



**THE SIGNIFICANCE OF NON-MOTORISED TRANSPORT INTERVENTIONS:
A CASE STUDY OF GREATER SEKHUKHUNE, LIMPOPO PROVINCE.**



BY MMANAKE MOKITIMI

**A Thesis submitted for the
MASTERS
DEGREE IN CIVIL ENGINEERING
September 2015**



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The Significance of Non-motorised Transport Intervention: A Case Study of Greater Sekhukhune, Limpopo Province.

By:

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A thesis submitted for the degree of

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IN CIVIL ENGINEERING

In the Department of Civil Engineering
Faculty of Engineering and the Built Environment

University of Cape Town

September 2015

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Lastly, to my loving husband, Tshepo Mokitimi, for being so supportive and motivating me at all times.



EXECUTIVE SUMMARY

South Africa is regarded as one of the African countries with good infrastructure. However, this superior infrastructure is concentrated in urban areas and is rarely visible in rural areas. This condition is exacerbated by the fact that different municipalities are trying to improve their infrastructure with little success, mainly due to high costs and insufficient technical resources of skilled municipal managers, which often results in low quality designs and non-sustainable project approaches (Rathete, 2010).

More than one fifth of the commuters killed on the world's roads each year are not commuting in a car, motorcycle or even on a bicycle, but are commuting on foot - pedestrians. Pedestrian fatalities and injuries are often avoidable, and proven interventions exist, yet in many locations pedestrian road safety does not attract the attention it merits (World Health Organisation, 2013).

South Africa has a significant proportion of learners (64%) who use walking as a means of transport on a daily basis to a place of education, and workers (21.1%) to work (Statistics SA, 2014). Non-Motorised Transport (NMT) should therefore have greater priority in rural areas, but it is largely neglected, due to the lack of awareness of the role of NMT modes of transport, minimal funding and other basic transport infrastructural needs taking preference over NMT. Non prioritisation of NMT, among other reasons, results in high rates of pedestrian accidents, with approximately 40% of pedestrian fatalities recorded in South Africa (Arrive Alive, 2012).

The primary purpose of this study is to highlight the current existing conditions of NMT interventions, constraints and opportunities within the selected rural area in South Africa. The research has underlined the importance, the role, the benefits, design parameters, and influencing factors of NMT in order to have a clear understanding on the significance of NMT and the required adequate facilitating infrastructure within rural and semi-rural areas in South Africa.

Successful interventions to protect NMT users and promote safe walking requires an understanding of the nature of risk factors for NMT related crashes.

The questions leading us to the ultimate findings in this research paper are derived to understand the problems experienced by NMT users in order to realise the significance of NMT in rural areas.



The questions are:

- i. Policy and Framework: Since the development of NMT frameworks and policies for rural areas; to what extent is change brought about in safe and adequate NMT access to social facilities within the local study area?
- ii. What are the current existing levels of NMT infrastructure, within the selected rural case study area in Limpopo, in comparison with other road infrastructure?
- iii. What are the critical repercussions identified in the study area due to the lack of adequate NMT facilities and amenities?
- iv. Engineering, Education and Enforcement: To what degree were the three E's of safety taken into account during the implementation?

Primary and secondary data was collected which formed the basis of this study.

The primary data was sourced by performing pedestrian questionnaires in the rural community of Sekhukhune in Limpopo Province, South Africa. The surveys were done at six identified locations along the R555 and R597/R37 (Link A1) corridors in the community which were selected with the help of the Traffic Officials. The selection was based on high concentrations of pedestrians, which were near school areas located adjacent to high mobility roads, and where accidents usually occurred. The survey focused on the pedestrian's perception of road safety, the demographics of the community and comments on the existing road infrastructure in the community. During the site visits, a road safety audit was performed in order to outline potential or existing road safety issues and establish a basis for an acceptable solution to the potential safety problems (Groenewald, 2013). Data collected included site photography observations, GPS observations and semi-structured interviews with various stakeholders from the community.

National and international literature was looked at in order to understand the impact of NMT infrastructure provision and other relevant interventions. Secondary data was collected from the review of academic journals, best practices, published and unpublished materials, government policies and frameworks from all three spheres of government, internet and print media. The GIS software, Photoshop program, and Microsoft Excel program were mainly used to carry out the data analysis, which subsequently resulted in recommendations to address rural mobility challenges.

The study found that there are a high number of NMT commuters in the case study area, whom are traveling long distances without adequate provision of NMT infrastructure. More than 80% of these commuters travel by foot to access their final destination or even public transport. This however is



not represented in terms infrastructure planning or implementation. Car owners amount to 20% of the population. However, there seems to be less emphasis on NMT construction in the area, which would be serving the majority of transport users in the studied area.

Although road safety education is limited, it is encouraged and practiced in primary schools. Furthermore community schools and numerous organizations are prepared to support the NMT sector. The Community Pedestrian Safety Project (CPSP), which is one of first initiatives with its primary purpose to improve road safety knowledge amongst children and to also actively implement road safety in order to change behaviour (Groenewald, 2013).

The research also determined that there is a high rate of pedestrian related road accidents, of which 47% resulted in fatality. Accident rates are tremendously high by world-wide standards and the main principal of NMT is to provide safe, good quality NMT facilities and amenities. The death toll of pedestrians, mainly learners who have to travel long distances by foot to access areas of education, is one of the consequences due to the lack of adequate infrastructure. This has led to an unsafe NMT environment within the study area.

Law enforcement was not visible during the period of the assessment and motorists travelling above the speed limit where noticed. Therefore, it can be concluded that the level of ensuring that vehicles and road users are complying with road regulation is low; which poses as a safety risk for pedestrians. However, during high pedestrian movement of scholars in the mornings and afternoons, three of the studied locations identified scholar petrol activities taking place in areas located along Link A1.

A deeper understanding of the planning process permits interested stakeholders to develop innovative strategies which will have a greater likelihood of success. A deeper understanding of the challenges faced by NMT users, and more importantly the cause of these challenges is more crucial when it boils down to delivering a safe and convenient environment for all.

The study recommends the integration of NMT with motorised transport to create a safe and well-balanced transport system that improves road safety, NMT education and awareness, implementation of adequate facilities and infrastructure for pedestrians. This is to minimise and eliminate NMT road users from having to share the roadway with other traffic modes, which puts them at high risk in doing so, as indicated by the high fatality figures among pedestrians. NMT needs to be mainstreamed and well integrated into the streetscape to modify the status quo. Furthermore, it recommended that politicians and officials need to shift focus from giving motorised planning priority over NMT to recognise the valuable role of the NMT in rural-areas. It is important that they adopt NMT policies & strategies that will support and expand the role of NMT modes in rural transport, backed up by NMT master plans. (Ribbens, 2014)



Lastly, the study recommends that the authorities should concentrate on addressing the funding mechanism and to consider innovative or alternative ways of accessing funds that will aid in the planning and implementing of motorised and non-motorised road infrastructure. Proper planning on allocated budgets to municipalities needs to be emphasised on, and to ensure that the money is spent accordingly, external advisers and professionals should be considered to give guidance on municipal finances.



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LIST OF ABBREVIATIONS

CITP's	Comprehensive Integrated Transport Plans
CPOs'	Community Pedestrian Officers
CPSP	Community Pedestrian Safety Project
DBSA	Development Bank of South Africa
DITP's	District Integrated Transport Plans
FHWA	Federal Highway Administration
GDPR	Gross Domestic Product per Region
GGP	Gross Geographic Product
GIS	Geographic information system
IPDs	Integrated Development Plans
ISRDS	National Integrated Sustainable Rural Development Strategy
NDoT	National Department of Transport
NHTS	National House Travel Survey
NLTSF	National Land Transport Strategic Framework
NLTTA	National Land Transport Transition Act
NMT	Non-Motorised Transport
NRTS	National Rural Transport Strategy
OCRSP	Oliphant's River Community Road Safety project
PLTF	Provincial Land Transport Framework
RTMC	Road Traffic Management Corporation
SANRAL	South African National Road Agency Limited
SDM	Sekhukhune District Municipality



CHAPTER 1

INTRODUCTION



CHAPTER 1

1. INTRODUCTION

1.1 BACKGROUND AND PROBLEM STATEMENT

“In rural areas there is very often little provision of infrastructure for pedestrians and cyclists. These road users must share rural roads with vehicles that can sometime travel at very high speeds. On many roads, this problem is somewhat mitigated by the provision of paved shoulders that can be used by pedestrians and cyclists, but on many other roads, only gravel shoulders are available.

Narrow road bridges, cuttings and fills often also create problems for pedestrians”

(South Africa Department of Transport, 2003).

Transport and mobility, coupled with adequate facilities, are counted among the basic conditions of social, cultural and economic development. Various modes of transport aid road users to move from one place to another, establishing connections between them and other regions. These various modes of transport vary between car, walking, cycling, freight, airplane, etc. Every mode has the task of satisfying the economic and social needs of people in a spatial context (Heyen-Perschon, 2001).

In South Africa, it has been the government’s main objective to improve the basic condition of living among the citizens of the country. South Africa as characterised by rural areas has 37% of the country’s population living in rural areas (The World Bank, 2013). It is also regarded as one of the few African countries to have made good progress in implementing infrastructure. However, superior infrastructure is more focused in urban areas and is rarely evident in rural areas (Rathete, 2010).

Many rural and peri-urban settlements have been left in the cold, due the country’s spatial development and town planning, with little or no existence of links between them and the urbanised settlements (South Africa Department of Transport, 2007). The existing practice of providing comprehensive road infrastructure that caters to all types of road users in urban areas; and only providing rural to urban links, often through higher order roads in rural and peri-urban settlements, has manifested into the current setting where roads in rural localities are primarily designed to meet the needs of motorised transport with little room to stimulate the co-existence between the other various modes of transportation (South Africa Department of Transport, 2007).

South Africa has a significant proportion of pedestrians (64%) that use walking as a means of transport on a daily basis to their place of education, and 21.1% to place of work education and other



destinations (Statistic SA, 2014). With that said, Non-Motorised Transport (NMT), should have greater priority within rural areas, but is largely neglected, due to the lack of awareness of the role of non-motorised modes of transport; minimal funding and other basic transport infrastructural needs taking first preference over NMT. Non prioritisation of NMT among other reasons, results in high rates of pedestrian crashes, mostly caused by unsatisfactory yielding or high speed approach driving by drivers at pedestrians. In March 2012, Arrive Alive recorded 1187 fatal car related crashes, of which 42% involved pedestrians (Arrive Alive, 2012).

Rural areas are highly characterised with long stretches of high order roads that run through built-up areas that lack short mid-block crossings or facilities that accommodates NMT users, which poses as high safety risk for NMT users. Furthermore, *Pedestrian and Bicycle Facility Guidelines, 2003*, states that the following: “*traffic signals, according to the Road Traffic Signs Manual, may not be installed on roads with a speed limit higher than 80 km/h. In South Africa where speed limits of 100 and 120 km/h are typically used on rural roads, it would often not be possible to provide pedestrian crossings on rural roads*” (South Africa Department of Transport, 2003).

Road Safety statistics show that pedestrians are the most vulnerable road user group and pedestrian injuries and fatalities constitute a major road traffic safety problem. High occurrence of pedestrian-related accidents and incidents are a result of high pedestrian exposure to motorised traffic (Mutabazi, 2008).

This evidence suggests that there is critical need to look at new models and guidelines for providing rural road design and as such, the research paper serves as an attempt to, and will focus, mainly, on key challenging issues NMT road users face on a daily basis, how the current road conditions and infrastructure influence unsatisfactory driving on roads that run through built-up areas in rural South Africa, and the impact of implementing adequate measures as a means reducing accidents and also improve the health and safety of the people in South African rural areas.

1.2 RESEARCH QUESTIONS

The questions leading to the ultimate findings in this research paper include:-

- Policy and Framework: Since the development of NMT frameworks and policies for rural areas; to what extend is change brought about in safe and adequate NMT access to social facilities with the local study area?
- What is the current existing level of NMT infrastructure, within the selected rural case study area in Limpopo, in comparison with other road infrastructure?
- What are the critical repercussion identified in the study area due to the lack of adequate NMT facilities and amenities?

- Engineering, Education, Enforcement and Evaluation: To what degree were the four E's of safety taken into account during the implementation of the studied routes running adjacent to residential community the study area?

1.3 PURPOSE FOR THE RESEARCH

The primary purpose of this study is to highlight the current existing conditions of NMT interventions, constraints and opportunities within the selected study rural area in South Africa. The research has underlined the importance, the role, the benefits, design parameters, and influencing factors of NMT in order to have a clear understanding on the significance of the NMT and its required adequate facilitating infrastructure within rural and semi-rural areas in South Africa and at large, within African rural settlements.

1.4 GOALS AND OBJECTIVES OF THE STUDY

The specific objectives and goals of this research are:-

- To determine the extent of which the developed NMT policies and strategies have been implemented within the local study area as means of improving the use of NMT;
- To determine the current levels of NMT use and current status of the infrastructure within the selected rural case study compared to other modes of transport;
- To identify the critical repercussions in the study area due to the lack of NMT provision;
- To examine whether the four E's of safety were taken into account during the implementation of the studied routes;
- To recommend intervention from investigated case studies to promote NMT awareness and use in order to offer comfortable and safe walking areas for future pedestrian planning options; and lastly
- To demonstrate the significance of NMT use and facilities within rural areas

1.5 METHODOLOGY

“The use of multiple methods to collect data is an important aspect of a case study, namely in-depth interviewing, obtaining information from secondary records, gathering data through observations, collecting information through focus groups and group interviews, etc.”.

(Kumar, 2011)

The method used for this research project was a combined qualitative and quantitative research method. The approved methods were used to collect the required data over a period of six weeks. These methods were used in order to determine the answers to the critical questions stated in chapter 1.2.

The study is focussed on the construction of a case study analysing the NMT related problems in a rural community of the Greater Tubatse Municipality, Sekhukhune in Limpopo Province, South Africa. In order to obtain conclusive results regarding the significance of NMT in rural areas, data was collected from the selected case study. This included pedestrian surveys, site observations, road safety audit, interviews with various stakeholders and performing analysis of statistics given. The survey focused on pedestrian perceptions of road safety, the demographics of the community, and comments on the existing road infrastructure provided in the community. All the data that was collected was recorded using field notes and survey forms to determine the answers to the guiding questions. Various stakeholders were then interviewed, included traffic officials, police official, community leaders and officials from the local municipality.

An extensive published literature was also reviewed. In 2010, the author completed her BSc in Civil Engineering, and during the year she did her undergraduate thesis in transport focusing on “The Use of Walkways as a Means to Improve the Infrastructure, with Specific Focus on Rural and Local Municipalities”. During that year, she built an extensive amount of literature that is applicable to this study. Added to the literature collected, an additional historical review of academic journals, previous papers and reports was carried out, in this study. This was done to gain a thorough overview of the literature for this study because the two studies complement one another. The literature for this current study addresses the meaning of NMT, NMT benefits, challenges and possible interventions of NMT in rural areas. The literature was mainly collected through the internet and local libraries.

To reinforce illustrations, graphical information, such as maps and pictures were used to present demographic information and to suggest or recommend the physical intervention that can promote the use of NMT within the study area. The acquiring and capturing of data, physical planning techniques and the use of Geographic Information System (GIS) was considered in the study.

The results were analysed in relation to the data collected from questionnaires, field observations, interviews and graphical information. The information acquired was cross examined to determine reliability and validity of the approach. The outcomes of the analysis were used to develop the method proposed in the research, and to draw conclusions and make recommendations.

Figure 1-1 illustrates the process followed during the development of the research paper which was broken down into three steps.



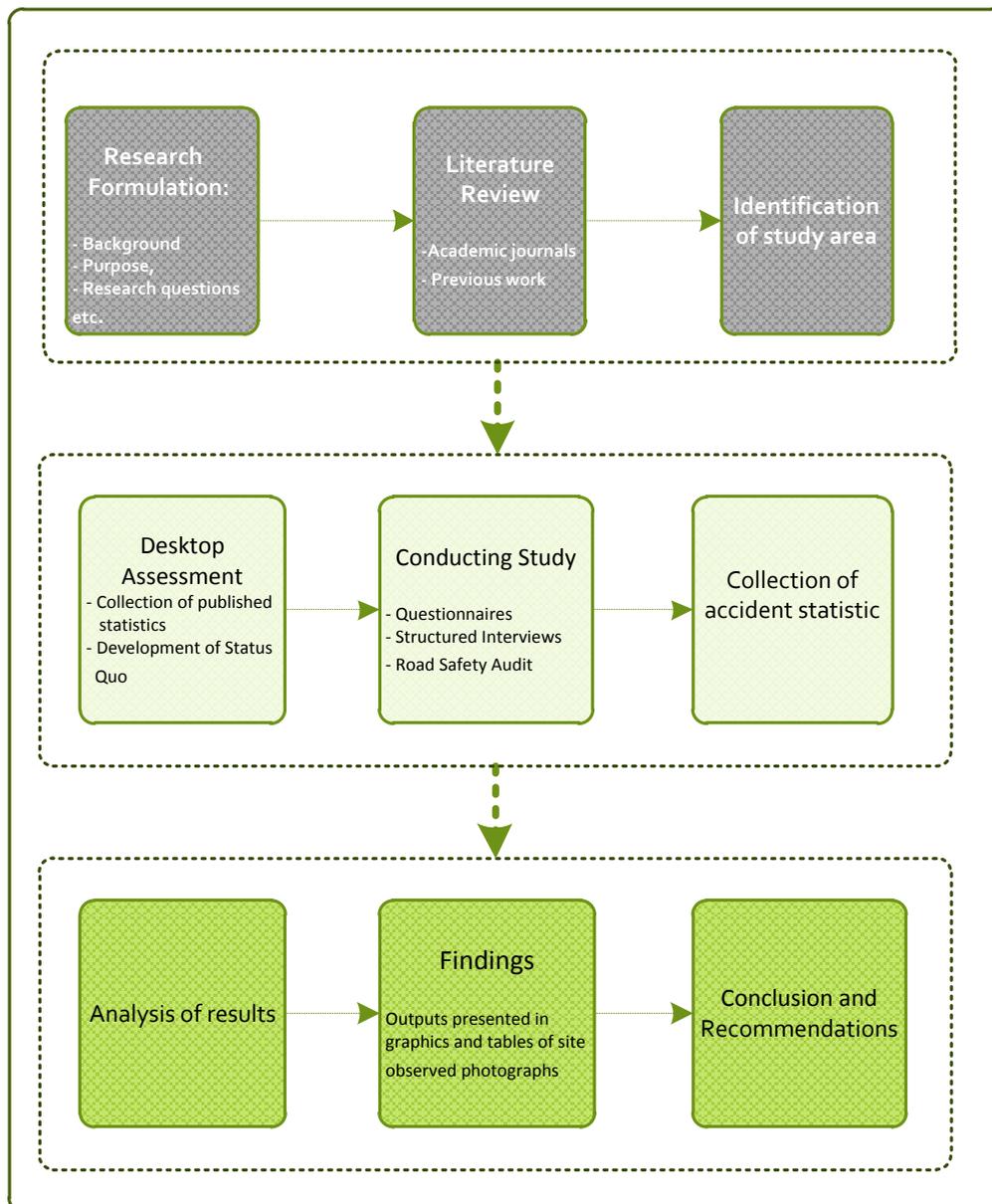


Figure 1-1: Methodology flow diagram

1.6 SCOPE AND LIMITATIONS OF THE STUDY

The study was based on a case study area of Greater Tubatse Local Municipality, Ward 27, 28 and 29, located in the Limpopo Province of South Africa. All aspects reported upon are on findings in Ward 27, 28 and 29. The study is limited to sections of the R579/37 June Furse/Lebowakgomo corridor and the R555 from Burgersfort/Middleburg corridor.

The surveys and examinations were carried out at six locations in ward 27, 28 and 29 of the Great Tubatse along R579/37 and R555 which are illustrated in Chapter 5 of this report.

This investigation was conducted to address NMT road user safety by evaluating effective and appropriate countermeasures that will address the poor current road conditions and infrastructure arrangement in rural areas.

The following limitations of this research were identified at the start of the study:

- a) The research conducted was limited to a specific South African rural location;
- b) One of the surveyed links is unnamed within the municipality and it lies between the R37 and R579 of the study and referred to R579/R37 above. For the purpose of this study, it will be named “Link A1”;
- c) The research was primarily concentrated on obtaining information related to non motorised facilities and amenities with the guidance of the supervisor of this research project;
- d) Furthermore, the research paper is limited to the evaluation of the different attributes and current designs of the road infrastructure which pose a threat towards the safety of NMT road users;
- e) The fieldwork was carried out over a period of 3 days by the author and 7 assistants. Due to the limited time and the number of fieldworkers, a small sample group was used;
- f) The South African National Department of Transport (NDoT) is in the process of finalising the new edition of the NMT Facility Guideline Manual, which is not referenced in this document because it is not yet published. Therefore, the author has made reference to the existing Pedestrian and Bicycle Facility Guidelines NMT Guidelines (2003) instead; and
- g) The Capricorn Local Municipality in Limpopo Province is also in the process of drafting the Polokwane Local Municipality NMT Master Plan, which is not referenced in this document because it is not yet published.

1.7 ORGANISATION OF THE DISSERTATION

The report is completed by five chapters and structured as follows:

Chapter 1 introduces the study by outlining the background information, problem statement, and the research objectives and guiding questions. Furthermore, brief discussions on research project methodology and the scope of the study are identified.

Chapter 2 provides the literature to solicit information relevant to the NMT system in South Africa. In this section, NMT is defined and the realities of NMT in Africa are discussed in detail. Furthermore, guidelines and policies relevant to NMT are presented. Furthermore, it discusses international and local best practices that have successfully implemented interventions as a means to improve pedestrian road safety.

Chapter 3 discusses the research design undertaken which informed the research questions and the data that need to be collected.

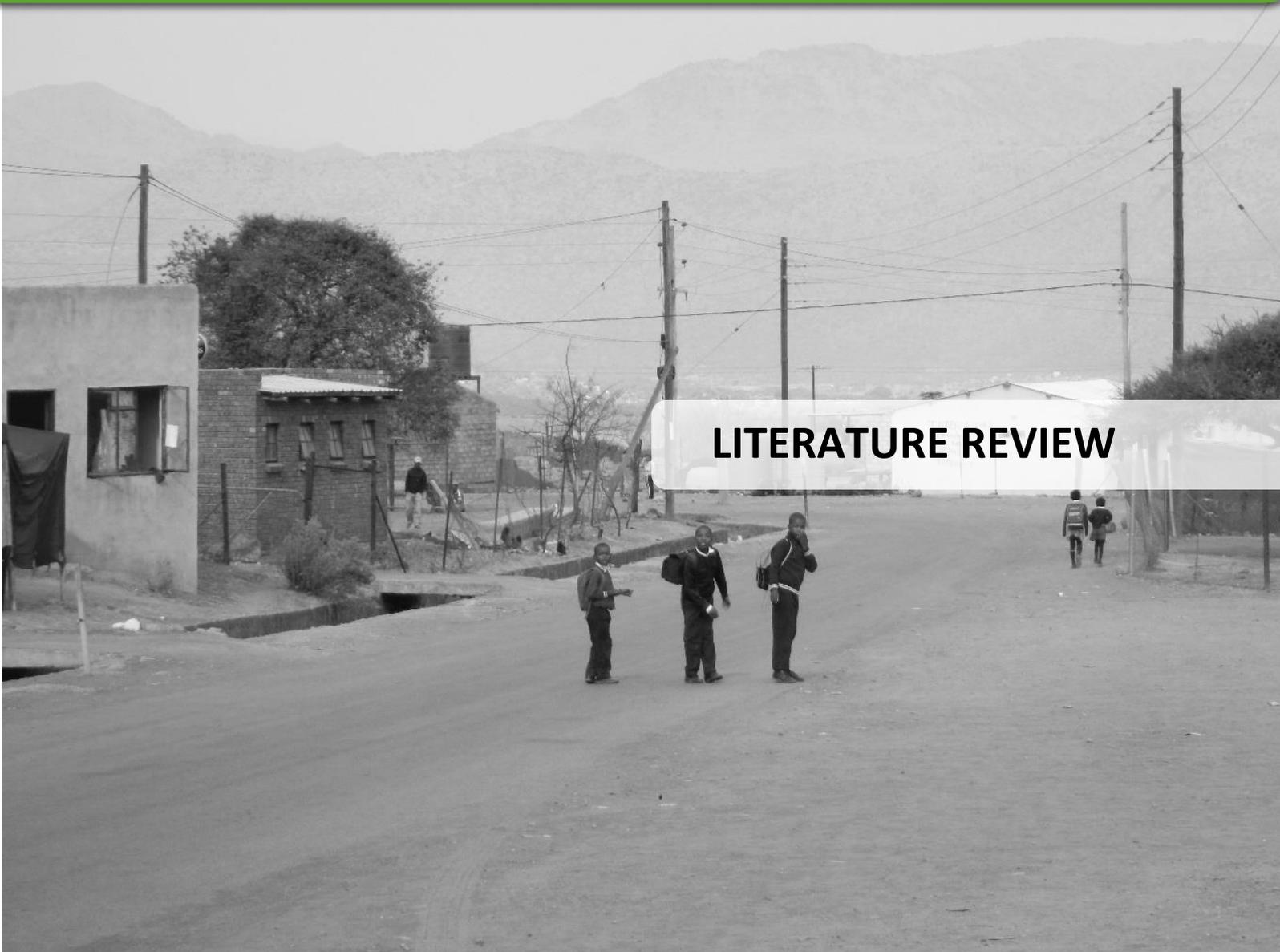
Chapter 4 Introduces the case study area and gives analysis by firstly outlining the province, Limpopo Province, and the district municipality, Sekhukhune, that the area is located in respectively. Social economic status and demographics are discussed in the mentioned area. The study area, Greater Tubatse ward 27, 28 and 29 is then defined and discussed in detail.

Chapter 5 gives analysis on the data collected including accident statistics, questionnaires, road safety audit and semi-structured interviews, and are discussed further.

Chapter 6 closes the research report with a summary of the findings. The conclusions are further drawn from the study and recommendations are given to realise the significance of NMT in rural areas.



CHAPTER 2



LITERATURE REVIEW

CHAPTER TWO

2. LITERATURE REVIEW

2.1 INTRODUCTION

This section provides the literature to solicit information relevant to the NMT system in South Africa. In this section, guidelines and policies relevant to NMT are presented. Furthermore, NMT is defined and the realities of NMT in Africa are discussed in detail.

Walking as a mode of transport provides transportation independence in rural communities. However NMT users in rural areas are faced with unique challenges, such and having to walk long distances and in most cases on narrower roads with no adequate facilities to facilitate the walking (California Walks, 2012).

In 2003, the NDoT stated that pedestrian facilities such as walkways and crossings are the most effective improvements that need to take place and most suitable in rural areas. The department further stated that walking is the most affordable form of transport and requires no form of imbursement for people that live in rural area. This is due to the reason that the majority highly depend on the lowest cost of transport and cannot afford to spend any money on travel (South Africa Department of Transport, 2003).

To preserve this mode of transport, adequate pedestrian infrastructure development, should be implemented in order to benefit the poor people in rural and local municipalities (South Africa Department of Transport, 2003).

2.2 POLICY AND LEGISLATIVE FRAMEWORK GUIDING RURAL NMT PLANNING IN SOUTH AFRICA

2.2.1 Introduction

The existence of regulatory and institutional systems that promote and encourage NMT is one of the key pillars that will ensure the inclusion of consistent NMT planning processes. This section briefly discusses the roles of the three tiers of government with regards to NMT. It also reflects on formal published policy instruments addressing transport and transport systems, NMT in particular, as well as other policy statements which either directly or indirectly impact on transport matters.

2.2.2 The Role of government in NMT

The roles of each sphere is summarised in Figure 2-1 (Department of Environmental Affairs, 2015).



Figure 2-1 Roles and responsibilities of government,

Source: Author

2.2.3 National rural transport perspective

2.2.3.1 White Paper on National Transport Policy (1996)

The National Government's transport policies, as well as overall framework within which all other policies, strategies and projects should be developed are outlined in the White Paper.

For a rural transport perspective, the White Paper (NDoT, 1996), sets out a number of relevant policy principles, which include:

- The promotion of the use of public transport over the use of private vehicle travel;
- Providing an appropriate and **affordable standard of accessibility to commercial, work and social services within rural areas;**
- **Promoting rural development that will improve access to prospects** by making sure that rural workers are housed within close proximity to their place of work and services, consequently reducing the need to travel;
- **Encouraging, promoting and planning for the use of NMT where applicable;**
- Providing appropriate institutional structures, which will facilitate the efficient and effective planning, funding, implementation, regulation and law enforcement of the passenger transport system; and
- Promote more **energy-efficient and less pollutant modes of transport.**

2.2.3.2 Moving South Africa (1999)

Moving South Africa (NDoT, 1999), the Action Agenda is a 20 year strategic framework to deliver on the long term vision for transportation in South Africa, with Chapter 9 outlining the vision, strategic challenges and rural transport strategy and key targets earmarked to lead in the improvement of rural transport service for all.

The rural transport vision for 2020 includes **provision of transport infrastructure and services in rural areas that will provide basic means of access and mobility to ensure integration of sustainable rural communities.**

2.2.3.3 National Integrated Sustainable Rural Development Strategy (2000)

The National Integrated Sustainable Rural Development Strategy (ISRDS) (NDoT, 2000), recognises that the co-ordination of sectorial activities is a precondition for the efficient allocation of resources and effective delivery. The South African Cabinet mandated the Independent Development Trust (IDT), University of Pretoria and the World Bank to develop the ISRDS.

The ISRDS, along with the Poverty Relief Fund, can be considered as the Government's major strategies for rural and urban development and poverty reduction. The ISRDS is aimed at the co-ordinated delivery of integrated bundles of services and anchor development projects in terms of a prioritised set of rural development nodes (13 at present). One of these nodes was partially located in Limpopo Province prior to 2006, which was the Greater Sekhukhune District Municipality. The district has subsequently been completely handed over to the Limpopo Province.

2.2.3.4 National Rural Transport Strategy for South Africa (2005), revised in 2007

The National Rural Transport Strategy (NRTS) (NDoT, 2007), gives a composite view of the national perspective towards rural transport. The NRTS encompasses the rural transport component of the National Land Transport Strategic Framework (NLTSF) and identifies strategic challenges, thrusts, operational aims and programmes and actions, as listed below

The strategy identifies two main strategic thrusts. Firstly, to promote co-ordinated rural nodal and linkage development, which should ideally be pursued within the context of strengthened Integrated Development Plans (IPDs), rural transport, and rural spatial planning procedures, and support the aims of the ISRDP, rural LED and poverty alleviation programmes. The main practical aim should be to develop an effectively inter-linked network of multi-purpose nodes and linkages.

The development of a balanced rural transport system requires the following:

- **Concerted actions to redress the relative neglect of all non-motorised** as well as intermediate motorised transport (such as tractor-trailers);



- Investment in access roads; and
- Improvement of other forms of Rural Transport Infrastructure (RTI) - such as local connector or district roads, suspension bridges, pontoons, paths, tracks, trails and public transport interchange.

2.2.3.5 Department of Transport Draft Policy Document on NMT, 2008

The draft NMT Policy document (NDoT, 2008) was published in 2008 and it provides a single framework and an allowing environment for the DoT, other government departments and stakeholders to address the challenges experienced in NMT.

The primary purpose of the NMT policy is to increase the role of NMT as one of the key transport modes and integrate NMT as an essential element of public transport. It further aims to provide a safe NMT infrastructure, and to allocate adequate and sustainable funding for the development and promotion of NMT.

The NMT policy covers several critical areas that are considered important to plan for and manage NMT more effectively. These are:

NMT Integrated Planning

The policy requires that NMT plans to be established and integrated into the Provincial Land Transport Framework (PLTF), as well as in the Integrated Transport Plans (ITP) of Local Government. NMT facilities need to integrate well to other modes of transport such as public transport as a feeder mode.

Transport safety – compliance, safety and security

Minimum standards and specifications of NMT modes that take cognisance to transport safety need to be developed. Key requirements of training programs for drivers and learners, indicators for monitoring and evaluation, and promotion of NMT are outlined in the implementation framework. To promote safety; the policy prescribes the need to train drivers and operators and safety audits are to be done.

The provision of NMT must be on the basis of principles which include; safety and security, energy conservation and the need to improve a quality of life.

Institutional Arrangements

In order to ensure that NMT provision is rendered in a suitable manner, the policy discusses various roles responsibilities of all stakeholders involved in the provision of NMT as mode of transport.

Management and implementation of NMT provision is administered by provincial Departments of Transport in their respective provinces. They are also responsible for planning (in consultation with key transport stakeholders), law enforcement, identifying beneficiaries, and ensuring road safety (together with Local Government), communication, capacity building, and monitoring services. The



DoT is the custodian of this policy and is responsible for planning, funding, regulation, communication, socio-economic benefits, infrastructure, monitoring and evaluation of overall national NMT policy. The office is also responsible for the evaluation of this national NMT policy in consultation with provincial Departments of Transport and relevant stakeholders.

Lastly the policy guarantees that NMT plays a role in economic development, empowerment of the marginalised groups and poverty alleviation.

2.2.3.6 DOT National Scholar Transport Policy, 2009

The absence of National Scholar Transport Policy (NDoT, 2009) resulted in fragmented provision of scholar transport services administered by the Provincial Departments of Education and Department of Transport. The first National Scholar Transport Policy was developed in 2009.

The difficulties that scholars are facing have been highlighted and identified in the 2003 National House Travel Survey (NHTS), the Nelson Mandela Foundation's Study on Rural Schooling and the Review of the Financing, Resourcing and Costs of Education in Public Schools Studies.

From the aforementioned studies, it was concluded that the ability for learners to access education areas is hindered by the long distances travelled, the cost of scholar transport and threats to road safety and security. Scholars have difficulty accessing educational institutions because of the unavailability of scholar transport. **The long distances travelled to schools and back, unsafe roads, security and the cost of transport, are amongst the factors that serve as barriers to scholars accessing schools. This is the case especially for those scholars residing in rural areas.**

Scholar transport is now the mandate of the Department of Transport. Consequently, the amount of funding made available for scholar transport varies and is generally insufficient to meet the existing need. The operationalization and management of scholar transport has also taken different forms in the various provinces.

2.2.4 Provincial Policy Framework – rural transport perspective

A select number of provincial documents were reviewed, and discussed.

2.2.4.1 Limpopo Province Pedestrian Management Plan (2004)

The report containing the Limpopo Province Pedestrian Management Plan (Limpopo Department of Roads and Transport, 2004), deals with the background to the development of a pedestrian management plan for Limpopo Province. The report also contains the results of the assessment of pedestrian facilities at selected hazardous sites, which was done as part of the audit process.



The Limpopo Province Pedestrian Management Plan formed the basis of a comprehensive pedestrian safety strategy for the Province that was to be implemented.

2.2.4.2 Limpopo in Motion (2005)

The Limpopo in Motion document (Limpopo Department of Roads and Transport, 2005), constitutes transport strategy for the province, which was driven by the National White Paper on National Transport Policy. The Limpopo Provincial Transport Strategy identified the following strategies that impact on rural transport planning:

- Improving the general mobility of Limpopo people;
- Improving passenger transport to learners, elders and disabled;
- Promote accessible transport to support economic development and job creation;
- **Promote the uses of NMT in both rural and urban areas.**

2.2.4.3 Provincial Land Transport Framework (2007)

The Provincial Land Transport Framework (PLTF) (Limpopo Department of Roads and Transport, 2007), is a legal requirement in terms of Clause 21 of the National Land Transport Transition Act (No. 22 of 2000) (NLTTA). The framework discusses broad strategies on land transport, including those that have a bearing on rural transport. They include:

- Development and promotion of NMT;
- Development of public transport facilities;
- Installation of lay-bys and shelters along public transport routes;
- Segregation of pedestrians from vehicle movement;
- Promotion of bicycle and pedestrian movement through the implementation of appropriate infrastructure; and
- Ensuring the planning and development of all new public transport facilities consider the needs of persons with disability.

2.2.5 Local Policy Context

2.2.5.1 Municipal Structures Act (1998)

The Municipal Structures Act (The National Department of Provincial and Local Government, 1998) mandates the council to strive within its capacity to achieve its constitutional obligations, by promoting social and economic development, safe and healthy environment and **ensuring that services are provided for to the communities in a sustainable manner.**



2.2.5.2 Public Finance Management Act (1999)

The Public Finance Management Act, Act 1 of 1999, (The National Department of Finance., 1999) as amended by Public Finance Management Amendment Act, Act 29 of 1999, is used to regulate financial management in the national government and provincial governments with the following specific aims, amongst others, to:

- Ensure that all revenue, expenditure, assets and liabilities of such governments are managed efficiently and effectively; and
- To provide for the responsibilities of persons entrusted with financial management in those governments.

2.2.5.3 Municipal Systems Act (2000)

The Municipal Systems Act, (Act 32 of 2000), (The National Department of Provincial and Local Government, 2000) provides core principles, mechanisms and processes that are necessary to enable municipalities to become developmental. Development, as defined in the Act, includes integrated social, economic, environmental, spatial, infrastructural, institutional, and organisational and human resources upliftment of a community. **The upliftment needs to improve the quality of life of its members with specific reference to the poor and other disadvantaged sections of the community.**

2.2.6 Resume

There is substantial backbone to rural development, rural transport planning, including NMT, from the national and provincial policy and legislative point of view. The existing frameworks provide adequate guiding principles, however it is evident that physical manifestation of the principles contained in the policies are lacking.

In terms of the Constitution, municipalities are accountable for municipal roads, municipal public transport, municipal planning, and roads and traffic. The municipal policy documents that were examined and could be examined show a significant awareness of the need to address, promote, and accommodate NMT in current and future years. This pertains to the planning and executing of operations and infrastructure, and to respond and complement the trends in national and provincial policy.

2.3 BACKGROUND ON SOUTH AFRICAN RURAL AREAS

Rural areas account for about 40% of South Africa's population with about 21 million inhabitants living in rural areas (Statistics South Africa, 2013). A central legacy of apartheid is the persistence of dense rural settlements with limited economic opportunities in the former "homeland" areas, which have particularly high rates of unemployment. The remoteness from major economic hubs and low population densities often means that the provision of transport infrastructure and services in remote areas is financially unviable. The result is the isolation of rural communities with limited mobility options, which in turn results in the inability to access economic opportunities in the formal labour market. This contributes to perpetuated poverty (Pillay, 2015).

Rural Government places the need to improve rural infrastructure and service centres as a key strategic priority. However, the implementation of rural transport is hampered by a lack of prioritised funding and technical or managerial capacity to oversee the roll-out of projects at district level.

The trends identified around travel modes and patterns from the NHTS for 2003 and 2013 (Statistics South Africa, 2013) show that:

- One in five workers walked all the way to work in South Africa. The majority (40.6 %) of those that walked all the way to work were found in the rural areas.
- In 2013, 81.2 % of scholars from rural areas were recorded walking all the way to school, followed by taxi commuters with 4.5%. There is a significant relationship between high percentage of scholars that walk all the way and income levels. From households with the lowest income quintile, 85 % of the commuters walk all the way to school.
- Rural learners (8.1%) were more likely than metropolitan (2.7%) or urban learners (3.0%) to walk more than 60 minutes.
- The use patterns of public transport have changed significantly between 2003 and 2013 in rural areas, with general increases in the percentage of households who used taxis (from 57.4% to 75.0%), buses (24.5% to 29.6%) and trains (0.7% to 1.8%).

Compared to 2003, rural households is the only subgroup that have seen a significant decrease in access time to selected services, even though rural travellers still need more time than their urban and metropolitan counterparts. Over time, households living in rural areas had better access to public transport and had reduced travel times when compared to 2003.

2.4 DEFINITION OF NON-MOTORISED TRANSPORT (NMT).

NMT is defined by travel completed without the use of cars, buses, trucks, trains, planes or any other form of motorised travel. In context of this study, a comprehensive definition of NMT was limited to pedestrians.

2.4.1 Pedestrians

The 2012 Oxford English Dictionary defines a pedestrian as “a person walking rather than travelling in a vehicle”. However, it is noted that in planning and designing NMT infrastructure, pedestrians also include those who travel via or with: wheelchairs; rollerblades/skates; prams; trolleys; etc. Also, the especially vulnerable (e.g.: children and the elderly) and different mobility levels or impairments must also be considered.

It is important to recognise that different types of pedestrians will have various levels of acceptable walking distances, speed and trip based characteristics. As such, it is important to consider surrounding land uses to determine likely types of pedestrians and the types of pedestrian facilities that they will require.

2.4.2 Walkability

Walkability refers to how friendly, safe, and accessible walk is in communities of neighbourhoods. There are a number of factors that influence walkability. Elements of the built environment influencing walking include the following common factors: level, continuous pathways and sidewalks, accessible and safe crossings, suitable vehicle speed, NMT amenities, limited number lanes and street width. Walking and walkability is also influenced by other factors that include real and perceived safety from crime, safe access to desired destinations (school, park, library, grocery, post office, etc.), and public amenities like benches among many others (California Walks, 2012).

2.5 THE REALITY OF NMT IN AFRICA

In terms of the promotion of soft-measures, such as campaigns and general NMT education is important to understand that there are definite contextual differences in the usage of NMT in developed countries versus developing countries. To provide a brief picture of the challenges that transportation is faced with in developing areas, such as Africa, in comparison to developed areas such as Europe, it is essential to look at the following aspects.

2.5.1 Transportation accessibility

In most developed countries a majority of the public transportation is publicly owned or run by major transportation companies, which exercise formal regulations, provide an affordable means of



transport and ensure that the safety of all road users are taken into consideration. Hence, the affordability factor of bicycles versus public transportation is relevant.

However, in the African context, in areas such as Abidjan, Dakar, Harare, Nairobi, Addis Ababa and Dar es Salaam public transportation is owned by what can be referred to as “informal micro-enterprises”. This is seen as a problematic issue, as cities are faced with increased urbanisation and a decrease in adequate affordable public transportation facilities, leading to public collective transportation modes that have no formal regulations and pose a threat to the safety of other road users. The main operators in public transportation in Africa are minibuses and cars. It has been shown that nearly 35-40% of the transport trips in Africa are made by informal collective transport modes, whereas, NMT accounts for the second highest trip generation mode at 30-35%. Findings from the Trans-African Consortium (2010) indicate that “Changing a walking or bicycle trip to a motorised collective transport trip is a first choice wherever this latter is provided at an affordable cost for the population”.

In short, the above statement and transport situation in developing countries show that NMT can be seen as a captive mode, rather than a choice mode; as is the case in developed countries. Because of this ‘capture’ factor in African regions, NMT users are likely to convert to motorise transportation as it provides a choice.

“NMT methods are seen as capture modes, rather than choice modes. This will have an ultimate impact on the strategy that needs to be used to change the mind-set transportation users in developing countries” (Servaas, 2000).

2.5.2 NMT user profile

It has been found that gender largely influences the usage of NMT, especially in developing countries. In accordance to Buis and Wittink (2000) men are the prominent users of bicycles in the developing world, they are generally between the ages of 25-35 and employed (Buis & Wittink, 2000). Any other form of motorised transportation are out of their affordability level and in many cases informal public transportation modes are more time consuming for this specific user. In terms of pedestrianism, no gender bias has been perceived and it is assumed that there are not specific user profiles, except disabled people, thus women and children are seen as the main pedestrian users. This should emphasise greater safety features for pedestrians.

Due to the fact that a stereotypical user for certain NMT modes in developing countries such as Africa can be created, it is vital to uses this “typical’ user as a platform for implementing interventions and promoting the further usage of NMT.



2.5.3 Road infrastructure conditions

Statistics show that nearly 1.3 million people are killed annually around the world in road crashes; most of these casualties occur in low to medium income groups. It was found that “in Africa, there is almost a total lack of adequate road infrastructure for sustainable transport and road-especially when it comes to walking and cycling” (Kim & de Jong, 2011).

In Africa, private car ownership is directly proportional to economic growth and road network expansion; mainly due to the fact that the usage of private car ownership in developing countries are, generally, not discouraged by traffic demand policies in the various countries. African countries tend not to have adequate road expansion plans or road maintenance plans and can, therefore, not manage the effect that a demand increase of private transportation has on the road network supply. Eventually various areas are left with severe congestion problems, thus contributing to the fact that sub-Saharan Africa is characterised with having the most dangerous road networks in the world. It is, therefore, important that road funds are not just spent on upgrading existing roads but also encourage budget allocation to implementing formal NMT infrastructure, especially due to the fact that rapid growth is taking place in the certain areas of Africa (such as South Africa) and most of the people are still reliant upon NMT, due to the fact that they cannot afford any other modes of transportation. It is, therefore, imperative that Africa invest in NMT infrastructure, mainly to combat road safety risks that a lack of adequate infrastructure imposes on the masses, which are unable to afford public transportation, and secondly due to the economic impact it has on these countries.

Current Transportation Infrastructure does not encourage or create a safe environment for NMT users. In developed countries road infrastructure make provision for NMT in the attempt to encourage the usage of this mode, even though it is not seen as a primary mode or most affordable transport mode, in developing countries, though NMT is the main modes it is not catered for or developed.

2.5.4 Lack of institutional support for NMT

In general, African countries have weak traffic demand policies, therefore, showing that institutional support for NMT is generally weak, as policies and government spending clearly do not promote the usage of NMT. The impact that institutional support can have on NMT development in developing countries can be immense; as the case of Bogota, where President Enrique Pensola implemented various soft-strategies and invested in infrastructure to promote the usage of NMT. In Bogota transportation networks were not constructed to accommodate cars but rather people, thus more open spaces, footpaths and cycles paths were provided and more restrictions were placed on motorised vehicles accessing areas of opportunities (Tseu, 2006)



There is a stigma around NMT, especially in developing countries that associates it with poverty. If Institutions make adequate provisions in terms of infrastructure investments and policies, this mind-set could be changed and people will tend to keep using NMT even though their income levels allow for the usage of motorised transportation.

Institutions should keep the culture of NMT usage in developing countries through encouraging investment in NMT infrastructure and implementing fewer car orientated transport policies. In developing countries the aim institutions have is to implement NMT, in developing countries. Institutions should aim to retain the high usage of NMT.

2.6 CASE FOR NMT- THE SIGNIFICANCE OF NMT IN RURAL AREAS

2.6.1 Benefits of NMT

Derived from Hook (2003), three key benefits for NMT are illustrated in Figure 2-2: and discussed in detail in this chapter to strengthen the importance of NMT and they are as follows: Environmental, Economic and Social. The three key elements that make up sustainable transport.

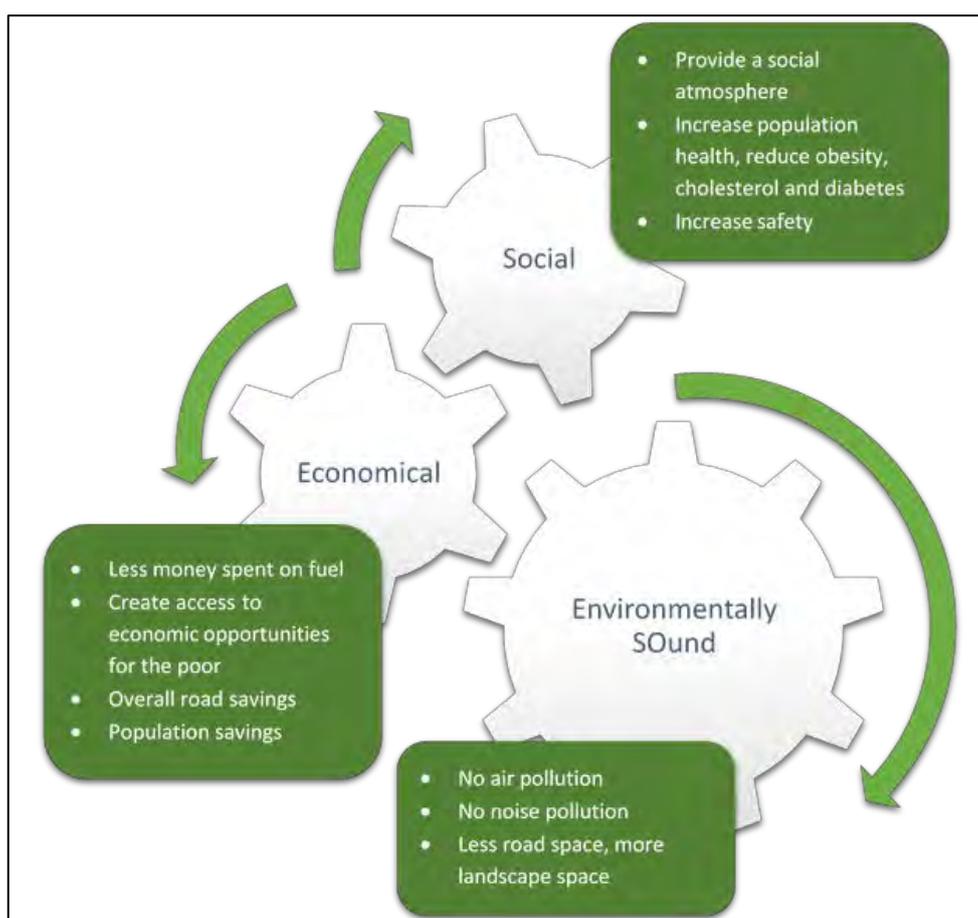


Figure 2-2: Benefits of NMT

Source: Hook, 2003

2.6.1.1 Environmental

NMT is characterised as a mode of transportation that does not cause any noise or air pollution (specifically greenhouse gases). Due to this, the overall air quality increased as less nitrogen oxides and carbon dioxides are released from car exhaust fumes (Litman, 2012).

The increase in cleaner air, as well as decrease in noise, means that there is a decrease in respiratory ailments in the population, as well as sleep deprivation. (Hook, 2003).

2.6.1.2 Economic

Countries as whole could become less fuel dependent thus meaning that less fuel would have to be imported for transportation usages and fewer portions of the population’s income will have to be spent on fuel consumption (Hook, 2003).

NMT infrastructure may be expensive to install in rural locations, but the long-term cost benefits in terms of road maintenance will be less, as fewer cars make use of the roads, thus there is an enormous decrease in the magnitude of axle load on roads.

The incorporation of NMT can lead to increasing access to economic opportunities for all income groups, thus creating a more economically integrated environment.

2.6.1.3 Social

One of the most important benefits that NMT offers to society is an increase in the overall population health, due to a decrease in obesity and diabetes. NMT creates a platform from which more social interaction can take place, as groups are formed that tend to cycle or walk to their various destinations together. Overall pedestrian safety is increased as fewer cars are on the roads and more pedestrian and cycling infrastructure and signage are incorporated (Hook, 2003).

From the above, it is clear that there are definite advantages to NMT, but it is also important to understand why these advantages exist. Thus, what negative impact does “automobile dependency” have on environmental, economic and social factors? The following table extracted from Schiller, Bruun & Kenworthy (2010) gives a clear indication of the problems that are associated with automobile dependency and creates a broader view of why there are so many benefits that can be enjoyed from NMT usage.

Table 2-1: Problems associated with automobile dependency

Source: (Schiller, P.L., Bruun, E.C., Kenworthy, J.R., , 2010)

Environmental Problems	Economic Problems	Social Problems
Oil Vulnerability	Congestion Problems	Loss of Street Life



Environmental Problems	Economic Problems	Social Problems
Urban Sprawl	High urban infrastructure costs for sewer, water and mains, roads, etc.	Loss of community and neighbourhood
Photochemical Smog	Loss of Productive Rural Land	Loss of Public health
Acid rain	Loss of urban land to pavement	Isolation in remote suburbs with few amenities
High greenhouse gases-global warming	Poor transit cost recovery	Access problems for those without cars or access to cars and those with disabilities
Greater storm water runoff potential	Economic and human costs of transportation accident trauma and death	Road rage
Traffic problems; noise neighbourhood severance, visual intrusion, physical danger	High Portion of City Wealth spent on passenger Transportation	Anti-social behaviour due to boredom in car-dependent suburbs
Decimated Transit systems	Public health costs from air and other pollutions	Enforced car ownership for lower-income households
	Health costs from growing obesity due to sedentary auto lifestyles	Physical and mental health problems related to lack of physical activity in isolated suburbs

2.6.2 Designing for pedestrians

2.6.2.1 Priority NMT Areas

Locations with a large concentration of pedestrian activity are often priority areas for improving walkability (Murguía, 2013). These are usually educational centres, public transport nodes, commercial areas and areas where walking is the only source of transport. Priority areas for improving and developing pedestrian facilities include the following:-

- Primary schools, secondary schools and universities;
- Public transport stations;
- Neighbourhood markets; and
- Slum area environs and access routes.

2.6.2.2 Designing Process

Land use and transport planning has historically been considered separately. Over the past few decades this has changed with more emphasis on integrating land use and transport planning. It is however seen that transportation follows development, responding to accessibility needs created by land use decisions outside of transport authority's control. At the same time, local planning authorities



increasingly separated commercial, employment, social and residential areas, increasing the need for travel over longer distances (Pillay, 2015).

The current reality however is that transport planning in South Africa is uncoordinated and occurs in modal and sectorial silos. There is also a lack of consistency between transport and land use planning practice (Pillay, 2015).

When designing for pedestrians, it is important that the overall network is considered. Pedestrian facilities have an important role in the transport network for journeys that are entirely made up by people that walk and by the first or last links of a journey made by other modes of transport (Department of Transport, 2011).

Inadequate provision of crossing facilities and pedestrian networks can have a significant impact on overall 'connectivity' and therefore 'walkability' of a route. As stated previously in section 2.4.1.2 of this report, walkability refers to how friendly, safe, and accessible walk is in communities of neighbourhoods. It includes factors such as connectivity, safety, legibility, and pedestrian Level of Service (Department of Transport, 2011) .

According to the Australian Department of Transport (2011), there are five key principals for planning and designing for pedestrians that contribute to a connected and walkable pedestrian network. From these principles, it is important that transport planners consider the following when designing for pedestrians:

- Connected – do walking networks provide good access to key destinations?
- Comfortable – does the path width, surface, landscaping and adjacent scale of development provide an attractive walking environment?
- Convenient - can streets be crossed easily, safely and without delay by all pedestrians?
- Convivial – are routes interesting, clean and free from threat?
- Conspicuous – are walking routes set out in a coherent network, clearly signposted and are they published in local maps?

A pedestrian transport network is required to be planned in order to minimise the walking distance between key land uses, and should provide appropriate pedestrian infrastructure to cross the road on high mobility roads. Furthermore, the network should avoid conflict with vehicle movements where possible and provide sidewalks on most streets, preferably on both sides of the road (Department of Transport, 2011).





Figure 2-3: Pedestrian Infrastructure and facilities

2.6.2.3 Pedestrian facilities

Any type of infrastructure built to enhance the ease of pedestrian traveling, such as crosswalks and sidewalks is referred to as pedestrian facilities. A more broad definition encompasses trail, walkways, kerb-ramps, street furniture and lighting. Existing infrastructure must be retrofitted in order to improve facilities (Murguía, 2013).

The significance to improving walking conditions is to manage pedestrian flows so they are properly secluded from vehicles. There are different forms of pedestrian facilities such, as sidewalks, connector pathways, off-street footpaths and road shoulders (Murguía, 2013).

Interventions to develop and improve the safety of pedestrians and facilities do not attain full effect if the facilities are randomly planned for. A comprehensive plan should be followed, that is linked to traffic strategies, integrated planning and interventions for other types of transport (Servaas, 2000).

According “The significance of NMT for developing countries” study, two sets of interventions need to be put central (Servaas, 2000), which are:-

- Area-wide speed reduction or traffic calming schemes which are usually applied in residential areas; and
- Provision of an integrated walking network, which is often found in town centers.

The way these interventions should be applied depends solely on the position of the road in the functionality hierarchical network (Servaas, 2000).

Table 2-2 below is derived from “*Design Guidelines for Non-Motorised Transport in Africa*” (2004) and discusses the types facilities associated with pedestrian environments that should be considered when improving the conditions for NMT users.



Table 2-2: Key Pedestrian facilities

Description		Benefits and Considerations
 <p>Source: www.clevelandbricksandmortar.com</p>	<p>Sidewalks are a necessity on all roads, except where there are no pedestrians, like on some sections of highways. Space for sidewalks can be achieved by reducing the number and/or width of carriageway lanes, which will also aid as a traffic-calming measure.</p>	<p>Benefits: The most important benefit of sidewalks is being able to keep pedestrians safe while walking. Increases pedestrian accessibility, encourages people to walk which subsequently improves on their health, and is one of the most cost effective measures for pedestrian safety.</p> <p>Considerations: Sidewalk width should be able to accommodate the existence and expected needs of pedestrians. For two pedestrians to pass each with ease and comfortably so, each pedestrian requires a 0.80m wide space of at least. Each country varies with different standards for sidewalk width; however, the standard width recommendation is 1.80m, and a minimum of 1.50 meters in residential areas.</p>
 <p>Source: www.rgbstock.com</p>	<p>Footpaths or desire lines are pedestrian paths not allied with paved roads or streets. The paths are created as the consequence of NMT traffic over a desire line. A large part of pedestrian travel in rural areas takes place along tracks that are not part and parcel with the official road links. If not well taken care off and ignored, these footpaths may fade as area density increases.</p>	<p>Benefits: Within mountainous sites, building footpaths along curves can prevent soil erosion and ease the ascent. By placing blocks of soil-retaining vegetation alongside the footpath can reduce topsoil runoff and hereby offer environmental value.</p> <p>Considerations: Footpaths should have a cross slope of at least 2% but not greater than 4% in order to facilitate natural drainage. Running slopes are parallel to the direction of travel. The maximum running inclination should be 8%, with a landing of at least 1.50m every 9 metres on extended slopes.</p>
 <p>Source: unknown</p>	<p>Crossings are places where pedestrians can cross the road legally on the same level as motorised transport. They are marked black and white in colour and could either be at intersections or at mid-block sections.</p>	<p>Types of Crossings</p> <ul style="list-style-type: none"> • Crosswalks • Mid-bloc crossings • Roundabout crossing • Pedestrian tunnel and bridges <p>Considerations: Designated crossings should be located in safe and suitable locations, and at continuous regular intervals. Crossing design requires detailed investigation and be site-specific so that they are properly integrated into pedestrian footpath improvements and barricades installation, which will in turn inspire their use.</p>



Description		Benefits and Considerations
 <p>Source: bedruum.com</p>	<p>Description: Street lighting should be a primary priority at intersections and corners where visibility is most vital. Where there is a high concentration of night-time pedestrian activity such as community centres, schools and shops, lighting is recommended.</p>	<p>Benefits: Good street lighting improves safety and comfort while improving the productivity of road users.</p> <p>Considerations: Street lighting should not interfere with vegetation for more effective illumination. When allocated along the same line as street vegetation, the lights should be located between trees. Lighting should remain below the tree canopy level where vegetation is dense.</p>
 <p>Source: www.dpti.sa.gov.au</p>	<p>Description Kerb ramps are solid ramp graded down from the top surface of a sidewalk to the surface of the street.</p>	<p>Benefits: Kerb ramps provide access between the sidewalk and the roadway for people using wheelchairs, strollers, walkers, etc.</p> <p>Consideration: These ramps should be provided at public transport stops, crossings, and any other access point. The designs should be able to prevent cars from intruding the ramp space. The maximum slope of the kerb ramp should be 12.5% and height should be 150mm in order to be able to allow easy access for all users.</p>



2.6.3 Road Safety

Walking has well documented environmental and health benefits, increasing physical activity can lead to combating obesity and cardiovascular-related disease (World Health Organisation, 2013). Unfortunately, in some cases walking can lead to increased risk of road traffic crashes, and that can lead to death or injury. Due to the significant increase in the frequency of motor vehicle use around the world and as well as the lack of land-use planning and designing for pedestrian needs in roadways, pedestrians are more than ever vulnerable to road traffic crashes (World Health Organisation, 2013). Pedestrian susceptibility is further sensitive in situations where traffic laws are ineffectively enforced. Improvements in pedestrian safety interventions contribute to urban renewal and walking environments, social cohesion, economic growth, reduction in the harmful effects of traffic noise and improved air quality (World Health Organisation, 2013). Safety measures also have additional benefits for other road users, such as cyclists and motorists. Implementation of safety measures needs the commitment and well informed decision-making by all spheres of government, the transport industry, international and non-governmental organisations (World Health Organisation, 2013). Effective intervention measures to improve pedestrian safety are described in section 2.6 of this report.

2.6.3.1 Overview on pedestrian accident Statistics

The most detrimental aspect to road safety is transport related accidents that occurs daily in our country. In Dr. Ribben's presentation, "*Reducing Non-Motorised Transport Casualties in African Cities: A Multi-Sectorial Approach*" he states that there is about 1.3 million people in the world killed on our roads each year and those that get injured or paralysed amount to 50 million with the majority being NMT users (The World Bank, 2013). He further indicated that Africa constitutes 16% of the 90% of road deaths in developing countries and that by 2020, road traffic deaths are to rise to 1.9 million people yearly (The World Bank, 2013).

The Road Traffic Management Corporation (RTMC), which is an agency for the South African Department of Transport, published Fatal Crashes Statistics in 2012. The RTMC recorded 42% of pedestrians killed out of 1187 road fatalities during November 2011 and March 2012 (Corporation, 2012). And In 2009, the Easter road traffic statistics were recorded, and with respect to the human factor attribute, South Africans contributed to the cause of accidents in the following manner; speed by driver (48%), jay walking (35%), hit and run (6%), unsafe overtaking (6%), driver doing a U-turn (2.4%) and pedestrians under the influence (1.6%) (Road Traffic Management Corporation, 2009).

2.6.3.2 Risk Factors for Pedestrian Crashes

In South Africa, formalised townships and rural areas that were developed prior to the mid-nineties, adjacent to towns and cities where considered dormitory areas with non-existent pedestrian



infrastructure and limited road infrastructure (Rathete, 2010). The road infrastructure that has been provided in rural areas have been constructed as high mobility roads serving rural communities, with no NMT related facilities and signage to accommodate the respective road users (Ribbens, 2008). Most of these roads are built near community households and schools; where more road safety issues are often experienced. The RTMC (2014), identified speed as one of factors that lead to pedestrian fatalities, and rural speed limits on these major roads are in the region of 80km/h to 100km/h in close proximity to rural schools without any traffic calming measures (Road Traffic Management Corporation, 2014).

Other contributing factors that exacerbate the occurrence of road crashes are and not limited to:

- **Alcohol** - The use of alcohol is a risk factor that is not only limited to drivers of vehicles but also pedestrians. Consuming alcohol results in impairment, which increases the likelihood of a road accident because it decreases the reaction time, produces poor judgment, and lowers attentiveness and visual acuity (World Health Organisation, 2013);
- **Lack of pedestrian facilities in roadway design and land-use** - Pedestrian safety risk is increased when land-use planning and roadway designs fail to plan for and provide pedestrian facilities. Traffic control mechanisms that segregate pedestrians from vehicles and support pedestrians to cross roads safely are vital mechanisms to ensure pedestrian safety, road system management and complementing vehicle speed (World Health Organisation, 2013).
- **Inadequate visibility of pedestrians** - The lack in providing pedestrian amenities such as street lights have safety risk implications for pedestrians at night. Pedestrians are also encouraged to wear reflective accessories or brightly coloured clothes and equip bicycles with lights to minimise NMT crashes (World Health Organisation, 2013).

2.6.3.3 Programs to address road safety in South Africa

According to the RTMC (2014), programs are put in place to improve road safety which also form part of their KPI system. The programs are summarised in Table 2-3.

Table 2-3: RTMC road safety programs

Source: (Road Traffic Management Corporation, 2014)

Program	Description
1. Make Roads Safe	The program is achieved by ensuring that there is safe road infrastructure, and developing safe road users through road safety awareness campaigns, road safety curriculum and implementing scholar transport. Furthermore, by also ensuring that all vehicles on the roads are road worthy and registered.
2. Law Enforcement and Coordination	The RTMC is responsible for the coordination of road traffic interventions across the three tiers of Government. The aim is to ensure harmonisation of operations to maximise the achievement of the Decade of Action by halving road crashes by the year 2020.



Program	Description
3. Stakeholder Management	The stakeholder management function seeks to promote and encourage collaboration with external parties in the promotion of road safety.
4. Corporate Support and Excellence	<p>The RTMC is to ensure that collection of data is improved upon and that the road safety information is strengthened. The agency is also to provide a support platform for core business to deliver on its mandate and monitor Traffic Training Colleges. Lastly, The RTMC is responsible for the investigation of road crashes in line with the following criteria:</p> <ol style="list-style-type: none"> i. Crashes in which five or more persons are killed; ii. Fatal crashes in which four or more vehicles are involved; iii. Fatal crashes in which vehicles carrying hazardous substances are involved; and iv. Any high profile crash at the discretion of the Corporation.

2.6.4 Engineering, Enforcement, education and Evaluation: pedestrian safety interventions

Pedestrian facilities, such as the ones indicated in Table 2-1 occupy less space than roads and assists traveling for many more individuals per square meter. Sharing the road amongst all road users in a more equitable way poses as a great challenge, which can be resolved and addressed through reasonable re-distribution of road space (Murguía, 2013).

This section of the report presents the different types of intervention to integrate NMT by retrofitting existing roads, which are derived from the *Share the road: Design guidelines for non motorised transport in Africa* (2013) report. According to Murguía (2013), one of the key retrofitting strategies for existing roads is improving pedestrian facilities on the road. The implementation of this intervention solely depends on the role of the streets within the road hierarchy (Murguía, 2013).

A systems approach to improving human behaviour, therefore, also means that there is a need to address the problems at different levels and that we need to work together - engineers, educators, law enforcement officials and other stake holders like community leaders, employers, health care and other emergency services.

This Section focuses on four key aspects that have an impact on pedestrian and road safety (four E's of road safety and security). The four aspects are:

- Engineering – physical factors;
- Education – societal factors;
- Enforcement – institutional factors; and
- Evaluation



2.6.4.1 Engineering

In order to improve road safety and security, there are several engineering interventions that could be undertaken (Servaas, 2000), which are:-

- Provision of safe walking and cycling facilities;
- Provision for universal access facilities;
- Traffic calming interventions for vehicles to give priority to pedestrians;
- Constructing pedestrian crossings, taxi bays and bus stops;
- Providing pedestrian crossing measures at signalised junctions;
- High quality road signs and road markings and careful selection of the pedestrian crossing position to ensure maximum sight distance;
- Suitable designs of roads in residential areas (enhancing reduced speed limits, increased traffic calming and ambient lighting);
- Suitable designs for road by areas of shopping (formal pedestrian crossings and NMT lanes);
- Suitable road designs for roads outside schools; and
- Road segregation designs between motorised vehicles with non-motorised vehicles.

2.6.4.2 Enforcement

To improve road safety and security, there are several key law enforcement interventions that can be undertaken (Servaas, 2000), as below:-

- Ensuring that all road users obey the Road Traffic Act and Regulations;
- Enforcing the use of seatbelts;
- Enforcing drivers to drive within speed limits; and
- Implementation of scholar patrol programs at school and officers being visible within the community.

2.6.4.3 Education

To improve road safety knowledge and awareness, there are several education interventions which are (Servaas, 2000):

- Road safety education (rules of the road and road signs) incorporated into the school curriculum; and
- Awareness programs and training of road use on traffic safety within the community.

Education can assist in bringing about a culture of concern and advance sympathetic attitudes towards effective interventions (Groenewald, 2013). Majority of road safety programmes do not work in isolation, therefore they need to be used in combination or linked or with other measures.



“There is a need for a balanced approach to the role of education, taking into account evidence from research on behavioural change” (Groenewald, 2013).

2.6.4.4 Evaluation

Lastly, success can only be confirmed or failures identified through monitoring and evaluating the outcomes of initiatives. One of the pillars of international best practices is considered to be monitoring and evaluation (Arrive Alive, 2011). This is effective where reliable and consistent information is available, however in the South African perspective, the collection and capturing of the road safety data, processing and dissemination requires further strengthening (Arrive Alive, 2011). An effective evaluation system is key to delivering on commitments to the road safety programs and plans.

2.6.5 Influencing Factors for NMT

Though there are numerous advantages to using NMT, it is evident that motorised transportation still gets prevalence in most part of the world, especially in developed countries. In order to drive the initiative of NMT, it is vital that one understands the factors that influence NMT use. Figure 2-4 is extracted from a presentation done by (Tarlupu & Guwahati, 2011) and gives a brief indication of the factors that influence NMT use.

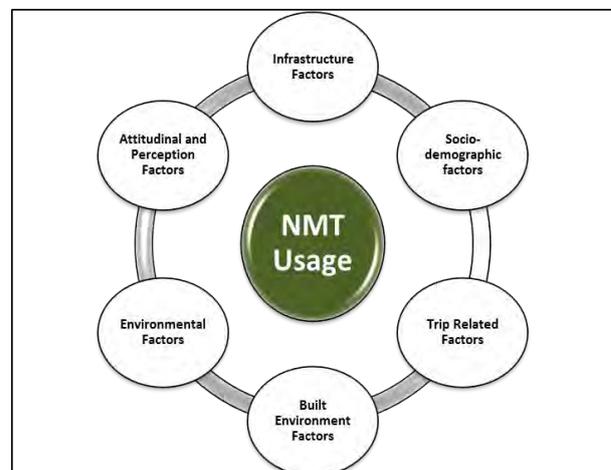


Figure 2-4: Factors Influencing NMT

Source: (Tarlupu & Guwahati, 2011)

The various abovementioned factors will be briefly discussed, in order to show the extent to which they may influence the usage or non-usage of NMT.

2.6.5.1 Socio-Economic Factors

- NMT is generally associated with poverty in developing countries and is seen as a leisure activity in developed countries;
- Catchment mode in developing countries and choice mode in developed countries;
- NMT is a “user friendly” mode that can be utilised by most ages. In developing countries men tend to make use of bicycles more than woman and children; and
- In developed countries, higher income might lead to more frequent usage of NMT, whereas in developing countries an increase in income leads to the usage of motorised transportation.



2.6.5.2 Attitudinal and Perceptions Factors

- Cultural aspirations tend to discourage the usage of bicycles by woman, thus men are the main users of bicycles;
- NMT not seen as a safe option in developing countries as NMT seen as being inferior to motorised transportation. However, in developed countries NMT gets preference over motorised transportation. Policies are implemented to encourage the usage of NMT; and
- Men tend to rate the 'speed' factor of NMT modes as the most important aspects, whereas women rate 'safety' as being the most important aspect of NMT usage.

2.6.5.3 Trip Related Factors

- Reliant upon time taken to complete the trip and the distance of the trip to be undertaken;
- In general, distances of 0.8 km for walking and 5 km for cycling seen as acceptable; and
- The usage of NMT can be encouraged if the time spent to travel a given distance is less than motorised transportation.

2.6.5.4 Built Environment Factors

- The built environment should be more conducive to NMT than motorised transportation. Thus, fewer obstructions should be present for NMT modes than motorised transportation.

2.6.5.5 Environmental Factors

- Climatic conditions such as rain, hail, extreme heat and cold and snow may inhibit the usage of NMT in areas:
- The topography of an area is can either encourage or discourage the usage of NMT. The usage of NMT will be more conducive in areas that have a flat terrain. Thus, it is important to implement routes that follow the flattest terrain.

2.6.5.6 Infrastructure Factors

- The implementation of NMT infrastructure such as:
 - o Cycle/walking lanes; and
 - o Parking/ storage facilities for bicycles.
- Specific non-motorised signals and signage will promote a culture of NMT awareness and usage.

2.7 EXAMPLES OF SUCCESSFUL IMPLEMENTATION OF NMT INTERVENTIONS

Locations with great pedestrian areas are more attractive, safer and more pleasant to live in. Furthermore, inclusive street design improves the economy of that area and gives access to productive opportunities (Murguía, 2013). This section discusses two NMT retrofitted interventions; one within the informal settlements in Africa and one within semi-rural areas of South Africa. The two cases serve as a guide to planning and implementing NMT facilities. The two selected case include:



- Dar es Salaam, Tanzania;
- Thaba Nchu, South Africa.

2.7.1 Example in Africa – Tanzania

2.7.1.1 Transport system

Dar es Salaam is large peri-urban area with a population of 2.2 million that is characterised with long trips, high cost of transport, high travel times, and the absence of proper infrastructure facilities for walking and cycling (Scott, 2002). More than 45% of commuters walk and a little more than 40% make use of public transport, the majority of which are by minibus. According to Scott (2002), the mobility rates are very low compared to >3.0 trips/person/day in other developing countries.



Figure 2-5: Limited mode share of NMT
Source: (Pendakur, 2005)

One of the main impediments of making use of NMT as a mode of transport is due to the fear of fatal traffic accidents exacerbated by the lack of NMT infrastructure and lack of financial ability to own a bicycle. Accident rates are very high with 58 fatalities per 10,000 people in Dar es Salaam recorded and compared to about 1.2 to 1.8 fatalities per 100,000 vehicles in EU countries.

“There is a serious lack of NMT infrastructure deterring people from using the NMT modes. Most serious is the absence of continuous routes for cycling or walking in many areas of Dar es Salaam. In addition, what little NMT space is available (footpaths and cycle lanes) is obstructed or occupied illegally by parked cars, and both legal and illegal kiosks”

(TRL, 2002)

2.7.1.2 NMT Intervention

The first example is taken from the old part of Temeke (Ward 14), which is located 8 km from the central business district. The area was developed in 1960’s and there has not been any form of road construction or road maintenance in the area since the 1970’s. Due to the increase in population in the area overtime, requirements for safe pedestrian routes were imperative to facilitate main travel flows (Pendakur, 2005).



According to Pendakur (2005), motorists would park along pedestrian walkways and the main pedestrian link within the area did not run along with collector roads and was in a bad condition. The drains were destroyed by trucks, which made the movement of NMT users more difficult within the area (Pendakur, 2005).

2.7.1.3 Object for intervention

“To create a safe, direct and comfortable access on foot or bicycle to the CBD of Temeke from Ward 14 and to the new market and its surrounding area from all residential parts of the ward”, (Pendakur, 2005).

2.7.1.4 Intervention and final outcome

The pedestrian link was newly constructed, with parts of the walkway paved with concrete slabs, and some parts were gravel compact. Furthermore, drains were also reconstructed.

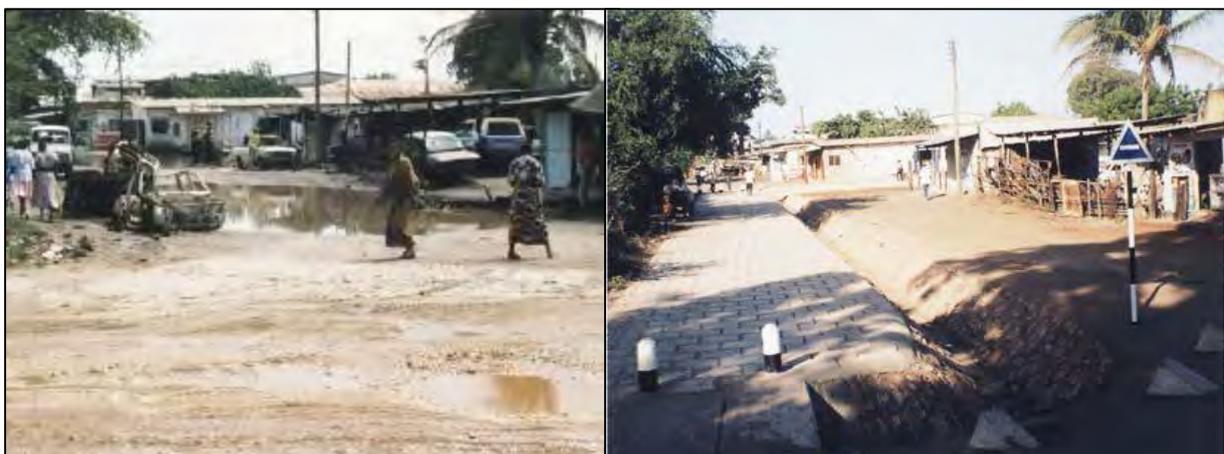


Figure 2-6: Part of the route before intervention **Figure 2-7: Same route after intervention**

Source: (Pendakur, 2005)

Source: (Pendakur, 2005)

2.7.1.5 Impact of the intervention

Overall, the intervention was a success and improved the daily needs for pedestrians in the community of Temeke Ward 14. According to Pendakur (2005), the road users responded positively to the change as the improvements brought into place benefited all road users.

Furthermore, the average daily traffic of pedestrians varied from 1000 to 4000 at different spots and the average travel time gain by pedestrians, was estimated at four minutes per kilometer once the new walkways were implemented.



2.7.2 Examples in South Africa - Thaba Nchu, Bloemfontein

2.7.2.1 Background

The second example is located 67km to the east of Bloemfontein, Thaba Nchu, and is characterised with a development pattern of 37 villages surrounding the peri-urban centre, some are as far as 35 kilometres from the closest peri-urban centre. Thaba Nchu is characterised with key pedestrian routes that do not have NMT facilities (Mangaung Metropolitan Municipality, 2014).

2.7.2.2 NMT Problem experienced

There were two NMT problems identified in the area, which are:

- One of the main mobility corridors entering Thaba Nchu is Brand Street, which is one of the corridors that are adjacent to two main schools. Prior to road interventions, the street had no NMT facilities or any form of traffic calming measures for school kinds crossing the street. Crossing for schoolchildren was extremely dangerous with the high speeds at which vehicles travelled without stopping.
- The second identified problem is located in Thaba Nchu 16, which lies on the southern side of the N8. Google street view maps (2010), demonstrated that the area had no direct access to Brand Street in order to gain access to the N8 and all other internal roads were gravel with no NMT provision.

2.7.2.3 Object for intervention

- i. To increase pedestrian safety and convenient travelling for NMT users;
- ii. To create access for public transport and NMT users;
- iii. Educate commuters on road safety and NMT.

2.7.2.4 Intervention - Engineering

- i. Brand Street is now upgraded with sidewalks on both sides of the road, sufficient pedestrian signage and a bus stop; pedestrian crossing at the school, a raised pedestrian crossing and the road was resurfaced. Access to the main school along the corridor is improved and a provision for sidewalks has been made.





Figure 2-8: Brand Street: 2010
Source: www.google.co.za/maps



Figure 2-9: Brand street: 2014
Source: The Author



Figure 2-10: Entrance of School: 2010
Source: www.google.co.za/maps



Figure 2-11 New Entrance at the school: 2014
Source: The Author

- ii. The access routes and pedestrian walkways within Thaba Nchu Extension 16 were constructed with block paving. Access was constructed from Brand Street into the community.



Figure 2-12 No access to Brand Street: 2010
Source: www.google.co.za/maps



Figure 2-13 Constructed Access to Brand Street: 2014.
Source: The Author





Figure 2-14 Unpaved internal streets: 2014
Source: Author



Figure 2-15 Paved internal streets: 2014
Source: Author

2.7.2.5 Intervention – Education

The Mangaung NMT awareness campaign took place in May 2014. The campaign focused on the three main townships/villages in Mangaung, Botshabelo, Thaba Nchu and Bochabela. It was the first awareness campaign that solely focused on NMT. The Author, Rathete, had the privilege to head all the conferences in partnership with the Municipality.

The conference aimed at educating the community on what is NMT, the importance of a NMT network and road safety. Key challenges were also identified and the attendees had the opportunity to share their experiences and challenges regarding NMT. The inputs were valuable and taken into consideration when plans were developed further.



Figure 2-16: Mangaung NMT Awareness Campaign
Source: Author

2.7.2.6 Impact of the intervention

The aggressive road work interventions had a significant impact on the pedestrians and other road users. The provision for sidewalks, bus stops and pedestrian crossings along Brand Street benefited the learners in the area making for safe and more easily accessible. The changes also restored some dignity into the area of Thaba Nchu, making it more liveable and greatly accessed.

The educational intervention was a success as it provided the opportunity for community members to engage on the aspect of NMT and gain better understanding on the subject matter. It was important



for community members to understand the rights and roles of NMT users within the transport sector. It was equally important for drivers to understand that NMT users also form a large part of our transport fraternity, and they to need to be respected at all times as road users.

2.7.3 Resume

The transport intervention in Temeke Ward 14 and Thaba Nchu serve as a model to developing countries and rural areas. Both these cases have shown what is achievable to implement projects and policies which support sustainable transport and are exemplars of an alternate approach to the transport system.

The significant levels of the public using NMT as a mode of transport in developing countries is an advantage and a benefit and should be capitalised on. Promoting the quality of these transport alternatives, restricting car use and encouraging other modes of transport in a rural context, can encourage a more a sustainable transport system (Moody, 2012).

As such, rural communities that have been underdeveloped, such as the selected case study of this research, should learn from the examples in this chapter



CHAPTER

RESEARCH DESIGN



CHAPTER 3

3. RESEARCH DESIGN

3.1 INTRODUCTION

The primary purpose of this study is to highlight the current existing conditions of NMT interventions, constraints and opportunities within the selected study rural area in South Africa.

This chapter discusses the research design undertaken which informed the research questions, covers the study area, the adopted collection methods of the data and the different types of data taken. The sample size and the technique employed in analysis and interpretation are discussed in this chapter.

3.2 LOCATION OF DATA COLLECTED

The location for assessments were identified together with the Traffic Officer based in the location; these were areas of high pedestrian concentration and where high accidents were recorded in the study area, see Figure 3-1.

- Maphopha Primary School – A1
- Tibamoshito Primary School – A1
- Maremele Primary School – R555
- Masha Primary School – A1
- Malekane Primary School – A1
- Madibeng Primary School - R555

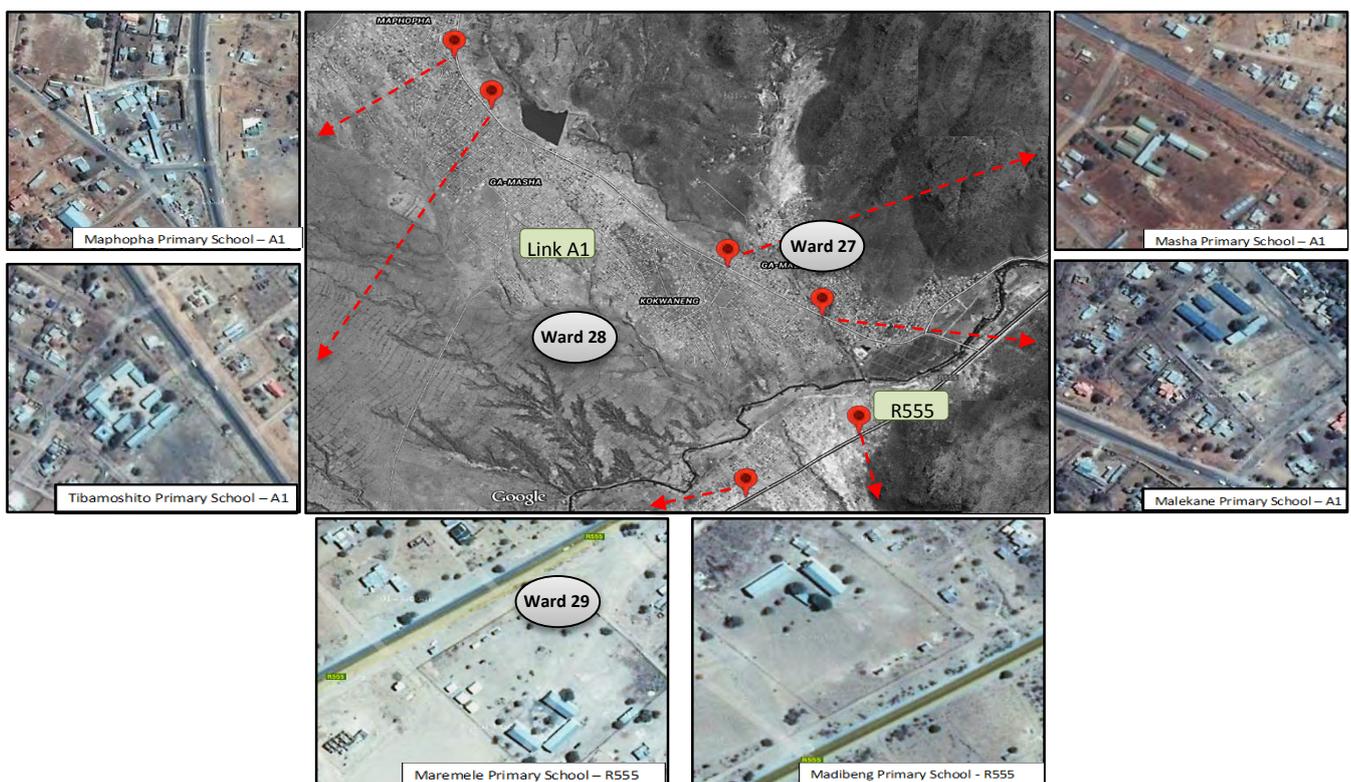


Figure 3-1 Satellite Image of Ward 27, 28 and 29 of the Greater Sekhukhune Local Municipality

Source: www.google.co.za/maps

3.3 TYPE OF DATA, SOURCES OF DATA AND COLLECTION METHODS

The author was guided by the “*Non Motorised User Safety- A Manual for local Rural road Owners*” (Nabors, et al., 2012), in order to formulate the questions for the instruments that were used during the data collection process, which were reviewed and approved by Associate Professor Marianne Vanderschuren (supervisor). The instruments used during the data collection process focused on and, were made sure to be applicable to the guiding questions.

Information was collected by direct site observations, administering survey questionnaires, site photographs, site auditing, GIS or Google maps and by interviewing key community members. All this information is presented in detail in Table 3-1.

Table 3-1 Data information and method of collection.

Type of Data	Description of data	Source	Method of collection used
Primary Data	Demographic data	Site	Administering the questionnaires
	Travel Mode data (Preferred mode and reasons for walking)	Site	Administering the questionnaires and direct observations
	Road Safety Knowledge assessment	Site	Administering the questionnaires
	Infrastructure condition assessment	Site	Direct site observations, photographs
	NMT users	Site	Administering the questionnaires and direct observations, photographs, semi- structured interviews
	Road safety audit	Site	Direct observations
	Focused semi- structured interviews	Site	Administering semi- structured questions
Secondary	Case Study: Province, District and Local Municipality information	Internet published documents Libraries	Research and reading the published documents and visiting the Polokwane library
	Spatial data: Maps	Internet and GIS data	Accessing the Global positioning Systems Data and Census 2011 information.
	Accident data	Limpopo Department of Roads and Transport.	Letter of request of information and visiting the department

The information collected from Table 3-1 is aimed at NMT road users and addressed the following problems:-

- Road Safety for NMT users in the area;



- Importance of NMT facilities in the area;
- NMT related current challenges experienced in the study area;
- The desired/recommended interventions that can be implemented to promote NMT utilisation and improve pedestrian safety.

3.3.1 Pedestrian Surveys

Pedestrian survey questionnaires were performed in July 2013 as part of the Pedestrian Safety and Security and NMT Infrastructure Assessment. The questionnaires related to socio-economic background of the respondents, the mode used for trips, the purpose of the trip and respondents inputs on views on how to improve pedestrian safety in the area. The questionnaires also contained questions regarding level of knowledge with respect to rules of the road and road signs, as well as a level of understanding of what is safe pedestrian behaviour.

The researcher and the research team administered a total of 138 questionnaires and randomly selected road foot based commuters on the R555 and Link A1. The research team consists of eight local Community Pedestrian officers (CPOs), whom had been identified through the Oliphant's River Community Road Safety project and were trained on how to carry out the questionnaire.

The CPOs assisted in order cover the study area extensively, which also allowed for the questions to be asked on the spot.

The questionnaire is appended in Appendix A.

3.3.2 Semi-structured interviews.

The pedestrian surveys were followed by scheduled personal interviews of key community members that demonstrated to have a good understanding of the area, its people, and the road safety challenges experienced by the community. Information regarding who was interviewed and when the interview took place is detailed in Table 3-2.

Table 3-2: Stakeholder interview schedule

Name of stakeholder	Scheduled date
Maphopa Area Local Community Leader	Wednesday 24 July 2013
Community Liaison Officer (The Oliphant's River Water Resources Development Project)	Wednesday 24 July 2013
Two seniors from the Greater Tubatse Traffic Department	Thursday 25 July 2013
The Limpopo Department of Roads and Transport Official	Tuesday 21 October 2014
Two teachers from Masha Primary school	Friday 26 July 2013



Name of stakeholder	Scheduled date
Two Community Pedestrian officers (CPO)- (Oliphant's River Community Road Safety project (OCRSP))	Thursday 25 and Friday 26 July 2013

The participants were able to answer all the questions asked which are attached in Appendix B. They elaborated further on aspects that could have not been covered through the survey questionnaires.

3.3.3 Pedestrian Road Safety Audit

Pedestrian Road Safety Audit is a formal procedure, which can be applied to all phases of road development projects. A Road Safety Audit is structured to review the safety performance of a road project, but is not intended as a prescription for redesign. The reporting procedure is intended to outline potential or existing road safety issues and establish a basis for an acceptable solution to the potential safety problems (Groenewald, 2013).

A site visit was undertaken by auditor, Melissa Groenewald, and The Author, Mmanake Rathete, accompanied the auditor from the 24th to the 26th July 2013 during daylight conditions.

The assessment focused specifically on pedestrian safety risks and on increasing pedestrian infrastructure and included improving understanding of pedestrian issues. Road Safety Audits are a cost effective method to proactively identify safety issues and make suggestions on measures and facilities to improve pedestrian safety (Nabors, et al., 2007)).

The procedures set out in the RTMC South African Road Safety Audit Manual (2012), have been followed in undertaking the draft design road safety assessment. However, the auditor points out that no guarantee is made that every deficiency has been identified. Further, if all the recommendations in this report were to be followed, this would not guarantee that the site is 'safe'; rather, adoption of the recommendations should improve the level of safety of the facility.

3.3.4 Site observation and photography

The capturing of photographs took place at the same time the questionnaires were administered. The photos were taken to document the existing NMT and road safety challenges experienced in the study area.

3.4 VERIFICATION OF THE DATA

To determine the accuracy and suitability of the data collected from field, the data had to be edited. Tables, charts and graphs are used to present the analysed quantitative and qualitative data using statistics. The analyses of the administered questionnaire was used to analyse the qualitative data with making reference to the study objectives. Interpretations of the research findings, discussions,



recommendations and conclusions of the study were formed from the information provided from the results of the data analysis.

GIS, Photoshop program and MS Excel program was used to carry out data handling, data documentation and data management. Furthermore, the programs were used to present the findings from the data collected into graphs, pie charts, photographs and tables where applicable.

The researcher later exported the analysed data to Microsoft Word were, emerging issues, recommendations and conclusions of analysis's were developed.

3.4.1 Access and Approval

The research team did not encounter major problems during the collections of the questionnaire surveys. More than 95% of the pedestrians approached were willing to assist with the research. Those who could not answer the questions were either in a rush, not interested, or felt that there are far more important social issues that need to be address first.

Scheduling one on one interviews with stakeholders mentioned in Table 3-2 was easily achievable and all of them adhered to the scheduled time, except for the officials from the Limpopo Department of Roads and Transport. The meetings were rescheduled two times mainly due to their busy schedules.

3.4.2 Challenges in data collection

The accident data was difficult to access from the traffic department within wards 27, 28 and 29. The researcher was transferred to the provincial department offices, Limpopo Department of Roads and Transport, to obtain the data which was already summarised. The summary had very little detailed information about road accidents but could determine the following:

- location and time of the accidents;
- age or gender information;
- type and cause of accident; and
- severity of the accidents and number of injuries.

CHAPTER 4



**CASE STUDY AREA - GREATER
TUBATSE LOCAL MUNICIPALITY**

CHAPTER FOUR

4. CASE STUDY AREA ANALYSIS - GREATER TUBATSE LOCAL MUNICIPALITY

4.1 INTRODUCTION

This chapter provides an overview of the background information, context and location of the study area looked at during the research process. A broad overview of the national, provincial and local municipality context is discussed and continues with detailed information of the study area pertaining to the subject of the study.

4.2 NATIONAL CONTEXT

4.2.1 South Africa Overview

The Republic of South Africa (RSA), is a country located in Southern Africa. The country borders the neighbouring countries of Namibia, Botswana and Zimbabwe in the north; Mozambique to the east; and Lesotho and Swaziland lie within the country. South Africa is the 25th-largest country in the world by land area, with close to 52 million people (SouthAfrica.info, 2012).

4.2.2 Transport Overview in South Africa

An efficient, effective and sustainable transport system is one of the most critical factors for the performance of the South African economy, its growth and the creation of employment and wealth necessary to help overcome the significant social challenges that the country faces.

The South African transport network has a total length of 750 000 km of road network, of which an estimated 17.6% comprises of public roads which are not formally gazetted by the Authority (unproclaimed gravel roads) (SANRAL, 2014). Of the proclaimed road network, 25.5% is paved and 74.5% are gravel roads.

The road network is characterised by wide disparity in condition, among the different categories. In 2013, SANRAL recorded that 26 % of municipal and provincial roads were in a poor to very poor condition and 38 % in a good to very good condition (SANRAL, 2014). The management and maintenance of roads is relatively average in Provincial and Municipal departments while SANRAL operations meet or exceed world standards with 48% of the SANRAL network in good to very good condition (SANRAL, 2014). Although national roads exceed world standards, close to 80% of the



The province is divided into the following five District Municipalities:

- Vhembe District,
- Capricorn District,
- Waterberg District,
- Mopani District, and
- Great Sekhukhune District.

The districts are further divided into 25 local municipalities and none of the districts or the major cities within the districts has metropolitan status. Hence, all the urban areas are classified as small cities or small towns (Punt, et al., 2005).

The Province is largely a rural province, making up 10.4 % (5 518 000 million) of the national population and 96.7% being Black African (Statistics South Africa, 2013). The province’s rural areas are inhabited by the majority of the population in comparison to the national average of 50% (Kwame & Kwabena, 2011). Census 2011 indicates that the majority of the province’s population is still young, aged below 35 years, with females accounting approximately 52% of the province’s population (Census 2011 Municipal Report, 2012).

The unemployment rate of 39.5% in the province is still relatively high (see Figure 4-2). However, it has decreased by 7.8% in 2011 over the past 10 years (Census 2011 Municipal Report, 2012). The education sector has also shown some improvement, the population older than 20 years, that had no schooling, reduced to 17.3% in 2011 from 33.2 in 2001 (Census 2011 Municipal Report, 2012).

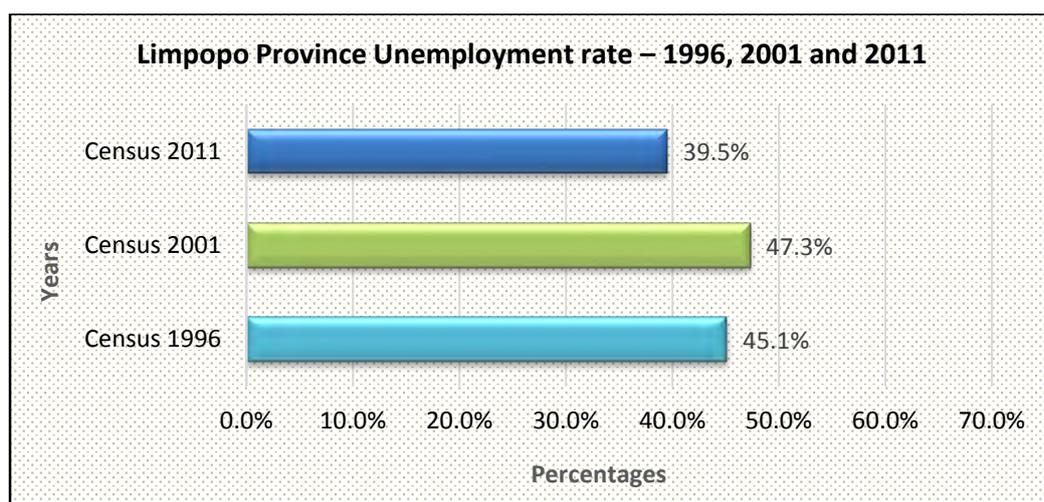


Figure 4-2 Unemployment Rate in Limpopo

Source: Census 2011 Municipal Report

The Limpopo Province contributed 7.2% towards the national gross domestic product (GDP) in 2010 making it the fourth lowest province contributing in the country, the highest being Gauteng with a 33.7% contribution (see Figure 4-3).

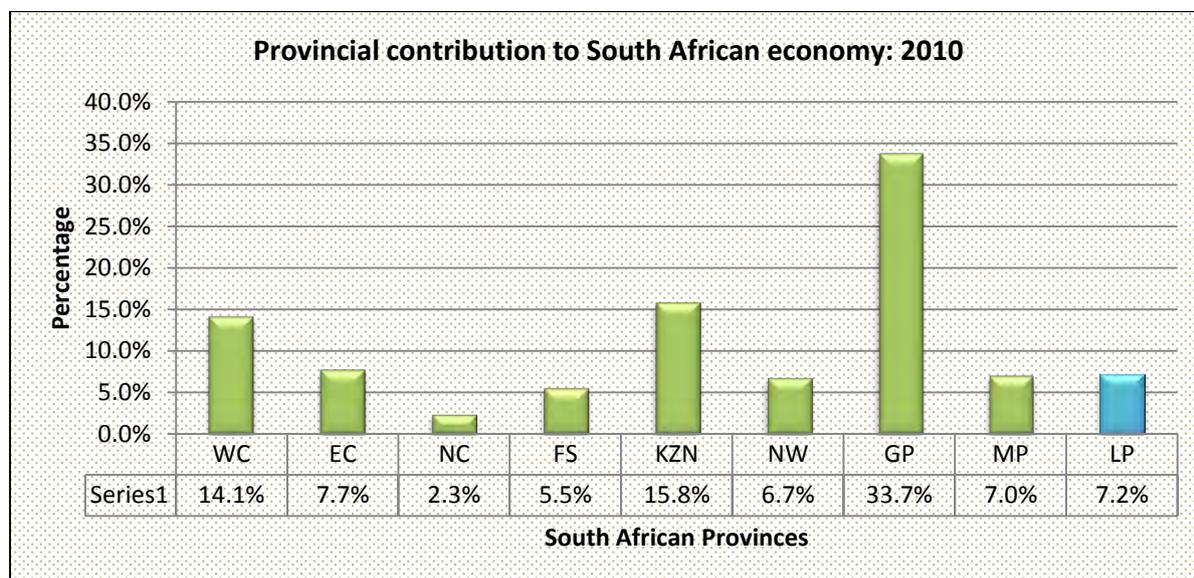


Figure 4-3 Comparison of the GDP contribution rates, SA provinces

Source: Statistics SA 2011

The primary driver of economic activity in the province is mining, contributing 23, 5% to the country’s Gross Domestic Product per Region (GDPR), see Figure 4-4 (Statistic South Africa, 2011). Limpopo is rich in mineral deposits, including iron ore, platinum-group metals, chromium, diamonds, high and middle-grading coking coal, antimony, copper and phosphate, as well as mineral reserves, such as emeralds, gold, scheelite, vermiculite, magnetite, mica and silicon (Young, 2013).

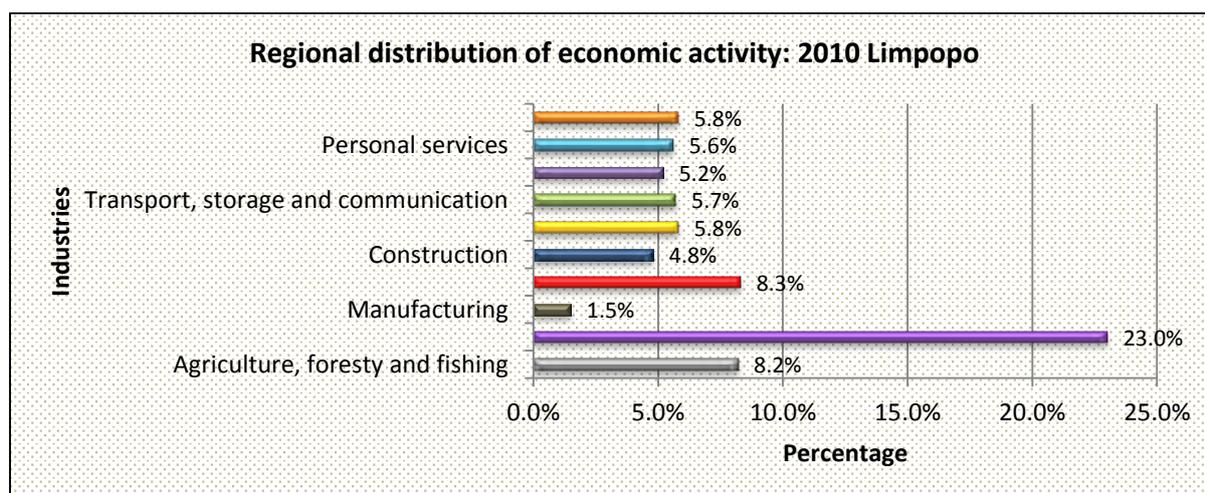


Figure 4-4 Contributors to the GDPR- Limpopo

Source: Statistics SA 2011

Limpopo province has an estimated total road network of 22 200km, with 31% paved (6450km) and the rest being gravel and dirt road. Local roads constitute 53% of the network, followed by the provincial roads constituting 33% and lastly 14% being National roads (Limpopo Province, 2012).

According to the 2013 NHTS, Limpopo has a higher percentage of scholar commuters than working commuters that walk all the way to area of education and work respectively. Scholar commuters make up 79% of those that walk all the way to school, while 12% and 9% use public transport and private vehicle to respectively (Statistic South Africa, 2012). Transportation for scholars is a huge problem within in rural communities of Limpopo Province. Majority of the scholars are captive NMT users due to high rates of public transport fees and the lack of other reliable modes of transport within the area.

4.4 SEKHUKHUNE DISTRICT MUNICIPALITY (SDM)

4.4.1 Municipality Overview

The Sekhukhune District Municipality (SDM) was established in 2000 and approximately measures up to 1 326 437 ha in area and forms part of the Olifants River Basin. The district is located outside major towns and cities, with Johannesburg and Pretoria being roughly 200 km and 250 km away respectively and North-West of Mpumalanga Province and South of Limpopo Province (SANRAL, 2007). The area is largely rural and it consists of five local Municipalities, namely; Greater Tubatse, Fetakgomo, Elias Motsoaledi, Ephraim Mogale, and Makhuduthamaga (Sekhukhune District Municipality, 2010)

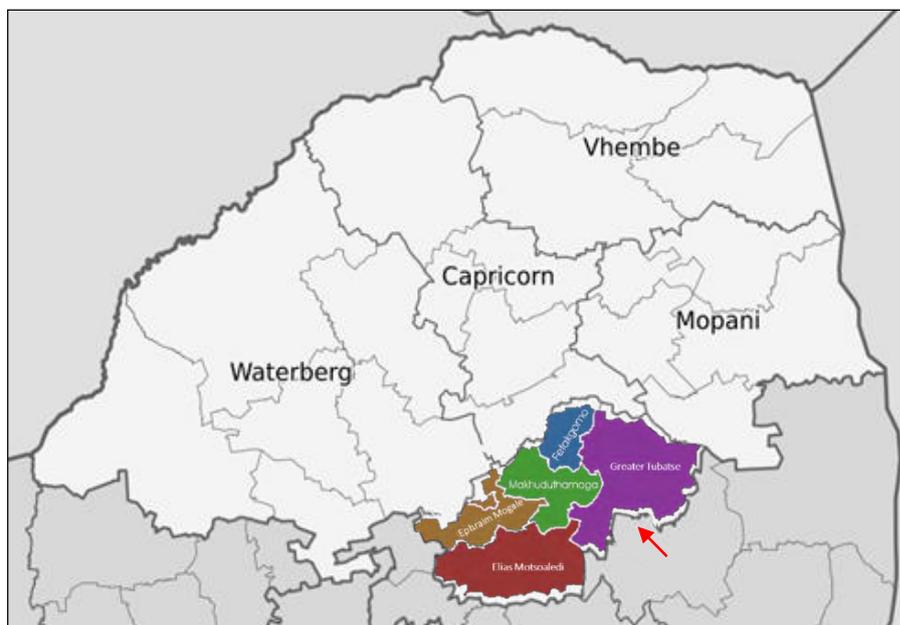


Figure 4-5: Local District Municipalities in Limpopo

Source: www.sekhukhune.gov.za

4.4.2 Demographic status of SDM

4.4.2.1 *SDM population*

There are 1 091 770 people living in the Sekhukhune District Municipality, with 53% being female (Statistic South Africa, 2012). Sekhukhune is 94% rural and 5.3% urban (SANRAL, 2007).

4.4.2.2 *SDM Economic status*

The Sekhukhune District has different variations of economic activities. Mining is one the three important and second biggest activity which lies in the Greater Tubatse municipality and it contributes 20% towards the Gross Geographic Product (GGP) of the Province, with 52% and 17% contributed by community services and trade respectively (Greater Sekhukhune District Municipality , 2010). Additional economical activities include construction, housing, retail and an emerging tourism industry due to the district's rich cultural diversity (SANRAL, 2007).

Most farming in the area is done on a subsistence basis and only 30% of the SDM land is used for commercial farming. This explains why agricultural activities contribute minimally towards the GGP. Water scarcity is also one of the reasons that farmers do not perform well. The local government's biggest priority is investing in irrigation schemes and projects.

4.4.2.3 *SDM social- economic status*

The majority (88.7%) of Sekhukhune houses are formalised structures, which are on separate stands and only 3.8% are traditional huts (Census 2011, 2012).

The District's illiteracy level is relatively high, with almost 20.9% of the population aged 20 years and older having no formal education at all. Approximately 6.1% of the population has acquired tertiary qualifications (Census 2011, 2012).

The District is highly distressed with high levels of poverty. In 2011, the unemployment rate at 51.6% was one of the highest in the Province of Limpopo (Census 2011, 2012). These high levels of poverty and unemployment continue to undermine interventions and developments to increase the quality of life of inhabitants and communities (Greater Sekhukhune District Municipality , 2010).

4.5 THE GREATER TUBATSE LOCAL MUNICIPALITY COMMUNITY

4.5.1 *Description of Greater Tubatse Municipality Area*

On the 5th of December 2002, the Greater Tubatse Local Municipality was established as part of the Sekhukhune District Municipality. The municipality has the 5th largest population in the province of Limpopo. Furthermore, it is largely rural in nature, with 90% (302 100 people) of the population



residing in tribal areas and 8% residing in urban area (Census 2011, 2012). The district is characterised with 220 settlements, of which 173 are villages and 40 are urbanised settlements, situated in the small towns of Steelpoort and the economic center of the municipality, Burgersfort. The municipality is located north of the N4 highway to Nelspruit, and east of the N1 highway to Groblersdal and Polokwane (see Figure 4-6) (The Greater Tubatse Municipality, 2009).

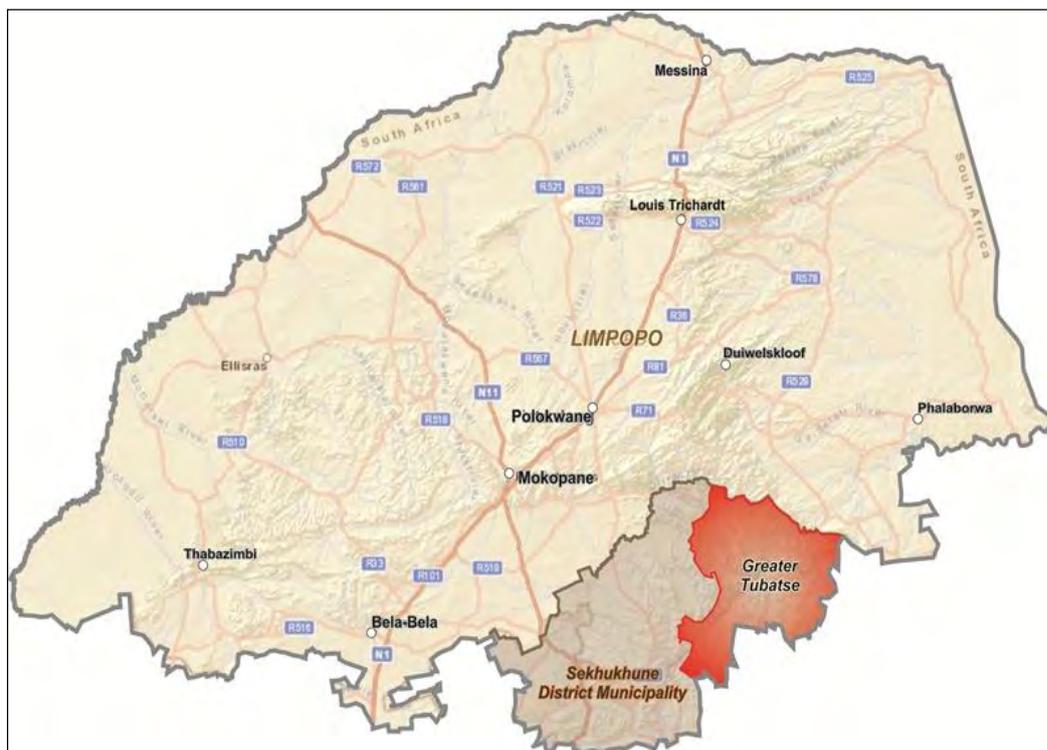


Figure 4-6: Location of the Greater Tubatse Municipality

Map by: Eulene Cronje

The Local Municipality is made up of 31 wards which comprises of 166 villages (The Greater Tubatse Municipality, 2009). The geographical area of the municipality is approximately 4500 km². The Municipality takes pride in being South Africa's first democratic platinum city which makes it the hub of the booming mining sector (The Greater Tubatse Municipality, 2009). According to Fin24.com, there are 15 mines in the municipality in Burgersfort and the town is estimated to be a "fully fledged city" by the year of 2016, with almost 23 billion rand invested in the area (samaYende, 2006).

4.5.2 Selected Study Area (Ward 27, 28 and 29)

The research concentrated on three of the 29 wards of the local municipality namely; Ward 27, Ward 28 and Ward 29 (see Figure 4-7). The study focuses on two major links; the R555 and Link 1A. Both the mentioned links run through built up communities, connecting Polokwane and Burgersfort and Tshwane and Burgersfort respectively. A total of eight primary schools were identified where in-depth analysis was done.

The Wards serves eight communities namely: Maphopa, Madidimola, Ga-Malekane, Ga-Mampururu, and Kokwaneng, Ga-Masha, Maphopha and Ga-Maepa.



Figure 4-7: Location of Ward 27, 28 and 29
Map by: Eulene Cronje

4.5.3 Ward 27, 28 and 29 Demographics

4.5.3.1 Population

There are approximately 36 000 people residing in ward 27, 28 and 29 of the Greater Tubatse area that make up a total of 7 500 households (Census 2011, 2012). Majority of the households reside from ward 28 of the study area as illustrated in Figure 4-8 and Figure 4-9, respectively. The population is 99% black and 1% is made up of coloureds, whites, and Indians (Census 2011, 2012).



Figure 4-8: Population Dot Density indicating areas of High Density
Map by: Eulene Cronje

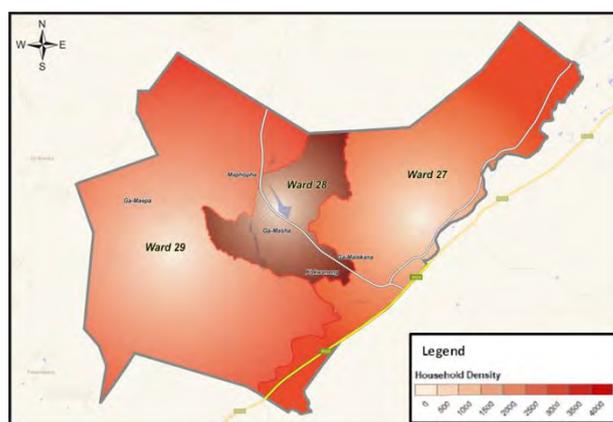


Figure 4-9: Household Density
Map by: Eulene Cronje

The Greater Tubatse Municipality has a very low population density of 0.72 people per hectare, largely due to 40% of the municipality not being developed (Housing Development Agency, 2013)



4.5.3.2 Land Use

Figure 4-10 below indicates the land use within ward 27, 28 and 29. The study area is well represented by a number of schools, of which nine are primary schools and two high schools.

Majority of the schools are closely located to major routes running through the villages, which poses a major pedestrian safety risk. Most of the land uses, predominantly residential areas, have been developed in parcels around a secondary road network.



Figure 4-10: Land use map

Map by: Author

4.5.3.3 Status of education in Ward 27, 28 and 29

According to Census 2011, these findings are verified in Ward 27, 28 and 29 where the largest part of the population has had high school education (43%). Only 29% has gone through primary school, and 12% had no education (Census 2011, 2012). Regarding the tertiary education, only 2% has completed training at a higher education training institute. Less than a percentage of the population falls under “other” category and 14% not applicable (see Figure 4-11) (Census 2011, 2012).

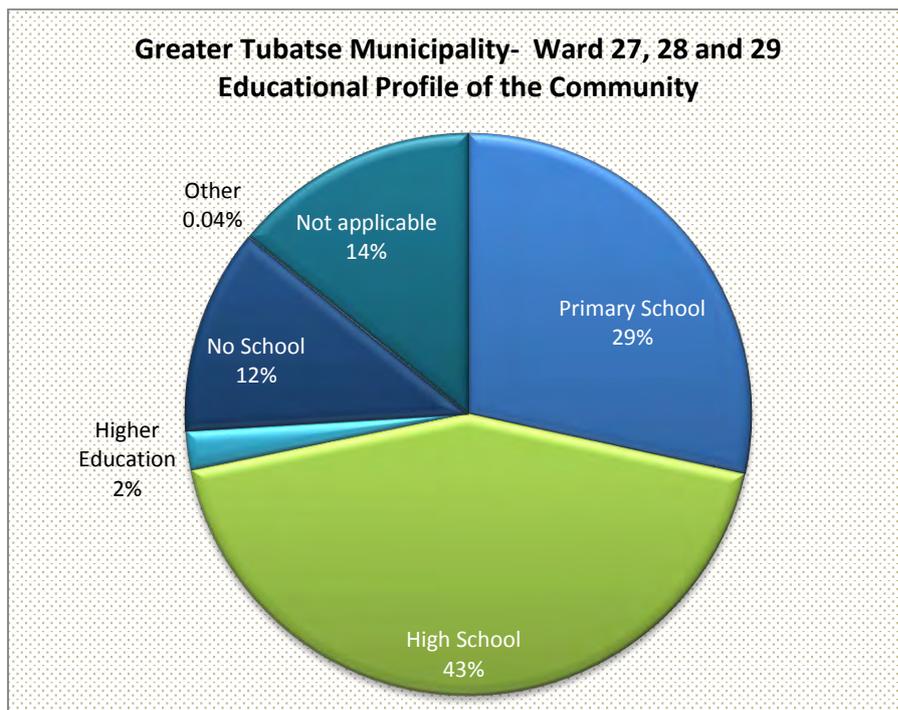


Figure 4-11: Educational profile of the community

Source: (Census 2011)

4.5.4 Socio-economic status in Ward 28, 29 and 30

4.5.4.1 Employment rate

A significantly low percentage of the population is economically active (10%), followed by 21% that are not employed or discouraged not to work. Over 23% of the population is not working, therefore, not economically active (Census 2011, 2012).

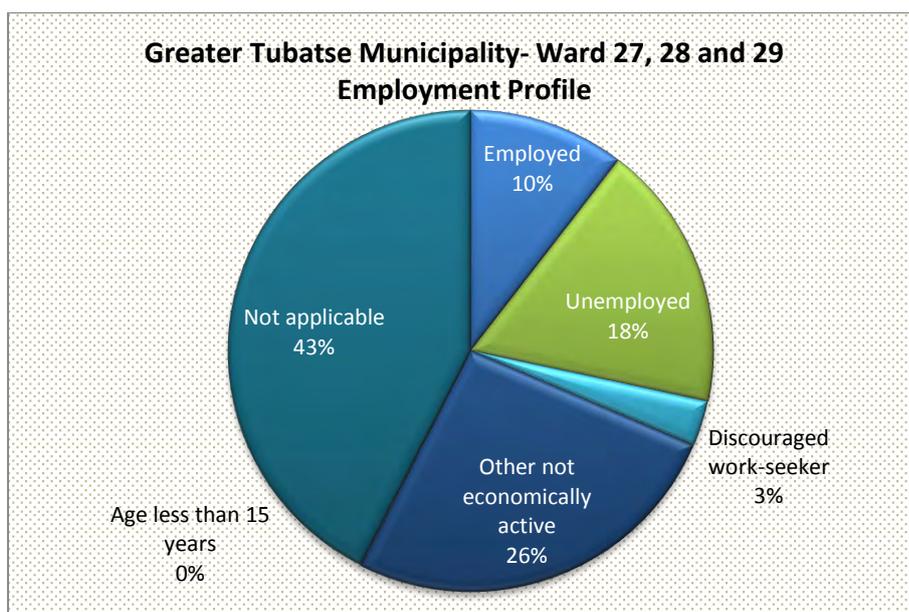


Figure 4-12: Employment in Tubatse

Source: (Census 2011)

Majority of the people that are economically active in the three wards, work within the formal sector (76.6%), with 13% working in the informal sector (Census 2011, 2012).

4.5.4.2 Individual income

Almost 55% of the people in the Greater Tubatse (of the economically active population) are earning no income at all, making the local municipality relatively poor (Housing Development Agency, 2013).

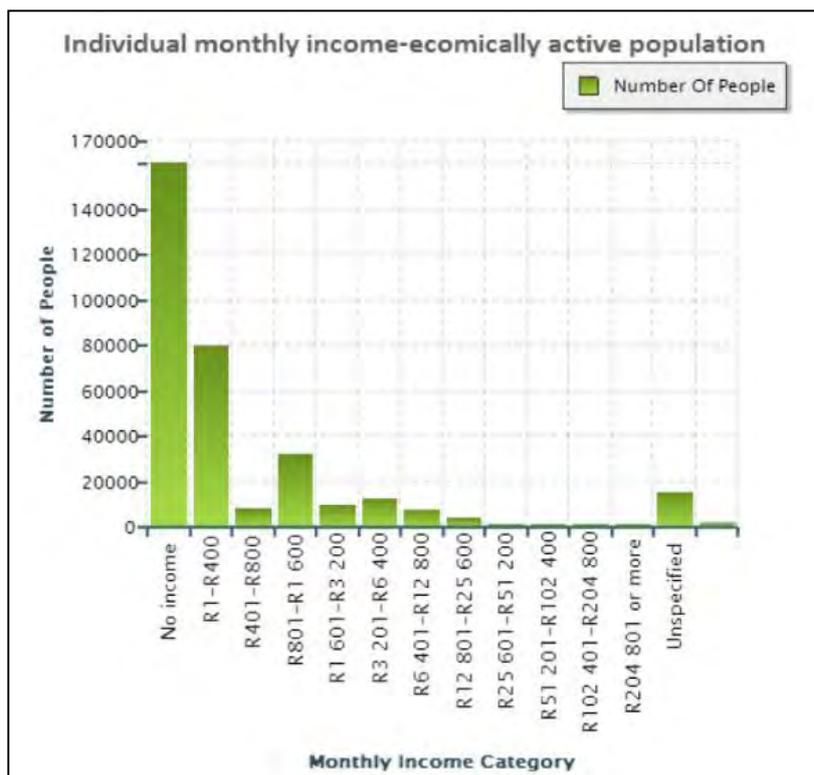


Figure 4-13: Individual monthly income-economically active people

Source: Housing Development Agency, (2013)

Individual monthly income in Tubatse is very little. Approximately 6 000 individuals in the Greater Tubatse Municipality earn more than R6400 per month. According to the Housing Development Agency (2013), there has been a significant increase in the revenue bracket earnings between R3500 and R 12 800 per month.

4.5.4.3 Health

According to the Sekhukhune District Municipality 2013/14 Draft Integrated Development Plan (2014), the local municipality has 78 health care facilities. Of the 78 facilities, 48 are mobile clinics, 28 are normal clinics and 2 hospital. In the 78 facilities, 13% were identified to be providing satisfactory service. More than 140 villages do not have access to health care facilities and more than 45% are located within a 5 km radius from the nearest healthcare facility (Sekhukhune District Municipality, 2014).

4.5.5 Service Delivery

The socio-economic service status in the three wards are summarised as follows (Census 2011, 2012):

- More than 85% of the population has access to electricity with less than 1% not having access to any form of energy;
- Access to sanitation in the municipality still remains a major challenge. Compared to other local municipalities, the Greater Tubatse Local Municipality scores the highest with regards to households not having access to toilets standing at 6.5%;
- More than 65% of the community own their own refuse dump, or have a communal refuse spot. However, 26% of the population still doesn't have access, which has serious health and hygiene implications; and
- The Greater Tubatse Local Municipality is located near the Steelpoort River which is tributary of the Oliphant's River. The municipality being in close proximity to the river, explains the high percentage of households (67%) accessing water from rivers and streams.

4.5.6 Transportation and Road Network

4.5.6.1 Mode of Transport

At present, the car ownership is relatively low at 19% as compared to commuters who use alternative modes of transport, see Figure 4-14. Furthermore, the figure below evidently demonstrates that wards 27, 28 and 29 are a predominantly pedestrian community with an average of 81% of the population using foot as a mode of transport to access their final destination, or public transport.



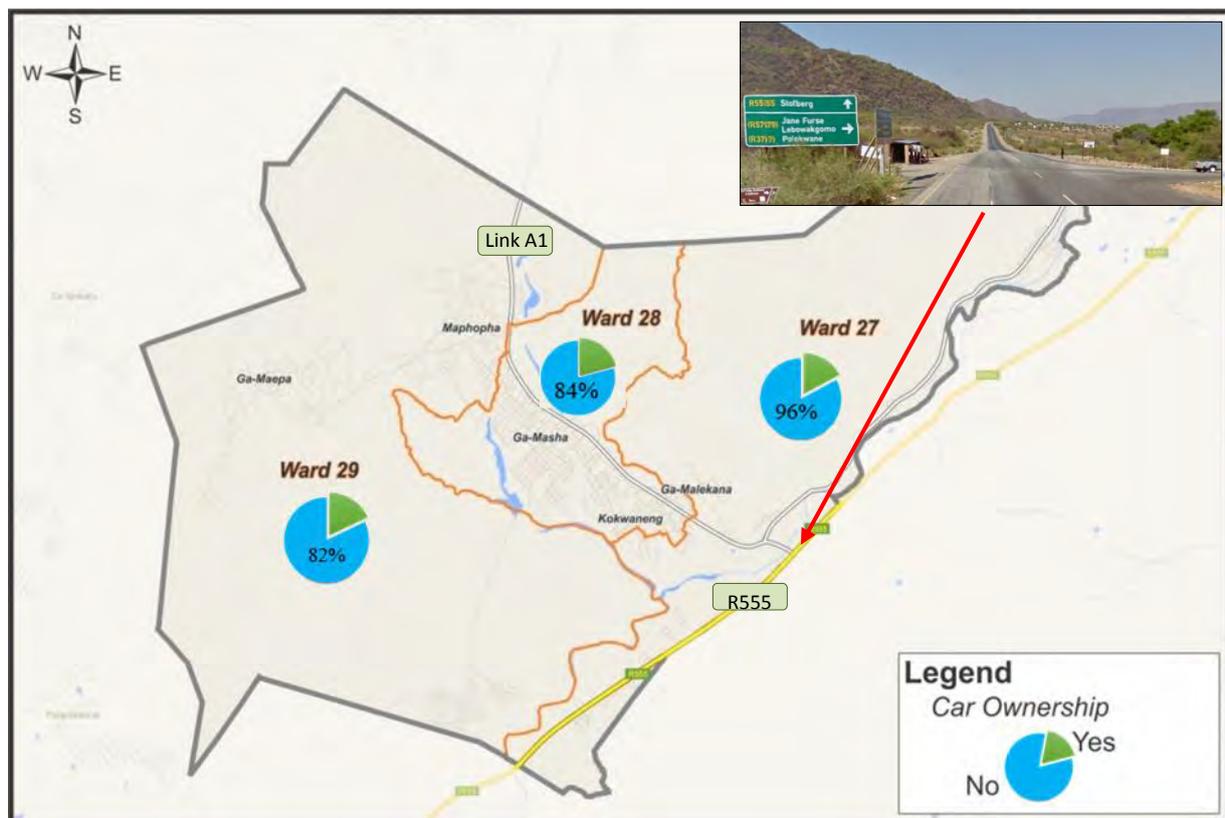


Figure 4-14 Car ownership percentage in the three wards

Map by: Author

4.5.6.2 Existing Transportation network

The study area extensively comprises of minor graveled internal road footpaths and two major road networks that serve the three wards which are located within the built-up area. The main attributes of the two main roads are as follows:

- The provincial road, R555, which runs parallel in a south east direction to the study area, connecting Burgersfort and Steelpoort to Stoffberg (Sekhukhune District Municipality, 2014).
- Link A1, which dissects the study area, lies between the R579 and R37 and joins the two corridors in a north-west direction towards Polokwane.

The two links studied constitute as main logistics and freight corridors, which connect the district with major nodes and areas that assist the district economically (Sekhukhune District Municipality, 2014).

4.5.6.3 Current Status of Infrastructure and Challenges

4.5.6.3.1 Road Network Infrastructure

Transport infrastructure is crucial to the development of any nation (DBSA: 2006). Sustaining an effective accessible road network in rural areas, like the study area, is a challenge (Greater



Sekhukhune District Municipality , 2010). The study area is characterised with more than 80% of its roads being gravel roads, which are rarely maintained through municipal programs. The roads that are paved are also in a bad condition, filled with potholes and faded barrier lines.



Figure 4-15 Existing Road infrastructure and challenges along Link A1 and R555

Source: Author

4.5.6.3.2 NMT Network Infrastructure

Pedestrian sidewalks that are supposed to serve the large amount of commuters travelling by foot are non-existent. The only provisions made are pedestrian crossings which need to be repainted and a few bus shelters constructed on the new link just off the A1. Another challenge for pedestrians in the area, predominantly school kids, is the distributaries running through the community from the Steelpoort River.



Source: Author

Source: Author

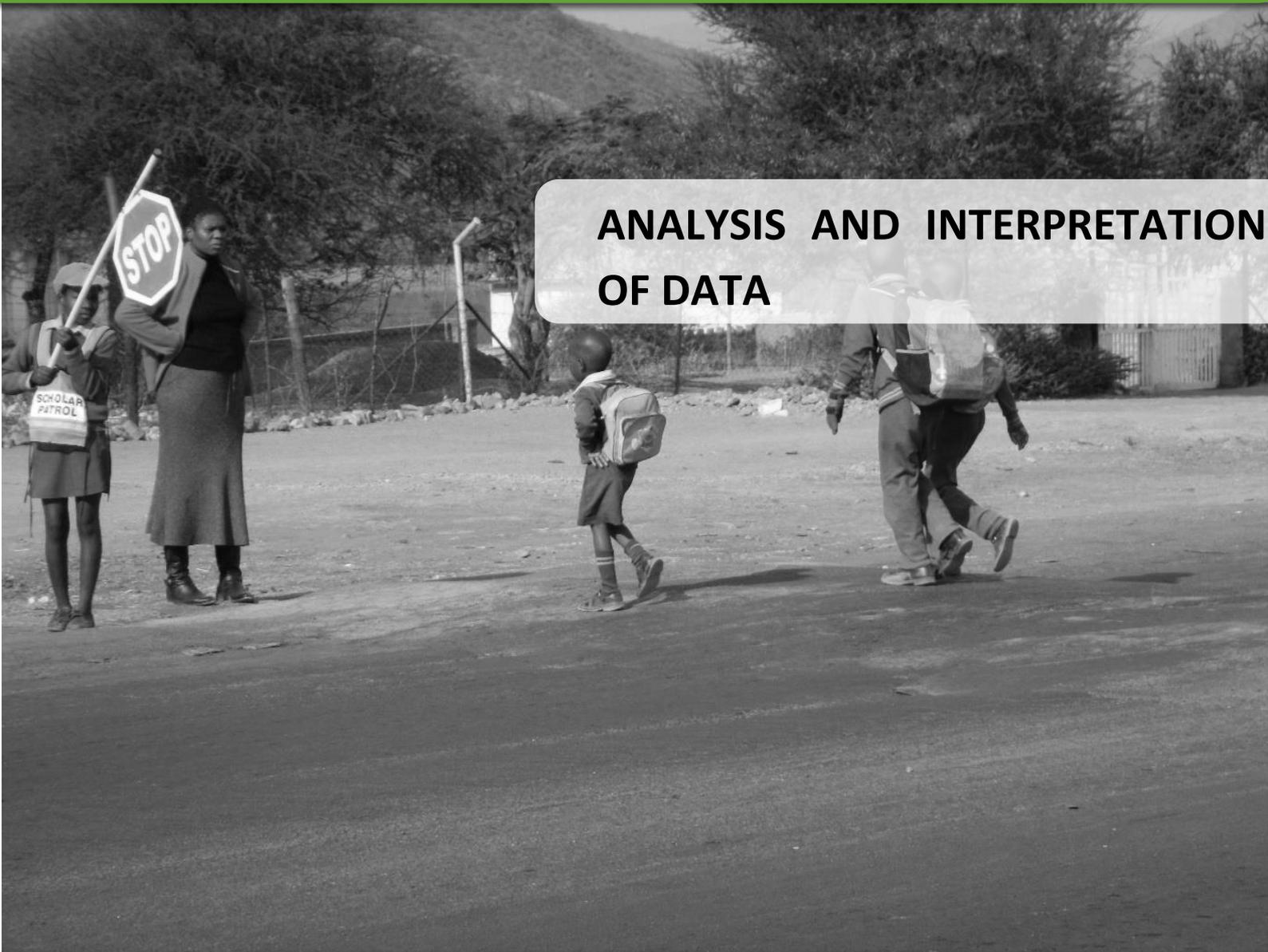
Source:
www.midlandsconservanciesforum.wordpress.com

Figure 4-16 Existing NMT infrastructure and challenges



CHAPTER 5

ANALYSIS AND INTERPRETATION OF DATA



CHAPTER FIVE

5. ANALYSIS AND INTERPRETATION OF DATA

5.1 INTRODUCTION

Chapter five discusses and presents the data that was administered through questionnaire surveys, site audits and observations, site and geographic photographs, maps and semi structured interviews. The demographic characteristics, number of pedestrian counted, travel based information, accident statistics, level of the road safety conditions and level of education on road safety are analysed and likewise, presented in this section.

5.2 ANALYSIS OF QUESTIONNAIRES

5.2.1 Demographics

To determine the socio-economic status of respondents who took part in the survey, a demographic survey was done. Demographics are the fundamental objective of this study, and variables such as gender, race, and age and employment status were investigated.

5.2.1.1 Response Rate

A percentage of 55% were female participants and 45% were males, see Table 5-1. All questions in the survey forms were answered by all the respondents.

Table 5-1 Respondents by gender

Gender	Frequency	Percentage (%)
Male	62	45%
Female	76	55%
Total	138	100%



Respondents between the ages of 26 – 40 years, which account for 41%, were the majority of those who were walking, followed by the 18 -25 age group which was 32%.

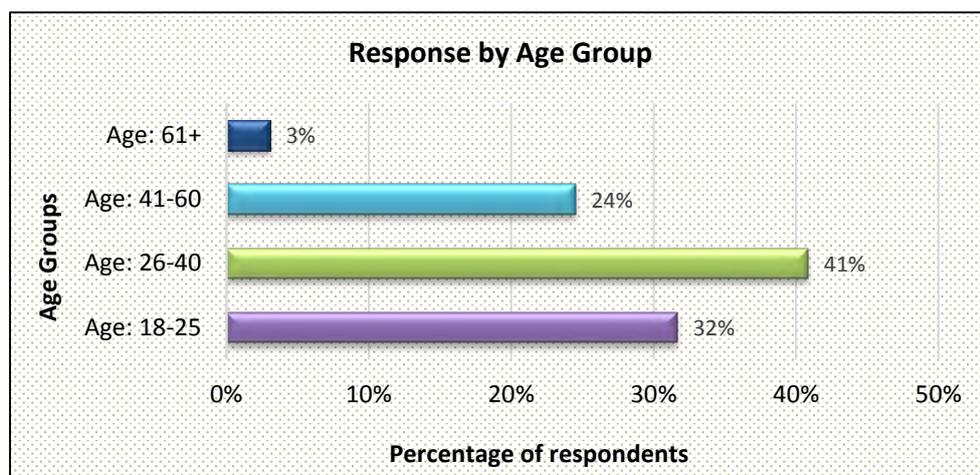


Figure 5-1 Respondents by age group

5.2.1.2 Economic status

Figure 5-2 shows that from the 98 people questioned, a significant 64% of the respondents were unemployed, and only 22% and 14% have formal employment and are self-employed respectively.

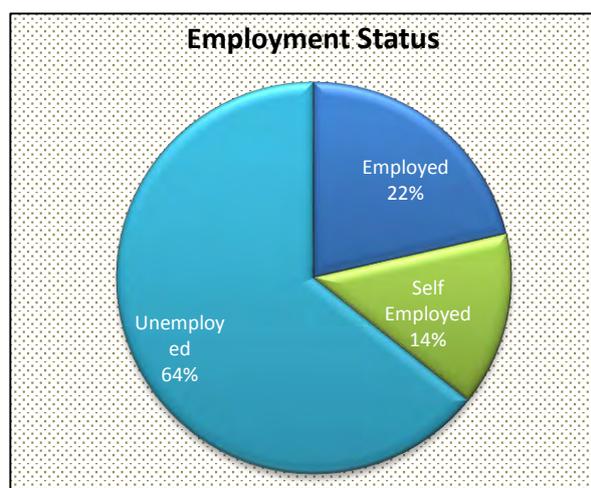


Figure 5-2 Occupation of the respondents

5.2.1.3 Purpose of journey

All the respondents questioned were walking during the surveying period and they were asked what the main purpose of their journey was. A large number of the respondents (37%) were traveling from school, followed by 20% of those who were traveling for retail purposes (see Figure 5-3).



Furthermore, over 14% were traveling to access public transport and 15% were traveling to a place of work.

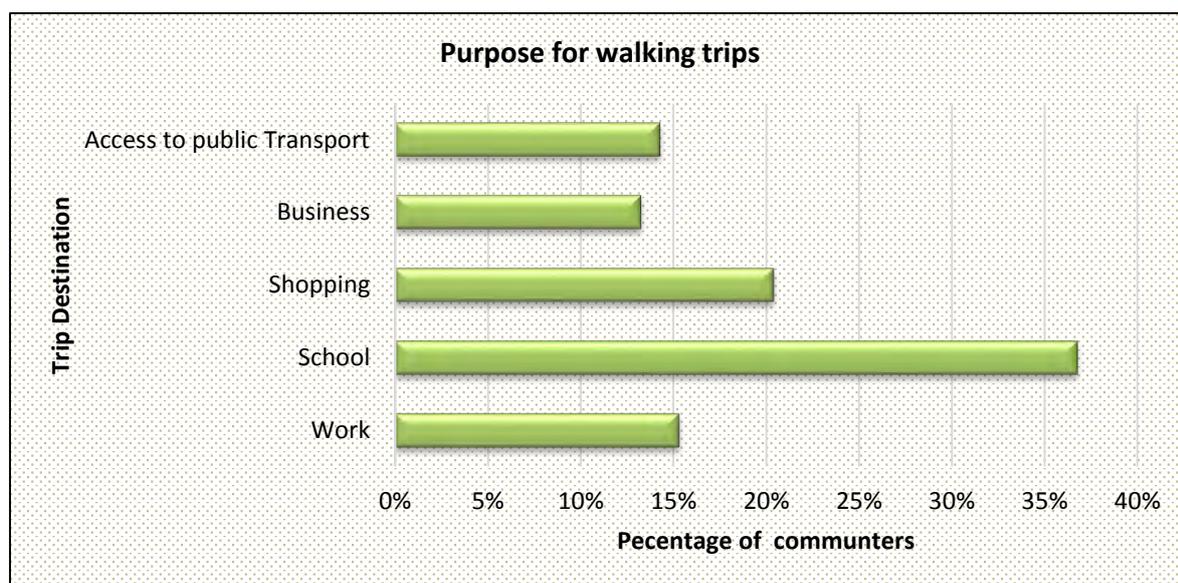


Figure 5-3 Purpose for walking trips

REFLECTION

According to the Census survey done in 2011, the three wards in this study presented that females made up 52% the population and males comprised of 48%, therefore the data collected is a close true reflection of ward 27, 28 and 29 (Census 2011 Municipal Report, 2012). With that said, the data implies that females and people in the age group of 28 – 40 years which, most fall under the youth category, are the main users of NMT.

5.2.2 Travel Mode

To understand transport problems experienced by community members better, travel patterns were studied for each of the respondents.

5.2.2.1 Preferred Mode of Transport

Each of the respondents were asked what mode of transport do they prefer using when traveling to key destination such as area of education or workplace. Some 46% of the respondents answered public transport, with 31% preferring taxis and 15% indicating bus. NMT also constitutes a large percentage in the area with 34% preferring foot as a mode of transport and 2 % cycling. A percentage of 18% of the respondents indicated that they used private cars of which, 15% had valid driver’s license and 15% owned the vehicles (see Figure 5-4)



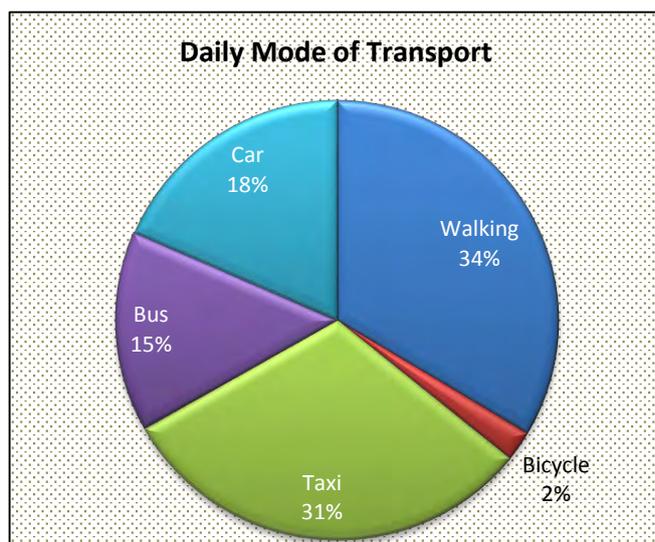


Figure 5-4 Preferred Mode of Transport

5.2.2.2 Reasons for Walking

The respondents that preferred walking as a mode of transport, where asked for the reasons they opted for walking as a means of transport. According to Figure 5-5, 53% indicated that they are captive NMT users, due to the lack of money, followed by 22% indicating that the travel distance was worth the walk. A small percentage of the respondents indicated that they lacked access to public transport, due to them being located far from the main road where taxis and buses collected commuters.

5.2.2.3 Views of current foot paths

The study displayed no footpath Infrastructure and respondents were further asked on the level of importance regarding the shortage on pedestrian crossings, stop signs, speed humps and sidewalks. Of the respondents, 64% indicated that it is very important to have these in place, followed by 24% who indicated that it was not important at all to have the facilities in place.

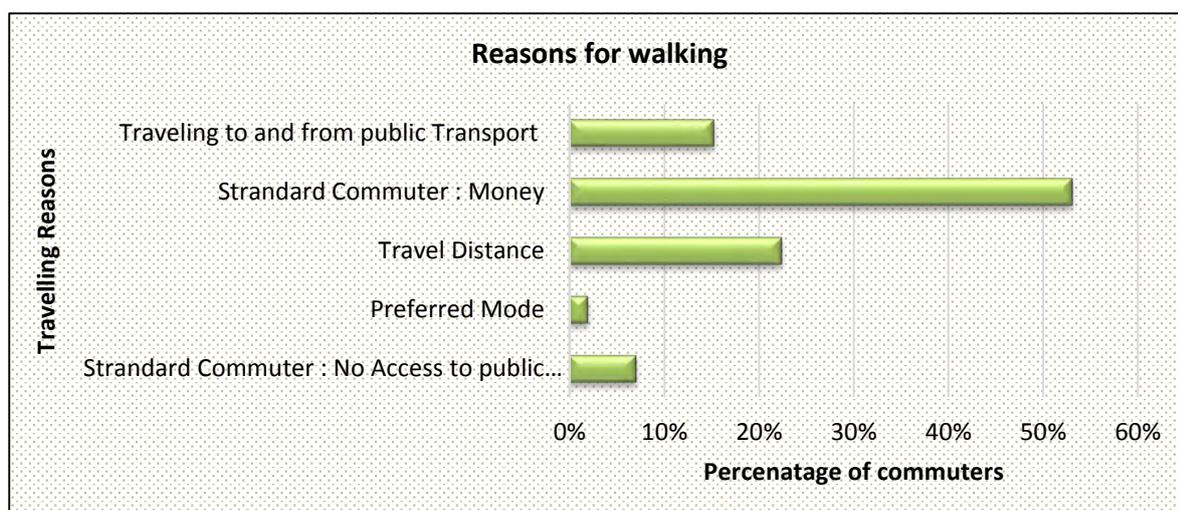


Figure 5-5 Reasons for walking



REFLECTION

People of Ward 27, 28 and 29 of the Greater Tubatse Municipality indicated that walking has become an intricate part of their daily lives, despite the significant difference in status of employment or lack of adequate facilities in the area. According to the study done by Tiwari and Saraf (2012), it is been proven that NMT road users from developing countries hardly voluntarily chose to walk or use a bicycle. For these NMT users, an alternative to choose from is non existent; and that makes them 'captive road users' (Tiwari & Saraf, 1997). Furthermore, the use of bicycles was not observed in the community, however 2% of respondents preferred to use bicycles as a mode of transport. It is therefore recommended that, they should be considered.

5.2.3 Road Safety

The respondents were asked questions regarding road safety. The intention was to gauge how well commuters understood road safety rules and to understand the respondent's different views on road safety.

5.2.3.1 Understanding rules of the road

Respondents were asked different question regarding basic rules the roads. When asked if drivers must stop at a pedestrian crossing, 90% said yes. Furthermore, it is important for drivers to stop and currently drivers are not stopping. Some 76% felt that it is unsafe for pedestrians to cross at any point of the road, and 92% indicated that it is unacceptable for motorist to exceed the zone speed limits. Lastly a significant 97% of the respondents agreed that pedestrians must obey traffic lights and know when to cross the road.

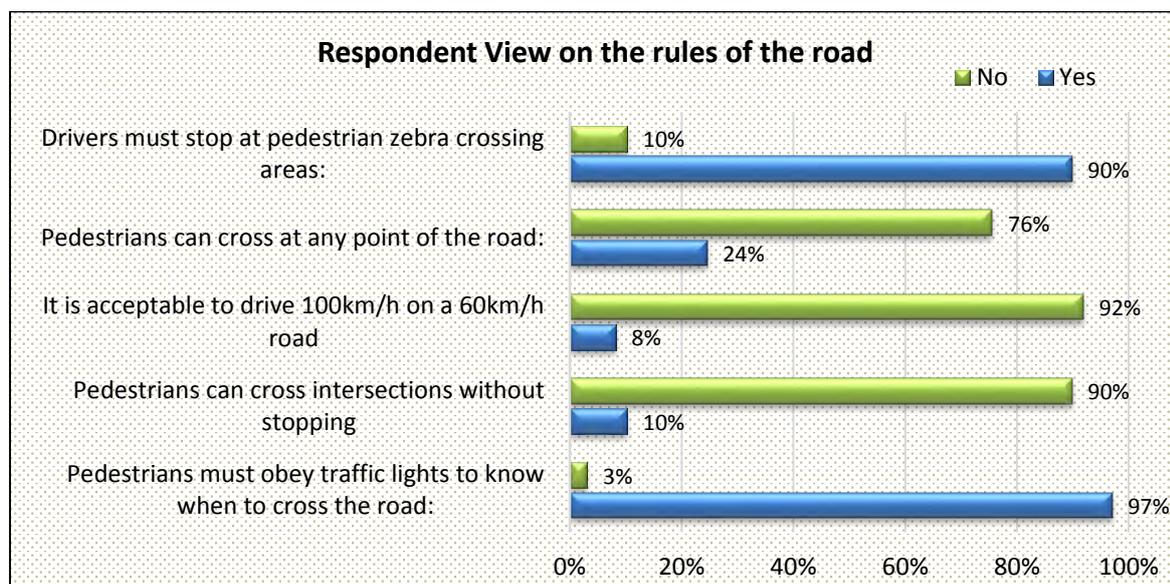
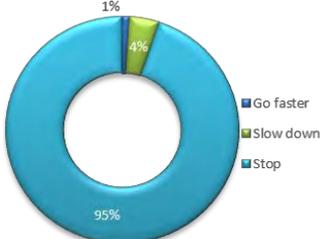
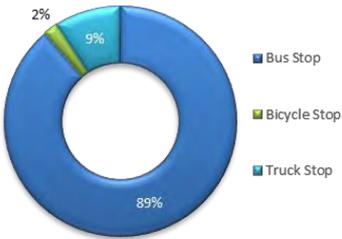
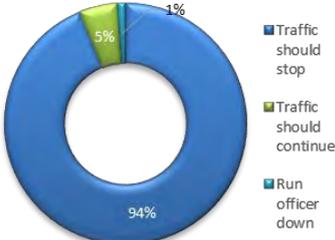
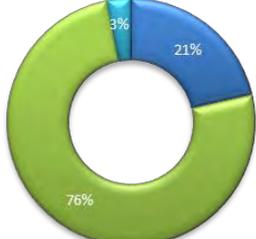
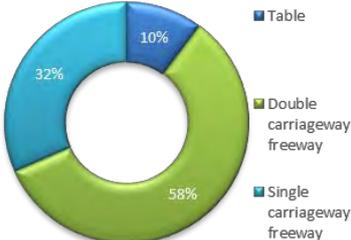
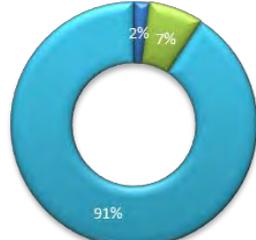


Figure 5-6 Respondents views on road rules

5.2.3.1 Level of understanding road signs

Respondents were asked if they understood what the figures in Table 6.2 represented. The responses are presented in below.

Table 5-2 Road signs assessment results

Road Sign:	Responds	Road Sign:	Responds
	 <ul style="list-style-type: none"> Go faster Slow down Stop 		 <ul style="list-style-type: none"> Bus Stop Bicycle Stop Truck Stop
	 <ul style="list-style-type: none"> Traffic should stop Traffic should continue Run officer down 		 <ul style="list-style-type: none"> Runners only Pedestrians only Freeze
	 <ul style="list-style-type: none"> Table Double carriageway freeway Single carriageway freeway 		 <ul style="list-style-type: none"> Pedestrians only Pedal cyclists only Pedestrians and Pedal cyclists only

The importance of this specific question was to assess the level of being able to interpret displayed road signs. An average of 85% of the respondents demonstrated to have good understanding of what the road signs meant and only an average of 15 % could not comprehend what the figures meant.

5.2.3.2 Usage of the provided facilities

From the questionnaire, only 52% of the respondents indicated that they used the pedestrian facilities (raised pedestrian or zebra crossings) and did not find them useful, while 55% of the respondents indicated they felt unsafe while walking on the road. Lastly, 51% of the respondents indicated that they do obey the traffic lights when crossing the road by foot (see Figure 5-7)



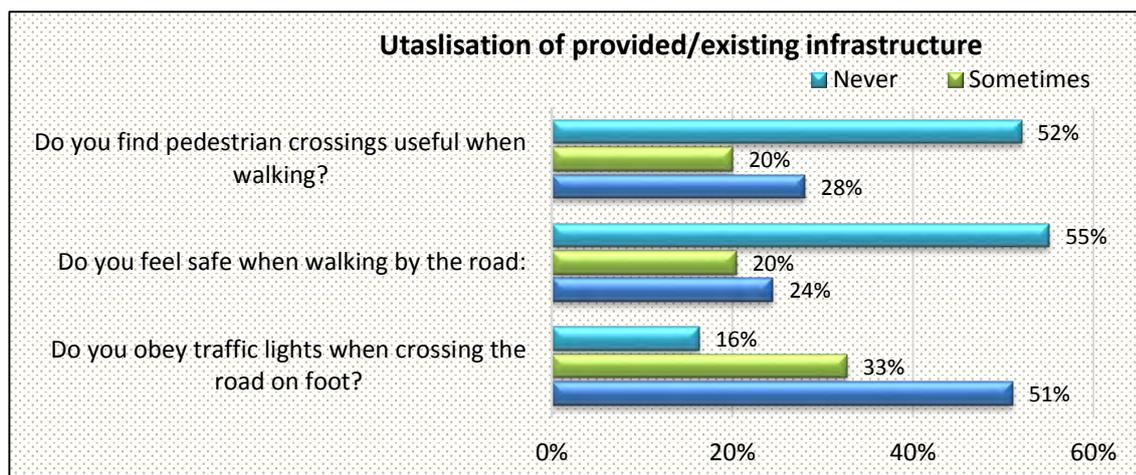


Figure 5-7 Utilisation of existing infrastructure

5.2.3.3 Effects on pedestrian safety

Each of the respondents were asked if the following issues presented in Figure 5-8 worsened pedestrian safety or increased pedestrian safety or made no impact on pedestrian safety. Regarding infrastructure matters more than 80% of the respondents felt safer should pedestrian crossings and public transport laybys be adequately implemented, followed by sidewalks with 78%. With respect to the human contributing behaviour, 90% felt safer when they stop, look and listen before crossing the road, followed by 84% of the respondents indicating that they feel safer wearing white clothing at night for visibility reasons. More than 81% understood that the abuse of alcohol worsened pedestrian safety whether it is consumed by the pedestrian or motor vehicle driver. An interesting realisation was that 17% however, thought that sidewalks would not improve road safety.

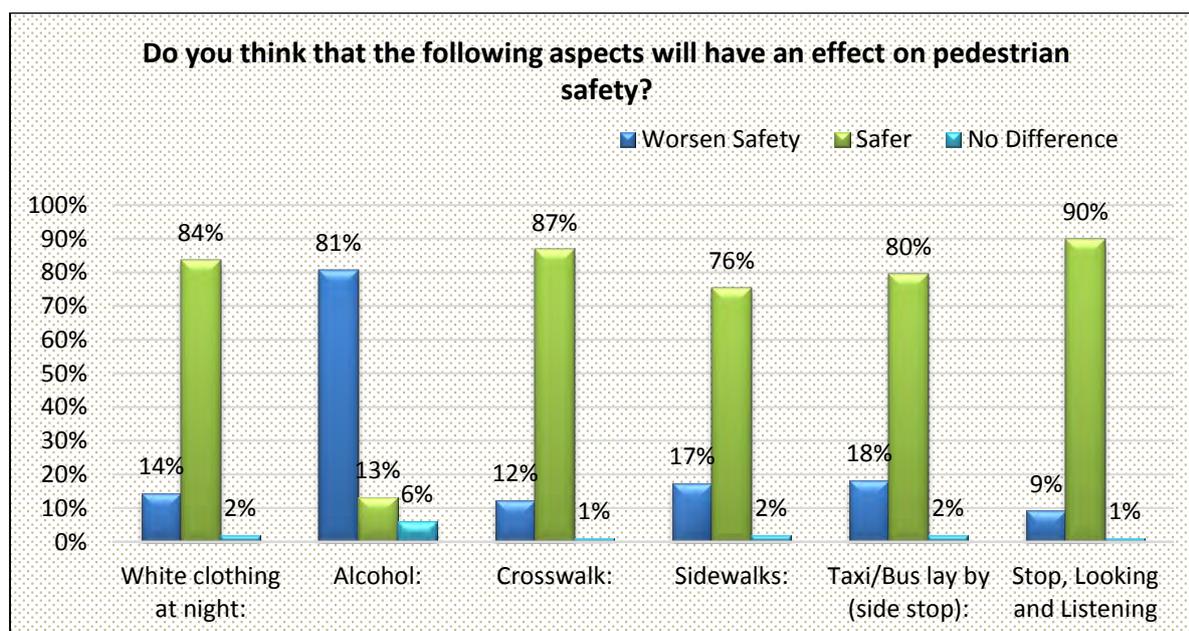


Figure 5-8 Responds road safety views



The questionnaire revealed that the knowledge of rules of the road and on road signs were high, with 89% of the participants answering correctly with respect to road signs and 86% demonstrating they understood the rules of the road. The 83% of the participants showed understanding on the importance of pedestrian safety, 91% were for road safety education in the community.

The importance of pedestrian facilities was also questioned, and the participants rated between 75% and 92% regarding shortage of different facilities, which include; from pedestrian phases at traffic signals, sidewalks, raised pedestrian crossings, road side barriers, lighting etc. When asked specifically what pedestrian facilities should be implemented, more than 75% requested more road signs, 65% requested sidewalks, and 62% requested more speed humps and 36% asked for more zebra crossings.

Road safety should, however, not only be focused on pedestrians, but more emphasis needs to be made towards motor vehicle drivers. In most cases reckless drivers are the main causes to pedestrian accidents, and it is vital for them to understand and adhere to rules of the road.

5.3 ANALYSIS OF ACCIDENT DATA

The accident data was collected from the Limpopo Department of Road and Transport in October 2014. The information was collected in order to investigate the rate of accidents that occur in the study area and find out the cause of the accidents. This information was to assist with identifying the number of pedestrians involved in the area.

From the data collected, the details of the accidents were limited to the following:

- Number of accidents per year from 2010 to 2013;
- Number of accidents in 2014 from January to Jun;
- Number of fatal accidents; and
- Number of pedestrian involved in the accidents.

In this section, the accident data with respect to the study area is analysed.

5.3.1 R555 and R579/37 accident data

5.3.1.1 Accident trends (2010 – 2013)

Majority of the accidents were recorded on the R579 which links up with Link A1 of the study area. In Figure 5-9 the accident trend in the study area, between the years of 2013 and 2014, is presented.



The number of accidents decreased by 30% in 2012, and increased significantly in the upcoming years on all the investigated routes, with a total of 54 road accidents in 2013.

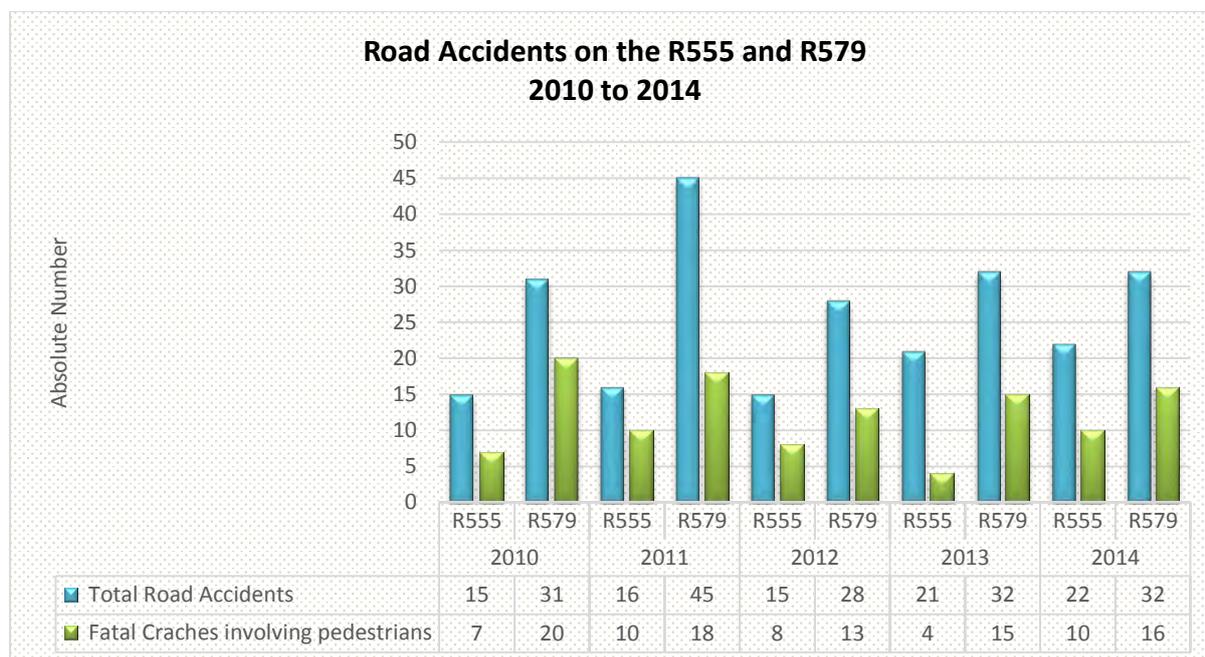


Figure 5-9 2010 -2013 Accident Trends

From Figure 5-9, pedestrian accidents that resulted in fatalities were determined from the total road accidents collected. In 2010, 59% of pedestrian fatalities were recorded on the two corridors. The R579 had 32 accidents in 2014 and 50% of the accidents involved pedestrians. The rate of pedestrian fatalities decreased over the years with 48% recorded in 2014. The R579 which links to Link A1 is located in a population dense area of the study area, which explains why most accidents were recorded on the R579 than the R555, with a total of 82 pedestrians killed in the past five years.

5.3.1.2 Reasons for accidents

During the focused individual interviews, the participants pointed out the following reasons when asked what could be the main reason for these accidents:

- 84% said due to reckless vehicle drivers who don't adhere to the road speed limits or road signs in the area;
- 67% said due to unattended domestic animals next to the road, which made vehicle movement difficult,
- 72% said due to no provision of adequate NMT facilities or road signs, which results in pedestrians jay walking or walking on roads for convenience and comfort as opposed to gravel roads;
- 89% said due to ignorant pedestrians and unattended school kids crossing the road, mostly during peak times of the day.



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In the ward 27, 28 and 29 area, the study shows that, an average of 47% of road accidents consist of pedestrians and according to the traffic officer interviewed, he indicated that majority of the accidents involved kids aged between 6 and 18 years. As mentioned earlier in study, the R555, R579/37 runs adjacent to primary and high schools with a number of kids traveling by foot to access the schools. Due to the location of these schools, it results in the kids having to cross high order roads without any assistance, which compromises their safety.

5.4 INDIVIDUAL SEMI-STRUCTURED INTERVIEWS

To identify all road safety views from all relevant participants, it was important to conduct semi-structured interviews (see Appendix B for questions asked) with traffic officials and school teachers from schools located near the studied roads. The main outcomes were elaborated on above. This section is to summarise all issues around road safety in the Greater Tubatse Local Municipality. Their perspectives were as follows:

- The children in the community are the ones who are mostly involved in accidents. They further elaborated that this is due to the kids having to cross the road unaccompanied to get to school and back.
- The participants felt that drivers and pedestrians are both guilty when it comes to road safety issues, however, often it is the drivers that don't respect pedestrians or pedestrian rules.
- Pedestrians that are under the influence of alcohol are deemed to be a major concern in the community. The participants indicated that taverns and 'shabeen' owners need to take responsibility towards building a safer community for all. Accidents due to drinking often take place during peak hours of the night or morning, and more especially during school holidays.
- Stray animals are a huge concern in the area and cause massive problems with respects to road safety.
- Lack of lighting at night in the area is also a major concern which poses a threat to young and old woman, and children walking at night. The participants explained that there have been a number of cases reported of people being mugged and young woman harassed at night or in the early hours of the morning. They further explained that pedestrians who walk at night do so not by choice but due to work commitments.
- The road in most areas is too narrow, and the provision of adequate facilities is lacking, which causes accidents and congestion. Furthermore, public transport is limited in the area causing pedestrians to walk for long kilometers to access public transport.
- Speed is a huge concern, and the participants indicated that taxi drivers are impatient drivers causing havoc, as well as heavy duty vehicles passing through the community who do not adhere to the rules of the road.



- The participants felt that there seems to be a lack of road safety knowledge and the most contributing factor is the issue of illiteracy. It was mentioned that adult pedestrians ignore road signs, and that most commuters battle in interpreting road signs because they cannot read. Therefore, road signs do not translate anything to the majority of them.
- Lastly, it was indicated that the community implemented a Community Pedestrian Safety Project (CPSP) which involves the local community by liaising and training local members of the community to actively participate in road safety. This is more targeted at pedestrian safety education in schools. The CPSP aims at not only improving road safety knowledge amongst children but for the children to also actively participate (Groenewald, 2013).

5.5 THE ROAD SAFETY AUDIT

Based on the issues identified from semi-structured interviews, road safety audit was done and this section gives a summary of the findings. This section includes not just an assessment of the pedestrian safety problems but also recommendations of how to improve the road safety in the study area.

5.5.1 Development of Assessment Framework

The objectives of a road safety assessment are to (Road Traffic Management Corporation, 2012):

- Provide an independent assessment of the design from a road safety perspective; Look beyond the project limits and consider the effects in transition areas the proposed design will have on the existing built environment;
- Identify potential safety problems for the particular design or section of road project; and
- Ensure that measures to eliminate or reduce the problems are presented to the asset owner for consideration.

An additional category is used to denote actions which may not improve safety, but which are needed to correct unintended non-conformances or poor maintenance. Table 5-3 to Table 5-5 demonstrates the risk rating assessment process as outlined in the RTMC South African Road Safety Audit Manual (2012).

Table 5-3: Likely frequency of the problem to lead to a crash

Source: (Road Traffic Management Corporation, 2012)

Likelihood	
Frequent	Once or more per week
Probable	Once or more per year (but less than once a week)
Occasional	Once every five to ten years
Improbable	Less often



Table 5-4: Likely severity of the resulting crash

Source: (Road Traffic Management Corporation, 2012)

Severity of resulting crash	
Catastrophic	Likely multiple deaths such as: <ul style="list-style-type: none"> • High-speed, multi-vehicle crash on a freeway • Car runs into crowded bus stop • Bus and petrol tanker collide • Collapse of a bridge or tunnel
Serious	Likely death or serious injury such as: <ul style="list-style-type: none"> • High or medium-speed vehicle/vehicle collision • High or medium-speed collision with a fixed roadside object • Pedestrian or cyclist struck by a car
Minor	Likely minor injury such as: <ul style="list-style-type: none"> • Some low-speed vehicle collisions • Cyclist falls from bicycle at low speed • Left-turn rear-end crash in a slip lane
Limited	Likely trivial injury to property damage only such as: <ul style="list-style-type: none"> • Some low-speed vehicle collisions • Pedestrian walks into object (no head injury) • Car reverses into post

Table 5-5: Resulting level of risk

Source: (Road Traffic Management Corporation, 2012)

Resulting level of risk		Likelihood of crash			
		Frequent	Probable	Occasional	Improbable
Likely severity of crash	Catastrophic	Intolerable	Intolerable	Intolerable	High
	Serious	Intolerable	Intolerable	High	Medium
	Minor	Intolerable	High	Medium	Low
	Limited	High	Medium	Low	Low

5.5.2 Likelihood, Severity and Risk Rating of the 5 identified key elements:

From the assessment findings, all the six locations that were assessed presented similar pedestrian and road safety issues which are summarised in the Table 5-6. The detailed findings are appended in Appendix C.



Table 5-6: Summary of the key Findings at the 6 locations (Picture Source: Author)

		
<p>Photo 1: Painted zebra crossing on R555 at Maramele Primary School. The zebra crossing was not painted to the Road Traffic Signs Manual standard and not visible due to poor maintenance and no regulatory and warning signs.</p>	<p>Photo 2: Many learners walk along Link A1 that has no NMT infrastructure or facilities. They have to in close proximity of vehicles travelling at relatively high speed.</p>	<p>Photo 3: Minimal road signs to warn motorists and pedestrians jaywalk</p>
		
<p>Photo 4: All kids were observed traveling on uncomfortable road conditions. All access routes are gravel based in the study area</p>	<p>Photo 5: All primary entrances of the schools are located along the R555 and Link A1. No School signs were put up at the school notify oncoming traffic</p>	<p>Photo 6: Stray animals identified by the main corridors (R555 and Link A1)</p>
		
<p>Photo 7: The raised pedestrian crossing has not been constructed to any specifications but is effective in lowering the speed of approaching vehicles.</p>	<p>Photo 8: Majority of the learners from Mash Primary cross Link A1 traveling from school to home. They were observed to run towards the road, and patiently wait for a safe time to cross and running across the road.</p>	<p>Photo 9: Scholar petrol or teachers were observed at the primary school entrances aiding the scholars to cross the road. This is one of the mitigating aspects of reducing pedestrian crashes for children.</p>



From the findings of the assessment, five key safety elements were derived from the six locations and further assessed in terms of the likelihood, severity and risk taking (see Table 5-7).

Table 5-7 Resulting level of risk – R555, R579/37

Identified Key Aspects	Description	Likelihood	Severity	Risk Rating
1. Pedestrian Crossing	Pedestrians/scholars were observed walking on road (jaywalking) or running while crossing the road. Perceived to be an uncomfortable and unsafe environment for pedestrians, especially if there are vehicles on road passing at speed. Running also increases the chances of them falling are higher especially carrying a heavy backpack.	Frequent	Serious	Intolerable
2. Poor visibility at late afternoon of pedestrians	Glare late afternoon and reduced visibility of pedestrians at night contributes to higher pedestrian accident and fatality rate at night	Frequent	Serious	Intolerable
3. Speed management	Drivers were perceived to be driving over the speed limit and observed to take unnecessary risks overtaking slower vehicles. This was compounded with heavy vehicles overtaking each other.	Occasional	Serious	High
4. Posted speed limit	The posted speed limit along the R555, A1 within the study area is 80 km/h. The majority of the R555, A1 is sign posted at and 120 km/h. A typical driver would anticipate the operating speed limit of a two lane rural national road to be 120 km/h. Drivers appear to exceed 60 km/h	Probable	Serious	Intolerable
5. Public transport	Lack of public transport facility. Vehicles stop on the R555, A1 to pick up passengers.	Probable	Serious	Intolerable

5.5.3 Resume

Recommendations for actions in response to the issues raised are assigned priority using the following rating system, in accordance with the 2012 RTMC South African Road Safety Audit Manual.



Table 5-8: Risk and suggested treatment action

Source: (Road Traffic Management Corporation, 2012)

Risk	Suggested treatment action:
Intolerable	The safety concern "must" be corrected, even if the cost is high
High	The safety concern "should" be corrected or the risk significantly reduced, even if the treatment cost is high
Medium	The safety concern "should" be corrected or the risk significantly reduced if the treatment cost is moderate, but not necessarily high
Low	The safety concern "should" be corrected or the risk reduced if the treatment cost is low

Furthermore, in order to reduce the probability of accident rates, involving pedestrians more specially, the following measures are also recommended:

Table 5-9 Recommended Measures

Recommended Measures		Responsibility			
		Government	School	Community Leader	Engineers
Short Term	Emphasis more on road safety education during life orientation classes		✓		
	Road safety committees to be created at the schools.		✓		
	Scholar patrol programs to be emphasised on before and after school, which should be led by road safety committees in schools		✓		
	Pedestrian crossing to be continuously maintained and appropriate road signs to be implemented along the road. Where there is pedestrian signs, it is recommended that they are moved to be in line with other road signs	✓			
	The speed limit within built-up areas to be reduced to 60 km/hr.	✓			✓
	Greater attention is required for speed management within the detailed design, given the likelihood of reduced speed limits and propensity for speeding			✓	
Long Term	Move the pedestrian crossing close to the entrance of the school and close to identified pedestrian desire line that dissects the main road.	✓		✓	✓
	Community leaders and school road safety committees to implement applicable programs like "Walking school bus".		✓		



Recommended Measures		Responsibility			
		Government	School	Community Leader	Engineers
	Municipality to promote and encourage cycling in the community in order to aid school children that walk longer distances to school. By achieving the notion, municipalities are further encouraged to plan and construct cycle lanes when pedestrian walkways are constructed.	✓			
	The lack of street lighting is a safety hazard for pedestrians that travel at night, more especially woman and kids. Street lighting should be planned for and implemented on major routes adjacent to the built up areas in the community.	✓		✓	✓

5.6 SUGGESTED PHYSICAL INTERVENTIONS

From all the analyses performed, it is now understood that the problems facing rural areas and specifically the ones in this case study, can be addressed effectively only by acknowledging that the issues are interrelated, and that the polices and strategies across all problems must be well developed and executed in an adequate manner.

With that said, the study area presented to have similar problem attributes throughout the studied corridors which have been discussed in the previous sections. Within the study, the author selected two focal points that were deemed to be a safety hazard for pedestrians and recommended practical and physical interventions that could be considered when applied in order to improve NMT safety (see Figure 5-10).





Figure 5-10 Proposed physical interventions for study area



CHAPTER 6

CONCLUSION AND RECOMMENDATIONS



CHAPTER SIX

6. CONCLUSIONS AND RECOMMENDATIONS

The primary purpose of this study is to highlight the current existing conditions of NMT interventions, constraints and opportunities within the selected study rural area in South Africa. The research has underlined the importance, the role, the benefits, design parameters, influencing factors of NMT in order to have a clear understanding on the significance of NMT and its required adequate facilitating infrastructure within rural and semi-rural areas in South Africa and at large, within African rural settlements. In the first chapter of the research, four questions leading us to the ultimate findings were established. This final chapter sums up the research findings by underlining the key issues through answering the four questions. Furthermore, recommendations and conclusions are discussed based on the findings that will address objectives.

6.1 RESPONSES TO THE RESEARCH QUESTIONS

Policy and Framework: Since the development of Transport frameworks and policies for rural areas; to what extent is change brought about in safe and adequate NMT access to social facilities within the local study area?

To determine the answer to the question above, it is important to reproduce the vision and mission statement of the Limpopo Province Department of Roads and Transport; which reads:

Vision: "An integrated, safe, reliable, affordable, and sustainable multi-modal transport system and adequate infrastructure."

Mission: "To develop, co-ordinate, implement, manage and maintain an integrated and sustainable multi modal transport system and appropriate infrastructure."

(Limpopo Department of Roads and Transport, 2014)

The vision and mission statement is realised in the Limpopo Province, however, mostly in the urban planning sector of the province. Urban/city planning has taken priority over rural area planning with regards to funding, implementing and maintaining. And should funds be allocated to rural areas for infrastructural and rural development, motorised transport takes priority over NMT often. The



dominant position of urban planning and motorised traffic planning is one of the major deterrents for NMT planning and implementation within rural areas.

Government administration responsibilities of any province, or local municipality revolves around planning, providing funding, implementing and maintenance. With regards to the study area, through the data administration process, it can be deduced that since the development of any transport related policies or frameworks, very little has been achieved.

I. Planning and Implementation

Given the statistics in chapter 4, more than 80% of commuters travel by foot to access their final destination or public transport. This however is not represented in terms infrastructure planning or implementation. Car owner's amount to 20% of the population. However, there seems to be less emphasis on NMT construction in the area, which would be serving the majority of transport users in ward 27, 28 and 29.

II. Maintenance

The Greater Tubatse Municipality maintenance plans and execution are not realised as observed during the assessment findings. Paved roads are in poor condition, characterised with a number of potholes and faded center and barrier lanes. Where there are speed humps or raised pedestrian crossings, the paint is either invisible or faded.

I. Funding

“Allocate adequate and sustainable funding for the development and promotion of NMT.”

(South Africa Department of Transport, 2008)

Based on the observation on site, allocation of funding towards NMT is not realised in the study. Should the funding be allocated to the local municipality, it can be deduced that proper guidance in spending of the funds or allocation is not well practiced within the municipality. The investigation has established that the emphasis and shifting of budgets is required to promote NMT.

What are the current existing level of NMT infrastructure within the study area in comparison with other road infrastructure?

Chapter 5 of the report discusses the key findings from the analyses of the primary and secondary data collected in Ward 27, 28 and 29. From the road safety audit, the following are some of the finds that describe the current existing level of NMT infrastructure in comparison to the road infrastructure:



I. Lack of NMT Infrastructures

The research identified that there is a lack of pedestrian infrastructure, which are gravel based. The entire study area lacks constructed facilities, and adequate pedestrian signage, including traffic calming, and traffic speed controls. As stated by Angira (2008), traffic calming can transform a roadways design in order to reduce traffic speeds, while the road diets minimise the number or size of the traffic lanes. It was further observed that there are no bicycle road users within the study, thus no provision for cycle lanes. The study area presented no public transport facilities, such as holding areas, taxi laybys or bus stops. Taxi and bus drivers require convenient and safe areas to pick up and drop off user's at all demarcated origins and destinations stops. Public transport facilities are important not only to encourage the use of services, but also to stop problems related to spontaneous parking on the side of road. Existing road and pavement conditions on the two study routes are in a bad condition, with potholes and drainage issues due to poor design and maintenance.

II. Level of accessibility: Pedestrian Paths

The study is characterised by a large amount of desire lines and gravel roads off the R555 and Link A1. The roads lack the connectivity and accessibility that can encourage NMT within the community. Well planned and constructed pathway systems allow more direct travel between destinations. Desire lines which are derived from identifying walking shortcuts, are mostly effective at promoting NMT travel. Water streams pose a challenge for pedestrians, more especially during the rainy season. Pedestrians are uncomfortable with having to cross the stream, which also poses as safety issue for vulnerable pedestrians.

III. Maintenance of existing infrastructure neglected

The study found exiting pedestrian raised speed humps and zebra crossings. However all the crossings had faint road markings and with the majority not done according to the standard specifications. Poorly maintained roads constrain mobility, significantly increase accident rates, and aggravate isolation, poor health, poverty, and illiteracy in rural communities (Burningham & Stankevich, 2005).



What are the critical repercussions identified in the study area due to the lack of adequate NMT facilities and amenities?

The lack of adequate planning and implementation for NMT in rural areas has had a large negative impact on the following in the community:

i. Pedestrian Safety and Security.

As stated above, Ward 27 - 29 areas have significant death data per studied route in all identified NMT areas. Accident rates are tremendously high by world-wide standards and the main principal of NMT is to provide safe, good quality NMT facilities and amenities. The death toll of pedestrians, mainly learners who have to travel long distances by foot to access areas of education, is one of the consequences due to the lack of adequate infrastructure. The rate of accidents has caused a lot of pain and suffering for the victims' families in the community. For most families, some of the victims are considered as bread winners and their loss results in a loss of income, which in the end affects the standard of living.

Pedestrian safety is, however, not limited to road accidents only, but extended to personal violation incidents such as mugging and rape. In most cases, these incidents take place in areas that not busy or during the night. The studied area presented no form of street lighting implemented, which contributes to the lack security and safety for pedestrians. Chapter 5 elaborated that there has been a few cases that took place in the area which has caused a lot of grievance for pedestrians who walk at night time.

ii. Accessibility

Internal roads are impossible to access within the Wards. The study area has unplanned settlements, where walkways or paved roads are absent. This is the result of poor pathways, which were in most cases earthen and narrow. This problem forces pedestrians to make use of the roadway which is encouraged by the lack of all weathered surfaces.

Engineering, Education and Enforcement: To what degree were the four E's of safety taken into account during the implementation of the R579 and R555 running through the built-up area in Sekhukhune?

As stated in chapter 6; to have an effective sustainable transport system means there is a need to address transport related issues at different spheres of the transport field by working together as engineers, educators, law enforcement officials and other stake holders like employers, community



leaders, and emergency services and health care officials. From the site inspection, the following was observed regarding the 4 E's:

I. Engineering-

During the construction of the R555 and Link A1, the provision for NMT facilities was not taken into account. Furthermore, traffic calming measures are limited and not implemented at all identified pedestrian concentrated locations such as primary schools and local shops. When plans for these roads were done, it can be concluded that road safety and security for NMT users was not considered.

II. Education

Road safety education in schools is encouraged and practiced in primary schools as indicated by the two teachers who were interviewed. This is also shown in the questionnaire assessments with more than 85% of the respondents showing to have good knowledge on rules of the road and on road signs. Furthermore, there are numerous organizations that are prepared to support the NMT sector. The CPSP program is one of first initiatives where its primary purpose is to improve road safety knowledge amongst children and to also actively implement road safety in order to change behaviour (Groenewald, 2013). To ensure the success of this program it is imperative to have community leaders lead this program by pooling financial muscle and prioritising these programs and projects.

"...The knowledge on road safety seems to be lacking and the most contributing factor is the issue of illiteracy..." as indicated by one of the participants in the semi structured interviews. With that said, school children are at an advantage because within their school curriculum road safety education is addressed and in-cooperated and emphasised through the CPSP program. However, training and educating adults to comprehend more with traffic rules is lacking in the community which contributes to pedestrian accidents in the community.

III. Enforcement

Law enforcement was not visible during the period of the assessments and motorists travelling above the speed limited where noticed at that time. Therefore, it can be concluded that, the level of ensuring that vehicles and road users are complying with road regulation is low which poses as a safety risk for pedestrians. However, during high pedestrian movement of scholars in the morning and afternoon, only three of the studied locations identified scholar petrol activities taking place along Link A1.

IV. Encouragement



As stated in section 3.25 “success can only be confirmed or failures identified through monitoring and evaluating the outcomes of initiatives”. Road infrastructure in the community seems to have been dilapidated over some time without monitoring or evaluation. Through monitoring and evaluation, problems that contribute to low pedestrian safety can be identified and mitigated.

6.2 CONCLUSION

This research paper gives an overview on the significance of NMT, and its position in total mobility. From the research, it can be concluded that well-planned implementation of NMT infrastructure for wards 27, 28 and 29 is needed. Successful implementation and integration of non- motorised transport in the studied areas, and in all rural areas at large, creates a safe and well-balanced transport system. This is solely dependent on adequate developments of NMT facilities and infrastructure, road safety educations and awareness, promotion and visible and active traffic law enforcements that will encourage road safety.

Furthermore, the significance of this research is based on enhancing our understanding on the importance of NMT and the users of NMT in order to achieve proper planning and implementation. A deeper understanding of the planning process permits interested stakeholders to develop innovative strategies which will have a greater likelihood of success. A deeper understanding of the challenges faced by the NMT users, and more importantly the cause of these challenges is more crucial when it boils down to delivering a safe and convenient system for all intervention.

6.3 RECOMMENDATIONS

To develop a supporting environment for NMT, the significance of the NMT infrastructural and educational interventions in rural areas needs to be realised. This will ensure that road safety and security, encouragement of affordable modes of transport, improvement of health, or other potential benefits are addressed and implemented. In order to achieve that, the following is recommended:

- i. The main setback for NMT in wards 27, 28 and 29 is the lack of NMT infrastructure and key road safety programs targeted for adults. When new roads are being planned, designed and constructed and when existing infrastructure is rehabilitated, cycle lanes and pedestrian sidewalks should be included, and not excluding lights and other applicable amenities. Furthermore, extra programs focusing on adult road safety education are required to encourage safe walking skills.
- ii. To minimise and eliminate NMT road users from having to share the roadway with other traffic modes, which puts them at high risk in doing so, as indicated by the high fatality figures among



- pedestrians. NMT needs to be mainstreamed and well integrated into the streetscape to modify the status quo (Gauteng Province Department of Roads and Transport, 2013).
- iii. Law enforcement is required to be more visible in the study, more especially during peak hours when children are traveling to schools to ensure the safety and security of NMT users.
 - iv. “In South Africa, NMT is often considered as an add-on and there is, therefore very little evidence of consistent NMT planning and infrastructure provision in most areas” (Gauteng Province Department of Roads and Transport, 2013). A more realistic approach is needed to recognise the valuable role of the NMT mode in rural areas in order to promote walking and cycling; politicians and officials need to shift focus from giving motorised traffic priority over NMT.
 - v. To assist municipalities in systematic planning and implementation of NMT facilities, it is important that they adopt NMT policies and strategies that will support and expand the role of NMT modes in rural transport, backed up by NMT master plans (Ribbens, 2014).
 - vi. Municipalities that are not in the forefront in planning and implementing road infrastructure effectively should take initiative to learn from municipalities or countries with similar attributes that have successfully implemented NMT facilities.
 - vii. The DoT, with the support of the provinces, municipalities, and agencies should commission research projects to monitor and evaluate the current transport system within the community, and report progress on the planning and implementing NMT infrastructure.
 - viii. Authorities are required to concentrate on addressing funding mechanisms and to consider innovative or alternative ways of accessing funds that will aid in the planning and implementing of motorised and non motorised road infrastructure. Furthermore, proper planning on allocating budgets to municipalities needs to be emphasised on, and to ensure that the money is spent accordingly; external experts should be consulted to give guidance.



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APPENDICES



PEDESTRIANS QUESTIONNAIRE FORM

General Information:

Location of Assessment:	Madibeng Primary School	Malekane Primary School	Maremele Primary School	Papong Primary School
	Masha Primary School	Tibamoshito Primary School		Maphopha Primary School
Date:				

Respondents answers:

Gender:	Male:  <input type="checkbox"/>	 Female: <input type="checkbox"/>		
Age:	18-25 <input type="checkbox"/>	26-40 <input type="checkbox"/>	41-60 <input type="checkbox"/>	61+ <input type="checkbox"/>
Address:				
Driving License			Yes <input type="checkbox"/>	No <input type="checkbox"/>
Employment:	Self Employed <input type="checkbox"/>	Employed <input type="checkbox"/>	Unemployed <input type="checkbox"/>	
Do you own a vehicle?	Yes <input type="checkbox"/>		No <input type="checkbox"/>	
Movement:	Daily (Everyday)	Weekly (# of Times on a week basis)	Monthly (#number of times in a month)	
Walking 				
Bicycle 				

 Taxi			
 Bus			
 Car			

What is your primary source of transport to key destinations?					
<input type="checkbox"/> Car	<input type="checkbox"/> Motorcycle	<input type="checkbox"/> Bicycle	<input type="checkbox"/> Walking	<input type="checkbox"/> Public transportation	<input type="checkbox"/> Other
					
What is your destination for walking trips					
<input type="checkbox"/> Work	<input type="checkbox"/> School	<input type="checkbox"/> Shopping	<input type="checkbox"/> Business	<input type="checkbox"/> Access to public transport	<input type="checkbox"/> Other
What are your main reasons for walking					
<input type="checkbox"/> No access to public transport	<input type="checkbox"/> Preferred mode	<input type="checkbox"/> Travel Distance	<input type="checkbox"/> Stranded Commuter: No money	<input type="checkbox"/> Travelling to and from public transport facility	<input type="checkbox"/> Other

Road Safety related questions

How often do you use the following sources of transport to get to your main destinations?

Do you find pedestrian crossings useful when walking?		<input type="checkbox"/> All the time	<input type="checkbox"/> Sometimes	<input type="checkbox"/> Never
Do you obey traffic lights when crossing the road on foot?		<input type="checkbox"/> All the time	<input type="checkbox"/> Sometimes	<input type="checkbox"/> Never
Do you feel safe when walking next to the roads?		<input type="checkbox"/> All the time	<input type="checkbox"/> Sometimes	<input type="checkbox"/> Never
Would you find it useful if education on road safety was provided?		Yes <input type="checkbox"/>		No <input type="checkbox"/>

How important do you as a pedestrian find the issues stated below:

Shortage of pedestrian crossings		<input type="checkbox"/> Very important	<input type="checkbox"/> Fairly important	<input type="checkbox"/> Not important
Shortage of pedestrian sidewalks		<input type="checkbox"/> Very important	<input type="checkbox"/> Fairly important	<input type="checkbox"/> Not important
Shortage of pedestrian traffic lights		<input type="checkbox"/> Very important	<input type="checkbox"/> Fairly important	<input type="checkbox"/> Not important
Stop signs		<input type="checkbox"/> Very important	<input type="checkbox"/> Fairly important	<input type="checkbox"/> Not important
Speed bumps		<input type="checkbox"/> Very important	<input type="checkbox"/> Fairly important	<input type="checkbox"/> Not important

What do the following Road Signs mean?

Sign:	Response:	
	Go faster	<input type="checkbox"/>
	Slow down	<input type="checkbox"/>
	Stop	<input type="checkbox"/>
	Bus stop	<input type="checkbox"/>
	Bicycle stop	<input type="checkbox"/>
	Truck stop	<input type="checkbox"/>
	Traffic should stop	<input type="checkbox"/>
	Traffic should continue	<input type="checkbox"/>
	Run officer down	<input type="checkbox"/>
	Runners only	<input type="checkbox"/>
	Pedestrians only	<input type="checkbox"/>
	Freeze	<input type="checkbox"/>
	Table	<input type="checkbox"/>
	Double carriageway freeway	<input type="checkbox"/>

	Single carriageway freeway	<input type="checkbox"/>
	Pedestrians only	<input type="checkbox"/>
	Pedal cyclers only	<input type="checkbox"/>
	Pedestrians and Pedal cyclers only	<input type="checkbox"/>

In General, do you think that the following items will have an effect on pedestrian safety?

Wearing white clothing at night		Worse Safety <input type="checkbox"/>	Safer <input type="checkbox"/>	No difference <input type="checkbox"/>
Alcohol		Worse Safety <input type="checkbox"/>	Safer <input type="checkbox"/>	No difference <input type="checkbox"/>
Crosswalk (zebra crossing)		Worse Safety <input type="checkbox"/>	Safer <input type="checkbox"/>	No difference <input type="checkbox"/>
Pedestrian Bridges		Worse Safety <input type="checkbox"/>	Safer <input type="checkbox"/>	No difference <input type="checkbox"/>
Sidewalks		Worse Safety <input type="checkbox"/>	Safer <input type="checkbox"/>	No difference <input type="checkbox"/>
Taxi/bus lay by (side stop)		Worse Safety <input type="checkbox"/>	Safer <input type="checkbox"/>	No difference <input type="checkbox"/>
Stop, looking and listening		Worse Safety <input type="checkbox"/>	Safer <input type="checkbox"/>	No difference <input type="checkbox"/>

Rules of the Road	Response
--------------------------	-----------------

It is acceptable to drive 100 km/h on a road with a 60 km/h speed limit		Yes <input type="checkbox"/>	No <input type="checkbox"/>
Pedestrians can cross at any point of a road		Yes <input type="checkbox"/>	No <input type="checkbox"/>
Pedestrians must cross without looking and listening		Yes <input type="checkbox"/>	No <input type="checkbox"/>
Drivers must stop at pedestrian zebra crossing areas		Yes <input type="checkbox"/>	No <input type="checkbox"/>
Pedestrians must walk in the middle of the road instead of the sidewalk		Yes <input type="checkbox"/>	No <input type="checkbox"/>
Pedestrians must obey traffic lights to know when to cross		Yes <input type="checkbox"/>	No <input type="checkbox"/>
Pedestrians can cross anywhere on a freeway		Yes <input type="checkbox"/>	No <input type="checkbox"/>
Pedestrians can cross intersections without stopping		Yes <input type="checkbox"/>	No <input type="checkbox"/>

How do you think pedestrian safety can be improved in terms of facilities?

<p>Full Name & Initials of Data Collector</p> <p>Signature</p>
--

SEMI-STRUCTURED INTERVIEW QUESTIONS

Semi-structured interview schedule

Name:

Date:

Venue:

What is the most used mode of transport in the community?

- a. _____
- b. _____
- c. _____
- d. _____

How would you describe the condition current Road infrastructure?

- a. _____
- b. _____
- c. _____
- d. _____

How would you describe the condition of each of the Non-Motorised Transport infrastructure (Foot paths and cycle tracks) along this road and within the community?

- a. _____
- b. _____
- c. _____
- d. _____

What are the road safety challenges experienced?

- a. _____
- b. _____
- c. _____
- d. _____

Which generation is involved in most in road accidents within the community?

- a. _____
- b. _____
- c. _____
- d. _____

What causes these type of accidents?

- a. _____
- b. _____
- c. _____
- d. _____

What do you suggest the Local, provincial and national Government can do to improve the NMT within the area?

- a. _____
- b. _____
- c. _____

d. _____

What road safety measure do you think should be implemented in the community?

a. _____

b. _____

c. _____

d. _____

Do you think that road safety education is important and is it given enough attention within the community?

a. _____

b. _____

c. _____

d. _____

According to you, who are the key players within the transport sectors and what can they do to promote the NMT.

a. _____

b. _____

c. _____

d. _____

ROAD SAFETY AUDIT FINDINGS

Table 0-1: Assessment findings- R555 R579/37

1. Madibeng Primary School		
<p>Assessment:</p> <ul style="list-style-type: none"> - School on the R555, with vehicles travelling at 120 km/h, and many heavy vehicles. - Community on either side of the R555. Learners have to cross the R555 to get to school. - School have two accesses. - Road signs erected as part of the Oliphant’s River project serve as warning signs, but speed limit not adhered to. - That the pedestrian sign was not in line with the other road signs and obscured by a tree. Many residents are pedestrians. The sight distance is good. - Faded barrier and center lanes - No sign indicating there is a school - There is only one pedestrian sign for the 2 entrances at the school 		
		
2. Maremele Primary School		
<p>Assessment:</p> <ul style="list-style-type: none"> - School on the R555, with vehicles travelling at 120 km/h, and many heavy vehicles. - Community on either side of the R555. Learners have to cross the R555 to get to school. - School have only one access. - Road signs erected as part of the Oliphant’s River project serve as warning signs, but speed limit not adhered to. - Pedestrian crossing painted had faint road markings and was not done according to the standard specifications. - Many residents are pedestrians. The sight distance is good. - Faded barrier and center lanes - Lack of pedestrian signs - No sign indicating that there is a school - The zebra crossing is not visible - The actual crossing is faded and the signage is not good - There are many trucks and over-speeding cars that drive along that road - Not enough speed humps and people on the R555 do not obey speed limits (80km/h) 		



3. Papong Primary School

Assessment:

- School off the main roads, with some learners crossing the street to get to the school, but the majority of the children live a few kilometers from the school and have to walk along the road to get to school
- There are road signs, pedestrian warning signs, along the way, but pedestrians still have to use the surface road shoulder to walk on.
- Vehicles were travelling at the speed limit. Many residents are pedestrians. The sight distance is good.
- No sign indicating that there is a school
- Faded barrier and center lanes
- No street lighting identified
- People drive too fast and do not obey the speed limit
- Not enough speed bumps to slow drivers down



4. Malekane Primary School

Assessment:

- School off the main road, A1, but learners live on both sides of the A1.
- There is a raised pedestrian crossing on the A1, with feint road markings. Vehicles do have to slow down significantly. The pedestrian crossing is used by many children. Children were observed to walk with younger siblings to and from the school.
- Many learners walk along A1 in close proximity of vehicles travelling at relatively high speeds.
- No sign indicating that there is a school
- Faded barrier and center lanes
- No street lighting identified
- Pedestrian zebra crossing was not visible enough



5. Masha Primary School

Assessment:

- School on the main road, A1, and learners live on both sides of the A1. Learners have to cross the A1.
- Some learners are collected with an LDV with a canopy.
- There is a raised pedestrian crossing on the A1, but was placed at the start of the school property, and not at the place where the learners cross the road (pedestrian desire line) which is closer to the entrance of the school.
- The pedestrian crossing is not used by the children.
- Children were observed to walk with younger siblings to and from the school.
- Children were observed to run to the road and then patiently wait for a safe time to cross the road. But then run across the road, increasing the risk of falling and not being able to clear the road in a safe time.
- No street lighting identified
- Faded barrier and center lanes
- Vehicles were travelling at the speed limit. Many residents are pedestrians. The sight distance is good.
- No sign indicating that there is a school
- One entrance
- The majority of the school cross the road



6. Tibamoshito Primary School

Assessment:

- School on the main road, A1, and learners live on both sides of the A1. Learners have to cross the A1.
- Some learners are collected with an LDV with a canopy. Some learners were collected with a taxi which was overloaded.
- There is a raised pedestrian crossing on the A1, which is manned with a scholar patrol from the school. The pedestrian crossing is used by the children.

- The learners were well mannered and formed lines outside of the school and waited for transport to arrive, or for the scholar patrol to be set up.
- No street lighting identified.
- Faded barrier and center lanes
- Teachers were also observed in assisting learners after school.
- Vehicles were travelling above the speed limit.
- Many residents are pedestrians. The sight distance is good.
- No sign indicating that there is a school.
- No street lighting identified



7. Maphopha Primary School

Assessment:

- The school is off the A1. The school has two accesses, one on the back and another with a gravel road leading to the R579, where learners have to cross the A1. There is a water stream on the other side of the road, opposite the school. Some of the scholars and non-scholars have to cross the river to access the neighbouring communities or resort to walking for a longer distance during the rainy season when the river gets swollen.
- There was no speed hump or raised pedestrian crossing in this area (pedestrian desire line of learners). Vehicles were travelling at the speed limit. Many residents are pedestrians. The sight distance is good.
- No sidewalks and cycle lanes in the community
- No sign indicating that there is a school
- Faded barrier and center lanes
- Not enough signs to warn the drivers
- No street lighting identified
- Not enough speed humps to slow drivers down
- Difficult for pedestrians to cross due to a lack of zebra crossings



**THE SIGNIFICANCE OF NON-MOTORISED TRANSPORT INTERVENTIONS:
A CASE STUDY OF GREATER SEKHUKHUNE, LIMPOPO PROVINCE**



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