

MOBILITY SOLUTIONS TO SOUTHERN AFRICA CHALLENGES: INTEGRATED PUBLIC TRANSPORT NETWORK VIA MOBILITY- AS-A-SERVICE

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ABSTRACT

Mobility as a catalyst for; economic development and social inclusion is put under pressure in transport systems throughout Southern Africa, which experience recurring challenges of high urbanization rates, historic inequalities, fragmented infrastructure, and weakly functioning transport governance systems. Public transport is still the predominant mode of mobility, but frequently suffers underinvestment, disintegration, and an incapacity to cope with rapid urban population increase. These challenges are creating an opportunity for integrated and MaaS supported public transport networks as a potential path to economically viable, environmentally sustainable, and socially accepted mobility systems. This strategy combines formal and informal options, improves service chains, limits car reliance, and promotes SDGs. But development is hampered by significant obstacles like weak policy frameworks, a lack of funding, a lack of data, and cultural reluctance. Strategic policy reform, focused research funding, public-private collaborations, and public awareness and trust-building campaigns are all necessary to overcome these challenges. Southern African towns have a crucial chance to match mobility practices with the Sustainable Development Goals as they move toward integrated, MaaS-supported transport networks.

1. INTRODUCTION

Mobility is essential to both social inclusion and a region's economic development. Access to healthcare, work, and education, as well as the flow of people and commodities within an area, are all impacted by the quality of a region's transportation system (Pooley, 2017; Berg & Ihlström, 2019). Therefore, having sufficient transportation systems is essential. Rapid urbanization in Southern Africa has put a great deal of strain on transportation networks, resulting in the growth of informal settlements and infrastructure that is unable to meet the demands of the region's growing urban population (Mbara & Pisa, 2018; Nyamai et al., 2024).

Public transportation is the most popular form of transportation in both rural and urban regions, but it is usually underfunded, and the architecture thereof is considerably poor as it does not always respond to the needs of the community, which exacerbates mobility problems. The necessity for lasting inclusive mobility solutions has been highlighted by the ongoing mobility problems in Southern African nations. As a result, it is essential to meet the 2030 Agenda for Sustainable Development, which calls for transport infrastructure that is affordable, accessible, and resilient (Oviedo et al., 2022).

Investment and a move toward sustainable modes and systems of transportation offer a possibility to address the current mobility issues in Southern African policy frameworks. In order to offer a mobility solution that can be applied in Southern African nations, this essay

examines mobility challenges in the region using South Africa, Botswana, Zimbabwe, and Namibia as examples.

2. CURRENT MOBILITY CHALLENGES IN SOUTHERN AFRICA

Transport systems in Southern Africa face various challenges attributable to rapid urbanisation, existing transportation policies, poor planning and historical inequalities. According to Oviedo et al. (2024), the challenges are evident in urban areas as the urban areas experience fragmented transportation networks, rising car dependence, pollution and poor integration between transportation modes. Furthermore, the rapid growth of informal transportation modes such as minibuses, motorcycles and tuk-tuks, which are often unregulated, poses significant pressure on the available infrastructure as the demand outpaces infrastructure investment and maintenance (Mbara & Pisa, 2018).

Zimbabwe serves as an example of how fragmented transport systems have led to the rapid growth of informal systems, which have further impacted the country's mobility. The deregulation of formal transport is the source of the collapse of formal public transport, such as metro trains and buses. This gap in formal transportation enabled the operations of informal minibus taxis, which are now the main transport mode (Cirella et al. 2018). With the informal transport being unregulated and unevenly distributed, the taxi services are clustered in more profitable areas, while other regions of the country remain underserved. Additionally, Bonga & Sithole (2020) found that the deteriorating roads in Zimbabwe have not only impacted the country's mobility but have turned the country into a bottleneck on the north-south corridor, exposing broader institutional weakness.

Looking at the impact of historical inequalities on transport, South Africa and Namibia serve as examples. In South Africa, the legacy of apartheid has left low-income communities distant from economic centres, and post-apartheid efforts have fallen short of improving mobility for the majority who rely on public transportation (Mbara & Pisa, 2018; Thomas, 2013). Consequently, Namibia faces similar mobility issues, whereby unreliable and high costs of public transportation has forced low-income households to walk or spend up to 25% of their income on transport. Although initiatives like the Sustainable Urban Transport Master Plan (SUTMP) aim to promote cycling and reduce congestion, progress remains limited (Nyamai et al., 2024).

Furthermore, the mobility challenges linked to congestion are better defined through Botswana's capital city, Gaborone. The city is grappling with a surge in private vehicle ownership which is overwhelming road networks and increasing congestion (Bashingi et al., 2020). While the encouragement of modal shift to public and non-motorised transport could ease these pressures, policy implementation has been slow in the country.

Looking at the region as a whole, it is evident that, inadequate cross-border infrastructure continues to undermine connectivity, with slow progress despite integration programmes. As a result, trade and economic development across neighbouring countries is limited (Lisinge & van Dijk, 2022). Overall, Southern Africa's mobility challenges are characterised by lack of infrastructure, investment, integration and policy implications.

Regional connectivity and integration are imperative for market expansions and attracting investments. However, the southern African infrastructure networks remain unconnected through which limits the mobility and integration of the region. As a result, trade and economic development across neighbouring countries is inefficient. Overall, Southern Africa's mobility challenges are characterised by a lack of regional connectivity, adequate infrastructure and policy implications.

3. SOLUTION: INTEGRATED PUBLIC TRANSPORT NETWORK VIA MOBILITY-AS-A-SERVICE

Mobility issues in Southern Africa comprise congestion, limited accessibility, poor transport integration and pollution due to high car dependency. Solutions such as BRT, non-motorised modes and rapid rail transit have been identified by various authors and institutions to address mobility issues. Implementing a solution that integrates previously recommended solutions and available transport modes is imperative for the improvement of mobility in the Southern African region. This solution can be achieved by an Integrated transport network through Mobility-as-a-Service (MaaS), which is supported by travel demand strategies (Meloni et al., 2025)

The Integrated transport network through MaaS model aims to incorporate formal modes, with informal services and non-motorised modes, which is user-centred, supported by ICT to provide real-time route information (Hasselwander & Bigotte, 2023; Kheder & Mohammed, 2024). According to Hlubi & Seftel (2019), the success of MaaS in Southern Africa depends on four key capabilities, which are a wide range of transport options, open access to real-time data from transport operators, user-friendly digital payment systems and supportive government legislation. With these capabilities met MaaS can be introduced to an integrated transport network.

Through a MaaS integrated network, seamless transfers between modes of transport can be achieved by the coordination of infrastructure, fares, and schedules across the different transport modes. As a user-centred platform, MaaS platform would allow users to plan, book and pay for trips based on the provided real-time data (Chen & Acheampong, 2023; Mubiru, 2025). The option to finalise trips is a crucial part of the implementation of MaaS in Southern Africa, where there are difficulties in dealing with the paratransit (Mokoma & Venter, 2023).

MaaS integrated transport network has the potential to benefit both the user and transport operators. The passengers will experience more convenient, cost-effective trips while providers expand their customer base through centralised models such as the Transport Management Company model utilised in Nairobi (Plano, 2022). However, a third-party MaaS operator model may be more effective for Southern Africa, as it encourages open competition and reduces institutional conflicts between existing public transport agencies.

Moreover, the improvement of transport policy is essential for the integrated transport networks via MaaS to function effectively and efficiently. To achieve this, it is necessary for governments in Southern Africa to reform outdated transport policies and regulations, collaborate with technology providers, and address challenges related to regulating informal transport (Muñoz et al., 2024). In addition to policy reforms, (Meloni et al., 2025) found that soft measures such as incentives, rewards, and public awareness campaigns can promote the adoption of integrated mobility options.

This approach to mobility issues aligns closely with multiple Sustainable Development Goals (SDGs), but aligns mostly with SDG 11, which advocates for inclusive and safe sustainable transport (Lindkvist & Melander, 2022) According to Munoz et al. (2024), the MaaS approach also contributes to climate goals (SGD 13) by supporting low-carbon mobility goals. In conclusion, developing an Integrated Transport Network supported by MaaS offers a progressive solution to Southern Africa.

4. BARRIERS TO INTEGRATED TRANSPORT NETWORKS USING MAAS

Encouraging modal shift from private cars to public transport by improving the quality and accessibility to discourage car dependency is a common strategy that has been developed. However, this approach has been hindered by cultural resistance to change, technological limitations, regulatory constraints, lack of information, and poor decision-making by policymakers (Bashingi et al., 2020).

One of the most recognised barriers of implementing integrated transport networks and MaaS is policy frameworks in urban areas. In Southern Africa, the mobility issues stimulated by the state of public transport and ineffective policies raises concerns regarding inclusiveness, efficiency, safety, and sustainability. Although governments, often supported by institutions such as the World Bank and the African Development Bank, have initiated reform efforts, the lack of clear policy frameworks continue to delay progress (Poku-Boansi, 2022). According to Hlubi & Seftel (2019) for MaaS to thrive, governments must ensure that transport legislation supports open data-sharing, integrated fare systems, and digital payment platforms, a vision not yet fully realised in most cities in the region.

Accessibility itself is multifaceted, involving not only the availability of transport but also land-use patterns, communication systems, temporal constraints, and socio-economic characteristics of individuals and households (Oviedo et al., 2024). In many developing cities, data to fully understand these accessibility dynamics remains inadequate, especially when contrasted with developed countries. This absence of data hinders effective planning for integrated systems like MaaS, where transport and land use must coincide to move towards more sustainable patterns (Oviedo et al., 2022).

The hindrance of development in the southern regions of Africa is the lack of finance. Unlike other nations that can set aside a lot of money to execute certain solutions towards sustainable urban transport, developing countries work on a very limited budget and hence, the less prioritised sustainable transport solution does not get promoted (Mbara & Pisa, 2018).

As far as Southern Africa is concerned, the control mechanisms as well as the absence of a stable financial backer, are pointed out as some stabilising obstacles towards further development of integrated MaaS. In order to successfully execute MaaS, there needs to be an effective control system that allocates clear functions and duties to every part of the system, provides reliable data and user privacy policies, guarantees low public contract financing, and legislative subsidies to aid the early operational phases (Wu et al., 2025). In the absence of these policies, it is harder to achieve success in the form of long-lasting value.

In the context of Southern Africa, regulatory systems and the lack of stable financial support are consistently highlighted as barriers specific to MaaS integration. To achieve a successful implementation of MaaS, a strong regulatory foundation that clearly defines the roles and responsibilities of all stakeholders, establishes secure frameworks for data sharing and user privacy, and introduces subsidies to support early-stage operations are a requirement. Without these structures in place, MaaS initiatives risk failure or may only achieve limited, short-term success.

5. CONCLUSION

Southern Africa has some big transport problems and it's not just about more people moving to cities or no money for buses and trains. These problems go deep into the

region's history and reflect past inequalities that are still playing out in daily life. Imagine a growing reliance on cars, more traffic and pollution. Add to that a disjointed public transport system where getting from a bus to a train is a nightmare. It's clear we need sustainable and fair transport for all.

One idea is an Integrated Public Transport System, where all the different ways to travel – buses, trains, taxis – work together. And Mobility-as-a-Service (MaaS) platforms are being looked at. Think of MaaS as an app that helps you plan, book and pay for all your journeys, making travel accessible, affordable and efficient. But making this happen in Southern Africa is not easy. There are obstacles like outdated rules, fragmented leadership and lack of funding. And getting support from the existing informal transport industries, which are a big part of how many people move around. Ultimately by focusing on people-centric and environmentally friendly transport, Southern African cities can create systems that are inclusive and contribute to global development and climate goals.

6. RECOMMENDATIONS

MaaS in Southern Africa should be guided by reformed transport policies that are clear and transparent (Poku-Boansi, 2022). The refined regulations and policies for integrated transport networks for MaaS must define the roles and responsibilities of all stakeholders and create a secure framework for data sharing and user privacy (Wu et al., 2025). Furthermore, the development of national policy frameworks for MaaS will introduce uniformity across the different regions of a country allowing for interoperable architecture that ensures the same user experience for ticketing and scheduling systems (Hlubi & Seftel, 2019).

However, the success of the development of national policy frameworks depends heavily on the availability of reliable and region-specific data of which Southern Africa lacks (Oviedo et al., 2022). This lack of data has proven to be a limiting factor to providing country and region-specific mobility solutions. Therefore, Southern African countries should invest in more research that will inform the development of strategies and decision-making processes by clearly communicating the long-term social, economic, and environmental benefits of MaaS to stakeholders for integrated transport networks and MaaS. (Muñoz et al., 2024).

Both policies and research are affected by the funding limitations which are prevalent in Southern Africa. According to Thomas (2013), the funding limitations linked to transport systems can be overcome by engaging in Public-Private Partnerships as seen with the Gautrain Project. With governments exploring such funding methods, MaaS can be implemented with assurance of its ongoing viability.

Targeted education programs are crucial to raising public knowledge and fostering a cultural shift toward shared and public transportation options, especially in light of the previously noted issues of user resistance to change and low public trust in new transport systems (Bashingi et al., 2020). These initiatives can help dispel myths and increase societal acceptance of new mobility paradigms.

Simultaneously, cities can identify operational challenges early, build public confidence through real-world engagement, and scale up successful solutions based on user feedback by implementing Mobility-as-a-Service (MaaS) initiatives through carefully planned pilot programs (Chen & Acheampong, 2023). Southern African nations may foster the integration of MaaS and eventually move toward more sustainable, inclusive, and

effective transport networks by coordinating these interventions with the barriers that have been identified.

7. REFERENCES

Bashingi, N, Mostafa, M & Kumar Das, D. 2020. The state of congestion in the developing world; The case of Gaborone, Botswana. *Transportation Research Procedia*, 45:434-42. Available at: <https://doi.org/10.1016/j.trpro.2020.03.036>

Berg, J & Ihlström, J. 2019. The Importance of Public Transport for Mobility and Everyday Activities among Rural Residents. *Social Sciences*, 8(2):58. Available at: <https://doi.org/10.3390/socsci8020058>

Bonga, WG & Sithole, R. 2020. Problematic Infrastructure Factors Affecting Development in the 21st Century for Zimbabwe. *World Journal of Economics and Finance*, 6(1):140-149. Available at: <https://ssrn.com/abstract=3591754>

Chen, Y & Acheampong, RA. 2023. Mobility-as-a-service transitions in China: Emerging policies, initiatives, platforms and MaaS implementation models. *Case Studies on Transport Policy*, 13:101054. Available at: <https://doi.org/10.1016/j.cstp.2023.101054>

Cirella, GT, Mtizi, C & Iyalomhe, FO. 2018. Public transportation solutions in Southern Africa: case study Zimbabwe and South Africa. *Transport Economics and Logistics*, 79:77-86. Available at: <https://doi.org/10.26881/etil.2018.79.06>

Hasselwander, M & Bigotte, JF. 2023. Mobility as a Service (MaaS) in the Global South: research findings, gaps, and directions. *European Transport Research Review*, 15(1):27. Available at: <https://doi.org/10.1186/s12544-023-00604-2>

Hlubi, N & Seftel, L. 2019. *Could Mobility as a Service (MaaS) have a role in an Integrated Public Transport Network in South African cities?*

Kheder, MQ & Mohammed, AA. 2024. Real-time traffic monitoring system using IoT-aided robotics and deep learning techniques. *Kuwait Journal of Science*, 51(1):100153. Available at: <https://doi.org/10.1016/j.kjs.2023.10.017>

Le Pira, M, Tavasszy, LA, de Almeida Correia, GH, Ignaccolo, M & Inturri, G. 2021. Opportunities for integration between Mobility as a Service (MaaS) and freight transport: A conceptual model. *Sustainable Cities and Society*, 74:103212. Available at: <https://doi.org/10.1016/j.scs.2021.103212>

Lindkvist, H & Melander, L. 2022. How sustainable are urban transport services? A comparison of MaaS and UCC. *Research in Transportation Business & Management*, 43:100829. Available at: <https://doi.org/10.1016/j.rtbm.2022.100829>

Lisinge, RT & van Dijk, MP. 2022. Regional transport infrastructure programmes in Africa: what factors influence their performance? *Canadian Journal of African Studies / Revue Canadienne Des Études Africaines*, 56(1):99-121. Available at: <https://doi.org/10.1080/00083968.2021.1896369>

Mbara, T & Pisa, N. 2018. *An analysis of impediments to deliver sustainable transport in cities of developing countries: The case of Harare, Zimbabwe*. 241-252. Available at: <https://doi.org/10.2495/UT180231>

- Meloni, I, Giubergia, D, Piras, F & Sottile, E. 2025. Can MaaS encourage travel behavior change? The role of cognitive, motivational factors in sustainable and pro-environmental choices. *Transportation Research Procedia*, 82:1896-1912. Available at: <https://doi.org/10.1016/j.trpro.2024.12.162>
- Mokoma, L & Venter, C. 2023. Pathways to integrating paratransit and formal public transport: Case studies from Tshwane, South Africa. *Research in Transportation Economics*, 102:101356. Available at: <https://doi.org/10.1016/j.retrec.2023.101356>
- Mubiru, I. 2025. Investigating the involvement of public transport authorities in MaaS developments. *Transportation Research Interdisciplinary Perspectives*, 29:101337. Available at: <https://doi.org/10.1016/j.trip.2025.101337>
- Muñoz, MRB, Panagakos, G, Shrestha, S, Martin, E, Hasselwander, M, Bonsu, S, López Realpe, G, Bachetti, F & Bruhn Barfod, M. 2024. Analyzing the enabling factors to implement MaaS in Asian, African and Latin American cities. *Transport Research Arena (TRA)*, 2024.
- Nyamai, DN, Dietrich, C, Dietsch, LC, Motitschke, LM & Wienand, L. 2024. Mapping mobility in Namibia's secondary cities informal settlements: A case study of rehoboth. *African Geographical Review*, 1-15. Available at: <https://doi.org/10.1080/19376812.2024.2403610>
- Oviedo, D, Cavoli, C, Chong, AZW, Romero de Tejada, J, Koroma, B & Yusuf, Y. 2024. Accessibility, (dis)advantage and everyday mobility practices and experiences: The cases of Maputo and Freetown. *Area Development and Policy*, 1-26. Available at: <https://doi.org/10.1080/23792949.2024.2383404>
- Oviedo, D, Cavoli, C, Levy, C, Koroma, B, Macarthy, J, Sabogal, O, Arroyo, F & Jones, P. 2022. Accessibility and sustainable mobility transitions in Africa: Insights from Freetown. *Journal of Transport Geography*, 105:103464. Available at: <https://doi.org/10.1016/j.jtrangeo.2022.103464>
- Plano, C. 2022. Improving paratransit service: Lessons from transport management companies in Nairobi, Kenya and their transferability. *Case Studies on Transport Policy*, 10(1):156-165. Available at: <https://doi.org/10.1016/j.cstp.2021.11.013>
- Poku-Boansi, M. 2022. *Public Transport Policy and Governance in African Cities: An Introduction* (pp. 175-180). Available at: https://doi.org/10.1007/978-3-031-17327-1_11
- Pooley, CG. 2017. Connecting historical studies of transport, mobility and migration. *The Journal of Transport History*, 38(2):251-259. Available at: <https://doi.org/10.1177/0022526617715538>
- Thomas, DP. 2013. The Gautrain project in South Africa: a cautionary tale. *Journal of Contemporary African Studies*, 31(1):77-94. Available at: <https://doi.org/10.1080/02589001.2013.747292>
- Wu, C, Le Vine, S & Sivakumar, A. 2025. Assessment of the barriers in establishing passenger mobility-as-a-service (MaaS) systems: An analogy with multimodal freight transport. *Case Studies on Transport Policy*, 20:101433. Available at: <https://doi.org/10.1016/j.cstp.2025.101433>