INNOVATIVE MOBILITY SOLUTIONS FOR SOUTHERN AFRICAN CHALLENGES: SOME PROSPECTS

P MUTWANAMBA

Department of Urban and Regional Planning, University of Venda, Faculty of Science, Engineering and Agriculture, Private Bag X5050, Thohoyandou, Limpopo 0950;
Tel: 071 459 0254; Email: mutwanambapfariso@gmail.com

ABSTRACT

Southern Africa continues to face ongoing mobility challenges rooted in historical spatial inequalities, infrastructural deficits, fragmented transport governance, affordability barriers, and environmental vulnerabilities. These challenges disproportionately affect rural communities, low-income households, and marginalised groups, limiting access to employment, healthcare, and education. This paper investigates the key mobility challenges and recommends innovative, inclusive, and sustainable solutions aligned with Southern Africa's development priorities and spatial dynamics. Secondary data and information content were analysed via a thematic approach, which was supported by comparative case study analysis of successful innovative mobility interventions. Case studies reviewed included Cape Town's MyCiTi BRT system, Malawi's rural mobility initiatives, Rwanda's Non-Motorised Transport policy, and Tokyo's multimodal integration. The findings highlight the importance of context-sensitive infrastructure, integrated governance frameworks, community-driven initiatives, and green mobility innovations. The paper concludes that with adequate political will, institutional capacity, and investment in inclusive and resilient infrastructure, Southern Africa can achieve sustainable transport systems that foster economic growth, social inclusion, and environmental sustainability.

1. INTRODUCTION

Southern Africa's transport infrastructure is characterised by uneven development, with South Africa dominating the region's road, rail, and port networks. The region's backbone includes transnational corridors such as the North-South Corridor (linking Durban, South Africa, to Lubumbashi, Democratic Republic of Congo (DRC), the Maputo Corridor (South Africa to Mozambique), and the Walvis Bay-Ndola-Lubumbashi Corridor (Namibia to Zambia/DRC). Studies exist that highlight underinvestment in maintenance and expansion, particularly in landlocked countries (e.g., Zimbabwe, Zambia, and Malawi), which rely heavily on neighbouring ports (e.g., Durban, Maputo and Walvis Bay) (AfDB, 2023; Chakwizira and Mashiri, 2011; SADC, 2023). Rail networks, largely inherited from colonial eras, are experiencing problems owing to ageing infrastructure. This adds to breakdown, low travel times and introduces various forms of inefficiencies, including pushing freight toward roads and exacerbating congestion (Pirie, 2019; World Bank, 2020). Rapid urbanisation has amplified the strain on public transport systems. Invariably, minibus taxis dominate urban mobility in countries like South Africa, Botswana, and Zimbabwe, but face challenges related to safety, regulation, and informal operations (Schalekamp and Behrens, 2020; Venter, 2021).

1.1 Aim of the Paper

This paper investigates the key mobility challenges and recommends innovative, inclusive, and sustainable solutions aligned with Southern Africa's development priorities and spatial dynamics.

1.2 Objectives of the paper

The paper's aim is achieved via the following objectives:

1. To analyse the key mobility challenges and spatial barriers affecting transport systems in Southern Africa.
2. To explore existing innovative transport solutions and best practices from both regional and international contexts.

2. RESEARCH METHODOLOGY

This paper employed a qualitative, desk-based research approach. Data was collected through an extensive review of academic literature, policy documents, institutional reports, and case studies relevant to mobility and transport challenges in Southern Africa. Secondary sources such as journal articles, government strategies, and international development publications provided insights into both the current limitations and innovative mobility solutions and practices within the region. Comparative analysis was used to draw lessons from successful interventions implemented in Africa and globally. The combination of these methods enabled the identification of context-sensitive, scalable mobility solutions applicable to Southern African contexts.

3. LITERATURE REVIEW – PRECEDENT STUDIES

3.1 Cape Town's MyCiTi Bus Rapid Transit (BRT) System – South Africa

Cape Town's MyCiTi BRT system, launched in 2010 before the FIFA World Cup, is a flagship example of formal innovative mobility and public transport reform in an African context. The BRT system was designed to provide a reliable, safe, and scheduled alternative to the fragmented and informal minibus taxi sector that dominated urban mobility. Key successes are the dedicated bus lanes that improved travel time, journey experience and service reliability. The introduction of an innovative cashless card system that enhances commuter/passenger security, data collection and integration of paratransit operators/public transport operators through compensation and retraining programs (Schalekamp & Behrens, 2020). Innovative mobility solutions and lessons learnt for Southern Africa are that urban mobility upgrades must balance infrastructure investment with inclusive governance, stakeholder buy-in, and progressive fare models to achieve sustainability.

3.2 Malawi's Community-Based Rural Mobility Projects

In rural Malawi, where over 80% of the population lives in non-urban areas, mobility interventions focus on last-mile connectivity. The use of bicycle ambulances, footbridges, and community-maintained feeder roads has improved access to healthcare, schools, and markets (Porter, 2020). Low-cost and locally built transport infrastructure can be highly effective in addressing last-mile mobility constraints. Additionally, community active involvement in infrastructure development and deployment, as well as non-motorised transport (NMT) ownership, ensures sustainability, maintenance, adaptability to terrain and climatic challenges in rural settings. Lessons learnt for Southern Africa are that attempts

aimed at innovative rural mobility can be enhanced through decentralised planning, non-motorised transport, and community participation.

3.3 Rwanda's Non-Motorised Transport (NMT) Policy

Rwanda has pioneered non-motorised transport integration in Africa, particularly in Kigali. Since adopting its NMT policy in 2021, the city has constructed dedicated bicycle lanes and pedestrian walkways, introduced a bike-sharing system accessible via mobile apps, and conducted public awareness campaigns to promote cycling and walking (Sietchiping et al., 2020). These measures have reduced traffic congestion and improved air quality. The government's strong political will and integration of NMT into urban plans have contributed to the success. Lessons learnt for Southern Africa are that political commitment and urban design focused on human-scaled innovative mobility solutions are crucial for sustainable transport transformation.

3.4 Tokyo's Multimodal Public Transport System – Japan

Tokyo boasts one of the world's most efficient and integrated transport systems, where rail, buses, and metro services are seamlessly connected. Key features include a single smart card (Suica/Pasmo) system for all modes, high frequency and punctuality with minimal delays, land-use integration, and stations that are often hubs for commercial and residential developments (Cervero, 1998). Lessons learnt for Southern Africa are that while technological advancement may differ, cities such as Durban, Gaborone, Lusaka, Maputo, Lilongwe, Harare and Windhoek can adopt smart ticketing and land-use integration around transit nodes.

4. REGIONAL POLICY FRAMEWORKS AND IMPLEMENTATION

Southern Africa's regional integration efforts are guided by a variety of strategic policy frameworks aimed at enhancing mobility, trade, and sustainable transport.

4.1 SADC Regional Infrastructure Development Master Plan (RIDMP)

Adopted in 2012 and updated periodically, the RIDMP identifies priority transport corridors and infrastructure investments necessary to achieve regional integration and economic development (SADC, 2023). Among the key flagship projects are the North-South Corridor, the Maputo Development Corridor, and the Walvis Bay-Ndola-Lubumbashi Corridor, which connect landlocked states to ports. Despite these ambitious plans, many projects remain delayed due to funding shortfalls and coordination bottlenecks (AfDB, 2023).

4.2 Green Transport Strategy (South Africa, 2018-2050)

South Africa's Department of Transport introduced the Green Transport Strategy to reduce greenhouse gas emissions from the transport sector and promote cleaner, more efficient systems (Department of Transport, 2018). The strategy includes promotion of electric vehicles (EVs), Expansion of non-motorised transport infrastructure and Introduction of modal shift incentives (e.g., from road to rail), However, implementation has lagged, especially in transitioning minibus taxis to cleaner technologies due to limited EV infrastructure and a lack of tailored incentives for the informal sector (Mlambo, Mageto and Thaba, 2024).

5. FINDINGS AND RESULTS

5.1 Key Mobility Challenges and Limitations in Southern Africa

5.1.1 Geographic and Spatial Barriers

Southern Africa's mobility is constrained by historical spatial segregation and urban sprawl, remnants of apartheid-era planning that separated residential areas from economic hubs (Zwane and Mthembu, 2024). This has created long commutes for low-income populations living in peripheral townships, often requiring multiple transfers between informal and formal transport modes (McKay, 2020). Rural-urban migration further strains transport systems, as infrastructure fails to accommodate non-CBD-centric travel patterns, such as suburb-to-suburb journeys critical for domestic workers (Duri, 2025). The physical landscape of Southern Africa, including mountainous terrain, expansive deserts (e.g., the Kalahari), and extensive river systems, presents inherent challenges to infrastructure development and transport connectivity (Naude & Krugell, 2006). Remote and landlocked countries such as Lesotho, Zimbabwe, and Malawi experience disproportionately high transportation costs due to their dependence on transit through neighbouring countries for access to ports and markets (World Bank, 2018). It takes an average of 4.5 days to clear goods through border posts in the SADC region, compared to the global average of less than 1 day (SADC Infrastructure Development Plan, 2020). In Zambia, less than 10% of the rural road network is paved, significantly hindering year-round mobility (AfDB, 2019). In Malawi, only 6% of roads are paved, making many rural areas inaccessible during the rainy season (World Bank, 2020).

5.1.2 Infrastructural Deficits and Unequal Development

Transport infrastructure development in the region remains uneven and urban-biased. While cities such as Johannesburg have seen improvements through initiatives like the BRT, rural areas still suffer from unpaved roads, weak bridges, and limited transport facilities (Roux, Ferreira and Retief, 2024). These inequalities stem from historical legacies and ongoing investment gaps that hinder regional integration (SADC, 2023). Botswana has invested in major highway corridors like the Trans-Kalahari Highway, but rural communities are still underserved. Gravel roads dominate in less developed regions, limiting agricultural and commercial activity (SADC, 2020). Approximately 70% of Madagascar's road network is in poor condition, particularly in rural and highland regions. Inaccessibility during rainy seasons hinders development, healthcare delivery, and educational access (African Development Bank, 2021).

5.1.3 Affordability Barriers and Transport Inequity

High transport costs remain a significant burden for low-income households, especially those living in informal settlements far from employment zones. These households spend a disproportionately high percentage of their income on transport, limiting access to essential services (Van der Merwe and Mokoena, 2024). The lack of subsidised or efficient transport options deepens spatial inequality and social exclusion. Vulnerable groups, including people with disabilities (PWDs), face additional barriers: 4.5% of South Africans cannot travel due to inaccessible services, and PWDs make 27-65% fewer trips than able-bodied individuals ((Vanderschuren and Nnene, 2021). Mauritius has introduced public transport subsidies for students and senior citizens, helping improve access. However, the rest of the population, especially low-income earners, still struggle with fare affordability, especially in more remote districts (SADC, 2020).

5.2 Innovative Mobility Solutions

5.2.1 Smart Infrastructure and Technological Integration

Addressing infrastructural gaps in Southern Africa requires scalable, low-cost, and innovative methods. The adoption of stabilised gravel roads, geocell reinforcements, and prefabricated modular bridges can provide cost-effective alternatives for remote and rural areas (African Development Bank, 2021).

5.2.2 Integrated and Participatory Transport Governance

Governance reforms should prioritise inter-agency collaboration, decentralised planning, and the formal integration of informal transport systems. Lessons from Cape Town's MyCiTi BRT show the benefits and challenges of including paratransit associations in formal networks (Schalekamp and Behrens, 2020). Digitalising transport permits, harmonising cross-border trade policies, and adopting transport observatories can strengthen governance (SADC, 2023).

5.2.3 Inclusive and Affordable Mobility Models

Subsidised public transport, especially for students, elderly citizens, and low-income households, can reduce transport poverty. Community-driven solutions such as bike-share programmes, motorcycle ambulances, and public transport cooperatives have shown promise in Malawi and Rwanda (Porter, 2020). South Africa could adopt a targeted subsidy approach like Mauritius to improve equity.

5.2.4 Green Mobility and Sustainability Innovation

Transitioning to electric buses, solar-powered tuk-tuks, and pedestrian-friendly infrastructure can reduce carbon emissions and improve safety. Incentives for private operators to adopt cleaner vehicles, combined with public investment in charging infrastructure, are key to accelerating change (Ntuli et al., 2024; Mlambo, Mageto and Thaba, 2024).

5.2.5 Transport Hubs and Rural Mobility Centres

The creation of multi-modal transport hubs in small towns and peri-urban areas facilitates the integration of formal and informal modes, shortening travel time and improving route efficiency. In South Africa, pilot Mobility-as-a-Service (MaaS) platforms have been explored to coordinate minibus taxi services with bus and rail systems in Gauteng and Cape Town (Behrens & Schalekamp, 2020).

5.3 Lessons From Comparative Case Studies

The comparative analysis of successful mobility interventions revealed important lessons for improving transport systems in Southern Africa. Cape Town's MyCiTi BRT system highlighted the critical role of inclusive governance and stakeholder engagement, particularly in formalising and integrating informal transport operators into formal public transport networks. Malawi's rural mobility projects demonstrated that low-cost, community-driven infrastructure, such as bicycle ambulances and footbridges, can significantly enhance accessibility and service delivery in underserved rural areas. Rwanda's Non-Motorised Transport (NMT) policy illustrated the impact of strong political will and human-centred urban design in promoting walking and cycling, leading to improved air quality and reduced congestion. International experiences such as Tokyo's multimodal transport network showed that seamless integration across transport modes, combined with smart ticketing systems, can enhance efficiency and user convenience even in densely populated urban settings.

6. CONCLUSIONS AND RECOMMENDATIONS

Southern Africa faces enduring mobility challenges driven by spatial inequalities, infrastructural deficits, fragmented governance, affordability constraints, and environmental vulnerabilities. These issues significantly limit equitable access to essential services, particularly for rural and marginalised communities. The paper revealed that many of these challenges are rooted in colonial legacies, weak coordination among transport agencies, and underinvestment in inclusive, sustainable infrastructure. The comparative analysis of mobility innovations from both regional and international contexts, such as Cape Town's MyCiTi BRT, Malawi's rural mobility projects, Rwanda's Non-Motorised Transport policy, and Tokyo's multimodal system, demonstrated that tailored, context-specific solutions can transform transport systems. Crucially, these case studies emphasise that effective governance, political will, community participation, and scalable innovations are essential for success. Based on the paper findings, the following recommendations are proposed:

1. Promote Community-Driven and Affordable Mobility Solutions:
   Governments should invest in low-cost, community-maintained infrastructure such as bicycle paths, footbridges, and rural feeder roads. Subsidies and inclusive fare policies must be introduced for vulnerable populations to reduce transport poverty and promote equitable access.

2. Invest in Smart Infrastructure and Green Technologies:
   Innovations such as geocell road reinforcements, smart ticketing systems, and electric public transport (e.g., solar-powered tuk-tuks, e-buses) should be scaled up, particularly in urban and peri-urban settings. These investments will improve sustainability, safety, and service delivery.

To sum up this paper, transforming mobility systems in Southern Africa is achievable with a multi-pronged approach that integrates infrastructure development, environmental sustainability, inclusive planning, and governance reforms. Such an approach will not only improve transport efficiency but also foster socio-economic development, spatial justice, and climate resilience in the region.

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