrades that might connect to and more seamlessly integrate access to railway station infrastructure. This can be attributed to the siloed planning processes and development strategies that are used to control and govern infrastructure development projects, which are planned separately.

5 THE LITERATURE REVIEW

5.1 PRASA'S METRORAIL AND INFRASTRUCTURE

5.1.1 THE IMPORTANCE OF PRASA'S METRORAIL

Research done to date on PRASA's Metrorail in Hatfield acknowledges the importance of this infrastructure as an affordable option that services poorer user groups and outlying disadvantaged communities, transporting them to economic opportunities found in city centres. Laabmayr (2019: iii) highlights the geographic reaches of the PRASA Metrorail which services the peripheral areas of non-white communities displaced during apartheid, this is made more pertinent by Makaepea (2017: 26) who states that the majority of the daily 2.2 million people, that utilise the Metrorail services, do so to access education and their place of work. Geldenhuys (2020: 22) quotes the ANC 2019 manifesto, which recognises the importance of railway services in South Africa, stating that railway services should be the backbone of the country's public transport system, and that it should be safe, reliable, and integrated with alternative public transport modes.

5.1.2 PRASA'S METRORAIL INTENTIONS, VISIONS AND POTENTIAL

PRASA's conception in 2009, was a government decision which replaced the South African Rail Commuter Corporation (SARRC), to improve rail transport accessibility by provisioning integrated rail passenger services, such as the Shosholoza Meyl long distance rail commutes, as well as the Autopax bus feeder systems that services the rail commutes (PRASA in Chikagwa, 2014: 51). The PRASA head of stations and facilities development stated that PRASA was a government agenda that aimed to transform the passenger railway into a vibrant and efficiently run public transport system across South Africa (Ayandibu, 2010: 55). According to the most recent Passenger Rail Agency of South Africa's Integrated Annual Report for the year 2021-2022 (2022: 4), PRASA's mission is to provide an environment and commuter rail service that is safe, consistent, affordable, predictable and of quality which is supported by core values of 'safety', 'fairness and integrity', 'teamwork', 'service excellence', 'communication', and 'performance driven'. These values were elaborated as follows:

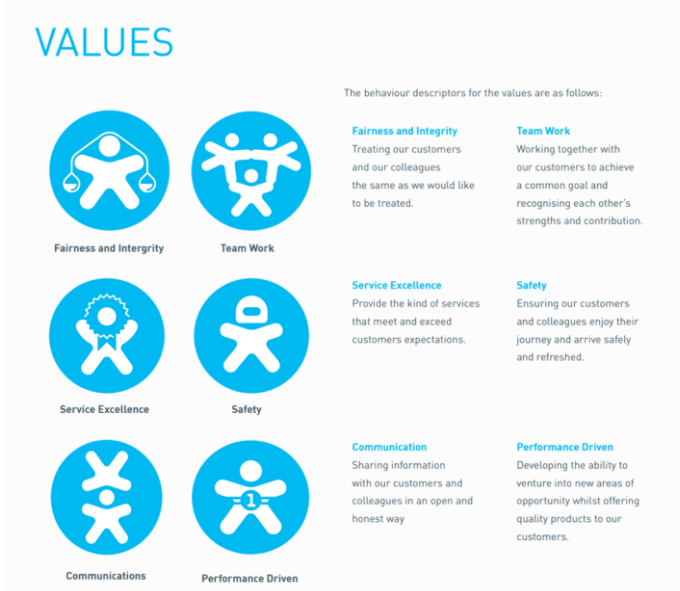

Figure 1: An image of PRASA's values captured from the Integrated Annual Report 2021/2022 (PRASA, 2022: 5).

However, literature covered in the background section (see page 2) highlights many PRASA railway station environments and infrastructure which were subjected to former governmental policies of the apartheid era where much of the infrastructural, spatial designs and operating practices were influenced and aligned to the political values of the time. PRASA has since inherited these railway stations and its infrastructure which are in contrast with PRASA values. In particular, values of 'fairness and integrity', 'teamwork', 'safety' and 'performance driven'.

PRASA is busy undergoing a 20-year modernisation programme, for which R2.2 billion has been allocated for the 2015 MTEF cycle (Medium Term Expenditure Framework) where it aims to upgrade and maintain its railway stations, and the railway infrastructure (which includes upgrading signalling systems, and fleet renewal) to improve the overall customer experience and add value to the service offered by PRASA (PRASA, n.d.). Such improvements aim to reduce issues of vandalism, crime, and destruction of infrastructure which have continued to worsen the conditions of these railway stations, particularly in Gauteng (PRASA, 2022: 53 and 76). However, the Passenger Rail Agency of South Africa's Integrated Annual Report for the year 2021-2022 states that there are no targets set for the next three to five years for the station modernisation programme, however an analysis of identified functional station features will indicate which station will be completed under which station modernisation programme (National Station Upgrade Programme (NSUP) or National Station Improvement Programme (NSIP)) (PRASA, 2022: 52). In addition, PRASA is re-evaluating the modernisation programme by

reflecting on work that has been accomplished since its commencement, by looking at the modernisation relevance and cost, as well as identifying the market conditions in which these stations are situated (PRASA, 2022: 52). PRASA's modernisation programme has prioritised 135 of their 468 stations, for modernisation for their high commuter volume as well as the stations' potential to increase business revenue (PRASA, n.d.). PRASA has been assigned a capital budget of R12.6 billion for the 2022/2023 financial year of which 5% (R0.6 billion) has been allocated to PRASA CRES (Corporate Real Estate Solutions) for the commuter station revitalisation programme to improve the station workplace, and revenue generating facilities (PRASA, 2022: 56). Among the selected 135 stations that are currently being revitalised are stations located along the Pienaarspoort-Pretoria corridor (PRASA, 2023: 48). To PRASA the revitalisation and modernisation of the selected Metrorail station environments, will serve as an economic enabler to the communities it services. To achieve this PRASA has implemented objectives known as pillars (PRASA, 2023: 228). These pillars are articulated as follows:

Pillar 1 – Rebuilding corridors for consistent good services with passenger at centre.

Pillar 2 – Modernisation of infrastructure, rolling stock and stations.

Pillar 3 – Enhancing Operational and Workplace Safety and Security covering assets and people.

Pillar 4 – Pursue financial gains through revenue enhancements and costing improvements.

Pillar 5 – Excellence in performance across all areas of the business with focus on enabling Operations.

Pillar 6 – People priorities addressing employees and stakeholders.

Pillar 7 – Enable transition to a digitally enabled organisation.

Figure 2: A screenshot of PRASA's modernisation objectives taken from the PRASA Integrated Annual Report for 2021/2022 (PRASA, 2022: 228).

According to PRASA, transportation is important for the economy, its environment, the transformation of space, global interaction, state capability, social cohesiveness, and health (Maboa, 2017:47). The PRASA Corporate Plan states that for public transportation to be successful it needs to be reliable, reasonably priced, and have operating corridors connecting the various modes of transportation (PRASA in Maboa, 2017:47). Investing in infrastructure is essential for any country's development because it offers advantages such as strengthening production and economic growth; lowering transactional and trade costs and encouraging competitiveness; creating job opportunities; and it offers infrastructure, both physical and social, to the less fortunate citizens (Chiloane in Maboa,2019:47). Effective public spending on infrastructure and human resources has the potential to foster economic growth and attracting private investment (Luiz in Maboa, 2017:47). Rail infrastructure can be thought of as economic infrastructure because it not only exists for purposes of its own but also supports different types of economic activities (Perkins et al. in Maboa,2019:47). As stated by PRASA, they intend to put into action programs for development that addresses South Africa's three problems of inequalities, poverty, and unemployment (PRASA, 2016 in Maboa,2019:47).

5.1.3 CURRENT SHORTCOMMINGS OF PRASA'S METRORAIL INFRASTRUCTURE

The primary issues confronting rail transport are rail infrastructure deterioration, rail infrastructure being shared between Transnet and PRASA, outdated rail infrastructure design, and financial limitations (PRASA in Chikagwa, 2014: 51). According to PRASA, the following factors affect how well rail operations perform - the age and state of the infrastructure; the accessibility and availability of aging rolling stock infrastructure; the lack of sufficient locomotive resources; a rise in passenger disturbances brought on by subpar services; the influence of the upgraded system while attempting to maintain the current system; Main Line Passenger Service (MLPS) as well as cross-subsidization with the effects of external concerns including criminal activity; disputes over service delivery; and informal settlements along the rail route (Maboa, 2019: 38). In big cities, it can be difficult to manage public transportation, especially commuter rail, to satisfy customer expectations. In a study done by Mageto and Luke (2019: 1) employee opinions of service quality on Gautrain and Metrorail were found to differ significantly. Employee views on service quality and ISQ were found to be positively correlated. Even though Metrorail provides a heavily subsidized service, it still needs help to meet customers' expectations. As a result, it should concentrate on ISQ to raise the level of service it provides generally (Mageto and Luke, 2019:1).

5.2 STUDYING INFRASTRUCTURE OF INEQUALITY

After unpacking literature in the background section (see page 2) which discusses the persisting issues of infrastructure inequality found within and around PRASA's railway stations, as well as addressing PRASA's modernisation programme focusses and intentions alongside their visions and values (page 8), an apparent disconnect appears between the objectives for station modernisation, PRASA's values and addressing the monofunctional, rational and austere station environments, which continues to other its non-white lower income or disadvantaged user groups. This study aims to investigate the hard and soft infrastructure characteristics

within Rissik Railway station, to understand how these engineered environments still perpetuate urban inequality to know what measures can be taken to achieve a social justice.

5.2.1 UNDERSTANDING URBAN INFRASTRUCTURE INEQUALITY

Pandey et. al. (2022: 1) states that there is no clear understanding of unequal infrastructures because of their many and varying spatial structures that act and have an effect across multiple scales. For this research investigation into infrastructures of inequality within transport gateways - unequal or socially unjust infrastructure needs to be defined so that it can be easily and readily identified on site for the data collection and the subsequent analysis. Pandey et. al. (2022: 2) in their investigation defines infrastructure of inequality as the extent at which the condition of physical infrastructure varies across metrics of availability, provisioning, and access across a geographical space. Urban infrastructure inequalities are also sites of conflict and controversy, because of their spatial structure, presence, or function. To fulfil their infrastructural needs, urban users moderate and mediate to use and instil meaning in these environments of conflict and controversy (Rubin, 2020: 164). Rubin also frames infrastructure inequality as a dialectical relationship or occurrence that manifests between the materiality of the services, tactics, practices, social conditions, and network provisions in context which actions questions of accessibility, quality, and provision of infrastructure (2020: 164). These considerations help determine the quality and lived experiences of frequent commuters and urban inhabitants. Rubin (2020: 163) further interprets infrastructure, beyond the tangible components of pipes, railway lines, and roads that link areas, communities, and provide basic services, as diverse networks (that are inclusive to people, places, practices, processes, systems, and policies) that act and have effect on each other. In addition, infrastructures are understood and influenced through historical forces as well as contemporary urban actors of market, state, political provision, interests, legal frames, and legislation (Easterling in Rubin, 2020: 163). These influences that inform urban infrastructure characteristics and operations, and vice versa suggests that the interrelated effects between urban infrastructure, history, and urban actors should therefore be understood and studied in their nature of entanglement. The research conducted by Pandey et. al. (2022: 2) into infrastructure inequalities relating to urbanisation can be adapted to investigate PRASA's Rissik Station. By applying this specific infrastructural investigation, focus will help advance and clarify the vagueness around infrastructural inequalities. This helps articulate the implications of infrastructural inequality, as well as the predictability and persistence of infrastructural inequality which will derive mitigation or minimisation strategies and help understand the multiscale consequences of infrastructure inequalities in the urban setting.

Pandey et. al. (2022: 1) explains, in five points, the significance of advancing the discourse of infrastructure inequalities. In this study four points that are most relevant to the study, are considered. The first is the progression in understanding infrastructure inequalities, which inhibit or slow sustainable development (as 72% of the United Nations Sustainable Development Goals (UN-SDG's) are related to infrastructure). The second is that a characteristic of most infrastructures are their durability, as a result they can exist in the urban context for long periods of time. Thirdly, infrastructure can negatively impact and set inequalities at different proportions within a society, such as restricting communities from accessing economic centres. Lastly, it is expected, globally, for urban areas to approximately double its population size by the year 2050, which will also result in a simultaneous pattern of infrastructure expansion. This offers opportunities to correct existing urban environments of unequal infrastructure into socially just systems. Hatfield, like many other areas in South Africa was subjected to apartheid policies and the subsequent spatial development of infrastructural inequalities, which persists today. Hatfield was formerly a white only suburb, which has since seen rapid economic transformation from the early 1980's as it became a desired location for decentralising businesses (Horn, 2021: 90). The construction of the Hatfield Gautrain Station in 2010 also changed Hatfield into a high investment area. In addition, between 1991 and 2011, the total Hatfield population increased by 42%, and in the new democratic post-apartheid context the African population in Hatfield increased from 10% to 75% by 2011 (Horn, 2021: 89). In this post-apartheid context, that has inherited many infrastructural inequalities from the past, in conjunction with PRASA's station modernisation programme, there lies a critical opportunity to derive and implement socially just strategies to change persisting unequal infrastructures.

5.2.2 UNDERSTANDING HOW TO INVESTIGATE INFRASTRUCTURE

Harvey (in Rubin 2020: 169) discusses space as something constructed, and that the users, in these spaces, impart meaning and purpose. These spaces are informed and derived from a diversity of forces and agents, acting in opposition or collaboration (Harvey in Rubin 2020: 169). In this way, the form, and the manufacturing of space, imbues meaning and rules, which control and influence the actions within a space, by restricting other activities (Rubin, 2020: 169). Therefore, Rubin (2020: 170), derives that the existence of infrastructure inequality is often pursued from the conceptualisation of space, embedded into the spatial practices, and then translated into space. This has material implication that influence how the space looks; the quality of the space; what the space offers for its users; and what can be enjoyed or accessed by the people in the community that utilise this space (Rubin, 2020: 170). What Rubin articulates is space and its infrastructure are interlinked with urban systems, urban actors, and their users. Therefore, to investigate infrastructure and persisting inequalities, Steele and Legacy suggests a research lens - which aims to broaden and deepen the study, perception and

understanding of infrastructure - by framing infrastructure "as a relational; ecological; everyday practice; as inherently political; as embedded in questions of human and non-human justice and equity, fiscal transparency, institutional accountability" (Steele and Legacy, 2017: 2). Devenish et. al. (2022) explores the eastern urban regions of Tshwane and analyses the opportunities to connect divided urban areas by researching how territorial operations moderate, mediate, transform, subvert, or operate together with historic and current urban infrastructures as means to overcome persisting infrastructural inequalities. Like Steele's and Legacy's view of infrastructure Devenish et. al. (2022: 1) explores infrastructure inequalities through assemblage theory, which considers the collection and entangled circumstances within the built environment that perpetuates infrastructural conditions of inequality. The process of uncovering urban infrastructure inequality scenarios is done, via case studies, in areas of infrastructure development that has established and constructed urban divisions and scarcities.

As Rubin defined infrastructures as both tangible components that connect areas or provide basic services, as well as interacting networks of people, places, practices, processes, systems, and policies which are understood through urban actors, Devenish et. al. (2022: 4), applies the concept of hard and soft infrastructures to better distinguish, the physical services (hard infrastructure) that functions through both human and non-human interfaces (soft infrastructure) and networks to articulate infrastructure relationships in urban spaces. Devenish et. al. (2022: 4) explains how developing solutions for infrastructure inequalities can be achieved by first understanding urban environments as a spatial configuration that facilitates or restricts exchange arrangements. To understand these urban environments and the infrastructures of inequality Devenish et. al. (2022: 3) references the work of Pieterse and Long, who proposes a method of studying urban arrangements, through reading and mapping an urban inhabitant's 'lifeworld'. This is a socio-spatial documentation (interpretative observational drawing and mapping) of the daily exchanges and interactions between the urban inhabitant with the built environment, urban systems, and other non-human actors to reveal urban patterns in relation (Devenish et.al. 2022: 3). Da Landa in Devenish et. al. (2022: 3) further explains the socio-spatial lifeworld mapping is an analysis of the state of territories and relationalities, where Simone in Devenish et. al. (2022: 3) adds the need for awareness and consideration of any limitations regarding occupation tenure. The result is an analysis that consists of considerate mapping of multiple perspectives and interpretations of emergent networks in the urban environment as well as the built environment systems, that have found ways to circumvent existing infrastructural inequalities (Dovey and Ristic in Devenish et. al. 2022: 3). It becomes important to investigate perspectives of emergent networks in urban environments with a background knowledge or awareness of 'who' to answer 'why' certain people from communities utilise the infrastructure. Rubin (2020: 163) states that infrastructures are related to nationality, social status, identity, and political affiliations, with access to resources, explained by Heller and Evans (2010: 440), which are "organised through a whole range of categorical inequalities, such as race, class, gender, caste, nationality and others".

5.3 POSTHUMAN INTERPRETATIONS

5.3.1 LEADING TO POSTHUMANISM

Devenish et. al. (2022: 4) applies a lens of assemblage theory to structure their methodology to critically study the spaces between urban objects which is analysed and interpreted through urban arrangements, territories or locations, and their potentialities. De Landa (2016: 1) defines assemblage theory as a multiplicity of heterogenous actors such as material and social parts, across different natures or origins (such as sex, ages, or power structures), that have established interrelationships between each other in symbiosis. This lens therefore articulates an analysis of an urban fabric (a series of interrelated heterogenous actors), which share multiple perspectives of space whereby the identity of such heterogenous objects (urban actors) can only exist inside their mutual relation (De Landa, 2016: 2). For Devenish et. al. (2022: 4) assemblage theory, investigates the multiple perspectives (the gaps or relationships) between urban actors and objects which provides a deeper understanding into infrastructure inequalities to derive socially just strategies for urban practices to mend damaged cities. Both De Landa (2016), and Devenish et. al. (2022) refers to Deleuze and Guattari when interpreting assemblage theory. For Deleuze and Guattari, the study of rhizomatic systems (heterogenous actors) as relationships, focussing on the space in-between, allows for a lateral over vertical examination of all subject perspectives and prevents any implicit existing classification or hierarchal tendency (Deleuze and Guattari in Thompson, 2019: 133). This allows for seeing the common contestable and central concepts that are guided by principles of connection and heterogeneity into collective assemblages.

The term assemblage initially appears in Deleuze and Guattari's writings (1987), which are mentioned most in their book A Thousand Plateaus (Dovey, 2013: 1). They add critical concepts to this theory, for this study of transport infrastructure inequalities, the most relevant are territorialisation and immanence. In contradiction to transcendence, immanence is defined as the phenomenon or situation of existing fully within something (Britannica, 2017). In this study, immanence becomes relevant by decentralising the anthropocentric focus, where the human and the non-human actors are understood and studied as rooted and part of the environment of which they are in relation. This further extends to Deleuze and Guattari´s theory of territorialisation, in which territorialisation results from the interaction of physical as well as psychosocial forces, which refers to the way social factors influence how people think and behave (Deleuze and Guattari in Fox, 2002: 353). This leads to

posthumanism through which an assemblage, according to Deleuze (2007: 179 in Dovey, 2013: 5), is what ties heterogeneous materials together, including both natural and manmade elements, and as part of Deleuze and Guattari's philosophies, posthumanism manifests as a variety of integrated ideas that seek to reframe our views in order to better grasp our interactions and connections with one another, and to further awareness of oneself (Daigle and McDonald eds 2022:2).

5.3.2 THE POSTHUMAN DIRECTION (INTRA-ACTION AND DIFFRACTION)

Assemblage is the term used for Deleuze's theory, similarly the term entanglement is used for Barad's relational theory (Murris and Bozalek, 2019: 7), both of which discuss the multiple equal perspectives of heterogenous actors. However, Barad furthers the research of Deleuze and Guattari through her theories of intra-action and diffraction which expands on Haraway's ideas about diffraction as a metaphor or representation (Barad 2007). She proposes diffraction as a methodical approach that focuses on variations and the entanglement of material and meaning (Bozalek and Zembylas, 2017:6). Diffraction pays attention to how differences relate to one another; it does not regard differences as either insignificant or of no consequence: "a diffraction pattern does not map where differences appear, but rather maps where the effects of differences appear" (ibid in Barad, 2007:73). Diffraction patterns keep track of interaction, influence, reinforcement, and difference (Barad, 2007:71). Diffraction itself is an entangled event that reveals the presence of entanglements. Barad (2007:87) further elaborates that important social elements like gender, ethnicity, status, cultural background, and nationality have been disregarded by general scientific investigations. This ties in with Rubin (2020: 164) who refers to other critiques (as mentioned on page 12) that show how particular representations of race, gender, class, nationality, and place, as well as the ideologies that support them, can affect infrastructure and their interactions with it.

In her study of intra-action Barad proposes that entangled agencies - the blending of people, things, and other phenomena - constitute mutually to one another. The differentiation between inter, which means amongst or in the middle of (two entities interacting while maintaining their individuality), and intra, which means from within (individuals evolve as a result of intra-actions, and being able to engage, rises from within the connection rather than outside of it) (Kerr, Adams and Pittard, 2014). This offers a unique perspective on how individuals relate to one another, with matter, elements, the environment, and ideas. When these things interact, our ability to act, either changes, transforms, or emerges (Kerr, Adams, and Pittard, 2014). The levels of responsibility of the fundamental entities are established by intra-action (in which agency enters the setting). By challenging rigid restrictions and tearing down barriers which include disciplined thought and action, intra-action aids in the ability to conceptualize in terms of simultaneity and reveals artificial boundaries that people are not aware was created (Kerr, Adams, and Pittard, 2014).

5.3.3 APPLYING POSTHUMANISM TO THE STUDY

This study will consider Rubin for the preliminary investigation into the user demographics of PRASA's Metrorail, to understand who may be disadvantaged or othered in this space and what a daily commute may comprise of for these users, so that the hard and soft infrastructure components that are studied are not separate to the human component. This will be followed by a posthuman critique which implements Barad's intra-action and diffraction principles to study the human and non-human actors (hard and soft infrastructures) of Rissik Station, by identifying the effect of the different perspectives that exists between each actor (the human and the rational components of Rissik Station). This research will apply an iterative observational mapping and drawing discussed in Devenish et. al. (2022), which will critically reflect on findings, before conducting more observational mapping. Therefore, to understand the social complexities between the human and non-human actors, through an iterative and reflective process, grounded theory is the chosen methodological process to investigate social inequalities that exist in this urban setting.

6 METHODOLOGY

6.1 DEFINING GROUNDED THEORY

The grounded theory research methodology is an investigatory process which is concentrated on the systematic collection and analysis of data to derive new theory or principles critically and logically (Noble, 2016: 34). This rigorous methodology requires an inductive process of reasoning through which key categories i.e., trends and themes, of urban phenomena are obtained from the data analysis to inform and initiate new concept and theory development (Allen and Davey, 2018: 222). This procedure ensures that the data collection, data analysis and the derived theory is interrelated and complimentary (by that the theory, in its conclusion, is relevant, appropriate, and useful) (Strauss and Corbin in Ong, 2012: 418). The data collection typically comprises of a series of in-depth interviews which is conducted using open ended questions (Noble, 2016: 34). The interview questions evolve as the study advances and the theory becomes more evident. In addition to interviews, observational methods and focus groups are also incorporated into the data gathering operations (Noble, 2016: 34). The type of data that is obtained from data gathering operations are either quantitative or qualitative, or both (Noble, 2016: 34).

Twenty interviews were conducted with commuters and traders who use or operate around Rissik Station to get a general understanding of the user demographics, what their relationship is with the environment, user demographics to determine, what the station offers for its commuters, workers, and traders and how it may support them in their day-to-day lives. Users were asked what challenges they may experience in the space and what they would like to see changed about the railway environment. Information was used to lay down the foundation for studying commuter and trader relationships with Rissik station. This information is used to identify who is experiencing inequality and how they are experiencing it. The goal of the data analysis is to distinguish elements of Rissik station and station occurrences to inform the posthumanist study.

A conventional grounded theory study implements analytical procedures as well as several flexible sampling strategies that is developed into a palimpsest of rich descriptions of the study focus (Van Aswegen, 2022: i and Noble, 2016: 34). The intention to apply the grounded theory in research is to produce a useful conceptual framework, so that data can be arranged and coded to make sense of the studied phenomena (Ong, 2012: 418). The grounded theory framework is developed from a recursive, iterative, and evolving method of data collection and analysis, that prioritises the reflection, and comparative evaluations of the data captured (Ong, 2012: 418). Comparative evaluations/analyses occur simultaneously with data collection, following each successive interval of data collection and analysis, strategies are implemented to refine and distil emerging analytic categories (Charmaz, 2017: 299). The researcher that applies grounded theory utilises conjecture and formulated hypotheses which is validated against the obtained data. This begins to articulate 'why' questions which can define and establish the answers "in the conditions of their production" (Charmaz, 2017: 299).

6.2 THE RELEVANCE OF GROUNDED THEORY

Grounded theory originates from the social sciences, because of which, the methodological process enables the researcher to understand and present the social complexities associated to urban actors within the built environment (Allen and Davey, 2018). This is achieved through simultaneous field research data collection and analysis over numerous intervals. Through the analytic process the revealed emerging patterns are developed, refined, and interrelated into concepts through induction principles and theories (Ong, 2012: 420). These patterns are of social processes, such as behaviours and relationships. Therefore, grounded theory operates within an interpretive and explicatory paradigm, where the researcher accepts the human [and their actions (intra-actions)] within their environment as the dialectical processes that confers and maintains meaning onto their realities (Ong, 2012: 420).

This research investigation aims to reveal the hard and soft infrastructure systems that affect the observed perpetuated inequality within Hatfield's public transport gateways. An appropriate method is required to determine urban components, operations, and systems; understand the social and economic relational implications of these urban actors on the associated public transport user groups and to articulate a possible relevant, useful, and integrated conceptual framework. The result of this 'grounded' conceptual framework provides for spatial practitioners an opportunity to adapt and apply these guidelines to their study area of interest. Grounded theory, therefore, provides an opportunity through iterative data collection (obtained from insitu interviews and observation) and analyses (which includes researcher and participant interpretation reflexivity (Charmaz, in Ong, 2012: 420)), to understand common experiences and relationships of participants/transport users with their environment to establish a rich layered understanding of the rational urban orders of these transport thresholds, and the inequality it perpetuates to its users. Therefore, grounded theory is critically followed to extract data for the study focus of urban transport infrastructure and inequality.

For this research investigation grounded theory is implemented to gather relevant data about the occupation and use of public transport gateway spaces, as well as, through critical reflexivity, analyse and deduce the rational social and economic arrangements that actions the public transport spatial characteristics and operations.

Following the analytic process, the identification of patterns and themes are utilised to inform and deepen the understanding of urban inequality in the study interest area of Hatfield's Rissik Station.

To address the sub-questions posed in the research project, grounded theory can be used to:

- Define and distinguish between hard and soft transport infrastructure networks by analysing and interpreting patterns of interaction and use.
- Identify the characteristics of urban inequalities, revealed by studying hard and soft infrastructure relationships and interrogating layers of exclusion.
- To facilitate a socio-spatial understanding of hard and soft infrastructure interfaces by understanding patterns or emergence of built environments through use and adaptation.

As Charmaz (2000: 250) explains "the constructivist grounded approach entails the relativism of multiple social realities, recognizes the mutual creation of knowledge by the viewer and the viewed, and aims toward interpretive understanding of subjects meanings".

6.3 THE APPLICATION OF GROUNDED THEORY

6.3.1 PRELIMINARY INVESTIGATIONS

Preliminary background research was conducted to explore and better understand the development of apartheid and the established social and economic inequalities that arose from the white-Afrikaner government (the western human). In this preliminary investigation contemporary racial-economic othering and infrastructural inequality (the current conditions and quality of transport infrastructure does not provide for social justice, environmental sustainability, and economic efficiency) revealed that many of these issues arose from apartheid legislative planning that enacted racial segregation (which deflected the non-white majority's economic aspirations and job opportunities from white privileged areas). This suggested that people who are non-white, require access to core business areas to find economic opportunity through informal trade or working in other businesses. This access is mostly facilitated through public transport systems.

6.3.2 PREPARING FOR THE FIRST DATA COLLECTION PROCESS

The process of preparing for the first data collection occurred by walking in Hatfield along routes that contained notable anchor points or landmarks in the area, as well as known public transport nodes (these included informal taxi stops on the corner of Burnett and Festival Street, Stanza Bopape Street, and Francis Baard Street, Rissik Train Station, Gautrain Station, and the A Re Yeng Bus-Rapid-Transit (BRT) stop on Arcadia Street. The investigation occurred starting from the University of Pretoria (Hatfield Campus), heading north along Festival Street to Rissik Station, at Arcadia Street heading east to Hilda Street and north again to Stanza Bopape Street. Heading south on Grosvenor Street to the Gautrain Station and the A Re Yeng BRT stop, then to Burnett Street to investigate the taxi network.

To understand further what inequalities are occurring within the identified public transport systems, metrics of mobility, economy, equity, land uses, and culture and wellbeing were implemented (refer to data analysis page 19). With a basic understanding of public transport systems operating in the area and having identified the relevant metrics for this research paper, interview questions were formulated to understand the public transport user demographic as well as their preferred mode of transport, where they are commuting to, how often, the cost, as well as their satisfaction with the public transport service they received. From these interviews it was revealed that most commuters were coming from Atteridgeville and Mamelodi to their place of employment, within the Hatfield business core.

6.3.3 ANALYSIS OF FIRST DATA COLLECTION PROCESS

The analytic process of this data collection aimed to understand and critically reflect on the obtained data of onsite observations which was compared with the interview data. This process revealed nuanced responses of users on site and the provided environment, showcasing non-human othering of humans that utilise the transport infrastructure out of necessity. This was investigated at a macro scale (where racial segregation, classifying and othering of non-white humans occurred, to understand the town-planning measures that restrict non-white access into the city, as well as indicate the passenger-rail commute necessary to access enter the Hatfield business core). The meso-scale was conducted to highlight urban planning strategy focusses – this included private vehicle transport efficiency. The micro-scale focused on the Metrorail stations, which informed operation nuances of this transport infrastructure, and how particular railway station components, such as barriers, costs, train departure and arrival frequency, may facilitate or inhibit the full utilisation of space by commuters and traders.

6.3.4 PREPARING FOR THE SECOND DATA COLLECTION PROCESS

These patterns prompted new inquiries into the characteristics of the railway infrastructure that contribute to non-white human othering. A deeper understanding of railway commuter and informal trader interactions with Rissik Station's infrastructure was necessary to understand what qualities of the space prevent human agency. The posthumanist critique was then applied to this research study to understand the human and non-human

exchanges without the boundaries associated with human centred perspectives. Research was conducted to understand who the human is, what is the non-human, how does agency differ between these two entities, and how should the analytic investigation frame both the human and non-human in relation to each other.

6.3.5 CONDUCTING A POST-HUMANIST STUDY ON METRORAIL RATIONALITIES

Findings from the first analytic process revealed inherited rationalities to achieve functional efficiency and to racially segregate user groups. These design rationalities are still present in the composition of Rissik Station. The posthumanist critique analyses identified design efficiencies or rational systems found in Rissik Station. In this investigation the human actions are understood through non-human agency. However, in some instances, humans have established measures to work around non-human rational systems. In these instances, the human, through physical attributes of the non-human, have adapted or manipulated its use to suit their needs. The exchange between these systems provides meaningful interpretations of how non-white humans have been othered by western-human rationalities, as well as provide some understanding how to best accommodate them.

6.3.6 PRODUCING AN INTEGRATED THEORY AND GUIDELINES

The patterns found from the posthuman critique provides a deeper understanding of inequalities that occurs on site. Contextually relevant and data-routed guidelines can then be derived to achieve the triple bottom line of social justice, economic efficiency, and environmental sustainability, that would help redefine PRASA's modernisation focus, that perpetuates the modern apartheid philosophy trends, so that social and economic othering (that occurs at these Metrorail stations) can be addressed.

7 INITIAL URBAN SAMPLE AND DATA ANALYSIS

7.1 ZONES, TERRITORIES AND BOUNDARIES (MACRO SAMPLE)

7.1.1 REGIONAL TERRITORIAL CONTEXT

7.1.1.1 The inherited apartheid condition.

To implement effective racial segregation apartheid powers aimed to minimise unnecessary non-white individuals from entering white areas of economic activity and to contain social exchanges between different racial groups. Town planning schemes allocated portions of land for separate racial development, the location of these land parcels was separated from white areas by geographic boundaries that included industrial precincts, more affluent white residential suburbs, and natural topographies such as ridges, water bodies, and ecologically sensitive areas. Access into economic areas was further restricted through limited transport infrastructure connecting peripheral areas to these white urban centres (which also required non-white commuters to present the necessary permits to negotiate their entry). Areas of Mamelodi and Atteridgeville share similar former urban planning practices of inequality.

The regional selection for this mini dissertation is delimited to the Hatfield precinct, situated in the city of Pretoria, South Africa. Hatfield is a densifying urban precinct that is close to the city centre. It is host to several education institutions, embassies, businesses, retail, and housing. It is well connected to broader mobility infrastructures such as the N1 highway, numerous feeder roads, bus service providers (such as A Re Yeng, Putco, Tshwane Municipal Busses and the Gautrain Bus Service). Three Metrorail stations service the Hatfield area, (Loftus Versfeld Park Station, Rissik Station and Hartebeesspruit Station) and one Gautrain Station. In addition, due to the suburb size it is possible to walk from one end of Hatfield to another in a relatively short space of time. What is interesting or particular to this study is that it is sited in a former white only area along the train line which connects peripheral zones to the CBD, this means that recent and ongoing developments in relation to public transport and associated micro scale mobility infrastructure can be studied to try to understand the various opportunities and obstacles that the precinct provides for commuters from peripheral areas. Furthermore, the location provides an opportunity to understand the extent to which recent developments around train stations could facilitate or hinder social justice aims.

Hatfield is a destination-based hub for the labour force, arriving from the peripheral township areas such as Atteridgeville and Mamelodi. This railway line, that runs through Hatfield, serviced both white and non-white communities under apartheid as well as connected to areas in the Moot (Gezina, Villieria, Rietfontein, Rietondale, Moregloed and Waverley). Currently, the majority demographic this railway line services are non-white. Many commuters who use the Metrorail infrastructure were classified and marginalised during the apartheid era, based on a rubric of race, identity, and praxis of living, which subsequently saw their relocation from white privileged areas to these peripheral areas. As discussed in the background (see page 2) these areas gained little service provision and saw strict access controls into white privileged areas to deflect economic and political aspirations of the non-white majority. In this post-apartheid era, with much of apartheid's racial legislative restrictions and access to services, economic opportunity and amenities lifted, these peripheral community areas are still disadvantaged due to their geographical location and its proximity to economic opportunity. Engineered and town planning urban typologies of the Hatfield urban fabric also restrict access to the city and limits urban economic

integration of the non-white majority. Many commuters rely on the passenger rail system to connect them to the business core of Hatfield on a regular basis. This research focus serves to establish areas of inquiry and to delineate the regional exploration to the economic nodes within the area. Therefore, the investigation context for this study is within the core business area of Hatfield (figure 2) and the facilitative or limiting relationship urban transport infrastructure actors have on disadvantaged non-white commuters.

7.1.2 REGIONAL TERRITORIAL LIMITS OF THIS MINI DISSERTATION

Figure 3: A map illustrating the Hatfield precinct boundary, the Pienaarspoort-Pretoria rail corridor, and the Hatfield railway stations (ArcGIS, 2023).

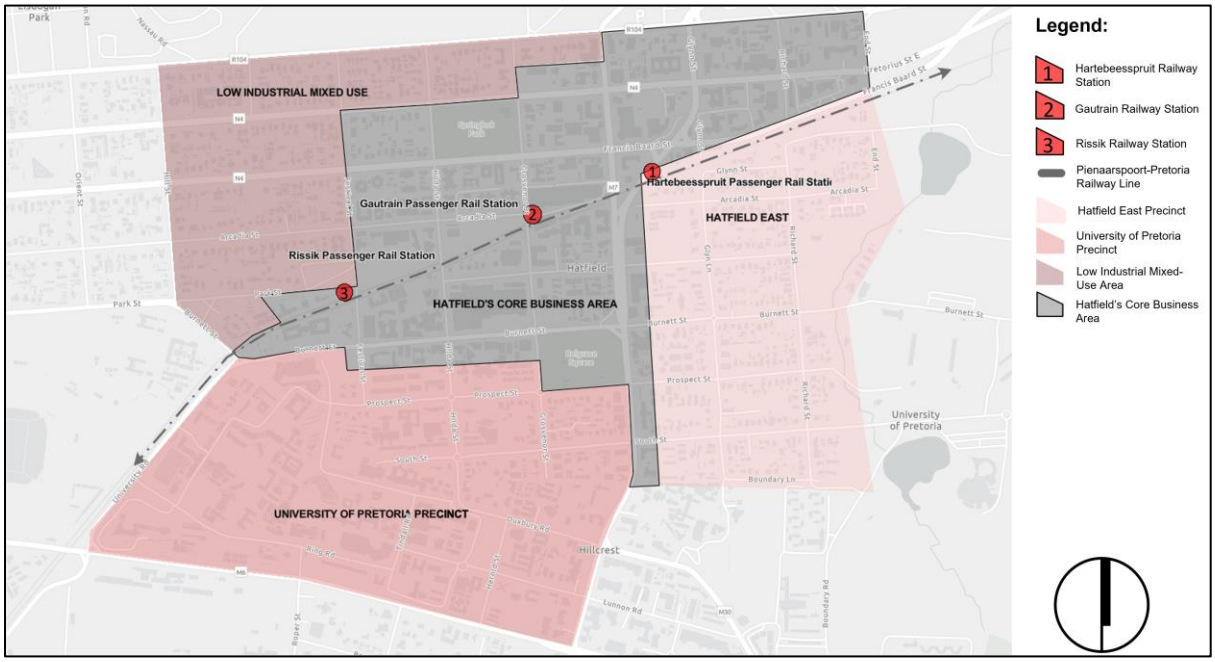

Figure 4: A map illustrating the Hatfield business core in relation to the train stations (adapted from le Roux, 2009: 17).

7.1.3 SELECTED FOCUS OF URBAN METRICS AND INFRASTRUCTURE TYPES

Salat, Labbé and Nowacki (2011: 499-506) pose a series of theoretical innovative indicators and metrics that are used to assess the quality of urban operations and forms. Salat, Labbe and Nowacki (2011: 499) apply selected metrics across three criteria of relevance – the urban form, socioeconomics, and environmental aspects – at scales for which they are most relevant. These metrics enable an investigation into the Rissik Station urban environment and its hard infrastructure components (non-human actors), and any potential factors that may inhibit the station environment from achieving the third world triple bottom line as mentioned in introduction (refer

to page 1). In this study these metrics are utilised to contextualise and delimit Hatfield's railway infrastructure and its supporting networks.

The metrics discussed by Salat, Labbé and Nowacki (2011) are discussed at an urban design/planner scale, where the effectiveness of implementing each metric is measured or understood through the complexity, diversity, scale and proximity of city structures, activities, and forms over a set geographical location. For this case study investigation at Rissik Station, these metrics are applied to the hard and soft infrastructures in, around or informing Rissik Station as well as Rissik Station's connection to its immediate socio-economic surroundings which is analysed through human and non-human intra-actions. The identified relevant metrics that are applied to this study include land use, economy, culture and wellbeing, and mobility (Salat et. al., 2011: 499-506). The metric of land use is interpretated as the number of diverse facilities or activities to achieve a functional mixed use, this is important to limit the unidirectional flows of people concentrated in short periods of time, it also counteracts facilities or areas that are functional at certain times (Salat et. al. 2011: 500). Salat et. al. (2011: 501 & 502) discusses the metric of mobility as the connectivity of pedestrian circulation, cycling, and automobile (as the amount of circulation intersections), as well as the mean distance between intersections (this informs the walkability to destinations within an area). In this case study, pedestrian movement is investigated to determine the walkability to destinations within the Hatfield precinct from Rissik Station. The metric of culture and wellbeing is described as the social standpoint to ensure that a person may be included in social activities (Salat et. al., 2011: 505), however, for this research the culture and wellbeing metric is applied to Rissik station slightly differently. This metric is used to investigate the Rissik Station environment and its immediate urban context, to understand how its materiality and hard infrastructural components may limit its users socially, inhibit user meaning making or comfort with the station environment, and to determine the effectiveness of the station to culturally connect to the Hatfield precinct. Lastly, the metric of economy is measured by the complexity of fabrics activities, its equidistribution and diversity (Salat et. al., 2011: 504). However, the scale at which human and non-human intra-action is analysed at Rissik Station, key components found within this urban environment are studied to allow or better cater informal economic arrangements. This research is conducted in the recently revitalised Rissik Station, which has experienced changes that were implemented as part of the PRASA's modernisation programme.

The use of Salat, Labbé and Nowacki's (2011) metrics are implemented as preliminary means to understand broadly the status quo of Rissik Station within the Hatfield precinct to uncover any perpetuated inequalities that was not highlighted during the desktop study in the background. In this process, key urban actors around the railway station and patterns begin to emerge. The following data collection occurs through onsite observations and interviews simultaneously with the analytic process, that interprets the economic, land use, equity, mobility and culture and wellbeing opportunities or limitations of the study area, and the impact it has on its users. The purpose of this preliminary investigation is to understand what characteristics of Rissik Station (since its station revitalisation) continues to other the human component through its station provisioning, as well as to be aware of which user demographics rely on this public transport service or its facilities, to understand the experience of the daily commute, and understand in what ways PRASA's Metrorail accommodates the commuters' needs. These metrics are then applied to the posthuman study to delimit the analysis to the relevant human and non-human intra-actions. The intention is to reveal any nuances of the station environment that needs specific consideration to improve the experience of the regular user.

7.1.4 LAND USE - SATELLITE NODES VISITED AS PART OF NETWORK ANALYSIS INVESTIGATION

The following map shows Hatfield's societal anchor points that inform much of the urban movement patterns and way finding. The railway line bisects Hatfield into north-south territories with a higher density of economic nodes occurring southwards. However, an evenly distributed spread of these economic nodes proliferates across the east-west corridor, with some nucleation occurring around the railway corridor. Clusters of satellite economic nodes comprising of retail, commercial, consumer/eatery/shop, social and sport programmes around the Pienaarspoort-Pretoria railway line stations located in Hatfield (seeing figure 4), helped delimit the research focus area and analysis to Rissik Station, between its infrastructure and the protentional socio-economic networks and relationships (intra-action) with the surrounding enterprises. The satellite economic node map reveals that Rissik station is ideally positioned within the economic core of the Hatfield Precinct. Despite it being positioned within a diverse economic use mix (providing a number of job opportunities particularly within retail nodes), Rissik station is located just north-east of the fields, and Hatfield Plaza, which significantly aids pedestrian movement through Hatfield area allowing commuters from the Rissik Train station to get to their place of work without having to inconveniently use movement routes along sidewalks and roadside pavements that perimeter the large city block urban typology. However, despite the diversity of land uses and economic activity, the existing built urban fabric form saw siloed private and state driven development that fails to integrate with existing transport infrastructures which creates urban environment spaces that are separated from informal traders and railway commuters who are walking to their place of employment.

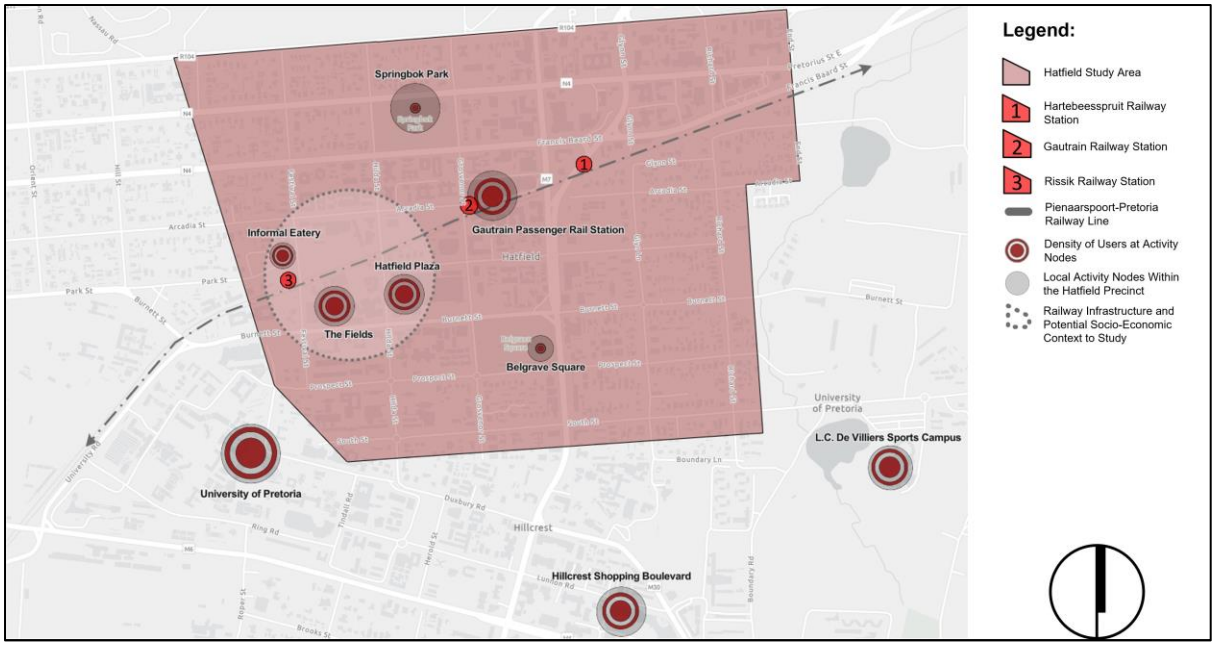

Figure 5: A map illustrating Hatfield's current land uses as well as its anchor activity nodes (adapted from Hatfield Precinct Node Plan, 2021: 47 & 51).

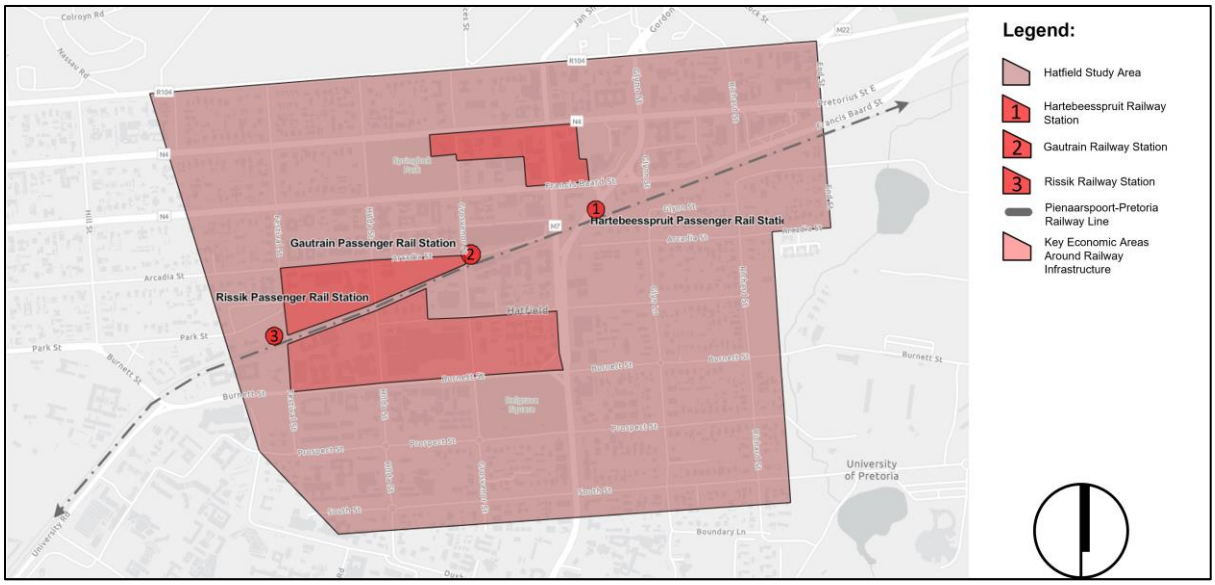

Figure 6: An aerial photograph illustrating key economic satellite nodes within the Hatfield precinct (ArcGIS, 2023).

7.2 PATTERNS OF INFRASTRUCTURE INTERACTION (MESO SAMPLES)

7.2.1 PATTERNS AND ARRANGEMENTS OF INFRASTRUCTURE INTERACTIONS

The development strategies of Hatfield have resulted in a strong grid system that prioritises motor-vehicle orientated mobility infrastructure, creating a dense motor-vehicle fabric that is more accessible to individuals who have the option to commute by private car. This grid system portions and controls land use potential, often resulting in a more monofunctional land use in each block (as seen in figure 3). This grid road structure, designed for automobile efficiency, comprise of multi-lane roads to accommodate both the speed of the traffic as well as the heavy traffic density. This urban condition inconveniences the commuters using the Metrorail line who must walk to their destination or to another transport mode. The focus on efficiency at which motor-vehicle transport operates within Hatfield (speed and proximity to the destination) results in most of the built form fenced off to public interfacing as well as limiting access. This restricts many inhabitants walking in the precinct to narrow sidewalks, where commuters and informal enterprises, of trade and transport act. Furthermore, railway stations within Hatfield are thresholds to the public environment, however, its barriers confine and isolate networking opportunity by containing access to a single entrance, and narrow pedestrian walkways. Nevertheless, the

railway infrastructure is centrally located within Hatfield, thereby reducing the travel time for the commuters to their destinations.

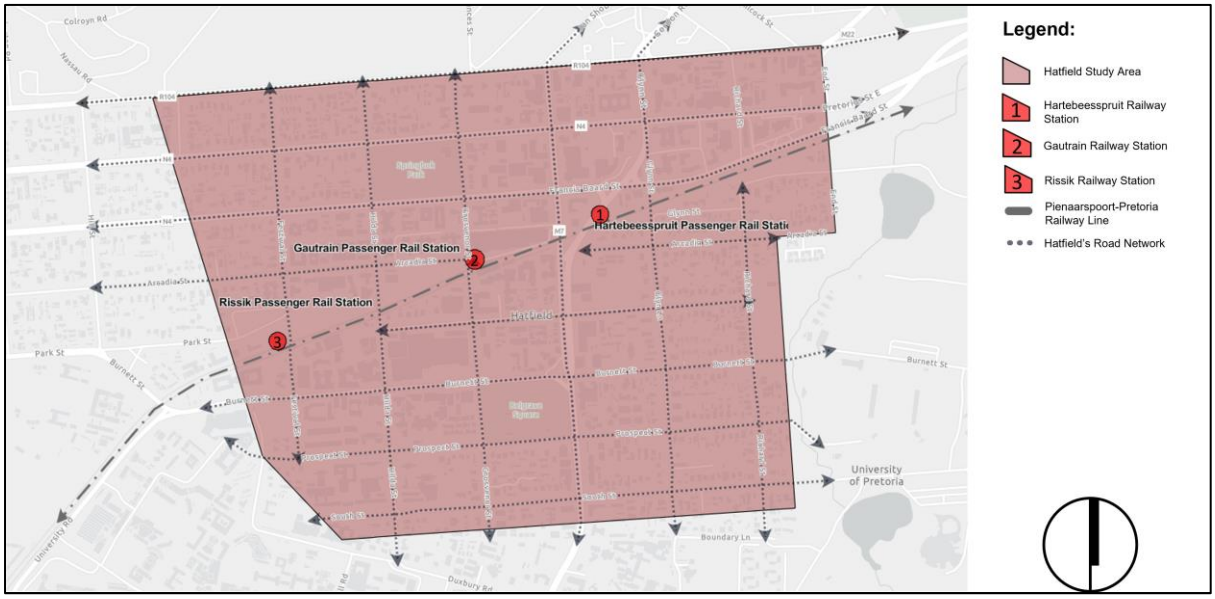

Figure 7: Aerial photograph of the prioritised private vehicle circulation (ArcGIS, 2023).

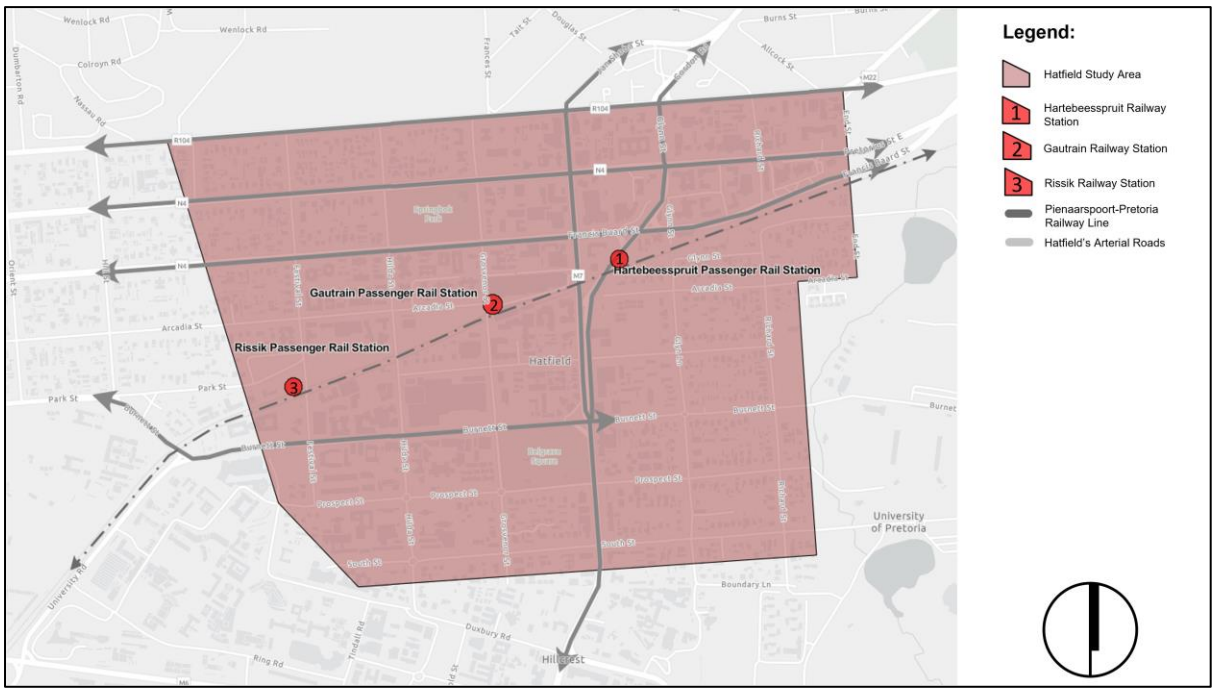

Figure 8: A map illustrating the arterial roads in Hatfield in relation to the railway infrastructure (ArcGIS, 2023).

Figure 9: A map illustrating the primary pedestrian movement (adapted from Hatfield Precinct Node Plan, 2021: 42)

7.2.2 ASSESSING URBAN INEQUALITY IN RELATION TO THESE INTERACTIONS

To assess the urban inequalities, it was essential to extract quantitative data (refer to appendix) from on-site observations, desktop data and the interviews that were conducted. The study, with emphasis on economic equality and social justice, sourced the relevant measurement criteria from the 'Urban self-reliance in South Africa' DIT 801 study group brief (Davey, 2023: 7). These criteria are as follows:

- To determine the median travelled distance required by these local businesses in Hatfield to obtain the necessary goods or services to operate their business.
- To determine the median commute time and the preferred transport type the commuter uses to get to their destination.
- To determine the median cost of transport used, by commuters, to get to their destination.
- To determine the commuter's frequency of use of a particular type of transport within their regular routine.
- To determine the percentage of people satisfied with the commute.

7.2.3 CRITICAL SITES SELECTED FOR THE MICRO SAMPLE

Within the Hatfield precinct the identified territories are focussed on the railway corridor of Hatfield's PRASA's Metrorail stations, as well as the departure and arrival platforms that interface and threshold regular commuters into the Hatfield business core, where many commuters walk to their place of work. These exchanges are analysed through Rissik Station.

7.3 OBSERVATIONAL SKETCHES AND DATA ANALYSIS (MICRO SAMPLE)

7.3.1 ACTIVITIES AND URBAN COMPONENTS IDENTIFIED AT CRITICAL SITES

On site observations were captured and documented through photographs. Urban components found within proximity to the demarcated area of analysis includes The Fields shopping centre, the University of Pretoria, Moja Gabedi Gardening Project, Rissik station, taxi and bus stops and a park-on-Park Street. These urban components facilitate activities of trade, waiting, eating, taxi and bus drop off/collections and some recreational activities. Trade activities occurring around Rissik station includes formal trade, permanent informal trade, and temporary informal trade.

7.3.2 WHERE INTERVIEWS WERE CONDUCTED AND THE SPECIFIC NETWORK NUANCES CONNECTED TO THESE NODES

Interviews were conducted in Rissik and Hartebeesspruit station, as well as the sites immediate surroundings.

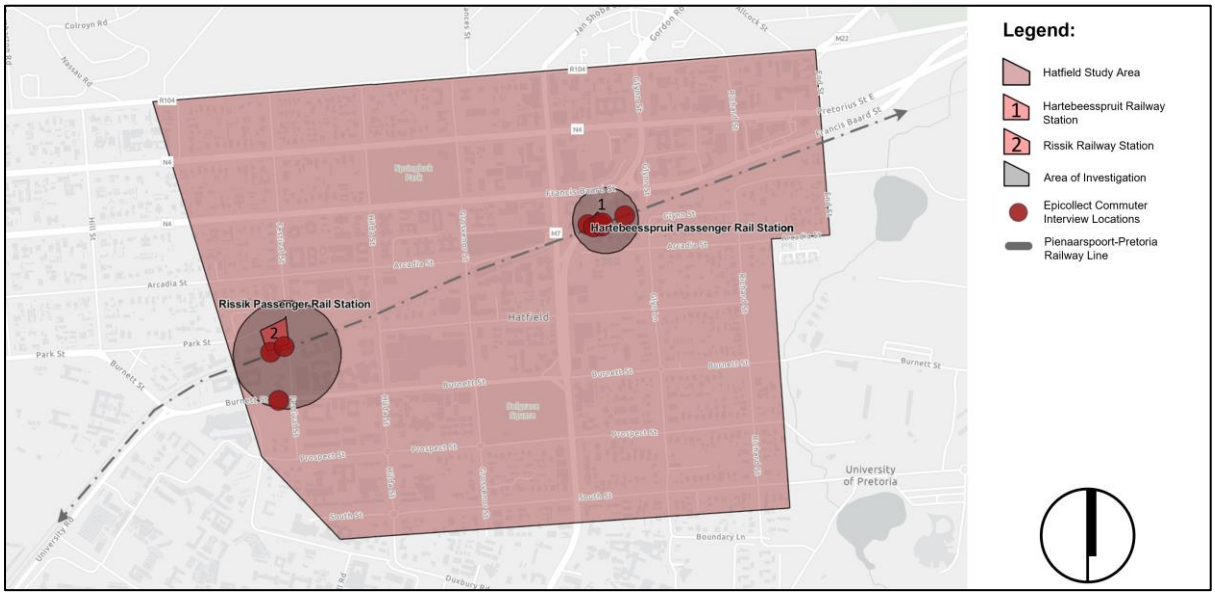

Figure 10: An Open Street Map on Epicollect illustrating the locations where commuter interviews took place (Urban Infrastructure Research Group, 2023).

Figure 11: An Open Street Map on Epicollect illustrating the locations where vendor interviews took place (Urban Infrastructure Research Group, 2023).

On site, the urban components of Rissik station, noted in the previous section, are urban enclosures that frame the site. However, these built forms are barriered or have restricted access, cutting off any socio-economic connection or response to the train station operations and its commuters. These built forms are also densely packed making space limited for emergent economies through which people can occupy spaces close to the site. These buildings defining the immediate context of Rissik station offer low density economic opportunities and provides little contribution to achieve economic network resilience. Further south, however, The Fields is a strong economic node with a high density of consumers, but it is still removed and appears separate from Rissik station. Nevertheless, The Fields, does offer a faster alternative route to circumvent the large city block typology of Hatfield.

Contributing to this low informal economic density are laws that prohibit and restrict informal traders from emerging. Select informal vendors, have been granted occupation tenure (permanent informal trade) through private sponsorship (through Fortis Hotel) as well as some low-budget permanent storage, which was local government funded. These businesses pay rent to government every month and have become an anchor point for many precinct inhabitants. After conducting interviews, temporary informal traders (those who set up shop everyday) fear law enforcement intervention, that requires them to stop conducting their business and leave this location. This is inconsistent as on-site observations revealed police offers to buy from these vendors.

Compared to Hartebeesspruit station, Rissik offers more economic opportunity as public spaces are more freely accessible and sidewalks are considerably wider catering sufficient space for small enterprises to emerge. The park across from Rissik station also consists of trees providing shade, green spaces for seating, and public bins and light services. These spatial characteristics as well as storage, enables permanent informal traders to bring in cooking equipment and provide meals to the public. The space also hosts social activities, as it was observed that people after work, waiting for their train, gathered to play a game of soccer. Whereas the open space outside Hartebeesspruit station offers no shade or greenery, and the pedestrian walkways are narrow and are located on a road with frequent traffic. Furthermore, Rissik station's permanent informal traders, as well as the temporary informal traders, utilise this location as it is a site that is ideally situated within a pedestrian network. Festival Street is a road used to establish and sustain informal economy emergences. These include informal taxi stops positioned on Stanza Bopape Street and Francis Baard Street, student residents in the periphery areas of Rissik station, and railway commuters. The point where all pedestrian foot traffic heading southwards converges at these informal traders.

Figure 12: An aerial photograph illustrating Festival Street, pedestrian traffic and strategic location of the informal vendors (Google Earth, 2023).

7.3.3 PRELIMINARY FINDINGS

After recording on-site observations and conducting interviews, the data was gathered and analysed. The data helped reveal economic nuances that continue to disadvantage people in this post-apartheid context. The study focussed on the Metrorail line and investigated public investment, emergent economies, as well as factors that limit the commuters' economic opportunity. The measurement criteria of access illustrated a context of regular obstructions of overcrowding, infrastructural failure, delays, and infrequent trips highlighting hard infrastructural unreliability. This affects the passengers' commute and their work-life sustainability. This also compromises their safety, as longer waits in the evening has risks of crime. Furthermore, a rigid perimeter boundary of the railway station and the surrounding urban forms removes any economic patterns and networking opportunities, and it also significantly restricts emergent economies, that includes taxi operations as well as trade.

Inequality is also noted for commuting vendors. On site investigations suggests that provisions for occupation tenure and certain assets can encourage a sense of agency (e.g., storage facilities for informal vendors). Vendors who have access to storage have the means to explore cheaper or more convenient modes of transport, as they are not required to carry a day's worth of produce (as they can receive produce by delivery or private

vehicles and heavy equipment can be safely stored away), these vendors also do not need to worry about law enforcement, as these vendors pay the municipality to operate in the area. Whereas, temporary vendors, need to arrive earlier to set up their business, they must either commute by train (and risk an overcrowded carriage), commute by taxi (and risk paying extra for the seats they may occupy with their produce), or their own private vehicle (where they have to pay for petrol and maintenance). Transport options, without storage facilities are risker, and are chosen for their economic convenience (affordability and ease of transporting goods). These vendors can also, at any moment, be asked to stop conducting their business and leave the area.

Inequality is further perpetuated by the platform conditions, as this monofunctional system does not provide comfortable seating, sufficient shade, or well-maintained ablution facilities. Investment into a diverse support system, that networks with the emergent economies may provide new economic opportunities, place-making, general community upliftment, and resilience. The lack of supporting facilities located outside the railway stations undermines any possibility of networking, which creates underused, sterile, uncomfortable, and unsheltered spaces. Approximately half of the commuters interviewed buy from surrounding vendors, which should encourage more economic opportunity within proximity to the stations. Furthermore, this first data analysis revealed that it is the rational engineered systems to design and build an operational system of efficiency that offers little to no provision extra than the functional requirements of a train station.

8 A POSTHUMAN URBAN SAMPLE AND DATA ANALYSIS

In the previous urban sample and data analysis section, metrics of economy, culture and wellbeing, land use and mobility were studied to understand what urban actors of Rissik station (human and non-human) and the Hatfield fabric contributes to passenger rail commuter and informal trade inequality. The same metrics are applied to the posthuman investigation of Rissik station and the Hatfield fabric, however the metrics have been refined to articulate the former planning and design rationalities of the current systems and how this rational approach to urban development has created spaces that still disadvantage the non-white passenger rail-commuters. The posthumanist lens aims to provide another perspective - to layer urban descriptions and establish a more complete picture of urban actors contributing to commuter inequalities. Therefore, the shift from the anthropocentric interaction onto the engineered environment to a study of how non-human actors have agency (influence over human exchange).

8.1 NON-HUMAN AGENCY (SOCIAL JUSTICE)

8.1.1 CULTURE AND WELLBEING

8.1.1.1 Rissik Station Materiality

The construction of Rissik station occurred during the early twentieth century – a modernist building comprising of brick, steel, and concrete materials. Rissik station, because of PRASA's modernisation programme, to improve the existing deteriorated station infrastructure, has since adopted the PRASA Metrorail colour scheme with the station buildings painted in grey with accents of blue. Based on observation, the construction of Rissik Station does not provide for much indigenous quality or tradition, nor does it respond to any place-making or cultural identity references for its regular user/commuter group, nor has PRASA recognised and adapted any heritage values to suit the current demographic who was previously disadvantaged by this railway system during the apartheid era. The posthumanist lens recognises both user/commuter (human) identity, as well as the building (not accepted non-human identity), particularly in intra-action. With the observed majority commuter demographic as black, and most of the interview participants travelling from Mamelodi and Atteridgeville areas, many of these non-white user groups possess common histories of othering, as well as diverse cultural backgrounds. The station does not facilitate much adaption or community identity appropriation onto this engineered landscape. Such accommodation, which could occur through activities that event for social occurrences and exchanges, can provide for a sense of place for its regular commuters. However, the current PRASA identity of the railway station still reflects a pre-apartheid and apartheid rational system that does not provide for more than the functional requirements of the station. Rissik Station engineered for its efficiency, it does not provide for anything more than its facile functional definition of a railway station (facilitating rituals of waiting, loading, and unloading, ticket acquisition and the commute only via railway). The functional responsibility (and position) of the Pienaarspoort-Pretoria railway line is to transport many lower-income to lower-middle-class income non-white individuals from Mamelodi to work. However, despite Rissik Station's ideal location to Hatfield's economic centre, its transport stops outside the station and the public open space and eateries outside the station, this modernist railway station references little to its positionality and connection to the vibrancy and energy of the Hatfield context to assist with placemaking. The infrastructure of Rissik Station creates an uncompromising position of apartheid and PRASA identity which could be the cause of the current complacency of many of its commuters (which was identified in the previous data collection and analytic process).

Figure 13: A photograph illustrating the typical construction materials used at Rissik Station (Author, 2023).

Figure 14: A photograph illustrating Rissik Stations painted colour scheme (Author, 2023).

Figure 15: A photograph illustrating the main spaces of activity in Rissik Station (Author, 2023).

Figure 16: A photograph of an African motif, a small reference to culture at Rissik Station (Author, 2023).

Figure 17: A photograph of Rissik Station showing little social activity occurring inside (Author, 2023).

8.1.1.2 Rissik Station Seating Provision

Inside Rissik Station, there are several benches positioned on the waiting platform. Generally, most seats become occupied quite early between train arrival and departure intervals. During busier times between 5:00 and 7:00 in the morning and 15:00 and 17:00 in the afternoon, there is limited seating available and so commuters find other seating alternatives. The posthumanist perspective addresses human agency, the way in which humans utilise and interact with the non-human elements (benches), as well as the non-human elements or agency (physical attributes that inform the way humans behave) that comprises both bench intra-action with human agents, and the absence of benches, resulting in other non-human such as the stairs, green block retaining walls, and perimeter ledges used beyond their primary function to facilitate the shortage in seating accommodation at these times. Seating at capacity informs commuters of their position in relation to the train carriage, providing for a safe distance that allows, first users exiting the train carriage, followed by the commuters who enter the train. This simultaneously keeps the platform clear of obstructions. As the capacity for seating is exceeded, users begin to obstruct the pedestrian bridge stairways, as the stairs change from a circulatory function to a dwelling/seating function, and comfortable seating options have been exhausted, commuters stand in shaded areas and against walls for support.

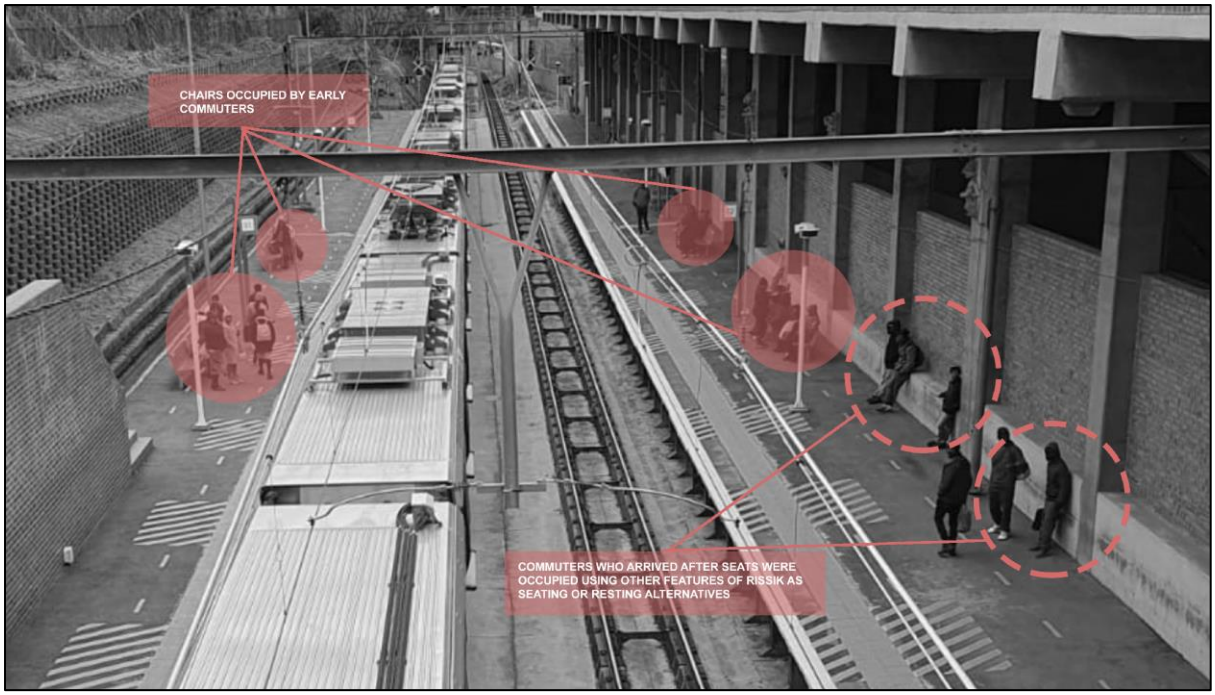

Figure 18: A photograph illustrating commuters finding alternative solutions due to a lack of seating (Author, 2023).

Figure 19: A photograph illustrating commuters finding seating alternatives (Author, 2023).

Outside of Rissik Station little public interface and comfort provision has been provided by PRASA, particularly opportunities for seating outside the station. Informal traders, who have been accommodated for by the government (informal permanent traders) with picnic tables and storage facilities have the means to sit comfortably during the day whilst they conduct business, as well provide opportunities for customers to dwell in the environment. However, informal temporary traders are required to provide for their own seating requirements and for those who have to commute via taxi or train (of which taxi's charges individuals for the additional seats that are occupied with luggage, or the train that limits the amount of goods you are allowed to transport (under the seat or on your lap to not obstruct the gangway of the train), informal temporary traders are unable to bring

seating options and are required to find alternative solutions. The informal temporary trader (human), manipulates materials of their existing context to accommodate the lack of seating, the non-human (loose bricks and rubble) transform from their structural purpose to accommodate and facilitate trade, which accommodates for the free arrangement of the informal trade providing for human agency, however the non-human agent (the brick or rubble) is assembled in alternates ways which informs spatial allocation and programme for the informal trader. The bricks are clustered and assembled vertically (in soldier course) to provide seating for the human, rubble is assembled in large quantities, with a timber board and tablecloth which acts as both storage and a display of the produce that they sell. In other instances, where gas cooking does occur, bricks are used as a plinth for the gas cylinder.

Figure 20: A photograph of a permanent informal trader with chairs and tables set out for lunch (Author, 2023).

Figure 21: A photograph of a temporary informal trader's seat for a day of trading - made using found materials (Author, 2023).

Figure 22: A photograph of the materials used by temporary informal traders for setting up their business (Author, 2023).

8.1.1.3 Rissik Station Shade

Shade provision is also limited, few seats have been equipped with shelter however much of the waiting platform remains exposed to the elements. Days that are warmer, brighter, or rainy create discomfort for commuters that wait for extended periods of time. As a result, the lack of shading instruments forces humans to utilise different parts of the provided non-human urban landscape (pedestrian bridges and stairways). In such circumstances commuter groups choose to wait in the station near the ticket's office, beneath the pedestrian bridges and the abutting staircases, or people resort to other methods (a common practice is to carry an umbrella on a regular basis for commuters to shield themselves from the sun or rain). Similarly, the effectiveness of the shading device or shelter (the ability to protect waiting commuters from the sun or rain), is also analysed. Users on warmer days, where the sun is low enough to create significant glare and the heat that is absorbed and radiated from the metal seats, adapt the way that they utilise the provided seating. Users tend to sit on top of the backrest (the part

usually shaded by the sun), and their feet on the seat of the bench, this positions the user within the angle of shade.

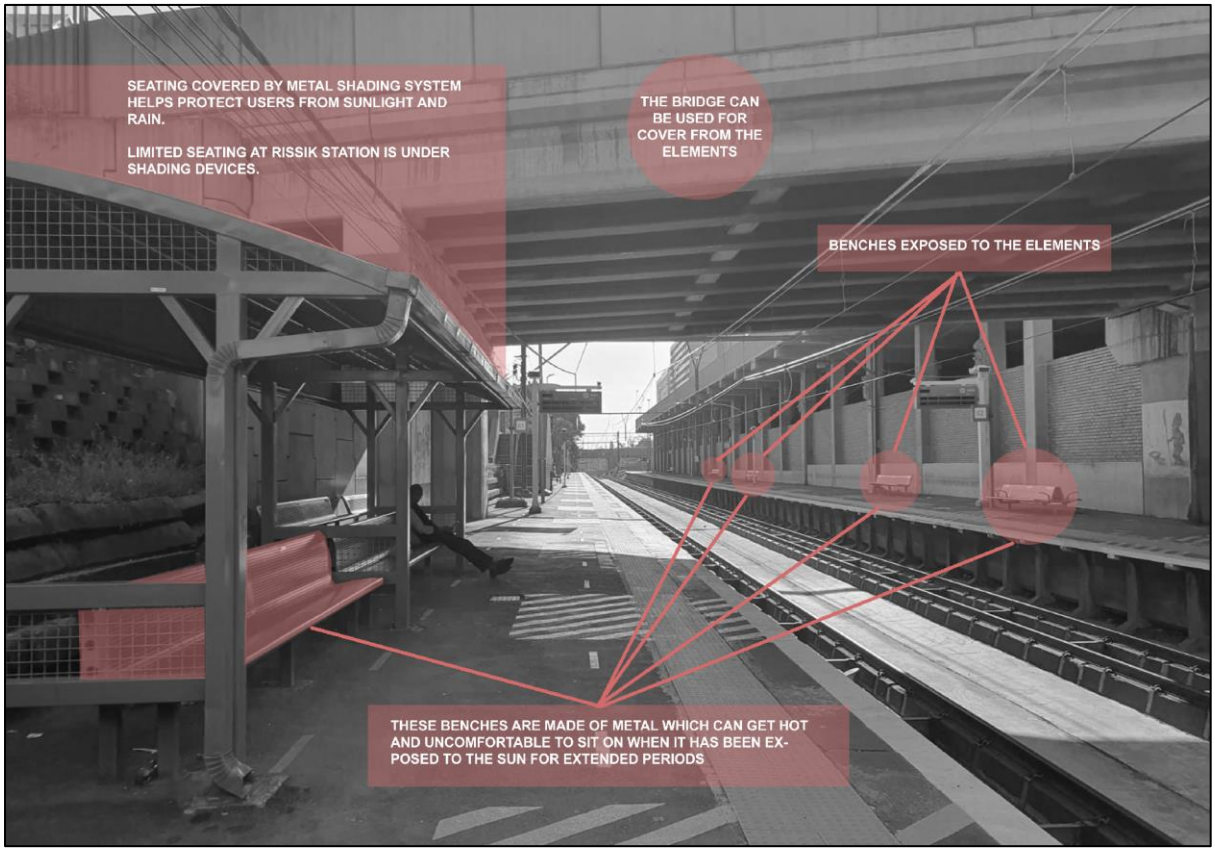

Figure 23: A photograph illustrating the shade provision of Rissik Station (Author, 2023).

Figure 24: A photograph illustrating commuters using the stairs for shade (Author, 2023).

8.2 NON-HUMAN AGENCY (ECONOMIC EFFICIENCY)

8.2.1 RISSIK STATION AND ECONOMY

8.2.1.1 Pienaarspoort-Pretoria Railway Line Schedules and Affordability

The study of perpetuating inequalities, and network opportunities would inform urban strategies for an inclusive economic upliftment. To further understand the circumstances and conditions of the disadvantaged majority, a critical analysis of their transport preference was conducted (refer to appendix page 44). Many of the participants addressed that PRASA's Metrorail is the most affordable option for an everyday commute to work, but they also expressed concerns of overcrowding at peak times (between 5-8am and 3-5pm), which often results in commuters waiting for extended periods of time as the train was too full to board (it should be further investigated if this affects their work e.g. enough space on the train for traders to transport their goods). Participants also voiced safety concerns, particularly for commuters waiting in the evening. The train is also infrequent, averaging a 45-minute wait during train intervals which is also accompanied by frequent delays. There are also few train stations and therefore the proximity of the station to the commuters' intended location is not always desirable. For these reasons this transport system is inconvenient to the regular commuters. However, a deeper investigation into the data reveals that many commuters have been using this transport for more than a year. Which indicates that there may not always be, for these regular commuters, a choice between affordability and convenience.

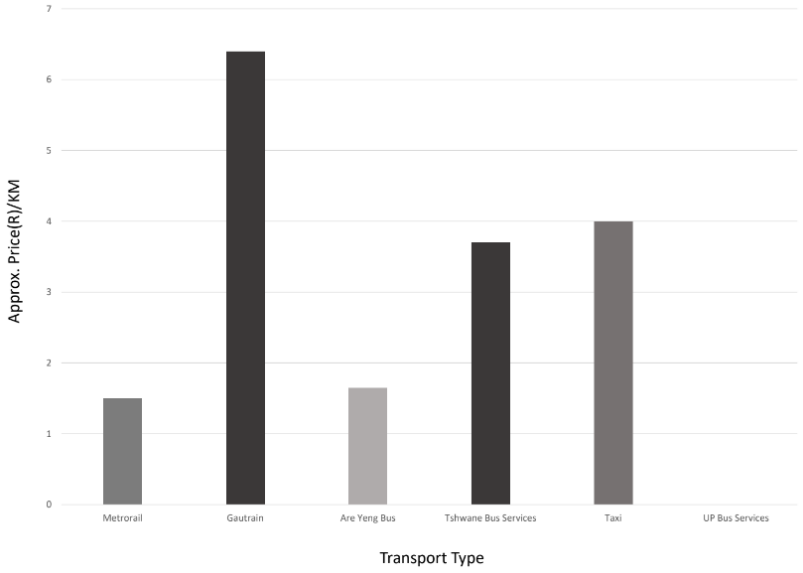

Figure 25: A graph illustrating the approximate price (R/km) of public transport (Urban Infrastructure Research Group, 2023).

Frequency of public transport and running times for Hatfield based stations

	Weekdays				Weekends			
	Times		Frequency of trips		Times		Frequency of trips	
Public Transport System	Operating Hours*	Peak Times**	Peak times	Off-peak times	Operating Hours	Peak Times	Peak times	Off-peak times
Gautrain	05:08- 21:24	AM: 06:00- 08:00 PM: 16:00-18:30	Every 10 minutes	Every 20 minutes	Sat & Sun: 05:30- 20:30	09:00-16:00	Every 20 minutes	Every 30 minutes
Metrorail: Rissik	04:51 - 19: 36	AM: 05:53-08:53 PM: 15:58- 17:28	Every 45 minutes	Every 90 - 120 minutes	Sat: 05:22- 19:41	AM: 05:20- 07:19 PM: 15:59 - 19:41	Every 60 mins	Every 120 minutes
					Sun: 06:11- 19:19	No obvious peak times	Every 120 minutes	
Metrorail: Hartebeesspruit	04:49- 19:37	AM: 05:51 - 07:57 PM: 15:56 - 17: 26	Every 40 minutes	Every 90 - 120 minutes	Sat: 05:24- 19:43	AM: 05:24- 07:23 PM: 16:01- 19: 43	Every 60 minutes	Every 120 minutes
					Sun: 06:13- 19:21	No obvious peak times	Every 90- 120 minutes	
Areyeng Buses	05:00- 19:50	No specified peak times found	Every 10 minutes	Every 20 minutes	Sat: 05:20- 19:40	No obvious peak times	Every 30 minutes	
					Sun: 05:30- 19:50	No obvious peak times	Every 60 minutes	
Tshwane Buses	06:10- 18:10	AM: 06:40- 08:00 PM: 16:10- 17:10	Every 5- 15 minutes	Every 60-90 minutes	Sat: 06:30- 13:45	No obvious peak times	Every 60-120 minutes	
					No service			
UP Buses	06:40- 18:00	AM: 06:40- 9:00 PM: 13:40- 17:40	Every 20 minutes	Every 40 minutes	No service			
PUTCO Buses	There is lack of information for PUTCO buses and their schedules							
Taxis	Taxis are a flexible service, therefore, their frequency & times are variable							

*When not specified by service provider -operating hours were deduced from when the first and last train/ bus leaves the station/ bus stop
** If not specified by service provider - peak times were deduced from the variation in trip frequency

Figure 26: A table depicting the frequency of public transport and running times for Hatfield based stations (Urban Infrastructure Research Group, 2023).

8.2.1.2 Rissik Station Storage

Informal traders, both permanent and temporary, have operated outside Rissik Station almost every day for many years. PRASA, however, through its modernisation process, prohibits and restricts any informal trade occurring within their premises. Since no trade operations can occur inside Rissik Station, and based only on insitu observations - no provision has been provided to traders operating outside the station - traders find alternative means to successfully operate within their chosen location. Informal permanent traders (humans) operating on the public green space across from Rissik Station, can achieve agency, through state sponsored furniture (non-human). The most significant contribution to human agency, is the provision of storage (non-human). For permanent informal traders, storage enables them to keep larger equipment, such as cooking appliances, tables, chairs, tablecloths, charcoal, gas and some produce in the area of operation, providing economic resilience, as the business does not depend on an individual responsibilities to provide equipment for the business to function, it also provides users with the freedom to choose the transport that best suits them, without requiring transport to facilitate their business needs (such as the transport of goods). Storage also means that any *mise-en-place* can occur on site, as a result these informal permanent traders can produce a large amount of food for its customers. Informal temporary traders with private vehicles, can store some cooking equipment (such as gas and a gas stove), some produce and snacks, and they are also able to transport their own seating and shading structures. However, these temporary informal traders are limited economically to the amount of goods they are able to transport. The ownership of the private vehicle does enable them to arrive earlier in the morning and stay later in the evening. However, since most customers rely on the Metrorail commute and therefore conform to the Metrorail time schedule (where the busiest times are in the morning from 5:00 to 7:00 and 15:00 to 17:00) most informal traders do not stay longer than these times. Informal traders, who commute via taxis and Metrorail, are significantly limited economically and the most othered, as they are unable to transport many goods during the day, and the produce they bring with are fruits, snacks, and cigarettes. These traders are limited to a portable storage container system that contains all the produce they are allowed to carry on the Metrorail or taxi, which restricts the produce quantity they can sell in a day. They operate as early as the train schedule allows, and as late as the what the economy (customer foot traffic increases because of close of business) would allow (approximately 15:00-17:00). These humans do not have the means to cook, provide seating or shelter.

Figure 27: A photograph of the PRASA's rules at Rissik Station (Author, 2023).

Figure 28: A photograph of a permanent informal trader situated on the public open space outside Rissik Station (Author, 2023).

Figure 29: A photograph of a temporary informal trader with a private vehicle (Author, 2023).

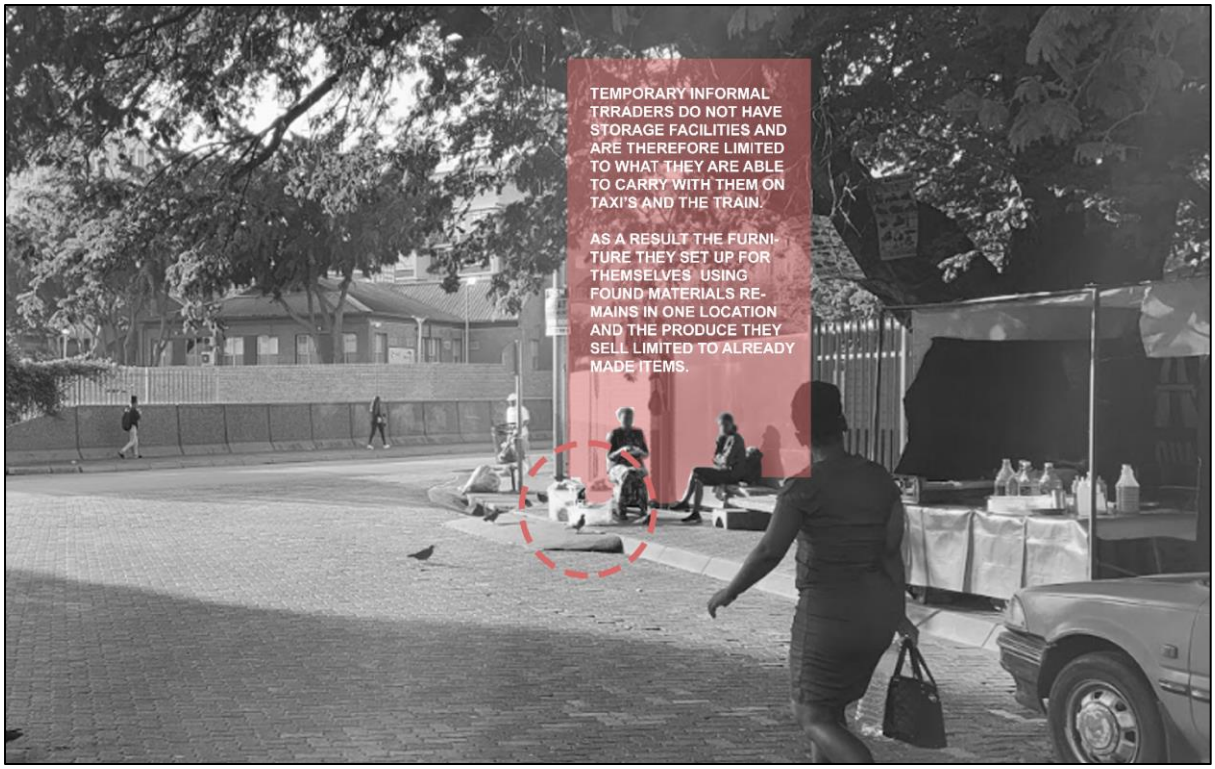

Figure 30: A photograph of a temporary informal trader who relies on public transport (Author, 2023).

8.2.1.3 Rissik Station Pavements

Pavements surround Rissik Station informing the circulation routes and the navigation of the urban space for railway commuters and other pedestrians travelling to work. It has a rational design of grey brick pavers and kerbing, around 1.5meters wide north of Rissik Station. Towards the east of the station (running north-south) the paving begins to widen to accommodate the flow of pedestrians crossing the bridge on Festival Street. Towards the west, similarly, the pavement widens and includes bicycle lanes. However, due to the PRASA Metrorail policies prohibiting trade from occurring within the train station, some traders adapt to Rissik Station's immediate context. In this instance the posthumanist perspective acknowledges human agency which includes the freedom to move and make decisions, as well as non-human agency, which is the ability of the pavement to inform the routes pedestrians must take to get to their desired destination. The posthumanist lens also investigates the exchange between the human and non-human as an exchange without boundaries. In this instance, the human changes the intended function of the non-human pavement (pedestrian circulation), and the ability of the non-human to facilitate and inform a secondary function (informal trade). Observations indicate that traders are positioned along routes of higher pedestrian foot-traffic. On site, the most frequently used pedestrian path occurs on Festival Street. Traders have strategically positioned themselves on pavements outside the Rissik Station perimeter. The non-human pavement informs the human trader where their trade can occur as well as the boundary of their trade. The non-human pavement is a raised platform, protecting produce from stormwater runoff, the pavement kerb fronts the trade exchange, and the pavement provides traders a space of safety which still accommodates pedestrian circulation as well as space for vehicles.

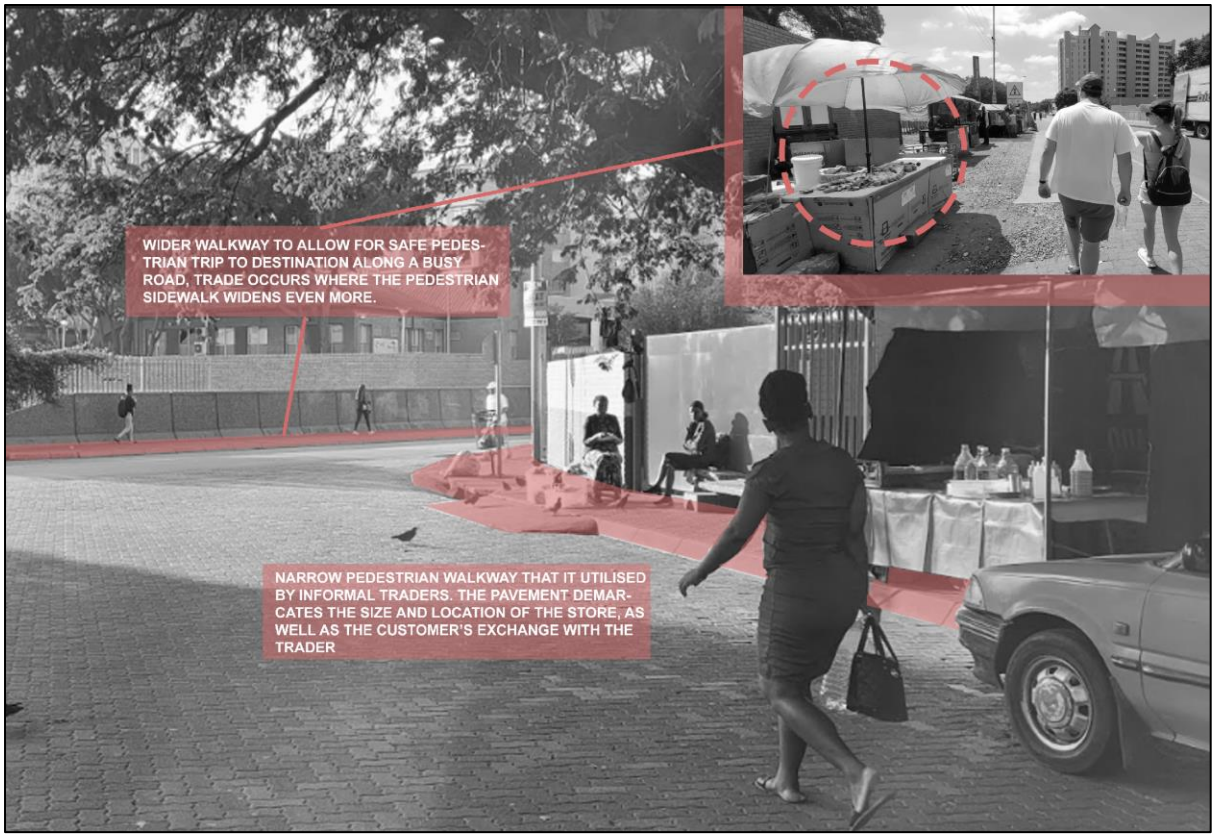

Figure 31: A photograph illustrating the use of the pavement by traders and pedestrians around Rissik Station (Author, 2023).

8.3 NON-HUMAN AGENCY (ENVIRONMENTAL SUSTAINABILITY)

8.3.1 RISSIK STATION AND THE SURROUNDING LAND USES

8.3.1.1 Rissik Station Boundaries and Access

Boundaries and access to Rissik Station limit users to a single entry and exit. The functional intention is to control access and ensure that all users entering or exiting the station does so with a valid ticket, indicating that they have paid for the Metrorail service. The existing barriers limits any potential of Rissik Station engaging with the immediate social or economic opportunities of its context (such as the open green space, retail, trade, transport, and pedestrian circulation). With many other urban stands doing the same thing, the pedestrian commute, like Rissik Station becomes an engineered inhospitable and sterile interface. However, posthumanism reveals that the non-human (the boundary/gate) as having agency over its human users (commuters and traders). For commuters, the physical form of the 3 meter high boundary (non-human), with anti-climb spikes has agency directing commuters toward the narrow gate threshold, before approaching the tickets office, however informal traders (humans) utilise the boundary as a spatial demarcation to define the area from which they trade, it also becomes a vertical apparatus to store furniture, business signs, a structural member to assemble their gazeboes, as well as a backrest for their seating. This indicates that boundaries, that are put in place for security purposes, can be implemented providing for some public interface for its commuters or informal traders to connect to social and economic exchanges in the area.

Figure 32: A photograph illustrating Rissik Station's boundary (Author, 2023).

8.3.1.2 Rissik Station Greenery

Outside Rissik Station, in contrast to the austerity of Rissik Station, is public open space with trees. Understanding this space through a post-humanist perspective, specific to commuter, informal trader and working people needs (humans), and the non-human natural features of the public open green space provides a unique representation of why this public open space in its immediate response to context is an important non-human and human exchange. This public open space and its position within the Hatfield context and Rissik Station, provides a welcomed juxtaposition for humans in the built urban fabric that comprises mostly of engineered infrastructural components with barriers restricting access into these buildings. Trees (non-humans) beyond providing ecosystem services of shade, reduces glare, biophilia and evaporative cooling (results of the natural primary functions and processes that counteract the radiating heat from the built environment), brings about comfort for traders, commuters, and dwellers. However, the way in which informal traders have utilised physical attributes of trees provides secondary functions of value. The position of trees, outside Rissik Station, becomes architectural, defining comfortable spaces with the built environment for traders to operate and define programmes. On the public open space, traders set up picnic tables, and seating between tree clusters, and the trees facilitate a comfortable dining experience. Whereas the open public space or park (non-human), becomes a meeting point for humans in the area, both non-human agents of seating, tables and the green space hosts the rituals of lunch for workers and students in the area. In the afternoon, the public open green space, facilitates social activities such as soccer games as well as a change of scenery of the built Hatfield context. The green space provides an area, that accommodates the sharing of ideas, social activities (like friendly soccer matches), comfort, trade providing local food, and biophilic relief. Moreover, the public open space allows for human agency, accommodating free thinking and decision making, as well as providing a sense of identity for humans using the space.

Figure 33: A photograph of permanent informal traders utilising green spaces (Author, 2023).

Figure 34: A photograph of commuters and residents playing soccer in the park (Author, 2023).

9 THE DISCUSSION – TOWARDS MORE-THAN-HUMAN

The research conducted of Rissik Station aimed to understand what hard and soft infrastructures of this railway station (non-human actors) contribute to urban inequality by studying the intra-actions between human and non-human actors, so that new insights and approaches can be developed to reduce inequity experienced in similar pre-apartheid and apartheid-built neighbourhood station typologies. Whereas the application of the posthuman critique aimed to reveal the transformation of existing refurbished rail infrastructure servicing former white regions to achieve social equity and justice. Since PRASA is currently undergoing a modernisation process of existing railway stations, the most affordable option of implementing social justice change to adapt the already built

station environment to consider more of the human component. To do so, principles of Deleuze, Guattari and Barad are applied. The outlook on spatial interventions should understand the human as equally routed and a part of the environment as the non-human actors (immanence), that urban designers should be aware and study the multiple perspectives between human and non-human actors (intra-action and diffraction) which reveals perspective differences, to understand the effect of these differences between human and non-human actors, and how these differences may relate to one another. Applying these principles in the analysis of Rissik Station, helped reveal some spatial strategy deductions to adapt and transform Rissik Station's environment.

9.1.1 GREENERY

Outside Rissik Station the public open space is populated with trees, and green spaces. This environment provides benefits of biophilia, evaporative cooling and shade. It also prompts areas for congregation and hosts social activities such as the soccer games and eating lunch at the permanent informal traders. Greenery implemented in the station can provide a visual break between the austere railway environment, as well as prompt areas for social gathering, that can allow for the exchange of ideas, knowledge, and opinions whilst commuters wait for their train. This can also offer shade in areas, that are exposed to direct sunlight for extended periods of time, making the station more habitable and hospitable on hotter days, cooling its users in an environment that is made of brick and concrete.

9.1.2 SHADE

The provision of shade should be applied strategically across the station in areas where people tend to congregate which is usually around urban infrastructure components like security camera posts, lamp posts, stair balustrades, retaining walls and structural systems where people rest if other seating options are not available. Due to the train arrival and departure frequency and peak train-use hours during the day, platforms can become busy and often congested, resulting in people arriving to the platform later than others, exposed to the elements. Shade components should be pulled away from the railway lines, and towards zones of congregation (such as the provided seating, and other station components that are used as a substitute, this will allow clear visual access on the platform as well as preventing obstacles along the railway platform for people getting on and off the train, it will also encourage waiting commuters to stay a safe distance from the railway lines. Lastly, the provision of shade devices should also provide users protection from other weather conditions such as rain.

9.1.3 PAVEMENTS

Pavements have become spatial demarcations for traders to operate on whilst maximising on the economic opportunities presented by the high pedestrian foot traffic around Rissik Station. Pavements around Rissik Station are at a width comfortable for two pedestrians to walk on side-by-side, and in some cases, the pedestrian walkway is wide enough to accommodate cyclers. However, temporary informal traders outside the station, who utilise the pedestrian walkway, requires people to navigate around them. Outside Rissik Station, where there is an increased chance of informal traders operating their business, widening, and narrowing pedestrian walkways can control the arrangement of informal traders to better accommodate them along safer and economically desired circulation routes, as well as the pedestrian customers. Narrowing the pavement will restrict the space in which traders can set up their business and allow for the safe and free movement for the pedestrian travelling to their destination. Whereas widening the pavements along the quieter roads leading towards Rissik Station may provide for a more comfortable location for traders, as well as seeing an increased number or size of informal trader businesses, providing some economic opportunity for people from non-white poorer communities. This may also increase the convenience of the users' daily commute, allowing them to be exposed to more and affordable goods along their commute, without having to walk further distances to shops. The increase in local goods, and traders may increase a local identity around the station.

9.1.4 SEATING

Rissik Station is populated by a few metal benches. The benches that do not have shading devices, are exposed to weather conditions such as rainy or hot summer days which affects the usability of these benches, as well as the comfort of the user. By implementing sheltered seating arrangements can maximise on the number of seats that can comfortably be used by waiting commuters. Incorporating other flexible seating arrangements, like ledges on the walls of the station or seats around lamp and security camera posts, increases the number of seating arrangement choices for the commuter, improves the comfort of the waiting commuter and can allow for more social exchanges.

9.1.5 STORAGE

Storage examined during the posthuman critique of Rissik Station showed a significant flexibility in informal trader operations. Allowing traders to store equipment in the business location, requiring very little set up and limited transportation of the necessary goods and equipment needed to conduct business for the day. This means that cooking equipment, consumables, shelter or shade and seating, can be stored allowing the trader's business to range from a selection of snack items, apparel, or meals. In addition, the trader can choose their public transport of preference for their commute, as they do not have to depend on taxis or private vehicles to transport them close to their trade location (so they can walk shorter distances carrying all the goods they intend on selling).

Traders who have access to storage do not have to carry a limited amount of goods, which is restricted by allowable luggage on the train, or the added costs of transporting goods which will occupy another seat in a taxi. Therefore, implementing optional rentable trader storage facilities inside or outside Rissik Station can ensure operational security and agency for traders, whilst improving economic opportunities and strengthening the identity and therefore sense of place.

9.1.6 BOUNDARIES AND ACCESS

The boundaries of Rissik Station regulate the access of commuters entering or leaving the train station. However informal traders utilised the boundary fences to spatially demarcate their setup, some mount posters of their businesses. In other instances, the anti-climb spikes are used for storage, as one trader stacks the chair on top of the fence. Boundaries of Rissik Station can be adapted to provide interactive systems to assist with the presentation of produce, storage, or posters to better promote trader businesses, as well as activating built environment interfaces into something that is more responsive and engaging for urban dwellers.

10 CONCLUSION

This research aimed to understand urban inequality within the context Hatfield's public transport infrastructure, which was explored through socio-spatial perspectives and hard and soft infrastructural interactions to reveal new insights and help derive critical urban and design considerations, for professionals, to inform a design thinking of urban equality. The investigation into hard and soft infrastructure interactions, relevant to the contextual topic of perpetuated inequalities of public transport infrastructure in Tshwane, were defined and distinguished critically through attributes of tangibility (the habitable environment as hard infrastructure and the dwelling spaces of hard infrastructure components) and the intangible that informs or measures the operational efficiency of hard infrastructure (soft infrastructure). This deliberate distinction aims to articulate a relational topography for investigation and reveal patterns of hard and soft infrastructure interactions. Tracing current patterns of urban inequalities, in this research, started at PRASA's Rissik Station, which was studied as the hard infrastructure within the context of Hatfield. This study revealed that much of the hard infrastructure of Rissik Station and its integration with the economic context was directly influenced by the white apartheid political powers and the strict and rational spatial planning policies they implemented during apartheid, which saw racial othering through territorial settling of the non-white majority at city peripheries and with-it unequal access to economic opportunity (due to increased travel time, regulated access, and increased travel costs). Furthermore, engineers involved in the construction of many Metrorail stations during apartheid, followed top-down approaches that resulted in passenger-rail stations designed and constructed to achieve operational efficiency resulting in a monofunctional, rational, and inhospitable transport gateway failing to achieve third world triple bottom line of social justice, economic efficiency, and environmental sustainability.

Posthumanism was therefore applied to the study of hard and soft infrastructure interactions to uncover the inherited and persisting engineered attributes of mono-functionality, rationality, and efficiency of Rissik Station and its hard infrastructure components that perpetuate racial othering. This investigation was conducted as an analysis of non-human (both living and non-living actors) and human actor exchanges from multiple perspectives to reveal the aforementioned hard infrastructural limitations of Rissik Station, brought about by soft infrastructures of apartheid spatial planning policies and subsequent station modernisation programmes. This research focussed on two human-user groups, PRASA Metrorail commuters as well as the informal traders that utilise the Rissik Station boundaries for economic exchange. The individual experiences of each human actor user group and the spaces or hard infrastructural components in which they dwell, as well as the overlapping user interactions within their hard infrastructural context were analysed. This analysis revealed the engineered interventions of Rissik Station (non-human actors) have agency over humans influencing how they operate within the space. These systems, such as sidewalks and pavements, are rationally and monofunctionally designed as a result, the rigid designs imposed onto Rissik Station, its surrounding areas in proximity and the greater Hatfield context, limit the current disadvantaged non-white user demographic. Temporary informal traders outside Rissik Station lack occupational tenure because they do not have access to basic services such as ablutions, water, electricity, storage, security, or proper shelter, which also affects the trader's comfort and wellbeing in this environment, and their temporary setup (a factor of little service provision) inhibits a Rissik Station sense of place or identity.

Passenger rail commuters at Rissik Station are subjected to overcrowding and long waits between train arrival and departure intervals, with little provision to shelter waiting commuters from the elements. Commuters are also subjected to insufficient seating provisions which requires users to find alternative built forms to sit on or lean against. These factors contribute to commuter discomfort. Furthermore, the prohibition of trade within Rissik Station and the railway carriages, limited carriage space for transporting goods or luggage, as well as infrequent railway intervals and train delays, decrease the commuters' choices and limits user actions. This decreases the commuters' sense of agency and the convenience of the railway commute. Lastly, the grey painted station, its brick and concrete construction, and limited trade inhibits a Hatfield and commuter identity.

From this research, the application of the posthumanist critique of Rissik Station provides urban professionals with a critically reflective lens of urban components, their function, their agency over humans and its contribution to the meaning making of space. Where the processes of critical framing, understanding and analysis of hard and soft infrastructure interactions, observed through non-human agency and their associated characteristics that informs human action, make explicit the inequalities of transport gateways and their urban components in their given context. Therefore, the significance of this research, for practicing professionals, is a critique that inherently applies a way of thinking that is considerate of multiple perspectives that contributes to a layered understanding of spatial networks and how they function. These entanglements inform design decisions on how to best engage with and transform racially unequal spaces into places of social justice, environmental sustainability, and economic resilience. This critical framing, understanding and analysis of hard and soft infrastructure interactions, observed through non-human agency and their associated characteristics that informs human action, illustrates the inequalities of transport gateways and their contextual urban components...

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12 APPENDICES

12.1.1 TRANSPORT USER AND COMMUTER EPICOLLECT INTERVIEWS

Interviewee No.	Date	Time	Interview location	Gender	Age	Race	Occupation	No. of Dependents	Suburb of Residence	Purpose of Commute	Location for Transport Departure	Frequency of Commute	Preferred Mode of Travel	Reason	Difficulties Using Public Transport
1	27/03/2023	15:13	Pedestrian Walkway (Hatebeespruit Station)	Male	36-64	Black	Information redacted to comply with the ethical	2 to 3	Mamelodi	Work	Hartebeespruit Station (Taxi)	Daily	Train	Affordability	No
2	27/03/2023	15:01	Waiting Platform (Hartebeespruit Station)	Male	36-64	Black		2 to 3	Mamelodi	Work	Hartebeespruit Station (Train)	Daily	Train	Affordability	be fixed, trains don't operate over weekend - use taxi (expensive)
3	27/03/2023	14:51	Waiting Platform (Hartebeespruit Station)	Male	36-64	Black		2 to 3	Mamelodi	Work	Hartebeespruit Station (Train)	Once off	Taxi	Accessibility	Train is not accessible, times frequently change, confusing
4	27/03/2023	14:52	Waiting Platform (Hartebeespruit Station)	Male	18-22	Black		0	Mamelodi	Work	Hartebeespruit Station (Train)	Daily	Train	Accessibility	Trains don't work over weekends
5	27/03/2023	14:40	Waiting Platform (Hartebeespruit Station)	Male	23-29	Black		0	Mamelodi	Work	Hartebeespruit Station (Train)	Daily	Train	Affordability	Unreliable, overcorwding
6	27/03/2023	14:34	Waiting Platform (Hartebeespruit Station)	Male	36-64	Black		4+	Mamelodi	Work	Hartebeespruit Station (Train)	2-3 time a week	Taxi/Bus	Convenience	Taxi won't depart until its filled
7	22/03/2023	09:47	Bus Stop (Cnr of Burnett St and Festival St)	Female	30-35	Black		4+	Soshanguve	Work (looking for employment)	Rissik Station (Train)	Monthly	Train	Affordability	Taxi's are expensive
8	22/03/2023	09:14	Taxi Rank (Cnr of Paul Kruger St and Jeff Masemola St	Female	18-22	Black		0	Rustenburg	Studies	Taxi Rank (Cnr of Paul Kruger St and Jeff Masemola St	Monthly	Taxi	Affordability & Accessibility	Safety concerns, bad driving, dangerous people
9	22/03/2023	07:32	Pedestrian Walkway (Rissik Station)	Male	30-35	Black		1	Mamelodi	Work	Rissik Station (Train)	Daily	Train	Affordability	Fixed location of trains makes it inconvenient, train delays (he is then late for work)
10	22/03/2023	09:09	Kruger St and Jeff Masemola St	Female	30-35	Black		2 to 3	Bedfordview	Work	N/A	Once off	Taxi	Accessibility	Traffic congestion
11	22/03/2023	07:29	Waiting Platform (Rissik Station)	Male	23-29	Black		1	Mamelodi	Work	Rissik Station (Train)	Daily	Train	Accessibility	Xenophobia and hate crimes against LGBTQ

Interviewee No.	Period Commuting	Transport Budget (R)	Commute Duration	Walking Distance During Commute	Any Suggestions to Improve Public Transport Service	What Time Do You Use Public Transport?	Do You Purchase at Surrounding Vendors?	What Items Do You Purchase?
1	10+ years	21 to 40	16 to 30 minutes	10.1km+	Add more trains/ increase frequency of train/add buses to commute	5am-8am & 6pm+	No	N/A
2	10+ years	11 to 20	31 to 60 minutes	2.1 to 5km	Nothing	5am-8am & 6pm+	No	N/A
3	10+ years	21 to 40	0 to 15 minutes	N/A (private vehicle/taxi)	Should rather use private transport	5am-8am & 12pm-2pm	No	N/A
4	1+ years	11 to 20	16 to 30 minutes	N/A (takes taxi)	Nothing	5am-8am & 3pm-5pm	No	N/A
5	1+ years	91+	31 to 60 minutes	1.1 to 2km	Nothing	5am-8am & 3pm-5pm	No	N/A
6	10+ years	41 to 90	0 to 15 minutes	N/A (takes taxi)	(reason for train being seconf option)	5am-8am & 3pm-5pm	Yes (informal vendors)	Snacks
7	10+ years	11 to 20	31 to 60 minutes	1.1 to 2km	Nothing	5am-8am & 3pm-5pm	No	N/A
8	Less than a month	91+	61+ minutes	0 to 1km	Bathrooms, shelter and shade at near taxi's	5am-8am	No	N/A
9	Less than 6 months	11 to 20	16 to 30 minutes	0 to 1km	Trains should be available and on time	5am-8am & 3pm-5pm	Yes (informal vendors)	Snacks
10	Less than a month	91+	61+ minutes	N/A (takes taxi)	Nothing	N/A	No	N/A
11	Less than a month	11 to 20	0 to 15 minutes	N/A	Nothing	5am-8am	Yes (informal vendors)	Snacks

12.1.2 INFORMAL TRADER EPICOLLECT INTERVIEWS

Interviewee No.	Date	Time	Interview location	Gender	Age	Race	Occupation	No. of Dependents	Suburb of Residence	Purpose of Commute	Business Operation Period	Frequency of Commute	Preferred Mode of Travel	Reason	Difficulties Using Public Transport
1	19/05/2023	16:10	Information redacted to comply with the ethical clearance.	Male	30-35	Black	Vendor	2 to 3	Soshanguve	Work	Year+	Daily	Taxi	Reliability	Time (has to leave home early and gets home late), train is too far
2	17/05/2023	08:36		Male	65+	Black	Vendor	4+	Mamelodi	Work	10+ years	Daily	Taxi	Convenience	Charged extra for carrying bag of produce (takes up extra space), expensive, long walk carrying goods
3	15/05/2023	07:56		Male	30-35	Black	Vendor	1	Soshanguve	Work	Less than 6 months	Daily	Private Vehicle	Convenience/ Flexibility	Taxi's drive dangerously, follow roundabout routes to collect more people, taxi is more expensive than private vehicle, pays extra to carry goods
4	27/03/2023	15:26		Male	36-64	Black	Vendor	2 to 3	Mamelodi	Work	10+ years	Daily	Train	Affordability (stores goods at station)	No
5	22/03/2023	14:50		Female	30-35	Black	Vendor	1	Sunnyside	Work	Less than a year	2-3 time a week	Private Vehicle	Convenience	Difficulty carrying products, no additional space is allowed on train, and you pay for the extra space on taxis (she has a lot of products)
6	22/03/2023	09:38		Female	36-64	Black	Vendor	2 to 3	Arcadia	Work	Less than a year	Daily	Private Vehicle	Convenience/ Affordability	No
7	22/03/2023	07:56		Female	36-64	Black	Vendor	2 to 3	Arcadia	Work	10+ years	Daily	Train	Convenience	No
8	22/03/2023	07:49		Female	30-35	Black	Vendor	2 to 3	Mamelodi	Work	10+ years	2-3 time a week	Taxi	Accessibility	No
9	22/03/2023	07:28		Female	30-35	Black	Vendor	0	Atteridgeville	Work	10+ years	Weekly	Taxi	Affordability/ Reliability	No

Interviewee No.	Operating Hours	Transport Budget (R)	Commute Duration	Walking Distance During Commute	Any Suggestions to Improve Public Transport Service	What Time Do You Use Public Transport?	Where Do You Source Your Products?	What Snacks Do You Sell?
1	5am to 7pm	91+	61+ minutes	0 to 1km	Nothing	3am-5am & 6pm+	Marabastad Market	Snacks
2	7am to 5pm	41 to 90	31 to 60 minutes	0 to 1km	Shorter walks to trading spot	5am-8am & 3pm-5pm	Marabastad Market	Snacks
3	4:30am to 4:30pm	91+	31 to 60 minutes	0 to 1km	To not have to pay extra for carrying goods	3am-5am & 3pm-5pm	Makes products himself (baked goods)	Snacks
4	5am to 7pm	21 to 40	16 to 30 minutes	10.1km+	Add more trains/ increase frequency of train/add buses to commute	5am-8am & 6pm+	Marabastad Market	Snacks and other
5	10am to 4pm	91+	0 to 15 minutes	0 to 1km	To receive occupation tenure, she is not registered to sell, worried about police affecting her business	N/A	Johannesburg markets	Other
6	7am to 6pm	91+	0 to 15 minutes	N/A	Nothing	5am-8am & 6pm+	Marabastad Market and Johannesburg market	Apparel and other
7	6:60am to 4:00pm	91+	0 to 15 minutes	0 to 1km	Already has ability to store equipment on site, therefore easier commute, more transport options	5am-8am & 3pm-5pm	Marabastad Market	Meals
8	5:00am to 8:30pm	41 to 90	31 to 60 minutes	1.1 to 2km	Nothing	5am-8am & 6pm+	Makes products herself (baked goods)	Snacks
9	5:15am to late	41 to 90	31 to 60 minutes	0 to 1km	Nothing	5am-8am & 6pm+	Pretoria CBD Delivery	Meals

12.1.3 INTERVIEW OUTLINES FOR TRANSPORT USERS AND OPERATORS

DIT 801: Ethical Clearance Interview Outline: Transport Users & operators

Preface:

As a group we will be conducting semi structured interviews for data collection for the research topic of Urban Infrastructure & Inequality under the supervision of Paul Devenish.

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Research Topic: Urban Infrastructure and Inequality:

Prior to the interview we will introduce ourselves as students from the University of Pretoria conducting research to gain an understanding of how different people use transport daily. Upon consent we will proceed to ask a series of short questions relating to the use of public transport. The answers shall be noted through text on our cell phones.

These are typical question examples we would ask in order to gain insight into the general movement patterns of commuters and the general demographics. Some questions will have a series of options to select from and others will be specific to the individual. The participants may be asked to draw their daily commute and other movements on a map. Data may also be collected in the form of an online survey. This list of questions serves as a guide the interview and will depend on how much time the interviewee has available:

Demographics

1. What is your:
2. Gender? Female/Male/Other
3. Age?
4. Nationality?
5. Race? Black/White/Coloured/Indian/Asian/Other
6. Profession/occupation?
7. Do you have any dependents?
8. Do you have any impairments? (if applicable)
9. Do you have difficulties due to impairments? (if applicable)

Patterns of movement

10. What suburb do you live in?
11. Have you experienced any difficulties with using public transport?
12. What do you enjoy about using public transport?
13. To where and from where are you travelling?
14. What is the purpose and frequency of the journey?
15. Which mode of transport do you frequently use?
16. Is this form of transport easily accessible?
17. How long have you been commuting?
18. What other options of travelling are available? (Public and private)
19. Why do you choose to use this/these modes of transport?
20. What is your daily estimated transport budget?
21. What do you do when you can't access this mode of transport?
22. What is the duration of your commute?
23. How far do you walk/ cycle (other) along your journey? (0-2km, 2-5km, 5-10km.)

General questions

24. What are the safety concerns and difficulties within your journey?
25. What services/ infrastructure or support facilities could you add to your route to make your experience more comfortable/ convenient?
26. What could make your journey safer?
27. Are there any sanitation issues on the public transport you take?
28. Were there any events that caused you to use public transport/ change the type of public transport?
29. What times do you generally use transport?
30. Why do you use transport at this time?
31. Did working online/remotely during the Covid pandemic relieve transportation related issues?

Neighbouring economy

32. Do you purchase at the stationed vendors?
33. What kinds of products do you purchase?
34. When do people buy from you most and what item is it?

12.1.4 INTERVIEW OUTLINES FOR INFORMAL VENDORS

DIT 801: Ethical Clearance Interview Outline: Informal vendors

Preface:

As a group we will be conducting semi structured interviews for data collection for the research topic of Urban Infrastructure & Inequality under the supervision of Paul Devenish.

All researchers are students from the Department of Architecture at the University of Pretoria:
Christopher Thompson, 0780103887, u18080295@tuks.co.za
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Research Topic: Urban Infrastructure and Inequality:

Prior to the interview we will introduce ourselves as students from the University of Pretoria conducting research to gain an understanding of how different people use transport daily. Upon consent we will proceed to ask a series of short questions relating to the use of public transport. The answers shall be noted through text on our cell phones.

These are typical question examples we would ask in order to gain insight into the general movement patterns of commuters and the general demographics. Some questions will have a series of options to select from and others will be specific to the individual. The participants may be asked to draw their daily commute and other movements on a map. Data may also be collected in the form of an online survey. This list of questions serves as a guide the interview and will depend on how much time the interviewee has available:

Demographics

1. What is your:
    1. Gender? Female/Male/Other
    2. Age?
    3. Nationality?
    4. Race? Black/White/Coloured/Indian/Asian/Other
    5. Profession/occupation?
2. Do you have any dependents?
3. Do you have any impairments? (if applicable)
4. Do you have difficulties due to impairments? (if applicable)

Patterns of movement

5. What suburb do you live in?
6. Have you experienced any difficulties with using public transport?
7. What do you enjoy about using public transport?
8. To where and from where are you travelling?
9. What is the purpose and frequency of the journey?
10. Which mode of transport do you frequently use?
11. Is this form of transport easily accessible?
12. How long have you been commuting?
13. What other options of travelling are available? (public and private)
14. Why do you choose to use this/these modes of transport?
15. What is your daily estimated transport budget?
16. What do you do when you can't access this mode of transport?
17. What is the duration of your commute?
18. How far do you walk/ cycle (other) along your journey? (0-2km, 2-5km, 5-10km.)

Emergent Economy

19. How long have you been operating here?
20. When do you start and how long do you operate for?
21. What did you do before operating here?
22. Where do you source your products?

13 ETHICAL CLEARANCE LETTER

UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

Faculty of Engineering, Built Environment and Information Technology

Fakulteit Ingenieurswese, Bou-omgewing en Inligtingtegnologie / Lefapha la Boetšenere, Tikologo ya Kago le Theknolotši ya Tshedimošo

27 March 2023

Reference number: EBIT/35/2023

Mr CJ Thompson
Department: Architecture
University of Pretoria
Pretoria
0083

Dear Mr CJ Thompson,

FACULTY COMMITTEE FOR RESEARCH ETHICS AND INTEGRITY

Your recent application to the EBIT Research Ethics Committee refers.

Conditional approval is granted.

This means that the research project entitled "Urban Infrastructure and Inequalities" is approved under the strict conditions indicated below. If these conditions are not met, approval is withdrawn automatically.

Conditions for approval:

This approval is conditioned to the UP Survey Committee's approval. Submit the approval from UP Survey Committee once obtained under Docs Due Conditional Approval.

This approval does not imply that the researcher, student or lecturer is relieved of any accountability in terms of the Code of Ethics for Scholarly Activities of the University of Pretoria, or the Policy and Procedures for Responsible Research of the University of Pretoria. These documents are available on the website of the EBIT Ethics Committee.

If action is taken beyond the approved application, approval is withdrawn automatically.

According to the regulations, any relevant problem arising from the study or research methodology as well as any amendments or changes, must be brought to the attention of the EBIT Research Ethics Office.

The Committee must be notified on completion of the project.

The Committee wishes you every success with the research project.

Prof K.-Y. Chan
Chair: Faculty Committee for Research Ethics and Integrity
FACULTY OF ENGINEERING, BUILT ENVIRONMENT AND INFORMATION TECHNOLOGY