MARKET ANALYSIS REPORT

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1. OVERVIEW AND PROJECT APPRECIATION

1.1 Introduction

1.1.1 Corridor A: Polokwane –Mokopane Commuter Rail Service

Presently the link between Polokwane and Mokopane stations is made by a rail line of 65 km

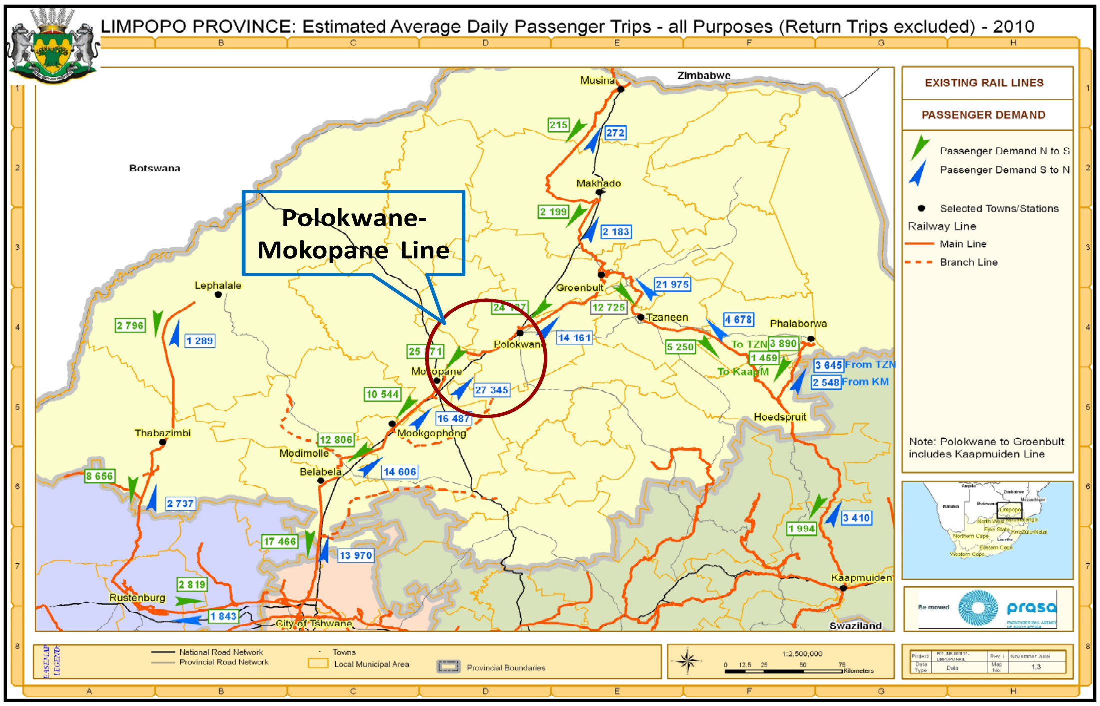


Figure 1: Polokwane-Mokopane line-Estimated Av Daily passenger Trips

electrified with 25 kV AC. By road, the distance is about 58 km. The current average travelling time is 1 1/4 hours whereas it's approximately ¾ hour by road. The modelling in Phase 1 indicated that 38,181 passengers would travel daily in 2010 for work purposes in the corridor that begins in the residential areas of Mokopane and traverses through the industrial /commercial areas of Polokwane to end at the educational complex of Mankweng.

1.1.2 Corridor D: Polokwane –Moloto Passenger Rail Corridor

The Moloto Corridor (Refer **Figure 2**) project was accepted by Cabinet to link Moloto in Mpumalanga to Tshwane with a standard gauge rail line. The corridor could be extended in future via Jane Furse to Burgersfort.

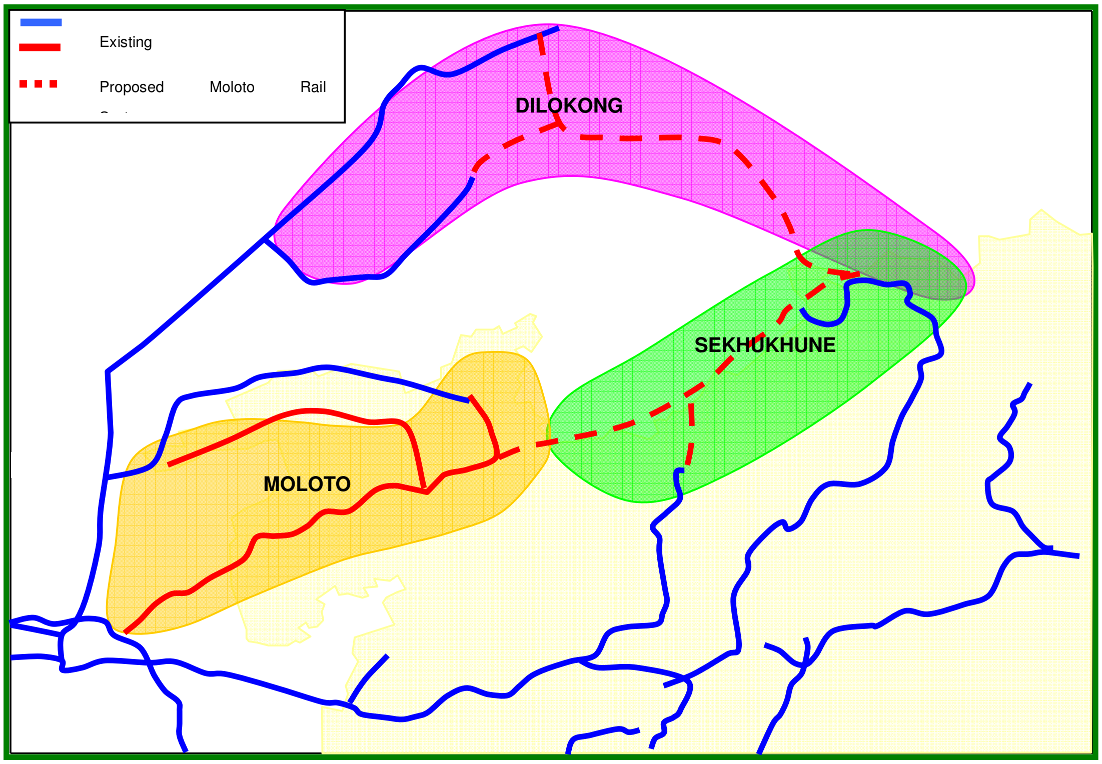


Figure 2: Moloto Development Corridor in Regional Context,

Source: NATMAP Phase 4 Report, September 2010

Two options are required to be studied. The first option could be a 36km new rail line could be provided from Polokwane to Zebediela with a possible extension to the Lebowakgomo area. This option would use 19km of the existing mainline between Polokwane and Mokopane. An alternative route to the Lebowakgomo area would be from the Polokwane – Mankweng option. Any one of these options could be extended from the Lebowakgomo area to Jane Furse to link with the Moloto Corridor. The total distance from Polokwane to Jane Furse is approximately 150 km (Refer **Figure 3**).

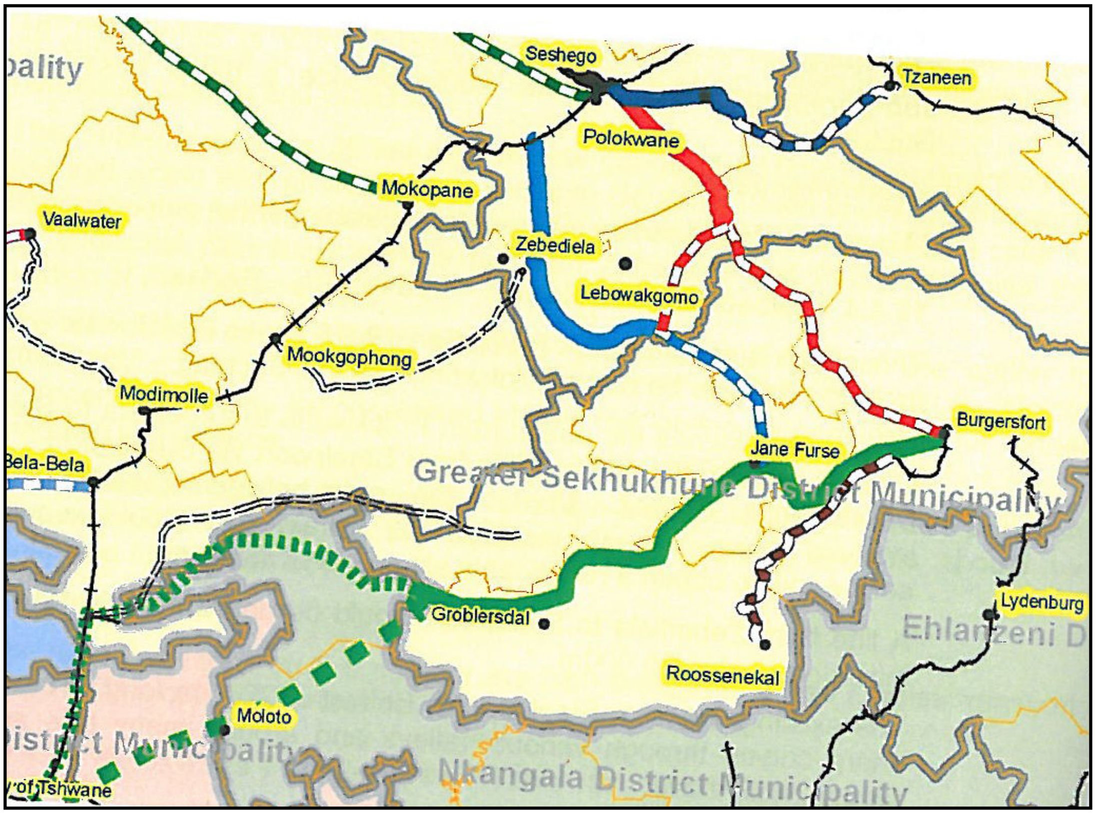


Figure 3: Approximate location of Rail options that could link to the Moloto Corridor

1.2 Scope of Study

1.2.1 Corridor A: Polokwane –Mokopane Commuter Rail Service

The aim of the study is to realize a **business case** and define how a commuter service could be provided between Polokwane and Mokopane stations. This commuter service should be efficient for work and scholar trip and would only be utilized to travel North in the morning and South in the afternoon, as Residences are in Mokopane area and the Industrial and Commercial area are around Polokwane. This report presents the detailed infrastructure proposed for the corridor based on travel demand estimates which are presented in the Market Analysis report for this corridor. The business case is presented separately in the business plan report for this corridor.

1.2.2 Corridor D: Polokwane –Moloto Passenger Rail Corridor

It was recommended in the Phase 1 report that a Conceptual Design be done to link Polokwane with the Moloto corridor which should include the options from Polokwane via Lebowakgomo on the Mankweng route to Jane Furse as well as from Polokwane via Zebediela to Jane Furse where it should link to the possible extension of the Moloto Corridor. The purpose should be to guide spatial development along this corridor in order that future rail facilities could support the corridor. According to all the previous observations, the aim of the study is to identify the preferred linkage between Polokwane and Jane Furse. The preferred linkage was determined. This was followed by a Conceptual Design and detailing of infrastructure requirements of the preferred alignment with proposition for station location. An operational assessment based on our experience of similar project was done as well as a Business case. This report presents the market analysis for the corridors.

1.3 Option Development

1.3.1 Corridor A: Polokwane –Mokopane Commuter Rail Service

This option (Corridor A) takes Polokwane to Mokopane as the core and adds 8 new stations in between, as depicted below on **Figure 4**.

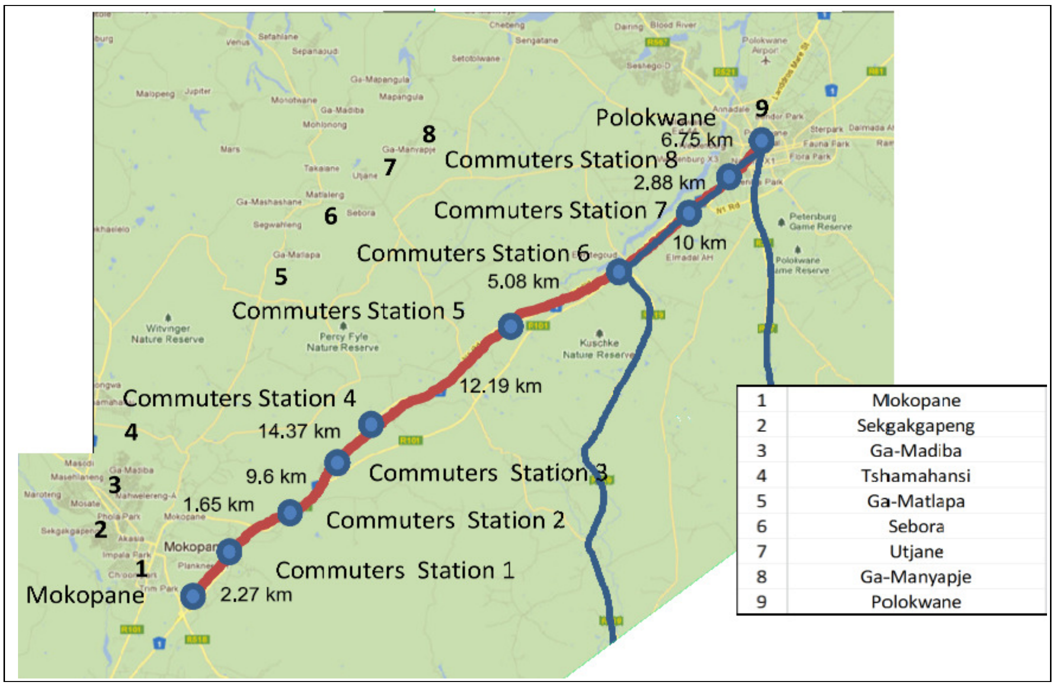


Figure 4: Corridor A – Polokwane to Mokopane

In operational terms, a wholly new line would be relatively simple to plan and operate, and should achieve excellent performance and reliability. If the existing classic line were to be adapted to provide commuter services alongside the current long-distance Shosholoza Meyl service, then there would be considerable operational constraints due to the technological performance characteristics of the classic line (including the one track nature of the line) as well as the complex mix of existing passenger and freight train on this route section. Classic line running also requires that new line rolling stock is compatible with the current classic line infrastructure.

1.3.2 Corridor D: Polokwane –Moloto Passenger Rail Corridor

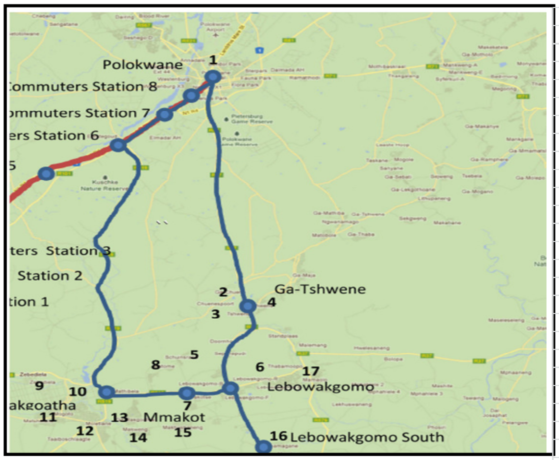


Figure 5: Corridor D – Polokwane to Lebowakgomo

Figure 6: Corridor D: Lebowakgomo to Jane Furse

1	Lebowakgomo
2	Mmakotse
3	Makhushaneg
5	Motsereng
4	Ga - Madisaleolo
6	Lenting
7	Marulaneng
8	Mamatonya
9	Ga - Phaswana
10	Byldrit
11	Grootklip
12	Malope
13	De Paarl
14	Mahlolaneng
15	Ga - Masemola
17	Sekale
24	Pitsaneng
25	Mashoanyaneng
26	Maraganeng
27	Lewalemolomo
28	Mosehla
29	Good Hope
30	Mgababa
31	Jane Furse
32	Sekhutlong
33	Sekwati
34	Ga-Tisane
35	Diphagane
36	Ga-Taine
37	Mohwelere
38	Ga-Mokalape
39	Ga - Chuene
40	Chuenespoort
41	Schuinsrand
42	Matome
43	Mathibela
44	Ga-Maja
45	Ga - Rakgoatha
46	Makweng
47	Moletlane
48	Mogoto
49	Zebediela
22	Mamaolo
20	Thamagane
19	Morotse

This option (Corridor D) takes Polokwane to Jane Furse (via Zebediela) as the core and adds 15 stations in between as depicted below on **Figures 5** and **6**.

Similar considerations as recorded under 1.2.1 above were factored into the assessment of the Polokwane – Jane Furse line with regard to the track portion from Polokwane to the kilometre 267.8 turn-off, where the route is parallel to the classic line route between Polokwane and Mokopane. The intuitive advantages of utilizing the classic line were far outweighed by the negative operational disadvantages. If the existing classic line were to be adapted to provide commuter services alongside the current long-distance Shosholoza Meyl service, then there would be considerable operational constraints due to the technological performance characteristics of the classic line (including the one track nature of the line) as well as the complex mix of existing passenger and freight train on this route section. Classic line running also requires that new line rolling stock is compatible with the current classic line infrastructure.

In terms of construction, there are a few issues that strongly favoured the Polokwane Jane Furse via Zebediela ahead of via Chuenespoort. The alignment through Zebediela traverses through flatter terrain; hence there is no requirement of tunnels.

Equally, environmental considerations weighed decisively in favour of the via Zebediela option. The option via Chuenespoort traverses through area of high environmental sensitivity viz; Bewaarkloof Nature Reserve, Centres of Endemism, vulnerable and endangered eco-systems, heritage areas, whereas there are no such issues via the Zebediela option.

Moreover, the option via Zebediela passes through land capable of arable culture and there will be fewer traffic accidents due to terrain conditions

In terms of suitability and, although the principal objective of this study is to provide for passenger transport, the detail feasibility should include freight movement capacity along the corridors of the preferred options.

In light of above mentioned considerations, the market analysis done in this report leads to the recommendation that the Polokwane – Mokopane rail commuter service (Corridor A) as well as the regional passenger rail service from Polokwane to Jane Furse (Corridor D) be taken forward for detail feasibility consideration when the appropriate market demand indicators are fulfilled in the medium term. The determination of passenger demand also spells out the option to be considered for Corridor D for detailing of infrastructure and operations.

1.4 Purpose of this Report

This Technical Report contains technical information required according to the scope of the project and in accordance with PRASA and Limpopo DoRT requirements. The content of this document is based on the understanding of the project's scope of work. Once approved by PRASA and Limpopo DoRT, this Technical Report will form the basis upon which the project will be executed.

1.5 Layout of this Document

In pursuing the objectives and scope of the document the outline of the remaining chapters is as follows:

- Chapter 2 presents the corridor profile for Corridor A Polokwane Mokopane Commuter Service and Corridor D-Polokwane Jane Furse Rail service.
- Chapter 3 presents the strategy for spatial development for Corridor A Polokwane Mokopane Commuter Service and Corridor D-Polokwane Jane Furse Rail service.
- Chapter 4 presents the identification of stations for Corridor A Polokwane Mokopane Commuter Service and Corridor D-Polokwane Jane Furse Rail service .
- Chapter 5 presents the traffic surveys and analysis for Corridor A Polokwane Mokopane Commuter Service and Corridor D-Polokwane Jane Furse Rail service.
- Chapter 6 presents the demand modelling methodology and results for Corridor A Polokwane Mokopane Commuter Service and Corridor D-Polokwane Jane Furse Rail service.
- Chapter 7 presents the feeder and distribution systems and station area planning for Corridor A Polokwane Mokopane Commuter Service and Corridor D-Polokwane Jane Furse Rail service.

2. CORRIDOR PROFILE - CORRIDOR A POLOKWANE –MOKOPANE AND CORRIDOR D-POLOKWANE MOLOTO CORRIDOR

2.1 Introduction

The present chapter discusses the socio-economic profile of the nodes along the corridor, features of existing transport system and proposed infrastructure projects planned by various agencies in the municipalities to cater to the anticipated future demand.

The proposed alignments linking Pololwane to Mokopane and Polokwane to the Moloto Corridor traverse the following District and Local Municipalities:

- Capricorn District Municipality, including
  - Polokwane Local Municipality, and
  - Lepelle Nkumpi Local Municipality;
- Waterberg District Municipality,including
  - Mogalakwena Local Municipality
- Greater Sekhukhune District Municipality, including
  - Fetakgomo Local Municipality,
  - Greater Tubatse Local Municipality, and
  - Makhuduthamaga Local Municipality.

2.2 Socio-Economic and Demographic Characteristics- Important Nodes

2.2.1 Polokwane

The population of the Polokwane Local Municipality (PLM) is about 561,000, according to the 2007 Community Survey. This represents 45% of the Capricorn District population and approximately10% of the Limpopo Province population. The population of PLM has grown by over 10% since 2001, in addition to a 16% increase from 1996 to 2001. Much of this growth is due to an influx of migrants from more rural municipalities into Polokwane. Meanwhile, growth overall in Limpopo province has been significantly lower, with only a 5% increase between 2001 and 2007. Nation-wide, there was an increase of about 8.7% during the same period. The distribution of the population across the municipality varies greatly, from rural areas to Polokwane City and other large population centres. The 2001 Census divided the municipality into Main Places and the population and number of households in each area is outlined in **Table 1**.

Table 1: Population and Population Density by Census "Main Place "Area

Area	Total Population	% Population	Area (Square km)	Population Density (per square km)
Bjatladibja Dikolobe	38,473	7.6%	179.34	215
Dikgale	39,964	7.9%	170.18	235
Ditlou Machidi	13,326	2.6%	21.51	619
Ga-Mashashane	1,669	0.3%	2.12	786
Maja	10,796	2.1%	75.78	142
Makgoba	911	0.2%	1.03	883
Mankoeng	37,995	7.5%	118.24	321
Mankweng	11,599	2.3%	4.43	2,621
Mixed TA	3	0.0%	97.84	0
Mojapelo	2,332	0.5%	1.57	1,481
Molepo	32,706	6.4%	286.65	114
Moletji	103,087	20.3%	468.21	220
Moloto Solomon Kgabo	1,018	0.2%	0.87	1,169
Mothiba	15,281	3.0%	11.46	1,333
Pietersburg Part 1	62,091	12.2%	128.80	482
Pietersburg Part 2	4,133	0.8%	38.53	107
Polokwane	20,354	4.0%	1914.38	11
Seshego Part 1	71,285	14.0%	21.47	3,320
Seshego Part 2	544	0.1%	12.44	44
Thabamoopo	5,802	1.1%	6.07	956
Tholongwe	31,694	6.2%	163.00	194
Turfloop	3,192	0.6%	1.83	1,746
Total	**508,255**	**100%**	3,726	136

Source: Polokwane IRPTN Final Operation Plan

The area of the Polokwane Local Municipality is about 3,775 square kilometres with an average population density of 136 people per square kilometre. The population density across the municipal area is illustrated in **Figure 7.** The population density by census "Main Place" area confirms that the places with the highest population density are Seshego Part 1, northwest of Polokwane City, and Mankweng, Turfloop, Mojapelo and Mothiba to the east of Polokwane City. Interestingly, the densest sections of the region are in Seshego and Bloodriver, not Polokwane City.

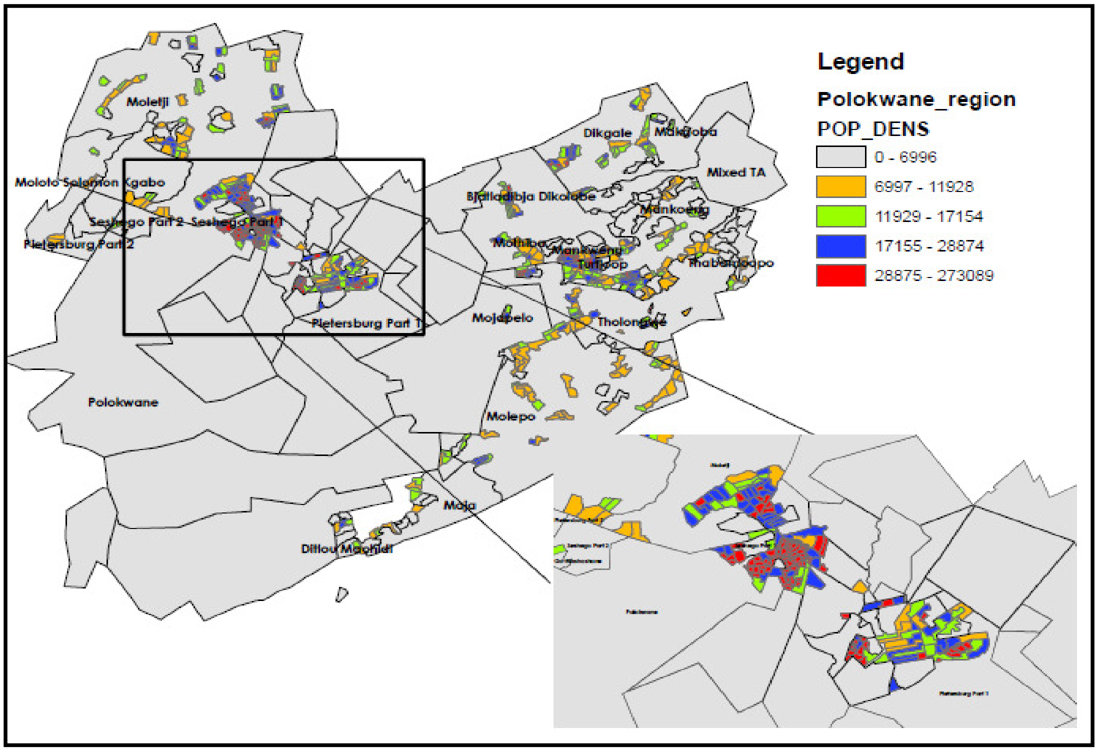


Figure 7: Polokwane Population Density by Census Enumeration area (2001), Source: Polokwane IRPTN Final Operation Plan

Figure 7: Population of Mogalakwena by Gender, 2001

Figure 7 indicates that even though the overall population density is relatively low at 136 people per square kilometre; the population density for individual census enumeration areas is comparatively high in areas around Seshego, Polokwane City, Bloodriver and Mankweng. **Figures 8** and **9** present snapshots of settlements in the study area.

Figure 8 and 9: Snapshots of Settlement sin Polokwane Municipality

Estimates for Mogalakwena population size vary. Most recent estimates are based on the 2001 SSA and BMR adjustments. According to these figures the total population of

Mogalakwena Municipality adds up to 298 440 persons at 68 010 households. The average household is home to 4,4 persons. Many households are home to more than ten persons. It should, however, be noted that the population size of the Municipality could be more than the number of people indicated as many people live on farms throughout the area. The area population changes with the seasons, since many residents migrate to work elsewhere. The annual population growth rate is estimated at 1,4%, which represents the average provincial population growth rate. The total population after projections by 1,4% annual growth rate is 324467 which gives an increase in population by 4480. The total population increased by 1.4 % since 2006. **Figure 10** presents the population by age and gender and **Figures 11** and **12** present snapshots of Mokopane**.**

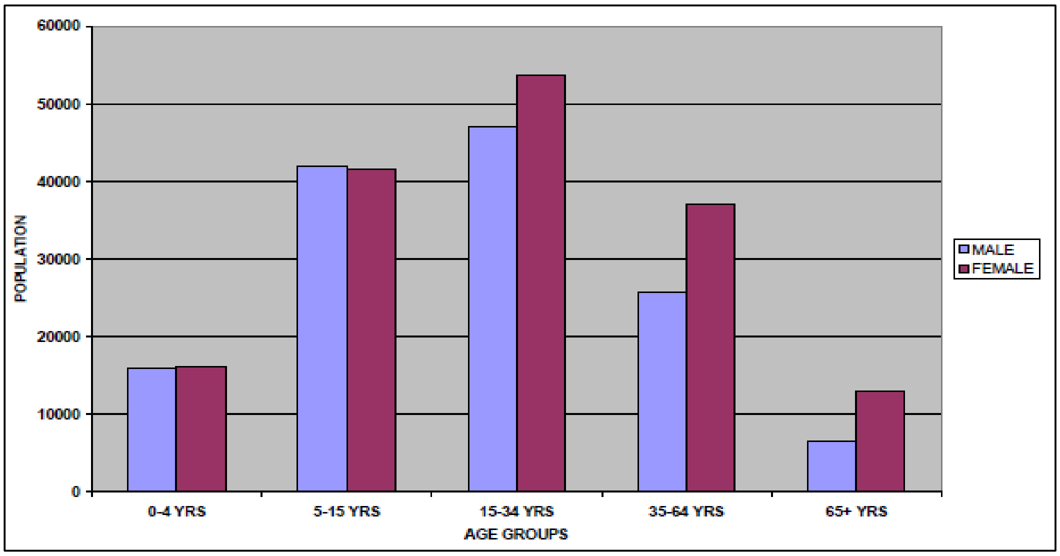


Figure 10: Population by Age and Gender

Figure 11 and 12: Snapshots of Mokopane

2.2.3 Jane Furse

Figure 13: Snapshot of Jane Furse

The most recent survey, 2007, find Makhuduthamaga population at about 300 206,146 settlements and 56 642 households (Statistics South Africa, Community Survey 2007). There is a higher proportion of females (56% females to 43% males) than males in terms of gender break down of the total population. The main reason for this trend could be labour migration to economic centres such as the metropolitan areas of Gauteng Province. The labour force is predominantly male. This indicates either a higher level of migration or single parent households, both factors place constraints on the households to afford proper services. There are 56 642 households in Makhuduthamaga Local Municipality. The average households' size has been calculated at 5.3 per household. The majority of the population works at institutions (90%). This is followed by occupations that are not specified and not classified at 3.68%. Elementary and professionals occupations contribute just in excess of 1%. The rest contribute less than 1% of the total occupation population. This distribution shows that the rural areas did not have any economic base. The major occupations were government related e.g. teachers, nurses, policemen, clerks, and magistrates to mention but a few. The number was swelled by the establishment of the local municipality and the hospitals at Jane Furse and Glen Cowie (St Rita's). **Figure 13** presents a snapshot of Jane Furse.

2.3 Land Use Patterns and Characteristics

The corridors have a number of land uses of national importance (Refer **Figure 14**). These are mostly related to the tourism, mining and agricultural industries.

2.3.1 Centroids

The major land use elements (centroids) within the corridors, include the following:

a. Polokwane CBD

Polokwane serves as the economic hub of Limpopo. The Polokwane CBD is therefore of regional importance, serving as a regional trading and shopping hub to the greater Polokwane area.

b. Gateway International Airport

The Gateway International Airport located in Polokwane is the only airport within Limpopo with international status. Plans are underway to establish the airport precinct as an Industrial Development Zone (IDZ). This initiative includes plans to use the airport as a UN depot for Sub-Saharan Africa.

c. Lebowakgomo Provincial Government

Even though Polokwane is the provincial capital, Lebowakgomo is home to the Provincial Government and Provincial Government departments. This town was the capital of the former Lebowa Government.

d. Mining Belt around Jane Furse and Burgersfort

The Burgersfort mining belt is situated in the Tubatse municipality area. Chrome, Vanadium and Platinum is found and mined extensively along this mining belt and is exported by rail and sea (via Richards Bay harbour) to overseas destinations.

e. Platinum Mines around Mokopane

Areas around Mokopane contain large concentration of platinum reserves. The Reef runs from Thabazimbi southwards towards Rustenburg and eastwards towards Madibeng (formerly Brits). Large mining companies operate within the municipal area, such as Anglo Platinum and Goldfields.

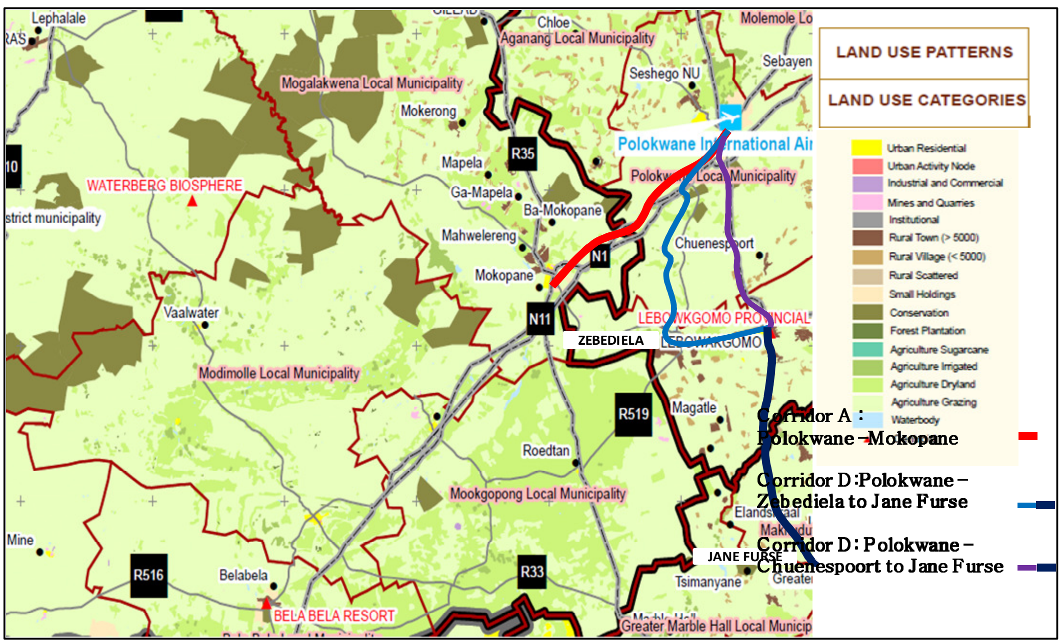


Figure 14: Land Use pattern along the corridors

2.3.2 Growth Points

The Limpopo Province drafted a Provincial Spatial Rationale, which identified a hierarchy of settlements with the aim of concentrating development at key identified places . Settlements hierarchies were identified based on a number of criteria, such as population size, the location of existing hospital and clinics, existing economic activities and the location of settlements relative to major arterials. A 5-tier settlement hierarchy was developed, as depicted in the box below. It is important to understand this Provincial Spatial Rationale study in order to understand the existing district-level land use patterns within the province

Provincial Growth Points include settlements such as Polokwane (which can also be classified as a national growth point), Mokopane (formerly Potgietersrus, Bela-Bela (formerly

Warmbaths), Makhado (formerly Louis Trichardt) and Tzaneen. District Growth Points include settlements such as Mankweng, Zebediela and Lebowakgomo.

2.3.3 Spatial Development Initiatives

The Spatial Development Framework identified several provincial corridors within Limpopo (Refer **Figure 15**). These are:

- The Trans Limpopo Corridor
- The East West Corridor
- The Dilokong Corridor
- The Phalaborwa Corridor

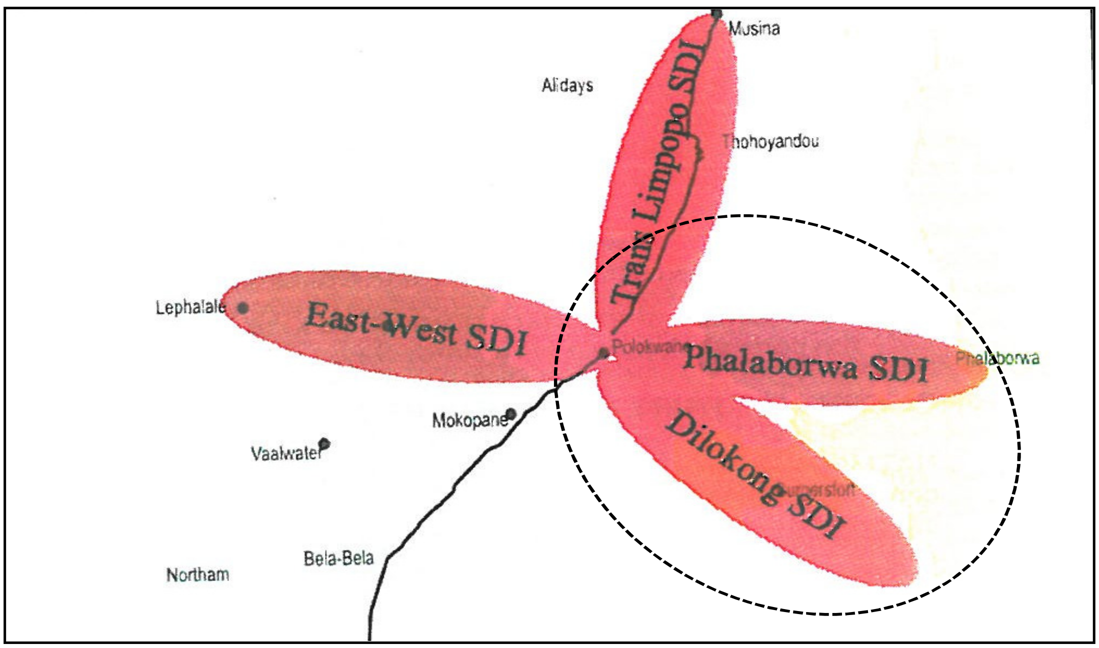


Figure 15: Spatial Development Initiatives along the Corridors

2.4 Sectoral Analysis

2.4.1 Agriculture

Of the total surface area for agriculture activity along the corridors, commercial farmers have access to about 70% and about 30% is occupied by emerging farmers. About 14,2% of the total land area has potential for cultivation purposes and the rest is only suitable for grazing, nature conservation, forestry, farmland and non-agricultural usage(Refer **Figure 16**). Large sections of the proposed corridors are unsuitable for arable agriculture and is some areas people live off subsistence farming. Arable land is mostly found around the Lebowakgomo area and south of Zebediela .Citrus farming is common in these areas (**Figure 18**).

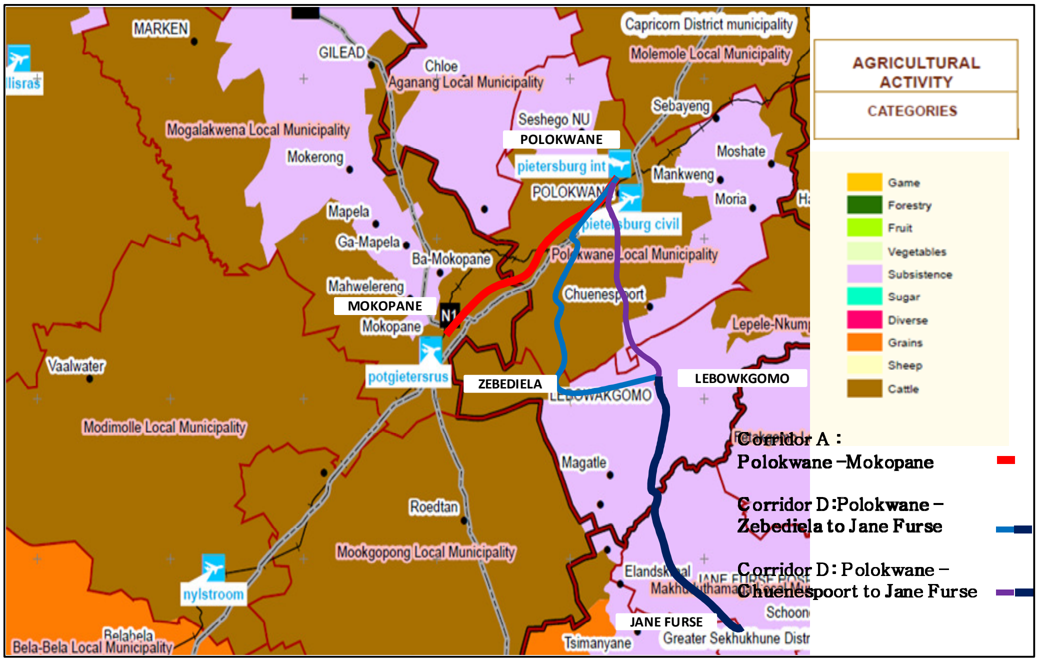


Figure 16: Agriculture Potential along the corridors

Figure 17: Oranges for sale near Lebowakgomo

2.4.2 Mining

Figure 18 illustrates mining activity and reserves in Limpopo alongside the two corridors. The Waterberg District has significant mineral zones with the most important being the Platreef, the Mogalakwena Area and the Mogalakwena tinfields. A number of minerals occur in the Mogalakwena area, the most important of which include:

- **Clay**: Clay is mined on the farm Weenen (40 KS) and is used by Weenen Bricks in the manufacturing of bricks and other pottery articles.

- **Dimension stone**: Granite is mined on the farms Klipplaatdrift (787 LR), Leyden (804 LR) and Bellevue (808 LR).
- **Limestone**: The main deposit is on the farm Uitloop (3 KS). This reserve was exploited in the past to such an extent that it represented the main source of limestone in the then
- Transvaal Province. The Duitsland Formation, located to the south-east of Potgietersrus, contains several layers of limestone.
- **Fluorspar**: A number of fluorspar deposits are located within the region, including those on the farms Buffelsfontein (347 KR), Vischaat (520 KR) and Eerste Geluk (512 KR). The Buffalo Fluorspar Mine was terminated (was located on the farm Buffelsfontein 347 KR).
- **Tin**: The Mogalakwena Tin Fields comprises deposits on the farms Roodepoort (222 KR), Zaaiplaats (223 KR), Salomon's Tempel (230 KR) and Groenfontein (227 KR).
- **Platinum:** A number of platinum mines are located around Mokopane.It is part of Bushveld complex and production is limited to 2% annual international demand for platinum. Large mining companies operate within the municipal area, such as Anglo Platinum and Goldfields.

The Waterberg coal field has about 45% of total in situ coal reserves of South Africa. However, it should be noted that only a fraction of this coal (about 4.13 billion tons) can be considered recoverable. The total reserve comprises about 15.5 billion tons, but the bulk is too deep to mine economically, given current technologies.
The Burgersfort mining belt is situated in the Tubatse municipality area. Chrome, Vanadium and Platinum is found and mined extensively along this mining belt and is exported by rail and sea (via Richards Bay harbour) to overseas destinations.

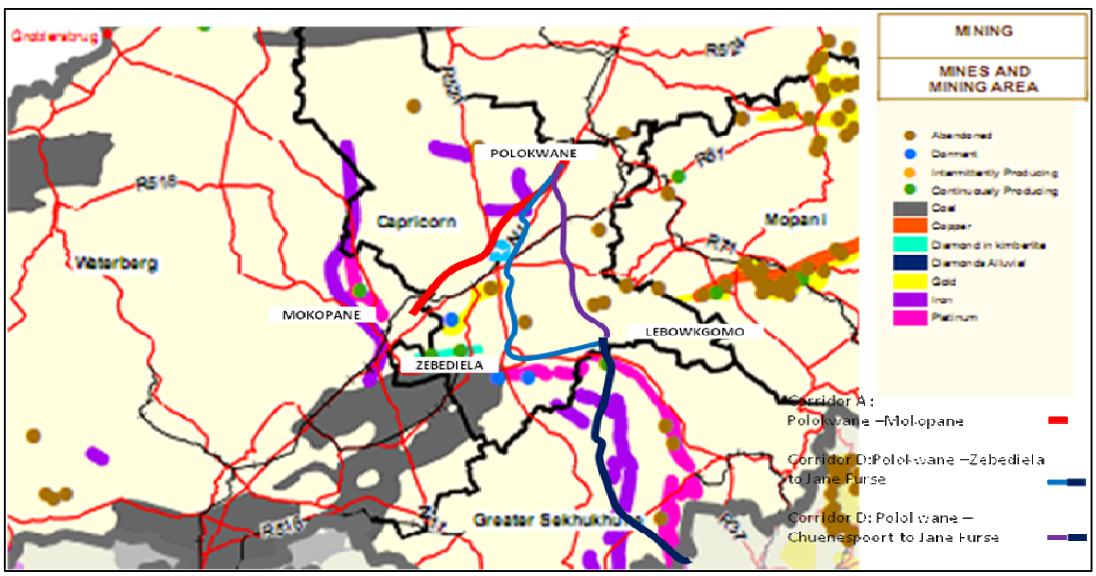


Figure 18: Mining Reserves along the corridors

Polokwane Local Municipality lies on a plateau 1230m above sea level, producing a temperate climate that has favoured a strong agricultural presence and an abundance of wildlife. The region is also blessed with significant reserves of **platinum metals** (refer **Figure 19)**. All of these elements are key drivers in the transport network of the region.

Figure 19: Snapshot of Polokwane Metallurgical Complex

2.4.3 Industries

The main manufacturing concentrations are in the Polokwane and Mokopane areas, with other industries being adjacent to mines or sources of raw materials. The settlements along the corridor viz. Mokopane, Lebowakgomo and Jane Furse have extensive logistics facilities, warehousing and supply centres for the handling of foodstuffs, household goods, building materials, fuel, and agricultural supplies, and is a major purchasing area for neighbouring countries to the north. **Figure 20** below shows location of various industries along the corridors.

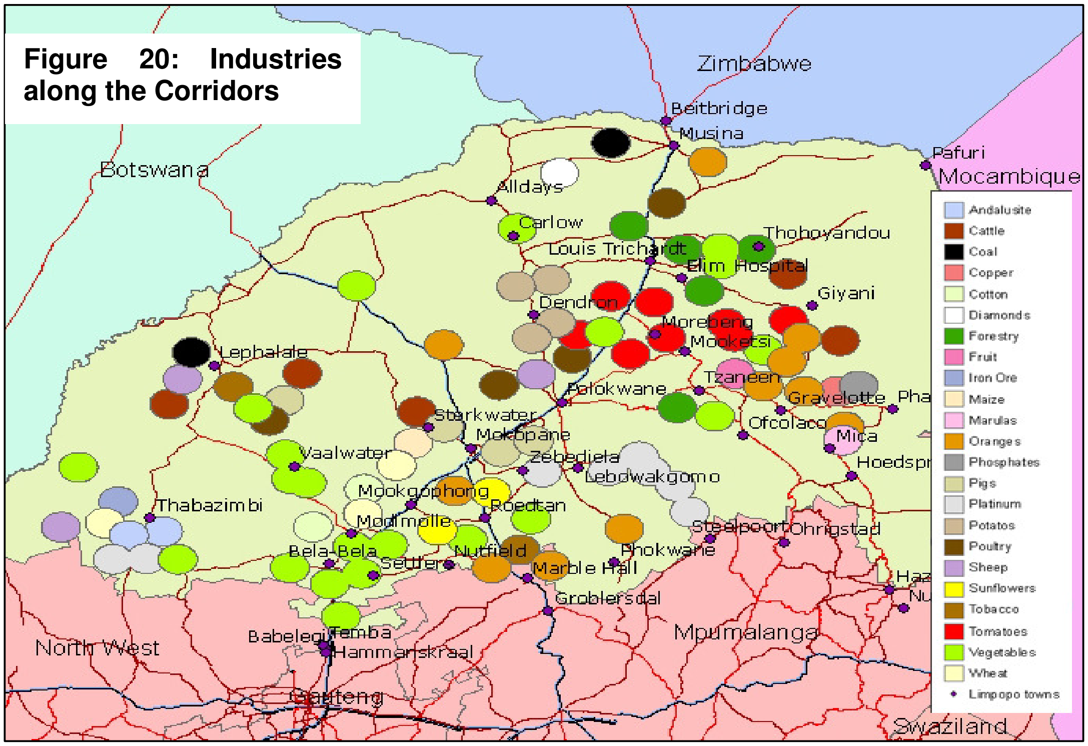


Figure 20: Industries along the Corridors

2.5 Public Transport Supply

Public transport in the study area consists primarily of the taxi industry and subsidised bus services. In addition, some limited services are also provided metered taxis and the rail system. Currently, the largest share of the market belongs to the taxi industry although this depends on the location of the route served. The data presented in the ensuing sections were sourced from CPTR's of the various municipalities and Polokwane IRPTN Operational Plan and supplemented by primary surveys by the project team.

2.5.1 Bus Transport

Bus services are operated by private sector companies contracted by the Limpopo Province Department of Transport. There are two subsidised bus companies in Polokwane, Great North Transport (GNT) and Bahwaduba Bus Services. Another company, the New Bus Company (NBC) is contracted to Bahwaduba Bus Service and also provides subsidised services on some specific routes. These companies receive ticket subsidies through the National/Provincial bus subsidisation scheme. Although the province sets policy on the itineraries of routes with the details contained in the contracts held with the private operators, the PLM can make recommendations to the province with regard to this.

There are also a number of small non-subsidised operators with the two main being Kopano and Madodi, although these operators do not provide commuter services and there is no information available on their operational role. There are 195 bus routes operating partly or fully within Polokwane Local Municipality also servicing the settlements of Mokopane, Zebediela, Lebowakgomo and Jane Furse.. Great North Transport is the largest service provider with 180 routes serving destinations both throughout the study area and beyond its borders (Refer **Figure 21**). Great North Transport (PTY) Ltd was formed in 1996, through the amalgamation of Gazankulu Transport (PTY) Ltd and Lebowa Transport (PTY) Ltd and has been in existence for over 32 years. GNT is a wholly owned subsidiary of the Limpopo Economic Development Enterprise (LimDev) and operations are managed by eleven depots, spread across the Limpopo Province. GNT is paid by means of fares collected from its passengers and subsidies paid to GNT in terms of negotiated contracts. The subsidy burden is divided between the Provincial Department and the National Department of Transport. GNT operates under three negotiated contracts for the areas of Seshego, Hoedspruit and Makopane. The remainder of their services are still operated under interim contracts. The GNT network covers about 3158 kilometres of bus routes in each direction.

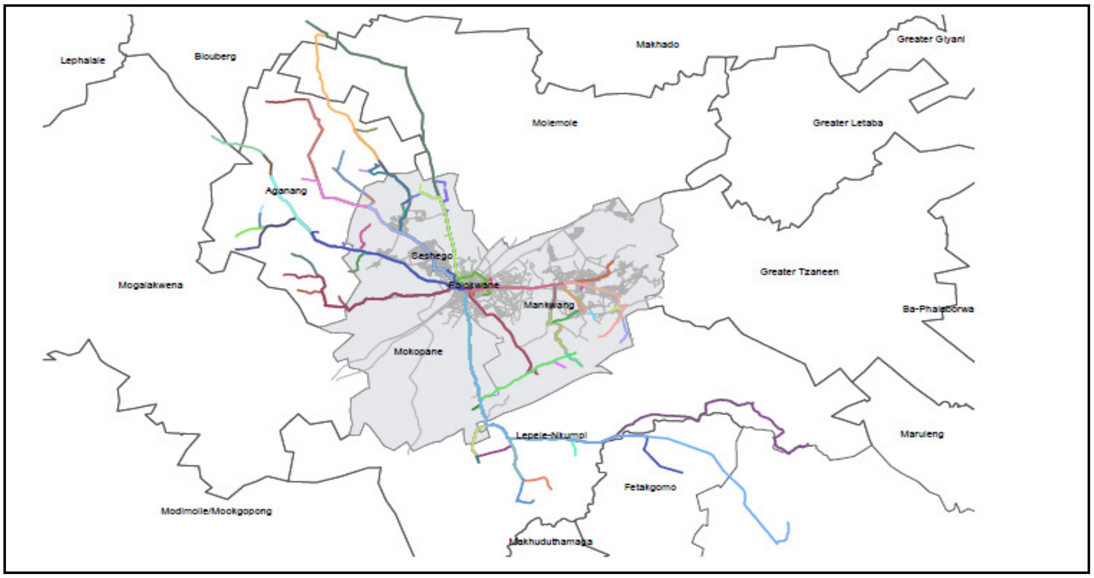


Figure 21: Great North Transport Bus Routes

The other subsidised provider is Bahwaduba Bus services which operates on 15 routes focusing primarily on the region east of Polokwane around Mankweng as well as into Molemole Local Municipality (Refer **Figure 22**). Both GNT and Bahwaduba bus services operate on fixed schedules and routes with set stops along the route. Payment is made in cash on board the vehicle to the driver who then issues the passenger with a ticket. In addition to this payment method, GNT also make use of Multi- Journey Tickets (MJT). The MJT is in the form of a smartcard or so called Tag. Once purchased the ticket seller will load the desired trips on the Tag for the passenger after which the passenger can hang the Tag around the neck for safe keeping. To use the Tag with the desired trips loaded onto it, the passenger simply boards any GNT bus, swipes the ticket and uses the service. With each swipe the trip gets deducted from the ticket and once depleted, the passenger can reload more trips on the Tag.

The Bahwaduba Bus network covers about 451 kilometres in each direction. It is estimated that 196 buses operate on the subsidised routes in the Polokwane Local Municipality area. Most of these vehicles are standard size vehicles with a maximum capacity of 65 seats and 20 standing passengers. In addition, GNT uses some articulated buses with maximum capacity of about 140 passengers. GNT operate a total fleet of 499 buses spread out throughout the Limpopo Province and parts of Mpumalanga and currently operating 156 buses in the Polokwane Local Municipality. The majority of the fleet's vehicles are aged between 8 and 9 years. The oldest vehicles are 2001 Scania models and the newest vehicles 2009 Scania models. Out of the 156 buses, five are articulated buses and the rest consist out of Standard type buses (Refer **Figures 23** and **24**).

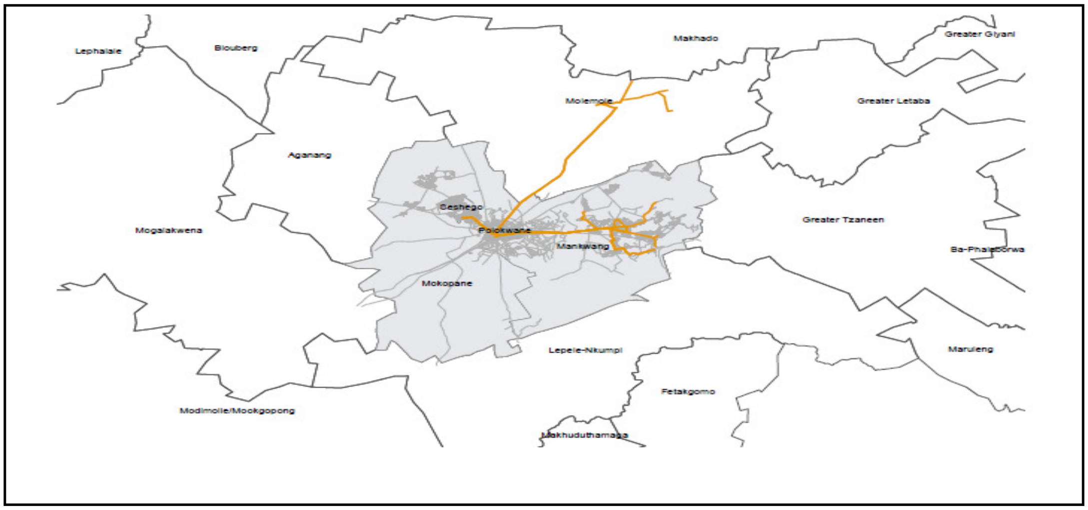


Figure 22: View of Bahwaduba Bus Network

Figure 23: View of Great North Transport Bus service-Subsidised Bus service

The only defined major bus terminus in the Capricorn District is in Polokwane, located to the northwest of the Polokwane CBD area to the west of the main rail station (Refer **Figure 25** and **26**). There are capacity constraint issues in the existing terminal that has recently been upgraded. Mokpane, Zebediela, Lebowakgomo and Jane Furse have designated bus and Taxi ranks in the city (Refer **Figure 27** and **28**).

Figure 24: View of Kopano Bus Service: Non-subsidised Bus service

Figures 25 and 26: Snapshots of Polokwane Bus Terminal illustrating capacity constraints

Figures 27 and 28: Snapshot of Bus and Taxi Ranks in Mokopane

Stops for boarding and alighting are located throughout the study area. **Figure 29** illustrates the locations of bus stops for both Great North Transport and Bahwaduba.

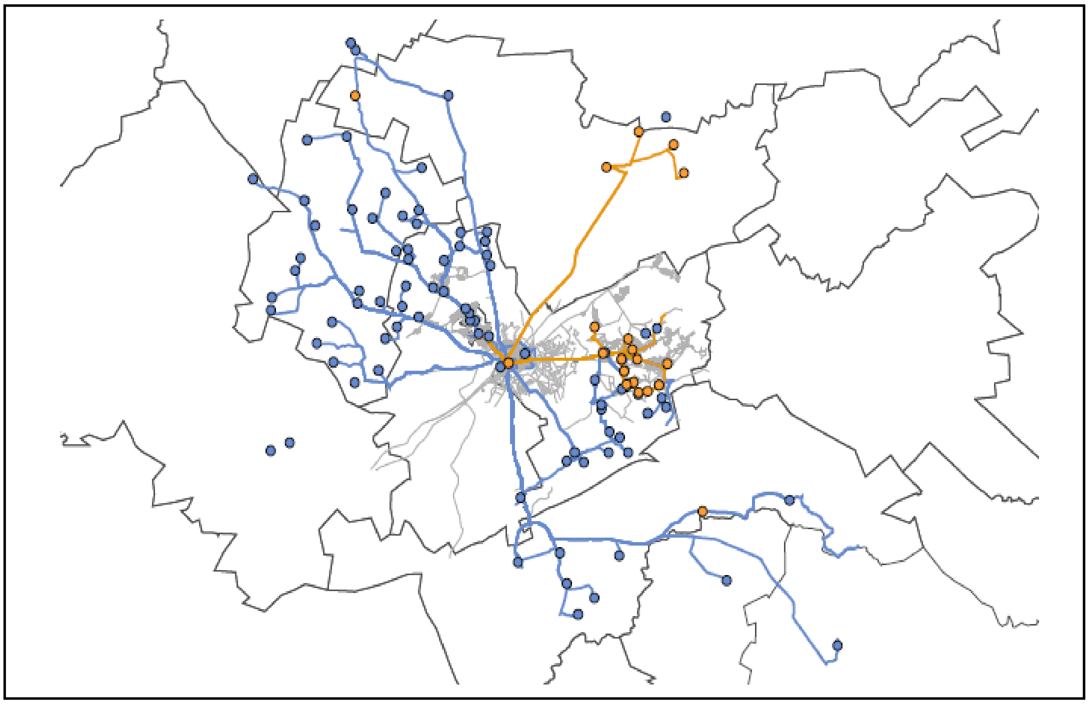


Figure 29: Bus Stops for GNT (blue) and Bahwaduba Bus (orange),

Source: Polokwane IRPTN Operational Plan

2.5.2 Minibus Taxi

The CPTR (2007) of Capricorn District Municipality identified 285 taxi routes in the Capricorn District with 149 of them operating in Polokwane Local Municipality and the residual in Waterberg and Greater Sekukhune District municipalities. This network covers about 1,660 kilometres of routes within the PLM area and approximately 2,879 kms in Waterberg and Greater Sekukhune District municipalities. The operations are illustrated in **Figures 30** and **31**. There are about 28 taxi associations operating services in Polokwane Local Municipality (Refer **Table 2**).

Figures 30 and 31: Snapshot of Taxi Operations in Study Area

Table 2: Taxi Ranks in Polokwane CBD

ID	Name	Location	Type
1	Pick 'n' Pay Rank	Church Street, opposite Pick 'n' Pay	Formal rank serving mainly short distance trips
2	Checkers Taxi Rank	Biccard Street between Grobler and Thabo Mbeki Streets	Formal rank
3	Oriental Plaza Taxi Rank	Excelsior Street & President Kruger Street	Formal rank
4	Polokwane Taxi Rank	Silicon Street near Polokwane Bus Terminal	Unused rank proposed as short distance trip holding area in PPT
5	RSA Taxi Rank	NW and SW of Thabo Mbeki / Dahl Street intersection	Informal holding area proposed for redevelopment
6	Jazz Taxi Rank		
7	Felldta Taxi Rank	87 Paul Kruger Street	Informal holding area for long distance trips on a private lot
8	Westernburg Taxi Rank	General Joubert Street	On-street holding

Source: Polokwane CBD Development Plan, 2007

2.6 Determinants of Growth

Although rich in terms of availability of mineral resources, power supply, forest cover etc, Limpopo is a rural province. The Provincial government and Municipalities have accorded priority to various sectors of the economy with emphasis on increasing production and productivity, judicious exploitation of state's natural resources and human development with emphasis on provision of basic amenities as enumerated in the Infrastructure Development Plans(IDP). The district and local municipalities within which the corridors lie with its human resource potential, proactive policies and commitment to ensure encouraging climate to the investors is poised to graduate into the league of prosperous municipalities.

There exist a vast number of investment and business opportunities in the municipalities. The government at municipal level is trying to harness the untapped potential of the identified sectors and create adequate forward and backward linkages to ensure citizen empowerment and sustainable economic development. Furthermore, attention is being paid to the development of infrastructural facilities to ensure rapid industrial growth in the municipalities as this is one of the major impediments to progress. The municipalities are trying to fully tap its advantage of abundant natural resources. Through the various policies/strategies, the municipalities are planning to develop and promote industries and create employment opportunities in various sectors. The emphasis is on developing adequate infrastructure, providing incentives and concessions and simplifying the rules and regulations for facilitating and easing the process of making investments in the province.

All economic sectors were investigated as an economic activity in a regional economy. The emphasis of the sectoral analysis was on both **existing and new opportunities.** Known opportunities were verified and reviewed, including new trends. These were investigated to identify new and innovative opportunities. Specific attention was given to the identification of a range of initiatives such as blue chip projects, investment opportunities and community development projects. We believe that the promotion of urban nodes and corridors within which public passenger services function, provide the principal means of accessibility and integration. This may be viewed as a '**beads on a string'**, where the area of concern is not only a single bead, but the string and the pattern of interconnection between each bead to the whole (adapted from Rapoport, 1990)-Refer **Figure 32**.Spatial allocation of economic opportunities in line with market forces and taking cognisance of settlement patterns within a **"beads on a string'"** framework reference represent the underlying rationale for a nodal strategy. A spatial-economic approach was followed which is explained in Chapter 3 and 4 and should be incorporated in the detailed feasibility study as well.

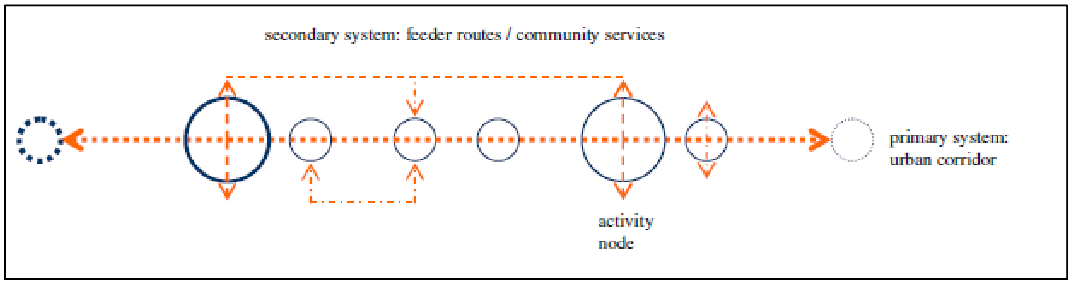


Figure 32: Illustration of "Beads on a String" Approach

3. STRATEGY FOR SPATIAL DEVELOPMENT ALONG CORRIDORS- CORRIDOR A POLOKWANE –MOKOPANE AND CORRIDOR D-POLOKWANE MOLOTO CORRIDOR

3.1 Vision for Spatial Development of the Study Corridors

The planning and development of a commuter and regional rail corridors need to fully incorporate the characteristics of the area in terms of Geography, Economy and People. Problems with rail corridor development are always large: they need to ensure feeder and distribution systems, develop livable communities and provide for economic development along the corridor. These problems are exacerbated and new problems are created when a corridor crosses jurisdictional boundaries.

The planning context for Corridor A and Corridor D highlights some of the key issues that need to be addressed in formulating a strategy for development as part of the **Corridor Modernization Programme of PRASA.** These factors include:

- Existing Land Use
- Existing and Planned Transit Nodes
- Existing Large Industries
- Existing Townships and Settlements
- Population Growth and Age Distribution
- Availability of Skilled and Unskilled Workers
- Availability of Water and Energy Resources
- Existing Education and Research Institutions
- Natural Features and Ecologically Sensitive Areas
- Wildlife Habitats and Sanctuaries
- Archaeological, Historic and Cultural Resources for Conservation and/or Tourism

3.2 Best Practices –Rail Corridors

The case studies selected represent rail corridors where global cities with large populations have decentralized economic activities to allow satellite cities to grow and specialize along a rail corridor.

In most of the case studies this process has happened organically as regional growth leads to the formation of a megalopolis or a cohesive network of numerous cities and towns stretching in a band at least 150 km long and holding a population of more than 20 million.

3.2.1 Rail Corridor Case Study 1 –China, Yangtze Delta Economic Region Shanghai – Nanjing Corridor

With a major transportation corridor linking Nanjing to Shanghai the corridor of development within the Lower Yangtze Delta Economic Region has seen the development of specialized sectors outside of the regional Global City of Shanghai. Shanghai is assuming a vastly different role in the delta region becoming a major tertiary services centre with many existing industries relocating outwards within the delta to cities and towns along the major transport corridors. Improvements in transport access, and constant upgrading of municipal and industrial infrastructure in these surrounding centers means that the structure of this regional market is changing from a single-city focus into a dynamic corridor.

3.2.1.1 Location

The Yangtze River Delta Economic Zone covers 15 cities and municipalites, including Shanghai Municipality, the Jiangsu Province cities of Nanjing, Zhenjiang, Yangzhou, Suzhou, Wuxi, Changzhou, Nantong and Taizhou. This forms much of the East-West urban corridor between Nanjing and Shanghai. The zone also includes the Zhejiang province cities of Hangzhou, Jiaxing, Huzhou, Ningbo, Shaoxing and Zhoushan forming a second North-South corridor between Ningbo and Shanghai.

Figure 33: Layout of Shanghai –Nanjing Corridor

3.2.1.2 Facilities

The head of the region is dominated by Shanghai which includes development zones such as Pudong's lujiazui. This includes tertiary services in finance, trade, retail and tourism. Industry in Shanghai has developed into high technology research and development which requires access to a wide range of top professional, scientific and technical expertise as well as excellent communications and international transportation systems. The development of the urban corridor is now becoming so vast that the area is defined as a megalopolis which is a cohesive network of numerous cities and towns stretching in a band at least 150 km long holding a population of more than 20 million.

3.2.2 Urban Rail Corridor Case Study 2 –Asia, Kuala Lumpur, Malaysia

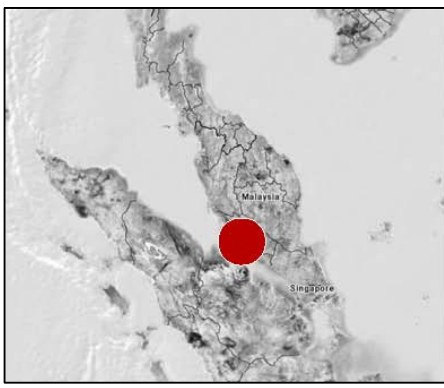
3.2.2.1 MSC-Malaysia

MSC stands for the Multimedia Super Corridor, Malaysia's 50km long urban corridor for the global information and communication technology (ICT) industry. Conceptualized in 1996, the MSC has since grown into a thriving dynamic ICT hub, hosting more than 900 multinationals, foreign-owned and home-grown Malaysian companies focused on multimedia and communications products, solutions, services and research and development.

With this unique corridor, Malaysia continues to attract leading ICT companies of the world to locate their industries in the MSC and undertake research, develop new products and technologies and export from this base. The MSC is also an ideal growth environment for Malaysian ICT SMEs to transform themselves into world-class companies. Furthermore, the MSC welcomes countries to use its highly advanced infrastructural facilities as a global test bed for ICT applications and a hub for their regional operations in Asia.

3.2.2.2 Location

The MSC is a 15-by-50 kilometer (9-by-30 mile) zone extending south from Malaysia's capital city and business hub, Kuala Lumpur and stretches south to the region's largest international airport, the Kuala Lumpur International Airport (KLIA).



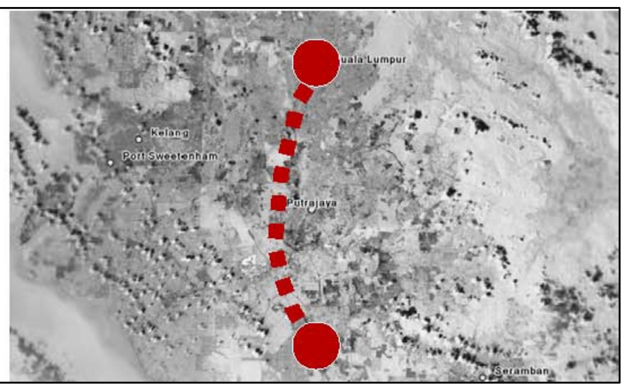


Figure 34 and 35: Location of Multimedia Super Corridor, Malaysia

3.2.2.3 Facilities

The Malaysian government has equipped core areas in the MSC with high-capacity global telecommunications and logistics networks. Emphasis has been placed on eco-friendly, yet sophisticated urban structures for businesses, homes, education and recreation. Secure cyberlaws, strategic policies; and a range of financial and non-financial incentives also support the MSC for investors.

3.2.2.4 Administration

Mandated to oversee the development of the MSC is the Multimedia Development Corporation (MDeC) based in Cyberjaya. Initially a Government-owned corporation but now incorporated under the Companies Act, MDeC facilitates applications by multinational and local companies to re-locate to the MSC. It globally markets the MSC, shapes MSC-specific laws, policies and practices by advising Malaysian Government and standardises MSC's information infrastructure and urban development.

3.2.3 Rail Corridor Case Study 3 –China, Pearl River Delta (PRD)

3.2.3.1 Pearl River Delta

Linking Guangzhou to Hong Kong the PRD role in China's economy is pivotal. Home to less than 3 percent of China's population, it contributes almost 7percent of its GDP. The PRD economy, measured in purchasing power parity (PPP) terms and excluding Hong Kong and Macao, is larger than the national economies of Malaysia, Portugal, and Greece, two-thirds the size of the Philippine economy, and just under half the GDP of Australia.

3.2.3.2 Location

Situated in South China the PRD stretches from Hong Kong through Shenzhen, Dongguan, Guangzhou, Foshan, and Shunde to Jiangmen. Also described as a megalopolis the area is predicted to extend to Zhongshan, Zhuhai, and Macao by 2020.

Figure 36: View of Guangzhou to Hong Kong Light Rail Corridor

3.2.3.3 Facilities

Strong transportation networks including expressways and light rail systems link the major cities within the region. Guangzhou's regional economy is a major production center for intermediate and finished inputs for the domestic chemical, textile, plastics, electrical machinery, transportation equipment, telecommunications equipment, leather, and food processing sectors. It is also a growing center for medium and high value-added manufacturing exports, particularly in the automotive and related sectors. Dongjiang is essentially a production center. Shenzhen was established as an SEZ in 1980 and has now become a sophisticated, well-managed metropolis attracting global investment in high-end manufacturing and advanced services, including innovative research and development. Hong Kong has developed specialized supply chain roles. Neither a major production center nor a major domestic distribution center, it is the largest offshore distribution center in China and the largest container port in the world. Hong Kong has become one of the world's most productive and innovative providers of support services in finance, law, business management, and trade.

3.2.4 Urban Corridor Case Study 4 –Indonesia, Jabotabek

3.2.4.1 Jabotabek

Jabotabek is the largest urban area in Indonesia, consisting of the following administrative areas: the Jakarta Special Region, (DKI Jakarta); the Municipalities of Bogor, Tangerang, and Bekasi; and the Districts of Bogor, Tangerang, and Bekasi. The last areas (or "Botabek"), are adjacent to DKI Jakarta.

3.2.4.2 Location

The Jabotabek region is located in the northwestern part of Java Island, covering more than 6000 km2.

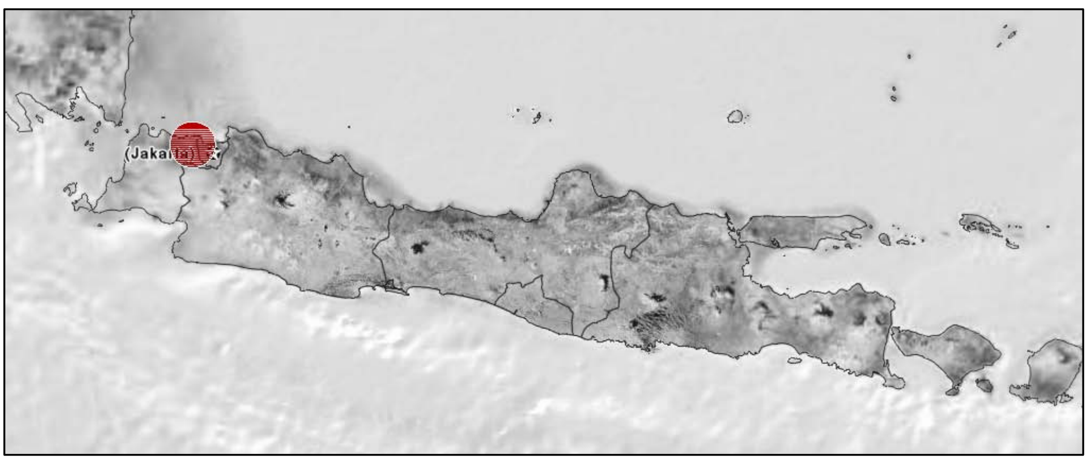


Figure 37: Location of Jakarta, Indonesia

3.2.4.3 Facilities

The regional development of Jabotabek does not conceive the east-west linear city concept as a homogeneous belt of urban development, but rather as a composite of both structured and informal land uses. A great variety of urban, suburban, and peripheral components coexist within the urban development zone. The region's spatial structure is planned to form:

i) Urban growth centres, including both new towns and the expansion of existing centres;

ii) The transportation system, including toll roads, arterial roads, suburban rails, and other infrastructures; and

iii) Green spaces, reserves, and low density, semi-open areas.

The combination of transportation networks and urban centres is seen as the skeletal form of the region's spatial structure.

3.2.5 Rail Corridor Case Study 5 –Ireland, Dublin-Belfast

The Dublin-Belfast corridor is principally a rail corridor linking stations between the two cities. The strong transportation corridor has led to the planned economic corridor with many large multi - national companies located in or around the corridor itself.

3.2.5.1 Location

Running north south along the East coast of Ireland, the corridor links Dublin and Belfast crossing the border into Northern Ireland.

Figure 38: Location of Dublin-Belfast Rail Corridor

To function as an economic corridor and promote economic growth it is planned to provide better facilities in the key areas of:-

- Health Services
- Education
- Sports and Recreation
- Broadband, Energy and Telecommunications
- Research and Development

3.2.5.2 Administration

Due to considerable differences between responsibilities of Local Government North and South of the Border the Dublin-Belfast corridor it is recognised that there should be the establishment of a separate Body, comprising interested parties in the Dublin Belfast-Corridor and that there needs to be, from the outset, Government commitment on both sides of the border to supporting the Regional Planning Guidelines goal and objectives.

3.2.6 Conclusions from Best Practices-Rail Corridors

It emerges from the study of global rail corridors, that following parameters are important for any spatial concept (refer **Figure 39**).

1. Efficient linkage with airport, port / dryport.
2. Location with respect to cosmopolitan city to support the functioning of settlements.

3. Availability of world class physical infrastructure like roads, power, water supply, sewerage, drainage etc.
4. Natural support base of land, water and environmental aspects to ensure ecological balance and environmental sustainability.

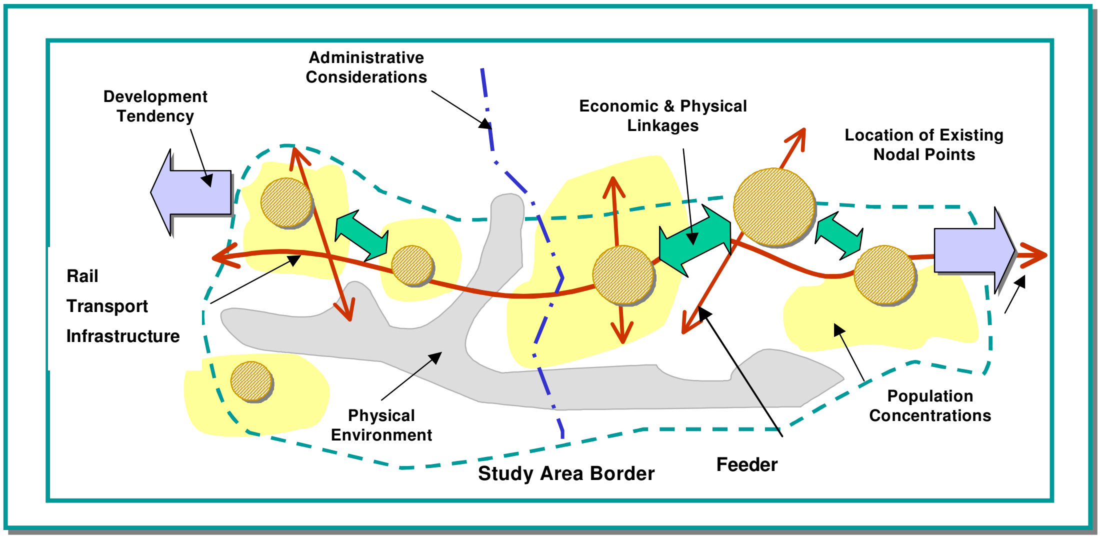


Figure 39: Schematic Representation of considerations for development of corridors (A and D)

3.3 Policy Context –Strategic Fit for Spatial Development along Rail Corridors

3.3.1 Development in Adjacent Provinces of Limpopo and countries

By virtue of its location, Limpopo Province is completely surrounded by provincial and international boundaries. It shares a common border with Botswana to the west, Zimbabwe to the north, Mpumalanga and the Kruger National Park to the south-east and east and Gauteng and North-west Province to the south and southwest. It is thus strategically ideally located as a conduit to the north, through Musina and Beitbridge via both the exiting road and rail north-south corridors. Its road and rail connectivity to the south, to the economic centres and ports of South Africa, present opportunities for extension of linkages to Botswana in the vicinity of Lephalale. Its proximity to the Kruger National Park presents opportunities for the exploitation of tourism to this area, while transport infrastructure in Mpumalanga presents opportunities for exploring improved linkages to the eastern seaboard ports of Richards Bay and Maputo for the export of raw materials from the existing and developing mining corridors through improved transport infrastructure.

The proposed Moloto Rail Corridor linking Mpumalanga to Gauteng has north-eastern termini At Groblersdal and Marble Hall in the Greater Sekhukhune District. This corridor presents possibilities for the further linkage towards Burgersfort, Steelpoort and the Dilokong Corridor to enhance the movement of passengers and goods between the south-eastern sector of Limpopo and Gauteng.

3.3.2 National Transport Strategies

The National Land Transport Strategic Framework provides an overarching national 5-year land transport strategy to give guidance on transport planning and land transport delivery by the three levels of government. The contextual framework is prepared within transport – related legislation and associated policy. It describes strategies in 15 separate functional areas, some of which are public transport, land-use restructuring, freight, inter-provincial and rural transport, tourism transport, intermodalism and integration of transport planning.

With respect to Land Transport Policy, it requires land transport functions to be integrated with related functions such as land use and economic planning and development through the development of corridors, densification and infill development. It requires transport planning to guide land-use development and vice versa. It clearly states that corridor densification and infilling, which promotes public transport, will be promoted across all three spheres of government through statutory transport plans.

With respect to Urban Land Use Restructuring, the document reflects the commitment to promoting greater public and governmental awareness of transport's land-use requirements. In support of the Urban Renewal Strategy in requires the preparation of a document setting out transport requirements in support of corridor densification. Awareness for fundamental urban restructuring to counter urban sprawl and the increasing dependence on private vehicles will be raised. It reflects the commitment of related departments to co-operate and strengthen inter-departmental planning, the support for corridor development and densification within IDP's that are effectively aligned with municipal transport plans.

With respect to Rural Development, the document acknowledges the Integrated Sustainable Rural Development Strategy (ISRDS), and to improve transport efficiency, infrastructure and services in support of governments stated commitment to uplift the material conditions of rural communities.

Strategies in 15 functional areas are addressed. Comment on those areas related to transport and relevant to this study is highlighted.

- **Public Transport**. For Land Transport Planning and the provision of land transport infrastructure and services, public transport is to be given higher priority than private transport at all spheres of government.
- **Transport Planning**. Requires transport planning to change to "needs or demand" driven from "supply" driven system, formulated through transport plans.
- **Freight Transport**. A more balanced sharing of freight transport between road, rail and pipeline will be promoted in line with the National Freight Logistics Strategy. Government to ensure enhanced quality in the road and rail arena.
- **Inter-Provincial Transport**. As a National competency, national government sphere will develop inter-provincial, long-distance transport strategy. I-P commuting will remain in the municipal planning authority domain and be included in municipal transport plans.

- **Rural transport**. Rural access planning to be implemented in the 13 priority rural nodes (Sekhukhune in Limpopo) through promotion of co-ordinated nodal and linkage development, primarily road-based interventions.
- **Intermodalism & integration of Transport Planning**. Public transport, services, facilities and infrastructure must be designed to promote intermodalism and the integration of different modes of land transport, through integrated planning.

With respect to Passenger Rail Development, reference is made to the recapitalisation of commuter rolling stock and related infrastructure (existing) in Priority Rail corridors as identified in the National Rail Plan. Local transport plans are required to inform national level institutions for rail service provision in order to develop Regional Rail Plans that would form part of the National Rail Plan. The document, in its recognition of rail as one of the transport modes, opens the door to the identification of appropriate rail solutions to be pursued and planned nationally and at regional levels. The use of existing rail infrastructure to explore possibilities of commuter and passenger rail services in urban development corridors, and in rural context, where nodes are linked by such infrastructure, creates several opportunities in Limpopo.

3.3.3 Provincial Transport Strategies, Policies and Objectives

The Provincial Land Transport Framework (PLTF) for Limpopo drew on all National and Provincial legislation, policy, strategy, and action plans relating to spatial development and transportation in order to develop a transport framework for Limpopo that embraced and supported national focus in the development of transport interventions for the Province. The PLTF addresses all facets of transport infrastructure and modes with respect to the status quo of transport in Limpopo, strategies, actions, funding and programmes for implementation.

Passenger Rail Development: The document addresses the National Policy Framework suggesting that rail operations " … *will have to be based on concessions…. with rail infrastructure, rolling stock and land owned by the National authority until the Metropolitan or Provincial authority is in a position to take over*". It quotes from the Provincial Policy Framework that *rail infrastructure is "fairly well developed" but underutilized.*

- **Current services: The document, in Chapter 2, reveals that passenger transportation only takes place ove**r the line between **Johannesburg and Makhado** in the form of a daily service to and from the Province (Bosvelder), identifying the main stations serving passengers, and that no commuter services rendered.
- **Proposed services**: The document refers in Chapter 2 to the potential for operating **a high speed** service between Tshwane and Polokwane. It also refers to services between Polokwane and Dikgale and Northam and Thabazimbi (for mineworkers from Eastern Cape) that were withdrawn and suggest possible consideration of re-introduction.

- **Proposed lines or links**: In Chapter 2, reference is also made to the possible extension of a line from **Polokwane to Moria** to provide a "door-to-door service to the user while at the same time helping to alleviate congestion on the road.

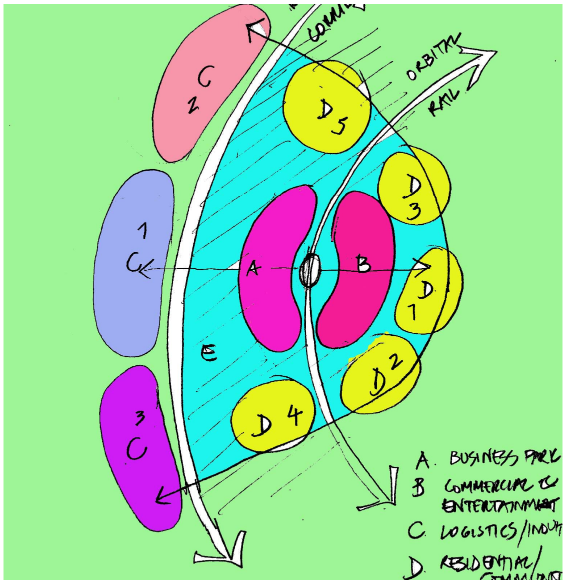
The strategies and possible projects for rail development as identified in the PLTF are summarized in **Table 3.**

Table 3: Strategies and Projects identified in Limpopo PLTF

STRATEGIES	PROJECTS
1. Promote rail services	• Develop a promotion campaign • Develop a mainline services as backbone to weekend & special occasion travel • Investigate the needs of existing & non-users for mainline services
2. Redefine role of rail transport in entire province	• Determine the optimum modal split between road and rail • Assessment of current Provincial Rail Network • Determine optimum rail network to support economic development, job creation in the province • Pre-feasibility investigations for specific rail corridors • Identify of corridors or routes that would be appropriate for freight transport by rail • The above should include the immediate, short-term actions and the long-terms actions for the rail development programs • Formulate business plans for the identified projects
3. Develop the rail network for long distance passengers, freight movements and local commuter transport	• Limpopo-Gauteng mainline service • Urban commuter Services: Polokwane and Seshego • Dilokong corridor rail Network • Coordinate projects through the national rail agencies

3.4 Concepts for Spatial Development along Corridors A and D

The spatial concept has to take into consideration policy directives and parameters contextually as they occur on the site of proposed development. Some concepts for spatial development alongside rail corridors are presented in the following figures.



1.

MODEL FOR ROAD BASED LOGISTICS/INDUSTRIAL ZONES & ORBITALRAIL COMMUNITY

LEGEND :

A.Business park

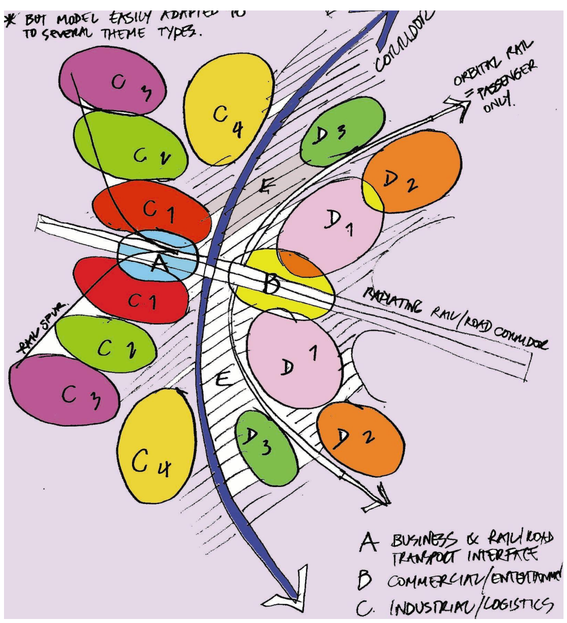
B.Commercial & Entertainment

C.Logistics

D.Residential/Communities

E.Green Buffer

1 – 4 Stages/ Flexibility in growth



2.

MODEL FOR CLUSTER DEVELOPMENT BASED ON ORBITAL RAIL AS PASSENGER ONLY MIXED THEME

Adaptable model for several other themes types

LEGEND :

A.Business & Rail/Road Transport Interface

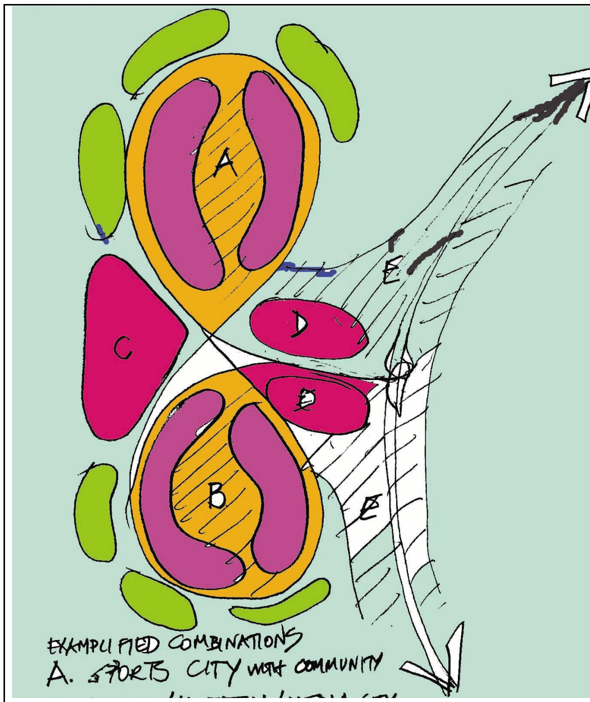
B.Commercial / Entertainment

C.Logistics / Industrial

D.Residential/Communities

E.Green Buffer

1 – 4 Stages/ Flexibility in growth



3.

MODEL WITH NO RADIATING CORRIDOR INFLUENCE OR RAIL INFLUENCE

ISLAND COMMUNITY WITH THEMED BILLING

LEGEND :

Combinations shown are examples :

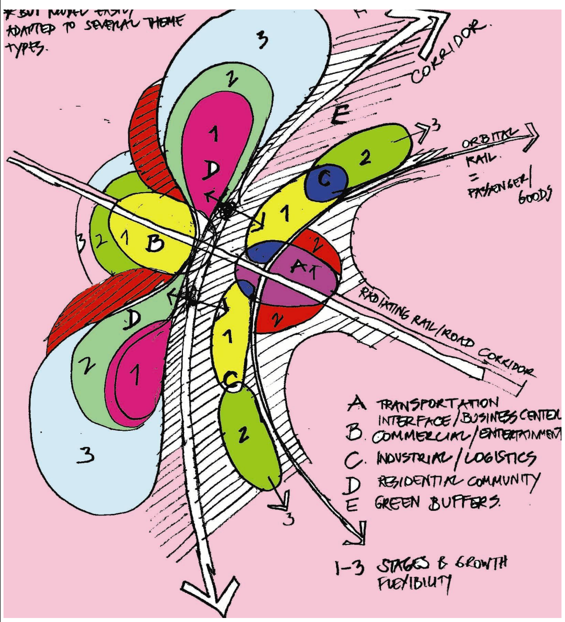
A.Sports City with Community

B.R&D / HI Tech / Media City with Community

C.Business Park

D.Commercial Park

E.Green Buffer



4.

MODEL FOR POSSIBLE "BUTTERFLY" DEVELOPMENT BASED ON NATURAL OR THEMED GROWTH

MIXED THEME : Not easily modified to suit many themes

LEGEND :

Combinations shown are examples :

A.Transportation Interface/Business Center

B.Commercial/Entertainment

C.Industrial / Logistics

D.Residential Community

E.Green Buffer

1-3 Stages & Growth Flexibility

Figure 40: Concepts for Spatial Development alongside Corridors A and D

3.5 Road Map for Future Development of Corridor A and D

It is important that the development of these corridor results in holistic development of the area so that the benefits of development occur equitably .The number of smaller urban areas & villages lack necessary social and physical infrastructure, and the structure of development should endeavour to integrate them. The settlements should not be repository of unintended development, but benefit from infrastructure that they don't have at the moment.

Three major paradigms will guide the future development:

i. Ecological sustainability
ii. Equitable development
iii. Space for economic growth

The spatial configuration and distribution of functions and infra-structure will require detailed study of the area, which should be undertaken on basis of detailed data on land, infrastructure, water, power etc and carrying capacity of the ecosystem to sustain population and development

4. IDENTIFICATION OF STATION LOCATION

4.1 Methodology

4.1.1 Constraints Mapping

The first step in the process of identifying potential station locations between Polokwane - Mokopane and Polokwane – Jane Furse was a review of the existing environmental conditions within the study area. This process included:

- review of the IDP and other municipality planning documents
- review of previous technical reports
- site visits
- consultation with municipalities and stakeholders to obtain relevant information including spatial mapping.

This process established existing baseline environmental and social conditions. Existing constraints and issues within the study area were then identified, including those which would have a low, medium or high bearing on the location of stations and alignments. Issues that were considered include:

- identified future growth areas;
- existing and future road networks;
- property boundaries and property access;
- the locations of dwellings and infrastructure;
- the locations of community facilities such as schools, places of worship and hospitals;
- topography and landform constraints;
- good quality agricultural land;
- mapped areas of soils;
- indigenous and non-indigenous cultural heritage;
- the location and value of watercourses;
- locations and depths of groundwater table;
- sensitive fauna and flora communities, remnant vegetation and records of endangered, vulnerable and rare fauna and flora species;
- provincial , regional and locally significant biodiversity corridors; and
- landscape and visual amenity

4.1.2 Evaluation Criteria

Aligning the proposed stations with future growth areas as identified in various planning documents would maximise rail patronage. This was the principal objective which guided the process of selecting possible station locations. The possible station locations were then refined based on study objectives and a review of the constraints and issues identified during the constraints mapping exercise. The development of Corridor A-Polokwane-

Mokopane Commuter service and Corridor D-Polokwane –Moloto Corridor is illustrated in the following figure.

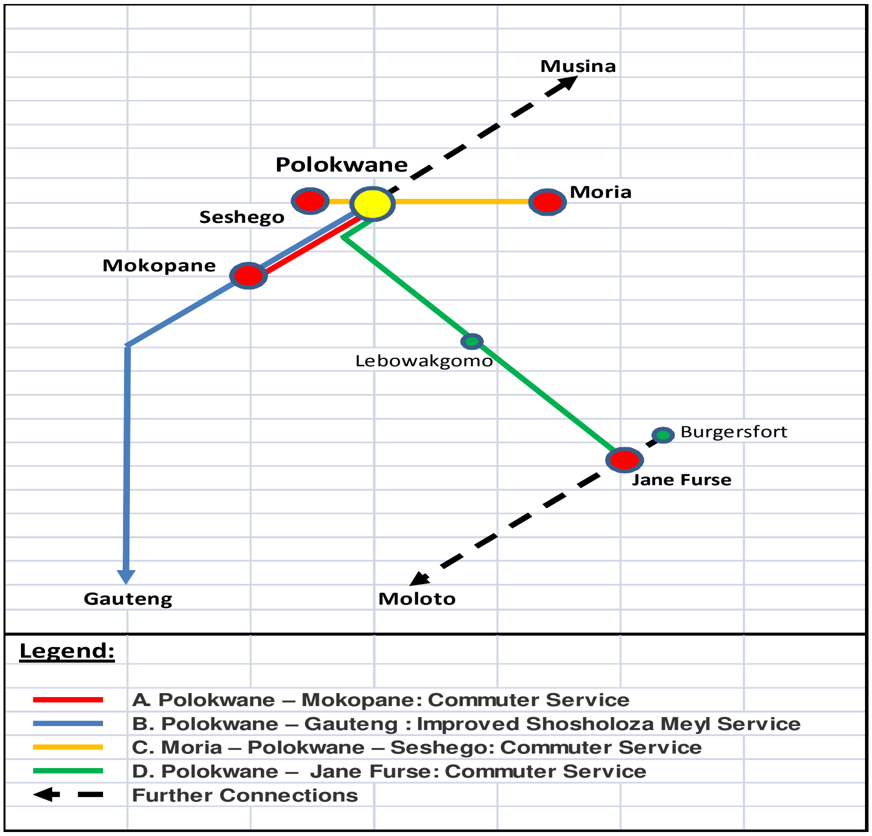


Figure 41: Network Overview

4.1.3 Defining Key Concepts

4.1.3.1 Catchment Area

The area within which passenger trips start or terminate.

The radius of the primary catchment area is defined as 25 km and secondary catchment area as 50 km.

4.1.3.2 Impact Area

The area that generates the "primary" riderships of the Rail Corridor.

4.1.3.3 Influence Area

The areas around the rail stations, which could be influenced in terms of economic and land use development, and redevelopment and revitalization stimulated. Land use and transport integration is an important consideration in this area, and it could be defined as an area with a radius of approximately 1 – 5 km.

4.1.3.4 Station Precinct

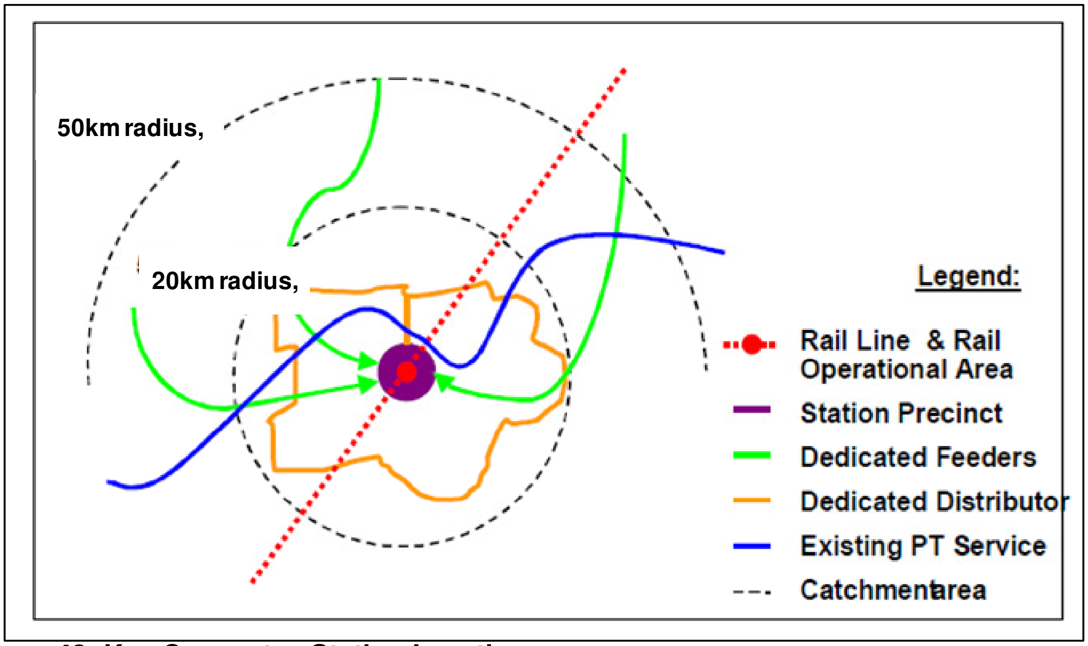
The site or number of adjacent sites that accommodate all the activities, infrastructure, facilities, and amenities related to the rail.

4.1.3.5 Rail Operational Area

The area within the station precinct that accommodates all activities, facilities and amenities directly related to rail operations, including:

- access control,
- concourse and walkways,
- escalators and lifts, and
- platforms.

The above mentioned concepts are presented in **Figure 42**.



42: Key Concepts –Station Location

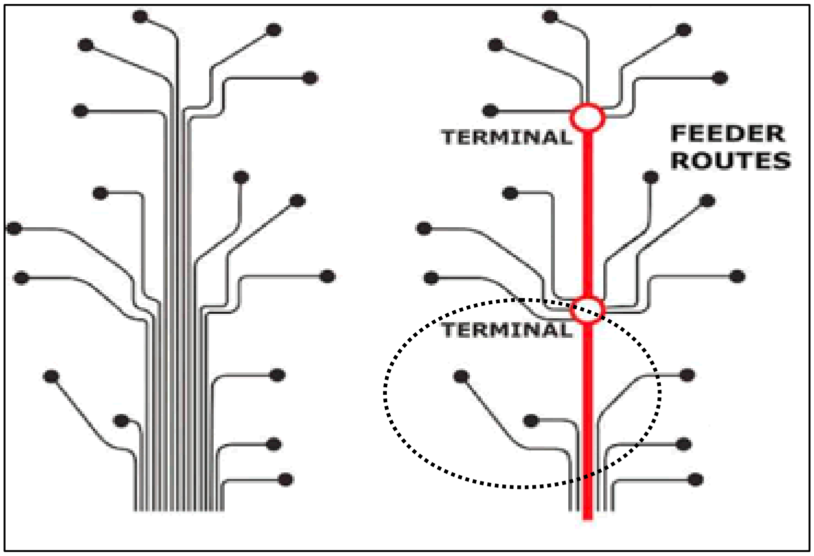


Figure 43: View of Conventional and Future Network

In case of the Rail and Feeder network system as illustrated in **Figure 43**, people travelling from settlements within a radius of 3-5 km to the final destination will rather use the existing mode of travel because of avoidance of multiple transfers between modes. This factor was also accounted for while determining station location. As Rail service will not be attractive from areas around Nuwe Smitsdorp to Polokwane as they originate either in areas 5 km east of the rail line or 3 km west of rail line, hence such settlements have been excluded from the process of identification of station location. The stations on Corridor A Polokwane Mokopane and Corridor D Polokwane Moloto Corridor are illustrated in **Figure 43.**

4.1.4 Searchlights

The concept of 'searchlights' has been developed to help focus the area of study and allow options to be generated. The searchlights look from Polokwane to target destinations along the Polokwane – Mokopane as well as Polokwane – Jane Furse alignments to determine targets destinations to be added to generate an option. These searchlights are not fixed in either bearing or breath beyond the 'common sense' practical limitations of physical geography and railway operability.

4.1.4.1 Identified Searchlights

Three broad searchlights have been identified. Due to geography, some targets feature in more than one searchlight. Identified 'searchlights' are depicted below on **Figures 44** to **46**, and summarised in **Table 4**.

Figure 44: Polokwane – Jane Furse (via Chuenespoort)

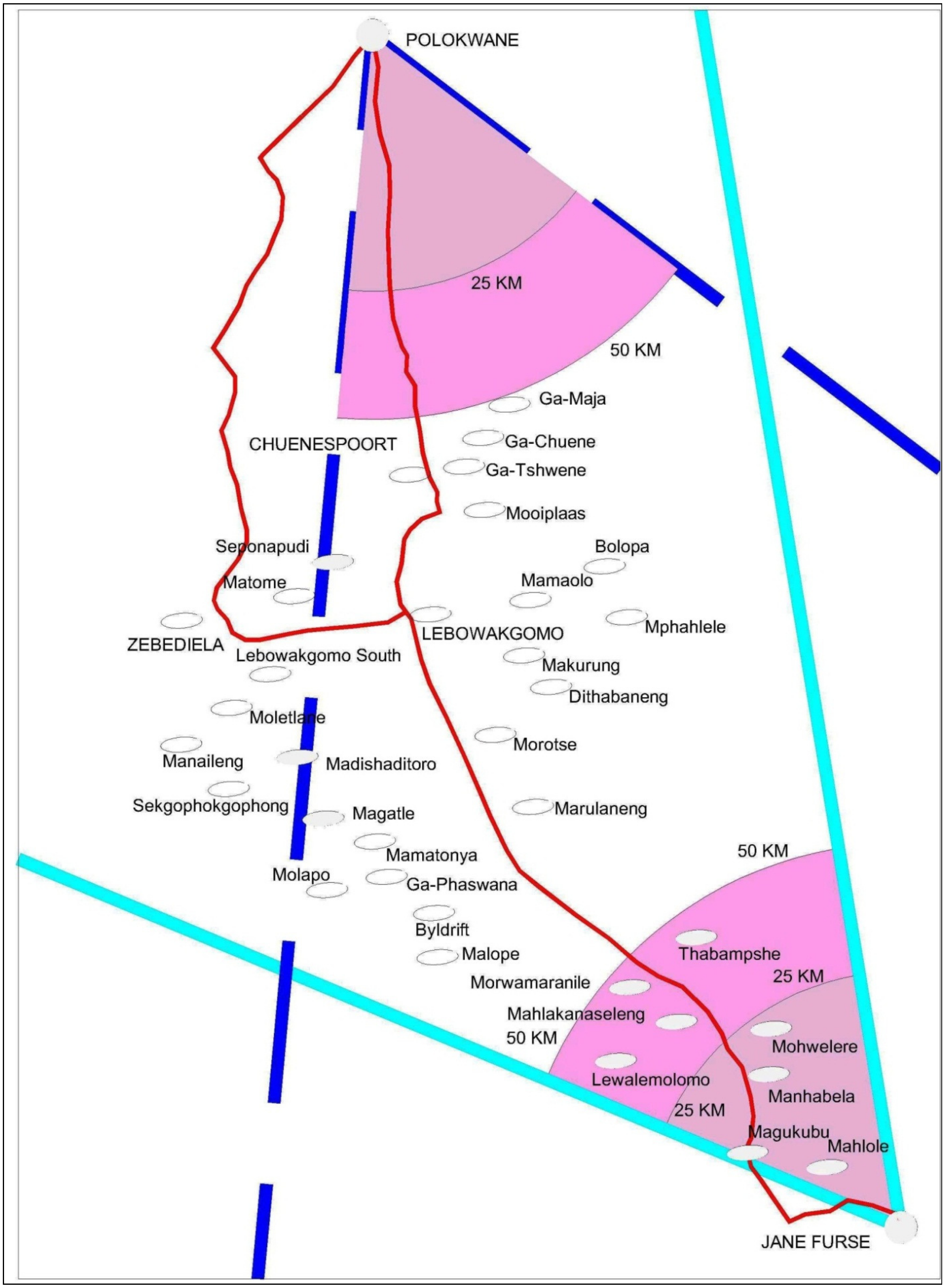
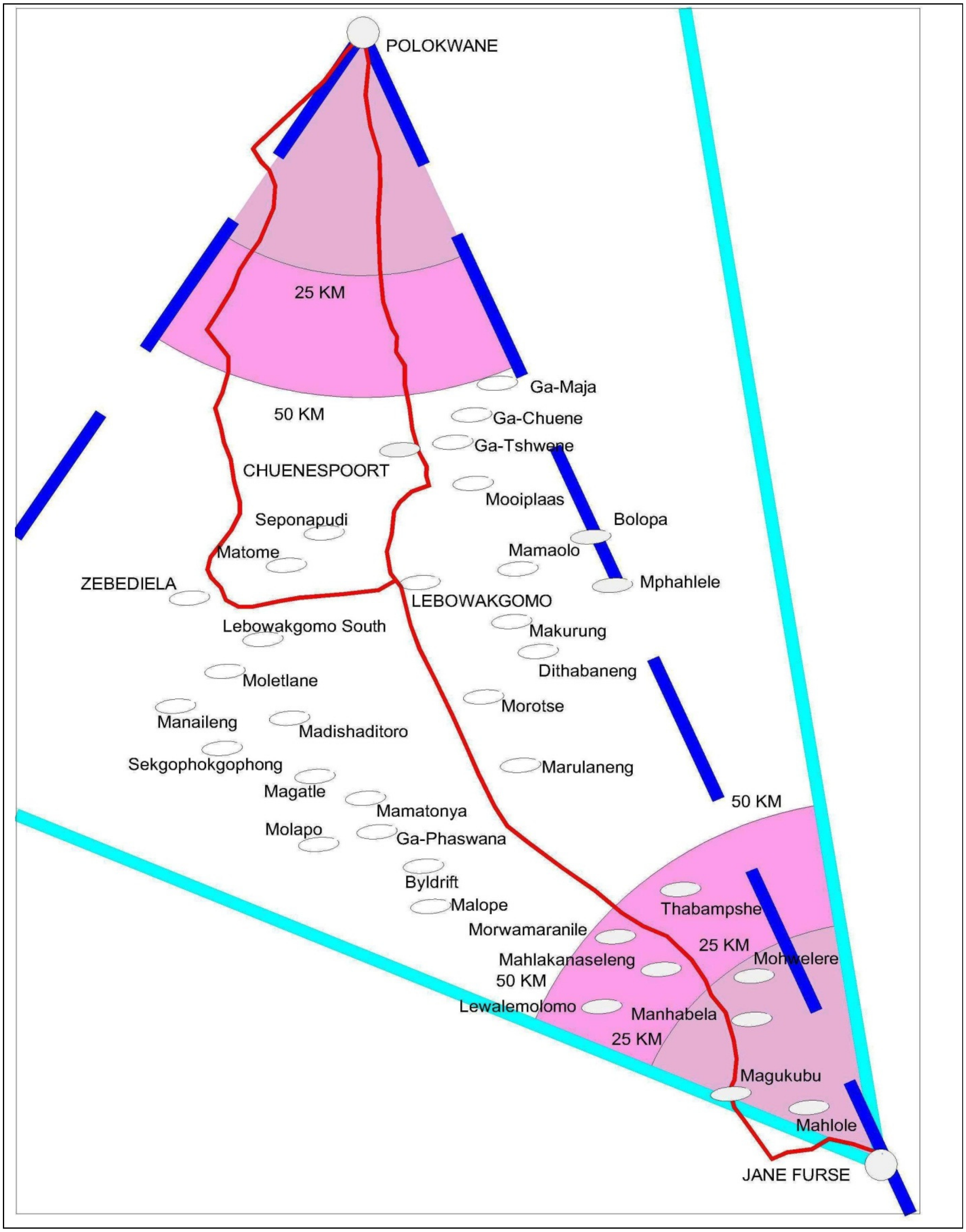


Figure 45 : Polokwane – Jane Furse (via Zebediela)



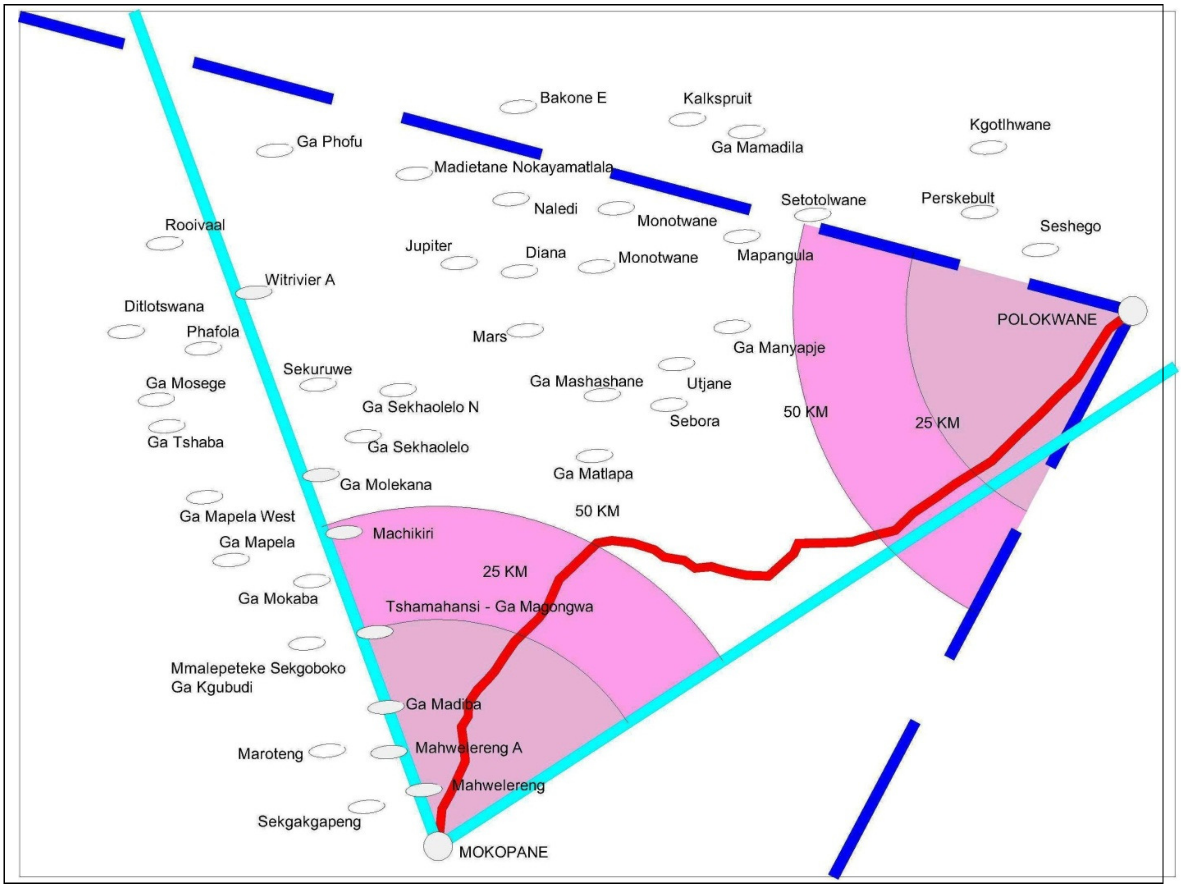


Figure 46 : Polokwane – Mokopane

Table 4: Identified Searchlights

Searchlight	Target Settlements
Polokwane – Jane Furse (via Chuenespoort)	25 km - 136 and 50 km - 112
Polokwane – Jane Furse (via Zebediela)	25 km - 152 and 50 km - 148
Polokwane – Mokopane	25 km -39 and 50km - 101

For determining the location of stations for Corridor A Polokwane Mokopane and Corridor D Polokwane Moloto Corridor, primary catchment area of 25km and secondary catchment area of 50 km was considered. For Corridor A Polokwane Mokopane, the number of settlements within radius of 25 km and 50 km are 39 and 101 respectively. For Corridor D Polokwane Moloto Corridor, the number of settlements within radius of 25 km and 50 km are 152 and 148 respectively. The decision to for station location is also a result of the estimated number of passenger boardings, which in turn is influenced by proximity to settlements.

4.1.5 Nodal Development Criteria for Stations

Figure 47 reflects the concept that is proposed for the development of nodal development areas identified for the stations along Moloto Corridor. The same principles have been applied for conceptual development of stations along Corridor A and D and shall be followed in the Detailed Feasibility stage.

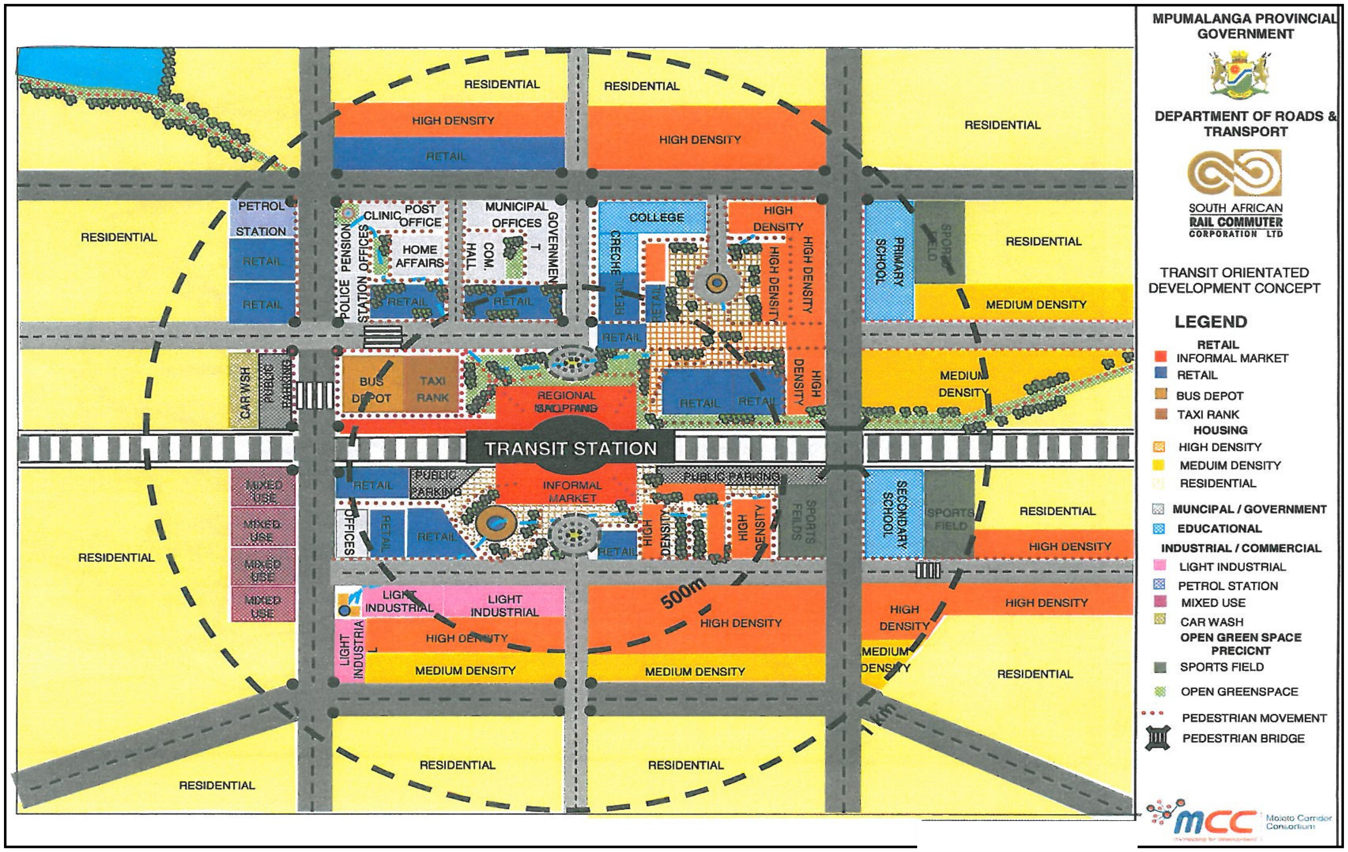


Figure 47: Nodal Development Concepts for Stations along Moloto Corridor,

Source: Handouts, DOT Investor Conference

The nodal development areas accommodates identified economic infrastructure and services connecting each economic activity segment along the corridor. Nodal Points are indicated in blue and white colours in **Figure 48**.Underneath the characteristics, requirements and considerations are identified for the nodal points as part of the conceptual framework for the proposed corridors:

- Apart from serving as the main connection points of the corridor, these nodal points must serve as the concentration and re-distribution points where public transport transfers should take place(interchanges between road feeder services and line haul rail services). The preferred nodal points should therefore support effective accessibility criteria in terms of public transport.
- They also serve as centre points where commercial and other economic activities will take place, and as such they define the geographic framework for new spatial formation, restructuring and physical development within the study area. They will perform the function as catalysts of economic activities and other local development.
- Where existing commercial land uses already exist in the form of a well developed shopping complex that serves a urban community, the preferred point where the railway station should be located , should rather support and strengthen the existing developments and should not create a competing additional nodal development, unless the size of urban area (population) justifies a second development, or where the existing development is out of position in terms of its strategic central position for easy and shortest accessibility to the general public.
- In some respects, the actual operation characteristics of the public transport system may redefine the importance of specific nodal development points

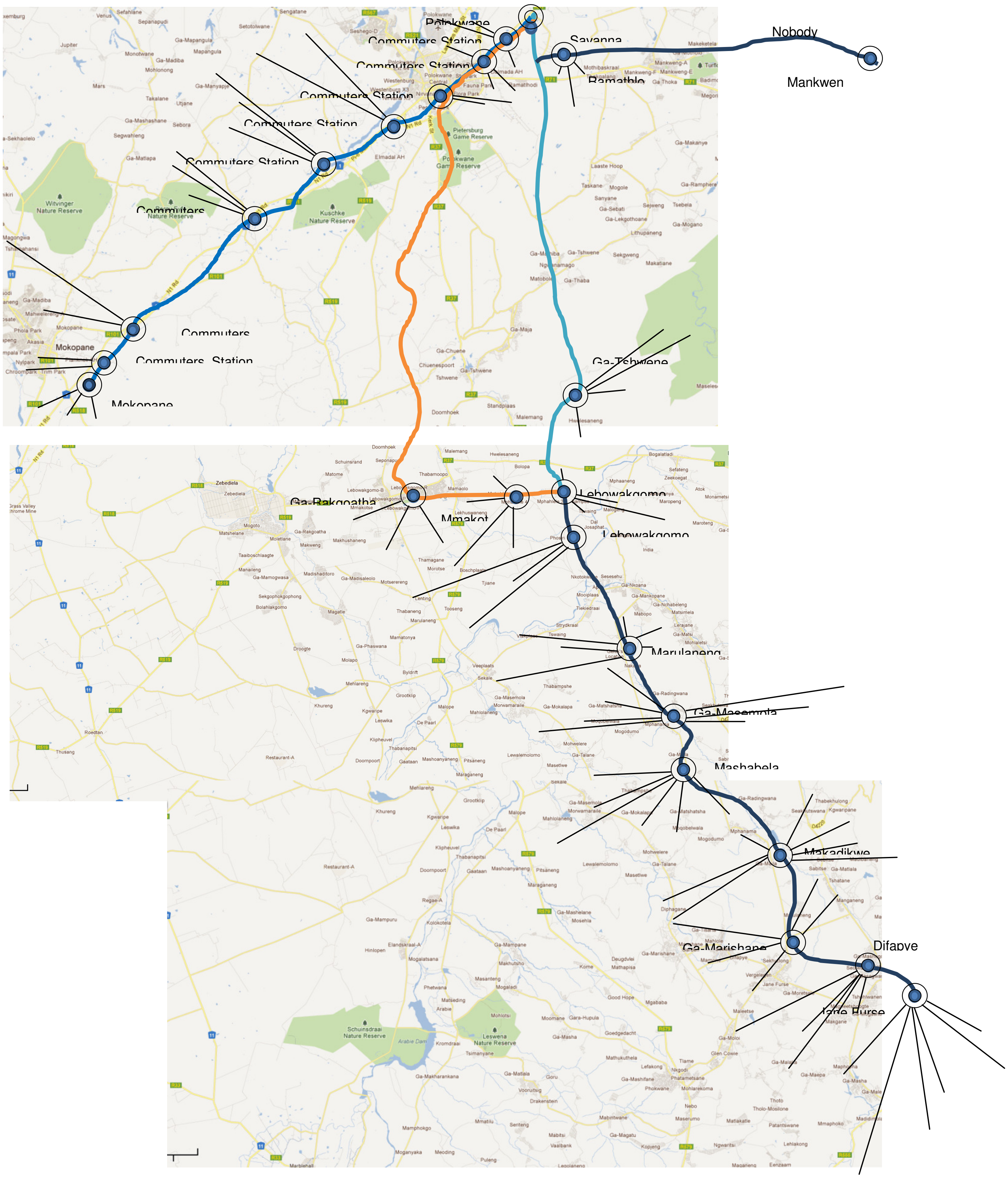
4.1.6 Railway Stations with Adjacent Transfer Facilities

As a general departure point, railway stations with adjacent transfer facilities should be positioned strategically and must integrate effectively with the entire development node and its associated facilities. It should be located optimally in terms of accessibility and close proximity to the densely populated areas and it should link well with the entire transportation network.

The following requirements and considerations are identified as part of the conceptual framework:

- The railway station should be an integral part of the entire nodal development ;
- As a general guideline, preference should be given to positions that are in close vicinity to major road infrastructure intersections that already serve as connecting points and will ensure effective accessibility;
- Apart from the above, Railway stations and its associated facilities should preferably be connected to existing transfer facilities.

Figure 48: Conceptual Framework for Corridor A-Polokwane-Mokopane Commuter service and Corridor D-Polokwane –Moloto Corridor: Integrated Public Transport System



4.1.7 Other Considerations

Other criteria used to evaluate the potential for inclusion of a station include:

- number of transfers at a station;
- availability of space to construct bus/taxi ranks and waiting areas;
- number of elderly or physically challenged individuals in the area;
- frequency of service;
- Balance between rail service and taxi/bus service;
- Topography/access and egress issues;
- Significant generators and attractors; and
- Connectivity to the local road network.

System equity or funding availability can cause the identification decision to be made on a case-by-case basis in the detailed design stage. Local priorities and municipality requests can also influence the decision to include or remove a station from the plan. Other factors that have accounted for are availability of right-of-way width, existing street furniture, landscaping, existing structures, and maintaining proper circulation distances around existing site features. Ideally, the final location of a rail station should enhance the circulation patterns of passengers, maximise patronage , reduce the amount of pedestrian congestion at bus/taxi ranks stop, and reduce conflict with nearby pedestrian activities.

The table underneath indicates all stations that will form part of Corridor A: Polokwane-Mokopane Corridor and Corridor D: Polokwane –Moloto Corridor. Some of this stations are existing stations(e.g. Polokwane and Mokopane) within the study area. A total of 10 stations have been identified along Corridor A: Polokwane –Mokopane Corridor, with 2 stations viz; Polokwane and Mokopane as existing stations. For Corridor D, the number of stations identified for the options via Chuenespoort and Zebediela are 11 and 14 respectively. Commuter stations 7 and 8 also form part of the network for the option via Zebediela for Corridor D, The identified candidate station positions include (Refer **Figure 49**):

Table 5: Stations along Corridor A and D

Corridor A:Polokwane -Mokopane		
SI No	**Station**	**Distance between Stations**
1	Mokopane	0
2	Commuter Station 1	6.75
3	Commuter Station 2	2.88
4	Commuter Station 3	10
5	Commuter Station 4	5.08
6	Commuter Station 5	12.19
7	Commuter Station 6	14.37
8	Commuter Station 7	9.6

9	Commuter Station 8	1.65
10	Polokwane	2.27
Corridor D: Polokwane -Jane Furse		
Option A: Polokwane to Jane Furse via Ga- Rakgoatha(Zebediela)		
1	Jane Furse	5.42
2	Difapyae	8.18
3	Ga-Marishane	3.31
4	Makadikwe	7.8
5	Mashabela	14.22
6	Ga-Masemola	14.65
7	Marulaneng	11.61
8	Lebowakgomo South	5.85
9	Lebowakgomo	3.3
10	Mmakotse	9.16
11	Ga-Rakgoatha (Zebediela)	53.63
12	Commuter Station 7	1.65
13	Commuter Station 8	2.27
14	Polokwane	
Option B: Polokwane to Jane Furse via Ga-Chuene / Chuenespoort		
Sl No	**Station**	**Distance between Stations**
1	Jane Furse	0
2	Difapyae	5.42
3	Ga-Marishane	8.18
4	Makadikwe	3.31
5	Mashabela	7.8
6	Ga-Masemola	14.22
7	Marulaneng	14.65
8	Lebowakgomo South	11.61
9	Lebowakgomo	5.85
10	Ga- Chuene	13.16
11	Polokwane	36.06

Figure 49: Location of Stations: Corridor A-Polokwane-Mokopane Commuter service and Corridor D-Polokwane –Moloto Corridor

5. TRAFFIC SURVEYS AND ANALYSIS

5.1 General

As a part of the traffic and revenue forecast study for proposed rail corridors, extensive data collection was carried out to develop baseline data for ridership estimation. The data collection included the primary surveys in the field and the secondary data collection from various sources in Limpopo. This chapter presents the details of traffic and commuter surveys, and the survey findings of the primary surveys carried out.

5.2 Base Line Data

Primary data was collected through traffic and transportation surveys between September 2011 and November 2011 at various locations along the proposed rail corridor, while the required secondary data was collected from various CPTR's, IDP's and ITP's etc. The surveys that were conducted are presented below:

- Public Transport Counts at Bus/Taxi Ranks for Corridors A) Mokopane - Polokwane D) Polokwane – Moloto corridor
- Origin/Destination Surveys at Bus/Taxi Ranks for Corridors A) Mokopane - Polokwane D) Polokwane – Moloto corridor
- Boarding and Alighting Locations/Trip Frequency and Fare Structure for routes for Corridors A) Mokopane - Polokwane D) Polokwane – Moloto corridor

5.3 Primary Data Analysis

The data collected through primary surveys was analyzed and the results are presented in the following sub sections.

5.3.1 Corridor A: Polokwane –Mokopane

The public transport supply is as follows:

- The route is primarily served by Taxis
- The pick –up and drop off locations in Mokopane are Ranch Hotel, Dinoko Lodge and Tiveka Lodge and Westernberg Taxi Rank in Polokwane, but the general principle of 'indicate when wishing to alight' applies. (Refer **Figure 50**)
- The Travel Time varies from 30 -45

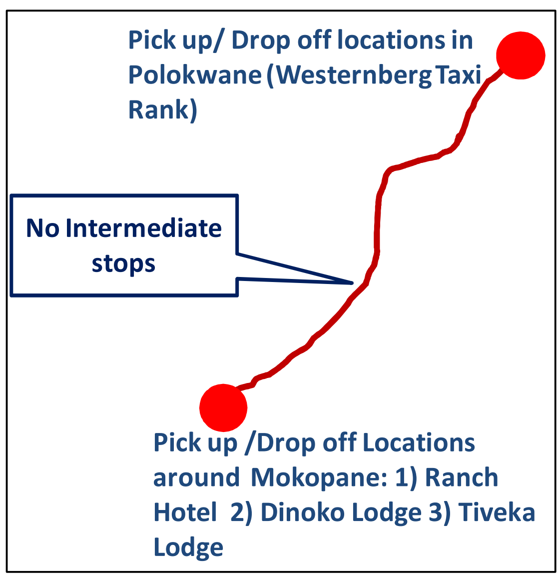


Figure 50: Taxi Route Plan – Corridor A: Polokwane Mokopane Commuter Service

minutes and the service is also unscheduled – being a factor of the standard full occupancy prior to departure;

- Trip cost for the entire route is R45;
- Taxi Composition : 60-80 Permanent taxis (13 seater, 16 seater, 22 seater and 28 seater mini-bus) operate on the route (R 101)- The composition of taxis in terms of fleet at count locations is presented in **Figure 51**;
- The morning peak hour occurs at 6 am and the Peak Hour Vehicle Occupancy is 1896 - Refer **Figure 52;**
- The Frequency between 6 am to 7 am – 2-5 minutes and the Frequency between 7 am to 12 am -15-25 minutes ;

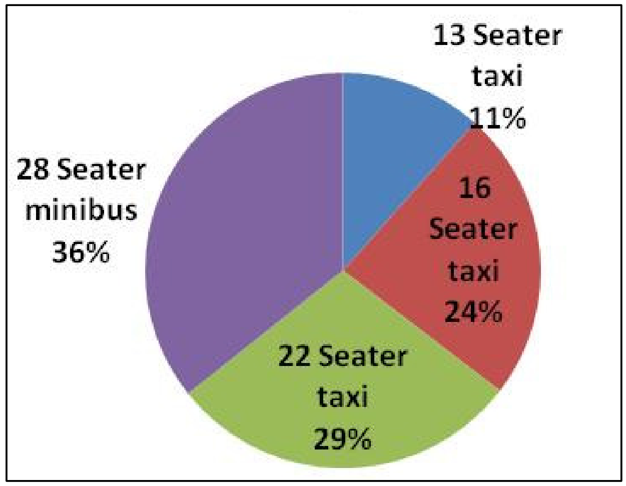


Figure 51: Composition of Taxi's at Mokopane Taxi Rank

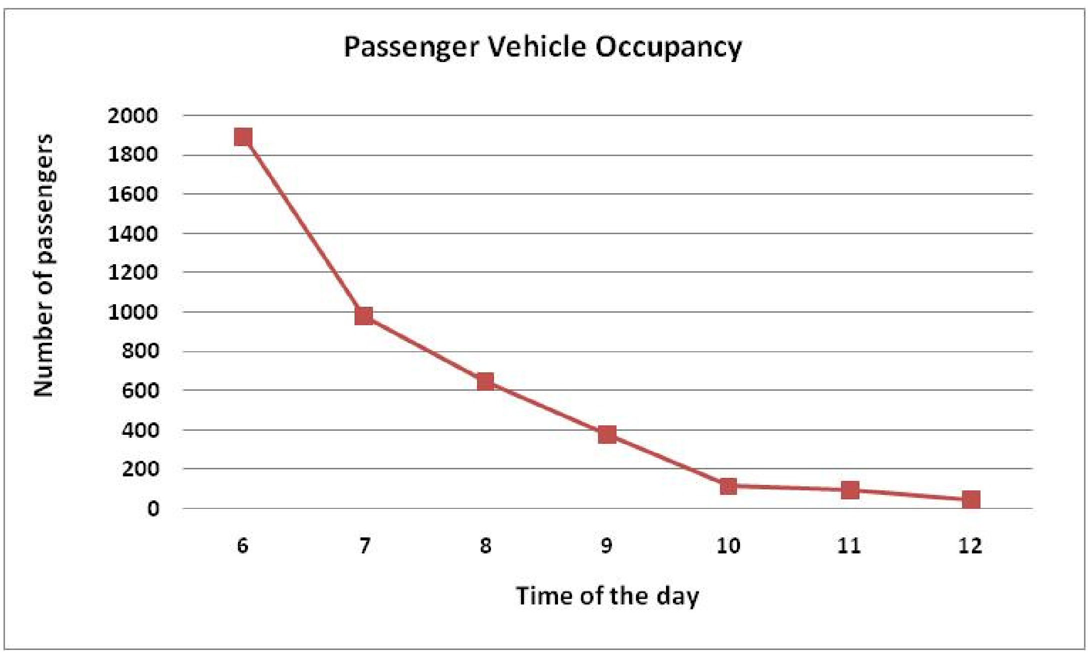


Figure 52: Vehicle Occupancy at Mokopane Taxi Rank

- Evening peak hour at Westerberg Taxi Rank in Polokwane occurs at 6 pm, the corresponding Peak Hour Vehicle occupancy is 1645-Refer **Figure 53.**
- Frequency between 2 pm to 6 pm varies from 2-3 minutes to 10-15 minutes

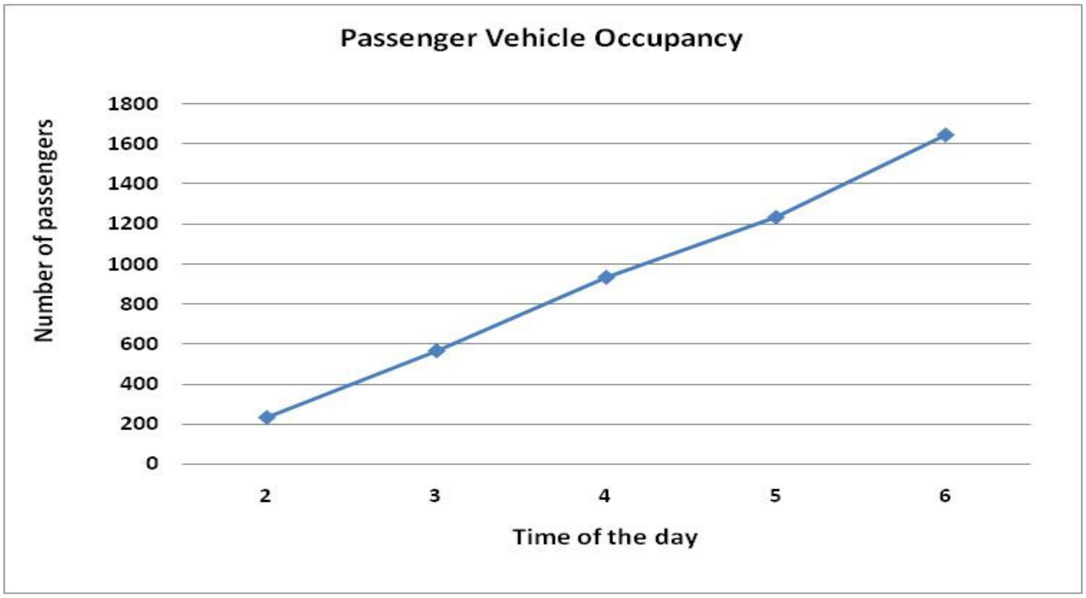


Figure 53: Vehicle Occupancy at Westernberg Taxi Rank

5.3.2 Corridor D: Polokwane – Moloto

The public transport supply is as follows:

Polokwane - Zebediela

- The route is primarily served by Taxis ;
- 3 – 10 taxis operate daily on the route between Polokwane and Zebediela (R 519), no bus service – Refer **Figure 54;**
- 80 – 110 taxis operate on Monday morning/Friday evening at Zebediela Taxi rank destined towards Polokwane /returning from Polokwane **-**Refer **Figure 55**
- The Travel Time varies from 45 minutes -60 minutes between Polokwane and Zebediela and the service is also unscheduled – being a factor of the standard full occupancy prior to departure;
- Trip cost between Polokwane and Zebediela varies from R25 to R30;

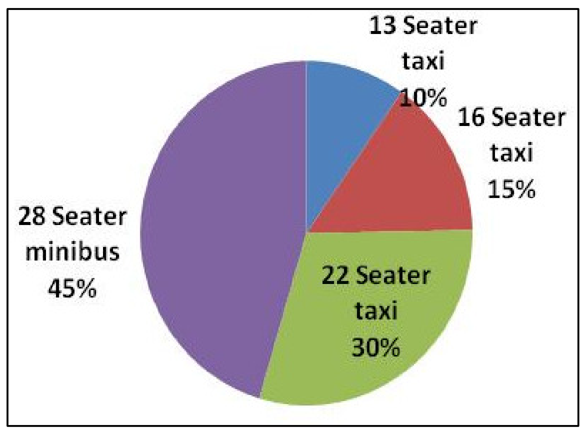


Figure 54: Composition of Taxi's at Zebediela Taxi Rank

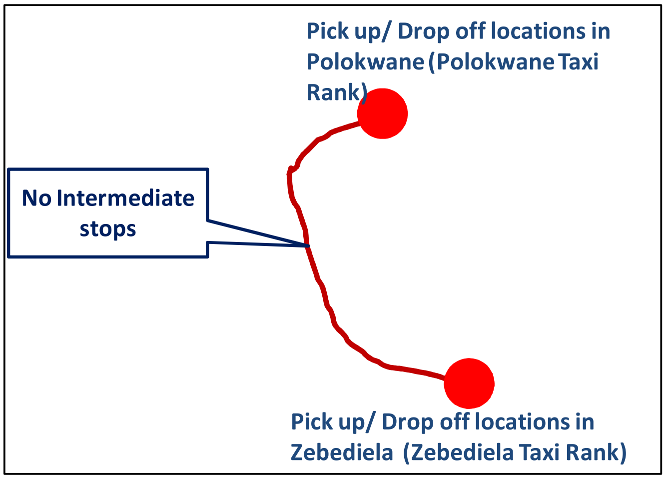


Figure 55: Taxi Route Plan –Polokwane - Zebediela

- The morning peak hour occurs at 6 am and the Peak Hour Vehicle Occupancy is 3235 - Refer **Figure 56;**
- The Frequency between 6 am to 7 am – 2-5 minutes and the Frequency between 7 am to 12 am -10-15 minutes;

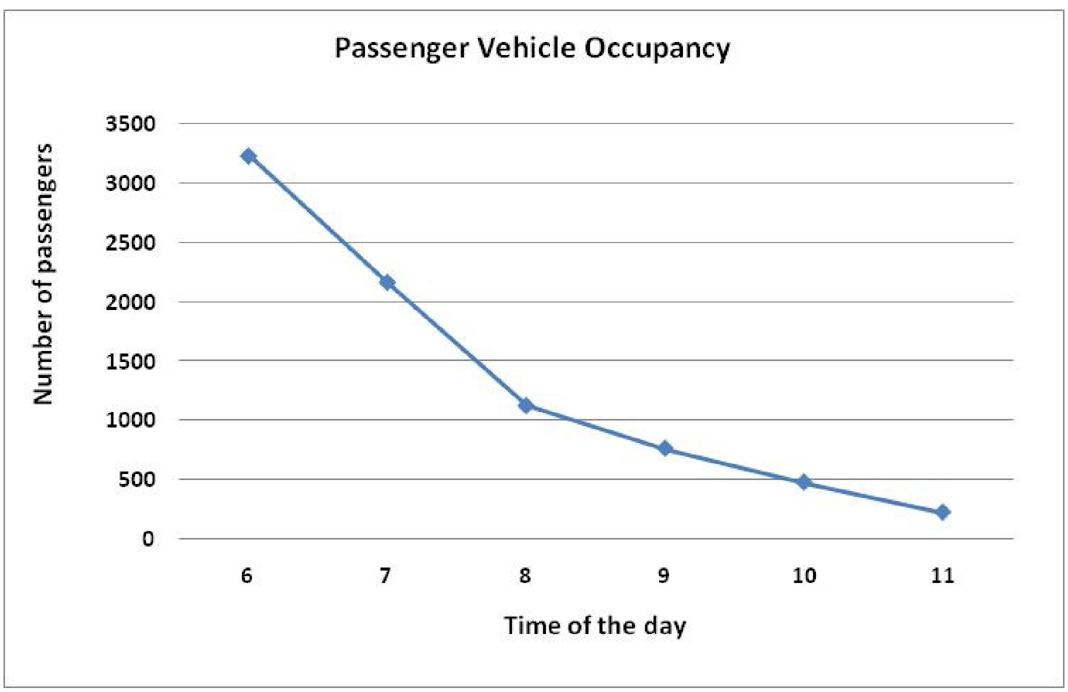


Figure 56: Vehicle Occupancy at Zebediela Taxi Rank

- Friday Evening peak hour at Zebediela Taxi Rank occurs at 6 pm, the corresponding Peak Hour Vehicle occupancy is 3789-Refer **Figure 57;**
- Frequency between 2 pm to 6 pm varies from 2-3 minutes to 10-15 minutes.

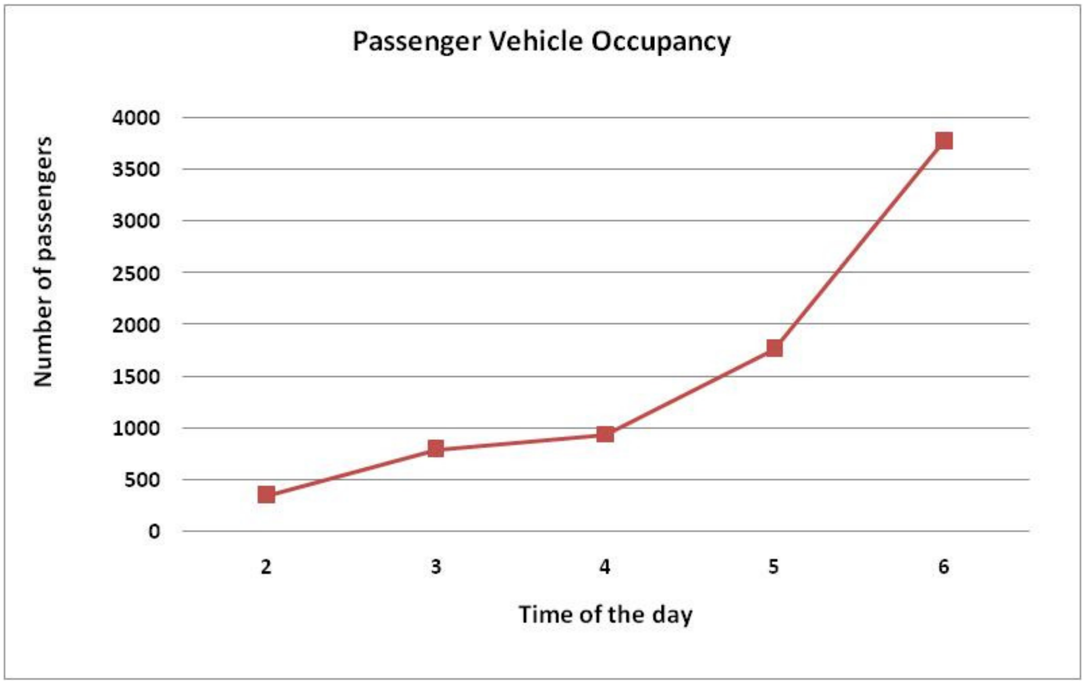


Figure 57: Vehicle Occupancy at Polokwane Taxi Rank

Zebediela - Lebowakgomo

- The route is primarily served by Taxis ;
- 60 – 80 taxis operate daily on the route from Zebediela Taxi rank destined Lebowakgomo Taxi Rank **-**Refer **Figure 58;**
- Trip cost between Zebediela and Lebowakgomo is R14;
- Morning peak hour occurs at 6 am, Peak Hour Vehicle occupancy is 2978-Refer **Figure 59**

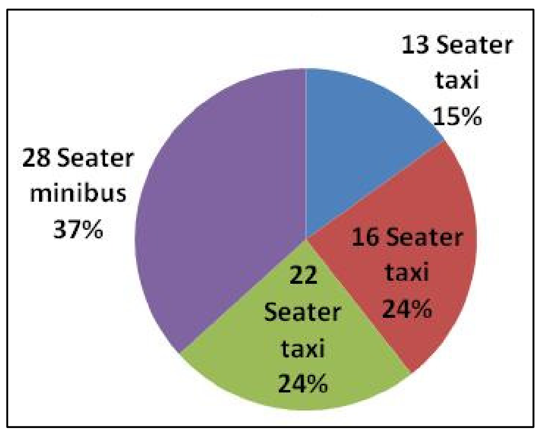


Figure 58: Composition of Taxis at Zebediela Taxi Rank (Towards Lebowakgomo)

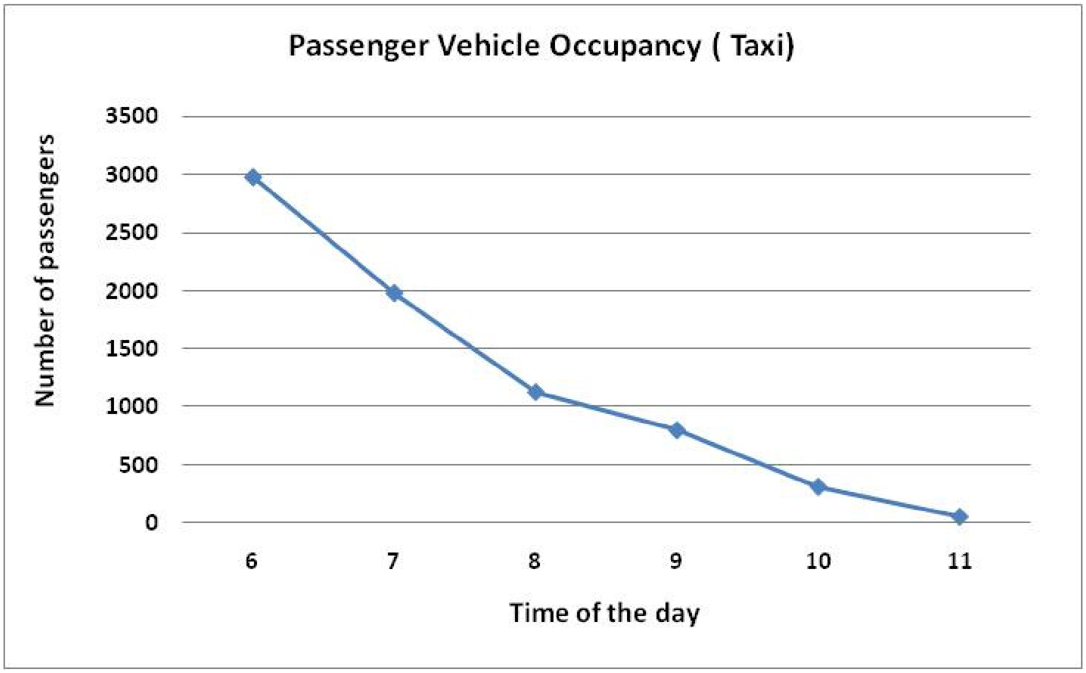


Figure 59: Vehicle Occupancy at Zebediela Taxi Rank

Lebowakgomo – Jane Furse

- The route is primarily served by Taxis ;
- 46 -59 Taxis operate daily on the section, no bus service on this section-Refer **Figure 60**;
- Trip cost between Lebowakgomo and Jane Furse is R40-Refer **Figure 61**;
- Morning peak hour occurs at 6 am, Peak Hour Vehicle occupancy is 2456-Refer **Figure 62.**

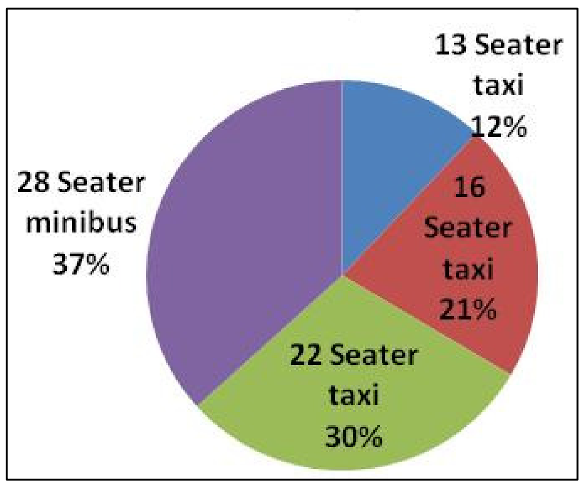


Figure 60: Composition of Taxis at Lebowakgomo Taxi Rank (Towards Jane Furse)

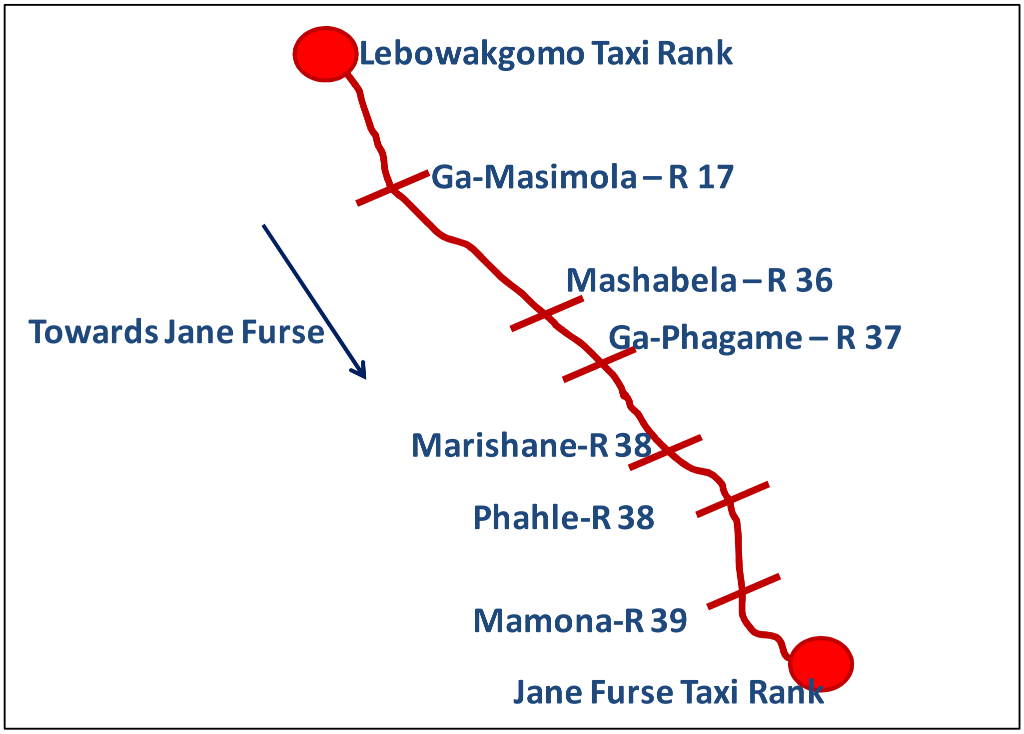


Figure 61: Taxi Route Plan (Lebowakgomo- Jane Furse)

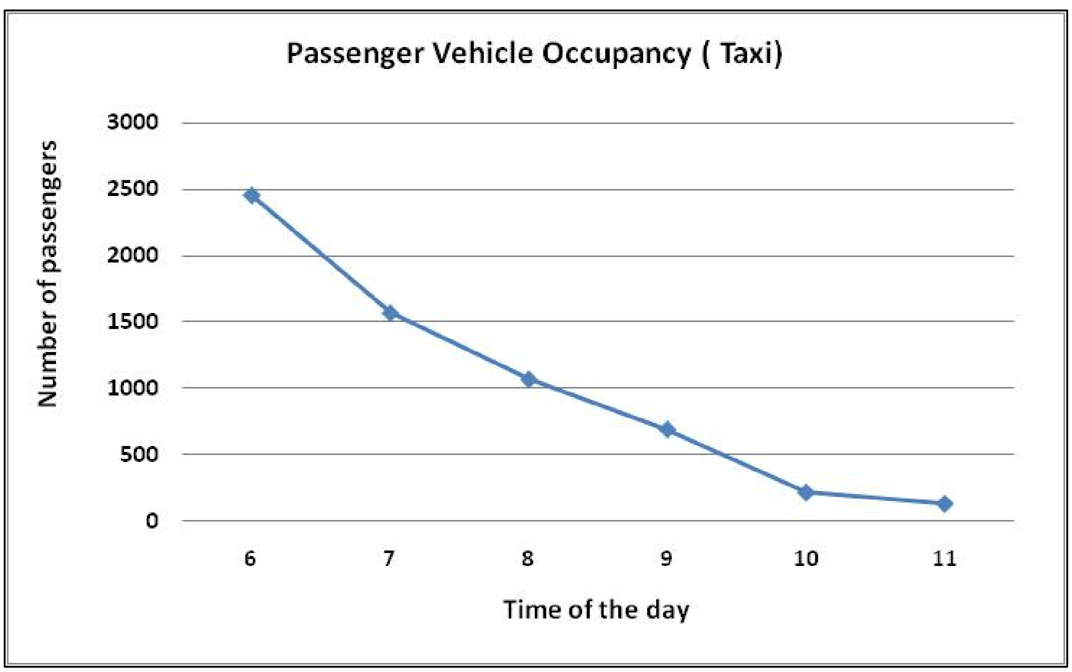


Figure 62: Vehicle Occupancy at Lebowakgomo Taxi Rank

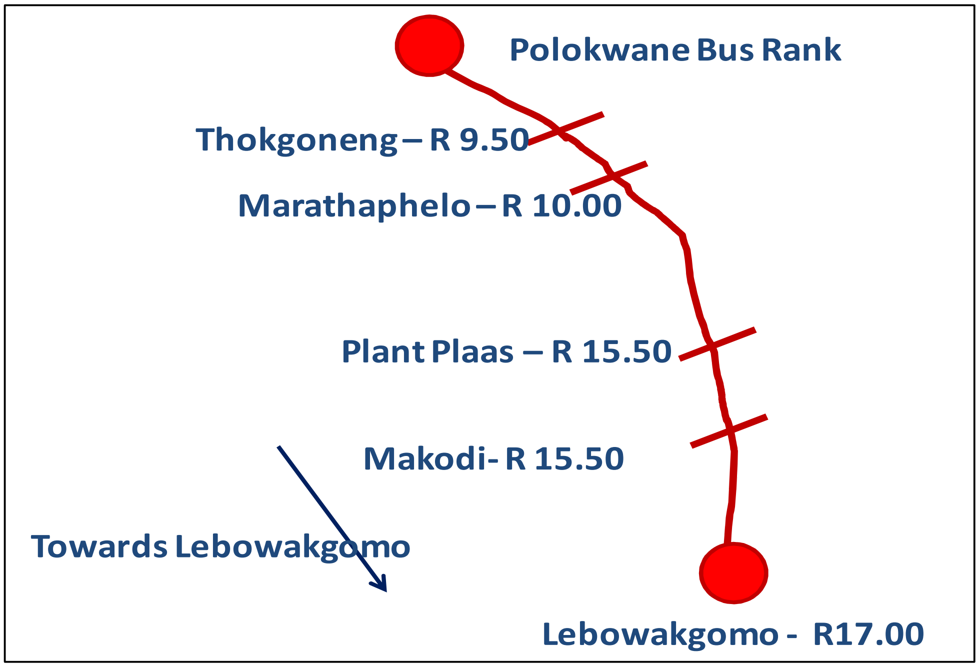


Figure 63: Bus Route Plan-Polokwane - Lebowakgomo

Polokwane - Lebowakgomo

- The route is served by taxis and buses ;
- The bus route plan is presented in **Figure 63;**
- Buses are operated by Great North and Kopano ;
- 65 seater buses with standing capacity of 19 passengers operate on the route;
- Morning peak hour occurs at (Towards Lebowakgomo) 6 am to 8 am-Refer **Figure 64**

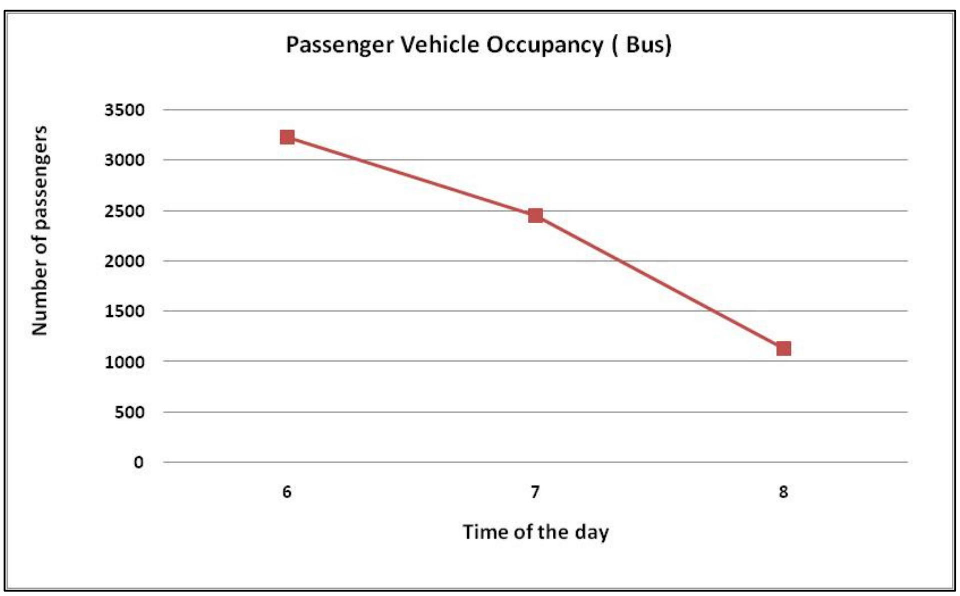


Figure 64: Vehicle Occupancy at Polokwane Bus Rank (Towards Lebowakgomo)

- 50- 70 taxis operate on the route -Refer **Figure 65**;
- Trip cost by Taxi between Polokwane and Lebowakgomo is R25;
- Morning peak hour occurs at 6 am, Peak Hour Vehicle occupancy is 1045.

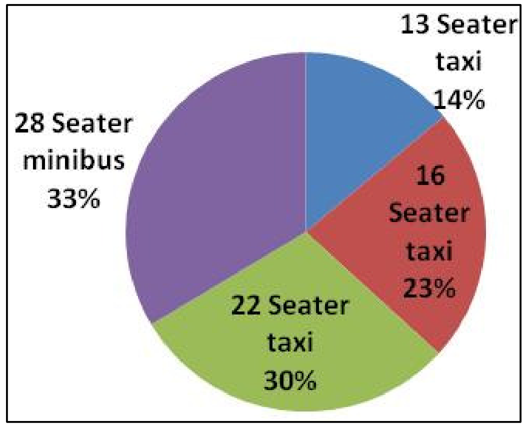


Figure 65: Composition of Taxi's at Polokwane

6. DEMAND MODELLING AND RIDERSHIP ESTIMATION

6.1 General

This chapter presents the framework of travel demand modelling carried out for developing realistic forecasts for Polokwane –Mokopane and Polokwane – Moloto Corridor. Various components of model formulation are detailed in the subsequent sections.

6.2 Transit Assignment Model

Detailed transit assignment model has been developed for the study for accurately forecasting the ridership levels for Polokwane –Mokopane and Polokwane – Moloto Corridor. Important aspects for forecasting were considered which are mentioned below:

- Forecast using the four Step Method(EMME3 Software)
- Interregional traffic volume is based on NATMAP
- Passenger transport: Updated the NATMAP model of percentage shares among transportation modes to reflect existing situation
- Prerequisites: Ensure safety and access to rail stations

The forecasting method is presented in **Figure 65** and study methodology in **Figure 67.**

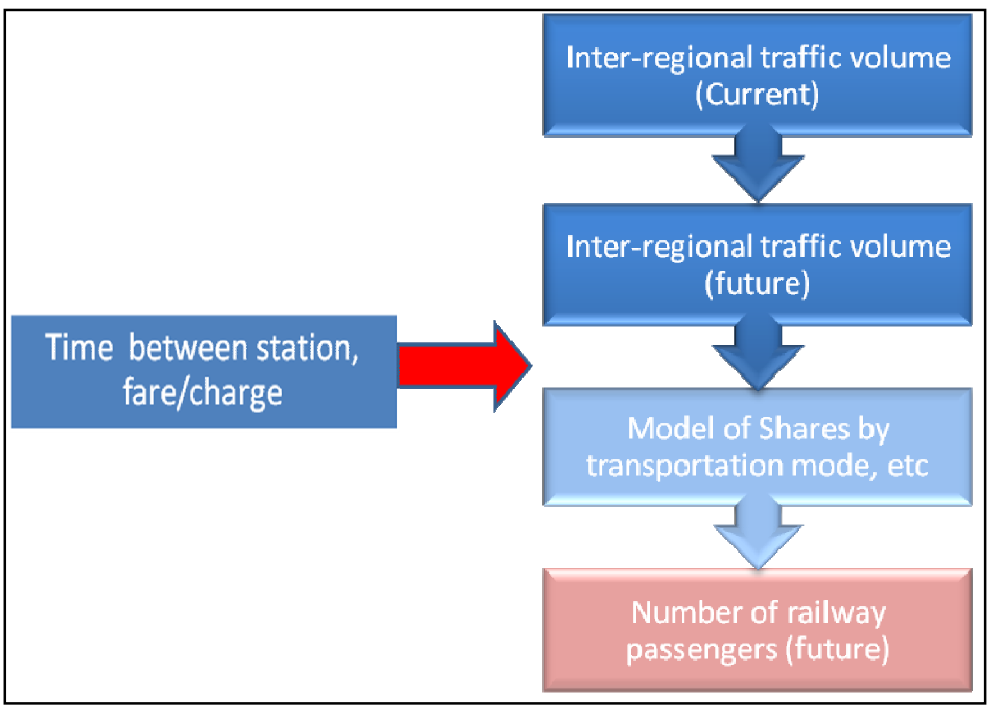


Figure 66: Forecasting Methodology

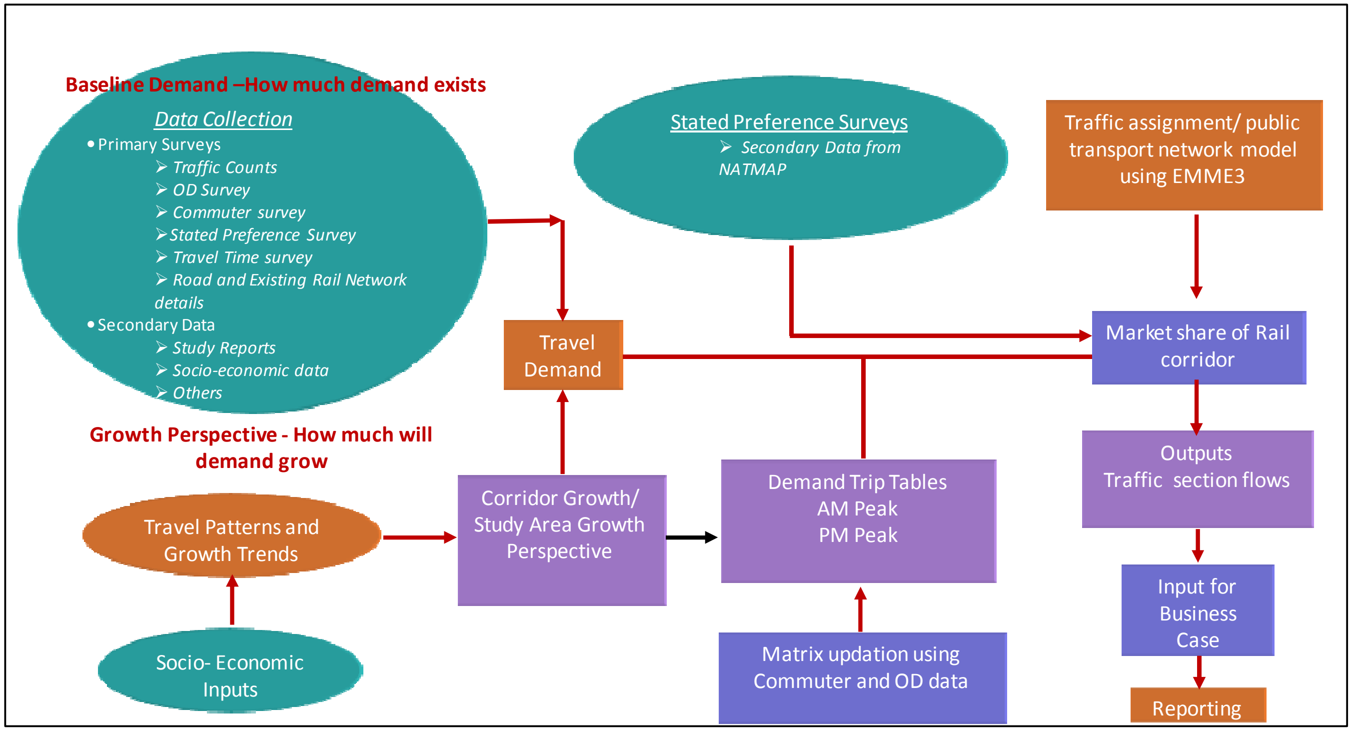


Figure 67: Study Methodology

6.2.1 Model Structure

The assignment model primarily focus on passenger segment, covering private and public transport modes. Methodology of modelling included development of highway and public transport networks based on data collected from past studies and updation from primary surveys and secondary data collection from various agencies. Trip matrices for base year were built covering various vehicle types. A detailed multi modal public transport assignment has been undertaken for estimating ridership for Polokwane –Mokopane and Polokwane – Moloto Corridor. Impact of various committed development projects was also included in the rider-ship levels.

6.2.2 Software

Modelling is done in EMME/3 software developed by INRO. EMME/3 is an interactive-graphic multimodal urban transportation planning system. It offers a complete and comprehensive set of tools for demand modelling, multimodal network modelling and analysis, and for the implementation of evaluation procedures. EMME/3 is also a decision support system which provides uniform and efficient data handling procedures, including input data validation. Its data bank is structured to permit the simultaneous description, analysis and comparison of several contemplated scenarios.

6.3 Model Development Process

The data required for analysis of travel demand and model development is categorised into three components. The first is the data on planning parameters at zonal level; the second is on the transport network and third is on the travel demand characteristics. The details of the base year data is described in the following sections.

6.3.1 Zoning Strategy

Data pertaining to various planning parameters such as population, household size, etc at zonal level was compiled from various sources and past reports. 165 zones were identified for the study. The factors considered for zoning are as follows:

- Proposed rail stations influencing areas(10 km for primary catchment and 25 km for secondary catchments area)
- Existing railway stations influencing areas
- Road network catering to the traffic to the proposed rail corridor and its traffic generating points.
- Major residential and commercial areas along proposed rail corridor.
- Physical boundaries and boundaries in the city

The zoning strategy is presented in **Figures 68, 69 and 70.**

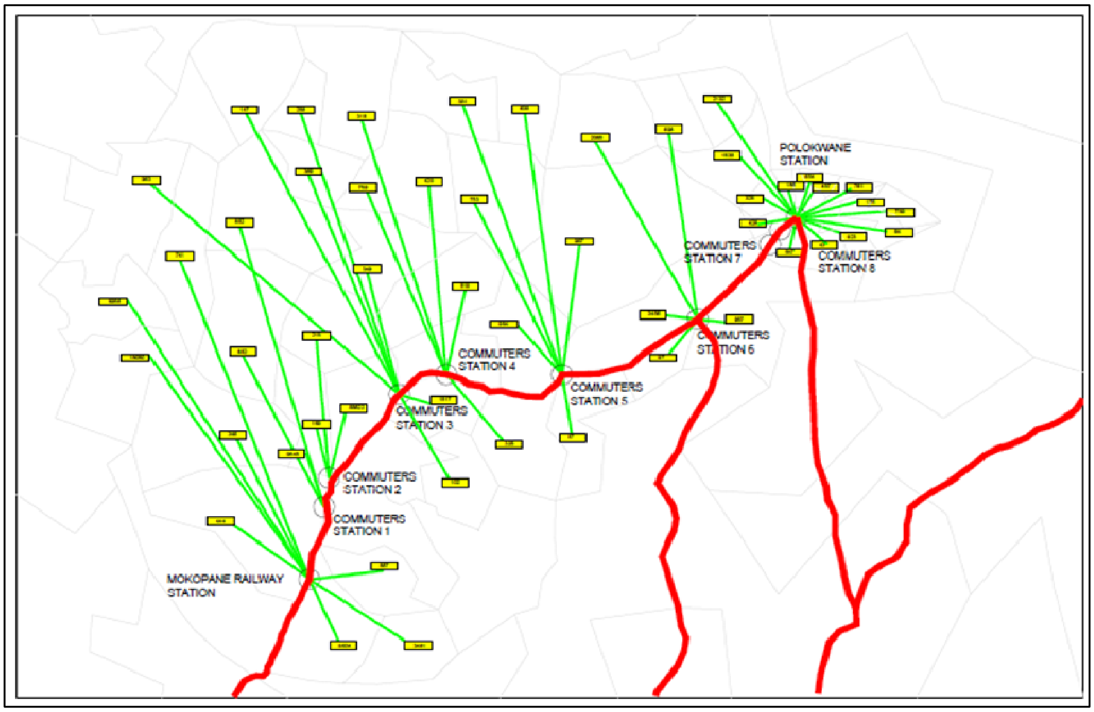


Figure 68: Zoning Strategy: Polokwane -Mokopane

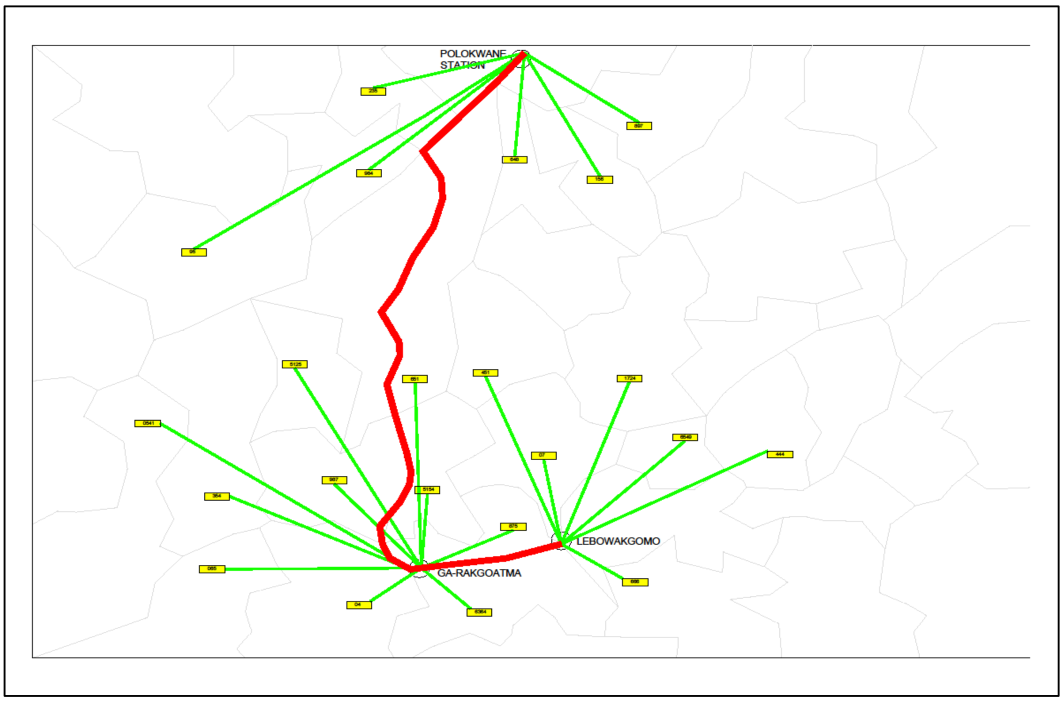


Figure 67: Zoning Strategy: Polokwane –Zebediela-Lebowakgomo

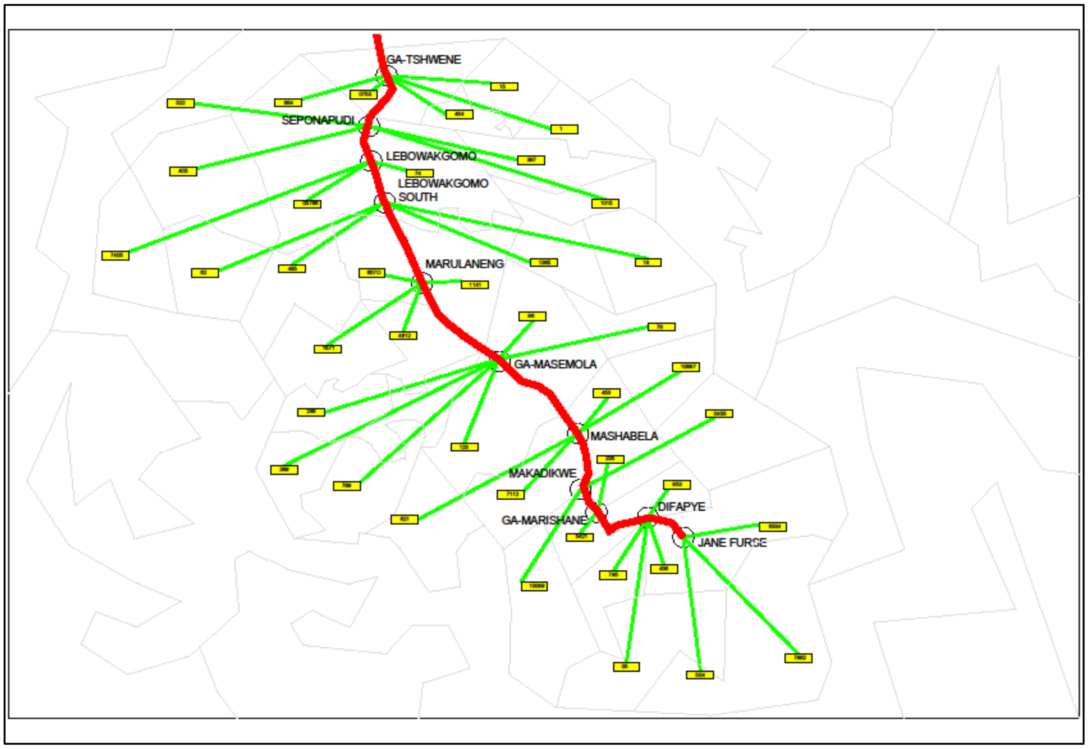


Figure 70: Zoning Strategy: Lebowakgomo – Jane Furse

6.3.2 Network Development

Road and public transport network were created in EMME software. The details are discussed below;

6.3.2.1 Modes

Network was developed considering following modes operating in the project area. Transit modes include all existing and proposed public transport system in the influence area. The details of Modes has been presented in **Table 6.**

Table 6: Transit & Auxiliary Transit Modes

S.N.	Modes
1	***Transit*** Bus
2	***Auxiliary Transit*** Walk, Taxi

6.3.2.2 Road Network Coding

Network development process includes building up highway network and creating transit lines utilising road link and nodes. In the highway network, primary road network included all major roads in the study area. **Figures 71** and **72** shows the network in the study area. **Table 7** shows different types of links in the study area.

Table 7: Links in Coded Network

Link Type	No. of Lanes	Type of Carriageway	Details
1	Two Lane	Undivided	Secondary Road
2	Three Lane	Undivided	Secondary Road
3	Four Lane	Undivided	Secondary Road
4	Four Lane	Divided	Highway
5	Six Lane	Divided	Highway
Other Links			
7	Connection from road to proposed Rail corridor		
8	Zone centroid to road (walk)		
9	Zone centroid to proposed Rail stations		
10	Proposed rail network		

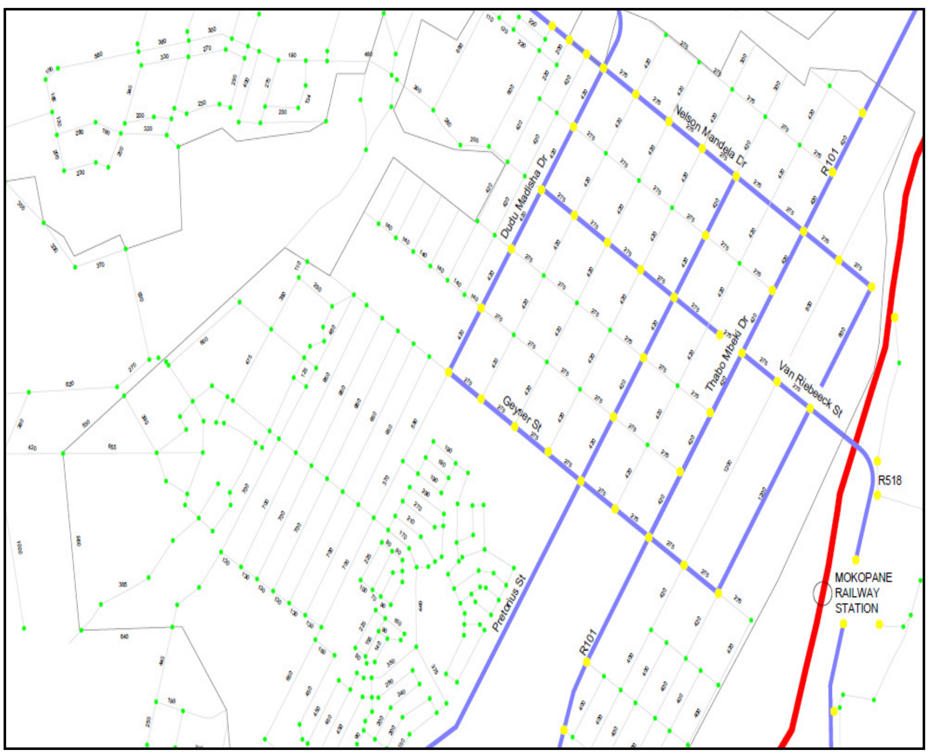


Figure 71: Link –Node Diagram: Polokwane Mokopane

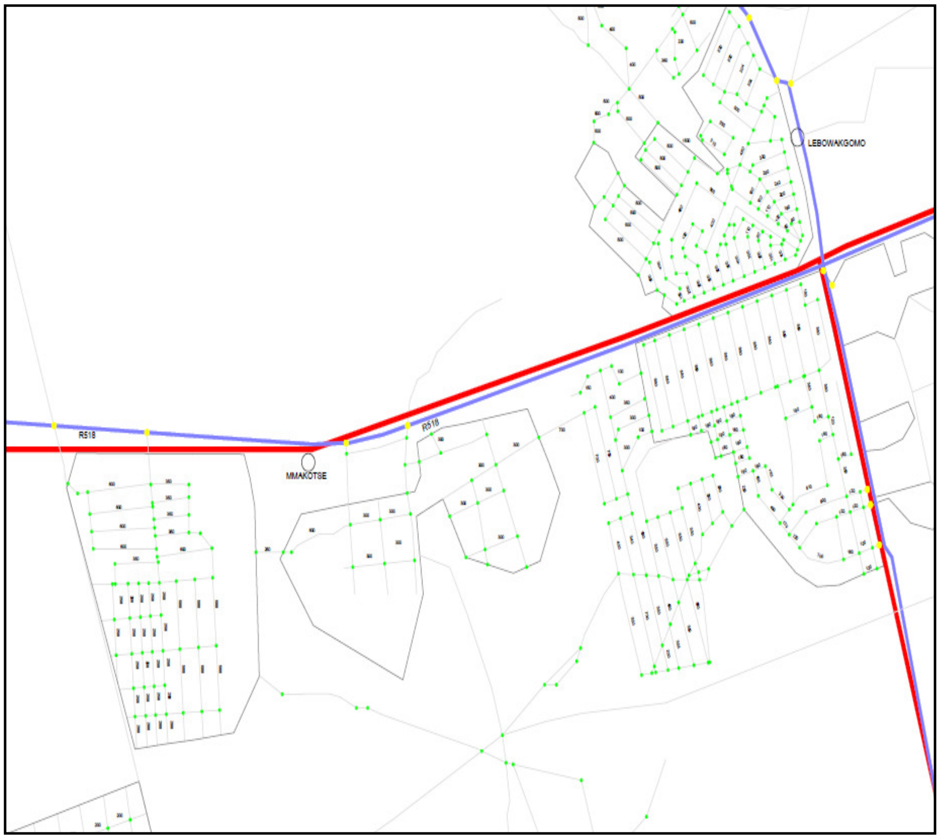


Figure 72: Link Node Diagram: Polokwane Moloto Corridor

The road network was properly connected to all zone centroids by means of dummy links. The characteristics of dummy links were defined based on the size of the zone and appropriate average speed of travel within the zone. In addition, the road nodes located close to the rail nodes (Railway Stations) were also provided with rail access links.

Attribute data like lengths, widths, capacity, etc were coded for each link including speeds, capacities and travel time. All the characteristics of the road links were collected through primary surveys (network inventory and speed and delay) besides secondary sources.. Details of bus routes, frequencies, seating capacities, maximum load factor and fares were collected for public transport buses

6.3.2.3 Transit Network Coding

After completing highway network coding, transit coding was carried out. Separate networks, including public transport and private modes were prepared and coded. Public Transport (PT) network includes all roads on which public transport buses and taxis operate.

The objective of separate public transport coding was to represent the service level provided by each alternative public transport system. This is done through the following elements:

6.3.2.4 Route Sequence Coding

The path of each transit route is coded by identifying a sequence of nodes in the highway network that represent the routing and bus stops provided by that route. The level of detail was consistent with that of the zone system and the coded road network. Transit speeds were an attribute of each link, and are based on observed, scheduled bus and sub urban train times. For future projects, such as the proposed rail corridor, a separate travel time is computed based on expected operating performance, station dwell times and assumed cruise speed. Each node along a transit route is coded as a transit stop.

6.3.2.5 Access Coding

Access coding represents the walk or time using auxiliary transit for getting to and egressing from the transit system. It also includes potential transfers. Walk access coding is provided from every Traffic Analysis Zone (TAZ) that has some portion within a km of a transit.

6.3.3 Matrices

Sample Origin-Destination and Commuter Opinion surveys were conducted to assess the base year traffic and travel characteristics in the study area. The sample data collected during the survey phase has been coded and loaded on to the digital format. Expansion factors were applied to transform the sample data to the total population and obtain the aggregate travel characteristics. The output of this analysis was to create public transport trip matrices. A desire line diagram from a zone built data in EMME/3 is presented in **Figure 73.**

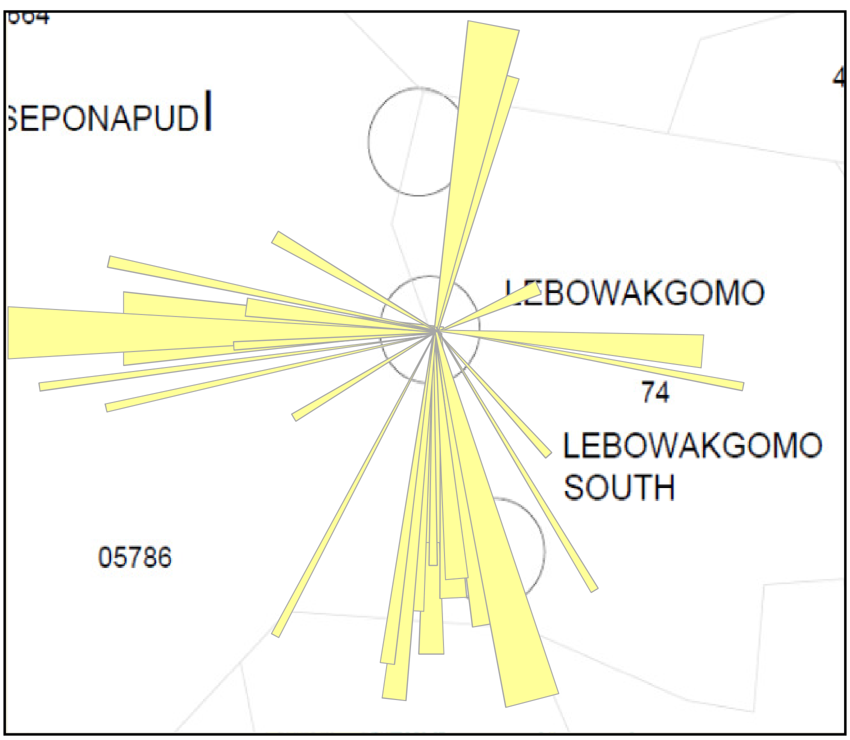


Figure 73: Desire Line Diagram

6.3.4 Base Year Assignment and Validation

For validation of passenger trips in the study area, the travel matrices built for base year for passenger vehicles were assigned to public transport network. The external trips provided by Public Transport (PT - Bus & Taxi) and Private Vehicles (PV) trips were accounted in the assignment for generalised time adjustment. The assignment was carried out based on Capacity Restrained Assignment Technique, for which the Travel Time Functions (TTF) was utilized. The network deterrence for assignment was generalised time function for individual modes.

6.3.4.1 Assignment Methodology of Public Transport Trips

Peak hour public transport passenger matrix was assigned on to the public transport network. The public transport network includes all coded bus and taxi routes on the road network. The public transport assignment was based on generalized time as stated earlier. The components of generalized time include In-Vehicle Travel Time (IVTT), Ingress/egress time and Waiting Time (WT), Transfer Time (TR), discomfort factor and fare in time units. Accordingly, the generalized time (GT), was worked out as follows:

GT = IVTT + WTFAC*WT +TRFAC*TR + FARE / VOT+ Discomfort Factor

Where,

GT = Generalised time in minutes

WTFAC = Wait time factor worked out as a ratio between value of WT and value of IVTT

TRFAC = Transfer time factor worked out as a ratio between value of TR and value of IVTT

VOT = Value of travel time, in Rands per minute

FARE = Fare paid for journey between origin and destination in Rands

There are two important steps in public transport assignment, viz., path building and loading trips on to these paths. The purpose of path building is to identify all reasonable paths between zones and provide associated travel information in generalised time so that the proportion of trips using each path may be calculated at the loading stage. Between any pair of zones, maximum number of trips are loaded on to the best path and other paths with longer generalised times are loaded with fewer trips. The proportion of trips to be loaded is calculated based on a logistic choice function based on generalised time.

6.3.4.2 Model Calibration and Validation

For validation of flows, assigned link flows (rail & bus) were compared at various screen lines. The variation was found acceptable (10 % variation) and model was considered appropriate for future forecasting.

6.4 Future Year Assignment

The base year calibrated model has been used for future forecasting up-to the horizon year 2050 to generate trip assignments. This process enable to better understand the implications of travel behaviour shifts caused by level of service variation to the transportation network apart from population and employment changes and respective impact on proposed rail corridor. The process involves running the Model for based on finalised trip forecasts and related future transport network. This is detailed further in subsequent sections.

6.5 Future Travel Pattern

The future travel pattern was forecasted till 2050. Both internal and external traffic streams were estimated separately and included in the transit assignment. An output of O-D matrix from model is presented in **Figure 74.**

	1001	1002	1003	1004	1005	1006	1007
1001	0	0	0	72	48	28	16
1002	1	0	22	64	42	23	14
1003	12	21	0	46	30	18	11
1004	71	14	46	0	42	36	21
1005	44	42	30	0	0	21	14
1006	29	25	18	38	26	0	0
1007	17	14	11	22	15	0	0
1008	41	35	25	38	25	11	6
1009	25	21	15	33	22	0	0
1010	13	13	7	16	11	0	0
1011	12	57	16	25	57	6	4
1012	92	35	13	47	31	15	9
1013	22	20	14	35	17	8	5
1014	33	30	21	40	67	11	7
1015	17	14	13	20	13	6	4
1016	35	26	15	36	34	116	57

Figure 74: O-D Matrix generated from Model

Having not conducted link (Mokopane –Polokwane and Polokwane - Jane Furse) Stated Preference Surveys, we relied on findings of NATMAP. The latter was not corridor specific, but macro-modelled. However, we have supplemented the NATMAP data with the physical counts (bus/taxi). Therefore the input relied heavily on existing volumes on road and complemented with projections with reference to NATMAP 2050.From the road volumes, a mode switch assumed 76%. We realise that this is on the high side, but the design of the service absorbs the current service providers and assigns them to become feeders to the rail. However, we do realize that there will be remnant service providers who will not be part of the buy-in. We have allowed 24% to accommodate these such independent operations.

Since some of the counts on the National Highways were done in 2010 and Public Transport (bus/taxi surveys) in 2011, we normalised the base at 2010.The base year model is calibrated for the year 2010 using the data from NATMAP 2050 projections, specially the NATMAP's Middle Scenario. We accepted the growth percentage of 5% for middle scenario, and another 1% due to the more recent activities in the corridors i.e. the Moloto corridor planned between Gauteng and Mpumalanga which Corridor D will be linking to and increased economic activity within the corridor due to heightened investment in the eastern limb for mineral exploitation. During discussion with stakeholders, we were advised that a 6% growth rate elsewhere in the Province has been recorded for bus public transport.

We gathered information on performance of the economy from the Infrastructure Development Plans (IDPs) for the respective districts through which the rail corridors lie. We have examined information on employment and development potential, and have factored-in this background – including recorded past trends, future prospects, and the emerging opportunities as they have been recorded in the IDPs of the 3 nodes of the network. In addition, the growth prospects for the corridors at a micro-level have been developed taking into consideration the past performance of the district economy and the economic growth envisaged for the future. We also have singled out the economic performance of construction sector as a good indicator of past and forecast future economic performance in the study area. From this, we derived average annual growth rates as obtained by using time –trend analysis as summarized under **Table 8** below.

Table 8: Annual Growth Rates (%) of construction sector

NODE	SOURCE	
Mokopane	MOGALAKWENA LOCAL MUNICIPALITY : 2011/12 IDP REVIEW	Time Period = 1994-2001 Annual Growth Rate = 6.3%
Jane Furse	SEKHUKUNE DISTRICT MUNICIPALITY – DRAFT 2012-2013 IDP/BUDGET	Time Period = 1994-2000 Annual Growth Rate = 0.32%
Polokwane	2010/2011 DRAFT NTEGRATED DEVELOPMENT PLAN	Time Period = 2001 - 2008 Annual Growth Rate = 8.76%

The available data in the study area at micro-level is very lacking. Even the most recent IDPs have very old numbers, which we have had to use in the absence of better sources at this level. It is thus that except for Jane Furse, the 6% growth rate we have used to compute demand forecast into the planning period is well within what has been achieved in the construction sector in the past. However, the Eastern limb lies in Sekhukhune (Jane Furse), and that is where mineral exploitation-driven growth is taking place – indicating that we can reasonably expect the rural slumber in that region to be over.

Ramp up factors considered in the ridership estimation have taken into account ramp up patterns on BRT corridors in South Africa and rail corridors world-wide, and are as follows:

- First Year operation: 50 %
- Second Year to year + 40: 80 %

We thus do not anticipate absorbing the entire available ridership potential.

6.5.1 Route Level Travel Demand Forecasts and Station Boarding /Alighting

The demand estimates are for the morning peak hour of 0500- 0700 hrs and evening peak hour of 1600 hrs -1800hrs and represent Peak Passenger Per two Hours per Direction. The model is an AM /PM peak hour model. However , morning/evening peak hour is going to constitute 70 % of the total travel demand on the corridor, with the remainder 30% accounted for shopping and leisure trips .We believe that the frequencies have to absorb the required patronage in the morning and evening peak hours. The demand estimates in the represent the realisable /normal estimates for the corridors. The detail for the year 2050 is has presented in **Table 9** and **10**. In case of Polokwane –Moloto Corridor, both the options viz. Option 1via Chuenespoort and Option 2 via were modelled. As the demand estimates are higher for the option via Zebediela, it is recommended for as the preferred linkage from demand side. **Figure 75** and **76** show the volume of trips assigned on rail network apart from boarding and alighting at various nodes. **Annexure 1** and **2** present the station boarding and alighting figures for the Polokwane Mokopane and Polokwane Zebediela Lebowakgomo corridor respectively.

Table 9: Station Boarding and Alighting Passenger Per two Hours Per Direction (2050) - Mokopane to Polokwane - Morning Peak

Route	**Embark**	**Dis- embark**	**Total in Section**
Mokopane	18463	0	18463
Commuter Station 1	15454	0	33917
Commuter Station 2	6736	0	40654
Commuter Station 3	6633	0	47286
Commuter Station 4	7213	0	54499
Commuter Station 5	541	0	55040
Commuter Station 6	7693	0	62733
Commuter Station 7	0	5126	57607
Commuter Station 8	0	17616	39990
Polokwane	0	39992	0
	62733	**62734**	

Table 10: Station Boarding and Alighting Passenger Per two Hours Per Direction (2050) - Jane Furse to Polokwane via Ga- Rakgoatha (Near Zebediela) Morning Peak

Route	**Embark**	**Dis- embark**	**Total in Section**
Jane Furse	6115	0	6115
Difapyae	5284	0	11399
Ga-Marishane	1325	0	12724
Makadikwe	314	0	13038
Mashabela	251	0	13289
Ga-Masemola	2493	0	15782
Marulaneng	1772	0	17554
Lebowakgomo South	11760	3760	25554
Lebowakgomo	44218	14468	55303
Mmakotse	3340	0	58643
Ga-Rakgoatha	5566	0	64210
Drop	0	0	64210
Plaas	0	0	64210
Commuter Station 7	0	8271	55938
Commuter Station 8	0	19158	36781
Polokwane	0	36781	0
Total	**82438**	**82438**	

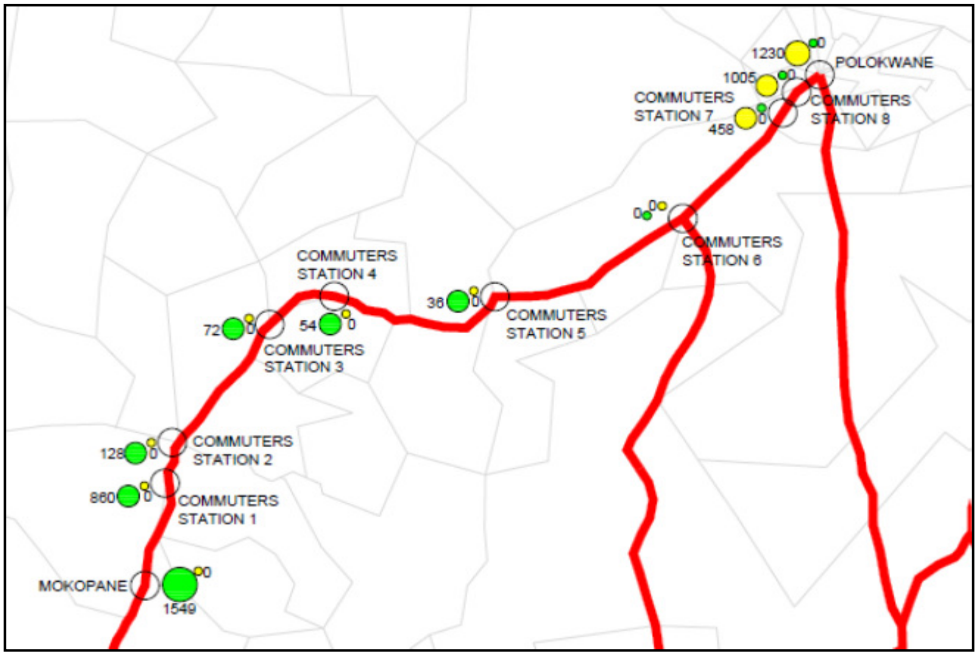


Figure 75: Assigned Traffic and boarding/alighting at various stations (2050)- Polokwane –Mokopane Corridor

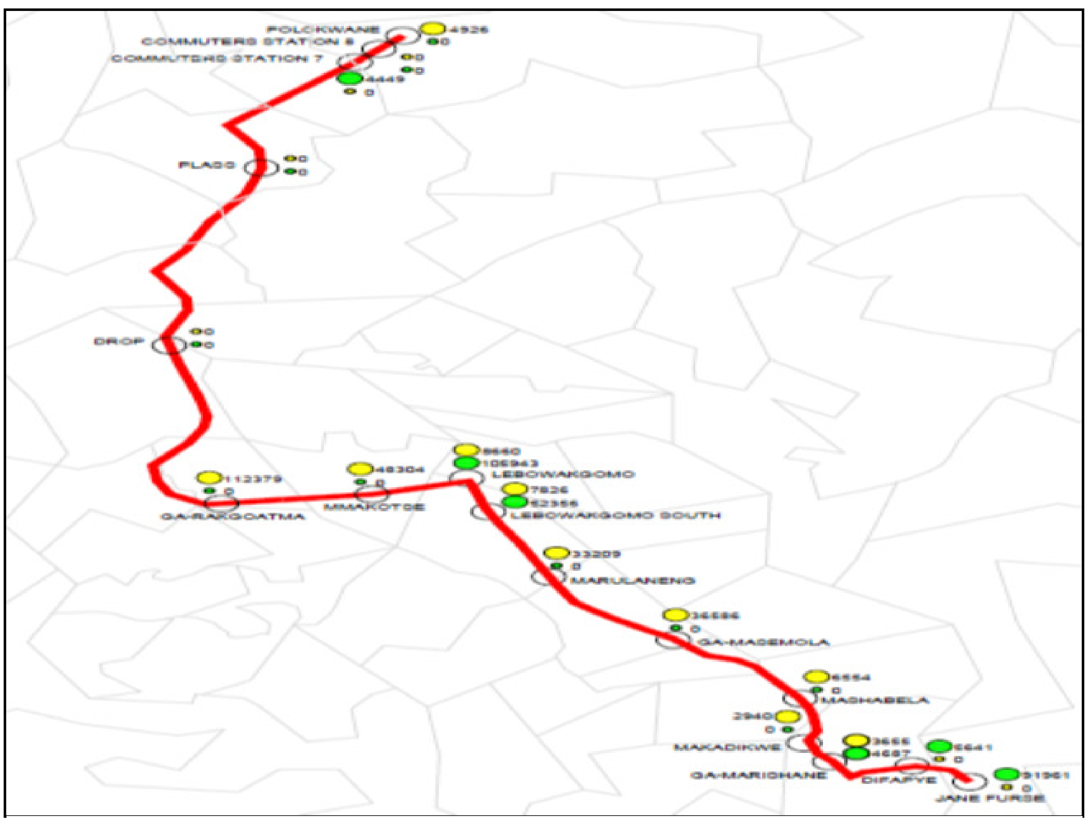


Figure 76: Assigned Traffic and boarding/alighting at various stations (2050)- Polokwane Jane Furse

6.6 Conclusion and Recommendations

As part of the pre-sift assessment, a market analysis ascertained the top target agglomerations – being Polokwane to Mokopane on the one hand and Polokwane Jane Furse, on the other. Broad searchlights were constructed using the top targets and settlements in the regions, and these were taken forward to the next phase of assessment.

Three broad options were then generated around these targets for the purpose of assessment:

- Polokwane – Mokopane;
- Polokwane –Jane Furse (via Chuenespoort); and
- Polokwane – Jane Furse (via Zebediela).

A high level analysis was undertaken of the top targets and the three options to understand their relative performance. The target Polokwane – Jane Furse (via Chuenespoort) performed the worst due to higher infrastructure costs and environmental impact, as well as market demand. Though the route length is shorter than the option via Zebediela, yet the number of settlements covered via Zebediela are higher. This results in higher demand estimates of 82438 morning peak hour trips towards Polokwane via Zebediela vis-a-vis 74872 morning peak hour trips towards Polokwane via Chuenespoort (2050).

In terms of feasibility, all options had some construction issues, although the most severe were considered to be in the Polokwane – Jane Furse (via Chuenespoort) variant. In terms of suitability and, although the principal objective of this study is to provide for passenger transport, the detail feasibility should include freight movement capacity along the corridors of the preferred options.

This assessment recommends that the Polokwane – Mokopane rail commuter service (Corridor A) as well as the regional passenger rail service from Polokwane to Jane Furse (Corridor D) be taken forward for detail feasibility consideration when the appropriate market demand indicators are fulfilled in the medium term.

7. FEEDER AND DISTRIBUTION SYSTEM

7.1 Objectives

The specific objectives of this chapter are to:

- discuss certain departure points and the approach to the development of feeder and distribution solutions for passengers using Rail;
- explain and motivate the broad concepts in developing such solutions;
- briefly deal with a number of generic issues related to the feeder and distribution system;
- describe the feeder and distribution networks and services;
- To quantify the feeder and distribution infrastructure and facilities required at the respective Rail stations;
- To give an indication of the costs involved with the provision of feeder and distribution services, infrastructure and facilities; and
- To briefly discuss the implementation of the proposed feeder and distribution solutions, including institutional arrangements.

7.2 Background

The level of success with which effective feeder and distribution services to rail stations are provided will be one of the key factors in drawing passengers to rail and ensuring optimum door-to-door travel time for its patrons. Feeder and distribution services are seen as an integral part of the rail solution and the planning of related services, infrastructure and facilities is, therefore, dealt with as such.

Private vehicles will play an important role in feeding passengers to rail. Significant attention therefore has to be given to aspects such as park-and-ride, kiss and- ride, and wait-and-ride (short-term parking) as part of the feeder and distribution systems. Consideration is also given to metered taxi, car hire, dial-and-rides, etc. Furthermore, it is accepted that existing road-based and public rail transport services, in their current form or with certain adaptations, will play a role in feeding passengers to the planned rail Stations. However, given the market segmentation and profile of the passengers that is envisaged will be attracted to rail and their needs and requirements, it will be essential for the existing public transport services to be re-organized to provide dedicated feeder and distribution services.

7.3 Interface with other Task-Streams

The three most important interfaces between the feeder and distribution element, as described in this chapter, and work done by the Project Team, are with:

- The demand modelling process;
- The development of station concepts; and
- Reports dealing with costing.

Results from the demand modeling process constituted some of the key inputs to develop feeder and distribution systems to serve the respective stations and to quantify the infrastructure and facilities required at these stations. However, certain inputs on feeder and distribution systems and networks were required for the demand modeling process. This resulted in an iterative process, which is described in the earlier sections of this report. The team responsible for the development of station concepts had to rely on outputs from the feeder and distribution systems development process, to conclude its work. These outputs related to the extent and quantities of feeder and distribution infrastructure and facilities at each of the respective stations. Cost-estimates were included in the reports dealing with income and costs in the business plan.

7.4 Methodology and Approach

The methodology followed to develop feeder and distribution solutions is presented in **Figure 77.**

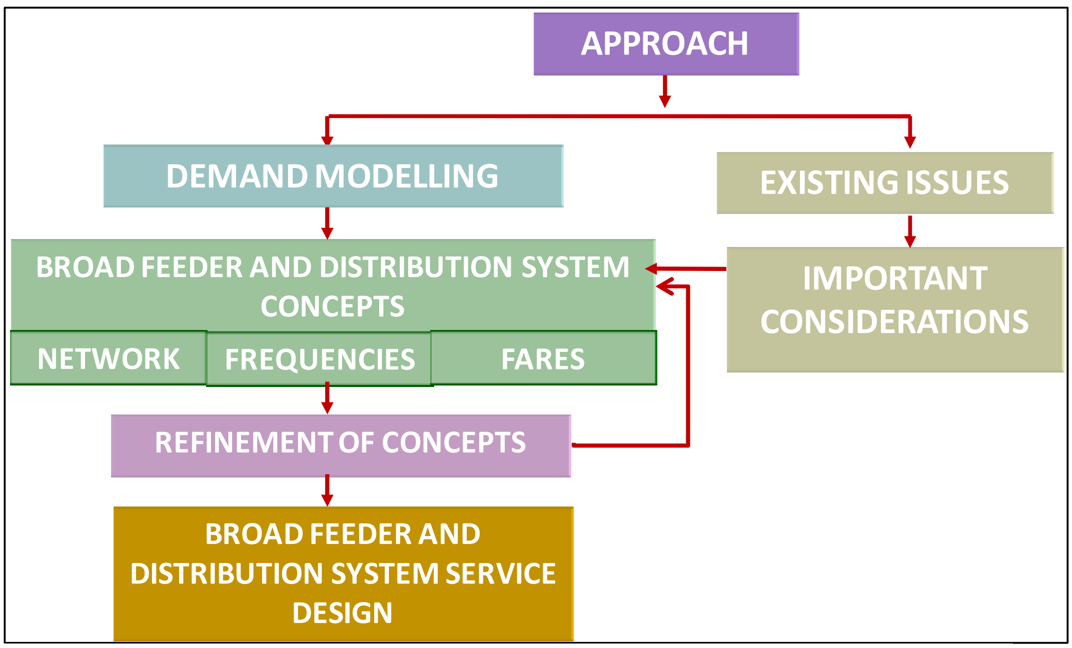


Figure 77: Methodology for Development of Feeder and Distribution System

The development of feeder and distribution solutions for rail was initiated by agreement on a number of departure points and the approach to this process. These aspects are discussed in the ensuing sections of this chapter. Broad feeder and distribution concepts were then developed in terms of:

- coarse feeder and distribution networks,
- frequencies; and
- fares.

During the development of the broad feeder and distribution concepts, a number of generic issues which must also receive attention (ie integrated payment for services, pedestrian facilities, etc) were identified. These issues are briefly alluded to in the next section and more detailed attention is given to some of these issues in the Business Plan. To plan efficient and cost-effective public transport systems a reasonable balance between supply and demand must be pursued. Broad feeder and distribution concepts were, therefore, discussed and further developed in conjunction with the Demand Forecasting element of the project.

7.4.1 Departure Points

Given the present land-use characteristics within the Polokwane Mokopane and Polokwane Jane Furse corridor, development of rail and stations on their own would not make economic sense. From international experience, it is clear that our city densities do not support rail based or mass transit solutions in general. To make the rail feasible and enable stations to be developed, such a system would have to be supported by an effective feeder and distribution system. The feeder and distribution services would make rail accessible beyond the area of walking distance at each station and would maximise the patronage. Based on the profiles of existing commuters within the corridor between Polokwane Mokopane and Polokwane Jane Furse, a larger group of potential customers of rail would either be:

- **captive to public transport**, but could **afford to choose** the "**best option**", or
- people that own **private vehicles**, but may opt to use **public transport of a high quality**.

As a departure point it is accepted that the current public transport service has to be adapted to fulfil the role of transporting larger groups of passengers to and from stations. Existing public transport services will, have to be supplemented by an extensive network of new dedicated feeder and distribution services. These new dedicated services will generally also have to be of a higher quality than most of the existing public transport services. The operational decisions (i.e. frequencies, area coverage, etc) related to these dedicated services need to be accounted for. Consideration should be given to the fact that dedicated public transport feeder and distribution services should be operated by the concessionaire or in an integrated manner by operators contracted to it. The choice of modes to be employed for dedicated public transport feeder and distribution services should be based on demand per corridor and modal niches. It may also be a combination of modes and vehicle sizes.

Rail will compete directly with high quality taxi-type services for the same customer base (i.e. 18-seater vehicles to be phased in over the next five years as part of government's initiative to recapitalise the current mini-bus fleet in South Africa). Mechanisms should be pursued to include these taxi operators into an integrated system, to provide feeder and distribution services to stations, rather than operating in competition. It is accepted that the extent of dedicated feeder and distribution services will be such that not every trip origin or destination within the catchment area would be accessible by foot. It will simply not be affordable to provide such a widespread and all-embracing network of services. It is therefore taken that these dedicated services will be focused primarily on:

• high-density employment, retail and commercial nodes;

• higher density residential areas, as well as

• satellite park-and-ride sites in lower density areas.

Integrated ticketing co-ordinated schedules, as well as information services, will be an essential aspect to address as part of the integration of rail service and feeder and distribution services. Other users with trips originating within the lower density residential areas will use park-and-ride facilities at rail station. Initially such users will probably constitute the majority of rail passengers. (This is confirmed by the demand model for the base year.) However, as densification around stations takes place, more people will be able to access rail on foot. Given the profile of rail customers, park-and-ride facilitates will have to be provided at most, if not at all, stations. These must include integrated pricing/payment for parking and fares. Consideration should be given to contracting out the operation of park-and-ride facilities. Some rail passengers may find it convenient to use existing public transport services as feeders and distributors. Attention should therefore be given to the integration and restructuring of such services (bus and rail) to support rail. It is therefore very important to co-ordinate the development of rail with other processes that involve the provision of public transport services (i.e. rail concessioning, bus contracts and permission strategies). Depending on the percentage of infrequent (i.e. business people, social travellers and tourists) travelling customers and the costs related to providing such services (or profit to be made from them), attention should be given to providing the following at all or certain stations, probably through quality controlled concessions:

• metered taxi services,

• dial-and-ride services, and

• car hire.

Accommodation of hotel and corporate shuttle services should also be considered as part of feeder and distribution solutions. Schemes to encourage organisations to provide such services may also have merit. Land-uses surrounding stations must reduce feeder/distribution requirements over time and optimise pedestrian access to the rail system. The needs and requirements of "special needs passengers" (i.e. people with disabilities) must also be catered for in terms of services, infrastructure and facilities.

7.5 Feeder and Distribution Concepts

This section deals with the development of feeder and distribution concepts. In terms of the feeder and distribution services, both existing public transport and dedicated services are considered. In the development of feeder and distribution concepts, a distinction is made between infrastructure and facilities within and outside the station precinct. This section concludes with a discussion on a number of generic issues related to feeder and distribution services. The recommended solution for feeder and distribution service requirements is based on a combination of existing public transport services (or non-dedicated services) and new dedicated public transport feeder and distribution services. The dedicated feeder and distribution services to be provided to the stations will consist mainly of road-based services (bus and taxi) . The feeder and distribution network for each station on both the corridors are presented in the **Annexures 3** and **4**.

7.5.1 Existing Public Transport Services

In certain instances, existing public transport services and operators can provide feeder and distribution services. Such services specifically will play an important role in bringing passengers from the periphery of the catchment area, or outside this area, to rail stations. This will include the following road based operators and services:

- Combi-taxis;
- Bus services
- Municipal bus operators.

Amendments to the above-mentioned services may, however, be necessary to suit the needs of rail passengers. Road-based operators may have to change routes and schedules. The issue of safe and convenient transfers from existing taxi, bus and rail services to rail will have to be given attention. The issue of through-ticketing will also have to be addressed.

7.5.2 Dedicated Feeder Services

New dedicated feeder bus services will be connecting important residential nodes within catchment areas with the respective rail station. The parameters and assumptions used to determine the vehicle capacity, fleet size and frequency are:

- rail passengers boarding rail from feeder buses in the morning peak hour as derived from the demand modelling process;
- average speed, of between 40 and 50 km/h depending on the type of vehicle and traffic conditions. The average speed also allows for acceleration, deceleration and stoppages; and
- route length.

7.5.3 Dedicated Distribution Services

New dedicated road-based distribution services will take rail passengers to major nodes (i.e. commercial, employment, education and entertainment) in close proximity to the respective stations. Such services will serve an area with a maximum radius of 5km from stations. Distribution will follow mainly circular routes, stopping at predetermined points, to drop passengers off at the destination-end of their journeys. Frequent stops will be provided along the route and the route will be determined to minimise walking distances. The existing road network will be shared with other traffic. However, priority measures will have to be provided for these services on congested arterials, to optimise travel time. Changes to local roads may be required and access roads to certain stations will have to be provided. As far as possible, such services will be operated at a maximum frequency of 5 minutes in peak hours. Smaller type buses with a seated capacity of 18 people will be used mainly for these services to optimise capacity utilisation and minimize waiting time.

The parameters and assumptions used to determine the vehicle capacity, fleet size and frequency are the same as for feeder services and are:

- rail passengers alighting from rail to be distributed by buses in the morning peak hour as derived from the demand modelling process;
- average speed of between 30 and 40 km/h depending on the type of vehicle and traffic conditions; and route length.

Major corporate organisations located within the vicinity of rail stations can also be encouraged to provide "shuttle services" through incentive schemes to and from stations for their employees. Depending on the success of such schemes, this will reduce the need for and extent of the dedicated distribution services. The number of buses and taxis required to services Polokwane - Mokopane and Polokwane Jane Furse Corridor is presented in **Tables 11** and **12.**

Table 11: Indicative Requirement of Feeder and Distribution Services for Polokwane – Mokopane Corridor (2050)

Station	AM Peak Hour Boarding Passengers (2050)	Bus(60 seater buses)	Midi-Bus(18 seater)	22 Seater taxi	16 Seater taxi	13 Seater taxi
Mokopane	18463	9	10	12	8	7
Commuter Station 1	15454	4	10	9	6	6
Commuter Station 2	6736	2	5	4	3	3
Commuter Station 3	6633	2	4	4	3	3
Commuter Station 4	7213	2	5	4	3	3
Commuter Station 5	541	0	0	0	0	0
Commuter Station 6	7693	2	5	4	3	3
Commuter Station 7	5126	2	5	4	3	3
Commuter Station 7	17616	5	10	10	7	7
Polokwane	39992	5	11	13	9	8

Table 12: Indicative Requirement of Feeder and Distribution Services for Polokwane – Jane Furse Corridor (2050)

Station	AM Peak Hour Boarding Passenger (2050)	Bus(60 seater buses)	Midi-Bus(18 seater)	22 Seater taxi	16 Seater taxi	13 Seater taxi
Jane Furse	6115	7	13	9	7	6
Difapyae	5284	6	11	8	6	5
Ga-Marishane	1325	2	3	2	1	1
Makadikwe	314	0	1	0	0	0
Mashabela	251	0	1	0	0	0
Ga-Masemola	2493	3	5	4	3	2
Marulaneng	1772	2	4	3	2	2
Lebowakgomo South	11760	14	17	11	9	12
Lebowakgomo	44218	22	23	26	19	23
Mmakotse	3340	4	7	5	4	3
Ga-Rakgoatha	5566	7	12	8	6	6

7.6 Infrastructure and Facilities within the Station Precinct

The feeder and distribution infrastructure and facilities within the station precinct provides the physical link for passengers between rail and the modes/services that will transport them to and from rail stations. The following infrastructure and facilities will, in the case of most stations, be provided within the station precinct:

- parking;
- kiss-and-ride;
- loading and off-loading for existing public transport services;
- facilities for dedicated feeder and distribution services
- pedestrian facilities; and
- vehicle access to the road network surrounding stations.

The infrastructure and facilities within the rail operational area are excluded from this report. The above-mentioned infrastructure and facilities have to be planned to ensure effective transfers and in such a manner that passengers experience a high level of service during transfers. The following principles have to be considered:

- shared vs separate access to the site for different modes and services;
- separate parking for modes and services;
- optimising site vehicle circulation and egress;
- accommodation of existing road-based public transport services on- or off the street;
- positions and layout of facilities to minimise walking distances and simplify pedestrian movements;
- safety, comfort and convenience of pedestrians; and

- conflict points between movements.

The various elements are dealt with separately below.

7.6.1 Parking

Parking will be one of the most significant infrastructure elements within the station precinct. Normal parking standards should be used for the design of parking facilities. Available space, number of bays required, and costs will determine whether a parkade (structured parking), covered surface parking, or both will be provided at the respective ***Rail*** stations. Availability of parking to be shared with other developments in the immediate vicinity of the stations will also be taken into consideration. A typical example would be parking at a shopping centre, which could be used for park-and-ride during the week, when shopping demand is low. Over weekends, when the demand from shopping is high, the demand for park-and-ride is low. Development of the parking facility will take place as part of the station development. These operations can be contracted out to a private company.

7.6.1.1 Park-and-ride

As previously stated, a significant proportion of the users of rail will require park-and-ride facilities at the origin-end of their trips. A large portion of passengers using park-and-ride facilities, are expected to do so for a full day, eg arriving in the morning, using the train to get to work, and returning in the afternoon. An isolated and demarcated part of the facility will be made available for sub-letting to car hire companies where applicable.

7.6.1.2 Collect-and-ride/short-term parking

Rail passengers that kiss-and-ride on their origin-end of their trips will typically have to be collected on their return trips. People meeting such passengers will usually require parking for a period of 5 to 10 minutes while waiting. A need for collect-and-ride or short-term parking will, therefore exist at most stations, if not all stations. Consideration must be given to either providing a separate facility for short term parking or separate space will have to be reserved within the park-and ride facility for this purpose. Depending on available space and whether a parkade is provided for park-and-ride, the short-term parking facility should preferably be independent of park-and-ride spaces. This facility should have easier access and need not be covered. Such facilities should be provided in close proximity to the egress points from the rail operational area. Utilisation of park-and-ride and collect-and-ride parking will have to be regulated by fares and time limits.

7.6.1.3 Other parking needs

Parking may also be required for other modes and services at stations, which could include:

- metered taxis;
- car pools;

- vehicles provided by employers for collection and distribution of their own employees (corporate shuttles);
- dial-&-ride services; and
- car hire services (at selected stations only).

Such parking may be planned and made available as dedicated areas within the park-and-ride facilities, or as separate facilities.

7.6.2 Kiss-and-ride

A fair percentage of passengers accessing rail by means of private vehicles are expected to be dropped off at stations. The need for kiss-and-ride "drop-off" zones or areas must be provided for at all stations. Such facilities should be in close proximity to access points to the rail operational area. Facilities for off-loading should be designed to avoid vehicle queues. To ensure this a conservative service frequency of 3-minute intervals should be assumed. All vehicles arriving within any 3-minute interval would be able to off-load immediately. Utilisation of kiss-and-ride areas will have to be regulated by maximum time limits.

7.6.3 Loading and off-loading for existing public transport services (Non-dedicated road-based public transport services)

A limited number of rail passengers are expected to use non-dedicated public transport to travel to and from stations. Non-dedicated public transport in the current scenario comprises of existing public transport services not under contract to the concessionaire, transporting passengers not only to and from rail stations, but also to other destinations.

To minimise competition and conflict between operators providing dedicated and non-dedicated services, it is desirable that separate on-street loading and off-loading facilities be created along the streets within or adjacent to the station precinct. Such facilities should include lay-byes and shelters with pedestrian access to stations by means of well-lit and paved walkways. It can be argued that the provision of these facilities will be the responsibility mainly of the applicable local authority. Regulatory and control measures will have to be instituted and their operation enforced by the local authority, to safeguard the quality of the environment within and around the station precinct.

7.6.4 Bus/Taxi Loading and Off-loading

Separate facilities will be provided within the station precincts for dedicated public transport feeder and distribution services. Provision will have to be made for different types of vehicles. It is foreseen that such services will be provided mostly by either 18-seater midi-buses and/or 60-seater buses. Due to differences between the characteristics of these two types of vehicles (i.e. size and turning radius); separate facilities may have to be provided. As far as possible, loading and off-loading areas should be located separately. Typically, a bus/midi-bus will enter the precinct, off-load close to the rail operational area, and then proceed to an area where it will either hold or load. Loading areas must also be positioned fairly close to the rail operational area, and pedestrian links should be covered and well lit. Ingress and egress must take place with the least amount of manoeuvring, especially reversing. Minimum holding of vehicles will be allowed within the precinct and vehicles not operational especially in the off-peak, should rather be parked at the operator(s) depot(s). It is foreseen that the loading and off-loading facilities will be developed in conjunction with the rest of the station building under the same ownership. Management of operations must be the responsibility of the operators using the facilities. This function must be incorporated within the institutional framework for the management of stations.

7.6.5 Pedestrian Facilities

Pedestrian movement within the station precinct will be significant and will have to receive high priority. Attention will be given to minimise vehicle-pedestrian conflict. At points were pedestrian flows intersect with other traffic, the pedestrian movements will always have priority, and signalling may be required. The normal design standards for the planning and design of pedestrian facilities will be used considering the following human elements:

- convenience
  - easy access;
  - integrate with other uses and services (i.e. pedestrian malls).
- information and directional signage;
- comfort
  - temperature;
  - lighting;
  - seating;
  - shelter;
  - cleanliness.
- Safety
  - walking surfaces;
  - adequate lighting;
  - railings and grade changes;
  - warning signs.

Facilities will be planned to guide pedestrians as quickly as possible to or from the rail operational area. Allowance will be made for persons with disabilities.

7.6.6 Vehicle Access

Access from the street network will be shared by all road-based modes. Once inside the station precinct modes will be separated and directed by clear and unambiguous signage. In exceptional cases, separate access and egress arrangements will be considered to contribute to more effective traffic circulation within the station precinct. As part of the development of the respective stations with reference to the traffic impact study and for approval by the local authority, the following should receive consideration:,

- site circulation;
- parking requirements;
- site layout;
- position and geometric design of accesses;
- trip generation;
- trip distribution;
- traffic assignment;
- improvements to the road network to improve/provide access; and
- traffic control.

7.7 Infrastructure and Facilities within the Station Impact Area (Outside the Station Precinct)

7.7.1 Infrastructure and facilities en-route

Attention needs to be given to infrastructure and facilities along feeder and distribution routes, including:

- lay-byes;
- shelters;
- information boards; and
- other amenities at larger stops.

It is essential that rail passengers experience the same levels and quality of service throughout their journeys. In the case of a passenger using a feeder service, a specific bus stop is the first point of access to the system. The same goes for the point where the passenger leaves the system. In cases where major arterials are used as dedicated feeder routes, travel time may be compromised as a result of traffic conditions during peak periods. To make feeder services more attractive to rail passengers and improve their travel times, attention needs to be given to priority measures, such as HOV lanes.

7.7.2 Decentralised park-and-rides

In certain cases provision will have to be made for decentralised park-and-ride facilities at major nodes (i.e. shopping centres) within the respective catchment areas of stations, to feed passengers to rail.

7.8 Station Layout and Sizing

Various forms of data need to be examined and considered for station design in the detailed feasibility study. This data includes information on the following aspects:

- Commuter Numbers(Demand Profile and expected growth);
- Intermodal transport(Buses, taxis and private vehicles and expected growth thereof);
- Commuter profile;

- Station Surroundings.

Indicatively, zoning plan has been prepared for Major, Medium and small stations as per Metro Rail and SARCC station guidelines. The zoning plan for Small, medium and large stations is presented in **Figures 78**, **79** and **80**.Polokwane Station is an ideal example of Major Station which can be emulated for other stations along the corridor.

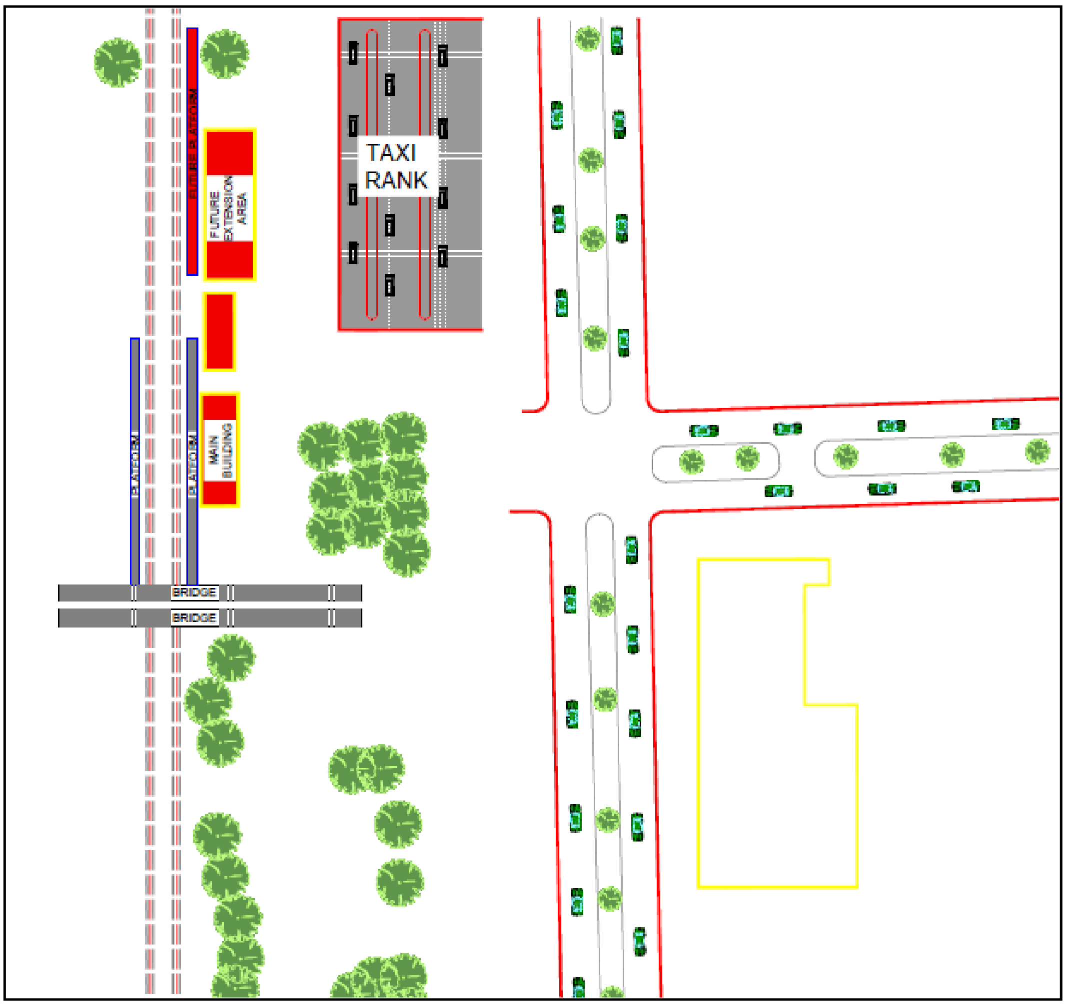


Figure 78: Small Station Zoning Plan

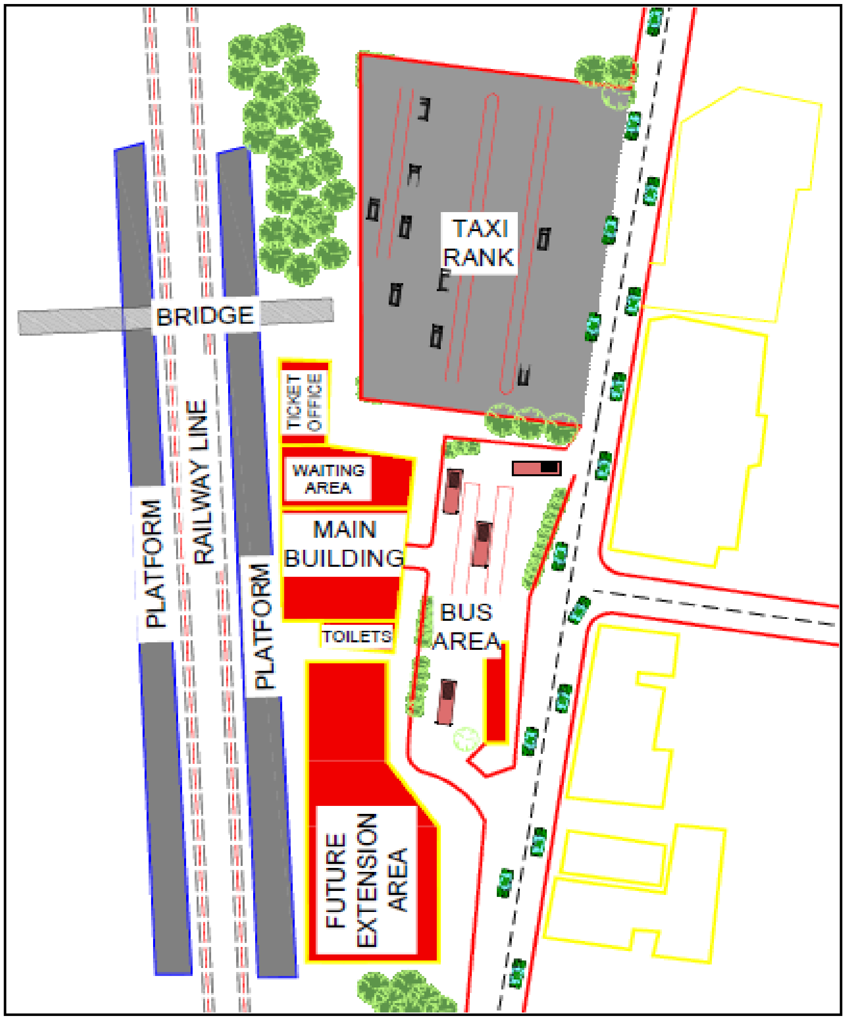


Figure 79: Medium Station Zoning Plan

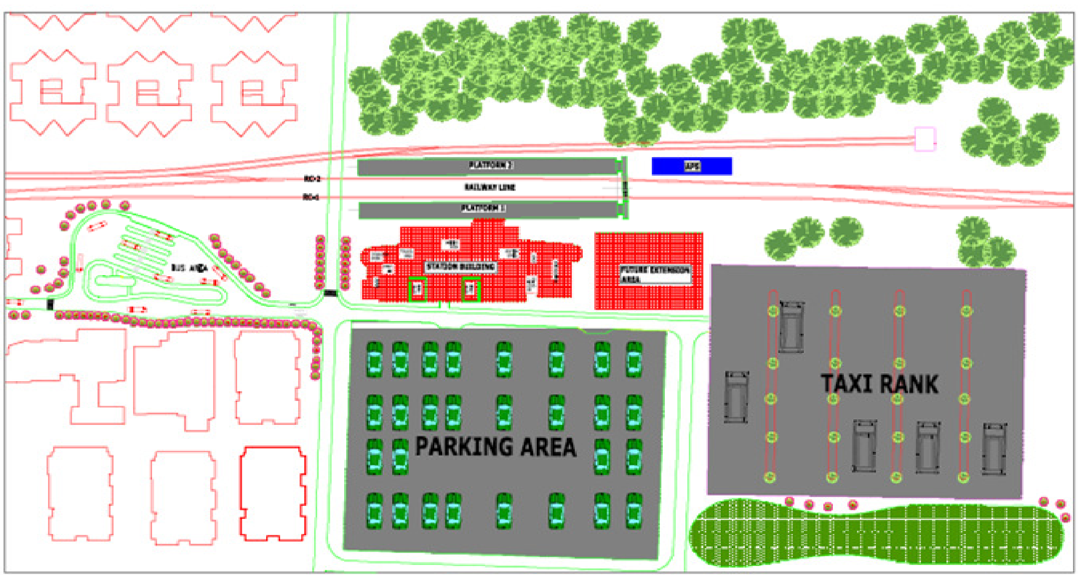


Figure 80: Large Station Zoning Plan

7.9 Generic Issues

The following generic issues were identified and are important to all feeder and distribution services and are also relevant to rail system and station development:

- integrated payment for services
- integrated passenger information
- passenger safety at stations
- pedestrian facilities (convenience, continuity and safety)
- dial-and-ride, metered taxis and car-hire services at stations
- lay-bys and facilities along dedicated feeder and distribution routes

Some of the above issues are dealt with as part of other reports (i.e. Operations Report Telecommunications and Safety and Security). Others are discussed below.

7.9.1 Integrated payment for services

The following issues will have to be developed to facilitate the integration of payment:

- institutional arrangements;
- operation of service (by whom, will a clearing house be required);
- standards;
- smartcards vs integrated ticketing;
- open vs closed system;
- cost-related to the implementation and operation of systems;
- internet facilities for bookings and payment.

7.9.2 Integrated passenger information

It is foreseen that this could be dealt with to a large extent through integrated ticketing, and fare infrastructure and facilities. However, issues that should, however, receive further consideration are:

- information desks (kiosks);
- information booklets;
- electronic information boards;
- information signs; and
- “Info on the Web”.

7.9.3 Transit Oriented Development

It should be acknowledged that the nature and extent of feeder and distribution services might change significantly over time. This will be due to the envisaged changes in land-use developments and densification at and around rail stations, which will enable far greater pedestrian accessibility. To promote transport planning co-ordination, as well as land-use and transportation integration, the proposed feeder and distribution solutions will have to be accommodated in local plans (i.e. Integrated Transport Plans, Land Development Objectives and Integrated Development Plans).

7.10 Recommendations

1. The following is recommended with regard to feeder and distribution services in general:

- A system of high-quality feeder and distribution services should be developed to transport passengers to and from rail stations, thereby offering them an effective "door-to-door" service.
- Existing public transport services should be amended / restructured where necessary to form part of the feeder services for passengers travelling to Stations.

2. The implementation of incentive schemes to encourage major corporates and other organisations to introduce shuttle services for their employees should be pursued.
3. Integrated payment and through-ticketing, linked to integrated information on all services, should be an essential link between the dedicated services and the Rail service. More work should be done on the ticketing and payment system taking cognisance of:

- International practices.
- Current developments in South Africa on smartcards.

4. Inclusion of the new dedicated feeder and distribution systems into the relevant Operating Licence Strategies for the Year 2006 should be discussed with the relevant local authorities and the Gauteng Operating Licence Board. This will be necessary to facilitate the award of operating licences to operators before commencement of the rail service.
5. The national government's initiative to recapitalise the existing ageing taxi fleet should, as far as possible, be accommodated as part of the development and implementation process of the new dedicated feeder and distribution services.
6. The modelling process will have to be refined, paying specific attention to the attractiveness of dedicated public transport distribution services or to make walking less appealing.
7. Discussions will have to take place with operators and institutions/authorities responsible for the provision of existing public transport services within the impact areas of the respective rail stations. Ideally "memorandums of understanding" should be signed with such operators.
8. Feeder and distribution fare levels will have to be in line with the per kilometer rail tariffs .
9. Feeder and distribution solutions should be accommodated in local plans (i.e. Integrated Transport Plans, Land Development Objectives and Integrated Development Plans) to promote transport-planning c ordination, as well as land-use and transportation integration.