

## Rethinking Mobility and Fixity in Developing Cities: a Case of South Africa

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### 1 ABSTRACT

Cities in the developing world are spaces of mobility and fixity. Globally access to mobility is often governed by social and economic constraints. Post 1994, South Africa metropolitan cities have seen numerous policies and legislative frameworks being developed to enhance urban mobility. Traditionally movement patterns in such developing cities is controlled by various transit services such as the level of accessibility, travel-time and number of alternative travel options. However in situations whereby there is no correlation between legislative instruments and daily operations of public transport systems. The objective of this paper was hence to access the rhythm of how commuters traverse in contemporary African cities. Using an explorative approach cognitive and spatial data was collected to develop a heat map to visualise variations of accessibility with the city. Preliminary finding reveal transportation hubs and areas of economic activities such as Park Station, Sandton and Rosebank have the highest levels of accessibility. Using the findings from the paper, city authorities can visualise movement patterns in the city and also forecast locations to improve transportation infrastructure.

Keywords: Urban mobility, Movement patterns, Cognitive data, Spatial data, South Africa.

### 2 INTRODUCTION

The concept of mobility vs fixity in the developing world has become a dominant theme in the discourse of city development practises. There is wide acceptance that transport planning and urban planning practices are ill aligned and are based on different philosophical principles. Citizens are entangled in system that either evokes movement or fixity (Hannam et al., 2006). Thus, there is need for research in the pursuit of achieving more transit oriented, compact and inclusive urban forms. Given how contemporary city authorities seek to become a part of the Fourth industrial Revolution (4iR) new developmental policies are being introduced. These policies promise to introduce ‘hyper-mobility’ which shall drive economic growth and improve the quality of life of citizens. The question however is, are contemporary developing cities ready, given how many cities are yet to have the infrastructure required to support these developmental projects.

Nonetheless, building on Harvey (1989) and Hannam et al (2006) sustainable urban mobility practises should address grassroot issues such as accessibility and quality of life. In Asia and African countries, new forms of urban mobility have arisen namely tuk-tuks, rickshaws and pedicab. The proliferation of these mobility modes can be linked partly as an effect of studies on innovative mobility. Given the exponential growth of urban areas, public transportation providers are now required to emphasise on investing on elements that influence citizen’s movement ability that is stillness and motion. Such research takes into account mobility trends. Sheller and Urry (2006) articulate how movement in urban areas, evokes different corporeal or sensory experiences for various citizens. For some the city can be described as a place of freedom where ideas, knowledge, money and places are easily accessible, whilst for others these remain unattainable.

Informed by Lefebvre’s rhythm analysis, recent mobility developments are informed by internal and external rhythms (Butler, 2012). The technological developments in transportation planning seek to enhance connectivity at key points of interest in the city. The actual practice of movement through space and time is can be seen through the ability of harnessing information and manipulating it to inform city growth. Consequently such studies encompasses both the embodied practice of movement and the representations, ideologies and meanings attached to both movement and stillness.

Managing movement in an urban setting requires a ‘spatial fix’ based on an abling spatial infrastructure and policies that enable movement (Harvey, 1989). Looking at the public transportation in Gauteng, South Africa, interdependent transportation systems have been developed namely a high speed train and bus rapid transportation services these which are supported by traditional public transportation systems. The complex

nature of balancing the innovative mobility systems and the traditional systems is a daunting task. Given how these systems have are targeted at different citizen groups, there is still a need to ensure overlapping between the systems is possible as they share the same spatial space. However there is no linear solution that can be used to ensure overlapping in these systems, as mobility is a reflection of the geometries of everyday life (Massey, 1994).

### 3 LITERATURE REVIEW

Sustainable urban transport planning and provision remains a pipe dream for most developing countries (Vasconcellos 2014). The significance of integration for moving towards sustainable development has become intertwined with the smart cities movement. It has been noted that, the problem is unprecedented in metropolitan cities which have witnessed an exponential spatial growth. This has led to many policy changes, with transportation policy emphasising 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.

The use of multi-mobility has received a special interest in the many urban areas. Commuters are encouraged to use two or three modes of mobility during their commuting trips to allow public transportation systems to share synergies. This in part has led to a growth of Bicycle sharing services. There are several reasons behind this trend such as the reduced burden of introducing a bus services for short trips and allocation for parking space. Diez et al (2017) have articulated the uptake of BSS by the public to incentives used to persuade the public such as the inclusion of small rewards (extra minutes, points etc). The joint efforts from city authorities and BSS providers have overtime led to development of various query systems on bicycle booking and availability at various stations, noteworthy examples include Bike Share Toronto in Canada, Citi Bike<sup>TM</sup> in New York and Bluegogo in China.

Within the South African context, much emphasis has been placed on the financial implications of the devolution of traditional transportation facilities. Due the nature of urban centres, De Beer & Valjarevic (2015) conducted a study to analyse factors influencing mobility in the city of Johannesburg, South Africa. Their results reveal topography, operational models, and infrastructure as the common factors for various age groups. These present a starting point for the introduction of multi-mobility. Other key issue to be addressed will be a need for integration of the urban space and improving connectivity levels amongst the various public transportation infrastructure. However, it is clear that there is much work that needs to be done in order to better understand how mobility in cities such as Johannesburg can become more sustainable and effective in providing improved levels of access and mobility to a wider spectrum of people.

One of the solutions used to regulate transportation is travel demand management (TDM). This with regards to public transportation provision seeks to reduce the amount of motorised travel (Del Mistro & Behrens, 2008), and this has been done in Gauteng through the implementation of the Rea viya; Metro rail and bus; Ari yang; Putsco; Gautrain and Gaubus. However, TDM has not been fully implemented as people still prefer to use the mini-bus taxis, as they argue that these cater more to their needs as they have more flexible operating hours and that they have successfully penetrated into various their points of interest. Thus they is still a need to make the formal forms of public transportation more attractive to the commuter. To address such issues, the National Government identified the use of Intelligent Transportation Systems (I.T.S), this which refers to the “application of data processing, data communications, and systems engineering methodologies with the purpose of improved management, safety and efficiency of the surface transportation network.” (Gauteng 25-year Integrated Transport Master Plan, 2013, p. 6). To fully implement I.T.S, real time and historical data needs to be collected and analysed, as a means of continuously making improvements in travel demand prediction, traffic modelling and O-D surveys. As the Gautrain Rapid Rail Link was initiated in 2010 (Johannesburg Metropolitan Municipality, 2008a), there is a need for innovative research techniques that can be used to guide the expansion and integration of the railway system into the urban environment.

Hensher and Wong (2011:1) have accentuated how the “public transportation is an indispensable service and ensuring its effective and efficient provision is a priority of many governments”. In South Africa, the National Land Transport Transition Act (No. 22 of 2000) has also outlined how public transport should be given precedence over private transport. Drawing from this the Gautrain has been identified as the backbone

of all public transportation in the Gauteng City Region (GCR) (Gautrain, 2009), this initiative was made as a means to move towards a more holistic provision of an integrated transport system to address the numerous socio-economic factors in Gauteng. Nevertheless, the realisation of an integrated transportation system is at early stages, as there is still a gap in the planning systems with regards to identifying the origins and destinations of commuters. As seen with the lack of integration of the current modes of public transportation.

Looking at the violent reverberations of colonialism in the processes of city living in Africa, cities have become places of intense fixity for many native communities. The contemporary Africa city although characterised by increased mobility due policy changes, this increased mobility is only enjoyed by the elite with many informal sector works being entangled in processes of city living, with many in constant battles with city authorities. A wide body of research on these protagonists, has been developed with many advocating for their right to the city.

The BRT system in South Africa has been well received by the public, however there is still a need to develop more similar systems as currently it has not yet penetrated to certain key areas of economic interest in the country as the only fully operational BRTs are in Cape Town, Johannesburg, Pretoria and the East Rand (Risimati & Gumbo, 2018). From the works of modern day scholars the integration of public transport systems will lead to improved service delivery, inter-connectivity of places of economic activity and improve quality of life (Filippi et al., 2013). Thus for metropolitan cities in South Africa to acme, there is a need for development of planning support systems which will guide the growth and integration of the existing and future public transport systems.

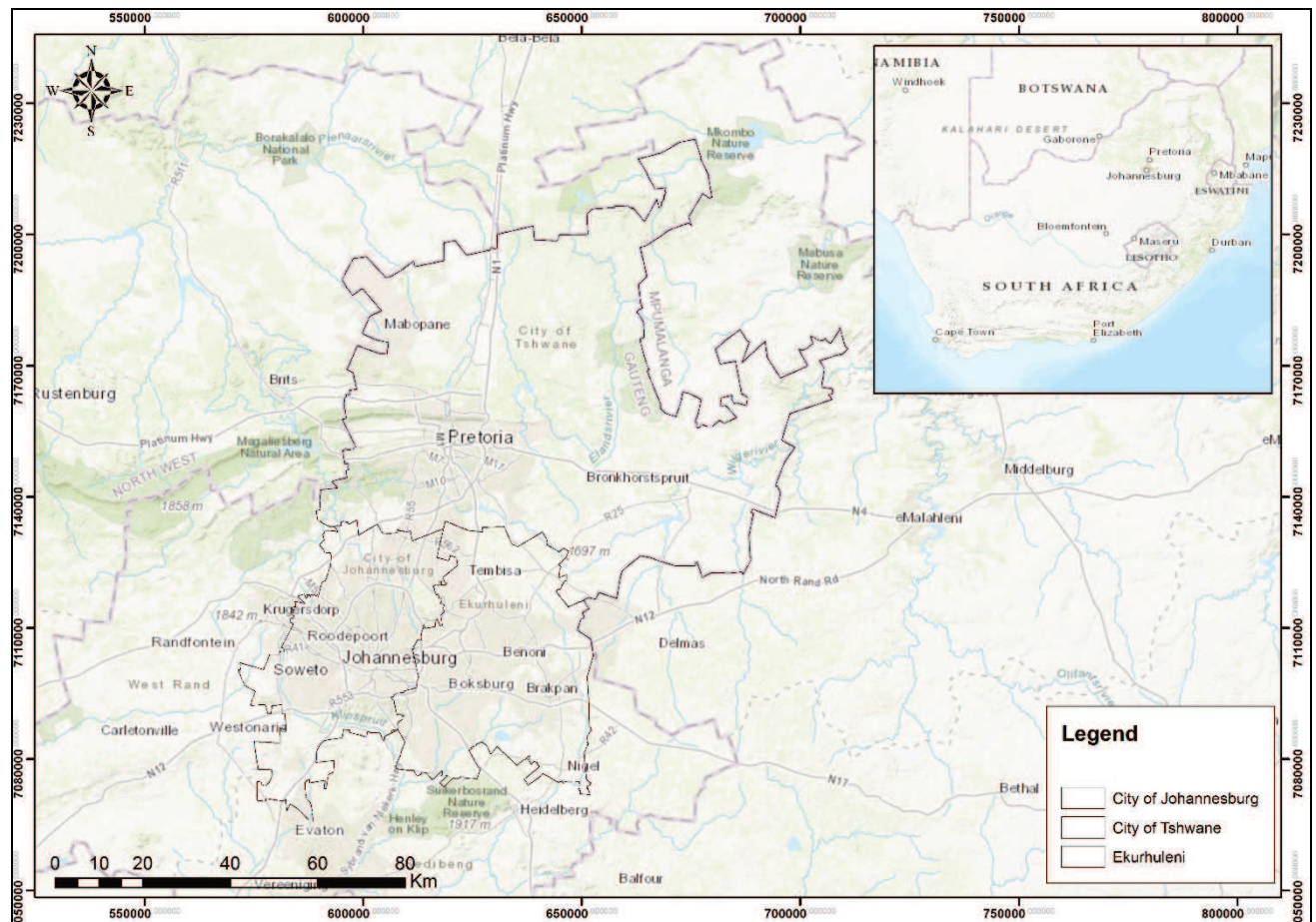


Figure 1: Study Area

#### 4 STUDY AREA

The Gauteng province in South Africa was selected as a case study (Figure 1). The Gauteng economic hub is made up of three metropolitan cities namely Johannesburg, Tshwane and Ekurhuleni. Johannesburg is the commercial capital of South Africa with a population of 957 441 people and a surface area of 1,645 km<sup>2</sup> (Stats S.A, 2011). Pretoria is located to the north of Johannesburg as is known as the administrative capital of South Africa with a surface area of 687,5 km<sup>2</sup> and a population of 741 651 people (Stats S.A, 2011).

Ekurhuleni lies to the east of Johannesburg and is known as South Africa’s manufacturing hub with a population nearly 3.2 million and a surface area of 1,975 km<sup>2</sup> (City of Ekurhuleni, 2013). All the four cities are run by an elected executive mayor from a political party.

## 5 METHODOLOGY

The study relied on a crowd-sourced data from social media posts. As a means of mining public opinions and also facilitate the research study, only social media (Web 2.0) posts relating public transportation for the year 2019 were collected. The execution of the public opinion data collection relied largely on the reliability of the information recorded that is all potential errors had to be minimised. Despite quality assurance being embedded in all the analytic processes, relating to social media collection and editing, errors may exist. To reduce errors accumulating the editing process was repeated until the researchers was satisfied that all the records used in the analysis reflected a true representation of the real world feeds (Figure 2).



Figure 2: Data collection and analysis framework

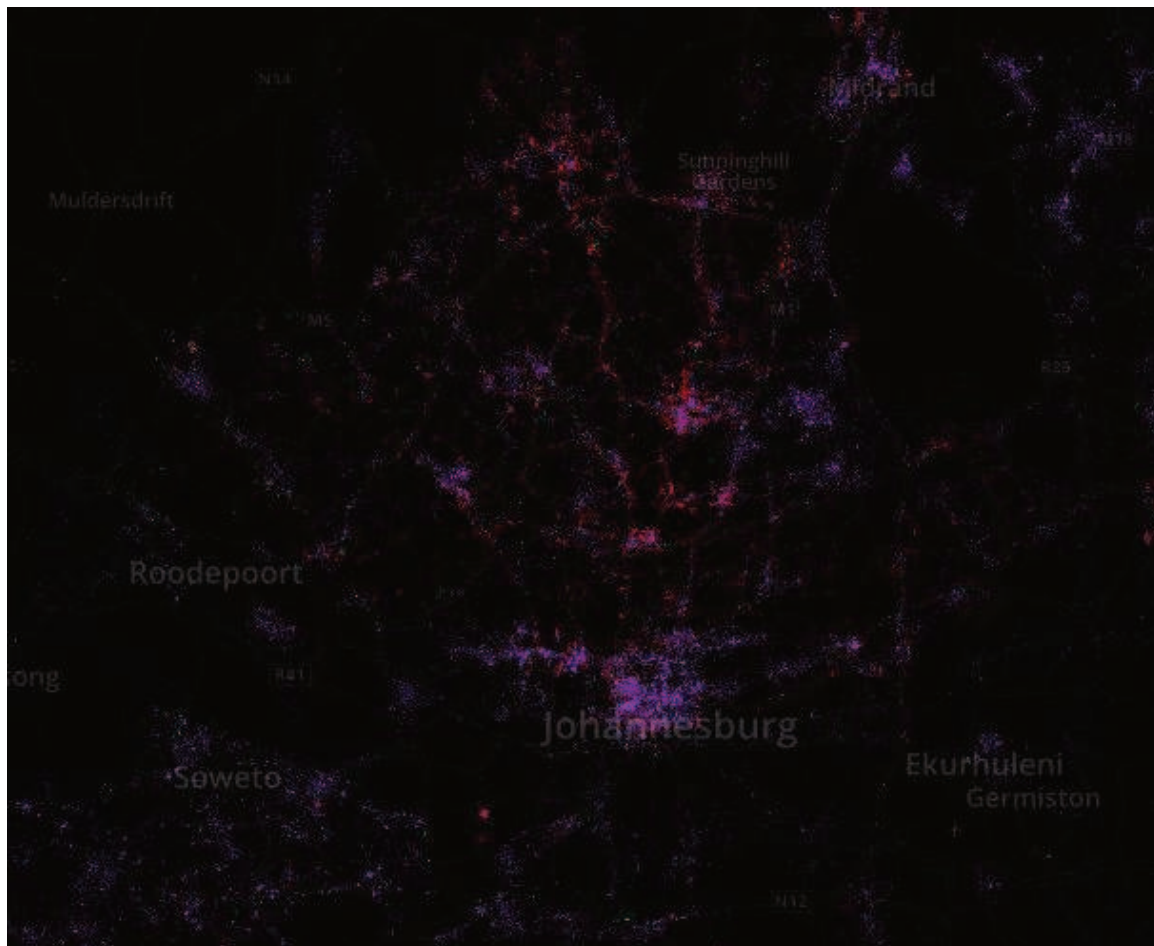


Figure 3: Mobility (purple) vs Fixity (black)

## 6 RESULTS AND DISCUSSION

Development of a public transportation system that promotes mobility in urban areas is a crucial and indispensable factor for the social and economic growth of any city. To a great extent public transportation providers within the City of Johannesburg have invested on mobility infrastructure. Using geo-location data from the cognitive dataset, we visualise the points of interest of the users. Places of high mobility are represented in purple and places of fixity in black (see figure 3). The locations in purple can be used to visualise

the spatial linkages between places of economic and social influence in the city. Zooming into the inner city of Johannesburg it becomes evident at locations such as Braamfontein, which is transit hub, which spatially promotes the use of multi-modal trips. Midrand, Rosebank and Sandton due to the high mobility rates have over time developed to become areas of economic importance as many companies, have set up their headquarters there. This has led to an increase of mobility in these regions. Other locations of high mobility include Sunninghill and Soweto.

Given the economic importance of such locations of high mobility, many citizens traverse to these locations in search of greener pastures. This has led to the commercialisation of public space in these locations which overtime become highly disreputable leading to a sprawl of illegal practise as the lower income groups and unemployed also seek to exercise their right to the city. This in part has given rise to a body of research documenting the continued battles between legality and illegality in cities. Nevertheless, although public transportation should be accessible to all, there are certain elements that hinder everyone equally enjoying the use of public transportation services. Factors such as income group, location and livelihood govern the social ranking of citizens, this inpart governs accessibility to services in the city. A notable example can be seen in Sandton, many citizens traverse daily to work in Sandton city, but not all can afford to utilise the Gautrain. Only the urban elites can park their cars at the train station and utilise the high speed train. The low income earners have to wait in long queues in the dusk of dawn and board commuter-mini-buses and in the evening queue again to return home. For many ordinary citizens this has become an acceptable norm, with innovative public transportation systems being solely reserved for the urban elite.

To unpack urban mobility one then has to explore the inter-relation with social norms. Looking at areas of spatial fixity (figure 4), such as parts of Rooderpoort to the west and locations in-between central Johannesburg and Soweto, we see the role of economic functions to govern mobility. Locations with little economic functions generally have little to no movement. This has led to infrastructure in such locations to decay and negatively impacted the quality of life of citizens in these locations. Indeed, in such locations people's movement is limited, for many physical movement is as important as financial freedom. A deeper analysis between mobility and fixity, thus could be essential for unpacking the sociological approach to studying the urban setting (figure 3). Applying this approach to citizens perspectives, entails not only spatially mapping movement patterns but also assessing citizen views that drive cognitive decision making.



Figure 4: Factors influencing mobility vs fixity

Urban mobility is consequently an essential element of citizen quality of life. The next question would be to assess the roles of city authorities and service providers to ensure equal access to mobility services, be it through developmental policies that establish and constantly reinforce the right of all citizens to access public services or re-thinking marketing strategies to ensure all have access to public transportation. In unpacking this relationship we illustrate the key terms associated with ‘mobility and fixity’. From a commuter perspective, elements such as time, space, information and speed are the main cognitive factors. Whilst for recreational trips elements such as access to information, opinions, connectivity and comfort are more essential. Where there is limited spatial integration and operational timetables most citizens have shown negative emotions to public transportation systems. Consequently in looking at the factors influencing movement, the relationship between being mobility and fixity is therefore dialectical and symbiotic in urban areas.

## 7 CONCLUSION

In this paper we have explored mobility and fixity in contemporary developing cities. Using the city of Johannesburg as a case study, we illustrate how certain locations in the city can be areas of hyper-mobility whilst also other areas in the city remain places of fixity. However space is never still, as is evident in South Africa as a whole, locations which were once reserved for a few pre-1994 are now accessible by all post 1994. However, it is clear that there is much work that needs to be done in order to better understand how public transportation in South Africa can become more sustainable and accessible by all whilst also providing improved levels of mobility to a wider spectrum of people. Furthermore explorative research is thus required around the opportunities for improved multi-modal integration both spatially and operationally.

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