# ACHIEVING EQUITABLE, SUSTAINABLE MOBILITY AND ACCESS IN SUB-SAHARAN AFRICA

AN OVERVIEW OF THE STATE OF KNOWLEDGE

USER NEEDS

M O B I L I T Y G O V E R N A N C E

E M E R G I N G B U S I N E S S M O D E L S

TRANSPORT AND PUBLIC HEALTH

SYSTEM DESIGN AND MODAL INTEGRATION





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# **ABOUT THIS BOOKLET**

In 2019 Volvo Research and Educational Foundations (VREF) launched its Mobility and Access in African Cities Programme (MAC). The purpose of MAC is to increase the knowledge and capacity base on equitable and sustainable mobility and access in cities in Sub-Saharan Africa (SSA) in order to contribute to medium- and long-term processes of change.

The MAC programme focuses on six core themes that have strong relevance for achieving equitable and sustainable mobility and access in SSA urban contexts:

- > User needs and practices, equity issues
- > Governance, politics, institutions, and finance
- Emerging business models and service options
- > Safety, health, and the urban environment
- > System design and modal integration
- > Analytical tools

VREF has commissioned position papers within each core theme (excepting the cross-cutting last theme). The purpose of the position papers is to provide an overview of current knowledge on issues related to mobility and access in Sub-Saharan African (SSA) cities, as well as to inform Volvo Research and Educational Foundations (VREF) and researchers in Sub-Saharan Africa in developing a research agenda in this area.

Each position paper has been written by a team of leading experts with SSA university-based research experience in the respective areas.

The key findings and messages of each position paper are summarised in this booklet. All papers are available at www.vref.se. We hope that you will enjoy reading and sharing the material with colleagues and others in your network.

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## INTRODUCTION

Urban passenger transport systems in Sub-Saharan Africa are placed daily under immense strain. In many cities, demand outstrips capacities for providing safe, reliable, and affordable opportunities for mobility and access among broad groups. Aging vehicle fleets and weak enforcement capabilities lead to unhealthy emissions levels and high casualty rates. Under-resourced city governments and small per capita tax revenues mean that infrastructure improvements are often promoted by international agencies rather than by local city officials and public representatives through their own city planning processes.

Fortunately, Sub-Saharan cities are small relative to those in other global regions, so the pressures on city resources have not been as intense as they would have been if megacities were more common. But forecasts about global urbanisation over the next three decades indicate that this situation is about to change. The urban population of the sub-continent is set to triple in size by 2050, subjecting already strained infrastructure networks to even greater pressure. Coupled with a changing global climate in which extreme weather events are predicted to become more common, the risk of humanitarian crises is high.

Central to meeting the challenge of alleviating pervasive poverty, as well as accommodating larger populations, will be the improvement of urban transport networks and services that strengthen equitable access to services and opportunities. Because many journeys will



continue to be non-motorised, there is an urgent need for pedestrian and bicycle infrastructure that improves access, safety, and connectivity for broad groups. Sub-Saharan African transport systems are also characterised by small, usually informal, service providers with primarily unscheduled services. Understanding how these shared services are operated, and learning how to improve and integrate them, is as large a challenge as strengthening the capacity to install and manage mass public transport networks.

The expansion of city limits, together with growing populations in which captive passengers will remain the majority, means that both shared and public transport networks will be particularly important to the creation of equitable access to the opportunities that city agglomerations offer, as well as to the creation of transport conditions conducive to just economic development. At present most cities in Sub-Saharan Africa do not have the governance systems, institutional capacity, or fiscal resources to provide scheduled, mass public transport networks at scale. The governance and economic prospects of many, if not most, of these cities are unlikely to change significantly over the next three decades, which indicates that city governments will continue to be unable to provide city-wide mass public transport networks in the medium term. The challenge of providing access for all will be too great for the public agencies alone; instead they will have to work with private sector transport service providers, both large and small.

The diversity and uniqueness of urban transport contexts will require homegrown solutions

based on local and regional knowledge, competence, and commitment rather than silver bullet technologies imported from elsewhere. International good practices must be a source of inspiration, not replication.

It is against this backdrop that the Volvo Research and Educational Foundations initiated its Mobility and Access in African Cities (MAC) programme to build research capacity and knowledge within these areas, as well as to stimulate further enquiry.

The position papers assembled in this collection seek to explore the current state of knowledge concerning the governance of city transport systems; the extent of transport-related health and safety challenges; the diversity of transport needs in city populations, especially amongst the poor and most vulnerable; the endemic business models underlying the provision of shared transport services; and the design and integration of mass public transport systems. The ambition of the papers is to serve as a useful resource and catalyst for further knowledge development and capacity building among researchers and other stakeholders both within and beyond the MAC programme.



## USER DIVERSITY AND MOBILITY PRACTICES IN SUB-SAHARAN AFRICAN CITIES: UNDERSTANDING THE NEEDS OF VULNERABLE POPULATIONS

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### PURPOSE AND SCOPE

Attention to the experiences and needs of users of public, shared, and non-motorised transport has only recently started to emerge in transport planning in Sub-Saharan African (SSA) cities. Nevertheless, research to encourage and support more appropriate interventions has been growing over the last two decades.

This paper considers the needs and everyday practices of the diversity of users and potential users who inhabit African cities, and whose perspectives have largely been unexamined due to the legacy of a planning and research focus on motorised transport and private vehicles. That traditional, narrow focus has left gaps in the knowledge and understanding of the access and mobility needs of marginalised and non-motorised users across the continent. The paper argues that, rather than being addressed in traditional transport planning, these gaps are more likely to be filled through a richer methodological repertoire that is embedded in situated, participatory processes.

## METHOD

Results and reflections in this paper are based primarily on the authors' extensive personal field experiences as social researchers in SSA.

## KEY FINDINGS

The needs of socially vulnerable and disadvantaged groups are still largely unaddressed, despite decades of discussion. When referring to vulnerable groups, however, it is necessary to be more specific regarding the populations being targeted for mobilities/ transport-related support, as well as to recognise the likely diversity of their needs. It is also necessary to note complexities that multiple identities (e.g. as woman, older person, businessowner, care-giver, peri-urban informal settlement

While the potential for technology to enable seamless user travel is seductive, there is a danger of the (corporate-driven) smart city agenda sidelining the needs of low-tech users of transport services.

#### USER DIVERSITY AND MOBILITY PRACTICES IN SUB-SAHARAN AFRICAN CITIES: UNDERSTANDING THE NEEDS OF VULNERABLE POPULATIONS

resident), and the interconnected nature of these social categorisations, may imply.

Generally, the more vulnerable tend to include women, children and young people, older people, people with disabilities, pregnant women, the unemployed, and people living in sites with especially poor access (such as off-road periurban areas, camps for internally displaced people). However, within each of these groups there may be some who are far more vulnerable than others.

The ability to travel, choice of trip mode, and temporalities and spatialities of travel among diverse users and non-users of transport services, can be shaped by multiple factors. These include class, income/socio-economic status, gender, age, household composition, bodily abilities (physical and mental health), religion/cultural attributes, sexualities, employment status and livelihood type, and residential and work locations.

Interconnected social categorisations of this kind can also contribute to overlapping and interdependent systems of discrimination and disadvantage, which adds further complexity. For example, the older woman who needs a wheelchair to get around and who lives in a poor neighbourhood experiences mobility very differently from the wealthy young woman who owns and drives her own car. Spatial context and other factors, such as seasonality, extend this potential for mobility complexity even further, as physical environment (including climate and topography), national and local political economy, and historical legacy (including infrastructural legacy) all intersect with user diversity in specific places at specific times. This paper addresses these concerns.



The locational focus of research needs extension from the primate cities that have been the main focus of urban transport research in SSA.

## KEY RESEARCH AND KNOWLEDGE GAPS

Understanding user diversity and mobility practices requires careful, sustained attention to the power relations that shape everyday practices, habits, and routines. It is also essential to recognise the unmet needs and stasis that contribute to current poverty among vulnerable groups in African cities.

Key transport needs among users extend well beyond the conventional focus of transport planning (such as access to livelihoods, health, education, and other basic services). Instead it is important to include wider considerations such as access to social networks, leisure, and places of worship (all of which are intimately tied up with both economic and social well-being).



User experience is shaped by a wide range of actors within transport. 'Experts' enthralled by automobility still dominate the planning scene within African cities, despite the relatively low levels of car ownership and use. The state and private sector are characteristically unwilling to engage with the experiences and perceptions of informal settlement residents, who remain 'outside of the loop' in most new ('smart') city planning. Training of key policy makers and practitioners in participatory transport planning would enable them to understand the diverse mobility needs of the residents of informal settlements, where the current lack of sound empirical evidence about those needs requires urgent attention.

Better forums for user engagement are essential. for instance the establishment of city-wide and community-based transport consumer groups and citizen audits in the transport sector that are linked to wider budget accountability and public scrutiny. Engagement with transport consumer groups could beneficially extend beyond the state, to for instance transport unions, citizen rights advocacy groups, and other parts of the private and voluntary sectors. Many of these actors already recognise transport and accessibility as core issues in the achievement of the Sustainable Development Goals (SDGs) in their cities.

Building in-depth knowledge about user diversity and mobility practices and needs in Sub-

Saharan African cities is crucial, especially when considering more vulnerable groups and their non-motorised travel practices.

In relation to meeting the needs of vulnerable social groups, close charting of the vulnerability of women and girls to harassment – whether while walking or using public transport – is needed, as well as specific attention to how to address this vulnerability. When doing so, careful reference to local context is essential. In addition, the travel constraints faced by people with disabilities are essentially unknown in most African cities, requiring considerable further exploration, as do the needs of marginalised ethnic and faith groups and lesbian and gay people.

> The use of technology in the form of mobile phones and smart mobility apps has expanded dramatically over the last two decades. However, while the potential for technology to enable seamless user travel is seductive, there is a danger of the

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#### USER DIVERSITY AND MOBILITY PRACTICES IN SUB-SAHARAN AFRICAN CITIES: UNDERSTANDING THE NEEDS OF VULNERABLE POPULATIONS

(corporate-driven) smart city agenda sidelining the needs of low-tech users; this issue, too, requires attention.

The locational focus of research needs extension from the primate cities that have been the main focus of urban transport research in Sub-Saharan Africa. Far less attention has been given to the transport needs of residents of secondary cities, which in part can be ascribed to the location of many leading research-focused universities in the primate cities. A more concerted effort to engage with transport issues in secondary cities, which often do not have well-established universities with a research tradition, is required. There has also been inadequate focus beyond the peri-urban to the peripheral city-connected areas that are located outside city boundaries, despite the fact that these areas generate substantial daily traffic in and out of cities.

Overall, what is required is an ambitious rethinking of research approaches and methods in ways that can improve understanding of user needs and practices. A move to a more holistic interdisciplinary approach to transport research is essential if recent advances in urban studies research are to benefit the transport field. The value of approaches to urban studies that draw from a rich methodological repertoire strongly embedded in situated, participatory processes is now increasingly recognised, but is only gradually gaining ground in transport research. Greater appreciation of and training in mixed-methods research (qualitative as well as quantitative) among transport researchers will be essential if the gaps identified in this position paper are to be

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filled satisfactorily. While quantitative surveys and big data (i.e. from mobile phones, GPS) can help to show where people move around and by what modes, such data will provide little understanding of the reasons behind these movements and will fail to capture the needs of others who are immobile.

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## GOVERNING MOBILITY IN SUB-SAHARAN AFRICAN CITIES

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### PURPOSE AND SCOPE

Urban mobility systems are fundamental to the operations of cities. These systems include fixed material infrastructures (such as roads and railways) and services (such as buses, private cars and paratransit). They also include the less-concrete structures of governance, such as institutional arrangements, financing, planning, and management of infrastructures and services. The myriad relationships between the structures and practices of governance, the material infrastructures, and the various transport services that use these infrastructures have direct and indirect implications for how cities function.

The objectives of this position paper are to provide an overview of the governance dynamics of African cities and their implications for mobility in cities, to unpack key trends in the governance of mobility infrastructures in Sub-Saharan African (SSA) cities, and to craft a compelling and interdisciplinary agenda for future research.

## METHOD

This paper is primarily based on a review and analysis of existing literature on the governance of urban mobility infrastructures in African cities. To do this, the authors reviewed literature on the governance of African cities more generally, including the territorial, fiscal, and political dimensions of urban decentralisation. The authors also reviewed the specific material on the governance of infrastructures and services such as road and cars, busses, rail, paratransit, and nonmotorised transport.

This work was further informed by several of the authors' own multi-year research projects (including African comparative research projects on various related subjects).

## KEY FINDINGS

It is important to situate the governance of mobility within a wider understanding of how African cities are governed.

While incredibly diverse, African cities have some shared governance challenges. The last 30 years of territorial, fiscal, and political decentralisation have left African cities with fragmented systems

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Research to date has paid insufficient attention to the way in which African city-systems operate. Instead, much of the research on mobility governance in Sub-Saharan African (SSA) cities has focused on particular technologies (for example BRT), without situating these technologies in wider infrastructural and governance systems.



of urban governance. Territorially, official municipal boundaries often fail to align with the functional urban form. This produces a myriad of challenges for the provision of services. Fiscally, city governments often have few resources or borrowing capacity, limiting their ability to meaningfully invest in urban services. Politically, cities are hotbeds of opposition politics and contested power relationships. Political attention has often focused on 'big-bang' projects, which are seen to be modern and impressive. Rather than producing robust and empowered city authorities, decades of reforms have created ample space for a plethora of actors - national and local, public and private, formal and informal - to stake claims to African cities. These claims are often contested, particularly in the context of control over key infrastructures and service delivery systems.

Overall, fragmented systems of decentralised urban governance and 'big bang' political projects

have produced fragmented urban and spatial forms. For example, a common problem in African cities, and one that has direct implications for mobility, is urban sprawl and low-residential densities. Another example is the emergence of hybrid infrastructure systems. Informal and noncentralised systems have emerged to fill the gaps in service delivery that have come about as a result of favouring large-scale and politically attractive investments, and misalignment between the various agencies operating at the city-scale.

With regard to mobility, the overall lack of investment in urban transport systems – particularly urban public transport systems – has created a large gap in urban service provision. In many African cities, we see the emergence of multi-layered and uncoordinated systems of mobility made up of a complex web of actors. This is largely because in many countries the *de jure* responsibility for sectors such as roads,



public transport, and urban land use and planning is shared across various actors and agencies. This fragmentation of material and institutional systems creates fertile ground for competition among actors with deep vested interests. These actors might include paratransit associations, unions, cartels, corrupt officials or politicians, lending agencies, and many others. Practices such as rent-seeking and skimming occur along all parts of the mobility infrastructure value chain. Both large-scale transport projects (such as trains) and smaller-scale systems (such as paratransit) are prone to these activities, albeit for different reasons.

The infrastructures that relate to various components of the mobility system - i.e. roads and private cars, buses, urban rail, paratransit, and walking and cycling - often operate in silos, each with their own governance structure and arrangements. Notably, interventions in one or other mode (such as rail, road, paratransit) often fail to recognise the various modes' interconnectedness and the way that they together shape urban systems. For example, a key trend in governance reforms for key mobility sub-sectors has been the creation of multiple agencies and authorities. In most African cities, authorities have been established to manage and maintain urban roads. As roads are undeniably the most important mobility infrastructure (as they serve as the base for buses, paratransit, and non-motorised transport), these agencies have significant power in cities. Similarly, in cities where there have been Bus Rapid Transit (BRT) investments, these have been accompanied by

the formation of metropolitan authorities. In both cases, these agencies have removed powers from local authorities.

Governance arrangements in the mobility sector are given effect not only in their formation, but also in the way in which they are resourced. A major determinant of the shape of mobility systems, and the outcomes of any changes to them, is who has money, how much they have, and who decides how it can be spent. Funding for mobility has focused on large capital projects to the exclusion of smaller and more everyday interventions. Where paratransit (the most important mode of mobility in most Sub-Saharan African cities) has been considered for reform and intervention, the focus has been on aggressive regulation rather than investment or subsidisation. The choice to tax these modes, while heavily subsidising 'formal' systems, reflects the enduring fixation on modernity evident in many African cities.

### KEY RESEARCH AND KNOWLEDGE GAPS

There are many important avenues for future work on mobility governance. To date, much of the mobility governance research has focused on particular technologies (for example BRT), without situating these technologies in wider infrastructural and governance systems. Work that contextualises these technologies is vital. The focus on the governance of mobility in African cities should also take into account wider shifts towards a discourse of 'accessibility'. This shift

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goes from considering how to move people through geographic space to understanding how people access whatever it is they need or desire. While there are lots of ideas about innovations in mobility technologies, there is little work on how to viably create change in the institutional systems that support mobility systems. More work on how institutional change can actually be given effect is necessary.

Finally, a future research agenda should consider co-producing knowledge, drawing on the grounded expertise of different actors involved in mobility systems and their governance. Coproduction for mobility governance research is particularly powerful as it allows different registers of knowledge to be joined together and resists the tendency to import and impose best practices or theoretical frameworks that might not be fit-for-purpose in the African context.

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## EMERGING BUSINESS MODELS AND SERVICE OPTIONS IN THE SHARED TRANSPORT SECTOR IN AFRICAN CITIES

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## PURPOSE AND SCOPE

This paper focuses on different business models evident amongst the privately operated but publicly available urban and near-urban shared mobility or shared passenger transport services across Sub-Saharan Africa (SSA), as well as on ways in which these services are, or may be, improved or developed.

Shared passenger transport is a broad cluster of services that spans a spectrum of operations falling between the scheduled mass transport funded, managed, and/or run by the public sector at the one end, and privately owned vehicles at the other. Often called paratransit, and more recently popular transport, these operations can most readily be identified by the presence of a vehicle driver who takes payment in exchange for a passenger's use of the transport service. The type of vehicle used to render the service might be as large as a bus or as small as a bicycle.

Shared transport takes two broad forms: collective shared transport, and ridesharing services. *Collective shared transport services* carry multiple passengers using the same vehicle, at the same or during overlapping time; these services typically There is little work that describes the often invisible yet powerful dynamics of politics and of corruption, another facet of governance in the shared transport arena in Sub-Saharan Africa.

take the role that mass, scheduled public transport plays in other world regions. The services tend to rely on buses, minibuses, and other forms of light commercial or passenger vehicles. Collective shared transport in the form of for-hire options carries different passengers using the same vehicle at different times. These for-hire options include metered taxis and those hailed and paid for through electronic means.

*Ride-sharing or pooling services* are a more recent, if not yet widespread, form of shared transport, a hybrid between collective and for-hire shared transport. What these services have in common, and which warrants their inclusion in this paper, is that they run on a for-reward basis, usually in the form of a fare that the passenger pays for being transported.

### EMERGING BUSINESS MODELS AND SERVICE OPTIONS IN THE SHARED TRANSPORT SECTOR IN AFRICAN CITIES

## METHOD

Supported by a review of key literature, this paper draws primarily on the knowledge of expert scholars and practitioners to capture their expertise and experience on the theme of shared transport in Africa by way of a two-day work session with 10 such individuals. This was complemented with individual work sessions with four experts who could not attend the group work session, as well as by written input from a further four senior academics with experience in the theme. A draft paper was then presented to a group of about 60 academics and practitioners working in and on Africa for further comment and input.



## KEY FINDINGS

Shared transport services are still, after many decades, the main form of motorised transport in nearly all of Africa's sprawling cities. Despite the prominence of Bus Rapid Transit (BRT), digital hailing, and payment technologies in the transport policy and development arenas, the impact of these services on daily life in urban Africa pales in comparison to that of shared transport.

Shared transport in the African context has a number of common characteristics. These include limited regulation by public authorities, the absence of public subsidies (especially for operations), demand-responsiveness, strong sector-internal competition, and a tendency to rely on older or poorly maintained vehicles. Operations are shaped by the pursuit of individual profit, even for collective modes where operators are organised in route groupings.

Key stakeholders in this sector include passengers (as the main source of revenue in the system), drivers and conductors (who manage vehicles and passengers), owners or operators and the collective representative bodies to which they belong, and the public sector. The latter's role tends to centre on licensing, enforcement, and, occasionally, the use and provision of public transport terminals.

There are three main categories of assets in shared transport operations: vehicles, the licensing systems, and the relationship between the vehicle owner and the driver. *Vehicles* take a variety of forms, ranging in size from buses to motorcycles and bicycles. *Licensing systems* are most evident for minibus-based services, but are



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also increasingly required for two-wheeler-based services. These authorisations come in different forms, and can be attached to a driver, a vehicle, or a service.

The relationship between the vehicle owner and driver is central to the sector's business model. Drivers usually pay owners a regular amount for the use of the vehicle, after which they enjoy a high degree of independence and make most operational decisions. Owners tend to have little oversight of revenue collection and passenger numbers, except where electronic payment systems are used. The dominant business model in the shared transport sector is a landlord model where an owner rents his or her vehicle to a driver against a fixed sum of money, on a daily or weekly basis.

The for-hire and collective business models tend to be stable, with the main trend being the proliferation of the number of businesses as a response to urban population growth.

Although digital ride-hailing platforms are growing in number, in effect all that these have introduced is the ability to hail and pay for for-hire services through digital means.

In the collective services space, BRT is widely seen as a means through which public authorities – typically funded by donor agencies – can absorb or displace collective shared transport services. However, the number of cities on the continent where BRT has been introduced is small, and the instances where shared transport has been effectively curbed or replaced by such introduction is even smaller. EMERGING BUSINESS MODELS AND SERVICE OPTIONS IN THE SHARED TRANSPORT SECTOR IN AFRICAN CITIES

### KEY RESEARCH AND KNOWLEDGE GAPS

Shared transport remains an emerging research field. There is much scope for further research to fully understand the nature and operations of collective shared transport services in cities across Africa, be that whether these services are based on a landlord revenue model, a commission-based system, a service in which drivers are in charge of most business decisions, or forms of operation in which owners are taking an active role in managing their businesses.

Similarly, there is a need to describe the characteristics and impacts of the more recent wave of digital technologies in shared transport. There is little documented research to date on the impact of innovations in how business is conducted or services delivered, or on how sector-, public- or development-led reform projects have transformed the shared transport sector.

Each city and type of shared transport business has its own unique set of physical and social circumstances; thus responses to research questions must be grounded within descriptions of such local contexts and variations.

A further key research gap is on the existing impacts and future prospects of digital network technologies that can attract passengers away from both the more mass transport end of the service spectrum and from private car reliance at the other end. The introduction of such technologies may have implications for The full paper can be accessed at http://www.vref.se/ macprogramme

the livelihoods of those who work in the sector at present, as such changes tend to imply the formalisation of employment structures.

There is also little work that describes the often invisible yet powerful dynamics of politics and of corruption, another facet of governance in the shared transport arena in Sub-Saharan Africa.

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## ROAD TRAFFIC INJURY AND TRANSPORT-RELATED AIR QUALITY IN SUB-SAHARAN AFRICA

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## PURPOSE AND SCOPE

Transport affects human health in several ways. It does this directly as a road safety issue, as well as through noise and air pollution, and indirectly due to increased dependence on motorised transport, often leading to a lack of adequate physical activities, and social severance and exclusion.

This paper describes the burden of road traffic injuries, as well as the state of air quality in Sub-Saharan African (SSA) cities, in relation to the current state of knowledge on these issues. It also highlights gaps in knowledge that might be addressed by future research.

Although active transport (such as walking and cycling) and social exclusion are important dimensions of transport and human health, these areas are largely excluded from this paper, as they are discussed in another position paper in this series: User diversity and mobility practices in Sub-Saharan African cities: understanding the needs of vulnerable populations.

### METHOD

The authors conducted a literature search of both scholarly work (using google scholar) and work that is available in the public domain (such as hospitals and public administrations). Key words used in the literature search included road traffic injuries (RTI), ambient air pollution (AAP) in Africa, traffic orash, traffic accidents, road accidents, road traffic injuries in Africa, vehicular pollution, vehicular emissions, traffic emissions in Africa.

## KEY CHALLENGES RELATING TO TRANSPORT AND HEALTH

Transport has often been handled as infrastructure and service, without close attention being paid to understanding its public health dimensions. This situation has contributed in part to transport not being given, for instance, a dedicated space in the 2000/2015 Millennium Development Goals (MDGs), which – despite their focus on critical issues such as poverty, education, and gender – did not include a recognition of the strong links between these issues and transport. Poor management of rapid urbanisation and growth over many years has

#### ROAD TRAFFIC INJURY AND TRANSPORT-RELATED AIR QUALITY IN SUB-SAHARAN AFRICA

also undermined delivery of services such as transportation, housing, water and sanitation, and health.

While Sub-Saharan African countries are expected to invest in strengthening their transport infrastructures in the coming years, this along with rapid urbanisation, can also have substantial adverse health impacts. These impacts include an increase in road traffic injuries, as well as an increase in vehicular pollution and associated health problems.

Deaths from road traffic injuries are already on the rise. In 2000, road traffic injuries accounted for 1.93% of deaths due to all causes in SSA, while in 2017 this percentage rose to 2.32%. Similarly, in 2000, road traffic injuries were the 13th most common cause of death in SSA, while in 2015 these injuries had risen to the 10th position.

Further, rapid urbanisation in SSA is, and will undoubtedly continue to be, associated with high ambient air pollution from households, industries and transport. Among harmful air pollutants, fine particulate matter (PM) has the greatest effect on human health. Most PM comes from fuel combustion, both from mobile sources such

Transport has often been handled as infrastructure and service, without close attention being paid to understanding the public health dimensions of transport.



as vehicles and from stationary sources such as power plants, industries, households, or biomass burning. Already, people in SSA are exposed to higher levels of PM (specifically PM2.5 and PM10) than people from high-income countries. These expected adverse health effects need to be addressed.

### KEY RESEARCH AND KNOWLEDGE GAPS

In view of the growing burden of health impacts from transport in SSA, consistent efforts by the research community are required to generate new knowledge in close cooperation with those responsible for investments and implementation of relevant policies and projects. Interactions between academics and practitioners are important for facilitating knowledge dissemination.

The study identifies the following key research gaps and concerns which may be useful in drafting



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a research agenda regarding transport and health challenges in SSA:

- > Few systematic reviews of road traffic injuries and air pollution;
- > Limited interdisciplinary studies;
- > Very limited data on air quality that can form the basis for analysis;
- Very limited data on road fatalities and road user types;
- > Unreliable data on road traffic crashes;
- > Limited studies based on hospital data;
- Limited data that can be used for emissions modelling;
- Lack of involvement and commitment among international agencies working on road safety in SSA to engage with the academic sector.

Researchers working in the areas of road traffic injury and transport-related air quality seldom undertake interdisciplinary studies. A large proportion of road traffic injury studies are based on either hospital data or secondary sources, whereas a significant number of air pollution studies are based on data from local experiments. There are very few systematic reviews of road traffic injuries, air pollution, or non-motorised transport.

Routine air quality monitoring is limited across the African continent, with many countries lacking air quality standards. Strengthening air quality monitoring in SSA will provide data for (a) developing national responses to the air pollution problem and (b) conducting health impact assessments to reduce the burden of disease attributable to air pollution, as well as for communicating air pollution risks.

Further, transport-related greenhouse emissions, climate change and mitigation continue to be viewed primarily through the perspective of global comparative studies. In most cases SSA is considered as one (or almost one) entity, which in terms of the nature, diversity and complexity of urban transport systems in SSA is definitely not the case. Specific local contingencies and contributing factors (such as vehicle mix, age of vehicles, types of fuels, maintenance and inspection policies) are seldom considered in the scientific literature, let alone how the built environment – including both formal and informal infrastructure – is influencing mode choice and use, which has crucial importance for air pollution and emissions.

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## PUBLIC TRANSPORT SYSTEM DESIGN AND MODAL INTEGRATION IN SUB-SAHARAN AFRICAN CITIES

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### PURPOSE AND SCOPE

This paper concerns *formal* public transport (rather than shared or informal modes, which are not part of the paper). The focus is on systems that are typically fixed-route, scheduled services (sometimes called institutional transport), and operated under some measure of government supervision, if not control. Typical modes under this definition include commuter rail, light rail, Bus Rapid Transit (BRT), and fixed-route bus services.

The purpose of the paper is to surface and synthesise major themes, findings, and questions that emerge from the collective research evidence about these systems.

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## METHOD

Knowledge related to mobility interventions is dispersed across academic institutions – covering diverse disciplines such as engineering, economics, political science, and urban planning – as well as the practice community. In the latter, this knowledge is tacit and embedded within the experiences and views of people who have been or are involved in the planning and delivery of transport on the ground. This paper therefore draws on a wide range of secondary sources, including grey literature, a review of experiences with BRT planning and implementation, and interviews conducted with experts across SSA.

## KEY FINDINGS

Mobility in Sub-Saharan African cities (SSA) cities is generally problematic due to a combination of underdeveloped road infrastructure, inefficient traffic management, land use that tends to be unsupportive of efficient public transport, and insufficient government ability to upgrade and improve public transport. There is also little interest amongst governments to manage or reduce reliance on the private car, leading to serious congestion in cities.

There is nevertheless growing momentum towards investing in new, fixed-route public transport systems in SSA cities. In cities that have implemented such systems, there is evidence of significant benefits to passengers in terms of

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reduced travel times, enhanced access, and more reliable services. However, the evidence regarding travel costs is contradictory, suggesting that many low-income passengers cannot afford to use these systems. The evidence regarding the unequal distribution of benefits across groups also raises key questions around how, and for whom, transport interventions are planned in Sub-Saharan African cities.

BRT seems to be the preferred mechanism through which many governments and development agencies in Africa want to improve passenger transport. This is despite some interest in rail investments, as well as some efforts at bus service modernisation via contracting and franchising schemes (with mixed results).

BRT projects have, however, proven more complex than previously thought in terms of the demands put on institutions, finance, and the need to involve existing industries. There is a growing criticism of BRT as an imported solution that is insufficiently sensitive to African realities and too easily captured by special interest groups.

A related issue is one of appropriate standards for the two existing approaches to BRT, namely so-called 'BRT Classic' and 'BRT Lite'. The pros and cons of each approach under different local circumstances are currently being debated. Key to the issue of standards is the question of affordability and financial sustainability, as most SSA cities are financially strained, and most governments seem unable or unwilling to provide ongoing subsidies for public transport. The pressure for systems to be self-sustaining affects



many aspects of the design, system scope, vehicle standards, and fare policy. An additional challenge is the financing of rolling-stock in new public transport systems.

Another key issue for fixed-route publictransport is its relationship to informal (paratransit) operators. Questions include whether it is inevitable and desirable to displace informal operators from fixed-route corridors, or if a more complementary role can be found in a hybrid system.

Integration between fixed-route systems (either rail or BRT) and other existing services (such as buses, informal modes) has generally been done poorly, although the situation seems to be improving.

The adoption of technology in the course of upgrading public transport has also often been problematic. Further, although some good practices exist, bus tracking and passenger data are generally not used effectively for operational management and planning, suggesting that a mismatch exists between the sophistication of



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technology provided, and the authority/operator's ability to make effective use of it.

Governance is commonly accepted as another constraint to the effective deployment of better public transport (and better cities in general).

These knowledge gaps and controversies should be seen in context. It is important for the future of mobility in Africa that they do not detract from the higher priority of helping policy makers, funders, and implementers to move from reflexive carbased projects towards better public and nonmotorised transport systems that benefit cities more broadly.

## KEY RESEARCH AND KNOWLEDGE GAPS

The knowledge base on the technical aspects of implemented public transport projects in Africa is very thin and variable. It is important to promote a systematic repository of project information – including data on operating costs and subsidies – to aid in comparative analysis and learning.

There are also cross-cutting themes around planning and political processes that need to be explored. These relate to:

- > the roles of different planning and funding agencies in adopting (or resisting) specific technologies or standards, and their motivations for doing so;
- the interaction between government agencies, operator groupings, and communities in the planning process and its outcomes;
- > appropriate institutional relationships between local and central governments in relation to public transport implementation, particularly with regard to the ownership of roads and the control of funding; and
- > corruption and incompetence within government.

This paper highlights competing approaches in the design of BRT systems, and the fact that there is little agreement about which features of BRT systems are critical to their success and which systems are optional *under SSA conditions*. Academic research could make a much larger contribution to this debate by searching for evidence and conducting critical and unbiased analysis of implemented systems.

There is also a need for standardisation of investment appraisal modalities. While individual project implementers will adopt appraisal approaches that reflect local goals, it is important that a standardised methodology is

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applied to allow comparison across cities. While acknowledging the political nature of cost-benefit analysis, its aim should be the identification of the best realistic alternatives to be adopted in response to the target objective(s).

Better implementation (and perhaps more success at motivating funding) requires a better understanding of how public transport projects impact populations which have different income levels, abilities, and needs. Impacts on other stakeholders such as incumbent transport operators, landowners, and businesses also need to be better understood.

Much better insight is required into both the operational aspects of fare collection and the user impacts of different fare structures, fare levels, and fare technologies. As digitally enabled fare collection systems emerge, better knowledge is needed of how they might enable or prevent access to public transport.

Much work is also needed on examining different pathways to move towards modal integration in terms of processes, not just results or endstates. The role of new mobility (such as e-hailing) should also be added as these are shaping new opportunities for network integration (such as between first/last mile trips). It is also necessary to gain a better understanding of the barriers to deploying and integrating vehicle technology, fare technology, and operational systems in SSA transport. The role of technology suppliers and decision makers needs to be examined.

Descriptive work is needed to examine the two-way relationships between transit and land-

The full paper can be accessed at http://www.vref.se/ macprogramme

use, as well as to understand how design and implementation decisions (regarding, for instance, technology choice and station spacing) that are made by planners affect or constrain the actions of private sector players in the land market. The levers that government players can deploy to promote desirable land use responses also need to be better understood.

Significant knowledge regarding local operating conditions and passenger needs resides within the informal transport sector, but it is unclear how to exploit this knowledge for the purpose of delivering better services. Professional development is needed in all aspects of public transport planning, management, and operations.

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This booklet summarises the key findings of five position papers on Mobility and Access in African Cities, commissioned by the Volvo Research and Educational Foundations (VREF). The purpose of the position papers is to provide an overview of current knowledge, as well as to inform VREF and researchers in Sub-Saharan Africa in developing a research agenda in this area. Each position paper has been written by a team of leading experts with Sub-Saharan Africa university-based research experience in the respective areas.

We hope you enjoy reading and sharing the material with colleagues and others in your network.

All papers are available at www.vref.se.



