



South African Cities Network

Literature review on public transport and mobility
in municipalities

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Acronyms

BRT	Bus Rapid Transit
IDP	Integrated Development Plan
IRTN	Integrated Rapid Transport Network
ITP	Integrated Transport Plan
NMT	Non-motorised transport
PTISG	Public Transport Infrastructure and Systems Grant
PRASA	Passenger Rail Agency of South Africa
SACN	South African Cities Network
TDM	Travel Demand Management
TIA	Traffic Impact Assessment
TOD	Transit Oriented Development

1. Executive Summary

The report provides perspective on public transport and mobility in South African cities through a review of existing literature surrounding these broad topics. The South African Cities Network (SACN) has identified transport as critical area in the future of South African cities. With the devolution of transport functions to the local government sphere, the future of South African transport systems will hinge on the ability of local governments to respond effectively to the increased transport responsibility. The SACN has conducted ad hoc research on transport based issues and is seeking to build on this using the transport and mobility practice and understanding that is developing in its cities. A research agenda will therefore be an outcome of this report.

The approach to transport planning in South African cities has been critiqued extensively in literature. One important critique has been the vehicle centric methods of transport planning which largely neglect public and non-motorised modes. In this regard South African transport policy has emphasised improvements in public and non-motorised transport options. On the one hand, there is the need to better integrate transport modes and on the other hand the need to improve integration of transport planning within broader urban planning processes. Transport authorities have been hailed as the solution to improving the integration of transport modes due to the fractured institutional arrangements governing transport across the three spheres of government. However, the manner in which transport planning is being conducted is also having an impact on the ability to achieve the land-use transport integration that is much advocated for in policy and legislative documents. It is questionable as to whether transport authorities will be able to achieve the required levels of transport land use integration. There is wide acceptance that transport planning and urban planning practices are ill aligned and are based on different philosophical principles, and as a result they simply do not 'speak' to one another. The integration of transport and urban planning is an area of critical importance, especially given the socio-

economically fractured nature of South African cities. Thus, there is need for research in the pursuit of achieving more transit oriented, compact and inclusive urban forms. It is further evident that there is a distinct gap in research around exploring the incentives for higher density, mixed use development around public transport infrastructure. Creating these transit oriented developments is arguably foundational to achieving more sustainable transport practices in South African cities.

Moving towards sustainable transport landscapes requires investigation into the financial, environmental and social aspects of transport systems. Much emphasis has been placed on the financial implications of the devolution of the transport function to local metropolitan municipalities. There are wide spread concerns regarding the ability of local governments to cover costs associated with operating and managing public transport systems in a sustainable manner. This is an area demanding further research. The reduction of vehicle trips has also become a priority given the negative environmental impacts which private vehicle based transport is having globally. Transport demand management has become a key concern for local municipalities and it has been argued that strategies to reduce private vehicle trips have been largely unsuccessful to date. This is attributed to a lack of understanding of what people base their travel decisions on. If people are to shift their transport modes, then a strong component of travel demand management is the improvement in the user focus of non-motorised and public transport infrastructure and services. Currently, South African cities poorly facilitate the movement of non-motorised travel modes. This is an area where much research and development needs to occur in South African cities because the benefits of non-motorised transport (NMT) are apparent. .

There has however, been a much strengthened focus on the improvement of public transport infrastructure and services. However, from a user perspective, the various routes of public transport modes are poorly integrated across space. Where there is limited spatial integration, operational timetables are poorly integrated across modes meaning that waiting times while transferring between modes can be frustratingly long. Further research is thus required around the opportunities for improved modal integration both spatially and operationally. Although there has been increased investment in public transport infrastructure over the past 5 years, there has been limited empirical research assessing how the systems are performing relative to broader policy objectives. This reflective research is critically important as it can provide potential lessons which can become instrumental in the improved development and effectiveness of public transport moving forward in South African cities.

There is evidence of an increased emphasis on public transport in South African cities, which is encouraging. However, it is clear that there is much work that needs to be done in order to better understand how transport in South Africa can become more sustainable and effective in providing improved levels of access and mobility to a wider spectrum of people. Some areas of research which are critical in this pursuit have been outlined.

2. Introduction

This literature review study on public transport and mobility in South African cities takes place at a crucial point in the trajectory of South African passenger transportation development. Since emergence from apartheid, South Africa as a nation has been locked in a process focused on overcoming the spatial and socio-economic inequalities inherited during the apartheid regime. From a transport perspective, there has been much progress made in transport policy reform which begun in the mid 1990s with the development of the *White Paper on National Transport* policy 1996. These early transport policy documents had to fundamentally address how transport planning and development was understood and conceptualised. Much work has been done to achieve this, at least from a policy perspective. The previous neglect of poorer residents, largely living on the periphery, who rely on public and non-motorised transport has meant that there has been far more policy emphasis on public transport and non-motorised transport users in the post apartheid era. However, it was only in the late 2000s when major public transport projects began to come to fruition.

There has been much literature which has emerged in South Africa around the topics of public transport and mobility. These include academic writing, policy documents and technical papers. The purpose of this study, commissioned by the SACN is to provide a collation of the various transport literature which has been developed in South Africa. It develops a narrative which begins to bring all the strands of thought together, highlighting areas where research has been conducted, areas for future study and potential gaps, the latter which will provide a research agenda for the SACN going forward. The SACN has conducted a number of *ad hoc* transport research projects and these will be mentioned in the review where appropriate. Importantly, South African passenger transportation writings do not occur in a vacuum, and there is a rich source international literature dealing with many topics which are pertinent to the development of South Africa's transport sector. This literature will be incorporated to provide avenues of learning and deepen understanding as well as provide ability to identify crucial gaps.

The study is based on collating academic literature, conference technical papers and policy literature, the latter that which has been developed by the various transport and urban planning departments at local, provincial and national government level. It weaves the literature together to provide a storyline on the topic in South Africa as well as internationally. From this, a research agenda is set for the SACN going forward. The study categorises subjects of interest into key focus areas, to enable easier understanding of the volume of literature available and easier dissemination of the results of this study:

Key areas of focus include:

- Institutional arrangements
- Transport planning approaches and decision making
- The evolution of transport policy
- Sustainability
- Newly developed public transport infrastructure

It is important to note that each of these areas of focus are interconnected and cannot be understood in isolation of one another. The report will highlight how these areas often feed into and inform one another.

A bibliography is included at the end of this review and literature access can be found on a spreadsheet which accompanies this review. The majority of literature used has been sourced from internet sites. The South African Transport conference archives have provided a useful source of technical and academic conference papers for the past decade and were drawn on in this review. Papers which have emerged out of the University of Cape Town centre for transport studies have also provided valuable input. A search for municipal technical and policy based literature yielded fairly limited responses. This means that there is a relatively small amount of municipal based literature that has been included in this study. As a result the review is largely academic and government based strands have been applied where possible.

3. Institutional Arrangements

The issue of institutional arrangements is critical to any discussion on public transport and mobility. The devolution of transport responsibility and functions to the local sphere of government has gathered wide support as it is understood to be the most effective sphere of government from which to plan, implement and manage public transport operations. However, there are complex and challenging institutional and financial issues which will need to be addressed if local government is to successfully take on the transport role. The National Development Plan when discussing the devolution rather aptly explains that ‘this will help align the fragmented and conflicting interests of multiple transport authorities, each with separate funding sources and mandates’. However, handing responsibility for transport over to municipal authorities will only succeed if it is accompanied by strengthening of institutions and alignment of legislation, policy and practice’ (National Planning Commission, 2011: 185). There has been much discussion and debate around the ability of local municipal governments to take on the responsibility from an institutional perspective. (Holtzhausen and Abrahamson, 2011; Kane, 2002; Wilkinson, 2002). Some authors have provided critical discussion on the manner in which municipal bodies have responded to the responsibility as a transport planner and service provider (Kane, 2002). In this regard, there is a trend toward creating a transport authority which has control and decision making powers over all transport in the local jurisdiction. The majority of metropolitan local governments have established or are working towards implementing transport authorities.

Holtzhausen and Abrahamson (2011) provide an account of how Cape Town Metropolitan Municipality has responded to the increased public transport functions which have been devolved to it. Their account highlights the complex challenges faced in adapting institutional structures to be able to deliver on increased transport responsibilities as national government maintains control of rail planning and operations and subsidy schemes. The City of Cape Town opted to take a phased approach towards establishing a single transport authority, which was officially established in October 2012. Kane (2002) and Wilkinson (2002) have cautioned the uncompromising formation of single transport authorities. Kane (2002) highlights that there are clear political, institutional arrangement and funding issues which need to be considered when moving to a single transport authority. Wilkinson (2002) is cautious of the limited impact transport authorities

will have in the pursuit for improved transport land-use integration. Wilkinson (2002) in his paper on integrated planning at the local level flags the issue around the ill alignment of the transport planning process and the Integrated Transport Plan (ITP) relative to the urban planning process and the Integrated Development Plan (IDP) and argues that the formation of transport authorities runs the risk of further entrenching this divide. This is problematic in the pursuit of land use-transport integration underpinning the sustainable transport agenda. Schmidt and McKenzie (2012) in a research project for the Treasury have highlighted this as a central issue to the development of South African cities. Schmidt and McKenzie (2012) make a number of useful recommendations targeted at improving the integration of spatial and transport planning. These include a learning event bringing transport planning, urban planning and urban economic specialists together. They also call for improvements to the Integrated Transport Planning process which sees the inclusion of strategies for increased urban density around public transport infrastructure.

Kane (2002) has called for more research to be undertaken to better understand how local governments can respond to a transport environment that remains institutionally fractured, where rail subsidies and operations remain national government responsibility whilst transport planning and operations have been largely devolved to the local level. This understanding is further supported by National Treasury (2011) in their Local Government Budgets and Expenditure Review. There are clearly issues around the institutional frameworks which are best suited to carry out transport functions in local metropolitan municipalities. It would be worthwhile assessing the research which has occurred since 2002 in the Metropolitan Municipalities as EThekweni, and more recently Cape Town, have already formed transport authorities. Similarly, Johannesburg has announced that they are in the process of establishing a transport authority.

A research agenda for the SACN could include a number of items. One, a determination on the ability of transport authorities to achieve transport-land use integration requires further investigation. Secondly, how transport planning processes can align with urban planning processes is a critical area of research. Thirdly, it would be useful to scrutinise the successes and challenges faced by transport authorities, as more and more, they become an important institutional players in the cities.

4. 'Who' are we planning for? Transport planning approaches and decision making

There has been much critique directed at the traditional transport planning process and what it means for non-motorised and public transport users (Vasconcellos, 2003; Behrens, 2004; Behrens, 2006, Kane, 2002, Kane 2010). These are the modes that are relied on by the poorer people in South Africa. Given that traditional approaches to transport planning focus on providing improved conditions for the vehicle, poorer peoples' travel needs are often not well understood and are neglected (Behrens, 2004). Vasconcellos (2003) provides a strong argument for the development of improved transport planning practices in the developing world which can begin to develop more equitable and socially just transport decisions. There is no doubt that this thinking has had a profound influence on the transport policy in South Africa as there is a clear policy focus on public transport and non-motorised transport users. However, transport planning practices have largely continued in a business as usual fashion through much of

the post-apartheid era. It is encouraging that much attention has been placed on developing public transport in South African cities and that there is a shift in transport planning practices and outcomes which is beginning to occur. However, there has been a critical response to the public transport projects, such as Gautrain and the My City bus system in Cape Town, questioning whether the investments are indeed targeting the poorer residents living in cities. These are the people who urgently need improved access to economic and social opportunities and activities. This will be discussed in more detail later in the report.

Intrinsically linked to the discussions around planning approaches is literature on transport planning decision making. Litman (2011: 2) provides a useful argument when explaining that the manner in which transport problems are perceived and surveyed can profoundly influence decision making and outcomes:

‘How things are measured can affect their perceived value. A particular activity or option may seem desirable and successful when measured one way, but undesirable and ineffective when measured in another. It is therefore important to understand the assumptions and implications of different types of measurements.’

This understanding is argued to be vitally important in understanding the decisions that are made regarding public transport and mobility in South Africa. How the problem is conceptualised frames the data collection method and assessment technique and can have an impact on the justifications for projects (Behrens, 2004; Behrens, 2005; Behrens, Diaz-Olvera, Plat, Pochet, 2006; Litman, 2011a). In this regard, it is vitally important to have a user focus in transport planning and ensure that all users travel needs are better understood and are catered for in a more equitable and sustainable manner. In some cases legislative requirements are constraining the problem framing and measuring processes which are used for decision making. This is evident in the Traffic Impact Assessment (TIA) process which is currently the legislative transport requirement in the property development process. These impact assessments have a predominant vehicle bias and require critical reflection, there has been very limited literature found on the TIA process and the transport requirements of developers.

A very useful angle of entry for the SACN would be among others, research around what impact the newly developed public transport systems have had on improving poorer peoples access and mobility in South African cities. Secondly, the transport planning legislative requirements such as the TIA which feed into the property development process need to be reviewed, to determine their efficacy and utility to the different modes of transport which they cater for.

5. South African transport policy: Moving in the right direction?

There has been much work conducted on the transport policy environment since the emergence of a democratic South Africa. Walters (2012) account of public transport policy in South Africa provides a useful overview of what has transpired in the policy arena. From the *White Paper on National Transport Policy*, 1996 there was an explicit emphasis on prioritising the needs of public transport and non-motorised users. There has been much work on understanding what this

might entail and these sentiments have been better understood and reinforced in transport legislation and policy documents formulated over the past 16 years. The public transport strategy document produced by National Department of Transport in 2006 is indicative of the amount of work that has occurred in this area, and the recent improvements in public transport infrastructure and services can arguably be attributed to this effort. However, Walters (2012) analyses each mode as well as the various operators of public transport separately and critically discusses that policy for each mode of public transport has been developed in a silo which presents major challenges for the integration of systems spatially and operationally. The lack of integration has clearly posed challenges at the local government level as highlighted by Moodley, Chetty, Reddy and Simmer (2011) and Holtzhausen and Abrahamson (2011) in their accounts of developing integrated transport networks in Ethekwini Metropolitan Municipality and Cape Town Metropolitan Municipality respectively. Walters (2012) further argues that the complexity and lack of clarity around the relationship that the three spheres of government share regarding transport, as well as a distinct lack of sustainable funding mechanisms pose great threats to the implementation of integrated public transport.

The South African government has clearly focused on the development of public transport and less so on the NMT improvements that policy documents have called for. A draft national NMT policy document was developed in 2007 and there is evidence of a growing focus on improving NMT conditions in South African cities. However, in-line with Walters (2012) comments, NMT policy development is largely occurring in a silo and thus runs the risk of further fracturing the transport environment. It is clear that there has been much progress made in terms of shifting policy away from a vehicle bias which focuses on the private vehicle owner and this is a shift in the right direction. However, there needs to be greater emphasis on integrating the policy development of various modes and their various operators. There are clearly many challenges which urgently need to be addressed if public and non-motorised transport is to become more effective and integrated in practice.

Important research items for the SACN include exploring how the integration of the transport policy pertaining to various public and non-motorised can be improved. This is in line with the need for greater emphasis on integrating the various modes and their various operators.

6. Sustainable transport: the challenging realities

The concept of sustainability is popular in transport vision statements for municipalities. However, as Litman and Burwell (2006) discuss in their paper, unpacking what sustainable transport means is often a challenge- sustainability is a broad and unclear concept which often gets misused. Transport is a major contributing factor to the economic, social and environmental sustainability of cities. As the concept of sustainability encompasses each of these areas it is imperative that the economic, social and environmental issues are addressed in transport research agendas moving forward.

In a critique of transport operations focused solely on economic sustainability Litman and Burwell (2006) explain that sustainable transport is that which, along with financial aspects, begins to account for broader social and environmental issues. The focus on ensuring the financial sustainability of transport systems in isolation of the environmental and social impacts on broader society is cautioned.

Kane (2010) is critical of the ability of South African metropolitan municipalities to create sustainable transport solutions and argues that neither the political focus nor the required capability is evident for them to do so. In her paper, Kane (2010) discusses the Tran:sit programme which positioned a sustainable transport expert within the Cape Town Metropolitan Municipality in the build up to the 2010 Soccer World Cup. Jennings and Covary (2008) in their analysis on the Tran:sit programme allude to similar conclusions to those of Kane (2010), highlighting that there are definite capacity shortfalls and priority conflicts in the attempt to provide sustainable transport solutions. Both Kane (2010) and Jennings and Covary (2008) papers highlight that although sustainability is a rhetoric priority, the same emphasis is not being placed on sustainability in practice. This is attributed largely to two factors. Firstly, the lack of political and technical leadership actively pushing sustainable agendas. Secondly, the lack of municipal staff with the understanding and expertise in delivering sustainable transport solutions.

Sustainable transport is an all encompassing concept, and as a result there are many aspects which fall within it. The racially and socio-economically segregated spatial landscapes of South African cities largely inherited from apartheid planning demands focus on the restructuring of fractured sprawling city forms, as well as the way in which people live and operate in the city. The traditional approaches to transport planning adopted in South Africa are vehicle centric by nature giving rise to environments which seek to primarily facilitate the efficient movement of vehicles. As a result, there has been much literature on the topics covering the movement towards more sustainable transport planning and practices in South African cities. These include writing around topics relating to the financial capabilities of municipalities to take on the public transport function, travel demand management, integrated land use-transport planning, non-motorised transport and public and non-motorised transport integration. Importantly all of these aspects are inter-connected and cannot be understood in isolation of one another.

Although there has been limited writing explicitly targeted at sustainability, all of the above mentioned topics are in some way or another dealing with the promotion of sustainable transport. Much of the literature to emerge is advocating for a change regarding the manner in which transport planning is currently conducted in South African cities and these will be discussed in more detail later in the chapter. As has been discussed previously data collection and planning approaches are vehicle centric and do not cater for improved levels of sustainability. However there has been much policy commitment to more sustainable transport solutions and the writing that has emerged to date is grappling with what sustainable policy objectives might mean in practice. The following sections will discuss some sustainable transport issues. Beyond the financial category it is difficult to categorise topics under financial, environmental and social as they arguably contribute to more than one category.

6.1. Financial Sustainability

There has been much debate as to whether Local Municipalities will be able to afford the public transport function (Hetherington, 2011; Palmer, 2011). Palmer (2011) has warned against the immense financial risk that might accompany local municipalities' implementing and managing public transport. National Treasury (2012) have advocated for the devolution of the management and operational transport function to the local sphere. This is because the urban planning occurs at the local municipal level and transport needs will be better understood and

planned for in conjunction with other facets at the local government sphere. Grant funding in the form of the Public Transport Infrastructure and Systems Grant (PTISG) has been made available to kick-start the development of public transport projects at the local municipal level. These greatly assist the capital finances required to implement transport projects, but much of the concern has been generated around the operating finance required to support public transport systems

Essentially the argument is that current public transport operation requires significant levels of subsidy, largely provided by national government. Given all the investment in Gautrain and the various Bus Rapid Transit (BRT) services, which are either operational or in the process of being implemented in South African cities, the amount of public transport operation in South African cities has increased. It is unclear if national government will continue to provide the level of subsidy necessary to operate public transport services as it is debatable as to whether revenues received will cover these costs. The risk is that public transport services then begin to target areas where higher fares can be collected to ensure the greatest possible revenues are generated. In this regard Buehler and Pucher (2011) advocate for the need for transport to service the areas which are not deemed to be the most lucrative in terms of fare collection as transport has a wider role to play in providing poorer residents with access to economic opportunities. Therefore, looking at transport as a service that can generate surplus is cautioned as the role that public transport plays in supporting economies as well as livelihoods of the poor is difficult to measure but is arguably immense. Thus, improved understandings of sustainable subsidies are critical.

The SACN in their State of City Finances report (2011) have acknowledged the immense challenges that local municipalities will face in the devolution of public transport function to the local sphere. The SACN notes that municipalities, through the support of grant funding, will be able to finance well functioning public transport networks. However, the exact nature of the financing and operating subsidy models required remains uncertain and is thus an area where much research is required.

With regards to subsidy and affordability Behrens and Venter (2005) critically analyse the 10 per cent household expenditure on transport level that South African transport policy uses to determine affordability levels generically. The paper argues that the fact that this benchmark is applied across all modes and population groups is unclear and problematic. This is because affordability means different things to different people. The paper calls for a more robust understanding of transport affordability, and the figure be revisited. Subsidy is clearly an important facet in the ability for local governments to provide effective transport solutions and is reiterated a critical area for further research.

Research agenda items for the SACN for this section include greater analysis into the operational finance sustainability, and what the subsidy implications for the devolution of transport responsibility to local municipalities are.

6.2. Travel Demand Management

Travel Demand Management (TDM) is a widely used term and is often hailed as one of the most effective methods to improve the sustainability of transport systems. TDM emerged as a reaction to the predict and supply based vehicle oriented transport practices, in an attempt to reduce the number of private vehicle trips made. Municipal bodies in South Africa are legislatively required to develop TDM strategies as part of their ITP, as is set out in the National Land Transport

Transition Act of 2000 and re-enforced in the National Land Transport Act of 2009. However, the research that has been conducted thus far has highlighted that there has been limited success with implementing TDM strategies in South Africa (Behrens and Del Mistro, 2006; Behrens, Del Mistro, Lombard and Venter, 2007; Behrens and Del Mistro, 2008; Behrens and Del Mistro, 2011, Van Dijk and Hitge, 2012). Much of the work done has been focused on understanding how TDM measures can be effectively implemented in order to have the desired effect. Behrens, et al (2007) provide an analysis of the triggers of transport behavioural change. This work is based on retrospective surveys conducted by Behrens and Del Mistro (2006) in an earlier study. Their findings indicated that triggers of transport behaviour change are largely non-transport related and the frequency of changes were between 7-18 years. Behrens and Del Mistro (2008) go further to explain that current understanding and knowledge of why people make the travel decisions they do is insufficient to be able to effectively implement TDM strategies. Thus, there is a call for more research in this area.

Van Dijk and Hitge (2012) provide a discussion on what is required to make public transport lifestyles more appealing. They argue that in order to get more people to substitute car travel with public transport, compact urban forms, improvements in public transport infrastructure, more effective integrated operations and improved marketing and communications need to happen simultaneously. Currently there is a big push towards improving the infrastructure of public transport, but this is being done in silos and without the other supplementary factors which are discussed.

As a way forward, there is need to investigate why people make certain travel decisions and what makes them change their travel choices

6.3. Land use-Transport integration

It is widely accepted both internationally and in South Africa that sustainable transport is dependent on urban form and land use patterns. (Cervero, 2001; Newman and Kenworthy, 1996; Wilkinson, 2006; Hitge and Gqaji, 2011; Yusuf and Allopi, 2010; Rabinovitch, 1996; Nina Herala, 2003, Camagni, Gibelli and Rigamonti, 2002). The private vehicle has had adverse effects on the urban form of cities as it encourages mono-functional sprawling land use development which consumes vast amounts of natural land and results in further travelling distances. There has been a dominant push for development to occur along land use-transport lines which gives rise to compact mixed used cities structured around public transport. Curitiba is often held up as the best practice example in transport-land use integrated planning (Rabinovitch, 1996). The city is often hailed for its Bus Rapid Transit (BRT) system whilst the rich history of urban planning based on principles of land use and transport integration and the unique institutional arrangements that were able to develop and implement plans are often neglected.

The compact city concept has filtered into South African urban and transport planning legislation and policy documents. There is a strong policy directive to restructure the social-economic and spatial segregation that exists in South African cities, which have arguably been exacerbated in the post apartheid era by the continued private vehicular focus of transport planning practices and sprawling urban development (Wilkinson, 2002; Wilkinson, 2006; Hitge and Gqaji, 2011; Yusuf and Allopi, 2010). However, the compact city outcomes on the ground have been limited. Wilkinson (2002) has provided a useful discussion on the inability of transport planning to speak to urban planning processes and as

a result there is limited opportunity for transport-land use integration to occur. The limited take up of density bonuses in the city of Johannesburg's in attempts to implement denser development around proposed BRT stations in 2006 is perhaps indicative of the disjuncture in urban planning and transport planning approaches and processes that Wilkinson discusses. The SACN has previously been involved in the creation of Transit Oriented Development (TOD) principles frameworks for the city of Johannesburg, focusing on densification around Gautrain stations. There has been limited empirical research on the success which the frameworks have had in shaping development around Gautrain stations. Given the level of public transport investment that is taking place in our cities, this is clearly an area where more research and development needs to be conducted.

The City of Cape Town (2012) recently produced a densification policy which is attempting to deal with the issue of more compact urban forms and the document has taken a strong focus to identify opportunities for development around public transport infrastructure. However, the document does not grapple with the prospect of aligning transport planning and urban planning processes in the pursuit of densification. Although the intention of these documents are consistent with improved transport-land use integration, the manner in which the solutions are perceived remains isolated. In this regard there is much work required around how best to integrate urban and transport planning processes.

With regards to opportunities that exist around public transport station, Urban Landmark (2012) undertook a study on Land Value Capture which explores these opportunities in South Africa as a method of improved infrastructure financing and growth management. The paper emphasises the importance of the contextual elements which need to be considered when choosing value capture mechanisms for specific sites. The paper concludes saying that infrastructure development attracts people and expenditure, and in that way, can create nodal focus points. This is important given the existing spatial structure of South African cities where outlying areas have no economic backbone. Importantly, land value capture can be used to include social development objectives in developments around transit stations, to move towards achieving inclusive transit oriented communities. This is an isolated study and in general there is a distinct lack of research targeted at the improvement of the transport-land use connection in South African cities. Internationally there is evidence of much research and innovation around improving land-use transport connection. These studies include, but are not limited to, the concepts of land banking, value capture, location efficient mortgages, density bonus schemes, relaxation or reduction on parking requirements for new developments. Schmidt and McKenzie (2012) recommend similar types of research to be conducted in South Africa which assess the financial or other mechanisms that incentive densification around public transport networks.

Transit Oriented Development (TOD) is a term often associated with the compact city urban form structured around public transport. These dense mixed use environments result in more people being able to access various land uses needed to carry out daily functions and activities without the use of private vehicles. A strong component of TOD environments are provision for non-motorised transport modes, as walking and cycling become increasingly attractive. Denser urban environments structured around public transport also provide higher volumes of potential public transport passengers and are thus crucial in the financial sustainability of public transport systems. From this understanding it is evident how the sustainable finance of public transport, travel demand management, denser urban environments and a reduction in the environmental

impacts of transport cannot be dealt with in isolation and are inherently dependant on one another.

Research agenda items for the SACN include those around tools to incentivise the development of mixed land use, mixed income, higher density developments structured around public transport nodes in the South African context.

6.4. Non-motorised transport

There are many authors globally who have documented the benefits of using NMT modes (Litman, 2011a; De Waal, 2009, Gakenheimer, 1999). In the developing world where motorization levels are still relatively low in comparison to the developed world, the majority of people rely on non-motorised transport to carry out their daily activities. However, as has been mentioned, the adoption of traditional transport planning practices in developing world countries means that NMT trips are often neglected and the majority of people are not considered in the planning and development of transport projects (Vasconcellos, 2003). In global contexts defined by limited financial and non-renewable energy resources NMT modes present the most affordable, flexible and sustainable transport solutions. Thus, there is an increasing global thrust towards facilitating NMT modes in cities.

In South Africa there has been a relatively large amount of literature that has emerged advocating for the promotion of walking and cycling in cities. Behrens (2004) has provided valuable insight on the manner in which the current assessment process excludes many short NMT trips that are done for non-work purposes in South Africa. This kind of research is vitally important to understand the extent of NMT which occurs in South African cities. Similarly, Bechstein (2010) in her research on commuting cyclists in Pretoria raises the awareness and profile of NMT users by documenting how long they travel for and how much money they save. This type of empirical research is vitally important to the development of cycling and walking in our cities and it is encouraging to see that there is more research emerging on NMT. Buehler and Ralph (2006; 2008; 2011) in their respective empirical studies have been able to showcase cycling activities and analyse why cycling levels are greater in certain areas and countries. Two of their most notable findings are that cities which have developed segregated cycle infrastructure networks display higher levels of cyclists. Further, cycling levels are more dependent on the policy thrusts and political will to implement than the physical conditions presented by various contexts.

The increased understanding and profile of NMT in South African cities can only lead to improvements in the planning and implementation of cycle based infrastructure. Litman (2011a) has provided a discussion on the factors that need to be considered when evaluating NMT. The argument is that by overlooking some of the factors which are less obvious and difficult to quantitatively measure, NMT might not seem as attractive. Some of the less obvious factors include but are not limited to the positive economic and social spin offs that the health and fitness benefits of using NMT modes present. The improvement in equality levels which come with providing a greater spectrum of people with access to economic and social opportunities. The impacts that NMT can have on land use and urban form whereby street fronts become more accessible providing the ability to generate increased economic activity. When all the factors are considered the benefits are palpable, providing strong justification arguments for perusing NMT development in cities.

Agenda items going forward include investigation into the financial and spatial requirements of NMT infrastructure, and improving understanding of existing NMT demand and economic research on the return on investment in NMT infrastructure in South African cities.

6.5. Public and non-motorised transport integration

The lack of modal policy integration which Walters (2012) discusses ultimately results in transport systems which are not spatially and operationally integrated. The complex and unclear institutional arrangements and responsibilities between the various spheres of government make integration even more challenging (Walters, 2012). The policy emphasis on Integrated Rapid Transport Networks (IRTN) which have to be legislatively prepared by metropolitan municipalities has meant that the metros have struggled with addressing the non-integration of transport systems (Wilkinson, 2002; Moodley et al., 2011; Holtzhausen and Abrahamson, 2011).

There is limited literature beginning to emerge around the operations integration of various public transport modes. Onderwater (2012) discusses how relatively simple changes to the operation schedule of the rail service in the EThekweni Metropolitan Municipality can begin to provide a more attractive and integrated public transport service using existing infrastructure and rolling stock. However, due to the isolated development of individual modes there is a lack of spatial and operational integration of public transport. Spatially not integrated, meaning that often routes are not planned to be integrate with routes of other transport modes and operationally not integrated, meaning that when routes are actually integrated, operational time tables are not synced to ensure that modal transfers are convenient and efficient. This is an area where more research is required in order to achieve a better understanding of how best to move forward and begin to achieve cost effective integration between various public transport and non-motorised modes. Coupled with this, there has been some research done looking at the physical design of transport nodes (Behrens and Schalekamp, 2008) and how accessible they are for pedestrians changing between modes, as all public transport users are pedestrians at some point in their journey. The paper calls for the development of guidelines for interchange sites to be developed which will require further research.

Ultimately, a user focus needs to be adopted whereby transport systems are looked at as a whole and assessed relative to various users' perspectives. In order to make public transport attractive they need to be integrated spatially, physically and operationally.

There is a requirement for research on the existing opportunities for transport systems as well as spatial and operational integration

7. Public transport: limited empirical research and response

Gautrain represents the single largest infrastructure investment in South Africa's transport history. Coupled with the expenditure on BRT systems around the country and the planned improvements to Passenger Rail Agency of South Africa's (PRASA) metrorail infrastructure and rolling stock highlights the commitment that the state is making to improving public transport in South

Africa. However, there has been limited research into exactly how these projects are performing and the impacts they have had relative to their objectives.

7.1. BRT

There is much emphasis on developing BRT systems in South African cities as is indicated by Pillay and Seedat (2006) in their discussion of the National public transport strategy document. BRT is seen as the backbone to the IRPT networks which are required to be developed in the metropolitan municipalities. Currently, Johannesburg and Cape Town BRT systems are operational with Nelson Mandela Bay, Tshwane, Buffalo City, Rustenburg and Polokwane are all in the process of implementing their systems.

The confidence in BRT systems is high. This is despite the lack of robust empirical research to support the benefits in a South African context. There is a distinct lack of research which has been conducted on how the systems which are operating or performing relative to broader policy objectives. Maunganidze (2011) in his research on the Cape Town system is critical of the degree to which the Cape Town BRT service has been able to address travel needs of the poor. More research is required in this area to assess the financial, land value and urban form and person travel impacts that the BRT systems are having. However, it seems that it is too late to impact on the decision making around the type of transport investment which will take place in cities.

7.2. Gautrain

Gautrain is a highly contentious project which provided much debate around the actual transport focus. Van der Westhuizen (2007) provided a critical discussion around the justifications for the Gautrain project which was then projected to cost 27 million rand and was developed to service the small portion of the already privileged vehicle owning population in the province. The paper provides the agreement that the political imperatives which seek to place regions within the competition to attract global capital investment were the actual basis on which the system was justified. The resulting force is that the Gautrain has reinforced the spatial and socio-economic inequalities associated with apartheid. By developing high quality infrastructure which services central locations and neglects the peripheries the well located wealthier portion of the population are further entrenched into an advantaged position. This happens whilst people living on the peripheries who rely on public transport daily and require improved public transport infrastructures and services remain spatially and economically segregated. It is for this reason that the Gautrain has come under immense criticism.

The system has however had positive impacts on land prices and has arguably got some people out of their private vehicles and using public transport. However, the accuracy with which this can be argued is limited given that there has been limited research into the exact impacts of system.

An agenda item going forward for the SACN includes empirical research studies which evaluate the impacts that newly developed public transport projects have had relative to broader policy objectives

8. Conclusion

A review of existing literature focusing on public transport and mobility in South African cities has been conducted. What is evident is that there is a myriad of different topics which have been covered in the literature that has emerged. It is encouraging to see the amount of literature that is being developed around the public transport and mobility theme in South Africa. Upon reflection, there are many challenges that South Africa faces in the attempt to improve public transport and mobility in cities. It seems that there are foundational institutional and process issues that need to be addressed. These will provide a much stronger ability and clearer understanding for metropolitan municipalities to respond effectively to the increased role they have to play in providing public transportation. Political will and necessary professional capacity to deliver more sustainable transport solutions have also emerged as major challenges and needs to be addressed. The integration of land use and transport seems to be critical in the pursuit of achieving more sustainable and equitable transport practices and has been widely emphasised in the literature.

Much of the literature around public transport and mobility in South Africa has emerged out of Cape Town. Whether this can be attributed to the establishment of the centre for transport studies cannot be said with any certainty. However, it is clear that the research centre is providing a deepened understanding on public transport and mobility in the Western Cape, which is arguably the region in South Africa which has the most well rounded policy and implementation programmes are occurring.

The vast majority of the literature that is available is dealing with policy analysis and the issues that policy directives present when attempting to move to implementation. These issues are clearly of prime importance as they begin to challenge existing understandings and frame new perspectives which are vital to the development of more sustainable transport practices. However, there is a distinct lack of empirical research in the South African context. Whether this is due to the relatively infant nature of the South African public transport improvement and development focus or the lack of capacity to conduct empirical research this needs to be improved as there are many lessons which can be learnt from systems that have been implemented and are operating. This is highlighted by the international literature which provides analysis of existing systems.

The technical literature of the various municipalities might prove to be valuable in the pursuit to improve empirical understanding of the impacts public transport systems are having in South African cities. Unfortunately, the amount of municipal based literature in this review is relatively limited. The inclusion of data and information that municipal departments have relative to issues relating to transport and land use is of critical importance to establishing a research agenda moving forward. This literature will need to be explored further. However, this study has outlined some critical research areas for the SACN moving forward. These include:

- The ability of transport authorities to achieve transport-land use integration requires further investigation
- How transport planning processes might begin to align with urban planning processes is a critical area of research

- Research scrutinising the successes and challenges faced by transport authorities, as more and more, they become an important institutional players in the cities.
- The legislative requirements for transport planning such as TIA which feed into the property development need to be reviewed to determine their utility and efficacy .
- Research exploring how the integration of transport policy pertaining to various public and non-motorised can be improved
- Further research into the operating finance and subsidy level implications of the devolution of transport responsibility to local municipalities
- Improved understanding of why people make certain travel decisions and what makes them change their travel choices
- Research around how to begin incentivising the development of mixed land use use, mixed income, higher density developments structured around public transport nodes in the South African context
- Research into the financial and spatial requirements of NMT infrastructure
- Research around improving the understanding of existing NMT demand
- Economic research on the return on investment in NMT infrastructure in South African cities
- Research on the existing opportunities for different modes of transport systems to be more spatially and operationally integrated.
- Empirical research studies which evaluate the impacts that public transport projects have had relative to broader policy objectives.

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