

A STUDY OF CURRENT AND POTENTIAL FUTURE COMMUTER
TRANSPORTATION REQUIREMENTS IN KAGISO TOWNSHIP

by
DAVID LEFUTSO

A dissertation submitted in partial fulfillment
of the requirements for the degree of

MASTER OF BUSINESS ADMINISTRATION

Rhodes University

© 2005

DECLARATION

I **David Lefutso** hereby declare that this research dissertation is my own original work and that all reference sources have been accurately reported and acknowledged and that this document has not been previously submitted to any university in order to obtain an academic qualification.

ACKNOWLEDGEMENTS

I wish to express my sincere appreciation to my supervisor, Prof. Etienne Nel for his generous contribution of time, interest, effort, and patience during the development and writing of this dissertation. Your constructive criticisms and encouragement deserve a hearty 'Thank You.'

DEDICATION

To my loving mother Mapule, who has a deep influence on my life, thanks for giving me the best gift a parent could give to a child, which is education; to my beautiful and gifted wife Xoliswa, who has been a pillar of strength in these trying times, for her understanding, generous support and encouragement during the completion of this dissertation; to my two beautiful daughters Thandolwethu and Tamsanqa, thanks for your unconditional love and inspiration and to the whole Lefutso clan, may you all reach for your stars too!

TABLE OF CONTENTS

	Page
Declaration	ii
Acknowledgements	iii
Dedication	iv
List of Tables	x
List of Figures	xi
List of Abbreviations and Acronyms	xii
Abstract	Xiii
Chapter 1: Introduction	1
1.1 Introduction	1
1.2 Statement of the problem	3
1.3 Rationale	5
1.4 The research questions	7
1.5 Aim of the study	8
1.6 Overview of the research framework	8
1.7 The study area	9
1.8 Structure of the dissertation	10
Chapter 2: Literature review	12
2.1 Introduction	12
2.2 Socio-economic characteristics	13
2.2.1 Variables that influence accessibility to a mode	13
2.2.1.1 Car ownership	13
2.2.1.2 Car condition	15
2.2.1.3 Accessibility to public transport	16
2.2.2 Variables that describe the personal characteristics of the user	18
2.2.2.1 Age	18
2.2.2.2 Gender	18
2.2.2.3 Household structure	19
2.2.2.4 Employment status and income	20
2.3 Urban travel demand forecasting models	20
2.3.1 Individual travel choice behaviour perspective	21

2.3.2	Activity analysis perspective	23
2.4	Integrating land use and transport planning	25
2.5	Conclusion	27
Chapter 3: Legislative and policy framework, post 1994		28
3.1	Introduction	28
3.2	Background	28
3.3	White Paper on National Transport Policy	30
3.4	Moving South Africa	31
3.4.1	Urban customers	32
3.5	Overview of the national transport legislation	35
3.5.1	National Road Traffic Act, No. 93 of 1996	35
3.5.2	National Land Transport Interim Arrangements Act, No. 45 of 1998	36
3.5.3	National Land Transport Transition Act, No. 22 of 2000	36
3.6	The Gauteng White Paper on Transport Policy	38
3.7	Overview of the provincial land transport legislation	39
3.7.1	The Gauteng Road Transportation Amendment Act, No. 6 of 1997	40
3.7.2	The Gauteng Provincial Road Traffic Act, No. 10 of 1997	40
3.7.3	The Gauteng Interim Minibus Taxi-type Services Act, No. 11 of 1997	40
3.7.4	The Gauteng Interim Road Transport Act, No.2 of 1998	41
3.7.5	The Gauteng Transport Framework Act, No. 8 of 1998	41
3.7.6	The Gauteng Public Passenger Road Transport Act, No. 7 of 2001	42
3.7.7	The Gauteng Transport Infrastructure Act, No. 8 of 2001	42
3.7.8	The Gauteng Transport Framework Revision Act, No. 8 of 2002	43
3.8	Conclusion	43
Chapter 4: Methodology		45
4.1	Introduction	45
4.2	Quantitative and qualitative research paradigms	45
4.3	Explanatory introduction to research methodology	47
4.3.1	A deductive approach	47
4.3.2	The identification of the research population	48
4.3.3	The drawing of a representative sample for the population	48

4.3.4	Control of variables	48
4.3.5	The generation of both qualitative and quantitative data	48
4.3.6	Generalisability of results	49
4.4	Research framework	49
4.4.1	Operationalisation of the research framework	51
4.4.1.1	Orientation	51
4.4.1.2	Discussions with role-players	51
4.4.1.3	Planning of surveys	51
4.4.1.4	Commuter surveys	54
4.4.1.5	Database, analysis and the travel forecasting model	55
4.4.1.6	Interviews with key informants: Municipal Group and Local Transport Association	56
4.4.1.7	Reporting	57
4.5	Ethical considerations	57
4.6	Limitations	58
Chapter 5: Findings: commuter perspectives		59
5.1	Introduction	59
5.2	A socio-economic profile of commuters and the disadvantaged in Kagiso Township	60
5.2.1	Socio-economic profile	60
5.2.2	Driver's licence possession and the use of a car	62
5.2.3	Features of a typical commuter	64
5.3	Dominant travel patterns of commuters based on transport use	66
5.3.1	Car availability	66
5.3.1.1	During weekday daytime	66
5.3.1.2	During weekday – evenings	67
5.3.1.3	During Saturday	67
5.3.1.4	During Sunday	68
5.3.2	Trip frequency	68
5.3.2.1	Number of trips going to work or looking for work	71
5.3.2.2	Number of trips devoted to educational matters	71
5.3.2.3	Number of trips devoted to grocery shopping	72
5.3.2.4	Number of trips devoted to other activities	73
5.4	Current and future mobility requirements	76

5.4.1	Current mobility requirements	77
5.4.1.1	Availability	77
5.4.1.2	Affordability	79
5.4.1.3	Accessibility of destinations	81
5.4.1.4	Acceptability	82
5.4.1.4.1	Cross tabulation of transport mode and hygienic standards	83
5.4.1.4.2	Cross tabulation of transport mode and safety levels	83
5.4.1.4.3	Cross tabulation of transport mode and the quality of transport facilities	84
5.4.1.4.4	Cross tabulation of the quality of transport facilities and hygienic standards	85
5.4.1.4.5	Cross tabulation of safety levels of transport mode and hygienic standards	86
5.4.2	Future mobility requirements	86
5.4.2.1	Mobility requirements of commuters	86
5.4.2.2	Estimation of travel demand	87
5.5	Conclusion	91
Chapter 6: Findings: regulator and operator perspectives		93
6.1	Introduction	93
6.2	Regulator perspectives	94
6.2.1	Legislative framework	94
6.2.2	Municipal transport planning	94
6.2.3	Transport infrastructure requirements	95
6.2.4	Service delivery	95
6.2.5	Environmental impact management	96
6.2.6	Consultation forums	96
6.2.7	Security	96
6.2.8	Future plans	97
6.3	Operator perspectives	98
6.3.1	Transport groups	98
6.3.2	Quality of transport	99
6.3.3	Capital investment / running costs	100
6.3.4	Profitability	100
6.3.5	Transport routes	101
6.3.6	Types of vehicles used	101
6.3.7	The police-transporter relationship and the organization of transport	102

6.4	Comparison of commuter needs to municipal plans	102
6.5	Conclusion	108
Chapter 7: Analysis of the commuter findings		111
7.1	Introduction	111
7.2	Analysis of the socio-economic characteristics	111
7.2.1	Levels of car ownership	111
7.2.2	Levels of accessibility to public transport	112
7.2.3	Age cohorts	114
7.2.4	Gender analysis	115
7.2.5	Household structure	115
7.2.6	Analysis of employment and income status	116
7.3	Analysis of the transport requirements	116
7.4	Conclusion	117
Chapter 8: Summary, conclusions and implications		118
8.1	Summary	118
8.2	Conclusions	119
8.2.1	What is the socio-economic profile of commuters and the disadvantaged in Kagiso Township?	119
8.2.2	What are the dominant travel patterns of households based on their transport use?	120
8.2.3	What are the current mobility requirements (based partially on the use of a travel demand model)?	121
8.2.4	What are the perceptions of households on: the physical and environmental quality of transport facilities; local transport costs; and safety levels of the transport modes?	121
8.2.5	What are the municipal plans for the development of an affordable and integrated transport system?	121
8.2.6	What are the current and future transport supply options?	122
8.2.7	What are the opportunities and challenges that are facing the local transport system?	122
8.3	Implications	123
8.4	Further research	123
8.5	Concluding remarks	123
References		124
Appendices		130
Appendix A	Commuter Questionnaire	131
Appendix B	Municipal Group Questionnaire	136
Appendix C	Local Transport Associations Questionnaire	139
Appendix D	Detailed Calculations: Simplified Travel Demand Forecasting Model	148

LIST OF TABLES

Table	Title	Page
2.1	Performance Objectives for the Urban Passenger Transport System	17
3.1	National Objectives and System Gaps	34
5.1	Frequency distribution for the age groups	60
5.2	Socio-economic characteristics	61
5.3	Do you have a medical aid? by Age by Gender	65
5.4	Percentage of trips on grocery shopping during weekday daytime by Gender	72
5.5	Percentage of trips on grocery shopping during weekday evenings by Gender	72
5.6	Destinations and costs	80
5.7	Hygienic standard of transport mode by Gender	83
5.8	Safety levels of transport mode by Gender	84
5.9	Quality of transport facilities by Gender	84
5.10	Quality of transport facilities by Age	85
5.11	Quality of transport facilities by Hygienic standard of transport mode	85
5.12	Safety levels of transport mode by Hygienic standard of transport mode	86
5.13	Simplified Travel Demand Forecasting Model	88
5.14	Population estimates and projections	89
5.15	Age group distribution, Gauteng Province	89
5.16	Modal and age distribution of trips (2004)	90
5.17	Age group distribution, Gauteng Province	91
6.1	Comparison of commuter needs to municipal plans	103

LIST OF FIGURES

Figure	Title	Page
1.1	Transport Customer Segments: Gaps Against Customer Needs	6
1.2	Orientation of Kagiso Township in Gauteng Province, South Africa	11
3.1	Structure for transport legislation in Gauteng Province	39
4.1	Research framework	50
5.1	Comparison of Age: Gender: Licence Possession	62
5.2	Comparison of Age: Driver / Passenger: Gender = Male	63
5.3	Comparison of Age: Driver / Passenger: Gender = Female	63
5.4	Weekday daytime trips	69
5.5	Weekday evening trips	70
5.6	Sport and recreation journeys	74
5.7	Non food shopping journeys	75
5.8	Visiting friends journeys	75
5.9	Leisure journeys	76
5.10	Mode choice during weekday daytime	77
5.11	Mode choice during weekday evenings	78
5.12	Mode choice during Saturdays	78
5.13	Mode choice during Sundays	79
5.14	Employment destinations	81
5.15	Comments regarding current local transport services	82

LIST OF ABBREVIATIONS AND ACRONYMS

AIDS	Acquired Immune Deficiency Syndrome
CBD	Central Business District
CPTR	Current Public Transport Records
CSIR	Council for Scientific and Industrial Research
Gautrans	Gauteng Department of Transport and Public Works
HDI	Household Disposable Income
HIV	Human Immune Virus
IDP	Integrated Development Plan
ITP	Integrated Transport Plan
MCLM	Mogale City Local Municipality
MEC	Member of the Executive Council
OECD	Organisation for Economic Co-operation and Development
OLS	Operating Licences Strategy
PUTCO	Public Utility Transport Corporation
RDP	Reconstruction and Development Programme
SANRAL	South African National Roads Agency Limited
SPSS	Statistical Package for Social Sciences
Wesmet	West Rand Metropolitan Transport Area
WGTC	Western Gauteng Taxi Council
WRDM	West Rand District Municipality

ABSTRACT

This study is intended to unpack the current and potential future commuter transport requirements in Kagiso Township within the context of transport planning and the ongoing transformation of the transport sector in South Africa. In order to meet the above challenges, it was felt that an investigation of the socio-economic profile of transport users in Kagiso Township was required, which would be indicative of potential needs and requirements in terms of current and future travel infrastructure. This study is significant, as it considers the impact of socio-economic factors and transport interactions by fully examining the impact of accessibility, urban development patterns, local mobility and planning. Mogale City's Kagiso Township was selected for in-depth study because it has seen one of the highest urbanization rates in Gauteng Province, with people from all over Gauteng relocating to this suburb, either buying relatively moderately priced housing via mortgaging or, alternatively, trying to gain access to government low-cost housing.

The study investigates the connection between socio-economic characteristics of a local population (*inter alia*, age, gender, household size, and vehicles per household, employment status and income) and their transport requirements (travel demand forecasting), within an urban transport context. Socio-economic characteristics of a population are important in transport demand forecasting because there is a general belief in transport planning that the predisposition to travel and trip generation vary with the characteristics of the traveller. A travel demand forecasting model by Bussière and Rice (1999) is used for the purposes of simulating existing and future travel patterns. The forecasted household mobility and needs of commuters in Kagiso Township are compared with current municipal plans to see whether such plans are realistic and can address existing needs. The evaluation of the current municipal plans is included to test the responsiveness of public policy and practice towards the needs of the affected local community. This evaluation extracted information on whether the relevant municipality has identified the problems and issues affecting the local community of Kagiso Township. In addition, it assessed whether the municipality has identified possible solutions to these problems and issues and whether it has prioritised any projects to improve transportation in Kagiso Township.

CHAPTER 1

Introduction

1.1 Introduction

Transport is a human activity that is essential for the movement of goods, people and information. Bhat and Koppelman (2003: 39) state that “since the beginning of civilization, the viability and economic success of communities have been, to a major extent, determined by the efficiency of the [available] transportation infrastructure.” In the 20th and 21st century, the increased efficiency and complexity of transportation systems have provided an enhanced level of local and international competitiveness for communities. Increased mobility has clearly accelerated development in countries over the past 100 years.

Urbanization has had a profound effect on the spatial location and operation of different communities around the world. The demand for space in urban areas has facilitated the development of residential and industrial areas, along with associated commerce and trade. The development of transportation systems for the movement of goods, people and information has transformed the world in which we live. Space has been, and always will be, a constraint in a physically finite world and transportation has to compete with other human activities in the geographic sphere. Wilkinson (2002: 2) succinctly states that “travel needs and hence the demands for transport provision are derived from the geographical separation of primary activities in urban areas, particularly those that are home-based and those that are work-based.” The demand for the fulfilment of mobility has had unintended externalities, which policymakers are grappling with on a day-to-day basis. Congestion, pollution, social exclusion and physical hazards are common in most urban areas around the world. These externalities are inevitable; however, they can be potentially mitigated over time. Despite this potential, though, as Bussière and Rice (1993: 3) note, “[t]he rapid growth of urbanization at a new world-wide scale is seriously challenging the ability of the urban planner to respond with suitable planning procedures and solutions, especially within cities of developing countries where the change is most rapid.” These challenges have confronted urban planners and transportation geographers for some time and will continue to do so as long as there is a scarcity of land resources and increasing demands on such resources.

According to May et al (2003: 157), “transport related obstacles are some of the most significant causes of unsustainability in urban areas.” This contention has a particular relevance in the South African context with the country’s historical legacy of racial separation and service under-provision in the poorer, formerly racial segregated townships. Although transportation is one of the many challenges currently being addressed by the authorities, it deserves prominent attention since addressing transport backlogs can help with the social and economic integration and development of urban areas. In response to this reality, Mogale City Local Municipality (MCLM) (of which Kagiso Township is a suburb) in Gauteng Province, South Africa has recognized the importance of transportation planning and has devised certain objectives, which must be achieved in terms of its Integrated Development Plan (IDP) and the West Rand District Municipality’s (WRDM) Integrated Transport Plan (ITP). In terms of the latter, transportation plans will help direct employment opportunities and activities, as well as promote mixed land uses and high-density residential developments. This will further enhance accessibility to public transportation services and facilities (Mogale City, 2003). In order to identify whether the challenges which have been identified in the ITP match reality in the actual locality and, more importantly, to investigate whether current plans can meet the above challenges, an investigation into the situation prevailing in Kagiso Township was deemed justifiable within the framework of transport planning. Thomson (1977: 47) states that “[g]ood transport planning does more than design facilities to move predetermined volumes of goods and passengers; it also helps to design a land-use pattern and the whole system of transport so as to enable people to obtain the activities and goods they want with the minimum time, trouble and cost incurred on transport.” The development of this discipline has been rapid in the last decade, due to globalization, the international division of labour and the dismantling of economic boundaries in Europe and North America. Hence, this study is significant, as it considers the impact of socio-economic factors and transport interactions by fully examining the impact of accessibility, urban development patterns, local mobility and planning. Mogale City’s Kagiso Township was selected for in-depth study because it has seen one of the highest urbanization rates in Gauteng Province, with people from all over Gauteng relocating to this suburb, either buying relatively moderately priced housing via mortgaging or, alternatively, trying to gain access to government low-cost housing. This influx has been accelerated by people relocating from nearby North-West

Province, a mainly rural province. The government's recent investment in infrastructure, such as in electrification, telecommunication, housing, health facilities and social infrastructure has made Kagiso Township an ideal place for families to relocate to. However, the urban form of the suburb has shown signs of an 'accessibility deficit' due to the inefficiency of the current transport system.

The importance of transport cannot be overemphasized in the development of local economies and communities. Local mobility is essential in the delivery of social and economic services. Lack of mobility results in social exclusion, the inevitable result being the marginalization of poor communities and the loss of socio-economic opportunities. Travel choices and opportunities within poor communities in South Africa have historically been poor and were further eroded by apartheid spatial planning, escalating transport costs, declining household incomes, disabilities and the relocation of essential economic services away from the traditional Central Business Districts (CBDs) into (mainly) white suburbs (Moving South Africa, 1998). Transport as a whole has seen a lack of investment in physical infrastructure (roads, public transportation facilities and services) in South Africa. More specifically, a lack of investment and funding in municipal transport infrastructure (taxi ranks, pavements, bus services, etc.) has resulted in a change of travel mode, with people switching from public transport services to the use of private vehicles and minibuses for commuting as well as the transportation of goods. The needs and expectations of local communities since the advent of democracy in South Africa in 1994 have surpassed the rate at which public goods are being delivered by local authorities and private transport operators, which places increased pressure on authorities to improve systems.

1.2 Statement of the problem

Pre-1994 town planning in South Africa created large dormitories of local communities who were, and often still are, excluded from social and economic opportunities. The mobility of these communities has been hampered by a lack of adequate physical transport infrastructure and also inadequate access to sustainable, dedicated funding for the overhaul of the transportation system. Travel choices in these communities have been eroded over time by the ageing taxi fleets, high costs of private vehicles, errant bus services, security concerns on trains and also a lack of affordability. Ten years after the end of Apartheid, the government has not fully

delivered on the promise of a “safe, reliable, effective, efficient, and fully integrated transportation operations and infrastructure which will best meet the needs of freight and passenger customers at improving levels of service and cost in a fashion which supports government strategies for economic and social development whilst being environmentally and economically sustainable” (White Paper on National Transport Policy, 1996: 3). According to Moving South Africa (1998), the following have been identified as strategic challenges for the current system of transport in the country:

- lack of affordable basic access (at least 2.8 million commuters are stranded. The stranded are passengers who lack affordable basic access to low cost public transport due to income levels and distance);
- up to 25% of passengers spend more than 10% of their Household Disposable Income (HDI) on transportation;
- ineffective public transportation (long travel times, poor safety / security, low convenience / comfort) and
- high car dependence (increasing system cost, inefficient land use and transportation patterns, increasing congestion).

Moving South Africa (1998: 53) has “divided urban passengers into six segments, each with different needs from the urban transport system.” These segments are elucidated in Figure 1.1. This Figure also illuminates gaps in terms of customer needs as set out in the White Paper on National Transport Policy and the projected growth of such needs if no interventions are made by the stakeholders.

Similarly, the transport infrastructure issues facing Mogale City are:

- a lack of adequate infrastructure - affecting sustainable economic development;
- no public transport – with major areas not being accessible [to public transport];
- no transport policy / planning – the basic needs of the people are not taken into consideration in the planning, and provision of transport;
- available transport is generally not affordable – people spend more on transport than on basic needs (e.g. food) and
- the cost of petrol impacts on the movement of people (Mogale City, 2003: 12).

This study is designed to unpack the current and potential future commuter transport requirements in Kagiso Township within the context of local transport planning and the ongoing transformation of the transport sector in South Africa. In order to meet the above challenges, it was felt that an investigation of the socio-economic profile of transport users in Kagiso Township was required, which would be indicative of potential needs and requirements in terms of current and future travel infrastructure.

This information was the foundation for the next stage of the investigation, which was to design a travel demand model. Though not being a core focus of the thesis, using a model has merit in terms of understanding future potential transport demands. According to Chen *et al* (2002: 2), “a travel demand model, which is based on numerous land uses, networks, and travel behaviour assumptions is needed to replicate the existing travel patterns in a transportation study area and must be used to forecast the transport demand.” A key component of a travel demand model is an investigation of the socio-economic profile of transport users, infrastructure networks, transport capacity (supply), etc. Thus, transport supply and demand elements were interpreted to determine the effective demand for future transport infrastructure and services to be provided for in a transport plan for Kagiso Township. Through the use of the model the current and expected demand per age group was calculated based on growth expectations in the local population.

1.3 Rationale

In 1996, the National Department of Transport introduced a White Paper on National Transport Policy to provide a policy framework for the transformation of the transport sector in order to enable it to play a strategic role in fulfilling the objectives of the Reconstruction and Development Programme (RDP) (1994): meeting basic needs, building the economy, developing human resources and democratising the state. A myriad of legislative and policy interventions have since been introduced and implemented in the three spheres of government (national, provincial and municipal). The impacts of these interventions on the urban transport system have met with limited success and significant strategic and operational challenges are still plaguing the transport system.

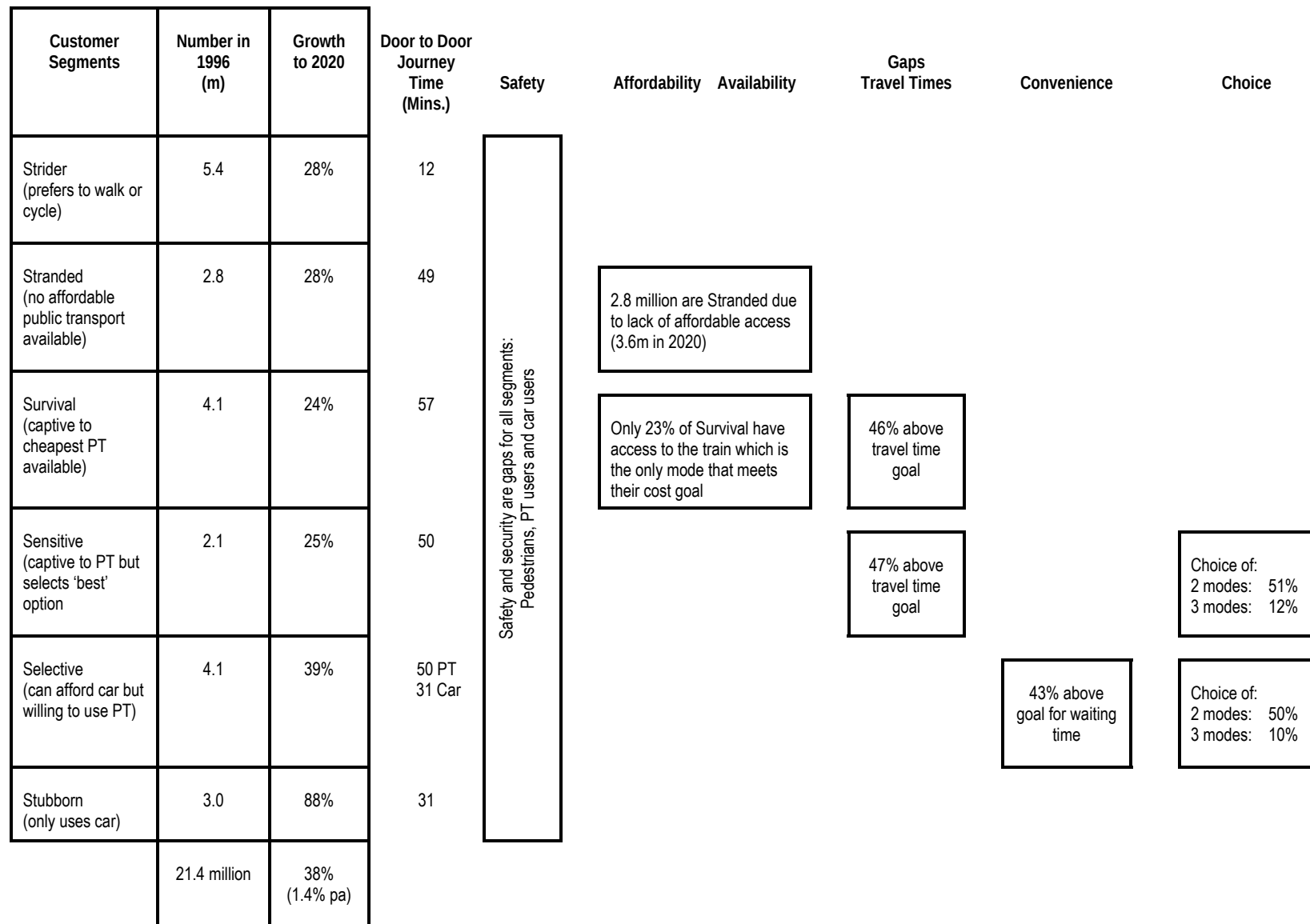


Figure 1.1: Transport Customer Segments: Gaps Against Customer Needs

Source: Moving South Africa (1999)

The *Moving South Africa* initiative, which is a construct of the National Department of Transport, has developed a vision for urban transport as a measure to unlock the bottleneck in the current transport system in the urban context. Its vision is to:

“Provide an effective and sustainable urban transport system, planned and regulated through the lowest possible level of government, based on competition and largely private sector operation, which reduces system costs and improves customer service in order to meet customer and national objectives for user cost, travel times, choice, and safety” (Moving South Africa, 1998: 131).

The rationale for the achievement of this vision can be summarized within a reference framework, which encapsulates an inclusive transport system (affordability and accessibility), integrating land use and transport (spatial planning), and the impact of car ownership (mobility and social cohesion).

1.4 The research questions

This study was designed to investigate household mobility, transport use and the needs of the commuters of Kagiso Township and to compare those needs with current municipal plans to see whether such plans are realistic and can address the needs which exist. Research questions were posed in order to ascertain information about household members and commuters in Kagiso Township and their associated current and potential future transport use and demand. The principal research questions were as follows:

- What is the socio-economic profile of commuters and the disadvantaged in Kagiso Township?
- What are the dominant travel patterns of households based on their transport use?
- What are the current and future mobility requirements (based partially on the use of a travel demand model)?
- What are the perceptions of households on: the physical and environmental quality of transport facilities; local transport costs; and safety levels of the transport modes?
- What are the municipal plans for the development of an affordable and integrated transport system?
- What are the current and future transport supply options?

- What are the opportunities and challenges that are facing the local transport system?

1.5 Aims of the study

The first key research aim was to obtain generalisable data from sampled residents in Kagiso Township regarding their current utilization of transport, their future demand for improved transport and its affordability. As a sub-aim Bussière and Rice's (1990) '*Simplified Travel Demand Forecasting*' model was used to forecast both the existing and the future demand. The second aim was to detail the current municipal transport plans and to assess the degree to which such plans are able to meet the transport concerns and requirements of the commuters. Hence, the objectives of the research were:

- to determine current transport use and demand patterns in Kagiso Township;
- to develop a profile of transport users and their current and future transport needs;
- to determine the needs and perceptions of the local community regarding transport;
- to establish what are the short, medium and long-term plans of the municipality with respect to transport provision in Kagiso Township and
- to compare current municipal plans with the transport needs of commuters of Kagiso Township.

1.6 Overview of the research framework

The research strategy was designed in such a way that the ontology, epistemology, and methodology were robust and ensured the validity and reliability of data collected. The research methodology that was pursued was based on positivistic and post-positivistic paradigms. The choice of these research paradigms has fitted well with the research study, as most of the data analysis is in the form of statistical analysis and categorised data (cross-tabulations). The post-positivism paradigm uses a range of techniques and tools such as sampling, questionnaires, structured interviews, etc. to analyse both qualitative and quantitative data. The formulation of the research questions in section 1.4 above was done in such a way that information could be easily collected and analysed for meaningful analysis. According to Yin (1994: 102), "[d]ata analysis consists of examining, categorizing, tabulating, or otherwise recombining the evidence, to address the initial propositions of a study." A survey questionnaire was designed and used for the collection of data in a structured format. In addition to

the collection of data by way of surveys and structured interviews, documentary analysis was conducted of published (official and otherwise) reports to augment the other methods of collecting data.

1.7 The study area

The Municipal Demarcation process established that the then-existing municipalities of Carletonville, Krugersdorp, Westonaria and Randfontein (as well as their respective rural administrations) were to be amalgamated to establish four Category B Municipalities (Merafong Local Municipality, Mogale City Local Municipality, Randfontein Local Municipality and Westonaria Local Municipality) and one Category C Municipality (West Rand District Municipality). Kagiso Township is a suburb within the newly demarcated municipality of the MCLM (see Figure 1.2 below). The township was officially proclaimed in 1920 as a residential area for migrant workers and other squatters who lived in the surrounding, booming gold mining areas. The township lies in a region known as Western Gauteng, which comprises all the municipalities mentioned above. Settlement and development in this area was initiated as a result of the establishment of the gold mining industry and therefore was focused on the development of heavy industries to support mining activities. A high level of inter-dependency between Johannesburg and Western Gauteng resulted in predominantly east-west transportation corridors that included both major roads and railways. To a lesser degree, the key towns (Krugersdorp, Randfontein, Carletonville, and Westonaria) provided services to agriculture and some agriculture-related industries and businesses developed. An extensive rural road network, albeit of a low design standard, developed in the Western Gauteng area. Although the R28 Freeway was constructed between Krugersdorp and the Pretoria Metropolitan area, Western Gauteng remains fairly isolated from the major corridors that surround the area (the N1 is to the East, the N12 to the South and the R28 to the North-West).

A number of national road infrastructure planning and implementation projects have been conducted at the national and provincial level that could have a major impact on Western Gauteng:

- the planned N17 national freeway that will link Western Gauteng with Greater Johannesburg;

- the PWV17, which is a provincial freeway that would connect Western Gauteng with the north-eastern urban and metropolitan areas (it remains a planned road but with perhaps a high priority);
- a provincial toll strategy could mean that the R28 would be tolled in the near future and
- a number of K-route upgrades are planned and some implementation projects have been completed.

1.8 Structure of the dissertation

Chapter 1 provides a general background to the research. Chapter 2 introduces a literature review on travel behaviour and passenger travel demand forecasting. Chapter 3 provides a historical perspective on land transport in South Africa and provides pertinent information on relevant political, legislative, economic, demographic and social considerations. In addition, major policy and legislative arrangements over the last decade are highlighted in order to elucidate the transformation that has occurred. Chapter 4 describes the methodology. Chapters 5 and 6 focus on the empirical aspects of the study and its findings. Chapter 7 will discuss the analysis and interpretation of the commuter findings. Chapter 8 provides a summary, conclusions and implications.

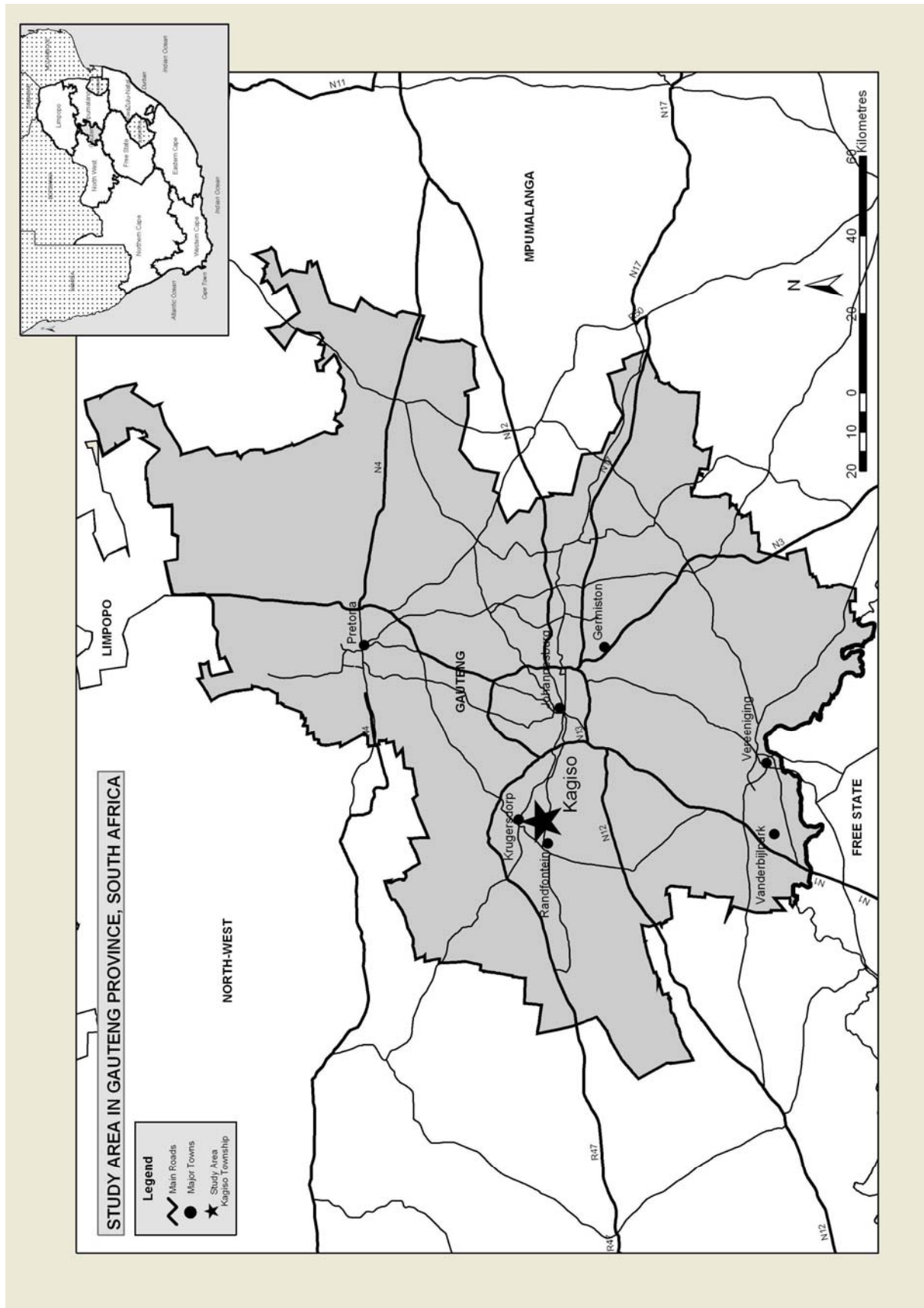


Figure 1.2: Orientation of Kagiso Township in Gauteng Province, South Africa

CHAPTER 2

Literature review

2.1 Introduction

The review presented in this chapter will serve as a discussion of the connection between socio-economic characteristics of a local population (*inter alia*, age, gender, household size, vehicles per household, employment status and income) and their transport requirements (travel demand forecasting), within an urban transport context. The chapter will begin with a discussion of the importance of socio-economic characteristics in a debate about factors affecting the mode of travel people use. According to Pas (1984) and Pund (2002), these socio-economic characteristics are associated with travel behaviour and trip generation. Thereafter, the review will discuss the relevance and effect of socio-economic characteristics on urban travel demand forecasting models in transport planning. Socio-economic characteristics of a population are important in transport demand forecasting because there is a general belief in transport planning that the predisposition to travel and trip generation vary with the characteristics of a traveller. Bussière (1992) points out that there is a strong structural link between socio-economic characteristics of the population and travel demand. van den Broecke and van Leusden (1987), Jansson (1989) and Madre and Gallez (1992) have used socio-economic techniques at the national level to realize long term projections of car fleet and car use in the Netherlands, Sweden and France, respectively. At the regional level, Madre and Pirotte (1991) and Peltan (1992) have used the same techniques. Even at the local level the same techniques have been used by Bussière (1992) in his study of forecasting travel demand from age structure, urban sprawl and behaviour in Montreal. The application of socio-economic characteristics at the local level was of critical importance in this study and the use of Bussière's '*Simplified Travel Demand Forecasting*' model was important in achieving the aims and objectives of this study. The chapter ends with a brief discussion of other additional factors that affect and determine overall travel activity, such as urban form. As Pund (1999) and Handy (1997) have pointed out, urban form plays a significant role on trip generation and mode use. As stated previously, apartheid spatial planning has undoubtedly had a definite effect on mode use and trip generation. The review presented in this chapter was

reliant on western experience due to the fact that the researcher could not find any substantive literature in South Africa and Africa on this particular subject matter. Nevertheless, the researcher was conscious of the limitations posed by this western literature in a South African context.

2.2 Socio-economic characteristics

Mannering *et al* (1994), Kim *et al* (1993) and Niemeier and Morita (1996) found that socio-economic characteristics are an important determinant of travel behaviour and demand. Passwell and Recker (1978) define socio-economic characteristics as variables that either influence accessibility to a mode of transport or variables that describe the personal characteristics of the user. The variables that influence accessibility of a mode are, *inter alia*, car ownership, car condition and accessibility to public transport. The variables that describe the personal characteristics of the user are, *inter alia*, age, gender, household structure, employment status and income.

2.2.1 Variables that influence accessibility to a mode

It is mainly the variables that describe personal characteristics which 'influence the total number of trips' embarked on by a transport user. Passwell and Recker (1978: 3), admittedly writing from a western perspective indicate that the use of these four variables "assumes that the car is and will continue to be the most desirable and primary mode of travel." They continue to add that accessibility to public transport is only considered for those who do not own cars. For the remainder, a car is an important contributor to a positive quality of life but should not necessarily be seen as competing with the use of public transport, rather it should be seen as complementing it. The negative aspects of car use should, of course, also not be overlooked. They affect not only car users, but all road users, residents and pedestrians alike in the form of road casualties, lost time, congestion, and other environmental hazards.

2.2.1.1 Car ownership

Car ownership has democratized mobility since the days of mass production by Henry Ford. It has become a necessity in achieving both the mundane and important day-to-day tasks of individuals and households. The ownership and use of a car provides an opportunity for individuals and households to satisfy their need for

mobility. Rodrigue *et al* (2003) states that transport serves two important functions of mobility, viz. by narrowing the friction of space (distance) and temporal constraints (space / time convergence). The socio-economic benefits of owning a car have been well documented in literature since the 1950s. Many people not only adore their cars, it is more so a status symbol which illustrates their achievements and aspirations. To other people, a car is a necessity and a means of transport to move from point A to point B. Villages, towns, cities, megacities and their road networks have been designed mainly with the car owner in mind. In most instances, especially in developed countries, these road networks have been designed to meet projected travel demand and also to keep the traffic flowing. In the meantime, increasing numbers of households and individuals (both in developed and developing countries) acquire a car in order to increase their mobility. The associated negative externalities have been researched extensively and, as a result the 'green lobby' has, in recent years, been highly active in promoting cleaner fuels and the manufacturing of smaller cars that consume less fuel. Bannister (1995: 2) argues that "the unconstrained growth in the demand for travel, particularly by car, is not desirable and there are substantial external costs imposed on people, cities and the environment." It is a well known fact that car-dependent sprawl has negative impacts such as community severance, pollution, escalating car prices, physical hazards, and the depletion of fossil fuels. An empirical study by Moving South Africa (1998: 149) has found that in South Africa "the most important considerations for both Stubborn and Selective segments, the car owning passengers, was time and convenience, rather than cost." The high price inelasticity amongst Stubborn and Selective segments will require a creative approach to convince them of the benefits of using public transport systems (land-based), which could be done by "reducing the time to travel by public transport, relative to travel time" (Ibid). Hence, mode choice and switching will only be possible once an 'acceptable level of service' is met within the current transport system *ceteris paribus*. According to Wickham (2002: i), "car usage in cities can be reduced, but this requires an integrated public transport system which only city governments with real power seem able to develop. Such a system can contribute to social inclusion and indeed to urban citizenship. Developing alternatives to the private car [public transport, walking, cycling] involves enhancing people's trust in and knowledge of these alternatives."

Passwell and Recker (1978: 6) state “that the acquisition of the first car has a more significant impact on a household’s trip frequency than the addition of a second or third car does, and that the additional trips taken as the number of cars increases is attributed to an increase in the number of non-work trips.” Hence, one could ask whether the predisposition to travel is a result of the number of vehicles owned. It has been found by Meurs (1993) that the demand for an additional car is more elastic than the first car. Factors such as current age of the car, opportunity costs incurred and ability to pay for a second car play an important and crucial role in the acquisition decision. Usually, a second car is a smaller car compared to the initial acquisition (Golob *et al*, 1994). The second car is mainly used for nonwork trips. A study by Dix *et al* (1983) found that in multi-car-owning households, cars are regarded as household rather than strictly personal assets; ‘first’ cars were always either the ‘biggest, newest, or smartest, and often all three.’ Bhat and Koppelman (1993) have found that the acquisition of a car becomes inelastic when household size increases with the presence of children in large metropolitan areas. This may be due mainly to readily available public transport and the close proximity to socio-economic opportunities. The OECD (1982: 37) found that “[t]he ownership of a second car is influenced by the level of public transport”, although Passwell and Recker (1978: 6) state succinctly that “[t]he fact that people who do not own cars and yet do not have public transportation readily available travel more suggests that the lack of transit accessibility may produce a greater dependence on cars from other sources. This indicates that one does not need to own a car to be dependent upon it, one needs only to have a car available.” An important finding of their study is that car ownership is not a valid explanation of accessibility to a suitable mode. In essence, the above authors state that “when people are in a position to have a car available, they travel more often.”

2.2.1.2 Car condition

Passwell and Recker (1978: 6) found that “people who own older cars travel less [, which] suggests that public transportation is not a viable alternative mode for these people while their cars are being repaired.” An explanation for this phenomenon could be that these people have been car users for a long time and have not been using public transport and are averse to using it out of habit.

2.2.1.3 Accessibility to public transport with specific reference to the South African scenario

Sinclair and Sinclair (2001: 8) argue that “a socially inclusive transport system should be available, affordable, accessible, and acceptable to passengers.” The lack of affordable basic access for an estimated 2.8 million stranded passengers in South Africa (Moving South Africa, 1998: 131) has been a result of the legacy of apartheid, which created large labour residential dormitories in the form of townships, located far from primary socio-economic opportunities. The concomitant transport systems, which were created to support these inefficient land use patterns, were designed mainly to support the skewed economic exploitation of the ‘migrant workers’ from the ‘homelands.’ The impact of this social exclusion has resulted in costly transport access to work, healthcare, community and social opportunities. This phenomenon is not exclusively prevalent in the urban South African context; to varying degrees it is also prevalent in both developed and developing countries of the world. The physical and social isolation of people and communities from socio-economic opportunities has since been recognized as a developmental problem that needs attention from both governments and non-governmental organizations. According to the Social Exclusion Unit (2002: 3) “poor transport contributes to social exclusion in two ways: it restricts access to activities that enhance people’s life chances, such as work, learning, health care, food shopping, and other activities; and deprived communities suffer disproportionately from pedestrian deaths, pollution and the isolation, which can results from living in near busy roads.”

Although, there is widespread evidence of increasing car ownership in urban areas in South Africa, this has not assisted in alleviating the problem of social exclusion, as there remain large numbers of people who do not own cars and who continue to be excluded from the socio-economic benefits that are being derived from being mobile. The need for affordable and accessible public transport is mostly a distant dream to those who have been historically disadvantaged by the legacy of past socio-economic-spatial policies in South Africa. Lucas (2002: 8) states that “the problem is multi-dimensional and arises from quite complex interactions between, the location of services, the personal circumstances of the individuals and access to transport.” He continues that “these interactions are reinforced or ameliorated to a lesser or greater extent in response to the wider context of the financial, legislative and regulatory framework.”

An inclusive transport system is potentially achievable in the urban areas of South Africa within the context of an integrated transport planning framework as envisaged in the National Land Transport Transition Act, No. 22 of 2000. Moving South Africa (1998: 134) has set itself performance objectives for the Urban Passenger Transport System, which are detailed in Table 2.1:

Table 2.1 Performance Objectives for the Urban Passenger Transport System

	Measure	Target ¹	Current Gap ²
Affordable	Commuter fares	< 10% HDI	25%
Accessible	Walking distance to public transport	< 15 minutes	4%
Reasonably Fast	Door to door journey times	< 60 minutes	12%
Choice	Availability of differentiated modes / level of service	More than 1 mode, where required	50%

¹ National Transport Objectives

² Average percentage of all customers for whom target is not met

Source: Moving South Africa (1998: 134)

An additional performance objective, which requires measuring and targets to be set, is the acceptability of urban transport modes to the stranded customer segment. According to Moving South Africa (1998: 53) “[the] transport system is failing more egregiously for this group than for any other, they lack affordable basic access to motorized transport and therefore have little ability to integrate with the rest of society or participate in the broader economy. ...two factors drive their current lack of access to low cost transport: income levels and distance.” The National Department of Transport has also admitted that these obstacles have been difficult to address and the current transport system is failing a quarter of urban passengers. An estimation of the scale and distribution of transport exclusion at a municipal level in South Africa is not readily available. This is partially due to local transport being perceived as a secondary priority in relation to other pressing socio-economic needs (i.e. housing, job creation, crime prevention, etc.). The advent of Integrated Transport Plans (ITP) in terms of the National Land Transport Transition Act, No. 22 of 2000 will hopefully elevate the concept of an inclusive transport system in national and local development debates. According to Sinclair and Sinclair

(2001: 5) “[t]ransport excluded groups may develop low expectations of service and narrowed horizons in response to experiences of deprivation, and a lack of familiarity with the opportunities available to other groups or areas may also reduce perceptions of deprivation.” They continue that “[t]ransport is an indispensable ‘gateway’ service – a necessary means to access essential services and provisions. Inadequate transport therefore acts as a barrier to social inclusion” (Ibid).

2.2.2 Variables that describe the personal characteristics of the user

The variables discussed in the following subsections are those that influence population segments taking fewer or more trips.

2.2.2.1 Age

Bussière (1992) found that there is a close relationship between age and the demand for public transport. The reality is that mobility declines with age. Age and physical condition are important determining factors in determining a person’s ability to drive a car. In many countries the legal age of possession of a driver’s licence is 18 and people who are less than 18 years old (or too old to have a driver’s licence; often 75 years or older) are prevented from driving a car. A list of those who are prevented from driving will usually include those with a physical handicap that prevents them from obtaining a driver’s licence, and thus driving legally.

Bhat (1998) found that older people are more likely to travel less and perform in-home rather than out-of-home activities as compared to younger people. This view is supported by Bussière (1992), who found that age reflects the cycle of life and the transport habits linked to it. He adds that the elderly have a higher public transport utilization rate compared to younger people. Hamed and Mannering (1993) found that the physical condition of older people prevents them from participating actively in sport and recreational activity as opposed to less taxing social or shopping activities. These physical conditions reduce mobility and the ability to travel often.

2.2.2.2 Gender

Numerous studies have been conducted on gender and transport. Gender differences in transport and travel are an important socio-economic characteristic in determining travel demand. According to Sasakawa (1997)

these differences are as a result of differential access, according to gender status, to socio-economic and time resources. Women tend to travel more on family responsibility trips, based on the travel needs of their children (Rosenbloom, 1987). In addition, research has indicated that females spend more of their time on household tasks (Hanson and Hanson, 1981; Hanson and Johnston, 1985). Of those females who work, Wachs (1987) found that they will use public transport more often than their male counterparts on work trips and conduct more family responsibility trips. The number of trips for females in employment was more than that of non-working females and females in employment tend to commute short distances to work compared to males (McLafferty and Preston, 1991; Blumen, 1994; Pratt, 1995). Despite the belief that males engage in more recreational activity after work, Hamed and Mannering (1993) found that males were more likely to go home after work. The abovementioned travel behaviours indicate that there is a definite difference between males and females. However, these differences also depend on other factors such as age, marital status, family responsibility (role playing), income, and other factors such as personal attitudes and preferences.

2.2.2.3 Household structure

Undeniably, societies around the world are predominantly patriarchal in nature. As Robinson (1998) indicates males in most societies dominate and control all levels of society based on socially constructed notions of gender roles and gender relations. The household structures are not immune to this domination and control and thus decisions to travel and the amount of time spent on nonwork activities is affected (Gordon *et al*, 1994). The household structure is mainly composed of, and determined by, parent(s), the number of children and their ages. Patriarchy in most societies determines the level of socio-economic participation of both males and females, with the former participating in more masculine activities such as employment and sport, and the latter in customarily more feminine activities such as household tasks and social activities / grocery shopping. Hanson and Johnston (1985) found that females make fewer recreational trips compared to males and Gronau (1977) found that females devote more time performing work at home and in leisure as the number of children in the household increases. The opportunity costs of these activities depends on several factors, such as level of income of the male counterpart, other sources of income, level of education of the female, etc. Passwell and

Recker (1978) found that the competition for a family car increases when family size increases and the number of trips decreases. Additionally, Redman (1980) reiterates this fact by concluding that an increase in family size has a negative effect on meals being eaten out of the home, as fewer social and recreational trips are being made. The result of an increase in family size leaves at least one parent curtailing his or her market production activities to concentrate on family production activities. This has an impact on the level of trip generation, as less commuting to work takes place. Hence, household structure has a direct bearing on travel behaviour and demand.

2.2.2.4 Employment status and income

Income and employment are linked with the ability to buy and maintain a car. There is extensive research on income / employment in transport studies. These studies relate to employment and marital status (Gronau, 1977; Kohlhase, 1986; Kooreman and Kapteyn, 1987), and income (Wales and Woodland, 1977; James, 1996; Turner *et al*, 1998). These studies indicate that there is a direct correlation between employment and trip generation, whether this be for commuting for market production or the performance of family production activities. Mensah (1994) found that an increasing number of females are faced with space-time constraints due to poorly paid jobs they are engaging in. People who are employed spend more time travelling than those who are unemployed (Prendergast and Williams, 1981; Wigan and Morris, 1981)

2.3 Urban travel demand forecasting models

Travel demand forecasting models are important in transport planning for the purpose of simulating existing and future travel patterns. These models are important with regards to testing alternative solutions to transport problems and the provision of a more appropriate plan to circumvent those transport problems. According to Pas (1986) the need for these models was stimulated by the rapid growth in urban populations, increased car ownership and use, and the migration of people from rural to urban areas. These factors have been recognized by May *et al* (2003) as the most significant causes of unsustainability of urban areas. Hence, the use of travel demand forecasting models is required to plan properly for more functional urban space that is well integrated.

There are two main perspectives to urban travel demand forecasting: the *individual travel choice behaviour* perspective and the *activity analysis* perspective.

2.3.1 *Individual travel choice behaviour perspective*

The individual travel choice behaviour perspective uses the traditional four-step approach to travel demand modelling. This approach begins with a systems view of travellers and the transport network. This perspective uses trips as units of analysis. The object of the latter is to predict the values of quantities in a given situation, that is, given the characteristics of the urban area, in terms of its spatial structure, and the personal characteristics of its inhabitants. According to Oppenheim (1995), this approach has four dimensions of travel demand:

- The number of personal trips originating in each zone. Obtaining these numbers is sometimes referred to as performing 'trip generation.' The factors affecting trip generation are land use and the intensity of land use. As indicated in Section 2.2, factors such as age, gender, household structure, employment status and income are also important;
- The number of trips originating in a given zone and terminating in a given zone. Obtaining these numbers is sometimes referred to as performing 'trip distribution.' Growth factor models such as the destination-choice logit models are then developed from computed matrices that reflect future conditions based on the *status quo* conditions (Bhat *et al*, 1998). The factors affecting trip distribution are generally distance, travel cost and time;
- The number of trips originating in a given zone, terminating in a given zone, and using a given mode. Obtaining these numbers is sometimes referred to as performing 'modal split.' Usually a discrete choice model that has a logit function is used to compute the utilities of using a given mode. These utilities are then matched up to the utilities using each of the other modes to compute the quantity of trips using that mode. The traveller is assumed to seek to maximize his utility in choosing amongst the available alternatives. Ben-Akiva and Lerman (1985) developed the 'individual specific expected maximum utility

value' which determines the value of a set of travel alternatives that reflects the variation in how individuals weigh up their alternatives and

- The number of trips originating in a given zone, terminating in a given zone, using a given mode and following a given route. Obtaining these numbers is sometimes referred to as performing 'trip assignment.' The latter is mainly the identification of the minimum distance, travel cost and time in the transport network. The availability of transport is an important factor in the performance of trip assignment and the individual as the decision maker is assumed to be a rational traveller (Ortúzar and Willumsen, 1994). The main factors affecting trip assignment from an individual point of view are distance, travel cost and time.

This approach is biased in that it demonstrates the growth in trips rather than the overall use of travel by individuals and households. Each trip origin is regarded as a dependent variable and other household factors as independent variables that have an exogenous effect. The result of this is that all trips are categorized and aggregated per zone. These categories are then used to compute travel behaviour and are, at an aggregate level, put into three independent classifications: home-based work trips, home-based other trips and non-home-based trips. Trip purposes are classified by origin and destination in relation to zonal household and personal characteristics. A serious shortcoming of this approach is that all trips are trip-based and the individual traveller is the decision maker. The behavioural aspects of the latter are ignored and are not computed in order to ascertain the reasons for travelling at certain times of the day, the constraints imposed by others in terms of travel, the opportunity costs of travel and so forth. In addition, this approach is prone to the cumulative effect of errors due to the sequential nature of the model. These errors replicate in successive steps and the result is an inaccurate travel demand forecast. The approach assumes the homogeneity of households and individuals, which is not realistic as there are definite differences in travel behaviours amongst different households (as indicated the in section on household structure). The individual travel choice behaviour perspective has serious limitations, particularly as most planning and transport legislation requires that socio-economic impact needs to be assessed and managed. The behavioural inadequacy of this perspective, and its

consequent limitations in evaluating demand management policies, has led to the emergence of the activity-based approach to demand analysis (Bhat and Koppelman, 2003).

2.3.2 Activity analysis perspective

Research into activity analysis gained prominence in the 1970s. Hägerstrand (1970), Chapin (1971) and Cullen and Godson (1975) shaped knowledge in this area of travel demand forecasting. The activity analysis perspective uses individuals and households as units of analysis. It differs from the individual travel choice behaviour perspective, which is biased towards where vehicles are moving rather than what people do. Jones *et al* (1990) defines activity analysis as a framework in which travel is analyzed as daily or multi-day patterns of behaviour, related to and derived from differences in life styles and activity participation among the population. In addition, travel is viewed as a derived demand. The activity decisions that people make are thus not necessarily identical to, or made simultaneously with, travel decisions (Damm, 1983). Both Jones *et al* (1990) and Damm (1983) reflect on very important aspects of travel demand forecasting, in that behavioural aspects are more pre-eminent over travel, the focus shifting away from vehicles to people. In contrast to the individual travel choice behaviour perspective, the activity analysis perspective focuses on the activities performed by the household and it is the latter which is the source of activity participation. The decision to travel is a successor to activity decisions, which are both spatial and temporal (Axhausen and Gärling, 1992).

In terms of the activity analysis perspective, travel is a derived demand which emanates from unlimited human wants to partake in non-travel activities. The interaction between travel and activities is modelled from the activity patterns of travel (distance, time and frequency) and the resultant outcome is travel cost ('activity utility'). Van Wissen *et al* (1991) developed a model that takes into account the connection between travel and activities. The basic premise of the model is that each activity is relative to the amount of time assigned to that activity. The focus is on patterns of behaviour and not discrete trips. Travel decisions are determined by a cumulative effect of activities that form an activity schedule for individual participation. Recker *et al* (1983) developed a pattern recognition algorithm for household travel in order to determine the sequences of activities and travel. A very important finding is by Pas and Koppelman (1987), who discovered that people with fewer

economic and role related constraints and those who mostly perform in-home activities demonstrate a higher variation in travel. A multivariate daily model of participation and duration of out-of-home, nonwork activities was developed by Damm (1980). This model is very adaptable, as every quantifiable variable can be considered to compute the effect of household interdependencies on individual activity choice. These patterns of behaviour indicate that individuals and households who have the same socio-economic characteristics have to be clustered together when computing travel demand.

The notion that households are decision making units is in contrast to the premises of the trips based perspective mentioned earlier. Several studies that take into account a household as a decision making unit have been conducted. For example, the distribution of activities, time and space amongst gender groups was examined by Ahrentzen *et al* (1989). Blau and Ferber (1992) and Manser and Brown (1993) examined how couples distribute their time and income between in-home and out-of-home activities. The detailed timing and duration of activities and travel were examined. Research into the allocation of time to out-of-home activities and travel have been conducted by van Wissen *et al* (1991), home stay duration models for commuters were developed by Hamed and Mannering (1993), sex-differentiated shopping duration models by Niemeier and Morita (1996), and the shopping activity duration during the evening work-to-home commute by Bhat (1996).

The activity analysis perspective integrates spatial, temporal and interpersonal constraints. Hägerstrand (1970) initiated the idea of constraints imposed by the friction of space on activity participation and timing on individual activity participation decisions. Cullen and Godson (1975) found that temporal constraints are more rigid than spatial constraints and that the rigidity of temporal constraints is closely related to activity type of participation (nonwork or work activities). The activity analysis perspective recognizes the interdependence amongst occurrences that are separated spatially and temporally. Damm (1980), Kitamura (1983, 1984), O'Kelly and Miller (1984) and Purvis *et al* (1996) have studied individual activity participation and scheduling. These studies endeavour to capture individual activity and travel patterns by applying a method by which individual activities are constructed and arranged. The activity analysis perspective is involved with the analysis of events over a period of time, for example a longitudinal approach. Madre *et al* (1994:1) researched the long term dynamics of

motorization in three urban regions by performing a longitudinal approach, using a model which took “into account three combined aspects of time: the moment in the life cycle (the age of the individual conditions his rate of motorization), the generation (the individual born in the same period share a common life experience and therefore a certain type of behaviour), and the period (the general economic context can influence decisions relative to motorization).”

Beckman *et al* (1996) found that the application of household and individual classification schemes based on variations in behavioural aspects and activity participation of households and individuals are important in activity analysis. According to Dix *et al* (1983: 1), household structure leads “to a demand for activities and travel that is significantly different from other households with different structures (i.e. a family with a pre-school child will have a different activity and travel pattern from a retired couple whose children have left home).” The most important household characteristics are, however, problematic because what is important and applicable in one society might not be same in other societies. Despite these limitations, these classifications are widely used in trip generation models by Reichman (1977), Dix *et al* (1983), Kitamura (1988), Bussière (1992) and (Berge and Nondal, 1994).

The activity analysis perspective to travel demand modelling is gaining more acceptance both by academics and practitioners in the field (Bhat and Koppelman, 1987). An increasing number of transport planning organizations have shifted away from the trip-based approach of the individual choice travel behaviour approach to a more holistic activity analysis perspective. The activity analysis perspective is preferred by researchers for its distinct advantages in combining socio-economic characteristics in urban travel demand modelling.

2.4 Integrating land use and transport planning

According to Bannister (1995: 1), “transport has a major impact on the spatial and economic development of cities and regions. The attractiveness of particular locations depends in part on their relative accessibility, and this in turn depends on the quality and quantity of the transport infrastructure.” There is overwhelming evidence

in urban South Africa that urban sprawl is being promoted by wealthy developers, individuals and money-orientated municipalities, due to the readily accessible quality transport infrastructure in previously advantaged areas, which is aided by an embedded culture of an excessive car-dependent lifestyle in privileged communities. The result of this current haphazard development planning is the inexorable rise in social exclusion, which manifests itself with more disadvantaged groups commuting long distances to areas of socio-economic opportunities. Wilkinson (2002: 3) has concisely determined the relationship between land use and transport planning by stating that “the spatial configuration of this transport infrastructure defines the patterns of accessibility within urban systems which, in turn, shape the locational decisions of urban actors and hence land use patterns in interlocking and ongoing process of change and response.”

Pund (2002: 17), in his study of urban form, level of service and bus patronage in eastern Sydney, determined that urban form, the quality of transport and personal socio-economic characteristics are factors that affect the mode of travel people use. The integration of land use and transport planning can ensure that vulnerable groups have equal access to the social benefits of transport infrastructure. “Land use patterns are the single greatest driver of the poor performance of the urban transport system in meeting customer needs” (Moving South Africa, 1998: 136). These land use patterns have contributed to the physical and social isolation of people and communities from socio-economic opportunities. In addition to the identification of the problem, Moving South Africa has furthermore recognized the importance of integrating land use and transport in one of its three categories of strategic action (i.e. ‘densification of transport corridors’). The latter strategy is aimed at halting urban sprawl and locating most new developments (residential and commercial) on well-located land within developed areas. The WRDM in its Integrated Transport Plan (2003: Volume E: 14), has set objectives to integrate land use and transport and these will be elucidated in forthcoming chapters. In addition to the objectives set, guidelines in support of the objectives have also been developed to “contain and reduce the need to travel [... to] promote the concept of development corridor and nodal development [... and to] identify and apply spatial development options which will enhance efficiency and opportunity within the region.” All these measures are designed to reduce the cost of future transport infrastructure and services and to promote

a more compact urban form within a regional context. The intention of implementing these measures is to foster a culture of moderate car reliance so that the social benefits of transport infrastructure are equitably shared amongst the citizens, thereby reducing any externalities such as social exclusion and environmental impact. The prime objective is to promote mobility and social cohesion.

2.5 Conclusion

The main theme emerging from the literature review is that socio-economic characteristics are important in the development and use of urban travel demand forecasting models. Studies have indicated that a strong structural link exists between socio-economic characteristics of the population and travel demand. Socio-economic characteristics influence accessibility to a mode and also describe the personal characteristics of the user. In addition, transport has a direct impact on land and planning. The above discussion indicated that there are a range of factors that affect travel demand (including induced travel). Researchers and practitioners in the field of transport studies have developed and used a myriad of travel forecasting models since the early 1950s. These models have been incrementally enhanced to take into consideration the temporal records of the behaviours of all transport actors. There is very little literature in South Africa on the subject of the impact of socio-economic characteristics on urban travel demand, except the report by the Moving South Africa project. Most of the literature used in this literature review is American and European. Some literary material from Asia and Australia has also been used. In the light of this, Chapter 3 will deal with the post-1994 South African legislative and policy framework to augment the literature review.

CHAPTER 3

Legislative and policy framework, post 1994

3.1 Introduction

This chapter provides a historical perspective on land transport in post-1994 South Africa and presents pertinent information on relevant political, legislative, economic, demographic and social considerations. In addition, major policy and legislative arrangements over the last decade are highlighted in order to elucidate the transformation that has occurred. This chapter also provides a background to the relevant political and legislative measures which were prevalent in South African urban transport prior to the advent of the new dispensation in 1994. Schedule 4 and 5 of the Constitution of the Republic of South Africa Act, No. 108 of 1996, *inter alia*, confers provincial governments legislative authority to regulate municipal planning, municipal public transport, municipal roads, street lighting, traffic and parking. These legislative measures are intended to provide at a municipal level for the development of an affordable and integrated transport system. Thereafter, the White Paper on National Transport Policy is discussed to highlight the measures the new government (post-1994) has undertaken to correct the land passenger transport system in South Africa. This is followed by a discussion of the Moving South Africa project, which is the basis on which the current transport policy is being implemented. Lastly, the provincial land passenger transport interventions that have taken in place in Gauteng Province in the last decade are discussed to highlight the implementation of the White Paper on National Transport Policy at the lowest level possible. This information is provided in order to provide a policy context in which situate the specific study detailed in this study. The information detailed here informs local government policy and guides it as it seeks to respond to the needs of commuters and plan for the transport needs of the area.

3.2 Background

The chaotic public transport system that many black urban South Africans are currently using is a legacy of apartheid transport policy. The transport policy of the apartheid government was based on the premise of the

enforced spatial engineering of people, neighbourhoods and all systems of physical interaction. The apartheid government, when it came to power in 1948, began with a programme to relocate black, coloured and other minorities to settlements on the urban periphery and away from centres of socio-economic opportunity. Residents of prominent areas such as Sophiatown and District Six, which were situated on well-located land near urban centres, were forcibly removed to townships. Kagiso Township was proclaimed in 1920, and thereafter discriminatory practices and measures applied to it and many other townships like it. Buffer zones to separate Black and White areas were created in the form of artificial transport corridors, as well as industrial and developments. In addition, transport policy played a part in the creation of Bantustans and territories of minority self-governance, created in order to thwart the urbanization of such majorities. Thus 'influx control' was introduced, in order to provide cheap labour to White-controlled industries in urban areas. All these measures created a temporal, spatial and cost burden to commuters, as they were expected to commute long periods, long distances and at a great cost.

With regards to public transport, two of the key pieces of legislation that were passed by the apartheid government to give effect to its system of racially based transport policy; they were the Native Transport Services Act, No. 53 of 1957 and the Transport Services for Coloureds and Indians Act, No. 27 of 1972. The purpose of the Native Transport Services Act, No. 53 of 1957 was "[t]o provide for the payment of contributions by employers towards the cost of transport services for their native employees, and for the establishment of a Native Transport Services Account..." An employer was defined as a person who employs one or more adult male natives. The purpose of the Transport Services for Coloureds and Indians Act, No. 27 of 1972 was "[t]o provide for the payment of contributions by employers towards the cost of transport services for their Coloured or Indian employees..." This law was similar in many respects to that of the Native Transport Services Act, No. 53 of 1957. The definitions of Coloured person and Indian were as provided for in the provisions of the Population Registration Act, No. 30 of 1950. The result of these laws was that the majority Blacks and most other racial minorities were expected to commute long distances to work, as they were forced to live in townships on the urban periphery and were dependent on government controlled transport schemes (such as subsidised commuter buses, and rail). The transport system under apartheid did not escape the brunt of the

anti-apartheid struggle, with various mass actions against the unaccountable and oppressive transport system taking place. Bus and rail boycotts against an inefficient, costly and insensitive transport system were recorded in almost every urban centre in South Africa. The transport system in the townships was always seen as a pillar of the apartheid machinery that needed to be destroyed – and in many aspects this was actually achieved. In the 1980s and early 1990s the urban transport system suffered its worst setbacks, as bus services ground to a halt due to political conflicts, trade union activity and increasing political risk associated with subsidizing modes (bus and rail) that were heading for economic ruin. The latter was the result of the decline in commuter numbers in subsidized modes and financial loss incurred due to the physical destruction of buses and trains. As these modes became increasingly unavailable, the minibus taxi industry grew to fill the void. This industry was unregulated, encouraged by the government, which did nothing to formalize it, and it has since become a force to be reckoned with. According to Moving South Africa (1998), the minibus taxi industry has a 65% market share of passenger trips and receives no government subsidy, though it has been plagued by violence, public contempt for its poor safety record and ever increasing fares. In the meantime, the rail, municipal and long distance bus services have a 15%, 4% and 16% market share of passenger trips, respectively and also receive a hefty subsidy of 50%, 9% and 41%, respectively. In the light of the above-mentioned challenges and opportunities, the next section will illuminate how the new, post-1994 government has tried to resolve them.

3.3 White Paper on National Transport Policy

In September 1996, the new government of the Republic of South Africa published its White Paper on a National Transport Policy as a means of addressing the daunting transport challenges facing South Africa. The development of this White Paper on a National Transport Policy was intended to provide a framework for national transport policy and a long-term vision for transport in South Africa. The basis for the drafting of this White Paper was the Reconstruction and Development Programme of the government, which sought to simultaneously address the socio-economic needs of the disadvantaged and also build the economy. The vision stated in the White Paper on National Transport Policy (1996: 3) is that transport, as a system in South Africa will “[p]rovide safe, reliable, effective, efficient and fully integrated transport operations and infrastructure

which will best meet the needs of freight and passenger customers at improving levels of service and cost in a fashion which supports government strategies for economic and social development whilst being environmentally and economically sustainable.” In addition, it recognized that “[a] key ingredient to future success will be the sharing of this vision by all key role players, backed by co-ordinated and integrated planning and decision-making.” As a way towards achieving this vision, the White Paper on National Transport Policy (1996) determined national transport policy goals to support, *inter alia*, the goals of the RDP, to meet the needs of customers requiring transport for people or goods, to address safety and security, to improve South Africa’s competitiveness and its infrastructure and operations and to address environmental sustainability. In addition to setting goals for the achievement of the stated vision, broad policy principles for the attainment of the goals were set. These included, *inter alia*, the reversal of the dominant government role as ‘a regulator of bureaucratic detail, a provider of infrastructure and a transport operator’, the future development of an institutional framework on transport matters, which will also include non-government, or statutory transport bodies, and intergovernmental relations. The strategic objectives for land passenger transport which are applicable at a local level that were identified by the White Paper on National Transport Policy (1996) are:

- dedicated funding for passenger transport infrastructure (subsidies and affordable transport), operations and law enforcement (safety and security);
- efficient urban land use structures to correct spatial imbalances (to improve accessibility and mobility and limit walking distances to less than one kilometre in urban areas) and
- promotion of a reliable public transport (especially for commuters, the elderly, scholars, the disabled, etc.) over private car travel.

3.4 Moving South Africa

The White Paper on National Transport Policy (1996: 47) states that “[i]n the longer term, specific goals, strategies, and action plans to proactively lead the South African transport system into the desired vision of the future will be developed through the Department of Transport ‘Vision 2020’ project.” The advent of the Moving South Africa project was a result of ‘Vision 2020’ and also the need to rectify the deficiency in raw data and

information with regards to the South African transport system. Empirical data and information was required for the implementation of 'Vision 2020.' The National Department of Transport commissioned an 18-month study to research, analyse and recommend a transport strategy for 2020. The Council for Scientific and Industrial Research (CSIR) was tasked with this assignment and produced a report in September 1998, which covered the strategic challenges and performance gaps facing the transport system in South Africa, viz. the Freight Transport System, the Urban Passenger Transport System, the Rural and Long Distance Passenger Transport Systems, the Tourism Passenger Transport System, the Special Needs Passenger Transport System and cross-cutting issues affecting the long-term sustainability of the transport system as a whole. This project was mainly data-driven, with the primary unit of analysis being the customer and their needs, including the needs of the nation as a customer. It was intended for the project to come up with long-term strategic trade-offs and choices which would be essential for the fulfilment of the goals set out in the White Paper on National Transport Policy. In the light of the above, the report came up with 32 key strategic challenges facing the transport sector, although only eight of these are applicable at a local level, namely: integration of spatial planning, affording basic access for the stranded, an attractive public transport system, a high system cost public transport system, the management of projected 2020 car usage, transport planning and regulation, adequate public funding for roads and public transport and the stabilization of destructive competition in private sector industries (minibus taxis). Kagiso Township is an urban suburb with different socio-economic groups living within its periphery who all have different transport needs. For the purpose of relevance to this dissertation, only the urban customer will be discussed in this chapter.

3.4.1 Urban customers

As mentioned in Chapter 1, the Moving South Africa project has categorized urban passengers into six segments: strider, stranded, survival, sensitive, selective and stubborn customers. The strider customer segment is a group that is "generally satisfied with dimensions of travel time, affordability, and availability since, by definition, they enjoy good low-cost access to their preferred destinations" (Moving South Africa, 1998: 53). This segment has the largest number of urban customers, at 5.4 million or 25.2% of the urban population, and favours a lifestyle of cycling or walking as a suitable mode to travel.

The stranded customer segment accounts for 13% of the urban population (2.8 million people, in 1996 figures). According to the Moving South Africa (1998: 53) project, “[t]he transport system is failing more egregiously for this group than any other: they lack affordable basic access to motorised transport and therefore have little ability to integrate with the rest of society or participate in the broader economy. The principal customer need is for low cost public transport.” The majority of these customers are low-income earners and township dwellers who live on average ‘20km from CBDs and other work locations.’ Traditional modes of transport (commuter rail, bus, minibus taxis) are not affordable to this segment.

The survival customer segment accounts for 19% of the urban population (4.1 million people, in 1996 figures). According to the Moving South Africa (1998: 54) project, “[t]his group can afford to use public transport, but is ‘captive’ to the least expensive option – they have few choices, even within public transport. Over 70% of this group spends above 10% of their household income – the standard set in the White Paper [on National Transport Policy] – on transport services.” In addition, at least “46% of this group spends more time travelling than they would like, leading to a high level of dissatisfaction with both service and cost” (Ibid).

The sensitive customer segment accounts for the smallest of all the segments, with 10% of the urban population. This “segment is captive to public transport but has enough income that members can select the best transport option. The key dimensions to dissatisfaction for this group centre on speed and choice, with some additional unhappiness with prices” (Ibid).

The selective customer segment encompasses 4.1 million people, or 19% of the urban population, and is expected to be one of the fastest growing in the future, with expected growth of 39% between 1998 and 2020” (Ibid). In addition, “[t]his segment can afford a car but is willing to use public transport if it meets their primary requirements of higher speed, and greater choice and convenience” (Moving South Africa, 1998: 55). In the future, this customer segment is important because it is better off and has the means (annual personal income) to purchase a car.

The stubborn customer segment will exclusively use cars as a means of transport. This “car dependence is enabled by the excellent urban road network in cities and adjacent suburbs where the stubborn residents tend

to live” (Moving South Africa, 1998: 55). This group has opted out of the public transport system long ago, due to their personal circumstances. They are, on average, better off in terms of personal income and are mainly White and Indian, although this customer segment is expected to grow significantly in the future, as more people will have higher disposal incomes in all demographic groups. At the moment, this customer segment encompasses 3 million people or 14% of the urban population (Moving South Africa, 1998: 55). The expected growth in car dependence will be stimulated by a number of elements, such as “the relatively low income levels at which South African begin to use cars as their primary mode” (Moving South Africa, 1998: 55). Apparently, “once a household income rises above R30 000 per annum, car use begins to dominate ...; [t]he result is a situation with a much higher than average vehicle population per capita among middle income groups, compared to other developing countries.” To conclude, “at an overall level, all customers were highly dissatisfied with the level of safety and security they experience in urban transport” (Moving South Africa, 1998: 56). The project also found that the national objectives as stated in the White Paper on National Transport Policy have not been met. The relevant performance gaps are elucidated below in Table 3.1.

Table 3.1: National Objectives and System Gaps

	National Objective	Gap¹
Cost	Expenditure on commuting = 10% of household disposable income	- Stranded cannot afford to travel - Most Survival spend more than 10% of HDI
Journey Time	- Commuting distance < 40km - Commuting time < 1 hour - Walking time < 15 minutes (1km)	30% of DoT subsidised bus trips exceed 40km target 12% exceed target 4% exceed target
Public Transport Share	Motorised trips by public transport = 80% of total	Expenditure on commuting = 10% of household disposable income

¹ October Household Survey / Moving South Africa Survey

Source: Moving South Africa (1998: 56)

The information in Table 3.1 illustrates that, as a whole, the nation is performing poorly (in areas of basic mobility, basic access and social integration) in most customer segments. Only the stubborn customer segment

is satisfied due to its higher incomes and a relatively good urban road network. The findings of Moving South Africa (1998: 57) project indicate that if the situation is not arrested immediately, “decentralised land use patterns will increase public transport journey time and cost, and increase car dependence ..., [t]he number of stranded will grow..., [t]he number of car users will double and road congestion will consequently worsen and have a significant effect on economic productivity and the viability of the public transport system.” This statement fits well with the aims of this study, which is to investigate the socio-economic profile of transport users in Kagiso Township, which will be indicative of potential needs and requirements in terms of current and future travel infrastructure. Finally, the National Department of Transport has adopted Moving South Africa as a framework for its work until 2020. However, it must be noted that many of the strategies are dependent on private sector involvement and implementation.

3.5 Overview of the national land transport legislation

The White Paper on National Transport Policy (1996:46) states that “[t]raffic legislation will be harmonised...in accordance with the relevant agreements between the provinces and the national Department of Transport. The Department of Transport will take the necessary steps to ensure the road traffic laws will be harmonised in the Southern African region.” This process of harmonisation is encapsulated in the revision, amendment, and repeal of legislation, which is discussed below. The following pieces of legislation are relevant to this study: the National Road Traffic Act, No. 93 of 1996; the National Land Transport Interim Arrangements Act, No. 45 of 1998; and the National Land Transport Transition Act, No.22 of 2000. There are a host of amendment Acts, which were passed during the above period (1940-2000), however, most of these amendments were of a technical nature and do not warrant more discussion at this juncture.

3.5.1 *National Road Traffic Act, No. 93 of 1996*

The National Road Traffic Act, No. 93 of 1996 was enacted as a result of the White Paper on National Transport Policy and to replace the outdated Road Traffic Act, No. 29 of 1989. The objective of the new legislation is to promote road traffic safety and discipline, in addition to protecting the expensive capital investment in the road system and the enhancement of the administrative and economic order in the field of

road traffic and transport. The purpose of the Act is to “provide for road traffic matters which shall apply uniformly throughout the Republic [of South Africa].”

3.5.2 National Land Transport Interim Arrangements Act, No. 45 of 1998

The National White Paper on Transport Policy (1996) clearly promotes land use and spatial development in support of land passenger transport. In terms of this policy, planning should be done at the lowest possible level of government or by the relevant transport authorities. Hence, the purpose of this Act is to “make arrangements relating or relevant to transport planning and public road transport services within metropolitan transport areas declared under the Urban Transport Act, 1977, and to the designation of core cities under that Act...” The Act fulfills the requirements of the National White Paper on Transport Policy.

3.5.3 National Land Transport Transition Act, No.22 of 2000

The purpose of the National Land Transport Transition Act, No. 22 of 2000 is “[t]o provide for the transformation and restructuring of the national transport system of the Republic [of South Africa]...”, with more emphasis given to public transport in order to give effect to the White Paper on National Transport Policy. This legislation is transitory in nature and is part of a suite of legislation to harmonize the national, provincial and municipal laws. With the restructuring of the local government system complete (with the passing of the Municipal Structures Act, No. 32 of 2000), the time had come to start finalizing a single all-encompassing transportation law for all spheres of government. This new legislation takes into account ‘Vision 2020’ as envisaged in the Moving South Africa project. The National Land Transport Transition Act, No. 22 of 2000 is divided into four chapters: Chapter 1: Introductory matters; Chapter 2: Matters of national concern; Chapter 3: Matters of provincial concern and Chapter 4: General matters. Chapters 1, 2 and 4 set national norms and standards for the whole country and are applicable to all provinces. It was thus designed for the effective handling of the restructuring and transformation of the land transport system in the Republic of South Africa as contemplated in section 146 (2) of the Constitution of the Republic of South Africa Act, No. 108 of 1996. Chapter 3 provides for matters of provincial concern, and is applicable in all provinces unless the relevant provincial legislature passes legislation to replace and provide for the same matters as contemplated in the

chapter. This means that provincial law cannot provide for any matter which will be deemed contradictory to the provisions of Chapter 3; in such a case, the relevant provision in Chapter 3 of the National Land Transport Transition Act, No. 22 of 2000 would continue to prevail. The Act came into operation in December 2000 by Proclamation 74 of 2000, except for the following provisions: Part 4: section 9(4), Part 5: section 10(13)(a), Part 7: the whole (sections 18 to 29 inclusive), Part 13: sections 131, 132, 133 and Part 9: section 44, which came into operation on July 2001. The Act sets out the main principles of national land transport policies which are relevant at the local level and they include, *inter alia*, the following:

- public transport services must be aimed at providing affordable transport to the public and be designed to achieve integration of modes, cost efficiency and service quality, the optimal allocation and utilization of available resources and develop markets;
- public transport services must be designed so that appropriate modes are selected and planned for on the basis of where they have the highest impact in reducing the total systems cost of travel and in such a way that subsidies are aimed to assist currently marginalized users, those who have poor access to social and economic activity and at the needs of special categories of passengers;
- an effective land transport system must be achieved through integrated planning, provision and regulation of services and infrastructure and diligent, effective law enforcement;
- safety and effective law enforcement must be promoted as vital to managing and regulating land transport, and the efforts of all involved must be co-ordinated to prevent duplication;
- for the purposes of land transport planning and the provision of land transport infrastructure and facilities, public transport must be given higher priority than private transport and
- land transport functions must be integrated with land use and economic planning and development through measures such as corridor development, densification and infilling; transport planning must guide land use and development planning.

The White Paper on National Transport Policy (1996: 47) has formed the basis on “which other transport institutions - government, statutory and private - should tailor their individual policies and strategies.” In addition, it has allocated the execution of certain important functions to the provinces, *inter alia*, land passenger

transport legislation, delineation and designation of passenger transport areas and transport authorities, implementation, monitoring and revision of provincial passenger transport policy, coordination of land use and transport planning at the provincial level and law enforcement. All these functions impact directly at the local level in all respects. Hence, the Gauteng Department of Transport and Public Works (Gautrans) has adopted its own Gauteng White Paper on Transport Policy to begin the process of reforming, shaping and managing its valuable transport industry. In addition, the province has enacted a suite of legislation to govern the land transport industry in the province. Thus, in South Africa, transport has become a concurrent function between the national, the provincial and the local spheres of government.

3.6 Gauteng White Paper on Transport

The Gauteng White Paper on Transport Policy forms the basis for the legislative reform that has taken place in the province since 1996. The following matters (which are also relevant to this dissertation) are, *inter alia*, covered in the Gauteng White Paper on Transport Policy:

- the promotion of public transport – this relates mainly to the development of corridors to facilitate public transport, mixed land use to minimize travel, the prioritization of facilities and infrastructure, financial assistance for public transport and the enhancement of safety on public transport. In addition, rural passenger transport, training, skills development and capacity building within the public transport industry are also promoted;
- the coordination of transport modes and services – this relates mainly to the overseeing and management of the financial support of different modes of transport, the monitoring of levels of service provision, the standardization of road traffic and inter-provincial liaison. In addition, it provides for the promotion of airports and other transport facilities, as well as overarching legislation;
- the provision, maintenance and operation of transport infrastructure – this relates mainly to the classification, development and maintenance of the road network and is mainly concerned with road links to poor and marginalised areas / communities and to new residential developments and administration/facilitation of road construction within poor and marginalised areas. In addition, the needs of the disabled are recognized and

- the integration of land-use and transport – this relates mainly to the undertaking of land use and transport planning, the coordination of planning undertaken by municipalities, the provision of transport-related input for land use and rezoning proposals and applications. In addition, partnerships between public and private sector development are promoted, including development in identified corridors.

Gautrans has been diligent in implementing its Gauteng White Paper on Transport Policy. These successes are evident at the local level, especially in Kagiso Township as is elucidated in Chapter 6 of this dissertation. Legislation has been passed by the Gauteng Provincial Legislature to give some effect to all the above matters, as is indicated in the following section.

3.7 Overview of the provincial land transport legislation

The aim of the White Paper was to lay the basis for a single overarching Gauteng Transport Act. Since 1996, interim legislative modules have been produced progressively in terms of their perceived urgency, which should lead, in time, to final legislation. Figure 3.1 shows the modules that are required to form a single Gauteng Transport Act. Most of the legislation discussed below has either been revised, repealed or amalgamated in order to drive the provincial transport legislative programme.

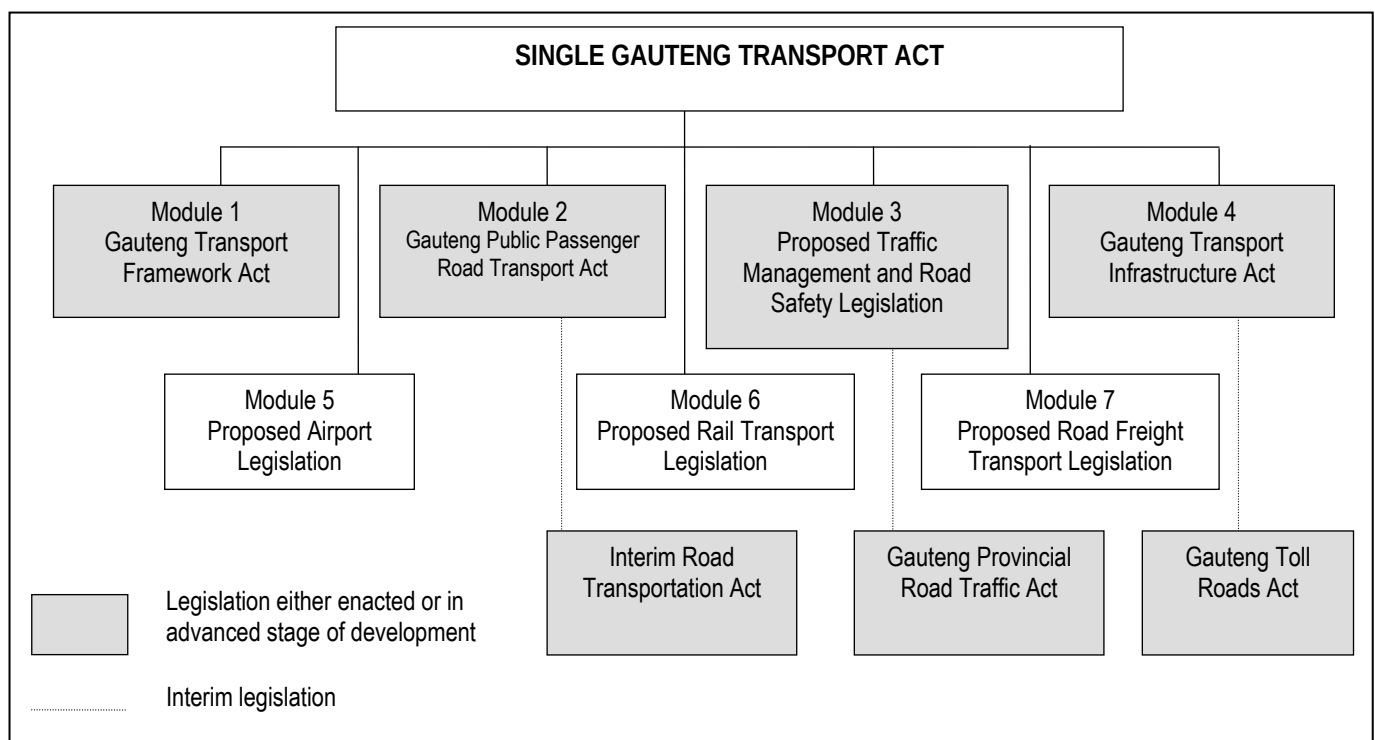


Figure 3.1: Structure for transport legislation in Gauteng Province

Source: Gautrans (1997: 6) as amended

The following Gauteng provincial legislation is briefly discussed: the Gauteng Road Transportation Amendment Act, No. 6 of 1997; the Gauteng Provincial Road Traffic Act, No. 10 of 1997; the Gauteng Interim Minibus Taxi-type Services Act, No. 11 of 1997; the Gauteng Interim Road Transport Act, No. 2 of 1998; the Gauteng Transport Framework Act, No. 8 of 1998; the Gauteng Public Passenger Road Transport Act, No. 7 of 2001; the Gauteng Transport Infrastructure Act, No. 8 of 2001 and the Gauteng Transport Framework Revision Act, No. 8 of 2002.

3.7.1 The Gauteng Road Transportation Amendment Act, No. 6 of 1997

The purpose of the Act is to amend the Road Transportation Act, No. 74 of 1977, in so much as it applies to Gauteng Province and to provide for the appointment of a Provincial Taxi Registrar and also to provide for the registration of minibus taxi associations, their members and non-members. In addition, the Gauteng Road Transportation Amendment Act, No. 6 of 1997 provides for special measures in respect of minibus taxi services in certain areas (vehicle impounds, regulation of routes, etc.). This Act has been hailed by industry players as the first measure by government to normalize the taxi industry. The Gauteng Road Transportation Amendment Act, No. 6 of 1997 was repealed by section 58(3) of the Gauteng Interim Minibus Taxi-Type Services Act, No. 11 of 1997.

3.7.2 The Gauteng Provincial Road Traffic Act, No. 10 of 1997

The purpose of the Act is “[t]o consolidate and amend the provisions relating to road traffic which should apply in the Province of Gauteng...” The operationalization of this legislation awaits the finalisation of similar legislation in the rest of the eight provinces. This legislation will ultimately form part of the proposed Traffic Management and Road Safety legislation. The Gauteng Provincial Road Traffic Act, No. 10 of 1997 meets the requirements of the National Road Traffic Act, No. 93 of 1996 in all respects.

3.7.3 The Gauteng Interim Minibus Taxi-type Services Act, No. 11 of 1997

The purpose of the Act is “[t]o provide for the interim regulation of minibus taxi-type services; to provide for the establishment of a Provincial Transport Commission and a Provincial Taxi Registrar; to exclude the provisions

of the Road Transportation Act, (No. 74 of) 1977, from applying to minibus taxi-type services...” In terms of section 59(3), the Gauteng Interim Minibus Taxi-Type Services Act “shall terminate on date of commencement of more comprehensive provincial public passenger legislation.” Section 104(1)(b) of the Gauteng Public Passenger Road Transport Act, No. 7 of 2001 repealed the latter Act.

3.7.4 *The Gauteng Interim Road Transport Act, No. 2 of 1998*

The purpose of the Act is to “[t]o provide for the interim regulation of public passenger road transport other than minibus taxi-type services, and...” The Act is of a technical nature and was meant to clean up the existing provisions of the Road Transportation Act, No. 74 of 1977 in light of the constitutional changes. The major changes made, *inter alia*, relate to references to classes of persons, freight transport, appeals, measures to combat taxi violence and the processing of permit applications by non minibus taxi-type operators as well as taxi operators.

In terms of section 41(1) of the Gauteng Interim Road Transport Act, No. 2 of 1998, the Road Transportation Act, No. 74 of 1997 is repealed insofar as it applies in Gauteng Province. Section 104(1)(b) of the Gauteng Public Passenger Road Transport Act, No. 7 of 2001 also repealed the Gauteng Interim Road Transport Act, No. 2 of 1998.

3.7.5 *The Gauteng Transport Framework Act, No. 8 of 1998*

The purpose of the Act is “[to] provide a framework for the integrated planning and provision of the transport system in the [Gauteng] Province; the establishment of transport authorities and transport authority funds; the administration and utilisation of the provincial land transport fund; the preparation of integrated transport plans; and...” In terms of sections 10 and 22 of the Act, it is a requirement that transport authorities must take responsibility for the environmental impact of transport development and the implementation of integrated transport plans. In addition, there must be consistency between the integrated transport plan and the transport development chapters of integrated development plans prepared in terms the Local Government Transition

Act, No. 209 of 1993. The Gauteng Transport Framework Act, No. 8 of 1998 was repealed by section 38(1) of the Gauteng Transport Framework Revision Act, No. 8 of 2002.

3.7.6 The Gauteng Public Passenger Road Transport Act, No. 7 of 2001

The purpose of the Act is “[t]o change the law governing public passenger road transport in Gauteng [Province], and for that purpose – to provide for a public passenger road transport system as part of an integrated system of land transport for Gauteng [Province], compatible with the national land transport system and the land transport systems of other provinces; to provide for the planning of public passenger road transport operations and infrastructure integrated with land use planning; to provide for the regulation and control of public passenger road transport by provincial and local government; to establish institutional structures to achieve these objectives; to repeal the Gauteng Interim Minibus Taxi-Type Services Act, 1997 [Act No. 11 of 1997] and the Gauteng Interim Road Transport Act, 1998 [Act No. 2 of 1998]; to bring provincial public passenger road transport legislation into line with Chapter 2 of the National Land Transport Transition Act, 2000 [Act No. 22 of 2000] and to replace Chapter 3 of the Act as regards provincial public passenger transport matter...”

3.7.7 The Gauteng Transport Infrastructure Act, No. 8 of 2001

The purpose of the Act is “[t]o consolidate the laws relating to road and other types of transport infrastructure in Gauteng [Province]; and to provide for the planning, design, development, construction, financing, management, control, maintenance, protection and rehabilitation of provincial roads, railway lines and other transport infrastructure in Gauteng [Province]; and...” In essence, this Act regulates all matters which are in the Roads Ordinance, No. 22 of 1957. The Gauteng Transport Infrastructure Act, No. 8 of 2001 was amended by the Gauteng Transport Infrastructure Act, No. 6 of 2003 in order “to provide for the necessary land use rights with respect to stations and for the necessary powers of the MEC [Member of the Executive Council] to enter into contracts for road and rail projects; to amend the procedure in relation to route determination; to make a second environmental investigation at the stage of preliminary design of a road or railway line unnecessary

where the competent environmental authority decides that the environmental investigation at the stage of route determination is adequate.”

3.7.8 The Gauteng Transport Framework Revision Act, No. 8 of 2002

The purpose of the Act is “[t]o provide a framework for integrated planning and provision of a transport system in the Province [of Gauteng]; to provide for founding agreements for transport authorities and the establishment thereof; to provide for the governance of transport authorities including the finances of such authorities; to provide for the preparation of various transport plans; to establish the Gauteng Transport Consultative Forum and the Gauteng Transport Co-ordination Committee...” The WRDM would be the designated transport authority in terms of this legislation.

3.8 Conclusion

The continuous transformation of the South African transport system is apparent judging from the degree of policy and legislative changes which has taken place. For the first time in the history of South Africa, the country has a transport policy focused on customers or users of the transport system, compared to previous policies which focused on suppliers of transport infrastructure and operators (both public and private). The major thrust of these post-1994 laws and policies is that transport must be integrated with other sectors of the economy, whilst bearing the customer (individual and firms) in mind. By being a customer-driven policy, the White Paper on National Transport Policy and the Moving South Africa project will bring on board the economic development of the country to new heights. The challenge is to bring on board private sector actors to do their part in making the transport system work. The policy and legislative framework to realize this has been put into place. The National Land Transport Transition Act, No. 22 of 2000 provides for the preparation of the following plans at a municipal level: ITP, Rationalisation Plan, Operating Licences Strategies (OLS), and Current Public Transport Records (CPTR). These plans are intended to meet the current and future transport needs of local communities. They extract information on the opportunities and challenges that are facing the local system and come up with alternative solutions to address these local transport issues. The involvement of the private sector will definitely accelerate the implementation of these laws and policies on the ground. All users of the

transport system in South Africa (and Gauteng Province specifically) stand to benefit from an effective and efficient transport system.

The laws and policies which have been discussed in the preceding sections have a direct impact at the local level. These laws and policies have made it possible for Gautrans, the WRDM and the MCLM to dedicate funds for the establishment, improvement and maintenance of transport infrastructure. In addition, these funds have made it possible for the provision of actual and planned public transport services in Kagiso Township. From a local socio-economic development point of view, the MCLM, as an agent of the WRDM, has managed to intervene in Kagiso Township by providing a service that links land use and transport in a manner that permits an effective establishment of services (safety and security, conflict resolution with respect to the minibus taxi industry, road traffic law enforcement, provision of transport related input for land use and rezoning applications, the assessment of environmental impact of transport, etc.) and infrastructure (development and maintenance of the road network, effective intermodal transfer facilities). These matters are discussed comprehensively in Chapter 6.

CHAPTER 4

Methodology

4.1 Introduction

This chapter describes the methodology that was used to investigate household mobility and the needs of commuters in Kagiso Township, as well as how this information and needs compares with current municipal plans to see whether such plans are realistic and can address existing needs. This chapter commences by highlighting the difference between quantitative and qualitative research paradigms. Thereafter, an explanatory introduction to research methodology is presented. A research framework was formulated for the purposes of conducting the research. Each of the elements of the framework are explained in detail in order to shed light on how they were applied during the research. Lastly, a critique of the framework is presented to elucidate ethical considerations, potential limitations, and the generalizability of the findings, which emanate from the use of the framework.

4.2 Quantitative and qualitative research paradigms

The research aims lend themselves to a research philosophy that utilizes a quantitative approach. According to Creswell (2003: 18) “a *quantitative* approach is one [in] which the investigator primarily uses postpositivist claims for developing knowledge (i.e., cause and effect thinking, reduction to specific variables and hypotheses and questions, use of measurement and observation, and the test of the theories), employs strategies of inquiry such as experiments and surveys, and collects data on predetermined instruments that yield statistical data.” This statement presupposes that reality can be discovered through observations and logical reasoning. The ontological assumptions are that reality is static and permanent, hence it can be measured precisely with the right instruments. The quantitative approach requires the researcher to be distant and independent from that which is being researched. Any involvement of the researcher in what is being observed could render the results false. Therefore the researcher has to be objective when selecting the data collection methods and

when analysing the data during the entire research process. Crotty (cited by Gray, 2004: 18) states “that the results of research will tend to be presented as objective facts and established truths.”

In contrast, Creswell (2003: 18) states that “a *qualitative* approach is one in which the inquirer often makes knowledge claims based on constructivist perspectives (i.e., the multiple meanings of individual experiences, meanings socially and historically constructed, with an intent of developing a theory or pattern) or advocacy / participatory perspectives (i.e., political, issue-oriented, collaborative, or change oriented) or both.” This approach requires the researcher to interact with that which is being researched. This interaction assumes a form of close observation of informants and sometimes living with them (where required). The strategies of inquiry that are usually used are ethnography, action research, grounded theory, phenomenological research, case studies, etc. All these strategies of inquiry debunk the assertion that ‘reality’ is rooted in objective fact.

In view of the nature and focus of the selected research, the researcher adopted a predominantly postpositivist, quantitative approach because there is one reality, that of an ‘accessibility deficit.’ The procedures and rules for conducting the research were worked out prior to the commencement of the research. The data collection methods and instruments that have been used in the study mainly utilised numerical data, closed-ended questions and document analysis, as well as predetermined approaches such, as a survey questionnaires and structured interviews. The researcher’s aims have a solid foundation in literature and most of the variables are known. The researcher used a deductive process, where empirical facts are composed, thereafter conclusions are drawn based on those facts. Not all the commuter survey questions were intended to provide quantitative data. The individual interview and questionnaire surveys were used by the researcher and the fieldworkers to converse with local people and to listen to what they had to say about their localized transport concerns. Naturally, the interpretation of those facts would have a quantitative as well as qualitative aspect. The structured interviews were designed to give qualitative information and results on Kagiso Township. They were intended to give a broader spread of views, and also to triangulate on the information provided in the actual commuter surveys and to provide further evidence.

4.3 Explanatory introduction to research methodology

According to Gray (2004: 25), “[t]he choice of research methodology is determined by a combination of several factors – for example, whether the researcher believes that there is some sort of external ‘truth’ out there that needs discovering, or whether the task of research is to explore and unpick people’s multiple perspectives in natural, field settings.” Before commencing with any study, a researcher must investigate which method is suitable and relevant for the research inquiry. Welman and Kruger (2001: 2) state that “[r]esearch involves the application of various methods and techniques in order to create scientifically obtained knowledge by using objective methods and procedures.” The research paradigms that are described in Section 4.2 were critical in developing the methodology.

A core facet of the research was the researcher’s preference for and an analytical surveys’ method in an “attempt to test a theory in the field through the association between variables” (Gray, 2004: 27). The latter author further states that “analytic surveys emphasize:

- a deductive approach;
- the identification of the research population;
- the drawing of a representative sample from the population;
- control of variables;
- the generation of both qualitative and quantitative data; and
- generalisability of results” (Ibid).

Each of the above elements are elucidated below:

4.3.1 A deductive approach:

There are various ways of drawing conclusions from research inquiry, mainly via induction and deduction. According to Gray (2004: 400), induction is “[t]he development of theory or inferences from observed or empirical reality.” In contrast, deduction is a process of creating knowledge from an inference of single incidences from theory. In a study of this nature, theory was used deductively and is the basis for the research. Through “[t]he objective of testing or verifying a theory rather than developing it, the researcher advances

theory, collects data to test it, and reflects on the confirmation or disconfirmation of the theory by the results” (Creswell, 2003: 125). In this study, the researcher collected data and analysed it in terms of relevant theory in order to ascertain whether the *status quo* conforms to theory or not. In addition, the researcher has extrapolated the data in order to determine future scenarios and intervention.

4.3.2 The identification of the research population:

A research population is “[t]he totality of people, organizations, objects or occurrences from which a sample is drawn” (Gray, 2004: 403). It is very important that the population is defined clearly and accurately. Elements that are being measured and those that are excluded must be specified in order to prevent the researcher from making claims that are outside the range of the population, which would affect the generalisability of the results.

4.3.3 The drawing of a representative sample for the population:

According to Sapsford and Jupp (1996: 25), “[t]he aim of sampling is to save time and effort, but also to obtain consistent and unbiased estimates of the population status in terms of whatever is being researched.” Samples are drawn from a sampling frame. The sample that is drawn must be representative of the population, thereafter it would be the basis on which inferences can be made on the measured characteristics of the population.

4.3.4 Control of variables:

All variables (controlled, independent / dependent, dichotomous, extraneous, etc.) that are being measured must be known beforehand.

4.3.5 The generation of both qualitative and quantitative data:

The generation of both qualitative and quantitative data must ultimately relate to the research questions that had been initially posed. The most important consideration with data is its validity – whether the evidence that has been collected can provide credible generalisations and that when it is put through the test, the same conclusion can be reached. Irrespective of the epistemological grounding that is adopted by the researcher,

similar conclusions should be reached if the same sample from the population is used. Any replication of the study must therefore follow the same methods. Data collection methods must be robust and rigorous.

4.3.6 Generalisability of results:

Generalisability of results refers to “[t]he extent to which the results of a study based upon evidence drawn from a sample can be applied to a population as a whole” (Gray, 2004: 399).

4.4 Research framework

In accordance with the research aims, the formulation of the research framework was undertaken in order to address the following research goals:

- the compilation of a basic demographic and socio-economic profile of the communities researched through a sample survey, which will represent the basis for determining the extent of transport needs and requirements in Kagiso Township;
- the undertaking of structured interviews with officials of both the MCLM and the Western Gauteng Taxi Council (WGTC) to establish their needs and problems with respect to transport issues facing the local population of Kagiso Township. The opinions of officials were solicited regarding current transport problems along with attitudes regarding possible options for improving the transport situation. These structured interviews were a necessary part of the consultation process and were used to introduce the aims of the research to all important stakeholders. According to the Integrated Transport Plan (2003), within the WRDM’s area of jurisdiction (which includes Kagiso Township) the minibus taxi industry accounts for 73% of all passengers using the mode, and the bus and rail industry account for 8% and 19%, respectively. Given the dominance of the first mode and the absence of managers from the other smaller modes in the local area, only the minibus taxi operators were the focus of this study;
- the use of accessible and available official documents to compare current municipal plans with the transport needs of commuters in Kagiso Township and

- the use of a simple urban travel demand forecasting model that utilizes socio-economic variables to predict local transport demand, given the characteristics of the urban area, in terms of its spatial structure, and the personal characteristics of its inhabitants.

In view of the above considerations, the following research framework has been constructed:

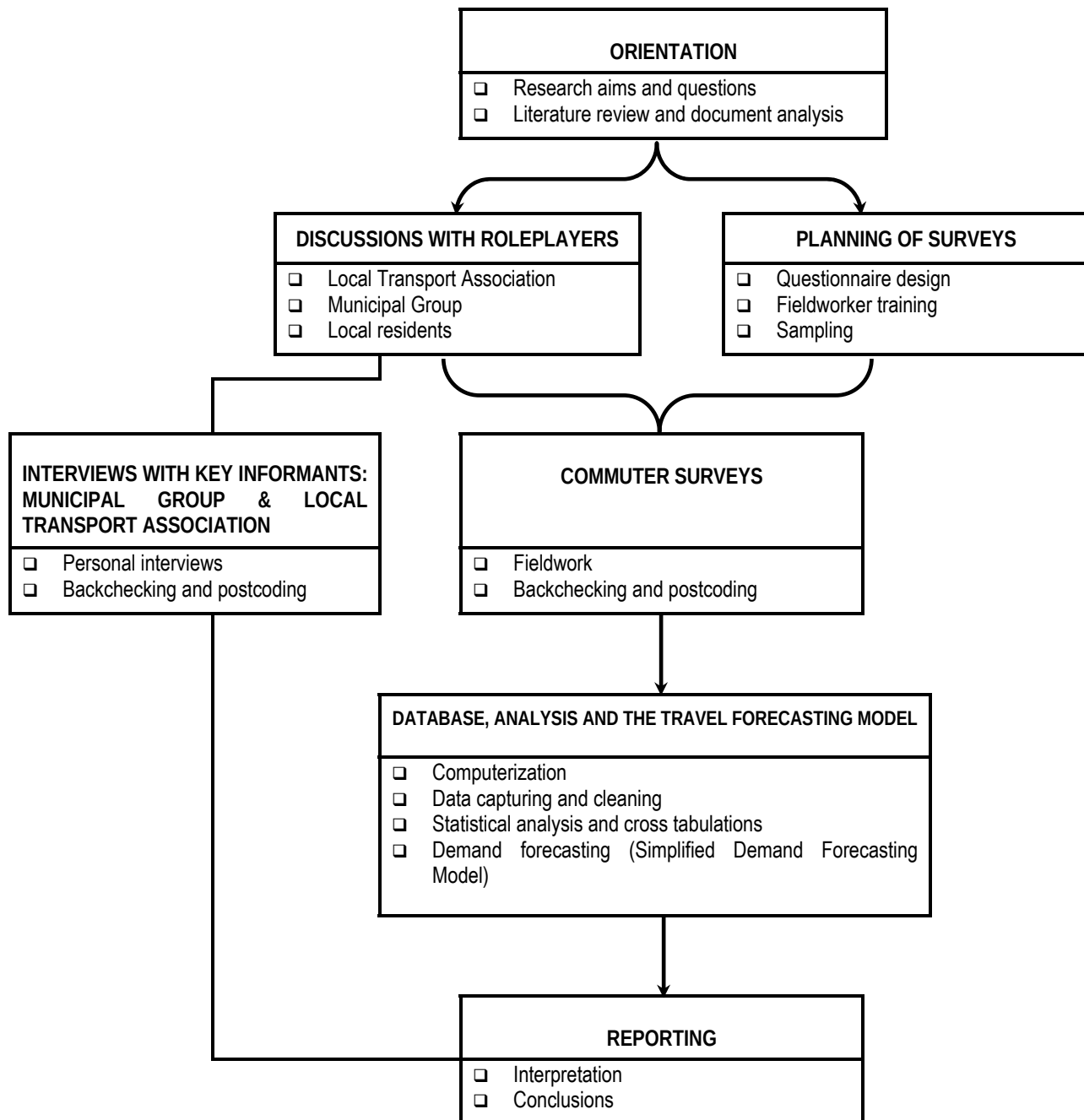


Figure 4.1: Research framework

The operationalization of the above research framework is discussed below.

4.4.1 Operationalization of the research framework

4.4.1.1 Orientation:

The orientation was undertaken for the purposes of verifying the validity of the research aims and questions and the delineation of the literature review and document analysis. Furthermore, existing maps of Kagiso Township were used to confirm the delineated study area. An inventory of all official documentation of relevance to the study was obtained from the WRDM, the Gautrans and the MCLM. Data was collected from these documents and an assessment was conducted of the local transport planning in Gauteng Province in general, and the MCLM in particular. These documents contained the following information and statistics: socio-economic and demographic information; regional and municipal transport profiles; institutional and financial arrangements; short-term and long-term transport goals; the spatial development framework; public transport contracts; public transport regulations and controls, implementation programmes and budget requirements. In addition to the above information, a wealth of data on current public transport records, land use integration and road and traffic management was analyzed.

4.4.1.2 Discussions with role-players:

The purpose of having discussions with role-players was to introduce the surveys to be undertaken to the community through their official representatives (i.e. municipal councillors) and to hold discussions with municipal officials. Opinions were solicited regarding current transport problems and attitudes regarding possible options for improving the transport situation. The Director responsible for infrastructure and transport matters at the MCLM was interviewed to request both technical and qualitative transport infrastructure information about Kagiso Township. Officials of the WGTC were interviewed to ask for information with regards to the transport situation in Kagiso Township.

4.4.1.3 Planning of surveys:

Also essential was the detailed planning and design of surveys, such as compiling the questionnaire, the training of fieldworkers, the piloting of the questionnaire and sampling. The questionnaires were finalized in conjunction with the supervisor. The Commuter Survey questionnaire (see Appendix 'A') is adapted from the

Local Transport Survey, which was designed by Fitzpatrick Associates in 2001. The survey questionnaire was customized to fit the research aims as outlined in Chapter 1. The questionnaire was designed in such a way that the following information could be obtained:

- Average household, and population size (current and future projections);
- Economic data (employment, number of vehicles in the household, affordability levels);
- Current access to transport (transport mode, number of trips undertaken, purpose of travel);
- Social / demographic information (age, gender, medical aid, health and disability, driver's licence);
- Commuter transport environment (physical and environmental quality, hygienic standards of transport modes, safety levels of transport modes);
- Attitudinal aspects (willingness to pay, use of alternative transport modes);
- Travel patterns & expenditure and usage patterns (both present and future) and
- Future plans (transport expenditure, new destinations, etc.).

Liaison with the supervisor was necessary to ensure that the aspects covered in the questionnaire were sufficient to provide the required results. During the questionnaire refinement process, the possibilities for analysis were determined in order to ensure that the questions asked would yield the required output for analysis. The recruitment and subsequent training of fieldworkers was done during this stage. The researcher recruited four fieldworkers to assist in conducting the commuter surveys. The criteria for recruitment consisted mainly of ability, communication skills, language proficiency and familiarity with local dynamics. In addition to the fieldworkers, two coordinators were utilised to oversee the fieldworkers. The training of fieldworkers and coordinators entailed an intensive training in survey methodology. All relevant aspects of fieldwork and surveying were included to adequately prepare the fieldworkers to conduct the surveys. Each fieldworker was supplied with the following documents to aid with the undertaking of the commuter surveys: background information on the study, questionnaires, contact details and the sampling procedure to be followed. A pilot test was conducted so that the ability of the fieldworkers to conduct the commuter surveys could be tested. The process entailed the testing of the feasibility of undertaking the full study by doing a trial run. The pilot study

laid the basis for later generating the master sample and the collection of household demographics within dwellings and at transport terminals, the administration of the entire set of questionnaires, data management and analysis of results. The pilot informed the refinement of the research methods and questionnaire development. Follow-up actions were taken during this stage and once these aspects were sufficiently addressed, the actual survey was conducted. During the pilot survey the fieldworkers did not complete all the questions in the surveys and many of the questionnaires were not usable for computerization and analysis. Problems that were identified were in terms of both coverage and content errors. Content errors surfaced in terms of the recorded characteristics of the households or commuters, which were caused by incorrect information being recorded during enumeration. Content errors included omissions (no data reported), impossible entries or invalid values or codes, inconsistent entries, and unreasonable magnitudes. These problems were rectified through more training and close monitoring by the coordinators, to ensure the success of the main exercise. The sample frame was defined as all residents of Kagiso Township, with an emphasis on commuters. The sampling methodology that was applied in this study is based on both the stratified random sampling method (Welman and Kruger, 2001: 55) and systematic sampling (Gomm, 2004: 76). The two types were used for different surveys, based on the identified appropriateness of each in that context (full details are provided in section 4.4.1.4 below). Despite time and budget constraints a sample size of at least 400 was determined to be the minimum return required. The chosen sample size had the effect of decreasing the margin of error and standard error. This number was arrived at on the basis that the study required a statistically representative sample, which would be the basis for the generalisation of the sample to the whole population of Kagiso Township. At least 0.4% of the population of Kagiso Township were sampled (455 respondents). Sapsford and Jupp (1996: 21) states-that in stratified random sampling, “[m]oney is saved by reduction in sample size for the required degree of statistical precision. Fieldwork costs, such as time, travel, interviewer and administration fees, and the printing and processing of questionnaires, are reduced.” They continue for the second method utilised that “[t]he great advantage of systematic sampling over simple random sampling is that it is easier to perform and thus provides more information per unit cost than does simple random sampling” (Ibid). In this study, every 8th person who fitted the sample frame was surveyed. The

commuter surveys were conducted on week and weekend days to obtain a representative sample of commuters at peak and off-peak transport times. Ten days were used for this purpose. The surveys were conducted mostly in the afternoons to early evenings (14h00 to 19h00). The final sample size of fully completed usable surveys was 455.

4.4.1.4 Commuter Surveys:

The purpose of commuter surveys was to undertake the local transport surveys in the strata as identified for sampling. At least 455 households were surveyed in Kagiso Township. During the fieldwork, it was essential that the fieldworkers understood the purpose of the study, as well as all the terminology within the questionnaire. Coordination was extremely important during the commuter surveys to allow for the many problems identified by the fieldworkers to be immediately addressed by the researcher. Furthermore, each coordinator was responsible to ensure that the correct sampling by the fieldworkers was undertaken. The geographical location of the households interviewed was accurately recorded, since this was important from a quality control point of view. For this purpose, maps indicating the area and households were used. Due to the need to target commuters, a three pronged strategy was followed:

- a stratified random sample was drawn of households in Kagiso Township and an interview was held with a randomly selected adult household member. This sampling method consisted of two distinct steps. Firstly, the classification of the population in various households in terms of their location criteria. At least 23 areas within Kagiso Township were chosen and at least six households from each area were chosen depending on the size of the area. This amounted to 138 fully completed survey questionnaires. Secondly, households within the 23 areas were chosen randomly;
- a systematic sample was drawn of Kagiso Township commuters at four points: Kagiso taxi rank; Leratong Hospital taxi rank; New Area taxi rank; and Luipaardsvlei train station. Every fourth person was chosen and interviewed until at most 254 people were completed and
- a systematic sample of Kagiso Township residents at the Kagiso Mall was taken. Every fourth person was chosen and interviewed until at most 63 people were completed.

The use of both stratified random sampling and systematic sampling in the study was informed by the practical dynamics of Kagiso Township. With regards to stratified random sampling, the researcher wanted a statistically representative sample in order to be able to generalize the results to the whole population of Kagiso Township. The choice of areas (strata) included both formal and informal dwellings in all 13 municipal wards of Kagiso Township. This survey method enabled the researcher to reach more respondents than would have been possible with other methods, again taking into consideration the limitation of money and time. The systematic sampling survey method was used to augment the household surveys mentioned above. The target were mainly commuters, who are *bona fide* residents of Kagiso Township. Non-residents were excluded from the survey as part of the design. This method of sampling was very useful, albeit most respondents were in a hurry to complete their travel journeys. To ensure that the quality of interviews, and therefore the information would be beyond doubt, a process of quality control (or back checks) was followed by the coordinators. This meant that 10% of the interviews were re-conducted to test the response as well as the actual work done by the fieldworkers. The researcher undertook the back checking (one out of ten every questionnaires) and postcoding ("[t]he process of examining completed survey questionnaires, choosing response categories for items not precoded, assigning code values to them on the documents, and recording codes and category labels in a codelist" (Alreck and Settle, 1995: 451)) of the 455 questionnaires.

4.4.1.5 Database, analysis and the travel forecasting model

The computerization and subsequent analysis of the demographic and socio-economic data was done during this stage. It was important to capture the data obtained from the surveys into a structured format, such as a database. The computerization and subsequent processing of the data gathered was a crucial component in a study of this nature. To ensure that data capture is undertaken with great accuracy, all the data was entered twice in order to verify the data, thus ensuring that an error rate of below 0.04% is achieved. This was critical and helped to ensure a very high level of accuracy in the database. In preparation for data-entry, the questionnaires were initially postcoded. To save time, a database had been set up for data-entry as soon as the first questionnaires were available. Data capturing was done using a statistical package (Statistical

Package for Social Sciences (SPSS) 12.0 for Windows) and data cleaning (correcting errors from questionnaires before keying into the computer) was done on one out every five questionnaires. The full complexity of the sample was analysed by using the appropriate procedures in SPSS 12.0 for Windows. Appropriate types of analysis were identified and applied to test the reliability and validity of the survey results. The structure of the questionnaire determined the selection of a specific form of analysis. The analysis entailed univariate analysis or frequency tables in a first round of analysis. The next round of analyses entailed cross-tabulations. Once the computerisation of the results had been completed, the interpretation of the results was undertaken. The interpretation of the results followed a three-pronged process, namely analysis of the social environment, the analysis of the socio-economic, demographic and transport characteristics of the commuters and an analysis of the attitudes and expectations relating to the provision of transport in Kagiso Township. The results of this analysis were used as inputs into an urban travel forecasting model. Bussière and Rice's (1999) simplified travel demand forecasting model was used for the development of travel forecasts. The latter model was computerised into a Microsoft Excel model for easy of use and analysis. The outputs of the Microsoft Excel model are fully illustrated in Appendix 'D'. They state that "there are two major sets of input material required:

1. [S]ocio-demographic forecasts desegregated by selected age / sex categories and residential location groups; and
2. [A]ssumed future travel behaviour characteristics, in the form of mobility or trip generation rates for the defined socio-demographic strata" (Bussière and Rice, 1993: 11).

The projections thus generated were used to determine future, potential, resource and service demands for the study area. Based on these analyses, the implications for service provision were formulated during this stage.

4.4.1.6 Interviews with key informants: Municipal Group and Local Transport Association:

Structured interviews were held with officials of the MCLM. The questionnaire (see Appendix 'B') was designed in such a way that the following information, *inter alia*, could be obtained: legislative framework, municipal transport planning, infrastructural requirements, service delivery, environmental impact management, consultation forums, security and future plans. In addition to the municipal officials, a separate structured

interview session was held with officials of the WGTC. A questionnaire (see Appendix 'C') was designed in such a way that the following information, *inter alia*, could be obtained: transport groups and institutional arrangements, quality of transport, capital investment / running costs, profitability, transport routes and types of vehicles used, police-transporters' relationship and organization of transport. The data that was collected from the above two surveys was augmented with further documentary analysis. The ITP of the WRDM was the source document used. Most of the information from these two surveys was thereafter triangulated with the latter document.

4.4.1.7 Reporting:

The reporting stage was intended to interpret the survey results and make sense of the important facts and relationships that are apparent in the data in terms of the implications for transport planning in Kagiso Township. By implication, the transport supply and demand elements were interpreted to determine the effective demand for future transport infrastructure and services to be provided for in a transport plan for Kagiso Township. The current and expected demands per age group were thereafter calculated based on growth expectations in the population and the local economy. During this process, cognizance was taken of the needs and perceptions of local communities regarding the transport issues which were obtained through the surveys and document analysis. Finally, the analysis culminated in a report, which provided the key survey results and conclusions to refine the implementation of the municipal plans and to monitor and evaluate the success of the municipal transport plans.

4.5 Ethical considerations

Welman and Kruger (2001: 2) state that “[e]thical considerations come into play at three stages of a research project, namely:

- when participants are recruited;
- during the intervention and / or the measurement procedure to which they are subjected; and
- in the release of the results obtained.”

Participants were frequently reluctant to provide demographic information such as income to people whom they may deem to be younger than them. All participants were assured that whatever information was collected through the survey questionnaire would be held confidentially. Officials of the WGTC demanded to be paid for giving information about the activities of their members. Their reasoning was that the information that they were being requested to give has a commercial value and, hence, payment for it would be justified. The researcher managed to convince them that the information would only be used for academic purposes and no payment was made. All respondents were also assured of anonymity and confidentiality. The research did not have a financial sponsor, it was entirely financed from the researcher's resources. The datasets and research output will be provided to other institutions of learning, including the MCLM and also any other party that requires it for the advancement of the socio-economic development agenda of the population of Kagiso Township.

4.6 Limitations

All survey research methods have some disadvantages and limitations. According to Alreck and Settle (1995: 6), "the most serious limitation is that it's difficult or impossible to measure *causality* using survey research." Threatening and sensitive information was excluded from the surveys, especially when it related to the activities of the WGTC. Information about the respondents' income was excluded due to local people being averse to disclosing their economic status.

CHAPTER 5

Findings: commuter perspectives

5.1 Introduction

This chapter presents key findings from the perspectives of commuters in Kagiso Township. The key research aim was to obtain generalisable data from sampled residents in Kagiso Township regarding their utilisation of transport, their demand for improved transport and the affordability thereof. A sub aim was to develop a profile of commuters and their travel patterns. The findings mainly respond to the research aims as discussed in Chapter 1. The principal research questions are as follows:

- What is the socio-economic profile of commuters in Kagiso Township?
- What are the dominant travel patterns of commuters based on transport use?
- What are the current and future mobility requirements?
- What are the perceptions of commuters on: the physical and environmental quality of transport facilities, safety levels of the transport modes; and a variety of transport issues?

In this chapter, firstly, with regards to the socio-economic profile of commuters, the researcher investigated the level of car ownership, driving licence possession, travel opportunities and the health status of commuters and these issues are discussed. Secondly, the following dominant patterns of commuter based transport use are discussed: car availability, trip frequency, mode choice and activity preferences. Thirdly, the current and future mobility requirements are discussed. Additionally, general factors affecting choice of mode of travel are highlighted. These factors relate to current mode choice, intention to switch to a new mode, area of employment, transport cost, and the intention to buy a car. Future travel demand is then forecasted by using Bussière and Rice's (1999) simplified travel demand forecasting model and lastly, the perceptions of commuters on the following issues are discussed: the physical and environmental quality of transport facilities, safety levels of transport modes and opinions on a variety of other transport issues (government intervention, international oil prices, etc.).

5.2 A socio-economic profile of commuters and the disadvantaged in Kagiso Township

The focus of the research was mainly to investigate household mobility and the needs of commuters in Kagiso Township. The socio-economic characteristics of the population are very important in so far as they have an impact on commuters and the disadvantaged. As indicated in Chapter 4, due to the need to target commuters a three pronged strategy was followed to collect data:

- a stratified random sample was drawn of households in Kagiso Township and interviews were held with a randomly selected adult household member. The choice of areas included both formal and informal dwellings in all 13 municipal wards of Kagiso Township;
- a systematic sample was drawn of Kagiso Township commuters at 4 points, namely: Kagiso taxi rank, Leratong Hospital taxi rank, New Area taxi rank, and Luipaardsvlei train station and
- a systematic sample was taken of Kagiso Township residents at Kagiso Mall.

The target was mainly commuters who are *bona fide* residents of Kagiso Township. Non-residents were excluded from the survey as part of the design.

5.2.1 Socio-economic profile

Based on the 455 completed questionnaires drawn from the three study areas detailed above, the following generalisable conclusions can be drawn. In terms of gender, 42.6% of the respondents were male and 57.4% were female. Fieldworkers failed to record the gender field on the questionnaire for eleven respondents. Frequencies for the age groups are as follows:

Table 5.1: Frequency distribution for the age groups

		Frequency	Percent
Age group	20-29	117	25.7
	30-39	177	38.9
	40-49	111	24.4
	50-59	40	8.8
	60+	10	2.2

In terms of Table 5.1, large proportions (38.9%) of respondents are between the ages of 30 and 39. These figures reflect current employment trends and could be the result of changes in the general economic

environment and the supply of jobs in the market. It is possible that the 30-39 age group has been in employment for longer than the other age groups due to this demographic group having concluded their educational training some time ago and are being in their prime years of their working life, hence there are relatively large number of commuting people in this age group. The 20-29 age group have either concluded their educational training and found work or have been out of work, only recently having concluded their education. A small proportion of commuters (2.2%) are over the age of 60+, this likely being a reflection of the majority of people belonging to this age group being either retired or on a disability pension and therefore are much less likely to travel. In terms of Table 5.2, the socio-economic characteristics of the 455 commuters surveyed is detailed:

Table 5.2: Socio-economic characteristics

Characteristic	Frequency							
	0	1	2	3	4	5	6	7
Number of family members who are employed	11.6%	33.8%	42%	10.5%	2%	-	-	-
Number of family members who have home duties	95.6%	4.2%	0.2%	-	-	-	-	-
Number of family members who are unemployed	49.5%	29.5%	14.5%	3.5%	2%	0.9%	-	0.2%
Number of family members who are looking for first regular job	65.3%	23.1%	7.7%	2.4%	1.5%	-	-	-
Number of family members who are students	24.8%	43.7%	24.4%	6.2%	0.9%	-	-	-
Number of family members who are too young to attend school	60.9%	31.4%	7%	0.4%	-	0.2%	-	-
Number of family members who are retired	84.6%	12.7%	2.4%	0.2%	-	-	-	-
Number of family members who are unable to work due to permanent sickness, disability	96.5%	3.3%	0.2%	-	-	-	-	-
Other	99.6%	0.4%	-	-	-	-	-	-

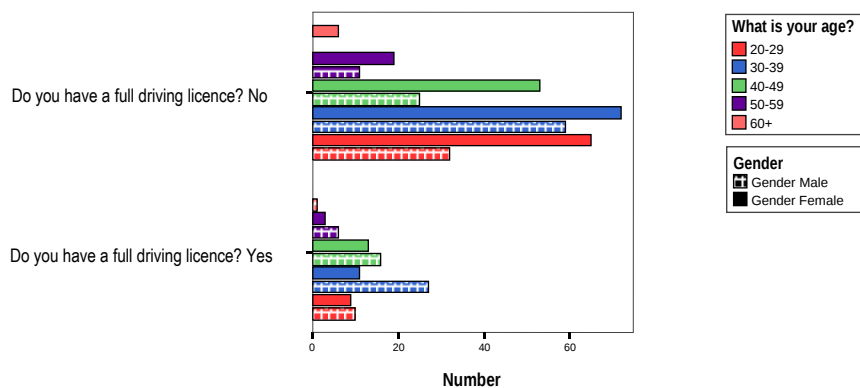
The above socio-economic characteristics reveal interesting information about the socio-economic landscape of Kagiso Township. At least 11.6% of commuters have indicated that they have no other family members who are employed. Household income affects the extent of car ownership and the use of public transport. On average, the unemployment rate in Kagiso Township is 51.5%. This figure excludes family members who are too young to work, those who are retired and those who are unable to work due to permanent sickness and / or disability. Household income increases when more people in the household are employed and so does the range of transport alternatives available to the household. At least 34.7% of the respondents are seeking

regular employment, which is an indication that at least short-term job opportunities for Kagiso Township commuters cannot be too scarce.

5.2.2 Driver's licence possession and the use of a car

The possession of a driver's licence and being the requisite age are essential for a person to legally drive a car. In South Africa, the prescribed age to acquire a driver's licence is 18 years (16 years for a learner permit which enables its holder to drive a car in the presence of person who has a driver's licence of a similar class or higher). On average, a fairly small number of commuters possess a driver's licence as indicated in Figure 5.1. At least 13.7 % of males possess a driver's licence compared to females at 8.2%. A comparison amongst the gender groups indicates that males in the respective age groups have on average a higher prevalence (32.1%) of driver's licence possession compared to females (14.3%).

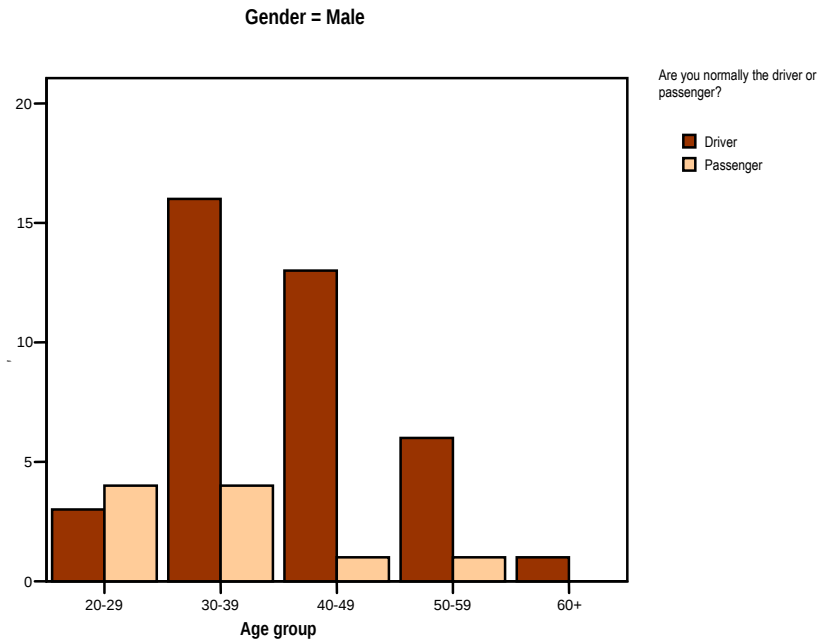
Figure 5.1: Comparison of Age: Gender: Licence Possession



According to the Social Exclusion Unit (2002) people with a driver's licence are twice more likely to find a job than those without. Hence, a driver's licence is an important necessity which facilitates social inclusion. Alternatively, those without a valid driver's licence are continually reliant on others for their travel requirements. At least 83.7% of commuters who indicated that they have a full driver's licence also indicated that they are normally drivers, as compared to the 16.3% who have indicated that they are normally passengers. Of those who do not have a full driver's licence, 12.5% indicated that they are normally the drivers of a vehicle, an indication that some respondents are driving vehicles unlawfully. The main reason advanced by these illegal drivers for driving without a valid driver's licence is that the costs (driving lessons, official registration fees, etc.)

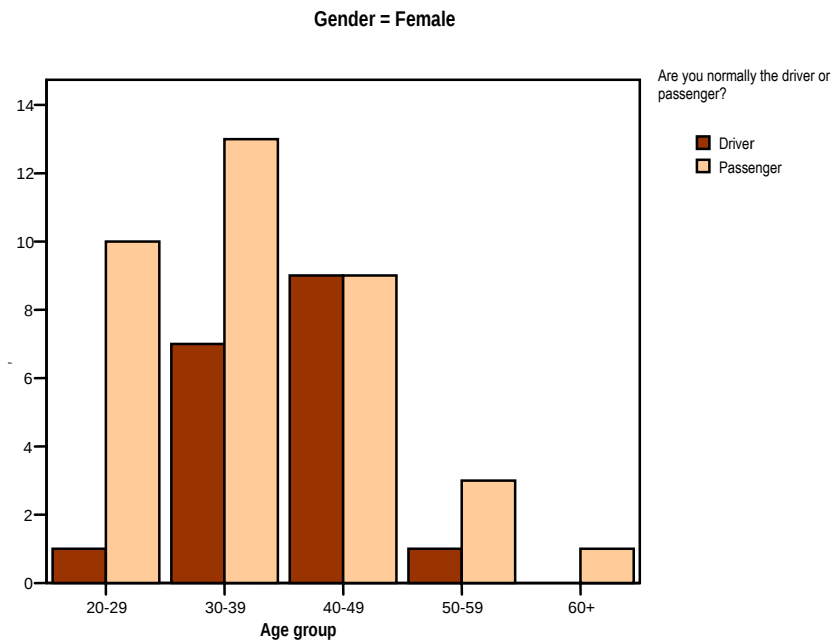
of obtaining a driver's licence are prohibitive. A high proportion of male commuters (79.6%) with licences have indicated that they are normally drivers of the car rather than passengers (see Figure 5.2).

Figure 5.2: Comparison of: Age: Driver / Passenger: Gender = Male



In contrast, only 33.3% of female commuters with licences have indicated that they are normally drivers of the car rather than passengers (see Figure 5.3).

Figure 5.3: Comparison of Age: Driver / Passenger: Gender = Female



Typically, the older age groups (30-39, 40-49 and 50-59) in both gender groups have higher driver prevalence - 56.1%, 68.8% and 63.6%, respectively. In contrast, the 20-29 age group has, at 22.2%, a significantly lower driver prevalence.

5.2.3 Features of a typical commuter

Most commuters surveyed do not possess a car (77.3%). Of the balance, at least 18.5% of commuters (or their families) possess one car, whilst the remainder owns two cars or more cars. Compared to males (74.1% not owning), females are less likely to own a car (79.6% not owning). Altogether, males have a higher incidence of access to at least one vehicle (21.2%) compared to females (16.5%).

On average, each household in Kagiso Township has 4.72 people, with a standard deviation of 2.122. These figures indicate the prevalence of the extended family phenomena in Kagiso Township. The results of the surveys show that there is a relationship between household size and the ownership of a car. The impact of household structure on car ownership concurs with general trends in the literature. The bigger the household size (from three up six members) in Kagiso Township, the more chances the family owns a car. Households with 3, 4, 5 and 6 members have, on average, 19.3%, 24%, 16.7% and 14.5% car ownership levels, respectively. Households at both ends of this spectrum have only marginal car ownership levels (i.e. two or less members or seven up to fifteen members). Bhat and Koppelman (1993) have found that the acquisition of a car becomes inelastic when household size increases with the presence of children in large metropolitan areas. This may be due mainly to readily available public transport and the close proximity to socio-economic opportunities. The proportion of households with zero vehicles and zero people employed is very low and stands at 11.3%. However, the proportion of households with one vehicle and one person employed stands at a respectable 28.9%. When a household has two people employed, the proportion of households with one vehicle increases to 45.8%. On average, each household in Kagiso Township has 0.29 vehicles, with a standard deviation of 0.167. At least 96.6% of commuters indicated that they do not have a free travel pass (a concession ticket for use with rail) and that their family members are not prevented from accessing transport due to permanent sickness or disability.

Table 5.3 provides information pertaining to the ownership of medical aid insurance amongst the age groups, distributed according to gender. The ownership of medical insurance is, to some degree, a proxy to formal employment status and income (no direct income data was collected in the Kagiso Township survey). Respondents were frequently reluctant to provide information such as income to people whom they may deem to be younger than them (in the pilot study); hence, the use of medical insurance ownership was regarded as a way to ascertain formal employment status and income. It is evident from Table 5.3 that a large number of commuters do not have medical aid insurance. On average, at least 67.7% of male commuters indicated that they do not possess medical aid insurance, compared to 74.8% of female commuters. The middle-aged male working age group (30-49) has a higher prevalence of medical aid insurance ownership, at 53.7%, amongst those who indicated that they have medical insurance. Their female counterparts reflect almost half of the latter figure, and this is an indication that females are generally more economically disadvantaged than males. The marginal ownership of medical insurance amongst females is prevalent amongst all the age groups, except the 20-29 age groups.

Table 5.3: Do you have a medical aid by Age by Gender

Gender		Do you have a medical aid?			
		Yes		No	
		No.	% within age group	No.	% within age group
Male	20 – 29	7	16.7%	35	83.3%
	30 – 39	27	31.8%	58	68.2%
	40 – 49	22	53.7%	19	46.3%
	50 – 59	3	17.6%	14	82.4%
	60+	1	100%	0	0%
	Total	60	32.3%	126	67.7%
Female	20 – 29	19	26.0%	54	74%
	30 – 39	24	28.9%	59	71.1%
	40 – 49	17	25.8%	49	74.2%
	50 – 59	3	13.6%	19	86.4%
	60+	0	0%	6	100%
	Total	63	25.2%	187	74.8%

The proportion of male commuters that has a long term illness / disability and also has medical aid is 32.3%, and in contrast the amount for females stands at 25.3%. The average number of commuters who indicated that they do not have a long-term illness or disability is 96.5%, as indicated in Table 5.2. This figure is also similar for the commuters who indicated that they, almost without exception, do not have family members who are

unable to work due to permanent sickness and disability. Of those commuters who indicated that they have a long-term illness or disability, 3.6% have experienced travel difficulties due to their health status. The proportion of those 3.6% commuters who indicated that they have long-term illness and cannot use public transport is 89.9%. The same applies with regards to commuters who indicated that they have a disability. At least 57.1% of commuters who indicated that one of their dependents have a long-term illness or disability also experienced travel difficulties.

5.3 Dominant travel patterns of commuters based on transport use

Travel patterns are influenced and decided upon by many factors: socio-economic considerations, cultural, physical ability, spatial, environmental, legal, political and behavioural. The literature is very detailed with respect to research on the need to study travel patterns during specific time periods, and to identify that particular activities are taking place during these periods (Damm, 1980; Hamed and Mannering, 1993; Bhat and Koppelman, 1993; Bhat and Singh, 2000). Transport use is mainly determined by mode availability and the desire to travel. Mode availability is important to household travel and activity decisions as discussed below.

5.3.1 Car availability

The ownership and use of a car provides an opportunity for individuals and households to satisfy their need for mobility. Households and individuals acquire a car in order to increase their mobility. Passwell and Recker (1978: 6) state “that the acquisition of the first car has a more significant impact on a household’s trip frequency than the addition of a second or third car does, and that the additional trips taken as the number of cars increases is attributed to an increase in the number of non-work trips.” They also add that “when people are in a position to have a car available, they travel more often” (Ibid).

5.3.1.1 During weekday daytime:

On the whole, car availability during weekday daytime for the age groups 20-29, 30-39, 40-49, 50-59 and 60+ is 17.1%, 39%, 30.5%, 11.4% and 1.95%, respectively. Therefore, there is a high car availability prevalence amongst the 30-39, and 40-49 age groups. Commuters were asked to rank, in order of regularity, how of the household car / bakkie, etc. available to the commuter for personal use as a driver or passenger (rank from 1 to

4, with 1 = always and 4 = never). Of those in the age group 30-39 who have indicated that they have a car available during weekday daytime, they always have a car available 42.9% of the time and the 40-49 age group have indicated that this frequency is always 34.5%. The average car availability between the gender groups is roughly split equally. Of those with access to a car, males have indicated that they have a car available 53% of the time, compared to females at 47% of the time. Car availability for females deteriorates to 66.7% at the other end of the spectrum (car never available), whilst that of males is marginal at 33.3%. These figures seem rather high relative to the low proportion (22.7%) of commuters who actually own cars. Passwell and Recker (1978: 6) state succinctly that “[t]he fact that people who do not own cars and yet do not have public transportation readily available travel more suggests that the lack of transit accessibility may produce a greater dependence on cars from other sources. This indicates that one does not need to own a car to be dependent upon it, one needs only to have a car available.”

5.3.1.2 During weekday -- evenings:

On the whole, car availability during weekday evenings for the age groups 20-29, 30-39, 40-49, 50-59 and 60+ is 17.2%, 40.4%, 29.3%, 11.1% and 2%, respectively. These figures are very close to those indicated above for car availability during weekday daytime. Commuters were asked to rank, in order of regularity, how often the household car / bakkie, etc. available to the commuter for personal use as a driver or passenger (rank from 1 to 4, with 1 = always and 4 = never). Again, there is high car availability prevalence amongst the 30-39, and 40-49 age groups. Of those in the age group 30-39, 40.4% indicated that they have a car available during weekday evenings, and the 40-49 age group have indicated that this frequency is always 29.3%. Of those with access to a car, males have indicated that they have a car available always at 56.5% of the time, compared to females at 43.5% of the time. Car availability for females deteriorates to 100% at the other end of the spectrum (car never available), whilst that of males is 0%.

5.3.1.3 During Saturday:

On the whole, car availability during Saturday for the age groups 20-29, 30-39, 40-49, 50-59 and 60+ is 18.4%, 39.8%, 28.2%, 11.7% and 1.9% respectively. Commuters were asked to rank, in order of regularity, how of the

household car / bakkie, etc. available to the commuter for personal use as a driver or passenger (rank from 1 to 4, with 1 = always and 4 = never). There is also high car availability prevalence amongst the 30-39, and 40-49 age groups. Of those in the age group 30-39, 39.8% indicated that they have a car available during Saturdays, and the 40-49 age group have indicated that this frequency is always 28.2%. The average availability between the males and females is closely split in half. Of those who always have access to a car, 58% males indicated that they have a car available all of the time, compared to females at 42% of the time.

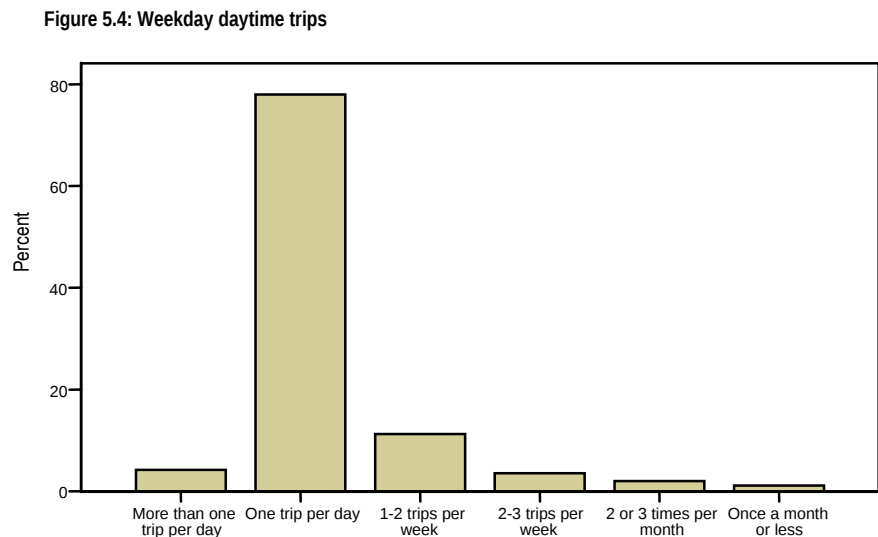
5.3.1.4 During Sunday:

On the whole, car availability on Sundays for the age groups 20-29, 30-39, 40-49, 50-59 and 60+ is 16.8%, 40.6%, 29.7%, 10.9% and 2%, respectively. Here too, car availability prevalence is high amongst the 30-39 and 40-49 age groups. Commuters were asked to rank, in order of regularity, how of the household car / bakkie, etc. available to the commuter for personal use as a driver or passenger (rank from 1 to 4, with 1 = always and 4 = never). Of those in the age group 30-39 who have indicated that they have a car available during Sundays, 43.3% they have a car available all of the time and the 40-49 age group have indicated that this frequency is always 31.3%. The average availability between the males and females is closely split in half. Of those with access to a car, males have indicated that they have a car available always at 56.1% of the time, compared to females at 43.9% of the time. Car availability for females deteriorates to 66.7% at the other end of the spectrum (car never available), whilst that of males is marginal at 33.3%.

5.3.2 Trip frequency

Pas and Koppelman (1986) have conducted studies on the trip frequency of commuters during morning and evening periods. They found that there is a great deal of intrapersonal variability across weekdays and substantial day-to-day variations when considering entire activity-travel patterns. It is evident from Figure 5.4 that at least 77.8 % of commuters make one return trip per day during weekday daytime. The number of those who make more than one return trip per day is substantially lower at 4.2%. Only a marginal number of commuters (1.2%) indicated that they make a trip once a month or less. Of those commuters who indicated that they make at least one return trip during weekday daytime, the most prevalent mode of transport used is a

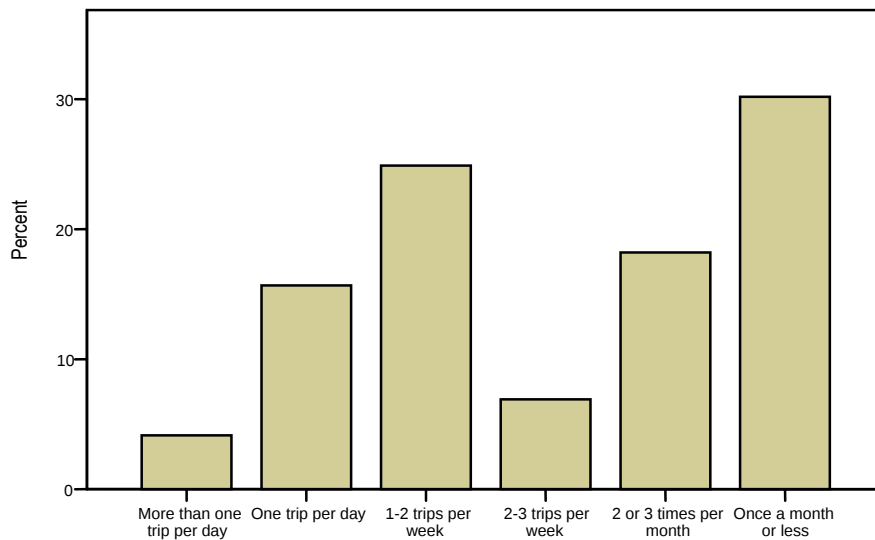
minibus taxi (75.8%), followed by a family-owned vehicle (18.2%). Surprisingly, the use of a train service and walking on foot is very marginal, standing at 0.2% and 3.3% respectively. In addition to the above, on the whole, at least 70.1% of the commuters indicated that despite the use of a minibus taxi during weekday daytime, access to a car is always available and 13.4% indicated that it is often available.



It is evident from Figure 5.5 that the figures for evening trips are markedly different from those made during the day - only 14.9% of commuters make one return trip per evening and only 4% make more than one return trip per evening. This could be an indication that fewer commuters work night-shift, and those that do travel might be avoiding the afternoon peak period and travel later during the evening. The afternoon peak periods in major urban centres are very busy and uncomfortable to drive in. At least 28.8% of commuters indicated that they make an evening trip once a month or less. This could be an indication that they are taking trips to attend evening meetings, go shopping, for recreational purposes, to take night classes and possibly for the delivery of work merchandise. Of those commuters who indicated that they make at least one trip during weekday evenings, the most prevalent mode of transport used is walking on foot (80.2%), followed by a family-owned vehicle (10.5%). Surprisingly, the use of a train service and a minibus taxi is very marginal at this time, standing at 0.2% and 3.1%, respectively. Commuters were asked to rank, in order of regularity, how often the household car / bakkie, etc. available to the commuter for personal use as a driver or passenger (rank from 1 to 4, with 1 = always and 4 = never). At least 80.6% of commuters indicated that despite the use of a minibus taxi during

weekday evenings, of a car is always available (either a family-owned car, or from neighbours and relatives) and 7.8% indicated that it is often available. In addition to the above and in terms of ranking, at least 72.3% of the commuters indicated that despite the use of walking on foot during weekday evenings, access to a car is always available and 11.7% indicated that it is often available.

Figure 5.5: Weekday evenings trips?



The figures for trip frequencies for Saturday and Sunday for one return trip per day stand at 38.9% and 52.7% respectively. Of those commuters who indicated that they make at least one return trip during Saturday, the most prevalent mode of transport used is a minibus taxi (50.3%), followed by walking on foot (27.5%). The use of a family owned vehicle is a close third (17.8%). None of the commuters indicated that they used any train services during Saturdays. With regards to Sundays, the most prevalent mode of transport is walking on foot (72.5%), followed by the use of a family owned vehicle (18.5%). The use of a minibus taxi is very low and stands at 5.9%. As with trips undertaken on Saturdays, none of the commuters indicated that they use the train services during Sunday. Of the commuters, 70.1% indicated that despite the use of a minibus taxi during Saturdays, access to a car is always available and 13.4% indicated that it is often available. Commuters were asked to rank, in order of regularity, how often the household car / bakkie, etc. available to the commuter for personal use as a driver or passenger (rank from 1 to 4, with 1 = always and 4 = never). At least 80.6% of the

commuters indicated that despite the use of walking on foot during Sunday, access to a car is always available and 7.8% indicated that it is often available.

5.3.2.1 Number of trips going to work or looking for work:

At least 69.4% of commuters indicated that they make at least five trips during weekday daytimes, either going to work or looking for work, of which 43.5% are male and 56.5% are female. Only 16.7% of commuters do not undertake this activity. This could be attributable to commuters who are visiting the Unemployment Insurance Fund (UIF) to collect and register for their unemployment benefits. This usually is a tedious process and requires an individual to travel many times to the offices of the Department of Labour. A person who claims these benefits needs to indicate whether they are still unemployed and that they have been actively looking for work (except for females who may be temporally unemployed due to maternity leave who have claimed the UIF benefits). Of the total number of evening trips, a total of 94.4% are not for the purposes of looking for work or going to work. The proportion of concomitant commuters for Saturday and Sunday is 78.4% and 97.5% respectively.

5.3.2.2 Number of trips devoted to educational matters:

Few commuters make use of transport for educational purposes. At least 90.1% of commuters indicated that they do not perform trips during weekday daytime for educational purposes. This figure increases for trips during weekday evenings, Saturdays and Sundays to an average of 99.5%. The gender split is almost evenly spread between males and females. This is also reflected amongst all the age groups. However, of the respondents who indicated that educational matters are their most important journey, 28.6% are female and 71.4% are male. The lack of travel for educational purposes could be attributable to the fact that most people in townships drop out before tertiary education due to financial difficulties associated with fees, transport costs, and the opportunity cost of education, as compared to having gainful employment to help take care of their families. In addition, adult education is not readily available in townships: hence people have to attend adult education in traditional white towns. Undoubtedly transport costs play as a significant barrier towards accessing not only education opportunities, also other socio-economic opportunities.

5.3.2.3 Number of trips devoted to grocery shopping:

It is evident from Table 5.4 below that the proportion of grocery shopping trips undertaken during weekday daytime is negligible (5.9%). Both males and females have an almost evenly split on this type of activity during weekday daytime. The spread amongst the age groups is also evenly split. The low shopping activity during weekday daytime could be attributable to poor access to car-orientated establishments such as shopping malls (which are located outside traditional black townships) and the poor availability of public transport to such locations (at least 44.3% of commuters indicated that the top destination to which they were unable to go to due to a lack of transport is the Kagiso Mall (located on the edge of Kagiso Township)). In addition, to the previous explanation, the desire instead to conduct shopping as a family (this is usually a township practice) on weekends could also be attributable to low shopping activity during weekday daytime. During weekday daytime, most family members are engaged in other activities (such as schooling, work, sport, etc.) and would not be available to carry the load (most shopping is done in bulk, hence the need to involve most family members).

Table 5.4: Percentage of trips on grocery shopping during weekday daytime by Gender

			Gender		Total
			Male	Female	
% of trips on grocery shopping during weekday daytime	No. of trips	0	94.7%	93.7%	94.1%
	No. of trips	1	5.3%	6.3%	5.9%

In terms of Table 5.5, the figures for grocery shopping during weekday evenings show some interesting patterns. The percentage of trips conducted is 43% of all commuters. At least 35.6% of commuters indicated that they go grocery shopping at least once, whilst 7.2% of commuters indicated that they go grocery shopping at least twice during weekday evenings. Within the male gender category, at least 32.3% conducted this activity compared to 38% of females.

Table 5.5: Percentage of trips on grocery shopping during weekday evenings by Gender

			Gender		Total
			Male	Female	
% of trips on grocery shopping during weekday evenings	No. of trips	0	60.8%	54.1%	57.0%
	No. of trips	1	32.3%	38.0%	35.6%
	No. of trips	2	6.9%	7.5%	7.2%
	No. of trips	7	.0%	.4%	.2%

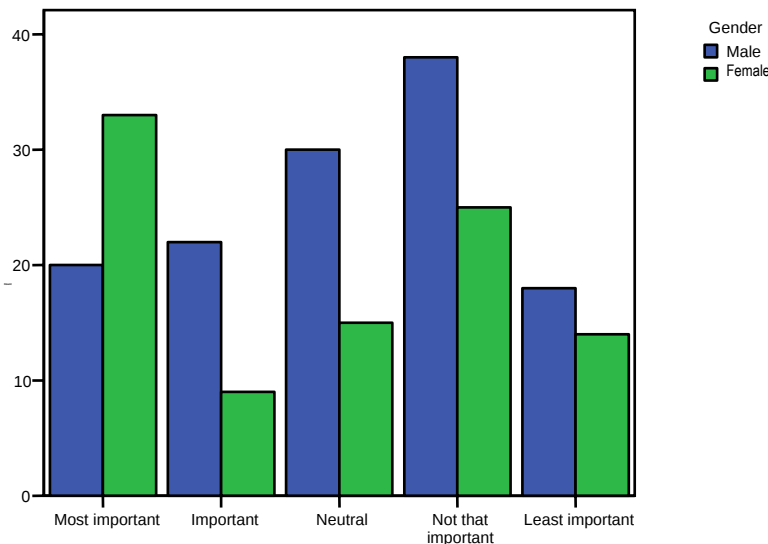
Amongst both gender groups, there is a lot of shopping activity undertaken on Saturdays. At least 81.1% of commuters indicated that they make one grocery shopping trip per Saturday. The figures for Sunday indicate that only 2.9% of all commuters commute to shops on that day. Of those commuters who indicated that grocery shopping is the most important journey, 76.6% are female and 23.4% are male. Bhat and Singh (2000) have developed an operational analytical framework for the workday activity travel pattern of an individual. Their “results indicate the strong effects of socio-economic variables, residential/workplace location characteristics, work schedule characteristics, and level-of-service measures on evening commute mode choice and number of stops during the evening commute/post home-arrival periods” Bhat and Singh (2002: 22). They found that a small proportion of individuals make stops for social-recreational and shopping purposes during weekday daytimes and close to half of the evening commutes are made for social-recreational and shopping purposes. With regards to weekday daytime and weekday evening commutes, the figures for Kagiso Township follow the same pattern as those indicated by the authors.

5.3.2.4 Number of trips devoted to other activities:

The proportion (within the relevant activity) of trips during weekday daytime spent going to school, visiting friends, on social activities, sport and recreation, and church are negligible: they are 11.9%, 5.4%, 0.5%, 0.2% and 0.9%, respectively. The figures for weekday evenings are more worthy of note. The proportion (within the relevant activity) of trips during weekday evenings spent going to school, visiting friends, on social activities, sport and recreation, and church are less negligible: they are 12.8%, 62.6%, 5.7%, 29.7% and 14.5%, respectively. The figures above are not surprising as most commuters would be either going to work or looking for work during weekday daytime. In the evening, time is available to do other activities as indicated above. The proportion of commuters who indicated that they do not generate trips during Saturdays (within the relevant activity) for the following activities are: going to school (99.5%), visiting friends (11.7%), on social activities (43%), sport and recreation 74.1% and church (88.7%). The proportion of commuters who indicated that they do not generate trips during Sundays (within the relevant activity) for the following activities are: going to school (99.8%), visiting friends (34.5%), on social activities (70.3%), sport and recreation (99.1%), and church

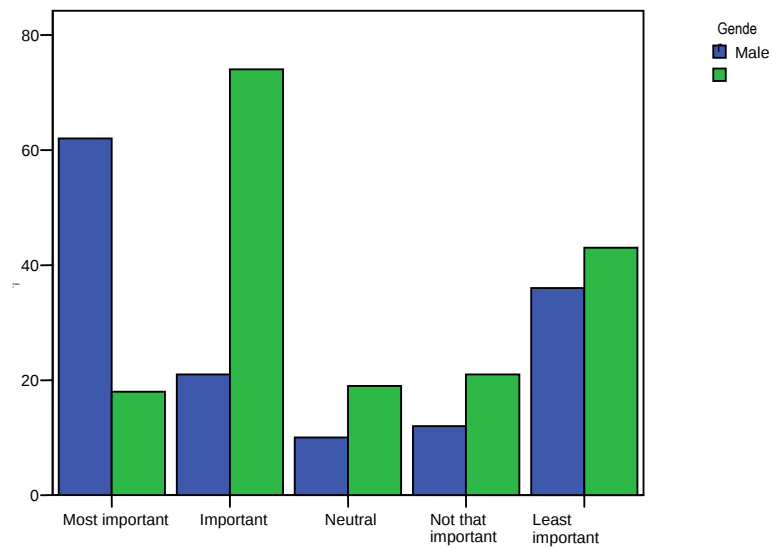
(16.5%). Commuters were asked to rank, in order of importance, the next most important journey other than work they regularly make (rank from 1 to 5, with 1 = most important and 5 = least important). It is evident from Figure 5.6 that of the 23.7% of commuters who indicated that sport and recreation is the most important journey, 62.3% are female and 37.7% male. In general, sport and recreation in townships is thought to be an activity of males. These latter figures debunk this general rule, which could be attributable to various factors:

Figure 5.6: Sport and recreation journeys



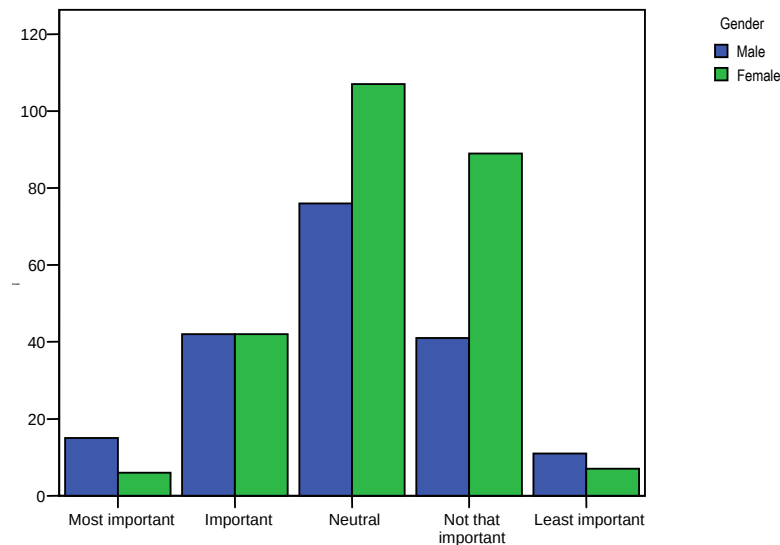
Firstly, the MCLM has been rigorously promoting sports by building sporting facilities in Kagiso Township. Tennis, cricket, swimming, soccer and basket ball facilities have been developed and / or renovated. In addition, the community hall has been maintained to a satisfactory level. These factors could have induced more females to participate in sport. Another factor that could also promote sport amongst women is the general access to and security of these facilities. They are all centrally located (with good access from a transport standpoint) next to the Kagiso Police Station and the whole sporting complex is well lit at night and very visible from the street. The Social Exclusion Unit (2002) has found that poor transport can affect people's participation in a range of activities, including sports and recreation. By being centrally located, these facilities promote social inclusion.

Figure 5.7: Non food shopping journeys



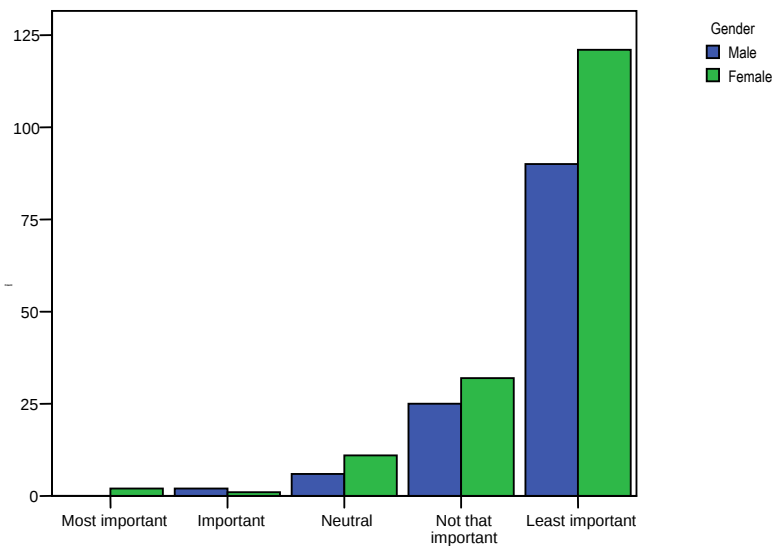
It is evident from Figure 5.7 that of the 25.3% of commuters who indicated that non-food shopping is the most important journey, 22.5% are female and 77.5% male.

Figure 5.8: Visiting friends journeys



It is evident from Figure 5.8 that of the 4.8% of commuters who indicated that visiting friends is the most important journey, 28.6% are female and 71.4% are male. The findings for those commuters who indicated that visiting loved ones in hospital is the most important journey, 100% are female and 0% is male. It should, however, be noted that only two female indicated this and no males.

Figure 5.9: Leisure most journeys



The figure for the category of leisure as the most important journey is similar to the hospital journey findings as indicated in Figure 5.9. The majority of commuters indicated that visiting loved ones in hospital was their least important journey. The findings are 84.6% female and 15.4% male, within the least important journey category. Spending time on leisure activities seems not to be a priority. This may be due to other factors such as household the performance of household chores after work or other activities such as grocery shopping in the evenings(as indicated above). Females also find going on leisure journeys as least important (57.3%), compared to their male counterparts (42.7%).

5.4 Current and future mobility requirements

An inclusive and sustainable transport system is one that meets current and future transport needs. It is available, affordable and accessible to passengers (Sinclair and Sinclair, 2001). In addition, it is integrated with other strategic issues such as the environment, local economic development, land use and, a more recent addition, with social inclusion. Current mobility requirements must not jeopardise the future use of the infrastructure for forthcoming generations. The assessment of current needs entails the use of surveys and forecasting models to determine availability, affordability, accessibility problems and travel demand requirements. These surveys are usually expensive and require specialist expertise and tools to decipher the

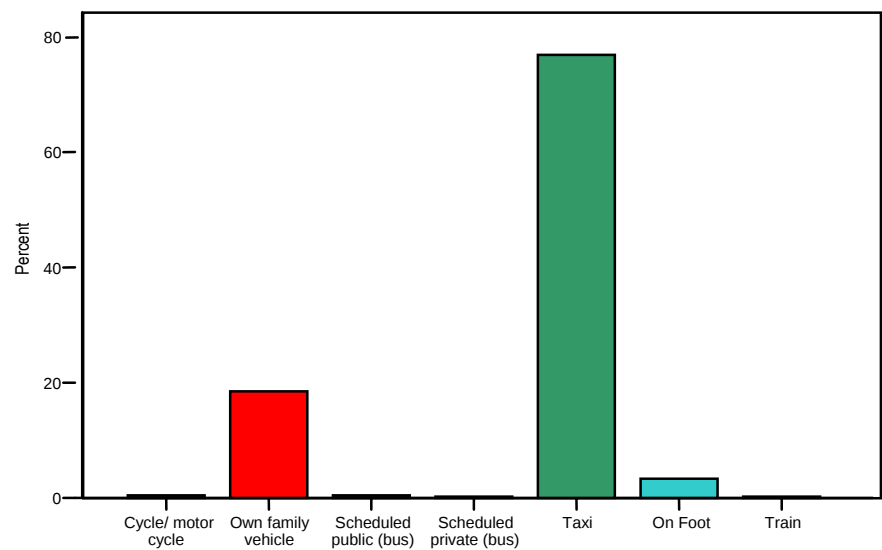
complex data that is generated. In the light of the latter constraints and for the purposes of this study, Bussière and Rice’s (1999) simplified travel demand forecasting model was used for the development of travel forecasts for future mobility requirements. This model is very useful for “the estimation of urban travel demands, within a structure that is directly responsive to the changing socio-demographic profile of expanding urban areas” (Bussière and Rice’s, 1999: 1). Estimation for the next three future years is done with the data that has been gathered in Kagiso Township. The base year for the forecast is 2004.

5.4.1 Current mobility requirements

5.4.1.1 Availability:

The propensity and want to travel is dependent on the availability of transport modes. The most available transport mode during weekday daytime is the minibus taxi. Figure 5.10 indicates that the most prevalent modes are the minibus taxi (76.8%), family-owned vehicle (18.5%) and walking (3.3%). Surprisingly, rail stands at 0.2%. The remaining balance of modes is insignificant.

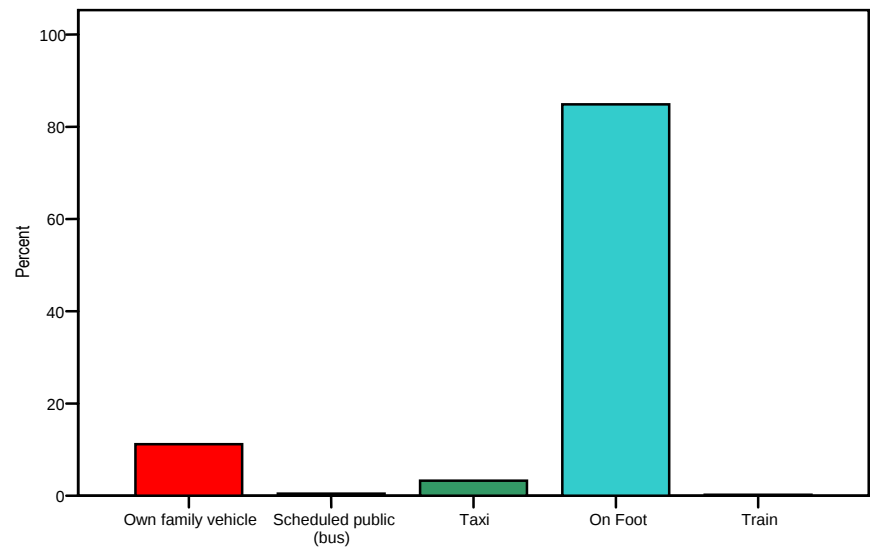
Figure 5.10: Mode choice during weekday daytime



Surprisingly, the most available transport mode during weekday evenings is movement on foot. Figure 5.11 indicates that the most prevalent modes are walking (84.9%), family-owned vehicle (11.2%) and minibus taxi

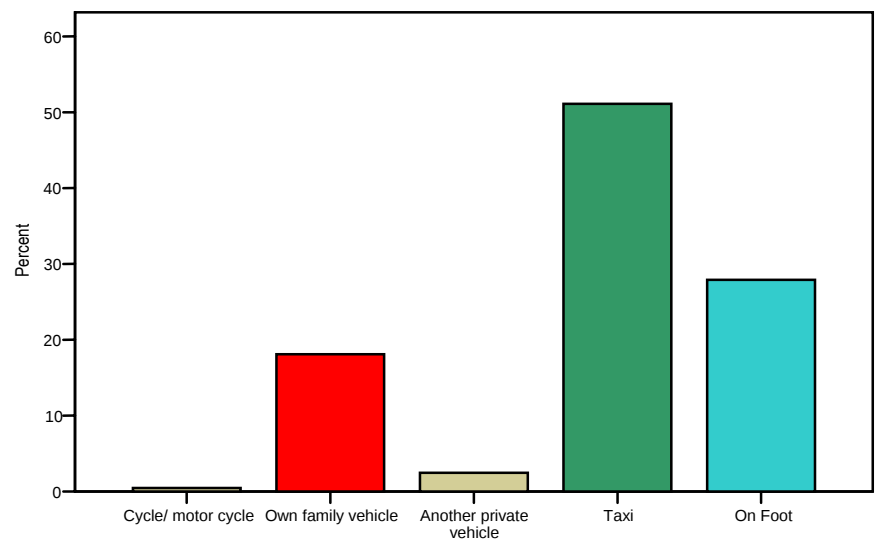
(3.3%). The figure for rail still stands at 0.2%. In this section key details regarding the requirements, transport use and perceptions of commuters are outlined before proceeding to an application of the model.

Figure 5.11: Mode choice during weekday evenings



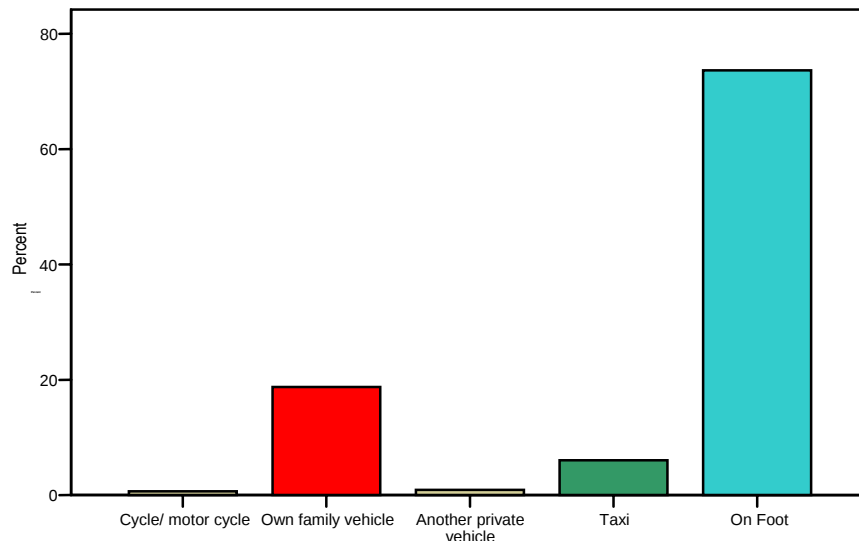
The most available transport mode during Saturdays is the minibus taxi. Figure 5.12 indicates that the most prevalent modes are the minibus taxi (51.1%), walking (27.9%) and family-owned vehicle (18.1%). No rail is used on Saturdays. The remaining balance of modes is insignificant.

Figure 5.12: Mode choice during Saturdays



The most available transport mode during Sundays is walking. Figure 5.13 indicates that the most prevalent modes are: walking (73.7%), family-owned vehicle (18.8%) and the minibus taxi (6%). No rail is used on Sundays. The remaining balance of modes is insignificant.

Figure 5.13: Mode choice during Sundays



The inevitable conclusion is that the minibus taxi and walking modes are the most widely available modes in Kagiso Township. Rail plays an insignificant role on the lives of commuters of Kagiso Township. The policy implications are that the MCLM should consider enhancing the pavement system and pedestrian facilities (i.e. benches, greening the township, signage, etc.) in Kagiso Township, as many commuters and residents are taking advantage of the walking transport mode. The street lighting systems should also be enhanced, as should the safety and security measures that are currently in place in Kagiso Township. The Metro Rail service should also consider having a train service to Kagiso Township, rather than commuters having to travel to Luipaardsvlei (± 10 kilometres away from Kagiso Township) to catch a train. This could possibly improve the usage of the rail system.

5.4.1.2 Affordability:

There are two types of problems which commuters often face: they are accessibility to a destination, because of a lack of transport to that destination and affordability. The former will be dealt with in the next subsection.

The spatial planning of the apartheid government isolated Kagiso Township from the closest centres of socio-economic opportunities (i.e. Krugersdorp). This isolation to the periphery of urban development resulted in unaffordable transport costs being imposed on those who wish to travel to attain these opportunities. Commuters were asked to rank to what extent cost will affect their willingness to use any type of new local transport service. At least 63.7% of commuters indicated that cost will greatly affect their willingness to use a new local transport service. Only 22.7% of commuters indicated that cost will not have any bearing on their willingness to use a new transport service. Of those who indicated that cost will greatly affect their willingness to use a new local transport, 58.9% were female and 41.1% male. Surprisingly, the inverse is true with regards to commuters who indicated that cost will not have very much a bearing on their willingness to use a new transport, and it was 53.3% females and 46.3% males. It is evident from Table 5.6 that, on average, commuters indicated how much they currently are paying as opposed to how much they are prepared to pay for the following destinations (see Figure 5.14):

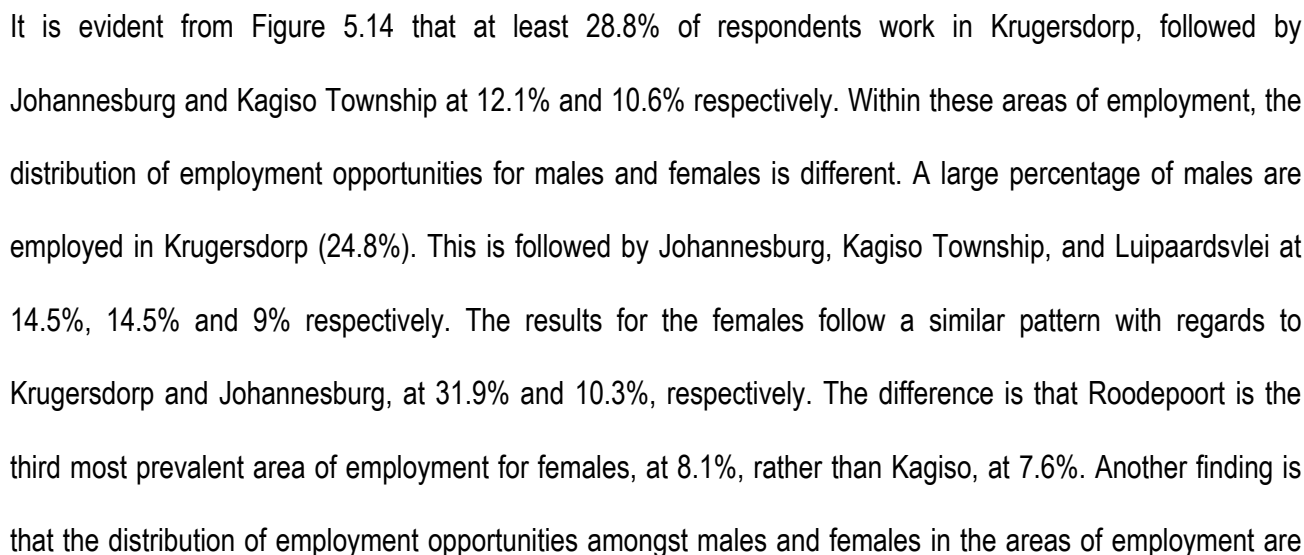
Table 5.6: Destinations and costs

Destination	Average cost	Standard deviation
Krugersdorp	R3.75	0.50
Luipaardsvlei	R3.24	0.59
Johannesburg	R6.35	0.82
Soweto	R5.57	1.49
Leratong hospital / Azaadville	R2.76	0.4
Randfontein / Westonaria / Carletonville	R5.46	2.04
Magaliesburg / Rustenburg	R23.31	11.51
Roodepoort	R4.51	2.42
Muldersdrift	R5.65	2.26
Other	R2.20	2.30

The responses from the commuters indicate that they are very elastic (sensitive) to cost changes. Hence, any transport system that could possibly be introduced in the future in Kagiso Township (i.e. a bus service and / or direct rail link) would need to be sensitive to these views. It is surprising that out of 16 issues (these issues are fully discussed in subsection 5.4.1.4) that commuters raised on local transport issues, rail was not mentioned at all. This confirms that rail is currently not playing a significant role in the transport needs of commuters of Kagiso Township. This is also confirmed by the low usage of rail (0.2%) on weekdays and the non-usage of rail

5.4.1.3 Accessibility of destinations:

Figure 5.14: Employment destinations

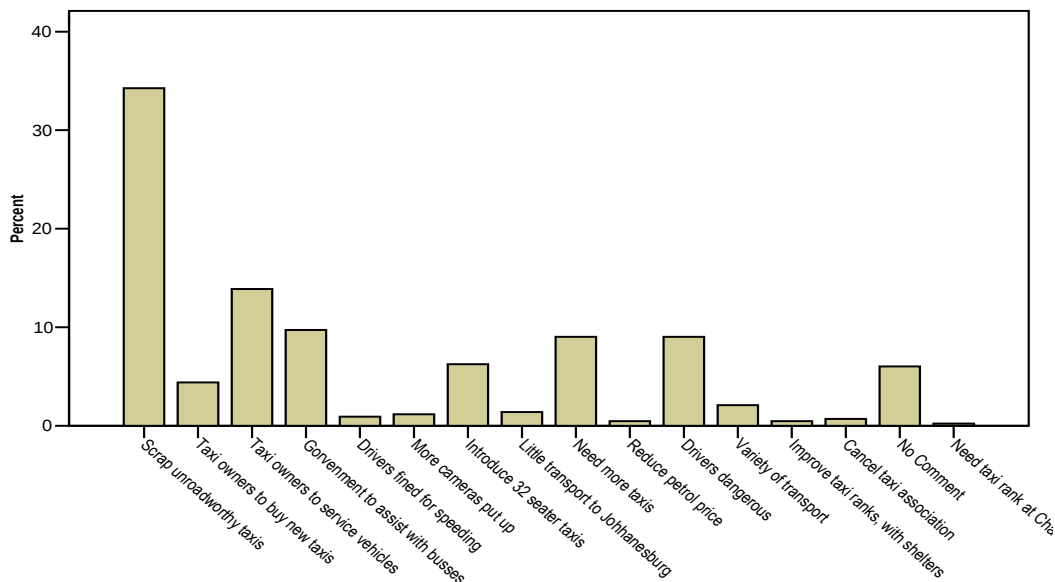


not similar. One of the concerns for commuters is that there is only limited transport to Johannesburg. The findings of the research also indicate that the average time it takes to commute to work is 23.59 minutes with a standard deviation of 23.85.

5.4.1.4 Acceptability:

Figure 5.15 illustrates the comments received from commuters regarding local transport services in Kagiso Township. They vary from the perceived need to scrap unroadworthy vehicles to the creation of a new taxi rank in Chamdor Industrial Township. A sizeable proportion of commuters (34.3%) indicated that all unroadworthy minibus taxis should be scrapped, followed by the comment that minibus taxi owners should service their vehicles regularly. These comments related to safety concerns held by commuters. Undoubtedly, most of the minibus taxis in Kagiso Township are very old and need urgent replacement due to their physical condition. At least 80.1% of commuters indicated that the safety levels of minibus taxis in Kagiso Township are below standard. In addition, issues of law enforcement, such as dangerous driving, minibus taxi drivers being fined for speeding and more security cameras being put up, are critical issues for commuters.

Figure 5.15: Comments regarding current local transport services



Government intervention is expected by at least 9.7% of the commuters to assist in the re-introduction of a bus service. The bus service was discontinued during the height of the anti-apartheid struggle and due to

continuing riots. Currently, there is no bus service in operation: not, even Learner Transport (as provided by the Gauteng Department of Education) for primary and high school children. The latter transport service is mainly provided in rural and peri-urban areas of the WRDM. The two other equally ranked issues that require attention are the need for more minibus taxis to be introduced, due to a shortage of roadworthy minibus taxis, and that the price of petrol should be decreased because it causes escalating transport costs, despite the surplus of minibus taxis in Kagiso Township. The government's programme of introducing a 32-seater taxi model was also raised as something that needs to be expedited – 6.3% of the commuters raised this issue (mainly as part of replenishing the ageing local minibus taxi fleet). In addition to the above perceptions of commuters on a variety of transport issues, several cross tabulations were done, which are discussed below. Commuters were asked to rank, in order of level of standard (rank from 1 to 4, with 1 = below standard and 4 = excellent standard), their evaluation of several factors that affect accessibility, such as safety levels, quality of transport facilities and hygienic standards.

5.4.1.4.1 Cross tabulation of transport mode and hygienic standards

At least 72.6% of commuters have indicated that transport modes have a hygienic standard that is below what is acceptable. The breakdown amongst the gender groups who indicated that the hygienic standard is below expectations is: 69.7% male and 74.8% female. Table 5.7 elucidates the figures per gender group. These hygienic standards relate mainly to the cleanliness and hygiene of minibus taxis and the personal hygiene of some minibus taxi drivers. Smoking is not allowed in minibus taxis: however, the emissions from exhausts and dust cause a breathing nuisance for passengers, as most minibus taxis have poor ventilation systems (i.e. the absence of air-conditioning systems and proper windows that can shut when required).

Table 5.7: Hygienic standard of transport mode by Gender

			Gender		Total
			Male	Female	
Hygienic standard of transport mode	Below standard	No.	131	190	321
		% within Gender	69.7%	74.8%	72.6%
	Adequate standard	No.	56	62	118
		% within Gender	29.8%	24.4%	26.7%
	High standard	No.	1	2	3
		% within Gender	.5%	.8%	.7%

5.4.1.4.2 Cross tabulation of transport mode and safety levels:

At least 79.6% of commuters have indicated that the safety levels of transport modes are below standard. The breakdown amongst the gender groups who indicated that the safety levels are below standard is: 78.7% male and 80.3% female. Only 26.7% of all commuters indicated that the safety levels of transport modes are of an adequate standard. The trend amongst males and females is the same, at 27.5% and 24.7%, respectively. Table 5.8 details these findings:

Table 5.8: Safety levels of transport mode by Gender

			Gender		Total
			Male	Female	
Safety levels for transport mode	Below standard	No.	148	204	352
		% within Gender	78.7%	80.3%	79.6%
	Adequate standard	No.	39	48	87
		% within Gender	20.7%	18.9%	19.7%
	High standard	No.	1	1	2
		% within Gender	.5%	.4%	.5%
	Excellent standard	No.	0	1	1
		% within Gender	.0%	.4%	.2%

5.4.1.4.3 Cross tabulation of transport mode and the quality of transport facilities:

At least 73% of commuters have indicated that the quality of transport facilities is below standard. Table 5.9 lists the figures per gender group:

Table 5.9: Quality of transport facilities by Gender

			Gender		Total
			Male	Female	
Quality of transport facilities	Below standard	No.	134	190	324
		% within Gender	70.9%	74.5%	73.0%
	Adequate standard	No.	52	63	115
		% within Gender	27.5%	24.7%	25.9%
	High standard	No.	2	2	4
		% within Gender	1.1%	.8%	.9%
	Excellent standard	No.	1	0	1
		% within Gender	.5%	.0%	.2%

The breakdown amongst the gender groups who indicated that the facilities are below standard is: 70.9% male and 74.5% female. Only 25.9% of commuters indicated that the transport facilities are of an adequate standard.

The trend amongst males and females stands the same, at 27.5% and 24.7%, respectively. The distribution of dissatisfaction with the quality of transport facilities amongst the age groups follows the same trend. These results are as outlined in Table 5.10:

Table 5.10: Quality of transport facilities by Age

			Age					Total
			20-29	30-39	40-49	50-59	60+	
Quality of transport facilities	Below standard	No.	81	128	85	29	10	333
		% within age group	69.2%	72.3%	76.6%	72.5%	100.0%	73.2%
	Adequate standard	No.	33	48	26	10	0	117
		% within age group	28.2%	27.1%	23.4%	25.0%	.0%	25.7%
	High standard	No.	3	1	0	0	0	4
		% within age group	2.6%	.6%	.0%	.0%	.0%	.9%
	Excellent standard	No.	0	0	0	1	0	1
		% within age group	.0%	.0%	.0%	2.5%	.0%	.2%

Only a very small proportion (0.2%) of commuters indicated that the quality of transport facilities is excellent. The quality of transport facilities mainly relates to the cleanliness of minibus taxi ranks and unregulated hawker activities which inconvenience commuters.

5.4.1.4.4 Cross tabulation of the quality of transport facilities and hygienic standards:

It is evident from Table 5.11 that at least 73.1% of commuters of Kagiso Township have indicated that the quality of transport facilities is below standard. Of those who had indicated that the quality of transport facilities are below standard, 88.5% have indicated that the hygienic standards of the transport modes (minibus taxis and rail) are also below standard.

Table 5.11: Quality of transport facilities by Hygienic standard of transport mode

			Hygienic standard of transport mode			Total
			Below standard	Adequate standard	High standard	
Quality of transport facilities	Below standard	% within Hygienic standard of transport mode	88.5%	32.5%	.0%	73.1%
	Adequate standard	% within Hygienic standard of transport mode	11.5%	65.8%	.0%	25.8%
	High standard	% within Hygienic standard of transport mode	.0%	.8%	100.0%	.9%
	Excellent standard	% within Hygienic standard of transport mode	.0%	.8%	.0%	.2%

On average only 25.8% of the commuters indicated that the quality of transport facilities is of an adequate standard. Of those who indicated that safety levels are adequate, 65.8% have indicated that the hygienic standards of the transport modes are also of an adequate standard.

5.4.1.4.5 Cross tabulation of safety levels of transport mode and hygienic standards:

It is evident from Table 5.12 that at least 80.1% of commuters of Kagiso Township have indicated that the safety levels of the local transport modes are below standard. Of those who had indicated that these safety levels are below standard, 96.4% have indicated that the hygienic standards of the transport modes are below standard.

Table 5.12: Safety levels of transport mode by Hygienic standard of transport mode

			Hygienic standard of transport mode			Total
			Below standard	Adequate standard	High standard	
Safety levels of transport mode	Below standard	% within Hygienic standard of transport mode	96.4%	37.5%	.0%	80.1%
	Adequate standard	% within Hygienic standard of transport mode	3.3%	62.5%	33.3%	19.2%
	High standard	% within Hygienic standard of transport mode	.0%	.0%	66.7%	.4%
	Excellent standard	% within Hygienic standard of transport mode	.3%	.0%	.0%	.2%

On average, only 19.2% of commuters indicated that the safety levels are of an adequate standard. Of those who indicated that these safety levels are adequate, 62.5% have indicated that the hygienic standards of the transport modes are also of an adequate standard.

5.4.2 *Future mobility requirements*

5.4.2.1 Mobility requirements of commuters:

The proportion of all commuters who intend buying a car for themselves or their family in the future is 56.2%, compared to 43.8% who indicated that they do not wish to acquire a car. The findings also indicate that only 17.1% of commuters who intend buying a car in the future have a full driving licence. Commuters who belong to households who have 3-4 members have a higher likelihood of acquiring a car. The findings also indicate that 54.7% of females intend buying a car for themselves or their family in the future, the figure for males is

56.6%. The results also show that 97.1% of females who intend buying a car for themselves or their families have an intention to change their current dominant mode of transport, the figure for males is 97.2%. The mean number of years for buying a car from the initial date of wanting a car for both gender groups is 1.94 years with a standard deviation of 2.21. It then takes between 4 to 5 years to pay-off the car. The three major purposes for buying a vehicle for females are: for going to work (31.3%), going to church (18.6%) and food and grocery shopping (14.7%). The findings for the males are: for going to work (31.5%), church (13.4%) and equally for visiting friends and sport and recreation (11%). At least 47.6% of commuters who indicated that they intend buying a car were currently unable to undertake certain trips due to a lack of transport. Only 22.5% of those who do not intend buying a car indicated that they are unable to undergo certain trips due to a lack of transport. The findings also show that 57.2% of females are unable to undergo certain trips due to a lack of transport. Surprisingly, at least 44.3% of commuters indicated that the top destination to which they were unable to go to due to a lack of transport is the Kagiso Mall (located on the edge of Kagiso Township), followed by Azaadville (a distance of 7 km away from the township) at 10.7%. A cross tabulation of commuters with long-term illness / disability, intention to buy a car and the ability to use normal public transport did not show any results of significance. This is because of the small number of people who have a long-term illness and / or a disability.

5.4.2.2 Estimation of travel demand:

Bussière and Rice's (1999) *Simplified Travel Demand Forecasting Model* was used for the development of urban travel demand forecasts. The projections thus generated were used to determine future resource and service demand for the study area. The model is described in Table 5.13. It uses socio-demographic variables to compute aggregate travel demand and is premised on the concept of travel as a function of one's own inherent characteristics and the characteristics of the transport alternatives which are available (Ibid). These inherent population characteristics are, *inter alia*, age, gender, family / individual status and economic status. Hence, the relationship between transport and socio-demographic characteristics are:

$$\text{Transport demand} = f(\text{population, transport behaviour})$$

$$\text{Transport behaviour} = f(\text{mobility, modal choice})$$

According to Bussière and Rice's (1999), the model is a direct trip generation model by mode and assumes the following form:

Table 5.13: Simplified Travel Demand Forecasting Model

$$\begin{aligned} D_m^{t+n} &= P^{t+n} \times \frac{D_m^t}{P^t} \\ &= P^{t+n} \times \frac{D^t}{P^t} \times \frac{D_m^t}{D^t} \quad 0 \quad (1) \end{aligned}$$

Where D_m^{t+n} = number of trips per day on mode m at future point in time $(t+n)$,

P^t = existing population at time t ,

P^{t+n} = future population at time $(t+n)$, and

D^t = total number of trips per day on all modes at time t .

As indicated, this model equation may be applied for any number of selected strata (age, sex, geographic region, socio-economic grouping), on the assumption that trip generation rates by mode differ for each stratum. Global travel demand, then, may be obtained by a simple summation of the desegregated demand, as follows:

$$D^{t+n} = \sum_{a=1}^k \sum_{m=1}^g \sum_{r=1}^h \sum_{s=1}^z D_{a,m,r,s}^{t+n} \quad 0 \quad (2)$$

Where D^{t+n} = total number of trips per day in year $(t+n)$

= number of trips per day by age, sex, mode and region

a = age group (from 1 to k)

m = mode of transport (from 1 to g)

r = geographic region , socio-economic strata (from 1 to h)

s = sex (male (1), female (2))

t = calendar year

n = period of projection in years

Source: Bussière and Rice (1999:4)

The primary focus of the model is the relationship between socio-demographic characteristics and travel behaviour (Ibid). For detailed calculations see Appendix D. With regards determining the appropriate study area variables to apply in the model, a range of sources were consulted. The estimates on population

projections (which are exogenous to the model) for South Africa (U.S. Bureau of the Census International Data Base, 2000; Statistics South Africa, 2001) and the distribution of age groups in Gauteng Province (Statistics South Africa, 2001) were used as inputs for the travel demand forecasts for Kagiso Township. The estimates on population projections are as follows (see Table 5.14):

Table 5.14: Population estimates and projections

	2004	2005	2006	2007	2008
Kagiso Township	113837	113177	112317	111328	110215

The population figure for the 13 municipal wards of Kagiso Township at the end of 2001 was 114180 people (Statistics South Africa, 2001). The U.S. Bureau of the Census International Data Base population projections have been used to calculate the 2004-2008 population figures by using the Statistics South Africa (2001) population figures as a base year, and the results are those elucidated in Table 5.14. The projections indicate that the population figures are projected to assume a percentage change of 0.14%, -0.1%, -0.34%, -0.58%, -0.76%, -0.88%, and -1% for the years 2002, 2003, 2004, 2005, 2006, 2007 and 2008, respectively. The slight decline in population would have an impact on transport demand. Surprisingly, transport authorities would be expected to plan for a reduced population, which brings about its own dynamics. The distribution of age groups for Kagiso Township are not readily available: however, the age distribution rates of Gauteng Province (in which Kagiso Township is located) as per Statistics South Africa (2001), were utilized in the modelling of the travel demand forecasts for Kagiso Township (Table 5.15):

Table 5.15: Age group distribution, Gauteng Province

Age group	Population estimates	% distribution
0-19	2839191.00	32.13%
20-29	2022207.00	22.88%
30-39	1650846.00	18.68%
40-49	1148160.00	12.99%
50-59	632250.00	7.15%
60+	544523.00	6.16%

Source: Statistics South Africa (2001)

Therefore, the numbers of trips (D_m^{t+n}) per day on mode m for the year 2004 (assuming a mobility and mode usage rates of 1 per capita for all age groups) are as indicated in Table 5.16, assuming a percentage unemployed of 51.5% for the population of Kagiso Township (see Table 5.2). No origin-destination surveys

were conducted, hence, a mobility and mode usage rates of 1 per capita for all age groups was assumed. These surveys require that at least three years of data be collected in order for the data to present a meaningful basis for analysis. Ideally, the traffic counting measures should be permanent in order to calculate day-to-day and seasonal variations. The percentage of the unemployed is not the unemployment rate, rather it is percentage unemployed of the entire working age population of Kagiso Township. D_m^{t+n} is divided into 5 age groups. The age structures of the travellers are fundamental to the model, in view of the fact that age reflects the cycle of life and the travel habits associated with it (Bussière, 1992). Each individual D_m^{t+n} is summed up ($\sum_{a=1}^k \sum_{m=1}^g \sum_{r=1}^h \sum_{s=1}^z D_{a,m,r,s}^{t+n}$) to form a total desegregated travel demand (D^{t+n}) of 39404 trips per day in 2004. This travel demand excludes long-term inward and outward migration patterns to Kagiso Township (which are mainly as a result of the decline in the mining activity in Krugersdorp and the growth of the residential market).

Table 5.16: Modal and age distribution of trips (2004)

Age group	Cycle / motor cycle	Own Family Vehicle	Another Private vehicle	Scheduled public Bus	Scheduled private Bus	School Bus	Taxi	On Foot	Train	Other
20-29	115	1145	0	0	115	0	11911	0	0	0
30-39	62	2169	0	62	0	0	8119	434	0	0
40-49	0	2007	0	69	0	0	5121	277	69	0
50-59	0	852	0	0	0	0	3089	213	0	0
60+	0	358	0	0	0	0	2504	715	0	0
	177	6531	0	131	115	0	30743	1639	69	0

The mode choice amongst the age groups differs. For instance, only the 20-29 and 30-39 age groups use a cycle / motor cycle as a mode to commute. The 40-49 age group is the only group that noticeably uses rail for commuting (this does not mean that the other age groups do not from time to time utilize this mode). There is also a high prevalence of the age group 60+ commuting to work by foot. This could possibly mean that the latter age group works in and around Kagiso Township and / or Chamdor Industrial Township. It is evident from Table 5.16 that transport demand for a mode of transport is a function of mode choice by the different age groups and the level of mobility. Therefore the travel demand forecasts by transport mode for Kagiso Township for the three year period 2005 – 2007 are as indicated in Table 5.17:

Table 5.17: Age group distribution, Gauteng Province

	2005	2006	2007
Trip estimates by mode			
No. of trips - Cycle / motor cycle	175.48	174.14	173.93
No. of trips - Own family vehicle	6493.10	6443.76	6387.02
No. of trips - Another private vehicle	0.00	0.00	0.00
No. of trips - Scheduled public bus	130.41	129.42	128.28
No. of trips - Scheduled public bus	113.86	113.00	112.00
No. of trips - School bus	0.00	0.00	0.00
No. of trips – Taxi	30564.77	30332.52	30065.43
No. of trips – On foot	1629.59	1617.21	1602.97
No. of trips – Train	68.80	68.28	67.68
No. of trips – Other	0.00	0.00	0.00
TOTAL	39176.01	38878.33	38537.31

It is evident from Table 5.17 that the number of trips per day in each year (2005-2007) will decline; hence, overall transport demand in Kagiso Township is projected to be on a decline. There are possibly many reasons for this; one could conclude that a projected increase in Human Immune Virus / Acquired Immune Deficiency Syndrome (HIV / AIDS) prevalence and deaths is a key cause of this decline. Statistics South Africa (2004) indicates that the future life expectancy of African males will decline by 12 years and that of females by 9.5 years (from 2003 onwards). But it is not only adults who are affected and infected by HIV / AIDS, infants and babies born to infected parents may be infected through mother-to-child transmission. These babies (future commuters) have a current life expectancy of 6.3 years (Statistics South Africa, 2004), assuming that the child got infected at birth. Such evidence will inevitably have a direct impact on transport planning, as modal choice would definitely change amongst the growing, uninfected aging groups. A declining population does not automatically stimulate a reduction in demand. Transport demand is on the whole a product of a number of factors, and they are: population growth, internal and external migration, urban form, general economic conditions (employment opportunities), improved socio-economic conditions (rising incomes), and household size and structure, etc.

5.5 Conclusion

In this chapter the key findings of the commuter perspective have been presented and the socio-economic profile of commuters in Kagiso Township comprehensively illustrated. The socio-economic profile sheds light

on noteworthy features of commuters, such as their socio-economic characteristics (gender, employment, household size, and education), driver's licence possession and the use of a car, travel opportunities, and health status. With regards to gender, females are more disadvantaged than males in all aspects of socio-economic opportunities. This phenomenon is not surprising, given the patriarchal system prevalent in South Africa. With regards to the dominant travel patterns of commuters based on transport use, aspects such as car availability and trip frequency were investigated. The findings show that car availability is surprisingly high amongst the age groups, however, amongst the gender groups it is usually split equally. In addition, the findings show that trip frequency is very high amongst the survey respondents (77.8%). The most prevalent mode of transport for commuters is a minibus taxi (75.8%), followed by a family-owned vehicle. Other traditional modes of transport in Kagiso Township (i.e. rail) are not prevalent. There is only a marginal use of this latter mode (0.2%) and this has serious consequences for the sunken investment, which is underutilized. From a transport planning point of view, rail needs to be reassessed as a method of serving feeder townships in the West Rand, in particular Kagiso Township. Lastly, the chapter investigated the current and future mobility requirements of commuters of Kagiso Township. With regards to current mobility requirements, the finding on the availability of transport modes is that minibus taxis and walking modes are the most available modes in Kagiso Township. Rail plays an insignificant role. The findings show that commuters are elastic to cost changes. At least 67% of commuters indicated that cost will greatly affect their willingness to use a new local transport services. With regards to accessibility to destinations, commuters in Kagiso Township do not have a problem in accessing their desired destinations. According to commuter perceptions, the physical and environmental quality of transport facilities is below standard. This also includes the safety levels of the transport modes.

Bussière and Rice's (1999) *Simplified Travel Demand Forecasting Model* was used for the development of urban travel demand forecasts. The forecasts indicate the travel demand for Kagiso Township will decline in the next three years (2005-2007). This does not however mitigate the need to improve services.

CHAPTER 6

Findings: regulator and operator perspectives

6.1 Introduction

This chapter presents key findings from the operators of minibus taxis and regulators of transport (excluding bus and rail as indicated in Chapter 4). The aim of this chapter is to ascertain the *status quo* with regards to both regulator and operator activities by highlighting the shortcomings (problems, deficiencies and issues) in the current transportation network. In addition, a comparison of the commuter needs and the municipal plans is also presented. The Gautrans, the West Rand Metropolitan Transport Area (Wesmet) and, by proxy, the MCLM (as the latter is a statutory member of Wesmet) are the regulators of transport. Structured interviews were undertaken with officials of the MCLM. The interview sessions were meant to solicit the following information: the legislative framework governing transport planning and infrastructure, current municipal transport planning, infrastructural requirements, service delivery, environmental impact management, consultation forums, security, and future plans. In addition to interviews with municipal officials, a separate structured interview session was held with officials of the Western Gauteng Taxi Council (WGTC), which was meant to solicit the following information: transport groups and institutional arrangements, quality of transport, capital investment / running costs, profitability, transport routes and types of vehicles used, police-transporters' relationship, and the organization of transport. The data that was collected from the above structured interview sessions was augmented with further documentary analysis, with the Integrated Transport Plan (ITP) of the West Rand District Municipality (WRDM) being the primary source document. The findings helped to provide answers to aspects of the research aims as discussed in Chapter 1. The principal research questions addressed in this chapter, then, are as follows:

- What are the municipal plans for the development of an affordable and integrated transport system?
- What are the current and future transport supply options?
- What are the opportunities and challenges that are facing the local transport system?
- How must these local transport issues be addressed?

6.2 Regulator perspectives

The findings of the regulator perspectives emanate from structured interviews that were held with officials of the MCLM. A questionnaire with a set of questions (see Appendix 'B') was used to solicit information and the results are discussed in the following section.

6.2.1 Legislative framework

The MCLM does not have a legal mandate with regards to the regulation and provision of local transport facilities. This mandate is held by the WRDM in terms of the Urban Transport Act, No. 78 of 1977. Hence, the Wesmet falls under the WRDM which is the Metropolitan Transport Authority whose area of jurisdiction includes the MCLM and other municipalities within the WRDM. The MCLM does not regulate the management of people and goods in its area of jurisdiction. Hence, it does not issue permits for the provision of local transport nor regulate the development of routes for the purposes of public transport. An agreement has been reached with the WRDM for the MCLM to develop its own public transport policy that integrates the movement of people and goods and transport facilities. According to the officials of the MCLM, the municipality does not run any transport service of its own, nor does it have any agreements / links with transport operators (discussions with PUTCO are underway however).

6.2.2 Municipal transport planning

The WRDM consults the MCLM's ITP when it conducts its transport planning. According to the officials of the MCLM the ITP of the WRDM is aligned to the IDP of the MCLM. The latter utilises established engineering standards for the design and construction of roads and transport facilities. To date, no violations have been reported on transport planning requirements. A land transport management system does not exist for the municipality and there are no plans to acquire any in the foreseeable future. The WRDM has an information system that is used for transport planning. The current system (Paxinfo System) needs enhancement to reflect new challenges of collecting public transport and passenger information. The WRDM has earmarked funds for the development of a comprehensive information system (pavement management system and traffic counting system) that will be compatible with both the national and provincial transport information systems.

6.2.3 Transport infrastructure requirements

The provision of local transport infrastructure is funded by grants from Gautrans (on a 50:50 basis) for planning, implementation and maintenance of roads. This only applies to previously disadvantaged areas. In addition, other funds may be accessed through the Development Bank of Southern Africa's Municipal Infrastructure Grants, an institution which acts as agent for the Department of Provincial and Local Government. Currently, funding is being earmarked for road infrastructure projects (local roads) and public transport facilities (minibus taxi ranks). The MCLM has budgeted R5.7 million for road infrastructure projects and WRDM has budgeted R2.71 million for the development of minibus taxi ranks in Kagiso Township. All of these projects are funded jointly with Gautrans in terms of the stipulations of the provincial policy. A predictable problem being experienced with regards to the allocation of funding to fulfil the transport planning mandate is that there are unlimited needs yet limited resources. However, and perhaps somewhat surprisingly, according to the officials of the MCLM, there is no backlog with regards to the design and construction of local roads in Kagiso Township. All roads are either in design stage, under construction or completed. Only 14km of roads have not been tarred (both minor collectors and local streets - Class 4 and 5 roads). The MCLM does not maintain any minibus taxi ranks in Kagiso Township as this is the responsibility of the WRDM. Kagiso Township has a total of two minibus taxi ranks and ten en-route stops: Leratong taxi rank, Kagiso mini-taxi rank, Kagiso Secondary School taxi stop "A", Kagiso Secondary School taxi stop "B", Phuthadichaba taxi stop, Hospital View 2 taxi stops, Temba Corner taxi stop, Shell taxi stop, First, Second, and, Third taxi stop and Ainsillie and Dastille Street taxi stop. These transport facilities are wholly maintained by the WRDM. Leratong taxi rank has been proposed as a regional taxi rank and a budget has been earmarked for this purpose. The Third taxi stop and Ainsillie and Dastille Street taxi stop have been earmarked for priority upgrading.

6.2.4 Service delivery

The WRDM is supposed to regulate and control the service standards in the provision of public transport in its area of jurisdiction, although self-regulation by the respective taxi associations is also promoted by the municipality. However, there is a high incidence of illegal minibus taxi operations and each short distance route

must also constantly be monitored to determine capacity. Three categories are used to identify capacity in various corridors: red zone corridors (areas where there is an over-supply of minibus taxis and in which no further operating licences should be issued), green zone corridors (additional operating licences could be considered) and yellow zone corridors (balanced corridors in which additional operating licences could be considered only in exceptional cases). The use of this classification system promotes the optimal use of public transport modes.

6.2.5 Environmental impact management

The MCLM does not monitor the impact of local transport on the environment. Air quality is currently not being investigated even though air quality apparatus for monitoring was bought in 2002. The municipality has low traffic density and therefore has relatively low vehicle emissions. Air pollution in this area is mainly caused by emissions from other sources such as, veld fires, dust from gravel roads (from informal settlements and townships) and mine dumps and industrial properties, etc. The resultant poor air quality has an impact on human health and affects the environment (natural biodiversity). No mitigating measures have been put in place in order to halt this trend.

6.2.6 Consultation forums

The MCLM does not have a consultative mechanism for the purpose of transport planning, a function which is fulfilled by the WRDM. The latter has fine-tuned the art of consultation through the Wesmet Technical Liaison Committee and its Working Groups. These structures are responsible for consultation on a range of transport issues, which include transport planning and implementation. The Wesmet Technical Liaison Committee and its Working Groups are inclusive bodies which have the following constituent members: officials responsible for transport matters in the WRDM, representatives of all municipalities under the jurisdiction of the WRDM, the transport industry, and the WGTC and Local Taxi Associations from the different municipalities.

6.2.7 Security

The MCLM has deployed a multi-pronged strategy to ensure traffic safety and management in Kagiso Township. This entails deploying 'warm bodies' of around 12 municipal police officers on the beat in the

township, putting traffic calming measures (traffic stops, speed humps, traffic lights, etc.) in place and hosting regular communications with both the taxi associations and community policing forums. According to the officials of the MCLM, the local police-transporter relationship is excellent and no major issues of dispute are in existence. In addition, members of the public also have confidence with regards to the conduct of municipal police officers.

6.2.8 Future plans

The WRDM, through the Wesmet, has the overall responsibility for transport planning and implementation in its area of jurisdiction, which includes the MCLM. The preparation of the ITP for 2003 – 2008 is an indication that the WRDM is serious about fulfilling its legal obligations and duties. The National Land Transport Transition Act, No. 22 of 2000 requires Transport Authorities to prepare, *inter alia*, an ITP, Rationalisation Plan, Public Passenger Plan, Operating Licences Strategy (OLS) and Current Public Transport Records (CPTR). The WRDM has completed all, except the Rationalisation Plan, which is not applicable to it. The municipality has the following measures in place to implement its transport vision: effective organisational structures for transport planning and implementation; a strategy for the establishment of a transport authority for the area under the jurisdiction of the WRDM and those of Wedella and Fochville (discussions with the North West Provincial authorities are underway in this regard); a variety of strategies for public transport are in place (Regional Public Transport Planning and Management, Rail Commuter System Development, Modal Integration, Road Based Public Transport Development, Public Transport for Rural Areas and Scholars, Development and Transformation of the Taxi Industry and a Land Use and Transport Integration Strategy); a Transport Infrastructure Maintenance Strategy, and a Long Term Transportation Infrastructure Strategy.

It must be noted that all strategies and measures are supported by an implementation programme and budget requirements. According to officials of the MCLM, potential barriers to the implementation of these strategies and programmes are a lack of qualified human resources and funding.

6.3 Operator perspectives

The findings from the operator perspectives emanate from structured interviews, in the form of questionnaires that were undertaken with officials of the WGTC. The WGTC is the legal body that represents the interests of minibus taxi owners and operators on the whole of the West Rand. A questionnaire with a set of questions (see Appendix 'C') was used to solicit information, the results are discussed in the following sub-sections.

6.3.1 Transport groups

WGTC was established in 1994 in terms of the recommendations of the National Taxi Task Team. The WGTC is governed by a duly adopted constitution. It has at least 17 local taxi associations registered with it, representing at least 2000 members who have amongst them ± 4000 minibus taxis. The WGTC offers a range of institutional services to its constituent members, which are, *inter alia*, liaison with all levels of government, especially the third sphere of government (i.e. Merafong Local Municipality, the MCLM, Randfontein Local Municipality and Westonaria Local Municipality), deliberation on applications for operator licences (minibus taxi permits) and subsequent recommendation for the award thereof to the Gautrans. In addition, the WGTC takes key decisions around the creation and approval of new routes, the mediation of disputes amongst members (including cross-border issues relating to minibus taxis) and the management of discipline (both for the owners and drivers of minibus taxis). In addition to the above activities, the WGTC offers relevant training to its registered members (on issues such as labour laws, HIV / AIDS, customer care, South African Revenue Service obligations, etc.), proper keeping of books and accounts, as well as making sure that all statutory meetings are held (i.e. Annual General Meetings and *ad hoc* meetings). The activities of the WGTC seem well organized and the keeping of records is satisfactory (i.e. keeping of financial records, disciplinary records, minutes, etc.). The Management Committee of the WGTC meets monthly (and sometimes on an *ad hoc* basis when there is a burning issue affecting the activities of the WGTC). The Executive Committee meetings take place every Monday. The WGTC also holds regular meetings with local taxi associations in order for them to give their inputs and offer suggestions. Each registered taxi association of the WGTC contributes up to R300 per month for the smooth administration of the organization. Some of these associations are in arrears and had

not paid for months at the time this study was conducted. Gautrans is supposedly responsible for providing subsistence and travel allowance to office bearers of the WGTC, but these allowances have not been forthcoming. Despite the modest level of organization which exists, the WGTC still requires some assistance with regards to the handling of its own internal human resource management and with financial management issues. There is currently not sufficient capacity to dedicate enough time on these activities. Office bearers sometimes fulfil these roles as when it is required. The reason why sufficient capacity has not been acquired is because of a lack of funds to do so. The financial records of the WGTC are audited annually in terms of the relevant prescripts and they are annually presented to the Annual General Meeting for approval. To date, there appear to have been no problems with regards to the soundness of the financial records.

6.3.2 Quality of transport

In terms of the assertions of the WGTC, at least 70% of the minibus taxis operating within their jurisdiction are in good condition. However, the minibus taxi ranks and transport facilities that they operate in are neither hygienic nor visually appealing. The facilities are currently owned and operated by the WRDM; however the WGTC wishes that these facilities be transferred to them in order for them to account for them and keep them in a satisfactory condition. The WGTC does not have a dress code for its drivers, and any driver may wear whatever they feel is appropriate for conducting his job. This is despite complaints by customers that the appearance of some minibus taxi drivers is not appropriate for working with members of the public. The WGTC does not have a proper mechanism to deal with customer complaints due to human resources capacity problems. In the meantime, taxi drivers' behaviour does not instil confidence amongst local transport users. According to the WGTC, customers are more or less evenly divided in how safe they feel in transactions with minibus taxi drivers. This should be rectified once the WGTC has enough funds to employ people to manage customer relationships and can afford the setting up of proper internal systems of control. According to the WGTC, the current operating hours for most minibus taxis is 5am up to 8pm, which is the case in Kagiso Township and no alternative times have been proposed to date. In future, the WGTC wishes to acquire a radio broadcasting licence and set up a radio station that is dedicated to its members and customers.

6.3.3 Capital investment / running costs

The average capital costs incurred by anyone wishing to operate a minibus taxis service are rather forbidding. The barriers to entry into this type of commercial undertaking are very high. A modest, used ten to twelve-seater minibus taxi costs, on average, R150 000; an operating licence costs R6 000 (black market value) and a R10 000 membership fee must be paid to the local taxi association. The underlying reason for the high cost of the acquisition of an operating licence is because there is a standing moratorium on the issuing of further minibus taxi operating licences. Furthermore, the average monthly running costs of a local minibus taxi service (i.e. petrol and oil, spares, vehicle maintenance, etc.) are R1 600 per month. However, there are further hidden costs of getting involved in this business, such as: long waiting lists, route restrictions, relationship building and rife favouritism. This is due to the fact that most of these businesses are family-owned and run.

6.3.4 Profitability

Most routes in Kagiso Township are not profitable. On average each minibus taxi does six to ten round trips per day. The calculation of minibus taxi fares are arbitrary and sometimes linked to the price of petrol and spare parts. The pricing mechanism is very sticky, as an increase in price gets factored-in infrequently. The pricing of routes is the prerogative of respective local taxi associations. Communities and their representatives are consulted prior to an increase being implemented. This is done in order to avoid wild-cat boycotts of minibus taxi services, as has often happened in the past. There is no benchmarking of fares between local taxi associations / councils. The activities of most minibus taxi operators are survivalist in nature rather than profit generating enterprises, the reason being an undeniable saturation of the market. This has led to infighting amongst individual owners of minibus taxis and route thefts. These thefts come in the form of route infringement by minibus taxi operators who do not have a permit to work in the area. Fierce competition is also being experienced from traditional modes of transport such as walking (some areas of socio-economic activity are of relative short distance), train services, and the ever-increasing levels of car ownership.

6.3.5 Transport routes

The WGTC is involved in the regulation and assignment of routes to local taxi associations and local minibus taxi operators. The WGTC assists the Gautrans with the verification of routes, which must be approved by the Management Committee. There are certain routes that are shared with other councils per written agreement. These agreements are very problematic and are a source of minibus taxi conflicts, although they were meant to be joint-venture agreements to allow the sharing of routes in different jurisdictions. The WGTC co-ordinates co-operation amongst rival minibus taxi groups (only those minibus taxi groups that are recognised by provincial structures) through meetings. These meetings are arranged irrespective of whether there are problems, in order to improve communication and anticipate any problems that could occur. These meetings are part of the signed co-operation agreements. There are fifteen formal routes that are controlled by the WGTC in Kagiso Township. In the short to medium-term the WGTC does not intend developing new routes because the current routes have reached saturation point. The WGTC is flooded with applications for operator licences for the existing routes, including proposals to split routes. In terms of the Integrated Transport Plan (2003), the MCLM has an oversupply of minibus taxis by at least 11%. In Kagiso Township, two routes are in oversupply with minibus taxis and they are the Kagiso Monument (K04) route and the Kagiso / Leratong Internal (K15) routes. According to the Integrated Transport Plan (2003), these routes are part of the Red Zone Corridor, which means no further operating licences should be considered. Only two routes in Kagiso Township fall under the Green Zone Corridor, which means that additional operating licences could be considered: they are Kagiso – Rietvallei (K05) route and the Kagiso – Key West (K08) route. The Kagiso – Krugersdorp CBD (K02) and the Kagiso – Luipaardsvlei (K03) routes fall under the Yellow Zone Corridor, which means that additional operating licences could be considered in exceptional cases only.

6.3.6 Types of vehicles used

In Kagiso Township, the main types of vehicles used for taxis are minibuses. The WGTC is in support of the new Taxi Recapitalisation Programme and will be participating fully. The WGTC raised a concern regarding the preparedness of its members for the programme. It asserts that the minibus taxi industry is vanishing due to

individualism and that it is not ready for the programme. It must be acknowledged, though, that some members are not working together, as a result of their dubious business ethics.

6.3.7 The Police-transporter relationship and the organization of transport

There is a formal, monthly meeting that is held with the MCLM's public safety department and councillors who are responsible for transport matters to deal with standing matters and any other matters of concern. These meetings are intended to build a relationship of trust between these two former arch-enemies. The relationship is still lukewarm and there is much room for improvement. Long-outstanding matters, *inter alia*, are the control and ownership of minibus taxi ranks (a possible source of regular income for the WGTC). The local community policing forum is also consulted on matters that are deemed to require their attention. Sadly, there are no programmes to promote legal compliance and road safety for members of the WGTC. A project to promote legal compliance and road safety was only held once by Gautrans, the constraining factor being human resources and finances. This has led to a situation in which the WGTC is ineffective in monitoring trends in its area of jurisdiction, especially in Kagiso Township (which is the largest township on the whole of the WRDM area). However, statistics on minibus taxi accidents are collected.

6.4 Comparison of commuter needs to municipal plans

This study has highlighted several needs of commuters in this and the preceding chapters. The need to understand the transport needs and concerns of commuters is important in so far that if the needs mesh with existing municipal plans, the situation for the disadvantaged will, hopefully improve. The WRDM and the MCLM could possibly adopt policies, programmes and projects that would result in promoting social inclusion addressing shortfalls and through facilitating and providing transport to areas of both socio-economic need and opportunities. Commuters have a myriad of needs. Some needs are within the municipal functional ambit and others are outside. Those that are outside the functional ambit of the municipalities will not be discussed here (such as private purchasing decisions). For the purposes of the comparison of commuter needs (as inferred from the discussion in subsection 5.4.1.1) with municipal plans, the following are discussed in Table 6.1: the taxi recapitalisation, law enforcement, infrastructure supply and government regulation.

Table 6.1: Comparison of commuter needs to municipal plans

Commuter needs	Municipal plans	(ITP volume & section)	Comparison and narrative
Taxi recapitalisation			
- Taxi owners to service vehicles - The need for more minibus taxis	The minibus taxi is viewed as a provider of feeder services to the bus and rail systems and to provide basic main line services in low demand situations. The municipality does not favour this mode as the primary mode for local transportation. The minibus taxi mode would eventually be transformed into a high capacity mode in terms of the national taxi recapitalization programme.	C: 5.4	The needs of the commuters are currently being met by the current supply of minibus taxis. As indicated earlier, there is an 11% oversupply of minibus taxis. The taxi recapitalisation programme would increase the supply of minibus taxi seats available and would under normal circumstances fulfil the demand conditions.
Government to assist with buses	The bus mode is viewed as a provider of main line and feeder services in high demand situations and for long distances where it is not economically viable to establish a rail system. No details are provided on how this will be implemented.	C: 5.4	The municipality has no definite strategy to bring back the bus services in Kagiso Township. Probably, the current transport demand conditions do not justify the multi-million rand subsidisation of a transport system that would not meet the current transport demand situations.
Introduce 32 seater minibus taxis	At total of R80 000 has been earmarked to study the impact of the taxi recapitalisation programme. The impact study will commence in 2005.	B: 5	The taxi recapitalisation programme is a controversial programme that has its own supporters and detractors. Its implementation would be difficult and its impact could only be assessed once it is fully implemented in most high public transport demand localities.
Law enforcement			
- Drivers fined for speeding - Drivers dangerous - Humps to stop speeding	The MCLM has deployed a multi-pronged strategy to ensure traffic safety and management in Kagiso Township.	-	At the moment the MCLM is providing the required services. The MCLM has facilities to test vehicles for

Commuter needs	Municipal plans	(ITP volume & section)	Comparison and narrative
- Scrap unroadworthy minibus taxis - Scrap unroadworthy minibus taxis	This entails deploying 'warm bodies' of around 12 municipal police officers on the beat in the township and hosting regular communications with both the taxi associations and community policing forums. The MCLM has also constructed traffic calming measures (traffic stops, speed humps, traffic lights, etc.) in place. According to the officials of the MCLM, the local police-transporter relationship is excellent and no major issues of dispute are in existence. In addition, members of the public also have confidence with regards to the conduct of municipal police officers.		roadworthiness and the system is managed relatively competently. There are no recent reported cases of corruptly issued roadworthy certificates endangering lives.
More cameras put up	There are no plans to put up cameras in Kagiso Township for the purposes of law enforcement.	-	The use of surveillance cameras in traditionally black townships has not been done anywhere in South Africa. These cameras are often installed and used in towns (mainly within the CBD area) and high traffic and crime areas as in Cape Town. The capital costs and maintenance costs are usually very expensive and may not be justified in poor urban black townships.
Infrastructure supply			
Little transport to Johannesburg	The municipality has recognised the need to improve the linkage with greater Johannesburg through the construction of the N17 (PWV 12-A) freeway. At this stage, the matter is only under	-	The N17 is a planned national freeway that will link Western Gauteng with Greater Johannesburg. National freeways are under the jurisdiction of the South African National Roads

Commuter needs	Municipal plans	(ITP volume & section)	Comparison and narrative
	discussion between the MEC for Public Works, Transport and Roads. No definite commitments have been made.		Agency Limited (SANRAL). Hence, accessibility will only be improved once formal discussions take place between the SANRAL and the WRDM. Funding would have to be provided by the national fiscus. Therefore, the commuter needs would not be met until the relevant stakeholders have allocated funding and commence with the reconstruction of the N17 in order to improve accessibility to Johannesburg.
Improve taxi ranks with shelters	The MCLM has budgeted R5.7 million for road infrastructure projects and WRDM has budgeted R2.71 million for the development of minibus taxi ranks in Kagiso Township. All of these projects are funded jointly with Gautrans in terms of the stipulations of the provincial policy.	A: 6	The planned projects would alleviate the shortage of shelters in the identified minibus taxi ranks. The hygiene of public transport facilities and the personal hygiene of some minibus taxi drivers is causing a discomfort. The municipality should look into this matter especially the public transport facilities. Since minibus taxi drivers are providing a service to the public, the municipal by-laws that govern community and environmental health could possibly be applied and enforced in order to minimise the discomfort that is being experienced by commuters.
New taxi rank at Chamdor Industrial Township	There are no plans to construct a minibus taxi rank at Chamdor Industrial Township.	-	A gap exists with regards to the provision of this taxi rank. It has not been prioritised anywhere in the ITP.
Variety of transport	Detailed planning of future rail routes: The conceptual design of the proposed	B: 7.2-4	The WRDM is promoting the use of rail, notwithstanding the reality on the

Commuter needs	Municipal plans	(ITP volume & section)	Comparison and narrative
	Rietvallei – Kagiso – Krugersdorp rail route (basic planning completed). An amount of R1 500 000 has been earmarked for the conceptual design, which will commence in 2005. The conceptual design of the proposed Rietvallei – Kagiso (Leratong Hospital) – Roodepoort route commenced in 2004. At least R2 500 000 has been allocated to the design phase.	B: 7.2-4	ground. Only 0.2% of commuters surveyed indicated that they use rail for commuting during weekdays. The current environmental quality of transport is not appropriate as indicated by the commuters. This quality mainly relates to hygiene factors such as ergonomics, air quality, noise and vibrations of most minibus taxis. This could possibly be due to the age of the vehicles and the lack of schedule maintenance of these vehicles.
Government regulation			
Reduce petrol prices	Despite the MCLM stating that the cost of petrol impacts on the movement of people, it has not provided for a way forward on how it could influence the reduction of petrol prices or the local subsidisation thereof.	-	The municipality has no jurisdiction over the pricing of oil, petrol and diesel. The Department of Minerals and Energy Affairs determines the pricing of these products. These prices are dependent on international oil prices too.
Disband the taxi association	The development and transformation of the taxi industry: Management of the OLS. R90 000 has been earmarked for planning and design. The planning and design phase has commenced in 2004. At least R15 175 000 has been earmarked for the implementation of the OLS. The implementation phase will commence in 2005.	B: 5	The WGTC is an autonomous body, which both MCLC and the WRDM have no jurisdiction over. These three organisations have a symbiotic relationship, which must be channelled towards serving the local community of Kagiso Township. The WRDM has influence in the recommendation of operating licences (minibus taxi permits) and may withhold their right to recommend if they deem that the operations of WGTC are not in the

Commuter needs	Municipal plans	(ITP volume & section)	Comparison and narrative
Driver's licence	No municipal plans to increase access to driver's licence possession.	-	public interest. The continued neglect of this matter by public authorities further alienates those without drivers' licences and prolongs social exclusion of commuters and the disadvantaged. The MCLM could introduce programmes to make the acquisition a driver's licence affordable and accessible in so far as establishing a testing station in Kagiso Township. Without a valid driver's licence, an individual of qualifying age is precluded from acquiring a vehicle and also financing it through financial institutions.
Pavement system and pedestrian facilities	There are no definite plans and budgetary allocations to improve and enhance the pavement system and pedestrian facilities such as benches, greening the township, signage, etc. This is despite most commuters and residents taking advantage of the walking transport mode.	-	No plans exist. This is a glaring omission on the part of WRDM and the MCLM.
Affordability	There are no definite plans and budgetary allocations to ensure that the transport "system is sustainable in terms of affordability to both transport users and the authorities that would have financial commitment towards the transport system." However, the WRDM is looking into the subsidisation of social services through a tender system.	B: 5.1 A: 4.3	Public policy and budget allocations at municipal level usually take a long time to converge. As there are no definite plans either in the short or medium term, commuters have to bear the burden of unaffordable public transport services.

Commuter needs	Municipal plans	(ITP volume & section)	Comparison and narrative
▪ Accessibility	There are no definite plans and budgetary allocations to ensure accessibility to areas of socio-economic opportunities through the effective planning of and improvements of the transport system.	B: 5.1	As there are no definite plans either in the short or medium term, commuters have to bear the burden of inaccessible areas of socio-economic opportunities, long travel times and increase costs of transport. This is despite the WRDM having a transport vision statement that provides for an accessible, effective and efficient transport system that will enable and serve as a catalyst for socio-economic development.

Source: Integrated Transport Plan (2003)

It is evident from Table 6.1 that many of the commuters' needs are being addressed or are in the process of being attended to through the ITP and the municipalities' budget allocations. However, some of the commuters' needs are beyond the ambit of the municipalities, such as the introduction of the 32 seater minibus taxis, the regulation of petrol prices and the regulation of the WGTC. Most of the commuters' needs that are within the ambit of the municipalities are currently being addressed and those that have been identified through this study would probably be addressed through the future integrated development planning processes. These processes are usually consultative in nature and members of the public (residents, commuters, business, etc.) form an integral part of the development of these integrated development plans (of which the ITP is a component thereof).

6.5 Conclusion

The WRDM and the MCLM have made substantial progress with regards to their mandate of providing transport infrastructure and regulatory services for the people of Kagiso Township. Legislation, policy, a variety of strategies for public transport, funding and implementation capabilities are in place and are working for the benefit of all transport users. The completion of the WRDM's Integrated Transport Plan (2003 – 2008) has

firmly positioned the regulator for the execution of the myriad public transport projects that are under implementation and those that have been identified for the coming years. All projects have been funded with the assistance of Gautrans, which provides co-funding of at least 50% of all transport infrastructure projects in Kagiso Township. The absence of a backlog in terms of transport infrastructure is an indication of maturity and efficiency of both the WRDM and the MCLM. The MCLM's initiative to promote safety and security by the provision of law enforcement officers in Kagiso Township also affirms its commitment to an integrated transport system. However, there are still some minor problems with regards to the development of the mini-transport plan for the MCLM, as identified in its own IDP, although officials of the municipality have indicated that they are in the process of fast-tracking the completion thereof. With regards to the current and future transport supply options, the WRDM has a Transport Maintenance Strategy and a Long Term Transportation Infrastructure Strategy. Current supply requirements are being addressed and there are no supply shortages with regards to public transport infrastructure. Some of the commuter needs are outside the functional ambit the municipalities and would not be met by the latter. They would either require the individual's personal attention or it would need to be handled by other public authorities that have a public mandate to deal with them (i.e. petrol prices).

With regards to operators, the WGTC has been efficient in providing the services it is mandated to provide in terms of its Constitution. Its own internal institutional and governance arrangements are sound, albeit they lack sufficient funding for day-to-day activities and essential programmes. The processing of institutional services as indicated above is done effectively and efficiently. The WGTC needs to manage the over-supply of minibus taxis in its area of jurisdiction, as a failure to do so could destabilize the industry. One way of pursuing this goal is to issue no more applications for operating licences for the Red Zone and Yellow Corridors. With regards to the regulation of its members, there are still important issues that need to be addressed: the development of a dress code for minibus taxi drivers, the development and management of a proper complaint handling system, and the payment of subscription fees by its constituent members. In summary, municipal plans for the development of an affordable and integrated transport system are in place and current and future transport

policy options have been addressed. The taxi industry still remains as a challenge due to its survivalist nature. An opportunity exists to make this industry a serious business and to introduce the development of viable enterprises for its owners. However, although the Taxi Recapitalization Programme intends to do this, both municipalities currently seem to have no control over this. Future research could determine whether progress has been made. The WRDM should continue with the implementation of its ITP, as it appears to have had a huge impact in Kagiso Township.

CHAPTER 7

Analysis of the commuter findings

7.1 Introduction

This chapter presents an interpretation of the findings which were detailed in Chapter 5. These findings are analysed and related to the key research aims, which were firstly to obtain generalisable data from sampled residents in Kagiso Township regarding their current utilization of transport, their future demand for improved transport and its affordability. The second aim was to detail the current municipal transport plans and to assess the degree to which such plans are able to meet the transport concerns and requirements of the commuters. A range of literary concepts were used to interpret the findings by taking into account the socio-economic characteristics and the transport requirements of the study area. These concepts have to do with travel behaviour and trip generation, which affects transport demand and the modes that people use.

7.2 Analysis of the socio-economic characteristics

According to Passwell and Recker (1978), socio-economic characteristics are variables that either influence accessibility to a mode of transport or variables that describe the personal characteristics of the user. The variables that influence accessibility to a mode are, *inter alia*, car ownership, car condition and accessibility to public transport. The variables that describe the personal characteristics of the user are, *inter alia*, household structure, employment status and income.

7.2.1 Levels of car ownership

The emerging theme is that most residents and commuters of Kagiso Township are transport disadvantaged. On average, a fairly small number of commuters possess a driver's licence. At least 13.7% of males possess a driver's licence compared to females at 8.2%. According to Passwell and Recker (1978: 70) "[t]he possession of a driver's licence affects the ability to borrow and use a car as a driver." Consequently, the level of car ownership is low, with at least 77.3% of commuters surveyed indicating they do not possess or own a car. Compared to males (74.1% not owning), females are less likely to own a car (79.6% not owning). Despite, a

driver's licence being a legal requirement to drive a vehicle, of those who do not have a full driver's licence, 12.5% indicated that they are normally the driver's of a vehicle, and indication that some respondents are driving vehicles unlawfully. Altogether, males have a higher incidence of access to at least one vehicle (21.2%) compared to females (16.5%). This may be a function of employment status, income and physical disability (however, this is unlikely, as only 3.5% of commuters have either a disability or long-term illness or have a family member who has those same medical characteristics). No income data was collected for the Kagiso Township survey. By using access to medical insurance as a proxy to ascertain formal employment status and income, the researcher could deduce that that income levels are low as only 32.3% of males have medical insurance compared to females at 25.2%. With regards to gender, females are more disadvantaged than males when it comes to both driver's licence possession and the ownership of a car. This phenomenon is not surprising, given the patriarchal system prevalent in South Africa. Despite low ownership and licensing levels, it is however important to note the majority of residents actually do have access to a vehicle for transport – presumably through family and friends who own a car. On the whole, during weekday daytime and evenings there is a high car availability prevalence. Of those with access to a car during weekday daytime, males have indicated that they always have a car available at a rate of 53% of the time, compared to females at 47% of the time. With regards to weekday evenings, of those with access to a car, males have indicated that they always have a car available 56.5% of the time, compared to females at 43.5% of the time. These figures seem rather high relative to the low proportion (22.7%) of commuters who actually own cars. Nevertheless, Passwell and Recker (1978: 6) state succinctly that “[t]he fact that people who do not own cars and yet do not have public transportation readily available travel more suggests that a lack of transit accessibility may produce a greater dependence on cars from other sources. This indicates that one does not need to own a car to be dependent upon it, one needs only to have a car available.” On the whole, the findings of the research with respect to the concepts on car ownership and availability concur with the literature.

7.2.2 Levels of accessibility to public transport

Sinclair and Sinclair (2001: 8) argue that “a socially inclusive transport system should be available, affordable, accessible, and acceptable to passengers.” As indicated, the propensity and want to travel is dependent on

the availability of modes. Despite the high potential access rates to cars indicated above, the most available transport mode in Kagiso Township during weekday daytime is the minibus taxi (76.8%), followed by a family-owned vehicle (18.5%) and walking (3.3%). Rail stands at 0.2%. In addition to the above, on the whole, at least 70.1% of the commuters indicated that despite the use of a minibus taxi during weekday daytime, access to a car is always available (either a family-owned car, or from neighbours and relatives) and 13.4% indicated that it is often available. Surprisingly, the most available transport mode during weekday evenings is walking (84.9%), followed by a family-owned vehicle (11.2%) and the minibus taxi (3.3%). The figure for rail still stands at 0.2%. In addition to the above, at least 72.3% of the commuters indicated that despite the use of walking on foot during weekday evenings, access to a car is always available and 11.7% indicated that it is often available. With respect to the availability of differentiated modes, the researcher concludes that in Kagiso Township, commuters and residents generally have adequate modes available for them to access socio-economic opportunities that will enhance their lifestyles (work, learning, health care, grocery shopping, and other activities).

There are two types of problems which commuters often face: they are accessibility to a particular destination, because of a lack of transport to that destination and affordability. Moving South Africa (1998) argues that two factors drive the current lack of access to low cost public transport in South African urban areas, and they are: income levels and distance. At least 63.7% of commuters in Kagiso Township indicated that cost will greatly affect their willingness to use a new local transport service. Of those who indicated that cost will greatly affect their willingness to use a new local transport service, 58.9% were female and 41.1% male. These responses from commuters indicate that they are very elastic (sensitive) to cost changes. With respect to affordability, the researcher concludes that affordability is a major problem in Kagiso Township and cognisance of this should be taken by private and public transport operators.

Accessibility of destinations is also dependent on available modes. Lucas (2002: 8) states that “the problem is multi-dimensional and arises from quite complex interactions between, the location of services, the personal circumstances of the individuals and access to transport.” With regards to Kagiso Township, there are a wide

variety of destinations for commuters travelling for employment reasons. It is significant to note that there are 43 destinations. All the 43 destinations are adequately accessible except Johannesburg. As indicated in Chapter 6, initiatives by public authorities are underway to tackle this problem. The findings of the research also indicate that the average time it takes to commute to work is 23.59 minutes, which is less than half of the target set by Moving South Africa as indicated in Table 2.1. This door to door journey time is rather fast. With regards to accessibility, the researcher concludes that commuters and residents of Kagiso Township have an accessible transport system that performs substantially above nationally set targets for urban areas (even though there is poor access to a limited number of destinations). However, according to commuter perceptions, the physical and environmental quality of transport facilities is below standard. This includes the safety levels of the transport modes. On the whole, the findings of the research with respect to the levels of accessibility to public transport concur with the literature in that regardless of socio-economic standing, everyone should have equal access to basic public transport in order to pursue their socio-economic opportunities.

7.2.3 *Age cohorts*

Bussière (1992) found that there is a close relationship between age and the demand for public transport. The reality is that mobility declines with age. According to Table 5.1, large proportions of respondents are between the ages of 30 and 39. As indicated, it is possible that the 30-39 age group has been in employment for longer than the other age groups due to this demographic group having concluded their educational training some time ago and they being in their prime years of working life, hence there are relatively large number of commuting people in this age group. It is evident from Table 5.1 that the driver's licence possession amongst the 20-29, 30-39, 40-49, 50-59, and 60+ age groups is 5.5%, 10.9%, 8.3%, 2.6% and 0.3%, respectively. This is supported by the higher driver prevalence in the 30-39, 40-49 and 50-59 age groups, which is 56.1%, 68.8% and 63.6% respectively. Hence, the 20-29 and 60+ age groups are relatively more likely to use public transport. On the whole, the findings of the research with respect to the age cohorts concur with the literature, in that the preferences indicated by the 30-39, 40-49 and 50-59 age groups may be specific to their generation and may not be similar to subsequent generations.

7.2.4 *Gender analysis*

Gender differences in transport and travel are an important socio-economic characteristic in determining travel demand. According to Sasakawa (1997) these differences are as a result of differential access, according to gender status, to socio-economic and time resources. The socio-economic profile in this study shed light on noteworthy features of commuters, such as their socio-economic characteristics (gender, employment, household size, and education), driver's licence possession and the use of a car, travel opportunities, and health status. With regards to gender, females are more disadvantaged than males in all aspects of socio-economic opportunities. This phenomenon is not surprising, given the patriarchal system prevalent in South Africa. The research found that at least 38% of females compared to 32.3% of males spend more of their time on household tasks such as grocery shopping during weekday evenings. This confirms the finding by Hamed and Mannering (1993) that males are more likely to go home after work compared to females. The figures are higher on Saturdays. Of those commuters who indicated that grocery shopping is the most important journey, 76.6% are female and 23.4% male. Surprisingly, despite the general belief that males engage in more recreational activity, the research has found that of those 23.7% of commuters who indicated that sport and recreation is the most important journey, 62.3% are female and 37.7% male.

7.2.5 *Household structure*

Passwell and Recker (1978) found that the competition for a family car increases when family size increases and the number of trips decreases. Additionally, Redman (1980) reiterates this fact by concluding that an increase in family size has a negative effect on meals being eaten out of the home, as fewer social and recreational trips are being made. On average, each household in Kagiso Township has 4.72 people, with a standard deviation of 2.122. These indicate the prevalence of the extended family phenomena in Kagiso Township. The results of the surveys show that there is a relationship between household size and the ownership of a car. The impact of household structure concurs with the literature. The bigger the household size (from three up six members) in Kagiso Township, the more chances the family owns a car. Households with 3, 4, 5 and 6 members have, on average, 19.3%, 24%, 16.7% and 14.5% car ownership levels,

respectively. The proportion (within the relevant activity) of trips during weekday daytime spent going to school, visiting friends, on social activities, sport and recreation, and church are negligible: they are 11.9%, 5.4%, 0.5%, 0.2% and 0.9%, respectively. The employment status and income generation ability of individuals is a resource constraint in decisions to buy or maintain a car.

7.2.6 Analysis of employment and income status

As indicate in Chapter 2, income and employment are linked with the ability to buy and maintain a car. Generally, the research found that a large proportion of commuters do not have adequate income to buy a car. This is derived from the proxy indicator of commuters with access to medical insurance. The latter has been used as a proxy for formal employment and the ability to earn adequate money to purchase a car as no income data was collected. On average, at least 67.7% of male commuters in the male category indicated that they do not possess medical aid insurance compared to 74.8% of female commuters. These latter figures are supported by the level of car ownership which is low, with at least 77.3% of commuters surveyed indicating they do not possess or own a car. On the whole, the findings of the research with respect to the employment and income status concur with the literature

7.3 Analysis of the transport requirements

The analysis of the transport requirements of the commuters are comprehensively elucidated in Chapter 6. These requirements have been compared with municipal plans to ascertain any gaps that exist. With regards to the transport demand, the research has found that the number of trips per day in each year (2005-2007) will probably decline; hence, transport demand in Kagiso Township is projected to be on a decline. There are many possible reasons for this. However, a declining population does not automatically stimulate a reduction in demand. Transport demand is on the whole a product of a number of factors, and they are: population growth, internal and external migration, urban form, general economic conditions (employment opportunities), improved socio-economic conditions (rising incomes), and household size and structure. The transport demand situation in Kagiso Township could improve as socio-economic conditions progress and the service delivery on the part of the municipalities expand to previously under-serviced areas.

7.4 Conclusion

On the whole the trends revealed in the investigation of the socio-economic characteristics of commuters concurred with the general profile of commuters to be found in the literature. The analysis of this aspect of the study mainly dealt with the findings, which are related to the first research aim, which was to obtain generalisable data from sampled residents in Kagiso Township regarding their current utilization of transport, their future demand for improved transport and its affordability. The analysis on the transport requirements of commuters, relative to local government planning was comprehensively dealt with in Chapter 6.

CHAPTER 8

Summary, conclusions and implications

8.1 Summary

The research presented in this study detailed the findings of an investigation into the household mobility and the needs of commuters of Kagiso Township. This information was compared with current municipal plans to see whether such plans are realistic and can address the transport needs which exist. A research framework was formulated for the purposes of conducting the research. This research framework enabled the researcher to examine the current and potential future commuter transportation requirements from several perspectives. These are the commuter, regulator and operator perspectives. The commuter perspectives provided a generalisable data from sampled residents of Kagiso Township regarding their utilisation of transport, their demand for transport and the affordability thereof. In August 2004, at least 455 commuters who are residents of Kagiso Township were interviewed through using a survey questionnaire. This questionnaire was designed to elicit socio-economic characteristics (i.e. car ownership, driving licence possession, travel opportunities and the health status of commuters), and the dominant travel patterns of commuters based on transport use (i.e. car availability, trip frequency and mode choice, and activity preferences). The structure of the questionnaire determined the selection of a specific form of analysis. The analysis entailed univariate analysis or frequency tables. The next round of analyses entailed cross-tabulations. Once the computerisation of the results was completed, the interpretation of the results was undertaken. The interpretation of the results followed a three-pronged process, namely the analysis of the social environment, the analysis of the socio-economic, demographic and transport characteristics of the commuters, and an analysis of their attitudes and expectations relating to the provision of transport in Kagiso Township. The results of this analysis were used as inputs into an urban travel forecasting model. The projections that were generated were used to determine future, potential resource and service demands for Kagiso Township. Based on these analyses, the implications for service provision were formulated. The regulator and operator perspectives obtained

highlighted the shortcomings (problems, deficiencies and issues) in the current transportation network. Structured interviews with officials from both the MCLM and the WGTC shed light into the functions and activities of these key role-players.

8.2 Conclusions

The conclusions arising from the findings of the research are explained in the context of the following research questions:

- What is the socio-economic profile of commuters and the disadvantaged in Kagiso Township?
- What are the dominant travel patterns of households based on their transport use?
- What are the current and future mobility requirements (based partially on the use of a travel demand model)?
- What are the perceptions of households on: the physical and environmental quality of transport facilities; local transport costs; and safety levels of the transport modes?
- What are the municipal plans for the development of an affordable and integrated transport system?
- What are the current and future transport supply options?
- What are the opportunities and challenges that are facing the local transport system?

8.2.1 What is the socio-economic profile of commuters and the disadvantaged in Kagiso Township?

In studying the socio-economic characteristics and travel patterns of the commuters, the researcher found that these commuters are not a homogenous group. They perform dissimilar activities and have different travel needs. The analysis of the socio-economic profile of the commuters in Kagiso Township showed that the largest proportion (38.9%) of commuters that completed the survey questionnaires are between the ages 30-39. This age group has a larger number of employed people in Kagiso Township than other cohorts, due to several factors: they are, early education attainment, work experience, etc. On average a fairly small number of commuters possess a driver's licence. At least 13.7% of males possess a driver's licence compared to females at 8.2%. At least 77.3% of commuters do not possess a car. A large percentage of female commuters (79.6%) do not own a car, compared to 74.1% of males. In addition, males have a higher incidence of owning one

vehicle (21.2%) compared to females (16.5%). A large proportion of commuters do not have medical insurance. On average, at least 67.7% of male commuters in the male category indicated that they do not possess medical aid insurance compared to 74.8% of female commuters. The middle-aged male group of 30-39 have the highest prevalence of medical insurance ownership at 53.7%. Their female counterparts reflect almost half of the latter figure. On the whole, the socio-economic profile shed light on noteworthy features of commuters, such as their socio-economic characteristics (gender, employment, household size, and education), driver's licence possession and the use of a car, travel opportunities, and health status. With regards to gender, females are more disadvantaged than males in all aspects of socio-economic opportunities.

8.2.2 What are the dominant travel patterns of households based on their transport use?

The dominant travel patterns of commuters based on transport use showed that car availability amongst the age groups differs, however, amongst the gender groups it is, on average, split equally. There is high car prevalence amongst the 30-39 and the 40-49 age groups during both weekday daytime and evening, and Saturday and Sunday. Despite high access levels to car, the most prevalent mode of transport for commuters is a minibus taxi (77.8%), followed by a family-owned vehicle. Rail usage is insignificant and stands at 0.2%. 69.4% of commuters indicated that they make at least five trips during weekday daytimes going to work or looking for work. The number of trips during weekday evenings indicated that 94.4% of commuters do not undertake any trips which were related to looking for work or going to work during the evening. However, the proportion of concomitant commuters for Saturday and Sunday is 78.4% and 97.5%, respectively. Few commuters make use of transport for educational purposes. At least 90.1% of commuters indicated that they do not perform trips during weekday daytime for educational purposes. For weekends the figure increases to an average of 99.5%. The proportion of grocery shopping during weekday daytime is negligible (5.9%). However, the percentage of grocery shopping during weekday evenings is 43% of all commuters. At least 23.7% of commuters indicated that sport and recreation is the most important journey. Females constitute 62.3% of those who indicated that sport and recreation is the most important journey. At least 25.3% of commuters indicated that non-food shopping is the most important journey, and a negligible 4.8% commuters

indicated that visiting friends is the most important journey. It seems that the 30-39 age group is the most advantaged amongst all other age groups as indicated above.

8.2.3 What are the current and future mobility requirements (based partially on the use of a travel demand model)?

The findings indicate that the current and future mobility requirements of households and commuters of Kagiso Township are adequately catered for. WRDM has invested adequately in the transport infrastructure and has strategies, plans and funding to execute an extensive, improved transport infrastructure programme in Kagiso Township as per its identified priorities. There is a current surplus of minibus taxis and there is a projected decline in the aggregate demand for travel in the coming three years (2005-2007). Current and future infrastructure projects will adequately maintain a functional transport system. This should be coupled with the introduction of the taxi recapitalisation programme to upgrade the minibus taxi fleet. With regards to the transport demand, the research has found that the number of trips per day in each year (2005-2007) will be in decline; hence, transport demand in Kagiso Township is projected to be on a decline. However, a declining population does not automatically stimulate a reduction in demand. Transport demand is on the whole a product of a number of factors, and they are: population growth, internal and external migration, urban form, general economic conditions (employment opportunities), improved socio-economic conditions (rising incomes), and household size and structure. Hence, slight increases may occur despite the anticipated decline in the number of commuters.

8.2.4 What are the perceptions of households on: the physical and environmental quality of transport facilities; local transport costs; and safety levels of the transport modes?

According to commuter perceptions, the physical and environmental quality of transport facilities is below standard. This also includes the safety levels of the transport modes.

8.2.5 What are the municipal plans for the development of an affordable and integrated transport system?

The minibus taxi is viewed as a provider of feeder services to the bus and rail systems and they are seen to provide basic main line services in low demand situations. The municipality does not favour this mode as the

primary mode for local transportation. The minibus taxi mode would eventually be transformed into a high capacity mode in terms of the national taxi recapitalization programme. The bus mode is viewed as a provider of main line and feeder services in high demand situations and for long distances where it is not economically viable to establish a rail system. In addition, some expansion of the rail system is planned. The conceptual design of the proposed Rietvallei – Kagiso – Krugersdorp rail route (basic planning completed) has been concluded. An amount of R1 500 000 has been earmarked for the conceptual design, which will commence in 2005. The conceptual design of the proposed Rietvallei – Kagiso– Roodepoort route commenced in 2004. At least R2 500 000 has been allocated to the design phase.

8.2.6 What are the current and future transport supply options?

Current supply requirements (private vehicles, minibus taxis, rail, etc.), are generally being addressed and there are no current supply shortages with regards to public transport infrastructure. Some of the commuter needs are outside the functional ambit the municipalities and would not be met by the latter. They would either require the individual's personal attention or could be handled by other public authorities that have a public mandate to deal with them (i.e. petrol prices).

8.2.7 What are the opportunities and challenges that are facing the local transport system?

The WRDM and the MCLM have made substantial progress with regards to their mandate of providing transport infrastructure and regulatory services for the people of Kagiso Township. Legislation, policy, a variety of strategies for public transport, funding and implementation capabilities are in place and are working for the benefit of all transport users. The completion of the WRDM's Integrated Transport Plan (2003 – 2008) has firmly positioned the regulator for the execution of the myriad public transport projects that are under implementation and those that have been identified for the coming years. All projects have been funded with the assistance of Gautrans, which provides co-funding of at least 50% of all transport infrastructure projects in Kagiso Town. The absence of a backlog in terms of transport infrastructure is an indication of maturity and efficiency of both the WRDM and the MCLM.

This study has therefore succeeded in unpacking the current and potential future commuter transport requirements in Kagiso Township within the context of transport planning and the ongoing transformation of the transport sector.

8.3 Implications

The Taxi Recapitalisation Programme will address many of the concerns that have been raised by the commuters on safety, hygiene and comfort (quality). The government should recognise these concerns and address them from a public policy point of view. The role of rail should be reassessed in the light of the low usage of the system. Lastly, HIV / AIDS has had and will continue to affect local travel demand. Unless an intervention is made to curb the scourge of this disease, local transport, socio-economic progress and development will suffer.

8.4 Further research

Further research is required into the impact of HIV / AIDS on local transport network. This would also entail an investigation into how to improve services and quality when the transport demand is not increasing. In addition, the role of rail in former Black townships needs to be reassessed as rail seems not to be the preferred mode of choice at present.

8.5 Concluding remarks

The dissertation has met its two aims, namely to provide an overview of the socio-economic characteristics and transport requirements of commuters in Kagiso Township and secondly to relate such requirements to current local government policy and plans. The study revealed the complex nature of current transport requirements and the demand patterns of commuters. Government policy seems well developed and efforts are being made to improve transport conditions as far as is possible. Whether there will be an increase in transport demand in the future is uncertain for reasons discussed above. It is however apparent that transport conditions seemed to have improved in Kagiso Township and overall government policy has played a key role in this context.

REFERENCES

- Ahrentzen, S., Levine, D.W., and Michelson, W., 1989. Space, time and activity in the home: A gender analysis. *Journal of Environmental Psychology*. v. 9. p 89-101.
- Alreck, P.L., and Settle, R.B., 1995. *The Survey Research Handbook (2nd edition)*. Chicago: IRWIN.
- Auxhasen, K.W., and Gärling, T., 1992. Activity-based approaches to travel analysis: Conceptual frameworks, models and research problems. *Transport Reviews*. v. 12. p 323-341.
- Banister, D. (ed.), 1995. *Transport and Urban Development*. London: E & FN Spon.
- Beckman, R., Baggerly, K., and McKay, M., 1996. Creating Synthetic Baseline Populations. *Transportation Research -A*. 30(6). p 415-429.
- Ben-Akiva, M., and Lerman, S.R., 1985. *Discrete Choice Analysis: Theory and Application to Travel Demand*. Cambridge: MIT Press.
- Berge, G., and Nondal, T., 1994. *Livsstil som barriere* (267/1994) TØI.A35
- Bhat, C., 1998. *Joint Model of Work Mode Choice, Evening Commute Stops, and Post-Home-Arrival Stops*. A Paper presented at the 77th Annual Meeting of the Transportation Research Board in Washington D.C., 11-15 January.
- Bhat, C.R. and Singh, S., 2000. A Comprehensive Daily Activity-Travel Generation Model System for Workers. *Transportation Research* 34A. p 1-22.
- Bhat, C.R., and Koppelman, F.S., 2003. *Activity-Based Modeling of Travel Demand (2nd edition)*. Boston: Kluwer Academic Publishers.
- Blau, F.D., and Ferber, M.A., 1992. *The Economics of Women, Men, and Work*. Englewood Cliffs, New Jersey: Prentice-Hall.
- Blumen, O., 1994. Gender differences in the journey to work. *Urban Geography*. 15 (3). p 223-245.
- Bussière, Y., 1992. *Forecasting Travel from Age Structure, Urban Sprawl, and Behaviour: the Montreal Case, 1986-2011*. Paper presented at the 6th World Conference on Transportation Research (WCTR 92), Lyon, France, 29 June - 3 July.
- Bussière, Y., and Rice, R.G., 1999. *Simplified Travel Demand Forecasting: A Comparison of Applications in Developed and Developing Countries*. Bibliothèque Nationale du Québec.
- Chapin, F.S., Jr. 1971. Free-time activities and the quality of urban life. *Journal of the American Institute of Planners*. 37. p 411-417.
- Chen, H., Barahimi, H., Wellander, S., and Ishimaru, K., 2002. *Travel Model Application Checklist*. 16th Annual EMME/2 Users Conference, Seattle, Washington. 18 March.
- Creswell, J.W., 2003. *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches (2nd*

- edition). Thousand Oaks: Sage Publications.
- Cullen, I., and Godson, V., 1975. Urban networks: the structure of activity patterns. *Progress in Planning*. 4. p 1-96.
- Damm, D., 1980. Interdependencies in Activity Behavior. *Transportation Research Record*. 750. p 33-40.
- Damm, D., 1983. *Theory and empirical results: a comparison of recent activity-based research*. In Carpenter, S., and Jones, P.M. (ed.), *Recent Advances in Travel Demand*. Aldershot: Gower Publishing Company Limited.
- Dix, M.C., Carpenter, S.M., Clarke, M.I., Pollard, H.R.T., and Spencer, M.B., 1983. *Car Use - A Social and Economic Study*. Aldershot: Gower Publishing Company Limited.
- Fitzpatrick Associates, 2001. *Local Transport Survey Questionnaire*. London: Steer Davies Gleave.
- Gauteng Framework Revision Act, Act No. 8 of 2002. Johannesburg: Gauteng Provincial Legislature.
- Gauteng Interim Minibus Taxi-Type Services Act, Act No. 11 of 1997. Johannesburg: Gauteng Provincial Legislature.
- Gauteng Interim Road Transport Act, Act No. 11 of 1997. Johannesburg: Gauteng Provincial Legislature.
- Gauteng Provincial Road Traffic Act, Act No. 10. of 1997. Johannesburg: Gauteng Provincial Legislature.
- Gauteng Public Passenger Road Transport Act, Act No. 7 of 2001. Johannesburg: Gauteng Provincial Legislature.
- Gauteng Road Transportation Amendment Act, Act No. 6 of 1997. Johannesburg: Gauteng Provincial Legislature.
- Gauteng Transport Framework Revision Act, Act No. 8 of 1998. Johannesburg: Gauteng Provincial Legislature.
- Gauteng Transport Infrastructure Act, Act No. 6 of 2003. Johannesburg: Gauteng Provincial Legislature.
- Gauteng Transport Infrastructure Act, Act No. 8 of 2001. Johannesburg: Gauteng Provincial Legislature.
- Gauteng White Paper on Transport Policy. Johannesburg: Gauteng Provincial Legislature.
- Golob, T.F., Kim, S., and Ren, W., 1994. *A Structural Model of Vehicle Use in Two-Vehicle Households*. A Working Paper, UUCTC No. 224, University of California Transportation Center, University of California, Berkeley, CA.
- Gomm, R., 2004. *Social Research Methodology: a critical introduction*. Basingstoke: Palgrave Macmillan.
- Gray, D.E., 2004. *Doing Research in the Real World*. London: Sage Publications.
- Gronau, R., 1977. Leisure, Home Production, and Work - the Theory of the Allocation of Time Revisited. *Journal of Political Economy*. 85(6). P 1099-1123.
- Hägerstrand, T., 1970. What about people in regional science? *Papers and Proceedings of the Regional Science Association*. 24. p 7-24.
- Hamed, M.M. and Mannering, F.L., 1993. Modeling Travelers' Postwork Activity Involvement: Toward A New Methodology. *Transportation Science*. 27(4). p 381-394.
- Handy, S., 1997. *Travel behavior - Land use interactions: An overview and assessment of the research*. A Presentation delivered at the Triennial Meeting of the International Association of Travel Behavior Research, Austin, Texas, in September.
- Hanson, S., and Hanson, P., 1981. The impact of women's employment on household travel patterns: A Swedish example. *Transportation*. 10. p 165-183.
- Hanson, S., and Johnston, I., 1985. Gender differences in work trip length: Explanations and implications. *Urban*

- Geography*. 6 (3). p 193-219.
- James, H.S., Jr. 1996. *The Valuation of Household Production: How Different are the Opportunity Cost and Market Price Valuation Methods?* Working Paper Series (JEL D13), West Hartford, CT: University of Hartford.
- Jansson, J.O., 1989. Car demand modelling and forecasting - A new approach. *Journal of Transport Economics and Policy*. Vol. XXIII, No. 2, p 125-140.
- Jones, P., Koppelman, F., and Orfeuil, J.P., 1990. *Activity analysis: State-of-the-art and future directions*. In Jones, P (ed.), *Developments in Dynamic and Activity-Based Approaches to Travel Analysis*. Aldershot: Gower Publishing Company Limited.
- Kim, S.G., Hamed, M., and Mannering, F., 1993. *A note on modeling travelers' home-stay duration and the efficiency of proportional hazards model*. Working paper. University of Washington: Department of Civil Engineering.
- Kitamura, R., 1983. *Serve passenger trips as a determinant of travel behaviour*. In Carpenter, S., and Jones, P.M. (ed.), *Recent Advances in Travel Demand*. Aldershot: Gower Publishing Company Limited.
- Kitamura, R., 1984. A model of daily time allocation to discretionary out-of-home activities and trips. *Transportation Research -B*. v.18B. p 255-266.
- Kitamura, R., 1988. An Evaluation of Activity-based Travel Analysis. *Transportation*. 15. p 9-34.
- Kohlhase, J.E., 1986. Labor Supply and Housing Demand for One-Two-Earner Households. *The Review of Economics and Statistics*. 68(1). p 48-56.
- Kooreman, P., and Kapteyn, A., 1987. A Disaggregated Analysis of the Allocation of Time within the Household. *Journal of Political Economy*. 95(2). p 223-249.
- Local Government Transition Act*, Act No. 209 of 1993. Pretoria: Government Printer.
- Local Government: Municipal Structures Act*, Act No. 117 of 1998. Pretoria: Government Printer.
- Local Government: Municipal Systems Act*, Act No. 32 of 2000. Pretoria: Government Printer.
- Lucas, K., 2002. *Transport and Social Exclusion: A G7 Comparison – An Overview of the UK Position*. Transport Studies Group, University of Westminster.
- Madre, J.L., and Galez, C., 1992. *Le parc automobile des ménages dans les années 2000: méthodes démographiques de projection à long terme*. Proceedings, 6th World Conference on Transportation Research, Lyon.
- Madre, J.L., and Pirotte, A., 1991. *Régionalisation des projections du parc et de la circulation automobile*. Paper presented at the 5th International Conference on Travel Behaviour, Québec.
- Madre, J.L., Bussière, Y., Armoogum, J., Gallez, C., and Girand, C., 1994. *Car Ownership and Mobility of Successive Generations. Long Term Dynamics in Urban Areas*. IATBR, Valle Nevado, Chile, Proceedings.
- Mannering, F., Murakami, E., and Kim, S.G., (1994). Temporal stability of travelers' activity choice and home-stay duration: some empirical evidence. *Transportation*. 21. p 371-392.
- Manser, M., and Brown, M., 1993. Marriage and Household Decision-Making: A Bargaining Analysis. *International*

- Economic Review*. 21(1). P 31-34.
- May, A.D., Jopson, A.F., and Matthews, B., 2003. Research challenges in urban transport policy. *Transport Policy* 10. p 157-164.
- McLafferty, S., and Preston, V., 1991. Gender, race and commuting among service sector workers. *Professional Geographer*. 43. p 1-15.
- Mensah, J., 1994. Journey to work and job search, characteristics of the urban poor: A gender analysis of a survey data from Edmonton, Alberta. *Transportation*. 22. p 1-19.
- Meurs, H., 1993. A Panel Data Switching Regression Model of Mobility and Car Ownership. *Transportation Research A*. 27A (6). p 461-476.
- Mogale City, 2003. *Mogale City Local Municipality Revised IDP 2003 / 04*. Mogale City.
- Moving South Africa, 1998. *Moving South Africa – the Action Agenda – A 20-Year Strategic Framework for Transportation in South Africa*. Pretoria: National Department of Transport.
- National Land Transport Interim Arrangements Act*, Act No. 45 of 1998. Pretoria: Government Printer.
- National Land Transport Transition Act*, Act No. 22 of 2000. Pretoria: Government Printer.
- National Road Traffic Act*, Act No. 29 of 1989. Pretoria: Government Printer.
- National Road Traffic Act*, Act No. 93 of 1996. Pretoria: Government Printer.
- Native Transport Services Act*, Act No. 53 of 1957. Pretoria: Government Printer.
- Niemeier, D.A., and Morita, J.G., 1996. Duration of trip-making activities by men and women. *Transportation*. 23. p 353-371.
- OECD, 1982. *Road Research - forecasting car ownership and use*. A Report Prepared by an OECD Road Research Group.
- O'Kelly, M.E., and Miller, E.J., 1984. Characteristics of multistop multipurpose travel: an empirical study of trip length. *Transportation Research Record*. 1203. p 33-39.
- Oppenheim, N., 1995. *Urban travel demand modeling: from individual choices to general equilibrium*. New York: John Wiley & Sons, Inc.
- Ortúzar, J. de D., and Willumsen, L.G., 1990. *Modelling Transport*. Chichester, UK: John Wiley & Sons.
- Pas, E.I. and F.S. Koppelman (1986). An Examination of the Determinants of Day-to-Day Variability in Individuals' Urban Travel Behavior. *Transportation*. 13. p 183-200.
- Pas, E.I., 1984. The Effect of Selected Sociodemographic Characteristics on Daily Travel-Activity Behaviour. *Environment and Planning A*16. p 571-581.
- Pas, E.I., 1986. *The Urban Transportation Process*. In Hanson, S. (ed.), *The Geography of Urban Transportation*. New York: The Guilford Press.
- Pas, E.I., and Koppelman, F.S., 1987. An examination of the determinants of day-to-day variability in individuals' urban travel behaviour. *Transportation*. v. 13. p 183-200.

- Peltan, C., 1992. *Application du modèle démographique a la projection du parc automobile régional*. Rapport de Stage, INRETS, Arcueil, France.
- Population Registration Act*, Act No. 30 of 1950. Pretoria: Government Printer.
- Prendergast, L.S., and Williams, R.D., 1981. Individual Travel Time Budgets. *Transportation Research -A*. 15A. p 39-46.
- Preston, B., 1991. *The Impact of the Motor Car*. Dyfed: Brefi Press.
- Pund, G., 1999. *Towards a theory of suburban form and travel mode use*. Paper presented at the 23rd Australian Transport Research Forum 22 (1) Perth: ATFF, p 111-126.
- Pund, G., 2002. *Urban form, level of service and bus patronage in eastern Sydney*. 25th Australian Transport Research Forum held on 2-4 October.
- Purvis, C.L., Iglesias, M., and Eisen, V., 1996. *Incorporating Work Trip Accessibility in nonwork trip generation models in the San Francisco Bay Area*. A paper submitted to the 75th Annual Meeting of the Transportation Research Board. Paper 960786, 7-11 January.
- Recker, W.W., McNally, M.G., and Root, G.S., 1983. *Application of pattern recognition theory to activity pattern Analysis*. In Carpenter, S., and Jones, P.M. (ed.), *Recent Advances in Travel Demand*. Aldershot: Gower Publishing Company Limited.
- Redman, B.J., 1980. The Impact of Women's Time Allocation on Expenditure for Meals from Home and Prepared Foods. *American Journal of Agricultural Economics*. 62(2). p 234-237.
- Reichman, S., 1977. Travel Adjustments and Life Styles - A Behavioral Approach. *Transportation Research Record* 649. p 38-42.
- Road Transportation Act*, Act No. 74 of 1977. Pretoria: Government Printer.
- Roads Ordinance*, Ordinance No. 22 of 1957. Pretoria: Government Printer.
- Robinson, G.M., 1998. *Methods and techniques in human geography*. New York: John Wiley and Sons.
- Rodrigue, J.P., et al., 2003. *Transport Geography on the Web*. Hofstra University, Department of Economics & Geography, <http://people.hofstra.edu/geotrans> .
- Rosenbloom, S., 1987. The Impact of Growing Children on their Parents' Travel Behavior: A Comparative Analysis. *Transportation Research Record*. 1135. p 17-25.
- Sapsford, R., and Jupp, V. (eds.), 1996. *Data Collection and Analysis*. London: Sage Publications.
- Sasakawa. 1997. *Women, agricultural intensification and household food security*. Mexico: Sasakawa.
- Sinclair, S.P., and Sinclair, F., 2001. *Access All Areas? An Assessment of Social Inclusion Measures in Scottish Local Transport Strategies*. Edinburgh: Edinburgh College of Art / Heriot Watt University.
- Social Exclusion Unit., 2002. *Making the Connections: Transport and Social Exclusion*. London: Transport Exclusion Unit.
- Statistics South Africa, Census 2001. *Census in Brief*. Pretoria: Statistics South Africa.

- Statistics South Africa, 2004. *Mid-year population estimates, South Africa: 2004*. Pretoria: Statistics South Africa.
- Thomson, J.M., 1977. *Great Cities and their Traffic*. London: Victor Gollancz Ltd.
- Transport Services for Coloureds and Indians Act*, Act No. 27 of 1972. Pretoria: Government Printer.
- Transport Research Laboratory, 2003. *Unpublished Project Report: Framework for the Inclusion of Social Benefits in Transport Planning: Inception Report*. Beckshire: TRL Limited.
- Turner, J., Grieco, M., and Apt, N., 1998. *Gender, transport and the New Deal: The social policy implications of gendered time transport and travel*. Lincoln: Social Policy Association Conference.
- U.S. Bureau of the Census International Data Base, 10 May 2000. Washington D.C.
- Urban Transport Act*, Act No. 78 of 1977. Pretoria: Government Printer.
- van den Broecke, A.J., and van den Leusden, G.C., 1987. *Long term forecasting of car ownership with the cohort processing model*. Paper presented at the 5th International Conference on Travel Behavior, La Baume-lès-Aix.
- van Wissen, L.J., Golob, T., and Meurs, H.J., 1991. *A simultaneous dynamic travel and activities time allocation model*. Working Paper 21. Berkeley, CA: University of California Transportation Center. September.
- Wachs, M. 1987. Men, Women, and Wheels: The Historical Basis of Sex Differences in Travel Patterns. *Transportation Research Record*. 1135. p 10-16.
- Wales, T.J., and Woodland, A.D., 1977. Estimation of the Allocation of Time for Work, Leisure and Housework. *Econometrica*. 35(1). p 115-132.
- Welman, J.C., and Kruger, S.J., 2002. *Research Methodology (2nd edition)*. Cape Town: Oxford University Press Southern Africa.
- WRDM, 2003. *Integrated Transport Plan 2003-2008*. Unpublished Internal Report for Council Approval.
- White Paper on National Transport Policy*. 1996. Pretoria: Government Printer.
- White Paper on Reconstruction and Development Programme*. 1994. Pretoria: Government Printer.
- Wickham, J., 2002. *Scenarios for a sustainable society: Car transport systems and the sociology of embedded technologies*. Dublin: Employment Research Centre.
- Wigan, M.R., and Morris, J.M., 1981. The Transport Implications of Activity and Time Budget Constraints. *Transport Research -A*. 15. p 63-86.
- Wilkinson, P., 2000. *Integrated planning at a local level? The problematic intersection of integrated planning and integrated transport planning in contemporary South Africa*. Cape Town: School of Architecture and Planning, University of Cape Town.
- Yin, R.K., 1994. *Case study research: design and methods*. Thousand Oaks: Sage Publications.

APPENDICES

APPENDIX A

Commuter Questionnaire

COMMUTER QUESTIONNAIRE

Interviewer	:		VA
Name	:		VB
Telephone	:		VC
Area of residence in Kagiso	:		VD

1 Are you:

Male:

1

Female:

2

V1

What is your age?

20-29	30-39	40-49	50-59	60+	V2
1	2	3	4	5	

2 Provide number of family members per your family's current status?

	Number			Number	
Employed		V3	Too young to attend school		V8
Home duties		V4	Retired		V9
Unemployed		V5	Unable to work due to permanent sickness, disability		V10
Looking for first regular job		V6	Other (please specify) _____ V11a		V11b
Student		V7			

3 Do you have a medical aid?

4 Do you have a full driving license?

5 Do you currently have a Free Travel Pass (Metrorail)?

Yes	No	
1	2	V12
1	2	V13
1	2	V14

6 How many people, including yourself, live in your household?

	V15
--	-----

7 How many motorized passenger vehicles (car, bakkie etc are there in your household?

	V16
--	-----

8 How often is the household car/bakkie, etc. available to you personally for use as a driver or passenger?

	Always	Often	Rarely	Never	
Weekday daytime	1	2	3	4	V17
Weekday evening	1	2	3	4	V18
Saturday	1	2	3	4	V19
Sunday	1	2	3	4	V20

Are you normally the:

Driver

Passenger

1	V21
2	

9 How often do you make a trip from your home at each of the following times?

	More than one trip per day	1 trip per day	1-2 trips per week	2-3 trips per week	2 or 3 times per month	Once a month or less	
Weekday daytime	1	2	3	4	5	6	V22
Weekday evening	1	2	3	4	5	6	V23
Saturday	1	2	3	4	5	6	V24
Sunday	1	2	3	4	5	6	V25

10 What type of transport do you normally use when you make trips at these times?

	TRANSPORT MODE										
	Cycle/ Motor cycle	Own family vehicle	Another private vehicle	Scheduled Public (bus)	Scheduled Private (bus)	School bus	Taxi	On foot	Train	Other	
Weekday daytime	1	2	3	4	5	6	7	8	9	10	V26
Weekday evening	1	2	3	4	5	6	7	8	9	10	V27
Saturday	1	2	3	4	5	6	7	8	9	10	V28
Sunday	1	2	3	4	5	6	7	8	9	10	V29

11 How many trips and at what times do you undertake each of the following activities?

	Weekday daytime (no. per week)	Weekday evening (no. per week)	Saturday (no. per day)	Sunday (no. per day)	
Going to work or looking for work					V30
Education/ Training					V31
Food and grocery shopping					V32
Children to /from creche/school etc					V33
Visiting friends/relatives					V34
Social activities (public house, cinema etc)					V35
Sport and recreation					V36
Going to church					V37

12 What is your total number of trips per transport mode per week?

Transport Mode	Number	
Cycle/ Motor cycle		V38
Own family vehicle		V39
Another private vehicle		V40
Scheduled Public (bus)		V41
Scheduled Private (bus)		V42
School bus		V43
Taxi		V44
On foot		V45
Train		V46
Other (please specify) _____ V47		V48

13 Where do you work (general area)? _____

(N/A = don't work)

V49

If yes, how long does it usually take?

Time: _____ Minutes

V50

14 Other than work what is the purpose of the next most important journey you regularly make? (rank from 1 to 5, with 1 = most important and 5 = least important)

Grocery shopping		V51	Non-food shopping		V55
Education		V52	Church		V56
Visiting Friends		V53	Sport		V57
Leisure		V54	Hospital		V58

15 Please list the most important destinations for the trips you typically make? (rank from 1 to 5, with 1 = most important and 5 = least important)

Krugersdorp		V59	Randfontein /Westonaria / Carletonville		V64
-------------	--	-----	---	--	-----

Luipaardsvlei		V60
Johannesburg		V61
Soweto		V62
Leratong Hospital / Azaadville		V63

Magaliesburg / Rustenburg		V65
Roodepoort		V66
Muldersdrift		V67
Other (please specify)_____ V68		V69

16 Are there trips you would like to make but are unable to due to lack of transport?

Yes:

1

No:

2

V70

Top ten destinations (list closest town)... or it could be places in Kagiso or other towns

	V71
	V72
	V73
	V74
	V75

	V76
	V77
	V78
	V79
	V80

17 For any type of new local transport service to what extent will cost affect your willingness to use it?

Greatly	Somewhat	Not very much	
1	2	3	V81

18 How much are you prepared to pay for the following destinations?

	Rands	
Krugersdorp		V82
Luipaardsvlei		V83
Johannesburg		V84
Soweto		V85
Leratong Hospital / Azaadville		V86

	Rands	
Randfontein / Westonaria / Carletonville		V87
Magaliesburg / Rustenburg		V88
Roodepoort		V89
Muldersdrift		V90
Other (please specify)_____ V91		V92

Yes	No
-----	----

19 Do you have:

(a) a long-term illness?

(b) a disability?

1	2	V93
1	2	V94

If yes, do you experience any travel difficulties as a result of this?

Can you use normal public transport?

Yes	No	
1	2	V95
1	2	V96

Yes	No
-----	----

20 Do you have a dependant with:

(a) a long-term illness?

(b) a disability?

If yes, do you experience any difficulties with transport for them?

1	2	V97
1	2	V98
1	2	V99

21 How do you find the physical and environmental quality of the transport facilities?

Below standard	Adequate standard	High Standard	Excellent standard	
1	2	3	4	V100

22 Are the transport modes of an appropriate hygienic standard?

Below standard	Adequate standard	High Standard	Excellent standard	
1	2	3	4	V101

23 How do you find the safety levels of the transport modes you usually use?

Below standard	Adequate standard	High Standard	Excellent standard	
1	2	3	4	V102

24 Do you intend buying a motor vehicle for you or your family in the future?

Yes:

1

No:

2

V103

25 When do you think this will happen (number of years)? _____

V104

26 What will be the three major purposes of the vehicle (choose only three)?

Going to work or looking for work	1	V105
Education/ Training	2	V106
Food and grocery shopping	3	V107
Children to /from creche/school etc	4	V108
Visiting friends/relatives	5	V109
Social activities (public house, cinema etc)	6	V110
Sport and recreation	7	V111
Going to church	8	V112

27 Do you intend changing the modes of transport presently utilized?

Yes:

1

No:

2

V113

If yes, how many trips per mode of transport will you make per week?(relate to Question 12)

Transport Mode	Number per week	
Cycle/ Motor cycle		V114
Own family vehicle		V115
Another private vehicle		V116
Scheduled Public (bus)		V117
Scheduled Private (bus)		V118
School bus		V119
Taxi		V120
On foot		V121
Train		V122
Other		V123

28 Do you have any comments regarding current local transport services in Kagiso Township and what would you like to see being done in the future and who should do it?

V124

APPENDIX B

Municipal Group Questionnaire

MUNICIPAL GROUP QUESTIONNAIRE

Legislative framework

1. What is the legal mandate of the municipality with regards to the regulation and provision of local transport facilities?
2. How does the municipality regulate the management of people and goods in its area of jurisdiction?
3. What are the different types of permits does the municipality issue for the provision of local transport?
4. Does the municipality run any transport service of its own?
5. Does it have any agreements / links with transport operators e.g. sub-contracted services

Municipal transport planning

6. How is transport planning conducted in the municipality?
7. What policies / strategies has the municipality put in place to ensure an effective and efficient transport system in Kagiso Township?
8. Does the municipality have regulations for the construction of taxi ranks, bus stops, footpaths, etc.?
9. Does the municipality regulate the development of routes for the purposes of public transportation?
10. How is the provision of local transport infrastructure funded?
11. What is the budget for Kagiso Township (Please provide disaggregated historical figures, where available).
12. What are the current problems experienced with regards to the allocation of funding to fulfil the transport planning mandate?
13. Has there been any violation of the transport planning requirements?
14. Does the municipality have a land transport management system or does it have a plan to acquire one in the foreseeable future?

Infrastructural requirements

15. What is the level of funding with regards to roads infrastructure in Kagiso Township?
16. Is there a backlog with regards to the provision of roads infrastructure, transport facilities (i.e. taxi ranks, bus stops)? Please provide figures, where available.
17. How many taxi ranks does the municipality maintain in Kagiso Township and how many does it intend to build / upgrade in the foreseeable future?
18. How many transport permits have been allocated in Kagiso Township?

Service delivery

19. Does the municipality control and monitor the service standards in the provision of public transport in its area of jurisdiction?
20. How does the municipality promote the optimal use of public transport modes?

Environmental impact management

21. How does the municipality control the impact of local transport in the environment (air quality, traffic congestion, noise pollution, aesthetics, etc.)?
22. What are the resultant conditions and its causes and effects for the above?
23. What mitigating measures is the municipality implementing in order to protect the environment?

Consultation forums

24. What consultative mechanisms does the municipality employ in its transport planning?
25. Who are the formal transport groups in Kagiso Township does the municipality consult with on local transport matters (except the Ward Committees)?
26. Do Ward Committee members participate in discussions on transport matters?

Security

27. How does the municipality ensure road traffic security and management in Kagiso Township?
28. How is the local police-transporter relationship?
29. How many full-time police officers are allocated to Kagiso Township for the purposes of monitoring and enforcing transport regulations?

Future plans

30. What are the plans of the municipality with regards to fulfilling its obligations in terms of the National Land Transport Transition (Act 22 of 2000)?
31. What measures is the municipality going to take to fulfil these obligations?
32. What are the potential barriers will the municipality face in this endeavour?

Thank you for your cooperation!

APPENDIX C

Local Transport Associations Questionnaire

LOCAL TRANSPORT ASSOCIATIONS QUESTIONNAIRE

Transport groups

1. What is the official name of your organization?

2. What year was your Association established?

3. How many registered members does your Association have?

4. What services are offered by the Association to its registered members?

5. What financial contributions are registered members supposed to make for the smooth running of the Association?

Institutional arrangements

6. Does the Association have a constitution to govern its day-to-day activities?

7. What are the main activities of the Association?

8. Does the Association keep records of its activities?

9. When was the last time elections were held for choosing officer bearers?

10. Does the Association hold regular meetings for all its members?

11. Does the Association need assistance with regards its administration?

12. Are the financial records of the Association audited every financial year?

Quality of transport

13. What physical condition are most of the vehicles which operate under your Association?

14. Are the taxi ranks or facilities that you use visually appealing?

15. Does the Association have a dress code for all the drivers, and do you strictly monitor their appearance?

16. Does the Association have a mechanism to receive and respond to customers' communication regarding services?

17. Does the conduct of your taxi drivers' behaviour instil confidence amongst local transport users?

18. Are the transport users feeling safe in transactions with the taxi drivers?

19. What are the operating hours for most of the routes?

20. Does the Association frequently source the views of its members (i.e. taxi owners)?

Capital investment / running costs

21. What are the average capital costs that are incurred by anyone who wishes to operate a minibus taxi (i.e. cost of a minibus, accessories, etc)?

22. What are the average monthly running costs of a local minibus taxi (i.e. petrol & oil, spares, service, etc.)?

23. Are all the above costs a barrier for entry to anyone who wishes to enter the industry?

Profitability

24. What are the average trips does any taxi make per route (please provide the statistics where available)?

25. Are all the routes profitable (please provide the statistics where available)?

26. What problems have been encountered with unprofitable routes, if any?

27. How is pricing calculated for each route?

28. How are the taxi-fare increases calculated and regulated?

29. Does the Association benchmark it's pricing with other similar Association working within the same scope (i.e. same size if township and population)?

Transport routes

30. Does your Association regulate the assignment of routes?

31. Are there any routes that you share with other associations? If, so please name them.

32. What are the routes that you Association are controlling?

33. Does your Association intend developing new routes?

Types of vehicles used

34. What types of vehicles (taxis) are prevalent in Kagiso Township? (May I have a copy of your database if available?)

35. Is the Association participating in the new Taxi Recapitalization Programme?

Police-transporter relationship

36. Does the Association have a structured relationship with the local law enforcement agencies (i.e. South African Police Service and the Mogale City Traffic Department)?

37. Does the Association have programmes to promote legal compliance and road safety for its members?

38. Are there any known problems between the individual Association members and the local law enforcement agencies?

39. Does the Association keep records of all road accidents, traffic fines, and other transport related transgression that have been allegedly caused by its members? If so, may I have the database?

Organization of transport

40. Is the Association competing with other transport service providers for its customer base (i.e. buses, trains, private motor vehicles)?

41. How does the Association coordinate the cooperation amongst the rival taxi groups?

42. Is this cooperation structured (i.e. memorandum of understanding, dispute resolution mechanisms, etc.)?

43. What type of relationship does the Association have with the Mogale City Local Municipality (e.g. co-operation or conflict)?

44. Are there any areas of concern with regards to the relationship between the Mogale City Local Municipality and the Association?

45. What resources does the Association require in the future from the Mogale City Local Municipality (e.g. more taxi ranks/ signs/ etc?)

APPENDIX D

Detailed Calculations

Simplified Travel Demand Forecasting Model

Detailed Calculations

Simplified Travel Demand Forecasting Model

	2002	2003	2004	2005	2006	2007	2008
Population estimates	114340	114226	113837	113177	112317	111328	110215

	Cycle / motor cycle	Own family vehicle	Another private vehicle	Scheduled public bus	Scheduled private bus	School bus	Taxi	On foot	Train	Other	Total
No. of trips on mode <i>m</i>											
20-29	1	10	0	0	1	0	104	0	0	0	116
30-39	1	35	0	1	0	0	131	7	0	0	175
40-49	0	29	0	1	0	0	74	4	1	0	109
50-59	0	8	0	0	0	0	29	2	0	0	39
60+	0	1	0	0	0	0	7	2	0	0	10
Total	2	83	0	2	1	0	345	15	1	0	449
	0.4%	18.5%	0.0%	0.4%	0.2%	0.0%	76.8%	3.3%	0.2%	0.0%	

Trip estimates by mode	2005	2006	2006
No. of trips - Cycle / motor cycle	175.48	174.14	173.93
No. of trips - Own family vehicle	6493.10	6443.76	6387.02
No. of trips - Another pvt vehicle	0.00	0.00	0.00
No. of trips - Scheduled public bus	130.41	129.42	128.28
No. of trips - Scheduled pvt bus	113.86	113.00	112.00
No. of trips - School bus	0.00	0.00	0.00
No. of trips - Taxi	30564.77	30332.52	30065.43
No. of trips - On foot	1629.59	1617.21	1602.97
No. of trips - Train	68.80	68.28	67.68
No. of trips - Other	0.00	0.00	0.00
Total	39176.01	38878.33	38537.31

Age group	Gauteng population estimates	% distribution
0-19	2839191	32.13%
20-29	2022207	22.88%
30-39	1650846	18.68%
40-49	1148160	12.99%
50-59	632250	7.15%
60+	544523	6.16%
Total	8837177	100%

	Cycle / motor cycle	Own family vehicle	Another private vehicle	Scheduled public bus	Scheduled private bus	School bus	Taxi	On foot	Train	Other	Total
No. of trips on mode <i>m</i>											
20-29	115	1145	0	0	115	0	11911	0	0	0	132285
30-39	62	2169	0	62	0	0	8119	434	0	0	10845
40-49	0	2007	0	69	0	0	5121	277	69	0	7543
50-59	0	852	0	0	0	0	3089	213	0	0	4154
60+	0	358	0	0	0	0	2504	715	0	0	3577
Total	177	6531	0	131	115	0	30743	1639	69	0	39404

Males

	Geographic region	Cycle / motor cycle	Own family vehicle	Another private vehicle	Scheduled public bus	Scheduled private bus	School bus	Taxi	On foot	Train	Other	Total
Age group (20 – 29)	Kagiso Ext 13	0	0	0	0	0	0	0	0	0	0	0
	Kagiso Central	0	3	0	0	0	0	23	0	0	0	26
	Kagiso Ext 12	0	0	0	0	0	0	3	0	0	0	3
	Kagiso Ext 2	0	1	0	0	0	1	2	0	0	0	4
	Kagiso Ext 6	0	0	0	0	0	0	0	0	0	0	0
	Riverside	0	1	0	0	0	0	3	0	0	0	4
	Kagiso Proper	0	0	0	0	0	0	3	0	0	0	3
	Tsakane	0	0	0	0	0	0	0	0	0	0	0
	Hillsview	0	0	0	0	0	0	0	0	0	0	0
	Kagiso Ext 10	0	0	0	0	0	0	0	0	0	0	0
	Kagiso Ext 3	0	0	0	0	0	0	0	0	0	0	0
	Kagiso Ext 8	0	0	0	0	0	0	1	0	0	0	1
	Kagiso Ext 13	0	0	0	0	0	0	0	0	0	0	0
	Father Gerald Martin	0	0	0	0	0	0	0	0	0	0	0
	Reservoir Ridge	0	0	0	0	0	0	0	0	0	0	0
	Senoamarena	0	0	0	0	0	0	0	0	0	0	0
	Kagiso Ext 11	0	0	0	0	0	0	0	0	0	0	0
	Hospital View	0	0	0	0	0	0	1	0	0	0	1
	Kagiso Ext 14	0	0	0	0	0	0	0	0	0	0	0
	Lewsham	0	0	0	0	0	0	0	0	0	0	0
	Mmandini	0	0	0	0	0	0	0	0	0	0	0
	Swanieville	0	0	0	0	0	0	0	0	0	0	0
	East Park	0	0	0	0	0	0	0	0	0	0	0
	Total	0	5	0	0	0	0	36	0	0	0	42

Females

	Geographic region	Cycle / motor cycle	Own family vehicle	Another private vehicle	Scheduled public bus	Scheduled private bus	School bus	Taxi	On foot	Train	Other	Total
Age group (20 – 29)	Kagiso Ext 13	0	0	0	0	0	0	0	0	0	0	0
	Kagiso Central	0	3	0	0	0	0	27	0	0	0	30
	Kagiso Ext 12	0	0	0	0	0	0	2	0	0	0	2
	Kagiso Ext 2	0	1	0	0	0	0	7	0	0	0	8
	Kagiso Ext 6	0	0	0	0	0	0	6	0	0	0	6
	Riverside	0	0	0	0	0	0	6	0	0	0	6
	Kagiso Proper	0	0	0	0	0	0	5	0	0	0	5
	Tsakane	0	0	0	0	0	0	3	0	0	0	3
	Hillsview	1	0	0	0	0	0	4	0	0	0	5
	Kagiso Ext 10	0	0	0	0	0	0	0	0	0	0	0
	Kagiso Ext 3	0	0	0	0	0	0	0	0	0	0	0
	Kagiso Ext 8	0	0	0	0	0	0	1	0	0	0	1
	Kagiso Ext 13	0	0	0	0	0	0	1	0	0	0	1
	Father Gerald Martin	0	0	0	0	0	0	0	0	0	0	0
	Reservoir Ridge	0	0	0	0	0	0	2	0	0	0	2
	Senoamarena	0	0	0	0	0	0	0	0	0	0	0
	Kagiso Ext 11	0	0	0	0	0	0	1	0	0	0	1
	Hospital View	0	0	0	0	0	0	0	0	0	0	0
	Kagiso Ext 14	0	1	0	0	0	0	0	0	0	0	1
	Lewsham	0	0	0	0	0	0	0	0	0	0	0
	Mmandini	0	0	0	0	0	0	0	0	0	0	0
	Swanieville	0	0	0	0	0	0	1	0	0	0	1
	East Park	0	0	0	0	0	0	2	0	0	0	2
	Total	1	5	0	0	0	0	68	0	0	0	74

Males

	Geographic region	Cycle / motor cycle	Own family vehicle	Another private vehicle	Scheduled public bus	Scheduled private bus	School bus	Taxi	On foot	Train	Other	Total
Age group (30 - 39)	Kagiso Ext 13	0	0	0	0	0	0	0	0	0	0	0
	Kagiso Central	0	7	0	0	0	0	40	2	0	0	49
	Kagiso Ext 12	0	1	0	1	0	0	3	0	0	0	5
	Kagiso Ext 2	1	3	0	0	0	0	8	0	0	0	12
	Kagiso Ext 6	0	1	0	0	0	0	2	0	0	0	3
	Riverside	0	1	0	0	0	0	1	0	0	0	2
	Kagiso Proper	0	1	0	0	0	0	4	1	0	0	6
	Tsakane	0	0	0	0	0	0	2	0	0	0	2
	Hillsview	0	1	0	0	0	0	3	0	0	0	4
	Kagiso Ext 10	0	0	0	0	0	0	0	0	0	0	0
	Kagiso Ext 3	0	0	0	0	0	0	0	0	0	0	0
	Kagiso Ext 8	0	0	0	0	0	0	0	0	0	0	0
	Kagiso Ext 13	0	0	0	0	0	0	0	0	0	0	0
	Father Gerald Martin	0	0	0	0	0	0	1	0	0	0	1
	Reservoir Ridge	0	0	0	0	0	0	0	0	0	0	0
	Senoamarena	0	0	0	0	0	0	1	0	0	0	1
	Kagiso Ext 11	0	1	0	0	0	0	0	0	0	0	1
	Hospital View	0	1	0	0	0	0	1	0	0	0	2
	Kagiso Ext 14	0	0	0	0	0	0	0	0	0	0	0
	Lewsham	0	0	0	0	0	0	0	0	0	0	0
	Mmandini	0	0	0	0	0	0	1	0	0	0	1
	Swanieville	0	0	0	0	0	0	0	0	0	0	0
	East Park	0	0	0	0	0	0	1	0	0	0	1
	Total	1	17	0	1	0	0	68	3	0	0	90

Females

	Geographic region	Cycle / motor cycle	Own family vehicle	Another private vehicle	Scheduled public bus	Scheduled private bus	School bus	Taxi	On foot	Train	Other	Total
Age group (30 - 39)	Kagiso Ext 13	0	0	0	0	0	0	0	0	0	0	0
	Kagiso Central	0	5	0	0	0	0	31	2	0	0	38
	Kagiso Ext 12	0	0	0	0	0	0	2	0	0	0	2
	Kagiso Ext 2	0	6	0	0	0	0	13	0	0	0	19
	Kagiso Ext 6	0	2	0	0	0	0	3	1	0	0	6
	Riverside	0	0	0	0	0	0	2	0	0	0	2
	Kagiso Proper	0	1	0	0	0	0	3	0	0	0	4
	Tsakane	0	1	0	0	0	0	2	0	0	0	3
	Hillsview	0	2	0	0	0	0	0	0	0	0	2
	Kagiso Ext 10	0	0	0	0	0	0	0	0	0	0	0
	Kagiso Ext 3	0	0	0	0	0	0	1	0	0	0	1
	Kagiso Ext 8	0	0	0	0	0	0	0	0	0	0	0
	Kagiso Ext 13	0	0	0	0	0	0	0	0	0	0	0
	Father Gerald Martin	0	0	0	0	0	0	1	0	0	0	1
	Reservoir Ridge	0	1	0	0	0	0	0	0	0	0	1
	Senoamarena	0	0	0	0	0	0	0	0	0	0	0
	Kagiso Ext 11	0	0	0	0	0	0	1	1	0	0	2
	Hospital View	0	0	0	0	0	0	0	0	0	0	0
	Kagiso Ext 14	0	0	0	0	0	0	1	0	0	0	1
	Lewsham	0	0	0	0	0	0	1	0	0	0	1
	Mmandini	0	0	0	0	0	0	1	0	0	0	1
	Swanieville	0	0	0	0	0	0	0	0	0	0	0
	East Park	0	0	0	0	0	0	1	0	0	0	1
	Total	0	18	0	0	0	0	63	4	0	0	85

Males

	Geographic region	Cycle / motor cycle	Own family vehicle	Another private vehicle	Scheduled public bus	Scheduled private bus	School bus	Taxi	On foot	Train	Other	Total
Age group (40 - 49)	Kagiso Ext 13	0	0	0	0	0	0	0	0	0	0	0
	Kagiso Central	0	5	0	0	0	0	13	1	0	0	19
	Kagiso Ext 12	0	0	0	0	0	0	3	0	0	0	3
	Kagiso Ext 2	0	2	0	0	0	0	2	0	0	0	4
	Kagiso Ext 6	0	2	0	0	0	0	1	1	0	0	4
	Riverside	0	2	0	0	0	0	2	0	0	0	4
	Kagiso Proper	0	1	0	0	0	0	1	1	0	0	3
	Tsakane	0	0	0	0	0	0	0	0	0	0	0
	Hillsview	0	0	0	0	0	0	1	0	0	0	1
	Kagiso Ext 10	0	0	0	0	0	0	0	0	0	0	0
	Kagiso Ext 3	0	0	0	0	0	0	2	0	0	0	2
	Kagiso Ext 8	0	0	0	0	0	0	0	0	0	0	0
	Kagiso Ext 13	0	0	0	0	0	0	0	0	0	0	0
	Father Gerald Martin	0	1	0	0	0	0	0	0	0	0	1
	Reservoir Ridge	0	0	0	0	0	0	1	0	0	0	1
	Senoamarena	0	0	0	0	0	0	0	0	0	0	0
	Kagiso Ext 11	0	0	0	0	0	0	0	0	0	0	0
	Hospital View	0	0	0	0	0	0	0	0	0	0	0
	Kagiso Ext 14	0	1	0	0	0	0	0	0	0	0	1
	Lewsham	0	0	0	0	0	0	0	0	0	0	0
	Mmandini	0	0	0	0	0	0	0	0	0	0	0
	Swanieville	0	0	0	0	0	0	0	0	0	0	0
	East Park	0	0	0	0	0	0	0	0	0	0	0
	Total	0	14	0	0	0	0	26	3	0	0	43

Females

	Geographic region	Cycle / motor cycle	Own family vehicle	Another private vehicle	Scheduled public bus	Scheduled private bus	School bus	Taxi	On foot	Train	Other	Total
Age group (40 - 49)	Kagiso Ext 13	0	1	0	0	0	0	0	0	0	0	1
	Kagiso Central	0	7	0	0	0	0	23	1	0	0	31
	Kagiso Ext 12	0	0	0	0	0	0	4	0	0	0	4
	Kagiso Ext 2	0	1	0	0	0	0	3	0	1	0	5
	Kagiso Ext 6	0	1	0	0	0	0	2	0	0	0	3
	Riverside	0	1	0	0	0	0	4	0	0	0	5
	Kagiso Proper	0	0	0	0	0	0	1	0	0	0	1
	Tsakane	0	0	0	0	0	0	1	0	0	0	1
	Hillsview	0	0	0	0	0	0	2	0	0	0	2
	Kagiso Ext 10	0	0	0	0	0	0	1	0	0	0	1
	Kagiso Ext 3	0	0	0	0	0	0	0	0	0	0	0
	Kagiso Ext 8	0	0	0	0	0	0	0	0	0	0	0
	Kagiso Ext 13	0	0	0	0	0	0	0	0	0	0	0
	Father Gerald Martin	0	1	0	1	0	0	2	0	0	0	4
	Reservoir Ridge	0	0	0	0	0	0	0	0	0	0	0
	Senoamarena	0	0	0	0	0	0	2	0	0	0	2
	Kagiso Ext 11	0	0	0	0	0	0	0	0	0	0	0
	Hospital View	0	3	0	0	0	0	1	0	0	0	4
	Kagiso Ext 14	0	0	0	0	0	0	0	0	0	0	0
	Lewsham	0	0	0	0	0	0	0	0	0	0	0
	Mmandini	0	0	0	0	0	0	0	0	0	0	0
	Swanieville	0	0	0	0	0	0	1	0	0	0	1
	East Park	0	0	0	0	0	0	1	0	0	0	1
	Total	0	15	0	1	0	0	48	1	1	0	66

Males

	Geographic region	Cycle / motor cycle	Own family vehicle	Another private vehicle	Scheduled public bus	Scheduled private bus	School bus	Taxi	On foot	Train	Other	Total
Age group (50 - 59)	Kagiso Ext 13	0	0	0	0	0	0	0	0	0	0	0
	Kagiso Central	0	3	0	0	0	0	6	2	0	0	11
	Kagiso Ext 12	0	0	0	0	0	0	0	0	0	0	0
	Kagiso Ext 2	0	1	0	0	0	0	3	0	0	0	4
	Kagiso Ext 6	0	0	0	0	0	0	0	0	0	0	0
	Riverside	0	0	0	0	0	0	0	0	0	0	0
	Kagiso Proper	0	0	0	0	0	0	0	0	0	0	0
	Tsakane	0	0	0	0	0	0	0	0	0	0	0
	Hillsvieiw	0	0	0	0	0	0	0	0	0	0	0
	Kagiso Ext 10	0	0	0	0	0	0	0	0	0	0	0
	Kagiso Ext 3	0	0	0	0	0	0	0	0	0	0	0
	Kagiso Ext 8	0	0	0	0	0	0	2	0	0	0	2
	Kagiso Ext 13	0	0	0	0	0	0	0	0	0	0	0
	Father Gerald Martin	0	0	0	0	0	0	0	0	0	0	0
	Reservoir Ridge	0	0	0	0	0	0	0	0	0	0	0
	Senoamarena	0	0	0	0	0	0	0	0	0	0	0
	Kagiso Ext 11	0	0	0	0	0	0	0	0	0	0	0
	Hospital View	0	0	0	0	0	0	0	0	0	0	0
	Kagiso Ext 14	0	0	0	0	0	0	0	0	0	0	0
	Lewsham	0	1	0	0	0	0	0	0	0	0	1
	Mmandini	0	0	0	0	0	0	0	0	0	0	0
	Swanieville	0	0	0	0	0	0	0	0	0	0	0
	East Park	0	0	0	0	0	0	0	0	0	0	0
	Total	0	5	0	0	0	0	11	2	0	0	18

Females

	Geographic region	Cycle / motor cycle	Own family vehicle	Another private vehicle	Scheduled public bus	Scheduled private bus	School bus	Taxi	On foot	Train	Other	Total
Age group (50 - 59)	Kagiso Ext 13	0	0	0	0	0	0	0	0	0	0	0
	Kagiso Central	0	3	0	0	0	0	10	0	0	0	13
	Kagiso Ext 12	0	0	0	0	0	0	1	0	0	0	1
	Kagiso Ext 2	0	0	0	0	0	0	2	0	0	0	2
	Kagiso Ext 6	0	0	0	0	0	0	2	0	0	0	2
	Riverside	0	0	0	0	0	0	1	0	0	0	1
	Kagiso Proper	0	0	0	0	0	0	0	0	0	0	0
	Tsakane	0	0	0	0	0	0	0	0	0	0	0
	Hillsvieiw	0	0	0	0	0	0	0	0	0	0	0
	Kagiso Ext 10	0	0	0	0	0	0	0	0	0	0	0
	Kagiso Ext 3	0	0	0	0	0	0	0	0	0	0	0
	Kagiso Ext 8	0	0	0	0	0	0	0	0	0	0	0
	Kagiso Ext 13	0	0	0	0	0	0	0	0	0	0	0
	Father Gerald Martin	0	0	0	0	0	0	0	0	0	0	0
	Reservoir Ridge	0	0	0	0	0	0	0	0	0	0	0
	Senoamarena	0	0	0	0	0	0	1	0	0	0	1
	Kagiso Ext 11	0	0	0	0	0	0	1	0	0	0	1
	Hospital View	0	0	0	0	0	0	0	0	0	0	0
	Kagiso Ext 14	0	0	0	0	0	0	0	0	0	0	0
	Lewsham	0	0	0	0	0	0	0	0	0	0	0
	Mmandini	0	0	0	0	0	0	0	0	0	0	0
	Swanieville	0	0	0	0	0	0	0	0	0	0	0
	East Park	0	0	0	0	0	0	0	0	0	0	0
	Total	0	3	0	0	0	0	18	0	0	0	21

Males

	Geographic region	Cycle / motor cycle	Own family vehicle	Another private vehicle	Scheduled public bus	Scheduled private bus	School bus	Taxi	On foot	Train	Other	Total
Age group (60+)	Kagiso Ext 13	0	0	0	0	0	0	0	0	0	0	0
	Kagiso Central	0	1	0	0	0	0	0	1	0	0	2
	Kagiso Ext 12	0	0	0	0	0	0	0	0	0	0	0
	Kagiso Ext 2	0	0	0	0	0	0	0	0	0	0	0
	Kagiso Ext 6	0	0	0	0	0	0	0	0	0	0	0
	Riverside	0	0	0	0	0	0	0	0	0	0	0
	Kagiso Proper	0	0	0	0	0	0	0	0	0	0	0
	Tsakane	0	0	0	0	0	0	0	0	0	0	0
	Hillsview	0	0	0	0	0	0	0	0	0	0	0
	Kagiso Ext 10	0	0	0	0	0	0	0	0	0	0	0
	Kagiso Ext 3	0	0	0	0	0	0	0	0	0	0	0
	Kagiso Ext 8	0	0	0	0	0	0	0	0	0	0	0
	Kagiso Ext 13	0	0	0	0	0	0	0	0	0	0	0
	Father Gerald Martin	0	0	0	0	0	0	0	0	0	0	0
	Reservoir Ridge	0	0	0	0	0	0	0	0	0	0	0
	Senoamarena	0	0	0	0	0	0	0	0	0	0	0
	Kagiso Ext 11	0	0	0	0	0	0	0	0	0	0	0
	Hospital View	0	0	0	0	0	0	0	0	0	0	0
	Kagiso Ext 14	0	0	0	0	0	0	0	0	0	0	0
	Lewsham	0	0	0	0	0	0	0	0	0	0	0
	Mmandini	0	0	0	0	0	0	0	0	0	0	0
	Swanieville	0	0	0	0	0	0	0	0	0	0	0
	East Park	0	0	0	0	0	0	0	0	0	0	0
	Total	0	1	0	0	0	0	0	1	0	0	2

Females

	Geographic region	Cycle / motor cycle	Own family vehicle	Another private vehicle	Scheduled public bus	Scheduled private bus	School bus	Taxi	On foot	Train	Other	Total
Age group (60+)	Kagiso Ext 13	0	0	0	0	0	0	0	0	0	0	0
	Kagiso Central	0	0	0	0	0	0	5	1	0	0	6
	Kagiso Ext 12	0	0	0	0	0	0	0	0	0	0	0
	Kagiso Ext 2	0	0	0	0	0	0	1	0	0	0	1
	Kagiso Ext 6	0	0	0	0	0	0	0	0	0	0	0
	Riverside	0	0	0	0	0	0	0	0	0	0	0
	Kagiso Proper	0	0	0	0	0	0	0	0	0	0	0
	Tsakane	0	0	0	0	0	0	1	0	0	0	1
	Hillsview	0	0	0	0	0	0	0	0	0	0	0
	Kagiso Ext 10	0	0	0	0	0	0	0	0	0	0	0
	Kagiso Ext 3	0	0	0	0	0	0	0	0	0	0	0
	Kagiso Ext 8	0	0	0	0	0	0	0	0	0	0	0
	Kagiso Ext 13	0	0	0	0	0	0	0	0	0	0	0
	Father Gerald Martin	0	0	0	0	0	0	0	0	0	0	0
	Reservoir Ridge	0	0	0	0	0	0	0	0	0	0	0
	Senoamarena	0	0	0	0	0	0	0	0	0	0	0
	Kagiso Ext 11	0	0	0	0	0	0	0	0	0	0	0
	Hospital View	0	0	0	0	0	0	0	0	0	0	0
	Kagiso Ext 14	0	0	0	0	0	0	0	0	0	0	0
	Lewsham	0	0	0	0	0	0	0	0	0	0	0
	Mmandini	0	0	0	0	0	0	0	0	0	0	0
	Swanieville	0	0	0	0	0	0	0	0	0	0	0
	East Park	0	0	0	0	0	0	0	0	0	0	0
	Total	0	0	0	0	0	0	7	1	0	0	8