The Role of Non-Motorised Transport (NMT) in Spatial integration The Case study of Lamontville in Durban, Kwa Zulu Natal

By

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DECLARATION

I **SIPHINDILE PHUMLA SIBIYA** declare that:

(i) The research reported in this dissertation except where otherwise indicated, is my original work

(ii) This dissertation has not been submitted for any degree or examination at any other University

(iii) This dissertation does not contain other person's data, pictures, graphs or other information unless specifically acknowledged as being sourced from other persons

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Abstract

This research focuses on the role on Non-Motorised Transport (NMT) in spatial integration by using Lamontville as the case study. South African Spatial planning under the apartheid regime has heavily shaped the spatial distribution and controlled accessibility and mobility of the South African residents. This has created a constant need for the people especially in the townships to travel to the places of employment often spending a large percentage of their income and time commuting using motorised transportation. Despite walking identified as the most common and widely used means of transportation for many people in South Africa, it is still marginalised and not receiving the recognition it deserves from the spatial and the transport planning professionals. It is for this reason that this study investigates the role of NMT in spatial integration.

This study adopted the qualitative methodology from a case study approach to achieve its goals. Primary and secondary data has been used by the researcher to ascertain the opinions and the perception of the various respondents. In - depth interviews has been the qualitative tool used to collect data from Key informants and the local residents.

The findings for this study reveal that NMT users in Lamontville are currently subjected to various challenges such safety, lighting, poor development and poor maintenance of the limited existing formal NMT routes. There are numerous informal NMT routes that have developed over the recent years due to population growth in Lamontville. These informal routes are disregarded by the transport planning officials, yet they are widely used and often are the only form of accessibility available to the residents.

This study therefore advocates for an urgent need for the development and the implementation of the NMT plan for Lamontville residents in order to promote spatial integration.

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Glossary:

NMT	Non-Motorised transport
TOD	Transit Oriented Development
SALGA	South African Local Government Association
ITDP	Institute for Transportation and Development Policy
NCP	National Planning Commission
NLTA	National Land Transport Act
DOT	Department of Transport
SPLUMA	Spatial Planning Land Use Management Act

Chapter 1

1. Introduction

Ballard (2011) argues that in South Africa racial discrimination under Apartheid planning has influenced spatial distribution. This has not only impacted on the location and distribution of land uses, but has also strongly controlled accessibility of some residents to essential economic activities and services as the land uses were planned along racial segregation. Transportation in South Africa has been designed to meet the needs of certain residents hence the heavy dependence on motorised transport. This is mostly because motorised transport is perceived as the major enabling factor in transportation. The role of transportation in the developing cities is mainly for mobility and not for accessibility thus not meeting the transport needs of all its residents (Pardo, 2012).

According to National Household Travel survey (2013) walking is by far the most common mode of transport in South Africa. Despite this, Non-Motorised Transport (NMT) is often marginalised in transport planning system and the provision of NMT facilities is often improvised rather than carefully planned in most developing countries (Guitink, 1995). Currently NMT users in South Africa face a lot of challenges ranging from inadequate facilities to poor maintenance of the little available NMT facilities. However the most crucial life threatening challenge is the one of road safety where the NMT users have to cross railways, freeways and other major urban arterials in order to get access to various land uses (Labuschagne and Riebens, 2014).

Ballard (2011) argues that the townships have been marginalised and located in the city's periphery which means that there is a constant need for the people to travel to the city in order to access employment and other services. This calls for a need for all transport practitioners to prioritise NMT so as to meet the travel needs of all residents and to promote spatial integration.

There is therefore a huge need for transportation as the people need to commute from their residential areas, in the periphery to the city centre and industrial areas around the city. The types of transportation that is provided for the people is the rail and road transport. In response to these transport demands, the planning and the design of roads only caters for vehicular transport travelling at certain designated routes. This type of planning and road design completely ignores the pedestrians, and any form of Non-Motorised Transportation (NMT) especially walking which is not catered for (Behrens, 2004).

Lamontville as a case study indicates how vehicle transport has impacted on the lifestyles of its residents. A large number of the Lamontville residents work outside Lamontville in areas like Isipingo, Durban CBD and Clairwood. They heavily rely on buses and taxis as means of transportation to and from work (in large part because of distances involved). For example in order to get to Isipingo the residents will have to travel to Umlazi then get a taxi to Isipingo which is both time consuming and expensive. A development of a well-planned NMT route

can be a tool for spatial integration and economic accessibility, thus saving the Lamontville residents money and time.

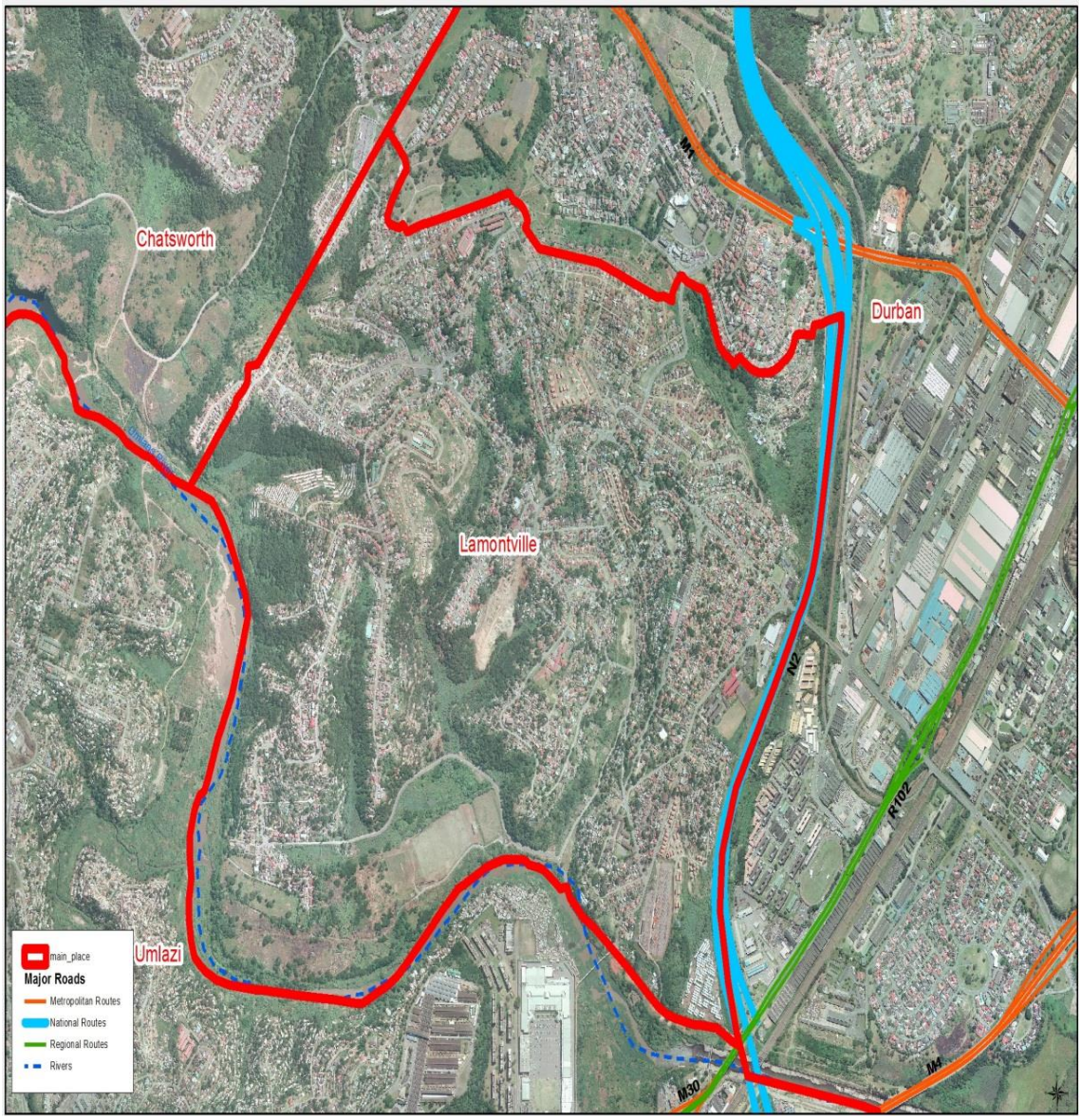
2. Review of Literature

This study reviews literature on the development and implementation of NMT in developing countries. It also specifically looks at the evolution and the status quo of NMT in South Africa. The literature also investigates the relationship between spatial planning and transportation and how the gap between these two disciplines can be bridged. Wilkinson (2002) argues that the post 1994 South African policies have been focusing on the restructuring of the social-economic and spatial segregation that has been caused by apartheid segregation policies.

The literature also looks at the legislative framework underpinning NMT development in South Africa and eThekwini Municipality and the benefits or challenges encountered during its planning and implementation. Lastly, the literature looks at case studies where NMT has been used as a tool for spatial integration.

3. Location of the Study

Figure 1: Locality map



Source: Author (2017)

Figure 1 is the map of Lamontville Township which is a township on the South Eastern part of Durban next to Mobeni and Isipingo. It is approximately 22 kilometres south of Durban Central Business District. It was named after Archibald Lamont who was the then mayor of Durban in 1929. It was built in 1934 as a dormitory town to accommodate migrant labourers who were working in nearby industrial areas. The population of Lamontville is estimated at 32,421 (Census, 2011). It is known for its political activity with the most famous politicians like Mr Msizi Dube and Advocate Griffiths Mxenge. Like many townships around Durban, Lamontville has high unemployment rate and the majority of the population depend on the government social grants (eThekwini Municipality, 2012).

4. Problem statement

Racial discrimination has influenced spatial distribution in South Africa. This has impacted not only on land use, but has strongly controlled accessibility of some residents to essential economic activities and services. The development of Non-Motorised Transport routes in a South African township like Lamontville could be a tool for spatial integration and accessibility for Lamontville residents.

5. Hypothesis

Planned Non-Motorised Transport route could assist in promoting spatial integration within Lamontville.

6. Research aim

The primary aim of this research is to investigate the role of Non-Motorised Transport in spatial integration and how the Lamontville residents could benefit from the development of Non-Motorised Transport routes.

7. Objectives

The objectives of the research are:-

1. To determine the nature and extent of Non-Motorised Transport internationally and locally and consider the precedents which could be relevant to the research.
2. To examine the legislation underpinning transport planning especially non-Motorised Transport planning and its implementation in South Africa especially within eThekwini Municipality.
3. To determine the impact of Non-Motorised Transport development on the Lamontville residents in spatial integration.

8. Research Questions

1. What is the nature and extent of Non-Motorised Transport internationally and locally including the world's best practice of Non-Motorised Transport?
2. What is the legislation underpinning Non-Motorised Transport planning and implementation in South Africa especially in eThekwini municipality?
3. What will be the impact of Non-Motorised Transport on spatial integration for Lamontville residents?

9. Research Methodology

Denzin and Lincoln (2008) argue that the most appropriate methodology to use when gathering data is best determined by the research question. The research questions of this study determines that the **qualitative method** be adopted as the overarching research methodology for this research. The qualitative research methodology highlights the processes, the meanings of various phenomenon that cannot be examined experimentally or measured in terms of quantity, intensity or frequency. In other words qualitative methodology looks at the association or relationships between phenomenon and the various situations that give meaning to the inquiry or study. The qualitative method looks at the reasoning why certain associations, patterns or relationships exist (Denzin and Lincoln 2011).

This study has used primary and secondary sources to collect data. The secondary sources used have been journals, books and policy documents. The primary data collection tools used in this study is the interviews and observation.

10. Validity, Reliability and Rigour

Yin (2011) argues that a valid study is a study that has properly collected and interpreted its data to ensure that the findings and the conclusions arrived at, reflect and represent the real world that was studied. Reliability is the accuracy and the precision of measurement procedure to work accurately at different times. This would mean that if the study would be conducted again consistency in the findings would be maintained. For this study validity and reliability was strengthened by triangulation where data was gathered from the Lamontville residents and the planning professionals using interviews and observation from the study area. Where possible photographs and maps were used to better explain and illustrate the point argued. The interviews were also piloted on a few professionals and Lamontville residents who were not part of the sample group. This was done to eliminate any errors or ambiguities and to ensure that the questions asked are relevant to the research objectives and the research questions.

11. Anticipated Problems/Limitations

There has been one major limitation to this study and this has been the time constraint. The study has been undertaken on a part time basis which meant that it took a bit longer than had initially anticipated. The scheduling of the interviews especially with the key informant respondents was not easy to conduct as most of the key informants hold senior positions with numerous responsibilities within the organisation and often would need to reschedule the planned appointments due to the demands and the pressures that come with the nature of such responsibilities.

12. Conclusion

Transportation was one of the strategic tools of Apartheid planning to promote racial and spatial segregation. This ensured that the township residents had limited access to economic services and activities thus limiting their engagement and participation in the South African economy. Complete transformation in transportation planning is necessary in order to redress these challenges and this can be achieved through the inclusion of Non-Motorised Transport in urban transport planning.

Chapter 2: Theoretical framework

2. Introduction

This chapter outlines in detail the theories that underpin the development of Non-Motorised Transport (NMT) as a tool in promoting spatial integration. This study has adopted two main theories that best outline the role of NMT as a sustainable tool in spatial integration and these are: the Smart growth theory and the sustainability theory. In this chapter the origins of the theory, its principles and its influence on the Non-Motorised transport will be carefully analysed. This will include the critique of each theory.

2.1. Origins of the Smart Growth theory

Smart growth is the theory on the development principles and planning practices that create efficient land use and transport patterns. This includes various strategies that result in more accessible land use patterns and multi-modal transport systems. It is an alternative to urban sprawl (Litman, 2015).

The Smart growth has its origins in the United States of America in the mid 1990's. It was a joint ideology of the American Planning Association (APA), the US Department of Housing (HUD), and the Henry M. Jackson foundation. Their main objective was to update the local land use Policies (controls) and to highlight the more compact development patterns. This led to the development of the APA's "growing Smarter" document that was released in 1977 (Goetz, 2005).

In 1996 the Smart Growth Network (SGN) was formed by the U.S. Environmental Protection Agency (EPA), government, and private organizations that had interests that ranged from environmental issues, real estate development and transportation. The ideology of SGN was based on the ideas of Calthorpe (1993), which highlighted the benefits of compact development, transit-orientated urban forms, which were later called neo traditional neighbourhood planning approaches (Goetz, 2005).

Research studies on the issues of urban sprawl revealed the social and fiscal costs associated with urban sprawl and this made the academics and policy organisations to gain interest and to start seriously looking into Smart growth as a concept. Various professional groups and academics then started publishing reports and papers about this new Smart Growth concept. The smart growth movement soon gained popularity and was used in various disciplines such as environment, planning, housing, labour organisation, business, public health and even government agencies (Goetz, 2005).

2.2. The principles of Smart growth

Smart growth principles can be considered as best tools communities can use to enhance economic development, create strong neighbourhoods with a range of housing, provide commercial and transportation options, and achieve healthy communities that provide families with a clean environment (Smart Growth Network, 2006).

There are ten basic smart growth principles that have been identified in making communities successful and these are:

- Mixed Land Uses

This principle believes that land uses should not be isolated from each other i.e. there should be no isolated residential, industrial, and commercial zones as this does not maximise the use of space. Mixed land use has a number of benefits which are the minimisation of transport demand as the people work, play and live within the same neighbourhood. This is one of the main reasons why this theory is best suited for this study as it will create less demand for vehicular transport to transport people to various destinations everyday but in turn people would opt for the use of the NMT routes. This principle therefore promotes predestination which in turn favours the use of NMT (Smart Growth Network, 2006).

- Take Advantage of Compact Building Design

If the land uses are to be mixed and the space or land to be maximised, it means that there should be vertical and not horizontal construction of buildings. This means that there is a need for a careful and considerate compact design of buildings. Vertical construction of buildings does not only save space but it also preserves more open land and green space thus reducing carbon footprint Smart Growth Network, (2006). Compact building design minimises distances thus promoting NMT and discouraging motorised transport.

- Create a Range of Compact Building Design

Housing has always been one of the prime factors for planners since it is largely responsible for significant development and construction. Housing development is also very crucial because it determines the access of various households to transportation, various services and resources. The construction of compact building designs also assists in that it reduces all the environmental impacts associated with housing development. The essential benefit of this compact building design in terms of transport is that it will reduce vehicle dependence as most services will be within the neighbourhood. The Compact building design allows the local communities to increase their choice in housing by increasing supply in the current existing land and neighbourhoods which are serviced by the existing infrastructure rather than on newly developed land.

This modification of housing on the existing neighbourhood and land allows for the integration of single and multi-family structures that can support a more diverse population and allow more equitable distribution of households of all income levels. These modifications also allow the maintenance of the current landscape and morphology as it does not radically change the urban landscape as the development is mainly the attachment on the existing housing structures (Smart Growth Network, 2006). Developing diverse range of building designs that are compact opens choices to a wider diverse population that allows accessibility to various types of services through other modes of transport such as NMT (Kesley, n.d.).

- Create Walkable Neighbourhoods

This is the fourth principle of Smart Growth and it talks directly to this study and the development of NMT. Due to mix land use, compact building design promotes the intense use of space meaning that the neighbourhood thrives as the various services and facilities are easily accessible due to mixed land use. The availability of the mixed land use ensures that all the necessary services and facilities are easily and safely accessed within the neighbourhood. This creates a true neighbourhood with people working, playing, worshiping and learning within the same neighbourhood. (Smart Growth Network, 2006)

The desire for walking and to use the alternative transport like bicycles is created within the community because of the main two factors: Firstly not only are the goods and services easily and safely accessible but also because of the unique contribution they make to the look and feel of the city. Secondly due to a decrease in the distance between services and facilities, pedestrian activity and the use of other transport modes especially NMT transportation is promoted. This creates a streetscape for a range of users like pedestrians, cyclists, transit riders and drivers. Walkable communities have been the characteristic of the early cities until the industrial revolution. The dependence on vehicle use has created legislation that promotes the use of vehicles prohibiting the mixed land use development. Communities that are dispersed are heavily dependent on vehicles and therefore build and design the streets specifically for the use of vehicles. This results in longer trips and a complete elimination of any form of NMT like walking or cycling. (Smart Growth Network, 2006)

- Foster Distinctive, Attractive Communities with a Strong Sense of Place

Sense of place can be defined as the uniqueness of a place, the features that make the place unique. The community needs to have a common vision on which elements give the area a sense of place. This means that the community needs to agree on elements such as pride and identity in order for it to determine their sense of place (Kesley, n.d.).

One of the greatest traits of Smart growth is that it brings community cohesiveness due to compact building design and mixed land use, which enables the strong interaction amongst community members. This also creates interesting unique neighbourliness and communities that reflect the values and cultures of the people who live in it. In smart growth, the

landmarks and boundaries are man-made and natural features. To the community these assets contribute to the look and feel of the neighbourhood, thus creating a strong sense of place to the communities living in such areas.

Smart growth encourages construction and preservation of buildings not merely because of their function but mainly because of the look and the feel of a town. The maintenance of the natural and architectural elements of buildings in such neighbourhoods ensures that the economic vitality and value is maintained over time, providing the residents with a distinctive and beautiful place that they can associate with and can call home for generations (Smart Growth Network, 2006). NMT contributes to a strong sense of place as the people get to interact and engage with their surroundings while walking which is something that is not common in motorised transport.

- Preserve Open Space, Farmland, Natural Beauty, and Critical Environmental Areas

Smart Growth Network (2006) defines the open space as natural areas that provide important community space, habitat for plants and animals and recreational opportunities, as well as farm and ranch land (working lands), places of natural beauty, and critical environmental areas such as wetlands.

In this way Smart Growth does not only protect the biodiversity and its habitat but also ensures that the development pressure on the environment is minimised and new development is managed in a sustainable manner (Smart Growth Network, 2006). This principle promotes the preservation of open space and green space and allows for the undeveloped land to remain undisturbed (Kesley, n.d.). NMT preserves natural beauty and environmental as its implementation always has minimum impact on the environment and minimal changes on the landscape.

- Strengthen and Direct Development towards Existing Communities

Corrigan et al (2007) argues that the first step in accommodating development is to identify the places that need to be protected from the development and should be conserved. He further argues that green infrastructure planning should be proactive, systematic, large scale (national, regional and local) and well-integrated with growth management, transportation planning and other policies.

Smart growth entrusts the responsibility and the choice of how and where development should take place, thus ensuring that the value of infill and green-field development is determined by its physical orientation, relationship with other buildings, open spaces but most importantly by its accessibility. This means that Smart Growth aims at directing development towards the existing communities with existing infrastructure, thus saving huge costs and improving quality of life (Corrigan et al 2007).
The development towards existing communities enables the communities to benefit on closer proximity of services and goods, increases efficiency due to already developed functional

existing infrastructure and serviced land thus preserving more green open space by decreasing pressure on the Greenfield development. Guided by a vision of how and where to grow, communities are able to identify and utilize opportunities to make new development conform to their standards of distinctiveness and beauty (Smart Growth Network, 2006).

- Provide a Variety of Transportation Choices

This is the eighth principle of the smart growth theory and it is the most relevant principle for this study as it embodies the whole concept or vision of this study as to determine how NMT can benefit the residents of Lamontville. This principle argues that urban sprawl promotes traffic congestion and leaves the people with limited transport choices as they are forced to use the motor vehicles or trains to access their daily destinations as they are far from their places of residence.

Smart Growth Network (2006) argues that the new smart growth approaches in land use development allows better multi modal approach to transportation and creates a variety of transport options such as walking. This does not only give the residents better transportation options but it also gives them better connectivity with their road networks and creates a sense of place.

- Make Development Decisions Predictable, Fair and Cost Effective

The smart growth concept is one of the relatively new concepts in development and built environment. This means that there is still a lot of marketing and convincing that needs to be conducted in order to ensure that all built environment stakeholders buy into this concept and fully comprehend the benefits of smart growth.

As the development industry is one of the highly regulated industries with the influences on property values and the desirability of a place, the government needs to ensure that the environment is conducive for the private sector to adopt the smart growth concept. This includes reviewing development regulations and policies, to ensure that the development decisions are predictable, fair and cost effective. In order for smart growth to thrive the national government and the municipalities need to make development decisions about smart growth to be more timeous, cost effective and predictable so as to entice the developers (Smart Growth Network, 2006).

Corrigan et al, (2007) is also echoing the same sentiments that the plans, codes and the policies of the cities and government decision making in all development and planning projects including NMT projects should embrace the smart growth principles so that the private and public investments in infrastructure should be used to give definition and support of the areas designated for smart growth.

- Encourage Community and Stakeholder Collaboration in Development Decisions

This is the tenth and the last principle of Smart Growth but a very essential principle which directly looks into the involvement of the community and stakeholder in the development decisions. Smart Growth Network (2006) argues that spatial planning and development should be done in consultation with the community and the stakeholders of that particular area. In other words it means that the development is for the people and the people best understand their needs than any planner or developer could.

Community needs are different from one community to another and at times even differ from the planners view therefore it is essential that community involvement should be effective and efficient and should be done at the early planning stage. This assists in the elimination of conflicts and ensures that there is ownership and support of the planning process at an early stage and it irons out and clarifies any ambiguities or misconceptions that each party might have earlier rather than later when a lot of resources and effort has been invested in the project. Conflicts with the public can be very costly and might even jeopardise the whole development process (Smart Growth Network, 2006).

Kesley ,(n.d.) supports this principle and he stresses the importance of citizen involvement and commitment in ensuring the long term support of the Smart growth planning processes as these processes need to be clearly understood and embraced if they are to be effective. The stakeholder forum also provides the platform where the participants can understand each other's viewpoints. This process also provides a learning exchange of the participants. This assists in reaching a consensus and having one vision as a community which is essential in the planning and the development goals of the community (Corrigan et al 2007). The people should be involved in transport planning as currently transport development is mainly focused on motorised transportation.

2.3. Transit Oriented Development as an element of Smart Growth

Transit Oriented Development (TOD) originated in the US in the late 1970's and early 1980's but it was not until the 1990's where it became prominent in the spatial planning field. This was mainly due to the widespread of Neo traditional urban planning theories such as Smart growth and the New urbanism of which TOD is strongly associated with (Wilkinson, 2006). Salga (South African Local Government Association) (2018) defines TOD as a concentration of medium to high density mixed use zones which are developed around transit stations. This is confirmed by the Institute for Transportation and Development Policy (ITDP) (2019) who also defines the TOD as an urban space which integrates various land uses and people with easily accessible, well connected NMT routes which are all located close to the transit service station.

These mixed use zones are pedestrian centred and promote the use of NMT and are not reliant on private vehicles. TOD developments because of high concentration of people create the necessary threshold for public transportation (Salga, 2018). The primary objective

of the TOD is to provide inclusive access to various local and citywide activities by utilising the transport modes that are economical and environmentally friendly such as NMT (ITDP, 2019)

Bickford and Behrens (2015) argue that the apartheid spatial planning laws coupled with the design for reliance on private cars in South Africa has created dependency on motorised transport. This caused the marginalised communities in the city outskirts to rely on public transport and the privileged on private cars in order to access various activities within the city. They further argue that TOD as a Smart growth tool can assist in redressing the spatial planning and transportation imbalances that were inherent from the apartheid regime. In 2011 the National Planning Commission (NPC) through the National Development Plan identified the TOD as an element of spatial vision that could help in achieving the desired socio-spatial transformation stating that "new urban development and infrastructure investments should be focused around corridors of mass transit and around existing and emergent economic nodes, applying internationally accepted principles of transit-oriented development". (NPC, 2011:285)

Although TOD is public transport centred but they have a strong element of NMT as its principles strongly emphasise the quality and the design of street network that prioritises cycling and walking. TOD advocates for comfortable, safe and attractive streets that enable easy access on foot or bicycles. The public transport station which is the centre of TOD and other land uses such as retail, entertainment, civic centre's around it should be within an easily accessible walking distance for all residents (Salga, 2018).

2.4. The influence of Smart Growth on NMT

Smart Growth is a response to urban sprawl, urban decay, disconnected neighbourhoods and traffic congestion, which challenges old assumptions in urban planning such as automobile focus and separating land uses (City Of Kirkland, 2013). From almost all the ten principles of smart growth discussed above there is a clear indication of a strong influence of Smart Growth on NMT. This influence on NMT can be broadly classified under the following topics.

Mobility - The provisions of the various choice of transport promotes various forms of mobility and affords the residents with the freedom of choice when it comes to transportation. This variety in the choice of transportation includes the NMT transportation. This is principle number eight of the Smart Growth theory.

Walkability - By mixing land uses this concept ensures that the restriction to walkability which is normally caused by travelling long distances by various vehicles is eliminated. This promotes pedestrian friendly access with walkable distances within various land uses thus ensuring walkability within the neighbourhood as the people work, live and play in the neighbourhood.

Accessibility and Connectivity - This is the crux of the theory as it all involves accessibility to various services that are required by the residents in order to engage in their daily activities (Principle 1,2 and 4). Transportation is all about accessibility to the needs of the community.

The access routes should also be connected to allow easy and direct travel by both motorised and non-motorised modes (Litman, 2015).

Conservation - Principle (5, 6 &7) these principles examine the conservation aspect of planning and development as it promotes construction on brownfield rather that green-field and preservation of open spaces.

Community Participation - This is the principle that acknowledges the importance of stakeholders and the community in the planning process. It shifts from the paradigm that planning should be a process that is conducted by the planning or built environment practitioners only. This principle is essential in NMT in that the residents will assist the planners in identifying the desire lines so as to ensure that the NMT routes will be sustainable and viable rather than wasting resources on the NMT routes that will not be used by the targeted community.

2.5. Critique of the Smart Growth theory

Litman (2017) argues that the critics of the smart growth theory make analytical errors which can lead to false conclusions. The first false conclusion is that the public does not like to live in confined mixed use areas and they prefer sprawl thus making them to be dependent on motorised transport. In this conclusion the critics ignore the many benefits offered by mixed zone such as transport saving cost and healthy lifestyle associated with NMT. Secondly, critics argue that smart growth promotes congestion as the mixed zone generally has smaller geographic area. This indicates that the critics only think of motorised transport as the only form of transportation and completely disregard other transport alternatives such as NMT. Thirdly, critics claim that smart growth is harmful to the economy as it restricts green-field development and promotes open space preservation. This is not the case as Smart growth promotes local economy with people buying at neighborhood retailers that are easily accessible within a short walking distance (Litman, 2017).

2.6. Sustainable Development Theory

The Brundtland Commission report which was commissioned by the United Nations World Commission on Environment and Development (WCED) was one of the earliest reports to come up with the concept of sustainable development (WCED, 1987). In this report there were various aspects that were considered in the sustainability concept which included economic, environmental and social aspects and how these have contributed in the deterioration of natural resources and the human environment. However since this report, this concept has evolved and has been used in various disciplines and various spheres.

Transportation is one of the disciplines that have adopted this definition and NMT is an example of sustainable development since it minimises the economic and environmental degradation of the environment while promoting social interaction through walking. Delladetsima (2012) clearly outlines how this concept has evolved and how it has penetrated and shaped the spatial planning concepts, policies and principles and how has this relationship between spatial planning and sustainable development been now consolidated into the term sustainable urban development.

Ben Eli (2015) describes sustainable development as a dynamic equilibrium in the process of interaction between a population and the carrying capacity of its environment. The population develops to express its full potential without producing irreversible, adverse effects on the carrying capacity of the environment upon which it depends. This definition is the one that is most relevant to this study as it outlines the two most essential aspects that are crucial in NMT as an efficient and sustainable form of transportation and these two are:

- The balance in the population and the carrying capacity of the environment.
- The sustainable and the just use of resources in that it produces irreversible, adverse effect on the carrying capacity of the environment upon which it depends.

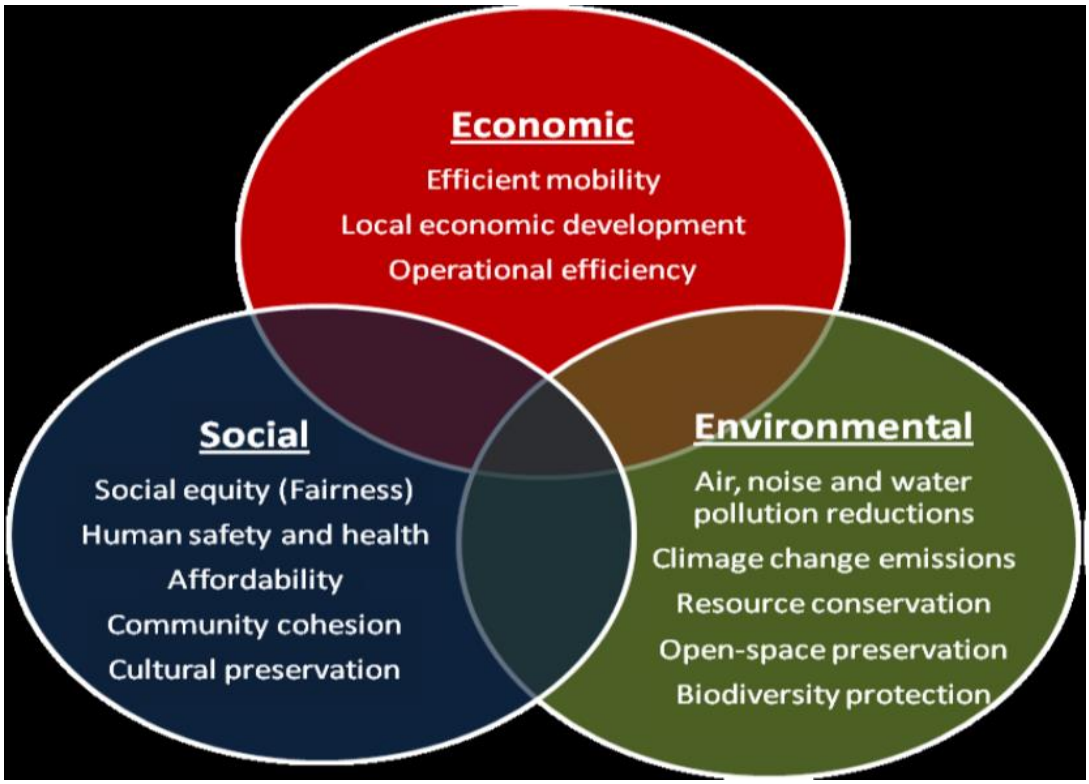
Ben Eli (2015) further mentions the other principle that does not reflect in all other principles of sustainability, which is the recognition of the universal ethics for guiding human actions on earth. He argues that this is the ignored but most essential principle of sustainability as it involves the ethical and the moral issue of sustainability and entrusts the responsibility in humans that as they are supernatural and spiritual beings they should seek to understand and fulfil humanity's unique existence in the universe. This includes responsible transport planning such as NMT planning and development.

He also states that this principle although embedded in the spiritual domain, it does not carry the connotation of any religion but rather evokes the integration of the mind, the heart and the consciousness when interacting with the environment and the universe as humans are part of this wider system (Ben Eli, 2015).

2.6.1. The principles of sustainable development

Sustainable development has three most essential components that form the basic principles of sustainable development as shown in Figure 2 below:

Figure 2: The principles of sustainable development



Source: Litman (2016)

- **Economic** - an economically sustainable system that will be able to produce goods and services on a continuous basis thus contributing positively to the economy of the country's GDP (Harris, 2000). Litman (2016) argues that a sustainable transport system should ensure efficient mobility and operation and should contribute significantly to the local economic development of the community it serves. NMT contributes to local economic development as people prefer to buy basic necessities such a bread, milk etc. closer to home within walkable distances.
- **Environmenta**l - the system must be environmentally sustainable ensuring that the resources are used in a just manner and not exploited and to ensure that there is no depletion of natural resources, degradation of landscape and pollution. This includes the by-products that are generated from this system e. g. carbon emission. (Harris, 2000). According to Litman (2016) a sustainable transport system should preserve open spaces, protect diversity and reduce the climate change emissions. The NMT transportation promotes all of the above mentioned components in that it does not involve green-field development but brownfield development, therefore the preservation of open spaces and biodiversity is guaranteed. There is no burning of

fossil fuel, there is no emission of harmful greenhouse gases thus making NMT truly environmentally friendly transport system.

- **Social** - equity is one of the essential principles of sustainable development in that there should be justice in the distribution, provision and accessibility of the system. This social justice cuts across race, gender, religion, socio-economic status (Harris 2000). Human safety and health, affordability, cultural preservation, community cohesion and social justice are the components that Litman (2016) mentions as part of social elements in sustainable transportation. Pardo (2012) further argues that a poorly planned transport system retards growth and makes the delivery of social services inefficient and inaccessible. This means that equity is a very essential component in enhancing accessibility of services and promoting spatial integration within the community. NMT is a transportation system with the most social benefits as it is affordable, less risky, with health benefits and promotes social cohesion through the interaction of people while walking.

Therefore NMT is a sustainable transport system as it is accessible, safe, environmentally-friendly and affordable (ECMT 2004). All the principles of sustainable theory such as affordability, environmentally friendly, safety and accessibility are all components of NMT.

2.6.2. Critique of sustainable development on transportation

There are some challenges that are noted with the Sustainable transportation planning and implementation and these are:

- Political and institutional influence - Transforum (2014) argues that the political agreement and commitment is essential and is the first step to ensure an efficient and successful implementation of sustainable transportation such as NMT. This is mainly because the policy making decisions at any level of government be it regional, national or locals is heavily dependent on the political will and commitment of the politicians. At times there might even be contradictions within various spheres of government when it comes to the implementation of sustainable transportation such as NMT development (Transforum, 2014).

Coupled with this, Transforum (2014) further argues that there is a need for fundamental transformation and development of institutions and organisations to allow appropriate institutional structures i.e. officials, practitioners and professionals to function without any political influences or blockages. The importance of sharing a similar vision of sustainable transportation for various ministers (i.e. Minister of Transport, Minister of Finance and Minister of Development and Planning) both at national and local level ensures that there is efficient implementation of sustainable transport without any political and institutional delays (Transforum, 2014; Banister, 2007).

Williams (2005) supports the above idea of integration among the institutions and she further argues that this integration should also extend to the integration of disciplines and professions. She further states that an integrated strategy is not only limited to physical relationship between transport and land use but also the institutional relationship between professions.

Public participation and stakeholder involvement are essential principles of sustainable transportation. It is also essential in the development of policies. The public perception is very important as it influences the policy decision making as the policy makers do not want to implement any changes which the public would dislike in fear of the risk of electoral defeat or public protest. This means that the public should be made aware of the importance and the benefits of sustainable transportation so as to influence policy towards sustainable transportation like NMT development. In the stakeholder forums the urban and transport planner needs to have clearly motivated goals of sustainable development, which promotes better integration between transport and urban planning, and between different modes of transport. To achieve this paradigm shift in the public and the stakeholders, it is essential that the governments work with the media in stimulating support for NMT as a sustainable transport strategy (ibid).

- Data collection - There is very limited data that indicates the knowledge about the sustainable transport technologies, this includes the various types of sustainable fuels and their performances, potential availability, necessary conditions of production and even possible effects. This means that there would need to be a data base that will collect all these available technologies and make them easily available to the stakeholders, practitioners and the public at large (Transforum, 2014).

- Skills -Omoke et al (2015) argue that the skills challenge in sustainable transportation includes the shortage of human resource skills among the transport practitioners. They argue that the main reason for failure of sustainable transport implementation in Nigeria is the human resource challenges. They argue that all failures in sustainable transportation implementation in Nigeria could be traced to human resource skills challenges. This means that all transport practitioners ranging from planners, engineers and even builders should be properly skilled in sustainable transportation to ensure that the implementation of sustainable transportation is effective and efficient (Omoke et al,2015).

Despite the above criticism of sustainable transportation, it should be noted that there is now a noticeable paradigm-shift in the political will and the policy making to embrace NMT development. Recently in South Africa the development of NMT facility guidelines in 2014 and the Draft NMT policy development clearly indicate this paradigm shift and embraces NMT development (DOT, 2008, DoT, 2014).

Policy development will therefore lead to the development and the sharpening of the transport professionals' skills in NMT development through radical training and funding of the young NMT professionals still in tertiary institutions thus addressing the skills gap in sustainable NMT development. Public stigma and perception on NMT should be addressed through radical awareness and education campaigns through various forms of media. This would be very easy to do given the economic climate where fuel hikes are translated into increase in public transportation and more people will seek for alternative transportation of which NMT will be the most viable option (DOT, 2008, DoT, 2014).

2.7. Conclusion

Corrigan et al (2007) merges the two theories, when they state that smart growth should not be a principle of design or planning, but a development principle that should sustain the community a lifetime. Both the smart growth and the sustainable principles are applicable to this study in that they both share the common principles of mixed use, walkable neighbourhoods, alternative choices to transportation, public participation, equity and accessibility of services. These are the essential principles that this study will be based upon. The next chapter will look at the various arguments on NMT covered in literature review.

Chapter 3: LITERATURE REVIEW

3. Introduction

This chapter reviews literature on various aspects of NMT such as the nature and extent of NMT, NMT and land use planning, integration of NMT into transport planning, modal choice and inter modality. This chapter also reviews the provision of NMT infrastructure and its implementation and in conclusion it looks at the evaluation of NMT looking at the benefits, challenges and the impact that NMT can have on the community.

3.1. History of movement over the past centuries

The earliest form of transportation to be ever used by human kind was walking. People moved and transported goods through walking, however this changed with the invention of the wheel which around 3500 BC. The invention of the wheel therefore changed the way people moved and transported things and also increased the amount of goods to be transported as a results the chariots, wagons and the carts came into existence. The paved roads were first constructed by 312 BC and these paved roads were first tarred in the 12th Century. In the 13th to the 15th century the sky rockets and the sailing ships were invented thus allowing intercontinental movement and discoveries of new continents. (Sahistory, 2019). The 16th to the 18th century the main focus of transportation was on rail with the construction steam powered railway locomotives. In the 19th century in 1816 there was an invention of a bicycle and the aircrafts. The aircrafts completely transformed transportation making the travelled distances shorter than any other mode of transport. The 20th and the 21st Century there was an improvement of the modes of transportation that were built in the previous centuries e.g. invention of motor driven airplanes, spaceships and rockets (Demartini, 2014).

It is evident that NMT is an oldest form of transportation and it is as old as mankind, however this form of transportation has been marginalised in the recent centuries especially in the 19th and the 20th centuries as the focus has been more on powered motorised modes of transportation.

3.2. Nature and extent of NMT in developing countries

3.2.1. Nature of NMT

Ramorobi et al (2010) defines Non-Motorised Transport (NMT) as the transport that is human or animal powered and the examples include walking, cycling, rollerblading, skateboarding, push scooters and wheelchair travel. Gqaji (2010) agrees with Ramorobi et al (2010) and further gives examples of the NMT which includes bicycles, tricycles, cycle trailers, cycle rickshaws, wheelchairs, prams, roller skates, skateboards and ice skates.

Midgley (2009) describes NMT as the trips on foot, by bicycle or tricycle including the use of handcarts and wheelchairs while Bossaerts (2007) classifies NMT according to recreational

and transportation modes. He argues that the difference between the two is that the recreational modes are modes which are an end themselves and used for pleasure or as a hobby e. g. Roller-skates and skateboards and these transportation modes do not provide access to services. He further argued that bicycles, animal drawn carts and walking may be classified as transportation modes since they provide accessibility to various services or other activities. However, Bossaerts (2007) admits that there is a fine line that exists between the two as cycling and walking can be used as means of transportation and also as recreational modes. For example, some people will choose to walk or cycle rather than drive because they enjoy the activity, although it takes longer.

Mkhize, Mouws and Linders (2005) define NMT as the transport system that includes all forms of travel that does not rely on engine or motor for movement. This form of transportation includes cycling, walking, rollerblading rickshaws and animal drawn carts. They further argue that NMT is part of most trips and everyone uses this form of transportation at one stage of the trip and might not even be aware of it e.g. when one gets out of a bus or car and walks to complete his trip or when someone walks to the bus station to begin his journey. This is confirmed by Midgley ((2009) who also states that nearly all trips begin or end with walking, therefore the developments made in NMT will be of benefit to everyone and not only to the classified regular users of NMT.

Mkhize et al (2005) definition of NMT is regarded as the most suited definition for this study as it does not only define NMT as the transportation that does not use an engine or motor but highlights that NMT is part of daily activity that is needed in the completion of one's travels at one point in time. However for the purpose of this study it should be noted that focus is only on the one mode of NMT which is walking.

3.2.2 Formal versus Informal NMT

While most literature classifies NMT under informal transportation, NMT (Ramorobi et al, 2010, Mkhize, Mouws and Linders 2005, Midgley, 2009) NMT can be further subdivided into formal and informal NMT. In developed countries when referring to NMT reference is to either concrete, paved or tarred NMT routes such as pedestrian walkways or paved cycle routes which are well designed and developed. These formal NMT routed are also registered by the officials as the transport routes. An example of such is the exclusive well maintained bicycle lanes in the Delft City in Netherlands (Schwanen et al, 2004). In developing countries the formalised NMT routes have similar features than the developed countries although poorly maintained. The examples of such formal routes are the Beachfront promenade in eThekwini which is currently being extended (eThekwini municipality, 2018). In the townships like Lamontville, Clermont and Chesterville there are other forms of formal NMT like the staircases and the sidewalks that are constructed for pedestrian use in the townships.

When coming to informal NMT there is a striking difference in the nature of NMT as there is a clear distinction between the formalised and the informal NMT routes. The informal routes

are commonly found in the townships especially in the informal settlements where the pedestrians use them as shortcuts to access various services like the bus stop, shops, work, schools, clinics etc. These are not tarred, paved or concrete and they are just footpaths. Such informal NMT routes are referred to in most literature as the desire paths because they follow the desire lines (Oliveira, 2013). The Guardian (2018) cited Macfarlane when he defines the desire paths as the "paths & tracks made over time by the wishes and feet of walkers, especially those paths that run contrary to design or planning".

Uiowa transport planning (2017) argues that the desire paths develop as a result of preference by many pedestrians because of its significant benefits such as convenience, time, safety and cost. The desire line is formed by a single pedestrian because of preferential reasons and within weeks or even days depending on the amount of pedestrian traffic, the desire line is reinforced and becomes more visible as more and more pedestrians use it.

The desire paths indicates the new travel options and often shows the new origin and destination (Uiowa transport planning, 2017). The guardian (2018) further argues that the desire paths indicate the yearning or the desire to walk and it is a way in which the residents of the city write back to the city planners giving them feedback with their feet.

This means that the people evolve and transit faster than the city itself. It is therefore not surprising that the transport planners and engineers cannot keep up with this quick evolution and find that most of these desire paths are ignored and disregarded by the transport planning officials (Walker, 2014).

Oliveira (2013) argues that when the transport planners do not adequately address the desire paths during the planning process or make attempts to discourage an existing one they always find a way to re surface as the pedestrians, redesign and redefine the urban transport landscape.

3.2.3 The extent of NMT usage in developing countries

The perception of NMT in the developing countries is completely different than that of the developed countries (Mkhize al, 2005). This is confirmed by Congui et al (2008) and Servaas, (2000) who state that in the developing countries the use of NMT is not by choice as it is in most developed countries but it is mainly influenced by affordability and availability as they are often the most affordable and the easily available mode of transport. Mkhize al (2005) classifies the users of NMT into two i.e. the captives (those who have no choice but are compelled to use NMT because of affordability or availability) and the non-captives (those who deliberately choose to use NMT despite other modes of transport available to them). This means that the non-captives make a conscious decision to choose the NMT transportation. From this classification it is evident that the extent of NMT in the developed countries is greatly influenced by the non-captives.

Congui et al (2008) and Servaas, (2000) further argue that the design and the layout of the roads in the developing countries discourage the use of NMT. The roads are designed for

vehicles and no other form of transportation, resulting in high competition between various road users and the road infrastructure. Congui and Servaas (2000) agree with Cox (2010) when he states that the way the community or group of individuals perceive the road determines how NMT will be used on that road. This means that if the road poses any potential fear or threat to the users especially pedestrians such as vehicular traffic then it automatically becomes a constraint to the pedestrians. This also means that the road becomes a barrier to accessibility and to any form of activity or service, thus limiting social and economic interaction beyond the road. This does not only result into spatial desegregation but also into social and economic inaccessibility (Ibid).

Pendakur (2005) highlights the challenges faced by the developing countries and how these contribute to the nature and extent of NMT in developing countries. He lists these challenges as the quality and accessibility to services, the traffic safety issues and the pollution caused by the motorised transport and states that all these challenges make the NMT travel conditions in Sub Saharan African (SSA) countries very difficult. This limits the extent to which the NMT in many developing countries can be widely used and chosen as a travel option. Pendakur (2005) argues that although the developing countries may differ in various transport policies and legislation the urban transport systems of developing countries all have the following similarities:

- The majority of urban trips are still done through walking
- There is little or no co -ordination amongst the different modes of transport;
- The small-scale private sector is the major supplier of urban transport service and is under capitalised and fragmented.
- The regulatory system governing public transport is inadequate and ineffective in meeting the demand
- Traffic accident rates are quite high;
- Roads are in poor condition;
- The skill levels of planning and regulatory personnel are inadequate or non-existent
- There is low/poor enforcement of traffic laws due to corruption and inadequate human and financial resources.

The above factors result into chaotic, traffic conditions, uncontrolled parking with the street vendors occupying an average of 25% to 35% of the road space, worsening an already bad situation (Pendakur 2005). These common characteristics of urban transport in SSA are resulting from environmental factors under which urban transport in the SSA evolves such as:

- The rapidly growing urban population,
- Continuing high incidence of poverty among the urban population,

- The impact of the city as the centre of economic productivity,
- The evolution of the role of government,
- The low density of cities,
- The process of decentralization, and
- Poor land use planning and control together with the lack of any linkage to urban transport planning.

From the above it is evident that NMT faces a lot of challenges which are inherent from the socio-economic condition of the SSA countries. It would need a multidisciplinary approach and strategy to address NMT challenges in the SSA countries (Pendakur, 2005).

3.3. NMT and Land use Planning

The Global Report on Human Settlement (UN,2013) argues that in the US before the industrial revolution and the mass production of motorised vehicles, the neighbourhoods were compact and highly walk able with a daily distance between shops, schools, clinics etc. lasting not more than five minutes. These neighbourhoods were referred to as traditional neighbourhoods as the growth of these neighbourhoods were organic and not heavily influenced by any external artificial factors such as industrial revolution and mass production of motor vehicles. However, with the mass production of motor vehicles as a result of industrial revolution in the US, slowly these traditional neighbourhoods diminished with a higher number of people moving away to reside in the suburbs. This is confirmed by Khisty (2003) who argues that the motorised transport then determined how, where people live, work and travel. Coupled with land use challenges the increase in the use of motorised transport also brought other social and economic challenges such as congestion, pollution and high crash rates. The urban planning and the transport planning was therefore greatly influenced by the modern ideologies of mass production and designing for vehicles.

Sharma (2009) argues that as the paradigm shift to postmodernism occurred in urban planning and urban design, so was the shift in transport planning and traffic engineering. The modernism transport planning believed in segregation of vehicles and the pedestrians, categorisation of roads according to their speed, traffic volume and function. The post modernism ideologies challenged this transport design and traffic engineering and they promote social zones instead of traffic zones. In social zones they advocate that the roads should be shared and accommodate all road users with the integration of traffic and pedestrian movements. They believe that no mode of transportation should be given priority over the other. This means that NMT should be of the same status as motorised transport and should be included in urban and transport design policies.

In South Africa during the apartheid regime it was not the mass production of motor vehicles that ended the traditional neighbourhoods but it was the land use policies, which were

strongly based on racial discrimination where the Africans were forced to reside on the city outskirts with no adequate provision of transportation. This is what the Global Report on Human Settlement (UN, 2013) termed `constrained mobility`, which they define as the constraints which are strategically created by the city planners in order to marginalise the poor and to limit their access to services. Furthermore this constrained mobility caused the poor to travel longer distances and increased their need for affordable transport. This created heavy reliance on motorised public transportation which had to transport the people from the city outskirts (townships) to their place of employment which was the cities (The Global Report on Human Settlement UN, 2013). This clearly indicated no form of coordination and alignment between land use planning and transport planning.

This means that the non-alignment of land use planning and transport planning is an old practice that has been in existence as long as apartheid in South Africa. The heavy reliance on motorised transport created by apartheid land use policies led to the sprawling land use development which has not only had negative impacts on the urban landform but has used huge amounts of natural land and increased the travelling distances between places of residence and employment (Gqaji, 2011). In 1994 the new democratic government inherited not only a non-aligned and non-integrated transport and land use policies, but also a fragmented and a segregated country (Schoeman, 2015).

Wilkinson (2002) states that the post 1994 South African policies have been focusing on the restructuring of the social-economic and spatial segregation that has been caused by apartheid segregation policies. He further argues that although these policies have tried to restructure the socio-economic and spatial segregation e.g. evolution of spatial policies ranging from the Development Facilitation Act 67 0f 1995 to SPLUMA (Act 13 of 2013) it has done very little in curbing the continued use of private transport and sprawling urban development through its transport planning policies and practices. There is an evident gap between transport planning and urban planning processes which have caused limitations in the integration of transportation into land-use planning (Wilkinson, 2012 and Schoeman, 2015). Gqaji (2010) argues that the democratic government tried various attempts through urban and transport legislation within the spatial framework to address this fragmentation and this led to South Africa embracing the concepts of compact city mixed zone and applying it to its urban and transport policies.

Schoeman (2015) argues that the problem of non-alignment and lack of integration has been challenges facing planning even in the past political era. The need for integration of transport planning, land use planning and environmental planning has been an on-going debate for the past two decades even before the democratic government in 1994. May et al (2003) agrees with Schoeman (2015) and they state that one of the major challenges facing urban transport policies has been the integration of land use planning policies with the transport policies. However with the promulgation of Spatial Planning and Land Use Management Act (SPLUMA)

(Act 16 0f 2013) this non-alignment between these fields coupled with non-alignment of the three spheres of government in South Africa might be addressed.

In support of this argument above, Bickford (2013) lists two local examples which indicate the gap and non-alignment of transport planning and urban planning. The first one is the city of Johannesburg where there has been Transit Oriented Development (TOD), which is the densification of mixed land use around the public transport nodes so that the proposed public transport gets the ridership that it needs in order for it to run efficiently and profitable as numbers are key in the successful and efficient implementation of public transport. In 2006 the South African Cities Network (SACN) proposed the TOD principles and focussed on the densification around the Gautrain stations. However, in 2009 the city of Johannesburg proposed the TOD principles around the BRT stations and not on the Gautrain station as it was initially indicated by the SACN. This clearly indicates that transport planning professionals and land use planning professionals within the same city are operating independently and isolated from each other (Bickford, 2013).

The second example is the City of Cape Town, which developed a densification policy in 2012 that strongly focused on compact urban forms and development around public transport. This policy document clearly indicates the non-alignment of transport planning and land use planning processes in the densification strategies. Although these documents promote transport-land use integration but the proposed recommendations remain isolated from each other, thus indicating more work in the integration of transport into land use planning (Bickford, 2013).

The Global Report on Human Settlement (Planning and Design for Sustainable Urban Mobility (UN, 2013) clearly states that the main focus of sustainable mobility should be accessibility, which involves a detailed consideration of the urban built form in order to foster a sense of place and encourage non-motorised mobility. In this statement the UN acknowledges that the urban form needs to be evaluated if the urban transport is serious in promoting urban mobility and not merely urban transportation. This is because urban transportation mainly focuses on infrastructure development which promotes the use of motorised vehicles while urban mobility focuses on efficient accessibility thus promoting the use of other modes of transport such as NMT (ibid).

Schwanen et al (2015) agrees with the argument of the Global Report on Human Settlement (UN, 2013) on the serious evaluation of urban form in order to improve accessibility. They further argue that the built environment plays a huge role in the effective functioning of NMT and they state how Netherlands which is one of the leading countries in NMT has over the past decades paid significant attention to land use development and urban form in order to promote NMT as a modal choice and to further influence travel distance. This is confirmed by Gqaji (2011) who states that both international and South African studies acknowledge that sustainable transportation such as NMT heavily relies on land use patterns and urban form.

The Global Report on Human Settlement (UN, 2013) further states that the way the city and its neighbourhood is designed determines a variety of travel options that can make the city truly sustainable. The infrastructure in developing cities prioritises the use of motorised transport. There are no mixed land uses which minimises travelling and promote NMT but instead the land uses are far apart thus requiring extensive travel. This distance caused by the disintegration of land use and transportation does not promote NMT. This is supported by Bryant (2005) who states that by providing housing near employment centres, mixed land use does not only greatly reduce reliance on motorised transport and promotes the use of NMT but promotes other land uses as well e.g. shops and restaurants which stimulate pedestrian activity and walkability. Schwanen et al (2004) agrees with Bryant (2005) and he argues that mixed land use and compact urban forms with various employment, retail and services greatly reduces trip lengths thus creating an enabling environment for NMT use provided that the NMT infrastructure is provided for (Schwanen et al 2004, Cervero and Duncan,2003).

The Global Report on Human Settlement (UN, 2013) defines this reliance on motorised transportation as" transportation bias "as it leads to heavy investments in road infrastructure, sprawling urban forms etc. which enhances the demand for personal mobility and increase in the rate of car ownership. This poor linkage between transport planning and land-use planning has promoted the investments in motorised transport thus greatly discouraging the use of NMT as a viable and efficient form of transportation. The Global Report on Human Settlement (UN, 2013) further argues that even the economic policies such as fuel subsidies also promote the marginalisation of NMT and promotion of motorised transport.

On the contrary, Giuliano, and Dargay (2005) argue that spatial land use development does not influence NMT but these two factors influence each other as car ownership allows for urban sprawl and low density developments, while at the same time these types of developments heavily rely on car travels in order to fulfil the various daily responsibilities. They further argue that factors such as socio-economic status and demographics also accounts for variability in travel behaviour for instance where older people and the low income groups are attracted to live in the mixed use developments because of savings on the transportation costs and also of close proximity of the various services such as shops, libraries, clinics etc. (ibid).

From the above discussion on NMT and land use planning it is essential to note that integration and coordination of transport planning and land use planning is crucial for the development of sustainable urban landform as the urban layout and design strongly determines urban travel.

3.4. Integration of NMT into Transport Planning

Khisty (2003) argues that transport planning and the implementation of transport facilities in the developing countries has always been biased and has favoured motorised transport. This is mainly attributed to the fact that many transport planners and engineers believe that choosing motorised transportation over NMT is essential to economic development of these countries. As a result third world cities are becoming unliveable with their national and local governments facing the challenge of moving people and goods at all times. The unliveable conditions in these cities include severe traffic congestion, air pollution, high road crashes, increased fuel costs and high infrastructure costs.

Rastogi (2011) agrees with Khisty (2003) when he argues that transportation planners in developing countries have disregarded accessibility and have prioritised mobility. This is evident through the construction of flyovers, road widening, subsidised licence fees and vehicle registration. This prioritisation of motorised transport has resulted into unsustainable conditions within the cities such as environmental degradation due to widening and construction of roads, health conditions due to lack of physical activity provided by walking, death or disability due to road crashes, air pollution due to congestion and high travel costs associated with longer distance travel etc. In many Sub-Saharan African cities, although there is a high rate of walking, NMT is not classified as a mode of transport and hence its exclusion in the transportation planning policies. In these cities high rate of walking is not optional but is a result of the inadequate, inefficient and poorly coordinated public transport which does not provide a door step public transport, forcing people to walk long distances to and from the public transport terminals in order to access public transport (Pirie, 2013).

With such challenges associated with motorised transport, especially in Sub-Saharan African cities the transportation policy makers and professionals in various fields now realise that they cannot keep up with the population growth in such cities as this would require huge investments in public transport which many people cannot afford as most of the people live below the poverty line and can only afford to walk. These transportation challenges have forced the researchers and transport practitioners to look at more sustainable and affordable means of transportation and this means seriously exploring NMT as one of the major sustainable ways to mitigate the transport problems of the third world cities and to incorporate it into transport planning policies (Khisty, 2003. Rastogi, 2011).

Rastogi (2011) acknowledges the importance of NMT and states that it should be part of transport planning so as to ensure that reliance on motorised vehicles and all its associated challenges is greatly reduced and a sustainable transport system accommodating all people is achieved. It is evident that unless NMT is incorporated into transport planning, transport planning would continue to result into the development of an unsustainable transportation that is vehicle dependent, unsafe, unaffordable, unhealthy, marginalising the majority of low income earners and designed for mobility and not accessibility. There should be clear deliberate policies that advocate for the incorporation of NMT into transport planning (ibid).

3.5. NMT Infrastructure and Implementation

Furness (2010) acknowledges that walking is one of the most common and widely used form of mobility in many countries especially third world countries, however it remains the most marginalised form of transportation in many cities. He further argues that the urban design and infrastructure in such cities favours the motorised transport. Adjei (2010) argues that the use of NMT in developing countries like Malaysia is not feasible and this is largely due to the inadequate facilities and services necessary for the implementation of such.

Martens (2007) states that access to public transport terminals is the most marginalised aspect of public transport yet a very essential one as about 90% of the commuters need to walk in order to finish their daily trips. According to Pirie (2013) despite having walking as one of the highest modes of mobility, the implementation and the provision of NMT facilities in the Sub-Saharan cities is inadequate as most of the people in these cities are forced to rely on motorised transport. Those who use NMT face enormous challenges of which most of them are the competition of the road space with other motorised traffic. This endangers the life of the NMT users. Although there are sidewalks provided for the pedestrians, these are often occupied by traders which again forces the pedestrian onto the roadway (Pirie, 2013).

According to Komanof and Roelofs (1993) walking would be a very viable choice for many commuters if there were adequate provision of NMT facilities. Adjei (2010) argues that walking should be incorporated into public transport planning and to do so there should be walk friendly infrastructure such as designated pedestrian lanes near buildings with optimum access to various services e.g. shops, schools etc.

Papaioannou et al (2010) best summarises the importance of NMT infrastructure and implementation when he argues that one of the essential needs for the pedestrians to ensure promotion of NMT is safe mobility. This can be achieved by eliminating the point of conflict between the pedestrians and the motorised vehicles and provide a safe, comfortable and accessible environment for NMT suitable for all ages and abilities. They further argue that walking should be considered as a transport mode with equal status as the other modes of transport, meaning that as the other modes have adequate infrastructure to ensure its efficiency so should the NMT (ibid).

However despite thoroughly understanding the importance of providing efficient NMT infrastructure but the implementation of such is very low in developing countries (The Global Report on Human Settlement (UN, 2013). This is largely because although the NMT implementation is low cost compared to motorised infrastructure e.g. sidewalks, pedestrian crossing, footbridges etc. Private investors and leading international agencies still do not invest in NMT as it does not provide investment benefits and does not generate any form of revenues unlike the e-tolls on freeways and fuel rebates for example. Therefore the implementation of NMT infrastructure thus remains the sole responsibility of the government, which in most cases allocates insufficient budget for such and prioritise other projects as they will generate income for the city (ibid).

3.6. NMT Implementation

The planning of NMT in developing countries is at a national strategic planning level but the detailed implementation strategy is drawn and carried out by the local government. There are some slight variations of guidelines that direct the implementation of NMT depending on the planning objectives of that city but according to Cox (2010) and Guitink (1996), there are standard objectives that need to be adhered to if the NMT implementation is to be successful and these guidelines are:.

- **National Policy** - There should be a national policy framework that guides direction and coordinates various programs and at all levels of government. The national policy should also clearly indicate the commitment of the government to the NMT initiatives such as incorporation of NMT into development plans, road design and maintenance etc. (Guitink, 1996).

- **Traffic surveys** - There should be surveys undertaken to determine the transport needs of the people and this should be coupled with active stakeholder engagement ensuring representation of all sectors e.g. business, education, NGO's etc. (Guitink, 1996).

- **Spatial planning** - The lay out and the size of the land uses and the transport networks including the relation of the city with its surrounding cities or towns should be considered in the implementation plan (Cox, 2010, Guitink, 1996). For instance cities with land use zones that are far from each other e.g. the residential areas that are kilometres away from commercial, industrial zones (as in the case with most South African cities) may not be ideal for implementing NMT on the whole city but prioritise certain sections of the city that can immediately benefit from the NMT implementation and showcase that section of the city (Servaas, 2000).
- **Infrastructure design** - The status quo of existing infrastructure should be considered when designing the NMT infrastructure, the infrastructure design is linked to the topography of the area that NMT is planned for (Guitink, 1996, Cox, 2010). Safety and accessibility are the most important factors that are considered when it comes to NMT infrastructure design. This safety includes safety from other road users especially the motorised vehicles as a top priority. Accessibility is the whole idea governing the NMT development and it should be one of the highest ranking factors to be considered in the NMT infrastructure design (Goyal, 2014).

- **Awareness Campaigns** - There should be strategic awareness campaigns to promote NMT to other modal users and to ensure its sustainability (Guitink, 1996).

All these factors are complex and dynamic and may vary within each city and this points out that transport development is a multidisciplinary approach with various layers of complexities. This means that there are various factors that need to be considered by the

transport practitioners such as planners and engineers when planning and even designing NMT networks.

3.7. Modal choice

Tyrinopoulos and Antoniou (2012) argue that spatial and land use planning of the urban environment influences the general urban mobility of an urban area and determines the choice of transport modes. They further argue that the major determinant factor in the modal transportation choice is the household disposable income. However, Buehler (2009) disagrees with Tyrinopoulos and Antoniou (2012) and argues that there are various factors of equal importance that influence the modal choice when it comes to transportation and not merely the household income. He conducted a comparative study of determinants of transport mode choice between Germany and the USA.

Buehler (2009) argued that both these countries are first world countries with almost similar wealth and standard of living and have the similar highly recognised automobile industries e.g. Mercedes in Germany and Ford in the USA. They also have extensive networks of motorised highways and highest motorisation rates in the world; however there is a striking difference when it comes to transport modal choice of these two countries. About 40% of trips in Germany are called green trips where 8% is public transport, 9% bicycles and 23% walking. In US motorised trips are doubled as compared to the German trips i.e. 11,000 km per capita in Germany while 24,000 km in the US. The growth in motorised travel in Germany has been increasing slowly by 5% between 1995 and 2005 while in the US the growth has been increasing by 12% which has been more than double the rate in the US.

He lists four critical factors that are responsible for these huge differences in modal choice for these two almost similar countries and these are:

- Socio-economic and demographic factors,
- Spatial development patterns,
- Transport and land - use policies and
- Culture and attitudes (Buehler, 2009).

3.8. Socio-economic and demographic factors

Tyrinopoulos and Antoniou (2012) agrees with Buehler (2009) that disposable income is one of the factors impacting on NMT as a modal choice but he argues that is it not the predominant factor as all the above four factors (see 3.6) are of equal importance in the determination of modal choice. There is a strong co- relation between household income and car ownership with an increase in the income enabling the ownership and maintenance of cars much easier. Higher income also increases the costs of travel time, pushing people away from the city and making faster cars with high pollution more appealing. Although income and car ownership have been good determinants of modal choice these may not be

necessarily true for highly industrialised and wealthy countries, but the demographic variables such as age, gender, household composition may play a large role in modal choice as opposed to income. Women, the elderly, and the very young also make seldom and shorter trips as compared to the employed middle aged men (Buehler 2009, Tyrinopoulos and Antoniou, 2012).

Rahula and Vermab (2013) conducted a study in 2009 to determine the socio economic and demographic factors influencing NMT usage in India. They used a logistic regression model developed from the house hold survey data of Bangalore city. From this study they discovered that the likeliness to walk and cycle was reduced by 68% and 79% respectively when the travelling time became more than 20 minutes. Old people (age greater than 50) had 12% and 92% less chance of walking and cycling respectively. Females had a positive attitude towards walking than males but for cycling this was the opposite. Men had an increasing effect on cycling. Rise in education levels had a negative correlation with walking and a positive correlation with cycling. Highly educated people preferred to cycle than to walk and the cycling was more of a recreational nature than accessibility. Increase in the income showed a negative effect on the use of NMT with a high percentage preferring to use their own private vehicles rather than using NMT (Ibid).

3.9. Spatial development patterns

The role of land use development has been discussed previously in detail under 3.3 on page 24 above, where it is evident that low density spread out developments with high proximities often make NMT travel an undesirable mode of transportation, as there are long distances between trip origins and destinations. In such developments the NMT facilities are inadequate, often causing high risk and conflict with motorised vehicles. On the contrary, mixed land use spatial developments enhance and promote the use of NMT because of shorter distances between points of origin and destination (Buehler, 2009).

3.10. Transport and land-use policies in Developed countries

Buehler (2009) argues that in most countries where the motorised transport is promoted and the NMT is sacrificed, there are often policies that favour the use of motorised transport. Policies such as fuel levy, vehicle registration fees are often used in the road subsidies for infrastructure development thus influencing travel behaviour where there is high dependence on motorised transport due to convenient car travel created by such infrastructure. He further argues that policies that promote NMT should make car use lower, inconvenient and high maintenance. This has been evident in Germany where the transport policies discourage car travels e.g. the tax fuel is nine times higher, annual registration fees are higher and general car maintenance is higher than in the US resulting in the doubling of car trips in the US than in Germany. There are more restrictions on drivers in Germany as compared to the US such as limited and expensive parking, reduced speed limits etc. Most of the German CBD is dedicated for pedestrian use with numerous traffic calming measures thus

making almost impossible to navigate with a car. On the other hand the US CBD traffic calming are rare and if present often confined to single streets and with high speed limits. (Buehler, 2009).

Land use planning policies in Germany involve all levels of government in a top-down and bottom up approach meaning that all government levels meet together and through collaboration and mediation come up with a land use plan that is understood and owned by various levels of government. This ensures that the concept and the vision of the government is seamless and clearly understood by the land use practitioners at all levels. Contrary to the US, land use plans are developed at all levels of government enabling the planners to incorporate the transport impacts of new developments. Also as part of the land use policies in Germany, the property rights laws limit the greenfield development thus discouraging the construction of new roads. This allows for the easy implementation of mixed land use which enables NMT in Germany to be more prevalent than in the US (Schmidt and Buehler, 2007).

3.11. Culture and attitudes with regards to NMT

Eco socialization is a theory developed by Gleesen and Low (2001), which defines how culture and attitudes influence travel behaviour of each country. Cultural differences impacts on the lifestyle which means that attitudes towards NMT may be influenced by the healthy lifestyle that the citizens of that city or country want to lead. They further argue that the dissimilarities in travel behaviour between Europe and the US are mainly caused by the desire and attitude towards sustainable transportation. In Germany as compared to the US, the acceptance of government interventions especially in land use policies e.g. the implementation of mixed use policies, the concerns about the environmental and social conditions of the country such as pollution, road safety etc. are more prevalent in Germany than in the US (Ibid).

3.12. Inter modality

Khisty (2003) argues that transport demand is caused by the need to move goods and people from one place to another. He further argues that there are essential factors that are carefully considered when moving people and goods from one place to another and these are affordability, convenience and time, these factors are not only essential but also predetermine the mode of transport that can be used to move the people or the goods. According to Barnfield & Plyushteva (2015), NMT should not be isolated from the other transportation modes as it takes more than one mode of transportation to complete each journey. For instance in the city of Sofia in Bulgaria inter modality is promoted in their transportation policies where cyclists take their bicycles and park them at train stations in order to complete their journeys by train. Therefore when talking about cyclists in Sofia you are not only referring to people using one mode of transport, which is the bicycles, but to people using more than one mode of transport to complete their journey.

Bickford (2013) argued that in South Africa the transport systems are spatially and operationally not integrated and this is largely due to the lack of modal integration policy. He

further argues that transport systems should be viewed holistically, incorporating various modes of transport in order for it to be completely operationally, physically and spatially integrated. Onderwater (2012) also indicate that minimal adjustments to other public transport modes can slowly and easily initiate modal integration using the current infrastructure. He uses eThekwini Municipality as an example where there has been a dedicated cycle route on Ruth First Highway, which has been a highway that has been in existence, but a lane was sacrificed in order to promote cycling in the city. He further states how the adjustments in the operational schedule of the PRASA and the bus system could have easily channel the people to inter modality where the bus schedule taking people to and from the rail stations could be aligned to the rail schedule. However, he further states that this is not easily achievable as the various modes of public transportation which is rail and buses all operate independently of each other spatially (routes are not planned to integrate with other transport modes) and operationally (no synchronisation of time schedules) thus making inter modality a huge challenge to achieve (Onderwater, 2012).

3.13. Legislative Framework underpinning NMT in South Africa

With the dawn of democracy in 1994, the new government inherited a segregated society, land use, infrastructure and services of which transport was one of them. This meant that the government of the day had a huge challenge to redress the transport challenges as it was embedded and tangled with all the other spatial, economic and social injustices. In doing this the government had to come up with various policies and legislation to address these injustices. These policies had to redress the transport injustices and to ensure that transport is not used as a tool for social and spatial segregation but as a tool for social reconstruction and spatial integration (Cox, 2010).

Act 108 of 1996 Section 85 (1) (b) of the South African constitution gives the national Department of Transport the mandate to develop the transport policy. This mandate clearly spells out that the policy of the Department of Transport needs to ensure that it addresses the mobility needs for all South African citizens. This was the first call for the development of an inclusive transportation framework which would recognise NMT as one form of transportation. In its attempt to redress the injustices in transportation and to implement this mandate the Department of Transport began to develop the following policies and Acts.

3.13.1. White Paper on National Transport Policy 1996

This paper was the result of the National Transport Policy Forum which was formed by the Department of Transport after 1994 and was the first key transport policy document to be issued in 1996 after the fall of apartheid regime in South Africa. This paper laid the foundation for future transport planning policies in South Africa. The focus of this paper was on addressing the disintegration of transport development and land use which was caused by the fragmentation of the apartheid regime. This paper outlined that this fragmentation in transportation could be addressed by improving the service and increasing the modal choice

(Department of Transport, 1996). However, this policy had no direct reference to NMT but was one step closer in recognising the relationship and the influence of the land use planning on transport and the acknowledgement of other modal choices besides the motorised transportation (ibid).

3.13.2. National Road Traffic Regulations of 1999

This was the amendment of the National Road Traffic Act No.93 of 1996. In this revised Act there is the mention of NMT, but not detailed as to how it could be implemented and this forum was advocating for the conventional road and rail transport such as buses, trains, taxis and there was no advocacy for the non - conventional one such as NMT of which the majority of South Africans use. It only focuses on the on the animal drawn vehicles as a form of NMT (Cox, 2010).

3.13.3. The National Land Transport Transition Act (NLTTA), No 22 of 2000

The main objective of this Act was to prioritise the use of public transport as compared to private transport. The public transport mentioned in this Act is the conventional transport and there is no detailed mention of the NMT (Department of Transport, 1996). However it should be noted that this Act promotes integration and it is for the first time the integration of rural areas is considered and mentioned to be part of the Integrated Transport Plans as they mainly focus on urban areas. This Act ensured that the marginalised rural dwellers are given access to various services that are offered in the urban areas. This Act was another step closer to NMT development as it advocated for the access and integration of the marginalised rural dwellers (Cox, 2010, eThekwini Municipality, 2013).

3.13.4. Rural Transport Strategy for South Africa 2007

After the NLTTA stated the integration of rural areas in the transport plan, it was eminent that there should be a detailed strategy specifically addressing the integration and active participation of rural communities in transport development and planning, hence the development of the Rural Transport Strategy for South Africa 2007. This strategy states that transport should not only give mobility and access to urban services but should empower the communities to participate in the economic and social growth of their own communities. This Act acknowledges the role played by NMT but goes further in arguing that the rural communities should not only be given access to services but also be empowered to participate in their own economic upliftment (Cox 2010, eThekwini municipality, 2013).

3.13.5. The Public Transport Strategy 2007

This strategy was developed in the same year as NLTTA and it had three objectives, the first one being the sustainability of the FIFA 2010 world cup public transport programmes such as the Gautrain and the NMT routes. Secondly, it was to promote the use of NMT and public transport and to increase the accessibility and the use of such. This was going to be funded

by the Municipal Infrastructure Grant and Expanded Public Works Programme which is administered at the municipal level. The third one was to align public transport network, NMT and travel demand to land use planning so as to achieve effective public transport implementation (Cox, 2010, eThekwini municipality, 2013).

From all the above mentioned legislation, this Act had a direct emphasis on the promotion of NMT as a tool of accessibility and again this strategy was the first to officially acknowledge that there is no alignment of the land use planning to the NMT, travel demand and public transport.

3.13.6. Local Government by Laws

These are the local by-laws that are developed by the municipalities in order to ensure that the daily transport operational functions of the city run smoothly. These by-laws often work together with other Acts such as the National Road traffic regulations (Cox, 2010). The eThekwini by-laws that pertain to NMT are the restriction of animal drawn carts and Rickshaw pullers in the CBD. The rest of the by-laws on CBD are about pedestrian behaviour in crossing the road and obstruction of sidewalks and not at all related to NMT (eThekwini municipality, 2013).

3.13.7. Draft NMT policy (2008)

From all the legislation developed by the Department of Transport, there has been no legislation dealing specifically with the detailed development of NMT. It had either not been mentioned in the legislation and if mentioned in some Acts such as the NLTTA it is has been the acknowledgement of the exclusion of NMT in major transport planning legislation. The previous legislation had stated that it should be incorporated into transport plans, but there has been no detailed mandatory NMT legislation outlining its development and implementation. The draft on NMT policy 2008 was the first legislation giving the details of NMT development and implementation.

The vision of this policy was to make NMT an integrated transport for sustainable social and economic development and the objective was to meet the mobility needs of marginalised communities through the provision of safe, secure and reliable integrated NMT transport. In doing this it outlined the strategic policy objectives which were:

- Integration of NMT into the transport system, including transport and spatial planning
- Endorsement and facilitation of the use of NMT modes
- Development of infrastructure and maintenance standards that recognise NMT as an essential mode of transport
- Enhancement of traffic legislation that recognises NMT as an alternative transport mode

- Facilitation of NMT as a feeder system to other modes of transport
- Empowerment of the marginalised groups through NMT
- Allocation of adequate and sustainable funding for promotion and development of NMT
- Promotion of NMT as a reliable, healthy and safe transport mode
- Reduction of the number of traffic fatalities of vulnerable non-motorised road users, and
- Facilitation of research and new initiatives to improve NMT performance (Department of Transport,2008).

This draft policy acknowledged the importance and the role of NMT in transport planning and in the mobility and accessibility to various services and activities by the marginalised groups. This policy also highlights that the development of effective and sustainable NMT routes require an integrated approach with other disciplines or fields like engineering for the NMT design and spatial planning for land use planning objectives. Community participation is also essential as it plays a role in the awareness and public consultation processes. The focus of this policy was therefore on the infrastructure improvement and development to prioritise the implementation of NMT in South Africa and this was a first of its kind in unpacking and detailing the development and the implementation processes of NMT. (Department of Transport, 2008 Ramorobi et al, 2010). Unfortunately this policy up to this day is still in its draft phase.

3.13.8. NMT facility Guidelines 2014

This is a revised and an updated version of the Pedestrian and Bicycle Facility Guideline of 2003. This manual was reviewed because of the changes within the transport industry and the number of legislation and policies developments which demanded a review of this manual. The main aim of this manual was to align it to the current developments and new technologies in order to not only incorporate the needs of all road users but to ensure that they are met efficiently. It is aligned to the IDP, NLTA of 2009, Road Traffic Act of 1996, Road Infrastructure Strategic Framework of 2006. The South African Road Safety Manual and the Universal Access principles for the disabled, aged and the young. However, it should be emphasised that this is not a new policy but it provides a more balanced approach to the design of NMT facilities in urban areas. And also promotes the improvement of the current infrastructure to accommodate NMT users (Department of Transport, 2014).

3.14. Evaluation of NMT

3.14.1. Benefits of NMT

Litman (2010) argues that NMT as a mode of transport has various benefits for the whole society. Baufeld (2016) agrees with Litman (2010) and further argues that NMT can provide the society with benefits such as achieving strategic land use objectives (reducing urban sprawl) health, road safety, energy consumption and pollution. Walking and cycling can improve public fitness and health, save money, reduce traffic congestion, increase road safety, save the environment and promote affordability and accessibility. Below is the breakdown of each of the benefits of NMT.

- **Cost effective -** Cost analysis is crucial when looking at the development of any form of transport network or infrastructure. In most cases the cost analysis often determines if the project will be implemented or not. Walking and cycling are the most cost effective transport modes for various reasons. NMT is not only cost effective in implementation but also to its users (Baufeld, 2016).
- **Safety -** safety can be two fold it can mean the safety from the road crashes and it can mean the safety which is protection against crime while using NMT. Cox (2010) argues that the most effective way to reduce the risk posed by the motor vehicles to road users is mass pedestrinisation and the development of NMT routes. He further argues that the perception of fear of public spaces decreases with the level of public space ownership as residents interact, socialise and relax with the public space while using the NMT facilities. This means that the residents reclaim their public spaces making them vibrant and liveable public spaces because of NMT. Residents tend to feel safer and able to use the public spaces if there is a high level of NMT as there are always people frequently cycling and walking on the public spaces. This is what Cox (2010) calls surveillance safety.
- **Health -** Lifestyle diseases like diabetes, cardiovascular diseases, joint and bone injuries are disease associated with obesity and physical inactivity. Dependency on motorised transport often leads to reduced physical activity (Labuschagne, 2011). Frank (2004) also argues that residents who reside in walkable and cycle able communities are less likely to be overweight than residents who reside in non-walkable communities and heavily rely on motorised transportation for mobility. This is confirmed by Litman (2010) who argues that cycling and walking provides the practical and affordable form of physical activity that is necessary in order to reduce these health risks and to make the society live a healthier and prolonged life.
- **Affordability and accessibility -** Litman (2010) argues that NMT promotes affordability and accessibility as most of the NMT routes such as walking and cycling are free and the routes cover a very short radius making the services and the activities to be easily accessible as they are in close proximity of each other. This translates into huge cuts and savings in transport costs for the NMT users.

- **Environmental -** Most motorised vehicles use petroleum oil which is a non-renewable resource and they emit the carbon monoxide gas which is one of the major contributors to greenhouse gas pollution. Tyrinopoulos and Antoniou (2012) states that in Greece urban traffic is responsible for 40% of CO2 emissions and 70% of emissions of other pollutants arising from road transport. It is no doubt that promotion of NMT will benefit not only the society when it comes to cost but also benefit the environment as walking and cycling will lead to petroleum conservation and again produce no pollution. Walking and cycling also reduce the level of noise pollution which is often a huge problem in big cities where there is very high vehicular congestion (Litman, 2010).

- **Land use planning -** Motorised transportation promotes separation of land use zones, and increases the distance between the land use zones and leads to urban sprawl as more land is required for the construction of roads and parking facilities. The development of NMT promotes walkability, mixed land use and reduces urban sprawl. In other words NMT development supports smart growth strategies as it creates walk able neighbourhoods with accessible, efficient land use patterns (Litman, 2010).

3.14.2. Challenges of NMT

Despite the above mentioned benefits of NMT, however there are barriers or challenges facing the successful development and the implementation of NMT. These challenges are not uniform but vary according to the dynamics of each country such as *physical* constraints e.g. climate and topography, *political* (policy vision and commitment) *Social* (public awareness etc.). In most cases the above constraints are interdependent on each other. However all these constraints can be broadly summarised into three overriding challenges that affect the implementation and use of NMT and these are policy developments, evolution of transport system and NMT as a retrofit development.

- **Policy developments** - Lack of political commitment in advocating for NMT development often results in development of transport policies with very little or no emphasis on NMT. This is mainly due to the fact that many developing countries perceive motorised transportation as a major contributory tool to economic development. The majority of NMT users in the developing countries are the "captives" with weak political empowerment and thus little influence when it comes to policy making (Guitinik, 1996).
- **Evaluation of transport system** - Conventional transport planning uses transportation demand management (TDM) which is a series of strategies such as surveys that look at the user profiles and transport needs of the society when planning or developing transport networks. One of the common TDM strategies is the traffic surveys that look at the user profiles and transport needs of the society. This form of conventional transport surveys which includes average traffic speed and congestion delay indices disregard the

non-motorised links of motorised transport e.g. walking to and from the bus terminals or stations, walking to and from parking facilities (Litman, 2003, Litman, 2010).

- **NMT as a retrofit development**

Labuschagne and Riebens (2014) argue that NMT development and integration into spatial planning in South Africa does not receive the attention it deserves from all spheres of government and their implementing agencies. They further argue that urban development and transport infrastructure has huge deficiencies with regard to NMT infrastructure development and services. The main challenge facing the implementation of NMT facilities is that it is implemented on ad hoc basis and is not incorporated in the initial spatial and transportation planning processes. This is confirmed by Western Cape (2009) which states that although NMT development is not limited to road network but since NMT is mostly a retrofit to the current road networks and landscape, there needs to be a thorough reconsideration of the legislation and policies that govern the road network development in terms of engineering design standards so as to promote opportunities for NMT development and facilities improvements (ibid).

Coupled with the above challenges is the exclusion of non-work travel, recreational travel and travel by children. These surveys often disregard these NMT travels or simply classify them as motorised travel which is not completely the case. This indicates how conventional transport planning and traffic management undervalue NMT as the development and performance of transportation system is evaluated based on auto mobility which is the movement of motorised vehicles rather than accessibility (Litman, 2003, Litman, 2010).

3.15. Conclusion

NMT is a transportation strategy with numerous benefits to both individuals and the society. It is therefore crucial to ensure that sufficient research and planning is conducted thoroughly so as to ensure successful and efficient implementation of NMT. However for successful implementation to be adequate, there should be strategies that promote the use of these NMT facilities to ensure its sustainability. NMT development should be driven by strong policy directive which heavily invests in Smart urban principles, active public participation and infrastructure development.

Chapter 4: Research Methodology

4.1. Introduction

This chapter outlines the research methodology adopted for this study, it gives a detailed data collection process. It further gives reasons why the research design and the research tools were selected and were the best suited for this study. It also looks and explains how the collected data will be analysed. In conclusion it discusses the ethical consideration, the validity and the reliability and the limitations of the study.

4.2. Research Methodology

Denzin and Lincoln (2008) argue that the most appropriate methodology to use when gathering data is best determined by the research question. The research questions of this study determines that the **qualitative method** be adopted as the overarching research methodology for this research. The qualitative research methodology highlights the processes, the meanings of various phenomenon that cannot be examined experimentally or measured in terms of quantity, intensity or frequency. In other words qualitative methodology looks at the association or relationships between phenomenon and the various situations that give meaning to the inquiry or study. The qualitative method looks at the reasoning why certain associations, patterns or relationships exist (Denzin and Lincoln 2011).

Cresswell (2009) defines qualitative approach as an approach for exploring and understanding the meaning of groups or individuals who ascribe to a social or human problem. Ospina (2004) defines qualitative research as a form of systematic empirical inquiry into meaning. Mack.et al (2011) argues that qualitative research seeks to understand a given research problem or topic from the perspectives of the local population it involves. Qualitative research is especially effective in obtaining culturally specific information about the values, opinions, behaviours, and social contexts of particular populations. However Yin (2011) argues that there is no singular definition to qualitative research but rather various distinctive characteristics that define the approach to be qualitative and he listed five of these characteristics which are:

4.2.1 Five Features of Qualitative Research

- Studying the meaning of people's lives, under real-world conditions, People are studied in their natural environment and their everyday roles and not taken into a foreign setting like a laboratory where there can be artificial research procedures that might influence their natural everyday behaviour or role.

- Representing the views and perspectives of the people: the ability to capture the views and perspective of the study. This plays a major role in giving meaning to real-life events by the people who experience them and not the imposed values or preconceptions of the researcher thus increasing the validity of the study.

- Covering the contextual conditions within which people live: This characteristic is similar to characteristic one mentioned above in that the contextual conditions of the participants which greatly influence the behaviour or condition of the participants are not disturbed in any way as the participants are not taken out of their natural environmental setting.

- Contributing insights into existing or emerging concepts that may help to explain human social behaviour: qualitative research can be the occasion for developing new concepts that might attempt to explain social processes, provide potentially useful explanations and even form a platform for new inquiries.

- Striving to use multiple sources of evidence rather than relying on a single source alone: qualitative research strives to collect, integrate, and present data from a variety of sources using various data collection tools. This triangulation further strengthens the reliability and validity of the research (Yin, 2011).

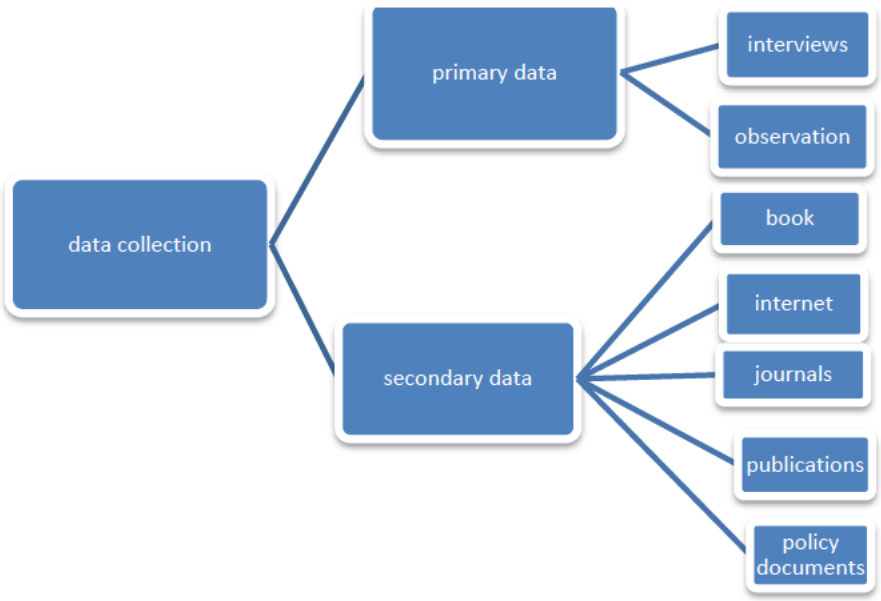
This study has adopted the qualitative approach because it has the five above mentioned characteristics. This research is a study on the role of NMT in spatial integration in Lamontville. The study will take place in the natural environment of Lamontville, thus there will be no artificial or outside forces that might influence the natural everyday behaviour of Lamontville or its residents. This is the first feature of a qualitative approach. Representation of views and perspectives of the people to give meaning to real-life events by people who experience it. This is the second quality. This study aims at capturing the views and the perspectives of the Lamontville residents through the qualitative research toll which is a survey and the researcher will not be in any way give her own preconceptions or values on this study (Yin, 2011).

The third quality is aligned to the first quality where the contextual conditions of the participants are not tampered with or compromised as the study occurs in its original context which in the Lamontville township. This research will apply smart growth and sustainable development concepts in an attempt to explain the spatial integration process through NMT. In doing so, this study might form a platform for new inquiry which might be undertaken at a doctoral level. This is the fourth feature of a qualitative approach (Ibid).

The fifth and the final quality of qualitative feature adopted in this study is the triangulation which strengthens the reliability and validity of the research (Yin, 2011). This study uses two data collection methods which is the Interviews targeting the residents of Lamontville and the Key informants who are the transport planning professionals. Observation is another data collection tool used by the researcher in this study (ibid).

4.3. Research flow process diagram

Figure 3: Research flow process



Source: Author (2018)

4.3.1. Data collection tool used

Figure 3 above indicates how the research process will flow. This study has used Primary and secondary sources to collect data. The secondary source used has been journals, books, policy documents data collection. The primary data collection tools used in this study is the interviews and observation.

4.3.2. Interviews

For primary data collection this study has identified, the interviews as the best tool for gathering data. The types of interviews that have been employed by this study have been the face to face interviews. The researcher has used the interview type based on the preference and availability of the interviewee.

The interviews that were undertaken in this study were **Key informant interviews** and the **Local resident interviews.** Key Informant Interview is defined as structured, unstructured or semi structured interview with the people who have specialised knowledge about the research topic that is being undertaken by the researcher. The Key informant interview allows the researcher to get more insight on the topic and to discover the information that would not have been revealed in a questionnaire because of the physical interaction with the key respondent (Ali et al, 2013, Mack et al, 2011). The local resident interview is an interview of the local residents residing within Lamontville which is the study area of this research. The interview schedule of both interviews comprised of the structured questions, and a few semi-structured questions to allow the researcher to probe deeper, and get further important

information about the researched study (Gill et al, 2008). All the respondents were debriefed to ensure that the interview questions were clear and understood.

The interview as a data collection tool has various advantages and according to Alshenqeeti (2014) these advantages include the following:

Strengths

- A high return rate with fewer unanswered questions as the interviewer takes the data with him after each interview has been conducted.
- No ambiguity in the questions as the interviewer may ask for clarification of the question at any point during the interview.
- Flexibility as to the choice of venue for the interview.
- Questions can be structured and answered in a way that is easy for the candidates to answer. Hence, a clear perspective and opinion can be received. It is relatively a cheap method of collecting data (Alshenqeeti, 2014).

Limitations

- Anonymity is minimised as there is a one on one interaction with the interviewee.
- Time consuming as all the information that was manually captured during the interview need to be captured electronically
- Difficulty in scheduling the convenient time and venue for the interviewees. (Alshenqeeti, 2014).

4.3.3. Observation

Yin (2011) argues that observation is an invaluable tool of the data collection as the researcher is able to see and perceive the observed phenomenon at first hand and the perceived information is not filtered by what others have reported or might have seen. He further argues that when and where to observe needs to be clearly understood and explained in the data collection strategy so as to eliminate biases. The researcher has conducted an observation at different times and at different locations within Lamontville. These have been done on weekdays and weekends, mornings, middays and afternoons. The observations have been done on the older and newer parts of Lamontville. This was to ensure that the different travel patterns are observed at different places, different times and different days so as to avoid biasness of the travel behaviours.

Strengths

- Allows access to real life situations
- Good for explaining meaning and context
- In-depth understanding (Cresswell, 2009).

Limitations

- High potential of conflict between the participants and the researcher. Difficulty in scheduling the convenient time and venue for the interviewees.
- Personal biasness of the researcher
- It is costly as it requires more time and effort (Creswell, 2009).

4.3.4. Mapping

All existing NMT routes noted during the survey were mapped and presented using GIS package and AutoCAD 2018 which was installed on a secure computer and Microsoft package.

4.4. Sampling

Mack (2011) argues that the research objectives determine the characteristics of the sample group to be selected. Therefore due to the nature of the study and the objectives of the research questions, this study identifies the purposive sampling method as the most suitable sampling method. Purposive sampling is the intentional sampling of the respondents based on their unique experiences, skills etc. (Mark et al, 2011). This is confirmed by Yin (2011) who states that purposive sampling is a deliberate selection of respondents that will give the most relevant and plentiful data about the research study.

Table 1: Table of participants

Numbers	Firms/ Department	Position
1	eThekwini Municipality - ETA	NMT Civil Engineer - Nkosinathi Dube
1	eThekwini Municipality	Senior Transport Planner - Manoj Rampersad
1	eThekwini Municipality	Public Transport Planning Manager - Robin Chetty
1	Community Leader	Ward Committee Member
24	Local residents	Lamontville Residents
Total:	28	

Source: Author (2018)

To eliminate biasness and to ensure equal and full representation of the Lamontville residents in the sample group, a sample table (table 1 above) was designed and based on the following categories which will be explained in detail later: age and gender, mode of transport, education level and employment and the region within Lamontville. For the Key informants it was based on their experience and exposure to NMT planning and development within eThekwini Municipality.

As for this study the sample group consist of two categories and these two categories were the Key informant category who are the professionals within the eThekwini Transport Authority responsible for the NMT planning and implementation within eThekwini municipality and these are, Mr Manoj Rampersad who is the Senior Transport Planner mainly responsible for the NMT policy development and strategic transport planning. The second official is Mr Robin Chetty who is a Manager for Public Transport Planning mainly responsible for policy development and public transport infrastructure within the municipality. The fourth one is Mr Nathi Dube, a Civil Engineer responsible for the drawing and implementation of NMT development within eThekwini Municipality. This category answers the second research question which is on the legislation underpinning NMT development.

The second sample category was the Lamontville residents which consist of 24 residents and this category answers the research first and the last research question. The first research question is on the nature and extent of NMT development within Lamontville and the last question is on the impact of NMT development on Lamontville residents. In order to ensure that there were no biases on the study this category was further subdivided into smaller categories which were:

Age and gender - The age and gender are crucial factors in the development and usage of NMT (Rahula and Verma, 2013). In order to get a broader representation of the age groups the study identified residents from three age group categories which were the youth from age (18-25), Middle age from age (25-50) and lastly age from age over 50 and above. The researcher had to ensure that there is a good balance of gender so as to ensure that both perspectives are captured. This is essential as the age and gender can strongly influence the transport needs (Theynell, 2016)

Employment status - The sample group had representation from the employed and the unemployed in order to ensure that the perceptions of both the employed and the unemployed is captured in the study as these two groups might have completely different transport needs and various trip generation. Western Cape DoT (2010) argues that the disadvantaged low-income communities are generally disadvantaged by being located on the outskirts of the city and often physically separated from all essential services. This results in a strong NMT movement between outlying poorer communities and employment opportunities in the City centre (Western Cape, 2010)

Mode of transport - In order to fully determine the impact of NMT on Lamontville residents it was essential to ensure that groups using various modes of transportation are incorporated. Therefore for this study both residents using NMT and other modes of transport were selected as part of the sample group. The NMT users were selected so as to understand the reasons for choosing NMT as their mode of transport. Secondly, the NMT users fully understand the benefits and the challenges of NMT and this can assist the study in better informing the future planning of NMT. The residents using other modes of transport were selected so as to understand the reason for their modal choice and also to determine if they can be future users of NMT.

Regions of Lamontville - To ensure that there is no biasness and both the NMT users and the motorised public users are accommodated in this study the researcher sampled in the following way. For the NMT users participants were sampled from the major formal and informal routes within Lamontville from all regions. Since there is no major public transport facility or rank in Lamontville, for motorised public transport users the researcher sampled from the four major public transport stops located along the major collector covering all the regions which are the older township region, the newer subsidized region and the informal settlements. These four public transport facilities are 1- Sithebeni, 2 - Madlala, 3 - Mhlongo, and 4 - Ringini (Refer Figure 4 below, map of major public transport stops page 49). The

numbers used in these public transport stops do not indicate any particular phenomenon but is mainly for sequencing of the stops only.

Figure 4: Lamontville major public transport stops

Source: Author (2018)

4.5. Data analysis

In order to fully understand and make sense of the data collected, the data needs to be carefully analysed. For data analysis this study was guided by the three principles proposed by Denscombe (2010) who argues that these principles are essential in order to achieve efficient outcomes in qualitative data analysis. The first one is to organise the data into a comprehensive structure e.g. tables or charts and this enables the researcher to identify, compare and determine the data to focus on. Second principle is to clearly link the research objectives to the data analysis so as to ensure that the research objectives are met in the data analysis. The last principle is to conclude by developing a model or improve the conceptual basis of the research. On top of these principles this study employed the thematic data analysis approach which Boyatzis (1998) argues that it is a form of qualitative data analysis and is used to analyse, classify and present data according to themes of the study. All the data collected though the primary sources (interviews and observation) and secondary sources (policy documents, publications, maps etc.) are analysed and presented as graphs, tables and maps using the Microsoft office package and GIS.

4.6. Ethical considerations

Mack et al (2011) argues that when conducting a research on people the well-being of the people should become the top priority and research question should be of secondary importance. This means that it is crucial to practice good ethical conduct when conducting a research. According to Jelsma (2005) there are four essential ethical considerations and these considerations had been adhered to in this study and these are:

Autonomy - Consent to participate in the interview was obtained before the interviews were conducted and the participants were informed that they could withdraw at any stage during the interview. Participants were also informed not to give any personal details that could be directly linked to them.

Non maleficence - although the nature of the study does not pose any harm to the participants but the researcher ensured that all the questions asked were free from any social, emotional harm and were asked in a considerate manner.

Beneficence - The people who will benefit in this study will be transport planning professionals who will get the grass root perceptions about NMT use and development in Lamontville. This information will greatly assist in future NMT and general transport planning within Lamontville thus assisting in meeting the NMT the transport needs and improving the quality of life for Lamontville residents (Jelsma, 2005).

4.7. Reliability and Validity

Yin (2011) argues that a valid study is a study that has properly collected and interpreted its data to ensure that the findings and the conclusions arrived at reflects and represents the real world that was studied. Reliability is the accuracy and the precision of measurement

procedure to work accurately at different times. This would mean that if the study would be conducted again consistency in the findings would be maintained. For this study validity and reliability was strengthened by triangulation where data was gathered from the Lamontville residents and the planning professionals using interviews and observation from the study area. Where possible photographs and maps were used to better explain and illustrate the point argued. The interviews were also piloted on a few professionals and Lamontville residents who were not part of the sample group. This was done to eliminate any errors or ambiguities and to ensure that the questions asked are relevant to the research objectives and the research questions.

4.8. Limitations of the study

There has been one major limitation to this study and this has been the time constraint. The study has been undertaken on a part time basis which meant that it took a bit longer than had initially anticipated. The scheduling of the interviews especially with the key informant respondents was not easy to conduct as most of the key informants hold senior positions with numerous responsibilities within the organization and often would need to reschedule the planned appointments due to the demands and the pressures that come with the nature of such responsibility.

4.9. Conclusion

This chapter has outlined the research methodology and the research tools that have been undertaken in this study. It has also explained how the selected research method and the research tools are the most suitable ones for this study. The strengths and the limitations of the research method and the research tool have also been discussed. This chapter has further highlighted the ethical considerations and the measures that have been taken to ensure reliability and validity of the study. The next chapter will be on the analysis of the data collected in this study.

CHAPTER 5: CASE STUDY Lamontville

5. Introduction

This chapter begins by giving a brief historical background of Lamontville, indicates its location within the eThekwini municipality and its neighbouring areas. It also analyses important factors about Lamontville that are crucial to this study such as the socio economic status of Lamontville residents and the existing mobility and transport context. Furthermore it also addresses the study's first objective: To determine the nature and extent of NMT development and implementation within eThekwini municipality with special reference to Lamontville.

5.1. Historical background

Lamontville is one of the oldest townships within the eThekwini municipality. It was established in 1934 and named after the then Durban mayor Reverend Lamont. This township developed after much pressure from the liberal groups who wanted the Durban authorities to create a township to accommodate the ever growing African migrant labourers. After much resistance the Durban city authorities eventually acquired a land known as the Woods Estate (later called Mobeni) for industrial activities and the portion that was unsuitable for industrial development was then set aside for the establishment (eThekwini Municipality,2011).

The development of Lamontville occurred in four phases with the old part built in 1932 -1934, the second part was the "new look" cottages built in 1937 -1939, the third was the flatted houses and flats built in 1948 -1953. The Letting and the selling scheme of Gijima built in 1955 -1961. It was not until the late 1980's that the people could lease or own the houses (eThekwini Municipality, 2011).

Urban planning during the apartheid government was used as an instrument to achieve the objectives of the apartheid policy which were racial segregation and inequality. This resulted in the marginalisation and dislocation of African communities into townships at the edges of the cities. This marginalisation and inequalities in built environment meant that townships were deprived of essential services of which accessibility and spatial integration was one of them. Being a township built during the apartheid era, Lamontville has all the physical typical features of an apartheid township such as the N2 and the railway line on the East, the Umlazi River on the South and Higginson Highway on the North (Ivan, 1994).

5.2. Location

Lamontville is located approximately 20km south of Durban's CBD, with the Mobeni Heights on the North, Mobeni and Merebank on the east, Chatsworth on the west and Umlazi on the South as indicated in Figure 5 below. Lamontville is not a very wide area only covering an area of 3.81km2 (Stats SA, 2010). It is divided into three wards according to eThekwini Municipality which are Ward 69, Ward 74 and Ward 75.

Figure 5: Locality Map

Source: Google Map (2018)

In the apartheid cities there were physical boundaries that were created to separate the whites from the non-white areas especially townships and these were often in the form of roads, railways, rivers, open spaces, ridges etc. (Schoeman, 2018). Lamontville is a typical

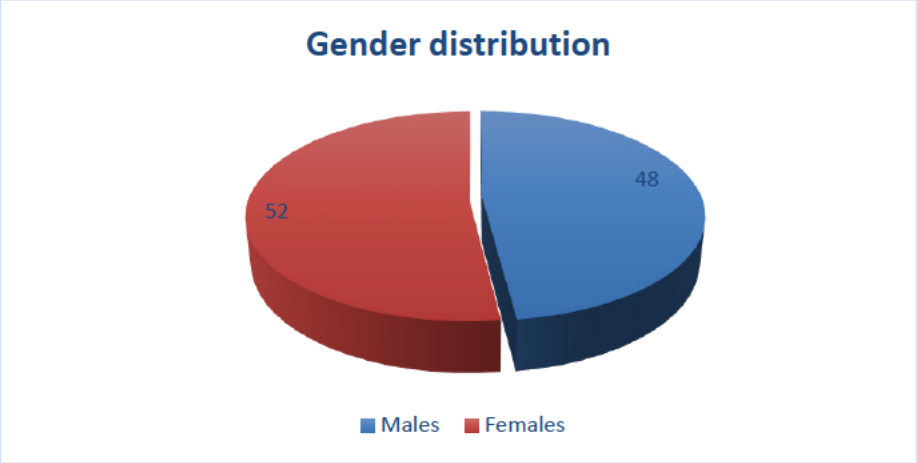
example of such apartheid planning with its physical boundary being Umlazi River on the south and on the east it has the National N2 freeway as its boundary.

5.3. Demographic Profile

Rahul and Verma (2013) argue that the demographic profile of an area is the best tool to understand the Nature and Extent of NMT use since NMT is often associated with factors such as socio economic status, age, gender, level of education etc. (Rahul and Verma, 2013).

5.3.1. Gender distribution in Lamontville

Figure 6: Gender distribution



Source: Author (2018)

It is crucial to understand the gender distribution within Lamontville as gender plays a huge role in transport perception and greatly influences modal choice Rahula and Vermab (2013). In Lamontville as indicated in Figure 6 above males make up 48% while females make up 52% (eThekwini municipality, 2011). This is consistent with the gender distribution of eThekwini municipality where females make up 51, 1% and males make up 48.9% (Stats S.A, 2011).

5.3.2. Age distribution of Lamontville

Table 2: Age distribution of Lamontville

AGE distribution for Person weighted, Lamontville								
Age	0 - 6	7-14	15 - 24	25 - 34	35 - 44	45 - 54	55 - 63	64 - 120
Number of people	4377	3901	7242	6659	4057	3061	1826	1298

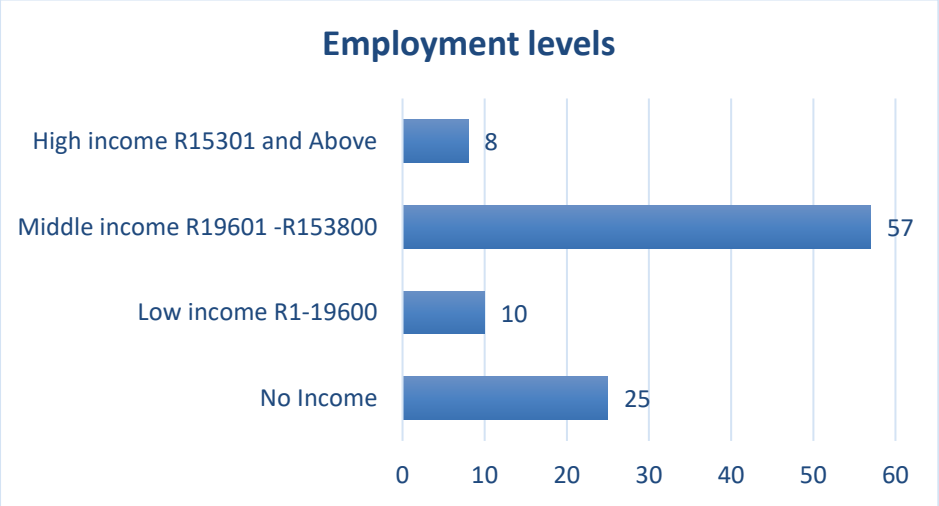
Source: Author (2018)

In a study conducted in India by Rahul and Verma (2013) there was a strong correlation between age and NMT usage as they discovered that an increase in age led to a decrease in

NMT use. Therefore it is crucial to determine the age groups within Lamontville. Table 2 above indicates the age distribution of Lamontville. The highest number of people is between the ages of 25-34 followed by people between ages 35-44. Both these age groups are physically active people who can use NMT with ease within Lamontville (eThekwini Municipality, 2011). This is consistent with the general age distribution of eThekwini where the highest age group is 20-29 and 30-39.

5.3.3. Employment levels within Lamontville

Figure 7: Employment levels within Lamontville

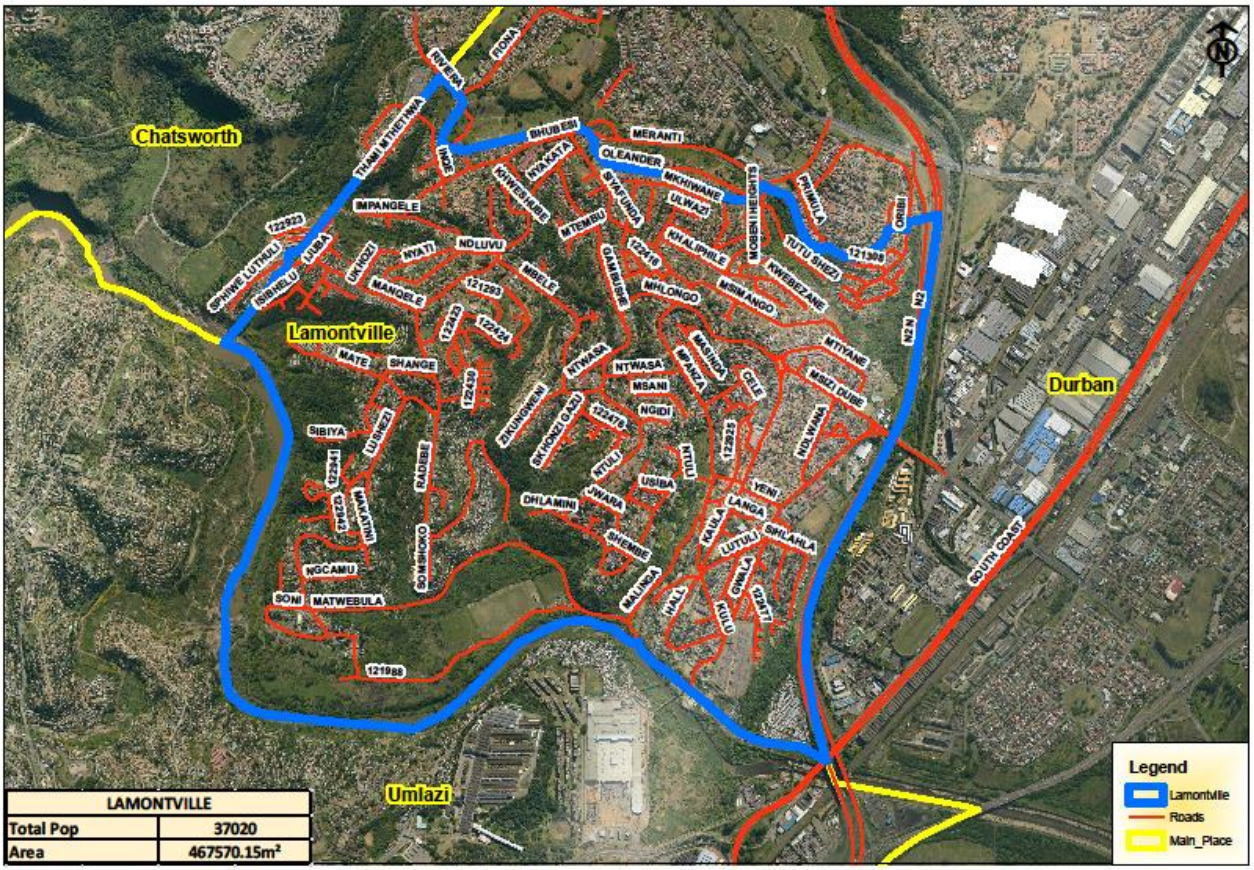


Source: Author (2018)

According to eThekwini municipality household survey (2011) the employment levels of Lamontville indicate that the largest group of Lamontville residents are middle income earners with an average income ranging from R19601 - R 153 800 p.a contributing 57% of the total number of Lamontville households. This is followed by the unemployed or no income earners and the low income earners mostly consist of the social grants recipients. These findings are indicated by Figure 7 above. This is different from the eThekwini municipality where the highest numbers of residents are unemployed and contribute about 17% of the eThekwini population. Employment levels are crucial in NMT development as affordability and willingness to pay play a major role in modal choice (Astuti and Tertia, 2015).

5.4. Transport status quo in Lamontville

Figure 8: Lamontville road network



Source: Author (2018)

5.4.1. Road layout

Figure 8 above indicates the road network within and around the project site in terms of a hierarchy of routes and the layout of the road network. The N2 freeway on the eastern side of Lamontville does not only act as a boundary to Lamontville but also acts as the corridor linking the Northern and the Southern parts of Kwa Zulu Natal. The M4 is a class 1 arterial route and South Coast Road is a class 2 arterial route and both act as corridors linking Lamontville with the Durban CBD and goes through the Eastern industrial zone like Isipingo, Mobeni, Clairwood and Bayhead. On the Northern part of Lamontville is M1 which is a corridor linking Lamontville to the Pinetown - Westmead - New Germany Western Industrial node.

The street pattern of the Lamontville roads is planned irregular pattern which accommodates the undulating topography of Lamontville. Although planed irregular is common in newer cities, topography also dictates this type of street pattern where the road lay out conforms to the topography of the area as it is the case with Lamontville.

According to The Road Infrastructure Strategic Framework for South Africa (RISFSA), which is a guiding document of the planning and development of road infrastructure in South Africa led to the development of the South African Road Classification and Access Management Manual, (SANRAL, 2012). The roads are classified according to their function with the high order roads like the national freeways being classified as the Class 1 roads and the low order roads like the small access roads that provide access to specific destinations as the class 5 roads.

Lamontville is made up of the class 4 roads and the class 5 roads. The Class 4 roads are the local arterial roads that act as collectors and distributors for Lamontville. The class 5 roads are the smaller roads that act as urban local streets or access roads that lead directly to individual households.

The class 4 roads area are dual carriageways with a width ranging from 4 metres to 6 metres All the class 4 roads are provided with a sidewalk as indicated by Image 1 below, although it is often very narrow and morning and afternoon peak where the pedestrian traffic is high the pedestrians are forced onto the roadway. The class 5 roads are the access roads and both dual carriage roads and single carriageways ranging from 4 metres to 6 metres. All these class 5 roads have no sidewalks as indicated in Image 2 below. This means that in Lamontville only class 4 roads provide NMT access in the form of sidewalks and the class 5 roads do not provide NMT access.

Image 1: Class 4 (Malinga Road) with side walk for pedestrians

Source: Author (2018)

Image 2: Class 5 (Radebe Street) with no side walk

Source: Author (2018)

The narrow roads were apartheid strategic road network layout which purposely prevented accessibility to other neighbourhoods around Lamontville such as Clairwood, Isipingo, Chatsworth and Mobeni Heights which provides employment for the majority of Lamontville residents. Therefore the only access to these neighbourhoods was through motorised transportation. Thus this further hindered the development of NMT and spatial integration of these neighbourhoods. Lamontville residents therefore had to use motorised transport in order to access these areas, hence the emergence of NMT routes linking Lamontville with areas like Isipingo and Clairwood.

This layout proves to be a challenge for the pedestrians who have to walk on the narrow sidewalks during peak morning or afternoon hours. The sidewalks are insufficient and force the people onto the roadway thus creating a Road safety hazard as indicated in Image 3 below. The road layout of Lamontville does not accommodate the pedestrians and is therefore not NMT friendly.

Image 3: No side walk on class 5 Kadali Road

Source: Author (2018)

5.4.2. Public transport

There are two public transport operators within Lamontville namely the bus transport operating under Tansnat, and the taxi operators under Lamontville taxi association. There is no major transport rank or facility within Lamontville but numerous public transport stops are located along the major collector. As these bus stops are located along the collector it means that a large number of residents do not have a doorstep public facility. This means that in order to complete their daily travels they have to walk to the bus stop. This is called the first mile and again after getting off from the bus stop have to walk to their destination to complete the journey and this is called the last Mile (Ribbens, 2015).

5.5. NMT use within Lamontville

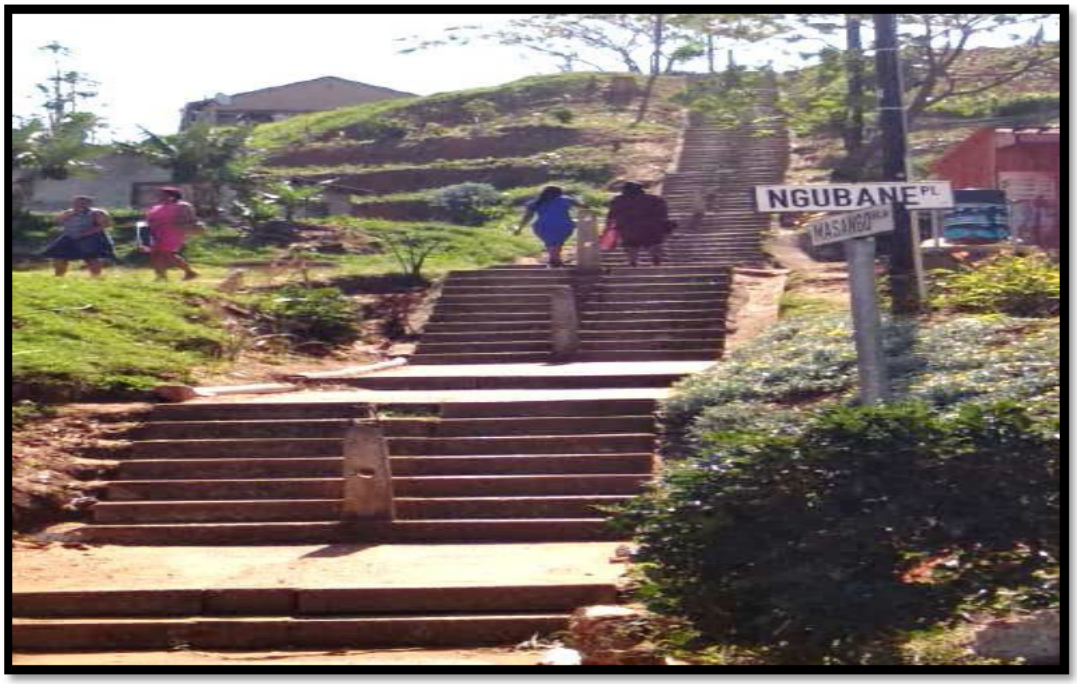
From the researcher's observation there are two types of NMT routes in Lamontville and these are the formal NMT and the informal NMT routes. Figure 9 below indicates the most frequently used formal and informal NMT routes.

Figure 9: Formal and informal NMT

Source: Author (2018)

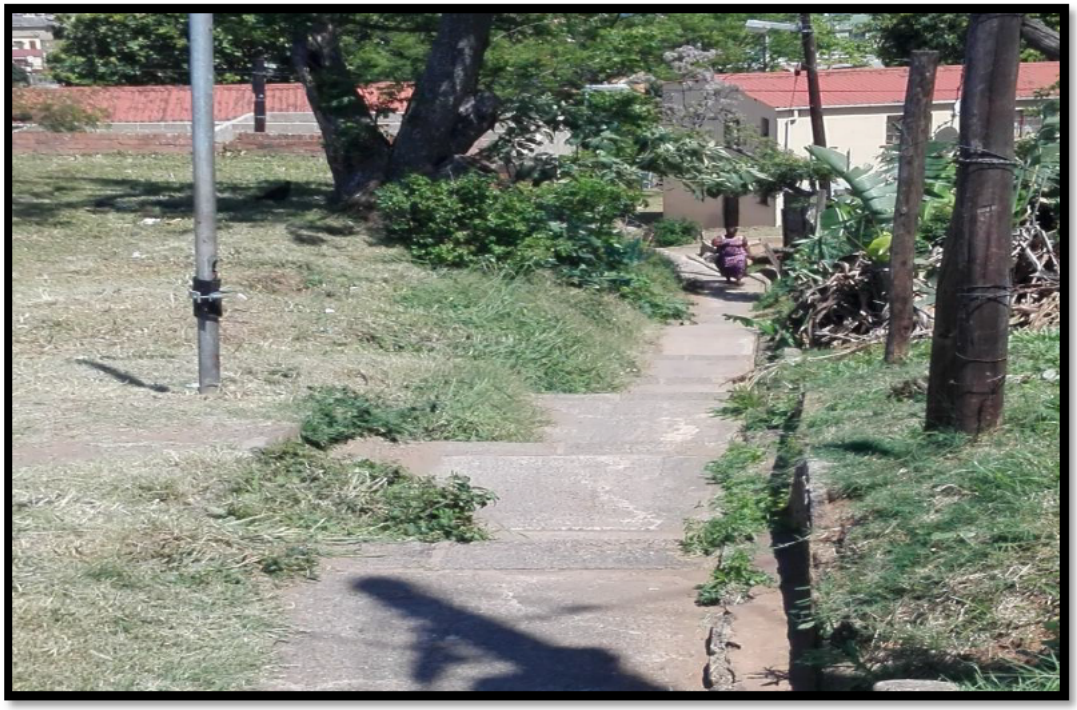
5.5.1. Formal NMT routes

Image 4: Msimango Walk linking Ngubane Place and Unnamed Road



Source: Author (2018)

Image 5: Msizi Dube linking Cele Road

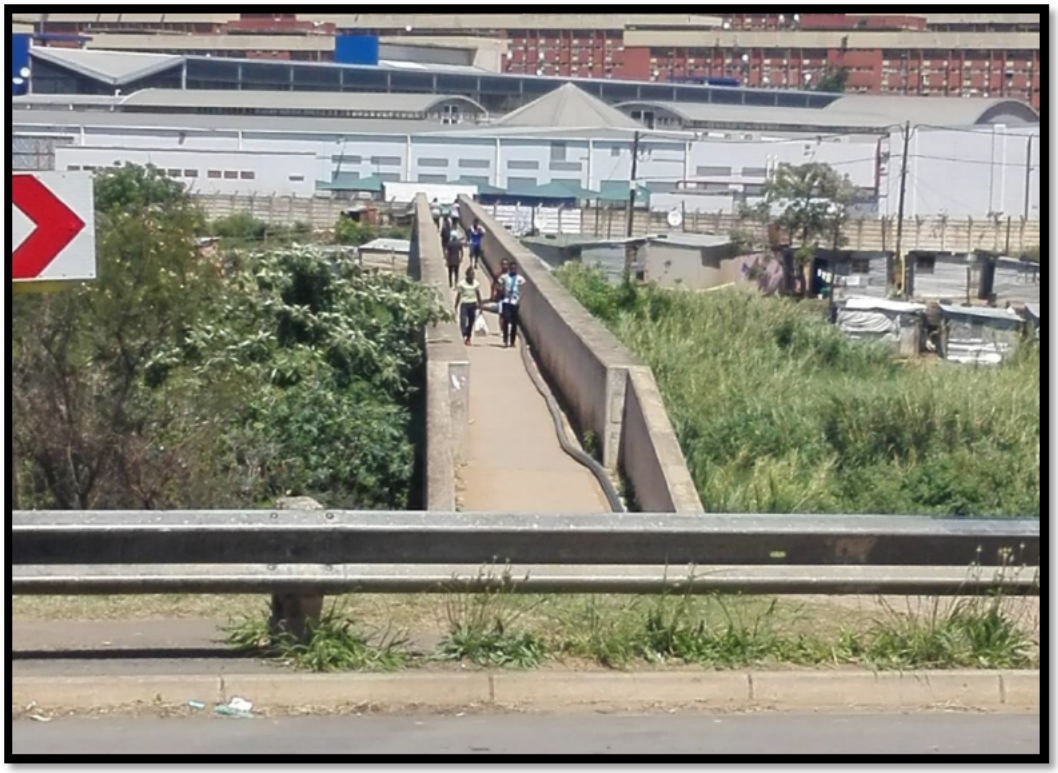


Source: Author (2018)

Lamontville like many similar townships within eThekwini municipality is characterised by undulating topography and thus in Lamontville, most of the formalised NMT routes are in the form of the flight of stairs. These NMT routes link the older parts of Lamontville with the newer part e.g. Unnamed Road on the newer part and Ngubane Place on the older part of Lamontville as indicated in Image 4 and Image 5 above.

Another type of formal NMT route in Lamontville is in the form of sidewalks especially located along the class 4 and the class 5 roads. These formal NMT routes are located within the formal households of Lamontville like the older parts of Lamontville and the newer parts of Lamontville as indicated by Image 1 in page 57.

Image 6: Side walk linking Lamontville and Umlazi Mega City



Source: Author (2018)

There is a walkway at Sithebeni linking Lamontville to Mega City in Umlazi, this walkway is also used by the residents who want to access other services at Umlazi like Prince Mshiyeni Hospital, Civic offices, the court, MUT and to get transportation to various destinations like transport to Isipingo as indicated by Image 6 above.

5.5.2. Informal NMT routes

Image 7: Informal NMT Route linking Radebe Street and eMathinini informal settlement

Source: Author (2018)

Image 8: Informal NMT Route Lushezi Road

Source: Author (2018)

The informal NMT routes in Lamontville are in the form of footpaths or desire paths and are found within the informal housing parts of Lamontville but a number of these informal routes are the only form of accessibility linking the informal part of Lamontville e.g. eMathinini with the formal part of Lamontville e.g. Radebe Road. There are also informal NMT routes that

most people use when going to work in the surrounding areas such as Clairwood, Mobeni and Isipingo as indicated by Image 7 and 8 in page 63.

5.3. Conclusion

This chapter has given an in-depth examination of the study area, painting a clear picture of the current status quo of transportation and nature and extent of NMT within Lamontville. This has enabled the researcher to gain facts about the study area and to eliminate any assumptions or pre conceived ideas that the researcher might have about the study area. The next chapter will be on the analysis of the data collected during the field research.

Chapter 6: Data Analysis

6.1. Introduction

In chapter 4 the researcher explained that the data collected in this study will be analysed using the thematic data analysis approach. Zengele (2009) argues that the data without meaningful analysis is just raw information that often does not make sense to any reader and it needs to be carefully analysed in order to become meaningful. Meaningful data is then interpreted in order to reach suitable conclusions, based on the actual conditions. The correct and accurate interpretation of data in this study will help the researcher to provide sound recommendations for the NMT development in townships within the eThekwini Municipality.

6.1.1. Lamontville and NMT

There are broadly two main types of NMT within Lamontville and these are the formal and informal NMT. The formal NMT is in the form of sidewalks, walkway and the concrete staircases found within the older part of Lamontville. The staircases often link the residential areas with the shops, schools and often lead to the transport terminals or main road where the residents can easily access transport. When excluding the sidewalk and the staircases the walkway which links Lamontville with Mega City is the only formal NMT route linking Lamontville with any other outside township.

The data collected indicated that a bulk of the NMT routes within Lamontville are the Informal NMT routes which are located mainly in the newer parts of Lamontville such as Madlala and Mathinini areas. These NMT routes are the only access linking the informal areas with other parts of Lamontville and often give access to the main roads. These informal NMT routes are in poor condition not tarred or paved with overgrown vegetation and pose great challenges in rainy season. These routes are what in most literature (Oliveira, 2013, The Guardian, 2018) refer to as the desire paths. They are the short cuts linking the residents from informal settlements to the rest of Lamontville and also to areas outside Lamontville such as Isipingo, Umlazi.

However, when it comes to the NMT use it should be noted that both the formal and the informal routes are used by the residents as access to various services within and outside Lamontville. There were numerous factors that impacted on the use of NMT in Lamontville such as gender, age, trip generation, origin and destination, employment levels etc. All these factors are discussed in detail in the section below.

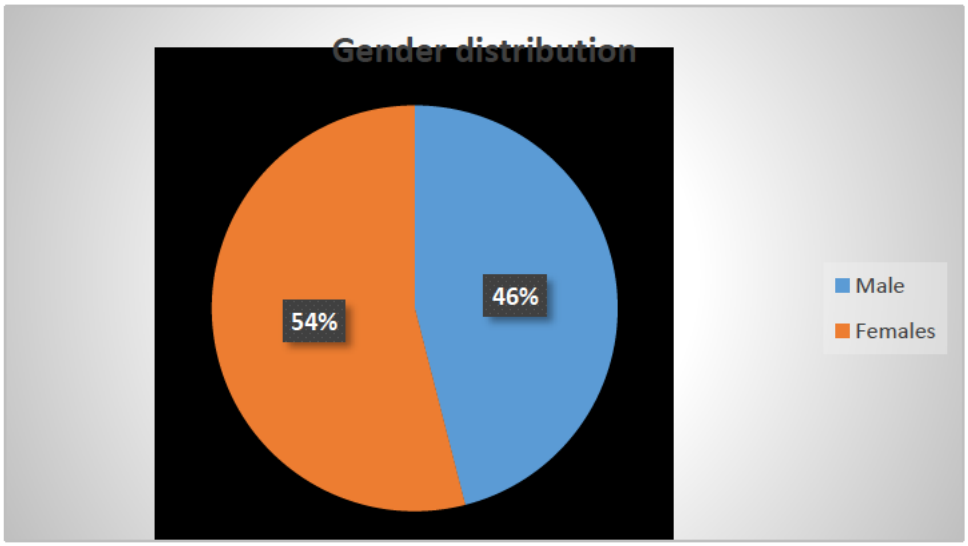
6.2. Nature and extent of NMT in Lamontville

Since NMT is often associated with factors such as socio economic status, age, gender, level of education. It is therefore essential to look at the demographic profile of an area to understand the nature and extent of NMT use in Lamontville (Rahula and Verma, 2013).

6.2.1. Gender distribution

The interview schedule for respondents required them to provide basic demographic data which includes age, gender, occupation, and education level. These variables assist in understanding the potential contrasts that exist between pedestrians' and commuters' perceptions, values and behaviours in relation to NMT (DoT, 2008). The following graph (Figure 10) shows the percentage of the pedestrians and commuters surveyed.

Figure 10: Gender distribution of Respondents

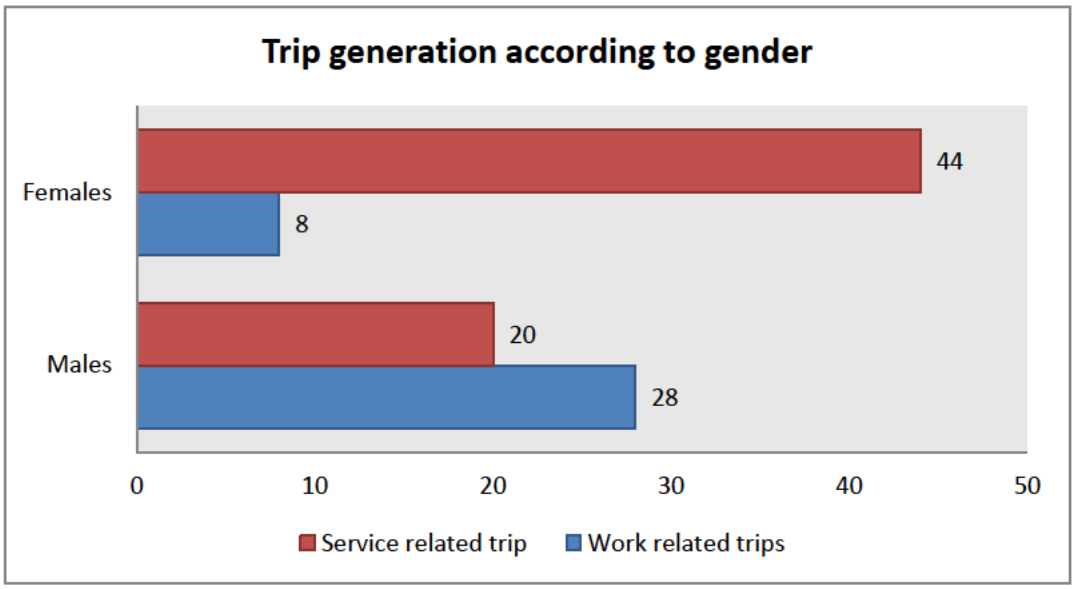


Source: Author (2018)

Rahula and Vermab (2013) argues that there is a striking difference in male and female travel behaviours. Women tend to do trip chains which means that they make numerous stops before their final destinations or make several trips a day as compared to men who often have a single trip. This is because the women's trips are more service and household related as compared to men's trips. This makes women to value accessibility, safety, and the general environment about the routes they travel on. This means that the perception of women and men is different when it comes to trip generation, and modal choice. From the sample group the male comprised of 46% while the females comprised of 54% this was to ensure that the perceptions of both genders were captured in the study.

6.2.2. Trip generation and NMT usage

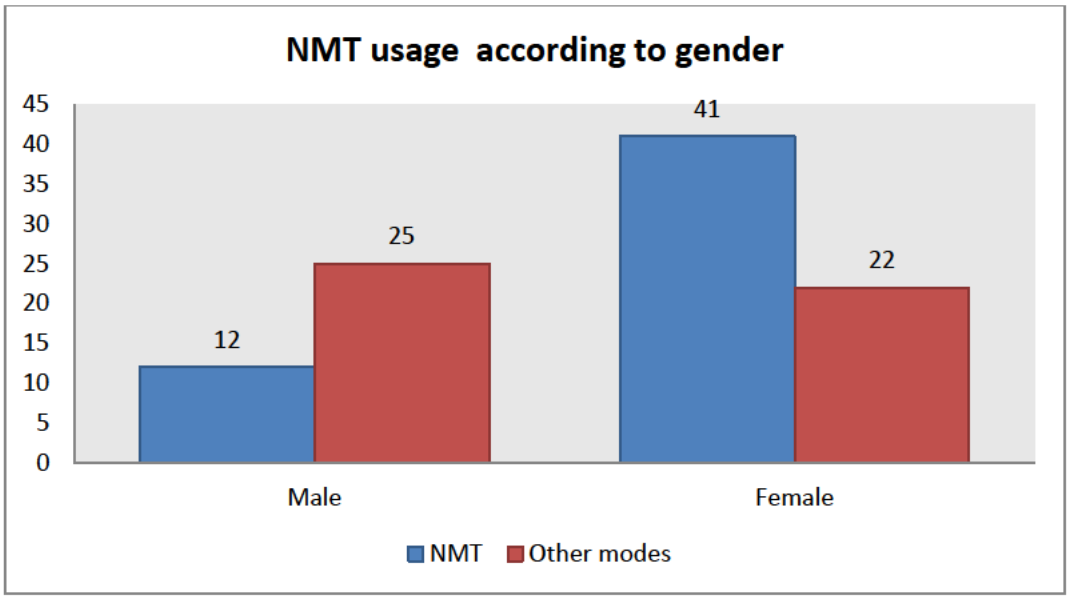
Figure 11: Trip generation and NMT usage



Source: Author (2018)

From the data collection it was discovered that all trips that the respondents had embarked upon were service or work related and none were for leisure. As indicated in Figure 11 above when analysing the male trip generation and the female trip generation it was discovered that the female service generated trips accounted for 44% while the male service generated trips accounted for 20%. This is more than double the amount of service generated trips that women take as compared to males. The males had more work related trips at 28% while females had only 8% which is way less than males had. This means that more women use NMT for other services than going to work. This confirms the findings by Rahula and Vermab (2013) above about the difference in male and female trip generation.

Figure 12: NMT usage according to gender



Source: Author (2018)

The data collected indicated that there are more females (41%) using NMT route as compared to males at 22% who use NMT while in other modes of transport there are more males (25%) who use other transport modes as compared to male who use NMT. When females were asked why they chose their mode of transport they all stated safety, accessibility, time saving and lack of the right transport mode that meets their daily travels. In contrary the males stated reasons such as saving cost and availability as their main reasons for modal choice. This again supports Rahula and Vermab (2013) who argues that there is a striking difference in the perception of males and females when it comes to travel choice and behaviours.

6.2.3. Age distribution and NMT usage

Table 3: Age distribution of the sample group

Age group	NMT Use	Other	Percentage Distribution
18 - 24	5	2	29%
25 - 50	7	5	50%
50 + Over	3	2	21%
Total	**15**	**09**	**100**

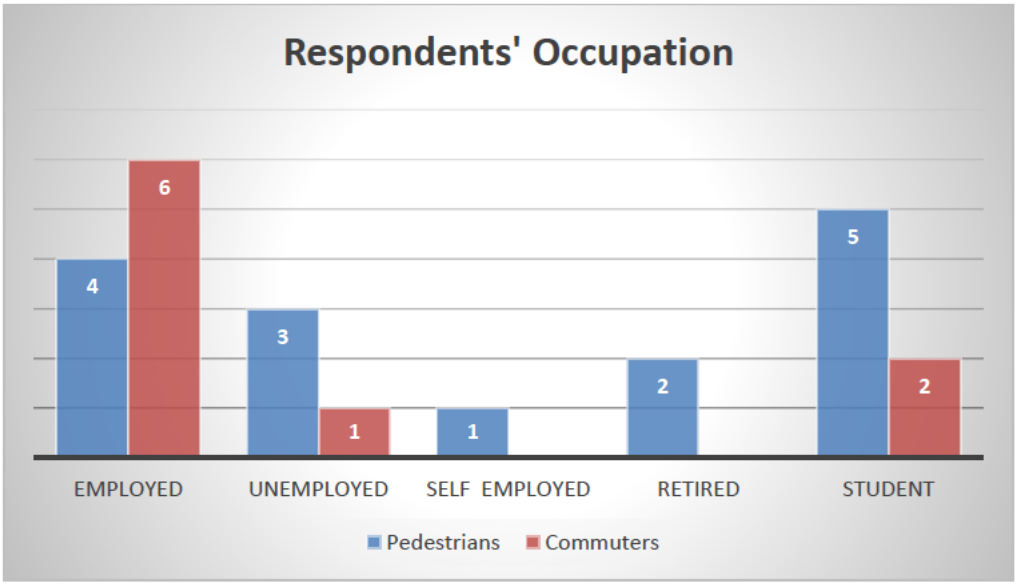
Source: Author (2018)

From the sample group 63% of the sample group were NMT users and only 37% were commuters. As indicated in Table 3 above 50 % of the respondents fell within the 25 - 50 age groups and 29% were between the ages 18 - 24. The least percentage of NMT users were at the age of 50 and above. The highest number NMT users falls in the 25 - 50 age category

which indicates that walking is mainly associated with the middle aged group. This is confirmed by Rahula and Verma (2013) from their NMT study conducted in India where they argue that an increase in age decreases the likeliness of NMT use. In their study conducted in India they discovered that people older than 50 years had 92% chances of not using NMT as compared to the youth between 20 - 40 years who reflected 73% likelihood of using NMT. In Lamontville more than half NMT users are active and physically fit people who are between 25 - 50 years of age. This age bracket is also associated with the physically and the economically active residents of Lamontville.

6.2.4. Residents' Employment Level vs. NMT usage

Figure 13: Respondents' occupation



Source: Author (2018)

From the total number of respondents 46% are employed, 17% unemployed, 4% is self-employed, 8% is retired and 25% are students. There are a high number of employed residents for both pedestrians and commuters. However, it should be noted that this not a reflection of employment rate in Lamontville since this was not a household survey (eThekwini Municipality, 2011). The respondents were people who were on route to various destinations during the morning, midday and afternoon. The unemployed respondents were going to the various services e.g. hospital and civic centre which are not daily travels.

From the graph above (Figure 13) it is clear that most of the people who are employed in Lamontville are working outside Lamontville hence they commute to work. When asked for their final destination they stated that they were going to work in Clairwood, Isipingo, Durban CBD, Jacobs and Umlazi. This is clearly associated with the restricted job opportunities within Lamontville (eThekwini municipality, 2011). The employed that walk all the way to their final destinations make up 17 % of the total sample size. They stated that they are working at, Mobeni, Clairwood and Isipingo. Those working at Isipingo state that walking are the only

convenient and affordable mode of transport to them as there is no public transport that goes straight to this area. This would mean they will have to pay R9.00 to go to Mega City, R6.00 to Isipingo and then from Isipingo pay R8.50 to go work which is on Fibres Road along Isipingo Beach. On an average day when travelling by a motorised vehicle it would take them approximately one and a half hours to travel a 16.1km distance. When walking to work it takes 45min to an hour to travel an 8. 5 km distance to get to work. This means that when walking to work they walk almost half the distance they would normally travel by motorised vehicle at no cost. This finding clearly indicates that there is a huge need for NMT development to accommodate the people working at Isipingo. Another large percentage of the NMT uses within Lamontville are the scholars and they make up 21% of the total sample and these include scholars walking to schools within Lamontville and students who walk to Mangosuthu University of Technology (MUT) in Umlazi using the Mega City walkway.

The interview question on occupation also assisted in assessing the relationship between affordability and NMT usage. Servaas (2000) argues that at times using NMT is not optional but because the transport costs are unaffordable especially to the unemployed and the low income earners. This is confirmed by the findings in Lamontville most of the pedestrians (58%) in Lamontville are captives they walk because it is the only affordable mode of transportation.

6.2.5. Origin and destination

Origin and destination is a very crucial factor that is used to determine trip generation and transport needs. The transport planners need to fully and carefully analyse the trip generation in order to respond efficiently to the transport needs of the people (DoT, 2014). In Lamontville most destinations travelled as shown in Table 4 below were as follows:

Table 4: Destinations

Destinations		
Ranking	NMT Users	Commuters
01	Mega City Local schools	City
02	Prince Mshiyeni Hospital MUT Isipingo Mobeni Clairwood	Isipingo Clairwood Mobeni
03	Jacobs	Mega City Prince Mshiyeni Hospital Jacobs

Source: Author (2018)

According to ranking, the highest destinations that many NMT users travel to is Mega City and the local schools, the second destination with the equal ranking is Prince Mshiyeni Hospital, Mangosuthu University of Technology, Isipingo, Clairwood and Mobeni. This again confirms that the NMT users walk in order to access various services. The walk to schools and the walks to Mangosuthu are the daily travels taken by the scholars and the students. The walk to Megacity and Prince Mshiyeni although they rank high in the destinations travelled by NMT users the researcher discovered that they are not daily travels but are travels that are need generated with a minimum frequency of at least once a week. Jacobs ranked the least on the destinations travelled by NMT users. It should be noted that there were no respondents that were walking to the city.

The highest ranking destinations travelled by the commuters are the city, followed by Isipingo, Mobeni and Clairwood and the lowest ranking destination is Jacobs, because of its distance. It should be noted that the destinations that rank the highest in NMT users rank the lowest in commuter travels and have a shorter distance as compared to distance travelled by commuters. This is confirmed by the Department of Transport Pedestrian and Bicycle facility guidelines (2003) that the acceptable walking distance in South Africa is between 1-2 kilometres and distances longer than this become less appealing.

6.3. Legislative framework underpinning NMT development within South Africa especially in eThekwini Municipality

The Key Informant interviews addressed the study's second objective which is to examine the legislation underpinning NMT planning and its implementation in South Africa especially within eThekwini Municipality. This section looks at the legislative framework that the eThekwini planning officials adopt when planning and developing NMT. In 2008 the Department of transport under the then Minister Jeff Radebe introduced the Draft Non-Motorised Transport Policy. This was the first National policy document on NMT and up to this day it has not been finalised but still in its draft stage (DoT, 2008). However the eThekwini municipality has developed its own NMT Policy which is part of the broader eThekwini Transport Plan that underpins NMT developments within eThekwini municipality.

When asked to list the NMT legislative framework underpinning NMT development within eThekwini municipality all officials agreed that there is no mandatory legislation on NMT but the NMT policy is based on numerous policies, strategies and Acts. Manoj Rampersad, a Transport Planner responsible for the strategic transport planning and development within eThekwini states that "*eThekwini Municipality uses the NMT transportation plan which was developed by eThekwini Transport Authority in 2013*"He further argued that this NMT plan is aligned to the national policies and strategies. Nathi Dube, a Civil Engineer responsible for the implementation of NMT went further and listed the legislation that informs the eThekwini Transport Plan as:

- The National Land Transport Act (NLTA)
- National Department of Transport - Draft NMT policy
- National Department of Transport - Rural transport Strategy
- National Road traffic Regulations
- Whitepaper on National Transport Policy
- Municipal by - Laws

All the above listed legislations are covered in detail in chapter 3: literature review.

When asked about the gaps within the current NMT policy, Rampersad states that the NMT plan itself covers all areas of an efficient NMT planning and implementation, however "*NMT implementation is a multisector function within the municipality and getting the various sections of the municipality to deliver and implement according to the plan is a challenge within the municipality."* Robin Chetty, a public transport planner responsible for public transport agrees with Rampersad and states that the huge gap with the NMT Plan is to get the commitment of other stakeholders within and outside the municipality to prioritise NMT development and deliver according to the NMT plan. Dube argues that the gap in the current NMT plan and the development of NMT for the townships around eThekwini municipality is that *"There are no NMT plans currently planned for Lamontville, However according to the*

city's NMT plan the NMT network development framework process have been classified into three categories which are the city, the town centred and the rural. According to the plan the city is almost 80% complete and the focus now is in the town centres and this has been aligned with the Go Durban IPTN programme (Go Durban) which is currently implementing Corridor 3 and Corridor 9. The main Townships being targeted along this route are Ntuzuma, KwaMashu and Inanda."

This is also confirmed by Cox (2010) who argues that the NMT policies and the NMT facilities continue to be fragmented, making it difficult to recognise or to spread the best NMT practice. He further argues that numerous NMT projects have been conducted in South Africa but because of the lack of a mandatory legislative framework each local government implements according to its own strategies and therefore no coherent picture emerges that could be adopted as the best practice. However with the development of the NMT facility guidelines in 2014 by Department of Transport which is a summary of the legal, policy and strategy context of NMT planning this fragmentation of policy and implementation could be addressed but again these are guidelines and not a mandatory legislation.

Table 5: Ranking of townships under small town ranking for NMT development (eThekwini Municipality)

Township	Employment	Population	Ratio	Rank
Umlazi	4 187	94 577	22.59	1
Chatsworth	5 292	48 477	9.16	2
KwaMashu	4 603	38 234	8.31	3

Source: Author (2018)

From reviewing the eThekwini NMT Plan the researcher identified that Lamontville has not been included in the NMT Network Development Framework Plan. The only townships that have been included are the Umlazi, Chatsworth and Kwa Mashu as indicated in Table 5 above which fall under the small town category. These townships have been ranked according to eThekwini Municipality demographic data and traffic zone system, as townships with the highest potential for NMT network usage and unfortunately Lamontville does not meet these ranking criteria hence no NMT plan for Lamontville currently. This study will therefore inform the transport Planning authorities that the plan needs to be reviewed and be inclusive of townships like Lamontville if the municipality is true to its vision of making "eThekwini the most liveable city by 2030" Ethekwini municipality,2018).

6.4. Benefit of NMT

6.4.1. Benefits to Residents

The third objective looks at the impact of NMT on Lamontville residents, in responding to this objective the researcher will look at the challenges currently experienced by the NMT users, the benefits of using the NMT routes and the use of the proposed NMT routes within Lamontville.

Table 6: Benefits of NMT

Ranking	Benefits
01	Short and quick
02	Save time
03	Save money
04	Save fuel
05	Health benefits
06	Saving the environment

Source: Author (2018)

When asked to state the benefits of NMT routes the respondents listed the above benefits as the most benefits that they experience as NMT users (Table 6 above). From the list it is evident that the NMT users find saving as the priority and it is saving both in cost and time. Other benefits such as health and environment benefits were not deemed as the priority by the users. This is confirmed by Mkhize et al (2009) who argue that the perception of NMT in South Africa is different from that of other European countries like Netherlands where using NMT is perceived as an environmentally-friendly mode of transport and residents who use NMT see themselves as making a contribution to sustainable environment. During observation the researcher also noticed social cohesion and social security when the pedestrians were walking; they were chatting and often walking in pairs or smaller groups. This is what Jane Jacobs call" eyes on the street". She argues that walking provides neighbourhood safety and a sense of security to people as they feel safe when walking in pairs and in groups. When there is high pedestrian traffic at all times there tend to be fewer opportunities for people to engage in criminal activities because of the fear of being seen. (Kanigel, 2016). This means that from the primary benefits that the respondents have listed there are other secondary benefits associated with NMT use such as safety and crime reduction.

6.4.2. Challenges experienced by the NMT users within Lamontville

Wothaya (2016) argues that the greatest challenge for any NMT user in developing countries is the lack of NMT infrastructure, poor design and maintenance where it exists. This is evident in the findings of the respondents within Lamontville.

As mentioned earlier in Chapter 5, there are formalised and informalised NMT routes within Lamontville. The respondents gave almost similar answers to the challenges facing the formalised and the informalised routes within Lamontville. From the respondents they stated that the formalised routes which are the staircases and the sidewalks are not well maintained there is often a problem with lighting and the overgrowth of vegetation which makes using them a safety risk. The sidewalks are narrow often forcing people onto roadway and increasing the chances of crashes. These sidewalks are at times incomplete and lead the people directly onto the roadway. On the use of informal routes, the residents stated reasons such as slippery when raining, steep gradient, vegetation overgrowth, lighting and safety as the main challenges facing the informal NMT routes. These routes also lead directly onto the roadway causing road safety risks. It was discovered during the observation that most of the informal routes were used by the people who reside in informal settlements like Kwa Madlala, Sithebeni and eMathinini and for them these are the only means of access to the bus stops and any other service whether located within or outside Lamontville.

6.4.3. NMT implementation within Lamontville

As mentioned above, Lamontville is not on the NMT Network Development Framework Plan of eThekwini Municipality. This means that Implementation of NMT within Lamontville is a serious challenge. When asked if are there any NMT plans for Lamontville, all the Key informants stated that there were none as the implementation is guided by the NMT Network Development Framework Plan. Rampersad states that *"apart from the normal sidewalks no other NMT plans have been formulated.*

During the observation the researcher discovered that not all roads within Lamontville have sidewalks. The roads with sidewalks in Lamontville are the minor arterial roads (class 3) and the collector roads (class 4). The local roads (class 5) that have sidewalks are the ones that give access to schools. The local roads are very crucial roads as they are low mobility roads which provide direct access to households and generally used by the resident as part of their last mile journey home. According to the NMT facility guidelines (2014) a sidewalk can be provided on one side on class 5 roads generally the side which serves most properties. This is another challenge that faces the NMT users on Lamontville, hence you find the road users on these roads walking on the roadway and becoming vulnerable to road crashes. Furthermore these roads that lack the sidewalks are the roads used by the residents who reside in the informal settlements like Kwa Madlala and eMathinini in Lamontville (DoT, 2014).

6.4.4. Impact of the proposed NMT routes on Lamontville residents

In challenges facing the implementation of NMT in Lamontville, Rampersad states "Lamontville is a product of apartheid spatial planning and is land locked with limited external linkages and connectivity to other social and economic activities". He further argues that Lamontville residents have limited access to social and economic services and a bulk of these services are located outside Lamontville. This clearly indicates that the connectivity of Lamontville to other areas like Umlazi, Isipingo, Mobeni, and Clairwood will not only promote accessibility but also achieve spatial integration of Lamontville with other surrounding area.

From the interviews the residents were asked to list the top three routes that they would like to be prioritised for implementation as indicated in Table 7 below these were:

Table 7: NMT developments

Ranking	NMT Developments
01	Lamontville and Umlazi (Mega City)
02	Mobeni Heights
03	Lamontville to Isipingo
04	Madlala Route
05	eMathinini Route

Source: Author (2018)

The researcher discovered that the residents did not identify any new NMT routes to be developed at Lamontville but stated that they want the current NMT to be well maintained and the informal routes to be formalised. The Lamontville to Megacity sidewalk was on top when asked to elaborate as there is already a formal walkway that links these two places. The respondents stated that the informal routes leading to the walkway that need to be formalised and the walkway itself needs to be maintained as there is constantly a lighting problem. The Lamontville to Mobeni heights was the second one according to ranking as the respondents especially the scholars use them when they go to school and it is informal and unsafe to use. Lamontville to Isipingo this was the most dangerous route as it not only the longest but the most dangerous as it involves the crossing of the N2 and the railway line. This means on daily basis the people who walk to the industries at Isipingo are exposed to life threatening risks.

There were also informal routes that the respondents felt they need to be formalised and these were the routes from informal settlements such as Madlala and eMathinini. The respondents who use these routes felt that the formalisation of these routes will make their daily travels easier as they use them on daily basis when going to any destination including

the local clinic and the public transport stations. These routes are the only form of activity and connectivity for the respondents.

When the commuters were asked if they could use the NMT routes if they were free of all the challenges that they had stated above, they all unanimously agreed and stated that even if the informal routes were formalised they would use them because of the benefits listed in 3.1.2 above. This indicates a strong demand for the NMT development within Lamontville as there is an indication of a high rise in usage once it is formalised and standardised.

Rampersad (2018) when asked about the impact of NMT on Lamontville residents he states that "*A robust and aggressive NMT roll out both internally and externally within Lamontville will assist in improving the quality of life by ensuring access to goods and services".* This is evidence that the transport planning officials confirm that the development of NMT within Lamontville will not only improve the quality of life of the Lamontville residents but also assist in the spatial integration of Lamontville.

6.5. Conclusion

From the analysis of data in this chapter it is evident that walking is one of modal choices used by residents to access various land uses within and outside Lamontville. It also became apparent that there has been minimal direct intervention done by the planning officials in order to prioritise and promote NMT within Lamontville. Lamontville is still primarily designed although not exclusively to promote motorised travel. In the recent years the number of pedestrians within the township has grown enormously with occurrence of the new informal settlements such as Madlala and Mathinini leading to the formation of numerous informal NMT routes as the only means of access for these residents.

There was also a strong indication of the commuters that they would use these routes if they were formalised as they were convenient and cost effective. However no deliberate transport or spatial planning interventions have been conducted up to the current stage to accommodate such. There was a strong indication of the resident's even commuters that they would use these routes if they were formalised. The eThekwini transport planning official stated that there need to be a robust and aggressive NMT plan for Lamontville. This is a clear indication of the important role that the municipality needs to play in the planning and the implementation of NMT in Lamontville. In the next final chapter the detailed findings of the study will be summarised and the recommendation based on the findings discussed.

Chapter 7: Recommendations and conclusion

7. 1. Introduction

This Chapter summarises the key findings of the study in order to make recommendations on how can NMT be used as a tool for spatial integration in Lamontville. The study has identified challenges associated with accessibility and mobility within Lamontville which could be addressed by the development of NMT. The study also highlights how NMT can address the daily transport and accessibility needs of Lamontville residents.

7.2. Summary of key research findings

As a result of apartheid planning Lamontville is physically separated from essential economic activities and there is a strong indication that this impacts on the accessibility and mobility of the residents within and outside Lamontville. Thus Lamontville had been spatially segregated from surrounding economic institutions and zones such as Umlazi, Isipingo, Clairwood and Jacobs. There are various modes of transportation used by the residents and NMT is also one of the widely used transport modes. The study has identified formal NMT routes and informal NMT routes, the formal routes have been mostly in the form of the staircases linking the older part of Lamontville and the newer part of Lamontville e.g. Gijima and storks sections. Another form of formal NMT facilities has been the sidewalks that have been provided on the Class 4 roads within Lamontville and lastly the walkway to Mega City. This was the finding on objective one which is the nature and extent of NMT in Lamontville.

The formal NMT facilities have proved to be insufficient and inadequate in bridging the spatial gap as the residents who use them have indicated a number of challenges such as lighting, safety which includes road safety as the sidewalks are too narrow and often force them onto the roadway. There are pedestrians who walk all the way to work to areas like Isipingo and they are forced to walk and cross the N2 Freeway and the railway thus exposing themselves to a number of risks. This is mainly due to the fact that some pedestrians are captives due to high transport costs. The study has discovered that the informal NMT routes within Lamontville are mostly from the informal settlements that have rapidly developed within Lamontville e.g. eMathinini and Madlala with a number of residents forced to use them as the only access to the public transport stops and to other destinations.

The research results have shown that all the respondents stated that they would use the NMT routes if they were formalised and standardised as they provide quick and easy access to the social and economic services thus spatially integrating Lamontville and its surrounding areas. This indicates a strong need for the implementation of NMT routes within Lamontville. This was confirmed by Rampersad, the transport planner who in his own words states that *"A robust and aggressive NMT roll out both internally and externally within Lamontville will assist in improving the quality of life by ensuring access to goods and services"* This finding addresses the impact of NMT development on Lamontville residents and its role in spatial integration.

Finally, the study discovered that there is a lack of mandatory NMT regulation and the national policy is still in its draft stage and has not been finalised by the DoT. The Local governments (not all) have developed their own NMT polices guided by the national NMT facility guide lines of 2014 and implement NMT according to these local policies. This results in lack of standardisation and uniformity in the development and implementation of NMT within South Africa. The sole responsibility of NMT planning and development rests with the local transport Authority which also heavily relies on the capacity and funding allocation of these municipalities. This finding is addressing the legislative framework underpinning NMT development.

7.3. Recommendation

Currently in South Africa there is no NMT legislation but only the policy guidelines such as the Draft national NMT policy developed in 2008, NMT facility guidelines developed in 2016, and lately the Draft roads policy developed in March 2018. This is a major challenge as these are merely guidelines and not mandatory legislation. There is an urgent need for the South African Department of Transport to speed up the finalisation of the NMT legislation. This will ensure that the gap between policy and implementation of NMT is quickly bridged. This will also enable a standardised NMT planning and implementation in all provinces of South Africa. The NMT regulation will then ensure that the budget for NMT development is prioritised. Mkhize et al (2010) argues that the budget allocation in South Africa is a huge problem with most municipalities allocating 10% or less to the development of NMT. This was confirmed by the Key informants who stated that most of the NMT projects that they have engaged in e.g. World Cup, COP17, Go Durban have received funding outside the municipality this indicates that the NMT does not receive budgets and solely relies on the budget of other projects and it is only viewed as subsidiary project within a bigger project.

The NMT Network Development Framework Plan for eThekwini municipality which ranks and prioritises the areas that need NMT development based on the demographic data and the traffic zone system should be reviewed as this leads to the marginalisation of all the areas that do not meet these ranking criteria e.g. Lamontville. Currently the NMT in eThekwini is implemented in pockets according this framework and is mostly aligned to certain projects like the COP 17, the World Cup and the IPTN routes. This is inadequate as it results in the marginalisation of townships and other areas that do not form part of this NMT Network Development Framework Plan. NMT development in eThekwini should be recognised as an independent and primary transportation mode so as to ensure that a clear implementation plan is developed, implemented and monitored to meet the daily transport needs of all its residents.

The transport practitioners responsible for the implementation of NMT within eThekwini were all in agreement that NMT implementation is a multi-departmental function within the municipality and getting the various sections to deliver according to plan is a challenge. NMT implementation involves the transport section, land use section and the roads section.

Therefore it is essential that urban planners, civil engineers and the transport planners plan together and not in silos in order to achieve an efficient, reliable, safe and cost effective sustainable transportation that caters for the needs of all residents. This co-operation between spatial planning and transport planning will assist in providing a different approach to planning and adopt the smart growth principles which will assist in reducing the distances between residential areas and place of work which was inherent from apartheid spatial planning (DOT,2018).

Last but not least there should be "a robust and aggressive NMT roll-out plan both internally and externally within Lamontville which will assist in the quality of life by ensuring access to goods and services "(Rampersad, 2018). This will promote spatial integration and access to essential socio economic services of Lamontville. This study also recommends further research on the assessment of NMT facilities and monitoring of the NMT implementation. This will assist in painting a holistic picture of NMT development within the municipality and also to bridge the current gap that exist between NMT policies and implementation.

7.4. Conclusion

The current land use and road design in Lamontville promotes the use and dependence on motorised transport at the expense of the NMT users. This study advocates the need for a and implementation of NMT in order to accommodate the travel needs of all residents. This calls for the review of some policies and plans within the municipality and the finalisation of the national NMT legislation. There should be integration and co-ordination of land use planning and the transport planning officials and other essential departments responsible for NMT development from the national level down to the local government. This will result into the development and implementation of a safe, efficient and reliable NMT routes that will be used and enjoyed by all residents of Lamontville. The lessons learnt from the NMT development in Lamontville could be applied to other land locked townships and marginalised townships within South Africa developed during the apartheid era.

In order to ensure that NMT is embraced and used by all residents ,the decision makers such politicians, transport planners and engineers should elevate the status of NMT to that of motorised transport and also ensure that any future infrastructural developments is aligned to NMT(Von Heyden et al, 2018).

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Annexure 1: Ethical Clearance

UNIVERSITY OF KWAZULU-NATAL
INYUVESI YAKWAZULU-NATALI

30 November 2015

Ms Siphindle Phumla Sibiya 9262793
School of Built Environment and Development Studies
Howard College Campus

Dear Ms Sibiya

Protocol reference number: HSS/1458/015M
Project Title: The role of non-motorised transport in spatial integration and economic accessibility: The case study of Lamontville in Durban, Kwa Zulu Natal

Full Approval – Expedited Application

In response to your application received on 6 October 2015, the Humanities & Social Sciences Research Ethics Committee has considered the abovementioned application and the protocol have been granted **FULL APPROVAL**.

Any alteration/s to the approved research protocol i.e. Questionnaire/Interview Schedule, Informed Consent Form, Title of the Project, Location of the Study, Research Approach and Methods must be reviewed and approved through the amendment/modification prior to its implementation. In case you have further queries, please quote the above reference number.

PLEASE NOTE: Research data should be securely stored in the discipline/department for a period of 5 years.

The ethical clearance certificate is only valid for a period of 3 years from the date of issue. Thereafter Recertification must be applied for on an annual basis.

I take this opportunity of wishing you everything of the best with your study.

Yours faithfully

[redacted]

pp **Dr Shenuka Singh (Chair)**
Humanities & Social Sciences Research Ethics Committee

/pm

Supervisor: Annette Von Riesen
Academic Leader Research: Dr Cathy Sutherland
School Administrator: Ms Lindile Danisa

Humanities & Social Sciences Research Ethics Committee
Dr Shenuka Singh (Chair)
Westville Campus, Govan Mbeki Building
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Website: www.ukzn.ac.za

Annexure 2: Interview Schedule for Key Informants

UNIVERSITY OF KWAZULU-NATAL
INYUVESI YAKWAZULU-NATALI

COLLEGE OF HUMANITIES

SCHOOL OF BUILT -ENVIRONMENT AND DEVELOPMENT STUDIES

Researcher : Ms Siphindile Phumla Sibiya - 083 627 6217

Supervisor : Dr K H Mchunu - 031 260 1190

Dear participant, this survey is designed to gather your opinions about your knowledge of the Non- Motorised transport within eThekwini Municipality specifically Lamontville. Please answer the questions based on your personal assumptions and knowledge about NMT and Lamontville. Some questions will require information about other modes of transport. All the information will be kept confidential and will be used for academic purposes only. Your participation in this survey is highly appreciated.

SECTION A: BIOGRAPHICAL DETAIL

Position/ Designation : ----------

Department : ----------

Gender : ----------

SECTION B: ROLE AND RESPONSIBILITIES

1. What is your role within the department?

2. How long have you been in this position?

SECTION C: NATURE AND EXTENT OF NMT

3. What are the NMT projects that the eThekwini Municipality has engaged in?

4. What are the NMT plans for townships within eThekwini municipality?

SECTION D: POLICY DEVELOPMENT

5. What are the policies that govern the development and the implementation of NMT within eThekwini?

6. Are there any challenges or gaps with the current eThekwini NMT policies? Please substantiate your answer.

SECTION E: IMPLEMENTATION OF NMT

8. Are there any challenges facing the implementation of NMT within eThekwini specifically Lamontville?

9. How do you think these challenges impact on accessibility and spatial integration in and around Lamontville?

10. Is there any proposed NMT development in Lamontville? Y/N Please substantiate your answer.

SECTION F: IMPACT OF NMT

11. Explain the impact that NMT development can have in spatial integration within Lamontville?

SECTION G:

12. Do you have any questions or would you like to add anything else to your responses?

COLLEGE OF HUMANITIES

SCHOOL OF BUILT -ENVIRONMENT AND DEVELOPMENT STUDIES

Dear participant, this survey is designed to gather your opinions about your knowledge of the Non- Motorised transport within eThekwini Municipality specifically Lamontville. Please answer the questions based on your personal assumptions and knowledge about NMT and Lamontville. Some questions will require information about other modes of transport. All the information will be kept confidential and will be used for academic purposes only. Your participation in this survey is highly appreciated.

Researcher : Ms Siphindile Phumla Sibiya - 083 627 6217

Supervisor : Dr K H Mchunu - 031 260 1190

SECTION A: BIOGRAPHICAL DETAILS

Gender : ----------

Age : ----------

Occupation : ----------

Education Level : ----------

SECTION B: NATURE AND EXTENT OF NMT

1. What is your most preferred mode of transport? And why?

   ……

2. How often do you use this mode of transport?

   ……

3. What are the most common destinations where you travel to?

   ……

   ……

4. Do you ever walk? Yes or No validate your answer.

……

……

5. How often do you walk?

……

……

6. What are the most common destinations where you walk or cycle to?

……

……

SECTION C: BENEFITS AND CHALLENGES OF NMT NETWORK IN LAMONTVILLE

7. Are there any NMT routes that you know within Lamontville?

……

……

……

8. Do you use any of these routes Yes/No.?

……

……

9. Are there challenges in using these routes? List the main three.

……

……

……

10. What are the benefits of using these routes? List the main three.

……

……

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